

HUALAPAI TRIBE PRE-DISASTER MITIGATION PLAN

Submitted to:

Federal Emergency Management Agency

1111 Broadway, Suite 1200

Oakland, CA 94607-4052

Prepared by:

Hualapai Department of Natural Resources

P.O. Box 300

Peach Springs, AZ 86434

August, 2004

1.0 INTRODUCTION

1.1 Planning Process

As the Hualapai Reservation in northwestern Arizona is governed solely by the Hualapai Tribe and its nine member Tribal Council, this pre-disaster mitigation plan (Plan) is not a multi-jurisdictional planning effort. A resolution from the Hualapai Tribal Council adopting this Plan is attached as Appendix A.

Various programs within the Hualapai Department of Natural Resources and other tribal departments were involved with the preparation of this Plan. These include the Agriculture, Wildlife, Fisheries and Parks, Water Resources, Administration and Forestry Programs. In addition, the Hualapai Tribe's Departments of Planning and Community Development, Roads, Cultural Resources, Public Works, Housing and Education also provided valuable information regarding the preparation of the Risk Assessment (RA). The Grand Canyon Resort Corporation and the U.S. Bureau of Indian Affairs, Truxton Canon Field Office also provided important information regarding disaster history and asset values. The twelve member Interdisciplinary Team (IDT) of the Hualapai Tribe were also involved from the beginning of this planning process by identifying hazards, resources and features of the Hualapai Reservation that needed to be evaluated within the RA document. The IDT is made up of the Health Department Director, the Natural Resources Department Director, a Cultural Resources Technician, the BIA Fire Management Officer, the Agriculture Program Manager, the BIA Forestry Supervisor, the Wildlife, Fisheries and Parks Program Manager, a Hualapai Tribal Member, the Grand Canyon Resort Corporation General Manager, the Planning and Economic Development Director, the Housing Director and the University of Arizona Agriculture Extension Agent. The IDT also reviewed the completed RA and provided comments and additional data for inclusion in the RA. The RA and this document were also reviewed and recommended for approval by the IDT and approved by the Hualapai Tribal Council. The IDT met with the Tribe's Senior Scientist (lead author of the Plan) a total of four times for two to six hours to discuss all aspects of the Risk Assessment and the final Plan. The IDT also provided written comments on drafts of each of the documents.

Staff of the Federal Emergency Management Agency (FEMA) were highly involved with development and review of all phases of preparation of the Risk Assessment and the Pre-disaster Mitigation Plan. FEMA also provided a Risk Assessment Workshop that was attended by the tribe's Senior Scientist. As mentioned above, the BIA Forestry program also provided valuable data regarding past disasters and wildfires and on emergency response capabilities.

This Plan integrates parts of the Hualapai Tribe's Cooperative Drought Contingency Plan and Fire Management Plan by proposing mitigation projects that were identified in these plans as needed to reduce the impacts of regional drought and

catastrophic wildfire. These projects are described below. Some of the information on hazard vulnerability were also derived from these plans. Loss estimates were derived from discussions with local engineers, construction companies, the tribal Finance Director, school superintendents and facilities managers.

1.2 BACKGROUND

1.2.1 Geography

The Hualapai Reservation is located in northwestern Arizona and includes nearly one million acres (1,562 mi²) of land including 108 miles of the Colorado River in Grand Canyon (Figure 1). The reservation is at the southwestern edge of the Colorado Plateau physiographic province. The northernmost boundary is 108 miles of the Colorado River from National Canyon to one mile above Columbine Falls on Lake Mead. Tribal headquarters are located in Peach Springs (Figure 2) on Route 66 at the southern boundary of the reservation. The majority of tribal members residing on the reservation live in Peach Springs.

Two satellite areas of the main reservation are both about 1.5 mi² in size. One is located in Valentine, AZ about 15 miles west of Peach Springs and the other is located on the Big Sandy River near Wickieup, AZ about 50 miles south of Peach Springs.

1.2.2 Topography

The topography of the reservation varies greatly because of its location at the southwestern edge of the Colorado Plateau province. The northeastern and northwestern parts of the reservation are characterized by deeply incised canyons and high plateaus that have steep to near-vertical cliffs typical of the western end of Grand Canyon. To the west and southwest, is a small range of mountains with moderate slope lying on top of prominent cliffs that mark the western edge of the Colorado Plateau. To the south and southeast are broad, flat plateaus interrupted by generally north-south trending cliffs. The elevations on the reservation range from as much as 8,500 feet on the eastern portion to 1,175 feet on the Colorado River above Columbine Falls (depending on the elevation of Lake Mead).

1.2.3 Climate

The climate throughout the Hualapai Reservation is generally mild and arid although extremes associated with microclimates in Grand Canyon are common (USGS 2000). Average daily maximum temperatures vary from the mid 90's during the summer and to the mid 50's during the winter. Summer temperatures along the Colorado River, however, typically exceed 100-105° F. Temperature extremes of over 110° F in the summer and below 0° F during the winter have been recorded. Annual precipitation is light and averages about 11 inches per year (Sellers and Hill 1985). Most of the precipitation occurs during isolated monsoonal thunderstorms in the summer months. Substantial accumulations of snow can occur in the winter months at higher elevations. As with other areas of the Colorado Plateau, the Hualapai Reservation

experiences drought conditions that can last for several years followed by much shorter periods of above normal precipitation. Current climatological data are available for the reservation at Peach Springs and Grand Canyon West on the far western end of the reservation.

1.2.4 Socioeconomics

The Hualapai Tribe depends on tourism, timber harvest, hunting and cattle ranching for the main economic development on the Hualapai Reservation. Nearly 100,000 tourists visit Grand Canyon West per year to experience the beauty of Grand Canyon and the Colorado River and enjoy an outdoor picnic lunch. In addition, the Hualapai Lodge is the headquarters for a river-rafting enterprise where visitors are provided a 55 mile white-water rafting trip from Diamond Creek to Pearce Ferry on the Colorado River.

Ponderosa pine covers nearly 100,000 acres of land on the eastern portion of the reservation where 25 timber harvest compartments have been delineated. The Hualapai Forestry Program manages silvicultural activities for the tribe. The schedule is for one compartment to be harvested per year on a rotating basis.

Members of the general public pay various permit fees to hunt desert bighorn sheep, elk, antelope and turkey on the Hualapai Reservation. The fees can be substantial as the reservation supports trophy wildlife populations and offers unique Grand Canyon hunting experiences. Each hunter is led by a certified Hualapai big-game guide who are also substantially compensated.

2.0 RISK ASSESSMENT

2.1 INTRODUCTION

The Hualapai Reservation (Figure 1) including the town of Peach Springs, satellite properties in Valentine and at the Big Sandy near Wickieup, Arizona and Grand Canyon West face the threat of several potential disaster situations. Among the potential disasters that these areas face are wildfire, drought, flooding, hazardous materials spills, earthquake and terrorism. This Risk Assessment for the Hualapai Reservation is an effort to identify potential hazards, their potential location, the losses that could be expected as a result of a disaster and the potential mitigation activities that may reduce the severity of loss in future disasters. The list of potentially affected areas was developed by the Hualapai Department of Natural Resources staff in conjunction with the tribe's Interdisciplinary Team (IDT). The BIA Forestry Program, the BIA Truxton Canon Field Office, the Hualapai Department of Public Works, the Hualapai Department of Planning and Economic Development, the Hualapai Department of Finance, the Grand Canyon Resort Corporation, the Peach Springs and Music Mountain Schools, the Hualapai Cultural Resources Program and the Hualapai Forestry Program provided valuable information regarding hazard history, vulnerability, mitigation, asset values and probabilities of future hazards. All of this information was conveyed orally from

individuals' memory and/or notes. Numerous web sites were consulted for data including the Flood Insurance Map site, the USGS Peak Acceleration web site and the National Drought Monitor site.

2.1.1 Land Use Trends

Trends in land uses on the Hualapai Reservation include increased dispersal of housing units from central Peach Springs, increased resort and transportation development at Grand Canyon West, potential for a golf course at Grand Canyon West, expansion of the Youth Camp facility, expansion of the Endangered Fish Rearing Facility, establishment of staging areas at Diamond Creek and potential development of a ranch at Quartermaster Canyon. Much of these land use trends will increase the assets of the Hualapai Tribe and will vary in their vulnerability to hazards.

2.1.2 Hazard Profiles

As mentioned above, the potential disasters that have the potential to occur on the Hualapai Reservation are wildfire, drought, flooding, hazardous materials spills, earthquake and terrorism. Below, we provide a general overview of each hazard type. There is very little written documentation of past hazard events within the Hualapai Tribe's and the Bureau of Indian Affairs' files located in Peach Springs. We contacted the regional BIA office requesting information and Mohave County. Neither of these entities had any documentation of hazard events and locations. The majority of the information given here is from general knowledge of the employees of the Hualapai Department of Natural Resources. Some employees of the department have been working in Peach Springs for over 20 years, and we are using their recollections and the documentation they may have to prepare the hazard profiles.

2.1.2.1 Wildfire

Wildfires are a common occurrence on the Hualapai Reservation with an average of nearly 56 fires occurring per year from 1991-2000 (Hualapai Tribe Fire Management Plan; Appendix C). The majority of the fires are caused by lightning with many fewer fires being caused by children, debris burning, smoking, railroads, campfires, arson and equipment use. Fires on the west side of the reservation are usually extinguished rapidly due to the low fuel loads found there. Occasionally, a fire will spread on the west side due to high winds. These fires are monitored closely by the BIA Forestry Program and extinguished if structures or other assets are in danger. On the east side of the reservation in the ponderosa pine and pinyon pine/juniper woodlands, there are much higher fuel loads and greater potential for catastrophic wildfires. Through prescribed burning and mechanical fuels management activities, the BIA Forestry Program has successfully reduced the threat from catastrophic fire in much of the eastern reservation. There have been significant wildfires, however, in the past. These fires are discussed below in the assessment of hazards that have the potential to impact the timber resources of the eastern reservation. Thus the main hazard area for wildfire is the eastern ponderosa pine and pinyon-juniper woodlands portions of the

reservation. In addition, the urban/wildfire interface around the town of Peach Springs is considered by the BIA Forestry Program (Richard Powskey, personal communication) as having a low potential for catastrophic fire and structure damage. Two fire engines are located in the town to respond to structural fires in Peach Springs.

2.1.2.2 Drought

Drought has periodically affected the Hualapai Reservation since its establishment in 1883. Drought impacts can be seen in the loss of livestock and wildlife as well as widespread tree mortality (Hualapai Cooperative Drought Contingency Plan; Appendix B). At times, mandatory water conservation measures are imposed on the Peach Springs community. Peach Springs gets its water supply from the Truxton Well eight miles west of the town. This well has never gone dry due to drought. The Hualapai Department of Natural Resources through the Cooperative Drought Contingency Plan has identified numerous drought mitigation activities that will reduce the impacts of future droughts. Some of those mitigation actions are identified in this document within the Mitigation Strategy section. Drought history, potential losses, drought vulnerability and drought mitigation are discussed below for many of the assets of the Hualapai Reservation. Drought hazard affects the entire reservation.

2.1.2.3 Flooding

Flooding occurs both within the town of Peach Springs and within the open canyons that drain to the Colorado River. Flooding of Peach Springs typically occurs during the summer monsoon thunderstorm season when large volumes of water are deposited over a short period of time. Flood waters travel through Peach Springs in the Truxton Wash canal that runs along the railroad tracks. Large volumes of water have overrun the banks of the canal several times in recent memory. In 2003, two large floods impacted the Hualapai Lodge and numerous residences in town. Floods also occur in Peach Springs Canyon that wash out Diamond Creek Road (Figures 1 and 12) in several places. The BIA Roads Program has the responsibility of repairing Diamond Creek road when it gets washed out.

There is also potential for flooding of the Colorado River in Grand Canyon on the northern border of the reservation. In 1983, there was an extended flood of 100,000 cubic feet per second (cfs) that damaged Glen Canyon Dam and two ramadas along the river at Diamond Creek. Fortunately, there are few assets located along the river beyond the natural resources of the canyon. In addition, the Glen Canyon Dam Adaptive Management Program has the ability to direct controlled floods along the river as a resource management tool for improving camping beaches and habitats for native fish in Grand Canyon. A controlled flood occurred in 1996 where the dam released 45,000 cfs for twelve days. Few of the benefits from that flood remain today.

2.1.2.4 Hazardous Materials Spills

The Santa Fe/Burlington-Northern railroad runs through the center of Peach Springs often carrying hazardous materials. This railroad also has the potential to transport nuclear waste to the Yucca Mountain Depository in Nevada in the future. Train derailment could result in a significant spill in the town of Peach Springs that could affect the health of the general public and pollute the environment. In 1998, the train derailed approximately 35 miles west of Peach Springs due to bridge failure resulting from torrential rains. In addition, hazardous materials are occasionally transported through Peach Springs by truck.

2.1.2.5 Earthquake

Mild to moderate earthquakes can be periodically felt in the Peach Springs community. Little or no damage has occurred due to earthquakes in Peach Springs in the recent past (Charles Murphy, IDT Chairman, personal communication). The Hualapai Lodge is the only multistory (2) building on the Hualapai Reservation. The lodge was built in 1997 without any earthquake-proof technology. Earthquakes have little potential for causing damage to the assets of the Hualapai Reservation.

2.1.2.6 Terrorism

It is conceivable that vandals or terrorists could damage the assets of the Hualapai Reservation. In the past, the majority of terrorist activities includes breaking into office buildings and destroying or stealing equipment and furniture and stealing tribal vehicles. Vehicles have also been vandalized while parked within the fenced yards of some of the tribal departments. Damage to water tanks, water lines and other remote equipment has also occurred in the past. In general, the level of damage to the assets of the Hualapai Reservation have been minor to moderate.

Below, we provide a table to identify assets of the Hualapai Reservation, potential hazards that could impact those assets, potential losses associated with those hazards and the potential mitigation actions that could be implemented to alleviate future losses. Following the table is text describing the assets, hazards, losses and mitigation actions.

Table 1. Risk Assessment for the Hualapai Reservation. Assets in greatest danger of loss from disaster are in red.

Assets Potentially Affected	Potential Hazard	Potential Losses	Potential Mitigation
Tribal Structures			
Peach Springs	Wildfire, Terrorism* Earthquake	Housing - \$18 million Tribal Govt. -\$ 20 million Personal Prop. - \$25 million Human Life - \$1 million	implement fire management plan, increase patrols, construction of a fire station in Peach Springs, reduce fuel loads
Water Tanks, Distribution Lines	Wildfires, Terrorism, Earthquake	Infrastructure - \$2 million	increase patrols, fence facilities, reduce fuel loads, increase penalties
Grand Canyon West	Wildfire, Earthquake, Terrorism	Airprt Term. -\$600,000 Tourism - \$??	positioning of a fire truck @GCW, increase security personnel, safety inspections, reduce fuel loads
Youth Camp	Wildfire, Terrorism, Earthquake	Facilities - \$650,000	reduce fuel loads, increase patrols, fence the facility, enhance fire fighting capabilities, install sprinkler system
Music Mtn School	Earthquake, Terrorism, Wildfire	Facilities - \$2.5 million	reduce fuel loads, increase security, increase communication capabilities, increase training
Assets Potentially Affected	Potential Hazard	Potential Losses	Potential Mitigation

Natural Resources			
Wildlife and Cattle	Drought, Disease, Wildfire	Wildlife - \$4.47 million Cattle - \$916,500	install new water pipelines, purchase storage containers, increase cattle inspections, reduce fuel loads, purchase water trucks, monitor disease vectors
Peach Springs (springs)	Hazardous Materials, Terrorism	Wildlife - \$?? Tourism - \$?? Economy - \$??	hazardous materials restrictions on Diamond Creek Rd., fencing of the springs, increased patrols, reduce fuel loads, increase penalties
Timber Resources	Wildfire, Drought, Disease	Timber - \$200 million Wildlife - \$1 million Big Game - \$4 million	reduce fuel loads, monitor pest populations, reduce competition by thinning, encourage timber harvest
Cultural Resources	Terrorism	Cultural Resources - ??	increase patrols, increase penalties
Assets Potentially Affected	Potential Hazard	Potential Losses	Potential Mitigation
Utilities			
Truxton Well	Hazardous Materials, Terrorism, wildfire	Infrastructure - \$1 million	fence the unfenced well heads, increase patrols, implement source water protection plan, reduce fuel loads, increase penalties
Power Lines	Earthquake, Terrorism, Wildfire	Power line towers- ??	increase inspections, reduce fuel loads, increase communication with WAPA

Communication Towers	Terrorism, Earthquake, Wildfire	Towers - ??	increase patrols, reduce fuel loads, install fencing where needed
Fiberoptic Cables	Terrorism	Cables - ??	Establish better communication with the FCC
Sewage Ponds	Terrorism	Facilities - \$1 million	increase patrols, add razor wire to fence, increase penalties
Glen Canyon Dam	Flooding, Terrorism	\$40 million per year	Snowpack monitoring, increased security

* Terrorism includes vandalism.

2.2 RISK EVALUATION

As mentioned above, there is very little documentation regarding hazard history on the Hualapai Reservation. In addition, there is little information available as to the probability of future hazards. For example, the Flood Insurance Rate Maps indicate that the reservation is not subject to flooding, yet we experience periodic flooding. In some instances we were able to make educated attempts at providing the probabilities of future hazard occurrences. For instance, because of the activities of the BIA Forestry Program in performing prescribed burns and mechanical fuels reductions, we can say that the probability of future catastrophic wildfires has been reduced, but the exact probability is unknown because of the stochastic nature of the physical environment. In other cases, flooding for example, we know we have had periodic floods in the past and that it is certain that there will be floods in the future. When these floods will occur is, however, unknown. We expect that the review of this document by a large and diverse audience has provided us with the best documentation and accuracy regarding hazard history and future hazard probabilities that is available. Below, we examine all the relevant assets that are found on the Hualapai Reservation as related to hazard history, vulnerability, probability of future hazard occurrence and potential mitigation measures.

2.2.1 Tribal Structures

2.2.1.1 Peach Springs

The town of Peach Springs is located in northwest Arizona and is home to approximately 2,000 tribal members and the Tribal Government (Figure 2). The Hualapai Lodge is located at the intersection of Diamond Creek Road and Route 66 and has 65 rooms and a restaurant. There is one store, one gas station and a gymnasium. Approximately 16 buildings are occupied by tribal government and the Grand Canyon Resort Corporation. Two-hundred forty residences are located in Peach Springs.

2.2.1.1.1 Hazards

The community of Peach Springs is vulnerable to wildfire, flooding, terrorism, earthquake and hazardous waste spills from the railroad as they may affect governmental and private buildings/homes and other community infrastructure. The United States Bureau of Indian Affairs Forestry Program has the responsibility for prevention and containment of wildfires on the Hualapai Reservation. In their Fire Management Plan (Christensen et al. 2002; Appendix C), the tribe has identified human life and personal property as the highest priority for protection from the threat of wildfire. The severe fires of 2002 in Arizona, Colorado and Oregon point to the real threat of wildfire as it affects personal property and the safety of firefighters and the general public.

Among other acts, terrorism could come in the form of arson, contamination of the water supply and hazardous material releases. At this time, the Hualapai Tribe does not consider itself a likely target of terrorism. The tribe does feel, however, that it is prudent to evaluate potential threats from terrorism and implement mitigation measures that might reduce the impacts from any act of terrorism on the Hualapai Reservation.

Probably the greatest threat to the Hualapai Reservation and its people is the threat of hazardous materials spills from a train derailment in Peach Springs. The Santa Fe- Burlington Northern railroad passes directly through the center of Peach Springs. A derailment at or near Diamond Creek Road would effectively disconnect the police department and emergency medical services from one half of the Peach Springs community. Approximately 50 trains per day travel through Peach Springs, and many of them are carrying hazardous materials.

One of the most common hazards to tribal infrastructure comes in the form of flooding. In 2003 alone, there were two significant flooding events where the Hualapai Lodge and numerous homes were inundated by floodwaters. The canal that runs behind the lodge and near the railway was over-run by flood waters such that water, dirt and other debris were deposited at or within these structures.

Earthquakes have periodically occurred in Peach Springs, but little or no damage has resulted. The last earthquake felt in Peach Springs occurred in the summer of 2003 and was estimated at 2.4 on the Richter scale. The epicenter was located in western Grand Canyon.

2.2.1.1.2 Hazard History and Future Probabilities

As mentioned above, flooding occurs periodically as the canal that carries rain water through the community has limited capacity. Flooding was particularly bad in 2003 during the summer monsoon season. It is probable that flooding will continue to be a problem in the future unless the capacity of the storm water canal is increased.

One of the most common hazards affecting tribal structures is vandalism (terrorism). The Hualapai Department of Natural Resources has had one vehicle stolen

from its yard and wrecked and several vehicles in their compound have been damaged by vandals. The Hualapai Department of Cultural Resources has been broken into and computers stolen as has the Hualapai Forestry Program. The Hualapai Tribal Administration building has also been vandalized where the building was damaged and spray-painted and petty cash was stolen.

Earthquakes will probably continue to occur on an irregular basis. We do not expect that major earthquakes nor extensive damage to occur as a result.

2.2.1.1.3 Vulnerability

Low-lying areas near the storm water canal are very vulnerable to flooding. Structures that are particularly vulnerable include the Hualapai Lodge, houses near the canal, the Hualapai Department of Natural Resources office and storage facilities and RD's gas station and the Peach Springs elementary school. Tribal structures are vulnerable to vandalism during nights, weekends and holidays when the tribal employees are not at work.

2.2.1.1.4 Losses

Tribal governmental buildings including the tribal administration, health department, health clinic, multipurpose building, gymnasium, elderly center, dialysis center, emergency medical facility, grocery store, gas station and jail are estimated to be worth 20 million dollars. The houses in Peach Springs including the Buck and Doe development are estimated to be worth 18 million dollars. As mentioned above, tribal vehicles have been stolen and damaged and buildings have been damaged by vandals. The total loss due to vandalism in the past ten years is estimated at \$30,000.

2.2.1.1.5 Mitigation

Many activities detailed in the Hualapai Tribe's Fire Management Plan should work to reduce the chance that a wildfire will impact the town of Peach Springs. Implementation of the plan is therefore one mitigation measure that could reduce the effects of wildfire on the Peach Springs community. Prescribed burning, mechanical fuels treatments and fire prevention strategies will all reduce the likelihood of impacts to personal and governmental properties. Construction of a Fire Station in Peach Springs equipped with a modern fire truck would greatly reduce the potential loss of personal and governmental property to both wildfire and domestic fires. This station would be staffed with volunteers and the firefighters in the U.S. BIA Forestry Program.

Increased patrols by the Hualapai Tribe's Police Department would help reduce the threat of terrorism in Peach Springs. In addition, the Hualapai government, police department and other departments should be sensitive to any intelligence regarding terrorist activities that they may become aware of.

The BIA Forestry Program is the lead for the Emergency Response team that has been trained in first response to hazardous materials spills. Mitigation for hazardous

materials spills resulting from train derailment could come in the form of increased training opportunities and purchase of protective clothing and other equipment used when dealing with hazardous materials spills. An overpass at the railroad crossing would also allow the police and emergency medical personnel access to all areas of Peach Springs in the event of a derailment or other accident. We do not anticipate implementing mitigation actions for earthquake due to the earthquake history of Peach Springs.

2.2.1.2 Water Tanks, Distribution Lines

Numerous water storage facilities and water distribution lines occur on the Hualapai Reservation (Figure 3). The majority of these facilities are to deliver water to Peach Springs for domestic use and across the reservation for cattle and wildlife. The Westwater well and pipeline deliver potable water to Grand Canyon West for human consumption.

2.2.1.2.1 Hazards

Water pipelines and storage facilities are vulnerable to intense wildfires, earthquakes and terrorism. Intense wildfires could melt metal storage facilities and above-ground pipelines. The Westwater pipeline, portions of the Frazier Wells distribution system and numerous storage facilities throughout the reservation are susceptible to wildfire. Earthquakes could also cause breaks and leaks in many of the water pipelines throughout the reservation. Terrorism is another threat to the water storage and distribution facilities of the Hualapai Reservation.

2.2.1.2.2 Hazard History and Future Probabilities

Water lines regularly break due to freezing in winter and heat in the summer and probably will continue to do so. Water tanks typically have a lower occurrence of problems compared to water lines.

2.2.1.2.3 Vulnerability

Water tanks and distribution lines are very vulnerable to terrorism as they often occur in remote areas with little oversight. Tanks and water lines are also very vulnerable to wildfire on the eastern portion of the reservation where fuel loads are highest.

2.2.1.2.4 Losses

A total of two million dollars have been put into the purchase and installation of water storage tanks and pipelines across the Hualapai Reservation over the past twenty years. The exact costs of replacement will depend on the severity of the destruction.

2.2.1.2.5 Mitigation

Mitigation for loss of water pipelines and storage facilities due to wildfire comes in

the form of prescribed burning and mechanical fuels treatments. These activities are currently performed by the BIA Forestry Program in Peach Springs. A goal of prescribed burning 5,000 acres per year has been established by the Forestry Program. The majority of the prescribed burning, however, occurs in the ponderosa pine forest on the east side of the reservation due to funding limitations. Much of the water systems on the west side are still vulnerable to wildfire. Funding for fuels management and line burial on the west side of the reservation would help alleviate this threat. Mitigation for earthquake threats to water systems could come in the form of pre-disaster stabilization and reinforcement of water pipelines and storage tanks.

2.2.1.3 Grand Canyon West

Grand Canyon West (GCW) is a tourist destination on the northwestern corner of the reservation (Figure 1). As many as 500 tourists visit GCW per day by way of bus, van or airplane from Las Vegas, NV. The visitors are given a tour of Guano Point and a picnic lunch. Helicopter tours are also available where visitors are flown down next to the river where they enjoy a brief snack.

2.2.1.3.1 Hazards

Although there is not as much of a fuel load at Grand Canyon West (GCW) compared to the eastern portion of the reservation, there still is potential for a brush fire to affect Grand Canyon West primarily by affecting access and visibility. We do foresee, however, that these effects would be relatively short-term due to the relative lack of fuel.

The peak acceleration map for the Hualapai Reservation (Figure 4) shows that there is a 7% peak acceleration with 10% probability of exceedance in 50 years. This level of acceleration indicates that a substantial earthquake could occur on the Hualapai Reservation. An earthquake could impact facilities at Grand Canyon West such as the runway, terminal building, fuel storage, the giant ramada and roadways.

Terrorist activities at Grand Canyon West may include contamination of the water supply, detonation of the fuel storage container, sabotage of aircraft, hijackings or other activities. Currently, there is little security at Grand Canyon West to deter these potential disastrous actions

2.2.1.3.2 Hazard History and Future Probabilities

Wildfire has occurred near Grand Canyon West at least once every five years over the past twenty years. Wildfire will continue to be a threat to Grand Canyon West due to its remote location and lack of fire-fighting equipment. Fire suppression at Grand Canyon West is provided by the BIA Forestry Program based 60 miles from GCW in Peach Springs.

2.2.1.3.3 Vulnerability

Grand Canyon West is particularly vulnerable to wildfire because of the lack of fire-suppression personnel on site and due to its remote location. Grand Canyon West is also vulnerable to drought because of its reliance on off-site wells and pipelines.

2.2.1.3.4 Losses

The facilities at Grand Canyon West would cost \$600,000 to replace.

2.2.1.3.5 Mitigation

Clearing of brush from around the terminal building, airway and roadways would likely reduce the danger from wildfire at Grand Canyon West. Prescribed burning may also reduce fuel loads in the vicinity of GCW to further reduce the threat from wildfire.

Regular inspections of the runway, terminal building, roadways and especially the giant ramada would help to determine whether these facilities would be impacted from an earthquake of the magnitude predicted by the peak acceleration map. In addition, satellite communication capabilities are essential at GCW in the event of earthquake in case normal communications are not possible. These communication capabilities would allow access to emergency services, firefighters and the tribal and GCRC administrations.

An increased presence of security at the terminal building, in the area of fuel storage and at Guano Point would decrease the threat of terrorism at Grand Canyon West. In addition, remote monitoring of facilities would allow for a more rapid response to potential terrorist threats.

2.2.1.4 Youth Camp

Facilities at the Youth Camp located on the eastern portion of the reservation in the ponderosa pine forest include a lodge, dormitories and cabins. The Youth Camp is utilized for the annual youth camps for Native American youth, retreats and as a hunting lodge in the fall of each year.

2.2.1.4.1 Hazards

Wildfire and terrorism are the main threats to the Youth Camp facilities. The main threat of terrorism is arson as the facilities are un-manned for much of the year. The BIA Forestry Program, however, manages fuel loads through prescribed burning and mechanical fuels treatments in the vicinity of the Youth Camp to reduce the likelihood of catastrophic fire.

2.2.1.4.2 Hazard History and Future Probabilities

Wildfires are common in the area surrounding Youth Camp occurring every year. The fires are typically started by lightning (Christensen et al. 2000). The BIA Forestry Program is the lead for fire suppression in that area, and they typically are nearby during

the fire season (June-September) such that fires are normally suppressed very quickly. The area within Youth Camp is kept clear such that there is little fuel (except for buildings) to burn.

There has been little vandalism at Youth Camp due to its remote nature. There is little likelihood of terrorist activities in the future.

2.2.1.4.3 Vulnerability

Youth Camp is not very vulnerable to terrorism and is moderately vulnerable to wildfire.

2.2.1.4.4 Losses

Replacement of the facilities at Youth Camp would cost approximately \$650,000.

2.2.1.4.5 Mitigation

Implementation of the Fire Management Plan and Cooperative Drought Contingency Plan will reduce the likelihood of catastrophic wildfire on the Hualapai Reservation. As mentioned above, BIA Forestry manages fuel loads in the area to reduce the likelihood of catastrophic fire. Increased patrols by the Hualapai Tribe's Wildlife Conservation rangers and the Cultural/Natural Resources Monitor will hopefully reduce the likelihood of terrorism. In addition, installation of an alarm system for the facilities that alerts the Peach Springs police department would help reduce the likelihood of terrorism or the losses associated with terrorism.

2.2.1.5 Music Mountain School

The Music Mountain School was opened in 2000, and approximately 350 students attend the school. The school is located on the far southwest corner of the reservation (Figures 1 and 5) adjacent to the town of Truxton. The school has an indoor gymnasium and a football field with lights and snack bar.

2.2.1.5.1 Hazards

The main hazards facing the Music Mountain School come in the form of earthquake, terrorism and wildfire. Because the school was built recently (2000), we expect that the latest earthquake technology was incorporated into construction of the facility so that damage from earthquake should be minimal. Terrorists could affect the school through explosives, arson or defacement. Fuel loads in the vicinity of the school are moderate so the threat from wildfire is not large.

2.2.1.5.2 Hazard History and Future Probabilities

There have been no hazardous incidents at the Music Mountain School since its inception.

2.2.1.5.3 Vulnerability

The Music Mountain school is moderately vulnerable to vandalism because of its isolated nature. This is especially true on weekends, nights, holidays and other times when the school is closed.

2.2.1.5.4 Losses

The Music Mountain School cost 2.5 million dollars to build. The equipment and furniture within the school are worth approximately \$500,000.

2.2.1.5.5 Mitigation

Mitigation for earthquake disasters would come in the form of having established emergency response and evacuation plans for the school, periodic evacuation drills and periodic facility inspections. Mitigation for terrorism include increased security and patrols and increased communication capabilities. Mitigation for wildfire disasters include a reduction in fuel loads in the vicinity of the school and adequate fire extinguishing equipment available in a timely manner.

2.2.1.6 Valentine and Big Sandy, Arizona

Valentine and Big Sandy, Arizona are satellite portions of the Hualapai Reservation consisting of 120 and 60 acres respectively. Valentine is approximately 18 miles from Peach Springs and the Big Sandy is approximately 50 miles from Peach Springs. The Bureau of Indian Affairs, Truxton Canon Field Office is located in Valentine as are several tribal residences and an historic school building as described above. There is little development at the Big Sandy property except for a well and an air quality monitoring station.

2.2.1.6.1 Hazards

Valentine and Big Sandy are both vulnerable to wildfire, earthquake, flooding and terrorism. Fuel loads at Valentine are relatively low compared to the Big Sandy which is dominated by cat-claw acacia and other woody shrubbery. Valentine is dominated by granite outcrops. Both Valentine and the Big Sandy are adjacent to, or in, a floodplain. Valentine is adjacent to the Truxton Wash floodplain while the Big Sandy is in the Big Sandy River floodplain. Both of these washes are active on a yearly basis, usually during the summer monsoon season. Because the railroad lies between the Truxton floodplain, there is a relatively low threat from flooding at Valentine compared to the Big Sandy. Earthquakes could affect the structures at Valentine. This is especially true for the historic Valentine School which is in a state of delapidation.

Terrorists could have an impact on the residences, offices and the historic school at Valentine and at the air-quality monitoring station at the Big Sandy. Damage could come from arson, explosives or by other means.

2.2.1.6.2 Hazard History and Future Probabilities

Wildfires occur periodically in the vicinity of the Big Sandy. The habitat is desert scrub vegetation with moderate fuel loads. Responsibility for fire suppression in the Big Sandy area is with the U.S. Bureau of Land Management and the Wickieup volunteer Fire Department.

2.2.1.6.3 Vulnerability

The Big Sandy and Valentine are not very vulnerable to terrorism because of the presence of the BIA in Valentine and because of the remoteness of the Big Sandy.

2.2.1.6.4 Losses

Losses to the BIA Truxton Canon Field Office and the homes in Valentine would cost approximately 2 million dollars to replace. There are no facilities at the Big Sandy except for test wells and a soon to be installed air quality monitoring station. Loss of the test wells would cost \$90,000 to replace. Loss of the air quality monitoring station would cost \$190,000 to replace.

2.2.1.6.5 Mitigation

Mitigation for wildfire at Valentine would be to reduce fuel loads around the existing structures, establishment of a fire station at Valentine and increased communication capabilities between the Truxton Canon Field Office and the BIA Forestry Program in Peach Springs. Mitigation for potential earthquakes would be for emergency stabilization of the Valentine School and other structures in Valentine. Mitigation for flooding would be an improved and channeled stream-way for the Truxton wash near the Valentine property.

2.2.1.7 Hualapai Reservation (from outside disasters)

In the event of disasters at locations away from the Hualapai Reservation (Las Vegas, Nevada for example), displaced individuals may seek safe haven in Peach Springs. This would likely strain the human services infrastructure of the reservation. In 1996, there was a severe flood in Cataract Canyon on the Havasupai Reservation that destroyed much of the community.. As a result, the entire village of 600 Havasupai Indians were temporarily housed at the Hualapai Tribe's gymnasium for several days. This influx of people into Peach Springs severely strained the capabilities of the Tribe to provide food, water and medical provisions to these displaced people.

2.2.1.7.1 Hazards

Terrorist activities or natural disasters off reservation could cause the displacement of many individuals who might seek safe haven in Peach Springs. The

proximity of Peach Springs to Interstate 40 could expose the reservation to these travelers. As mentioned above, flooding on the Havasupai Reservation can also cause an influx of people to Peach Springs.

2.2.1.7.2 Hazard History and Future Probabilities

In 1997, there was a major flood that affected the Havasupai Reservation adjacent to the Hualapai Reservation and people living in Havasupai were evacuated and housed at the Hualapai Tribal Gymnasium for a period of five days. The people were taken care of by the Red Cross. Future flooding in Havasupai is likely.

2.2.1.7.3 Vulnerability

Havasupai is probably the only community that would need to escape hazards by coming to the Hualapai Reservation. We estimate that this might occur once every ten to twenty years.

2.2.1.7.4 Losses

At this time, we are unable to estimate the potential losses to Peach Springs resulting from outside catastrophes.

2.2.1.7.5 Mitigation

Mitigation for dealing with immigration to the Hualapai Reservation could be in the updating of the Emergency Response Plan, increasing security capabilities and the stockpiling of resources. Communication capabilities should also be upgraded.

2.2.1.8 Endangered Fish Rearing Facility

The Hualapai Tribe's Endangered Fish Rearing Facility is located on the eastern portion of the reservation near Frazier Wells (Figure 1). The facility consists of twelve, one-half acre rearing ponds, a two and one-half acre recirculation pond, a raceway and a pumphouse. We are currently rearing the endangered razorback sucker in two of the ponds.

2.2.1.8.1 Hazards

The Hualapai Endangered Fish Rearing facility is vulnerable to drought and terrorism. Extended periods of drought could result in an insufficient supply of water from the aquifer that the facility relies upon. Terrorists could poison the water thereby killing the fish or they could physically damage the infrastructure (pumps, pipelines, generator, electrical supply) thereby rendering the facility unusable.

2.2.1.8.2 Hazard History and Future Probabilities

At this time, there have been no hazards reported at the fish rearing facility. The

facility is fenced and locked at all times.

2.2.1.8.3 Vulnerability

The fish rearing facility is slightly vulnerable to terrorism. It is possible that someone could break into the pump house and destroy equipment or otherwise compromise the integrity of the fish facility systems. We believe, however, that there is little motive to do so.

2.2.1.8.4 Losses

At this time, approximately \$1,000,000 has been invested into the endangered fish rearing facility.

2.2.1.8.5 Mitigation

Mitigation for drought include the establishment of a pipeline connection to the Frazier Wells water distribution system and a comprehensive study of the aquifer that supplies the rearing facility. The Frazier Wells system relies on three separate wells that may be able to maintain the supply of water even through extended periods of drought. Mitigation for terrorism may include increased patrols, installation of an alarm system that notifies the Peach Springs police department and increased fencing. In addition, stationing of a permanent caretaker for the facility would also improve security at the facility.

2.2.2 Roadways and Railroads

2.2.2.1 Diamond Creek Road Bridge

The Diamond Creek Road Bridge (Figures 6 and 7) connects the northern and southern portions of Peach Springs over a water discharge canal. Water flows down the canal during periods of excessive precipitation; usually during the summer monsoon season. If the bridge is unpassable, the police do not have access to the northern part of the town and the southern part of the town is not accessible to emergency medical services.

2.2.2.1.1 Hazards

The main hazards to the Diamond Creek Road Bridge are flooding and terrorism. In 1974 and twice in 2003, rain runoff overtopped the banks of the canal and inundated the bridge. This effectively disrupted emergency services and law enforcement from access to both sides of the bridge. The integrity of the bridge remained intact following all three of these flood events. It is possible, however, that more extensive flooding could disrupt the bridge foundation causing it to fail.

The 2003 flooding caused extensive damage to the Hualapai Lodge and houses

located in low-lying areas. The Hualapai Department of Housing estimates that there was \$275,000 in damages from the first 2003 flood.

The recent floods have dramatically increased the amount of silt, rock and boulders beneath the Diamond Creek Road Bridge. This build up of sediment reduces the capacity of the canal beneath the bridge such that we may realize more extensive flood damage in the future.

Another hazard to the bridge comes in the way of terrorism. It would be possible for terrorists to destroy the bridge using explosives. This would greatly affect the Peach Springs community and imperil the health and safety on both sides of the bridge.

2.2.2.1.2 Hazard History and Future Probabilities

In 2003, the bridge was twice overcome with water flowing down the canal. Fortunately, the bridge remained intact. There was a considerable build up of dirt and rocks in the canal such that there is a higher probability of damage in the future from storm water.

2.2.2.1.3 Vulnerability

The Diamond Creek Road Bridge is moderately vulnerable to terrorism and moderately vulnerable to flood damage.

2.2.2.1.4 Losses

The Tribe's road engineer estimates that it would cost \$270,000 dollars to replace the Diamond Creek Road Bridge. This estimate includes construction of a temporary bridge by-pass to allow access during construction of the new bridge.

2.2.2.1.5 Mitigation

Construction of an overpass over the canal would greatly reduce the likelihood that the bridge would be flooded, but the bridge would remain susceptible to terrorist attack. We feel, however, that the risk of terrorist attack on the bridge is minimal. Construction of an overpass over both the canal and the railroad tracks would greatly improve the ability of police and medical personnel to gain access to both sides of Peach Springs. Removal of silt from a one-mile stretch of the canal beneath the bridge would also reduce the likelihood that the banks of the canal would be overrun.

2.2.2.2 Diamond Creek Takeout

The Diamond Creek takeout is located on the Colorado River at mile 225.0 L in Grand Canyon at the terminus of Diamond Creek Road (Figures 1 and 8). During the peak season (May to September) as many as 30 rafts per day take out from the river at Diamond Creek. The Hualapai River-runners also launch up to 10 rafts per day at Diamond Creek. In addition, Action Tours from Las Vegas brings tourists in SUV's down to Diamond Creek to see the river in Grand Canyon.

2.2.2.2.1 Hazards

The Diamond Creek takeout is susceptible to flooding and terrorism. During the controlled flood of 1996, when the Colorado River was running at 45,000 cfs, the takeout was fully inundated to behind the two ramadas. A larger flood would likely displace the two ramadas and potentially could affect the portable restrooms. The worst case scenario, however, would be a terrorist act at Glen Canyon Dam where the dam was partially or wholly breached. Results of this type of disaster are currently unknown. Other terrorist activities could be those that affect the ramadas and the portable restrooms.

2.2.2.2.2 Hazard History and Future Probabilities

Prior to completion of Glen Canyon Dam in 1963, there were regular floods through Grand Canyon up to 300,000 cubic feet per second (cfs). Since closure of the dam, there was a 100,000 cfs flood in 1983 when the dam overflowed due to miscalculations in snow pack in the watershed. There will undoubtedly be additional planned floods of 45,000 cfs or greater in the future to manage sediment resources in the canyon. There is a slight chance for unanticipated flooding due to miscalculations in the future.

2.2.2.2.3 Vulnerability

The Diamond Creek takeout has persisted for many decades through floods and other natural events and is therefore not very vulnerable to most hazards. As stated above, terrorist activities affecting Glen Canyon Dam could have a severe impact to the Diamond Creek takeout.

2.2.2.2.4 Losses

The Hualapai Tribe currently receives \$300,000 per year in take-out fees at the Diamond Creek take out.

2.2.2.2.5 Mitigation

Mitigation for flooding disasters would be to reinforce the ramada anchors and to stabilize the restroom facilities. Measures to prevent and minimize terrorist activities at Glen Canyon Dam would also serve as pre-disaster mitigation.

2.2.2.3 Railroad

The Santa Fe/Burlington-Northern railroad passes directly through the center of Peach Springs along Route 66 (Figures 9 and 10). Approximately 50 trains per day travel through Peach Springs. Many types of hazardous materials are transported on trains that travel this railroad.

2.2.2.3.1 Hazards

The main hazards to the Santa Fe/Burlington-Northern railroad are track failure, earthquake and terrorism. Normal deterioration occurs on railways that could lead to train derailment. There is also potential that a strong earthquake could disrupt the rail lines possibly causing a derailment and hazardous material spill or fire. Terrorists also have the potential to disrupt the rail lines thereby causing a derailment with similar consequences.

2.2.2.3.2 Hazard History and Future Probabilities

There have been several train derailments between Flagstaff and Kingman over the past 20 years. In 1999, an overpass 15 miles northeast of Kingman was washed away during monsoon rains causing the derailment of a passenger train. Fortunately, no one was killed. The train has never derailed in Peach Springs according to the Tribal Elders.

2.2.2.3.3 Vulnerability

The railway is moderately vulnerable to terrorism due to the rural landscape across which it runs. A terrorist could easily damage the track causing derailments in many areas. It is not clear how vulnerable the railway is to earthquake.

2.2.2.3.4 Losses

At this time, it is unclear what the potential losses to the railroad might be from earthquake or terrorism.

2.2.2.3.5 Mitigation

Mitigation measures for potential losses from train derailment include increased hazardous materials training for the emergency response entities (BIA Forestry Program), increased communication capabilities to reduce the impact of a derailment and frequent update and revision of the emergency response plan. In addition, it would be beneficial to establish a closer relationship with the Santa Fe/Burlington-Northern railroad to allow better communication regarding terrorism awareness and rail maintenance and condition.

2.2.2.4 Route 66 Highway

Route 66 runs along 16.2 miles of the southern border of the Hualapai Reservation (Figure 1 and 11). This road is the main transportation corridor between Peach Springs and both Kingman and Seligman.

2.2.2.4.1 Hazards

Historic Route 66 across the Hualapai Reservation is vulnerable to hazardous

materials spills, terrorism and earthquake. Interstate 40 between Kingman and Seligman, Arizona has been shut down in the past for a variety of reasons including snowpack and hostage situations. When this occurs, traffic is re-routed along Route 66 through Peach Springs. Many of the trucks that travel on Route 66 through the reservation in these situations are carrying hazardous materials. Because Route 66 is a much smaller highway than the interstate, the traffic is very congested in these situations and accidents are much more likely. Terrorists could damage Route 66 through various means including explosives and artillery. Earthquake also has the potential to damage Route 66 through faulting action of the ground.

2.2.2.4.2 Hazard History and Future Probabilities

To our knowledge, there have not been any hazards affecting Route 66 on the Hualapai Reservation.

2.2.2.4.3 Vulnerability

Route 66 is no more vulnerable than any other highway.

2.2.2.4.4 Losses

The cost to replace one mile of Route 66 is approximately one million dollars.

2.2.2.4.5 Mitigation

Mitigation for hazardous materials spills include revision of the emergency response plan to bring it up to current conditions and increased training in hazardous materials containment by first responders. Mitigation for terrorism include increased patrols by the Peach Springs police department. Mitigation for earthquake damage includes increased communications with the Arizona Department of Transportation (ADOT).

2.2.2.5 Diamond Creek Road

Diamond Creek Road is a dirt road that runs north from Route 66 in Peach Springs 23 miles to the Colorado River in Grand Canyon. Diamond Creek road is the main takeout for river rafters exiting the canyon. Because the road runs along the Peach Springs wash, it is vulnerable to periodically being washed out by summer monsoon floods. There is little development along the road except for the pump house at Peach Springs (Figures 1 and 12). The springs were once used as the main water supply for Peach Springs but have not been functional for quite some time. The Hualapai Tribe's Water Resources Program is currently evaluating renovation of the springs as a secondary source of water for Peach Springs.

2.2.2.5.1 Hazards

As mentioned above, the main threat to Diamond Creek Road is from flooding. In the past, the road has washed out an average of once every other year. After a flood, the tribe's Roads Program clears the road of debris with heavy equipment. Another threat to the road is from terrorism in the form of blockades or other travel-altering structures.

2.2.2.5.2 Hazard History and Future Probabilities

On a nearly annual basis, Diamond Creek Road gets washed out from monsoon rains. In 2003, it was washed out three times during July and August. Each time, heavy equipment is used to repair the road to a passable condition. The probability of future flooding is very high.

2.2.2.5.3 Vulnerability

As mentioned above, Diamond Creek Road is very vulnerable to flooding.

2.2.2.5.4 Losses

We estimate that it costs \$15,000 each time the Diamond Creek road washes out.

2.2.2.5.5 Mitigation

Mitigation for flooding of the Diamond Creek Road would be to install culverts and pave the road. To mitigate the threat of terrorism, increased patrols could be implemented as well as increased attention to terrorism intelligence.

2.2.3 Natural Resources

2.2.3.1 Wildlife and Cattle

The Hualapai Reservation supports an abundance of big- and non-game wildlife. Desert bighorn sheep, elk, mule deer, antelope, turkey, quail, doves and squirrels are abundant game animals while riparian vegetation along the Colorado River and its tributaries support large passerine bird populations. In addition, numerous reptiles inhabit both terrestrial and riparian habitats including the western diamondback rattlesnake, red-spotted toads, whiptail lizards, tree lizards, side-blotch lizards, chuckwallas and desert spiny lizards. Five cattle districts are located across the reservation where an average of 1,488 animal unit months are utilized. Wildlife and cattle are very vulnerable to the effects of drought and wildfire due to the high risks of wildfire and the lack of water sources across the reservation.

2.2.3.1.1 Hazards

In 2002, the effects of disaster from drought were very visible on the Hualapai Reservation. Hundreds of cattle, elk and antelope perished from the lack of forage and drinking water. As a result, the Hualapai Department of Natural Resources was forced

to haul feed and water across the reservation during the entire summer. This came at a considerable cost to the department.

Newcastle disease was recently identified in poultry from along the Colorado River in western Arizona. This disease could easily infect our wild turkey populations on the east side of the reservation. In addition, there is evidence that the west Nile virus is headed toward the Hualapai Reservation. This virus infects passerine birds, poultry and horses. It is unclear at this time whether other wildlife species such as mule deer, antelope and elk are susceptible to this disease.

Wildfire can be devastating to cattle, wildlife and their habitats. Fortunately, we are managing fuel loads through prescribed burning and mechanical fuels treatments to reduce the likelihood of having a wildfire on the Hualapai Reservation that is so large and fast moving that both cattle and wildlife cannot seek safe haven. The last time there were losses of cattle and wildlife was in the 1977 Prospect Valley fire that covered over 20,000 acres. It is unknown exactly how many animals perished.

2.2.3.1.2 Hazard History and Future Probabilities

As mentioned above, periodic drought, including the current persistent drought, can have devastating impacts to wildlife and cattle. The likelihood of future droughts is high. Currently, there has not been any disease outbreaks in wildlife or cattle on the Hualapai Reservation.

2.2.3.1.3 Vulnerability

Due to expansion of our well and pipeline systems across the reservation, we have reduced the vulnerability of wildlife to drought. Much work remains to be done, however, to fully alleviate the impacts of drought on wildlife and cattle. Wildlife and cattle remain slightly vulnerable to wildfire as well.

2.2.3.1.4 Losses

We estimate that the big-game wildlife on the Hualapai Reservation to be valued at \$4,436,500 and the cattle on the reservation are valued at \$916,500.

2.2.3.1.5 Mitigation

To reduce the effects of drought on cattle and wildlife on the reservation, it is necessary to install additional water pipelines, drinkers, storage tanks and deep wells

across the reservation. Lateral lines from the Westwater pipeline (Figure 13) that runs to Grand Canyon West are needed as well as additional pipeline infrastructure in the Frazier Wells and Prospect Valley areas of the reservation. We recently attempted to drill a deep well in Prospect Valley, but were unable to reach water. More locations for deep wells need to be evaluated and attempted.

Implementation of the Hualapai Tribe's Cooperative Drought Contingency Plan and Fire Management Plan (Christensen 2003; Appendix B and C) will also reduce the likelihood of catastrophic wildfire on the Hualapai Reservation. These plans identify specific activities to be implemented by various entities to reduce fuel loads and mitigate the effects of drought across the reservation.

To reduce the effects of disease on cattle and wildlife, more frequent inspections of cattle and wildlife need to be performed. In addition, it is important to keep abreast of disease vectors and their proximity to the Hualapai Reservation. Training in the identification of various diseases that infect cattle and wildlife is also an important activity to be undertaken as a mitigation measure to this potential disaster.

Much of the same activities to reduce the threats of wildfire to the Peach Springs community can be adopted to reduce the likelihood of catastrophic wildfire on the rest of the reservation. As mentioned above, reductions in fuel loads through prescribed burning and mechanical fuels activities greatly reduces the threat of fire, especially in the ponderosa pine forests on the eastern side of the reservation where large numbers of cattle and elk occur.

2.2.3.2 Peach Springs (Springs)

The springs in Peach Springs Canyon (Figure 14) are adjacent to Diamond Creek Road and produce approximately 3 cubic feet per second. A pumphouse is located at the springs as the water used to be pumped to the Peach Springs Community. At this time, the Hualapai Water Resources Program is attempting to renovate the facilities so that the springs can supply water to the community in Peach Springs.

2.2.3.2.1 Hazards

An automobile accident at or near the springs could release gasoline or other toxic substances into the waters flowing from the springs thereby affecting the wetland vegetation and wildlife associated with the springs. This would be especially devastating if the tribe was in an emergency drought situation where we were utilizing water from the springs for the Peach Springs community.

Terrorist activities could also impact the springs by contaminating the water supply. Again, this would be especially devastating during a drought emergency.

2.2.3.2.2 Hazard History and Future Probabilities

To date, there have not been any hazards affecting the water quality of the Peach Springs springs. A fire in 2000 did kill many of the large cottonwood trees surrounding the springs. The probability of future hazards is small as the Hualapai Department of Natural Resources is currently restoring the pumphouse and will soon install a new distribution line to the Peach Springs community. The new pumphouse will be moderately vulnerable to terrorism due to its remote location.

2.2.3.2.3 Vulnerability

As mentioned above, the new pumphouse will be moderately vulnerable to terrorism and wildfire as well.

2.2.3.2.4 Losses

Complete contamination of the water at Peach Springs would likely result in the loss of wetland vegetation and the associated wildlife. At this time, we are unable to affix a price tag to that loss.

2.2.3.2.5 Mitigation

To ensure that gasoline is the only toxic materials being transported down Diamond Creek Road past the springs, the tribe needs to enact a hazardous materials ordinance that places restrictions on the types of materials that can be transported past the springs. Vehicle inspection may also be implemented to assure that hazardous materials are not being transported past the springs.

Fencing of the springs may be necessary to prevent access to the water supply by terrorists. This may be especially necessary during emergency drought situations.

2.2.3.3 Timber Resources

The Hualapai Tribe's Forestry Program is in charge of managing timber harvest operations on the Hualapai Reservation. In the Tribe's Forest Management Plan (1987), which covered the period 1987 to 2000, 53,029 acres of ponderosa pine were identified for harvest that would yield 7,978 board feet per acre. In addition, 160,701 acres of Pinyon-juniper fuel wood lands were identified that would produce 16.8 cords of wood per acre. The threat of wildfire is very high during periods of drought.

2.2.3.3.1 Hazards

Extended periods of drought lead to increased probabilities of both wildfire and disease/herbivory in the ponderosa pine forests of the Hualapai reservation.

Devastating fires in Arizona, Oregon and Colorado in 2002 attest to the effects of extended drought on the vulnerability of timber resources to wildfire. In much of northern Arizona following the summer of 2002, infestation of ponderosa pine by bark beetles has resulted in the death of millions of trees. This again is the result of the extended drought. Fortunately, the timber resources of the Hualapai reservation have mostly escaped infestation by bark beetles as of spring, 2003.

2.2.3.3.2 Hazard History and Future Probabilities

In the past 30 years, there have been three wildfires in the ponderosa pine forests that were greater than 1,000 acres in size. These fires resulted from lightning strikes during hot, dry and windy weather conditions. Each of these fires was suppressed within two days.

2.2.3.3.3 Vulnerability

Because of silvicultural practices such as prescribed burning and mechanical fuels treatments, the vulnerability of the timber resources to wildfire is low to moderate. Vulnerability to disease appears to be low.

2.2.3.3.4 Losses

The Hualapai Tribal Forestry Program Manager has estimated the value of the ponderosa pine forest on the Hualapai Reservation at \$200 million.

2.2.3.3.5 Mitigation

Implementation of the Fire Management Plan for the Hualapai Reservation will greatly reduce the threat of catastrophic wildfires through the reduction of fuel loads and improved fire fighting capabilities. In addition, thinning programs and timber harvests will also help reduce fuel loads. Increased monitoring of disease and pest populations will help reduce the threat of disease and bark beetle outbreaks.

Implementation of the Cooperative Drought Contingency Plan (Appendix B) will also help mitigate the effects of drought on the Hualapai Reservation. This Plan identifies agencies, entities and individuals that monitor and respond to various drought conditions. Specific activities are identified to reduce the impacts of drought which will hopefully reduce the likelihood of wildfire and disease outbreaks in the future.

2.2.3.4 Cultural Resources

There are numerous culturally significant sites and artifacts scattered throughout the Hualapai Reservation. Meriwhitica, a perennial stream and riparian area in the northwestern portion of the reservation is an extremely coveted historic site for the Hualapai Tribe as well as most creeks and springs. Numerous areas of historic habitation are located throughout the reservation that contains features such as roasting

pits, sweat lodges and farming remnants.

- Small cemeteries and old burial grounds are also spread throughout the Reservation. Box Canyon, Laughing Jack Butte, Limestone, Peach Springs and Valentine are to name a few.
- Protection of historic buildings is also important. Perhaps the most notable historic structure is the Valentine School in Valentine. Abandoned in the 1950's, the school will soon undergo emergency stabilization and hopefully restoration in the near future.

2.2.3.4.1 Hazards

The main hazard to cultural resources of the Hualapai Reservation are from terrorist activities. Defacement, desecration, removal and/or damage to culturally important features of the reservation are possible and have occurred in the past. In addition, wildfires and arson have the potential to impact historical structures and features of the reservation.

2.2.3.4.2 Hazard History and Future Probabilities

The Peach Springs pump house, is a very important Traditional Cultural Property with a large grove of cottonwood trees, the springs and associated wetland and the pump house itself. This area was burned by arsonists in 1999 which destroyed the pump house, killed many of the trees and sterilized the wetland. Other hazard occurrences include vandalism of sacred sites and archaeological features. Other hazards that occur include wildfire across the reservation. The Hualapai Cultural Resources Department has a policy to suppress fires that are threatening historical structures, but not other cultural resources such as roasting pits or gathering sites. The old trading post located in Peach Springs is eligible for the National Register of Historic Places and has been impacted by vandalism in recent years. In 2000, 2001 and 2002 the building was broken into and ransacked. The probability of future break-ins to the trading post have been diminished by the installation of new doors and windows and an alarm system.

2.2.3.4.3 Vulnerability

The Hualapai Tribe has a policy of keeping information regarding the location of culturally significant resources private. There are certainly individuals, however, with local knowledge of the reservation that are aware of the location of these resources. Thus there is a small level of vulnerability of these resources to terrorism. As mentioned above, some of the significant cultural resources such as the Peach Springs pump house and the trading post are moderately vulnerable. The tribe does not consider the scattered cultural resource features not associated with structures as vulnerable because of their remote locations.

2.2.3.4.4 Losses

We are unable to assign a dollar value to the cultural resources of the Hualapai Reservation. It is safe to say, however, that the majority of the cultural resources of the Hualapai Reservation are irreplaceable.

2.2.3.4.5 Mitigation

Mitigation for the protection of cultural resources on the Hualapai Reservation include increased patrols in areas of known significant resources and increased penalties for impacts to cultural resources of the reservation. In addition, increased education of the Peach Springs police department as to the location and status of especially important cultural resources would facilitate their protection.

2.2.4 Utilities

2.2.4.1 Truxton Well

The Truxton Well is located approximately eight miles west of Peach Springs and provides the main supply of water for the community (Figures 1 and 15). Two pumping stations (one at the well and one between the well and Peach Springs) deliver water to storage tanks in Peach Springs. Due to the importance of the Truxton Well to the Peach Springs community, it is critical to reduce the threats to the well from hazardous materials spills, terrorism and wildfire.

2.2.4.1.1 Hazards

Route 66 and the Santa Fe/Burlington Northern railroad both pass in close proximity to the Truxton Well. A train derailment or an accident involving a truck carrying hazardous materials could cause spills and contamination of the Truxton aquifer. In addition, the Music Mountain High School is located in the vicinity of the well. Hazardous materials generated at the school, in the chemistry laboratory for example, could escape into the Truxton aquifer as well.

Terrorist activities also have the potential to contaminate the Truxton Well. Biological and chemical materials could be introduced into the water supply. Such contamination would have an extreme effect on the Peach Springs community as described above.

Facilities at the Truxton Well are also vulnerable to wildfire. The pumphouse, wellhead pumps and piping could be destroyed by a wildfire. Damage to these facilities would greatly affect the Peach Springs community as the Truxton Well is the sole source of potable water.

2.2.4.1.2 Hazard History and Future Probabilities

To date, no hazards have affected the Truxton Well.

2.2.4.1.3 Vulnerability

The Truxton Well is only slightly vulnerable to fire due to low fuel loads in the area. It is also slightly vulnerable to terrorism. The fence surrounding the well structures deters vandals from affecting the well.

2.2.4.1.4 Losses

Loss of the Truxton Well as the source drinking water for Peach Springs would result in having to identify a new well location, drilling of a new well, installation of pumps and storage containers and laying of a new water pipeline. We estimate the costs for these efforts to be one million dollars.

2.2.4.1.5 Mitigation

A Source Water Protection Plan that is currently being developed for the Truxton Well should be implemented to reduce the likelihood of contamination from various sources. Patrols of the facilities by the police should increase during times of elevated terrorism potential. Fuel loads in the vicinity of the well should be reduced using prescribed burns.

2.2.4.2 Power Lines

A large, three-wire 500kV power line crosses the Hualapai Reservation from the southeast portion of the reservation passing north of Peach Springs and exiting the reservation on the southwest edge (Figure 16). The towers holding the lines are 120 feet high and placed one-quarter mile apart on average. Various other, smaller, power lines occur in Peach Springs and other portions of the reservation providing electrical and telephone services to residences and tribal buildings.

2.2.4.2.1 Hazards

Earthquake, terrorism and wildfire have the potential to affect the power lines of the Hualapai Reservation. Earthquake could cause towers and/or power poles to be damaged or fall down. Terrorists could damage towers and power poles using explosives or by other means, and wildfire has the potential to melt or burn towers or power poles.

2.2.4.2.2 Hazard History and Future Probabilities

To date, no hazards have affected the power lines on the Hualapai Reservation.

2.2.4.2.3 Vulnerability

The power lines of the Hualapai Reservation have low vulnerability due to the low population numbers and few roads that are near the lines.

2.2.4.2.4 Losses

At this time, we are unable to evaluate the costs for the replacement of power lines across the reservation.

2.2.4.2.5 Mitigation

Mitigation for the impacts of earthquakes to power lines include increased inspections, increased stabilization of the towers and increased communications with Western Area Power Association regarding tower maintenance and stabilization. Mitigation for terrorism could include increased patrols and increased intelligence efforts. Mitigation for wildfire include reduction of fuel loads, area restrictions and increased numbers of fire-fighting personnel.

2.2.4.3 Communication Towers

Several communication towers are located across the Hualapai Reservation including those in Peach Springs (Figure 17). These towers serve as links to satellite and other communication venues.

2.2.4.3.1 Hazards

Earthquake, terrorism and wildfire have the potential to affect the communication towers of the Hualapai Reservation. Earthquake could cause towers and to be damaged or fall down. Terrorists could damage towers using explosives or by other means, and wildfire has the potential to melt or burn towers.

2.2.4.3.2 Hazard History and Future Probabilities

To date, no hazards have affected the communication towers on the Hualapai Reservation.

2.2.4.3.3 Vulnerability

The communications towers on the reservation have low vulnerability due to the low population level and because few roads are near the towers.

2.2.4.3.4 Losses

At this time, we are unable to evaluate the cost of the replacement of communication towers.

2.2.4.3.5 Mitigation

Mitigation for the impacts of earthquakes to communication towers include increased inspections, increased stabilization of the towers and increased communications with the Federal Communications Commission (FCC) regarding tower

maintenance and stabilization. Mitigation for terrorism could include increased patrols and increased intelligence efforts. Mitigation for wildfire include reduction of fuel loads, area restrictions and increased numbers of fire-fighting personnel.

2.2.4.4 Fiberoptic Cables

A single, under-ground fiberoptic cable runs along the utility corridor adjacent to Route 66 from the western edge of the reservation into Peach Springs and up Diamond Creek Road to a sub-station. The cable is buried to a depth of three feet.

2.2.4.4.1 Hazards

The main hazard to the fiberoptic cable is from electronic manipulation of the data traveling along the fiberoptic cable. At this time, the Hualapai Tribe is unsure what types of manipulation are possible and what the possible consequences of that manipulation might be.

2.2.4.4.2 Hazard History and Future Probabilities

To date, no hazards have affected the fiberoptic cables on the Hualapai Reservation.

2.2.4.4.3 Vulnerability

The fiberoptic cables on the reservation have low vulnerability due to the low population level and because few roads cross the cable.

2.2.4.4.4 Losses

At this time, we are unable to evaluate the cost of the replacement of fiber optic cables.

2.2.4.4.5 Mitigation

The main form of mitigation for terrorist manipulation of the fiberoptic cable comes in the form of increased communications with the FCC and with increased intelligence regarding terrorist activities in the area. In addition, increased education of the tribal government regarding terrorism and fiberoptic cables would help mitigate future actions.

2.2.4.5 Sewage Ponds

There are five, two-acre ponds on the western edge of Peach Springs, two, two-acre ponds at the Buck and Doe housing development and three, two-acre ponds at Valentine. These ponds provide sewage services for these developments and are maintained by the Indian Health Services (IHS).

2.2.4.5.1 Hazards

The main hazard to the sewage ponds is from terrorism. Unknown terrorist activities may affect the ponds.

2.2.4.5.2 Hazard History and Future Probabilities

To date, no hazards have affected the sewage ponds on the Hualapai Reservation.

2.2.4.5.3 Vulnerability

The sewage ponds on the reservation have low vulnerability due to the low population level and because the ponds are fenced.

2.2.4.5.4 Losses

We estimate the cost to replace the sewage ponds in Peach Springs to be one million dollars.

2.2.4.5.5 Mitigation

Mitigation for terrorist activities at the sewage ponds is to increase patrols, install razor-wire along the tops of the fences surrounding the ponds and to increase penalties for trespass and/or damage to the ponds.

2.2.4.6 Glen Canyon Dam/Colorado River

Glen Canyon Dam is located approximately 180 miles upstream from the eastern edge of the Hualapai Reservation on the Colorado River. The reservoir created by the dam is called Lake Powell. The dam is operated to produce hydropower and to maintain the natural and cultural resources of Grand Canyon. Completed in 1963, the dam greatly influences the character of the river below the dam. The Hualapai Tribe monitors wildlife and vegetation communities below Diamond Creek with funding from the Grand Canyon Monitoring and Research Center in Flagstaff, Arizona. In addition, the Hualapai Tribe's Grand Canyon Resort Corporation operates a river-running enterprise where visitors are taken on one and two day raft trips from Diamond Creek to the ramadas below Quartermaster Canyon (Figure 1). Numerous commercial and private rafting trips also navigate along the Colorado River on the Hualapai Reservation.

2.2.4.6.1 Hazards

The main hazards to Glen Canyon Dam and the Colorado River below the dam are flooding and terrorism. In 1983, Lake Powell spilled over the top of Glen Canyon Dam due to unexpectedly high runoff into the lake. This spill compromised the dam

such that part of the dam was washed away. As a result of the great volume of water entering Lake Powell, there was a concomitant flood in Grand Canyon of 100,000 cubic feet per second (normal is 8,000 to 25,000cfs). This flood caused extensive rearrangement of beaches and other features of the canyon.

2.2.4.6.2 Hazard History and Future Probabilities

To date, flooding in 1983 caused damage to the dam and concomitant flooding in Grand Canyon. The probability of future flooding is relatively low.

2.2.4.6.3 Vulnerability

An additional threat to Glen Canyon Dam comes in the form of terrorism.

Large dams such as Glen Canyon Dam are likely targets of terrorism as damage to a dam would have devastating consequences to downstream populations and resources. In addition, damage to the electrical generators would have large impacts to the electrical grid. Impacts from terrorists could come in many different forms including damage from explosives and crashed airliners. Another form of terrorism would be to poison the water supply of Lake Powell and the Colorado River with biological or chemical contaminants.

2.2.4.6.4 Losses

Damage to Glen Canyon Dam would likely result in multi-million dollar costs. Loss of rafting experiences in Grand Canyon is worth approximately 40 million dollars per year.

2.2.4.6.5 Mitigation

Mitigation for flooding at Glen Canyon Dam include increased monitoring of snowpack levels in the eastern Rocky Mountains and maintenance of spillways and discharge tubes at the dam. Mitigation for terrorist activities would be increased security and patrols at and around the dam. Increased intelligence activities would also help mitigate future terrorist acts.

3.0 MITIGATION STRATEGY

3.1 Mitigation Goals and Objectives

In general, the goals for disaster mitigation on the Hualapai Reservation are to reduce the level of impacts of future flooding, wildfires, drought and human-caused disasters through the design and implementation of pre-disaster mitigation actions. These goals and objectives arose out of the evaluations within the risk and vulnerability

assessments presented in Section 2.0 of this document. In addition, the mitigation goals and objectives were developed through discussions among the planning team, the IDT and various programs within the Hualapai Department of Natural Resources (Agriculture, Water Resources, Wildlife, Fisheries and Parks, Air Quality, Forestry and Administration).

3.1.1 Flooding

The Hualapai Tribe has the goal of reducing the impacts of flooding from the Truxton Wash Canal that runs through the center of Peach Springs. The objective is to increase the capacity of the canal. The mitigation action is to therefore remove the silt and rubble that has been deposited in the canal over the years. The last time the canal was cleaned was after a large flood in the mid 1970's. Another goal is to decrease the effects of flooding of the Diamond Creek Road leading to the river. The objective would be to improve the road crossings of the wash and implement other protection actions to reduce the likelihood that the road would wash out. The mitigation actions would be to install culverts, berms and rip-rap to stabilize the channel and protect the road.

3.1.2 Wildfire

The Hualapai Tribe has the goal of reducing losses of timber and wildlife habitats across the Hualapai Reservation as a result of wildfire. The objective is to implement the Fire Management Plan as prepared by the Hualapai Department of Natural Resources. As the Fire Management Plan has been adopted by the Hualapai Tribal Council and the U.S. Bureau of Indian Affairs, future losses of assets to wildfires will be less likely. Many wildfire goals and mitigation activities have been identified in the Fire Management Plan (e.g. prescribed burning and mechanical fuels treatments). The Fire Management Plan has been attached as Appendix C. The tribe also has the goal of reducing losses from structural fires within the town of Peach Springs. The objective to reduce losses within town is to establish a fire station within the community to respond to structural fires. Another objective is to reduce fuel loads at the perimeter of town to reduce the likelihood that wildfires will enter the town.

3.1.3 Drought

The Hualapai Tribe has the goal of reducing the effects of drought on cattle, wildlife, vegetation and the Peach Springs community on the Hualapai Reservation. The objective is to implement the tribe's Cooperative Drought Contingency Plan as developed by the Hualapai Department of Natural Resources and adopted by the Hualapai Tribal Council and the U.S. Bureau of Reclamation. Many drought mitigation goals and mitigation projects have been identified in the Drought Mitigation Plan that also serve as disaster mitigation plans as well. The Drought Contingency Plan has been attached as Appendix B.

3.1.4 Human-caused Disasters

The Hualapai Tribe has the goal of reducing future losses of assets resulting from

human-caused disasters. The objective is to reduce the vulnerability of tribal assets and infrastructure through increased communication, awareness, preparedness and protection.

3.2 Identification and Analysis of Mitigation Measures

In this section, we will identify major mitigation measures that have the potential to reduce the likelihood of catastrophic losses from future disasters. The hazards to be addressed with proposed mitigation activities include flooding, drought, train derailment and wildfire. These hazards were identified by the planning team as the most likely to affect the Hualapai Reservation and were also identified as those for which cost effective mitigation could be implemented. For all proposed projects, the appropriate level of compliance with the National Environmental Policy Act (NEPA) and the Endangered Species Act (ESA) will be provided prior to implementation of the proposed projects. These projects have been prioritized with the first described project having the greatest priority and the last project with the least priority. Prioritization of the projects was provided by the staff of the Hualapai Department of Natural Resources through a one-day prioritization meeting. Prioritization was based on the likelihood of a particular disaster actually happening and by weighing the benefits of a mitigation action compared with the associated costs. Finally, a summary of mitigation actions, potential losses avoided and associated costs is given in Table 1. The estimates of potential losses avoided was made by an inventory of assets that are within the areas of potential disasters.

The Frazier Wells consolidation project is extremely important to both the cattle and wildlife industries. Cattle ranchers in the Frazier Wells area have had to reduce their herds by 40% in response to the drought. In addition, some ranchers have had cattle die (as discussed above) as a result of a lack of water and feed. The elk herd in the Frazier Wells area has also declined by 44% over the past year further adding to the loss of assets for the tribe. Tourism at Grand Canyon West is limited by infrastructure development including water availability. Facilities such as a lodge, golf course and swimming pool are not possible due to a lack of water. With unemployment on the Hualapai Reservation at 70%, the lack of water at Grand Canyon West has far reaching impacts to the local community. For the amount expended, reduction in fuel loads in the ponderosa pine forest is well worth preventing devastating losses to the tribe's valuable timber resources. Clearing of the Truxton Wash is a relatively low cost project with immediate impacts to the Hualapai Lodge and local housing through reduction in the threat of flooding. Finally, while the overpass at the railroad tracks is needed, it has a very high price tag. Hopefully, however, we can find enough resources in the future to complete all of the proposed projects.

Table 2. A comparison of avoided losses and costs for mitigation actions.

Mitigation Action	Potential Losses Avoided	Costs	Potential Funding Sources
Frazier Wells Consolidation	\$5.684 million	\$388,000	U.S. Bureau of Reclamation, FEMA
Deep Well at GCW	\$4.5 million	\$462,405	U.S. Bureau of Reclamation
Reduce Fuel Loads	\$2 million	\$75,000/year	U.S. Bureau of Indian Affairs, FEMA
Clear Truxton Wash	\$121,469/event	\$30,000	Santa Fe-Burlington Northern Railroad, FEMA
Railroad Overpass	Slight potential for loss of life	\$1 million	U.S. Bureau of Indian Affairs, Arizona Dept. of Transportation, Federal Highway Administration

3.2.1 Drought

As identified in the tribe's Cooperative Drought Contingency Plan, there are several projects that can be implemented to reduce the impacts of current and future droughts on the Hualapai Reservation. Here, we will focus on two main projects; consolidation of the Frazier Wells well and pipeline system and drilling of a deep well near Grand Canyon West. Below, we outline the tasks and costs associated with these projects.

3.2.1.1 Frazier Wells Consolidation

On the east side of the Hualapai Reservation in the Frazier Wells area (Figure 1), there are three wells that serve different purposes in their water delivery. Frazier Wells

#1 serves the Thornton Tower, with the pipeline running north to the tower. This water supply is crucial to fire suppression in the fire season and for supplying the Thornton Tower fire lookout facility with water. In addition, the line continues on to Youth Camp (Figure 1) where the water is used at the hunting lodge and for the summer youth camps and retreats. Future lines connecting to the Thornton line have been proposed to extend the water supply into Prospect Valley. In addition, we just received funding from the Natural Resources Conservation Service to replace the degenerating Thornton line and install a 50,000 gallon storage tank at the tower as a contributing part of this overall consolidation plan.

Frazier Wells #2 serves a pipeline that runs in a southwesterly direction to the Twenty Pines area where the water is used for cattle, wildlife and a recreational pond. There is a 50,000 gallon storage container there for additional storage in the system. This line then continues on to Blue Mountain where a 100,000 gallon storage container exists. Frazier Wells #3 is dedicated for supplying water to the endangered fish rearing facility and the Native Tree Nursery at Frazier Wells (Figure 1). The fish facility is comprised of twelve, one-half acre rearing ponds and a two and one-half acre re-circulation pond, and the nursery covers approximately twenty acres and supports over 400 Goodding's willows.

At this time, these three well and pipeline systems are entirely independent of each other. Thus, if the pump or pipe fail or the well goes dry at well # 1 for example, there is no immediate way to ensure an adequate supply of water at the Thornton Tower for fire suppression. Similarly, if something happened to well # 3, we could not supply the fish facility and nursery with water for an unknown period of time. We propose to integrate these three well and pipeline systems by installing a 150,000 gallon centralized storage container connected to each of the three wells. In this way, if one of the wells, pumps or pipelines fails, there would be sufficient storage and production from the other two wells to maintain a constant supply of water to the three destinations. We estimate the costs associated with this project to be \$388,000.

3.2.1.2 Grand Canyon West Deep Well

Grand Canyon West (GCW) is a tourist destination on the western end of the Hualapai Reservation where tourists are bussed or flown in to enjoy a picnic lunch and the spectacular views of western Grand Canyon. Currently, up to 500 visitors per day visit GCW. Economic development at GCW is limited by a lack of a permanent water supply. The tribe has proposed construction of a destination resort complete with a hotel, golf course and RV park. These developments cannot occur until a permanent source of water is available. In addition, cattle and wildlife on the west side of the Hualapai Reservation suffer during periods of drought as there are few sources of water on this arid portion of the reservation. Drilling of a well would help supply water to the antelope and cattle in this area.

Water is currently hauled to GCW from Meadview, Arizona, a trip of approximately 60 miles round trip. Water hauling cannot provide enough water to allow further

development at GCW. In the mid 1990's, the tribe was able to secure funding from the U.S. Bureau of Reclamation (Reclamation) and others to install a solar-powered water pipeline that ran 26 miles from the Westwater Well to a storage tank near GCW. While this pipeline was a great success for the tribe and Reclamation, it was meant to be temporary in nature and does not have enough production for increased development at GCW.

Previous efforts to drill for water on the west end of the reservation by the U.S. Bureau of Indian Affairs were not successful because the wells were not deep enough (1,000 and 1,300 feet). In 1999, Reclamation funded drilling of a deep well near GCW to serve as a permanent and plentiful supply of water for GCW. Water was realized in this well at a depth of 2,870 feet. Unfortunately, casing for the hole was not installed soon enough and the well hole collapsed. Prior to collapse, the well was producing 26 gallons per minute.

We propose to drill a new deep well near the existing well and stabilize the well immediately with the appropriate casing to prevent collapse. While we expect that the water quality of water in the new well will be slightly contaminated, we expect to be able to clean the water for use in a cost-effective manner. We estimate the costs associated with development of a deep well near Grand Canyon West to be \$462,405.

3.2.2 Catastrophic Wildfire

The U.S. Bureau of Indian Affairs Forestry Program provides wildfire suppression and fuels management on the Hualapai Reservation. They have identified a need to increase their forest thinning activities on the eastern portion of the Hualapai Reservation in the ponderosa pine forest to reduce the threats of future catastrophic fires on the reservation. This is a very cost effective method for decreasing the potential loss of valuable timber and wildlife habitat resources. This project is consistent with President Bush's recent movement to thin forests throughout the western United States. We estimate that a five man crew working six months per year could sufficiently reduce fuel loads of the pine forest. We estimate the costs to implement this mitigation action to be \$75,000 per year. In addition, there is a need to establish a fire station within Peach Springs to respond to residential and governmental structural fires. It is estimated that it would cost \$120,000 to build a fire station.

3.2.3 Peach Springs Flooding

To reduce the threat of flooding in Peach Springs, we propose to use a front-end loader to clear the silt, boulders and other debris from the Truxton Wash Canal that runs through Peach Springs. This is a low-cost, highly effective method of reducing the threat of flooding in Peach Springs. We estimate the cost of this proposed project to be \$30,000 including equipment rental, operator salary and fuel costs.

3.2.4 Train Derailment

The Santa Fe/Burlington Northern Railway passes directly through the center of Peach Springs. The police department is on the south side of the tracks while the emergency medical services are located north of the tracks. If a train happened to derail (the last train derailment was 30 miles west of Peach Springs in 1996) at or near the intersection with Diamond Creek Road (Figures 1, 9 and 10), there would be no effective way for emergency medical or hazardous spill responders to have access to the entire community. To rectify this problem, we propose to build an overpass over the train tracks at Diamond Creek Road. We estimate the costs to construct the overpass to be one million dollars.

3.3 Pre- and Post-hazard Management Policies, Programs and Capabilities.

Pre-hazard management policies include implementation of the tribe's Fire Management Plan and Cooperative Drought Contingency Plan. In these plans, various pre-hazard mitigation activities are identified to reduce the likelihood of catastrophic fire and the impacts of future droughts respectively. These measures include prescribed burning and mechanical fuels treatments to reduce fuel loads to prevent catastrophic fire. To reduce the impacts of future droughts, mitigation measures such as pipeline and storage tank installation, reduction of invasive weeds and cleaning of stock tanks are being implemented.

The majority of the pre-hazard capabilities lie within the Hualapai Department of Natural Resources and the U.S. Bureau of Indian Affairs Forestry Program. The Hualapai Department of Natural Resources consists of the Administration, Agriculture, Air Quality, Forestry, Water Resources and Wildlife, Fisheries and Parks Programs. Within these programs there is a Program Manager and Assistant Program Manager as well as technicians. The BIA Forestry Program consists of the Fire Management Officer, Wildland Fire Program Manager and Fuels Management Specialist as well as various technicians. The BIA Forestry Program is overseen by the Superintendent of the Truxton Canon Field Office (TCFO) and his staff.

Post-hazard management policies include the U.S. Bureau of Indian Affairs, TCFO Emergency Response Plan. In this plan, individuals, departments and activities of the Hualapai Tribe and the TCFO are identified to respond to emergency hazard situations. The Forestry Program has six fire engines with fire suppression and hazardous materials response capabilities. In addition, the Hualapai Department of Health has an Emergency Medical Services Program that employs 12 paramedics and emergency medical technicians. This program has three ambulances and a station house.

Furthermore, any post-hazard mitigation activities would be evaluated under the Hualapai Environmental Review Code (HERC) and its various subtitles. The HERC is enforced by the tribe's Interdisciplinary Team (IDT) and the Tribal Environmental Review Commission (TERC). These entities would enforce the statutes found within the HERC

and make recommendations to the Hualapai Tribal Council regarding project implementation. These evaluations would likely involve consultation with the Pre-disaster Mitigation Plan regarding mitigation actions. These evaluations would be performed regardless of whether the mitigation actions were located within or outside of hazard prone areas.

3.4 Current and Potential Funding Sources.

In the past, the Hualapai Tribe received funding from the U.S. Bureau of Reclamation, Lower Colorado Region for drought relief. We have constructed new wells and water pipelines and cleared stock tanks of silt to increase capacity with this funding. The BIA, TCFO Forestry Program is funded through the Field Office as determined by the BIA Western Regional Office in Phoenix. In addition, the Hualapai Tribe provides funding to its departments for training in emergency response capacity. In addition, preparation of this pre-disaster mitigation plan was funded by the Federal Emergency Management Agency (FEMA).

Potential sources of new funding include the U.S. Bureau of Reclamation, the U.S. Bureau of Indian Affairs, FEMA, the Hualapai Tribe, U.S. Housing and Urban Development, the U.S. Department of Agriculture, Federal Highway Administration and the state of Arizona. In addition, we continue to seek additional sources of disaster mitigation funding. If the Hualapai Tribe receives grant funding for disaster mitigation from a federal agency, the tribe will comply with all applicable federal statutes and regulations during the period(s) for which it receives funding, in compliance with 44 CFR Section 13.11(c).

4.0 STRATEGY IMPLEMENTATION PLAN

4.1 Drought

4.1.1 Frazier Wells Consolidation

Implementation of the Frazier Wells well consolidation and pipeline project will involve several tasks ranging from NEPA clearance to trench excavation and equipment purchases. Below, we identify the tasks associated with this mitigation action.

Task 1. Prepare Regulatory Compliance Documents and Complete NEPA Process. A Biological Evaluation (BE) and Cultural Assessment will be performed by staff personnel at the proposed project site. Following these evaluations, an Environmental Assessment (EA) will be prepared and taken to the Tribe's Interdisciplinary Team (IDT) for review and comment. Once the EA is approved by the IDT, it will be forwarded to the Superintendent of the BIA Truxton Canon Field Office for a Finding of No Significant Impact if so warranted. The amount required for this task is \$ 5,000.

Task 2. Prepare Request for Bids (RFB) for the Storage Tank (1 RFB), Pipe, Pumps and Fittings (1 RFB) and System Design (1 RFB). We will seek bids from local and regional suppliers of these materials to follow the Tribe's procurement process. A minimum of three bids will be secured for each of the three RFB's if possible. The amount required for this task is \$2,000.

Task 3. Contract System Design. We will release a RFB (developed above) for a water systems engineer to design the system including the specifications of the pipe and pumps, electrical system and associated hardware. The engineer will work with the Natural Resource Conservation Service engineers in system design and implementation. The engineer will also provide installation supervision to the degree required. The amount required for this task is \$20,000.

Task 4. Hire or Identify Existing Employees That Will Complete the Construction Process. The Hualapai Department of Natural Resources has completed several large pipeline and storage projects over the past ten years. The Westwater solar-powered water pipeline runs 26 miles to a 250,000 gallon storage container near Grand Canyon West on the west side of the reservation. This is the largest solar-powered water pipeline in North America. In addition to current staff, we also regularly hire temporary employees to assist with larger projects. The amount required for this task is \$ 2,000.

Task 5. Install the Storage Tank, the Pumps and Pipeline to Complete the Project. We will use a backhoe to dig routes for the new pipe. The storage tank will be set by the tank contractor. The pumps will be installed by the Range Water Program Manager and Water Technician. Oversight of the construction process will be by the Agriculture Program Manager and Assistant Manager. The amount required for this task is \$350,000.

Task 6. Use a Global Positioning System to Identify the Locations of the New Pipelines. To ensure that the exact locations of the new pipelines are known in case of future failure, we propose to GPS the pipelines by walking their course. These data will be entered into our Geographic Information System (GIS) to be added to the existing data base regarding pipeline and storage tank locations. The amount required for this task is \$ 5,000.

Task 7. Prepare Quarterly and Final Reports. During the course of the proposed project, Dr. Kerry Christensen, the Senior Scientist in the Natural Resources Department, will compile information regarding the progress accomplished per quarter. Quarterly reports will be submitted within fifteen days of each quarter (ending in April, June, September and December). A final report will also be prepared including the GIS maps, photographs and water production. The amount required for this task is \$ 5,000.

4.1.2 Grand Canyon West Deep Well

Implementation of a deep well near Grand Canyon West will involve several tasks including evaluation of the well site, drilling of the well, design of a water purification system and installation of associated pipelines. Below, we identify the tasks associated with development of a deep well near Grand Canyon West.

Task 1. Prepare Regulatory Compliance Documents and Complete NEPA Process. A Biological Evaluation (BE) and Cultural Assessment will be performed by staff personnel at the proposed project site. Following these evaluations, an Environmental Assessment (EA) will be prepared and taken to the Tribe's Interdisciplinary Team (IDT) for review and comment. Once the EA is approved by the TERC, it will be forwarded to the Superintendent of the BIA Truxton Canon Field Office for a Finding of No Significant Impact if so warranted. The amount required for this task is \$ 5,000.

Task 2. Prepare Request for Bids (RFB) for the Drilling and Casing (1 RFB), Pump Jack Relocation (1 RFB) and Purification System Design (1 RFB). We will seek bids from local and regional suppliers of these materials to follow the Tribe's procurement process. A minimum of three bids will be secured for each of the three RFB's if possible. The amount required for this task is \$2,000.

Task 3. Drill Well, Case and Relocate Pump Jack. Actual drilling of the well, casing installation of well head and pumps and associated activities in preparing the well for use will be completed during this task. The amount required for this task is \$388,405.

Task 4. Design, Purchase and Install Purification System. There are two feasible ways to purify (reduce the level of radium to acceptable standards) the water from the deep well (assuming that the new well will reach the same aquifer as the previous well). One is to use reverse osmosis to purify the water, and the other is to dilute the deep well water with clean water from the Westwater pipeline. Results of the purification system design study will identify the preferred method and the required equipment. The approximate cost of the reverse osmosis system is \$65,000. The approximate cost of the blending system with increased monitoring is also \$65,000. The cost of the system design is approximately \$2,000.

Task 5. Prepare Quarterly and Final Reports. Quarterly reports will be submitted within fifteen days from the end of each quarter (April, June, September, December) that will include a discussion of the progress made during the quarter, problems encountered and fund expended. A final report will be submitted two months prior to expiration of the agreement giving the final results of the proposed project and the specifications with regard to the well construction and well output.

4.2 Catastrophic Wildfire

To reduce the threat of catastrophic wildfire, the Hualapai Tribe's forest thinning

program would be expanded within the ponderosa pine forest of the eastern reservation to reduce fuel loads. Standard thinning protocols would be employed to reduce stand densities to the level identified in the tribe's Forest Management Plan (Murphy and Wahlquist 2004). Sites to be thinned would also be determined as outlined in the Fire Management Plan. The trees that are cut would later be piled and burned as outlined in the Management Plan. Costs for these activities are estimated at \$75,000 per year.

To reduce losses to structural fires within the Peach Springs community, there is a need to establish a fire station within Peach Springs to be manned by a volunteer fire department. The fire department would be overseen by the BIA Fire Management Officer and other BIA staff. Construction of the facility would be performed by an appropriate entity (Hualapai Housing, outside contractor etc.; to be determined) once funding for the facility was secured. An operational plan for the fire department would be developed by the department volunteers in conjunction with BIA Forestry and the local police department. Construction of a fire station would cost \$120,000.

4.3 Peach Springs Flooding

To implement the clearing of the Truxton Wash canal, the Agriculture Program within the Hualapai Department of Natural Resources will hire a temporary heavy equipment operator to remove silt and rubble from the canal and deposit the material outside of the canal proper. A front loader will be rented from United Rentals in Kingman, Arizona. The area to be cleared will run from one mile east of Peach Springs to one mile west of town. The activities will occur from April to June; a time period when the typically is little rainfall in this area. Costs to clear the canal would be \$30,000 per year.

4.4 Train Derailment

To alleviate the impacts of a train derailment or other railroad hazard at the intersection with the Santa Fe/Burlington-Northern railway and Diamond Creek Road, an overpass over the railway needs to be constructed. Construction of an overpass at the railroad crossing on Diamond Creek Road would be overseen by the Hualapai Tribe's roads engineer. We have received a list of tasks from the engineer and the associated costs for each task. We identify and discuss these tasks below.

Task 1. Secure funding for construction of the overpass. Potential funding sources include federal highway dollars, the railroad company itself, the State of Arizona and the Hualapai Tribe.

Task 2. Prepare feasibility study for construction of an overpass at the Diamond Creek/railroad intersection. The feasibility study will include an assessment of potential funding sources, will identify the issues to be evaluated in the National Environmental Policy Act (NEPA) environmental assessment (EA) and will scope the Hualapai Tribal

Government regarding the proposed overpass. The feasibility study will also identify construction costs. We estimate the cost of the feasibility study to be \$50,000.

Task 3. Release a Request for Proposals (RFP) for an engineering design for the overpass. Gather responses and select a contractor. We estimate the cost of the engineering design to be \$50,000.

Task 4. Contact the Santa Fe/Burlington-Northern Railroad to determine the process by which approval for an overpass at the intersection can be secured.

Task 5. Prepare the appropriate NEPA documents. We estimate the cost of the NEPA compliance to be \$20,000.

Task 6. Ensure that there is adequate funding available to cover the costs detailed in the engineering design.

Task 7. Release a RFP for construction of the overpass.

Task 8. Contract construction of the overpass and construct the overpass. We estimate construction of the overpass to cost \$1,000,000.

5.0 PLAN MAINTENANCE

5.1 Method and Schedule for Monitoring, Evaluating and Updating Plan.

The federal hazard mitigation planning regulations (44 CFR 201.4) require state-level plans to be reviewed, revised and submitted for approval to the FEMA Regional Director every three years. Here, we provide the methods and schedule for monitoring, evaluating and updating the Plan. On an annual basis, the Hualapai Interdisciplinary Team (IDT) in conjunction with the Planning and Economic Development Department and the Hualapai Department of Natural Resources will meet to discuss Plan implementation, revision and update. At each meeting, a list of any hazards that had occurred during the previous six months will be prepared with a description of the responses and damages. These responses and damages will be assessed as to how they may be improved in the future. In addition, an update will be given as to the status of each of the mitigation actions, the problems confronted and the methods used to facilitate implementation of the mitigation actions. An assessment will also be made on an annual basis as to whether the Plan is meeting the mitigation goals and objectives as outlined in the Plan. Areas where the goals and objectives of the Plan are not being met will be evaluated and a course of action will be delineated and implemented on an annual basis. Any information gained during these discussions will

be integrated into the Plan at the appropriate location during the revision of the Plan. After two years, the accumulated recommendations will be reflected in the revision of the Plan. The revised plan will be prepared by the Hualapai Department of Natural Resources (HDNR). The Plan will also be reviewed, evaluated and revised whenever there is a change in state or federal law or statute that may affect the Plan or implementation of the Plan as required in 44 CFR Section 13.11(c).

The revised Plan will be reviewed by the IDT and a list of changes will be prepared by HDNR following the final revision of the Plan. The list of revisions and the revised Plan will then be taken to the Hualapai Tribal Council for their approval. A resolution adopting the revised plan will be presented to the Tribal Council for their approval. The revised plan will then in the third year (and every third year after) be submitted to the FEMA Regional Director.

6.0 Literature Cited

Murphy, C.A. and T.C. Wahlquist. 2004. Hualapai Nation Forest Management Plan 2001-1012. Hualapai Tribal Forestry. 233 pp.

Sellers, Mary F. and G.R. Hill. 1985. Historical precipitation patterns in northwest Arizona. Journal of Climatology 19(2): 24-38.

HUALAPAI TRIBAL COUNCIL
RESOLUTION NO. _____
OF THE GOVERNING BODY OF THE
HUALAPAI TRIBE OF THE HUALAPAI RESERVATION

WHEREAS, The Hualapai Reservation has suffered from several natural disasters in the past including flooding, wildfire and drought, and

WHEREAS, The Hualapai Tribe received funding from the Federal Emergency Management Agency (FEMA) to prepare a Pre-disaster Mitigation Plan (Plan), and

WHEREAS, The purpose of the Plan is to identify mitigation projects and strategies that will eliminate or reduce the effects of future disasters (including terrorism) on the assets of the Hualapai Tribe and Hualapai Tribal Members.

WHEREAS, The Hualapai Department of Natural Resources, working in conjunction
With the Hualapai Interdisciplinary Team (IDT), the Planning
and Economic Development Department and
FEMA, have developed a
Pre-disaster Mitigation Plan for the Hualapai Reservation
including a

Risk Assessment, and

WHEREAS, adoption of the Plan will make the Hualapai Reservation eligible for funding to implement pre-disaster mitigation actions and to alleviate the impacts of future hazards on the reservation, and

NOW THEREFORE BE IT RESOLVED THAT the Hualapai Tribal Council adopts the Pre-disaster Mitigation Plan for the Hualapai Reservation and will forward the Plan to FEMA for their acceptance.

CERTIFICATION

I, the undersigned as Chairman of the Hualapai Tribal Council, hereby certify that the Hualapai Tribal Council of the Hualapai Tribe is composed of nine (9) members of whom _____ constituting a quorum were present at a _____ meeting held this _____ day of _____, 2004; and that the foregoing resolution was duly adopted by a vote of _____ for, _____ against, _____ not voting and _____ excused, pursuant to authority of Article V, Section (a) of the Constitution of the Hualapai Tribe approved March 13, 1991.

ATTEST:

Charles Vaughn, Chairman
HUALAPAI TRIBAL COUNCIL

Christine Lee, Tribal Secretary

TABLE OF CONTENTS

	<u>Page</u>
1.0 Introduction.....	1
1.1 Planning Process.....	1
1.2 Background.....	2
1.2.1 Geography.....	2
1.2.2 Topography.....	2
1.2.3 Climate.....	3
1.2.4 Socioeconomics.....	3
2.0 Risk Assessment.....	4
2.1 Introduction.....	4
2.1.1 Land Use Trends.....	4
2.1.2 Hazard Profiles.....	4
2.2 Risk Evaluation.....	12
2.2.1 Tribal Structures.....	12
2.2.2 Roadways and Railroads.....	23
2.2.3 Natural Resources.....	28
2.2.4 Utilities.....	35
3.0 Mitigation Strategy.....	40
3.1 Mitigation Goals and Objectives.....	40

3.1.1 Flooding.....	40
3.1.2 Wildfire.....	41
3.1.3 Drought.....	41
3.1.4 Human-caused Disasters.....	41
3.2 Identification and Analysis of Mitigation Measures.....	41
3.2.1 Drought.....	43
3.2.2 Wildfire.....	45
3.2.3 Flooding.....	45
3.2.4 Train Derailment.....	46
3.3 Pre- and Post-hazard Management Policies and Programs.....	46
3.4 Current and Potential Funding Sources.....	47
4.0 Strategy Implementation Plan.....	47
4.1 Drought.....	47
4.1.1 Frazier Wells.....	47
4.1.2 Grand Canyon West Deep Well.....	49
4.2 Wildfire.....	50
4.3 Flooding.....	
50	
4.4 Train Derailment.....	51
5.0 Plan Maintenance.....	52
4.1 Method and Schedule for Monitoring, Evaluating and Updating Plan	52
6.0 Literature Cited.....	52

List of Figures

	<u>Page</u>
Figure 1. Location Map.....	2a
Figure 2. Photograph overlooking Peach Springs.....	2b
Figure 3. Water lines and storage tanks across the reservation.....	15a
Figure 4. Peak Acceleration Map.....	16a
Figure 5. Music Mountain School photograph.....	18a
Figure 6. Diamond Creek Road Bridge location map.....	23a
Figure 7. Photograph of Diamond Creek Road Bridge.....	23b
Figure 8. Diamond Creek takeout photograph.....	24a
Figure 9. Railroad map location.....	25a

Figure 10. Railway photograph.....	25b
Figure 11. Route 66 photograph.....	26a
Figure 12. Diamond Creek Road photograph.....	27a
Figure 13. Westwater Well photograph.....	29a
Figure 14. Peach Springs pump house photograph.....	30a
Figure 15. Truxton Well photograph.....	34a
Figure 16. Power lines photograph.....	35a
Figure 17. Communication tower photograph.....	36a

List of Tables

Table 1. Risk Assessment for the Hualapai Reservation.....	8
Table 2. A comparison of avoided losses and costs for mitigation actions...	43

List of Appendices

Appendix A. Tribal Resolution.....	52
Appendix B. Cooperative Drought Contingency Plan.....	53
Appendix C. Fire Management Plan.....	104

July 28, 2004

Mr. Robert McCord
Federal Emergency Management Agency
1111 Broadway, Suite 1200
Oakland, CA 94607-4052

Dear Mr. McCord,

Please consider the Hualapai Tribe's Pre-disaster Mitigation Plan for final approval. Your comments have been incorporated and have been very helpful in the revision of the document and we hope that you consider this suitable for acceptance by FEMA. Specifically, we added a table and paragraph on page 42 discussing the priority and cost/benefits of mitigation measures. In addition, we want to point out that there are mitigation activities identified for each hazard within the Risk Assessment portion of the document. Finally, we have attempted as well as possible to identify mitigation versus preparedness activities wherever possible.

Again, we appreciate yours and your colleague's assistance in the preparation of the Plan and look forward to your response. We have included the signed Tribal Resolution adopting the plan by the Hualapai Tribal Council and will soon distribute the Plan to the Hualapai Community for their comments and information.

Please contact my office if we can provide additional information.

Sincerely,

Donald E. Bay, Director
Hualapai Department of Natural Resources