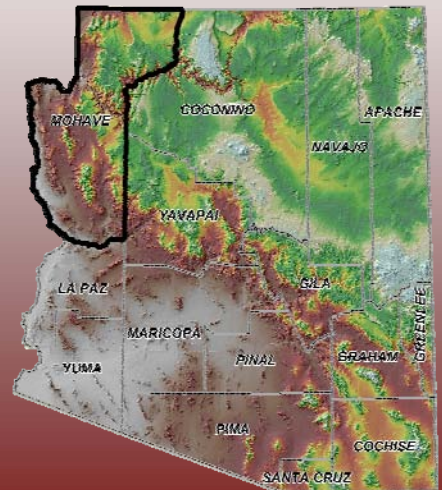
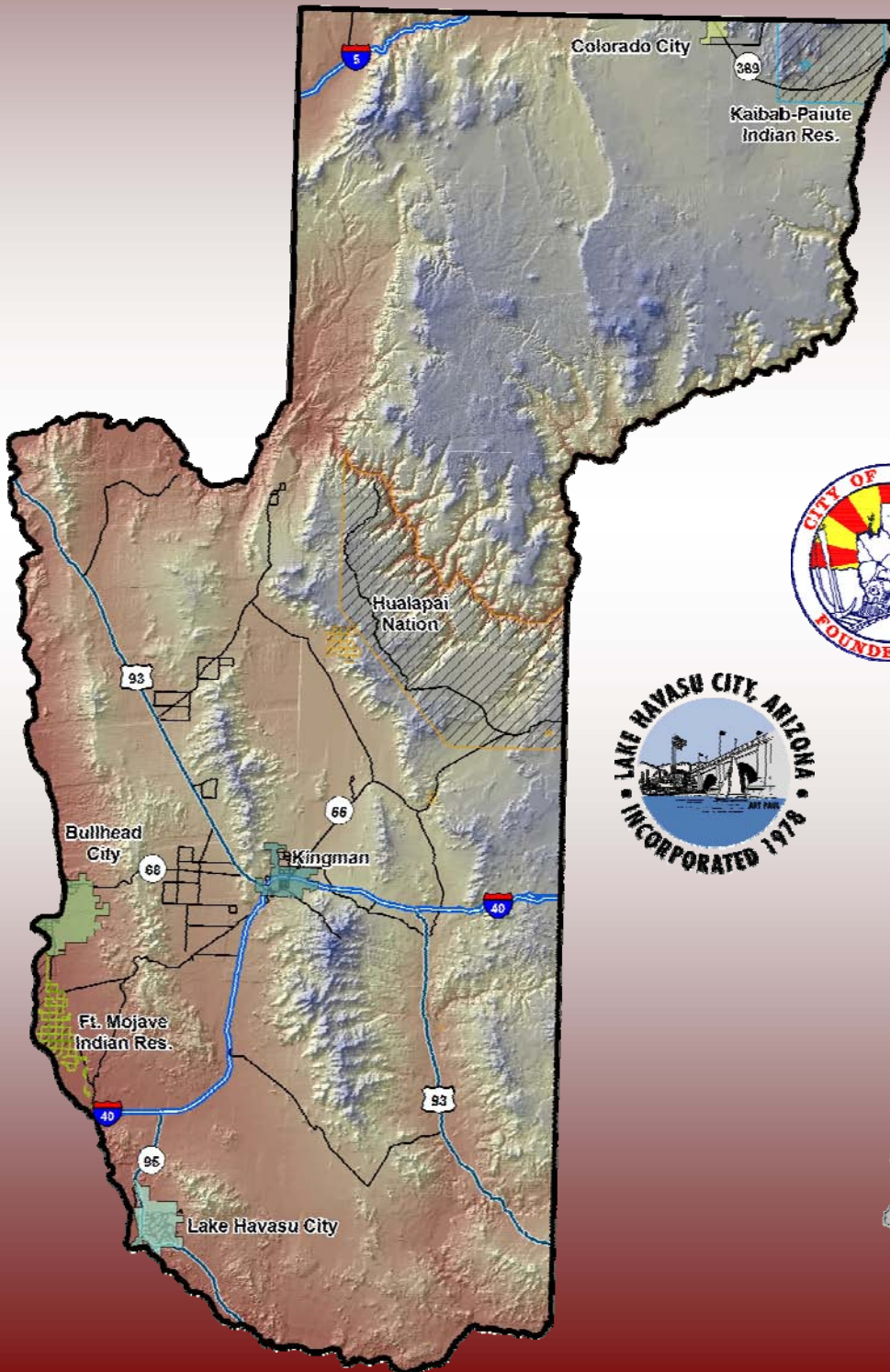




Mohave County Multi-Jurisdictional Hazard Mitigation Plan 2010



EXECUTIVE SUMMARY

Across the United States, natural and human-caused disasters have led to increasing levels of death, injury, property damage, and interruption of business and government services. The toll on families and individuals can be immense and damaged businesses cannot contribute to the economy. The time, money and effort to respond to and recover from these emergencies or disasters divert public resources and attention from other important programs and problems. With 51 federal or state declarations, 106 other significant events, and a combined total of 157 disaster events recorded, the five jurisdictions within Mohave County, Arizona participating in this planning effort, recognize the consequences of disasters and the need to reduce the impacts of natural and human-caused hazards. The county and jurisdictions also know that with careful selection, mitigation actions in the form of projects and programs can become long-term, cost effective means for reducing the impact of natural and human-caused hazards.

The elected and appointed officials of Mohave County and four other participating jurisdictions demonstrated their commitment to hazard mitigation in 2004-2005 by preparing the Mohave County Multi-Jurisdictional Hazard Mitigation Plans (2005 Plan). The 2005 Plan was developed through a planning effort that resulted in a multi-jurisdictional plan that covered the unincorporated county and three cities, one town, and three Indian tribes. The 2005 Plan was approved by FEMA on July 29, 2005, and requires a full, FEMA approved, update prior to the subsequent five year expiration.

In response, the Arizona Division of Emergency Management (ADEM) secured a federal planning grant and hired JE Fuller/ Hydrology & Geomorphology, Inc. to assist the county and participating jurisdictions with the update process. Mohave County reconvened a multi-jurisdictional planning team comprised of veteran and first-time representatives from each participating jurisdiction, various county departments and organizations, ADEM, local fire and flood control districts, and Indian tribes. The Planning Team met five times during the period of December 2008 to April 2010 in a collaborative effort to review, evaluate, and update the 2005 Plan. The Mohave County Multi-Jurisdictional Hazard Mitigation Plan (Plan) will continue to guide the county and participating jurisdictions toward greater disaster resistance in full harmony with the character and needs of the community and region.

The Plan has been prepared in compliance with Section 322 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act (Stafford Act or the Act), 42 U.S. C. 5165, enacted under Sec. 104 the Disaster Mitigation Act of 2000, (DMA 2000) Public Law 106-390 of October 30, 2000, as implemented at CFR 201.6 and 201.7 dated October, 2007. The Plan identifies hazard mitigation measures intended to eliminate or reduce the effects of future disasters throughout the county, and was developed in a joint and cooperative venture by members of the Mohave County Planning Team.

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LIST OF APPENDICES

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- Appendix B: Planning Process Documentation**
- Appendix C: Public Involvement Records**
- Appendix D: Detailed Historic Hazard Records**
- Appendix E: Plan Maintenance Review Memorandums**

SECTION 1: JURISDICTIONAL ADOPTION AND FEMA APPROVAL

Requirement §201.6(c)(5): *[The local hazard mitigation plan shall include...] Documentation that the plan has been formally adopted by the governing body of the jurisdiction requesting approval of the plan (e.g., City Council, County Commissioner, Tribal Council). For multi-jurisdictional plans, each jurisdiction requesting approval of the plan must document that it has been formally adopted.*

Requirement §201.6(d)(3): *A local jurisdiction must review and revise its plan to reflect changes in development, progress in local mitigation efforts, and changes in priorities, and resubmit it for approval within five (5) years in order to continue to be eligible for mitigation project grant funding.*

1.1 DMA 2000 Requirements

1.1.1 General Requirements

The Mohave County Multi-Jurisdictional Hazard Mitigation Plan (the Plan) has been prepared in compliance with Section 322 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act of 1988 (Stafford Act), 42 U.S.C. 5165, as amended by Section 104 of the Disaster Mitigation Act of 2000 (DMA 2000) Public Law 106-390 enacted October 30, 2000. The regulations governing the mitigation planning requirements for local mitigation plans are published under the Code of Federal Regulations (CFR) Title 44, Section 201.6 (44 CFR §201.6). Additionally, a DMA 2000 compliant plan that addresses flooding will also meet the minimum planning requirements for the Flood Mitigation Assistance program as provided for under 44 CFR §78.

DMA 2000 provides requirements for States, Tribes, and local governments to undertake a risk-based approach to reducing risks to natural hazards through mitigation planning¹. The local mitigation plan is the representation of the jurisdiction's commitment to reduce risks from natural hazards, serving as a guide for decision makers as they commit resources to reducing the effects of natural hazards. Local plans will also serve as the basis for the State to provide technical assistance and to prioritize project funding.

Under 44 CFR §201.6, local governments must have a Federal Emergency Management Agency (FEMA)-approved local mitigation plan in order to apply for and/or receive project grants under the following hazard mitigation assistance programs:

- Hazard Mitigation Grant Program (HMGP)
- Pre-Disaster Mitigation (PDM)
- Flood Mitigation Assistance (FMA)
- Severe Repetitive Loss (SRL)

FEMA, at its discretion, may also require a local mitigation plan under the Repetitive Flood Claims (RFC) program as well.

1.1.2 Update Requirements

DMA 2000 requires that existing plans be updated every five years, with each plan cycle requiring a complete review, revision, and re-approval of the plan at both the state and FEMA level. The FEMA approved *Mohave County Multi-Jurisdictional Hazard Mitigation Plan (2005 Plan)*² currently includes Mohave County, the incorporated communities of Bullhead City, Colorado City, Kingman and Lake Havasu City, and three Indian Tribes. The Plan is the result of an update process performed by the participating Mohave County jurisdictions to update the 2005 Plan.

¹ FEMA, 2008, *Local Multi-Hazard Mitigation Planning Guidance*

² PBS&J, 2004, *Mohave County Multi-Jurisdictional Hazard Mitigation Plan*

1.2 Official Record of Adoption

Adoption of the Plan is accomplished by the governing body for each participating jurisdiction in accordance with the authority and powers granted to those jurisdictions by the State of Arizona. Participating jurisdictions in the Plan include:

- Mohave County
- City of Bullhead City
- City of Kingman
- City of Lake Havasu City
- Town of Colorado City.

Each jurisdiction will keep a copy of their official resolution of adoption located in Appendix A of their copy of the Plan.

1.3 FEMA Approval Letter

The Plan was submitted to the Arizona Division of Emergency Management (ADEM), the authorized state agency, and FEMA for review and approval. FEMA's approval letter is provided on the following page.

**MOHAVE COUNTY
MULTI-JURISDICTIONAL HAZARD MITIGATION PLAN**

2010

U.S. Department of Homeland Security
1111 Broadway, Suite 1200
Oakland, CA. 94607-4052



FEMA

November 23, 2011

Byron Steward
County Emergency Manager
Mohave County Emergency Management
3250 E. Kino Avenue
Kingman, AZ 86401

Dear Mr. Steward:

We have received documentation from the Cities of Bullhead City, Kingman and Lake Havasu, AZ confirming their adoption of the *Mohave County Multi-Jurisdictional Hazard Mitigation Plan Update*. The Cities of Bullhead City, Kingman and Lake Havasu are now in compliance with the planning requirements of the Disaster Mitigation Act of 2000.

The *Mohave County Multi-Jurisdictional Hazard Mitigation Plan Update* is valid for five years from the approval date, March 3, 2011, for all approved participants. The plan must be reviewed, updated and submitted to FEMA Region IX for approval at least once every five years. An updated list of the current status of participating jurisdictions is enclosed with this letter.

The approval of this plan ensures the Cities of Bullhead City, Kingman and Lake Havasu continued eligibility for project grants under FEMA's hazard mitigation assistance programs, including Hazard Mitigation Grant Program, Pre-Disaster Mitigation, Flood Mitigation Assistance and Severe Repetitive Loss grant programs. All requests for funding, however, will be evaluated individually according to the specific eligibility, and other requirements of the particular program under which applications are submitted. Approved mitigation plans are eligible for points under the National Flood Insurance Program's Community Rating System (CRS). Additional information regarding the CRS can be found at www.fema.gov/business/nfip/crs.shtm or through your local floodplain manager.

If you have any questions regarding the planning or review processes, please contact Juliette Hayes, Community Planner at (510) 627-7211, or by email at juliette.hayes@dhs.gov.

Sincerely,

A handwritten signature in black ink, appearing to read "Sally Ziolkowski".

Sally Ziolkowski, Director
Mitigation Division

Enclosure

cc: Darlene Trammell, Arizona State Hazard Mitigation Officer

www.fema.gov

RESOLUTION NO. 2011-042

WHEREAS, the Mohave County Multi-Jurisdictional Hazard Mitigation Plan Update has been completed by the contracted consultant of the Arizona Division of Emergency Management and agencies of Mohave County, Lake Havasu City, Bullhead City, the City of Kingman, and Colorado City, and

WHEREAS, Plan Update adoption by all participating government jurisdictions is necessary before the final approval of the Plan Update can be obtained from the Federal Emergency Management Agency (FEMA), and

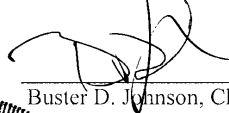
WHEREAS, the Plan Update contains numerous recommended measures to mitigate existing hazards in the various jurisdictions, and FEMA approval is required for the county and cities to qualify for most disaster and pre-disaster assistance funding administered by FEMA, and

WHEREAS, the Mohave County Multi-Jurisdictional Hazard Mitigation Plan Update is necessary and proper to protect, and preserve the safety, health, and well being of the citizens of Mohave County, and

NOW THEREFORE BE IT RESOLVED, that the Board of Supervisors, at their regular meeting on Monday, February 7, 2011, approved Mohave County Resolution No. 2011-042, adopting the Mohave County Multi-Jurisdictional Hazard Mitigation Plan Update as the official Mohave County Multi-Jurisdictional Hazard Mitigation Plan.

ATTEST

MOHAVE COUNTY BOARD OF SUPERVISORS



Buster D. Johnson, Chairman


Barbara Bracken, Clerk

SECTION 2: INTRODUCTION

2.1 Plan History

In 2004 and 2005, Mohave County, all incorporated cities, towns and the three Indian tribes in Mohave County participated in a multi-jurisdictional mitigation planning process that resulted in the development, approval and adoption of the 2005 Plan. The Fort Mojave Indian Tribe, Kaibab Paiute Indian Tribe and the Hualapai Tribal Nation subsequently developed tribal plans since Arizona Revised Statute indicated tribes could not be a sub-grantee in the State of Arizona. The 2005 Plan received official FEMA approval on July 29, 2005. The 2005 Plan is nearing the end of the 5-year planning cycle and the multi-jurisdictional plan will expire July 29, 2010.

2.2 Plan Purpose and Authority

The purpose of the Plan is to identify natural hazards that impact the various jurisdictions located within Mohave County, assess the vulnerability and risk posed by those hazards to community-wide human and structural assets, develop strategies for mitigation of those identified hazards, present future maintenance procedures for the plan, and document the planning process. The Plan is prepared in compliance with DMA 2000 requirements and represents a multi-jurisdictional update of the 2005 Plan.

Mohave County and all of the incorporated cities and towns are political subdivisions of the State of Arizona and are organized under Title 9 (cities/towns) and Title 11 of the Arizona Revised Statutes (ARS). As such, each of these entities are empowered to formally plan and adopt the Plan on behalf of their respective jurisdictions.

Funding for the development of the Plan was provided through a PDM planning grant obtained by the State of Arizona from FEMA. JE Fuller Hydrology & Geomorphology (JE Fuller) was retained by Arizona Division of Emergency Management (ADEM) to provide consulting services in guiding the update planning process and Plan development.

The following jurisdictions participated and included in this Plan:

- Mohave County
- City of Bullhead City
- City of Kingman
- City of Lake Havasu City
- Town of Colorado City.

2.3 General Plan Description

The Plan is generally arranged and formatted to be consistent with the 2007 State of Arizona Multi-Hazard Mitigation Plan (State Plan) and is comprised of the following major sections:

Planning Process – this section summarizes the planning process used to update the Plan, describes the assembly of the planning team and meetings conducted, and summarizes the public involvement efforts.

Community Description – this section provides an overall description of the participating jurisdictions and the County as a whole.

Risk Assessment – this section summarizes the identification and profiling of natural hazards that impact the County and the vulnerability assessment for each hazard that considers exposure/loss estimations and development trend analyses.

Mitigation Strategy – this section presents a capability assessment for each participating jurisdiction and summarizes the Plan mitigation goals, objectives, actions/projects, and strategy for implementation of those actions/projects.

Plan Maintenance Strategy – this section outlines the proposed strategy for evaluating and monitoring the Plan, updating the Plan in the next 5 years, incorporating plan elements into existing planning mechanisms, and continued public involvement.

Plan Tools – this section includes a list Plan acronyms and a glossary of definitions.

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SECTION 3: PLANNING PROCESS

§201.6 (b): *Planning process. An open public involvement process is essential to the development of an effective plan. In order to develop a more comprehensive approach to reducing the effects of natural disasters, the planning process shall include:*

- (1) An opportunity for the public to comment on the plan during the drafting stage and prior to plan approval;*
- (2) An opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, and agencies that have the authority to regulate development, as well as businesses, academia and other private and non-profit interests to be involved in the planning process; and*
- (3) Review and incorporation, if appropriate, of existing plans, studies, reports, and technical information.*

§201.6(c)(1): *[The plan shall include...] (1) Documentation of the planning process used to develop the plan, including how it was prepared, who was involved in the process, and how the public was involved.*

This section includes the delineation of various DMA 2000 regulatory requirements, as well as the identification of key stakeholders and planning team members within Mohave County. In addition, the necessary public involvement meetings and actions that were applied to this process are also detailed.

3.1 Update Process Description

ADEM applied for and received a PDM planning grant to fund a multi-jurisdictional effort to review, update and consolidate the 2005 Plans. Once the grant was received, ADEM then selected JE Fuller/ Hydrology & Geomorphology, Inc. (JE Fuller) to work with the participating jurisdictions and guide the Plan update process. An initial project kick-off meeting between JE Fuller and ADEM was convened August 26, 2008 to begin the plan update process, outline the plan objectives, outline the meeting dates and agendas for the plan update efforts, and to discuss the new plan format and other administrative tasks. Initial points of contact were also established. A total of five Multi-Jurisdictional Planning Team (Planning Team) meetings were conducted over the period of December 2008 to April 2010, beginning with the first meeting on December 3, 2008. Throughout that period of time, all the work required to collect, process, and document updated data and make changes to the plan was performed, culminating in draft of the Plan. Details regarding updated key contact information and promulgation authorities, the planning team selection, participation, and activities, and public involvement are discussed in the following sections.

3.2 Previous Planning Process Assessment

The first task of preparation for the Plan update, was to evaluate the process used to develop the 2005 Plans. This was initially discussed by ADEM and JE Fuller prior to the county planning team kickoff meeting. The previous planning approach included an initial county level meeting followed by two mitigation advisory committee (Committee) meetings. Members of the Committee included representatives from all participating jurisdictions, ADEM, and various other stakeholders. The first Committee meeting was convened to educate officials from all participating jurisdictions on the mitigation planning process being sponsored by Mohave County, as well as to explain the DMA 2000 multi-jurisdictional planning requirements and the individual roles being required and assigned to each of the committee members. The first meeting also served to initiate the preliminary data collection efforts for the risk and capability assessment tasks associated with the development of the 2005 Plan. The second Committee meeting was a “mitigation strategy workshop,” wherein the findings of the risk assessment and capability assessment were presented and a mitigation strategy was developed through various group exercises.

The Plan update process was presented and discussed at the first multi-jurisdictional planning team meeting and was contrasted to the 2005 Plan approach. Most of the planning team members were not involved with the development of the 2005 Plan, so there were only a few members with institutional knowledge of the prior process. Those in the Planning Team that participated felt that the 2005 Plan meeting process worked moderately well, but required extra time and effort at the end to provide the needed data for a complete and FEMA approvable plan. The Planning Team also noted that one primary difference between the original 2005 Plan effort and the current Plan update effort, is that a base plan exists and the focus is on updating that plan as needed.

3.3 Primary Point of Contact

Table 3-1 summarizes the primary points of contact identified for each participating jurisdiction.

Table 3-1: List of jurisdictional primary points of contact					
Jurisdiction	Name	Department / Position	Address	Phone	Email
Mohave County	Byron Steward	Development Services Department – Emergency Management Division / Emergency Management Coordinator	3250 E. Kino Ave. Kingman, AZ 86401	928-757-0930	byron.steward@co.mohave.az.us
Bullhead City	Brian Williamson	Police Department / Deputy Police Chief	1255 Marina Blvd. Bullhead City, AZ 86442	928-763-9200	bwilliamson@bullheadcity.com
Colorado City	Brian Meldrum	Deputy Emergency Manager	220 E. Township Ave. Colorado City, AZ 86021	928-875-2400	brian@hccfd.org
Kingman	Bill Johnston	Fire Department / Battalion Chief	412 E. Oak St. Kingman, AZ 86401	928-753-2891	bjohnston@cityofkingman.gov
Lake Havasu City	Dennis Mueller	Fire Department / Fire Chief and Emergency Manager	2330 McCulloch Blvd. North Lake Havasu City, AZ 86403	928-855-1141	muellerd@lhcas.gov

3.4 Planning Teams

Two levels of planning teams were organized for this Plan update. The first was a Multi-Jurisdictional Planning Team (Planning Team) that was comprised of one or more representatives from each participating jurisdiction. The second level planning team was the Local Planning Team.

The role of the Planning Team was to work with the planning consultant to perform the coordination, research, and planning element activities required to update the 2005 Plan. Attendance by each participating jurisdiction was required for every Planning Team meeting as the meetings were structured to progress through the plan update process. Steps and procedures for updating the 2005 Plan were presented and discussed at each Planning Team meeting, and assignments were normally given. Each meeting built on information discussed and assignments given at the previous meeting. The Planning Team also had the responsibility of liaison to the Local Planning Team, and were tasked with:

- Conveying information and assignments received at the Planning Team meetings to the Local Planning Team
- Ensuring that all requested assignments was completed fully and returned on a timely basis.
- Arranging for review and official adoption of the Plan.

The function and role of the Local Planning Team was to:

- Provide support and data
- Assist the Planning Team representative in completing each assignment
- Make planning decisions regarding plan update components
- Review the Plan draft documents

3.4.1 Planning Team Assembly

At the beginning of the update planning process, Mohave County organized and identified members for the core Planning Team by initiating contact with various county departments and all of the incorporated communities. Other entities invited to participate included the Bureau of Land Management, Fort Mojave Indian Tribe, Kaibab-Paiute Indian Tribe, Hualapai Tribal Nation, CERT volunteers, Fort Mojave Fire District, and the Golden Valley Fire District. The participating members of the Planning Team are summarized in Table 3-2. Returning planning team members are highlighted.

Table 3-2: Summary of multi-jurisdictional planning team participants

Name	Jurisdiction / Organization	Department / Position	Planning Team Role
Joe Anderson	Bullhead City	Bullhead City Fire Department	Planning Team participant Local Planning Team resource
Bill Avery	Bullhead City	Engineering / Civil Engineering Associate	Planning Team participant Secondary Point of Contact Support and Resource for all steps in the Plan update
Christine Ballard	Mohave County	Development Services / Planning Department / Planner	Planning Team participant Local Planning Team resource for planning and zoning
Chad Benson	U.S. Department of Interior	Bureau of Land Management	Planning Team participant Colorado River valley wildfire resource
Rosie Blanco	CERT	Volunteer	Planning Team Participant CERT volunteer
Mike Browning	Mohave County	Development Services / Emergency Management Department / Emergency Management Coordinator	Planning Team participant Local Planning Team resource
Mark Chastain	Kingman	Police Department	Planning Team participant Local Planning Team resource
Kerry Christensen	Ecological Research Associates	Consultant to Hualapai Nation	Planning Team participant Local Planning Team resource
W. Mark Clark	Lake Havasu City	Public Works / Public Works Director	Planning Team participant Local Planning Team resource
Gary Cook	U.S. Department of Interior	Bureau of Land Management	Planning Team participant
Vince Corazza	Bullhead City	Public Works Department – Engineering Division / Asst City Engineer	Planning Team participant Local Planning Team resource
Liz Durst	Mohave County	Public Works Department – Emergency Management Division / Office Assistant	Planning Team participant Local Planning Team resource Administrative assistance
Steve Harris	Bullhead City	No Longer With City (Former Emergency Services Coordinator)	Planning Team participant Former Lead coordinator for LPT
Randy Johnson	Mohave County	Sheriff's Office	Planning Team participant Local Planning Team resource
Bill Johnston	Kingman	Fire Department / Battalion Chief	Jurisdictional Point of Contact Lead coordinator for LPT Planning Team participant
Joe Mahoney	Hualapai Tribe	Peach Springs EMS	Planning Team participant
Brian Meldrum	Colorado City	Deputy Emergency Manager	Jurisdictional Point of Contact Lead coordinator for LPT Planning Team participant
Dennis Mueller	Lake Havasu City	Fire Department	Jurisdictional Point of Contact Lead coordinator for LPT Planning Team participant
W. Scott Ogden	JE Fuller/ Hydrology & Geomorphology, Inc.	Project Manager	Planning Team Lead Consultant Preparation and presentation of plan update elements
Ronald Quasula	Hualapai Tribe	Hualapai Nation Fire Department	Jurisdictional Point of Contact Lead coordinator for LPT Planning Team participant
Darrell Raburn	Fort Mojave Mesa Fire District	Fort Mojave Mesa Fire Department / Fire Marshall	Planning Team participant Local Planning Team resource
Jeff Sayre	Gold Valley Fire District	Golden Valley Fire Department	Planning Team participant Local Planning Team resource
Jim Schnabel	Hualapai Tribe	Hualapai Nation Fire Department	Planning Team participant Local Planning Team resource

Table 3-2: Summary of multi-jurisdictional planning team participants			
Name	Jurisdiction / Organization	Department / Position	Planning Team Role
Byron Steward	Mohave County	Public Works Department- Emergency Management Division / Emergency Management Coordinator	Jurisdictional Point of Contact Lead coordinator for LPT Planning Team participant
Shannon Summers	Mohave County	Public Works Department – Flood Control Division / Flood Control Technical Supervisor	Planning Team participant Local Planning Team resource
Ed Tapia	City of Kingman	Public Works Department	Planning Team participant
Brian Williamson	Bullhead City	Police Department – Deputy Police Chief	Jurisdictional Point of Contact Lead coordinator for LPT Planning Team participant
Sue Wood	State of Arizona	ADEM – Mitigation Division – Program Manager	Planning Team participant Project/Grant Manager State reviewer
Zelda Wright	Mohave County	Public Works Department – Improvement District Division / Improvement District Supervisor	

Lists of Local Planning Team members and their respective roles, for each jurisdiction, are provided in Appendix B.

3.4.2 Planning Team Activities

The Planning Team met for the first time on December 3, 2009 to begin the plan update process. Three more meetings were convened on about a bi-monthly basis to step through the plan review and update process, with a final fifth meeting occurring on April 19, 2010. Planning Team members used copies of the 2005 Plan for review and reference. Following each Planning Team meeting, the Point of Contact for each jurisdiction would convene meetings with the Local Planning Team as needed to work through the assignments. Table 3-3 summarizes the Planning Team meetings along with a brief list of the agenda items discussed. Detailed meeting notes for all of the Planning Team meetings are provided in Appendix B. There are no details of the Local Planning Team meetings.

Table 3-3: Summary of planning meetings convened as part of the plan update process	
Meeting Type, Date, and Location	Meeting Agenda
MJPT Meeting No. 1 <u>Initial Meeting:</u> December 3, 2008 Mohave County Administration Building – Saguaro Rooms Kingman, AZ	• Team introductions • Present an overview of mitigation planning and the update process • Discussed converting from single to a true Multi-Jurisdictional Plan • Presented the MJPT roles and responsibilities • Determined PPOC for each jurisdiction. • Discussed the public involvement requirements • Discussed what is included in risk assessment • Reviewed list of hazards from 2004 Plan and State of Arizona’s 2007 Plan. • JEF presented the declared and undeclared hazard events. • The team worked through Calculated Priority Risk Index (CPRI) evaluation. • Overview of the asset inventory of vulnerability analysis. • Next meeting set for January 13, 2009 • Assignments included: ○ Issuing public notices through newspaper and county website ○ JEF provide historical hazard spreadsheets for review and augmentation. ○ S. Harris and B. Meldrum will check if earthquake should be included in hazard list for respective cities. ○ JEF provide CPRI to each jurisdiction to complete. ○ JEF will provide asset inventory template to jurisdiction for data collection. ○ Each community will provide latest General or Comprehensive Plan, city/town boundaries, and future critical facility locations

Table 3-3: Summary of planning meetings convened as part of the plan update process	
Meeting Type, Date, and Location	Meeting Agenda
MJPT Meeting No. 2 January 13, 2009 Mohave County Administration Building – Senita Room Kingman, AZ	• Reviewed status of action items from previous meeting • Presented mapping elements for hazards identified and cut-off date for new data • Provided and discussed ADWR listing of repetitive loss properties • Presented and discussed the need for capability assessment tables • Presented overview and discussed plan maintenance elements • Next meeting set for February 18, 2009 • Assignments included: - o JEF finish asset inventory and CPRI worksheets and provide to JEF by end of February. - o S. Summers and B. Steward will provide shapefile with city limits. JEF will generate check plots for distribution to each jurisdiction for verification. - o B. Steward will provide BOR Colorado River dam failure maps to JEF. - o S. Summers will provide most current set of FEMA DFIRM data to JEF. - o M. Brown will provide a brief write-up of the levee conditions along the Colorado River. - o S. Summers will forward a levee list to JEF. - o JEF will send list of repetitive loss properties to S. Summers for review and comment. - o JEF will forward template document for use by each jurisdiction to generate a capability assessment.

Table 3-3: Summary of planning meetings convened as part of the plan update process	
Meeting Type, Date, and Location	Meeting Agenda
MJPT Meeting No. 3 February 18, 2009 Mohave County Sheriff's Office – Training Room Kingman, AZ	• Homework status review • S. Ogden presented data needs for identification of Local Planning Team members in updated plan. • S. Ogden presented map data for several hazards. • Presented a list of 2004 goals and objectives and current State plan goals. • Presented a procedure and template table for performing an evaluation and review of the current plan's mitigation actions/projects. • Presented NFIP compliance and discussed. • Next meeting is set for April 8, 2009 • Assignments included: ○ Each community needs to finalize the CPRI, capability assessment and local planning worksheets, and provide to JEF prior to next meeting. ○ JEF will divide the asset inventory list to provide each community for editing, completing, or revising. ○ J. Schnabel will provide a wildfire hazard profile coverage for the Hualapai Nation boundaries that will be divided into "high", "medium", and "low " polygons by March 7, 2009. ○ JEF to send current plan mitigation actions/projects assessment worksheet to each community for completion and return by next meeting date.

Table 3-3: Summary of planning meetings convened as part of the plan update process	
Meeting Type, Date, and Location	Meeting Agenda
MJPT Meeting No. 4 April 29, 2009 Mohave County Sheriff's Office – Training Room Kingman, AZ	• Handed out graphic depicting homework status and discussed. • Presented results of vulnerability analysis to the MJPT summarized by community which resulted in discussion. • MJPT reviewed Table 7.9 in existing plan and discussed updating the data. • Overview was provided on development of new mitigation actions and implementation strategy for all projects considered. JEF discussed the format of tables and provided examples. • Discussed ADEM documentation request of past mitigation activities. • ADEM discussed ranking alternatives used by the State of Arizona and provided the factors and rating system. • Reviewed the NFIP compliance requirement and MJPT brainstormed an action/project and implementation strategy for inclusion in the plan. • JEF reiterated the homework assignments and need to complete outstanding tasks • JEF will be meeting with Hualapai Nation in the future to finish their data collection. • Once all items are received, JEF will deliver draft to MJPT for review and comment. • Assignments included: ○ JEF will send out template files for the Past Mitigation Activity summary and the new mitigation A/P and implementation strategy worksheet. ○ All jurisdictions are to work at completing the outstanding planning elements.
Planning Team Meeting No. 5 April 19, 2010 Mohave County Public Works Department – Training Room Kingman, AZ	• Discussed and reviewed outstanding task assignments • Discussed Plan incorporation mechanisms • Discussed and brainstormed future public involvement efforts • Discussed final plan development schedule

3.4.3 Agency/Organizational Participation

The planning process used to develop the 2005 Plan included participation from several agencies and organizations, including the adopting jurisdictions that operate within or have jurisdiction over small and large areas of Mohave County. At the start of the Plan update, a list of the stakeholder agencies and organizations that participated in the development of the 2005 Plan was compiled to provide continuity and institutional knowledge to the planning team and the overall update process. Invitations were sent twice (once on 9/26/08 and again on 10/17/08) via email that was addressed to the original participant or their successor. The following were included on the invitation list:

- Arizona Division of Emergency Management
- Beaver Dam Littlefield Fire District
- Bureau of Land Management
- City of Bullhead City
 - o Emergency Mgmt
 - o Fire
 - o Police
 - o Public Works
- City of Kingman
 - o Fire
 - o Police
 - o Public Works
- City of Lake Havasu City
 - o Fire
 - o Police
 - o Public Works
- Fort Mojave Mesa Fire District
- Fort Mojave Indian Tribe
- Golden Valley Fire District
- Grapevine Mesa Fire District
- Hualapai Indian Nation
- J.E. Fuller/ Hydrology & Geomorphology, Inc.
- Kaibab-Paiute Indian Tribe
- Mohave County Golden Valley Improvement District
- Mohave Valley Fire Department
- Northern Arizona Consolidated Fire District
- Pine lake Fire District
- Pinion Pine Fire District
- Mohave County
 - o Emergency Mgmt
 - o Planning and Zoning
 - o Public Health
 - o Public Works
 - o Sheriff
- Town of Colorado City
 - o Fire

Table 3-4 summarizes the organizations and agencies that participated in the 2005 Plan and those that participated in the 2009-2010 Plan update process. An explanation of the differences between the two lists is also provided where appropriate.

Table 3-4: Comparative summary of agency/organization participation in the plan update process			
Agency / Organization	Participation		Explanation
	2005 Plan	2010 Plan	
Arizona Division of Emergency Management	yes	yes	
Bullhead City	yes	yes	
Colorado City	yes	yes	
Fort Mojave Indian Tribe	yes	no	Was invited but did not attend any meetings. FMIT developed a standalone tribal plan in 2008.
Hualapai Nation	yes	yes	Did not finish the planning effort and withdrew from the planning team
Kaibab Paiute Indian Tribe	yes	no	Was invited but did not attend any meetings. FMIT developed a standalone tribal plan in 2008.
Kingman	yes	yes	
Mohave County	yes	yes	
Mohave Valley Fire Department	yes	no	Was invited but did not attend any meetings
U.S. Bureau of Reclamation	yes	no	Very limited participation in first 2005 Plan. USBR was contacted as a resource for Colorado River dam failure information but not as a participant on the planning team.
U.S. Bureau of Land Management	yes	yes	

Additional contact with targeted organizations was made individually and outside the context of the main planning team by several of the participating jurisdictions. The following are summaries of those contacts:

- Mohave County Emergency Management contacted Unisource Energy via e-mail and Mohave Electric Cooperative via phone to discuss their potentially vulnerable electric substation locations to determine susceptibility to identified hazards during the process of identifying critical facilities throughout the county, including the cities. Most were not in areas susceptible to flooding or wildfire.

- Mohave County Emergency Management gave updates on the Hazard Mitigation planning process at the quarterly LEPC meetings held in March, June, and September of 2009. Agendas for those meetings are included in Appendix B. The Mohave County LEPC membership includes representatives from schools, hospitals, and businesses. A copy of the LEPC member list is provided in Appendix B.
- In Colorado City, the Plan was talked about in open session of city council where members of the school district and local utilities were present. Draft copies of the Plan were also made available to Planning and Zoning, Utilities, Fire, PD and City Administration.
- Lake Havasu City Fire Department coordinated with the Lake Havasu Unified School District, Local C.E.R.T. members, the local Red Cross, and the local Salvation Army during the development of Plan. Contact was primarily to obtain asset data and to discuss mitigation in reference to emergency response plans.

An integral part of the planning process included coordination with agencies and organizations outside of the participating jurisdiction's governance to obtain information and data for inclusion into the Plan or to provide more public exposure to the planning process. Much of the information and data that is used in the risk assessment is developed by agencies or organizations other than the participating jurisdictions. In some cases, the jurisdictions may be members of a larger organization that has jointly conducted a study or planning effort like the development of a community wildfire protection plan or participation in an area association of governments. Examples of those data sets include the FEMA floodplain mapping, severe weather statistics and incidents, and the South Eastern Arizona Governments Organization. A summary of the resources obtained, reviewed and compiled into the risk assessment are summarized at the end of each subsection of Section 5.3 and in Section 3.6. Jurisdictions needing these data sets obtained them by requesting them directly from the host agency or organization, downloading information posted to website locations, or engaging consultants.

3.5 Public Involvement

3.5.1 Previous Plan Assessment

The pre-draft public involvement strategy for the 2005 Plan development included the use of open public meetings and surveys. One county-level, two public meetings were held at Lake Havasu City and Kingman following the second planning meeting wherein the findings of the risk and capability assessments were presented. A total of eight residents attended. Take home surveys were distributed to meeting attendees and other interested citizens, to solicit input regarding unique hazard concerns and possible mitigation actions. Recipients were asked to return the completed surveys and a total of six surveys were received.

The post-draft strategy included posting the draft plan to the county website and at government offices and public libraries, requesting public comment and participation in the formal council and board of supervisors meetings wherein the 2005 Plans were presented and promulgated. The details of the meeting process varied from jurisdiction to jurisdiction, but typically included some form of advertisement of the meeting agenda two to four weeks in advance of the council/board meeting. In most cases, an informal, pre-adoption presentation of the 2005 Plan was made during a working session of the council/board. The final adoption of the resolutions were almost unanimously done as part of a consent agenda at a formal council/board meeting.

The Planning Team discussed the past public involvement efforts and in particular, the pre-draft open public meetings. The Planning Team felt that the response gained versus the effort expended was not beneficial enough to warrant using the same process with the update of the Plan. The post-draft process is required for any formal council/board action and has a built-in public notification and comment opportunity, so the Planning Team chose to continue using this process as one of the post-draft mechanisms for getting the Plan before the public.

3.5.2 Plan Update

Public involvement and input to the plan update process was encouraged cooperatively among all of the participating jurisdictions using several venues throughout the course of the pre-draft planning. The Mohave County website was used to post a public notice of the planning activities and a press release was also issued on March 2, 2009. Additional notices announcing the planning process were posted to the Bullhead City, Kingman, and Lake Havasu City websites. Invitations to CERT volunteers were also extended for participation in the regular Planning Team meetings. No questions, concerns, or responses were received from the first round of notices from the general public.

A post-draft public notice and copy of the draft plan was posted to the Mohave County website, as well as a press release announcing the availability of the draft for public review and comment. Updated website notices directing readers to the Mohave County website were also posted to the Bullhead City, Kingman, and Lake Havasu City websites. Interested citizens were also encouraged to participate in the local community adoption process which, depending upon the jurisdiction, may have included a public meeting and a formal public hearing. Copies of the public notices, web pages, and press releases are provided in Appendix C.

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SECTION 4: COMMUNITY DESCRIPTIONS

4.1 General

The purpose of this section is to provide updated basic background information on Mohave County as a whole and includes information on geography, climate, population and economy. Abbreviated details and descriptions are also provided for each participating jurisdiction.

4.2 County Overview

4.2.1 Geography

Mohave County is located in northwest corner of Arizona as illustrated in Figure 4-1, and shares a border with California and Nevada along the Colorado River to the west, and Utah to the north. Its southern border is the Bill Williams River and La Paz County, with Coconino County and Yavapai County sharing the boundary to the east. Mohave County is the second largest county in Arizona, covering 13,479 square miles and is also a great water sports center with over 186 square miles of water and 1,000 miles of shoreline.

Mohave County is bisected in the northern portion by the Grand Canyon and varies in elevation ranging from 500 at the Colorado River to 8,000 feet atop Hualapai Peak. The topography varies from flat desert ranges in the eastern portion of the county to rolling, mountainous terrain and deep canyons of the western and northern areas.

The county is generally bounded on the east and west by Longitudes 112.54 and 114.75 degrees West, and on the south and north between Latitudes 34.21 to 37.01 degrees North. Major transportation routes through the area are shown on Figure 4-2 and include Interstate Highways 40 and 15, U.S. Highway 93, and State Routes 95, 66, 68 and 389, as illustrated in Figure 4-2.

The terrestrial characteristics of Mohave County are quite diverse, and have been mapped into four unique ecoregions depicted in Figure 4-2 and described below:³

- **Arizona Mountain Forests** – A mountainous landscape, with moderate to steep slopes. Elevations in this zone range from approximately 4,000 to 13,000 feet, resulting in comparatively cool summers and cold winters. Vegetation in these areas are largely high altitude grasses, shrubs, brush, and conifer forests.
- **The Colorado Plateau Shrublands** –. Elevations in this zone average around 4,000 to 5,000 feet. Vegetation is comprised mainly of Plains Grassland and Great Basin Desert scrub. Temperatures can vary widely in this zone, with comparatively warm summers and cool winters.
- **Sonoran Desert** – An arid environment that covers much of southwestern Arizona. The elevation varies in this zone from approximately sea level to 3,000 feet. Vegetation in this zone is comprised mainly of Sonoran Desert Scrub and is one of the few locations in the world where saguaro cactus can be found. The climate is typically hot and dry during the summer and mild during the winter.
- **Mojave Desert** – An area covering a relatively small portion of northwest Arizona, including portions of Coconino and Mojave Counties. The elevation varies from 1,500 feet to nearly 4,000 feet on some mountains. Typically the climate is very hot and dry during the summer and comparatively warm during the winter.

³ World Wildlife Fund, 2010, GIS database of Terrestrial Ecoregions

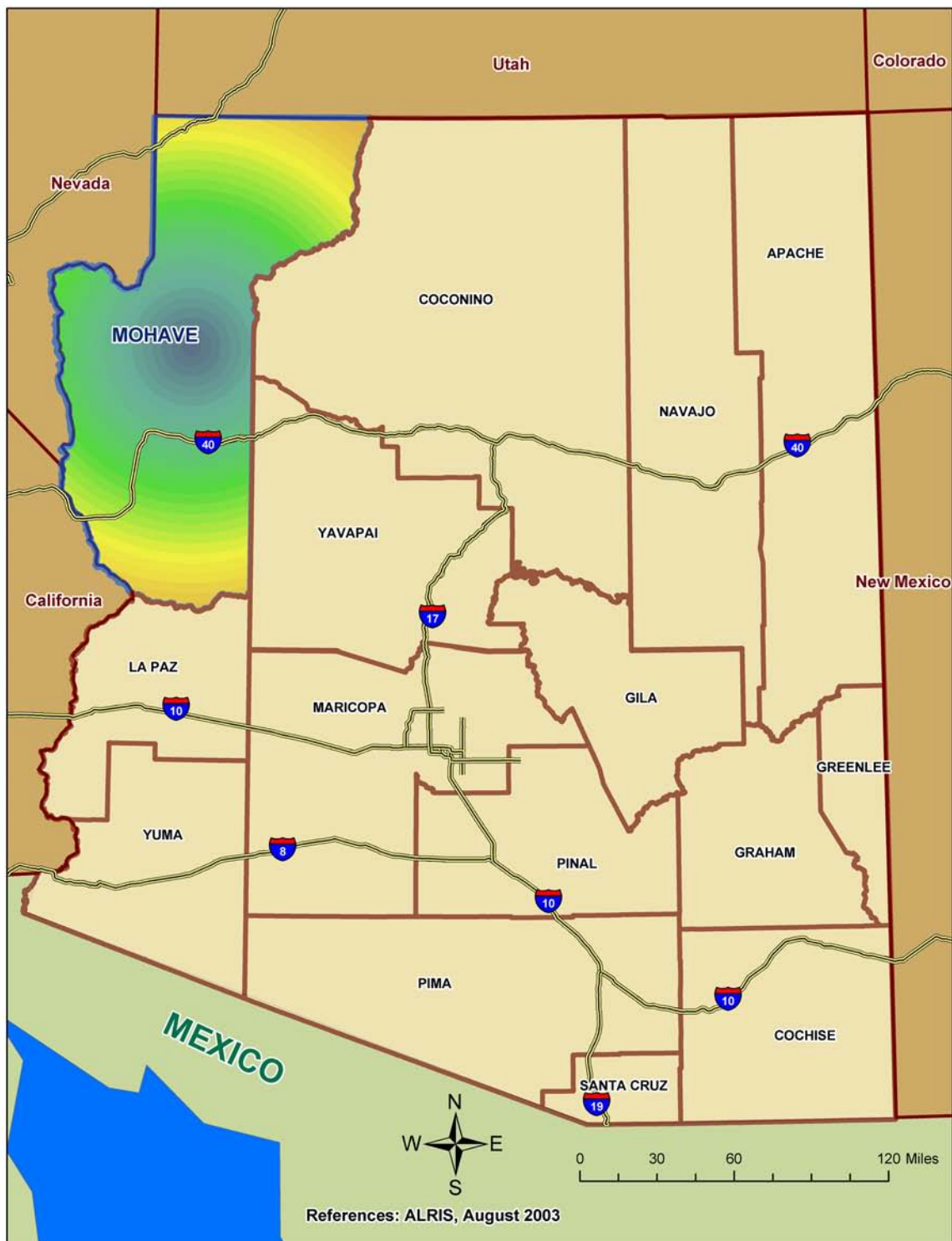


Figure 4-1: Vicinity Map

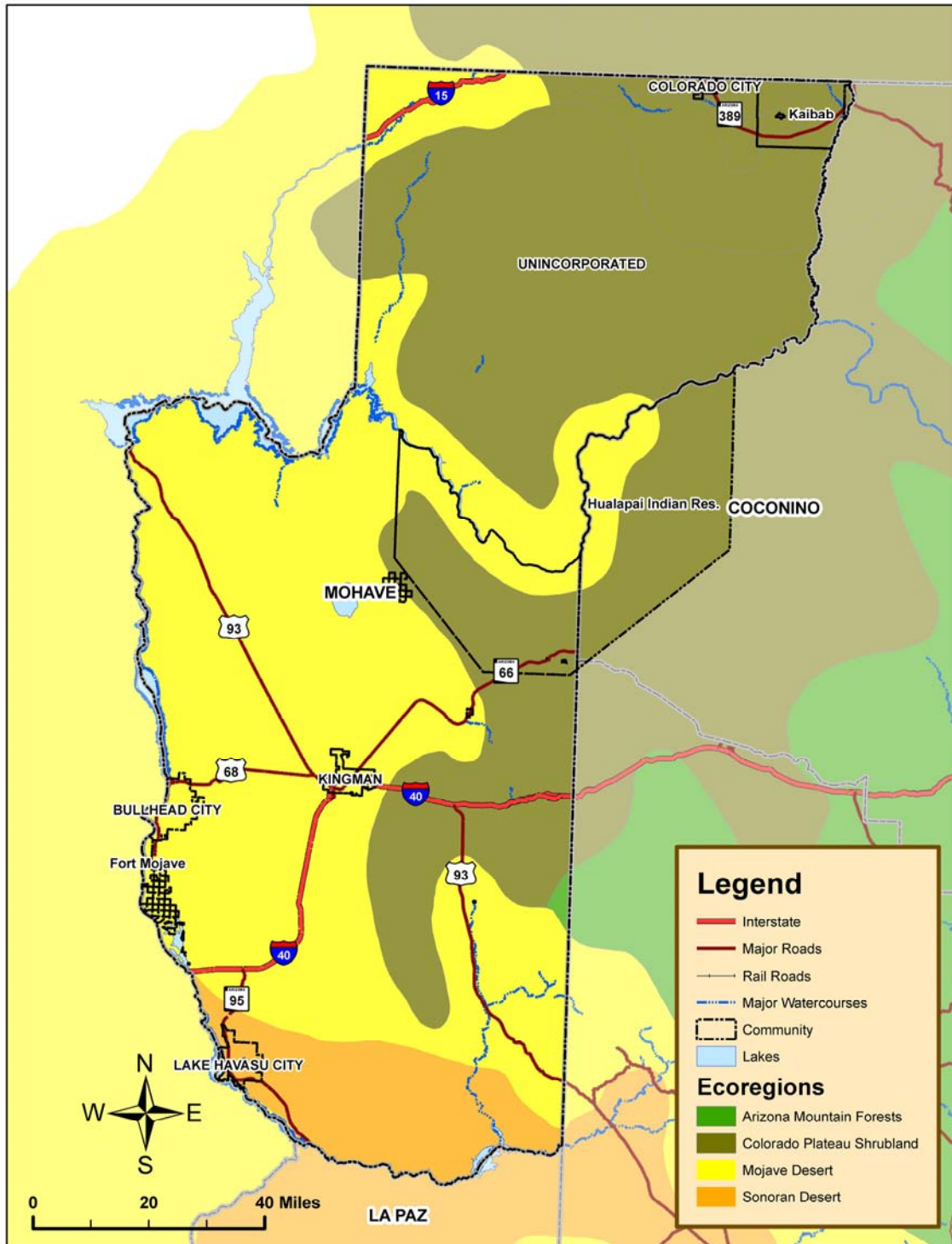


Figure 4-2: Terrestrial Ecoregions Map

Mohave County lies entirely within the Upper and Lower Colorado River Basins. The Upper Colorado River Basin includes the Grand Canyon and Lake Mead. Mountain ranges include the Virgin, Black, and Cerbat ranges. The lower basin includes Lakes Mead and Havasu on the Colorado River and Lake Alamo on the Bill Williams River, a tributary to the Colorado. The lower basin also includes the Hualapai, Peacock, Cottonwood, Aquarius, Bill Williams, Mohave, McCracken, Rawhide, and Artillery Mountains.

Land ownership within Mohave County, as depicted in Figure 4-3, is divided between Bureau of Land Management (57.6%), National Parks (13.0%), Private (12.0%), Indian Reservations, (8.3%); U.S. Forest (4.6%), State of Arizona Trust Lands (4.3%), and other (0.5%).

4.2.2 Climate

The climate across Mohave County differs significantly due to its varied terrain and geography. Climatic statistics for weather stations within Mohave County are produced by the Western Region Climate Center and span records dating back to the early 1900's.⁴ Locations of reporting stations within or near Mohave County are shown on Figure 4-4.

Average temperatures within Mohave County range from below freezing during the winter months to over 112 degrees Fahrenheit during the hot summer months. The severity of temperatures in either extreme is highly dependent upon the location, and more importantly the altitude, within the county. For instance, temperature extremes at Kingman are more moderate than those for the Bullhead City area on the Colorado River. Figures 4-5 through 4-8 present graphical depictions of annual temperature variability and extremes for the Bullhead City, Colorado City, Kingman, and Lake Havasu City stations. Station elevations and representative ecoregions are:

- Bullhead City – 580 feet – lower Mojave Desert
- Colorado City – 5,010 feet – Colorado Plateau Shrubland
- Kingman – 3,360 feet – upper Mojave Desert
- Lake Havasu City – 500 feet – lower Mojave Desert

In general, there is a ten to fifteen degree reduction in temperatures between the upper and lower elevation stations. It is plausible to expect another 10 degree reduction for areas above 9,000 feet.

Precipitation throughout Mohave County is governed to a great extent by elevation and season of the year. From November through March, storm systems from the Pacific Ocean cross the state as broad winter storms producing mild precipitation events and snowstorms at the higher elevations. Summer rainfall begins early in July and usually lasts until mid-September. Moisture-bearing winds move into Arizona at the surface from the southwest (Gulf of California) and aloft from the southeast (Gulf of Mexico). The shift in wind direction, termed the North American Monsoon, produces summer rains in the form of thunderstorms that result largely from excessive heating of the land surface and the subsequent lifting of moisture-laden air, especially along the primary mountain ranges.

Figures 4-9 through 4-12 present tabular temperature and precipitation statistics for the Bullhead City, Colorado City, Kingman and Lake Havasu City stations.

⁴ Most of the data provided and summarized in this plan are taken from the WRCC website beginning at the following URL:
<http://www.wrcc.dri.edu/CLIMATEDATA.html>

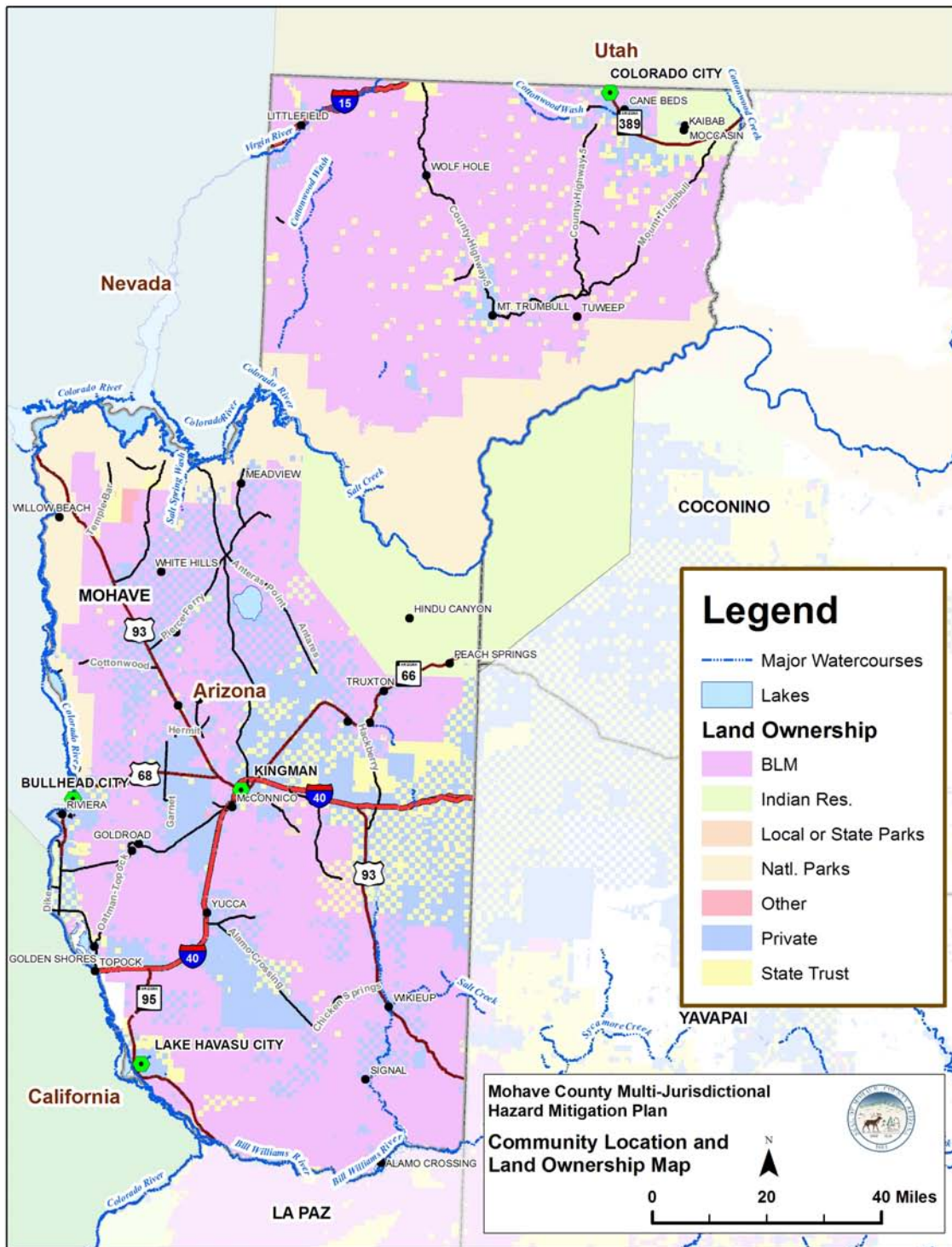


Figure 4-3: Map of land ownership for Mohave County

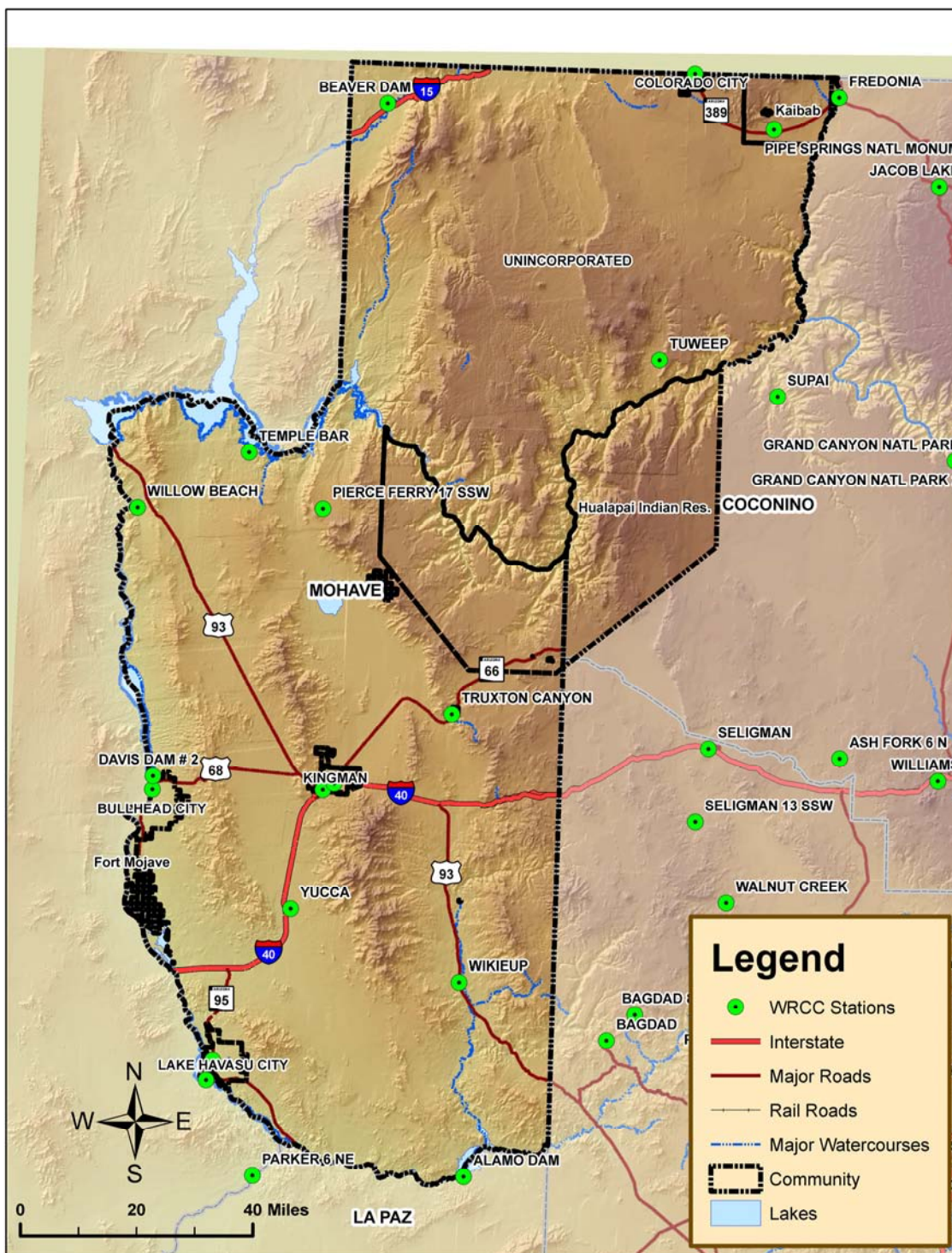


Figure 4-4: Map of general features for Mohave County

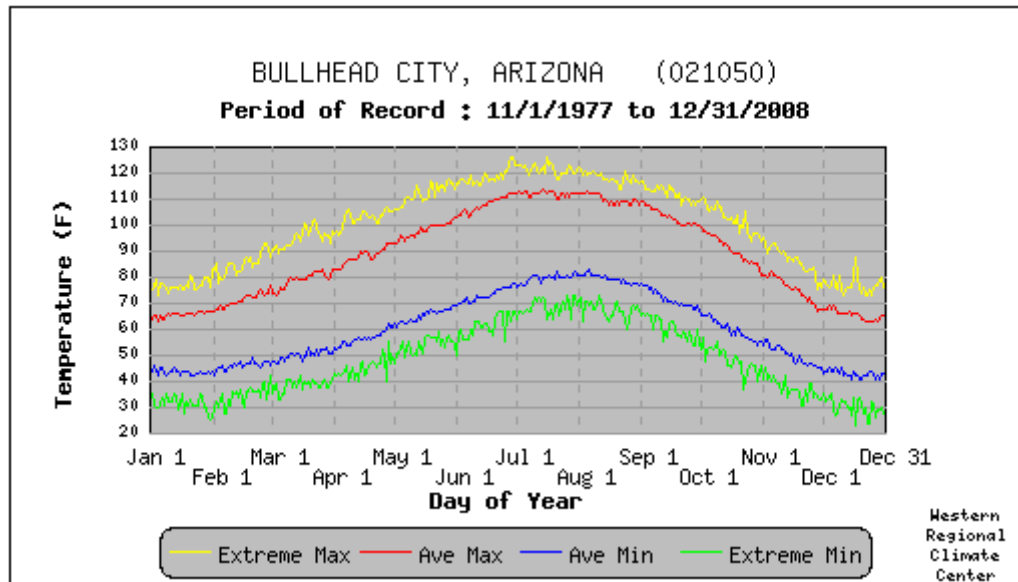


Figure 4-5
Daily Temperatures and Extremes for Bullhead City, Arizona

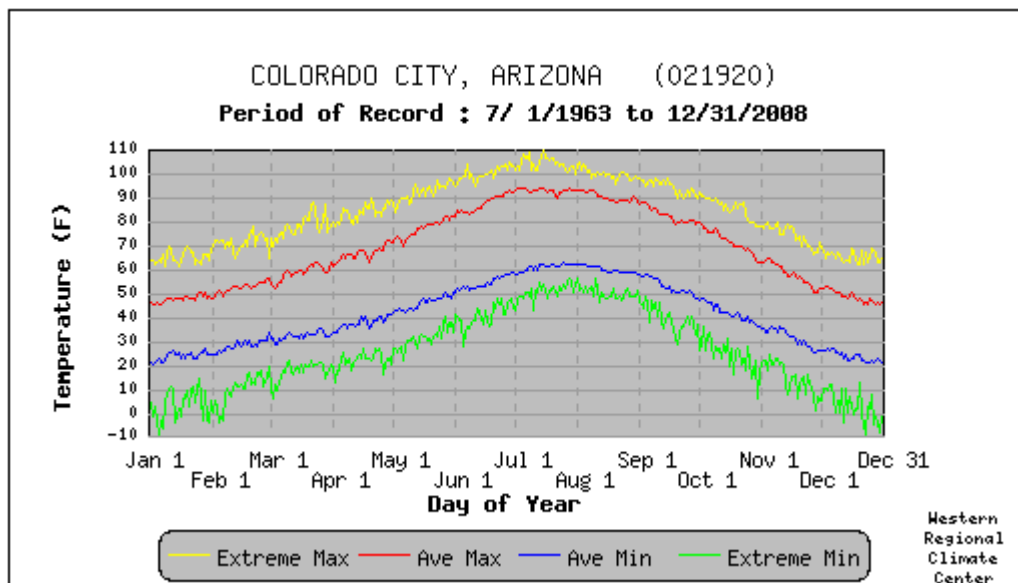


Figure 4-6
Daily Temperatures and Extremes for Colorado City, Arizona

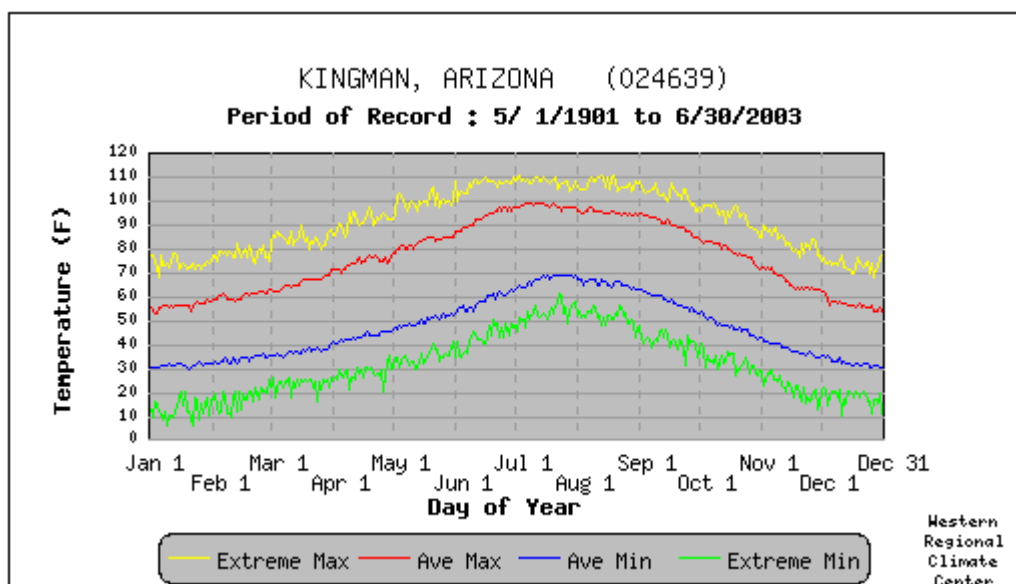


Figure 4-7
Daily Temperatures and Extremes for Kingman, Arizona

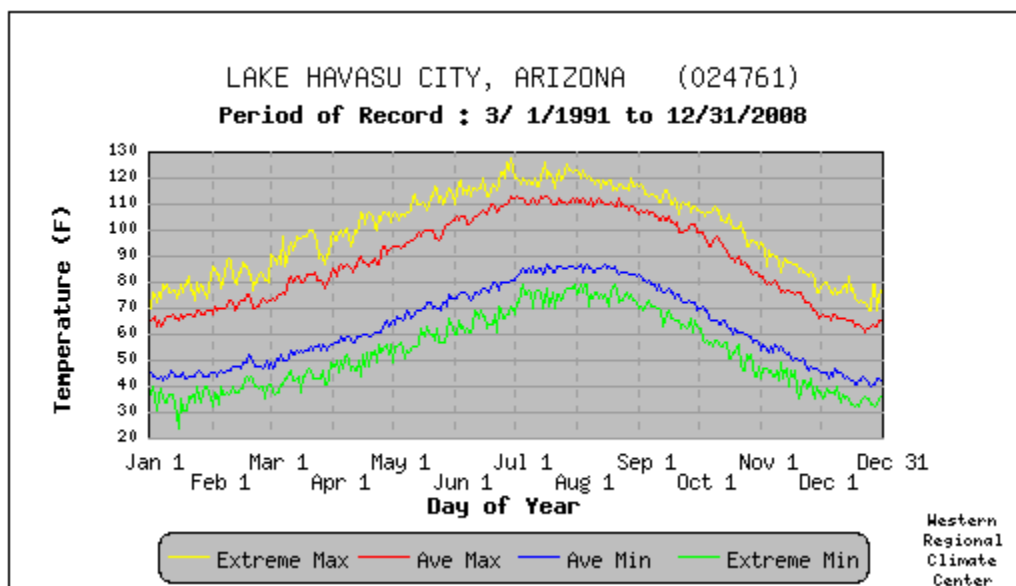


Figure 4-8
Daily Temperatures and Extremes for Lake Havasu City, Arizona

BULLHEAD CITY, ARIZONA (021050)

Period of Record Monthly Climate Summary

Period of Record : 11/1/1977 to 12/31/2008

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average Max. Temperature (F)	65.8	71.4	78.9	88.0	97.8	108.0	112.0	110.0	103.4	90.5	75.3	65.5	88.9
Average Min. Temperature (F)	43.7	46.1	49.9	56.5	65.3	73.1	79.7	79.6	71.7	59.7	49.7	42.8	59.8
Average Total Precipitation (in.)	0.99	1.04	0.85	0.15	0.08	0.01	0.30	0.72	0.34	0.43	0.45	0.52	5.89
Average Total SnowFall (in.)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Average Snow Depth (in.)	0	0	0	0	0	0	0	0	0	0	0	0	0

Percent of possible observations for period of record.

Max. Temp.: 99.7% Min. Temp.: 99.6% Precipitation: 99.8% Snowfall: 100% Snow Depth: 99.9%

Check [Station Metadata](#) or [Metadata graphics](#) for more detail about data completeness.

Western Regional Climate Center, wrcc@dri.edu

Figure 4-9
Monthly Climate Summary for Bullhead City, Arizona

COLORADO CITY, ARIZONA (021920)

Period of Record Monthly Climate Summary

Period of Record : 7/ 1/1963 to 12/31/2008

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average Max. Temperature (F)	47.6	52.4	58.8	66.6	77.0	87.7	93.0	90.4	82.8	71.7	58.0	48.6	69.6
Average Min. Temperature (F)	23.6	27.9	32.1	37.5	45.9	54.3	60.9	60.2	52.9	41.8	31.4	23.6	41.0
Average Total Precipitation (in.)	1.37	1.55	1.53	0.95	0.61	0.41	1.19	1.57	1.20	1.03	1.13	1.04	13.58
Average Total SnowFall (in.)	4.3	3.7	2.7	1.1	0.0	0.0	0.0	0.0	0.0	0.3	1.9	2.9	16.9
Average Snow Depth (in.)	1	0	0	0	0	0	0	0	0	0	0	0	0

Percent of possible observations for period of record.

Max. Temp.: 95.2% Min. Temp.: 95.1% Precipitation: 95.2% Snowfall: 94.5% Snow Depth: 94.3%

Check [Station Metadata](#) or [Metadata graphics](#) for more detail about data completeness.

Western Regional Climate Center, wrcc@dri.edu

Figure 4-10
Monthly Climate Summary for Colorado City, Arizona

KINGMAN, ARIZONA (024639)

Period of Record Monthly Climate Summary

Period of Record : 5/ 1/1901 to 6/30/2003

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average Max. Temperature (F)	55.9	60.0	65.8	74.2	82.7	92.7	97.8	95.3	90.3	79.0	66.5	56.7	76.4
Average Min. Temperature (F)	31.1	33.6	36.8	43.2	49.7	58.1	67.2	65.5	58.0	47.6	37.8	32.1	46.7
Average Total Precipitation (in.)	1.09	1.30	1.05	0.66	0.25	0.15	0.90	1.42	0.98	0.66	0.71	1.17	10.35
Average Total SnowFall (in.)	1.3	0.3	0.7	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.3	1.0	3.7
Average Snow Depth (in.)	0	0	0	0	0	0	0	0	0	0	0	0	0

Percent of possible observations for period of record.

Max. Temp.: 91.8% Min. Temp.: 92.2% Precipitation: 96.3% Snowfall: 96.3% Snow Depth: 95.9%

Check [Station Metadata](#) or [Metadata graphics](#) for more detail about data completeness.

Western Regional Climate Center, wrcc@dri.edu

Figure 4-11
Monthly Climate Summary for Kingman, Arizona

LAKE HAVASU CITY, ARIZONA (024761)

Period of Record Monthly Climate Summary

Period of Record : 3/ 1/1991 to 12/31/2008

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average Max. Temperature (F)	66.8	71.5	79.4	87.7	97.6	107.0	111.4	110.4	103.9	91.3	75.8	64.8	89.0
Average Min. Temperature (F)	44.2	47.7	52.6	59.7	69.3	77.1	84.9	84.8	76.7	62.8	51.3	43.4	62.9
Average Total Precipitation (in.)	0.54	0.39	0.37	0.09	0.03	0.01	0.16	0.28	0.34	0.27	0.31	0.38	3.16
Average Total SnowFall (in.)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Average Snow Depth (in.)	0	0	0	0	0	0	0	0	0	0	0	0	0

Percent of possible observations for period of record.

Max. Temp.: 96.4% Min. Temp.: 96.3% Precipitation: 92.8% Snowfall: 96.6% Snow Depth: 96.5%

Check [Station Metadata](#) or [Metadata graphics](#) for more detail about data completeness.

Western Regional Climate Center, wrcc@dri.edu

Figure 4-12
Monthly Climate Summary for Lake Havasu City, Arizona

4.2.3 Population

As of July 2009, the total population for Mohave County is estimated at 206,763 residents, which represents an approximate growth of 15% over the July 2004 estimate of 180,210. The majority of the population is located in Unincorporated Mohave County in the 30 or so towns and communities and incorporated city/town fringe areas. The largest incorporated city is Lake Havasu City. Table 4-1 summarizes jurisdictional population statistics for Mohave County communities and the County as a whole.

Table 4-1: Summary of jurisdictional population estimates for Mohave County					
Jurisdiction	1990	2000	2009	2010	2020
Mohave County	93,497	155,032	206,763	221,443	281,688
City and Towns					
Bullhead City	21,951	33,769	41,609	42,075	50,810
Colorado City	2,426	3,334	4,033	4,835	6,196
Kingman	13,208	20,069	29,189	31,722	42,290
Lake Havasu City	24,363	41,938	55,502	65,073	86,053
Hualapai Indian Tribe	822	1,353	N/A	1,955	2,503
Fort Mojave Indian Tribe	454	773	N/A	1,138	1,469
Kaibab Paiute Indian Tribe	165	196	N/A	218	242
<i>Note: Figures for 1990 and 2000 from US Census Bureau Figures for 2009 population: http://www.azcommerce.com/doclib/econinfo/FILES/2009AZestimates.pdf Figures for 2010 to 2020: Arizona Department of Economic Security, Research Administration, Population Statistics Unit, 12/01/06.</i>					

4.2.4 Economy

Through the Treaty of Guadalupe Hidalgo in 1848, Mohave County began to attract settlers after it became part of the United States. During the 1860s, an influx of miners came after the discovery of gold, and Mormons were sent from the north by their church leaders. Kingman became the county seat during the 1880s with the construction of the railroad. Today, the Burlington Northern Santa Fe Railway and AMTRAK service the area.

Some of Mohave County and all of Colorado City are designated Enterprise Zones⁵. Mohave County's major industries are retail, health care, social assistance and construction. The large population centers can contribute much of the growth to tourism and recreational activities along the Colorado River and lakes, the seasonal and full-time migration of retirees, and the rapid growth of the employment opportunities in the gaming industry of Laughlin and Las Vegas, Nevada⁶. The primary employment sectors are trade, transportation, utilities, government, education and health services.

In 2005, the total labor force for Mohave County was estimated to average 88,625 with an unemployment rate of 4.2%. As of March 2010, the labor force was estimated at 92,600 with an unemployment rate of 10.7%.⁷

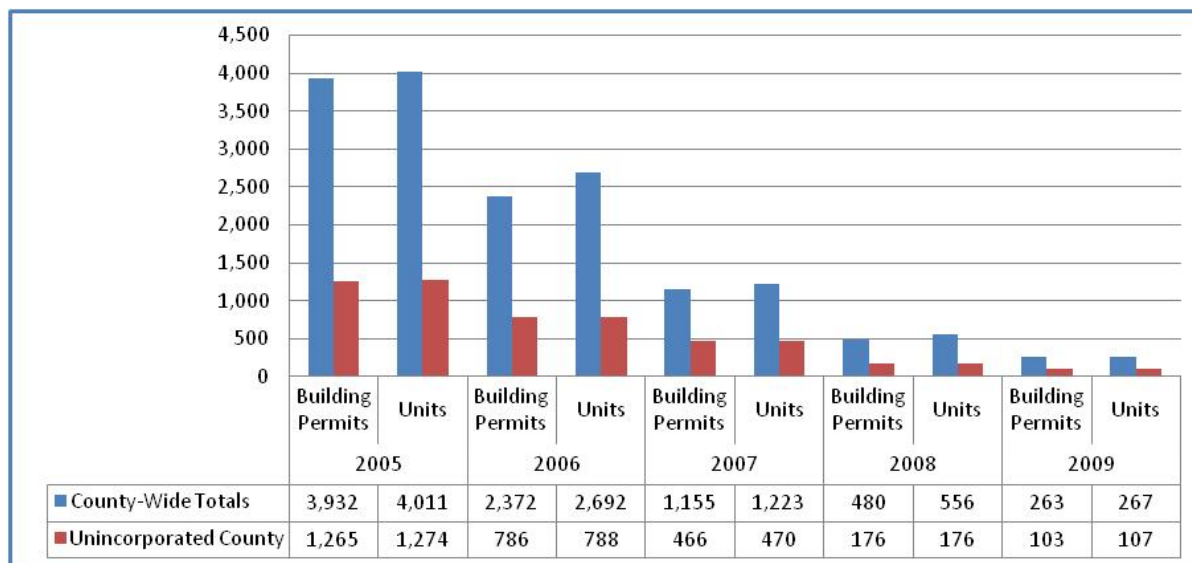
According the U.S. Census Bureau, there has been at least 8,202 residential building permits issued and 8,749 units completed county-wide for the five year period of 2005 to 2009. Figure 4-13 presents a comparison of the residential units completed for the unincorporated county versus the county-wide

⁵ <http://www.azcommerce.com/doclib/COMMUNE/Mohave%20County.pdf>

⁶ Mohave County Multi-Jurisdictional Hazard Mitigation Plan, 2004

⁷ Source: Arizona Workforce Informer website at:
<http://www.workforce.az.gov/cgi/dataanalysis/?PAGEID=94&SUBID=142>

totals for the period of 2005 to 2009. At least one-quarter of all the building permits were issued for areas outside of incorporated communities.

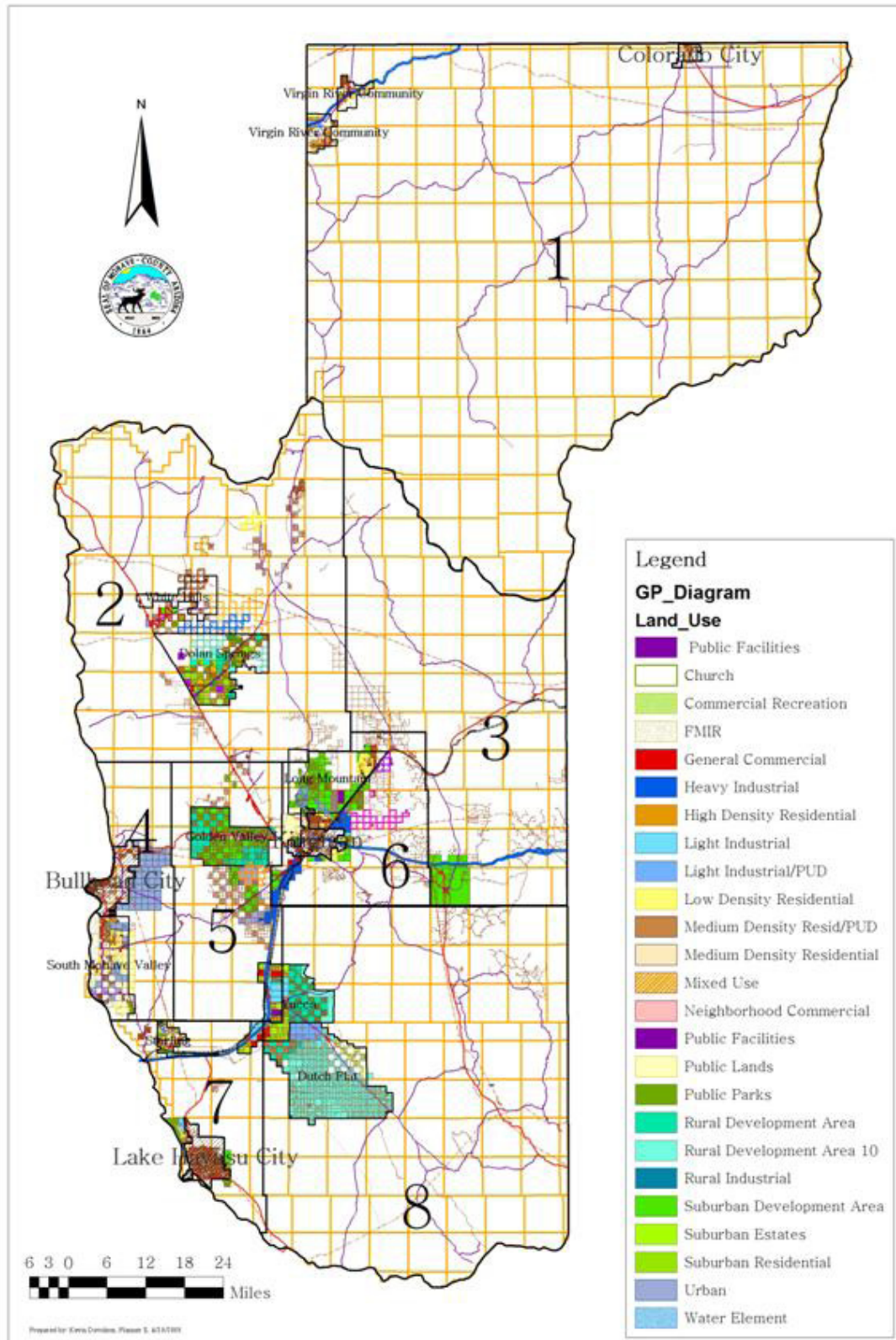


Source: U.S. Census Bureau, 2010

Figure 4-13: Residential building permits and units completed for Unincorporated Mohave County for the period of 2005 to 2009

For the unincorporated areas of the county, the Mohave County General Plan⁸ recognized high rates of growth in the South Mohave Valley, Golden Valley and areas surrounding Bullhead City, Kingman and Lake Havasu City. Over 85% of the land in the County is owned by federal and state governments. Because of the vast size of the County, the public lands do not normally restrict or constrain growth, except where alternating sections of public ownership increases cost of development. The availability or access to water and sewer is the primary restraint of growth. Land use planning for the unincorporated areas of the county is guided by the Mohave County General Plan, as illustrated by Figure 4-14.

⁸ Mohave County, 2005, *Mohave County, Arizona General Plan*, original text by Freilich, Leitner & Carlisle, March 1995.



Source: Mohave County General Plan, 2005, Exhibit VI.1, p 57.

Figure 4-14: Countywide land use plan

4.3 Jurisdictional Overviews

The following are brief overviews for each of the participating jurisdictions in the Plan.

4.3.1 Bullhead City

Bullhead City is located along the central-western edge of Mohave County near the common border of Arizona, California, and Nevada. The city is located approximately 218 miles northwest of Phoenix, 62 miles north of Lake Havasu City, and is approximately 35 miles west of Kingman. The city is situated along the east bank of the Colorado River on either side of State Highway 95, as shown in Figure 4-15. Land ownership within the city is primarily private with a few areas of State Trust Land and BLM land.

Bullhead City was originally named Hardyville by the founder, William Harrison Hardy, who was one of the first men to call the area home in the 1860s. At the turn of the century, mining activities ceased and railroads were constructed from Needles through Yucca to Kingman and farther. Hardyville was soon abandoned and became a ghost town. Eventually, the area resurrected in the early 1940s with the construction of Davis Dam, and was renamed to Bullhead City after Bull's Head Rock, an old landmark and navigation point located along the Colorado River that is now partially submerged by Lake Mohave. The city began as the headquarters for construction of Davis Dam in 1945. Bullhead City incorporated in 1984 with much of the recent growth in the last 25 years is attributable to the successful development of Laughlin, Nevada.⁹

According to Bullhead City's current General Plan¹⁰, land use planning includes various densities of residential, commercial, industrial, and mixed land uses as illustrated in Figure 4-16. The city has identified the following four general areas of focus for growth:

- The area surrounding the intersection of Marina Boulevard and Highway 95 that includes some of the City's major retail centers, the City Hall and additional vacant land.
- The original Bullhead City townsite, just west of the Airport.
- The Laughlin-Bullhead International Airport.
- The Bullhead Parkway.

Bullhead City's proximity to the Colorado River/Lake Mohave and Lake Mead National Recreation Area offers visitors year round water sports activities. The 67 mile long Lake Mohave is the gateway to the Lake Mead area. Lake Mohave offers camping, fishing, water skiing, jet skiing and many other activities which entice visitors to the Bullhead City area.

According to the Arizona Department of Commerce, tourism is the primary economic activity, centering on the Laughlin resort/gaming industry and Colorado River related activities. Currently, the city serves a trade area population that exceeds 144,000. The civilian labor force in 2008 was 22,012 with an unemployment rate of 6.6 percent. In 2008, there were approximately \$632.9 million of taxable sales in the City.¹¹ Residential building permits issued and units constructed in the city over the period of 2005-2009, are shown in Figure 4-17. County-wide totals are also provided for comparison.

⁹ <http://www.bullheadcity.com>

¹⁰ HDR, 2002, *Bullhead City General Plan*

¹¹ <http://www.azcommerce.com/doclib/COMMUNE/bullhead%20city.pdf>

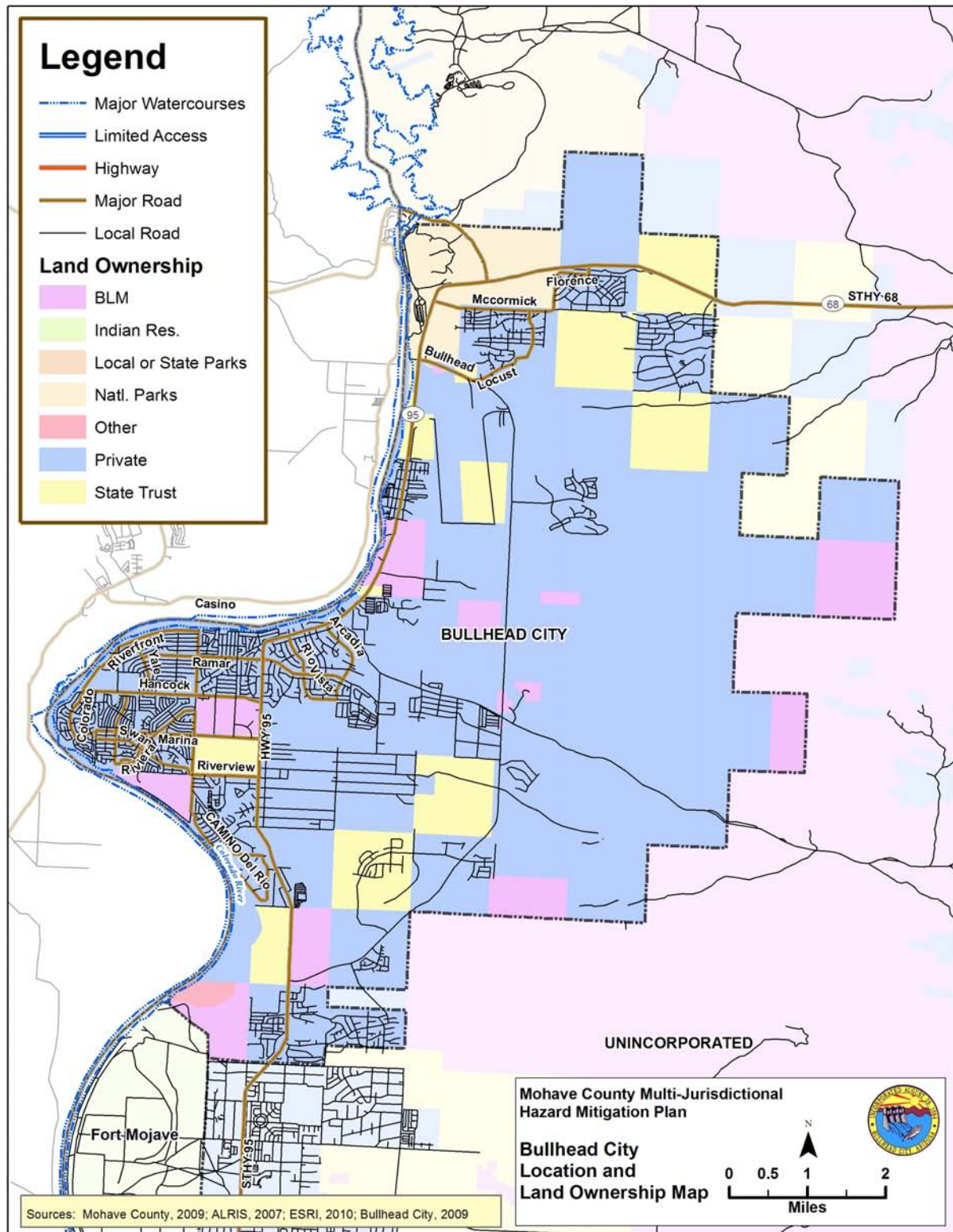


Figure 4-15: Bullhead City location and land ownership map

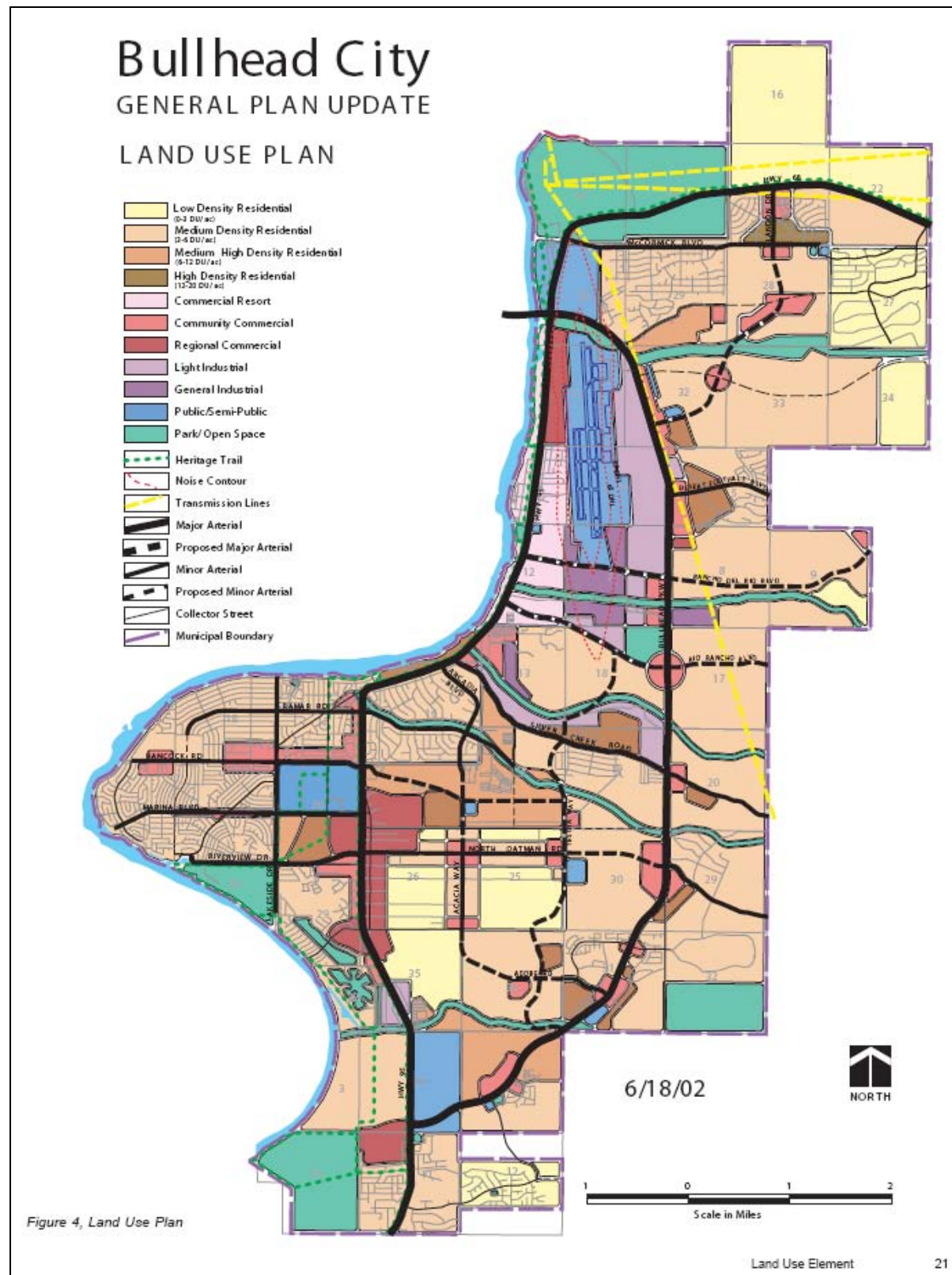
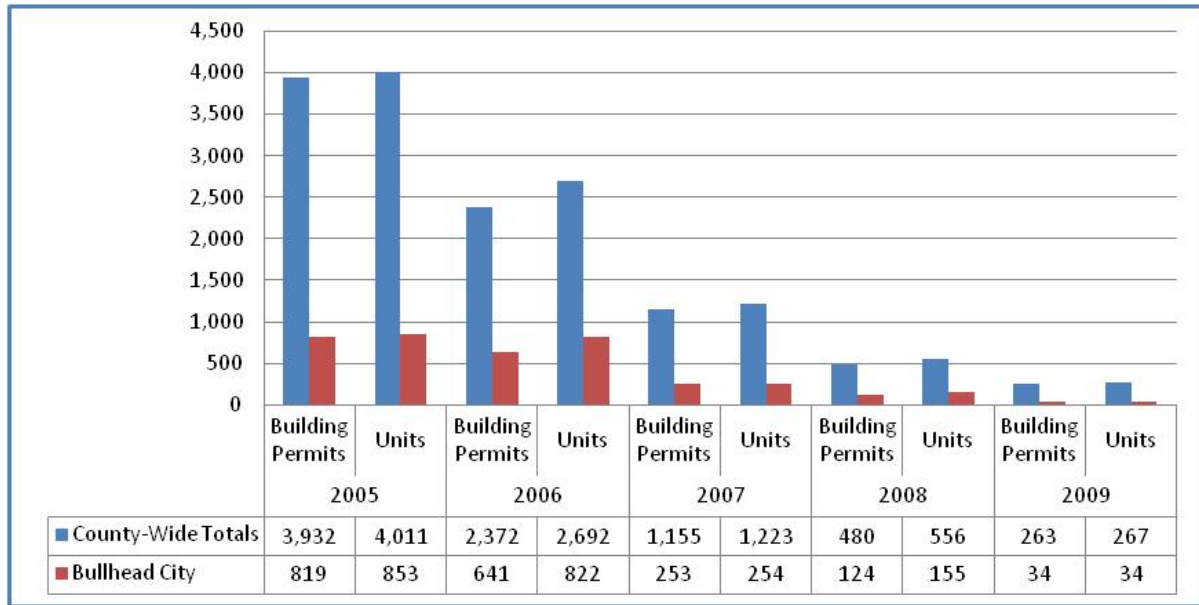


Figure 4-16: Land use plan for Bullhead City



Source: U.S. Census Bureau 2010

Figure 4-17: Residential building permits issued and units constructed for Bullhead City during 2005 to 2009

4.3.2 Colorado City

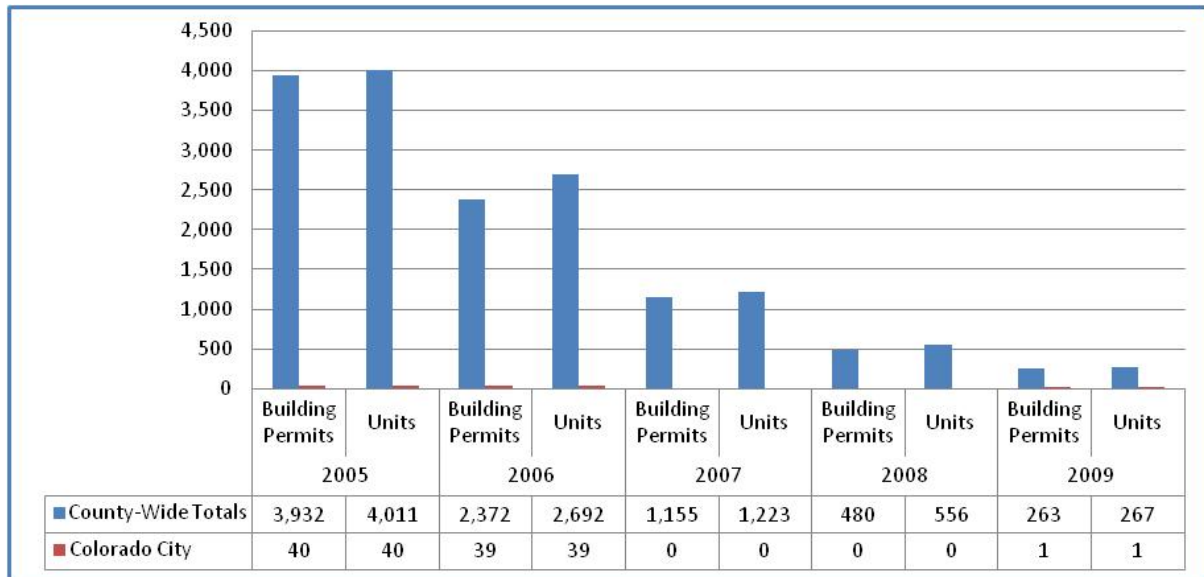
Colorado City is located on the Arizona-Utah border in the northeastern part of the county, as illustrated by Figure 4-2, and shares a common border with Hildale, Utah. The average elevation is about 5,200 feet. The major highway is State Route 389. Colorado City is located approximately 354 miles north of Phoenix and 162 miles northeast of Las Vegas, Nevada. The North Rim of the Grand Canyon is about 100 miles south. A local map depicting the major transportation and land ownership elements in and around Colorado City is provided in Figure 4-18. The land surrounding Colorado City is either Bureau of Land Management or State Trust or privately owned.

Colorado City was originally named Short Creek after a nearby intermittent stream that exhibited surface flow for a short distance before disappearing into the sandy bottom of the watercourse. One of the first modern settlers was William Maxwell in 1908. Other early settlers were cattlemen and ranchers, and eventually homesteaders. During the 1930s, a group of religious fundamentalists came from Utah seeking refuge and played a major role in developing Colorado City for what it is today. The community officially changed its name to Colorado City in 1963 and was incorporated in 1985.

According to the Arizona Department of Commerce, the traditional economic focus on agriculture and ranching has gradually changed with growth and urban expansion. The local school district is the largest single employer in town, but manufacturing plants and regional construction provide the most jobs. The neighboring community of Hildale, Utah, has an active industrial park and service industries, which plays an important role in Colorado City's economy. The industrial activities for the most part are in Hildale, while commercial and retail is in Colorado City. The civilian labor force in 2008 was 1,323 with an unemployment rate of 4.5 percent. In 2008, there were approximately \$13.7 million of taxable sales in the town.¹² Residential building permits issued and units constructed in the city over the period of 2005-2009, are shown in Figure 4-19. County-wide totals are also provided for comparison.

¹²<http://www.azcommerce.com/doclib/COMMUNE/colorado%20city.pdf>





Source: U.S. Census Bureau 2010

Figure 4-19: Residential building permits issued and units constructed for Colorado City during 2005 to 2009

4.3.3 Kingman

Kingman is located in central Mohave County 35 miles east of the Arizona-California border as illustrated in Figure 4-2. The average elevation is about 3,345 feet. Kingman is located approximately 186 miles northwest of Phoenix and 104 miles southeast of Las Vegas, Nevada. The city is situated along the intersection of Interstate Highway 40 and U.S 93. Kingman lies in the Hualapai Valley between the Cerbat and Hualapai Mountain Ranges. A map depicting the major transportation and land ownership elements in and around Kingman is provided in Figure 4-20.

The following excerpt from the General Plan for Kingman¹³ details the development history of the city:

In the early years, the mining of gold, silver, copper and molybdenum was a mainstay of the Kingman economy. Many of the early structures were built of locally quarried tufa stone, other native rock materials, adobe, or lumber from the Hualapai Mountains. Buildings blended well with the colors and textures of the surrounding environment. Houses were generally set back from the street with enclosed yards. Early landscaping consisted of natural desert vegetation and features. Commercial areas were compact, usually with zero setbacks, and no landscaping. The construction of Boulder (Hoover) Dam and the highway to it in the 1930s, the establishment of the artillery gunnery school at the Kingman Airport during World War II and the construction of the Davis Dam provided the stimulus for the area's growth. In 1939 there were only a few houses built in what is now referred to as the Hilltop area of Kingman. After World War II, the Hilltop area began to slowly develop. Eight major subdivisions in the Hilltop area had been recorded by 1945. These subdivisions all used a gridiron street pattern with lots primarily 25' x 100' in size. In fact over 13,600 lots were created with the majority less than 6,000 square feet. For example the Golden Gate Addition subdivision was created with 4,185 lots of only 2,500 square feet in size and little or no subdivision improvements. These subdivisions were based on land speculation and cheap land prices and were platted without regard to topography. There were several private water companies operating at that time which provided water to the Hilltop area.

¹³ City of Kingman, 2004, *City of Kingman, Arizona General Plan 2020*

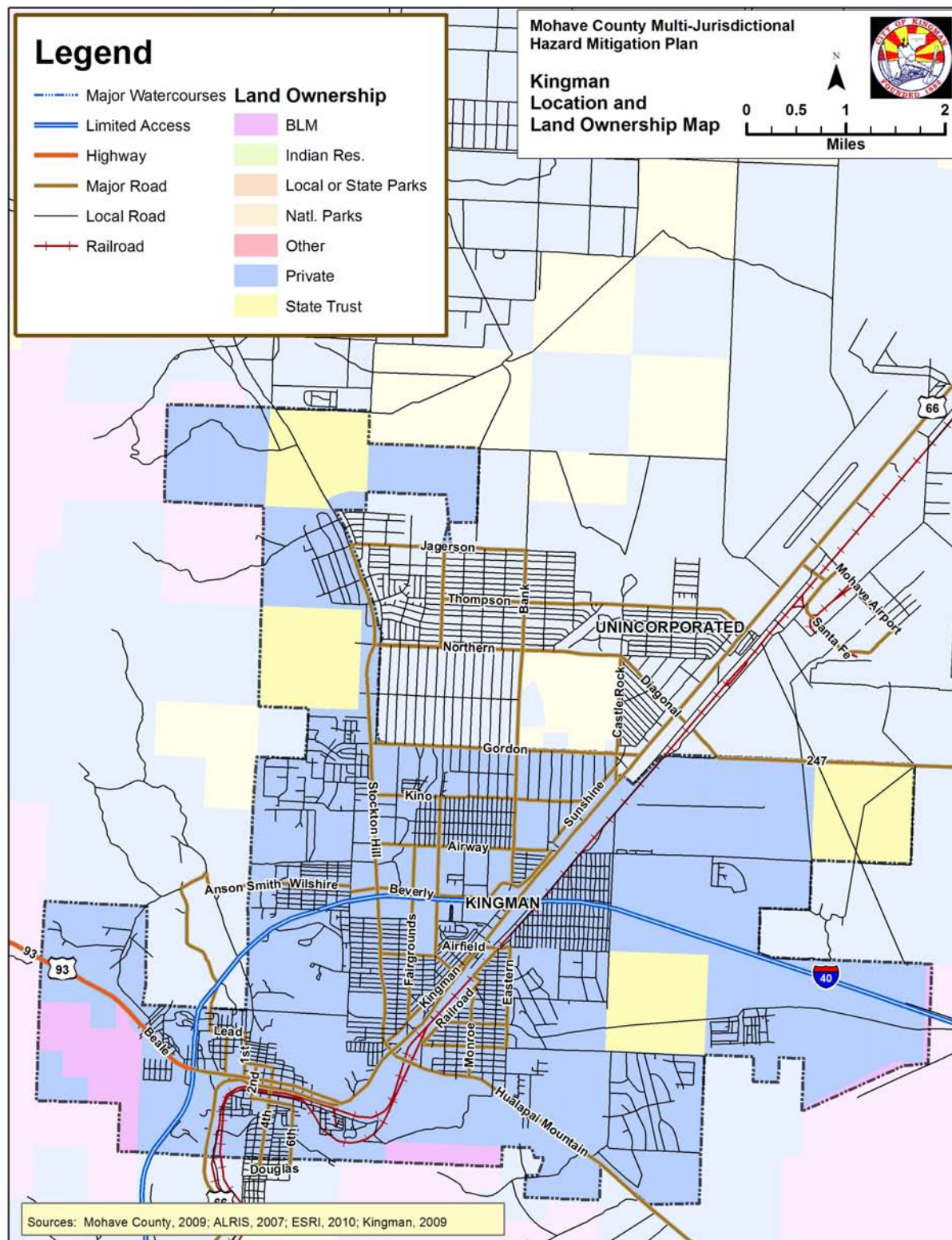


Figure 4-20: Kingman location and land ownership map

In 1952 the City of Kingman was incorporated with a population of about 3,400. This brought road paving, sidewalks, street lights and city parks. The City entered into the water business when it purchased the Kingman Water Company in 1960. In 1972 the City purchased the Long Mountain Water Company which served the New Kingman/Butler area. The Hilltop area began to develop in earnest in the late 1950s and 1960s. The residential areas east of Stockton Hill Road and west of La Salle Avenue north of Airfield Avenue were developed at this time. Beginning in the mid 1960s the New Kingman Addition subdivisions, commonly referred to as Butler, north of the City of Kingman began to develop and infill with mobile homes and site-built homes. By 1970 the population of the City of Kingman had risen to 7,312 and the population within the entire Kingman area had reached 13,387.

In the 1970s and early 1980s the Cecil Davis subdivision east of the railroad tracks and south of Southern Avenue was almost entirely built out with single family homes. The Kingman Park Estates area also developed in this area. Further north near Western Avenue and Gordon Drive, the Canyon Shadows subdivision began to develop with single family homes and later with patio home development. In what was outside the City limits at the time, the Kingman Camelback area developed in the 1980s with a mixture of site-built and manufactured homes and the Hualapai Foothills area southeast of Kingman began to develop. Commercial development at this time was centered along Stockton Hill Road and Andy Devine Avenue in the Hilltop area. Interstate 40 was completed in the early 1980s which bypassed the Downtown area and focused commercial development in the Hilltop area. Additional commercial development occurred near the I-40/Highway 93 interchange. By 2000, the population of the City of Kingman had risen to 20,069 from the 13,208 in 1990 and population within the entire Kingman area had reached over 35,000. Beginning in the 1990s and continuing through the 2000, Kingman began to see a substantial amount of residential and commercial infill development. This was due in part to successful City improvement districts in older, partially developed subdivisions. These included the Gates Avenue Improvement District west of Stockton Hill Road and south of I-40, the Kingman Airport Tract Improvement District north of Airway Avenue, the Greater Kingman Addition Improvement District east of Eastern Street and north of I-40, and the East Golden Gate Improvement District, in the Louise Avenue/Washington Avenue area. Beginning in the early 1990s, the Stockton Hill Road corridor between I-40 and Northern Avenue became the main commercial corridor in Kingman. This began with the addition of the Wal-Mart/Albertson's shopping center in 1993, followed by numerous other commercial developments and the hospital expansion.

The East Kingman area including the Hualapai Mountain/Fripps Ranch, Rancho Santa Fe and Hualapai Foothills Estates neighborhoods saw tremendous residential growth in the 1990s and early 2000s. Other new residential development occurred in centralized areas including Silver Ridge and the Walleck Ranch neighborhoods. Finally, new residential development has occurred on the far northern side of the Kingman area including the Chaparral Mesa and Fountain Hills subdivisions.

While most of Kingman's residential development has been in the form of single family homes, some substantial multiple family developments has occurred since the mid 1980s. These include Kingman Station Apartments with 144 units in Downtown Kingman, Centennial Parkview with 118 units and Parkcrest Village Apartments with 80 units in the Centennial Park area, and Copper Ridge Apartments with 156 units in the Hualapai Mountain Road area. Large scale senior level housing has also occurred most notably near the intersection of Western and Detroit.

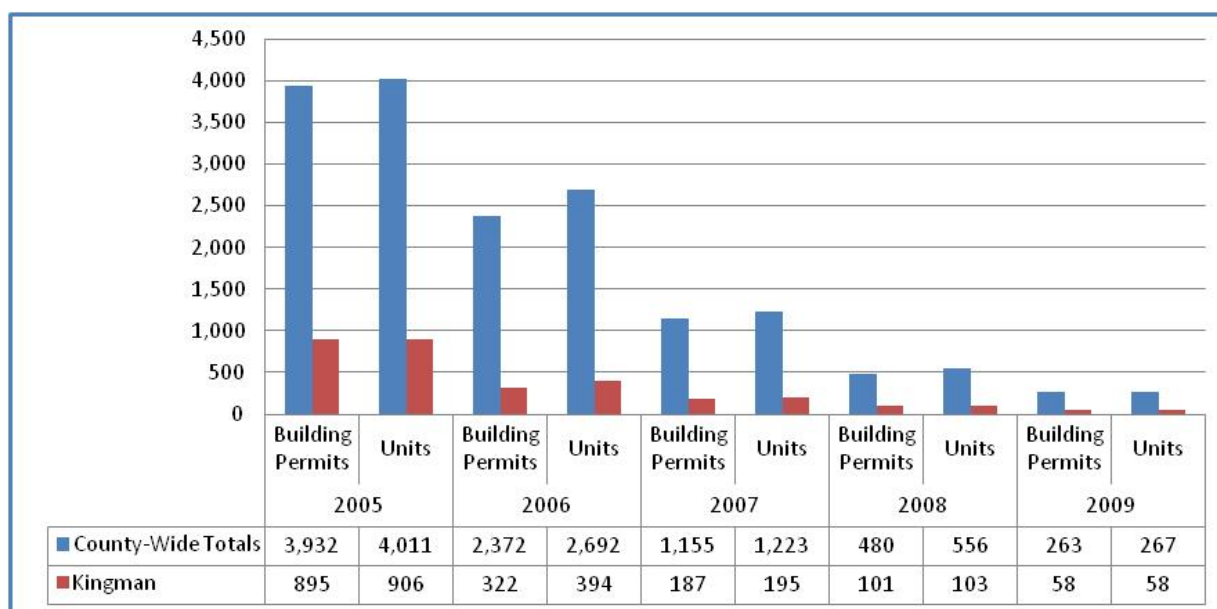
Similar growth trends and patterns can be expected in the future with the largest concentration of residential growth occurring on the east side of Kingman and the main area of commercial growth occurring along the Stockton Hill Road corridor primarily from I-40 to Gordon Drive.

According to the Arizona Department of Commerce, Kingman has become a regional trade, service and distribution center for northwestern Arizona. Its proximity to Los Angeles, Las Vegas, Phoenix, Laughlin and the Grand Canyon has made tourism, transportation, manufacturing, and distribution the leading industries. The reasonable land costs of the fully developed, rail-served Kingman Airfield & Industrial park attracts manufacturers and distributors serving the Western United States. Growth in

U.S. trade with Canada and Mexico, combined with the City's strategic location on the national transportation routes, provides an excellent opportunity for Kingman to be a center for international trade. Major transportation routes serving Kingman include I-40, U.S. 93, two BNSF main lines, and a commercial airport offering one-day access to major southwest markets. I-40 provides immediate east-west access from California to the east coast. U.S. 93 is widely known as the CANAMEX Corridor providing north-south access from Canada to Mexico.¹⁴

The completion of the Hoover Dam Bypass project, located along U.S. 93, will enable Kingman and other communities to provide affordable alternatives for Las Vegas commuters. The price difference, coupled with the new bypass, has Las Vegas developers making land deals with property owners in Kingman, Arizona. Figure 4-22 illustrates the projected land use for the City of Kingman through 2020 from the General Plan.

The civilian labor force in 2008 was 12,616 with an unemployment rate of 12.3 percent. In 2008, there were approximately \$649.5 million of taxable sales in the city.¹⁵ Residential building permits issued and units constructed in the city over the period of 2005-2009, are shown in Figure 4-21. County-wide totals are also provided for comparison.



Source: U.S. Census Bureau 2010

Figure 4-21: Residential building permits issued and units constructed for Kingman during 2005 to 2009

¹⁴ <http://www.cityofkingman.gov/pages/about/community.asp>

¹⁵ <http://www.azcommerce.com/doclib/commune/kingman.pdf>

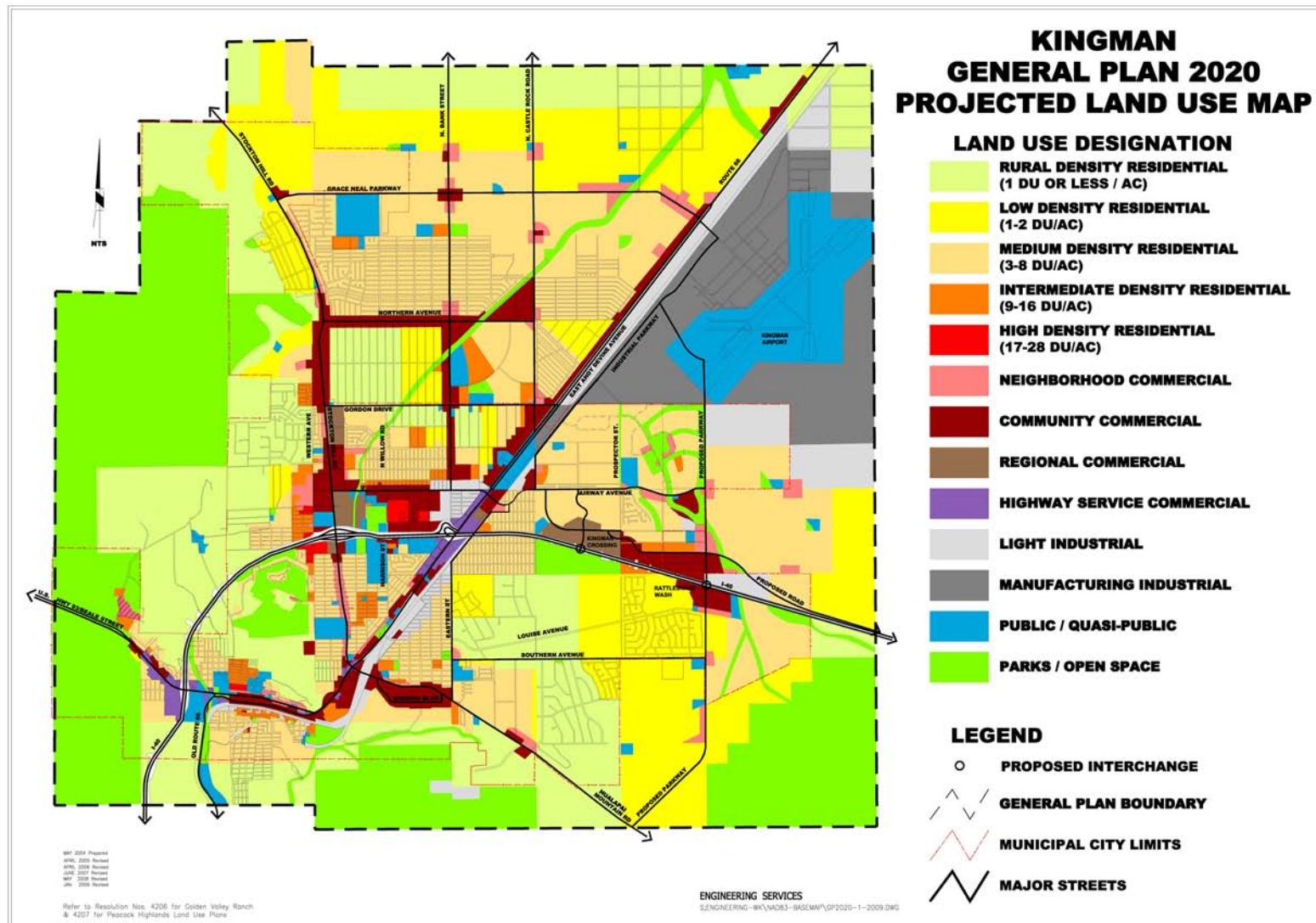


Figure 4-22: City of Kingman projected land use map

4.3.1 Lake Havasu City

Lake Havasu City is located along Lake Havasu, formed by the Parker Dam on the Colorado River. Lake Havasu City is located in southwestern Mohave County along the east shore of the Colorado River/Lake Havasu impoundment of Parker Dam. The Arizona-California border parallels the western city limits, as illustrated in Figure 4-2. The average elevation is about 575 feet. Lake Havasu City is located approximately 206 miles northwest of Phoenix, 20 miles south of Interstate 40, and 62 miles south of Bullhead City. The city is situated on either side of State Route 95 and is home to the famous London Bridge. A map depicting the major transportation and land ownership elements in and around Lake Havasu City is provided in Figure 4-23.

According to the Lake Havasu City General Plan¹⁶, the city was conceived in 1963 as a master-planned community with an emphasis on recreation and retirement residential. This theme, deriving from the area's outstanding features of scenery, climate, and shoreline, was augmented by adding a strong employment base. The city's founder, Robert P. McCulloch, commissioned comprehensive planning and design studies. He also brought his own industry as well as others to the community. He successfully sought to put Lake Havasu on the map by transporting the London Bridge from the River Thames in England, to its current place of prominence spanning Bridgewater Channel. The community experienced strong growth during the 1960s and 1970s, which accelerated after official incorporation in 1978.

According to the Arizona Department of Commerce, Lake Havasu City attracts hundreds of thousands of visitor each year to its calm waters and beautiful beaches. The London Bridge and adjoining English village are a focal point of a multi-million dollar resort complex that infuses \$100 million dollars a year into the city's economy. Along with the profitable tourism trade, a wide variety of manufacturing industries and the supporting retail trade also contribute significantly to the economy. Future growth plans include concentrations of commercial and employment sectors to north around the airport, resort related development along Lake Havasu, and rural residential areas to east. There are also large open space / park land used proposed at the north and south ends of the city. Figure 4-24 illustrates the future land use proposed for Lake Havasu City by the current General Plan.

The civilian labor force in 2008 was 25,068 with an unemployment rate of 5.2 percent. In 2008, there were approximately \$911.1 million of taxable sales in the city.¹⁷ Residential building permits issued and units constructed in the city over the period of 2005-2009, are shown in Figure 4-25. County-wide totals are also provided for comparison.

¹⁶ City of Lake Havasu City, 2002, *Lake Havasu City General Plan 2002*

¹⁷ <http://www.azcommerce.com/doclib/commune/kingman.pdf>

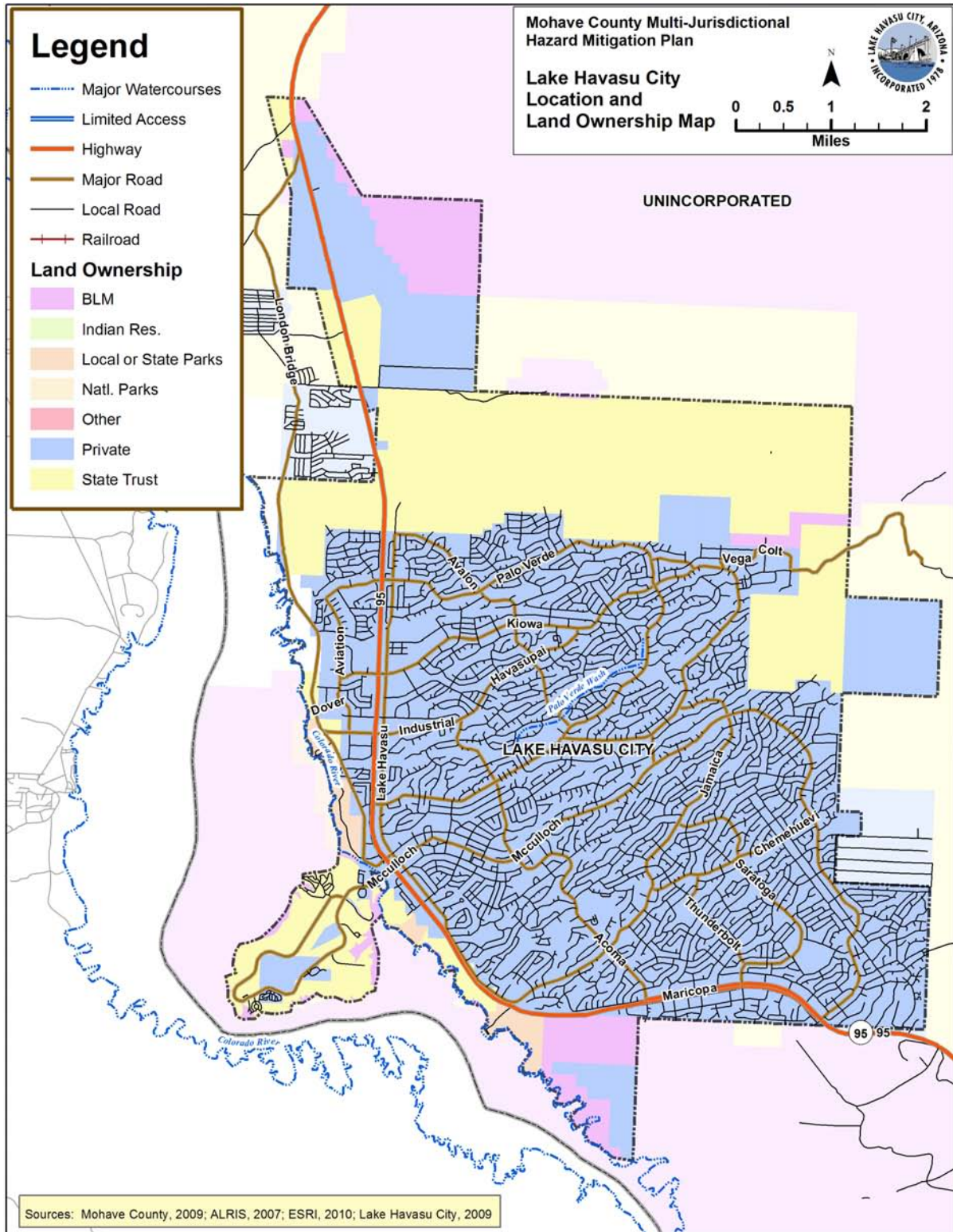


Figure 4-23: Lake Havasu City community location and land ownership map

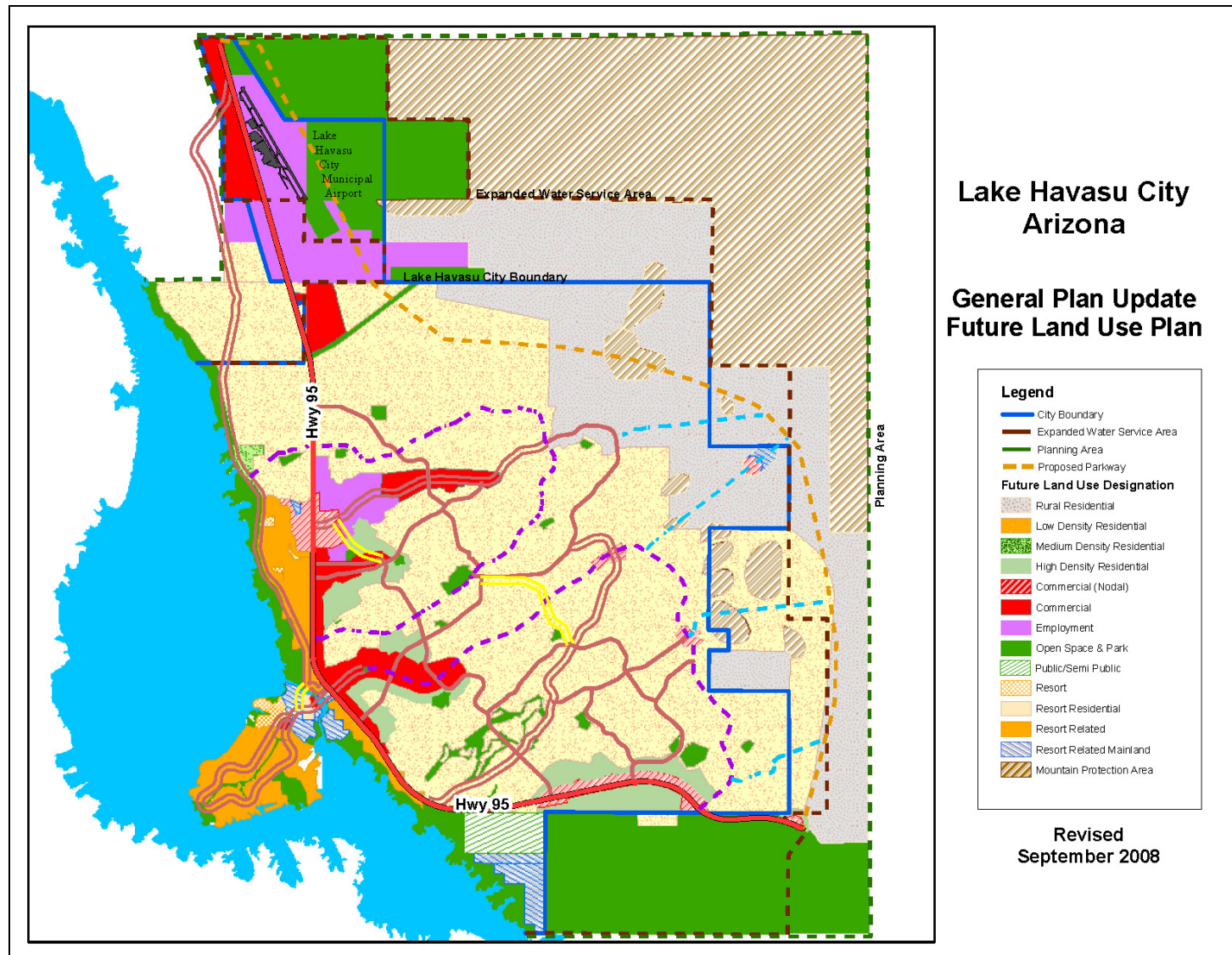
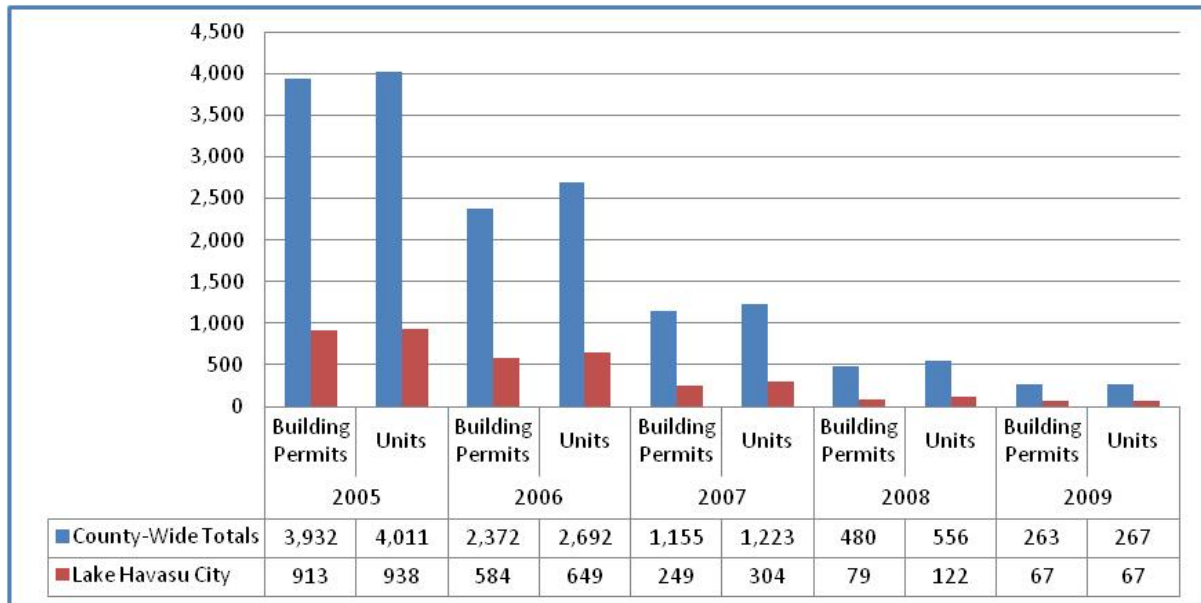


Figure 4-24: Lake Havasu City future land use plan



Source: U.S. Census Bureau 2010

Figure 4-25: Residential building permits issued and units constructed for Lake Havasu City during 2005 to 2009

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SECTION 5: RISK ASSESSMENT

§201.6(c)(2): *[The plan shall include...] (2) A risk assessment that provides the factual basis for activities proposed in the strategy to reduce losses from identified hazards. Local risk assessments must provide sufficient information to enable the jurisdiction to identify and prioritize appropriate mitigation actions to reduce losses from identified hazards. The risk assessment shall include:*

- (i) A description of the type, location, and extent of all natural hazards that can affect the jurisdiction. The plan shall include information on previous occurrences of hazard events and on the probability of future hazard events.*
- (ii) A description of the jurisdiction's vulnerability to the hazards described in paragraph (c)(2)(i) of this section. This description shall include an overall summary of each hazard and its impact on the community. The plan should describe vulnerability in terms of:*
 - (A) The types and numbers of existing and future buildings, infrastructure, and critical facilities located in the identified hazard areas;*
 - (B) An estimate of the potential dollar losses to vulnerable structures identified in paragraph (c)(2)(i)(A) of this section and a description of the methodology used to prepare the estimate;*
 - (C) Providing a general description of land uses and development trends within the community so that mitigation options can be considered in future land use decisions.*
- (iii) For multi-jurisdictional plans, the risk assessment section must assess each jurisdiction's risks where they vary from the risks facing the entire planning area.*

One of the key elements to the hazard mitigation planning process is the risk assessment. In performing a risk assessment, a community determines “what” can occur, “when” (how often) it is likely to occur, and “how bad” the effects could be¹⁸. According to DMA 2000, the primary components of a risk assessment that answer these questions are generally categorized into the following measures:

Hazard Identification and Screening

Hazard Profiling

Assessing Vulnerability to Hazards

The risk assessment for Mohave County and participating jurisdictions was performed using a county-wide, multi-jurisdictional perspective, with much of the information gathering and development being accomplished by the Planning Team. This integrated approach was employed because many hazard events are likely to affect numerous jurisdictions within the County, and are not often relegated to a single jurisdictional boundary. The vulnerability analysis was performed in a way such that the results reflect vulnerability at an individual jurisdictional level, and at a countywide level.

5.1 Hazard Identification and Screening

Hazard identification is the process of answering the question; “*What hazards can and do occur in my community or jurisdiction?*” For this Plan, the list of hazards identified in the 2005 Plan were reviewed by the Planning Team with the goal of refining the list to reflect the natural hazards that pose the greatest risk to the jurisdictions represented by this Plan. The planning team also chose to focus on natural hazards, with the exception of dam failure and transportation accidents, which were considered to be closely tied to natural events and therefore kept. The Planning Team also compared and contrasted the 2005 Plan list to the comprehensive hazard list summarized in the 2007 State Plan¹⁹ to ensure compatibility with the State Plan. Table 5-1 summarizes the 2005 Plan and 2007 State Plan hazard lists.

¹⁸ National Fire Protection Association, 2000, *Standard on Disaster/Emergency Management and Business Continuity Programs*, NFPA 1600.

¹⁹ ADEM, 2007, *State of Arizona Multi-Hazard Mitigation Plan*

Table 5-1: Summary of initial hazard identification lists	
2005 Mohave County Plan Hazard List	2007 State Plan Hazard List
• Civil Disturbance • Dam/Levee Failure • Drought • Earthquake • Extreme Cold and Heat • Flooding/Flash Flooding • Hazardous Material Incidents • Landslides/Mudslides • Power/Utility Failure • Radiological Accident • Terrorism • Thunderstorms/High Winds • Tornadoes/Dust Devils • Transportation Accident • Tropical Storms/Hurricane • Wildfires • Winter Storms	• Dam Failure • Drought • Earthquake • Fissure • Flooding/Flash Flooding • Hazardous Materials Incidents • Landslides/Mudslides • Monsoon • Subsidence • Thunderstorms/High Winds • Tornadoes/Dust Devils • Tropical Storms/Hurricane • Wildfires • Winter Storms

The review included an initial screening process to evaluate each of the listed hazards based on the following considerations:

- Experiential knowledge on behalf of the Planning Team with regard to the relative risk associated with the hazard
- Documented historic context for damages and losses associated with past events (especially events that have occurred during the last plan cycle)
- The ability/desire of Planning Team to develop effective mitigation for the hazard under current DMA 2000 criteria
- Compatibility with the state hazard mitigation plan hazards
- Duplication of effects attributed to each hazard

One tool used in the initial screening process was the historic hazard database referenced in the 2005 Plan. With this Plan, the 2005 Plan database was reviewed and revised to separately summarize declared disaster events versus non-declared events. Declared event sources included Arizona Division of Emergency Management (ADEM), Federal Emergency Management Agency (FEMA), and United States Department of Agriculture (USDA). Non-declared sources included Arizona State Land Department (ASLD), National Weather Service (NWS), National Oceanic and Atmospheric Administration (NOAA), National Climatic Data Center (NCDC), United States Geological Survey (USGS), United States Forest Service (USFS), United States National Park Service, National Response Center, and ADEM. Both data sets were updated with additional hazard events that have occurred over the last plan cycle and were also modified to primarily represent the period of August 1957 to February 2010. Two tables are used in this Plan to summarize the historic hazard events. Table 5-2 summarizes the federal and state disaster declarations that included Mohave County. Table 5-3 summarizes all non-declared hazard events that meet the following selection criteria:

- 1 or more fatalities
- 1 or more injuries
- Any dollar amount in property or crop damages
- For wildfires, all the following must be met:
 - 100 acres or larger, and
 - Any reported amount for firefight costs, and
 - Any reported damages to structures
- Significant event, as expressed in historical records or according to defined criteria above

The following should be noted when reviewing Tables 5-2 and 5-3: 1) Table 5-2 hazard categories are listed per the declaration type; 2) Table 5-3 hazard categories follow the updated hazard categories discussed in the following paragraphs; 3) Events in Table 5-3 do not duplicate events in Table 5-2; 4) If a hazard is not listed, that means there were no events reported for that hazard that fit the criteria above.

Table 5-2: State and Federally Declared Natural Hazard Events That Included Mohave County – December 1967 to February 2010				
Hazard	No. of	Recorded Losses		
	Declarations	Fatalities	Injuries	Damage Costs (\$)
Drought	9	0	0	\$303,000,000
Flooding / Flash Flooding	15	31	116	\$590,111,000
Snow Storm	2	4	0	\$0
Thunderstorm / High Wind	1	0	1	\$1,022,000
Tropical Storm	4	15	975	\$750,000,000
Wildfire	20	0	28	\$150,000
Notes: Damage Costs include property and crop/livestock losses and are reported as is with no attempt to adjust costs to current dollar values. Furthermore, wildfire damage costs do not include the cost of suppression which can be quite substantial.				
Sources: ADEM, FEMA, USDA				

Table 5-3: Mohave County Historic Hazard Events – August 1957 to February 2010				
Hazard	No. of	Recorded Losses		
	Records	Fatalities	Injuries	Damage Costs (\$)
Flooding / Flash Flooding	20	6	122	\$13,252,000
Severe Wind	72	4	22	\$7,444,030
Wildfire	13	0	0	\$0
Winter Storm	1	0	0	\$10,000
Notes: Damage Costs include property and crop/livestock losses and are reported as is with no attempt to adjust costs to current dollar values. Furthermore, wildfire damage costs do not include the cost of suppression which can be quite substantial.				
Sources: ADEM, NCDC, NWCG, NWS, ASLD, USGS, USFS, USNPS, NRC,				

Detailed historic hazard records are provided in Appendix D.

The culmination of the review and screening process by the Planning Team resulted in a revised list of hazards that will be carried forward with this updated mitigation plan. The 2005 Plan hazards selected for removal are listed below and include a brief explanation of the reason for removal:

Civil Disturbance, Hazardous Material Incidents, Power/Utility Failure, Radiological Accident, Terrorism, and Transportation Accident – Following the State’s lead, the Planning Team chose to drop these human-caused hazards from the Plan focus the efforts on natural hazards. HAZMAT events are usually addressed by Local Emergency Planning Committees (LEPC) and Community Emergency Response Teams (CERT).

Earthquake – there are no significant damage causing historic seismic events recorded for Mohave County, and the majority of the county is in a relatively low seismic risk area. The MJPT felt that the perceived low risk did not warrant further consideration.

Landslides/Mudslides – There are no significant damage causing recorded incidents of landslides or mudslides for the county, and most incidents that do occur correspond with roadway cuts in hillside areas. The Planning Team chose to drop this hazard from the Plan.

Winter Storms – The Planning Team acknowledges that the effects of heavy snow, ice, and freezing rain can and have impacted certain areas of the county in the past, the significance of the hazard was not deemed sufficient to warrant further analysis and mitigation planning.

Several of the hazards in the 2005 Plan list may be better described as storm events wherein the effects of the storm may pose exposure to multiple hazards. For instance, hazards associated with **Tropical Storms/Hurricane** may include flooding and severe winds in a single event. With the direction of ADEM, the Planning Team chose to eliminate this hazard and account for its impacts in other categories. Similarly, the predominant perceived hazard associated with **Thunderstorms/High Winds** and **Tornadoes/Dust Devils** is the associated damaging high winds. Therefore, ADEM has decided to account for the wind related hazards associated with these hazards into a new category named **Severe Winds**. Flooding aspects of these events is addressed in the **Flooding/Flash Flooding** category. The Planning Team also chose to follow the State's lead and split **Dam/Levee Failure** into separate categories since each is handled differently regarding regulation and mitigation.

The Planning Team has selected the following list of hazards for profiling and updating based on the above explanations and screening process. Revised and updated definitions for each hazard are provided in Section 5.3 and in Section 8.2:

- **Dam Failure**
- **Drought**
- **Extreme Heat**
- **Flooding/Flash Flooding**
- **Levee Failure**
- **Severe Wind**
- **Wildfire**

5.2 Vulnerability Analysis Methodology

5.2.1 General

The following sections summarize the methodologies used to perform the vulnerability analysis portion of the risk assessment. For this Plan, the entire vulnerability analysis was either revised or updated to reflect the new hazard categories, the availability of new data, or differing loss estimation methodology. Specific changes are noted below and/or in Section 5.3.

For the purposes of this vulnerability analysis, hazard profile maps were developed for Dam Failure, Flooding/Flash Flooding, Levee Failure and Wildfire to map the geographic variability of the probability and magnitude risk of the hazards as estimated by the Planning Team. Hazard profile categories of HIGH, MEDIUM, and/or LOW were used and were subjectively assigned based on the factors discussed in the Probability and Magnitude sections below. Within the context of the county limits, the other hazards do not exhibit significant geographic variability and will not be categorized as such.

Unless otherwise specified in this Plan, the general cutoff date for new hazard profile data and jurisdictional corporate limits is the end of March 2009.

5.2.2 Calculated Priority Risk Index (CPRI) Evaluation

The first step in the vulnerability analysis (VA) is to assess the perceived overall risk for each of the plan hazards using a tool developed by the State of Arizona called the Calculated Priority Risk Index²⁰ (CPRI). The CPRI value is obtained by assigning varying degrees of risk to four (4) categories for each hazard, and then calculating an index value based on a weighting scheme.

²⁰ ADEM, 2003, *Arizona Model Local Hazard Mitigation Plan*, prepared by JE Fuller/ Hydrology & Geomorphology, Inc.

Table 5-4 summarizes the CPRI risk categories and provides guidance regarding the assignment of values and weighting factors for each category. As an example, assume that the project team is assessing the hazard of flooding, and has decided that the following assignments best describe the flooding hazard for their community:

- Probability = Likely
- Magnitude/Severity = Critical
- Warning Time = 12 to 24 hours
- Duration = Less than 6 hours

The CPRI for the flooding hazard would then be:

$$\text{CPRI} = [(3 \times 0.45) + (3 \times 0.30) + (2 \times 0.15) + (1 \times 0.10)]$$

$$\text{CPRI} = 2.65$$

5.2.3 Asset Inventory

An initial asset inventory developed by the county and comprised of GIS point locations for 124 public buildings that included government offices, fire stations, police stations, schools, and some commercial structures, was used in the 2005 Plan for assessing the vulnerability of each jurisdiction's assets to the hazards previously identified. The asset inventory from the 2005 Plan was updated to reflect the current critical and non-critical facilities potentially exposed to hazards. Details of the update are discussed later in this section.

The 2007 State Plan defines assets as:

Any natural or human-caused feature that has value, including, but not limited to people; buildings; infrastructure like bridges, roads, and sewer and water systems; lifelines like electricity and communication resources; or environmental, cultural, or recreational features like parks, dunes, wetlands, or landmarks.

The asset inventory is generally tabularized into **critical** and **non-critical** categories. **Critical facilities and infrastructure** are systems, structures and infrastructure within a community whose incapacity or destruction would:

- Have a debilitating impact on the defense or economic security of that community.
- Significantly hinder a community's ability to recover following a disaster.

Following the criteria set forth by the Critical Infrastructure Assurance Office (CIAO), the State of Arizona has adopted eight general categories²¹ that define critical facilities and infrastructure:

1. **Telecommunications Infrastructure:** Telephone, data services, and Internet communications, which have become essential to continuity of business, industry, government, and military operations.
2. **Electrical Power Systems:** Generation stations and transmission and distribution networks that create and supply electricity to end-users.
3. **Gas and Oil Facilities:** Production and holding facilities for natural gas, crude and refined petroleum, and petroleum-derived fuels, as well as the refining and processing facilities for these fuels.
4. **Banking and Finance Institutions:** Banks, financial service companies, payment systems, investment companies, and securities/commodities exchanges.
5. **Transportation Networks:** Highways, railroads, ports and inland waterways, pipelines, and airports and airways that facilitate the efficient movement of goods and people.

²¹ Instituted via Executive Order 13010, which was signed by President Clinton in 1996.

Table 5-4: Summary of Calculated Priority Risk Index (CPRI) categories and risk levels

CPRI Category	Degree of Risk			Assigned Weighting Factor
	Level ID	Description	Index Value	
Probability	Unlikely	- Extremely rare with no documented history of occurrences or events. - Annual probability of less than 0.001.	1	45%
	Possibly	- Rare occurrences with at least one documented or anecdotal historic event. - Annual probability that is between 0.01 and 0.001.	2	
	Likely	- Occasional occurrences with at least two or more documented historic events. - Annual probability that is between 0.1 and 0.01.	3	
	Highly Likely	- Frequent events with a well documented history of occurrence. - Annual probability that is greater than 0.1.	4	
Magnitude/Severity	Negligible	- Negligible property damages (less than 5% of critical and non-critical facilities and infrastructure). - Injuries or illnesses are treatable with first aid and there are no deaths. - Negligible quality of life lost. - Shut down of critical facilities for less than 24 hours.	1	30%
	Limited	- Slight property damages (greater than 5% and less than 25% of critical and non-critical facilities and infrastructure). - Injuries or illnesses do not result in permanent disability and there are no deaths. - Moderate quality of life lost. - Shut down of critical facilities for more than 1 day and less than 1 week.	2	
	Critical	- Moderate property damages (greater than 25% and less than 50% of critical and non-critical facilities and infrastructure). - Injuries or illnesses result in permanent disability and at least one death. - Shut down of critical facilities for more than 1 week and less than 1 month.	3	
	Catastrophic	- Severe property damages (greater than 50% of critical and non-critical facilities and infrastructure). - Injuries or illnesses result in permanent disability and multiple deaths. - Shut down of critical facilities for more than 1 month.	4	
Warning Time	Less than 6 hours	Self explanatory.	4	15%
	6 to 12 hours	Self explanatory.	3	
	12 to 24 hours	Self explanatory.	2	
	More than 24 hours	Self explanatory.	1	
Duration	Less than 6 hours	Self explanatory.	1	10%
	Less than 24 hours	Self explanatory.	2	
	Less than one week	Self explanatory.	3	
	More than one week	Self explanatory.	4	

6. **Water Supply Systems:** Sources of water; reservoirs and holding facilities; aqueducts and other transport systems; filtration, cleaning, and treatment systems; pipelines; cooling systems; and other delivery mechanisms that provide for domestic and industrial applications, including systems for dealing with water runoff, wastewater, and firefighting.
7. **Government Services:** Capabilities at the federal, state, and local levels of government required to meet the needs for essential services to the public.
8. **Emergency Services:** Medical, police, fire, and rescue systems.

Other assets such as public libraries, schools, museums, parks, recreational facilities, historic buildings or sites, churches, residential and/or commercial subdivisions, apartment complexes, and so forth, are classified as non-critical facilities and infrastructure, as they would not necessarily have a debilitating impact on the defense or economic security of that community and/or significantly hinder a community's ability to recover following a disaster. They are, however, still considered by the Planning Team to be important facilities and critical and non-critical should not be construed to equate to important and non-important. For each asset, attributes such name, description, physical address, geospatial position, and estimated replacement cost were identified to the greatest extent possible and entered into a GIS geodatabase.

The 2005 Plan used a combination of the initial Asset Inventory and HAZUS[®]-MH²² data, to represent the total critical and non-critical facility exposure for Mohave County jurisdictions. An updated GIS database of critical and non-critical facilities was provided by the county and distributed to each participating jurisdiction for review. New facilities not identified in the county database were provided by each jurisdiction and compiled to create the updated Asset Inventory for this Plan. Changes included updates to the geographic position, revising asset names, updating replacement costs, addition of new facilities, etc. Table 5-5 summarizes the facility counts by category²³ for each of the participating jurisdictions in this Plan.

5.2.4 *Loss Estimations*

In the original 2005 Plan, losses were estimated by either quantitative or qualitative methods. Quantitative methods consisted of intersecting hazard map layers with the Asset Inventory map layer and also the use of the HAZUS[®]-MH program. Other quantitative methods included statistical analyses based on historic data. The qualitative assessment relied less on technology, but more on historical and anecdotal data, community input and professional judgment regarding expected hazard impacts.

The loss estimates for this Plan employ similar methods to the 2005 Plan, but are different than the 2005 Plan in that some of the HAZUS[®]-MH data is used, but the program itself is not due to inherent inaccuracies with much of the point facility data. The new quantitative loss estimate procedures are discussed below.

Economic loss and human exposure estimates for each of the final hazards identified in Section 5.1 begins with an assessment of the potential exposure of critical and non-critical assets and human populations to those hazards. Exposure estimates of critical and non-critical assets identified by each jurisdiction is accomplished by intersecting the asset inventory with the hazard profiles in Section 5.3. Human or population exposures are estimated by intersecting the same hazards with population statistics based on 2000 Census Data and distributed with HAZUS[®]-MH.

²² U.S. Department of Homeland Security, Federal Emergency Management Agency, HAZUS[®]-MH.

²³ Counts do not include HAZUS data.

Table 5-5: Summary of Critical and Non-Critical Facility counts by category and jurisdiction as of March 2009

Participating Jurisdiction	Critical Facilities and Infrastructure								Non-Critical Facilities and Infrastructure					
	Communications Infrastructure	Electrical Power Systems	Gas and Oil Facilities	Banking and Finance Institutions	Transportation Networks	Water Supply Systems	Government Services	Emergency Services	Educational	Cultural	Business	Flood Control	Residential	Recreational
Countywide Totals	15	2	1	0	9	52	61	56	80	3	0	0	2	24
Bullhead City	0	0	1	0	1	14	8	9	12	0	0	0	2	6
Colorado City	0	1	0	0	1	5	2	4	2	0	0	0	0	0
Kingman	0	1	0	0	1	29	16	14	22	3	0	0	0	16
Lake Havasu City	0	0	0	0	1	4	9	9	18	0	0	0	0	1
Unincorporated Mohave County	15	0	0	0	5	0	26	20	26	0	0	0	0	1

Additional exposure estimates for general residential, commercial, and industrial building stock not specifically identified with the asset inventory, are also accomplished using the HAZUS database, wherein the developers of the HAZUS database have made attempts to correlate building/structure counts to census block data. *It is duly noted that the HAZUS data population statistics may not exactly equate to the current population statistics provided in Section 4.2 due to actual changes in population counts associated with a particular census block, GIS positioning anomalies and the way HAZUS depicts certain census block data. It is also noted that the residential, commercial and industrial building stock estimates for each census block may severely under-predict the actual buildings present due to the substantial growth in the last decade, the general lack of commercial and industrial data for some of the more rural communities and counties, and the disparity of the HAZUS replacement cost estimates for these categories when compared to current market rates. However, without a detailed, site specific structure inventory of these types of buildings, the HAZUS database is still the best available and the results are representative of a general magnitude of population and residential, commercial and industrial facility exposures to the various hazards discussed. Combining the exposure results from the asset inventory and the HAZUS database provides a fairly comprehensive depiction of the overall exposure of building stock and the two datasets are considered complimentary and not redundant.*

Economic losses to structures and facilities are estimated by multiplying the exposed facility replacement cost estimates by an assumed loss to exposure ratio for the hazard. The loss to exposure ratios used in this plan update are summarized by hazard in Section 5.3. It is important to note that the loss to exposure ratios are subjective and the estimates are solely intended to provide an understanding of relative risk from the hazards and potential losses. The reality is that uncertainties are inherent in any loss estimation methodology due to:

- Incomplete scientific knowledge concerning hazards and our ability to predict their effects on the built environment;
- Approximations and simplifications that are necessary for a comprehensive analysis; and,
- Lack of detailed data necessary to implement a viable statistical approach to loss estimations.

Several of the hazards profiled in this Plan update will not include quantitative exposure and loss estimates. The vulnerability of people and assets associated with some hazards are nearly impossible to evaluate given the uncertainty associated with where these hazards will occur as well as the relatively limited focus and extent of damage. Instead, a qualitative review of vulnerability will be discussed to provide insight to the nature of losses that are associated with the hazard. For subsequent updates of this Plan, the data needed to evaluate these unpredictable hazards may become refined such that comprehensive vulnerability statements and thorough loss estimates can be made.

5.2.5 *Development Trend Analysis*

The 2005 Plan development trend analysis will require updating to reflect growth and changes in Mohave County and jurisdiction boundaries over the last planning cycle. The updated analysis will focus on the potential risk associated with projected growth patterns and their intersection with the Plan identified hazards.

5.3 **Hazard Risk Profiles**

The following sections summarize the risk profiles for each of the Plan hazards identified in Section 5.1. For each hazard, the following elements are addressed to present the overall risk profile:

- **Description**
- **History**
- **Probability and Magnitude**
- **Vulnerability**
- **Sources**
- **Profile Maps (if applicable)**

Much of the 2005 Plan data has been updated, incorporated and/or revised to reflect current data and Planning Team changes, as well as an overall plan format change. County-wide and community specific profile maps are provided at the end of the section (if applicable). Also, the maps are not included in the page count.

5.3.1 Dam Failure

Description

The primary risk associated with dam failure in Mohave County is the inundation of downstream facilities and population by the resulting flood wave. Dams within or impacting Mohave County can generally be divided into two groups: (1) storage reservoirs designed to permanently impound water, provide flood protection, and/or generate power, and (2) single purpose flood retarding structures (FRS) designed to attenuate or reduce flooding by impounding stormwater for relatively short durations of time during flood events. Dam failures may be caused by a variety of reasons including: seismic events, extreme wave action, leakage and piping, overtopping, material fatigue and spillway erosion.

History

Mohave County has no history of dam failure.

Probability and Magnitude

The probability and magnitude of dam failure discharges vary greatly with each dam and are directly influenced by the type and age of the dam, its operational purpose, storage capacity and height, downstream conditions, and many other factors. There are two sources of data that publish hazard ratings for dams impacting Mohave County. The first is the Arizona Department of Water Resources (ADWR) and the second is the National Inventory of Dams (NID). Hazard ratings from each source are based on an assessment of the consequence of failure and/or dam safety considerations, and they are not tied to probability of occurrence.

ADWR has regulatory jurisdiction over the non-federal dams impacting the County and is responsible for regulating the safety of these dams, conducting field investigations, and participating in flood mitigation programs with the goal of minimizing the risk for loss of life and property to the citizens of Arizona. ADWR jurisdictional dams are inspected regularly according to downstream hazard potential classification, which follows the NID classification system. High hazard dams are inspected annually, significant hazard dams every three years, and low hazard dams every five years. Via these inspections, ADWR identifies safety deficiencies requiring correction and assigns each dam one of six safety ratings. Examples of safety deficiencies include: lack of an adequate emergency action plan, inability to safely pass the required Inflow Design Flood (IDF), embankment erosion, dam stability, etc. Further descriptions of each safety classification are summarized in Table 5-6.

Table 5-6: Summary of ADWR safety categories	
ADWR Safety Rating	Definition
No Deficiency	Not Applicable
Safety Deficiency	One or more conditions at the dam that impair or adversely affects the safe operation of the dam.
Unsafe Categories	
Category 1: Unsafe Dams with Elevated Risk of Failure	These dams have confirmed safety deficiencies for which there is concern they could fail during a 100-year or smaller flood event. There is an urgent need to repair or remove these dams.
Category 2: Unsafe Dams Requiring Rehabilitation or Removal	These dams have confirmed safety deficiencies and require either repair or removal. These dams are prioritized for repair or removal behind the Category 1 dams.

Table 5-6: Summary of ADWR safety categories	
ADWR Safety Rating	Definition
Category 3: Unsafe Dams with Uncertain Stability during Extreme Events (Requiring Study)	Concrete or masonry dams that have been reclassified to high hazard potential because of downstream development (i.e. hazard creep"). The necessary documentation demonstrating that the dams meet or exceed standard stability criteria for high hazard dams during extreme overtopping and seismic events is lacking. The dams are classified as unsafe pending the results of required studies. Upon completion of these studies, the dams are either removed from the list of unsafe dams or moved to Category 2 and prioritized for repair or removal.
Category 4: Unsafe Dams Pending Evaluation of Flood-Passing Capacity (Requiring Study)	In 1979, the U.S. Army Corps of Engineers established Federal Guidelines for assessing the safe-flood passing capacity of high hazard potential dams (CFR Vol. 44 No. 188). These guidelines established one-half of the "probable maximum flood" (PMF) as the minimum storm which must be safely passed without overtopping and subsequent failure of the dam. Dams unable to safely pass a storm of this size were classified as being in an "unsafe, non-emergency" condition. Prior studies for these earthen dams (mostly performed in the 1980's) predicted they could not safely pass one-half of the PMF. They were predicted to overtop and fail for flood events ranging from 30 to 46 percent of the PMF. Recent studies both statewide and nationwide have indicated that the science of PMF hydrology as practiced in the 1990's commonly overestimates the PMF for a given watershed. The ADWR is leading efforts on a statewide update of probable maximum precipitation (PMP) study scheduled for completion in 2011. These dams should be re-evaluated using updated methods to confirm their safety status. Upon completion of these evaluations, they are either removed from the list of unsafe dams or moved to Category 2 and prioritized for repair or removal.
Source: ADWR, 2009.	

The NID database contains information on approximately 77,000 dams in the 50 states and Puerto Rico, with approximately 30 characteristics reported for each dam, such as: name, owner, river, nearest community, length, height, average storage, max storage, hazard rating, Emergency Action Plan (EAP), latitude, and longitude.

The NID and ADWR databases provide useful information on the potential hazard posed by dams. Each dam in the NID is assigned one of the following three hazard potential classes based on the potential for loss of life and damage to property should the dam fail (listed in increasing severity): low, significant, or high. The hazard potential classification is based on an evaluation of the probable present and future incremental adverse consequences that would result from the release of water or stored contents due to failure or improper operation of the dam or appurtenances, regardless of the condition of the dam.

The ADWR evaluation of the potential hazard posed by dams includes land-use zoning and development projected for the affected area over the 10-year period following the classification of the dam. It is important to note that the hazard potential classification is an assessment of the consequences of failure, but not an evaluation of the probability of failure or improper operation. Table 5-7 summarizes the hazard potential classifications and criteria for dams regulated by the State of Arizona.

Table 5-7: Downstream hazard potential classes for state regulated dams		
Hazard Potential Classification	Loss of Human Life	Economic, Environmental, Lifeline Losses
Low	None expected	Low and generally limited to owner
Significant	None expected	Yes
High	Probable. One or more expected	Yes (but not necessary for this classification)
Note: The hazard potential classification is an assessment of the consequences of failure, but not an evaluation of the probability of failure.		
Source: ADWR and NID 2009		

The NID database includes dams that are either:

- High or Significant hazard potential class dams, or,
- Low hazard potential class dams that exceed 25 feet in height and 15 acre-feet storage, or,
- Low hazard potential class dams that exceed 50 acre-feet storage and 6 feet height.

There are 19 dams located in, or directly impacting Mohave County based on the two databases. Of the 19 dams, seven are under ADWR jurisdiction. Table 5-8 provides a summary of the hazard and safety classifications by count for both the ADWR and NID databases.

Table 5-8: Summary of NID and ADWR dams by hazard classification								
Hazard Class	ADWR ID No.	NID ID No.	Dam Name	ADWR Safety Types	EAP	Inundation Mapping	Nearest Downstream Development	Distance in Miles
High	08.10	AZ00177	Short Creek Southside #1	Safety Deficiency	Yes	Yes	Colorado City	1
	N/A	AZ10309	Davis BOR	N/A	Yes	Yes	Bullhead City	4
	N/A	NV10122	Hoover	N/A	Yes	Yes	Bullhead City	56
Significant	08.09	AZ00078	Short Creek Southside #2	Safety Deficiency	No	Yes	Colorado City	1
	08.11	AZ00219	Stockton Hill	No Deficiency	Yes	No	Kingman	2
	08.13	AZ00250	Brine Disposal Pond Dam	No Deficiency	Yes	No	Topock	42
Sources: NID, ADWR Dam Safety Database (October 2009)								

The magnitude of impacts due to dam failure are usually depicted by mapping the estimated downstream inundation limits and assigning notification zones based on an assessment of a combination of flow depth and velocity. These limits are typically a critical part of the emergency action plan. Downstream dam failure inundation limits were available for Alamo Dam on the Bill Williams River, Hoover and Davis Dams on the Colorado River, and Short Creek Dam No. 1 in Colorado City. Inundation mapping for the Alamo Dam was produced by the U.S. Army Corps of Engineers (USACE) and mapping for Short Creek Dam No. 1 was produced by the NRCS (NRCS,

2000). The Bureau of Reclamation (USBR, 2001) has developed multiple scenarios for Hoover, Davis and Parker Dams including multiple/cascading dam failures and probable maximum flood spillway releases. The scenario of cascading failures by Hoover and Davis Dams causes the worst case inundation limit and was used for the purposes of this Plan.

For inundation resulting from dam failure, the following two classes of hazard risk are depicted:

HIGH Hazard = Inundation limits due to dam failure

LOW Hazard = All other areas outside the inundation limits

Maps 1A – 1C are countywide maps showing the location, jurisdiction, and dam safety classifications for each dam in or near the county, and the corresponding dam failure inundation limits (if available).

Vulnerability – CPRI Results

Dam inundation CPRI results for each community are summarized in Table 5-9.

Table 5-9: Summary of CPRI results by jurisdiction for dam failure					
Participating Jurisdiction	Probability	Magnitude/ Severity	Warning Time	Duration	CPRI Score
Bullhead City	Possible	Catastrophic	< 6 hours	> one week	3.10
Colorado City	Possible	Limited	< 6 hours	< 6 hours	2.20
Kingman	Unlikely	Negligible	< 6 hours	< one week	1.65
Lake Havasu City	Possible	Critical	< 6 hours	> one week	2.80
Unincorporated Mohave County	Unlikely	Catastrophic	< 6 hours	> one week	2.65
County-wide average CPRI =					2.48

Vulnerability – Loss Estimations

The estimation of potential losses due to inundation from a dam failure was accomplished by intersecting the human and facility assets with the inundation limits depicted on Maps 1A – 1C. As stated previously, only four of the 19 dams has a delineated dam failure inundation limit downstream of the dam. Therefore, the results of this analysis are expected to underestimate the exposure of people and infrastructure to dam failure within Mohave County.

Since no common methodology is available for obtaining losses from the exposure values, estimates of the loss-to-exposure ratios were assumed based on the perceived potential for damage. Any hazard event, or series of hazard events of sufficient magnitude to cause a significant a dam failure scenario, would have potentially catastrophic consequences in the inundation area. Floodwaves from these types of events travel very fast and possess tremendous destructive energy. Accordingly, an average event based loss-to-exposure ratio for the inundation areas with a high hazard rating are estimated to be 0.25. Low rated areas are zero.

It should be noted that the Planning Team recognizes that the probability of a dam failure occurring on multiple (or all) structures at the same time is essentially zero. Accordingly, the loss estimates presented below are intended to serve as a collective evaluation of the potential exposure to dam failure inundation events.

Table 5-10 summarizes estimations of losses to Planning Team identified assets for the dam failure inundation hazard. Table 5-11 summarizes the estimated population exposed to the dam failure inundation hazard. Tables 5-12 through 5-17 summarize exposure and loss estimates to the HAZUS residential, commercial, and industrial building stock for the dam failure inundation hazard. Table 5-12 summarizes the HAZUS based exposure and losses for the entirety of Mohave County. Tables 5-13 through 5-17 summarize jurisdiction specific HAZUS data exposure and loss estimates. It should be noted that Countywide exposure totals for HAZUS building stock and the population within Mohave County includes statistics from several Indian Tribes not participating in this Plan.

Table 5-10: Summary asset inventory losses due to dam failure flooding					
Community	Total Facilities Reported by Community	Impacted Facilities	Percentage of Total Community Facilities Impacted	Estimated Replacement Cost (x \$1000)	Estimated Structure Loss (x \$1000)
HIGH					
County-Wide Totals	308	46	14.94%	\$177,941	\$44,485
Bullhead City	53	29	54.72%	\$106,761	\$26,690
Colorado City	18	2	11.11%	\$1,857	\$464
Kingman	102	0	0.00%	\$0	\$0
Lake Havasu City	42	0	0.00%	\$0	\$0
Unincorporated Mohave County	93	15	16.13%	\$69,324	\$17,331

Table 5-11: Summary of population sectors exposed to dam failure						
Community	Total Population	Population Exposed	Percent of Population Exposed	Total Population Over 65	Population Over 65 Exposed	Percent of Population Over 65 Exposed
HIGH						
County-Wide Totals	155,001	31,587	20.38%	31,380	5,482	17.47%
Bullhead City	33,645	21,677	64.43%	6,577	3,898	59.26%
Colorado City	3,309	1,244	37.59%	48	18	36.85%
Kingman	20,942	0	0.00%	3,593	0	0.00%
Lake Havasu City	41,838	515	1.23%	10,670	191	1.79%
Unincorporated Mohave County	52,900	7443	14.07%	10,271	1,268	12.35%

Table 5-12: Summary of Mohave County HAZUS building exposure to Dam Failure									
	RESIDENTIAL		COMMERCIAL		INDUSTRIAL		SUMMARY		
Mohave County HAZUS Summary	Building Count	Potential Economic Impact (x\$1000)	Building Count	Potential Economic Impact (x\$1000)	Building Count	Potential Economic Impact (x\$1000)	Total of All Potential Economic Impact (x\$1000)	Loss-to-Exposure Ratio	Total Estimated Loss (x\$1000)
County-Wide Totals	82,663	\$11,009,311	3,074	\$2,373,884	1,104	\$682,102	\$14,065,296		
High Hazard Exposure	16,981	\$1,911,465	529	\$408,893	166	\$66,483	\$2,386,840	25%	\$596,710
Mohave County HAZUS Summary	% Building Count	% Potential Economic Impact	% Building Count	% Potential Economic Impact	% Building Count	% Potential Economic Impact			
High Hazard Exposure	20.54%	17.36%	17.21%	17.22%	15.0%	09.75%			

Table 5-13: Summary of Bullhead City HAZUS building exposure to Dam Failure									
	RESIDENTIAL		COMMERCIAL		INDUSTRIAL		SUMMARY		
Bullhead City HAZUS Summary	Building Count	Potential Economic Impact (x\$1000)	Building Count	Potential Economic Impact (x\$1000)	Building Count	Potential Economic Impact (x\$1000)	Total of All Potential Economic Impact (x\$1000)	Loss-to-Exposure Ratio	Total Estimated Loss (x\$1000)
Community-Wide Totals	16,803	\$2,008,953	521	\$461,765	141	\$48,270	\$2,518,988		
High Hazard Exposure	11,336	\$1,209,802	329	\$270,046	82	\$27,859	\$1,507,707	25%	\$376,927
Bullhead City HAZUS Summary	% Building Count	% Potential Economic Impact	% Building Count	% Potential Economic Impact	% Building Count	% Potential Economic Impact			
High Hazard Exposure	67.46%	60.22%	63.16%	58.48%	58.46%	57.71%			

Table 5-14: Summary of Colorado City HAZUS building exposure to Dam Failure									
	RESIDENTIAL		COMMERCIAL		INDUSTRIAL		SUMMARY		
Colorado City HAZUS Summary	Building Count	Potential Economic Impact (x\$1000)	Building Count	Potential Economic Impact (x\$1000)	Building Count	Potential Economic Impact (x\$1000)	Total of All Potential Economic Impact (x\$1000)	Loss-to-Exposure Ratio	Total Estimated Loss (x\$1000)
Community-Wide Totals	848	\$57,989	18	\$5,319	14	\$8,751	\$72,060		
High Hazard Exposure	311	\$20,452	4	\$871	6	\$3,167	\$24,490	25%	\$6,123
Colorado City HAZUS Summary	% Building Count	% Potential Economic Impact	% Building Count	% Potential Economic Impact	% Building Count	% Potential Economic Impact			
High Hazard Exposure	36.63%	35.27%	23.21%	16.37%	44.25%	36.19%			

Table 5-15: Summary of Kingman HAZUS building exposure to Dam Failure									
	RESIDENTIAL		COMMERCIAL		INDUSTRIAL		SUMMARY		
Kingman HAZUS Summary	Building Count	Potential Economic Impact (x\$1000)	Building Count	Potential Economic Impact (x\$1000)	Building Count	Potential Economic Impact (x\$1000)	Total of All Potential Economic Impact (x\$1000)	Loss-to-Exposure Ratio	Total Estimated Loss (x\$1000)
Community-Wide Totals	10,152	\$1,553,841	647	\$536,118	148	\$72,190	\$2,162,149		
High Hazard Exposure	0	\$0	0	\$0	0	\$0	\$0	25%	\$0
Kingman HAZUS Summary	% Building Count	% Potential Economic Impact	% Building Count	% Potential Economic Impact	% Building Count	% Potential Economic Impact			
High Hazard Exposure	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%			

Table 5-16: Summary of Lake Havasu City HAZUS building exposure to Dam Failure									
	RESIDENTIAL		COMMERCIAL		INDUSTRIAL		SUMMARY		
Lake Havasu City HAZUS Summary	Building Count	Potential Economic Impact (x\$1000)	Building Count	Potential Economic Impact (x\$1000)	Building Count	Potential Economic Impact (x\$1000)	Total of All Potential Economic Impact (x\$1000)	Loss-to-Exposure Ratio	Total Estimated Loss (x\$1000)
Community-Wide Totals	22,300	\$4,349,328	985	\$831,031	422	\$266,828	\$5,447,187		
High Hazard Exposure	502	\$128,195	22	\$19,276	4	\$1,841	\$149,312	25%	\$37,328
Lake Havasu City HAZUS Summary	% Building Count	% Potential Economic Impact	% Building Count	% Potential Economic Impact	% Building Count	% Potential Economic Impact			
High Hazard Exposure	02.25%	02.95%	02.20%	02.32%	01.02%	0.69%			

Table 5-17: Summary of Unincorporated Mohave County HAZUS building exposure to Dam Failure									
	RESIDENTIAL		COMMERCIAL		INDUSTRIAL		SUMMARY		
Unincorporated Mohave County HAZUS Summary	Building Count	Potential Economic Impact (x\$1000)	Building Count	Potential Economic Impact (x\$1000)	Building Count	Potential Economic Impact (x\$1000)	Total of All Potential Economic Impact (x\$1000)	Loss-to-Exposure Ratio	Total Estimated Loss (x\$1000)
Community-Wide Totals	31,547	\$2,921,091	865	\$505,939	371	\$280,140	\$3,707,170		
High Hazard Exposure	4,552	\$517,415	156	\$105,373	68	\$31,898	\$654,686	25%	\$163,671
Unincorporated Mohave County HAZUS Summary	% Building Count	% Potential Economic Impact	% Building Count	% Potential Economic Impact	% Building Count	% Potential Economic Impact			
High Hazard Exposure	14.43%	17.71%	18.08%	20.83%	18.39%	11.39%			

In summary, \$44.5 million in asset related losses are estimated for dam failure inundation for all the participating jurisdictions in Mohave County. An additional \$597 million in losses to HAZUS defined residential, commercial, and industrial facilities is estimated for all participating Mohave County jurisdictions. Regarding human vulnerability, a total population of 31,587 people, or 20.4% of the total Mohave County population, is potentially exposed to a dam failure inundation event. The potential for deaths and injuries are directly related to the warning time and type of event. Given the magnitude of such an event(s), it is realistic to anticipate at least one death and several injuries. There is also a high probability of population displacement for most of the inhabitants within the inundation limits downstream of the dam(s).

Vulnerability – Development Trend Analysis

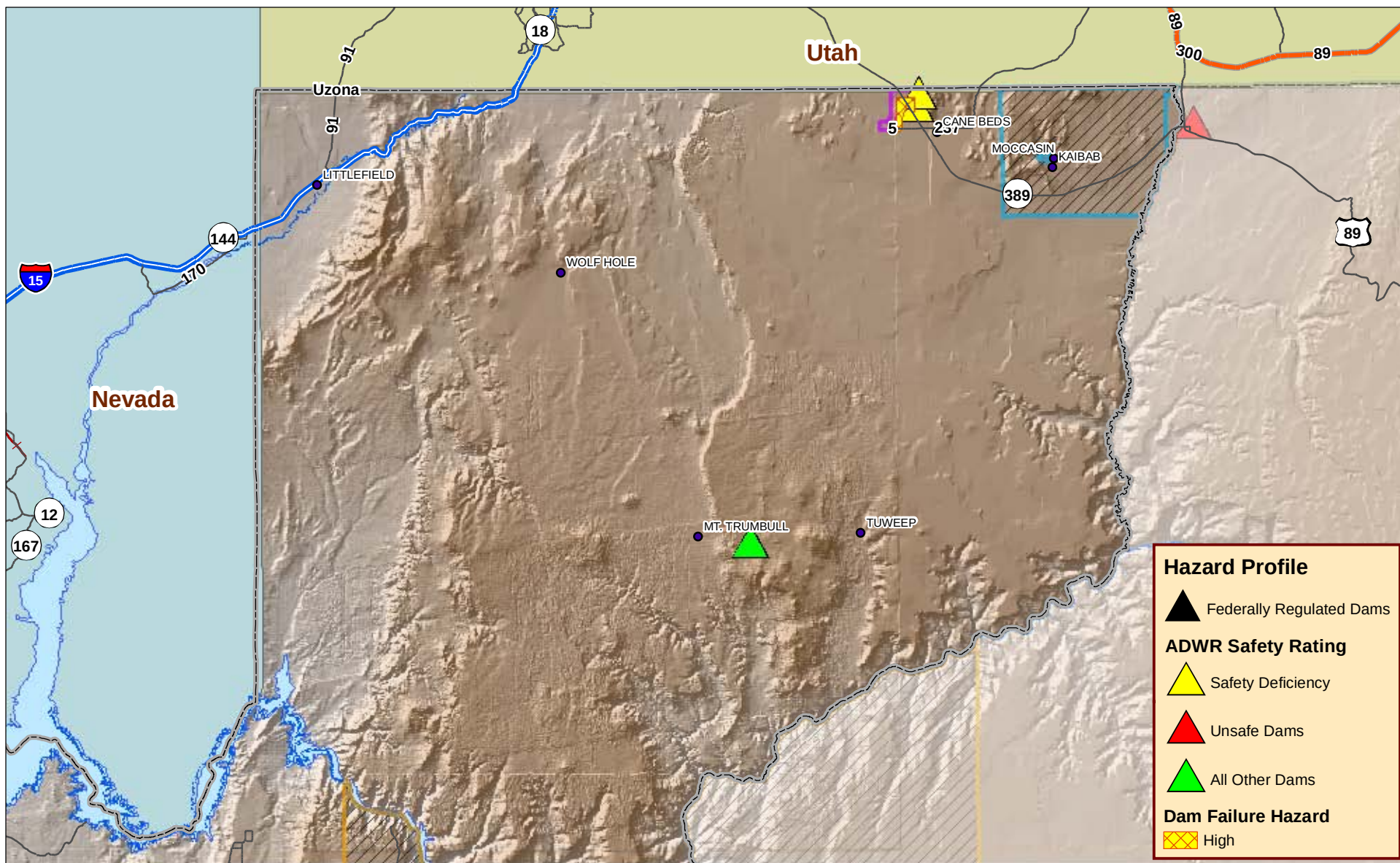
The flood protection afforded by dams in Mohave County has encouraged development of downstream lands, and it is reasonable to expect additional development within these areas. Public awareness measures such as notices on final plats and public education on dam safety are ways that the local county, city and town officials can mitigate the potential impact of a dam failure. Over the past five years, Mohave County, Safford and Thatcher have been actively working with ADWR and NRCS to update and improve the dams upstream of Safford and Thatcher to enhance the safety of those structures. They have also worked on installing gages and telemetry to provide tools for monitoring and prediction. Also, Emergency Action Plans (EAPs) that establish potential dam failure inundation limits, notification procedures, and thresholds are also prepared for response to potential dam related disaster events.

Sources

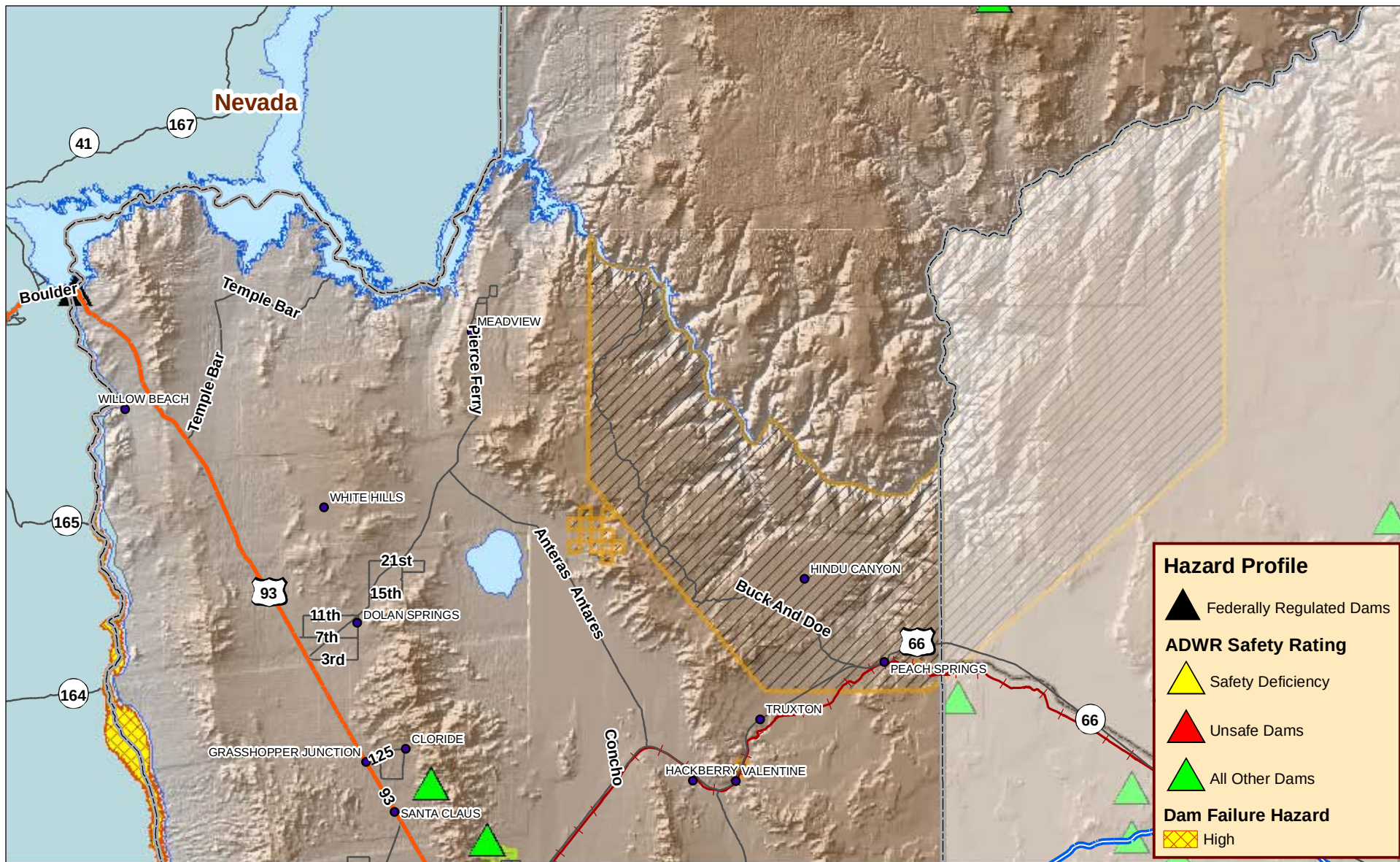
- Arizona Department of Water Resources, 2009,
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- Arizona Division of Emergency Management, 2009, *State of Arizona Multi-Hazard Mitigation Plan, 2010 Update, DRAFT*.
- U.S. Army Corps of Engineers, Emergency Action Plan for Alamo Dam
- U.S. Army Corps of Engineers, National Inventory of Dams, 2009, <https://nid.usace.army.mil/>
- U.S. Department of Agriculture, Natural Resource Conservation Service, 2000, *Colorado City Short Creek Dam No. 1 Breach Analysis*.
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Profile Maps

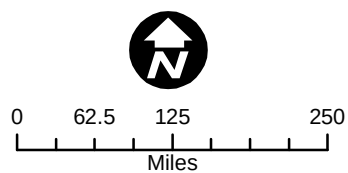
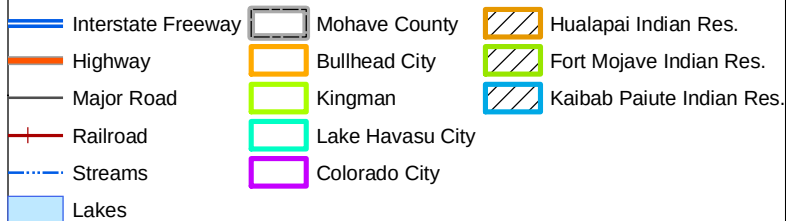
Maps 1A through 1G – Dam Failure Hazard Maps



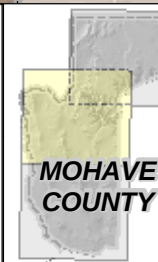
Legend Interstate Freeway Highway Major Road Railroad Streams Lakes Mohave County Bullhead City Kingman Lake Havasu City Colorado City Hualapai Indian Res. Fort Mojave Indian Res. Kaibab Paiute Indian Res.		 Source: JE FULLER 2010; Mohave County, 2009; ALRIS, 2007; ADWR, 2009; NID, 2009	 MOHAVE COUNTY	Mohave County Multi-Jurisdictional Hazard Mitigation Plan Map 1A Dam Failure Hazard Map as of May 2010
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Legend



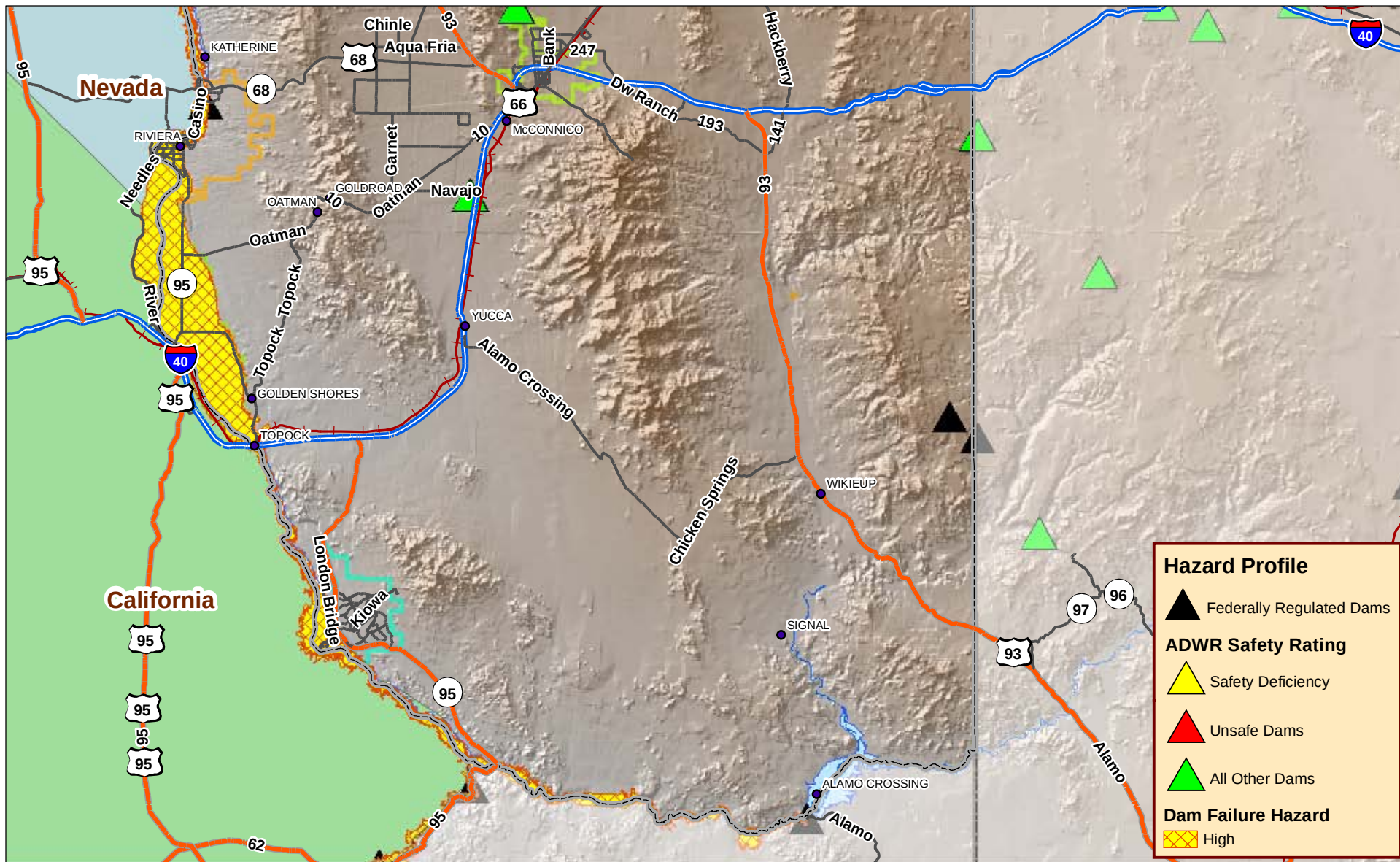
Source: JE FULLER 2010; Mohave County, 2009; ALRIS, 2007; ADWR, 2009; NID, 2009



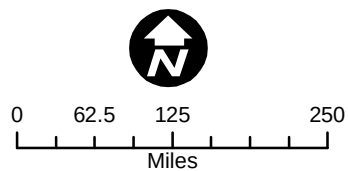
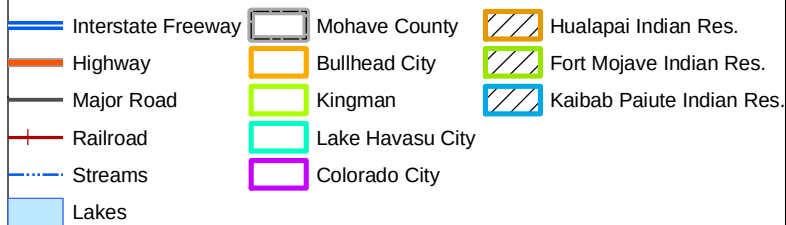
Mohave County Multi-Jurisdictional Hazard Mitigation Plan



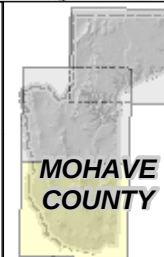
Map 1B
Dam Failure
Hazard Map
as of May 2010



Legend



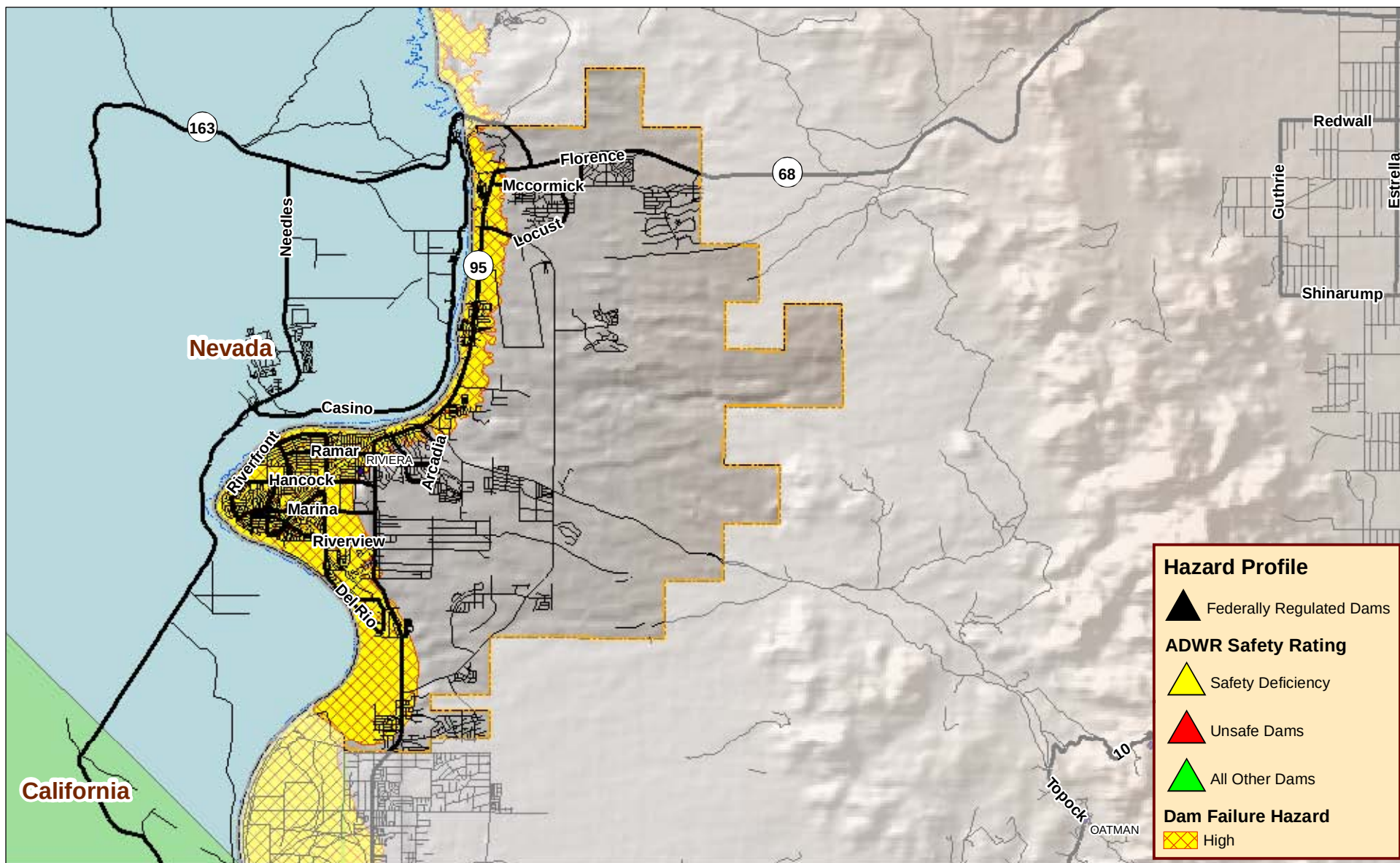
Source: JE FULLER 2010; Mohave County, 2009; ALRIS, 2007; ADWR, 2009; NID, 2009



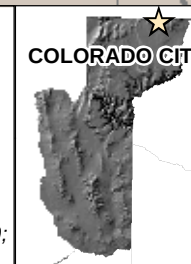
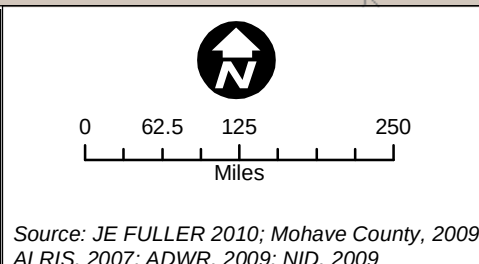
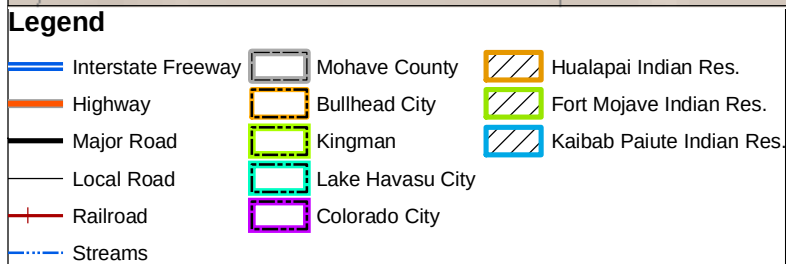
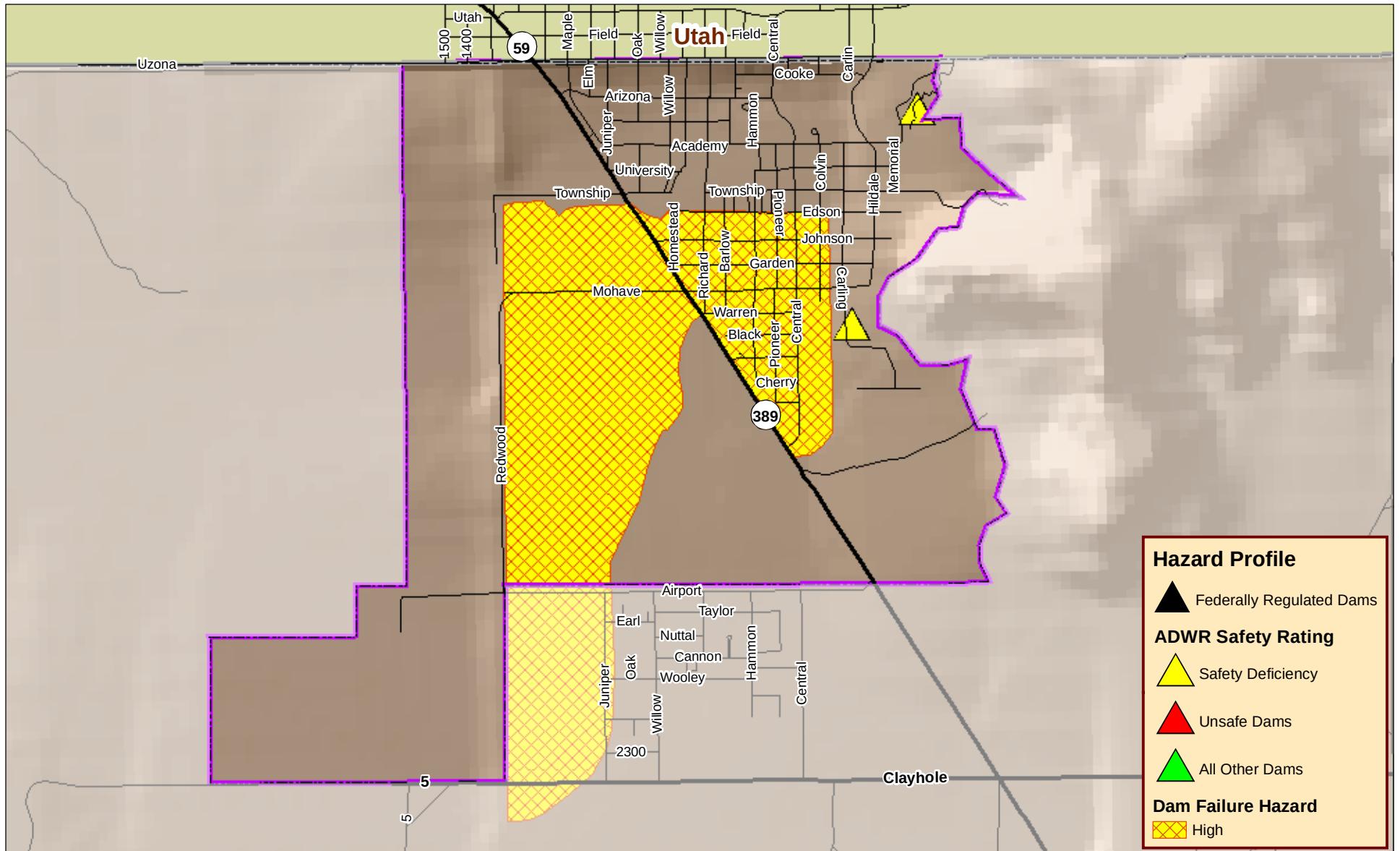
Mohave County Multi-Jurisdictional Hazard Mitigation Plan



Map 1C
Dam Failure
Hazard Map
as of May 2010

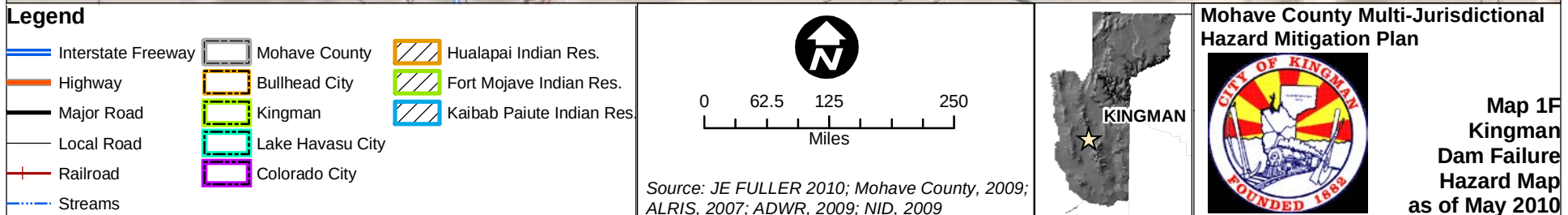
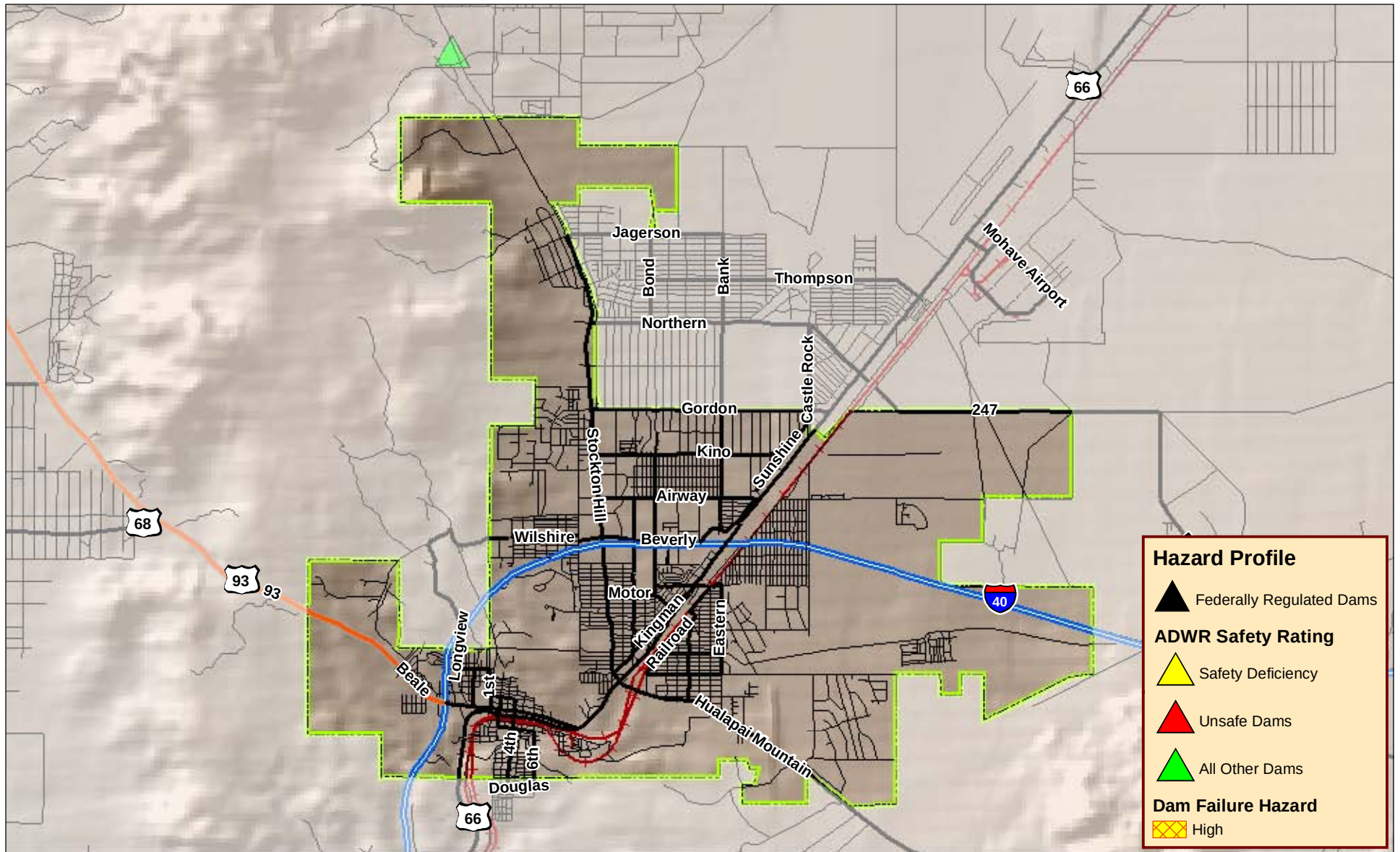


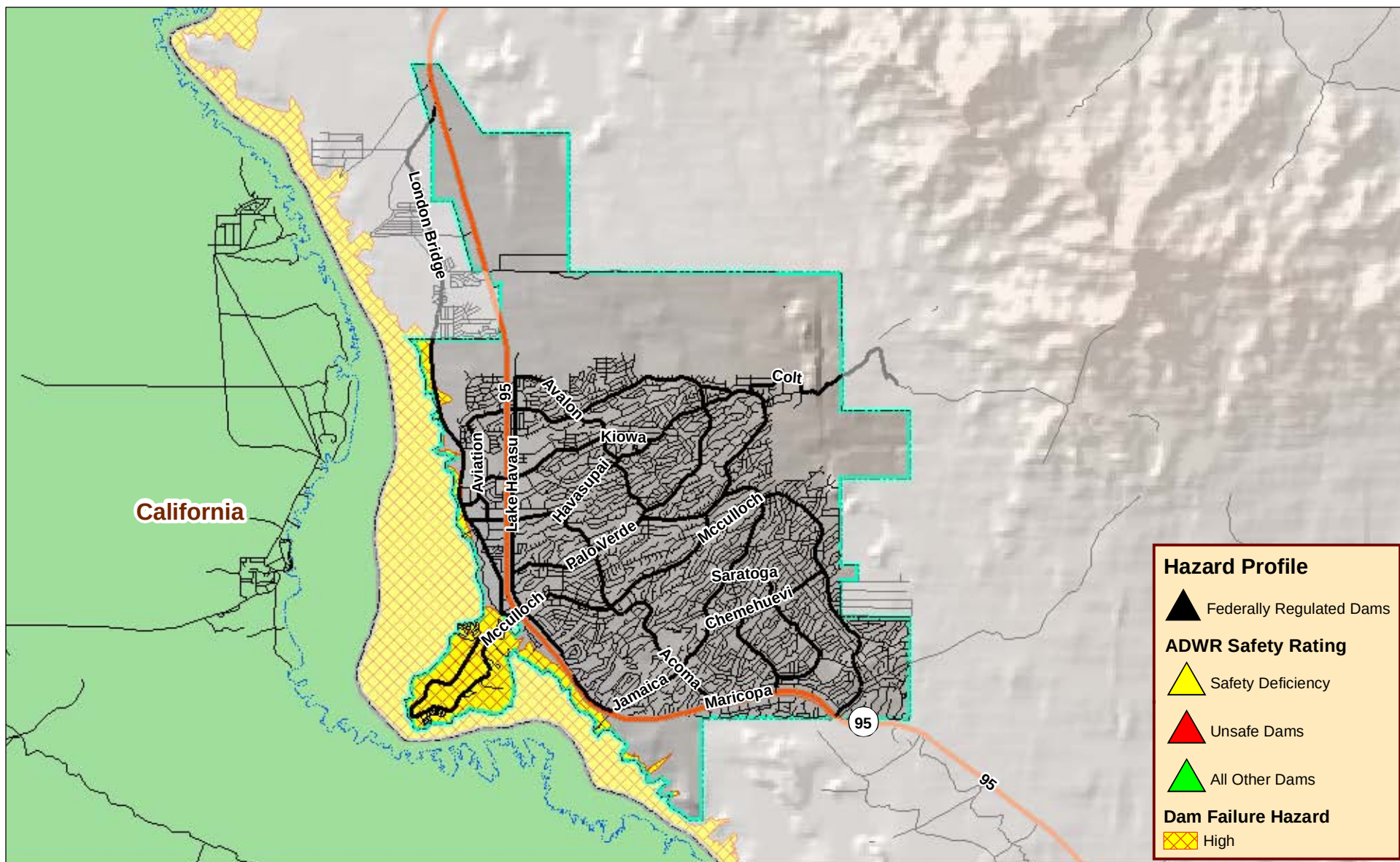
Source: JE FULLER 2010; Mohave County, 2009; ALRIS, 2007; ADWR, 2009; NID, 2009



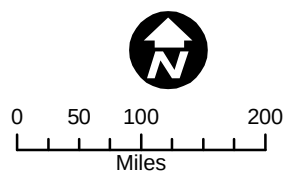
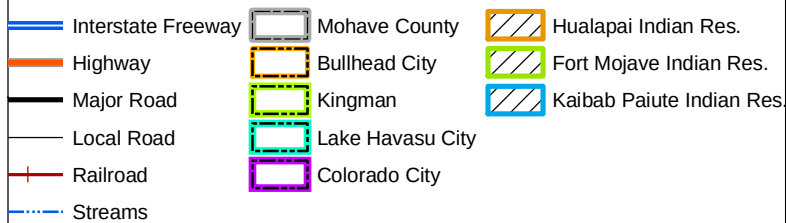
Mohave County Multi-Jurisdictional Hazard Mitigation Plan

Map 1E
Colorado City
Dam Failure
Hazard Map
as of May 2010

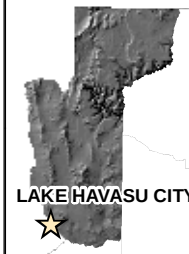




Legend



Source: JE FULLER 2010; Mohave County, 2009; ALRIS, 2007; ADWR, 2009; NID, 2009



Mohave County Multi-Jurisdictional Hazard Mitigation Plan



Map 1G
Lake Havasu City
Dam Failure
Hazard Map
as of May 2010

5.3.2 *Drought*

Description

Drought is a normal part of virtually every climate on the planet, including areas of high and low rainfall. It is different from normal aridity, which is a permanent characteristic of the climate in areas of low rainfall. Drought is the result of a natural decline in the expected precipitation over an extended period of time, typically one or more seasons in length. The severity of drought can be aggravated by other climatic factors, such as prolonged high winds and low relative humidity (FEMA, 1997).

Drought is a complex natural hazard which is reflected in the following four definitions commonly used to describe it:

- Meteorological – drought is defined solely on the degree of dryness, expressed as a departure of actual precipitation from an expected average or normal amount based on monthly, seasonal, or annual time scales.
- Hydrological – drought is related to the effects of precipitation shortfalls on streamflows and reservoir, lake, and groundwater levels.
- Agricultural – drought is defined principally in terms of naturally occurring soil moisture deficiencies relative to water demands of plant life, usually arid crops.
- Socioeconomic – drought associates the supply and demand of economic goods or services with elements of meteorological, hydrologic, and agricultural drought. Socioeconomic drought occurs when the demand for water exceeds the supply as a result of weather-related supply shortfall. It may also be called a water management drought.

A drought's severity depends on numerous factors, including duration, intensity, and geographic extent as well as regional water supply demands by humans and vegetation. Due to its multi-dimensional nature, drought is difficult to define in exact terms and also poses difficulties in terms of comprehensive risk assessments.

Drought differs from other natural hazards in three ways. First, the onset and end of a drought are difficult to determine due to the slow accumulation and lingering effects of an event after its apparent end. Second, the lack of an exact and universally accepted definition adds to the confusion of its existence and severity. Third, in contrast with other natural hazards, the impact of drought is less obvious and may be spread over a larger geographic area. These characteristics have hindered the preparation of drought contingency or mitigation plans by many governments.

Droughts may cause a shortage of water for human and industrial consumption, hydroelectric power, recreation, and navigation. Water quality may also decline and the number and severity of wildfires may increase. Severe droughts may result in the loss of agricultural crops and forest products, undernourished wildlife and livestock, lower land values, and higher unemployment.

History

Arizona has experienced 17 droughts declared as drought disasters/emergencies and 93 drought events (droughts affecting multiple years are recorded as a distinct event for each year affected). Figures 5-1 and 5-2 depict the most recent precipitation data from NCDC regarding average statewide precipitation variances from normal. Between 1849 and 1905, the most prolonged period of drought conditions in 300 years occurred in Arizona (Jacobs, 2003). Another prolonged drought occurred during the period of 1941 to 1965. The period from 1979-1983 appears to have been anomalously wet, while the rest of the historical records shows that dry conditions are most likely the normal condition for Arizona. Between 1998 and 2007, there have been more months with below normal precipitation than months with above normal precipitation.

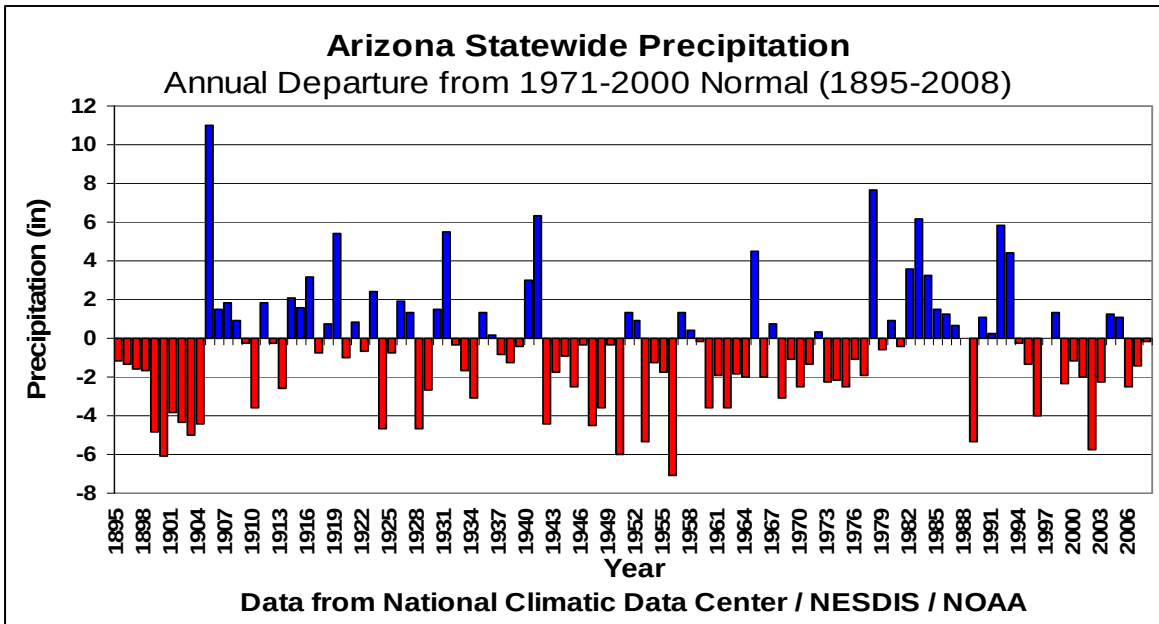


Figure 5-1: Average statewide precipitation variances from a normal based on 1971-2000 period.

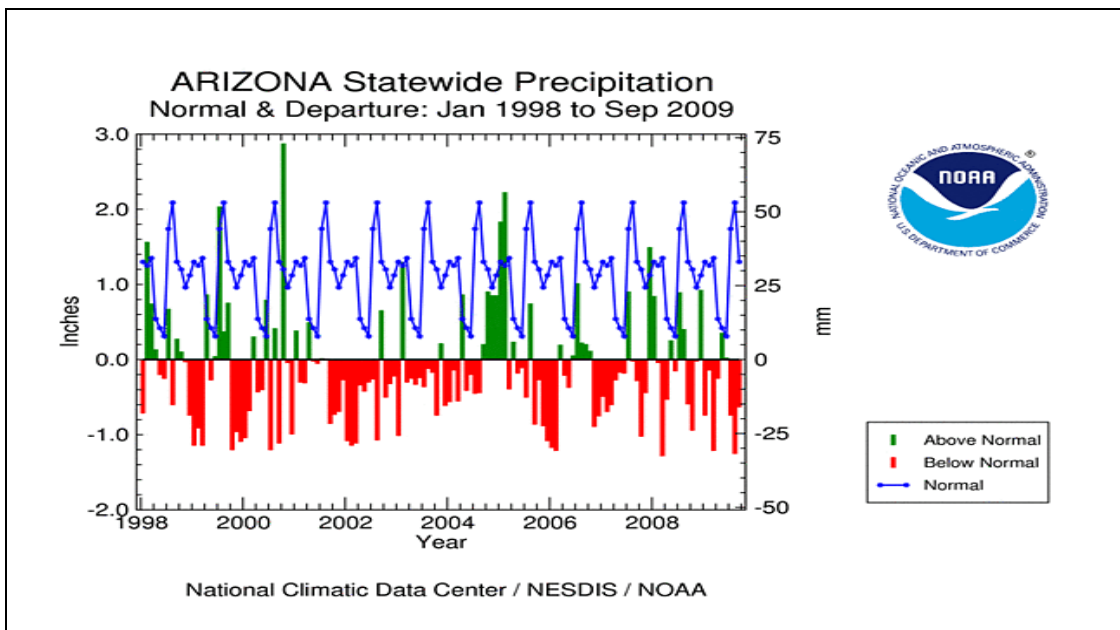
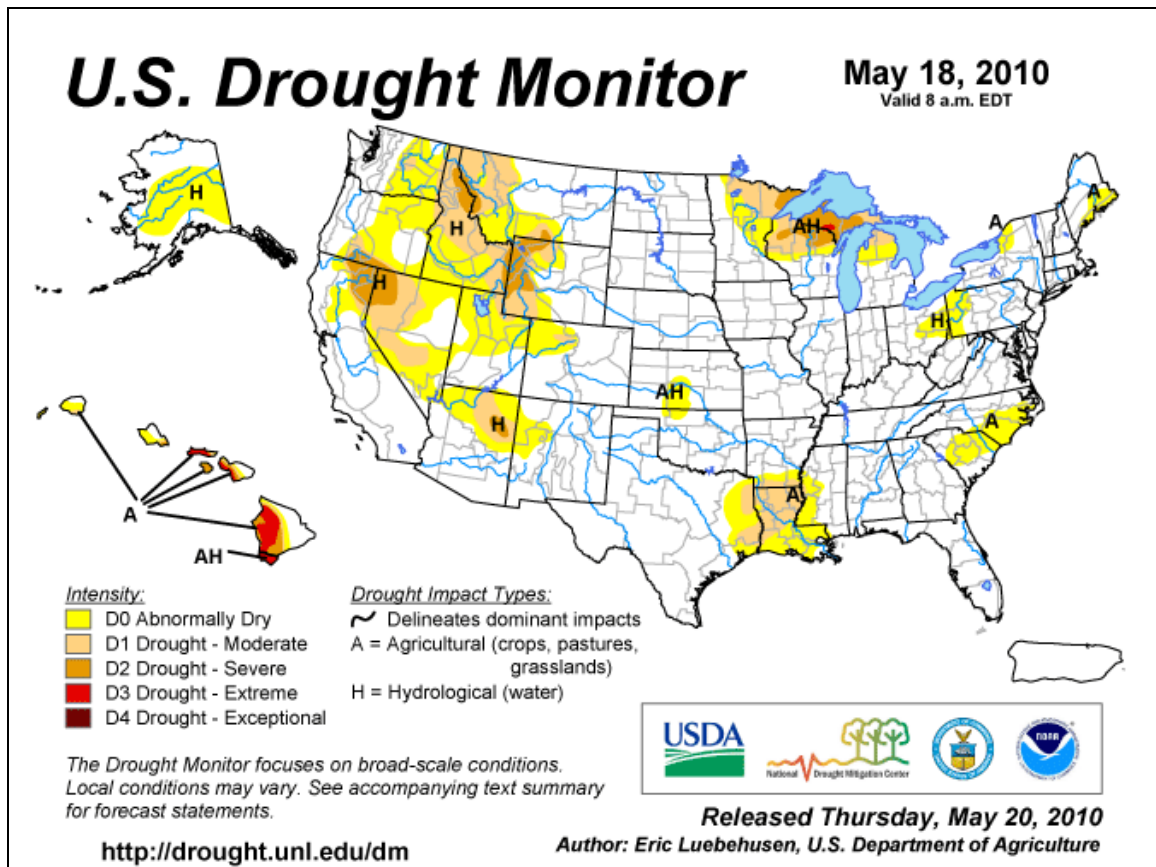


Figure 5-2: Average statewide precipitation variances from a normal based on 1998-2009 period

Probability and Magnitude

There is no commonly accepted return period or non-exceedance probability for defining the risk from drought (such as the 100-year or 1% annual chance of flood). The magnitude of drought is usually measured in time and the severity of the hydrologic deficit. There are several resources available to evaluate drought status and even project expected conditions for the very near future.

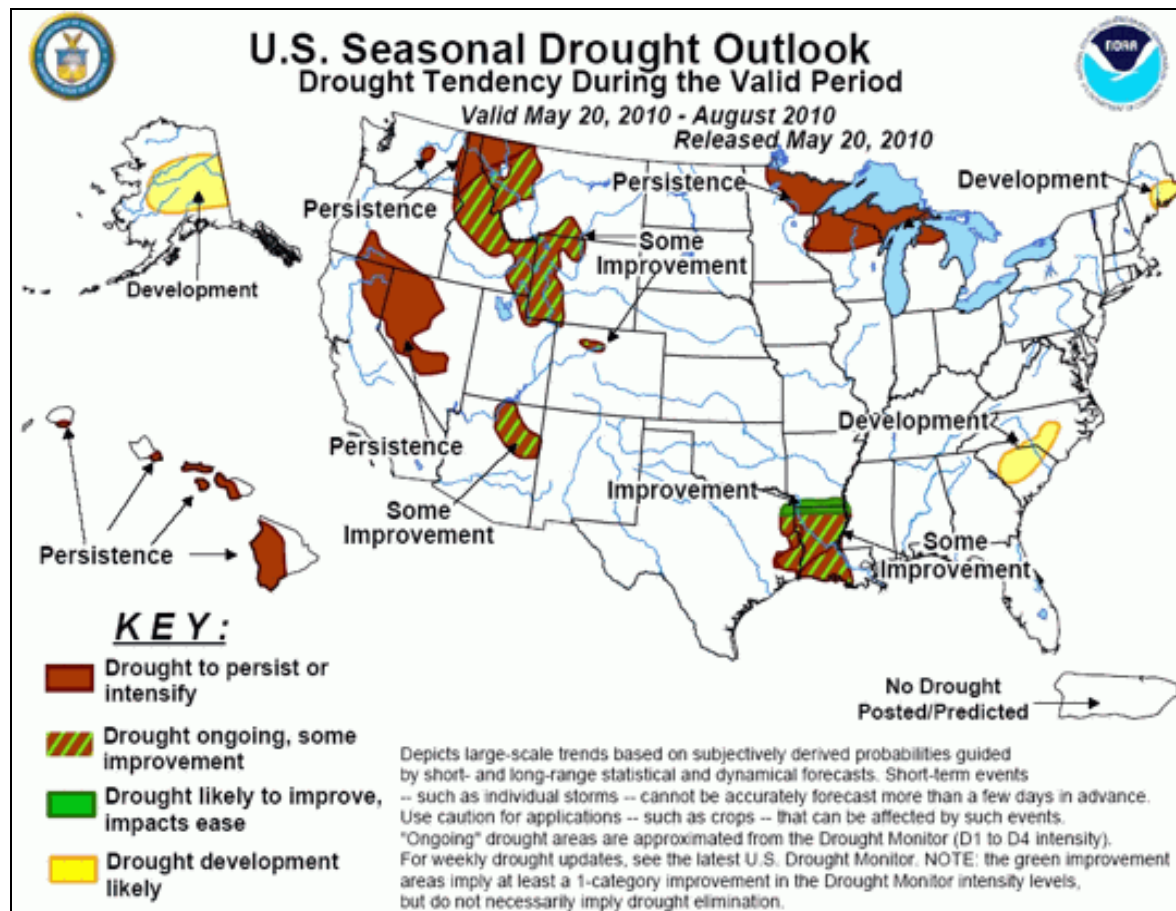
The National Integrated Drought Information System (NIDIS) Act of 2006 (Public Law 109-430) prescribes an interagency approach for drought monitoring, forecasting, and early warning (NIDIS, 2007). The NIDIS maintains the U.S. Drought Portal²⁴ which is a centralized, web-based access point to several drought related resources including the U.S. Drought Monitor (USDM) and the U.S. Seasonal Drought Outlook (USSDO). The USDM, shown in Figure 5-3, is a weekly map depicting the current status of drought and is developed and maintained by the National Drought Mitigation Center. The USSDO, shown in Figure 5-4, is a six month projection of potential drought conditions developed by the National Weather Service's Climate Prediction Center. The primary indicators for these maps for the Western U.S. are the Palmer Hydrologic Drought Index and the 60-month Palmer Z-index. The Palmer Drought Severity Index (PDSI) is a commonly used index that measures the severity of drought for agriculture and water resource management. It is calculated from observed temperature and precipitation values and estimates soil moisture. However, the Palmer Index is not considered to be consistent enough to characterize the risk of drought on a nationwide basis (FEMA, 1997) and neither of the Palmer indices are well suited to the dry, mountainous western United States.



Source: http://www.drought.gov/portal/server.pt/gateway/PTARGS_0_2_693_208_0_43/http%3B/drought.unl.edu/dm/monitor.html

Figure 5-3: U.S. Drought Monitor Map for May 18, 2010

²⁴ NIDIS U.S. Drought Portal website is located at: <http://www.drought.gov/portal/server.pt/community/drought.gov/202>

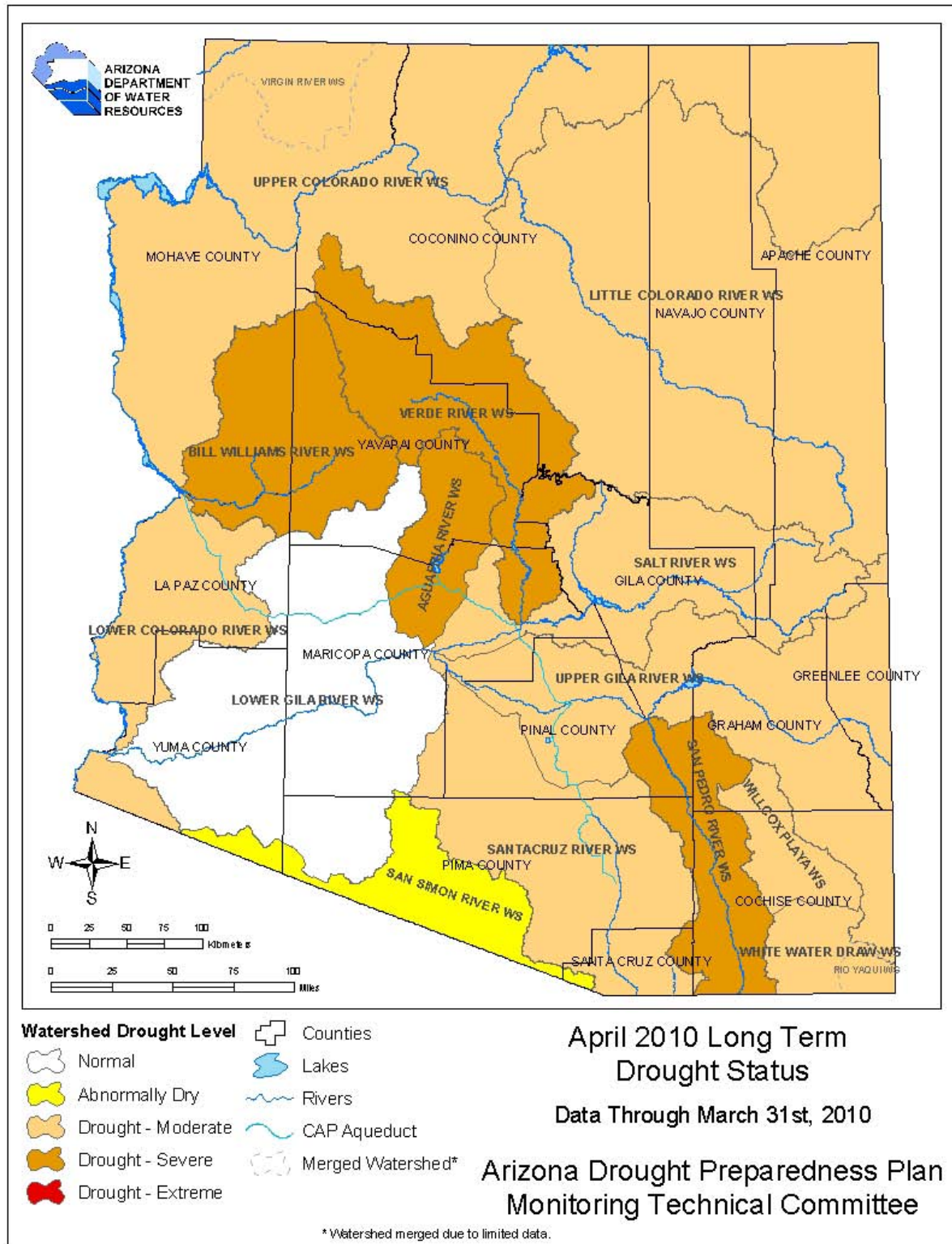


Source: http://www.cpc.ncep.noaa.gov/products/expert_assessment/seasonal_drought.html

Figure 5-4: U.S. Seasonal Drought Outlook, May to August, 2010

In 2003, Governor Janet Napolitano created the Arizona Drought Task Force (ADTF), led by ADWR, which developed a statewide drought plan. The plan includes criteria for determining both short and long-term drought status for each of the 15 major watersheds in the state using assessments that are based on precipitation and stream flow. The plan also provides the framework for an interagency group which reports to the governor on drought status, in addition to local drought impact groups in each county and the State Drought Monitoring Technical Committee. Twice a year this interagency group reports to the governor on the drought status and the potential need for drought declarations. The counties use the monthly drought status reports to implement drought actions within their drought plans. Currently, the State Drought Monitoring Technical Committee uses the USDM maps for the short-term drought status and a combination of the Standardized Precipitation Index (SPI) and streamflow data for the long-term drought status. The short term map is depicted in Figure 5-3. The most current long term map available as of the writing of this plan is shown in Figure 5-5.

The current drought maps are in general agreement that Mohave County is currently abnormally dry and in a moderate to severe drought condition for the long term. Figure 5-4 indicates that the drought conditions will likely remain the same for Mohave County over the next few months.



Source: ADWR, 2010, *Arizona Drought Monitor Report - January 2010*

Figure 5-5: Arizona long term drought status map for April 2010

Vulnerability – CPRI Results

Drought CPRI results for each community are summarized in Table 5-18 below.

Table 5-18: Summary of CPRI results by jurisdiction for drought					
Participating Jurisdiction	Probability	Magnitude/Severity	Warning Time	Duration	CPRI Score
Bullhead City	Highly Likely	Limited	> 24 hours	> one week	2.95
Colorado City	Highly Likely	Critical	> 24 hours	> one week	3.25
Kingman	Highly Likely	Critical	> 24 hours	> one week	3.10
Lake Havasu City	Unlikely	Negligible	< 6 hours	> one week	1.75
Unincorporated Mohave County	Highly Likely	Negligible	> 24 hours	> one week	2.65
County-wide average CPRI =					2.74

Vulnerability – Loss Estimations

No standardized methodology exists for estimating losses due to drought and drought does not generally have a direct impact on critical and non-critical facilities and building stock. A direct correlation to loss of human life due to drought is improbable for Mohave County. Instead, drought vulnerability is primarily measured by its potential impact to certain sectors of the County economy and natural resources include the following:

- Crop and livestock agriculture
- Municipal and industrial water supply
- Recreation/tourism
- Wildlife and wildlife habitat

Sustained drought conditions will also have secondary impacts to other hazards such as fissures, flooding, subsidence and wildfire. Extended drought may weaken and dry the grasses, shrubs, and trees of wildfire areas, making them more susceptible to ignition. Drought also tends to reduce the vegetative cover in watersheds, and hence decrease the interception of rainfall and increase the flooding hazard. Subsidence and fissure conditions are aggravated when lean surface water supplies force the pumping of more groundwater to supply the demand without the benefit of recharge from normal rainfall.

From 1995 to 2009, Mohave County farmers and ranchers received \$2.2 million in disaster related assistance funding from the U.S Department of Agriculture (USDA) for crop and livestock damages (EWG, 2010). Over \$1.8 million of those funds were received in 2000-2005, which corresponds to the most severe period of the current drought cycle for Mohave County. Other direct costs such as increased pumping costs due to lowering of groundwater levels and costs to expand water infrastructure to compensate for reduced yields or to develop alternative water sources, are a significant factor but very difficult to estimate due to a lack of documentation. There are also the intangible costs associated with lost tourism revenues, and impacts to wildlife habitat and animals. Typically, these impacts are translated into the general economy in the form of higher food and agricultural goods prices and increased utility costs.

Vulnerability – Development Trends

Population growth in Mohave County will also require additional surface and ground water to meet the demands of potable, landscape, and industrial uses. It is unlikely that significant growth will occur in the ranching and farming sectors given the current constraints on water rights, grazing rights, and available range land. Drought planning should be a critical component of any domestic water system expansions or land development planning.

The Mohave County Local Drought Impact Group (LDIG) was established by vote of the Board of Supervisors in April, 2008, as a result of a recommendation from the Governor's Drought Task Force that all Arizona counties form an LDIG in response to the current drought. The LDIG's tasks are to:

- Monitor the current level and impacts of the ongoing drought in Mohave County and provide information to local jurisdictions and ADWR

- Establish a public outreach program on drought impacts and preparedness
- Identify and recommend mitigation measures for implementation by jurisdictions, businesses, and individual families during various levels of drought.

The LDIG has met several times over the past couple of years and provides a public forum for addressing drought related issues in the county.

The ADTF is also working cooperatively with water providers within the State to develop System Water Plans that are comprised of three components:

- *Water Supply Plan* – describes the service area, transmission facilities, monthly system production data, historic demand for the past five years, and projected demands for the next five, 10 and 20 years.
- *Drought Preparedness Plan* – includes drought and emergency response strategies, a plan of action to respond to water shortage conditions, and provisions to educate and inform the public.
- *Water Conservation Plan* – addresses measures to control lost and unaccounted for water, considers water rate structures that encourage efficient use of water, and plans for public information and education programs on water conservation.

The combination of these requirements will work to ensure that future development in Mohave County will recognize drought as a potential constraint.

Sources

Arizona Department of Water Resources, 2010, *Arizona Drought Monitor Report - January 2010*

Arizona Division of Emergency Management, 2009, *State of Arizona Multi-Hazard Mitigation Plan, 2010 Update, DRAFT*.

Environmental Working Group's Farm Subsidy Database, 2010,
<http://farm.ewg.org/regiondetail.php?fips=04015&summlevel=2>

Federal Emergency Management Agency, 1997, *Multi-Hazard Identification and Risk Assessment – A Cornerstone of the National Mitigation Strategy*.

Jacobs, Katharine and Morehouse, Barbara. June 11-13, 2003. "Improved Drought Planning for Arizona," from Conference on Water, Climate, and Uncertainty: Implications for Western Water Law, Policy and Management
http://www.water.az.gov/gdtf/content/files/06262003/Improved_Drought_Planning_for_AZ_6-17.pdf

National Integrated Drought Information System, 2007, *National Integrated Drought Information System Implementation Plan*, NOAA.

NIDIS U.S. Drought Portal website is located at:
<http://www.drought.gov/portal/server.pt/community/drought.gov/202>

NOAA, NWS, Climate Prediction Center, 2010, website located at:
http://www.cpc.ncep.noaa.gov/products/expert_assessment/seasonal_drought.html

Profile Maps - No profile maps are provided.

5.3.3 *Extreme Heat*

Description

Extreme Heat is the combination of very high temperatures and exceptionally humid conditions that exceed regionally based indices for perceived risk. The major human risks associated with extreme heat are as follows:

- *Heat Cramps:* May occur in people unaccustomed to exercising in the heat and generally ceases to be a problem after acclimatization.
- *Heat Syncope:* This refers to sudden loss of consciousness and is typically associated with people exercising who are not acclimated to warm temperatures. Causes little or no harm to the individual.
- *Heat Exhaustion:* While much less serious than heatstroke, heat exhaustion victims may complain of dizziness, weakness, or fatigue. Body temperatures may be normal or slightly to moderately elevated. The prognosis is usually good with fluid treatment.
- *Heatstroke:* Considered a medical emergency, heatstroke is often fatal. It occurs when the body's responses to heat stress are insufficient to prevent a substantial rise in the body's core temperature. While no standard diagnosis exists, a medical heatstroke condition is usually diagnosed when the body's temperature exceeds 105°F due to environmental temperatures. Rapid cooling is necessary to prevent death, with an average fatality rate of 15 percent even with treatment.

In addition to affecting people, extreme heat places significant stress on plants and animals leading to reduced agricultural yields and increased mortality rates.

History

Arizona's highest recorded temperature of 128 °F was set in Lake Havasu City on June 29, 1994, which also ranks second in the U.S. behind California's Death Valley record of 134 °F. For the period of 1992 to 2009, there were 51 deaths attributed to excessive natural heat in Mohave County, with ten of those deaths occurring in 2005-2009 (Mrela, 2010).

Probability/Magnitude

There are no recurrence or non-exceedance probabilities developed for extreme heat events in Mohave County. One indicator of the degree of danger associated with extreme heat is the Heat Index (HI) or the "Apparent Temperature". According to the NWS, the HI is an accurate measure of how hot it really feels when the Relative Humidity (RH) is added to the actual air temperature. Figure 5-6 is a quick reference published by the NWS that shows the HI based on current temperature and relative humidity, and levels of danger for HI values. ***It is should be noted that the HI values presented in Figure 5-6 were devised for shady, light wind conditions. Exposure to full sunshine can increase HI values by up to 15°F. Also, strong winds, particularly with very hot, dry air, can be extremely hazardous due to rapid evaporation of body moisture and extreme dehydration potential.***

Each National Weather Service (NWS) Weather Forecast Office (WFO) can issue the following heat-related products as conditions warrant:

Excessive Heat Outlook: when the potential exists for an excessive heat event in the next 3 to 7 days. An outlook is used to indicate that a heat event may develop. It is intended to provide information to those who need considerable lead time to prepare for the event, such as public utilities, emergency management and public health officials.

Excessive Heat Watch: when conditions are favorable for an excessive heat event in the next 12 to 48 hours. A watch is used when the risk of a heat wave has increased, but its occurrence and timing is still uncertain. It is intended to provide enough lead time so those who need to set their plans in motion can do so, such as established individual city excessive heat event mitigation plans.

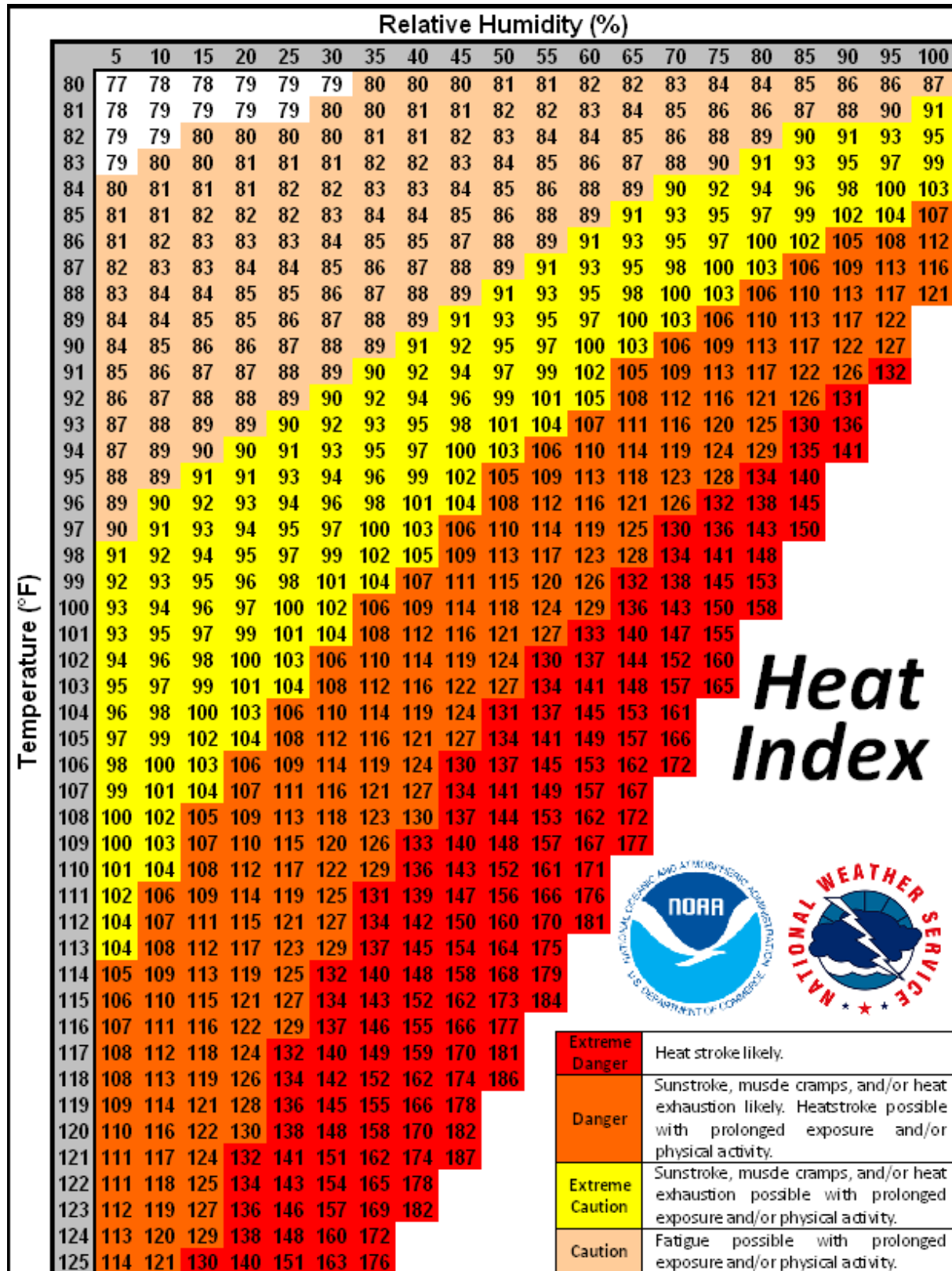


Figure 5-6: NWS Heat Index chart

Excessive Heat Warning/Advisory: when an excessive heat event is expected in the next 36 hours. These products are issued when an excessive heat event is occurring, is imminent, or has a very high probability of occurrence. The warning is used for conditions posing a threat to life or property. An advisory is for less serious conditions that cause significant discomfort or inconvenience and, if caution is not taken, could lead to a threat to life and/or property.

The geographical risk of extreme heat is relatively uniform across Mohave County, though some areas in the northern and higher elevation portions of the county don't get quite as hot and those of the valley areas adjacent to Colorado River.

Vulnerability – CPRI Results

Extreme Heat CPRI results for each community are summarized in Table 5-19 below.

Table 5-19: Summary of CPRI results by jurisdiction for extreme heat					
Participating Jurisdiction	Probability	Magnitude/Severity	Warning Time	Duration	CPRI Score
Bullhead City	Highly Likely	Critical	> 24 hours	< one week	3.15
Colorado City	Highly Likely	Critical	> 24 hours	< one week	3.15
Kingman	Highly Likely	Critical	> 24 hours	< one week	3.15
Lake Havasu City	Highly Likely	Critical	> 24 hours	< one week	3.15
Unincorporated Mohave County	Highly Likely	Critical	> 24 hours	< one week	3.15
County-wide average CPRI =					3.15

Vulnerability – Loss Estimations

Losses due to extreme heat primarily occur in the form of death and illness. There are currently no statistical analyses for projecting heat related deaths in Mohave County, however, the Arizona Department of Health Services continues to track data and monitor trends and other factors to determine if a statistical significance exists. Past history would indicate that multiple deaths due to extreme heat are highly likely.

The homeless are particularly vulnerable to extreme heat during the summer months when the increased humidity keeps nighttime temperatures above 90 degrees. The cumulative effects over several days of continuous 24-hour exposure to this heat, without relief, put the homeless at serious risk of heat stress or worse. Others at significant risk are the low income populations who do not have air conditioning, or in many cases do not even have evaporative coolers. The lack of air conditioning means this population, like the homeless, is also lacking night time relief from the heat, elevating their risk of heat stress or other complications.

Vulnerability – Development Trends

Paved surfaces typically absorb and retain the heat of the day and then slowly release that heat back into the atmosphere through the night. When large areas are paved, a phenomenon known as an "urban heat island" will develop, wherein temperatures in the center of the development area become much warmer than those on the outskirts of the development due to the storage of heat during the day. As the urban footprint grows, significant portions of the once natural desert and/or agricultural farm lands are transformed into concrete and asphalt paved streets, roofs, driveways, sidewalks, parking lots, and other hardscapes, with an intensification of the urban heat island effect and a steady increase in the nighttime low temperatures as a result. The impacts of this expansion include increased cooling costs and greater demand on power resources. According to Salt River Project, the utility's 610,000 residential customers in the Phoenix metropolitan area pay \$3.2 million to \$3.8 million extra per month in cooling costs for every degree increase in temperature, which averages out to around \$5 to \$7 per customer per month (Az Republic, 1998). Use of low impact development techniques that minimize the paved areas and maximize the use of natural open space will reduce cooling costs.

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Profile Maps

No profile maps are provided.

5.3.4 Flood / Flash Flood

Description

For the purpose of this Plan, the hazard of flooding addressed in this section will pertain to floods that result from precipitation/runoff related events. Other flooding due to dam failures is addressed separately. The three seasonal atmospheric events that tend to trigger floods in Mohave County are:

- *Tropical Storm Remnants:* Some of the worst flooding tends to occur when the remnants of a hurricane that has been downgraded to a tropical storm or tropical depression enter the State. These events occur infrequently and mostly in the early autumn, and usually bring heavy and intense precipitation over large regions causing severe flooding.
- *Winter Rains:* Winter brings the threat of low intensity; but long duration rains covering large areas that cause extensive flooding and erosion, particularly when combined with snowmelt.
- *Summer Monsoons:* A third atmospheric condition that brings flooding to Arizona is the annual summer monsoon. In mid to late summer the monsoon winds bring humid subtropical air into the State. Solar heating triggers afternoon and evening thunderstorms that can produce extremely intense, short duration bursts of rainfall. The thunderstorm rains are mostly translated into runoff and in some instances, the accumulation of runoff occurs very quickly resulting in a rapidly moving flood wave referred to as a flash flood. Flash floods tend to be very localized and cause significant flooding of local watercourses.

Damaging floods in the County can be primarily categorized as either riverine or local area flows. Riverine flooding occurs along established watercourses when the bankfull capacity of a watercourse is exceeded by storm runoff or snowmelt and the overbank areas become inundated. Local area flooding is often the result of poorly designed or planned development wherein natural flowpaths are altered, blocked or obliterated, and localized ponding and conveyance problems result. Erosion is also often associated with damages due to flooding.

History

Flooding is clearly a major hazard in Mohave County as shown in Tables 5-2 and 5-3. Mohave County has been part of 19 presidential disaster declarations for flooding related events, with three of those declarations occurring in the past 5 years. There have been at least 20 other non-declared events of reported flooding incidents that met the thresholds outlined in Section 5.1, three of which occurred in the last 5 years. The following incidents represent examples of major flooding that has impacted the County:

- In July 1974, a severe thunderstorm with winds up to 80 mph and heavy rain caused extensive flooding in Lake Havasu City and completely washed out 4 and 5 feet deep sections in some streets. Many cars were abandoned during the storm and a number washed away. Three members of one family were carried to their deaths and one was injured when their station wagon was carried 3,000 feet down a wash by a wall of water 10 feet high. Damage to public and private property amounted to \$1.7million. At Bullhead City, over 2.0 inches of rain caused extensive flooding on the morning of the 20th. The event ultimately received a state disaster declaration (AFMA, 2003 and ADEM, 2010).
- In September 1976, two storms hit the Bullhead City within weeks of each other. The first storm on the 11th dropped 2 to 5 inches of rain causing severe flash flooding. Eight washes carried walls of water from the hills east of the city causing severe damage to streets, highways, residences, businesses, water and gas mains, and culverts. Many cars were swamped in tons of debris. Silver Creek Wash crossing Highway 95 was cut into a 20-40 foot deep canyon. The city was severed from all outside assistance. Estimates of damage to roads and streets were put in excess of \$500,000 and damage to private property at \$2,500,000. The second storm on the 24th dropped another 2-5 inches of rain producing walls of water that inundated the city, which was still trying to dig out from the millions of tons of silt, rocks, and

debris from tropical storm Kathleen. Highway 95, the only access to the outside, was again quickly inundated in several places. A number of cars, some with occupants, were swept down the washes. Eight persons were rescued, some by a private helicopter. Additional damage from this second wave was estimated at \$2-3 million. (AFMA, 2003 and ADEM, 2010).

- In July 1981, massive flash flooding resulting from very heavy rains caused \$250,000 in damage in Colorado City. Roads, streets, water and sewer lines were destroyed and basements filled with water and mud. Ravines three to six feet deep were cut into the streets. The large hail that preceded the heavy rain accumulated to a depth of one inch and severely damaged crops.
- In June 1983, releases from federal reservoirs caused flooding along the entire Colorado River below Hoover Dam resulting in a federal disaster declaration (FEMA 686-DR) for La Paz, Mohave, and Yuma Counties.
- In September 1983, tropical storm remains, including those from Hurricane Octave, caused heavy rain over Arizona during a 10-hour period resulting in a federal disaster declaration (FEMA-691-DR). Southeast Arizona, Yavapai and Mohave Counties were particularly hard hit. Fourteen fatalities and 975 injuries were attributed to the flooding, and at least 1000 Arizonans were left temporarily homeless. Damages were estimated at \$370 million in 2001 dollars (ADEM, 2010).
- In July 2003, flash flooding in Peach Springs from a stationary thunderstorm. Mud and debris were deposited across Route 66. Trailers were moved off foundations and cars were floated in flood waters. All washes reported flooded with Santa Fe railroad tracks under water. SR 18 was also under water and closed. Damages were estimated at \$500,000 (NCDC, 2010).
- In July 2007, flood waters were up to the door of a home in Golden Valley, and many cars were stuck in washes. Two men died when their truck was swept down a wash after they attempted to drive across it. Damages were estimated at \$20,000.
- In August 2007, several roads were closed and/or damaged by flooding, including U.S. Highway 93 20 miles north of Wikieup, Stockton Hills Rd. in the Kingman area, and Antares Rd. and Diamond Bar Rd. north of Kingman. Damages were estimated at \$2 million (NCDC, 2010).
- In September 2009, runoff and mud covered Primavera Loop and Primavera Road near Mohave Valley. Two homes were destroyed, nine had moderate damage, and 16 had minor damage. Damages were estimated at \$600,000 (NCDC, 2010).
- In January 2010, a series of four Pacific storms pounded the Mojave Desert and southern Great Basin between January 18th and 21st with heavy rain and snow, locally high winds, and isolated severe thunderstorms. A spotter in Kingman reported that a driveway was washed out and four to six inches of water flowed down some streets, with several road closures. The Big Sandy River near Wikieup crested at 17.9 feet, which was the all-time record crest. Rocks were washed onto Bullhead Parkway south of Adobe Road in Bullhead City and contributed to a vehicle rollover. Several roads were washed away throughout the county. Mohave County damages were estimated at \$1.2 million and the event resulted in a federal disaster declaration (FEMA-1888-DR) (NCDC, 2010 and ADEM, 2010).

Numerous other flood related incidents are summarized in the historic hazard database provided in Appendix D.

Probability and Magnitude

For the purposes of this Plan, the probability and magnitude of flood hazards in Mohave County jurisdictions are based on the 1% probability floodplains delineated on FEMA Flood Insurance Rate Maps (FIRMs). FEMA has recently completed a map modification program to update the FIRMs for the County into a digital FIRM (DFIRM) format. The effective date for the new DFIRM maps is November 18, 2009. DFIRM floodplain GIS base files were obtained from Mohave County and are the basis for the flood hazard depictions in this Plan.

Two designations of flood hazard are used. Any “A” zone is designated as a HIGH hazard area. MEDIUM flood hazard areas are all “Shaded X” zones. All “A” zones (e.g. – A, A1-99, AE, AH, AO, etc.) represent areas with a one percent (1%) probability of being flooded at a depth of one-foot or greater in any given year. All “Shaded X” zones represent areas with a 0.2% probability of being flooded at a depth of one-foot or greater in any given year. These two storms are often referred to as the 100-year and 500-year storm, respectively.

Maps 2A-2C are county-wide map showing the flood hazard areas for the entire county. Detailed maps for each jurisdiction are provided in the Jurisdictional Summaries.

Vulnerability – CPRI Results

Flooding CPRI results for each community are summarized in Table 5-20 below.

Table 5-20: Summary of CPRI results by jurisdiction for flooding					
Participating Jurisdiction	Probability	Magnitude/ Severity	Warning Time	Duration	CPRI Score
Bullhead City	Highly Likely	Catastrophic	< 6 hours	> one week	4.00
Colorado City	Likely	Limited	6 to 12 hours	< 24 hours	2.60
Kingman	Highly Likely	Negligible	< 6 hours	< 6 hours	2.80
Lake Havasu City	Likely	Negligible	< 6 hours	< 6 hours	2.35
Unincorporated Mohave County	Highly Likely	Critical	< 6 hours	< one week	3.60
County-wide average CPRI =					3.07

Vulnerability – Loss Estimations

The estimation of potential exposure to high and medium flood hazards was accomplished by intersecting the human and facility assets with the flood hazard limits depicted on Maps 2A, 2B, and 2C. Loss estimates to all facilities located within the high and medium flood hazard areas were made based on the loss estimation tables published by FEMA (FEMA, 2001). Most of the assets located within high hazard flood areas will be subject to three feet or less of flooding. Using the FEMA tables, it is assumed that all structural assets located within the high hazard areas will have a loss-to-exposure ratio of 0.20 (or 20%). A loss to exposure ratio of 0.05 (5%) is assumed for assets located in the medium hazard areas. Table 5-21 summarizes the Planning Team identified critical and non-critical facilities potentially exposed to high and medium flood hazards, and the corresponding estimates of losses. Table 5-22 summarizes population sectors exposed to the high and medium flood hazards. HAZUS residential, commercial and industrial exposures and loss estimates to high and medium flood hazards are summarized in Tables 5-23 through 5-28.

In summary, \$12.1 million and \$9.4 million in asset related losses are estimated for high and medium flood hazards, for all the participating jurisdictions in Mohave County. An additional \$216 and \$58.8 million in high and medium flood losses to HAZUS defined residential, commercial, and industrial facilities is estimated for all participating Mohave County jurisdictions. Regarding human vulnerability, a total population of 12,407 people, or 8.0% of the total population, is potentially exposed to a high hazard flood event. A total population of 12,932 people, or 8.3% of the total population, is potentially exposed to a medium hazard flood event. Based on the historic record, multiple deaths and injuries are plausible and a substantial portion of the exposed population is subject to displacement depending on the event magnitude.

Table 5-21: Summary of asset inventory exposure to high and medium hazard flooding and corresponding loss estimates					
Community	Total Facilities Reported by Community	Impacted Facilities	Percentage of Total Community Facilities Impacted	Estimated Replacement Cost (x \$1000)	Estimated Structure Loss (x \$1000)
HIGH					
County-Wide Totals	308	21	6.82%	\$60,665	\$12,133
Bullhead City	53	3	5.66%	\$24,250	\$4,850
Colorado City	18	0	0.00%	\$0	\$0
Kingman	102	5	4.90%	\$3,138	\$628
Lake Havasu City	42	2	4.76%	\$13,700	\$2,740
Unincorporated Mohave County	93	11	11.83%	\$19,577	\$3,915
MEDIUM					
County-Wide Totals	308	45	14.61%	\$187,464	\$9,373
Bullhead City	53	2	3.77%	\$5,853	\$293
Colorado City	18	0	0.00%	\$0	\$0
Kingman	102	30	29.41%	\$121,744	\$6,087
Lake Havasu City	42	0	0.00%	\$0	\$0
Unincorporated Mohave County	93	13	13.98%	\$59,867	\$2,993

Table 5-22: Summary of population sectors exposed to high and medium hazard flooding						
Community	Total Population	Population Exposed	Percent of Population Exposed	Total Population Over 65	Population Over 65 Exposed	Percent of Population Over 65 Exposed
HIGH						
County-Wide Totals	155,001	12,407	8.00%	31,380	2,242	7.15%
Bullhead City	33,645	3,521	10.46%	6,577	637	9.68%
Colorado City	3,309	292	8.82%	48	4	8.81%
Kingman	20,942	359	1.71%	3,593	54	1.49%
Lake Havasu City	41,838	468	1.12%	10,670	124	1.16%
Unincorporated Mohave County	52,900	7,579	14.33%	10,271	1,385	13.48%

Table 5-22: Summary of population sectors exposed to high and medium hazard flooding						
Community	Total Population	Population Exposed	Percent of Population Exposed	Total Population Over 65	Population Over 65 Exposed	Percent of Population Over 65 Exposed
MEDIUM						
County-Wide Totals	155,001	12,932	8.34%	31,380	2,270	7.23%
Bullhead City	33,645	1,182	3.51%	6,577	227	3.46%
Colorado City	3,309	11	0.35%	48	0	0.40%
Kingman	20,942	4,605	21.99%	3,593	850	23.65%
Lake Havasu City	41,838	13	0.03%	10,670	3	0.03%
Unincorporated Mohave County	52,900	6,508	12.30%	10,271	1,101	10.72%

Table 5-23: Summary of Mohave County HAZUS building exposure to Flooding									
	RESIDENTIAL		COMMERCIAL		INDUSTRIAL		SUMMARY		
Mohave County HAZUS Summary	Building Count	Potential Economic Impact (x\$1000)	Building Count	Potential Economic Impact (x\$1000)	Building Count	Potential Economic Impact (x\$1000)	Total of All Potential Economic Impact (x\$1000)	Loss-to-Exposure Ratio	Total Estimated Loss (x\$1000)
County-Wide Totals	82,663	\$11,009,311	3,074	\$2,373,884	1,104	\$682,102	\$14,065,296		
High Hazard Exposure	6,749	\$840,674	251	\$195,876	86	\$43,225	\$1,079,775	20%	\$215,955
Medium Hazard Exposure	6,758	\$811,548	373	\$318,031	97	\$46,497	\$1,176,075	5%	\$58,804
Mohave County HAZUS Summary	% Building Count	% Potential Economic Impact	% Building Count	% Potential Economic Impact	% Building Count	% Potential Economic Impact			
High Hazard Exposure	08.16%	07.64%	08.16%	08.25%	07.81%	06.34%			
Medium Hazard Exposure	08.18%	07.37%	12.13%	13.40%	08.83%	06.82%			

Table 5-24: Summary of Bullhead City HAZUS building exposure to Flooding									
	RESIDENTIAL		COMMERCIAL		INDUSTRIAL		SUMMARY		
Bullhead City HAZUS Summary	Building Count	Potential Economic Impact (x\$1000)	Building Count	Potential Economic Impact (x\$1000)	Building Count	Potential Economic Impact (x\$1000)	Total of All Potential Economic Impact (x\$1000)	Loss-to-Exposure Ratio	Total Estimated Loss (x\$1000)
Community-Wide Totals	16,803	\$2,008,953	521	\$461,765	141	\$48,270	\$2,518,988		
High Hazard Exposure	1,788	\$270,859	74	\$72,699	19	\$9,108	\$352,666	20%	\$70,533
Medium Hazard Exposure	554	\$71,179	60	\$48,038	10	\$4,310	\$123,527	5%	\$6,176
Bullhead City HAZUS Summary	% Building Count	% Potential Economic Impact	% Building Count	% Potential Economic Impact	% Building Count	% Potential Economic Impact			
High Hazard Exposure	10.64%	13.48%	14.19%	15.74%	13.25%	18.87%			
Medium Hazard Exposure	03.30%	03.54%	11.48%	10.40%	06.97%	08.93%			

Table 5-25: Summary of Colorado City HAZUS building exposure to Flooding									
	RESIDENTIAL		COMMERCIAL		INDUSTRIAL		SUMMARY		
Colorado City HAZUS Summary	Building Count	Potential Economic Impact (x\$1000)	Building Count	Potential Economic Impact (x\$1000)	Building Count	Potential Economic Impact (x\$1000)	Total of All Potential Economic Impact (x\$1000)	Loss-to-Exposure Ratio	Total Estimated Loss (x\$1000)
Community-Wide Totals	848	\$57,989	18	\$5,319	14	\$8,751	\$72,060		
High Hazard Exposure	67	\$4,411	2	\$726	0	\$431	\$5,568	20%	\$1,114
Medium Hazard Exposure	3	\$162	0	\$21	0	\$63	\$246	5%	\$12
Colorado City HAZUS Summary	% Building Count	% Potential Economic Impact	% Building Count	% Potential Economic Impact	% Building Count	% Potential Economic Impact			
High Hazard Exposure	07.85%	07.61%	12.92%	13.64%	01.93%	04.93%			
Medium Hazard Exposure	0.31%	0.28%	0.29%	0.40%	0.26%	0.72%			

Table 5-26: Summary of Kingman HAZUS building exposure to Flooding									
	RESIDENTIAL		COMMERCIAL		INDUSTRIAL		SUMMARY		
Kingman HAZUS Summary	Building Count	Potential Economic Impact (x\$1000)	Building Count	Potential Economic Impact (x\$1000)	Building Count	Potential Economic Impact (x\$1000)	Total of All Potential Economic Impact (x\$1000)	Loss-to- Exposure Ratio	Total Estimated Loss (x\$1000)
Community-Wide Totals	10,152	\$1,553,841	647	\$536,118	148	\$72,190	\$2,162,149		
High Hazard Exposure	209	\$25,939	16	\$9,469	3	\$754	\$36,162	20%	\$7,232
Medium Hazard Exposure	2,232	\$340,371	205	\$215,711	36	\$20,662	\$576,745	5%	\$28,837
Kingman HAZUS Summary	% Building Count	% Potential Economic Impact	% Building Count	% Potential Economic Impact	% Building Count	% Potential Economic Impact			
High Hazard Exposure	02.06%	01.67%	02.43%	01.77%	02.22%	01.04%			
Medium Hazard Exposure	21.98%	21.91%	31.69%	40.24%	24.46%	28.62%			

Table 5-27: Summary of Lake Havasu City HAZUS building exposure to Flooding									
	RESIDENTIAL		COMMERCIAL		INDUSTRIAL		SUMMARY		
Lake Havasu City HAZUS Summary	Building Count	Potential Economic Impact (x\$1000)	Building Count	Potential Economic Impact (x\$1000)	Building Count	Potential Economic Impact (x\$1000)	Total of All Potential Economic Impact (x\$1000)	Loss-to- Exposure Ratio	Total Estimated Loss (x\$1000)
Community-Wide Totals	22,300	\$4,349,328	985	\$831,031	422	\$266,828	\$5,447,187		
High Hazard Exposure	262	\$52,726	9	\$7,296	5	\$2,322	\$62,344	20%	\$12,469
Medium Hazard Exposure	7	\$1,307	0	\$215	0	\$69	\$1,591	5%	\$80
Lake Havasu City HAZUS Summary	% Building Count	% Potential Economic Impact	% Building Count	% Potential Economic Impact	% Building Count	% Potential Economic Impact			
High Hazard Exposure	01.18%	01.21%	0.93%	0.88%	01.23%	0.87%			
Medium Hazard Exposure	0.03%	0.03%	0.02%	0.03%	0.03%	0.03%			

Table 5-28: Summary of Unincorporated Mohave County HAZUS building exposure to Flooding									
	RESIDENTIAL		COMMERCIAL		INDUSTRIAL		SUMMARY		
Unincorporated Mohave County HAZUS Summary	Building Count	Potential Economic Impact (x\$1000)	Building Count	Potential Economic Impact (x\$1000)	Building Count	Potential Economic Impact (x\$1000)	Total of All Potential Economic Impact (x\$1000)	Loss-to-Exposure Ratio	Total Estimated Loss (x\$1000)
Community-Wide Totals	31,547	\$2,921,091	865	\$505,939	371	\$280,140	\$3,707,170		
High Hazard Exposure	4,297	\$463,845	147	\$103,716	57	\$29,599	\$597,160	20%	\$119,432
Medium Hazard Exposure	3,744	\$373,679	94	\$43,082	49	\$20,595	\$437,356	5%	\$21,868
Unincorporated Mohave County HAZUS Summary	% Building Count	% Potential Economic Impact	% Building Count	% Potential Economic Impact	% Building Count	% Potential Economic Impact			
High Hazard Exposure	13.62%	15.88%	16.96%	20.50%	15.30%	10.57%			
Medium Hazard Exposure	11.87%	12.79%	10.81%	08.52%	13.23%	07.35%			

It is duly noted that the loss and exposure numbers presented above represent a comprehensive evaluation of the County as a whole. It is unlikely that a storm event would occur that would flood all of the delineated high and medium flood hazard areas at the same time. Accordingly, actual event based losses and exposure are likely to be only a fraction of those summarized above. Furthermore, it should be noted that the 100-year floodplain would be entirely inundated during a 500-year flood.

Vulnerability – Repetitive Loss Properties

Repetitive Loss (RL) properties are those NFIP-insured properties that since 1978, have experience multiple flood losses. FEMA tracks RL properties and in particular to identify Severe RL (SRL) properties. RL properties demonstrate a track record of repeated flooding for a certain location and are one element of the vulnerability analysis. RL properties are also important to the NFIP, since structures that flood frequently put a strain on the National Flood Insurance Fund. FEMA records dated January 2010 (provided by FEMA to ADEM) indicate that there are five identified RL properties in Mohave County, with a total of over \$55,000 in associated building and contents value payments. Table 5-29 summarizes the RL property characteristics by jurisdiction.

Table 5-29: Summary of RL property statistics for Mohave County jurisdictions			
Jurisdiction	No. of Properties	No. of Properties Mitigated	Total Payments
Kingman	3	1	\$31,541
Unincorporated Mohave County	2	2	\$24,058

Source: FEMA, 2010

Vulnerability – Development Trends

For most Mohave County jurisdictions, adequate planning and regulatory tools are in place to regulate future development. Challenges with new growth will include the need for master drainage planning and additional floodplain delineations to identify and map the flood hazards within the growth areas where no or outdated mapping currently exists.

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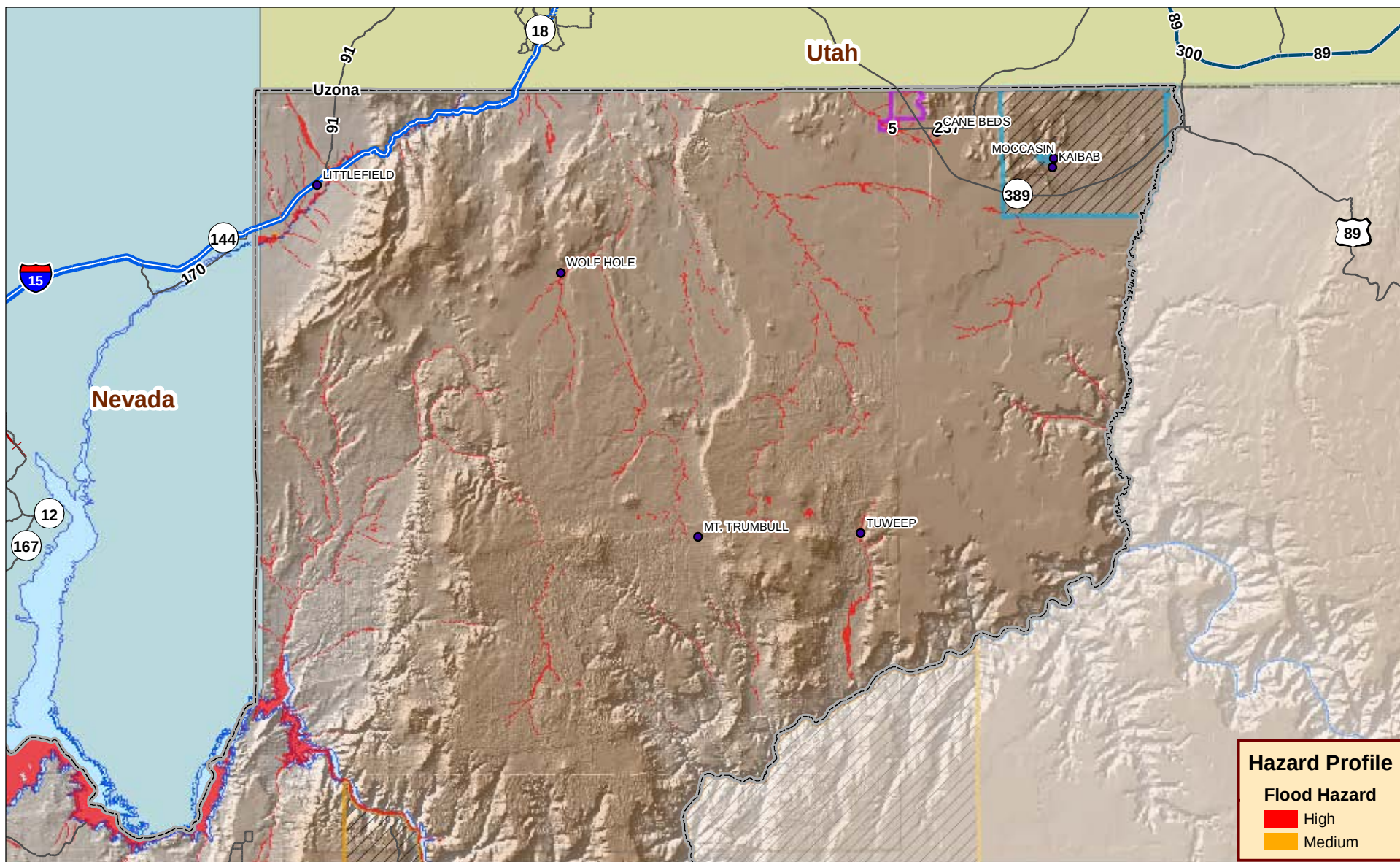
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Profile Maps

Maps 2A through 2G – Flood Hazard Maps



Hazard Profile

Flood Hazard

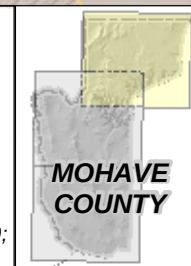
- High
- Medium

Legend

Interstate Freeway	Mohave County	Hualapai Indian Res.
Highway	Bullhead City	Fort Mojave Indian Res.
Major Road	Kingman	Kaibab Paiute Indian Res.
Railroad	Lake Havasu City	
Streams	Colorado City	
Lakes		

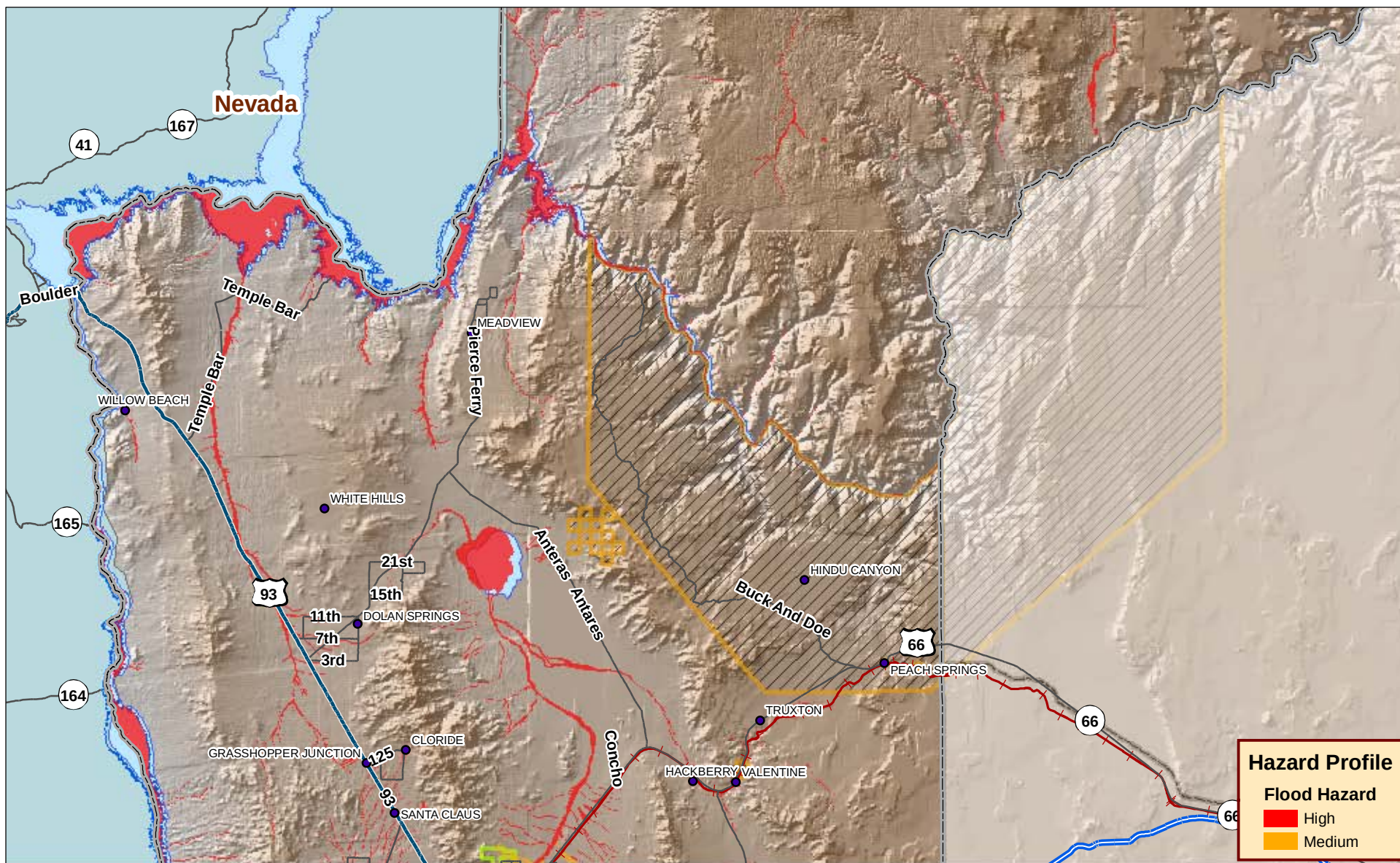
0 62.5 125 250
Miles

Source: JE FULLER 2010; Mohave County, 2009; ALRIS, 2007; FEMA, 2010

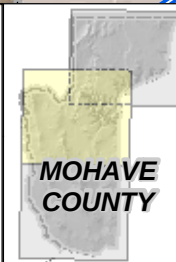
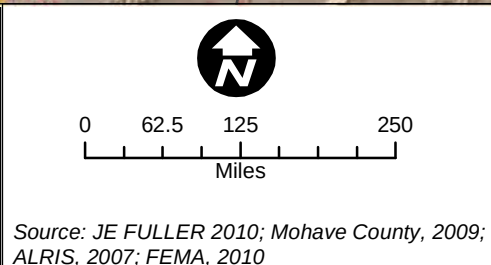
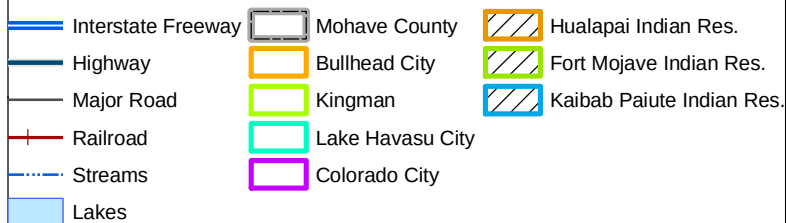


Mohave County Multi-Jurisdictional Hazard Mitigation Plan

Map 2A
Flood Hazard Map
as of May 2010



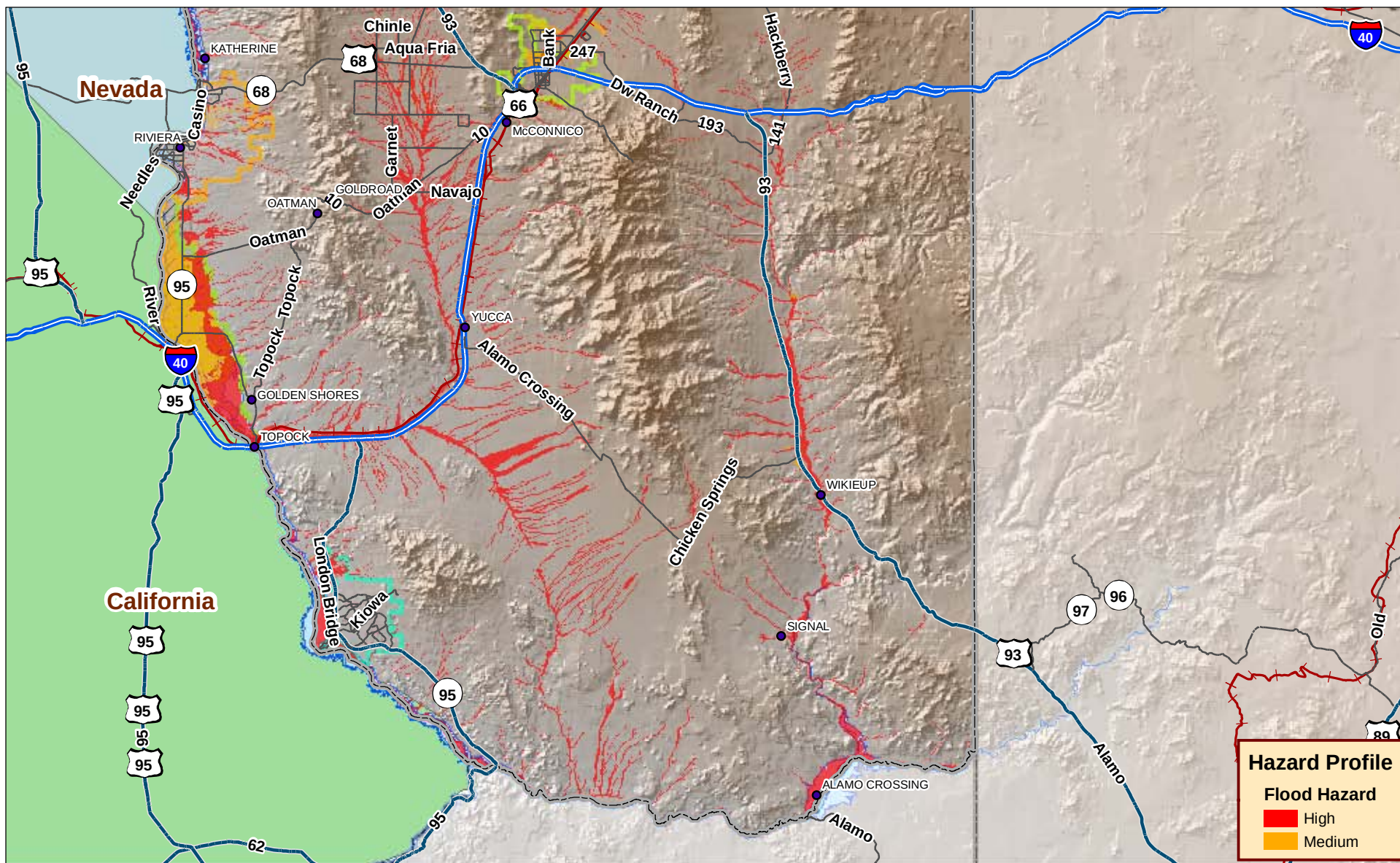
Legend



Mohave County Multi-Jurisdictional Hazard Mitigation Plan



Map 2B
Flood Hazard Map
as of May 2010



Hazard Profile

Flood Hazard

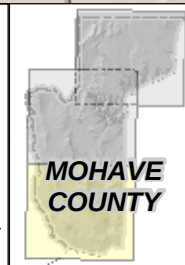
- High
- Medium

Legend

Interstate Freeway	Mohave County	Hualapai Indian Res.
Highway	Bullhead City	Fort Mojave Indian Res.
Major Road	Kingman	Kaibab Paiute Indian Res.
Railroad	Lake Havasu City	
Streams	Colorado City	
Lakes		

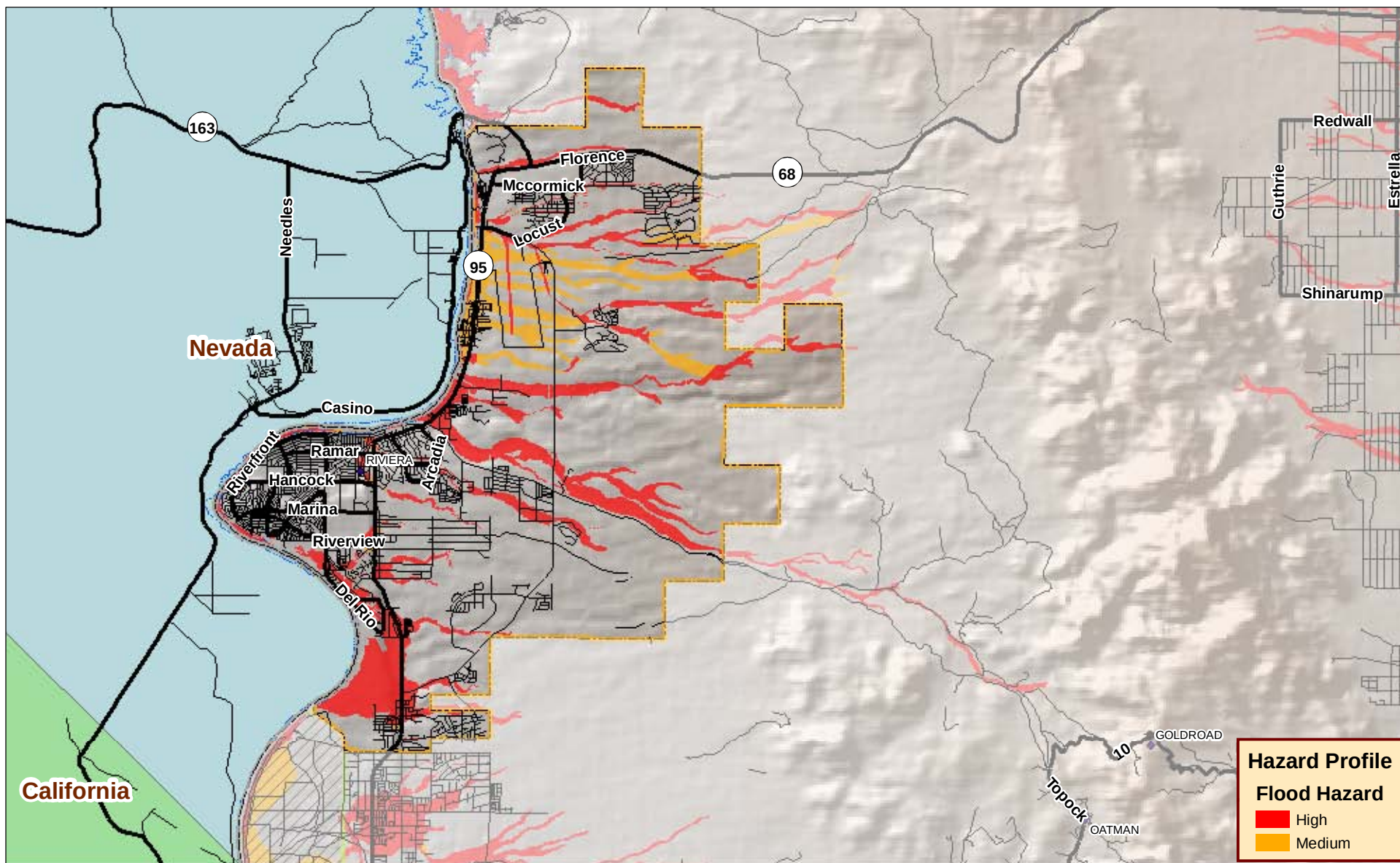
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Miles

Source: JE FULLER 2010; Mohave County, 2009; ALRIS, 2007; FEMA, 2010



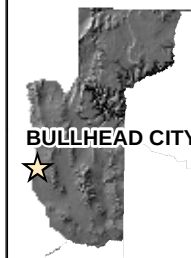
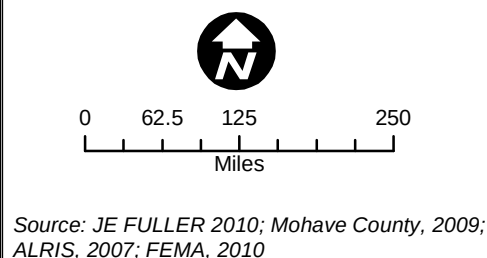
Mohave County Multi-Jurisdictional Hazard Mitigation Plan

Map 2C
Flood Hazard Map
as of May 2010



Legend

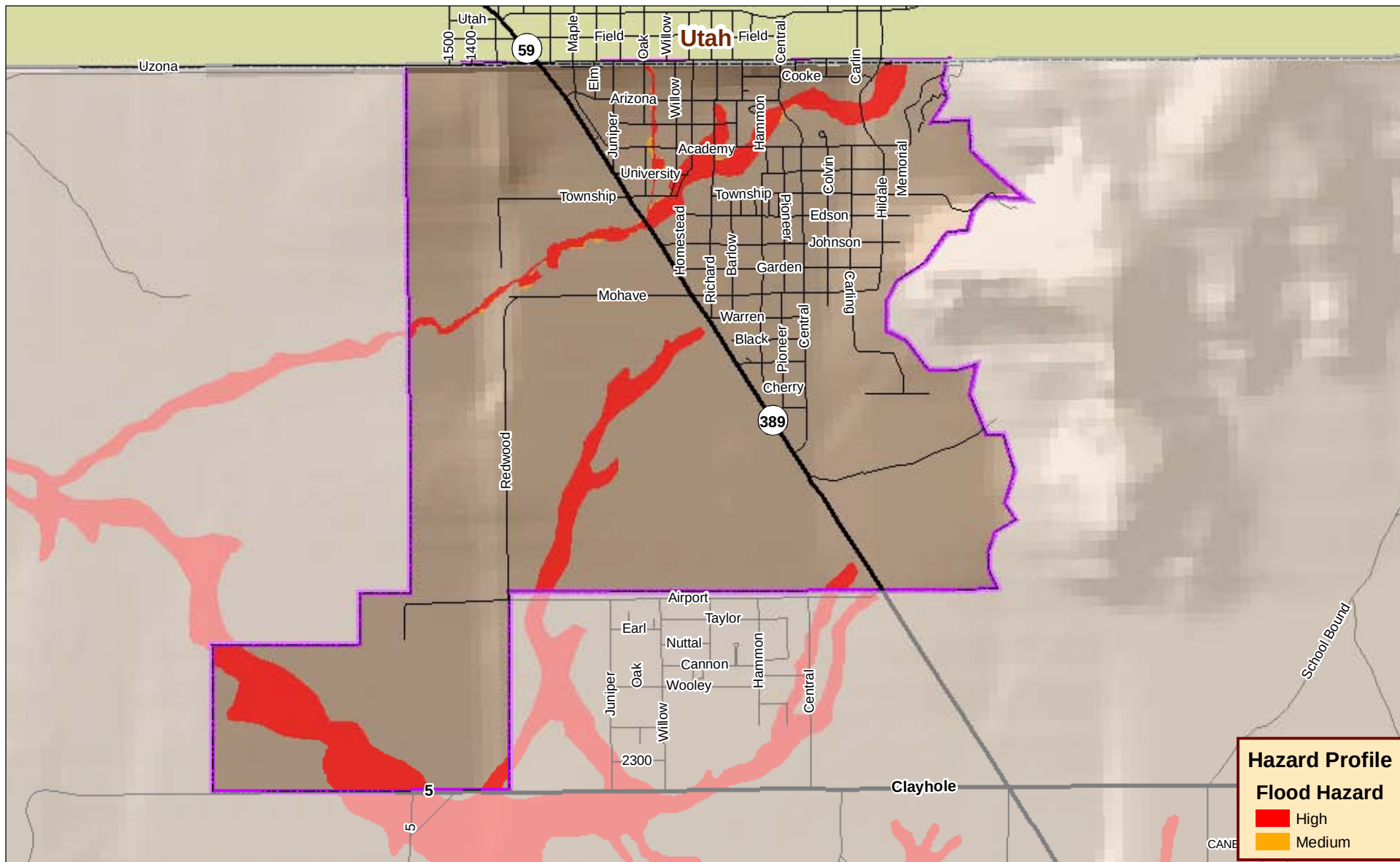
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|--------------------|------------------|---------------------------|
| Interstate Freeway | Mohave County | Hualapai Indian Res. |
| Highway | Bullhead City | Fort Mojave Indian Res. |
| Major Road | Kingman | Kaibab Paiute Indian Res. |
| Local Road | Lake Havasu City | |
| Railroad | Colorado City | |
| Streams | | |



Mohave County Multi-Jurisdictional Hazard Mitigation Plan



Map 2D
 Bullhead City
 Flood
 Hazard Map
 as of May 2010



Hazard Profile

Flood Hazard

High

Medium

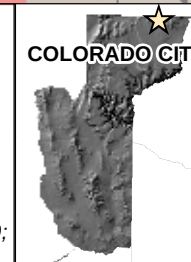
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Interstate Freeway	Mohave County	Hualapai Indian Res.
Highway	Bullhead City	Fort Mojave Indian Res.
Major Road	Kingman	Kaibab Paiute Indian Res.
Local Road	Lake Havasu City	
Railroad	Colorado City	
Streams		

0 62.5 125 250

Miles

Source: JE FULLER 2010; Mohave County, 2009; ALRIS, 2007; FEMA, 2010



Mohave County Multi-Jurisdictional Hazard Mitigation Plan

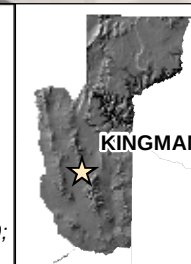
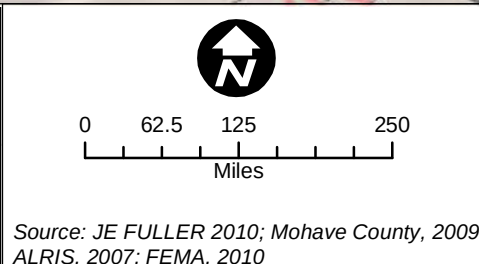
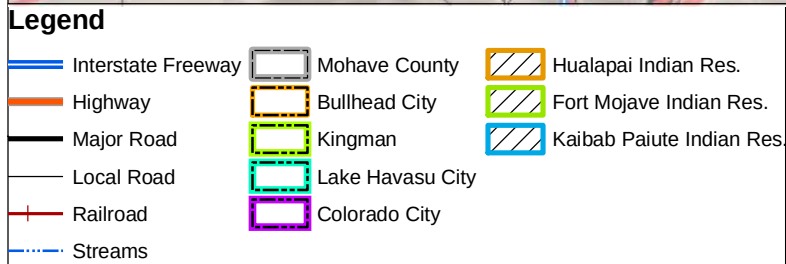
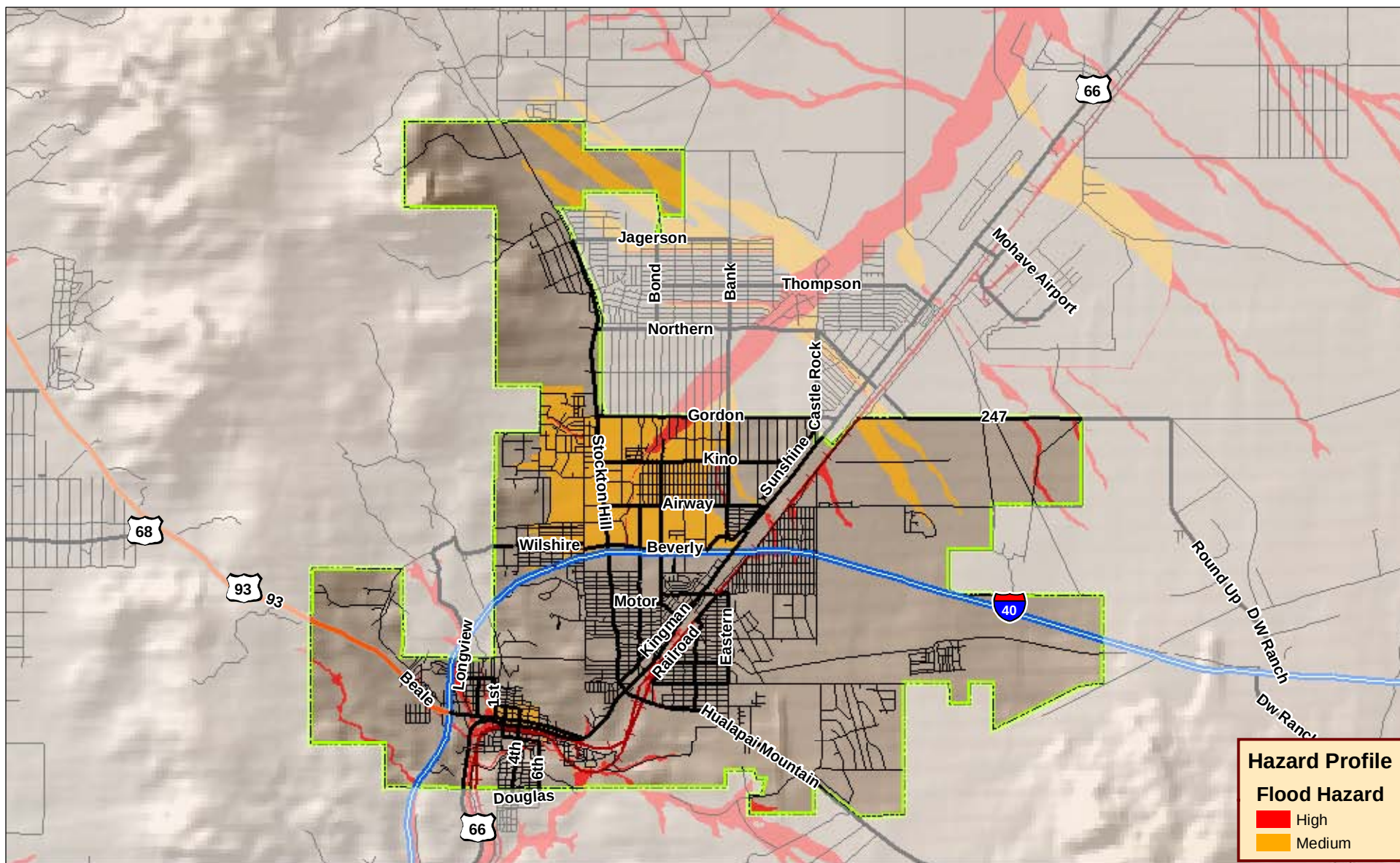
Map 2E

Colorado City

Flood

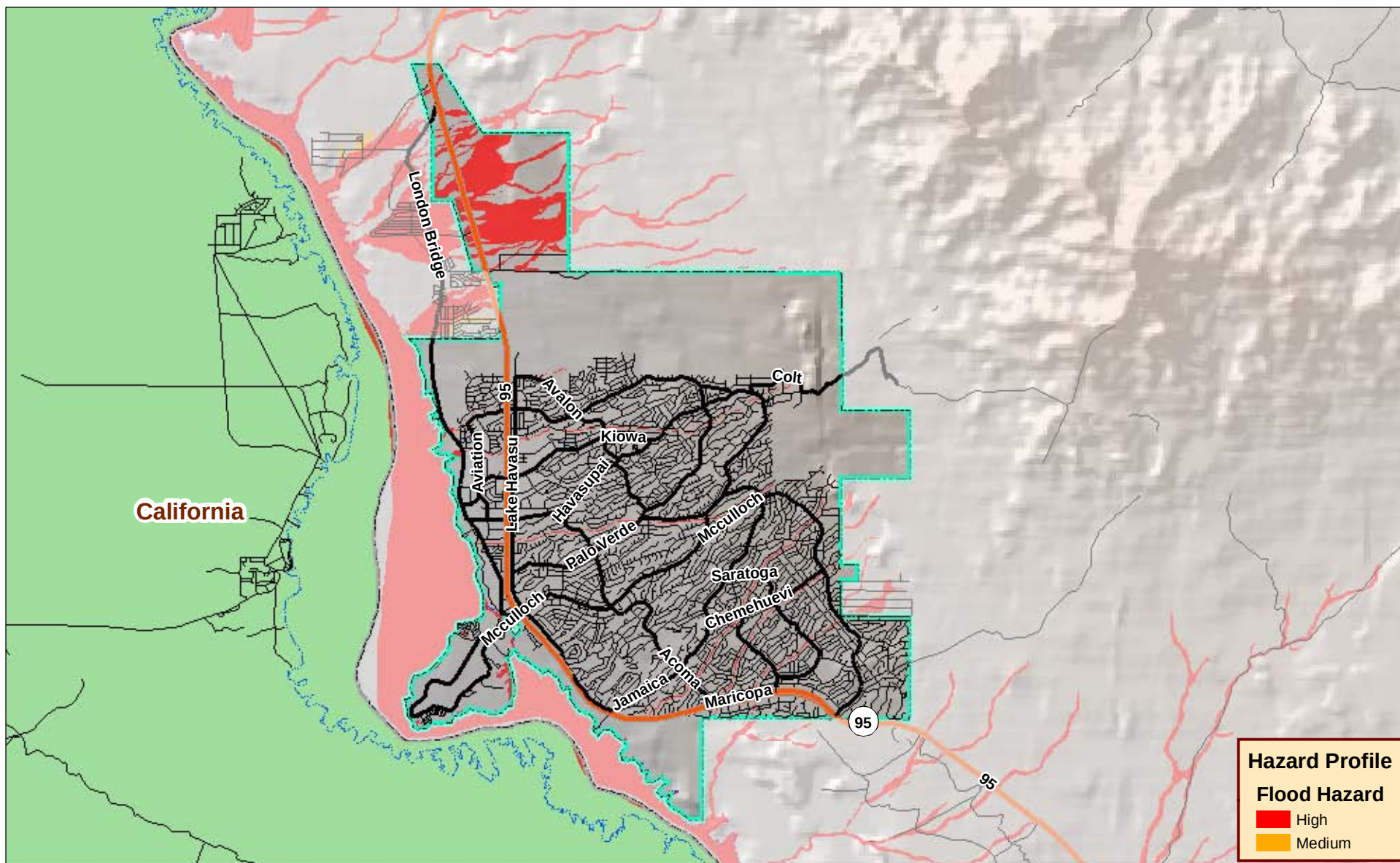
Hazard Map

as of May 2010

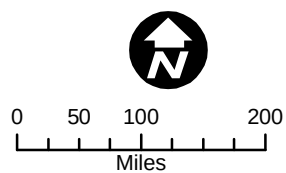
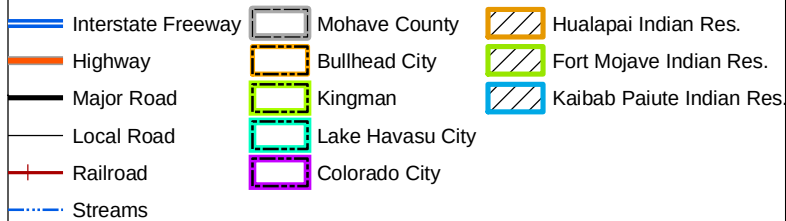


Mohave County Multi-Jurisdictional Hazard Mitigation Plan

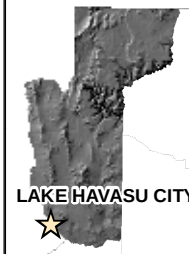
**Map 2F
Kingman
Flood
Hazard Map
as of May 2010**



Legend



Source: JE FULLER 2010; Mohave County, 2009; ALRIS, 2007; FEMA, 2010



Mohave County Multi-Jurisdictional
Hazard Mitigation Plan



Map 2G
Lake Havasu City
Flood
Hazard Map
as of May 2010

5.3.5 *Levee Failure*

Description

FEMA defines levees as man-made structures, usually earthen embankments, that are designed and constructed in accordance with sound engineering practices to contain, control or divert the flow of water so as to provide protection from temporary flooding (FEMA, 2009). National flood policy now recognizes the term “levee” to mean only those structures which were designed and constructed according to sound engineering practices, have up to date inspection records and current maintenance plans, and have been certified as to their technical soundness by a professional engineer. FEMA has classified all other structures that impound, divert, and/or otherwise impede the flow of runoff as “non-levee embankments”. In Mohave County, these “non-levee embankments” might be comprised of features such as roadway and railway embankments, canals, irrigation ditches and drains, and agricultural dikes. Currently there is no state or federal levee safety program and no official state or federal levee inventory. It is anticipated that FEMA will institute a National Levee Safety Program in the near future.

By design, a levee and many non-levee embankments increase the conveyance capacity of a watercourse by artificially creating a deeper channel via embankments that extend above the natural overbank elevation. Upon failure, floodwaters will return to the natural overbank areas, and sometimes further. FEMA urges communities to recognize that all areas protected by levees and embankments are at some risk of flooding and that there are no guarantees that a levee or embankment will not fail or breach if a large quantity of water collects upstream.

Mechanisms for levee failure are similar to those for dam failure. Failure by overtopping could occur due to an inadequate design capacity, sediment deposition and vegetation growth in the channel, subsidence, and/or a flood event that exceeds the design recurrence interval of the levee. Failure by piping could be due to embankment cracking, fissures, animal borings, embankment settling, or vegetal root penetrations.

History

Levees (certified or not) have been used in Mohave County for over a hundred years to protect communities and agricultural assets from flooding, as well as to facilitate the delivery and removal of irrigation water. These levees range from simple earthen embankments pushed up by small equipment to large engineered embankments lining both sides of a watercourse. The most prominent levees within Mohave County are those constructed along the Colorado River in the Mohave Valley. The structural integrity of levees with regard to flood protection and policy has been discussed at a national level since the early 1980s but was elevated to a high priority after the collapse and breach of New Orleans’ levees after Hurricane Katrina in 2005.

During the 1983 Colorado River Flood several small communities located along the Arizona border with California and Nevada were flooded by the man made event. Water releases from Glen Canyon, Hoover and Davis Dams forced local river flows upward from 21,000 cfs to around 38,000 cfs over a several month period. This flooding event and the damages it left behind prompted the federal government to upgrade and repair several of the dikes and levees located in Mohave Valley. During the flood, local and state officials were concerned about the damages and stress to the dikes and levees. The current levee and dike system was upgraded in several areas shortly after the flooding to provide additional flood strength for future events. In a few areas located south of the Arizona, California and Nevada state line the levee system was not upgraded and remains with limited protection to this date. Other damages created by new development along the river may have further stressed the already weakened levees.

There are no documented failures of certified levees within Mohave County, nor are there any documented records of non-levee embankment failures.

Probability and Magnitude

There are no established probability or magnitude criteria regarding levee failure due to variability in levee design and maintenance. For flood protection credit under the NFIP, FEMA has established

certain design criteria that are based on the 1 percent (100-year) storm event. Federally constructed levees are usually designed for larger, more infrequent events that equate to 250 to 500 year events. All of the FEMA certified levees within Mohave County are designed to safely convey the 100-year event, with a factor of safety provided by a minimum additional freeboard of 3 feet. Failure of any part of the Mohave Valley Levee System will flood all downstream community developments in up to four feet of water.

Mohave County has identified an initial group of levee and non-levee embankment failure hazard zones as a part of the DFIRM data. For this Plan cycle, the Planning Team chose to map only the zones related directly to known levees and to assign a High hazard rating to these areas. The remaining areas are set to low hazard. It is also noted that the county has not completed the identification of all levees, and therefore, the data presented in this Plan should be considered incomplete and will require revision at the next plan update. The currently identified High hazard levee failure zones are indicated on Maps 3A – 3C.

Vulnerability – CPRI Results

Levee Failure CPRI results for each community are summarized in Table 5-30 below.

Table 5-30: Summary of CPRI results by jurisdiction for levee failure					
Participating Jurisdiction	Probability	Magnitude/ Severity	Warning Time	Duration	CPRI Score
Bullhead City	Unlikely	Negligible	< 6 hours	> one week	1.75
Colorado City	Possible	Limited	< 6 hours	< 6 hours	2.20
Kingman	Highly Likely	Catastrophic	> 24 hours	> one week	1.45
Lake Havasu City	Unlikely	Negligible	< 6 hours	< 6 hours	1.45
Unincorporated Mohave County	Possible	Critical	6 to 12 hours	> one week	2.65
County-wide average CPRI =					1.90

Vulnerability – Loss Estimations

There are no commonly accepted methods for estimating potential levee related losses. Many variables including storm size and duration, as well as size, speed, and timing at which a levee breach forms, all contribute to the potential for human and economic losses. For the purposes of this Plan, the Planning Team chose to use the same loss to exposure ratio as the high hazard flooding, since the flooding characteristics are similar. Table 5-31 summarizes the Planning Team defined critical and non-critical facilities potentially exposed to a high hazard levee failure zone. Table 5-32 summarizes population sectors exposed to the high hazard levee failure zones. HAZUS residential, commercial and industrial exposures to high hazard levee failure zones are summarized in Tables 5-33 through 5-38.

In summary, \$10.5 million in county-wide losses to the Planning Team identified assets are estimated for high hazard levee failure. An additional \$89.3 million in county-wide high hazard levee failure losses to HAZUS defined residential, commercial, and industrial facilities is estimated. Regarding human vulnerability, a total population of 6,114 people, or 3.9% of the total county-wide population, is potentially exposed to a high hazard levee failure event. Should a levee structure fail suddenly, it is plausible that death and injury might occur. It can also be expected that a substantial portion of the exposed population is subject to displacement depending on the event magnitude.

Table 5-31: Summary asset inventory losses due to levee failure flooding					
Community	Total Facilities Reported by Community	Impacted Facilities	Percentage of Total Community Facilities Impacted	Estimated Replacement Cost (x \$1000)	Estimated Structure Loss (x \$1000)
HIGH					
County-Wide Totals	308	10	3.25%	\$52,410	\$10,482
Bullhead City	53	0	0.00%	\$0	\$0
Colorado City	18	0	0.00%	\$0	\$0
Kingman	102	0	0.00%	\$0	\$0
Lake Havasu City	42	0	0.00%	\$0	\$0
Unincorporated Mohave County	93	10	10.75%	\$52,410	\$10,482

Table 5-32: Summary of population sectors exposed to levee failure						
Community	Total Population	Population Exposed	Percent of Population Exposed	Total Population Over 65	Population Over 65 Exposed	Percent of Population Over 65 Exposed
HIGH						
County-Wide Totals	155,001	6,114	3.94%	31,380	996	3.17%
Bullhead City	33,645	0	0.00%	6,577	0	0.00%
Colorado City	3,309	0	0.00%	48	0	0.00%
Kingman	20,942	0	0.00%	3,593	0	0.00%
Lake Havasu City	41,838	0	0.00%	10,670	0	0.00%
Unincorporated Mohave County	52,900	5,458	10.32%	10,271	898	8.75%

Table 5-33: Summary of Mohave County HAZUS building exposure to levee failure									
	RESIDENTIAL		COMMERCIAL		INDUSTRIAL		SUMMARY		
Mohave County HAZUS Summary	Building Count	Potential Economic Impact (x\$1000)	Building Count	Potential Economic Impact (x\$1000)	Building Count	Potential Economic Impact (x\$1000)	Total of All Potential Economic Impact (x\$1000)	Loss-to-Exposure Ratio	Total Estimated Loss (x\$1000)
County-Wide Totals	82,663	\$11,009,311	3,074	\$2,373,884	1,104	\$682,102	\$14,065,296		
High Hazard Exposure	3471	\$381,326	102	\$49,125	45	\$16,136	\$446,588	20%	\$89,318
Mohave County HAZUS Summary	% Building Count	% Potential Economic Impact	% Building Count	% Potential Economic Impact	% Building Count	% Potential Economic Impact			
High Hazard Exposure	04.20%	03.46%	03.31%	02.07%	04.06%	02.37%			

Table 5-34: Summary of Bullhead City HAZUS building exposure to levee failure									
	RESIDENTIAL		COMMERCIAL		INDUSTRIAL		SUMMARY		
Bullhead City HAZUS Summary	Building Count	Potential Economic Impact (x\$1000)	Building Count	Potential Economic Impact (x\$1000)	Building Count	Potential Economic Impact (x\$1000)	Total of All Potential Economic Impact (x\$1000)	Loss-to-Exposure Ratio	Total Estimated Loss (x\$1000)
Community-Wide Totals	16,803	\$2,008,953	521	\$461,765	141	\$48,270	\$2,518,988		
High Hazard Exposure	0	\$0	0	\$0	0	\$0	\$0	20%	\$0
Bullhead City HAZUS Summary	% Building Count	% Potential Economic Impact	% Building Count	% Potential Economic Impact	% Building Count	% Potential Economic Impact			
High Hazard Exposure	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%			

Table 5-35: Summary of Colorado City HAZUS building exposure to levee failure									
	RESIDENTIAL		COMMERCIAL		INDUSTRIAL		SUMMARY		
Colorado City HAZUS Summary	Building Count	Potential Economic Impact (x\$1000)	Building Count	Potential Economic Impact (x\$1000)	Building Count	Potential Economic Impact (x\$1000)	Total of All Potential Economic Impact (x\$1000)	Loss-to-Exposure Ratio	Total Estimated Loss (x\$1000)
Community-Wide Totals	848	\$57,989	18	\$5,319	14	\$8,751	\$72,060		
High Hazard Exposure	0	\$0	0	\$0	0	\$0	\$0	20%	\$0
Colorado City HAZUS Summary	% Building Count	% Potential Economic Impact	% Building Count	% Potential Economic Impact	% Building Count	% Potential Economic Impact			
High Hazard Exposure	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%			

Table 5-36: Summary of Kingman HAZUS building exposure to levee failure									
	RESIDENTIAL		COMMERCIAL		INDUSTRIAL		SUMMARY		
Kingman HAZUS Summary	Building Count	Potential Economic Impact (x\$1000)	Building Count	Potential Economic Impact (x\$1000)	Building Count	Potential Economic Impact (x\$1000)	Total of All Potential Economic Impact (x\$1000)	Loss-to-Exposure Ratio	Total Estimated Loss (x\$1000)
Community-Wide Totals	10,152	\$1,553,841	647	\$536,118	148	\$72,190	\$2,162,149		
High Hazard Exposure	0	\$0	0	\$0	0	\$0	\$0	20%	\$0
Kingman HAZUS Summary	% Building Count	% Potential Economic Impact	% Building Count	% Potential Economic Impact	% Building Count	% Potential Economic Impact			
High Hazard Exposure	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%			

Table 5-37: Summary of Lake Havasu City HAZUS building exposure to levee failure									
	RESIDENTIAL		COMMERCIAL		INDUSTRIAL		SUMMARY		
Lake Havasu City HAZUS Summary	Building Count	Potential Economic Impact (x\$1000)	Building Count	Potential Economic Impact (x\$1000)	Building Count	Potential Economic Impact (x\$1000)	Total of All Potential Economic Impact (x\$1000)	Loss-to-Exposure Ratio	Total Estimated Loss (x\$1000)
Community-Wide Totals	22,300	\$4,349,328	985	\$831,031	422	\$266,828	\$5,447,187		
High Hazard Exposure	0	\$0	0	\$0	0	\$0	\$0	20%	\$0
Lake Havasu City HAZUS Summary	% Building Count	% Potential Economic Impact	% Building Count	% Potential Economic Impact	% Building Count	% Potential Economic Impact			
High Hazard Exposure	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%			

Table 5-38: Summary of Unincorporated Mohave County HAZUS building exposure to levee failure									
	RESIDENTIAL		COMMERCIAL		INDUSTRIAL		SUMMARY		
Unincorporated Mohave County HAZUS Summary	Building Count	Potential Economic Impact (x\$1000)	Building Count	Potential Economic Impact (x\$1000)	Building Count	Potential Economic Impact (x\$1000)	Total of All Potential Economic Impact (x\$1000)	Loss-to-Exposure Ratio	Total Estimated Loss (x\$1000)
Community-Wide Totals	31,547	\$2,921,091	865	\$505,939	371	\$280,140	\$3,707,170		
High Hazard Exposure	3225	\$351,564	86	\$36,715	41	\$14,734	\$403,014	20%	\$80,603
Unincorporated Mohave County HAZUS Summary	% Building Count	% Potential Economic Impact	% Building Count	% Potential Economic Impact	% Building Count	% Potential Economic Impact			
High Hazard Exposure	10.22%	12.04%	09.95%	07.26%	11.07%	05.26%			

It is duly noted that the loss and exposure numbers presented above represent a comprehensive evaluation of the County as a whole. It is unlikely that a storm event would occur that would fail all of the levees at the same time. Accordingly, actual event based losses and exposure are likely to be only a fraction of those summarized above.

Vulnerability – Development Trend Analysis

With the new focus on residual downstream risk for the land-side of levees and a general refocusing of national levee regulation and policy, it is likely that new and old developments in these areas will need to be revisited to determine if additional measures are necessary for adequate flood protection. Many structures located downstream of non-levee embankments are being re-mapped into Special Flood Hazard Zones. New developments should be evaluated to determine if sufficient protection is proposed to mitigate damages should the upstream structure fail.

Sources

Arizona Division of Emergency Management, 2009, State of Arizona Multi-Hazard Mitigation Plan, 2010 Update, DRAFT.

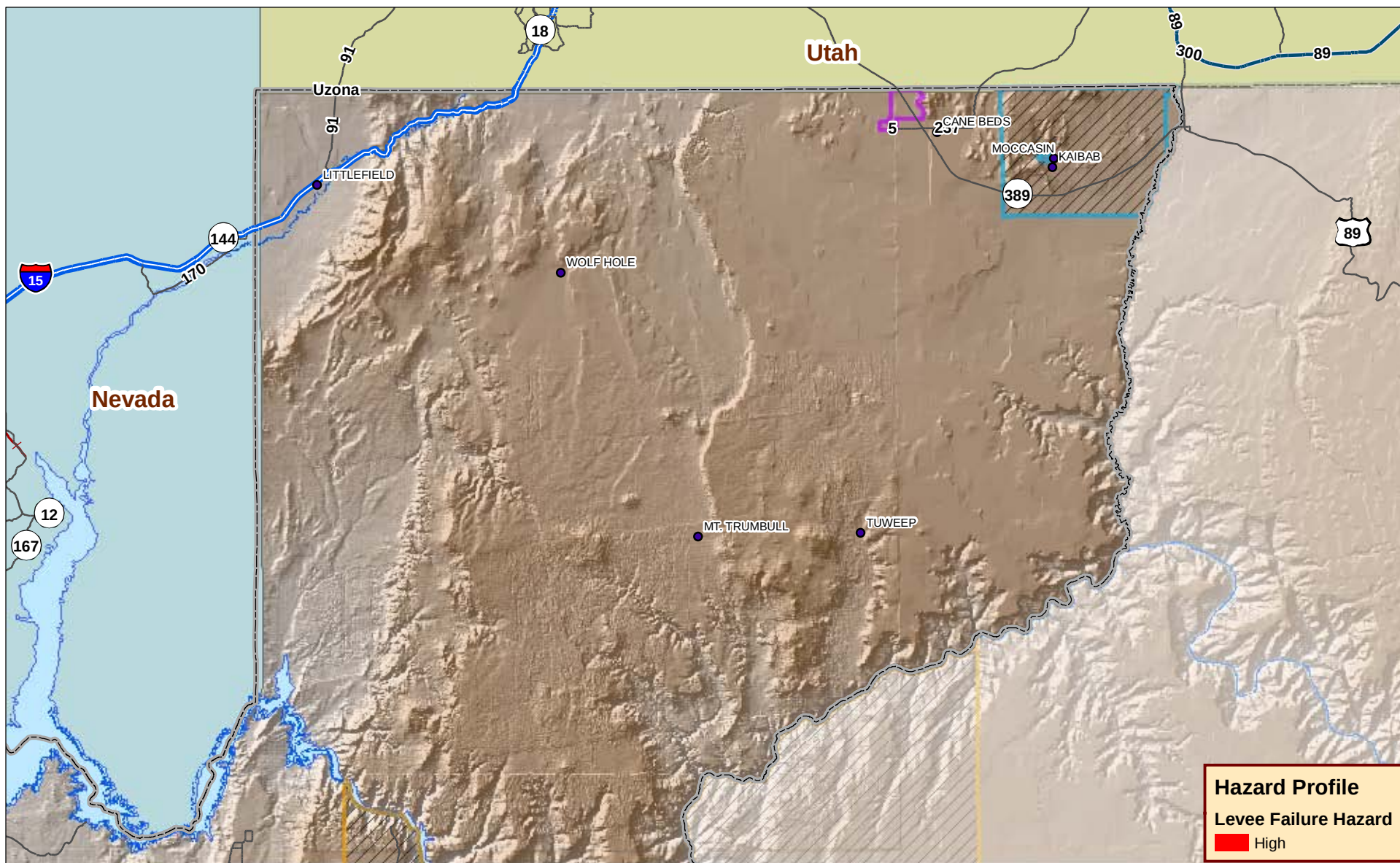
FEMA, 2001, Understanding Your Risks; Identifying Hazards and Estimating Losses, FEMA Document No. 386-2.

FEMA, 2009, Web page at URL: http://www.fema.gov/plan/prevent/fhm/lv_intro.shtm#3

Pinal County, 2010, GIS files with levee failure hazard areas.

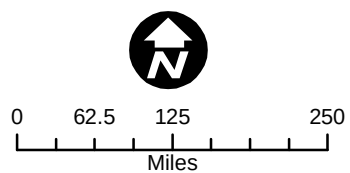
Profile Maps

Maps 3A through 3G – Levee Failure Hazard Maps

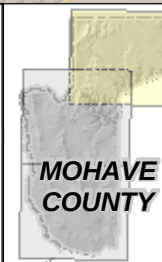


Legend

	Interstate Freeway		Mohave County		Hualapai Indian Res.
	Highway		Bullhead City		Fort Mojave Indian Res.
	Major Road		Kingman		Kaibab Paiute Indian Res.
	Railroad		Lake Havasu City		
	Streams		Colorado City		
	Lakes				



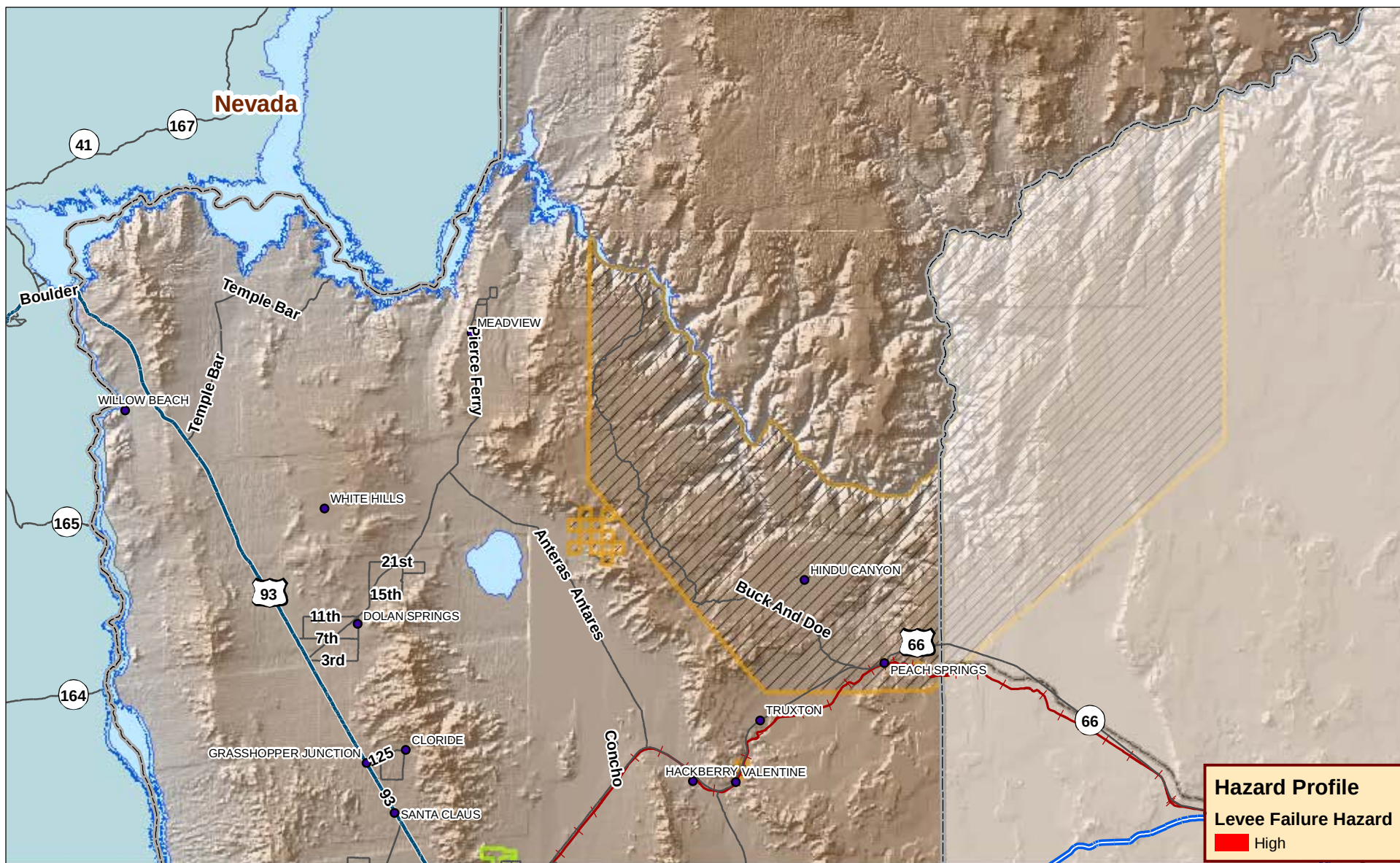
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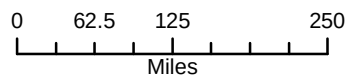
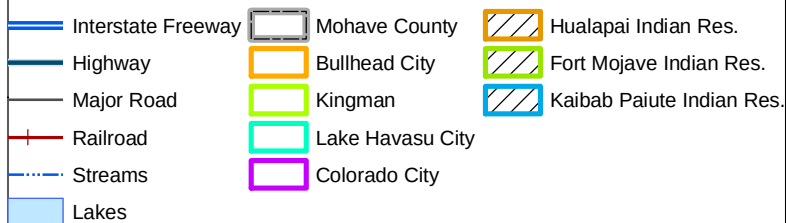
Mohave County Multi-Jurisdictional Hazard Mitigation Plan



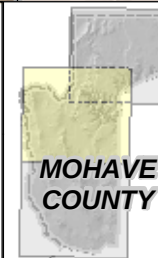
Map 3A
Levee Failure
Hazard Map
as of May 2010



Legend



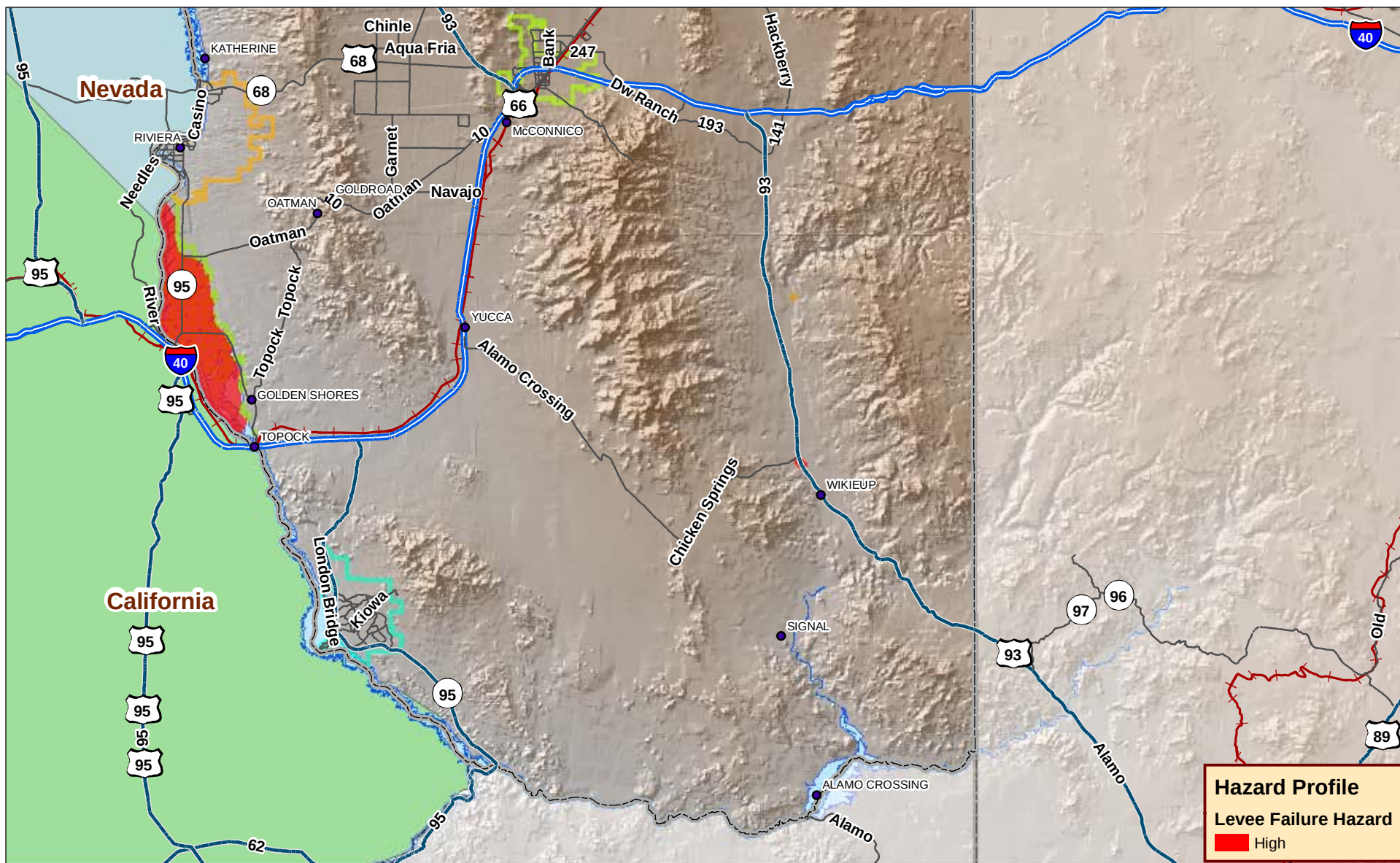
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Mohave County Multi-Jurisdictional Hazard Mitigation Plan



Map 3B
Levee Failure
Hazard Map
as of May 2010



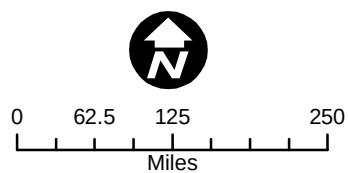
Hazard Profile

Levee Failure Hazard

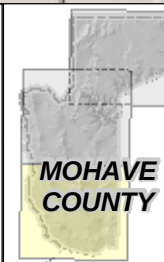
High

Legend

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|--------------------|------------------|---------------------------|
| Interstate Freeway | Mohave County | Hualapai Indian Res. |
| Highway | Bullhead City | Fort Mojave Indian Res. |
| Major Road | Kingman | Kaibab Paiute Indian Res. |
| Railroad | Lake Havasu City | |
| Streams | Colorado City | |
| Lakes | | |



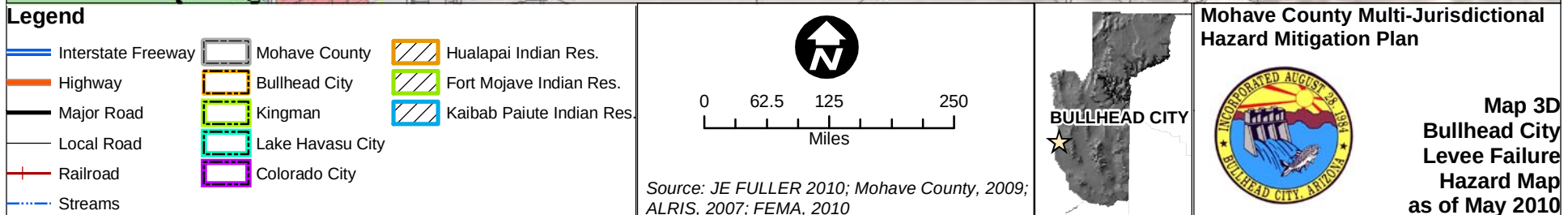
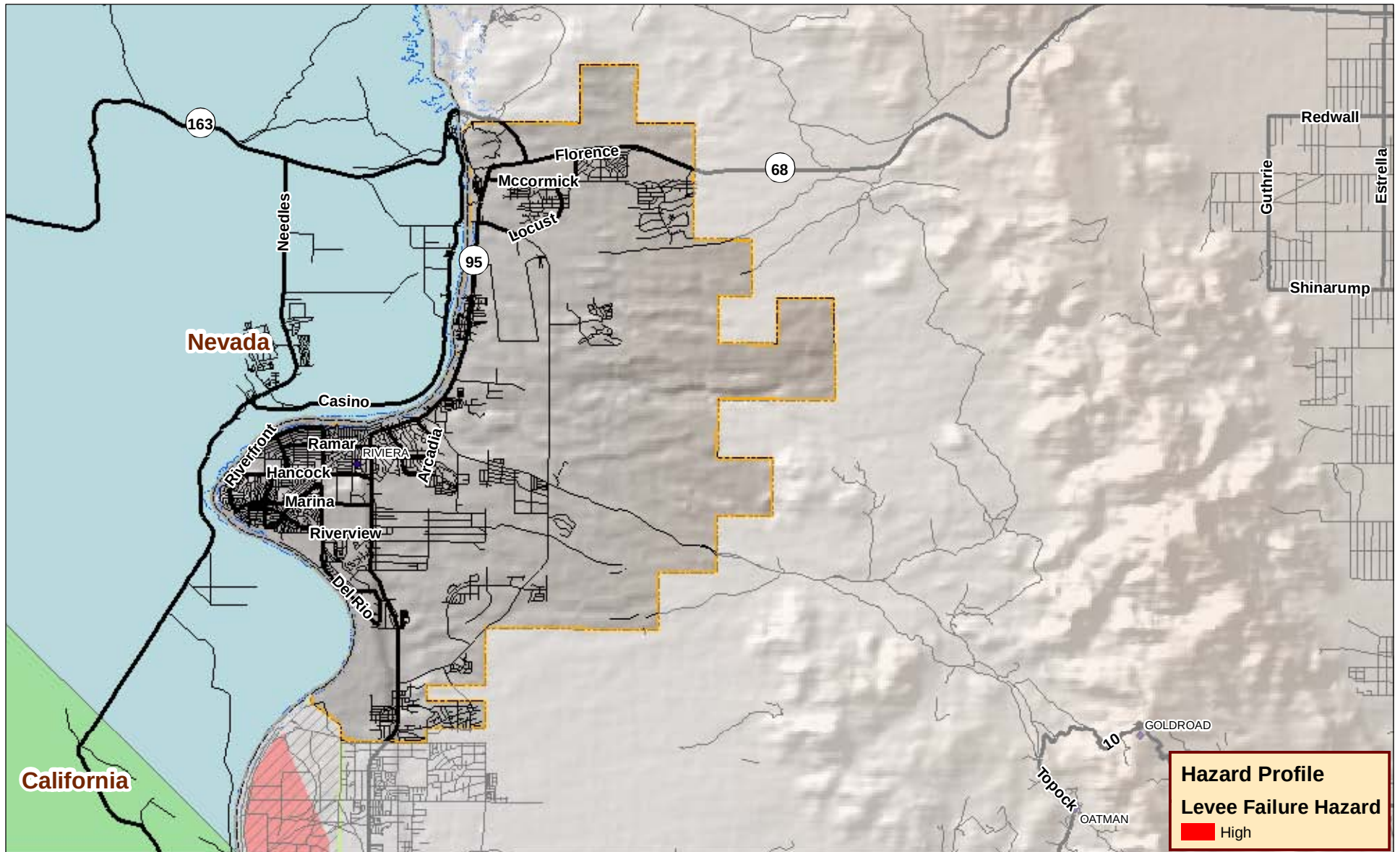
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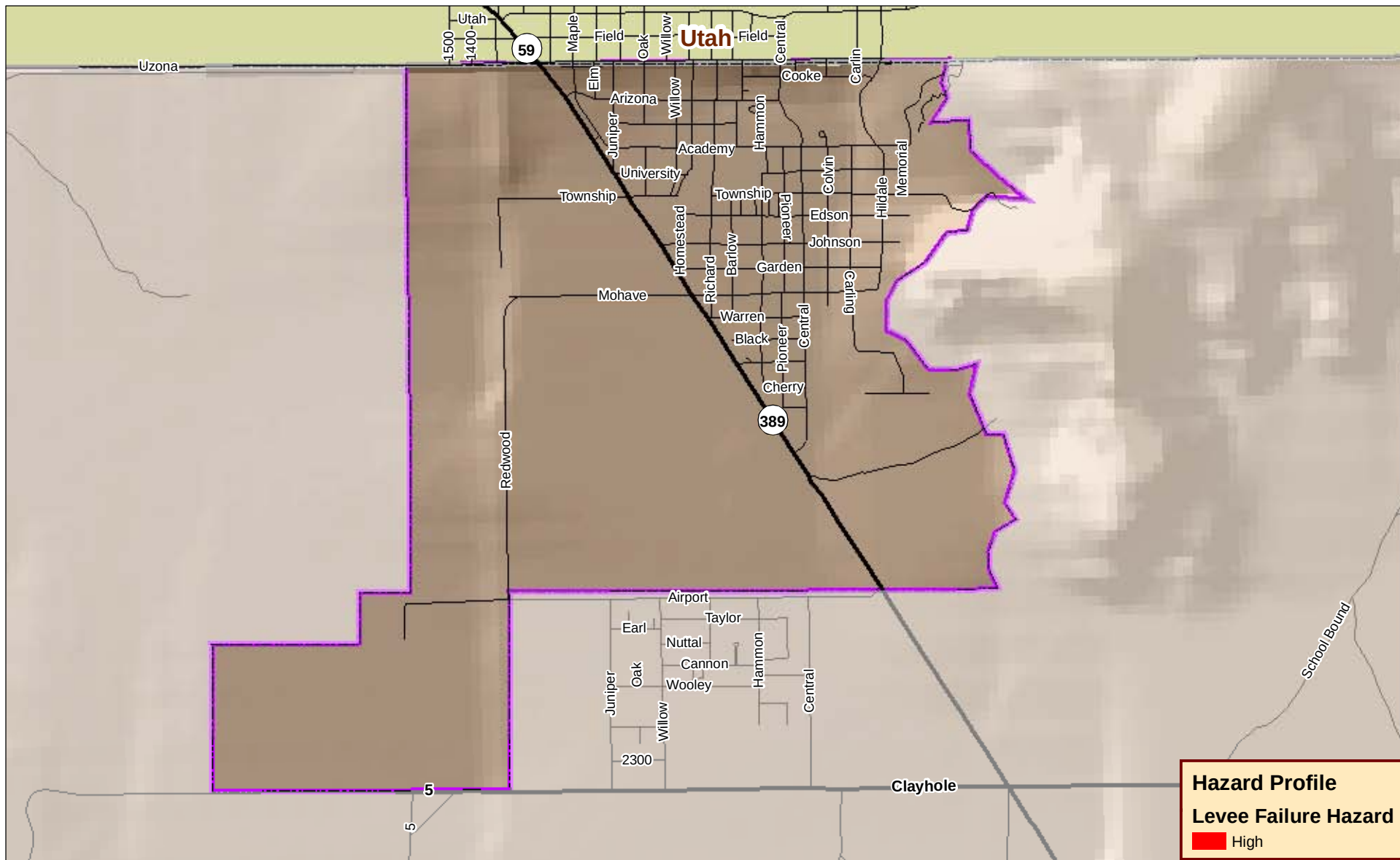


Mohave County Multi-Jurisdictional Hazard Mitigation Plan



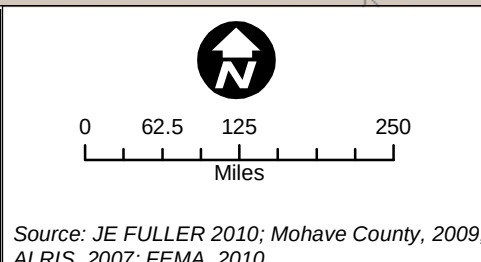
Map 3C
Levee Failure
Hazard Map
as of May 2010





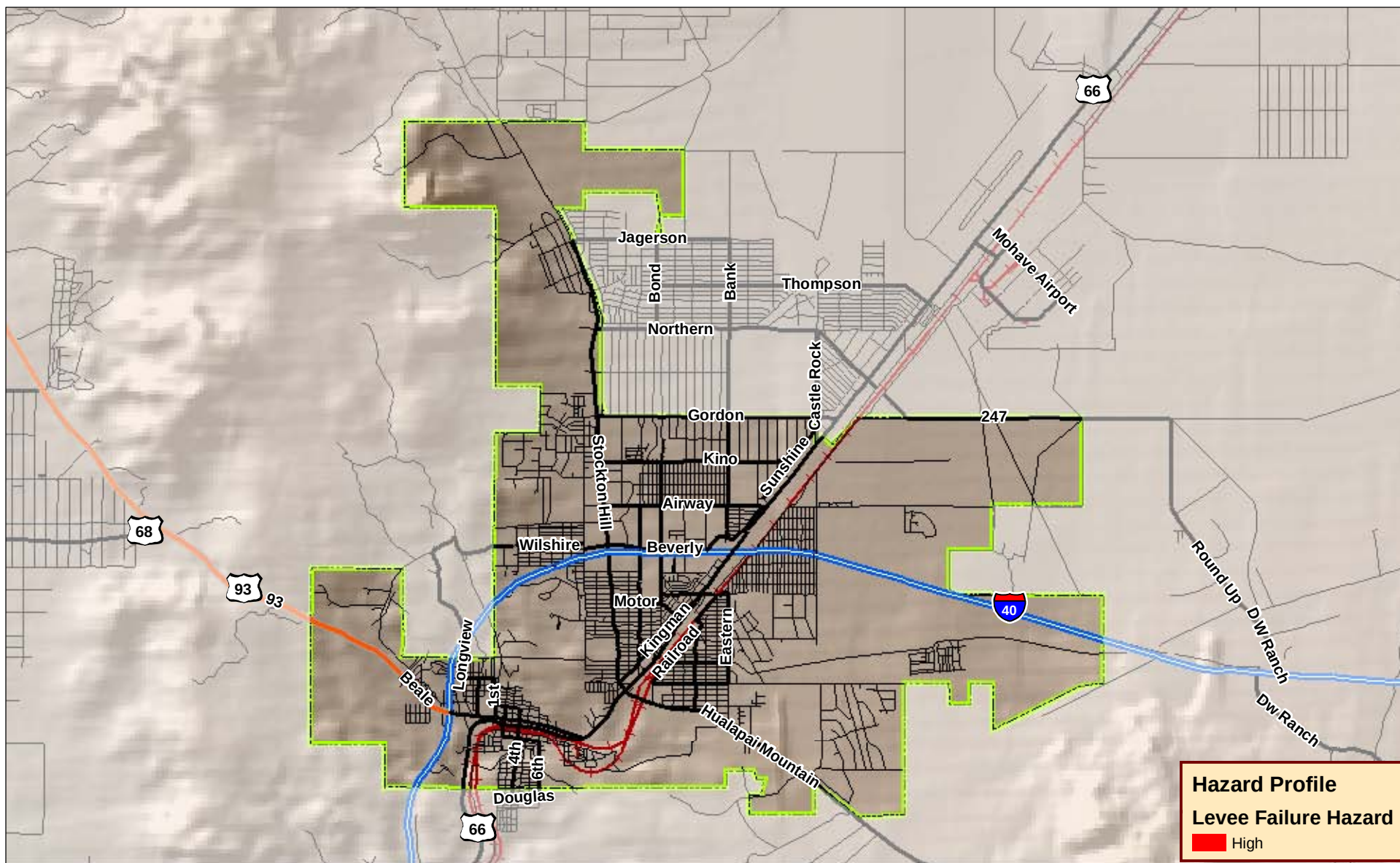
Legend

- Interstate Freeway
- Highway
- Major Road
- Local Road
- + Railroad
- ... Streams
- Mohave County
- Bullhead City
- Kingman
- Lake Havasu City
- Colorado City
- Hualapai Indian Res.
- Fort Mojave Indian Res.
- Kaibab Paiute Indian Res.



Mohave County Multi-Jurisdictional Hazard Mitigation Plan

Map 3E
Colorado City
Levee Failure
Hazard Map
as of May 2010



Hazard Profile

Levee Failure Hazard

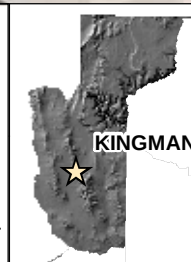
■ High

Legend

— Interstate Freeway	 Mohave County	 Hualapai Indian Res.
— Highway	 Bullhead City	 Fort Mojave Indian Res.
— Major Road	 Kingman	 Kaibab Paiute Indian Res.
— Local Road	 Lake Havasu City	
+ Railroad	 Colorado City	
... Streams		

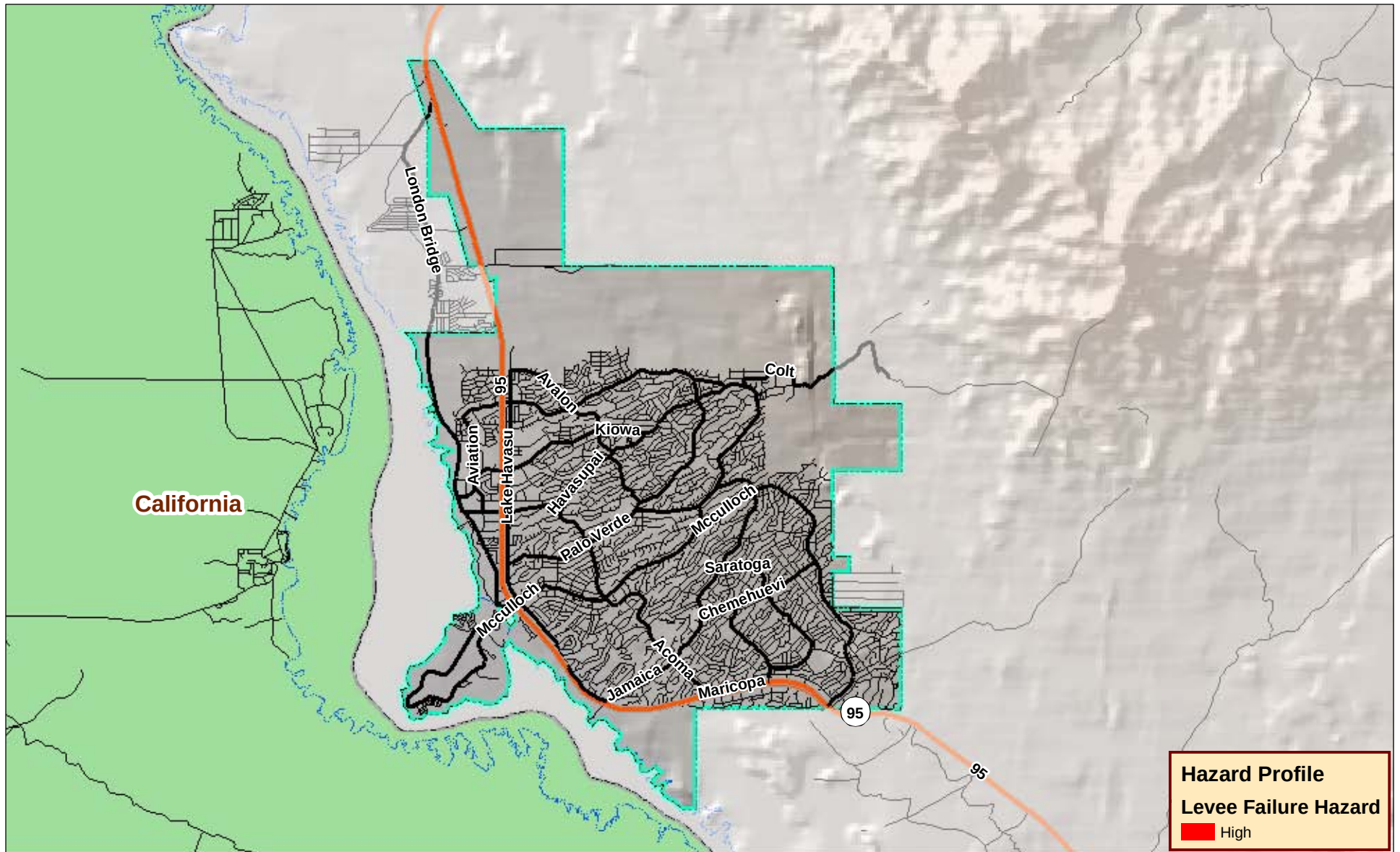
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Miles

Source: JE FULLER 2010; Mohave County, 2009; ALRIS, 2007; FEMA, 2010



Mohave County Multi-Jurisdictional Hazard Mitigation Plan

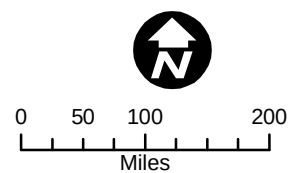
Map 3F
Kingman
Levee Failure
Hazard Map
as of May 2010



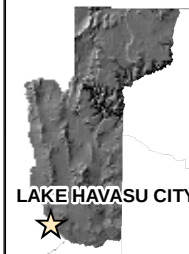
Hazard Profile
Levee Failure Hazard
 High

Legend

- | | | |
|--------------------|------------------|---------------------------|
| Interstate Freeway | Mohave County | Hualapai Indian Res. |
| Highway | Bullhead City | Fort Mojave Indian Res. |
| Major Road | Kingman | Kaibab Paiute Indian Res. |
| Local Road | Lake Havasu City | |
| Railroad | Colorado City | |
| Streams | | |



Source: JE FULLER 2010; Mohave County, 2009; ALRIS, 2007; FEMA, 2010



Mohave County Multi-Jurisdictional
 Hazard Mitigation Plan



Map 3G
 Lake Havasu City
 Levee Failure
 Hazard Map
 as of May 2010

5.3.6 *Severe Wind*

Description

The hazard of severe wind encompasses all climatic events that produce damaging winds. For Mohave County, severe winds generally result from either extreme pressure gradients that usually occur in the spring and early summer months, or from thunderstorms. Thunderstorms can occur year-round and are usually associated with cold fronts in the winter, monsoon activity in the summer, and tropical storms in the late summer or early fall.

Three types of damaging wind related features typically accompany a thunderstorm; 1) downbursts, 2) straight line winds, and infrequently, 3) tornadoes.

Downbursts are columns of air moving rapidly downward through a thunderstorm. When the air reaches the ground, it spreads out in all directions, creating horizontal wind gusts of 80 mph or higher. Downburst winds have been measured as high as 140 mph. Some of the air curls back upward with the potential to generate a new thunderstorm cell. Downbursts are called macrobursts when the diameter is greater than 2.5 miles, and microbursts when the diameter is 2.5 miles or less. They can be either dry or wet downbursts, where the wet downburst contains precipitation that continues all the way down to the ground, while the precipitation in a dry downburst evaporates on the way to the ground, decreasing the air temperature and increasing the air speed. In a microburst the wind speeds are highest near the location where the downdraft reached the surface, and are reduced as they move outward due to the friction of objects at the surface. Typical damage from downbursts includes uprooted trees, downed power lines, mobile homes knocked off their foundations, block walls and fences blown down, and porches and awnings blown off homes.

Straight line winds are developed similar to downbursts, but are usually sustained for greater periods as a thunderstorm reaches the mature stage, traveling parallel to the ground surface at speeds of 75 mph or higher. These winds are frequently responsible for generating dust storms and sand storms, reducing visibility and creating hazardous driving conditions.

A tornado is a rapidly rotating funnel (or vortex) of air that extends toward the ground from a cumulonimbus cloud. Most funnel clouds do not touch the ground, but when the lower tip of the funnel cloud touches the earth, it becomes a tornado and can cause extensive damage. For Mohave County, tornadoes are the least common severe wind to accompany a thunderstorm.

History

According to Tables 5-2 and 5-3, Mohave County has been subject to over 73 severe wind events meeting the criteria listed in Section 5.1, including one state declared disaster (PCA No. 21102), with a combined loss of over \$8.5 million to structures and agriculture in the last 53 years. The Planning Team recognizes that severe wind events occur in the county on a frequent basis and that Table 5-3 under represents the true historic account of severe winds in the County. In fact, a total of 35 severe wind events were noted in the NCDC database for the period of January 2005 through February 2010 alone. The following are examples of documented past events:

- In September 1997, a powerful thunderstorm unleashed a destructive wind that wreaked havoc on a small section of Bullhead City. The fierce wind snapped 24 power poles and damaged approximately 80 houses and mobile homes. Roofs were blown off or damaged, a garage was blown away and numerous awnings were ripped off and hurled through the air. Twenty-two of the homes were condemned. Damages were estimated to exceed \$750,000. (NCDC, 2010).
- In August 2000, a wind storm emergency was declared by the State of Arizona for Mohave County (PCA No. 21102) due to strong thunderstorm wind gusts of 80 -100 mph that moved through the community of Golden Shores near Lake Havasu City on August 16, 2000. Two mobile homes were destroyed and 17 other mobile homes and frame houses were unlivable. Another 117 homes received minor damage. One injury occurred when the homeowner sought shelter in a tub in the mobile home's bathroom. As the mobile home rolled the toilet was ripped from its foundation and struck the homeowner in the head causing cuts and bruises. In addition, numerous pontoon boats were either flipped over or destroyed and several windows were broken on homes

and cars. The storm snapped several power lines which cut power, in turn cutting the city's water supply. Damages were estimated at over one million dollars in damage. Lightning associated with the storm, started three fires in Lake Havasu City, AZ causing an estimated \$20,000 dollars in damage. (ADEM, 2010; NCDC, 2010).

- In July 2002, strong thunderstorm winds blew through Kingman destroying 16 homes and damaging 36 more. Most of the damaged and destroyed homes were mobile homes in the Kingman Shadows subdivision. Four people received minor injuries from flying debris. Several power lines were also blown down knocking out power to an estimated 3,000 to 4,000 people. Damages were estimated to exceed \$400,000. (NCDC, 2010).
- In August 2008, thunderstorm winds estimated at 80 to 100 mph damaged numerous roofs and outbuildings, downed trees and at least eight power lines, and damaged or destroyed 40 airplane hangars at Eagle Airpark. Golf ball sized hail was also reported. Damages were estimated to exceed \$2 million. (NCDC, 2010).
- In September 2009, thunderstorm winds and hail ripped through the Golden Valley and Bullhead City areas. Several power poles along Bullhead City Parkway were snapped and blown down. Golf ball size hail and high wind broke all the windows on the west side of a spotter's house, broke his weather station, and damaged his shortwave radio equipment. Seven mobile home trailers were blown over in the Riviera area. Damages were estimated to exceed \$545,000. (NCDC, 2010).

Figure 5-7 presents a graphical depiction of historic severe wind occurrences in Mohave County, as recorded by the NCDC for the period of August 1955 to October 2007. It is noted that the data presented does not reflect all documented events, but only those that included latitude and longitude coordinates for location. Also, the locations are approximate.

Probability and Magnitude

Most severe wind events are associated with thunderstorms as previously mentioned. The probability of a severe thunderstorm occurring with high velocity winds increases as the average duration and number of thunderstorm events increases. The average annual duration of thunderstorms in Mohave County ranges from 90 to over 130 minutes and is among the longest in the nation. Despite the long duration time, the highest number of thunderstorms on average in Mohave County is 40-50 annually. Lightning strikes are another indicator of thunderstorm hazard. Mohave County has ten or less lightning strikes per square kilometer annually, with the highest density being found in the northeast quadrant of the county (Changnon, 1988 and ADEM, 2004).

The NWS issues a severe thunderstorm watch when conditions are favorable for the development of severe thunderstorms. The local NWS office considers a thunderstorm severe if it produces hail at least 3/4-inch in diameter, wind of 58 mph or higher, or tornadoes. When a watch is issued for a region, residents are encouraged to continue normal activities but should remain alert for signs of approaching storms, and continue to listen for weather forecasts and statements from the local NWS office. When a severe thunderstorm has been detected by weather radar or one has been reported by trained storm spotters, the local NWS office will issue a severe thunderstorm warning. A severe thunderstorm warning is an urgent message to the affected counties that a severe thunderstorm is imminent. The warning time provided by a severe thunderstorm watch may be on the order of hours, while a severe thunderstorm warning typically provides an hour or less warning time.

Based on the historic record, the probability of tornadoes occurring in Mohave County is very limited. Tornado damage severity is measured by the Fujita Tornado Scale, which assigns a numerical value of 0 to 5 based on wind speeds, as shown in Table 5-39, with the letter F preceding the number (e.g., FO, F1, F2). Most tornadoes last less than 30 minutes, but some last for over an hour. The path of a tornado can range from a few hundred feet to miles. The width of a tornado may range from tens of yards to more than a quarter of a mile.

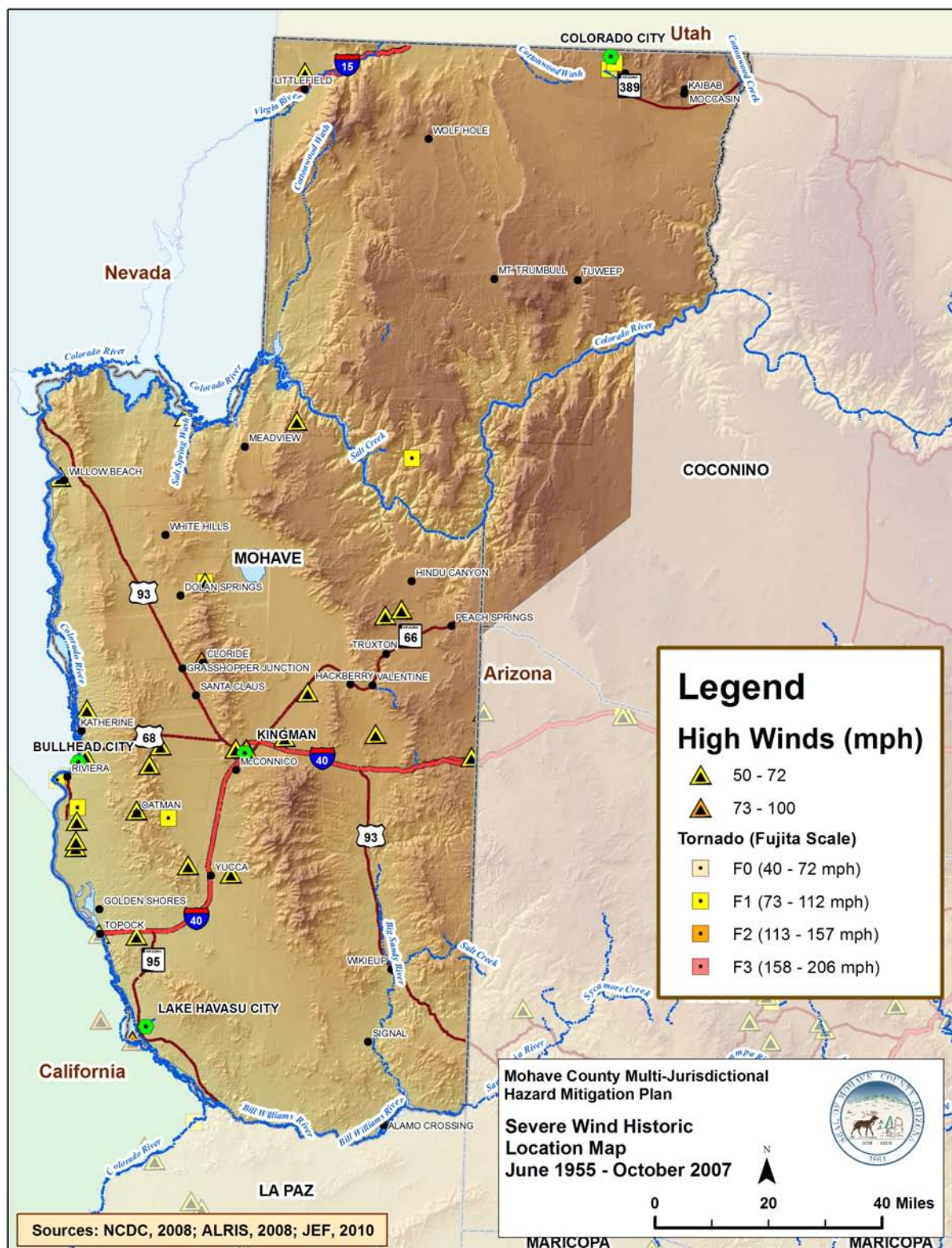


Figure 5-7: Historic severe wind event locations for Mohave County

Table 5-39: Fujita Tornado Scale		
Category	Wind Speed	Description of Damage
F0	40-72 mph	Light damage. Some damage to chimneys; break branches off trees; push over shallow-rooted trees; damage to sign boards.
F1	73-112 mph	Moderate damage. The lower limit is the beginning of hurricane speed. Roof surfaces peeled off; mobile homes pushed off foundations or overturned; moving autos pushed off roads.
F2	113-157 mph	Considerable damage. Roofs torn off frame houses; mobile homes demolished; boxcars pushed over; large trees snapped or uprooted; light-object missiles generated.
F3	158-206 mph	Severe damage. Roofs and some walls torn off well constructed houses; trains overturned; most trees in forest uprooted; cars lifted off ground and thrown.
F4	207-260 mph	Devastating damage. Well-constructed houses leveled; structures with weak foundations blown off some distance; cars thrown and large missiles generated.
F5	261-318 mph	Incredible damage. Strong frame houses lifted off foundations and carried considerable distance to disintegrate; automobile-sized missiles fly through the air in excess of 100-yards; trees debarked.
Source: FEMA, 1997.		

Vulnerability – CPRI Results

Severe Wind CPRI results for each community are summarized in Table 5-40 below.

Table 5-40: Summary of CPRI results by jurisdiction for severe wind					
Participating Jurisdiction	Probability	Magnitude/Severity	Warning Time	Duration	CPRI Score
Bullhead City	Highly Likely	Critical	< 6 hours	< one week	3.60
Colorado City	Highly Likely	Critical	6 to 12 hours	< 6 hours	3.25
Kingman	Highly Likely	Limited	< 6 hours	< 6 hours	3.10
Lake Havasu City	Highly Likely	Negligible	< 6 hours	< 6 hours	2.80
Unincorporated Mohave County	Highly Likely	Limited	< 6 hours	< 6 hours	3.10
County-wide average CPRI =					3.17

Vulnerability – Loss Estimations

The entire county is assumed to be equally exposed to the damage risks associated with the severe winds. Typically, incidents are fairly localized and damages associated with individual events are relatively small. Based on the historic record over the last 30 years, it is feasible to expect average annual losses of \$150,000 to \$200,000 (county-wide). It is difficult to estimate losses for individual jurisdictions within the county due to the lack of discrete data.

Vulnerability – Development Trend Analysis

Future development will expand the exposure of life and property to the damaging effects of severe wind events. Enforcement and/or implementation of modern building codes to regulate new developments in conjunction with public education on how to respond to severe wind conditions are arguably the best way to mitigate against losses.

Sources

Arizona Division of Emergency Management, 2004, State of Arizona All Hazard Mitigation Plan.

Arizona Division of Emergency Management, 2010, State of Arizona Multi-Hazard Mitigation Plan, 2010 Update, DRAFT.

Changnon, Jr. S., 1988, *Climatology of Thunder Events in the Conterminous U.S., Part I: Temporal Aspects and Part II: Spatial Aspects*, Journal of Climate, Vol. 1, No. 4, pp. 389-405.

U.S. Dept of Commerce, National Climatic Data Center, 2008, Storm Events Database, accessed via the following URL: <http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwevent~storms>

Profile Maps

No profile maps provided.

5.3.7 Wildfire

Description

A wildfire is an uncontrolled fire spreading through wildland vegetative fuels and/or urban interface areas where fuels may include structures. They often begin unnoticed, spread quickly, and are usually signaled by dense smoke that may fill the area for miles around. Wildfires can be human-caused through acts such as arson or campfires, or can be caused by natural events such as lightning. If not promptly controlled, wildfires may grow into an emergency or disaster. Even small fires can threaten lives, resources, and destroy improved properties.

The indirect effects of wildfires can also be catastrophic. In addition to stripping the land of vegetation and destroying forest resources and personal property, large, intense fires can harm the soil, waterways and the land itself. Soil exposed to intense heat may temporarily lose its capability to absorb moisture and support life. Exposed soils in denuded watersheds erode quickly and are easily transported to rivers and streams thereby enhancing flood potential, harming aquatic life and degrading water quality. Lands stripped of vegetation are also subject to increased landslide hazards.

History

According to Tables 5-2 Mohave County has been part of at least 20 statewide wildfire declarations since 1966. For the period of 1980 to 2008, data compiled by the Arizona State Forestry Division for the 2010 State Plan update indicates that at least 406 wildfires greater than 100 acres in size, have occurred in all of Mohave County, as depicted in Figure 5-8. Fourteen of those fires were larger than 10,000 acres. For the period of 2002 to 2009, a total of 13 wildfires reported by the National Wildfire Coordination Group (NWCG, 2010) met the criteria specified in Section 5.1. The largest of those fires are described below:

- In June 2005, the Perkins Complex Fire was started by lightning and burned an area northwest of Kingman and northeast of Bullhead City. The fire started June 22, 2005 and was controlled July 30, 2005 and consumed a total of 21,600 acres with over \$1.6 million in fire suppression costs (NWCG, 2010).
- In July 2005, the Tank Complex Fire was started by humans and burned an area 40 miles south of St. George, Utah. The fire started July 19, 2005 and was controlled July 27, 2005 and burned a total of 69,934 acres with over \$2.2 million in fire suppression costs and two destroyed outbuildings (NWCG, 2010).
- In July 2005, the Twin Mills Fire was started by lightning and burned an area northwest of Kingman and northeast of Bullhead City. The fire started July 22, 2005 and was controlled July 27, 2005 and burned a total of 11,967 acres with over \$1.0 million in fire suppression costs (NWCG, 2010).
- In July 2006, the Pocket Complex Fire was started by lightning and burned an area 15 miles south of Mesquite, NV. The fire started July 24, 2006 and was controlled July 31, 2006, and burned a total of 11,236 acres with over \$1.1 million in fire suppression costs (NWCG, 2010).
- In July 2007, the Black Rock Gulch Fire was started by lightning and burned an area 30 miles south of St. George, Utah. The fire started July 5, 2007 and was controlled July 25, 2007, and burned a total of 22,387 acres with over \$1.9 million in fire suppression costs and one destroyed outbuilding (NWCG, 2010).

The Planning Team recognized that the declared disaster and historic hazard data collected and summarized in Section 5.1 does not adequately reflect the true cost of a wildfire. Particularly, the cost of wildfire suppression efforts to prevent structure and human loss. For example, damage estimates for the Nuttal fire was estimated at \$150,000. However, the suppression costs for the Nuttal Fire exceeded \$9.2 million. Furthermore, the County, State, Forest Service, and other agencies spend millions of dollars every year in wildfire mitigation in fuel treatment projects.

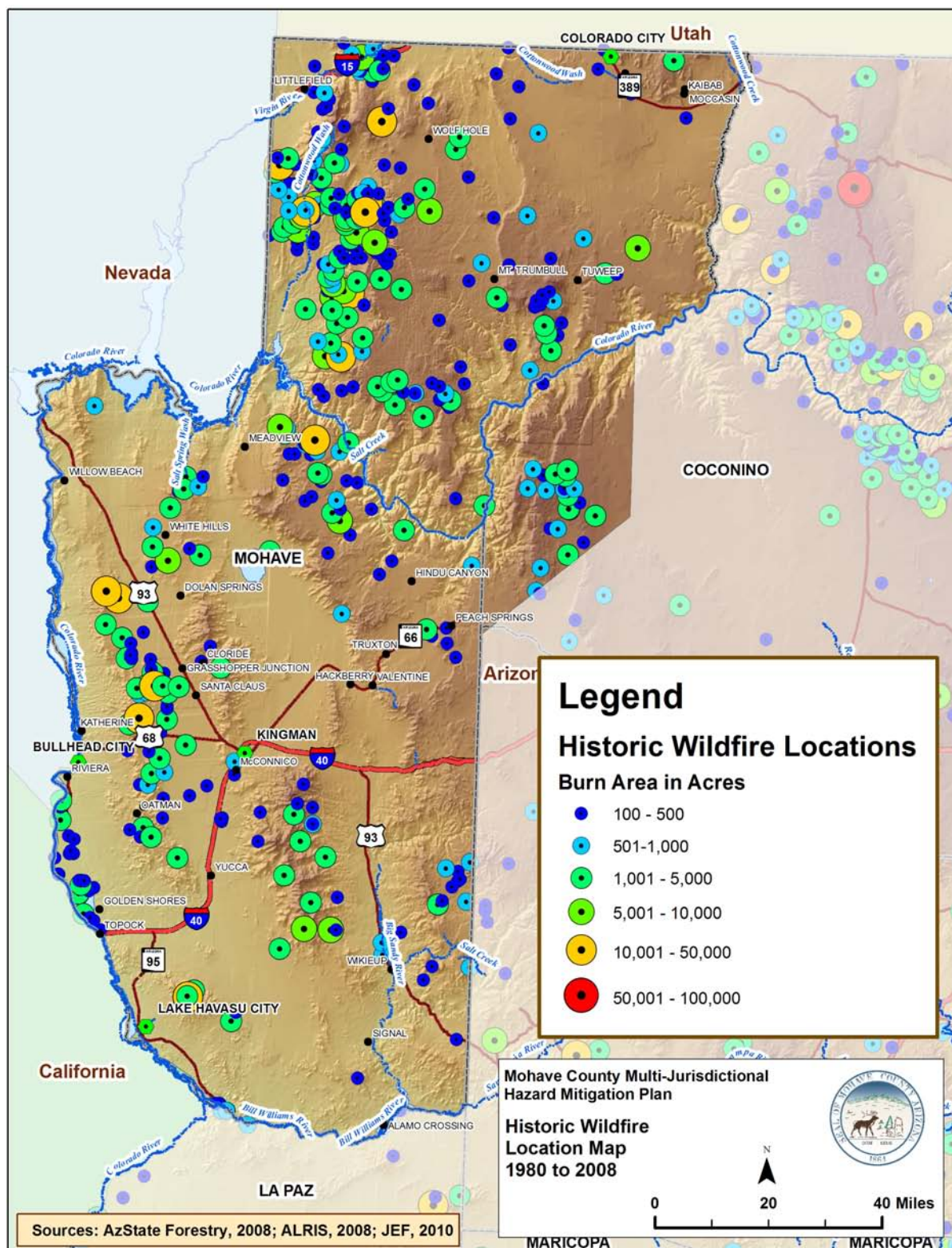


Figure 5-8: Historic wildfire locations for Mohave County

Probability and Magnitude

The probability and magnitude of wildfire incidents for Mohave County are influenced by numerous factors including vegetation densities, previous burn history, hydrologic conditions, climatic conditions such as temperature, humidity, and wind, ignition source (human or natural), topographic aspect and slope, and remoteness of area.

Two sources were used to map the wildfire risk for Mohave County. The first is the data developed for the Mohave County Community Wildfire Protection Plan (LSDI, 2008). The second is a statewide coverage developed by the State of Arizona as a part of the 2003/04 Arizona Wildland Urban Interface Assessment (AWUIA) project (Fisher, 2004).

Mohave County and participating jurisdictions developed a county-wide community wildfire protection plan in 2008 (LSDI, 2008). The primary objective of the Mohave County Community Wildfire Protection Plan (MCCWPP) was to help local governments, fire departments and districts, and residents identify at-risk public and private lands to better protect those lands from severe wildfire threat. Elements identified in the PCCWPP include delineation of the wildland urban interface (WUI) areas, mapping of vegetative fuels and topographical slope and aspect elements impacting wildfire risk, and mapping of wildfire risk zones that include consideration for the built environment. The WUI areas within Mohave County are shown in Figure 5-9.

The MCCWPP also identified two models of wildland fuel hazards: a typical year of rainfall and an extraordinarily heavy rainfall year, to present a range of wildland fuel hazards across the county. Each model divided the fuel hazard into three categories; high, medium and low. The Planning Team chose to use the extraordinary rainfall fuel hazard model, which is indicated in Figure 5-10.

Wildfire hazard areas have been identified by the State of Arizona as a part of the 2003/04 Arizona Wildland Urban Interface Assessment (AWUIA) project (Fisher, 2004). The increasing growth of Arizona's rural populations, urban sprawl, and increasing wildland fuel loads ads to create a mix of situations that is known as the wildland urban interface (WUI). The purpose of the AWUIA was to attempt to conduct an analysis on a statewide basis using a common spatial model, for validation of those communities listed in the federal register as WUI, and further identify possible other communities at risk. The AWUIA approach used four main data layers:

- TOPO – aspect and slope derived from 30 meter Digital Elevation Model data from USGS.
- RISK – historical fire density using point data from fire record years 1986–1996 from all wildland agencies.
- HAZARD – fuels, natural fire regimes and condition class.
- HOUSE – houses and/or structures

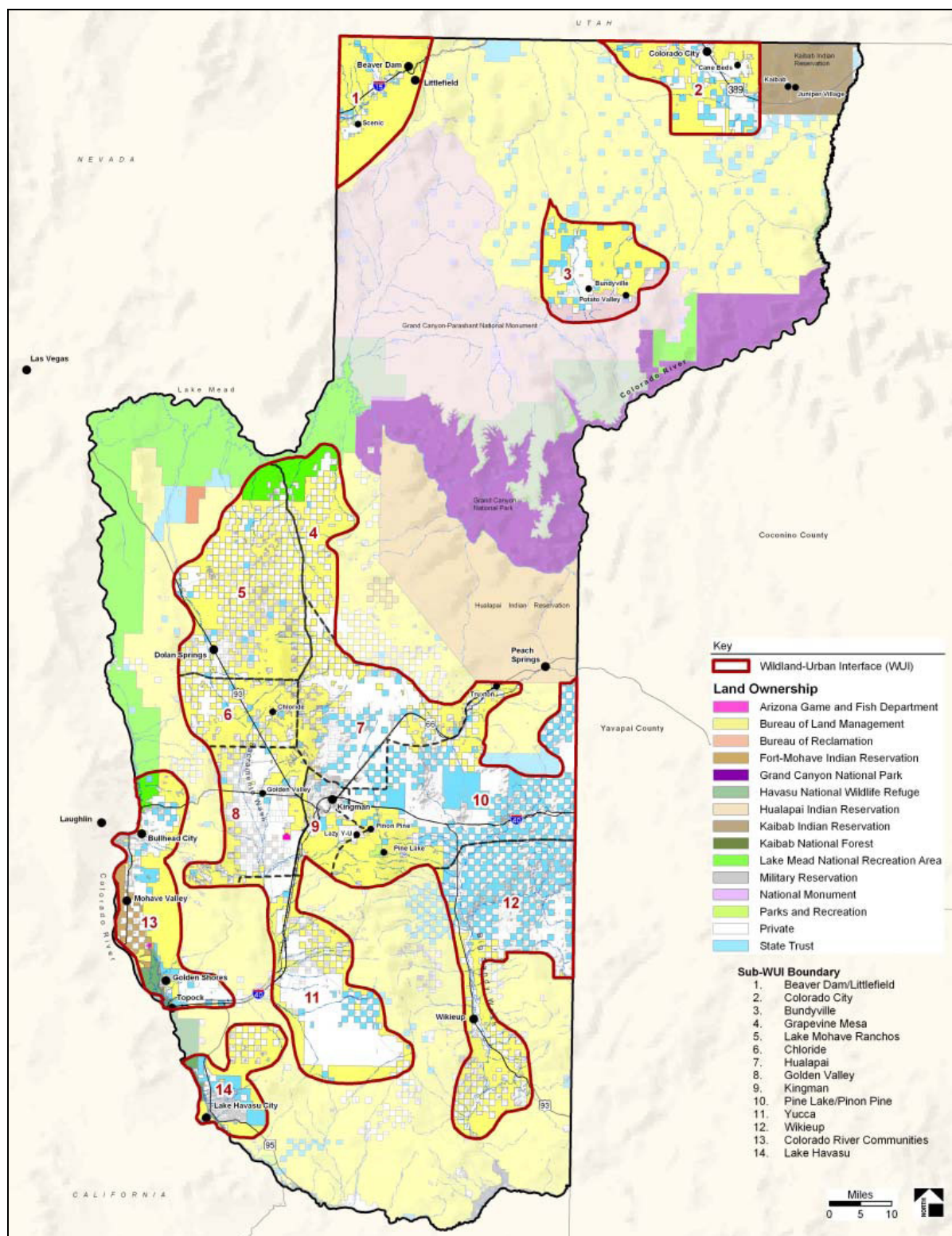
A value rating of 1-15 was used for all layers.

Two separate results were developed. The first coverage used an applied weighting scheme that combined each of the four data layers to develop a ranking model for identifying WUI communities at greatest risk. The second coverage, referred to as the “Land Hazard”, also applied a weighting scheme that combined only the TOPO, RISK, and HAZARD layers, as follows:

$$\text{LAND HAZARD} = (\text{HAZARD} \times 70\%) + (\text{RISK} \times 20\%) + (\text{TOPO} \times 10\%)$$

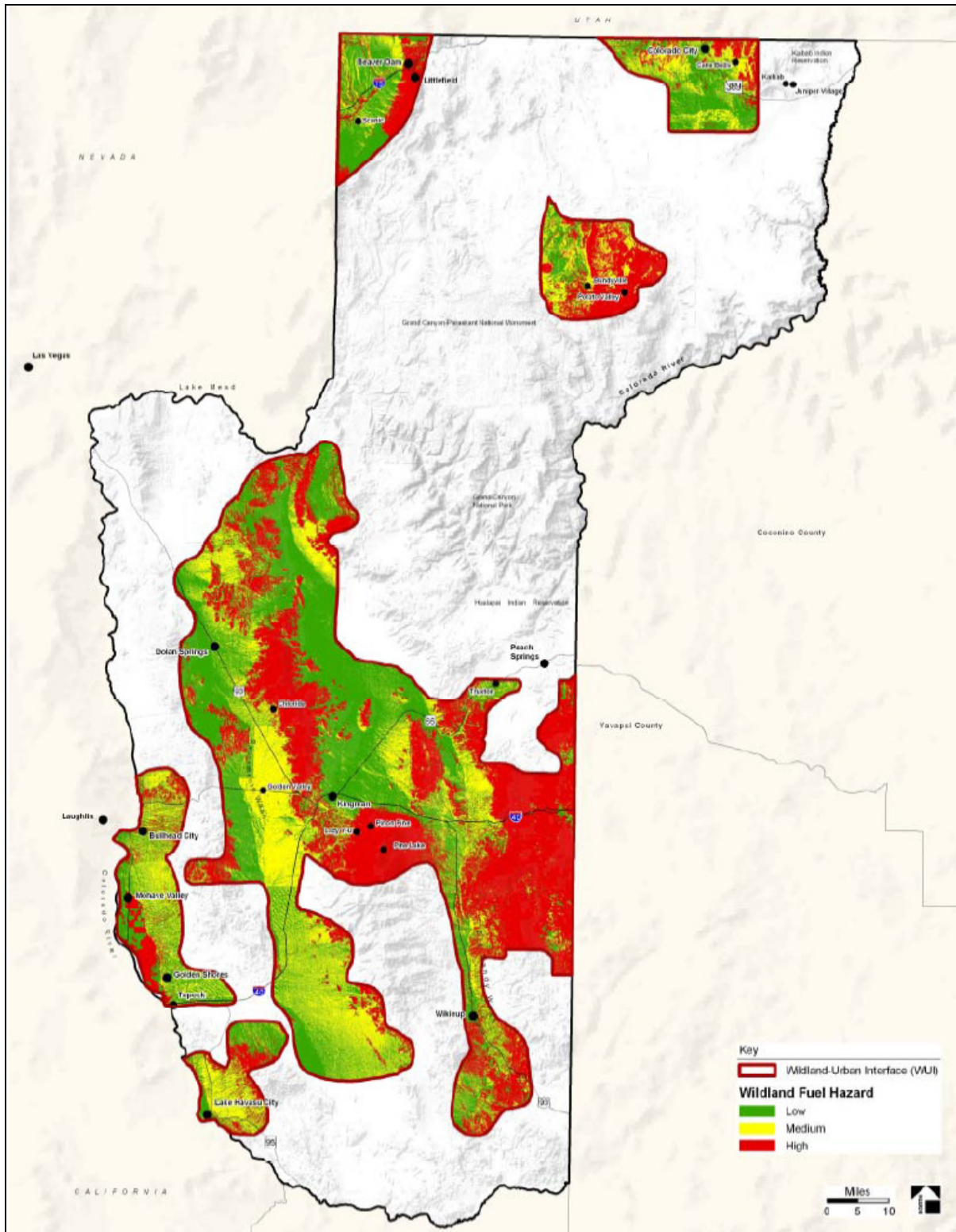
Weighing percentages were determined through discussion with the Arizona Interagency Coordinating Group. The “Land Hazard” layer produced from this model is based on a 250-meter raster grid (some data originated at 1,000-meter). The resultant raster values range from 1-15 and were classified into three groups to depict wildfire hazard without the influence of structures: HIGH (values of 10-15), MEDIUM (values of 7-9), and LOW (values of 1-6). Map 3A indicates the various wildfire hazard areas for Mohave County based on the “Land Hazard” layer.

The AWUIA identified three Mohave County WUI communities (Mohave Mountain, Point of Pines, and William Creek NFH) as having a moderate wildfire risk. Each of these communities is located on Map 3B.



Source: MCCWPP, July 2008

Figure 5-9: Mohave County Wildland Urban Interface area



Source: MCCWPP, July 2008

Figure 5-10: MCCWPP extraordinary rainfall year fuel hazards map

The final wildfire hazard profile map for this Plan depicts the three levels of hazard previously discussed from each source, with the MCCWPP identified WUI area replicating the extraordinary precipitation year hazards, and the rest of the area reflecting the statewide AWUIA “Land Hazard” area. Maps 4A through 4C indicates the various wildfire hazard areas for Mohave County based on the “Land Hazard” layer.

Vulnerability – CPRI Results

Wildfire CPRI results for each community are summarized in Table 5-41 below.

Table 5-41: Summary of CPRI results by jurisdiction for wildfire					
Participating Jurisdiction	Probability	Magnitude/ Severity	Warning Time	Duration	CPRI Score
Bullhead City	Likely	Critical	< 6 hours	> one week	3.25
Colorado City	Likely	Critical	< 6 hours	< one week	3.15
Kingman	Highly Likely	Limited	< 6 hours	< 6 hours	3.10
Lake Havasu City	Possible	Negligible	< 6 hours	< 6 hours	1.90
Unincorporated Mohave County	Highly Likely	Limited	< 6 hours	< one week	3.30
County-wide average CPRI =					2.94

Vulnerability – Loss Estimations

The estimation of potential exposure to high and medium wildfire hazards was accomplished by intersecting the human and facility assets with the wildfire hazard limits depicted on Maps 4A, 4B, and 4C. Loss to exposure ratios of 0.20 (20%) and 0.05 (5%) were assumed to estimate losses for all facilities located within the high and medium wildfire hazard areas, respectively. Table 5-42 summarizes the Planning Team identified critical and non-critical facilities potentially exposed to high and medium wildfire hazards, and the corresponding estimates of losses. Table 5-43 summarizes population sectors exposed to the high and medium wildfire hazards. HAZUS residential, commercial and industrial exposures and loss estimates to high and medium wildfire hazards are summarized in Tables 5-44 through 5-50.

In summary, \$11.7 million and \$35.5 million in asset related losses are estimated for high and medium wildfire hazards, for all the participating jurisdictions in Mohave County. An additional \$159 and \$333 million in high and medium hazard wildfire losses to HAZUS defined residential, commercial, and industrial facilities, is estimated for all participating Mohave County jurisdictions. It should be noted that these exposure dollar amounts do not include the cost of wildfire suppression which can be substantial. For example, a Type 1 wildfire fighter crew costs about \$1 million per day.

Regarding human vulnerability, a total population of 9,578 and 61,158 people, or 6.2% and 39.5% of the total 2000 Mohave County population, is potentially exposed to a high and medium hazard wildfire event, respectively. Typically, deaths and injuries not related to firefighting activities are rare. However, it is feasible to assume that at least one death and/or injury may be plausible. There is also a high probability of population displacement during a wildfire event, and especially in the urban wildland interface areas.

It is duly noted that the loss and exposure numbers presented above represent a comprehensive evaluation of the County as a whole. It is unlikely that a wildfire would occur that would impact all of the high and medium wildfire hazard areas at the same time. Accordingly, actual event based losses and exposure are likely to be only a fraction of those summarized above.

Table 5-42: Summary of asset inventory exposure to high and medium hazard wildfire and corresponding loss estimates					
Community	Total Facilities Reported by Community	Impacted Facilities	Percentage of Total Community Facilities Impacted	Estimated Replacement Cost (x \$1000)	Estimated Structure Loss (x \$1000)
HIGH					
County-Wide Totals	308	17	5.52%	\$58,395	\$11,679
Bullhead City	53	1	1.89%	\$750	\$150
Colorado City	18	2	11.11%	\$470	\$94
Kingman	102	0	0.00%	\$0	\$0
Lake Havasu City	42	0	0.00%	\$0	\$0
Unincorporated Mohave County	93	14	15.05%	\$57,175	\$11,435
MEDIUM					
County-Wide Totals	308	107	34.74%	\$710,577	\$35,529
Bullhead City	53	12	22.64%	\$51,312	\$2,566
Colorado City	18	2	11.11%	\$10,000	\$500
Kingman	102	25	24.51%	\$23,624	\$1,181
Lake Havasu City	42	39	92.86%	\$535,400	\$26,770
Unincorporated Mohave County	93	29	31.18%	\$90,241	\$4,512

Table 5-43: Summary of population sectors exposed to high and medium hazard wildfire						
Community	Total Population	Population Exposed	Percent of Population Exposed	Total Population Over 65	Population Over 65 Exposed	Percent of Population Over 65 Exposed
HIGH						
County-Wide Totals	155,001	9,578	6.18%	31,380	1,557	4.96%
Bullhead City	33,645	1,035	3.08%	6,577	180	2.74%
Colorado City	3,309	157	4.73%	48	1	2.83%
Kingman	20,942	555	2.65%	3,593	81	2.25%
Lake Havasu City	41,838	292	0.70%	10,670	77	0.72%
Unincorporated Mohave County	52,900	6,676	12.62%	10,271	1,139	11.09%

Table 5-43: Summary of population sectors exposed to high and medium hazard wildfire						
Community	Total Population	Population Exposed	Percent of Population Exposed	Total Population Over 65	Population Over 65 Exposed	Percent of Population Over 65 Exposed
MEDIUM						
County-Wide Totals	155,001	61,158	39.46%	31,380	14,137	45.05%
Bullhead City	33,645	5,966	17.73%	6,577	1,256	19.10%
Colorado City	3,309	372	11.25%	48	7	15.07%
Kingman	20,942	2,281	10.89%	3,593	322	8.96%
Lake Havasu City	41,838	38,328	91.61%	10,670	9,759	91.46%
Unincorporated Mohave County	52,900	13,161	24.88%	10,271	2,714	26.42%

Table 5-44: Summary of Mohave County HAZUS building exposure to wildfire									
	RESIDENTIAL		COMMERCIAL		INDUSTRIAL		SUMMARY		
Mohave County HAZUS Summary	Building Count	Potential Economic Impact (x\$1000)	Building Count	Potential Economic Impact (x\$1000)	Building Count	Potential Economic Impact (x\$1000)	Total of All Potential Economic Impact (x\$1000)	Loss-to-Exposure Ratio	Total Estimated Loss (x\$1000)
County-Wide Totals	82,663	\$11,009,311	3,074	\$2,373,884	1,104	\$682,102	\$14,065,296		
High Hazard Exposure	5,666	\$667,629	157	\$109,071	56	\$19,717	\$796,417	20%	\$159,283
Medium Hazard Exposure	32,808	\$5,275,802	1,364	\$1,075,064	532	\$312,797	\$6,663,663	5%	\$333,183
Mohave County HAZUS Summary	% Building Count	% Potential Economic Impact	% Building Count	% Potential Economic Impact	% Building Count	% Potential Economic Impact			
High Hazard Exposure	06.85%	06.06%	05.10%	04.59%	05.08%	02.89%			
Medium Hazard Exposure	39.69%	47.92%	44.37%	45.29%	48.21%	45.86%			

Table 5-45: Summary of Bullhead City HAZUS building exposure to wildfire

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	RESIDENTIAL		COMMERCIAL		INDUSTRIAL		SUMMARY		
Bullhead City HAZUS Summary	Building Count	Potential Economic Impact (x\$1000)	Building Count	Potential Economic Impact (x\$1000)	Building Count	Potential Economic Impact (x\$1000)	Total of All Potential Economic Impact (x\$1000)	Loss-to- Exposure Ratio	Total Estimated Loss (x\$1000)
Community-Wide Totals	16,803	\$2,008,953	521	\$461,765	141	\$48,270	\$2,518,988		
High Hazard Exposure	503	\$85,155	23	\$31,102	5	\$1,573	\$117,831	20%	\$23,566
Medium Hazard Exposure	2,841	\$418,477	119	\$99,419	34	\$13,125	\$531,020	5%	\$26,551
Bullhead City HAZUS Summary	% Building Count	% Potential Economic Impact	% Building Count	% Potential Economic Impact	% Building Count	% Potential Economic Impact			
High Hazard Exposure	03.0%	04.24%	04.44%	06.74%	03.24%	03.26%			
Medium Hazard Exposure	16.91%	20.83%	22.91%	21.53%	24.22%	27.19%			

Table 5-46: Summary of Colorado City HAZUS building exposure to wildfire

	RESIDENTIAL		COMMERCIAL		INDUSTRIAL		SUMMARY		
Colorado City HAZUS Summary	Building Count	Potential Economic Impact (x\$1000)	Building Count	Potential Economic Impact (x\$1000)	Building Count	Potential Economic Impact (x\$1000)	Total of All Potential Economic Impact (x\$1000)	Loss-to- Exposure Ratio	Total Estimated Loss (x\$1000)
Community-Wide Totals	848	\$57,989	18	\$5,319	14	\$8,751	\$72,060		
High Hazard Exposure	44	\$2,632	2	\$312	0	\$56	\$2,999	20%	\$600
Medium Hazard Exposure	106	\$6,771	3	\$729	2	\$587	\$8,087	5%	\$404
Colorado City HAZUS Summary	% Building Count	% Potential Economic Impact	% Building Count	% Potential Economic Impact	% Building Count	% Potential Economic Impact			
High Hazard Exposure	05.21%	04.54%	10.62%	05.86%	0.87%	0.64%			
Medium Hazard Exposure	12.46%	11.68%	15.11%	13.70%	12.11%	06.71%			

Table 5-47: Summary of Kingman HAZUS building exposure to wildfire									
	RESIDENTIAL		COMMERCIAL		INDUSTRIAL		SUMMARY		
Kingman HAZUS Summary	Building Count	Potential Economic Impact (x\$1000)	Building Count	Potential Economic Impact (x\$1000)	Building Count	Potential Economic Impact (x\$1000)	Total of All Potential Economic Impact (x\$1000)	Loss-to- Exposure Ratio	Total Estimated Loss (x\$1000)
Community-Wide Totals	10,152	\$1,553,841	647	\$536,118	148	\$72,190	\$2,162,149		
High Hazard Exposure	276	\$42,511	12	\$15,804	3	\$891	\$59,206	20%	\$11,841
Medium Hazard Exposure	1,248	\$160,514	99	\$79,306	18	\$6,276	\$246,095	5%	\$12,305
Kingman HAZUS Summary	% Building Count	% Potential Economic Impact	% Building Count	% Potential Economic Impact	% Building Count	% Potential Economic Impact			
High Hazard Exposure	02.72%	02.74%	01.84%	02.95%	02.01%	01.23%			
Medium Hazard Exposure	12.29%	10.33%	15.23%	14.79%	11.95%	08.69%			

Table 5-48: Summary of Lake Havasu City HAZUS building exposure to wildfire									
	RESIDENTIAL		COMMERCIAL		INDUSTRIAL		SUMMARY		
Lake Havasu City HAZUS Summary	Building Count	Potential Economic Impact (x\$1000)	Building Count	Potential Economic Impact (x\$1000)	Building Count	Potential Economic Impact (x\$1000)	Total of All Potential Economic Impact (x\$1000)	Loss-to- Exposure Ratio	Total Estimated Loss (x\$1000)
Community-Wide Totals	22,300	\$4,349,328	985	\$831,031	422	\$266,828	\$5,447,187		
High Hazard Exposure	197	\$41,767	4	\$1,991	3	\$1,080	\$44,838	20%	\$8,968
Medium Hazard Exposure	20,226	\$3,932,491	906	\$775,782	385	\$240,700	\$4,948,974	5%	\$247,449
Lake Havasu City HAZUS Summary	% Building Count	% Potential Economic Impact	% Building Count	% Potential Economic Impact	% Building Count	% Potential Economic Impact			
High Hazard Exposure	0.88%	0.96%	0.43%	0.24%	0.74%	0.40%			
Medium Hazard Exposure	90.70%	90.42%	91.99%	93.35%	91.23%	90.21%			

Table 5-49: Summary of Unincorporated Mohave County HAZUS building exposure to wildfire									
	RESIDENTIAL		COMMERCIAL		INDUSTRIAL		SUMMARY		
Unincorporated Mohave County HAZUS Summary	Building Count	Potential Economic Impact (x\$1000)	Building Count	Potential Economic Impact (x\$1000)	Building Count	Potential Economic Impact (x\$1000)	Total of All Potential Economic Impact (x\$1000)	Loss-to-Exposure Ratio	Total Estimated Loss (x\$1000)
Community-Wide Totals	31,547	\$2,921,091	865	\$505,939	371	\$280,140	\$3,707,170		
High Hazard Exposure	4260	\$457,206	99	\$44,884	42	\$13,187	\$515,277	20%	\$103,055
Medium Hazard Exposure	7943	\$702,424	227	\$110,682	91	\$50,325	\$863,432	5%	\$43,172
Unincorporated Mohave County HAZUS Summary	% Building Count	% Potential Economic Impact	% Building Count	% Potential Economic Impact	% Building Count	% Potential Economic Impact			
High Hazard Exposure	13.50%	15.65%	11.40%	08.87%	11.44%	04.71%			
Medium Hazard Exposure	25.18%	24.05%	26.24%	21.88%	24.48%	17.96%			

Vulnerability – Development Trend Analysis

By its very definition, the WUI represents the fringe of urban development as it intersects with the natural environment. As previously discussed, wildfire risks are very significant for a sizeable portion of the county and most of the populated areas. Any future development will only increase the WUI areas and expand the potential exposure of structures to wildfire hazards. The various CWPPs address mitigation opportunities for expanding WUI areas and provide recommended guidelines for safe building and land-use practices in wildfire hazard areas.

Sources

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<http://www.azsf.az.gov/UserFiles/PDF/Arizona%20Wildland%20Urban%20Interface%20Assessment%2005MAR04.pdf>

Logan Simpson Design, Inc., 2008, *Mohave County Community Wildfire Protection Plan*

National Wildfire Coordination Group, 2010, Historical ICS 209 reports at: http://fam.nwccg.gov/fam-web/hist_209/report_list_209

Southwest Area Incident Management Team, 2004, website data at the following URL:
<http://www.fireteam-sw.com/oltrogge/incidents/nuttall/maps/index.htm>

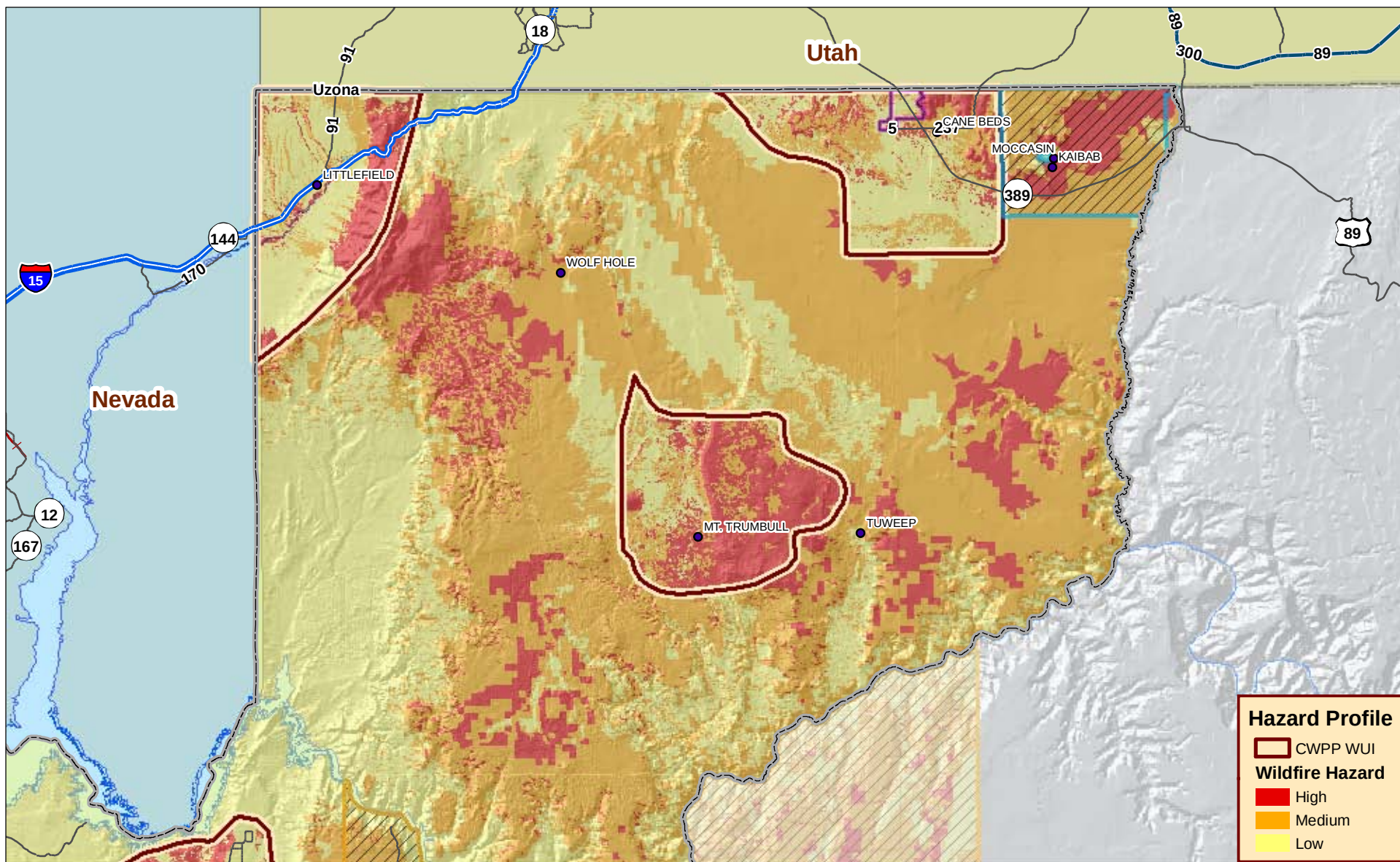
Profile Maps

Maps 4A through 4C – Wildfire Hazard Maps

5.4 Risk Assessment Summary

The jurisdictional variability of risk associated with each hazard assessed in Section 5.3 is demonstrated by the various CPRI and loss estimation results. Accordingly, each jurisdiction has varying levels of need regarding the hazards to be mitigated, and may not consider all of the hazards as posing a great risk to their individual communities. Table 5-50 summarizes the hazards selected for mitigation by each jurisdiction and will be the basis for each jurisdictions mitigation strategy.

Table 5-50: Summary of hazards to be mitigated by each participating jurisdiction							
Jurisdiction	Dam Failure	Drought	Flooding	Extreme Heat	Levee Failure	Severe Wind	Wildfire
Unincorporated Mohave County		x	x	x	x	x	x
Bullhead City	x		x				x
Colorado City			x				
Kingman			x	x		x	x
Lake Havasu City		x	x			x	



Hazard Profile

 CWPP WUI

Wildfire Hazard

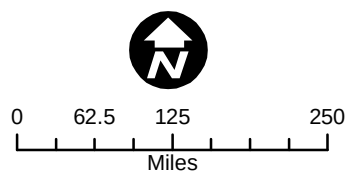
High

Medium

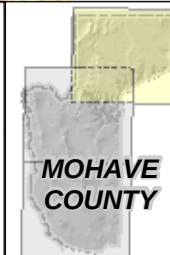
Low

Legend

- | | | |
|--|--|--|
| — Interstate Freeway | Mohave County | Hualapai Indian Res. |
| — Highway | Bullhead City | Fort Mojave Indian Res. |
| — Major Road | Kingman | Kaibab Paiute Indian Res. |
| + Railroad | Lake Havasu City | |
| — Streams | Colorado City | |
| — Lakes | | |



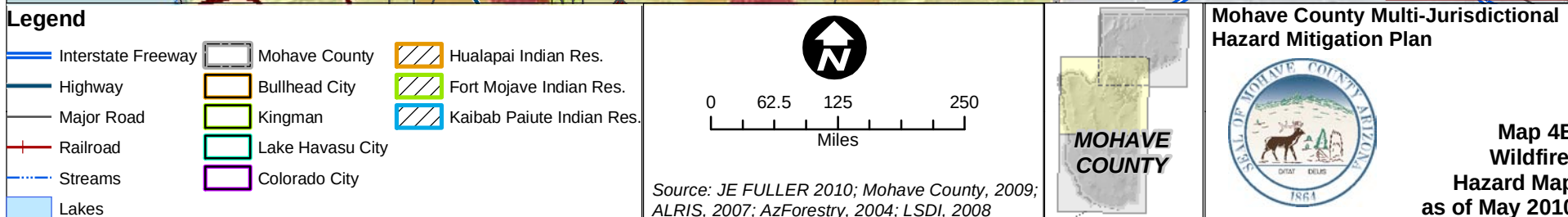
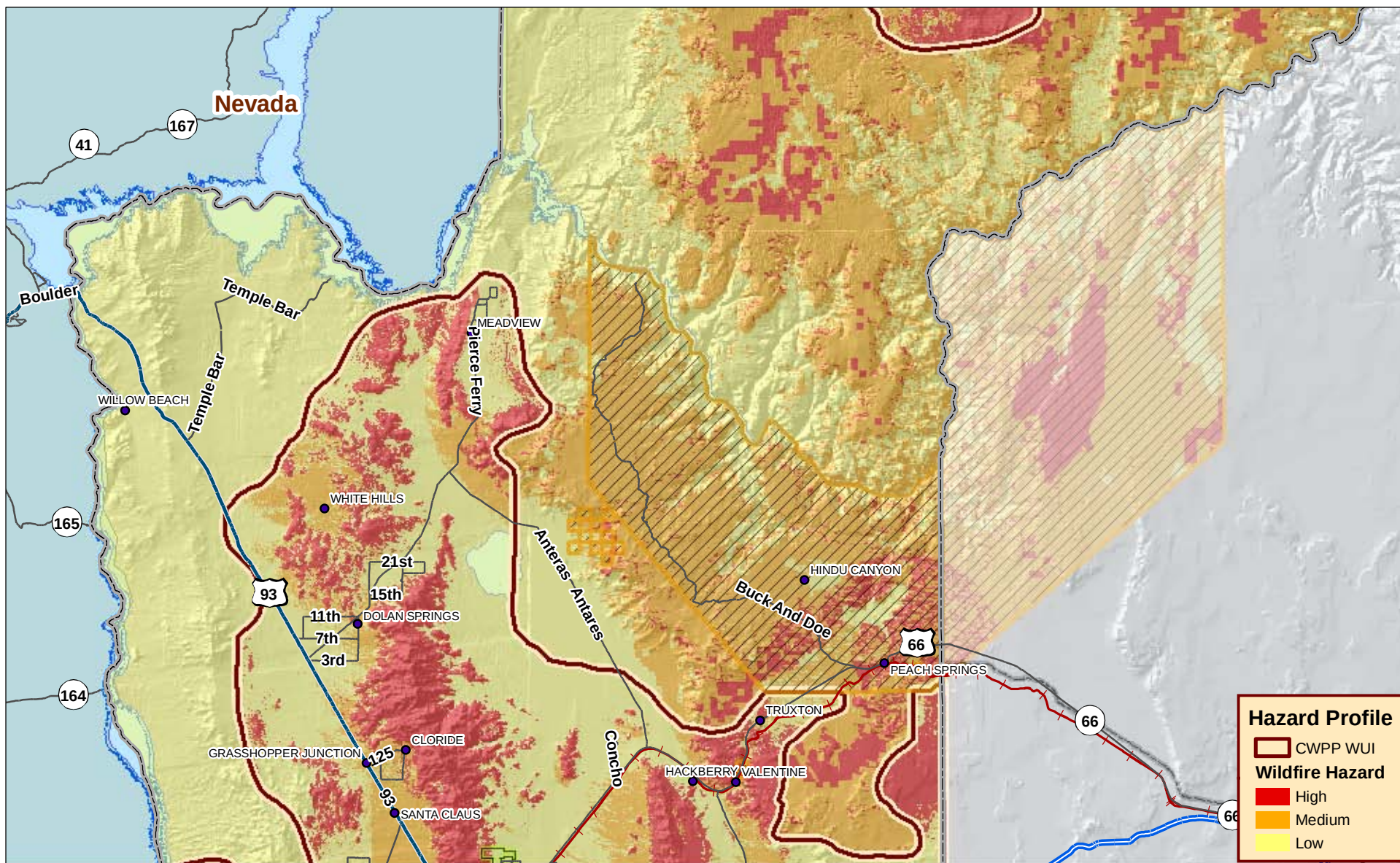
Source: JE FULLER 2010; Mohave County, 2009; ALRIS, 2007; AzForestry, 2004; LSDI, 2008

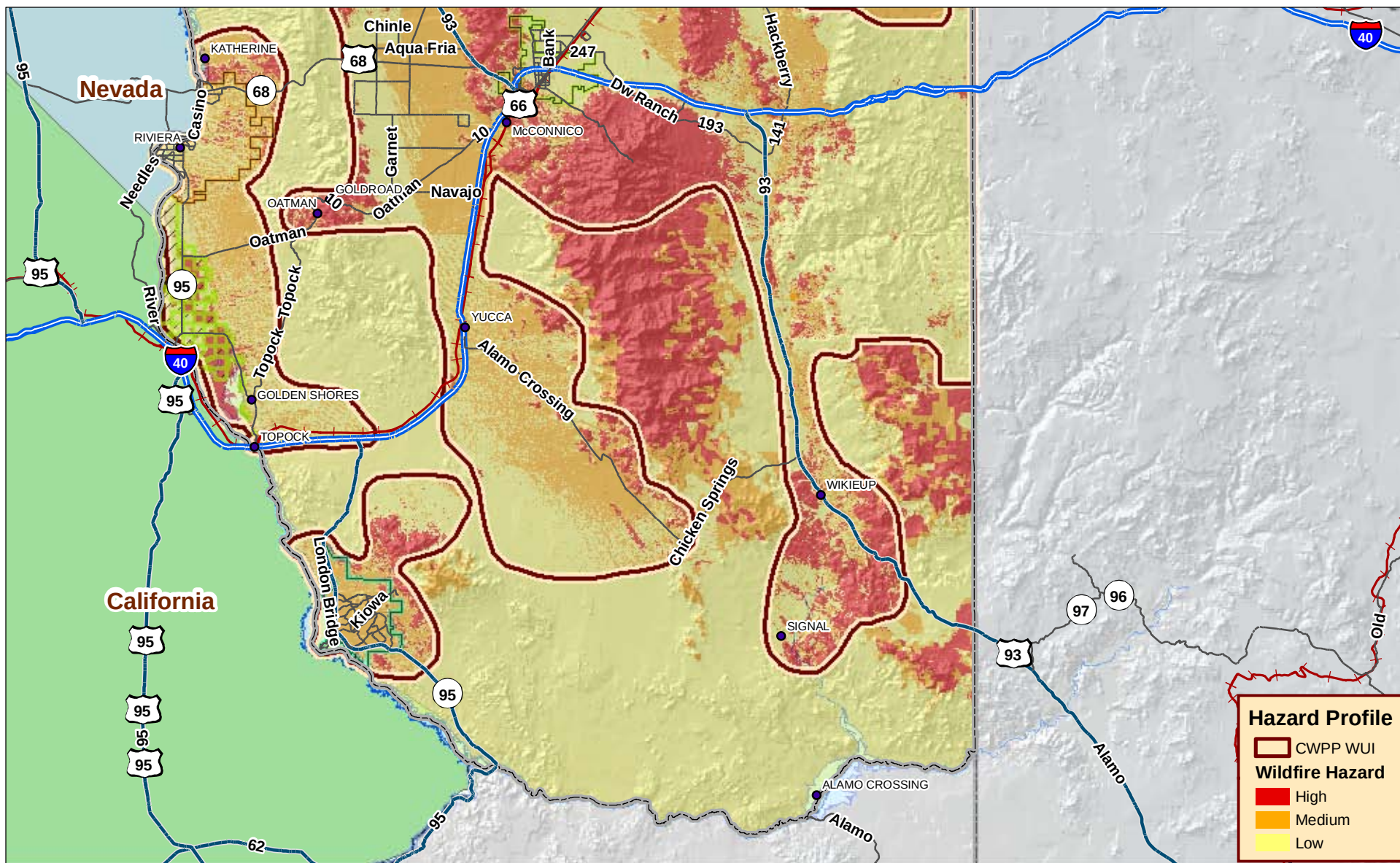


Mohave County Multi-Jurisdictional Hazard Mitigation Plan

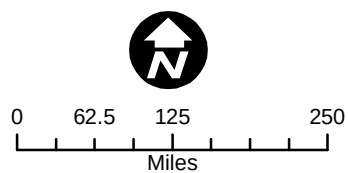
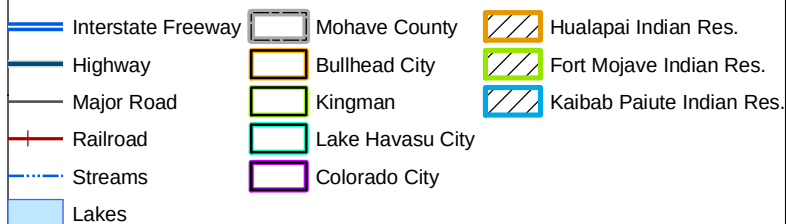


Map 4A
Wildfire
Hazard Map
as of May 2010

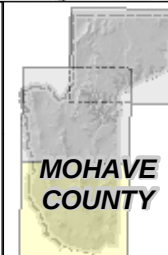




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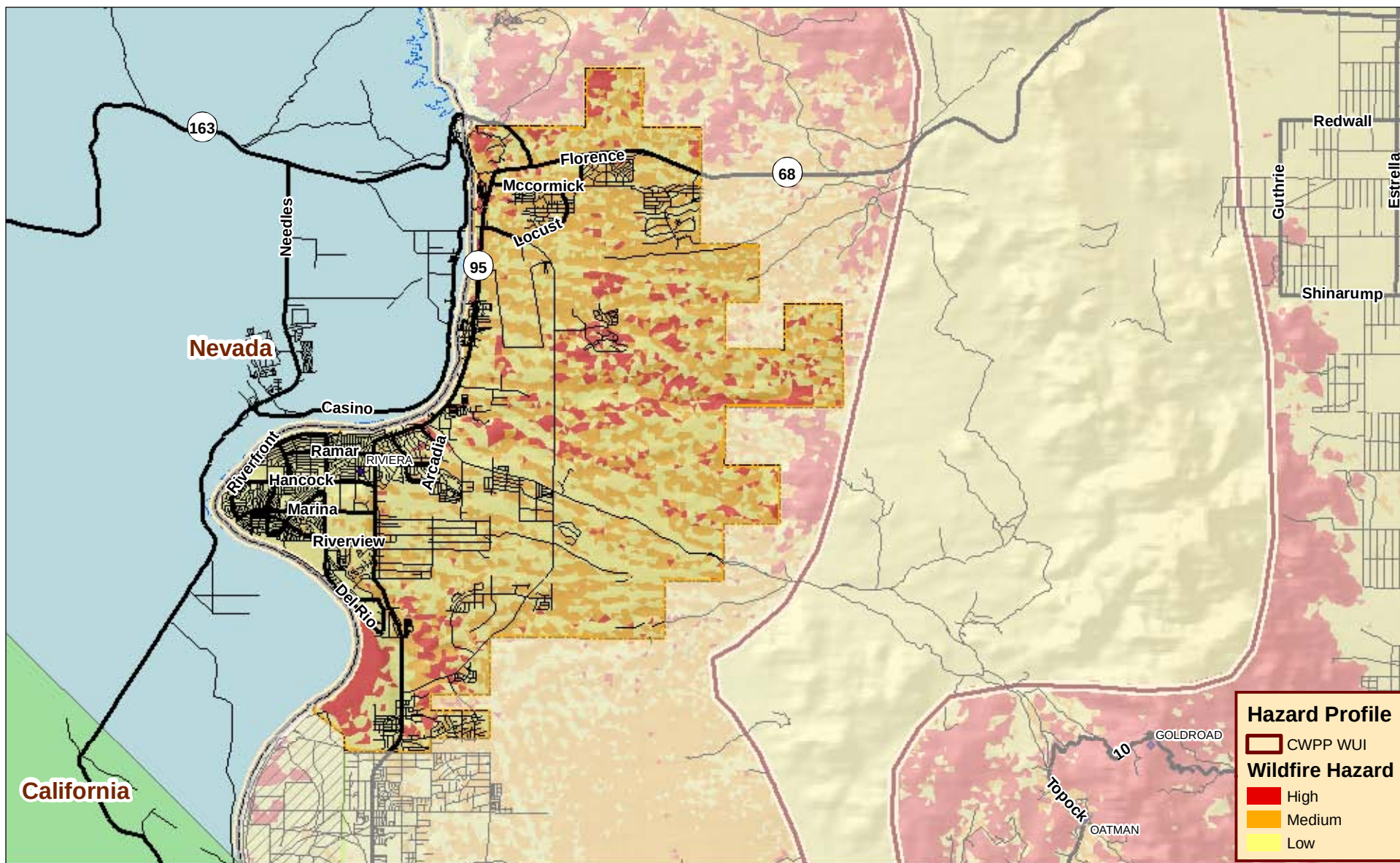
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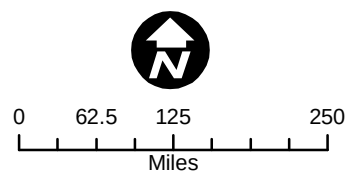
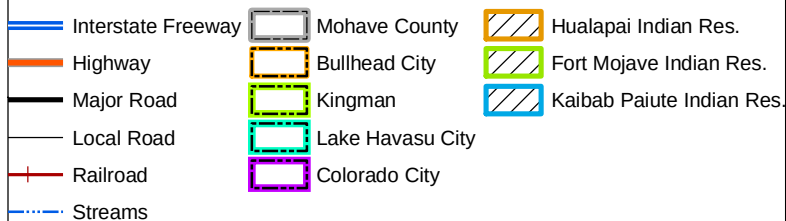
Mohave County Multi-Jurisdictional Hazard Mitigation Plan



Map 4C
Wildfire
Hazard Map
as of May 2010



Legend



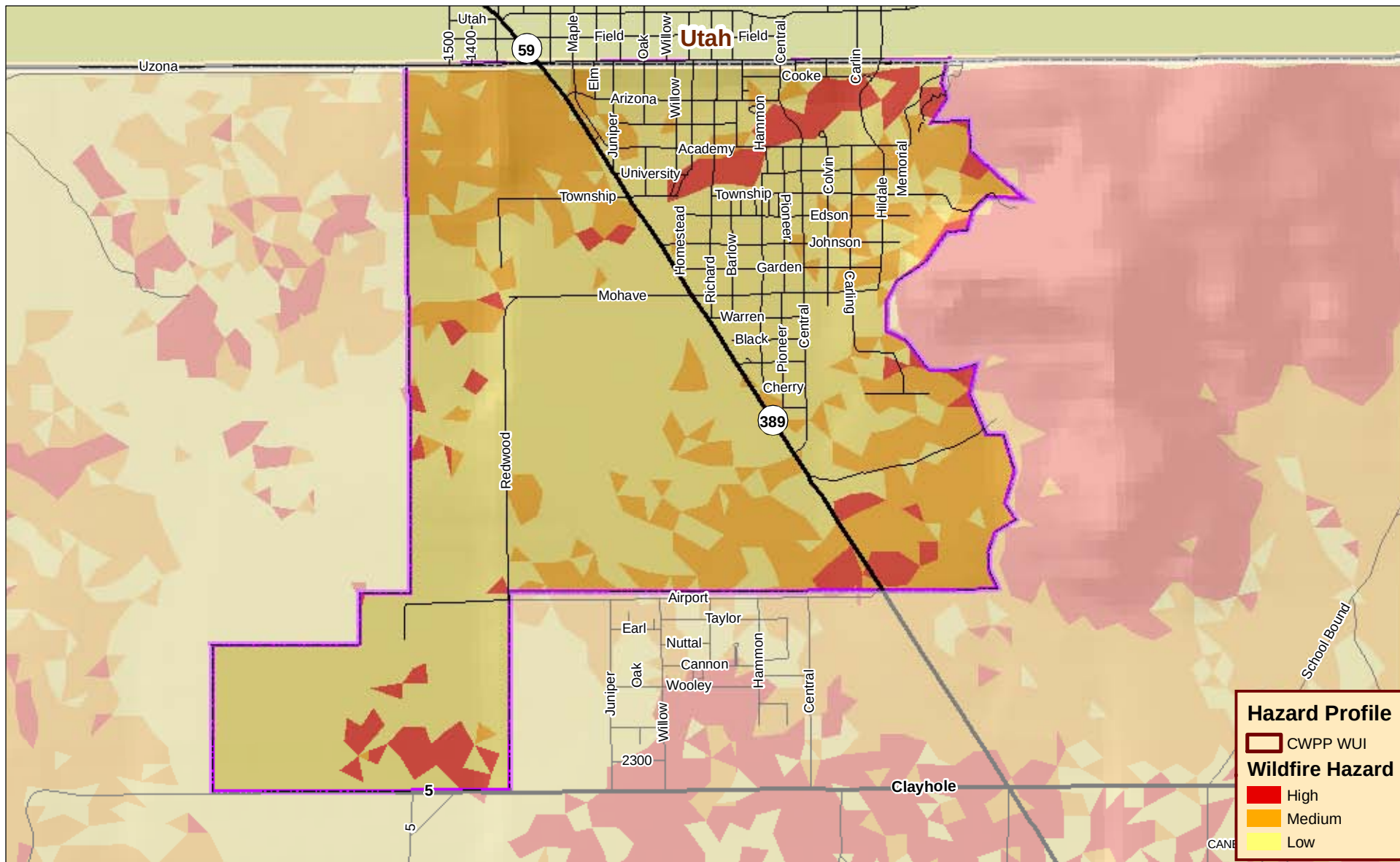
Source: JE FULLER 2010; Mohave County, 2009; ALRIS, 2007; AzForestry, 2004; LSDI, 2008



Mohave County Multi-Jurisdictional Hazard Mitigation Plan



Map 4D
Bullhead City
Wildfire
Hazard Map
as of May 2010



Hazard Profile

CWPP WUI

Wildfire Hazard

High

Medium

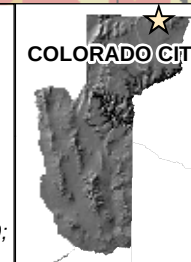
Low

Legend

- | | | |
|--|--|---|
| — Interstate Freeway | Mohave County | Hualapai Indian Res. |
| — Highway | Bullhead City | Fort Mojave Indian Res. |
| — Major Road | Kingman | Kaibab Paiute Indian Res. |
| — Local Road | Lake Havasu City | |
| + Railroad | Colorado City | |
| ... Streams | | |


 0 62.5 125 250
 Miles

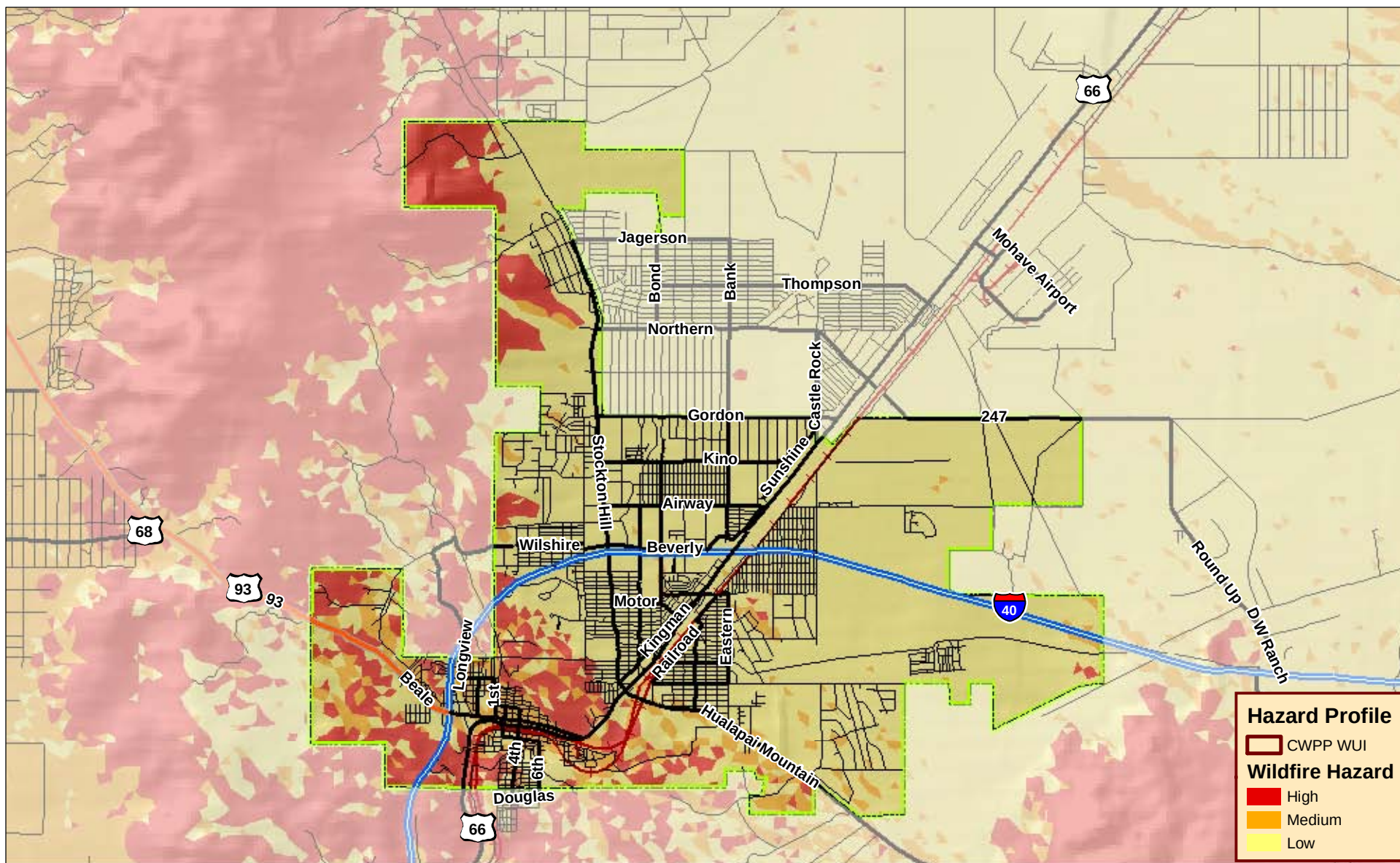
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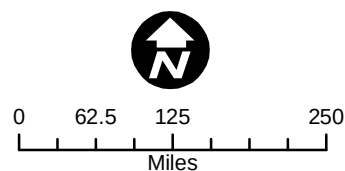
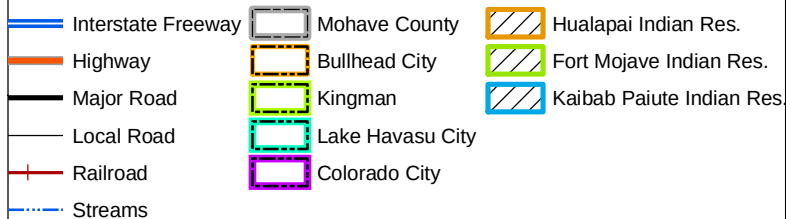
Mohave County Multi-Jurisdictional Hazard Mitigation Plan

Map 4E
Colorado City
Wildfire
Hazard Map
as of May 2010





Legend



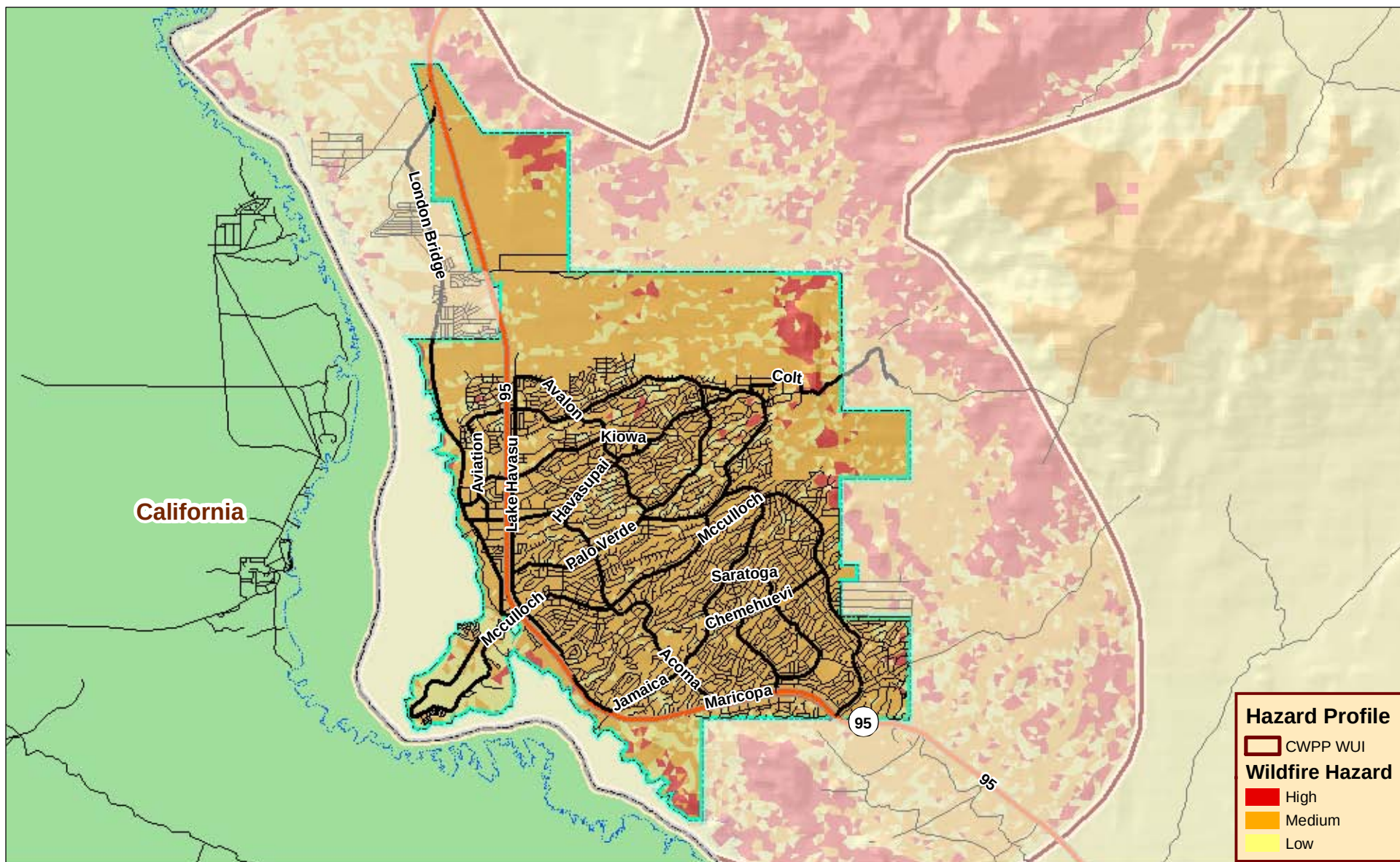
Source: JE FULLER 2010; Mohave County, 2009; ALRIS, 2007; AzForestry, 2004; LSDI, 2008



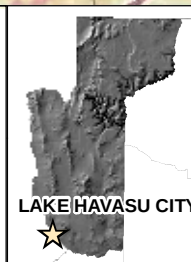
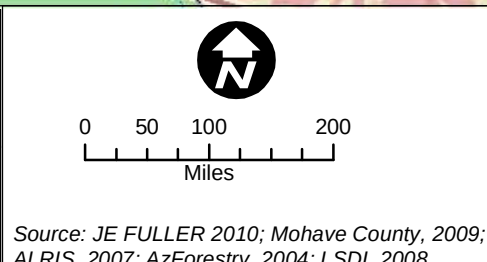
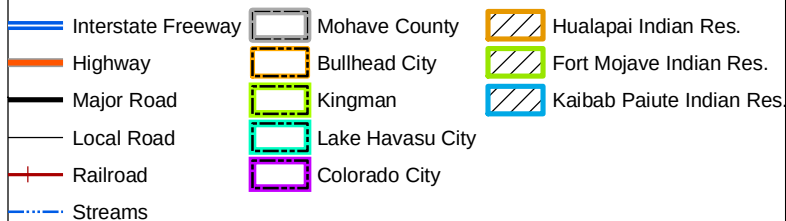
Mohave County Multi-Jurisdictional Hazard Mitigation Plan



Map 4F
Kingman
Wildfire
Hazard Map
as of May 2010



Legend



Mohave County Multi-Jurisdictional Hazard Mitigation Plan

Map 4G
Lake Havasu City
Wildfire
Hazard Map
as of May 2010

LAKE HAVASU CITY, ARIZONA
INCORPORATED 1978

SECTION 6: MITIGATION STRATEGY

§201.6(c)(3): *[The plan shall include...] (3) A **mitigation strategy** that provides the jurisdiction's blueprint for reducing the potential losses identified in the risk assessment, based on existing authorities, policies, programs and resources, and its ability to expand on and improve these existing tools. This section shall include:*

- (i) A description of mitigation goals to reduce or avoid long-term vulnerabilities to the identified hazards.*
- (ii) A section that identifies and analyzes a comprehensive range of specific mitigation actions and projects being considered to reduce the effects of each hazard, with particular emphasis on new and existing buildings and infrastructure.*
- (iii) An action plan describing how the actions identified in paragraph (c)(3)(ii) of this section will be prioritized, implemented, and administered by the local jurisdiction. Prioritization shall include a special emphasis on the extent to which benefits are maximized according to a cost benefit review of the proposed projects and their associated costs.*
- (iv) For multi-jurisdictional plans, there must be identifiable action items specific to the jurisdiction requesting FEMA approval or credit of the plan.*

The mitigation strategy provides the “what, when, and how” of actions that will reduce or possibly remove the community’s exposure to hazard risks. According to DMA 2000, the primary components of the mitigation strategy are generally categorized into the following:

Goals and Objectives

Capability Assessment

Mitigation Actions/Projects and Implementation Strategy

The entire 2005 Plan mitigation strategy was reviewed and updated by the Planning Team, including a major re-organization of the mitigation strategy elements into this multi-jurisdictional plan format. Specifics of the changes and updates are discussed in the subsections below.

6.1 Hazard Mitigation Goals and Objectives

The 2005 Plan goals and objectives were developed through a facilitated discussion and brainstorming session with the 2005 Plan mitigation advisory committee. An assessment of those goals and objectives by the Planning Team and the Local Planning Team for each jurisdiction was made with consideration of the following²⁵:

- Do the goals and objectives identified in the 2005 Plan reflect the updated risk assessment?
- Did the goals and objectives identified in the 2005 Plan lead to mitigation projects and/or changes to policy that helped the jurisdiction(s) to reduce vulnerability?
- Do the goals and objectives identified in the 2005 Plan support any changes in mitigation priorities?
- Are the goals and objectives identified in the 2005 Plan reflective of current State goals?

Copies of the 2007 State Plan goals and objectives were distributed and reviewed by the Planning Team. After much discussion and comparison of the 2005 Plan goals and objectives to the 2007 State Plan, the Planning Team chose to completely drop the current list of goals and objectives in favor of preparing a multi-jurisdictional template of goals and objectives that are closely based on the 2007 State Plan. Reasons for the change included:

- The 2005 Plan goals and objectives referred to human caused hazards which are being dropped with this Plan.
- The 2007 State Plan goals and objectives were much simpler and better captured the overall planning vision of the Planning Team.

²⁵ FEMA, 2008, *Local Multi-Hazard Mitigation Planning Guidance*

- Having a simpler, common set of goals and objectives for the multi-jurisdictional plan will make future assessment of the progress and achievements easier.

The result of the discussions resulted in establishing one goal and four clear objectives that will be used by all participating jurisdictions, as follows:

- **GOAL:** Reduce or eliminate the risk to people and property from natural hazards.
 - ◆ **Objective 1:** Reduce or eliminate risks that threaten life and property in the incorporated, unincorporated, and Tribal jurisdictions within Mohave County.
 - ◆ **Objective 2:** Reduce risk to critical facilities and infrastructure from natural hazards.
 - ◆ **Objective 3:** Promote hazard mitigation throughout the incorporated, unincorporated, and Tribal jurisdictions within Mohave County.
 - ◆ **Objective 4:** Increase public awareness of hazards and risks that threaten the incorporated, unincorporated, and Tribal jurisdictions within Mohave County.

6.2 Capability Assessment

While not required by DMA 2000, an important component of the Mitigation Strategy is a review of each participating jurisdiction's resources in order to identify, evaluate, and enhance the capacity of local resources to mitigate the effects of hazards. The capability assessment is comprised of several components:

- ✓ Legal and Regulatory Review – a review of the legal and regulatory capabilities, including ordinances, codes, plans, manuals, guidelines, and technical reports that address hazard mitigation activities.
- ✓ Technical Staff and Personnel – this assessment evaluated and describes the administrative and technical capacity of the jurisdiction's staff and personnel resources.
- ✓ Fiscal Capability – this element summarizes each jurisdiction's fiscal capability to provide the financial resources to implement the mitigation strategy.
- ✓ National Flood Insurance Program (NFIP) Participation – the NFIP contains specific regulatory measures that enable government officials to determine where and how growth occurs relative to flood hazards. Participation in the NFIP is voluntary for local governments, but the program is promoted by FEMA as a basic first step for implementing and sustaining an effective flood hazard mitigation program, and is a key indicator for measuring local capability as part of this assessment.
- ✓ Prior Mitigation Actions – the final part of the capability assessment is a summary review of prior mitigation actions and/or projects that have been completed over the last five or so years.

For this update, the Planning Team reviewed the information provided in Section 7 of the 2005 Plan. The Planning Team chose to simplify and reduce the amount of material in capability assessment to provide a more concise summary of each jurisdiction's capabilities. Information in Table 7.1 and the following text, and Tables 7.5 and 7.6 were updated and reformatted to be more community specific. The following sections summarize the replacement tables and updated information.

6.2.1 Jurisdictional Capabilities

Tables 6-1-1 through 6-1-5 summarize the legal and regulatory mitigation capability for each jurisdiction. Information provided includes a brief listing of current codes, mitigation relevant ordinances, plans, and studies/reports. Tables 6-2-1 through 6-2-5 summarize the staff and personnel resources employed by each jurisdiction that serve as a resource for hazard mitigation. Tables 6-3-1 through 6-3-5 summarize the fiscal capability and budgetary tools available to each participating jurisdiction. Each of these three tables are listed below by jurisdiction.

Table 6-1-1: Summary of legal and regulatory capabilities for Mohave County		
Regulatory Tools for Hazard Mitigation	Description	Responsible Department/Agency
CODES	• 2005 Building Code • 2005 Plumbing Code	• Development Services – P&Z Building Inspector • Development Services – P&Z Building Inspector
ORDINANCES	• Floodplain Management Ordinance - 11/6/2000 • Weed Abatement Ordinance - 3/31/98 • Subdivision/Zoning Ordinance - 9/65 Revised 8/08	• Development Services – Flood Control • Fire Districts, Co. Attorney Civil Div. • Development Services – Planning & Zoning
PLANS, MANUALS, and/or GUIDELINES	• General or Comprehensive Plan - 3/10/95 and Updated 12/5/05 • Capital Improvement Project Plan • Development Guidelines - 3/10/95 and updated 12/5/05 • Drainage Manual - preliminary • Drought Management Plan – being developed • Community Wildfire Protection Plan - 9/15/08 • Area Drainage Master Plans - 1988 • Snow Removal Plan - 2008	• Development Services – P&Z • Finance Dept. • Development Services - Flood Control • Development Services - Emer. Mgmt. • Public Works Road Dept.
STUDIES	• Flood Insurance Studies - 10/20/00 • Floodplain Delineation Studies - 12/8/07 • Dam Safety Studies / Emergency Action Plans - 1996 • Emergency Routes Evaluation - 2005	• Development Services – Flood Control • US Bureau of Reclamation • Public Works Road Dept.

Table 6-2-1: Summary of technical staff and personnel capabilities for Mohave County		
Staff/Personnel Resources	☒	Department/Agency - Position
Planner(s) or engineer(s) with knowledge of land development and land management practices	☒	Development Services – Planning Manager, Planners Public Works – Engineering Manager (Design)
Engineer(s) or professional(s) trained in construction practices related to buildings and/or infrastructure	☒	Public Works – Engineering Manager (Construction) Development Services – Chief Building Official, Combination Building Inspectors
Planner(s) or engineer(s) with and understanding of natural and/or human-caused hazards	☒	Development Services – Planning Manager, Planners Public Works – County Engineer, Assistant Engineer, Engineering Manager (Design), Engineering Manager (Construction)
Floodplain Manager	☒	Public Works – Assistant Public Works Director
Surveyors	☒	Public Works – County Surveyor, Survey Party Chiefs, Surveyors
Staff with education or expertise to assess the community's vulnerability to hazards	☒	Public Works – Emergency Management Coordinator, Assistant Emergency Management Coordinator
Personnel skilled in GIS and/or HAZUS	☒	Information Technology – GIS Coordinator Public Works – Civil Engineers, Engineering Technicians
Scientists familiar with the hazards of the community		
Emergency manager	☒	Public Works – Emergency Management Coordinator, Assistant Emergency Management Coordinator
Grant writer(s)	☒	Public Works – Emergency Management Coordinator, Assistant Emergency Management Coordinator Community Development – Deputy Director for Economic Development, Grants Coordinator Specialist

Table 6-3-1: Summary of fiscal capabilities for Mohave County		
Financial Resources	Accessible or Eligible to Use (Yes, No, Don't Know)	Comments
Community Development Block Grants	Yes	
Capital Improvements Project funding	Yes	
Authority to levy taxes for specific purposes	Yes	
Fees for water, sewer, gas, or electric service	Yes	For fees in Water Improvement Districts only; no other utilities are under the county
Impact fees for homebuyers or new developments/homes	No	
Incur debt through general obligation bonds	Yes	
Incur debt through special tax bonds	No	

Table 6-1-2: Summary of legal and regulatory capabilities for Bullhead City		
Regulatory Tools for Hazard Mitigation	Description	Responsible Department/Agency
CODES	• Building Code: 2006 International Building Code • Plumbing Code: 2006 International Plumbing Code • City Code: Municipal Code Title 15	• Develop. Services
ORDINANCES	• Floodplain Management Ordinance: Municipal Code 15.36 • Weed Abatement Ordinance • Subdivision/Zoning Ordinance	• Engineering Dept. • Develop. Services
PLANS, MANUALS, and/or GUIDELINES	• General or Comprehensive Plan • Capital Improvement Project Plan • Development Guidelines • Drainage Manual • Drought Management Plan • Community Wildfire Protection Plan • Area Drainage Master Plans • All Hazards Emergency Operations Plan • City building plans • Park Plans	• Develop. Services • Engineering Dept. • Police Department • Parks Dept.
STUDIES	• Flood Insurance Studies • Floodplain Delineation Studies • Dam Safety Studies / Emergency Action Plans • Fissure / Subsidence Risk Studies • Emergency Routes Evaluation	• Engineering Dept. • Police Department

Table 6-2-2: Summary of technical staff and personnel capabilities for Bullhead City		
Staff/Personnel Resources	☒	Department/Agency - Position
Planner(s) or engineer(s) with knowledge of land development and land management practices	☒	Development Services Director
Engineer(s) or professional(s) trained in construction practices related to buildings and/or infrastructure	☒	Public Works & Engineering
Planner(s) or engineer(s) with and understanding of natural and/or human-caused hazards	☒	Emergency Management and Police Dept.
Floodplain Manager	☒	Engineering, Floodplain
Surveyors	☒	Engineering
Staff with education or expertise to assess the community's vulnerability to hazards	☒	Emergency Management and Police Dept.
Personnel skilled in GIS and/or HAZUS	☒	Engineering GIS
Scientists familiar with the hazards of the community	☒	Emergency Management, High School
Emergency manager	☒	Emergency Services Coordinator
Grant writer(s)	☒	Interim Director Parks, Recreation & Community Services Development Services Director City Administrative Analyst

Table 6-3-2: Summary of fiscal capabilities for Bullhead City		
Financial Resources	Accessible or Eligible to Use (Yes, No, Don't Know)	Comments
Community Development Block Grants	Yes	Current program is for housing rehab or replacement
Capital Improvements Project funding	Yes	Various grants
Authority to levy taxes for specific purposes	Yes	Special improvement districts, anything else must be approved through the voters
Fees for water, sewer, gas, or electric service	Yes	Building Division
Impact fees for homebuyers or new developments/homes	No	
Incur debt through general obligation bonds	Yes	Must be approved through the voters
Incur debt through special tax bonds	Yes	Improvement Districts

Table 6-1-3: Summary of legal and regulatory capabilities for Colorado City		
Regulatory Tools for Hazard Mitigation	Description	Responsible Department/Agency
CODES	• 2006 IBC • 2006 IRC • 2006 IPC • 2006 IMC • 2005 NEC • 2006 IEEC • 2009 Town Code • 2006 IFC	• Building Department • Administration • Fire
ORDINANCES	• Flood Hazard Mitigation Ordinance • Airport Zoning Ordinance • Subdivision / Zoning Ordinance	•
PLANS, MANUALS, and/or GUIDELINES	• General Plan • CWIPP • Multi-Jurisdictional Hazard Mitigation Plan	•
STUDIES	• Floodplain delineation study	•

Table 6-2-3: Summary of technical staff and personnel capabilities for Colorado City		
Staff/Personnel Resources	☒	Department/Agency - Position
Planner(s) or engineer(s) with knowledge of land development and land management practices	☒	Planning and Zoning – P&Z Director
Engineer(s) or professional(s) trained in construction practices related to buildings and/or infrastructure	☒	Building Department- Inspectors
Planner(s) or engineer(s) with and understanding of natural and/or human-caused hazards	☒	Planning and Zoning – P&Z Director / Inspectors
Floodplain Manager	☒	Public Works- Director
Surveyors		Contracted
Staff with education or expertise to assess the community's vulnerability to hazards	☒	Building Department – Inspectors Police – Chief Public Works- Director Emergency Services – Battalion Chiefs Emergency Management – EM Staff
Personnel skilled in GIS and/or HAZUS	☒	Emergency Dispatch- GIS Addressing Coordinator
Scientists familiar with the hazards of the community		N/A
Emergency manager	☒	Administration
Grant writer(s)	☒	Administration / Emergency Dispatch
Others	☒	All other Staff

Table 6-3-3: Summary of fiscal capabilities for Colorado City		
Financial Resources	Accessible or Eligible to Use (Yes, No, Don't Know)	Comments
Community Development Block Grants	Yes	
Capital Improvements Project funding	Yes	Airport and Utilities
Authority to levy taxes for specific purposes	Yes	
Fees for water, sewer, gas, or electric service	Yes	
Impact fees for homebuyers or new developments/homes	Yes	
Incur debt through general obligation bonds	Yes	
Incur debt through special tax bonds	Yes	

Table 6-1-4: Summary of legal and regulatory capabilities for Kingman		
Regulatory Tools for Hazard Mitigation	Description	Responsible Department/Agency
CODES	• 2006 I.C.C. Family of Codes – adopted in 2008 • City Code	• Planning and Zoning • Development Services • Fire
ORDINANCES	• Floodplain Management – Mohave County Floodplain Ordinance • Weed Abatement – Part of I.F.C • 1983 Subdivision Ordinance • 1971 Zoning Ordinance • Wildfire Defensible Space – Part of I.F.C.	• Development Services • Fire • Planning and Zoning • Engineering
PLANS, MANUALS, and/or GUIDELINES	• 2003 General Plan • Capital Improvement Plan • Development Guidelines • Drainage Manual • 2008 Community Wildfire Protection Plan. • 2005 Multi-Jurisdictional Hazard Mitigation Plan • Snow Removal Plan • Area Drainage Master Plan	• Development Services • Fire • Planning and Zoning • Building • Public Works
STUDIES	• Flood Insurance Studies	• Mohave County FCD • Engineering

Table 6-2-4: Summary of technical staff and personnel capabilities for Kingman		
Staff/Personnel Resources	☒	Department/Agency - Position
Planner(s) or engineer(s) with knowledge of land development and land management practices	☒	Development Services – Director
Engineer(s) or professional(s) trained in construction practices related to buildings and/or infrastructure	☒	Building Department – Building Official and staff Engineering Department – City Engineer and staff
Planner(s) or engineer(s) with and understanding of natural and/or human-caused hazards	☒	Development Services – Director Engineering Department – City Engineer
Floodplain Manager	☒	Engineering Department – City Engineer and Assistant City Engineer
Surveyors	☒	Surveying – Surveyor and staff
Staff with education or expertise to assess the community’s vulnerability to hazards	☒	Development Services – Director Engineering Department – City Engineer Fire Department – Staff Police Department - Staff
Personnel skilled in GIS and/or HAZUS	☒	Engineering Department – GIS Technician and Engineering Technician Development Services - Planner
Scientists familiar with the hazards of the community		
Emergency manager	☒	Administration - City Manager
Grant writer(s)	☒	Finance – Grant Administrator Public Works Department - Director Fire Department – Staff Police Department - Staff

Table 6-3-4: Summary of fiscal capabilities for Kingman		
Financial Resources	Accessible or Eligible to Use (Yes, No, Don’t Know)	Comments
Community Development Block Grants	Yes	
Capital Improvements Project funding	Yes	Growth related
Authority to levy taxes for specific purposes	Yes	Voter approval
Fees for water, sewer, gas, or electric service	Yes	Water and sewer
Impact fees for homebuyers or new developments/homes	Yes	
Incur debt through general obligation bonds	Yes	Voter approval
Incur debt through special tax bonds	Yes	

Table 6-1-5: Summary of legal and regulatory capabilities for Lake Havasu City		
Regulatory Tools for Hazard Mitigation	Description	Responsible Department/Agency
CODES	• Building Code: 2003 Int. Residential & Commercial Building Code • Plumbing Code: 2003 International Plumbing Code • Lake Havasu City Code of Ordinances	• Development Service Dept. (DSD)
ORDINANCES	• Floodplain Management Ordinance: 08-935 – 8/12/08 • Weed Abatement Ordinance: 92-386 • Subdivision Ordinance: 08-913 – 3/11/08 • Zoning Ordinance: 04-741 – 10/26/04	• Public Works for Floodplain & Weed abatement • DSD for Subdivision Ord. & Zoning Ord.
PLANS, MANUALS, and/or GUIDELINES	• General Plan Res 02-1689 8/20/02 • Capital Improvement Project Plan – Fiscal Year 09/10 • Development Guidelines Ord 04-741 10/26/04 • Drainage Manual Ord 08-935 – 8/12/08 • Drought Management Plan Ord 08-935 – 8/12/08 • Community Wildfire Protection Plan No (See County Plan) • Area Drainage Master Plans Ord 08-935 – 8/12/08	• DSD = General Plan • City Manger & City Council = CIP Imprv. Plan • DSD = Development Guidelines • Public works = Drought Mgt & Area Drainage Master Plan • Fire Dept. = Wildfire Prot. Plan
STUDIES	• Floodplain Delineation Studies Ord 08-935 – 8/12/08 • Dam Safety Studies / Emergency Action Plans Ord 08-935 – 8/12/08 • Emergency Routes Evaluation Yes (County Plan)	• Public works = Flood Delineation • Fire Dept. = Emergency Action Plans and Evacuation Routes

Table 6-2-5: Summary of technical staff and personnel capabilities for Lake Havasu City		
Staff/Personnel Resources	☒	Department/Agency - Position
Planner(s) or engineer(s) with knowledge of land development and land management practices	☒	Planning & Development has 5 planners
Engineer(s) or professional(s) trained in construction practices related to buildings and/or infrastructure	☒	Planning & Development has 8 Engineers and 3 professional plans examiners
Planner(s) or engineer(s) with and understanding of natural and/or human-caused hazards	☒	Planning & Development has 2 planners
Floodplain Manager	☒	1 Manager in Public Works
Surveyors		None
Staff with education or expertise to assess the community's vulnerability to hazards	☒	Planning & Development has 2 trained through I.C.C. (International Commercial Code)
Personnel skilled in GIS and/or HAZUS	☒	Planning and Development has 1 individual and the I.T. Department has 2 individuals
Scientists familiar with the hazards of the community	☒	Public Works has 1 individual
Emergency manager	☒	None (Fire Chief acts as the emergency manager)
Grant writer(s)	☒	Community Services Department has 1 grant writer

Table 6-3-5: Summary of fiscal capabilities for Lake Havasu City		
Financial Resources	Accessible or Eligible to Use (Yes, No, Don't Know)	Comments
Community Development Block Grants	Yes	
Capital Improvements Project funding	Yes	
Authority to levy taxes for specific purposes	Yes	
Fees for water, sewer, gas, or electric service	Yes	
Impact fees for homebuyers or new developments/homes	Yes	
Incur debt through general obligation bonds	Yes	
Incur debt through special tax bonds	Yes	Hard to receive due to Proposition 201 (Limit on taxation)

6.2.2 Previous Mitigation Activities

During the last planning cycle many mitigation activities have been accomplished by the jurisdictions within Mohave County. Table 6-4 provides an updated summary, by jurisdiction, of recent mitigation activities performed over the last planning cycle or generally within the last five to ten years.

Mohave County and the Town of Colorado City are the only participating jurisdictions to receive funding for a project through federal hazard mitigation grant money such as FMA, HMGP, or PDM. Mohave County used HMGP funds to prepare the 2005 Plan. Colorado City used HMGP funds from the same disaster to perform public education on flood safety and awareness. The Mohave County grant totaled \$100,000 and the Colorado City grant totaled \$16,460. Figure 6-1 is a graphical depiction of past federally funded mitigation projects in the State tracked by ADEM.

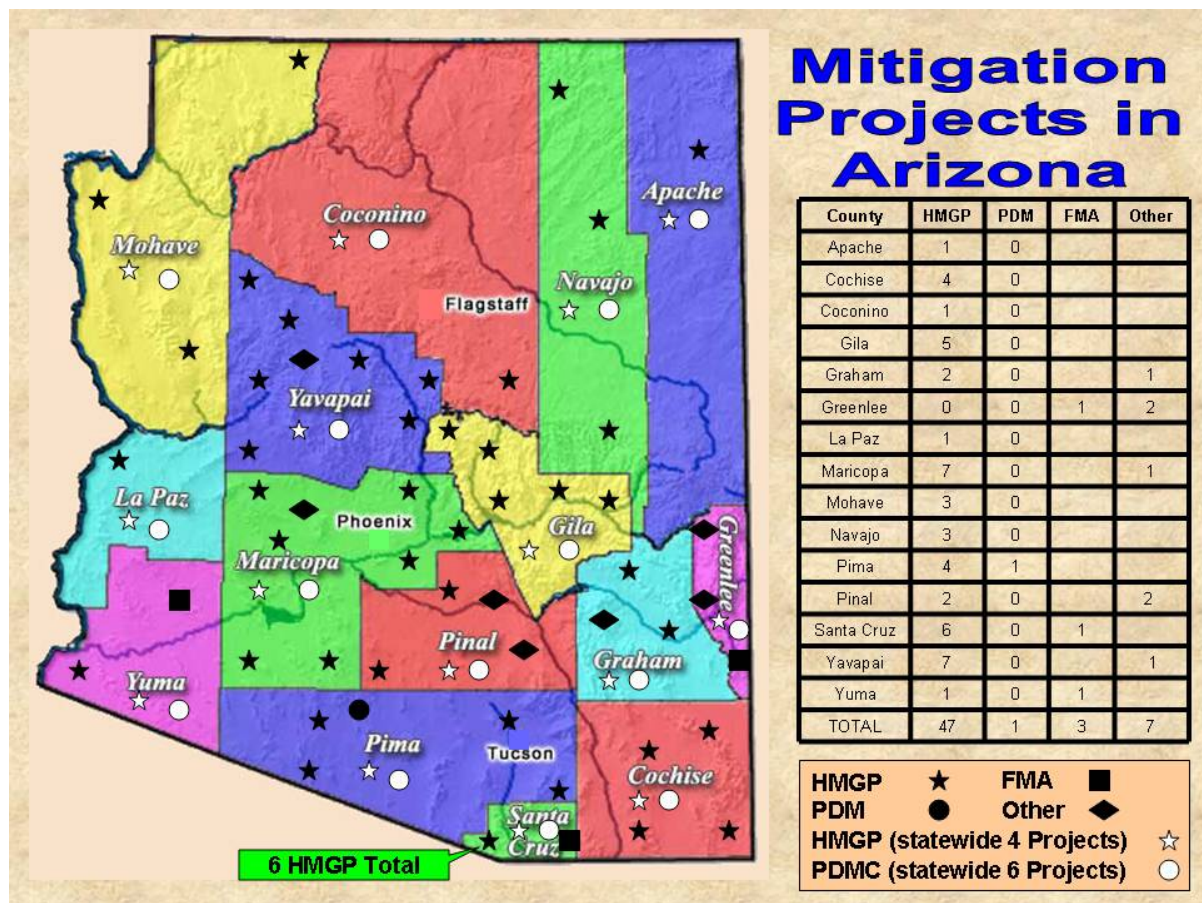


Figure 6-1: Past Mitigation Projects in Arizona

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Table 6-4: Summary of previous mitigation activities for Mohave County jurisdictions						
Jurisdiction	Project Name	Project Description	Project Cost	Funding Source	Responsible Department	Completion Date
Mohave County	Develop Debris Management Plan	General Debris Management procedures have been included in the Mohave County Public Works Emergency Operations Manual developed in 2007 as part of the APWA accreditation process. Additional detailed checklists and training are still needed.	\$2,000	General Fund/staff time	Emergency Management	October 2007
Mohave County	Telephone Warning System	An automated telephone warning system is currently being installed county-wide (June 2009) by the Sheriff's Office after three years of planning and acquisitions of grant funding.	\$110,000	Homeland Security grants	Sheriff's Office, EM	December 2010
Mohave County	Enhance radio communications interoperability and coverage	Acquired and installed multiple interoperable radio equipment sites and communications systems for emergency services, EOC's and mobile command units.	\$907,000	Homeland Security grants	Sheriff's Office, EM	January 2009
Mohave County	Develop county government continuity plan	This is in progress with about six county departments having completed initial drafts and others are in various stages of preliminary work.	\$4,000	General Fund/staff time	Emergency Management	December 2010 (est)
Mohave County	Expand the county's flood detection and warning system.	Since January 2005, 74 weather sites with 156 sensors have been installed in the county ALERT flood warning system.	\$370,000	HURF, ADOT, AZGFD, Flood Control	Flood Control/AFWS Systems Supervisor	Ongoing
Mohave County	Establish Local Drought Impact Group	The Mohave County Local Drought Impact Group was approved by the Board of Supervisors in April, 2008 and has been meeting in regular quarterly meetings since July, 2008. An impact monitoring program plan is in final stages of development.	\$5,000	General Fund/staff time	Emergency Management	April 2008
Mohave County	Develop a Colorado River Emergency Plan	Basic components of this plan have been developed by Mohave County, Bullhead City, and Mohave Valley over the period 2005-2007. Substantial additional development work is needed.	\$5,000	General Fund/staff time	Emergency Management	June 2010 (est.)
Bullhead City	Fox Wash Flood Control Project	A concrete channel to convey all the Fox Wash water around the Fiesta RV park and under State Route 95 was built for the 100 year storm, and Fiesta RV Park was taken out of the floodplain.	\$2,200,000	County Flood Control Funds and ADOT funding.	Public Works Department	2007
Bullhead City	Rotary Park Drainage Channel	Convey the unnamed Wash #2 around the sports fields and parking in Rotary Park using detention areas that infiltrate into the sand below the top clay layer. Add drainage outlets to the river.	\$207,000	County Flood Control Funds.	Public Works Department	Dec 2009
Bullhead City	Adopt 2003 IBC	Adopt the 2003 International Building Code in place of the 1997 Uniform Building Code currently enforced by Bullhead City.	N/A	N/A	Development Services	July 2008
Colorado City	Hildale Street Crossing	Hildale Street Creek Crossing was upgdaded to an all weather route with Labor/ Equipment provided by the local community and real costs covered by Public Works Funds.	\$250,000	City General Fund / Donations	Public Works Department	1994
Colorado City	Warren Ave Flood Control	Converting Warren Ave from central street to 389 to control flood waters. This project is approx 20% done	\$100,000	CDBG / General Funds	Public Works Department	2009

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Table 6-4: Summary of previous mitigation activities for Mohave County jurisdictions						
Jurisdiction	Project Name	Project Description	Project Cost	Funding Source	Responsible Department	Completion Date
Lake Havasu City	Havasupai at Kiowa Drain	Install Culverts at DIP Crossing for Emergency Access	\$324,156	Flood Control Funds	Public Works	6/30/2007
Lake Havasu City	Havasupai at San Juan Drain	Install Culverts at DIP Crossing for Emergency Access	\$294,202	Flood Control Funds	Public Works	6/30/2007
Lake Havasu City	Palo Verde at Hillside	Install Culverts at DIP Crossing for Emergency Access	\$543,355	Flood Control Funds	Public Works	6/30/2007
Lake Havasu City	Lake Havasu Avenue at Havasupai Wash	Install Box Culvert at DIP Crossing for Emergency Access	\$909,830	Flood Control Funds	Public Works	6/30/2007
Lake Havasu City	Lake Havasu Avenue at Neptune Wash	Install Culverts at DIP Crossing for Emergency Access	\$480,283	Flood Control Funds	Public Works	6/30/2007
Lake Havasu City	Palo Verde at Kicking Horse	Install Culverts at DIP Crossing for Emergency Access	\$243,310	Flood Control Funds	Public Works	3/1/2010
Lake Havasu City	Water Conservation Measures for Lake Havasu City	Implementation of a water conservation plan through education, advertising and institution of a rebate program City wide	\$130,000	Bureau of Reclamation	Public Works	12/31/2008
Lake Havasu City	Water Conservation Ord.	Approve and adopt a new ordinance for no water waste within Lake Havasu City	Staff Time Only	N/A	Public Works	4/13/2010

6.2.3 National Flood Insurance Program Participation

Participation in the NFIP is a key element of any community's local floodplain management and flood mitigation strategy. Mohave County and 3 of the 4 incorporated jurisdictions participate in the NFIP. Joining the NFIP requires the adoption of a floodplain management ordinance that requires jurisdictions to follow established minimum standards set forth by FEMA and the State of Arizona, when developing in the floodplain. These standards require that all new buildings and substantial improvements to existing buildings will be protected from damage by the 100-year flood, and that new floodplain development will not aggravate existing flood problems or increase damage to other properties. As a participant in the NFIP, communities also benefit from having Flood Insurance Rate Maps (FIRM) that map identified flood hazard areas and can be used to assess flood hazard risk, regulate construction practices and set flood insurance rates. FIRMs are also an important source of information to educate residents, government officials and the private sector about the likelihood of flooding in their community. Table 6-5 summarizes the NFIP status and statistics as of March 31, 2010, for each of the jurisdictions participating in this Plan.

Table 6-5: Summary of NFIP status and statistics for Mohave County and participating jurisdictions						
Jurisdiction	Community ID	NFIP Entry Date	Current Effective Map Date	Number of Policies	Amount of Coverage (x \$1,000)	Floodplain Management Role
Mohave County	040058	3/15/1982	11/18/2009	2,093	\$397,424	Provides floodplain management for the Unincorporated County. Participant of the Mohave County Flood Control District.
Bullhead City	040125	3/15/1982	11/18/2009	690	\$114,708	Provides in-house floodplain management. Participant of the Mohave County Flood Control District.
Colorado City	040059	8/4/1988	11/18/2009	0	\$0	Provides in-house floodplain management. Participant of the Mohave County Flood Control District.
Kingman	040060	8/15/1977	11/18/2009	107	\$18,520	Provides in-house floodplain management. Participant of the Mohave County Flood Control District.
Lake Havasu City	040116	9/1/1981	11/18/2009	26	\$6,501	Provides in-house floodplain management. Participant of the Mohave County Flood Control District.

6.3 Mitigation Actions/Projects and Implementation Strategy

Mitigation actions/projects (A/P) are those activities identified by a jurisdiction, that when implemented, will have the effect of reducing the community's exposure and risk to the particular hazard or hazards being mitigated. The implementation strategy addresses the "how, when, and by whom?" questions related to implementing an identified A/P.

The update process for defining the new list of mitigation A/Ps for the Plan was accomplished in three steps. First, an assessment of the actions and projects specified in Section 5 of the 2005 Plan was performed, wherein each jurisdiction reviewed and evaluated their jurisdiction specific list. Second, a new list of A/Ps for the Plan was developed by combining the carry forward results from the assessment with new A/Ps. Third, an implementation strategy for the combined list of A/Ps was formulated. Details of each step and the results of the process are summarized in the following sections.

6.3.1 Previous Mitigation Actions/Projects Assessment

The Planning Team and Local Planning Team for each jurisdiction reviewed and assessed the actions and projects listed in Tables 5-5 and 5-6 of their corresponding 2005 Plans. The assessment included evaluating and classifying each of the previously identified A/Ps based on the following criteria:

STATUS		DISPOSITION	
Classification	Explanation Requirement:	Classification	Explanation Requirement:
"No Action"	Reason for no progress	"Keep"	None required
"In Progress"	What progress has been made	"Revise"	Revised components
"Complete"	Date of completion and final cost of project (if applicable)	"Delete"	Reason(s) for exclusion.

Any A/P with a disposition classification of "Keep" or "Revise" was carried forward to become part of the new A/P list for the Plan. All A/Ps identified for deletion were removed and are not included in this updated plan. The results of the assessment for each of the 2005 Plan A/Ps is summarized by jurisdiction in Tables 6-6-1 through 6-6-5.

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**Table 6-6-1
Summary of Mohave County assessment of previous plan cycle mitigation actions/projects**

ID	Name	Description	• Lead Agency • Proposed Cost • Proposed Comp Date	Status	Disposition	Explanation
1	Debris Management Plan	Develop a Debris Management Plan and train personnel in its implementation	• Public Works • \$50,000 in staff time • November 2005	In Progress	Retain	A Debris Management section has been included in the Mohave County Public Works Emergency Response Manual. More detailed procedures need to be added and training provided. Implementation schedule January-December 2010.
2	Telephone Notification System	Install telephone notification system to enhance public warning of emergencies	• Sheriff's Office • \$300,000 plus \$53,000 for GIS staff and \$30,000/yr maintenance • ASAP	In Progress	Retain	A county –wide automated phone notification system has been purchased and is being installed; completion date estimated late 2009.
3	Water Service Provider Oversight	Establish county oversight of water service providers and enhance review of proposed new commercial and residential developments to ensure provision of adequate potable water supply capacity in perpetuity to accommodate future growth and to maintain reserve well, equipment infrastructure, and/or storage capacity for fire suppression and public health needs.	• County BOS, P&Z, Emergency Mgmt • staff time • ASAP	No Action	Remove	County has no statutory authority for oversight of providers; that rests with state agencies.
4	County-wide Drought Emergency Plan	Develop a county-wide drought emergency plan, including specific water management and restriction measures for implementation upon declaration of a drought emergency by the Board of Supervisors.	• Emergency Mgmt • \$20,000 • June 2005	In Progress	Retain	The establishment of a Local Drought Impact Group in 2008 provides a structure through which a county-wide plan can be developed. Schedule Jan-Dec 2010.

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**Table 6-6-1
Summary of Mohave County assessment of previous plan cycle mitigation actions/projects**

ID	Name	Description	• Lead Agency • Proposed Cost • Proposed Comp Date	Status	Disposition	Explanation
5	Fire District Formation and Uniform Fire Code Use Change Name to "Fire District Formation and Use of Community Wildfire Protection Plan Mitigation Measures"	Actively encourage through county development services review and permitting procedures the development of fire services for new residential housing and commercial developments. Encourage formation of new fire districts or annexation into existing districts. Encourage communities to follow the recommended mitigation measures in the Community Wildfire Protection Plan for higher threat areas within the Wildland Urban Interface.	• P&Z, Emergency Mgmt, Fire Districts • \$100,000 to \$500,000 • ASAP	In Progress	Revise	County Developmental Services is actively encouraging development of fire service in new housing developments with urban densities, including annexation into existing fire districts or formation of new ones. A fire code is included in the county regulations. A Community Wildfire Protection Plan has been adopted by Mohave County with mitigation measures specified for high threat areas within the Wildland Urban Interface.
6	Enhance Radio Communications Interoperability	Enhance radio communications interoperability and coverage for the highly populated areas of the county as a first priority, followed by extension of the capability throughout the county.	• Sheriff's Office, Emergency Mgmt • \$450,000 initially and \$1,050,000 later • Phase I by June 2005	In Progress	Keep	Much of this has been accomplished through Homeland Security Grants although there will continually be improvements and modifications needed. Schedule 2010-2015.
7	Regional Master Drainage Plan Base Data Acquisition	Aerial Flights to provide current topographic information to provide base data for watershed studies, drainage master plans, FEMA map updates, permit administration, and other critical Flood Control functions.	• Mohave County FCD in cooperation with Bullhead City and Lake Havasu City • \$1 million for studies and \$400,000 for mapping • 2004-2006	No Action	Revise	Schedule 2010-2015 Est. Cost \$1,500,000
8	Mitigation of Repetitive Loss Properties	Coordinate with willing owners of repetitive loss properties to apply for hazard mitigation funding to reduce or eliminate the long-term risk of future flood damages. This may be accomplished through property buyouts, elevation or retrofit projects that remove or alter insured, at-risk repetitive loss structures.	• Mohave County FCD • TBD • Ongoing	In Progress	Keep	No properties are currently identified within the unincorporated county, although there are some within city jurisdiction. Retain in the event of properties being identified in future. Schedule 2010-2015.

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**Table 6-6-1
Summary of Mohave County assessment of previous plan cycle mitigation actions/projects**

ID	Name	Description	• Lead Agency • Proposed Cost • Proposed Comp Date	Status	Disposition	Explanation
9	Centralized Rural Fire and EMS Dispatch Center	Establish a centralized rural fire and EMS dispatch center.	• Emergency Mgmt • \$250,000 initially and \$450,000 annually thereafter • January 2006	No Action	Keep	Schedule 2010-2015.
10	County Government Continuity Plan	Develop an overall county government continuity plan, with site-specific plans for each critical facility. Upgrade facilities where necessary with emergency power, communication and security systems.	• Public Works • \$250,000 • January 2006	In Progress	Keep	Planning is in progress and partially complete. Schedule June 2009 thru 2010.
11	Flood Warning System	Develop/expand the County's flood detection (flood warning) system. This includes the installation of new ALERT precipitation and stage gages, repeaters, and possibly additional base station(s) and software. The system would add a county-wide benefit (incorporated and unincorporated) in the areas of public safety and emergency response.	• Public Works • TBD • Two years	In Progress	Keep	System has been expanded to over 100 sensors, and more are continually being added to fill gaps in geographic coverage. Schedule 2010-2015.
12	Establish County Fire Marshal	Establish a county position of Fire Marshal, or change the duties of those specified for the Forestry Fire Marshal, to allow enforcement of the state fire code in areas outside a fire district or the jurisdiction of another government agency.	• County BOS, Emergency Mgmt • \$40,000 annually • One year	No Action	Delete	
13	County Emergency Preparedness Booklet	Preparation and distribution to the public of a county emergency preparedness booklet listing potential emergencies, preparedness, and mitigation measures.	• Emergency Mgmt • \$50,000 • April 2005	No Action	Keep	Schedule 2010 – 2012.
14	School and Public Health Facility Hazard Mitigation	Develop a list of school and public health facilities in higher risk areas, particularly those in flood zones or proximate to hazardous materials, and conduct joint planning to mitigate threats through early notification, evacuation or shelter-in-place, and structural protection measures.	• School Districts, Fire Districts, Emergency Mgmt • TBD • Early 2006	In Progress	Keep	Schedule 2010 – 2015.

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**Table 6-6-1
Summary of Mohave County assessment of previous plan cycle mitigation actions/projects**

ID	Name	Description	• Lead Agency • Proposed Cost • Proposed Comp Date	Status	Disposition	Explanation
15	Unincorporated Area Floodplain Mapping	Complete floodplain mapping of unincorporated areas adjacent to Coconino and Yavapai county borders. Areas are growing at a significant rate and are shown as Zone D on the county FIRMs. Even approximate A-zones would be helpful and the County could consider the use of automated rainfall/runoff estimation techniques to develop basic floodplain information.	• Mohave County FCD • \$200,000 • 2006-2010	No Action	Keep	Schedule 2010-2015.
16	Inundation Mapping and EAPs	Develop watershed studies and drainage master plans to include Flood Hazard Response plans for the 100 year storm frequency, as well as frequencies less than 100 year. Mapping and related action plans would be tied to the Flood Control district ALERT Flood Warning System (AFWS).	• Mohave County FCD • TBD • 2007	In Progress	Keep	Schedule 2010-2015.
17	Establish a "Local Area Impact Assessment Group" for Drought	Under increasing drought conditions, establish a "Local Area Impact Assessment Group" in coordination with the State of Arizona [as called for in the Arizona Drought Preparedness Plan] to coordinate public awareness, provide impact assessment information to local and state leaders, and to implement and initiate local mitigation or response options as necessary.	• Emergency Mgmt • Staff time • As necessary	Completed	Delete	A Local Drought Impact Group was established in 2008 and is actively establishing a monitoring system to provide data for development of drought mitigation plans.
18	Colorado River Emergency Plan	Develop and implement a Colorado River Emergency Plan, including identification of specific mitigation measures, in coordination with Bullhead City, Lake Havasu City and the Mohave Valley Fire District.	• Sheriff's Office, Emergency Mgmt • \$20,000 in staff time • June 2005	In Progress	Keep	Initial planning meetings in 2007. Plan to include flood mitigation measures, not just response. Schedule 2009 -2012.

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Table 6-6-2 Summary of Bullhead City assessment of previous plan cycle mitigation actions/projects						
ID	Name	Description	• Lead Agency • Proposed Cost • Proposed Comp Date	Status	Disposition	Explanation
1	Flood Mitigation Projects Prioritization	Prioritize flood mitigation projects that can be funded through existing federal and state grant programs, with an emphasis on protecting the city's infrastructure in proximity to washes and other known flood hazard areas.	• Community Development and Engineering Depts. • TBD • FY 2006	In Progress	Revise	As funding becomes available
2	Adopt 2003 IBC	Adopt the 2003 International Building Code in place of the 1997 Uniform Building Code currently enforced by the City.	• Community Development and Engineering Depts. • Staff and training time • FY 2004/2005	Complete	Delete	The City adopted the 2006 International code on July 1,2008.
3	Fox Wash Flood Control Project	Develop a flood control plan and implement flood control measures to improve Fox Wash to protect adjacent properties.	• Community Development and Engineering Depts. • \$2.2 million • FY 2004/2005	Complete	Delete	Construction complete and map revised by FEMA.
4	Lakeside Drive Flood Control	Help control flooding in the Lakeside Drive area through improved storm water management systems (curb, gutter and storm sewers).	• Community Development and Engineering Depts. • \$1,010,500 • FY 2004/2005	In Progress	Keep	Preliminary design is complete and corrections to the plans are in progress.
5	Miscellaneous Drainage Improvements	Construct miscellaneous drainage improvements to existing facilities throughout the city as determined through flood control planning.	• Community Development and Engineering Depts. • \$200,000/yr • Ongoing	In Progress	Revise	Repairs are ongoing as a part of routine maintenance by the Public Works Department Crews.
6	Rotary Park Drainage Channel	Improve the drainage channel upon completion of the Rotary Park.	• Community Development and Engineering Depts. • TBD • TBD	In Progress	Keep	Phased Construction is Underway.

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Table 6-6-2
Summary of Bullhead City assessment of previous plan cycle mitigation actions/projects

ID	Name	Description	• Lead Agency • Proposed Cost • Proposed Comp Date	Status	Disposition	Explanation
7	Subdivision Drainage	Review new subdivision or housing track plans to ensure that drainage and flood control issues are addressed.	• Community Development and Engineering Depts. • Staff time • Ongoing	In Progress	Keep	Standard procedure as a part of the plan review process.
8	Alternate Colorado River Bridge	Design and Build an alternative (redundant) Colorado River Bridge between Laughlin and Needles, in the event the bridge at 163 is closed due to a transportation incident.	• Public Works • \$2 million • 2014	In Progress	Revise	Project needs to be revised to the bridge site selection and funding process. NEPA Process underway Regional Transportation Commission of Nevada is the lead agency.
9	Early Warning & Siren System	Early Warning & Siren System that could be used in the event that any type of incident causes the implementation of Evacuation or Shelter in place.	• Engineering Dept • TBD • TBD	In Progress	Joint project with Fort Mojave	Joint Project with Fort Mojave Indian Tribe. Federal Signal has done preliminary assessment of how many and cost for sirens in BHC. Federal Signal has also done one for Ft. Mojave Tribe.

Table 6-6-3 Summary of Colorado City assessment of previous plan cycle mitigation actions/projects						
ID	Name	Description	• Lead Agency • Proposed Cost • Proposed Comp Date	Status	Disposition	Explanation
1	GIS – 911 Addressing	Implement GIS, 911 addressing system	• Town of Colorado City • \$50,000 • Within 2 years	In Progress	Keep	
2	Flood Warning System	Develop a flood warning system	• Town of Colorado City • \$25,000 to \$100,000 • Within 2 years	Complete	Delete	Project Completed
3	Willow Street Flood Control Project	Complete the Willow Street Flood Control Project	• Town of Colorado City • \$200,000 • Within 4 yrs	In Progress	Keep	Completed to Academy Ave
4	HAZMAT Team Equipment	Complete equipping the Hazardous Materials Response Team.	• Town of Colorado City, Colorado City Fire District • \$150,000 • Within 4 yrs	In Progress	Keep	Equipment and training needs ongoing.

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**Table 6-6-4
Summary of Kingman assessment of previous plan cycle mitigation actions/projects**

ID	Name	Description	• Lead Agency • Proposed Cost • Proposed Comp Date	Status	Disposition	Explanation
1	Improve Interoperable Communications	Improve interoperable communications between public safety agencies and government service entities.	• Current committee working through Mohave County LEPC • TBD • TBD	In Progress	Revise	Minor improvements made; EOC functional ; Need to replace aging Public Safety Communication Equipment; Need to identify funding sources
2	Improve Stormwater Retention and Channelization	Improve stormwater retention and channelization, including the Railroad Channel, Louise/Andy Devine Detention Basin, Bull Mountain Channel, Mohave Channel, and Riata Valley Drainage Project.	• City of Kingman • \$3 million • TBD	In Progress	Keep	Numerous improvements have been made with identified projects. Need to identify funding sources to continue improvements.
3	Upgrade Dispatch Center Console	Upgrade dispatch center console and related equipment.	• Police Dept • \$150,000 • TBD	Complete	Delete	Upgrades to dispatch center consoles and related equipment have been made. Moved to ID #1
4	Automated Telephone Notification System	Implement an automated telephone notification system to increase public notification for imminent hazards in coordination with Mohave County Emergency Management.	• Police Dept • TBD • TBD	In Progress	Keep	Various components being activated in county; Need to identify funding sources
5	Public Warning Siren Systems	Implement public warning siren systems.	• Fire Dept • \$75,000 • TBD	No Action	Keep	Need to identify funding sources
6	Emergency Operations Plan	Review and update emergency operations plan.	• Fire Dept. • Staff time • TBD	Complete	Keep	Plan completed, needs formal adoption and implementation. Annual review
7	GIS	Expedite GIS and multi-jurisdictional integration and use.	• City of Kingman Management Team • TBD • TBD	Complete	Delete	GIS is integrated and utilized by various departments.

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**Table 6-6-5
Summary of Lake Havasu City assessment of previous plan cycle mitigation actions/projects**

ID	Name	Description	• Lead Agency • Proposed Cost • Proposed Comp Date	Status	Disposition	Explanation
1	Thunderstorm Public Service Announcement	Develop public service announcements to inform the public of how to prepare and respond to thunderstorms or high winds. Also increase the use of NOAA Weather Radios for notification to the public.	• Fire Dept, Emergency Mgmt • \$3,000 • Prior to each Monsoon season	Completed	Delete	PSA is part of the EOP for the city and is handled by the PIO for the community.
2	Water Use Plan	Develop a water use plan and inform the public of ways to conserve water to avoid rationing. As part of the plan, develop a water rationing plan in case reserves become dangerously low.	• Public Works – Water Division • \$3,000 • 2005-2006	Completed	Revise	Dr. Doyle Wilson, Water Manager for the City developed a plan and presented it to City Council. This is an ongoing program.
3	HAZMAT Call Response Capacity	Be fully prepared to respond to each emergency call for assistance to any hazardous materials incident that occurs within the Lake Havasu City Fire Department response area, as well as mutual aid requests by other emergency response agencies within the mutual aid agreement system.	• Fire Dept. • TBD • Ongoing – as needed	Completed	Delete	LHCFD maintains a Level “A” Haz. Mat. Team and has automatic and mutual aid agreements in place. This is an ongoing program.
4	Dike Maintenance Program	Develop a dike maintenance program to ensure continued diversion of flood waters to flood control washes as described in the <i>Diversion Dike Stability Evaluation</i> performed for Lake Havasu City.	• Public Works • \$3.5 million over 8 years • 2004 – 2011	In Progress	Delete	Dike maintenance program has been identified in the drainage master plan and is to be programmed as part of future CIP programs. This is part of the LHC Drainage Master Plan
5	Continued Enforcement of UBC Seismic Requirements	Minimize the devastation of an earthquake by utilizing the Lake Havasu City adopted Uniform Building Codes, and continue with the inspection process set forth by the Community Development Department.	• Community Development • \$55,000 annually • Ongoing with request for building permits	Completed	Delete	LHC has adopted the 2006 Int. Building Code (IBC) and the Int. Fire Code. (IFC). And continues to conduct inspections and plan review of said codes

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Table 6-6-5 Summary of Lake Havasu City assessment of previous plan cycle mitigation actions/projects						
ID	Name	Description	• Lead Agency • Proposed Cost • Proposed Comp Date	Status	Disposition	Explanation
6	Lake Havasu City Drainage Master Plan	Prepare a Drainage Master Plan and obtain aerial mapping for Lake Havasu City. A drainage master plan for Lake Havasu City would greatly help the city identify potential flood and storm water damage areas to properly prepare for storm events and design and implement improvements to alleviate flood and storm water damage. This project will include a detailed drainage study and aerial mapping in order to predict potential areas of flooding hazard and determine the improvements necessary to mitigate the hazard.	• Public Works and Information Services • \$900,000 • FY 2004-2006	Completed	Delete	Plan was prepared and completed April 2009
7	Diversion Dike Repair and Improvements – High Priority	Repair and improvements to three flood control diversion dikes, El Dorado 2, Neptune 3 and 4. Improvements include earthwork, riprap, concrete slope paving.	• Public Works • \$632,000 • FY 2004-2005	In progress	Delete	Identified in drainage master plan to be programmed as part of future CIP program. Priority lessened based on study showing no catastrophic effects on dikes. This is part of the LHC Drainage Master Plan
8	Culvert Improvement / Widening	Continue improving/widening culverts throughout the city at wash crossings. Lake Havasu City identified 18 street/wash crossings that were determined to be emergency crossings for fire, police and other emergency vehicles. Of the 18 crossings 11 have been completed. These projects include the design and construction of either concrete box or corrugated metal pipe culverts to provide emergency access during storm events.	• Public Works • \$2.8 million • FY 2004-2008	In progress	Delete	Improvements are planned in future CIP programs. This is part of the LHC Drainage Master Plan

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Table 6-6-5 Summary of Lake Havasu City assessment of previous plan cycle mitigation actions/projects						
ID	Name	Description	• Lead Agency • Proposed Cost • Proposed Comp Date	Status	Disposition	Explanation
9	Continued Wash Maintenance	Continue Lake Havasu City's regular wash maintenance program. The City's wash crew routinely performs improvements involving wash restoration and the armoring of wash crossings at streets to prevent the streets and utilities from being washed out during storm events. These improvements range from the installation of concrete drop structures to culverts to slope stabilization using either riprap or concrete slope paving.	• Public Works • \$1.25 million • FY 2004-2008	In progress	Delete	Programmed as a part of Transportation Division Activities. Increased personnel from 3 on staff to 6. This is part of the LHC Drainage Master Plan
10	ID At-Risk Power Outage Population	Identify specific at-risk populations that are adversely affected by long term power outages.	• Fire Dept, Emergency Mgmt, Civic Organizations • \$5,000 • 2005 – 2006	Completed	Delete	At risk populations have been identified, but are constantly being updated.
11	Update Civil Disturbance Response Plan	Update the Civil Disturbance Response Plan encompassing the police and fire department and the local ambulance company and hospital.	• Police and Fire Depts • \$5,000 • 2005 – 2006	Completed	Delete	The EOP which was updated on 4/15/09 covers this provision
12	Update Lake Havasu City Emergency Operations Plan – Dam Failure	Update the Lake Havasu City Emergency Operations Plan to include a section on emergency response to flooding caused by a dam failure.	• Fire Dept, Emergency Mgmt • \$5,000 • 2005 – 2006	Completed	Delete	The EOP which was updated on 4/15/09 covers this provision
13	Update Lake Havasu City Emergency Operations Plan – Tornado & Dust Devil	Update the Lake Havasu City Emergency Operations Plan to include a section on emergency response to tornado and dust devil consequences.	• Fire Dept., Emergency Mgmt • \$5,000 • 2006-2007	Completed	Delete	The EOP which was updated on 4/15/09 covers this provision
14	Update Lake Havasu City Emergency Operations Plan – Extreme Heat / Power Outage	Update the Lake Havasu City Emergency Operations Plan to include a section on emergency response to extreme heat and power outage.	• Fire Dept., Emergency Mgmt • \$5,000 • 2007-2008	Completed	Delete	The EOP which was updated on 4/15/09 covers this provision

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Table 6-6-5 Summary of Lake Havasu City assessment of previous plan cycle mitigation actions/projects						
ID	Name	Description	• Lead Agency • Proposed Cost • Proposed Comp Date	Status	Disposition	Explanation
15	Airpark Road Business Park and Wastewater Treatment Plant Emergency Access	Provide culvert crossings for emergency access to the new Airpark Road business park development and wastewater treatment plant. This project will include the design and construction of culvert crossings for the business park and also provide access to the city's new North Regional Wastewater Treatment Plant.	• Public Works • \$1.2 million • FY 2004-2005	Completed	Delete	Culverts were constructed and an "All Weather" roadway was installed to the Waste Water Treatment plant. This is part of the LHC Drainage Master Plan
16	London Bridge Road and Mesquite Avenue Stormwater Conveyance Widening	Lake Havasu City's storm drainage system consists mainly of the existing washes through the city and the city streets. Due to using the streets as drainage facilities streets are widened from the existing 24' wide pavement to a wider section (44' to 54') with curbs to convey the storm water runoff and keep it contained in the street section. This reduces the erosion of the shoulders, which makes streets impassible during storm events. Two streets are programmed for widening, London Bridge Road and Mesquite Avenue. Widening of these streets also includes culvert crossings at washes.	• Public Works • \$600,000 • FY 2004-2006	Completed	Delete	This is part of the LHC Drainage Master Plan
17	Diversion Dike Repair and Improvements – Moderate Priority	Repair and improvements to nine flood control diversion dikes, El Dorado 1, Havasupai 2, 5, 6, 7, Avalon 1, 2, 3, and Neptune 5. Improvements include earthwork, riprap, concrete slope paving.	• Public Works • \$2.1 million • FY 2005-2009	In progress	Delete	Identified in drainage master plan to be programmed as part of future CIP program. Priority lessened based on study showing no catastrophic effects on dikes. This is part of the LHC Drainage Master Plan
18	Diversion Dike Repair and Improvements – Low Priority	Repair and improvements to 11 flood control diversion dikes, Chesapeake 1, 2, El Dorado 3, Havasupai 1, 4, 4A, 8, Hillside 1, Neptune 1 and 2 and a diversion dike located on private property. Improvements include earthwork, riprap, concrete slope paving.	• Public Works • \$770,000 • FY 2009-2011	In progress	Delete	Identified in drainage master plan to be programmed as part of future CIP program. Priority lessened based on study showing no catastrophic effects on dikes. This is part of the LHC Drainage Master Plan

6.3.2 *New Mitigation Actions / Projects and Implementation Strategy*

Upon completion of the assessment summarized in Section 6.4.1, each jurisdiction's Local Planning Team met and developed new A/Ps using the goals and objectives, results of the vulnerability analysis and capability assessment, and the planning team's institutional knowledge of hazard mitigation needs in the community. The A/Ps can be generally classified as either structural or non-structural. Structural A/Ps typify a traditional "bricks and mortar" approach where physical improvements are provided to effect the mitigation goals. Examples may include forest thinning, channels, culverts, bridges, detention basins, dams, emergency structures, and structural augmentations of existing facilities. Non-structural A/Ps deal more with policy, ordinance, regulation and administrative actions or changes, buy-out programs, and legislative actions. For each A/P, the following elements were identified:

- **ID No.** – a unique alpha-numeric identification number for the A/P.
- **Description** – a brief description of the A/P including a supporting statement that tells the "what" and "why" reason for the A/P.
- **Hazard(s) Mitigated** – a list of the hazard or hazards mitigated by the A/P.
- **Community Assets Mitigated** – a brief descriptor to qualify the type of assets (existing, new, or both) that the proposed mitigation A/P addresses.
- **Estimated Costs** – concept level cost estimates that may be a dollar amount or estimated as staff time.

Once the full list of A/Ps was completed to the satisfaction of the Local Planning Team, the team then set to work developing the implementation strategy for those A/Ps. The implementation strategy addresses the "*priority, how, when, and by whom?*" questions related to the execution and completion of an identified A/P. Specific elements identified as a part of the implementation strategy included:

- **Priority Ranking** – each A/P was assigned a priority ranking of either "High", "Medium", or "Low". The assignments were subjectively made using a simple process that assessed how well the A/P satisfied the following considerations:
 - A favorable benefit versus cost evaluation, wherein the perceived direct and indirect benefits outweighed the project cost.
 - A direct beneficial impact on the ability to protect life and/or property from natural hazards.
 - A mitigation solution with a long-term effectiveness
- **Planning Mechanism(s) for Implementation** – where applicable, a list of current planning mechanisms or processes under which the A/P will be implemented. Examples could include CIPs, General Plans, Area Drainage Master Plans, etc.
- **Anticipated Completion Date** – a realistic and general timeframe for completing the A/P. Examples may include a specific target date, a timeframe contingent upon other processes, or recurring timeframes.
- **Primary Agency and Job Title Responsible for Implementation** – this would be the agency, department, office, or other entity and corresponding job title that will have responsibility for the A/P and its implementation.
- **Funding Source** – the source or sources of anticipated funding for the A/P.

Tables 6-7-1 through 6-7-5 summarize the updated mitigation A/P and implementation strategy for each participating Plan jurisdiction. Projects (A/Ps) listed in *italics font* are recognized as being more response and recovery oriented, but are considered to be a significant part of the overall hazard management goals of the community and will be retained in the Plan.

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Table 6-7-1: Summary of mitigation actions and projects and implementation strategy for Mohave County

GOAL: Reduce or eliminate the risk to people and property from natural hazards. Objective 1: Reduce or eliminate risks that threaten life and property in the incorporated, unincorporated, and Tribal jurisdictions within Mohave County. Objective 2: Reduce risk to critical facilities and infrastructure from natural hazards. Objective 3: Promote hazard mitigation throughout the incorporated, unincorporated, and Tribal jurisdictions within Mohave County. Objective 4: Increase public awareness of hazards and risks that threaten the incorporated, unincorporated, and Tribal jurisdictions within Mohave County.									
Mitigation Action/Project					Implementation Strategy				
ID No.	Description	Hazard(s) Mitigated	Community Assets Mitigated (Ex/New)	Estimated Cost	Priority Ranking	Planning Mechanism(s) for Implementation	Anticipated Completion Date	Primary Agency / Job Title Responsible for Implementation	Funding Source(s)
1	Obtain chipper/shredder, grinders, or other equipment for treatment and processing of vegetative slash for wildland fuel mitigation throughout county.	Wildfire	Both	\$100,000	High	CWPP	Jan 2012	Emergency Management / Coordinator	Grants (BLM, others)
2	Explore the feasibility of adoption of a Wildland Urban Interface code or ordinance in areas not covered by a Fire District.	Wildfire	Both	Staff time	Medium	N/A	Jan 2012	Development Services / Building Official	General Fund
3	Retrofit existing wells or water supply sites for local Fire District use and immediate fire protection use in multiple locations in county	Wildfire	Both	\$50,000	High	CWPP	2010-2012	Fire Districts / Fire Chief	Grants (BLM, others)
4	Install water storage tanks (5,000-20,000 gal. capacities) for fire suppression in selected areas of the county, including the Pinion Pine, Grapevine Mesa, Northern Arizona Consolidated, Oatman, and Beaver Dam / Littlefield Fire Districts	Wildfire	Both	\$90,000	High	CWPP	2010-2014	Fire Districts / Fire Chief	Grants (BLM, others)
5	Obtain additional water tenders (3-4) and Type 6 engines (3-4) for wildland fire suppression for selected fire districts	Wildfire	Both	\$560,000	High	CWPP	2010-2014	Fire Districts / Fire Chief	Grants (BLM, others)
6	Obtain Wildland firefighter personal protective equipment and training for personnel of multiple fire districts	Wildfire	Both	\$100,000	High	CWPP	2009-2014	Fire Districts / Fire Chief	Grants (BLM, others)
7	Review and update Weed Abatement and Fire Safety Codes	Wildfire	Both	Staff time	Medium	N/A	2009-2014	Fire Districts / Fire Chief	FD Budgets
8	Conduct fuel modification and vegetative hazard removal in Willow Valley and Topock Lake Ranchero Subdivisions, Mohave Valley	Wildfire	Both	\$100,000	High	CWPP	2010-2012	Fire Districts / Fire Chief	Grants (BLM, others)

**MOHAVE COUNTY
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Table 6-7-1: Summary of mitigation actions and projects and implementation strategy for Mohave County

GOAL: Reduce or eliminate the risk to people and property from natural hazards.

Objective 1: Reduce or eliminate risks that threaten life and property in the incorporated, unincorporated, and Tribal jurisdictions within Mohave County.

Objective 2: Reduce risk to critical facilities and infrastructure from natural hazards.

Objective 3: Promote hazard mitigation throughout the incorporated, unincorporated, and Tribal jurisdictions within Mohave County.

Objective 4: Increase public awareness of hazards and risks that threaten the incorporated, unincorporated, and Tribal jurisdictions within Mohave County.

Mitigation Action/Project					Implementation Strategy				
ID No.	Description	Hazard(s) Mitigated	Community Assets Mitigated (Ex/New)	Estimated Cost	Priority Ranking	Planning Mechanism(s) for Implementation	Anticipated Completion Date	Primary Agency / Job Title Responsible for Implementation	Funding Source(s)
9	Develop Community Flood Hazard Awareness Outreach to increase public awareness of current and future vulnerability to flooding and benefits of flood insurance.	Flood	Both	\$75,000	High	Flood Control	2010-2014	Flood Control / ?	Hazard Mitigation Grants
10	Continue Review and enforcement of building code provisions regarding earthquake mitigation	Earthquake	Both	Staff time	Medium	N/A	2009-2014	Development Services / Building Officials	General Fund
11	Identify cooling station facilities and obtain backup generators for these facilities for mitigation of health risk to vulnerable populations in extreme heat events	Extreme Heat	Both	\$500,000, Staff Time	High	Target Capability Assessment	2009-2014	Emergency Management / Coordinator	Grants; Homeland Security, others
12	Implement National Weather Service Storm Ready Program provisions, including public awareness campaigns	Severe Wind	Both	Staff time	Medium	Storm Ready	2009-2011	Emergency Management / Coordinator	General Fund
13	Quail Run Storm Water Mitigation	Flood	Both	\$275,000	High	Flood Control	2009-2010	Flood Control / Project Manager	Grants / Flood Control
14	Continue to ensure that Mohave County residents are safe from flooding by meeting the NFIP requirements for development within a Special Flood Hazard Area through enforcement of the Floodplain Ordinance	Flood	Both	Staff Time	High	Code Enforcement	On-Going	Mohave County Flood Control District / District Engineer	Special Tax District

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Table 6-7-1: Summary of mitigation actions and projects and implementation strategy for Mohave County

GOAL: Reduce or eliminate the risk to people and property from natural hazards.

Objective 1: Reduce or eliminate risks that threaten life and property in the incorporated, unincorporated, and Tribal jurisdictions within Mohave County.

Objective 2: Reduce risk to critical facilities and infrastructure from natural hazards.

Objective 3: Promote hazard mitigation throughout the incorporated, unincorporated, and Tribal jurisdictions within Mohave County.

Objective 4: Increase public awareness of hazards and risks that threaten the incorporated, unincorporated, and Tribal jurisdictions within Mohave County.

Mitigation Action/Project					Implementation Strategy				
ID No.	Description	Hazard(s) Mitigated	Community Assets Mitigated (Ex/New)	Estimated Cost	Priority Ranking	Planning Mechanism(s) for Implementation	Anticipated Completion Date	Primary Agency / Job Title Responsible for Implementation	Funding Source(s)
15	Watershed Master Drainage Plan Development to include Flood Hazard Response plans for the 100 year storm frequency, as well as frequencies less than 100 year. Mapping and related action plans would be tied to the Flood Control district ALERT Flood Warning System (AFWS).	Flood	Both	\$1,000,000	High	Flood Control	2009-2014	Flood Control / Project Manager	Grants / Flood Control / CTP
16	Develop more detailed procedures and perform training on the Debris Management section of the Mohave County Public Works Emergency Response Manual.	Flood, Severe Wind	Both	\$50,000	Medium	Public Works / Emergency Management	January-December 2010	Public Works / EM Coordinator	Public Works
17	<i>Finalize telephone notification system to enhance public warning of emergencies</i>	<i>ALL</i>	<i>Both</i>	<i>\$20,000</i>	<i>High</i>	<i>Sheriff's Office</i>	<i>Late 2009</i>	<i>Sheriff's Office / Project Manager</i>	<i>Sheriff's Office</i>
18	Develop a county-wide drought emergency plan, including specific water management and restriction measures for implementation upon declaration of a drought emergency by the Board of Supervisors.	Drought	Both	\$40,000	Medium	Local Drought Impact Group	January-December 2010	Emergency Management / Coordinator	Emergency Management
19	<i>Continue to enhance radio communications interoperability and coverage for the highly populated areas of the county as a first priority, followed by extension of the capability throughout the county.</i>	<i>All</i>	<i>Both</i>	<i>\$500,000</i>	<i>High</i>	<i>Emergency Management / Sheriff's Office</i>	<i>2010-2015</i>	<i>Emergency Management / Coordinator</i>	<i>Homeland Security Grants</i>

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Table 6-7-1: Summary of mitigation actions and projects and implementation strategy for Mohave County

GOAL: Reduce or eliminate the risk to people and property from natural hazards. Objective 1: Reduce or eliminate risks that threaten life and property in the incorporated, unincorporated, and Tribal jurisdictions within Mohave County. Objective 2: Reduce risk to critical facilities and infrastructure from natural hazards. Objective 3: Promote hazard mitigation throughout the incorporated, unincorporated, and Tribal jurisdictions within Mohave County. Objective 4: Increase public awareness of hazards and risks that threaten the incorporated, unincorporated, and Tribal jurisdictions within Mohave County.									
Mitigation Action/Project					Implementation Strategy				
ID No.	Description	Hazard(s) Mitigated	Community Assets Mitigated (Ex/New)	Estimated Cost	Priority Ranking	Planning Mechanism(s) for Implementation	Anticipated Completion Date	Primary Agency / Job Title Responsible for Implementation	Funding Source(s)
20	Actively encourage through county development services review and permitting procedures, the development of fire services for new residential housing and commercial developments. Encourage formation of new fire districts or annexation into existing districts. Encourage communities to follow the recommended mitigation measures in the Community Wildfire Protection Plan for higher threat areas within the Wildland Urban Interface.	Wildfire	Both	\$40,000	High	Emergency Management	2009-2014	Emergency Management / Coordinator	Emergency Management
21	Obtain aerial topographic and photogrammetric data to provide current topographic information and base mapping data for watershed studies, watershed master plans, FEMA map updates, permit administration, and other critical Flood Control functions.	Flood	Both	\$1,500,000	High	Flood Control	2010-2015	Flood Control / Project Manager	Flood Control
22	Coordinate with willing owners of repetitive loss properties to apply for hazard mitigation funding to reduce or eliminate the long-term risk of future flood damages. This may be accomplished through property buyouts, elevation or retrofit projects that remove or alter insured, at-risk repetitive loss structures.	Flood	Existing	\$1,000,000	Medium	Local Government	2009-2014	Flood Control / Project Manager	Grants / Flood Control
23	Establish a centralized rural fire and EMS dispatch center.	Wildfire	Both	\$500,000	Medium	Fire Districts / Emergency Management	2010-2015	Fire District Working Group / Project Manager	Homeland Security Grants

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Table 6-7-1: Summary of mitigation actions and projects and implementation strategy for Mohave County

GOAL: Reduce or eliminate the risk to people and property from natural hazards. Objective 1: Reduce or eliminate risks that threaten life and property in the incorporated, unincorporated, and Tribal jurisdictions within Mohave County. Objective 2: Reduce risk to critical facilities and infrastructure from natural hazards. Objective 3: Promote hazard mitigation throughout the incorporated, unincorporated, and Tribal jurisdictions within Mohave County. Objective 4: Increase public awareness of hazards and risks that threaten the incorporated, unincorporated, and Tribal jurisdictions within Mohave County.									
Mitigation Action/Project					Implementation Strategy				
ID No.	Description	Hazard(s) Mitigated	Community Assets Mitigated (Ex/New)	Estimated Cost	Priority Ranking	Planning Mechanism(s) for Implementation	Anticipated Completion Date	Primary Agency / Job Title Responsible for Implementation	Funding Source(s)
24	Develop an overall county government continuity plan, with site-specific plans for each critical facility. Upgrade facilities where necessary with emergency power, communication and security systems.	All	Both	\$30,000	High	Emergency Management	June 2009-2010	Emergency Management / Coordinator	Emergency Management / General Fund
25	Continue to develop/expand the County's flood detection (flood warning) system. This includes the installation of new ALERT precipitation and stage gages, repeaters, and possibly additional base station(s) and software. The system would add a county-wide benefit (incorporated and unincorporated) in the areas of public safety and emergency response.	Flood	Both	\$250,000	High	Flood Control	2010-2015	Flood Control / Flood Warning System Supervisor	Flood Control
26	Preparation and distribution to the public of a county emergency preparedness booklet listing potential emergencies, preparedness, and mitigation measures.	All	Both	\$30,000	Medium	Emergency Management	2010-2012	Emergency Management / Coordinator	Emergency Management / Grants
27	Develop a list of school and public health facilities in higher risk areas, particularly those in flood zones or proximate to hazardous materials, and conduct joint planning to mitigate threats through early notification, evacuation or shelter-in-place, and structural protection measures.	Flood, Wildfire	Both	\$10,000	Medium	Emergency Management	2010-2015	Emergency Management / Coordinator	Emergency Management
28	Complete floodplain mapping of unincorporated areas adjacent to Coconino and Yavapai county borders. Areas are growing at a significant rate and are shown as Zone D on the county FIRMs. Even approximate A-zones would be helpful and the County could consider the use of automated rainfall/runoff estimation techniques to develop basic floodplain information.	Flood	Both	\$200,000	Medium	Flood Control	2010-2015	Flood Control / Project Manager	FEMA

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Table 6-7-1: Summary of mitigation actions and projects and implementation strategy for Mohave County

GOAL: Reduce or eliminate the risk to people and property from natural hazards.

Objective 1: Reduce or eliminate risks that threaten life and property in the incorporated, unincorporated, and Tribal jurisdictions within Mohave County.

Objective 2: Reduce risk to critical facilities and infrastructure from natural hazards.

Objective 3: Promote hazard mitigation throughout the incorporated, unincorporated, and Tribal jurisdictions within Mohave County.

Objective 4: Increase public awareness of hazards and risks that threaten the incorporated, unincorporated, and Tribal jurisdictions within Mohave County.

Mitigation Action/Project					Implementation Strategy				
ID No.	Description	Hazard(s) Mitigated	Community Assets Mitigated (Ex/New)	Estimated Cost	Priority Ranking	Planning Mechanism(s) for Implementation	Anticipated Completion Date	Primary Agency / Job Title Responsible for Implementation	Funding Source(s)
29	Develop and implement a Colorado River Emergency Plan, including identification of specific mitigation measures, in coordination with Bullhead City, Lake Havasu City and the Mohave Valley Fire District.	Flood, Severe Wind, Extreme Heat	Both	\$100,000	Medium	Emergency Management	2009-2012	Emergency Management / Coordinator	Emergency Management / HS Grants
30	Wikieup Channel Rehabilitation and Diversion Dike Reconstruction	Flood Levee Failure	Both	\$1,200,000	High	Flood Control	2009-2011	Flood Control / Project Engineer	FEMA Grants / Flood Control

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Table 6-7-2: Summary of mitigation actions and projects and implementation strategy for Bullhead City

GOAL: Reduce or eliminate the risk to people and property from natural hazards. Objective 1: Reduce or eliminate risks that threaten life and property in the incorporated, unincorporated, and Tribal jurisdictions within Mohave County. Objective 2: Reduce risk to critical facilities and infrastructure from natural hazards. Objective 3: Promote hazard mitigation throughout the incorporated, unincorporated, and Tribal jurisdictions within Mohave County. Objective 4: Increase public awareness of hazards and risks that threaten the incorporated, unincorporated, and Tribal jurisdictions within Mohave County.									
Mitigation Action/Project					Implementation Strategy				
ID No.	Description	Hazard(s) Mitigated	Community Assets Mitigated (Ex/New)	Estimated Cost	Priority Ranking	Planning Mechanism(s) for Implementation	Anticipated Completion Date	Primary Agency / Job Title Responsible for Implementation	Funding Source(s)
1	Havasupai and Chaparral Washes Area Drainage Improvement – Phase 1	Flood	Existing	\$1 million	High	5 year CIP	FY 2011	Public Works/ Engineering	Flood Control Funding
2	Havasupai and Chaparral Washes Area Drainage Improvement – Phase 2	Flood	Existing	\$1.2 Million	High	5 Year CIP	FY 2012	Public Works/ Engineering	Flood Control Funding
3	Montana Wash Crossing at Gold Rush Road	Flood	Existing	\$650,000	Med	5 Year CIP	FY 2013	Public Works/ Engineering	Flood Control Funding
4	Rio Lomas – Fort Mojave Wash Drainage	Flood	Existing	\$750,000	Low	5 Year CIP	FY 2014	Public Works/ Engineering	Flood Control Funding.
5	Flood Mitigation Projects Prioritization- Prioritize flood mitigation projects that can be funded through existing federal and state grant programs, with an emphasis on protecting the city's infrastructure in proximity to washes and other known flood areas.	Flood	Existing	N/A	High	5 year CIP	Continuing	Public Works/ Engineering	Flood Control Funding/ Grants
6	Subdivision Drainage – Review new subdivision or housing track plans to ensure that drainage and flood control issues are addressed.	Flood	New	N/A	High	Ongoing	Ongoing	Development Services	Budgeted
7	<i>Alternate Colorado River Bridge-Design and build an alternative (redundant) Colorado River Bridge between Laughlin and Needles, in the event the bridge at 163 is closed due to transportation incident.</i>	<i>Transportation Incident</i>	<i>Both</i>	<i>\$54 Million</i>	<i>High</i>	<i>IGA w/ Clarke County, NV and RTC of Southern Nevada</i>	<i>2014</i>	<i>Public Works/ Engineering</i>	<i>Federal Approp.</i>

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Table 6-7-2: Summary of mitigation actions and projects and implementation strategy for Bullhead City

GOAL: Reduce or eliminate the risk to people and property from natural hazards. Objective 1: Reduce or eliminate risks that threaten life and property in the incorporated, unincorporated, and Tribal jurisdictions within Mohave County. Objective 2: Reduce risk to critical facilities and infrastructure from natural hazards. Objective 3: Promote hazard mitigation throughout the incorporated, unincorporated, and Tribal jurisdictions within Mohave County. Objective 4: Increase public awareness of hazards and risks that threaten the incorporated, unincorporated, and Tribal jurisdictions within Mohave County.									
Mitigation Action/Project					Implementation Strategy				
ID No.	Description	Hazard(s) Mitigated	Community Assets Mitigated (Ex/New)	Estimated Cost	Priority Ranking	Planning Mechanism(s) for Implementation	Anticipated Completion Date	Primary Agency / Job Title Responsible for Implementation	Funding Source(s)
8	Early Warning and Siren System – This could be used in the event that any type of incident causes the implementation of Evacuation or Shelter in place.	Flood, Fire, Davis Dam Failure, Chemical Incident	Both	\$250,000	High	Joint Project with Fort Mojave Tribe	2014	Police Department/ Emergency Management	Grant Funding
9	Miscellaneous Drainage Improvements – Construct miscellaneous drainage improvements to existing facilities throughout the city as determined through flood control planning	Flood	Both	\$50, 000	Med	Flood Control Plans	Ongoing	Public Works/ Engineering	Flood Control Funding
10	Lakeside Drive Flood Control – Help control flooding in the Lakeside Drive area through improved storm water management systems (curb, gutter and storm sewers).	Flood	Both	\$100,000	Low	5 yr CIP	2014	Public Works/ Engineering	Grant Funding

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Table 6-7-3: Summary of mitigation actions and projects and implementation strategy for Colorado City

GOAL: Reduce or eliminate the risk to people and property from natural hazards.

Objective 1: Reduce or eliminate risks that threaten life and property in the incorporated, unincorporated, and Tribal jurisdictions within Mohave County.

Objective 2: Reduce risk to critical facilities and infrastructure from natural hazards.

Objective 3: Promote hazard mitigation throughout the incorporated, unincorporated, and Tribal jurisdictions within Mohave County.

Objective 4: Increase public awareness of hazards and risks that threaten the incorporated, unincorporated, and Tribal jurisdictions within Mohave County.

Mitigation Action/Project					Implementation Strategy				
ID No.	Description	Hazard(s) Mitigated	Community Assets Mitigated (Ex/New)	Estimated Cost	Priority Ranking	Planning Mechanism(s) for Implementation	Anticipated Completion Date	Primary Agency / Job Title Responsible for Implementation	Funding Source(s)
1	Arizona Ave West Flood Control	Flooding	Streets /highway Access/ Homes/ Businesses/ public works facility	\$2 mil	High (No. 1)	City Engineer Review	2 yrs	Public Works	CDBG/ FEMA/ General Funds/ Flood Control Funds/ State Highway Funds
2	Warren Ave Flood Control	Flooding	Streets / homes	\$1 mil	High (No. 4)	City Engineer Review	7 years	Public Works	CDBG/ FEMA/ General Funds/ Flood Control Funds
3	West 389 Flood Control	Flooding	Streets / Hwy 389	\$1.5 mil	Medium (No. 6)	City Engineer Review	15 years	Public Works	CDBG/ FEMA/ General Funds/ Flood Control Funds
4	Central / Plum Drainage Underflow	Flooding	Streets / highway access	\$1.5 Mil	High (No. 2)	City Engineer Review	5 Years	Public Works	CDBG/ FEMA/ General Funds/ Flood Control Funds
5	East Watershed Flood Control Upgrade	Flooding	Streets/ Homes/ Bussiness/ Fire Stations/ Utilities	\$1.5 Mil	Medium (No. 5)	City Engineer Review	10 years	Public Works	CDBG/ FEMA/ General Funds/ Flood Control Funds
6	Floodplain Map Amendment	Flooding	Buildings/ New Development s	\$250k	High (No. 3)	City Engineer Review	5 years	Public Works	CDBG/ FEMA/ General Funds/ Flood Control Funds

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Table 6-7-4: Summary of mitigation actions and projects and implementation strategy for Kingman

GOAL: Reduce or eliminate the risk to people and property from natural hazards.

Objective 1: Reduce or eliminate risks that threaten life and property in the incorporated, unincorporated, and Tribal jurisdictions within Mohave County.

Objective 2: Reduce risk to critical facilities and infrastructure from natural hazards.

Objective 3: Promote hazard mitigation throughout the incorporated, unincorporated, and Tribal jurisdictions within Mohave County.

Objective 4: Increase public awareness of hazards and risks that threaten the incorporated, unincorporated, and Tribal jurisdictions within Mohave County.

Mitigation Action/Project					Implementation Strategy				
ID No.	Description	Hazard(s) Mitigated	Community Assets Mitigated (Ex/New)	Estimated Cost	Priority Ranking	Planning Mechanism(s) for Implementation	Anticipated Completion Date	Primary Agency / Job Title Responsible for Implementation	Funding Source(s)
1	Improve Interoperable Communications (9-1-1 equipment)	All Hazard	Both	\$1,200,000	High	Public Safety	Jan 2012	Public Safety Staff	Grants general fund, others
2	Construct Fire Station Five in east Kingman.	All Hazard	New	\$3,500,000	High	Public Safety	Jan 2014	Fire Chief, Fire Marshall	General Fund, grants, other
3	Improve storm water retention and channelization including Railroad Channel, Lousie/Andy Devine Detention Basin, Mohave Channel, and Riata Valley Drainage Project.	Flood	Both	N/A	High	Engineering	2010-2016	City Engineer	Grants General Fund, Other
4	Continue review and enforcement of building code provisions regarding earthquake mitigation	Earthquake	New	Staff time	Medium	Building Dept.	Continuous	Building Official	General Fund
5	Construct Fire Station Two	All Hazard	Both	\$5,200,000	High	Fire Staff	Jan 2014	Fire Chief/Fire Marshall	General Fund, Grants , others
6	Continue to provide training and personal protective equipment for firefighter personnel.	Wildfire	Both	Staff time	High	Fire Staff	Continuous	Fire Chief/ Fire Staff	Grants General Fund, others
7	Review and update Weed Abatement and Fire Safety Codes	Wildfire	Both	Staff time	Medium	N/A	Continuous	Fire Chief/Fire Marshall	General Fund
8	Public Warning Siren Systems	All Hazards	Both	\$500,000	High	Fire Staff / IS	2016	Fire Chief Information Systems Director	Grants General Fund Other

MOHAVE COUNTY
MULTI-JURISDICTIONAL HAZARD MITIGATION PLAN

2010

Table 6-7-4: Summary of mitigation actions and projects and implementation strategy for Kingman

GOAL: Reduce or eliminate the risk to people and property from natural hazards. Objective 1: Reduce or eliminate risks that threaten life and property in the incorporated, unincorporated, and Tribal jurisdictions within Mohave County. Objective 2: Reduce risk to critical facilities and infrastructure from natural hazards. Objective 3: Promote hazard mitigation throughout the incorporated, unincorporated, and Tribal jurisdictions within Mohave County. Objective 4: Increase public awareness of hazards and risks that threaten the incorporated, unincorporated, and Tribal jurisdictions within Mohave County.									
Mitigation Action/Project					Implementation Strategy				
ID No.	Description	Hazard(s) Mitigated	Community Assets Mitigated (Ex/New)	Estimated Cost	Priority Ranking	Planning Mechanism(s) for Implementation	Anticipated Completion Date	Primary Agency / Job Title Responsible for Implementation	Funding Source(s)
9	Develop Community Flood Hazard Awareness Outreach to increase public awareness of current and future vulnerability to flooding and benefits of flood insurance.	Flood	Both	Staff time	High	Engineering Flood Control	2010-2014	City Engineer Partnerships	General Fund/ Hazard Mitigation Grants
10	Automated Telephone Notification System (Reverse 9-1-1)	All Hazards	Both	\$109,000	High	KPD/MCSO	2010-2012	KPD/MCSO	Grants
11	Identify cooling station facilities and obtain backup generators for these facilities for mitigation of health risk to vulnerable populations in extreme heat events	Extreme Heat	Both	TBD / Staff time	High	Target Capability Assessment	2009-2014	Fire Staff/ Community Partnerships	Grants; Homeland Security, others
12	Implement National Weather Service Storm Ready Program provisions, including public awareness campaigns	Severe Wind	Both	Staff time	Medium	Storm Ready	2009-2012	Fire Chief/ Fire Staff	General Fund

MOHAVE COUNTY
MULTI-JURISDICTIONAL HAZARD MITIGATION PLAN

2010

Table 6-7-5: Summary of mitigation actions and projects and implementation strategy for Lake Havasu City

GOAL: Reduce or eliminate the risk to people and property from natural hazards. Objective 1: Reduce or eliminate risks that threaten life and property in the incorporated, unincorporated, and Tribal jurisdictions within Mohave County. Objective 2: Reduce risk to critical facilities and infrastructure from natural hazards. Objective 3: Promote hazard mitigation throughout the incorporated, unincorporated, and Tribal jurisdictions within Mohave County. Objective 4: Increase public awareness of hazards and risks that threaten the incorporated, unincorporated, and Tribal jurisdictions within Mohave County.									
Mitigation Action/Project					Implementation Strategy				
ID No.	Description	Hazard(s) Mitigated	Community Assets Mitigated (Ex/New)	Estimated Cost	Priority Ranking	Planning Mechanism(s) for Implementation	Anticipated Completion Date	Primary Agency / Job Title Responsible for Implementation	Funding Source(s)
1	City wide construction of drainage improvements in washes and drains as defined in the Drainage Master Plan. Project Number ST2930	Flood	New	\$6,215,000	Medium	5-year CIP	June 2015	Public Works Department	Flood Control Funding
2	Repair major erosion and channelization issues that are occurring in the El Dorado Wash between the high school and the parking area. Project Number ST3050	Flood	Existing	\$500,000	Medium	5-year CIP	June 2012	Public Works Department	Flood Control Funding
3	Construct a culvert at Lake Havasu Ave, north of Kiowa Blvd. in order to construct an all weather crossing and eliminate major erosion issues in this area. Project Number ST2820	Flood	New	\$500,000	Medium	5-year CIP	June 2012	Public Works Department	Flood Control Funding
4	Construct box culvert at Swanson Avenue at Pima Wash for flood mitigation and allow emergency vehicles access during flooding. Project Number ST2850	Flood	New	\$900,000	Medium	5-Year CIP	June 2012	Public Works Department	Flood Control Funding
5	Wash / Bank stabilization of washes within the incorporated boundaries of the City to protect against heavy rains and erosion. Project Number ST3070	Flood	Both	\$2,500,000	Low	5-Year CIP	June 2016	Public Works Department	Flood Control Funding
6	Construct box culvert at Oro Grande Blvd and the Mockingbird Wash for flood mitigation and allow emergency vehicles access during flooding. Project Number ST3060	Flood	New	\$ 500,000	Medium	5-Year CIP	June 2013	Public Works Department	Flood Control Funding
7	Construct and develop recharge / recovery system to continuously track water resources and water quality conditions and to assist in drought	Drought	New	\$1,000,000	Medium	5-Year CIP	June 2013	Public Works Department / Water Division	Irrigation & Drainage District

MOHAVE COUNTY
MULTI-JURISDICTIONAL HAZARD MITIGATION PLAN

2010

Table 6-7-5: Summary of mitigation actions and projects and implementation strategy for Lake Havasu City

GOAL: Reduce or eliminate the risk to people and property from natural hazards. Objective 1: Reduce or eliminate risks that threaten life and property in the incorporated, unincorporated, and Tribal jurisdictions within Mohave County. Objective 2: Reduce risk to critical facilities and infrastructure from natural hazards. Objective 3: Promote hazard mitigation throughout the incorporated, unincorporated, and Tribal jurisdictions within Mohave County. Objective 4: Increase public awareness of hazards and risks that threaten the incorporated, unincorporated, and Tribal jurisdictions within Mohave County.									
Mitigation Action/Project					Implementation Strategy				
ID No.	Description	Hazard(s) Mitigated	Community Assets Mitigated (Ex/New)	Estimated Cost	Priority Ranking	Planning Mechanism(s) for Implementation	Anticipated Completion Date	Primary Agency / Job Title Responsible for Implementation	Funding Source(s)
	mitigation measures Project Number WT7290								
8	Update building code to meet the 2009 International Fire Code and 2009 International Building Code to ensure adequate designs of new or remodeled facilities	Flood, Severe Wind, Earthquakes	New	Staff Time	Medium	N/A	FY 2012	Development Services, Building Officials, and Fire Department	General Fund
9	Develop a water use plan and inform the public of ways to conserve water to avoid rationing. As part of the plan, develop a water rationing plan in case reserves become dangerously low.	Drought	Both	Staff Time	Medium	N/A	FY2012	Public Works Department / Water Division	General Fund

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SECTION 7: PLAN MAINTENANCE PROCEDURES

§201.6(c)(4): *[The plan shall include...] (4) A **plan maintenance process** that includes:*

- (i) A section describing the method and schedule of monitoring, evaluating, and updating the mitigation plan within a five-year cycle.*
- (ii) A process by which local governments incorporate the requirements of the mitigation plan into other planning mechanisms such as comprehensive or capital improvement plans, when appropriate.*
- (iii) Discussion on how the community will continue public participation in the plan maintenance process.*

§201.6(d)(3): *Plans must be reviewed, revised if appropriate, and resubmitted for approval within five years in order to continue to be eligible for HMGP project grant funding.*

According to the DMA 2000 requirements, each plan must define and document processes or mechanisms for maintaining and updating the hazard mitigation plan within the established five-year planning cycle. Elements of this plan maintenance section include:

Monitoring and Evaluating the Plan

Updating the Plan

Implementing the Plan by Incorporation into Other Agency or Jurisdictional Planning Mechanisms

Continued Public Participation

Mohave County and the other participating jurisdictions recognize that this Plan is intended to be a “living” document with regularly scheduled monitoring, evaluation, and updating.

Section 10 of the 2005 Plan outlined specific steps for plan maintenance. A poll of the Planning Team indicated that some level of plan review and maintenance was accomplished with the county leading the effort with two annual reviews over the past five years:

Date of Review	Activity	Notes
June 27, 2007	Mohave County Emergency Management responded to a survey sent by ADEM requesting a review and summary of the following 2005 Plan related items: • Regulatory tools such as codes, ordinances, and other plans used by the County • Progress on current actions/projects.	Notes were sent as requested. A/Ps reported on included Nos. 1, 2, 3, 4, 6, 9, 10, 12, and 13.
August 27, 2008	Mohave County Emergency Management requested that the cities and county departments that participated in the preparation of the 2005 Plan conduct the annual review of the Plan and forward suggested revisions to Emergency Management. None were received. The Mohave County Flood Control District identified three new projects for inclusion in the Plan. All are structural projects to protect residential areas or county infrastructure from flooding. In addition to these, it was recommended to add a general mitigation action to cover future county structural projects for flood prevention and property protection.	

The mitigation actions/projects in the 2005 Plan were also referred to by several jurisdictions on a periodic basis. Reasons for the lack of review included:

- Changes in staff and a lack of effectively communicating plan maintenance requirements and responsibilities,
- A general lack of priority regarding the importance and requirements of the maintenance element.
- A four year period of extremely rapid growth and the lack of resources or time to perform the plan maintenance tasks.

Recognizing the need for improvement, the Planning Team discussed ways to make sure that the Plan review and maintenance process will occur over the next five years. The results of those discussions are outlined in the following sections and the plan maintenance strategy.

7.1 Monitoring and Evaluation

Switching to a true multi-jurisdictional plan will aide in the Plan monitoring and evaluation by the consolidation of information for all county jurisdictions into one document. The Planning Team has established the following monitoring and evaluation procedures:

- **Schedule** – The Plan shall be reviewed on at least an annual basis or following a major disaster. Mohave County Emergency Management will take the lead to reconvene the Planning Team in or around the month of November and will work out a suitable reporting format with ADEM. ADEM has also committed to help with reminders to the County as a double accountability. Copies of the annual review report will also be included in Appendix E.
- **Review Content** – One month prior to the Planning Team review meeting, a reminder questionnaire will be distributed to each jurisdictions' Point of Contact, with the following questions:
 - **Hazard Identification:** *Have the risks and hazards changed?*
 - **Goals and objectives:** *Are the goals and objectives still able to address current and expected conditions?*
 - **Mitigation Projects and Actions:** *Has the project been completed? If not complete but started, what percent of the project has been completed? How much money has been expended on incomplete projects? Did the project require additional funds over the expected amount or were the costs less than expected?*

During the annual meeting, each jurisdiction will have the opportunity to provide a report to the group summarizing its review of the Plan. The report will include their responses to the above questions and any other items specific to their community. Documentation of the annual meeting will include notes on the results of the meeting as well as more specific information on the reasoning behind proposed changes to the Plan.

A formal presentation of the review material will be presented to a jurisdiction's council or board only if a major update to the Plan is proposed prior to the next five year update, or if changes to the mitigation A/Ps are desired to be acknowledged by the State and FEMA.

7.2 Plan Update

According to DMA 2000, the Plan requires updating and approval from FEMA every five years. The plan updates will adhere to that set schedule using the following procedure:

- ✓ One year prior to the plan expiration date, the Planning Team will re-convene to review and assess the materials accumulated in Appendix E.
- ✓ The Planning Team will update and/or revise the appropriate or affected portions of the plan and produce a revised plan document.
- ✓ The revised plan document will be presented before the respective councils and boards for an official concurrence/adoption of the changes.
- ✓ The revised plan will be submitted to ADEM and FEMA for review, comment and approval.

7.3 Incorporation into Existing Planning Mechanisms

Incorporation of the Plan into other planning mechanisms, either by content or reference, enhances a community's ability to perform natural hazard mitigation by expanding the scope of the Plan's influence. A poll of the participating jurisdictions revealed that success of incorporating the 2005 Plan elements over the past planning cycle into other planning programs has varied. Ways in which the 2005 Plan has been successfully incorporated or referenced into other planning mechanisms for each jurisdiction are summarized below:

Mohave County:

- The hazard analysis and identification of the top countywide hazards in the 2005 Plan has been used as the basis for evaluating risk in updates of the County Emergency Response and Recovery Plan, local fire district planning, county government facility emergency plans, and emergency planning for new facilities such as hospitals.
- The mitigation measures identified in the 2005 Plan have served as the basis for project planning/scheduling and grant assistance searches.
- Since County Planning and Zoning participated in the planning process, the mitigation plan has been available to them for use in revisions of the County General Plan.

City of Bullhead City:

- The 2005 was used to develop the city's Emergency Operations Plan, including the development of a mitigation annex to the EOP, which is not yet completed.

City of Kingman:

- The hazard analysis and identification of the top COK hazards in the 2005 Plan has been used as the basis for evaluating risk in updates of the COK Emergency Operation Plan, Fire/Police communication planning, COK government facility emergency plans, and emergency planning for new facilities such as hospitals.
- The mitigation measures identified in the 2005 Plan have served as the basis for project planning/scheduling and grant assistance searches by the Engineering Department
- The 2005 Plan has been available for use in revisions and updates of the COK General Plan and has generally been made available to all city departments and elected officials.

City of Lake Havasu City:

- The 2005 Plan was recently used to develop an emergency preparedness plan for citizens of Lake Havasu City. This plan can be found on the City's website and was announced to all citizens during a Council meeting this past month.
- The 2005 Plan was referred to when updates to the response plans housed in the city's EOC were made.
- The 2005 Plan helped the Fire Department to preplan and discuss the most potential hazards within the community.

Town of Colorado City:

- The 2005 Plan was made available as a reference for an ongoing traffic study that will ultimately result in a master traffic plan for the town.

In all of the above instances, the 2005 Plan was found to be very beneficial, and especially with regard to the critical facility inventories and the vulnerability analysis results. Obstacles to further incorporation of the 2005 Plan for some of the communities were generally tied to a lack of awareness of the Plan by departments outside of the emergency management community, and the relative "newness" of the Plan with regard to other, more commonplace planning mechanisms such as comprehensive or general plans. It is anticipated that with each passing year, the usage and knowledge of the Plan will grow within the jurisdictions, and so will its use.

Typical ways the current Plan will be incorporated over the next five-year planning cycle will include:

- Use of, or reference to, Plan elements in updates to general and comprehensive planning documents, as appropriate.
- Addition of defined mitigation A/Ps to capital improvement programming.
- Inclusion of Plan elements into development planning and practices.
- Function as a resource for developing and/or updating emergency operations plans.

The Plan will continue to function as a standalone document subject to its own review and revision schedule presented in Sections 7.1 and 7.2. The Plan will also serve as a reference for other mitigation and land planning needs of the participating jurisdictions. Whenever possible, each jurisdiction will endeavor to incorporate the risk assessment results and mitigation actions and projects identified in the Plan, into existing and future planning mechanisms. At a minimum, each of the responsible agencies/departments noted in Tables 6-1-1 through 6-1-5 will review and reference the Plan and revise and/or update the legal and regulatory planning documents, manuals, codes, and ordinances summarized in Tables 6-1-1 through 6-1-5, as appropriate. Specific incorporation of the Plan risk assessment elements into the natural resources and safety elements of each jurisdictions' general plans (county comprehensive plan) and development review processes, adding or revising building codes, adding or changing zoning and subdivision ordinances, and incorporating mitigation goals and strategies into general and/or comprehensive plans, will help to ensure hazard mitigated future development. In addition, an implementation strategy outlining assignments of responsibility and completion schedules for specific actions/projects proposed in this plan are summarized in Tables 6-7-1 through 6-7-5.

7.4 Continued Public Involvement

The Mohave County jurisdictions represented by the Planning Team are committed to keeping the public informed about the hazard mitigation planning efforts, actions and projects. In order to accomplish this, the Planning Team shall pursue the following opportunities for public involvement and dissemination of information whenever possible and appropriate:

- Board of Supervisor and Town/City Council presentations will be made following the annual Plan review. Presentations will be made by the designated local emergency manager within two months prior to the start of the annual Monsoon season.
- Following the annual Plan review, the local emergency managers will provide a review summary to Mohave County Emergency Management to be compiled and posted to the County's static web page location where the Plan resides.
- The County Emergency Manager will prepare a press release distributed countywide, informing the public of the annual Plan review and where to find the review postings.
- The County Emergency Manager will present the results of the annual Plan review at a quarterly Local Emergency Planning Committee meeting.

SECTION 8: PLAN TOOLS

8.1 Acronyms

A/P.....	Mitigation Action/Project
ADEM	Arizona Division of Emergency Management
ADEQ	Arizona Department of Environmental Quality
ADWR	Arizona Department of Water Resources
AGFD	Arizona Game and Fish Department
ARS	Arizona Revised Statutes
ASCE	American Society of Civil Engineers
ASERC	Arizona State Emergency Response Commission
ASLD	Arizona State Land Department
ASU	Arizona State University
AZGS	Arizona Geological Survey
BLM	Bureau of Land Management
CAP	Central Arizona Project
CAP	Community Assistance Program
CFR	Code of Federal Regulations
CRS	Community Rating System
CWPP	Community Wildfire Protection Plan
DEMA	Arizona Department of Emergency and Military Affairs
DFIRM	Digital Flood Insurance Rate
DMA 2000	Disaster Mitigation Act of 2000
DOT	Department of Transportation
EHS	Extremely Hazardous Substance
EPA	Environmental Protection Agency
EPCRA	Emergency Planning and Community Right to Know Act
FCDMC.....	Flood Control District of Mohave County
FEMA	Federal Emergency Management Agency
FMA	Flood Mitigation Assistance Grant Program
GIS	Geographic Information System
HAZMAT	Hazardous Material
HAZUS-99	Hazards United States 1999
HAZUS-MH	Hazards United States Multi-Hazard
IFCI	International Fire Code Institute
LEPC	Local Emergency Planning Committee
MJHMP	Multi-Jurisdictional Hazard Mitigation Plan
MMI	Modified Mercalli Intensity
NCDC	National Climate Data Center
NDMC	National Drought Mitigation Center
NESDIS	National Environmental Satellite, Data and Information Service
NFIP	National Flood Insurance Program
NFPA	National Fire Protection Association
NHC	National Hurricane Center
NIBS	National Institute of Building Services
NID	National Inventory of Dams
NIST	National Institute of Standards and Technology
NSF	National Science Foundation
NOAA	National Oceanic and Atmospheric Administration
NRC	National Response Center
NWCG.....	National Wildfire Coordination Group
NWS	National Weather Service
PSDI	Palmer Drought Severity Index
RL	Repetitive Loss

SARA	Superfund Amendments and Reauthorization Act
SRLP	Severe Repetitive Loss Properties
SRL	Severe Repetitive Loss
SRP	Salt River Project
UBC	Uniform Building Code
USACE	United States Army Corps of Engineers
USDA	United States Department of Agriculture
USFS	United States Forest Service
USGS	United States Geological Survey
VA	Vulnerability Analysis
WUI	Wildland Urban Interface

8.2 Definitions

The following terms and definitions are provided for reference and are taken from the 2007 State Plan with a few minor modifications.

ARIZONA HAZARDS

Dam Failure

A dam failure is a catastrophic type of failure characterized by the sudden, rapid and uncontrolled release of impounded water. Dam failures are typically due to either overtopping or piping and can result from a variety of causes including natural events such as floods, landslides or earthquakes, deterioration of foundation or compositional materials, penetration by vegetative roots or animal burrows, fissures or improper design and construction. Such a failure presents a significant potential for a disaster as significant loss of life and property would be expected in addition to the possible loss of power and water resources.

Drought

A drought is a deficiency of precipitation over an extended period of time, resulting in water shortage for some activity, group or environmental sector. "Severe" to "extreme" drought conditions endanger livestock and crops, significantly reduce surface and ground water supplies, increase the potential risk for wildland fires, increase the potential for dust storms, and cause significant economic loss. Humid areas are more vulnerable than arid areas. Drought may not be constant or predictable and does not begin or end on any schedule. Short term droughts are less impacting due to the reliance on irrigation and groundwater in arid environments.

Earthquake

An earthquake is a naturally-induced shaking of the ground, caused by the fracture and sliding of rock within the Earth's crust. The magnitude is determined by the dimensions of the rupturing fracture (fault) and the amount of displacement that takes place. The larger the fault surface and displacement, the greater the energy. In addition to deforming the rock near the fault, this energy produces the shaking and a variety of seismic waves that radiate throughout the Earth. Earthquake magnitude is measured using the Richter Scale and earthquake intensity is measured using the Modified Mercalli Intensity Scale.

Fissure

Earth fissures are tension cracks that open as the result of subsidence due to severe overdrafts (i.e., pumping) of groundwater, and occur about the margins of alluvial basins, near exposed or shallow buried bedrock, or over zones of differential land subsidence. As the ground slowly settles, cracks form at depth and propagate towards the surface, hundreds of feet above. Individual fissures range in length from hundreds of feet to several miles, and from less than an inch to several feet wide. Rainstorms can erode fissure walls rapidly causing them to widen and lengthen suddenly and dangerously, forming gullies five to 15- feet wide and tens of feet deep.

Flooding

Flooding is an overflowing of water onto normally dry land and is one of the most significant and costly of natural disasters. Flooding tends to occur in Arizona during anomalous years of prolonged, regional rainfall (typical of an El Nino year), and is typified by increased humidity and high summer temperatures.

Flash flooding is caused excessive rain falling in a small area in a short time and is a critical hazard in Arizona. Flash floods are usually associated with summer monsoon thunderstorms or the remnants of a tropical storm. Several factors contribute to flash flooding: rainfall intensity and duration, topography, soil conditions, and ground cover. Most flash flooding is caused by slow-moving thunderstorms or thunderstorms repeatedly moving over the same area and can occur within a few minutes or hours of excessive rainfall, or a quick release from a dam or levee failure. Thunderstorms produce flash flooding, often far from the actual storm and at night when natural warnings may not be noticed.

Landslide / Mudslide

Landslides like avalanches are massive downward and outward movements of slope-forming materials. The term landslide is restricted to movement of rock and soil and includes a broad range of velocities. Slow movements, although rarely a threat to life, can destroy buildings or break buried utility lines. A landslide occurs when a portion of a hill slope becomes too weak to support its own weight. The weakness is generally initiated when rainfall or some other source of water increases the water content of the slope, reducing the shear strength of the materials. A mud slide is a type of landslide referred to as a flow. Flows are landslides that behave like fluids: mud flows involve wet mud and debris.

Levee Failure / Breach

Levee failures are typically due to either overtopping or erosive piping and can result from a variety of causes including natural events such as floods, hurricane/tropical storms, or earthquakes, deterioration of foundation or compositional materials, penetration by vegetative roots or animal burrows, fissures, or improper design, construction and maintenance. A levee breach is the opening formed by the erosion of levee material and can form suddenly or gradually depending on the hydraulic conditions at the time of failure and the type of material comprising the levee.

Severe Wind

Thunderstorms are characterized as violent storms that typically are associated with high winds, dust storms, heavy rainfall, hail, lightning strikes, and/or tornadoes. The unpredictability of thunderstorms, particularly their formation and rapid movement to new locations heightens the possibility of floods. Thunderstorms, dust/sand storms and the like are most prevalent in Arizona during the monsoon season, which is a seasonal shift in the winds that causes an increase in humidity capable of fueling thunderstorms. The monsoon season in Arizona typically is from late-June or early-July through mid-September.

Tornadoes are violently rotating columns of air extending from a thunderstorm to the ground. The most violent tornadoes are capable of tremendous destruction with wind speeds in excess of 250 mph. Damage paths can exceed a mile wide and 50 miles long. The damage from tornadoes is due to high winds. The Fujita Scale of Tornado Intensity measures tornado / high wind intensity and damage.

Tropical Storms are storms in which the maximum sustained surface wind ranges from 39-73 mph. Tropical storms are associated with heavy rain and high winds. High intensity rainfall in short periods is typical. A tropical storm is classified as a hurricane when its sustained winds reach or exceed 74 mph. These storms are medium to large in size and are capable of producing dangerous winds, torrential rains, and flooding, all of which may result in tremendous property damage and loss of life, primarily in coastal populated areas. The effects are typically most dangerous before a hurricane makes landfall, when most damage occurs. However, Arizona has experienced a number of tropical storms that caused extensive flooding and wind damage.

Subsidence

Land subsidence in Arizona is primarily attributed to substantial groundwater withdrawal from aquifers in sedimentary basins. As the water is removed, the sedimentary layers consolidate resulting in a general lowering of the corresponding ground surface. Subsidence frequently results in regional bowl-shaped depressions, with loss of elevation greatest in the center and decreasing towards the perimeter. Subsidence can measurably change or reverse basin gradients causing expensive localized flooding and adverse impacts or even rupture to long-baseline infrastructure such as canals, sewer systems, gas lines and roads. Earth fissures are the most spectacular and destructive manifestation of subsidence-related phenomena.

Wildfire

Wildfire is a rapid, persistent chemical reaction that releases heat and light, especially the exothermic combination of a combustible substance with oxygen. Wildfires present a significant potential for disaster in the southwest, a region of relatively high temperatures, low humidity, low precipitation, and during the spring moderately strong daytime winds. Combine these severe burning conditions with people or lightning and the stage is set for the occurrence of large, destructive wildfires.

Winter Storm

Winter storms bring heavy snowfall and frequently have freezing rain and sleet. Sleet is defined as pellets of ice composed of frozen or mostly frozen raindrops or refrozen partially melted snowflakes. These pellets of ice usually bounce after hitting the ground or other hard surfaces. Freezing rain begins as snow at higher altitudes and melts completely on its way down while passing through a layer of air above freezing temperature, then encounters a layer below freezing at lower level to become supercooled, freezing upon impact of any object it then encounters. Because freezing rain hits the ground as a rain droplet, it conforms to the shape of the ground, making one thick layer of ice. Snow is generally formed directly from the freezing of airborne water vapor into ice crystals that often agglomerates into snowflakes. Average annual snowfall in Arizona varies with geographic location and elevation, and can range from trace amounts to hundreds of inches. Severe snow storms can affect transportation, emergency services, utilities, agriculture and basic subsistence supply to isolated communities. In extreme cases, snowloads can cause significant structural damage to under-designed buildings.

GENERAL PLAN TERMS

Asset

Any natural or human-caused feature that has value, including, but not limited to people; buildings; infrastructure like bridges, roads, and sewer and water systems; lifelines like electricity and communication resources; or environmental, cultural, or recreational features like parks, dunes, wetlands, or landmarks.

Building

A structure that is walled and roofed, principally above ground and permanently affixed to a site. The term includes a manufactured home on a permanent foundation on which the wheels and axles carry no weight.

Critical Facilities and Infrastructure

Systems or facilities whose incapacity or destruction would have a debilitating impact on the defense or economic security of the nation. The Critical Infrastructure Assurance Office (CIAO) defines eight categories of critical infrastructure, as follows:

Telecommunications infrastructure: Telephone, data services, and Internet communications, which have become essential to continuity of business, industry, government, and military operations.

Electrical power systems: Generation stations and transmission and distribution networks that create and supply electricity to end-users.

Gas and oil facilities: Production and holding facilities for natural gas, crude and refined petroleum, and petroleum-derived fuels, as well as the refining and processing facilities for these fuels.

Banking and finance institutions: Banks, financial service companies, payment systems, investment companies, and securities/commodities exchanges.

Transportation networks: Highways, railroads, ports and inland waterways, pipelines, and airports and airways that facilitate the efficient movement of goods and people.

Water supply systems: Sources of water; reservoirs and holding facilities; aqueducts and other transport systems; filtration, cleaning, and treatment systems; pipelines; cooling systems; and other delivery mechanisms that provide for domestic and industrial applications, including systems for dealing with water runoff, wastewater, and firefighting.

Government services: Capabilities at the federal, state, and local levels of government required to meet the needs for essential services to the public.

Emergency services: Medical, police, fire, and rescue systems.

Disaster Mitigation Act of 2000 (DMA2K)

A law signed by the President on October 30, 2000 that encourages and rewards local and state pre-disaster planning, promotes sustainability as a strategy for disaster resistance, and is intended to integrate state and local planning with the aim of strengthening statewide mitigation planning.

Emergency Preparedness and Response (EPR) Directorate

One of five major Department of Homeland Security Directorates which builds upon the formerly independent Federal Emergency Management Agency (FEMA). EPR is responsible for preparing for natural and human-caused disasters through a comprehensive, risk-based emergency management program of preparedness, prevention, response, and recovery. This work incorporates the concept of disaster-resistant communities, including providing federal support for local governments that promote structures and communities that reduce the chances of being hit by disasters.

Emergency Response Plan

A document that contains information on the actions that may be taken by a governmental jurisdiction to protect people and property before, during, and after a disaster.

Federal Emergency Management Agency (FEMA)

Formerly independent agency created in 1978 to provide a single point of accountability for all Federal activities related to disaster mitigation and emergency preparedness, response and recovery. As of March 2003, FEMA is a part of the Department of Homeland Security's Emergency Preparedness and Response (EPR) Directorate.

Flood Insurance Rate Map (FIRM)

Map of a community, prepared by FEMA that shows the special flood hazard areas and the risk premium zones applicable to the community.

Frequency

A measure of how often events of a particular magnitude are expected to occur. Frequency describes how often a hazard of a specific magnitude, duration, and/or extent typically occurs, on average. Statistically, a hazard with a 100-year recurrence interval is expected to occur once every 100 years on average, and would have a 1% chance – its probability – of happening in any given year. The reliability of this information varies depending on the kind of hazard being considered.

Geographic Information Systems (GIS)

A computer software application that relates physical features on the earth to a database to be used for mapping and analysis.

Hazard

A source of potential danger or adverse condition. Hazards include both natural and human-caused events. A natural event is a hazard when it has the potential to harm people or property and may include events such as floods, earthquakes, tornadoes, tsunami, coastal storms, landslides, and wildfires that strike populated areas. Human-caused hazard events originate from human activity and may include technological hazards and terrorism. Technological hazards arise from human activities and are assumed to be accidental and/or have unintended consequences (e.g., manufacture, storage and use of hazardous materials). While no single definition of terrorism exists, the Code of Federal Regulations defines terrorism as "...unlawful use of force and violence against persons or property to intimidate or coerce a government, the civilian population, or any segment thereof, in furtherance of political or social objectives."

Hazard Event

A specific occurrence of a particular type of hazard.

Hazard Identification

The process of identifying hazards that threaten an area.

Hazard Mitigation

Cost effective measures taken to reduce or eliminate long-term risk associated with hazards and their effects.

Hazard Profile

A description of the physical characteristics of hazards and a determination of various descriptors including magnitude, duration, frequency, probability, and extent.

HAZUS

A GIS-based nationally standardized earthquake, flood and high wind event loss estimation tool developed by FEMA.

Mitigate

To cause to become less harsh or hostile; to make less severe or painful. Mitigation activities are actions taken to eliminate or reduce the probability of the event, or reduce its severity of consequences, either prior to or following a disaster/emergency.

Mitigation Plan

A systematic evaluation of the nature and extent of vulnerability to the effects of natural hazards typically present in a defined geographic area, including a description of actions to minimize future vulnerability to hazards.

100-Hundred Year Floodplain

Also referred to as the Base Flood Elevation (BFE) and Special Flood Hazard Area (SFHA). An area within a floodplain having a 1% or greater chance of flood occurrence in any given year.

Planning

The act or process of making or carrying out plans; the establishment of goals, policies, and procedures for a social or economic unit.

Probability

A statistical measure of the likelihood that a hazard event will occur.

Promulgation

To make public and put into action the Hazard Mitigation Plan via formal adoption and/or approval by the governing body of the respective community or jurisdiction (i.e. – Town or City Council, County Board of Directors, etc.).

Q3 Data

The Q3 Flood Data product is a digital representation of certain features of FEMA's Flood Insurance Rate Map (FIRM) product, intended for use with desktop mapping and Geographic Information Systems technology. The digital Q3 Flood Data are created by scanning the effective FIRM paper maps and digitizing selected features and lines. The digital Q3 Flood Data are designed to serve FEMA's needs for disaster response activities, National Flood Insurance Program activities, risk assessment, and floodplain management.

Repetitive Loss Property

A property that is currently insured for which two or more National Flood Insurance Program losses (occurring more than ten days apart) of at least \$1,000 each have been paid within any 10 year period since 1978.

Risk

The estimated impact that a hazard would have on people, services, facilities, and structures in a community; the likelihood of a hazard event resulting in an adverse condition that causes injury or damage. Risk is often expressed in relative terms such as a high, moderate, or low likelihood of sustaining damage beyond a particular threshold due to a specific type of hazard event. It also can be expressed in terms of potential monetary losses associated with the intensity of the hazard.

Substantial Damage

Damage of any origin sustained by a structure in a Special Flood Hazard Area whereby the cost of restoring the structure to its before-damaged condition would equal or exceeds 50% of the market value of the structure before the damage.

Vulnerability

Describes how exposed or susceptible to damage an asset is. Vulnerability depends on an asset's construction, contents, and the economic value of its functions. Like indirect damages, the vulnerability of one element of the community is often related to the vulnerability of another. For example, many businesses depend on uninterrupted electrical power—if an electric substation is flooded, it will affect not only the substation itself, but a number of businesses as well. Often, indirect effects can be much more widespread and damaging than direct effects.

Vulnerability Analysis

The extent of injury and damage that may result from a hazard event of a given intensity in a given area. The vulnerability analysis should address impacts of hazard events on the existing and future built environment.

Vulnerable Populations

Any segment of the population that is more vulnerable to the effects of hazards because of things such as lack of mobility, sensitivity to environmental factors, or physical abilities. These populations can include, but are not limited to, senior citizens and school children.

Goals

General guidelines that explain what you want to achieve. Goals are usually broad statements with long-term perspective.

Objectives

Defined strategies or implementation steps intended to attain the identified goals. Objectives are specific, measurable, and have a defined time horizon.

Actions/Projects

Specific actions or projects that help achieve goals and objectives.

Implementation Strategy

A comprehensive strategy that describes how the mitigation actions will be implemented.

GENERAL HAZARD TERMS

Fujita Scale of Tornado Intensity

Rates tornadoes with numeric values from F0 to F5 based on tornado winds speed and damage sustained. An F0 indicates minimal damage such as broken tree limbs or signs, while an F5 indicates severe damage sustained.

Liquefaction

The phenomenon that occurs when ground shaking (earthquake) causes loose soils to lose strength and act like viscous fluid. Liquefaction causes two types of ground failure: lateral spread and loss of bearing strength.

Modified Mercalli Intensity Scale

The Modified Mercalli Intensity Scale is commonly used in the United States by seismologists seeking information on the severity of earthquake effects. Intensity ratings are expressed as Roman numerals between I at the low end and XII at the high end. The Intensity Scale differs from the Richter Magnitude Scale in that the effects of any one earthquake vary greatly from place to place, so there may be many Intensity values (e.g.: IV, VII) measured from one earthquake. Each earthquake, on the other hand, should have just one Magnitude, although the several methods of estimating it will yield slightly different values (e.g.: 6.1, 6.3).

Monsoon

A monsoon is any wind that reverses its direction seasonally. In the Southwestern U.S., for most of the year the winds blow from the west/northwest. Arizona is located on the fringe of the Mexican Monsoon which during the summer months turns the winds to a more south/southeast direction and brings moisture from the Pacific Ocean, Gulf of California, and Gulf of Mexico. This moisture often leads to thunderstorms in the higher mountains and Mogollon Rim, with air cooled from these storms often moving from the high country to the deserts, leading to further thunderstorm activity in the desert. A common misuse of the term monsoon is to refer to individual thunderstorms as monsoons.

Richter Magnitude Scale

A logarithmic scale devised by seismologist C.F. Richter in 1935 to express the total amount of energy released by an earthquake. While the scale has no upper limit, values are typically between 1 and 9, and each increase of 1 represents a 32-fold increase in released energy.

Appendix A

Official Resolution of Adoption

Appendix B

Planning Process Documentation

Memorandum

JE Fuller/ Hydrology & Geomorphology, Inc.

DATE: September 15, 2008

TO: All County Primary Points of Contact

FROM: W. Scott Ogden, P.E.



RE: County Multi-Jurisdictional, Multi-Hazard Mitigation Plan Updates
Planning Team Roles and Responsibilities

CC: Sue Wood (ADEM)
Dwight Nield (JEF)
file

JE Fuller/Hydrology & Geomorphology, Inc. (JEF) has been contracted by the Arizona Division of Emergency Management (ADEM) to assist your county and included incorporated communities in developing and/or updating your existing multi-hazard mitigation plan (MHMP) to a multi-jurisdictional multi-hazard mitigation plan (MJMHMP). The purpose of this memorandum is to explain the anticipated multi-jurisdictional planning process expectations and to clarify the county/community responsibilities and potential consequences of non-participation. This memo will also outline a list of items that need to be done by each county primary point of contact (PPOC) prior to the first meeting.

For all MHMP updates, ADEM is requiring that MJMHMPs (Plan or The Plan) be prepared for each Arizona county with the intention of streamlining and standardizing the planning across the state. This should also facilitate future updates and ease the burden of individual communities.

RESPONSIBILITIES

There will be two primary levels of responsibility regarding the planning process. The first is the PPOC and the second is the community representative(s). It is imperative that each understand their role and what is expected of them in the planning process. The following outlines the roles and responsibilities of each:

PPOC – the PPOC for The Plan and the planning team will be the County Emergency Manager or their official delegate. Throughout the planning process, the responsibilities of the PPOC will be:

- Contact, coordinate and organize the planning team
- Coordinate and follow-up with county representatives and incorporated communities regarding attendance and participation
- Organize and arrange for planning team meeting locations and facilities

Community Representatives – we understand that it will likely not be possible for all interested parties from each community to attend the planning team meetings, and that one or more may attend as a representative. The responsibilities of these individuals will be:

- Attend EVERY planning team meeting or make sure their community is represented otherwise. Each meeting will build on information discussed at the last meeting. Complete attendance is crucial.

- Convey information received at planning team meetings to the appropriate individuals within their community and vice-versa.
- Ensure that all requested homework is completed fully and returned to JEF on a timely basis.
- Arrange for official adoption of plan document, when appropriate.

PLEASE NOTE THE FOLLOWING:

******Failure to meet these responsibilities will result in removal from the planning process, exclusion from The Plan and federal disaster mitigation fund ineligibility. ******

This planning effort WILL NOT include individual meetings with local communities, as have been conducted in the past. Therefore, the planning team must function as the conduit for disseminating information and homework, and receiving completed plan components. ADEM and JEF have prepared the planning process to simplify and minimize the effort required, however, there are minimum requirements of the Disaster Mitigation Act of 2000 that must be satisfied to ensure the plan meets FEMA approval. Should issues or concerns arise, I strongly urge you to bring it to the attention of ADEM or JEF as early as possible as full participation is required of all jurisdictions wishing to be included in The Plan.

TENTATIVE PLANNING MEETING NEEDS

The following is a list of planning team meeting details we have at this point:

- Each meeting will be scheduled for a 4-hour time slot (8am-Noon, 1-5pm, or similar). Less time may be actually required depending on the efficiency of the planning team.
- At this point, we anticipate the need for at least 4 and probably 5 planning team meetings.
- At each meeting, homework will be assigned and received, with a detailed status check. JEF and ADEM will provide all planning handouts and materials.
- JEF will provide a laptop and projector and will only require a screen or white wall to project on.
- The county or communities are responsible for any refreshments (if desired).

INITIAL PLANNING TEAM FORMULATION

The following is a list of actions for the PPOC to accomplish prior to scheduling the first planning meeting:

1. Formulate the planning team (county and local level).
 - a. Contact all jurisdictions/tribes within your county boundaries to inform them of the planning effort and determine the point of contact(s) for each.
 - b. Contact county staff to participate
 - c. Contact others as desired (Flood Control Districts, Fire Districts, experts, etc.)
2. Provide an initial planning team list to JEF and ADEM
3. Choose a location for the planning team meetings
4. Provide at least three (3) meeting date/time options for the first meeting to JEF and ADEM.

Because our focus is on mitigation planning, it is important that the planning team be comprised of individuals that serve a planning and project management role as well as those involved in public safety and emergency management. The following is a recommended list of potential/typical departments and divisions that could be encouraged to attend:

- Public Works (county and local)
- Planning and Zoning (county and local)
- Flood Control Districts
- Fire Departments/Districts (county and local)
- Building Safety
- County and City Engineers
- Floodplain/Stormwater Management

Please review these responsibility and requirement guidelines and reply to JEF with any questions or concerns. We are looking forward to doing this next round of mitigation planning with you and look forward to you reply.

Memorandum **JE Fuller/ Hydrology & Geomorphology, Inc.**

MEETING DATE: December 3, 2008

MEETING TIME: 8:30AM – NOON

MEETING LOCATION: Mohave County Administration Building - Saguaro Rooms
Kingman, AZ

DISTRIBUTION: Meeting Attendees

FROM: W. Scott Ogden, P.E. - JEF

**RE: Mohave County Multi-Jurisdictional Multi-Hazard Mitigation Plan
Multi-Jurisdictional Planning Team Meeting No. 1**

ATTENDEES: Joe Anderson - Bullhead City Fire District
Bill Avery - Bullhead City
Christine Ballard - Mohave County
Chad Benson - BLM
Mark Chastain - City of Kingman Police Department
Kerry Christensen - Ecological Research Associates
W. Mark Clark - Lake Havasu City Public Works
Gary Cook – BLM
Liz Durst - Mohave County Emergency Management
Steve Harris - Bullhead City Emergency Management
Randy Johnson - Mohave County Sheriff's Office
Bill Johnston - City of Kingman Fire Department
Joe Mahoney - Hualapai Tribe – Peach Springs EMS
Brian Meldrum - Colorado City
W. Scott Ogden – JE Fuller
Ronald Quasula - Hualapai Nation Fire Department
Darrell Raburn - Fort Mohave Mesa Fire District
Jeff Sayre - Golden Valley Fire District
Jim Schnabel - Hualapai Nation Fire Department
Byron Steward - Mohave County Emergency Management
Shannon Summers - Mohave County Flood Control
Ed Tapia - City of Kingman Public Works Department
Susan Wood – ADEM
Zelda Wright - Mohave County Improvement Districts

AGENDA

- 1. GREETING**
- 2. MITIGATION PLANNING OVERVIEW**
- 3. INTRODUCTIONS**
- 4. PLANNING PROCESS**
 - a. MJ Planning Team Roles**

- b. Public Involvement Strategy
- 5. RISK ASSESSMENT
 - a. Hazard Identification / Profiling
 - b. Asset Inventory
- 6. OTHER DATA NEEDS
- 7. MEETING ENDING
 - a. Review of action items
 - b. Set next meeting date

DISCUSSION

Agenda Item 1:

- B. Steward gave a brief introduction and turned the meeting over to JEF and ADEM
- S. Ogden and S. Wood explained the role of JEF and ADEM.

Agenda Item 2:

- S. Ogden presented an overview / review of the mitigation process and purpose for preparing a mitigation plan. He also discussed the process of converting from a single plans to a true Multi-Jurisdictional plan.
- S. Ogden and S. Wood provided meeting folders and handouts to each participant and discussed the contents of those items.

Agenda Item 3:

- Introductions were made for each member of the multi-jurisdictional planning team (MJPT), wherein each team member shared their name, title, and their perceived role.

Agenda Item 4a:

- S. Ogden led a discussion / presentation of the MJPT roles and responsibilities.
- B. Steward was identified as the primary point of contact (PPOC) for the county and the MJPT as a whole.
- The community point of contacts (CPOC) were identified as follows:
 - o Unincorporated Mohave County – B. Steward
 - o City of Bullhead City – S. Harris
 - o City of Colorado City – TBD (B. Meldrum for interim)
 - o City of Kingman – B. Johnston
 - o City of Lake Havasu City – Mark Clark
 - o Hualapai Tribe – Kerry Christensen

Agenda Item 4b:

- S. Ogden and S. Wood led a discussion / presentation of the public involvement requirements of DMA2K.
- The MJPT discussed various options including newspaper notices, general public announcements, and web page postings.
- A decision was made to publish an announcement in the local newspaper and also to create a web page on the Mohave County website that will contain the same

announcement. Mohave County will take the lead in generating an announcement template and then distribute to the incorporated communities. Once the draft plan is ready, it will be posted to the website and a second newspaper announcement will be used.

- ADEM and JEF have developed template language (copies provided in meeting folder) for the county to use in the newspaper announcements. JEF will provide those to the MJPT via email
- M. Clark recommended adding a link to the current plan on the web notice.
- B. Steward will take responsibility for coordinating with the communities and getting the template notice developed, distributed, and published.

Agenda Item 5a:

- S. Ogden presented an overview of what a risk assessment includes.
- The MJPT reviewed the list of hazards previously evaluated in 2004 Mohave County Multi-Jurisdictional Hazard Mitigation Plan (2004 Plan) as well as a comprehensive list of hazards identified by the State of Arizona MHMP.
- S. Ogden presented the results of a historic hazard event search and database compilation performed by JEF that looks at declared and undeclared hazard events.
- The MJPT reviewed the hazard lists and historic records and discussed which hazards should be evaluated further. The following is a brief summary of that discussion:
 - The 2004 Plan included several human-caused hazards. The MJPT discussed whether or not the human-caused hazards should remain in the plan. The purpose of the plan was discussed and the MJPT jointly decided to remove all the human-caused hazards and focus the plan on natural hazards.
 - The MJPT discussed earthquake at length and wrestled with keeping or dropping the hazard from further consideration. Bullhead City and Colorado City expressed the most interest in keeping the hazard in the list, as they are the most vulnerable. It was decided that earthquake would remain on the list for now and the representatives from Bullhead City and Colorado City would talk with others in their cities to determine if there was support for keeping earthquake on the list.
 - The County is currently working on a Community Wildfire Protection Plan and is nearing completion. B. Steward confirmed that the draft JEF has is the latest copy available.
- The resulting list of hazards to be addressed is as follows:
 - Dam Failure
 - Drought
 - Earthquake
 - Flooding / Flash Flooding
 - Levee Failure
 - Thunderstorm / High Wind
 - Wildfire
- S. Ogden presented information regarding application and development of the Calculated Priority Risk Index (CPRI). The MJPT worked through an example using

a preformatted spreadsheet and a handout with guidance on selecting CPRI parameters. S. Ogden will send the CPRI spreadsheet to the POC for each jurisdiction for them to complete and get back to JEF.

Agenda Item 5b:

- S. Ogden presented an overview of the asset inventory portion of the vulnerability analysis and provided a handout detailing the types of data that potentially could be collected. Each community is requested to compile a list of the most critical data sets and provide to JEF for use in the vulnerability analysis.
- S. Ogden will send some template files for use by the communities in compiling the asset list.

Agenda Item 6:

- S. Ogden requested the following additional data from each community:
 - Latest General Plan or Comprehensive Plan
 - Latest Town/City boundaries
 - Known Future critical facility locations.

Agenda Item 7:

- Next meeting set for January 13, 2009 from 8:30am to Noon at the Mohave County Administrative Building (room TBD) in Kingman, AZ.

ACTION ITEMS:

1. B. Steward will take responsibility for coordinating with the communities and getting the template notice developed, distributed, and published.
2. JEF to provide Historic Hazard spreadsheets to MJPT members for review and augmentation if needed.
3. S. Harris and B. Meldrum will check with other respective city staff to determine if earthquake is a hazard they want to consider.
4. JEF to provide CPRI worksheet to each jurisdiction for completion prior to the next meeting.
5. JEF will provide template worksheets and GIS files for compiling the asset inventory lists.
6. Each jurisdiction shall provide:
 - a. Updates/revisions/additions to the Historic Hazard spreadsheets
 - b. Completed CPRI worksheet
 - c. Compilation of asset inventory data
 - d. Latest General Plan or Comprehensive Plan
 - e. Latest Town/City boundaries
 - f. Known Future critical facility locations.

HAZARD MITIGATION PLAN REVIEW
12-03-08

Name	Contact Number	Agency	Email
1. <u>Shannon Summers</u>	928 757 0925	Mohave County F.C.	Shannon.summers@co.mohave.az.us
2. <u>Byron Steward</u>	928-757-0930	Mohave Co. EMI	byron.steward@co.mohave.az.us
3. <u>Zelda Wright</u>	928-757-0914	Mohave County ID	zelda.wright@co.mohave.az.us
4. <u>Joe Anderson</u>	928-758-3971	Bullhead City Fire	asstchief@bullheadfire.org
5. <u>Darrell Rabuan</u>	928-768-9181	Fort Mojave Fire	PRAVANTION@FMMFD.ORG
6. <u>MARK CHASTAIN</u>	928-753-8151	KINGMAN P.D.	CHASTAIN@CITYOFKINGMAN.GOV
7. <u>Kerry Christensen</u>	928-767-2254	Hualapai	CUSCHMEN@jchd.com
8. <u>W. MARK CLARK</u>	(928) 453-6600	LAKE HAVASU CITY	CLARKM@LHC.AZ.GOV
9. <u>Randy Johnson</u>	928-453-0745	Mohave SO	Randy.Johnson@co.mohave.az.us
10. <u>Jim Schnabel</u>	928 769 2205	Hualapai Nation Fire Dept.	Schnabel72@gmail.com
11. <u>Joe Mahoney</u>	928-769-2656	Peach Springs EMS	joseph.r.mahoney@gmail.com
12. <u>Ronald Quasula</u>	928-769-2205	HUALAPAI FIRE	
13. <u>CHAD BENSON</u>	928-718-3750	BLM	chad-benson@blm.gov
14. <u>Gary Cook</u>	928-718-3745	BLM	gary-cook@blm.gov
15. <u>Brian Melhorn</u>	928-875-2400	Colorado City	brian@cccd.org
16. <u>Jeff Sayre</u>	928/565-3479	GOLDEN VALLEY FIRE	SayreJ@gvfdaz.com
17. <u>Bill Johnston</u>	928/753-2891	KINGMAN FIRE	BJOHNSTON@CITYOFKINGMAN.GOV
18. <u>Ed Tapiq</u>	928/692-3102	KINGMAN Public Works	etapiq@CityofKingman.GOV
19. <u>Steve Harris</u>	928/542-3771	BHC/OEM	sharris@bullheadcity.com
20. <u>Bill Avery</u>	928 763-0128	BHC	bavery@bullheadcity.com

21. Christine Ballard 928-757-0903 County ^{christine.ballard@}
^{maricopa.gov} co.maricopa.az.us

22. Liz DURST 928 757 0930 EM LIZ.DURST@CO.MARICOPA.AZ.US

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Memorandum **JE Fuller/ Hydrology & Geomorphology, Inc.**

MEETING DATE: January 13, 2009

MEETING TIME: 8:30AM – NOON

MEETING LOCATION: Mohave County Administration Building - Senita Room
Kingman, AZ

DISTRIBUTION: Meeting Attendees

FROM: W. Scott Ogden, P.E. - JEF

**RE: Mohave County Multi-Jurisdictional Multi-Hazard Mitigation Plan
Multi-Jurisdictional Planning Team Meeting No. 1**

ATTENDEES: Bill Avery - Bullhead City
Rosie Blanco – Mohave County CERT
Mike Browning – Mohave County Emergency Management
Liz Durst - Mohave County Emergency Management
Steve Harris - Bullhead City Emergency Management
Bill Johnston - City of Kingman Fire Department
Brian Meldrum - Colorado City
Dennis Mueller – Lake Havasu City Fire Department
W. Scott Ogden – JE Fuller
Darrell Raburn - Fort Mojave Mesa Fire District
Byron Steward - Mohave County Emergency Management
Shannon Summers - Mohave County Flood Control
Susan Wood – ADEM

AGENDA

- 1. STATUS REVIEW**
- 2. HAZARD PROFILE MAPS**
- 3. REPETITIVE LOSS PROPERTIES**
- 4. CAPABILITY ASSESSMENT**
- 5. PLAN MAINTENANCE STRATEGY**
- 6. MEETING ENDING**
 - a. Review of action items**
 - b. Set next meeting date**

DISCUSSION

Agenda Item 1:

- S. Ogden reviewed the status of Action Items from previous meeting, which are summarized as follows:
 - o AI1 – B. Steward will take responsibility for coordinating with the communities and getting the public notice template developed, distributed, and published
STATUS – In Progress
 - o AI2 – JEF to provide Historic Hazard spreadsheets to MJPT members for review and augmentation if needed.
STATUS – Sent by email on December 9th. No feedback received to-date
 - o AI3 – S. Harris and B. Meldrum will check with other respective city staff to determine if earthquake is a hazard they want to consider.
STATUS – Both jurisdictions would like to keep earthquake as a hazard.
 - o AI4 – JEF to provide CPRI worksheet to each jurisdiction for completion prior to the next meeting.
STATUS - JEF emailed worksheets on Dec 9th. As of the meeting date, Bullhead City, Colorado City, and Mohave County have completed the worksheet. Still need Kingman, Lake Havasu City, and Hualapai Tribe.
 - o AI5 – JEF will provide template worksheets and GIS files for compiling the asset inventory lists.
STATUS – JEF sent the worksheets and GIS files via email on Dec 9th. As of the meeting date, JEF has received an initial submittal from the county and an initial contact from Kingman. S. Summers will take responsibility for getting the replacement costs added to the county data set and provide to JEF by the end of the month. JEF will then divide and distribute list to appropriate jurisdictions for review and/or augmentation.
 - o AI6a – Each Community to provide latest General Plan or Comprehensive Plan; Latest Town/City boundaries; Known Future critical facility locations.
STATUS – As of the meeting date, General/Comp Plans were acquired for Mohave County, Kingman and Lake Havasu City. Still need Bullhead City, Colorado City, and Hualapai IT. After some discussion, it was decided that S. Summers or B. Steward will provide the town/city coverage the county has and JEF will send plots to each CPOC for verification.
 - o AI6b – Each Community to provide latest Town/City boundaries.
STATUS – As of the meeting date none had been received.
 - o AI6c – Each Community to provide known future critical facility locations.
STATUS – As of the meeting date none had been received

Agenda Item 2:

- The MJPT discussed mapping elements for profiling each of the hazards identified for review and discussion. The following summarizes the main discussion items.
 - Data Cut-Off date – the MJPT agreed to set the cut-off date for new data at February 1, 2009.
 - Dam Failure – the county has inundation limits for the Colorado River prepared by the Bureau of Reclamation (BOR) dated 2006. B. Steward will provide to JEF.
 - Drought – use the AzGTF latest long-term and short-term maps as of cut-off date.
 - Earthquake – Colorado City and Bullhead City will include earthquake.
 - Flooding/Flash Flooding – S. Summers will send the latest FEMA DFIRM data. Data is to marked as draft on all maps and discussions since it has not been officially accepted by the county.
 - Levee Failure – M. Brown has a report that discusses BOR levees along the Colorado River. M. Brown will write up a couple of paragraphs describing the Colorado River levee conditions. S. Summer will forward a list of levees known to the county.
 - Thunderstorm / High Wind – produce a map showing historic locations and magnitudes as available from the NCDC.
 - Wildfire – Use the coverage provided by the Arizona State Forester’s Office with a cross-check back to the community wildfire protection plan currently underway.

Agenda Item 3:

- S. Ogden presented a spreadsheet obtained from ADWR listing the Repetitive Loss properties for the county. The location of the properties was discussed. S. Summers thought that a couple of the structures had already been mitigated and was not sure about the others. S. Ogden will send the spreadsheet to S. Summers for her review and comment.

Agenda Item 4:

- S. Ogden led a discussion / presentation of the need and purpose for performing a capability assessment, including the tables and formats that will appear in the plan.
- S. Ogden will provide template tables for each community to complete.

Agenda Item 5:

- S. Ogden presented an overview of plan maintenance elements required by DMA2K.
- The MJPT discussed past plan maintenance activities. In general, some level of plan maintenance was performed with the county leading the effort. B. Steward would send out an email to all communities soliciting comments or review considerations.

Most of the reviews centered on the list of mitigation actions/projects. In the 2008 review, B. Steward forwarded an a letter to ADEM with a summary of the review and a list of added projects.

- No significant response was received from any of the other jurisdictions. Reasons given were primarily due to changes in staff, dealing with the tremendous growth that occurred during the last 4 years, and simply not taking the time to do the maintenance activities.
- The MJPT discussed how to ensure that maintenance happens in the future. Ideas included:
 - Working with ADEM to develop a template memorandum that could be submitted to the state on an annual basis. This would provide another level of accountability.
- The MJPT brainstormed ways to satisfy the requirement for continued public involvement and came up with the following:
 - Board of Supervisor / Town-City Council presentations
 - Post review memorandums/documents to the web at the same location where the plan will reside
 - Do a public notice in the local newspaper informing the community where to find the review postings
 - Coordinate through LEPC meetings, which are usually held on a quarterly basis.
- S. Ogden will draft up a Plan Maintenance Section that reflects the discussions and provide to the MJPT for review and comment

Agenda Item 6:

- It is noted that the following jurisdictions were not represented at this meeting:
 - Hualupai Indian Tribe – No contact
- Next Meeting will be February 18, 2009 from 8:30 – Noon at the Mohave County Sheriff's Office.

ACTION ITEMS:

1. Each community needs to finalize the asset inventory and CPRI worksheets and provide to JEF by the end of the January.
2. S. Summers will finalize the county's asset inventory data set and provided to JEF. JEF will divide up the asset inventory list and provide to each community for editing, completing, or revising.
3. S. Summers or B. Steward will provide a shapefile with city limits. JEF will generate check-plots for distribution to each jurisdiction for verification.
4. B. Steward will provide BOR Colorado River dam failure maps to JEF

5. S. Summers will provide the most current set of FEMA DFIRM data to JEF.
6. M. Brown will provide a brief write-up of the levee conditions along the Colorado River.
7. S. Summer will forward a levee list to JEF.
8. JEF will send list of repetitive loss properties to S. Summers for review and comment.
9. JEF will forward a template document for use by each jurisdiction to generate a capability assessment.

Name	Jurisdiction/Agency/Organization	Department/Division/Branch	Title	Office Phone	Cell Phone	E-Mail Address
Joe Anderson	Bullhead City Fire District	Bullhead City Fire Department		928-758-3971		asstchief@bullheadfire.org
Bill Avery 	Bullhead City	ENGINEERING	Civil Engineering	928-763-0128	(928) 542-0531	bavery@bullheadcity.com
Christine Ballard	Mohave County			928-757-0903		christine.ballard@co.mohave.az.us
Chad Benson	U.S. Department of the Interior	Bureau of Land Management		928-718-3750		chad_benson@blm.gov
Mark Chastain	City of Kingman	Police Department		928-753-8151		mchastain@cityofkingman.gov
Kerry Christensen	Ecological Research Associates			928-769-2254	928-565-0275	cuszhman@yahoo.com
W. Mark Clark 	Lake Havasu City	Public Works Department	Public Works Director	928-453-6660		clarkm@lhcaz.gov
Gary Cook	U.S. Department of the Interior	Bureau of Land Management		928-718-3745		gary_cook@blm.gov
Liz Durst	Mohave County	Public Works Department - Emergency Management Division	Office Assistant	928-757-0930		liz.durst@co.mohave.az.us
Steve Harris	Bullhead City	Office of Emergency Management	Emergency Services Coord.	928-542-3771		sharris@bullheadcity.com
Randy Johnson	Mohave County	Sheriff's Office		928-453-0745		randy.johnson@co.mohave.az.us
Bill Johnston 	City of Kingman	Fire Department	Battalion Chief	928-753-2891	928-727-6524	bjohnston@cityofkingman.gov
Joe Mahoney	Hualapai Tribe	Peach Springs EMS		928-769-2656		joseph.r.mahoney@gmail.com
Brian Meldrum 	Colorado City		Dep. Emergency Manager	928-875-2400		brian@hccfd.org
W. Scott Ogden	JE Fuller/ Hydrology & Geomorphology, Inc.		Project Manager	480-222-5717	480-299-3394	scott@jefuller.com
Ronald Quasula	Hualapai Tribe	Hualapai Nation Fire Department	Chief	928-769-2205		
Darrell Raburn 	Fort Mohave Mesa Fire District	Fort Mohave Mesa Fire Department	Fire Marshal	928-768-9181		prevention@fmmfd.org
Jeff Sayre	Golden Valley Fire District	Golden Valley Fire Department		928-565-3479		sayrej@gvfdaz.com
Jim Schnabel	Hualapai Tribe	Hualapai Nation Fire Department		928-769-2205		schnabel72@gmail.com
Byron Steward	Mohave County	Public Works Department - Emergency Management Division	Emergency Management Coordinator	928-757-0930		byron.steward@co.mohave.az.us
Shannon Summers	Mohave County	Public Works Department - Flood Control Division	Flood Control Technical Supervisor	928-757-0925	928-715-1531	shannon.summers@co.mohave.az.us
Ed Tapia	City of Kingman	Public Works Department		928-692-3102		etapia@cityofkingman.gov
Sue Wood	State of Arizona	Department of Emergency and Military Affairs - Division of Emergency Management	State/Local Mitigation Program Manager	602-392-7518		susan.wood@azdema.gov
Zelda Wright	Mohave County	Public Works Department - Improvement Districts Division	Improvement District Supervisor	928-757-0914		zelda.wright@co.mohave.az.us
Dennis Mueller	LAKE HAVASU CITY FIRE DIST.	Fire Dept. / Emergency Mgt.		928-855-1141	928-486-4729	muellerd@lhcaz.gov
Mike Browning 	Mohave County	Emergency Management	Emergency Coord.	928-757-0930		mike.browning@co.mohave.az.us



[illegible]

Memorandum **JE Fuller/ Hydrology & Geomorphology, Inc.**

MEETING DATE: February 18, 2009

MEETING TIME: 8:30AM – NOON

MEETING LOCATION: Mohave County Sheriff's Office - Training Room
Kingman, AZ

DISTRIBUTION: Meeting Attendees

FROM: W. Scott Ogden, P.E. - JEF

**RE: Mohave County Multi-Jurisdictional Multi-Hazard Mitigation Plan
Multi-Jurisdictional Planning Team Meeting No. 3**

ATTENDEES: Bill Avery - Bullhead City
Mike Browning – Mohave County Emergency Management
Liz Durst - Mohave County Emergency Management
Steve Harris - Bullhead City Emergency Management
Bill Johnston - City of Kingman Fire Department
Brian Meldrum - Colorado City
Dennis Mueller – Lake Havasu City Fire Department
W. Scott Ogden – JE Fuller
Jeff Sayre – Golden Valley Fire District
Jim Schnabel – Hualapai Nation Fire Department
Byron Steward - Mohave County Emergency Management
Shannon Summers - Mohave County Flood Control

AGENDA

- 1. STATUS REVIEW**
- 2. LOCAL PLANNING TEAM DOCUMENTATION**
- 3. HAZARD PROFILE REVIEW**
- 4. GOALS & OBJECTIVES REVIEW/UPDATE**
- 5. EXISTING MITIGATION ACTIONS/PROJECTS EVALUATION**
- 6. NFIP COMPLIANCE**
- 7. MEETING ENDING**
 - a. Review of homework assignments**
 - b. Set next meeting date**

DISCUSSION

Agenda Item 1:

- S. Ogden reviewed the status of Action Items from previous meeting, which are summarized as follows:
 - o AI1 – Each community needs to finalize the asset inventory and CPRI worksheets and provide to JEF by the end of the January.
STATUS: CPRI NOT Received – Kingman, Lake Havasu City, Hualapai Tribe. Asset Inventory – In progress.
 - o AI2 – S. Summers will finalize the county’s asset inventory data set and provide to JEF. JEF will divide up the asset inventory list and provide to each community for editing, completing, or revising.
STATUS: In Progress
 - o AI3 – S. Summers or B. Steward will provide a shapefile with city limits. JEF will generate check-plots for distribution to each jurisdiction for verification.
STATUS: Done (individual plots emailed on 2/16/09 – Kingman provided own shapefile). All communities verified that limits shown were correct.
 - o AI4 – B. Steward will provide BOR Colorado River dam failure maps to JEF.
STATUS: Done – uploaded to JEF ftp site.
 - o AI5 – S. Summers will provide the most current set of FEMA DFIRM data to JEF.
STATUS: Done – uploaded to JEF ftp site.
 - o AI6 – M. Brown will provide a brief write-up of the levee conditions along the Colorado River.
STATUS: Done – emailed 1/16/09
 - o AI7 – S. Summer will forward a levee list to JEF.
STATUS: Pending
 - o AI8 – JEF will send list of repetitive loss properties to S. Summers for review and comment.
STATUS: List sent by JEF via email on 1/15/09. Response by S. Summers on 1/16/09.
 - o AI8 – JEF will forward a template document for use by each jurisdiction to generate a capability assessment.
STATUS: Template sent on 1/28/09. Kingman had provided information and Lake Havasu City provided info at meeting.
 - o PUBLIC INVOLVEMENT – B. Steward was working to get website posting on-line and a template public notice out to the team members.

Agenda Item 2:

- S. Ogden presented data needs for identification of the Local Planning Team members in the updated plan. S. Ogden will send out a template file for each CPOC to fill in and send back.

Agenda Item 3:

- S. Ogden presented map data for several hazards. The following summarizes the main discussion items.
 - o Dam Failure – S. Ogden formally contacted the Bureau of Reclamation (BOR) to request shapefiles for the 2006 Colorado River dam failure inundation limits. The BOR denied the request citing that the data was sensitive and not for public distribution. The planning team discussed the differences between the 2001 limits (which JEF has shapefiles for) and the 2006 limits, noting that the 2001 limits map a slightly larger area. The MJPT decided to conservatively use the 2001 inundation limits for the vulnerability assessment.
 - o Flooding/Flash Flooding – S. Summers stated that the more updated FEMA DFIRM data may be available in a couple of weeks, although it will still be preliminary. S. Ogden will contact S. Summers for any last minute updates prior to performing the vulnerability analysis (VA).
 - o Levee Failure – S. Summer will forward a list of levees known to the county.
 - o Wildfire – S. Ogden presented the coverage provided by the Arizona State Forester's Office in comparison to the risk presented in the Mohave County CWPP. The following were noted:
 - The CWPP does not cover the whole county
 - The Hualapai Tribe may have a coverage that depicts the hazard risk for the reservation. J. Schnabel will provide that coverage to S. Ogden within two weeks.
 - The statewide coverage and the CWPP coverage generally agree with exceptions in a few areas.
 - The MJPT concluded that a blending of the three data sets should be used.

Agenda Item 4:

- S. Ogden provided copies of the current plan goals and the current State plan goals. Each list was reviewed and the following are noted:
 - o All goals pertaining to human-caused hazards will need to be dropped.
 - o When comparing the current list of goals to the those developed by the state, the MJPT unanimously concluded that the state goals were cleaner and more adequately encompassed the goals of the MJPT regarding hazard mitigation.

Agenda Item 5:

- S. Ogden presented a procedure and template table to be used for performing an evaluation and review of the current plan's mitigation actions/projects.
- S. Ogden will send out the worksheet for each community to fill out and return. Worksheets will be due prior to next meeting.

Agenda Item 6:

- S. Ogden presented the new regulations requiring a discussion of NFIP participation and compliance for each community.
- S. Ogden presented a table summarizing the following NFIP statistics for each community:
 - NFIP identification number, date of entry into NFIP, current effective map date, number of FIS policies, and the gross insured amount.
- The MJPT was encouraged to begin thinking about a mitigation action/project that would address NFIP compliance.

Agenda Item 7:

- Next Meeting will be April 8, 2009 from 8:30 – Noon at the Mohave County Sheriff's Office.
- Supplemental Hualapai planning meeting is tentatively scheduled for April 7, 2009 from 9am to Noon at Peach Springs, AZ. Meeting place TBD.

ACTION ITEMS:

1. Each community needs to finalize the CPRI, capability assessment, and local planning team worksheets, and provide to JEF prior to the next meeting.
2. JEF will divide up the asset inventory list and provide to each community for editing, completing, or revising.
3. J. Schnabel will provide a wildfire hazard profile coverage for the Hualapai Nation boundaries that will be divided into "high", "medium", and "low" polygons by March 7, 2009.
4. JEF to send current plan mitigation actions/projects assessment worksheet to each community for completion and return by next meeting date.

Name	Jurisdiction/Agency/Organization	Department/Division/Branch	Title	Office Phone	Cell Phone	E-Mail Address
Joe Anderson	Bullhead City Fire District	Bullhead City Fire Department		928-758-3971		asstchief@bullheadfire.org
Bill Avery	Bullhead City	Engineering	Civil Engineering Associate	928-763-0128	928-542-0531	bavery@bullheadcity.com
Christine Ballard	Mohave County			928-757-0903		christine.ballard@co.mohave.az.us
Chad Benson	U.S. Department of the Interior	Bureau of Land Management		928-718-3750		chad_benson@blm.gov
Rosie Blanco	CERT		Volunteer	928-565-1696	928-715-5839	rosieblanco@hotmail.com
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Mark Chastain	City of Kingman	Police Department		928-753-8151		mchastain@cityofkingman.gov
Kerry Christensen	Ecological Research Associates			928-769-2254	928-565-0275	cuszhman@yahoo.com
W. Mark Clark	Lake Havasu City	Public Works Department	Public Works Director	928-453-6660		clarkm@lhcaz.gov
Gary Cook	U.S. Department of the Interior	Bureau of Land Management		928-718-3745		gary_cook@blm.gov
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Brian Meldrum	Colorado City		Deputy Emergency Manager	928-875-2400		brian@hccfd.org
Dennis Mueller	Lake Havasu City	Fire Department		928-855-1141	928-486-4729	muellerd@lhcaz.gov
W. Scott Ogden	JE Fuller/ Hydrology & Geomorphology, Inc.		Project Manager	480-222-5717	480-299-3394	scott@jefuller.com
Ronald Quasula	Hualapai Tribe	Hualapai Nation Fire Department	Chief	928-769-2205		
Darrell Raburn	Fort Mojave Mesa Fire District	Fort Mojave Mesa Fire Department	Fire Marshal	928-768-9181		prevention@fmmfd.org
Jeff Sayre	Golden Valley Fire District	Golden Valley Fire Department		928-565-3479		sayrej@gvfdaz.com
Jim Schnabel	Hualapai Tribe	Hualapai Nation Fire Department		928-769-2205		schnabel72@gmail.com
Byron Steward	Mohave County	Public Works Department - Emergency Management Division	Emergency Management Coordinator	928-757-0930		byron.steward@co.mohave.az.us
Shannon Summers	Mohave County	Public Works Department - Flood Control Division	Flood Control Technical Supervisor	928-757-0925		shannon.summers@co.mohave.az.us
Ed Tapia	City of Kingman	Public Works Department		928-692-3102		etapia@cityofkingman.gov



Memorandum **JE Fuller/ Hydrology & Geomorphology, Inc.**

MEETING DATE: April 29, 2009

MEETING TIME: 8:30AM – NOON

MEETING LOCATION: Mohave County Sheriff's Office - Training Room
Kingman, AZ

DISTRIBUTION: Meeting Attendees

FROM: W. Scott Ogden, P.E. - JEF

**RE: Mohave County Multi-Jurisdictional Multi-Hazard Mitigation Plan
Multi-Jurisdictional Planning Team Meeting No. 3**

ATTENDEES: Liz Durst - Mohave County Emergency Management
Steve Harris - Bullhead City Emergency Management
Bill Johnston - City of Kingman Fire Department
Brian Meldrum - Colorado City
Dennis Mueller – Lake Havasu City Fire Department
W. Scott Ogden – JE Fuller
Byron Steward - Mohave County Emergency Management
Shannon Summers - Mohave County Flood Control

No Show: Hualapai Tribal Nation

AGENDA

1. STATUS REVIEW
2. VA RESULTS REVIEW
3. PAST MITIGATION ACTIVITY UPDATE
4. MITIGATION ACTIONS/PROJECTS
5. IMPLEMENTATION STRATEGY
6. NFIP COMPLIANCE ACTION/PROJECT BRAINSTORM
7. MEETING ENDING
 - a. Review of homework assignments

DISCUSSION

Agenda Item 1:

- S. Ogden handed out a graphic depicting the status of all homework assignments and item was discussed to determine status.
 - o S. Ogden requested each community to provide digital logos
 - o B. Steward and B. Meldrum requested that JEF resend the Existing Mitigation Action/Project Assessment worksheets as they did could not find them.

- o The County a press release on 3/2/09 and posted an announcement to their website that same day. No papers published the press release, although one did call B. Steward to ask him a few questions about it.
- o S. Ogden reiterated the need to complete the Existing Mitigation Action/Project Assessment worksheets and they will feed into developing the new list of A/Ps.

Agenda Item 2:

- S. Ogden presented the results of the vulnerability assessment for the dam failure, levee failure, flood, earthquake, and wildfire hazards. He reviewed the base data, the process, and summary tables. The following are highlights of the discussion:
 - o The MJPT noted that the exposure and loss estimates for the wildfire were exceedingly high. S. Ogden explained that this was due to the CWPP hazard coverage chosen for use by the MJPT, which showed significant portions of the urbanized areas to be “high” hazards. The CWPP layer chosen for use by the MJPT included an assessment of structure risk already, which lead to the high hazard. S. Ogden recommended the MJPT use the fuels based hazard coverage for this plan and the MJPT agreed. JEF will revise the wildfire part of the VA.
 - o The MJPT chose to add Extreme Heat back into the list of hazards.
- S. Ogden will make the modifications to the wildfire coverage and re-run the VA. The updated results will be included in the draft plan.

Agenda Item 3:

- The MJPT reviewed Table 7.9 in the existing plan and discussed updating the data.
- S. Ogden provided a template worksheet for each community to complete and return to JEF with updated information.

Agenda Item 4:

- S. Ogden presented a general discussion on types and classifications of mitigation actions/projects.
- S. Ogden provided a template worksheet for summarizing new mitigation A/Ps and reviewed a couple of examples.
- S. Ogden will distribute a worksheet that will include the any projects identified as “Keep” or “Revise” in the existing mitigation A/P assessment plus blank spaces for new projects.

Agenda Item 5:

- S. Ogden discussed the implementation strategy requirements and reviewed a template worksheet with example mitigation A/Ps.
- The MJPT reviewed the current plan tool for evaluating and ranking the mitigation A/Ps (STAPLEE Method). S. Ogden presented the methodology used by the State of Arizona in the 2007 plan, wherein:

- Each mitigation A/P was evaluated based on the following factors:
 - Cost versus benefit
 - Direct impact on life and/or property
 - Long-term effectiveness as a solution
- Each A/P was assigned an importance rating of either “High”, “Medium”, or “Low” as it pertained to satisfying each of the three evaluation criteria.
- After some discussion, the MJPT chose to use the simpler methodology noted in the State Plan. Discretion was given to the MJPT to decide on how to assign the rankings (i.e. – either by simple vote or some point system). Each individual community will rank their own projects and report back to JEF on what methodology they used.
- The remainder of the implementation strategy elements will also be completed for each A/P on the worksheet provided, and sent back to JEF.

Agenda Item 6:

- S. Ogden led the MJPT through a brainstorming session to develop a mitigation A/P that addresses the NFIP compliance requirement.

Agenda Item 7:

- S. Ogden reiterated the homework assignments and the need to complete the outstanding tasks.
- JEF will be meeting with the Hualapai Tribal Nation in the future to finish their data collection.
- Once all items are received, JEF will deliver a draft of the plan to the MJPT for review and comment.

ACTION ITEMS:

1. JEF will send out template files for the Past Mitigation Activity summary and the new mitigation A/P and implementation strategy worksheet.
2. All jurisdictions are to work at completing the outstanding planning elements.

Name	Jurisdiction/Agency/Organization	Department/Division/Branch	Title	Office Phone	Cell Phone	E-Mail Address
Joe Anderson	Bullhead City Fire District	Bullhead City Fire Department		928-758-3971		asstchief@bullheadfire.org
Bill Avery	Bullhead City	Engineering	Civil Engineering Associate	928-763-0128	928-542-0531	bavery@bullheadcity.com
Christine Ballard	Mohave County			928-757-0903		christine.ballard@co.mohave.az.us
Chad Benson	U.S. Department of the Interior	Bureau of Land Management		928-718-3750		chad_benson@blm.gov
Rosie Blanco	CERT		Volunteer	928-565-1696	928-715-5839	rosieblanco@hotmail.com
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Mark Chastain	City of Kingman	Police Department		928-753-8151		mchastain@cityofkingman.gov
Kerry Christensen	Ecological Research Associates			928-769-2254	928-565-0275	cuszhman@yahoo.com
W. Mark Clark	Lake Havasu City	Public Works Department	Public Works Director	928-453-6660		clarkm@lhcaz.gov
Gary Cook	U.S. Department of the Interior	Bureau of Land Management		928-718-3745		gary_cook@blm.gov
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Dennis Mueller	Lake Havasu City	Fire Department		928-855-1141	928-486-4729	muellerd@lhcaz.gov
W. Scott Ogden	JE Fuller/ Hydrology & Geomorphology, Inc.		Project Manager	480-222-5717	480-299-3394	scott@jefuller.com
Ronald Quasula	Hualapai Tribe	Hualapai Nation Fire Department	Chief	928-769-2205		
Darrell Raburn	Fort Mojave Mesa Fire District	Fort Mojave Mesa Fire Department	Fire Marshal	928-768-9181		prevention@fmmfd.org
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Byron Steward	Mohave County	Public Works Department - Emergency Management Division	Emergency Management Coordinator	928-757-0930		byron.steward@co.mohave.az.us
Shannon Summers	Mohave County	Public Works Department - Flood Control Division	Flood Control Technical Supervisor	928-757-0925		shannon.summers@co.mohave.az.us
Ed Tapia	City of Kingman	Public Works Department		928-692-3102		etapia@cityofkingman.gov



Memorandum **JE Fuller/ Hydrology & Geomorphology, Inc.**

MEETING DATE: April 19, 2010

MEETING TIME: 1:00PM – 3:00PM

MEETING LOCATION: Mohave County Public Works Department
Kingman, AZ

DISTRIBUTION: Meeting Attendees

FROM: W. Scott Ogden, P.E. - JEF

RE: Mohave County Multi-Jurisdictional Multi-Hazard Mitigation Plan

ATTENDEES: Bill Avery – Bullhead City Engineering
Vince Corazza – Bullhead City Engineering
Dennis Mueller – Lake Havasu City Fire Department
Byron Steward - Mohave County Emergency Management
Shannon Summers - Mohave County Flood Control
W. Scott Ogden – JEF

No Show Communities: Colorado City and Kingman

AGENDA

1. STATUS REVIEW
 - a. Task Assignment Review and Discussion
 - i. PI Website Posting
 - ii. Prior Mitigation Activity Sheet
 - iii. New Mitigation A/Ps and Implementation Strategy Discussion
2. PLAN MAINTENANCE DISCUSSIONS
 - a. Plan Integration Discussion
 - b. Continuing Public Involvement Discussion
3. FINAL SCHEDULE
4. MEETING ENDING
 - a. Review of task assignments

DISCUSSION

Agenda Item 1:

- Steve Harris is no longer with Bullhead City and the new emergency manager for the City is Brian Williamson. B. Avery will continue to assist.
- S. Ogden handed out a graphic depicting the status of all task assignments and outstanding items were discussed to determine status and provide clarification or additional discussion on each topic as needed. A copy of the status sheet is attached hereto.
 - **PI Website Posting** – B. Avery noted that Bullhead City lost their GIS/IT person and that is probably why the notice never got posted to the web. Bullhead City and Lake Havasu City will both get a web page notice up and running similar to what Kingman has.
 - **Prior Mitigation Activity** – S. Ogden reiterated the purpose of this table and the value of filling it out. He also noted that it was not a requirement for FEMA approval.
 - **Updated Mitigation A/P and Implementation Strategy** – Since some of the jurisdictions had not completed this, S. Ogden reiterated the purpose of the table and clarified the relationship between this table and the Existing Mitigation A/P Assessments. He re-explained each element and what should be provided.

Agenda Item 2:

- S. Ogden handed out draft Sections 7.3 (Incorporation Into Existing Planning Mechanisms) and a modified version of the legal and regulatory tool table (Table 6-1-xx) to each jurisdiction. He explained past FEMA comments on this section of the plan and the need to provide additional and more specific data to help meet the DMA2K requirements. The Planning Team reviewed the draft section text and discussed. For the most part, the mitigation plan will be incorporated or referenced by the general and comprehensive plans and possibly the emergency operations plan, as appropriate. No other changes or additions were offered by the Planning Team.
- S. Ogden handed out a draft of Section 7.4 (Continuing Public Involvement) and asked the Planning Team to read. Based on past FEMA comments, S. Ogden led a discussion on more specific ways to accomplish the goal of this section. The Planning Team refined the items originally defined in Meeting No. 2 to add more detail regarding responsibilities and schedules for the activities.

Agenda Item 3:

- S. Ogden presented the following schedule for the finalization of the Plan.
 - May 3rd - All task assignments due by COB
 - May 17th - Draft Plan to ADEM and Planning Team for review
 - June 3rd – ADEM/Planning Team Comments Due
 - June 10th – Plan Submitted to FEMA

ACTION ITEMS:

1. JEF to send out a final email with templates and documents that need completing, to each jurisdiction
2. All jurisdictions must complete the outstanding planning elements and deliver to JEF by no later than COB on April 26th.

Jurisdiction	PI Website Posting	PI Newspaper Notice/Article	CPRI	Local Team List	Mitigation Hazard List	Jurisdictional Boundary Confirmation	Logo
Mohave County (Uninc)	Received	Received	Received	Not Received	Received	Received	Received
Bullhead City	Not Received	Received	Received	Received	Received	Received	Received
Colorado City	Not Received	Received	Received	Received	Received	Received	Received
Kingman	Received	Received	Received	Received	Received	Received	Received
Lake Havasu City	Not Received	Received	Received	Received	Received	Received	Received
Hualapai Tribal Nation	Not Received	Received	Not Received	Not Received	Not Received	Received	Not Received
Jurisdiction	Asset Inventory	Capability Assessment	Ex Mitigation A/P Assmt	Prior Mitigation Activity	Updated Mitigation A/P and Implementation Strategy	Capability Assessment - First Table, 3rd Column Addition	Section 7.4 Additions
Mohave County (Uninc)	Received	Received	Received	Received	Received	Not Received	Not Received
Bullhead City	Received	Received	Received	Not Received	Not Received	Not Received	Not Received
Colorado City	Received	Not Received	Not Received	Not Received	Not Received	Not Received	Not Received
Kingman	Received	Not Received	Received	Not Received	Received	Not Received	Not Received
Lake Havasu City	Received	Received	Received	Not Received	Not Received	Not Received	Not Received
Hualapai Tribal Nation	Partially Complete	Not Received	Not Received	Not Received	Not Received	Not Received	Not Received

Name	Jurisdiction/Agency/Organization	Department/Division/Branch	Title	Office Phone	Cell Phone	E-Mail Address
Joe Anderson	Bullhead City Fire District	Bullhead City Fire Department		928-758-3971		asstchief@bullheadfire.org
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W. Mark Clark	Lake Havasu City	Public Works Department	Public Works Director	928-453-6660		clarkm@lhcaz.gov
Gary Cook	U.S. Department of the Interior	Bureau of Land Management		928-718-3745		gary_cook@blm.gov
Liz Durst	Mohave County	Public Works Department - Emergency Management Division	Office Assistant	928-757-0930		liz.durst@co.mohave.az.us
Steve Harris	Bullhead City	Office of Emergency Management	Emergency Services Coordinator	928-542-3771		sharris@bullheadcity.com
Randy Johnson	Mohave County	Sheriff's Office		928-453-0745		randy.johnson@co.mohave.az.us
Bill Johnston	City of Kingman	Fire Department	Battalion Chief	928-753-2891		bjohnston@cityofkingman.gov
Joe Mahoney	Hualapai Tribe	Peach Springs EMS		928-769-2656		joseph.r.mahoney@gmail.com
Brian Meldrum	Colorado City		Deputy Emergency Manager	928-875-2400		brian@hccfd.org
Dennis Mueller	Lake Havasu City	Fire Department		928-855-1141	928-486-4729	muellerd@lhcaz.gov
W. Scott Ogden	JE Fuller/ Hydrology & Geomorphology, Inc.		Project Manager	480-222-5717	480-299-3394	scott@jefuller.com
Ronald Quasula	Hualapai Tribe	Hualapai Nation Fire Department	Chief	928-769-2205		
Darrell Raburn	Fort Mojave Mesa Fire District	Fort Mojave Mesa Fire Department	Fire Marshal	928-768-9181		prevention@fmmfd.org
Jeff Sayre	Golden Valley Fire District	Golden Valley Fire Department		928-565-3479		sayrej@gvfdaz.com
Jim Schnabel	Hualapai Tribe	Hualapai Nation Fire Department		928-769-2205		schnabel72@gmail.com
Byron Steward	Mohave County	Public Works Department - Emergency Management Division	Emergency Management Coordinator	928-757-0930		byron.steward@co.mohave.az.us
Shannon Summers	Mohave County	Public Works Department - Flood Control Division	Flood Control Technical Supervisor	928-757-0925		shannon.summers@co.mohave.az.us
Ed Tapia	City of Kingman	Public Works Department		928-692-3102		etapia@cityofkingman.gov



Name	Jurisdiction/Agency/Organization	Department/Division/Branch	Title	Planning Team Role / Description of Duties
Byron Steward	Mohave County	Public Works Department-Emergency Management Division	Emergency Management Director	Jurisdictional Point of Contact Lead coordinator for Local Planning Team
Shannon Summers	Mohave County	Public Works Department-Flood Control Division	Flood Control Technical Supervisor	Planning Team participant Hazard profiling and Mitigation A/P resource
Mike Browning	Mohave County	Public Works Department-Emergency Management Division	Emergency Management Coordinator	Planning Team participant Hazard profiling and Mitigation A/P resource
Liz Durst	Mohave County	Public Works Department-Emergency Management Division	Office Assistant	Planning Team participant Administrative support

Name	Jurisdiction/Agency/Organization	Department/Division/Branch	Title	Planning Team Role / Description of Duties
Lee Creiglow	City of Bullhead City	DSD Building Division	Building Official	Damage Assessment
Al Caisse	City of Bullhead City	DSD Building Division	Senior Inspector	Damage Assessment
Tami Davis	City of Bullhead City	DSD Building Division	Building Inspector	Damage Assessment
William Hade	City of Bullhead City	DSD Building Division	Building Inspector	Damage Assessment
JC Farris	City of Bullhead City	DSD Code Enforcement Division	Code Enforcement Inspector	Damage Assessment
Bill Avery	City of Bullhead City	PWD Engineering	Engineer	Flood Plain Manager
Beth Scott	City of Bullhead City	HR Risk Management	Risk Manager	Safety

Name	Jurisdiction/Agency/Organization	Department/Division/Branch	Title	Planning Team Role / Description of Duties
Brian Meldrum	Town of Colorado City	Emergency Management	Deputy Emergency Manager	Team Leader
Jake Barlow	Colorado City Fire District	Fire Department	Fire Chief	Team Member / building official and hazard mitigation resource
Jonathan Roundy	Town of Colorado City	Marshals Office	Marshal	Team Member / law enforcement resource
Dean Cooke	Town of Colorado City	Public Works Department	Public Works Director	Team Member / mitigation project identification and implementation
David Darger	Town of Colorado City	Adminstration	Town Manager	Team Member / administration support and building safety
Kevin Barlow	Colorado City Fire District	Fire Department	Emergency Manager	Team Member / prior plan developer and resource
Deidre Barlow	Mohave County	Health Department	Area Representative	Team Member / health and safety resource

Name	Jurisdiction/Agency/Organization	Department/Division/Branch	Title	Planning Team Role / Description of Duties
Bill Johnston	City of Kingman	Kingman Fire Department	Battalion Chief	Jurisdictional point of contact and local planning team lead
Doug Bradley	City of Kingman	Kingman Fire Department	Fire Marshal	Assisted/provided input CPRI calculations
Gary Jeppson	City of Kingman	Developmental Services	Director	Provided information/input -Legal and regulatory capabilities for the COK
Coral Loyd	City of Kingman	Finance	Director	Provided information/input -Survey of financial capabilities for the COK
Mike Jennings	City of Kingman	Information Services	GIS Technician	Provided information/input- GIS mapping for COK

Name	Jurisdiction/Agency/ Organization	Department/Division/Branch	Title	Planning Team Role / Description of Duties
Dennis Mueller	Lake Havasu City - Fire Department	Fire Department / Administration	Fire Chief	Team Leader / Emergency manager for Lake Havasu City
Steve Dorney	Lake Havasu City - Information Services	Finance / Information Services	Division Manager of I.S.	Information Systems team leader / Ensure GIS information is up to date
Jennefier Cox	Lake Havasu City - Information Services	Finance / Information Services	Information Technician	Information Systems / GIS representative
Larry Didion	Lake Havasu City - Planning & Zoning	Development Services Department (DSD)	Department Director	Planning and zoning representative / Ensure codes are enforced
Dan Doyle	Lake Havasu City - Police Department	Police Department / Administration	Police Chief	Police administrative leader / coordinate data related to PD ops
Mark Clark	Lake Havasu City - Public Works	Public Works / Administration	Interim PW Dept. Head	Public works administrative leader / develop - coordinate data related to PW

Appendix C

Public Involvement Records

Press Release issued March 2, 2009
by Mohave County Emergency Management

Mohave County and Cities Begin Work on Hazard Mitigation Plan

A planning team comprised of representatives from Mohave County, Bullhead City, Lake Havasu City, Colorado City, the City of Kingman, and the Hualapai Tribe is meeting regularly to review and update the Mohave County Multi-Jurisdictional Hazard Mitigation Plan, in accordance with the Disaster Mitigation Act of 2000 (DMA2K). The DMA2K requires all local, county, tribal and state governments to have a FEMA approved hazard mitigation plan in order to be eligible for federal disaster mitigation funds. The county plan was originally approved by FEMA in July, 2005, and is due for renewal in 2010. The plan will focus on the area's most threatening hazards and provide a strategy to reduce or eliminate the risk from those hazards to the people and property in the county. The planning team anticipates having a plan draft in mid-2009, at which time the public will be provided access to the draft and the opportunity to comment.

For more information or answers to questions regarding the hazard mitigation planning process/plan, please contact Byron Steward, Mohave County Emergency Management Coordinator, at 928-757-0930 or byron.steward@co.mohave.az.us.

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HIDE NAV

Mohave County Multi-Jurisdictional Hazard Mitigation PlanMohave County and Cities Begin Work on [Hazard Mitigation Plan](#)

A planning team comprised of representatives from Mohave County, Bullhead City, Lake Havasu City, Colorado City, the City of Kingman, and the Hualapai Tribe is meeting regularly to review and update the Mohave County Multi-Jurisdictional Hazard Mitigation Plan, in accordance with the Disaster Mitigation Act of 2000 (DMA2K). The DMA2K requires all local, county, tribal and state governments to have a FEMA approved hazard mitigation plan in order to be eligible for federal disaster mitigation funds. The county plan was originally approved by FEMA in July, 2005, and is due for renewal in 2010. The plan will focus on the area's most threatening hazards and provide a strategy to reduce or eliminate the risk from those hazards to the people and property in the county. The planning team anticipates having a plan draft in mid-2009, at which time the public will be provided access to the draft and the opportunity to comment.

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Bullhead City

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Furlough Day, Friday, April 30th Bullhead City Offices Closed.

Latest News:

[Disaster Mitigation Plan](#)
Public input sought

[Cong. Franks' Rep Here May 5th](#)
For an appointment call 928-763-9400

[Strategic Planning Volunteers Wanted](#)

[Hazardous Waste Drop-Off](#): Sunday, May 2nd
8am to 2pm- MVD Bldg Alona's Way and Marina Bl.

[Animal Control event: May 5th](#)
Be Kind to Animals Week

[Peace Officers Memorial: May 12th](#)
Join us to pay respect to our fallen heroes.

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Losses can cost customers

[Census: "Where's My Form?" Q and A](#)

[Watch those Weeds](#)
Stop 'em early!

[Census Workers Needed](#)

[BATS Senior Fares](#)
Call 704-2287

[Have-A-Heart: Help A Crime Victim](#)

[Recycling](#)
Drop offs at Wal-Mart, Sam's Club and River Gardens
Shopping Center (Hancock Rd.)

[Bulky Item Pick-Up](#)
Call Allied Waste to arrange: 758-0000



Municipal Arts Commission Featured Artist

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Data displayed as of:
April 27, 2010

Bullhead City city, AZ

54%

Participation Rate



[Census 2010 Participation Map](#) See how the rest of the country is doing

[ADOT Press Releases](#) Updates on highway projects here and around the state.

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CALENDAR

May 2010

Sun	Mon	Tue	Wed	Thu	Fri	Sat
25	26	27	28	29	30	1
2	3	4	5	6	7	8
		City Council meeting	Animal Control "Operation Cool Hound"	Planning & Zoning Commission meeting		
9	10	11	12	13	14	15
			Peace Officers Memorial	CERT Volunteer meeting		
16	17	18	19	20	21	22
		City Council meeting	Parks & Recreation Commission meeting			
23	24	25	26	27	28	29
			Employee Benefit Trust meeting	CERT Volunteer meeting		
				Municipal Arts Commission meeting		
30	31	1	2	3	4	5
	Memorial Day Holiday	City Council meeting		Planning & Zoning Commission meeting		
< Apr				Jun >		
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Mohave County and Cities Begin Work on Hazard Mitigation Plan

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For more information or answers to questions regarding the hazard mitigation planning process/plan, please contact:

Brian Williamson, Deputy Chief of Police and Bullhead City Emergency Manager, at 928-763-9200 ext. 105 or bwilliamson@bullheadcity.com

OR

Byron Steward, Mohave County Emergency Management Coordinator, at 928-757-0930 or byron.steward@co.mohave.az.us.

W. Scott Ogden

From: Bill Johnston [bjohnston@cityofkingman.gov]
Sent: Wednesday, February 25, 2009 1:17 PM
To: W. Scott Ogden
Subject: Emailing: City of Kingman (Official Government Site).htm

This was posted today



Welcome to Kingman Arizona

CITYOFKINGMAN.GOV

"The Heart Of Historic Route 66"



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[Golf Course](#)

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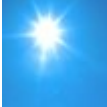
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 **Current Conditions:**
Kingman, AZ 86401
Station ID: KIGM
35.15.28N 113.55.59W

Last Updated on Feb 25, 12:59 pm MST

Temperature 68 F (20 C)
Wind Chill NA
Wind From the Southwest at 17
Gusting to 30 MPH
Conditions Fair
Humidity 16
Dew Point 20 F (-7 C)
Pressure 30.03" (1012.3 mb)

Upcoming Meetings

02/26/2009
Municipal Utilities Commission Meeting
Location:
Council Chambers
Regular Meeting 5:30 PM
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03/02/2009
City Council
Location: Council Chambers
Regular Meeting 6:00 PM

03/16/2009
City Council
Location: Council Chambers
Regular Meeting 6:00 PM

Announcements

Mohave County and the City of Kingman begin Work on Hazard Mitigation Plan

A planning team comprised of representatives from Mohave County, Bullhead City, Lake Havasu City, Colorado City, the City of Kingman and the Hualapai Tribe is meeting regularly to review and update the Mohave County Multi-Jurisdictional Hazard Mitigation Plan, in accordance with the Disaster Mitigation Act of 2000 (DMA2K). The DMA2K requires all local, county, tribal and state governments to have a FEMA approved hazard mitigation plan in order to be eligible for federal disaster mitigation funds. The county plan was originally approved by FEMA in July, 2005, and is due for renewal in 2010. The plan will focus on the area's most threatening hazards and provide a strategy to reduce or eliminate the risk from those hazards to the people and property in the county. The planning team anticipates having a plan draft in mid-2009, at which time the public will be provided access to the draft and the opportunity to comment.

For more information or answers to questions regarding the hazard mitigation planning process/plan, please contact Byron Steward, Mohave County Emergency Management Coordinator, at 928-757-0930 email: byron.steward@co.mohave.az.us.
Or Bill Johnston, Battalion Chief, Kingman Fire Department at 928-753-2891 email: bjohnston@cityofkingman.gov

New Water and Wastewater Rates
On February 1, 2009 new water and wastewater

Previous Council Meeting

February 17th, 2009

[View Agenda](#)

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February 2nd, 2009

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Current Open Bids

The City of Kingman will accept sealed written bids for:

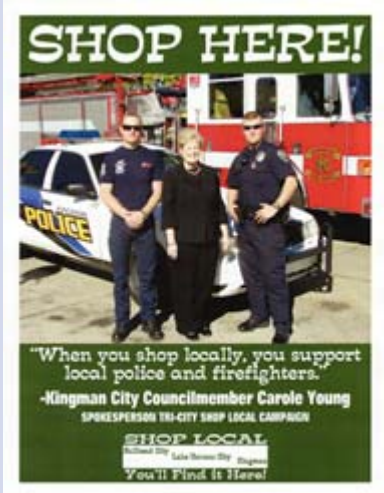
rates will take effect. A copy of the water and wastewater rate and investment fee study can be found [here](#).

City of Kingman Public Records Request Form Available for Download.

The public at large is entitled to be provided with copies of City documents. It is reasonable and necessary to charge a nominal per page fee to offset the cost of paper, supplies and equipment. The City charges \$0.20 per page after the first two pages which are free. If you are in need of a document please fill out the Request Form and return it to the City Clerk's office at 310 N. 4th Street. [Download Form](#)

Shop Local Campaign

View the Tri-City Commission's Shop Local press release video [here](#).



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Fire Department

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[Holiday Safety Tips](#)

[Home Safety Babysitting Skills Classes](#)

[Mohave County and Cities Begin Work on Hazard Mitigation Plan](#)

About the Department

The Lake Havasu City Fire Department began as a volunteer department in 1964, operating out of headquarters located at the old airport on the Island. It was soon decided that a more central location was needed, and the department moved and began operations along side of Baxter Harris' Chevron Station on the corner of McCulloch and Smoketree Avenue. It became a combination department in 1970. The department has approximately 100 full and part time employees. We have six fire stations strategically located throughout the city, and we are proud to have an ISO rating of 3. Our response area covers approximately 52 square miles.

The department provides fire and emergency medical services to our citizens and visitors along with a number of public education opportunities. We also have specialized teams able to respond to hazardous materials incidents as well as technical rescues involving swift water, lakeshore, confined space, and desert rescues. In addition, our fireboat is ready to respond to emergencies on the lake at a moment's notice. Handling the emergency management planning for the city is another duty of the Fire Department.

- Specialized Apparatus & Equipment
- Fire Boat
- Rehab Vehicle

Press Release issued March 2, 2009
by Mohave County Emergency Management

Mohave County and Cities Begin Work on Hazard Mitigation Plan

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Appendix D

Detailed Historic Hazard Records

**State and Federally Declared Events That Included Mohave County
January 1966 to October 2008**

Hazard	No. of Declarations	Recorded Losses		
		Fatalities	Injuries	Damage Costs (\$)
Drought	9	0	0	\$303,000,000
Dam Failure	0	0	0	\$0
Earthquake	0	0	0	\$0
Fissure	0	0	0	\$0
Flooding / Flash Flooding	15	31	116	\$590,111,000
Hazardous Materials Incident	3	0	0	\$0
Landslide / Mudslide	0	0	0	\$0
Levee Failure	0	0	0	\$0
Snow Storm	2	4	0	\$0
Sleet / Freezing Rain	0	0	0	\$0
Subsidence	0	0	0	\$0
Thunderstorm / High Wind	1	0	1	\$1,022,000
Tornado	0	0	0	\$0
Tropical Storm / Hurricane	4	15	975	\$750,000,000
Wildfire	20	0	0	\$0

Notes:

- Damage Costs are reported as is and no attempt has been made to adjust costs to current dollar values

State of Arizona Declaration				Federal Presidential Declaration			
Date	Hazard	State PCA No.	Expenditures	Date	ID	Expenditures	Counties Affected
4/28/1973	Wildfire		\$36,718				Statewide
7/12/1973	Fire / Explosion		\$19,520				Mohave
1/7/1974	Service Interruption		\$199,028				Statewide
7/19/1974	Flooding / Flash Flooding		\$85,000				Mohave
4/22/1975	Wildfire		\$8,923				Statewide
9/10/1976	Tropical Storm / Hurricane		\$150,000				Mohave
8/6/1977	Wildfire						Mohave
8/24/1977	Tropical Storm / Hurricane		\$70,000				Mohave, Yuma Gila
9/2/1977	Infestation						Statewide
3/2/1978	Flooding / Flash Flooding		\$485,718	03/04/78	550-DR	\$67,122,627	Statewide
4/21/1978	Wildfire		\$11,528				Statewide
8/6/1978	Hazardous Materials Incident		\$165				Statewide
11/30/1978	Prison Problem		\$425				Statewide
12/16/1978	Flooding / Flash Flooding		\$1,909,498	12/21/78	570-DR	\$113,561,122	Statewide
2/5/1979	Snow Storm						Mohave, Coconino

State of Arizona Declaration		
Date	Hazard	Description
4/28/1973	Wildfire	
7/12/1973	Fire / Explosion	Fire/ Explosion - The tank car spouts flames only moments before the explosion which injured more than 100 persons and has left 12 persons dead. Total material damage exceeded one million dollars.
1/7/1974	Service Interruption	Energy Shortage
7/19/1974	Flooding / Flash Flooding	On July 19th, a severe thunderstorm with winds up to eighty mph and heavy rain caused extensive flooding in Lake Havasu City and completely washed out sections 4 and 5 feet deep in some streets. Many cars were abandoned during the storm and a number washed away. Three members of one family were carried to their deaths and one was injured when their station wagon was carried 3,000 feet down a wash by a wall of water 10 feet high. Damage to public and private property amounted to \$1.7million. At Bullhead City, over 2.0 inches of rain caused extensive flooding on the morning of the 20th.
4/22/1975	Wildfire	
9/10/1976	Tropical Storm / Hurricane	On September 10 and 11 the remains of Hurricane Kathleen moved across Baja and into southern California near El Centro. With its circulation still intact a tropical storm force winds produced considerable damage in Yuma. Sustained winds exceeded 50 mph and gust as high as 76 mph. One man was killed when a 75 foot palm tree crashed into his mobile home. Severe flooding occurs in Mohave County and across southern California. Residual moisture brought more severe thunderstorms to the state on September 24 and 25. The Tucson area was particularly hard hit with flash flooding and hail as large as golf balls. Hail covered the ground to a depth of 5 inches on Mount Lemon. On the 11th, 2 to 5 inches of rain brought severe flash flooding to Mohave County. The hardest hit was Bullhead City and the surrounding area along the Colorado River. Eight washes carried walls of water from elevations of over 3,000 feet to the east in to the Bullhead City area with an elevation of 675.0 feet. There was severe damage to streets, highways, residences, businesses, water and gas mains, and culverts. Many cars were swamped in tons of debris. Silver Creek Wash crossing Highway 95 was cut into a 20-40 foot deep canyon. The city was severed from all outside assistance. Estimates of damage to roads and streets were put in excess of \$500,000 and damage to private property at \$2,500,000. On the 24th, Bullhead City was again hit by a severe storm of 2-5 inches produced walls of water that inundated this community, which was still trying to dig out from the millions of tons of silt, rocks, and debris from tropical storm Kathleen. Highway 95, the only access to the outside, was again quickly inundated in several places. A number of cars, some with occupants, were swept down the washes. Eight persons were rescued, some by a private helicopter. Additional damage from this second wave was estimated at \$2-3 million.
8/6/1977	Wildfire	"Canyon Fire"
8/24/1977	Tropical Storm / Hurricane	On the 14th and 15th of August, tropical storm Doreen, dumped 2-7 inches of rain that resulted in floods to areas along the Colorado River. In Yuma County, two bridges were destroyed and 25-30 miles of roads and streets were damaged with total losses estimated at over \$1 million. There was some flooding of houses and businesses and strong winds did extensive roof damage to a school and power lines. Lightning caused numerous minor fires. One day later, a number of washes became raging torrents causing damage to streets, highways, residences, and businesses. Damages to homes and businesses were estimated at \$250,000. The hardest hit highway was the junction of Hwy 95 and 68 where very large chunks of pavement were torn loose and tossed to the side in powerful surges. Several dikes were heavily damaged. \$40,000 was allocated for Bullhead City which suffered flood and mud damage and Payson received \$30,000 in state emergency funds.
9/2/1977	Infestation	Cotton Crop Pesticide Application
3/2/1978	Flooding / Flash Flooding	Warm temperatures accompanied by heavy rain filled reservoirs behind all of the dams on the Salt and Verde Rivers and forced large volumes of runoff to be released. This was the largest flow of water down the Salt since 1891. The released water overflowed the channel and flooded residential areas and farmlands. During the same period storm fronts passing over the state caused flash flooding and destruction. 9.53 inches of rainfall occurred on Mt Lemmon. Overflows of the Gila River flooded Duncan and 1000-2000 acres of farmland in Safford Valley. The Rillito Creek, Pantano and Tanque Verde Creeks in Tucson were near bankfull. Total damage was approximately \$65.9 million, of which \$37 million was attributed to Maricopa County alone. Thousands of homes were damaged and 116 homes were destroyed. More than 7,000 people had to be sheltered and four people lost their lives. For Maricopa County - the storm centered over the mountains north and east of Phoenix, 35 miles north at Rock Springs. Extrapolation of intensity-probability data: 5.73 in./ 24 hr. equates to a 400 yr. storm. Main source of flooding due to Verde River with runoff volume exceeding reservoir storage capacity above Bartlett Dam. Flooding also occurred along irrigation canals on north side of metro area, and along tributaries of the Gila River and Queen Creek. 1 death-countywide. Total damage costs: \$37 million: \$3.1 million-residential, \$16 million-public, \$4 million-agriculture, \$7.8 million-industrial, \$0.75 million-commercial. "Flood Damage Report, 28 February-6 March 1978 on the storm and floods in Maricopa County, Arizona", U.S. Army Corps of Engineers, Los Angeles District, FCDMC Library #802.024.
4/21/1978	Wildfire	
8/6/1978	Hazardous Materials Incident	
11/30/1978	Prison Problem	Prison Break
12/16/1978	Flooding / Flash Flooding	Following the spring flooding, Arizona was hit hard again in December 16th-20th. Total precipitation ranged from less than 1 inch in the northeastern and far southwestern portions of Arizona to nearly 10 inches in the Mazatzal Mountains northeast of Phoenix. A large area of the central mountains received over 5 inches. The main stems of the Gila, Salt, Verde, Agua Fria, Bill Williams, and Little Colorado Rivers, as well as a number of major tributaries, experienced especially large discharges. The flooding areas with the most significant damages included the Little Hollywood District near Safford and major portions of Duncan, Clifton, Winslow, and Williams. Damages were estimated at \$39,850,000. 10 people die and thousands are left homeless. Severe damage to roads and bridges. For Maricopa County, 4 deaths, \$16.3 million-public and \$5 million-agriculture losses estimated. ["Flood Damage Report, Phoenix Metropolitan Area, December 1978 Flood", November 1979, U.S. Army Corps of Engineers, FCDMC Library #802.027]
2/5/1979	Snow Storm	Snow relief declaration - heavy snowfall caused hazards for Indian Nations

State of Arizona Declaration				Damage Estimates			
Date	Hazard	Fatalities	Injuries	Property	Crop/Livestock	Total	Sources
4/28/1973	Wildfire					\$0	ADEM, 2008
7/12/1973	Fire / Explosion			\$83,000		\$83,000	ADEM, 2008
1/7/1974	Service Interruption					\$0	ADEM, 2008
7/19/1974	Flooding / Flash Flooding	3	1	\$1,700,000		\$1,700,000	ADEM, 2008; AFMA Floods Happen, Spring 2003.
4/22/1975	Wildfire					\$0	ADEM, 2008
9/10/1976	Tropical Storm / Hurricane	1		\$5,000,000		\$5,000,000	ADEM, 2008; AFMA Floods Happen, Spring 2003.
8/6/1977	Wildfire					\$0	ADEM, 2008
8/24/1977	Tropical Storm / Hurricane					\$0	ADEM, 2008
9/2/1977	Infestation					\$0	ADEM, 2008
3/2/1978	Flooding / Flash Flooding	4		\$65,900,000		\$65,900,000	ADEM, 2008; Tucson NWS, 2008 at http://www.wrh.noaa.gov/twc/hydro/floodhis.php ; AFMA Flood Happens, Fall 2003
4/21/1978	Wildfire					\$0	ADEM, 2008
8/6/1978	Hazardous Materials Incident					\$0	ADEM, 2008
11/30/1978	Prison Problem					\$0	ADEM, 2008
12/16/1978	Flooding / Flash Flooding	10		\$39,850,000		\$39,850,000	ADEM, 2008; Tucson NWS, 2008 at http://www.wrh.noaa.gov/twc/hydro/floodhis.php ; AFMA Flood Happens, Fall 2003
2/5/1979	Snow Storm					\$0	ADEM, 2008

State of Arizona Declaration				Federal Presidential Declaration			
Date	Hazard	State PCA No.	Expenditures	Date	ID	Expenditures	Counties Affected
4/16/1979	Wildfire		\$204,207				Statewide
2/13/1980	Flooding / Flash Flooding		\$1,958,611	02/19/80	614-DR	\$42,744,642	Maricopa, Gila, Yavapai, Mohave , White Mt. Apache Tribe, San Carlos Apache Tribe, Fort Gila River Indian Community, Fort McDowell Indian Community, Salt River Indian Community
6/2/1980	Wildfire		\$298,845				Statewide
6/16/1980	Infestation		\$67,773				Coconino, gila, Yavapai, Mohave, Apache, Graham, Navajo, Cochise
6/16/1980	Wildfire						Statewide
7/25/1980	Wildfire						
3/31/1981	Hazardous Materials Incident		\$492,635				Statewide
6/26/1981	Wildfire						Statewide
6/30/1981	Wildfire		\$256,904				Statewide
6/30/1982	Wildfire		\$492,635				Statewide
3/3/1983	Flooding / Flash Flooding		\$104,335				Santa Cruz
6/16/1983	Flooding / Flash Flooding		\$825,097	07/01/83	686-DR	\$2,501,740	La Paz, Mohave, Yuma
9/28/1983	Tropical Storm / Hurricane		\$863,283	10/05/83	691-DR	\$13,446,148	Mohave, Apache, Yavapai, Gila, Graham, Greenlee, Pinal, Pima, Santa Cruz, Cochise, Navajo
11/5/1983	Flooding / Flash Flooding		\$65,000				Mohave
7/23/1984	Flooding / Flash Flooding		\$55,373	1/15/1985	730-DR	\$505,323	Mohave, Yuma, Maricopa
03/17/1987	Wildfire	EUZSLD					Statewide
03/31/1987	Hazardous Materials Incident						Statewide
12/21/1988	Miscellaneous	EUZHTS	\$129,624				Statewide
05/09/1989	Infestation						Mohave, Coconino
03/17/1990	Wildfire	EUFIR					Statewide
09/07/1990	Flooding / Flash Flooding	EUZ901	\$1,175,040	12/06/90	884-DR	\$5,875,202	Mohave, Gila, Pima, Pinal, Yavapai, Graham, Coconino, Maricopa
11/9/1990	Service Interruption	EUZ903	\$25,000				Mohave
6/25/1992	Miscellaneous	92004					Statewide
01/08/1993	Flooding / Flash Flooding	93003	\$30,072,157	01/19/93	977-DR	\$104,069,362	Statewide
09/09/1993	Wildfire	94002	\$200,000				Statewide
6/30/1994	Wildfire						Statewide
07/26/1994	Public Safety	95001	\$646,236				Mohave
10/14/1994	Wildfire	95003	\$600,000				Statewide

State of Arizona Declaration		
Date	Hazard	Description
4/16/1979	Wildfire	
2/13/1980	Flooding / Flash Flooding	Severe flooding in central Arizona. Record discharges (later broken in 1993) were recorded in the Phoenix metro area on the Salt, Verde, Agua Fria and Gila Rivers, as well as on Oak Creek in north central Arizona. The Phoenix metro area is almost cut in half as only two bridges remain open over the Salt River. It takes hours for people to move between Phoenix and the East Valley using either the Mill Avenue or Central Avenue bridges. Even the Interstate 10 bridge is closed for fear that it has been damaged. Precipitation during this period at Crown King in the Bradshaw Mountains was 16.63 inches. Three people die. Salt River has a peak flow of 170,000 cubic feet per second. Damages estimated at \$63,700,000 for Phoenix Metro Area. [Phoenix Flood Damage Survey, February 1980, U.S. Army Corps of Engineers, Los Angeles District, FCDMC Library #802.029]
6/2/1980	Wildfire	
6/16/1980	Infestation	AZ Executive Order 81-4: [Terminating the Declaration of a State of Emergency of June 16, 1980 (caused by the abundance of grasshoppers).
6/16/1980	Wildfire	AZ Executive Order 81-5: [Terminating the Declaration of a State of Emergency of June 16, 1980 (caused by a severe forest and grassland fire contingency) and returning all unexpended funds authorized by A.R.S. § 35-192 to the General Fund.
7/25/1980	Wildfire	Fire suppression assistance for Bureau of Land Management
3/31/1981	Hazardous Materials Incident	
6/26/1981	Wildfire	Fire suppression assistance
6/30/1981	Wildfire	
6/30/1982	Wildfire	
3/3/1983	Flooding / Flash Flooding	Flooding due to heavy rain
6/16/1983	Flooding / Flash Flooding	Releases from federal reservoirs caused flooding along the entire Colorado River below Hoover Dam
9/28/1983	Tropical Storm / Hurricane	The autumn floods of 1983. Tropical storm remains, including those from Hurricane Octave, caused heavy rain over Arizona during a 10-hour period. Southeast Arizona and Yavapai and Mohave Counties are particularly hard hit. Severe flooding occurred in Tucson, Clifton and Safford. Fourteen fatalities and 975 injuries were attributed to the flooding. At least 1000 Arizonans were left temporarily homeless. Damage estimated at \$370 million in today's value (2001). Record water levels in the Santa Cruz, Gila, San Pedro and San Francisco Rivers contributed to heavy flooding statewide. Greenlee County was hit hard. Damages in Clifton alone were over \$20 million where approximately 41 businesses were destroyed and over 231 homes and 57 businesses suffered major damages. The Corps constructed an emergency dike in the Winkelman Flats area to try and protect 112 homes. There were floodfight activities at Florence to protect a sewage treatment plant and at Safford to protect critical arterial bridge embankment from severe damage.
11/5/1983	Flooding / Flash Flooding	Heavy flooding in Mohave County and particularly in Colorado City
7/23/1984	Flooding / Flash Flooding	Flooding and Wind Damage
03/17/1987	Wildfire	Wildland fires statewide
03/31/1987	Hazardous Materials Incident	
12/21/1988	Miscellaneous	EUZHTS Homeless Shelter
05/09/1989	Infestation	Grasshopper Infestation
03/17/1990	Wildfire	Wildland fire contingency
09/07/1990	Flooding / Flash Flooding	Severe storms caused monsoon rains from July 8 through September 14, 1990. Heavy rains and high winds caused flash flooding and wind damage. Havasupai reservation received heavy flood losses. Three lives were lost.
11/9/1990	Service Interruption	Chloride Water Emergency
6/25/1992	Miscellaneous	Emergency government state budget
01/08/1993	Flooding / Flash Flooding	During January and February 1993, winter rain flooding damage occurred from winter storms associated with the El Nino phenomenon. These storms flooded watersheds throughout Arizona by dumping excessive rainfall amounts that saturated soils and increased runoff. Warm temperature snowmelt exacerbated the situation over large areas. Erosion caused tremendous damage and some communities along normally dry washes were devastated. Stream flow velocities and runoff volumes exceeded historic highs. Many flood prevention channels and retention reservoirs were filled to capacity and so water was diverted to the emergency spillways or the reservoirs were breached, causing extensive damage in some cases (e.g., Painted Rock Reservoir spillway). Ultimately, the President declared a major federal disaster that freed federal funds for both public and private property losses for all of Arizona's fifteen counties. Damages were widespread and significant, impacting over 100 communities. Total public and private damages exceeded \$400 million and eight deaths and 112 injuries were reported to the Red Cross (FEMA, April 1, 1993; ADEM, March, 1998).
09/09/1993	Wildfire	Statewide wildfire suppression - State Land Department
6/30/1994	Wildfire	AZ Executive Order 94-9: In Accordance with Established Emergency Procedures declare a state of emergency in Apache, Cochise, Coconino, Gila, Graham, Greenlee, LaPaz, Maricopa, Mohave, Navajo, Pima, Pinal, Santa Cruz, Yavapai and Yuma counties due to wildfire conditions pursuant to A.R.S. § 37-623.02 effective June 30, 1994.
07/26/1994	Public Safety	Mohave County public health & safety
10/14/1994	Wildfire	Statewide wildfire suppression - State Land Department

State of Arizona Declaration				Damage Estimates			
Date	Hazard	Fatalities	Injuries	Property	Crop/Livestock	Total	Sources
4/16/1979	Wildfire					\$0	ADEM, 2008
2/13/1980	Flooding / Flash Flooding	3	3	\$63,700,000	\$3,000,000	\$66,700,000	ADEM, 2008
6/2/1980	Wildfire					\$0	ADEM, 2008
6/16/1980	Infestation					\$0	ADEM, 2008
6/16/1980	Wildfire					\$0	ADEM, 2008
7/25/1980	Wildfire					\$0	ADEM, 2008
3/31/1981	Hazardous Materials Incident					\$0	ADEM, 2008
6/26/1981	Wildfire					\$0	ADEM, 2008
6/30/1981	Wildfire					\$0	ADEM, 2008
6/30/1982	Wildfire					\$0	ADEM, 2008
3/3/1983	Flooding / Flash Flooding					\$0	ADEM, 2008
6/16/1983	Flooding / Flash Flooding					\$0	ADEM, 2008
9/28/1983	Tropical Storm / Hurricane	14	975	\$370,000,000		\$370,000,000	ADEM, 2008
11/5/1983	Flooding / Flash Flooding					\$0	ADEM, 2008
7/23/1984	Flooding / Flash Flooding					\$0	ADEM, 2008
03/17/1987	Wildfire					\$0	ADEM, 2008
03/31/1987	Hazardous Materials Incident					\$0	ADEM, 2008
12/21/1988	Miscellaneous					\$0	ADEM, 2008
05/09/1989	Infestation					\$0	ADEM, 2008
03/17/1990	Wildfire					\$0	ADEM, 2008
09/07/1990	Flooding / Flash Flooding	3				\$0	ADEM, 2008
11/9/1990	Service Interruption					\$0	ADEM, 2008
6/25/1992	Miscellaneous					\$0	ADEM, 2008
01/08/1993	Flooding / Flash Flooding	8	112	\$330,000,000	\$70,000,000	\$400,000,000	ADEM, 2008
09/09/1993	Wildfire					\$0	ADEM, 2008
6/30/1994	Wildfire					\$0	ADEM, 2008
07/26/1994	Public Safety					\$0	ADEM, 2008
10/14/1994	Wildfire					\$0	ADEM, 2008

State of Arizona Declaration				Federal Presidential Declaration			
Date	Hazard	State PCA No.	Expenditures	Date	ID	Expenditures	Counties Affected
03/07/1995	Flooding / Flash Flooding	95008	\$280,436				Coconino, Mohave, Yavapai
03/13/1996	Infestation	96003	\$796,456				Statewide
05/16/1996	Wildfire	96004	\$1,000,729				Statewide
06/07/1996	Drought	96005	\$211,499				Statewide
01/14/1997	Snow Storm	97002	\$1,590,468				Coconino, Navajo, Mohave
09/24/1997	Tropical Storm / Hurricane	98002	\$2,318,259				Statewide
01/20/1999	Infestation	99001	\$177,702				Statewide
05/06/1999	Wildfire	99004	\$4,894				Statewide
6/23/1999	Drought	99006					Statewide
8/13/1999	Drought			08/13/99	USDA		Apache, Cochise, Coconino, Gila, Graham, Greenlee, Maricopa, Mohave, Navajo, Pima, Pinal, Santa Cruz, Yavapai
01/05/2000	Service Interruption	20005	\$23,073				Statewide
6/23/2000	Drought						Statewide
8/25/2000	Thunderstorm / High Wind	21102	\$20,337				Mohave

State of Arizona Declaration		
Date	Hazard	Description
03/07/1995	Flooding / Flash Flooding	The Governor proclaimed an emergency due to flooding in Coconino, Mohave, and Yavapai Counties. A strong Pacific storm resulted in heavy rain falling over the central and northern mountains, where soils were already saturated from previous events. Between the afternoon of March 5, and the morning of March 6, a remote rain gage at Mt. Union, south of Prescott reported 4.92 inches, with many locations receiving about two inches of rain. Near record flows were observed on Oak Creek, at Cornville (peak 17.94 feet), and on Dry Beaver Creek. The record at Cornville is 19.5 feet, set in 1980. At Oak Creek Cliffs, at least 10 vehicles were flooded and pushed around. In the Sedona, Cornville, and Oak Creek Canyon area 20 homes were flooded. About 200 people were relocated. Several roads and bridges were damaged. Damages were estimated at over \$1.4 million.
03/13/1996	Infestation	Wheat (karnal bunt)
05/16/1996	Wildfire	Statewide wildfire suppression - State Land Department
06/07/1996	Drought	
01/14/1997	Snow Storm	Perhaps the largest snow storm of the decade brought heavy snow to most of northern Arizona. Heavy snow fell from early Sunday morning, the 12th, through last Tuesday night, the 14th. Four deaths from exposure occurred during, or immediately after the storm, on the Navajo Nation Reservation and were directly related to this catastrophic winter storm. Following the storm, National Guard trucks and helicopters were needed to evacuate people on the Navajo Nation who required medical attention due to chronic medical problems and who were unable to obtain needed medication. National Guard helicopters also dropped food to people and livestock who were stranded for several days following the storm. Unofficial snow accumulations up to 6 feet were reported along the Mogollon Rim in extreme southeastern Coconino county. Very strong winds created drifts as high as 10 feet at many wind-prone areas across northern Arizona. Numerous trees fell on cars, houses and roads causing power outages and property damage. Hundreds of miles of major highways were closed mainly along the Mogollon Rim and the White Mountains area. Highways surrounding Flagstaff were the most affected. Interstate 40 from Winslow to Ashfork and Interstate 17 from Cordes Junction to Flagstaff were closed from noon Monday, Jan. 13 through 6 AM MST, Wednesday, Jan. 15. Over 200 vehicles were stranded on these two highways. The heavy snow in Flagstaff caused Northern Arizona University to close for the first time in 20 years. Flagstaff public schools were closed for five days. This was the 12th biggest snow storm in Flagstaff's 100 years of weather records.
09/24/1997	Tropical Storm / Hurricane	Hurricane Nora - \$200 million property damage. An estimated \$150 to \$200 million in damage was sustained by crops throughout Yuma County due mainly to flooded crops. About \$30 to \$40 million was to lemon trees. The heavy rain was attributed to Tropical Storm Nora. Flooding from Hurricane Nora results in the breaching of Narrows Dam. The calculated 24-hour, 100-year rainfall amount in NW Maricopa County was exceeded at six ALERT measuring sites. 3 to 5 inches of rain which fell from Nora led to some flash flooding in portions of northwest Maricopa County. Two earthen dams gave way in Aguila and caused widespread flooding. One dike was located seven miles east of Aguila and the second in the center of the Martori Farms complex. Half of the cotton crop was lost at Martori Farms, as well as 300 to 500 acres of melons. Up to five feet of water filled Aguila. About 40 people were evacuated from the hardest hit area of the town. Water flowing down the Sols Wash was so high that the Sols Wash Bridge in Wickenburg was closed for more than two hours. There was some flooding below Sols Wash in the streets around Coffinger Park. Several houses in the area were flooded. Highway 71 west of Wickenburg and Highway 95 north were closed due to high water from the storm.
01/20/1999	Infestation	Red Imported Fire Ant Emergency
05/06/1999	Wildfire	Statewide wildland fire emergency
6/23/1999	Drought	endanger crops, property and livestock of the citizens of Arizona. This proclamation has been extended to June 23, 2003, as this is still a threatening situation. USDA Programs offer Arizona Ranchers Drought Relief, (Phoenix) - Federal officials this week announced three programs designed to ease the impact of Arizona's drought on the state's ranching industry and the state's natural resources. Gov. Jane Dee Hull in June issued a drought declaration for the state, initiating a federal review process that culminated in the U.S. Department of Agriculture's determination that Arizona agriculture could qualify for drought assistance. The following are brief descriptions of the three assistance packages for which Arizona ranchers may qualify: Those ranching operations that earlier this year reduced herd sizes in response to poor pasture conditions and lack of water due to the drought can receive capital gains tax deferment if those herds are replaced within two years, according to the Internal Revenue Service. It is recommended that businesses consult their tax specialist or the IRS for further details. For more information, contact Joe Lane, Associate Director of Animal Services Division, at (602) 542-3629. The USDA Natural Resource Conservation Service has received an initial \$6 million through its Emergency Watershed Program (EWP) to treat short- and long-term damage to rangeland and cropland due to drought. Ranchers and farmers can receive financial assistance to implement recovery measures that will retard runoff and reduce the threat of future flooding and erosion hazards. For more
8/13/1999	Drought	GLICKMAN DECLARES PENNSYLVANIA, 13 ARIZONA COUNTIES AS DISASTER AREAS AND ANNOUNCES ADDITIONAL DROUGHT ASSISTANCE Release No. 0334.99, WASHINGTON August 13, 1999 Agriculture Secretary Dan Glickman today declared all of Pennsylvania and 13 counties in Arizona as agricultural disaster areas due to drought. The declaration makes farmers in those areas and all contiguous counties eligible for emergency low-interest loans and other assistance to help cover losses from the drought. In Arizona, today's disaster declaration applies to Apache, Cochise, Coconino, Gila, Graham, Greenlee, Maricopa, Mohave, Navajo, Pima, Pinal, Santa Cruz, and Yuvapai Counties. Also eligible, because they are contiguous, are La Paz and Yuma Counties. Glickman has already declared all or part of Arizona, Connecticut, Maryland, New Jersey, New Mexico, New York, Ohio, Pennsylvania, Virginia, and West Virginia as disaster areas. Due to the close proximity to these states, certain counties in California, Delaware, Indiana, Kentucky, Massachusetts, Michigan, Nevada, Rhode Island, Vermont, and Utah also qualify for emergency loan assistance.
01/05/2000	Service Interruption	Y2K
6/23/2000	Drought	Annual extension of PCA 99006; Statewide Drought Emergency, Declared June 23, 1999: Lack of precipitation had significantly reduced surface and ground water supplies and stream flows. The drought continues to endanger crops, property and livestock of the citizens of Arizona. This proclamation has been extended until further notice, as this is still a threatening situation.
8/25/2000	Thunderstorm / High Wind	Wind storm emergency for Mohave County - Strong thunderstorm wind gusts of 80 -100 mph moved through the community of Golden Shores near Lake Havasu City on August 16, 2000, causing one million dollars in damage. Two mobile homes were destroyed and 17 other mobile homes and frame houses were unlivable. Another 117 homes received minor damage. One injury occurred when the homeowner sought shelter in a tub in the mobile home's bathroom. As the mobile home rolled the toilet was ripped from its foundation and struck the homeowner in the head causing cuts and bruises. In addition, numerous pontoon boats were either flipped over or destroyed and several windows were broken on homes and cars. The storm snapped several power lines which cut power, in turn cutting the towns water supply. Lightning started 3 fires in Lake Havasu City, AZ causing an estimated \$20,000 dollars in damage.

State of Arizona Declaration				Damage Estimates			
Date	Hazard	Fatalities	Injuries	Property	Crop/Livestock	Total	Sources
03/07/1995	Flooding / Flash Flooding			\$1,400,000		\$1,400,000	ADEM, 2008 NCDC, 2008
03/13/1996	Infestation					\$0	ADEM, 2008
05/16/1996	Wildfire					\$0	ADEM, 2008
06/07/1996	Drought					\$0	ADEM, 2008
01/14/1997	Snow Storm	4				\$0	ADEM, 2008
09/24/1997	Tropical Storm / Hurricane			\$200,000,000	\$175,000,000	\$375,000,000	ADEM, 2008
01/20/1999	Infestation					\$0	ADEM, 2008
05/06/1999	Wildfire					\$0	ADEM, 2008
6/23/1999	Drought					\$0	ADEM, 2008
8/13/1999	Drought					\$0	ADEM, 2008
01/05/2000	Service Interruption					\$0	ADEM, 2008
6/23/2000	Drought			\$2,000,000	\$1,000,000	\$3,000,000	ADEM, 2008
8/25/2000	Thunderstorm / High Wind		1	\$1,022,000		\$1,022,000	ADEM, 2008 NCDC, 2008

State of Arizona Declaration				Federal Presidential Declaration			
Date	Hazard	State PCA No.	Expenditures	Date	ID	Expenditures	Counties Affected
6/23/2001	Drought						Statewide
9/12/2001	Terrorism	22002	\$3,070,329	09/12/01			Statewide
10/16/2001	Terrorism	22003	\$7,324				Statewide
05/17/2002	Drought			05/17/02	USDA		Statewide
5/18/2002	Disease						Statewide
6/23/2002	Drought						Statewide
07/11/2002	Drought			07/11/02	USDA		Statewide
2/3/2003	Disease	23002					La Paz, Mohave, Yuma
5/2/2003	Wildfire	23003	\$2,378,020				Statewide
6/23/2003	Drought						Statewide
12/29/2004	Flooding / Flash Flooding	25004	\$2,131,217	2/17/2005	1581-DR	\$5,986,604	Gila, Graham, Greenlee, Pinal, Yavapai, Maricopa, Mohave
2/16/2005	Flooding / Flash Flooding	25005	\$4,669,352	3/14/2005	1586-DR	\$9,536,276	Gila, Graham, Greenlee, Pinal, Yavapai, Maricopa, Mohave
9/3/2005	Miscellaneous	26003		9/12/2005	3241-EM	\$5,421,732	Statewide
2/22/2006	Wildfire	26006	\$192,390				Statewide
9/14/2007	Flooding / Flash Flooding	28002	\$200,000				Maricopa, Mohave
1/18/2010	Flooding / Flash Flooding			3/18/2010	1888-DR		Apache, Coconino, Gila, Greenlee, La Paz, Mohave, Navajo, Yavapai

State of Arizona Declaration		
Date	Hazard	Description
6/23/2001	Drought	Annual extension of PCA 99006; Statewide Drought Emergency, Declared June 23, 1999: Lack of precipitation had significantly reduced surface and ground water supplies and stream flows. The drought continues to endanger crops, property and livestock of the citizens of Arizona. This proclamation has been extended until further notice, as this is still a threatening situation.
9/12/2001	Terrorism	September Terrorism Incident, Declared September 12, 2001: Terrorist attacks inflicted in various locations across the United States posed significant threat to the citizens of this country causing us to heighten the level of security throughout the State of Arizona. This proclamation has been extended to November 12, 2002.
10/16/2001	Terrorism	Military Airport Security
05/17/2002	Drought	VENEMAN DESIGNATES ARIZONA AS DROUGHT DISASTER AREA, Governor Hull and Veneman Tour Fire Areas and Assess Damage in Prescott National Forest Areas: PHOENIX, Ariz., May 17, 2002-- Agriculture Secretary Ann M. Veneman today designated the entire state of Arizona as a drought disaster area. This designation makes Arizona farmers and ranchers immediately eligible for USDA emergency farm loans due to losses caused by drought this year.
5/18/2002	Disease	the Arizona Game and Fish Department placed an emergency ban on the importation of live hoofed animals (e.g., deer and elk) into Arizona due to a fear of Chronic Wasting Disease (CWD). CWD is a disease closely related to "mad cow disease" in cattle and scrapie in domestic sheep and goats but affects deer and elk.
6/23/2002	Drought	Annual extension of PCA 99006; Statewide Drought Emergency, Declared June 23, 1999: Lack of precipitation had significantly reduced surface and ground water supplies and stream flows. The drought continues to endanger crops, property and livestock of the citizens of Arizona. This proclamation has been extended until further notice, as this is still a threatening situation.
07/11/2002	Drought	VENEMAN ANNOUNCES EXPANSION OF CRP EMERGENCY HAYING AND GRAZING PROGRAM FOR WEATHER-STRICKEN STATES, WASHINGTON, July 11, 2002 - Agriculture Secretary Ann M. Veneman today approved 18 states for Conservation Reserve Program emergency haying and grazing statewide, making all CRP participants in these states basically eligible for this emergency measure. Veneman also said USDA will waive rental reduction fees to encourage donation of hay to farmers and ranchers in immediate need. "Drought and severe weather conditions have depleted hay stocks and grazing lands across the country," said Veneman. "This approval provides immediate relief to livestock producers and encourages donations of hay to producers who need immediate assistance." The 18 approved states are: Arizona, Colorado, Georgia, Idaho, Kansas, Minnesota, Montana, Nebraska, New Mexico, North Carolina, North Dakota, Oklahoma, South Carolina, South Dakota, Texas, Utah, Virginia and Wyoming.ARIZONA FARMERS FACING CATASTROPHE ... Arizona officials are saying that the losses from the livestock industry alone last year will be upward of \$300 million. ...
2/3/2003	Disease	Exotic Newcastle Disease
5/2/2003	Wildfire	Forest Health Emergency - As a result of the on-going drought conditions the forests within our state have been infested with the Pine Bark Beetle. This proclamation will expedite the clearing of dead, dying and diseased trees and other vegetation that interfere with emergency response and evacuation needs.
6/23/2003	Drought	Annual extension of PCA 99006; Statewide Drought Emergency, Declared June 23, 1999: Lack of precipitation had significantly reduced surface and ground water supplies and stream flows. The drought continues to endanger crops, property and livestock of the citizens of Arizona. This proclamation has been extended until further notice, as this is still a threatening situation.
12/29/2004	Flooding / Flash Flooding	A strong Pacific storm system moved across Arizona December 28th and 29th with heavy rainfall. The heavy rain and melting snow resulted in excessive runoff in many areas from Williams to Flagstaff to Winslow and south to Prescott and Black Canyon City. High water, mudslides, and rock slides resulted in numerous road closures and evacuations in the area. Many creeks experienced significant rises. Seventy people were evacuated in southwest Flagstaff when water over-topped an earthen flood control dam. A dozen neighborhoods (about 300 people) along Oak Creek were evacuated in the Sedona area and two neighborhoods down stream. A 14 mile section of Highway 89 between Flagstaff and Sedona was closed because of rock slides. High water on the Verde River forced evacuations in Cornville and Bridgeport. Four RVs were lost in Oak Creek at the Page Springs RV park while 23 vehicles were removed before the water rose too high. About 100 people were evacuated in Black Canyon City in two different mobile-home parks. Portions of Navajo Route 71 and Old Navajo Route 2 were closed northeast of Winslow when the Little Colorado River overflowed the banks. Six families were evacuated near Bird Springs on the Navajo Reservation. All thirty-one low water crossings and seven other streets were closed in Prescott due to flooding. Two passengers were rescued from a stranded vehicle in Prescott. Preliminary counts indicate that as many as 150 homes may have sustained damages up to approximately one million dollars. Roads and bridges sustained an additional one million dollars damage.
2/16/2005	Flooding / Flash Flooding	the early hours on Sunday (02/13). Rainfall totals of 2 to 3 inches were common in many locations...with locally heavier amounts found in portions of Yavapai and Northern Gila counties. Flooding caused road closures in Black Canyon City, Walker, Pinedale, and Globe. Paper Mill Road in Snowflake was washed out by the flood waters. Highway 377 was closed due to flooding between Heber and Holbrook. A trailer park in Black Canyon City was evacuated before the water rose into the parking lot. No trailers were damaged. Minor pasture flooding was reported in Cornville. A trailer park in the community of Tonto Creek was evacuated. Flood waters entered homes in Porter Creek Estates (near Show Low). The Gila River at the Town of Duncan had moderate flooding and the smaller dikes broke allowing water to backup into the town. Damage occurred to a residence near Duncan High School, and a trailer downstream of the high school. Also, U.S. Highway 70 near the high school was covered with four feet of water and the approach ramps to the highway were overtopped with flowing water. East Avenue and low lying areas in the west end of the Town of Duncan were evacuated on the evening of Saturday February 12, 2005. The railroad tracks also on the west end of Duncan were covered with water and power went out in the west side of the town. The San Francisco River at the Town of Clifton had minor flooding reported. There was no damage reported in the Town of Clifton. However, there was water to the bottom of the Railroad Bridge which stopped railroad traffic from the Morenci
9/3/2005	Miscellaneous	Emergency declaration to provide shelter and assistance to victims of Hurricane Katrina
2/22/2006	Wildfire	On February 22, 2006, the Governor declared an emergency due to the driest winter in recorded history coupled with above average temperatures and the earliest recorded start to a wildfire season. The entire state was threatened by extreme wildfire hazards. The 2006 state wildfire presuppression resources strategy required additional financial support. The declaration provided \$200,000 for pre-suppression resources to the Arizona State Land Department, Office of State Forester and the Arizona Division of Emergency Management.
9/14/2007	Flooding / Flash Flooding	On September 14, 2007, the Governor declared a state of emergency for a series of potent monsoon storms and flash floods throughout several communities in Arizona, specifically Mohave County, the Town of Cave Creek and the Town of Mammoth from July 21 – August 6, 2007 and allocated \$200,000 to this emergency.
1/18/2010	Flooding / Flash Flooding	On January 18-22, 2010, a series of four Pacific storms pounded the Mojave Desert and southern Great Basin between January 18th and 21st with heavy rain and snow (which led to river flooding), locally high winds, and isolated severe thunderstorms.

State of Arizona Declaration				Damage Estimates			
Date	Hazard	Fatalities	Injuries	Property	Crop/Livestock	Total	Sources
6/23/2001	Drought					\$0	ADEM, 2008
9/12/2001	Terrorism					\$0	ADEM, 2008
10/16/2001	Terrorism					\$0	ADEM, 2008
05/17/2002	Drought					\$0	ADEM, 2008
5/18/2002	Disease					\$0	ADEM, 2008
6/23/2002	Drought					\$0	ADEM, 2008
07/11/2002	Drought				\$300,000,000	\$300,000,000	ADEM, 2008
2/3/2003	Disease					\$0	ADEM, 2008
5/2/2003	Wildfire					\$0	ADEM, 2008
6/23/2003	Drought					\$0	ADEM, 2008
12/29/2004	Flooding / Flash Flooding			\$2,000,000		\$2,000,000	ADEM, 2008 NCDC, 2008
2/16/2005	Flooding / Flash Flooding			\$1,500,000		\$1,500,000	ADEM, 2008 NCDC, 2008
9/3/2005	Miscellaneous					\$0	ADEM, 2008
2/22/2006	Wildfire					\$0	ADEM, 2008
9/14/2007	Flooding / Flash Flooding					\$0	ADEM, 2008
1/18/2010	Flooding / Flash Flooding			\$11,061,000	\$0	\$11,061,000	ADEM, 2010 NCDC, 2010

Mohave County Historic Hazard Events
September 1960 to January 2010

Hazard	No. of Records	Recorded Losses		
		Fatalities	Injuries	Damage Costs (\$)
Drought	0	0	0	\$0
Dam Failure	0	0	0	\$0
Earthquake	0	0	0	\$0
Fissure	0	0	0	\$0
Flooding / Flash Flooding	20	6	122	\$13,252,000
Landslide / Mudslide	0	0	0	\$0
Levee Failure	0	0	0	\$0
Subsidence	0	0	0	\$0
Severe Wind	72	4	22	\$7,444,030
Winter Storms	1	0	0	\$10,000
Wildfire	13	0	0	\$0

Notes:

- No attempt has been made to adjust Damage Costs to current dollar values

Date	Hazard	Description	Location
8/8/1972	Severe Wind	Tornado - F0	
9/18/1972	Severe Wind	Tornado - F1	
7/19/1974	Flooding / Flash Flooding	State Declared Event: On July 19th, a severe thunderstorm with winds up to 80 mph and heavy rain caused extensive flooding in Lake Havasu City and completely washed out sections 4 and 5 feet deep in some streets. Many cars were abandoned during the storm and a number washed away. Three members of one family were carried to their deaths and one was injured when their station wagon was carried 3,000 feet down a wash by a wall of water 10 feet high. Damage to public and private property amounted to \$1.7million. At Bullhead City, over 2.0 inches of rain caused extensive flooding on the morning of the 20th.	Lake Havasu City
8/12/1976	Severe Wind	Tornado - F1	
8/16/1976	Flooding / Flash Flooding	Bullhead City in Mohave County was devastated between the evening of the 16th and the morning of the 17th. A number of washes became raging torrents. There was severe damage to streets, highways, residences, and businesses. Damages to homes and places of business were put at \$250,000. Some streets were gouged out to a depth of three to five feet and resembled small canyons. The hardest hit highway was the junction of 95 and 68 where raging waters tore up one-thousand-pound chunks of pavement and tossed them to the side in powerful surges. Several dikes were heavily damaged.	Bullhead City
9/11/1976	Flooding / Flash Flooding	State Declared Event: On the 11th, 2 to 5 inches of rain brought severe flash flooding to Mohave County. The hardest hit was Bullhead City and the surrounding area along the Colorado River. Eight washes carried walls of water from elevations of over 3,000 feet to the east in to the Bullhead City area with an elevation of 675.0 feet. There was severe damage to streets, highways, residences, businesses, water and gas mains, and culverts. Many cars were swamped in tons of debris. Silver Creek Wash crossing Highway 95 was cut into a 20-40 foot deep canyon. The city was severed from all outside assistance. Estimates of damage to roads and streets were put in excess of \$500,000 and damage to private property at \$2,500,000.	Bullhead City
9/24/1976	Flooding / Flash Flooding	On the 24th, Bullhead City was again hit by a severe storm of 2-5 inches produced walls of water that inundated this community, which was still trying to dig out from the millions of tons of silt, rocks, and debris from tropical storm Kathleen. Highway 95, the only access to the outside, was again quickly inundated in several places. A number of cars, some with occupants, were swept down the washes. Eight persons were rescued, some by a private helicopter. Additional damage from this second wave was estimated at \$2-3 million.	Bullhead City
3/14/1979	Severe Wind	Tornado - F0	
7/16/1981	Flooding / Flash Flooding	Massive flash flooding resulting from very heavy rains caused \$250,000 in damage. Roads, streets, water and sewer lines were destroyed and basements filled with water and mud. Ravines three to six feet deep were cut into the streets. The large hail that preceded the heavy rain accumulated to a depth of one inch and severely damaged crops.	COLORADO CITY
8/6/1983	Severe Wind	Tornado - F1	
12/27/1983	Severe Wind	Tornado - F1	
5/29/1986	Severe Wind		
1/8/1993	Flooding / Flash Flooding	Streets and intersections flooded by sudden heavy rains. Many washes and low spots flooded.	Bullhead City

Date	Hazard	Fatalities	Injuries	Damage Estimates		Total	Sources
				Property	Crop/Livestock		
8/8/1972	Severe Wind	0	0	\$30	\$0	\$30	NCDC, 2008
9/18/1972	Severe Wind	0	1	\$250,000	\$0	\$250,000	NCDC, 2008
7/19/1974	Flooding / Flash Flooding	3	1	\$1,700,000	\$0	\$1,700,000	ADEM, 2008 AFMA Floods Happen, Spring 2003.
8/12/1976	Severe Wind	0	0	\$2,500	\$0	\$2,500	NCDC, 2008
8/16/1976	Flooding / Flash Flooding	0	0	\$250,000	\$0	\$250,000	AFMA Floods Happen, Spring 2003.
9/11/1976	Flooding / Flash Flooding	0	0	\$3,000,000	\$0	\$3,000,000	ADEM, 2008 AFMA Floods Happen, Spring 2003.
9/24/1976	Flooding / Flash Flooding	0	0	\$2,500,000	\$0	\$2,500,000	ADEM, 2008 AFMA Floods Happen, Spring 2003.
3/14/1979	Severe Wind	0	3	\$25,000	\$0	\$25,000	NCDC, 2008
7/16/1981	Flooding / Flash Flooding	0	0	\$250,000	\$0	\$250,000	Mohave County MJHMP, 2004
8/6/1983	Severe Wind	0	0	\$25,000	\$0	\$25,000	NCDC, 2008
12/27/1983	Severe Wind	0	0	\$250,000	\$0	\$250,000	NCDC, 2008
5/29/1986	Severe Wind	0	1	\$0	\$0	\$0	NCDC, 2008
1/8/1993	Flooding / Flash Flooding	0	0	\$500,000	\$0	\$500,000	NCDC, 2008

Date	Hazard	Description	Location
8/6/1993	Severe Wind	High winds, small hail and heavy rains tore down signs, uprooted trees, and caused considerable damage to homes. At one residence, a board was embedded in the garage wall.	Bullhead City
3/19/1994	Flooding / Flash Flooding	Roads were closed around the town as a sudden deluge left motorists stranded in water. The Chaparral Country Club had to be closed for three days due to flood damages.	Bullhead City
3/11/1995	Flooding / Flash Flooding	Heavy rains during March 11 and 12, resulted in flooding along the Beaver Dam Creek and the Virgin River, in the vicinity of Littlefield. Erosion of the banks along the creek caused four mobile homes (converted into two apartments per mobile home) to be washed down stream, where they floated into the Highway 91 bridge. Both erosion and debris damaged a local golf course. Streets and utilities were damaged in a subdivision along the creek. The foundation of a home was undercut by flood waters. About 25 people were evacuated. Damage to public property was estimated at \$335,000; and private property \$1,290,000.	Littlefield
9/6/1995	Severe Wind	A very strong thunderstorm caused damage to more than 250 homes, several extensively. Roofs were ripped off and air conditioners at three homes were blown to the ground. Winds overturned some boats with a few of them crashing into the street. Winds also knocked down powerlines. Torrential rains caused washes to run very high.	Lake Havasu City
9/6/1996	Severe Wind	A thunderstorm produced wind gusts to 60 mph reducing visibility to near zero and downing power lines in parts of Kingman.	KINGMAN
11/22/1996	Flooding / Flash Flooding	Heavy rain created flash flooding in Kingman causing street closures and some road damage. A few cars were abandoned but no injuries were reported. Also, the combination of rain and hail produced slippery roads resulting in numerous automobile accidents.	KINGMAN
11/22/1996	Severe Wind	An F0 tornado observed near Kingman, AZ touched down in a field and caused significant damage to a barn and tool shed. Doors were torn from their hinges, windows were broken and part of the roof was blown off.	KINGMAN
6/6/1997	Severe Wind	Damaging thunderstorm winds whipped through Kingman tearing half the roof from a motel and downing several trees and power poles.	KINGMAN
7/28/1997	Severe Wind	Thunderstorm winds estimated at 55 to 60 mph caused minor roof damage to several buildings.	TEMPLE BAR MARINA
8/7/1997	Flooding / Flash Flooding	A cluster of severe thunderstorms raked Lake Havasu City between 5:50 and 6:25 PM MST. Wind from the storms reportedly ripped trees out of the ground, downed power lines, and tore tiles from roofs. The city was also pelted with heavy rain and 3/4 inch diameter hail on the south side of town and up to one inch diameter hail on the north side. Subsequent flash flooding of washes swept away several vehicles and required swift water rescues of the occupants. No serious injuries were reported.	LAKE HAVASU CITY
8/7/1997	Severe Wind	A cluster of severe thunderstorms raked Lake Havasu City between 5:50 and 6:25 PM MST. Wind from the storms reportedly ripped trees out of the ground, downed power lines, and tore tiles from roofs. The city was also pelted with heavy rain and 3/4 inch diameter hail on the south side of town and up to one inch diameter hail on the north side. Subsequent flash flooding of washes swept away several vehicles and required swift water rescues of the occupants. No serious injuries were reported.	LAKE HAVASU CITY
8/8/1997	Severe Wind	The Mohave County Sheriff's Office reported sustained winds at an estimated 60 mph, with gusts up to 75 mph, over an area extending from the Mohave Valley to Lake Havasu City, AZ. Visibilities were reduced to zero and some homes in Lake Havasu City sustained minor damage to roofs and windows.	BULLHEAD CITY

Date	Hazard	Fatalities	Injuries	Damage Estimates		Total	Sources
				Property	Crop/Livestock		
8/6/1993	Severe Wind	0	0	\$50,000	\$0	\$50,000	NCDC, 2008
3/19/1994	Flooding / Flash Flooding	0	0	\$50,000	\$0	\$50,000	NCDC, 2008
3/11/1995	Flooding / Flash Flooding	0	0	\$1,600,000	\$0	\$1,600,000	NCDC, 2008
9/6/1995	Severe Wind	0	0	\$500,000	\$0	\$500,000	NCDC, 2008
9/6/1996	Severe Wind	0	0	\$10,000	\$0	\$10,000	NCDC, 2008
11/22/1996	Flooding / Flash Flooding	0	0	\$50,000	\$0	\$50,000	NCDC, 2008
11/22/1996	Severe Wind	0	0	\$10,000	\$0	\$10,000	NCDC, 2008
6/6/1997	Severe Wind	0	0	\$100,000	\$0	\$100,000	NCDC, 2008
7/28/1997	Severe Wind	0	0	\$3,000	\$0	\$3,000	NCDC, 2008
8/7/1997	Flooding / Flash Flooding	0	0	\$30,000	\$0	\$30,000	NCDC, 2008
8/7/1997	Severe Wind	0	0	\$20,000	\$0	\$20,000	NCDC, 2008
8/8/1997	Severe Wind	0	0	\$5,000	\$0	\$5,000	NCDC, 2008

Date	Hazard	Description	Location
8/8/1997	Severe Wind	The Bullhead City Fire Department reported damaging winds resulting in broken tree branches, downed power lines, awnings torn off mobile homes and a blown down shed.	BULLHEAD CITY
8/9/1997	Flooding / Flash Flooding	Severe thunderstorms with very heavy rain began over central Mohave County around 12:30 am and ended around 2:30 am MST. Washes rapidly filled in the vicinity of Kingman and several roads were washed out. At least two cars were caught in a flooded wash and their four occupants had to be rescued by helicopter. Also, one woman was found dead hours later in a sewer drainage pond. It is unknown how she was caught in the flood waters. Another serious result occurred a few hours after the storms ended when a passenger train derailed while crossing a small bridge damaged and weakened by flood waters. Of the 302 passengers and crew members aboard, 116 were injured and of those eight sustained serious injuries.	KINGMAN
8/27/1997	Flooding / Flash Flooding	A Skywarn Spotter reported several roads around Kingman eroded and damaged and one road completely washed out. Many locations around the city had up to a foot of standing water.	KINGMAN
8/27/1997	Severe Wind	A Skywarn Spotter reported dime-sized hail which caused minor damage to his house.	KINGMAN
8/27/1997	Severe Wind	Damaging winds ripped part of a roof off a house, downed several trees and knocked over a fence. Although the exact time was not known, a Skywarn Spotter also recorded a 75 mph thunderstorm gust that occurred sometime between 5:30 and 8:00 pm MST. Other events that occurred between 6 and 8 pm MST included power outages, a roof blown off a fitness center, apartment parking awnings mangled and street signs blown over and bent.	KINGMAN
8/27/1997	Severe Wind	A storm spotter in Truxton reported that strong winds from a nearby thunderstorm knocked over a fence and broke small tree limbs.	TRUXTON
9/14/1997	Severe Wind	A Skywarn Spotter in Lake Havasu City reported thunderstorm winds had downed a few power lines and some trees.	LAKE HAVASU CITY
9/14/1997	Severe Wind	A powerful thunderstorm unleashed a destructive wind that wreaked havoc on a small section of Bullhead City, AZ. The fierce wind snapped 24 power poles and damaged approximately 80 houses and mobile homes. Roofs were blown off or damaged, a garage was blown away and numerous awnings were ripped off and hurled through the air. 22 of the homes were condemned.	BULLHEAD CITY
3/28/1998	Severe Wind	Thunderstorm wind gusts destroyed a HAM radio antenna and caused minor roof damage to a weather spotter's house 10 miles west of Kingman. About 10 minutes later, winds estimated at 60 mph downed power lines along Highway 93 to the northwest of town.	KINGMAN
3/28/1998	Severe Wind	Thunderstorm wind gusts destroyed a HAM radio antenna and caused minor roof damage to a weather spotter's house 10 miles west of Kingman. About 10 minutes later, winds estimated at 60 mph downed power lines along Highway 93 to the northwest of town.	KINGMAN
7/18/1998	Severe Wind	Thunderstorms in central Mohave County produced strong wind gusts which caused widespread blowing dust. A 63 mph wind gust was recorded in the Golden Valley west of Kingman. The winds also reached Bullhead City causing some roof and awning damage at a car dealership.	BULLHEAD CITY
8/8/1998	Severe Wind	Strong thunderstorms rolled through Mohave County in the vicinity of Kingman producing continuous lightning and brief heavy rain. A Skywarn spotter reported local street flooding around Kingman and water running in the washes. Several transformers were struck by lightning resulting in loss of electricity throughout the city for a few hours.	KINGMAN

				Damage Estimates			
Date	Hazard	Fatalities	Injuries	Property	Crop/Livestock	Total	Sources
8/8/1997	Severe Wind	0	0	\$15,000	\$0	\$15,000	NCDC, 2008
8/9/1997	Flooding / Flash Flooding	1	120	\$110,000	\$0	\$110,000	NCDC, 2008
8/27/1997	Flooding / Flash Flooding	0	0	\$10,000	\$0	\$10,000	NCDC, 2008
8/27/1997	Severe Wind	0	0	\$400	\$0	\$400	NCDC, 2008
8/27/1997	Severe Wind	0	0	\$75,000	\$0	\$75,000	NCDC, 2008
8/27/1997	Severe Wind	0	0	\$1,000	\$0	\$1,000	NCDC, 2008
9/14/1997	Severe Wind	0	0	\$15,000	\$0	\$15,000	NCDC, 2008
9/14/1997	Severe Wind	0	0	\$750,000	\$0	\$750,000	NCDC, 2008
3/28/1998	Severe Wind	0	0	\$1,000	\$0	\$1,000	NCDC, 2008
3/28/1998	Severe Wind	0	0	\$2,000	\$0	\$2,000	NCDC, 2008
7/18/1998	Severe Wind	0	0	\$2,000	\$0	\$2,000	NCDC, 2008
8/8/1998	Severe Wind	0	0	\$8,000	\$0	\$8,000	NCDC, 2008

Date	Hazard	Description	Location
8/29/1998	Severe Wind	A large window (14' by 6') was blown out at a restaurant causing minor cuts and injuries to seven people. The damaging winds also ripped off two balcony roofs from another resort building and sank a boat at a nearby dock.	LAKE HAVASU CITY
8/31/1998	Severe Wind	Thunderstorm winds were blamed for downing a lemon tree and tearing shingles off a roof during the early morning hours.	LAKE HAVASU CITY
9/9/1998	Severe Wind	Fierce thunderstorm winds overturned a tractor-trailer on Interstate 40 near Topock. The same storms later produced winds in Dolan Springs which caused roof damage to some homes.	TOPOCK
9/9/1998	Severe Wind	Damaging thunderstorm winds downed power lines as they blew through Colorado City.	COLORADO CITY
9/9/1998	Severe Wind	Fierce thunderstorm winds overturned a tractor-trailer on Interstate 40 near Topock. The same storms later produced winds in Dolan Springs which caused roof damage to some homes.	DOLAN SPGS
7/15/1999	Severe Wind	The Mohave County Sheriff's Office reported a roof was torn from a house in Kingman by thunderstorm winds.	KINGMAN
7/28/1999	Severe Wind	Severe thunderstorms unleashed damaging winds and torrential rain from Mohave Valley to near Oatman along Route 66. Flood waters blocked Route 66 around 3:15 p.m. MST, but the height of the storm struck around 3:45 p.m. producing winds which damaged 45 residential properties and tore the roof completely off a duplex. Several carports and numerous trees and power lines were blown down. The roofless duplex was quickly drenched by the heavy downpour and was condemned by authorities. Streets were filled with water and many were impassable until around 6:00 p.m. MST.	BULLHEAD CITY
9/13/1999	Severe Wind	Strong thunderstorm winds swept through an area extending north from Mohave Valley to Temple Bar Marina on Lake Mead. Power was knocked out to 300 homes and business in Mohave Valley and Bullhead City due to downed power poles and several tree branches being blown into power lines. Estimated wind gusts up to 65 miles an hour occurred along Lake Mohave and some awnings were damaged at Temple Bar.	BULLHEAD CITY
9/18/1999	Flooding / Flash Flooding	Heavy rainfall in the Kingman area caused area washes to flood. Several cars were caught in flood waters and at least one swift water rescue was performed.	KINGMAN
6/21/2000	Severe Wind	A peak wind gust of 83 mph was reported in Lake Havasu City, AZ from thunderstorm outflow. These winds caused trees and transformers to be blown down and several houseboats were damaged as the strong winds pushed them ashore.	(LHU)LAKE HAVASU CITY
8/2/2000	Severe Wind	Several transformers and power poles were damaged in Kingman due to several lightning strikes from thunderstorms that rolled through the area.	KINGMAN
8/16/2000	Severe Wind	Lightning started 3 fires in Lake Havasu City, AZ causing an estimated \$20,000 dollars in damage.	LAKE HAVASU CITY
8/16/2000	Severe Wind	Strong thunderstorm winds caused a houseboat to be blown ashore causing an estimated three thousand dollars in damage.	(LHU)LAKE HAVASU CITY
8/16/2000	Severe Wind	Strong wind gusts up to 63 mph blew several power lines down in Lake Havasu City, AZ. Damage was estimated at two thousand dollars.	LAKE HAVASU CITY

				Damage Estimates			
Date	Hazard	Fatalities	Injuries	Property	Crop/Livestock	Total	Sources
8/29/1998	Severe Wind	0	7	\$20,000	\$0	\$20,000	NCDC, 2008
8/31/1998	Severe Wind	0	0	\$1,000	\$0	\$1,000	NCDC, 2008
9/9/1998	Severe Wind	0	0	\$30,000	\$0	\$30,000	NCDC, 2008
9/9/1998	Severe Wind	0	0	\$2,000	\$0	\$2,000	NCDC, 2008
9/9/1998	Severe Wind	0	0	\$8,000	\$0	\$8,000	NCDC, 2008
7/15/1999	Severe Wind	0	0	\$15,000	\$0	\$15,000	NCDC, 2008
7/28/1999	Severe Wind	0	0	\$500,000	\$0	\$500,000	NCDC, 2008
9/13/1999	Severe Wind	0	0	\$25,000	\$0	\$25,000	NCDC, 2008
9/18/1999	Flooding / Flash Flooding	0	0	\$15,000	\$0	\$15,000	NCDC, 2008
6/21/2000	Severe Wind	0	0	\$50,000	\$0	\$50,000	NCDC, 2008
8/2/2000	Severe Wind	0	0	\$5,000	\$0	\$5,000	NCDC, 2008
8/16/2000	Severe Wind	0	0	\$20,000	\$0	\$20,000	NCDC, 2008
8/16/2000	Severe Wind	0	0	\$3,000	\$0	\$3,000	NCDC, 2008
8/16/2000	Severe Wind	0	0	\$2,000	\$0	\$2,000	NCDC, 2008

Date	Hazard	Description	Location
8/16/2000	Severe Wind	Strong thunderstorm wind gusts of 80 -100 mph moved through the community of Golden Shores causing one million dollars in damage. Two mobile homes were destroyed and 17 other mobile homes and frame houses were unlivable. Another 117 homes received minor damage. One injury occurred when the homeowner sought shelter in a tub in the mobile homes bathroom. As the mobile home rolled the toilet was ripped from its foundation and struck the homeowner in the head causing cuts and bruises. In addition, numerous pontoon boats were either flipped over or destroyed and several windows were broken on homes and cars. The storm snapped several power lines which cut power, in turn cutting the towns water supply.	LAKE HAVASU CITY
2/19/2001	Severe Wind	High winds caused an accident on Interstate 40 near Kingman, AZ. A truck towing a trailer lost control causing the trailer to flip. The trailer was demolished and its contents was strewn across the highway closing several lanes for about an hour.	
8/7/2001	Severe Wind	Strong thunderstorm winds downed several power lines knocking out power to several hundred residents. High winds also destroyed a large aluminum storage shed that had been in the same area for 18 years. The roof was also torn off a local business a several large pieces of equipment were also damaged on the property.	LAKE HAVASU CITY
8/12/2001	Severe Wind	The Kingman ASOS reported a wind gust to 70 mph which caused property damage to portions of Kingman. The storm also caused damage to numerous homes with roofs being torn off many. The strong winds also flipped an unoccupied mobile home. The storm also caused a brick to slam through a vehicle's window striking a teenager in the head causing minor injuries.	KINGMAN
3/1/2002	Severe Wind	A dry cold front pushed through the area causing several homes to recieve roof damage. Several trees and power lines were also blown over.	
3/13/2002	Severe Wind	Strong winds caused a tree to topple onto a house causing moderate damage to the roof.	
4/15/2002	Severe Wind	A strong low pressure system caused several porch covers to be destroyed along with several trees and powerlines down.	
4/15/2002	Severe Wind	A strong low pressure system brought strong winds to many areas of the Lake Mead National Recreation area. Damage on the Arizona side included several trees down, damage to roofs and awnings, and windows broken in a park service vehicle.	
7/10/2002	Severe Wind	Strong winds from a thunderstorm damaged a boat dock at Temple Bar Marina in the Lake Mead National Recreation area.	TEMPLE BAR MARINA
7/12/2002	Severe Wind	Strong thunderstorm winds blew through Kingman destroying 16 homes and damaging 36. Most of the damaged and destroyed homes were mobile homes in the Kingman Shadows subdivision. Four people recieved minor injuries from flying debris. Several powerlines were also blown down knocking out power to an estimated 3,000 to 4,000 people.	KINGMAN
7/13/2002	Severe Wind	Strong winds from thunderstorms pushed through Kingman knocking down powerlines causing minor roof damage to several homes around town. A 3-foot diameter tree was also knocked down by the winds.	KINGMAN
7/13/2002	Severe Wind	Thunderstorm winds estimated at 100 mph blew the roof off a horse coral.	CHLORIDE
9/10/2002	Flooding / Flash Flooding	The Kingman ASOS recorded 0.85 inches of rain in an hour. This caused several large puddles to form around the airport. A dirt road in the vicinity of the airport was damaged due to the excessive run-off.	KINGMAN ARPT
1/5/2003	Severe Wind	High winds estimated at 60 mph caused several power lines and trees to be blown over in Bullhead City, AZ. Several cars sustained damage from falling trees and power was out for several hours.	

				Damage Estimates			
Date	Hazard	Fatalities	Injuries	Property	Crop/Livestock	Total	Sources
8/16/2000	Severe Wind	0	1	\$1,000,000	\$0	\$1,000,000	NCDC, 2008
2/19/2001	Severe Wind	0	0	\$20,000	\$0	\$20,000	NCDC, 2008
8/7/2001	Severe Wind	0	0	\$20,000	\$0	\$20,000	NCDC, 2008
8/12/2001	Severe Wind	0	1	\$100,000	\$0	\$100,000	NCDC, 2008
3/1/2002	Severe Wind	0	0	\$10,000	\$0	\$10,000	NCDC, 2008
3/13/2002	Severe Wind	0	0	\$25,000	\$0	\$25,000	NCDC, 2008
4/15/2002	Severe Wind	0	0	\$100,000	\$0	\$100,000	NCDC, 2008
4/15/2002	Severe Wind	0	0	\$50,000	\$0	\$50,000	NCDC, 2008
7/10/2002	Severe Wind	0	0	\$1,000	\$0	\$1,000	NCDC, 2008
7/12/2002	Severe Wind	0	4	\$400,000	\$0	\$400,000	NCDC, 2008
7/13/2002	Severe Wind	0	0	\$10,000	\$0	\$10,000	NCDC, 2008
7/13/2002	Severe Wind	0	0	\$5,000	\$0	\$5,000	NCDC, 2008
9/10/2002	Flooding / Flash Flooding	0	0	\$2,000	\$0	\$2,000	NCDC, 2008
1/5/2003	Severe Wind	0	0	\$15,000	\$0	\$15,000	NCDC, 2008

Date	Hazard	Description	Location
7/25/2003	Flooding / Flash Flooding	Flash flooding in Peach Springs from a stationary thunderstorm. Route 66 under debris and mud. Trailers moved off foundations and cars floating in flood waters. All washes reported flooded with Santa Fe railroad tracks under water. SR 18 also under water and closed.	PEACH SPGS
7/28/2003	Severe Wind	A wind gust blew the screen door off the front of a NPS Rangers home.	TEMPLE BAR MARINA
8/26/2003	Flooding / Flash Flooding	Moderate to intense rain caused flash flooding in Kingman. Two people became trapped in their vehicles after becoming stuck under a bridge.	KINGMAN
9/3/2003	Flooding / Flash Flooding	Runoff from heavy rain caused a car to be swept off the road into a wash. One woman inside the car was rescued and taken to a local hospital with undisclosed injuries.	LAKE HAVASU CITY
12/25/2003	Severe Wind	Strong winds from thunderstorm outflow damaged several roofs in the Kingman areas.	
4/28/2004	Severe Wind	An area of low pressure produced strong wind gusts over the Mojave Desert in northwest Arizona. A wind gust of 60 mph was reported in Beaver Dam. Several power poles were blown down and visibility was reduced to less than 200 yards.	
7/16/2004	Severe Wind	Five forty foot telephone poles were blown down by strong thunderstorm winds.	BULLHEAD CITY
8/11/2004	Severe Wind	Lightning from thunderstorms over Lake Havasu City caused two house fires and ignited several palm trees.	LAKE HAVASU CITY
9/8/2004	Severe Wind	Strong winds from a severe thunderstorms pushed through Lake Havasu City. Several trees were blown over, one house received roof damage and a construction trailer was overturned.	LAKE HAVASU CITY
11/22/2004	Winter Storms	Freezing rain knocked out power to a large area of Hualapai Mountain. People without power for several hours. Top of the mountain received 2 feet of new snow.	
5/22/2005	Wildfire	Sacramento Fire - a human caused fire that burned an area north of Kingman. The fire started May 22, 2005 and was controlled May 24, 2005 and burned a total of 120 acres with over \$27,000 in fire suppression costs. One residence received damages.	
5/24/2005	Wildfire	Shiner Fire - a human caused fire that burned an area northwest of Kingman and northeast of Bullhead City. The fire started May 24, 2005 and was controlled May 25, 2005 and burned a total of 2,000 acres with over \$100,000 in fire suppression costs.	
6/4/2005	Wildfire	Secret Fire - a human caused fire that burned an area 15 miles southwest of Kingman. The fire started June 4, 2005 and was controlled June 6, 2005 and burned a total of 460 acres with over \$175,000 in fire suppression costs, one damaged residence and one destroyed residence.	
6/22/2005	Wildfire	Perkins Complex Fire - a lightning caused fire that burned an area northwest of Kingman and northeast of Bullhead City. The fire started June 22, 2005 and was controlled July 30, 2005 and consumed a total of 21,600 acres with over \$1.6 million in fire suppression costs.	
7/19/2005	Wildfire	Tank Complex Fire - a human caused fire that burned an area 40 miles south of St. George, Utah. The fire started July 19, 2005 and was controlled July 27, 2005 and burned a total of 69,934 acres with over \$2.2 million in fire suppression costs and two destroyed outbuildings.	
7/22/2005	Wildfire	Twin Mills Fire - a lightning caused fire that burned an area northwest of Kingman and northeast of Bullhead City. The fire started July 22, 2005 and was controlled July 27, 2005 and burned a total of 11,967 acres with over \$1.0 million in fire suppression costs.	
5/21/2006	Severe Wind	Two drownings at Lake Mead National Recreation Area. 69YO female fell off a personal watercraft near Temple Bar, and 4YO female fell off a raft near South Telephone Cove. Strong winds contributed to both drownings. F69BO, F4IW	

Date	Hazard	Fatalities	Injuries	Damage Estimates		Total	Sources
				Property	Crop/Livestock		
7/25/2003	Flooding / Flash Flooding	0	0	\$500,000	\$0	\$500,000	NCDC, 2008
7/28/2003	Severe Wind	0	0	\$100	\$0	\$100	NCDC, 2008
8/26/2003	Flooding / Flash Flooding	0	0	\$50,000	\$0	\$50,000	NCDC, 2008
9/3/2003	Flooding / Flash Flooding	0	1	\$15,000	\$0	\$15,000	NCDC, 2008
12/25/2003	Severe Wind	0	0	\$5,000	\$0	\$5,000	NCDC, 2008
4/28/2004	Severe Wind	0	0	\$5,000	\$0	\$5,000	NCDC, 2008
7/16/2004	Severe Wind	0	0	\$2,000	\$0	\$2,000	NCDC, 2008
8/11/2004	Severe Wind	0	0	\$100,000	\$0	\$100,000	NCDC, 2008
9/8/2004	Severe Wind	0	0	\$10,000	\$0	\$10,000	NCDC, 2008
11/22/2004	Winter Storms	0	0	\$10,000	\$0	\$10,000	NCDC, 2008
5/22/2005	Wildfire	0	0	\$0	\$0	\$0	Arizona State Forestry National Wildfire Coordinating Group, 2010
5/24/2005	Wildfire	0	0	\$0	\$0	\$0	Arizona State Forestry National Wildfire Coordinating Group, 2010
6/4/2005	Wildfire	0	0	\$0	\$0	\$0	Arizona State Forestry National Wildfire Coordinating Group, 2010
6/22/2005	Wildfire	0	0	\$0	\$0	\$0	Arizona State Forestry National Wildfire Coordinating Group, 2010
7/19/2005	Wildfire	0	0	\$0	\$0	\$0	Arizona State Forestry National Wildfire Coordinating Group, 2010
7/22/2005	Wildfire	0	0	\$0	\$0	\$0	Arizona State Forestry National Wildfire Coordinating Group, 2010
5/21/2006	Severe Wind	2	0	\$0	\$0	\$0	NCDC, 2008

Date	Hazard	Description	Location
5/26/2006	Severe Wind	Two drownings at Lake Mead National Recreation Area. 32YO female fell off a personal watercraft near Princess Cove, AZ on Lake Mohave, and 21YO male fell off a small boat at an unknown location. Strong winds contributed to both deaths. F32BO, M21BO	
6/6/2006	Wildfire	Meriwhitica Fire - a lightning caused fire that burned an area 45 miles northwest of Peach Springs, AZ. The fire started June 6, 2006 and was controlled June 10, 2006, and burned a total of 203 acres with over \$25,000 in fire suppression costs.	
6/11/2006	Wildfire	Ranger 2 Fire - a lightning caused fire that burned an area 50 miles northwest of Peach Springs, AZ. The fire started June 11, 2006 and was controlled June 14, 2006, and burned a total of 393 acres with over \$800,000 in fire suppression costs.	
6/30/2006	Wildfire	White Hills Complex Fire - a lightning caused fire that burned the White Hills area near Lake Mead and 1.5 miles east of Dolan Springs, AZ. The fire started June 30, 2006 and was controlled July 15, 2006, and burned a total of 2,344 acres with over \$1.0 million in fire suppression costs.	
7/17/2006	Wildfire	Rim Fire - a lightning caused fire that burned an area 15 miles south of Grand Canyon West Resort on the Hualapai Indian Reservation. The fire started July 17, 2006 and was controlled July 20, 2006, and burned a total of 1,100 acres with over \$11,000 in fire suppression costs.	
7/24/2006	Wildfire	Pocket Complex Fire - a lightning caused fire that burned an area 15 miles south of Mesquite, NV. The fire started July 24, 2006 and was controlled July 31, 2006, and burned a total of 11,236 acres with over \$1.1 million in fire suppression costs.	
7/5/2007	Wildfire	Black Rock Gulch Fire - a lightning caused fire that burned an area 30 miles south of St. George, Utah. The fire started July 5, 2007 and was controlled July 25, 2007, and burned a total of 22,387 acres with over \$1.9 million in fire suppression costs and one destroyed outbuilding.	
7/24/2007	Flooding / Flash Flooding	Water was up to the door of a home in Golden Valley, and many cars were stuck in washes. Two men died when their truck was swept down a wash after they attempted to drive across it. A push of monsoon moisture brought thunderstorms with flash flooding and severe weather to the Mojave Desert and Southern Great Basin from July 24th through the 30th.	(IGM)MOJAVE CO ARPT
8/1/2007	Flooding / Flash Flooding	Several roads were closed and/or damaged by flooding, including U.S. Highway 93 20 miles north of Wikieup, Stockton Hills Rd. in the Kingman area, and Antares Rd. and Diamond Bar Rd. north of Kingman. Subtropical moisture over the Desert Southwest fueled thunderstorms which brought heavy rain and flooding.	KINGMAN
9/2/2007	Severe Wind	Blowing dust caused a ten-car pileup on Interstate 40 near Yucca. Monsoon moisture fueled late-season thunderstorms.	
9/2/2007	Severe Wind	Lightning set fire to a drug store. Monsoon moisture fueled late-season thunderstorms.	KINGMAN
1/16/2008	Severe Wind	A gust of wind in Bullhead City picked up a patio roof and blew it into two houses. The time of the event is an estimate. A cold front moved down the Colorado River valley, producing locally strong north winds in its wake.	
2/20/2008	Severe Wind	Strong winds lifted a trampoline into one set of power lines, and blew a tree down into another set of power lines. Approximately 5,000 people were without power for one to two hours. Yet another series of Pacific storms brought heavy snow, high winds, and thunderstorms to parts of the Mojave Desert and Southern Great Basin.	
3/2/2008	Severe Wind	The framework of a building under construction was destroyed, and trash cans and debris were blown through the streets.	

Date	Hazard	Fatalities	Injuries	Damage Estimates		Total	Sources
				Property	Crop/Livestock		
5/26/2006	Severe Wind	2	0	\$0	\$0	\$0	NCDC, 2008
6/6/2006	Wildfire	0	0	\$0	\$0	\$0	Arizona State Forestry National Wildfire Coordinating Group, 2010
6/11/2006	Wildfire	0	0	\$0	\$0	\$0	Arizona State Forestry National Wildfire Coordinating Group, 2010
6/30/2006	Wildfire	0	0	\$0	\$0	\$0	Arizona State Forestry National Wildfire Coordinating Group, 2010
7/17/2006	Wildfire	0	0	\$0	\$0	\$0	Arizona State Forestry National Wildfire Coordinating Group, 2010
7/24/2006	Wildfire	0	0	\$0	\$0	\$0	Arizona State Forestry National Wildfire Coordinating Group, 2010
7/5/2007	Wildfire	0	0	\$0	\$0	\$0	Arizona State Forestry National Wildfire Coordinating Group, 2010
7/24/2007	Flooding / Flash Flooding	2	0	\$20,000	\$0	\$20,000	NCDC, 2008
8/1/2007	Flooding / Flash Flooding	0	0	\$2,000,000	\$0	\$2,000,000	NCDC, 2008
9/2/2007	Severe Wind	0	0	\$100,000	\$0	\$100,000	NCDC, 2008
9/2/2007	Severe Wind	0	0	\$50,000	\$0	\$50,000	NCDC, 2008
1/16/2008	Severe Wind	0	0	\$5,000	\$0	\$5,000	NCDC, 2008
2/20/2008	Severe Wind	0	0	\$5,000	\$0	\$5,000	NCDC, 2010
3/2/2008	Severe Wind	0	0	\$25,000	\$0	\$25,000	NCDC, 2010

Date	Hazard	Description	Location
7/10/2008	Severe Wind	Thunderstorm winds blew down wooden fences and a satellite dish, and ripped the roof off a mobile home garage in Kingman.	Kingman
7/10/2008	Severe Wind	Thunderstorm winds blew down a large tree in Lake Havasu City. The tree was 71 inches in circumference at its base.	Lake Havasu City
7/10/2008	Severe Wind	Thunderstorm winds blew signs off several businesses, blew shingles and an awning off a house, and blew one person over (no injury) in Bullhead City.	Bullhead City
8/25/2008	Severe Wind	Thunderstorm winds estimated at 80 to 100 mph damaged numerous roofs and outbuildings, downed trees and at least eight power lines, and damaged or destroyed 40 airplane hangars at Eagle Airpark. Golf ball sized hail was also reported.	Mohave Valley
7/17/2009	Wildfire	Cliffs Fire - a lightning caused fire that burned an area of the Music Mountains near Music Mountain Mine. The fire started July 17, 2009 and was controlled July 22, 2009, and burned a total of 156 acres with over \$175,000 in fire suppression costs.	
7/20/2009	Severe Wind	Two porches were blown over, and several homes had roof tiles damaged.	Mohave Valley
9/4/2009	Severe Wind	Several power poles along Bullhead City Parkway were snapped and blown down.	Bullhead City
9/4/2009	Severe Wind	Golf ball size hail and high wind broke all the windows on the west side of the spotter's house, broke his weather station, and damaged his shortwave radio equipment.	Golden Valley
9/4/2009	Severe Wind	Seven mobile home trailers were blown over. Several others suffered minor to moderate damage.	Riviera
9/5/2009	Flooding / Flash Flooding	Runoff and mud covered Primavera Loop and Primavera Rd. near Mohave Valley. Two homes were destroyed, nine had moderate damage, and 16 had minor damage.	Mohave Valley

				Damage Estimates			
Date	Hazard	Fatalities	Injuries	Property	Crop/Livestock	Total	Sources
7/10/2008	Severe Wind	0	0	\$5,000	\$0	\$5,000	NCDC, 2010
7/10/2008	Severe Wind	0	0	\$5,000	\$0	\$5,000	NCDC, 2010
7/10/2008	Severe Wind	0	0	\$10,000	\$0	\$10,000	NCDC, 2010
8/25/2008	Severe Wind	0	0	\$2,000,000	\$0	\$2,000,000	NCDC, 2010
7/17/2009	Wildfire	0	0	\$0	\$0	\$0	Arizona State Forestry National Wildfire Coordinating Group, 2010
7/20/2009	Severe Wind	0	0	\$15,000	\$0	\$15,000	NCDC, 2010
9/4/2009	Severe Wind	0	0	\$40,000	\$0	\$40,000	NCDC, 2010
9/4/2009	Severe Wind	0	0	\$5,000	\$0	\$5,000	NCDC, 2010
9/4/2009	Severe Wind	0	4	\$500,000	\$0	\$500,000	NCDC, 2010
9/5/2009	Flooding / Flash Flooding	0	0	\$600,000	\$0	\$600,000	NCDC, 2010

Appendix E

Plan Maintenance Review Memorandums