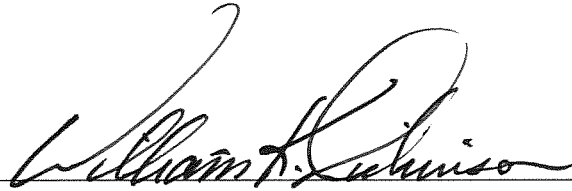
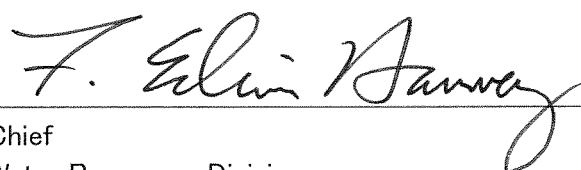




APPENDIX A: FLOODPLAIN STATEMENT OF FINDINGS
COTTONWOOD COVE AND KATHERINE LANDING DEVELOPMENT
CONCEPT PLANS / ENVIRONMENTAL IMPACT STATEMENT

LAKE MEAD NATIONAL RECREATION AREA

Recommended:  12/3/2014
Superintendent Date
Lake Mead National Recreation Area

Concurred:  12/11/2014
Chief Date
Water Resources Division

Concurred:  12/15/14
Safety Officer Date
Pacific West Region

Approved:  12/17/2014
Regional Director Date
Pacific West Region

INTRODUCTION

In May 1977, Executive Order (EO) 11988, "Floodplain Management," required the National Park Service (NPS) and other federal agencies to evaluate the likely impacts of actions in floodplains. The objectives of the executive order are to avoid to the extent possible the long-term and short-term adverse impacts associated with occupancy, modification, or destruction of floodplains and to avoid indirect support of development and new construction in such areas wherever there is a practicable alternative. NPS Director's Order 77-2, Floodplain Management Procedural Manual provides NPS policies and procedures for complying with EO 11988. The purpose of this Floodplain Statement of Findings (SOF) for Executive Order 11988 is to present the rationale for the location of development at Cottonwood Cove and Katherine Landing in the floodplains, describe the amount of risk associated with the sites, and describe associated flood mitigation actions.

PROPOSED ACTION

The preferred alternatives in the development concept plans (DCPs) for Cottonwood Cove and Katherine Landing would retain and improve both developed areas consistent with the management direction established in the *1986 Lake Mead National Recreation Area General Management Plan / Environmental Impact Statement* and the *2003 Lake Mead National Recreation Area Lake Management Plan*. A number of facilities including overnight accommodations /residences are proposed to remain or be replaced within the probable maximum floodplains. Some of these structures at Cottonwood Cove are contributing elements to a Mission 66 historic district determined to be eligible in the National Register of Historic Places in 2006.

The following actions would occur within the probable maximum floodplains at Cottonwood Cove:

- redevelop the trailer village site for short-term overnight visitor accommodations
- retain and allow expansion of the motel

- retain a portion of the upper campground for visitors and redevelop remainder of the campground for volunteer sites and employee housing
- convert lower campground to summer day use and continue operation as a campground during the winter season
- enhance existing picnic area
- construct combined visitor contact / commercial services facility on the site of the existing store/café
- increase parking capacity per the lake management plan and construct new loop road and ready lane
- maintain launch ramp
- retain NPS housing, maintenance, and emergency service facilities
- expand existing concession maintenance area

The following actions would occur at Katherine Landing within the probable maximum floodplains:

- remove the motel and redevelop area for visitor parking
- retain visitor parking east of the motel
- maintain launch ramp
- convert portion of trailer village to short-term campground
- retain NPS maintenance area and consolidate NPS offices and operations
- retain dry boat storage
- maintain day-use areas at North and South Arizona Telephone Cove

SITE AND FLOOD HAZARD DESCRIPTION

Cottonwood Cove and Katherine Landing are two of the major developed areas on Lake Mohave. The

majority of development is located near the shoreline of the lake within Cottonwood Wash and North and South Katherine Washes, but for Katherine Landing the *Draft Cottonwood Cove and Katherine Landing Development Concept Plans / Environmental Impact Statement* includes shoreline day-use areas in South and North Arizona Telephone Cove washes. The development sites in the wash bottoms are encompassed by the intervening ridges between the drainages. Consequently, there is limited, nonflood prone, developable land that provides access to the lake. As a result, almost all facilities at Cottonwood Cove and many of those at Katherine Landing are within the probable maximum floodplain.

Both developed areas accommodate a wide variety of recreational activities and provide public launch facilities and commercial marina services, as well as other public use and support facilities. As such, the natural floodplain values have been largely altered by existing development and use.

Desert washes drain from the surrounding mountain ranges across broad bajadas at their base and down into the lake. The washes are subject to flash flooding caused by intense thunderstorms over their drainages. The following washes/basins were identified for the purposes of calculating flood flows at both developed areas. Estimated flood depths at Cottonwood Cove are approximately 6 to 7 feet (ft) during the probable maximum floodplains and 3 to 6 ft during the 100-year flood. At Katherine Landing, estimated flood depths are approximately 3 to 8 ft during the probable maximum floodplains and 1 to 6 ft during the 100-year flood. The warning time, or time from the onset of rainfall until the maximum flood flows reach various facilities, varies between approximately 42 minutes for Ranger Wash to 8 minutes for the Dry Boat Storage basin at Cottonwood Cove. At Katherine Landing, warning times vary between approximately 7 minutes at the Dry Boat Storage Wash to 33 minutes at the motel in South Katherine Wash. Warning times for South and North Arizona Telephone Coves are approximately 51 and 79 minutes. See tables C-1 and C-2 for summaries of peak runoffs at Cottonwood Cove and Katherine Landing.

Existing flood protection consists of earthen dikes and channels that provide various levels of flood protection, ranging from approximately 10- to 100-year flows but that do not convey the probable maximum flood flows. At Cottonwood Cove, rain gauges located upstream of the developed area are used to monitor rainfall in real-time. An automated system consisting of flash flood hazard monitoring and warning equipment is in place to notify the public in the developed area of flood danger. All hydrologic data and siren activation/deactivation capability is also available at the emergency dispatch center in Boulder City, Nevada.

**TABLE C-1. SUMMARY OF PEAK RUNOFF –
COTTONWOOD COVE**

Wash/Channel	100-year Peak (cfs)	pmf Peak (cfs)
Ranger Residence	1,900	8,400
Upper Access Road	600	2,500
Dry Boat Storage	150	600
Lower Access Road	2,200	11,000
Lower Boat Storage	125	500
Upper Campground	400	1,800

cfs = cubic feet per second.

**TABLE C-2. SUMMARY OF PEAK RUNOFF –
KATHERINE LANDING**

Wash/Channel	100-year Peak (cfs)	pmf Peak (cfs)
North Katherine Wash	230	1,500
South Katherine Wash	950	6,500
Dry Boat Storage Wash	350	1,730
South Arizona Telephone Cove Wash	1,400	8,150
North Arizona Telephone Cove Wash	4,500	25,500

JUSTIFICATION FOR THE USE OF FLOODPLAIN

Cottonwood Cove and Katherine Landing were developed where drainages enter the Colorado River/lower Lake Mohave in order to provide recreation-related facilities. These developed areas were historically the only accessible point to lower Lake Mohave above Davis Dam. As such, they were logical locations to provide recreation-related facilities. Facilities were developed over time that included overnight and day-use facilities, as well as boat launches and marinas. Both Cottonwood Cove and Katherine Landing were established prior to the 1964 enabling legislation formally establishing Lake Mead National Recreation Area and well before issuance of EO 11988 providing guidance for federal actions in floodplain locations.

Facilities have to be located in the floodplains and retain public access, services, and support facilities. There are no adequate developable flood-free areas near the lakeshore because of the nature of the terrain that is comprised of washes and intervening ridges. The preferred alternative for the Cottonwood Cove and Katherine Landing development concept plans includes actions necessary for the preservation of public access to Lake Mohave, improvements to visitor use and experience, and to protect historic resources. Therefore, although the facilities must be located within the floodplains, the protection of people and property is a major objective for the plans.

FLOOD MITIGATION MEASURES

The preferred alternative for each developed area would minimize potential hazards to human life and property within the probable maximum floodplains through a combination of structural and nonstructural measures. An improved system of diversion dikes and channels would be constructed to convey 500-year flows through the developed areas in Cottonwood Wash and North and South Katherine Washes (see figures 5, 8, and 11 at the end of chapter 2). Flood warning signs would be posted at North and South Telephone Coves. An early warning detection system similar to the one

at Cottonwood Cove would be installed at Katherine Landing to augment the structural flood protection system. Flood evacuation planning would be developed that would direct emergency actions and evacuations in the event of flooding.

Beginning in the early 1980s, a series of flood studies at both developed areas were prepared. In 2004, studies were completed to review and update the past flood mitigation recommendations (HDR 2004a, 2004b). Conceptual designs of the proposed structural flood protection were refined based on field observations, aerial survey data, and engineering judgment. Previous hydrologic calculations were used for flow estimates (NPS 1982). Hydraulic design criteria were also identified to provide the engineering background supporting the structural flood control components. Further updating of the hydrologic and hydraulic analysis and refinement of the design would occur as part of the future stages of the project design process.

The proposed structural flood protection would include the following elements.

Cottonwood Cove

- Diversion dike needed upstream of the developed area to intercept and redirect a majority of flood flows into parallel wash north of developed area
- Maintenance and reinforcement of the existing diversion dikes
- 9,300 linear feet (lf) of concrete channels (up to 52 ft top width)
- Deflector wall and concrete swale outlet at lake
- Low-flow road crossings and road realignment

Katherine Landing

- Rehabilitate existing diversion dike (upstream of the developed area) that directs flows from North Katherine Wash around the developed area into South Telephone Cove Wash

- Raise, extend, and rehabilitate existing diversion dike, directing flows into South Katherine Wash
- New concrete channel (up to 65 ft top width) along South Katherine Wash extends from borrow pit (proposed sediment basin) to beginning of launch ramp
- Low-flow road crossings

SUMMARY

The National Park Service has determined that there is no practicable alternative to maintaining development at Cottonwood Cove and Katherine Landing within the floodplains. This determination was based on the decision to continue to maintain both developed areas as primary visitor use sites on Lake Mohave that provide lake access and provision for overnight and day-use facilities. Although these facilities are within areas subject to flooding, the proposed flood mitigation measures would reduce the risk to life or property. Structural flood protection would be designed to convey floods up to the 500-year floodplain. Early warning/detection systems, flood warning signs, and evacuation plans would also be implemented.