

LAME

**environmental assessment
development concept plan
willow beach**

waso review draft
september 1991

LAKE MEAD NATIONAL RECREATION AREA • ARIZONA

UNITED STATES DEPARTMENT OF THE INTERIOR / NATIONAL PARK SERVICE
DENVER SERVICE CENTER



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PURPOSE AND NEED FOR ACTION

GMP/DCP MANAGEMENT OBJECTIVES

The General Management Plan (GMP) for Lake Mead National Recreation Area was approved in 1986. The primary objective of this plan centers on accommodating increasing visitor use while protecting the area's most outstanding natural and cultural resources. It also addresses visitor use and flash flood safety problems that face most developed areas. The GMP proposals seek to alleviate crowding/congestion problems while accommodating projected increases in visitation and include expansion and improvement of existing developed areas; circulation improvements; improvement of existing shoreline access points; and establishment of new developed areas. The plan establishes maximum levels of development that could accommodate increasing use in the future, while not exceeding reasonable boating capacity limits. Increased use on Lake Mohave was to be met by varying degrees of expansion of the three major developed areas - Katherine Landing, Cottonwood Cove, and Willow Beach; improvement or addition of three access points; and development of a new major developed area at Fire Mountain.

The GMP includes a Development Concept Plan (DCP) for Willow Beach. Willow Beach is located within Lake Mead National Recreation Area on the Arizona shore of Lake Mohave, approximately 11 river miles below Hoover Dam. Historically, Willow Beach has operated as a small concession operation that functioned primarily as a fishing resort, providing access to northern Lake Mohave and its excellent trout fishing. Since 1974 when the Eldorado Canyon development was destroyed by a flash flood, Willow Beach has provided the only developed access to the northern part of the lake. The management objective for Willow Beach calls for maintaining the small fishing resort character of the area. Limited motel and marina expansion and a small campground would be provided, if demand warranted it. All other concession services would remain at the existing level. Other actions are directed at improving visitor safety and traffic circulation through relocation of facilities to flood safe locations, construction of flood structures, and redesign and relocation of parking. Willow Beach has the most severe flood hazard of any development in the recreation area. Consequently, flash flooding is the most limiting environmental constraint to development and use at Willow Beach.

ADDITIONAL SITE PLANNING INFORMATION/CHANGING CONDITIONS

The GMP/DCP gave prominent recognition to the flood hazards that exist at Willow Beach and treated safety from flooding as a key consideration in the development of the plan. The GMP/DCP called for relocation of a number of facilities to flood safe areas. Further site planning has revealed that severe space limitations exist that are posed by the topography and other development that would hinder accommodation of some of the facilities at the relocation sites proposed in the GMP/DCP. These facilities include the proposed park service housing and maintenance, parking, and campground.

Since completion of the GMP/DCP a number of changes have occurred in the area. The lake fishery has changed with the establishment of striped bass. The number and size of trout taken has decreased and fishing for striped bass has greatly increased. Although fishing is still a popular activity, Willow Beach continues to grow both in numbers of users and the variety of activities available. Canoeing and raft trips have grown in popularity. Jet skiing and scuba diving also occur. Rental houseboats are now available.

The increasing population growth of Las Vegas and surrounding areas, along with the concessioner's active management of the resort, play a big part in the changing and growing usage of this area. There was a change in concessioner in 1986. The current concessioner has emphasized Willow Beach as a family oriented resort and has encouraged diversity of use, with a focus on the unique qualities of the Black Canyon. The Las Vegas regional population has shown a dramatic increase, particularly in the last few years. This population is within an hour and a half drive of Willow Beach and a large number of visitors to the recreation area are from the Las Vegas area. The recreation area will continue to attract these visitors. Las Vegas area tourism is also up, increasing the number of potential visitors. A record 8.8 million people visited the recreation area in 1989. Willow Beach visitation also continues to grow, reaching over 287,000 visitors in 1989. The overall trend of increasing visitation indicates that the GMP visitation projections of 11 million visitors by the year 2010 are likely to be reached sooner than expected.

PROPOSAL PURPOSE

Given these changes in user conditions and additional site planning/design information, the National Park Service (NPS) has reexamined the Development Concept Plan for Willow Beach. The NPS proposes to reevaluate the management strategy for Willow Beach to address increasing visitation; to determine the most appropriate flood safe locations for the relocation of facilities; and to determine the necessary flood mitigation structures.

The purpose of this environmental assessment is to evaluate alternative proposals for addressing the level of development and location of land based facilities at Willow Beach, as well as to identify the flood mitigation measures for the area. Because the specific actions identified in the alternative proposals differ from the actions recommended in the 1986 GMP/DCP, any of the alternatives proposals, if adopted, would constitute an amendment to the 1986 GMP/DCP.

RELATIONSHIP TO OTHER STUDIES

The Lake Mead Carrying Capacity Study (USDI 1980) investigated boating use and capacity limits for Lakes Mead and Mohave. Utilizing information compiled in this study, the General Management Plan calculated the maximum marina expansion that could occur at each developed area pending completion of detailed launch rate studies to guide expansion. At Willow Beach 270 slips was the limit set on marina expansion. Boating use, capacity limits, and marina development will be addressed in a separate environmental document upon completion of launch rate studies and a new carrying capacity study. No further expansion of marina facilities beyond the 270 slips identified in the GMP would be allowed until these further studies were completed.

ALTERNATIVES INCLUDING THE PROPOSED ACTION

INTRODUCTION

The alternatives address two primary issues at Willow Beach, increasing visitor use and flood safety. The alternatives differ in the degree to which they provide for visitor use and safety from flooding at Willow Beach. The floodplains and the steep and rocky topography are the major constraints on the location and size of development. Consequently, there are very limited developable flood-free locations, and use of some floodplain locations for some development is necessary. Use of floodplain locations (with provisions for structural and nonstructural protection) and use of sites outside the immediate developed area vary between alternatives based on the level of visitor use that would be accommodated under each alternative.

Expansion proposals in the alternatives are the maximum levels of development that would be constructed to accommodate increasing use in the future. These levels are not goals; development within these maximum levels would occur only when demand and economic feasibility justify the expansion. A preliminary economic feasibility analysis has concluded that there is currently no demonstrated demand for any expansion of overnight facilities at Willow Beach based on current occupancy rates. The need for and feasibility of expansion would be periodically reevaluated. In the event that demand grows, overnight facilities could be expanded within or up to the maximum level.

A unified visual identity for Willow Beach would be established through the use of architectural and site guidelines that have been developed specifically for Willow Beach. All new development would adhere to these guidelines.

Marina Facilities. Only land based facilities are addressed by the alternatives. Marina facilities are not addressed. A launch rate/carrying capacity study would be completed prior to addressing this particular development issue further. However, some actions identified in the alternatives would effect the flood hazard posed to some of the marina facilities, requiring alteration of the dock layout.

Fire Mountain Developed Area. Willow Beach is the only developed area that provides access to upper Lake Mohave. As identified in the GMP, further accommodation of increasing use on upper Lake Mohave could be accomplished by developing a major new developed area downlake at Fire Mountain. A major advantage of the Fire Mountain site is that it has no flood hazard. The Fire Mountain development would remain as an option under all of the Willow Beach alternatives.

The Fire Mountain development would be considered if increased visitation warranted it, an economic feasibility study indicated that new concession facilities were warranted, and funding became available. At that time a site plan and separate environmental assessment would be prepared.

ALTERNATIVE A - NO ACTION

Objective/Strategy. Alternative A would be a continuation of existing conditions. The area would provide convenient day access to upper Lake Mohave; overnight accommodations would be minimal. Parking capacity would be approximately 224 spaces, with an additional 106 spaces in Jumbo Wash. Of these 330 spaces, 105 would be outside of the floodplains and 225 would be within the 100-year

floodplains. Flood mitigation would be provided by nonstructural mitigation measures consisting of a warning system and evacuation plan; facilities now closed due to the flood hazard, NPS residences in Access Road Wash and Jumbo Wash campground, would remain closed (see Existing Conditions map).

Actions. Development would remain as shown on the existing conditions map. Minor improvements would be accomplished through routine maintenance when money and manpower became available.

ALTERNATIVE B

Objective/strategy. Under this alternative, Willow Beach would remain primarily a day use area. There would be a minor expansion in overnight facilities. Parking capacity would be reduced to approximately 190 spaces after relocation to avoid flood hazard areas, a decrease of 140 spaces from existing conditions. However, all 190 spaces would be outside the floodplains (see Alternative B map).

The flood mitigation strategy would include relocating overnight and day use facilities either out of the floodplains or to areas of outside of the main flood flows and/or providing structural protection against floods up to the PMF level; and nonstructural mitigation measures consisting of a warning system and evacuation plan. This alternative also seeks to reduce the flood hazard by limiting the number of visitors to Willow Beach.

GMP/DCP Action Modifications. Alternative B is basically the GMP/DCP proposal. However, this alternative includes certain modifications to some of the actions identified in the GMP/DCP. These modifications from the GMP/DCP have resulted in either relocating facilities to areas not identified in the plan or reducing the size of facilities from the plan, but these changes were considered appropriate based on their compatibility with the GMP/DCP visitor use/flood mitigation objectives for Willow Beach. These changes and the rationale for them are discussed below.

Further examination of locations recommended in the GMP/DCP for the relocation of facilities has revealed that severe space limitations exist at some of these sites. Specifically, adequate space is not available for the NPS housing and maintenance, 50 recreational vehicle (RV) site campground, and all of the 225 parking spaces. Extensive and expensive hard rock excavation would be required to locate these facilities at the sites called for; therefore, either other sites have been identified in Alternative B, or the facility has been downsized. These changes are as follows:

The GMP/DCP called for relocation of NPS housing and maintenance near similar Fish and Wildlife Service facilities. Instead, NPS housing and maintenance would be relocated and consolidated further up Access Road Wash near the existing landfill.

The GMP/DCP allowed parking in non-floodplain areas only. Consequently, some existing parking was removed where it was within the floodplain, and new parking was added outside of the floodplain. Expansion of parking within the small side drainage to Willow Beach Wash and near the motel would be very limited. Coupled with the addition of ready/deready lanes, and maximization of pull-through spaces, the total amount of parking available would be reduced from 225 spaces as proposed in the GMP/DCP to about 180 spaces.

GMP/DCP identified relocation of a much smaller 50 site RV/campground near the shoreline. Development of this site is very limited due the topography and would require substantial environmental

**FISH AND WILDLIFE
SERVICE AREA**

Hatchery / Display
FWS Housing
FWS Maintenance

**CONCESSION DRY
BOAT STORAGE**

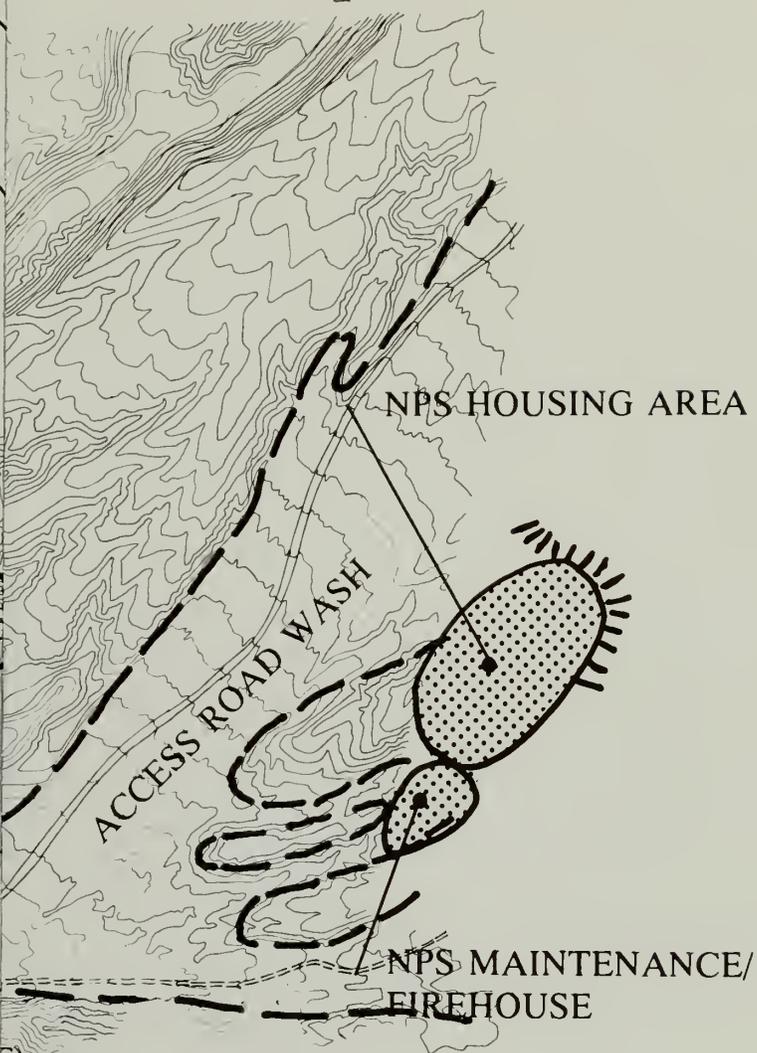
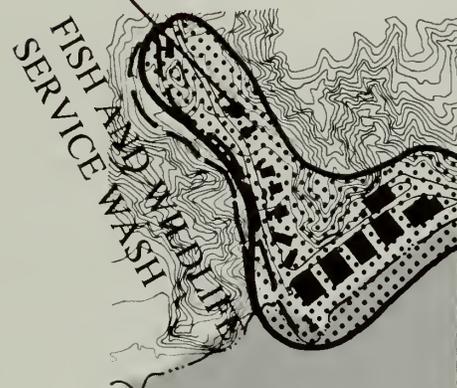
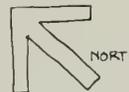
120 Boat Spaces

PICNIC AREA

20 Picnic Spaces
12 Single Parking
Stalls

RV CAMPSITES (15)

400 800



TRAILER VILLAGE

10 to remain

MOTEL / EXPANSION

24-48 Units

STORE / RESTAURANT

100 Seats

MARINA

**LOWER WILLOW
BEACH PARKING AREA**

47 Single Stalls

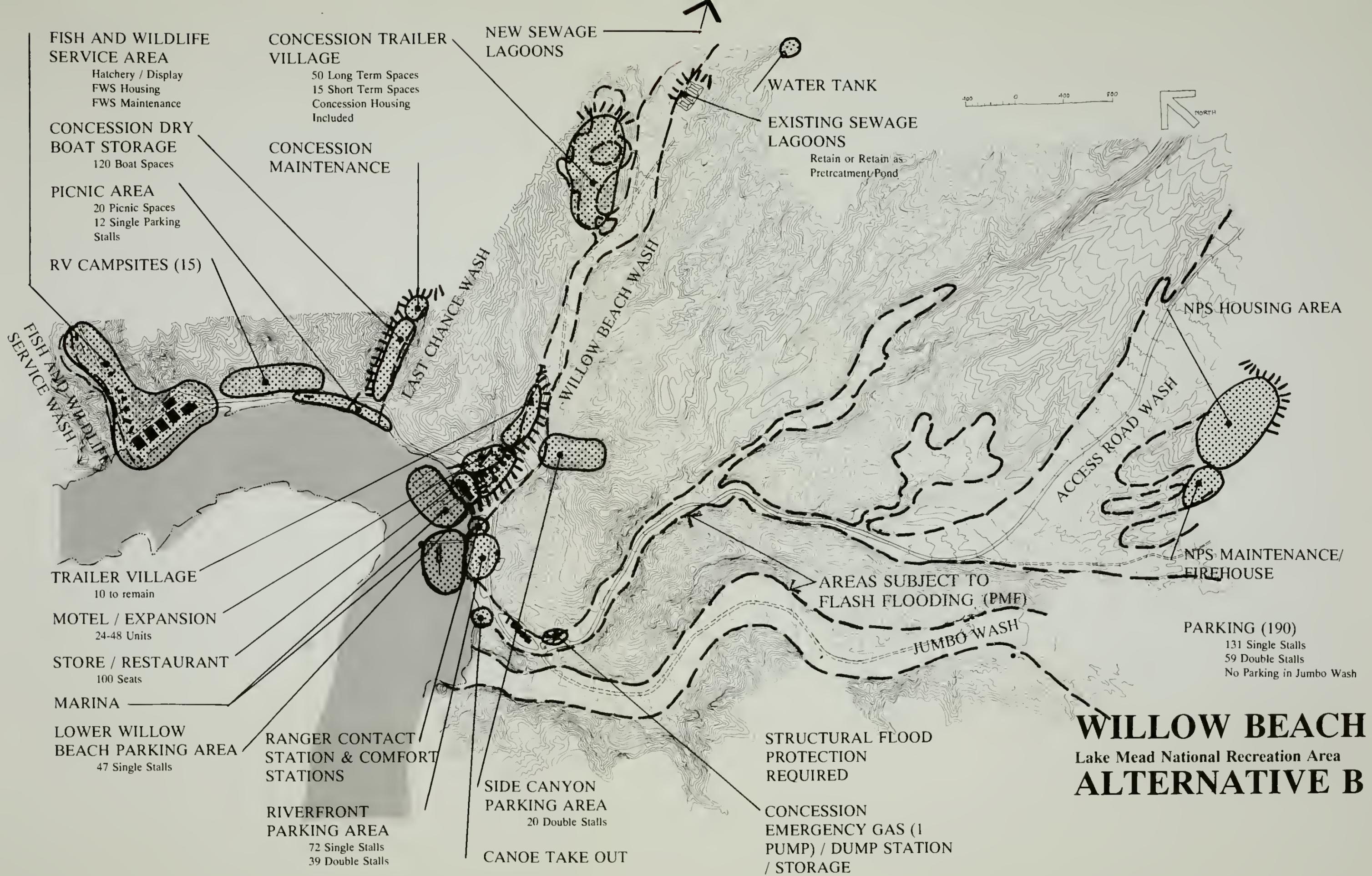
PARKING (190)

131 Single Stalls
59 Double Stalls
No Parking in Jumbo Wash

WILLOW BEACH

Lake Mead National Recreation Area

ALTERNATIVE B



WILLOW BEACH

Lake Mead National Recreation Area

ALTERNATIVE B

alteration; essentially, leveling much of the intervening rock bluffs. Despite its size limitations and difficulty to develop, this site was selected in the GMP/DCP based on providing the visitor with the often requested opportunity to camp near the water, it being an easy area to patrol, and perhaps most importantly its location close to the water/existing development which reduces the need for additional parking spaces within the developed area for visitors who would drive to the water from a more remote campground. Under this alternative all parking would be located outside of the floodplains, and non-floodplain areas are limited at Willow Beach. Further site evaluation has concluded that only about 15 sites could be reasonably located at this site without accruing extensive costs, greatly altering the landscape, and compromising the design quality/visitor experience. Therefore, a downsized 15 site RV campground would be built in the location identified the GMP/DCP near the shoreline between the fish hatchery and Last Chance Wash.

Actions. An increase in overnight visitor facilities would occur at Willow Beach. The existing 24-unit motel could be expanded to 48-units. A 15-site RV campground would be constructed. Picnic sites would be expanded along the riverfront to 20 sites. Parking capacity would be reduced to 190 spaces outside the floodplains.

Due to the flood hazard a number of facilities would be relocated and/or structurally protected. Facilities that would be relocated to non-floodplain locations include the RV campground and visitor contact station. The RV campground would be located along the riverfront between the fish hatchery and Last Chance Wash. The visitor contact station would be combined with ranger and restroom facilities near the launch ramp. Trailer village (50 long-term sites/15 short-term sites) which includes concession housing would be relocated and consolidated further up Willow Beach Wash at the old sewage lagoon area, which is in a side drainage outside of the main flood flows. These facilities would be structurally protected to the PMF level with a 20-foot wide channel on the uphill side of a 3 foot high by 8 foot wide armored dike. The channel and dike would be about 100 feet long and would funnel flood waters into a drainage ditch along the western periphery of the site. The drainage ditch would be gabion lined and would be approximately 27 feet wide by 2 feet deep by 700 feet long. NPS housing, maintenance, and firehouse would be relocated further up Access Road Wash near the existing landfill, which is also in a side drainage outside of the main flood flows. These NPS facilities would be structurally protected to the PMF level by a 3 feet high by 8 feet wide by 500 feet long armored dike. Structures that would be protected in place include the motel and restaurant/store complex and its parking area, which would be structurally protected to the PMF level by a 626 feet by 6 feet concrete wall with buried gabions and a solid, sliding gate in the wall at the road to allow access and that could be easily and quickly closed during flood conditions.

The concession maintenance area would be consolidated with dry boat storage in Last Chance Wash. The maintenance building would not be sized to accommodate indoor houseboat maintenance due to the space limitations within Last Chance Wash. These facilities would be structurally protected to the 100-year level by an armored flood channel approximately 35 ft. wide that would convey 100-year flood flows along the western side of the drainage and would terminate in a large box culvert structure which will pass the flows under the road and into the river.

An emergency gas pump with underground storage tank and dump station would be constructed at the site of existing NPS houses which would be removed. The existing visitor contact station and maintenance building would remain and would be used for storage only. No structural protection from floods would be provided for these day use only facilities.

Parking would be redesigned. Existing spaces in floodplains would be closed and new parking areas would be added outside of the probable maximum floodplains. Approximately 190 parking spaces would be provided. There would be no parking allowed in Jumbo Wash.

Roads and utilities would be redesigned and extended to service all new or relocated facilities. A new well/pumphouse would be constructed near the new campground to replace one of the two wells in Jumbo Wash. The one well that would remain in Jumbo Wash would function as the backup well/pumphouse. A new water storage tank would be constructed above the relocated trailer village site. The sewage lagoons would be relocated further up Willow Beach Wash and expanded; their present location does not provide sufficient space for expansion nor adequate separation (900 feet) from the trailer village as required by the state. The lagoons would be structurally protected to the 100-year flood level by a 6 foot high by 300 foot long dike. In addition, toe protection along the sides of the new lagoons which parallel the wash would be required up to 5 feet high for a length of approximately 420 feet. The existing lagoons would be removed or retained as pretreatment ponds' (aeration included) from which sewage would be pumped to the new lagoons. If the existing lagoons are retained, they would be structurally protected by rip-rap up to 5 feet high for 500 feet along the toe of the slope adjacent to the wash. The two existing sewage lift stations would be replaced and a third lift station would be added.

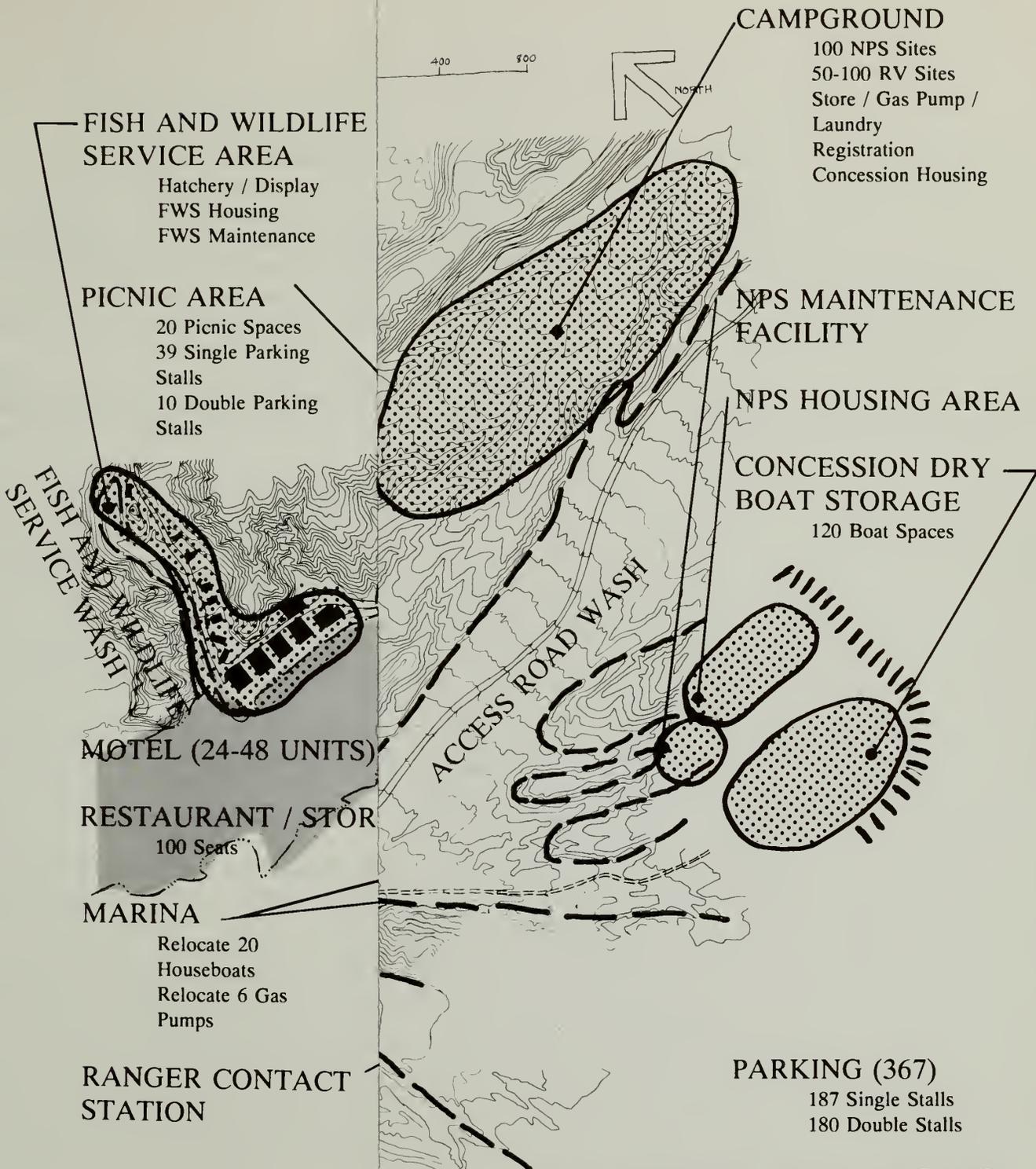
Planting in developed areas would be used to provide shade, screening, and direction. Minimal irrigation would be provided as necessary. Planting in areas outside the immediate existing developed area would utilize native plant materials with low water requirements. Erosion control measures and plantings would be incorporated along the riverfront to stabilize banks and improve the general appearance of this area. Stabilization measures would utilize materials of a similar type as that used for flood protection.

ALTERNATIVE C - PROPOSED ACTION

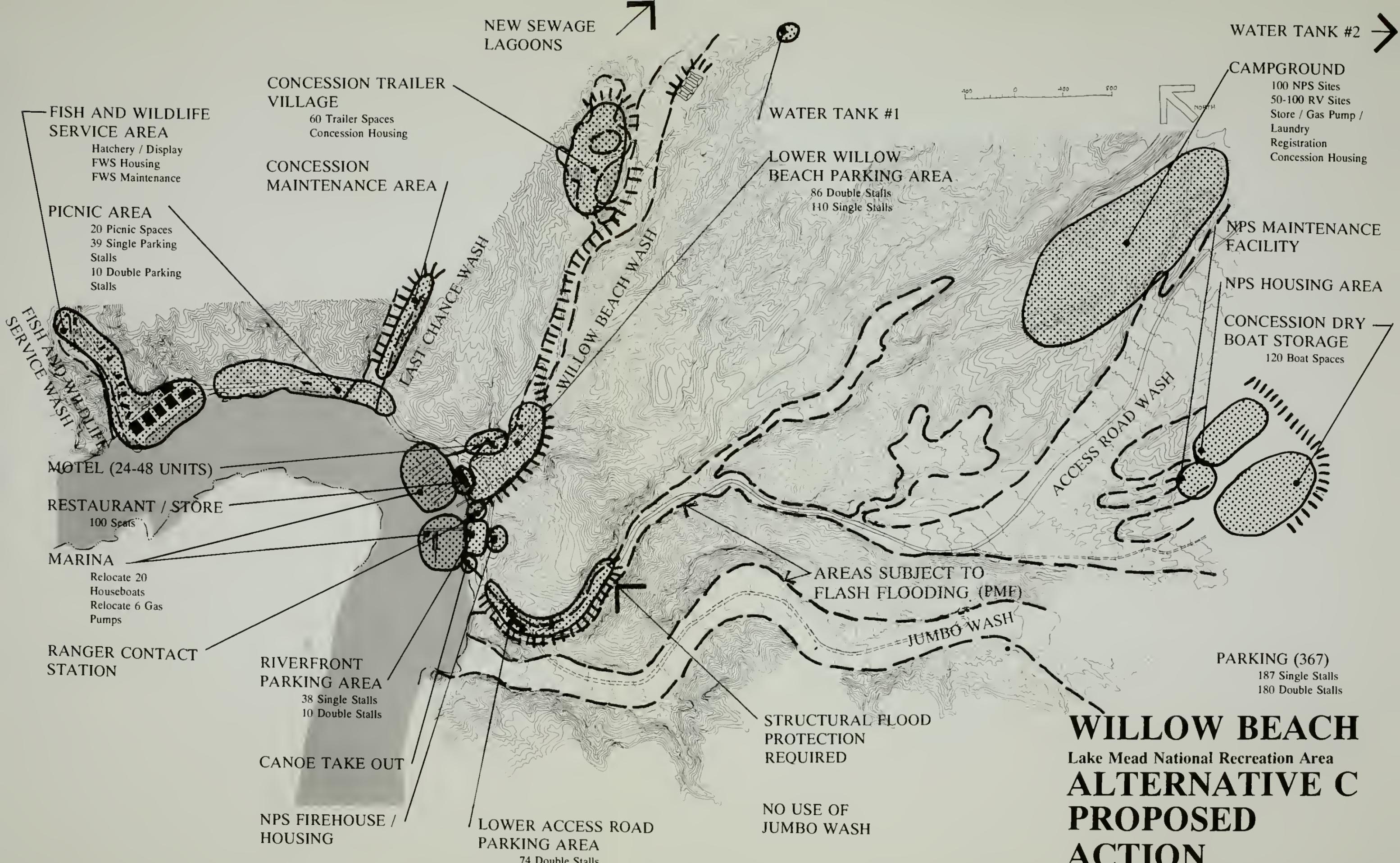
Objective/Strategy. The objective of Alternative C is to provide a greater balance between day use and overnight use at Willow Beach, similar to historical use levels, with the addition of a new campground similar in capacity to the original campground in Jumbo Wash. However, due to the lack of flood safe sites near the river, the campground would be located 2 miles outside of the existing developed area. Parking on site would be expanded to 367 spaces, an increase of 37 spaces over existing. Of these 367 spaces, 97 would be outside the floodplains and 270 would be structurally protected to the 100-year flood level, but would still be within the PMF (see Alternative C - Proposed Action map).

The flood mitigation strategy would include relocating overnight facilities either out of the floodplains or relocating these facilities to areas of outside of the main flood flows and providing structural protection against floods up to the PMF; providing protection against floods up to the 100-year level with flood structures for day use facilities; and nonstructural mitigation measures consisting of a warning system and evacuation plan. In order to accommodate a greater number of people, parking would be expanded within the floodplain and protected up to the 100-year flood level.

Actions. Visitor facilities would be expanded at Willow Beach. The motel would be relocated to the trailer village bench/hillside and could be expanded to 48-units. A 100-unit campground with an additional 50 to 100 RV sites, store, laundry, gas, and concession housing would be constructed approximately 2 miles from the developed area on the access road. Picnic sites would be expanded along the riverfront to 20 sites. Parking would be increased to about 367 spaces.



WILLOW BEACH
Lake Mead National Recreation Area
ALTERNATIVE C
PROPOSED
ACTION



WILLOW BEACH

Lake Mead National Recreation Area

ALTERNATIVE C

PROPOSED ACTION

Facilities that would be relocated and/or structurally protected as in Alternative B include the ranger/contact station, NPS housing and maintenance, concession housing and maintenance, and trailer village. The campground and motel would be relocated to non-floodplain sites as noted above. The restaurant/store and parking would be structurally protected to the 100-year flood level. In Willow Beach Wash, an armored flood channel approximately 35 feet wide would convey 100-year flood flows around the restaurant/store and expanded parking. This channel would be located along the southern side of the drainage and would terminate in a large box culvert structure which will pass the flows under the corner of the parking lot south of the launch ramp and into the river. A similar 35 feet wide channel and box culvert system would provide protection to the new concession maintenance area in Last Chance Wash. A 9 feet to 11 feet high by 1800 feet long flood wall would be constructed in Access Road Wash to protect parking in the lower portion of this wash.

The layout of the marina would be redesigned to remove the houseboat and gas dock from their current location due to the Willow Beach Wash flood structural mitigation measures that discharge flood flows into the river toward this same area.

The concession maintenance area would be relocated to Last Chance Wash. The maintenance building and area would be sized to accommodate houseboats, which would require the relocation of dry boat storage. Dry boat storage would be relocated to the existing landfill site off of Access Road Wash. A new launch ramp would be built at Last Chance Wash to accommodate transport of houseboats to the concession maintenance area and take pressure off of the existing launch ramp.

A firehouse and NPS residence would be constructed near the riverfront, where the concession maintenance and gas pump is currently located.

Parking would be redesigned. Existing parking areas would be expanded and protected to the 100-year flood level. New parking areas would be added and also protected to the 100-year flood level. Approximately 367 parking spaces would be provided. There would be no parking allowed in Jumbo Wash.

Roads and utilities would be redesigned and extended to service all new or relocated facilities. A new well/pumphouse would be constructed near the riverfront to replace one of the two wells in Jumbo Wash. The one well that would remain in Jumbo Wash would function as the backup well/pumphouse. Two new water storage tanks would be constructed, one located above the relocated trailer village/concession housing area and the second above the new campground. The sewage lagoons would be relocated further up Willow Beach Wash, expanded, and protected to the 100-year flood level with a 6 feet high by 300 feet long armored dike. In addition, toe protection along the sides of the new lagoons which parallel the wash would be required up to 5 feet high for a length of approximately 420 feet. The existing lagoons would be removed or retained as pretreatment ponds (aeration included) from which sewage would be pumped to the new lagoons. If the existing lagoons are retained, they would be structurally protected by rip-rap up to 5 feet high for 500 feet along the toe of the slope adjacent to the wash. The two existing lift stations would be replaced and a third lift station would be added.

Planting in developed areas would be used to provide shade, screening, and direction. Minimal irrigation would be provided as necessary. Plantings outside of the immediate developed area would utilize native plants with low water requirements. Erosion control measures and plantings would be incorporated along the riverfront to stabilize banks and improve the general appearance of this area. Stabilization measures

would utilize materials of a similar type as that used for flood protection. Jumbo Wash would be restored following the relocation of facilities out of this area.

ALTERNATIVES CONSIDERED AND REJECTED

The preliminary economic feasibility study evaluated motel and employee housing expansion levels that were proposed by the Willow Beach concessioner. These expansion proposals were eliminated from further study for the following reasons.

Motel Expansion up to 100 Rooms. Expansion of the motel up to 100 units would require creating a new demand that does not now exist for a destination resort facility. The feasibility of such an expansion would be doubtful because of the high room rates that may be necessary to charge the public and the debt service that would be incurred. In addition, the intent of the GMP is to maintain different experiences for visitors at the different developed areas around the lakes. Willow Beach has been and is a small, relatively quiet development, in comparison to the other larger, more crowded, multi-use developed areas on the lakes. The limited land base, economic constraints, and the intent of the GMP to maintain the unique experience and character of Willow Beach precludes development of this type of facility at Willow Beach.

Concession Employee Housing Expansion. The preliminary economic feasibility study evaluated the possibility of providing up to 26 concession housing units at Willow Beach. Employee housing is a nonrevenue producing entity. The debt service on this construction would seriously jeopardize the feasibility of the concession operation at Willow Beach. Given the costs and proximity of potential off-site housing at Boulder City, which is within a 30 minute drive of Willow Beach, a major expansion in concession employee housing was dismissed from further study.

Table 1: Alternative Actions

DEVELOPMENT	Alternative A No Action continuation of existing conditions	Alternative B primarily day use area with nonstructural/structural/relocation flood mitigation	Alternative C balanced day/overnight use with nonstructural/structural/relocation flood mitigation
Flood Mitigation	nonstructural measures: warning system, evacuation plan, closure of some facilities	relocate outside PMF: campground, ranger/contact station, parking relocate and structurally protect to PMF: NPS housing/maintenance, trailer village, concession housing relocate and/or structurally protect to 100-year flood: concession maintenance, sewage lagoons, dry boat storage structurally protect to PMF: motel, restaurant/store	relocate outside PMF: campground, ranger/contact station, motel relocate and structurally protect to PMF: NPS housing/maintenance, trailer village, concession housing, dry boat storage relocate and/or structurally protect to 100-year flood: concession maintenance, sewage lagoons, restaurant/store, parking, launch ramp
Parking	105 spaces outside floodplains 225 spaces within 100-yr. floodplain (includes 106 spaces in Jumbo Wash) 330 spaces total	Close spaces in floodplain; redesign remaining spaces; add new spaces outside PMF : 190 spaces total (all spaces outside floodplains)	retain/redesign existing and add new spaces with protection from 100-year flood: 97 spaces outside floodplains 270 spaces within PMF 367 spaces total
Launch Ramp	1 ramp	1 ramp	2 ramps
Ranger Station	trailer near riverfront	relocate near launch ramp	relocate near launch ramp
Interpretation/Information	Access Road Wash	contact at relocated ranger station	contact at relocated ranger station
NPS Maintenance/ Firehouse	Access Road Wash / none	relocate maintenance up Access Road Wash / add new fire station up Access Road Wash	relocate maintenance up Access Road Wash / add new fire station near riverfront
NPS Housing	4 houses (closed) 1 trailer	relocate 4 houses up Access Road Wash near existing landfill	relocate 2 houses and 4 duplexes up Access Road Wash near existing landfill and 1 apt. with fire station

DEVELOPMENT	Alternative A No Action continuation of existing conditions	Alternative B primarily day use area with nonstructural/structural/relocation flood mitigation	Alternative C balanced day/overnight use with nonstructural/structural/relocation flood mitigation
Picnic Area	15 sites	expand to 20 sites	expand to 20 sites
Campground	closed (formerly 150 sites, plus group site for up to 50 people)	develop 15 RV sites near river	develop 50-100 RV / 100 camping sites 2 miles from developed area (with gas station and store)
Trailer Village/ Concession Housing	60 long-term sites and 15 short-term sites / 10 trailers included in trailer village	relocate 50 long-term and 15 short-term sites up Willow Beach Wash and retain 10 long-term sites on bench / included in trailer village	relocate 60 long-term sites up Willow Beach Wash / relocate and expand 10 units up Willow Beach Wash; 1 unit with campground
Motel	24 units	expansion potential to 48 units	relocate and expansion potential to 48 units
Restaurant/Store	100 seats	100 seats	100 seats
Dry Boat Storage	120 spaces in Last Chance Wash	120 spaces in Last Chance Wash	relocate 120 spaces up Access Road Wash to landfill
Concession Maintenance	near riverfront parking	relocate to lower Last Chance Wash	relocate / enlarge for houseboats in Last Chance Wash;
Gas Station	1 pump near riverfront	relocate emergency service only - 1 pump to Access Road Wash	relocate gas station with new store up Access Road Wash near campground
Sewage Lagoons/Water Tanks	2 lagoons in Willow Beach Wash / 1 tank in Jumbo Wash	relocate and expand lagoons up Willow Beach Wash / 1 tank above trailer village	relocate and expand lagoons up Willow Beach Wash / 1 tank each above campground and trailer village

AFFECTED ENVIRONMENT

EXISTING DEVELOPMENT

A major road through the recreation area is U.S. 93, a two-lane highway connecting Phoenix to Las Vegas. Willow Beach is reached via a four mile access road off of U.S. 93. The majority of development is located at the base of the washes near the shoreline of the Colorado River. Existing facilities at Willow Beach are shown on the Existing Conditions map.

Water and wastewater systems serve the entire development. The water system consists of two wells/pumphouses and an above ground 200,000 gallon storage tank located in Jumbo Wash and associated waterlines. The wastewater system consists of three lift stations and remote sewage lagoons in Willow Beach Wash and associated pipelines. The existing sewage lagoons do not meet current environmental requirements of the Arizona Department of Environmental Quality (ADEQ). The lagoons are not adequately sized to handle existing wastewater flows and effluent currently overflows into the wash. The original intent was to apply effluent to the land to augment evaporation, and spray irrigation was used up until 1987. However, the irrigation system does not comply with the revised regulations for land application for operation within the state of Arizona. A former sewage lagoon site is located on the western side of Willow Beach Wash, northwest of the present lagoons. These former lagoons have been abandoned.

TOPOGRAPHY/GEOLOGY/SOILS

The Willow Beach developed area lies within the Black Canyon of the Colorado River, 11 miles downriver of Hoover Dam. The Black Canyon extends approximately 20 miles below Hoover dam, becoming more precipitous and narrower as one moves up the canyon. The massive volcanic walls of the canyon vary from about 300 to 600 feet apart and rise nearly vertically 700 feet above the river. Numerous canyons and washes wind their way down to the river. Hot springs and pools lie within some of these narrow side drainages to the canyon. The steep and confining topography of the narrow river corridor through the canyon is a marked contrast to the typical expansive reservoir environment, further downstream.

Willow Beach sits at a narrow bend in the river, flanked by steep, rocky bluffs. These sparsely vegetated bluffs are divided by small drainages and five major washes which empty into Lake Mohave and extend upward from the river into the open desert. These washes are Jumbo Wash, Access Road Wash, Willow Beach Wash, Last Chance Wash, and U.S. Fish and Wildlife Service Wash. The open desert terrain consists of somewhat flatter hills with intervening canyon washes.

A number of geologic units are exposed in the Willow Beach area. Bedrock is primarily erosion resistant gneiss of granitic origin. Bedrock is overlain by the Muddy Creek Fanglomerate which is a resistant and coarse grained bouldery conglomerate containing gravel, cobbles, and boulders that are moderately well cemented (calichified) with calcium carbonate. Fanglomerate is overlain by the Muddy Creek Siltstone that is composed of weakly cemented sandstone conglomerate that grades upward in section to the highly erodible gypsiferous silty sand. Erosion by runoff of these friable sediments has resulted in downcutting and headward erosion of the unit forming steep sloped washes and erosional remnant knobs. Alluvial fan deposits blanket the somewhat flatter, narrow ridge crests between the west sloping drainages and

consists of surface deposits of sandy gravel, cobbles, and boulders, that occur as uncemented to weakly cemented sandy conglomerate, covered by surface (desert) pavement. Alluvial wash deposits along the drainage bottoms are predominantly sandy gravel and cobbles with boulders which have been transported and deposited by floods. Slope wash consists of uncemented surface deposits transported downslope by gravity and erosion. Colorado River deposits consist of loose, hard, and well rounded gravel and cobbles.

A soil sample from the area of the former sewage lagoon site was sent to the Environmental Protection Agency for testing to determine if anomalous concentrations of heavy metals or organics were present in the soil. No measurable concentrations of metals were detected except for Barium, which was still 100 times below the maximum permissible level.

CLIMATE/FLOODING/HYDROLOGY

Most of the recreation area is arid desert characterized by extremely hot summers and mild winters. Summer temperatures often exceed 100 °F. Precipitation is low, averaging only 3 to 5 inches annually. Most of the precipitation occurs during July through September when warm, moist, tropical air dominates weather conditions in this area, creating higher than average humidity and scattered thunderstorms. These storms tend to form quickly and produce intensive rains over relatively small areas resulting in flash flooding of washes. Willow Beach has the most severe flood hazard of any development in the recreation area.

The washes at Willow Beach are all subject to flash flooding when thunderstorms occur within their drainages. NPS guidelines define a flash flood as one in which the flood waters rise so rapidly that there is insufficient time for warning and evacuation of persons threatened by the flood. NPS guidelines classify such flash flood areas as high hazard areas and require that management actions be taken to reduce the flood hazard. A high hazard area is defined as the area covered by the probable maximum flood.

The location of the floodplain for the probable maximum flood (PMF) are shown on the Existing Conditions map. The 100-year floodplain is indistinguishable on the map from the PMF, and therefore is not shown separately on the map. The 100-year flood is the average maximum flood that can be expected to occur every 100 years or that has a 1% chance of occurring in any given year. Floods of this magnitude occur frequently enough to pose a serious threat to facilities and people. The PMF is the largest flood that can ever be expected to occur in the area; however, these floods are rare, and their statistical probability of occurring is uncertain.

All structures at Willow Beach are in both the 100-year floodplain and also in the PMF, with the exception of the sewage lagoons which are outside of the 100-year floodplain, but within the PMF. Structures in the floodplains might be damaged or destroyed if a flood occurred. The Jumbo Wash campground and 4 NPS houses in Access Road Wash have been closed because of the flood hazard. Jumbo Wash has the highest flood hazard, 84,000 cfs during a PMF and 12,000 cfs during a 100-year flood.

The 21 miles of Black Canyon/Colorado River below Hoover Dam are considered the upper portion of Lake Mohave. This portion of the lake can be characterized as a river with variable flows. The elevation and water velocity at Willow Beach depends on the elevation of Lake Mohave and the quantity of water

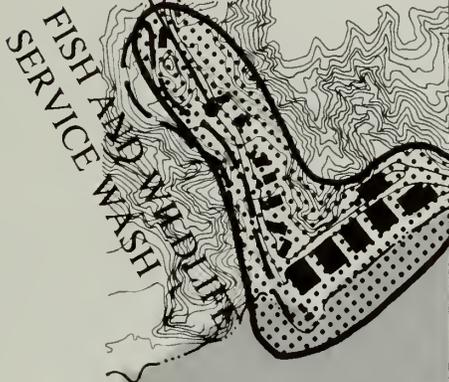
FISH AND WILDLIFE SERVICE AREA

Hatchery / Display
FWS Housing
NPS House
Maintenance Areas

CONCESSION DRY BOAT STORAGE (1)

PORTABLE COMFORT STATION

PICNIC AREA
12 Single Parking Stalls

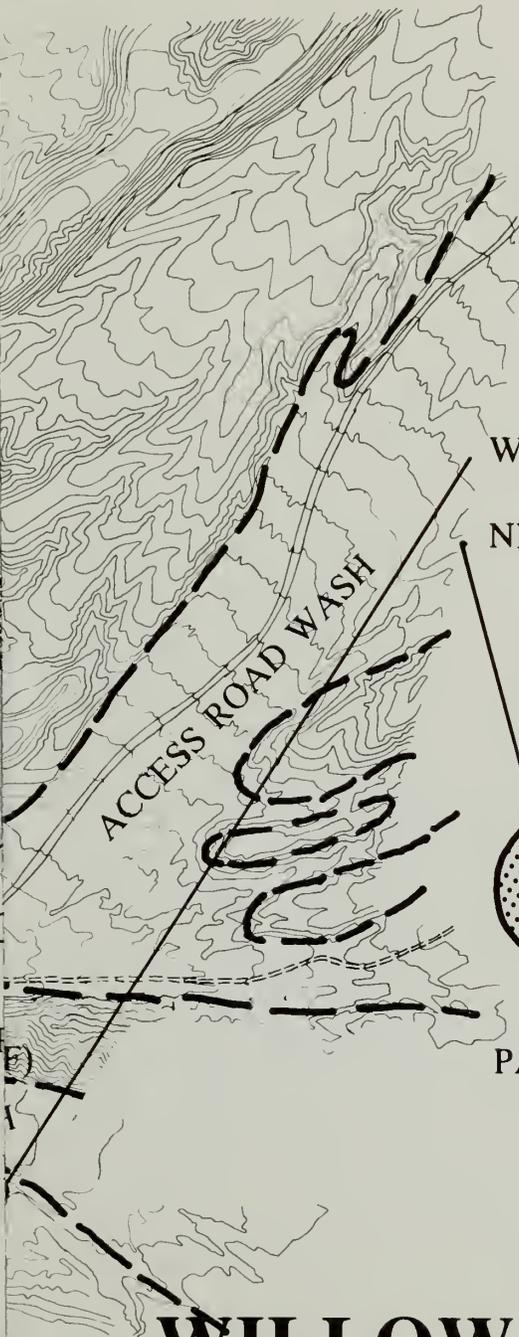


MARINA

PORTABLE COMFORT STATION (2)

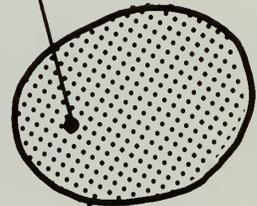
RIVERFRONT PARKING AREA
29 Double Stalls
64 Single Stalls

CONCESSION GAS STATION & MAINTENANCE AREA



WATER TANK

NPS LANDFILL



PARKING (330)
181 Single Stalls,
43 Double Stalls
106 Stalls in
Jumbo Wash

WILLOW BEACH

Lake Mead National Recreation Area

EXISTING CONDITIONS

FISH AND WILDLIFE SERVICE AREA

- Hatchery / Display
- FWS Housing
- NPS House
- Maintenance Areas

CONCESSION DRY BOAT STORAGE (120)

PORTABLE COMFORT STATION

PICNIC AREA
12 Single Parking Stalls

MARINA

PORTABLE COMFORT STATION (2)

RIVERFRONT PARKING AREA
29 Double Stalls
64 Single Stalls

CONCESSION GAS STATION & MAINTENANCE AREA

CONCESSION TRAILER VILLAGE

- 60 Trailers
- 15 RV Sites

MOTEL (24 UNIT)

LOWER WILLOW BEACH PARKING AREA
14 Double Stalls
85 Single Stalls

RESTAURANT / STORE
100 Seats

CANOE TAKE OUT

NPS RANGER TRAILER

NPS HOUSING
4 Abandoned Units
1 Employee Trailer

SEWAGE LAGOONS

NPS VISITOR CONTACT STATION / NPS MAINTENANCE BUILDING

JUMBO WASH OVERFLOW PARKING AREA
51 Double Stalls
55 Single Stalls

WELL HOUSES



WATER TANK

NPS LANDFILL

PARKING (330)
181 Single Stalls,
43 Double Stalls
106 Stalls in
Jumbo Wash

AREAS SUBJECT TO FLASH FLOODING (PMF)

WILLOW BEACH
Lake Mead National Recreation Area
EXISTING CONDITIONS

released from Hoover Dam. When Lake Mohave is near a maximum elevation of 647 feet, variations in water releases from the dam cause water levels to fluctuate a maximum of 0.5 feet at Willow Beach. When Lake Mohave is near a minimum elevation 630, the maximum daily fluctuations in water level are greater, about 2.5 feet. Water velocity also fluctuates up to a maximum average velocity of 2.5 mph through the Black Canyon. Increased maximum average velocities of up to 3.6 mph and daily fluctuations in water elevation of up to 6 feet could occur if the proposed Hoover Powerplant modification should be funded and constructed.

VEGETATION

The hot and arid desert environment supports a creosote bush community. This vegetation type is regionally common and covers nearly three quarters of the recreation area. Vegetation cover is sparse in this community and is dominated by creosote bush and bursage, with scattered *Opuntia* cactus and annuals. Cheesebush is common in wash bottoms. Palms and oleander have been introduced in developed areas near the river, and occur along with palo verde, acacia, desert willow, tamarisk, and some cottonwood. Cactus gardens have been used near the motel, store and visitor center as well as near the upper bench of trailer housing. Shade trees have been planted throughout the lower regions of the trailer village, in the U.S. Fish and Wildlife Service housing area, near the abandoned National Park Service housing, and near the mouth of Jumbo wash. Some oleander and other vegetation still exists in what was the old Jumbo Wash campground.

Development of riparian vegetation along the river or in the washes in the developed area is extremely limited by the fluctuating water levels and existing development and use. Mesquite and tamarisk occur along the river and at the mouth of washes. Disposal of effluent from the sewage lagoons into Willow Beach Wash has resulted in the creation of a small riparian area. There are no desert spring communities in the vicinity.

FISH AND WILDLIFE

Following the completion of Hoover dam in 1935, the part of the Colorado River that became upper Lake Mohave changed from a warm, silt-laden river into a cold, swift-flowing stream due to releases of water near the base of the dam. The cold waters of the river through the Black Canyon which remain a fairly constant 55 degrees Fahrenheit were developed into an excellent cold water trout fishery. Stocking of rainbow trout has continued regularly to maintain the fishery since natural reproduction does not occur. The Willow Beach National Fish Hatchery operated by the U.S. Fish and Wildlife Service stocks Lake Mohave with trout. Experimental releases of other salmonids have also been made by the state of Nevada. Striped bass have never been planted in Lake Mohave. However, a viable population of striped bass has apparently become established in the lake. Their establishment has had a detrimental effect on the trout fishery due to predation. The introduced striped bass and rainbow trout provide the major sport fishing resource in upper Lake Mohave.

Wildlife species found in the creosote bush community include blacktail jackrabbit, desert cottontail, coyote, kit fox, bobcat, raven, desert sparrow, horned lark, roadrunner, rock wrens, and a number of diurnal lizards and nocturnal snakes. Bighorn sheep are often seen in the rugged terrain of the Black Canyon.

THREATENED AND ENDANGERED SPECIES

Two federally listed endangered fish species occur in Lake Mohave, the boneytail chub (*Gila elegans*) and the razorback sucker (*Xyrauchen texanus*). The alteration of their natural habitat by dam construction coupled with the introduction of exotic fish species have contributed to the decline of these species. The Black Canyon probably does not contain boneytail chub because of the cold, deep, swift river conditions. If boneytail chub are present, low water temperatures likely preclude reproduction. Identified recovery coves for this species exist down lake in the general vicinity of Cottonwood Cove. The razorback sucker is found in Black Canyon although they are not known to spawn in this area. Successful spawning has occurred in an area along the lakeshore north of Cottonwood Cove. Recovery efforts to re-establish both of these species is on-going.

The peregrine falcon (*Falco peregrinus anatum*) is federally listed as endangered. Five nesting pairs of peregrine falcons were found within the Black Canyon during a survey initiated during spring 1990 by the Arizona Game and Fish Department. It is currently uncertain if these birds are year-round residents. The closest nest sites to Willow Beach are approximately two miles south and one mile north. The birds appear to be foraging exclusively within the river corridor flanking the nest sites.

The bald eagle (*Haliaeetus leucocephalus*) is federally listed as endangered. Bald eagles are not known to nest in the area. The NPS has conducted wintering bald eagle surveys within the recreation area since 1979. These surveys have identified as many as 20 bald eagles utilizing the recreation area during the winter months, November through March. Typically there have been limited observations of 1 to 3 birds throughout the entire Black Canyon reach, although 6 birds were observed in the canyon during the winter 1990 survey. Roosting areas are currently unknown, although with the paucity of mature trees or large snags throughout the canyon area, rocky cliff sites are likely to be used.

The wandering skipper (*Pseudocopaeodes eunus eunus*; order Lepidoptera - butterflies and moths) is a federal candidate category 2 species. The known range of this species is California, western Nevada, and Mexico, but it is suspected to occur in Arizona and Utah. This species is found in inland stands of desert saltgrass, near desert seeps. There are no records for this species in the Willow Beach area.

The desert tortoise (*Gopherus agassizii*), Sonoran population, is a federal candidate category 2 species. The sonoran population is found in Arizona, south and east of the Colorado River, and in Mexico. This population typically inhabits steep, rocky slopes of mountain ranges, primarily in Arizona upland vegetation dominated by palo verde and saguaro cactus. The distribution of the present population and habitat is disjunct.

The Willow Beach area was surveyed for evidence of desert tortoise in June 1990. Although no live tortoises were found, 13 burrows were found, only one of which was classified as currently active with recent tortoise sign. Seven of the burrows were classified as deteriorated. The remaining 5 burrows were in good to fair condition. All of these burrows were located in hillsides or wash banks and bottoms, except for one located on a bluff overlooking the developed area.

Although there are no federally listed or proposed plant species in the area, two federal candidate category 2 plant species may occur in the Willow Beach vicinity. *Penstemon bicolor* ssp. *roseus* occurs in the creosote-yucca-Hymenoclea plant community of northern Mohave County, Arizona, and Clark County, Nevada on shallow gravelly washes and plains at 1800- 5500 feet elevation. *Arctomecon*

californica occurs in southern Nevada, Clark County, and northwest Arizona, Mohave County, on gypsum-rich soils derived from the Muddy Creek formation, at 1300-2750 feet elevation.

CULTURAL RESOURCES

Archeological surveys were conducted of the Willow Beach area in 1988 and 1991. One mining prospect and nine prehistoric sites were discovered. One site is listed on the Arizona State Historic Register. All are small and represent limited human activity. Five consist of rock circles, two of which are associated with a light scatter of stone tool-making debris. One of the latter also includes a petroglyph. Two other petroglyph sites were also recorded. One recently recorded site consists of a pot-break, scattered stone tool-making debris, and a possible hammerstone. An anomalous rock alignment comprises the remaining site. Seven of these prehistoric sites are located near Jumbo Wash, possibly reflecting its importance as a route of travel. The significance of all eight sites is limited by their small size, paucity of artifacts, and lack of depth. The information potential of such resources can be realized by examining and describing the artifacts, and by recording site type, location, and environmental setting (Ervin 1986:27). It is expected that any additional sites found in the project area will be of a similar type.

An historic resources study for Lake Mead National Recreation Area has determined that there are no other properties in or eligible for listing in the National Register within the project area.

VISUAL QUALITY

Identified in the GMP as outstanding views are the viewshed from the Colorado River through the Black Canyon and the Black Canyon viewed from highway 93. This highway section has one pullout, overlooking Willow Beach and the Colorado River. Both the Willow Beach developed area and adjacent bluffs are highly visible in the foreground view from the river. The surrounding open desert is visible to motorists on either highway 93 or the Willow Beach access road.

Some of the facilities at Willow Beach are inappropriately located or highly visible, and impact the visual quality on site. The NPS and concession maintenance areas are two of the first facilities encountered by visitors as they enter the site. The latter facility is in easy view from the riverfront/marina area. Eroding banks and exposure of buried utility lines along the river's edge are unattractive as well as a safety hazard. The motel and RV sites are poorly located to take advantage of any views.

VISITOR USE

Willow Beach provides access to northern Lake Mohave/Black Canyon, into a river canyon environment that is unlike anywhere else in the recreation area. The enveloping and isolating nature of the canyon reflects an intimate and tranquil quality, particularly in comparison to the much more open, and more heavily used other portions of the lakes in the recreation area. The Black Canyon offers a special visitor experience that cannot be matched elsewhere around the lakes.

In the past, with the presence of an excellent trout fishery, activities at Willow Beach were primarily focused on fishing. Also, prior to the closure of the 151 site (plus group site for up to 50 people) Jumbo Wash campground in 1979, a greater number of visitors came to Willow Beach. Willow Beach continues

to serve the highest percentage of fishermen of any developed area within the recreation area. Fishing, both from boats and shore, is a primary activity; however, other water oriented recreation has increased. Boaters, rafters, and canoers all venture through the canyon to enjoy the spectacular scenery, fish, and/or visit the hot springs. River raft trips are offered by the concessioner from below Hoover Dam to Willow Beach through the Black Canyon. Up to 300 people per day are permitted on these trips. Up to 30 canoe permits are issued for put in below the dam. The concessioner now offers 20 houseboats for rent at Willow Beach. These houseboats and any that arrive from downlake are restricted from proceeding upriver beyond Willow Beach.

The majority of visitors are day users. Overnight accommodations for visitors are currently limited to a 24 unit motel and 60 long-term and 15 short-term trailer village sites. The Jumbo Wash campground has been closed since July 1979. Prior to its closure, the campground typically was busiest starting in mid-September and filled from mid-February to mid-April.

Amount and design of parking and circulation in the developed area has posed some traffic congestion problems. The recent pavement striping to designate ready and dready lanes, has reduced congestion problems associated with use of the launch ramp, although some parking was eliminated to accommodate these lanes. Total parking is usually adequate, although the number of double pull-through spaces that accommodate RVs and vehicles with boat trailers is inadequate. Designated parking spaces in Jumbo Wash are used for long-term parking. Visitor use usually peaks on summer weekends, and particularly on holidays, and vehicles fill paved parking areas with additional parking occurring in undesignated areas along the riverfront roadway in the developed area, and in Jumbo Wash. There are approximately 224 parking spaces of which 181 are single spaces and 43 are double spaces. There are an additional 106 spaces located in Jumbo Wash.

Visitation to the recreation area reached over 8.9 million people in 1990. Visitation grew at a rate of approximately 10 percent between 1983-1986, but reduced to between 3-4 percent in 1987-1989. Fluctuations in visitation for Willow Beach have been much greater than for the recreation area in general, although there has been an upward trend (see table 2).

Willow Beach is about an hour and a half drive from Las Vegas and within a 6-hour's drive from portions of southern California (e.g., Los Angeles, San Diego, and San Bernardino). The Bureau of Reclamation is currently evaluating alternative bridge crossing sites to divert traffic off of Hoover Dam. Depending on the location of this crossing, driving time to Willow Beach from areas to the north could be reduced.

The Las Vegas population is expanding at a rapid rate and has been the fastest growing metropolitan area in the country the last two years. Visitors from this area are frequent returnees to the recreation area. It could be expected that as local and regional populations grow in size, increasing numbers of residents would seek relief from the congestion and urban pace of life. As a result, the recreation area's resources could be subjected to greater pressure by a greater number of visitors seeking a greater variety of recreational resources.

Table 2: Willow Beach Visitation¹

Year	Total Visitation	Percentage Annual Increase/Decrease
1974	260,154	--
1989	278,250	6.9
1978	259,064	-6.9
1979	355,678	37.3
1978	369,431	3.9
1979	238,543	-35.4 ²
1979	198,175	-16.9
1981	225,402	13.7
1982	169,814	-24.7
1981	185,983	-4.5
1981	177,604	-4.5
1978	196,320	10.5
1979	217,919	11.0
1979	218,369	0.2
1981	270,095	23.7
1989	287,645	5.0
1990	271,483	-5.6

1. Based on vehicle count times 3.3 people/vehicle.

2. Jumbo Wash campground closed July, 1979.

ENVIRONMENTAL CONSEQUENCES

ALTERNATIVE A - NO ACTION

Impact On Public Safety And Property In Floodplains

The existing warning system and evacuation plan would remain in effect. Facilities that are now closed, the NPS residences, ranger station, and campground, would remain closed.

Warning systems provide less protection than relocating or structurally protecting facilities. To be effective, the Park Service personnel must receive the warning signal and put the evacuation plan into effect. Occupants of the floodplain must then cooperate in getting to higher ground. Some people might not receive the warning or refuse to follow evacuation instructions. Thus, the possibility of injury or loss of life exists for the people in the floodplain at the time of a flood event.

The warning system at Willow Beach is less effective than warning systems at other areas because of the following conditions. It only provides notice of an impending flood approximately 20 minutes before the flood strikes. Flood conditions develop relatively rapidly at Willow Beach because flows concentrate very quickly in its steep canyons. Floods are difficult to flee because steep canyons make escape to higher ground difficult. Road access to the area is severed during most floods because the access road follows a narrow canyon bottom. Any emergency services or help from outside the area would also be cut off.

Development that would remain in the floodplains is shown in Table 3. The cost of replacing structures left unprotected in the 100-year floodplain would be approximately \$3,579,000. This cost does not include utilities, furnishings, equipment, vehicles, houseboats, flood control devices, debris removal, search and rescue, or expenses of potential victims. The number of people in the 100-year floodplain on an average summer weekend who would only be protected by the warning system, which is of limited effectiveness, and evacuation plan is estimated to be 450 during the day and 360 at night. For the probable maximum flood, the numbers would be the same.

Impact On Vegetation/Soils

There would be no new destruction or damage to soils and vegetation from construction. Erosion of river banks would continue, and possibly accelerate if the Hoover Dam modification is implemented.

Impact On Visual Quality

There would be no new impacts to visual quality.

Impact On Trailer Village Residents And Concession Services

Alternative A would not have any additional affects on trailer village residents. Concession services would remain at their existing levels, and the economic viability of the concession operation probably would not change.

Table 3: Alternative A - Existing development in floodplains that would be left unprotected by structural flood mitigation measures and would be vulnerable to flood damage or destruction

STRUCTURE	ALTERNATIVE A	
	100-YEAR	PMF
Access Roads main access trailer village access	2 miles 0.25 mile	
Parking	119 spaces 106 spaces in Jumbo Wash	
Launch Ramp	1 ramp	
Visitor Contact Station	1 building	
NPS Maintenance	1 building	
NPS Housing	4 houses (closed) 1 trailer	
Trailer Village	50 long-term sites 15 short-term sites	
Motel	24 units	
Restaurant/Store	100 seats	
Dry Boat Storage	120 spaces	
Concession Housing	within trailer village	
Well Pumphouse	2 buildings	
Canoe/Raft Takeout	graded area	
Sewage Lagoons		2 lagoons

Note: Structures listed in the 100-year floodplain are also in the probable maximum floodplain; however, to avoid repetition, only structures that are in the PMF, but not in the 100-year floodplain are listed in the PMF column.

Impact on Threatened, Endangered, or Candidate Species

There would be no new development under this alternative. No new impacts to threatened, endangered, or candidate species would occur.

Impact on Visitor Experience/Congestion

Alternative A does not propose any change in visitors facilities. The existing number of double pull-through spaces for boats and trailers would remain inadequate. If visitation to Willow Beach increases, crowding and congestion problems would also likely increase. These problems would be most severe on weekends and holidays. Increasing numbers of visitors and variety of activities may contribute to the continued reduction in angling use.

Impact on Cultural Resources

There would be no impact on any historical or archeological resources.

ALTERNATIVE B

Impact On Public Safety And Property In Floodplains

Alternative B would relocate some facilities outside of the probable maximum floodplain, mitigate the impact of floodwaters to the probable maximum flood level with structural measures, and also mitigate flood hazards with a warning system and evacuation plan. Relocation of structures out of the floodplain provides the best protection. Structural measures offer the next best method. Warning systems provide less protection than either of the former two methods. Facilities that would be relocated out of the floodplain include: campground, ranger/contact station, and parking.

Facilities that would be structurally protected in place to the PMF would include: motel and restaurant/store and its parking. Facilities that would be relocated to areas of lower flood flows and structurally protected to the PMF include: NPS housing and maintenance, trailer village, and concession housing. These facilities would be located in side drainages outside of the main flood flows which would reduce the flood hazard and require less extensive and costly flood structures. The difference between flood flows at the existing and relocation sites for these facilities is as follows:

NPS Housing/Maintenance Area	
Existing	Relocated
PMF = 38,000 cfs	PMF = 3,240 cfs
100-year = 5,400 cfs	100-year = 820 cfs

Trailer Village/Concession Housing Area	
Existing	Relocated
PMF = 35,000 cfs	PMF = 534 cfs
100-year = 5,100 cfs	100-year = 141 cfs

The sewage lagoons would be relocated further up Willow Beach Wash and structurally protected to the 100-year flood level. Concession maintenance would be consolidated with dry boat storage in Last Chance Wash and structurally protected to the 100-year flood level.

Development that would remain in floodplains is shown in Table 4. The cost of replacing structures left unprotected in the 100-year floodplain would be approximately \$234,000; and for replacing those in the PMF approximately \$145,000. This cost does not include utilities, furnishings, equipment, vehicles, flood control devices, debris removal, search and rescue, or expenses of potential victims. The estimated number of people in the 100-year floodplain at any one time on an average summer weekend who would only be protected by a warning system and evacuation plan would be 40 people in the daytime and none at night. The estimated number of people in the probable maximum floodplain, but outside the 100-year floodplain, would be 20 people in the day and 0 at night.

Table 4: Alternative B - Existing and proposed development in floodplains that would be left unprotected by structural flood mitigation measures and would be vulnerable to flood damage or destruction

STRUCTURE	ALTERNATIVE B	
	100-YEAR	PMF
Access Roads main access trailer village access	2 miles 0.5 mile	
Launch Ramp	1 ramp	
Visitor Contact Station	1 building used for storage	
Dry Boat Storage/Concession Maintenance		120 spaces/1 building
Trailer Dump Station/Emergency Gas Pump	1 pump	
Well Pumphouse	1 building	
Canoe/Raft Takeout	graded area	
Sewage Lagoons		2 lagoons

Note: Structures listed in the 100-year floodplain are also in the probable maximum floodplain; however, to avoid repetition, only structures that are in the PMF, but not in the 100 year floodplain are listed in the PMF column. The sewage lagoons would be structurally protected to prevent wash out.

The majority of NPS facilities (fire station, housing, maintenance) would be relocated up Access Road Wash. Consequently, NPS personnel and equipment needed during a flood may be cut off from the developed area by flooding in Access Road Wash. The ranger station would be located in the developed area near the riverfront, however, it is not likely to be occupied during the evening and night time hours.

This alternative reduces the flood hazard in the area by limiting development and consequently reducing the overall number of people using Willow Beach.

Impact On Vegetation/Soils

A total of approximately 20 acres would be disturbed by new or relocated facilities at Willow Beach. The majority of this acreage has already been impacted to varying degrees by past and current development and use. About 3 acres are currently developed and native desert vegetation and soils have been permanently lost. This is acreage in the lower washes within the existing developed area. Another 5 acres of previously developed and moderately disturbed land (abandoned sewage lagoon site) would also be impacted. Leveling and excavation of this area has previously occurred, and vegetative cover on this site has been significantly reduced. About 12 acres are currently undeveloped, which includes a narrow side wash and ridge west of the relocated trailer village/concession housing (proposed water tank/waterline/access road), the small riverfront washes east of the fish hatchery (proposed campground site), upper Willow Beach Wash bottom (proposed sewage lagoons/access road), and an area adjacent to the landfill (proposed NPS housing/maintenance). These areas consist of primarily undisturbed native desert vegetation and soils of the creosote bush community, with cheesebush in the wash bottoms. The small riverfront washes also contain stands of mesquite.

Riparian vegetation below the existing sewage lagoons would likely be lost once the effluent overflow from these lagoons is eliminated.

Erosion would be accelerated in the areas in and around development. Susceptibility to erosion would increase with slope and in areas of less resistant sediments. The majority of construction would occur on less than 15% slopes. Development on the steepest slopes would occur on more erosion resistant terrain, consisting of bedrock gneiss and schist, and fanglomerate. However, excavation and/or leveling of resistant bedrock for construction would generally be hard rock excavation and would require blasting or other equivalent hard rock removal techniques. Construction of the campground, additional motel units and parking in the side cove of lower Willow Beach Wash would likely require this type of excavation.

Excavation and leveling in the abandoned sewage lagoon area for the trailer village/concession housing would disturb the highly erodible Muddy Siltstone deposits. This is an area of less than 15% slopes which would help minimize erosion from runoff. Some excavation into the surrounding lower hillsides would occur where retaining walls may be necessary. Construction and post-construction vehicle and foot traffic would increase erosion susceptibility by disturbing the very thin salt/carbonate crust that coats and marginally protects the loose sandy silts and clays from wind erosion. Consequently a local dust problem could arise. Hardening of surfaces with pavement, gravel, or other materials along with planting of vegetation to stabilize soils would help to lessen this problem.

Temporary erosion control measures to direct run off would be used during construction where necessary and vegetation around developments would be planted that would help reduce possible erosion.

Bank stabilization measures would be implemented along the shoreline to reduce bank erosion caused by visitor use as well as fluctuating water levels.

Impact On Threatened, Endangered Or Candidate Species

Areas used by the peregrine falcons for nesting are high cliffs, well above the river. These areas are remote and would not be disturbed. Foraging above the river is also not expected to be affected in that new development at Willow Beach would either occur back from the river corridor or along the river within the confines of the existing developed area. Boating use along the river currently occurs and does not apparently interfere with the bird's hunting activity above the river. No impact on peregrines would be expected.

No impacts to the boneytail chub or razorback sucker would occur. Some fill work within the river below high water elevations would occur to construct the riverbank stabilization structures. No spawning occurs in this area. Bank protection would be accomplished with clean materials not readily subject to erosion, and any fill material would be placed so as not to enter the water. Any turbidity caused by construction would be minor and short-term. A Section 404 permit from the Army Corps of Engineers would be obtained prior to construction.

A limited number of wintering bald eagles occur scattered along the length of the Black Canyon. Available habitat and food sources exist along the river outside of the immediate Willow Beach area. Where development is proposed at Willow Beach, it would occur primarily in previously disturbed land back from the river or along the river within the confines of the existing developed area. What few large trees exist in the Willow Beach area would not be affected and there would be no impact to cliff sites. Therefore, there would be no impact to any potential perch sites or roost areas. Boating use along the river and lake currently occurs, and conflicts between this use and eagles apparently have not been a problem. This alternative is not expected to generate any increase in boater use. No impacts to wintering bald eagles is expected.

There are no known populations of *Penstemon bicolor ssp. roseus* or *Arctomecon californica* in the Willow Beach area, although these species may occur there. Much of the land disturbed under this alternative would occur in areas that are currently developed or that have been previously impacted. No impact on these species is anticipated. However, areas that would be impacted by construction would be surveyed for these species prior to construction.

The wandering skipper is not known to occur in the Willow Beach area. This species is found in inland stands of desert saltgrass, near desert seeps. There are no desert seeps or springs, or moist streamside areas that support desert saltgrass stands that would be impacted by this project. Since this skipper is always associated with desert saltgrass, no impact on this species is expected.

The Willow Beach area is known desert tortoise habitat based on the June, 1990 survey of the area. Approximately 17 acres of land would be disturbed by construction that would result in loss of tortoise habitat. Habitat loss would result in loss of food, cover, and burrow sites. Of this acreage, about 5 acres are largely graded, barren ground that have been impacted by past and present development that has deteriorated the quality of habitat for the tortoise. The remaining 12 acres that would be impacted are currently undisturbed land. Five of these acres encompass somewhat flatter narrow ridge tops between drainages. These ridges are covered by alluvial fan deposits consisting of surface deposits of sandy gravel, cobbles, and boulders, that occur as uncemented to weakly cemented sandy conglomerate, covered by surface pavement. Two acres encompass the small riverfront washes and surrounding steeply sloped exposed bedrock. Five acres cover sandy, gravelly wash bottom/banks.

The Sonoran population of desert tortoise usually inhabit rocky hillsides and washes. The tortoise survey of the Willow Beach area found similar results. Of the 17 acres of habitat that would be impacted, 12 acres may be marginal habitat based on the type of terrain, surface covering of desert pavement or resistant bedrock, and past impacts. The five acres of wash bottom/banks that would be impacted, constitute the habitat type where tortoise sign have been found. This acreage would be impacted by construction of the sewage lagoons, the primitive roads to access the lagoons and water storage tank above trailer village, a portion of the campground, and possibly a portion of trailer village that could impact the bottom of the slopes on the periphery of the site.

Of the 13 currently known burrow sites in the Willow Beach area, three that were not active at the time of the survey may be impacted by construction. Two of these burrows are located near the slope bottoms adjacent to the existing landfill area and the proposed NPS housing and maintenance area. These burrows were in deteriorated condition. The third burrow, is located within the narrow (25 feet - 50 feet wide) wash that the access road to the trailer village water tank would follow. This burrow was in fair condition. Grading of this route would be held to a minimum to allow construction and maintenance access, and disturbance to the wash banks could likely be avoided.

Indirect impacts to tortoises could result from human use. Off road vehicle use is not currently a major problem at Willow Beach, and an increase in this type of use due to new development would not be expected to occur. New access roads, to the sewage lagoons and water tanks, and the existing access road into Jumbo Wash would be blocked to prevent public access. There would also be a continued NPS ranger presence throughout the developed area. Impacts to tortoise from the dispersal of people on foot in the vicinity of new facilities could occur due to handling, vandalism, or collection of tortoises by people. Visitor facilities would remain concentrated along the riverfront within the existing developed area. Because of the rugged nature of the terrain, the climate, and lack of cover, combined with the water oriented use of the area, little human use currently occurs or would be expected to occur in the future outside of the immediate areas of development. The NPS would inform visitors of the occurrence of the desert tortoise in the area, the status of this species, and potential impacts to this species.

The following mitigation measures would be implemented to minimize impacts to desert tortoises and their habitat. Areas within construction limits would be surveyed for tortoises and their burrows prior to construction in any given area. Tortoise burrows found within the construction limits that could be avoided would be protected by a barrier that would extend a minimum of 20 feet out from the burrow on sides bordering construction. Tortoise burrows located within construction limits that could not be avoided would be inspected for tortoises. All tortoises found within the project area, whether above ground or in burrows, would be placed 300 to 1000 feet outside of the construction limits in the direction of undisturbed habitat. All tortoise surveys and necessary handling of tortoises would be done by a qualified biologist.

The sewage lagoons would be fenced; and fencing would be buried a minimum of 18 inches to prevent tortoises from entering the lagoon site.

To limit adverse impacts to tortoise habitat construction activity and personnel would be restricted to the designated construction areas. Construction staging areas would be designated within the project area or in previously disturbed areas. Disturbed areas outside of the immediate riverfront developed area would be revegetated with native species. The access roads to the sewage lagoons and water tanks would be blocked to prevent public use of these roads.

Impact On Visual Quality

Development around Black Canyon visible from U.S. 93 on the Arizona side of Hoover dam would detract from the overall scenic integrity of the canyon. Only limited glimpses of the developed area would continue to be possible from U.S. 93 and the existing pullout, analogous to the existing view. Although the new facilities (including lights) in Access Road Wash might be visible from U.S. 93.

Additional riverfront development that would be highly visible from the river would be the picnic sites, bank stabilization, campground, motel expansion, and flood wall structure. All of this development would be within the bounds of existing development along the river corridor, between the fish hatchery and Access Road Wash. As is the case now, this development with its attendant plantings would contrast with the surrounding austere environment. Site work required to build the campground within the confining small riverfront washes and expand the motel along the bluff would likely require extensive blasting of rock on steep terrain, resulting in visible cut slopes. Extensive rock excavation and blasting would also be required to construct the additional parking area in Willow Beach Wash; although this area would not be as highly visible from the river.

The flood control structure within the developed area would consist of a 6 feet high by 626 feet long wall. Design and materials would help harmonize this structure with other site elements; however, a 6-foot high wall and gate through the midst of the developed area would still appear as an incongruent and imposing structure.

The overall visual quality of the development itself would be improved through the application of architectural and site guidelines designed to give a cohesive visual identity to the developed area. Use of vegetation around river front development would preserve the existing oasis character.

Impact on Visitor Experience/Congestion

Willow Beach would continue to function as a relatively small day use development. Fishing would remain a primary focus although other activities such as rafting, canoeing, and general boating would continue.

Although the numbers of flood safe parking spaces would increase in this alternative, the overall number of parking spaces would decrease. A limited expansion of overnight accommodations would occur at Willow Beach. Only a limited number of visitors desiring convenient access to northern Lake Mohave/Black Canyon would be accommodated. Competition for parking, and parking in undesignated areas during high use weekend and holiday periods would also likely increase at Willow Beach. Movement of trailers to an area further removed from the water could be considered by trailer residents enough of an inconvenience for them to drive down to the development from trailer village, adding to traffic and taking up limited parking. Development of the Fire Mountain site would be more essential to relieving visitor pressure on Willow Beach than under the other alternatives.

The existing motel site and adjacent potential expansion area is poorly located and would not take advantage of the views or cooling breezes at Willow Beach.

Day use of the riverfront would be expanded and improved with the addition of picnic sites and stabilization of the river banks.

Impact On Trailer Village Residents And Concession Services

Trailer village residents of 50 long-term and 15-short term RV sites would be relocated to a safer area, although further from the river. The new trailer village sites would be oriented to take advantage of the views toward the river as well as to catch cooling breezes. The 10 long-term sites on the existing bench outside of the floodplain would remain at that location. Total number of long-term sites would not change.

In comparing the proposed concession services to existing conditions at Willow Beach, there could be an increase in the number of motel units from 24 to 48, a 100% increase. There would also be an increase of 15 RV sites, from 15 to 30. The level of all other concession services would not change. An increase in overnight facilities would provide an increased opportunity for the concessioner to enhance sales at existing on-site facilities; however, there is no demonstrated demand at this time for more overnight accommodations. In addition, a reduction in total parking may result in fewer visitors using the area at any one time, which could negatively affect sales at existing on-site facilities. Construction of any nonrevenue producing facilities would have a negative affect on the overall of the concession operation.

Impact on Cultural Resources

While nine archeological sites lie within the general area, none would be directly affected by this alternative. Specific actions have been designed to avoid all sites. If during detailed project design, it becomes infeasible to avoid a specific site, mitigative measures will be developed in consultation with the Arizona State Historic Preservation Officer and the Advisory Council on Historic Preservation.

The NPS has applied the criteria of effect found in 36 CFR 800 and has determined that implementation of this alternative would have no effect on properties listed in, or eligible for listing in the National Register of Historic Places. Should unknown resources be uncovered during construction, work would stop in the project area and the NPS would consult according to 36 CFR 800.11.

ALTERNATIVE C - PROPOSED ACTION

Impact On Public Safety And Property In Floodplains

Alternative C would relocate some facilities outside of the probable maximum floodplain, mitigate the impact of floodwaters to the 100-year level with structural measures, and mitigate floods larger than the 100-year flood with a warning system and evacuation plan. As discussed under the previous alternatives, relocation of structures out of the floodplain provides the best protection; structural measures offer the next best method; and warning systems provide less protection than either of the former two methods. Facilities that would be relocated out of the floodplain include: the campground, motel, and ranger/contact station.

Structural measures for protecting people and development are less effective than relocating the people and development out of the floodplain because the former rely on human attempts to change the shape of the natural floodplain into a configuration that is more convenient to people. These measures must be adequately designed, constructed , and maintained to be effective. Sometimes structural measures

provide the basis for a false sense of security to people in the floodplain, and people fail to evacuate the floodplain in case of potential flooding. Facilities that would be structurally protected to the 100-year flood level would include: the restaurant/store, launch ramp, parking, concession maintenance, and sewage lagoons.

Facilities that would be relocated to areas of lower flood flows and structurally protected to the PMF, similar to Alternative B, include: NPS housing and maintenance, trailer village, concession housing, and dry boat storage.

Development that would remain in the floodplains is shown in Table 5. The cost of replacing structures in the 100-year floodplain would be approximately \$102,000; for replacing those in the PMF approximately \$1,179,000. These costs do not include utilities, furnishings, equipment, vehicles, flood control devices, debris removal, search and rescue, or expenses of potential victims. The estimated number of people in the 100-year floodplains at any one time on an average summer weekend who would only be protected by a warning system of limited effectiveness and evacuation plan would be 10 people in the daytime and 0 at night. The estimated number of people in the probable maximum floodplain, but outside the 100-year floodplain, would be 165 for day and 0 for night.

Table 5: Alternative C - Existing and proposed development in floodplains that would be left unprotected by structural flood mitigation measures and would be vulnerable to flood damage or destruction

STRUCTURE	ALTERNATIVE C	
	100-YEAR	PMF
Access Roads main access	2 miles	
Parking		295 spaces
Launch Ramp		2 ramps
Restaurant/Store		100 seats
Concession Maintenance		1 building
Well Pumphouse	1 building	
Canoe/Raft Takeout	graded area	
Sewage Lagoons		2 lagoons

Note: Structures listed in the 100-year floodplain are also in the probable maximum floodplain; however, to avoid repetition, only structures that are in the PMF, but not in the 100-year floodplain are listed in the PMF column. The sewage lagoons would be structurally protected to prevent wash out.

NPS housing and maintenance would be relocated up Access Road Wash and NPS personnel present there during a flood may be cut off from the developed area by flooding in Access Road Wash. The ranger station, firehouse, and one NPS apartment residence would however, be located in the developed area near the riverfront outside the flood zone to provide quick response during emergencies.

Impact On Vegetation/Soils

A total of approximately 60 acres would be disturbed by new or relocated facilities. The majority of this acreage has been impacted to varying degrees by past and current development. About 4 acres are currently developed and native vegetation and soils have been lost. This is acreage in the lower washes within the developed area. Another 8 acres of previously developed land and moderately disturbed land (old sewage lagoon and landfill sites) would also be impacted. Leveling and excavation of these areas has previously occurred, and vegetative cover has been significantly reduced. About 48 acres are currently undeveloped, which includes a narrow wash and ridge west of the relocated trailer village/concession housing (proposed water tank/waterline/access road), a ridge (proposed campground), upper Willow Beach Wash bottom (proposed sewage lagoons), and an area adjacent to the landfill (proposed NPS housing/maintenance). These areas are covered by the creosote community vegetation type, with cheesebush common in the wash bottoms.

Riparian vegetation below the existing sewage lagoons would likely be lost once the effluent overflow from these lagoons is eliminated.

Erosion would be accelerated in the areas in and around development. The majority of construction would occur on less than 15% slopes. Development on the steepest slopes for construction of the motel would occur on more erosion resistant terrain consisting of bedrock gneiss and schist. Hard rock

excavation requiring blasting or other equivalent hard rock removal techniques would likely be required for construction of the motel.

Excavation and leveling in the abandoned sewage lagoon area for the trailer village/concession housing would disturb the highly erodible Muddy Siltstone deposits. This is an area of less than 15% slopes which would help minimize erosion from runoff. Some excavation into the surrounding lower hillsides would occur though. Retaining walls may be necessary. Construction and post-construction vehicle and foot traffic would increase erosion susceptibility by disturbing the very thin salt/carbonate crust that coats and marginally protects the loose sandy silts and clays from wind erosion. Consequently a local dust problem could arise. Hardening of surfaces with pavement, gravel, or other materials along with planting of vegetation to stabilize soils would help to lessen this problem.

Temporary erosion control measures would be used during construction where necessary and vegetation around developments would be planted that would help reduce possible erosion.

Bank stabilization measures implemented along the shoreline would reduce bank erosion caused by visitor use as well as fluctuating water levels.

Impact on Threatened, Endangered, and Candidate Species

No impacts to the peregrine falcon, bald eagle, wandering skipper, boneytail chub, or razorback sucker is expected for the same reasons as discussed under the impact section for Alternative B. Additional work within the river below high water line would occur under this alternative with the construction of a new launch ramp. However, the area of the river bottom affected would be limited (less than 0.3 acre). A permit from the Army Corps of Engineers would be obtained prior to construction.

Areas that would be impacted by construction would be surveyed for *Penstemon bicolor ssp. roseus* and *Arctomecon californica* prior to construction.

Approximately 56 acres of land would be disturbed that would result in the permanent loss of tortoise habitat which provides food, cover, and/or burrow sites. Of this acreage, about 8 acres are largely graded, barren ground that have been impacted by past and present development (old sewage lagoon site and existing landfill). Of the remaining 48 undisturbed acres, 43 acres are encompass ridges between drainages, and composed of alluvial fan deposits with a surface pavement. The remaining 5 undisturbed acres cover sandy, gravelly wash bottom/banks. Of the 56 acres of desert tortoise habitat that would be impacted, 51 acres may be marginal habitat based on the type of terrain, covering of desert pavement and rocks, and past impacts. The 5 acres of wash bottom/banks that would be impacted, constitute the type of habitat where tortoise sign have been found. This acreage would be impacted by construction of the sewage lagoons, the primitive roads to access the lagoons and water tank site above trailer village, and possibly a portion of trailer village that could impact the bottom slopes on the periphery of the site.

Of the 13 currently known burrow sites, three that were not active at the time of the survey may be impacted by construction. Two of these burrows are located near the slope bottoms adjacent to the existing landfill area and the proposed NPS housing and maintenance area. The third burrow found, is located within the narrow (25-50 feet wide) wash that the access road to the trailer village water tank would follow. Grading of this route would be held to a minimum to allow construction and maintenance access, and disturbance to the wash banks could likely be avoided.

Indirect impacts to tortoises from human use is not expected to occur as the result of proposed development, as discussed under Alternative B, even with the remote location of the new campground. Vehicle and foot traffic in the vicinity of the new campground would be limited to the campground ridge due to the steep drop-off into the adjacent wash.

Mitigation measures to minimize impacts to tortoises and their habitat would be the same as for Alternative B.

Impact On Visual Quality

Development around Black Canyon visible from U.S. 93 on the Arizona side of Hoover dam would detract from the overall scenic integrity of the canyon. Glimpses of the development near the river would be possible from the highway. The most visible new development from the highway and existing overlook would be the campground and water tank which would contrast with the surrounding terrain. Planting of the campground to provide shade, even if native species and more horizontal vegetation is used, would likely stand out as a type of green oasis next to the surrounding creosote bush community.

Additional riverfront development that would be visible from the river would be the new parking areas, picnic areas, bank stabilization, flood wall structure, motel expansion, and concession maintenance (which would replace the current dry boat storage area). All of this development would be within the bounds of existing development along the river corridor, between the fish hatchery and Access Road Wash. As is the case now, this development with its attendant plantings would contrast with the surrounding austere environment. Site work required to expand the motel up the bluff and along the upper bench would likely result in extensive hard rock excavation and blasting, and visible cut slopes.

The flood control structures within the developed area would consist of 35 feet wide drainage channels and culverts, and a 9 feet to 11 feet high by 1800 feet long flood wall. Design and materials would help harmonize these structures with other site elements; however, the flood wall would be the first structure encountered when entering the riverfront area, and would be quite large and imposing.

The overall visual quality of the development itself would be improved through the application of architectural and site guidelines designed to give a cohesive visual identity to the developed area. Heavy use of vegetation around development would echo the existing oasis character. Plantings outside of the immediate developed area at the campground would consist of native vegetation.

Impact on Visitor Experience/Congestion

A greater balance between day and overnight use would be accommodated at Willow Beach, similar to historical use prior to the closure of the Jumbo Wash campground. Total parking in the developed area would be increased by approximately 37 spaces over existing conditions, to 367 spaces. The number of double pull-through spaces for boats and trailers would be increased from about 43 to 180. However, due to the remote location of the campground, as well as the trailer village, these visitors would likely drive from these facilities down to the water, adding to traffic and taking up much of the available parking. Consequently, the amount of parking available for day users would be comparable to Alternative B, and traffic, competition for parking spaces, and parking in undesignated areas during high use weekend and holiday periods would likely increase. The remote location of dry boat storage would also result in increased traffic along the access road. In general, there would be increased traffic and demand for riverfront parking due to the dispersal of visitor facilities.

Increasing numbers of visitors and variety of activities may contribute to the continued reduction in angling use.

The relocated motel would take advantage of views toward the river as well as breezes, which would enhance the visitor experience for the motel users.

Day use of the riverfront would be expanded and improved with the addition of picnic sites and stabilization of the river banks.

Impact On Trailer Village Residents And Concession Services

Trailer village residents (60 long-term sites) would be relocated up Willow Beach Wash to a location further from the river. The new trailer village sites would be oriented to take advantage of views toward

the river as well as cooling breezes. Total number of long-term sites would not change. Short-term RV sites would not be accommodated at the relocated trailer village site, but at the new campground.

Comparing the proposed concession services to existing conditions at Willow Beach, there could be an increase in the number of motel units from 24 to 48, a 100% increase. There would also be an increase of up to a maximum of 100 RV sites. New store and laundry facilities would be added near the new campground. The level of all other concession services would not change. An increase in concession facilities would provide an increased opportunity for the concession to enhance sales; however, there is no demonstrated demand at this time for more overnight accommodations. Construction of any nonrevenue producing facilities would have a negative affect on the overall of the concession operation. Concession facilities would be more dispersed than under existing conditions.

Impact on Cultural Resources

While nine archeological sites lie within the general area, none would be directly affected by this alternative. Specific actions have been designed to avoid all sites. If during detailed project design, it becomes infeasible to avoid a specific site, mitigative measures will be developed in consultation with the Arizona State Historic Preservation Officer and the Advisory Council on Historic Preservation.

The NPS has applied the criteria of effect found in 36 CFR 800 and has determined that implementation of this alternative would have no effect on properties listed in, or eligible for listing in the National Register of Historic Places. Should unknown resources be uncovered during construction, work would stop in the project area and the NPS would consult according to 36 CFR 800.11.

Table 6: Summary of Impacts

Impacts On:	Alternative A	Alternative B	Alternative C
People in floodplains: 100-year ¹ PMF ²	450 day, 360 night	40 day, 0 night 20 day, 0 night	10 day, 0 night 165 day, 0 night
Property in floodplains: ³ 100-year PMF	\$3,579,000	\$ 234,000 145,000	\$ 102,000 \$1,179,000
Vegetation/soils # total acres impacted # undisturbed acres impacted	no new impacts	20 acres 12 acres	60 acres 48 acres
Threatened and endangered species: # acres desert tortoise habitat impacted	no new impacts	17 acres	56 acres
Visual quality from US 93 from river	no new impacts	-NPS housing, maintenance visible -new development within bounds of existing development	-NPS housing, maintenance, campground visible -new development within bounds of existing development
Visitor experience	no new impacts	-primarily day use area; -decrease in parking to 190 spaces; -decrease in traffic; -decrease in visitors accommodated on site	-greater balance between day and overnight use; -increase in parking to 367 spaces; -increase in traffic and demand for riverfront parking
Trailer village residents	no change	50 long-term and 15 short-term sites relocated; 10 long-term sites remain on bench	60 long-term sites relocated
Level of concession operations	no change	small increase in overnight facilities; no demonstrated demand for increase in overnight facilities at this time	Large increase in overnight facilities; no demonstrated demand for increase in overnight facilities at this time
Development costs to NPS		\$10,932,000	\$16,743,000
Development costs to concession		\$ 3,131,000	\$ 6,362,000

1 Estimated number of people in the 100-year floodplain at any one time on a average summer weekend who would only be protected by warning system and evacuation plan.
 2 Estimated number of people in the probable maximum floodplain at any one time on an average summer weekend who would only be protected by warning system and evacuation plan.
 3 These costs do not include utilities, furnishings, equipment, vehicles, flood control devices, debris removal, search and rescue, or expenses of victims.

APPENDIXES

APPENDIX A: ESTIMATED PROJECT COSTS

DEVELOPMENT	ALTERNATIVE B	ALTERNATIVE C
National Park Service Costs:		
Structural Protection	\$ 2,514,000	\$ 5,186,000
Parking	21,000	1,008,000
Launch Ramp	0	183,000
Ranger/Info./Comfort Station	324,000	324,000
Maintenance	216,000	216,000
Firehouse	164,000	164,000
Employee Housing	567,000	978,000
Campground	0	931,000
Picnic Sites/Restrooms	85,000	85,000
Bank Stabilization	104,000	104,000
Utilities	5,464,000	5,464,000
Rd. to T.V./Lagoons	341,000	341,000
Building Removal	<u>8,000</u>	<u>38,000</u>
Total NPS Gross Construction Cost:	\$ 9,808,000	\$15,022,000
Design Cost:	<u>1,124,000</u>	<u>1,721,000</u>
Total NPS Project Cost:	\$10,932,000	\$16,743,000
Concessioner Costs:		
Campground	\$ 564,000	\$ 1,273,000
Trailer Village	766,000	707,000
Motel	1,333,000	2,521,000
Employee Housing	w/trail. vil. 130,000	516,000
Concession Maintenance	130,000	649,000
Dry Boat Storage	0	42,000
Gas Station	<u>15,000</u>	<u>w/cmpgrd.</u>
Total Gross Construction Concessioner Costs:	\$ 2,808,000	\$ 5,708,000
Design Cost:	<u>323,000</u>	<u>654,000</u>
Total Concessioner Project Cost:	\$ 3,131,000	\$ 6,362,000

*NPS policy requires that, to the extent it is economically feasible, the concessioner undertake all costs relating to construction of its own facilities, as well as utilities, roads, parking, and similar infrastructure. Such feasibility determination has not been made, but would be accomplished prior to implementation of the proposal. The costs allocations above must therefore be regarded as tentative. Additionally, the NPS would purchase possessory interest in concessioner facilities proposed for removal/relocation as negotiated under provisions of the concession contract; this would mitigate to some extent the cost of construction to the concessioner of proposed facilities.

APPENDIX B: FLOODPLAIN COMPLIANCE

Executive Order 11988 was developed "in order to avoid to the extent possible the long and short term adverse impacts associated with the occupancy and modification of floodplains and to avoid direct and indirect support of floodplain development wherever there is a practicable alternative" (EO 11988; 42 FR 26951).

National Park Service "Floodplain Management and Wetland Protection Guidelines" (Federal Register vol. 45, no. 104, May 28, 1980) list procedures for complying with the executive order. These procedures require identification of floodplain, flood hazard, and wetland areas subject to public use and/or development, where the magnitude of hazard and impact of human activities is likely to be greatest; determination if the proposed action is in, or could affect, a floodplain or wetland; public review; identification and evaluation of practicable alternatives to locating in the base floodplain or wetland; identification of impacts; minimization of impacts; restoration, preservation, and enhancement of floodplain values; and findings and public explanation.

This environmental assessment identifies the 100-year and probable maximum floodplains at Willow Beach. There are no wetlands in the project area. For each alternative, the facilities that would remain in the floodplains are shown in the enclosed tables. Estimates are provided for numbers of people expected to be in the floodplains. The action alternatives would remove all overnight development out of the probable maximum floodplain; some day use development would remain in the floodplains. Estimates are provided for numbers of people expected to be in the floodplains. The floodplains at Willow Beach have already been disturbed by its use as a development area; and protecting life and property already in the floodplains was judged to be a higher priority than restoring the natural qualities of the floodplains, which are the very qualities that endanger life and property; and Lake Mead has been set aside as a recreation area with access to the lakes a primary service. Some tradeoff in natural values is necessary to provide this service.

In summary, the environmental assessment already provides compliance with most of the requirements of the executive order and implementing guidelines. All that remains to complete the compliance process is public review of the environmental assessment and development and approval of a statement of findings.

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