LAKE
GIP Report

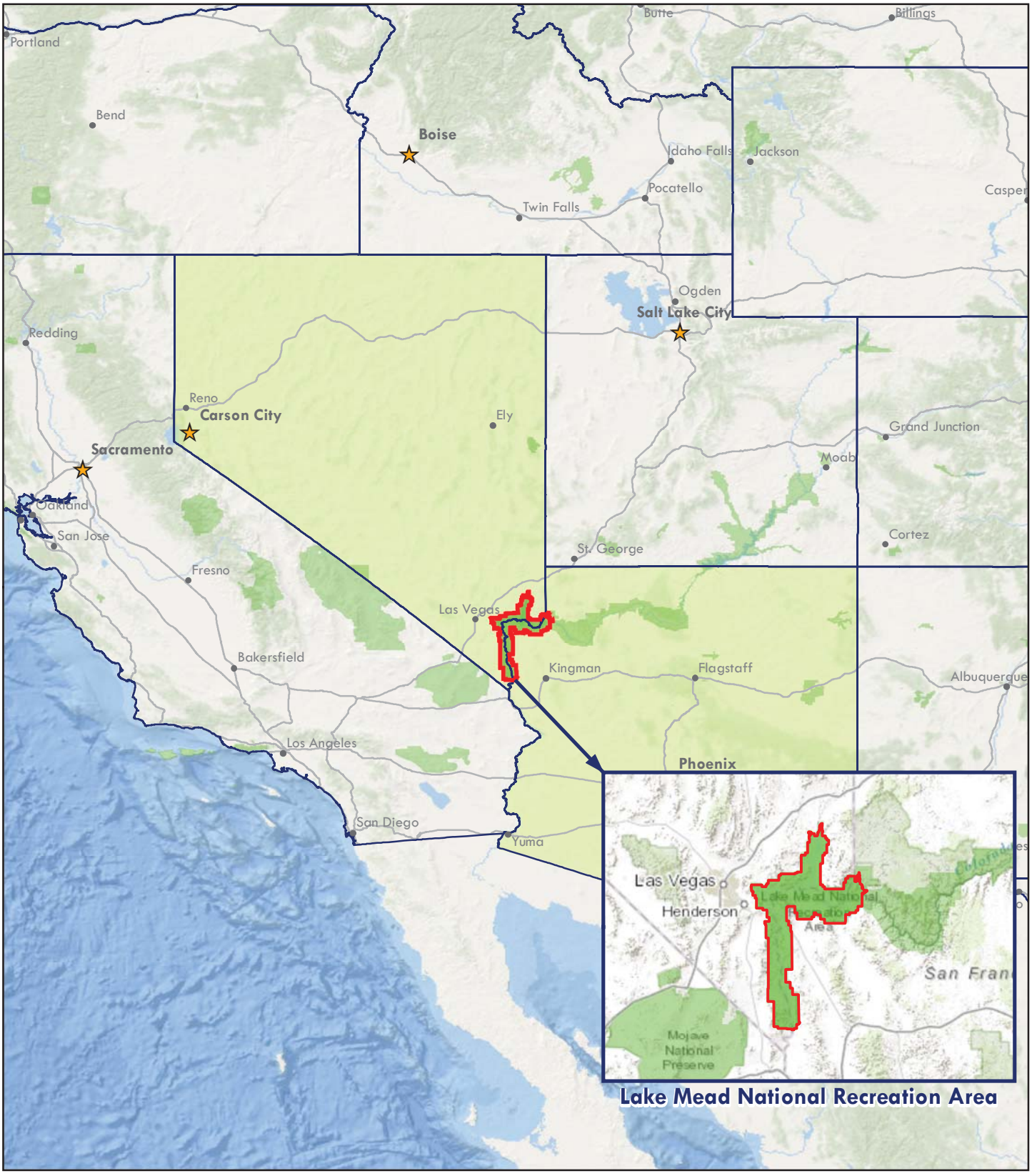
NPS Guardwall/Rail Inventory Program
Lake Mead National Recreation Area

Federal Lands Highway
Road Inventory Program

Prepared By:
Federal Highway Administration
Eastern Federal Lands Highway Division
Road Inventory Program (RIP)

Data Collection Date: May 2010
Report Date: November 2015

Lake Mead National Recreation Area
in
Arizona and Nevada



Sources: Esri, HERE, DeLorme, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community
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Introduction

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Introduction

In support of the NPS Facility Management Software System (FMSS) asset management program, FHWA- contracted staff completed the Guardwall/Rail Inventory Program (GIP) inspections within selected National Park Service (NPS) units between 2010 and 2011. This inventory provides static information to FMSS regarding barrier characteristics such as height, length and location, as well as dynamic information about the condition of the barrier. In addition, when barrier deficiencies were identified, repair recommendations and estimated costs, suitable for use as FMSS work orders, were generated to bring the barrier back to its "new" condition.

In over 30 parks, numerous crashworthy barriers inspected maybe in poor condition by simply applying a new overlay of asphalt without milling previous layers. In instances such as this, basically the critical element of barrier height decreased as the elevation of the roadway increased. Resulting work orders were drafted to raise w-beam barriers or to remove and reset stone masonry barriers to their original design height.

This inventory provides static information and a condition assessment of each barrier inventoried. In addition, when barrier deficiencies were identified, repair recommendations and estimated costs were drafted to bring the barrier back to its "new" condition.

Drafted work orders have been classified as being either deferred maintenance or capital improvement. This classification is based on the type of work recommended, as defined below.

- *Deferred Maintenance* can be classified as repair or replace in kind. Work done to the barrier does not include any upgrading.
- *Capital Improvement* can be classified as upgrading part of or the entire existing barrier. Typically the upgrade will be from a non-crashworthy to a crashworthy device. Other examples of capital improvements would be the addition of a curb to improve drainage.

Care was taken to maintain the cultural significance of historic barriers located in the NPS. While historic traffic barriers likely would not withstand current crashworthiness performance criteria, they are considered by the NPS to be important resources for the historic and/or cultural value. Historic barriers may be "character defining features" that contribute to the cultural significance of historic roadways. As such, these barriers have resource value in and of themselves which may be somewhat independent from their functionality as barriers as previously defined. The consideration of both the crashworthiness and resource value of historic barriers was a significant challenge for the NPS and the FHWA when designing the GIP, to the point that for historic stone masonry barriers, the barrier height had to be more than 6-in below its design height before any work would be considered to deal with height issues. To preserve historic stone masonry barriers, typical drafted work orders for historic barriers were to remove and reset the barrier to the barrier's original design height on a concrete footer, as compared to replacing it with a similar crashworthy barrier.

This report is organized in a tiered approach from the broad park overview perspective (Tier 1) to a route overview perspective (Tier 2), then down to the details of each barrier (Tier 3). Tier 1 presents park barrier location maps and an overall park-specific summary narrative of the results of the guardwall/rail inventory program. Tier 2 presents route overview maps with associated barrier summary information. Tier 3 presents individual barrier information in a one-page detailed format, including a photograph of each barrier. Appendix A provides a condensed summary of guardwall/rail inventory definitions and assessment categories to assist in reading this report.

Park Barrier Location Maps

Lake Mead National Recreation Area

Federal Lands Highway
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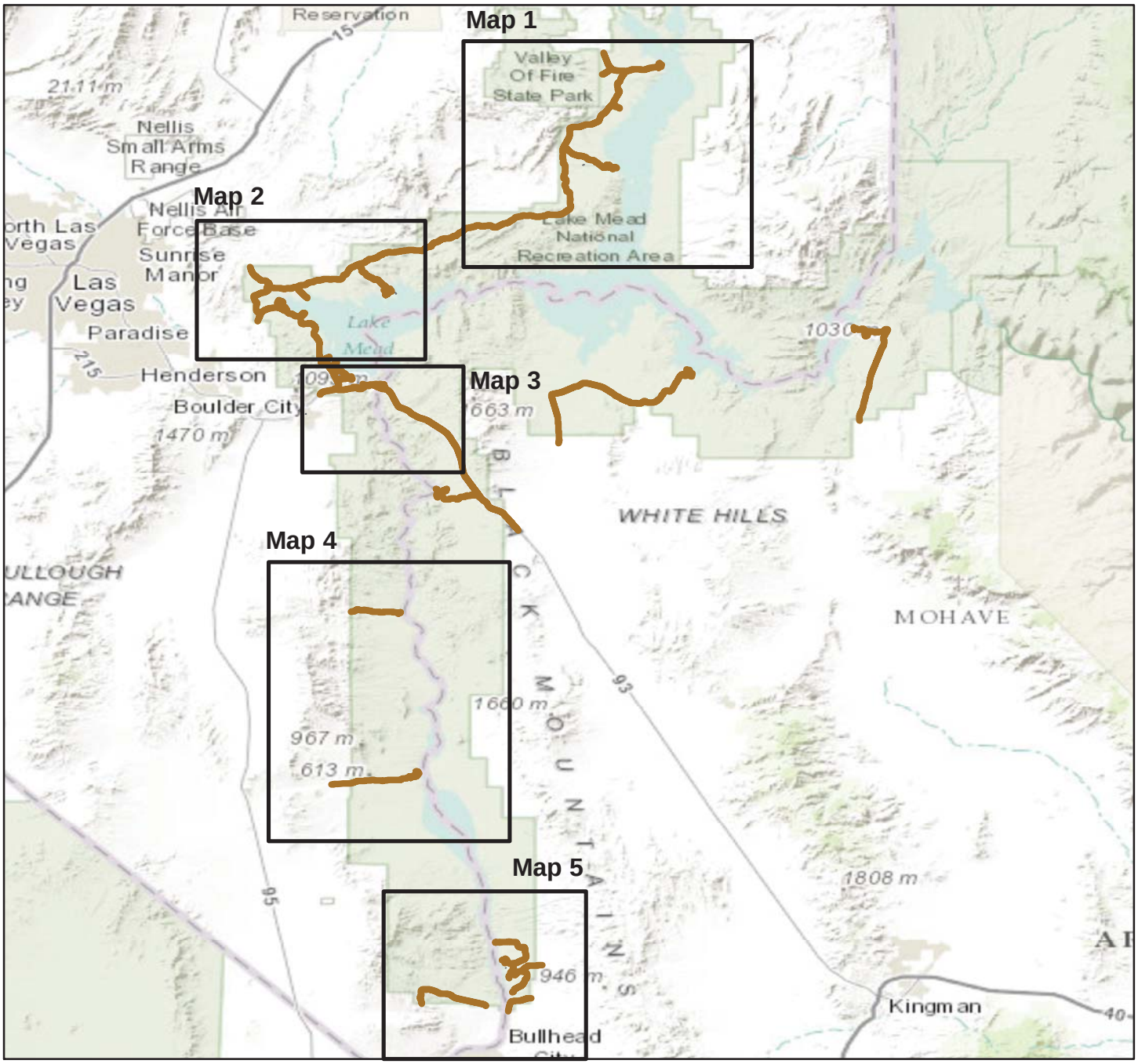
BARRIER LOCATION MAP

Key Map



Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

RIP Collected Routes

Miles

0 10 20

N

Lake Mead National Recreation Area

BARRIER LOCATION MAP

Map 1

Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

Barrier Locations

RIP Collected Routes

Miles

0 2 4

N

Lake Mead National Recreation Area

BARRIER LOCATION MAP

Map 2

Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

Barrier Locations

RIP Collected Routes

Miles

0 1.5 3

N

Lake Mead National Recreation Area

BARRIER LOCATION MAP

Map 3

Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

Barrier Locations

RIP Collected Routes

Miles

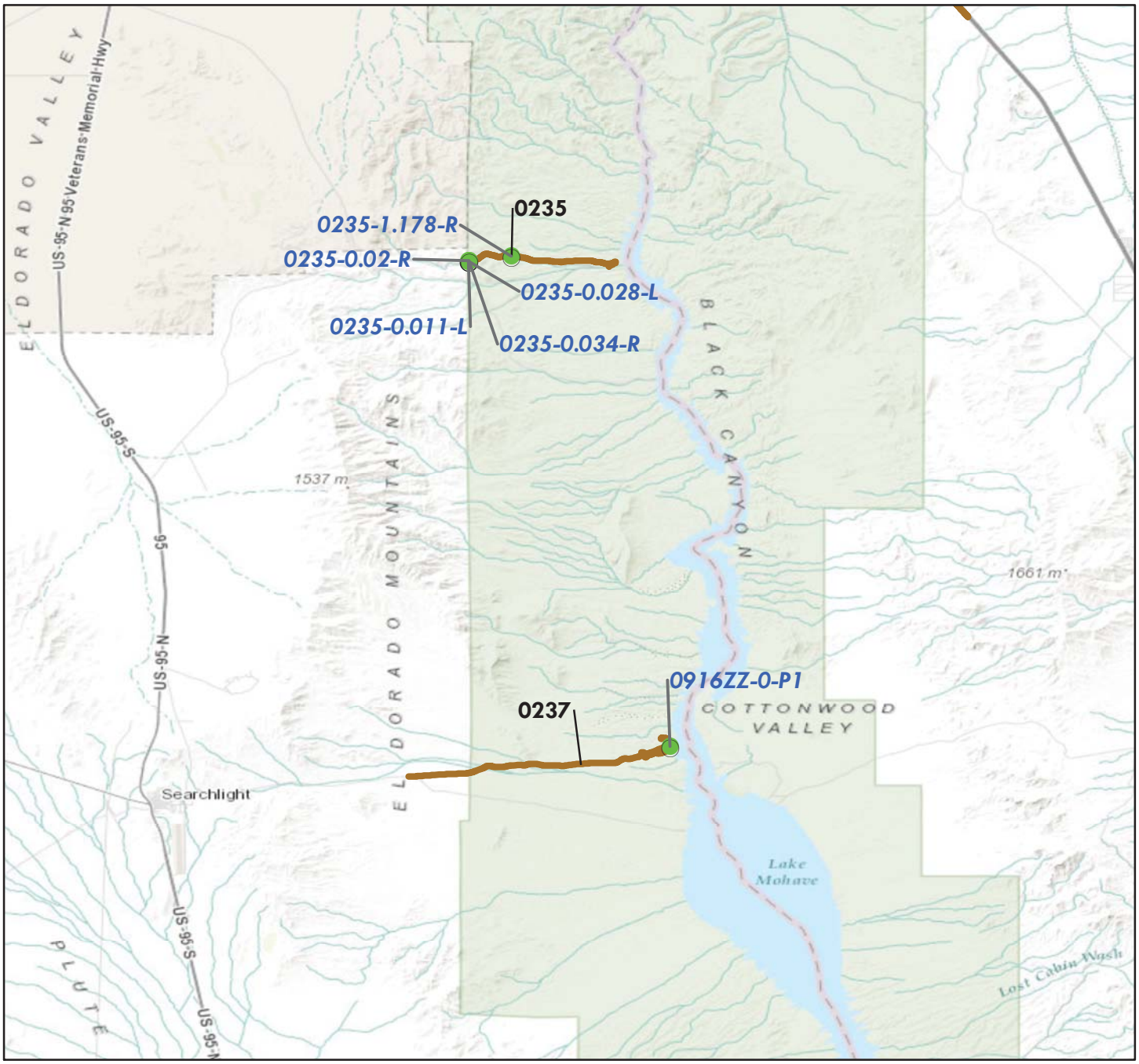
0 1 2

N

Lake Mead National Recreation Area

BARRIER LOCATION MAP

Map 4



Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

Barrier Locations

RIP Collected Routes

Miles

0 4 8

N

Lake Mead National Recreation Area

BARRIER LOCATION MAP

Map 5

Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

Barrier Locations

RIP Collected Routes

Miles

0 1.5 3

N

Tier 1
Park Barrier Overview

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Parkwide Summary: Lake Mead National Recreation Area

Initial barrier inspections were conducted at Lake Mead National Recreation Area in 2010, and encompassed all known barriers associated with Park roadways. In general, walls are not included in this assessment, but were inspected for Lake Mead National Recreation Area in under a separate effort as part of the Retaining Wall Inventory Program (WIP). A report for WIP is available under separate cover.

All paved roadways and parking areas listed in the RIP Route Identification Report were inspected for barriers.

The following tables provide an overview of the findings of this inspection and assessment effort. In all, 52 barriers were inventoried on the routes listed below.

Table 1: Number of Barriers by Route

Route Number	Route Name	No. of Barriers
0001	EB NORTHSHORE ROAD	25
0003ZZ	LV LAKESHORE ROADS	9
0010	CB CALLVILLE BAY ACCESS ROAD	2
0112	EB ECHO BAY ACCESS ROAD	2
0114ZZ	KA KATHERINE AREA ACCESS ROADS	3
0203	LV GOVERNMENT WASH ROAD	1
0233	BB LAKE VIEW ROAD	2
0235	CC EL DORADO CANYON ROAD	5
0457ZZ	BB CONC LAKE MEAD CRUISES ROADS	2
0916ZZ	CC COTTONWOOD COVE CONCESSION PARKING AREAS	1

Due to the different GIP assessment criteria of barriers based on their intended use, barriers were classified as being either traffic barriers or non-traffic barriers.

- *Traffic* barriers are physical devices intended to keep vehicles or people from straying into dangerous or off-limits areas. For the purpose of this inventory, a traffic barrier is categorized as roadside hardware placed longitudinally, excluding pedestrian railing and fencing.

- *Non-traffic* barriers provide a physical delineation between public access areas and restricted or protected areas in locations such as a parking lot, viewpoint or turnout. **Non-traffic barriers which inhibit access of vehicles are included in this report; non-traffic barriers which only inhibit access of pedestrians or bicyclists are not included. For the purpose of this inventory, non-traffic barriers are guidewalls and guiderails. Note: rocks, stones, boulders, fences or curbs were excluded from this inventory.**

There are instances in parks where a single barrier can switch between being classified as a traffic barrier and a non-traffic barrier. Such instances typically occur at pullouts, where a traffic barrier along the road will continue through the pullout without interruption. In such instances, the traffic barrier and non-traffic barrier were assessed using different criteria. Due to the different criteria, the GIP database was designed to record the traffic barrier and non-traffic barrier as multiple distinct barriers, even though to the eye, they appear as one barrier. Other instances where a single barrier is split into multiple barriers would be when the barrier is placed continuously along two legs of an intersection, so that one portion of the barrier may be on one road and the remaining portion of the barrier is on a different road.

Table 2: Number of Barriers by Function

Barrier Function	No. of Barriers
TRAFFIC	47
NON-TRAFFIC	5

The following table shows the barrier types that were inventoried and assessed.

Table 3: Number of Barriers by Type

Primary Barrier Type	No. of Barriers
Other: Concrete Block	1
Stone Masonry Without Concrete Core Wall	2
Thrie Beam/Modified Thrie Beam	1
W-Beam Strong Post	31
Concrete Barrier	5
Concrete With Simulated Stone Face	12

The following table shows the number of barriers by one of four categories of recommended action along with associated work order costs and the number of barriers that are in each recommended action. All work order information is presented for individual barriers, even though some work orders were not accepted by the Park. Some work orders were later combined to simplify route deferred maintenance requests.

Table 4: Number of Barriers by Recommended Action and Associated 2008 Cost

Recommended Action	Repair Costs*	No. of Barriers
No Action	$0	22
Monitor	$0	0
Repair	$249,010	30
Replace	$0	0
Totals	**$249,010**	**52**

*2008 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.

The following table categorizes the number of barriers that fall into one of ten cost ranges, based on the prepared work orders. The locations, work descriptions, and cost of the recommended repairs for these barriers are listed by individual barrier in Tier 3 of this report.

Table 5: Number of Barriers Grouped by Associated 2008 Cost

Cost Range*	No. of Barriers
$0	22
$1 - $25,000	30
$25,001 - $50,000	0
$50,001 - $100,000	0
$100,001 - $250,000	0
$250,001 - $500,000	0
$500,001 - $1,000,000	0
$1,000,001 - $2,000,000	0
$2,000,001 - $3,000,000	0
$3,000,001 - $4,000,000	0
Total Number of Barriers	**52**

*2008 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.

Data for end terminals was collected on the GIP data collection form and indicates if an end terminal meets current crashworthiness standards. End terminals are specially designed barrier ends that attenuate impacts to the ends of barriers. This is supplemental information that WASO designed into the inventory program.

A total of 50 end terminals were found on barriers at the Park. There are generally a greater number of end treatments than actual barriers because end treatments are located at both the beginning and end of each barrier.

Tier 2
Route Barrier Overview

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ROUTE 0001: EB NORTHSHORE ROAD

Sources: Esri, HERE, DeLorme, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

Barrier ID Inspection Date	Barrier Length (Ft.)	Barrier Type	Barrier End Treatment		*Repair Cost
			Begin	End	
LAKE-0001-1.066-R 5/3/2010	166	W-BEAM STRONG POST	W-BEAM FLARED 350 COMPLIANT	W-BEAM FLARED 350 COMPLIANT	$3,102.00
LAKE-0001-1.072-L 5/3/2010	983	W-BEAM STRONG POST	W-BEAM FLARED 350 COMPLIANT	W-BEAM FLARED 350 COMPLIANT	$3,624.00
LAKE-0001-1.131-R 5/3/2010	120	CONCRETE BARRIER	NONE	NONE	$4,840.00
LAKE-0001-1.174-R 5/3/2010	169	CONCRETE BARRIER	NONE	NONE	$7,260.00
LAKE-0001-1.448-L 5/3/2010	1048	W-BEAM STRONG POST	W-BEAM FLARED 350 COMPLIANT	W-BEAM TANGENT 350 COMPLIANT	$0.00

*2008 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.

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ROUTE 0001: EB NORTHSHORE ROAD

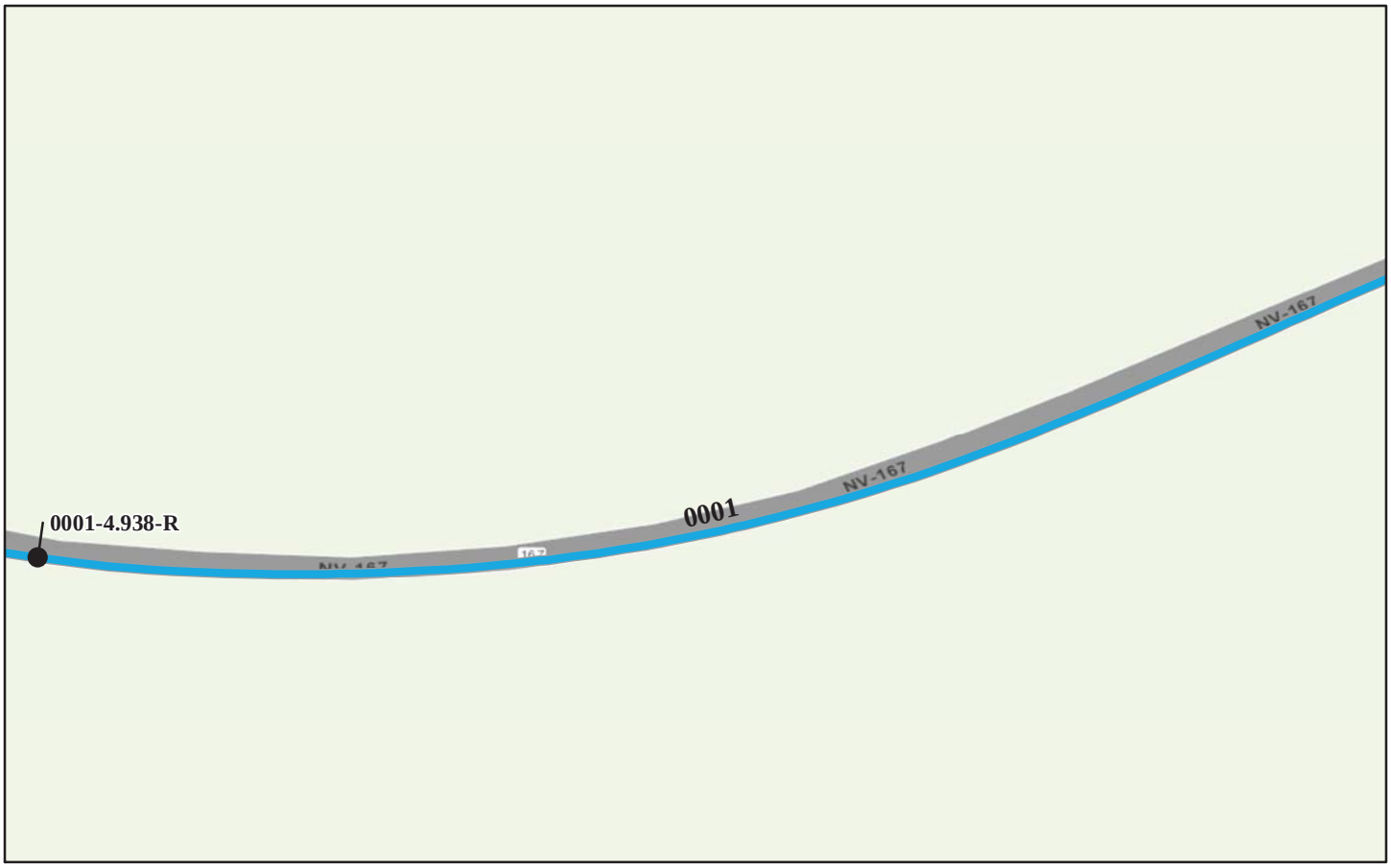
Sources: Esri, HERE, DeLorme, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

Barrier ID Inspection Date	Barrier Length (Ft.)	Barrier Type	Barrier End Treatment		*Repair Cost
			Begin	End	
LAKE-0001-1.792-L 5/3/2010	926	W-BEAM STRONG POST	NONE	W-BEAM FLARED 350 COMPLIANT	$17,924.00
LAKE-0001-2.290-R 5/3/2010	167	W-BEAM STRONG POST	W-BEAM FLARED 350 COMPLIANT	W-BEAM FLARED 350 COMPLIANT	$0.00
LAKE-0001-2.295-L 5/3/2010	156	W-BEAM STRONG POST	W-BEAM FLARED 350 COMPLIANT	W-BEAM FLARED 350 COMPLIANT	$0.00
LAKE-0001-4.481-L 5/3/2010	831	W-BEAM STRONG POST	W-BEAM FLARED 350 COMPLIANT	W-BEAM FLARED 350 COMPLIANT	$4,004.00
LAKE-0001-4.483-R 5/3/2010	787	W-BEAM STRONG POST	W-BEAM FLARED 350 COMPLIANT	W-BEAM BURIED END	$4,108.00

*2008 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.

Lake Mead National Recreation Area

ROUTE 0001: EB NORTHSHORE ROAD



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Barrier ID Inspection Date	Barrier Length (Ft.)	Barrier Type	Barrier End Treatment		*Repair Cost
			Begin	End	
LAKE-0001-4.938-R 5/4/2010	635	W-BEAM STRONG POST	W-BEAM BURIED END	W-BEAM BURIED END	$11,522.00

*2008 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.

Lake Mead National Recreation Area

ROUTE 0001: EB NORTHSHORE ROAD

Sources: Esri, HERE, DeLorme, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

Barrier ID Inspection Date	Barrier Length (Ft.)	Barrier Type	Barrier End Treatment		*Repair Cost
			Begin	End	
LAKE-0001-5.424-R 5/4/2010	356	W-BEAM STRONG POST	W-BEAM BURIED END	W-BEAM BCT	$3,558.00
LAKE-0001-9.287-L 5/4/2010	996	W-BEAM STRONG POST	W-BEAM BURIED END	W-BEAM BCT	$20,790.00
LAKE-0001-10.508-R 5/4/2010	354	W-BEAM STRONG POST	W-BEAM FLARED 350 COMPLIANT	W-BEAM FLARED 350 COMPLIANT	$2,684.00
LAKE-0001-10.510-L 5/4/2010	355	W-BEAM STRONG POST	W-BEAM FLARED 350 COMPLIANT	W-BEAM FLARED 350 COMPLIANT	$0.00
LAKE-0001-24.836-R 5/4/2010	242	W-BEAM STRONG POST	W-BEAM FLARED 350 COMPLIANT	W-BEAM FLARED 350 COMPLIANT	$3,135.00

*2008 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.

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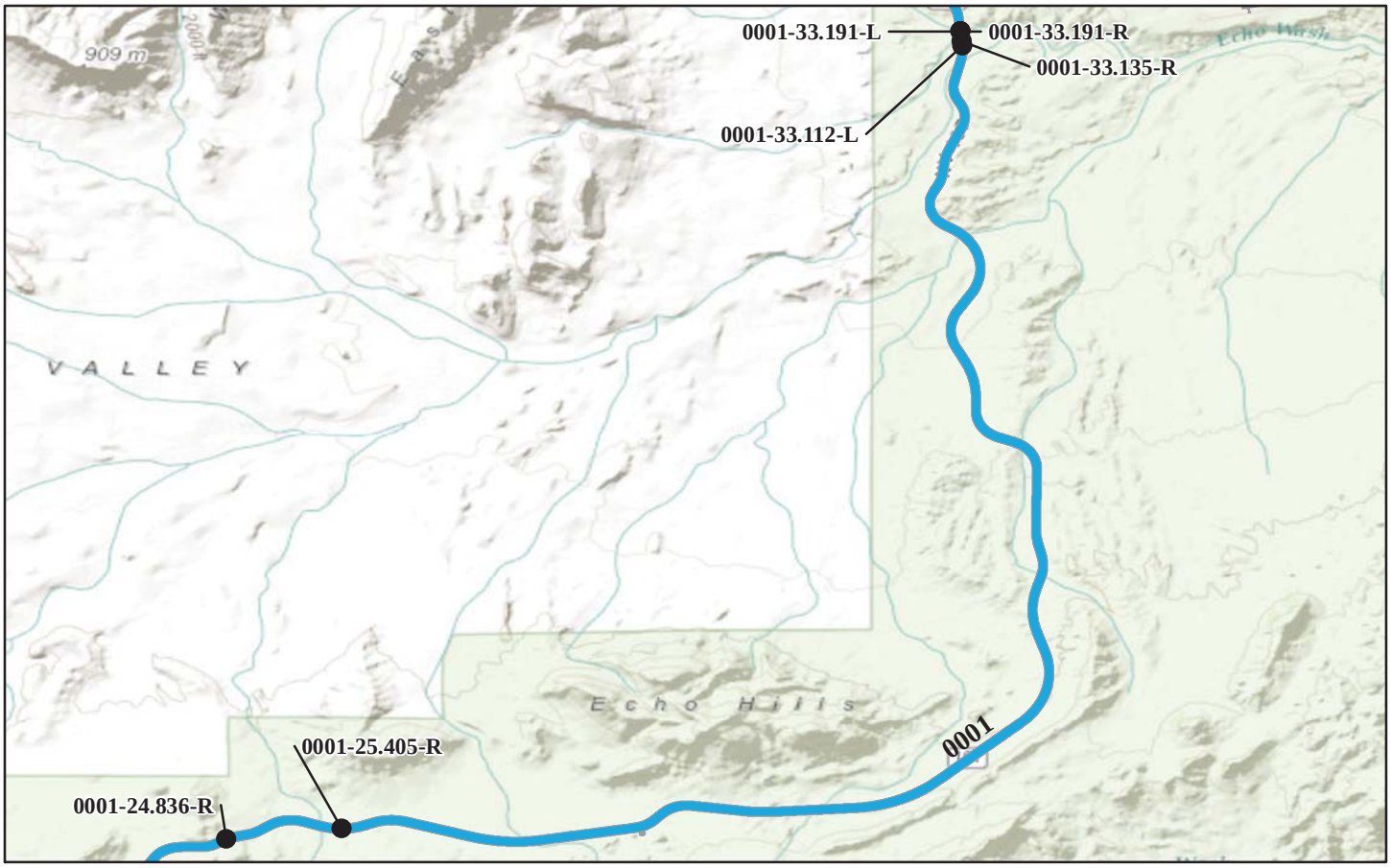
ROUTE 0001: EB NORTHSHORE ROAD



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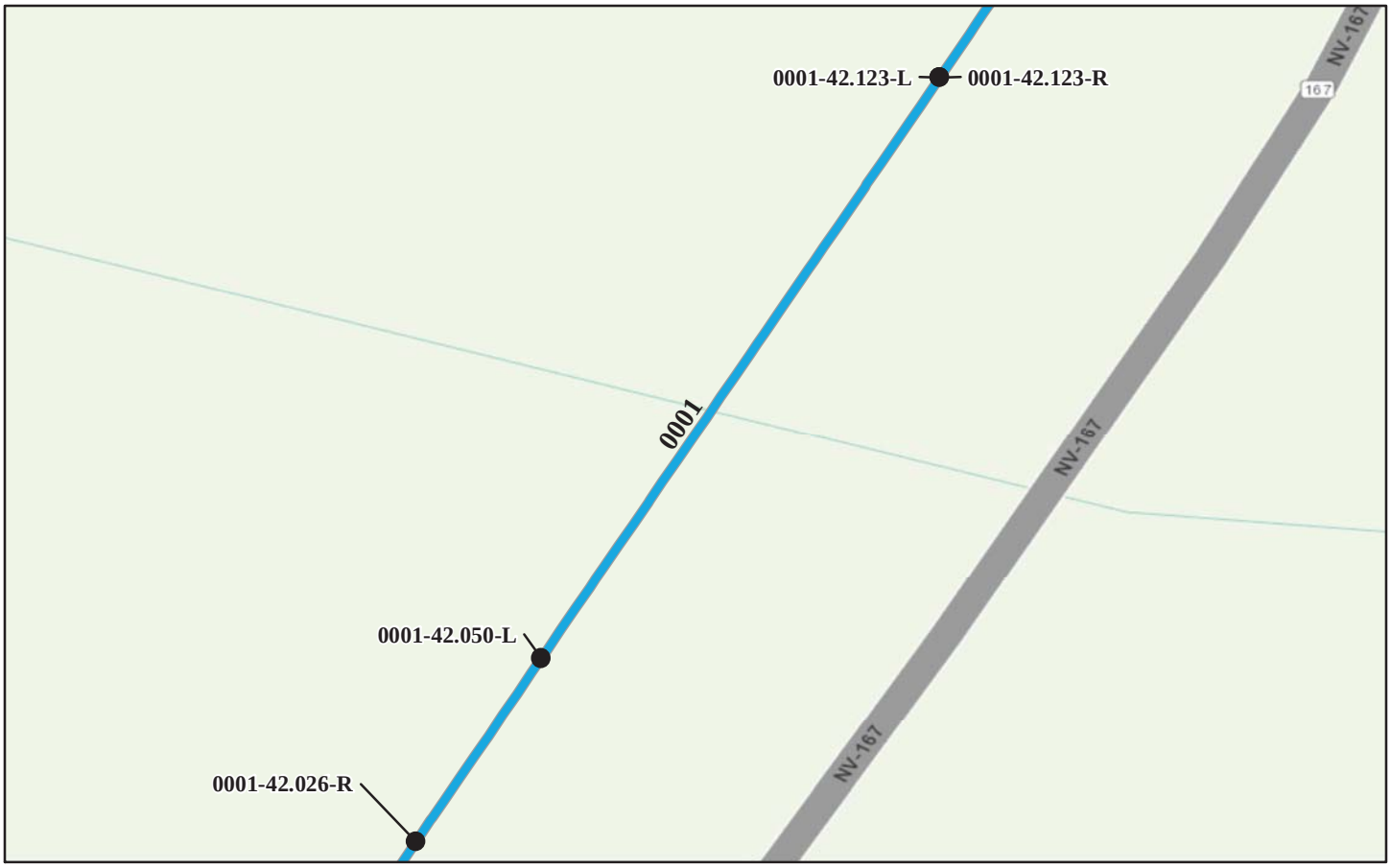
Barrier ID Inspection Date	Barrier Length (Ft.)	Barrier Type	Barrier End Treatment Begin	 End	*Repair Cost
LAKE-0001-25.405-R 5/4/2010	455	W-BEAM STRONG POST	W-BEAM FLARED 350 COMPLIANT	W-BEAM FLARED 350 COMPLIANT	$2,827.00
LAKE-0001-33.112-L 5/4/2010	28	CONCRETE WITH SIMULATED STONE FACE	NONE	NONE	$0.00
LAKE-0001-33.135-R 5/4/2010	160	CONCRETE WITH SIMULATED STONE FACE	NONE	NONE	$0.00
LAKE-0001-33.191-L 5/4/2010	161	CONCRETE WITH SIMULATED STONE FACE	NONE	NONE	$0.00
LAKE-0001-33.191-R 5/4/2010	28	CONCRETE WITH SIMULATED STONE FACE	NONE	NONE	$0.00

*2008 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.

Lake Mead National Recreation Area

ROUTE 0001: EB NORTHSHORE ROAD



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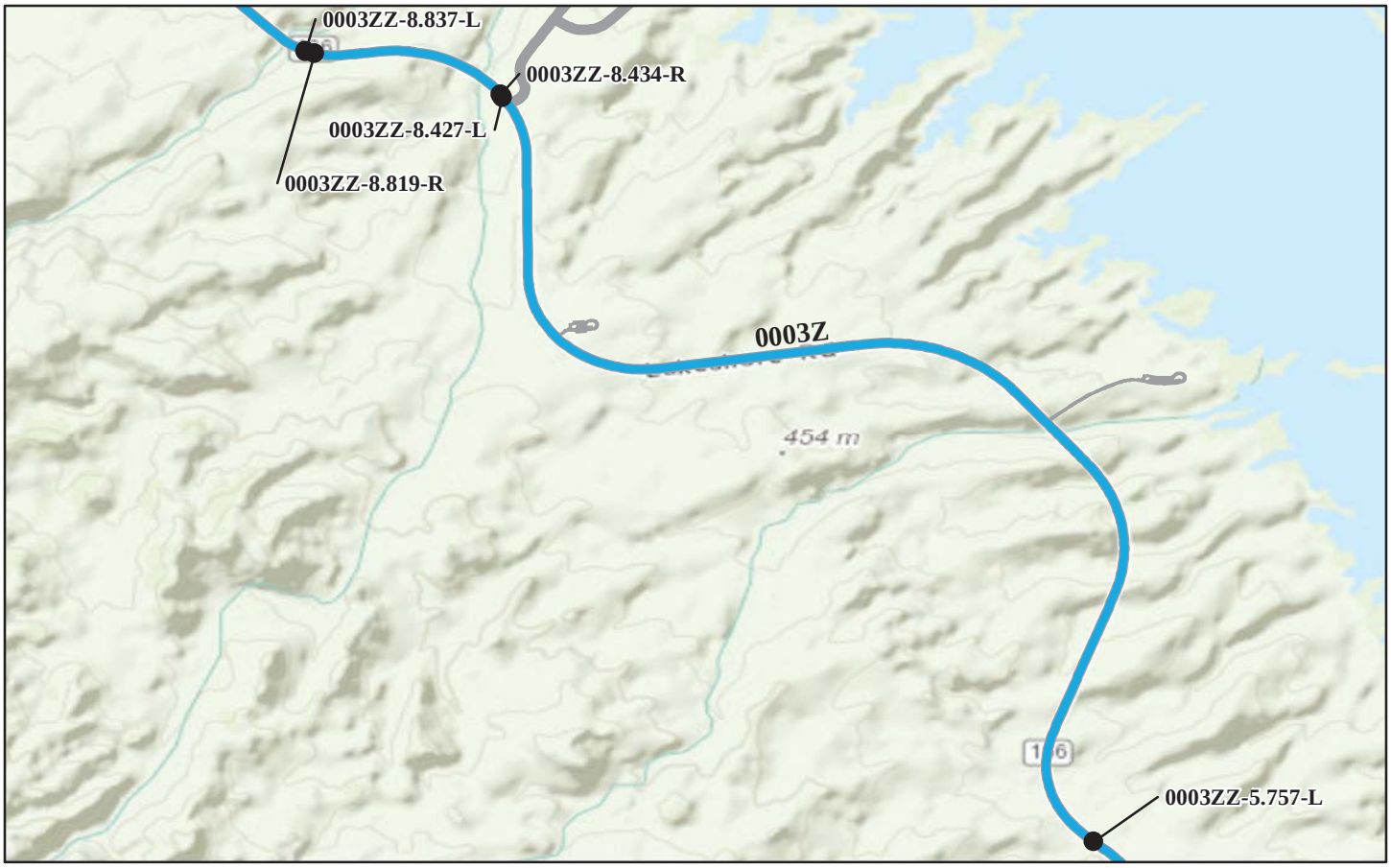
Barrier ID Inspection Date	Barrier Length (Ft.)	Barrier Type	Barrier End Treatment		*Repair Cost
			Begin	End	
LAKE-0001-42.026-R 5/4/2010	28	CONCRETE WITH SIMULATED STONE FACE	NONE	NONE	$0.00
LAKE-0001-42.050-L 5/4/2010	159	CONCRETE WITH SIMULATED STONE FACE	NONE	NONE	$0.00
LAKE-0001-42.123-L 5/4/2010	26	CONCRETE WITH SIMULATED STONE FACE	NONE	NONE	$0.00
LAKE-0001-42.123-R 5/4/2010	157	CONCRETE WITH SIMULATED STONE FACE	NONE	NONE	$0.00

*2008 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.

Lake Mead National Recreation Area

ROUTE 0003ZZ: LV LAKESHORE ROADS



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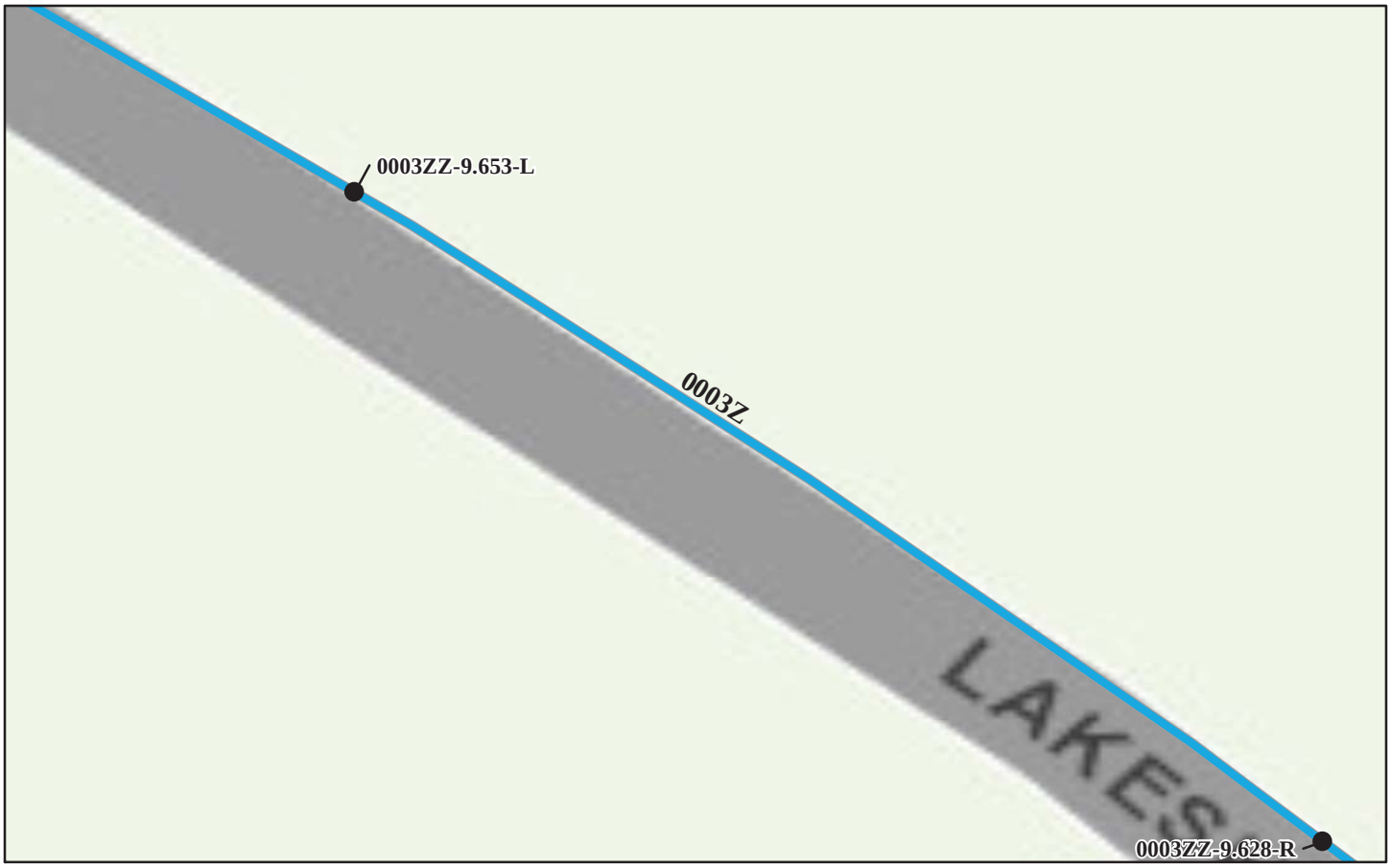
Barrier ID Inspection Date	Barrier Length (Ft.)	Barrier Type	Barrier End Treatment		*Repair Cost
			Begin	End	
LAKE-0003ZZ-5.757-L 5/3/2010	595	THRIE BEAM/MODIFIED THRIE BEAM	W-BEAM FLARED 350 COMPLIANT	W-BEAM FLARED 350 COMPLIANT	$13,794.00
LAKE-0003ZZ-8.427-L 5/3/2010	681	W-BEAM STRONG POST	NONE	W-BEAM FLARED 350 COMPLIANT	$4,609.00
LAKE-0003ZZ-8.434-R 5/3/2010	731	W-BEAM STRONG POST	W-BEAM FLARED 350 COMPLIANT	NONE	$14,025.00
LAKE-0003ZZ-8.819-R 5/3/2010	546	W-BEAM STRONG POST	W-BEAM FLARED 350 COMPLIANT	NONE	$17,853.00
LAKE-0003ZZ-8.837-L 5/3/2010	504	W-BEAM STRONG POST	NONE	W-BEAM FLARED 350 COMPLIANT	$4,312.00

*2008 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.

Lake Mead National Recreation Area

ROUTE 0003ZZ: LV LAKESHORE ROADS



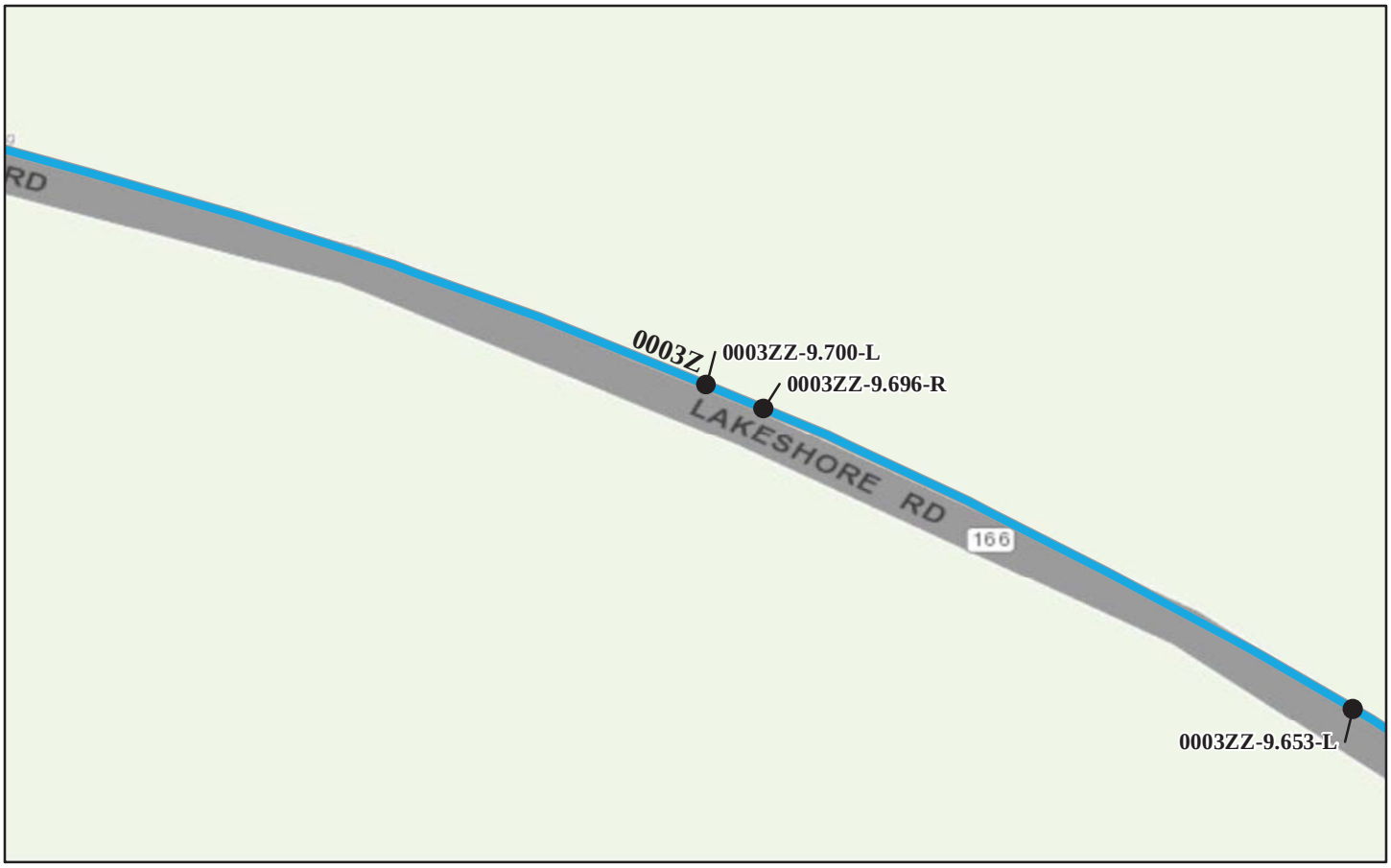
Sources: Esri, HERE, DeLorme, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

Barrier ID Inspection Date	Barrier Length (Ft.)	Barrier Type	Barrier End Treatment		*Repair Cost
			Begin	End	
LAKE-0003ZZ-9.628-R 5/3/2010	165	CONCRETE WITH SIMULATED STONE FACE	NONE	NONE	$0.00

*2008 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.

Lake Mead National Recreation Area

ROUTE 0003ZZ: LV LAKESHORE ROADS



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Barrier ID Inspection Date	Barrier Length (Ft.)	Barrier Type	Barrier End Treatment Begin	 End	*Repair Cost
LAKE-0003ZZ-9.653-L 5/3/2010	33	CONCRETE WITH SIMULATED STONE FACE	NONE	NONE	$0.00
LAKE-0003ZZ-9.696-R 5/3/2010	104	CONCRETE WITH SIMULATED STONE FACE	NONE	NONE	$0.00
LAKE-0003ZZ-9.700-L 5/3/2010	227	CONCRETE WITH SIMULATED STONE FACE	NONE	NONE	$0.00

*2008 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.

Lake Mead National Recreation Area

ROUTE 0010: CB CALLVILLE BAY ACCESS ROAD

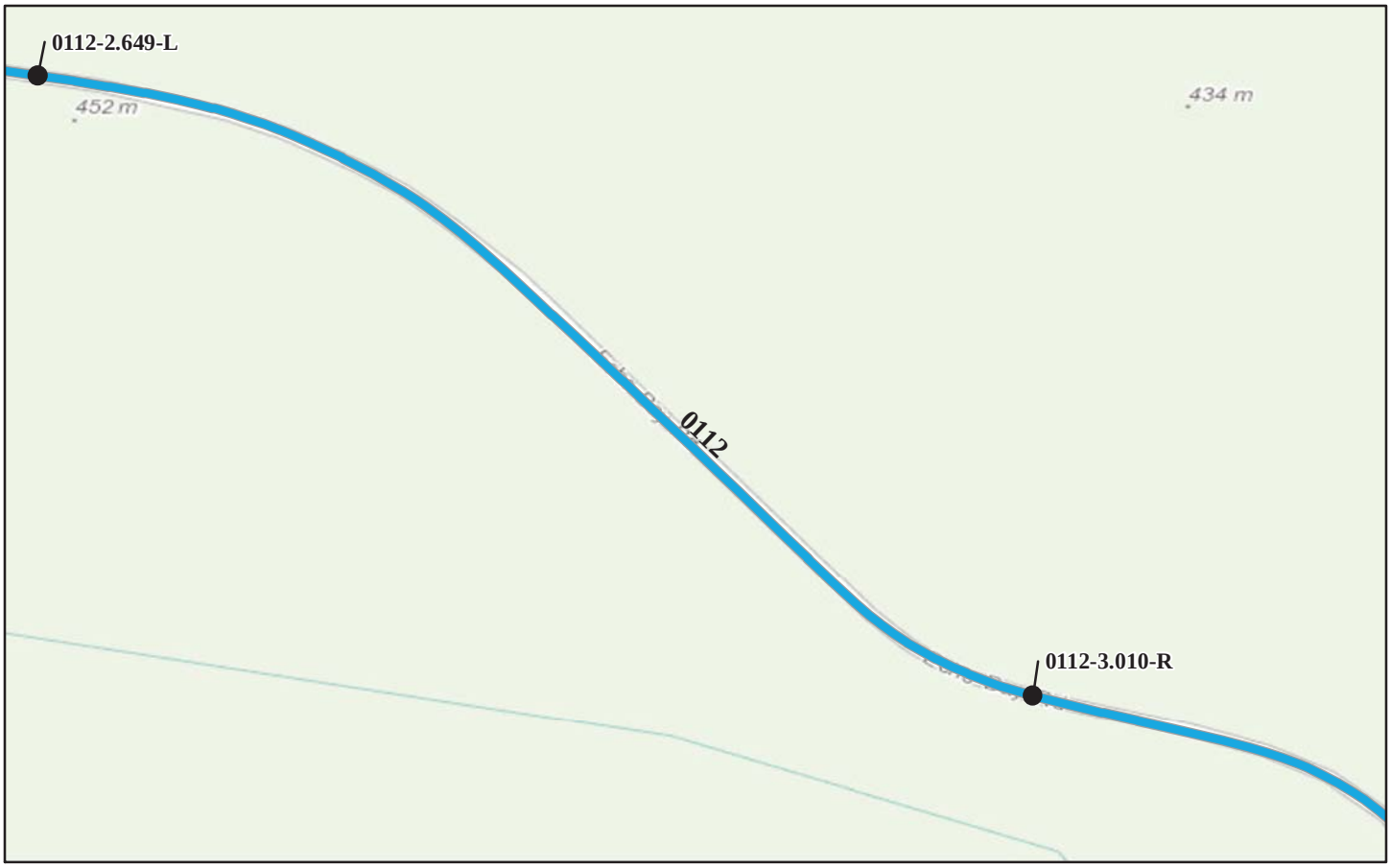
Sources: Esri, HERE, DeLorme, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

Barrier ID Inspection Date	Barrier Length (Ft.)	Barrier Type	Barrier End Treatment		*Repair Cost
			Begin	End	
LAKE-0010-0.699-R 5/4/2010	438	W-BEAM STRONG POST	W-BEAM BURIED END	W-BEAM FLARED 350 COMPLIANT	$2,568.00
LAKE-0010-4.077-L 5/4/2010	238	W-BEAM STRONG POST	NONE	NONE	$0.00

*2008 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.

Lake Mead National Recreation Area

ROUTE 0112: EB ECHO BAY ACCESS ROAD



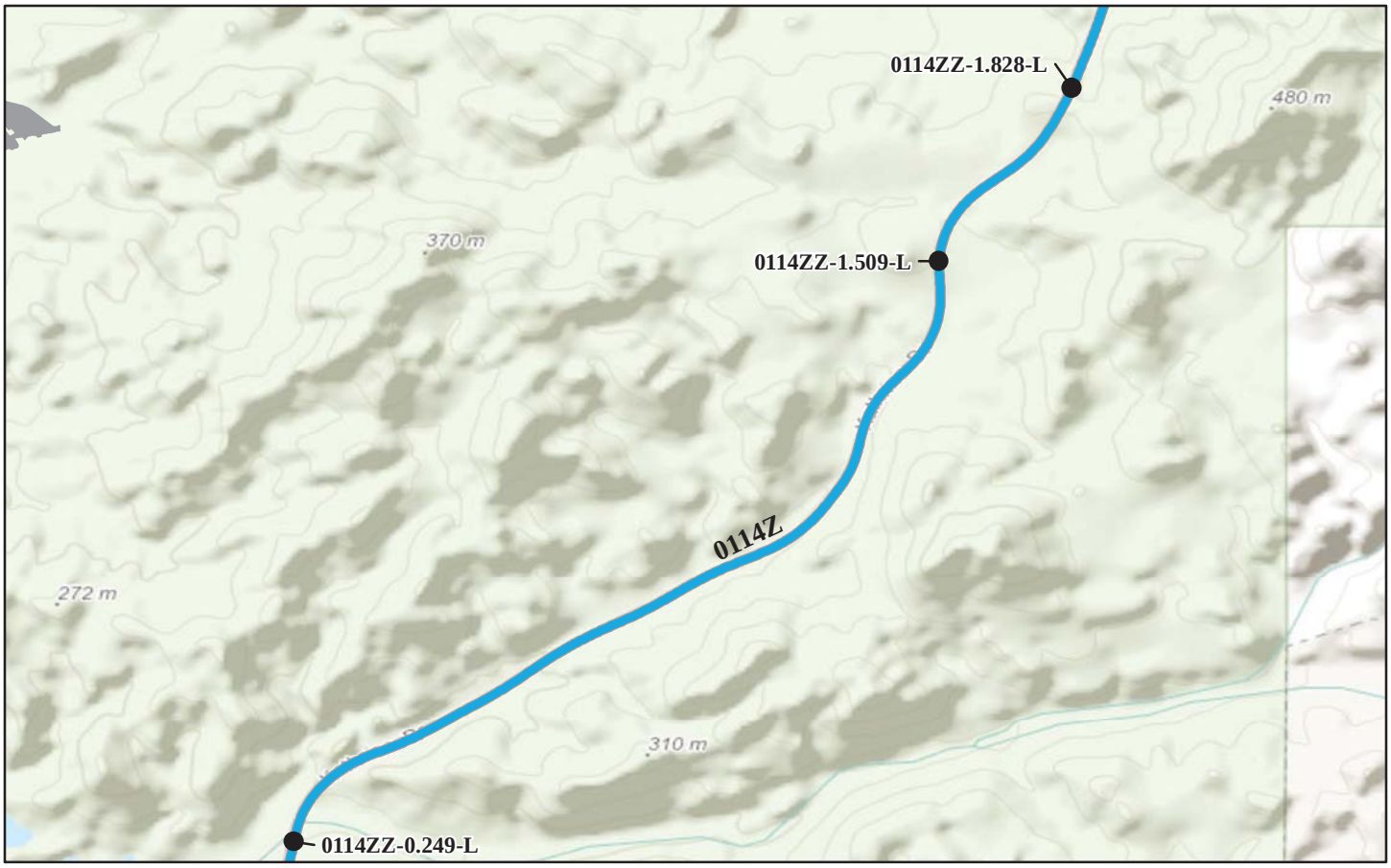
Sources: Esri, HERE, DeLorme, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

Barrier ID Inspection Date	Barrier Length (Ft.)	Barrier Type	Barrier End Treatment Begin	 End	*Repair Cost
LAKE-0112-2.649-L 5/4/2010	411	W-BEAM STRONG POST	W-BEAM BCT	W-BEAM BCT	$9,691.00
LAKE-0112-3.010-R 5/4/2010	512	W-BEAM STRONG POST	W-BEAM BCT	W-BEAM BCT	$16,786.00

*2008 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.

Lake Mead National Recreation Area

ROUTE 0114ZZ: KA KATHERINE AREA ACCESS ROADS



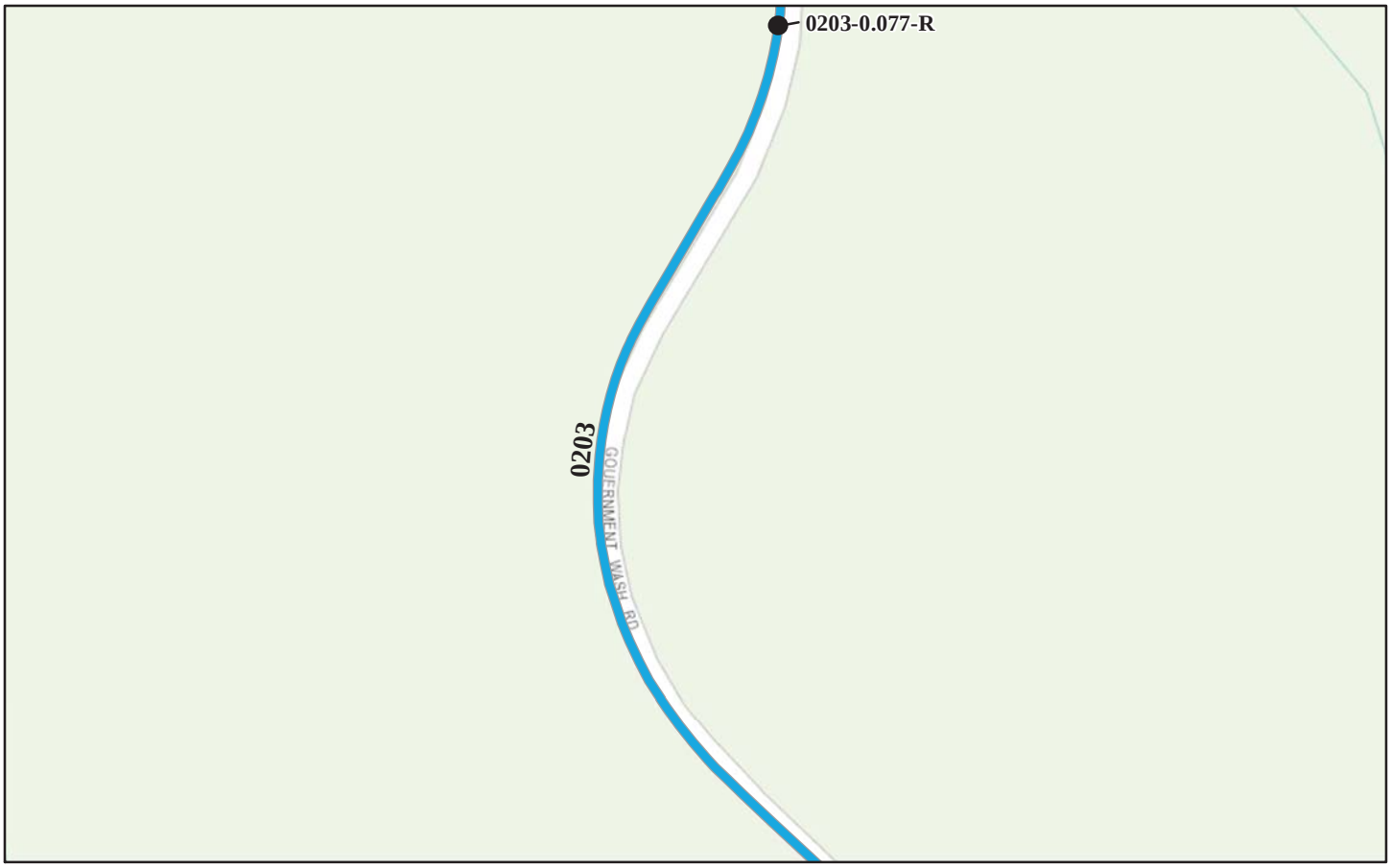
Sources: Esri, HERE, DeLorme, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

Barrier ID Inspection Date	Barrier Length (Ft.)	Barrier Type	Barrier End Treatment Begin	 End	*Repair Cost
LAKE-0114ZZ-0.249-L 5/5/2010	645	W-BEAM STRONG POST	W-BEAM FLARED 350 COMPLIANT	W-BEAM FLARED 350 COMPLIANT	$4,785.00
LAKE-0114ZZ-1.509-L 5/5/2010	254	W-BEAM STRONG POST	W-BEAM FLARED 350 COMPLIANT	W-BEAM FLARED 350 COMPLIANT	$0.00
LAKE-0114ZZ-1.828-L 5/5/2010	505	W-BEAM STRONG POST	W-BEAM FLARED 350 COMPLIANT	W-BEAM FLARED 350 COMPLIANT	$3,278.00

*2008 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.

Lake Mead National Recreation Area

ROUTE 0203: LV GOVERNMENT WASH ROAD



Sources: Esri, HERE, DeLorme, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

Barrier ID Inspection Date	Barrier Length (Ft.)	Barrier Type	Barrier End Treatment		*Repair Cost
			Begin	End	
LAKE-0203-0.077-R 5/4/2010	1,155	W-BEAM STRONG POST	W-BEAM BCT	W-BEAM BCT	$23,353.00

*2008 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.

Lake Mead National Recreation Area

ROUTE 0233: BB LAKE VIEW ROAD

Sources: Esri, HERE, DeLorme, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

Barrier ID Inspection Date	Barrier Length (Ft.)	Barrier Type	Barrier End Treatment Begin	 End	*Repair Cost
LAKE-0233-0.181-R 5/4/2010	204	STONE MASONRY WITHOUT CONCRETE CORE WALL	NONE	NONE	$0.00
LAKE-0233-0.247-R 5/4/2010	132	STONE MASONRY WITHOUT CONCRETE CORE WALL	NONE	NONE	$0.00

*2008 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.

Lake Mead National Recreation Area

ROUTE 0235: CC EL DORADO CANYON ROAD

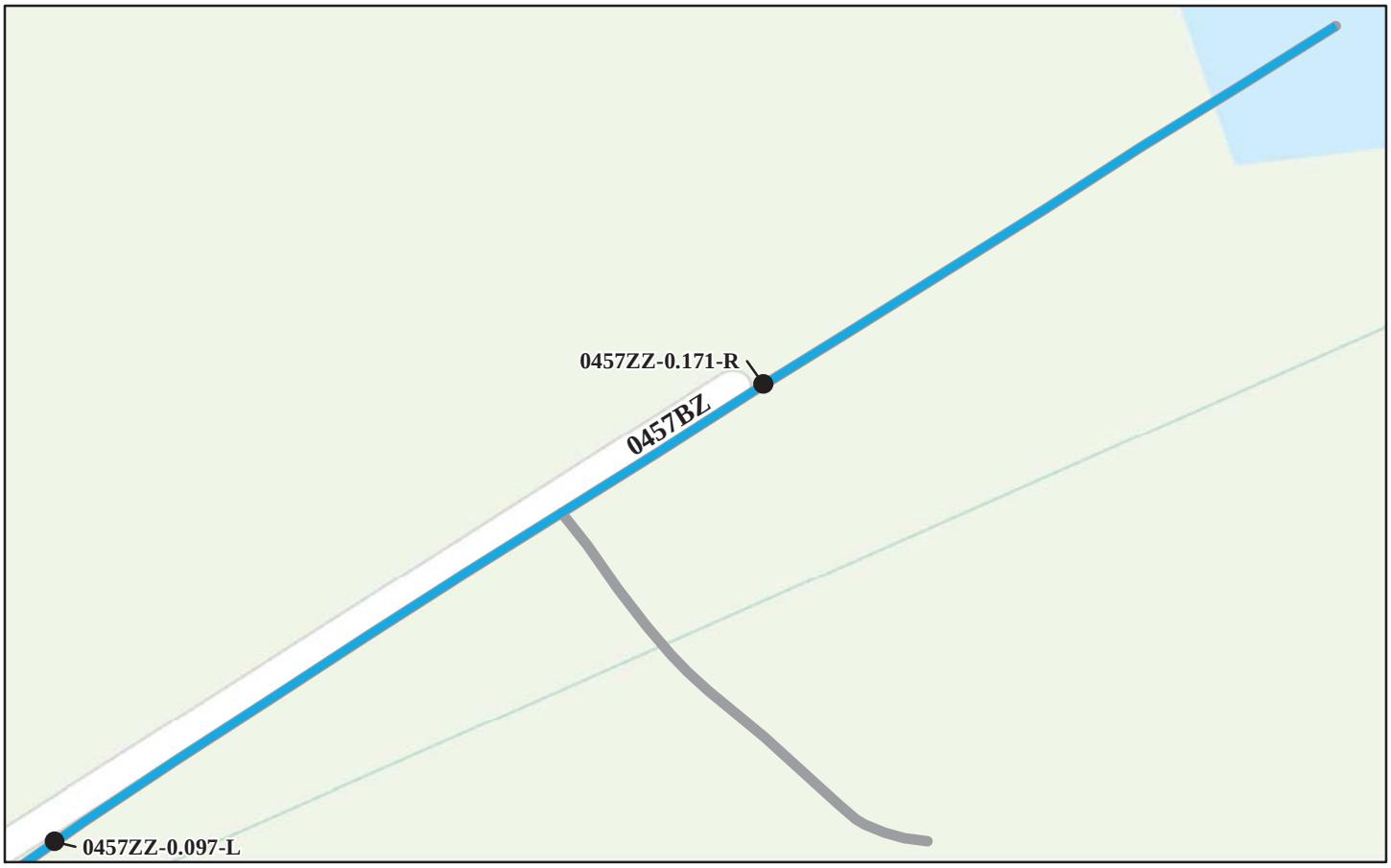
Sources: Esri, HERE, DeLorme, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

Barrier ID Inspection Date	Barrier Length (Ft.)	Barrier Type	Barrier End Treatment		*Repair Cost
			Begin	End	
LAKE-0235-0.011-L 5/5/2010	40	W-BEAM STRONG POST	NONE	NONE	$2,118.00
LAKE-0235-0.020-R 5/5/2010	38	W-BEAM STRONG POST	NONE	NONE	$2,178.00
LAKE-0235-0.028-L 5/5/2010	38	W-BEAM STRONG POST	NONE	W-BEAM BCT	$0.00
LAKE-0235-0.034-R 5/5/2010	33	W-BEAM STRONG POST	NONE	NONE	$2,189.00
LAKE-0235-1.178-R 5/5/2010	108	CONCRETE BARRIER	NONE	NONE	$10,379.00

*2008 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.

Lake Mead National Recreation Area

ROUTE 0457ZZ: BB CONC LAKE MEAD CRUISES ROADS



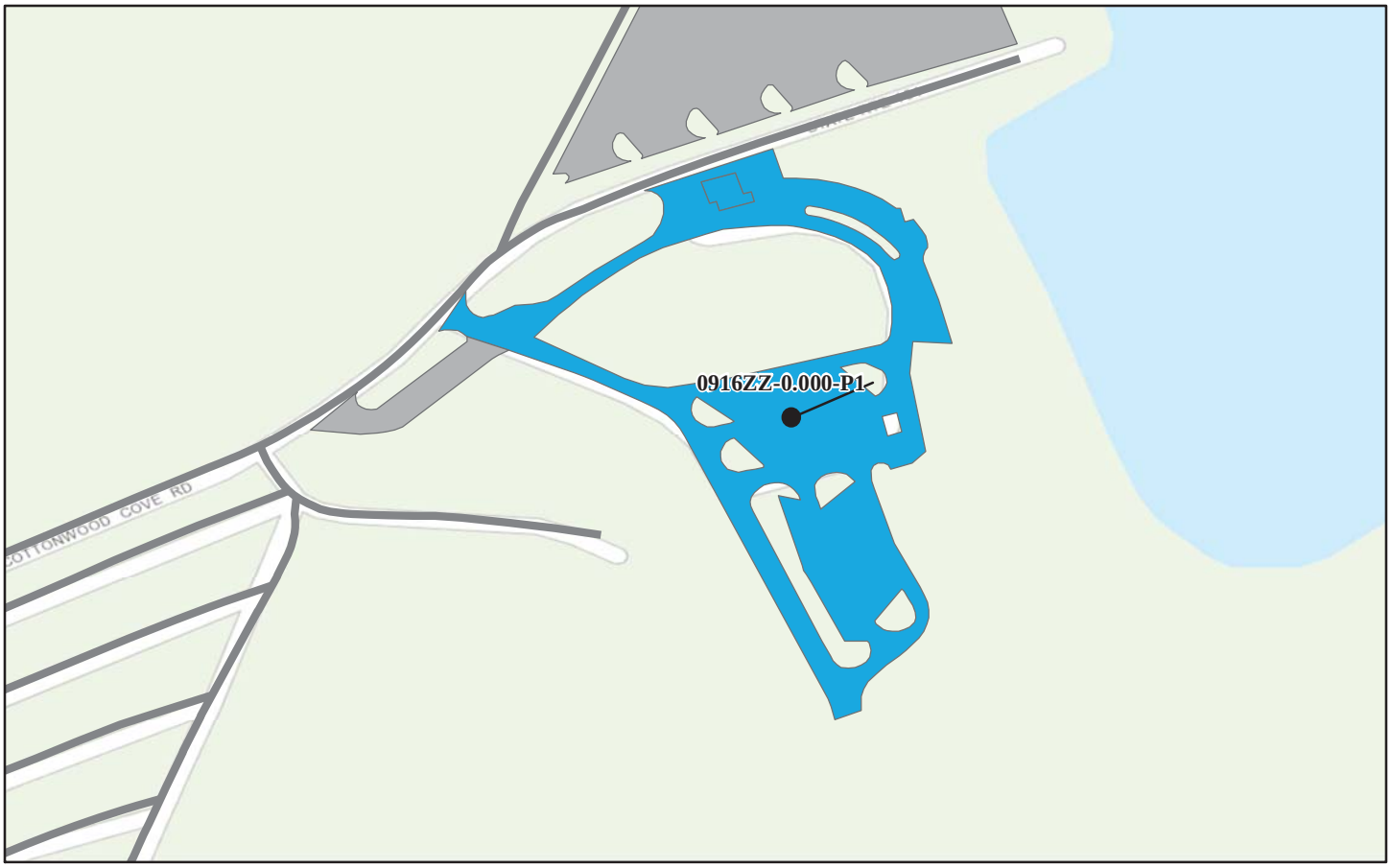
Sources: Esri, HERE, DeLorme, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

Barrier ID Inspection Date	Barrier Length (Ft.)	Barrier Type	Barrier End Treatment		*Repair Cost
			Begin	End	
LAKE-0457ZZ-0.097-L 5/3/2010	712	CONCRETE BARRIER	NONE	NONE	$18,700.00
LAKE-0457ZZ-0.171-R 5/3/2010	312	CONCRETE BARRIER	NONE	NONE	$9,014.00

*2008 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.

Lake Mead National Recreation Area

ROUTE 0916ZZ: CC COTTONWOOD COVE CONCESSION PARKING AREAS



Sources: Esri, HERE, DeLorme, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

Barrier ID Inspection Date	Barrier Length (Ft.)	Barrier Type	Barrier End Treatment		*Repair Cost
			Begin	End	
LAKE-0916ZZ-0.000-P1 5/5/2010	146	OTHER: CONCRETE BLOCK	NONE	NONE	$0.00

*2008 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.

Tier 3
Barrier Details

Lake Mead National Recreation Area

Federal Lands Highway
Road Inventory Program

Barrier ID:	**LAKE-0001-1.066-R**		
Route Name:	EB NORTHSHORE ROAD		
Inspection Date:	05/03/2010	**Barrier Rating:**	22.60

Barrier Description

Type:	W-BEAM STRONG POST	**Barrier Function:**	TRAFFIC
Barrier Material:	WEATHERING STEEL/CORTEN	**Post Material:**	WOOD
Blockout Type:	WOOD	**Length (ft.):**	166
Speed Limit (MPH):	50	**Placement with Respect to Road:**	TANGENT
Hazard Behind Barrier:	HIGH		

Barrier Crashworthiness

Appropriate Test Level:	TL-3	**Barrier Test Level:**	TL-3	**Is Barrier Crashworthy?:**	YES
Beg. End Trtmt Type:	W-BEAM FLARED 350 COMPLIANT	**Is Beg. End Trtmt Crashhworthy?:**	YES	**Approach Transition Type:**	NONE
Ending End Trtmt Type:	W-BEAM FLARED 350 COMPLIANT	**Ending End Trtmt Crashhworthy?:**	YES		

Average Measurements

Design Height (In.):	27	**Width (In.):**	0.0	**Post Spacing (In.):**	75.0
Height (In.):	26.7	**Lateral Offset (In.):**	68.0	**Road Grade (%):**	3.90

Physical Condition

Barrier	**Alignment and Height:**	Alignment of barrier is acceptable. 10 ft. of barrier has a height 2-in. below the the 27-in. design height. Rest of barrier is within 1-in. of 27-in. design height.
	Breaking and Cracking:	No major breaking or cracking was observed.
	Missing Elements:	No missing barrier elements were observed.
	Corrrosion and Weathering:	No major corrosion or weathering was observed.
End Treatments	**Alignment and Height:**	End treatment alignment is acceptable but the beginning end treatment (37-ft) is 2 in below the 27 in design height for 37-ft.
	Breaking and Cracking:	No breaks or cracks were observed in the end treatments.
	Missing Elements:	No missing end treatment elements observed.
	Corrrosion and Weathering:	No corrosion or weathering observed in end treatments.

Barrier ID:	**LAKE-0001-1.066-R**		
Route Name:	EB NORTHSHORE ROAD		
Inspection Date:	05/03/2010	**Barrier Rating:**	22.60

Repair Recommendations

Repair Action:	REPAIR	**FMSS Work Type:**	DEFERRED MAINTENANCE	**Repair Cost:**	$3102
Brief Workorder:	Raise the height of the first 47 feet of barrier up to the 27 inch design height.				
Workorder:	Adjust Guardrail at $10- per -Lin. Ft. for 47 LF = $470. Raise 47-ft of barrier up to the 27 inch design height. High Speed Traffic Control at $2350- per -Day for 1 Day(s) = $2350.				

2008 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.

Lake Mead National Recreation Area

ROUTE 0001: EB NORTHSHORE ROAD

Barrier Condition Photos

LAKE_0001_1.066_R_1.JPG

Barrier ID:	**LAKE-0001-1.072-L**		
Route Name:	EB NORTHSHORE ROAD		
Inspection Date:	05/03/2010	**Barrier Rating:**	33.70

Barrier Description

Type:	W-BEAM STRONG POST	**Barrier Function:**	TRAFFIC
Barrier Material:	WEATHERING STEEL/CORTEN	**Post Material:**	WOOD
Blockout Type:	WOOD	**Length (ft.):**	983
Speed Limit (MPH):	50	**Placement with Respect to Road:**	INSIDE OF CURVE
Hazard Behind Barrier:	MEDIUM		

Barrier Crashworthiness

Appropriate Test Level:	TL-3	**Barrier Test Level:**	TL-3	**Is Barrier Crashworthy?:**	YES
Beg. End Trtmt Type:	W-BEAM FLARED 350 COMPLIANT	**Is Beg. End Trtmt Crashhworthy?:**	YES	**Approach Transition Type:**	NONE
Ending End Trtmt Type:	W-BEAM FLARED 350 COMPLIANT	**Ending End Trtmt Crashhworthy?:**	YES		

Average Measurements

Design Height (In.):	27	**Width (In.):**	0.0	**Post Spacing (In.):**	74.4
Height (In.):	26.8	**Lateral Offset (In.):**	63.5	**Road Grade (%):**	5.00

Physical Condition

Barrier	**Alignment and Height:**	Alignment is acceptable. 958-ft of barrier is within 1-in. of 27-in. design height.
	Breaking and Cracking:	4 loose blocks in barrier. 25 ft of bent rail from probable impact.
	Missing Elements:	No missing elements in barrier.
	Corrrosion and Weathering:	Minor erosion 4 to 6 in deep around 5 posts in barrier.
End Treatments	**Alignment and Height:**	End treatments are in alignment. Approach end treatment (20-ft) is below 27 in design height by 2 in.
	Breaking and Cracking:	Trailing end treatment buffered end is severely bent.
	Missing Elements:	No missing end treatment elements observed.
	Corrrosion and Weathering:	Minor erosion around approach end treatment post is 6-in deep.

Barrier ID:	**LAKE-0001-1.072-L**		
Route Name:	EB NORTHSHORE ROAD		
Inspection Date:	05/03/2010	**Barrier Rating:**	33.70

Repair Recommendations

Repair Action:	REPAIR	**FMSS Work Type:**	DEFERRED MAINTENANCE	**Repair Cost:**	$3624
Brief Workorder:	Raise 20-ft of barrier to 27-in. design height replace bent rail sections tighten loose blocks.				
Workorder:	Replace Rail at $25- per -Lin. Ft. for 25 LF = $625. Replace bent rail and replace the buffer end of the end treatment. Adjust Guardrail at $10- per -Lin. Ft. for 20 LF = $200. Raise 20-ft. of barrier up to 27-in design height. Labor at $60- per -Hour for 2 Hrs = $120. Tighten 4 loose blocks. High Speed Traffic Control at $2350- per -Day for 1 Day(s) = $2350.				

2008 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.

Lake Mead National Recreation Area

ROUTE 0001: EB NORTHSHORE ROAD

Barrier Condition Photos

LAKE_0001_1.072_L_1.JPG

Barrier ID:	**LAKE-0001-1.131-R**		
Route Name:	EB NORTHSHORE ROAD		
Inspection Date:	05/03/2010	**Barrier Rating:**	4.40

Barrier Description

Type:	CONCRETE BARRIER	**Barrier Function:**	NON-TRAFFIC
Barrier Material:	CONCRETE	**Post Material:**	N/A
Blockout Type:	N/A	**Length (ft.):**	120
Speed Limit (MPH):	15	**Placement with Respect to Road:**	NON-TRAFFIC BARRIER
Hazard Behind Barrier:	N/A		

Barrier Crashworthiness

Appropriate Test Level:	TL-1	**Barrier Test Level:**	N/A	**Is Barrier Crashworthy?:**	N/A
Beg. End Trtmt Type:	NONE	**Is Beg. End Trtmt Crashhworthy?:**	N/A	**Approach Transition Type:**	NONE
Ending End Trtmt Type:	NONE	**Ending End Trtmt Crashhworthy?:**	N/A		

Average Measurements

Design Height (In.):	32	**Width (In.):**	6.0	**Post Spacing (In.):**	0.0
Height (In.):	31.0	**Lateral Offset (In.):**	0.0	**Road Grade (%):**	0.00

Physical Condition

Barrier	**Alignment and Height:**	Alignment acceptable. Barrier height is within 1-in of the 32-in design height.
	Breaking and Cracking:	Breaking and cracking over 3 in deep; exposed rebar on two 20 ft long sections of barrier.
	Missing Elements:	No missing barrier elements.
	Corrrosion and Weathering:	No major corrosion or weathering was observed.
End Treatments	**Alignment and Height:**	
	Breaking and Cracking:	
	Missing Elements:	
	Corrrosion and Weathering:	

Barrier ID:	**LAKE-0001-1.131-R**		
Route Name:	EB NORTHSHORE ROAD		
Inspection Date:	05/03/2010	**Barrier Rating:**	4.40

Repair Recommendations

Repair Action:	REPAIR	**FMSS Work Type:**	DEFERRED MAINTENANCE	**Repair Cost:**	$4840
Brief Workorder:	Replace two 20 ft sections of broken type 7 guardwalls (Jersey barriers).				
Workorder:	Remove Concrete Barrier at $50- per -Lin. Ft. for 40 LF = $2000. Replace two 20-ft long sections of type 7 guardwall (Jersey barriers). Concrete Barrier at $60- per -Lin. Ft. for 40 LF = $2400. replace two 20-ft long sections of type 7 guardwall.				

2008 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.

Lake Mead National Recreation Area

ROUTE 0001: EB NORTHSHORE ROAD

Barrier Condition Photos

LAKE_0001_1.131_R_1.JPG

Barrier ID:	**LAKE-0001-1.174-R**		
Route Name:	EB NORTHSHORE ROAD		
Inspection Date:	05/03/2010	**Barrier Rating:**	4.40

Barrier Description

Type:	CONCRETE BARRIER	**Barrier Function:**	NON-TRAFFIC
Barrier Material:	CONCRETE	**Post Material:**	N/A
Blockout Type:	N/A	**Length (ft.):**	169
Speed Limit (MPH):	15	**Placement with Respect to Road:**	NON-TRAFFIC BARRIER
Hazard Behind Barrier:	N/A		

Barrier Crashworthiness

Appropriate Test Level:	TL-1	**Barrier Test Level:**	N/A	**Is Barrier Crashworthy?:**	N/A
Beg. End Trtmt Type:	NONE	**Is Beg. End Trtmt Crashhworthy?:**	N/A	**Approach Transition Type:**	NONE
Ending End Trtmt Type:	NONE	**Ending End Trtmt Crashhworthy?:**	N/A		

Average Measurements

Design Height (In.):	23	**Width (In.):**	6.0	**Post Spacing (In.):**	0.0
Height (In.):	31.0	**Lateral Offset (In.):**	0.0	**Road Grade (%):**	0.00

Physical Condition

Barrier	**Alignment and Height:**	Alignment acceptable. Barrier height is within 1-in of the 32-in design height.
	Breaking and Cracking:	Breaking and cracking over 3 in deep; exposed rebar on three 20 ft. long sections.
	Missing Elements:	No missing barrier elements.
	Corrrosion and Weathering:	No corrosion or weathering observed.
End Treatments	**Alignment and Height:**	
	Breaking and Cracking:	
	Missing Elements:	
	Corrrosion and Weathering:	

Barrier ID:	**LAKE-0001-1.174-R**		
Route Name:	EB NORTHSHORE ROAD		
Inspection Date:	05/03/2010	**Barrier Rating:**	4.40

Repair Recommendations

Repair Action:	REPAIR	**FMSS Work Type:**	DEFERRED MAINTENANCE	**Repair Cost:**	$7260
Brief Workorder:	Replace three 20 ft sections of concrete barrier (Jersey barriers).				
Workorder:	Remove Concrete Barrier at $50- per -Lin. Ft. for 60 LF = $3000. Remove 3 sections of type 7- 20 feet long (Jersey barriers). Concrete Barrier at $60- per -Lin. Ft. for 60 LF = $3600. Replace 3 sections of type 7- 20 feet long.				

2008 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.

Lake Mead National Recreation Area

ROUTE 0001: EB NORTHSHORE ROAD

Barrier Condition Photos

LAKE_0001_1.174_R_1.JPG

Barrier ID:	**LAKE-0001-1.448-L**		
Route Name:	EB NORTHSHORE ROAD		
Inspection Date:	05/03/2010	**Barrier Rating:**	39.40

Barrier Description

Type:	W-BEAM STRONG POST	**Barrier Function:**	TRAFFIC
Barrier Material:	WEATHERING STEEL/CORTEN	**Post Material:**	WOOD
Blockout Type:	WOOD	**Length (ft.):**	1048
Speed Limit (MPH):	50	**Placement with Respect to Road:**	OUTSIDE OF CURVE
Hazard Behind Barrier:	MEDIUM		

Barrier Crashworthiness

Appropriate Test Level:	TL-3	**Barrier Test Level:**	TL-3	**Is Barrier Crashworthy?:**	YES
Beg. End Trtmt Type:	W-BEAM FLARED 350 COMPLIANT	**Is Beg. End Trtmt Crashhworthy?:**	YES	**Approach Transition Type:**	NONE
Ending End Trtmt Type:	W-BEAM TANGENT 350	**Ending End Trtmt Crashhworthy?:**	YES		

Average Measurements

Design Height (In.):	27	**Width (In.):**	0.0	**Post Spacing (In.):**	75.4
Height (In.):	27.5	**Lateral Offset (In.):**	85.5	**Road Grade (%):**	5.80

Physical Condition

Barrier	**Alignment and Height:**	Alignment acceptable. Height within 1-in of 27-in design height.
	Breaking and Cracking:	No breaking or cracking observed.
	Missing Elements:	No missing barrier elements observed.
	Corrrosion and Weathering:	No corrosion or weathering observed.
End Treatments	**Alignment and Height:**	Alignment acceptable. Height within 1-in of 27-in design height.
	Breaking and Cracking:	No breaks or cracks were observed in the end treatments.
	Missing Elements:	No missing end treatment elements observed.
	Corrrosion and Weathering:	No corrosion or weathering observed in end treatments.

Barrier ID:	**LAKE-0001-1.448-L**		
Route Name:	EB NORTHSHORE ROAD		
Inspection Date:	05/03/2010	**Barrier Rating:**	39.40

Repair Recommendations

Repair Action:	NO ACTION	**FMSS Work Type:**	N/A	**Repair Cost:**	$0
Brief Workorder:	N/A				
Workorder:					

2008 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.

Lake Mead National Recreation Area

ROUTE 0001: EB NORTHSHORE ROAD

Barrier Condition Photos

LAKE_0001_1.448_L_1.JPG

Barrier ID:	**LAKE-0001-1.792-L**		
Route Name:	EB NORTHSHORE ROAD		
Inspection Date:	05/03/2010	**Barrier Rating:**	39.50

Barrier Description

Type:	W-BEAM STRONG POST	**Barrier Function:**	TRAFFIC
Barrier Material:	WEATHERING STEEL/CORTEN	**Post Material:**	WOOD
Blockout Type:	WOOD	**Length (ft.):**	926
Speed Limit (MPH):	50	**Placement with Respect to Road:**	OUTSIDE OF CURVE
Hazard Behind Barrier:	MEDIUM		

Barrier Crashworthiness

Appropriate Test Level:	TL-3	**Barrier Test Level:**	TL-3	**Is Barrier Crashworthy?:**	YES
Beg. End Trtmt Type:	NONE	**Is Beg. End Trtmt Crashhworthy?:**	N/A	**Approach Transition Type:**	NONE
Ending End Trtmt Type:	W-BEAM FLARED 350 COMPLIANT	**Ending End Trtmt Crashhworthy?:**	YES		

Average Measurements

Design Height (In.):	27	**Width (In.):**	0.0	**Post Spacing (In.):**	75.6
Height (In.):	26.3	**Lateral Offset (In.):**	82.5	**Road Grade (%):**	4.60

Physical Condition

Barrier	**Alignment and Height:**	Barrier is in alignment. Barrier is below design height of 27 in by 1 to 2 in for 254 linear ft and is below by more than 6 ines for 100 ft. Remainder of barrier is at design height.
	Breaking and Cracking:	18 broken posts and 18 broken blocks in 100 ft of barrier that is torn down from major impact at approach end.
	Missing Elements:	No missing elements in barrier.
	Corrrosion and Weathering:	No corrosion or weathering observed.
End Treatments	**Alignment and Height:**	Trailing end treatment is in alignment and at 27 in design height. Approach end treatment is gone due to impact.
	Breaking and Cracking:	Entire approach end treatment is broken off at road level due to impact.
	Missing Elements:	No missing end treatment elements observed.
	Corrrosion and Weathering:	No corrosion or weathering observed in end treatments.

Barrier ID:	**LAKE-0001-1.792-L**		
Route Name:	EB NORTHSHORE ROAD		
Inspection Date:	05/03/2010	**Barrier Rating:**	39.50

Repair Recommendations

Repair Action:	REPAIR	**FMSS Work Type:**	DEFERRED MAINTENANCE	**Repair Cost:**	$17924
Brief Workorder:	Replace the 100 LF of barrier that has been destroyed by vehicle impact and adjust the height of 254 LF up to the 27 inch design height.				
Workorder:	Remove Guardrail at $10- per -Lin. Ft. for 100 LF = $1000. Remove damaged guardrail W-Beam Strong Post at $35- per -Lin. Ft. for 63 LF = $2205. Replace damaged guardrail. W-beam flared 350 compliant at $3500- per -Each for 1 Unit(s) = $3500. Replace damaged end treatment Adjust Guardrail at $10- per -Lin. Ft. for 254 LF = $2540. Raise 254-ft. of barrier up to 27-in design height. High Speed Traffic Control at $2350- per -Day for 3 Day(s) = $7050. 1 day removal; 1 day install end treatment; 1 day to raise barrier.				

2008 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.

Lake Mead National Recreation Area

ROUTE 0001: EB NORTHSHORE ROAD

Barrier Condition Photos

LAKE_0001_1.792_L_1.JPG

Barrier ID:	**LAKE-0001-2.290-R**		
Route Name:	EB NORTHSHORE ROAD		
Inspection Date:	05/03/2010	**Barrier Rating:**	20.70

Barrier Description

Type:	W-BEAM STRONG POST	**Barrier Function:**	TRAFFIC
Barrier Material:	WEATHERING STEEL/CORTEN	**Post Material:**	WOOD
Blockout Type:	WOOD	**Length (ft.):**	167
Speed Limit (MPH):	50	**Placement with Respect to Road:**	TANGENT
Hazard Behind Barrier:	MEDIUM		

Barrier Crashworthiness

Appropriate Test Level:	TL-3	**Barrier Test Level:**	TL-3	**Is Barrier Crashworthy?:**	YES
Beg. End Trtmt Type:	W-BEAM FLARED 350 COMPLIANT	**Is Beg. End Trtmt Crashhworthy?:**	YES	**Approach Transition Type:**	NONE
Ending End Trtmt Type:	W-BEAM FLARED 350 COMPLIANT	**Ending End Trtmt Crashhworthy?:**	YES		

Average Measurements

Design Height (In.):	27	**Width (In.):**	0.0	**Post Spacing (In.):**	75.0
Height (In.):	27.0	**Lateral Offset (In.):**	73.6	**Road Grade (%):**	0.90

Physical Condition

Barrier	**Alignment and Height:**	Alignment acceptable. Height within 1-in of 27-in design height.
	Breaking and Cracking:	No breaking or cracking observed.
	Missing Elements:	No missing barrier items were observed.
	Corrrosion and Weathering:	No corrosion or weathering observed.
End Treatments	**Alignment and Height:**	Alignment acceptable. Height within 1-in of 27-in design height.
	Breaking and Cracking:	No breaks or cracks were observed in the end treatments.
	Missing Elements:	No missing end treatment elements observed.
	Corrrosion and Weathering:	No major corrosion or weathering of the end treatments was observed.

Barrier ID:	**LAKE-0001-2.290-R**		
Route Name:	EB NORTHSHORE ROAD		
Inspection Date:	05/03/2010	**Barrier Rating:**	20.70

Repair Recommendations

Repair Action:	NO ACTION	**FMSS Work Type:**	N/A	**Repair Cost:**	$0
Brief Workorder:	N/A				
Workorder:					

2008 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.

Lake Mead National Recreation Area

ROUTE 0001: EB NORTHSHORE ROAD

Barrier Condition Photos

LAKE_0001_2.290_R_1.JPG

Barrier ID:	**LAKE-0001-2.295-L**		
Route Name:	EB NORTHSHORE ROAD		
Inspection Date:	05/03/2010	**Barrier Rating:**	18.20

Barrier Description

Type:	W-BEAM STRONG POST	**Barrier Function:**	TRAFFIC
Barrier Material:	WEATHERING STEEL/CORTEN	**Post Material:**	WOOD
Blockout Type:	WOOD	**Length (ft.):**	156
Speed Limit (MPH):	50	**Placement with Respect to Road:**	TANGENT
Hazard Behind Barrier:	LOW		

Barrier Crashworthiness

Appropriate Test Level:	TL-3	**Barrier Test Level:**	TL-3	**Is Barrier Crashworthy?:**	YES
Beg. End Trtmt Type:	W-BEAM FLARED 350 COMPLIANT	**Is Beg. End Trtmt Crashhworthy?:**	YES	**Approach Transition Type:**	NONE
Ending End Trtmt Type:	W-BEAM FLARED 350 COMPLIANT	**Ending End Trtmt Crashhworthy?:**	YES		

Average Measurements

Design Height (In.):	27	**Width (In.):**	0.0	**Post Spacing (In.):**	74.6
Height (In.):	27.2	**Lateral Offset (In.):**	72.0	**Road Grade (%):**	0.70

Physical Condition

Barrier	**Alignment and Height:**	Alignment acceptable. Height within 1-in of 27-in design height.
	Breaking and Cracking:	No breaking or cracking observed.
	Missing Elements:	No missing barrier elements were observed.
	Corrrosion and Weathering:	No corrosion or weathering observed.
End Treatments	**Alignment and Height:**	Alignment acceptable. Height within 1-in of 27-in design height.
	Breaking and Cracking:	No breaks or cracks were observed in the end treatments.
	Missing Elements:	No missing end treatment elements observed.
	Corrrosion and Weathering:	No major corrosion or weathering of end treatments was observed.

Barrier ID:	**LAKE-0001-2.295-L**		
Route Name:	EB NORTHSHORE ROAD		
Inspection Date:	05/03/2010	**Barrier Rating:**	18.20

Repair Recommendations

Repair Action:	NO ACTION	**FMSS Work Type:**	N/A	**Repair Cost:**	$0
Brief Workorder:	N/A				
Workorder:					

2008 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.

Lake Mead National Recreation Area

ROUTE 0001: EB NORTHSHORE ROAD

Barrier Condition Photos

LAKE_0001_2.295_L_1.JPG

Barrier ID:	**LAKE-0001-4.481-L**		
Route Name:	EB NORTHSHORE ROAD		
Inspection Date:	05/03/2010	**Barrier Rating:**	26.50

Barrier Description

Type:	W-BEAM STRONG POST	**Barrier Function:**	TRAFFIC
Barrier Material:	WEATHERING STEEL/CORTEN	**Post Material:**	WOOD
Blockout Type:	WOOD	**Length (ft.):**	831
Speed Limit (MPH):	50	**Placement with Respect to Road:**	TANGENT
Hazard Behind Barrier:	MEDIUM		

Barrier Crashworthiness

Appropriate Test Level:	TL-3	**Barrier Test Level:**	TL-3	**Is Barrier Crashworthy?:**	YES
Beg. End Trtmt Type:	W-BEAM FLARED 350 COMPLIANT	**Is Beg. End Trtmt Crashhworthy?:**	YES	**Approach Transition Type:**	NONE
Ending End Trtmt Type:	W-BEAM FLARED 350 COMPLIANT	**Ending End Trtmt Crashhworthy?:**	YES		

Average Measurements

Design Height (In.):	27	**Width (In.):**	0.0	**Post Spacing (In.):**	74.5
Height (In.):	27.0	**Lateral Offset (In.):**	68.0	**Road Grade (%):**	1.00

Physical Condition

Barrier	**Alignment and Height:**	Alignment acceptable. Height within 1-in of 27-in design height.
	Breaking and Cracking:	Three 12 ft rail sections and 13 blocks have substantial cracking from impact to the barrier.
	Missing Elements:	No missing barrier elements observed.
	Corrrosion and Weathering:	No corrosion or weathering observed.
End Treatments	**Alignment and Height:**	Alignment acceptable. Height within 1-in of 27-in design height.
	Breaking and Cracking:	No breaks or cracks were observed in the end treatments.
	Missing Elements:	No missing end treatment elements observed.
	Corrrosion and Weathering:	No corrosion or weathering observed in end treatments.

Barrier ID:	**LAKE-0001-4.481-L**		
Route Name:	EB NORTHSHORE ROAD		
Inspection Date:	05/03/2010	**Barrier Rating:**	26.50

Repair Recommendations

Repair Action:	REPAIR	**FMSS Work Type:**	DEFERRED MAINTENANCE	**Repair Cost:**	$4004
Brief Workorder:	Replace damaged barrier items.				
Workorder:	Replace Rail at $25- per -Lin. Ft. for 36 LF = $900. Replace Block at $30- per -Each for 13 Block(s) = $390. High Speed Traffic Control at $2350- per -Day for 1 Day(s) = $2350.				

2008 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.

Lake Mead National Recreation Area

ROUTE 0001: EB NORTHSHORE ROAD

Barrier Condition Photos

LAKE_0001_4.481_L_1.JPG

Barrier ID:	**LAKE-0001-4.483-R**		
Route Name:	EB NORTHSHORE ROAD		
Inspection Date:	05/03/2010	**Barrier Rating:**	32.70

Barrier Description

Type:	W-BEAM STRONG POST	**Barrier Function:**	TRAFFIC
Barrier Material:	WEATHERING STEEL/CORTEN	**Post Material:**	WOOD
Blockout Type:	WOOD	**Length (ft.):**	787
Speed Limit (MPH):	50	**Placement with Respect to Road:**	TANGENT
Hazard Behind Barrier:	HIGH		

Barrier Crashworthiness

Appropriate Test Level:	TL-3	**Barrier Test Level:**	TL-3	**Is Barrier Crashworthy?:**	YES
Beg. End Trtmt Type:	W-BEAM FLARED 350 COMPLIANT	**Is Beg. End Trtmt Crashhworthy?:**	YES	**Approach Transition Type:**	NONE
Ending End Trtmt Type:	W-BEAM BURIED END	**Ending End Trtmt Crashhworthy?:**	YES		

Average Measurements

Design Height (In.):	27	**Width (In.):**	0.0	**Post Spacing (In.):**	75.5
Height (In.):	27.2	**Lateral Offset (In.):**	72.8	**Road Grade (%):**	0.70

Physical Condition

Barrier	**Alignment and Height:**	Alignment acceptable. Height within 1-in of 27-in design height.
	Breaking and Cracking:	No breaking or cracking observed.
	Missing Elements:	No missing elements in barrier were observed.
	Corrrosion and Weathering:	No corrosion or weathering observed.
End Treatments	**Alignment and Height:**	Trailing end treatment is in alignment but is 2-in below 27-in design height for 9 ft. Approach end treatment is out of alignment by more than 6-inches and is 4-inches below design height for 30 feet.
	Breaking and Cracking:	37 ft. of approach end treatment is bent.
	Missing Elements:	No missing end treatment elements observed.
	Corrrosion and Weathering:	No corrosion or weathering observed in end treatments.

Barrier ID:	**LAKE-0001-4.483-R**		
Route Name:	EB NORTHSHORE ROAD		
Inspection Date:	05/03/2010	**Barrier Rating:**	32.70

Repair Recommendations

Repair Action:	REPAIR	**FMSS Work Type:**	DEFERRED MAINTENANCE	**Repair Cost:**	$4108
Brief Workorder:	Replace 37-ft. of W-beam rail and adjust 46 ft. up to 27-in. design height.				
Workorder:	Replace Rail at $25- per -Lin. Ft. for 37 LF = $925. Replace damaged rail Adjust Guardrail at $10- per -Lin. Ft. for 46 LF = $460. Raise 46-ft. of barrier up to 27-in design height. High Speed Traffic Control at $2350- per -Day for 1 Day(s) = $2350.				

2008 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.

Lake Mead National Recreation Area

ROUTE 0001: EB NORTHSHORE ROAD

Barrier Condition Photos

LAKE_0001_4.483_R_1.JPG

Barrier ID:	**LAKE-0001-4.938-R**		
Route Name:	EB NORTHSHORE ROAD		
Inspection Date:	05/04/2010	**Barrier Rating:**	42.90

Barrier Description

Type:	W-BEAM STRONG POST	**Barrier Function:**	TRAFFIC
Barrier Material:	WEATHERING STEEL/CORTEN	**Post Material:**	WOOD
Blockout Type:	WOOD	**Length (ft.):**	635
Speed Limit (MPH):	50	**Placement with Respect to Road:**	OUTSIDE OF CURVE
Hazard Behind Barrier:	HIGH		

Barrier Crashworthiness

Appropriate Test Level:	TL-3	**Barrier Test Level:**	TL-3	**Is Barrier Crashworthy?:**	YES
Beg. End Trtmt Type:	W-BEAM BURIED END	**Is Beg. End Trtmt Crashhworthy?:**	YES	**Approach Transition Type:**	NONE
Ending End Trtmt Type:	W-BEAM BURIED END	**Ending End Trtmt Crashhworthy?:**	YES		

Average Measurements

Design Height (In.):	27	**Width (In.):**	0.0	**Post Spacing (In.):**	74.6
Height (In.):	25.2	**Lateral Offset (In.):**	56.2	**Road Grade (%):**	0.30

Physical Condition

Barrier	**Alignment and Height:**	Alignment acceptable. Barrier is below 27-in design height by 1 to 3 in for 213 linear ft and by 3 to 4 in for 54 linear ft. Remainder of barrier is at design height.
	Breaking and Cracking:	74 ft total of rail is bent at 2 different impact areas. 1 broken post and 1 broken block.
	Missing Elements:	No missing elements in barrier were observed.
	Corrrosion and Weathering:	5 posts set in asphalt shifted up to 1-in due to impact and cracked asphalt has eroded up to 6-in deep around posts. 5 other posts have weathering cracks up to 1/2 inch wide.
End Treatments	**Alignment and Height:**	End treatments alignment is acceptable. Approach end treatment (37-ft) is 2 to 5 in below 27 in design height. Trailing end (37-ft) is 4 to 9 inches below design height.
	Breaking and Cracking:	No breaks or cracks were observed in the end treatments.
	Missing Elements:	No missing end treatment elements observed.
	Corrrosion and Weathering:	1 post at approach end has 4 in deep erosion.

Barrier ID:	**LAKE-0001-4.938-R**		
Route Name:	EB NORTHSHORE ROAD		
Inspection Date:	05/04/2010	**Barrier Rating:**	42.90

Repair Recommendations

Repair Action:	REPAIR	**FMSS Work Type:**	DEFERRED MAINTENANCE	**Repair Cost:**	$11522
Brief Workorder:	Raise 267-ft. of barrier up to 27-in design height. Replace damaged barrier items and fix erosion around 5 posts.				
Workorder:	Adjust Guardrail at $10- per -Lin. Ft. for 267 LF = $2670. Raise 267-ft. of barrier up to 27-in design height. Replace Rail at $25- per -Lin. Ft. for 74 LF = $1850. Replace damaged rail. Replace Block at $30- per -Each for 1 Block(s) = $30. Replace broken block. Replace Post at $100- per -Each for 1 Post(s) = $100. Replace broken post. Loader at $125- per -Hour for 4 Hrs = $500. Excavate face of buried ends to bring height up to 27-in design height. Remove and Reset guardrail at $25- per- Lin. Ft. for 25 LF = $625. Reset shifted posts. High Speed Traffic Control at $2350- per -Day for 2 Day(s) = $4700.				

2008 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.

Lake Mead National Recreation Area

ROUTE 0001: EB NORTHSHORE ROAD

Barrier Condition Photos

LAKE_0001_4.938_R_1.JPG

Barrier ID:	**LAKE-0001-5.424-R**		
Route Name:	EB NORTHSHORE ROAD		
Inspection Date:	05/04/2010	**Barrier Rating:**	42.70

Barrier Description

Type:	W-BEAM STRONG POST	**Barrier Function:**	TRAFFIC
Barrier Material:	WEATHERING STEEL/CORTEN	**Post Material:**	WOOD
Blockout Type:	WOOD	**Length (ft.):**	356
Speed Limit (MPH):	50	**Placement with Respect to Road:**	OUTSIDE OF CURVE
Hazard Behind Barrier:	HIGH		

Barrier Crashworthiness

Appropriate Test Level:	TL-3	**Barrier Test Level:**	TL-3	**Is Barrier Crashworthy?:**	YES
Beg. End Trtmt Type:	W-BEAM BURIED END	**Is Beg. End Trtmt Crashhworthy?:**	YES	**Approach Transition Type:**	NONE
Ending End Trtmt Type:	W-BEAM BCT	**Ending End Trtmt Crashhworthy?:**	NO		

Average Measurements

Design Height (In.):	27	**Width (In.):**	0.0	**Post Spacing (In.):**	75.3
Height (In.):	26.2	**Lateral Offset (In.):**	50.7	**Road Grade (%):**	6.50

Physical Condition

Barrier	**Alignment and Height:**	Alignment acceptable. Height within 1-in of 27-in design height.
	Breaking and Cracking:	Minor cracking of posts and blocks in barrier less than 1/2 in in width.
	Missing Elements:	No missing barrier elements were observed.
	Corrrosion and Weathering:	Minor weather of barrier posts and blocks in the barrier.
End Treatments	**Alignment and Height:**	For the trailing end alignment acceptable and height within 1-in of 27-in design height. For approach end alignment acceptable, but height is 2-in below the 27-in. design height.
	Breaking and Cracking:	2 cracked and broken posts 25 LF of bent W- beam from impact on approach end treatment.
	Missing Elements:	2 missing blocks on the approach end from impact.
	Corrrosion and Weathering:	Minor weathering of end section posts and blocks.

Barrier ID:	**LAKE-0001-5.424-R**		
Route Name:	EB NORTHSHORE ROAD		
Inspection Date:	05/04/2010	**Barrier Rating:**	42.70

Repair Recommendations

Repair Action:	REPAIR	**FMSS Work Type:**	DEFERRED MAINTENANCE	**Repair Cost:**	$3558
Brief Workorder:	Replace 25 ft. of rail and repair impact area of approach end treatment.				
Workorder:	Replace Post at $100- per -Each for 2 Post(s) = $200. replace posts in approach end impact area Replace Block at $30- per -Each for 2 Block(s) = $60. replace missing blocks in impact area Replace Rail at $25- per -Lin. Ft. for 25 LF = $625. replace bent and torn rail at approach end impact zone High Speed Traffic Control at $2350- per -Day for 1 Day(s) = $2350.				

2008 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.

Lake Mead National Recreation Area

ROUTE 0001: EB NORTHSHORE ROAD

Barrier Condition Photos

LAKE_0001_5.424_R_1.JPG

Barrier ID:	**LAKE-0001-9.287-L**		
Route Name:	EB NORTHSHORE ROAD		
Inspection Date:	05/04/2010	**Barrier Rating:**	48.20

Barrier Description

Type:	W-BEAM STRONG POST	**Barrier Function:**	TRAFFIC
Barrier Material:	WEATHERING STEEL/CORTEN	**Post Material:**	WOOD
Blockout Type:	WOOD	**Length (ft.):**	996
Speed Limit (MPH):	50	**Placement with Respect to Road:**	OUTSIDE OF CURVE
Hazard Behind Barrier:	MEDIUM		

Barrier Crashworthiness

Appropriate Test Level:	TL-3	**Barrier Test Level:**	TL-3	**Is Barrier Crashworthy?:**	YES
Beg. End Trtmt Type:	W-BEAM BURIED END	**Is Beg. End Trtmt Crashhworthy?:**	YES	**Approach Transition Type:**	NONE
Ending End Trtmt Type:	W-BEAM BCT	**Ending End Trtmt Crashhworthy?:**	NO		

Average Measurements

Design Height (In.):	27	**Width (In.):**	0.0	**Post Spacing (In.):**	75.0
Height (In.):	25.0	**Lateral Offset (In.):**	65.5	**Road Grade (%):**	3.90

Physical Condition

Barrier	**Alignment and Height:**	Barrier alignment is acceptable. 861-ft is 1 to 3 in below the design height of 27 in.
	Breaking and Cracking:	Minor cracking of blocks and posts in barrier were observed; 2 blocks cracked.
	Missing Elements:	No missing barrier elements were observed.
	Corrrosion and Weathering:	No corrosion or weathering observed.
End Treatments	**Alignment and Height:**	The beginning end alignment off is by 3 to 6 in at impact area while the trailing end alignment appears to be correct. Height within 1-in of 27-in design height.
	Breaking and Cracking:	1 broken block 32 LF of rail bent and torn at impact area of beginning end with minor cracking of blocks and post in the rest of the end treatments.
	Missing Elements:	No missing end treatment elements observed.
	Corrrosion and Weathering:	Minor weathering of posts and blocks was observed.

Barrier ID:	**LAKE-0001-9.287-L**		
Route Name:	EB NORTHSHORE ROAD		
Inspection Date:	05/04/2010	**Barrier Rating:**	48.20

Repair Recommendations

Repair Action:	REPAIR	**FMSS Work Type:**	DEFERRED MAINTENANCE	**Repair Cost:**	$20790
Brief Workorder:	Raise 861 ft. of W-beam to the 27-in design height replace 32 ft. of rail and broken hardware.				
Workorder:	Replace Block at $30- per -Each for 3 Block(s) = $90. Replace badly cracked blocks. Replace Rail at $25- per -Lin. Ft. for 32 LF = $800. Replace bent and torn rail at impact area. Adjust Guardrail at $10- per -Lin. Ft. for 861 LF = $8610. Raise 861 ft. of W- beam to design height of 27 inches. High Speed Traffic Control at $2350- per -Day for 4 Day(s) = $9400.				

2008 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.

Lake Mead National Recreation Area

ROUTE 0001: EB NORTHSHORE ROAD

Barrier Condition Photos

LAKE_0001_9.287_L_1.JPG

Barrier ID:	**LAKE-0001-10.508-R**		
Route Name:	EB NORTHSHORE ROAD		
Inspection Date:	05/04/2010	**Barrier Rating:**	29.80

Barrier Description

Type:	W-BEAM STRONG POST	**Barrier Function:**	TRAFFIC
Barrier Material:	WEATHERING STEEL/CORTEN	**Post Material:**	WOOD
Blockout Type:	WOOD	**Length (ft.):**	354
Speed Limit (MPH):	50	**Placement with Respect to Road:**	TANGENT
Hazard Behind Barrier:	HIGH		

Barrier Crashworthiness

Appropriate Test Level:	TL-3	**Barrier Test Level:**	TL-3	**Is Barrier Crashworthy?:**	YES
Beg. End Trtmt Type:	W-BEAM FLARED 350 COMPLIANT	**Is Beg. End Trtmt Crashhworthy?:**	YES	**Approach Transition Type:**	NONE
Ending End Trtmt Type:	W-BEAM FLARED 350 COMPLIANT	**Ending End Trtmt Crashhworthy?:**	YES		

Average Measurements

Design Height (In.):	27	**Width (In.):**	0.0	**Post Spacing (In.):**	75.6
Height (In.):	25.7	**Lateral Offset (In.):**	57.7	**Road Grade (%):**	1.20

Physical Condition

Barrier	**Alignment and Height:**	Barrier is in alignment and within 1 in of 27 in design height for entire length except 9 linear ft that is below the design height by more than 1 to 2 in.
	Breaking and Cracking:	No breaking or cracking observed.
	Missing Elements:	No missing elements in barrier.
	Corrrosion and Weathering:	No corrosion or weathering observed.
End Treatments	**Alignment and Height:**	End treatments are in alignment and at or above design height of 27 in.
	Breaking and Cracking:	No breaks or cracks were observed in the end treatments.
	Missing Elements:	No missing end treatment elements observed.
	Corrrosion and Weathering:	No corrosion or weathering observed in end treatments.

Barrier ID:	**LAKE-0001-10.508-R**		
Route Name:	EB NORTHSHORE ROAD		
Inspection Date:	05/04/2010	**Barrier Rating:**	29.80

Repair Recommendations

Repair Action:	REPAIR	**FMSS Work Type:**	DEFERRED MAINTENANCE	**Repair Cost:**	$2684
Brief Workorder:	Raise 9 feet of barrier to the 27 inch design height.				
Workorder:	Adjust Guardrail at $10- per -Lin. Ft. for 9 LF = $90. Raise 9-ft. of barrier up to 27-in design height. High Speed Traffic Control at $2350- per -Day for 1 Day(s) = $2350.				

2008 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.

Lake Mead National Recreation Area

ROUTE 0001: EB NORTHSHORE ROAD

Barrier Condition Photos

LAKE_0001_10.508_R_1.JPG

Barrier ID:	**LAKE-0001-10.510-L**		
Route Name:	EB NORTHSHORE ROAD		
Inspection Date:	05/04/2010	**Barrier Rating:**	25.50

Barrier Description

Type:	W-BEAM STRONG POST	**Barrier Function:**	TRAFFIC
Barrier Material:	WEATHERING STEEL/CORTEN	**Post Material:**	WOOD
Blockout Type:	WOOD	**Length (ft.):**	355
Speed Limit (MPH):	50	**Placement with Respect to Road:**	TANGENT
Hazard Behind Barrier:	HIGH		

Barrier Crashworthiness

Appropriate Test Level:	TL-3	**Barrier Test Level:**	TL-3	**Is Barrier Crashworthy?:**	YES
Beg. End Trtmt Type:	W-BEAM FLARED 350 COMPLIANT	**Is Beg. End Trtmt Crashhworthy?:**	YES	**Approach Transition Type:**	NONE
Ending End Trtmt Type:	W-BEAM FLARED 350 COMPLIANT	**Ending End Trtmt Crashhworthy?:**	YES		

Average Measurements

Design Height (In.):	27	**Width (In.):**	0.0	**Post Spacing (In.):**	74.6
Height (In.):	27.0	**Lateral Offset (In.):**	56.7	**Road Grade (%):**	1.60

Physical Condition

Barrier	**Alignment and Height:**	Alignment acceptable. Height within 1-in of 27-in design height.
	Breaking and Cracking:	No breaking or cracking observed.
	Missing Elements:	No missing elements in barrier.
	Corrrosion and Weathering:	No corrosion or weathering observed.
End Treatments	**Alignment and Height:**	Alignment acceptable. Height within 1-in of 27-in design height.
	Breaking and Cracking:	No breaks or cracks were observed in the end treatments.
	Missing Elements:	No missing end treatment elements observed.
	Corrrosion and Weathering:	No corrosion or weathering observed in end treatments.

Barrier ID:	**LAKE-0001-10.510-L**		
Route Name:	EB NORTHSHORE ROAD		
Inspection Date:	05/04/2010	**Barrier Rating:**	25.50

Repair Recommendations

Repair Action:	NO ACTION	**FMSS Work Type:**	N/A	**Repair Cost:**	$0
Brief Workorder:	N/A				
Workorder:					

2008 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.

Lake Mead National Recreation Area

ROUTE 0001: EB NORTHSHORE ROAD

Barrier Condition Photos

LAKE_0001_10.510_L_1.JPG

Barrier ID:	**LAKE-0001-24.836-R**		
Route Name:	EB NORTHSHORE ROAD		
Inspection Date:	05/04/2010	**Barrier Rating:**	28.20

Barrier Description

Type:	W-BEAM STRONG POST	**Barrier Function:**	TRAFFIC
Barrier Material:	WEATHERING STEEL/CORTEN	**Post Material:**	WOOD
Blockout Type:	WOOD	**Length (ft.):**	242
Speed Limit (MPH):	50	**Placement with Respect to Road:**	TANGENT
Hazard Behind Barrier:	HIGH		

Barrier Crashworthiness

Appropriate Test Level:	TL-3	**Barrier Test Level:**	TL-3	**Is Barrier Crashworthy?:**	YES
Beg. End Trtmt Type:	W-BEAM FLARED 350 COMPLIANT	**Is Beg. End Trtmt Crashhworthy?:**	YES	**Approach Transition Type:**	NONE
Ending End Trtmt Type:	W-BEAM FLARED 350 COMPLIANT	**Ending End Trtmt Crashhworthy?:**	YES		

Average Measurements

Design Height (In.):	27	**Width (In.):**	0.0	**Post Spacing (In.):**	75.0
Height (In.):	26.7	**Lateral Offset (In.):**	55.2	**Road Grade (%):**	7.30

Physical Condition

Barrier	**Alignment and Height:**	The alignment is acceptable. 50-ft is 2 in below the 27 in design height.
	Breaking and Cracking:	No breaking or cracking observed.
	Missing Elements:	No missing elements observed.
	Corrrosion and Weathering:	No corrosion or weathering observed.
End Treatments	**Alignment and Height:**	Alignment acceptable. Height within 1-in of 27-in design height.
	Breaking and Cracking:	No breaks or cracks were observed in the end treatments.
	Missing Elements:	No missing end treatment elements observed.
	Corrrosion and Weathering:	No corrosion or weathering observed in end treatments.

Barrier ID:	**LAKE-0001-24.836-R**		
Route Name:	EB NORTHSHORE ROAD		
Inspection Date:	05/04/2010	**Barrier Rating:**	28.20

Repair Recommendations

Repair Action:	REPAIR	**FMSS Work Type:**	DEFERRED MAINTENANCE	**Repair Cost:**	$3135
Brief Workorder:	Adjust the height of 50 LF up to the 27 inch design height.				
Workorder:	Adjust Guardrail at $10- per -Lin. Ft. for 50 LF = $500. Adjust the height of 50 LF up to 27 inches. High Speed Traffic Control at $2350- per -Day for 1 Day(s) = $2350.				

2008 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.

Lake Mead National Recreation Area

ROUTE 0001: EB NORTHSHORE ROAD

Barrier Condition Photos

LAKE_0001_24.836_R_1.jpg

Barrier ID:	**LAKE-0001-25.405-R**		
Route Name:	EB NORTHSHORE ROAD		
Inspection Date:	05/04/2010	**Barrier Rating:**	26.80

Barrier Description

Type:	W-BEAM STRONG POST	**Barrier Function:**	TRAFFIC
Barrier Material:	WEATHERING STEEL/CORTEN	**Post Material:**	WOOD
Blockout Type:	WOOD	**Length (ft.):**	455
Speed Limit (MPH):	50	**Placement with Respect to Road:**	OUTSIDE OF CURVE
Hazard Behind Barrier:	LOW		

Barrier Crashworthiness

Appropriate Test Level:	TL-3	**Barrier Test Level:**	TL-3	**Is Barrier Crashworthy?:**	YES
Beg. End Trtmt Type:	W-BEAM FLARED 350 COMPLIANT	**Is Beg. End Trtmt Crashhworthy?:**	YES	**Approach Transition Type:**	NONE
Ending End Trtmt Type:	W-BEAM FLARED 350 COMPLIANT	**Ending End Trtmt Crashhworthy?:**	YES		

Average Measurements

Design Height (In.):	27	**Width (In.):**	0.0	**Post Spacing (In.):**	75.1
Height (In.):	28.7	**Lateral Offset (In.):**	53.2	**Road Grade (%):**	1.90

Physical Condition

Barrier	**Alignment and Height:**	Alignment acceptable. Height within 1-in of 27-in design height.
	Breaking and Cracking:	4 blocks and 1 post are broken or split.
	Missing Elements:	No missing elements observed.
	Corrrosion and Weathering:	There is some minor rusting of the steel on the rail.
End Treatments	**Alignment and Height:**	Alignment acceptable. Height within 1-in of 27-in design height.
	Breaking and Cracking:	No breaks or cracks were observed in the end treatments.
	Missing Elements:	No missing end treatment elements observed.
	Corrrosion and Weathering:	Minor rusting of the steel on the rail.

Barrier ID:	**LAKE-0001-25.405-R**		
Route Name:	EB NORTHSHORE ROAD		
Inspection Date:	05/04/2010	**Barrier Rating:**	26.80

Repair Recommendations

Repair Action:	REPAIR	**FMSS Work Type:**	DEFERRED MAINTENANCE	**Repair Cost:**	$2827
Brief Workorder:	Replace 4 broken blocks and 1 broken post.				
Workorder:	Replace Block at $30- per -Each for 4 Block(s) = $120. Replace 4 broken blocks. Replace Post at $100- per -Each for 1 Post(s) = $100. Replace 1 broken post. High Speed Traffic Control at $2350- per -Day for 1 Day(s) = $2350.				

2008 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.

Lake Mead National Recreation Area

ROUTE 0001: EB NORTHSHORE ROAD

Barrier Condition Photos

LAKE_0001_25.405_R_1.jpg

Barrier ID:	**LAKE-0001-33.112-L**		
Route Name:	EB NORTHSHORE ROAD		
Inspection Date:	05/04/2010	**Barrier Rating:**	15.30

Barrier Description

Type:	CONCRETE WITH SIMULATED STONE FACE	**Barrier Function:**	TRAFFIC
Barrier Material:	CONCRETE	**Post Material:**	N/A
Blockout Type:	N/A	**Length (ft.):**	28
Speed Limit (MPH):	50	**Placement with Respect to Road:**	TANGENT
Hazard Behind Barrier:	LOW		

Barrier Crashworthiness

Appropriate Test Level:	TL-3	**Barrier Test Level:**	TL-3	**Is Barrier Crashworthy?:**	YES
Beg. End Trtmt Type:	NONE	**Is Beg. End Trtmt Crashhworthy?:**	N/A	**Approach Transition Type:**	NONE
Ending End Trtmt Type:	NONE	**Ending End Trtmt Crashhworthy?:**	N/A		

Average Measurements

Design Height (In.):	27	**Width (In.):**	25.7	**Post Spacing (In.):**	0.0
Height (In.):	31.7	**Lateral Offset (In.):**	66.0	**Road Grade (%):**	1.70

Physical Condition

Barrier	**Alignment and Height:**	Alignment acceptable. Height within 3-in of 27-in design height.
	Breaking and Cracking:	No breaking or cracking observed.
	Missing Elements:	No missing elements observed.
	Corrrosion and Weathering:	No corrosion or weathering observed.
End Treatments	**Alignment and Height:**	
	Breaking and Cracking:	
	Missing Elements:	
	Corrrosion and Weathering:	

Barrier ID:	**LAKE-0001-33.112-L**		
Route Name:	EB NORTHSHORE ROAD		
Inspection Date:	05/04/2010	**Barrier Rating:**	15.30

Repair Recommendations

Repair Action:	NO ACTION	**FMSS Work Type:**	N/A	**Repair Cost:**	$0
Brief Workorder:	N/A				
Workorder:					

2008 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.

Lake Mead National Recreation Area

ROUTE 0001: EB NORTHSHORE ROAD

Barrier Condition Photos

LAKE_0001_33.112_L_1.jpg

Barrier ID:	**LAKE-0001-33.135-R**		
Route Name:	EB NORTHSHORE ROAD		
Inspection Date:	05/04/2010	**Barrier Rating:**	17.80

Barrier Description

Type:	CONCRETE WITH SIMULATED STONE FACE	**Barrier Function:**	TRAFFIC
Barrier Material:	CONCRETE	**Post Material:**	N/A
Blockout Type:	N/A	**Length (ft.):**	160
Speed Limit (MPH):	50	**Placement with Respect to Road:**	TANGENT
Hazard Behind Barrier:	MEDIUM		

Barrier Crashworthiness

Appropriate Test Level:	TL-3	**Barrier Test Level:**	TL-3	**Is Barrier Crashworthy?:**	YES
Beg. End Trtmt Type:	NONE	**Is Beg. End Trtmt Crashhworthy?:**	N/A	**Approach Transition Type:**	NONE
Ending End Trtmt Type:	NONE	**Ending End Trtmt Crashhworthy?:**	N/A		

Average Measurements

Design Height (In.):	27	**Width (In.):**	26.7	**Post Spacing (In.):**	0.0
Height (In.):	30.0	**Lateral Offset (In.):**	108.0	**Road Grade (%):**	0.60

Physical Condition

Barrier	**Alignment and Height:**	Alignment acceptable. Height within 3-in of 27-in design height.
	Breaking and Cracking:	No breaking or cracking observed.
	Missing Elements:	No missing elements observed.
	Corrrosion and Weathering:	No corrosion or weathering observed.
End Treatments	**Alignment and Height:**	
	Breaking and Cracking:	
	Missing Elements:	
	Corrrosion and Weathering:	

Barrier ID:	**LAKE-0001-33.135-R**		
Route Name:	EB NORTHSHORE ROAD		
Inspection Date:	05/04/2010	**Barrier Rating:**	17.80

Repair Recommendations

Repair Action:	NO ACTION	**FMSS Work Type:**	N/A	**Repair Cost:**	$0
Brief Workorder:	N/A				
Workorder:					

2008 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.

Lake Mead National Recreation Area

ROUTE 0001: EB NORTHSHORE ROAD

Barrier Condition Photos

LAKE_0001_33.135_R_1.jpg

Barrier ID:	**LAKE-0001-33.191-L**		
Route Name:	EB NORTHSHORE ROAD		
Inspection Date:	05/04/2010	**Barrier Rating:**	13.60

Barrier Description

Type:	CONCRETE WITH SIMULATED STONE FACE	**Barrier Function:**	TRAFFIC
Barrier Material:	CONCRETE	**Post Material:**	N/A
Blockout Type:	N/A	**Length (ft.):**	161
Speed Limit (MPH):	50	**Placement with Respect to Road:**	TANGENT
Hazard Behind Barrier:	MEDIUM		

Barrier Crashworthiness

Appropriate Test Level:	TL-3	**Barrier Test Level:**	TL-3	**Is Barrier Crashworthy?:**	YES
Beg. End Trtmt Type:	NONE	**Is Beg. End Trtmt Crashhworthy?:**	N/A	**Approach Transition Type:**	NONE
Ending End Trtmt Type:	NONE	**Ending End Trtmt Crashhworthy?:**	N/A		

Average Measurements

Design Height (In.):	27	**Width (In.):**	27.0	**Post Spacing (In.):**	0.0
Height (In.):	31.7	**Lateral Offset (In.):**	60.0	**Road Grade (%):**	2.30

Physical Condition

Barrier	**Alignment and Height:**	Alignment acceptable. Height within 3-in of 27-in design height.
	Breaking and Cracking:	No breaking or cracking observed.
	Missing Elements:	No missing elements observed.
	Corrrosion and Weathering:	No corrosion or weathering observed.
End Treatments	**Alignment and Height:**	
	Breaking and Cracking:	
	Missing Elements:	
	Corrrosion and Weathering:	

Barrier ID:	**LAKE-0001-33.191-L**		
Route Name:	EB NORTHSHORE ROAD		
Inspection Date:	05/04/2010	**Barrier Rating:**	13.60

Repair Recommendations

Repair Action:	NO ACTION	**FMSS Work Type:**	N/A	**Repair Cost:**	$0
Brief Workorder:	N/A				
Workorder:					

2008 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.

Lake Mead National Recreation Area

ROUTE 0001: EB NORTHSHORE ROAD

Barrier Condition Photos

LAKE_0001_33.191_L_1.jpg

Barrier ID:	**LAKE-0001-33.191-R**		
Route Name:	EB NORTHSHORE ROAD		
Inspection Date:	05/04/2010	**Barrier Rating:**	13.60

Barrier Description

Type:	CONCRETE WITH SIMULATED STONE FACE	**Barrier Function:**	TRAFFIC
Barrier Material:	CONCRETE	**Post Material:**	N/A
Blockout Type:	N/A	**Length (ft.):**	28
Speed Limit (MPH):	50	**Placement with Respect to Road:**	TANGENT
Hazard Behind Barrier:	MEDIUM		

Barrier Crashworthiness

Appropriate Test Level:	TL-3	**Barrier Test Level:**	TL-3	**Is Barrier Crashworthy?:**	YES
Beg. End Trtmt Type:	NONE	**Is Beg. End Trtmt Crashhworthy?:**	N/A	**Approach Transition Type:**	NONE
Ending End Trtmt Type:	NONE	**Ending End Trtmt Crashhworthy?:**	N/A		

Average Measurements

Design Height (In.):	27	**Width (In.):**	27.0	**Post Spacing (In.):**	0.0
Height (In.):	31.2	**Lateral Offset (In.):**	115.3	**Road Grade (%):**	2.70

Physical Condition

Barrier	**Alignment and Height:**	Alignment acceptable. Height within 3-in of 27-in design height.
	Breaking and Cracking:	No breaking or cracking observed.
	Missing Elements:	No missing elements observed.
	Corrrosion and Weathering:	No corrosion or weathering observed.
End Treatments	**Alignment and Height:**	
	Breaking and Cracking:	
	Missing Elements:	
	Corrrosion and Weathering:	

Barrier ID:	**LAKE-0001-33.191-R**		
Route Name:	EB NORTHSHORE ROAD		
Inspection Date:	05/04/2010	**Barrier Rating:**	13.60

Repair Recommendations

Repair Action:	NO ACTION	**FMSS Work Type:**	N/A	**Repair Cost:**	$0
Brief Workorder:	N/A				
Workorder:					

2008 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.

Lake Mead National Recreation Area

ROUTE 0001: EB NORTHSHORE ROAD

Barrier Condition Photos

LAKE_0001_33.191_R_1.jpg

LAKE_0001_33.191_R_2.jpg

Barrier ID:	**LAKE-0001-42.026-R**		
Route Name:	EB NORTHSHORE ROAD		
Inspection Date:	05/04/2010	**Barrier Rating:**	17.80

Barrier Description

Type:	CONCRETE WITH SIMULATED STONE FACE	**Barrier Function:**	TRAFFIC
Barrier Material:	CONCRETE	**Post Material:**	N/A
Blockout Type:	N/A	**Length (ft.):**	28
Speed Limit (MPH):	50	**Placement with Respect to Road:**	TANGENT
Hazard Behind Barrier:	MEDIUM		

Barrier Crashworthiness

Appropriate Test Level:	TL-3	**Barrier Test Level:**	TL-3	**Is Barrier Crashworthy?:**	YES
Beg. End Trtmt Type:	NONE	**Is Beg. End Trtmt Crashhworthy?:**	N/A	**Approach Transition Type:**	NONE
Ending End Trtmt Type:	NONE	**Ending End Trtmt Crashhworthy?:**	N/A		

Average Measurements

Design Height (In.):	27	**Width (In.):**	27.0	**Post Spacing (In.):**	0.0
Height (In.):	30.7	**Lateral Offset (In.):**	101.6	**Road Grade (%):**	0.90

Physical Condition

Barrier	**Alignment and Height:**	Alignment acceptable. Height within 3-in of 27-in design height.
	Breaking and Cracking:	No breaking or cracking observed.
	Missing Elements:	No missing elements observed.
	Corrrosion and Weathering:	No corrosion or weathering observed.
End Treatments	**Alignment and Height:**	
	Breaking and Cracking:	
	Missing Elements:	
	Corrrosion and Weathering:	

Barrier ID:	**LAKE-0001-42.026-R**		
Route Name:	EB NORTHSHORE ROAD		
Inspection Date:	05/04/2010	**Barrier Rating:**	17.80

Repair Recommendations

Repair Action:	NO ACTION	**FMSS Work Type:**	N/A	**Repair Cost:**	$0
Brief Workorder:	N/A				
Workorder:					

2008 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.

Lake Mead National Recreation Area

ROUTE 0001: EB NORTHSHORE ROAD

Barrier Condition Photos

LAKE_0001_42.026_R_1.jpg

Barrier ID:	**LAKE-0001-42.050-L**		
Route Name:	EB NORTHSHORE ROAD		
Inspection Date:	05/04/2010	**Barrier Rating:**	17.80

Barrier Description

Type:	CONCRETE WITH SIMULATED STONE FACE	**Barrier Function:**	TRAFFIC
Barrier Material:	CONCRETE	**Post Material:**	N/A
Blockout Type:	N/A	**Length (ft.):**	159
Speed Limit (MPH):	50	**Placement with Respect to Road:**	TANGENT
Hazard Behind Barrier:	MEDIUM		

Barrier Crashworthiness

Appropriate Test Level:	TL-3	**Barrier Test Level:**	TL-3	**Is Barrier Crashworthy?:**	YES
Beg. End Trtmt Type:	NONE	**Is Beg. End Trtmt Crashhworthy?:**	N/A	**Approach Transition Type:**	NONE
Ending End Trtmt Type:	NONE	**Ending End Trtmt Crashhworthy?:**	N/A		

Average Measurements

Design Height (In.):	27	**Width (In.):**	27.0	**Post Spacing (In.):**	0.0
Height (In.):	30.7	**Lateral Offset (In.):**	68.3	**Road Grade (%):**	0.70

Physical Condition

Barrier	**Alignment and Height:**	Alignment acceptable. Height within 3-in of 27-in design height.
	Breaking and Cracking:	No breaking or cracking observed.
	Missing Elements:	No missing elements observed.
	Corrrosion and Weathering:	No corrosion or weathering observed.
End Treatments	**Alignment and Height:**	
	Breaking and Cracking:	
	Missing Elements:	
	Corrrosion and Weathering:	

Barrier ID:	**LAKE-0001-42.050-L**		
Route Name:	EB NORTHSHORE ROAD		
Inspection Date:	05/04/2010	**Barrier Rating:**	17.80

Repair Recommendations

Repair Action:	NO ACTION	**FMSS Work Type:**	N/A	**Repair Cost:**	$0
Brief Workorder:	N/A				
Workorder:					

2008 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.

Lake Mead National Recreation Area

ROUTE 0001: EB NORTHSHORE ROAD

Barrier Condition Photos

LAKE_0001_42.050_L_1.jpg

Barrier ID:	**LAKE-0001-42.123-L**		
Route Name:	EB NORTHSHORE ROAD		
Inspection Date:	05/04/2010	**Barrier Rating:**	19.30

Barrier Description

Type:	CONCRETE WITH SIMULATED STONE FACE	**Barrier Function:**	TRAFFIC
Barrier Material:	CONCRETE	**Post Material:**	N/A
Blockout Type:	N/A	**Length (ft.):**	26
Speed Limit (MPH):	50	**Placement with Respect to Road:**	TANGENT
Hazard Behind Barrier:	N/A		

Barrier Crashworthiness

Appropriate Test Level:	TL-3	**Barrier Test Level:**	TL-3	**Is Barrier Crashworthy?:**	YES
Beg. End Trtmt Type:	NONE	**Is Beg. End Trtmt Crashhworthy?:**	N/A	**Approach Transition Type:**	NONE
Ending End Trtmt Type:	NONE	**Ending End Trtmt Crashhworthy?:**	N/A		

Average Measurements

Design Height (In.):	27	**Width (In.):**	27.0	**Post Spacing (In.):**	0.0
Height (In.):	31.2	**Lateral Offset (In.):**	0.0	**Road Grade (%):**	0.00

Physical Condition

Barrier	**Alignment and Height:**	Alignment acceptable. Height within 3-in of 27-in design height.
	Breaking and Cracking:	No breaking or cracking observed.
	Missing Elements:	No missing elements observed.
	Corrrosion and Weathering:	No corrosion or weathering observed in barrier.
End Treatments	**Alignment and Height:**	
	Breaking and Cracking:	
	Missing Elements:	
	Corrrosion and Weathering:	

Barrier ID:	**LAKE-0001-42.123-L**		
Route Name:	EB NORTHSHORE ROAD		
Inspection Date:	05/04/2010	**Barrier Rating:**	19.30

Repair Recommendations

Repair Action:	NO ACTION	**FMSS Work Type:**	N/A	**Repair Cost:**	$0
Brief Workorder:	N/A				
Workorder:					

2008 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.

Lake Mead National Recreation Area

ROUTE 0001: EB NORTHSHORE ROAD

Barrier Condition Photos

LAKE_0001_42.123_L_1.jpg

Barrier ID:	**LAKE-0001-42.123-R**		
Route Name:	EB NORTHSHORE ROAD		
Inspection Date:	05/04/2010	**Barrier Rating:**	13.60

Barrier Description

Type:	CONCRETE WITH SIMULATED STONE FACE	**Barrier Function:**	TRAFFIC
Barrier Material:	CONCRETE	**Post Material:**	N/A
Blockout Type:	N/A	**Length (ft.):**	157
Speed Limit (MPH):	50	**Placement with Respect to Road:**	TANGENT
Hazard Behind Barrier:	MEDIUM		

Barrier Crashworthiness

Appropriate Test Level:	TL-3	**Barrier Test Level:**	TL-3	**Is Barrier Crashworthy?:**	YES
Beg. End Trtmt Type:	NONE	**Is Beg. End Trtmt Crashhworthy?:**	N/A	**Approach Transition Type:**	NONE
Ending End Trtmt Type:	NONE	**Ending End Trtmt Crashhworthy?:**	N/A		

Average Measurements

Design Height (In.):	27	**Width (In.):**	27.0	**Post Spacing (In.):**	0.0
Height (In.):	31.5	**Lateral Offset (In.):**	102.3	**Road Grade (%):**	0.90

Physical Condition

Barrier	**Alignment and Height:**	Alignment acceptable. Height within 3-in of 27-in design height.
	Breaking and Cracking:	No breaking or cracking observed.
	Missing Elements:	No missing elements observed.
	Corrrosion and Weathering:	No corrosion or weathering observed in barrier.
End Treatments	**Alignment and Height:**	
	Breaking and Cracking:	
	Missing Elements:	
	Corrrosion and Weathering:	

Barrier ID:	**LAKE-0001-42.123-R**		
Route Name:	EB NORTHSHORE ROAD		
Inspection Date:	05/04/2010	**Barrier Rating:**	13.60

Repair Recommendations

Repair Action:	NO ACTION	**FMSS Work Type:**	N/A	**Repair Cost:**	$0
Brief Workorder:	N/A				
Workorder:					

2008 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.

Lake Mead National Recreation Area

ROUTE 0001: EB NORTHSHORE ROAD

Barrier Condition Photos

LAKE_0001_42.123_R_1.jpg

Barrier ID:	**LAKE-0003ZZ-5.757-L**		
Route Name:	LV LAKESHORE ROADS		
Inspection Date:	05/03/2010	**Barrier Rating:**	34.20

Barrier Description

Type:	THRIE BEAM/MODIFIED THRIE BEAM	**Barrier Function:**	TRAFFIC
Barrier Material:	WEATHERING STEEL/CORTEN	**Post Material:**	WOOD
Blockout Type:	WOOD	**Length (ft.):**	595
Speed Limit (MPH):	50	**Placement with Respect to Road:**	OUTSIDE OF CURVE
Hazard Behind Barrier:	LOW		

Barrier Crashworthiness

Appropriate Test Level:	TL-3	**Barrier Test Level:**	TL-3	**Is Barrier Crashworthy?:**	YES
Beg. End Trtmt Type:	W-BEAM FLARED 350 COMPLIANT	**Is Beg. End Trtmt Crashhworthy?:**	YES	**Approach Transition Type:**	NONE
Ending End Trtmt Type:	W-BEAM FLARED 350 COMPLIANT	**Ending End Trtmt Crashhworthy?:**	YES		

Average Measurements

Design Height (In.):	35	**Width (In.):**	0.0	**Post Spacing (In.):**	75.3
Height (In.):	33.2	**Lateral Offset (In.):**	137.0	**Road Grade (%):**	1.80

Physical Condition

Barrier	**Alignment and Height:**	The alignment had less than 6 in of deflection. The design height was 35 in for Thrie beam barrier. 100 ft of rail was 35 to 37 ines high while 495 ft was between 1-3-in. below 35-in design height.
	Breaking and Cracking:	8 blocks and 3 posts are broken.
	Missing Elements:	No missing elements observed.
	Corrrosion and Weathering:	There is some minor rusting on the steel throughout the guardrail.
End Treatments	**Alignment and Height:**	The alignment had less than 6 in of deflection. The height was 32 ines.
	Breaking and Cracking:	No breaks or cracks were observed in the end treatments.
	Missing Elements:	No missing end treatment elements observed.
	Corrrosion and Weathering:	Minor rusting of the steel.

Barrier ID:	**LAKE-0003ZZ-5.757-L**		
Route Name:	LV LAKESHORE ROADS		
Inspection Date:	05/03/2010	**Barrier Rating:**	34.20

Repair Recommendations

Repair Action:	REPAIR	**FMSS Work Type:**	DEFERRED MAINTENANCE	**Repair Cost:**	$13794
Brief Workorder:	Raise 495-ft of guardrail up to the 35 inch design height replace 8 broken blocks and 3 broken posts.				
Workorder:	Adjust Guardrail at $10- per -Lin. Ft. for 495 LF = $4950. Raise 495-ft of guardrail up to the 35 inch design height. Replace Block at $30- per -Each for 8 Block(s) = $240. Replace 8 broken blocks. Replace Post at $100- per -Each for 3 Post(s) = $300. Replace 3 broken posts. High Speed Traffic Control at $2350- per -Day for 3 Day(s) = $7050. 2 days to raise barrier; 1 day to replace hardware.				

2008 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.

Lake Mead National Recreation Area

ROUTE 0001: EB NORTHSHORE ROAD

Barrier Condition Photos

Condition photos are not available for LAKE-0003AA-5.757-L

Barrier ID:	**LAKE-0003ZZ-8.427-L**		
Route Name:	LV LAKESHORE ROADS		
Inspection Date:	05/03/2010	**Barrier Rating:**	41.70

Barrier Description

Type:	W-BEAM STRONG POST	**Barrier Function:**	TRAFFIC
Barrier Material:	WEATHERING STEEL/CORTEN	**Post Material:**	WOOD
Blockout Type:	WOOD	**Length (ft.):**	681
Speed Limit (MPH):	50	**Placement with Respect to Road:**	INSIDE OF CURVE
Hazard Behind Barrier:	HIGH		

Barrier Crashworthiness

Appropriate Test Level:	TL-3	**Barrier Test Level:**	TL-3	**Is Barrier Crashworthy?:**	YES
Beg. End Trtmt Type:	NONE	**Is Beg. End Trtmt Crashhworthy?:**	N/A	**Approach Transition Type:**	NONE
Ending End Trtmt Type:	W-BEAM FLARED 350 COMPLIANT	**Ending End Trtmt Crashhworthy?:**	YES		

Average Measurements

Design Height (In.):	27	**Width (In.):**	0.0	**Post Spacing (In.):**	75.5
Height (In.):	25.7	**Lateral Offset (In.):**	60.0	**Road Grade (%):**	0.40

Physical Condition

Barrier	**Alignment and Height:**	The alignment is acceptable. 131-ft is 1 to 2 in below the 27 in design height.
	Breaking and Cracking:	11 blocks and 2 posts have cracks more than 1/2 in wide.
	Missing Elements:	No missing elements observed.
	Corrrosion and Weathering:	There were numerous blocks and posts that had cracking of more than 1/2 in due to weathering.
End Treatments	**Alignment and Height:**	Alignment acceptable. Height within 1-in of 27-in design height.
	Breaking and Cracking:	No breaks or cracks were observed in the end treatments.
	Missing Elements:	No missing end treatment elements observed.
	Corrrosion and Weathering:	No corrosion or weathering observed in end treatments.

Barrier ID:	**LAKE-0003ZZ-8.427-L**		
Route Name:	LV LAKESHORE ROADS		
Inspection Date:	05/03/2010	**Barrier Rating:**	41.70

Repair Recommendations

Repair Action:	REPAIR	**FMSS Work Type:**	DEFERRED MAINTENANCE	**Repair Cost:**	$4609
Brief Workorder:	Raise 131-ft. of barrier up to 27-in design height replace 11 blocks and 2 posts.				
Workorder:	Adjust Guardrail at $10- per -Lin. Ft. for 131 LF = $1310. Raise 131-ft. of barrier up to 27-in design height. Replace Post at $100- per -Each for 2 Post(s) = $200. Replace the damaged posts. Replace Block at $30- per -Each for 11 Block(s) = $330. Replace the damaged blocks. High Speed Traffic Control at $2350- per -Day for 1 Day(s) = $2350.				

2008 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.

Lake Mead National Recreation Area

ROUTE 0003ZZ: LV LAKESHORE ROADS

Barrier Condition Photos

Condition photos are not available for LAKE-0003ZZ-8.427-L.

Barrier ID:	**LAKE-0003ZZ-8.434-R**		
Route Name:	LV LAKESHORE ROADS		
Inspection Date:	05/03/2010	**Barrier Rating:**	45.90

Barrier Description

Type:	W-BEAM STRONG POST	**Barrier Function:**	TRAFFIC
Barrier Material:	WEATHERING STEEL/CORTEN	**Post Material:**	WOOD
Blockout Type:	WOOD	**Length (ft.):**	731
Speed Limit (MPH):	50	**Placement with Respect to Road:**	OUTSIDE OF CURVE
Hazard Behind Barrier:	HIGH		

Barrier Crashworthiness

Appropriate Test Level:	TL-3	**Barrier Test Level:**	TL-3	**Is Barrier Crashworthy?:**	YES
Beg. End Trtmt Type:	W-BEAM FLARED 350 COMPLIANT	**Is Beg. End Trtmt Crashhworthy?:**	YES	**Approach Transition Type:**	NONE
Ending End Trtmt Type:	NONE	**Ending End Trtmt Crashhworthy?:**	N/A		

Average Measurements

Design Height (In.):	27	**Width (In.):**	0.0	**Post Spacing (In.):**	75.0
Height (In.):	26.7	**Lateral Offset (In.):**	47.0	**Road Grade (%):**	0.20

Physical Condition

Barrier	**Alignment and Height:**	The alignment is acceptable. 113-ft is 1 to 2 in below the 27 in design height.
	Breaking and Cracking:	10 blocks and 4 posts have cracks more than 1/2 in wide.
	Missing Elements:	No missing elements observed.
	Corrrosion and Weathering:	There were a number of blocks and post that are badly cracked due to weathering.
End Treatments	**Alignment and Height:**	The barrier end treatment appears to have been impacted and thus there was no height or alignment to evaluate.
	Breaking and Cracking:	The entire end treatment appears to have been impacted.
	Missing Elements:	The entire end treatment is missing.
	Corrrosion and Weathering:	No corrosion or weathering observed in end treatments.

Barrier ID:	**LAKE-0003ZZ-8.434-R**		
Route Name:	LV LAKESHORE ROADS		
Inspection Date:	05/03/2010	**Barrier Rating:**	45.90

Repair Recommendations

Repair Action:	REPAIR	**FMSS Work Type:**	DEFERRED MAINTENANCE	**Repair Cost:**	$14025
Brief Workorder:	Replace the impacted end treatment raise the first 113-ft of barrier up to 27 inch design height and replace 10 blocks and 4 posts.				
Workorder:	Remove Guardrail at $10- per -Lin. Ft. for 37 LF = $370. Remove the damaged end treatment. W-beam flared 350 compliant at $3500- per -Each for 1 Unit(s) = $3500. Install new end treatment. Adjust Guardrail at $10- per -Lin. Ft. for 113 LF = $1130. Raise the first 113-ft of barrier up to 27 inch design height. Replace Post at $100- per -Each for 4 Post(s) = $400. Replace the damaged posts. Replace Block at $30- per -Each for 10 Block(s) = $300. Replace the damaged blocks. High Speed Traffic Control at $2350- per -Day for 3 Day(s) = $7050. 1 day removal; 1 day install new end treatment; 1 day to replace other hardware.				

2008 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.

Lake Mead National Recreation Area

ROUTE 0003ZZ: LV LAKESHORE ROADS

Barrier Condition Photos

Condition photos are not available for LAKE-0003ZZ-8.434-R.

Barrier ID:	**LAKE-0003ZZ-8.819-R**		
Route Name:	LV LAKESHORE ROADS		
Inspection Date:	05/03/2010	**Barrier Rating:**	37.20

Barrier Description

Type:	W-BEAM STRONG POST	**Barrier Function:**	TRAFFIC
Barrier Material:	WEATHERING STEEL/CORTEN	**Post Material:**	WOOD
Blockout Type:	WOOD	**Length (ft.):**	546
Speed Limit (MPH):	50	**Placement with Respect to Road:**	INSIDE OF CURVE
Hazard Behind Barrier:	HIGH		

Barrier Crashworthiness

Appropriate Test Level:	TL-3	**Barrier Test Level:**	TL-3	**Is Barrier Crashworthy?:**	YES
Beg. End Trtmt Type:	W-BEAM FLARED 350 COMPLIANT	**Is Beg. End Trtmt Crashhworthy?:**	YES	**Approach Transition Type:**	NONE
Ending End Trtmt Type:	NONE	**Ending End Trtmt Crashhworthy?:**	N/A		

Average Measurements

Design Height (In.):	27	**Width (In.):**	0.0	**Post Spacing (In.):**	75.3
Height (In.):	26.2	**Lateral Offset (In.):**	58.2	**Road Grade (%):**	2.10

Physical Condition

Barrier	**Alignment and Height:**	The alignment had less than 6 in of deflection. The height was 1-2 in below the 27 in design height for 150 ft.
	Breaking and Cracking:	15 blocks and 4 posts are broken or severely split.
	Missing Elements:	No missing elements observed.
	Corrrosion and Weathering:	The steel rail had some minor rusting throughout the length of the rail. Remove vegetation in front of the rail.
End Treatments	**Alignment and Height:**	The alignment had no deflection. The beginning end was severely impacted. The ending end was 19 in high.
	Breaking and Cracking:	The beginning end was severely impacted.
	Missing Elements:	No missing end treatment elements observed.
	Corrrosion and Weathering:	Steel rail had minor rusting present.

Barrier ID:	**LAKE-0003ZZ-8.819-R**		
Route Name:	LV LAKESHORE ROADS		
Inspection Date:	05/03/2010	**Barrier Rating:**	37.20

Repair Recommendations

Repair Action:	REPAIR	**FMSS Work Type:**	DEFERRED MAINTENANCE	**Repair Cost:**	$17853
Brief Workorder:	Raise 187 feet of low guardrail to 27-in. design height. Replace impacted beginning end treatment. Replace 15 blocks and 4 posts and remove vegetation in front of guardrail.				
Workorder:	Adjust Guardrail at $10- per -Lin. Ft. for 187 LF = $1870. Raise 187-ft. of barrier up to 27-in design height. Remove Guardrail at $10- per -Lin. Ft. for 37 LF = $370. Remove impacted beginning end treatment. W-beam flared 350 compliant at $3500- per -Each for 1 Unit(s) = $3500. Replace impacted beginning end treatment. Replace Block at $30- per -Each for 15 Block(s) = $450. Replace 15 blocks. Replace Post at $100- per -Each for 4 Post(s) = $400. Replace 4 posts. Labor at $60- per -Hour for 4 Hrs = $240. Remove vegetation in front of guardrail. High Speed Traffic Control at $2350- per -Day for 4 Day(s) = $9400. 1 day raise guardrail; 2 days replace end treatment; 1 day all other work.				

2008 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.

Lake Mead National Recreation Area

ROUTE 0003ZZ: LV LAKESHORE ROADS

Barrier Condition Photos

Condition photos are not available for LAKE-0003ZZ-8.819-R.

Barrier ID:	**LAKE-0003ZZ-8.837-L**		
Route Name:	LV LAKESHORE ROADS		
Inspection Date:	05/03/2010	**Barrier Rating:**	44.00

Barrier Description

Type:	W-BEAM STRONG POST	**Barrier Function:**	TRAFFIC
Barrier Material:	WEATHERING STEEL/CORTEN	**Post Material:**	WOOD
Blockout Type:	WOOD	**Length (ft.):**	504
Speed Limit (MPH):	50	**Placement with Respect to Road:**	OUTSIDE OF CURVE
Hazard Behind Barrier:	MEDIUM		

Barrier Crashworthiness

Appropriate Test Level:	TL-3	**Barrier Test Level:**	TL-3	**Is Barrier Crashworthy?:**	YES
Beg. End Trtmt Type:	NONE	**Is Beg. End Trtmt Crashhworthy?:**	N/A	**Approach Transition Type:**	NONE
Ending End Trtmt Type:	W-BEAM FLARED 350 COMPLIANT	**Ending End Trtmt Crashhworthy?:**	YES		

Average Measurements

Design Height (In.):	27	**Width (In.):**	0.0	**Post Spacing (In.):**	74.0
Height (In.):	26.0	**Lateral Offset (In.):**	45.2	**Road Grade (%):**	1.90

Physical Condition

Barrier	**Alignment and Height:**	Alignment acceptable. Height within 1-in of 27-in design height.
	Breaking and Cracking:	11 blocks and 4 posts are broken rotated or split.
	Missing Elements:	No missing elements observed.
	Corrrosion and Weathering:	There is only minor corrosion and weathering observed to the barrier.
End Treatments	**Alignment and Height:**	Alignment acceptable. Height within 1-in of 27-in design height.
	Breaking and Cracking:	3 blocks 1 post and 26 ft of rail is broken or bent.
	Missing Elements:	No missing end treatment elements observed.
	Corrrosion and Weathering:	Minor corrosion and weathering observed.

Barrier ID:	**LAKE-0003ZZ-8.837-L**		
Route Name:	LV LAKESHORE ROADS		
Inspection Date:	05/03/2010	**Barrier Rating:**	44.00

Repair Recommendations

Repair Action:	REPAIR	**FMSS Work Type:**	DEFERRED MAINTENANCE	**Repair Cost:**	$4312
Brief Workorder:	Replace 14 blocks 5 posts and 26 feet of bent rail.				
Workorder:	Replace Block at $30- per -Each for 14 Block(s) = $420. Replace 14 blocks. Replace Post at $100- per -Each for 5 Post(s) = $500. Replace 5 posts. Replace Rail at $25- per -Lin. Ft. for 26 LF = $650. Replace 26 feet of bent rail. High Speed Traffic Control at $2350- per -Day for 1 Day(s) = $2350. Replacement of blocks posts and rail = 1 day				

2008 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.

Lake Mead National Recreation Area

ROUTE 0003ZZ: LV LAKESHORE ROADS

Barrier Condition Photos

Condition photos are not available for LAKE-0003ZZ-8.837-L.

Barrier ID:	**LAKE-0003ZZ-9.628-R**		
Route Name:	LV LAKESHORE ROADS		
Inspection Date:	05/03/2010	**Barrier Rating:**	35.70

Barrier Description

Type:	CONCRETE WITH SIMULATED STONE FACE	**Barrier Function:**	TRAFFIC
Barrier Material:	CONCRETE	**Post Material:**	N/A
Blockout Type:	N/A	**Length (ft.):**	165
Speed Limit (MPH):	50	**Placement with Respect to Road:**	OUTSIDE OF CURVE
Hazard Behind Barrier:	HIGH		

Barrier Crashworthiness

Appropriate Test Level:	TL-3	**Barrier Test Level:**	TL-3	**Is Barrier Crashworthy?:**	YES
Beg. End Trtmt Type:	NONE	**Is Beg. End Trtmt Crashhworthy?:**	N/A	**Approach Transition Type:**	NONE
Ending End Trtmt Type:	NONE	**Ending End Trtmt Crashhworthy?:**	N/A		

Average Measurements

Design Height (In.):	27	**Width (In.):**	18.0	**Post Spacing (In.):**	0.0
Height (In.):	28.2	**Lateral Offset (In.):**	117.3	**Road Grade (%):**	0.02

Physical Condition

Barrier	**Alignment and Height:**	Alignment acceptable. Height within 3-in of 27-in design height.
	Breaking and Cracking:	No breaking or cracking observed.
	Missing Elements:	No missing elements observed.
	Corrrosion and Weathering:	No corrosion or weathering observed.
End Treatments	**Alignment and Height:**	
	Breaking and Cracking:	
	Missing Elements:	
	Corrrosion and Weathering:	

Barrier ID:	**LAKE-0003ZZ-9.628-R**		
Route Name:	LV LAKESHORE ROADS		
Inspection Date:	05/03/2010	**Barrier Rating:**	35.70

Repair Recommendations

Repair Action:	NO ACTION	**FMSS Work Type:**	N/A	**Repair Cost:**	$0
Brief Workorder:	N/A				
Workorder:					

2008 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.

Lake Mead National Recreation Area

ROUTE 0003ZZ: LV LAKESHORE ROADS

Barrier Condition Photos

Condition photos are not available for LAKE-0003ZZ-9.628-R.

Barrier ID:	**LAKE-0003ZZ-9.653-L**		
Route Name:	LV LAKESHORE ROADS		
Inspection Date:	05/03/2010	**Barrier Rating:**	28.20

Barrier Description

Type:	CONCRETE WITH SIMULATED STONE FACE	**Barrier Function:**	TRAFFIC
Barrier Material:	CONCRETE	**Post Material:**	N/A
Blockout Type:	N/A	**Length (ft.):**	33
Speed Limit (MPH):	50	**Placement with Respect to Road:**	INSIDE OF CURVE
Hazard Behind Barrier:	MEDIUM		

Barrier Crashworthiness

Appropriate Test Level:	TL-3	**Barrier Test Level:**	TL-3	**Is Barrier Crashworthy?:**	YES
Beg. End Trtmt Type:	NONE	**Is Beg. End Trtmt Crashhworthy?:**	N/A	**Approach Transition Type:**	NONE
Ending End Trtmt Type:	NONE	**Ending End Trtmt Crashhworthy?:**	N/A		

Average Measurements

Design Height (In.):	27	**Width (In.):**	18.0	**Post Spacing (In.):**	0.0
Height (In.):	28.0	**Lateral Offset (In.):**	69.0	**Road Grade (%):**	1.20

Physical Condition

Barrier	**Alignment and Height:**	Alignment acceptable. Height within 3-in of 27-in design height.
	Breaking and Cracking:	No breaking or cracking observed.
	Missing Elements:	No missing elements observed.
	Corrrosion and Weathering:	No corrosion or weathering observed.
End Treatments	**Alignment and Height:**	
	Breaking and Cracking:	
	Missing Elements:	
	Corrrosion and Weathering:	

Barrier ID:	**LAKE-0003ZZ-9.653-L**		
Route Name:	LV LAKESHORE ROADS		
Inspection Date:	05/03/2010	**Barrier Rating:**	28.20

Repair Recommendations

Repair Action:	NO ACTION	**FMSS Work Type:**	N/A	**Repair Cost:**	$0
Brief Workorder:	N/A				
Workorder:					

2008 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.

Lake Mead National Recreation Area

ROUTE 0003ZZ: LV LAKESHORE ROADS

Barrier Condition Photos

Condition photos are not available for LAKE-0003ZZ-9.653-L.

Barrier ID:	**LAKE-0003ZZ-9.696-R**		
Route Name:	LV LAKESHORE ROADS		
Inspection Date:	05/03/2010	**Barrier Rating:**	22.20

Barrier Description

Type:	CONCRETE WITH SIMULATED STONE FACE	**Barrier Function:**	TRAFFIC
Barrier Material:	CONCRETE	**Post Material:**	N/A
Blockout Type:	N/A	**Length (ft.):**	104
Speed Limit (MPH):	50	**Placement with Respect to Road:**	OUTSIDE OF CURVE
Hazard Behind Barrier:	MEDIUM		

Barrier Crashworthiness

Appropriate Test Level:	TL-3	**Barrier Test Level:**	TL-3	**Is Barrier Crashworthy?:**	YES
Beg. End Trtmt Type:	NONE	**Is Beg. End Trtmt Crashhworthy?:**	N/A	**Approach Transition Type:**	NONE
Ending End Trtmt Type:	NONE	**Ending End Trtmt Crashhworthy?:**	N/A		

Average Measurements

Design Height (In.):	27	**Width (In.):**	18.0	**Post Spacing (In.):**	0.0
Height (In.):	28.2	**Lateral Offset (In.):**	91.3	**Road Grade (%):**	3.70

Physical Condition

Barrier	**Alignment and Height:**	Alignment acceptable. Height within 3-in of 27-in design height.
	Breaking and Cracking:	No breaking or cracking observed.
	Missing Elements:	No missing elements observed.
	Corrrosion and Weathering:	No corrosion or weathering observed.
End Treatments	**Alignment and Height:**	
	Breaking and Cracking:	
	Missing Elements:	
	Corrrosion and Weathering:	

Barrier ID:	**LAKE-0003ZZ-9.696-R**		
Route Name:	LV LAKESHORE ROADS		
Inspection Date:	05/03/2010	**Barrier Rating:**	22.20

Repair Recommendations

Repair Action:	NO ACTION	**FMSS Work Type:**	N/A	**Repair Cost:**	$0
Brief Workorder:	N/A				
Workorder:					

2008 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.

Lake Mead National Recreation Area

ROUTE 0003ZZ: LV LAKESHORE ROADS

Barrier Condition Photos

Condition photos are not available for LAKE-0003ZZ-9.696-R.

Barrier ID:	**LAKE-0003ZZ-9.700-L**		
Route Name:	LV LAKESHORE ROADS		
Inspection Date:	05/03/2010	**Barrier Rating:**	18.30

Barrier Description

Type:	CONCRETE WITH SIMULATED STONE FACE	**Barrier Function:**	TRAFFIC
Barrier Material:	CONCRETE	**Post Material:**	N/A
Blockout Type:	N/A	**Length (ft.):**	227
Speed Limit (MPH):	50	**Placement with Respect to Road:**	INSIDE OF CURVE
Hazard Behind Barrier:	LOW		

Barrier Crashworthiness

Appropriate Test Level:	TL-3	**Barrier Test Level:**	TL-3	**Is Barrier Crashworthy?:**	YES
Beg. End Trtmt Type:	NONE	**Is Beg. End Trtmt Crashhworthy?:**	N/A	**Approach Transition Type:**	NONE
Ending End Trtmt Type:	NONE	**Ending End Trtmt Crashhworthy?:**	N/A		

Average Measurements

Design Height (In.):	27	**Width (In.):**	18.0	**Post Spacing (In.):**	0.0
Height (In.):	27.2	**Lateral Offset (In.):**	140.0	**Road Grade (%):**	4.70

Physical Condition

Barrier	**Alignment and Height:**	Alignment acceptable. Height within 3-in of 27-in design height.
	Breaking and Cracking:	No breaking or cracking observed.
	Missing Elements:	No missing elements observed.
	Corrrosion and Weathering:	No corrosion or weathering observed.
End Treatments	**Alignment and Height:**	
	Breaking and Cracking:	
	Missing Elements:	
	Corrrosion and Weathering:	

Barrier ID:	**LAKE-0003ZZ-9.700-L**		
Route Name:	LV LAKESHORE ROADS		
Inspection Date:	05/03/2010	**Barrier Rating:**	18.30

Repair Recommendations

Repair Action:	NO ACTION	**FMSS Work Type:**	N/A	**Repair Cost:**	$0
Brief Workorder:	N/A				
Workorder:					

2008 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.

Lake Mead National Recreation Area

ROUTE 0003ZZ: LV LAKESHORE ROADS

Barrier Condition Photos

Condition photos are not available for LAKE-0003ZZ-9.700-L.

Barrier ID:	**LAKE-0010-0.699-R**		
Route Name:	CB CALLVILLE BAY ACCESS ROAD		
Inspection Date:	05/04/2010	**Barrier Rating:**	42.90

Barrier Description

Type:	W-BEAM STRONG POST	**Barrier Function:**	TRAFFIC
Barrier Material:	WEATHERING STEEL/CORTEN	**Post Material:**	WOOD
Blockout Type:	WOOD	**Length (ft.):**	438
Speed Limit (MPH):	35	**Placement with Respect to Road:**	OUTSIDE OF CURVE
Hazard Behind Barrier:	HIGH		

Barrier Crashworthiness

Appropriate Test Level:	TL-2	**Barrier Test Level:**	TL-3	**Is Barrier Crashworthy?:**	YES
Beg. End Trtmt Type:	W-BEAM BURIED END	**Is Beg. End Trtmt Crashhworthy?:**	YES	**Approach Transition Type:**	NONE
Ending End Trtmt Type:	W-BEAM FLARED 350 COMPLIANT	**Ending End Trtmt Crashhworthy?:**	YES		

Average Measurements

Design Height (In.):	27	**Width (In.):**	0.0	**Post Spacing (In.):**	73.6
Height (In.):	27.7	**Lateral Offset (In.):**	47.0	**Road Grade (%):**	6.20

Physical Condition

Barrier	**Alignment and Height:**	Barrier is in alignment. Barrier is at or up to 2 in higher than 27 in design height for most of barrier length and below by 2 in for 24 linear ft.
	Breaking and Cracking:	No breaking or cracking in barrier.
	Missing Elements:	No missing elements observed.
	Corrrosion and Weathering:	No corrosion or weathering observed.
End Treatments	**Alignment and Height:**	Approach end treatment is below 27-in design height by 2 in and has gravel build up of up to 20 inches in front of rail for 12 linear ft.
	Breaking and Cracking:	No breaks or cracks were observed in the end treatments.
	Missing Elements:	No missing end treatment elements observed.
	Corrrosion and Weathering:	No corrosion or weathering observed in end treatments.

Barrier ID:	**LAKE-0010-0.699-R**		
Route Name:	CB CALLVILLE BAY ACCESS ROAD		
Inspection Date:	05/04/2010	**Barrier Rating:**	42.90

Repair Recommendations

Repair Action:	REPAIR	**FMSS Work Type:**	DEFERRED MAINTENANCE	**Repair Cost:**	$2568
Brief Workorder:	Raise 36 feet of guardrail up 2 inches to 27 inch design height and remove excess gravel from face of approach buried end treatment.				
Workorder:	Adjust Guardrail at $10- per -Lin. Ft. for 36 LF = $360. Raise 36-ft. of barrier up to 27-in design height. Loader at $125- per -Hour for 4 Hrs = $500. Excavate and move gravel from in front of barrier for 12 linear feet. Low Speed Traffic Control at $1475- per -Day for 1 Day(s) = $1475.				

2008 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.

Lake Mead National Recreation Area

ROUTE 0010: CB CALLVILLE BAY ACCESS ROAD

Barrier Condition Photos

LAKE_0010_0.699_R_1.JPG

Barrier ID:	**LAKE-0010-4.077-L**		
Route Name:	CB CALLVILLE BAY ACCESS ROAD		
Inspection Date:	05/04/2010	**Barrier Rating:**	22.70

Barrier Description

Type:	W-BEAM STRONG POST	**Barrier Function:**	TRAFFIC
Barrier Material:	GALVANIZED STEEL	**Post Material:**	GALVANIZED STEEL
Blockout Type:	STEEL	**Length (ft.):**	238
Speed Limit (MPH):	15	**Placement with Respect to Road:**	TANGENT
Hazard Behind Barrier:	LOW		

Barrier Crashworthiness

Appropriate Test Level:	TL-1	**Barrier Test Level:**	TL-3	**Is Barrier Crashworthy?:**	YES
Beg. End Trtmt Type:	NONE	**Is Beg. End Trtmt Crashhworthy?:**	N/A	**Approach Transition Type:**	NONE
Ending End Trtmt Type:	NONE	**Ending End Trtmt Crashhworthy?:**	N/A		

Average Measurements

Design Height (In.):	27	**Width (In.):**	0.0	**Post Spacing (In.):**	75.0
Height (In.):	26.7	**Lateral Offset (In.):**	30.0	**Road Grade (%):**	6.70

Physical Condition

Barrier	**Alignment and Height:**	Alignment acceptable. Height within 1-in of 27-in design height.
	Breaking and Cracking:	No breaking or cracking observed.
	Missing Elements:	No missing elements observed.
	Corrrosion and Weathering:	No corrosion or weathering observed.
End Treatments	**Alignment and Height:**	
	Breaking and Cracking:	
	Missing Elements:	
	Corrrosion and Weathering:	

Barrier ID:	**LAKE-0010-4.077-L**		
Route Name:	CB CALLVILLE BAY ACCESS ROAD		
Inspection Date:	05/04/2010	**Barrier Rating:**	22.70

Repair Recommendations

Repair Action:	NO ACTION	**FMSS Work Type:**	N/A	**Repair Cost:**	$0
Brief Workorder:	N/A				
Workorder:					

2008 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.

Lake Mead National Recreation Area

ROUTE 0010: CB CALLVILLE BAY ACCESS ROAD

Barrier Condition Photos

LAKE_0010_4.077_L_1.JPG

Barrier ID:	**LAKE-0112-2.649-L**		
Route Name:	EB ECHO BAY ACCESS ROAD		
Inspection Date:	05/04/2010	**Barrier Rating:**	42.40

Barrier Description

Type:	W-BEAM STRONG POST	**Barrier Function:**	TRAFFIC
Barrier Material:	WEATHERING STEEL/CORTEN	**Post Material:**	WOOD
Blockout Type:	WOOD	**Length (ft.):**	411
Speed Limit (MPH):	50	**Placement with Respect to Road:**	OUTSIDE OF CURVE
Hazard Behind Barrier:	MEDIUM		

Barrier Crashworthiness

Appropriate Test Level:	TL-3	**Barrier Test Level:**	TL-3	**Is Barrier Crashworthy?:**	YES
Beg. End Trtmt Type:	W-BEAM BCT	**Is Beg. End Trtmt Crashhworthy?:**	NO	**Approach Transition Type:**	NONE
Ending End Trtmt Type:	W-BEAM BCT	**Ending End Trtmt Crashhworthy?:**	NO		

Average Measurements

Design Height (In.):	27	**Width (In.):**	0.0	**Post Spacing (In.):**	74.3
Height (In.):	23.0	**Lateral Offset (In.):**	51.7	**Road Grade (%):**	1.90

Physical Condition

Barrier	**Alignment and Height:**	The alignment is good. The height is between 2 and 5 in below the 27 in design height for the entire barrier.
	Breaking and Cracking:	No breaking or cracking observed
	Missing Elements:	No missing elements observed.
	Corrrosion and Weathering:	No corrosion or weathering observed.
End Treatments	**Alignment and Height:**	The alignment of the end treatments is good. The height for both end treatments is 5 in below the 27 in design height.
	Breaking and Cracking:	No breaks or cracks were observed in the end treatments.
	Missing Elements:	No missing end treatment elements observed.
	Corrrosion and Weathering:	No corrosion or weathering observed in end treatments.

Barrier ID:	**LAKE-0112-2.649-L**		
Route Name:	EB ECHO BAY ACCESS ROAD		
Inspection Date:	05/04/2010	**Barrier Rating:**	42.40

Repair Recommendations

Repair Action:	REPAIR	**FMSS Work Type:**	DEFERRED MAINTENANCE	**Repair Cost:**	$9691
Brief Workorder:	Adjust the height of the entire barrier up to 27-in. design height.				
Workorder:	Adjust Guardrail at $10- per -Lin. Ft. for 411 LF = $4110. Adjust the height of the entire barrier. High Speed Traffic Control at $2350- per -Day for 2 Day(s) = $4700.				

2008 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.

Lake Mead National Recreation Area

ROUTE 0112: EB ECHO BAY ACCESS ROAD

Barrier Condition Photos

LAKE_0112_2.649_L_1.jpg

Barrier ID:	**LAKE-0112-3.010-R**		
Route Name:	EB ECHO BAY ACCESS ROAD		
Inspection Date:	05/04/2010	**Barrier Rating:**	41.50

Barrier Description

Type:	W-BEAM STRONG POST	**Barrier Function:**	TRAFFIC
Barrier Material:	WEATHERING STEEL/CORTEN	**Post Material:**	WOOD
Blockout Type:	WOOD	**Length (ft.):**	512
Speed Limit (MPH):	50	**Placement with Respect to Road:**	INSIDE OF CURVE
Hazard Behind Barrier:	HIGH		

Barrier Crashworthiness

Appropriate Test Level:	TL-3	**Barrier Test Level:**	TL-3	**Is Barrier Crashworthy?:**	YES
Beg. End Trtmt Type:	W-BEAM BCT	**Is Beg. End Trtmt Crashhworthy?:**	NO	**Approach Transition Type:**	NONE
Ending End Trtmt Type:	W-BEAM BCT	**Ending End Trtmt Crashhworthy?:**	NO		

Average Measurements

Design Height (In.):	27	**Width (In.):**	0.0	**Post Spacing (In.):**	75.0
Height (In.):	24.0	**Lateral Offset (In.):**	35.0	**Road Grade (%):**	5.00

Physical Condition

Barrier	**Alignment and Height:**	The alignment is acceptable. 449-ft is 3 in below the 27 in design height.
	Breaking and Cracking:	63 ft of barrier has been impacted. 2 posts are cracked more than 1/2 in.
	Missing Elements:	No missing elements observed.
	Corrrosion and Weathering:	No corrosion or weathering observed.
End Treatments	**Alignment and Height:**	The alignment is acceptable. Height is 3 in below the 27 in design height.
	Breaking and Cracking:	The beginning end treatment rail is bent and/scraped for 25 LF.
	Missing Elements:	End treatment cable is not attached.
	Corrrosion and Weathering:	No corrosion or weathering observed in end treatments.

Barrier ID:	**LAKE-0112-3.010-R**		
Route Name:	EB ECHO BAY ACCESS ROAD		
Inspection Date:	05/04/2010	**Barrier Rating:**	41.50

Repair Recommendations

Repair Action:	REPAIR	**FMSS Work Type:**	DEFERRED MAINTENANCE	**Repair Cost:**	$16786
Brief Workorder:	Replace 63 ft. of barrier raise 449 ft. of barrier up to 27-in. design height and reattach the end treatment cable.				
Workorder:	Remove Guardrail at $10- per -Lin. Ft. for 63 LF = $630. Remove the impacted sections of barrier. W-Beam Strong Post at $35- per -Lin. Ft. for 63 LF = $2205. Replace the impacted sections of barrier. Adjust Guardrail at $10- per -Lin. Ft. for 449 LF = $4490. Raise 449 ft. of barrier to 27-in. design height. Replace Post at $100- per -Each for 2 Post(s) = $200. Replace the damaged post. Replace Rail at $25- per -Lin. Ft. for 25 LF = $625. Replace the bent rail on the beginning end treatment. Labor at $60- per -Hour for 1 Hrs = $60. Reattach the cable on the end treatment. High Speed Traffic Control at $2350- per -Day for 3 Day(s) = $7050.				

2008 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.

Lake Mead National Recreation Area

ROUTE 0112: EB ECHO BAY ACCESS ROAD

Barrier Condition Photos

LAKE_0112_3.010_R_1.jpg

Barrier ID:	**LAKE-0114ZZ-0.249-L**		
Route Name:	KA KATHERINE AREA ACCESS ROADS		
Inspection Date:	05/05/2010	**Barrier Rating:**	45.70

Barrier Description

Type:	W-BEAM STRONG POST	**Barrier Function:**	TRAFFIC
Barrier Material:	WEATHERING STEEL/CORTEN	**Post Material:**	CORTEN
Blockout Type:	WOOD	**Length (ft.):**	645
Speed Limit (MPH):	45	**Placement with Respect to Road:**	OUTSIDE OF CURVE
Hazard Behind Barrier:	HIGH		

Barrier Crashworthiness

Appropriate Test Level:	TL-2	**Barrier Test Level:**	TL-3	**Is Barrier Crashworthy?:**	YES
Beg. End Trtmt Type:	W-BEAM FLARED 350 COMPLIANT	**Is Beg. End Trtmt Crashhworthy?:**	YES	**Approach Transition Type:**	NONE
Ending End Trtmt Type:	W-BEAM FLARED 350 COMPLIANT	**Ending End Trtmt Crashhworthy?:**	YES		

Average Measurements

Design Height (In.):	27	**Width (In.):**	0.0	**Post Spacing (In.):**	74.5
Height (In.):	28.2	**Lateral Offset (In.):**	40.0	**Road Grade (%):**	5.40

Physical Condition

Barrier	**Alignment and Height:**	Alignment acceptable. Height within 1-in of 27-in design height.
	Breaking and Cracking:	No breaking or cracking observed.
	Missing Elements:	No missing elements observed.
	Corrrosion and Weathering:	No corrosion or weathering observed.
End Treatments	**Alignment and Height:**	Alignment acceptable. Height within 1-in of 27-in design height.
	Breaking and Cracking:	No breaks or cracks were observed in the end treatments.
	Missing Elements:	No missing end treatment elements observed.
	Corrrosion and Weathering:	More than 8 in of erosion observed for 10 LF at each end treatment.

Barrier ID:	**LAKE-0114ZZ-0.249-L**		
Route Name:	KA KATHERINE AREA ACCESS ROADS		
Inspection Date:	05/05/2010	**Barrier Rating:**	45.70

Repair Recommendations

Repair Action:	REPAIR	**FMSS Work Type:**	DEFERRED MAINTENANCE	**Repair Cost:**	$4785
Brief Workorder:	Add slope paving to fix erosion problems at the end treatments.				
Workorder:	Slope Paving at $125- per -Sq. Yd. for 23 SY = $2875. Slope paving to fix the erosion problems at the end treatments. Low Speed Traffic Control at $1475- per -Day for 1 Day(s) = $1475.				

2008 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.

Lake Mead National Recreation Area

ROUTE 0114ZZ: KA KATHERINE AREA ACCESS ROADS

Barrier Condition Photos

Condition photos are not available for LAKE-0114ZZ-0.249-L.

Barrier ID:	**LAKE-0114ZZ-1.509-L**		
Route Name:	KA KATHERINE AREA ACCESS ROADS		
Inspection Date:	05/05/2010	**Barrier Rating:**	44.00

Barrier Description

Type:	W-BEAM STRONG POST	**Barrier Function:**	TRAFFIC
Barrier Material:	WEATHERING STEEL/CORTEN	**Post Material:**	CORTEN
Blockout Type:	WOOD	**Length (ft.):**	254
Speed Limit (MPH):	45	**Placement with Respect to Road:**	OUTSIDE OF CURVE
Hazard Behind Barrier:	MEDIUM		

Barrier Crashworthiness

Appropriate Test Level:	TL-2	**Barrier Test Level:**	TL-3	**Is Barrier Crashworthy?:**	YES
Beg. End Trtmt Type:	W-BEAM FLARED 350 COMPLIANT	**Is Beg. End Trtmt Crashhworthy?:**	YES	**Approach Transition Type:**	NONE
Ending End Trtmt Type:	W-BEAM FLARED 350 COMPLIANT	**Ending End Trtmt Crashhworthy?:**	YES		

Average Measurements

Design Height (In.):	27	**Width (In.):**	0.0	**Post Spacing (In.):**	76.3
Height (In.):	28.0	**Lateral Offset (In.):**	24.0	**Road Grade (%):**	6.00

Physical Condition

Barrier	**Alignment and Height:**	Alignment acceptable. Height within 1-in of 27-in design height.
	Breaking and Cracking:	No breaking or cracking observed.
	Missing Elements:	No missing elements observed.
	Corrrosion and Weathering:	No corrosion or weathering observed.
End Treatments	**Alignment and Height:**	Alignment acceptable. Height within 1-in of 27-in design height.
	Breaking and Cracking:	No breaks or cracks were observed in the end treatments.
	Missing Elements:	No missing end treatment elements observed.
	Corrrosion and Weathering:	No corrosion or weathering observed in end treatments.

Barrier ID:	**LAKE-0114ZZ-1.509-L**		
Route Name:	KA KATHERINE AREA ACCESS ROADS		
Inspection Date:	05/05/2010	**Barrier Rating:**	44.00

Repair Recommendations

Repair Action:	NO ACTION	**FMSS Work Type:**	N/A	**Repair Cost:**	$0
Brief Workorder:	N/A				
Workorder:					

2008 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.

Lake Mead National Recreation Area

ROUTE 0114ZZ: KA KATHERINE AREA ACCESS ROADS

Barrier Condition Photos

Condition photos are not available for LAKE-0114ZZ-1.509-L.

Barrier ID:	**LAKE-0114ZZ-1.828-L**		
Route Name:	KA KATHERINE AREA ACCESS ROADS		
Inspection Date:	05/05/2010	**Barrier Rating:**	33.90

Barrier Description

Type:	W-BEAM STRONG POST	**Barrier Function:**	TRAFFIC
Barrier Material:	WEATHERING STEEL/CORTEN	**Post Material:**	CORTEN
Blockout Type:	WOOD	**Length (ft.):**	505
Speed Limit (MPH):	45	**Placement with Respect to Road:**	TANGENT
Hazard Behind Barrier:	MEDIUM		

Barrier Crashworthiness

Appropriate Test Level:	TL-2	**Barrier Test Level:**	TL-3	**Is Barrier Crashworthy?:**	YES
Beg. End Trtmt Type:	W-BEAM FLARED 350 COMPLIANT	**Is Beg. End Trtmt Crashhworthy?:**	YES	**Approach Transition Type:**	NONE
Ending End Trtmt Type:	W-BEAM FLARED 350 COMPLIANT	**Ending End Trtmt Crashhworthy?:**	YES		

Average Measurements

Design Height (In.):	27	**Width (In.):**	0.0	**Post Spacing (In.):**	74.6
Height (In.):	27.5	**Lateral Offset (In.):**	22.7	**Road Grade (%):**	5.20

Physical Condition

Barrier	**Alignment and Height:**	Alignment acceptable. Height within 1-in of 27-in design height.
	Breaking and Cracking:	There is 1 post and 1 block that are split.
	Missing Elements:	No missing elements observed.
	Corrrosion and Weathering:	There is only minor rusting on the steel guardrail.
End Treatments	**Alignment and Height:**	Alignment acceptable. Height within 1-in of 27-in design height.
	Breaking and Cracking:	No breaks or cracks were observed in the end treatments.
	Missing Elements:	No missing end treatment elements observed.
	Corrrosion and Weathering:	The ending end had erosion around the last post. The beginning end had minor erosion around posts. It is protected with curb but still should be monitored.

Barrier ID:	**LAKE-0114ZZ-1.828-L**		
Route Name:	KA KATHERINE AREA ACCESS ROADS		
Inspection Date:	05/05/2010	**Barrier Rating:**	33.90

Repair Recommendations

Repair Action:	REPAIR	**FMSS Work Type:**	DEFERRED MAINTENANCE	**Repair Cost:**	$3278
Brief Workorder:	Replace 1 split post and 1 split block. Install 10 ft x 10 ft paving slope to fix erosion at the ending end.				
Workorder:	Replace Post at $100- per -Each for 1 Post(s) = $100. Replace 1 split post. Replace Block at $30- per -Each for 1 Block(s) = $30. Replace 1 split block. Slope Paving at $125- per -Sq. Yd. for 11 SY = $1375. Install slope paving section to fix erosion at ending end. [(10ft)(10ft)]/9 = 11.1 s.y. Low Speed Traffic Control at $1475- per -Day for 1 Day(s) = $1475.				

2008 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.

Lake Mead National Recreation Area

ROUTE 0114ZZ: KA KATHERINE AREA ACCESS ROADS

Barrier Condition Photos

Condition photos are not available for LAKE-0114ZZ-1.828-L.

Barrier ID:	**LAKE-0203-0.077-R**		
Route Name:	LV GOVERNMENT WASH ROAD		
Inspection Date:	05/04/2010	**Barrier Rating:**	39.50

Barrier Description

Type:	W-BEAM STRONG POST	**Barrier Function:**	TRAFFIC
Barrier Material:	WEATHERING STEEL/CORTEN	**Post Material:**	WOOD
Blockout Type:	WOOD	**Length (ft.):**	1155
Speed Limit (MPH):	25	**Placement with Respect to Road:**	OUTSIDE OF CURVE
Hazard Behind Barrier:	MEDIUM		

Barrier Crashworthiness

Appropriate Test Level:	TL-1	**Barrier Test Level:**	TL-3	**Is Barrier Crashworthy?:**	YES
Beg. End Trtmt Type:	W-BEAM BCT	**Is Beg. End Trtmt Crashhworthy?:**	NO	**Approach Transition Type:**	NONE
Ending End Trtmt Type:	W-BEAM BCT	**Ending End Trtmt Crashhworthy?:**	NO		

Average Measurements

Design Height (In.):	27	**Width (In.):**	0.0	**Post Spacing (In.):**	74.8
Height (In.):	24.7	**Lateral Offset (In.):**	41.2	**Road Grade (%):**	0.90

Physical Condition

Barrier	**Alignment and Height:**	38 ft of barrier is more than 6 in. out of alignment in impact area. 24 ft of barrier is 3 to 6 in. out of alignment in second impact area. Barrier is below 27-in. design height by more than 1 to 3 in. for 524 lin ft and below by 3 to 4 in. for 146 lin ft
	Breaking and Cracking:	2 broken blocks and 50 ft of bent rail in impact zones.
	Missing Elements:	No missing elements observed.
	Corrrosion and Weathering:	No corrosion or weathering observed in barrier. 2-in gravel buildup in front of 67-ft. of barrier.
End Treatments	**Alignment and Height:**	Approach end out of alignment by more than 6 in and height is below 27 in design height by 4 inches.
	Breaking and Cracking:	1 broken post and severely bent BCT buffer end in impact zone at approach end.
	Missing Elements:	1 missing block in approach end.
	Corrrosion and Weathering:	No corrosion or weathering observed in end treatments.

Barrier ID:	**LAKE-0203-0.077-R**		
Route Name:	LV GOVERNMENT WASH ROAD		
Inspection Date:	05/04/2010	**Barrier Rating:**	39.50

Repair Recommendations

Repair Action:	REPAIR	**FMSS Work Type:**	DEFERRED MAINTENANCE	**Repair Cost:**	$23353
Brief Workorder:	Replace damaged end treatment 50 ft. of rail 2 blocks and raise 670 ft. of barrier up to the 27 inch design height.				
Workorder:	Replace Rail at $25- per -Lin. Ft. for 50 LF = $1250. Replace 50 feet of damaged rail in 2 impact zones Replace Block at $30- per -Each for 2 Block(s) = $60. Replace 2 broken blocks Adjust Guardrail at $10- per -Lin. Ft. for 670 LF = $6700. Raise 670 ft. of barrier up to 27-in design height. Loader at $125- per -Hour for 4 Hrs = $500. Move 2 inch depth of gravel from in front of 67 linear ft of barrier W-beam flared 350 compliant at $3500- per -Each for 1 Unit(s) = $3500. Replace bent and broken approach end treatment Remove Guardrail at $10- per -Lin. Ft. for 37 LF = $370. Remove impacted end treatment in preparation for the new one. Low Speed Traffic Control at $1475- per -Day for 6 Day(s) = $8850. 3 days to raise guardrail 2 days to replace end treatment 1 day for remaining work.				

2008 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.

Lake Mead National Recreation Area

ROUTE 0203: LV GOVERNMENT WASH ROAD

Barrier Condition Photos

LAKE_0203_0.077_R_1.JPG

Barrier ID:	**LAKE-0233-0.181-R**		
Route Name:	BB LAKE VIEW ROAD		
Inspection Date:	05/04/2010	**Barrier Rating:**	15.00

Barrier Description

Type:	STONE MASONRY WITHOUT CONCRETE CORE WALL	**Barrier Function:**	TRAFFIC
Barrier Material:	STONE	**Post Material:**	N/A
Blockout Type:	N/A	**Length (ft.):**	204
Speed Limit (MPH):	20	**Placement with Respect to Road:**	TANGENT
Hazard Behind Barrier:	MEDIUM		

Barrier Crashworthiness

Appropriate Test Level:	TL-1	**Barrier Test Level:**	NCW	**Is Barrier Crashworthy?:**	NO
Beg. End Trtmt Type:	NONE	**Is Beg. End Trtmt Crashhworthy?:**	N/A	**Approach Transition Type:**	NONE
Ending End Trtmt Type:	NONE	**Ending End Trtmt Crashhworthy?:**	N/A		

Average Measurements

Design Height (In.):	24	**Width (In.):**	32.0	**Post Spacing (In.):**	0.0
Height (In.):	38.7	**Lateral Offset (In.):**	84.0	**Road Grade (%):**	5.80

Physical Condition

Barrier	**Alignment and Height:**	The alignment had less than 6 in of deflection. The height of the barrier is between 37 and 40 in which appears to be the height it was designed to.
	Breaking and Cracking:	No breaking or cracking observed.
	Missing Elements:	No missing elements observed.
	Corrrosion and Weathering:	No corrosion or weathering observed.
End Treatments	**Alignment and Height:**	
	Breaking and Cracking:	
	Missing Elements:	
	Corrrosion and Weathering:	

Barrier ID:	**LAKE-0233-0.181-R**		
Route Name:	BB LAKE VIEW ROAD		
Inspection Date:	05/04/2010	**Barrier Rating:**	15.00

Repair Recommendations

Repair Action:	NO ACTION	**FMSS Work Type:**	N/A	**Repair Cost:**	$0
Brief Workorder:	N/A				
Workorder:	No Action				

2008 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.

Lake Mead National Recreation Area

ROUTE 0233: BB LAKE VIEW ROAD

Barrier Condition Photos

LAKE_0233_0.181_R_1.jpg

LAKE_0233_0.181_R_2.jpg

Barrier ID:	**LAKE-0233-0.247-R**		
Route Name:	BB LAKE VIEW ROAD		
Inspection Date:	05/04/2010	**Barrier Rating:**	24.10

Barrier Description

Type:	STONE MASONRY WITHOUT CONCRETE CORE WALL	**Barrier Function:**	TRAFFIC
Barrier Material:	STONE	**Post Material:**	N/A
Blockout Type:	N/A	**Length (ft.):**	132
Speed Limit (MPH):	20	**Placement with Respect to Road:**	OUTSIDE OF CURVE
Hazard Behind Barrier:	HIGH		

Barrier Crashworthiness

Appropriate Test Level:	TL-1	**Barrier Test Level:**	NCW	**Is Barrier Crashworthy?:**	NO
Beg. End Trtmt Type:	NONE	**Is Beg. End Trtmt Crashhworthy?:**	N/A	**Approach Transition Type:**	NONE
Ending End Trtmt Type:	NONE	**Ending End Trtmt Crashhworthy?:**	N/A		

Average Measurements

Design Height (In.):	24	**Width (In.):**	30.0	**Post Spacing (In.):**	0.0
Height (In.):	30.7	**Lateral Offset (In.):**	40.7	**Road Grade (%):**	0.20

Physical Condition

Barrier	**Alignment and Height:**	The alignment had less than 6-in deflection. Height is between 28-35-in which appears to be the height it was designed to.
	Breaking and Cracking:	No breaking or cracking observed.
	Missing Elements:	No missing elements observed.
	Corrrosion and Weathering:	No corrosion or weathering observed.
End Treatments	**Alignment and Height:**	
	Breaking and Cracking:	
	Missing Elements:	
	Corrrosion and Weathering:	

Barrier ID:	**LAKE-0233-0.247-R**		
Route Name:	BB LAKE VIEW ROAD		
Inspection Date:	05/04/2010	**Barrier Rating:**	24.10

Repair Recommendations

Repair Action:	NO ACTION	**FMSS Work Type:**	N/A	**Repair Cost:**	$0
Brief Workorder:	N/A				
Workorder:					

2008 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.

Lake Mead National Recreation Area

ROUTE 0233: BB LAKE VIEW ROAD

Barrier Condition Photos

LAKE_0233_0.247_R_1.jpg

Barrier ID:	**LAKE-0235-0.011-L**		
Route Name:	CC EL DORADO CANYON ROAD		
Inspection Date:	05/05/2010	**Barrier Rating:**	13.60

Barrier Description

Type:	W-BEAM STRONG POST	**Barrier Function:**	TRAFFIC
Barrier Material:	WEATHERING STEEL/CORTEN	**Post Material:**	WOOD
Blockout Type:	WOOD	**Length (ft.):**	40
Speed Limit (MPH):	35	**Placement with Respect to Road:**	TANGENT
Hazard Behind Barrier:	MEDIUM		

Barrier Crashworthiness

Appropriate Test Level:	TL-2	**Barrier Test Level:**	TL-3	**Is Barrier Crashworthy?:**	YES
Beg. End Trtmt Type:	NONE	**Is Beg. End Trtmt Crashhworthy?:**	N/A	**Approach Transition Type:**	NONE
Ending End Trtmt Type:	NONE	**Ending End Trtmt Crashhworthy?:**	N/A		

Average Measurements

Design Height (In.):	27	**Width (In.):**	0.0	**Post Spacing (In.):**	75.0
Height (In.):	29.0	**Lateral Offset (In.):**	55.7	**Road Grade (%):**	5.80

Physical Condition

Barrier	**Alignment and Height:**	Alignment acceptable. Height within 1-in of 27-in design height.
	Breaking and Cracking:	12.5 ft of rail is bent.
	Missing Elements:	No missing elements observed.
	Corrrosion and Weathering:	No corrosion or weathering observed in barrier. Vegetation in front of barrier.
End Treatments	**Alignment and Height:**	
	Breaking and Cracking:	
	Missing Elements:	
	Corrrosion and Weathering:	

Barrier ID:	**LAKE-0235-0.011-L**		
Route Name:	CC EL DORADO CANYON ROAD		
Inspection Date:	05/05/2010	**Barrier Rating:**	13.60

Repair Recommendations

Repair Action:	REPAIR	**FMSS Work Type:**	DEFERRED MAINTENANCE	**Repair Cost:**	$2118
Brief Workorder:	Replace 13-ft. of bent rail and remove the dirt and vegetation in front of the barrier.				
Workorder:	Replace Rail at $25- per -Lin. Ft. for 13 LF = $325. Replace the damaged rail section. Loader at $125- per -Hour for 1 Hrs = $125. Remove the dirt and vegetation in front of the barrier. Low Speed Traffic Control at $1475- per -Day for 1 Day(s) = $1475.				

2008 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.

Lake Mead National Recreation Area

ROUTE 0235: CC EL DORADO CANYON ROAD

Barrier Condition Photos

LAKE_0235_0.011_L_1.jpg

Barrier ID:	**LAKE-0235-0.020-R**		
Route Name:	CC EL DORADO CANYON ROAD		
Inspection Date:	05/05/2010	**Barrier Rating:**	19.70

Barrier Description

Type:	W-BEAM STRONG POST	**Barrier Function:**	TRAFFIC
Barrier Material:	WEATHERING STEEL/CORTEN	**Post Material:**	WOOD
Blockout Type:	WOOD	**Length (ft.):**	38
Speed Limit (MPH):	35	**Placement with Respect to Road:**	TANGENT
Hazard Behind Barrier:	HIGH		

Barrier Crashworthiness

Appropriate Test Level:	TL-2	**Barrier Test Level:**	TL-3	**Is Barrier Crashworthy?:**	YES
Beg. End Trtmt Type:	NONE	**Is Beg. End Trtmt Crashhworthy?:**	N/A	**Approach Transition Type:**	NONE
Ending End Trtmt Type:	NONE	**Ending End Trtmt Crashhworthy?:**	N/A		

Average Measurements

Design Height (In.):	27	**Width (In.):**	0.0	**Post Spacing (In.):**	74.6
Height (In.):	33.0	**Lateral Offset (In.):**	49.0	**Road Grade (%):**	4.50

Physical Condition

Barrier	**Alignment and Height:**	The alignment is acceptable but the entire length of the barrier is between 4 and 9 in above the 27 in design height.
	Breaking and Cracking:	No breaking or cracking observed.
	Missing Elements:	No missing elements observed.
	Corrrosion and Weathering:	There is a large amount of material built-up at the base of the barrier.
End Treatments	**Alignment and Height:**	
	Breaking and Cracking:	
	Missing Elements:	
	Corrrosion and Weathering:	

Barrier ID:	**LAKE-0235-0.020-R**		
Route Name:	CC EL DORADO CANYON ROAD		
Inspection Date:	05/05/2010	**Barrier Rating:**	19.70

Repair Recommendations

Repair Action:	REPAIR	**FMSS Work Type:**	DEFERRED MAINTENANCE	**Repair Cost:**	$2178
Brief Workorder:	Lower 38 feet of barrier down to the 27 inch design height and remove the dirt and vegetation in front of the barrier.				
Workorder:	Adjust Guardrail at $10- per -Lin. Ft. for 38 LF = $380. Lower 38 feet of barrier down to the 27 inch design height. Loader at $125- per -Hour for 1 Hrs = $125. Remove the dirt and vegetation in front of the barrier. Low Speed Traffic Control at $1475- per -Day for 1 Day(s) = $1475.				

2008 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.

Lake Mead National Recreation Area

ROUTE 0235: CC EL DORADO CANYON ROAD

Barrier Condition Photos

LAKE_0235_0.020_R_1.jpg

LAKE_0235_0.020_R_2.jpg

Barrier ID:	**LAKE-0235-0.028-L**		
Route Name:	CC EL DORADO CANYON ROAD		
Inspection Date:	05/05/2010	**Barrier Rating:**	15.10

Barrier Description

Type:	W-BEAM STRONG POST	**Barrier Function:**	TRAFFIC
Barrier Material:	WEATHERING STEEL/CORTEN	**Post Material:**	WOOD
Blockout Type:	WOOD	**Length (ft.):**	38
Speed Limit (MPH):	35	**Placement with Respect to Road:**	INSIDE OF CURVE
Hazard Behind Barrier:	MEDIUM		

Barrier Crashworthiness

Appropriate Test Level:	TL-2	**Barrier Test Level:**	TL-3	**Is Barrier Crashworthy?:**	YES
Beg. End Trtmt Type:	NONE	**Is Beg. End Trtmt Crashhworthy?:**	N/A	**Approach Transition Type:**	NONE
Ending End Trtmt Type:	W-BEAM BCT	**Ending End Trtmt Crashhworthy?:**	N/A		

Average Measurements

Design Height (In.):	27	**Width (In.):**	0.0	**Post Spacing (In.):**	74.0
Height (In.):	27.5	**Lateral Offset (In.):**	45.7	**Road Grade (%):**	5.80

Physical Condition

Barrier	**Alignment and Height:**	Alignment acceptable. Height within 1-in of 27-in design height.
	Breaking and Cracking:	No breaking or cracking observed.
	Missing Elements:	No missing elements observed.
	Corrrosion and Weathering:	No corrosion or weathering observed.
End Treatments	**Alignment and Height:**	Alignment acceptable. Height within 1-in of 27-in design height.
	Breaking and Cracking:	No breaks or cracks were observed in the end treatments.
	Missing Elements:	No missing end treatment elements observed.
	Corrrosion and Weathering:	No corrosion or weathering observed in end treatments.

Barrier ID:	**LAKE-0235-0.028-L**		
Route Name:	CC EL DORADO CANYON ROAD		
Inspection Date:	05/05/2010	**Barrier Rating:**	15.10

Repair Recommendations

Repair Action:	NO ACTION	**FMSS Work Type:**	N/A	**Repair Cost:**	$0
Brief Workorder:	N/A				
Workorder:					

2008 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.

Lake Mead National Recreation Area

ROUTE 0235: CC EL DORADO CANYON ROAD

Barrier Condition Photos

LAKE_0235_0.028_L_1.jpg

Barrier ID:	**LAKE-0235-0.034-R**		
Route Name:	CC EL DORADO CANYON ROAD		
Inspection Date:	05/05/2010	**Barrier Rating:**	26.60

Barrier Description

Type:	W-BEAM STRONG POST	**Barrier Function:**	TRAFFIC
Barrier Material:	WEATHERING STEEL/CORTEN	**Post Material:**	WOOD
Blockout Type:	WOOD	**Length (ft.):**	33
Speed Limit (MPH):	35	**Placement with Respect to Road:**	OUTSIDE OF CURVE
Hazard Behind Barrier:	MEDIUM		

Barrier Crashworthiness

Appropriate Test Level:	TL-2	**Barrier Test Level:**	TL-3	**Is Barrier Crashworthy?:**	YES
Beg. End Trtmt Type:	NONE	**Is Beg. End Trtmt Crashhworthy?:**	N/A	**Approach Transition Type:**	NONE
Ending End Trtmt Type:	NONE	**Ending End Trtmt Crashhworthy?:**	N/A		

Average Measurements

Design Height (In.):	27	**Width (In.):**	0.0	**Post Spacing (In.):**	74.3
Height (In.):	35.7	**Lateral Offset (In.):**	55.2	**Road Grade (%):**	7.10

Physical Condition

Barrier	**Alignment and Height:**	The alignment has less than 6 in of deflection. The barrier height is between 35 and 37 in which is 8-10-in. above the 27-in. design height.
	Breaking and Cracking:	2 blocks are broken or split.
	Missing Elements:	No missing elements observed.
	Corrrosion and Weathering:	There is a large dirt mound in front of the guardrail that needs to be removed.
End Treatments	**Alignment and Height:**	
	Breaking and Cracking:	
	Missing Elements:	
	Corrrosion and Weathering:	

Barrier ID:	**LAKE-0235-0.034-R**		
Route Name:	CC EL DORADO CANYON ROAD		
Inspection Date:	05/05/2010	**Barrier Rating:**	26.60

Repair Recommendations

Repair Action:	REPAIR	**FMSS Work Type:**	DEFERRED MAINTENANCE	**Repair Cost:**	$2189
Brief Workorder:	Lower 33 ft of guardrail down to 27 inches. Replace 2 broken blocks and remove the dirt mound that is build-up in front of the guardrail.				
Workorder:	Adjust Guardrail at $10- per -Lin. Ft. for 33 LF = $330. Lower 33 ft of guardrail down to 27-in. design height. Replace Block at $30- per -Each for 2 Block(s) = $60. Replace 2 broken blocks. Loader at $125- per -Hour for 1 Hrs = $125. Remove dirt mound with a loader. Low Speed Traffic Control at $1475- per -Day for 1 Day(s) = $1475.				

2008 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.

Lake Mead National Recreation Area

ROUTE 0235: CC EL DORADO CANYON ROAD

Barrier Condition Photos

LAKE_0235_0.034_R_1.jpg

Barrier ID:	**LAKE-0235-1.178-R**		
Route Name:	CC EL DORADO CANYON ROAD		
Inspection Date:	05/05/2010	**Barrier Rating:**	24.00

Barrier Description

Type:	CONCRETE BARRIER	**Barrier Function:**	TRAFFIC
Barrier Material:	CONCRETE	**Post Material:**	N/A
Blockout Type:	N/A	**Length (ft.):**	108
Speed Limit (MPH):	35	**Placement with Respect to Road:**	INSIDE OF CURVE
Hazard Behind Barrier:	HIGH		

Barrier Crashworthiness

Appropriate Test Level:	TL-2	**Barrier Test Level:**	TL-3	**Is Barrier Crashworthy?:**	YES
Beg. End Trtmt Type:	NONE	**Is Beg. End Trtmt Crashhworthy?:**	N/A	**Approach Transition Type:**	NONE
Ending End Trtmt Type:	NONE	**Ending End Trtmt Crashhworthy?:**	N/A		

Average Measurements

Design Height (In.):	32	**Width (In.):**	6.0	**Post Spacing (In.):**	0.0
Height (In.):	32.2	**Lateral Offset (In.):**	13.6	**Road Grade (%):**	1.80

Physical Condition

Barrier	**Alignment and Height:**	The concrete barriers are misaligned slightly but not significantly. The height was within 1-in of the 32-in design height.
	Breaking and Cracking:	9 ft of severe breaking where rebar is visible and 2 ft of moderate breaking where rebar is not visible.
	Missing Elements:	No missing elements observed.
	Corrrosion and Weathering:	There is minor chipping of the concrete and there is graffiti spray-painted on the side.
End Treatments	**Alignment and Height:**	
	Breaking and Cracking:	
	Missing Elements:	
	Corrrosion and Weathering:	

Barrier ID:	**LAKE-0235-1.178-R**		
Route Name:	CC EL DORADO CANYON ROAD		
Inspection Date:	05/05/2010	**Barrier Rating:**	24.00

Repair Recommendations

Repair Action:	REPAIR	**FMSS Work Type:**	DEFERRED MAINTENANCE	**Repair Cost:**	$10379
Brief Workorder:	Replace three 20-foot sections of concrete barrier due to severe breaking exposing rebar. Repaint barrier to cover graffiti.				
Workorder:	Concrete Barrier at $60- per -Lin. Ft. for 60 LF = $3600. Replace 3 (20 feet) sections of concrete barrier. Labor at $60- per -Hour for 16 Hrs = $960. Labor to repaint barrier. Lump Sum - $400 - paint to repaint barrier. Remove Concrete Barrier at $50- per -Lin. Ft. for 60 LF = $3000. Low Speed Traffic Control at $1475- per -Day for 1 Day(s) = $1475.				

2008 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.

Lake Mead National Recreation Area

ROUTE 0235: CC EL DORADO CANYON ROAD

Barrier Condition Photos

LAKE_0235_1.178_R_1.jpg

Barrier ID:	**LAKE-0457ZZ-0.097-L**		
Route Name:	BB CONC LAKE MEAD CRUISES ROADS		
Inspection Date:	05/03/2010	**Barrier Rating:**	5.50

Barrier Description

Type:	CONCRETE BARRIER	**Barrier Function:**	NON-TRAFFIC
Barrier Material:	CONCRETE	**Post Material:**	N/A
Blockout Type:	N/A	**Length (ft.):**	712
Speed Limit (MPH):	25	**Placement with Respect to Road:**	NON-TRAFFIC BARRIER
Hazard Behind Barrier:	N/A		

Barrier Crashworthiness

Appropriate Test Level:	TL-1	**Barrier Test Level:**	N/A	**Is Barrier Crashworthy?:**	N/A
Beg. End Trtmt Type:	NONE	**Is Beg. End Trtmt Crashhworthy?:**	N/A	**Approach Transition Type:**	NONE
Ending End Trtmt Type:	NONE	**Ending End Trtmt Crashhworthy?:**	N/A		

Average Measurements

Design Height (In.):	32	**Width (In.):**	6.0	**Post Spacing (In.):**	0.0
Height (In.):	31.3	**Lateral Offset (In.):**	0.0	**Road Grade (%):**	0.00

Physical Condition

Barrier	**Alignment and Height:**	The two jersey barriers on the end are further from the road than the other barriers. The design height on the barriers is 32 in. 40 ft of barrier is between 29 and 30 in and the remaining is between 31 and 34 ines.
	Breaking and Cracking:	14 ft of cracking deep enough to expose rebar and there is 3 ft of cracking which is present but less severe.
	Missing Elements:	No missing elements observed.
	Corrrosion and Weathering:	There are 3 Jersey barriers that have sediment build-up in front that needs to be removed.
End Treatments	**Alignment and Height:**	
	Breaking and Cracking:	
	Missing Elements:	
	Corrrosion and Weathering:	

Barrier ID:	**LAKE-0457ZZ-0.097-L**		
Route Name:	BB CONC LAKE MEAD CRUISES ROADS		
Inspection Date:	05/03/2010	**Barrier Rating:**	5.50

Repair Recommendations

Repair Action:	REPAIR	**FMSS Work Type:**	DEFERRED MAINTENANCE	**Repair Cost:**	$18700
Brief Workorder:	Replace 7 of the 9 concrete barrier sections that have major breaking or cracking and remove the sediment build-up in front of the barrier.				
Workorder:	Remove Concrete Barrier at $50- per -Lin. Ft. for 140 LF = $7000. Replace 7 of the 9 concrete barrier sections that have large breaks with rebar exposed. Concrete Barrier at $60- per -Lin. Ft. for 140 LF = $8400. Install 7 new concrete barriers to replace the damaged barriers. Loader at $125- per -Hour for 1 Hrs = $125. Remove sediment build-up next to guardwalls with loader. Low Speed Traffic Control at $1475- per -Day for 1 Day(s) = $1475. Approx.				

2008 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.

Lake Mead National Recreation Area

ROUTE 0457ZZ: BB CONC LAKE MEAD CRUISES ROADS

Barrier Condition Photos

LAKE_0457ZZ_0.097_L_1.jpg

LAKE_0457ZZ_0.097_L_2.jpg

Barrier ID:	**LAKE-0457ZZ-0.171-R**		
Route Name:	BB CONC LAKE MEAD CRUISES ROADS		
Inspection Date:	05/03/2010	**Barrier Rating:**	2.90

Barrier Description

Type:	CONCRETE BARRIER	**Barrier Function:**	NON-TRAFFIC
Barrier Material:	CONCRETE	**Post Material:**	N/A
Blockout Type:	N/A	**Length (ft.):**	312
Speed Limit (MPH):	25	**Placement with Respect to Road:**	NON-TRAFFIC BARRIER
Hazard Behind Barrier:	N/A		

Barrier Crashworthiness

Appropriate Test Level:	TL-1	**Barrier Test Level:**	N/A	**Is Barrier Crashworthy?:**	N/A
Beg. End Trtmt Type:	NONE	**Is Beg. End Trtmt Crashhworthy?:**	N/A	**Approach Transition Type:**	NONE
Ending End Trtmt Type:	NONE	**Ending End Trtmt Crashhworthy?:**	N/A		

Average Measurements

Design Height (In.):	32	**Width (In.):**	6.0	**Post Spacing (In.):**	0.0
Height (In.):	32.0	**Lateral Offset (In.):**	0.0	**Road Grade (%):**	0.00

Physical Condition

Barrier	**Alignment and Height:**	The alignment is acceptable but the height was 2 in below the 32 in design height for approximately 40 LF.
	Breaking and Cracking:	There are numerous locations where the barrier is badly chipped and the rebar is exposed.
	Missing Elements:	No missing elements observed.
	Corrrosion and Weathering:	No corrosion or weathering observed.
End Treatments	**Alignment and Height:**	
	Breaking and Cracking:	
	Missing Elements:	
	Corrrosion and Weathering:	

Barrier ID:	**LAKE-0457ZZ-0.171-R**		
Route Name:	BB CONC LAKE MEAD CRUISES ROADS		
Inspection Date:	05/03/2010	**Barrier Rating:**	2.90

Repair Recommendations

Repair Action:	REPAIR	**FMSS Work Type:**	DEFERRED MAINTENANCE	**Repair Cost:**	$9014
Brief Workorder:	Replace the damaged concrete barrier sections (60 ft.) and remove the dirt build-up in front of the barrier.				
Workorder:	Remove Concrete Barrier at $50- per -Lin. Ft. for 60 LF = $3000. Remove three 20-ft sections of damaged concrete barrier. Concrete Barrier at $60- per -Lin. Ft. for 60 LF = $3600. Replace three 20-ft sections of damaged concrete barrier. Labor at $60- per -Hour for 2 Hrs = $120. Remove the dirt build up at the face of 40-ft of the barrier. Low Speed Traffic Control at $1475- per -Day for 1 Day(s) = $1475.				

2008 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.

Lake Mead National Recreation Area

ROUTE 0457ZZ: BB CONC LAKE MEAD CRUISES ROADS

Barrier Condition Photos

LAKE_0457ZZ_0.171_R_1.jpg

Barrier ID:	**LAKE-0916ZZ-0.000-P1**		
Route Name:	CC COTTONWOOD COVE CONCESSION PARKING AREAS		
Inspection Date:	05/05/2010	**Barrier Rating:**	0.00

Barrier Description

Type:	OTHER: CONCRETE BLOCK	**Barrier Function:**	NON-TRAFFIC
Barrier Material:	CONCRETE	**Post Material:**	N/A
Blockout Type:	N/A	**Length (ft.):**	146
Speed Limit (MPH):	15	**Placement with Respect to Road:**	NON-TRAFFIC BARRIER
Hazard Behind Barrier:	N/A		

Barrier Crashworthiness

Appropriate Test Level:	TL-1	**Barrier Test Level:**	N/A	**Is Barrier Crashworthy?:**	N/A
Beg. End Trtmt Type:	NONE	**Is Beg. End Trtmt Crashhworthy?:**	N/A	**Approach Transition Type:**	NONE
Ending End Trtmt Type:	NONE	**Ending End Trtmt Crashhworthy?:**	N/A		

Average Measurements

Design Height (In.):	24	**Width (In.):**	6.0	**Post Spacing (In.):**	0.0
Height (In.):	25.0	**Lateral Offset (In.):**	0.0	**Road Grade (%):**	0.00

Physical Condition

Barrier	**Alignment and Height:**	Alignment acceptable. Height within 3-in of 24-in design height.
	Breaking and Cracking:	No breaking or cracking.
	Missing Elements:	No missing elements observed.
	Corrrosion and Weathering:	No corrosion or weathering observed.
End Treatments	**Alignment and Height:**	
	Breaking and Cracking:	
	Missing Elements:	
	Corrrosion and Weathering:	

Barrier ID:	**LAKE-0916ZZ-0.000-P1**		
Route Name:	CC COTTONWOOD COVE CONCESSION PARKING AREAS		
Inspection Date:	05/05/2010	**Barrier Rating:**	0.00

Repair Recommendations

Repair Action:	NO ACTION	**FMSS Work Type:**	N/A	**Repair Cost:**	$0
Brief Workorder:	N/A				
Workorder:					

2008 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.

Lake Mead National Recreation Area

ROUTE 0916ZZ: CC COTTONWOOD COVE CONCESSION PARKING AREAS

Barrier Condition Photos

LAKE_0916ZZ_0.000_P1_1.jpg

Appendix A
Summary of GIP Definitions and Assessment

Lake Mead National Recreation Area

Federal Lands Highway
Road Inventory Program

Appendix A:
Guardwall/Rail Inventory Program (GIP)
EXPLANATION OF REPORT TERMS

The Guardwall/rail Inventory Program (GIP) was commissioned by WASO to identify deferred maintenance related to barriers in National Parks that have more than one mile of guardwall or guardrail. GIP was designed jointly by the NPS and FHWA and the inventory process records both static characteristics of the barrier (e.g., length, height, etc.) as well as dynamic information about the condition of the barrier.

Barriers that traverse bridges are not included in this inventory, these barriers are covered in FHWA's Bridge Inventory Program (BIP); however, barriers that are approaches to bridges were part of this inventory.

The following discussion highlights each of the elements found in the reports.

Static Barrier Characteristics

BARRIER TYPE

Refers to both the design and the construction materials used:

- W-Beam, Strong Post
- W-Beam, Weak Post
- Thrie Beam/Modified Thrie Beam
- Box Beam
- Steel-Backed Timber, w/ Blockout
- Steel-Backed Timber, w/o Blockout
- Steel-Backed Log Rail
- High Tension Cable
- Three-Strand Cable
- Stone Masonry, w/o Concrete Core Wall
- Stone Masonry, w/ Concrete Core Wall
- Random Rubble Cavity Wall
- Concrete Barrier
- Concrete, with Simulated Stone Face
- W-Beam (Double Face), Strong Post
- Steel-Backed Timber (Double Face)
- Other: *Completed by field crew*

BARRIER MATERIAL

The type of material of which the barrier is composed:

- Cable
- Concrete
- Galvanized Steel
- Log/Timber/Wood
- Steel-Backed Timber/Log
- Weathering Steel/Corten
- Stone
- Other: *Completed by field crew*

LENGTH

The longitudinal distance between the beginning and end of the barrier. It should include the length of end treatments in the overall length of the barrier. For roadside barriers, this can be calculated from the start and end locations.

BARRIER FUNCTION: Traffic or Non-Traffic Barrier.
Due to the different GIP assessment criteria of barriers based on their intended use, barriers were classified as being either traffic barriers or non-traffic barriers.

> *Traffic barriers* are physical devices intended to keep vehicles or people from straying into dangerous or off-limits areas. For the purpose of this inventory and assessment, a traffic barrier is categorized as roadside hardware placed longitudinally, excluding pedestrian railing and fencing.
>
> *Non-traffic barriers* provide a physical delineation between public access areas and restricted or protected areas in locations such as a parking lot, viewpoint or turnout. Non-traffic barriers which inhibit access of vehicles are included in this report; non-traffic barriers which only inhibit access of pedestrians or bicyclists are not included. For the purpose of this inventory, non-traffic barriers are guidewalls and guiderails. Note: rocks, stones, boulders, fences or curbs were excluded from this inventory.

There are instances in parks where a single barrier can switch between being classified as a traffic barrier and a non-traffic barrier. Such instances typically occur at pullouts, where a traffic barrier along the road will continue through the pullout without interruption. In such instances, the traffic barrier and non-traffic barrier were assessed using different criteria. Due to the different criteria, the GIP database was designed to record the traffic barrier and non-traffic barrier as two distinct barriers, even though to the eye, they appear as one barrier. Other instances where a single barrier is split into multiple barriers would be when the barrier is placed continuously along two legs of an intersection, so that one portion of the barrier may be on one road and the remaining portion of the barrier is on a different road.

POST MATERIAL
The type or material that the barrier's supporting posts are made of:

- Galvanized Steel
- Wood
- Corten
- Other: *Completed by field crew*
- N/A

BLOCKOUT TYPE

The type of blockout or of what it is comprised:

- Wood
- Plastic
- Steel
- N/A

BARRIER PLACEMENT WITH RESPECT TO ROADWAY
To identify the roadway alignment the barrier is located upon:

- Tangent
- Inside of Curve
- Both Inside and Outside of Curve
- Outside of Curve

POSTED SPEED LIMIT
The posted speed limit of the roadway section.

HAZARD BEHIND BARRIER

A qualitative description of the severity of the hazard behind the barrier:

- Low
- Medium
- High
- Extreme

APPROPRIATE TEST LEVEL (TL) FOR ROAD

Based on the posted speed limit, the NCHRP 350 Crashworthiness test level appropriate for the roadway.

- TL-1, 30 mph and lower
- TL-2, 35-45 mph
- TL-3, 50 mph and higher

BARRIER TEST LEVEL (TL)

A traffic barrier is crashworthy if it was successfully crash tested under *NCHRP Report 350* at speeds along the park road or parkway or if it was accepted through analysis by FHWA, based on similarity to other crashworthy critical design element features. Non-traffic barriers are classified at N/A.

- TL-1
- TL-2
- TL-3
- No
- N/A – Non-Traffic Barrier

IS BARRIER CRASHWORTHY

This compared the appropriate crashworthy test level required for the posted speed limit to the barrier's test level.

- Yes
- No

BEGINNING END TREATMENT TYPE

An end treatment is safety hardware that mitigates impacts to the ends of a barrier. Most common end treatments are for w-beam systems. Note that stonemasonry barriers typically do not have end treatments.

The beginning end treatment is based on the travel lane closest to the barrier. A vehicle traveling in the lane closest to the barrier will encounter the barrier's beginning end treatment first. It is not based on the RIP primary direction. Identifies the barrier's beginning end treatment type:

- W-Beam Flared 350 Compliant
- W-Beam Tangent 350 Complaint
- W-Beam Buried End
- W-Beam Trailing End/CRG
- W-Beam BCT, Flared
- W-Beam, Turn Down
- SBT/Log, Flared
- SBT/Log, Buried
- Median Treatments
- Box Beam
- Cable
- Crash Cushions/Attenuator
- Other: *Completed by field crew*
- None

IS BEGINNING END TREATMENT CRASHWORTHY

Identifies if the barrier's beginning end treatment (based on direction of travel for the travel lane closest to barrier) is crashworthy, based on NCHRP-350.

- Yes
- No
- N/A

APPROACH TRANSITION TYPE

A transition is safety hardware designed to be placed between two different types of barrier. Most common transition types are between bridge rail and w-beam systems.

This identifies the barrier's transition type:

- Bridge Rail, W-Beam
- Bridge Rail, SBT
- Rigid W-Beam, W-Beam
- Rigid SBT (Wall), SBT
- Concrete/Masonry, W-Beam
- Concrete/Masonry, SBT
- Concrete/Masonry, Thrie Beam
- Other: *Completed by field crew*
- None

ENDING END TREATMENT TYPE

The ending end treatment is based on the travel lane closest to the barrier. A vehicle traveling in the lane closest to the barrier will encounter the barrier's ending end treatment last, after passing the rest of the barrier. It is not based on the RIP primary direction. Identifies the barrier's ending end treatment type:

- W-Beam Flared 350 Compliant
- W-Beam Tangent 350 Complaint
- W-Beam Buried End
- W-Beam Trailing End/CRG
- W-Beam BCT, Flared
- W-Beam, Turn Down
- SBT/Log, Flared
- SBT/Log, Buried
- Median Treatments
- Box Beam
- Cable
- Crash Cushions/Attenuator
- Other: *Completed by field crew*
- None

IS ENDING END TREATMENT CRASHWORTHY

Identifies if the barrier's ending end treatment (based on direction of travel for the travel lane closest to barrier) is crashworthy, based on NCHRP-350.

- Yes
- No
- N/A

BARRIER DESIGN HEIGHT

Identifies the barrier's original "as-built" design height:

- 27-in, W-beam, Steel-Backed Timber, Stone Masonry w/ Concrete Core Wall
- 24-in, Stone Masonry w/o Concrete Core Wall, Log on Log
- 20-in, Timber on Wood Posts, Timber on Concrete Posts, Timber on Granite Posts
- 18/24-in, Crenellated Stone Masonry Barrier
- 18/24-in, Dry Stack Stone Wall
- 31-in, Steel-Backed Log
- 32-in, Jersey Barrier

AVERAGE MEASUREMENTS

Minimum of three measurements taken on each barrier.

First measurement approximately 50-ft from the beginning of the barrier, measured from the extreme ends of the barrier's end treatment/transition. Do not take a measurement along the end treatment
Measure and record measurement every 200-ft thereafter for the run of barrier

Last measurement approximately 50-ft from the end of the barrier. Do not take a measurement along the end treatment
If a barrier is less than 300-ft, even say 45-ft, a minimum of three measurements were still taken.

AVERAGE WIDTH

The width of the barrier. Only recorded for guardwalls; not guardrail.

AVERAGE POST SPACING

The spacing of the barrier's (not the end treatments') posts. Only recorded for guardrails; not guardwalls or non-traffic barriers.

AVERAGE BARRIER HEIGHT

The average barrier height. If the barrier has crenellations, the height is measured in the non-crenellated sections of the barrier. If the average lateral offset is less than or equal to 4-ft, average barrier height is measured from the roadway; if the average lateral offset is greater than 4-ft, average barrier height is measured at the barrier face.

AVERAGE LATERAL OFFSET

Determine the average distance between the barrier and the edge of roadway. If a white edgeline is present on the roadway, average lateral offset is measured from the outside edge of the white line to the barrier face. If no white edgeline is present, average lateral offset is measured from the edge of pavement to the barrier face.

AVERAGE ROAD GRADE and UPHILL OR DOWNHILL

Determine an average roadway grade at each barrier location, based on the direction of travel in the lane closest to the barrier.

DYNAMIC BARRIER CHARACTERISTICS – CONDITION ASSESSMENT NARRATIVES

Field crews were directed to write a narrative of the barrier's physical condition. To keep consistency between field crews, all narratives were based on severity and distress criteria, which were developed jointly by the NPS and FHWA. Condition assessments were based on barrier type and can be found directly after this description of report elements.

BARRIER ALIGNMENT/HEIGHT

Narrative completed by field crew describing the barrier's alignment and height. Height comments are based on the barrier's original "as-built" design height.

BARRIER BREAKING/CRACKING

Narrative completed by field crew describing any barrier breaking or cracking found during the inspection.

BARRIER MISSING ELEMENTS

Narrative completed by field crew describing any barrier missing elements encountered during the inspection.

BARRIER CORROSION/WEATHERING

Narrative completed by field crew describing and corrosion or weathering issues associated with the barrier.

END TREATMENTS ALIGNMENT/HEIGHT

Narrative completed by field crew describing the barrier end treatment's alignment and height, when present. Height comments are based on the end treatment's original "as-built" design height.

END TREATMENTS BREAKING/CRACKING

Narrative completed by field crew describing any barrier end treatment's breaking or cracking found during the inspection.

END TREATMENTS MISSING ELEMENTS

Narrative completed by field crew describing any barrier end treatment missing elements encountered during the inspection.

END TREATMENTS CORROSION/WEATHERING

Narrative completed by field crew describing and corrosion or weathering issues associated with the barrier's end treatments.

BARRIER PHOTOGRAPHS

During the inspection, the field crews photographed the beginning end (based on the closest lane's direction of travel) of each barrier. Additional photographs were taken of any unusual deficiencies encountered. Up to two photographs of the barrier are included in this report.

CONDITION AND SEVERITY DISTRESS TABLES

Due to the extreme number of possible conditions of the barrier, transition and end treatment, the following descriptions and matrices are guidelines created to help classify the condition of the element. While the distinction between good and fair is needed, the distinction between fair and poor is much more important since this is the threshold that defines if the element is slightly compromised or is not functional.

In all likelihood, according to these guidelines different portions of an element (most likely a barrier) may be classified differently; however, a single classification will need to be provided for the element. The survey team will use their professional judgment to determine this single classification. The single classification of each element should be considered an index value that provides a general indicator of overall performance, but not necessarily indicate that a specific treatment is warranted. The specific work order that is prepared based on the observed deficiencies will be a much more definitive indicator of the appropriate treatment based on existing distresses. The overall condition will be used as part of the risk assessment tool to evaluate the risk to driver safety associated with the physical condition of the barrier.

GOOD

The barrier performs as intended. The barrier is in fairly straight alignment but may have some small amount that is slightly out of alignment. While the height of the barrier may vary over its run, the height is relatively consistent and is close to its original "as-built" design height. Minor cracks may be visually observed on some the posts, though these cracks are neither long nor deep and the only hardware missing are isolated nuts and bolts. Minor surface corrosion on small portions of the surface is visible but there is no decay associated with connections.

The end treatment performs as intended. The end treatment is in good alignment and tension is acceptable. While the end treatment may exhibit some dents, there are no cracked rails, posts, blocks or any missing elements. Corrosion and erosion, while present, are at a minimum.

In general, all distresses observed, either in isolation or in combination, do not seriously affect the ability of the element to serve the intended functions of protecting drivers from a roadside hazard and/or contributing to the cultural value of the roadway corridor. Keep in mind that "intended function" is a relative term. In many cases, older designs were "intended" to protect drivers but would not be considered fully functional in that regard by today's standards.

FAIR

The barrier is slightly compromised. The barrier is noticeably out of alignment and the height along the run of barrier varies considerably. Cracks and broken elements are visible from the roadside. The barrier may be missing elements, such as nuts, bolts, blockouts or even a post. Surface corrosion is visible on a fair amount of the barrier but connections will still provide element interlock. Decay and minor erosion, while not always visible, may begin to reduce element strength and individual post stability.

The end treatment is slightly compromised. The end treatment may be somewhat out of alignment, have low cable anchor tension or isolated broken or cracked rail, posts or blocks. Corrosion and erosion are evident.

In general, the distresses observed, either in isolation or combination, may generate unpredictable outcomes related to the functions of the element stated above.

POOR

The barrier is not functional. The barrier will not function as intended. Any of the following could mean that the barrier is in poor condition: The barrier has fallen out of alignment or its height varies greatly from the designed height. Cracks and broken elements are visible from the roadside. The barrier is missing several elements, such as nuts, bolts, blockouts or consecutive posts. Corrosion, causing structural compromise is significant and obvious. Erosion around posts will reduce the barrier's strength and capacity.

The end treatment is not functional. The end treatment does not function as intended. There is no tension in the cable anchor. A significant portion of the end treatment has broken, cracked or dented elements. Elements are missing and corrosion or erosion is significant.

In general, the distresses observed clearly illustrate the inability of the element to perform the intended functions.

CONDITION AND SEVERITY DISTRESS TABLES – BARRIERS

Condition and Severity Distress Table for Semi-Rigid Barriers (including barriers with posts, rail elements and blocks).

	GOOD	FAIR	POOR
Alignment/Design Height			
	• Alignment off by less than 6”	• Alignment off by 6”-12”	• Alignment off by more than 12”
	• Within 1” of ***design height***	• Less than 3” lower than ***design height***	• Greater than 3” lower than ***design height***
Breaking/Cracking, an member, post or rail – due to impact loading			
	• Metal – no twisting/bending, tears or cracking	• Metal – no cracking or tearing (but minor twisting/bending is ok)	• Metal – any cracks or tears
	• Wood – no impact related cracking	• Wood – maybe cracked but retains original cross section	• Wood – cracks or tears that deform original section
	• Isolated broken blocks	• Two Consecutive broken blocks	• Consecutive broken blocks (three or more consecutive)
Missing Elements			
	• No bolts and nuts missing	• One or two bolt/nut missing at one rail/rail connection	• Three or more bolts/nuts missing at one rail/rail connection
	• n/a	• Two consecutive missing blocks	• Three or more consecutive missing blocks
	• n/a	• n/a	• One missing rail element or post
Corrosion/Decay/Weathering, all posts, rails and blocks – due to aging			
	• Loss of 5% or less of cross section	• Loss of 5% to 50% of cross section	• Loss of 50% or more of cross section
	• Erosion (less than 8” of post exposed below original groundline)	• Erosion around posts (8” or more of post exposed below original groundline) for one	• Erosion around consecutive posts (more than 8” of post exposed below original groundline)

Condition and Severity Distress Table for Rigid Concrete Barriers (including pre-cast).

	GOOD	FAIR	POOR
Alignment/Design Height			
	• Alignment off by less than 6”	• Alignment off by 6”-12”	• Alignment off by more than 12”
	• Within 1” of *design height*	• Less than 3” lower than *design height*	• Greater than 3” lower than *design height*
Breaking/Cracking– due to impact loading			
	• Minor cracks (less than ¼”) present	• Cracking present ¼” or greater but no displacement or discontinuity in face	• Barrier displaced and/or discontinuous
	• n/a	• Pieces broken from barrier 3” deep or less without exposing rebar	• Cracking exposes rebar
	• n/a	• n/a	• Pieces broken from face greater than 3” deep
Missing Elements			
	• n/a	• n/a	• n/a
Corrosion/Decay/Weathering – due to aging			
	• Surface corrosion on less than 5% of the run	• Surface corrosion on between 5-25% of the run	• Surface corrosion on more than 25% of the run
	• n/a	• Spalling 3” deep or less without exposing rebar	• Spalling greater than 3” deep
	• Erosion (less than 8” below groundline) around base	• Erosion (8” or more below groundline) around base	• Erosion (8” or more below groundline)
	• n/a	• Less than 50% undermined (less than half barrier width)	• 50% or more undermined (less than half barrier width)

Condition and Severity Distress Table for Rigid Stone/Masonry Barriers (including all types of stone or masonry barriers).

	GOOD	FAIR	POOR
Alignment/Design Height			
	• Alignment (off by less than 6”)	• Alignment (off by 6”-12”)	• Alignment (off by more than 12”)
	• Within 3” of *design height*	• Between 3.1 - 6” lower than *design height*	• Greater than 6.1” lower than *design height*
Breaking/Cracking – due to impact loading			
	• Minor cracks (less than ¼”) present	• Cracks, less than ½” present	• Cracks greater than ½” present
		• Stones broken/displaced extending less than 1/3 of width of barrier	• Stones broken/displaced extending 1/3 width or more through the barrier
Missing Elements			
	• n/a	• n/a	• n/a
Corrosion/Decay/Weathering – due to aging			
	• Cracks in mortar joints 1/4” or less and/or single loose or missing stones	• Mortar joints deteriorated resulting in two - three loose or missing adjacent stones (without impact)	• Mortar joints deteriorated resulting in more than three continuous/adjacent loose or missing stones (without impact)
	• Erosion (less than 8” below groundline) around base	• Erosion (8” or more below groundline) around base	• Erosion (8” or more below groundline)
	• n/a	• Less than 50% undermined (less than half barrier width)	• 50% or more undermined (less than half barrier width)

Condition and Severity Distress Table for Flexible Barriers, (including cable barriers and weak-post systems designed without blocks).

	GOOD	FAIR	POOR
Alignment/Tension/Design Height			
	• No bent posts	• Bent posts; one to three consecutive posts	• Bent posts; four or more consecutive posts
	• Cable has tension	• Cable under-tensioned/sagging	• No cable tension
	• Less than 1” too low	• 1-3” too low	• Greater than 3” too low
Breaking/Cracking			
	• No cracked or broken posts	• One to three isolated broken posts	• Four or more consecutive broken posts
	• n/a	• Cable frayed	• Cable broken or severed
Missing Elements			
	• No bolts and nuts missing at anchors	• n/a	• Bolts and nuts missing or loose at anchors
	• n/a	• n/a	• Any missing posts or cable for any length of run
Corrosion/Decay/Weathering – due to aging			
	• Loss of 5% or less of cable cross section	• Loss of 5% to 15% of cable cross section	• Loss of 15% or more of cross section
	• Erosion (less than 8” of post exposed below original groundline)	• Erosion around one post (8” or more of post exposed below original groundline)	• Erosion around consecutive posts (more than 8” of post exposed below original groundline)

CONDITION AND SEVERITY DISTRESS TABLES – END TREATMENTS

Condition and Severity Distress Table for Flexible End Treatments, (including cable end terminals).

	GOOD	FAIR	POOR
Alignment/Tension			
	• Alignment off by less than 4”	• Alignment off by 4”-8”	• Alignment off by more than 8”
	• Adequate cable tension	• Low cable anchor tension	• No cable anchor tension
Breaking/Cracking – due to impact loading			
	• No broken or cracked elements	• Minor cable fraying but still with adequate tension	• Broken or cracked cables or posts
	• No damage to posts, cable or anchor	• Slight damage to posts without cracking or tearing (*but minor twisting/bending on isolated posts is OK)*	• Cable broken or severed on any cable
Missing Elements			
	• No bolts and nuts missing at anchors; No missing cables	• n/a	• Any missing element (post, cable, bolts, nuts, or anchor)
Corrosion/Decay/Weathering – due to aging			
	• Loss of 5% or less of cable cross section	• Loss of 5% to 15% of cable cross section	• Loss of 15% or more of cross section
	• Connections weathered but still provide element interlock on less than 5% of the end treatment	• Connections weathered but still provide element interlock on between 5% to 15% of the end treatment	• Connections weathered but still provide element interlock on more than 15% of the end treatment

Condition and Severity Distress Table for Semi-Rigid End Treatments, including Flared and Tangent

	GOOD	FAIR	POOR
Alignment/Tension			
	• Alignment of flares and offsets off by less than 4”	• Alignment of flares and offsets off by 4”-8”	• Alignment of flares and offsets off by more than 8”
	• Within 1” of ***design height***	• Less than 3” lower than ***design height***	• Greater than 3” lower than ***design height***
For *Aesthetic Barriers* (i.e. – SBT and SBL guardrail) that do not have crashworthy terminals:	• Approach barrier terminals are buried, anchored, and flared away from the travel lane	• Approach barrier terminals are buried, anchored, and flared away from the travel lane	• Approach barrier ends are NOT buried, anchored, nor flared away from the travel lane
Breaking/Cracking – due to impact loading			
	• Metal – no twisting/bending, tears or cracking	• Metal – no cracking or tearing (but minor twisting or bending is ok)	• Metal – any cracks or tears
	• Wood – no impact related cracking	• Wood – maybe cracked but retains original cross section	• Wood – cracks or tears that deform original section
	• No broken blocks	• One broken block	• Two consecutive broken blocks
Missing Elements			
	• No missing elements, including breakaway cables and struts	• Isolated bolts, nuts, or blocks loose on non-consecutive posts	• Any missing element, including blocks, rails, posts cables, or struts
	• No bolts, nuts, or blocks missing or loose	• Breakaway strut present but vertical height off by more than 2”	• Missing nuts / bolts on consecutive posts
Corrosion/Decay/Weathering – due to aging			
	• Surface corrosion / decay / connections weathered with a loss of 5% or less of cross section of interlocking elements	• Surface corrosion / decay / connections weathered with between 5-25% loss of cross section along transition interlocking elements	• Surface corrosion / decay / connections weathered with more than 25% loss of cross section along transition interlocking elements
	• Erosion (less than 8” of post exposed below original groundline)	• Erosion around 1 post (8” or more of post exposed below original groundline)	• Erosion around consecutive posts (8” or more of post exposed below original groundline)

SPECIFIC RISK ELEMENTS

The potential risk to a motorist after a vehicle impacts a traffic barrier depends on the crashworthiness of the traffic barrier as well as traffic exposure factors. Variables relating to the roadside, the traffic barrier's crashworthiness and traffic data include the following:

ADT. The number of vehicles (in both directions) that travel the roadway on which the traffic barrier is located.

Barrier Crashworthy. A traffic barrier is crashworthy if it was successfully crash tested under NCHRP Report 350 at speeds along the park road or parkway or if it was accepted through analysis by FHWA, based on similarity to other crashworthy critical design element features. If crashworthy, the appropriate test level also needs to be recorded. For crashworthy barriers, the barrier test level will be compared to the test level appropriate for the roadway (based solely on posted speed limit). The intent is to record situations in which a crashworthy barrier of a lower test level is installed on a roadway which should have a barrier of a higher test level.

Barrier Height. Determined from barrier height as collected in the physical condition assessment. The database will compare this value to the NCHRP test level height that is appropriate for the posted speed of the road and barrier type.

End Treatment Crashworthy. An end treatment is crashworthy if it has been successfully crash tested. This is for the approach end treatment, which is defined as the end treatment which a vehicle will first pass when traveling on the same side of the road as the barrier.

Existing Roadway Features. The list of roadway features is limited to the following, all of which have a documented history of reducing the number of crashes, and are found later in the GIP as possible countermeasures.

Centerline pavement markings	Grooved pavement surface
Edgeline pavement markings	Delineators on curve and tangent
Wider centerline	Chevrons
Wider edgeline	Warning sign
Centerline rumble strips	Flashing beacon on warning sign
Shoulder rumble strips	Lighting
Barrier reflectors	Speed feedback sign

Factored Crash Rate. The average annual number of crashes (on the overall road and by barrier segment), over the last 5 years. If the road has an ADT of less than 1000, evaluate a minimum of
7 to 10 years of crash data, if available.

Lateral Offset of Barrier from Edge of Traveled Way. The distance from the edge of traveled way to the face of the barrier is useful for determining impact to asset during different types of construction. Two or three measurements will be taken – beginning, middle and end of barrier run (not including the end treatments) – and the average will be used.

Posted Speed Limit. The posted speed limit(s) of the roadway section.

Roadway Grade and Uphill or Downhill. Is refers to the grade of the roadway, in the direction of travel closest to the barrier.

Severity of the Hazard behind Barrier. A rating system based on photos will be used to rate the severity of the hazard behind the barrier. Choices include:

- Low
- Medium
- High
- Extreme

RISK ASSESSMENT AND RISK SCORE

The following table shows the variables relating to the overall roadway safety in the vicinity of barriers. In addition, the table illustrates the range of values considered for each variable and associated levels of risk. For categorization purposes, variables have been placed into one of three categories: segment, site or barrier variables. The "Associated Risk" column identifies the relative risk posed by each variable. This looks at the relative risk of the each variable itself and is only a cursory evaluation.

A Risk Score or Rating ("Barrier Rating" on Tier 3 Barrier page) was created for each barrier based on the table values. The level of risk tolerated is dependent on the category of road, which will be discussed in subsequent pages.

Once the inventory has been conducted, a total risk value can be assigned to each barrier. A comparison of the relative risk to an acceptable risk threshold will be performed in order to analyze the overall risk of a given barrier.

Variable and Associated Levels of Risk

VARIABLE	RANGE	ASSOCIATED RISK
SEGMENT VARIABLES		
ADT	0 – 1000	0.0
	1001 – 4000	2.9
	4001 – 8000	5.7
	8001 – 20,000	7.1
	20,001 and greater	8.6
Crash Factor	0	0.0
	0.1 – 5.0	4.2
	5.1 – 20.0	8.7
	20.1 – 30.0	17.1
	30.1 – 75.0	25.8
	75.1 and greater	34.2
Posted Speed Limit	15 – 25 mph	0.0
	30 – 40 mph	4.3
	45 and higher	8.6
SITE VARIABLES		
Barrier Placement w/ Respect to Roadway Geometry	Tangent	0.0
	Inside of curve	2.9
	Both inside and outside of curve	8.6
	Outside of curve	8.6
Severity of Hazard behind the Barrier	Low severity	2.6
	Medium severity	5.1
	High severity	6.9
	Extreme severity	8.6
Longitudinal Length of Barrier	1 – 250-ft	0.0
	251 – 750-ft	2.9
	751 – ft and greater	5.7
Lateral Offset of Barrier from Edge of Traveled Way	4.1 – ft and greater	0.0
	2 – 4-ft	2.9
	less than 2-ft	5.7
Roadway Grade	Uphill/level/downgrade less than 3%	0.0
	Mild downgrade (3 – 6%)	4.3
	Steep downgrade (greater than 6%)	8.6
BARRIER VARIABLES		
Actual Barrier Height (compared to test level height)	0 – 1-in lower	0.0
	1.1 – 4-in lower	4.4
	4.1 – 7-in lower	12.9
	7.1 – 12-in lower	19.4
	12.1-in and greater lower	21.5
Dynamic Barrier Condition Rating (based on design height)	0 – 25	0.0
	26 – 200	4.4
	201 – 400	8.6
	401 – 600	12.9
	601 – 800	17.1
	801 and above	21.5
Barrier Conformance with Current Crashworthiness Criteria	Yes	0.0
	No	5.7
	Maximum Total Possible Risk Score	**100**

REPLACEMENT/REPAIR STRATEGIES

Information is integrated by combining static data on barrier type, materials, dimensions, etc. with the condition and risk assessments, and the asset management roadway categories (which include cultural and historic resource considerations) to come up with actionable repair strategies for barriers. In addition, repair costs are accounted for so that estimates can be made for repair actions identified. Costed repair estimates, or work orders, then form the basis for estimating deferred maintenance associated with roadside barriers.
Repair recommendations generated by this assessment are intended to provide an estimated cost of deferred maintenance of barriers. As such, the evaluation is not rigorous and may be changed when a more detailed review and assessment at a project level is completed. In addition, any repairs or replacements that are recommended by this inventory and assessment process must be vetted through a project selection, planning and design process, including compliance with the National Historic Preservation Act (NHPA) and the National Environmental Policy Act (NEPA).

Many park barriers are located in harsh environments where freeze-thaw cycles, avalanche impacts, surface erosion, rockfall and vehicle impacts damage them; consequently, they are showing signs of fatigue, at times serious. Whenever possible, historic barriers are repaired or rehabilitated in place so that the historic significance can be preserved; however, removal or reconstruction, which is typically the least preferred alternative, is at times necessary.

Barrier deficiencies can generally be categorized into one of two categories:

- Barriers that pose an unacceptable risk to the traveling public (as determined by the risk assessment methods described in Chapter Seven and including standards found in NCHRP Report 350), or
- Damaged barriers, due to either crash impacts, other loadings (e.g., snow / avalanche, etc) or deteriorated parts (from age / weathering).

Outside of the national park system, barriers that do not meet NCHRP Report 350 crashworthiness standards are typically removed and a barrier of a crashworthy design is constructed in its place. However given the sensitive natural and cultural environments found within the national park system, deficient barriers not meeting national crashworthiness standards may warrant no action, particularly where risk is low.

The type of repair strategy is often dependent on the barrier deficiency and its cultural context. Typically barriers that do not meet current crashworthiness criteria may be replaced while damaged or deteriorated barriers can be repaired. However, under unique situations found in certain national parks and as evaluated using the risk assessment and asset management roadway categories, some barriers that do not meet current crashworthiness criteria may warrant no action being taken for their replacement or repair.

Risk assessment and asset management roadway categories are integrated in the following table, which establishes different risk thresholds within each roadway category. In essence, a higher level of risk will be tolerated in Asset Management Roadway Category A, as demonstrated by the higher risk threshold (90), while less risk will be tolerated in Roadway Category B (70) and even less risk in Roadway Category C (50).

Asset Management Roadway Categories, Risk Thresholds and Treatment Recommendations.

ASSET MANAGEMENT ROADWAY CATEGORY	RISK THRESHOLD	PROGRAM-LEVEL TREATMENT RECOMMENDATION
A	90-100	1. Identify measures other than barrier replacement that could be taken to reduce risk (including engineering countermeasures). 2. Corrective action (including reconstruct/replacement, if necessary) needed to reduce risk below 90.
	Below 90	1. Identify measures that could be taken to reduce risk (including engineered countermeasures). 2. Identify repairs needed to improve physical condition/maintain historic integrity. 3. When condition is good and risk is acceptable, no action is necessary.
B	70-100	1. Identify measures that could be taken to reduce risk (including engineered countermeasures). 2. Corrective action (including reconstruct/replacement, if necessary) needed to reduce risk below 70.
	Below 70	1. Identify measures that could be taken to reduce risk (including engineered countermeasures). 2. Identify repairs needed to improve physical condition/maintain historic integrity. 3. When condition is good and risk is acceptable, no action is necessary.
C	50-100	1. Identify measures that could be taken to reduce risk (including engineered countermeasures). 2. Corrective action (including reconstruct/replacement, if necessary) needed to reduce risk below 50.
	Below 50	1. Identify measures that could be taken to reduce risk (including engineered countermeasures). 2. Identify repairs needed to improve physical condition/maintain historic integrity. 3. When condition is good and risk is acceptable, no action is necessary.

Fourteen engineering countermeasures have been specifically selected for use with the GIP risk assessment tool, and are show in the next table. This is an all-inclusive list of available countermeasures for the risk assessment toll; countermeasures not on the list should not be considered.

The concept of employing countermeasures is evident with barriers that have a risk score just above the risk threshold. For such barriers, installing countermeasures should reduce the future number of crashes by a given amount, based on the countermeasure. Depending on the factored crash rate, reducing the number of crashes will lower the overall risk score. Thus, barriers that were classified as “reconstruct/replace” may be able to be reclassified as “repair”.

The decision to include any of the engineering countermeasures can be done only when the risk score is over the risk threshold by three points or less. When countermeasures are employed to reduce the risk score, they must be based on engineering judgment. The GIP database will allow the user to select up to three countermeasures to reduce the risk score under the threshold, based on crash reduction factors from the FHWA publication “Desktop Reference for Crash Reduction Factors” FHWA-SA-07-015.

Proposed Countermeasures.

COUNTERMEASURE	CRASH REDUCTION FACTOR
Speed Feedback Signs	0.46
Flashing Beacons On Warning Signs	0.30
Centerline Pavement Marking	0.30
Lighting	0.25
Chevrons	0.20
Warning Signs	0.20
Barrier Reflectors	0.16
Grooved Pavement Surface	0.15
Edgeline Pavement Marking	0.12
Shoulder Rumble Strips	0.12
Delineators on Curve and Tangent	0.05
Centerline Rumble Strips	0.04
Wider Edgeline	0.02
Wider Centerline	0.02

Maintaining Barriers As Is

Individual barrier elements and roadside conditions are interrelated. Sometimes, barrier deficiencies will be obvious and the best course of action is apparent; however, in context sensitive environments barrier deficiencies may be marginal and a decision will be based on judgment.

If risk is low (as determined by the assessment of variables such as traffic speeds, volumes), it may be acceptable for an historical or culturally significant barrier that does not meet current crashworthiness standards to remain until changes in risk factors would require an upgrading.

If the maintaining barrier as is alternative is the preferred choice through this approach, low cost mitigation measures may be considered to improve safety, such as improving roadside delineation (e.g., pavement markings / rumble strip(e)s, etc.), improving visibility (e.g., advance warning signs, increased sign size, etc.), upgrading the roadway shoulder, or improving skid resistance of the road surface. Although these measures will not reduce crash severity of an errant vehicle impact, these improvements have been tried or proven to reduce the frequency or probability of a vehicle striking the barrier.

Barrier Repair

If a barrier has been damaged due to a crash or there are parts that have deteriorated due to age or weathering but the majority of the barrier meets current crashworthiness standards and is functionally sound, repairing the system can be considered a viable option. Examples of these improvements include replacing damaged timber rail, removing a corroded, weathered steel post and replacing with new, upgraded guardrail blockouts to meet standards on high speed facilities or repointing, resetting or replacing loose or missing stones on the concrete corewalls of stone masonry guardwalls. Pursuing a repair approach should be the first consideration for Roadway Category A and B road assets.

For barriers that do not meet crashworthiness criteria but are functionally sound and have been determined good candidates to be maintained as-is based on the risk assessment and application of asset management roadway categories, repair could include measures such as repointing deteriorated masonry, re-setting or replacing loose, broken or missing stones, restoring walls to their original height (by adding a concrete footing, for example), restoring or improving drainage through or under walls or restoring wall foundations. Alterations to improve safety may also be considered, such as adding or changing end treatments or other mitigation measures as mentioned above.

For historic, stone masonry barriers that have a risk score below the threshold, it is possible that portions of the barrier need to be removed and reset in order increase the height of the barrier. The following guidelines are provided to assist in determining when this should be done and to what height the barrier should be rebuilt:

1. If all or a portion of stone masonry guardwall has a deficient height based upon the Severity Description Charts, that is, at worst, within the fair category, do not raise it. (Other work besides raising the barrier can be specified.)

2. If a portion of a stone masonry guardwall has a deficiency in height based upon the Severity Description Charts, considered "poor" (assumed typically to be less than 18-in) write a work order to raise the poor segment to the height of the adjacent barrier with a non-poor height.

3. If the entire stone masonry guardwall is in poor condition due to height based upon the Severity Description Charts– write a work order to raise the entire segment to its design height (assumed typically to be 24-in).

For aesthetic barrier systems used on many park roads and parkways, there is not a sufficient bid history database for estimating costs to repair or replace individual elements of the system, such as posts or rail. Usually repair of an aesthetic barrier system, such as steel-backed timber guardrail consists of removing and resetting the post or rail section or raising the guardrail to meet standard height requirements.

Barrier Replacement/Reconstruction

If the risk analysis, including the application of asset management roadway categories, indicates the barrier poses an unacceptable safety risk, the first step should be an analysis to determine if there are mitigating measures that can be applied to reduce the risk to an acceptable level without the need to reconstruct the barrier. A second step is to determine if the barrier is needed. If it is practical to eliminate the shielded hazard (by removal, relocation or redesign) removal of the barrier should be considered. However, if the shielded hazard cannot be eliminated or if it is determined inappropriate to remove the barrier (e.g., it is historically significant and/or contributes to the historical or aesthetic significance of the associated road, district or landscape), reconstruction or replacement of the barrier to meet current criteria for crashworthiness may be the appropriate recommended treatment.

The typical reconstruction option used by the NPS for stone masonry guardwalls is to document then dismantle the existing barrier, construct a concrete core and build a stone masonry veneer around the concrete core using the original wall materials and using stone masonry designs that are compatible with the historic road, district or landscape. A number of concrete core stone masonry barrier types have been designed for use in national parks, including 18-in, 22-in, 24-in and 27-in barriers; however, not all have been crash tested or otherwise determined to meet current criteria for crashworthiness.

WORK ORDERS

Work order preparation is essentially determining and documenting the repair actions needed to correct the deficiencies observed during the condition assessment. Barriers are relatively simple structures so this determination can be made by trained inspectors. Keep in mind that this is not a design environment and that more rigorous analysis (if needed) may change the work that is actually performed. The intent of this effort is to prepare a credible estimate of deferred maintenance that may or may not be directly actionable. Simple repairs and/or those that require no compliance with environmental policies (which may be a large percentage of the work orders) can probably be executed without modification.

Once a repair strategy is determined, a cost must be developed for the proposed action. Work orders will be classified as being either deferred maintenance or capital improvement. This classification is based on the type of work recommended, as defined below.

Definition: *Deferred Maintenance* can be classified as repair or replace in kind. Work done to the barrier does not include any upgrading.

Definition: *Capital Improvement* can be classified as upgrading existing barrier. Typically the upgrade will be from a non-crashworthy to a crashworthy device. Other examples of capital improvements would be the addition of a curb to improve drainage or the inclusion of any countermeasure.

There are four types of work:

- No Action
- Monitor
- Repair
- Replace

"No Action" – if risk is low (based on the GIP risk score), a barrier that does not meet current crashworthy performance standards may be acceptable to remain until changes in risk factors would require upgrading.

"Monitor" – if risk is low (based on the GIP risk score), a barrier that does not meet current crashworthy performance standards may be acceptable to remain until changes in risk factors would require upgrading, however, if conditions exist that the park should monitor (e.g., erosion), then "monitor" can be selected as a recommended action.

"Repair" – considered when a barrier damaged by impact deteriorated due to age/weathering and the barrier is functionally sound in a low risk environment. The goal is to bring the barrier back to its "new" condition.

"Replacement/Reconstruction" – when a barrier poses an unacceptable safety risk:

1. If the risk score is less than 3 points above the risk threshold, determine if countermeasures can reduce risk so the barrier can be repaired.
2. Determine if the barrier is warranted and either shielded hazard or barrier itself can be removed (only when barrier NOT considered historically/culturally significant)

For all barrier repair/replace/reconstruction recommendations, the NPS will vet the recommendations through a project selection, planning and design process, including compliance with:

National Historic Preservation Act (NHPA)
National Environmental Policy Act (NEPA)

Aesthetic barriers are commensurate with an approved crashworthy design for the specific conditions at the barrier site as the basis for selecting a crashworthy structure. Types of barriers are generally selected based on emulating the existing types of barriers in the park.