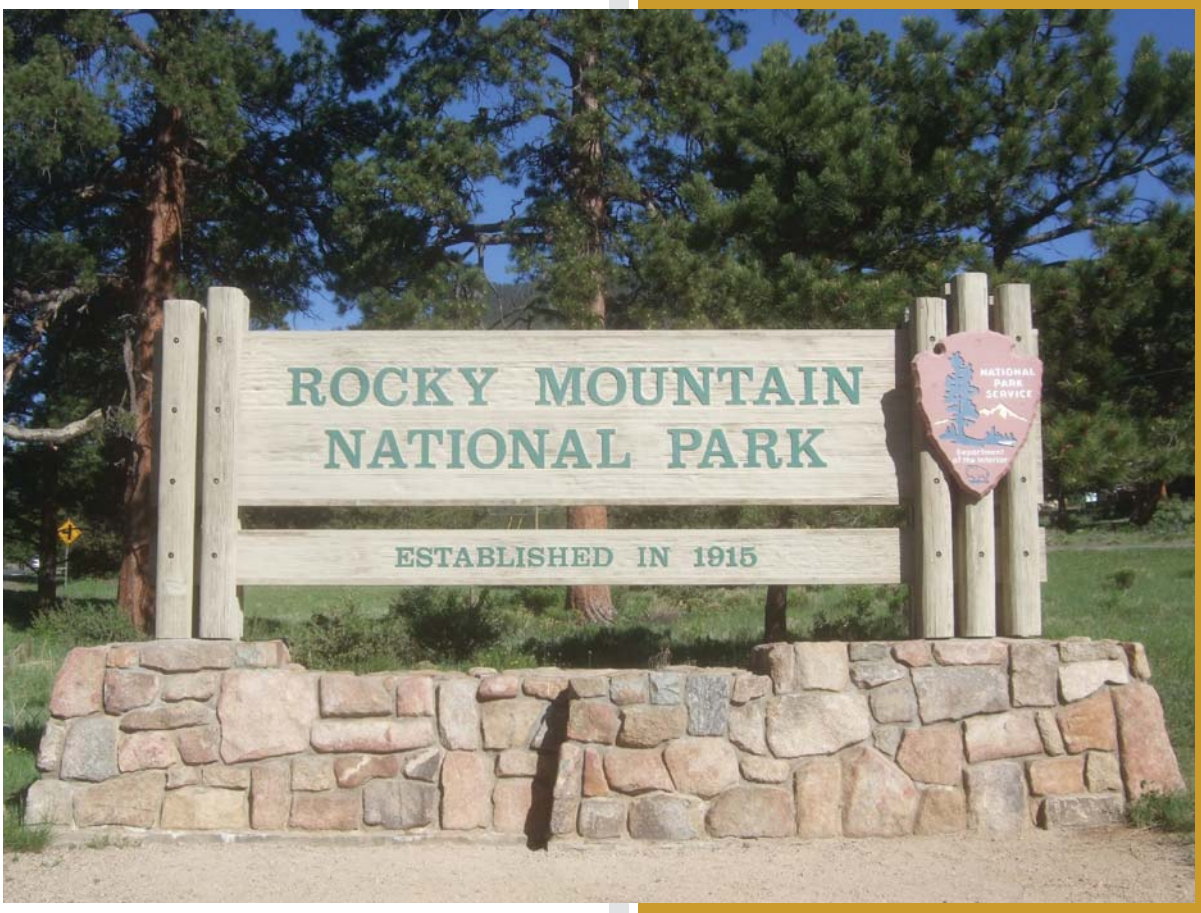
ROMO
GIP Report

NPS Guardwall/Rail Inventory Program
Rocky Mountain National Park

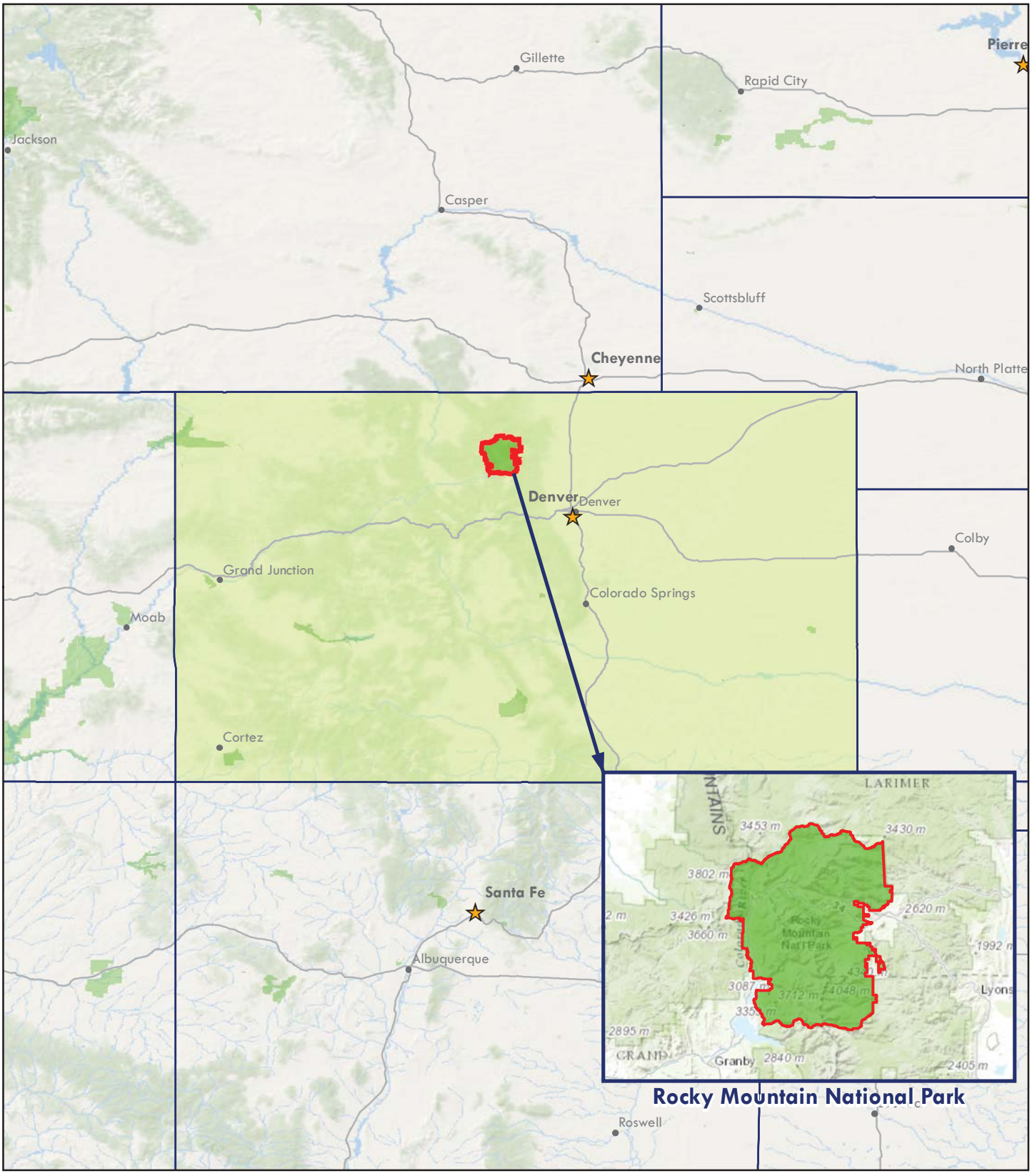


Federal Lands Highway
Road Inventory Program

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

Data Collection Date: October 2009
Report Date: November 2015

Rocky Mountain National Park
in
Colorado



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
Esri, DeLorme, GEBCO, NOAA NGDC, and other contributors

N

Table of Contents

SECTION		PAGE NO.
1.	**INTRODUCTION**	**1 - 1**
2.	**PARK BARRIER LOCATION MAPS** Retaining Barrier Location Maps	**2 - 1**
3.	**TIER 1 - PARK BARRIER OVERVIEW**	**3 - 1**
4.	**TIER 2 - ROUTE BARRIER OVERVIEW**	**4 - 1**
5.	**TIER 3 - BARRIER DETAILS**	**5 - 1**
6.	**APPENDIX A - SUMMARY OF GIP DEFINITIONS**	**A - 1**

Introduction

Rocky Mountain National Park

Federal Lands Highway
Road Inventory Program

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

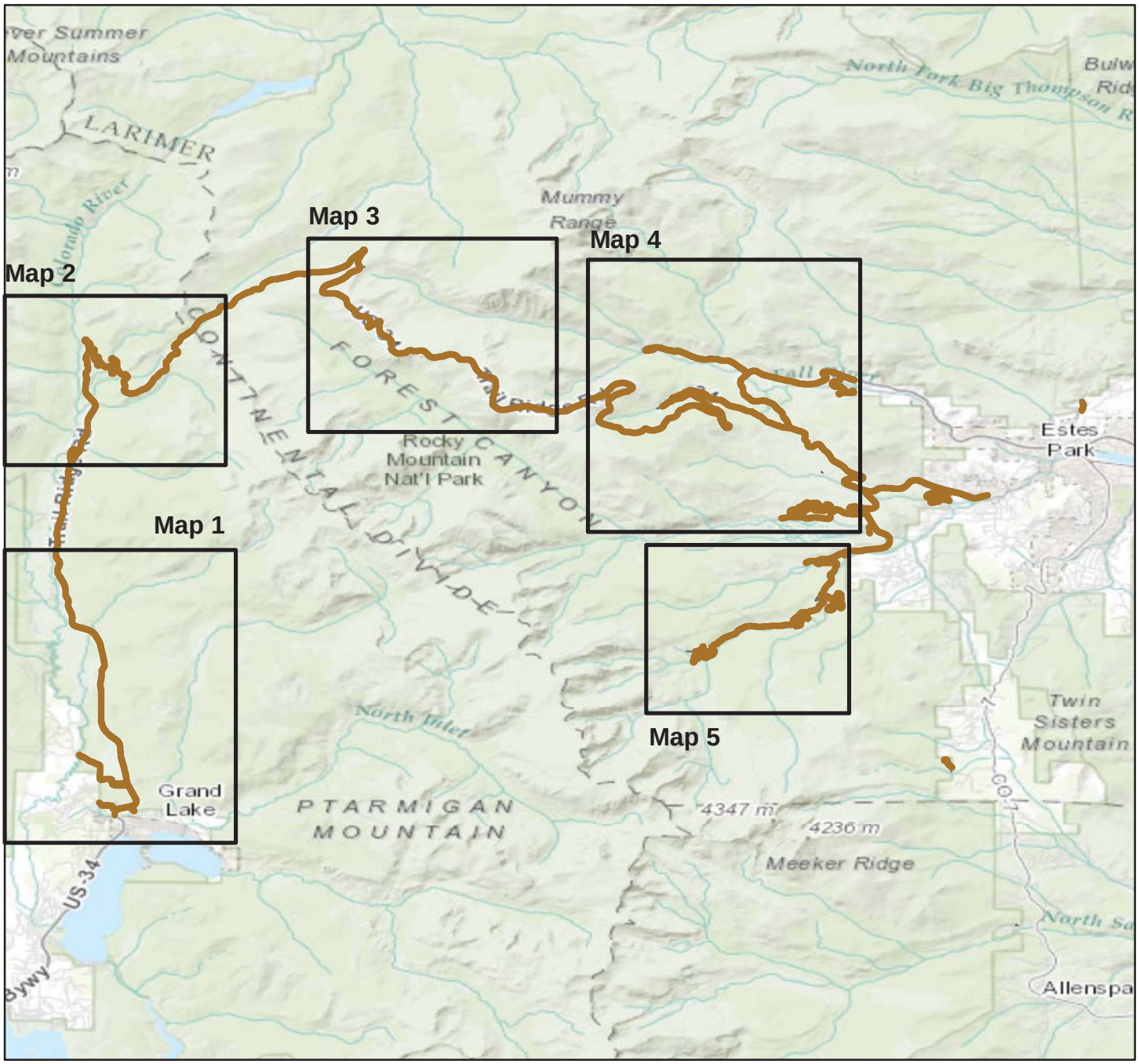
Rocky Mountain National Park

Federal Lands Highway
Road Inventory Program

Rocky Mountain National Park

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

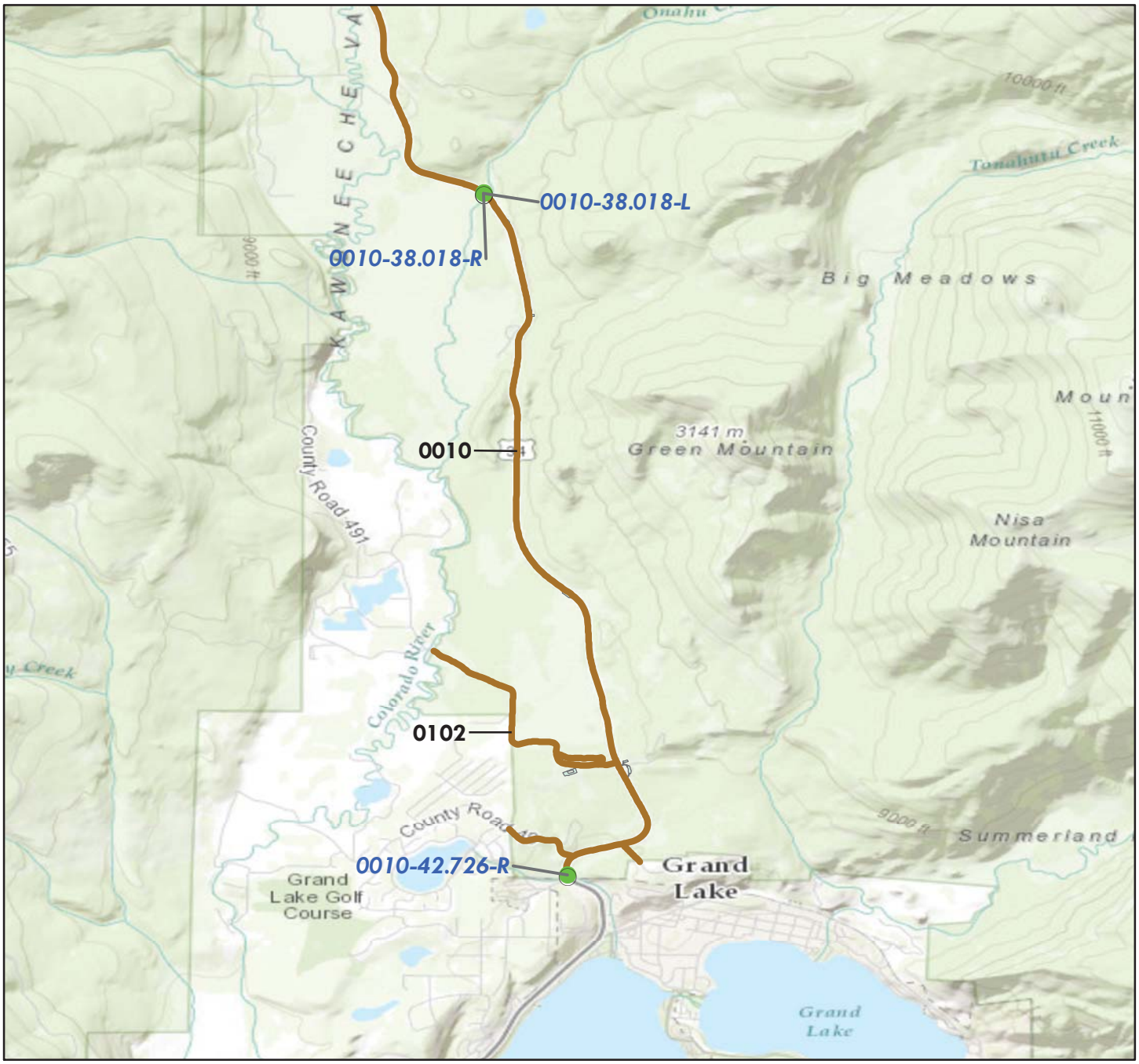
0 3 6

N

Rocky Mountain National Park

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

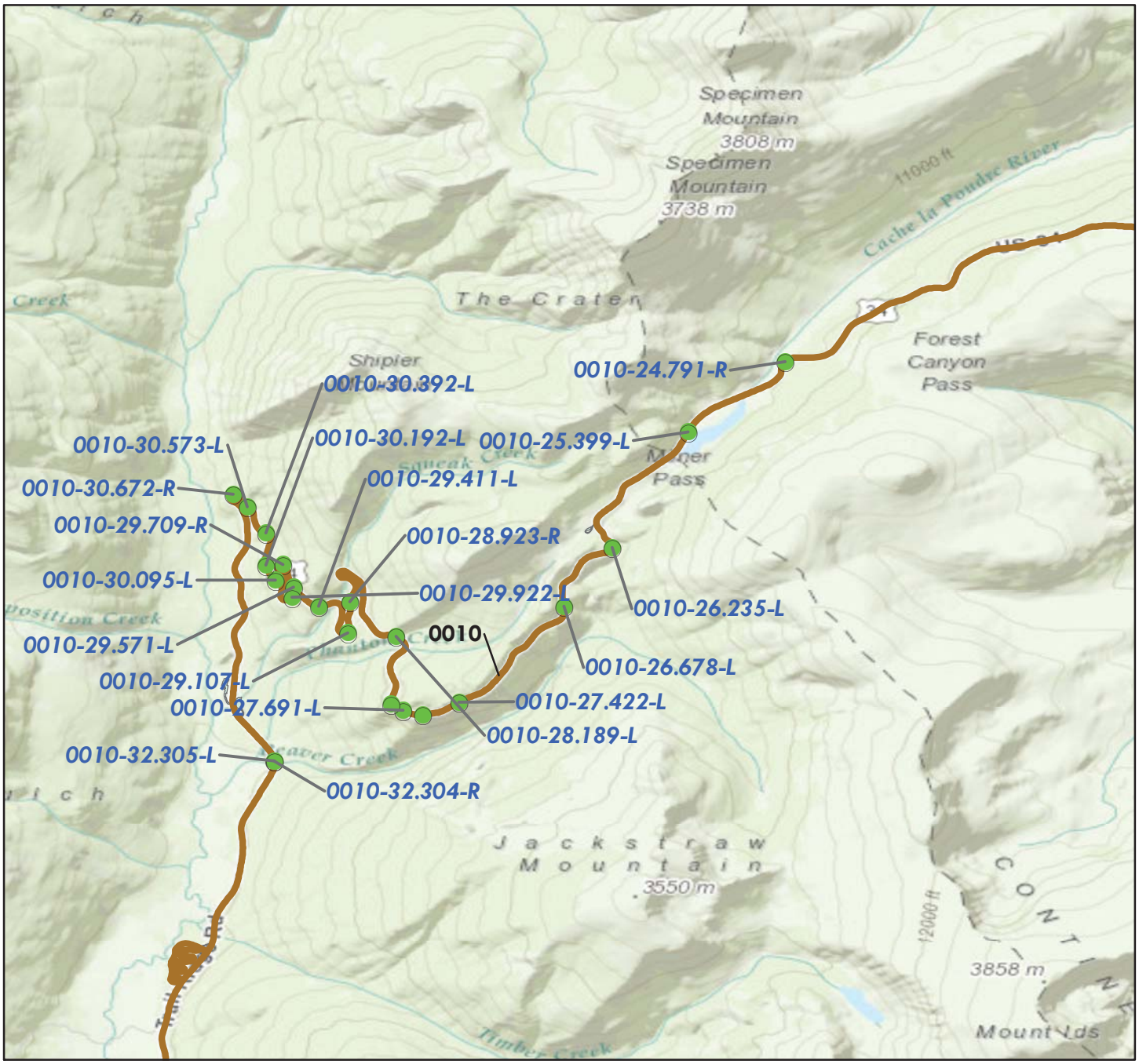
0 1 2

N

Rocky Mountain National Park

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

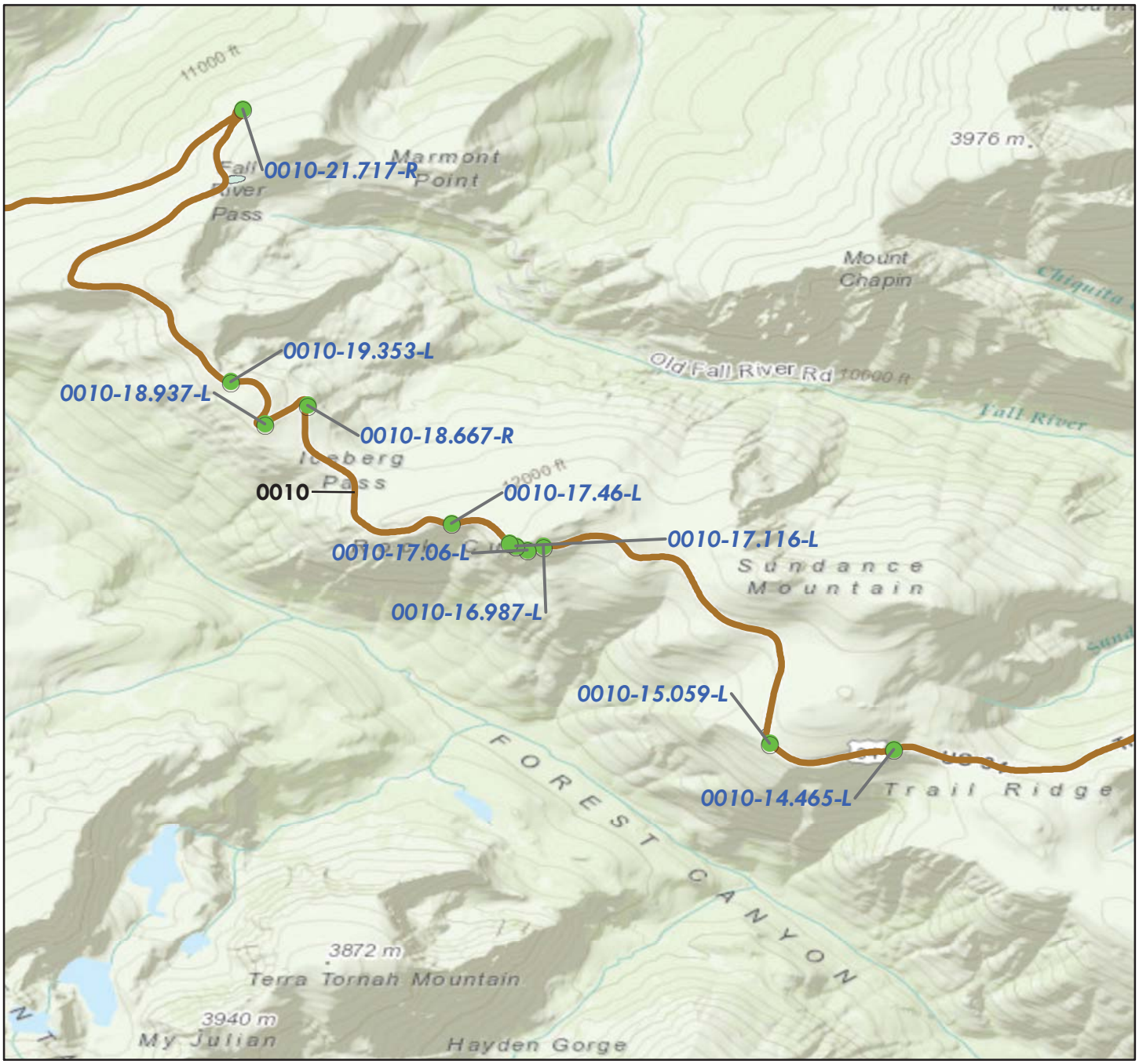
0 1 2

N

Rocky Mountain National Park

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

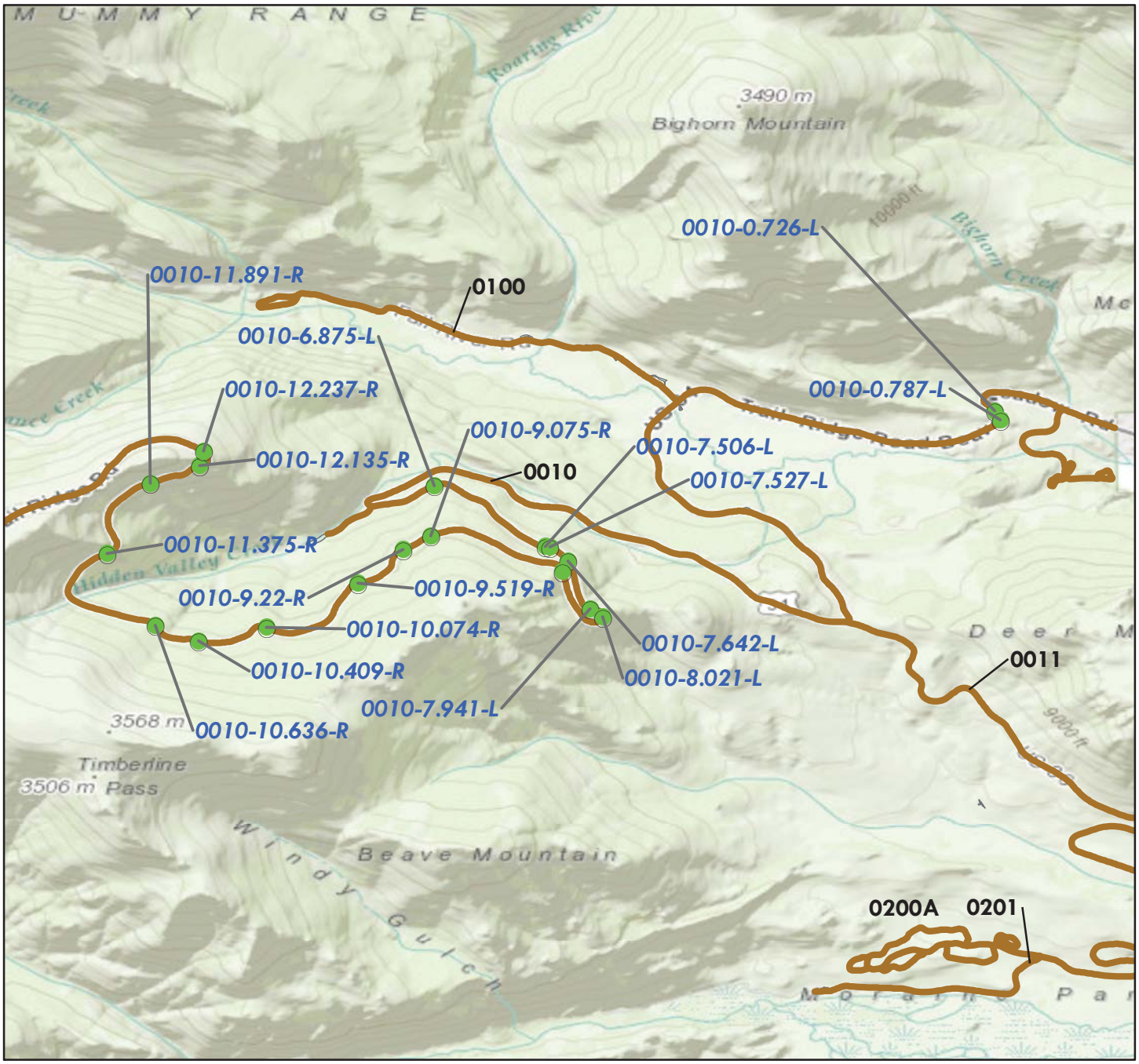
0 1 2

N

Rocky Mountain National Park

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

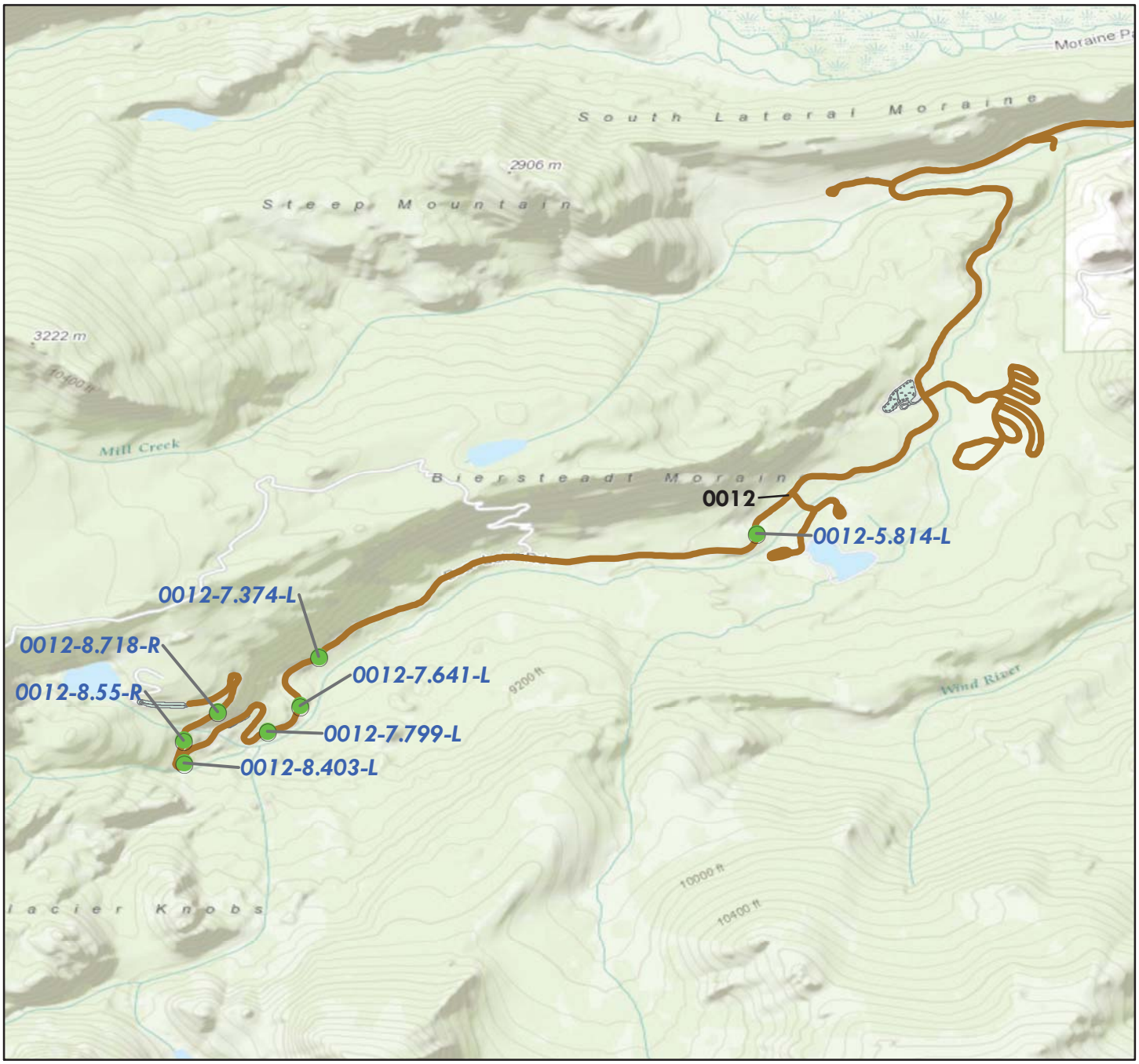
0 1 2

N

Rocky Mountain National Park

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 0.7 1.4

N

Tier 1
Park Barrier Overview

Rocky Mountain National Park

Federal Lands Highway
Road Inventory Program

Parkwide Summary: Rocky Mountain National Park

Initial barrier inspections were conducted at Rocky Mountain National Park in 2009, and encompassed all known barriers associated with Park roadways. In general, walls are not included in this assessment, but were inspected for Rocky Mountain National Park in 2007 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, 63 barriers were inventoried on the routes listed below.

Table 1: Number of Barriers by Route

Route Number	Route Name	No. of Barriers
0010	TRAIL RIDGE ROAD	55
0012	BEAR LAKE ROAD	7
0201	CUB LAKE / STABLES ROAD	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	57
NON-TRAFFIC	6

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: Log Rail On Log Posts	1
Steel-Backed Timber With Blockout	7
W-Beam Strong Post	1
Stone Masonry Without Concrete Core Wall	54

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	30
Monitor	$0	0
Repair	$7,193,316	33
Replace	$0	0
Totals	**$7,193,316**	**63**

*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	30
$1 - $25,000	7
$25,001 - $50,000	3
$50,001 - $100,000	2
$100,001 - $250,000	13
$250,001 - $500,000	5
$500,001 - $1,000,000	2
$1,000,001 - $2,000,000	1
$2,000,001 - $3,000,000	0
$3,000,001 - $4,000,000	0
Total Number of Barriers	**63**

*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 14 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.

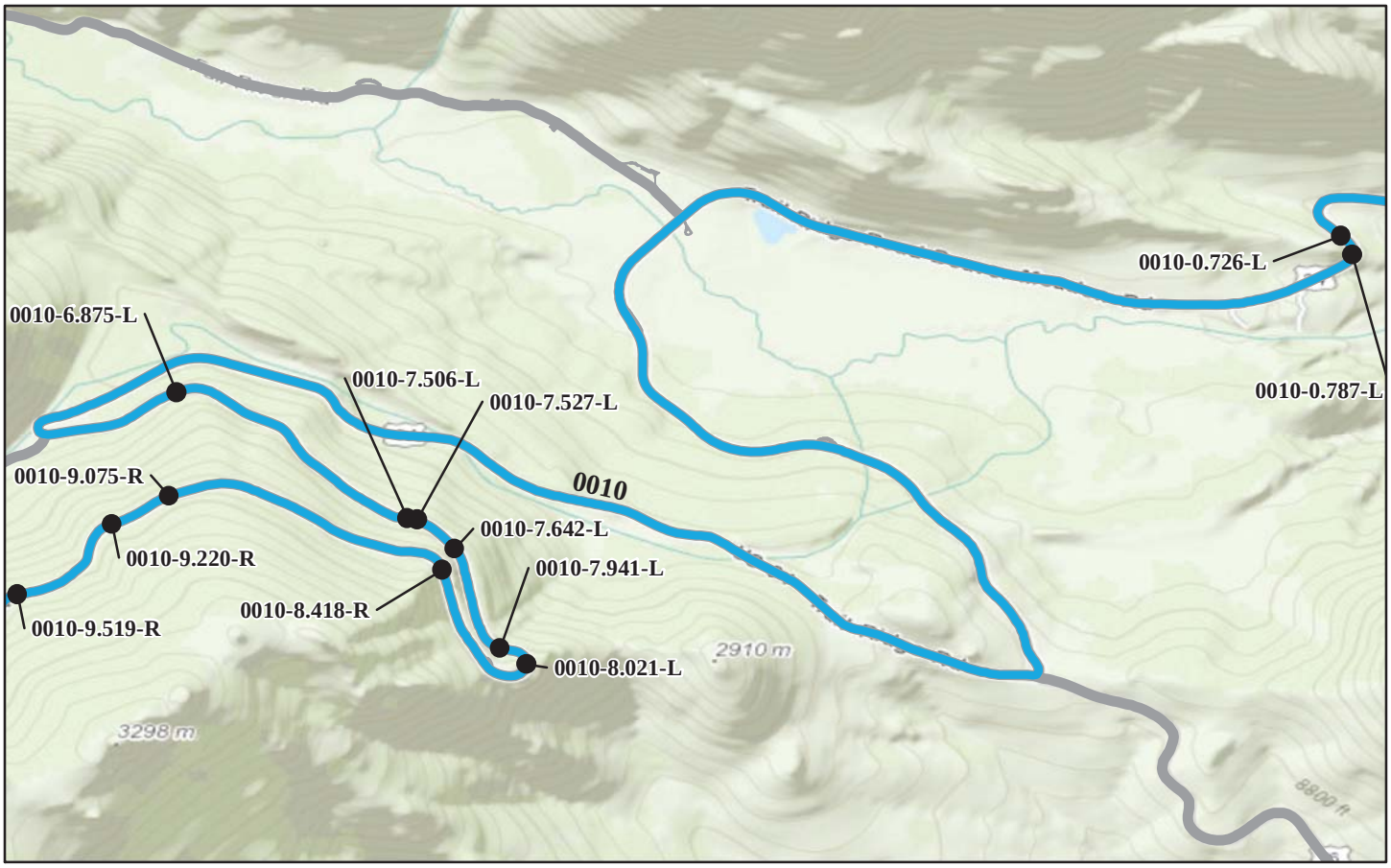
Tier 2
Route Barrier Overview

Rocky Mountain National Park

Federal Lands Highway
Road Inventory Program

Rocky Mountain National Park

ROUTE 0010: TRAIL RIDGE ROAD



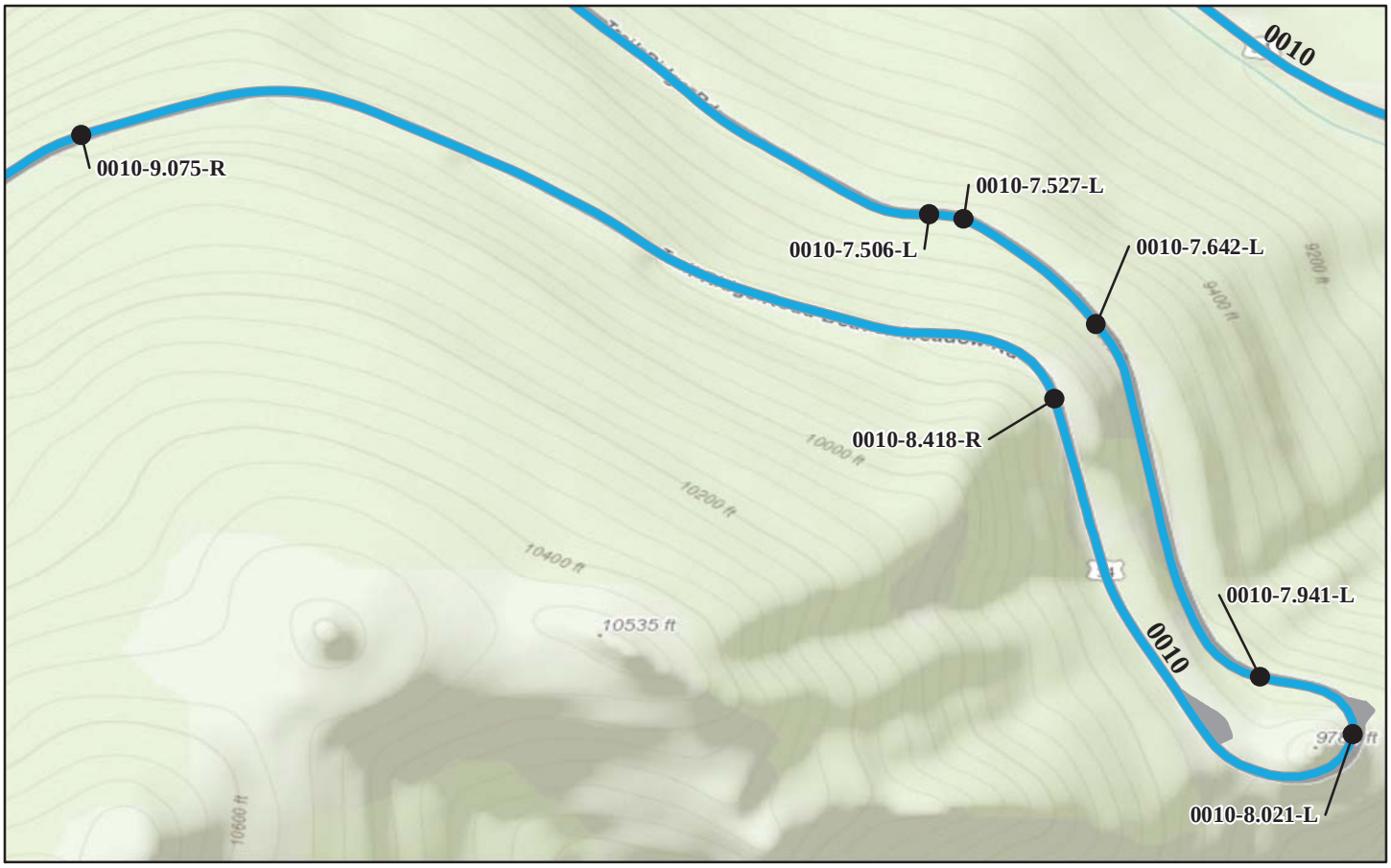
Sources: Esri, HERE, DeLorme, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

Barrier ID Inspection Date	Barrier Length (Ft.)	Barrier Type	Barrier End Treatment Begin	 End	*Repair Cost
ROMO-0010-0.726-L 10/1/2009	240	STONE MASONRY WITHOUT CONCRETE CORE WALL	NONE	NONE	$0.00
ROMO-0010-0.787-L 10/1/2009	311	STONE MASONRY WITHOUT CONCRETE CORE WALL	NONE	NONE	$0.00
ROMO-0010-6.875-L 10/2/2009	587	STONE MASONRY WITHOUT CONCRETE CORE WALL	NONE	NONE	$70,813.00
ROMO-0010-7.506-L 10/2/2009	104	STONE MASONRY WITHOUT CONCRETE CORE WALL	NONE	NONE	$33,468.00
ROMO-0010-7.527-L 10/2/2009	97	STONE MASONRY WITHOUT CONCRETE CORE WALL	NONE	NONE	$28,243.00

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

Rocky Mountain National Park

ROUTE 0010: TRAIL RIDGE 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	
ROMO-0010-7.642-L 10/2/2009	308	STONE MASONRY WITHOUT CONCRETE CORE WALL	NONE	NONE	$116,078.00
ROMO-0010-7.941-L 10/2/2009	288	STONE MASONRY WITHOUT CONCRETE CORE WALL	NONE	NONE	$226,738.00
ROMO-0010-8.021-L 10/2/2009	443	STONE MASONRY WITHOUT CONCRETE CORE WALL	NONE	NONE	$0.00
ROMO-0010-8.418-R 10/2/2009	490	STONE MASONRY WITHOUT CONCRETE CORE WALL	NONE	NONE	$0.00
ROMO-0010-9.075-R 10/2/2009	168	STONE MASONRY WITHOUT CONCRETE CORE WALL	NONE	NONE	$0.00

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

Rocky Mountain National Park

ROUTE 0010: TRAIL RIDGE ROAD

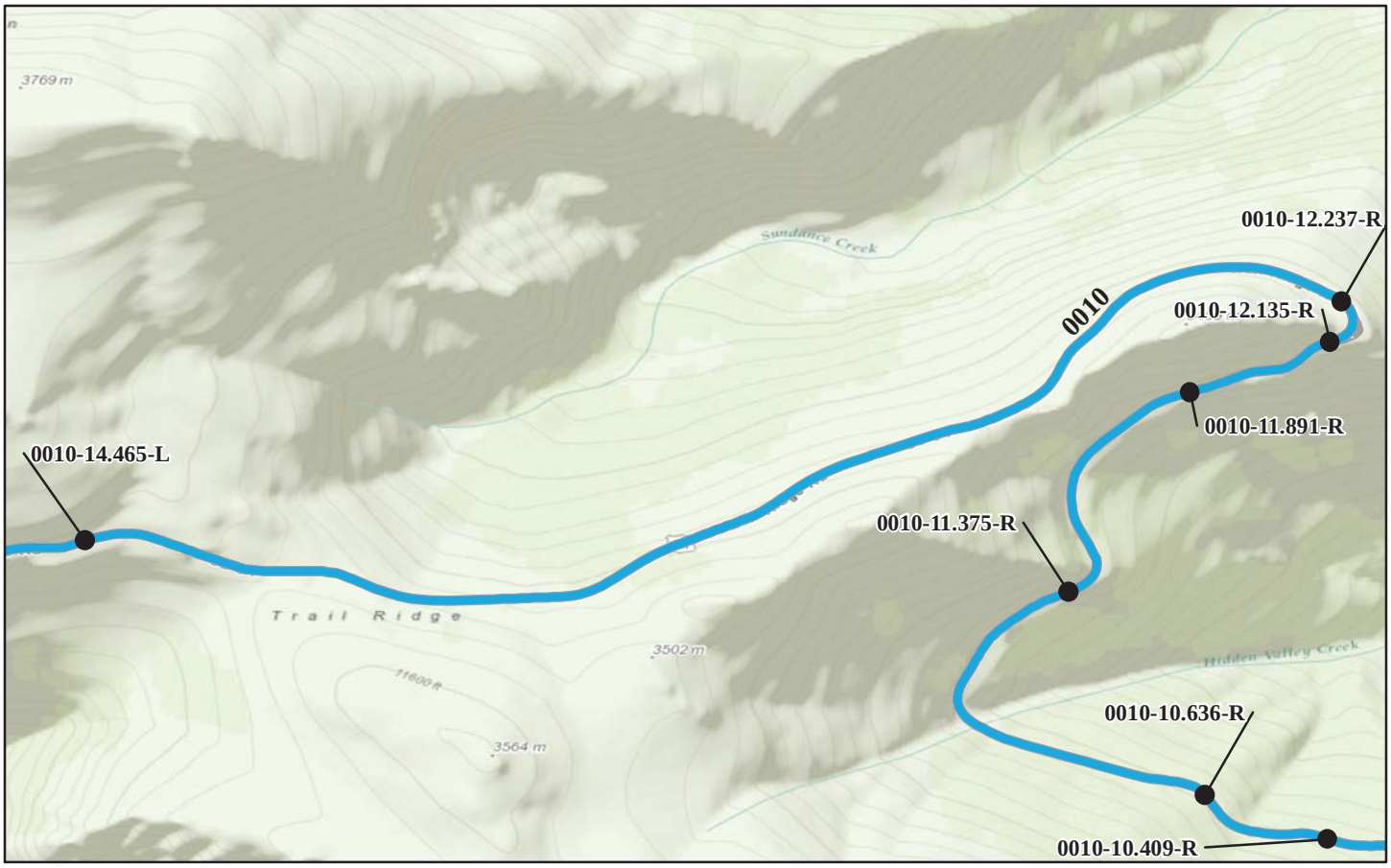
Sources: Esri, HERE, DeLorme, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

Barrier ID Inspection Date	Barrier Length (Ft.)	Barrier Type	Barrier End Treatment		*Repair Cost
			Begin	End	
ROMO-0010-9.220-R 10/2/2009	608	STONE MASONRY WITHOUT CONCRETE CORE WALL	NONE	NONE	$145,475.00
ROMO-0010-9.519-R 10/2/2009	292	STONE MASONRY WITHOUT CONCRETE CORE WALL	NONE	NONE	$0.00
ROMO-0010-10.074-R 10/2/2009	203	STONE MASONRY WITHOUT CONCRETE CORE WALL	NONE	NONE	$126,528.00
ROMO-0010-10.409-R 10/2/2009	299	STONE MASONRY WITHOUT CONCRETE CORE WALL	NONE	NONE	$162,745.00
ROMO-0010-10.636-R 10/2/2009	242	STONE MASONRY WITHOUT CONCRETE CORE WALL	NONE	NONE	$165,495.00

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

Rocky Mountain National Park

ROUTE 0010: TRAIL RIDGE ROAD



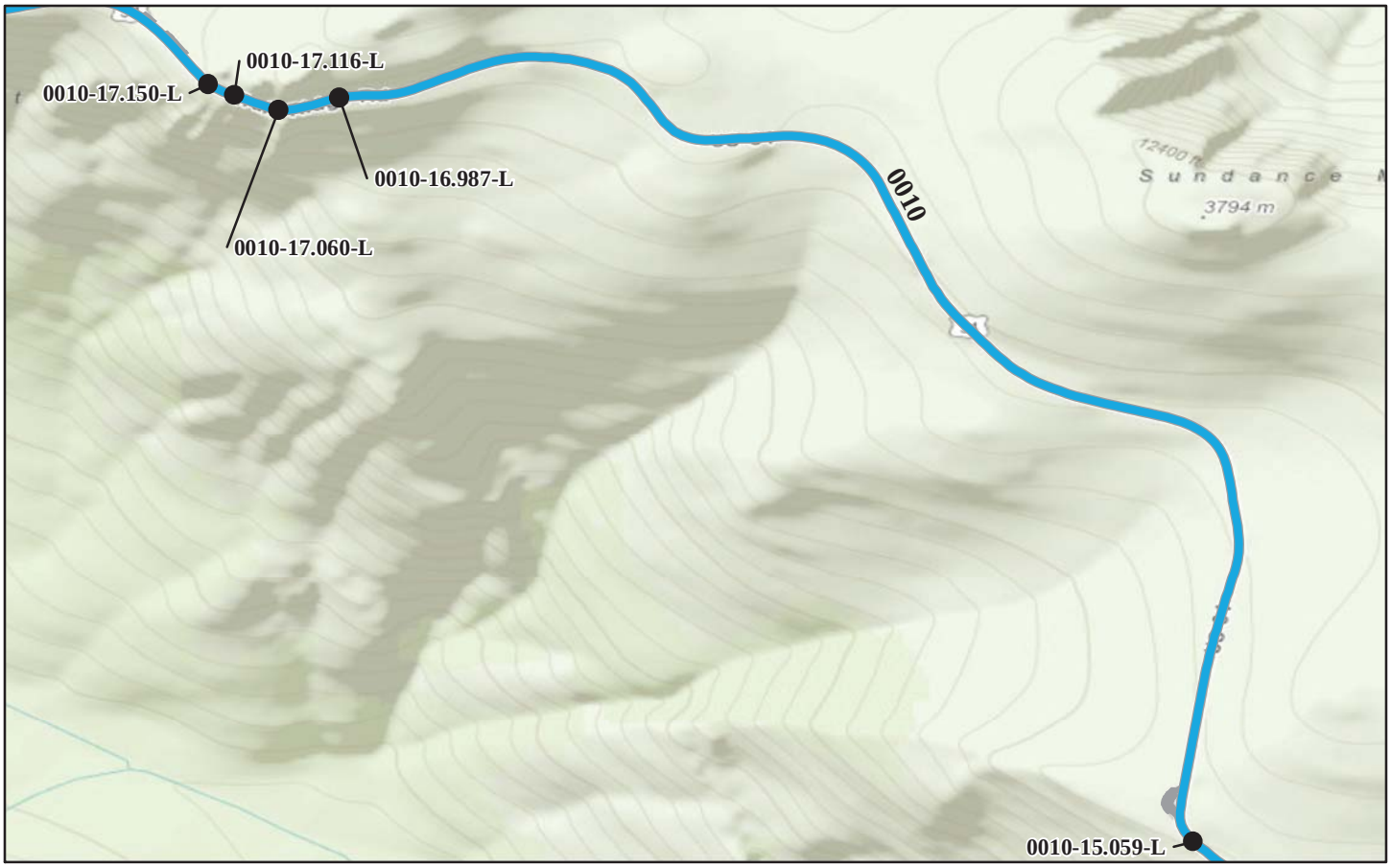
Sources: Esri, HERE, DeLorme, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

Barrier ID Inspection Date	Barrier Length (Ft.)	Barrier Type	Barrier End Treatment		*Repair Cost
			Begin	End	
ROMO-0010-11.375-R 10/2/2009	575	STONE MASONRY WITHOUT CONCRETE CORE WALL	NONE	NONE	$0.00
ROMO-0010-11.891-R 10/2/2009	1295	STONE MASONRY WITHOUT CONCRETE CORE WALL	NONE	NONE	$706,558.00
ROMO-0010-12.135-R 10/2/2009	135	STONE MASONRY WITHOUT CONCRETE CORE WALL	NONE	NONE	$0.00
ROMO-0010-12.237-R 9/29/2009	2272	STONE MASONRY WITHOUT CONCRETE CORE WALL	NONE	NONE	$1,795,640.00
ROMO-0010-14.465-L 9/29/2009	423	STONE MASONRY WITHOUT CONCRETE CORE WALL	NONE	NONE	$164,824.00

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

Rocky Mountain National Park

ROUTE 0010: TRAIL RIDGE ROAD



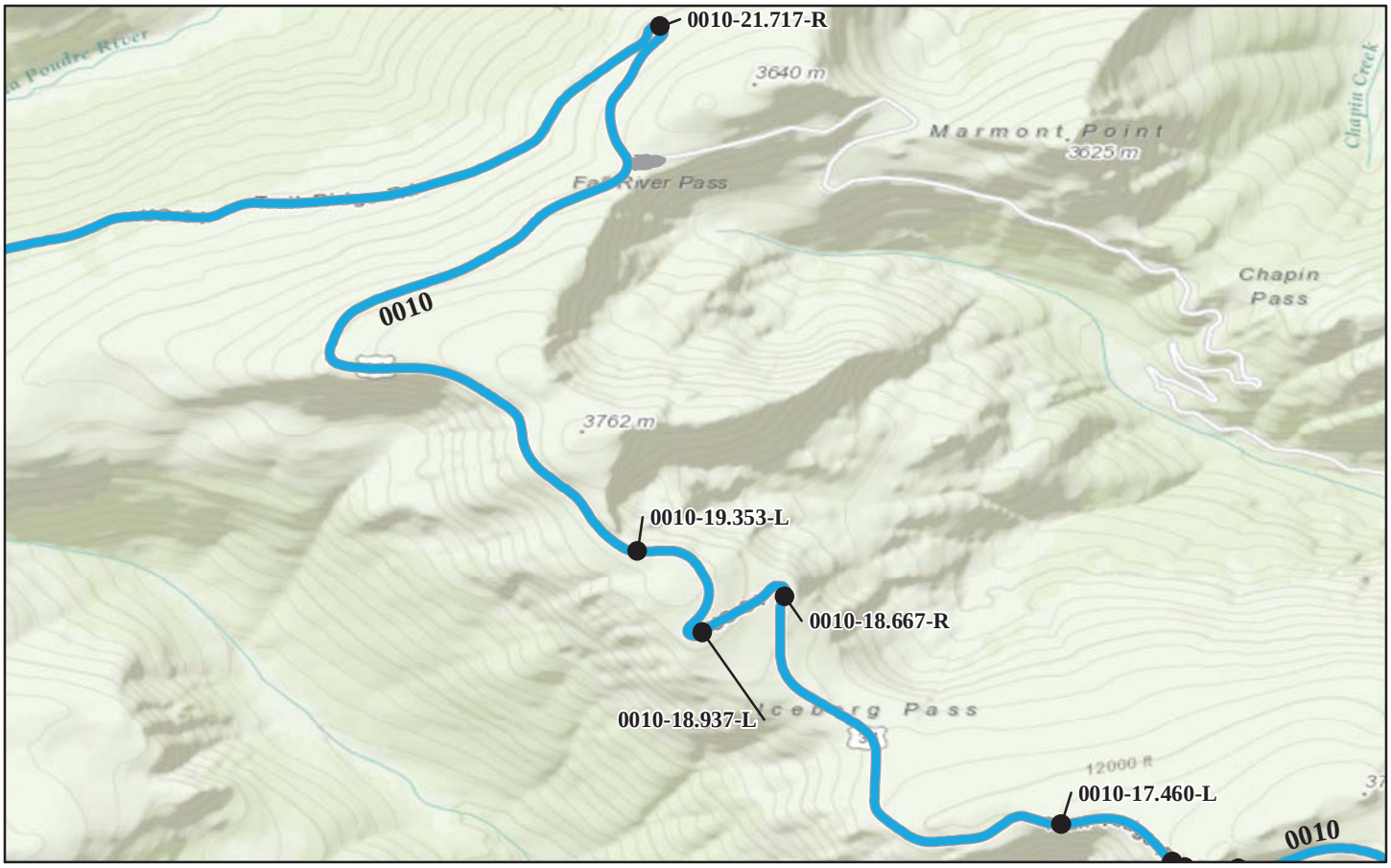
Sources: Esri, HERE, DeLorme, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

Barrier ID Inspection Date	Barrier Length (Ft.)	Barrier Type	Barrier End Treatment		*Repair Cost
			Begin	End	
ROMO-0010-15.059-L 9/29/2009	188	STONE MASONRY WITHOUT CONCRETE CORE WALL	NONE	NONE	$30,993.00
ROMO-0010-16.987-L 9/29/2009	379	STONE MASONRY WITHOUT CONCRETE CORE WALL	NONE	NONE	$258,005.00
ROMO-0010-17.060-L 9/29/2009	203	STONE MASONRY WITHOUT CONCRETE CORE WALL	NONE	NONE	$0.00
ROMO-0010-17.116-L 9/29/2009	34	STONE MASONRY WITHOUT CONCRETE CORE WALL	NONE	NONE	$154.00
ROMO-0010-17.150-L 9/29/2009	593	STONE MASONRY WITHOUT CONCRETE CORE WALL	NONE	NONE	$169,895.00

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

Rocky Mountain National Park

ROUTE 0010: TRAIL RIDGE 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	
ROMO-0010-17.460-L 9/29/2009	150	STONE MASONRY WITHOUT CONCRETE CORE WALL	NONE	NONE	$0.00
ROMO-0010-18.667-R 9/29/2009	292	STONE MASONRY WITHOUT CONCRETE CORE WALL	NONE	NONE	$234,713.00
ROMO-0010-18.937-L 9/29/2009	324	STONE MASONRY WITHOUT CONCRETE CORE WALL	NONE	NONE	$242,358.00
ROMO-0010-19.353-L 9/29/2009	257	STONE MASONRY WITHOUT CONCRETE CORE WALL	NONE	NONE	$1,777.00
ROMO-0010-21.717-R 9/28/2009	234	STONE MASONRY WITHOUT CONCRETE CORE WALL	NONE	NONE	$24,976.00

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

Rocky Mountain National Park

ROUTE 0010: TRAIL RIDGE ROAD

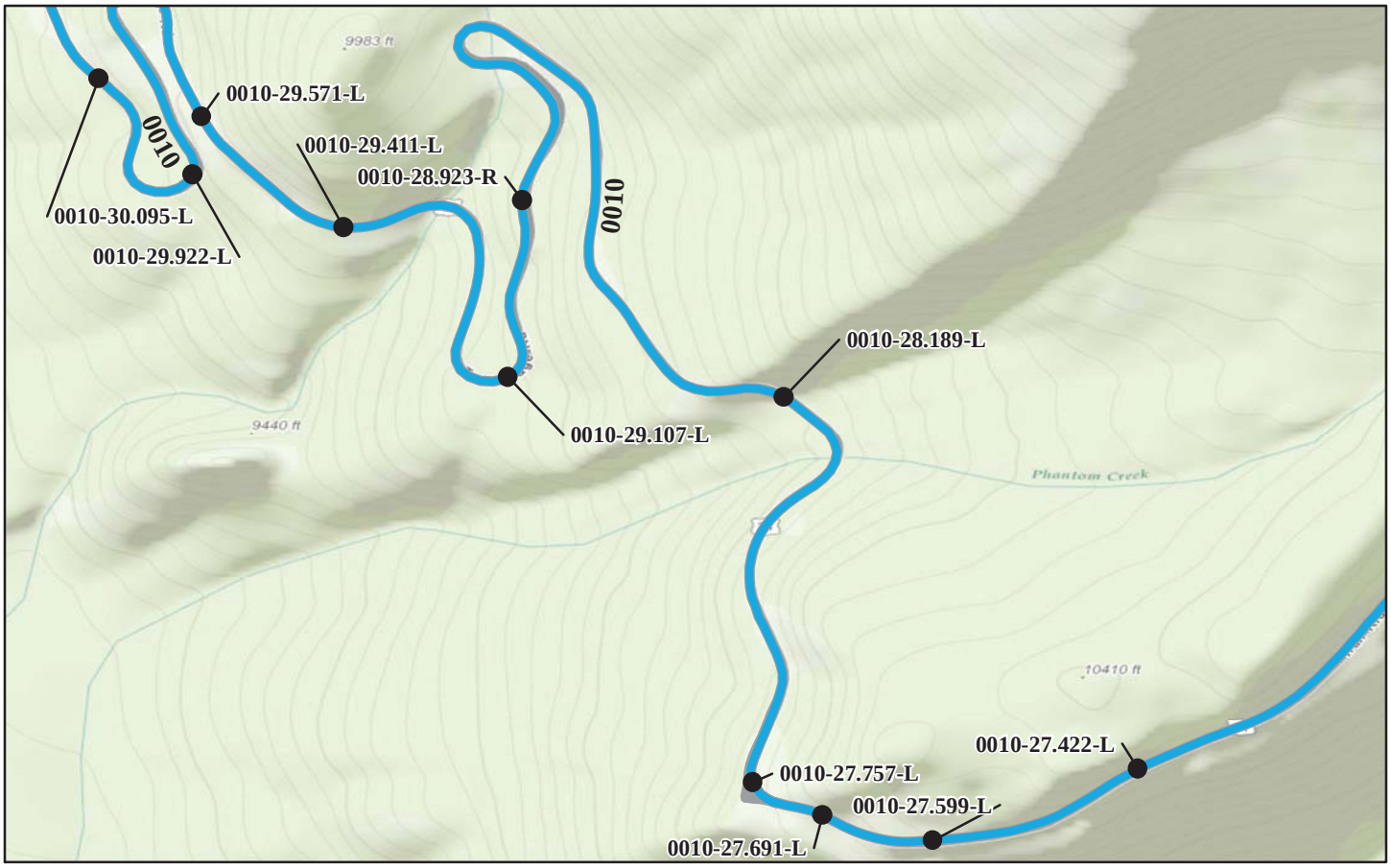
Sources: Esri, HERE, DeLorme, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

Barrier ID Inspection Date	Barrier Length (Ft.)	Barrier Type	Barrier End Treatment Begin	 End	*Repair Cost
ROMO-0010-24.791-R 9/28/2009	311	STONE MASONRY WITHOUT CONCRETE CORE WALL	NONE	NONE	$0.00
ROMO-0010-25.399-L 9/29/2009	521	STONE MASONRY WITHOUT CONCRETE CORE WALL	NONE	NONE	$365,420.00
ROMO-0010-26.235-L 9/29/2009	153	STONE MASONRY WITHOUT CONCRETE CORE WALL	NONE	NONE	$0.00
ROMO-0010-26.678-L 9/29/2009	598	STONE MASONRY WITHOUT CONCRETE CORE WALL	NONE	NONE	$303,985.00
ROMO-0010-27.422-L 9/29/2009	439	STONE MASONRY WITHOUT CONCRETE CORE WALL	NONE	NONE	$355,768.00

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

Rocky Mountain National Park

ROUTE 0010: TRAIL RIDGE ROAD



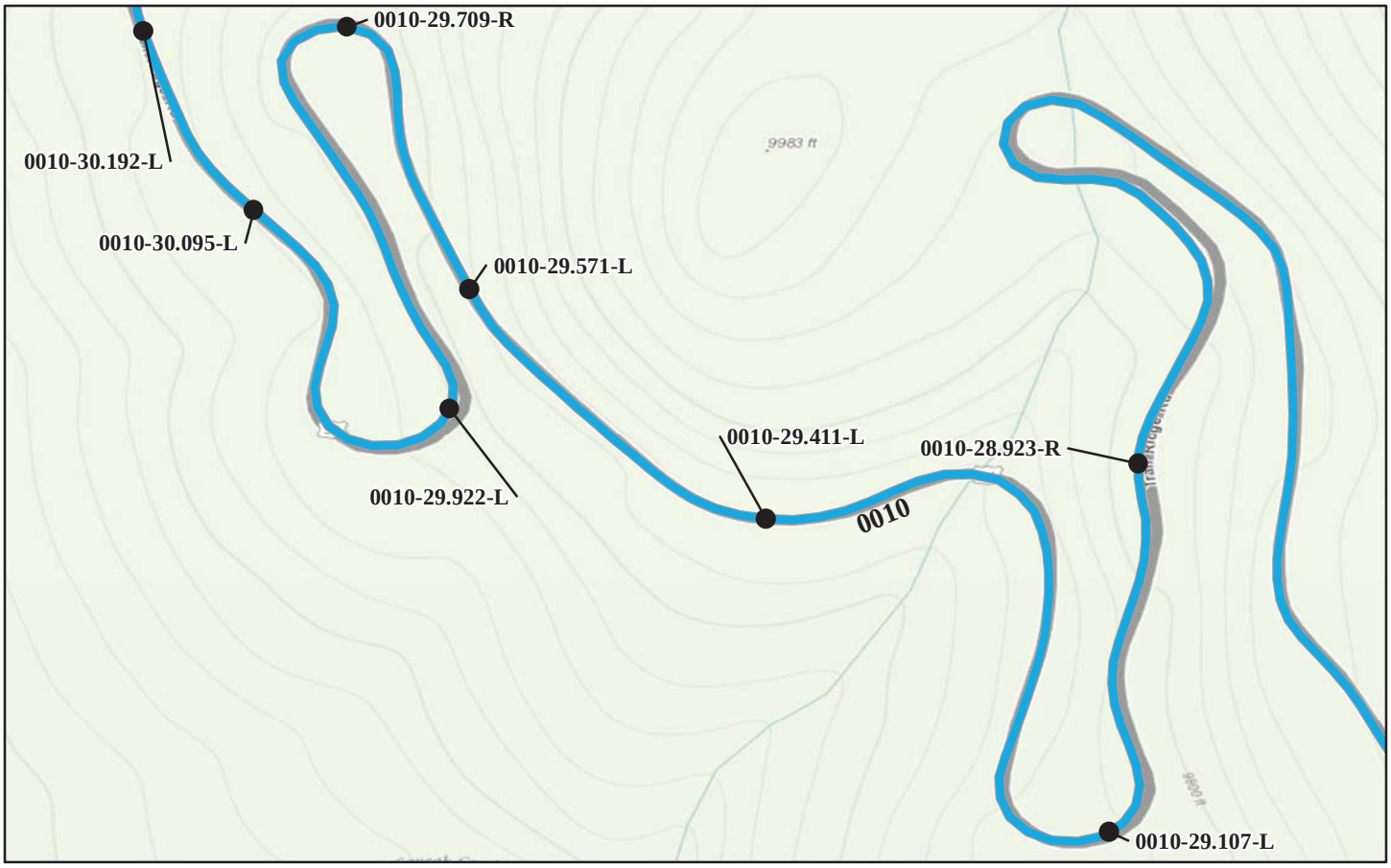
Sources: Esri, HERE, DeLorme, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

Barrier ID Inspection Date	Barrier Length (Ft.)	Barrier Type	Barrier End Treatment Begin	 End	*Repair Cost
ROMO-0010-27.599-L 9/29/2009	512	STONE MASONRY WITHOUT CONCRETE CORE WALL	NONE	NONE	$513,508.00
ROMO-0010-27.691-L 9/29/2009	214	STONE MASONRY WITHOUT CONCRETE CORE WALL	NONE	NONE	$0.00
ROMO-0010-27.757-L 9/29/2009	76	STONE MASONRY WITHOUT CONCRETE CORE WALL	NONE	NONE	$0.00
ROMO-0010-28.189-L 9/30/2009	403	STONE MASONRY WITHOUT CONCRETE CORE WALL	NONE	NONE	$0.00
ROMO-0010-28.923-R 9/30/2009	315	STONE MASONRY WITHOUT CONCRETE CORE WALL	NONE	NONE	$0.00

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

Rocky Mountain National Park

ROUTE 0010: TRAIL RIDGE ROAD



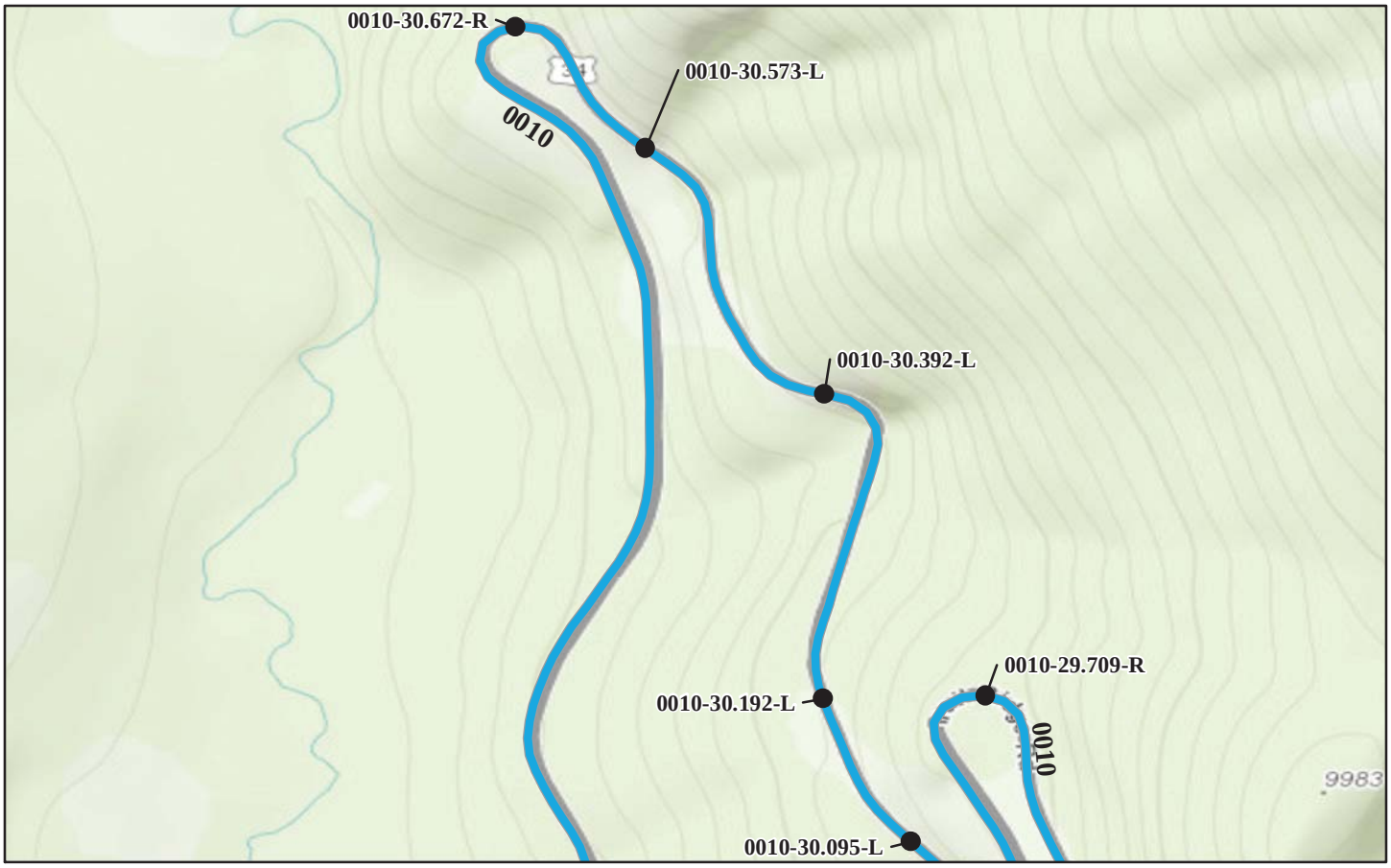
Sources: Esri, HERE, DeLorme, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

Barrier ID Inspection Date	Barrier Length (Ft.)	Barrier Type	Barrier End Treatment		*Repair Cost
			Begin	End	
ROMO-0010-29.107-L 9/30/2009	143	STONE MASONRY WITHOUT CONCRETE CORE WALL	NONE	NONE	$114,730.00
ROMO-0010-29.411-L 9/30/2009	806	STONE MASONRY WITHOUT CONCRETE CORE WALL	NONE	NONE	$4,395.00
ROMO-0010-29.571-L 9/30/2009	384	STONE MASONRY WITHOUT CONCRETE CORE WALL	NONE	NONE	$0.00
ROMO-0010-29.709-R 9/30/2009	323	STONE MASONRY WITHOUT CONCRETE CORE WALL	NONE	NONE	$318,258.00
ROMO-0010-29.922-L 9/30/2009	204	STONE MASONRY WITHOUT CONCRETE CORE WALL	NONE	NONE	$170,720.00

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

Rocky Mountain National Park

ROUTE 0010: TRAIL RIDGE ROAD



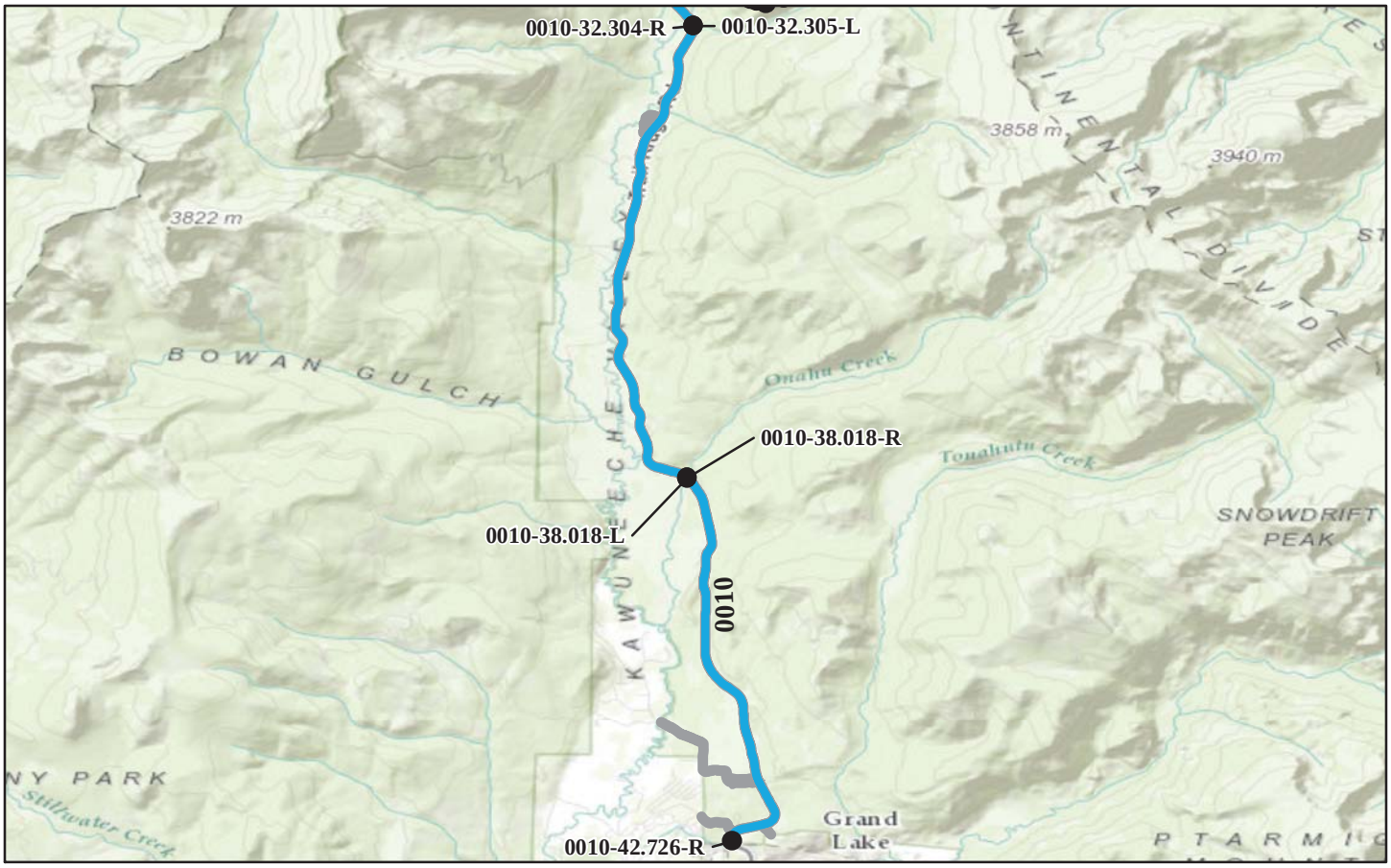
Sources: Esri, HERE, DeLorme, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

Barrier ID Inspection Date	Barrier Length (Ft.)	Barrier Type	Barrier End Treatment		*Repair Cost
			Begin	End	
ROMO-0010-30.095-L 9/30/2009	368	STONE MASONRY WITHOUT CONCRETE CORE WALL	NONE	NONE	$0.00
ROMO-0010-30.192-L 10/1/2009	275	STONE MASONRY WITHOUT CONCRETE CORE WALL	NONE	NONE	$224,015.00
ROMO-0010-30.392-L 9/30/2009	620	STONE MASONRY WITHOUT CONCRETE CORE WALL	NONE	NONE	$0.00
ROMO-0010-30.573-L 9/30/2009	151	STONE MASONRY WITHOUT CONCRETE CORE WALL	NONE	NONE	$86,983.00
ROMO-0010-30.672-R 9/30/2009	660	STONE MASONRY WITHOUT CONCRETE CORE WALL	NONE	NONE	$0.00

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

Rocky Mountain National Park

ROUTE 0010: TRAIL RIDGE ROAD



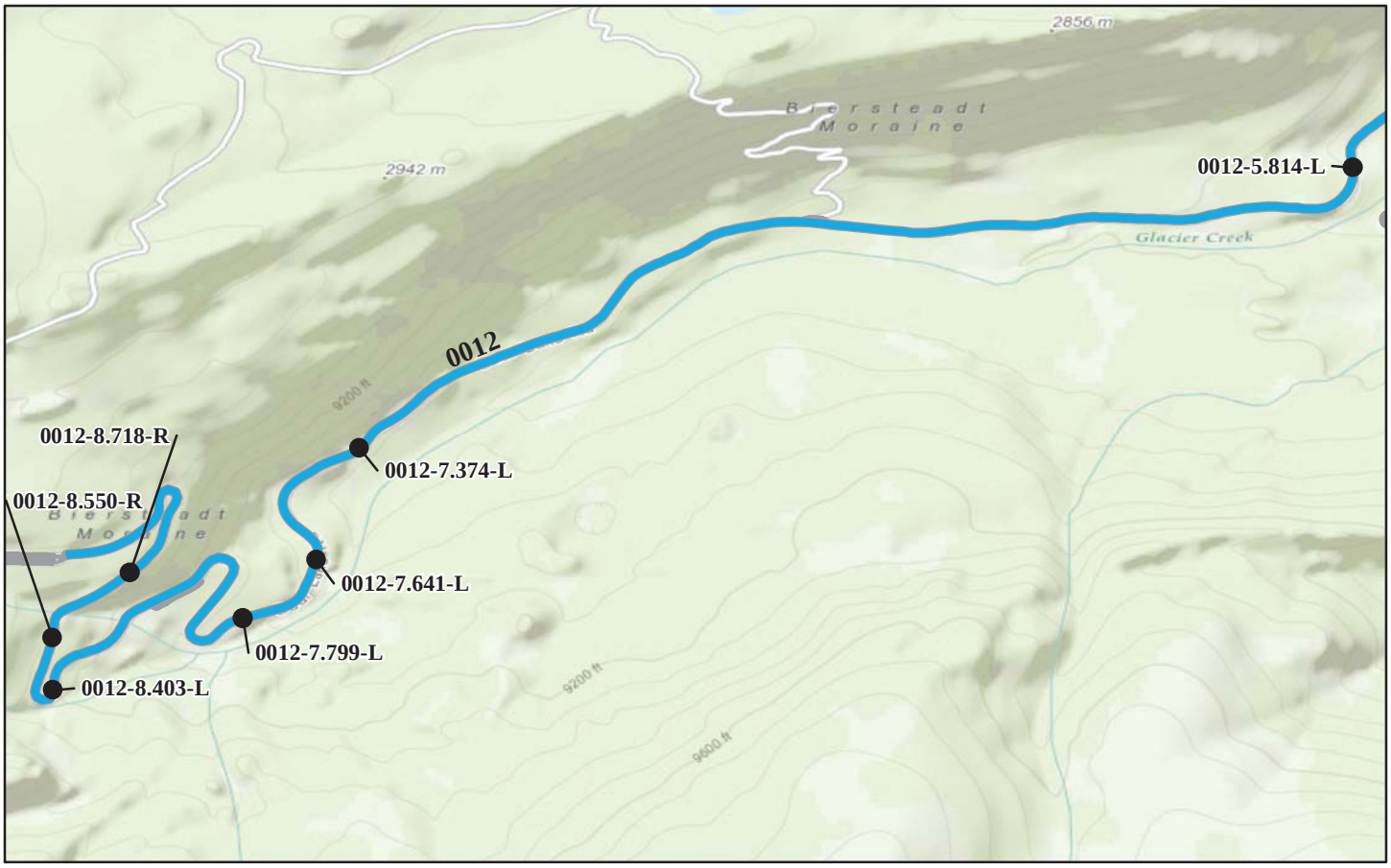
Sources: Esri, HERE, DeLorme, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

Barrier ID Inspection Date	Barrier Length (Ft.)	Barrier Type	Barrier End Treatment Begin	 End	*Repair Cost
ROMO-0010-32.304-R 9/30/2009	27	STONE MASONRY WITHOUT CONCRETE CORE WALL	NONE	NONE	$12,870.00
ROMO-0010-32.305-L 9/30/2009	27	STONE MASONRY WITHOUT CONCRETE CORE WALL	NONE	NONE	$12,870.00
ROMO-0010-38.018-L 9/30/2009	47	STONE MASONRY WITHOUT CONCRETE CORE WALL	NONE	NONE	$0.00
ROMO-0010-38.018-R 9/30/2009	34	STONE MASONRY WITHOUT CONCRETE CORE WALL	NONE	NONE	$0.00
ROMO-0010-42.726-R 9/30/2009	33	W-BEAM STRONG POST	W-BEAM FLARED 350 COMPLIANT	NONE	$0.00

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

Rocky Mountain National Park

ROUTE 0012: BEAR LAKE ROAD



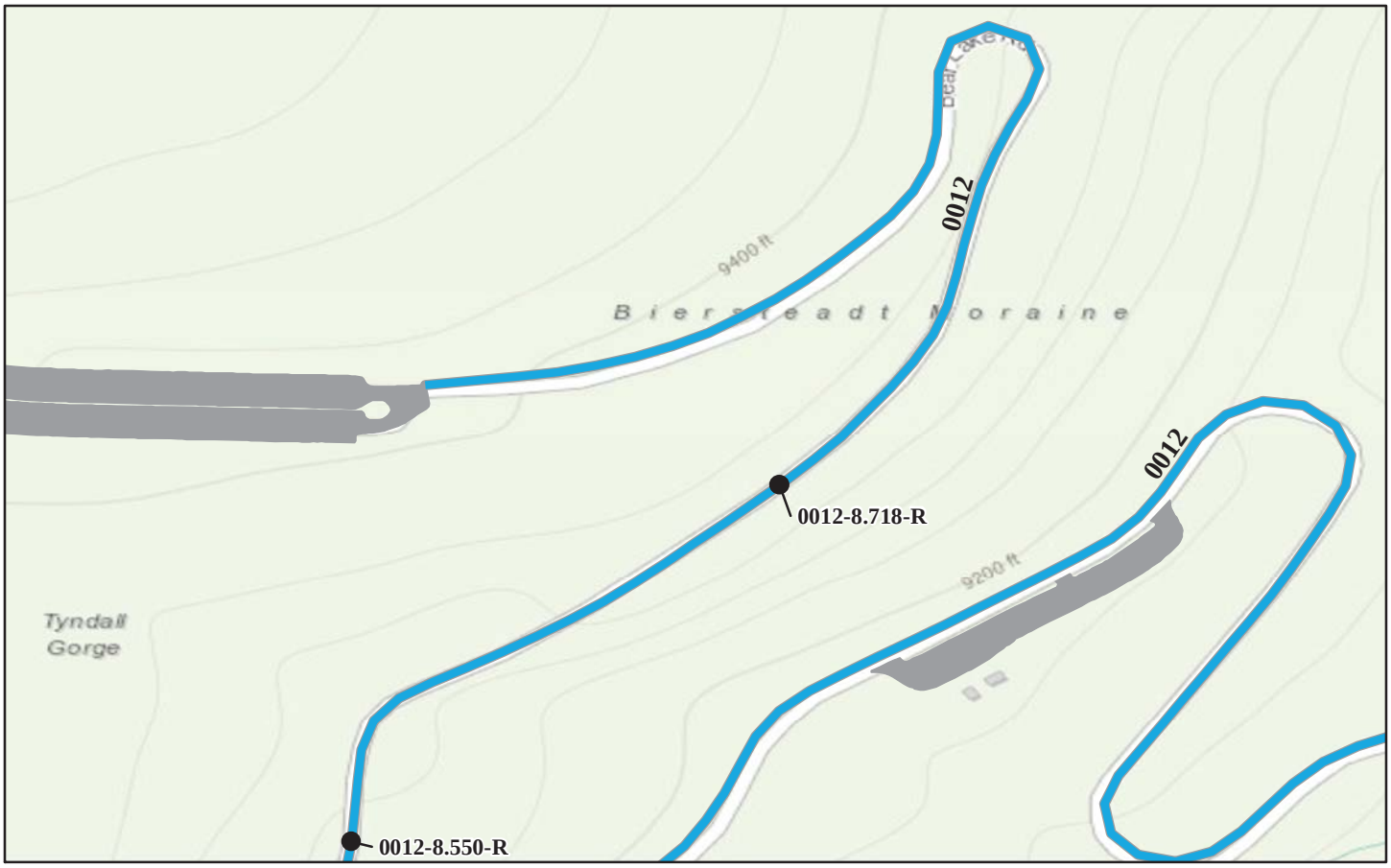
Sources: Esri, HERE, DeLorme, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

Barrier ID Inspection Date	Barrier Length (Ft.)	Barrier Type	Barrier End Treatment Begin	 End	*Repair Cost
ROMO-0012-5.814-L 10/2/2009	1,115	STEEL-BACKED TIMBER WITH BLOCKOUT	SBT/LOG FLARED	SBT/LOG FLARED	$0.00
ROMO-0012-7.374-L 10/2/2009	825	STEEL-BACKED TIMBER WITH BLOCKOUT	SBT/LOG FLARED	SBT/LOG FLARED	$0.00
ROMO-0012-7.641-L 10/2/2009	248	STEEL-BACKED TIMBER WITH BLOCKOUT	SBT/LOG FLARED	NONE	$0.00
ROMO-0012-7.799-L 10/2/2009	525	STEEL-BACKED TIMBER WITH BLOCKOUT	SBT/LOG BURIED	SBT/LOG FLARED	$0.00
ROMO-0012-8.403-L 10/2/2009	190	STEEL-BACKED TIMBER WITH BLOCKOUT	SBT/LOG BURIED	SBT/LOG FLARED	$0.00

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

Rocky Mountain National Park

ROUTE 0012: BEAR LAKE 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
ROMO-0012-8.550-R 10/1/2009	583	STEEL-BACKED TIMBER WITH BLOCKOUT	SBT/LOG FLARED	SBT/LOG FLARED	$4,318.00
ROMO-0012-8.718-R 10/1/2009	968	STEEL-BACKED TIMBER WITH BLOCKOUT	SBT/LOG FLARED	SBT/LOG BURIED	$0.00

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

Rocky Mountain National Park

ROUTE 0201: CUB LAKE / STABLES ROAD

Barrier location is unknown.

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	
ROMO-0201-1.450-R 10/1/2009	133	OTHER: LOG RAIL ON LOG POSTS	NONE	NONE	$0.00

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

Tier 3
Barrier Details

Rocky Mountain National Park

Federal Lands Highway
Road Inventory Program

Barrier ID:	**ROMO-0010-0.726-L**		
Route Name:	TRAIL RIDGE ROAD		
Inspection Date:	10/01/2009	**Barrier Rating:**	42.40

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.):**	240
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:**	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.):**	19.0	**Post Spacing (In.):**	0.0
Height (In.):	21.6	**Lateral Offset (In.):**	42.5	**Road Grade (%):**	3.20

Physical Condition

Barrier	**Alignment and Height:**	Alignment acceptable. Height was within 3-in of the 18-in/24-in crenellated design height.
	Breaking and Cracking:	No major cracking/no breaking.
	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:	**ROMO-0010-0.726-L**		
Route Name:	TRAIL RIDGE ROAD		
Inspection Date:	10/01/2009	**Barrier Rating:**	42.40

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.

Rocky Mountain National Park

ROUTE 0010: TRAIL RIDGE ROAD

Barrier Condition Photos

ROMO_0010_0.726_L_1.jpg

Barrier ID:	**ROMO-0010-0.787-L**		
Route Name:	TRAIL RIDGE ROAD		
Inspection Date:	10/01/2009	**Barrier Rating:**	41.00

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.):**	311
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:**	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.):**	19.0	**Post Spacing (In.):**	0.0
Height (In.):	21.0	**Lateral Offset (In.):**	36.5	**Road Grade (%):**	2.20

Physical Condition

Barrier	**Alignment and Height:**	Alignment acceptable. Height was within 3-in of the 18-in/24-in crenellated design height.
	Breaking and Cracking:	No major cracking or breaking.
	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:	**ROMO-0010-0.787-L**		
Route Name:	TRAIL RIDGE ROAD		
Inspection Date:	10/01/2009	**Barrier Rating:**	41.00

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.

Rocky Mountain National Park

ROUTE 0010: TRAIL RIDGE ROAD

Barrier Condition Photos

ROMO_0010_0.787_L_1.jpg

Barrier ID:	**ROMO-0010-6.875-L**		
Route Name:	TRAIL RIDGE ROAD		
Inspection Date:	10/02/2009	**Barrier Rating:**	76.60

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.):**	587
Speed Limit (MPH):	35	**Placement with Respect to Road:**	OUTSIDE OF CURVE
Hazard Behind Barrier:	EXTREME		

Barrier Crashworthiness

Appropriate Test Level:	TL-2	**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.):**	19.0	**Post Spacing (In.):**	0.0
Height (In.):	14.3	**Lateral Offset (In.):**	30.2	**Road Grade (%):**	6.90

Physical Condition

Barrier	**Alignment and Height:**	Alignment acceptable. 360-ft was 3-6-in below the 18-in/24-in crenellated design height and 90-ft was 7-in below.
	Breaking and Cracking:	No breaking or cracking observed.
	Missing Elements:	No missing elements were observed.
	Corrrosion and Weathering:	No corrosion or weathering observed.
End Treatments	**Alignment and Height:**	
	Breaking and Cracking:	
	Missing Elements:	
	Corrrosion and Weathering:	

Barrier ID:	**ROMO-0010-6.875-L**		
Route Name:	TRAIL RIDGE ROAD		
Inspection Date:	10/02/2009	**Barrier Rating:**	76.60

Repair Recommendations

Repair Action:	REPAIR	**FMSS Work Type:**	DEFERRED MAINTENANCE	**Repair Cost:**	$70813
Brief Workorder:	Raise guardwall 2-in. Remove and reset 90-ft of stone masonry guardwall on concrete footer to adjacent crenellated 12-in/18-in height.				
Workorder:	Remove & Reset Stone Masonry Guardwall at $250- per -Cu. Ft. for 216 CF = $54000. [(1.5ft)(1.6ft)(90ft)] = 216 CF. Structural Concrete at $1000- per -Cu. Yd. for 3 CY = $3000. [(1.6ft)(.5ft)(90ft)]/27 = 2.7 CY. Low Speed Traffic Control at $1475- per -Day for 5 Day(s) = $7375. 1 day removal 4 days installation.				

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

Rocky Mountain National Park

ROUTE 0010: TRAIL RIDGE ROAD

Barrier Condition Photos

ROMO_0010_6.875_L_1.jpg

Barrier ID:	**ROMO-0010-7.506-L**		
Route Name:	TRAIL RIDGE ROAD		
Inspection Date:	10/02/2009	**Barrier Rating:**	60.70

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.):**	104
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:**	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.):**	19.0	**Post Spacing (In.):**	0.0
Height (In.):	12.0	**Lateral Offset (In.):**	113.0	**Road Grade (%):**	4.80

Physical Condition

Barrier	**Alignment and Height:**	Alignment is skewed off road way-wall leans away from road 6 in. 64-ft was 3-6-in below the 18-in/24-in crenellated design height and 40-ft was 7-in below.
	Breaking and Cracking:	No breaking or cracking observed.
	Missing Elements:	No missing elements.
	Corrrosion and Weathering:	No corrosion or weathering observed.
End Treatments	**Alignment and Height:**	
	Breaking and Cracking:	
	Missing Elements:	
	Corrrosion and Weathering:	

Barrier ID:	**ROMO-0010-7.506-L**		
Route Name:	TRAIL RIDGE ROAD		
Inspection Date:	10/02/2009	**Barrier Rating:**	60.70

Repair Recommendations

Repair Action:	REPAIR	**FMSS Work Type:**	DEFERRED MAINTENANCE	**Repair Cost:**	$33468
Brief Workorder:	Raise guardwall 2-in. Remove and reset 40-ft of stone masonry guardwall on concrete footer to adjacent crenellated 12-in/18-in height.				
Workorder:	Remove & Reset Stone Masonry Guardwall at $250- per -Cu. Ft. for 96 CF = $24000. [(1.5ft)(1.6ft)(40ft)] = 96 CF. Structural Concrete at $1000- per -Cu. Yd. for 2 CY = $2000. [(1.6ft)(0.5ft)(40ft)] /27 = 1.2 CY. Low Speed Traffic Control at $1475- per -Day for 3 Day(s) = $4425. 1 day removal and 2 days installation.				

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

Rocky Mountain National Park

ROUTE 0010: TRAIL RIDGE ROAD

Barrier Condition Photos

ROMO_0010_7.506_L_1.jpg

Barrier ID:	**ROMO-0010-7.527-L**		
Route Name:	TRAIL RIDGE ROAD		
Inspection Date:	10/02/2009	**Barrier Rating:**	58.50

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.):**	97
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:**	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.):**	18.0	**Post Spacing (In.):**	0.0
Height (In.):	11.0	**Lateral Offset (In.):**	137.3	**Road Grade (%):**	1.60

Physical Condition

Barrier	**Alignment and Height:**	Alignment acceptable. 61-ft was 3-6-in below the 18-in/24-in crenellated design height and 36-ft was 9-in below.
	Breaking and Cracking:	No breaking or cracking observed.
	Missing Elements:	No missing elements were observed.
	Corrrosion and Weathering:	No corrosion or weathering observed.
End Treatments	**Alignment and Height:**	
	Breaking and Cracking:	
	Missing Elements:	
	Corrrosion and Weathering:	

Barrier ID:	**ROMO-0010-7.527-L**		
Route Name:	TRAIL RIDGE ROAD		
Inspection Date:	10/02/2009	**Barrier Rating:**	58.50

Repair Recommendations

Repair Action:	REPAIR	**FMSS Work Type:**	DEFERRED MAINTENANCE	**Repair Cost:**	$28243
Brief Workorder:	Raise guardwall 3-in. Remove and reset 36-ft of stone masonry guardwall on concrete footer to adjacent crenellated 12-in/18-in height.				
Workorder:	Remove & Reset Stone Masonry Guardwall at $250- per -Cu. Ft. for 81 CF = $20250. [(1.5ft)(1.5ft)(36ft)] = 81 CF. Structural Concrete at $1000- per -Cu. Yd. for 1 CY = $1000. [(1.5ft)(.5ft)(36ft)] /27 = 1 CY. Low Speed Traffic Control at $1475- per -Day for 3 Day(s) = $4425. 1 day removal and 2 days installation.				

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

Rocky Mountain National Park

ROUTE 0010: TRAIL RIDGE ROAD

Barrier Condition Photos

ROMO_0010_7.527_L_1.jpg

Barrier ID:	**ROMO-0010-7.642-L**		
Route Name:	TRAIL RIDGE ROAD		
Inspection Date:	10/02/2009	**Barrier Rating:**	66.50

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.):**	308
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:**	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.):**	18.0	**Post Spacing (In.):**	0.0
Height (In.):	12.6	**Lateral Offset (In.):**	32.2	**Road Grade (%):**	3.90

Physical Condition

Barrier	**Alignment and Height:**	Alignment acceptable. 153-ft was 3-6-in below the 18-in/24-in crenellated design height and 155-ft was 7-in below.
	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:	**ROMO-0010-7.642-L**		
Route Name:	TRAIL RIDGE ROAD		
Inspection Date:	10/02/2009	**Barrier Rating:**	66.50

Repair Recommendations

Repair Action:	REPAIR	**FMSS Work Type:**	DEFERRED MAINTENANCE	**Repair Cost:**	$116078
Brief Workorder:	Raise guardwall 2-in. Remove and reset 155-ft of stone masonry guardwall on concrete footer to adjacent crenellated 12-in/18-in height.				
Workorder:	Remove & Reset Stone Masonry Guardwall at $250- per -Cu. Ft. for 349 CF = $87250. [(1.5ft)(1.5ft)(155ft)] = 348.8 CF. Structural Concrete at $1000- per -Cu. Yd. for 5 CY = $5000. [(1.5ft)(.5ft)(155ft)] /27 = 4.3 CY. Low Speed Traffic Control at $1475- per -Day for 9 Day(s) = $13275. 2 days removal and 7 days installation.				

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

Rocky Mountain National Park

ROUTE 0010: TRAIL RIDGE ROAD

Barrier Condition Photos

ROMO_0010_7.642_L_1.jpg

Barrier ID:	**ROMO-0010-7.941-L**		
Route Name:	TRAIL RIDGE ROAD		
Inspection Date:	10/02/2009	**Barrier Rating:**	72.80

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.):**	288
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:**	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.):**	18.7	**Post Spacing (In.):**	0.0
Height (In.):	10.6	**Lateral Offset (In.):**	39.0	**Road Grade (%):**	5.10

Physical Condition

Barrier	**Alignment and Height:**	Alignment acceptable. 288-ft was 7-in to 10-in below the 18-in/24-in crenellated 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:	**ROMO-0010-7.941-L**		
Route Name:	TRAIL RIDGE ROAD		
Inspection Date:	10/02/2009	**Barrier Rating:**	72.80

Repair Recommendations

Repair Action:	REPAIR	**FMSS Work Type:**	DEFERRED MAINTENANCE	**Repair Cost:**	$226738
Brief Workorder:	Raise guardwall 7-in. Remove and reset 288-ft of stone masonry guardwall on concrete footer to crenellated 18-in/24-in design height.				
Workorder:	Remove & Reset Stone Masonry Guardwall at $250- per -Cu. Ft. for 692 CF = $173000. [(1.5ft)(1.6ft)(288ft)] = 691.2 CF. Structural Concrete at $1000- per -Cu. Yd. for 11 CY = $11000. [(1.5ft)(.6ft)(288ft)] /27 = 10.3 CY. Low Speed Traffic Control at $1475- per -Day for 15 Day(s) = $22125. 3 days removal and 12 days installation.				

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

Rocky Mountain National Park

ROUTE 0010: TRAIL RIDGE ROAD

Barrier Condition Photos

ROMO_0010_7.941_L_1.jpg

Barrier ID:	**ROMO-0010-8.021-L**		
Route Name:	TRAIL RIDGE ROAD		
Inspection Date:	10/02/2009	**Barrier Rating:**	61.40

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.):**	443
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:**	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.):**	18.2	**Post Spacing (In.):**	0.0
Height (In.):	17.2	**Lateral Offset (In.):**	73.0	**Road Grade (%):**	6.30

Physical Condition

Barrier	**Alignment and Height:**	Alignment acceptable. Height was within 3-in of the 18-in/24-in crenellated 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:	**ROMO-0010-8.021-L**		
Route Name:	TRAIL RIDGE ROAD		
Inspection Date:	10/02/2009	**Barrier Rating:**	61.40

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.

Rocky Mountain National Park

ROUTE 0010: TRAIL RIDGE ROAD

Barrier Condition Photos

ROMO_0010_8.021_L_1.jpg

ROMO_0010_8.021_L_2.jpg

Barrier ID:	**ROMO-0010-8.418-R**		
Route Name:	TRAIL RIDGE ROAD		
Inspection Date:	10/02/2009	**Barrier Rating:**	48.40

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.):**	490
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:**	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.):**	19.7	**Post Spacing (In.):**	0.0
Height (In.):	19.2	**Lateral Offset (In.):**	81.3	**Road Grade (%):**	5.10

Physical Condition

Barrier	**Alignment and Height:**	Alignment acceptable. Height was within 3-in of the 18-in/24-in crenellated 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:	**ROMO-0010-8.418-R**		
Route Name:	TRAIL RIDGE ROAD		
Inspection Date:	10/02/2009	**Barrier Rating:**	48.40

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.

Rocky Mountain National Park

ROUTE 0010: TRAIL RIDGE ROAD

Barrier Condition Photos

ROMO_0010_8.418_R_1.jpg

Barrier ID:	**ROMO-0010-9.075-R**		
Route Name:	TRAIL RIDGE ROAD		
Inspection Date:	10/02/2009	**Barrier Rating:**	59.20

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.):**	168
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:**	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.):**	17.0	**Post Spacing (In.):**	0.0
Height (In.):	15.3	**Lateral Offset (In.):**	32.2	**Road Grade (%):**	4.60

Physical Condition

Barrier	**Alignment and Height:**	Alignment acceptable. Height was within 3-in of the 18-in/24-in crenellated 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:	**ROMO-0010-9.075-R**		
Route Name:	TRAIL RIDGE ROAD		
Inspection Date:	10/02/2009	**Barrier Rating:**	59.20

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.

Rocky Mountain National Park

ROUTE 0010: TRAIL RIDGE ROAD

Barrier Condition Photos

ROMO_0010_9.075_R_1.jpg

Barrier ID:	**ROMO-0010-9.220-R**		
Route Name:	TRAIL RIDGE ROAD		
Inspection Date:	10/02/2009	**Barrier Rating:**	70.60

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.):**	608
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:**	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.):**	18.5	**Post Spacing (In.):**	0.0
Height (In.):	12.1	**Lateral Offset (In.):**	30.0	**Road Grade (%):**	4.50

Physical Condition

Barrier	**Alignment and Height:**	Alignment acceptable. 410-ft was 3-6-in below the 18-in/24-in crenellated design height and 198-ft was 8-in below.
	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:	**ROMO-0010-9.220-R**		
Route Name:	TRAIL RIDGE ROAD		
Inspection Date:	10/02/2009	**Barrier Rating:**	70.60

Repair Recommendations

Repair Action:	REPAIR	**FMSS Work Type:**	DEFERRED MAINTENANCE	**Repair Cost:**	$145475
Brief Workorder:	Raise 198 feet of guardwall 3 inches. Remove and reset on concrete footer to to match the adjacent 14" non-crenellated height of the existing barrier.				
Workorder:	Remove & Reset Stone Masonry Guardwall at $250- per -Cu. Ft. for 446 CF = $111500. [(1.5ft)(1.5ft)(198ft)] = 445.5 CF. Structural Concrete at $1000- per -Cu. Yd. for 6 CY = $6000. [(1.5ft)(.5ft)(198ft)] /27 = 5.5 CY. Low Speed Traffic Control at $1475- per -Day for 10 Day(s) = $14750. 2 days removal and 8 days installation.				

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

Rocky Mountain National Park

ROUTE 0010: TRAIL RIDGE ROAD

Barrier Condition Photos

ROMO_0010_9.220_R_1.jpg

Barrier ID:	**ROMO-0010-9.519-R**		
Route Name:	TRAIL RIDGE ROAD		
Inspection Date:	10/02/2009	**Barrier Rating:**	57.50

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.):**	292
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:**	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.):**	19.6	**Post Spacing (In.):**	0.0
Height (In.):	15.0	**Lateral Offset (In.):**	71.3	**Road Grade (%):**	4.20

Physical Condition

Barrier	**Alignment and Height:**	Alignment acceptable. 72-ft was 3-6-in below the 18-in/24-in crenellated 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:	**ROMO-0010-9.519-R**		
Route Name:	TRAIL RIDGE ROAD		
Inspection Date:	10/02/2009	**Barrier Rating:**	57.50

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.

Rocky Mountain National Park

ROUTE 0010: TRAIL RIDGE ROAD

Barrier Condition Photos

ROMO_0010_9.519_R_1.jpg

Barrier ID:	**ROMO-0010-10.074-R**		
Route Name:	TRAIL RIDGE ROAD		
Inspection Date:	10/02/2009	**Barrier Rating:**	58.50

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.):**	203
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:**	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.):**	18.6	**Post Spacing (In.):**	0.0
Height (In.):	11.0	**Lateral Offset (In.):**	88.5	**Road Grade (%):**	6.30

Physical Condition

Barrier	**Alignment and Height:**	Alignment acceptable. 161-ft was 7-in below the 18-in/24-in crenellated design height.
	Breaking and Cracking:	Cracks greater than 0.5in. found in 161ft. of barrier.
	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:	**ROMO-0010-10.074-R**		
Route Name:	TRAIL RIDGE ROAD		
Inspection Date:	10/02/2009	**Barrier Rating:**	58.50

Repair Recommendations

Repair Action:	REPAIR	**FMSS Work Type:**	DEFERRED MAINTENANCE	**Repair Cost:**	$126528
Brief Workorder:	Raise guardwall 1 inch. Remove and reset 161 feet of stone masonry guardwall on concrete footer to adjacent crenellated 12in/18in height.				
Workorder:	Remove & Reset Stone Masonry Guardwall at $250- per -Cu. Ft. for 387 CF = $96750. [(1.5ft)(1.6ft)(161ft)] = 386.4 CF. Structural Concrete at $1000- per -Cu. Yd. for 5 CY = $5000. [(1.6ft)(.5ft)(161ft)] /27 = 4.7 CY. Low Speed Traffic Control at $1475- per -Day for 9 Day(s) = $13275. 2 days removal and 7 days installation.				

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

Rocky Mountain National Park

ROUTE 0010: TRAIL RIDGE ROAD

Barrier Condition Photos

ROMO_0010_10.074_R_1.jpg

Barrier ID:	**ROMO-0010-10.409-R**		
Route Name:	TRAIL RIDGE ROAD		
Inspection Date:	10/02/2009	**Barrier Rating:**	66.40

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.):**	299
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:**	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.):**	18.2	**Post Spacing (In.):**	0.0
Height (In.):	12.0	**Lateral Offset (In.):**	38.0	**Road Grade (%):**	5.30

Physical Condition

Barrier	**Alignment and Height:**	Alignment acceptable. 15-ft was 3-6-in below the 18-in/24-in crenellated design height and 219-ft was 8-in below.
	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:	**ROMO-0010-10.409-R**		
Route Name:	TRAIL RIDGE ROAD		
Inspection Date:	10/02/2009	**Barrier Rating:**	66.40

Repair Recommendations

Repair Action:	REPAIR	**FMSS Work Type:**	DEFERRED MAINTENANCE	**Repair Cost:**	$162745
Brief Workorder:	Raise guardwall 3-in. Remove and reset 219-ft of stone masonry guardwall on concrete footer to adjacent crenellated 12-in/18-in height.				
Workorder:	Remove & Reset Stone Masonry Guardwall at $250- per -Cu. Ft. for 493 CF = $123250. [(1.5ft)(1.5ft)(219ft)] = 492.8 CF. Structural Concrete at $1000- per -Cu. Yd. for 7 CY = $7000. [(1.5ft)(.5ft)(219ft)] /27 = 6.1 CY. Low Speed Traffic Control at $1475- per -Day for 12 Day(s) = $17700. 3 days removal and 9 days installation.				

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

Rocky Mountain National Park

ROUTE 0010: TRAIL RIDGE ROAD

Barrier Condition Photos

ROMO_0010_10.409_R_1.jpg

Barrier ID:	**ROMO-0010-10.636-R**		
Route Name:	TRAIL RIDGE ROAD		
Inspection Date:	10/02/2009	**Barrier Rating:**	65.50

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.):**	242
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:**	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.):**	17.7	**Post Spacing (In.):**	0.0
Height (In.):	6.3	**Lateral Offset (In.):**	27.2	**Road Grade (%):**	7.00

Physical Condition

Barrier	**Alignment and Height:**	Alignment acceptable. 22-ft was 3-6-in. below the 18-in/24-in crenellated design height and 220-ft was 12-16-in. below.
	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:	**ROMO-0010-10.636-R**		
Route Name:	TRAIL RIDGE ROAD		
Inspection Date:	10/02/2009	**Barrier Rating:**	65.50

Repair Recommendations

Repair Action:	REPAIR	**FMSS Work Type:**	DEFERRED MAINTENANCE	**Repair Cost:**	$165495
Brief Workorder:	Raise guardwall 8-in. Remove and reset 220-ft of stone masonry guardwall on concrete footer to adjacent crenellated 12-in/18-in height.				
Workorder:	Remove & Reset Stone Masonry Guardwall at $250- per -Cu. Ft. for 495 CF = $123750. [(1.5ft)(1.5ft)(220ft)] = 495 CF. Structural Concrete at $1000- per -Cu. Yd. for 9 CY = $9000. [(1.5ft)(0.67ft)(220ft)] = 8.2 CY. Low Speed Traffic Control at $1475- per -Day for 12 Day(s) = $17700. 3 days removal and 9 days installation.				

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

Rocky Mountain National Park

ROUTE 0010: TRAIL RIDGE ROAD

Barrier Condition Photos

ROMO_0010_10.636_R_1.jpg

Barrier ID:	**ROMO-0010-11.375-R**		
Route Name:	TRAIL RIDGE ROAD		
Inspection Date:	10/02/2009	**Barrier Rating:**	38.40

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.):**	575
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:**	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.):**	18.7	**Post Spacing (In.):**	0.0
Height (In.):	25.7	**Lateral Offset (In.):**	29.7	**Road Grade (%):**	6.20

Physical Condition

Barrier	**Alignment and Height:**	Alignment acceptable. Height was within 3-in of the 18-in/24-in crenellated 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:	**ROMO-0010-11.375-R**		
Route Name:	TRAIL RIDGE ROAD		
Inspection Date:	10/02/2009	**Barrier Rating:**	38.40

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.

Rocky Mountain National Park

ROUTE 0010: TRAIL RIDGE ROAD

Barrier Condition Photos

ROMO_0010_11.375_R_1.jpg

Barrier ID:	**ROMO-0010-11.891-R**		
Route Name:	TRAIL RIDGE ROAD		
Inspection Date:	10/02/2009	**Barrier Rating:**	85.90

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.):**	1295
Speed Limit (MPH):	35	**Placement with Respect to Road:**	BOTH INSIDE AND OUTSIDE
Hazard Behind Barrier:	EXTREME		

Barrier Crashworthiness

Appropriate Test Level:	TL-2	**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.):**	18.6	**Post Spacing (In.):**	0.0
Height (In.):	10.8	**Lateral Offset (In.):**	30.2	**Road Grade (%):**	5.60

Physical Condition

Barrier	**Alignment and Height:**	Alignment acceptable. 310-ft was 3-6-in below the 18-in/24-in crenellated design height and 910-ft was 7-12-in below.
	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:	**ROMO-0010-11.891-R**		
Route Name:	TRAIL RIDGE ROAD		
Inspection Date:	10/02/2009	**Barrier Rating:**	85.90

Repair Recommendations

Repair Action:	REPAIR	**FMSS Work Type:**	DEFERRED MAINTENANCE	**Repair Cost:**	$706558
Brief Workorder:	Raise guardwall 5-in. Remove and reset 910-ft of stone masonry guardwall on concrete footer to adjacent crenellated 12-in/18-in height.				
Workorder:	Remove & Reset Stone Masonry Guardwall at $250- per -Cu. Ft. for 2184 CF = $546000. [(1.5ft)(1.6ft)(910ft)] = 2184 CF. Structural Concrete at $1000- per -Cu. Yd. for 27 CY = $27000. [(1.6ft)(.5ft)(910ft)] /27= 26.9 CY. Low Speed Traffic Control at $1475- per -Day for 47 Day(s) = $69325. 10 days removal and 37 days installation.				

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

Rocky Mountain National Park

ROUTE 0010: TRAIL RIDGE ROAD

Barrier Condition Photos

ROMO_0010_11.891_R_1.jpg

Barrier ID:	**ROMO-0010-12.135-R**		
Route Name:	TRAIL RIDGE ROAD		
Inspection Date:	10/02/2009	**Barrier Rating:**	18.60

Barrier Description

Type:	STONE MASONRY WITHOUT CONCRETE CORE WALL	**Barrier Function:**	NON-TRAFFIC
Barrier Material:	STONE	**Post Material:**	N/A
Blockout Type:	N/A	**Length (ft.):**	135
Speed Limit (MPH):	35	**Placement with Respect to Road:**	NON-TRAFFIC BARRIER
Hazard Behind Barrier:	N/A		

Barrier Crashworthiness

Appropriate Test Level:	TL-2	**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.):**	18.0	**Post Spacing (In.):**	0.0
Height (In.):	22.7	**Lateral Offset (In.):**	0.0	**Road Grade (%):**	0.00

Physical Condition

Barrier	**Alignment and Height:**	Alignment acceptable. Height was within 3-in of the 18-in/24-in crenellated 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:	**ROMO-0010-12.135-R**		
Route Name:	TRAIL RIDGE ROAD		
Inspection Date:	10/02/2009	**Barrier Rating:**	18.60

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.

Rocky Mountain National Park

ROUTE 0010: TRAIL RIDGE ROAD

Barrier Condition Photos

ROMO_0010_12.135_R_1.jpg

Barrier ID:	**ROMO-0010-12.237-R**		
Route Name:	TRAIL RIDGE ROAD		
Inspection Date:	09/29/2009	**Barrier Rating:**	88.60

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.):**	2272
Speed Limit (MPH):	35	**Placement with Respect to Road:**	OUTSIDE OF CURVE
Hazard Behind Barrier:	EXTREME		

Barrier Crashworthiness

Appropriate Test Level:	TL-2	**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.):**	18.7	**Post Spacing (In.):**	0.0
Height (In.):	9.4	**Lateral Offset (In.):**	22.0	**Road Grade (%):**	6.10

Physical Condition

Barrier	**Alignment and Height:**	Alignment acceptable. 2272-ft was 6-in to 10-in below the 18-in/24-in crenellated 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:	**ROMO-0010-12.237-R**		
Route Name:	TRAIL RIDGE ROAD		
Inspection Date:	09/29/2009	**Barrier Rating:**	88.60

Repair Recommendations

Repair Action:	REPAIR	**FMSS Work Type:**	DEFERRED MAINTENANCE	**Repair Cost:**	$1795640
Brief Workorder:	Raise guardwall 9 inches. Remove and reset 2272 feet of stone masonry guardwall on concrete footer to crenellated 18-in/24-in design height.				
Workorder:	Remove & Reset Stone Masonry Guardwall at $250- per -Cu. Ft. for 5453 CF = $1363250. [(1.5ft)(1.6ft)(2272ft)] = 5452.8 CF. Structural Concrete at $1000- per -Cu. Yd. for 101 CY = $101000. [(1.6ft)(0.75ft)(2272ft)/27 = 100.9 CY. Low Speed Traffic Control at $1475- per -Day for 114 Day(s) = $168150. 23 days removal and 91 days installation.				

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

Rocky Mountain National Park

ROUTE 0010: TRAIL RIDGE ROAD

Barrier Condition Photos

ROMO_0010_12.237_R_1.jpg

Barrier ID:	**ROMO-0010-14.465-L**		
Route Name:	TRAIL RIDGE ROAD		
Inspection Date:	09/29/2009	**Barrier Rating:**	72.80

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.):**	423
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:**	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.):**	17.7	**Post Spacing (In.):**	0.0
Height (In.):	11.3	**Lateral Offset (In.):**	24.2	**Road Grade (%):**	4.00

Physical Condition

Barrier	**Alignment and Height:**	Alignment acceptable. 201-ft was 3-6-in below the 18-in/24-in crenellated design height and 222ft. was 7-in below
	Breaking and Cracking:	No breaking or cracking observed.
	Missing Elements:	2 missing rocks approximately totalling 8 cu ft; missing grout 2 sq ft.
	Corrrosion and Weathering:	No corrosion or weathering observed.
End Treatments	**Alignment and Height:**	
	Breaking and Cracking:	
	Missing Elements:	
	Corrrosion and Weathering:	

Barrier ID:	**ROMO-0010-14.465-L**				
Route Name:	TRAIL RIDGE ROAD				
Inspection Date:	09/29/2009		**Barrier Rating:**	72.80	

Repair Recommendations

Repair Action:	REPAIR	**FMSS Work Type:**	DEFERRED MAINTENANCE	**Repair Cost:**	$164824
Brief Workorder:	Raise guardwall 2-in. Remove and reset 222-ft of stone masonry guardwall on concrete footer to adjacent crenellated 12-in/18-in height. Repoint 1SY and replace 2 missing stones.				
Workorder:	Remove & Reset Stone Masonry Guardwall at $250- per -Cu. Ft. for 500 CF = $125000. [(1.5ft)(1.5ft)(222ft)] = 499.5 CF. Structural Concrete at $1000- per -Cu. Yd. for 7 CY = $7000. [(1.5ft)(0.5ft)(222ft)] /27 = 6.2 CY. Low Speed Traffic Control at $1475- per -Day for 12 Day(s) = $17700. 3 days removal and 9 days installation. Re-Point Masonry Barrier at $140- per -Sq. Yd. for 1 SY = $140. Replace 2 missing stones and repoint.				

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

Rocky Mountain National Park

ROUTE 0010: TRAIL RIDGE ROAD

Barrier Condition Photos

ROMO_0010_14.465_L_1.jpg

Barrier ID:	**ROMO-0010-15.059-L**		
Route Name:	TRAIL RIDGE ROAD		
Inspection Date:	09/29/2009	**Barrier Rating:**	63.90

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.):**	188
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:**	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.):**	19.2	**Post Spacing (In.):**	0.0
Height (In.):	11.6	**Lateral Offset (In.):**	39.5	**Road Grade (%):**	5.40

Physical Condition

Barrier	**Alignment and Height:**	Alignment acceptable. 152-ft was 3-6-in below the 18-in/24-in crenellated design height and 36-ft. was 7-in below
	Breaking and Cracking:	Minor cracking 1/4 to 1/2 in.
	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:	**ROMO-0010-15.059-L**		
Route Name:	TRAIL RIDGE ROAD		
Inspection Date:	09/29/2009	**Barrier Rating:**	63.90

Repair Recommendations

Repair Action:	REPAIR	**FMSS Work Type:**	DEFERRED MAINTENANCE	**Repair Cost:**	$30993
Brief Workorder:	Raise guardwall 2-in. Remove and reset 36-ft of stone masonry guardwall on concrete footer to adjacent crenellated 12-in/18-in height.				
Workorder:	Remove & Reset Stone Masonry Guardwall at $250- per -Cu. Ft. for 87 CF = $21750. [(1.5ft)(1.6ft)(36ft)] = 86.4 CF. Structural Concrete at $1000- per -Cu. Yd. for 2 CY = $2000. [(1.6ft)(0.5ft)(36ft)] /27 = 1.1 CY. Low Speed Traffic Control at $1475- per -Day for 3 Day(s) = $4425. 1 day removal and 2 days installation.				

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

Rocky Mountain National Park

ROUTE 0010: TRAIL RIDGE ROAD

Barrier Condition Photos

ROMO_0010_15.059_L_1.jpg

Barrier ID:	**ROMO-0010-16.987-L**		
Route Name:	TRAIL RIDGE ROAD		
Inspection Date:	09/29/2009	**Barrier Rating:**	68.50

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.):**	379
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:**	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.):**	19.2	**Post Spacing (In.):**	0.0
Height (In.):	9.0	**Lateral Offset (In.):**	29.2	**Road Grade (%):**	1.50

Physical Condition

Barrier	**Alignment and Height:**	Approximately 1/3 of wall is leaning away from road. 12-ft was 3-6-in below the 18-in/24-in crenellated design height and 330-ft. was 10-11in. below
	Breaking and Cracking:	No breaking or cracking observed.
	Missing Elements:	5 sq ft missing grout.
	Corrrosion and Weathering:	Some lichen growth on stones.
End Treatments	**Alignment and Height:**	
	Breaking and Cracking:	
	Missing Elements:	
	Corrrosion and Weathering:	

Barrier ID:	**ROMO-0010-16.987-L**		
Route Name:	TRAIL RIDGE ROAD		
Inspection Date:	09/29/2009	**Barrier Rating:**	68.50

Repair Recommendations

Repair Action:	REPAIR	**FMSS Work Type:**	DEFERRED MAINTENANCE	**Repair Cost:**	$258005
Brief Workorder:	Raise guardwall 5-in. Remove and reset 330-ft of stone masonry guardwall on concrete footer to adjacent crenellated 12-in/18-in height.				
Workorder:	Remove & Reset Stone Masonry Guardwall at $250- per -Cu. Ft. for 792 CF = $198000. [(1.5ft)(1.6ft)(330ft)] = 792 CF. Structural Concrete at $1000- per -Cu. Yd. for 10 CY = $10000. [(1.6ft)(0.5ft)(330ft)] /27 = 9.7 CY. Low Speed Traffic Control at $1475- per -Day for 18 Day(s) = $26550. 4 days removal and 14 days installation.				

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

Rocky Mountain National Park

ROUTE 0010: TRAIL RIDGE ROAD

Barrier Condition Photos

ROMO_0010_16.987_L_1.jpg

Barrier ID:	**ROMO-0010-17.060-L**		
Route Name:	TRAIL RIDGE ROAD		
Inspection Date:	09/29/2009	**Barrier Rating:**	30.00

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.):**	203
Speed Limit (MPH):	35	**Placement with Respect to Road:**	TANGENT
Hazard Behind Barrier:	EXTREME		

Barrier Crashworthiness

Appropriate Test Level:	TL-2	**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.):**	24.0	**Post Spacing (In.):**	0.0
Height (In.):	30.0	**Lateral Offset (In.):**	27.6	**Road Grade (%):**	3.90

Physical Condition

Barrier	**Alignment and Height:**	Alignment acceptable. Height was 5-7in. above the 24-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:	**ROMO-0010-17.060-L**		
Route Name:	TRAIL RIDGE ROAD		
Inspection Date:	09/29/2009	**Barrier Rating:**	30.00

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.

Rocky Mountain National Park

ROUTE 0010: TRAIL RIDGE ROAD

Barrier Condition Photos

ROMO_0010_17.060_L_1.jpg

Barrier ID:	**ROMO-0010-17.116-L**		
Route Name:	TRAIL RIDGE ROAD		
Inspection Date:	09/29/2009	**Barrier Rating:**	8.50

Barrier Description

Type:	STONE MASONRY WITHOUT CONCRETE CORE WALL	**Barrier Function:**	NON-TRAFFIC
Barrier Material:	STONE	**Post Material:**	N/A
Blockout Type:	N/A	**Length (ft.):**	34
Speed Limit (MPH):	35	**Placement with Respect to Road:**	NON-TRAFFIC BARRIER
Hazard Behind Barrier:	N/A		

Barrier Crashworthiness

Appropriate Test Level:	TL-2	**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.):**	20.0	**Post Spacing (In.):**	0.0
Height (In.):	23.7	**Lateral Offset (In.):**	0.0	**Road Grade (%):**	0.00

Physical Condition

Barrier	**Alignment and Height:**	Alignment acceptable. Height was between 4-in below to 15-in above crenellated 18in/24in design height.
	Breaking and Cracking:	No breaking or cracking observed.
	Missing Elements:	Missing grout is 1 sq yd.
	Corrrosion and Weathering:	No corrosion or weathering observed.
End Treatments	**Alignment and Height:**	
	Breaking and Cracking:	
	Missing Elements:	
	Corrrosion and Weathering:	

Barrier ID:	**ROMO-0010-17.116-L**		
Route Name:	TRAIL RIDGE ROAD		
Inspection Date:	09/29/2009	**Barrier Rating:**	8.50

Repair Recommendations

Repair Action:	REPAIR	**FMSS Work Type:**	DEFERRED MAINTENANCE	**Repair Cost:**	$154
Brief Workorder:	Repoint 1 SY. of wall for missing grout				
Workorder:	Re-point masonry barrier at $140- per -Sq. Yd. for 1 SY = $140.				

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

Rocky Mountain National Park

ROUTE 0010: TRAIL RIDGE ROAD

Barrier Condition Photos

ROMO_0010_17.116_L_1.jpg

Barrier ID:	**ROMO-0010-17.150-L**		
Route Name:	TRAIL RIDGE ROAD		
Inspection Date:	09/29/2009	**Barrier Rating:**	56.50

Barrier Description

Type:	STONE MASONRY WITHOUT CONCRETE CORE WALL	**Barrier Function:**	NON-TRAFFIC
Barrier Material:	STONE	**Post Material:**	N/A
Blockout Type:	N/A	**Length (ft.):**	593
Speed Limit (MPH):	35	**Placement with Respect to Road:**	NON-TRAFFIC BARRIER
Hazard Behind Barrier:	N/A		

Barrier Crashworthiness

Appropriate Test Level:	TL-2	**Barrier Test Level:**	NCW	**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.):**	19.0	**Post Spacing (In.):**	0.0
Height (In.):	12.8	**Lateral Offset (In.):**	0.0	**Road Grade (%):**	0.00

Physical Condition

Barrier	**Alignment and Height:**	Alignment acceptable. 162-ft was 3-6-in below the 18-in/24-in crenellated design height and 216-ft was 7-in below.
	Breaking and Cracking:	Minor cracking on back side of barrier.
	Missing Elements:	No missing elements observed.
	Corrrosion and Weathering:	Some weathering of grout.
End Treatments	**Alignment and Height:**	
	Breaking and Cracking:	
	Missing Elements:	
	Corrrosion and Weathering:	

Barrier ID:	**ROMO-0010-17.150-L**		
Route Name:	TRAIL RIDGE ROAD		
Inspection Date:	09/29/2009	**Barrier Rating:**	56.50

Repair Recommendations

Repair Action:	REPAIR	**FMSS Work Type:**	DEFERRED MAINTENANCE	**Repair Cost:**	$169895
Brief Workorder:	Raise guardwall 2-in. Remove and reset 216-ft of stone masonry guardwall on concrete footer to adjacent crenellated 12-in/18-in height.				
Workorder:	Remove & Reset Stone Masonry Guardwall at $250- per -Cu. Ft. for 519 CF = $129750. [(1.5ft)(1.6ft)(216ft)] = 518.4 CF. Structural Concrete at $1000- per -Cu. Yd. for 7 CY = $7000. [(1.6ft)(0.5ft)(216ft)] /27 = 6.4 CY. Low Speed Traffic Control at $1475- per -Day for 12 Day(s) = $17700. 3 days removal and 9 days installation.				

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

Rocky Mountain National Park

ROUTE 0010: TRAIL RIDGE ROAD

Barrier Condition Photos

ROMO_0010_17.150_L_1.jpg

Barrier ID:	**ROMO-0010-17.460-L**		
Route Name:	TRAIL RIDGE ROAD		
Inspection Date:	09/29/2009	**Barrier Rating:**	41.50

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.):**	150
Speed Limit (MPH):	35	**Placement with Respect to Road:**	OUTSIDE OF CURVE
Hazard Behind Barrier:	EXTREME		

Barrier Crashworthiness

Appropriate Test Level:	TL-2	**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.):**	20.7	**Post Spacing (In.):**	0.0
Height (In.):	20.0	**Lateral Offset (In.):**	39.0	**Road Grade (%):**	7.70

Physical Condition

Barrier	**Alignment and Height:**	Alignment acceptable. Height was within 3-in of the 18-in/24-in crenellated 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:	**ROMO-0010-17.460-L**		
Route Name:	TRAIL RIDGE ROAD		
Inspection Date:	09/29/2009	**Barrier Rating:**	41.50

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.

Rocky Mountain National Park

ROUTE 0010: TRAIL RIDGE ROAD

Barrier Condition Photos

ROMO_0010_17.460_L_1.jpg

Barrier ID:	**ROMO-0010-18.667-R**		
Route Name:	TRAIL RIDGE ROAD		
Inspection Date:	09/29/2009	**Barrier Rating:**	63.70

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.):**	292
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:**	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.):**	18.2	**Post Spacing (In.):**	0.0
Height (In.):	7.0	**Lateral Offset (In.):**	61.5	**Road Grade (%):**	5.40

Physical Condition

Barrier	**Alignment and Height:**	Alignment acceptable. 292-ft was 9-in to 12-in below the 18-in/24-in crenellated design height.
	Breaking and Cracking:	Broken sections on both ends major cracking.
	Missing Elements:	No missing elements observed.
	Corrrosion and Weathering:	Some weathering of the grout.
End Treatments	**Alignment and Height:**	
	Breaking and Cracking:	
	Missing Elements:	
	Corrrosion and Weathering:	

Barrier ID:	**ROMO-0010-18.667-R**		
Route Name:	TRAIL RIDGE ROAD		
Inspection Date:	09/29/2009	**Barrier Rating:**	63.70

Repair Recommendations

Repair Action:	REPAIR	**FMSS Work Type:**	DEFERRED MAINTENANCE	**Repair Cost:**	$234713
Brief Workorder:	Raise guardwall 11-in. Remove and reset 292-ft of stone masonry guardwall on concrete footer to crenellated 18-in/24-in design height.				
Workorder:	Remove & Reset Stone Masonry Guardwall at $250- per -Cu. Ft. for 701 CF = $175250. [(1.5ft)(1.6ft)(292ft)] = 700.8 CF. Structural Concrete at $1000- per -Cu. Yd. for 16 CY = $16000. [(1.6ft)(0.9ft)(292ft)] /27 = 15.5 CY. Low Speed Traffic Control at $1475- per -Day for 15 Day(s) = $22125. 3 days removal and 12 days installation.				

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

Rocky Mountain National Park

ROUTE 0010: TRAIL RIDGE ROAD

Barrier Condition Photos

ROMO_0010_18.667_R_1.jpg

Barrier ID:	**ROMO-0010-18.937-L**		
Route Name:	TRAIL RIDGE ROAD		
Inspection Date:	09/29/2009	**Barrier Rating:**	69.90

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.):**	324
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:**	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.):**	18.2	**Post Spacing (In.):**	0.0
Height (In.):	10.0	**Lateral Offset (In.):**	83.3	**Road Grade (%):**	4.40

Physical Condition

Barrier	**Alignment and Height:**	Alignment acceptable. 324-ft was 7-in to 9-in below the 18-in/24-in crenellated design height.
	Breaking and Cracking:	No breaking or cracking observed.
	Missing Elements:	1 sq yd missing grout.
	Corrrosion and Weathering:	No corrosion or weathering observed.
End Treatments	**Alignment and Height:**	
	Breaking and Cracking:	
	Missing Elements:	
	Corrrosion and Weathering:	

Barrier ID:	**ROMO-0010-18.937-L**		
Route Name:	TRAIL RIDGE ROAD		
Inspection Date:	09/29/2009	**Barrier Rating:**	69.90

Repair Recommendations

Repair Action:	REPAIR	**FMSS Work Type:**	DEFERRED MAINTENANCE	**Repair Cost:**	$242358
Brief Workorder:	Raise guardwall 8-in. Remove and reset 324-ft of stone masonry guardwall on concrete footer to crenellated 18-in/24-in design height.				
Workorder:	Remove & Reset Stone Masonry Guardwall at $250- per -Cu. Ft. for 729 CF = $182250. [(1.5ft)(1.5ft)(324ft)] = 729 CF. Structural Concrete at $1000- per -Cu. Yd. for 13 CY = $13000. [(1.5ft)(.67ft)(324ft)] /27 = 12.1 CY. Low Speed Traffic Control at $1475- per -Day for 17 Day(s) = $25075. 4 days removal and 13 days installation.				

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

Rocky Mountain National Park

ROUTE 0010: TRAIL RIDGE ROAD

Barrier Condition Photos

ROMO_0010_18.937_L_1.jpg

Barrier ID:	**ROMO-0010-19.353-L**		
Route Name:	TRAIL RIDGE ROAD		
Inspection Date:	09/29/2009	**Barrier Rating:**	62.20

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.):**	257
Speed Limit (MPH):	35	**Placement with Respect to Road:**	OUTSIDE OF CURVE
Hazard Behind Barrier:	N/A		

Barrier Crashworthiness

Appropriate Test Level:	TL-2	**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.):**	19.6	**Post Spacing (In.):**	0.0
Height (In.):	14.3	**Lateral Offset (In.):**	40.5	**Road Grade (%):**	2.70

Physical Condition

Barrier	**Alignment and Height:**	Alignment acceptable. 160-ft was 3-6-in below the 18-in/24-in crenellated design height.
	Breaking and Cracking:	Some cracking 1 loose stone.
	Missing Elements:	No missing elements observed.
	Corrrosion and Weathering:	Minor weathering.
End Treatments	**Alignment and Height:**	
	Breaking and Cracking:	
	Missing Elements:	
	Corrrosion and Weathering:	

Barrier ID:	**ROMO-0010-19.353-L**		
Route Name:	TRAIL RIDGE ROAD		
Inspection Date:	09/29/2009	**Barrier Rating:**	62.20

Repair Recommendations

Repair Action:	REPAIR	**FMSS Work Type:**	DEFERRED MAINTENANCE	**Repair Cost:**	$1777
Brief Workorder:	Reset 1 stone.				
Workorder:	Re-Point Masonry Barrier at $140- per -Sq. Yd. for 1 SY = $140. 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.

Rocky Mountain National Park

ROUTE 0010: TRAIL RIDGE ROAD

Barrier Condition Photos

ROMO_0010_19.353_L_1.jpg

Barrier ID:	**ROMO-0010-21.717-R**		
Route Name:	TRAIL RIDGE ROAD		
Inspection Date:	09/28/2009	**Barrier Rating:**	27.80

Barrier Description

Type:	STONE MASONRY WITHOUT CONCRETE CORE WALL	**Barrier Function:**	NON-TRAFFIC
Barrier Material:	STONE	**Post Material:**	N/A
Blockout Type:	N/A	**Length (ft.):**	234
Speed Limit (MPH):	35	**Placement with Respect to Road:**	NON-TRAFFIC BARRIER
Hazard Behind Barrier:	N/A		

Barrier Crashworthiness

Appropriate Test Level:	TL-2	**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.):**	18.5	**Post Spacing (In.):**	0.0
Height (In.):	13.1	**Lateral Offset (In.):**	0.0	**Road Grade (%):**	0.00

Physical Condition

Barrier	**Alignment and Height:**	Alignment acceptable. 166-ft was 3-6-in below the 18-in/24-in crenellated design height and 30-ft was 7-9-in below.
	Breaking and Cracking:	No breaking or cracking observed.
	Missing Elements:	Grout has separated 0.5-2-ines in 5 areas.
	Corrrosion and Weathering:	No corrosion or weathering observed.
End Treatments	**Alignment and Height:**	
	Breaking and Cracking:	
	Missing Elements:	
	Corrrosion and Weathering:	

Barrier ID:	**ROMO-0010-21.717-R**		
Route Name:	TRAIL RIDGE ROAD		
Inspection Date:	09/28/2009	**Barrier Rating:**	27.80

Repair Recommendations

Repair Action:	REPAIR	**FMSS Work Type:**	DEFERRED MAINTENANCE	**Repair Cost:**	$24976
Brief Workorder:	Raise guardwall 5-in. Remove and reset 30-ft of stone masonry guardwall on concrete footer to adjacent crenellated 12-in/18-in height. Repoint 2sy. of stone wall where grout has separated.				
Workorder:	Remove & Reset Stone Masonry Guardwall at $250- per -Cu. Ft. for 68 CF = $17000. [(1.5ft)(1.5ft)(30ft)] = 67.5 CF. Structural Concrete at $1000- per -Cu. Yd. for 1 CY = $1000. [(1.5ft)(.5ft)(30ft)] /27 =0.8 CY. Re-Point Masonry Barrier at $140- per -Sq. Yd. for 2 SY = $280. Low Speed Traffic Control at $1475- per -Day for 3 Day(s) = $4425. 1 day removal and 2 days installation.				

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

Rocky Mountain National Park

ROUTE 0010: TRAIL RIDGE ROAD

Barrier Condition Photos

ROMO_0010_21.717_R_1.jpg

Barrier ID:	**ROMO-0010-24.791-R**		
Route Name:	TRAIL RIDGE ROAD		
Inspection Date:	09/28/2009	**Barrier Rating:**	53.70

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.):**	311
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:**	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.):**	18.2	**Post Spacing (In.):**	0.0
Height (In.):	17.7	**Lateral Offset (In.):**	42.0	**Road Grade (%):**	5.50

Physical Condition

Barrier	**Alignment and Height:**	Alignment acceptable. 12-ft was 3-6-in below the 18-in/24-in crenellated design height.
	Breaking and Cracking:	No breaking or cracking observed.
	Missing Elements:	No missing elements.
	Corrrosion and Weathering:	No corrosion or weathering observed.
End Treatments	**Alignment and Height:**	
	Breaking and Cracking:	
	Missing Elements:	
	Corrrosion and Weathering:	

Barrier ID:	**ROMO-0010-24.791-R**		
Route Name:	TRAIL RIDGE ROAD		
Inspection Date:	09/28/2009	**Barrier Rating:**	53.70

Repair Recommendations

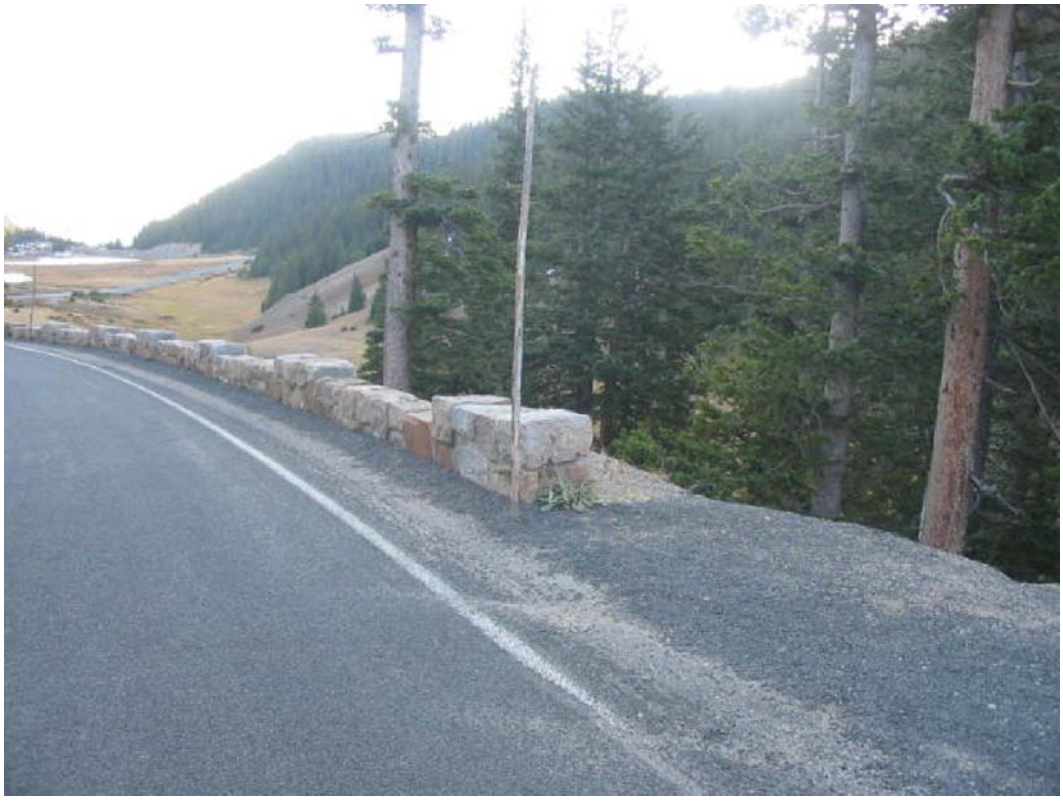
Repair Action:	NO ACTION	**FMSS Work Type:**	N/A	**Repair Cost:**	$0
Brief Workorder:	N/A				
Workorder:					

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

Rocky Mountain National Park

ROUTE 0010: TRAIL RIDGE ROAD

Barrier Condition Photos



ROMO_0010_24.791_R_1.jpg

Barrier ID:	**ROMO-0010-25.399-L**		
Route Name:	TRAIL RIDGE ROAD		
Inspection Date:	09/29/2009	**Barrier Rating:**	62.40

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.):**	521
Speed Limit (MPH):	35	**Placement with Respect to Road:**	TANGENT
Hazard Behind Barrier:	MEDIUM		

Barrier Crashworthiness

Appropriate Test Level:	TL-2	**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.):**	19.2	**Post Spacing (In.):**	0.0
Height (In.):	3.0	**Lateral Offset (In.):**	33.0	**Road Grade (%):**	1.20

Physical Condition

Barrier	**Alignment and Height:**	Alignment acceptable. 521-ft was 11-in to 17-in below the 18-in/24-in crenellated design height.
	Breaking and Cracking:	No breaking or cracking observed.
	Missing Elements:	No missing elements.
	Corrrosion and Weathering:	No corrosion or weathering observed.
End Treatments	**Alignment and Height:**	
	Breaking and Cracking:	
	Missing Elements:	
	Corrrosion and Weathering:	

Barrier ID:	**ROMO-0010-25.399-L**		
Route Name:	TRAIL RIDGE ROAD		
Inspection Date:	09/29/2009	**Barrier Rating:**	62.40

Repair Recommendations

Repair Action:	REPAIR	**FMSS Work Type:**	DEFERRED MAINTENANCE	**Repair Cost:**	$365420
Brief Workorder:	Raise guardwall 17-in. Remove and reset 521-ft stone masonry guardwall on 3 rows of new stone to raise barrier to crenellated 18-in/24-in design height.				
Workorder:	Remove & Reset Stone Masonry Guardwall at $250- per -Cu. Ft. for 417 CF = $104250. [(0.5ft)(1.6ft)(521ft)] = 416.8 CF. Remove top layer of stones in barrier for 521 ft. New Stones at $250- per -Each for 782 Unit(s) = $195500. [(521 ft)/(2 ft/stone)] x 3 rows = 782 stones. Insert new stone on retaining wall to increase barrier height then reset top layer of barrier. Low Speed Traffic Control at $1475- per -Day for 22 Day(s) = $32450. 5 days removal and 17 days installation.				

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

Rocky Mountain National Park

ROUTE 0010: TRAIL RIDGE ROAD

Barrier Condition Photos

ROMO_0010_25.399_L_1.jpg

Barrier ID:	**ROMO-0010-26.235-L**		
Route Name:	TRAIL RIDGE ROAD		
Inspection Date:	09/29/2009	**Barrier Rating:**	35.50

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.):**	153
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:**	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.):**	19.0	**Post Spacing (In.):**	0.0
Height (In.):	29.0	**Lateral Offset (In.):**	40.2	**Road Grade (%):**	4.80

Physical Condition

Barrier	**Alignment and Height:**	Alignment acceptable. Height within 3-in of 24-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:	**ROMO-0010-26.235-L**		
Route Name:	TRAIL RIDGE ROAD		
Inspection Date:	09/29/2009	**Barrier Rating:**	35.50

Repair Recommendations

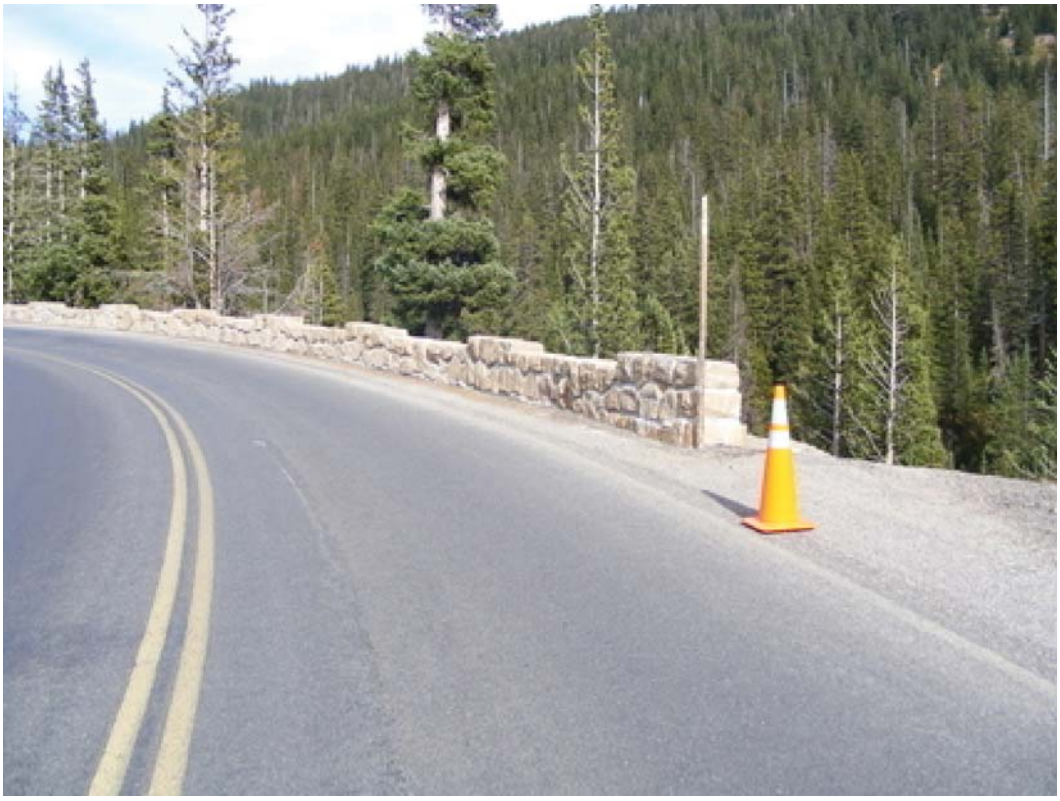
Repair Action:	NO ACTION	**FMSS Work Type:**	N/A	**Repair Cost:**	$0
Brief Workorder:	N/A				
Workorder:					

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

Rocky Mountain National Park

ROUTE 0010: TRAIL RIDGE ROAD

Barrier Condition Photos



ROMO_0010_26.235_L_1.jpg

Barrier ID:	**ROMO-0010-26.678-L**		
Route Name:	TRAIL RIDGE ROAD		
Inspection Date:	09/29/2009	**Barrier Rating:**	73.80

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.):**	598
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:**	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.):**	18.7	**Post Spacing (In.):**	0.0
Height (In.):	10.0	**Lateral Offset (In.):**	23.0	**Road Grade (%):**	6.80

Physical Condition

Barrier	**Alignment and Height:**	Alignment acceptable. 197-ft was 3-6-in below the 18-in/24-in crenellated design height and 401-ft was 7-11in. below.
	Breaking and Cracking:	First 6 ft of wall broken off to pavement level. Last 20 ft of wall is broken and missing 15 ft of stone. Stones remain but are broken or loose.
	Missing Elements:	No missing elements.
	Corrrosion and Weathering:	No corrosion or weathering observed.
End Treatments	**Alignment and Height:**	
	Breaking and Cracking:	
	Missing Elements:	
	Corrrosion and Weathering:	

Barrier ID:	**ROMO-0010-26.678-L**		
Route Name:	TRAIL RIDGE ROAD		
Inspection Date:	09/29/2009	**Barrier Rating:**	73.80

Repair Recommendations

Repair Action:	REPAIR	**FMSS Work Type:**	DEFERRED MAINTENANCE	**Repair Cost:**	$303985
Brief Workorder:	Raise guardwall 2-in. Remove and reset 401-ft of stone masonry guardwall on concrete footer to adjacent crenellated 12-in/18-in height.				
Workorder:	Remove & Reset Stone Masonry Guardwall at $250- per -Cu. Ft. for 963 CF = $240750. [(1.5ft)(1.6ft)(401ft)] = 962.4 CF. Structural Concrete at $1000- per -Cu. Yd. for 12 CY = $12000. [(1.6ft)(.5ft)(401ft)] /27 = 11.9 CY. Low Speed Traffic Control at $1475- per -Day for 16 Day(s) = $23600. 4 days removal and 12 days installation.				

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

Rocky Mountain National Park

ROUTE 0010: TRAIL RIDGE ROAD

Barrier Condition Photos

ROMO_0010_26.678_L_1.jpg

Barrier ID:	**ROMO-0010-27.422-L**		
Route Name:	TRAIL RIDGE ROAD		
Inspection Date:	09/29/2009	**Barrier Rating:**	68.80

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.):**	439
Speed Limit (MPH):	35	**Placement with Respect to Road:**	INSIDE OF CURVE
Hazard Behind Barrier:	EXTREME		

Barrier Crashworthiness

Appropriate Test Level:	TL-2	**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.):**	19.0	**Post Spacing (In.):**	0.0
Height (In.):	7.6	**Lateral Offset (In.):**	28.0	**Road Grade (%):**	5.80

Physical Condition

Barrier	**Alignment and Height:**	Alignment acceptable. 439-ft was 9-in to 12-in below the 18-in/24-in crenellated design height.
	Breaking and Cracking:	3 major break zones/ cracking & loose mortar.
	Missing Elements:	No missing elements observed.
	Corrrosion and Weathering:	Heavy weathering.
End Treatments	**Alignment and Height:**	
	Breaking and Cracking:	
	Missing Elements:	
	Corrrosion and Weathering:	

Barrier ID:	**ROMO-0010-27.422-L**		
Route Name:	TRAIL RIDGE ROAD		
Inspection Date:	09/29/2009	**Barrier Rating:**	68.80

Repair Recommendations

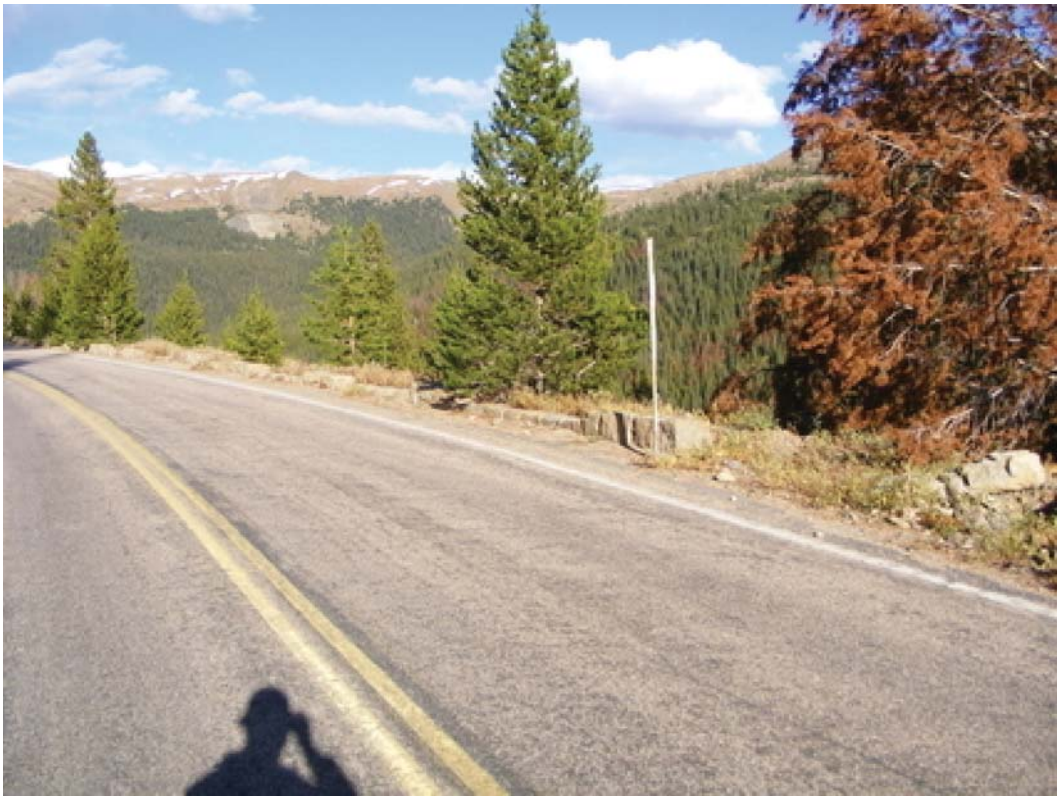
Repair Action:	REPAIR	**FMSS Work Type:**	DEFERRED MAINTENANCE	**Repair Cost:**	$355768
Brief Workorder:	Raise guardwall 12-in. Remove and reset 439-ft of stone masonry guardwall on concrete footer to crenellated 18-in/24-in design height.				
Workorder:	Remove & Reset Stone Masonry Guardwall at $250- per -Cu. Ft. for 1054 CF = $263500. [(1.5ft)(1.6ft)(439ft)] = 1053.6 CF. Structural Concrete at $1000- per -Cu. Yd. for 26 CY = $26000. [(1.6ft)(1ft)(439ft)] /27 = 26 CY. Low Speed Traffic Control at $1475- per -Day for 23 Day(s) = $33925. 5 days removal and 18 days installation.				

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

Rocky Mountain National Park

ROUTE 0010: TRAIL RIDGE ROAD

Barrier Condition Photos



ROMO_0010_27.422_L_1.jpg

Barrier ID:	**ROMO-0010-27.599-L**		
Route Name:	TRAIL RIDGE ROAD		
Inspection Date:	09/29/2009	**Barrier Rating:**	72.80

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.):**	512
Speed Limit (MPH):	35	**Placement with Respect to Road:**	BOTH INSIDE AND OUTSIDE
Hazard Behind Barrier:	HIGH		

Barrier Crashworthiness

Appropriate Test Level:	TL-2	**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.):**	17.7	**Post Spacing (In.):**	0.0
Height (In.):	0.3	**Lateral Offset (In.):**	37.0	**Road Grade (%):**	6.40

Physical Condition

Barrier	**Alignment and Height:**	Alignment acceptable. 512-ft was 17-in to 18-in below the 18-in/24-in crenellated 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:	**ROMO-0010-27.599-L**		
Route Name:	TRAIL RIDGE ROAD		
Inspection Date:	09/29/2009	**Barrier Rating:**	72.80

Repair Recommendations

Repair Action:	REPAIR	**FMSS Work Type:**	DEFERRED MAINTENANCE	**Repair Cost:**	$513508
Brief Workorder:	Raise guardwall 18-in. Remove and reset 512-ft of stone masonry guardwall on concrete footer to crenellated 18-in/24-in design height.				
Workorder:	Remove & Reset Stone Masonry Guardwall at $250- per -Cu. Ft. for 1536 CF = $384000. [(2ft)(1.5ft)(512ft)] = 1536 CF. Structural Concrete at $1000- per -Cu. Yd. for 43 CY = $43000. [(1.5ft)(1.5ft)(512ft)] /27 = 42.7 CY. Low Speed Traffic Control at $1475- per -Day for 27 Day(s) = $39825. 6 days removal and 21 days installation.				

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

Rocky Mountain National Park

ROUTE 0010: TRAIL RIDGE ROAD

Barrier Condition Photos

ROMO_0010_27.599_L_1.jpg

Barrier ID:	**ROMO-0010-27.691-L**		
Route Name:	TRAIL RIDGE ROAD		
Inspection Date:	09/29/2009	**Barrier Rating:**	33.70

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.):**	214
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:**	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.):**	19.2	**Post Spacing (In.):**	0.0
Height (In.):	25.0	**Lateral Offset (In.):**	46.0	**Road Grade (%):**	4.80

Physical Condition

Barrier	**Alignment and Height:**	Alignment acceptable. Height within 3-in of 24-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:	**ROMO-0010-27.691-L**		
Route Name:	TRAIL RIDGE ROAD		
Inspection Date:	09/29/2009	**Barrier Rating:**	33.70

Repair Recommendations

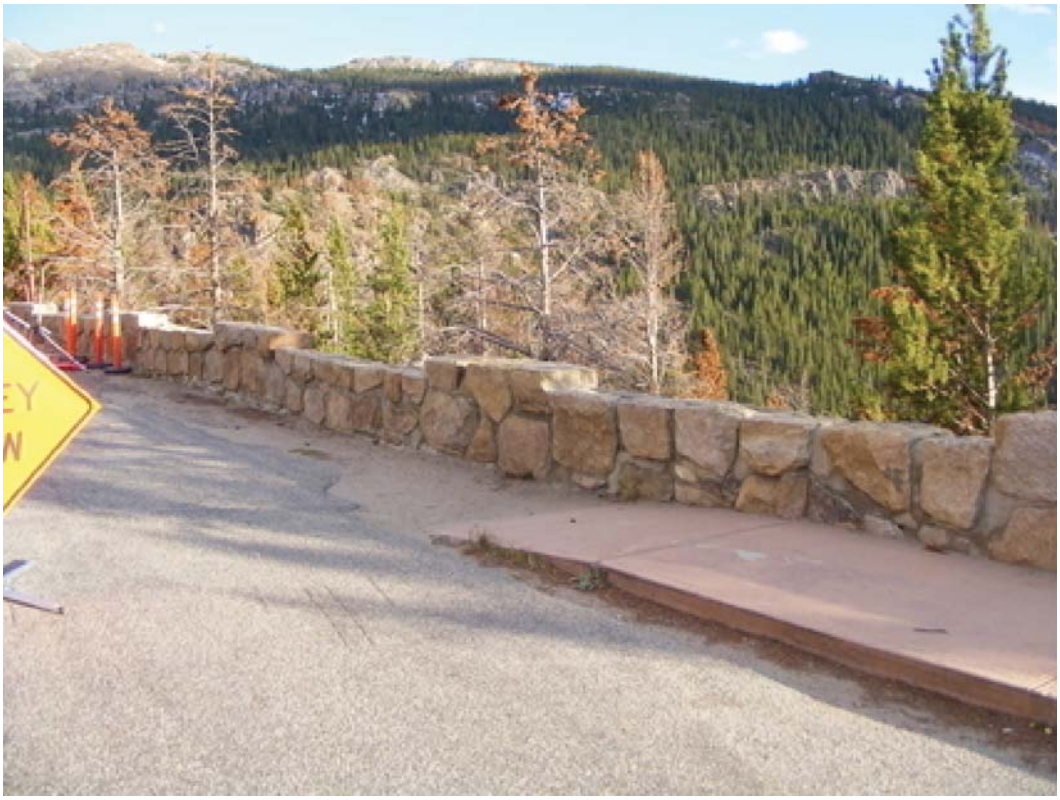
Repair Action:	NO ACTION	**FMSS Work Type:**	N/A	**Repair Cost:**	$0
Brief Workorder:	N/A				
Workorder:					

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

Rocky Mountain National Park

ROUTE 0010: TRAIL RIDGE ROAD

Barrier Condition Photos



ROMO_0010_27.691_L_1.jpg

Barrier ID:	**ROMO-0010-27.757-L**		
Route Name:	TRAIL RIDGE ROAD		
Inspection Date:	09/29/2009	**Barrier Rating:**	8.50

Barrier Description

Type:	STONE MASONRY WITHOUT CONCRETE CORE WALL	**Barrier Function:**	NON-TRAFFIC
Barrier Material:	STONE	**Post Material:**	N/A
Blockout Type:	N/A	**Length (ft.):**	76
Speed Limit (MPH):	35	**Placement with Respect to Road:**	NON-TRAFFIC BARRIER
Hazard Behind Barrier:	N/A		

Barrier Crashworthiness

Appropriate Test Level:	TL-2	**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.):**	19.0	**Post Spacing (In.):**	0.0
Height (In.):	28.6	**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 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:	**ROMO-0010-27.757-L**		
Route Name:	TRAIL RIDGE ROAD		
Inspection Date:	09/29/2009	**Barrier Rating:**	8.50

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.

Rocky Mountain National Park

ROUTE 0010: TRAIL RIDGE ROAD

Barrier Condition Photos

ROMO_0010_27.757_L_1.jpg

Barrier ID:	**ROMO-0010-28.189-L**		
Route Name:	TRAIL RIDGE ROAD		
Inspection Date:	09/30/2009	**Barrier Rating:**	53.00

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.):**	403
Speed Limit (MPH):	35	**Placement with Respect to Road:**	BOTH INSIDE AND OUTSIDE
Hazard Behind Barrier:	EXTREME		

Barrier Crashworthiness

Appropriate Test Level:	TL-2	**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.):**	18.2	**Post Spacing (In.):**	0.0
Height (In.):	19.0	**Lateral Offset (In.):**	37.7	**Road Grade (%):**	4.00

Physical Condition

Barrier	**Alignment and Height:**	Alignment acceptable. Height was within 3-in of the 18-in/24-in crenellated 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:	**ROMO-0010-28.189-L**		
Route Name:	TRAIL RIDGE ROAD		
Inspection Date:	09/30/2009	**Barrier Rating:**	53.00

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.

Rocky Mountain National Park

ROUTE 0010: TRAIL RIDGE ROAD

Barrier Condition Photos

ROMO_0010_28.189_L_1.jpg

Barrier ID:	**ROMO-0010-28.923-R**		
Route Name:	TRAIL RIDGE ROAD		
Inspection Date:	09/30/2009	**Barrier Rating:**	34.00

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.):**	315
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:**	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.):**	20.2	**Post Spacing (In.):**	0.0
Height (In.):	28.6	**Lateral Offset (In.):**	51.2	**Road Grade (%):**	5.80

Physical Condition

Barrier	**Alignment and Height:**	Alignment acceptable. Height was 3-6in above the 24-in design height.
	Breaking and Cracking:	No cracks or breaks.
	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:	**ROMO-0010-28.923-R**		
Route Name:	TRAIL RIDGE ROAD		
Inspection Date:	09/30/2009	**Barrier Rating:**	34.00

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.

Rocky Mountain National Park

ROUTE 0010: TRAIL RIDGE ROAD

Barrier Condition Photos

ROMO_0010_28.923_R_1.jpg

Barrier ID:	**ROMO-0010-29.107-L**		
Route Name:	TRAIL RIDGE ROAD		
Inspection Date:	09/30/2009	**Barrier Rating:**	56.70

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.):**	143
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:**	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.):**	18.2	**Post Spacing (In.):**	0.0
Height (In.):	0.8	**Lateral Offset (In.):**	94.6	**Road Grade (%):**	3.20

Physical Condition

Barrier	**Alignment and Height:**	Alignment acceptable. 143-ft was 16-in to 18-in below the 18-in/24-in crenellated design height.
	Breaking and Cracking:	No breaking or cracking observed.
	Missing Elements:	No missing elements.
	Corrrosion and Weathering:	No corrosion or weathering observed.
End Treatments	**Alignment and Height:**	
	Breaking and Cracking:	
	Missing Elements:	
	Corrrosion and Weathering:	

Barrier ID:	**ROMO-0010-29.107-L**		
Route Name:	TRAIL RIDGE ROAD		
Inspection Date:	09/30/2009	**Barrier Rating:**	56.70

Repair Recommendations

Repair Action:	REPAIR	**FMSS Work Type:**	DEFERRED MAINTENANCE	**Repair Cost:**	$114730
Brief Workorder:	Raise guardwall 18-in. Remove and reset 143-ft of stone masonry guardwall on concrete footer to crenellated 18-in/24-in design height.				
Workorder:	Remove & Reset Stone Masonry Guardwall at $250- per -Cu. Ft. for 322 CF = $80500. [(1.5ft)(1.5ft)(143ft)] = 321.8 CF. Structural Concrete at $1000- per -Cu. Yd. for 12 CY = $12000. [(1.5ft)(1.5ft)(143ft)] /27 = 11.9 CY. Low Speed Traffic Control at $1475- per -Day for 8 Day(s) = $11800. 2 days removal and 6 days installation.				

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

Rocky Mountain National Park

ROUTE 0010: TRAIL RIDGE ROAD

Barrier Condition Photos

ROMO_0010_29.107_L_1.jpg

Barrier ID:	**ROMO-0010-29.411-L**		
Route Name:	TRAIL RIDGE ROAD		
Inspection Date:	09/30/2009	**Barrier Rating:**	44.40

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.):**	806
Speed Limit (MPH):	35	**Placement with Respect to Road:**	OUTSIDE OF CURVE
Hazard Behind Barrier:	N/A		

Barrier Crashworthiness

Appropriate Test Level:	TL-2	**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.):**	19.3	**Post Spacing (In.):**	0.0
Height (In.):	22.3	**Lateral Offset (In.):**	55.5	**Road Grade (%):**	5.40

Physical Condition

Barrier	**Alignment and Height:**	Alignment acceptable. Height within 3-in of 24-in design height.
	Breaking and Cracking:	40 ft of breaking and cracks over 1/4 in loose stones.
	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:	**ROMO-0010-29.411-L**		
Route Name:	TRAIL RIDGE ROAD		
Inspection Date:	09/30/2009	**Barrier Rating:**	44.40

Repair Recommendations

Repair Action:	REPAIR	**FMSS Work Type:**	DEFERRED MAINTENANCE	**Repair Cost:**	$4395
Brief Workorder:	Repoint 80 L.F.of stone masonry barrier.				
Workorder:	Re-Point Masonry Barrier at $140- per -Sq. Yd. for 18 SY = $2520. Repoint 18sy. [(80ft)(2ft)] /9 = 17.7sy. 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.

Rocky Mountain National Park

ROUTE 0010: TRAIL RIDGE ROAD

Barrier Condition Photos

ROMO_0010_29.411_L_1.jpg

Barrier ID:	**ROMO-0010-29.571-L**		
Route Name:	TRAIL RIDGE ROAD		
Inspection Date:	09/30/2009	**Barrier Rating:**	44.50

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.):**	384
Speed Limit (MPH):	35	**Placement with Respect to Road:**	OUTSIDE OF CURVE
Hazard Behind Barrier:	EXTREME		

Barrier Crashworthiness

Appropriate Test Level:	TL-2	**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.):**	19.2	**Post Spacing (In.):**	0.0
Height (In.):	22.6	**Lateral Offset (In.):**	27.2	**Road Grade (%):**	3.70

Physical Condition

Barrier	**Alignment and Height:**	Alignment acceptable. Height within 3-in of 24-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:	**ROMO-0010-29.571-L**		
Route Name:	TRAIL RIDGE ROAD		
Inspection Date:	09/30/2009	**Barrier Rating:**	44.50

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.

Rocky Mountain National Park

ROUTE 0010: TRAIL RIDGE ROAD

Barrier Condition Photos

ROMO_0010_29.571_L_1.jpg

Barrier ID:	**ROMO-0010-29.709-R**		
Route Name:	TRAIL RIDGE ROAD		
Inspection Date:	09/30/2009	**Barrier Rating:**	68.00

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.):**	323
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:**	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.):**	17.7	**Post Spacing (In.):**	0.0
Height (In.):	4.7	**Lateral Offset (In.):**	56.0	**Road Grade (%):**	4.60

Physical Condition

Barrier	**Alignment and Height:**	Alignment acceptable. 323-ft was 14-in to 15-in below the 18-in/24-in crenellated 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:	**ROMO-0010-29.709-R**		
Route Name:	TRAIL RIDGE ROAD		
Inspection Date:	09/30/2009	**Barrier Rating:**	68.00

Repair Recommendations

Repair Action:	REPAIR	**FMSS Work Type:**	DEFERRED MAINTENANCE	**Repair Cost:**	$318258
Brief Workorder:	Raise guardwall 14-in. Remove and reset 323-ft of stone masonry guardwall on concrete footer to crenellated 18-in/24-in design height.				
Workorder:	Remove & Reset Stone Masonry Guardwall at $250- per -Cu. Ft. for 969 CF = $242250. [(2ft)(1.5ft)(323ft)] = 969 CF. Structural Concrete at $1000- per -Cu. Yd. for 22 CY = $22000. [(1.5ft)(1.2ft)(323ft)] /27 = 21.5 CY. Low Speed Traffic Control at $1475- per -Day for 17 Day(s) = $25075. 4 days removal and 13 days installation.				

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

Rocky Mountain National Park

ROUTE 0010: TRAIL RIDGE ROAD

Barrier Condition Photos

ROMO_0010_29.709_R_1.jpg

Barrier ID:	**ROMO-0010-29.922-L**		
Route Name:	TRAIL RIDGE ROAD		
Inspection Date:	09/30/2009	**Barrier Rating:**	65.50

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):	35	**Placement with Respect to Road:**	OUTSIDE OF CURVE
Hazard Behind Barrier:	HIGH		

Barrier Crashworthiness

Appropriate Test Level:	TL-2	**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.):**	19.0	**Post Spacing (In.):**	0.0
Height (In.):	4.3	**Lateral Offset (In.):**	46.2	**Road Grade (%):**	4.50

Physical Condition

Barrier	**Alignment and Height:**	Alignment acceptable. 204-ft was 10-in to 17-in below the 18-in/24-in crenellated design height.
	Breaking and Cracking:	Breaking and cracking more than 1/2 in.
	Missing Elements:	No missing elements observed.
	Corrrosion and Weathering:	Weathered and crumbling.
End Treatments	**Alignment and Height:**	
	Breaking and Cracking:	
	Missing Elements:	
	Corrrosion and Weathering:	

Barrier ID:	**ROMO-0010-29.922-L**		
Route Name:	TRAIL RIDGE ROAD		
Inspection Date:	09/30/2009	**Barrier Rating:**	65.50

Repair Recommendations

Repair Action:	REPAIR	**FMSS Work Type:**	DEFERRED MAINTENANCE	**Repair Cost:**	$170720
Brief Workorder:	Raise guardwall 14-in. Remove and reset 204-ft of stone masonry guardwall on concrete footer to crenellated 18-in/24-in design height.				
Workorder:	Remove & Reset Stone Masonry Guardwall at $250- per -Cu. Ft. for 490 CF = $122500. [(1.5ft)(1.6ft)(204ft)] = 489.6 CF. Structural Concrete at $1000- per -Cu. Yd. for 15 CY = $15000. [(1.6ft)(1.2ft)(204ft)] /27 = 14.5 CY. Low Speed Traffic Control at $1475- per -Day for 12 Day(s) = $17700. 3 days removal and 9 days installation.				

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

Rocky Mountain National Park

ROUTE 0010: TRAIL RIDGE ROAD

Barrier Condition Photos

ROMO_0010_29.922_L_1.jpg

Barrier ID:	**ROMO-0010-30.095-L**		
Route Name:	TRAIL RIDGE ROAD		
Inspection Date:	09/30/2009	**Barrier Rating:**	44.50

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.):**	368
Speed Limit (MPH):	35	**Placement with Respect to Road:**	OUTSIDE OF CURVE
Hazard Behind Barrier:	EXTREME		

Barrier Crashworthiness

Appropriate Test Level:	TL-2	**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.):**	19.0	**Post Spacing (In.):**	0.0
Height (In.):	22.2	**Lateral Offset (In.):**	26.2	**Road Grade (%):**	4.40

Physical Condition

Barrier	**Alignment and Height:**	Alignment acceptable. Height within 3-in of 24-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:	**ROMO-0010-30.095-L**		
Route Name:	TRAIL RIDGE ROAD		
Inspection Date:	09/30/2009	**Barrier Rating:**	44.50

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.

Rocky Mountain National Park

ROUTE 0010: TRAIL RIDGE ROAD

Barrier Condition Photos

ROMO_0010_30.095_L_1.jpg

Barrier ID:	**ROMO-0010-30.192-L**		
Route Name:	TRAIL RIDGE ROAD		
Inspection Date:	10/01/2009	**Barrier Rating:**	67.30

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.):**	275
Speed Limit (MPH):	35	**Placement with Respect to Road:**	OUTSIDE OF CURVE
Hazard Behind Barrier:	EXTREME		

Barrier Crashworthiness

Appropriate Test Level:	TL-2	**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.):**	19.0	**Post Spacing (In.):**	0.0
Height (In.):	5.6	**Lateral Offset (In.):**	54.0	**Road Grade (%):**	5.50

Physical Condition

Barrier	**Alignment and Height:**	Barrier leaning out for 140ft. 275-ft was 10-in to 16-in below the 18-in/24-in crenellated design height.
	Breaking and Cracking:	Broken sections numerous areas with cracks larger than 1/2 in.
	Missing Elements:	No missing elements observed.
	Corrrosion and Weathering:	Weathered badly.
End Treatments	**Alignment and Height:**	
	Breaking and Cracking:	
	Missing Elements:	
	Corrrosion and Weathering:	

Barrier ID:	**ROMO-0010-30.192-L**		
Route Name:	TRAIL RIDGE ROAD		
Inspection Date:	10/01/2009	**Barrier Rating:**	67.30

Repair Recommendations

Repair Action:	REPAIR	**FMSS Work Type:**	DEFERRED MAINTENANCE	**Repair Cost:**	$224015
Brief Workorder:	Raise guardwall 13-in. Remove and reset 275-ft of stone masonry guardwall on concrete footer to crenellated 18-in/24-in design height.				
Workorder:	Remove & Reset Stone Masonry Guardwall at $250- per -Cu. Ft. for 660 CF = $165000. [(1.5ft)(1.6ft)(275ft)] = 660 CF. Structural Concrete at $1000- per -Cu. Yd. for 18 CY = $18000. [(1.6ft)(1.1ft)(275ft)] /27 = 17.9 CY. Low Speed Traffic Control at $1475- per -Day for 14 Day(s) = $20650. 3 days removal and 11 days installation.				

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

Rocky Mountain National Park

ROUTE 0010: TRAIL RIDGE ROAD

Barrier Condition Photos

ROMO_0010_30.192_L_1.jpg

Barrier ID:	**ROMO-0010-30.392-L**		
Route Name:	TRAIL RIDGE ROAD		
Inspection Date:	09/30/2009	**Barrier Rating:**	42.70

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.):**	620
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:**	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.):**	18.7	**Post Spacing (In.):**	0.0
Height (In.):	22.7	**Lateral Offset (In.):**	33.7	**Road Grade (%):**	3.80

Physical Condition

Barrier	**Alignment and Height:**	Alignment acceptable. Height within 3-in of 24-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:	**ROMO-0010-30.392-L**		
Route Name:	TRAIL RIDGE ROAD		
Inspection Date:	09/30/2009	**Barrier Rating:**	42.70

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.

Rocky Mountain National Park

ROUTE 0010: TRAIL RIDGE ROAD

Barrier Condition Photos

ROMO_0010_30.392_L_1.jpg

Barrier ID:	**ROMO-0010-30.573-L**		
Route Name:	TRAIL RIDGE ROAD		
Inspection Date:	09/30/2009	**Barrier Rating:**	59.20

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.):**	151
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:**	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.):**	18.0	**Post Spacing (In.):**	0.0
Height (In.):	12.0	**Lateral Offset (In.):**	28.0	**Road Grade (%):**	3.30

Physical Condition

Barrier	**Alignment and Height:**	Alignment acceptable. 36-ft was 3-6-in below the 18-in/24-in crenellated design height and 115-ft was 10-in below.
	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:	**ROMO-0010-30.573-L**		
Route Name:	TRAIL RIDGE ROAD		
Inspection Date:	09/30/2009	**Barrier Rating:**	59.20

Repair Recommendations

Repair Action:	REPAIR	**FMSS Work Type:**	DEFERRED MAINTENANCE	**Repair Cost:**	$86983
Brief Workorder:	Raise guardwall 6-in. Remove and reset 115-ft of stone masonry guardwall on concrete footer to adjacent crenellated 12-in/18-in height.				
Workorder:	Remove & Reset Stone Masonry Guardwall at $250- per -Cu. Ft. for 259 CF = $64750. [(1.5ft)(1.5ft)(115ft)] = 258.8 CF. Structural Concrete at $1000- per -Cu. Yd. for 4 CY = $4000. [(1.5ft)(.5ft)(115ft)] /27 = 3.2 CY. Low Speed Traffic Control at $1475- per -Day for 7 Day(s) = $10325. 2 days removal and 5 days installation.				

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

Rocky Mountain National Park

ROUTE 0010: TRAIL RIDGE ROAD

Barrier Condition Photos

ROMO_0010_30.573_L_1.jpg

Barrier ID:	**ROMO-0010-30.672-R**		
Route Name:	TRAIL RIDGE ROAD		
Inspection Date:	09/30/2009	**Barrier Rating:**	37.20

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.):**	660
Speed Limit (MPH):	35	**Placement with Respect to Road:**	BOTH INSIDE AND OUTSIDE
Hazard Behind Barrier:	EXTREME		

Barrier Crashworthiness

Appropriate Test Level:	TL-2	**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.):**	18.5	**Post Spacing (In.):**	0.0
Height (In.):	25.2	**Lateral Offset (In.):**	60.5	**Road Grade (%):**	2.90

Physical Condition

Barrier	**Alignment and Height:**	Alignment acceptable. Height within 3-in of 24-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:	**ROMO-0010-30.672-R**		
Route Name:	TRAIL RIDGE ROAD		
Inspection Date:	09/30/2009	**Barrier Rating:**	37.20

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.

Rocky Mountain National Park

ROUTE 0010: TRAIL RIDGE ROAD

Barrier Condition Photos

ROMO_0010_30.672_R_1.jpg

Barrier ID:	**ROMO-0010-32.304-R**		
Route Name:	TRAIL RIDGE ROAD		
Inspection Date:	09/30/2009	**Barrier Rating:**	32.40

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.):**	27
Speed Limit (MPH):	45	**Placement with Respect to Road:**	TANGENT
Hazard Behind Barrier:	MEDIUM		

Barrier Crashworthiness

Appropriate Test Level:	TL-2	**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.):	18	**Width (In.):**	18.2	**Post Spacing (In.):**	0.0
Height (In.):	15.0	**Lateral Offset (In.):**	150.6	**Road Grade (%):**	0.40

Physical Condition

Barrier	**Alignment and Height:**	Alignment acceptable. Height was 1-6in. below 18-in design height.
	Breaking and Cracking:	No breaking or cracking observed.
	Missing Elements:	No missing elements.
	Corrrosion and Weathering:	No corrosion or weathering observed.
End Treatments	**Alignment and Height:**	
	Breaking and Cracking:	
	Missing Elements:	
	Corrrosion and Weathering:	

Barrier ID:	**ROMO-0010-32.304-R**		
Route Name:	TRAIL RIDGE ROAD		
Inspection Date:	09/30/2009	**Barrier Rating:**	32.40

Repair Recommendations

Repair Action:	REPAIR	**FMSS Work Type:**	DEFERRED MAINTENANCE	**Repair Cost:**	$12870
Brief Workorder:	Raise guardwall 6-in. Remove and reset 27-ft of stone masonry guardwall on concrete footer to 18-in height.				
Workorder:	Remove & Reset Stone Masonry Guardwall at $250- per -Cu. Ft. for 21 CF = $5250. [(0.5ft)(1.5ft)(27ft)] = 20.3 CF. Remove top layer of stones in barrier for 27 ft. New Stones at $250- per -Each for 14 Unit(s) = $3500. [(27ft)/(2ft/stone)] x 1 row = 14 stones. Insert new stone on retaining wall to increase barrier hei Low Speed Traffic Control at $1475- per -Day for 2 Day(s) = $2950. 1 day removal and 1 day installation.				

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

Rocky Mountain National Park

ROUTE 0010: TRAIL RIDGE ROAD

Barrier Condition Photos

ROMO_0010_32.304_R_1.jpg

Barrier ID:	**ROMO-0010-32.305-L**		
Route Name:	TRAIL RIDGE ROAD		
Inspection Date:	09/30/2009	**Barrier Rating:**	49.50

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.):**	27
Speed Limit (MPH):	45	**Placement with Respect to Road:**	TANGENT
Hazard Behind Barrier:	MEDIUM		

Barrier Crashworthiness

Appropriate Test Level:	TL-2	**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.):	18	**Width (In.):**	18.0	**Post Spacing (In.):**	0.0
Height (In.):	11.6	**Lateral Offset (In.):**	171.3	**Road Grade (%):**	0.20

Physical Condition

Barrier	**Alignment and Height:**	Alignment acceptable. Height was 2-8 in below the 18-in design height.
	Breaking and Cracking:	No breaking or cracking observed.
	Missing Elements:	No missing elements.
	Corrrosion and Weathering:	No corrosion or weathering observed.
End Treatments	**Alignment and Height:**	
	Breaking and Cracking:	
	Missing Elements:	
	Corrrosion and Weathering:	

Barrier ID:	**ROMO-0010-32.305-L**		
Route Name:	TRAIL RIDGE ROAD		
Inspection Date:	09/30/2009	**Barrier Rating:**	49.50

Repair Recommendations

Repair Action:	REPAIR	**FMSS Work Type:**	DEFERRED MAINTENANCE	**Repair Cost:**	$12870
Brief Workorder:	Raise guardwall 6-in. Remove and reset 27-ft of stone masonry guardwall on concrete footer to 18-in height.				
Workorder:	Remove & Reset Stone Masonry Guardwall at $250- per -Cu. Ft. for 21 CF = $5250. [(0.5ft)(1.5ft)(27ft)] = 20.3 CF. Remove top layer of stones in barrier for 27 ft. New Stones at $250- per -Each for 14 Unit(s) = $3500. [(27ft0 / (2ft/stone)] x 1 row = 14 stones. Insert new stone on retaining wall to increase barrier h Low Speed Traffic Control at $1475- per -Day for 2 Day(s) = $2950. 1 day removal and 1 day installation.				

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

Rocky Mountain National Park

ROUTE 0010: TRAIL RIDGE ROAD

Barrier Condition Photos

ROMO_0010_32.305_L_1.jpg

Barrier ID:	**ROMO-0010-38.018-L**		
Route Name:	TRAIL RIDGE ROAD		
Inspection Date:	09/30/2009	**Barrier Rating:**	52.40

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.):**	47
Speed Limit (MPH):	45	**Placement with Respect to Road:**	TANGENT
Hazard Behind Barrier:	MEDIUM		

Barrier Crashworthiness

Appropriate Test Level:	TL-2	**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.):	18	**Width (In.):**	18.0	**Post Spacing (In.):**	0.0
Height (In.):	9.3	**Lateral Offset (In.):**	24.7	**Road Grade (%):**	1.40

Physical Condition

Barrier	**Alignment and Height:**	Alignment is over culvert for arch. Alignment acceptable. Height of midpoint of arch is 21 in.
	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:	**ROMO-0010-38.018-L**		
Route Name:	TRAIL RIDGE ROAD		
Inspection Date:	09/30/2009	**Barrier Rating:**	52.40

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.

Rocky Mountain National Park

ROUTE 0010: TRAIL RIDGE ROAD

Barrier Condition Photos

ROMO_0010_38.018_L_1.jpg

Barrier ID:	**ROMO-0010-38.018-R**		
Route Name:	TRAIL RIDGE ROAD		
Inspection Date:	09/30/2009	**Barrier Rating:**	28.10

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.):**	34
Speed Limit (MPH):	35	**Placement with Respect to Road:**	TANGENT
Hazard Behind Barrier:	MEDIUM		

Barrier Crashworthiness

Appropriate Test Level:	TL-2	**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.):	18	**Width (In.):**	18.0	**Post Spacing (In.):**	0.0
Height (In.):	16.0	**Lateral Offset (In.):**	152.3	**Road Grade (%):**	2.00

Physical Condition

Barrier	**Alignment and Height:**	Alignment is over a culvert for arch. Alignment acceptable. Height of midpoint of arch is 16 in.
	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:	**ROMO-0010-38.018-R**		
Route Name:	TRAIL RIDGE ROAD		
Inspection Date:	09/30/2009	**Barrier Rating:**	28.10

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.

Rocky Mountain National Park

ROUTE 0010: TRAIL RIDGE ROAD

Barrier Condition Photos

ROMO_0010_38.018_R_1.jpg

Barrier ID:	**ROMO-0010-42.726-R**		
Route Name:	TRAIL RIDGE ROAD		
Inspection Date:	09/30/2009	**Barrier Rating:**	16.50

Barrier Description

Type:	W-BEAM STRONG POST	**Barrier Function:**	TRAFFIC
Barrier Material:	GALVANIZED STEEL	**Post Material:**	WOOD
Blockout Type:	WOOD	**Length (ft.):**	33
Speed Limit (MPH):	40	**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:	NONE	**Ending End Trtmt Crashhworthy?:**	N/A		

Average Measurements

Design Height (In.):	27	**Width (In.):**	0.0	**Post Spacing (In.):**	36.0
Height (In.):	28.2	**Lateral Offset (In.):**	68.6	**Road Grade (%):**	1.40

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 breaking or cracking observed.
	Missing Elements:	No missing elements observed.
	Corrrosion and Weathering:	No corrosion or weathering observed.

Barrier ID:	**ROMO-0010-42.726-R**		
Route Name:	TRAIL RIDGE ROAD		
Inspection Date:	09/30/2009	**Barrier Rating:**	16.50

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.

Rocky Mountain National Park

ROUTE 0010: TRAIL RIDGE ROAD

Barrier Condition Photos

ROMO_0010_42.726_R_1.jpg

Barrier ID:	**ROMO-0012-5.814-L**		
Route Name:	BEAR LAKE ROAD		
Inspection Date:	10/02/2009	**Barrier Rating:**	32.50

Barrier Description

Type:	STEEL-BACKED TIMBER WITH BLOCKOUT	**Barrier Function:**	TRAFFIC
Barrier Material:	STEEL-BACKED TIMBER/LOG	**Post Material:**	CORTEN
Blockout Type:	WOOD	**Length (ft.):**	1115
Speed Limit (MPH):	25	**Placement with Respect to Road:**	BOTH INSIDE AND OUTSIDE
Hazard Behind Barrier:	HIGH		

Barrier Crashworthiness

Appropriate Test Level:	TL-1	**Barrier Test Level:**	TL-3	**Is Barrier Crashworthy?:**	YES
Beg. End Trtmt Type:	SBT/LOG FLARED	**Is Beg. End Trtmt Crashhworthy?:**	NO	**Approach Transition Type:**	NONE
Ending End Trtmt Type:	SBT/LOG FLARED	**Ending End Trtmt Crashhworthy?:**	NO		

Average Measurements

Design Height (In.):	27	**Width (In.):**	0.0	**Post Spacing (In.):**	118.0
Height (In.):	27.2	**Lateral Offset (In.):**	27.6	**Road Grade (%):**	4.60

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 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 breaking or cracking observed.
	Missing Elements:	No missing elements observed.
	Corrrosion and Weathering:	No corrosion or weathering observed.

Barrier ID:	**ROMO-0012-5.814-L**		
Route Name:	BEAR LAKE ROAD		
Inspection Date:	10/02/2009	**Barrier Rating:**	32.50

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.

Rocky Mountain National Park

ROUTE 0012: BEAR LAKE ROAD

Barrier Condition Photos

ROMO_0012_5.814_L_1.jpg

Barrier ID:	**ROMO-0012-7.374-L**		
Route Name:	BEAR LAKE ROAD		
Inspection Date:	10/02/2009	**Barrier Rating:**	35.40

Barrier Description

Type:	STEEL-BACKED TIMBER WITH BLOCKOUT	**Barrier Function:**	TRAFFIC
Barrier Material:	STEEL-BACKED TIMBER/LOG	**Post Material:**	CORTEN
Blockout Type:	WOOD	**Length (ft.):**	825
Speed Limit (MPH):	25	**Placement with Respect to Road:**	BOTH INSIDE AND OUTSIDE
Hazard Behind Barrier:	HIGH		

Barrier Crashworthiness

Appropriate Test Level:	TL-1	**Barrier Test Level:**	TL-3	**Is Barrier Crashworthy?:**	YES
Beg. End Trtmt Type:	SBT/LOG FLARED	**Is Beg. End Trtmt Crashhworthy?:**	NO	**Approach Transition Type:**	NONE
Ending End Trtmt Type:	SBT/LOG FLARED	**Ending End Trtmt Crashhworthy?:**	NO		

Average Measurements

Design Height (In.):	27	**Width (In.):**	0.0	**Post Spacing (In.):**	98.3
Height (In.):	27.2	**Lateral Offset (In.):**	22.2	**Road Grade (%):**	4.40

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 breaking or cracking observed.
	Missing Elements:	No missing elements observed.
	Corrrosion and Weathering:	No corrosion or weathering observed.

Barrier ID:	**ROMO-0012-7.374-L**		
Route Name:	BEAR LAKE ROAD		
Inspection Date:	10/02/2009	**Barrier Rating:**	35.40

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.

Rocky Mountain National Park

ROUTE 0012: BEAR LAKE ROAD

Barrier Condition Photos

ROMO_0012_7.374_L_1.jpg

Barrier ID:	**ROMO-0012-7.641-L**		
Route Name:	BEAR LAKE ROAD		
Inspection Date:	10/02/2009	**Barrier Rating:**	15.60

Barrier Description

Type:	STEEL-BACKED TIMBER WITH BLOCKOUT	**Barrier Function:**	TRAFFIC
Barrier Material:	STEEL-BACKED TIMBER/LOG	**Post Material:**	CORTEN
Blockout Type:	WOOD	**Length (ft.):**	248
Speed Limit (MPH):	25	**Placement with Respect to Road:**	TANGENT
Hazard Behind Barrier:	EXTREME		

Barrier Crashworthiness

Appropriate Test Level:	TL-1	**Barrier Test Level:**	TL-3	**Is Barrier Crashworthy?:**	YES
Beg. End Trtmt Type:	SBT/LOG FLARED	**Is Beg. End Trtmt Crashhworthy?:**	NO	**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.):**	99.5
Height (In.):	26.6	**Lateral Offset (In.):**	29.0	**Road Grade (%):**	1.80

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 breaking or cracking observed.
	Missing Elements:	No missing elements observed.
	Corrrosion and Weathering:	No corrosion or weathering observed.

Barrier ID:	**ROMO-0012-7.641-L**		
Route Name:	BEAR LAKE ROAD		
Inspection Date:	10/02/2009	**Barrier Rating:**	15.60

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.

Rocky Mountain National Park

ROUTE 0012: BEAR LAKE ROAD

Barrier Condition Photos

ROMO_0012_7.641_L_1.jpg

Barrier ID:	**ROMO-0012-7.799-L**		
Route Name:	BEAR LAKE ROAD		
Inspection Date:	10/02/2009	**Barrier Rating:**	28.00

Barrier Description

Type:	STEEL-BACKED TIMBER WITH BLOCKOUT	**Barrier Function:**	TRAFFIC
Barrier Material:	STEEL-BACKED TIMBER/LOG	**Post Material:**	CORTEN
Blockout Type:	WOOD	**Length (ft.):**	525
Speed Limit (MPH):	25	**Placement with Respect to Road:**	BOTH INSIDE AND OUTSIDE
Hazard Behind Barrier:	MEDIUM		

Barrier Crashworthiness

Appropriate Test Level:	TL-1	**Barrier Test Level:**	TL-3	**Is Barrier Crashworthy?:**	YES
Beg. End Trtmt Type:	SBT/LOG BURIED	**Is Beg. End Trtmt Crashhworthy?:**	YES	**Approach Transition Type:**	NONE
Ending End Trtmt Type:	SBT/LOG FLARED	**Ending End Trtmt Crashhworthy?:**	NO		

Average Measurements

Design Height (In.):	27	**Width (In.):**	0.0	**Post Spacing (In.):**	118.0
Height (In.):	27.2	**Lateral Offset (In.):**	31.2	**Road Grade (%):**	5.10

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 breaking or cracking observed.
	Missing Elements:	No missing elements observed.
	Corrrosion and Weathering:	No corrosion or weathering observed.

Barrier ID:	**ROMO-0012-7.799-L**		
Route Name:	BEAR LAKE ROAD		
Inspection Date:	10/02/2009	**Barrier Rating:**	28.00

Repair Recommendations

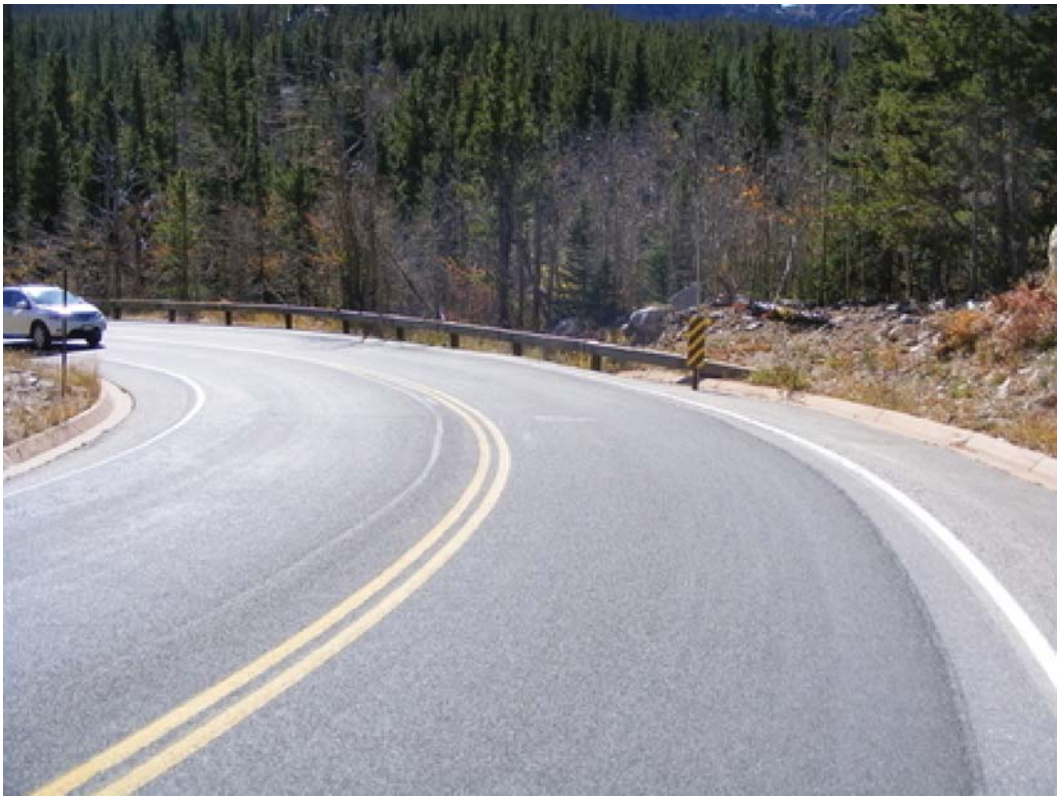
Repair Action:	NO ACTION	**FMSS Work Type:**	N/A	**Repair Cost:**	$0
Brief Workorder:	N/A				
Workorder:					

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

Rocky Mountain National Park

ROUTE 0012: BEAR LAKE ROAD

Barrier Condition Photos



ROMO_0012_7.799_L_1.jpg

Barrier ID:	**ROMO-0012-8.403-L**		
Route Name:	BEAR LAKE ROAD		
Inspection Date:	10/02/2009	**Barrier Rating:**	26.80

Barrier Description

Type:	STEEL-BACKED TIMBER WITH BLOCKOUT	**Barrier Function:**	TRAFFIC
Barrier Material:	STEEL-BACKED TIMBER/LOG	**Post Material:**	CORTEN
Blockout Type:	WOOD	**Length (ft.):**	190
Speed Limit (MPH):	25	**Placement with Respect to Road:**	OUTSIDE OF CURVE
Hazard Behind Barrier:	HIGH		

Barrier Crashworthiness

Appropriate Test Level:	TL-1	**Barrier Test Level:**	TL-3	**Is Barrier Crashworthy?:**	YES
Beg. End Trtmt Type:	SBT/LOG BURIED	**Is Beg. End Trtmt Crashhworthy?:**	YES	**Approach Transition Type:**	NONE
Ending End Trtmt Type:	SBT/LOG FLARED	**Ending End Trtmt Crashhworthy?:**	NO		

Average Measurements

Design Height (In.):	27	**Width (In.):**	0.0	**Post Spacing (In.):**	119.5
Height (In.):	27.2	**Lateral Offset (In.):**	46.2	**Road Grade (%):**	4.40

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 breaking or cracking observed.
	Missing Elements:	No missing elements observed.
	Corrrosion and Weathering:	No corrosion or weathering observed.

Barrier ID:	**ROMO-0012-8.403-L**		
Route Name:	BEAR LAKE ROAD		
Inspection Date:	10/02/2009	**Barrier Rating:**	26.80

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.

Rocky Mountain National Park

ROUTE 0012: BEAR LAKE ROAD

Barrier Condition Photos

ROMO_0012_8.403_L_1.jpg

Barrier ID:	**ROMO-0012-8.550-R**		
Route Name:	BEAR LAKE ROAD		
Inspection Date:	10/01/2009	**Barrier Rating:**	34.20

Barrier Description

Type:	STEEL-BACKED TIMBER WITH BLOCKOUT	**Barrier Function:**	TRAFFIC
Barrier Material:	STEEL-BACKED TIMBER/LOG	**Post Material:**	CORTEN
Blockout Type:	WOOD	**Length (ft.):**	583
Speed Limit (MPH):	25	**Placement with Respect to Road:**	BOTH INSIDE AND OUTSIDE
Hazard Behind Barrier:	HIGH		

Barrier Crashworthiness

Appropriate Test Level:	TL-1	**Barrier Test Level:**	TL-3	**Is Barrier Crashworthy?:**	YES
Beg. End Trtmt Type:	SBT/LOG FLARED	**Is Beg. End Trtmt Crashhworthy?:**	NO	**Approach Transition Type:**	NONE
Ending End Trtmt Type:	SBT/LOG FLARED	**Ending End Trtmt Crashhworthy?:**	NO		

Average Measurements

Design Height (In.):	27	**Width (In.):**	0.0	**Post Spacing (In.):**	99.0
Height (In.):	25.7	**Lateral Offset (In.):**	33.5	**Road Grade (%):**	4.00

Physical Condition

Barrier	**Alignment and Height:**	Alignment acceptable. 245-ft was between 1 and 3-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 breaking or cracking observed.
	Missing Elements:	No missing elements observed.
	Corrrosion and Weathering:	No corrosion or weathering observed.

Barrier ID:	**ROMO-0012-8.550-R**		
Route Name:	BEAR LAKE ROAD		
Inspection Date:	10/01/2009	**Barrier Rating:**	34.20

Repair Recommendations

Repair Action:	REPAIR	**FMSS Work Type:**	DEFERRED MAINTENANCE	**Repair Cost:**	$4318
Brief Workorder:	Raise 245ft. of barrier up to 27-in design height.				
Workorder:	Adjust guardrail at $10- per -Lin. Ft. for 245 LF = $2450. Raise 245ft. of barrier up to 27-in design height. 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.

Rocky Mountain National Park

ROUTE 0012: BEAR LAKE ROAD

Barrier Condition Photos

ROMO_0012_8.550_R_1.jpg

Barrier ID:	**ROMO-0012-8.718-R**		
Route Name:	BEAR LAKE ROAD		
Inspection Date:	10/01/2009	**Barrier Rating:**	28.20

Barrier Description

Type:	STEEL-BACKED TIMBER WITH BLOCKOUT	**Barrier Function:**	TRAFFIC
Barrier Material:	STEEL-BACKED TIMBER/LOG	**Post Material:**	CORTEN
Blockout Type:	WOOD	**Length (ft.):**	968
Speed Limit (MPH):	25	**Placement with Respect to Road:**	BOTH INSIDE AND OUTSIDE
Hazard Behind Barrier:	HIGH		

Barrier Crashworthiness

Appropriate Test Level:	TL-1	**Barrier Test Level:**	TL-3	**Is Barrier Crashworthy?:**	YES
Beg. End Trtmt Type:	SBT/LOG FLARED	**Is Beg. End Trtmt Crashhworthy?:**	NO	**Approach Transition Type:**	NONE
Ending End Trtmt Type:	SBT/LOG BURIED	**Ending End Trtmt Crashhworthy?:**	YES		

Average Measurements

Design Height (In.):	27	**Width (In.):**	0.0	**Post Spacing (In.):**	99.0
Height (In.):	26.3	**Lateral Offset (In.):**	27.0	**Road Grade (%):**	3.90

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 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 breaking or cracking observed.
	Missing Elements:	No missing elements observed.
	Corrrosion and Weathering:	No corrosion or weathering observed.

Barrier ID:	**ROMO-0012-8.718-R**		
Route Name:	BEAR LAKE ROAD		
Inspection Date:	10/01/2009	**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.

Rocky Mountain National Park

ROUTE 0012: BEAR LAKE ROAD

Barrier Condition Photos

ROMO_0012_8.718_R_1.jpg

Barrier ID:	**ROMO-0201-1.450-R**		
Route Name:	CUB LAKE / STABLES ROAD		
Inspection Date:	10/01/2009	**Barrier Rating:**	0.00

Barrier Description

Type:	OTHER: LOG RAIL ON LOG POSTS	**Barrier Function:**	NON-TRAFFIC
Barrier Material:	LOG/TIMBER/WOOD	**Post Material:**	WOOD
Blockout Type:	N/A	**Length (ft.):**	133
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.):	20	**Width (In.):**	12.0	**Post Spacing (In.):**	60.0
Height (In.):	22.0	**Lateral Offset (In.):**	0.0	**Road Grade (%):**	0.00

Physical Condition

Barrier	**Alignment and Height:**	Alignment acceptable. Height was 2-in above the 20-in deisgn 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 was 2-in above the 20-in deisgn height.
	Breaking and Cracking:	No breaking or cracking observed.
	Missing Elements:	No missing elements observed.
	Corrrosion and Weathering:	No corrosion or weathering observed.

Barrier ID:	**ROMO-0201-1.450-R**		
Route Name:	CUB LAKE / STABLES ROAD		
Inspection Date:	10/01/2009	**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.

Rocky Mountain National Park

ROUTE 0201: CUB LAKE / STABLES ROAD

Barrier Condition Photos

ROMO_0201_1.450_R_1.jpg

Appendix A
Summary of GIP Definitions and Assessment

Rocky Mountain National Park

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.