

# COLM WIP Report

## NPS Retaining Wall Inventory Program Colorado National Monument



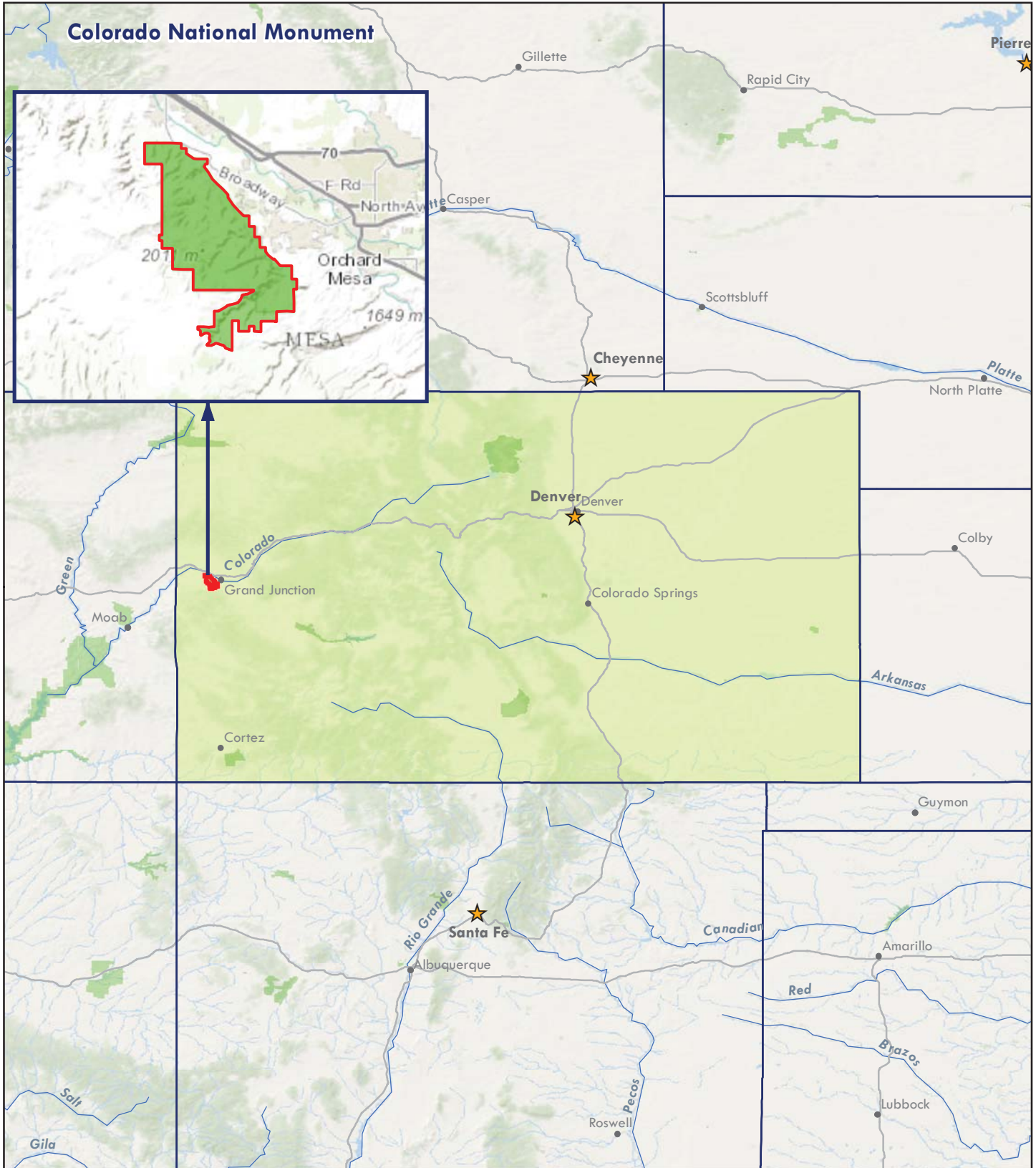
**Federal Lands Highway  
Road Inventory Program**

**Prepared By:**

**Federal Highway Administration  
Eastern Federal Lands Highway Division  
Road Inventory Program (RIP)**

**Data Collection Date: May 2007  
Report Date: October 2015**

# Colorado National Monument 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  
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# Table of Contents

<b>SECTION</b>	<b>PAGE NO.</b>
<b>1. INTRODUCTION</b>	<b>1 - 1</b>
<b>2. PARK RETAINING WALL LOCATION MAPS</b> Retaining Wall Location Maps	<b>2 - 1</b>
<b>3. TIER 1 - PARK RETAINING WALL OVERVIEW</b>	<b>3 - 1</b>
<b>4. TIER 2 - ROUTE RETAINING WALL OVERVIEW</b>	<b>4 - 1</b>
<b>5. TIER 3 - RETAINING WALL DETAILS</b>	<b>5 - 1</b>
<b>6. APPENDIX A - SUMMARY OF WIP DEFINITIONS AND ASSESSMENT CATEGORIES</b>	<b>A - 1</b>



# Introduction



## Colorado National Monument



**Federal Lands Highway  
Road Inventory Program**



## **Introduction**

The Federal Lands Highway Division (FLH) of the Federal Highway Administration (FHWA), in partnership with the National Park Service (NPS), has conducted a retaining wall inventory and condition assessment as part of the NPS Retaining Wall Inventory Program (WIP). This inventory provides information to the NPS Facility Management Software System (FMSS) regarding such things as type, size and location of retaining structures, as well as the condition of these facilities and consequences of failure. In addition, when wall and/or adjacent element deficiencies are identified, repair recommendations and estimated costs are also provided, suitable for use as FMSS work orders.

The main intent of this effort is to determine the backlog of needs associated with retaining wall assets – equipment features ascribed to the “parent” roadway asset. Inventory and condition assessments (pavement only) for the roads themselves are conducted under the NPS Road Inventory Program (RIP). Prior to development of the WIP, the vast majority of retaining walls were not accounted for in FMSS. Based on WIP inventory work to date, NPS wall assets are valued at well over \$400M. A second and equally important intent of this effort is to inform and improve project selection, prioritization, and development activities and processes at NPS regions/parks, FLH Division offices and the NPS Denver Service Center.

In support of WIP, a comprehensive procedures manual (available at the following link: <http://www.cflhd.gov/programs/techDevelopment/geotech/WIP/>) was developed to document the data collection and management process, wall attribute and element definitions, and team member responsibilities for conducting retaining wall inventories and condition assessments. This manual was used for nearly 3,500 wall assessments initially conducted between 2007 and 2008 within 34 national parks. WIP is supported by several key components described in the procedures manual, including a comprehensive training program for field inspectors, an Oracle-based database for long-term data management, unique data collection forms, a supporting field guide, and a wall repair/replace cost estimate guide.

Ultimately, condition assessments for retaining wall structures are expressed as deferred maintenance costs, which are then divided by current year replacement costs to arrive at a “Facility Condition Index” (FCI). Coupling this condition prioritization index with an “Asset Priority Index” (API), which measures the feature’s importance to the mission of the park, capital asset investments are made more efficiently. This approach appropriately focuses maintenance and construction priorities on value, rather than solely on cost. Wall inventory condition and cost data are transferred from the WIP database to FMSS, the primary asset documentation, management and planning platform maintained at each park. In addition, wall data are also provided to the Road Inventory Program to update equipment assets associated with the parent roadway asset.

Initial inventories were conducted based on RIP Cycle 3 data, but future planning has ensured updates to WIP will occur simultaneously with RIP. For long-term data management purposes, the WIP database will be linked to the larger, parent RIP database and be updated under the responsibility of the RIP Database Administrator.

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 wall (Tier 3). Tier 1 presents park wall location maps and an overall park-specific summary narrative of the results of the wall inventory program. Tier 2 presents route overview maps with associated wall summary information. Tier 3 presents individual wall information in a three-page detailed format, including a photograph of each wall. Appendix A provides a condensed summary of wall inventory definitions and assessment categories to assist in reading this report.

# Park Retaining Wall Location Maps



Colorado National Monument



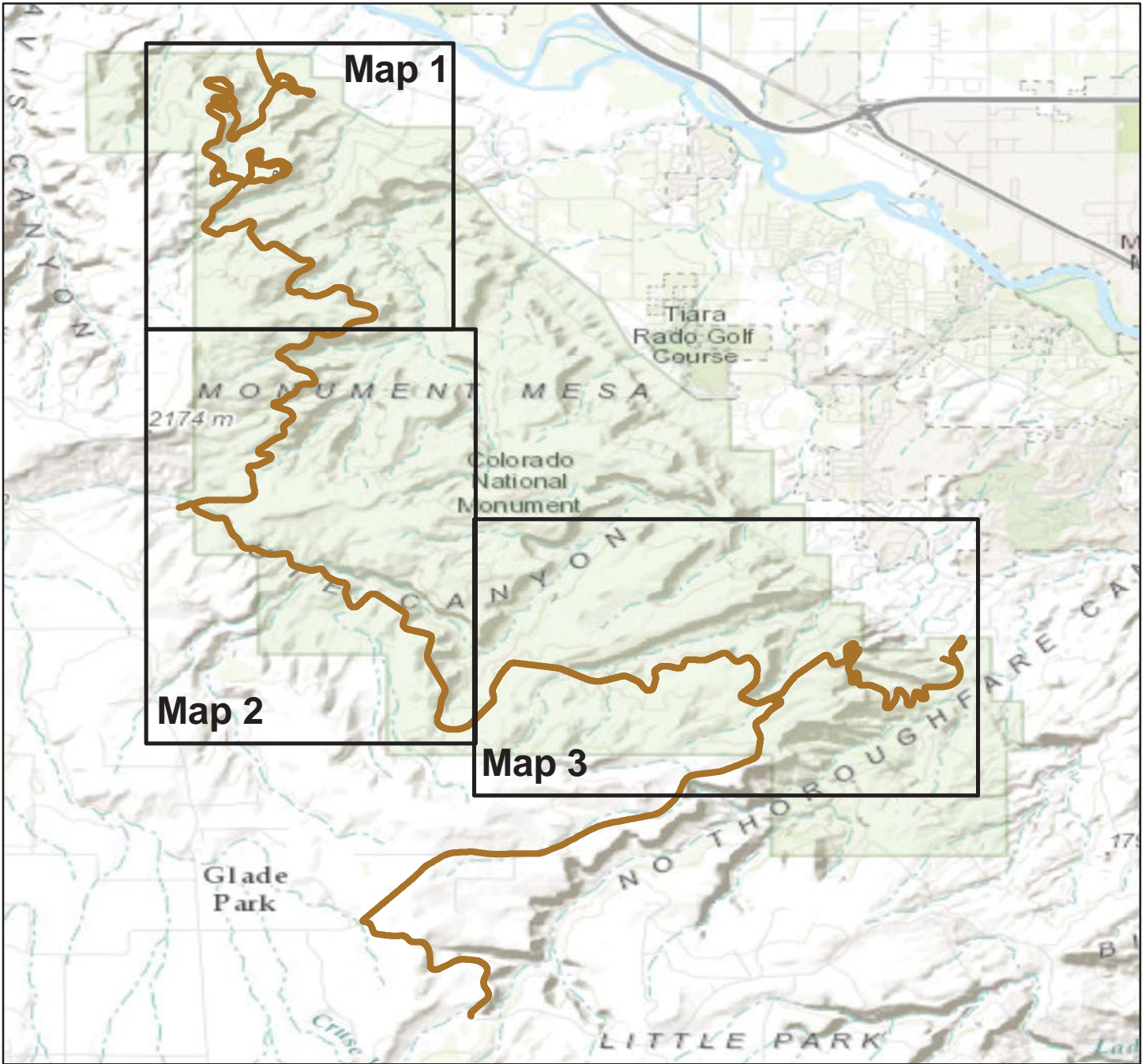
**Federal Lands Highway  
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# Colorado National Monument

## WALL 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

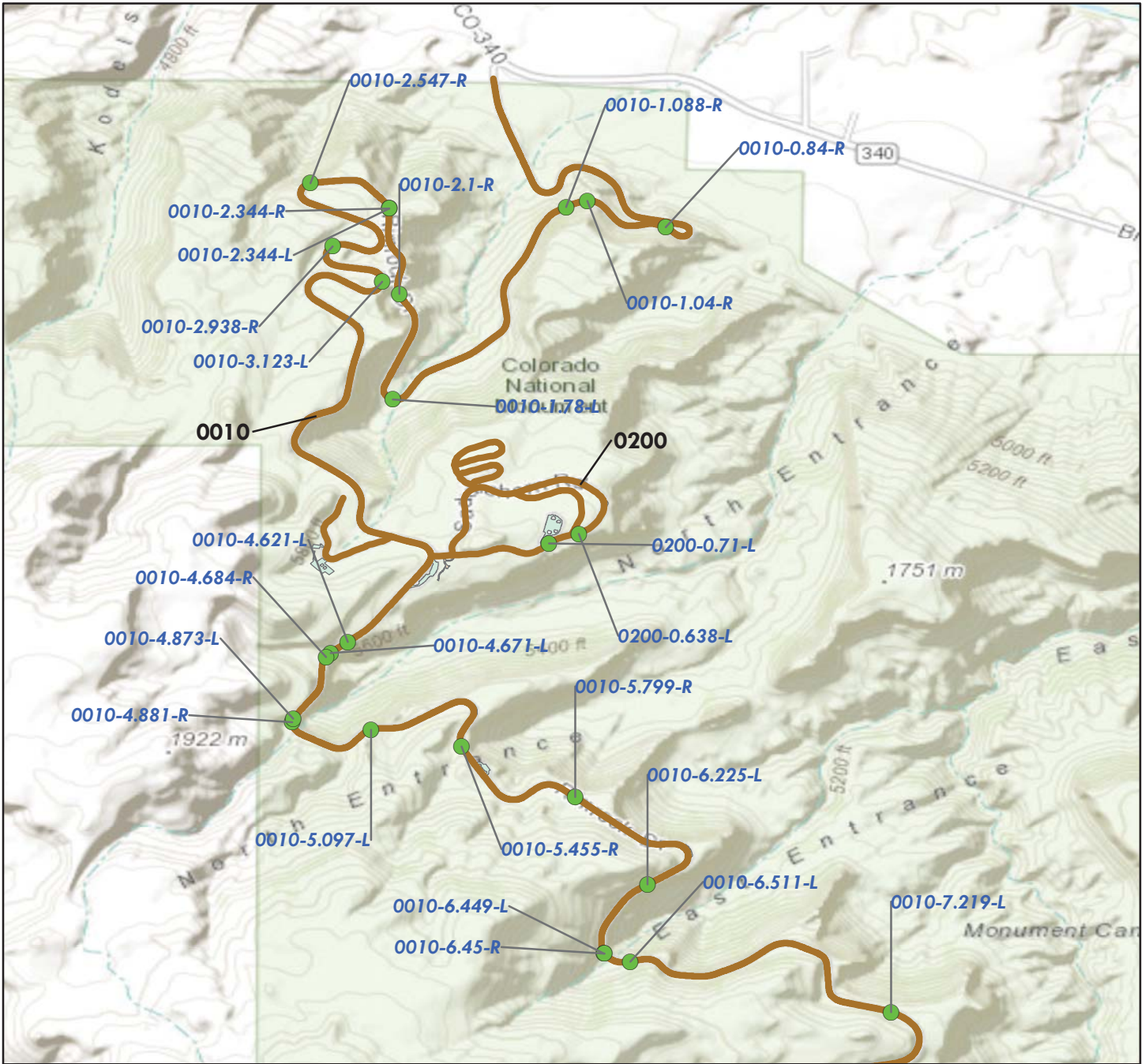




# Colorado National Monument

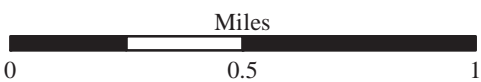
## WALL LOCATION MAP

### 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

- Wall Locations
- RIP Collected Routes



# Colorado National Monument

## WALL 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

● Wall Locations

— RIP Collected Routes

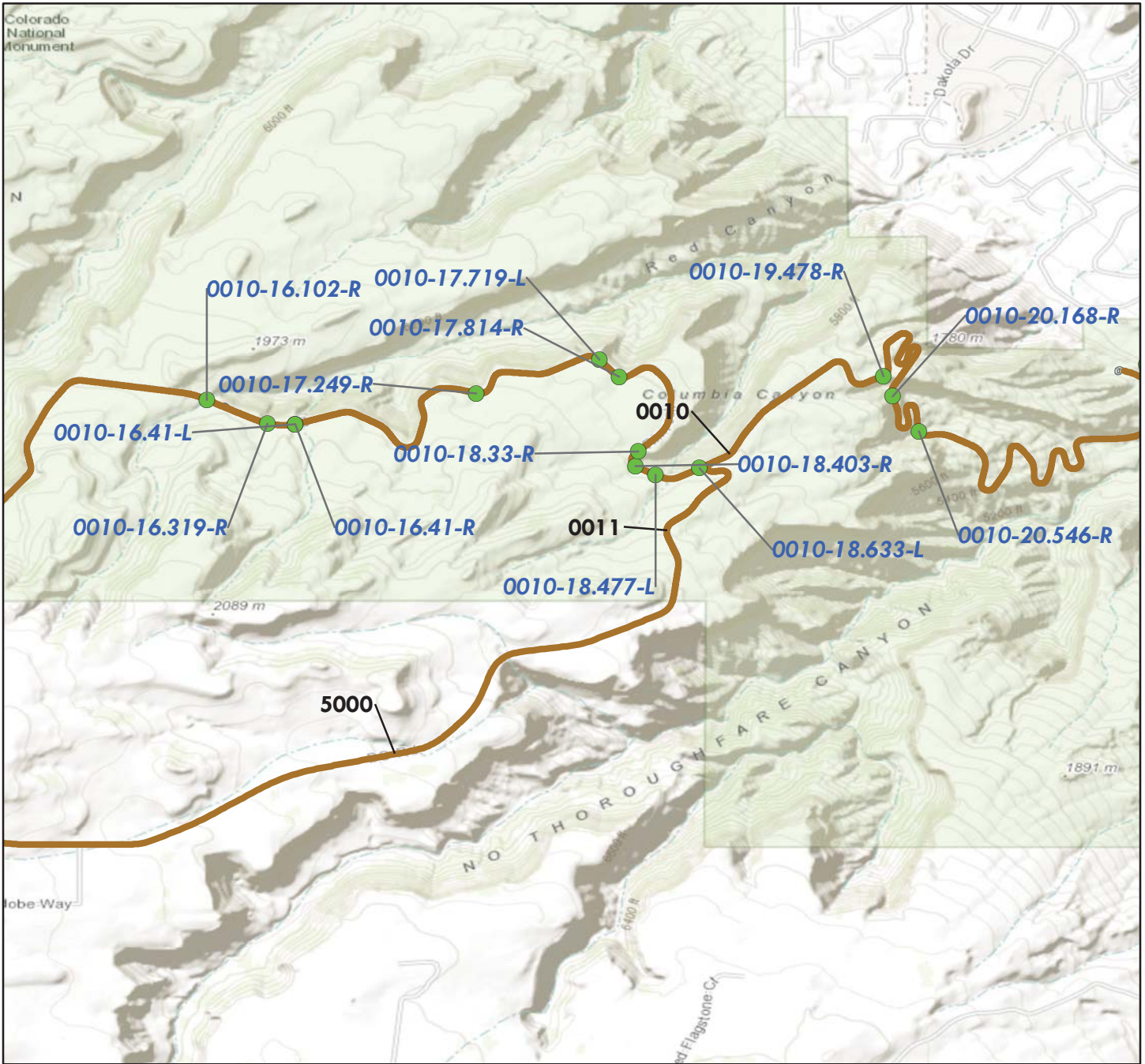




# Colorado National Monument

## WALL 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

● Wall Locations

— RIP Collected Routes





# Tier 1 Park Retaining Wall Overview



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# Parkwide Summary: Colorado National Monument

Initial retaining wall inspections were conducted at Colorado National Monument in 2007, and encompassed all known retaining wall structures associated with Park roadways - including structure's retaining cuts and fills, as well as qualifying headwalls at culverts. For the purposes of the assessment, walls must be a minimum of 4 feet in maximum height of retained earth and greater than 6 feet in maximum height for culvert headwalls. This does not include the height of parapet or guardwall above a retaining wall. In general, guardwall or parapets are not included in this assessment, but were inspected for Colorado National Monument in 2011 under a separate effort as part of the Guardwall/Rail Inventory Program (GIP). A report for GIP is available under separate cover.

All paved roadways and parking areas listed in the RIP Route Identification Report were inspected for walls. Occasionally, unpaved routes not in RIP were inventoried due to their future programmatic addition at the park, which was a decision made on site specific to each park.

The following tables provide an overview of the findings of this inspection and assessment effort. In all, 49 walls were inventoried on the routes listed below.

**Table 1: Number of Walls by Route**

<b>Route Number</b>	<b>Route Name</b>	<b>No. of Walls</b>
0010	RIMROCK DRIVE	47
0200	SADDLEHORN LOOP ROAD	2

The following table shows the number of walls broken out by seven possible categories of basic wall function.

**Table 2: Number of Walls by Wall Function**

<b>Wall Function</b>	<b>No. of Walls</b>
FW - Fill Wall	22
HW - Head Wall	25
SP - Slope Protection	2

The following table shows the primary wall types that were inventoried and assessed. There are 24 possible primary wall types, which are summarized in Appendix A.

**Table 3: Number of Walls by Primary Wall Type**

Primary Wall Type	No. of Walls
CL, Cantilever - Concrete	1
GC, Gravity - Mass Concrete	5
GD, Gravity - Dry Stone	12
GM, Gravity - Mortared Stone	30
MW, MSE - Welded Wire Face	1

The following table shows the number of walls by one of six categories of recommended action along with associated 2007 costs and the number of walls that are in each recommended action category. The majority of walls have a recommendation of *No Action* or *Monitor*; work orders were created for all other recommended actions.

**Table 4: Number of Walls by Recommended Action and Associated 2007 Cost**

Recommended Action	2007 Repair Costs*	No. of Walls
No Action	\$0	42
Monitor	\$0	0
Maintenance	\$4,165	7
Repair Elements	\$0	0
Replace Elements	\$0	0
Replace Wall	\$0	0
<b>Totals</b>	<b>\$4,165</b>	<b>49</b>

\*2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.



The following table categorizes the number of walls 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 walls are listed by individual wall in Tier 3 of this report.

**Table 5: Number of Walls Grouped by Associated 2007 Cost**

<b>Cost Range*</b>	<b>No. of Walls</b>
\$0	42
\$1 - \$25,000	7
\$25,001 - \$50,000	0
\$50,001 - \$100,000	0
\$100,001 - \$250,000	0
\$250,001 - \$500,000	0
\$500,001 - \$1,000,000	0
\$1,000,001 - \$2,000,000	0
\$2,000,001 - \$3,000,000	0
\$3,000,001 - \$4,000,000	0
<b>Total Number of Walls</b>	<b>49</b>

\*2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.

Routine inspection and performing the noted maintenance will greatly aid in the continued performance of all walls at Colorado National Monument. Work orders for walls needing maintenance generally included items such as replacing missing stones, replacing mortar, filling voids at the top or bottom of fill walls, and clearing vegetation.

Work orders for walls needing localized element repairs generally included items such as adding riprap protection to the wall foundation, replacing missing sections of dry stone walls, replacing culverts, grouting voids in walls, and patching/restoring roadway pavement. While decaying mortar generally does not threaten wall stability in the near term, grout repair will extend the life of these walls.

Work orders for walls needing major repairs (replace elements or replace wall) generally include items such as foundation repair or replacement, fill voids, repair roadway shoulder, replace or extend retaining wall in either height or length, rebuild failed segments of walls, repair elements across 50% or more of the wall, remove and recompact backfill material, add scour protection (typically with riprap, concrete, or rock fill), and remove/reset culvert headwalls. Due to the large unit items associated with major repairs, recommendations vary by specific wall and are presented in Tier 3 of this report.

WIP identified 55 critically deficient walls nationally based on wall ratings less than 49 (poor/critical overall condition). The following table presents the walls in Colorado National Monument that are on this list and have been elevated to the Park Regional Coordinators in a Regional Park Summary Memorandum. Generally, these are walls with major repair element recommendations that may be a priority for repair work in your park.

**Table 6: Number of Walls by Route**

<b>Wall Identification</b>	<b>Failure Consequence<sup>(1)</sup></b>	<b>Wall Rating<sup>(2)</sup></b>	<b>Recommended Action<sup>(3)</sup></b>	<b>2007 Repair Costs<sup>(4)</sup></b>
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No critically deficient walls.

Notes: 1) Low consequence of failure and/or no recommended action may indicate repairs are not needed.

2) Wall ratings listed range from 0-49 (Poor/Critical).

3) Information was prepared for project planning purposes only. Actual repair work order scopes and actual costs will need to be evaluated based on current pay item unit prices for specific locations.

4) 2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.

# Tier 2 Route Retaining Wall Overview



Colorado National Monument



**Federal Lands Highway  
Road Inventory Program**



# Colorado National Monument

## ROUTE 0010: RIMROCK DRIVE



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

### Retaining Wall Condition Legend – Wall Condition Rating

Critical / Poor (0 - 49)

Fair (50 - 69)

Good to Excellent (70 - 100)

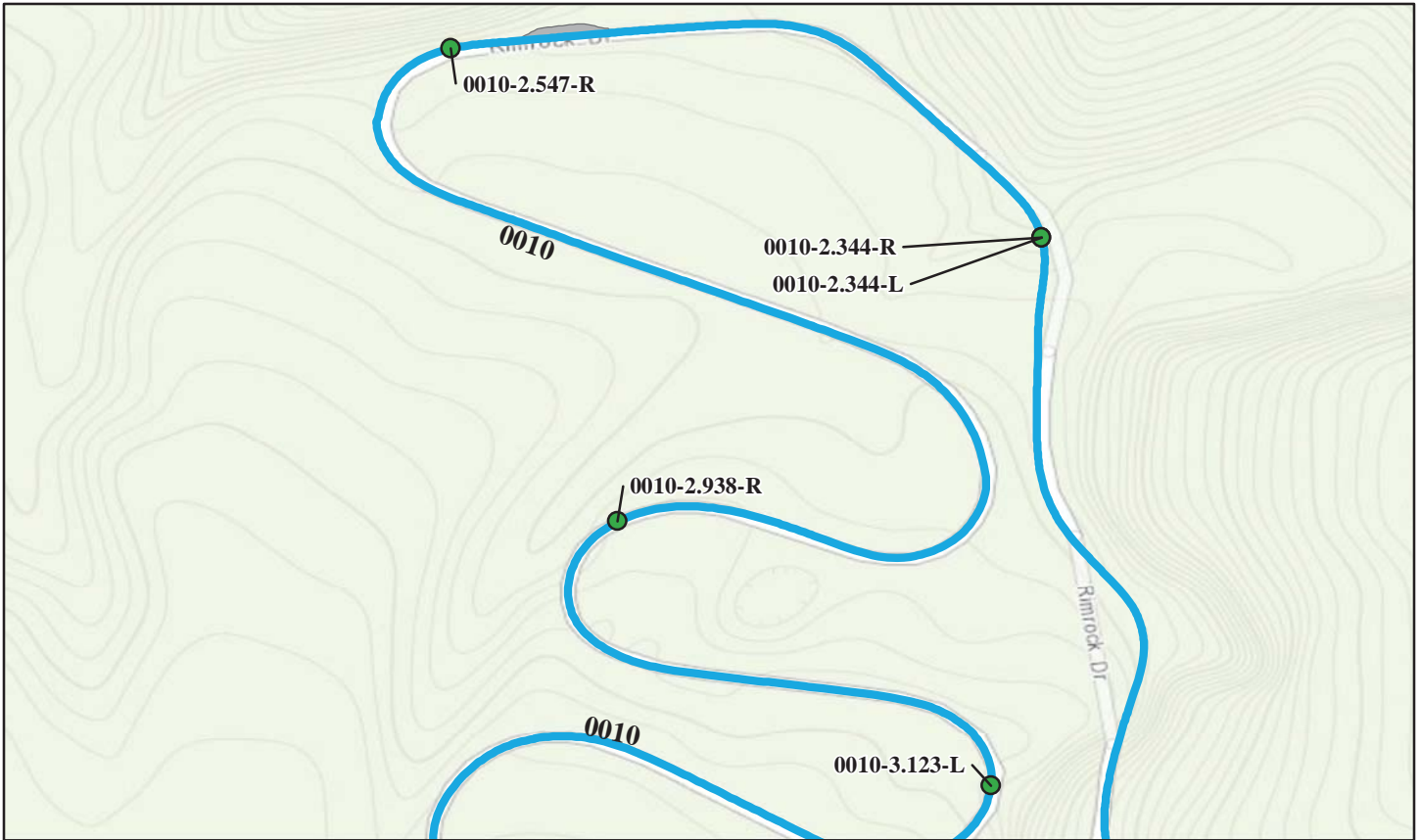
No Data

Wall ID Inspection Date:	Wall Area (Sq. Ft.)	Wall Length (Ft.)	Wall Type	Wall Function	Overall Rating	Repair Cost
COLM-0010-0.840-R 4/22/2007	471	65	Gravity - Dry Stone	Fill Wall	82	\$0.00
COLM-0010-1.040-R 4/22/2007	50	9	Gravity - Mass Concrete	Head Wall	85	\$55.00
COLM-0010-1.088-R 4/22/2007	670	111	Gravity - Dry Stone	Fill Wall	84	\$0.00
COLM-0010-1.780-L 4/22/2007	180	29	Gravity - Mortared Stone	Head Wall	74	\$0.00
COLM-0010-2.100-R 4/22/2007	175	47	Gravity - Mortared Stone	Fill Wall	86	\$0.00

\*2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.

# Colorado National Monument

## ROUTE 0010: RIMROCK DRIVE



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### Retaining Wall Condition Legend – Wall Condition Rating

Critical / Poor (0 - 49)

Fair (50 - 69)

Good to Excellent (70 - 100)

No Data

Wall ID Inspection Date:	Wall Area (Sq. Ft.)	Wall Length (Ft.)	Wall Type	Wall Function	Overall Rating	Repair Cost
COLM-0010-2.344-L 4/23/2007	80	30	Gravity - Dry Stone	Head Wall	80	\$0.00
COLM-0010-2.344-R 4/23/2007	1,205	241	Gravity - Dry Stone	Fill Wall	87	\$0.00
COLM-0010-2.547-R 4/23/2007	900	179	Gravity - Mortared Stone	Fill Wall	85	\$0.00
COLM-0010-2.938-R 4/23/2007	680	167	Gravity - Mortared Stone	Fill Wall	87	\$0.00
COLM-0010-3.123-L 4/22/2007	220	68	Gravity - Dry Stone	Fill Wall	80	\$0.00

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# Colorado National Monument

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Good to Excellent (70 - 100)

No Data

Wall ID Inspection Date:	Wall Area (Sq. Ft.)	Wall Length (Ft.)	Wall Type	Wall Function	Overall Rating	Repair Cost
COLM-0010-4.621-L 4/22/2007	960	120	Gravity - Mortared Stone	Fill Wall	91	\$55.00
COLM-0010-4.671-L 4/23/2007	1,256	132	MSE - Welded Wire Face	Fill Wall	98	\$0.00
COLM-0010-4.684-R 4/22/2007	92	23	Gravity - Mortared Stone	Head Wall	89	\$0.00
COLM-0010-4.873-L 4/22/2007	700	74	Gravity - Mortared Stone	Fill Wall	86	\$0.00
COLM-0010-4.881-R 4/23/2007	780	65	Gravity - Dry Stone	Fill Wall	71	\$0.00

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# Colorado National Monument

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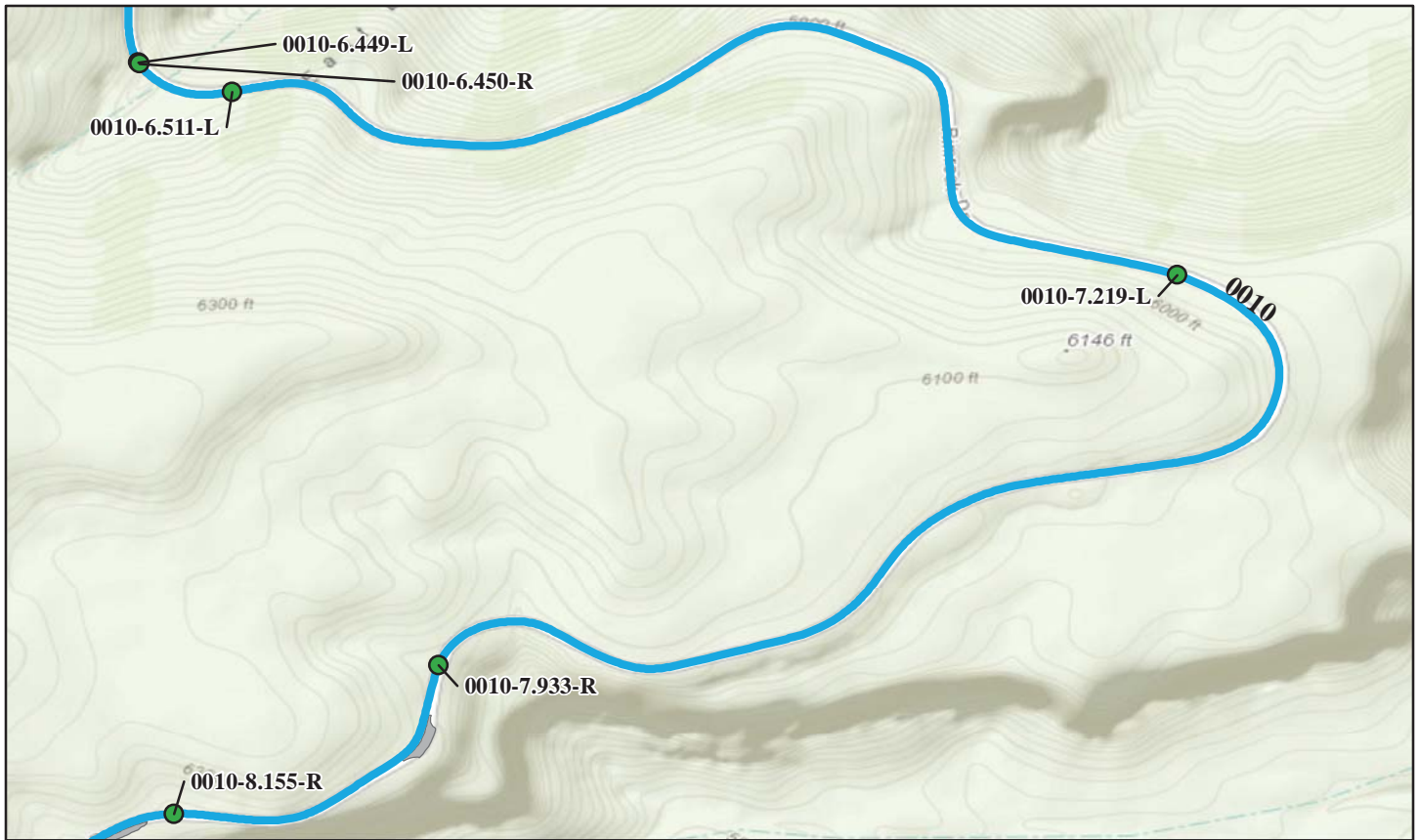
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Wall ID Inspection Date:	Wall Area (Sq. Ft.)	Wall Length (Ft.)	Wall Type	Wall Function	Overall Rating	Repair Cost
COLM-0010-5.097-L 4/23/2007	1,400	70	Gravity - Dry Stone	Slope Protection	77	\$0.00
COLM-0010-5.455-R 4/23/2007	120	30	Gravity - Mortared Stone	Head Wall	86	\$0.00
COLM-0010-5.799-R 4/23/2007	120	18	Gravity - Mortared Stone	Head Wall	87	\$0.00
COLM-0010-6.225-L 4/23/2007	1,450	364	Gravity - Mortared Stone	Fill Wall	87	\$0.00
COLM-0010-6.449-L 4/23/2007	162	25	Cantilever - Concrete	Fill Wall	96	\$0.00

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# Colorado National Monument

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No Data

Wall ID Inspection Date:	Wall Area (Sq. Ft.)	Wall Length (Ft.)	Wall Type	Wall Function	Overall Rating	Repair Cost
COLM-0010-6.450-R 4/23/2007	160	20	Gravity - Mortared Stone	Head Wall	85	\$0.00
COLM-0010-6.511-L 4/23/2007	260	120	Gravity - Mass Concrete	Fill Wall	90	\$0.00
COLM-0010-7.219-L 4/23/2007	178	34	Gravity - Mortared Stone	Head Wall	84	\$0.00
COLM-0010-7.933-R 4/23/2007	150	34	Gravity - Mass Concrete	Head Wall	91	\$0.00
COLM-0010-8.155-R 4/23/2007	161	25	Gravity - Mass Concrete	Head Wall	91	\$0.00

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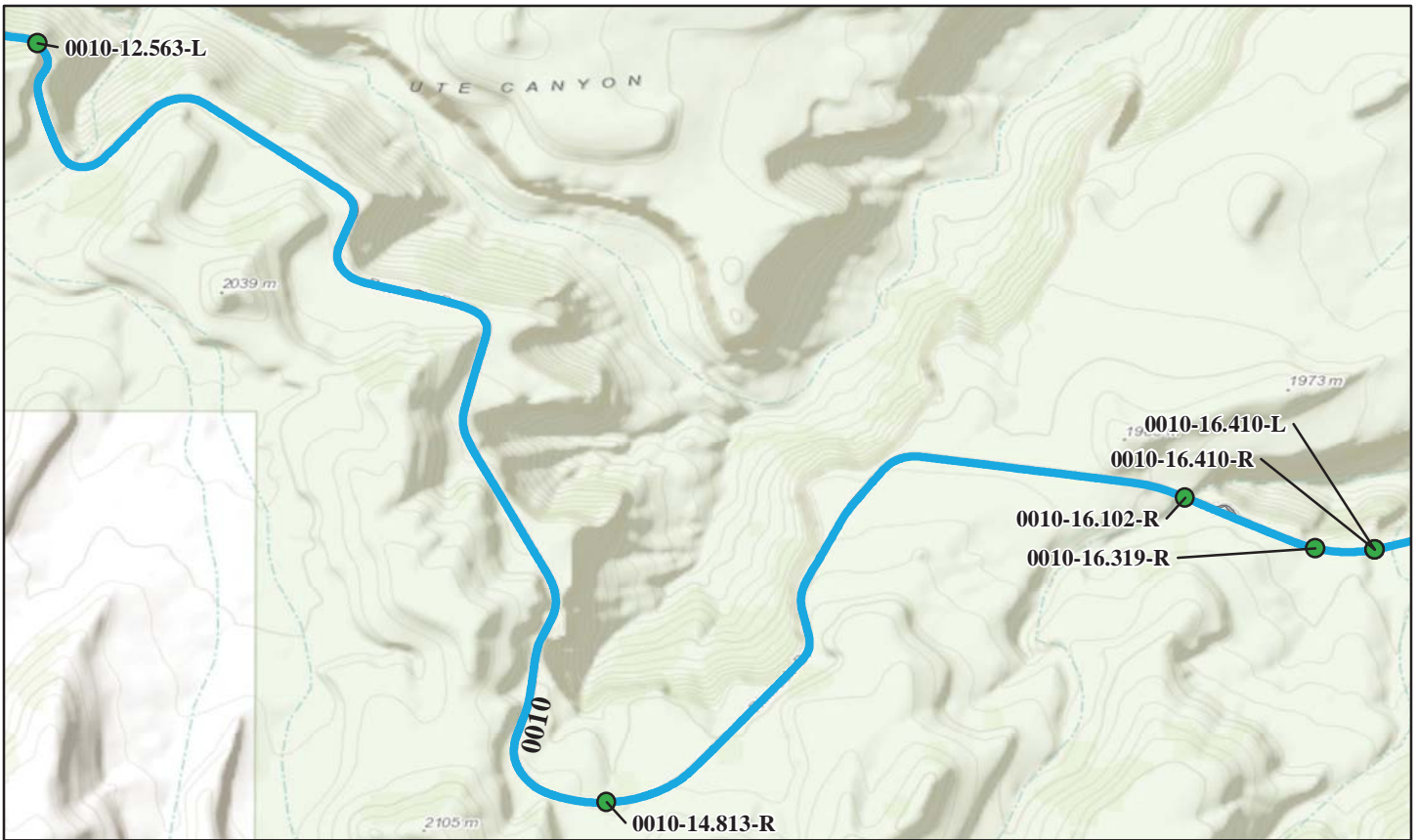
Wall ID Inspection Date:	Wall Area (Sq. Ft.)	Wall Length (Ft.)	Wall Type	Wall Function	Overall Rating	Repair Cost
COLM-0010-8.640-L 4/23/2007	703	148	Gravity - Mass Concrete	Fill Wall	87	\$0.00
COLM-0010-8.874-R 4/23/2007	108	18	Gravity - Mortared Stone	Head Wall	79	\$0.00
COLM-0010-9.826-R 4/23/2007	45	21	Gravity - Mortared Stone	Head Wall	76	\$0.00
COLM-0010-10.185-L 4/24/2007	180	31	Gravity - Mortared Stone	Head Wall	76	\$0.00
COLM-0010-11.627-L 4/24/2007	1,070	170	Gravity - Mortared Stone	Fill Wall	74	\$0.00

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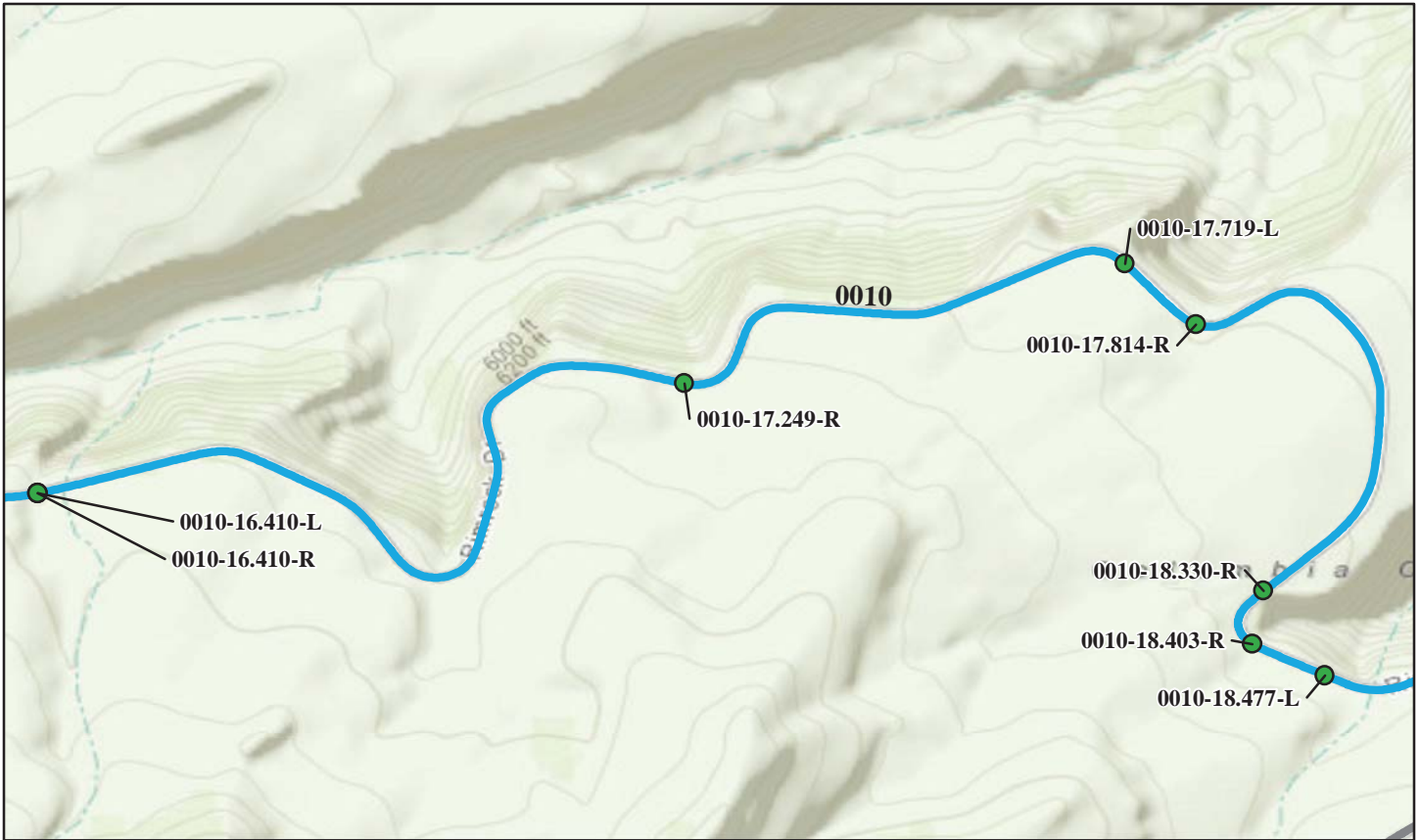
No Data

Wall ID Inspection Date:	Wall Area (Sq. Ft.)	Wall Length (Ft.)	Wall Type	Wall Function	Overall Rating	Repair Cost
COLM-0010-12.563-L 4/24/2007	1,640	164	Gravity - Mortared Stone	Fill Wall	73	\$440.00
COLM-0010-14.813-R 4/24/2007	35	10	Gravity - Mortared Stone	Head Wall	90	\$0.00
COLM-0010-16.102-R 4/24/2007	306	34	Gravity - Mortared Stone	Head Wall	90	\$0.00
COLM-0010-16.319-R 5/24/2007	88	18	Gravity - Dry Stone	Head Wall	80	\$0.00
COLM-0010-16.410-L 4/24/2007	245	40	Gravity - Mortared Stone	Head Wall	90	\$0.00

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No Data

Wall ID Inspection Date:	Wall Area (Sq. Ft.)	Wall Length (Ft.)	Wall Type	Wall Function	Overall Rating	Repair Cost
COLM-0010-16.410-R 4/24/2007	75	15	Gravity - Dry Stone	Head Wall	74	\$220.00
COLM-0010-17.249-R 4/24/2007	210	25	Gravity - Mortared Stone	Head Wall	83	\$0.00
COLM-0010-17.719-L 4/24/2007	470	47	Gravity - Mortared Stone	Fill Wall	90	\$0.00
COLM-0010-17.814-R 4/24/2007	100	25	Gravity - Mortared Stone	Head Wall	83	\$0.00
COLM-0010-18.330-R 4/24/2007	40	16	Gravity - Mortared Stone	Head Wall	78	\$0.00

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COLM-0010-18.403-R 4/24/2007	65	13	Gravity - Dry Stone	Head Wall	71	\$55.00
COLM-0010-18.477-L 4/24/2007	642	107	Gravity - Dry Stone	Fill Wall	84	\$0.00
COLM-0010-18.633-L 4/24/2007	450	30	Gravity - Dry Stone	Slope Protection	83	\$0.00
COLM-0010-19.478-R 4/24/2007	2,964	494	Gravity - Mortared Stone	Fill Wall	80	\$0.00
COLM-0010-20.168-R 4/24/2007	76	19	Gravity - Mortared Stone	Head Wall	83	\$0.00

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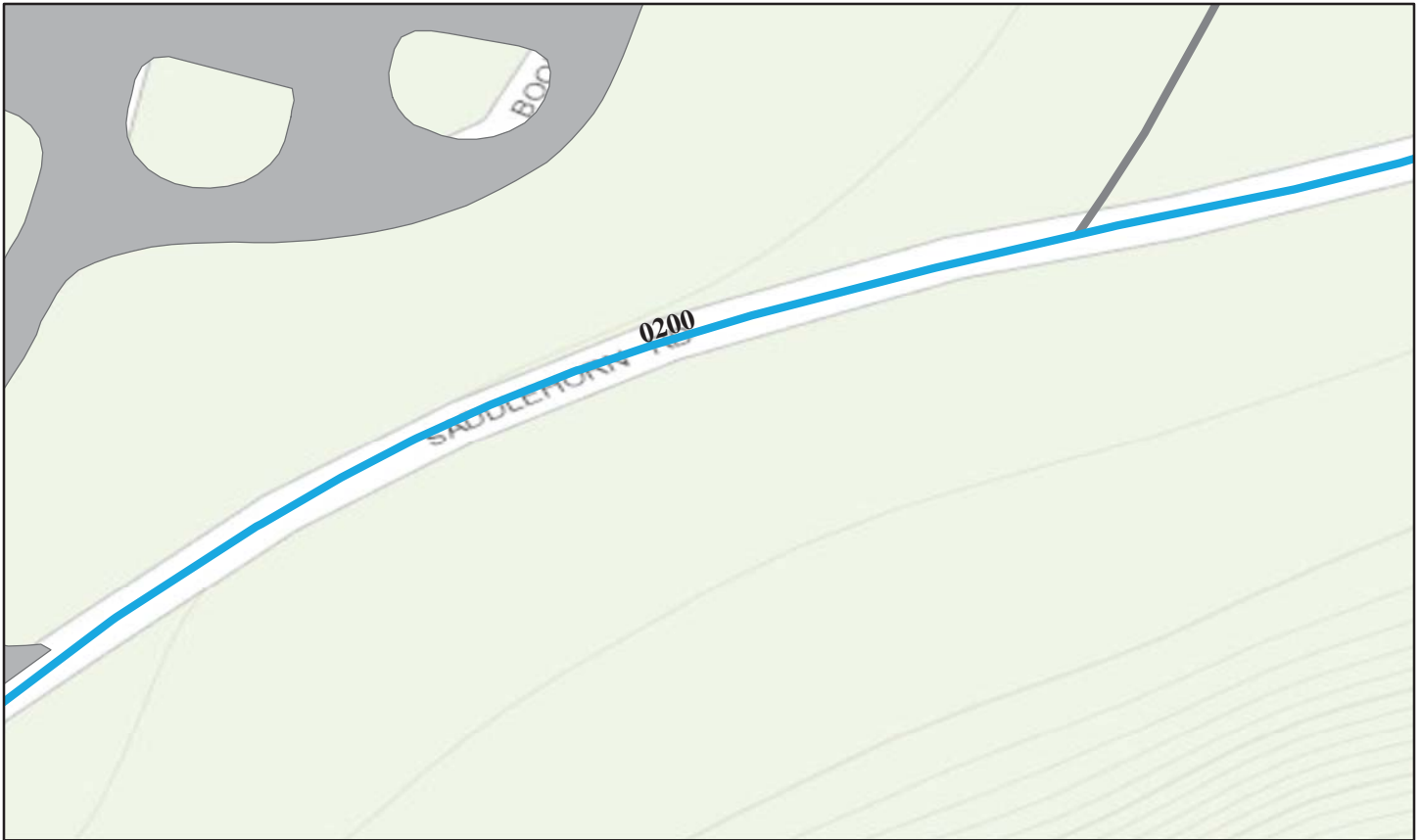
No Data

Wall ID Inspection Date:	Wall Area (Sq. Ft.)	Wall Length (Ft.)	Wall Type	Wall Function	Overall Rating	Repair Cost
COLM-0010-20.546-R 4/24/2007	150	17	Gravity - Mortared Stone	Head Wall	72	\$2,360.00
COLM-0010-22.271-R 4/24/2007	57	19	Gravity - Mortared Stone	Head Wall	82	\$980.00

\*2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.

# Colorado National Monument

## ROUTE 0200: SADDLEHORN LOOP 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

### Retaining Wall Condition Legend – Wall Condition Rating

Critical / Poor (0 - 49)

Fair (50 - 69)

Good to Excellent (70 - 100)

No Data

Wall ID Inspection Date:	Wall Area (Sq. Ft.)	Wall Length (Ft.)	Wall Type	Wall Function	Overall Rating	Repair Cost
COLM-0200-0.638-L 4/24/2007	400	80	Gravity - Mortared Stone	Fill Wall	90	\$0.00
COLM-0200-0.710-L 4/24/2007	170	51	Gravity - Mortared Stone	Fill Wall	90	\$0.00

\*2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.

# Tier 3 Retaining Wall Details



Colorado National Monument



Federal Lands Highway  
Road Inventory Program



<b>Wall ID:</b>	COLM-0010-0.840-R		
<b>Route Name:</b>	RIMROCK DRIVE		
<b>Inspection Date:</b>	April 22, 2007	<b>Approximate Year Built:</b>	1936
<b>*Wall Rating:</b>	82	<b>Maintenance Action:</b>	No Action

**Wall Description**

<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	Gravity - Dry Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Dry-laid stone masonry wall with large, well-cut and well-placed sandstone blocks. Wall bears on steep sandstone bedrock.		

**Wall Measurements**

<b>Wall Length (ft.):</b>	65	<b>Face Area (sq.):</b>	471
<b>Average Wall Height (ft.):</b>	7	<b>Face Angle (deg.):</b>	70
<b>Maximum Wall Height (ft.):</b>	14	<b>Vertical Offset (ft.):</b>	0

**Assessed Elements**

<b>Element (Weighting Factor)</b>	<b>Narrative</b>	<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	No signs of global distresses. Functioning as intended.	8
WALL FOUNDATION MATERIAL 8.00	Foundation is hard, durable and stable sandstone, showing no signs of bearing distress.	9
PLACED STONE 8.00	See stone masonry.	8
STONE MASONRY 8.00	Dense, fresh cut sandstone blocks showing no signs of weathering, cracking, or similar distress. No blocks are missing or displaced.	8
ROAD/SIDEWALK/SHOULDER 0.50	No signs of distress, cracking, or settlement.	8
WALL DRAINS 0.50	No visible drains, but wall appears to be draining without problem - no signs of water staining, seepage, or soft ground.	8
LATERAL SLOPE 0.50	Lateral slopes are either exposed durable bedrock or well-vegetated, draining soil slopes showing no signs of erosion or slope distress.	9
TRAFFIC BARRIER/FENCE 1.00	Mortared stone guard wall with no significant signs of wall-related distress. Some minor mortar cracking, possibly due to wall settlement or weathering.	7
VEGETATION 1.00	Small sage brush bushes and grasses prevalent throughout the wall face, but no impacts to wall performance. Should monitor shrub growth in the future, but for now vegetation serves to hide the wall in the landscape.	7

**Repair Recommendations**

<b>Failure Consequence:</b>	HIGH
<b>Recommendation Narrative:</b>	None
<b>Repair Cost:</b>	\$0

2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.

# Colorado National Monument

ROUTE 0010: RIMROCK DRIVE

## Retaining Wall Condition Photos



COLM\_0010\_0.840\_R\_1.jpg



COLM\_0010\_0.840\_R\_2.jpg

<b>Wall ID:</b>	COLM-0010-1.040-R		
<b>Route Name:</b>	RIMROCK DRIVE		
<b>Inspection Date:</b>	April 22, 2007	<b>Approximate Year Built:</b>	1936
<b>*Wall Rating:</b>	85	<b>Maintenance Action:</b>	Maintenance

**Wall Description**

<b>Wall Function:</b>	Head Wall	<b>Primary Wall Type:</b>	Gravity - Mass Concrete
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Gravity mass concrete culvert headwall located in steep terrain		

**Wall Measurements**

<b>Wall Length (ft.):</b>	9	<b>Face Area (sq.):</b>	50
<b>Average Wall Height (ft.):</b>	5	<b>Face Angle (deg.):</b>	90
<b>Maximum Wall Height (ft.):</b>	6	<b>Vertical Offset (ft.):</b>	0

**Assessed Elements**

<b>Element (Weighting Factor)</b>	<b>Narrative</b>	<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	No signs of global distresses. Performing as intended. No signs of rotation, significant settlement, or lost bearing due to scour.	9
WALL FOUNDATION MATERIAL 8.00	Firm, stable sandstone boulder and cobble soil mass. No signs of seepage, excessive erosion, etc.	8
CONCRETE 8.00	Excellent condition (like new), showing no signs of cracking, weathering or chemical attack.	9
DOWNSLOPE 0.50	Steep, 40 deg. Slope comprised of broken sandstone rock. Appears stable with minor soil erosion.	8
LATERAL SLOPE 0.50	Steep slope comprised of broken sandstone blocks. Appears stable with minor soil erosion.	8
ROAD/SIDEWALK/SHOULDER 0.50	No signs of headwall-related distress.	8
CULVERT 0.50	Culvert pipe is functioning as intended, with no signs of distress to the headwall.	9
WALL DRAINS 0.50	No drains, but wall is clearly unaffected by water seepage.	9
VEGETATION 1.00	Bushes growing along the top and sides of the headwall may eventually impact wall performance. Need to be removed.	5

**Repair Recommendations**

<b>Failure Consequence:</b>	MODERATE
<b>Recommendation Narrative:</b>	Remove brush and shrubs growing along the top and sides of the headwall to prevent root damage. 1 hour general labor at \$55/hr = \$55.
<b>Repair Cost:</b>	\$55

2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.



# Colorado National Monument

ROUTE 0010: RIMROCK DRIVE

## Retaining Wall Condition Photos



COLM\_0010\_1.040\_R\_1.jpg

<b>Wall ID:</b>	COLM-0010-1.088-R		
<b>Route Name:</b>	RIMROCK DRIVE		
<b>Inspection Date:</b>	April 22, 2007	<b>Approximate Year Built:</b>	1936
<b>*Wall Rating:</b>	84	<b>Maintenance Action:</b>	No Action

### Wall Description

<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	Gravity - Dry Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Dry-laid stone masonry wall in steep terrain		

### Wall Measurements

<b>Wall Length (ft.):</b>	111	<b>Face Area (sq.):</b>	670
<b>Average Wall Height (ft.):</b>	6	<b>Face Angle (deg.):</b>	80
<b>Maximum Wall Height (ft.):</b>	11	<b>Vertical Offset (ft.):</b>	0

### Assessed Elements

<b>Element (Weighting Factor)</b>	<b>Narrative</b>	<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	Wall is well-founded and shows no signs of global distress.	9
WALL FOUNDATION MATERIAL 8.00	Sandstone bedrock, stable with no signs of distress.	8
PLACED STONE 8.00	See stone masonry.	8
STONE MASONRY 8.00	Dense, fresh cut sandstone blocks showing no signs of weathering, cracking, or similar distress. No blocks are missing or displaced.	8
CONCRETE 8.00	Excellent condition (like new), showing no signs of cracking, weathering or chemical attack.	9
LATERAL SLOPE 0.50	Lateral slopes are intact bedrock and rock fill, with no significant signs of erosion or drainage problems.	8
TRAFFIC BARRIER/FENCE 0.50	Mortared stone guard wall with no significant signs of wall-related distress. Some minor mortar cracking, possibly due to wall settlement or weathering.	8
VEGETATION 0.50	Minor vegetation in the wall face and at the wall toe, but not impacting wall performance.	8
WALL DRAINS 0.50	No visible drains. Free-draining wall with no signs of seepage, soft ground, water staining to indicate wall distress.	8

### Repair Recommendations

<b>Failure Consequence:</b>	HIGH
<b>Recommendation Narrative:</b>	None
<b>Repair Cost:</b>	\$0

2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.



# Colorado National Monument

ROUTE 0010: RIMROCK DRIVE

## Retaining Wall Condition Photos



COLM\_0010\_1.088\_R\_1.jpg



COLM\_0010\_1.088\_R\_2.jpg



<b>Wall ID:</b>	COLM-0010-1.780-L		
<b>Route Name:</b>	RIMROCK DRIVE		
<b>Inspection Date:</b>	April 22, 2007	<b>Approximate Year Built:</b>	1936
<b>*Wall Rating:</b>	74	<b>Maintenance Action:</b>	No Action

### Wall Description

<b>Wall Function:</b>	Head Wall	<b>Primary Wall Type:</b>	Gravity - Mortared Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	Gravity - Dry Stone
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Arched, mortared stone masonry headwall overlain by approximate 2 ft-tall dry laid irregular-cut stone masonry wall.		

### Wall Measurements

<b>Wall Length (ft.):</b>	29	<b>Face Area (sq.):</b>	180
<b>Average Wall Height (ft.):</b>	6	<b>Face Angle (deg.):</b>	90
<b>Maximum Wall Height (ft.):</b>	8	<b>Vertical Offset (ft.):</b>	-1

### Assessed Elements

<b>Element (Weighting Factor)</b>	<b>Narrative</b>	<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	Primary headwall is performing as intended, showing no signs of global distress. The short dry laid wall is stable, but highly weathered.	7
WALL FOUNDATION MATERIAL 8.00	Bedrock with large boulders in drainage. Very stable, with no signs of significant scour/erosion problems.	8
STONE MASONRY 8.00	Mortared headwall arch is comprised of strong, durable granite blocks. Dry-laid section is comprised of weathered, thinly laminated, and deteriorating sandstone blocks, poorly laid.	5
PLACED STONE 8.00	See Stone Masonry	8
MORTAR 8.00	Weathered but durable, intact, with minor cracking and separation along rock interface.	9
CULVERT 0.50	Performing as intended with no signs of distress.	8
DOWNSLOPE 0.50	Culvert opens onto mostly bedrock at a shallow grade, showing no signs of distress.	8
ROAD/SIDEWALK/SHOULDER 0.50	No headwall related distress evident along the roadway.	8
LATERAL SLOPE 0.50	Newly constructed riprap side slope and drainage run-down working as intended. No signs of lateral slope distress.	9

### Repair Recommendations

<b>Failure Consequence:</b>	MODERATE
<b>Recommendation Narrative:</b>	None
<b>Repair Cost:</b>	\$0

2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.

# Colorado National Monument

ROUTE 0010: RIMROCK DRIVE

## Retaining Wall Condition Photos



COLM\_0010\_1.780\_L\_1.jpg



COLM\_0010\_1.780\_L\_2.jpg

<b>Wall ID:</b>	COLM-0010-2.100-R		
<b>Route Name:</b>	RIMROCK DRIVE		
<b>Inspection Date:</b>	April 22, 2007	<b>Approximate Year Built:</b>	1936
<b>*Wall Rating:</b>	86	<b>Maintenance Action:</b>	No Action

### Wall Description

<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	Gravity - Mortared Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Mortared stone masonry ashlar wall with culvert.		

### Wall Measurements

<b>Wall Length (ft.):</b>	47	<b>Face Area (sq.):</b>	175
<b>Average Wall Height (ft.):</b>	3	<b>Face Angle (deg.):</b>	85
<b>Maximum Wall Height (ft.):</b>	6	<b>Vertical Offset (ft.):</b>	0

### Assessed Elements

<b>Element (Weighting Factor)</b>	<b>Narrative</b>	<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	No signs of global wall distress. Functioning as intended.	9
WALL FOUNDATION MATERIAL 8.00	Solid, intact, unjointed bedrock showing no signs of distress.	10
MORTAR 8.00	Sound, durable, and intact with minor cracking.	8
STONE MASONRY 8.00	Sandstone cut blocks with minor to no weathering, showing no cracking distress or missing blocks.	8
LATERAL SLOPE 0.50	Sound, intact bedrock on one end and intact well-vegetated steep soil slope on other end showing no signs of distress from erosion or sliding failure.	8
ROAD/SIDEWALK/SHOULDER 0.50	Minor transverse cracking possibly related to wall fill settlement - but significant distress.	8
WALL DRAINS 0.50	No visible drains, but no signs of seepage, staining, or water-related distress.	8
CULVERT 0.50	No signs of water-related distress around the pipe outlet.	9
TRAFFIC BARRIER/FENCE 0.50	Crenellated mortared stone masonry guard wall showing no signs of distress.	9

### Repair Recommendations

<b>Failure Consequence:</b>	HIGH
<b>Recommendation Narrative:</b>	None
<b>Repair Cost:</b>	\$0

2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.



# Colorado National Monument

ROUTE 0010: RIMROCK DRIVE

## Retaining Wall Condition Photos



COLM\_0010\_2.100\_R\_1.jpg



COLM\_0010\_2.100\_R\_2.jpg

<b>Wall ID:</b>	COLM-0010-2.344-L		
<b>Route Name:</b>	RIMROCK DRIVE		
<b>Inspection Date:</b>	April 23, 2007	<b>Approximate Year Built:</b>	1936
<b>*Wall Rating:</b>	80	<b>Maintenance Action:</b>	No Action

**Wall Description**

<b>Wall Function:</b>	Head Wall	<b>Primary Wall Type:</b>	Gravity - Dry Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Culvert inlet with large rock tunnel.		

**Wall Measurements**

<b>Wall Length (ft.):</b>	30	<b>Face Area (sq.):</b>	80
<b>Average Wall Height (ft.):</b>	2	<b>Face Angle (deg.):</b>	85
<b>Maximum Wall Height (ft.):</b>	4	<b>Vertical Offset (ft.):</b>	0

**Assessed Elements**

<b>Element (Weighting Factor)</b>	<b>Narrative</b>	<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	No signs of global wall distress. Minimal foundation rock weathering.	8
WALL FOUNDATION MATERIAL 8.00	Bedrock (sandstone) moderately weathered, signs of water damage; stable.	8
STONE MASONRY 8.00	Blocks are large with no significant weathering. Hard sandstone intact. No chinking.	8
ROAD/SIDEWALK/SHOULDER 0.50	Concrete slab. No signs of fatigue.	8
TRAFFIC BARRIER/FENCE 0.50	Steel barrier face. No signs of distress, rusted.	8
VEGETATION 0.50	Some bushes are growing into the drainage. No need for clearing at this time.	8
WALL DRAINS 0.50	No wall drains, large gaps, free draining. Water stains (expected).	8
LATERAL SLOPE 0.50	Stable massive bedrock. No significant weathering.	9
DOWNSLOPE 1.00	Bedrock dropping into inlet tunnel.	7

**Repair Recommendations**

<b>Failure Consequence:</b>	LOW
<b>Recommendation Narrative:</b>	None
<b>Repair Cost:</b>	\$0

2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.



# Colorado National Monument

ROUTE 0010: RIMROCK DRIVE

## Retaining Wall Condition Photos



COLM\_0010\_2.344\_L\_1.jpg



COLM\_0010\_2.344\_L\_2.jpg



<b>Wall ID:</b>	COLM-0010-2.344-R		
<b>Route Name:</b>	RIMROCK DRIVE		
<b>Inspection Date:</b>	April 23, 2007	<b>Approximate Year Built:</b>	1936
<b>*Wall Rating:</b>	87	<b>Maintenance Action:</b>	No Action

### Wall Description

<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	Gravity - Dry Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Dry stack wall with large cut boulders, varies in height from 2 ft to 11 ft.		

### Wall Measurements

<b>Wall Length (ft.):</b>	241	<b>Face Area (sq.):</b>	1205
<b>Average Wall Height (ft.):</b>	5	<b>Face Angle (deg.):</b>	82
<b>Maximum Wall Height (ft.):</b>	11	<b>Vertical Offset (ft.):</b>	0

### Assessed Elements

<b>Element (Weighting Factor)</b>	<b>Narrative</b>	<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	Performing well as designed. No signs of stress, rotation, or movement.	9
WALL FOUNDATION MATERIAL 8.00	Bedrock, stable, slight weathering but not a concern.	9
STONE MASONRY 8.00	No signs of weathering or distress, good condition.	8
ROAD/SIDEWALK/SHOULDER 0.50	Concrete slab, no signs of fatigue; near tunnel.	8
VEGETATION 0.50	Minor bushes growing through wall.	8
DOWNSLOPE 0.50	Bedrock, very steep @ 70 degrees.	9
LATERAL SLOPE 0.50	Bedrock, very steep, excellent condition.	9
WALL DRAINS 0.50	Drainage below wall foundation. No wall drains, self-draining, no signs of problems.	9

### Repair Recommendations

<b>Failure Consequence:</b>	MODERATE
<b>Recommendation Narrative:</b>	None
<b>Repair Cost:</b>	\$0

2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.

# Colorado National Monument

ROUTE 0010: RIMROCK DRIVE

## Retaining Wall Condition Photos



COLM\_0010\_2.344\_R\_1.jpg



COLM\_0010\_2.344\_R\_2.jpg

<b>Wall ID:</b>	COLM-0010-2.547-R		
<b>Route Name:</b>	RIMROCK DRIVE		
<b>Inspection Date:</b>	April 23, 2007	<b>Approximate Year Built:</b>	1936
<b>*Wall Rating:</b>	85	<b>Maintenance Action:</b>	No Action

### Wall Description

<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	Gravity - Mortared Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Cut masonry wall with mortar in excellent condition and stability.		

### Wall Measurements

<b>Wall Length (ft.):</b>	179	<b>Face Area (sq.):</b>	900
<b>Average Wall Height (ft.):</b>	5	<b>Face Angle (deg.):</b>	79
<b>Maximum Wall Height (ft.):</b>	9	<b>Vertical Offset (ft.):</b>	0

### Assessed Elements

<b>Element (Weighting Factor)</b>	<b>Narrative</b>	<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	No signs of global wall distress. Functioning as intended. Performing well and stable.	9
WALL FOUNDATION MATERIAL 8.00	Fill layer over bedrock. No signs of distress.	9
MORTAR 8.00	No significant signs of cracking or fatigue; minor cracking only.	8
STONE MASONRY 8.00	Nicely cut stone, moderate weathering, some staining, some separation from mortar.	8
CULVERT 0.50	Culvert at both ends of wall, functioning as intended.	8
DOWNSLOPE 0.50	Bedrock, well-weathered.	8
ROAD/SIDEWALK/SHOULDER 0.50	No signs of cracking caused by wall movement.	8
WALL DRAINS 0.50	No internal wall drains present. Drainage runoff on both sides of wall.	8
LATERAL SLOPE 0.50	Fill layer over bedrock. No signs of distress. Well vegetated.	9

### Repair Recommendations

<b>Failure Consequence:</b>	HIGH
<b>Recommendation Narrative:</b>	None
<b>Repair Cost:</b>	\$0

2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.



# Colorado National Monument

ROUTE 0010: RIMROCK DRIVE

## Retaining Wall Condition Photos



COLM\_0010\_2.547\_R\_1.jpg



COLM\_0010\_2.547\_R\_2.jpg

<b>Wall ID:</b>	COLM-0010-2.938-R		
<b>Route Name:</b>	RIMROCK DRIVE		
<b>Inspection Date:</b>	April 23, 2007	<b>Approximate Year Built:</b>	1936
<b>*Wall Rating:</b>	87	<b>Maintenance Action:</b>	No Action

### Wall Description

<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	Gravity - Mortared Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Cut masonry wall with mortar in excellent condition.		

### Wall Measurements

<b>Wall Length (ft.):</b>	167	<b>Face Area (sq.):</b>	680
<b>Average Wall Height (ft.):</b>	4	<b>Face Angle (deg.):</b>	80
<b>Maximum Wall Height (ft.):</b>	4	<b>Vertical Offset (ft.):</b>	0

### Assessed Elements

<b>Element (Weighting Factor)</b>	<b>Narrative</b>	<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	No signs of global wall distress. Stable, performing well.	9
WALL FOUNDATION MATERIAL 8.00	Thin weathered materials on sandstone bedrock; excellent condition.	9
MORTAR 8.00	Very minor cracking in mortar; good condition.	8
STONE MASONRY 8.00	Sandstone, moderately weathered, minor staining.	9
DOWNSLOPE 0.50	Steep sandstone bedrock, slightly weathered.	8
LATERAL SLOPE 0.50	Stable massive bedrock. No significant weathering.	8
ROAD/SIDEWALK/SHOULDER 0.50	No signs of distress or fatigue caused by wall.	8
VEGETATION 0.50	No vegetation in wall. Trees and bushes near wall toe.	8
WALL DRAINS 0.50	No internal wall drains present. Runoff drains well on both sides.	8

### Repair Recommendations

<b>Failure Consequence:</b>	MODERATE
<b>Recommendation Narrative:</b>	None
<b>Repair Cost:</b>	\$0

2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.



# Colorado National Monument

ROUTE 0010: RIMROCK DRIVE

## Retaining Wall Condition Photos



COLM\_0010\_2.938\_R\_1.jpg



COLM\_0010\_2.938\_R\_2.jpg



<b>Wall ID:</b>	COLM-0010-3.123-L		
<b>Route Name:</b>	RIMROCK DRIVE		
<b>Inspection Date:</b>	April 22, 2007	<b>Approximate Year Built:</b>	1936
<b>*Wall Rating:</b>	80	<b>Maintenance Action:</b>	No Action

**Wall Description**

<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	Gravity - Dry Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Dry-laid stone masonry wall overlain by mortared stone masonry (probably associated with guardwall construction), located atop very steep terrain (cliff).		

**Wall Measurements**

<b>Wall Length (ft.):</b>	68	<b>Face Area (sq.):</b>	220
<b>Average Wall Height (ft.):</b>	3	<b>Face Angle (deg.):</b>	78
<b>Maximum Wall Height (ft.):</b>	4	<b>Vertical Offset (ft.):</b>	0

**Assessed Elements**

<b>Element (Weighting Factor)</b>	<b>Narrative</b>	<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	No signs of global wall distress. Functioning as intended.	9
WALL FOUNDATION MATERIAL 8.00	Built atop sandstone escarpment and bedrock. Very stable, showing no signs of distress.	8
MORTAR 8.00	Mortar used in top couple of rock lifts. Intact, durable, and sound with only minor cracking and separation along rock interface.	7
STONE MASONRY 8.00	Moderately weathered sandstone blocks with several-inch-wide gaps between some stones. No chinking in dry laid section.	8
LATERAL SLOPE 0.50	Thinly bedded sandstone bedrock showing no signs of distress.	8
ROAD/SIDEWALK/SHOULDER 0.50	No signs of wall-related distress.	8
VEGETATION 0.50	Very minor vegetation growing along the base of the wall and at isolated locations in the wall. No impact to wall long-term performance.	8
DOWNSLOPE 0.50	Massive sandstone escarpment bedrock showing no signs of distress.	9
TRAFFIC BARRIER/FENCE 0.50	Stone masonry guard wall shows no signs of wall-related distress.	9

**Repair Recommendations**

<b>Failure Consequence:</b>	LOW
<b>Recommendation Narrative:</b>	None
<b>Repair Cost:</b>	\$0

2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.

# Colorado National Monument

ROUTE 0010: RIMROCK DRIVE

## Retaining Wall Condition Photos



COLM\_0010\_3.123\_L\_1.jpg

<b>Wall ID:</b>	COLM-0010-4.621-L		
<b>Route Name:</b>	RIMROCK DRIVE		
<b>Inspection Date:</b>	April 22, 2007	<b>Approximate Year Built:</b>	1936
<b>*Wall Rating:</b>	91	<b>Maintenance Action:</b>	Maintenance

**Wall Description**

<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	Gravity - Mortared Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Ashlar mortared stone masonry wall.		

**Wall Measurements**

<b>Wall Length (ft.):</b>	120	<b>Face Area (sq.):</b>	960
<b>Average Wall Height (ft.):</b>	8	<b>Face Angle (deg.):</b>	85
<b>Maximum Wall Height (ft.):</b>	10	<b>Vertical Offset (ft.):</b>	-12

**Assessed Elements**

<b>Element (Weighting Factor)</b>	<b>Narrative</b>	<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	No signs of global distress. Performing like new.	10
WALL FOUNDATION MATERIAL 8.00	Massive, hard sandstone bedrock showing no signs of erosion or distress.	9
MORTAR 8.00	Excellent condition - like new, no signs of cracking.	9
STONE MASONRY 8.00	Ashlar stone masonry sandstone blocks in like-new condition, showing no signs of weathering distress.	10
DOWNSLOPE 0.50	Some rock fill atop solid, hard bedrock, transitioning to steep escarpment (cliff). No signs of slope distress.	8
LATERAL SLOPE 0.50	Intact rock fill and bedrock showing no signs of distress.	8
ROAD/SIDEWALK/SHOULDER 0.50	No signs of wall-related distress.	9
UPSLOPE 0.50	2:1 fill slope, minor vegetation, showing no signs of distress due to slumping or erosion.	9
WALL DRAINS 0.50	No visible wall drains present. No signs of seepage, staining or other water-related problems.	9

**Repair Recommendations**

<b>Failure Consequence:</b>	HIGH
<b>Recommendation Narrative:</b>	Remove small tree at toe of wall to prevent future wall damage. 1 hour general labor at \$55/hr = \$55.
<b>Repair Cost:</b>	\$55

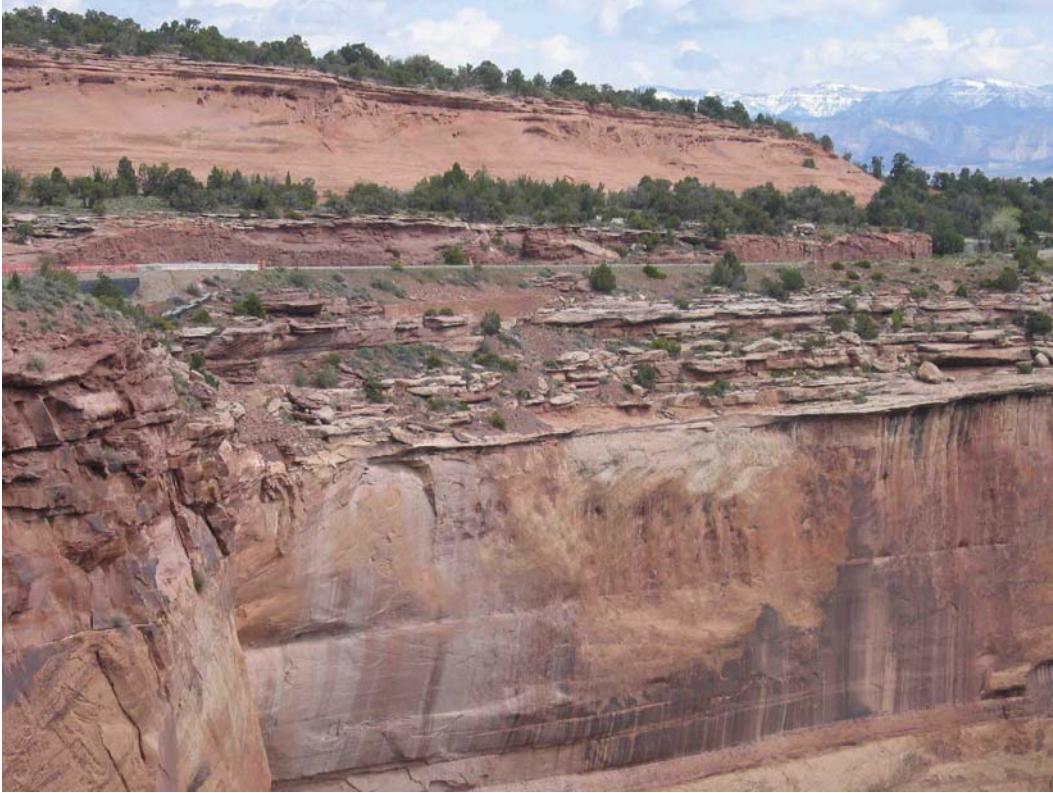
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.



# Colorado National Monument

ROUTE 0010: RIMROCK DRIVE

## Retaining Wall Condition Photos



COLM\_0010\_4.621\_L\_1.jpg



COLM\_0010\_4.621\_L\_2.jpg

<b>Wall ID:</b>	COLM-0010-4.671-L		
<b>Route Name:</b>	RIMROCK DRIVE		
<b>Inspection Date:</b>	April 23, 2007	<b>Approximate Year Built:</b>	2007
<b>*Wall Rating:</b>	98	<b>Maintenance Action:</b>	No Action

### Wall Description

<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	MSE - Welded Wire Face
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	Other - Facing is planned. Wall
<b>General Description:</b>	Newly constructed MSE Wall.		

### Wall Measurements

<b>Wall Length (ft.):</b>	132	<b>Face Area (sq.):</b>	1256
<b>Average Wall Height (ft.):</b>	9	<b>Face Angle (deg.):</b>	88
<b>Maximum Wall Height (ft.):</b>	11	<b>Vertical Offset (ft.):</b>	-3

### Assessed Elements

<b>Element (Weighting Factor)</b>	<b>Narrative</b>	<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	Newly constructed wall, performing perfectly. Yet to be faced; road above wall not paved yet.	10
WALL FOUNDATION MATERIAL 8.00	Thin soil overlain sandstone bedrock-stable.	10
WIRE/GEOSYNTHETIC FACING 8.00	Newly constructed.	10
DOWNSLOPE 0.50	15' construction back stable tapers off to 1:1 slope and vertical cliff. Good condition.	9
ROAD/SIDEWALK/SHOULDER 0.50	No signs of wall-related distress.	9
WALL DRAINS 0.50	Newly constructed wall drains; approx 40'. Fully functioning.	10
LATERAL SLOPE 1.00	Loose, easily eroded soil. Not compacted, yet to be vegetated during construction.	7

### Repair Recommendations

<b>Failure Consequence:</b>	HIGH
<b>Recommendation Narrative:</b>	None
<b>Repair Cost:</b>	\$0

2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.



# Colorado National Monument

ROUTE 0010: RIMROCK DRIVE

## Retaining Wall Condition Photos



COLM\_0010\_4.671\_L\_1.jpg



COLM\_0010\_4.671\_L\_2.jpg



<b>Wall ID:</b>	COLM-0010-4.684-R		
<b>Route Name:</b>	RIMROCK DRIVE		
<b>Inspection Date:</b>	April 22, 2007	<b>Approximate Year Built:</b>	1936
<b>*Wall Rating:</b>	89	<b>Maintenance Action:</b>	No Action

### Wall Description

<b>Wall Function:</b>	Head Wall	<b>Primary Wall Type:</b>	Gravity - Mortared Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Mortared stone well-cut masonry headwall for a naturally excavated culvert (shaft). The wall covers part of the drainage shaft.		

### Wall Measurements

<b>Wall Length (ft.):</b>	23	<b>Face Area (sq.):</b>	92
<b>Average Wall Height (ft.):</b>	4	<b>Face Angle (deg.):</b>	85
<b>Maximum Wall Height (ft.):</b>	4	<b>Vertical Offset (ft.):</b>	-18

### Assessed Elements

<b>Element (Weighting Factor)</b>	<b>Narrative</b>	<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	No signs of global distresses or major weathering. Head wall is functioning as intended.	9
WALL FOUNDATION MATERIAL 8.00	Foundation is hard bedrock, durable and stable sandstone, showing no signs of bearing distress. A grade beam is also installed to bridge the culvert. No visible drains, but wall appears to be draining without problem - no signs of water staining, seepage	9
MORTAR 8.00	Sound durable mortar with no significant signs of cracking, shrinkage, or water problems.	9
STONE MASONRY 8.00	Slightly weathered, sandstone blocks, showing no signs of cracking or deteriorating. Good condition blocks. Foundation is hard, durable and stable sandstone, showing no signs of bearing distress.	9
DOWNSLOPE 0.50	Downslope is generally flat bedded sandstone bedrock with drainage feeding into the culvert (shaft)	8
LATERAL SLOPE 0.50	Lateral slope are vegetated fill materials overlain sandstone bedrock. The slopes have diversion ditches that appear to divert water efficiently into the culvert.	8
ROAD/SIDEWALK/SHOULDER 0.50	No signs of distress, cracking, or settlement that is generally the effect of wall movement.	8
UPSLOPE 0.50	Upslope is layed at 1:2 slope with fill materials and cobbles, moderately vegetated, and stable.	8
WALL DRAINS 0.50	No visible internal wall drains, but wall appears to be draining without problem - no signs of water staining, seepage, or soft materials caused but water.	8

### Repair Recommendations

<b>Failure Consequence:</b>	MODERATE
<b>Recommendation Narrative:</b>	None
<b>Repair Cost:</b>	\$0

2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.

# Colorado National Monument

ROUTE 0010: RIMROCK DRIVE

## Retaining Wall Condition Photos



COLM\_0010\_4.684\_R\_1.jpg

<b>Wall ID:</b>	COLM-0010-4.873-L		
<b>Route Name:</b>	RIMROCK DRIVE		
<b>Inspection Date:</b>	April 22, 2007	<b>Approximate Year Built:</b>	1936
<b>*Wall Rating:</b>	86	<b>Maintenance Action:</b>	No Action

### Wall Description

<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	Gravity - Mortared Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Ashlar mortared stone masonry wall. Too steep conditions to evaluate closely.		

### Wall Measurements

<b>Wall Length (ft.):</b>	74	<b>Face Area (sq.):</b>	700
<b>Average Wall Height (ft.):</b>	9	<b>Face Angle (deg.):</b>	85
<b>Maximum Wall Height (ft.):</b>	10	<b>Vertical Offset (ft.):</b>	-36

### Assessed Elements

<b>Element (Weighting Factor)</b>	<b>Narrative</b>	<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	No signs of global wall distress. Like new condition.	10
WALL FOUNDATION MATERIAL 8.00	Massive, hard sandstone bedrock.	9
MORTAR 8.00	Good condition, like new, no signs of cracking.	8
STONE MASONRY 8.00	Ashlar patterned masonry sandstone blocks. No signs of cracking, weathering, or distress.	8
UPSLOPE 0.50	2:1 Fill with no signs of bulging, movement or degrading. Light vegetation.	8
DOWNSLOPE 0.50	Rock fill and bedrock, very steep.	9
LATERAL SLOPE 0.50	Rock fill and bedrock, good condition. No signs of distress.	9
ROAD/SIDEWALK/SHOULDER 0.50	No signs of wall-related distress.	9
VEGETATION 0.50	No vegetation in wall face.	9

### Repair Recommendations

<b>Failure Consequence:</b>	MODERATE
<b>Recommendation Narrative:</b>	None
<b>Repair Cost:</b>	\$0

2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.



# Colorado National Monument

ROUTE 0010: RIMROCK DRIVE

## Retaining Wall Condition Photos



COLM\_0010\_4.873\_L\_1.jpg

<b>Wall ID:</b>	COLM-0010-4.881-R		
<b>Route Name:</b>	RIMROCK DRIVE		
<b>Inspection Date:</b>	April 23, 2007	<b>Approximate Year Built:</b>	1936
<b>*Wall Rating:</b>	71	<b>Maintenance Action:</b>	No Action

**Wall Description**

<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	Gravity - Dry Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Fill Wall, dry stack above drainage shaft.		

**Wall Measurements**

<b>Wall Length (ft.):</b>	65	<b>Face Area (sq.):</b>	780
<b>Average Wall Height (ft.):</b>	12	<b>Face Angle (deg.):</b>	88
<b>Maximum Wall Height (ft.):</b>	21	<b>Vertical Offset (ft.):</b>	-10

**Assessed Elements**

<b>Element (Weighting Factor)</b>	<b>Narrative</b>	<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	Overall poorly constructed wall with missing blocks, no chinking, performing adequately, slight bulging and stability issues.	7
WALL FOUNDATION MATERIAL 8.00	Weathered bedrock, no signs of movement.	8
PLACED STONE 8.00	Moderately weathered, signs of movement, some rocks missing, not chinked, silt washout.	6
DOWNSLOPE 0.50	Bedrock with drainage shaft below foundation, newly installed steel grate.	8
UPSLOPE 0.50	2:1 Lightly vegetated fill embankment. No erosion, no bulging, no significant distress.	8
VEGETATION 0.50	Vegetation only on toe of wall, but having no negative effect.	8
TRAFFIC BARRIER/FENCE 0.50	Steel rail fence above wall. No signs of distress caused by wall.	9
LATERAL SLOPE 1.00	Drainage diversion ditch through one end of wall; erosion and stone weathering.	6
CULVERT 1.00	Shaft in weathered sandstone, performing adequately: approx. 12' diameter.	7

**Repair Recommendations**

<b>Failure Consequence:</b>	MODERATE
<b>Recommendation Narrative:</b>	None
<b>Repair Cost:</b>	\$0

2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.



# Colorado National Monument

ROUTE 0010: RIMROCK DRIVE

## Retaining Wall Condition Photos



COLM\_0010\_4.881\_R\_1.jpg



COLM\_0010\_4.881\_R\_2.jpg



<b>Wall ID:</b>	COLM-0010-5.097-L		
<b>Route Name:</b>	RIMROCK DRIVE		
<b>Inspection Date:</b>	April 23, 2007	<b>Approximate Year Built:</b>	1936
<b>*Wall Rating:</b>	77	<b>Maintenance Action:</b>	No Action

**Wall Description**

<b>Wall Function:</b>	Slope Protection	<b>Primary Wall Type:</b>	Gravity - Dry Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Rubble stacked slope protection.		

**Wall Measurements**

<b>Wall Length (ft.):</b>	70	<b>Face Area (sq.):</b>	1400
<b>Average Wall Height (ft.):</b>	20	<b>Face Angle (deg.):</b>	88
<b>Maximum Wall Height (ft.):</b>	28	<b>Vertical Offset (ft.):</b>	-1

**Assessed Elements**

<b>Element (Weighting Factor)</b>	<b>Narrative</b>	<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	Good condition; performing as expected. No significant movement is noticed.	8
WALL FOUNDATION MATERIAL 8.00	Massive sandstone, very steep, slightly weathered.	8
PLACED STONE 8.00	Slightly weathered irregular sandstone rock placed @ 1:1 slope; signs of slight movement.	7
LATERAL SLOPE 0.50	Weathered bedrock very steep 1:1 slope.	8
WALL DRAINS 0.50	No internal drainage; draining naturally.	8
DOWNSLOPE 0.50	Very steep sandstone massive cliff 70 degrees.	9
ROAD/SIDEWALK/SHOULDER 0.50	No signs of wall-related distress.	9
VEGETATION 0.50	Minor vegetation growing on wall face; small bushes.	10

**Repair Recommendations**

<b>Failure Consequence:</b>	HIGH
<b>Recommendation Narrative:</b>	None
<b>Repair Cost:</b>	\$0

2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.

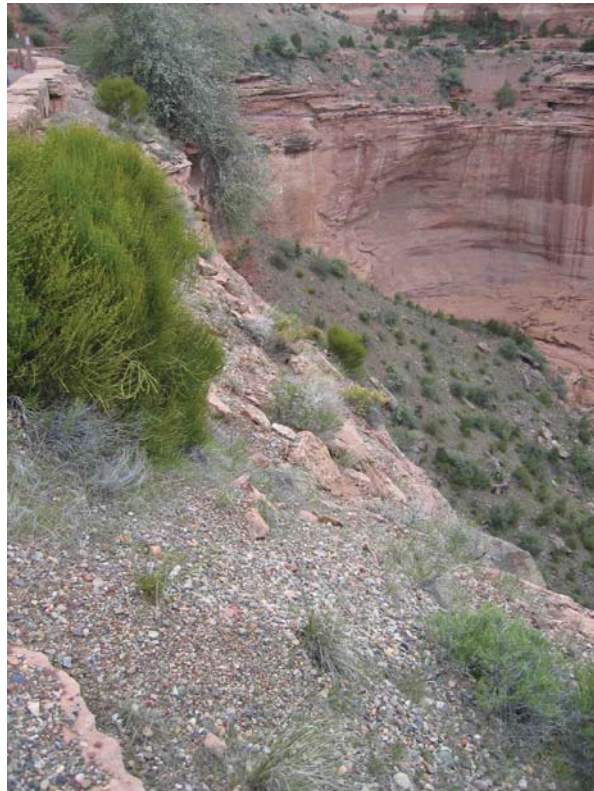
# Colorado National Monument

ROUTE 0010: RIMROCK DRIVE

## Retaining Wall Condition Photos



COLM\_0010\_5.097\_L\_1.jpg



COLM\_0010\_5.097\_L\_2.jpg

<b>Wall ID:</b>	COLM-0010-5.455-R		
<b>Route Name:</b>	RIMROCK DRIVE		
<b>Inspection Date:</b>	April 23, 2007	<b>Approximate Year Built:</b>	1936
<b>*Wall Rating:</b>	86	<b>Maintenance Action:</b>	No Action

### Wall Description

<b>Wall Function:</b>	Head Wall	<b>Primary Wall Type:</b>	Gravity - Mortared Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Ashlar mortared sandstone masonry wall.		

### Wall Measurements

<b>Wall Length (ft.):</b>	30	<b>Face Area (sq.):</b>	120
<b>Average Wall Height (ft.):</b>	4	<b>Face Angle (deg.):</b>	88
<b>Maximum Wall Height (ft.):</b>	6	<b>Vertical Offset (ft.):</b>	-18

### Assessed Elements

<b>Element (Weighting Factor)</b>	<b>Narrative</b>	<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	Performing well. No signs of distress or movement.	9
WALL FOUNDATION MATERIAL 8.00	Bedrock, massive sandstone with fill next to a drainage shaft.	9
MORTAR 8.00	Minor cracking in some areas.	8
STONE MASONRY 8.00	No signs of weathering, good condition, no distress.	9
DOWNSLOPE 0.50	Bedrock, flat drainage area.	8
ROAD/SIDEWALK/SHOULDER 0.50	No signs of wall-related distress. Good condition.	9
WALL DRAINS 0.50	No wall drainage. Wet conditions on wall face, drainage over wall.	9
LATERAL SLOPE 1.00	Filled with vegetation. Signs of water runoff cutting into slope.	7
UPSLOPE 1.00	2:1 fill with vegetation, minor washout.	7

### Repair Recommendations

<b>Failure Consequence:</b>	LOW
<b>Recommendation Narrative:</b>	None
<b>Repair Cost:</b>	\$0

2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.



# Colorado National Monument

ROUTE 0010: RIMROCK DRIVE

## Retaining Wall Condition Photos



COLM\_0010\_5.455\_R\_1.jpg

<b>Wall ID:</b>	COLM-0010-5.799-R		
<b>Route Name:</b>	RIMROCK DRIVE		
<b>Inspection Date:</b>	April 23, 2007	<b>Approximate Year Built:</b>	1936
<b>*Wall Rating:</b>	87	<b>Maintenance Action:</b>	No Action

### Wall Description

<b>Wall Function:</b>	Head Wall	<b>Primary Wall Type:</b>	Gravity - Mortared Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Ashlar mortared sandstone masonry wall, good condition (like new), with small drain shaft.		

### Wall Measurements

<b>Wall Length (ft.):</b>	18	<b>Face Area (sq.):</b>	120
<b>Average Wall Height (ft.):</b>	6	<b>Face Angle (deg.):</b>	85
<b>Maximum Wall Height (ft.):</b>	7	<b>Vertical Offset (ft.):</b>	-11

### Assessed Elements

<b>Element (Weighting Factor)</b>	<b>Narrative</b>	<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	Performing well. No signs of movement or distress.	9
WALL FOUNDATION MATERIAL 8.00	Bedrock massive sandstone, next to shaft drainage.	8
MORTAR 8.00	No signs of distress, cracking, or fatigue.	9
STONE MASONRY 8.00	No signs of weathering, distress, or fracturing, like new.	9
DOWNSLOPE 0.50	Bedrock, flat draining area with shaft inlet.	8
LATERAL SLOPE 0.50	2:1 Fill with some vegetation, signs of water runoff on top of wall.	8
UPSLOPE 0.50	2:1 fill with some vegetation, good condition, no bulging.	8
ROAD/SIDEWALK/SHOULDER 0.50	No signs of wall related distress. No signs of movement.	9
WALL DRAINS 0.50	No internal wall drains present. No signs of water seepage.	9

### Repair Recommendations

<b>Failure Consequence:</b>	LOW
<b>Recommendation Narrative:</b>	None
<b>Repair Cost:</b>	\$0

2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.

# Colorado National Monument

ROUTE 0010: RIMROCK DRIVE

## Retaining Wall Condition Photos



COLM\_0010\_5.799\_R\_1.jpg



<b>Wall ID:</b>	COLM-0010-6.225-L		
<b>Route Name:</b>	RIMROCK DRIVE		
<b>Inspection Date:</b>	April 23, 2007	<b>Approximate Year Built:</b>	1936
<b>*Wall Rating:</b>	87	<b>Maintenance Action:</b>	No Action

### Wall Description

<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	Gravity - Mortared Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Mortared stone masonry wall, underlain stone guard wall.		

### Wall Measurements

<b>Wall Length (ft.):</b>	364	<b>Face Area (sq.):</b>	1450
<b>Average Wall Height (ft.):</b>	3	<b>Face Angle (deg.):</b>	85
<b>Maximum Wall Height (ft.):</b>	9	<b>Vertical Offset (ft.):</b>	0

### Assessed Elements

<b>Element (Weighting Factor)</b>	<b>Narrative</b>	<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	Performing well. No signs of global wall distress or movement.	9
WALL FOUNDATION MATERIAL 8.00	Massive sandstone bedrock. Very steep 70 degrees. Good stable condition.	9
STONE MASONRY 8.00	Blocks show moderate signs of weathering, no major fracture, stable.	8
MORTAR 8.00	Good condition, no signs of fatigue or cracking.	9
DOWNSLOPE 0.50	Fill over very steep cliff @ 70 degrees, excellent condition.	9
ROAD/SIDEWALK/SHOULDER 0.50	No signs of wall-related distress. Good condition.	9
WALL DRAINS 0.50	No internal wall drains present. No signs of water seepage or water damage to wall.	9
LATERAL SLOPE 1.00	Fill over bedrock sings of water erosion.	7

### Repair Recommendations

<b>Failure Consequence:</b>	HIGH
<b>Recommendation Narrative:</b>	None
<b>Repair Cost:</b>	\$0

2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.

# Colorado National Monument

ROUTE 0010: RIMROCK DRIVE

## Retaining Wall Condition Photos



COLM\_0010\_6.225\_L\_1.jpg



COLM\_0010\_6.225\_L\_2.jpg

<b>Wall ID:</b>	COLM-0010-6.449-L		
<b>Route Name:</b>	RIMROCK DRIVE		
<b>Inspection Date:</b>	April 23, 2007	<b>Approximate Year Built:</b>	2006
<b>*Wall Rating:</b>	96	<b>Maintenance Action:</b>	No Action

**Wall Description**

<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	Cantilever - Concrete
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Newly constructed CIP concrete wall.		

**Wall Measurements**

<b>Wall Length (ft.):</b>	25	<b>Face Area (sq.):</b>	162
<b>Average Wall Height (ft.):</b>	6	<b>Face Angle (deg.):</b>	90
<b>Maximum Wall Height (ft.):</b>	6	<b>Vertical Offset (ft.):</b>	0

**Assessed Elements**

<b>Element (Weighting Factor)</b>	<b>Narrative</b>	<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	New wall, performing as designed.	10
WALL FOUNDATION MATERIAL 8.00	Fill on massive sandstone bedrock, steep @ 80 degrees.	9
CONCRETE 8.00	Newly constructed concrete (CIP) wall in excellent condition, no signs of cracking.	10
LATERAL SLOPE 0.50	Non compacted fill - newly constructed. No vegetation.	8
DOWNSLOPE 0.50	Fill on bedrock	9
VEGETATION 0.50	No vegetation in wall.	10
WALL DRAINS 0.50	Drains operating well, 3 inch PVC pipe, newly constructed.	10

**Repair Recommendations**

<b>Failure Consequence:</b>	HIGH
<b>Recommendation Narrative:</b>	None
<b>Repair Cost:</b>	\$0

2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.



# Colorado National Monument

ROUTE 0010: RIMROCK DRIVE

## Retaining Wall Condition Photos



COLM\_0010\_6.449\_L\_1.jpg

<b>Wall ID:</b>	COLM-0010-6.450-R		
<b>Route Name:</b>	RIMROCK DRIVE		
<b>Inspection Date:</b>	April 23, 2007	<b>Approximate Year Built:</b>	1936
<b>*Wall Rating:</b>	85	<b>Maintenance Action:</b>	No Action

### Wall Description

<b>Wall Function:</b>	Head Wall	<b>Primary Wall Type:</b>	Gravity - Mortared Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Headwall near a very large shaft drain Masonry sandstone block, wall nicely cut.		

### Wall Measurements

<b>Wall Length (ft.):</b>	20	<b>Face Area (sq.):</b>	160
<b>Average Wall Height (ft.):</b>	8	<b>Face Angle (deg.):</b>	85
<b>Maximum Wall Height (ft.):</b>	10	<b>Vertical Offset (ft.):</b>	-13

### Assessed Elements

<b>Element (Weighting Factor)</b>	<b>Narrative</b>	<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	Performing well. No signs of movement.	9
WALL FOUNDATION MATERIAL 8.00	Weathered sandstone, moderate strength.	8
STONE MASONRY 8.00	Good condition, sandstone blocks, slightly weathered.	8
MORTAR 8.00	Good condition, slight cracking.	9
DOWNSLOPE 0.50	Bedrock, excavated drainage shaft in sandstone.	8
LATERAL SLOPE 0.50	Natural drainage in fill, good condition.	8
TRAFFIC BARRIER/FENCE 0.50	Steel guard fence, good condition. Fence surrounds shaft drain.	8
UPSLOPE 0.50	2:1 fill with vegetation, no signs of distress or bulging.	8
ROAD/SIDEWALK/SHOULDER 0.50	No signs of wall-related distress.	9

### Repair Recommendations

<b>Failure Consequence:</b>	MODERATE
<b>Recommendation Narrative:</b>	None
<b>Repair Cost:</b>	\$0

2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.

# Colorado National Monument

ROUTE 0010: RIMROCK DRIVE

## Retaining Wall Condition Photos



COLM\_0010\_6.450\_R\_1.jpg



<b>Wall ID:</b>	COLM-0010-6.511-L		
<b>Route Name:</b>	RIMROCK DRIVE		
<b>Inspection Date:</b>	April 23, 2007	<b>Approximate Year Built:</b>	1936
<b>*Wall Rating:</b>	90	<b>Maintenance Action:</b>	No Action

**Wall Description**

<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	Gravity - Mass Concrete
<b>Surface Treatment:</b>	Stain	<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Gravity mass concrete stained wall with mortared sandstone masonry guard wall.		

**Wall Measurements**

<b>Wall Length (ft.):</b>	120	<b>Face Area (sq.):</b>	260
<b>Average Wall Height (ft.):</b>	2	<b>Face Angle (deg.):</b>	90
<b>Maximum Wall Height (ft.):</b>	4	<b>Vertical Offset (ft.):</b>	0

**Assessed Elements**

<b>Element (Weighting Factor)</b>	<b>Narrative</b>	<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	Performing well. No signs of distress or movement.	9
WALL FOUNDATION MATERIAL 8.00	Massive sandstone bedrock. Very steep 70 degrees.	9
CONCRETE 8.00	Good condition, no signs of cracking or distress.	9
DOWNSLOPE 0.50	Massive sandstone cliff.	9
LATERAL SLOPE 0.50	Fill on sandstone bedrock.	9
ROAD/SIDEWALK/SHOULDER 0.50	No signs of wall-related distress.	9
WALL DRAINS 0.50	No internal wall drains present.	9
VEGETATION 0.50	No vegetation in wall.	10

**Repair Recommendations**

<b>Failure Consequence:</b>	MODERATE
<b>Recommendation Narrative:</b>	None
<b>Repair Cost:</b>	\$0

2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.

# Colorado National Monument

ROUTE 0010: RIMROCK DRIVE

## Retaining Wall Condition Photos



COLM\_0010\_6.511\_L\_1.jpg



COLM\_0010\_6.511\_L\_2.jpg

<b>Wall ID:</b>	COLM-0010-7.219-L		
<b>Route Name:</b>	RIMROCK DRIVE		
<b>Inspection Date:</b>	April 23, 2007	<b>Approximate Year Built:</b>	1936
<b>*Wall Rating:</b>	84	<b>Maintenance Action:</b>	No Action

### Wall Description

<b>Wall Function:</b>	Head Wall	<b>Primary Wall Type:</b>	Gravity - Mortared Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Mortared sandstone masonry headwall near a drain shaft.		

### Wall Measurements

<b>Wall Length (ft.):</b>	34	<b>Face Area (sq.):</b>	178
<b>Average Wall Height (ft.):</b>	5	<b>Face Angle (deg.):</b>	85
<b>Maximum Wall Height (ft.):</b>	13	<b>Vertical Offset (ft.):</b>	-11

### Assessed Elements

<b>Element (Weighting Factor)</b>	<b>Narrative</b>	<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	Performing well. No signs of global wall distress or movement.	9
WALL FOUNDATION MATERIAL 8.00	Weathered massive sandstone bedrock.	8
MORTAR 8.00	Minor cracking, good condition.	8
STONE MASONRY 8.00	Slight signs of weathering, no signs of fractures, good condition.	9
CULVERT 0.50	Shaft drainage next to head wall, excavated with natural rock.	8
LATERAL SLOPE 0.50	2:1 fill with vegetation stable on both sides, signs of water drainage.	8
VEGETATION 0.50	No vegetation on wall face.	8
WALL DRAINS 0.50	No internal wall drains present. No signs of water seepage or water damage to wall.	9
DOWNSLOPE 1.00	Bedrock flat with drainage shaft.	7

### Repair Recommendations

<b>Failure Consequence:</b>	MODERATE
<b>Recommendation Narrative:</b>	None
<b>Repair Cost:</b>	\$0

2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.



# Colorado National Monument

ROUTE 0010: RIMROCK DRIVE

## Retaining Wall Condition Photos



COLM\_0010\_7.219\_L\_1.jpg



COLM\_0010\_7.219\_L\_2.jpg

<b>Wall ID:</b>	COLM-0010-7.933-R		
<b>Route Name:</b>	RIMROCK DRIVE		
<b>Inspection Date:</b>	April 23, 2007	<b>Approximate Year Built:</b>	1936
<b>*Wall Rating:</b>	91	<b>Maintenance Action:</b>	No Action

### Wall Description

<b>Wall Function:</b>	Head Wall	<b>Primary Wall Type:</b>	Gravity - Mass Concrete
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	Gravity - Mortared Stone
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Mass concrete headwall with wingwalls overlain by mortared stone masonry wall with masonry stain foundation.		

### Wall Measurements

<b>Wall Length (ft.):</b>	34	<b>Face Area (sq.):</b>	150
<b>Average Wall Height (ft.):</b>	4	<b>Face Angle (deg.):</b>	90
<b>Maximum Wall Height (ft.):</b>	9	<b>Vertical Offset (ft.):</b>	-6

### Assessed Elements

<b>Element (Weighting Factor)</b>	<b>Narrative</b>	<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	Performing well. No signs of global wall distress or movement.	9
WALL FOUNDATION MATERIAL 8.00	Sandstone, slightly to moderately weathered with drain shaft @ bottom.	9
MORTAR 8.00	Good condition, no signs of cracking.	9
STONE MASONRY 8.00	Slightly weathered sandstone blocks and cut stone.	9
CONCRETE 8.00	No cracking or stress, good condition.	10
DOWNSLOPE 0.50	Flat sandstone moderately weathered.	8
ROAD/SIDEWALK/SHOULDER 0.50	Good condition, new pavement, no distress.	8
UPSLOPE 0.50	2:1 fill materials with some erosion problems.	8
VEGETATION 0.50	No vegetation in wall.	9

### Repair Recommendations

<b>Failure Consequence:</b>	MODERATE
<b>Recommendation Narrative:</b>	None
<b>Repair Cost:</b>	\$0

2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.



# Colorado National Monument

ROUTE 0010: RIMROCK DRIVE

## Retaining Wall Condition Photos



COLM\_0010\_7.933\_R\_1.jpg



COLM\_0010\_7.933\_R\_2.jpg



<b>Wall ID:</b>	COLM-0010-8.155-R		
<b>Route Name:</b>	RIMROCK DRIVE		
<b>Inspection Date:</b>	April 23, 2007	<b>Approximate Year Built:</b>	1936
<b>*Wall Rating:</b>	91	<b>Maintenance Action:</b>	No Action

### Wall Description

<b>Wall Function:</b>	Head Wall	<b>Primary Wall Type:</b>	Gravity - Mass Concrete
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	Gravity - Mortared Stone
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Mass concrete headwall with wingwalls overlain by mortared stone masonry wall with masonry stain foundation.		

### Wall Measurements

<b>Wall Length (ft.):</b>	25	<b>Face Area (sq.):</b>	161
<b>Average Wall Height (ft.):</b>	6	<b>Face Angle (deg.):</b>	90
<b>Maximum Wall Height (ft.):</b>	9	<b>Vertical Offset (ft.):</b>	-6

### Assessed Elements

<b>Element (Weighting Factor)</b>	<b>Narrative</b>	<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	Performing well. No signs of global wall distress or movement.	9
WALL FOUNDATION MATERIAL 8.00	Sandstone, slightly to moderately weathered with drain shaft @ bottom.	9
MORTAR 8.00	Good condition, no signs of cracking.	9
CONCRETE 8.00	No cracking or stress, good condition.	10
DOWNSLOPE 0.50	Flat sandstone moderately weathered.	8
ROAD/SIDEWALK/SHOULDER 0.50	Good condition, new pavement, no distress.	8
UPSLOPE 0.50	2:1 fill materials with some erosion problems.	8
VEGETATION 0.50	No vegetation in wall. Trees and bushes near wall toe.	9
WALL DRAINS 0.50	No internal wall drains present. No signs of water seepage or water damage to wall.	9

### Repair Recommendations

<b>Failure Consequence:</b>	LOW
<b>Recommendation Narrative:</b>	None
<b>Repair Cost:</b>	\$0

2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.

# Colorado National Monument

ROUTE 0010: RIMROCK DRIVE

## Retaining Wall Condition Photos



COLM\_0010\_8.155\_R\_1.jpg

<b>Wall ID:</b>	COLM-0010-8.640-L		
<b>Route Name:</b>	RIMROCK DRIVE		
<b>Inspection Date:</b>	April 23, 2007	<b>Approximate Year Built:</b>	1936
<b>*Wall Rating:</b>	87	<b>Maintenance Action:</b>	No Action

**Wall Description**

<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	Gravity - Mass Concrete
<b>Surface Treatment:</b>	Stain	<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Mass concrete wall with mortared sandstone masonry guard wall.		

**Wall Measurements**

<b>Wall Length (ft.):</b>	148	<b>Face Area (sq.):</b>	703
<b>Average Wall Height (ft.):</b>	4	<b>Face Angle (deg.):</b>	90
<b>Maximum Wall Height (ft.):</b>	5	<b>Vertical Offset (ft.):</b>	0

**Assessed Elements**

<b>Element (Weighting Factor)</b>	<b>Narrative</b>	<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	Performing well. No signs of global wall distress or movement.	9
WALL FOUNDATION MATERIAL 8.00	Fill on sandstone bedrock, good condition, no signs of erosion.	8
CONCRETE 8.00	Good condition, no signs of cracking or distress.	9
ROAD/SIDEWALK/SHOULDER 0.50	No signs of wall related distress, no signs of movement.	8
DOWNSLOPE 0.50	Sandstone cliff 80 degrees, good condition.	9
LATERAL SLOPE 0.50	Fill on sandstone, not signs of failure.	9
WALL DRAINS 0.50	No internal wall drains present. No signs of water seepage or water damage to wall.	9
VEGETATION 0.50	No vegetation in wall.	10

**Repair Recommendations**

<b>Failure Consequence:</b>	HIGH
<b>Recommendation Narrative:</b>	None
<b>Repair Cost:</b>	\$0

2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.



# Colorado National Monument

ROUTE 0010: RIMROCK DRIVE

## Retaining Wall Condition Photos



COLM\_0010\_8.640\_L\_1.jpg



COLM\_0010\_8.640\_L\_2.jpg

<b>Wall ID:</b>	COLM-0010-8.874-R		
<b>Route Name:</b>	RIMROCK DRIVE		
<b>Inspection Date:</b>	April 23, 2007	<b>Approximate Year Built:</b>	1936
<b>*Wall Rating:</b>	79	<b>Maintenance Action:</b>	No Action

### Wall Description

<b>Wall Function:</b>	Head Wall	<b>Primary Wall Type:</b>	Gravity - Mortared Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Sandstone, mortared masonry headwall, good condition.		

### Wall Measurements

<b>Wall Length (ft.):</b>	18	<b>Face Area (sq.):</b>	108
<b>Average Wall Height (ft.):</b>	6	<b>Face Angle (deg.):</b>	90
<b>Maximum Wall Height (ft.):</b>	8	<b>Vertical Offset (ft.):</b>	-4

### Assessed Elements

<b>Element (Weighting Factor)</b>	<b>Narrative</b>	<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	No signs of global wall distress. Functioning as intended.	8
WALL FOUNDATION MATERIAL 8.00	Weathered sandstone, good condition.	8
MORTAR 8.00	Moderate cracking.	7
STONE MASONRY 8.00	Slightly weathered sandstone blocks, good condition.	8
ROAD/SIDEWALK/SHOULDER 0.50	No signs of wall related distress, no signs of movement.	8
UPSLOPE 0.50	7:1 fill, well vegetated, stable.	8
CULVERT 0.50	In natural stone.	9
DOWNSLOPE 0.50	Weathered sandstone boulders-drainage area.	9
LATERAL SLOPE 0.50	Good stable rock on slope.	9

### Repair Recommendations

<b>Failure Consequence:</b>	MODERATE
<b>Recommendation Narrative:</b>	None
<b>Repair Cost:</b>	\$0

2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.



# Colorado National Monument

ROUTE 0010: RIMROCK DRIVE

## Retaining Wall Condition Photos



COLM\_0010\_8.874\_R\_1.jpg



COLM\_0010\_8.874\_R\_2.jpg



<b>Wall ID:</b>	COLM-0010-9.826-R		
<b>Route Name:</b>	RIMROCK DRIVE		
<b>Inspection Date:</b>	April 23, 2007	<b>Approximate Year Built:</b>	1936
<b>*Wall Rating:</b>	76	<b>Maintenance Action:</b>	No Action

### Wall Description

<b>Wall Function:</b>	Head Wall	<b>Primary Wall Type:</b>	Gravity - Mortared Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Mortared sandstone masonry headwall with wingwall on one side.		

### Wall Measurements

<b>Wall Length (ft.):</b>	21	<b>Face Area (sq.):</b>	45
<b>Average Wall Height (ft.):</b>	2	<b>Face Angle (deg.):</b>	85
<b>Maximum Wall Height (ft.):</b>	6	<b>Vertical Offset (ft.):</b>	-4

### Assessed Elements

<b>Element (Weighting Factor)</b>	<b>Narrative</b>	<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	Performing well. No signs of global wall distress or movement.	8
WALL FOUNDATION MATERIAL 8.00	Weathered sandstone and a shaft drainage.	8
MORTAR 8.00	Moderate cracking.	7
STONE MASONRY 8.00	Moderately weathered sandstone blocks, missing some stones on top layer.	7
UPSLOPE 0.50	3.5 :1 fill, almost no vegetation; good condition.	8
WALL DRAINS 0.50	No internal wall drains present. No signs of water seepage or water damage to wall.	8
DOWNSLOPE 0.50	Sandstone bedrock and drainage.	9
LATERAL SLOPE 0.50	Bedrock with fill good stable condition.	9
ROAD/SIDEWALK/SHOULDER 0.50	No cracking, new pavement.	10

### Repair Recommendations

<b>Failure Consequence:</b>	LOW
<b>Recommendation Narrative:</b>	None
<b>Repair Cost:</b>	\$0

2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.

# Colorado National Monument

ROUTE 0010: RIMROCK DRIVE

## Retaining Wall Condition Photos



COLM\_0010\_9.826\_R\_1.jpg

<b>Wall ID:</b>	COLM-0010-10.185-L		
<b>Route Name:</b>	RIMROCK DRIVE		
<b>Inspection Date:</b>	April 24, 2007	<b>Approximate Year Built:</b>	1936
<b>*Wall Rating:</b>	76	<b>Maintenance Action:</b>	No Action

### Wall Description

<b>Wall Function:</b>	Head Wall	<b>Primary Wall Type:</b>	Gravity - Mortared Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	Gravity - Mass Concrete
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Concrete headwall overlain a non-functioning mortared sandstone masonry headwall.		

### Wall Measurements

<b>Wall Length (ft.):</b>	31	<b>Face Area (sq.):</b>	180
<b>Average Wall Height (ft.):</b>	5	<b>Face Angle (deg.):</b>	90
<b>Maximum Wall Height (ft.):</b>	8	<b>Vertical Offset (ft.):</b>	-22

### Assessed Elements

<b>Element (Weighting Factor)</b>	<b>Narrative</b>	<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	It is obvious that an old culvert with masonry head wall was abandoned and a new culvert was installed.	8
WALL FOUNDATION MATERIAL 8.00	Materials consist of moderately weathered sandstone rock adequate for wall support.	8
CONCRETE 8.00	Moderately weathered concrete, aggregate is exposed in certain areas.	7
STONE MASONRY 8.00	Moderate to severe weathering. Missing some blocks.	7
MORTAR 8.00	Mortar is sound with minor cracking, some signs of spalling or significant shrinkage.	8
UPSLOPE 0.50	1.5:1 soft fill with moderate vegetation, stable slope.	8
VEGETATION 0.50	Moderate vegetation near wall face; none on wall face affecting condition.	8
WALL DRAINS 0.50	No internal wall drains present. No signs of water seepage or water damage to wall.	8
ROAD/SIDEWALK/SHOULDER 0.50	No cracks related to wall.	9

### Repair Recommendations

<b>Failure Consequence:</b>	MODERATE
<b>Recommendation Narrative:</b>	None
<b>Repair Cost:</b>	\$0

2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.



# Colorado National Monument

ROUTE 0010: RIMROCK DRIVE

## Retaining Wall Condition Photos



COLM\_0010\_10.185\_L\_1.jpg



COLM\_0010\_10.185\_L\_2.jpg

<b>Wall ID:</b>	COLM-0010-11.627-L		
<b>Route Name:</b>	RIMROCK DRIVE		
<b>Inspection Date:</b>	April 24, 2007	<b>Approximate Year Built:</b>	1936
<b>*Wall Rating:</b>	74	<b>Maintenance Action:</b>	No Action

### Wall Description

<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	Gravity - Mortared Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	Gravity - Mortared Stone
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	A mortared masonry wall comprised of two shorter end segments (@ 40 ft long each) on each end constructed with smaller sandstone cut blocks and a longer mid-segment constructed with longer uncut sandstone blocks.		

### Wall Measurements

<b>Wall Length (ft.):</b>	170	<b>Face Area (sq.):</b>	1070
<b>Average Wall Height (ft.):</b>	6	<b>Face Angle (deg.):</b>	80
<b>Maximum Wall Height (ft.):</b>	10	<b>Vertical Offset (ft.):</b>	-16

### Assessed Elements

<b>Element (Weighting Factor)</b>	<b>Narrative</b>	<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	Wall segments are performing according to design, no signs of movement.	8
WALL FOUNDATION MATERIAL 8.00	Soil over bedrock, intact, no signs of failure, sufficient to support structure.	8
MORTAR 8.00	In the end segments mortar is mostly intact with moderate to severe shrinkage, cracking. In center segment, mortar is severely shrinking with many gaps between blocks.	6
STONE MASONRY 8.00	Moderately weathered sandstone with large gaps and chinking in center segment. Wall appears to be remortared.	7
DOWNSLOPE 0.50	Drainage stream bottom, boulders, stable.	8
LATERAL SLOPE 0.50	Bedrock and fill materials no distress or failure, stable.	8
UPSLOPE 0.50	1:1 fill material soft with heavy vegetation, trees and sage bushes.	8
WALL DRAINS 0.50	No internal wall drains present. Self draining wall with minor seepage through wall face.	8
CULVERT 0.50	One culvert excavated in natural rock exists in middle segment of wall.	9

### Repair Recommendations

<b>Failure Consequence:</b>	HIGH
<b>Recommendation Narrative:</b>	None
<b>Repair Cost:</b>	\$0

2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.



# Colorado National Monument

ROUTE 0010: RIMROCK DRIVE

## Retaining Wall Condition Photos



COLM\_0010\_11.627\_L\_1.jpg



COLM\_0010\_11.627\_L\_2.jpg



<b>Wall ID:</b>	COLM-0010-12.563-L		
<b>Route Name:</b>	RIMROCK DRIVE		
<b>Inspection Date:</b>	April 24, 2007	<b>Approximate Year Built:</b>	1936
<b>*Wall Rating:</b>	73	<b>Maintenance Action:</b>	Maintenance

### Wall Description

<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	Gravity - Mortared Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Mortared masonry wall with guard wall, good condition.		

### Wall Measurements

<b>Wall Length (ft.):</b>	164	<b>Face Area (sq.):</b>	1640
<b>Average Wall Height (ft.):</b>	10	<b>Face Angle (deg.):</b>	80
<b>Maximum Wall Height (ft.):</b>	12	<b>Vertical Offset (ft.):</b>	-10

### Assessed Elements

<b>Element (Weighting Factor)</b>	<b>Narrative</b>	<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	Wall performing as designed, no signs of movement.	7
WALL FOUNDATION MATERIAL 8.00	Fill on sandstone bedrock, very steep cliff, signs of failure; adequate to support structure.	8
MORTAR 8.00	It appears to have been refreshed recently; moderate shrinkage.	7
STONE MASONRY 8.00	Moderately weathered sandstone large blocks; good condition.	7
DOWNSLOPE 0.50	1:1 fill over massive sandstone bedrock, well vegetated with trees and bushes.	8
LATERAL SLOPE 0.50	1:1 fill over massive sandstone bedrock, well vegetated with trees and bushes.	8
VEGETATION 0.50	Vegetation growing in wall face and along foundation toe. Recommend removing some trees from face area.	8
WALL DRAINS 0.50	No internal wall drains present. No signs of water seepage or water damage to wall.	8
ROAD/SIDEWALK/SHOULDER 0.50	Newly paved road, no evidence of cracking.	10

### Repair Recommendations

<b>Failure Consequence:</b>	HIGH
<b>Recommendation Narrative:</b>	Remove small trees / bushes from wall face and wall toe: estimate 8.00 man hours @ \$55.00 / hr. \$440.00
<b>Repair Cost:</b>	\$440

2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.

# Colorado National Monument

ROUTE 0010: RIMROCK DRIVE

## Retaining Wall Condition Photos



COLM\_0010\_12.563\_L\_1.jpg



COLM\_0010\_12.563\_L\_2.jpg

<b>Wall ID:</b>	COLM-0010-14.813-R		
<b>Route Name:</b>	RIMROCK DRIVE		
<b>Inspection Date:</b>	April 24, 2007	<b>Approximate Year Built:</b>	1936
<b>*Wall Rating:</b>	90	<b>Maintenance Action:</b>	No Action

### Wall Description

<b>Wall Function:</b>	Head Wall	<b>Primary Wall Type:</b>	Gravity - Mortared Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Headwall - Mortared sandstone masonry headwall, excellent condition.		

### Wall Measurements

<b>Wall Length (ft.):</b>	10	<b>Face Area (sq.):</b>	35
<b>Average Wall Height (ft.):</b>	3	<b>Face Angle (deg.):</b>	85
<b>Maximum Wall Height (ft.):</b>	7	<b>Vertical Offset (ft.):</b>	-18

### Assessed Elements

<b>Element (Weighting Factor)</b>	<b>Narrative</b>	<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	Excellent head wall performance, no signs of distress.	9
WALL FOUNDATION MATERIAL 8.00	Excellent on bedrock sandstone, no signs of distress or failure, adequate strength for foundation.	9
MORTAR 8.00	Slight shrinkage, minor cracks, good condition.	9
STONE MASONRY 8.00	Excellent condition, minor weathering.	9
CULVERT 0.50	Cut in natural stone.	9
DOWNSLOPE 0.50	Sandstone bedrock drainage with boulders.	9
LATERAL SLOPE 0.50	Excellent condition fill with boulder, well vegetated with trees and bushes.	9
UPSLOPE 0.50	1:2 well vegetated fill with boulders.	9
WALL DRAINS 0.50	No internal wall drains present. No signs of water seepage or water damage to wall.	9

### Repair Recommendations

<b>Failure Consequence:</b>	LOW
<b>Recommendation Narrative:</b>	None
<b>Repair Cost:</b>	\$0

2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.



# Colorado National Monument

ROUTE 0010: RIMROCK DRIVE

## Retaining Wall Condition Photos



COLM\_0010\_14.813\_R\_1.jpg

<b>Wall ID:</b>	COLM-0010-16.102-R		
<b>Route Name:</b>	RIMROCK DRIVE		
<b>Inspection Date:</b>	April 24, 2007	<b>Approximate Year Built:</b>	1936
<b>*Wall Rating:</b>	90	<b>Maintenance Action:</b>	No Action

### Wall Description

<b>Wall Function:</b>	Head Wall	<b>Primary Wall Type:</b>	Gravity - Mortared Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Wingwall constructed of very large cut sandstone with mortar. Steps down from 18 ft to 2 ft at the bottom.		

### Wall Measurements

<b>Wall Length (ft.):</b>	34	<b>Face Area (sq.):</b>	306
<b>Average Wall Height (ft.):</b>	9	<b>Face Angle (deg.):</b>	90
<b>Maximum Wall Height (ft.):</b>	18	<b>Vertical Offset (ft.):</b>	-27

### Assessed Elements

<b>Element (Weighting Factor)</b>	<b>Narrative</b>	<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	Excellent wing wall; performing as designed, no distress.	9
WALL FOUNDATION MATERIAL 8.00	Sandstone boulders and sandstone bedrock, adequate strength to support structure.	9
MORTAR 8.00	No shrinking or cracking observed.	9
STONE MASONRY 8.00	Excellent condition. Slightly weathered with some staining.	9
CULVERT 0.50	Cut in natural stone	9
LATERAL SLOPE 0.50	2:1 Good condition fill with cobbles. Stable.	9
ROAD/SIDEWALK/SHOULDER 0.50	Fresh pavement with new shoulder fill.	9
UPSLOPE 0.50	1.75:1 lightly vegetated fill with cobbles.	9
VEGETATION 0.50	No vegetation in wall or wall toe; not affecting wall performance.	9

### Repair Recommendations

<b>Failure Consequence:</b>	MODERATE
<b>Recommendation Narrative:</b>	None
<b>Repair Cost:</b>	\$0

2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.



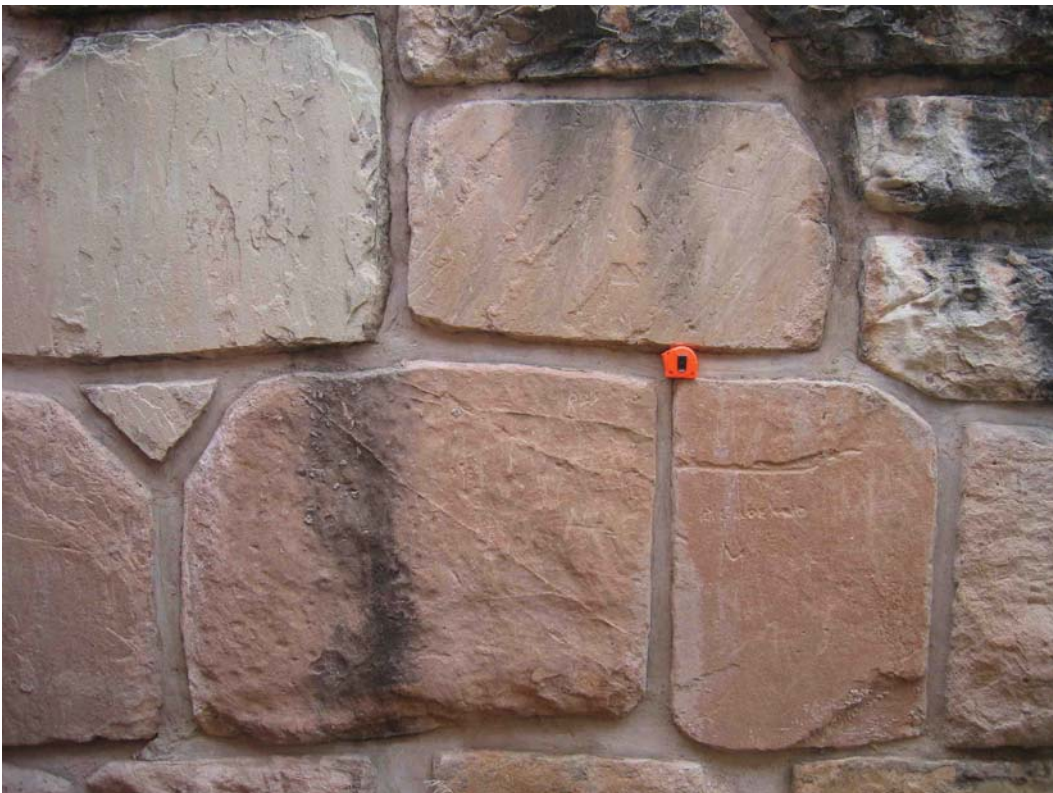
# Colorado National Monument

ROUTE 0010: RIMROCK DRIVE

## Retaining Wall Condition Photos



COLM\_0010\_16.102\_R\_1.jpg



COLM\_0010\_16.102\_R\_2.jpg



<b>Wall ID:</b>	COLM-0010-16.319-R		
<b>Route Name:</b>	RIMROCK DRIVE		
<b>Inspection Date:</b>	May 24, 2007	<b>Approximate Year Built:</b>	1936
<b>*Wall Rating:</b>	80	<b>Maintenance Action:</b>	No Action

### Wall Description

<b>Wall Function:</b>	Head Wall	<b>Primary Wall Type:</b>	Gravity - Dry Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Rounded headwall around a drainage shaft constructed with masonry dry stack blocks.		

### Wall Measurements

<b>Wall Length (ft.):</b>	18	<b>Face Area (sq.):</b>	88
<b>Average Wall Height (ft.):</b>	4	<b>Face Angle (deg.):</b>	90
<b>Maximum Wall Height (ft.):</b>	6	<b>Vertical Offset (ft.):</b>	-18

### Assessed Elements

<b>Element (Weighting Factor)</b>	<b>Narrative</b>	<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	Performing well.	8
WALL FOUNDATION MATERIAL 8.00	Sandstone bedrock, moderately weathered, no signs of failure.	8
STONE MASONRY 8.00	Moderately weathered with chinking, stable.	8
CULVERT 0.50	Natural stone.	9
DOWNSLOPE 0.50	Bedrock with drainage.	9
VEGETATION 0.50	No vegetation on wall.	9
WALL DRAINS 0.50	No internal wall drains present. No signs of water seepage or water damage to wall.	9
ROAD/SIDEWALK/SHOULDER 0.50	Fresh pavement with new shoulder fill.	10
LATERAL SLOPE 1.00	2:1 fill slope with cobbles, slightly vegetated.	7

### Repair Recommendations

<b>Failure Consequence:</b>	HIGH
<b>Recommendation Narrative:</b>	None
<b>Repair Cost:</b>	\$0

2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.

# Colorado National Monument

ROUTE 0010: RIMROCK DRIVE

## Retaining Wall Condition Photos



COLM\_0010\_16.319\_R\_1.jpg

<b>Wall ID:</b>	COLM-0010-16.410-L		
<b>Route Name:</b>	RIMROCK DRIVE		
<b>Inspection Date:</b>	April 24, 2007	<b>Approximate Year Built:</b>	1936
<b>*Wall Rating:</b>	90	<b>Maintenance Action:</b>	No Action

### Wall Description

<b>Wall Function:</b>	Head Wall	<b>Primary Wall Type:</b>	Gravity - Mortared Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Wingwall triangular in shape (25 ft x 15 ft). headwall 15 ft x 3 ft high. Well vegetated slope with trees and bushes. Seepage in slope.		

### Wall Measurements

<b>Wall Length (ft.):</b>	40	<b>Face Area (sq.):</b>	245
<b>Average Wall Height (ft.):</b>	6	<b>Face Angle (deg.):</b>	90
<b>Maximum Wall Height (ft.):</b>	15	<b>Vertical Offset (ft.):</b>	-12

### Assessed Elements

<b>Element (Weighting Factor)</b>	<b>Narrative</b>	<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	Excellent wing wall; performing as designed, no distress.	9
WALL FOUNDATION MATERIAL 8.00	Sandstone boulders and sandstone bedrock, adequate strength to support structure.	9
MORTAR 8.00	No shrinking or cracking observed.	9
STONE MASONRY 8.00	Excellent condition. Slightly weathered with some staining.	9
CULVERT 0.50	Cut in natural stone	9
LATERAL SLOPE 0.50	2:1 Good condition fill with cobbles. Stable.	9
ROAD/SIDEWALK/SHOULDER 0.50	Fresh pavement with new shoulder fill.	9
UPSLOPE 0.50	1.75:1 lightly vegetated fill with cobbles.	9
VEGETATION 0.50	No vegetation in wall or wall toe; not affecting wall performance.	9

### Repair Recommendations

<b>Failure Consequence:</b>	HIGH
<b>Recommendation Narrative:</b>	None
<b>Repair Cost:</b>	\$0

2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.



# Colorado National Monument

ROUTE 0010: RIMROCK DRIVE

## Retaining Wall Condition Photos



COLM\_0010\_16.410\_L\_1.jpg

<b>Wall ID:</b>	COLM-0010-16.410-R		
<b>Route Name:</b>	RIMROCK DRIVE		
<b>Inspection Date:</b>	April 24, 2007	<b>Approximate Year Built:</b>	1936
<b>*Wall Rating:</b>	74	<b>Maintenance Action:</b>	Maintenance

### Wall Description

<b>Wall Function:</b>	Head Wall	<b>Primary Wall Type:</b>	Gravity - Dry Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Rounded headwall with masonry dry stack.		

### Wall Measurements

<b>Wall Length (ft.):</b>	15	<b>Face Area (sq.):</b>	75
<b>Average Wall Height (ft.):</b>	5	<b>Face Angle (deg.):</b>	90
<b>Maximum Wall Height (ft.):</b>	6	<b>Vertical Offset (ft.):</b>	-11

### Assessed Elements

<b>Element (Weighting Factor)</b>	<b>Narrative</b>	<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	Performing well.	8
WALL FOUNDATION MATERIAL 8.00	Sandstone bedrock, moderately weathered, no signs of failure.	8
PLACED STONE 8.00	Missing few stones. Recommend replacing missing blocks on left side of wall.	5
STONE MASONRY 8.00	Moderately weathered with chinking, stable.	8
CULVERT 0.50	Natural stone.	9
DOWNSLOPE 0.50	Bedrock with drainage.	9
VEGETATION 0.50	No vegetation on wall face.	9
WALL DRAINS 0.50	No internal wall drains present. No signs of water seepage or water damage to wall.	9
ROAD/SIDEWALK/SHOULDER 0.50	Fresh pavement with new shoulder fill.	10

### Repair Recommendations

<b>Failure Consequence:</b>	HIGH
<b>Recommendation Narrative:</b>	Replace missing blocks on left side of shaft drainage with maintenance crew. 4 hours at \$55.00 per hour = \$220.00
<b>Repair Cost:</b>	\$220

2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.

# Colorado National Monument

ROUTE 0010: RIMROCK DRIVE

## Retaining Wall Condition Photos



COLM\_0010\_16.410\_R\_1.jpg



<b>Wall ID:</b>	COLM-0010-17.249-R		
<b>Route Name:</b>	RIMROCK DRIVE		
<b>Inspection Date:</b>	April 24, 2007	<b>Approximate Year Built:</b>	1936
<b>*Wall Rating:</b>	83	<b>Maintenance Action:</b>	No Action

### Wall Description

<b>Wall Function:</b>	Head Wall	<b>Primary Wall Type:</b>	Gravity - Mortared Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Mortared sandstone masonry wall.		

### Wall Measurements

<b>Wall Length (ft.):</b>	25	<b>Face Area (sq.):</b>	210
<b>Average Wall Height (ft.):</b>	8	<b>Face Angle (deg.):</b>	85
<b>Maximum Wall Height (ft.):</b>	6	<b>Vertical Offset (ft.):</b>	-8

### Assessed Elements

<b>Element (Weighting Factor)</b>	<b>Narrative</b>	<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	Performing well.	9
WALL FOUNDATION MATERIAL 8.00	Highly fractured sandstone bedrock with deep shaft drainage.	8
MORTAR 8.00	Signs of shrinkage and cracking.	8
STONE MASONRY 8.00	Sandstone, good condition, light weathering.	8
DOWNSLOPE 0.50	Sandstone bedrock.	9
LATERAL SLOPE 0.50	Rocky with drainage on both sides.	9
UPSLOPE 0.50	2:1 fill with boulders with only a few bushes.	9
WALL DRAINS 0.50	No internal wall drains present. No signs of water seepage or water damage to wall.	9
ROAD/SIDEWALK/SHOULDER 0.50	Fresh pavement.	10

### Repair Recommendations

<b>Failure Consequence:</b>	HIGH
<b>Recommendation Narrative:</b>	None
<b>Repair Cost:</b>	\$0

2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.

# Colorado National Monument

ROUTE 0010: RIMROCK DRIVE

## Retaining Wall Condition Photos



COLM\_0010\_17.249\_R\_1.jpg

<b>Wall ID:</b>	COLM-0010-17.719-L		
<b>Route Name:</b>	RIMROCK DRIVE		
<b>Inspection Date:</b>	April 24, 2007	<b>Approximate Year Built:</b>	1936
<b>*Wall Rating:</b>	90	<b>Maintenance Action:</b>	No Action

### Wall Description

<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	Gravity - Mortared Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Fill wall on top of 100 ft high cliff.		

### Wall Measurements

<b>Wall Length (ft.):</b>	47	<b>Face Area (sq.):</b>	470
<b>Average Wall Height (ft.):</b>	10	<b>Face Angle (deg.):</b>	85
<b>Maximum Wall Height (ft.):</b>	20	<b>Vertical Offset (ft.):</b>	-6

### Assessed Elements

<b>Element (Weighting Factor)</b>	<b>Narrative</b>	<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	Excellent wall performing well, no signs of distress or movement.	9
WALL FOUNDATION MATERIAL 8.00	Massive sandstone cliff with @ 100' drop.	9
MORTAR 8.00	Excellent condition, no signs of shrinkage or cracking.	9
STONE MASONRY 8.00	Excellent condition, no signs of weathering or fracture.	9
UPSLOPE 0.50	2:1 fill with adequate vegetation.	8
CULVERT 0.50	One culvert through the wall face, performing well.	9
DOWNSLOPE 0.50	Massive sandstone cliff about 100' high.	9
LATERAL SLOPE 0.50	2:1 fill with vegetation.	9
VEGETATION 0.50	None affecting wall performance.	9

### Repair Recommendations

<b>Failure Consequence:</b>	HIGH
<b>Recommendation Narrative:</b>	None
<b>Repair Cost:</b>	\$0

2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.



# Colorado National Monument

ROUTE 0010: RIMROCK DRIVE

## Retaining Wall Condition Photos



COLM\_0010\_17.719\_L\_1.jpg



COLM\_0010\_17.719\_L\_2.jpg

<b>Wall ID:</b>	COLM-0010-17.814-R		
<b>Route Name:</b>	RIMROCK DRIVE		
<b>Inspection Date:</b>	April 24, 2007	<b>Approximate Year Built:</b>	1936
<b>*Wall Rating:</b>	83	<b>Maintenance Action:</b>	No Action

### Wall Description

<b>Wall Function:</b>	Head Wall	<b>Primary Wall Type:</b>	Gravity - Mortared Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Headwall constructed as mortared mason sandstone wall, signs of bulging in the midsection caused by earth pressure		

### Wall Measurements

<b>Wall Length (ft.):</b>	25	<b>Face Area (sq.):</b>	100
<b>Average Wall Height (ft.):</b>	4	<b>Face Angle (deg.):</b>	85
<b>Maximum Wall Height (ft.):</b>	5	<b>Vertical Offset (ft.):</b>	-14

### Assessed Elements

<b>Element (Weighting Factor)</b>	<b>Narrative</b>	<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	Performing well.	9
WALL FOUNDATION MATERIAL 8.00	Highly fractured sandstone bedrock with deep shaft drainage.	8
MORTAR 8.00	Signs of shrinkage and cracking.	8
STONE MASONRY 8.00	Sandstone, good condition, light weathering.	8
DOWNSLOPE 0.50	Sandstone bedrock.	9
LATERAL SLOPE 0.50	Rocky with drainage on both sides.	9
UPSLOPE 0.50	2:1 fill with boulders with only a few bushes.	9
WALL DRAINS 0.50	No internal wall drains present. No signs of water seepage or water damage to wall.	9
ROAD/SIDEWALK/SHOULDER 0.50	Fresh pavement.	10

### Repair Recommendations

<b>Failure Consequence:</b>	HIGH
<b>Recommendation Narrative:</b>	None
<b>Repair Cost:</b>	\$0

2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.



# Colorado National Monument

ROUTE 0010: RIMROCK DRIVE

## Retaining Wall Condition Photos



COLM\_0010\_17.814\_R\_1.jpg



COLM\_0010\_17.814\_R\_2.jpg



<b>Wall ID:</b>	COLM-0010-18.330-R		
<b>Route Name:</b>	RIMROCK DRIVE		
<b>Inspection Date:</b>	April 24, 2007	<b>Approximate Year Built:</b>	1936
<b>*Wall Rating:</b>	78	<b>Maintenance Action:</b>	No Action

### Wall Description

<b>Wall Function:</b>	Head Wall	<b>Primary Wall Type:</b>	Gravity - Mortared Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Semi-rounded headwall constructed with mortared masonry sandstone blocks.		

### Wall Measurements

<b>Wall Length (ft.):</b>	16	<b>Face Area (sq.):</b>	40
<b>Average Wall Height (ft.):</b>	2	<b>Face Angle (deg.):</b>	85
<b>Maximum Wall Height (ft.):</b>	4	<b>Vertical Offset (ft.):</b>	-5

### Assessed Elements

<b>Element (Weighting Factor)</b>	<b>Narrative</b>	<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	Performing well.	8
WALL FOUNDATION MATERIAL 8.00	Sandstone bedrock, moderately weathered, no signs of failure.	8
MORTAR 8.00	Moderate cracking.	7
STONE MASONRY 8.00	Moderately weathered with chinking, stable.	8
CULVERT 0.50	Natural stone.	9
DOWNSLOPE 0.50	Bedrock with drainage.	9
VEGETATION 0.50	No vegetation on wall face.	9
WALL DRAINS 0.50	No internal wall drains present. No signs of water seepage or water damage to wall.	9
ROAD/SIDEWALK/SHOULDER 0.50	Fresh pavement with new shoulder fill.	10

### Repair Recommendations

<b>Failure Consequence:</b>	HIGH
<b>Recommendation Narrative:</b>	None
<b>Repair Cost:</b>	\$0

2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.

# Colorado National Monument

ROUTE 0010: RIMROCK DRIVE

## Retaining Wall Condition Photos



COLM\_0010\_18.330\_R\_1.jpg

<b>Wall ID:</b>	COLM-0010-18.403-R		
<b>Route Name:</b>	RIMROCK DRIVE		
<b>Inspection Date:</b>	April 24, 2007	<b>Approximate Year Built:</b>	1936
<b>*Wall Rating:</b>	71	<b>Maintenance Action:</b>	Maintenance

### Wall Description

<b>Wall Function:</b>	Head Wall	<b>Primary Wall Type:</b>	Gravity - Dry Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Rounded dry stack sandstone blocks.		

### Wall Measurements

<b>Wall Length (ft.):</b>	13	<b>Face Area (sq.):</b>	65
<b>Average Wall Height (ft.):</b>	5	<b>Face Angle (deg.):</b>	85
<b>Maximum Wall Height (ft.):</b>	6	<b>Vertical Offset (ft.):</b>	-8

### Assessed Elements

<b>Element (Weighting Factor)</b>	<b>Narrative</b>	<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	Performing well, no signs of distress or failure.	7
WALL FOUNDATION MATERIAL 8.00	Massive sandstone bedrock with shaft drain in bottom.	7
PLACED STONE 8.00	Small sandstone blocks with large gaps in between with no chinking.	7
CULVERT 0.50	Shaft in natural rock.	8
LATERAL SLOPE 0.50	Bedrock with loose fill and some trees.	8
DOWNSLOPE 0.50	Bedrock sandstone with drainage.	9
WALL DRAINS 0.50	No internal wall drains present. No signs of water seepage or water damage to wall.	9
UPSLOPE 1.00	2:1 slope with loose fill with one bush on top.	7
VEGETATION 1.00	Tree in toe of head wall. Recommend removing.	7

### Repair Recommendations

<b>Failure Consequence:</b>	HIGH
<b>Recommendation Narrative:</b>	Remove the small tree growing at the wall toe. Estimated cost is one hour @ \$55.00 = \$55.00.
<b>Repair Cost:</b>	\$55

2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.



# Colorado National Monument

ROUTE 0010: RIMROCK DRIVE

## Retaining Wall Condition Photos



COLM\_0010\_18.403\_R\_1.jpg

<b>Wall ID:</b>	COLM-0010-18.477-L		
<b>Route Name:</b>	RIMROCK DRIVE		
<b>Inspection Date:</b>	April 24, 2007	<b>Approximate Year Built:</b>	1936
<b>*Wall Rating:</b>	84	<b>Maintenance Action:</b>	No Action

### Wall Description

<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	Gravity - Dry Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Fill wall constructed with two sizes, in two segments, of sandstone blocks on top of a very steep cliff.		

### Wall Measurements

<b>Wall Length (ft.):</b>	107	<b>Face Area (sq.):</b>	642
<b>Average Wall Height (ft.):</b>	6	<b>Face Angle (deg.):</b>	85
<b>Maximum Wall Height (ft.):</b>	11	<b>Vertical Offset (ft.):</b>	-15

### Assessed Elements

<b>Element (Weighting Factor)</b>	<b>Narrative</b>	<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	Performing as designed.	9
WALL FOUNDATION MATERIAL 8.00	Massive sandstone bedrock cliff. Very steep.	8
STONE MASONRY 8.00	Two sizes, large and small, in two segments. Slight weathering of sandstone blocks.	8
LATERAL SLOPE 0.50	Sandstone bedrock with loose fill on top of wall. Vegetated with trees and bushes. Stable.	8
VEGETATION 0.50	No vegetation in wall face, a tree in wall toe.	8
WALL DRAINS 0.50	No internal wall drains present. No signs of water seepage or water damage to wall.	8
DOWNSLOPE 0.50	Sandstone bedrock cliff.	9
UPSLOPE 0.50	2:1 well vegetated slope with bushes and trees.	9
ROAD/SIDEWALK/SHOULDER 0.50	Fresh pavement.	10

### Repair Recommendations

<b>Failure Consequence:</b>	HIGH
<b>Recommendation Narrative:</b>	None
<b>Repair Cost:</b>	\$0

2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.



# Colorado National Monument

ROUTE 0010: RIMROCK DRIVE

## Retaining Wall Condition Photos



COLM\_0010\_18.477\_L\_1.jpg



COLM\_0010\_18.477\_L\_2.jpg



<b>Wall ID:</b>	COLM-0010-18.633-L		
<b>Route Name:</b>	RIMROCK DRIVE		
<b>Inspection Date:</b>	April 24, 2007	<b>Approximate Year Built:</b>	1936
<b>*Wall Rating:</b>	83	<b>Maintenance Action:</b>	No Action

### Wall Description

<b>Wall Function:</b>	Slope Protection	<b>Primary Wall Type:</b>	Gravity - Dry Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Slope protection constructed to protect a steep slope between road and cliff with mortared masonry guard wall on top. A newer guard rail is constructed in front of guard wall. Visibility of wall is poor heavily vegetated.		

### Wall Measurements

<b>Wall Length (ft.):</b>	30	<b>Face Area (sq.):</b>	450
<b>Average Wall Height (ft.):</b>	15	<b>Face Angle (deg.):</b>	45
<b>Maximum Wall Height (ft.):</b>	15	<b>Vertical Offset (ft.):</b>	-1

### Assessed Elements

<b>Element (Weighting Factor)</b>	<b>Narrative</b>	<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	Slope protection is performing as designed; no signs of movement.	8
WALL FOUNDATION MATERIAL 8.00	Sandstone massive compacted and adequate to protect structure.	9
PLACED STONE 8.00	Very small sandstone blocks used for slope protection. Moss growing on top stones.	8
CULVERT 0.50	None	8
DOWNSLOPE 0.50	Sandstone bedrock.	8
LATERAL SLOPE 0.50	Bedrock with moderately loose fill on top.	8
VEGETATION 0.50	Heavily vegetated slope.	9
ROAD/SIDEWALK/SHOULDER 0.50	Fresh pavement.	10
WALL DRAINS 1.00	None. Water runoff on top of slope.	7

### Repair Recommendations

<b>Failure Consequence:</b>	HIGH
<b>Recommendation Narrative:</b>	None
<b>Repair Cost:</b>	\$0

2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.

# Colorado National Monument

ROUTE 0010: RIMROCK DRIVE

## Retaining Wall Condition Photos



COLM\_0010\_18.633\_L\_1.jpg

<b>Wall ID:</b>	COLM-0010-19.478-R		
<b>Route Name:</b>	RIMROCK DRIVE		
<b>Inspection Date:</b>	April 24, 2007	<b>Approximate Year Built:</b>	1936
<b>*Wall Rating:</b>	80	<b>Maintenance Action:</b>	No Action

### Wall Description

<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	Gravity - Mortared Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Fill wall built of mortared sandstone masonry blocks, Ashlar design, with guard wall.		

### Wall Measurements

<b>Wall Length (ft.):</b>	494	<b>Face Area (sq.):</b>	2964
<b>Average Wall Height (ft.):</b>	6	<b>Face Angle (deg.):</b>	85
<b>Maximum Wall Height (ft.):</b>	7	<b>Vertical Offset (ft.):</b>	0

### Assessed Elements

<b>Element (Weighting Factor)</b>	<b>Narrative</b>	<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	Performing well as designed.	9
WALL FOUNDATION MATERIAL 8.00	Moderately weathered sandstone cliff sufficient foundation to support the structure.	9
MORTAR 8.00	Moderately to severe cracked mortar with some shrinkage.	7
STONE MASONRY 8.00	Moderately weathered sandstone blocks; a couple of blocks are missing.	7
CULVERT 0.50	None. Runoff to downslope on roadway.	8
ROAD/SIDEWALK/SHOULDER 0.50	No distress or cracking indicates no significant wall movement.	8
LATERAL SLOPE 0.50	Sandstone massive bedrock compacted on steep cliff within 20 feet.	9
VEGETATION 0.50	Minimal vegetation.	9
WALL DRAINS 0.50	No internal wall drains present. No signs of water seepage or water damage to wall.	9

### Repair Recommendations

<b>Failure Consequence:</b>	HIGH
<b>Recommendation Narrative:</b>	None
<b>Repair Cost:</b>	\$0

2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.



# Colorado National Monument

ROUTE 0010: RIMROCK DRIVE

## Retaining Wall Condition Photos



COLM\_0010\_19.478\_R\_1.jpg



COLM\_0010\_19.478\_R\_2.jpg

<b>Wall ID:</b>	COLM-0010-20.168-R		
<b>Route Name:</b>	RIMROCK DRIVE		
<b>Inspection Date:</b>	April 24, 2007	<b>Approximate Year Built:</b>	1958
<b>*Wall Rating:</b>	83	<b>Maintenance Action:</b>	No Action

### Wall Description

<b>Wall Function:</b>	Head Wall	<b>Primary Wall Type:</b>	Gravity - Mortared Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Headwall is mortared sandstone masonry with a wingwall 2 ft high for protection of a 45 degree slope.		

### Wall Measurements

<b>Wall Length (ft.):</b>	19	<b>Face Area (sq.):</b>	76
<b>Average Wall Height (ft.):</b>	4	<b>Face Angle (deg.):</b>	85
<b>Maximum Wall Height (ft.):</b>	5	<b>Vertical Offset (ft.):</b>	-2

### Assessed Elements

<b>Element (Weighting Factor)</b>	<b>Narrative</b>	<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	Performing well as designed.	9
WALL FOUNDATION MATERIAL 8.00	Fill on bedrock, adequate to support structure.	9
MORTAR 8.00	Some cracking and missing in segments.	7
STONE MASONRY 8.00	Moderately weathered.	8
VEGETATION 0.50	Bushes growing through the wall.	8
CULVERT 0.50	CMP culvert is in good condition.	9
DOWNSLOPE 0.50	Bedrock and drainage.	9
LATERAL SLOPE 0.50	Fill slope with vegetation.	9
ROAD/SIDEWALK/SHOULDER 0.50	No cracking or distress related to the wall.	9

### Repair Recommendations

<b>Failure Consequence:</b>	LOW
<b>Recommendation Narrative:</b>	None
<b>Repair Cost:</b>	\$0

2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.

# Colorado National Monument

ROUTE 0010: RIMROCK DRIVE

## Retaining Wall Condition Photos



COLM\_0010\_20.168\_R\_1.jpg



<b>Wall ID:</b>	COLM-0010-20.546-R		
<b>Route Name:</b>	RIMROCK DRIVE		
<b>Inspection Date:</b>	April 24, 2007	<b>Approximate Year Built:</b>	1958
<b>*Wall Rating:</b>	72	<b>Maintenance Action:</b>	Maintenance

### Wall Description

<b>Wall Function:</b>	Head Wall	<b>Primary Wall Type:</b>	Gravity - Mortared Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Headwall of mortared sandstone masonry.		

### Wall Measurements

<b>Wall Length (ft.):</b>	17	<b>Face Area (sq.):</b>	150
<b>Average Wall Height (ft.):</b>	8	<b>Face Angle (deg.):</b>	80
<b>Maximum Wall Height (ft.):</b>	12	<b>Vertical Offset (ft.):</b>	-13

### Assessed Elements

<b>Element (Weighting Factor)</b>	<b>Narrative</b>	<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	Performing adequately, but needs maintenance before it deteriorates further.	7
WALL FOUNDATION MATERIAL 8.00	Sandstone bedrock, adequate to support the structure.	8
MORTAR 8.00	Mortar cracked in many places, moderate shrinking, some mortar is missing in segments.	7
STONE MASONRY 8.00	Slightly weathered, but generally in good condition. Some blocks have fallen off the wing wall.	7
CULVERT 0.50	CMP culvert.	8
ROAD/SIDEWALK/SHOULDER 0.50	No distress caused by wall movement or wall rotation.	8
DOWNSLOPE 1.00	Bedrock with boulders in drainage path.	7
LATERAL SLOPE 1.00	Fill on top of bedrock.	7
UPSLOPE 1.00	2:1 Loose fill with minor vegetation. Drainage and runoff on both sides of wall.	7

### Repair Recommendations

<b>Failure Consequence:</b>	HIGH
<b>Recommendation Narrative:</b>	Rebuild the upper 3 foot section of the wall and reinstall mortar and fallen blocks. Add riprap on both sides of the wall. Regrout where needed. Maintenance labor for removing vegetation from wall face estimated at 32 man hours at \$55.00 per hour = \$1,76
<b>Repair Cost:</b>	\$2,360

2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.

# Colorado National Monument

ROUTE 0010: RIMROCK DRIVE

## Retaining Wall Condition Photos



COLM\_0010\_20.546\_R\_1.jpg



COLM\_0010\_20.546\_R\_2.jpg

<b>Wall ID:</b>	COLM-0010-22.271-R		
<b>Route Name:</b>	RIMROCK DRIVE		
<b>Inspection Date:</b>	April 24, 2007	<b>Approximate Year Built:</b>	1958
<b>*Wall Rating:</b>	82	<b>Maintenance Action:</b>	Maintenance

### Wall Description

<b>Wall Function:</b>	Head Wall	<b>Primary Wall Type:</b>	Gravity - Mortared Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Double culvert headwall, mortared sandstone masonry blocks.		

### Wall Measurements

<b>Wall Length (ft.):</b>	19	<b>Face Area (sq.):</b>	57
<b>Average Wall Height (ft.):</b>	3	<b>Face Angle (deg.):</b>	85
<b>Maximum Wall Height (ft.):</b>	6	<b>Vertical Offset (ft.):</b>	-1

### Assessed Elements

<b>Element (Weighting Factor)</b>	<b>Narrative</b>	<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	Performing well but needs drainage improvement due to roadway runoff draining behind the wall.	8
WALL FOUNDATION MATERIAL 8.00	Sandstone bedrock.	9
MORTAR 8.00	Moderate shrinking and cracking.	7
STONE MASONRY 8.00	Good condition, slight weathering, water staining.	9
DOWNSLOPE 0.50	Bedrock, drainage path.	8
LATERAL SLOPE 0.50	Bedrock on one side, fill over bedrock on other side.	8
ROAD/SIDEWALK/SHOULDER 0.50	No distress caused by wall movement or settlement.	8
CULVERT 0.50	Double CMP culverts in good condition.	9
WALL DRAINS 0.50	None	9

### Repair Recommendations

<b>Failure Consequence:</b>	HIGH
<b>Recommendation Narrative:</b>	Divert roadway drainage to one side of the wall so it does not drain behind the head wall face. If not improved, pressure might build up and cause wall damage. Remove bushes from wall face and foundation toe. Maintenance: 16 hours at \$55.00 per hour = \$880
<b>Repair Cost:</b>	\$980

2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.



# Colorado National Monument

ROUTE 0010: RIMROCK DRIVE

## Retaining Wall Condition Photos



COLM\_0010\_22.271\_R\_1.jpg

<b>Wall ID:</b>	COLM-0200-0.638-L		
<b>Route Name:</b>	SADDLEHORN LOOP ROAD		
<b>Inspection Date:</b>	April 24, 2007	<b>Approximate Year Built:</b>	1936
<b>*Wall Rating:</b>	90	<b>Maintenance Action:</b>	No Action

### Wall Description

<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	Gravity - Mortared Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Mortared stone wall made with local available sandstone blocks. In very good condition.		

### Wall Measurements

<b>Wall Length (ft.):</b>	80	<b>Face Area (sq.):</b>	400
<b>Average Wall Height (ft.):</b>	5	<b>Face Angle (deg.):</b>	85
<b>Maximum Wall Height (ft.):</b>	7	<b>Vertical Offset (ft.):</b>	-3

### Assessed Elements

<b>Element (Weighting Factor)</b>	<b>Narrative</b>	<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	Performing very well.	9
WALL FOUNDATION MATERIAL 8.00	Sandstone bedrock in excellent condition; no signs of failure.	9
MORTAR 8.00	Good condition with minor signs of shrinkage. No cracking observed.	9
STONE MASONRY 8.00	Strong sandstone blocks of varying shapes with no signs of significant weathering.	9
WALL DRAINS 0.50	No internal wall drainage.	8
DOWNSLOPE 0.50	Sandstone rock with some fill on top.	9
LATERAL SLOPE 0.50	2.5:1 Fill over sandstone with a few small trees.	9
ROAD/SIDEWALK/SHOULDER 0.50	No cracking on road related to wall.	9
UPSLOPE 0.50	3:1 Semi-compacted fill with few bushes.	9

### Repair Recommendations

<b>Failure Consequence:</b>	HIGH
<b>Recommendation Narrative:</b>	None
<b>Repair Cost:</b>	\$0

2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.

# Colorado National Monument

ROUTE 0200: SADDLEHORN LOOP ROAD

## Retaining Wall Condition Photos



COLM\_0200\_0.638\_L\_1.jpg



COLM\_0200\_0.638\_L\_2.jpg



<b>Wall ID:</b>	COLM-0200-0.710-L		
<b>Route Name:</b>	SADDLEHORN LOOP ROAD		
<b>Inspection Date:</b>	April 24, 2007	<b>Approximate Year Built:</b>	1936
<b>*Wall Rating:</b>	90	<b>Maintenance Action:</b>	No Action

### Wall Description

<b>Wall Function:</b>	Fill Wall	<b>Primary Wall Type:</b>	Gravity - Mortared Stone
<b>Surface Treatment:</b>		<b>Secondary Wall Type:</b>	
<b>Secondary Surface Treatment:</b>		<b>Architectural Facing:</b>	
<b>General Description:</b>	Mortared stone wall made with local available sandstone blocks. In very good condition.		

### Wall Measurements

<b>Wall Length (ft.):</b>	51	<b>Face Area (sq.):</b>	170
<b>Average Wall Height (ft.):</b>	3	<b>Face Angle (deg.):</b>	85
<b>Maximum Wall Height (ft.):</b>	4	<b>Vertical Offset (ft.):</b>	-1

### Assessed Elements

<b>Element (Weighting Factor)</b>	<b>Narrative</b>	<b>Condition Rating (0 - 10)</b>
PERFORMANCE 8.00	Performing very well as designed.	9
WALL FOUNDATION MATERIAL 8.00	Sandstone bedrock in excellent condition; no signs of failure.	9
MORTAR 8.00	Good condition with minor signs of shrinkage. No cracking observed.	9
STONE MASONRY 8.00	Strong sandstone blocks of varying shapes with no signs of significant weathering.	9
WALL DRAINS 0.50	No internal wall drainage.	8
DOWNSLOPE 0.50	Sandstone rock with some fill on top.	9
LATERAL SLOPE 0.50	2.5:1 Fill over sandstone with a few small trees.	9
ROAD/SIDEWALK/SHOULDER 0.50	No cracking on road related to wall.	9
UPSLOPE 0.50	6:1 Semi-compacted fill with few bushes.	9

### Repair Recommendations

<b>Failure Consequence:</b>	HIGH
<b>Recommendation Narrative:</b>	None
<b>Repair Cost:</b>	\$0

2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.

# Colorado National Monument

ROUTE 0200: SADDLEHORN LOOP ROAD

## Retaining Wall Condition Photos



COLM\_0200\_0.710\_L\_1.jpg



COLM\_0200\_0.710\_L\_2.jpg



# Appendix A

## Summary of WIP Definitions



Colorado National Monument



Federal Lands Highway  
Road Inventory Program



# **Appendix A**

## **Summary of WIP Definitions and Assessment Categories**

## Wall Naming Convention

Unique “Wall Identification” names were assigned to the retaining walls that were inventoried. The Wall Identification includes the Park Name, the RIP Route Number (e.g., **0013**), the beginning milepoint of a wall (e.g., **0.622**) and the side of the road the wall is located on (e.g., **L.**) relative to the primary direction of travel (direction of increasing mileposts). Thus, a typical wall identified would have the following format: **YOSE-0013-0.622-L.**

For roadways not in RIP, park-supplied route numbers were used or the convention RRR#. Similarly, for parking areas not in RIP, the park-supplied parking area number or the convention PPP# was used. Also for parking areas, walls are numbered in ascending order as they are encountered when traveling counterclockwise around the parking area (most common direction of traffic flow). Parking area walls are designated P1, P2, P3, etc. as new walls are encountered.

**- NPS Retaining Wall Inventory Program Field Guide (WIFG)-**

**Retaining Wall Acceptance Criteria**

- \*All classes of paved roadways and parking areas included in the RIP Route Investigation Report and/or identified by park staff.
- \*Walls must reside within the constructed roadway/parking area prism.
- \*Maximum wall height, including only that portion actively retaining soil and/or rock, must be  $\geq 4$  ft. (>6ft for culvert headwalls).
- \*Consider known/verifiable wall embedment in determining maximum retaining wall height. Include fully buried retaining structures.
- \*Walls have an internal wall face angle  $\geq 45^\circ$  ( $\geq 1H:1V$  face slope ratio).
- \*Include all walls where the intent is to support/protect the travelway, and where failure would require replacement with a retaining wall.

**Definitions**

<b>Design Criteria</b>	Measure of how well current design criteria are satisfied: <b>None</b> - Does not meet any known standards. <b>Non-AASHTO</b> - Does not meet AASHTO, but is consistent with other structures of its type/period with good performance. <b>AASHTO</b> - Apparently meets current AASHTO Geometric, Design, Materials, and Construction Standards.
<b>Consequence of Failure</b>	<b>Low</b> - No loss of roadway, no to low public risk, no impact to traffic during wall repair/replacement <b>Moderate</b> - Hourly to short-term closure of roadway, low-to-moderate public risk, multiple alternate routes available <b>High</b> - Seasonal to long-term loss of roadway, substantial loss-of-life risk, no alternate routes available
<b>Action</b>	Select from: <b>No Action, Monitor, Maintenance, Repair Elements, Replace Elements, and Replace Wall</b>
<b>Weighting Factor</b>	Weighting Factor to be applied to the Condition Rating (CR). When indicated on the Condition Assessment Input Form: WF=0.5 for CR=8-10; WF=1.0 for CR=4-7; and WF=5 for CR=1-3.
<b>Data Reliability</b>	Estimate of how well observed conditions represent wall performance, and if additional investigations may be warranted. <b>1-Poor</b> Conditions cannot be sufficiently observed to rate element(s), warranting additional investigations to better define element performance and/or to determine the cause(s) or poor performance. <b>2-Good</b> Observed conditions are sufficient to rate the conditions of wall element(s); however, additional investigations would be useful to better understand element performance. <b>3-Very Good</b> Observed conditions clearly describe wall performance. Additional investigations are not needed.

**Wall Function Codes**

[FW] Fill Wall	[BW] Bridge Wall	[SW] Switchback Wall
[CW] Cut Wall	[HW] Head Wall	[SP] Slope Protection [FL] Flood Wall

**Wall Type Codes**

[AH] Anchor, Tieback H-Pile	[CC] Crib, Concrete	[MG] MSE, Geosynthetic Wrapped Face
[AM] Anchor, Micropile	[CM] Crib, Metal	[MP] MSE, Precast Panel
[AS] Anchor, Tieback Sheet Pile	[CT] Crib, Timber	[MS] MSE, Segmental Block
[BC] Bin, Concrete	[GB] Gravity, Concrete Block/ Brick	[MW] MSE, Welded Wire Face
[BM] Bin, Metal	[GC] Gravity, Mass Concrete	[SN] Soil Nail
[CL] Cantilever, Concrete	[GD] Gravity, Dry Stone	[TP] Tangent/ Secant Pile
[CP] Cantilever, Soldier Pile	[GG] Gravity, Gabion	[OT] Other, User Defined
[CS] Cantilever, Sheet Pile	[GM] Gravity, Mortared Stone	[NO] None

**Architectural Facing Type Codes**

[BV] Brick Veneer	[PF] Planted Face	[SS] Simulated Stone
[CO] Cementitious Overlay	[SC] Sculpted Shotcrete	[SV] Stone Veneer
[FF] Fractured Fin Concrete	[SH] Shotcrete (nozzle finish)	[TI] Timber
[FL] Formlined Concrete	[SM] Steel/Metal	[OT] Other, User Defined
[PC] Plain Concrete (float finish or light texture)	[SO] Stone	[NO] None

**Surface Treatment Codes**

[BG] Bush Gun (tool-textured concrete)	[PS] Preservative	[WS] Weathering Steel
[CA] Color Additive	[SE] Silane Sealer	[OT] Other, User Defined
[GL] Galvanized	[ST] Stain	[NO] None
[PA] Painted	[TR] Tar Coated	



### Condition Ratings

Condition Ratings apply to all Primary and Secondary Wall Elements, and are intended to assist in consistently defining element **severity**, **extent**, and **repair/replace urgency** of wall element distresses.

<b>9-10 (Excellent)</b>	-Any defects are minor and are within normal range for <i>newly constructed or fabricated</i> elements. -Defects may include those typically caused from fabrication or construction.
<b>7-8 (Good)</b>	-Low-to-moderate extent of low severity distress. -Distress present does not significantly compromise the element function, nor is there significantly severe distress to major structural components of an element.
<b>5-6 (Fair)</b>	-High extent of low severity distress and/or low-to-medium extent of medium to high severity distress. -Distress present does not compromise element function, but lack of treatment may lead to impaired function/elevated risk of element failure in the near term.
<b>3-4 (Poor)</b>	-Medium-to-high extent of medium-to-high severity distress. -Distress present threatens element function, and strength is obviously compromised and/or structural analysis is warranted. -The element condition does not pose an immediate threat to wall stability and road closure is not necessary.
<b>1-2 (Critical)</b>	-Medium-to-high extent of high severity distress. -Element is no longer serving intended function. Element performance threatening overall stability of the wall at the time of inspection.

### Wall Performance Condition Ratings

<b>Performance</b>	Evaluation of overall wall performance as indicated by observations not necessarily captured by observed distresses for specific elements, including global wall distresses (rotation, settlement, translation, displacement, etc.) and/or evidence of prior repairs that may further indicate component problems.	<p><b>Good to Excellent</b> - No observation of distresses not already captured by individual element condition assessment. No combination of element distresses indicating unseen problems or creating significant performance problems. No history of remediation or repair to wall or adjacent elements.</p> <p><b>Fair</b> - Some observed global distress is not associated with specific elements. Some observation of element distress combinations that indicate wall component problems. Minor work on primary elements or major work on secondary elements has occurred improving overall wall function.</p> <p><b>Poor to Critical</b> - Global wall rotation, settlement, and/or overturning is readily apparent. Combined element distresses clearly indicate serious stability problems with components or global wall stability. Major repairs have occurred to wall structural elements, though functionality has not improved significantly.</p>
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