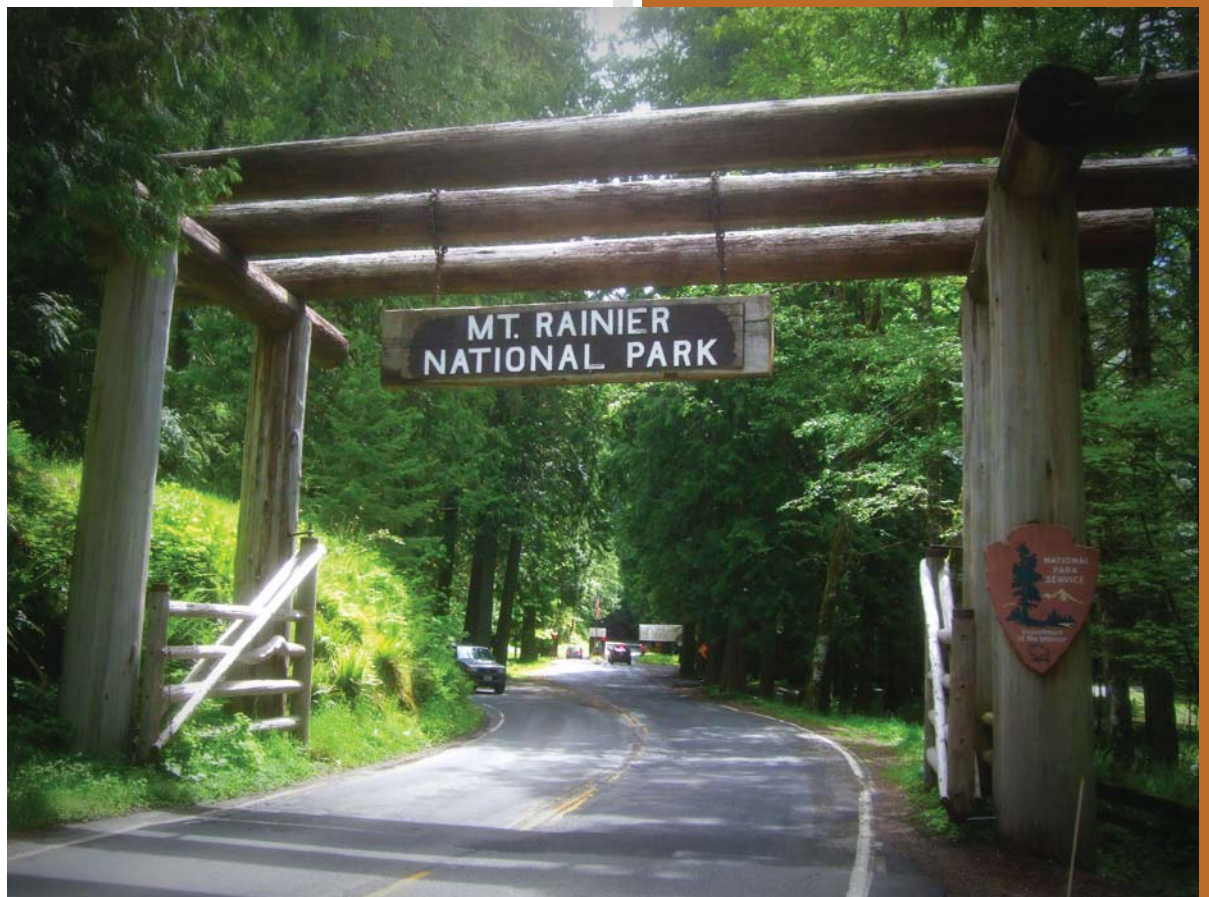


MORA WIP Report

NPS Retaining Wall Inventory Program Mount Rainier National Park



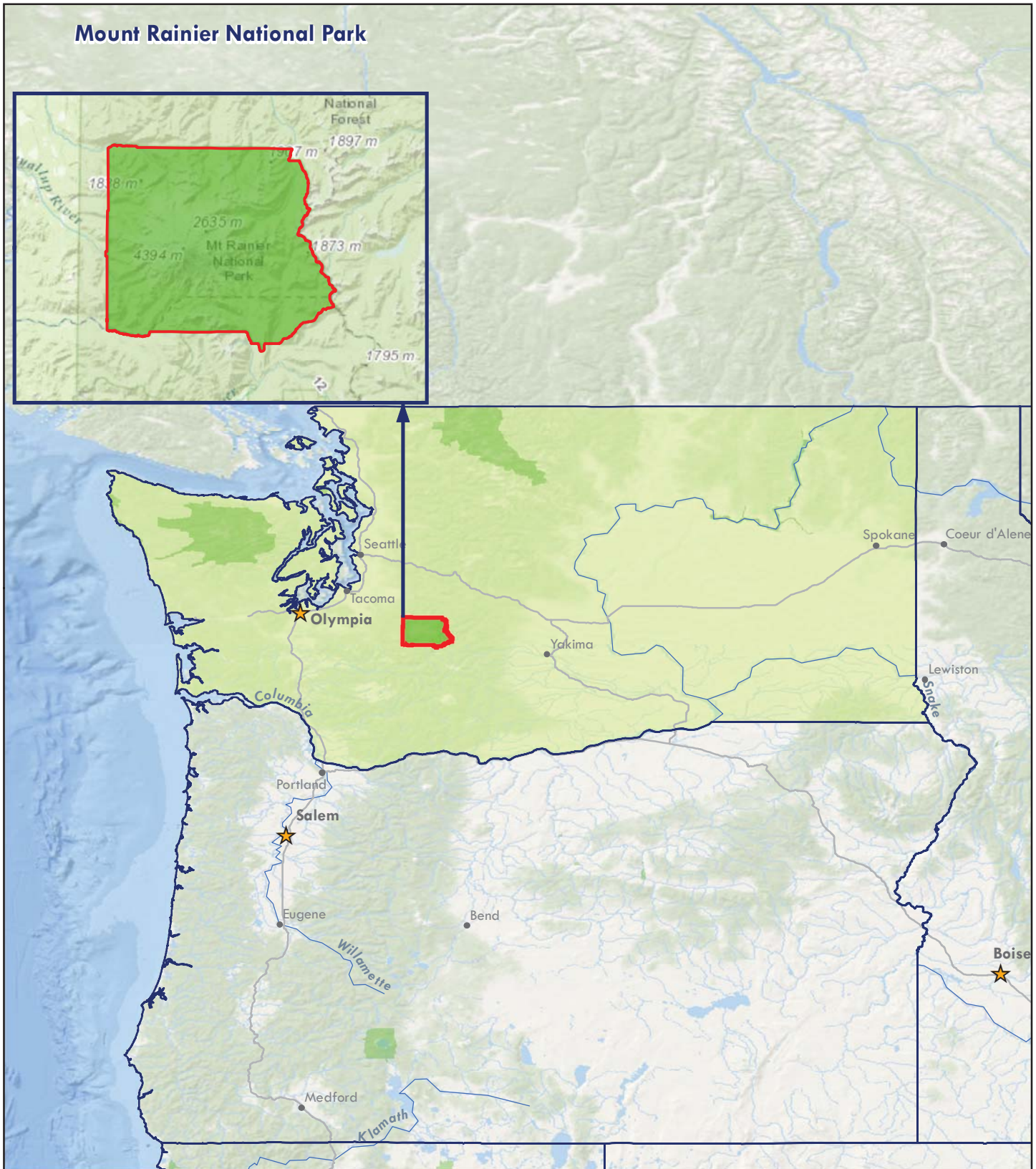
**Federal Lands Highway
Road Inventory Program**

Prepared By:

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

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

Mount Rainier National Park in Washington



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



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Introduction



Mount Rainier National Park



**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



Mount Rainier National Park

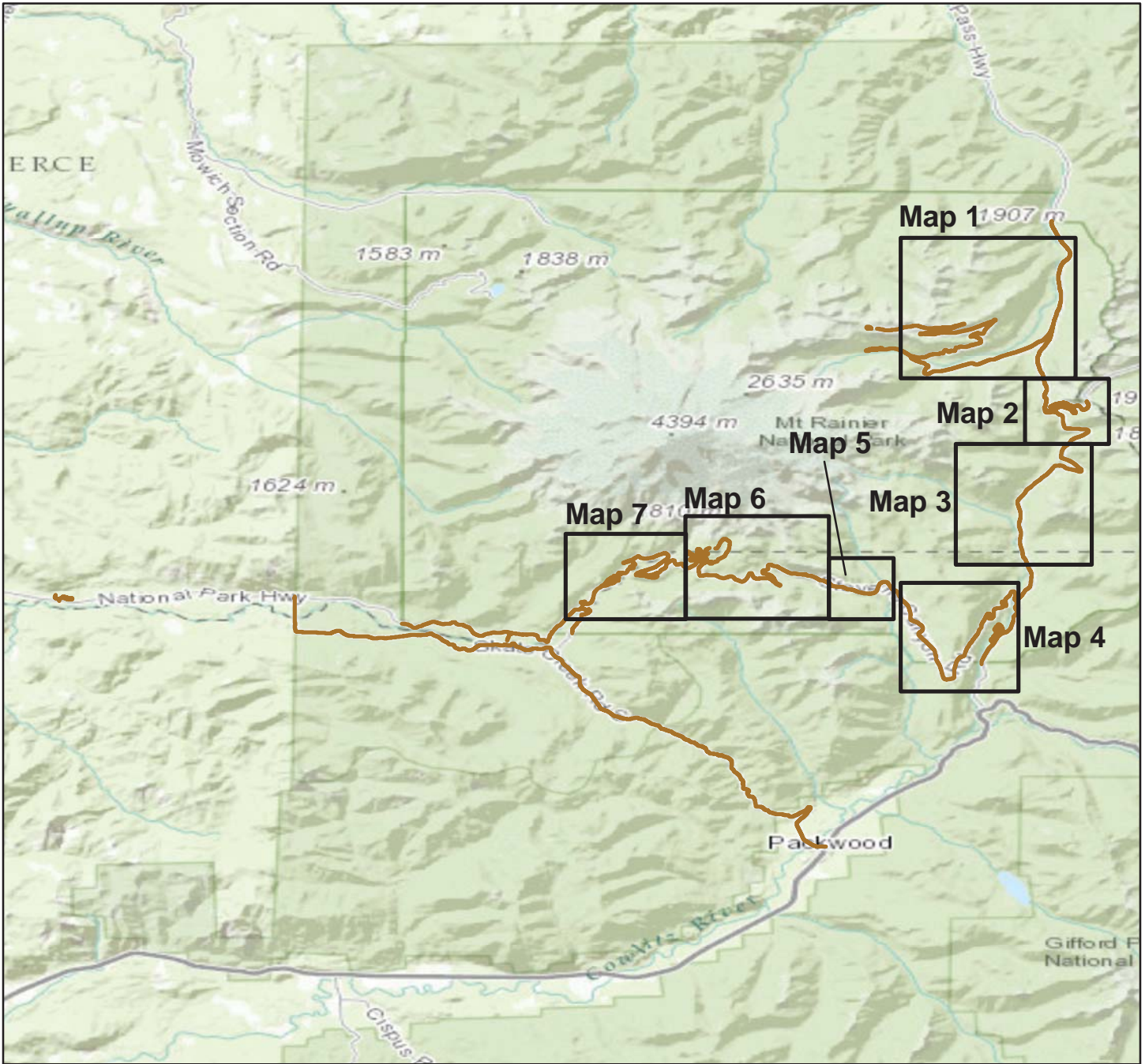


Federal Lands Highway
Road Inventory Program

Mount Rainier National Park

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

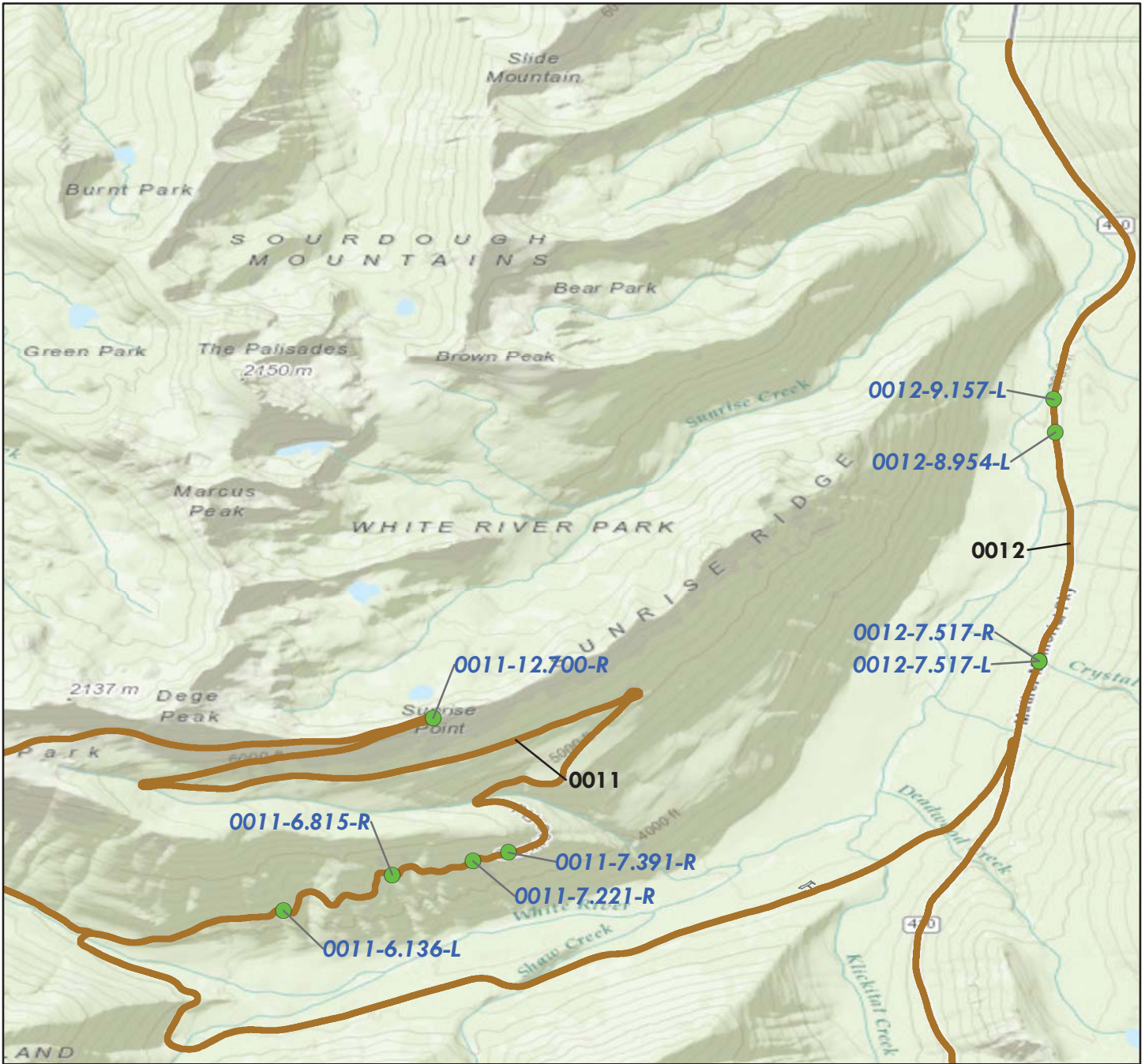
 RIP Collected Routes



Mount Rainier National Park

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

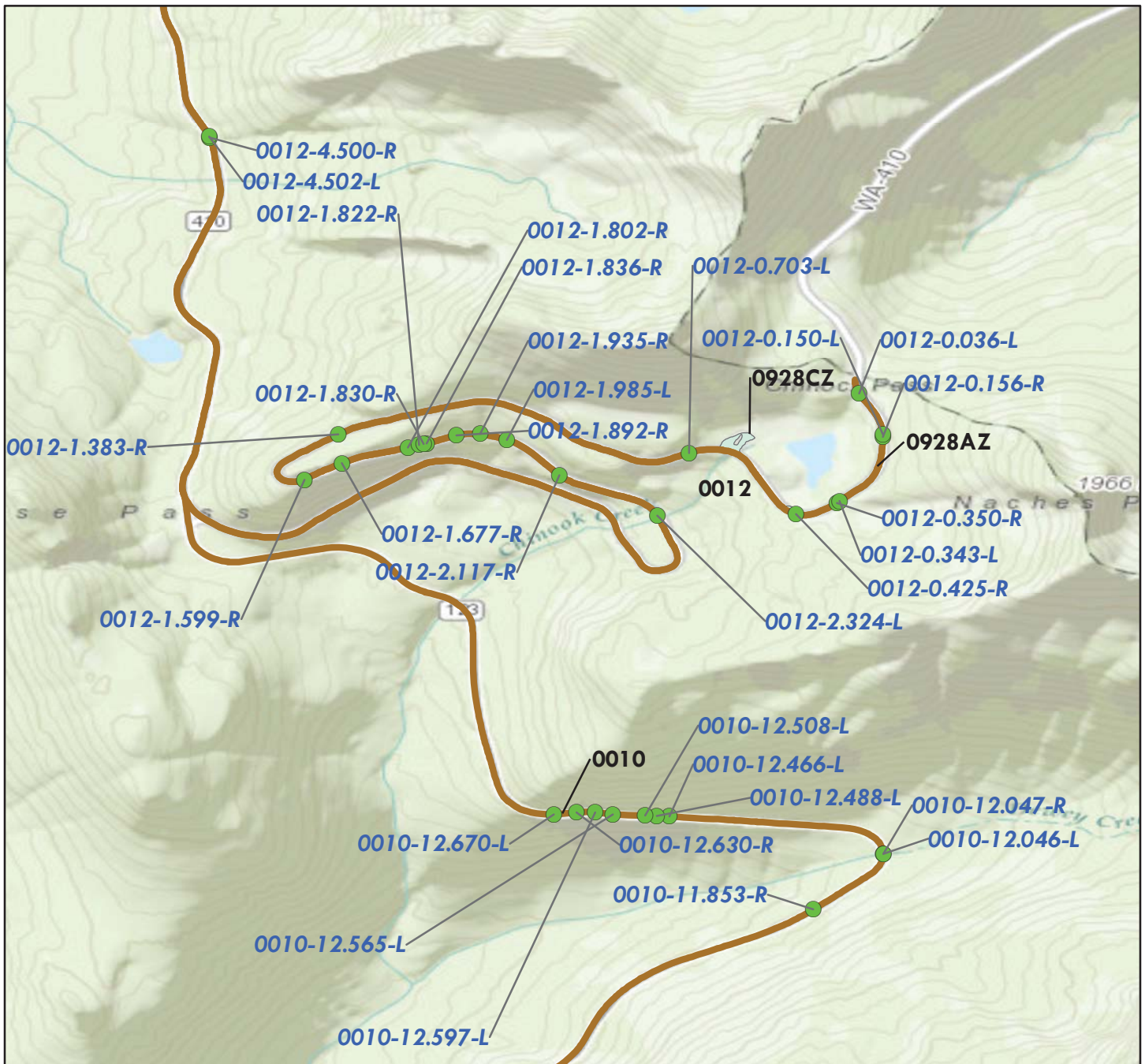
- Wall Locations
- RIP Collected Routes



Mount Rainier National Park

WALL LOCATION MAP

Map 2

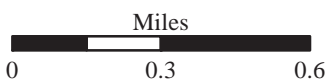


Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

● Wall Locations

— RIP Collected Routes

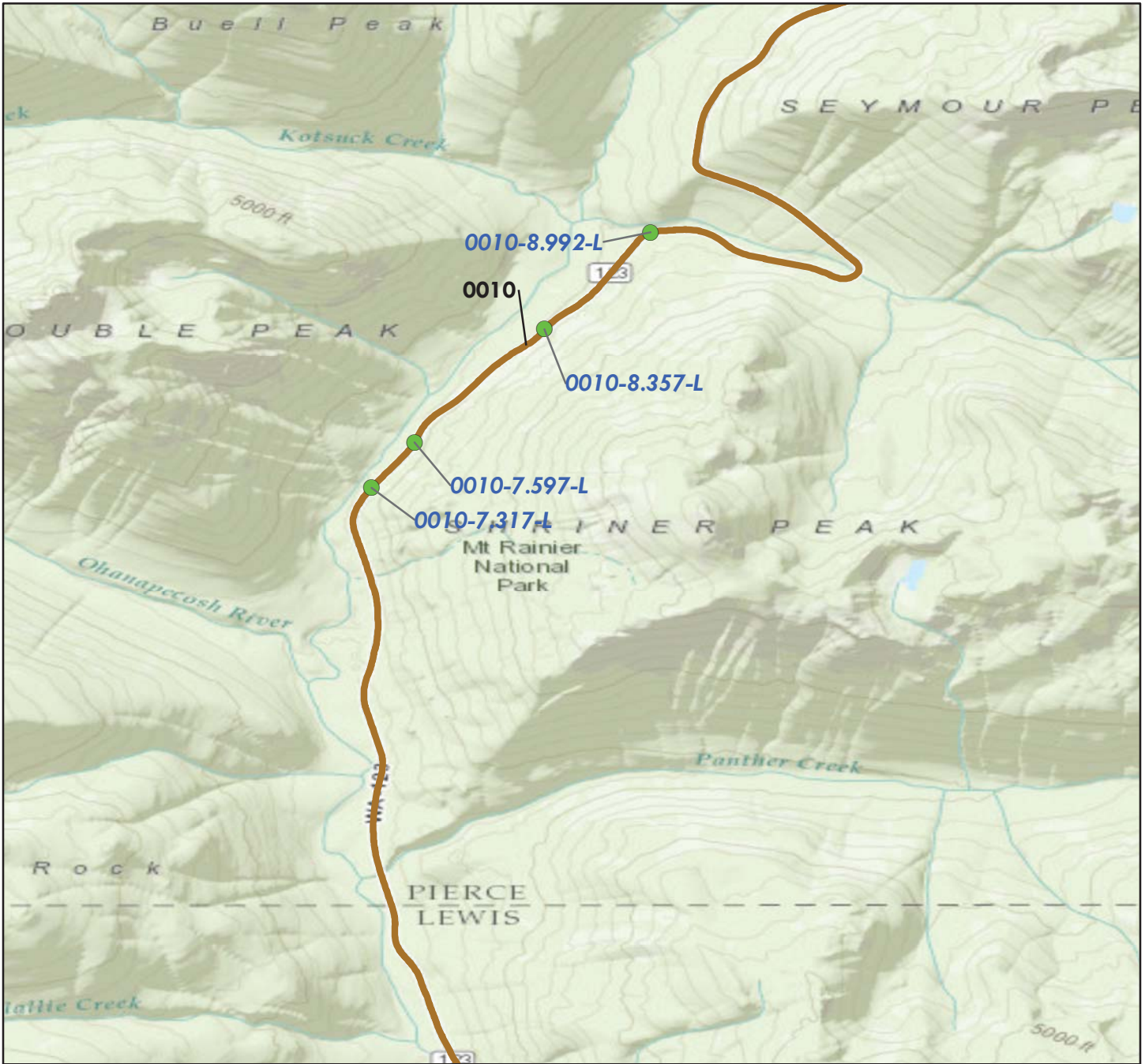
□ RIP Collected Parking



Mount Rainier National Park

WALL LOCATION MAP

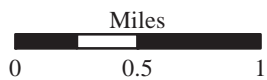
Map 3



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

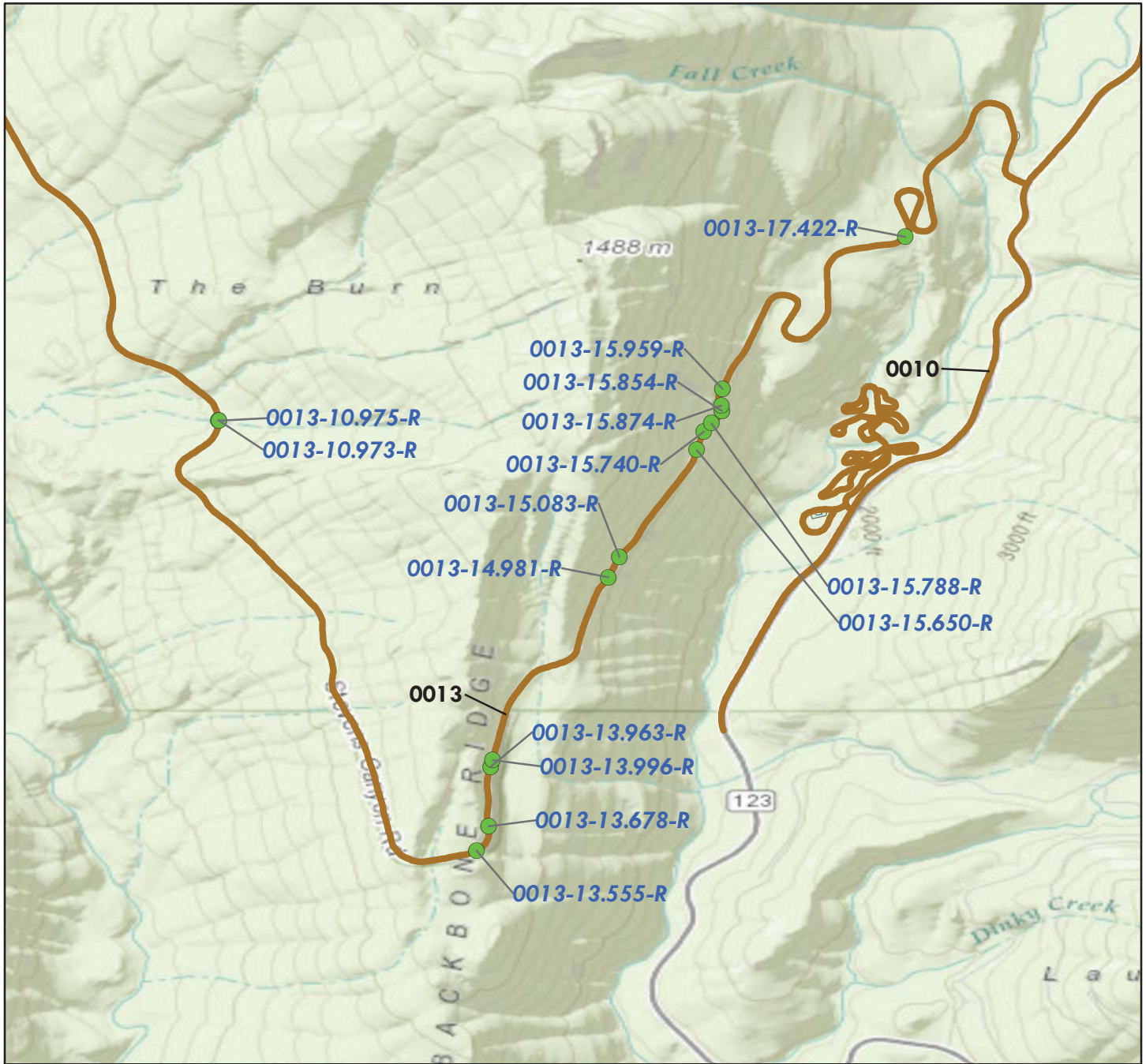
— RIP Collected Routes



Mount Rainier National Park

WALL LOCATION MAP

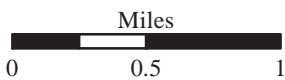
Map 4



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

● Wall Locations

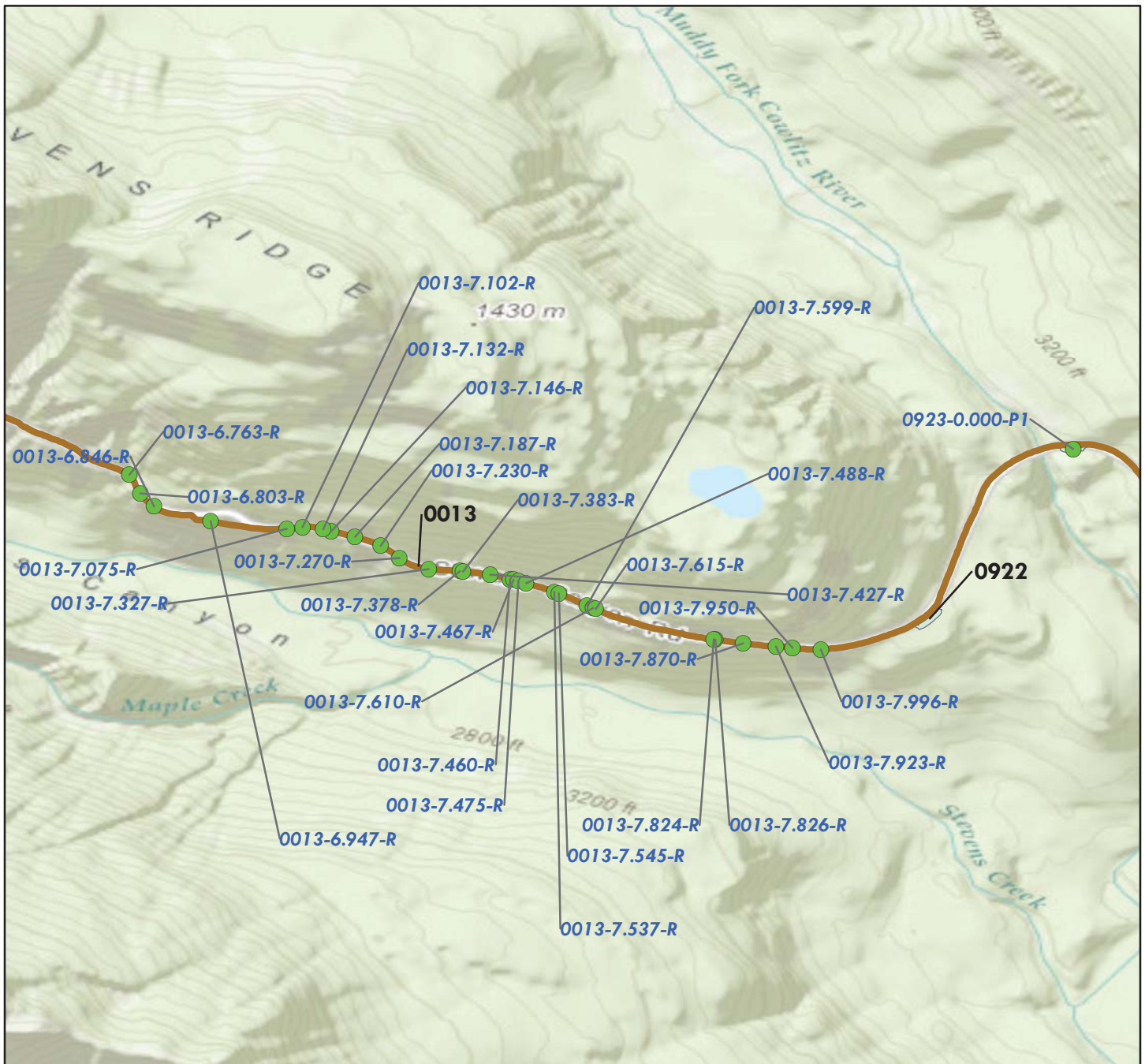
— RIP Collected Routes



Mount Rainier National Park

WALL LOCATION MAP

Map 5



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

● Wall Locations

— RIP Collected Routes

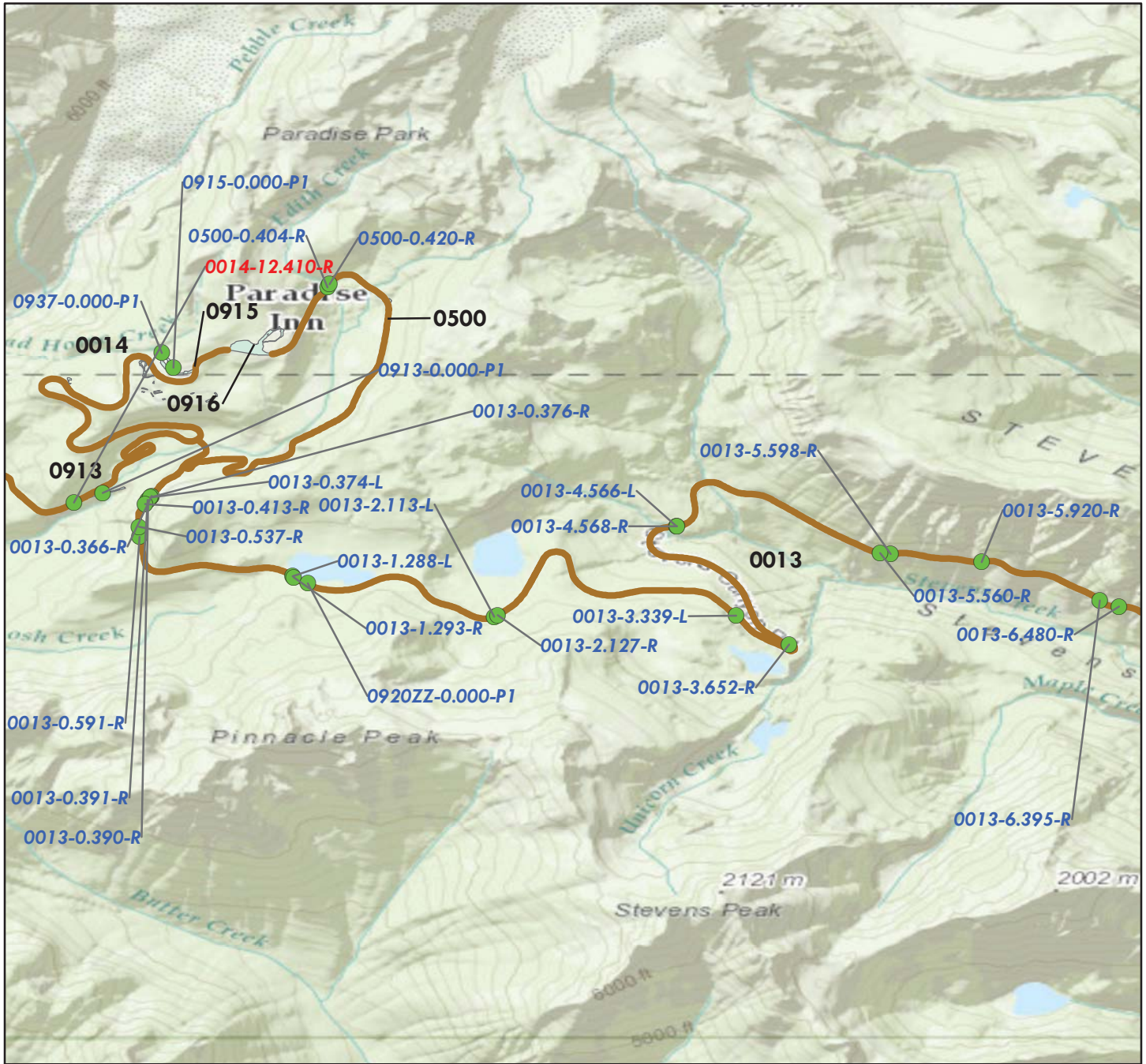
■ RIP Collected Parking



Mount Rainier National Park

WALL LOCATION MAP

Map 6



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

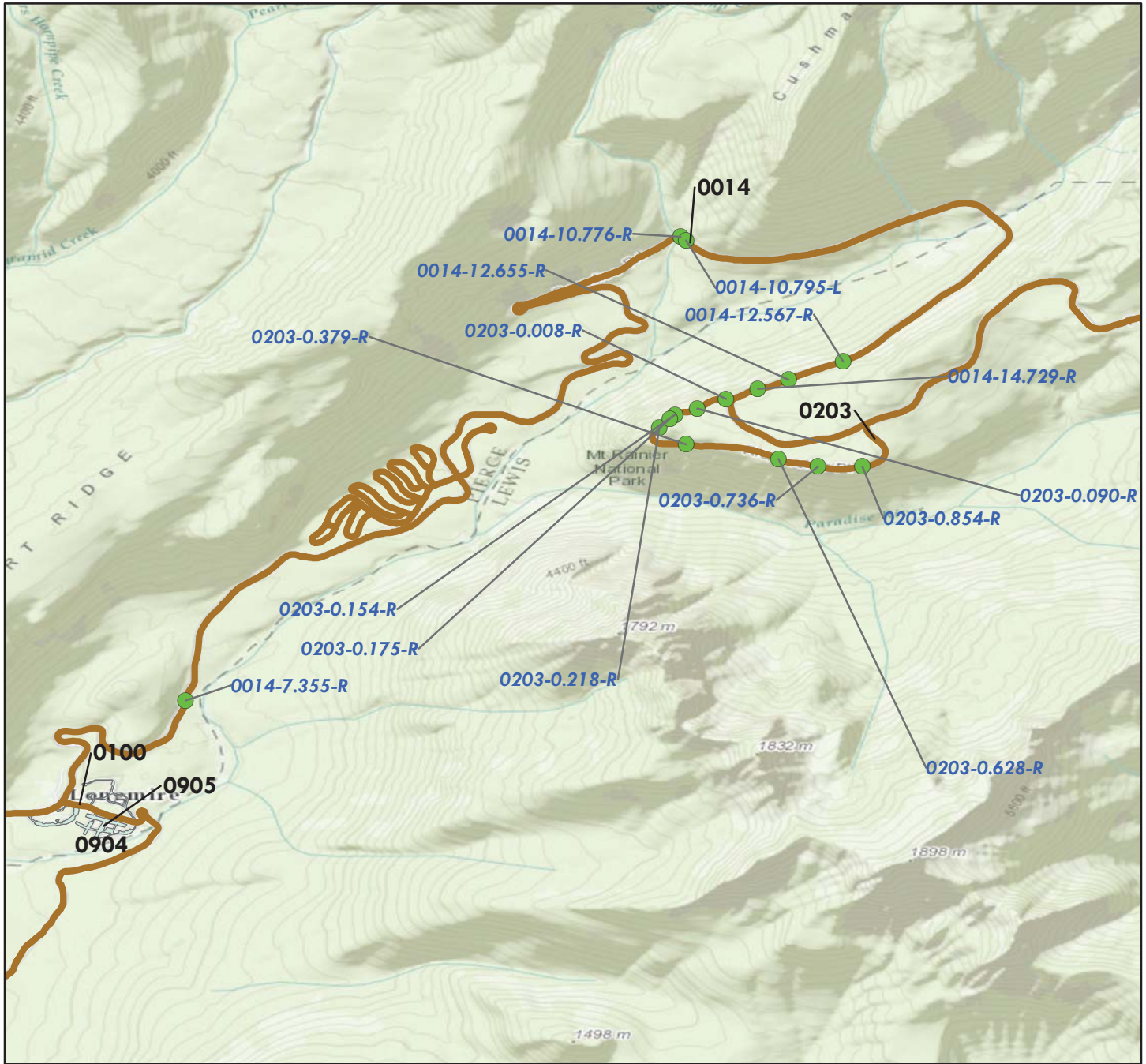
■ RIP Collected Parking



Mount Rainier National Park

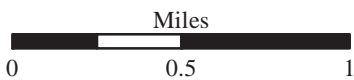
WALL LOCATION MAP

Map 7



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
- RIP Collected Parking



Tier 1 Park Retaining Wall Overview



Mount Rainier National Park



Federal Lands Highway
Road Inventory Program

Parkwide Summary: Mount Rainier National Park

Initial retaining wall inspections were conducted at Mount Rainier National Park 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 Mount Rainier National Park in 2009 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, 133 walls were inventoried on the routes listed below.

Table 1: Number of Walls by Route

Route Number	Route Name	No. of Walls
0010	STATE ROUTE 123 (EAST SIDE HIGHWAY)	14
0011	SUNRISE ROAD	5
0012	STATE ROUTE 410 (MATHER MEMORIAL PARKWAY)	25
0013	STEVENS CANYON ROAD	66
0014	STATE ROUTE 706 (NISQUALLY ROAD)	7
0203	MILLER CUT OFF / RICKSECKER POINT LOOP ROAD	9
0500	VALLEY ROAD	2
0913	NARADA FALLS PARKING	1
0915	PARADISE PARKING (LOWER LOT)	1
0920ZZ	REFLECTION LAKES PARKING COMPLEX	1
0923	BOX CANYON OVERLOOK / EXHIBIT PARKING	1
0937	PARADISE RESIDENCE ROAD PARKING	1

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

Wall Function	No. of Walls
CW - Cut Wall	6
FW - Fill Wall	111
HW - Head Wall	16

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	5
GD, Gravity - Dry Stone	39
GG, Gravity - Gabion	1
GM, Gravity - Mortared Stone	85
MP, MSE - Precast Panel	2
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	95
Monitor	\$0	0
Maintenance	\$6,800	8
Repair Elements	\$559,100	27
Replace Elements	\$40,600	2
Replace Wall	\$9,000	1
Totals	\$615,500	133

*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

Cost Range*	No. of Walls
\$0	95
\$1 - \$25,000	32
\$25,001 - \$50,000	4
\$50,001 - \$100,000	0
\$100,001 - \$250,000	2
\$250,001 - \$500,000	0
\$500,001 - \$1,000,000	0
\$1,000,001 - \$2,000,000	0
\$2,000,001 - \$3,000,000	0
\$3,000,001 - \$4,000,000	0
Total Number of Walls	133

*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 Mount Rainier National Park. 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 Mount Rainier National Park 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

Wall Identification	Failure Consequence⁽¹⁾	Wall Rating⁽²⁾	Recommended Action⁽³⁾	2007 Repair Costs⁽⁴⁾
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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



Mount Rainier National Park



Federal Lands Highway
Road Inventory Program

Mount Rainier National Park

ROUTE 0010: STATE ROUTE 123 (EAST SIDE HIGHWAY)



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

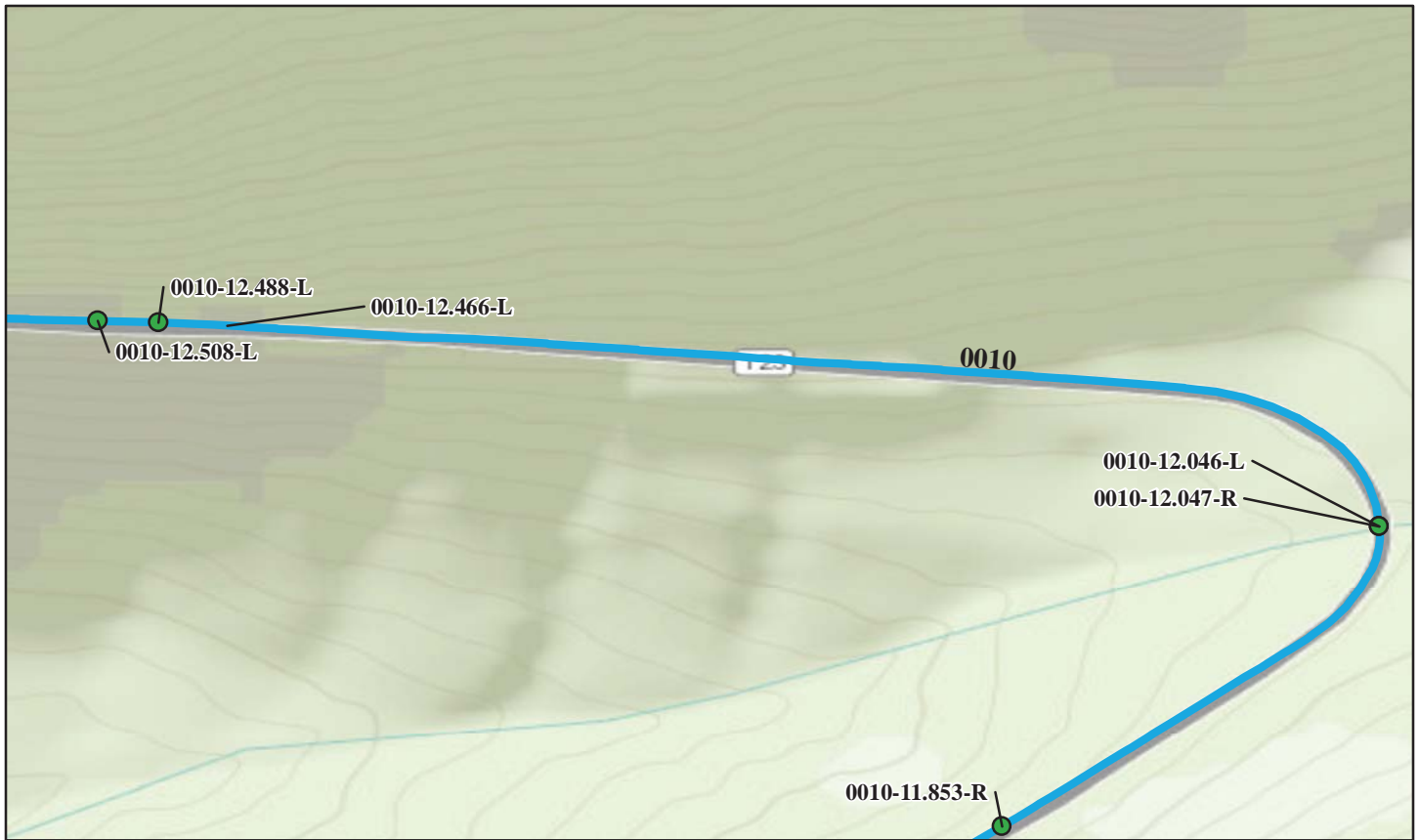
Critical / Poor (0 - 49)	Fair (50 - 69)	Good to Excellent (70 - 100)	No Data
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Wall ID Inspection Date:	Wall Area (Sq. Ft.)	Wall Length (Ft.)	Wall Type	Wall Function	Overall Rating	Repair Cost
MORA-0010-7.317-L 8/27/2007	440	68	Cantilever - Concrete	Fill Wall	83	\$0.00
MORA-0010-7.597-L 8/28/2007	5,531	525	Gravity - Mortared Stone	Fill Wall	83	\$0.00
MORA-0010-8.357-L 8/28/2007	4,400	360	MSE - Welded Wire Face	Fill Wall	73	\$150.00
MORA-0010-8.992-L 8/28/2007	1,701	195	Gravity - Mortared Stone	Fill Wall	88	\$0.00
MORA-0010-11.853-R 8/28/2007	115	21	Gravity - Mortared Stone	Head Wall	73	\$3,000.00

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

Mount Rainier National Park

ROUTE 0010: STATE ROUTE 123 (EAST SIDE HIGHWAY)



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)

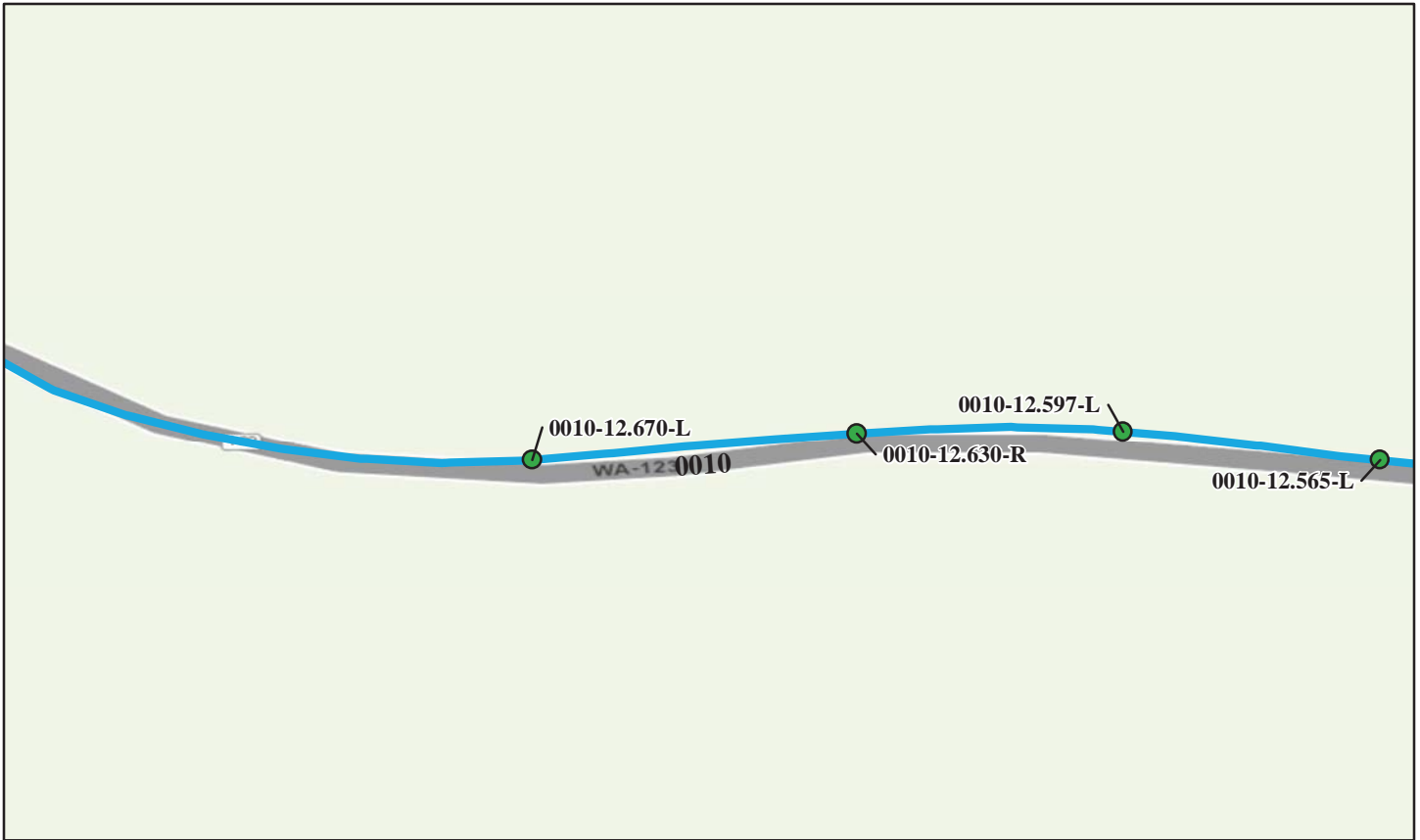
No Data

Wall ID Inspection Date:	Wall Area (Sq. Ft.)	Wall Length (Ft.)	Wall Type	Wall Function	Overall Rating	Repair Cost
MORA-0010-12.046-L 8/28/2007	250	37	Gravity - Mortared Stone	Head Wall	76	\$2,200.00
MORA-0010-12.047-R 8/28/2007	160	32	Gravity - Mortared Stone	Head Wall	71	\$25,300.00
MORA-0010-12.466-L 8/21/2007	320	70	Gravity - Mortared Stone	Fill Wall	57	\$20,000.00
MORA-0010-12.488-L 8/28/2007	230	65	Gravity - Mortared Stone	Fill Wall	79	\$0.00
MORA-0010-12.508-L 8/28/2007	561	100	Gravity - Mortared Stone	Fill Wall	85	\$0.00

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

Mount Rainier National Park

ROUTE 0010: STATE ROUTE 123 (EAST SIDE HIGHWAY)



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)

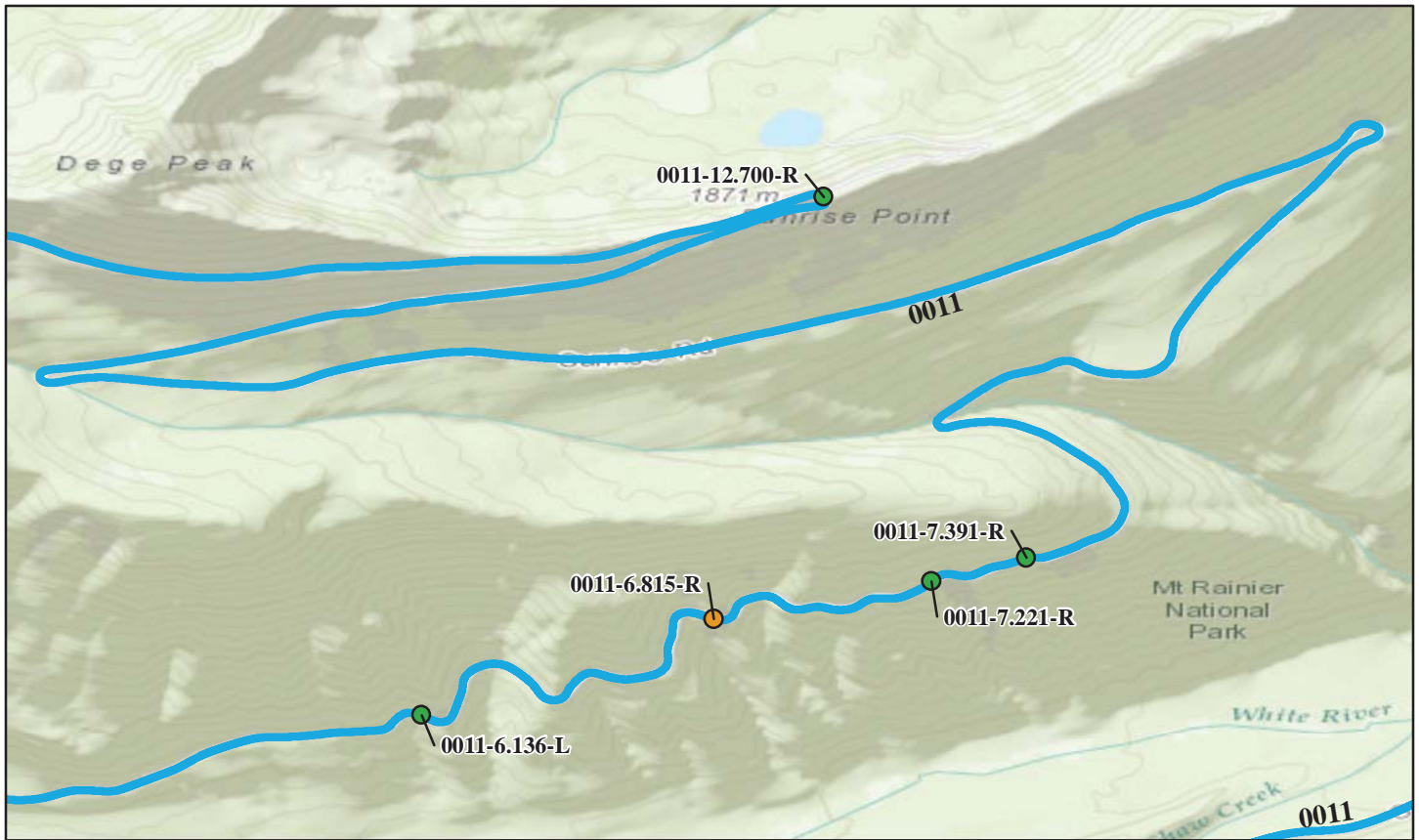
No Data

Wall ID Inspection Date:	Wall Area (Sq. Ft.)	Wall Length (Ft.)	Wall Type	Wall Function	Overall Rating	Repair Cost
MORA-0010-12.565-L 8/28/2007	877	87	Gravity - Mortared Stone	Fill Wall	82	\$0.00
MORA-0010-12.597-L 8/28/2007	530	53	Gravity - Mortared Stone	Fill Wall	84	\$0.00
MORA-0010-12.630-R 8/28/2007	1,700	135	Gravity - Mortared Stone	Fill Wall	85	\$0.00
MORA-0010-12.670-L 8/28/2007	3,800	330	Gravity - Mortared Stone	Fill Wall	80	\$0.00

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

Mount Rainier National Park

ROUTE 0011: SUNRISE 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
MORA-0011-6.136-L 8/28/2007	1,950	244	Gravity - Mortared Stone	Cut Wall	77	\$0.00
MORA-0011-6.815-R 8/28/2007	270	30	Gravity - Dry Stone	Fill Wall	67	\$800.00
MORA-0011-7.221-R 8/28/2007	2,055	248	Cantilever - Concrete	Fill Wall	82	\$2,200.00
MORA-0011-7.391-R 8/28/2007	150	30	Gravity - Mortared Stone	Fill Wall	77	\$0.00
MORA-0011-12.700-R 8/28/2007	2,050	232	Gravity - Mortared Stone	Fill Wall	82	\$16,500.00

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

Mount Rainier National Park

ROUTE 0012: STATE ROUTE 410 (MATHER MEMORIAL PARKWAY)



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)

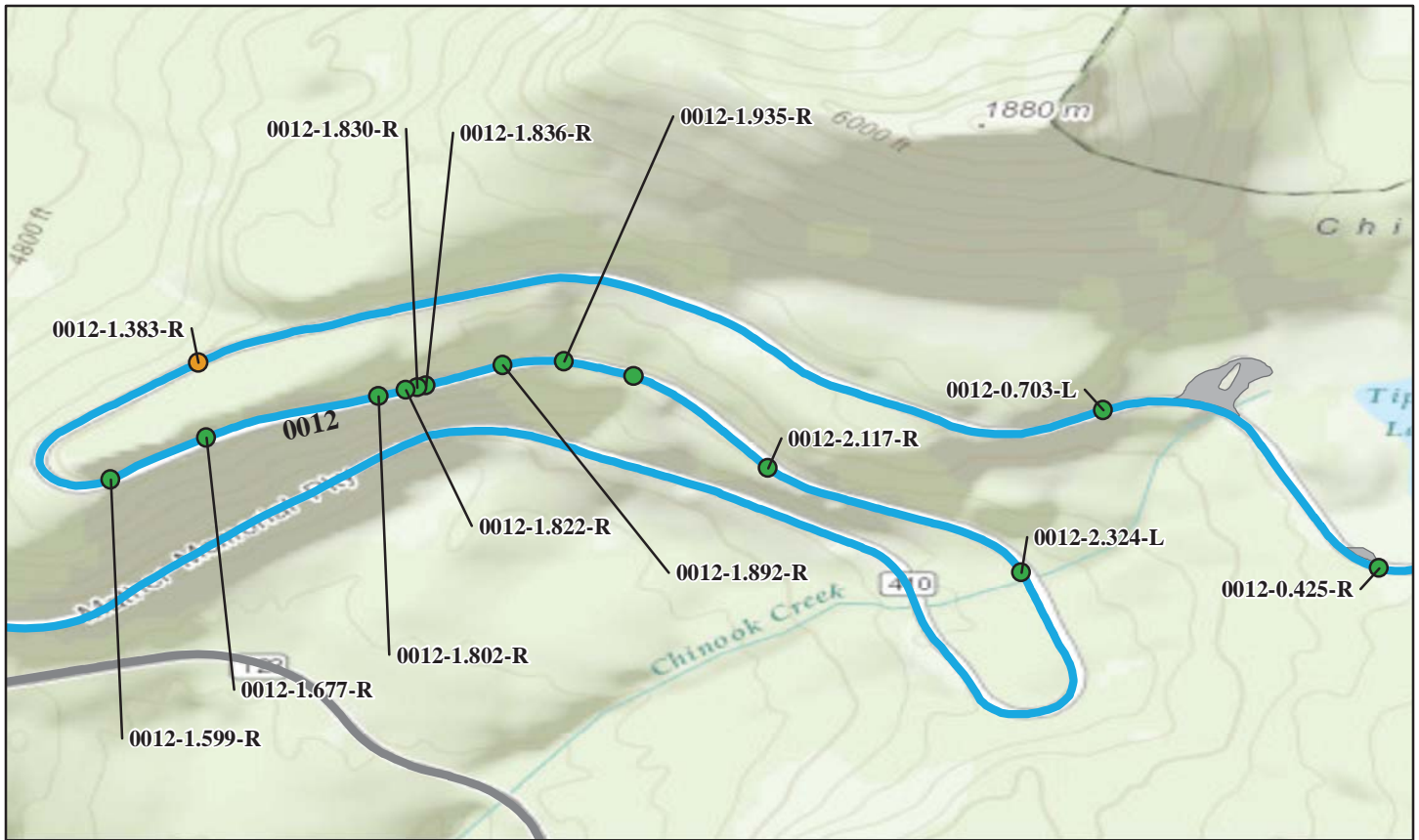
No Data

Wall ID Inspection Date:	Wall Area (Sq. Ft.)	Wall Length (Ft.)	Wall Type	Wall Function	Overall Rating	Repair Cost
MORA-0012-0.036-L 8/28/2007	2,230	328	Gravity - Dry Stone	Cut Wall	90	\$0.00
MORA-0012-0.150-L 8/28/2007	1,400	276	Gravity - Dry Stone	Fill Wall	82	\$0.00
MORA-0012-0.156-R 8/28/2007	960	190	Gravity - Dry Stone	Fill Wall	80	\$0.00
MORA-0012-0.343-L 8/28/2007	100	22	Gravity - Mortared Stone	Head Wall	75	\$0.00
MORA-0012-0.350-R 8/28/2007	646	92	Gravity - Dry Stone	Fill Wall	88	\$0.00

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

Mount Rainier National Park

ROUTE 0012: STATE ROUTE 410 (MATHER MEMORIAL PARKWAY)



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)

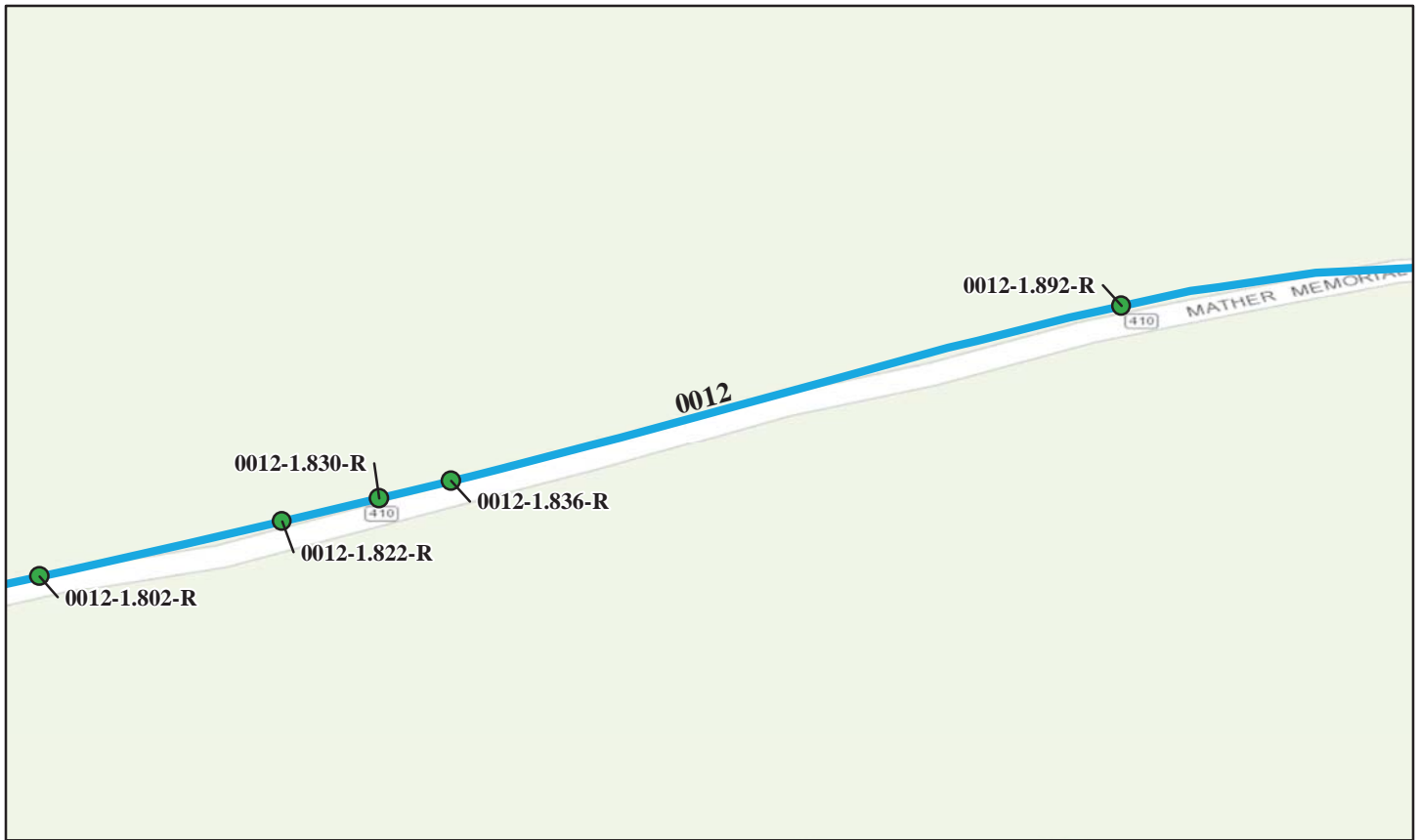
No Data

Wall ID Inspection Date:	Wall Area (Sq. Ft.)	Wall Length (Ft.)	Wall Type	Wall Function	Overall Rating	Repair Cost
MORA-0012-0.425-R 8/28/2007	850	180	Gravity - Dry Stone	Fill Wall	80	\$0.00
MORA-0012-0.703-L 8/28/2007	1,445	205	Gravity - Dry Stone	Fill Wall	88	\$0.00
MORA-0012-1.383-R 8/28/2007	2,600	325	Gravity - Gabion	Fill Wall	65	\$1,600.00
MORA-0012-1.599-R 8/28/2007	1,515	231	Gravity - Mortared Stone	Fill Wall	88	\$0.00
MORA-0012-1.677-R 8/28/2007	3,939	574	Gravity - Mortared Stone	Fill Wall	85	\$0.00

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

Mount Rainier National Park

ROUTE 0012: STATE ROUTE 410 (MATHER MEMORIAL PARKWAY)



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)

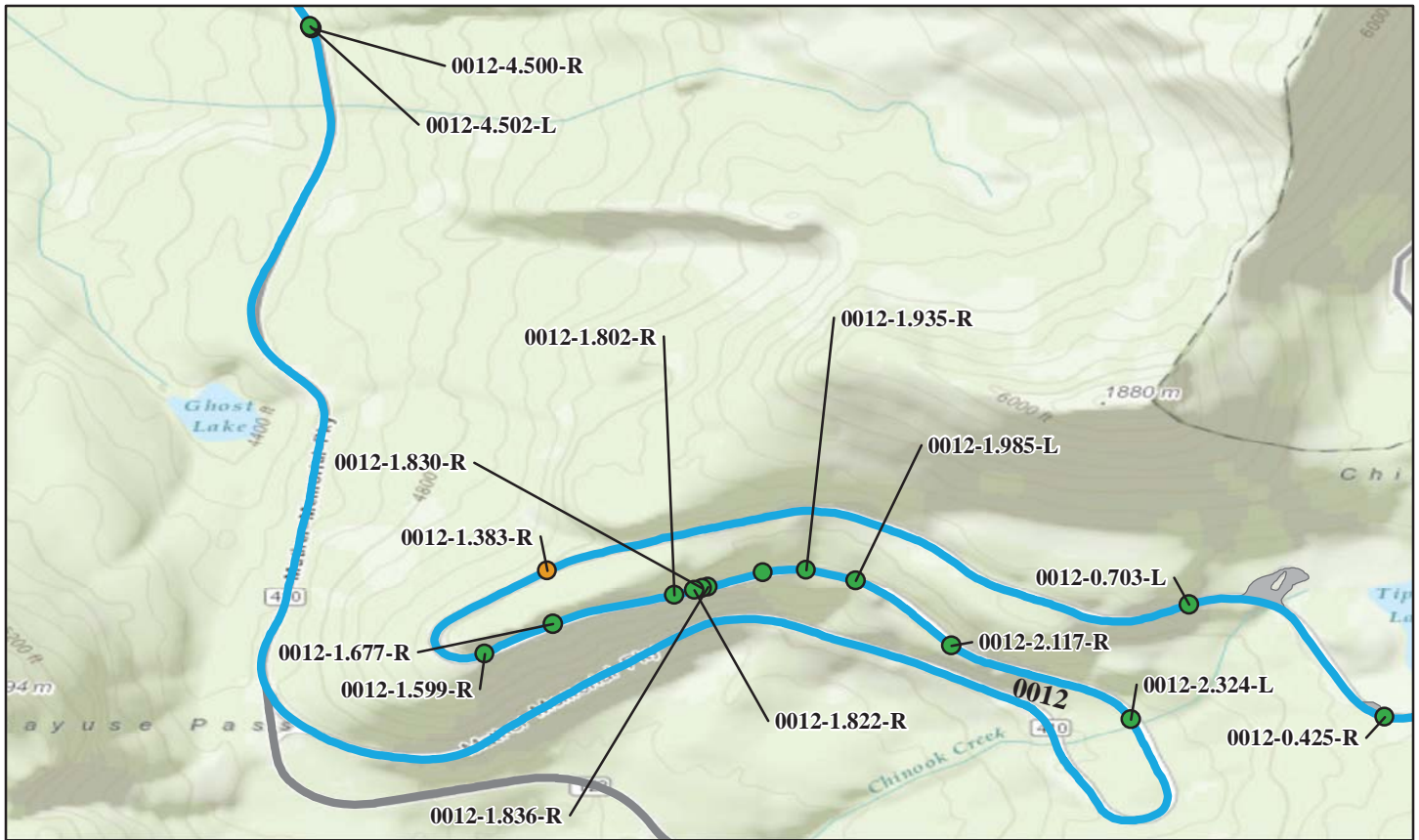
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Wall ID Inspection Date:	Wall Area (Sq. Ft.)	Wall Length (Ft.)	Wall Type	Wall Function	Overall Rating	Repair Cost
MORA-0012-1.802-R 8/28/2007	300	75	Gravity - Mortared Stone	Fill Wall	84	\$0.00
MORA-0012-1.822-R 8/28/2007	332	49	Gravity - Dry Stone	Fill Wall	90	\$0.00
MORA-0012-1.830-R 8/28/2007	156	27	Gravity - Mortared Stone	Fill Wall	90	\$0.00
MORA-0012-1.836-R 8/28/2007	400	60	Gravity - Dry Stone	Fill Wall	77	\$2,200.00
MORA-0012-1.892-R 8/28/2007	450	110	Gravity - Dry Stone	Fill Wall	80	\$0.00

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

Mount Rainier National Park

ROUTE 0012: STATE ROUTE 410 (MATHER MEMORIAL PARKWAY)



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)

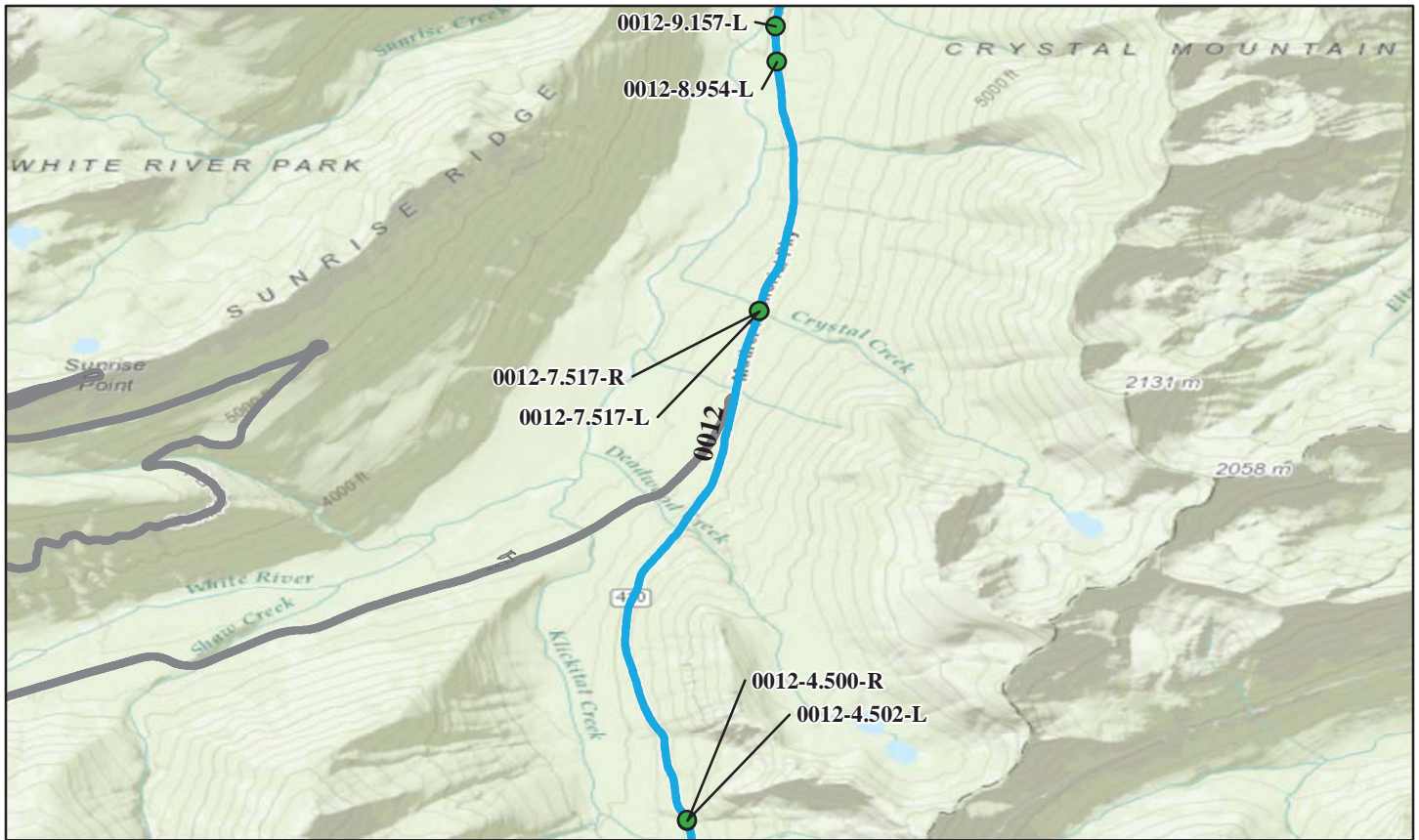
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Wall ID Inspection Date:	Wall Area (Sq. Ft.)	Wall Length (Ft.)	Wall Type	Wall Function	Overall Rating	Repair Cost
MORA-0012-1.935-R 8/28/2007	370	61	Gravity - Dry Stone	Fill Wall	82	\$0.00
MORA-0012-1.985-L 8/29/2007	535	107	Gravity - Dry Stone	Cut Wall	90	\$0.00
MORA-0012-2.117-R 8/29/2007	5,100	275	Gravity - Mortared Stone	Fill Wall	80	\$0.00
MORA-0012-2.324-L 8/29/2007	61	18	Gravity - Mortared Stone	Head Wall	80	\$500.00
MORA-0012-4.500-R 8/29/2007	65	14	Gravity - Mortared Stone	Head Wall	81	\$700.00

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

Mount Rainier National Park

ROUTE 0012: STATE ROUTE 410 (MATHER MEMORIAL PARKWAY)



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
MORA-0012-4.502-L 8/29/2007	70	17	Gravity - Mortared Stone	Fill Wall	80	\$0.00
MORA-0012-7.517-L 8/29/2007	80	23	Cantilever - Concrete	Head Wall	80	\$0.00
MORA-0012-7.517-R 8/29/2007	90	27	Cantilever - Concrete	Head Wall	85	\$0.00
MORA-0012-8.954-L 8/29/2007	190	45	Gravity - Mortared Stone	Fill Wall	85	\$0.00
MORA-0012-9.157-L 8/29/2007	110	22	Gravity - Mortared Stone	Fill Wall	78	\$0.00

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

Mount Rainier National Park

ROUTE 0013: STEVENS CANYON ROAD



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

Retaining Wall Condition Legend – Wall Condition Rating

Critical / Poor (0 - 49)

Fair (50 - 69)

Good to Excellent (70 - 100)

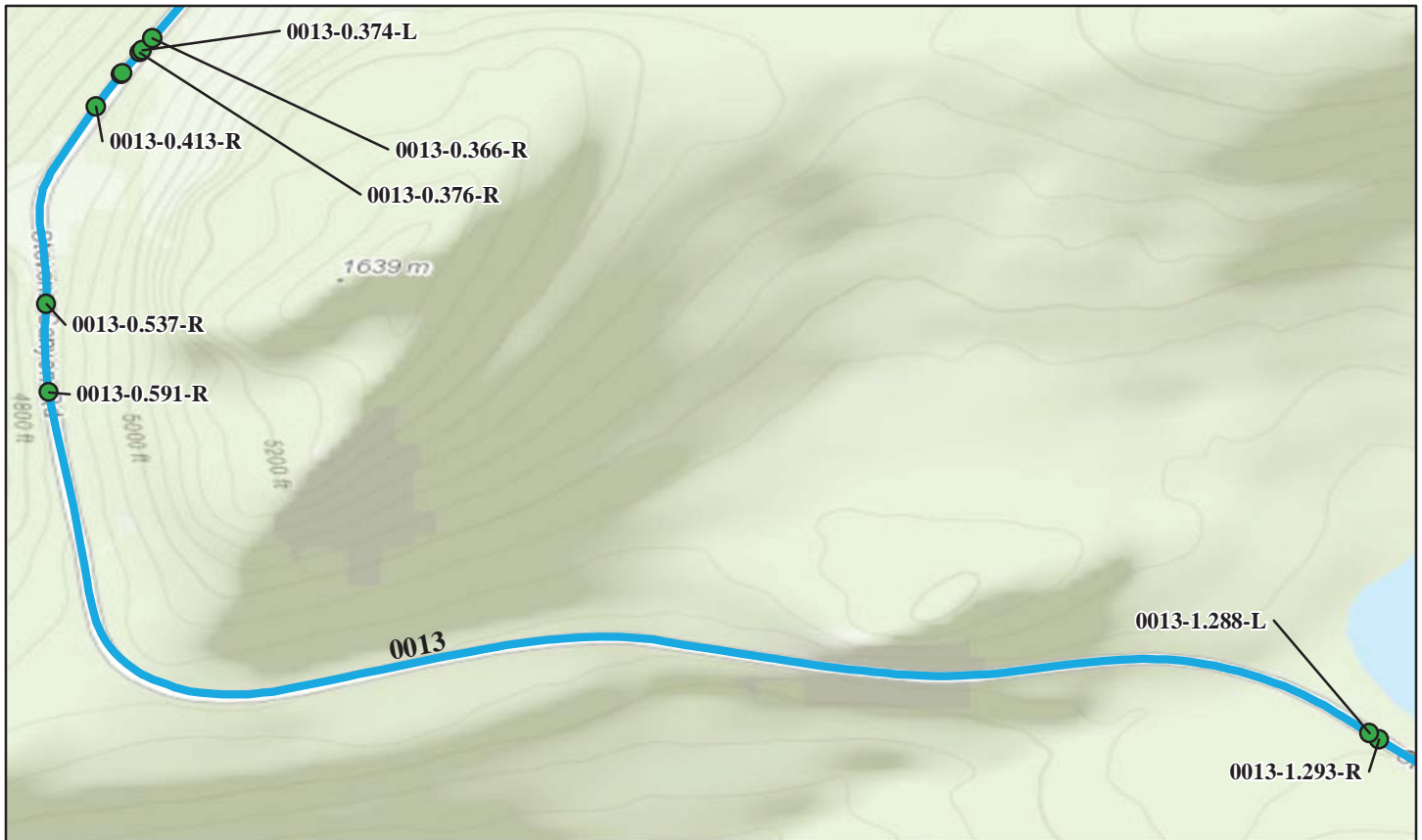
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Wall ID Inspection Date:	Wall Area (Sq. Ft.)	Wall Length (Ft.)	Wall Type	Wall Function	Overall Rating	Repair Cost
MORA-0013-0.366-R 8/22/2007	150	25	Gravity - Dry Stone	Fill Wall	79	\$0.00
MORA-0013-0.374-L 8/22/2007	5,130	590	Gravity - Mortared Stone	Cut Wall	72	\$137,000.00
MORA-0013-0.376-R 8/22/2007	120	30	Gravity - Mortared Stone	Fill Wall	72	\$0.00
MORA-0013-0.390-R 8/22/2007	209	22	Gravity - Mortared Stone	Fill Wall	86	\$0.00
MORA-0013-0.391-R 8/22/2007	209	22	Gravity - Mortared Stone	Fill Wall	86	\$0.00

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

Mount Rainier National Park

ROUTE 0013: STEVENS CANYON ROAD



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

Retaining Wall Condition Legend – Wall Condition Rating

Critical / Poor (0 - 49)

Fair (50 - 69)

Good to Excellent (70 - 100)

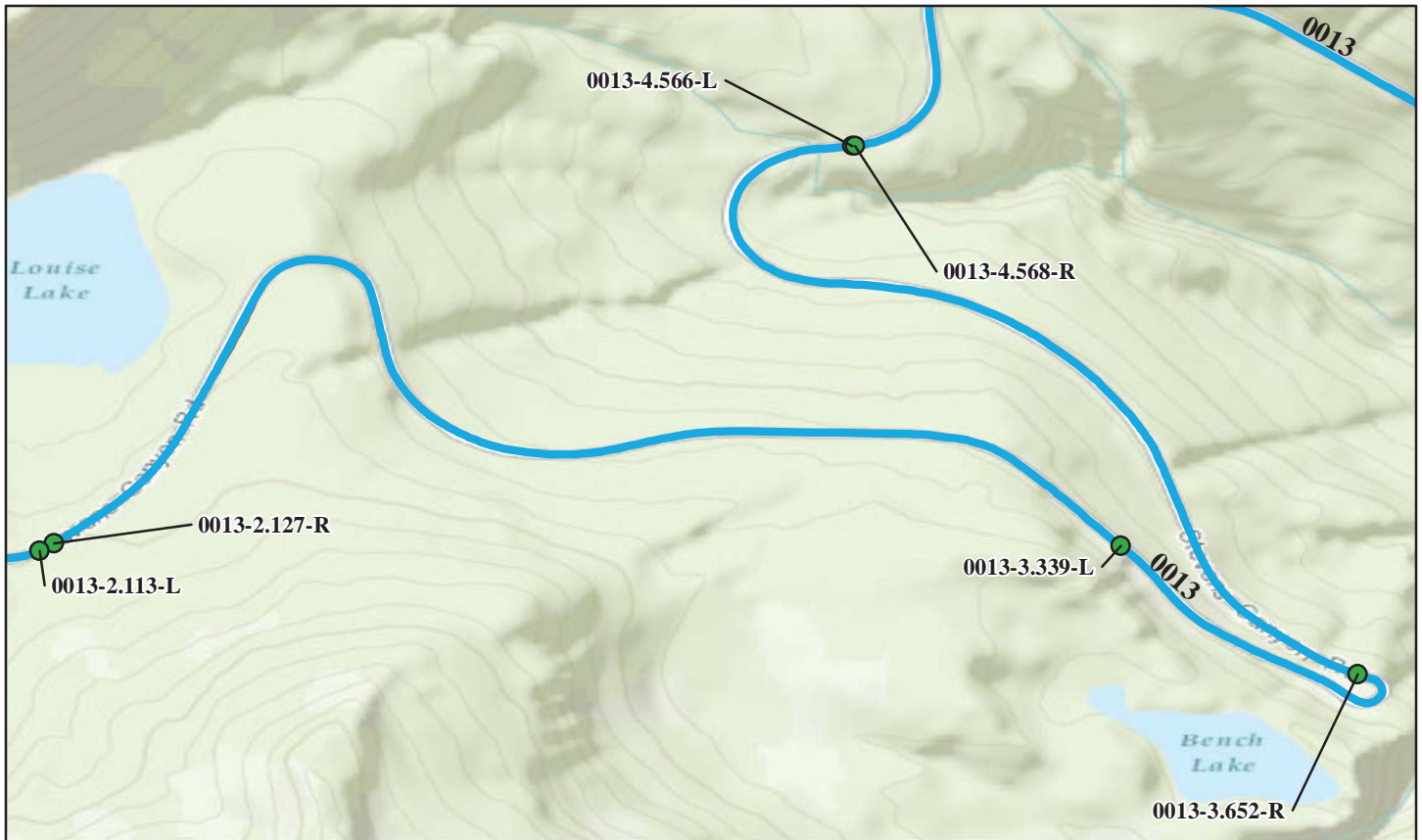
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Wall ID Inspection Date:	Wall Area (Sq. Ft.)	Wall Length (Ft.)	Wall Type	Wall Function	Overall Rating	Repair Cost
MORA-0013-0.413-R 8/22/2007	216	27	Gravity - Dry Stone	Fill Wall	79	\$0.00
MORA-0013-0.537-R 8/22/2007	3,200	220	Gravity - Mortared Stone	Fill Wall	77	\$0.00
MORA-0013-0.591-R 8/22/2007	11,780	642	Gravity - Mortared Stone	Fill Wall	80	\$0.00
MORA-0013-1.288-L 8/22/2007	70	16	Gravity - Mortared Stone	Head Wall	80	\$2,000.00
MORA-0013-1.293-R 8/22/2007	54	10	Gravity - Mortared Stone	Head Wall	85	\$0.00

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

Mount Rainier National Park

ROUTE 0013: STEVENS CANYON ROAD



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

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
MORA-0013-2.113-L 8/22/2007	500	130	Gravity - Mortared Stone	Head Wall	75	\$0.00
MORA-0013-2.127-R 8/22/2007	110	35	Gravity - Mortared Stone	Head Wall	88	\$0.00
MORA-0013-3.339-L 8/22/2007	2,585	70	Gravity - Dry Stone	Fill Wall	86	\$0.00
MORA-0013-3.652-R 8/22/2007	5,500	250	Gravity - Mortared Stone	Fill Wall	77	\$0.00
MORA-0013-4.566-L 8/22/2007	112	32	Gravity - Mortared Stone	Head Wall	66	\$8,700.00

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

Mount Rainier National Park

ROUTE 0013: STEVENS CANYON ROAD



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

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
MORA-0013-4.568-R 8/22/2007	110	34	Gravity - Mortared Stone	Head Wall	71	\$8,200.00
MORA-0013-5.560-R 8/22/2007	570	100	Gravity - Mortared Stone	Fill Wall	80	\$0.00
MORA-0013-5.598-R 8/22/2007	1,850	50	Gravity - Dry Stone	Fill Wall	77	\$0.00
MORA-0013-5.920-R 8/22/2007	2,160	275	Gravity - Mortared Stone	Fill Wall	76	\$50,000.00
MORA-0013-6.395-R 8/22/2007	650	80	Gravity - Mortared Stone	Fill Wall	78	\$0.00

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

Mount Rainier National Park

ROUTE 0013: STEVENS CANYON ROAD



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

Retaining Wall Condition Legend – Wall Condition Rating

Critical / Poor (0 - 49)

Fair (50 - 69)

Good to Excellent (70 - 100)

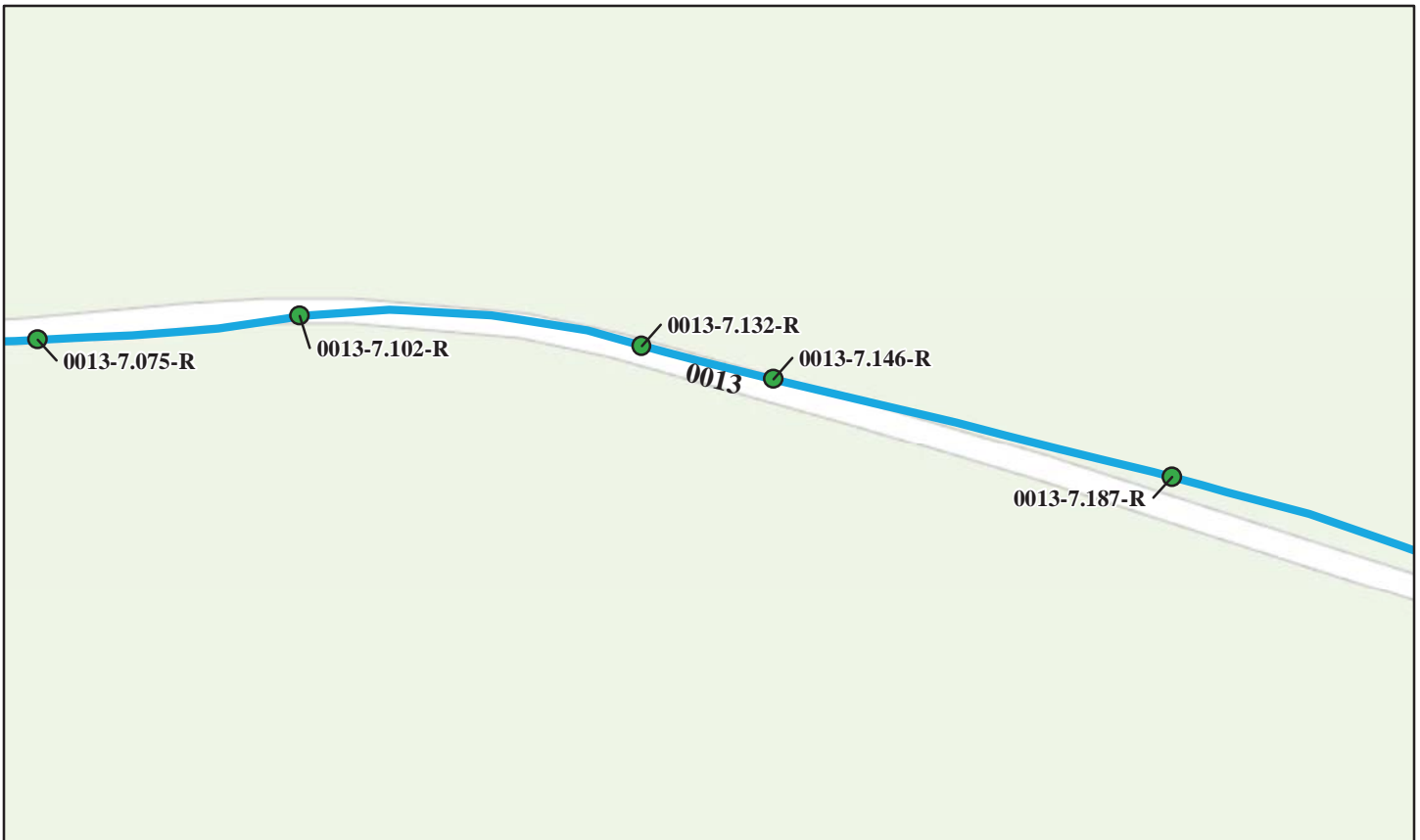
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Wall ID Inspection Date:	Wall Area (Sq. Ft.)	Wall Length (Ft.)	Wall Type	Wall Function	Overall Rating	Repair Cost
MORA-0013-6.480-R 8/22/2007	369	84	Gravity - Mortared Stone	Fill Wall	85	\$0.00
MORA-0013-6.763-R 8/22/2007	1,200	143	Gravity - Mortared Stone	Fill Wall	82	\$2,100.00
MORA-0013-6.803-R 8/22/2007	720	53	Gravity - Dry Stone	Fill Wall	79	\$0.00
MORA-0013-6.846-R 8/22/2007	1,900	269	Gravity - Mortared Stone	Fill Wall	85	\$0.00
MORA-0013-6.947-R 8/22/2007	350	86	Gravity - Mortared Stone	Fill Wall	78	\$0.00

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

Mount Rainier National Park

ROUTE 0013: STEVENS CANYON ROAD



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

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
MORA-0013-7.075-R 8/23/2007	402	67	Gravity - Mortared Stone	Fill Wall	88	\$0.00
MORA-0013-7.102-R 8/23/2007	585	97	Gravity - Dry Stone	Fill Wall	75	\$0.00
MORA-0013-7.132-R 8/23/2007	500	46	Gravity - Dry Stone	Fill Wall	77	\$10,000.00
MORA-0013-7.146-R 8/23/2007	2,200	135	Gravity - Dry Stone	Fill Wall	76	\$0.00
MORA-0013-7.187-R 8/23/2007	924	108	Gravity - Mortared Stone	Fill Wall	85	\$0.00

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

Mount Rainier National Park

ROUTE 0013: STEVENS CANYON ROAD



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

Retaining Wall Condition Legend – Wall Condition Rating

Critical / Poor (0 - 49)

Fair (50 - 69)

Good to Excellent (70 - 100)

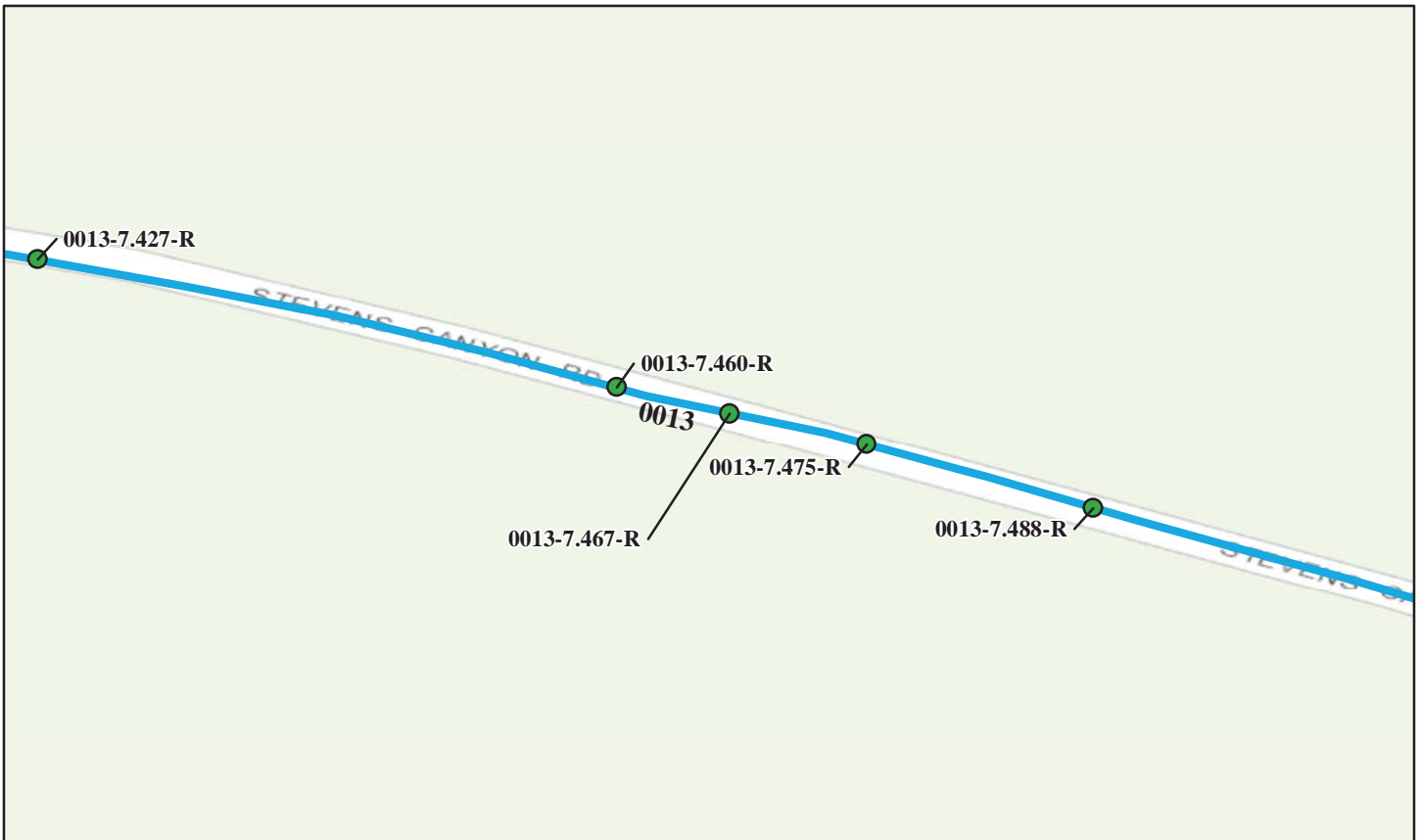
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Wall ID Inspection Date:	Wall Area (Sq. Ft.)	Wall Length (Ft.)	Wall Type	Wall Function	Overall Rating	Repair Cost
MORA-0013-7.230-R 8/23/2007	4,225	133	Gravity - Dry Stone	Fill Wall	83	\$4,800.00
MORA-0013-7.270-R 8/23/2007	1,200	94	Gravity - Mortared Stone	Fill Wall	71	\$6,000.00
MORA-0013-7.327-R 8/23/2007	8,100	225	Gravity - Dry Stone	Fill Wall	77	\$0.00
MORA-0013-7.378-R 8/23/2007	90	18	Gravity - Mortared Stone	Fill Wall	82	\$0.00
MORA-0013-7.383-R 8/23/2007	4,008	139	Gravity - Dry Stone	Fill Wall	83	\$0.00

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

Mount Rainier National Park

ROUTE 0013: STEVENS CANYON ROAD



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

Retaining Wall Condition Legend – Wall Condition Rating

Critical / Poor (0 - 49)

Fair (50 - 69)

Good to Excellent (70 - 100)

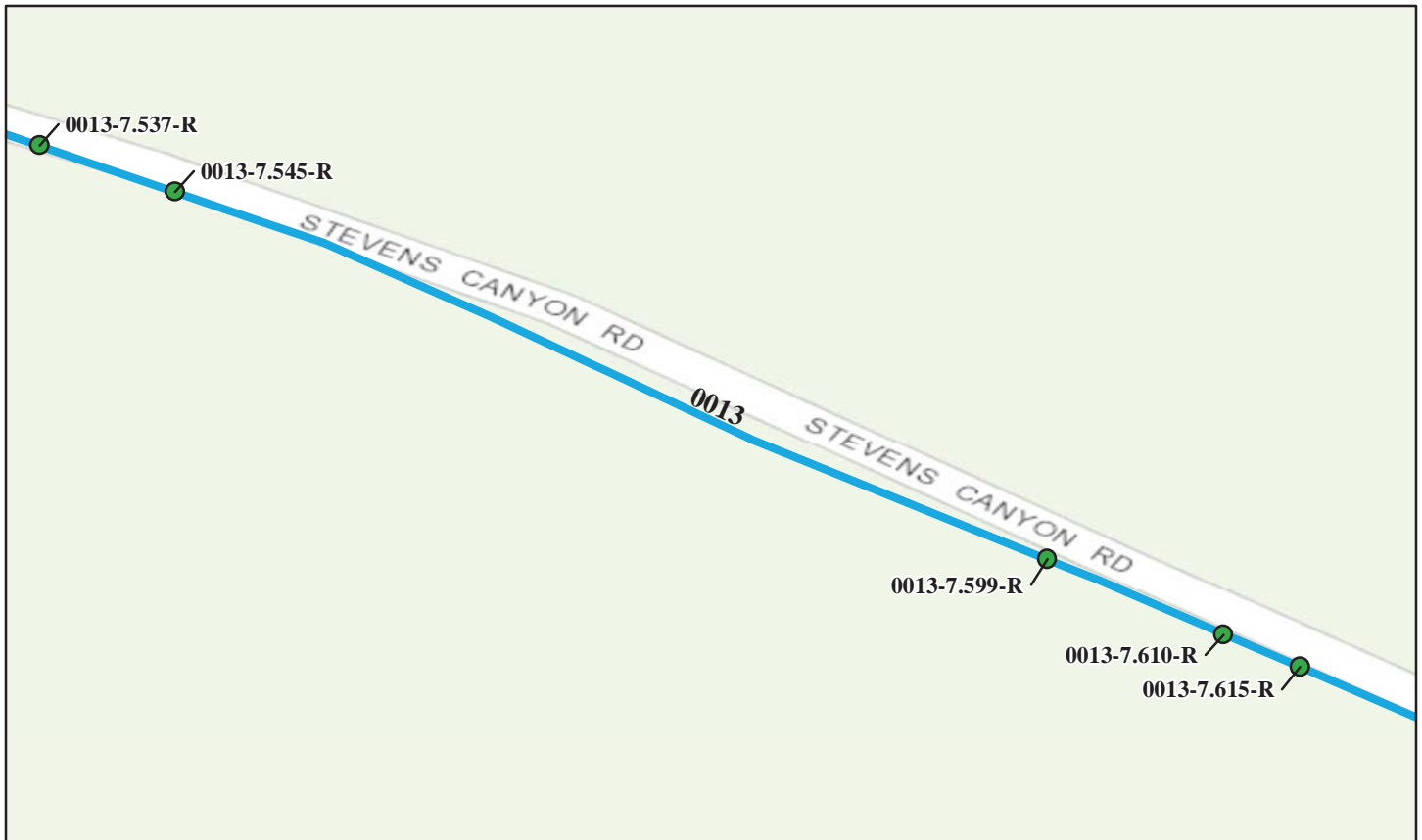
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Wall ID Inspection Date:	Wall Area (Sq. Ft.)	Wall Length (Ft.)	Wall Type	Wall Function	Overall Rating	Repair Cost
MORA-0013-7.427-R 8/23/2007	6,883	181	Gravity - Dry Stone	Fill Wall	83	\$0.00
MORA-0013-7.460-R 8/23/2007	81	18	Gravity - Mortared Stone	Fill Wall	82	\$0.00
MORA-0013-7.467-R 8/23/2007	32	14	Gravity - Mortared Stone	Fill Wall	85	\$0.00
MORA-0013-7.475-R 8/23/2007	150	42	Gravity - Mortared Stone	Fill Wall	75	\$0.00
MORA-0013-7.488-R 8/23/2007	2,200	90	Gravity - Dry Stone	Fill Wall	74	\$0.00

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

Mount Rainier National Park

ROUTE 0013: STEVENS CANYON ROAD



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

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
MORA-0013-7.537-R 8/23/2007	192	32	Gravity - Mortared Stone	Fill Wall	83	\$0.00
MORA-0013-7.545-R 8/23/2007	9,300	275	Gravity - Dry Stone	Fill Wall	73	\$0.00
MORA-0013-7.599-R 8/23/2007	300	30	Gravity - Dry Stone	Fill Wall	86	\$0.00
MORA-0013-7.610-R 8/23/2007	675	30	Gravity - Dry Stone	Fill Wall	83	\$0.00
MORA-0013-7.615-R 8/23/2007	392	28	Gravity - Dry Stone	Fill Wall	74	\$0.00

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

Mount Rainier National Park

ROUTE 0013: STEVENS CANYON ROAD



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

Retaining Wall Condition Legend – Wall Condition Rating

Critical / Poor (0 - 49)

Fair (50 - 69)

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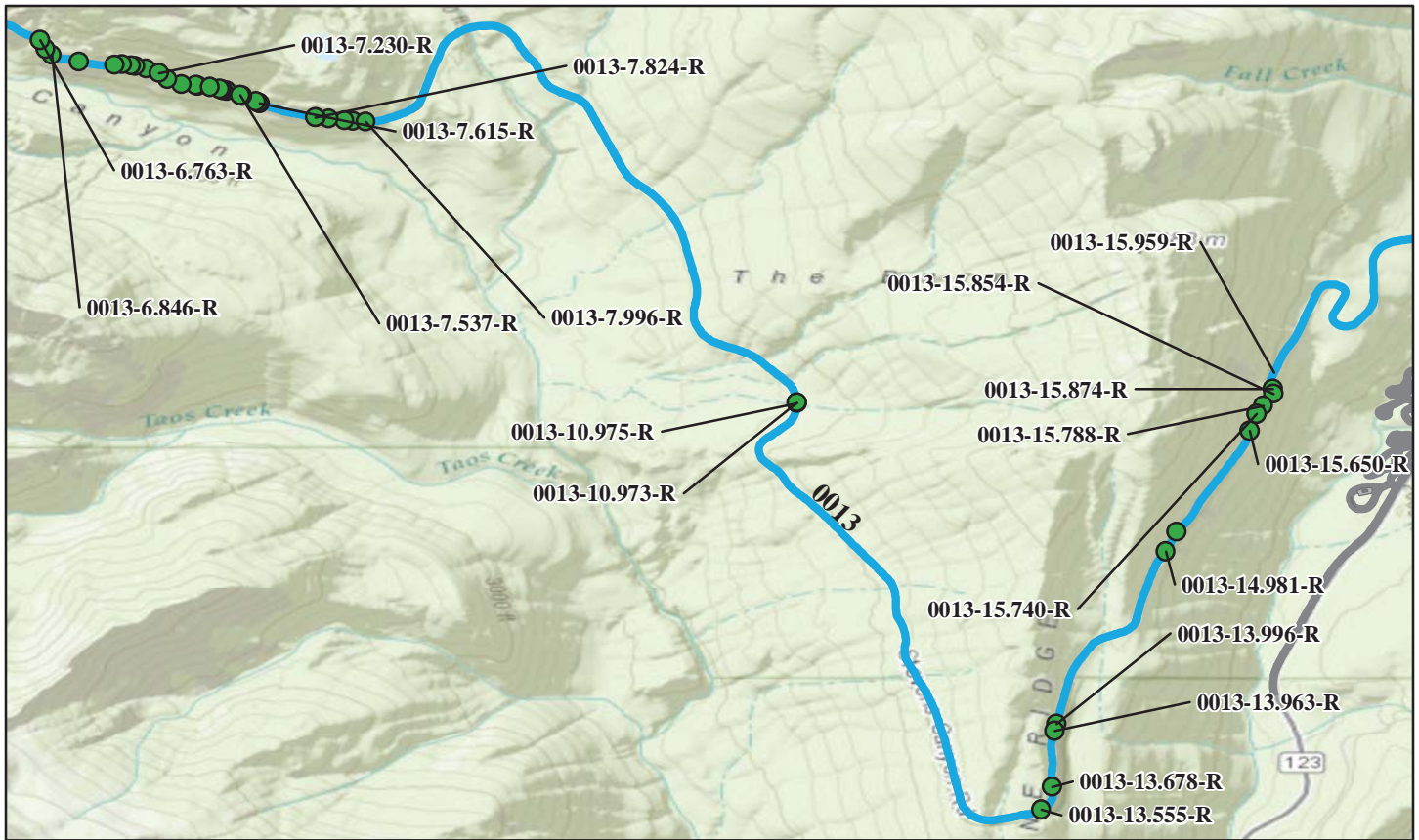
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Wall ID Inspection Date:	Wall Area (Sq. Ft.)	Wall Length (Ft.)	Wall Type	Wall Function	Overall Rating	Repair Cost
MORA-0013-7.824-R 8/23/2007	2,100	128	Gravity - Dry Stone	Fill Wall	79	\$0.00
MORA-0013-7.826-R 8/23/2007	96	24	Gravity - Mortared Stone	Fill Wall	66	\$400.00
MORA-0013-7.870-R 8/23/2007	416	26	Gravity - Dry Stone	Fill Wall	90	\$0.00
MORA-0013-7.923-R 8/23/2007	3,800	135	Gravity - Dry Stone	Fill Wall	77	\$0.00
MORA-0013-7.950-R 8/23/2007	2,250	132	Gravity - Mortared Stone	Fill Wall	72	\$4,000.00

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

Mount Rainier National Park

ROUTE 0013: STEVENS CANYON ROAD



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

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
MORA-0013-7.996-R 8/23/2007	3,588	299	Gravity - Mortared Stone	Fill Wall	88	\$0.00
MORA-0013-10.973-R 8/23/2007	160	30	Gravity - Mortared Stone	Head Wall	70	\$7,400.00
MORA-0013-10.975-R 8/23/2007	180	30	Gravity - Mortared Stone	Head Wall	76	\$13,700.00
MORA-0013-13.555-R 8/23/2007	3,550	350	MSE - Precast Panel	Fill Wall	90	\$0.00
MORA-0013-13.678-R 8/23/2007	5,850	585	MSE - Precast Panel	Fill Wall	90	\$0.00

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

Mount Rainier National Park

ROUTE 0013: STEVENS CANYON ROAD



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

Retaining Wall Condition Legend – Wall Condition Rating

Critical / Poor (0 - 49)

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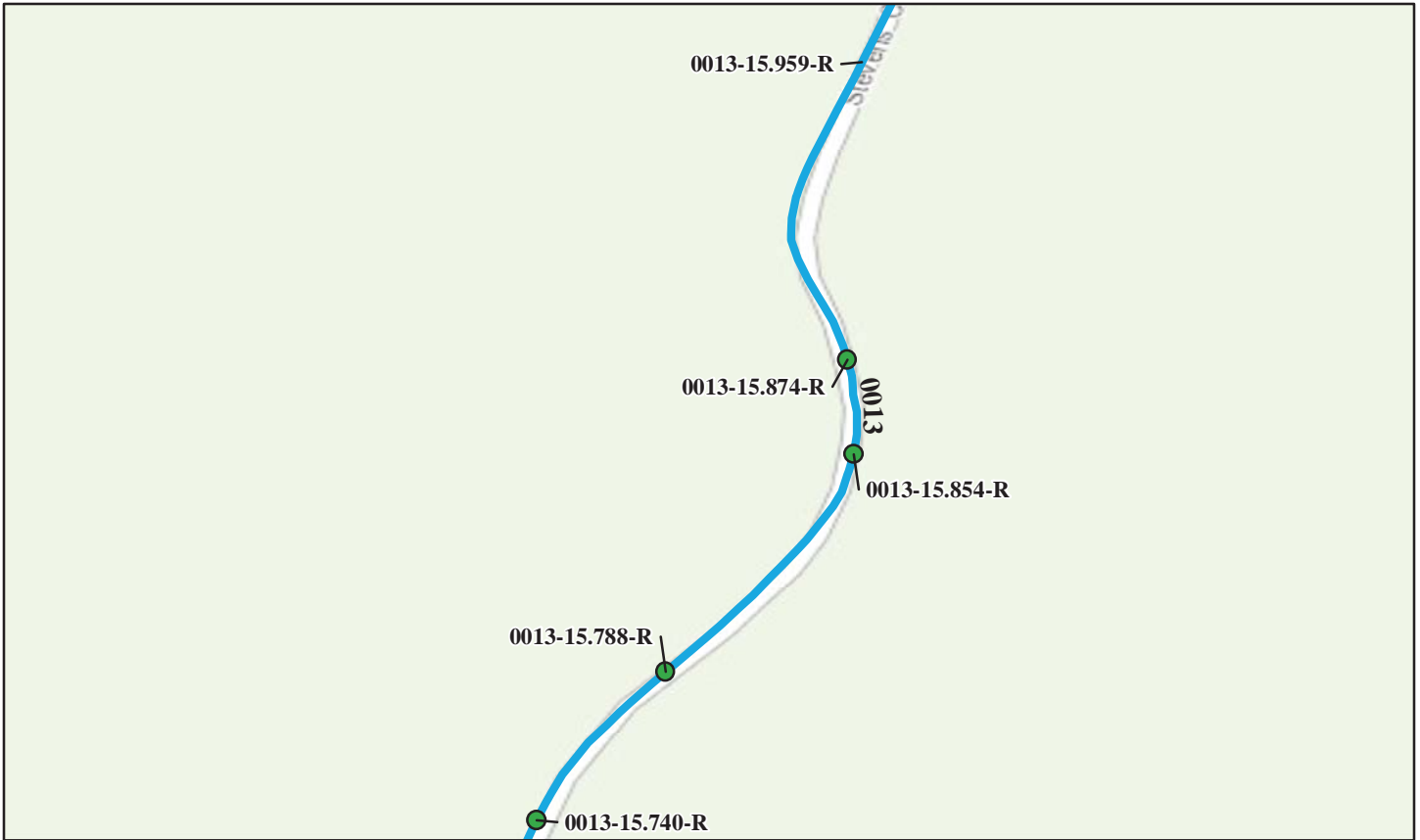
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Wall ID Inspection Date:	Wall Area (Sq. Ft.)	Wall Length (Ft.)	Wall Type	Wall Function	Overall Rating	Repair Cost
MORA-0013-13.963-R 8/23/2007	1,450	220	Gravity - Mortared Stone	Fill Wall	77	\$0.00
MORA-0013-13.996-R 8/23/2007	1,190	104	Gravity - Dry Stone	Fill Wall	75	\$400.00
MORA-0013-14.981-R 8/24/2007	5,333	334	Gravity - Mortared Stone	Fill Wall	82	\$1,000.00
MORA-0013-15.083-R 8/24/2007	621	215	Gravity - Mortared Stone	Fill Wall	80	\$0.00
MORA-0013-15.650-R 8/24/2007	1,534	198	Gravity - Mortared Stone	Fill Wall	81	\$1,200.00

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

Mount Rainier National Park

ROUTE 0013: STEVENS CANYON ROAD



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

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
MORA-0013-15.740-R 8/24/2007	1,325	98	Gravity - Mortared Stone	Fill Wall	73	\$0.00
MORA-0013-15.788-R 8/24/2007	6,223	320	Gravity - Mortared Stone	Fill Wall	83	\$0.00
MORA-0013-15.854-R 8/24/2007	960	90	Gravity - Mortared Stone	Fill Wall	78	\$0.00
MORA-0013-15.874-R 8/24/2007	1,008	155	Gravity - Mortared Stone	Fill Wall	82	\$0.00
MORA-0013-15.959-R 8/24/2007	215	65	Gravity - Dry Stone	Fill Wall	53	\$172,000.00

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

Mount Rainier National Park

ROUTE 0013: STEVENS CANYON ROAD



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

Retaining Wall Condition Legend – Wall Condition Rating

Critical / Poor (0 - 49)

Fair (50 - 69)

Good to Excellent (70 - 100)

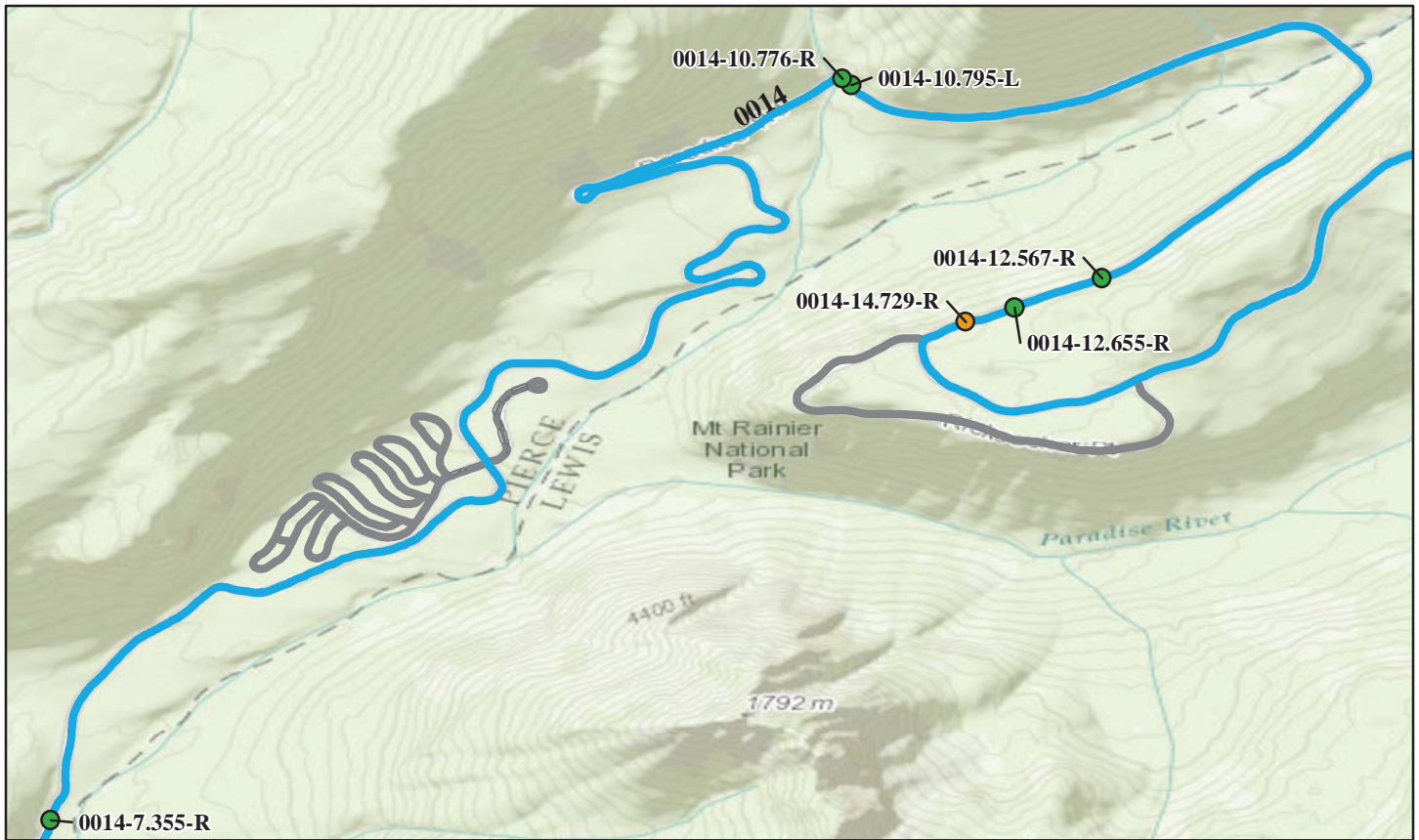
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Wall ID Inspection Date:	Wall Area (Sq. Ft.)	Wall Length (Ft.)	Wall Type	Wall Function	Overall Rating	Repair Cost
MORA-0013-17.422-R 8/24/2007	2,429	272	Gravity - Mortared Stone	Fill Wall	90	\$0.00

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

Mount Rainier National Park

ROUTE 0014: STATE ROUTE 706 (NISQUALLY 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)

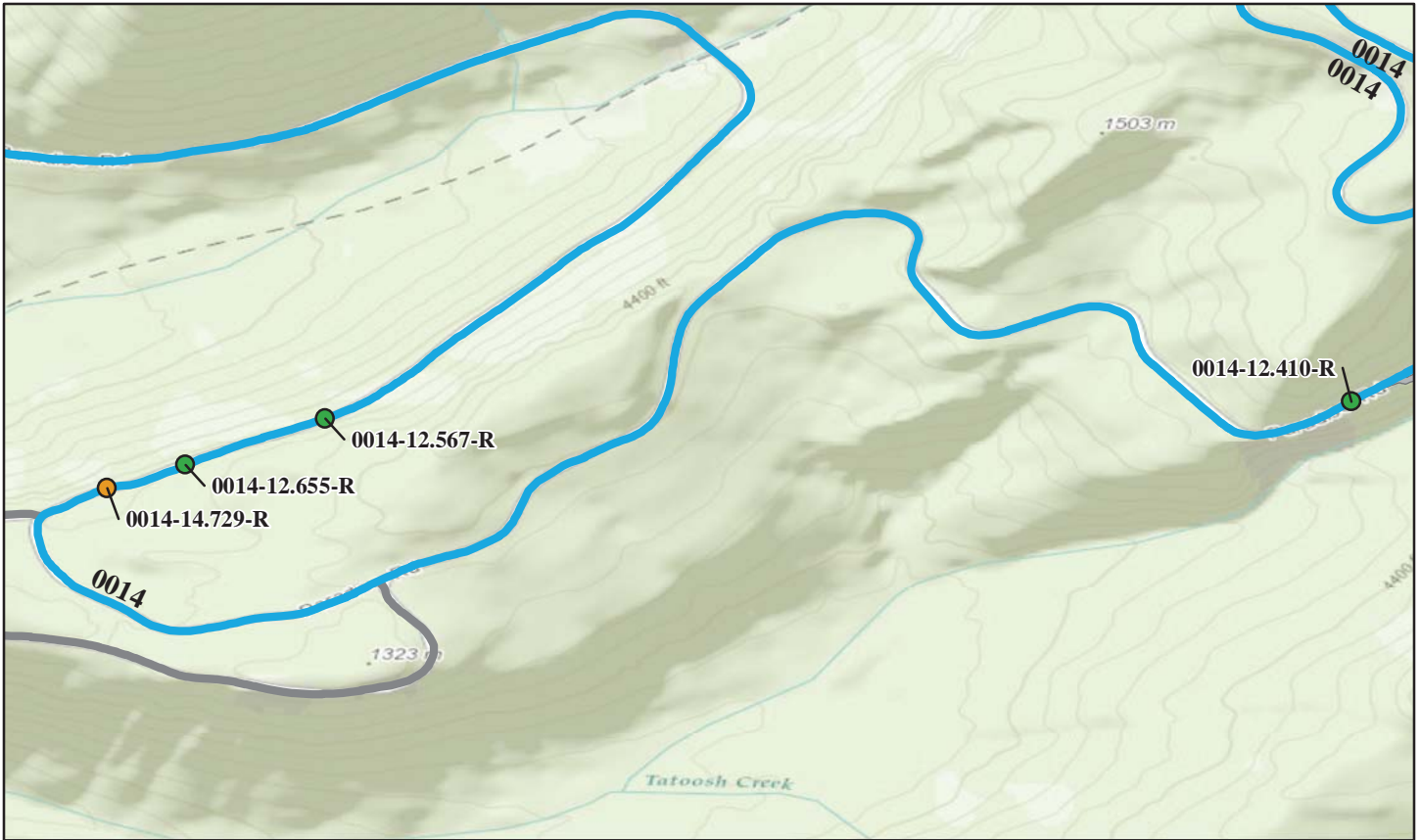
No Data

Wall ID Inspection Date:	Wall Area (Sq. Ft.)	Wall Length (Ft.)	Wall Type	Wall Function	Overall Rating	Repair Cost
MORA-0014-7.355-R 8/21/2007	300	49	Gravity - Dry Stone	Fill Wall	79	\$0.00
MORA-0014-10.776-R 8/21/2007	530	168	Gravity - Mortared Stone	Fill Wall	78	\$0.00
MORA-0014-10.795-L 8/21/2007	2,303	155	Gravity - Dry Stone	Cut Wall	76	\$0.00
MORA-0014-12.410-R 8/21/2007	2,300	345	Gravity - Mortared Stone	Fill Wall	71	\$0.00
MORA-0014-12.567-R 8/21/2007	780	132	Gravity - Mortared Stone	Fill Wall	77	\$0.00

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

Mount Rainier National Park

ROUTE 0014: STATE ROUTE 706 (NISQUALLY 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
MORA-0014-12.655-R 8/21/2007	168	56	Gravity - Mortared Stone	Fill Wall	83	\$0.00
MORA-0014-14.729-R 8/21/2007	1,325	201	Gravity - Mortared Stone	Fill Wall	68	\$30,000.00

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

Mount Rainier National Park

ROUTE 0203: MILLER CUT OFF / RICKSECKER POINT 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
MORA-0203-0.008-R 8/21/2007	130	60	Gravity - Mortared Stone	Fill Wall	80	\$0.00
MORA-0203-0.090-R 8/21/2007	1,333	165	Gravity - Mortared Stone	Fill Wall	81	\$0.00
MORA-0203-0.154-R 8/21/2007	288	64	Gravity - Mortared Stone	Fill Wall	82	\$0.00

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

Mount Rainier National Park

ROUTE 0203: MILLER CUT OFF / RICKSECKER POINT 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)

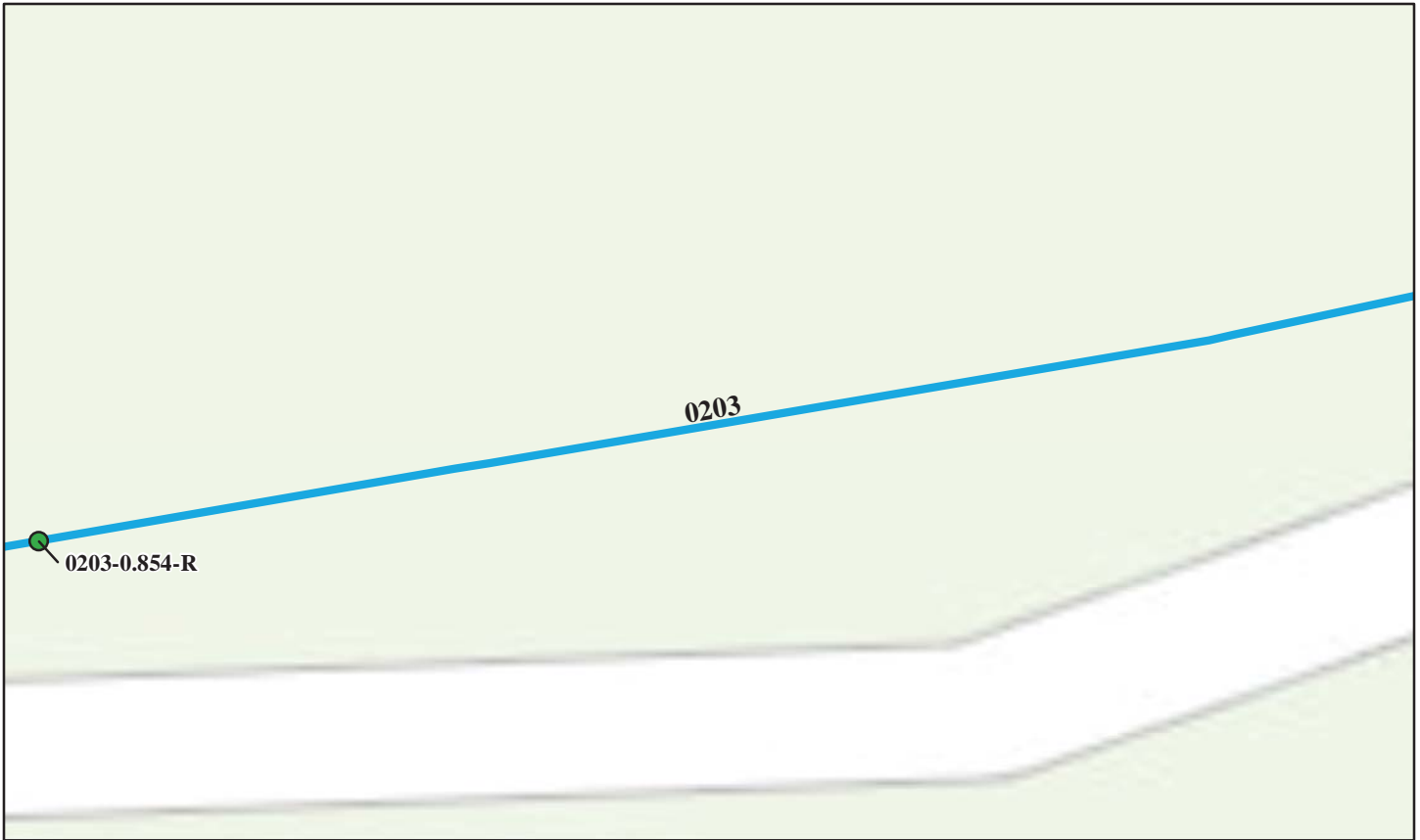
No Data

Wall ID Inspection Date:	Wall Area (Sq. Ft.)	Wall Length (Ft.)	Wall Type	Wall Function	Overall Rating	Repair Cost
MORA-0203-0.175-R 8/21/2007	255	85	Gravity - Mortared Stone	Fill Wall	84	\$0.00
MORA-0203-0.218-R 8/21/2007	725	77	Gravity - Mortared Stone	Fill Wall	75	\$0.00
MORA-0203-0.379-R 8/21/2007	200	53	Gravity - Mortared Stone	Fill Wall	79	\$5,500.00
MORA-0203-0.628-R 8/21/2007	523	110	Gravity - Mortared Stone	Fill Wall	73	\$3,750.00
MORA-0203-0.736-R 8/21/2007	412	93	Gravity - Mortared Stone	Fill Wall	79	\$14,000.00

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

Mount Rainier National Park

ROUTE 0203: MILLER CUT OFF / RICKSECKER POINT 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
MORA-0203-0.854-R 8/21/2007	606	96	Gravity - Mortared Stone	Fill Wall	78	\$0.00

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

Mount Rainier National Park

ROUTE 0500: VALLEY 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
MORA-0500-0.404-R 8/21/2007	490	30	Gravity - Dry Stone	Fill Wall	74	\$6,400.00
MORA-0500-0.420-R 8/21/2007	90	20	Gravity - Dry Stone	Fill Wall	61	\$9,000.00

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

Mount Rainier National Park

ROUTE 0913: NARADA FALLS PARKING



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)

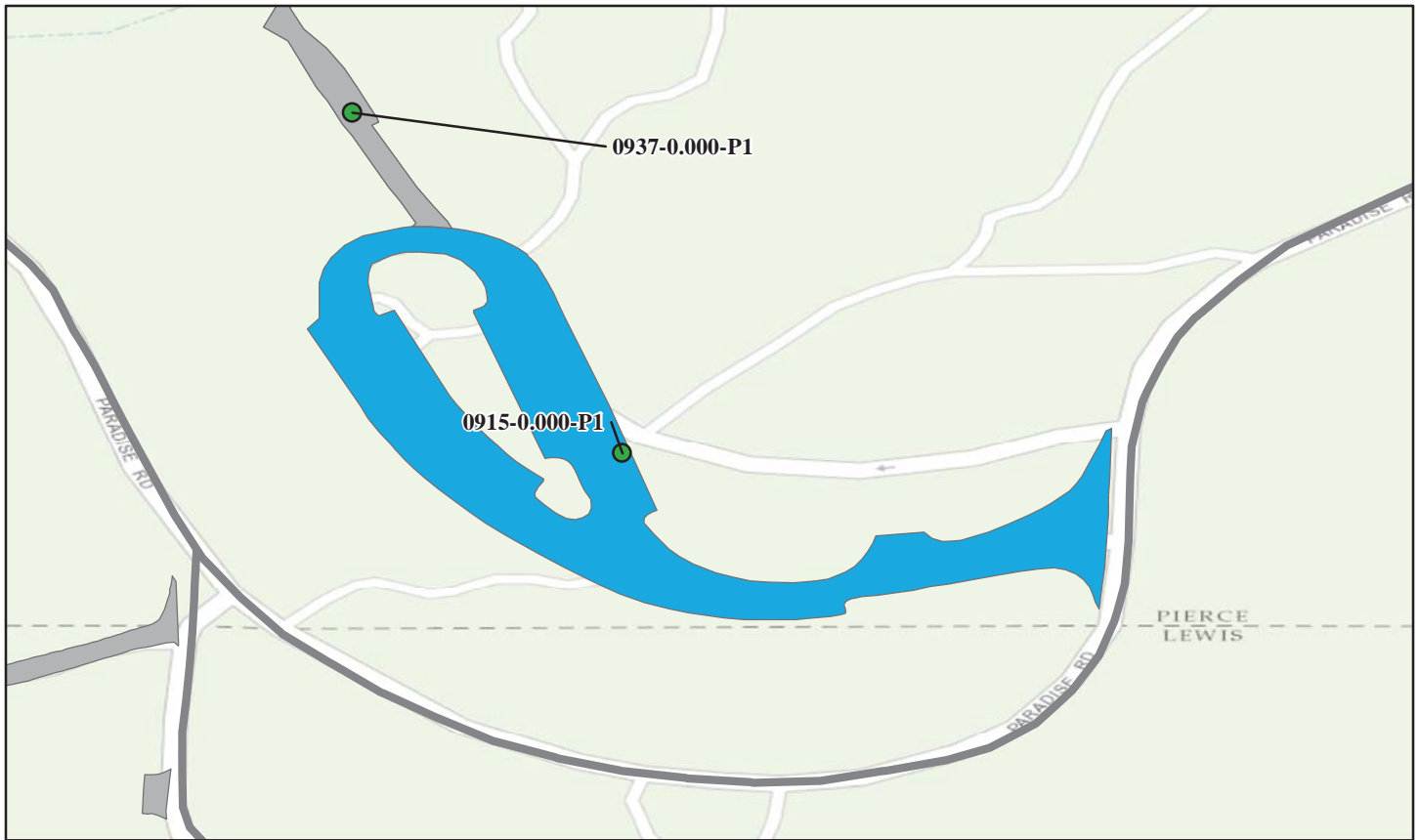
No Data

Wall ID Inspection Date:	Wall Area (Sq. Ft.)	Wall Length (Ft.)	Wall Type	Wall Function	Overall Rating	Repair Cost
MORA-0913-0.000-P1 8/21/2007	5850	415	Gravity - Mortared Stone	Fill Wall	66	\$38,400.00

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

Mount Rainier National Park

ROUTE 0915: PARADISE PARKING (LOWER LOT)



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

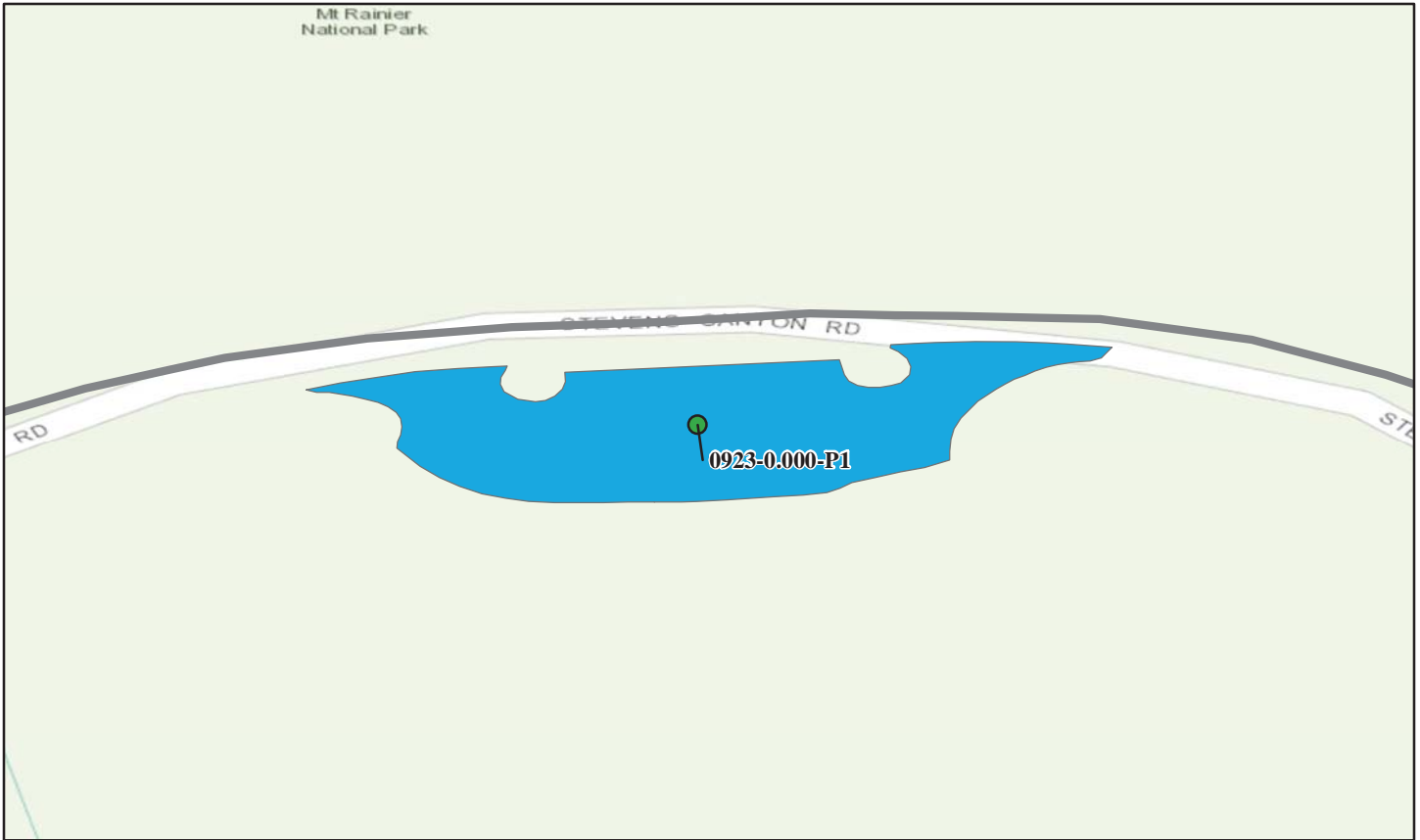
Critical / Poor (0 - 49)	Fair (50 - 69)	Good to Excellent (70 - 100)	No Data
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Wall ID Inspection Date:	Wall Area (Sq. Ft.)	Wall Length (Ft.)	Wall Type	Wall Function	Overall Rating	Repair Cost
MORA-0915-0.000-P1 8/21/2007	4700	585	Cantilever - Concrete	Fill Wall	86	\$4,000.00

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

Mount Rainier National Park

ROUTE 0923: BOX CANYON OVERLOOK / EXHIBIT PARKING



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
MORA-0923-0.000-P1 8/23/2007	1590	159	Gravity - Mortared Stone	Fill Wall	88	\$0.00

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

Mount Rainier National Park

ROUTE 0937: PARADISE RESIDENCE ROAD PARKING



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
MORA-0937-0.000-P1 8/21/2007	1525	216	Gravity - Dry Stone	Cut Wall	77	\$0.00

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

Tier 3 Retaining Wall Details



Mount Rainier National Park



Federal Lands Highway
Road Inventory Program

Wall ID:	MORA-0010-7.317-L		
Route Name:	STATE ROUTE 123 (EAST SIDE HIGHWAY)		
Inspection Date:	August 27, 2007	Approximate Year Built:	1990
*Wall Rating:	83	Maintenance Action:	No Action

Wall Description

Wall Function:	Fill Wall	Primary Wall Type:	Cantilever - Concrete
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Precast, concrete cantilever fill wall		

Wall Measurements

Wall Length (ft.):	68	Face Area (sq.):	440
Average Wall Height (ft.):	6	Face Angle (deg.):	90
Maximum Wall Height (ft.):	11	Vertical Offset (ft.):	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	No performance distress	8
WALL FOUNDATION MATERIAL 8.00	Soil, stable	8
CONCRETE 8.00	No distress, 3 precast panel section with CIP toe	9
DOWNSLOPE 0.50	Soil, vegetated, no erosion	8
WALL DRAINS 0.50	3" pvc drains at 10' spacing	9
LATERAL SLOPE 1.00	Bedrock at beginning, dry stack at end	7

Repair Recommendations

Failure Consequence:	MODERATE
Recommendation Narrative:	None
Repair Cost:	\$0

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

Mount Rainier National Park
ROUTE 0010: STATE ROUTE 123 (EAST SIDE HIGHWAY)

Retaining Wall Condition Photos



MORA_0010_7.317_L_1.jpg

Wall ID:	MORA-0010-7.597-L		
Route Name:	STATE ROUTE 123 (EAST SIDE HIGHWAY)		
Inspection Date:	August 28, 2007	Approximate Year Built:	Unknown
*Wall Rating:	83	Maintenance Action:	No Action

Wall Description

Wall Function:	Fill Wall	Primary Wall Type:	Gravity - Mortared Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Mortared stone wall supporting a fill		

Wall Measurements

Wall Length (ft.):	525	Face Area (sq.):	5531
Average Wall Height (ft.):	10	Face Angle (deg.):	85
Maximum Wall Height (ft.):	28	Vertical Offset (ft.):	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	high- wall performing as intended, minor weathering	8
WALL FOUNDATION MATERIAL 8.00	bedrock, no distress noted	9
MORTAR 8.00	minor debonding and effloresence, 20% moss covered	8
STONE MASONRY 8.00	very minor weathering of stone blocks	8
CULVERT 0.50	18" cmp culvert outlets on face, no distress , limited access	9
DOWNSLOPE 0.50	bedrock and talus over bedrock, no distress noted	9
LATERAL SLOPE 0.50	bedrock and talus over bedrock, no distress, wooded	9
ROAD/SIDEWALK/SHOULDER 0.50	no distress noted	9
WALL DRAINS 0.50	none, no distress noted	9

Repair Recommendations

Failure Consequence:	HIGH
Recommendation Narrative:	None
Repair Cost:	\$0

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

Mount Rainier National Park
ROUTE 0010: STATE ROUTE 123 (EAST SIDE HIGHWAY)

Retaining Wall Condition Photos



MORA_0010_7.597_L_1.jpg

Wall ID:	MORA-0010-8.357-L		
Route Name:	STATE ROUTE 123 (EAST SIDE HIGHWAY)		
Inspection Date:	August 28, 2007	Approximate Year Built:	1990
*Wall Rating:	73	Maintenance Action:	Repair Elements

Wall Description

Wall Function:	Fill Wall	Primary Wall Type:	MSE - Welded Wire Face
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Hilfiker fill wall		

Wall Measurements

Wall Length (ft.):	360	Face Area (sq.):	4400
Average Wall Height (ft.):	12	Face Angle (deg.):	85
Maximum Wall Height (ft.):	19	Vertical Offset (ft.):	-11

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Minor element damage doesn't effect overall performance	8
WALL FOUNDATION MATERIAL 8.00	One isolated area of toe material erosion, undermining	7
WIRE/GEOSYNTHETIC FACING 8.00	One damaged basket at sta 340. Minor areas of basket deformations.	7
WALL DRAINS 0.50	None	8
DOWNSLOPE 1.00	Soil, talus, minor erosion	7
LATERAL SLOPE 1.00	Soil, minor erosion	7

Repair Recommendations

Failure Consequence:	HIGH
Recommendation Narrative:	Repair wire basket at sta 340. Labor: 2 man-hours@\$50=\$100. Materials: Wire@\$50=\$50. Total=\$150
Repair Cost:	\$150

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

Mount Rainier National Park
ROUTE 0010: STATE ROUTE 123 (EAST SIDE HIGHWAY)

Retaining Wall Condition Photos



MORA_0010_8.357_L_1.jpg

Wall ID:	MORA-0010-8.992-L		
Route Name:	STATE ROUTE 123 (EAST SIDE HIGHWAY)		
Inspection Date:	August 28, 2007	Approximate Year Built:	Unknown
*Wall Rating:	88	Maintenance Action:	No Action

Wall Description

Wall Function:	Fill Wall	Primary Wall Type:	Gravity - Mortared Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Mortared stone wall supporting a fill, narrow shoulder		

Wall Measurements

Wall Length (ft.):	195	Face Area (sq.):	1701
Average Wall Height (ft.):	8	Face Angle (deg.):	85
Maximum Wall Height (ft.):	14	Vertical Offset (ft.):	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	high- wall performing as intended	9
WALL FOUNDATION MATERIAL 8.00	firm soil, no distress noted	9
MORTAR 8.00	mostly moss covered, minor debonding	8
STONE MASONRY 8.00	no distress noted	9
ROAD/SIDEWALK/SHOULDER 0.50	1/2" crack running along fog line	8
DOWNSLOPE 0.50	moderate slope, wooded, no distress noted	9
LATERAL SLOPE 0.50	moderate slope, wooded, no distress noted	9
WALL DRAINS 0.50	none noted, no distress	9

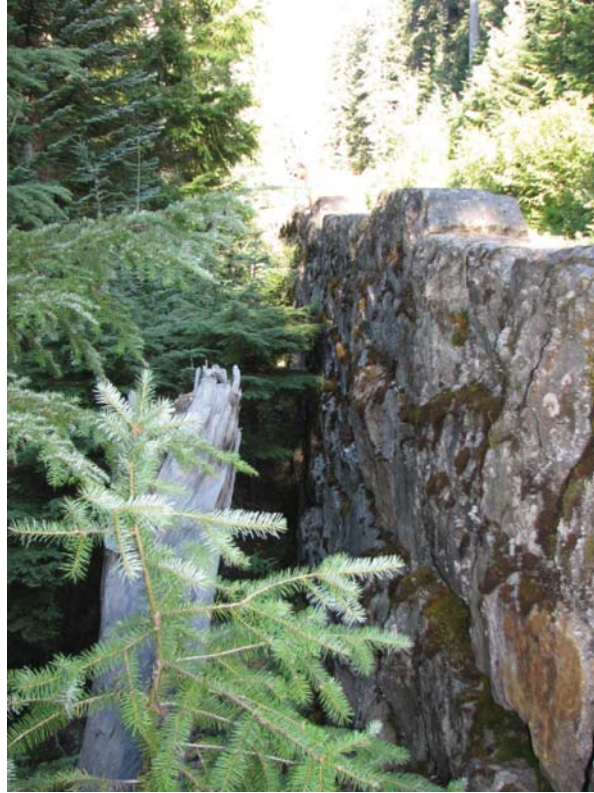
Repair Recommendations

Failure Consequence:	MODERATE
Recommendation Narrative:	None
Repair Cost:	\$0

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

Mount Rainier National Park
ROUTE 0010: STATE ROUTE 123 (EAST SIDE HIGHWAY)

Retaining Wall Condition Photos



MORA_0010_8.992_L_1.jpg

Wall ID:	MORA-0010-11.853-R		
Route Name:	STATE ROUTE 123 (EAST SIDE HIGHWAY)		
Inspection Date:	August 28, 2007	Approximate Year Built:	1930
*Wall Rating:	73	Maintenance Action:	Repair Elements

Wall Description

Wall Function:	Head Wall	Primary Wall Type:	Gravity - Mortared Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Upstream headwall of a 36 in concrete pipe		

Wall Measurements

Wall Length (ft.):	21	Face Area (sq.):	115
Average Wall Height (ft.):	5	Face Angle (deg.):	85
Maximum Wall Height (ft.):	8	Vertical Offset (ft.):	-4

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	No performance issues	8
WALL FOUNDATION MATERIAL 8.00	Bedrock	8
STONE MASONRY 8.00	2 stones displaced at end of headwall	6
MORTAR 8.00	Voids, cracking and debonding	7
CULVERT 0.50	36" concrete pipe slopes at 20°	8
WALL DRAINS 0.50	None	8
LATERAL SLOPE 1.00	Minor erosion of side slopes, drainage coming from end of headwall ditchline	7

Repair Recommendations

Failure Consequence:	LOW
Recommendation Narrative:	Reset 2 loose stones at end of headwall. Repoint 30ft ² of stone masonry headwall. Reset loose stone: \$200/sqft x 4sqft = \$800. Stone Masonry Repointing: \$75/sqft x 30sqft = \$2250. Total: \$3000
Repair Cost:	\$3,000

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

Mount Rainier National Park
ROUTE 0010: STATE ROUTE 123 (EAST SIDE HIGHWAY)

Retaining Wall Condition Photos



MORA_0010_11.853_R_1.jpg

Wall ID:	MORA-0010-12.046-L		
Route Name:	STATE ROUTE 123 (EAST SIDE HIGHWAY)		
Inspection Date:	August 28, 2007	Approximate Year Built:	1930
*Wall Rating:	76	Maintenance Action:	Repair Elements

Wall Description

Wall Function:	Head Wall	Primary Wall Type:	Gravity - Mortared Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Downstream headwall of Dewey Creek		

Wall Measurements

Wall Length (ft.):	37	Face Area (sq.):	250
Average Wall Height (ft.):	6	Face Angle (deg.):	85
Maximum Wall Height (ft.):	11	Vertical Offset (ft.):	-8

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Headwall performance is good, repair is concerned with culvert side walls	8
WALL FOUNDATION MATERIAL 8.00	Concrete apron	8
MORTAR 8.00	Minor cracking and debonding	7
STONE MASONRY 8.00	No distress	8
CULVERT 1.00	6'x8' culvert shows undermining of outlet apron and deterioration of culvert side walls (severe)	4
LATERAL SLOPE 0.50	Stones protect lateral slope at beginning of wall, no erosion	8
WALL DRAINS 0.50	None	8

Repair Recommendations

Failure Consequence:	LOW
Recommendation Narrative:	Remove deteriorated concrete and patch to original design lines. Labor: 2 man-days @ \$350 = \$700. Materials: 1 cyd concrete @ \$1500/cyd = \$1500. Total=\$2200
Repair Cost:	\$2,200

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

Mount Rainier National Park
ROUTE 0010: STATE ROUTE 123 (EAST SIDE HIGHWAY)

Retaining Wall Condition Photos



MORA_0010_12.046_L_1.jpg

Wall ID:	MORA-0010-12.047-R		
Route Name:	STATE ROUTE 123 (EAST SIDE HIGHWAY)		
Inspection Date:	August 28, 2007	Approximate Year Built:	1930
*Wall Rating:	71	Maintenance Action:	Repair Elements

Wall Description

Wall Function:	Head Wall	Primary Wall Type:	Gravity - Mortared Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Upstream stone masonry headwall to Dewey Creek box culvert		

Wall Measurements

Wall Length (ft.):	32	Face Area (sq.):	160
Average Wall Height (ft.):	5	Face Angle (deg.):	85
Maximum Wall Height (ft.):	9	Vertical Offset (ft.):	-19

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Still performing but needs maintenance & repair to prevent total failure from creek back up	7
WALL FOUNDATION MATERIAL 8.00	Likely shallow bedrock or course soil, no distress.	9
MORTAR 8.00	50% of mortar crack or missing.	6
STONE MASONRY 8.00	Good condition, 8 blocks missing on top of wingwalls	6
CULVERT 0.50	6'x8' concrete box culvert, some missing concrete at bottom edge	8
LATERAL SLOPE 0.50	moderately wooded, mild creep	8
ROAD/SIDEWALK/SHOULDER 0.50	1" crack in asphalt crosses road at location of culvert	8
UPSLOPE 0.50	moderate fill embankment, mild creep, vegetated	8
WALL DRAINS 0.50	none, no distress	9

Repair Recommendations

Failure Consequence:	LOW
Recommendation Narrative:	Repair/replace 30ft ² of missing stone masonry. Repoint 80ft ² of stone masonry wall. Remove vegetation from wall face and remove channel debris. Replace stone masonry: \$620/ft ² x 30ft ² = \$18,600. Repoint stone masonry: \$75/ft ² x 80ft ² = \$6,000.
Repair Cost:	\$25,300

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

Mount Rainier National Park
ROUTE 0010: STATE ROUTE 123 (EAST SIDE HIGHWAY)

Retaining Wall Condition Photos



MORA_0010_12.047_R_1.jpg

Wall ID:	MORA-0010-12.466-L		
Route Name:	STATE ROUTE 123 (EAST SIDE HIGHWAY)		
Inspection Date:	August 21, 2007	Approximate Year Built:	1930
*Wall Rating:	57	Maintenance Action:	Repair Elements

Wall Description

Wall Function:	Fill Wall	Primary Wall Type:	Gravity - Mortared Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Stone masonry fill wall		

Wall Measurements

Wall Length (ft.):	70	Face Area (sq.):	320
Average Wall Height (ft.):	4	Face Angle (deg.):	85
Maximum Wall Height (ft.):	7	Vertical Offset (ft.):	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Wall is stable, damage is primarily to guardwall	6
WALL FOUNDATION MATERIAL 8.00	Soil, bedrock outcroppings	8
MORTAR 8.00	Cracking and debonding of mortar in end of wall due to minor impacts associated with end dumping of material onto downslope	5
STONE MASONRY 8.00	End of wall stones are loose and pushed out due to end dumping of material into canyon	5
WALL DRAINS 0.50	None	9
ROAD/SIDEWALK/SHOULDER 1.00	Cracking and settlement of shoulder adjacent to wall section.	5
DOWNSLOPE 1.00	Vegetated, soil, minor erosion.	7
LATERAL SLOPE 1.00	Vegetated, soil, minor erosion.	7
TRAFFIC BARRIER/FENCE 5.00	Guardwall at end of wall is broken and cracked with loss of stone	3

Repair Recommendations

Failure Consequence:	MODERATE
Recommendation Narrative:	Reset 25' of guardwall (100 ft ²) Reset stone: 100ft ² x \$200/ft ² = \$20,000 Total: \$20,000
Repair Cost:	\$20,000

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

Mount Rainier National Park
ROUTE 0010: STATE ROUTE 123 (EAST SIDE HIGHWAY)

Retaining Wall Condition Photos



MORA_0010_12.466_L_1.jpg

Wall ID:	MORA-0010-12.488-L		
Route Name:	STATE ROUTE 123 (EAST SIDE HIGHWAY)		
Inspection Date:	August 28, 2007	Approximate Year Built:	1930
*Wall Rating:	79	Maintenance Action:	No Action

Wall Description

Wall Function:	Fill Wall	Primary Wall Type:	Gravity - Mortared Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Stone masonry fill wall		

Wall Measurements

Wall Length (ft.):	65	Face Area (sq.):	230
Average Wall Height (ft.):	3	Face Angle (deg.):	85
Maximum Wall Height (ft.):	6	Vertical Offset (ft.):	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	No performance issues	8
WALL FOUNDATION MATERIAL 8.00	No distress	8
MORTAR 8.00	Isolated cracking and debonding otherwise no distress	8
STONE MASONRY 8.00	No distress	8
WALL DRAINS 0.50	None	8
DOWNSLOPE 1.00	Soil, erodible but stable	7
LATERAL SLOPE 1.00	Soil, erodible	7

Repair Recommendations

Failure Consequence:	MODERATE
Recommendation Narrative:	None
Repair Cost:	\$0

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

Mount Rainier National Park
ROUTE 0010: STATE ROUTE 123 (EAST SIDE HIGHWAY)

Retaining Wall Condition Photos



MORA_0010_12.488_L_1.jpg

Wall ID:	MORA-0010-12.508-L		
Route Name:	STATE ROUTE 123 (EAST SIDE HIGHWAY)		
Inspection Date:	August 28, 2007	Approximate Year Built:	Unknown
*Wall Rating:	85	Maintenance Action:	No Action

Wall Description

Wall Function:	Fill Wall	Primary Wall Type:	Gravity - Mortared Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Mortared stone wall supporting a fill, narrow shoulder		

Wall Measurements

Wall Length (ft.):	100	Face Area (sq.):	561
Average Wall Height (ft.):	5	Face Angle (deg.):	85
Maximum Wall Height (ft.):	10	Vertical Offset (ft.):	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	high- wall performing as intended	8
WALL FOUNDATION MATERIAL 8.00	bedrock, no distress noted	9
MORTAR 8.00	minor debonding and efflorescence over entire wall, some missing mortar along guardwall	8
STONE MASONRY 8.00	no distress noted	9
DOWNSLOPE 0.50	bedrock, no distress noted	9
LATERAL SLOPE 0.50	bedrock, no distress noted	9
WALL DRAINS 0.50	6" wide opening at base of wall, evidence of water flow onto bedrock below wall, no distress noted	9
ROAD/SIDEWALK/SHOULDER 1.00	up to 1/2" cracks running along road shoulder and traffic lanes	7

Repair Recommendations

Failure Consequence:	MODERATE
Recommendation Narrative:	None
Repair Cost:	\$0

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

Mount Rainier National Park
ROUTE 0010: STATE ROUTE 123 (EAST SIDE HIGHWAY)

Retaining Wall Condition Photos



MORA_0010_12.508_L_1.jpg

Wall ID:	MORA-0010-12.565-L		
Route Name:	STATE ROUTE 123 (EAST SIDE HIGHWAY)		
Inspection Date:	August 28, 2007	Approximate Year Built:	Unknown
*Wall Rating:	82	Maintenance Action:	No Action

Wall Description

Wall Function:	Fill Wall	Primary Wall Type:	Gravity - Mortared Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Stone masonry wall supporting a fill, very limited access along base of wall		

Wall Measurements

Wall Length (ft.):	87	Face Area (sq.):	877
Average Wall Height (ft.):	10	Face Angle (deg.):	85
Maximum Wall Height (ft.):	18	Vertical Offset (ft.):	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	high- wall performing as intended	8
WALL FOUNDATION MATERIAL 8.00	bedrock, no distress noted	9
MORTAR 8.00	slight debonding of mortar and minor weathering, may have been repaired	8
STONE MASONRY 8.00	semi-angular stone, minor weathering	8
DOWNSLOPE 0.50	very steep bedrock	8
LATERAL SLOPE 0.50	steep bedrock	8
ROAD/SIDEWALK/SHOULDER 0.50	cracking in road along the length of the wall	8
WALL DRAINS 0.50	no distress noted	9

Repair Recommendations

Failure Consequence:	HIGH
Recommendation Narrative:	None
Repair Cost:	\$0

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

Mount Rainier National Park
ROUTE 0010: STATE ROUTE 123 (EAST SIDE HIGHWAY)

Retaining Wall Condition Photos



MORA_0010_12.565_L_1.jpg

Wall ID:	MORA-0010-12.597-L		
Route Name:	STATE ROUTE 123 (EAST SIDE HIGHWAY)		
Inspection Date:	August 28, 2007	Approximate Year Built:	Unknown
*Wall Rating:	84	Maintenance Action:	No Action

Wall Description

Wall Function:	Fill Wall	Primary Wall Type:	Gravity - Mortared Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Mortared stone wall supporting a fill, bedrock cut, has a narrow shoulder		

Wall Measurements

Wall Length (ft.):	53	Face Area (sq.):	530
Average Wall Height (ft.):	10	Face Angle (deg.):	85
Maximum Wall Height (ft.):	10	Vertical Offset (ft.):	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	high- wall performing as intended, minor weathering of mortar	8
WALL FOUNDATION MATERIAL 8.00	bedrock, no distress noted	9
MORTAR 8.00	minor debonding and cracking of mortar, slight efflorescence	8
STONE MASONRY 8.00	no distress noted	9
DOWNSLOPE 0.50	steep bedrock, no distress noted	9
LATERAL SLOPE 0.50	steep bedrock, no distress noted	9
WALL DRAINS 0.50	12" wide openings at base of wall, evidence of water flow from this point, no distress noted	9
ROAD/SIDEWALK/SHOULDER 1.00	1" wide cracks in pavement along fog line and at center line	7
TRAFFIC BARRIER/FENCE 1.00	moderate cracking of mortar in top 1 foot of guardwall	7

Repair Recommendations

Failure Consequence:	MODERATE
Recommendation Narrative:	None
Repair Cost:	\$0

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

Mount Rainier National Park
ROUTE 0010: STATE ROUTE 123 (EAST SIDE HIGHWAY)

Retaining Wall Condition Photos



MORA_0010_12.597_L_1.jpg

Wall ID:	MORA-0010-12.630-R		
Route Name:	STATE ROUTE 123 (EAST SIDE HIGHWAY)		
Inspection Date:	August 28, 2007	Approximate Year Built:	1930
*Wall Rating:	85	Maintenance Action:	No Action

Wall Description

Wall Function:	Fill Wall	Primary Wall Type:	Gravity - Mortared Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Stone masonry fill wall		

Wall Measurements

Wall Length (ft.):	135	Face Area (sq.):	1700
Average Wall Height (ft.):	12	Face Angle (deg.):	85
Maximum Wall Height (ft.):	17	Vertical Offset (ft.):	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Wall is performing as intended	8
WALL FOUNDATION MATERIAL 8.00	Bedrock and soil/talus overburden	9
MORTAR 8.00	Areas of cracking less than 5%, mortar is weathered, areas of debonding less than 15%.	8
STONE MASONRY 8.00	Stones are angular and interlocked, size form 2 ft2 to 4 ft2	9
LATERAL SLOPE 0.50	Bedrock outcrops	9
WALL DRAINS 0.50	Evidence of several wall drains	9
ROAD/SIDEWALK/SHOULDER 1.00	Road shows some distress, cracks and settlement	7

Repair Recommendations

Failure Consequence:	HIGH
Recommendation Narrative:	None
Repair Cost:	\$0

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

Mount Rainier National Park
ROUTE 0010: STATE ROUTE 123 (EAST SIDE HIGHWAY)

Retaining Wall Condition Photos



MORA_0010_12.630_R_1.jpg

Wall ID:	MORA-0010-12.670-L		
Route Name:	STATE ROUTE 123 (EAST SIDE HIGHWAY)		
Inspection Date:	August 28, 2007	Approximate Year Built:	1930
*Wall Rating:	80	Maintenance Action:	No Action

Wall Description

Wall Function:	Fill Wall	Primary Wall Type:	Gravity - Mortared Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Stone masonry fill wall		

Wall Measurements

Wall Length (ft.):	330	Face Area (sq.):	3800
Average Wall Height (ft.):	11	Face Angle (deg.):	85
Maximum Wall Height (ft.):	21	Vertical Offset (ft.):	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	No performance issues	8
WALL FOUNDATION MATERIAL 8.00	Bedrock, stable	9
MORTAR 8.00	Widespread debonding, otherwise no distress	7
STONE MASONRY 8.00	No distress	8
DOWNSLOPE 0.50	Steep, bedrock and soil	8
LATERAL SLOPE 0.50	Soil, stable	8
WALL DRAINS 0.50	None	8

Repair Recommendations

Failure Consequence:	HIGH
Recommendation Narrative:	None
Repair Cost:	\$0

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

Mount Rainier National Park
ROUTE 0010: STATE ROUTE 123 (EAST SIDE HIGHWAY)

Retaining Wall Condition Photos



MORA_0010_12.670_L_1.jpg

Wall ID:	MORA-0011-6.136-L		
Route Name:	SUNRISE ROAD		
Inspection Date:	August 28, 2007	Approximate Year Built:	1930
*Wall Rating:	77	Maintenance Action:	No Action

Wall Description

Wall Function:	Cut Wall	Primary Wall Type:	Gravity - Mortared Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Cut wall, base of colluvial slope, stone masonry, inside turn		

Wall Measurements

Wall Length (ft.):	244	Face Area (sq.):	1950
Average Wall Height (ft.):	7	Face Angle (deg.):	85
Maximum Wall Height (ft.):	8	Vertical Offset (ft.):	-1

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Minor damage at top of wall due to rock fall and accumulation	8
WALL FOUNDATION MATERIAL 8.00	Firm soil, no distress	9
MORTAR 8.00	Mild debonding over cut wall, moderate debonding and some missing/cracked mortar along top 1 foot of wall	7
STONE MASONRY 8.00	Large interlocking stone blocks good condition, minor cracking along some joints in stone blocks, 10 slightly dislodged blocks along top of wall	7
CURB/BERM/DITCH 0.50	Minor flow through ditch at base of wall, minor debris accumulation	8
ROAD/SIDEWALK/SHOULDER 0.50	No distress	9
WALL DRAINS 0.50	None	9
LATERAL SLOPE 1.00	Steep, ravelling, sand cobble boulder slope	7
UPSLOPE 1.00	Steep, ravelling soil, cobble, boulder slope, some rock accumulation at top of wall, minor damage to top of wall resulting from rock fall	7

Repair Recommendations

Failure Consequence:	MODERATE
Recommendation Narrative:	None
Repair Cost:	\$0

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

Mount Rainier National Park

ROUTE 0011: SUNRISE ROAD

Retaining Wall Condition Photos



MORA_0011_6.136_L_1.jpg

Wall ID:	MORA-0011-6.815-R		
Route Name:	SUNRISE ROAD		
Inspection Date:	August 28, 2007	Approximate Year Built:	1930
*Wall Rating:	67	Maintenance Action:	Repair Elements
Wall Description			
Wall Function:	Fill Wall	Primary Wall Type:	Gravity - Dry Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Dry stacked fill wall		
Wall Measurements			
Wall Length (ft.):	30	Face Area (sq.):	270
Average Wall Height (ft.):	9	Face Angle (deg.):	85
Maximum Wall Height (ft.):	10	Vertical Offset (ft.):	-1
Assessed Elements			
Element (Weighting Factor)	Narrative		Condition Rating (0 - 10)
PERFORMANCE 8.00	Wall performing as intended although undermining could lead to settlement or rotation		7
WALL FOUNDATION MATERIAL 8.00	Pocket of undermining at toe of beginning of wall 2'x2'		6
PLACED STONE 8.00	No signs of settlement or movement, voids between stones		7
WALL DRAINS 0.50	None		8
DOWNSLOPE 1.00	Vegetated, steep, no erosion		7
LATERAL SLOPE 1.00	Soil, no significatn erosion		7
VEGETATION 1.00	Alder growing from wall face		7
Repair Recommendations			
Failure Consequence:	MODERATE		
Recommendation Narrative:	Repair toe undermining. Underpinning/stabilization: \$200/ft2 x 4 ft2 = \$800 Total=\$800		
Repair Cost:	\$800		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			

Mount Rainier National Park

ROUTE 0011: SUNRISE ROAD

Retaining Wall Condition Photos



MORA_0011_6.815_R_1.jpg

Wall ID:	MORA-0011-7.221-R		
Route Name:	SUNRISE ROAD		
Inspection Date:	August 28, 2007	Approximate Year Built:	1980
*Wall Rating:	82	Maintenance Action:	Maintenance

Wall Description

Wall Function:	Fill Wall	Primary Wall Type:	Cantilever - Concrete
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Cantilever concrete fill wall		

Wall Measurements

Wall Length (ft.):	248	Face Area (sq.):	2055
Average Wall Height (ft.):	8	Face Angle (deg.):	90
Maximum Wall Height (ft.):	10	Vertical Offset (ft.):	-1

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	As intended	8
WALL FOUNDATION MATERIAL 8.00	No apparent distress, likely coarse talus/colluvium	9
CONCRETE 8.00	Minor cracking and efflorescence but otherwise functioning as intended	8
ROAD/SIDEWALK/SHOULDER 0.50	No distress in roadway	9
WALL DRAINS 0.50	3" pvc wall drains spaced at 10', no distress	9
CURB/BERM/DITCH 1.00	Ditch above wall along road is slightly irregular surface with at least one hole in ground behind wall	7
DOWNSLOPE 1.00	0 to 20 ft wide flat bench with erosion control fabric, edge of bench is eroding down steep debris chute below road	7
LATERAL SLOPE 1.00	Steep, eroding, coarse talus/colluvium	7

Repair Recommendations

Failure Consequence:	MODERATE
Recommendation Narrative:	Clean out ditch, patch holes in ditch above wall. Labor: 2 man-hour days x \$350/day = \$700. Material: 1 cyd concrete x \$1500 = \$1500. Total=\$2,200
Repair Cost:	\$2,200

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

Mount Rainier National Park

ROUTE 0011: SUNRISE ROAD

Retaining Wall Condition Photos



MORA_0011_7.221_R_1.jpg

Wall ID:	MORA-0011-7.391-R		
Route Name:	SUNRISE ROAD		
Inspection Date:	August 28, 2007	Approximate Year Built:	1930
*Wall Rating:	77	Maintenance Action:	No Action

Wall Description

Wall Function:	Fill Wall	Primary Wall Type:	Gravity - Mortared Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Stone masonry fill wall		

Wall Measurements

Wall Length (ft.):	30	Face Area (sq.):	150
Average Wall Height (ft.):	5	Face Angle (deg.):	85
Maximum Wall Height (ft.):	6	Vertical Offset (ft.):	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	No performance issues	8
WALL FOUNDATION MATERIAL 8.00	No distress	8
STONE MASONRY 8.00	20% of stones are fractured, weathered	7
MORTAR 8.00	No distress	8
LATERAL SLOPE 0.50	No erosion	8
ROAD/SIDEWALK/SHOULDER 0.50	No distress	8
WALL DRAINS 0.50	None	8
DOWNSLOPE 1.00	Soil, minor erosion	7

Repair Recommendations

Failure Consequence:	MODERATE
Recommendation Narrative:	None
Repair Cost:	\$0

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

Mount Rainier National Park

ROUTE 0011: SUNRISE ROAD

Retaining Wall Condition Photos



MORA_0011_7.391_R_1.jpg

Wall ID:	MORA-0011-12.700-R		
Route Name:	SUNRISE ROAD		
Inspection Date:	August 28, 2007	Approximate Year Built:	1930
*Wall Rating:	82	Maintenance Action:	Repair Elements

Wall Description

Wall Function:	Fill Wall	Primary Wall Type:	Gravity - Mortared Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Stone masonry fill wall at overlook		

Wall Measurements

Wall Length (ft.):	232	Face Area (sq.):	2050
Average Wall Height (ft.):	8	Face Angle (deg.):	85
Maximum Wall Height (ft.):	19	Vertical Offset (ft.):	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	As intended	8
WALL FOUNDATION MATERIAL 8.00	Coarse angular rock, shallow bedrock, no distress	9
OTHER PRIMARY ELEMENT 8.00	Cast in place, stair stepped concrete footing, some original, some repaired, up to 9' high, undermined slightly in some places	7
MORTAR 8.00	Mild debonding	8
STONE MASONRY 8.00	No distress	9
LATERAL SLOPE 0.50	Steep, wooded, minor creep, shallow bedrock	8
ROAD/SIDEWALK/SHOULDER 0.50	Sidewalk, broken-uneven asphalt, no visible holes	8
CULVERT 0.50	18" culvert (cmp) outlets in wall face, no distress	9
WALL DRAINS 0.50	Several 4" drain tiles outletting wall face spaced every 12-15 feet, no distress	9

Repair Recommendations

Failure Consequence:	MODERATE
Recommendation Narrative:	Repair last 50 ft of concrete footing Concrete: \$1500/cyd x 11 cyd = \$16,500
Repair Cost:	\$16,500

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

Mount Rainier National Park

ROUTE 0011: SUNRISE ROAD

Retaining Wall Condition Photos



MORA_0011_12.700_R_1.jpg

Wall ID:	MORA-0012-0.036-L		
Route Name:	STATE ROUTE 410 (MATHER MEMORIAL PARKWAY)		
Inspection Date:	August 28, 2007	Approximate Year Built:	2000
*Wall Rating:	90	Maintenance Action:	No Action

Wall Description

Wall Function:	Cut Wall	Primary Wall Type:	Gravity - Dry Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Dry stack cut wall		

Wall Measurements

Wall Length (ft.):	328	Face Area (sq.):	2230
Average Wall Height (ft.):	6	Face Angle (deg.):	80
Maximum Wall Height (ft.):	10	Vertical Offset (ft.):	-1

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	high- wall performing as intended, monitor potential erosion of wall at drainage ditch at base of wall	9
WALL FOUNDATION MATERIAL 8.00	firm soil, shallow bedrock	9
PLACED STONE 8.00	large blocks, good condition, no distress noted	9
CURB/BERM/DITCH 0.50	ditch at base of wall feed two culvert inlets, storm water flows along base of wall for the last 50' at second culvert inlet- monitor	8
CULVERT 0.50	no distress noted, inlet at base of wall	9
LATERAL SLOPE 0.50	bedrock, no distress noted	9
UPSLOPE 0.50	moderate grassy slope, no distress noted	9
WALL DRAINS 0.50	none noted, no distress noted	9

Repair Recommendations

Failure Consequence:	MODERATE
Recommendation Narrative:	None
Repair Cost:	\$0

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

Mount Rainier National Park

ROUTE 0012: STATE ROUTE 410 (MATHER MEMORIAL PARKWAY)

Retaining Wall Condition Photos



MORA_0012_0.036_L_1.jpg

Wall ID:	MORA-0012-0.150-L		
Route Name:	STATE ROUTE 410 (MATHER MEMORIAL PARKWAY)		
Inspection Date:	August 28, 2007	Approximate Year Built:	1930
*Wall Rating:	82	Maintenance Action:	No Action

Wall Description

Wall Function:	Fill Wall	Primary Wall Type:	Gravity - Dry Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Dry laid fill wall overlooking Tipsoo lake		

Wall Measurements

Wall Length (ft.):	276	Face Area (sq.):	1400
Average Wall Height (ft.):	5	Face Angle (deg.):	80
Maximum Wall Height (ft.):	7	Vertical Offset (ft.):	-1

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	As intended	8
WALL FOUNDATION MATERIAL 8.00	Soil and cobble foundation and talus	8
PLACED STONE 8.00	Stones are irregular shaped angular from 1ft to 5 ft	9
LATERAL SLOPE 0.50	45° bare soil and cobble slope with bedrock outcrop at the start of wall and 20° vegetated slope at end of wall	8
WALL DRAINS 0.50	No evidence	9
CURB/BERM/DITCH 1.00	There is evidence of erosion at the base of the wall in the ditch line	7
UPSLOPE 1.00	25°-30° upslope with evidence of some slope failure. Slope immediate above about 15 feet vertical is oversteepened.	7

Repair Recommendations

Failure Consequence:	LOW
Recommendation Narrative:	None
Repair Cost:	\$0

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

Mount Rainier National Park

ROUTE 0012: STATE ROUTE 410 (MATHER MEMORIAL PARKWAY)

Retaining Wall Condition Photos



MORA_0012_0.150_L_1.jpg

Wall ID:	MORA-0012-0.156-R		
Route Name:	STATE ROUTE 410 (MATHER MEMORIAL PARKWAY)		
Inspection Date:	August 28, 2007	Approximate Year Built:	2000
*Wall Rating:	80	Maintenance Action:	No Action

Wall Description

Wall Function:	Fill Wall	Primary Wall Type:	Gravity - Dry Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Dry laid fill wall		

Wall Measurements

Wall Length (ft.):	190	Face Area (sq.):	960
Average Wall Height (ft.):	5	Face Angle (deg.):	80
Maximum Wall Height (ft.):	8	Vertical Offset (ft.):	-1

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	As intended	8
WALL FOUNDATION MATERIAL 8.00	No erosion, soil, stable	8
PLACED STONE 8.00	Minor voids, no apparent movement, no distress	8
DOWNSLOPE 0.50	Vegetated, stable	8
WALL DRAINS 0.50	None	8
LATERAL SLOPE 1.00	Minor erosion adjacent to wall ends, soil	7

Repair Recommendations

Failure Consequence:	MODERATE
Recommendation Narrative:	None
Repair Cost:	\$0

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

Mount Rainier National Park

ROUTE 0012: STATE ROUTE 410 (MATHER MEMORIAL PARKWAY)

Retaining Wall Condition Photos



MORA_0012_0.156_R_1.jpg

Wall ID:	MORA-0012-0.343-L		
Route Name:	STATE ROUTE 410 (MATHER MEMORIAL PARKWAY)		
Inspection Date:	August 28, 2007	Approximate Year Built:	Unknown
*Wall Rating:	75	Maintenance Action:	No Action

Wall Description

Wall Function:	Head Wall	Primary Wall Type:	Gravity - Mortared Stone
Surface Treatment:		Secondary Wall Type:	Gravity - Dry Stone
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Headwall supporting a fill, bottom 6 ft of wall is a GM, top 3 ft wall is a GD		

Wall Measurements

Wall Length (ft.):	22	Face Area (sq.):	100
Average Wall Height (ft.):	4	Face Angle (deg.):	85
Maximum Wall Height (ft.):	9	Vertical Offset (ft.):	-5

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	moderate- wall performing as intended but has minimal voids and weathering, monitor	7
WALL FOUNDATION MATERIAL 8.00	bedrock, no distress noted	9
MORTAR 8.00	cracking and debonding less than 5%	7
PLACED STONE 8.00	weathered with small voids, small voids	7
STONE MASONRY 8.00	weathered stones with minimal cracking in stones	7
CULVERT 0.50	4' concrete culvert, no distress noted	8
DOWNSLOPE 0.50	stream bed material	8
LATERAL SLOPE 0.50	begin-rock ditch end- rocky slope with vegetation	8
ROAD/SIDEWALK/SHOULDER 0.50	no distress noted	9

Repair Recommendations

Failure Consequence:	LOW
Recommendation Narrative:	None
Repair Cost:	\$0

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

Mount Rainier National Park

ROUTE 0012: STATE ROUTE 410 (MATHER MEMORIAL PARKWAY)

Retaining Wall Condition Photos



MORA_0012_0.343_L_1.jpg

Wall ID:	MORA-0012-0.350-R		
Route Name:	STATE ROUTE 410 (MATHER MEMORIAL PARKWAY)		
Inspection Date:	August 28, 2007	Approximate Year Built:	2000
*Wall Rating:	88	Maintenance Action:	No Action

Wall Description

Wall Function:	Fill Wall	Primary Wall Type:	Gravity - Dry Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Dry stack wall supporting a fill, sidewalk on top		

Wall Measurements

Wall Length (ft.):	92	Face Area (sq.):	646
Average Wall Height (ft.):	7	Face Angle (deg.):	85
Maximum Wall Height (ft.):	9	Vertical Offset (ft.):	-1

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	high- wall performing as intended, stone pillars are failing but don't affect the wall performance	9
WALL FOUNDATION MATERIAL 8.00	firm soil, no distress noted	9
PLACED STONE 8.00	large, roughly square blocks, some voids built in, no distress noted	9
TRAFFIC BARRIER/FENCE 1.00	stone pillars are falling down, not related to retaining wall	4
DOWNSLOPE 0.50	moderate slope no distress noted	9
LATERAL SLOPE 0.50	moderate, wooded slope, no distress noted	9
ROAD/SIDEWALK/SHOULDER 0.50	no distress notedj	9
WALL DRAINS 0.50	none, no distress noted	9

Repair Recommendations

Failure Consequence:	MODERATE
Recommendation Narrative:	None
Repair Cost:	\$0

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

Mount Rainier National Park

ROUTE 0012: STATE ROUTE 410 (MATHER MEMORIAL PARKWAY)

Retaining Wall Condition Photos



MORA_0012_0.350_R_1.jpg

Wall ID:	MORA-0012-0.425-R		
Route Name:	STATE ROUTE 410 (MATHER MEMORIAL PARKWAY)		
Inspection Date:	August 28, 2007	Approximate Year Built:	2000
*Wall Rating:	80	Maintenance Action:	No Action

Wall Description

Wall Function:	Fill Wall	Primary Wall Type:	Gravity - Dry Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Dry laid fill wall		

Wall Measurements

Wall Length (ft.):	180	Face Area (sq.):	850
Average Wall Height (ft.):	4	Face Angle (deg.):	85
Maximum Wall Height (ft.):	8	Vertical Offset (ft.):	-1

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	As intended	8
WALL FOUNDATION MATERIAL 8.00	No erosion, soil, stable	8
PLACED STONE 8.00	Minor voids, no apparent movement, no distress	8
DOWNSLOPE 0.50	Vegetated, stable	8
LATERAL SLOPE 0.50	Soil, stable	8
WALL DRAINS 0.50	None	8

Repair Recommendations

Failure Consequence:	LOW
Recommendation Narrative:	None
Repair Cost:	\$0

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

Mount Rainier National Park

ROUTE 0012: STATE ROUTE 410 (MATHER MEMORIAL PARKWAY)

Retaining Wall Condition Photos



MORA_0012_0.425_R_1.jpg

Wall ID:	MORA-0012-0.703-L		
Route Name:	STATE ROUTE 410 (MATHER MEMORIAL PARKWAY)		
Inspection Date:	August 28, 2007	Approximate Year Built:	2000
*Wall Rating:	88	Maintenance Action:	No Action

Wall Description

Wall Function:	Fill Wall	Primary Wall Type:	Gravity - Dry Stone
Surface Treatment:		Secondary Wall Type:	Gravity - Mortared Stone
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Dry stack wall supporting a fill, short guard/retaining wall on top		

Wall Measurements

Wall Length (ft.):	205	Face Area (sq.):	1445
Average Wall Height (ft.):	7	Face Angle (deg.):	85
Maximum Wall Height (ft.):	9	Vertical Offset (ft.):	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	high- wall performing as intended	9
WALL FOUNDATION MATERIAL 8.00	firm coarse soil, no distress noted	9
OTHER PRIMARY ELEMENT 8.00	stone masonry wall supported by drystack wall, minor efflorescence	8
PLACED STONE 8.00	large irregular blocks with some voids, no distress noted	9
WIRE/GEOSYNTHETIC FACING 8.00	geo membrane, partly visible, no distress noted	9
DOWNSLOPE 0.50	narrow (4'-10' _ wide bench over steep talus and shot rock slope, minor ravelling	8
LATERAL SLOPE 0.50	steep, wooded, talus and shot rock slope, mild raveling	8
ROAD/SIDEWALK/SHOULDER 0.50	no distress noted	9
WALL DRAINS 0.50	none noted, no distress noted	9

Repair Recommendations

Failure Consequence:	MODERATE
Recommendation Narrative:	None
Repair Cost:	\$0

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

Mount Rainier National Park

ROUTE 0012: STATE ROUTE 410 (MATHER MEMORIAL PARKWAY)

Retaining Wall Condition Photos



MORA_0012_0.703_L_1.jpg

Wall ID:	MORA-0012-1.383-R		
Route Name:	STATE ROUTE 410 (MATHER MEMORIAL PARKWAY)		
Inspection Date:	August 28, 2007	Approximate Year Built:	2000
*Wall Rating:	65	Maintenance Action:	Repair Elements

Wall Description

Wall Function:	Fill Wall	Primary Wall Type:	Gravity - Gabion
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Gabion basket fill wall with stone masonry guardwall		

Wall Measurements

Wall Length (ft.):	325	Face Area (sq.):	2600
Average Wall Height (ft.):	8	Face Angle (deg.):	85
Maximum Wall Height (ft.):	9	Vertical Offset (ft.):	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	As intended currently, although continued loss of basket fill material could jeopardize wall stability	7
WALL FOUNDATION MATERIAL 8.00	Soil, talus, steep, erodible	8
WIRE/GEOSYNTHETIC FACING 8.00	13 basket sections (3' width) have broken wires allowing rock fill to spill out	4
LATERAL SLOPE 0.50	Soil, talus, stable	8
TRAFFIC BARRIER/FENCE 0.50	Stone masonry guardwall atop gabion baskets	8
WALL DRAINS 0.50	None	8
DOWNSLOPE 1.00	Steep, erodible, soil and talus	7

Repair Recommendations

Failure Consequence:	HIGH
Recommendation Narrative:	Repair 13 broken gabion baskets. Labor: 4 man-days @ \$350/day = \$1400. Materials: Wire at \$200 = \$200. Total=\$1,600
Repair Cost:	\$1,600

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

Mount Rainier National Park

ROUTE 0012: STATE ROUTE 410 (MATHER MEMORIAL PARKWAY)

Retaining Wall Condition Photos



MORA_0012_1.383_R_1.jpg

Wall ID:	MORA-0012-1.599-R		
Route Name:	STATE ROUTE 410 (MATHER MEMORIAL PARKWAY)		
Inspection Date:	August 28, 2007	Approximate Year Built:	2000
*Wall Rating:	88	Maintenance Action:	No Action

Wall Description

Wall Function:	Fill Wall	Primary Wall Type:	Gravity - Mortared Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Mortered stone wall supporting a fill, top part of wall is new construction (2000), bottom 3 ft to 4 ft is of older construction		

Wall Measurements

Wall Length (ft.):	231	Face Area (sq.):	1515
Average Wall Height (ft.):	6	Face Angle (deg.):	85
Maximum Wall Height (ft.):	10	Vertical Offset (ft.):	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	high- old and new sections of wall are performing as intended	9
WALL FOUNDATION MATERIAL 8.00	bedrock, no distress noted	9
MORTAR 8.00	mild debonding of old portion fo wall, new mortar has no distress	8
STONE MASONRY 8.00	good condition, no distress noted	9
DOWNSLOPE 0.50	steep bedrock, no distress noted	9
LATERAL SLOPE 0.50	steep bedrock, no distress noted	9
ROAD/SIDEWALK/SHOULDER 0.50	no distress noted	9
WALL DRAINS 0.50	several drain openings at base of wall, no apparent distress	9

Repair Recommendations

Failure Consequence:	MODERATE
Recommendation Narrative:	None
Repair Cost:	\$0

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

Mount Rainier National Park

ROUTE 0012: STATE ROUTE 410 (MATHER MEMORIAL PARKWAY)

Retaining Wall Condition Photos



MORA_0012_1.599_R_1.jpg

Wall ID:	MORA-0012-1.677-R		
Route Name:	STATE ROUTE 410 (MATHER MEMORIAL PARKWAY)		
Inspection Date:	August 28, 2007	Approximate Year Built:	2000
*Wall Rating:	85	Maintenance Action:	No Action

Wall Description

Wall Function:	Fill Wall	Primary Wall Type:	Gravity - Mortared Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Mortared stone wall supporting a fill, two different years, 1930s on the lower section of wall and the upper top of wall was redone in 2000		

Wall Measurements

Wall Length (ft.):	574	Face Area (sq.):	3939
Average Wall Height (ft.):	6	Face Angle (deg.):	85
Maximum Wall Height (ft.):	19	Vertical Offset (ft.):	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	high- wall performing as intended	9
WALL FOUNDATION MATERIAL 8.00	bedrock, no distress noted	9
MORTAR 8.00	minor weathering of mortar	8
STONE MASONRY 8.00	stones are angular and well interlocked, no distress noted	8
UPSLOPE 0.50	bedrock slope, 80% slope	8
DOWNSLOPE 0.50	bedrock, 45% slope, road is 300' verticla feet below	9
LATERAL SLOPE 0.50	bedrock	9
WALL DRAINS 0.50	evidence of wall drains	9

Repair Recommendations

Failure Consequence:	HIGH
Recommendation Narrative:	None
Repair Cost:	\$0

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

Mount Rainier National Park

ROUTE 0012: STATE ROUTE 410 (MATHER MEMORIAL PARKWAY)

Retaining Wall Condition Photos



MORA_0012_1.677_R_1.jpg

Wall ID:	MORA-0012-1.802-R		
Route Name:	STATE ROUTE 410 (MATHER MEMORIAL PARKWAY)		
Inspection Date:	August 28, 2007	Approximate Year Built:	2000
*Wall Rating:	84	Maintenance Action:	No Action

Wall Description

Wall Function:	Fill Wall	Primary Wall Type:	Gravity - Mortared Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Stone masonry fill wall		

Wall Measurements

Wall Length (ft.):	75	Face Area (sq.):	300
Average Wall Height (ft.):	4	Face Angle (deg.):	85
Maximum Wall Height (ft.):	8	Vertical Offset (ft.):	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	As intended	8
WALL FOUNDATION MATERIAL 8.00	No distress	8
MORTAR 8.00	No distress	9
STONE MASONRY 8.00	No distress	9
LATERAL SLOPE 0.50	Some loose soil, shallow bedrock	8
WALL DRAINS 0.50	None	8
DOWNSLOPE 0.50	Very steep, bedrock	9
CULVERT 1.00	24" concrete pipe at base of toe, sta 55 with minor spalling	7

Repair Recommendations

Failure Consequence:	MODERATE
Recommendation Narrative:	None
Repair Cost:	\$0

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

Mount Rainier National Park

ROUTE 0012: STATE ROUTE 410 (MATHER MEMORIAL PARKWAY)

Retaining Wall Condition Photos



MORA_0012_1.802_R_1.jpg

Wall ID:	MORA-0012-1.822-R		
Route Name:	STATE ROUTE 410 (MATHER MEMORIAL PARKWAY)		
Inspection Date:	August 28, 2007	Approximate Year Built:	2000
*Wall Rating:	90	Maintenance Action:	No Action

Wall Description

Wall Function:	Fill Wall	Primary Wall Type:	Gravity - Dry Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Dry stack fill wall that retains road and elevated berm at shoulder		

Wall Measurements

Wall Length (ft.):	49	Face Area (sq.):	332
Average Wall Height (ft.):	6	Face Angle (deg.):	80
Maximum Wall Height (ft.):	7	Vertical Offset (ft.):	2

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	high- wall performing as intended	9
WALL FOUNDATION MATERIAL 8.00	bedrock or firm soil over bedrock, no distress noted	9
PLACED STONE 8.00	large irregular blocks, minimal voids, no distress noted	9
DOWNSLOPE 0.50	steep bedrock or shallow bedrock, no distress noted	9
LATERAL SLOPE 0.50	bedrock or shallow bedrock, adjoining walls, no distress noted	9
ROAD/SIDEWALK/SHOULDER 0.50	no distress noted	9
WALL DRAINS 0.50	no distress noted	9

Repair Recommendations

Failure Consequence:	MODERATE
Recommendation Narrative:	None
Repair Cost:	\$0

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

Mount Rainier National Park

ROUTE 0012: STATE ROUTE 410 (MATHER MEMORIAL PARKWAY)

Retaining Wall Condition Photos



MORA_0012_1.822_R_1.jpg

Wall ID:	MORA-0012-1.830-R		
Route Name:	STATE ROUTE 410 (MATHER MEMORIAL PARKWAY)		
Inspection Date:	August 28, 2007	Approximate Year Built:	2000
*Wall Rating:	90	Maintenance Action:	No Action

Wall Description

Wall Function:	Fill Wall	Primary Wall Type:	Gravity - Mortared Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Mortared stone wall supporting a fill		

Wall Measurements

Wall Length (ft.):	27	Face Area (sq.):	156
Average Wall Height (ft.):	5	Face Angle (deg.):	85
Maximum Wall Height (ft.):	7	Vertical Offset (ft.):	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	high- wall performing as intended	9
WALL FOUNDATION MATERIAL 8.00	bedrock, no distress noted	9
MORTAR 8.00	no distress noted	9
STONE MASONRY 8.00	semi-angular stone, well interlocked, no distress noted	9
DOWNSLOPE 0.50	very steep bedrock and talus slope	8
LATERAL SLOPE 0.50	steep slope with vegetation	8
ROAD/SIDEWALK/SHOULDER 0.50	no roadway distress noted	9
WALL DRAINS 0.50	no distress noted	9

Repair Recommendations

Failure Consequence:	HIGH
Recommendation Narrative:	None
Repair Cost:	\$0

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

Mount Rainier National Park

ROUTE 0012: STATE ROUTE 410 (MATHER MEMORIAL PARKWAY)

Retaining Wall Condition Photos



MORA_0012_1.830_R_1.jpg

Wall ID:	MORA-0012-1.836-R		
Route Name:	STATE ROUTE 410 (MATHER MEMORIAL PARKWAY)		
Inspection Date:	August 28, 2007	Approximate Year Built:	2000
*Wall Rating:	77	Maintenance Action:	Replace Elements

Wall Description

Wall Function:	Fill Wall	Primary Wall Type:	Gravity - Dry Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Dry laid stone wall		

Wall Measurements

Wall Length (ft.):	60	Face Area (sq.):	400
Average Wall Height (ft.):	6	Face Angle (deg.):	80
Maximum Wall Height (ft.):	10	Vertical Offset (ft.):	1

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	As intended	8
WALL FOUNDATION MATERIAL 8.00	Soil and cobbles with bedrock outcrop	8
PLACED STONE 8.00	Stones are combination of angular and rounded. Missing a few stones on top with some gaps behind	7
DOWNSLOPE 0.50	45° soil and cobble overburden slope with vegetation. Bedrock outcrop beneath.	8
LATERAL SLOPE 0.50	Steep bedrock outcrop and soil/cobble overburden	8
WALL DRAINS 0.50	None	9

Repair Recommendations

Failure Consequence:	LOW
Recommendation Narrative:	Replace missing stones with local material. Labor: 2 man-days @ \$350/day = \$700. Concrete: 1 cyd @\$1500/cyd = \$1500. Total=\$2200
Repair Cost:	\$2,200

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

Mount Rainier National Park

ROUTE 0012: STATE ROUTE 410 (MATHER MEMORIAL PARKWAY)

Retaining Wall Condition Photos



MORA_0012_1.836_R_1.jpg

Wall ID:	MORA-0012-1.892-R		
Route Name:	STATE ROUTE 410 (MATHER MEMORIAL PARKWAY)		
Inspection Date:	August 28, 2007	Approximate Year Built:	2000
*Wall Rating:	80	Maintenance Action:	No Action

Wall Description

Wall Function:	Fill Wall	Primary Wall Type:	Gravity - Dry Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Dry laid fill wall with stone masonry guardwall		

Wall Measurements

Wall Length (ft.):	110	Face Area (sq.):	450
Average Wall Height (ft.):	4	Face Angle (deg.):	85
Maximum Wall Height (ft.):	8	Vertical Offset (ft.):	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	As intended	8
WALL FOUNDATION MATERIAL 8.00	Soil, no distress	8
PLACED STONE 8.00	Large voids in dry laid, no movement noted	8
LATERAL SLOPE 0.50	Soil, stable	8
WALL DRAINS 0.50	None	8
CULVERT 0.50	24" corrugated plastic pipe	9
ROAD/SIDEWALK/SHOULDER 0.50	Stone masonry guardwall, no distress	9
DOWNSLOPE 1.00	Soil, talus, minor erosion	7

Repair Recommendations

Failure Consequence:	MODERATE
Recommendation Narrative:	None
Repair Cost:	\$0

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

Mount Rainier National Park

ROUTE 0012: STATE ROUTE 410 (MATHER MEMORIAL PARKWAY)

Retaining Wall Condition Photos



MORA_0012_1.892_R_1.jpg

Wall ID:	MORA-0012-1.935-R		
Route Name:	STATE ROUTE 410 (MATHER MEMORIAL PARKWAY)		
Inspection Date:	August 28, 2007	Approximate Year Built:	2000
*Wall Rating:	82	Maintenance Action:	No Action

Wall Description

Wall Function:	Fill Wall	Primary Wall Type:	Gravity - Dry Stone
Surface Treatment:		Secondary Wall Type:	Gravity - Mortared Stone
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Stone masonry fill wall (5 ft high) supported by dry laid stone wall (7 ft high)		

Wall Measurements

Wall Length (ft.):	61	Face Area (sq.):	370
Average Wall Height (ft.):	6	Face Angle (deg.):	85
Maximum Wall Height (ft.):	12	Vertical Offset (ft.):	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Vertical crack in GM wall above GD wall, crack has been patched with caulking	8
WALL FOUNDATION MATERIAL 8.00	Firm soil, no distress	9
MORTAR 8.00	Vertical crack through new GM wall at center of wall runs along mortar joints, minor efflorescence	7
OTHER PRIMARY ELEMENT 8.00	GM wall has vertical crack (0.5" diam) at middle of wall that has been filled with caulking	7
PLACED STONE 8.00	Good condition, no distress (GD wall), some voids irregular boulders	9
STONE MASONRY 8.00	Stone on GM wall in good condition	9
LATERAL SLOPE 0.50	Moderate slope, sand and cobbles, minor creep, ravelling	8
TRAFFIC BARRIER/FENCE 0.50	Vertical crack in guard/retaining wall	8
CULVERT 0.50	30" cmp outlet, no distress	9

Repair Recommendations

Failure Consequence:	MODERATE
Recommendation Narrative:	None
Repair Cost:	\$0

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

Mount Rainier National Park

ROUTE 0012: STATE ROUTE 410 (MATHER MEMORIAL PARKWAY)

Retaining Wall Condition Photos



MORA_0012_1.935_R_1.jpg

Wall ID:	MORA-0012-1.985-L		
Route Name:	STATE ROUTE 410 (MATHER MEMORIAL PARKWAY)		
Inspection Date:	August 29, 2007	Approximate Year Built:	Unknown
*Wall Rating:	90	Maintenance Action:	No Action

Wall Description

Wall Function:	Cut Wall	Primary Wall Type:	Gravity - Dry Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Dry laid cut wall		

Wall Measurements

Wall Length (ft.):	107	Face Area (sq.):	535
Average Wall Height (ft.):	5	Face Angle (deg.):	85
Maximum Wall Height (ft.):	6	Vertical Offset (ft.):	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	High - Wall performing as intended	9
WALL FOUNDATION MATERIAL 8.00	Solid fill material	9
PLACED STONE 8.00	Semi-angular well interlocked stone, no distress, some vegetation growing out of rocks	9
LATERAL SLOPE 0.50	Beginning of wall has steep slope with vegetation, end of wall has bedrock outcrop	8
UPSLOPE 0.50	Steep slope with very sparse vegetation	8
ROAD/SIDEWALK/SHOULDER 0.50	No distress noted	9
WALL DRAINS 0.50	No distress notes	9

Repair Recommendations

Failure Consequence:	LOW
Recommendation Narrative:	None
Repair Cost:	\$0

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

Mount Rainier National Park

ROUTE 0012: STATE ROUTE 410 (MATHER MEMORIAL PARKWAY)

Retaining Wall Condition Photos



MORA_0012_1.985_L_1.jpg

Wall ID:	MORA-0012-2.117-R		
Route Name:	STATE ROUTE 410 (MATHER MEMORIAL PARKWAY)		
Inspection Date:	August 29, 2007	Approximate Year Built:	1930
*Wall Rating:	80	Maintenance Action:	No Action

Wall Description

Wall Function:	Fill Wall	Primary Wall Type:	Gravity - Mortared Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Stone masonry fill wall		

Wall Measurements

Wall Length (ft.):	275	Face Area (sq.):	5100
Average Wall Height (ft.):	18	Face Angle (deg.):	85
Maximum Wall Height (ft.):	30	Vertical Offset (ft.):	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Performing as intended. Drains installed in 2000 and guardwall portion rebuilt, indicating past problems	8
WALL FOUNDATION MATERIAL 8.00	Soil and bedrock, stable	8
MORTAR 8.00	Repointed in 2000	8
STONE MASONRY 8.00	No distress	8
DOWNSLOPE 0.50	Steep, talus and bedrock	8
LATERAL SLOPE 0.50	Soil, stable	8
WALL DRAINS 0.50	Wall drains (2" pvc) installed at 10' intervals in 2000	8
TRAFFIC BARRIER/FENCE 0.50	Guardwall portion reconstructed in 2000	9

Repair Recommendations

Failure Consequence:	HIGH
Recommendation Narrative:	None
Repair Cost:	\$0

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

Mount Rainier National Park

ROUTE 0012: STATE ROUTE 410 (MATHER MEMORIAL PARKWAY)

Retaining Wall Condition Photos



MORA_0012_2.117_R_1.jpg

Wall ID:	MORA-0012-2.324-L		
Route Name:	STATE ROUTE 410 (MATHER MEMORIAL PARKWAY)		
Inspection Date:	August 29, 2007	Approximate Year Built:	1930
*Wall Rating:	80	Maintenance Action:	Maintenance

Wall Description

Wall Function:	Head Wall	Primary Wall Type:	Gravity - Mortared Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Inlet stone masonry headwall for 5 ft diam concrete pipe		

Wall Measurements

Wall Length (ft.):	18	Face Area (sq.):	61
Average Wall Height (ft.):	3	Face Angle (deg.):	85
Maximum Wall Height (ft.):	6	Vertical Offset (ft.):	-3

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	As intended, needs minor maintenance	7
WALL FOUNDATION MATERIAL 8.00	No distress	9
MORTAR 8.00	Minor debonding, minor missing mortar at base of wall at culvert inlet, debris covering base of wall	7
STONE MASONRY 8.00	Good condition, no distress	9
DOWNSLOPE 0.50	Creek bed, coarse material, no distress	9
LATERAL SLOPE 0.50	Coarse material, steep, cobbles and small boulders, no distress	9
ROAD/SIDEWALK/SHOULDER 0.50	No distress	9
UPSLOPE 0.50	Small vegetated shoulder, moderate slope, no distress	9
WALL DRAINS 0.50	None, no distress	9

Repair Recommendations

Failure Consequence:	MODERATE
Recommendation Narrative:	Repoint 2 sqft at base of wall near inlet. Remove 1/2 cyd of debris from inside culvert. Repoint: \$75/sqft x 2 = \$150. Labor: 1 man-day = \$350. Total=\$500
Repair Cost:	\$500

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

Mount Rainier National Park

ROUTE 0012: STATE ROUTE 410 (MATHER MEMORIAL PARKWAY)

Retaining Wall Condition Photos



MORA_0012_2.324_L_1.jpg

Wall ID:	MORA-0012-4.500-R		
Route Name:	STATE ROUTE 410 (MATHER MEMORIAL PARKWAY)		
Inspection Date:	August 29, 2007	Approximate Year Built:	1930
*Wall Rating:	81	Maintenance Action:	Maintenance

Wall Description

Wall Function:	Head Wall	Primary Wall Type:	Gravity - Mortared Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Stone masonry inlet headwall for 5 ft diameter concrete pipe		

Wall Measurements

Wall Length (ft.):	14	Face Area (sq.):	65
Average Wall Height (ft.):	4	Face Angle (deg.):	85
Maximum Wall Height (ft.):	6	Vertical Offset (ft.):	9

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	As intended, clean out debris in culvert, monitor crib wall	7
WALL FOUNDATION MATERIAL 8.00	Likely bedrock, no distress	9
MORTAR 8.00	Minor debonding, bottom of wall covered with 1'-2' of debris (cobbles and boulders)	8
STONE MASONRY 8.00	No distress	9
UPSLOPE 0.50	Steep grassy slope, mild creep, ravelling	8
CURB/BERM/DITCH 0.50	Ditch empties over wood cribwall, no distress	9
ROAD/SIDEWALK/SHOULDER 0.50	No distress in roadway	9
WALL DRAINS 0.50	None, no distress	9
CULVERT 1.00	5' diameter concrete pipe, 1/3 full for entire length with cobbles and boulders	5

Repair Recommendations

Failure Consequence:	MODERATE
Recommendation Narrative:	Remove 14 cyd of debris from inside culvert. Labor: 2 man-days x \$350/day = \$700 Total: \$700
Repair Cost:	\$700

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

Mount Rainier National Park

ROUTE 0012: STATE ROUTE 410 (MATHER MEMORIAL PARKWAY)

Retaining Wall Condition Photos



MORA_0012_4.500_R_1.jpg

Wall ID:	MORA-0012-4.502-L		
Route Name:	STATE ROUTE 410 (MATHER MEMORIAL PARKWAY)		
Inspection Date:	August 29, 2007	Approximate Year Built:	1930
*Wall Rating:	80	Maintenance Action:	No Action

Wall Description

Wall Function:	Fill Wall	Primary Wall Type:	Gravity - Mortared Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Stone masonry outlet headwall for a 5 ft diameter concrete pipe		

Wall Measurements

Wall Length (ft.):	17	Face Area (sq.):	70
Average Wall Height (ft.):	4	Face Angle (deg.):	85
Maximum Wall Height (ft.):	7	Vertical Offset (ft.):	-10

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	As intended	8
WALL FOUNDATION MATERIAL 8.00	Stream bed and soil	8
MORTAR 8.00	Crack from center top to the culvert to along the edge to the stream bed. Some debonding	7
STONE MASONRY 8.00	Stones are angular and not weathered, missing 1 stone	9
LATERAL SLOPE 0.50	Vegetated slopes	8
ROAD/SIDEWALK/SHOULDER 0.50	No distress	9
WALL DRAINS 0.50	No evidence	9
CULVERT 1.00	5' diameter concrete pipe, culvert is 1/3 full, work to remove debris is part of 4.502 wall	7

Repair Recommendations

Failure Consequence:	LOW
Recommendation Narrative:	None
Repair Cost:	\$0

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

Mount Rainier National Park

ROUTE 0012: STATE ROUTE 410 (MATHER MEMORIAL PARKWAY)

Retaining Wall Condition Photos



MORA_0012_4.502_L_1.jpg

Wall ID:	MORA-0012-7.517-L		
Route Name:	STATE ROUTE 410 (MATHER MEMORIAL PARKWAY)		
Inspection Date:	August 29, 2007	Approximate Year Built:	1960
*Wall Rating:	80	Maintenance Action:	No Action

Wall Description

Wall Function:	Head Wall	Primary Wall Type:	Cantilever - Concrete
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Outlet cast in-place concrete headwall for 6 ft x 8 ft box culvert		

Wall Measurements

Wall Length (ft.):	23	Face Area (sq.):	80
Average Wall Height (ft.):	3	Face Angle (deg.):	90
Maximum Wall Height (ft.):	8	Vertical Offset (ft.):	-19

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	As intended	8
WALL FOUNDATION MATERIAL 8.00	No distress	8
CONCRETE 8.00	Moss buildup on tops of wingwalls and headwalls	8
LATERAL SLOPE 0.50	Boulders and soil, stable	8
UPSLOPE 0.50	Soil, boulders, minor slump above box culvert	8
WALL DRAINS 0.50	None	8
CULVERT 1.00	6'x8' cast in place box culvert, minor undermining of small section of outlet apron, steep	7

Repair Recommendations

Failure Consequence:	MODERATE
Recommendation Narrative:	None
Repair Cost:	\$0

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

Mount Rainier National Park

ROUTE 0012: STATE ROUTE 410 (MATHER MEMORIAL PARKWAY)

Retaining Wall Condition Photos



MORA_0012_7.517_L_1.jpg

Wall ID:	MORA-0012-7.517-R		
Route Name:	STATE ROUTE 410 (MATHER MEMORIAL PARKWAY)		
Inspection Date:	August 29, 2007	Approximate Year Built:	1960
*Wall Rating:	85	Maintenance Action:	No Action

Wall Description

Wall Function:	Head Wall	Primary Wall Type:	Cantilever - Concrete
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Inlet cast in-place concrete headwall for 6 ft x 8 ft box culvert		

Wall Measurements

Wall Length (ft.):	27	Face Area (sq.):	90
Average Wall Height (ft.):	3	Face Angle (deg.):	90
Maximum Wall Height (ft.):	8	Vertical Offset (ft.):	-4

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	As intended, some concrete scour/erosion at culvert bottom	8
WALL FOUNDATION MATERIAL 8.00	Likely bedrock, no distress	9
CONCRETE 8.00	Mild weathering, good condition, no distress	9
LATERAL SLOPE 0.50	Moderate slope, vegetated, minor creep	8
UPSLOPE 0.50	Short, steep, grass shoulder, minor creep	8
ROAD/SIDEWALK/SHOULDER 0.50	No distress in pavement	9
WALL DRAINS 0.50	None, no distress	9
CULVERT 1.00	6' x 8' concrete box culvert, steep, high water flows evident, concrete apron is scoured	7
DOWNSLOPE 1.00	Poured concrete apron, stream scour has exposed steel reinforcing at 2 locations	7

Repair Recommendations

Failure Consequence:	MODERATE
Recommendation Narrative:	None
Repair Cost:	\$0

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

Mount Rainier National Park

ROUTE 0012: STATE ROUTE 410 (MATHER MEMORIAL PARKWAY)

Retaining Wall Condition Photos



MORA_0012_7.517_R_1.jpg

Wall ID:	MORA-0012-8.954-L		
Route Name:	STATE ROUTE 410 (MATHER MEMORIAL PARKWAY)		
Inspection Date:	August 29, 2007	Approximate Year Built:	1930
*Wall Rating:	85	Maintenance Action:	No Action

Wall Description

Wall Function:	Fill Wall	Primary Wall Type:	Gravity - Mortared Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Stone masonry fill wall		

Wall Measurements

Wall Length (ft.):	45	Face Area (sq.):	190
Average Wall Height (ft.):	4	Face Angle (deg.):	85
Maximum Wall Height (ft.):	7	Vertical Offset (ft.):	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	As intended	8
WALL FOUNDATION MATERIAL 8.00	Shallow bedrock or firm soil, no distress	9
MORTAR 8.00	Mild debonding, partially moss covered	8
STONE MASONRY 8.00	No distress	9
DOWNSLOPE 0.50	Steep, talus over bedrock, minor ravelling	8
LATERAL SLOPE 0.50	Steep, talus/fill, mild creep, ravelling	8
ROAD/SIDEWALK/SHOULDER 0.50	No distress	9
WALL DRAINS 0.50	None, no distress	9

Repair Recommendations

Failure Consequence:	MODERATE
Recommendation Narrative:	None
Repair Cost:	\$0

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

Mount Rainier National Park

ROUTE 0012: STATE ROUTE 410 (MATHER MEMORIAL PARKWAY)

Retaining Wall Condition Photos



MORA_0012_8.954_L_1.jpg

Wall ID:	MORA-0012-9.157-L		
Route Name:	STATE ROUTE 410 (MATHER MEMORIAL PARKWAY)		
Inspection Date:	August 29, 2007	Approximate Year Built:	1930
*Wall Rating:	78	Maintenance Action:	No Action

Wall Description

Wall Function:	Fill Wall	Primary Wall Type:	Gravity - Mortared Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Stone masonry fill wall		

Wall Measurements

Wall Length (ft.):	22	Face Area (sq.):	110
Average Wall Height (ft.):	5	Face Angle (deg.):	85
Maximum Wall Height (ft.):	7	Vertical Offset (ft.):	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	As intended	8
WALL FOUNDATION MATERIAL 8.00	Soil, boulders	8
MORTAR 8.00	Minor cracking and debonding of mortar otherwise no distress	7
STONE MASONRY 8.00	One stone lost from top of wall beginning. Moss buildup on face, no distress	8
DOWNSLOPE 0.50	Soil, boulders, no erosion	8
LATERAL SLOPE 0.50	Steep, stable	8
WALL DRAINS 0.50	None	8

Repair Recommendations

Failure Consequence:	MODERATE
Recommendation Narrative:	None
Repair Cost:	\$0

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

Mount Rainier National Park

ROUTE 0012: STATE ROUTE 410 (MATHER MEMORIAL PARKWAY)

Retaining Wall Condition Photos



MORA_0012_9.157_L_1.jpg

Wall ID:	MORA-0013-0.366-R		
Route Name:	STEVENS CANYON ROAD		
Inspection Date:	August 22, 2007	Approximate Year Built:	Unknown
*Wall Rating:	79	Maintenance Action:	No Action

Wall Description

Wall Function:	Fill Wall	Primary Wall Type:	Gravity - Dry Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Mortared stone wall supporting a fill, slope protection located 3 ft below bottom of long short guardwall		

Wall Measurements

Wall Length (ft.):	25	Face Area (sq.):	150
Average Wall Height (ft.):	6	Face Angle (deg.):	65
Maximum Wall Height (ft.):	6	Vertical Offset (ft.):	-6

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Moderate- as intended, localized retaining and slope protection will not support road fill prism	8
WALL FOUNDATION MATERIAL 8.00	colluvium, sand to boulder, no distress	8
PLACED STONE 8.00	good condition, irregular shaped, minor voids	8
DOWNSLOPE 0.50	steep talus slope, minor creep	8
LATERAL SLOPE 0.50	thickly vegetated, steep, minor creep	8
VEGETATION 0.50	alder growing from wall, recently trimmed	8
WALL DRAINS 0.50	no distress noted	9
ROAD/SIDEWALK/SHOULDER 1.00	up to 1/2" cracks in asphalt at road shoulder and traffic lane	7
TRAFFIC BARRIER/FENCE 1.00	guardwall is leaning out slightly	7

Repair Recommendations

Failure Consequence:	LOW
Recommendation Narrative:	None
Repair Cost:	\$0

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

Mount Rainier National Park

ROUTE 0013: STEVENS CANYON ROAD

Retaining Wall Condition Photos



MORA_0013_0.366_R_1.jpg

Wall ID:	MORA-0013-0.374-L		
Route Name:	STEVENS CANYON ROAD		
Inspection Date:	August 22, 2007	Approximate Year Built:	1930
*Wall Rating:	72	Maintenance Action:	Repair Elements

Wall Description

Wall Function:	Cut Wall	Primary Wall Type:	Gravity - Mortared Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Stone masonry cut wall		

Wall Measurements

Wall Length (ft.):	590	Face Area (sq.):	5130
Average Wall Height (ft.):	8	Face Angle (deg.):	80
Maximum Wall Height (ft.):	10	Vertical Offset (ft.):	-1

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	As intended	8
WALL FOUNDATION MATERIAL 8.00	No distress. Drainage ditch runs along toe of wall.	8
MORTAR 8.00	Cracking, debonding and voids throughout top 2' of wall	6
STONE MASONRY 8.00	Efflorescence staining on 20% of wall face. Several top stones missing due to rock fall impacts.	7
ROAD/SIDEWALK/SHOULDER 0.50	No distress	8
WALL DRAINS 0.50	None	8
LATERAL SLOPE 1.00	Minor ravelling of slope adjacent to end of wall	6
UPSLOPE 1.00	Voids behind wall is isolated areas. Wall retains slope and prevents some rock fall.	7

Repair Recommendations

Failure Consequence:	MODERATE
Recommendation Narrative:	Repoint 1000 sqft of wall and replace missing stones. Repoint: 1000 sqft x \$75/sqft = \$75,000. Replace stones: 100 sqft x \$620/sqft = \$62,000. Total: \$137,000
Repair Cost:	\$137,000

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

Mount Rainier National Park

ROUTE 0013: STEVENS CANYON ROAD

Retaining Wall Condition Photos



MORA_0013_0.374_L_1.jpg

Wall ID:	MORA-0013-0.376-R		
Route Name:	STEVENS CANYON ROAD		
Inspection Date:	August 22, 2007	Approximate Year Built:	Unknown
*Wall Rating:	72	Maintenance Action:	No Action

Wall Description

Wall Function:	Fill Wall	Primary Wall Type:	Gravity - Mortared Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Mortared stone wall supporting a fill		

Wall Measurements

Wall Length (ft.):	30	Face Area (sq.):	120
Average Wall Height (ft.):	4	Face Angle (deg.):	55
Maximum Wall Height (ft.):	4	Vertical Offset (ft.):	-2

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Moderate- wall performing as intended, no intended to support road fill prism, also wall foundation erosion	7
WALL FOUNDATION MATERIAL 8.00	talus, 8' of wall is undermined up to 1.5' into wall, minor settling of wall at this location	6
MORTAR 8.00	coarse aggregate concrete	8
STONE MASONRY 8.00	irregular, angular stones up to 1.5' diam	8
LATERAL SLOPE 0.50	steep well vegetated slope with minor creep	8
WALL DRAINS 1.00	no wall drains, water may be flowing behind and over wall creating erosion of foundation material	6
DOWNSLOPE 1.00	evidence of minor to moderate creep and surface erosion	7
ROAD/SIDEWALK/SHOULDER 1.00	minor cracking along asphalt shoulder	7
TRAFFIC BARRIER/FENCE 1.00	guardwall leaning out slightly	7

Repair Recommendations

Failure Consequence:	LOW
Recommendation Narrative:	None
Repair Cost:	\$0

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

Mount Rainier National Park

ROUTE 0013: STEVENS CANYON ROAD

Retaining Wall Condition Photos



MORA_0013_0.376_R_1.jpg

Wall ID:	MORA-0013-0.390-R		
Route Name:	STEVENS CANYON ROAD		
Inspection Date:	August 22, 2007	Approximate Year Built:	1930
*Wall Rating:	86	Maintenance Action:	No Action

Wall Description

Wall Function:	Fill Wall	Primary Wall Type:	Gravity - Mortared Stone
Surface Treatment:		Secondary Wall Type:	Gravity - Dry Stone
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Dry laid wall retaining soil directly below short stone masonry wall and guardwall		

Wall Measurements

Wall Length (ft.):	22	Face Area (sq.):	209
Average Wall Height (ft.):	9	Face Angle (deg.):	80
Maximum Wall Height (ft.):	10	Vertical Offset (ft.):	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Stone masonry wall performing as intended, erosion and undermining of wall fixed with dry laid wall below	8
WALL FOUNDATION MATERIAL 8.00	Stone masonry guard wall founded on concrete footing; footing on talus/fill that is being retained by dry laid wall	9
MORTAR 8.00	Mild debonding, minor efflorescence	8
OTHER PRIMARY ELEMENT 8.00	Dry laid wall below stone masonry wall; no distress in dry laid wall, likely a slope repair done later	9
PLACED STONE 8.00	Strong angular rock	9
STONE MASONRY 8.00	Good condition	9
WALL DRAINS 0.50	None, no distress	9
DOWNSLOPE 1.00	Steep, coarse fill/talus slope, evidence of surface water scour and channelization and erosion of slope	7
LATERAL SLOPE 1.00	Steep, coarse rip-rap and lower dry laid wall located up wall and downslope, mild ravelling	7

Repair Recommendations

Failure Consequence:	MODERATE
Recommendation Narrative:	None
Repair Cost:	\$0

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

Mount Rainier National Park

ROUTE 0013: STEVENS CANYON ROAD

Retaining Wall Condition Photos



MORA_0013_0.390_R_1.jpg

Wall ID:	MORA-0013-0.391-R		
Route Name:	STEVENS CANYON ROAD		
Inspection Date:	August 22, 2007	Approximate Year Built:	Unknown
*Wall Rating:	86	Maintenance Action:	No Action

Wall Description

Wall Function:	Fill Wall	Primary Wall Type:	Gravity - Mortared Stone
Surface Treatment:		Secondary Wall Type:	Gravity - Dry Stone
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Dry stack wall retaining soil directly below short GM wall, compound wall		

Wall Measurements

Wall Length (ft.):	22	Face Area (sq.):	209
Average Wall Height (ft.):	9	Face Angle (deg.):	80
Maximum Wall Height (ft.):	10	Vertical Offset (ft.):	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Stone masonry performing as intended, erosion and undermining of wall fixed with dry laid wall below	8
WALL FOUNDATION MATERIAL 8.00	Strong angular rock	9
MORTAR 8.00	Mild debonding, minor efflorescence	8
OTHER PRIMARY ELEMENT 8.00	Dry	9
STONE MASONRY 8.00	Good condition	9
UPSLOPE 0.50	steep talus/ fill, then compound wall at road above, earlier erosion of wall repaired with different dry stack wall	8
WALL DRAINS 0.50	No distress	9
TRAFFIC BARRIER/FENCE 0.50	Stone masonry retaining/guard wall founded on concrete footing; footing on talus/fill that is being retained by dry laid wall	9
DOWNSLOPE 1.00	steep coarse fill/ talus slope, evidence of surface water, slight erosion of slope	7

Repair Recommendations

Failure Consequence:	MODERATE
Recommendation Narrative:	None
Repair Cost:	\$0

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

Mount Rainier National Park

ROUTE 0013: STEVENS CANYON ROAD

Retaining Wall Condition Photos



MORA_0013_0.391_R_1.jpg

Wall ID:	MORA-0013-0.413-R		
Route Name:	STEVENS CANYON ROAD		
Inspection Date:	August 22, 2007	Approximate Year Built:	Unknown
*Wall Rating:	79	Maintenance Action:	No Action

Wall Description

Wall Function:	Fill Wall	Primary Wall Type:	Gravity - Dry Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Dry stack wall supporting a fill, wall is midslope on a talus slope		

Wall Measurements

Wall Length (ft.):	27	Face Area (sq.):	216
Average Wall Height (ft.):	8	Face Angle (deg.):	75
Maximum Wall Height (ft.):	8	Vertical Offset (ft.):	-8

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	moderate- wall performing as intended, minor slope creep of surrounding talus slope	8
WALL FOUNDATION MATERIAL 8.00	loose talus, no apparent distress	8
PLACED STONE 8.00	1' to 3' stone, good condition, mild bulge	8
WALL DRAINS 0.50	no distress noted	9
DOWNSLOPE 1.00	steep talus, minor creep/ravelling	7
LATERAL SLOPE 1.00	evidence of scour erosion by surface water from guardwall drain	7
ROAD/SIDEWALK/SHOULDER 1.00	cracking and settling (up to 2") of asphalt at roadway and shoulder	7
UPSLOPE 1.00	coarse fill, minor settling, small voids, minor erosion from guardwall drain outlet	7

Repair Recommendations

Failure Consequence:	MODERATE
Recommendation Narrative:	None
Repair Cost:	\$0

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

Mount Rainier National Park

ROUTE 0013: STEVENS CANYON ROAD

Retaining Wall Condition Photos



MORA_0013_0.413_R_1.jpg

Wall ID:	MORA-0013-0.537-R		
Route Name:	STEVENS CANYON ROAD		
Inspection Date:	August 22, 2007	Approximate Year Built:	1930
*Wall Rating:	77	Maintenance Action:	No Action

Wall Description

Wall Function:	Fill Wall	Primary Wall Type:	Gravity - Mortared Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Stone masonry fill wall beginning in Inspiration Point parking lot and continues onto 0013		

Wall Measurements

Wall Length (ft.):	220	Face Area (sq.):	3200
Average Wall Height (ft.):	14	Face Angle (deg.):	85
Maximum Wall Height (ft.):	22	Vertical Offset (ft.):	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	As intended	8
WALL FOUNDATION MATERIAL 8.00	No distress, firm stable soil	8
STONE MASONRY 8.00	Bulging of 40' section at wall end. No significant distress noted	7
MORTAR 8.00	Minor separations and voids	8
CULVERT 0.50	18" cmp through wall face at sta 135	8
LATERAL SLOPE 0.50	No distress, stable	8
WALL DRAINS 0.50	None, minor seepage through wall face in isolated areas	8
VEGETATION 1.00	Minor vegetation/alder growth from wall face near cmp culvert	7

Repair Recommendations

Failure Consequence:	MODERATE
Recommendation Narrative:	None
Repair Cost:	\$0

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

Mount Rainier National Park

ROUTE 0013: STEVENS CANYON ROAD

Retaining Wall Condition Photos



MORA_0013_0.537_R_1.jpg

Wall ID:	MORA-0013-0.591-R		
Route Name:	STEVENS CANYON ROAD		
Inspection Date:	August 22, 2007	Approximate Year Built:	1930
*Wall Rating:	80	Maintenance Action:	No Action

Wall Description

Wall Function:	Fill Wall	Primary Wall Type:	Gravity - Mortared Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Stone masonry wall supporting a fill, roadway is cracking along length of wall, possibly due to lean of wall		

Wall Measurements

Wall Length (ft.):	642	Face Area (sq.):	11780
Average Wall Height (ft.):	18	Face Angle (deg.):	85
Maximum Wall Height (ft.):	31	Vertical Offset (ft.):	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	high- wall performing as intended	8
WALL FOUNDATION MATERIAL 8.00	rocky and soil material, appears stable, steep	8
MORTAR 8.00	no distress noted	8
STONE MASONRY 8.00	bulge in 1st 90' of wall 20'-30' long and 15' up from bottom of wall slight lean at top in guardwall part, efflorescence staining over 50% of wall, vegetation growth at culvert, semi-angular rock	8
CULVERT 0.50	18" cmp no distress noted	8
WALL DRAINS 0.50	6" wall drains at base of wall approximately 40' apart	8
DOWNSLOPE 0.50	steep well vegetated slope	9
LATERAL SLOPE 0.50	steep well vegetated slope	9
ROAD/SIDEWALK/SHOULDER 1.00	cracking along the length of wall, may be due to lean of guardwall, approx 2' out from wall	7

Repair Recommendations

Failure Consequence:	HIGH
Recommendation Narrative:	None
Repair Cost:	\$0

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

Mount Rainier National Park

ROUTE 0013: STEVENS CANYON ROAD

Retaining Wall Condition Photos



MORA_0013_0.591_R_1.jpg

Wall ID:	MORA-0013-1.288-L		
Route Name:	STEVENS CANYON ROAD		
Inspection Date:	August 22, 2007	Approximate Year Built:	1930
*Wall Rating:	80	Maintenance Action:	Repair Elements

Wall Description

Wall Function:	Head Wall	Primary Wall Type:	Gravity - Mortared Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Stone masonry inlet headwall at outlet of Reflection Lake		

Wall Measurements

Wall Length (ft.):	16	Face Area (sq.):	70
Average Wall Height (ft.):	4	Face Angle (deg.):	90
Maximum Wall Height (ft.):	7	Vertical Offset (ft.):	3

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	As intended	8
WALL FOUNDATION MATERIAL 8.00	Good, stable	8
MORTAR 8.00	Minor cracking in mortar near top stones	8
STONE MASONRY 8.00	No distress	8
CULVERT 0.50	4'x4' cip box culvert; minor undermining just inside upstream end of culvert at base of east wall	8
LATERAL SLOPE 0.50	Heavily vegetated, stable	8
ROAD/SIDEWALK/SHOULDER 0.50	No distress	8
UPSLOPE 0.50	Well vegetated	8
WALL DRAINS 0.50	None	8

Repair Recommendations

Failure Consequence:	LOW
Recommendation Narrative:	Repair minor undermining at base of headwall Underpinning/stabilization: \$200/sqft x 10sqft=\$2000 Total=\$2000
Repair Cost:	\$2,000

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

Mount Rainier National Park

ROUTE 0013: STEVENS CANYON ROAD

Retaining Wall Condition Photos



MORA_0013_1.288_L_1.jpg

Wall ID:	MORA-0013-1.293-R		
Route Name:	STEVENS CANYON ROAD		
Inspection Date:	August 22, 2007	Approximate Year Built:	Unknown
*Wall Rating:	85	Maintenance Action:	No Action

Wall Description

Wall Function:	Head Wall	Primary Wall Type:	Gravity - Mortared Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Mortared stone head wall, with a 4 ft x 4 ft concrete box culvert, outlet		

Wall Measurements

Wall Length (ft.):	10	Face Area (sq.):	54
Average Wall Height (ft.):	5	Face Angle (deg.):	85
Maximum Wall Height (ft.):	7	Vertical Offset (ft.):	-5

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	high- wall performing as intended	8
WALL FOUNDATION MATERIAL 8.00	firm soil, no distress noted	9
MORTAR 8.00	minor debonding, moss covered	8
STONE MASONRY 8.00	no distress noted	9
LATERAL SLOPE 0.50	thickly forested, vegetated, no apparent distress	8
ROAD/SIDEWALK/SHOULDER 0.50	minor cracking in asphalt	8
UPSLOPE 0.50	road shoulder, moderate slope, no distress	9
WALL DRAINS 0.50	no distress noted	9

Repair Recommendations

Failure Consequence:	MODERATE
Recommendation Narrative:	None
Repair Cost:	\$0

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

Mount Rainier National Park

ROUTE 0013: STEVENS CANYON ROAD

Retaining Wall Condition Photos



MORA_0013_1.293_R_1.jpg

Wall ID:	MORA-0013-2.113-L		
Route Name:	STEVENS CANYON ROAD		
Inspection Date:	August 22, 2007	Approximate Year Built:	1930
*Wall Rating:	75	Maintenance Action:	No Action

Wall Description

Wall Function:	Head Wall	Primary Wall Type:	Gravity - Mortared Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Downstream stone masonry headwall at Sun Beam Creek		

Wall Measurements

Wall Length (ft.):	130	Face Area (sq.):	500
Average Wall Height (ft.):	3	Face Angle (deg.):	90
Maximum Wall Height (ft.):	8	Vertical Offset (ft.):	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	As intended, although over-rotation should be monitored	7
WALL FOUNDATION MATERIAL 8.00	Good, stable	8
STONE MASONRY 8.00	Entire length of wall has over rotated slightly (>90°), no distress noted	7
MORTAR 8.00	Minor cracking	8
CULVERT 0.50	6'x5' cip box culvert	8
DOWNSLOPE 0.50	Steep, falls	8
LATERAL SLOPE 0.50	Good, stable	8
WALL DRAINS 0.50	None, no distress	9
ROAD/SIDEWALK/SHOULDER 1.00	Long cracks in roadway 3' from internal wall face	7

Repair Recommendations

Failure Consequence:	MODERATE
Recommendation Narrative:	None
Repair Cost:	\$0

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

Mount Rainier National Park

ROUTE 0013: STEVENS CANYON ROAD

Retaining Wall Condition Photos



MORA_0013_2.113_L_1.jpg

Wall ID:	MORA-0013-2.127-R		
Route Name:	STEVENS CANYON ROAD		
Inspection Date:	August 22, 2007	Approximate Year Built:	Unknown
*Wall Rating:	88	Maintenance Action:	No Action

Wall Description

Wall Function:	Head Wall	Primary Wall Type:	Gravity - Mortared Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Mortared stone head wall, with a 5 ft x 6 ft concrete box culvert, inlet		

Wall Measurements

Wall Length (ft.):	35	Face Area (sq.):	110
Average Wall Height (ft.):	3	Face Angle (deg.):	85
Maximum Wall Height (ft.):	7	Vertical Offset (ft.):	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	high- wall performing as intended	9
WALL FOUNDATION MATERIAL 8.00	bedrock, no distress noted	9
MORTAR 8.00	very mild debonding	8
STONE MASONRY 8.00	no distress noted	9
ROAD/SIDEWALK/SHOULDER 0.50	minor cracking in roadway where culvert runs under road	8
CURB/BERM/DITCH 0.50	ditch empties onto side slope over bedrock slope, no distress noted	9
DOWNSLOPE 0.50	bedrock creek bed, no distress noted	9
LATERAL SLOPE 0.50	bedrock, no distress noted	9
WALL DRAINS 0.50	no distress noted	9

Repair Recommendations

Failure Consequence:	MODERATE
Recommendation Narrative:	None
Repair Cost:	\$0

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

Mount Rainier National Park

ROUTE 0013: STEVENS CANYON ROAD

Retaining Wall Condition Photos



MORA_0013_2.127_R_1.jpg

Wall ID:	MORA-0013-3.339-L		
Route Name:	STEVENS CANYON ROAD		
Inspection Date:	August 22, 2007	Approximate Year Built:	Unknown
*Wall Rating:	86	Maintenance Action:	No Action

Wall Description

Wall Function:	Fill Wall	Primary Wall Type:	Gravity - Dry Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Dry stacked fill wall, 4 tiers		

Wall Measurements

Wall Length (ft.):	70	Face Area (sq.):	2585
Average Wall Height (ft.):	36	Face Angle (deg.):	85
Maximum Wall Height (ft.):	42	Vertical Offset (ft.):	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	high- wall performing as intended, mild bulge on upper tier	8
WALL FOUNDATION MATERIAL 8.00	coarse talus or bedrock, no distress noted	9
PLACED STONE 8.00	large blocks, minor cracking in 2 blocks	9
DOWNSLOPE 0.50	steep talus and rip rap slope, channelized	8
LATERAL SLOPE 0.50	steep, vegetated, minor ravelling	8
WALL DRAINS 0.50	no distress noted	9
ROAD/SIDEWALK/SHOULDER 1.00	minor to moderate settling at fill prism, up to 4" settlement cracks in asphalt, have been sealed	7

Repair Recommendations

Failure Consequence:	HIGH
Recommendation Narrative:	None
Repair Cost:	\$0

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

Mount Rainier National Park

ROUTE 0013: STEVENS CANYON ROAD

Retaining Wall Condition Photos



MORA_0013_3.339_L_1.jpg

Wall ID:	MORA-0013-3.652-R		
Route Name:	STEVENS CANYON ROAD		
Inspection Date:	August 22, 2007	Approximate Year Built:	1930
*Wall Rating:	77	Maintenance Action:	No Action

Wall Description

Wall Function:	Fill Wall	Primary Wall Type:	Gravity - Mortared Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Stone masonry fill wall in switchback of upper Stevens Canyon		

Wall Measurements

Wall Length (ft.):	250	Face Area (sq.):	5500
Average Wall Height (ft.):	22	Face Angle (deg.):	90
Maximum Wall Height (ft.):	28	Vertical Offset (ft.):	-6

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	As intended	8
WALL FOUNDATION MATERIAL 8.00	Minor, isolated area of toe undermining near sta 50	7
MORTAR 8.00	No distress	8
STONE MASONRY 8.00	No distress, minor staining beneath cmp culvert around sta 50	8
CULVERT 0.50	12" cmp at sta 50	8
VEGETATION 0.50	Minor vegetation growth on wall face	8
WALL DRAINS 0.50	None, no distress	9
DOWNSLOPE 1.00	Steep downslope with areas of heavy erosion due to surface drainage	6
LATERAL SLOPE 1.00	Surface drainage erosion heavy near beginning of wall	6

Repair Recommendations

Failure Consequence:	MODERATE
Recommendation Narrative:	None
Repair Cost:	\$0

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

Mount Rainier National Park

ROUTE 0013: STEVENS CANYON ROAD

Retaining Wall Condition Photos



MORA_0013_3.652_R_1.jpg

Wall ID:	MORA-0013-4.566-L		
Route Name:	STEVENS CANYON ROAD		
Inspection Date:	August 22, 2007	Approximate Year Built:	1930
*Wall Rating:	66	Maintenance Action:	Repair Elements

Wall Description

Wall Function:	Head Wall	Primary Wall Type:	Gravity - Mortared Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Inlet, stone masonry headwall of 8 ft x 6 ft concrete box culvert		

Wall Measurements

Wall Length (ft.):	32	Face Area (sq.):	112
Average Wall Height (ft.):	3	Face Angle (deg.):	85
Maximum Wall Height (ft.):	8	Vertical Offset (ft.):	-10

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Retaining slope but needs repair and maintenance	6
WALL FOUNDATION MATERIAL 8.00	Coarse channel deposits, some voids in culvert walls, exposing rebar, allowing water behind	7
MORTAR 8.00	Moderate to severe debonding/missing mortar/voids over 50% of wall	5
STONE MASONRY 8.00	Good condition, no distress, some missing/dislodged blocks	8
ROAD/SIDEWALK/SHOULDER 0.50	No wall-related distress in pavement	8
UPSLOPE 0.50	Steep, vegetated, minor creep	8
DOWNSLOPE 0.50	Boulders, creek bed, no distress	9
LATERAL SLOPE 0.50	Steep, cobbles and boulders, no distress	9
WALL DRAINS 0.50	None, no distress	9

Repair Recommendations

Failure Consequence:	LOW
Recommendation Narrative:	Repoint 50% of wall face (60 sqft), reset 3 stone blocks, repair voids in culvert side walls. Repoint: 60 sqft x \$75 = \$4500. Reset stones: 10 sqft x \$200/sqft=\$2000. Repair voids culvert: 2 man-days x \$350 = \$700.
Repair Cost:	\$8,700

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

Mount Rainier National Park

ROUTE 0013: STEVENS CANYON ROAD

Retaining Wall Condition Photos



MORA_0013_4.566_L_1.jpg

Wall ID:	MORA-0013-4.568-R		
Route Name:	STEVENS CANYON ROAD		
Inspection Date:	August 22, 2007	Approximate Year Built:	1930
*Wall Rating:	71	Maintenance Action:	Repair Elements

Wall Description

Wall Function:	Head Wall	Primary Wall Type:	Gravity - Mortared Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Downstream stone masonry headwall for 8 ft x 6 ft box culvert at Sunbeam Creek		

Wall Measurements

Wall Length (ft.):	34	Face Area (sq.):	110
Average Wall Height (ft.):	3	Face Angle (deg.):	90
Maximum Wall Height (ft.):	8	Vertical Offset (ft.):	-20

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	As intended	8
WALL FOUNDATION MATERIAL 8.00	Concrete footing cracked at beginning of wall; heavy undermining, spalling	6
MORTAR 8.00	70% cracked and deteriorated or missing mortar	5
STONE MASONRY 8.00	No sign of distress	9
WALL DRAINS 0.50	None	8
LATERAL SLOPE 0.50	No distress	9
UPSLOPE 0.50	Vegetated, stable	9
CULVERT 1.00	8'x6' cip box culvert undermined at outlet	7

Repair Recommendations

Failure Consequence:	LOW
Recommendation Narrative:	Repoint 70% of stone masonry face (80 sqft). Repair undermining of culvert. Repoint: 80sqft x \$75 = \$6,000. Repair undermining: 2 man-days x \$350 = \$700. 1 cyd concrete x \$1500=\$1500. Total=\$8,200
Repair Cost:	\$8,200

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

Mount Rainier National Park

ROUTE 0013: STEVENS CANYON ROAD

Retaining Wall Condition Photos



MORA_0013_4.568_R_1.jpg

Wall ID:	MORA-0013-5.560-R		
Route Name:	STEVENS CANYON ROAD		
Inspection Date:	August 22, 2007	Approximate Year Built:	1930
*Wall Rating:	80	Maintenance Action:	No Action

Wall Description

Wall Function:	Fill Wall	Primary Wall Type:	Gravity - Mortared Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Stone masonry fill wall		

Wall Measurements

Wall Length (ft.):	100	Face Area (sq.):	570
Average Wall Height (ft.):	5	Face Angle (deg.):	85
Maximum Wall Height (ft.):	9	Vertical Offset (ft.):	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	As intended	8
WALL FOUNDATION MATERIAL 8.00	No distress, stable	8
MORTAR 8.00	No distress	8
STONE MASONRY 8.00	No distress	8
DOWNSLOPE 0.50	Steep, vegetated	8
LATERAL SLOPE 0.50	Stable	8
ROAD/SIDEWALK/SHOULDER 0.50	No distress	8
WALL DRAINS 0.50	None, No distress	8

Repair Recommendations

Failure Consequence:	MODERATE
Recommendation Narrative:	None
Repair Cost:	\$0

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

Mount Rainier National Park

ROUTE 0013: STEVENS CANYON ROAD

Retaining Wall Condition Photos



MORA_0013_5.560_R_1.jpg

Wall ID:	MORA-0013-5.598-R		
Route Name:	STEVENS CANYON ROAD		
Inspection Date:	August 22, 2007	Approximate Year Built:	1930
*Wall Rating:	77	Maintenance Action:	No Action

Wall Description

Wall Function:	Fill Wall	Primary Wall Type:	Gravity - Dry Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Midslope, Gravity dry stacked wall supporting a fill, Debris slope below roadway		

Wall Measurements

Wall Length (ft.):	50	Face Area (sq.):	1850
Average Wall Height (ft.):	37	Face Angle (deg.):	55
Maximum Wall Height (ft.):	37	Vertical Offset (ft.):	-13

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Moderate- wall is performing as intended but has a slight bulge, monitor	7
WALL FOUNDATION MATERIAL 8.00	bedrock, wall may be sliding slightly over steep bedrock base	8
PLACED STONE 8.00	large, irregular-angular blocks, no distress noted, 1'-4' diam stone	8
LATERAL SLOPE 0.50	bedrock, no distress	9
ROAD/SIDEWALK/SHOULDER 0.50	no distress noted	9
WALL DRAINS 0.50	none, no distress noted	9
DOWNSLOPE 1.00	channelized debris chute in bedrock, minor ravelling	7
UPSLOPE 1.00	minor to moderate settling of fill slope	7

Repair Recommendations

Failure Consequence:	MODERATE
Recommendation Narrative:	None
Repair Cost:	\$0

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

Mount Rainier National Park

ROUTE 0013: STEVENS CANYON ROAD

Retaining Wall Condition Photos



MORA_0013_5.598_R_1.jpg

Wall ID:	MORA-0013-5.920-R		
Route Name:	STEVENS CANYON ROAD		
Inspection Date:	August 22, 2007	Approximate Year Built:	1930
*Wall Rating:	76	Maintenance Action:	Repair Elements

Wall Description

Wall Function:	Fill Wall	Primary Wall Type:	Gravity - Mortared Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Stone masonry fill wall		

Wall Measurements

Wall Length (ft.):	275	Face Area (sq.):	2160
Average Wall Height (ft.):	7	Face Angle (deg.):	85
Maximum Wall Height (ft.):	20	Vertical Offset (ft.):	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	1 vertical crack at station 50 needs maint; repoint 30%	7
WALL FOUNDATION MATERIAL 8.00	Bedrock, mostly no distress except at station 50 where wall is separating from bedrock knob - 3" separation	7
MORTAR 8.00	Minor to moderate debonding over 30% of wall, sever cracking and 3" separation at vertical crack at station 50, 1% missing mortar	7
STONE MASONRY 8.00	No distress	9
DOWNSLOPE 0.50	Steep, bedrock slope and talus, minor ravelling and creep	8
LATERAL SLOPE 0.50	Bedrock and talus, minor ravelling and creep	8
ROAD/SIDEWALK/SHOULDER 0.50	No distress	9
WALL DRAINS 0.50	None, no distress	9

Repair Recommendations

Failure Consequence:	HIGH
Recommendation Narrative:	Repoint 30% of wall face including repair of vertical crack Repoint: 650 sqft x \$75/sqft = \$50,000 Total= \$50,000
Repair Cost:	\$50,000

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

Mount Rainier National Park

ROUTE 0013: STEVENS CANYON ROAD

Retaining Wall Condition Photos



MORA_0013_5.920_R_1.jpg

Wall ID:	MORA-0013-6.395-R		
Route Name:	STEVENS CANYON ROAD		
Inspection Date:	August 22, 2007	Approximate Year Built:	1930
*Wall Rating:	78	Maintenance Action:	No Action

Wall Description

Wall Function:	Fill Wall	Primary Wall Type:	Gravity - Mortared Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Stone masonry fill wall adjacent to viaduct (bridge)		

Wall Measurements

Wall Length (ft.):	80	Face Area (sq.):	650
Average Wall Height (ft.):	8	Face Angle (deg.):	85
Maximum Wall Height (ft.):	12	Vertical Offset (ft.):	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	As intended	8
WALL FOUNDATION MATERIAL 8.00	Good, stable	8
MORTAR 8.00	Minor cracking, debonding, voids near bridge end	7
STONE MASONRY 8.00	No distress	8
LATERAL SLOPE 0.50	Stable, no erosion noted	8
ROAD/SIDEWALK/SHOULDER 0.50	Good, no distress	8
WALL DRAINS 0.50	None	9
DOWNSLOPE 1.00	Steep, some minor erosion	7

Repair Recommendations

Failure Consequence:	MODERATE
Recommendation Narrative:	None
Repair Cost:	\$0

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

Mount Rainier National Park

ROUTE 0013: STEVENS CANYON ROAD

Retaining Wall Condition Photos



MORA_0013_6.395_R_1.jpg

Wall ID:	MORA-0013-6.480-R		
Route Name:	STEVENS CANYON ROAD		
Inspection Date:	August 22, 2007	Approximate Year Built:	1930
*Wall Rating:	85	Maintenance Action:	No Action

Wall Description

Wall Function:	Fill Wall	Primary Wall Type:	Gravity - Mortared Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Mortared stone wall supporting a fill that is sitting on a bedrock surface		

Wall Measurements

Wall Length (ft.):	84	Face Area (sq.):	369
Average Wall Height (ft.):	4	Face Angle (deg.):	85
Maximum Wall Height (ft.):	8	Vertical Offset (ft.):	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	high- wall performing as intended, minor debonding	8
WALL FOUNDATION MATERIAL 8.00	bedrock, no distress noted	9
MORTAR 8.00	10% mild debonding of mortar, some areas have been repointed	8
STONE MASONRY 8.00	no distress noted	9
ROAD/SIDEWALK/SHOULDER 0.50	mild cracking in asphalt	8
DOWNSLOPE 0.50	steep bedrock slope	9
LATERAL SLOPE 0.50	steep bedrock slope	9
WALL DRAINS 0.50	none, no distress noted	9

Repair Recommendations

Failure Consequence:	MODERATE
Recommendation Narrative:	None
Repair Cost:	\$0

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

Mount Rainier National Park

ROUTE 0013: STEVENS CANYON ROAD

Retaining Wall Condition Photos



MORA_0013_6.480_R_1.jpg

Wall ID:	MORA-0013-6.763-R		
Route Name:	STEVENS CANYON ROAD		
Inspection Date:	August 22, 2007	Approximate Year Built:	1930
*Wall Rating:	82	Maintenance Action:	Repair Elements

Wall Description

Wall Function:	Fill Wall	Primary Wall Type:	Gravity - Mortared Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Stone masonry fill wall		

Wall Measurements

Wall Length (ft.):	143	Face Area (sq.):	1200
Average Wall Height (ft.):	8	Face Angle (deg.):	85
Maximum Wall Height (ft.):	15	Vertical Offset (ft.):	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	As intended, minor repointing needed at 2% of wall and at 18" culvert	8
WALL FOUNDATION MATERIAL 8.00	Bedrock, no distress	9
MORTAR 8.00	Minor to no debonding over 98% of face, moderate debonding over 2% of wall, missing mortar around 18" cmp culvert, some repointing already completed	7
STONE MASONRY 8.00	Good, no distress	9
DOWNSLOPE 0.50	Thin layer of loose rock over bedrock, minor raveling	8
LATERAL SLOPE 0.50	Bedrock, no distress	9
WALL DRAINS 0.50	None, no distress	9
CULVERT 1.00	18" cmp - no distress (missing mortar); 30" concrete - 1" separation at pipe joint	7

Repair Recommendations

Failure Consequence:	MODERATE
Recommendation Narrative:	Repoint around 18" culvert (5 sqft) and 2% of wall face (25 sqft). Repoint: 30 sqft x \$75/sqft = \$ 2,100 Total: \$2,100
Repair Cost:	\$2,100

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

Mount Rainier National Park

ROUTE 0013: STEVENS CANYON ROAD

Retaining Wall Condition Photos



MORA_0013_6.763_R_1.jpg

Wall ID:	MORA-0013-6.803-R		
Route Name:	STEVENS CANYON ROAD		
Inspection Date:	August 22, 2007	Approximate Year Built:	1930
*Wall Rating:	79	Maintenance Action:	No Action

Wall Description

Wall Function:	Fill Wall	Primary Wall Type:	Gravity - Dry Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Dry laid fill wall		

Wall Measurements

Wall Length (ft.):	53	Face Area (sq.):	720
Average Wall Height (ft.):	13	Face Angle (deg.):	80
Maximum Wall Height (ft.):	23	Vertical Offset (ft.):	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	As intended	8
WALL FOUNDATION MATERIAL 8.00	No distress	8
PLACED STONE 8.00	Three stacked dry placed stone walls, no distress in stone	8
DOWNSLOPE 0.50	Steep, talus slope	8
WALL DRAINS 0.50	None	9
LATERAL SLOPE 1.00	Minor erosion	7
ROAD/SIDEWALK/SHOULDER 1.00	Road shows slight settlement, longitudinal cracking	7

Repair Recommendations

Failure Consequence:	HIGH
Recommendation Narrative:	None
Repair Cost:	\$0

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

Mount Rainier National Park

ROUTE 0013: STEVENS CANYON ROAD

Retaining Wall Condition Photos



MORA_0013_6.803_R_1.jpg

Wall ID:	MORA-0013-6.846-R		
Route Name:	STEVENS CANYON ROAD		
Inspection Date:	August 22, 2007	Approximate Year Built:	1930
*Wall Rating:	85	Maintenance Action:	No Action

Wall Description

Wall Function:	Fill Wall	Primary Wall Type:	Gravity - Mortared Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Mortared stone wall supporting a fill		

Wall Measurements

Wall Length (ft.):	269	Face Area (sq.):	1900
Average Wall Height (ft.):	7	Face Angle (deg.):	85
Maximum Wall Height (ft.):	23	Vertical Offset (ft.):	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	high- wall performing as intended, minor weathering of mortar	8
WALL FOUNDATION MATERIAL 8.00	bedrock, no distress noted	9
MORTAR 8.00	minor debonding over 50% of wall, some re-pointing has occurred in the past	8
STONE MASONRY 8.00	no distress noted	9
ROAD/SIDEWALK/SHOULDER 0.50	very minor cracking in overlay, likley not wall related	8
CURB/BERM/DITCH 0.50	18" cmp, no distress noted	9
DOWNSLOPE 0.50	bedrock, no distress noted	9
LATERAL SLOPE 0.50	bedrock, no distress noted	9
WALL DRAINS 0.50	none, no distress noted	9

Repair Recommendations

Failure Consequence:	HIGH
Recommendation Narrative:	None
Repair Cost:	\$0

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

Mount Rainier National Park

ROUTE 0013: STEVENS CANYON ROAD

Retaining Wall Condition Photos



MORA_0013_6.846_R_1.jpg

Wall ID:	MORA-0013-6.947-R		
Route Name:	STEVENS CANYON ROAD		
Inspection Date:	August 22, 2007	Approximate Year Built:	1930
*Wall Rating:	78	Maintenance Action:	No Action

Wall Description

Wall Function:	Fill Wall	Primary Wall Type:	Gravity - Mortared Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Stone masonry fill wall		

Wall Measurements

Wall Length (ft.):	86	Face Area (sq.):	350
Average Wall Height (ft.):	4	Face Angle (deg.):	85
Maximum Wall Height (ft.):	7	Vertical Offset (ft.):	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	As intended	8
WALL FOUNDATION MATERIAL 8.00	Stable, no distress	8
MORTAR 8.00	Some debonding, deterioration of mortar <2%	7
STONE MASONRY 8.00	No distress, Minor weeping through wall face < 5%	8
DOWNSLOPE 0.50	Very steep bedbrock and talus slope	8
LATERAL SLOPE 0.50	Bridges and their wingwalls at each end of wall	8
ROAD/SIDEWALK/SHOULDER 0.50	Minor cracking in roadway surface	8
WALL DRAINS 0.50	None	9

Repair Recommendations

Failure Consequence:	MODERATE
Recommendation Narrative:	None
Repair Cost:	\$0

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

Mount Rainier National Park

ROUTE 0013: STEVENS CANYON ROAD

Retaining Wall Condition Photos



MORA_0013_6.947_R_1.jpg

Wall ID:	MORA-0013-7.075-R		
Route Name:	STEVENS CANYON ROAD		
Inspection Date:	August 23, 2007	Approximate Year Built:	Unknown
*Wall Rating:	88	Maintenance Action:	No Action

Wall Description

Wall Function:	Fill Wall	Primary Wall Type:	Gravity - Mortared Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Mortared stone fill wall, it is a transition from bridge structure		

Wall Measurements

Wall Length (ft.):	67	Face Area (sq.):	402
Average Wall Height (ft.):	6	Face Angle (deg.):	85
Maximum Wall Height (ft.):	12	Vertical Offset (ft.):	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	high- wall performing as intended	9
WALL FOUNDATION MATERIAL 8.00	bedrock, no distress noted	9
MORTAR 8.00	mild debonding	8
STONE MASONRY 8.00	no distress noted	9
ROAD/SIDEWALK/SHOULDER 0.50	minor cracking in concrete roadway, not likley wall related	8
DOWNSLOPE 0.50	cut bench in bedrock above steep cliff, no distress noted	9
LATERAL SLOPE 0.50	shallow bedrock, no distress noted	9
WALL DRAINS 0.50	none, no distress noted	9

Repair Recommendations

Failure Consequence:	MODERATE
Recommendation Narrative:	None
Repair Cost:	\$0

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

Mount Rainier National Park

ROUTE 0013: STEVENS CANYON ROAD

Retaining Wall Condition Photos



MORA_0013_7.075_R_1.jpg

Wall ID:	MORA-0013-7.102-R		
Route Name:	STEVENS CANYON ROAD		
Inspection Date:	August 23, 2007	Approximate Year Built:	1930
*Wall Rating:	75	Maintenance Action:	No Action

Wall Description

Wall Function:	Fill Wall	Primary Wall Type:	Gravity - Dry Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Dry laid rock buttress with stone masonry guard wall		

Wall Measurements

Wall Length (ft.):	97	Face Area (sq.):	585
Average Wall Height (ft.):	6	Face Angle (deg.):	60
Maximum Wall Height (ft.):	18	Vertical Offset (ft.):	-2

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	As intended	8
WALL FOUNDATION MATERIAL 8.00	No distress	8
PLACED STONE 8.00	Irregular angular blocks placed in wedge shape; no apparent movement	7
WALL DRAINS 0.50	None, no distress	8
DOWNSLOPE 1.00	Steep, talus slope leading to sheer cliff	6
ROAD/SIDEWALK/SHOULDER 1.00	Concrete slab heavily cracked due to rockfall from large overhang above roadway	6
LATERAL SLOPE 1.00	Minor erosion, talus slope	7
TRAFFIC BARRIER/FENCE 1.00	Minor voids beneath guardwall	7

Repair Recommendations

Failure Consequence:	HIGH
Recommendation Narrative:	None
Repair Cost:	\$0

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

Mount Rainier National Park

ROUTE 0013: STEVENS CANYON ROAD

Retaining Wall Condition Photos



MORA_0013_7.102_R_1.jpg

Wall ID:	MORA-0013-7.132-R		
Route Name:	STEVENS CANYON ROAD		
Inspection Date:	August 23, 2007	Approximate Year Built:	1930
*Wall Rating:	77	Maintenance Action:	Repair Elements

Wall Description

Wall Function:	Fill Wall	Primary Wall Type:	Gravity - Dry Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Dry laid fill wall with stone masonry guardwall		

Wall Measurements

Wall Length (ft.):	46	Face Area (sq.):	500
Average Wall Height (ft.):	10	Face Angle (deg.):	55
Maximum Wall Height (ft.):	16	Vertical Offset (ft.):	-3

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Possible bulge in wall, erosion at starting edge of wall is undermining existing retaining/guardwall above	7
WALL FOUNDATION MATERIAL 8.00	Likely bedrock, maybe talus over bedrock	8
PLACED STONE 8.00	Large 1'-3' diameter stone blocks, some missing at start of wall, voids to 1' diameter common	8
DOWNSLOPE 0.50	Top of steep debris chute consisting of thin talus over bedrock, mild ravelling	8
LATERAL SLOPE 0.50	Thin talus/fill over shallow bedrock, mild ravelling	8
ROAD/SIDEWALK/SHOULDER 0.50	No distress	9
WALL DRAINS 0.50	None, no distress	9
TRAFFIC BARRIER/FENCE 1.00	Short retaining wall/guardwall, 5' section of this wall is undermined up to 1 ft into wall	7

Repair Recommendations

Failure Consequence:	HIGH
Recommendation Narrative:	Stabilize undermining at beginning of wall. Add 5 cyd of coarse rip-rap to undermined area and grout into place. Underpinning/stabilization: \$200/sqft x 10ft x 5ft = \$10,000 Total=\$10,000
Repair Cost:	\$10,000

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

Mount Rainier National Park

ROUTE 0013: STEVENS CANYON ROAD

Retaining Wall Condition Photos



MORA_0013_7.132_R_1.jpg

Wall ID:	MORA-0013-7.146-R		
Route Name:	STEVENS CANYON ROAD		
Inspection Date:	August 23, 2007	Approximate Year Built:	1930
*Wall Rating:	76	Maintenance Action:	No Action

Wall Description

Wall Function:	Fill Wall	Primary Wall Type:	Gravity - Dry Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Dry laid rock buttress with stone masonry guardwall		

Wall Measurements

Wall Length (ft.):	135	Face Area (sq.):	2200
Average Wall Height (ft.):	16	Face Angle (deg.):	70
Maximum Wall Height (ft.):	30	Vertical Offset (ft.):	-2

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	As intended	8
WALL FOUNDATION MATERIAL 8.00	No distress	8
PLACED STONE 8.00	Dry laid irregular angular stone with talus material	7
DOWNSLOPE 0.50	Steep, vegetated	8
LATERAL SLOPE 0.50	Vegetated, no distress	8
WALL DRAINS 0.50	None	8
CULVERT 1.00	24" cmp at station 109; light rust and partially deformed at end	7
ROAD/SIDEWALK/SHOULDER 1.00	Concrete slab and asphalt with down drain that latches into 24" cmp; cracked	7
TRAFFIC BARRIER/FENCE 1.00	Stone masonry guardwall. Minor voids beneath guardwall.	7

Repair Recommendations

Failure Consequence:	HIGH
Recommendation Narrative:	None
Repair Cost:	\$0

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

Mount Rainier National Park

ROUTE 0013: STEVENS CANYON ROAD

Retaining Wall Condition Photos



MORA_0013_7.146_R_1.jpg

Wall ID:	MORA-0013-7.187-R		
Route Name:	STEVENS CANYON ROAD		
Inspection Date:	August 23, 2007	Approximate Year Built:	1930
*Wall Rating:	85	Maintenance Action:	No Action

Wall Description

Wall Function:	Fill Wall	Primary Wall Type:	Gravity - Mortared Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Stone mason fill wall with a guardwall on top		

Wall Measurements

Wall Length (ft.):	108	Face Area (sq.):	924
Average Wall Height (ft.):	8	Face Angle (deg.):	90
Maximum Wall Height (ft.):	18	Vertical Offset (ft.):	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	high- wall performing as intended	8
WALL FOUNDATION MATERIAL 8.00	stable bedrock, no distress noted	9
MORTAR 8.00	minor debonding and missing mortar	8
STONE MASONRY 8.00	no distress in stone masonry	9
DOWNSLOPE 0.50	steep bedrock material	8
LATERAL SLOPE 0.50	steep vegetated slope	8
ROAD/SIDEWALK/SHOULDER 0.50	no distress noted	9
WALL DRAINS 0.50	no distress noted	9

Repair Recommendations

Failure Consequence:	HIGH
Recommendation Narrative:	None
Repair Cost:	\$0

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

Mount Rainier National Park

ROUTE 0013: STEVENS CANYON ROAD

Retaining Wall Condition Photos



MORA_0013_7.187_R_1.jpg

Wall ID:	MORA-0013-7.230-R		
Route Name:	STEVENS CANYON ROAD		
Inspection Date:	August 23, 2007	Approximate Year Built:	Unknown
*Wall Rating:	83	Maintenance Action:	Repair Elements

Wall Description

Wall Function:	Fill Wall	Primary Wall Type:	Gravity - Dry Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Dry laid fill wall		

Wall Measurements

Wall Length (ft.):	133	Face Area (sq.):	4225
Average Wall Height (ft.):	31	Face Angle (deg.):	54
Maximum Wall Height (ft.):	44	Vertical Offset (ft.):	-2

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Overall working as intended, need to fix 6 feet of wall at far end	7
WALL FOUNDATION MATERIAL 8.00	Bedrock, no distress	9
PLACED STONE 8.00	No distress, large 1' to 4' diameter, angular stone blocks; voids up to 1' diameter common	9
ROAD/SIDEWALK/SHOULDER 0.50	Mild cracking in road, random orientation, likely not wall related	8
DOWNSLOPE 0.50	Bedrock, very steep, no distress	9
LATERAL SLOPE 0.50	Bedrock, no distress	9
WALL DRAINS 0.50	None, no distress	9
CURB/BERM/DITCH 1.00	Surface water pouring out through guardwall drain may be cause of erosion	7
TRAFFIC BARRIER/FENCE 1.00	6' of guardwall undermined up to 3' below sholder, stones slightly displaced, cracked mortar	7

Repair Recommendations

Failure Consequence:	HIGH
Recommendation Narrative:	Reset stones at end of wall. Reset: \$200/sqft x 6 ft x 4 ft = \$4,800 Total=\$4,800
Repair Cost:	\$4,800

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

Mount Rainier National Park

ROUTE 0013: STEVENS CANYON ROAD

Retaining Wall Condition Photos



MORA_0013_7.230_R_1.jpg

Wall ID:	MORA-0013-7.270-R		
Route Name:	STEVENS CANYON ROAD		
Inspection Date:	August 23, 2007	Approximate Year Built:	1930
*Wall Rating:	71	Maintenance Action:	Repair Elements

Wall Description

Wall Function:	Fill Wall	Primary Wall Type:	Gravity - Mortared Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Stone masonry fill wall		

Wall Measurements

Wall Length (ft.):	94	Face Area (sq.):	1200
Average Wall Height (ft.):	12	Face Angle (deg.):	87
Maximum Wall Height (ft.):	19	Vertical Offset (ft.):	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	As intended	8
WALL FOUNDATION MATERIAL 8.00	Stepped concrete footing for 25' near wall end; undermined last 15' of wall	6
MORTAR 8.00	Minor cracking, debonding of mortar; no deterioration	7
STONE MASONRY 8.00	Voids in last 10' of wall. 2% of stones show deterioration.	7
CULVERT 0.50	24" cmp exposed at wall end	8
DOWNSLOPE 0.50	Steep, talus slope	8
WALL DRAINS 0.50	One near concrete footing; no distress	8
LATERAL SLOPE 0.50	Bedrock	9

Repair Recommendations

Failure Consequence:	HIGH
Recommendation Narrative:	Repair undermining at wall end. Underpinning/stabilization: \$200/sqft x 15ft x 2ft = \$6,000 Total=\$6,000
Repair Cost:	\$6,000

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

Mount Rainier National Park

ROUTE 0013: STEVENS CANYON ROAD

Retaining Wall Condition Photos



MORA_0013_7.270_R_1.jpg

Wall ID:	MORA-0013-7.327-R		
Route Name:	STEVENS CANYON ROAD		
Inspection Date:	August 23, 2007	Approximate Year Built:	1930
*Wall Rating:	77	Maintenance Action:	No Action

Wall Description

Wall Function:	Fill Wall	Primary Wall Type:	Gravity - Dry Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Dry laid rock buttress with stone masonry guardwall		

Wall Measurements

Wall Length (ft.):	225	Face Area (sq.):	8100
Average Wall Height (ft.):	36	Face Angle (deg.):	55
Maximum Wall Height (ft.):	70	Vertical Offset (ft.):	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	As intended	8
WALL FOUNDATION MATERIAL 8.00	No distress	8
PLACED STONE 8.00	Some possible bulging in last 50' of wall, otherwise no distress. Wall steepened at toe.	7
CULVERT 0.50	18" cmp near station 110 drains onto wall face.	8
DOWNSLOPE 0.50	Bedrock outcrops and talus.	8
LATERAL SLOPE 0.50	Bedrock, talus, no distress	8
ROAD/SIDEWALK/SHOULDER 0.50	Transverse cracking in roadway. No signs of movement.	8
TRAFFIC BARRIER/FENCE 0.50	Guardwall is stone masonry. No distress. Sections show newer repointing.	8
WALL DRAINS 0.50	None, no distress	8

Repair Recommendations

Failure Consequence:	HIGH
Recommendation Narrative:	None
Repair Cost:	\$0

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

Mount Rainier National Park

ROUTE 0013: STEVENS CANYON ROAD

Retaining Wall Condition Photos



MORA_0013_7.327_R_1.jpg

Wall ID:	MORA-0013-7.378-R		
Route Name:	STEVENS CANYON ROAD		
Inspection Date:	August 23, 2007	Approximate Year Built:	1930
*Wall Rating:	82	Maintenance Action:	No Action

Wall Description

Wall Function:	Fill Wall	Primary Wall Type:	Gravity - Mortared Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Stone masonry fill wall		

Wall Measurements

Wall Length (ft.):	18	Face Area (sq.):	90
Average Wall Height (ft.):	5	Face Angle (deg.):	85
Maximum Wall Height (ft.):	6	Vertical Offset (ft.):	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	As intended	8
WALL FOUNDATION MATERIAL 8.00	Soil, stable	8
MORTAR 8.00	Slightly weathered, 20% of the mortar has debonded, less than 5% spalling areas with one area 1 inch x 3 inches and 4 inches deep	8
STONE MASONRY 8.00	10% of the stones show signs of weathering	9
DOWNSLOPE 0.50	40° soil and talus slope	8
LATERAL SLOPE 0.50	40° soil and talus slope with large trees	8
WALL DRAINS 0.50	No evidence of wall drains	8
ROAD/SIDEWALK/SHOULDER 1.00	Few minor lateral cracking in roadway, slight rutting	7

Repair Recommendations

Failure Consequence:	MODERATE
Recommendation Narrative:	None
Repair Cost:	\$0

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

Mount Rainier National Park

ROUTE 0013: STEVENS CANYON ROAD

Retaining Wall Condition Photos



MORA_0013_7.378_R_1.jpg

Wall ID:	MORA-0013-7.383-R		
Route Name:	STEVENS CANYON ROAD		
Inspection Date:	August 23, 2007	Approximate Year Built:	Unknown
*Wall Rating:	83	Maintenance Action:	No Action

Wall Description

Wall Function:	Fill Wall	Primary Wall Type:	Gravity - Dry Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Dry stacked stone fill wall on a steep bedrock slope		

Wall Measurements

Wall Length (ft.):	139	Face Area (sq.):	4008
Average Wall Height (ft.):	28	Face Angle (deg.):	50
Maximum Wall Height (ft.):	51	Vertical Offset (ft.):	-1

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	high- wall performing as intended, mild bulging at base but may have been built that way, 2"-3" settling in road and guardwall	7
WALL FOUNDATION MATERIAL 8.00	likley bedrock	9
PLACED STONE 8.00	1'-4' angular stone blocks, no distress, up to 1' voids common	9
DOWNSLOPE 0.50	loose talus over bedrock, mild raveling	8
CULVERT 0.50	18" cmp outlets onto bedrock at far end fo wall, no distress noted	9
LATERAL SLOPE 0.50	bedrock, no distress	9
WALL DRAINS 0.50	none no distress noted	9
ROAD/SIDEWALK/SHOULDER 1.00	approxiatmetly 2"-3" of settling of last 80' of the roadway	7
TRAFFIC BARRIER/FENCE 1.00	guardwall has settled 2"-3" and appears to be leaning in slightly along left 80' of gd wall	7

Repair Recommendations

Failure Consequence:	HIGH
Recommendation Narrative:	None
Repair Cost:	\$0

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

Mount Rainier National Park

ROUTE 0013: STEVENS CANYON ROAD

Retaining Wall Condition Photos



MORA_0013_7.383_R_1.jpg

Wall ID:	MORA-0013-7.427-R		
Route Name:	STEVENS CANYON ROAD		
Inspection Date:	August 23, 2007	Approximate Year Built:	1930
*Wall Rating:	83	Maintenance Action:	No Action

Wall Description

Wall Function:	Fill Wall	Primary Wall Type:	Gravity - Dry Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Dry stacked rockery supporting a fill, cracking along roadway, also slight lean in guardwall barrier		

Wall Measurements

Wall Length (ft.):	181	Face Area (sq.):	6883
Average Wall Height (ft.):	38	Face Angle (deg.):	55
Maximum Wall Height (ft.):	44	Vertical Offset (ft.):	-1

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	moderate- wall performing as intended but with some guardwall and roadway issues, monitor	8
WALL FOUNDATION MATERIAL 8.00	bedrock, no distress noted	9
PLACED STONE 8.00	semi-angular stone, 3'-4' rock, large common voids throughout with some slight weathering	8
DOWNSLOPE 0.50	steep bedrock material	8
LATERAL SLOPE 0.50	gm wall and also rock outcrop at end bedrock with coluvial material at beginning of wall	8
ROAD/SIDEWALK/SHOULDER 0.50	minor cracking along length of wall, arcuate shape	8
WALL DRAINS 0.50	none- no distress noted	9
TRAFFIC BARRIER/FENCE 1.00	guardwall has slight lean towards center line	7

Repair Recommendations

Failure Consequence:	HIGH
Recommendation Narrative:	None
Repair Cost:	\$0

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

Mount Rainier National Park

ROUTE 0013: STEVENS CANYON ROAD

Retaining Wall Condition Photos



MORA_0013_7.427_R_1.jpg

Wall ID:	MORA-0013-7.460-R		
Route Name:	STEVENS CANYON ROAD		
Inspection Date:	August 23, 2007	Approximate Year Built:	1930
*Wall Rating:	82	Maintenance Action:	No Action

Wall Description

Wall Function:	Fill Wall	Primary Wall Type:	Gravity - Mortared Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Mortared stone wall supporting a fill		

Wall Measurements

Wall Length (ft.):	18	Face Area (sq.):	81
Average Wall Height (ft.):	4	Face Angle (deg.):	85
Maximum Wall Height (ft.):	9	Vertical Offset (ft.):	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	moderate- wall performing as intended	8
WALL FOUNDATION MATERIAL 8.00	shallow bedrock, no distress noted	9
MORTAR 8.00	mild debonding	8
STONE MASONRY 8.00	minor cracking and spalling	8
DOWNSLOPE 0.50	angular fill over bedrock, steep	8
ROAD/SIDEWALK/SHOULDER 0.50	cracking along length of wall, no related to wall	8
LATERAL SLOPE 0.50	gd wall at begin bedrock at end	9
WALL DRAINS 0.50	none, no distress noted	9
CULVERT 1.00	possible culvert outlet at end of wall, covered with debris	7

Repair Recommendations

Failure Consequence:	MODERATE
Recommendation Narrative:	None
Repair Cost:	\$0

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

Mount Rainier National Park

ROUTE 0013: STEVENS CANYON ROAD

Retaining Wall Condition Photos



MORA_0013_7.460_R_1.jpg

Wall ID:	MORA-0013-7.467-R		
Route Name:	STEVENS CANYON ROAD		
Inspection Date:	August 23, 2007	Approximate Year Built:	1930
*Wall Rating:	85	Maintenance Action:	No Action

Wall Description

Wall Function:	Fill Wall	Primary Wall Type:	Gravity - Mortared Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Stone masonry fill wall		

Wall Measurements

Wall Length (ft.):	14	Face Area (sq.):	32
Average Wall Height (ft.):	2	Face Angle (deg.):	85
Maximum Wall Height (ft.):	6	Vertical Offset (ft.):	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Wall is performing as intended	8
WALL FOUNDATION MATERIAL 8.00	Bedrock	9
MORTAR 8.00	Slightly weathered and debonding less than 5%	8
STONE MASONRY 8.00	Strong stone with little weathering	9
WALL DRAINS 0.50	No evidence of wall drains	8
DOWNSLOPE 0.50	65° bedrock and soil and talus slope	9
LATERAL SLOPE 0.50	Stable, no distress	9
ROAD/SIDEWALK/SHOULDER 0.50	Very slight evidence of distress	9

Repair Recommendations

Failure Consequence:	LOW
Recommendation Narrative:	None
Repair Cost:	\$0

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

Mount Rainier National Park

ROUTE 0013: STEVENS CANYON ROAD

Retaining Wall Condition Photos



MORA_0013_7.467_R_1.jpg

Wall ID:	MORA-0013-7.475-R		
Route Name:	STEVENS CANYON ROAD		
Inspection Date:	August 23, 2007	Approximate Year Built:	1930
*Wall Rating:	75	Maintenance Action:	No Action

Wall Description

Wall Function:	Fill Wall	Primary Wall Type:	Gravity - Mortared Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Stone masonry fill wall		

Wall Measurements

Wall Length (ft.):	42	Face Area (sq.):	150
Average Wall Height (ft.):	3	Face Angle (deg.):	85
Maximum Wall Height (ft.):	7	Vertical Offset (ft.):	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	As intended	8
WALL FOUNDATION MATERIAL 8.00	No distress	8
MORTAR 8.00	Minor cracking, separations, debonding otherwise no distress	7
STONE MASONRY 8.00	Random cracking in isolated stones	7
DOWNSLOPE 0.50	Bedrock outcrops, talus	8
LATERAL SLOPE 0.50	Bedrock, vegetated	8
WALL DRAINS 0.50	None	8
ROAD/SIDEWALK/SHOULDER 1.00	Map cracking in asphalt pavement; no settlement noted	7

Repair Recommendations

Failure Consequence:	MODERATE
Recommendation Narrative:	None
Repair Cost:	\$0

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

Mount Rainier National Park

ROUTE 0013: STEVENS CANYON ROAD

Retaining Wall Condition Photos



MORA_0013_7.475_R_1.jpg

Wall ID:	MORA-0013-7.488-R		
Route Name:	STEVENS CANYON ROAD		
Inspection Date:	August 23, 2007	Approximate Year Built:	1930
*Wall Rating:	74	Maintenance Action:	No Action

Wall Description

Wall Function:	Fill Wall	Primary Wall Type:	Gravity - Dry Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Dry laid fill wall with stone masonry guardwall		

Wall Measurements

Wall Length (ft.):	90	Face Area (sq.):	2200
Average Wall Height (ft.):	24	Face Angle (deg.):	55
Maximum Wall Height (ft.):	35	Vertical Offset (ft.):	-2

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	As intended	8
WALL FOUNDATION MATERIAL 8.00	Minor undermining of toe stones, stable	7
PLACED STONE 8.00	Bulging of middle of wall face at station 40, no other distress	7
DOWNSLOPE 0.50	Talus, no erosion, stable	8
ROAD/SIDEWALK/SHOULDER 0.50	Minor cracking in roadway, no settlement evident	8
TRAFFIC BARRIER/FENCE 0.50	Stone masonry guardwall shows minor undermining in isolated areas.	8
WALL DRAINS 0.50	None	8
LATERAL SLOPE 1.00	Drainage erodin at wall end mainly down bedrock chute, stable	7

Repair Recommendations

Failure Consequence:	HIGH
Recommendation Narrative:	None
Repair Cost:	\$0

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

Mount Rainier National Park

ROUTE 0013: STEVENS CANYON ROAD

Retaining Wall Condition Photos



MORA_0013_7.488_R_1.jpg

Wall ID:	MORA-0013-7.537-R		
Route Name:	STEVENS CANYON ROAD		
Inspection Date:	August 23, 2007	Approximate Year Built:	Unknown
*Wall Rating:	83	Maintenance Action:	No Action

Wall Description

Wall Function:	Fill Wall	Primary Wall Type:	Gravity - Mortared Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Mortared stone wall supporting a fill		

Wall Measurements

Wall Length (ft.):	32	Face Area (sq.):	192
Average Wall Height (ft.):	6	Face Angle (deg.):	85
Maximum Wall Height (ft.):	12	Vertical Offset (ft.):	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	High- wall performing as intended, minor weathering of mortar and blocks	8
WALL FOUNDATION MATERIAL 8.00	bedrock, no distress noted	9
MORTAR 8.00	mild debonding	8
STONE MASONRY 8.00	minor spalling along natural joints of 5% of store block	8
ROAD/SIDEWALK/SHOULDER 0.50	minor random orientated cracking in roadway, not likley related to wall performance	8
DOWNSLOPE 0.50	steep narrow bedrock chute, no distress noted	9
LATERAL SLOPE 0.50	bedrock, no distress noted	9
WALL DRAINS 0.50	none noted, no distress	9

Repair Recommendations

Failure Consequence:	MODERATE
Recommendation Narrative:	None
Repair Cost:	\$0

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

Mount Rainier National Park

ROUTE 0013: STEVENS CANYON ROAD

Retaining Wall Condition Photos



MORA_0013_7.537_R_1.jpg

Wall ID:	MORA-0013-7.545-R		
Route Name:	STEVENS CANYON ROAD		
Inspection Date:	August 23, 2007	Approximate Year Built:	1930
*Wall Rating:	73	Maintenance Action:	No Action

Wall Description

Wall Function:	Fill Wall	Primary Wall Type:	Gravity - Dry Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Dry laid stone fill wall with stone masonry guardwall		

Wall Measurements

Wall Length (ft.):	275	Face Area (sq.):	9300
Average Wall Height (ft.):	33	Face Angle (deg.):	55
Maximum Wall Height (ft.):	62	Vertical Offset (ft.):	-2

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	As intended	8
WALL FOUNDATION MATERIAL 8.00	Minor pockets/voids at toe of wall stones	7
PLACED STONE 8.00	First wall section (182') shows no distress; last section (93') shows bulging and irregular stone placement; no specific distress noted	7
DOWNSLOPE 0.50	Talus and bedrock with minor erosion.	8
LATERAL SLOPE 0.50	Talus and bedrock with minor erosion	8
WALL DRAINS 0.50	None	8
CULVERT 1.00	18" cmp at station 125, 30" cmp at station 205, 30" cmp is damaged, still functioning	7
ROAD/SIDEWALK/SHOULDER 1.00	Area of longitudinal cracking in a/c surfacing indicate possible movement.	7
TRAFFIC BARRIER/FENCE 1.00	Stone masonry guardwall with isolated voids in toe of guardwall and cracking of mortar	7

Repair Recommendations

Failure Consequence:	HIGH
Recommendation Narrative:	None
Repair Cost:	\$0

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

Mount Rainier National Park

ROUTE 0013: STEVENS CANYON ROAD

Retaining Wall Condition Photos



MORA_0013_7.545_R_1.jpg

Wall ID:	MORA-0013-7.599-R		
Route Name:	STEVENS CANYON ROAD		
Inspection Date:	August 23, 2007	Approximate Year Built:	Unknown
*Wall Rating:	86	Maintenance Action:	No Action

Wall Description

Wall Function:	Fill Wall	Primary Wall Type:	Gravity - Dry Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Dry stack wall supporting a fill, large blocks, terraced wall (2 tiers)		

Wall Measurements

Wall Length (ft.):	30	Face Area (sq.):	300
Average Wall Height (ft.):	10	Face Angle (deg.):	90
Maximum Wall Height (ft.):	15	Vertical Offset (ft.):	-2

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	high- wall performing as intended, history of minor road cracking	8
WALL FOUNDATION MATERIAL 8.00	bedrock or thin talus over bedrock, no distress noted	9
PLACED STONE 8.00	large roughly rectangular blocks stacked in rows 1-5 ft long, bottom blocks are crudely stacked	9
DOWNSLOPE 0.50	steep loose angular talus slope, minor ravelling	8
LATERAL SLOPE 0.50	steep coarse angular talus, minor ravelling	8
ROAD/SIDEWALK/SHOULDER 0.50	10 ft long crack along shoulder, has been patched	8
WALL DRAINS 0.50	none, no distress noted	9

Repair Recommendations

Failure Consequence:	MODERATE
Recommendation Narrative:	None
Repair Cost:	\$0

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

Mount Rainier National Park

ROUTE 0013: STEVENS CANYON ROAD

Retaining Wall Condition Photos



MORA_0013_7.599_R_1.jpg

Wall ID:	MORA-0013-7.610-R		
Route Name:	STEVENS CANYON ROAD		
Inspection Date:	August 23, 2007	Approximate Year Built:	1930
*Wall Rating:	83	Maintenance Action:	No Action

Wall Description

Wall Function:	Fill Wall	Primary Wall Type:	Gravity - Dry Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Gravity dry stacked wall that is terraced, 3 tiers that are approx 30 ft long		

Wall Measurements

Wall Length (ft.):	30	Face Area (sq.):	675
Average Wall Height (ft.):	22	Face Angle (deg.):	90
Maximum Wall Height (ft.):	27	Vertical Offset (ft.):	-1

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	high- wall performing as intended	8
WALL FOUNDATION MATERIAL 8.00	shallow stable bedrock, no distress	9
PLACED STONE 8.00	semi-angular 4'-5' stone, well interlocked with tight chinking	8
DOWNSLOPE 0.50	steep slope , bedrock covered in rocky material	8
LATERAL SLOPE 0.50	begin-talus slope with sparse vegetation end- GD wall	8
ROAD/SIDEWALK/SHOULDER 0.50	10' of cracking that has been sealed	8
WALL DRAINS 0.50	no distress noted	9

Repair Recommendations

Failure Consequence:	HIGH
Recommendation Narrative:	None
Repair Cost:	\$0

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

Mount Rainier National Park

ROUTE 0013: STEVENS CANYON ROAD

Retaining Wall Condition Photos



MORA_0013_7.610_R_1.jpg

Wall ID:	MORA-0013-7.615-R		
Route Name:	STEVENS CANYON ROAD		
Inspection Date:	August 23, 2007	Approximate Year Built:	Unknown
*Wall Rating:	74	Maintenance Action:	No Action

Wall Description

Wall Function:	Fill Wall	Primary Wall Type:	Gravity - Dry Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Dry stack wall supporting a fill		

Wall Measurements

Wall Length (ft.):	28	Face Area (sq.):	392
Average Wall Height (ft.):	14	Face Angle (deg.):	50
Maximum Wall Height (ft.):	14	Vertical Offset (ft.):	-8

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	moderate- some setling(up to 1ft) may have occurred at far end of road	7
WALL FOUNDATION MATERIAL 8.00	likley shallow bedrock or talus, may have moved	7
PLACED STONE 8.00	large angular stones, minor voids	8
LATERAL SLOPE 0.50	steep talus slope, mild ravelling, GD wall	8
UPSLOPE 0.50	moderate steep dirt slope, mild to moderate ravelling	8
ROAD/SIDEWALK/SHOULDER 0.50	no distress noted	9
WALL DRAINS 0.50	none, no distress noted	9
DOWNSLOPE 1.00	steep talus slope, minor ravelling	7

Repair Recommendations

Failure Consequence:	MODERATE
Recommendation Narrative:	None
Repair Cost:	\$0

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

Mount Rainier National Park

ROUTE 0013: STEVENS CANYON ROAD

Retaining Wall Condition Photos



MORA_0013_7.615_R_1.jpg

Wall ID:	MORA-0013-7.824-R		
Route Name:	STEVENS CANYON ROAD		
Inspection Date:	August 23, 2007	Approximate Year Built:	1930
*Wall Rating:	79	Maintenance Action:	No Action

Wall Description

Wall Function:	Fill Wall	Primary Wall Type:	Gravity - Dry Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Dry laid fill wall		

Wall Measurements

Wall Length (ft.):	128	Face Area (sq.):	2100
Average Wall Height (ft.):	16	Face Angle (deg.):	52
Maximum Wall Height (ft.):	33	Vertical Offset (ft.):	-3

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Wall appears to be performing as intended	8
WALL FOUNDATION MATERIAL 8.00	Soil bench well vegetated	8
PLACED STONE 8.00	Irregular shaped stones from 1-5 foot	8
LATERAL SLOPE 0.50	Soil slopes 35°	8
WALL DRAINS 0.50	No evidence, no distress	9
ROAD/SIDEWALK/SHOULDER 1.00	Pavement distress at the beginning of wall, longitudinal crack along the entire length	6

Repair Recommendations

Failure Consequence:	MODERATE
Recommendation Narrative:	None
Repair Cost:	\$0

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

Mount Rainier National Park

ROUTE 0013: STEVENS CANYON ROAD

Retaining Wall Condition Photos



MORA_0013_7.824_R_1.jpg

Wall ID:	MORA-0013-7.826-R		
Route Name:	STEVENS CANYON ROAD		
Inspection Date:	August 23, 2007	Approximate Year Built:	1930
*Wall Rating:	66	Maintenance Action:	Maintenance

Wall Description

Wall Function:	Fill Wall	Primary Wall Type:	Gravity - Mortared Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Stone masonry fill wall		

Wall Measurements

Wall Length (ft.):	24	Face Area (sq.):	96
Average Wall Height (ft.):	4	Face Angle (deg.):	86
Maximum Wall Height (ft.):	4	Vertical Offset (ft.):	1

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Performance is satisfactory	6
WALL FOUNDATION MATERIAL 8.00	Soil and talus material that shows minor settlement	6
MORTAR 8.00	Mortar is debonded and spalled	7
STONE MASONRY 8.00	Stone shows little weathering	8
LATERAL SLOPE 0.50	Above the start of wall slope is vegetated; slope at end of wall is a guardwall and dry laid wall	8
CULVERT 1.00	Culvert exit is in the dry laid wall; looks clogged, water looks like it is piping	5
ROAD/SIDEWALK/SHOULDER 1.00	Pavement distress at the stone masonry and dry laid stone longitudinal crack along the entire length. Road is settling, pavement has been patched	5
WALL DRAINS 1.00	No evidence of wall drains however there is evidence of weeping	6

Repair Recommendations

Failure Consequence:	MODERATE
Recommendation Narrative:	Clean out culvert Labor: 8 man-hours x \$50/hour = \$400 Total=\$400
Repair Cost:	\$400

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

Mount Rainier National Park

ROUTE 0013: STEVENS CANYON ROAD

Retaining Wall Condition Photos



MORA_0013_7.826_R_1.jpg

Wall ID:	MORA-0013-7.870-R		
Route Name:	STEVENS CANYON ROAD		
Inspection Date:	August 23, 2007	Approximate Year Built:	Unknown
*Wall Rating:	90	Maintenance Action:	No Action

Wall Description

Wall Function:	Fill Wall	Primary Wall Type:	Gravity - Dry Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Dry stack wall supporting a fill		

Wall Measurements

Wall Length (ft.):	26	Face Area (sq.):	416
Average Wall Height (ft.):	16	Face Angle (deg.):	55
Maximum Wall Height (ft.):	16	Vertical Offset (ft.):	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	high- wall performing as intended	9
WALL FOUNDATION MATERIAL 8.00	bedrock, no distress noted	9
PLACED STONE 8.00	1'-3' irregular stone blocks, no distress, minor voids	9
ROAD/SIDEWALK/SHOULDER 0.50	minor random cracks, not wall related	8
DOWNSLOPE 0.50	bedrock, no distress noted	9
LATERAL SLOPE 0.50	bedrock, no distress noted	9
WALL DRAINS 0.50	none, no distress noted	9

Repair Recommendations

Failure Consequence:	MODERATE
Recommendation Narrative:	None
Repair Cost:	\$0

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

Mount Rainier National Park

ROUTE 0013: STEVENS CANYON ROAD

Retaining Wall Condition Photos



MORA_0013_7.870_R_1.jpg

Wall ID:	MORA-0013-7.923-R		
Route Name:	STEVENS CANYON ROAD		
Inspection Date:	August 23, 2007	Approximate Year Built:	1930
*Wall Rating:	77	Maintenance Action:	No Action

Wall Description

Wall Function:	Fill Wall	Primary Wall Type:	Gravity - Dry Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Dry laid stone fill wall with stone masonry guardwall		

Wall Measurements

Wall Length (ft.):	135	Face Area (sq.):	3800
Average Wall Height (ft.):	28	Face Angle (deg.):	50
Maximum Wall Height (ft.):	42	Vertical Offset (ft.):	-2

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	As intended	8
WALL FOUNDATION MATERIAL 8.00	Last 70' of wall founded on large bedrock outcrop	8
PLACED STONE 8.00	Large irregular blocks with areas of bulging	7
DOWNSLOPE 0.50	Talus, soil	8
LATERAL SLOPE 0.50	Talus slope at beginning, stone masonry wall at end	8
ROAD/SIDEWALK/SHOULDER 0.50	Transverse cracking in asphalt concrete, no settlement noted	8
WALL DRAINS 0.50	None	9
TRAFFIC BARRIER/FENCE 1.00	Stone masonry guardwall shows isolated voids in mortar, debonding	7

Repair Recommendations

Failure Consequence:	HIGH
Recommendation Narrative:	None
Repair Cost:	\$0

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

Mount Rainier National Park

ROUTE 0013: STEVENS CANYON ROAD

Retaining Wall Condition Photos



MORA_0013_7.923_R_1.jpg

Wall ID:	MORA-0013-7.950-R		
Route Name:	STEVENS CANYON ROAD		
Inspection Date:	August 23, 2007	Approximate Year Built:	1930
*Wall Rating:	72	Maintenance Action:	Repair Elements

Wall Description

Wall Function:	Fill Wall	Primary Wall Type:	Gravity - Mortared Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Stone masonry fill wall		

Wall Measurements

Wall Length (ft.):	132	Face Area (sq.):	2250
Average Wall Height (ft.):	17	Face Angle (deg.):	88
Maximum Wall Height (ft.):	24	Vertical Offset (ft.):	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	As intended	8
WALL FOUNDATION MATERIAL 8.00	Pocket of undermining at masonry/bedrock interface (20' length) near station 70	6
MORTAR 8.00	Areas of cracking and debonding although difficult to examine	7
STONE MASONRY 8.00	No distress	8
LATERAL SLOPE 0.50	Bedrock	8
ROAD/SIDEWALK/SHOULDER 0.50	Map cracking of asphalt, no settlement	8
WALL DRAINS 0.50	None	8
TRAFFIC BARRIER/FENCE 1.00	Guardwall mortar shows voids, deterioration and debonding	6
DOWNSLOPE 1.00	Talus, stable	7

Repair Recommendations

Failure Consequence:	HIGH
Recommendation Narrative:	Repair undermining of tow Underpin/stabilization: \$200/sqft x 20 ft x 1 ft = \$4000
Repair Cost:	\$4,000

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

Mount Rainier National Park

ROUTE 0013: STEVENS CANYON ROAD

Retaining Wall Condition Photos



MORA_0013_7.950_R_1.jpg

Wall ID:	MORA-0013-7.996-R		
Route Name:	STEVENS CANYON ROAD		
Inspection Date:	August 23, 2007	Approximate Year Built:	Unknown
*Wall Rating:	88	Maintenance Action:	No Action

Wall Description

Wall Function:	Fill Wall	Primary Wall Type:	Gravity - Mortared Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Mortared stone wall supporting a fill, on a bedrock ledge		

Wall Measurements

Wall Length (ft.):	299	Face Area (sq.):	3588
Average Wall Height (ft.):	12	Face Angle (deg.):	85
Maximum Wall Height (ft.):	19	Vertical Offset (ft.):	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	high- wall performing as intended	9
WALL FOUNDATION MATERIAL 8.00	bedrock, no distress noted	9
MORTAR 8.00	mild weathering and very mild debonding	8
STONE MASONRY 8.00	no distress noted	9
ROAD/SIDEWALK/SHOULDER 0.50	minor random orientated cracks in roadway, likley not wall related	8
DOWNSLOPE 0.50	bedrock, no distress noted	9
LATERAL SLOPE 0.50	bedrock, no distress noted	9
WALL DRAINS 0.50	scattered wall drains, no distress noted	9

Repair Recommendations

Failure Consequence:	HIGH
Recommendation Narrative:	None
Repair Cost:	\$0

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

Mount Rainier National Park

ROUTE 0013: STEVENS CANYON ROAD

Retaining Wall Condition Photos



MORA_0013_7.996_R_1.jpg

Wall ID:	MORA-0013-10.973-R		
Route Name:	STEVENS CANYON ROAD		
Inspection Date:	August 23, 2007	Approximate Year Built:	1930
*Wall Rating:	70	Maintenance Action:	Repair Elements

Wall Description

Wall Function:	Head Wall	Primary Wall Type:	Gravity - Mortared Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Stone masonry headwall, outlet of 6 ft x 6 ft box		

Wall Measurements

Wall Length (ft.):	30	Face Area (sq.):	160
Average Wall Height (ft.):	5	Face Angle (deg.):	85
Maximum Wall Height (ft.):	10	Vertical Offset (ft.):	-36

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	As intended	8
WALL FOUNDATION MATERIAL 8.00	Minor undermining of wings and headwall	7
MORTAR 8.00	Deterioration and voids on 25% of mortar lines	6
STONE MASONRY 8.00	Several stones dislodged from end of wingwall. Moderate separation of headwall from culvert.	7
LATERAL SLOPE 0.50	Vegetated, stable	8
UPSLOPE 0.50	Heavily vegetated, no distress	8
WALL DRAINS 0.50	None	8
CULVERT 1.00	6'x6' cip box, moderate undermining of downstream apron. 10'x6" section of bottom of interior culvert wall is eroded completely away, only rebar remains	5

Repair Recommendations

Failure Consequence:	LOW
Recommendation Narrative:	Repoint headwall (40 sqft) and repair culvert interior wall. Repointing: 40 sqft x \$75/sqft = \$3,000. Culvert repair: 4 man-days x \$350/day = \$1,400. 2 cyd concrete x \$1500 = \$3,000. Total=\$7,400
Repair Cost:	\$7,400

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

Mount Rainier National Park

ROUTE 0013: STEVENS CANYON ROAD

Retaining Wall Condition Photos



MORA_0013_10.973_R_1.jpg

Wall ID:	MORA-0013-10.975-R		
Route Name:	STEVENS CANYON ROAD		
Inspection Date:	August 23, 2007	Approximate Year Built:	1930
*Wall Rating:	76	Maintenance Action:	Repair Elements

Wall Description

Wall Function:	Head Wall	Primary Wall Type:	Gravity - Mortared Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Inlet stone masonry headwall for a 6 ft x 6 ft box culvert		

Wall Measurements

Wall Length (ft.):	30	Face Area (sq.):	180
Average Wall Height (ft.):	6	Face Angle (deg.):	90
Maximum Wall Height (ft.):	9	Vertical Offset (ft.):	-19

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Still retaining, needs repair and maintenance	7
WALL FOUNDATION MATERIAL 8.00	Coarse, native, firm ground, no distress	9
MORTAR 8.00	Moss covered, weathered, 50% of mortar cracked and missing 3-4" into wall	6
STONE MASONRY 8.00	Moss covered, good condition, 5 dislodged blocks, 2 blocks missing into creek channel	8
CULVERT 0.50	6'x6' concrete box culvert, mild cracking at interface with wall	8
DOWNSLOPE 0.50	Coarse creek bed, minor accumulation of cobble/small boulders at inlet	8
UPSLOPE 0.50	Moderate slope, vegetated, minor creep	8
LATERAL SLOPE 0.50	Coarse channel deposits (cobbles, boulders) vegetated, no distress	9
ROAD/SIDEWALK/SHOULDER 0.50	No distress	9

Repair Recommendations

Failure Consequence:	LOW
Recommendation Narrative:	Repoint 50% of wall (140 sqft), Reset stones (15 sqft), Remove vegetation. Repoint: 140 sqft x \$75/sqft = \$10,500. Reset stones: 15 sqft x \$200/sqft = \$3,000. Remove veg: 4 man-hours x \$50/hour=\$200. Total=\$13,700
Repair Cost:	\$13,700

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

Mount Rainier National Park

ROUTE 0013: STEVENS CANYON ROAD

Retaining Wall Condition Photos



MORA_0013_10.975_R_1.jpg

Wall ID:	MORA-0013-13.555-R		
Route Name:	STEVENS CANYON ROAD		
Inspection Date:	August 23, 2007	Approximate Year Built:	Unknown
*Wall Rating:	90	Maintenance Action:	No Action

Wall Description

Wall Function:	Fill Wall	Primary Wall Type:	MSE - Precast Panel
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Fill wall, elevated road at bridge approach, precast panel wall		

Wall Measurements

Wall Length (ft.):	350	Face Area (sq.):	3550
Average Wall Height (ft.):	10	Face Angle (deg.):	90
Maximum Wall Height (ft.):	14	Vertical Offset (ft.):	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	high- wall performing as intended	9
WALL FOUNDATION MATERIAL 8.00	likley bedrock, no distress noted	9
CONCRETE 8.00	concrete panel, no distress noted	9
ARCHITECTURAL FACING 0.50	large interlocking, precast panels, with galvanized steel rod, connectors, no distress noted	9
DOWNSLOPE 0.50	relatively flat bench of weathered bedrock, no distress noted	9
LATERAL SLOPE 0.50	no distress noted	9
ROAD/SIDEWALK/SHOULDER 0.50	no distress noted	9
TRAFFIC BARRIER/FENCE 0.50	no distress noted	9
WALL DRAINS 0.50	none visible, no distress noted	9

Repair Recommendations

Failure Consequence:	HIGH
Recommendation Narrative:	None
Repair Cost:	\$0

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

Mount Rainier National Park

ROUTE 0013: STEVENS CANYON ROAD

Retaining Wall Condition Photos



MORA_0013_13.555_R_1.jpg

Wall ID:	MORA-0013-13.678-R		
Route Name:	STEVENS CANYON ROAD		
Inspection Date:	August 23, 2007	Approximate Year Built:	1980
*Wall Rating:	90	Maintenance Action:	No Action
Wall Description			
Wall Function:	Fill Wall	Primary Wall Type:	MSE - Precast Panel
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	Formlined Concrete
General Description:	Concrete panelled MSE wall after a bridge		
Wall Measurements			
Wall Length (ft.):	585	Face Area (sq.):	5850
Average Wall Height (ft.):	10	Face Angle (deg.):	87
Maximum Wall Height (ft.):	18	Vertical Offset (ft.):	0
Assessed Elements			
Element (Weighting Factor)	Narrative		Condition Rating (0 - 10)
PERFORMANCE 8.00	As intended		9
WALL FOUNDATION MATERIAL 8.00	Flat bench of weathered bed rock		9
CONCRETE 8.00	Concrete panels - no distress		9
DOWNSLOPE 0.50	40° soil and dry laid stone wall		8
ARCHITECTURAL FACING 0.50	No distress, large interlocking concrete panels		9
LATERAL SLOPE 0.50	40° soil and stone slope, no distress		9
WALL DRAINS 0.50	None visible, no distress		9
Repair Recommendations			
Failure Consequence:	HIGH		
Recommendation Narrative:	None		
Repair Cost:	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			

Mount Rainier National Park

ROUTE 0013: STEVENS CANYON ROAD

Retaining Wall Condition Photos



MORA_0013_13.678_R_1.jpg

Wall ID:	MORA-0013-13.963-R		
Route Name:	STEVENS CANYON ROAD		
Inspection Date:	August 23, 2007	Approximate Year Built:	1930
*Wall Rating:	77	Maintenance Action:	No Action

Wall Description

Wall Function:	Fill Wall	Primary Wall Type:	Gravity - Mortared Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Stone masonry fill wall		

Wall Measurements

Wall Length (ft.):	220	Face Area (sq.):	1450
Average Wall Height (ft.):	6	Face Angle (deg.):	85
Maximum Wall Height (ft.):	10	Vertical Offset (ft.):	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	As intended	8
WALL FOUNDATION MATERIAL 8.00	No distress	8
MORTAR 8.00	10% of mortar is deteriorated, debonded	7
STONE MASONRY 8.00	1% of stones cracked and/or spalled	8
DOWNSLOPE 0.50	Soil, stable	8
LATERAL SLOPE 0.50	Dry stacked wall at beginning, soil at end; stable	8
WALL DRAINS 0.50	None	8
ROAD/SIDEWALK/SHOULDER 1.00	Longitudinal crack down center on downhill lane indicates some movement	7

Repair Recommendations

Failure Consequence:	MODERATE
Recommendation Narrative:	None
Repair Cost:	\$0

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

Mount Rainier National Park

ROUTE 0013: STEVENS CANYON ROAD

Retaining Wall Condition Photos



MORA_0013_13.963_R_1.jpg

Wall ID:	MORA-0013-13.996-R		
Route Name:	STEVENS CANYON ROAD		
Inspection Date:	August 23, 2007	Approximate Year Built:	1930
*Wall Rating:	75	Maintenance Action:	Maintenance

Wall Description

Wall Function:	Fill Wall	Primary Wall Type:	Gravity - Dry Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Dry laid fill wall		

Wall Measurements

Wall Length (ft.):	104	Face Area (sq.):	1190
Average Wall Height (ft.):	11	Face Angle (deg.):	65
Maximum Wall Height (ft.):	14	Vertical Offset (ft.):	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Some bulging on wall, 8 feet at base of wall undermined by water erosion, 2 missing blocks	7
WALL FOUNDATION MATERIAL 8.00	Weathered bedrock below, 1-foot thick concrete footing, no distress	9
PLACED STONE 8.00	Large (2-5') angular blocks, large voids common, 2 large stones missing from base due to water erosion at edge of wall	7
WALL DRAINS 0.50	None, no distress	9
CURB/BERM/DITCH 1.00	Surface water empties out from roadway at edge of wall and is eroding base of wall	6
DOWNSLOPE 1.00	Steep, loose, talus, minor ravelling	7
LATERAL SLOPE 1.00	Steep, wooded, slope at start, water erosion, creep, ravelling, stone masonry wall at end	7
ROAD/SIDEWALK/SHOULDER 1.00	1-2" wide crack running along fog line at shoulder	7
TRAFFIC BARRIER/FENCE 1.00	Guardwall leaning out slightly	7

Repair Recommendations

Failure Consequence:	HIGH
Recommendation Narrative:	Redirect surface water away from beginning of wall Labor: 8 man-hours x \$50/hour = \$400 Total: \$400
Repair Cost:	\$400

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

Mount Rainier National Park

ROUTE 0013: STEVENS CANYON ROAD

Retaining Wall Condition Photos



MORA_0013_13.996_R_1.jpg

Wall ID:	MORA-0013-14.981-R		
Route Name:	STEVENS CANYON ROAD		
Inspection Date:	August 24, 2007	Approximate Year Built:	Unknown
*Wall Rating:	82	Maintenance Action:	Maintenance

Wall Description

Wall Function:	Fill Wall	Primary Wall Type:	Gravity - Mortared Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Mortared stone wall supporting a fill, guardwall on top, no shoulder		

Wall Measurements

Wall Length (ft.):	334	Face Area (sq.):	5333
Average Wall Height (ft.):	15	Face Angle (deg.):	85
Maximum Wall Height (ft.):	26	Vertical Offset (ft.):	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	high- wall performing as intended, needs minor maintenance	8
WALL FOUNDATION MATERIAL 8.00	bedrock, no distress noted	9
MORTAR 8.00	mild debonding over entire wall, moderate debonding over 2% of wall, erosion of mortar (back 3"-4" into wall) below 18" culvert outlet	8
STONE MASONRY 8.00	mostly good rock blocks, 1%-2% of stone blocks are weathering and spalling at face, not affecting structure yet	8
LATERAL SLOPE 0.50	steep wooded bedrock with thin soil, minor creep	8
ROAD/SIDEWALK/SHOULDER 0.50	minor cracking in asphalt, random orientation, not likley wall related	8
CULVERT 0.50	18" culvert outlets through face of wall, 19ft above base of wall, not accesible, no visible distress	9
DOWNSLOPE 0.50	steep bedrock, or shallow bedrock	9
WALL DRAINS 0.50	at least 2 6" diam concrete drain pipes at base of wall, no distress noted	9

Repair Recommendations

Failure Consequence:	HIGH
Recommendation Narrative:	Repoint mortar below culvert - 38 sqft - 2 laborers
Repair Cost:	\$1,000

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

Mount Rainier National Park

ROUTE 0013: STEVENS CANYON ROAD

Retaining Wall Condition Photos



MORA_0013_14.981_R_1.jpg

Wall ID:	MORA-0013-15.083-R		
Route Name:	STEVENS CANYON ROAD		
Inspection Date:	August 24, 2007	Approximate Year Built:	1930
*Wall Rating:	80	Maintenance Action:	No Action

Wall Description

Wall Function:	Fill Wall	Primary Wall Type:	Gravity - Mortared Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Mortar stone fill wall along a rock faced cliff		

Wall Measurements

Wall Length (ft.):	215	Face Area (sq.):	621
Average Wall Height (ft.):	2	Face Angle (deg.):	86
Maximum Wall Height (ft.):	13	Vertical Offset (ft.):	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	high- wall performing as intended, but is bowed out at the culvert	8
WALL FOUNDATION MATERIAL 8.00	combination of soil and bedrock	8
MORTAR 8.00	has been repointed in the past, areas of debonding, less than 15%, slight areas of lost mortar 1%	8
STONE MASONRY 8.00	strong stone with little weathering	9
LATERAL SLOPE 0.50	benched slopes with vegetation	8
ROAD/SIDEWALK/SHOULDER 1.00	road shows distress at the culvert settlement	5
DOWNSLOPE 1.00	soil slope 43% with vegetation	7
WALL DRAINS 1.00	evidence of weeping	7

Repair Recommendations

Failure Consequence:	MODERATE
Recommendation Narrative:	None
Repair Cost:	\$0

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

Mount Rainier National Park

ROUTE 0013: STEVENS CANYON ROAD

Retaining Wall Condition Photos



MORA_0013_15.083_R_1.jpg

Wall ID:	MORA-0013-15.650-R		
Route Name:	STEVENS CANYON ROAD		
Inspection Date:	August 24, 2007	Approximate Year Built:	1930
*Wall Rating:	81	Maintenance Action:	Maintenance

Wall Description

Wall Function:	Fill Wall	Primary Wall Type:	Gravity - Mortared Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Stone masonry fill wall, guardwall, no shoulder		

Wall Measurements

Wall Length (ft.):	198	Face Area (sq.):	1534
Average Wall Height (ft.):	7	Face Angle (deg.):	88
Maximum Wall Height (ft.):	13	Vertical Offset (ft.):	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	High- wall performing as intended, needs minor maintenance	8
WALL FOUNDATION MATERIAL 8.00	bedrock or shallow bedrock, no distress	9
MORTAR 8.00	Mild debonding over most of wall, some moss covered areas, small voids over 2% of wall, scour erosion(back 3" into face, from culvert outlet	7
STONE MASONRY 8.00	some moss covered, no distress	9
CULVERT 0.50	18 inch cmp culvert outlets through wall face, 8 ft above base of wall, not accesible appears operational	8
DOWNSLOPE 0.50	steep bedrock and thin soil, vegetated, minor creep	8
LATERAL SLOPE 0.50	steep bedrock or thin soil over shallow bedrock, vegetated, minor creep	8
ROAD/SIDEWALK/SHOULDER 0.50	minor lateral cracking along roadway and shoulder, up to 1/4" wide	8
CURB/BERM/DITCH 1.00	water flowing down bedrock face, across road and in the ditch below, some of the water is flowing under the road and through the face of the wall	7

Repair Recommendations

Failure Consequence:	HIGH
Recommendation Narrative:	Repoint 2% of wall, Repoint 48 sqft of wall, remove vegetation from wall, 2 laborers @ \$55.00/hr x 8hrs = \$880.00, 2 flaggers \$300.00.
Repair Cost:	\$1,200

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

Mount Rainier National Park

ROUTE 0013: STEVENS CANYON ROAD

Retaining Wall Condition Photos



MORA_0013_15.650_R_1.jpg

Wall ID:	MORA-0013-15.740-R		
Route Name:	STEVENS CANYON ROAD		
Inspection Date:	August 24, 2007	Approximate Year Built:	1930
*Wall Rating:	73	Maintenance Action:	No Action

Wall Description

Wall Function:	Fill Wall	Primary Wall Type:	Gravity - Mortared Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Stone masonry fill wall		

Wall Measurements

Wall Length (ft.):	98	Face Area (sq.):	1325
Average Wall Height (ft.):	13	Face Angle (deg.):	85
Maximum Wall Height (ft.):	21	Vertical Offset (ft.):	49

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	moderate- wall performing as intended with some slight weathering, monitor	8
WALL FOUNDATION MATERIAL 8.00	minor voids in footing stones, no undermining	7
MORTAR 8.00	isolated areas of debonding and cracking	7
STONE MASONRY 8.00	moss growth over 50% of wall face, stones weathered with isolated stones showing decay	7
CULVERT 0.50	24" cmp at station 65	8
LATERAL SLOPE 0.50	stable soil	8
UPSLOPE 0.50	stable soil	8
WALL DRAINS 0.50	drain near base of wall	8
DOWNSLOPE 1.00	soil with drainage erosion @ downslope fo culvert	7

Repair Recommendations

Failure Consequence:	MODERATE
Recommendation Narrative:	None
Repair Cost:	\$0

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

Mount Rainier National Park

ROUTE 0013: STEVENS CANYON ROAD

Retaining Wall Condition Photos



MORA_0013_15.740_R_1.jpg

Wall ID:	MORA-0013-15.788-R		
Route Name:	STEVENS CANYON ROAD		
Inspection Date:	August 24, 2007	Approximate Year Built:	1930
*Wall Rating:	83	Maintenance Action:	No Action

Wall Description

Wall Function:	Fill Wall	Primary Wall Type:	Gravity - Mortared Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Stone masonry wall supporting a fill. Built on steep bedrock, limited access to base of wall		

Wall Measurements

Wall Length (ft.):	320	Face Area (sq.):	6223
Average Wall Height (ft.):	19	Face Angle (deg.):	90
Maximum Wall Height (ft.):	39	Vertical Offset (ft.):	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	High- wall performing as intended, monitor weathering of stone blocks and mortar	8
WALL FOUNDATION MATERIAL 8.00	bedrock, no distress noted	9
MORTAR 8.00	Mild debonding over most of wall, very small voids, NO ACCESS TO MOST OF WALL	8
STONE MASONRY 8.00	mostly competent rock- 1% of rock blocks composed of highly weathered volcanic rocks and are spalling, does not seem to affect wall structure, NO ACCESS TO MOST OF WALL	8
ROAD/SIDEWALK/SHOULDER 0.50	mild cracking along the length of the wall	8
DOWNSLOPE 0.50	bedrock, no distress noted	9
LATERAL SLOPE 0.50	bedrock, no distress noted	9
WALL DRAINS 0.50	No distress noted	9

Repair Recommendations

Failure Consequence:	HIGH
Recommendation Narrative:	None
Repair Cost:	\$0

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

Mount Rainier National Park

ROUTE 0013: STEVENS CANYON ROAD

Retaining Wall Condition Photos



MORA_0013_15.788_R_1.jpg

Wall ID:	MORA-0013-15.854-R		
Route Name:	STEVENS CANYON ROAD		
Inspection Date:	August 24, 2007	Approximate Year Built:	1930
*Wall Rating:	78	Maintenance Action:	No Action
Wall Description			
Wall Function:	Fill Wall	Primary Wall Type:	Gravity - Mortared Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Stone masonry fill wall		
Wall Measurements			
Wall Length (ft.):	90	Face Area (sq.):	960
Average Wall Height (ft.):	10	Face Angle (deg.):	85
Maximum Wall Height (ft.):	18	Vertical Offset (ft.):	0
Assessed Elements			
Element (Weighting Factor)	Narrative		Condition Rating (0 - 10)
PERFORMANCE 8.00	moderate- wall performing as intended		8
WALL FOUNDATION MATERIAL 8.00	isolated voids in soil adjacent to wall toe, no undermining noted		7
MORTAR 8.00	isolated debonding and seperation, otherwise no distress noted		8
STONE MASONRY 8.00	moss growth on 50% of wall face		8
DOWNSLOPE 0.50	stable soil, no distress noted		8
LATERAL SLOPE 0.50	bedrock, no distress noted		8
WALL DRAINS 0.50	no distress noted		8
Repair Recommendations			
Failure Consequence:	HIGH		
Recommendation Narrative:	None		
Repair Cost:	\$0		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			

Mount Rainier National Park

ROUTE 0013: STEVENS CANYON ROAD

Retaining Wall Condition Photos



MORA_0013_15.854_R_1.jpg

Wall ID:	MORA-0013-15.874-R		
Route Name:	STEVENS CANYON ROAD		
Inspection Date:	August 24, 2007	Approximate Year Built:	1930
*Wall Rating:	82	Maintenance Action:	No Action

Wall Description

Wall Function:	Fill Wall	Primary Wall Type:	Gravity - Mortared Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Stone masonry wall supporting a fill		

Wall Measurements

Wall Length (ft.):	155	Face Area (sq.):	1008
Average Wall Height (ft.):	6	Face Angle (deg.):	85
Maximum Wall Height (ft.):	11	Vertical Offset (ft.):	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	high- wall performing as intended	8
WALL FOUNDATION MATERIAL 8.00	shallow bedrock that is covered in vegetation	9
MORTAR 8.00	slight cracking and debonding of mortar	8
STONE MASONRY 8.00	semi-angular stone with slight weathering, moss covered 2' stone, minor vegetation growing out of wall	8
DOWNSLOPE 0.50	steep well vegetated slope	8
LATERAL SLOPE 0.50	begin-vegitated covered bedrock end-steep well vegetated slope	8
ROAD/SIDEWALK/SHOULDER 0.50	minimal cracking in roadway	8
WALL DRAINS 0.50	no distress noted	9

Repair Recommendations

Failure Consequence:	HIGH
Recommendation Narrative:	None
Repair Cost:	\$0

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

Mount Rainier National Park

ROUTE 0013: STEVENS CANYON ROAD

Retaining Wall Condition Photos



MORA_0013_15.874_R_1.jpg

Wall ID:	MORA-0013-15.959-R		
Route Name:	STEVENS CANYON ROAD		
Inspection Date:	August 24, 2007	Approximate Year Built:	1990
*Wall Rating:	53	Maintenance Action:	Repair Elements
Wall Description			
Wall Function:	Fill Wall	Primary Wall Type:	Gravity - Dry Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Dry laid fill wall		
Wall Measurements			
Wall Length (ft.):	65	Face Area (sq.):	215
Average Wall Height (ft.):	3	Face Angle (deg.):	73
Maximum Wall Height (ft.):	6	Vertical Offset (ft.):	0
Assessed Elements			
Element (Weighting Factor)	Narrative		Condition Rating (0 - 10)
PERFORMANCE 8.00	Wall performing but erosion of wall foundation, downslope and lateral slope could jeopardize wall		6
WALL FOUNDATION MATERIAL 8.00	Pockets of erosion at wall toe could lead to failure		4
PLACED STONE 8.00	Irregular sized angular blocks		7
WALL DRAINS 0.50	None		8
DOWNSLOPE 1.00	Heavy erosion of downslope beneath wall; soil, cobbles		5
ROAD/SIDEWALK/SHOULDER 1.00	Settlement of roadway, cracking and patches apparent		6
LATERAL SLOPE 5.00	End of wall slope erodible; 40' length has failed, impacts the adjacent roadway shoulder such that the lane was closed to traffic.		3
Repair Recommendations			
Failure Consequence:	MODERATE		
Recommendation Narrative:	Extend wall 50' to address current lateral slope failure and stabilize downslope beneath existing wall. Build gravity, mortared stone wall: \$160/sqft x 50 ft x 15 ft = \$120,000 Underpin/stabilize existing wall: \$200/sqft x 65 ft x 4 ft = \$52,000		
Repair Cost:	\$172,000		
2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.			

Mount Rainier National Park

ROUTE 0013: STEVENS CANYON ROAD

Retaining Wall Condition Photos



MORA_0013_15.959_R_1.jpg

Wall ID:	MORA-0013-17.422-R		
Route Name:	STEVENS CANYON ROAD		
Inspection Date:	August 24, 2007	Approximate Year Built:	Unknown
*Wall Rating:	90	Maintenance Action:	No Action

Wall Description

Wall Function:	Fill Wall	Primary Wall Type:	Gravity - Mortared Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Mortared stone wall supporting a fill		

Wall Measurements

Wall Length (ft.):	272	Face Area (sq.):	2429
Average Wall Height (ft.):	8	Face Angle (deg.):	85
Maximum Wall Height (ft.):	19	Vertical Offset (ft.):	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	high- wall performing as intended	9
WALL FOUNDATION MATERIAL 8.00	bedrock or talus, no distress noted	9
MORTAR 8.00	50% covered with moss, great condition where visible	9
STONE MASONRY 8.00	no distress noted, partly moss covered	9
CULVERT 0.50	18" cmp, outlets through face of wall at 100' from start, and 5' above base, no distress noted	9
DOWNSLOPE 0.50	steep bedrock or talus slope, moss covered, no distress noted	9
LATERAL SLOPE 0.50	steep bedrock or talus slope, moss covered, no distress noted	9
ROAD/SIDEWALK/SHOULDER 0.50	no distress noted	9
WALL DRAINS 0.50	none noted, no distress	9

Repair Recommendations

Failure Consequence:	HIGH
Recommendation Narrative:	None
Repair Cost:	\$0

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

Mount Rainier National Park

ROUTE 0013: STEVENS CANYON ROAD

Retaining Wall Condition Photos



MORA_0013_17.422_R_1.jpg

Wall ID:	MORA-0014-7.355-R		
Route Name:	STATE ROUTE 706 (NISQUALLY ROAD)		
Inspection Date:	August 21, 2007	Approximate Year Built:	1930
*Wall Rating:	79	Maintenance Action:	No Action

Wall Description

Wall Function:	Fill Wall	Primary Wall Type:	Gravity - Dry Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Dry laid fill wall		

Wall Measurements

Wall Length (ft.):	49	Face Area (sq.):	300
Average Wall Height (ft.):	6	Face Angle (deg.):	70
Maximum Wall Height (ft.):	10	Vertical Offset (ft.):	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Stable and performing as intended	8
WALL FOUNDATION MATERIAL 8.00	Firm ground, no distress	8
PLACED STONE 8.00	Irregularly sized natural stone; minor impact damage; moderate bulge in wall stone near beginning of wall, moss covered with vegetation	8
DOWNSLOPE 0.50	Very minor creep or ravelling. Trail beneath wall to secondary down slope is steep, outside bend of river	8
LATERAL SLOPE 0.50	Steep coarse riprap and soil, no erosion; very minor slope creep	8
ROAD/SIDEWALK/SHOULDER 0.50	Wheel ruts in road, no distress in overlay	8
WALL DRAINS 0.50	None, no distress	9
TRAFFIC BARRIER/FENCE 1.00	Stone masonry guardwall. One vertical 2" crack in guardwall near beginning end of wall; one stone missing at end of wall	7
VEGETATION 1.00	Minor to moderate fern and moss growth on wall face	7

Repair Recommendations

Failure Consequence:	MODERATE
Recommendation Narrative:	None
Repair Cost:	\$0

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

Mount Rainier National Park
ROUTE 0014: STATE ROUTE 706 (NISQUALLY ROAD)

Retaining Wall Condition Photos



MORA_0014_7.355_R_1.jpg

Wall ID:	MORA-0014-10.776-R		
Route Name:	STATE ROUTE 706 (NISQUALLY ROAD)		
Inspection Date:	August 21, 2007	Approximate Year Built:	1930
*Wall Rating:	78	Maintenance Action:	No Action

Wall Description

Wall Function:	Fill Wall	Primary Wall Type:	Gravity - Mortared Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Stone masonry fill wall adjacent to Christine Falls Bridge		

Wall Measurements

Wall Length (ft.):	168	Face Area (sq.):	530
Average Wall Height (ft.):	3	Face Angle (deg.):	87
Maximum Wall Height (ft.):	14	Vertical Offset (ft.):	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	As intended	8
WALL FOUNDATION MATERIAL 8.00	Firm, solid, no distress	8
MORTAR 8.00	Minor separations, debonding in mortar lines	7
PLACED STONE 8.00	No distress. Vertical joint 30' from wall end	8
LATERAL SLOPE 0.50	No distress	8
ROAD/SIDEWALK/SHOULDER 0.50	No distress	8
WALL DRAINS 0.50	Drains in wall at roadway/parking lot level	8

Repair Recommendations

Failure Consequence:	MODERATE
Recommendation Narrative:	None
Repair Cost:	\$0

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

Mount Rainier National Park
ROUTE 0014: STATE ROUTE 706 (NISQUALLY ROAD)

Retaining Wall Condition Photos



MORA_0014_10.776_R_1.jpg

Wall ID:	MORA-0014-10.795-L		
Route Name:	STATE ROUTE 706 (NISQUALLY ROAD)		
Inspection Date:	August 21, 2007	Approximate Year Built:	Unknown
*Wall Rating:	76	Maintenance Action:	No Action

Wall Description

Wall Function:	Cut Wall	Primary Wall Type:	Gravity - Dry Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Dry stacked cut wall at base of shallow landslide slope, exhibits shallow ravelling slope above is high and steep		

Wall Measurements

Wall Length (ft.):	155	Face Area (sq.):	2303
Average Wall Height (ft.):	14	Face Angle (deg.):	80
Maximum Wall Height (ft.):	26	Vertical Offset (ft.):	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	moderate- mild bulging in placed stones, otherwise wall is performing as intended, monitor bulging	7
WALL FOUNDATION MATERIAL 8.00	bedrock or coarse firm soil	9
PLACED STONE 8.00	1' to 4' diameter blocks that are angular, very little moss, mild bulging at end, some small voids	7
CULVERT 0.50	24" cmp, no distress noted	8
CURB/BERM/DITCH 0.50	ditch runs along base of wall, no apparent distress noted	8
LATERAL SLOPE 0.50	bedrock at beginning of wall, steep course soil at end of wall, minor creep	8
ROAD/SIDEWALK/SHOULDER 0.50	no distress noted	9
WALL DRAINS 0.50	no distress noted	9
UPSLOPE 1.00	steep slope that appears to be a shallow landslide area, that extends 200 ft above the road, moderate rock fall accumulation at top of wall	6

Repair Recommendations

Failure Consequence:	HIGH
Recommendation Narrative:	None
Repair Cost:	\$0

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

Mount Rainier National Park
ROUTE 0014: STATE ROUTE 706 (NISQUALLY ROAD)

Retaining Wall Condition Photos



MORA_0014_10.795_L_1.jpg

Wall ID:	MORA-0014-12.410-R		
Route Name:	STATE ROUTE 706 (NISQUALLY ROAD)		
Inspection Date:	August 21, 2007	Approximate Year Built:	1930
*Wall Rating:	71	Maintenance Action:	No Action

Wall Description

Wall Function:	Fill Wall	Primary Wall Type:	Gravity - Mortared Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Stone masonry fill wall		

Wall Measurements

Wall Length (ft.):	345	Face Area (sq.):	2300
Average Wall Height (ft.):	6	Face Angle (deg.):	88
Maximum Wall Height (ft.):	15	Vertical Offset (ft.):	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Overall as intended, isolated areas should be monitored for movement	7
WALL FOUNDATION MATERIAL 8.00	Stable, no distress	8
MORTAR 8.00	Cracks in mortar (1") 90' from wall beginning; 1% of mortar has voids that extend up to 6", debonding in 20% of wall face	6
STONE MASONRY 8.00	Bulging in wall face 90' from beginning ; weeping throughout wall face (10%)	7
DOWNSLOPE 0.50	45°, stable	8
LATERAL SLOPE 0.50	Well vegetated, no erosion	8
WALL DRAINS 0.50	None	8
CULVERT 0.50	18" cmp at station 130	9
VEGETATION 1.00	Alder, brush growing from face of wall	7

Repair Recommendations

Failure Consequence:	MODERATE
Recommendation Narrative:	None
Repair Cost:	\$0

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

Mount Rainier National Park
ROUTE 0014: STATE ROUTE 706 (NISQUALLY ROAD)

Retaining Wall Condition Photos

Condition photos are not available for MORA-0014-12,410-R.

Wall ID:	MORA-0014-12.567-R		
Route Name:	STATE ROUTE 706 (NISQUALLY ROAD)		
Inspection Date:	August 21, 2007	Approximate Year Built:	1930
*Wall Rating:	77	Maintenance Action:	No Action

Wall Description

Wall Function:	Fill Wall	Primary Wall Type:	Gravity - Mortared Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Stone masonry fill wall		

Wall Measurements

Wall Length (ft.):	132	Face Area (sq.):	780
Average Wall Height (ft.):	5	Face Angle (deg.):	88
Maximum Wall Height (ft.):	10	Vertical Offset (ft.):	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	As intended	8
WALL FOUNDATION MATERIAL 8.00	Stable, no distress	8
MORTAR 8.00	Up to 10% minor debonding, 1% voids in mortar	7
STONE MASONRY 8.00	Naturally jointed. Slow weeps through wall face, 1% spalling.	8
DOWNSLOPE 0.50	40° slope, stable	8
LATERAL SLOPE 0.50	Stable, no erosion	8
WALL DRAINS 0.50	None, no distress	9
VEGETATION 1.00	Minor to moderate vegetation growth in wall face	6
TRAFFIC BARRIER/FENCE 1.00	Minor to moderate mortar loss in guard wall	7

Repair Recommendations

Failure Consequence:	MODERATE
Recommendation Narrative:	None
Repair Cost:	\$0

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

Mount Rainier National Park
ROUTE 0014: STATE ROUTE 706 (NISQUALLY ROAD)

Retaining Wall Condition Photos



MORA_0014_12.567_R_1.jpg

Wall ID:	MORA-0014-12.655-R		
Route Name:	STATE ROUTE 706 (NISQUALLY ROAD)		
Inspection Date:	August 21, 2007	Approximate Year Built:	Unknown
*Wall Rating:	83	Maintenance Action:	No Action

Wall Description

Wall Function:	Fill Wall	Primary Wall Type:	Gravity - Mortared Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Mortared stone wall supporting a fill		

Wall Measurements

Wall Length (ft.):	56	Face Area (sq.):	168
Average Wall Height (ft.):	3	Face Angle (deg.):	85
Maximum Wall Height (ft.):	6	Vertical Offset (ft.):	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	moderate- wall performing as intended	8
WALL FOUNDATION MATERIAL 8.00	shallow bedrock or firm soil, no distress	9
MORTAR 8.00	mild debonding over 50%, up to 6" voids in 1% of mortar	7
STONE MASONRY 8.00	good condition, mild weathering, with mild vegetation	9
DOWNSLOPE 0.50	very steep wooded slope, talus, minor creep and raveling	8
LATERAL SLOPE 0.50	steep wooded talus slope, minor ravelling	8
ROAD/SIDEWALK/SHOULDER 0.50	good condition, minor debonding of overlay	8
CULVERT 0.50	18" cmp outlets through wall, operational	9
WALL DRAINS 0.50	no distress noted	9

Repair Recommendations

Failure Consequence:	MODERATE
Recommendation Narrative:	None
Repair Cost:	\$0

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

Mount Rainier National Park
ROUTE 0014: STATE ROUTE 706 (NISQUALLY ROAD)

Retaining Wall Condition Photos



MORA_0014_12.655_R_1.jpg

Wall ID:	MORA-0014-14.729-R		
Route Name:	STATE ROUTE 706 (NISQUALLY ROAD)		
Inspection Date:	August 21, 2007	Approximate Year Built:	1930
*Wall Rating:	68	Maintenance Action:	Repair Elements

Wall Description

Wall Function:	Fill Wall	Primary Wall Type:	Gravity - Mortared Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Stone masonry fill wall		

Wall Measurements

Wall Length (ft.):	201	Face Area (sq.):	1325
Average Wall Height (ft.):	6	Face Angle (deg.):	85
Maximum Wall Height (ft.):	8	Vertical Offset (ft.):	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Wall appears to be leaning ~2° past vertical and bulging and cracked mortar between stations 150 & 200.	6
WALL FOUNDATION MATERIAL 8.00	Shallow bedrock and coarse fill, may have minor settling at sta 150-200	7
MORTAR 8.00	Moderate debonding over 50% of wall, minor weeping fro sta 150-200, up to 1/2" cracks in mortar where wall is leaning and bulging (sta 150-200); mild efflorescence 5% of wall	6
STONE MASONRY 8.00	Good condition, no distress	8
DOWNSLOPE 0.50	Moderate to steep, shot rock and soil, mild creep	8
LATERAL SLOPE 0.50	steep shot rock embankment, mild creep	8
WALL DRAINS 0.50	Several 4" galv pipe drains spaced ~20' apart along middle portion of wall, no distress	8
ROAD/SIDEWALK/SHOULDER 1.00	1/2 to 1" cracks in overlay, overlay is delaminating	7

Repair Recommendations

Failure Consequence:	MODERATE
Recommendation Narrative:	Repoint mortar (400 ft2) Repoint: 400 sqft x \$75 = \$30,000 Total=\$30,000
Repair Cost:	\$30,000

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

Mount Rainier National Park
ROUTE 0014: STATE ROUTE 706 (NISQUALLY ROAD)

Retaining Wall Condition Photos



MORA_0014_14.729_R_1.jpg

Wall ID:	MORA-0203-0.008-R		
Route Name:	MILLER CUT OFF / RICKSECKER POINT LOOP ROAD		
Inspection Date:	August 21, 2007	Approximate Year Built:	Unknown
*Wall Rating:	80	Maintenance Action:	No Action

Wall Description

Wall Function:	Fill Wall	Primary Wall Type:	Gravity - Mortared Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Mortared stone wall supporting a fill		

Wall Measurements

Wall Length (ft.):	60	Face Area (sq.):	130
Average Wall Height (ft.):	2	Face Angle (deg.):	90
Maximum Wall Height (ft.):	6	Vertical Offset (ft.):	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	moderate- wall performing as intended	8
WALL FOUNDATION MATERIAL 8.00	firm soil, slightly undermined at end of wall below guardrail	8
MORTAR 8.00	minor debonding over 10% of mortar, moss covered, minor voids over 1%, slow weeping over 5%	7
STONE MASONRY 8.00	no distress noted	9
DOWNSLOPE 0.50	steep wooded minor creep	8
LATERAL SLOPE 0.50	steep wooded minor creep	8
VEGETATION 0.50	minor small vegetation growing from wall	8
WALL DRAINS 0.50	no distress noted	9

Repair Recommendations

Failure Consequence:	LOW
Recommendation Narrative:	None
Repair Cost:	\$0

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

Mount Rainier National Park

ROUTE 0203: MILLER CUT OFF / RICKSECKER POINT LOOP ROAD

Retaining Wall Condition Photos



MORA_0203_0.008_R_1.jpg

Wall ID:	MORA-0203-0.090-R		
Route Name:	MILLER CUT OFF / RICKSECKER POINT LOOP ROAD		
Inspection Date:	August 21, 2007	Approximate Year Built:	Unknown
*Wall Rating:	81	Maintenance Action:	No Action

Wall Description

Wall Function:	Fill Wall	Primary Wall Type:	Gravity - Mortared Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Fill wall along road, also has shotcrete slope protection that extends downslope 12 ft to 50 ft		

Wall Measurements

Wall Length (ft.):	165	Face Area (sq.):	1333
Average Wall Height (ft.):	8	Face Angle (deg.):	90
Maximum Wall Height (ft.):	14	Vertical Offset (ft.):	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	moderate- wall performing well	7
WALL FOUNDATION MATERIAL 8.00	bedrock, no distress noted	9
MORTAR 8.00	minor debonding, minor efflorescence	8
STONE MASONRY 8.00	good condition, no distress noted	9
WALL DRAINS 0.50	no distress noted	9
DOWNSLOPE 1.00	very steep bedrock, talus slope, mortar slope protection extends 10' below 2/3 of wall, shotcrete slope protection extends 50 ft below wall, on last 1/3 of wall slope protection is being undermined 2' to 3'	6
LATERAL SLOPE 1.00	bedrock	7
ROAD/SIDEWALK/SHOULDER 1.00	minor cracking in asphalt on shoulder	7
VEGETATION 1.00	minor small plants growing from face of wall	7

Repair Recommendations

Failure Consequence:	MODERATE
Recommendation Narrative:	None
Repair Cost:	\$0

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

Mount Rainier National Park

ROUTE 0203: MILLER CUT OFF / RICKSECKER POINT LOOP ROAD

Retaining Wall Condition Photos



MORA_0203_0.090_R_1.jpg

Wall ID:	MORA-0203-0.154-R		
Route Name:	MILLER CUT OFF / RICKSECKER POINT LOOP ROAD		
Inspection Date:	August 21, 2007	Approximate Year Built:	Unknown
*Wall Rating:	82	Maintenance Action:	No Action

Wall Description

Wall Function:	Fill Wall	Primary Wall Type:	Gravity - Mortared Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Mortared sone wall supporting a fill		

Wall Measurements

Wall Length (ft.):	64	Face Area (sq.):	288
Average Wall Height (ft.):	4	Face Angle (deg.):	90
Maximum Wall Height (ft.):	9	Vertical Offset (ft.):	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	high- wall performing as intended	8
WALL FOUNDATION MATERIAL 8.00	bedrock, no distress noted	9
MORTAR 8.00	small voids, minor debonding	8
STONE MASONRY 8.00	slight weathering of stones, small voids	8
DOWNSLOPE 0.50	steep slope with vegetation, high slide potential	8
LATERAL SLOPE 0.50	bedrock, no distress noted	9
ROAD/SIDEWALK/SHOULDER 0.50	no distress noted	9
WALL DRAINS 0.50	no distress noted	9
UPSLOPE 1.00	rocky and steep with high rockfall potential	7

Repair Recommendations

Failure Consequence:	MODERATE
Recommendation Narrative:	None
Repair Cost:	\$0

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

Mount Rainier National Park

ROUTE 0203: MILLER CUT OFF / RICKSECKER POINT LOOP ROAD

Retaining Wall Condition Photos



MORA_0203_0.154_R_1.jpg

Wall ID:	MORA-0203-0.175-R		
Route Name:	MILLER CUT OFF / RICKSECKER POINT LOOP ROAD		
Inspection Date:	August 21, 2007	Approximate Year Built:	1930
*Wall Rating:	84	Maintenance Action:	No Action

Wall Description

Wall Function:	Fill Wall	Primary Wall Type:	Gravity - Mortared Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Stone masonry fill wall		

Wall Measurements

Wall Length (ft.):	85	Face Area (sq.):	255
Average Wall Height (ft.):	3	Face Angle (deg.):	90
Maximum Wall Height (ft.):	6	Vertical Offset (ft.):	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	Minor over-rotation, other as intended	8
WALL FOUNDATION MATERIAL 8.00	Weathered bedrock, no distress	9
MORTAR 8.00	Mild debonding over 30% of face	8
STONE MASONRY 8.00	Good condition, no distress	9
UPSLOPE 0.50	Steep rock slope above road, rock fall hazard	8
LATERAL SLOPE 0.50	Bedrock, no distress	9
WALL DRAINS 0.50	None, no distress	9
DOWNSLOPE 1.00	Very steep, weathered bedrock slope, evidence of erosion, shotcrete slope protection extends 30 feet.	7
ROAD/SIDEWALK/SHOULDER 1.00	1" wide crack in overlay along shoulder, road asphalt is ok	7

Repair Recommendations

Failure Consequence:	MODERATE
Recommendation Narrative:	None
Repair Cost:	\$0

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

Mount Rainier National Park

ROUTE 0203: MILLER CUT OFF / RICKSECKER POINT LOOP ROAD

Retaining Wall Condition Photos



MORA_0203_0.175_R_1.jpg

Wall ID:	MORA-0203-0.218-R		
Route Name:	MILLER CUT OFF / RICKSECKER POINT LOOP ROAD		
Inspection Date:	August 21, 2007	Approximate Year Built:	1930
*Wall Rating:	75	Maintenance Action:	No Action

Wall Description

Wall Function:	Fill Wall	Primary Wall Type:	Gravity - Mortared Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Stone masonry fill wall		

Wall Measurements

Wall Length (ft.):	77	Face Area (sq.):	725
Average Wall Height (ft.):	9	Face Angle (deg.):	85
Maximum Wall Height (ft.):	14	Vertical Offset (ft.):	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	As intended	8
WALL FOUNDATION MATERIAL 8.00	No distress, shotcrete	8
MORTAR 8.00	Minor debonding, voids in mortar, especially near beginning of wall	6
STONE MASONRY 8.00	Minor cracking in stone, minor bulging at 30' from wall start	8
LATERAL SLOPE 0.50	Stable, well vegetated, no erosion	8
WALL DRAINS 0.50	None, no distress noted	8

Repair Recommendations

Failure Consequence:	LOW
Recommendation Narrative:	None
Repair Cost:	\$0

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

Mount Rainier National Park

ROUTE 0203: MILLER CUT OFF / RICKSECKER POINT LOOP ROAD

Retaining Wall Condition Photos



MORA_0203_0.218_R_1.jpg

Wall ID:	MORA-0203-0.379-R		
Route Name:	MILLER CUT OFF / RICKSECKER POINT LOOP ROAD		
Inspection Date:	August 21, 2007	Approximate Year Built:	1930
*Wall Rating:	79	Maintenance Action:	Repair Elements

Wall Description

Wall Function:	Fill Wall	Primary Wall Type:	Gravity - Mortared Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Stone masonry fill wall		

Wall Measurements

Wall Length (ft.):	53	Face Area (sq.):	200
Average Wall Height (ft.):	3	Face Angle (deg.):	85
Maximum Wall Height (ft.):	6	Vertical Offset (ft.):	2

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	As intended	8
WALL FOUNDATION MATERIAL 8.00	Bedrock outcrops and sandy soil medium dense, 10' of undermining beginning at sta 18	7
MORTAR 8.00	Slight weathering, 10% of debonding and some spalling	8
STONE MASONRY 8.00	Stone masonry is of strong rock material	9
LATERAL SLOPE 0.50	Stable	8
DOWNSLOPE 1.00	Evidence of slope failure of sandy material, 40°	6
UPSLOPE 1.00	Slope unravelling, scarp on top	7
WALL DRAINS 1.00	None, minor wall seepage	7

Repair Recommendations

Failure Consequence:	LOW
Recommendation Narrative:	Repoint 10% of wall, repair minor undermining. Repoint: 20 sqft x \$75 = \$1,500. Underpin/stabilize: 10 ft x 2 ft x \$200 = \$4,000. Total=\$5,500
Repair Cost:	\$5,500

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

Mount Rainier National Park

ROUTE 0203: MILLER CUT OFF / RICKSECKER POINT LOOP ROAD

Retaining Wall Condition Photos



MORA_0203_0.379_R_1.jpg

Wall ID:	MORA-0203-0.628-R		
Route Name:	MILLER CUT OFF / RICKSECKER POINT LOOP ROAD		
Inspection Date:	August 21, 2007	Approximate Year Built:	1930
*Wall Rating:	73	Maintenance Action:	Repair Elements

Wall Description

Wall Function:	Fill Wall	Primary Wall Type:	Gravity - Mortared Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Stone masonry fill wall		

Wall Measurements

Wall Length (ft.):	110	Face Area (sq.):	523
Average Wall Height (ft.):	4	Face Angle (deg.):	90
Maximum Wall Height (ft.):	10	Vertical Offset (ft.):	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	As intended	7
WALL FOUNDATION MATERIAL 8.00	Shallow bedrock, minor undermining over 2% of wall	8
MORTAR 8.00	Moderate debonding over 50% of wall face, 5% missing mortar, 1% of wall has voids in mortar, minor weep through cracks 2% of wall, 5% of mortar repointed but falling out	7
STONE MASONRY 8.00	95% in good condition, several missing stones at base, 5% highly weathered rock that is fractured or decayed	7
DOWNSLOPE 0.50	Steep slope, mild ravelling	8
LATERAL SLOPE 0.50	Steep slope, mild ravelling	8
WALL DRAINS 0.50	None, no distress	9
ROAD/SIDEWALK/SHOULDER 1.00	No distress, mild cracking along shoulder	7

Repair Recommendations

Failure Consequence:	MODERATE
Recommendation Narrative:	Repoint 10% of wall face Repoint: 50 sqft x \$75 = \$3,750 Total= \$3,750
Repair Cost:	\$3,750

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

Mount Rainier National Park

ROUTE 0203: MILLER CUT OFF / RICKSECKER POINT LOOP ROAD

Retaining Wall Condition Photos



MORA_0203_0.628_R_1.jpg

Wall ID:	MORA-0203-0.736-R		
Route Name:	MILLER CUT OFF / RICKSECKER POINT LOOP ROAD		
Inspection Date:	August 21, 2007	Approximate Year Built:	1930
*Wall Rating:	79	Maintenance Action:	Repair Elements

Wall Description

Wall Function:	Fill Wall	Primary Wall Type:	Gravity - Mortared Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Stone masonry fill wall		

Wall Measurements

Wall Length (ft.):	93	Face Area (sq.):	412
Average Wall Height (ft.):	4	Face Angle (deg.):	85
Maximum Wall Height (ft.):	6	Vertical Offset (ft.):	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	As intended	8
WALL FOUNDATION MATERIAL 8.00	Good; soil pulling away from footing near station 50, no undermining noted	8
MORTAR 8.00	Good in retaining wall portion; cracked and debonded on guardwall portion	8
STONE MASONRY 8.00	No distress	8
LATERAL SLOPE 0.50	Well vegetated, no erosion	8
WALL DRAINS 0.50	None, no distress	8
TRAFFIC BARRIER/FENCE 1.00	Guardwall portion mortar is cracked/debonded with loose stones. Traffic face of guardwall repointed	5

Repair Recommendations

Failure Consequence:	LOW
Recommendation Narrative:	Repoint guardwall Repoint: 93 ft x 2 ft x \$75/sqft = \$14,000 Total=\$14,000
Repair Cost:	\$14,000

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

Mount Rainier National Park

ROUTE 0203: MILLER CUT OFF / RICKSECKER POINT LOOP ROAD

Retaining Wall Condition Photos



MORA_0203_0.736_R_1.jpg

Wall ID:	MORA-0203-0.854-R		
Route Name:	MILLER CUT OFF / RICKSECKER POINT LOOP ROAD		
Inspection Date:	August 21, 2007	Approximate Year Built:	Unknown
*Wall Rating:	78	Maintenance Action:	No Action

Wall Description

Wall Function:	Fill Wall	Primary Wall Type:	Gravity - Mortared Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Mortared stone wall supporting a fill		

Wall Measurements

Wall Length (ft.):	96	Face Area (sq.):	606
Average Wall Height (ft.):	6	Face Angle (deg.):	85
Maximum Wall Height (ft.):	10	Vertical Offset (ft.):	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	moderate- wall performing as intended	7
WALL FOUNDATION MATERIAL 8.00	shallow weathered volcanic rock, no distress, first 10' of foundation appears to have been patched	9
MORTAR 8.00	minor to moderate debonding on 30% of mortar, mild weeping through 10% of mortar, small voids in mortar over 2% of wall	7
PLACED STONE 8.00	Mostly good condition, 2% of blocks show mild spalling	8
DOWNSLOPE 0.50	steep wooded slope, mild creep/raveling	8
LATERAL SLOPE 0.50	steep wooded slope, mild creep/raveling	8
ROAD/SIDEWALK/SHOULDER 0.50	No distress noted	9
WALL DRAINS 0.50	no distress	9

Repair Recommendations

Failure Consequence:	MODERATE
Recommendation Narrative:	None
Repair Cost:	\$0

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

Mount Rainier National Park

ROUTE 0203: MILLER CUT OFF / RICKSECKER POINT LOOP ROAD

Retaining Wall Condition Photos



MORA_0203_0.854_R_1.jpg

Wall ID:	MORA-0500-0.404-R		
Route Name:	VALLEY ROAD		
Inspection Date:	August 21, 2007	Approximate Year Built:	1930
*Wall Rating:	74	Maintenance Action:	Repair Elements

Wall Description

Wall Function:	Fill Wall	Primary Wall Type:	Gravity - Dry Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Dry laid fill wall adjacent to Paradise Creek Bridge		

Wall Measurements

Wall Length (ft.):	30	Face Area (sq.):	490
Average Wall Height (ft.):	16	Face Angle (deg.):	65
Maximum Wall Height (ft.):	22	Vertical Offset (ft.):	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	As intended	8
WALL FOUNDATION MATERIAL 8.00	Good, no distress	8
PLACED STONE 8.00	Slight bulge in wall face. Voids in stone. Large stones missing from end of wall toe and mid section.	6
DOWNSLOPE 0.50	Loose rock subject to stream erosion	8
LATERAL SLOPE 0.50	Good, no distress	8
WALL DRAINS 0.50	None	8

Repair Recommendations

Failure Consequence:	MODERATE
Recommendation Narrative:	Reset stones missing from end of wall toe and mid section Reset stones: 8 ft x 4 ft x \$200/sqft = \$6,400 Total=\$6,400
Repair Cost:	\$6,400

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

Mount Rainier National Park

ROUTE 0500: VALLEY ROAD

Retaining Wall Condition Photos



MORA_0500_0.404_R_1.jpg

Wall ID:	MORA-0500-0.420-R		
Route Name:	VALLEY ROAD		
Inspection Date:	August 21, 2007	Approximate Year Built:	1930
*Wall Rating:	61	Maintenance Action:	Replace Wall

Wall Description

Wall Function:	Fill Wall	Primary Wall Type:	Gravity - Dry Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Dry laid fill wall adjacent to Paradise Creek Bridge		

Wall Measurements

Wall Length (ft.):	20	Face Area (sq.):	90
Average Wall Height (ft.):	4	Face Angle (deg.):	65
Maximum Wall Height (ft.):	9	Vertical Offset (ft.):	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	50% of wall collapsed	5
WALL FOUNDATION MATERIAL 8.00	Coarse angular soil and rock, no distress	8
PLACED STONE 8.00	50% of blocks collapsed and missing, remaining blocks are ok	5
DOWNSLOPE 0.50	Coarse rock and soil, moderate slope	8
WALL DRAINS 0.50	None, no distress	9
CURB/BERM/DITCH 1.00	Ditch empties out at wall location causing wall failure	5
LATERAL SLOPE 1.00	Erosion due to surface water runoff	6
ROAD/SIDEWALK/SHOULDER 1.00	Gravel shoulder eroding from behind wall due to storm run-off	6

Repair Recommendations

Failure Consequence:	MODERATE
Recommendation Narrative:	Replace wall (90 ft ²) Replace gravity, dry stone wall: \$100/sqft x 90 = \$9000 Total=\$9,000
Repair Cost:	\$9,000

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

Mount Rainier National Park

ROUTE 0500: VALLEY ROAD

Retaining Wall Condition Photos



MORA_0500_0.420_R_1.jpg

Wall ID:	MORA-0913-0.000-P1		
Route Name:	NARADA FALLS PARKING		
Inspection Date:	August 21, 2007	Approximate Year Built:	1930
*Wall Rating:	66	Maintenance Action:	Replace Elements

Wall Description

Wall Function:	Fill Wall	Primary Wall Type:	Gravity - Mortared Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Stone masonry fill wall at Narada Falls pull out		

Wall Measurements

Wall Length (ft.):	415	Face Area (sq.):	5850
Average Wall Height (ft.):	14	Face Angle (deg.):	85
Maximum Wall Height (ft.):	23	Vertical Offset (ft.):	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	As intended overall, however isolated area of near failure between stations 10 through 30	6
WALL FOUNDATION MATERIAL 8.00	Firm soil, stable	8
MORTAR 8.00	Vertical cracks through wall height at station 40; voids and separations at station 200 (20 sqft)	6
STONE MASONRY 8.00	Movement evident at stations 10 through 30, cracking	6
CULVERT 0.50	18" cmp at station 10; 12" cmp at station 20; 18" cmp at station 150	8
DOWNSLOPE 0.50	Stable	8
LATERAL SLOPE 0.50	No distress	8
WALL DRAINS 0.50	Along toe of wall	8

Repair Recommendations

Failure Consequence:	MODERATE
Recommendation Narrative:	Replace 20' section of wall full height with proper drainage Replace gravity, mortared stone wall, 20' length x 12' height x \$160/sqft = \$38,400
Repair Cost:	\$38,400

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

Mount Rainier National Park

ROUTE 0913: NARADA FALLS PARKING

Retaining Wall Condition Photos



MORA_0913_0.000_P1_1.jpg

Wall ID:	MORA-0915-0.000-P1		
Route Name:	PARADISE PARKING (LOWER LOT)		
Inspection Date:	August 21, 2007	Approximate Year Built:	1960
*Wall Rating:	86	Maintenance Action:	Repair Elements

Wall Description

Wall Function:	Fill Wall	Primary Wall Type:	Cantilever - Concrete
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	Stone
General Description:	Cast in-place concrete wall with stone facing at Paradise visitor center		

Wall Measurements

Wall Length (ft.):	585	Face Area (sq.):	4700
Average Wall Height (ft.):	8	Face Angle (deg.):	80
Maximum Wall Height (ft.):	16	Vertical Offset (ft.):	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	As intended, minor loss of architectural facing	8
WALL FOUNDATION MATERIAL 8.00	Firm soil, no distress, wall may be sitting on concrete footing	9
CONCRETE 8.00	Concrete core not accesible for inspection, no apparent distress	9
ROAD/SIDEWALK/SHOULDER 0.50	Sidewalk, no distress, cracking in asphalt parking lot	8
DOWNSLOPE 0.50	Flat, grassy, no distress	9
LATERAL SLOPE 0.50	Gentle, no distress	9
WALL DRAINS 0.50	None, no distress	9
ARCHITECTURAL FACING 1.00	Minor efflorescence, minor weathering of mortar over 1% of wall, minor debonding, minor weeping, approx 10 missing stones	7

Repair Recommendations

Failure Consequence:	MODERATE
Recommendation Narrative:	Repoint 400 sqft, replace minor facing. Repoint: 400 sqft x \$75/sqft = \$2,000. Replace stones: 10 stones @ 1 sqft x \$200/sqft = \$2,000. Total=\$4,000
Repair Cost:	\$4,000

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

Mount Rainier National Park
ROUTE 0915: PARADISE PARKING (LOWER LOT)

Retaining Wall Condition Photos



MORA_0915_0.000_P1_1.jpg

Wall ID:	MORA-0920ZZ-0.000-P1		
Route Name:	REFLECTION LAKES PARKING COMPLEX		
Inspection Date:	August 22, 2007	Approximate Year Built:	1930
*Wall Rating:	82	Maintenance Action:	Maintenance

Wall Description

Wall Function:	Fill Wall	Primary Wall Type:	Gravity - Mortared Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Stone masonry fill wall at Reflection Lake pull out		

Wall Measurements

Wall Length (ft.):	230	Face Area (sq.):	674
Average Wall Height (ft.):	2	Face Angle (deg.):	85
Maximum Wall Height (ft.):	8	Vertical Offset (ft.):	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	As intended	8
WALL FOUNDATION MATERIAL 8.00	Firm fill, no distress, wall sits on concrete footing, minor erosion at toe	8
MORTAR 8.00	Minor debonding, minor weeping	8
STONE MASONRY 8.00	Large blocks, no distress	9
DOWNSLOPE 0.50	Edge of lake shore, minor erosion, likely due to wave action	8
LATERAL SLOPE 0.50	Upwall - no distress; downwall - surface erosion due to storm runoff, rip-rap placed to stop erosion	8
ROAD/SIDEWALK/SHOULDER 0.50	No distress	9
WALL DRAINS 0.50	Several drains located either on midwall or at base, no distress	9
CULVERT 1.00	Rusted 18" cmp culvert which is partially buried runs below wall and into lake at well end; partially clogged	7

Repair Recommendations

Failure Consequence:	LOW
Recommendation Narrative:	Clean out 18" cmp culvert at end of wall Labor: 8 man-hours x \$50 = \$400 Total=\$400
Repair Cost:	\$400

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

Mount Rainier National Park
ROUTE 0920ZZ: REFLECTION LAKES PARKING COMPLEX

Retaining Wall Condition Photos



MORA_0920ZZ_0.000_P1_1.jpg

Wall ID:	MORA-0923-0.000-P1		
Route Name:	BOX CANYON OVERLOOK / EXHIBIT PARKING		
Inspection Date:	August 23, 2007	Approximate Year Built:	Unknown
*Wall Rating:	88	Maintenance Action:	No Action

Wall Description

Wall Function:	Fill Wall	Primary Wall Type:	Gravity - Mortared Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Mortared stone wall supporting a fill, parking lot, transitions into a bridge abutment		

Wall Measurements

Wall Length (ft.):	159	Face Area (sq.):	1590
Average Wall Height (ft.):	10	Face Angle (deg.):	85
Maximum Wall Height (ft.):	14	Vertical Offset (ft.):	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	high- wall performing as intended	9
WALL FOUNDATION MATERIAL 8.00	bedrock, no distress noted	9
MORTAR 8.00	mild debonding	8
STONE MASONRY 8.00	large blocks, no distress noted	9
LATERAL SLOPE 0.50	none	9
ROAD/SIDEWALK/SHOULDER 0.50	no distress noted	9
WALL DRAINS 0.50	none, no distress noted	9
DOWNSLOPE 0.50	flat bedrock	10

Repair Recommendations

Failure Consequence:	LOW
Recommendation Narrative:	None
Repair Cost:	\$0

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

Mount Rainier National Park

ROUTE 0923: BOX CANYON OVERLOOK / EXHIBIT PARKING

Retaining Wall Condition Photos



MORA_0923_0.000_P1_1.jpg

Wall ID:	MORA-0937-0.000-P1		
Route Name:	PARADISE RESIDENCE ROAD PARKING		
Inspection Date:	August 21, 2007	Approximate Year Built:	1930
*Wall Rating:	77	Maintenance Action:	No Action

Wall Description

Wall Function:	Cut Wall	Primary Wall Type:	Gravity - Dry Stone
Surface Treatment:		Secondary Wall Type:	
Secondary Surface Treatment:		Architectural Facing:	
General Description:	Dry laid cut wall		

Wall Measurements

Wall Length (ft.):	216	Face Area (sq.):	1525
Average Wall Height (ft.):	7	Face Angle (deg.):	65
Maximum Wall Height (ft.):	11	Vertical Offset (ft.):	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	As intended	8
WALL FOUNDATION MATERIAL 8.00	Good, stable, no distress	8
PLACED STONE 8.00	Uniform light colored stone dry stacked; minor loss at top of wall near station 200	7
LATERAL SLOPE 0.50	Good, no distress	8
UPSLOPE 0.50	Vegetated, no distress	8
WALL DRAINS 0.50	None	8

Repair Recommendations

Failure Consequence:	LOW
Recommendation Narrative:	None
Repair Cost:	\$0

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

Mount Rainier National Park
ROUTE 0937: PARADISE RESIDENCE ROAD PARKING

Retaining Wall Condition Photos



MORA_0937_0.000_P1_1.jpg

Appendix A

Summary of WIP Definitions



Mount Rainier National Park



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 ≥ 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

Design Criteria	Measure of how well current design criteria are satisfied: None - Does not meet any known standards. Non-AASHTO - Does not meet AASHTO, but is consistent with other structures of its type/period with good performance. AASHTO - Apparently meets current AASHTO Geometric, Design, Materials, and Construction Standards.
Consequence of Failure	Low - No loss of roadway, no to low public risk, no impact to traffic during wall repair/replacement Moderate - Hourly to short-term closure of roadway, low-to-moderate public risk, multiple alternate routes available High - Seasonal to long-term loss of roadway, substantial loss-of-life risk, no alternate routes available
Action	Select from: No Action, Monitor, Maintenance, Repair Elements, Replace Elements, and Replace Wall
Weighting Factor	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.
Data Reliability	Estimate of how well observed conditions represent wall performance, and if additional investigations may be warranted. 1-Poor 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. 2-Good Observed conditions are sufficient to rate the conditions of wall element(s); however, additional investigations would be useful to better understand element performance. 3-Very Good 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.

9-10 (Excellent)	-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.
7-8 (Good)	-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.
5-6 (Fair)	-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.
3-4 (Poor)	-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.
1-2 (Critical)	-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

Performance	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>Good to Excellent - 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>Fair - 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>Poor to Critical - 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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