# **PEFO GIP Report**

## NPS Guardwall/Rail Inventory Program Petrified Forest National Park

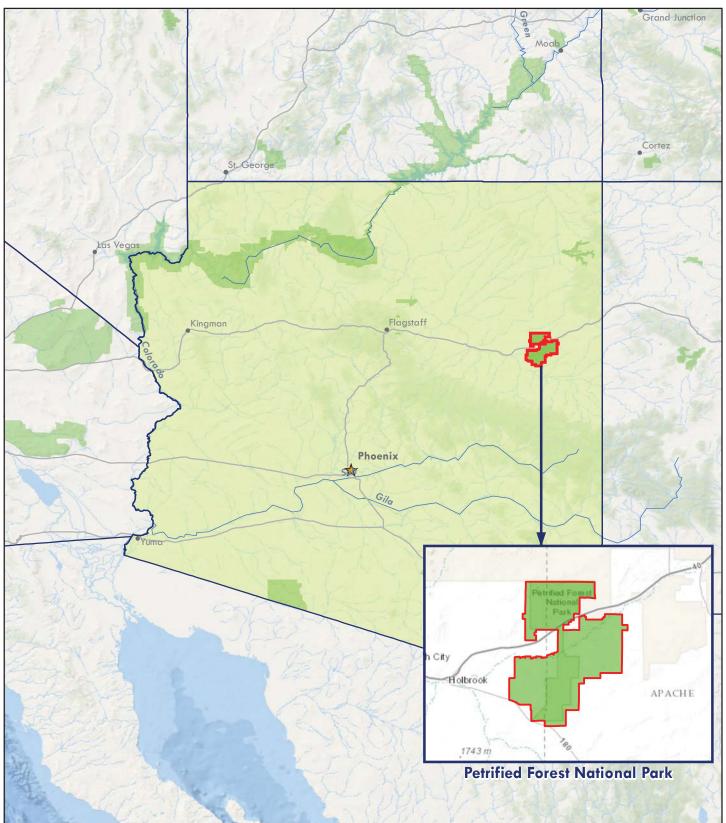




Federal Lands Highway Road Inventory Program Prepared By: Federal Highway Administration Eastern Federal Lands Highway Division Road Inventory Program (RIP)

Data Collection Date: April 2010 Report Date: November 2015

### Petrified Forest National Park in Arizona



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

## **Table of Contents**

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

## Introduction



### **Petrified Forest National Park**



#### **Introduction**

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

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

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

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

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

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

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

## **Park Barrier Location Maps**

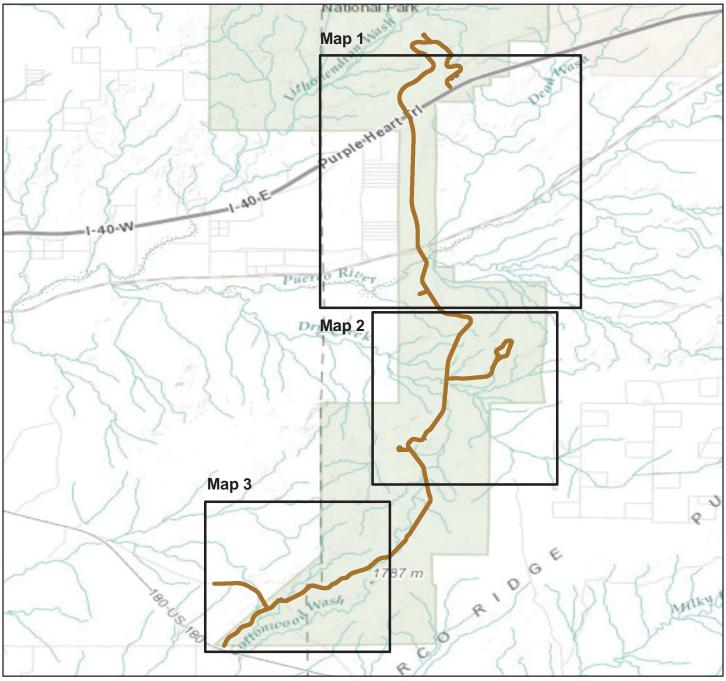


**Petrified Forest National Park** 



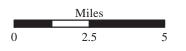
**BARRIER LOCATION MAP** 

Key Map



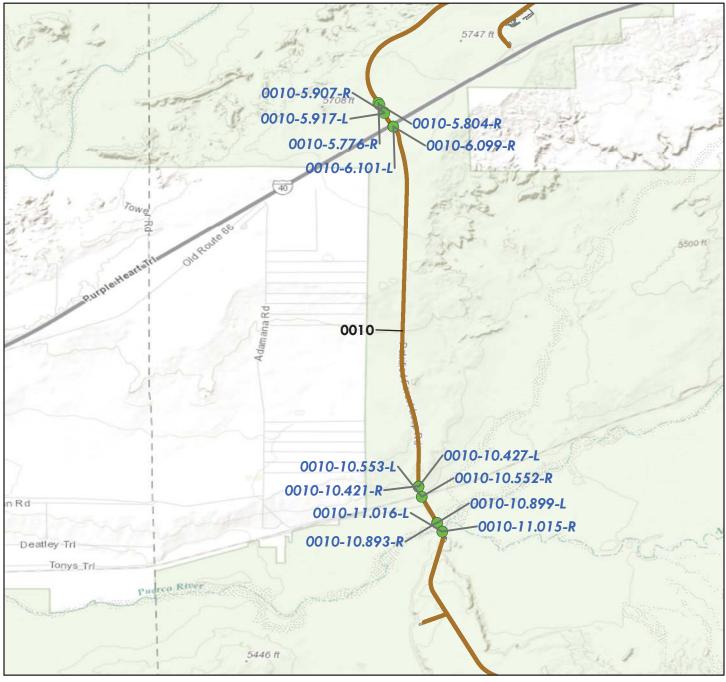
Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

RIP Collected Routes



**BARRIER LOCATION MAP** 

Map 1



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





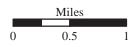
**BARRIER LOCATION MAP** 

Map 2



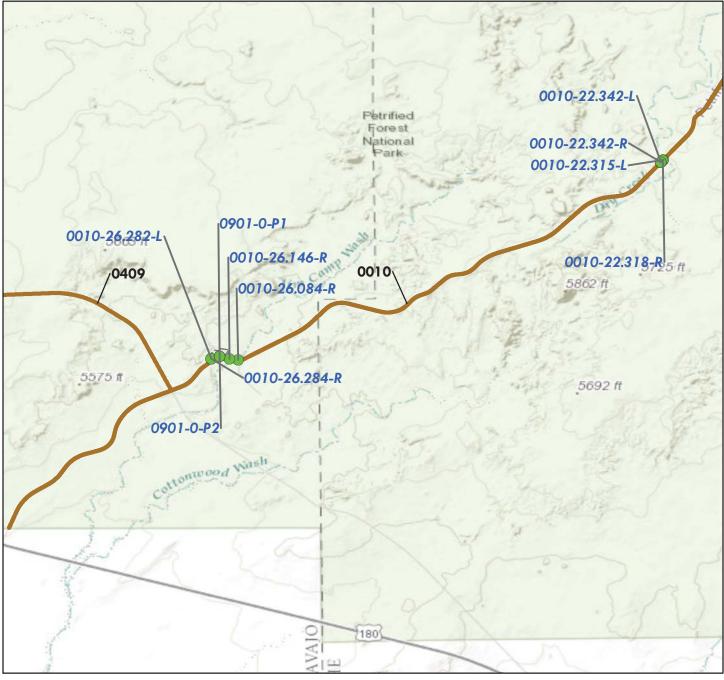
Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

Barrier Locations
 RIP Collected Routes



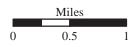
**BARRIER LOCATION MAP** 

Map 3



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





# **Tier 1 Park Barrier Overview**



**Petrified Forest National Park** 



### Parkwide Summary: Petrified Forest National Park

Initial barrier inspections were conducted at Petrified Forest National Park in 2010, and encompassed all known barriers associated with Park roadways. In general, walls are not included in this assessment, but were inspected under a separate effort as part of the Retaining Wall Inventory Program (WIP).

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

The following tables provide an overview of the findings of this inspection and assessment effort. In all, 42 barriers were inventoried on the routes listed below.

Route Number	Route Number Route Name	
0010	NORTH-SOUTH HIGHWAY	38
0011	BLUE MESA ROAD	2
0901	RF MUSEUM AND PICNIC PARKING	2

#### Table 1: Number of Barriers by Route

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

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

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

Barrier Function	No. of Barriers
NON-TRAFFIC	9
TRAFFIC	33

#### Table 2: Number of Barriers by Function

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

Primary Barrier Type	No. of Barriers
Stone Masonry Without Concrete Core Wall	4
W-Beam Strong Post	28
Other: Concrete Block	10

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

Recommended Action	Repair Costs*	No. of Barriers
No Action	\$0	12
Monitor	\$0	0
Repair	\$232,571	28
Replace	\$12,992	2
Totals	\$245,563	42

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

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

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

Cost Range*	No. of Barriers
\$0	12
\$1 - \$25,000	27
\$25,001 - \$50,000	2
\$50,001 - \$100,000	1
\$100,001 - \$250,000	0
\$250,001 - \$500,000	0
\$500,001 - \$1,000,000	0
\$1,000,001 - \$2,000,000	0
\$2,000,001 - \$3,000,000	0
\$3,000,001 - \$4,000,000	0
Total Number of Barriers	42

#### Table 5: Number of Barriers Grouped by Associated 2008 Cost

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

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

A total of 28 end terminals were found on barriers at the Park. There are generally a greater number of end treatments than actual barriers because end treatments are located at both the beginning and end of each barrier.

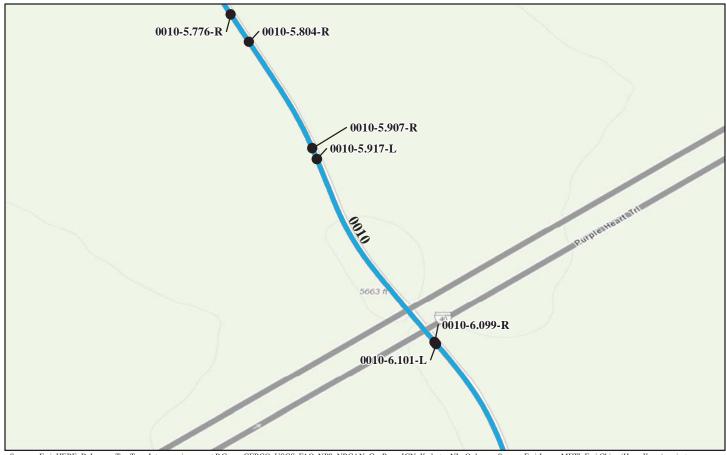
# **Tier 2 Route Barrier Overview**



**Petrified Forest National Park** 

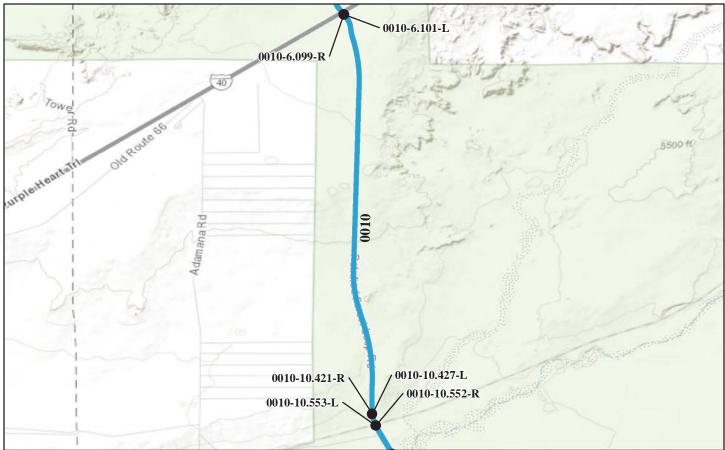


**ROUTE 0010: NORTH-SOUTH HIGHWAY** 



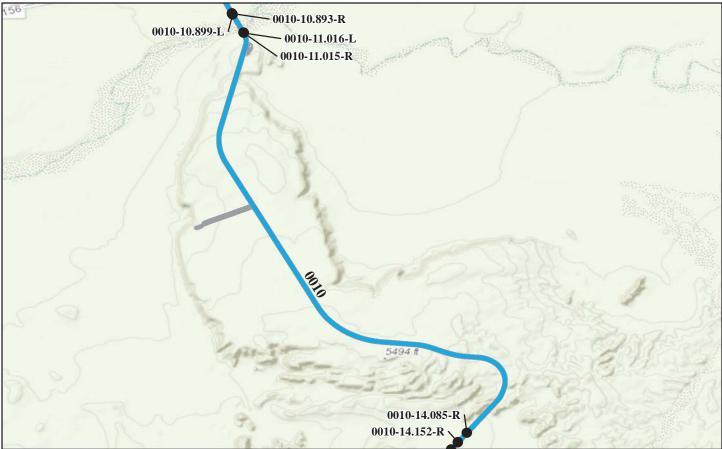
Sources: Esri, HERE, DeLorme, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

Barrier ID	Barrier Length	Barrier	Barrier End	l Treatment	*Repair
Inspection Date	(Ft.)	Туре	Begin	End	Cost
PEFO-0010-5.776-R 4/2/2010	171	OTHER: CONCRETE BLOCK	NONE	NONE	\$0.00
PEFO-0010-5.804-R 4/2/2010	135	OTHER: CONCRETE BLOCK	NONE	NONE	\$0.00
PEFO-0010-5.907-R 4/2/2010	749	W-BEAM STRONG POST	W-BEAM BCT	NONE	\$7,381.00
PEFO-0010-5.917-L 4/2/2010	706	W-BEAM STRONG POST	W-BEAM BCT	NONE	\$12,172.00
PEFO-0010-6.099-R 4/2/2010	505	W-BEAM STRONG POST	NONE	W-BEAM BCT	\$4,373.00
*2008 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.					



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

Barrier ID	Barrier Length	Barrier	Barrier End	d Treatment	*Repair	
Inspection Date	(Ft.)	Туре	Begin	End	Cost	
PEFO-0010-6.101-L	530	W-BEAM STRONG POST	NONE	W-BEAM BCT	\$14,344.00	
4/2/2010						
PEFO-0010-10.421-R	505	W-BEAM STRONG POST	W-BEAM BCT	NONE	\$6,545.00	
4/2/2010						
PEFO-0010-10.427-L	472	W-BEAM STRONG POST	W-BEAM BCT	NONE	\$9,763.00	
4/2/2010						
PEFO-0010-10.552-R	838	W-BEAM STRONG POST	NONE	W-BEAM BCT	\$4,131.00	
4/2/2010						
PEFO-0010-10.553-L	865	W-BEAM STRONG POST	NONE	W-BEAM BCT	\$2,822.00	
4/2/2010						
	*2008 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.					



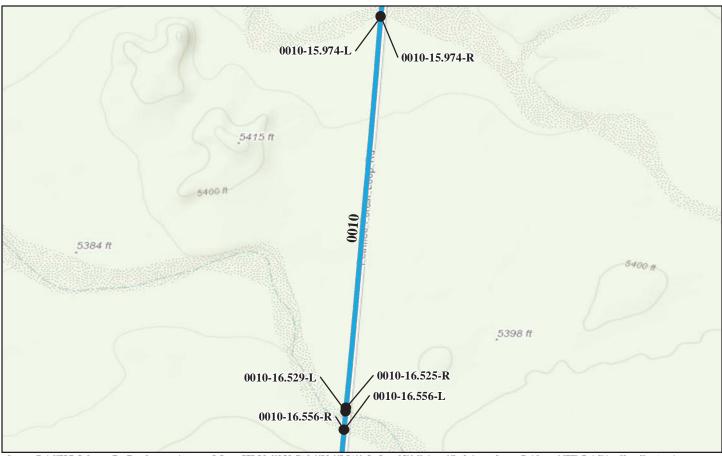
Sources: Esri, HERE, DeLorme, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

Barrier ID	Barrier Length	Barrier	Barrier End	Barrier End Treatment	
Inspection Date	(Ft.)	Туре	Begin	End	Cost
PEFO-0010-10.893-R	103	W-BEAM STRONG POST	W-BEAM BCT	NONE	\$0.00
4/2/2010					
PEFO-0010-10.899-L	78	W-BEAM STRONG POST	W-BEAM BCT	NONE	\$2,481.00
4/2/2010					
PEFO-0010-11.015-R	79	W-BEAM STRONG POST	NONE	W-BEAM BCT	\$0.00
4/2/2010					
PEFO-0010-11.016-L	102	W-BEAM STRONG POST	NONE	W-BEAM BCT	\$1,733.00
4/2/2010					
PEFO-0010-14.085-R	220	OTHER: CONCRETE	NONE	NONE	\$0.00
4/3/2010		BLOCK			
*2008 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.					

0010-15.950-R 0010-15.955-L 0010-15.974-R 0010-15.974-R

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

Barrier ID	Barrier Length         Barrier         Barrier End Treatment		*Repair			
Inspection Date	(Ft.)	Туре	Begin	End	Cost	
PEFO-0010-14.152-R 4/3/2010	26	OTHER: CONCRETE BLOCK	NONE	NONE	\$0.00	
PEFO-0010-14.204-L 4/3/2010	75	OTHER: CONCRETE BLOCK	NONE	NONE	\$0.00	
PEFO-0010-15.778-L 4/3/2010	163	OTHER: CONCRETE BLOCK	NONE	NONE	\$0.00	
PEFO-0010-15.950-R 4/3/2010	77	W-BEAM STRONG POST	W-BEAM BCT	NONE	\$2,580.00	
PEFO-0010-15.955-L 4/3/2010	52	W-BEAM STRONG POST	W-BEAM BCT	NONE	\$2,332.00	
*2008 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.						



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

Barrier ID	Barrier Length	Barrier	<b>Barrier End Treatment</b>		*Repair
Inspection Date	(Ft.)	Туре	Begin	End	Cost
PEFO-0010-15.974-L	77	W-BEAM STRONG POST	NONE	W-BEAM BCT	\$2,250.00
4/3/2010					
PEFO-0010-15.974-R	52	W-BEAM STRONG POST	NONE	W-BEAM BCT	\$1,936.00
4/3/2010					
PEFO-0010-16.525-R	78	W-BEAM STRONG POST	W-BEAM BCT	NONE	\$2,442.00
4/3/2010					
PEFO-0010-16.529-L	55	W-BEAM STRONG POST	W-BEAM BCT	NONE	\$2,585.00
4/3/2010					
PEFO-0010-16.556-L	80	W-BEAM STRONG POST	NONE	W-BEAM BCT	\$1,931.00
4/3/2010					
*2008 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.					

0010-16.525-R 0010-16.525-R 0010-16.525-R 0010-16.556-R 0010-16.556-R 0010-16.556-R 0010-16.556-R 0010-16.556-R

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

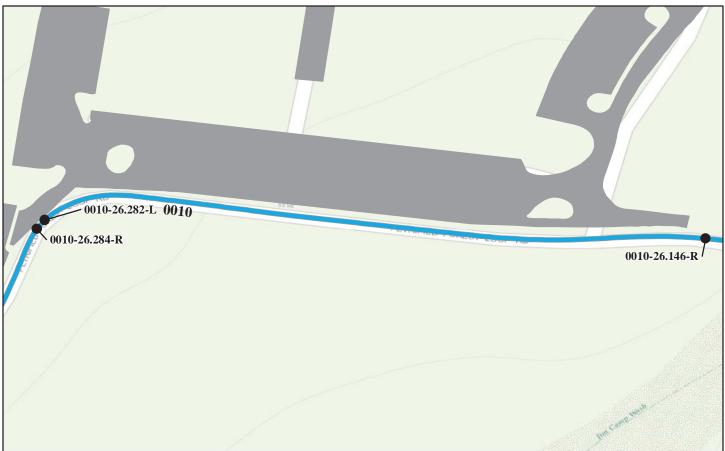
Barrier ID	<b>Barrier Length</b>	Barrier	Barrier End	d Treatment	*Repair
Inspection Date	(Ft.)	Туре	Begin	End	Cost
PEFO-0010-16.556-R	55	W-BEAM STRONG POST	NONE	W-BEAM BCT	\$2,228.00
4/3/2010					
PEFO-0010-19.425-R	79	W-BEAM STRONG POST	W-BEAM BCT	NONE	\$2,525.00
4/3/2010					
PEFO-0010-19.431-L	52	W-BEAM STRONG POST	W-BEAM BCT	NONE	\$2,338.00
4/3/2010					
PEFO-0010-19.448-L	76	W-BEAM STRONG POST	NONE	W-BEAM BCT	\$3,399.00
4/3/2010					
PEFO-0010-19.448-R	52	W-BEAM STRONG POST	NONE	W-BEAM BCT	\$1,760.00
4/3/2010					
3	2008 cost estimate (A	STM Class D), preliminary for co	omparison to other repair co	sts only.	•



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

Barrier ID	Barrier Length	Barrier	Barrier End	l Treatment	*Repair
Inspection Date	(Ft.)	Туре	Begin	End	Cost
PEFO-0010-22.315-L	77	W-BEAM STRONG POST	W-BEAM BCT	NONE	\$2,140.00
4/3/2010					
PEFO-0010-22.318-R	70	W-BEAM STRONG POST	W-BEAM BCT	NONE	\$2,426.00
4/3/2010					
PEFO-0010-22.342-L	70	W-BEAM STRONG POST	NONE	W-BEAM BCT	\$6,463.00
4/3/2010					
PEFO-0010-22.342-R	76	W-BEAM STRONG POST	NONE	W-BEAM BCT	\$6,529.00
4/3/2010					
PEFO-0010-26.084-R	34	OTHER: CONCRETE	NONE	NONE	\$0.00
4/4/2010		BLOCK			
*	*2008 cost estimate (A	STM Class D), preliminary for co	mparison to other repair cos	sts only.	

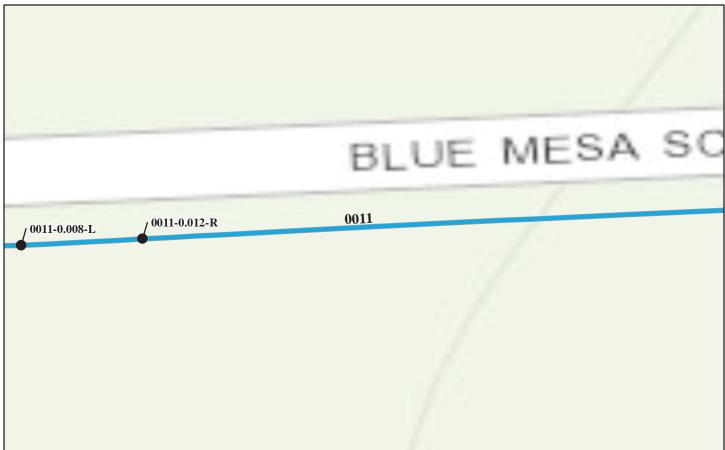
ROUTE 0010: NORTH-SOUTH HIGHWAY



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

Barrier ID	Barrier Length	Barrier	Barrier End	d Treatment	*Repair
Inspection Date	(Ft.)	Туре	Begin	End	Cost
PEFO-0010-26.146-R 4/4/2010	78	OTHER: CONCRETE BLOCK	NONE	NONE	\$0.00
PEFO-0010-26.282-L 4/4/2010	47	STONE MASONRY WITHOUT CONCRETE CORE WALL	NONE	NONE	\$52,168.00
PEFO-0010-26.284-R 4/4/2010	44	STONE MASONRY WITHOUT CONCRETE CORE WALL	NONE	NONE	\$0.00
	*2008 cost estimate (AS	STM Class D), preliminary for co	omparison to other repair co	sts only.	

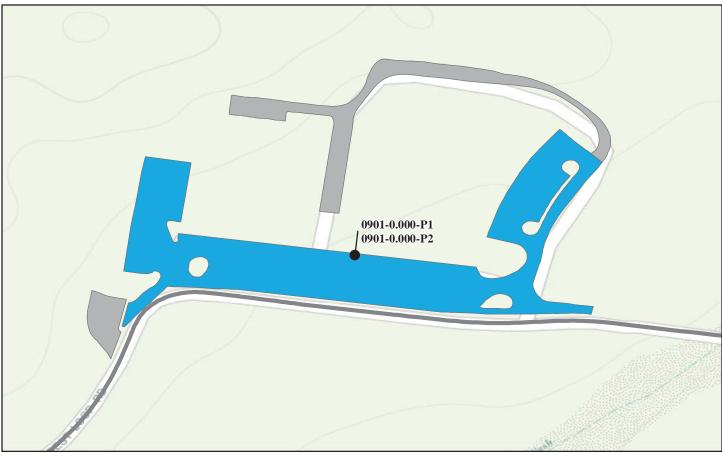
ROUTE 0011: BLUE MESA ROAD



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

Barrier ID	Barrier Length	Barrier	Barrier End	d Treatment	*Repair
Inspection Date	(Ft.)	Туре	Begin	End	Cost
PEFO-0011-0.008-L 4/4/2010	114	OTHER: CONCRETE BLOCK	NONE	NONE	\$1,760.00
PEFO-0011-0.012-R 4/4/2010	111	OTHER: CONCRETE BLOCK	NONE	NONE	\$0.00
	*2008 cost estimate (AS	STM Class D), preliminary for c	omparison to other repair co	sts only.	

### **Petrified Forest National Park** ROUTE 0901: RF MUSEUM AND PICNIC PARKING



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

Barrier ID	Barrier Length	Barrier	Barrier En	d Treatment	*Repair
Inspection Date	(Ft.)	Туре	Begin	End	Cost
PEFO-0901-0.000-P1 4/4/2010	84	STONE MASONRY WITHOUT CONCRETE CORE WALL	NONE	NONE	\$32,368.00
PEFO-0901-0.000-P2 4/4/2010	118	STONE MASONRY WITHOUT CONCRETE CORE WALL	NONE	NONE	\$47,658.00
	*2008 cost estimate (AS	STM Class D), preliminary for co	omparison to other repair co	sts only.	

# Tier 3 Barrier Details



**Petrified Forest National Park** 



Ba	rrier ID:	<b>PEFO-001</b>	PEFO-0010-5.776-R							
	te Name:		OUTH HIGHWAY							
Inspect	ion Date.	02/04/201	0	Rorrid	er Rating:	21.10				
Barrier Description		02/04/201		Daili	i Kating.	21.10				
	Туре:	OTHER: C	ONCRETE BLOCK	Barrier Function:		NON-TRA	FFIC			
Barrier 1	Barrier Material: CONCRET		Е	Post	Material:	N/A				
	Blockout Type:	N/A		Le	ngth (ft.):	171				
Speed Limit		45			ment with t to Road:	NON-TRA	FFIC BARRIER			
Hazard Behind	Barrier:	N/A								
Barrier Crashwo	rthiness	- 								
Appropriate Test Level:			Barrier Test Level:	N/A		Is Barrier	N/A			
	NONE		Is Beg. End Trtmt Crashhworthy?:	N/A		Approach	NONE			
Ending End Trtmt Type:	NONE		Ending End Trtmt Crashhworthy?:	N/A						
Average Measure	me <u>nts</u>			· · · · · · · · · · · · · · · · · · · ·						
Design Height (In.):	24		Width (In.):	8.0	Post Spa	cing (In.):	0.0			
Height (In.):	23.7		Lateral Offset (In.):	0.0		rade (%):	0.00			
<b>Physical Conditio</b>	n									
		ment and Height:	Alignment is acceptable. H	leight is within 3-in of 24-in	design height.					
Barrier		aking and Cracking:								
	Missing	Elements:	There were no missing eler	nents observed.						
		osion and eathering:	There is no corrosion or we finish.	eathering to the wall. There	is minor weath	nering/peeling	of the painted			
	Align	ment and Height:								
End Treatments		aking and Cracking:								
	Missing	Elements:								
		osion and eathering:								

Barrie	er ID:	<b>PEFO-001</b>	0-5.776-R							
Route N	Name:	NORTH-S	OUTH HIGHWAY							
Inspection Date: 02/04/2010			B	Barrier Rating: 21.10						
Repair Recommenda	ations									
RepairNOAction:	ACTIO	N	FMSS Work Type:	N/A		Repair Cost:	\$0			
Brief Workorder:	L.									
Workorder:										
1	2008 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.									

**Barrier Condition Photos** 



PEFO\_0010\_5.776\_R\_1.jpg



PEFO\_0010\_5.776\_R\_2.jpg

Ba	arrier ID:	PEFO-0010-5.804-R							
	ite Name:	NORTH-S	SOUTH HIGHWAY						
Inspect	tion Date.	02/04/201	0	R	arrier Rating:	24.00			
	Barrier Description			D	arrier Rating.	21.00			
	Туре:	OTHER: C	ONCRETE BLOCK	Barrier Function:		NON-TRA	FFIC		
Barrier	Material:	CONCRET	Έ		Post Material:	N/A			
	Blockout Type:	N/A			Length (ft.):	135			
Speed Limi		45			Placement with spect to Road:	NON-TRA	FFIC BARRIER		
Hazard Behind	Barrier:	N/A							
<b>Barrier Crashwo</b>	rthiness								
Appropriate Test Level:	TL-2		Barrier Test Level:	N/A		Is Barrier worthy?:	N/A		
Beg. End Trtmt Type:			Is Beg. End Trtmt Crashhworthy?:			Approach ion Type:	NONE		
Ending End Trtmt Type:	NONE		Ending End Trtmt Crashhworthy?:	N/A					
Average Measure	ements								
Design Height (In.):	24		Width (In.):	8.0		cing (In.):	0.0		
Height (In.):	23.0		Lateral Offset (In.):	0.0	Road G	rade (%):	0.00		
Physical Condition		ment and Height:	Alignment is acceptable. Height is within 3-in of 24-in design height.						
Barrier		aking and Cracking:	There was no breaking or c	cracking observed.					
	Missing	Elements:	There were no missing eler	nents observed.					
		osion and eathering:	There is no corrosion or we painted finish.	eathering to the wall.	There is minor weat	hering and pee	eling of the		
	Align	ment and Height:							
End Treatments		aking and Cracking:							
	Missing 1	Elements:							
		osion and eathering:							

Ba	arrier ID:	PEFO-001	0-5.804-R							
Rou	ite Name:	NORTH-S	SOUTH HIGHWAY							
<b>Inspection Date:</b> 02/04/2010			0	Barrier Rating: 24.00						
<b>Repair Recomme</b>	ndations	5								
Repair Action:	NO ACTIC	DN	FMSS Work Type:	N/A		Repair Cost:	\$0			
Brief Workorder:	N/A									
Workorder:										
	2008 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.									

**Barrier Condition Photos** 



PEFO\_0010\_5.804\_R\_1.jpg

B	arrier ID:	PEFO-001	PEFO-0010-5.907-R								
	ite Name:		OUTH HIGHWAY								
	·	02/04/201				42.00					
		02/04/201	0	B	Barrier Rating:	42.90					
Barrier Descripti	on										
	Туре:	W-BEAM S	STRONG POST	Bar	rrier Function:	TRAFFIC					
Barrier	Material:	WEATHER STEEL/CO			Post Material:	WOOD					
	Blockout Type:	WOOD			Length (ft.):	749					
Speed Lim	it (MPH):	45			Placement with espect to Road:	OUTSIDE	OF CURVE				
Hazard Behind	l Barrier:	HIGH									
<b>Barrier Crashwo</b>	rthiness										
Appropriate Test Level:	TL-2		Barrier Test Level:	TL-3		Is Barrier worthy?:	YES				
Beg. End Trtmt Type:	W-BEAM	ВСТ	Is Beg. End Trtmt Crashhworthy?:	NO		Approach ion Type:	BRIDGE RAIL W-BEAM				
Ending End Trtmt Type:	NONE		Ending End Trtmt Crashhworthy?:	N/A							
Average Measure	ements										
Design Height (In.):	27		Width (In.):	0.0	Post Spa	cing (In.):	75.0				
Height (In.):	25.5		Lateral Offset (In.):	71.3	Road G	rade (%):	2.50				
<b>Physical Condition</b>	on										
	Align	ment and Height:	Alignment acceptable. 350	)-ft was between 1 and	d 3-in below the 27-i	n design heigl	nt.				
Barrier		aking and Cracking:									
	Missing	Elements:	There were no missing eler	nents observed.							
		osion and eathering:	There was no corrosion or	weathering observed.							
	Align	ment and Height:	Alignment acceptable. 30-	ft was between 1 and	3-in below the 27-in	design height	-				
End Treatments		aking and Cracking:	There was no breaking or o	cracking observed.							
	Missing	Elements:	There were no missing elements observed.								
		osion and eathering:	There was no corrosion or	weathering observed.							
<u>i</u>											

B	arrier ID:	PEFO-001	0-5.907-R					
Rou	ite Name:	NORTH-S	NORTH-SOUTH HIGHWAY					
Inspect	tion Date:	02/04/201	0	Barrie	r Rating:	42.90		
Repair Recomme	endations	5						
Repair Action:	REPAIR			DEFERRED MAINTENANCE		Repair Cost:	\$7381	
Brief Workorder:	Raise 350 L.	F. to 27-in des	ign height and replace 2 pos	ats and 2 blocks.				
Workorder:Adjust Guardrail at \$10- per -Lin. Ft. for 350 LF = \$3500. Raise 350-ft. of barrier up to 27-in design height. Replace Post at \$100- per -Each for 2 Post(s) = \$200. Replace the 2 cracked posts. Replace Block at \$30- per -Each for 2 Block(s) = \$60. Replace the 2 cracked and turned blocks. Low Speed Traffic Control at \$1475- per -Day for 2 Day(s) = \$2950.								
	2008 co	st estimate (A	ASTM Class D), prelimin	ary for comparison to oth	ier repair co	osts only.		

ROUTE 0010: NORTH-SOUTH HIGHWAY

#### **Barrier Condition Photos**



PEFO\_0010\_5.907\_R\_1.jpg

B	arrier ID:	PEFO-001	0-5.917-L					
	ite Name:		SOUTH HIGHWAY					
		02/04/201	0	Barri	er Rating:	32.50		
Barrier Descripti	on							
	Type: W-BEAM		STRONG POST	Barrier	Function:	TRAFFIC		
Barrier	Barrier Material: WEATHE			Post	t Material:	WOOD		
	Blockout Type:	WOOD		L	ength (ft.):	706		
Speed Lim	it (MPH):	45			ement with et to Road:	INSIDE OF	F CURVE	
Hazard Behind	l Barrier:	MEDIUM						
<b>Barrier Crashwo</b>	rthiness							
Appropriate Test Level:	TL-2		Barrier Test Level:	TL-3		Is Barrier worthy?:	YES	
Beg. End Trtmt Type:	W-BEAM	ВСТ	Is Beg. End Trtmt Crashhworthy?:	NO		Approach ion Type:	BRIDGE RAIL W-BEAM	
Ending End Trtmt Type:	NONE		Ending End Trtmt Crashhworthy?:	N/A				
Average Measure	ements							
Design Height (In.):	27		Width (In.):	0.0	Post Spa	cing (In.):	74.8	
Height (In.):	25.3		Lateral Offset (In.):	66.0		rade (%):	2.60	
Physical Condition	on							
	Align	ment and Height:	Alignment acceptable. 606-ft was between 1 and 3-in below the 27-in design height.					
Barrier		aking and Cracking:						
	Missing 1	Elements:	There were no missing eler	nents observed.				
		osion and eathering:	There was no corrosion or	weathering observed.				
	Align	ment and Height:	Alignment acceptable. 30-	ft was between 1 and 3-in b	pelow the 27-in	design height		
End Treatments		aking and Cracking:	There was no breaking or o	racking observed.				
	Missing	Elements:	There were no missing eler	nents observed.				
		osion and eathering:	There was no corrosion or	weathering observed.				
L								

Ba	arrier ID:	PEFO-001	0-5.917-L							
Rou	ite Name:	NORTH-S	NORTH-SOUTH HIGHWAY							
Inspect	tion Date:	02/04/201	0	Barrie	er Rating:	32.50				
Repair Recomme	endations									
Repair Action:	REPAIR	RFMSSDEFERREDRepair\$12172Work Type:MAINTENANCECost:								
Brief Workorder:	Raise 606 L.	F. of barrier to	27-in design height and rep	lace 4 posts and 6 blocks.						
Workorder:	Workorder:Adjust Guardrail at \$10- per -Lin. Ft. for 606 LF = \$6060. Raise 606-ft. of barrier up to 27-in design height. Replace Post at \$100- per -Each for 4 Post(s) = \$400. Replace the 4 damaged posts. Replace Block at \$30- per -Each for 6 Block(s) = \$180. Replace the 6 damaged blocks. Low Speed Traffic Control at \$1475- per -Day for 3 Day(s) = \$4425.									
	2008 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.									

**Barrier Condition Photos** 



PEFO\_0010\_5.917\_L\_1.jpg

B	arrier ID:	PEFO-001	0-6.099-R					
	ite Name:		OUTH HIGHWAY					
					<b>.</b>			
		02/04/201	U		<b>Barrier Rating:</b>	34.20		
Barrier Descripti	ion							
	Туре:	W-BEAM S	STRONG POST		<b>Barrier Function:</b>	TRAFFIC		
Barrier	Material:	WEATHEF STEEL/CO				WOOD		
	Blockout Type:	WOOD			Length (ft.):	505		
Speed Lim	it (MPH):	45			Placement with Respect to Road:	INSIDE OI	FCURVE	
Hazard Behind	d Barrier:	HIGH				•		
Barrier Crashwo	rthiness							
Appropriate Test Level:	TL-2		Barrier Test Level:	TL-3		Is Barrier hworthy?:	YES	
Beg. End Trtmt Type:	NONE		Is Beg. End Trtmt Crashhworthy?:	N/A		Approach tion Type:	BRIDGE RAIL W-BEAM	
Ending End Trtmt Type:	W-BEAM	ВСТ	Ending End Trtmt Crashhworthy?:	NO				
Average Measure	ements							
Design Height (In.):	27		Width (In.):	0.0	Post Spa	cing (In.):	75.1	
Height (In.):	25.5		Lateral Offset (In.):	77.3		rade (%):	0.60	
Physical Condition	on							
		ment and Height:	Alignment acceptable. 185	-ft was between	1 and 3-in below the 27-i	n design heigh	t.	
Barrier		aking and Cracking:	There are 3 blocks and 4 p	osts that are seve	rely cracked.			
	Missing	Elements:	There were no missing eler	ments observed.				
		osion and eathering:	There was no corrosion or	weathering obser	rved.			
	Align	ment and Height:	Alignment acceptable. 0-f than 3-in below the design		and 3-in below the 27-in	design height :	and 30-ft was more	
End Treatments		Breaking and Cracking: There is 1 post that is badly cracked.						
	Missing I	Elements:	There is 1 block that is mis	sing.				
		osion and eathering:	There was no corrosion or	weathering obser	rved.			
L								

Ba	arrier ID:	PEFO-001	0-6.099-R							
Rou	ite Name:	NORTH-S	NORTH-SOUTH HIGHWAY							
Inspect	tion Date:	02/04/201	0	Barrie	r Rating:	34.20				
Repair Recomme	endations									
Repair Action:	REPAIR	FMSSDEFERREDRepair\$4373Work Type:MAINTENANCECost:								
Brief Workorder:	Raise 185 L.	F. of barrier to	the 27-in design height and	replace 5 posts and 5 blocks	3.					
Workorder:Adjust Guardrail at \$10- per -Lin. Ft. for 185 LF = \$1850. Raise 185-ft. of barrier up to 27-in design height. Replace Block at \$30- per -Each for 5 Block(s) = \$150. Replace the 5 missing / damaged blocks. Replace Post at \$100- per -Each for 5 Post(s) = \$500. Replace 5 damaged posts. Low Speed Traffic Control at \$1475- per -Day for 1 Day(s) = \$1475.										
	2008 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.									



PEFO\_0010\_6.099\_R\_1.jpg

NORTH-SOUTH HIGHWAY         Inspection Date:       02/04/2010       Barrier Rating:       38.20         Barrier Description         Type:       W-BRAM STRONG POST       Barrier Function:       TRAFFIC         Barrier Material:       WOOD       Cash Material:       WOOD         Borkout WOOD       Length (ft.):       530         Speed Limit (MPTH)       45       Placement with       OUTSIDE OF CURVE         Barrier Test Level:       Test Level:       Test Level:       Crashworthy?:       YES         Adjop of the MEDUM         Barrier Test Level:       Test Level:       Crashworthy?:       YES         Adjop of the MEDUM       NONTE:       Transition Type:       VES         Adjop of the MEDUM       Issee: Crashworthy?:       YES         Crashworthy?:       YES         Crashworthy?:       VES         Digit Heigh (ft.):       7.9	B	arrier ID:	PEFO-001	0-6.101-L							
Barrier Description       Type:       W-BEAM STRONG POST       Barrier Function:       TRAFFIC         Barrier Material:       WEATHERING STEELCORTEN       Bost Material:       WOOD         Bookout       WOOD       Length (ft.):       530         Speed Limit (MPH):       45       Placement with Respect to Road:       OUTSIDE OF CURVE         Barrier CrashworthPire:       MEDIUM         Barrier Test Level:       11-3       Is Barrier Test Level:       VISS         Appropriate Test Level:       Is Beg Turnt NON       Appropriate Test Transition Type:       VISS         Appropriate Test Type:       VISS       Crashworthy?:       Transition Type:       VISS         Appropriate Test Type:       VISS       Crashworthy?:         VISS       Crashworth?:       To Width (fn.):       0       OPSIS Spacing (1n.):       74.9       VISS         Spacing (1n.):       25.5       Lateral Offset (1n.):				RTH-SOUTH HIGHWAY							
Barrier Description       Type:       W-BEAM STRONG POST       Barrier Function:       TRAFFIC         Barrier Material:       WEATHERING STEELCORTEN       Bost Material:       WOOD         Bookout       WOOD       Length (ft.):       530         Speed Limit (MPH):       45       Placement with Respect to Road:       OUTSIDE OF CURVE         Barrier CrashworthPire:       MEDIUM         Barrier Test Level:       11-3       Is Barrier Test Level:       VISS         Appropriate Test Level:       Is Beg Turnt NON       Appropriate Test Transition Type:       VISS         Appropriate Test Type:       VISS       Crashworthy?:       Transition Type:       VISS         Appropriate Test Type:       VISS       Crashworthy?:         VISS       Crashworth?:       To Width (fn.):       0       OPSIS Spacing (1n.):       74.9       VISS         Spacing (1n.):       25.5       Lateral Offset (1n.):		· .	00/04/201	4/2010 Barrier Rating 38 20							
Type:     W-BEAM SIRONG POST     Barrier Function:     TRAFFIC       Barrier Function:     WOD       Barrier Turce:     WIEXTURENCE       STEEL CORTED     STEEL CORTED       Barrier Troe     OUTSUDE OF CURVE       Barrier Transition Type:     VES       STEEL CORTED       Barrier Transition Type:     VES       STEEL CORTED       Barrier Transition Type:     VES       STEEL CORTED       STEEL CORTED <th col<="" th=""><th></th><th></th><th>02/04/201</th><th>0</th><th> </th><th>Barrier Rating:</th><th>38.20</th><th></th></th>	<th></th> <th></th> <th>02/04/201</th> <th>0</th> <th> </th> <th>Barrier Rating:</th> <th>38.20</th> <th></th>			02/04/201	0		Barrier Rating:	38.20			
Image: Simple for the stand of the stan	Barrier Descripti	on					1				
STEEL/CORTEN     STEEL/CORTEN     Steel/Corrent     Stee//Corrent     Stee//Corrent     Stee/		Туре:	W-BEAM S	STRONG POST		Barrier Function:	TRAFFIC				
Type:     Image: Cartering of the second seco	Barrier	Material:				Post Material:	WOOD				
Image: constraint of constraints       Meter interaction of the set o			WOOD			Length (ft.):	530				
Barrier Crashworthiness         TL-2       Barrier Test Level:       TL-3       Is Barrier Crashworthy?:       YES         Beg. End Trimt Type:       NONE       Is Beg. End Trimt Crashworthy?:       NA       Approach BRIDGE RAIL         Transition Type:       W-BEAM         Ending End Trimt Type:       NA       Approach Transition Type:       W-BEAM         Average Measurements         Design Height (In.):       27       Width (In.):       67.3       Road Grade (%):       0.90         Physical Condition         Barrier       Alignment and Height:       The alignment had less than 6 in of deflection. 380ft. was 1-3 in below the 27-in. design height.         Breaking and Cracking:       The alignment and Height:       The alignment and Soles and 3 posts have large cracks and/or rotated sideways. There was no breaking or cracking to the rail.         Missing Elements:       There was no corrosion or weathering observed.         Missing Elements:       There was no corrosion or weathering observed.         Missing Elements:       T	Speed Lim	it (MPH):	45				OUTSIDE	OF CURVE			
Appropriate Test Level:TL-2Barrier Test Level:TL-3Is Barrier Crashworthy:YESBeg. End Trimt Type:NONEIs Beg. End Trimt Crashworthy:N/AApproach Transition Type:BRIDGE RAIL W-BEAMEnding End Trimt Type:W-BEAM BCTEnding End Trimt Crashworthy:NOIs Beg. End Trimt Transition Type:BRIDGE RAIL W-BEAMEnding End Trimt Type:W-BEAM BCTEnding End Trimt Crashworthy:NOIs Berait Transition Type:BRIDGE RAIL W-BEAMObject Ending Physical Contif27Width (In):0.0Post Spacing (In):74.9Physical Contif25.6Lateral Offset (In):67.3Road Grade (%):0.90Physical Contif3Soleskand 3 posts have levelsIs Berait BarrierIs Beraking and Cracking:Soleskand 3 posts have level cracks and/or rotated sideways. There was no break or cracking to 	Hazard Behind	l Barrier:	MEDIUM		1						
Level:       Image: Crashworthy?       Crashworthy?       Crashworthy?         Beg. End Trimi Type:       NONE       Is Beg. End Trimi Crashworthy?       N/A       Approach Transition Type:       BRIDGE RAIL         Ending End Trimi Type:       W-BEAM BCT       Ending End Trimi Crashworthy?       N/A       Approach Transition Type:       W-BEAM         Average Measure       Ending End Trimi Crashworthy?       N/A       Post Spacing (In.):       74.9         Negin Height (In.):       27       Width (In.):       0.0       Post Spacing (In.):       74.9         Height (In.):       25.6       Lateral Offset (In.):       67.3       Road Grade (%):       0.90         Physical Condition:       Stocks and 3 posts have large cracks and/or rotated sideways. There was no breaking or cracking to the rail.       0.90         Barrier       Breaking and Cracking:       Stocks and 3 posts have large cracks and/or rotated sideways. There was no breaking or cracking to the rail.       Image: Stocks and 3 posts have large cracks and/or rotated sideways. There was no breaking or cracking to the rail.         Missing Elements:       There was no corrosion or weathering observed.       Image: Stocks and 3 posts have large cracks and/or rotated sideways. There was no breaking and the rail.       Image: Stocks and 3 posts have large cracks and/or rotated sideways. There was no breaking or the rail.       Image: Stocks and 3 posts have large cracks and/or rotated sideways. There was	<b>Barrier Crashwo</b>	rthiness									
Beg. End Trtmt Type:       NONE       Is Beg. End Trtmt Crashhworthy?:       N/A       Approach Transition Type:       BRIDGE RAIL W-BEAM         Ending End Trtmt Type:       W-BEAM BCT       Ending End Trtmt Crashhworthy?:       NO       Image: Construction Type:       W-BEAM         Design Height (In.):       27       Width (In.):       0.0       Post Spacing (In.):       74.9         Height (In.):       25.6       Lateral Offset (In.):       67.3       Road Grade (%):       0.90         Physical Condition       Alignment and Height:       The alignment had less than 6 in of deflection.       380ft. was 1-3 in below the 27-in. design height.         Barrier       Alignment and Cracking:       5 blocks and 3 posts have large cracks and/or rotated sideways. There was no breaking or cracking to the rail.         Missing Elements:       There ware no missing clements observed.         Corrrosion and Weathering:       Alignment acceptable. 30-ft was between 1 and 3-in below the 27-in design height.         Height:       There ware no missing clements observed.         End Treatments       The were was minor cracking present to the posts and blocks but they are still in good condition.         Missing Elements:       There ware no missing clements observed.         Missing Elements:       There ware no missing clements observed.         Missing Elements:       There ware no missing clements obser		TL-2			TL-3			YES			
Type:       Crashworthy?:       Image: Crashworthy?:<		NONE			N/A						
Design Height (In.):       27       Width (In.):       0.0       Post Spacing (In.):       74.9         Height (In.):       25.6       Lateral Offset (In.):       67.3       Road Grade (%):       0.90         Physical Condition       Alignment and Height:       The alignment had less than 6 in of deflection.       380ft. was 1-3 in below the 27-in. design height.         Breaking and Cracking:       5 blocks and 3 posts have large cracks and/or rotated sideways. There was no breaking or cracking to the rail.         Missing Elements:       There were no missing elements observed.         Corrrosion and Height:       There was no corrosion or weathering observed.         Breaking and Cracking:       Alignment acceptable.       30-ft was between 1 and 3-in below the 27-in design height.         Missing Elements:       There was minor cracking present to the posts and blocks but they are still in go-d condition.         End Treatments       There were no missing elements observed.         Missing Elements:       There were no missing elements observed.         Missing Elements:       The were was minor cracking present to the posts and blocks but they are still in go-d condition.         Corrrosion and       There were no missing elements observed.         Missing Elements:       There was no corrosion or weathering observed.	-	W-BEAM I	ВСТ		NO						
Design Height (In.):       27       Width (In.):       0.0       Post Spacing (In.):       74.9         Height (In.):       25.6       Lateral Offset (In.):       67.3       Road Grade (%):       0.90         Physical Condition       Alignment and Height:       The alignment had less than 6 in of deflection.       380ft. was 1-3 in below the 27-in. design height.         Breaking and Cracking:       5 blocks and 3 posts have large cracks and/or rotated sideways. There was no breaking or cracking to the rail.         Missing Elements:       There were no missing elements observed.         Corrrosion and Height:       There was no corrosion or weathering observed.         Breaking and Cracking:       Alignment acceptable.       30-ft was between 1 and 3-in below the 27-in design height.         Missing Elements:       There was minor cracking present to the posts and blocks but they are still in go-d condition.         End Treatments       There were no missing elements observed.         Missing Elements:       There were no missing elements observed.         Missing Elements:       The were was minor cracking present to the posts and blocks but they are still in go-d condition.         Corrrosion and       There were no missing elements observed.         Missing Elements:       There was no corrosion or weathering observed.	Average Measure	ements									
Height (In.):       25.6       Lateral Offset (In.):       67.3       Road Grade (%):       0.9         Physical Condition       Alignment and Height:       The alignment had less that of deflection. 380ft. was 1-3 in below the 27-in. design height.       Image: Condition of the alignment had less that of deflection. 380ft. was 1-3 in below the 27-in. design height.       Image: Condition of the alignment had less that a large cracks and/or rotated sideways. There was no be cracking to the rail.         Barrier       Breaking and Cracking       Sblocks and 3 posts have large cracks and/or rotated sideways. There was no cracking to the rail.       Image: Condition of the rail.       Image: Condition of the rail.         Corrrosion and Height:       There was no corrosion or wathering observed.       Image: Condition of the rail.       Image: Condition of the rail.       Image: Condition of the rail.         End Treatments       Alignment and Height:       Alignment acceptable. 30-R was between 1 and 3-in between 27-in design height.       Image: Condition.         End Treatments       Breaking and Cracking:       The was minor cracking present to the posts and blocks but they are still in good condition.         End Treatments       Image: Cracking:       There was no corrosion or wathering observed.       Image: Cracking:				Width (In.):	0.0	Post Spa	cing (In.):	74.9			
Alignment and Height:         The alignment had less than 6 in of deflection. 380ft. was 1-3 in below the 27-in. design height.           Barrier         Breaking and Cracking:         5 blocks and 3 posts have large cracks and/or rotated sideways. There was no breaking or cracking to the rail.           Missing Elements:         There were no missing elements observed.           Corrosion and Weathering:         There was no corrosion or weathering observed.           Breaking and Cracking:         Alignment acceptable. 30-ft was between 1 and 3-in below the 27-in design height.           End Treatments         Breaking and Cracking:         The were was minor cracking present to the posts and blocks but they are still in good condition.           End Treatments         Breaking and Cracking:         There were no missing elements observed.           The were was minor cracking present to the posts and blocks but they are still in good condition.         There were no missing elements observed.           There were no missing elements observed.         There were no missing elements observed.		25.6		Lateral Offset (In.):	67.3			0.90			
Barrier       Height:         Breaking and Cracking:       5 blocks and 3 posts have large cracks and/or rotated sideways. There was no breaking or cracking to the rail.         Missing Elements:       There were no missing elements observed.         Corrrosion and Weathering:       There was no corrosion or weathering observed.         Alignment and Height:       Alignment acceptable. 30-ft was between 1 and 3-in below the 27-in design height.         Breaking and Cracking:       The were no missing elements observed.         Missing Elements:       The were was minor cracking present to the posts and blocks but they are still in good condition.         Cracking:       There were no missing elements observed.         Missing Elements:       There were no missing elements observed.         There were no missing elements observed.       There were no missing elements observed.	<b>Physical Condition</b>	)n									
Barrier       Cracking:       the rail.         Missing Elements:       There were no missing elements observed.         Corrrosion and Weathering:       There was no corrosion or weathering observed.         Alignment and Height:       Alignment acceptable. 30-ft was between 1 and 3-in below the 27-in design height.         Breaking and Cracking:       The were was minor cracking present to the posts and blocks but they are still in good condition.         Missing Elements:       There were no missing elements observed.         Corrrosion and       There was no corrosion or weathering observed.		Align		The alignment had less tha	n 6in of deflectio	n. 380ft. was 1-3 in belo	w the 27-in. d	esign height.			
Breaking and Cracking:       There was no corrosion or weathering observed.         End Treatments       Alignment and Height:       Alignment acceptable. 30-ft was between 1 and 3-in below the 27-in design height.         Breaking and Cracking:       The were was minor cracking present to the posts and blocks but they are still in good condition.         Missing Elements:       There were no missing elements observed.         Corrrosion and       There was no corrosion or weathering observed.	Barrier				arge cracks and/o	or rotated sideways. The	re was no brea	king or cracking to			
Weathering:Alignment and Height:Alignment acceptable. 30-ft was between 1 and 3-in below the 27-in design height.End TreatmentsBreaking and Cracking:The were was minor cracking present to the posts and blocks but they are still in good condition.End TreatmentsDescriptionThe were no missing elements observed.Missing Elements:There was no corrosion or weathering observed.		Missing 3	Elements:	There were no missing eler	ments observed.						
End Treatments       Breaking and Cracking:       The were was minor cracking present to the posts and blocks but they are still in good condition.         End Treatments       Missing Elements:       There were no missing elements observed.         Corrrosion and       There was no corrosion or weathering observed.				There was no corrosion or	weathering obser	ved.					
End Treatments       Cracking:         Missing Elements:       There were no missing elements observed.         Corrrosion and       There was no corrosion or weathering observed.		Align		Alignment acceptable. 30-	ft was between 1	and 3-in below the 27-ir	ı design height				
Corrrosion and     There was no corrosion or weathering observed.	End Treatments										
		Missing 3	Elements:	There were no missing eler	ments observed.						
				There was no corrosion or	weathering obser	ved.					

B	arrier ID:	PEFO-001	)-6.101-L					
Rou	ute Name:	NORTH-S	OUTH HIGHWAY					
Inspec	tion Date:	02/04/201	)	Barrie	r Rating:	38.20		
Repair Recomme								
Repair Action:	REPAIR			DEFERRED MAINTENANCE		Repair Cost:	\$14344	
Brief Workorder:	Raise 380 L.	F. of guardrail	up to 27-in design height re	place transition section repla	ace 8 blocks a	nd 3 posts.		
Workorder:       Adjust Guardrail at \$10- per -Lin. Ft. for 380 LF = \$3800. Raise 380-ft. of barrier up to 27-in design height.         Replace Block at \$30- per -Each for 8 Block(s) = \$240. Replace 8 cracked/rotated blocks.         Replace Post at \$100- per -Each for 3 Post(s) = \$300. Replace 3 cracked posts.         Remove Guardrail at \$10- per -Lin. Ft. for 30 LF = \$300. Remove entire transition section.         Bridge Rail - W-Beam at \$2500- per -Each for 1 = \$2500. Install new transition section.         Low Speed Traffic Control at \$1475- per -Day for 4 Day(s) = \$5900. 2 days to raise guardrail 1 day for transition removal 1 day for transition.								
	2008 co	st estimate (A	ASTM Class D), prelimin	ary for comparison to otl	her repair co	sts only.		



PEFO\_0010\_6.101\_L\_1.jpg



PEFO\_0010\_6.101\_L\_2.jpg

B	arrier ID:	PEFO-001	0-10.421-R				
	ite Name:		OUTH HIGHWAY				
	-					22.70	
		02/04/201	0	B	arrier Rating:	33.70	
Barrier Descript	on						
	Туре:	W-BEAM S	STRONG POST	Barı	rier Function:	TRAFFIC	
Barrier	Material:	WEATHEF STEEL/CO				WOOD	
	Blockout Type:	WOOD			Length (ft.):	505	
Speed Lim	it (MPH):	45			acement with pect to Road:	OUTSIDE	OF CURVE
Hazard Behine	l Barrier:	MEDIUM		•		1	
<b>Barrier Crashwo</b>	rthiness						
Appropriate Test Level:	TL-2		Barrier Test Level:	TL-3		Is Barrier worthy?:	YES
Beg. End Trtmt Type:	W-BEAM I	ВСТ	Is Beg. End Trtmt Crashhworthy?:	NO		Approach ion Type:	CONC/MASON W-BEAM
Ending End Trtmt Type:	NONE		Ending End Trtmt Crashhworthy?:	N/A			
Average Measur	ements						
Design Height (In.):	27		Width (In.):	0.0	Post Spa	cing (In.):	75.3
Height (In.):	26.2		Lateral Offset (In.):	55.7		rade (%):	0.40
<b>Physical Condition</b>	on						
		ment and Height:	Alignment acceptable. 300	)-ft was between 1 and	3-in below the 27-i	n design heigl	ıt.
Barrier		aking and Cracking:	There was no breaking or c	cracking observed.			
	Missing 1	Elements:	There were no missing elem	ments observed.			
		osion and eathering:	There was no corrosion or	weathering observed.			
	Align	ment and Height:	Alignment is acceptable. I	Height is within 1-in of	27-in design height	i.	
End Treatments		aking and Cracking:	There was no breaking or c	eracking observed.			
	Missing 1	Elements:	There were no missing eler	ments observed.			
		osion and eathering:	There was no corrosion or	weathering observed.			

Ba	arrier ID:	PEFO-001	0-10.421-R							
Rou	ite Name:	NORTH-S	NORTH-SOUTH HIGHWAY							
Inspect	tion Date:	02/04/201	0	Barrie	r Rating:	33.70				
Repair Recomme	endations									
Repair Action:	REPAIR	FMSSDEFERREDRepair\$6545Work Type:MAINTENANCECost:								
Brief Workorder:	Raise the hei	ght of 300 L.F	C. of guardrail to 27 inch des	ign height.						
Workorder: Adjust Guardrail at \$10- per -Lin. Ft. for 300 LF = \$3000. Raise 300-ft. of barrier up to 27-in design height. Low Speed Traffic Control at \$1475- per -Day for 2 Day(s) = \$2950.										
	2008 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.									



PEFO\_0010\_10.421\_R\_1.jpg

NORTH-SOUTH HIGHWAY         Inspection Date:       02/04/2010       Barrier Rating:       22.50         Barrier Description         Type:       W-BFAM STRONG POST       Barrier Function:       TRAFFIC         Barrier Material:       WODD       Image: Colspan="2">Transition Type:         Physical Condition       Fadigment and Height (h.):       Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2"       Colspan="2"       Colspan="2"        Colspan="2"        Colspan="2"       Colspan="2"       Colspan="2"        Colspan="2"        Colspan="2"        Colspan="2"           Colspan="2" <th colspa<="" th=""><th>B</th><th>arrier ID:</th><th>PEFO-001</th><th>0-10.427-L</th><th></th><th></th><th></th><th></th></th>	<th>B</th> <th>arrier ID:</th> <th>PEFO-001</th> <th>0-10.427-L</th> <th></th> <th></th> <th></th> <th></th>	B	arrier ID:	PEFO-001	0-10.427-L						
Barrier Description       Type:     W-BEAM STRONG POST     Barrier Function:     TRAFFIC       Barrier Material:     WEATHERING STELLCORTEN     Post Material:     WOOD       Blockoat     WOOD     Length (ft.);     472       Speed Limit (MPH):     45     Placement with Respect to Road:     INSIDE OF CURVE       Barrier Level:     District Crashworthiness     Inside of Crashworthy?     VES       Appropriate Test Level:     II-2     Barrier Test Level:     II-3     Is Barrier Crashworthy?     VES       Ending End Trunt Type:     NONE     Fading End Trunt Crashworthy?     N/A     ONC/MASON       Appropriate Test Level:     II-2     Beg. End Trunt Crashworthy?     N/A     ONC/MASON       W-BEAM     BCT     Is Beg. End Trunt Crashworthy?     N/A     Transition Type:     CONC/MASON       Average Measurements     Post Spacing (In.):     74.6       Design Height (In.):     27     Width (In.):     0.0     Post Spacing (In.):     74.6       Physical Condition     The alignment and Height:     The alignment and los than 6 or deficetion. The height was within 1° of the 27-in design height for 72ft. and was between 24° and 26° for 400ft.       Barrier     Alignment and Neading to the romained of the post and blocks.     Jaterian design height is within 1-in 027-in design height.       Breaking											
Barrier Description       Type:     W-BEAM STRONG POST     Barrier Function:     TRAFFIC       Barrier Material:     WEATHERING STELLCORTEN     Post Material:     WOOD       Blockoat     WOOD     Length (ft.);     472       Speed Limit (MPH):     45     Placement with Respect to Road:     INSIDE OF CURVE       Barrier Level:     District Crashworthiness     Inside of Crashworthy?     VES       Appropriate Test Level:     II-2     Barrier Test Level:     II-3     Is Barrier Crashworthy?     VES       Ending End Trunt Type:     NONE     Fading End Trunt Crashworthy?     N/A     ONC/MASON       Appropriate Test Level:     II-2     Beg. End Trunt Crashworthy?     N/A     ONC/MASON       W-BEAM     BCT     Is Beg. End Trunt Crashworthy?     N/A     Transition Type:     CONC/MASON       Average Measurements     Post Spacing (In.):     74.6       Design Height (In.):     27     Width (In.):     0.0     Post Spacing (In.):     74.6       Physical Condition     The alignment and Height:     The alignment and los than 6 or deficetion. The height was within 1° of the 27-in design height for 72ft. and was between 24° and 26° for 400ft.       Barrier     Alignment and Neading to the romained of the post and blocks.     Jaterian design height is within 1-in 027-in design height.       Breaking	T	tion Datas	02/04/2014	0		Donnion Dating	32 50				
Image: state in the state	· · · · ·		02/04/201	0		Barrier Rating:	32.30				
Barrier Marrier Mathematical STEEL/CORTEN     WOOD     WOOD       Blockout     STEEL/CORTEN     Post Material:     WOOD       Speed Limit (MPH):     45     Respect to Road:     INSIDE OF CURVE       Barrier Crashworth/rest     MEDUM     Barrier Test I evel:     Total Starrier Starworthy?:     VIS       Barrier Crashworth/rest     Is Barrier Test I evel:     Total Starrier Crashworthy?:     VIS     Conc/MASON       Barrier Type:     Total Is Barrier Type:     Total Is Barrier Test I evel:     Transition Type:     VIS       Beg. End Trint Work     WAEL MBCT     Is Beg. End Trint NO     Approach Conc/MASON     Approach Conc/MASON       Type:     Transition Type:     VIS     Crashhworthy?:     VIS     VIS       Finding End Trint Type:     NONE     Ending End Trint NO     Approach Conc/MASON     VIS       Average Measurements     Carashhworthy?:     VIS     VIS     VIS       Average Measurements     Lateral Offset (In):     542     Road Grade (%):     0.80       Physical Condition:     Corrosion and Theight     Stocks and Stock schild three constand blocks     Just minor       Missing Elements:     Stocks and Stock schild Type conclained approximation of the posts and blocks but they were atil in good condition.     Information Cracking and Cracking and Stocks reduit approximatin and blocks but they were atil in good condition.	Barrier Descripti				_						
STEEL/CORTEN     Constraint       Biochout     WOD     Length (ft, y)     472       Speed Limit (MPH):     45     Placement with Respect to Road:     INSIDE OF CURVE       Barrier Crashworthiness     MEDIU     Instance of the second of the sec		Туре:	W-BEAM S	STRONG POST	B	arrier Function:	TRAFFIC				
Blockout Type:       WOOD Type:       WOOD Image: Classing of the parameter of the posts and blocks.       472         Speed Linit (MPH):       45       Placement with Respect to Road:       INSIDE OF CURVE.         Hazard Behind Barrier:       MEDIUM       Image: Classing of the parameter of the posts and blocks.       Instance of the parameter of the posts and blocks.       Image: Classing of the parameter of the posts and blocks.       Image: Classing of the parameter of the posts and blocks.       Image: Classing of the parameter of the posts and blocks.       Image: Classing of the parameter of the posts and blocks.       Image: Classing of the parameter of the posts and blocks.       Image: Classing of the parameter of the posts and blocks.       Image: Classing of the parameter of the posts and blocks.       Image: Classing of the parameter of the posts and blocks.       Image: Classing of the parameter of the posts and blocks.       Image: Classing of the parameter of the posts and blocks.       Image: Classing of the parameter of the posts and blocks.       Image: Classing of the parameter of the posts and blocks.       Image: Classing of the parameter of the posts and blocks.       Image: Classing of the parameter of the posts and blocks.       Image: Classing of the parameter of the posts and blocks.       Image: Classing of the parameter of the posts and blocks.       Image: Classing of the parameter of the posts and blocks.       Image: Classing of the parameter of the posts and blocks.       Image: Classing of the posts and blocks.       Image: Classing of the parameter of the posts and blocks.       Image: Classing of the parameter of the posts and	Barrier	Material:	WEATHER	RING		Post Material:	WOOD				
Type:     Type:     Instruction of the second of t			STEEL/CO								
Speed Limit (MPH);       45       Placement with Respect to Road;       INSIDE OF CURVE         Hazard Behind Barrier:       MEDUM       Barrier Crashworthiness       Instance of Road;       INSIDE of CURVE         Barrier Crashworthiness       TL-2       Barrier Test Level;       TL-3       Is Barrier Crashworth)?;       YES         Beg, End Trutt Type;       Is Beg, End Trutt Type;       NO       Approach ConcMASON       CONCMASON         Ending End Trutt Type;       NONE       Ending End Trutt Crashhworthy?;       N/A       CONCMASON         Average Measurements       Ending End Trutt Type;       N/A       F4.6       CONCMASON         Average Measurements       Design Height (In.);       2.7       Width (In.);       0.0       Post Spacing (In.);       74.6         Height (In.);       25.7       Lateral Offset (In.);       54.2       Road Grade (%);       0.80         Physical Condition       Alignment and Height;       The alignment had less than 6in of deflection. The height was within 1° of the 27-in design height for 720-in design height       F6.4       Intervent in through the cross-section. Just minor         Barrier       Alignment and Cracking:       S blocks and 3 posts exhibit large cracking more than 1 in through the cross-section. Just minor       cracking to the remainder of the posts and blocks.       Just minor         End Treat			WOOD			Length (ft.):	472				
Image: constraint (constraint)       MEDUM         Barrier Crashworthiness       MEDUM         Barrier Crashworthiness       Sarrier Crashworthiness       YES         Appropriate Test Level:       It-3       Is Barrier Crashworthines       YES         Beg. End Trimt Level:       W-BEAM BCT       Is Beg. End Trimt Crashworthy?       NO       Appropriate Crashworth?       VES         Beg. End Trimt Level:       W-BEAM BCT       Is Beg. End Trimt Crashworth??       NO       Appropriate Crashworth?       ONC/MASON W-BEAM         Ending End Trimt Type:       NONE       Ending End Trimt Type:       NO       Post Spacing (In.):       74.6         Average Measurements       Ending End Trimt Type:       N/A       Is algoment and the field (In.):       0.0       Post Spacing (In.):       74.6         Height (In.):       25.7       Lateral Offset (In.):       54.2       Road Grade (%):       0.80         Physical Condition       The algoment and the set han 6in of deflection. The height was within 1° of the 27-in design height for 72fi. and was between 24° and 26° for 400fi.       Sole in the algoment is acceptable. The algoment is abserved.         Barrier       Alignment and Weathering:       Sole is and blocks.       Sole is and blocks.       Sole is and blocks.         Missing Elements:       There was no corrosion or weathering observed. <th< th=""><th>Speed Lim</th><th></th><th>45</th><th></th><th></th><th>Placement with</th><th>INSIDE OI</th><th>FCURVE</th></th<>	Speed Lim		45			Placement with	INSIDE OI	FCURVE			
Barrier Crashworthines         Appropriate Test Level:       TL-2       Barrier Test Level:       TL-3       Is Barrier Crashworthy?:       YES         Beg, End Trintt Type:       W-BEAM BCT       Is Beg, End Trint Crashhworthy?:       NO       Approach Approach Transition Type:       CONC/MASON         Ending End Trintt Type:       NONE       Ending End Trint Crashhworthy?:       NO       Approach Transition Type:       CONC/MASON         Average Measurements       Ending End Trint Crashhworthy?:       N/A       Image: Concentration Type:       Post Spacing (In.):       74.6         Besign Height (In.):       27       Width (In.):       0.0       Post Spacing (In.):       74.6         Height (In.):       25.7       Lateral Offset (In.):       54.2       Road Grade (%):       0.80         Physical Condition       The alignment and Height:       The alignment hal less than 6 in of deflection. The height was within 1" of the 27-in design height for 72.1t. and was between 24" and 26" for 400ft.       Image: State	~p~~	. (			]						
Appropriate Test Level:       TL-2       Barrier Test Level:       TL-3       Is Barrier Crashworthy?:       YES         Beg. End Trimi Type:       W-BEAM BCT       Is Beg. End Trimi Crashworthy?:       NO       Approach (CONC/MASON)       CONC/MASON)         Ending End Trimi Type:       NONE       Ending End Trimi Crashworthy?:       N/A       Transition Type:       W-BEAM         Average Measurements       Ending End Trimi Crashworthy?:       N/A       Post Spacing (In.):       74.6         Design Height (In.):       27       Width (In.):       0.0       Post Spacing (In.):       74.6         Height (In.):       25.7       Lateral Offset (In.):       54.2       Road Grade (%):       0.80         Physical Condition       Transition Type:       The alignment had less that of for 400th.       The align ment had less that of for 400th.       The align ment had less that of for 400th.         Barrier       Alignment and Height:       5 blocks and 3 posts exhibit large cracking more than 1 in through the cross-section. Just minor cracking to the remainder or beosts and blocks.       Just minor         Missing Elements:       There was no corrosion or weathering observed.       Just minor         Missing Elements:       Minor cracking was present in the posts and blocks but they were still in good condition.         Freeking and Cracking       Minor cracking was present in the	Hazard Behind	l Barrier:	MEDIUM								
Levei:       Crashworthy?:       Crashworthy?:       Construction of the second of t	<b>Barrier Crashwo</b>	rthiness									
Beg. End Trtmt Type:       W-BEAM BCT       Is Beg. End Trtmt Crashhworthy?:       NO       Approach Transition Type:       CONC/MASON W-BEAM         Ending End Trtmt Type:       NONE       Ending End Trtmt Crashhworthy?:       N/A		TL-2			TL-3			YES			
Type:       None       Crashhworthy?:       Transition Type:       W-BEAM         Ending End Trtmt Type:       NONE       Ending End Trtmt Crashhworthy?:       N/A       Image: Crashhworthy?:       Image: C		WBEAM	PCT		NO		•	CONCIMASON			
Type:       Crashhworthy?:       Image: Comparison of the post sector of the	-	W-DLAW	bei		NO						
Average Measurements         Design Height (In.):       27       Width (In.):       0.0       Post Spacing (In.):       74.6         Height (In.):       25.7       Lateral Offset (In.):       54.2       Road Grade (%):       0.80         Physical Condition       Integration of the alignment and Height:       The alignment had less than 6in of deflection. The height was within 1" of the 27-in design height for 72ft. and was between 24" and 26" for 400ft.       Solo (200)         Barrier       Breaking and Cracking:       5 blocks and 3 posts exhibit large cracking more than 1 in through the cross-section. Just minor cracking to the remainder of the posts and blocks.       Just minor         Missing Elements:       There was no corrosion or weathering observed.       Just minor cracking was present in the posts and blocks but they were still in good condition.         End Treatments       Breaking and Cracking:       Minor cracking was present in the posts and blocks but they were still in good condition.       There were no missing elements observed.         End Treatments       Breaking and Cracking:       Minor cracking was present in the posts and blocks but they were still in good condition.       There were no missing elements observed.         Missing Elements:       There were no missing elements observed.       There were no missing elements observed.		NONE			N/A						
Design Height (In.):       27       Width (In.):       0.0       Post Spacing (In.):       74.6         Height (In.):       25.7       Lateral Offset (In.):       54.2       Road Grade (%):       0.80         Physical Condition         Might (In.):       25.7       Lateral Offset (In.):       54.2       Road Grade (%):       0.80         Physical Condition         Mising Element and Height:         To r2ft. and was between 24" and 26" for 400ft.         Breaking and Cracking:       5 blocks and 3 posts exhibit large cracking more than 1 in through the cross-section. Just minor cracking to the remainder of the posts and blocks.       Just minor         Missing Elements:       There was no corrosion or weathering observed.       Image: State Stat		ements									
Height (In.):       25.7       Lateral Offset (In.):       54.2       Road Grade (%):       0.80         Physical Condition	<u> </u>			Width (In.):	0.0	Post Spa	cing (In.):	74.6			
Alignment and Height:         The alignment had less than 6in of deflection. The height was within 1" of the 27-in design height for 72ft. and was between 24" and 26" for 400ft.           Barrier         Breaking and Cracking:         5 blocks and 3 posts exhibit large cracking more than 1 in through the cross-section. Just minor cracking to the remainder of the posts and blocks.           Missing Elements:         There were no missing elements observed.           Corrrosion and Weathering:         There was no corrosion or weathering observed.           Breaking and Cracking and Corrosion and Height:         Minor cracking was present in the posts and blocks but they were still in good condition.           End Treatments         Breaking and Cracking:         Minor cracking was present in the posts and blocks but they were still in good condition.           End Treatments         Dreaking and Cracking:         There were no missing elements observed.		25.7			54.2						
Barrier       Freaking and Cracking:       5 blocks and 3 posts exhibit large cracking more than 1 in through the cross-section. Just minor cracking to the remainder of the posts and blocks.         Missing Elements:       There were no missing elements observed.         Corrrosion and Weathering:       There was no corrosion or weathering observed.         Alignment and Height:       Alignment is acceptable. Height is within 1-in of 27-in design height.         Breaking and Cracking:       Minor cracking was present in the posts and blocks but they were still in good condition.         Cracking:       There were no missing elements observed.         Image: Second Sec	<b>Physical Condition</b>	on									
Barrier       Cracking:       cracking to the remainder of the posts and blocks.         Missing Elements:       There were no missing elements observed.         Corrrosion and Weathering:       There was no corrosion or weathering observed.         Alignment and Height:       Alignment is acceptable. Height is within 1-in of 27-in design height.         Breaking and Cracking:       Minor cracking was present in the posts and blocks but they were still in good condition.         End Treatments       Missing Elements:         There was no corrosion or weathering observed.         There was no corrosion or weathering observed.		Align		•		•	1" of the 27-	n design height			
Image: Defendence       Image: Defendence         Corrrosion and Weathering:       There was no corrosion or weathering observed.         Alignment and Height:       Alignment is acceptable. Height is within 1-in of 27-in design height.         Breaking and Cracking:       Minor cracking was present in the posts and blocks but they were still in good condition.         Missing Elements:       There were no missing elements observed.         Corrrosion and       There was no corrosion or weathering observed.	Barrier		0				cross-section	. Just minor			
Weathering:       Weathering:         Alignment and Height:       Alignment is acceptable. Height is within 1-in of 27-in design height.         Breaking and Cracking:       Minor cracking was present in the posts and blocks but they were still in good condition.         Missing Elements:       There were no missing elements observed.         Corrrosion and       There was no corrosion or weathering observed.		Missing	Elements:	There were no missing eler	ments observed.						
End Treatments       Breaking and Cracking:       Minor cracking was present in the posts and blocks but they were still in good condition.         End Treatments       Missing Elements:       There were no missing elements observed.         Corrrosion and       There was no corrosion or weathering observed.				There was no corrosion or	weathering observe	ed.					
End Treatments       Cracking:         Missing Elements:       There were no missing elements observed.         Corrrosion and       There was no corrosion or weathering observed.		Align		Alignment is acceptable. I	Height is within 1-i	n of 27-in design height	i.				
Corrosion and     There was no corrosion or weathering observed.	End Treatments		0	Minor cracking was presen	locks but they were stil	l in good conc	lition.				
		Missing	Elements:	There were no missing eler	ments observed.	observed.					
				There was no corrosion or	weathering observe	ed.					

B	arrier ID:	PEFO-001	0-10.427-L							
Rou	ite Name:	NORTH-S	NORTH-SOUTH HIGHWAY							
Inspect	tion Date:	02/04/201	0	Barrie	r Rating:	32.50				
Repair Recomme	endations	5								
Repair Action:	REPAIR		FMSSDEFERREDRepair\$9763Work Type:MAINTENANCECost:							
Brief Workorder:	Raise 400 L.	F. of guardrail	to the 27-in. design height a	and replace 5 cracked blocks	and 3 cracked	d posts.				
Workorder:Adjust Guardrail at \$10- per -Lin. Ft. for 400 LF = \$4000. Raise 400-ft. of barrier up to 27-in design height. Replace Block at \$30- per -Each for 5 Block(s) = \$150. Replace 5 cracked blocks. Replace Post at \$100- per -Each for 3 Post(s) = \$300. Replace 3 cracked posts. Low Speed Traffic Control at \$1475- per -Day for 3 Day(s) = \$4425.										
	2008 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.									

**Barrier Condition Photos** 



PEFO\_0010\_10.427\_L\_1.jpg

R	arrier ID:	PEFO-001	0-10.552-R						
	ite Name:		OUTH HIGHWAY						
	· .	00/04/201	0			40.00			
		02/04/201	0		Barrier Rating:	40.00			
Barrier Descripti	on								
	Type:	W-BEAM S	STRONG POST		Barrier Function:	TRAFFIC			
Barrier	Material:	WEATHEF STEEL/CO			Post Material:	WOOD			
	Blockout Type:	WOOD			Length (ft.):	838			
Speed Lim	it (MPH):	45			Placement with Respect to Road:	OUTSIDE	OF CURVE		
Hazard Behind	l Barrier:	EXTREME	,						
<b>Barrier Crashwo</b>	rthiness								
Appropriate Test Level:	TL-2		Barrier Test Level:	TL-3		Is Barrier worthy?:	YES		
Beg. End Trtmt Type:	NONE		Is Beg. End Trtmt Crashhworthy?:	N/A		Approach ion Type:	CONC/MASON W-BEAM		
Ending End Trtmt Type:	W-BEAM	ВСТ	Ending End Trtmt Crashhworthy?:	NO					
Average Measure	ements								
Design Height (In.):	27		Width (In.):	0.0	Post Spa	cing (In.):	75.1		
Height (In.):	27.0		Lateral Offset (In.):	52.5		rade (%):	3.40		
<b>Physical Condition</b>	on								
	Align	ment and Height:	Alignment is acceptable. I	Height is within 1-	in of 27-in design height	t.			
Barrier		aking and Cracking:	There are 8 blocks and 10	posts that are extr	emely cracked and 37.5 f	ft of bent rail.			
	Missing 1	Elements:	There were no missing eler	ments observed.					
		osion and eathering:	There was no corrosion or	weathering observ	ved.				
	Align	ment and Height:	Alignment is acceptable. I	Height is within 1-	in of 27-in design height	i.			
End Treatments		aking and Cracking:							
	Missing	Elements:	nents: There were no missing elements observed.						
		osion and eathering:	There was no corrosion or	weathering obser-	ved.				
1									

B	arrier ID:	PEFO-001	0-10.552-R							
Rou	ite Name:	NORTH-S	NORTH-SOUTH HIGHWAY							
Inspec	tion Date:	02/04/201	0	Barrie	er Rating:	40.00				
Repair Recomme	endations	5								
Repair Action:	REPAIR			DEFERRED MAINTENANCE		Repair Cost:	\$4131			
Brief Workorder:	Replace 38 f	eet of rail 11 b	locks and 10 posts.							
Workorder:	Workorder:Replace Block at \$30- per -Each for 11 Block(s) = \$330. Replace the 11 cracked blocks. Replace Post at \$100- per -Each for 10 Post(s) = \$1000. Replace the 10 cracked posts. Replace Rail at \$25- per -Lin. Ft. for 38 LF = \$950. Replace the 37.5 ft of bent rail. Low Speed Traffic Control at \$1475- per -Day for 1 Day(s) = \$1475.									
	2008 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.									

**Barrier Condition Photos** 



PEFO\_0010\_10.552\_R\_1.jpg

B	arrier ID:	PEFO-001	0-10.553-L				
	ite Name:		SOUTH HIGHWAY				
				-			
		02/04/201	0	Barr	ier Rating:	23.60	
Barrier Descripti	ion						
	Туре:	W-BEAM S	STRONG POST	Barrier	r Function:	TRAFFIC	
Barrier	Material:	WEATHER STEEL/CO				WOOD	
	Blockout Type:	WOOD		L	ength (ft.):	865	
Speed Lim	it (MPH):	45			ement with ct to Road:	TANGENT	- -
Hazard Behind	l Barrier:	MEDIUM					
<b>Barrier Crashwo</b>	rthiness						
Appropriate Test Level:	TL-2		Barrier Test Level:	TL-3		Is Barrier worthy?:	YES
Beg. End Trtmt Type:	NONE		Is Beg. End Trtmt Crashhworthy?:	N/A		Approach ion Type:	CONC/MASON W-BEAM
Ending End Trtmt Type:	W-BEAM	ВСТ	Ending End Trtmt Crashhworthy?:	NO			
Average Measure	ements						
Design Height (In.):	27		Width (In.):	0.0	Post Spa	cing (In.):	74.9
Height (In.):	26.1		Lateral Offset (In.):	59.0		rade (%):	3.40
<b>Physical Condition</b>	on						
	Align	ment and Height:	Alignment acceptable. 100	)-ft was between 1 and 3-ir	1 below the 27-i	n design heigl	nt.
Barrier		aking and Cracking:	Two blocks are cracked an	d damaged.			
	Missing	Elements:	One block is missing.				
		osion and eathering:	There was no corrosion or	weathering observed.			
	Align	ment and Height:	Alignment is acceptable. I	Height is within 1-in of 27-	in design height		
End Treatments		aking and Cracking:					
	Missing	Elements:	There were no missing eler	ments observed.			
		osion and eathering:	There was no corrosion or	weathering observed.			

Ba	Barrier ID: PEFO-0010-10.553-L									
Rou	ite Name:	NORTH-SOUTH HIGHWAY								
Inspect	tion Date:	02/04/201	0	Barrie	r Rating:	23.60				
Repair Recomme	Repair Recommendations									
Repair Action:	Action:     Work Type:     MAINTENANCE     Cost:									
Brief       Raise 100-ft. of barrier up to 27-in design height and replace 3 blocks.         Workorder:       Image: Comparison of the second se										
Workorder:	Workorder: Adjust Guardrail at \$10- per -Lin. Ft. for 100 LF = \$1000. Raise 100-ft. of barrier up to 27-in design height. Replace Block at \$30- per -Each for 3 Block(s) = \$90. Replace the three damaged blocks. Low Speed Traffic Control at \$1475- per -Day for 1 Day(s) = \$1475.									
	2008 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.									

# **Petrified Forest National Park**

ROUTE 0010: NORTH-SOUTH HIGHWAY



PEFO\_0010\_10.553\_L\_1.jpg

B	arrier ID:	PEFO-001	0-10.893-R							
	ite Name:		RTH-SOUTH HIGHWAY							
		02/04/201	0		<b>D</b> (*	12.60				
	tion Date:	02/04/201	0	Barrie	r Rating:	13.60				
Barrier Descripti	ion									
	Туре:	W-BEAM S	STRONG POST	Barrier	Function:	TRAFFIC				
Barrier	Material:	WEATHEF STEEL/CO		Post	Material:	WOOD				
	Blockout Type:	WOOD		Le	ength (ft.):	103				
Speed Lim	it (MPH):	35	35 Placement with Respect to Road:							
Hazard Behind	d Barrier:	MEDIUM								
Barrier Crashwo	rthiness									
Appropriate Test Level:	TL-2		Barrier Test Level:	TL-3		Is Barrier worthy?:	YES			
Beg. End Trtmt Type:	W-BEAM I	ВСТ	Is Beg. End Trtmt Crashhworthy?:	NO		Approach ion Type:	CONC/MASON W-BEAM			
Ending End Trtmt Type:	NONE		Ending End Trtmt Crashhworthy?:	N/A						
Average Measure	ements									
Design Height (In.):	27	Width (In.):         0.0         Post Spacing (In.):         74.5								
Height (In.):	26.7		Lateral Offset (In.):	56.0		rade (%):	0.40			
<b>Physical Condition</b>	on									
	Align	ment and Height:	Alignment is acceptable. I	Height is within 1-in of 27-ir	n design height	i.				
Barrier		aking and Cracking:	There is only minor cracking	ng in the posts and blocks bu	ut they are still	in good cond	ition.			
	Missing	Elements:	There were no missing eler	ments observed.						
		osion and eathering:								
	Align	ment and Height:								
End Treatments	Breaking and Cracking:       There is minor cracking in the posts/blocks but they are still in good condition.									
	Missing	Elements:	There were no missing eler	ments observed.						
		osion and eathering:	There was no corrosion or	weathering observed.						
	I		1							

Ba	Barrier ID: PEFO-0010-10.893-R									
Rou	Ite Name: NORTH-SOUTH HIGHWAY									
Inspect	Inspection Date:02/04/2010Barrier Rating:13.60									
Repair Recommendations										
Repair Action:										
Brief Workorder:	Brief N/A Workorder:									
Workorder:	Workorder:									
	2008 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.									

**Barrier Condition Photos** 



PEFO\_0010\_10.893\_R\_1.jpg

B	arrier ID:	PEFO-001	0-10.899-L							
	ite Name:		RTH-SOUTH HIGHWAY							
				1						
		02/04/201	0	Ba	arrier Rating:	22.20				
Barrier Descripti	ion									
	Туре:	W-BEAM S	STRONG POST	Barı	rier Function:	TRAFFIC				
Barrier	Material:	WEATHER STEEL/CO		Post Material:		WOOD				
	Blockout Type:	WOOD			Length (ft.):	78				
Speed Lim	it (MPH):	45			lacement with spect to Road:	TANGENT	-			
Hazard Behind	l Barrier:	MEDIUM								
<b>Barrier Crashwo</b>	rthiness									
Appropriate Test Level:	TL-2		Barrier Test Level:	TL-3		Is Barrier worthy?:	YES			
Beg. End Trtmt Type:	W-BEAM	BCT	Is Beg. End Trtmt Crashhworthy?:	NO		Approach ion Type:	CONC/MASON W-BEAM			
Ending End Trtmt Type:	NONE		Ending End Trtmt Crashhworthy?:	N/A						
Average Measure	ements									
Design Height (In.):	27	Width (In.):         0.0         Post Spacing (In.):         74.3								
Height (In.):	24.5		Lateral Offset (In.):	59.0		rade (%):	0.40			
<b>Physical Condition</b>	on									
	Align	ment and Height:	Alignment acceptable. 78-	ft was between 1 and 3	in below the 27-in	design height				
Barrier		aking and Cracking:								
	Missing	Elements:	There were no missing eler	There were no missing elements observed.						
		osion and eathering:								
	Align	ment and Height:								
End Treatments	Breaking and Cracking:     There was no breaking or cracking observed.									
	Missing	Elements:	There were no missing eler	ments observed.						
		osion and eathering:	There was no corrosion or	weathering observed.						
			1							

B	Barrier ID: PEFO-0010-10.899-L									
Rou	ite Name:	Name: NORTH-SOUTH HIGHWAY								
Inspec	tion Date:	02/04/201	0	Barrie	r Rating:	22.20				
Repair Recomme	Repair Recommendations									
Repair Action:	Action:         Work Type:         MAINTENANCE         Cost:									
Brief       Raise 78 L.F. of guardrail up to 27" design height.         Workorder:       Image: Comparison of the second se										
Workorder:	Workorder: Adjust Guardrail at \$10- per -Lin. Ft. for 78 LF = \$780. Raise 78-ft. of barrier up to 27-in design height. Low Speed Traffic Control at \$1475- per -Day for 1 Day(s) = \$1475.									
	2008 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.									

# **Petrified Forest National Park**

ROUTE 0010: NORTH-SOUTH HIGHWAY



PEFO\_0010\_10.899\_L\_1.jpg

B	arrier ID:	PEFO-001	0-11.015-R							
	ite Name:		RTH-SOUTH HIGHWAY							
Turan	tion Datas	02/04/201	4/2010 Barrier Rating: 16.50							
		02/04/201	U	Barı	ier kating:	10.30				
Barrier Descripti										
	Туре:	W-BEAM S	STRONG POST	Barrie	r Function:	TRAFFIC				
Barrier	Material:	WEATHER	RING	Pos	t Material:	WOOD				
Durrier	iviateriai.	STEEL/CO		10.						
	Blockout	WOOD		I	ength (ft.):	79				
	Type:	25				DIGIDE OI				
Speed Lim	it (MPH):	35			ement with ct to Road:	INSIDE OI	CURVE			
Hazard Behind	d Barrier:	MEDIUM								
Barrier Crashwo	rthiness	1								
Appropriate Test			Barrier	TL-3		ls Barrier	YES			
Level:			Test Level:			worthy?:	120			
Beg. End Trtmt	NONE			N/A		Approach				
Type:	WDEAN	DOT	Crashhworthy?:		Transit	ion Type:	W-BEAM			
Ending End Trtmt Type:	W-BEAM	BCT	Ending End Trtmt Crashhworthy?:	NO						
Average Measure	ements			l			l			
Design Height (In.):	27		Width (In.):	0.0	Post Sna	cing (In )•	73.6			
Height (In.):	26.5	Width (In.):         0.0         Post Spacing (In.):         73.6           Lateral Offset (In.):         51.7         Road Grade (%):         0.30								
Physical Condition	on									
	Align	ment and Height:	Alignment is acceptable. I	Height is within 1-in of 27-	in design height	-				
		aking and	There was no breaking or c	cracking observed.						
Barrier		Cracking:								
	Missing	Elements:	There were no missing eler	ments observed.						
	Corrr	osion and	There was no corrosion or	weathering observed.						
		eathering:								
	Alion	ment and	Alignment is acceptable. I	Height is within 1-in of 27-	in design height	-				
		Height:								
End Treatments	Breaking and nd Treatments     There was no breaking or cracking observed.									
	Missing	Elements:	There were no missing eler	ments observed.						
		osion and	There was no corrosion or	weathering observed.						
	We	eathering:								

Ba	Barrier ID: PEFO-0010-11.015-R									
Rou	te Name:	P: NORTH-SOUTH HIGHWAY								
Inspect	ion Date:	<b>n Date:</b> 02/04/2010 <b>Barrier Rating:</b> 16.50								
Repair Recommendations										
Repair Action:										
Brief Workorder:	Brief N/A Workorder:									
Workorder:	Workorder:									
	2008 cos	st estimate (A	ASTM Class D), prelimin	ary for compar	ison to other repair co	osts only.				

**Barrier Condition Photos** 



PEFO\_0010\_11.015\_R\_1.jpg

B	arrier ID:	PEFO-001	0-11.016-L							
	ite Name:		SOUTH HIGHWAY							
	·	02/04/201								
		02/04/201	0		Barrier Rating:	24.00				
Barrier Descripti	on	l								
	Туре:	W-BEAM S	STRONG POST	]	Barrier Function:	TRAFFIC				
Barrier	Material:	WEATHER STEEL/CO			Post Material:	WOOD				
	Blockout Type:	WOOD			Length (ft.):	102				
Speed Lim	it (MPH):	45			Placement with Respect to Road:	OUTSIDE	OF CURVE			
Hazard Behind	l Barrier:	LOW								
<b>Barrier Crashwo</b>	rthiness									
Appropriate Test Level:	TL-2		Barrier Test Level:	TL-3		Is Barrier worthy?:	YES			
Beg. End Trtmt Type:	NONE		Is Beg. End Trtmt Crashhworthy?:	N/A		Approach ion Type:	CONC/MASON W-BEAM			
Ending End Trtmt Type:	W-BEAM	ВСТ	-	Ending End Trtmt     NO       Crashhworthy?:     Image: Crash and Cra						
Average Measure	ements									
Design Height (In.):	27		Width (In.):	0.0	Post Spa	cing (In.):	75.6			
Height (In.):	27.0		Width (In.):         0.0         Post Spacing (In.):         75.6           Lateral Offset (In.):         70.6         Road Grade (%):         1.50							
<b>Physical Condition</b>	on									
		ment and Height:								
Barrier		aking and Cracking:	1 post was broken. Only n	ost was broken. Only minor cracking present in the posts and blocks. ere were no missing elements observed.						
	Missing 1	Elements:	There were no missing eler							
		rosion and eathering:	There was no corrosion or weathering observed.							
	Align	ment and Height:	Alignment is acceptable. Height is within 1-in of 27-in design height.							
End Treatments	ad Treatments Breaking and Cracking: Only minor cracking in posts and blocks but they are still in good condition.									
	Missing	Elements:	There were no missing eler	nents observed.						
		osion and eathering:	There was no corrosion or	weathering observ	red.					

B	Barrier ID: PEFO-0010-11.016-L										
Rou	ite Name:	Name: NORTH-SOUTH HIGHWAY									
Inspect	tion Date:	02/04/201	0	Barrie	er Rating:	24.00					
Repair Recomme	Repair Recommendations										
Repair Action:											
Brief     Replace the 1 broken post.											
Workorder:	Workorder: Replace Post at \$100- per -Each for 1 Post(s) = \$100. Replace 1 broken post. Low Speed Traffic Control at \$1475- per -Day for 1 Day(s) = \$1475.										
	2008 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.										

### **Petrified Forest National Park**

ROUTE 0010: NORTH-SOUTH HIGHWAY



PEFO\_0010\_11.016\_L\_1.jpg

Route Name:         NORTH-SOUTH HIGHWAY           Inspection Date:         03/04/2010         Barrier Rating:         12.80           Barrier Description         Type:         OTHER: CONCRETE BLOCK         Barrier Function:         NON-TRAFFIC           Barrier Material:         CONCRETE         Post Material:         N/A         Image: Second	В	arrier ID:	PEFO-001	0-14.085-R					
Barrier Description         Type:       OTHER: CONCRETE BLOCK       Barrier Function:       NON-TRAFFIC         Barrier Material:       CONCRETE       Post Material:       N/A         Blockout       N/A       Length (ft.):       220         Speed Limit (MPH):       45       Placement with NON-TRAFFIC BARRIER Respect to Road:         Hazard Behind Barrier:       N/A         Barrier Crashworthiness         Appropriate Test Level:       TI-2       Barrier Test Level:       N/A       Is Barrier Crashworthy?:       N/A         Beg. End Trtmt       N/A       Is Barrier Transition Type:         Transition Type:         Crashworthy?:       Transition Type:         Average Measurements         Design Height (In.):       24       Width (In.):       8.0       Post Spacing (In.):       0.0       Road Grade (%):       0.00       Physical Condition         Barrier       Alignment and Light:	Rou	ite Name:	NORTH-S	SOUTH HIGHWAY					
Type:     OTHER: CONCRETE BLOCK     Barrier Function:     NON-TRAFFIC       Barrier Material:     CONCRETE     Post Material:     N/A       Blockout     N/A     Length (ft.):     220       Speed Limit (MPH):     45     Placement with Respect to Road:     NON-TRAFFIC BARRIER       Barrier Crashworthiness     MA     Image: Concent of the second	Inspec	tion Date:	03/04/201	0	Barrie	er Rating:	12.80		
Barrier Material:       CONCRETE       Post Material:       N/A         Biockout Type:       N/A       Length (ft,):       220         Speed Limit (MPH):       45       Placement with Respect to Road:       NON-TRAFFIC BARRIER         Barrier Crashworthiness       N/A       Is Barrier       N/A         Barrier Crashworthiness       TI-2       Barrier Test Level:       N/A       Is Barrier Crashworthy?:       N/A         Beg. End Trtmt Type:       NONE       Is Beg. End Trtmt Crashworthy?:       N/A       Approach Approach       NONE         Ending End Trtmt Type:       NONE       Ending End Trtmt Crashworthy?:       N/A       0.0       0.0         Average Measurements       Design Height (In.):       24       Width (In.):       8.0       Post Spacing (In.):       0.0         Physical Condition       Alignment is acceptable. Height is within 3-in of 24-in design height.       0.0       00         Physical Condition       There was no breaking or eracking observed.       Transing elements:       There was no corrosion or weathering observed.         Corrrosion and Weathering:       There was no corrosion or weathering observed.       Inter was no corrosion or weathering observed.	Barrier Descripti	ion							
Biockout Type:     N/A     Length (ft.):     220       Speed Limit (MPH):     45     Placement with Respect to Road:     NON-TRAFFIC BARRIER       Hazard Behind Barrier:     N/A     Respect to Road:     NON-TRAFFIC BARRIER       Barrier Crashworthiness     Appropriate Test Level:     N/A     Is Barrier     N/A       Beg. End Tritmt Type:     NONE     Is Beg. End Tritmt Crashworthy?:     N/A     Approach Transition Type:     N/A       Ending End Tritmt Type:     NONE     Ending End Tritmt Crashworthy?:     N/A     Approach Transition Type:     NONE       Average Measurements     Eosign Height (In.):     24     Width (In.):     8.0     Post Spacing (In.):     0.0       Height (In.):     21.7     Lateral Offset (In.):     0.0     Road Grade (%):     0.00       Physical Condition     Alignment and Height:     Alignment is acceptable. Height is within 3-in of 24-in design height.     Image: Control of the was no breaking or eracking observed.       Missing Elements:     There was no breaking or eracking observed.     Image: Control of the was no corrosion or weathering observed.       Missing Elements:     There was no corrosion or weathering observed.     Image: Control of the was no corrosion or weathering observed.		Туре:	OTHER: C	ONCRETE BLOCK	Barrier	Function:	NON-TRAFFIC		
Type:     Description       Speed Limit (MPH):       45     Placement with Respect to Road:       Hazard Behind Barrier:     N/A       Barrier Crashworthiness     MA       Appropriate Test     TL-2     Barrier       Level:     Transition     Is Barrier       V/A     Beg. End Trimt     NONE     Is Beg. End Trimt       Type:     Transition Type:     N/A     Approach       NONE     Is Beg. End Trimt     N/A     Approach       Type:     Crashhworthy?:     Transition Type:       Ending End Trimt     NONE     Ending End Trimt     N/A       Average Measurements     Ending End Trimt     N/A     Crashhworthy?:       Out     Road Grade (%):     0.0     0.0       Physical Condition     Alignment and     Alignment is acceptable. Height is within 3-in of 24-in design height.       Barrier     Alignment and     Alignment is acceptable. Height is within 3-in of 24-in design height.       Missing Elements:     There was no breaking or cracking observed.       Corrrosion and Weathering:     There was no corrosion or weathering observed.	Barrier	Material:	CONCRET	Έ	Post Material:		N/A		
Respect to Road:         Respect to Road:         Hazard Behind Barrier:       N/A         Barrier Crashworthiness         Appropriate Test Level:       TL-2       Barrier Test Level:       N/A       Is Barrier Crashworthy?:       N/A         Beg. End Trimt Type:       NONE       Is Beg. End Trimt Crashhworthy?:       N/A       Approach Transition Type:       NONE         Ending End Trimt Type:       NONE       Ending End Trimt Crashhworthy?:       N/A       Approach Transition Type:       NONE         Average Measurements       Ending End Trimt Crashhworthy?:       N/A       O       Post Spacing (In.):       0.0         Height (In.):       24       Width (In.):       8.0       Post Spacing (In.):       0.0         Physical Condition       Alignment and Reight:       Alignment is acceptable. Height is within 3-in of 24-in design height.       Image: Spacing Condition         Breaking and Cracking:       There was no breaking or cracking observed.       Image: Spacing Condition       Image: Spacing Condition         Missing Elements:       There was no corrosion or weathering observed.       Image: Spacing Conrosion and Weathering:       There was no corrosion or weathering observed.         Missing Elements:       There was no corrosion or weathering observed.       Alignment and			N/A		Le	ength (ft.):	220		
Barrier Crashworthiness         Appropriate Test Level:       TL-2       Barrier Test Level:       N/A       Is Barrier Crashworthy?:       N/A         Beg, End Trtmt Type:       NONE       Is Beg, End Trtmt Crashhworthy?:       N/A       Approach Transition Type:       NONE         Ending End Trtmt Type:       NONE       Ending End Trtmt Crashhworthy?:       N/A       Approach Transition Type:       NONE         Average Measurements       Ending End Trtmt Crashhworthy?:       N/A       0.0       0.0         Pesign Height (In.):       24       Width (In.):       8.0       Post Spacing (In.):       0.0         Height(In.):       21.7       Lateral Offset (In.):       0.0       Road Grade (%):       0.00         Physical Condition       Itere was no breaking or cracking observed.       Itere was no breaking or cracking observed.       Itere was no breaking or cracking observed.         Missing Elements:       There was no corrosion or weathering observed.       Itere was no corrosion or weathering observed.         Corrrosion and Weathering:       There was no corrosion or weathering observed.       Itere was no corrosion or weathering observed.	Speed Lim	it (MPH):	45						
Appropriate Test Level:       TL-2       Barrier Test Level:       N/A       Is Barrier Crashworthy?:       N/A         Beg. End Trtmt Type:       NONE       Is Beg. End Trtmt Crashworthy?:       N/A       Approach Approach       NONE         Ending End Trtmt Type:       NONE       Ending End Trtmt Crashworthy?:       N/A       Approach Transition Type:       NONE         Average Measurements       Crashworthy?:       N/A       0.0       0.0       0.0         Height (In.):       24       Width (In.):       8.0       Post Spacing (In.):       0.0         Height (In.):       21.7       Lateral Offset (In.):       0.0       Road Grade (%):       0.00         Physical Condition       Alignment and Height:       Alignment is acceptable. Height is within 3-in of 24-in design height.       Image: Second Condition         Barrier       Missing Elements:       There was no breaking or cracking observed.       Image: Second Condition       Image: Second Condition         Missing Elements:       There was no corrosion or weathering observed.       Image: Second Condition       Image: Second Condition       Image: Second Condition         Alignment and       Alignment and       Image: Second Condition       Image: Second Condition       Image: Second Condition         Alignment and       Missing Elements:       There was n	Hazard Behine	d Barrier:	N/A						
Level:       Crashworth?:         Beg. End Trimt Type:       NONE       Is Beg. End Trimt Crashhworth?:       N/A       Approach Transition Type:       NONE         Ending End Trimt Type:       NONE       Ending End Trimt Crashhworth?:       N/A       Approach Transition Type:       NONE         Average Measurements       Ending End Trimt Crashhworth?:       N/A       0.0       Road Grade (%):       0.0         Height (In.):       24       Width (In.):       8.0       Post Spacing (In.):       0.0         Height (In.):       21.7       Lateral Offset (In.):       0.0       Road Grade (%):       0.00         Physical Condition       Image: State and Cracking:       Alignment is acceptable. Height is within 3-in of 24-in design height.       Image: State and Cracking:       There was no breaking or cracking observed.       Image: State and Cracking:       Image: State and Cracking:       Image: State and Cracking:       There was no corrosion or weathering observed.       Image: State and Cracking:       Image: State	Barrier Crashwo	rthiness							
Type:       Crashhworthy?:       Transition Type:         Ending End Trtmt Type:       NONE       Ending End Trtmt Crashhworthy?:       N/A         Average Measurements       Ending End Trtmt Crashhworthy?:       N/A       Image: Crashhworthy?:       N/A         Design Height (In.):       24       Width (In.):       8.0       Post Spacing (In.):       0.0         Height (In.):       21.7       Lateral Offset (In.):       0.0       Road Grade (%):       0.00         Physical Condition       Alignment and Height:       Alignment is acceptable. Height is within 3-in of 24-in design height.       Image: Cracking:       There was no breaking or cracking observed.         Barrier       Missing Elements:       There was no breaking or cracking observed.       There was no breaking or cracking observed.         Missing Elements:       There was no corrosion or weathering observed.       There was no corrosion or weathering observed.         Missing Elements:       There was no corrosion or weathering observed.       There was no corrosion or weathering observed.		TL-2			N/A			N/A	
Type:       Crashhworth?:       Image: Crashhworth?:<		NONE			N/A			NONE	
Design Height (In.):       24       Width (In.):       8.0       Post Spacing (In.):       0.0         Height (In.):       21.7       Lateral Offset (In.):       0.0       Road Grade (%):       0.00         Physical Condition       Alignment and Height:       Alignment is acceptable. Height is within 3-in of 24-in design height.       Image: Condition       There was no breaking or cracking observed.       There was no breaking or cracking observed.       Image: Condition         Barrier       Missing Elements:       There was no corrosion or weathering observed.       There was no corrosion or weathering observed.       Image: Corrosion and Weathering:       There was no corrosion or weathering observed.         Alignment and       Alignment and       There was no corrosion or weathering observed.       Image: Corrosion and Weathering:       There was no corrosion or weathering observed.		NONE			N/A				
Height (In.):       21.7       Lateral Offset (In.):       0.0       Road Grade (%):       0.00         Physical Condition       Alignment and Height:       Alignment is acceptable. Height is within 3-in of 24-in design height.       0.00         Barrier       Breaking and Cracking:       There was no breaking or cracking observed.       0.00         Missing Elements:       There was no breaking elements observed.       There was no corrosion or weathering observed.         Corrrosion and Weathering:       There was no corrosion or weathering observed.       Alignment and	Average Measur	ements							
Physical Condition       Alignment and Height:       Alignment is acceptable. Height is within 3-in of 24-in design height.         Barrier       Breaking and Cracking:       There was no breaking or cracking observed.         Missing Elements:       There were no missing elements observed.         Corrrosion and Weathering:       There was no corrosion or weathering observed.         Alignment and       There was no corrosion or weathering observed.	Design Height (In.):	24		Width (In.):	8.0	Post Spa	cing (In.):	0.0	
Alignment and Height:       Alignment is acceptable. Height is within 3-in of 24-in design height.         Breaking and Cracking:       There was no breaking or cracking observed.         Missing Elements:       There were no missing elements observed.         Corrrosion and Weathering:       There was no corrosion or weathering observed.	Height (In.):	21.7		Lateral Offset (In.):	0.0	Road G	rade (%):	0.00	
Barrier       Breaking and Cracking:       There was no breaking or cracking observed.         Missing Elements:       There were no missing elements observed.         Corrrosion and Weathering:       There was no corrosion or weathering observed.         Alignment and       Element and	<b>Physical Condition</b>	on							
Barrier       Cracking:         Missing Elements:       There were no missing elements observed.         Corrrosion and Weathering:       There was no corrosion or weathering observed.         Alignment and       Image: Corrosion of the sector of th		Align		Alignment is acceptable. H	leight is within 3-in of 24-in	design height.			
Corrrosion and Weathering:     There was no corrosion or weathering observed.       Alignment and	Barrier			There was no breaking or c	cracking observed.				
Weathering:       Alignment and		Missing 3	Elements:	There were no missing eler	ments observed.				
				There was no corrosion or	weathering observed.				
		Align							
End Treatments     Breaking and Cracking:	End Treatments								
Missing Elements:		Missing 1	Elements:						
Corrrosion and Weathering:									

Ba	Barrier ID: PEFO-0010-14.085-R									
Rou	ite Name:	ame: NORTH-SOUTH HIGHWAY								
Inspect	Inspection Date: 03/04/2010 Barrier Rating: 12.80									
<b>Repair Recomme</b>	Repair Recommendations									
Repair Action:										
Brief Workorder:	Brief W/A Workorder:									
Workorder:	Workorder:									
	2008 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.									



PEFO\_0010\_14.085\_R\_1.jpg

Ba	rrier ID:	PEFO-001	0-14.152-R					
	te Name:	NORTH-S	SOUTH HIGHWAY					
Inspect	ion Data.	03/04/201	0	Rarri	er Rating:	12.80		
Barrier Description		03/04/2010	0	Darri	er Rating.	12.00		
	Туре:	OTHER: C	ONCRETE BLOCK	Barrier	Function:	NON-TRAFFIC		
Barrier I	Material:	CONCRET	Е	Post Material:		N/A		
	Blockout Type:	N/A		Length (ft.):		26		
Speed Limi		45			ment with t to Road:			
Hazard Behind	Barrier:	N/A				1		
Barrier Crashwo	rthiness							
Appropriate Test Level:	TL-2		Barrier Test Level:	N/A		Is Barrier worthy?:	N/A	
Beg. End Trtmt Type:	NONE		Is Beg. End Trtmt Crashhworthy?:	N/A		Approach tion Type:	NONE	
Ending End Trtmt Type:	NONE		Ending End Trtmt Crashhworthy?:	N/A				
Average Measure	ements							
Design Height (In.):	20		Width (In.):	8.0	Post Spa	cing (In.):	0.0	
Height (In.):	18.5		Lateral Offset (In.):	0.0		rade (%):	0.00	
<b>Physical Conditio</b>	n							
	Align	ment and Height:	Alignment is acceptable. H	eight is within 3-in of 20-in	i design height.			
Barrier		aking and Cracking:	There was no breaking or c	cracking observed.				
-	Missing	Elements:	There are no missing barrie	er elements observed.				
		osion and eathering:	The painted finish is peelir condition.	g due to wind and sand but	the integrity of	f the wall is in	very good	
	Align	ment and Height:						
End Treatments		aking and Cracking:						
	Missing	Elements:						
		osion and eathering:						

Ba	Barrier ID: PEFO-0010-14.152-R								
Rou	ite Name:	e Name: NORTH-SOUTH HIGHWAY							
Inspection Date: 03/04/2010 Barrier Ra						12.80			
Repair Recommendations									
Repair Action:	NO ACTIC	DN	FMSS Work Type:	N/A		Repair Cost:	\$0		
Brief Workorder:	N/A								
Workorder:									
	2008 co	st estimate (A	ASTM Class D), prelimin	ary for comparis	son to other repair co	sts only.			



PEFO\_0010\_14.152\_R\_1.jpg

Ba	arrier ID:	<b>PEFO-001</b>	0-14.204-L					
	ite Name:	NORTH-S	SOUTH HIGHWAY					
Inspect	ion Date.	03/04/201	0	R	Barrier Rating:	21.10		
Barrier Descripti		55, 0 <del>1</del> , 201	• 		- in iter itering.			
	Туре:	OTHER: CONCRETE BLOCK		Barrier Function:		NON-TRAFFIC		
Barrier	Material:	CONCRET	Έ		Post Material:	N/A		
	Blockout Type:	N/A			Length (ft.):	75		
Speed Limi	t (MPH):	45			Placement with espect to Road:			
Hazard Behind	Barrier:	N/A						
Barrier Crashwo	rthiness							
Appropriate Test Level:	TL-2		Barrier Test Level:	N/A		Is Barrier worthy?:	N/A	
Beg. End Trtmt Type:			Is Beg. End Trtmt Crashhworthy?:	N/A		Approach ion Type:	NONE	
Ending End Trtmt Type:	NONE		Ending End Trtmt Crashhworthy?:	N/A				
Average Measure	ements							
Design Height (In.):	24		Width (In.):	8.0		cing (In.):	0.0	
Height (In.):	21.7		Lateral Offset (In.):	0.0	Road G	rade (%):	0.00	
Physical Condition								
	Align	ment and Height:	Alignment is acceptable. H	leight is within 3-in of	f 24-in design height.			
Barrier		aking and Cracking:	There was only minor crac	king and peeling of th	e painted finish.			
	Missing ]	Elements:	There were no missing eler	ments observed.				
		osion and eathering:	There was no corrosion or	weathering observed.				
	Align	ment and Height:						
End Treatments		aking and Cracking:						
	Missing	Elements:						
		osion and eathering:						

Ba	arrier ID:	ID: PEFO-0010-14.204-L							
Rou	te Name:	me: NORTH-SOUTH HIGHWAY							
Inspect	ion Date:	03/04/201	/04/2010 Barrier Rating: 21.10						
<b>Repair Recomme</b>	ndations	5							
Repair Action:	NO ACTIC	DN	FMSS Work Type:	N/A		Repair Cost:	\$0		
Brief Workorder:	N/A								
Workorder:									
	2008 co	st estimate (A	ASTM Class D), prelimin	ary for compariso	on to other repair co	osts only.			



PEFO\_0010\_14.204\_L\_1.jpg

Ba	arrier ID:	PEFO-001	0-15.778-L				
	ite Name:		OUTH HIGHWAY				
Incorect	ion Datas	03/04/201	0	Darrei	ier Rating:	12.80	
		03/04/2010	0	Darr	ter Katilig:	12.80	
Barrier Descripti		0.774757 0					
	Туре:	OTHER: C	ONCRETE BLOCK	Barrier	Function:	NON-TRA	FFIC
Barrier	Material:	CONCRET	Е	Pos	t Material:	N/A	
	Blockout Type:	N/A		L	ength (ft.):	163	
Speed Limi	it (MPH):	45			ement with ct to Road:	NON-TRA	FFIC BARRIER
Hazard Behind	Barrier:	N/A				•	
<b>Barrier Crashwo</b>	rthiness						
Appropriate Test Level:	TL-2		Barrier Test Level:	N/A		Is Barrier worthy?:	N/A
Beg. End Trtmt Type:	NONE		Is Beg. End Trtmt Crashhworthy?:	N/A		Approach tion Type:	NONE
Ending End Trtmt Type:	NONE		Ending End Trtmt Crashhworthy?:	N/A			
Average Measure	ements						
Design Height (In.):	24		Width (In.):	8.0	Post Spa	cing (In.):	0.0
Height (In.):	26.7		Lateral Offset (In.):	0.0		rade (%):	0.00
<b>Physical Condition</b>	on						
	Align	ment and Height:	Alignment is acceptable. I	Height ranges from 0-8 in a	bove 24-in desi	gn height.	
Barrier		aking and Cracking:	There was no breaking or o	cracking observed.			
	Missing	Elements:	There were no missing elem	nents observed.			
		osion and eathering:	There was no corrosion or	weathering observed.			
	Align	ment and Height:					
End Treatments		aking and Cracking:					
	Missing	Elements:					
		osion and eathering:					

Ba	Barrier ID: PEFO-0010-15.778-L								
Rou	te Name:	me: NORTH-SOUTH HIGHWAY							
Inspect	ion Date:	03/04/201	0	Barrier Rating: 12.80					
Repair Recommendations									
Repair Action:	NO ACTIO	DN	FMSS Work Type:	N/A		Repair Cost:	\$0		
Brief Workorder:	N/A								
Workorder:									
L	2008 cos	st estimate (A	ASTM Class D), prelimin	ary for comparis	son to other repair co	sts only.			

# **Petrified Forest National Park**

ROUTE 0010: NORTH-SOUTH HIGHWAY



PEFO\_0010\_15.778\_L\_1.jpg

R	arrier ID:	PEFO-001	0-15.950-R							
	ite Name:		SOUTH HIGHWAY							
	(*	02/04/201	0		Dente Detter	22.70				
		03/04/201	0		<b>Barrier Rating:</b>	22.70				
Barrier Descripti										
	Туре:	W-BEAM S	STRONG POST	Ba	rrier Function:	TRAFFIC				
Barrier	Material:	WEATHEF	ERING Post Material: V		WOOD					
		STEEL/CO								
	Blockout	WOOD			Length (ft.):	77				
Speed Lim	Type:	45			Placement with	TANGENT	-			
Speed Lim	и ( <b>МРП</b> ):	43			espect to Road:	TANGENI				
Hazard Behind	d Barrier:	LOW								
Barrier Crashwo	rthiness									
Appropriate Test	TL-2		Barrier	TL-3	]	ls Barrier	YES			
Level:			Test Level:			worthy?:				
Beg. End Trtmt Type:	W-BEAM	ВСТ	Is Beg. End Trtmt Crashhworthy?:	NO		Approach ion Type:	RIGID W-BEAM - W-BEAM			
Ending End Trtmt	NONE		Ending End Trtmt	N/A						
Туре:			Crashhworthy?:							
Average Measur	ements									
Design Height (In.):	27		Width (In.):	0.0		cing (In.):	74.6			
Height (In.):	24.7		Lateral Offset (In.):	29.0	Road G	rade (%):	0.10			
Physical Condition										
	Align	ment and Height:	Alignment acceptable. 77-	ft was between 1 and	1 3-in below the 27-in	design height				
		aking and	There is one post that is cra	acked down the center	er.					
Barrier		Cracking:								
	Missing	Elements:	There were no missing eler	nents observed.						
	Corrr	osion and	There was no corrosion or	weathering observed	•					
		eathering:								
	Align	ment and	Alignment acceptable. 30-	ft was between 1 and	d 3-in below the 27-in	design height				
	- Align	Height:				0 0				
	D		These see here been							
End Treatments		aking and Cracking:	There was no breaking or cracking observed.							
	Missing	<b>ng Elements:</b> There were no missing elements observed.								
		osion and	There was no corrosion or	weathering observed						
	We	eathering:								
L										

B	arrier ID:	PEFO-001	PEFO-0010-15.950-R							
Rou	ite Name:	NORTH-SOUTH HIGHWAY								
Inspection Date: 03/04/2010 Barrier Rating: 22.70										
Repair Recomme	endations	5								
Repair Action:	REPAIR	FMSSDEFERREDRepair\$25Work Type:MAINTENANCECost:								
Brief Workorder:	Raise 77 L.F	. of barrier up	to the 27 inch design height	and replace one post.						
Workorder:	Workorder:Adjust Guardrail at \$10- per -Lin. Ft. for 77 LF = \$770. Raise 77-ft. of barrier up to 27-in design height. Replace Post at \$100- per -Each for 1 Post(s) = \$100. Replace one cracked post. Low Speed Traffic Control at \$1475- per -Day for 1 Day(s) = \$1475.									
	2008 cos	st estimate (A	ASTM Class D), prelimin	ary for comparison to oth	ner repair co	sts only.				



PEFO\_0010\_15.950\_R\_1.jpg

B	arrier ID:	PEFO-001	0-15.955-L				
	ite Name:		SOUTH HIGHWAY				
	thom Dist	02/04/201	0		Doundon Di 4	22.70	
		03/04/201	0		Barrier Rating:	22.70	
Barrier Descripti	on						
	Туре:	W-BEAM S	STRONG POST	Ba	rrier Function:	TRAFFIC	
Barrier	Material:	WEATHER STEEL/CO			Post Material:	WOOD	
	Blockout Type:	WOOD			Length (ft.):	52	
Speed Lim	it (MPH):	45			Placement with Respect to Road:TANGENT		
Hazard Behind	l Barrier:	LOW					
<b>Barrier Crashwo</b>	rthiness						
Appropriate Test Level:	TL-2		Barrier Test Level:	TL-3		Is Barrier	YES
Beg. End Trtmt Type:	W-BEAM	ВСТ	Is Beg. End Trtmt Crashhworthy?:	NO		Approach ion Type:	RIGID W-BEAM - W-BEAM
Ending End Trtmt Type:	NONE		Ending End Trtmt Crashhworthy?:	N/A			
Average Measure	ements						
Design Height (In.):	27		Width (In.):	0.0	Post Spa	cing (In.):	76.1
Height (In.):	24.7		Lateral Offset (In.):	46.2		rade (%):	0.30
<b>Physical Condition</b>	on						
	Align	ment and Height:	Alignment acceptable. 52-	ft was between 1 and	d 3-in below the 27-in	design height	
Barrier		aking and Cracking:	There is only minor cracking	ng in posts and block	S.		
	Missing I	Elements:	There were no missing eler	ments observed.			
		osion and eathering:	There is some gravel and s	ediment build-up nex	t to the guardrail.		
	Align	ment and Height:	Alignment acceptable. 30-	ft was between 1 and	d 3-in below the 27-in	design height	
End Treatments		aking and Cracking:	There is only minor cracking	ng in posts and block	IS.		
	Missing Elements: There were no missing elements observed.						
		osion and eathering:	There is some gravel and s	ediment build-up nex	tt to the guardrail.		
L			1				

Ba	arrier ID:	ID: PEFO-0010-15.955-L								
Rou	ite Name:	NORTH-S	NORTH-SOUTH HIGHWAY							
Inspect	tion Date:	03/04/201	0	Barrie	er Rating:	22.70				
Repair Recomme	endations	5								
Repair Action:	REPAIR		FMSSDEFERREDRepair\$2Work Type:MAINTENANCECost:							
Brief Workorder:	Raise 52 L.F	. of guardrail t	o 27-in design height and re	move sediment build-up from	m the base of t	he barrier.				
Workorder:Adjust Guardrail at \$10- per -Lin. Ft. for 52 LF = \$520. Raise 52-ft. of barrier up to 27-in design height. Loader at \$125- per -Hour for 1 Hrs = \$125. Remove gravel buildup next to guardrail. Low Speed Traffic Control at \$1475- per -Day for 1 Day(s) = \$1475.										
	2008 co	st estimate (A	ASTM Class D), prelimin	ary for comparison to oth	ier repair co	sts only.				

#### **Barrier Condition Photos**



PEFO\_0010\_15.955\_L\_1.jpg

B	arrier ID:	PEFO-001	0-15.974-L				
	ite Name:		SOUTH HIGHWAY				
						0.5.60	
		03/04/201	0	Barr	ier Rating:	25.60	
Barrier Descripti	ion						
	Туре:	W-BEAM S	STRONG POST	<b>Barrier Function:</b>		TRAFFIC	
Barrier	Material:	WEATHER STEEL/CO		Po	st Material:	WOOD	
	Blockout Type:	WOOD		1	Length (ft.):	77	
Speed Lim	it (MPH):	45			Placement with TANGENT Respect to Road:		
Hazard Behind	l Barrier:	LOW		•			
<b>Barrier Crashwo</b>	rthiness						
Appropriate Test Level:	TL-2		Barrier Test Level:	TL-3		Is Barrier worthy?:	YES
Beg. End Trtmt Type:	NONE		Is Beg. End Trtmt Crashhworthy?:	N/A		Approach tion Type:	RIGID W-BEAM - W-BEAM
Ending End Trtmt Type:	W-BEAM	ВСТ	Ending End Trtmt Crashhworthy?:	NO			
Average Measure	ements						
Design Height (In.):	27		Width (In.):	0.0	Post Spa	cing (In.):	74.0
Height (In.):	25.0		Lateral Offset (In.):	25.0		rade (%):	0.30
<b>Physical Condition</b>	on						
	Align	ment and Height:	Alignment acceptable. 57-	ft was between 1 and 3-in	below the 27-in	design height	
Barrier		aking and Cracking:	There was no breaking or o	cracking observed.			
	Missing I	Elements:	There were no missing elements	ments observed.			
		rosion and eathering:	There was no corrosion or	weathering observed.			
	Align	ment and Height:	Alignment acceptable. 30-	ft was between 1 and 3-in	below the 27-in	design height	
End Treatments		aking and Cracking:	There was no breaking or o	pracking observed.			
	Missing	Elements:	There were no missing elements	ments observed.			
		osion and eathering:	There was no corrosion or	weathering observed.			

B	arrier ID:	PEFO-001	0-15.974-L						
Rou	ite Name:	NORTH-S	NORTH-SOUTH HIGHWAY						
Inspection Date:03/04/2010Barrier Rating:25.60									
Repair Recomme	endations	5							
Repair Action:	REPAIR			DEFERRED MAINTENANCE		Repair Cost:	\$2250		
Brief Workorder:	Raise 57 L.F	of barrier to t	he 27 inch design height.						
Workorder:	Workorder: Adjust Guardrail at \$10- per -Lin. Ft. for 57 LF = \$570. Raise 57 ft of guardrail up to the 27 inch design height. Low Speed Traffic Control at \$1475- per -Day for 1 Day(s) = \$1475.								
	2008 co	st estimate (A	ASTM Class D), prelimin	ary for comparison to oth	ier repair co	sts only.			

OUTE 0010: NORTH-SOUTH HIGHWA

#### **Barrier Condition Photos**



PEFO\_0010\_15.974\_L\_1.jpg

B	arrier ID:	<b>PEFO-001</b>	0-15.974-R				
	ite Name:		SOUTH HIGHWAY				
T	·	02/04/201	0	I	<b>D</b> : D (:	19.20	
		03/04/201	0		Barrier Rating:	18.20	
Barrier Descripti	on						
	Туре:	W-BEAM S	STRONG POST	E	Barrier Function:	TRAFFIC	
Barrier	Material:	WEATHER STEEL/CO			Post Material:	WOOD	
	Blockout Type:	WOOD			Length (ft.):	52	
Speed Limi	Speed Limit (MPH): 45			-	Placement with Respect to Road:	TANGENI	
Hazard Behind	l Barrier:	LOW					
<b>Barrier</b> Crashwo	rthiness						
Appropriate Test Level:	TL-2		Barrier Test Level:	TL-3		Is Barrier worthy?:	YES
Beg. End Trtmt Type:	NONE		Is Beg. End Trtmt Crashhworthy?:	N/A		Approach ion Type:	RIGID W-BEAM - W-BEAM
Ending End Trtmt Type:	W-BEAM	ВСТ	Ending End Trtmt Crashhworthy?:	NO			
Average Measure	ements						
Design Height (In.):	27		Width (In.):	0.0	Post Spa	cing (In.):	74.0
Height (In.):	26.7		Lateral Offset (In.):	50.0	Road G	rade (%):	0.10
<b>Physical Condition</b>	on						
	Align	ment and Height:	Alignment is acceptable. I	Height is within 1-i	n of 27-in design height		
Barrier		aking and Cracking:	There was no breaking or c	cracking observed.			
	Missing	Elements:	There were no missing eler	nents observed.			
		rosion and eathering:	There is a large amount of	material deposited	at the base of the barrie	r.	
	Align	ment and Height:	Alignment is acceptable. I	Height is within 1-i	n of 27-in design height		
End Treatments		aking and Cracking:	There was no breaking or c	eracking observed.			
	Missing 1	Elements:	There were no missing eler	nents observed.			
		osion and eathering:	There is a large amount of	material deposited	at the base of the barrie	r.	
			1				

B	arrier ID:	PEFO-001	0-15.974-R							
Rou	ite Name:	NORTH-S	IORTH-SOUTH HIGHWAY							
Inspect	tion Date:	03/04/201	0	Barrie	er Rating:	18.20				
Repair Recomme	endations	5								
Repair Action:	REPAIR			DEFERRED MAINTENANCE		Repair Cost:	\$1936			
Brief Workorder:	Replace 2 blo	ocks and 1 pos	t and remove the material at	t the base of the barrier.						
Workorder:	Replace Post Loader at \$1	teplace Block at \$30- per -Each for 2 Block(s) = \$60. Replace the 2 damaged blocks in the transition section. teplace Post at \$100- per -Each for 1 Post(s) = \$100. Replace the 1 damaged post in the transition section. to oader at \$125- per -Hour for 1 Hrs = \$125. Use loader to remove the deposited material at the base of barrier. to wow Speed Traffic Control at \$1475- per -Day for 1 Day(s) = \$1475.								
	2008 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.									



PEFO\_0010\_15.974\_R\_1.jpg

B	arrier ID:	PEFO-001	0-16.525-R				
	ite Name:		SOUTH HIGHWAY				
				-	• • •	22.50	
		03/04/201	0	Ba	rrier Rating:	22.70	
Barrier Descripti	on						
	Туре:	W-BEAM S	STRONG POST	Barr	ier Function:	TRAFFIC	
Barrier	Material:	WEATHER STEEL/CO		P	Post Material:	WOOD	
	Blockout Type:	WOOD			Length (ft.):	78	
Speed Lim	it (MPH):	45			acement with pect to Road:	TANGENT	
Hazard Behind	l Barrier:	LOW					
<b>Barrier Crashwo</b>	rth <u>iness</u>						
Appropriate Test Level:			Barrier Test Level:	TL-3		Is Barrier worthy?:	YES
Beg. End Trtmt Type:	W-BEAM I	ВСТ	Is Beg. End Trtmt Crashhworthy?:	NO		Approach ion Type:	RIGID W-BEAM - W-BEAM
Ending End Trtmt Type:	NONE		Ending End Trtmt Crashhworthy?:	N/A			
Average Measure	ements						
Design Height (In.):	27		Width (In.):	0.0	Post Sna	cing (In.):	75.3
Height (In.):	25.7		Lateral Offset (In.):	48.0		rade (%):	0.20
Physical Condition	on						
		ment and Height:	Alignment acceptable. 46-	ft was between 1 and 3	-in below the 27-in	design height	
Barrier		aking and Cracking:	1 block is broken.				
	Missing	Elements:	There were no missing eler	ments observed.			
		osion and eathering:	There was some gravel/sed	liment build-up next to	the guardrail.		
	Align	ment and Height:	Alignment is acceptable. I	Height is within 1-in of	27-in design height		
End Treatments		aking and Cracking:	1 block and 1 post were broken.				
	Missing	Elements:	There were no missing eler	ments observed.			
		osion and eathering:	There is some gravel/sedin	nent build-up next to the	e guardrail.		
			1				

B	arrier ID:	PEFO-001	EFO-0010-16.525-R							
Rou	ite Name:	NORTH-S	ORTH-SOUTH HIGHWAY							
Inspec	Spection Date:         03/04/2010         Barrier Rating:         22.70									
Repair Recomme	endations	5								
Repair Action:	REPAIR			DEFERRED MAINTENANCE		Repair Cost:	\$2442			
Brief Workorder:	Raise 46 Lf o	of guardrail up	to the 27 inch design height	t and replace 2 blocks and 1 p	post.					
Workorder:       Adjust Guardrail at \$10- per -Lin. Ft. for 46 LF = \$460. Raise 46-ft. of barrier up to 27-in design height.         Replace Block at \$30- per -Each for 2 Block(s) = \$60. Replace 2 broken blocks.         Replace Post at \$100- per -Each for 1 Post(s) = \$100. Replace 1 broken post.         Loader at \$125- per -Hour for 1 Hrs = \$125. Remove sediment/gravel build-up.         Low Speed Traffic Control at \$1475- per -Day for 1 Day(s) = \$1475.										
				ary for comparison to oth	er repair co	osts only.				

# **Petrified Forest National Park**

ROUTE 0010: NORTH-SOUTH HIGHWAY



PEFO\_0010\_16.525\_R\_1.jpg

B	arrier ID:	<b>PEFO-001</b>	0-16.529-L				
	ite Name:		SOUTH HIGHWAY				
	·	02/04/201	0			22.70	
		03/04/201	0		<b>Barrier Rating:</b>	22.70	
Barrier Descripti	on						
	Туре:	W-BEAM S	STRONG POST	B	arrier Function:	TRAFFIC	
Barrier	Material:	WEATHER STEEL/CO			Post Material:	WOOD	
	Blockout Type:	WOOD			Length (ft.):	55	
Speed Lim	Speed Limit (MPH): 45			ŀ	Placement with Respect to Road:	TANGENI	
Hazard Behind	l Barrier:	LOW					
<b>Barrier Crashwo</b>	rthiness						
Appropriate Test Level:	TL-2		Barrier Test Level:	TL-3		Is Barrier worthy?:	YES
Beg. End Trtmt Type:	W-BEAM	ВСТ	Is Beg. End Trtmt Crashhworthy?:	NO		Approach ion Type:	RIGID W-BEAM - W-BEAM
Ending End Trtmt Type:	NONE		Ending End Trtmt Crashhworthy?:	N/A			
Average Measure	ements						
Design Height (In.):	27		Width (In.):	0.0	Post Spa	cing (In.):	75.0
Height (In.):	24.5		Lateral Offset (In.):	26.2		rade (%):	0.10
<b>Physical Condition</b>	on						
	Align	ment and Height:	Alignment acceptable. 55-	ft was between 1 ar	nd 3-in below the 27-in	design height	
Barrier		aking and Cracking:	There is 12.5 ft of rail that	is bent.			
	Missing 1	Elements:	There were no missing eler	ments observed.			
		osion and eathering:	There was no corrosion or	weathering observe	d.		
	Align	ment and Height:	Alignment acceptable. 30-	ft was between 1 ar	nd 3-in below the 27-in	design height	
End Treatments		aking and Cracking:	There was no breaking or cracking observed.				
	Missing 1	Elements:	There were no missing eler	ments observed.			
		osion and eathering:	There was no corrosion or	weathering observe	d.		
			1				

B	arrier ID:	PEFO-001	EFO-0010-16.529-L						
Rou	ite Name:	NORTH-S	NORTH-SOUTH HIGHWAY						
Inspect	tion Date:	<b>n Date:</b> 03/04/2010 <b>Barrier Rating:</b> 22.70							
Repair Recomme	endations	5							
Repair Action:	REPAIR			DEFERRED MAINTENANCE		Repair Cost:	\$2585		
Brief Workorder:	Raise 55 L.F	of barrier to	the 27 inch design height and	d replace 13 feet of rail.					
Workorder:	Workorder: Adjust Guardrail at \$10- per -Lin. Ft. for 55 LF = \$550. Raise 55-ft. of barrier up to 27-in design height. Replace Rail at \$25- per -Lin. Ft. for 13 LF = \$325. Replace the bent rail section. Low Speed Traffic Control at \$1475- per -Day for 1 Day(s) = \$1475.								
	2008 co	st estimate (A	ASTM Class D), prelimin	ary for comparison to oth	ner repair co	sts only.			

**Barrier Condition Photos** 



PEFO\_0010\_16.529\_L\_1.jpg

Route Nation Date Nation Date Nation Date Nation Date Nation	ID:         PEFO-001           me:         NORTH-1           ate:         03/04/201	SOUTH HIGHWAY								
<b>Barrier Description</b>	ate: 03/04/201	-		RTH-SOUTH HIGHWAY						
<b>Barrier Description</b>	ate:  03/04/201				21.20					
		0	Barri	er Rating:	21.20					
Ту	pe: W-BEAM	STRONG POST	Barrier	Function:	TRAFFIC					
Barrier Mater	ial: WEATHE STEEL/CO		Post	t Material:	WOOD					
Block	out WOOD		L	ength (ft.):	80					
Speed Limit (MP	<b>H):</b> 45			ement with et to Road:	TANGENI	-				
Hazard Behind Barr	ier: LOW									
Barrier Crashworthin	ess									
Appropriate Test Level:		Barrier Test Level:	TL-3		Is Barrier worthy?:	YES				
Beg. End Trtmt NONE Type:	]	Is Beg. End Trtmt Crashhworthy?:	N/A		Approach ion Type:	RIGID W-BEAM - W-BEAM				
Ending End Trtmt W-BE Type:	AM BCT	Ending End Trtmt Crashhworthy?:	NO							
Average Measurement	ts									
Design Height (In.): 27		Width (In.):	0.0	Post Spa	cing (In.):	74.6				
Height (In.): 26.0		Lateral Offset (In.):	28.7		rade (%):	1.20				
<b>Physical Condition</b>										
A	lignment and Height:	Alignment acceptable. 25-	ft was between 1 and 3-in b	below the 27-in	design height					
Barrier	Breaking and Cracking:	1 block is broken.	1 block is broken.							
Miss	ing Elements:	There were no missing elements	ments observed.							
С	orrrosion and Weathering:	There was no corrosion or	weathering observed.							
A	lignment and Height:	Alignment is acceptable. I	Height is within 1-in of 27-i	n design height	-					
End Treatments	Breaking and Cracking:	There was only minor cracking in posts and blocks but still in good condition.								
Miss	ing Elements:	There were no missing eler	ments observed.							
С	orrrosion and Weathering:	There was no corrosion or	weathering observed.							

B	arrier ID:	PEFO-001	EFO-0010-16.556-L						
Rou	ite Name:	NORTH-S	IORTH-SOUTH HIGHWAY						
Inspect	tion Date:	Date:         03/04/2010         Barrier Rating:         21.20							
Repair Recomme	endations	5							
Repair Action:	REPAIR			DEFERRED MAINTENANCE		Repair Cost:	\$1931		
Brief Workorder:	Raise 25 L.F	. of guardrail ı	ip to the 27 inch design heig	ht and replace 1 broken bloc	:k.				
Workorder:	Workorder: Adjust Guardrail at \$10- per -Lin. Ft. for 25 LF = \$250. Raise 25-ft. of barrier up to 27-in design height. Replace Block at \$30- per -Each for 1 Block(s) = \$30. Replace 1 broken block. Low Speed Traffic Control at \$1475- per -Day for 1 Day(s) = \$1475.								
	2008 co	st estimate (A	ASTM Class D), prelimin	ary for comparison to oth	ner repair co	sts only.			

#### **Barrier Condition Photos**



PEFO\_0010\_16.556\_L\_1.jpg

B	arrier ID:	PEFO-001	0-16.556-R					
	ite Name:		SOUTH HIGHWAY					
Taracter	tion Data:	02/04/201	0	D	wion Detine	25.60		
		03/04/201	0	Bar	rier Rating:	25.60		
Barrier Descripti								
	Туре:	W-BEAM	STRONG POST	Barrie	er Function:	TRAFFIC		
Barrier	Material:	WEATHEF	RING	Po	st Material:	WOOD		
Durrier	iviateriai.	STEEL/CO		10	st mater fur.			
	Blockout	WOOD		]	Length (ft.):	55		
	Type:	45				TANGENI		
Speed Lim	it (MPH):	45			cement with ect to Road:	TANGENT		
Hazard Behind	d Barrier:	LOW				1		
<b>Barrier Crashwo</b>	rthiness	8						
Appropriate Test			Barrier	TL-3		Is Barrier	YES	
Level:			Test Level:	-		worthy?:		
Beg. End Trtmt	NONE			N/A		Approach		
Type:	WDEAM	DOT	Crashhworthy?:	NO	Transit	ion Type:	W-BEAM	
Ending End Trtmt Type:	W-BEAM	BCI	Ending End Trtmt Crashhworthy?:	NO				
Average Measure	ements							
Design Height (In.):	27		Width (In.):	0.0	Post Sna	cing (In.):	74.6	
Height (In.):	24.5		Lateral Offset (In.):	45.2		rade (%):	1.10	
<b>Physical Condition</b>	on							
	Align	ment and Height:	Alignment acceptable. 55-	ft was between 1 and 3-ir	a below the 27-in	design height		
		aking and	There was no breaking or c	cracking observed.				
Barrier		Cracking:						
	Missing	Elements:	There were no missing elem	ments observed.				
	Corre	osion and	There was no corrosion or	weathering observed				
		eathering:						
	A 12	montand	Alignment acceptable. 30-	ft was between 1 and 2 ir	below the 27 in	design height		
	Align	ment and Height:	Angiment acceptable. 30-	n was octween 1 and 3-If	i Jelow life 27-III	acsign neight		
End Treatments		aking and Cracking:	There was no breaking or c	cracking observed.				
	'	CI aCKIIIS:						
	Missing	Elements: There were no missing elements observed.						
	Corrr	osion and	There was no corrosion or	weathering observed.				
	We	eathering:						

Ba	arrier ID:	PEFO-001	PEFO-0010-16.556-R						
Rou	ite Name:	NORTH-S	NORTH-SOUTH HIGHWAY						
Inspect	tion Date:	03/04/201	0	Barrie	er Rating:	25.60			
Repair Recomme	endations	5							
Repair Action:	REPAIR			DEFERRED MAINTENANCE		Repair Cost:	\$2228		
Brief Workorder:	Raise 55 L.F	. of guardrail ι	up to the 27" design height.						
Workorder:	der: Adjust Guardrail at \$10- per -Lin. Ft. for 55 LF = \$550. Raise 55-ft. of barrier up to 27-in design height. Low Speed Traffic Control at \$1475- per -Day for 1 Day(s) = \$1475.								
	2008 co	st estimate (A	ASTM Class D), prelimin	ary for comparison to otl	her repair co	sts only.			

**Barrier Condition Photos** 



PEFO\_0010\_16.556\_R\_1.jpg

B	arrier ID:	PEFO-001	0-19.425-R					
	ite Name:		OUTH HIGHWAY					
						00.10		
		03/04/201	0		Barrier Rating:	28.10		
Barrier Descripti	ion							
	Туре:	W-BEAM S	W-BEAM STRONG POST		rrier Function:	TRAFFIC		
Barrier	Material:	WEATHEF STEEL/CO			Post Material:	WOOD		
	Blockout Type:	WOOD			Length (ft.):	79		
Speed Lim	it (MPH):	45			Placement with espect to Road:	INSIDE OI	F CURVE	
Hazard Behind	l Barrier:	MEDIUM		1		1		
<b>Barrier Crashwo</b>	rthiness							
Appropriate Test Level:			Barrier Test Level:	TL-3		Is Barrier worthy?:	YES	
Beg. End Trtmt Type:	W-BEAM	ВСТ	Is Beg. End Trtmt Crashhworthy?:	NO		Approach ion Type:	RIGID W-BEAM - W-BEAM	
Ending End Trtmt Type:	NONE		Ending End Trtmt Crashhworthy?:	N/A				
Average Measure	ements							
Design Height (In.):	27		Width (In.):	0.0	Post Sna	cing (In.):	75.0	
Height (In.):	25.0		Lateral Offset (In.):	37.2		rade (%):	1.50	
<b>Physical Condition</b>	on							
		ment and Height:	Alignment acceptable. 79-	ft was between 1 and	1 3-in below the 27-in	design height		
Barrier		aking and Cracking:	There is one broken block.	here is one broken block.				
	Missing 3	Elements:	There were no missing elem	ments observed.				
		osion and eathering:	There was no corrosion or	weathering observed				
	Align	ment and Height:	Alignment acceptable. 30-	ft was between 1 and	l 3-in below the 27-in	design height		
End Treatments		aking and Cracking:	There was no breaking or o	eracking observed.				
	Missing	Elements:	There were no missing elements	ments observed.				
		osion and eathering:	There was no corrosion or	weathering observed				

B	arrier ID:	PEFO-001	PEFO-0010-19.425-R								
Rou	ite Name:	NORTH-S	NORTH-SOUTH HIGHWAY								
Inspec	tion Date:	03/04/201	0	Barrie	er Rating:	28.10					
Repair Recomme	endations										
Repair Action:	REPAIR			DEFERRED MAINTENANCE		Repair Cost:	\$2525				
Brief Workorder:	Raise 79 L.F	of barrier to t	he 27 inch design height and	d replace one broken block.							
Workorder:Adjust Guardrail at \$10- per -Lin. Ft. for 79 LF = \$790. Raise 79-ft. of barrier up to 27-in design height. Replace Block at \$30- per -Each for 1 Block(s) = \$30. Replace the 1 broken block. Low Speed Traffic Control at \$1475- per -Day for 1 Day(s) = \$1475.											
	2008 co	st estimate (A	ASTM Class D), prelimin	ary for comparison to oth	ner repair co	sts only.					



PEFO\_0010\_19.425\_R\_1.jpg

B	arrier ID:	PEFO-001	0-19.431-L					
	ite Name:		SOUTH HIGHWAY					
There are	tion Data:	03/04/201	0		Barrier Rating:	31.20		
		03/04/201	0		Barrier Kating:	31.20		
Barrier Descripti								
	Туре:	W-BEAM S	W-BEAM STRONG POST		<b>Barrier Function:</b>	TRAFFIC		
Barrier	Material:	WEATHEF STEEL/CO			Post Material:	WOOD		
	Blockout Type:	WOOD			Length (ft.):	52		
Speed Lim		45			Placement with OUTSIDE OF CURVE Respect to Road:			
Hazard Behind	l Barrier:	LOW						
Barrier Crashwo	rthiness							
Appropriate Test Level:			Barrier Test Level:	TL-3		Is Barrier 1worthy?:	YES	
Beg. End Trtmt Type:	W-BEAM	BCT	Is Beg. End Trtmt Crashhworthy?:	NO		Approach	RIGID W-BEAM - W-BEAM	
Ending End Trtmt Type:	NONE		Ending End Trtmt Crashhworthy?:	N/A				
Average Measure	ements							
Design Height (In.):	27		Width (In.):	0.0	Post Sna	cing (In.):	75.5	
Height (In.):	25.0		Lateral Offset (In.):	43.2		rade (%):	1.50	
<b>Physical Condition</b>	on							
		ment and Height:	Alignment acceptable. 52-	ft was between 1 a	and 3-in below the 27-in	design height		
Barrier		aking and Cracking:	One post and one block are	both cracked dow	n the middle.			
	Missing 1	Elements:	There were no missing elem	nents observed.				
		osion and eathering:	There was no corrosion or	weathering observ	ed.			
	Align	ment and Height:	Alignment acceptable. 30-	ft was between 1 a	and 3-in below the 27-in	design height		
End Treatments		aking and Cracking:	There was no breaking or cracking observed.					
	Missing Elements: There were no missing elements observed.							
		osion and eathering:	There was no corrosion or	weathering observ	ed.			
			1					

B	arrier ID:	PEFO-001	0-19.431-L							
Rou	ite Name:	NORTH-SOUTH HIGHWAY								
Inspection Date: 03/04/2010 Barrier Rating: 31.20										
Repair Recomme	endations									
Repair Action:	REPAIR	AIR FMSS DEFERRED Repair \$23 Work Type: MAINTENANCE Cost:								
Brief Workorder:	Raise 52 L.F	. of barrier to t	the 27 inch design height and	d replace the damaged post a	nd block.					
Workorder:	Workorder:Adjust Guardrail at \$10- per -Lin. Ft. for 52 LF = \$520. Raise 52-ft. of barrier up to 27-in design height. Replace Post at \$100- per -Each for 1 Post(s) = \$100. Replace 1 broken post. Replace Block at \$30- per -Each for 1 Block(s) = \$30. Replace 1 broken block. Low Speed Traffic Control at \$1475- per -Day for 1 Day(s) = \$1475.									
	2008 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.									



PEFO\_0010\_19.431\_L\_1.jpg

B	arrier ID:	PEFO-001	0-19.448-L				
	ite Name:		SOUTH HIGHWAY				
		02/04/201	0		<b>D I D I</b>	20.10	
		03/04/201	0		Barrier Rating:	28.10	
Barrier Descripti	on						
	Туре:	W-BEAM STRONG POST		]	Barrier Function:	TRAFFIC	
Barrier	Material:	WEATHER STEEL/CO			Post Material:	WOOD	
	Blockout Type:	WOOD			Length (ft.):	76	
Speed Lim	Speed Limit (MPH): 45				Placement with Respect to Road:	TANGENT	
Hazard Behind	l Barrier:	MEDIUM					
<b>Barrier Crashwo</b>	rthiness						
Appropriate Test Level:	TL-2		Barrier Test Level:	TL-3		Is Barrier worthy?:	YES
Beg. End Trtmt Type:	NONE		Is Beg. End Trtmt Crashhworthy?:	N/A		Approach ion Type:	RIGID W-BEAM - W-BEAM
Ending End Trtmt Type:	W-BEAM	ВСТ	Ending End Trtmt Crashhworthy?:	NO			
Average Measure	ements						
Design Height (In.):	27		Width (In.):	0.0	Post Spa	cing (In.):	75.1
Height (In.):	24.7		Lateral Offset (In.):	33.2		rade (%):	0.60
<b>Physical Condition</b>	on						
	Align	ment and Height:	Alignment acceptable. 76-	ft was between 1	and 3-in below the 27-in	design height	
Barrier		aking and Cracking:	There is 1 block and 1 post	that are cracked.	25ft. of rail is bent.		
	Missing I	Elements:	There were no missing eler	nents observed.			
		osion and eathering:	There was no corrosion or	weathering observ	ved.		
	Align	ment and Height:	Alignment acceptable. 30-	ft was between 1	and 3-in below the 27-in	design height	
End Treatments		aking and Cracking:	There was no breaking or o	eracking observed			
	Missing	Elements:	There were no missing eler	ments observed.			
		osion and eathering:	There was no corrosion or	weathering observ	/ed.		
L			1				

B	arrier ID:	PEFO-001	EFO-0010-19.448-L							
Rou	ite Name:	NORTH-S	ORTH-SOUTH HIGHWAY							
Inspec	tion Date: 03/04/2010 Barrier Rating: 28.10									
Repair Recomme	endations	;								
Repair Action:	REPAIR			DEFERRED MAINTENANCE		Repair Cost:	\$3399			
Brief Workorder:	Raise 76 L.F	. of barrier to t	he 27 inch design height and	d replace 25 feet of rail 2 pos	sts and 1 block	Χ.				
Workorder:Adjust Guardrail at \$10- per -Lin. Ft. for 76 LF = \$760. Raise 76-ft. of barrier up to 27-in design height. Replace Post at \$100- per -Each for 2 Post(s) = \$200. Replace the two damaged post. Replace Block at \$30- per -Each for 1 Block(s) = \$30. Replace the one turned block. Replace Rail at \$25- per -Lin. Ft. for 25 LF = \$625. Replace the 25 ft of barrier that is bent. Low Speed Traffic Control at \$1475- per -Day for 1 Day(s) = \$1475.										
				ary for comparison to oth	ier repair co	sts only.				



PEFO\_0010\_19.448\_L\_1.jpg

B	arrier ID:	PEFO-001	0-19.448-R					
	ite Name:	NORTH-S	SOUTH HIGHWAY					
There are	tion Data:	03/04/201	0		Barrier Rating:	21.20		
-		03/04/201	0		barrier Rating:	21.20		
Barrier Descripti								
	Туре:	W-BEAM S	STRONG POST	-	Barrier Function:	TRAFFIC		
Barrier	Material:	WEATHER	RING		Post Material:	WOOD		
		STEEL/CO	RTEN					
	Blockout Type:	WOOD			Length (ft.):	52		
Speed Lim		45			Placement with	TANGEN		
Speed Lini	II (IVII II).				Respect to Road:	milli		
Hazard Behind	l Barrier:	LOW						
<b>Barrier Crashwo</b>	rthiness							
Appropriate Test	TL-2		Barrier	TL-3		Is Barrier	YES	
Level:			Test Level:		Crash	nworthy?:		
Beg. End Trtmt	NONE		Is Beg. End Trtmt Crashhworthy?:	N/A		Approach ion Type:	RIGID W-BEAM - W-BEAM	
Type: Ending End Trtmt	W-BEAM	BCT	Ending End Trtmt	NO		ion Type:	W-DEAN	
Type:		bei	Crashhworthy?:	110				
Average Measure	ements							
Design Height (In.):	27		Width (In.):	0.0	Post Spa	cing (In.):	75.0	
Height (In.):	26.2		Lateral Offset (In.):	44.7		rade (%):	0.80	
<b>Physical Condition</b>	on							
	Align	ment and Height:	Alignment is acceptable. I	Height is within 1-	in of 27-in design height	t.		
Barrier		aking and Cracking:	There was only minor crac condition.	king and chipping	g on the posts and blocks	but they are s	till in good	
	Missing	Elements:	There were no missing eler	ments observed.				
		rosion and eathering:	There was some gravel/sed	iment build-up.				
	Align	ment and Height:	Alignment is acceptable. I	Height is within 1-	in of 27-in design height	i.		
End Treatments		aking and Cracking:	There was only minor cracking of posts and blocks but they are still in good condition.					
	Missing	Elements:	There were no missing eler	nentsobserved.				
		osion and eathering:	There is some gravel/sedin	nent build-up next	to the guardrail.			

B	arrier ID:	D: PEFO-0010-19.448-R								
Rou	ite Name:	NORTH-S	NORTH-SOUTH HIGHWAY							
Inspect	Barrier Rating:         21.20									
Repair Recomme	endations	5								
Repair Action:	REPAIR	R         FMSS         DEFERRED         Repair         \$1           Work Type:         MAINTENANCE         Cost:								
Brief Workorder:	Remove sedi	ment/gravel b	uild-up next to the guardrail							
Workorder:	r: Loader at \$125- per -Hour for 1 Hrs = \$125. Remove gravel/sediment build-up next to guardrail. Low Speed Traffic Control at \$1475- per -Day for 1 Day(s) = \$1475.									
	2008 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.									

#### **Barrier Condition Photos**



PEFO\_0010\_19.448\_R\_1.jpg

B	arrier ID:	PEFO-001	0-22.315-L				
	ite Name:		SOUTH HIGHWAY				
	-					0.5.00	
		03/04/201	0	Barr	ier Rating:	25.20	
Barrier Descripti	ion						
	Туре:	W-BEAM S	STRONG POST	Barrier	• Function:	TRAFFIC	
Barrier	Material:	WEATHER STEEL/CO		Pos	t Material:	WOOD	
	Blockout Type:	WOOD		L	ength (ft.):	77	
Speed Limit (MPH): 45					ement with ct to Road:	TANGENT	,
Hazard Behind	l Barrier:	MEDIUM					
<b>Barrier Crashwo</b>	rthiness						
Appropriate Test Level:	TL-2		Barrier Test Level:	TL-3		Is Barrier worthy?:	YES
Beg. End Trtmt Type:	W-BEAM I	ВСТ	Is Beg. End Trtmt Crashhworthy?:	NO		Approach ion Type:	RIGID W-BEAM - W-BEAM
Ending End Trtmt Type:	NONE		Ending End Trtmt Crashhworthy?:	N/A			
Average Measure	ements						
Design Height (In.):	27		Width (In.):	0.0	Post Spa	cing (In.):	75.0
Height (In.):	25.2		Lateral Offset (In.):	24.2		rade (%):	2.00
<b>Physical Condition</b>	on						
	Align	ment and Height:	Alignment acceptable. 47-	ft was between 1 and 3-in	below the 27-in	design height	
Barrier		aking and Cracking:	There was only minor crac	king in posts and blocks bu	t they are still i	n good condit	ion.
	Missing 3	Elements:	There were no missing elements	ments observed.			
		osion and eathering:	There was no corrosion or	weathering observed.			
	Align	ment and Height:	Alignment acceptable. 30-	ft was between 1 and 3-in	below the 27-in	design height	
End Treatments		aking and Cracking:	There was only minor crac	king in posts and blocks bu	t they are still i	n good condit	ion.
	Missing ]	Elements:	There were no missing elements	ments observed.			
		osion and eathering:	There was no corrosion or	weathering observed.			

Ba	arrier ID:	PEFO-001	PEFO-0010-22.315-L						
Rou	ite Name:	NORTH-S	NORTH-SOUTH HIGHWAY						
Inspect	tion Date:         03/04/2010         Barrier Rating:         25.20								
Repair Recomme	endations	5							
Repair Action:	REPAIR	FMSSDEFERREDRepair\$21Work Type:MAINTENANCECost:							
Brief Workorder:	Raise 47 L.F	. of guardrail ι	ip to the 27 inch design heig	ht.					
Workorder:	Adjust Guardrail at \$10- per -Lin. Ft. for 47 LF = \$470. Raise 47ft. of barrier to 27 inch design height. Low Speed Traffic Control at \$1475- per -Day for 1 Day(s) = \$1475.								
	2008 co	st estimate (A	ASTM Class D), prelimin	ary for comparison to oth	ier repair co	sts only.			

#### **Barrier Condition Photos**



PEFO\_0010\_22.315\_L\_1.jpg

B	arrier ID:	PEFO-001	0-22.318-R				
	ite Name:		SOUTH HIGHWAY				
		03/04/201	0		Barrier Rating:	22.70	
Barrier Descripti	ion						
	Туре:	W-BEAM S	STRONG POST	Baı	rrier Function:	TRAFFIC	
Barrier	Material:	WEATHER STEEL/CO			Post Material:	WOOD	
	Blockout Type:	WOOD			Length (ft.):	70	
<b>Speed Limit (MPH):</b> 45					Placement with espect to Road:	TANGENT	
Hazard Behind	l Barrier:	LOW					
<b>Barrier Crashwo</b>	rthiness						
Appropriate Test Level:	TL-2		Barrier Test Level:	TL-3		Is Barrier worthy?:	YES
Beg. End Trtmt Type:	W-BEAM	ВСТ	Is Beg. End Trtmt Crashhworthy?:	NO		Approach ion Type:	RIGID W-BEAM - W-BEAM
Ending End Trtmt Type:	NONE		Ending End Trtmt Crashhworthy?:	N/A			
Average Measure	ements						
Design Height (In.):	27		Width (In.):	0.0	Post Spa	cing (In.):	74.8
Height (In.):	24.5		Lateral Offset (In.):	29.2		rade (%):	1.60
<b>Physical Condition</b>	on						
		ment and Height:	Alignment acceptable. 70-	ft was between 1 and	3-in below the 27-in	design height	
Barrier		aking and Cracking:	There is one block that is t	wisted and cracked.			
	Missing I	Elements:	There were no missing eler	ments observed.			
		osion and eathering:	There was no corrosion or	weathering observed.			
	Align	ment and Height:	Alignment acceptable. 30-	ft was between 1 and	3-in below the 27-in	design height	
End Treatments		aking and Cracking:	There was no breaking or o	cracking observed.			
	Missing	Elements:	There were no missing eler	ments observed.			
		osion and eathering:	There was no corrosion or	weathering observed.			

B	arrier ID:	PEFO-001	2EFO-0010-22.318-R							
Rou	ite Name:	NORTH-S	NORTH-SOUTH HIGHWAY							
Inspect	tion Date:	03/04/201	0	Barrie	er Rating:	22.70				
Repair Recomme	endations									
Repair Action:	REPAIR	FMSSDEFERREDRepair\$24Work Type:MAINTENANCECost:								
Brief Workorder:	Raise 70 L.F	of barrier to	he 27 inch design height and	d replace one block.						
Workorder:	Workorder:Adjust Guardrail at \$10- per -Lin. Ft. for 70 LF = \$700. Raise 70-ft. of barrier up to 27-in design height. Replace Block at \$30- per -Each for 1 Block(s) = \$30. Replace one damaged block. Low Speed Traffic Control at \$1475- per -Day for 1 Day(s) = \$1475.									
	2008 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.									



PEFO\_0010\_22.318\_R\_1.jpg

B	arrier ID:	PEFO-001	0-22.342-L				
	ite Name:		SOUTH HIGHWAY				
	them Dist	02/04/201	0		Doubles D. (	20.00	
		03/04/201	U	 	Barrier Rating:	30.00	
Barrier Descripti							
	Туре:	W-BEAM S	STRONG POST	B	arrier Function:	TRAFFIC	
Barrier	Material:	WEATHEF STEEL/CO			Post Material:	WOOD	
	Blockout Type:	WOOD			Length (ft.):	70	
Speed Lim	Speed Limit (MPH): 45			ŀ	Placement with Respect to Road:	TANGENT	
Hazard Behind	l Barrier:	LOW					
<b>Barrier Crashwo</b>	rthiness						
Appropriate Test Level:	TL-2		Barrier Test Level:	TL-3		Is Barrier worthy?:	YES
Beg. End Trtmt Type:	NONE		Is Beg. End Trtmt Crashhworthy?:	N/A		Approach ion Type:	RIGID W-BEAM - W-BEAM
Ending End Trtmt Type:	W-BEAM	BCT	Ending End Trtmt Crashhworthy?:	NO			
Average Measure	ements						
Design Height (In.):	27		Width (In.):	0.0	Post Spa	cing (In.):	73.8
Height (In.):	24.7		Lateral Offset (In.):	35.2		rade (%):	0.20
<b>Physical Condition</b>	on						
		ment and Height:	Alignment acceptable. 70-	ft was between 1 ar	nd 3-in below the 27-in	design height	
Barrier		aking and Cracking:	There are 2 posts that are b	adly cracked.			
	Missing 3	Elements:	There were no missing eler	ments observed.			
		osion and eathering:	There was no corrosion or	weathering observe	d.		
	Align	ment and Height:	Alignment acceptable. 30-	ft was between 1 ar	nd 3-in below the 27-in	design height	
End Treatments		aking and Cracking:	The entire end treatment is	bent.			
	Missing	Elements:	There were no missing eler	ments observed.			
		osion and eathering:	There was no corrosion or	weathering observe	d.		
L							

B	arrier ID:	PEFO-001	EFO-0010-22.342-L							
Rou	ite Name:	NORTH-S	OUTH HIGHWAY							
Inspec	tion Date:	<b>Barrier Rating:</b> 30.00								
Repair Recomme	endations	5								
Repair	REPLACE		FMSS	CAPITAL		Repair	\$6463			
Action:		Work Type: IMPROVEMENT Cost:								
Brief	Raise 40 L.F	Raise 40 L.F. of barrier to the 27 inch design height replace damaged end treatment and replace one post								
Workorder:										
Workorder:		1		. Raise 40-ft. of barrier up to	•	height.				
				0. Remove the damaged end			1 1			
		t-beam flared 350 compliant at \$3500- per -Each for 1 Unit(s) = \$3500. Install new end treatment to replace the damaged								
	Replace Post at \$100- per -Each for 2 Post(s) = \$200. Replace the damaged post.									
L	Low Speed Traffic Control at \$1475- per -Day for 1 $Day(s) = $1475$ .									
	2008 co	st estimate (A	ASTM Class D), prelimin	ary for comparison to otl	her repair co	sts only.				



PEFO\_0010\_22.342\_L\_1.jpg

B	arrier ID:	PEFO-001	0-22.342-R				
	ite Name:		SOUTH HIGHWAY				
						22.50	
		03/04/201	0	Barr	ier Rating:	32.70	
Barrier Descripti	ion						
	Туре:	W-BEAM S	STRONG POST	Barrie	r Function:	TRAFFIC	
Barrier	Material:	WEATHER STEEL/CO		Pos	st Material:	WOOD	
	Blockout Type:	WOOD		I	Length (ft.):	76	
<b>Speed Limit (MPH):</b> 45					ement with ect to Road:	TANGENT	
Hazard Behind	l Barrier:	LOW					
<b>Barrier Crashwo</b>	rthiness						
Appropriate Test Level:	TL-2		Barrier Test Level:	TL-3		Is Barrier worthy?:	YES
Beg. End Trtmt Type:	NONE		Is Beg. End Trtmt Crashhworthy?:	N/A		Approach ion Type:	RIGID W-BEAM - W-BEAM
Ending End Trtmt Type:	W-BEAM	ВСТ	Ending End Trtmt Crashhworthy?:	NO			
Average Measure	ements						
Design Height (In.):	27		Width (In.):	0.0	Post Spa	cing (In.):	75.0
Height (In.):	24.5		Lateral Offset (In.):	22.0		rade (%):	0.10
<b>Physical Condition</b>	on						
	Align	ment and Height:	Alignment acceptable. 76-	ft was between 1 and 3-in	below the 27-in	design height	
Barrier		aking and Cracking:	Two posts are cracked.				
	Missing 1	Elements:	There were no missing elem	nents observed.			
		osion and eathering:	There was no corrosion or	weathering observed.			
	Align	ment and Height:	Alignment is acceptable. H	eight is 1-3in. below 27 in	n design height.		
End Treatments		aking and Cracking:	The existing BCT end trea	tement is badly dented.			
	<b>Missing</b>	Elements:	There were no missing elements	nents observed.			
		osion and eathering:	There was no corrosion or	weathering observed.			

Ba	arrier ID:	PEFO-001	0-22.342-R							
Rou	ite Name:	NORTH-S	OUTH HIGHWAY							
Inspection Date: 03/04/2010 Barrier Rating: 32.70										
Repair Recomme	endations	5								
Repair Action:	REPLACE	FMSS     CAPITAL     Repair     \$6       Work Type:     IMPROVEMENT     Cost:								
Brief Workorder:	Raise 46 L.F	aise 46 L.F. of barrier up to 27 inch design height. Replace end treatment and 2 cracked posts.								
Workorder:	<b>rkorder:</b> Adjust Guardrail at \$10- per -Lin. Ft. for 46 LF = \$460. Raise 46-ft. of barrier up to 27-in design height.         Replace Post at \$100- per -Each for 2 Post(s) = \$200. Two posts are damaged. Replace.         Remove Guardrail at \$10- per -Lin. Ft. for 30 LF = \$300. Remove the end treatment due to damage. 30 LF.         W-beam flared 350 compliant at \$3500- per -Each for 1 Unit(s) = \$3500. Replace existing damaged BCT.         Low Speed Traffic Control at \$1475- per -Day for 1 Day(s) = \$1475.									
	2008 co	st estimate (A	ASTM Class D), prelimin	ary for comparison to otl	ner repair co	sts only.				

**Barrier Condition Photos** 



PEFO\_0010\_22.342\_R\_1.jpg

B	arrier ID:	PEFO-001	0-26.084-R					
	ite Name:		OUTH HIGHWAY					
Inspace	tion Data:	04/04/201	0	Ra	rrier Rating:	17.80		
Barrier Descripti		04/04/201	0	Da	irrier Katilig.	17.80		
Darrier Descripti	Туре:	OTHER: C	ONCRETE BLOCK	Barrier Function:		TRAFFIC		
	- ) p • •							
Barrier Material: CONCRET		Έ	Р	ost Material:	N/A			
	Blockout N/A Type:				Length (ft.):	34		
Speed Limit (MPH): 15		15			acement with pect to Road:	INSIDE OF	FCURVE	
Hazard Behind	Hazard Behind Barrier: MEDIUM			internet int	peer to Road.			
<b>Barrier Crashwo</b>	rthiness							
Appropriate Test Level:	TL-1		Barrier Test Level:	NCW		Is Barrier hworthy?:	NO	
Beg. End Trtmt Type:	NONE		Is Beg. End Trtmt Crashhworthy?:	N/A		Approach tion Type:	NONE	
Ending End Trtmt	NONE		Ending End Trtmt	N/A	1141151	tion Type.		
Туре:			Crashhworthy?:					
Average Measure				15.0				
Design Height (In.):	24 26.5		Width (In.): Lateral Offset (In.):	15.0 56.0		cing (In.):	0.0	
Height (In.):			Lateral Oliset (III.):	50.0	Koau G	rade (%):	1.40	
Physical Condition		ment and Height:						
Barrier		aking and Cracking:	There was no breaking or c	cracking observed.				
	Missing	Elements:	There are no missing element	ents.				
		osion and eathering:	There was no corrosion or weathering observed.					
	Align	ment and Height:						
End Treatments		aking and Cracking:						
	Missing 1	Elements:						
		osion and eathering:						

B	arrier ID:	PEFO-001	0-26.084-R						
Rou	ite Name:	NORTH-S	NORTH-SOUTH HIGHWAY						
Inspection Date:		04/04/2010		Barrier Rating:		17.80			
Repair Recomme	endations	5							
Repair Action:	NO ACTIC	DN	FMSS Work Type:	N/A		Repair Cost:	\$0		
Brief Workorder:	N/A								
Workorder:									
	2008 co	st estimate (A	ASTM Class D), prelimin	ary for comparis	on to other repair co	sts only.			

**Barrier Condition Photos** 



PEFO\_0010\_26.084\_R\_1.jpg

B	arrier ID:	<b>PEFO-001</b>	0-26.146-R					
	ite Name:		SOUTH HIGHWAY					
T	tion Dete	04/04/201	0		Doumion Dating	15.00		
		04/04/201	U		Barrier Rating:	13.00		
Barrier Descripti								
	Туре:	OTHER: C	ONCRETE BLOCK	Ba	rrier Function:	TRAFFIC		
Barrier	Material:	CONCRET	È	Post Material:		N/A		
		_		i ost material.				
Blockout N/A				Length (ft.):	78			
	Type:	15				TANGENI		
Speed Lim	it (MPH):	15			Placement with espect to Road:	TANGENT		
Hazard Behind	Hazard Behind Barrier: MEDIUM							
Barrier Crashwo	rthiness	8						
Appropriate Test			Barrier	NCW		Is Barrier	NO	
Level:			Test Level:			worthy?:		
Beg. End Trtmt	NONE		Is Beg. End Trtmt	N/A		Approach	NONE	
Type:	NONE		Crashhworthy?:	2.7/4	Transit	ion Type:		
Ending End Trtmt Type:	NONE		Ending End Trtmt Crashhworthy?:	N/A				
Average Measure	ements							
Design Height (In.):	24		Width (In.):	16.0	Post Sna	cing (In.):	0.0	
Height (In.):	27.5		Lateral Offset (In.):	70.0		rade (%):	1.40	
Physical Condition	on							
		ment and Height:						
		aking and	There was no breaking or c	racking observed.				
Barrier		Cracking:						
	Missing	Elements:	There were no missing eler	nents observed.				
	Com	osion and	There was no corrosion or	weathering observed				
		eathering:						
	Alian	ment and						
	Align	Height:						
End Treatments		aking and Cracking:						
	'	CI aCKIIIS:						
	Missing	Elements:						
	Corrr	osion and						
		eathering:						

B	arrier ID:	PEFO-001	0-26.146-R						
Rou	ite Name:	NORTH-S	NORTH-SOUTH HIGHWAY						
Inspection Date:		04/04/2010		Barrier Rating:		15.00			
Repair Recomme	endations	5							
Repair Action:	NO ACTIC	DN	FMSS Work Type:	N/A		Repair Cost:	\$0		
Brief Workorder:	N/A								
Workorder:									
	2008 co	st estimate (A	ASTM Class D), prelimin	ary for comparis	son to other repair co	sts only.			



PEFO\_0010\_26.146\_R\_1.jpg

Ba	arrier ID:	PEFO-001	0-26.282-L					
	ite Name:		SOUTH HIGHWAY					
Inspect	ion Data.	04/04/201	0		Barrier Rating:	36.20		
Barrier Descripti		04/04/201	0		Darrier Katilig.	50.20		
Darrier Descripti				Barrier Function:				
	Туре:		ASONRY WITHOUT TE CORE WALL	Ba	rrier Function:	TRAFFIC		
Barrier	Material:	STONE			Post Material:	N/A		
	Blockout N/A Type:				Length (ft.):	47		
Speed Limi	Speed Limit (MPH): 15				Placement with espect to Road:	TANGENT	•	
Hazard Behind	Barrier:	LOW						
Barrier Crashwo	rthiness							
Appropriate Test Level:	TL-1		Barrier Test Level:	NCW		Is Barrier	NO	
Beg. End Trtmt Type:	NONE		Is Beg. End Trtmt Crashhworthy?:	N/A		Approach ion Type:	NONE	
Ending End Trtmt Type:	NONE		Ending End Trtmt Crashhworthy?:	N/A				
Average Measure	ements							
Design Height (In.):	24		Width (In.):	20.0	Post Spa	cing (In.):	0.0	
Height (In.):	13.0		Lateral Offset (In.):	99.3		rade (%):	0.20	
Physical Condition	on							
	Align	ment and Height:						
Barrier		aking and Cracking:						
	Missing 1	Elements:	There is a missing piece of 20" wide.	stone on the beginn	ing end of the wall tha	it measures 6in	n deep 6" long and	
		osion and eathering:	There was no corrosion or	weathering observed	l.			
	Align	ment and Height:						
End Treatments		aking and Cracking:						
	Missing	Elements:						
		osion and eathering:						

B	arrier ID:	PEFO-001	0-26.282-L						
Roi	ite Name:	NORTH-S	OUTH HIGHWAY						
Inspec	tion Date:	04/04/2010		Barrie	r Rating:	36.20			
Repair Recomme	endations	5							
Repair Action:	REPAIR	AIR FMSS DEFERRED Repair \$521 Work Type: MAINTENANCE Cost:							
Brief Workorder:	Raise guardy	vall 11-in. Re	move and reset 47-ft stone n	nasonry guardwall on concre	te footer to de	sign height of	24-in.		
Workorder:	der: Remove & Reset Stone Masonry Guardwall at \$250- per -Cu. Ft. for 160 CF = \$40000. Remove and reset entire length of wall up to 24" design height. [(1.7ft)(2ft)(47ft)] = 160CF. Structural Concrete at \$1000- per -Cu. Yd. for 3 CY = \$3000. Install 11" of structural pad under wall to raise it to 24". [(1.7ft) (0.9ft)(47ft)] /27 = 2.6 CY. Low Speed Traffic Control at \$1475- per -Day for 3 Day(s) = \$4425. 1 day removal 2 days installation.								
	-			ary for comparison to oth					



PEFO\_0010\_26.282\_L\_1.jpg

Route Name:       NORTH-SOUTH HIGHWAY         Inspection Date:       04/04/2010       Barrier Rating:       4.10         Barrier Description       Type:       STONE MASONRY WITHOUT CONCRETE CORE WALL       Barrier Function:       NON-TRAFFIC         Barrier Material:       STONE       Post Material:       N/A       N/A         Blockout       N/A       Length (ft.):       44         Speed Limit (MPH):       15       Placement with Respect to Road:       NON-TRAFFIC BARRIE         Barrier Crashworthiness       M/A       Length (ft.):       44         Barrier Crashworthiness       N/A       Non-TRAFFIC BARRIE         Barrier Crashworthiness       N/A       N/A       Non-TRAFFIC BARRIE         Beg. End Trtmt       N/A       Is Beg. End Trtmt       N/A       N/A         Beg. End Trtmt       NONE       Is Beg. End Trtmt       N/A       Approach       NONE         Friding End Teter       NONE       Friding End Teter       N/A       Approach       NONE	R
Barrier Description         Type:       STONE MASONRY WITHOUT CONCRETE CORE WALL       Barrier Function:       NON-TRAFFIC         Barrier Material:       STONE       Post Material:       N/A         Blockout Type:       N/A       Length (ft.):       44         Speed Limit (MPH):       15       Placement with Respect to Road:       N/A-TRAFFIC BARRIE         Hazard Behind Barrier:       N/A         Barrier Crashworthiness         Appropriate Test Level:       TL-1       Barrier Test Level:       N/A         Beg. End Trtmt Type:       N/A	
Type:       STONE MASONRY WITHOUT CONCRETE CORE WALL       Barrier Function:       NON-TRAFFIC         Barrier Material:       STONE       Post Material:       N/A         Blockout Type:       N/A       Length (ft.):       44         Speed Limit (MPH):       15       Placement with Respect to Road:       NON-TRAFFIC BARRIE         Hazard Behind Barrier:       N/A       N/A       NON-TRAFFIC BARRIE         Barrier Crashworthiness       N/A       Is Barrier Test Level:       N/A       N/A         Beg. End Trtmt Type:       NONE       Is Beg. End Trtmt Crashhworthy?:       N/A       Approach Transition Type:       NONE	
CONCRETE CORE WALL         Barrier Material:       STONE       Post Material:       N/A         Blockout Type:       N/A       Length (ft.):       44         Speed Limit (MPH):       15       Placement with Respect to Road:       NON-TRAFFIC BARRIE         Hazard Behind Barrier:       N/A       MA       Is Barrier Test Level:       N/A         Beg. End Trtmt Type:       NONE       Is Beg. End Trtmt Crashhworthy?:       N/A       Approach Transition Type:       NONE	
Blockout       N/A       Length (ft.):       44         Speed Limit (MPH):       15       Placement with Respect to Road:       NON-TRAFFIC BARRIE         Hazard Behind Barrier:       N/A       N/A       Is Barrier       N/A         Barrier Crashworthiness       TL-1       Barrier Test Level:       N/A       Is Barrier Crashworthy?:       N/A         Beg. End Trtmt       NONE       Is Beg. End Trtmt Crashworthy?:       N/A       Approach Transition Type:       NONE	
Trupe:       Trupe:       Trupe:       Speed Limit (MPH):     15       Placement with Respect to Road:       N/A       Hazard Behind Barrier:     N/A       Barrier Crashworthiness       Appropriate Test     TL-1     Barrier Test Level:     N/A       Beg. End Trtmt     NONE     Is Beg. End Trtmt Crashworthy?:     N/A       Beg. End Trtmt     NONE     Is Beg. End Trtmt Crashhworthy?:     N/A	R
Appropriate Test Level:     TL-1     Barrier Test Level:     N/A       Beg. End Trtmt Type:     NONE     Is Beg. End Trtmt Crashworthy?:     N/A	R
Barrier Crashworthiness         Appropriate Test Level:       TL-1       Barrier Test Level:       N/A       Is Barrier Crashworthy?:       N/A         Beg. End Trtmt Type:       NONE       Is Beg. End Trtmt Crashhworthy?:       N/A       Approach Transition Type:       NONE	11
Appropriate Test Level:TL-1Barrier Test Level:N/AIs Barrier Crashworthy?:N/ABeg. End Trtmt Type:NONEIs Beg. End Trtmt Crashhworthy?:N/AApproach Transition Type:NONE	
Level:     Test Level:     Crashworthy?:       Beg. End Trtmt Type:     NONE     Is Beg. End Trtmt Crashhworthy?:     N/A     Approach Transition Type:	
Type:         Crashhworthy?:         Transition Type:	
Ending End Tatmt NONE Ending End Tatmt N/A	
Ending End Trtmt     NONE     Ending End Trtmt     N/A       Type:     Crashhworthy?:     N/A	
Average Measurements	
Design Height (In.):         24         Width (In.):         20.0         Post Spacing (In.):         0.0	
Height (In.):         24.0         Lateral Offset (In.):         0.0         Road Grade (%):         0.00	
Physical Condition	
Alignment and Height:       Alignment is acceptable. Height is within 3-in of 24-in design height.	
Barrier     Breaking and Cracking:     There is no breaking or cracking observed.	
Missing Elements:       There were no missing elements observed.	
Corrrosion and Weathering:       There was no corrosion or weathering observed.	
Alignment and Height:	
End Treatments     Breaking and Cracking:	
Missing Elements:	
Corrrosion and Weathering:	

Ba	arrier ID:	PEFO-001	0-26.284-R						
Rou	ite Name:	NORTH-S	NORTH-SOUTH HIGHWAY						
Inspection Date:		04/04/2010		Barrier Rating:		4.10			
Repair Recomme	endations	;							
Repair Action:	NO ACTIC	DN	FMSS Work Type:	N/A		Repair Cost:	\$0		
Brief Workorder:	N/A								
Workorder:									
	2008 co	st estimate (A	ASTM Class D), prelimin	ary for compariso	on to other repair co	sts only.			



PEFO\_0010\_26.284\_R\_1.jpg

B	arrier ID:	PEFO-001	1-0.008-L						
	ite Name:		ESA ROAD						
T	tion Data	04/04/201	0		Doumier Detter	19.20			
		04/04/201	U		Barrier Rating:	19.20			
Barrier Descripti									
	Туре:	OTHER: C	ONCRETE BLOCK	B	arrier Function:	TRAFFIC			
Barriar	Material:	CONCRET	Έ		Post Material:	N/A			
					i ost material.	1 1/ 1 1			
Blockout N/A				Length (ft.):	114				
	Type:						_		
Speed Lim	it (MPH):	35		F	Placement with Respect to Road:	TANGENT			
Hazard Behind	Hazard Behind Barrier: MEDIUM								
Barrier Crashwo	rthiness								
Appropriate Test			Barrier	NCW		Is Barrier	NO		
Level:	10 2		Test Level:			worthy?:			
Beg. End Trtmt	NONE		Is Beg. End Trtmt	N/A		Approach	NONE		
Туре:			Crashhworthy?:		Transit	ion Type:			
Ending End Trtmt Type:	NONE		Ending End Trtmt Crashhworthy?:	N/A					
Average Measure	ements		Crushi worthy !!						
Design Height (In.):	24		Width (In.):	8.0	Dogt Smo		0.0		
Height (In.):				70.3		cing (In.): rade (%):	1.20		
Physical Condition	on		Lateral Offset (In.):						
		ment and Height:							
Barrier		aking and Cracking:							
	Missing		There are no missing eleme	are as no missing elements					
	wiissing	Elements:	There are no missing ciclin						
		osion and eathering:	There is gravel/sediment by	uild-up next to the v	vall.				
	Align	ment and							
		Height:							
	Bre	aking and	<u> </u>						
End Treatments		Cracking:							
	Missing	Elements:							
		osion and eathering:							

B	arrier ID:	PEFO-001	1-0.008-L							
Route Name: BLUE MESA ROAD										
Inspection Date: 04/04/2010			0	Barrie	r Rating:	19.20				
Repair Recomme	endations	5								
Repair Action:	REPAIR			DEFERRED MAINTENANCE	Repair \$1760					
Brief Workorder:	Remove the	Remove the gravel/sediment build-up next to the barrier.								
Workorder:	r: Loader at \$125- per -Hour for 1 Hrs = \$125. Remove gravel/sediment build-up next to wall Low Speed Traffic Control at \$1475- per -Day for 1 Day(s) = \$1475.									
	2008 co	st estimate (A	ASTM Class D), prelimin	ary for comparison to otl	her repair co	sts only.				

# **Petrified Forest National Park**

ROUTE 0011: BLUE MESA ROAD



PEFO\_0011\_0.008\_L\_1.jpg

Ba	arrier ID:	PEFO-001	1-0.012-R					
Rou	ite Name:	BLUE ME	ESA ROAD					
Inspect	tion Date:	04/04/201	0		Barrier Rating:	16.70		
Barrier Descripti					Surrier Funding,			
	Туре:	OTHER: C	ONCRETE BLOCK Barrier Function:		TRAFFIC			
Barrier	Barrier Material: CONCRET				Post Material:	N/A		
Blockout N/A Type:				Length (ft.):	111			
Speed Limit (MPH): 35					Placement with Respect to Road:	TANGENT		
Hazard Behind	l Barrier:	LOW						
<b>Barrier Crashwo</b>	rthiness							
Appropriate Test Level:	TL-2		Barrier Test Level:	NCW		Is Barrier worthy?:	NO	
Beg. End Trtmt Type:	NONE		Is Beg. End Trtmt Crashhworthy?:	N/A		Approach ion Type:	NONE	
Ending End Trtmt Type:	NONE		Ending End Trtmt Crashhworthy?:	N/A				
Average Measure	ements							
Design Height (In.):	24		Width (In.):	8.0	Post Spa	cing (In.):	0.0	
Height (In.):	28.7		Lateral Offset (In.):	69.0	Road G	rade (%):	2.20	
Physical Condition		ment and Height:	Alignment is acceptable. Height is 0-9 in above 24-in design height.					
Barrier		aking and Cracking:	There was no breaking or c	racking observed.				
	Missing	Elements:	There are no missing eleme	ents.				
		osion and eathering:	There is no corrosion or we some minor peeling due to	-	uctural portion of the ba	rrier but the p	ainted finish has	
	Align	ment and Height:						
End Treatments		aking and Cracking:						
	Missing	Elements:						
		osion and eathering:						

Barrier ID: PEFO-0011-0.012-R			1-0.012-R				
Route Name:		BLUE ME	BLUE MESA ROAD				
Inspection Date:		04/04/201	0		Barrier Rating:	16.70	
Repair Recomme	endations	5					
Repair Action:	NO ACTIC	DN	FMSS Work Type:	N/A		Repair Cost:	\$0
Brief Workorder:	N/A						
Workorder:							
	2008 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.						

# **Petrified Forest National Park**

ROUTE 0011: BLUE MESA ROAD

# **Barrier Condition Photos**



PEFO\_0011\_0.012\_R\_1.jpg

Route Name:       RF MUSEUM AND PICNIC PARKING         Inspection Date:       04/04/2010       Barrier Rating:       19.80         Barrier Description         Type:       STONE MASONRY WITHOUT CONCRETE CORE WALL       Barrier Function:       NON-TRAFFIC         Barrier Material:       STONE       Post Material:       N/A         Blockout Type:       N/A       Length (ft.):       84         Stone MASONRY WITHOUT CONCRETE CORE WALL       Post Material:       N/A         Barrier Material:       STONE       Post Material:       N/A         Blockout Type:       N/A       Length (ft.):       84         Stone MasonRY WITHOUT CONCRETE CORE WALL       Post Material:       N/A         Barrier Material:       N/A       Length (ft.):       84         Type:       TL-1       Barrier Test Level:       N/A       Appropriate Test Level:       Is Beg. End Triutt       N/A       Approach	B	arrier ID:	PEFO-090	1-0.000-P1				
Barrier Description         Type:       STONE MASONRY WITHOUT CONCRETE CORE WALL       Barrier Function:       NON-TRAFFIC         Barrier Material:       STONE       Post Material:       N/A         Blockout Type:       N/A       Length (ft.):       84         Blockout Type:       N/A       Length (ft.):       84         Monorthiness         Hazard Behind Barrier:       LOW         Barrier Crashworthiness         Appropriate Test Level:       TL-1       Barrier Test Level:       N/A         Barrier Crashworthiness         Appropriate Test Level:       N/A       Is Beg. End Trtmt Crashworthy?:       N/A         Barrier Crashworthiness         Appropriate Test Level:       N/A       Is Beg. End Trtmt Crashworthy?:       N/A         Beg. End Trtmt Type:       N/A       Crashworthiness         Appropriate Test Level:       Is Beg. End Trtmt Crashworthy?:       N/A         Beg.					RKING			
Barrier Description         Type:       STONE MASONRY WITHOUT CONCRETE CORE WALL       Barrier Function:       NON-TRAFFIC         Barrier Material:       STONE       Post Material:       N/A         Blockout Type:       N/A       Length (ft.):       84         Blockout Type:       N/A       Length (ft.):       84         Monorthiness         Hazard Behind Barrier:       LOW         Barrier Crashworthiness         Appropriate Test Level:       TL-1       Barrier Test Level:       N/A         Barrier Crashworthiness         Appropriate Test Level:       N/A       Is Beg. End Trtmt Crashworthy?:       N/A         Barrier Crashworthiness         Appropriate Test Level:       N/A       Is Beg. End Trtmt Crashworthy?:       N/A         Beg. End Trtmt Type:       N/A       Crashworthiness         Appropriate Test Level:       Is Beg. End Trtmt Crashworthy?:       N/A         Beg.	Inspec	tion Date.	04/04/201	0	Bar	rier Rating.	19.80	
Type:       STONE MASONRY WITHOUT CONCRETE CORE WALL       Barrier Function:       NON-TRAFFIC         Barrier Material:       STONE       Post Material:       N/A         Blockout Type:       N/A       Length (ft.):       84         Speed Limit (MPH):       15       Placement with Respect to Road:       NON-TRAFFIC BARRIER         Barrier Crashworthiness       LOW       NON-TRAFFIC BARRIER       NON-TRAFFIC BARRIER         Barrier Crashworthiness       LOW       NON-TRAFFIC BARRIER       N/A         Beg. End Trtmt Type:       TL-1       Barrier Test Level:       N/A       Is Barrier Crashworthy?:       N/A         Beg. End Trtmt Type:       NONE       Is Beg. End Trtmt Crashhworthy?:       N/A       Approach Transition Type:       NONE         Ending End Trtmt Type:       NONE       Ending End Trtmt Crashhworthy?:       N/A       0.0       0.0         Average Measurements       Design Height (In.):       24       Width (In.):       19.0       Post Spacing (In.):       0.0         Height (In.):       18.7       Lateral Offset (In.):       0.0       Road Grade (%):       0.00         Physical Condition       Alignment and       Alignment is acceptable. Height is 3-6 in below 24-in design height for 14 ft and more than 6 in			01/01/201	0	Dui	ner Rating.	19.00	
Blockout Type:       N/A       Length (ft.):       84         Speed Limit (MPH):       15       Placement with Respect to Road:       NON-TRAFFIC BARRIER         Hazard Behind Barrier:       LOW       Low       NON-TRAFFIC BARRIER         Barrier Crashworthiness       Is Barrier       N/A       Is Barrier         Appropriate Test Level:       TL-1       Barrier Test Level:       N/A       Is Barrier Crashworthy?:         Beg. End Trtmt Type:       NONE       Is Beg. End Trtmt Crashhworthy?:       N/A       Approach Transition Type:       NONE         Ending End Trtmt Type:       NONE       Ending End Trtmt Crashhworthy?:       N/A       0.0       0.0         Average Measurements       Utidth (In.):       19.0       Post Spacing (In.):       0.0         Physical Condition       Alignment and       Alignment is acceptable. Height is 3-6 in below 24-in design height for 14 ft and more than 6 in					Barrie	er Function:	NON-TRAFFIC	
Type:         Type:         Type:         Speed Limit (MPH):       15       Placement with Respect to Road:         NON-TRAFFIC BARRIER         Hazard Behind Barrier:       LOW         Barrier Crashworthiness         Appropriate Test       TL-1       Barrier Test Level:       N/A       Is Barrier Crashworthy?:       N/A         Beg. End Trtmt       NONE       Is Beg. End Trtmt Crashhworthy?:       N/A       Approach Transition Type:       NONE         Ending End Trtmt       NONE       Ending End Trtmt Crashhworthy?:       N/A       ONE       ONE         Average Measurements       Ending End Trtmt       N/A       Post Spacing (In.):       0.0         Height (In.):       18.7       Lateral Offset (In.):       0.0       Road Grade (%):       0.00         Physical Condition	Barrier	Material:	STONE		Po	st Material:	N/A	
Respect to Road:         Respect to Road:         Hazard Behind Barrier:       LOW         Barrier Crashworthiness         Appropriate Test       TL-1       Barrier       N/A       Is Barrier       N/A         Level:       TL-1       Barrier       N/A       Is Barrier       N/A         Beg. End Trtmt       NONE       Is Beg. End Trtmt       N/A       Approach       NONE         Type:       Is Beg. End Trtmt       N/A       Approach       NONE         Ending End Trtmt       NONE       Ending End Trtmt       N/A       Approach       NONE         Ending End Trtmt       NONE       Ending End Trtmt       N/A       One       One         Average Measurements       Ending End Trtmt       N/A       Is 0.0       Post Spacing (In.):       0.0         Design Height (In.):       18.7       Lateral Offset (In.):       0.0       Road Grade (%):       0.00         Physical Condition       Alignment and       Alignment is acceptable. Height is 3-6 in below 24-in design height for 14 ft and more than 6 in			N/A		-	Length (ft.):	84	
Barrier Crashworthiness         Appropriate Test Level:       TL-1       Barrier Test Level:       N/A       Is Barrier Crashworthy?:       N/A         Beg. End Trtmt Type:       NONE       Is Beg. End Trtmt Crashhworthy?:       N/A       Approach Transition Type:       NONE         Ending End Trtmt Type:       NONE       Ending End Trtmt Crashhworthy?:       N/A       Approach Transition Type:       NONE         Average Measurements       Ending End Trtmt Crashhworthy?:       N/A       O.0       O.0       O.0         Height (In.):       24       Width (In.):       19.0       Post Spacing (In.):       0.0       0.0         Physical Condition       Is.7       Lateral Offset (In.):       0.0       Road Grade (%):       0.00	Speed Lim	it (MPH):	15				NON-TRA	FFIC BARRIER
Appropriate Test Level:TL-1Barrier Test Level:N/AIs Barrier Crashworthy?:N/ABeg. End Trtmt Type:NONEIs Beg. End Trtmt Crashhworthy?:N/AApproach Transition Type:NONEEnding End Trtmt Type:NONEEnding End Trtmt Crashhworthy?:N/AApproach Transition Type:NONEAverage MeasurementsEnding End Trtmt Crashhworthy?:N/A0.00.0Height (In.):24Width (In.):19.0Post Spacing (In.):0.0Height (In.):18.7Lateral Offset (In.):0.0Road Grade (%):0.00Physical ConditionAlignment andAlignment is acceptable. Height is 3-6 in below 24-in design height for 14 ft and more than 6 in	Hazard Behind	d Barrier:	LOW					
Level:Test Level:Crashworthy?:Beg. End Trtmt Type:NONEIs Beg. End Trtmt Crashhworthy?:N/AApproach Transition Type:Ending End Trtmt Type:NONEEnding End Trtmt Crashhworthy?:N/AAverage MeasurementsCrashhworthy?:0.0Design Height (In.):24Width (In.):19.0Height (In.):18.7Lateral Offset (In.):0.0NoneIsoment andAlignment is acceptable. Height is 3-6 in below 24-in design height for 14 ft and more than 6 in	Barrier Crashwo	rthiness						
Type:Crashhworthy?:Transition Type:Ending End Trtmt Type:NONEEnding End Trtmt Crashhworthy?:N/AAverage MeasurementsCrashhworthy?:N/ADesign Height (In.):24Width (In.):19.0Post Spacing (In.):0.0Height (In.):18.7Lateral Offset (In.):0.0Road Grade (%):0.00Physical ConditionAlignment andAlignment is acceptable. Height is 3-6 in below 24-in design height for 14 ft and more than 6 in		TL-1			N/A			N/A
Type:Crashhworthy?:Image: Crashhworthy?:Average MeasurementsDesign Height (In.):24Width (In.):19.0Post Spacing (In.):0.0Height (In.):18.7Lateral Offset (In.):0.0Road Grade (%):0.00Physical ConditionAlignment andAlignment is acceptable. Height is 3-6 in below 24-in design height for 14 ft and more than 6 in	_	NONE			N/A			NONE
Design Height (In.):       24       Width (In.):       19.0       Post Spacing (In.):       0.0         Height (In.):       18.7       Lateral Offset (In.):       0.0       Road Grade (%):       0.00         Physical Condition       Alignment and       Alignment is acceptable. Height is 3-6 in below 24-in design height for 14 ft and more than 6 in		NONE			N/A			
Height (In.):       18.7       Lateral Offset (In.):       0.0       Road Grade (%):       0.00         Physical Condition       Alignment and       Alignment is acceptable. Height is 3-6 in below 24-in design height for 14 ft and more than 6 in	Average Measur	ements						
Physical Condition         Alignment and       Alignment is acceptable. Height is 3-6 in below 24-in design height for 14 ft and more than 6 in	Design Height (In.):	24		Width (In.):	19.0	Post Spa	cing (In.):	0.0
Alignment and Alignment is acceptable. Height is 3-6 in below 24-in design height for 14 ft and more than 6 in	Height (In.):	18.7		Lateral Offset (In.):	0.0	Road G	rade (%):	0.00
	<b>Physical Condition</b>	on						
		Align	ment and Height:			in design height f	for 14 ft and m	ore than 6 in
Barrier     Breaking and Cracking:     There was no breaking or cracking observed.	Barrier							
Missing Elements: There are no missing elements.		Missing 3	Elements:	There are no missing elements.				
Corrrosion and Weathering:       There was no corrosion or weathering observed.				There was no corrosion or	weathering observed.			
Alignment and Height:		Align						
End Treatments     Breaking and Cracking:								
Missing Elements:		Missing 3	Elements:					
Corrrosion and Weathering:								

Ba	arrier ID: PEFO-0901-0.000-P1						
Rou	ute Name: RF MUSEUM AND PICNIC PA			RKING			
Inspect	tion Date:	04/04/201	)	Barrie	er Rating:	19.80	
<b>Repair Recomme</b>	endations	5					
Repair	REPAIR		FMSS	DEFERRED		Repair	\$32368
Action:			Work Type:	MAINTENANCE		Cost:	
Brief	Raise guardwall 4-in. Remove and reset 30-ft. of stone masonry guardwall on concrete footer to adjacent 18-in height.						
Workorder:							
Workorder:			5	er -Cu. Ft. for 96 CF = $$240$	00. Remove ar	nd reset 30 fee	t to match
	0 0	L \	(2ft)(2ft)(30ft) = 96CF.	¢1000 I ( 11 ( ) 1		1 1	· · · · · · · · · · · · · · · · · · ·
	Structural Concrete at \$1000- per -Cu. Yd. for 1 CY = \$1000. Install structural concrete 4 inches deep to raise barrier. [(1.6ft) $(0.56)(206)(27-0.0)CV$						
	(0.5ft)(30ft)] /27 = 0.9 CY. Low Speed Traffic Control at \$1475, per Day for 2 Day(c) = \$4425. Traffic control may be required for parking lot 1 day						
	Low Speed Traffic Control at $1475$ - per -Day for 3 Day(s) = $4425$ . Traffic control may be required for parking lot. 1 day removal 2 days installation.						
		·		ary for comparison to otl	her repair co	sts only.	

# **Petrified Forest National Park** ROUTE 0901: RF MUSEUM AND PICNIC PARKING

## **Barrier Condition Photos**



PEFO\_0901\_0.000\_P1\_1.jpg

Ba	arrier ID:	PEFO-0901-0.000-P2					
	te Name:	RF MUSE	RF MUSEUM AND PICNIC PARKING				
Inspect	<b>Dection Date:</b> 04/04/2010		10 Barrier Rating		arrier Rating.	26.30	
Barrier Descripti		5 1/ 0 T/ 201	• 				
	Туре:	STONE MA			rier Function:	NON-TRAFFIC	
Barrier	Material:	STONE			Post Material:	N/A	
	Blockout Type:	N/A			Length (ft.):	118	
Speed Limi	t (MPH):	15			Placement with espect to Road:	NON-TRA	FFIC BARRIER
Hazard Behind	Barrier:	LOW					
Barrier Crashwo	rthiness						
Appropriate Test Level:	TL-1		Barrier Test Level:	N/A		Is Barrier worthy?:	N/A
Beg. End Trtmt Type:	NONE		Is Beg. End Trtmt Crashhworthy?:	N/A		Approach tion Type:	NONE
Ending End Trtmt Type:	NONE		Ending End Trtmt Crashhworthy?:	N/A			
Average Measure	ements						
Design Height (In.):	24		Width (In.):	19.0	Post Spa	cing (In.):	0.0
Height (In.):	14.6		Lateral Offset (In.):	0.0	Road G	rade (%):	0.00
<b>Physical Conditio</b>	n						
	Align	ment and Height:	Alignment is acceptable. 7 below the 24-in design hei		24-in design height a	and 46ft. was r	nore than 6 in
Barrier		aking and Cracking:	There was no breaking or c	cracking observed.			
	Missing ]	Elements:	There are no missing elements.				
		osion and eathering:	There was no corrosion or	weathering observed.			
	Align	ment and Height:					
End Treatments Cracking		aking and Cracking:					
	Missing	Elements:					
		osion and eathering:					

B	Barrier ID: PEFO-0901-0.000-P2						
Rou	ate Name: RF MUSEUM AND PICNIC PA			NIC PARKING			
	tion Date: 04/04/2010		Darri	Definer	26.30		
· · · · ·			J	Barrie	er Rating:	20.30	
Repair Recomme	endations	5					
Repair Action:	REPAIR			DEFERRED MAINTENANCE		Repair Cost:	\$4765
Brief Workorder:	Raise guardv	Raise guardwall 6-in. Remove and reset 46-ft. of stone masonry guardwall on concrete footer to adjacent 18-in height.					
Workorder:	Remove & Reset Stone Masonry Guardwall at \$250- per -Cu. Ft. for 147 CF = \$36750. Remove and reset guardwall. [(1.6ft) (2ft)(46ft)] = 147CF. Structural Concrete at \$1000- per -Cu. Yd. for 2 CY = \$2000. Structural concrete for stability. [(1.6ft)(0.5ft)(46ft)] /27 = 1.4CY. Replace Block at \$30- per -Each for 5 Block(s) = \$150. Replace 5 cracked blocks. Low Speed Traffic Control at \$1475- per -Day for 3 Day(s) = \$4425. Parking lot but traffic control may be needed. 1 day removal 2 days installation.						
	2008 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.						

# **Petrified Forest National Park** ROUTE 0901: RF MUSEUM AND PICNIC PARKING

# **Barrier Condition Photos**



PEFO\_0901\_0.000\_P2\_1.jpg



PEFO\_0901\_0.000\_P2\_2.jpg

# Appendix A Summary of GIP Definitions and Assessment



**Petrified Forest National Park** 



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

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

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

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

# **Static Barrier Characteristics**

### **BARRIER TYPE**

Refers to both the design and the construction materials used:

- W-Beam, Strong Post
- W-Beam, Weak Post
- Thrie Beam/Modified Thrie Beam
- Box Beam
- Steel-Backed Timber, w/ Blockout
- Steel-Backed Timber, w/o Blockout
- Steel-Backed Log Rail
- High Tension Cable
- Three-Strand Cable

### **BARRIER MATERIAL**

The type of material of which the barrier is composed:

- Cable
- Concrete
- Galvanized Steel
- Log/Timber/Wood

- Steel-Backed Timber/Log
- Weathering Steel/Corten
- Stone
- Other: Completed by field crew

### LENGTH

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

A-1

Stone Masonry, w/ Concrete Core WallRandom Rubble Cavity Wall

Stone Masonry, w/o Concrete Core Wall

• Concrete Barrier

•

- Concrete, with Simulated Stone Face
- W-Beam (Double Face), Strong Post
- Steel-Backed Timber (Double Face)
- Other: Completed by field crew

### BARRIER FUNCTION: Traffic or Non-Traffic Barrier.

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

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

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

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

### POST MATERIAL

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

- Galvanized Steel
- Wood
- Corten

### **BLOCKOUT TYPE**

The type of blockout or of what it is comprised:

- Wood
- Plastic

Other: Completed by field crew

• Steel

N/A

• N/A

### BARRIER PLACEMENT WITH RESPECT TO ROADWAY

To identify the roadway alignment the barrier is located upon:

- Tangent
- Inside of Curve

- Both Inside and Outside of Curve
- Outside of Curve

### POSTED SPEED LIMIT

The posted speed limit of the roadway section.

## HAZARD BEHIND BARRIER

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

- Low
- Medium

## APPROPRIATE TEST LEVEL (TL) FOR ROAD

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

- TL-1, 30 mph and lower
- TL-2, 35-45 mph

## **BARRIER TEST LEVEL (TL)**

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

- TL-1
- TL-2
- TL-3

### **IS BARRIER CRASHWORTHY**

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

• Yes

• No

No

### **BEGINNING END TREATMENT TYPE**

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

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

- W-Beam Flared 350 Compliant
- W-Beam Tangent 350 Complaint
- W-Beam Buried End
- W-Beam Trailing End/CRG
- W-Beam BCT, Flared
- W-Beam, Turn Down
- SBT/Log, Flared

- SBT/Log, Buried
- Median Treatments
- Box Beam
- Cable
- Crash Cushions/Attenuator
- Other: Completed by field crew
- None

TL-3, 50 mph and higher

N/A – Non-Traffic Barrier

High

Extreme

# IS BEGINNING END TREATMENT CRASHWORTHY

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

- Yes
- No

# APPROACH TRANSITION TYPE

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

This identifies the barrier's transition type:

- Bridge Rail, W-Beam
- Bridge Rail, SBT
- Rigid W-Beam, W-Beam
- Rigid SBT (Wall), SBT
- Concrete/Masonry, W-Beam

# ENDING END TREATMENT TYPE

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

- W-Beam Flared 350 Compliant
- W-Beam Tangent 350 Complaint
- W-Beam Buried End
- W-Beam Trailing End/CRG
- W-Beam BCT, Flared
- W-Beam, Turn Down
- SBT/Log, Flared

- SBT/Log, Buried
- Median Treatments
- Box Beam
- Cable
- Crash Cushions/Attenuator
- Other: *Completed by field crew*
- None

N/A

# IS ENDING END TREATMENT CRASHWORTHY

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

- Yes
- No

# **BARRIER DESIGN HEIGHT**

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

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

- 31-in, Steel-Backed Log
- 32-in, Jersey Barrier

- Concrete/Masonry, SBT
- Concrete/Masonry, Thrie Beam
- Other: *Completed by field crew*
- None

- two different to
- N/A

### **AVERAGE MEASUREMENTS**

Minimum of three measurements taken on each barrier.

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

Last measurement approximately 50-ft from the end of the barrier. Do not take a measurement along the end treatment

If a barrier is less than 300-ft, even say 45-ft, a minimum of three measurements were still taken.

### **AVERAGE WIDTH**

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

### AVERAGE POST SPACING

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

### **AVERAGE BARRIER HEIGHT**

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

### **AVERAGE LATERAL OFFSET**

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

### **AVERAGE ROAD GRADE and UPHILL OR DOWNHILL**

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

# DYNAMIC BARRIER CHARACTERISTICS – CONDITION ASSESSMENT NARRATIVES

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

### **BARRIER ALIGNMENT/HEIGHT**

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

### **BARRIER BREAKING/CRACKING**

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

### **BARRIER MISSING ELEMENTS**

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

### BARRIER CORROSION/WEATHERING

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

### END TREATMENTS ALIGNMENT/HEIGHT

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

### END TREATMENTS BREAKING/CRACKING

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

### END TREATMENTS MISSING ELEMENTS

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

### END TREATMENTS CORROSION/WEATHERING

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

### **BARRIER PHOTOGRAPHS**

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

# CONDITION AND SEVERITY DISTRESS TABLES

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

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

### GOOD

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

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

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

### FAIR

<u>The barrier is slightly compromised.</u> The barrier is noticeably out of alignment and the height along the run of barrier varies considerably. Cracks and broken elements are visible from the roadside. The barrier may be missing elements, such as nuts, bolts, blockouts or even a post. Surface corrosion is visible on a fair amount of the barrier but connections will still provide element interlock. Decay and minor erosion, while not always visible, may begin to reduce element strength and individual post stability. <u>The end treatment is slightly compromised.</u> The end treatment may be somewhat out of alignment, have low cable anchor tension or isolated broken or cracked rail, posts or blocks. Corrosion and erosion are evident.

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

### POOR

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

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

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

# **CONDITION AND SEVERITY DISTRESS TABLES – BARRIERS**

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

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

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

Condition and Severity		crete Barriers (including pre-c	
	GOOD	FAIR	POOR
Alignment/Design H	leight		
	• Alignment off by less than 6"	• Alignment off by 6"-12"	• Alignment off by more than 12"
	Within 1" of <i>design</i> <u>height</u>	• Less than 3" lower than <i>design height</i>	• Greater than 3" lower than <u>design height</u>
Breaking/Cracking-	- due to impact loading		
	• Minor cracks (less than 1/4") present	Cracking present ¼" or greater but no displacement or discontinuity in face	Barrier displaced and/or discontinuous
	• n/a	Pieces broken from barrier 3" deep or less without exposing rebar	Cracking exposes rebar
	• n/a	• n/a	• Pieces broken from face greater than 3" deep
Missing Elements			
	• n/a	• n/a	• n/a
Corrosion/Decay/W	eathering – due to aging		
	• Surface corrosion on less than 5% of the run	• Surface corrosion on between 5-25% of the run	• Surface corrosion on more than 25% of the run
	• n/a	• Spalling 3" deep or less without exposing rebar	• Spalling greater than 3" deep
	• Erosion (less than 8" below groundline) around base	Erosion (8" or more below groundline) around base	• Erosion (8" or more below groundline)
	• n/a	• Less than 50% undermined (less than half barrier width)	• 50% or more undermined (less than half barrier width)

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

masonry barriers).	GOOD	FAIR	POOR
Alignment/Design H	leight		
	• Alignment (off by less than 6")	• Alignment (off by 6"- 12")	• Alignment (off by more than 12")
	Within 3" of <u>design</u> <u>height</u>	• Between 3.1 - 6" lower than <i>design height</i>	• Greater than 6.1" lower than <i>design height</i>
Breaking/Cracking -	- due to impact loading		
	• Minor cracks (less than 1/4") present	• Cracks, less than <sup>1</sup> / <sub>2</sub> " present	• Cracks greater than <sup>1</sup> /2" present
		• Stones broken/displaced extending less than 1/3 of width of barrier	• Stones broken/displaced extending 1/3 width or more through the barrier
Missing Elements			
	• n/a	• n/a	• n/a
Corrosion/Decay/We	eathering – due to aging		
	Cracks in mortar joints     1/4" or less and/or single     loose or missing stones	Mortar joints     deteriorated resulting in     two - three loose or     missing adjacent stones     (without impact)	Mortar joints     deteriorated resulting in     more than three     continuous/adjacent     loose or missing stones     (without impact)
	• Erosion (less than 8" below groundline) around base	• Erosion (8" or more below groundline) around base	• Erosion (8" or more below groundline)
	• n/a	• Less than 50% undermined (less than half barrier width)	• 50% or more undermined (less than half barrier width)

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

designed without blocks	GOOD	FAIR	POOR
Alignment/Tension/	Design Height		
	No bent posts	• Bent posts; one to three consecutive posts	Bent posts; four or more consecutive posts
	Cable has tension	Cable under- tensioned/sagging	No cable tension
	• Less than 1" too low	• 1-3" too low	• Greater than 3" too low
Breaking/Cracking			
	No cracked or broken     posts	One to three isolated broken posts	• Four or more consecutive broken posts
	• n/a	Cable frayed	Cable broken or severed
Missing Elements			
	No bolts and nuts missing at anchors	• n/a	Bolts and nuts missing     or loose at anchors
	• n/a	• n/a	• Any missing posts or cable for any length of run
Corrosion/Decay/We	eathering – due to aging		
	• Loss of 5% or less of cable cross section	• Loss of 5% to 15% of cable cross section	• Loss of 15% or more of cross section
	• Erosion (less than 8" of post exposed below original groundline)	• Erosion around one post (8" or more of post exposed below original groundline)	Erosion around consecutive posts (more than 8" of post exposed below original groundline)

# **CONDITION AND SEVERITY DISTRESS TABLES – END TREATMENTS**

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

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

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

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

# SPECIFIC RISK ELEMENTS

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

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

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

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

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

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

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

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

7 to 10 years of crash data, if available.

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

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

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

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

- Low
- Medium
- High
- Extreme

### RISK ASSESSMENT AND RISK SCORE

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

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

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

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

# **REPLACEMENT/REPAIR STRATEGIES**

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

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

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

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

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

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

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

Asset Management Roadway Categories, Risk Thresholds and Treatment Recommendations.

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

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

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

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

Proposed Countermeasures.

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

#### **Maintaining Barriers As Is**

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

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

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

### **Barrier Repair**

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

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

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

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

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

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

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

### **Barrier Replacement/Reconstruction**

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

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

### WORK ORDERS

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

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

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

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

There are four types of work:

- No Action
- Monitor
- Repair
- Replace

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

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

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

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

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

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

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

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