Attachment F

September 12, 2022

Railroad Rehabilitation Assessment
Willits MP 139.5 to Longvale MP 152.5

American Rail Engineers

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Contents

1. Introduction

This Assessment was completed to determine an estimated cost necessary to rehabilitate 13 miles of GRTA Rail Line from Willits, CA MP 139.5 north to Longvale, CA MP 152.5 to FRA Class 1 track standards for freight rail service.

This segment of the railroad was last in-service 24 years ago. It was embargoed on December 9, 1998 by the FRA due to washouts and flooding events associated with El Niño storms rendering the track unsafe. The 13 miles of rail line had minimal maintenance prior to the embargo and has not been maintained since the embargo. Therefore, obtaining access was challenging given the inherent geohazards and the heavy vegetation over much of the right-of-way.

ARE's team for the assessment includes several senior individuals with decades of railroad experience. The separate individual's areas of expertise include:

- Geotechnical engineering with extensive experience working with shortline and Class 1 railroads addressing slides, erosion, and tunnels.
- Roadmaster responsibilities for track maintenance and safety with extensive knowledge of FRA regulations for Class 1 track.
- Railroad Bridges and Structures experience with extensive knowledge of FRA related requirements for Bridge Management Programs, inspection requirements and load capacity determinations.
- Railroad CEO responsible for overall operations and P&L.

Bios of the team members and their roles are included at the end of this document.

The current condition of the railroad was determined by field inspection of approximately 6.5 miles of the line and low-level photography and LiDAR collected by helicopter. The LiDAR was helpful in areas of heavy vegetation for detection of land formations, such as outlining landslides. It however was not helpful for more detailed information like tie conditions in areas that were not accessible on foot. In addition, as outlined in the geotechnical assessment, past assessments in 2002 and 2007 provided insight to tunnel condition over time.

2. Geotechnical Assessment

Line Segment Description[1]

North of Willits (MP 139.5), the railroad parallels Highway 101 and Outlet Creek along the western margin of Little Lake Valley. A few miles north of Willits (MP 142), the railroad curves west, diverging away from Highway 101. The rail alignment continues to follow Outlet Creek, transitioning from alluvial soils in the valley to terraces and benches along the toe of steep slopes in a relatively narrow, incised valley. As Outlet Creek flows to the northwest, it cuts across ridges and curves around hills in sharp bends past Tunnel 11 (MP 145.49) and Bridge 145.69. North of the bridge, the creek and railroad follow a relatively straight course along the toe of a ridge to MP 148 where they rejoin Highway 101. From MP 148 to the Highway 162 turnoff near Longvale (MP 152.5), the highway, Outlet Creek and the railroad curve and

[1] Line Segment Description from *Geotechnical & Tunnels Assessment Report* by Shannon & Wilson, see Appendix A.

cross twice in the narrow valley. The railroad continues to follow Outlet Creek to its confluence with the Eel River near MP 159.5.

Between MP 142 and MP 152, Outlet Creek and the railroad cut through and traverse an elongated, northwest-southeast trending exposure mapped as the Coastal Terrane geologic unit (TKfs), part of the Coastal Belt of the Franciscan Complex. Northeast of MP 152, the alignment is within Late Jurassic to Middle Cretaceous rocks of the Central Belt of the Franciscan Complex Mélange (KJfm). This Franciscan Mélange unit consists predominantly of highly fractured, highly sheared argillite. The Coastal Terrane and Central Terrane Mélange units are both highly susceptible to landsliding.

Geotechnical / Tunnel Work items

The location and description of geotechnical work items found within the 13 miles of this assessment are detailed in Appendix A. Table 1 is a summary of the work items and the estimated quantities. Costs associated with these work items and projected ongoing maintenance related to these items is provided in Section 6 Maintenance and Section 7 Rehabilitation Costs.

Table 1 – Geotechnical Work Items and Quantities

Geotechnical / Tunnel	Number of Locations	Estimated Total Track Length (Ft)	Estimated Total Quantity
Tunnel 11 Repair	1	704	1 LS
Ditching (1-side) / Shoulder Cleaning at Rock & Debris Slides	20	9,610	3,797 CY
Rock Slope Scaling	2	2,720	70 HRS
Catchment Walls (K-Rail Barrier)	2	300	125 LF
Shoulder Retaining Wall	4	1,270	1,270 LF

Tunnels: Two tunnels are located within this assessment project area. Tunnel 11 is located at MP 145.49 and is approximately 704 ft long. It was constructed with timber sets and timber lagging in the early 1900’s and has had some timber sets replaced with steel sets. This tunnel has collapsed and needs extensive repairs. Tunnel 12 is located at MP 149.94 and is approximately 895 ft long. It was constructed in the early 1900’s like tunnel 11. This tunnel was damaged by a fire and rebuilt with steel sets and lined with concrete. It is in good condition but has standing water because of lack of ditch maintenance.

Ditching at Slides: There are several areas that require ditching due to rock and debris slides. The rockslides consist of fracture rock, mixed soil, and woody debris resulting in talus slopes. It is evident at several of these slide areas that they have required substantial clearing over time based on large stockpiles of material on the opposite side of the track from ditching. In areas of recurring larger rock falls it is recommended that rock slopes be scaled and catchment walls constructed with K-Rail Barriers.

Photo 1 Typical slide example

Photo 2 MP 146.0 Talus slope

Shoulder Walls: As a result of steep embankment slopes and bank erosion along bends of Outlet Creek, four locations require shoulder retaining walls. Shannon & Wilson geotechnical engineers recommend cast-in-place concrete or shotcrete walls supported on vertical micropiles installed from the roadbed as the most economical solution. The four locations are: MPs 148.9, MP 151.0, MP 151.6, and MP 151.8. At MP 151.6 a field visit measured the distance from face-of-rail to top-of-embankment down slope of 4.0 feet. See Photo 3 and Photo 4 showing the steep railroad embankment on the right side of the track and at the same location the left side of the track with poor drainage. At MP's 148.9 and 152.6 Photos 5 and 6 show bare earth LiDAR views of the erosion of Outlet Creek which is very susceptible to frequent high flows in the rainy season.

Photo 3 MP 151.6 steep slope at Outlet Creek.

Photo 4 MP 151.6 poor drainage

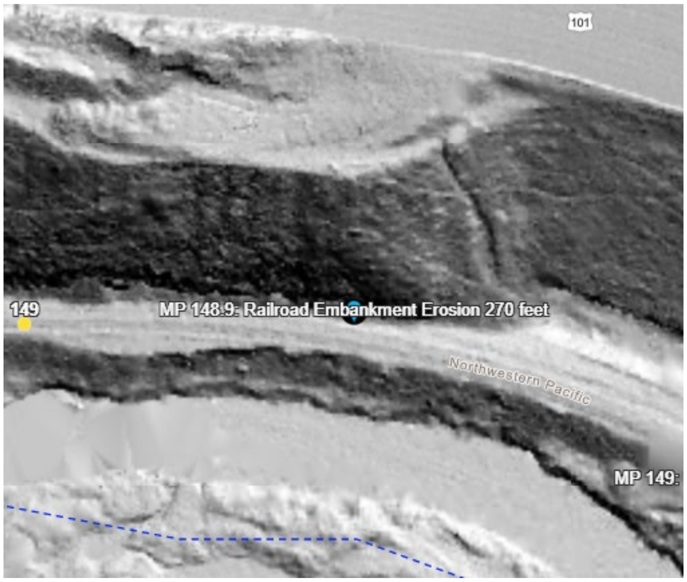

Photo 5 LiDAR image MP 148.9 erosion at Outlet Creek

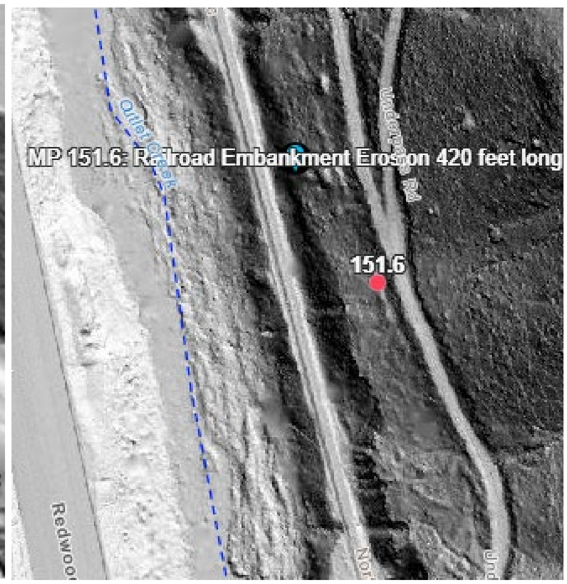

Photo 6 LiDAR image MP 151.6 erosion

3. Track Rehabilitation

Brush Cutting and Vegetation Removal

The summary findings below are based on a July 2022 field inspection of approximately 1/3 of the right of way and review of aerial photography of the line acquired in December of 2021:

Table 2 – Vegetation Condition

Classification	Miles	Scope of Work
Cleared	1.5	Brush cutting
Light	1.5	Brush cutting
Medium	3	Brushcutting
Heavy	7	Manual Tree/Shrub Removal and brush cutting

Cleared = Able to hi-rail; locals have cleared track for speeder use
Light = No trees; small shrubs; track 90% visible able to walk.
Medium = Trees up to 4” diameter; difficult to walk; track 50% visible
Heavy = Trees up to 6” to 8” diameter; not walkable; track 20% visible

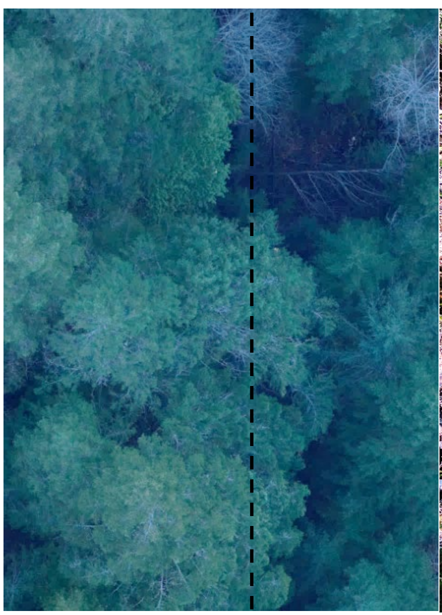

Photo 7 Example of Heavy Vegetation Canopy over Rail Right-of-way MP 150.6 (dashed line is centerline of track)

Photo 8 Example of Heavy Vegetation at Track Level MP 150.6

Vegetation needs to be cleared 15 feet to 20 feet horizontally from centerline of track and 20 feet vertically to provide required site distance, safety of train crew, and to minimize fire hazard. The cost to clear vegetation assumes using an on-track mounted brush cutter to clear 6 miles and spreading the chipped debris on the right of way. The 6 miles of brush cutting would cover all but the 7 miles of heavy vegetation. Heavy vegetation includes 20-to-30-foot-tall trees mixed with low level shrubs, small trees and fallen trees from up slopes. See Photo 7 showing an aerial view of tree canopies and Photo 8 taken when walking the track. For heavy vegetation areas the removal cost assumes that there would be a combination of brush cutting and manual labor falling trees and a flatbed grapple truck to assist with the clearing. Many areas of heavy vegetation are in a narrow corridor requiring removal of material to a disposal area. The larger vegetation that is growing within the track bed will require the removal of stumps and root system. This also assumes manual labor and use of a grapple truck. This will disturb and destroy several ties. The tie program discussed below takes this into account.

Culverts

Based on track charts there are 52 culverts on this 13-mile segment of track, as listed in the table below. They consist of 12” x 12” to 24” x 24” timber culverts, 12” to 24” corrugated metal pipes (CMP), and 24” to 36” concrete pipes.

Table 3 – Culverts Willits to Longvale[2]

Culvert No.	Station	MP	Material/Type	Dimensions	Length (ft)
1	8538	141.51	Timber box	12" x 12"	17
2	10935	141.96	CMP	24" diameter	36
3	11780	142.12	Concrete Pipe	36" diameter	63
4	12710	142.3	Timber box	12" x 18"	16
5	13073	142.37	Concrete Pipe	24" diameter	57
6	14081	142.56	Concrete Pipe	36" diameter	62
7	15360	142.8	Concrete Pipe	36" diameter	57
8	16272	142.97	Concrete Pipe	24" diameter	68.4
9	18164	143.33	Concrete Pipe	24" diameter	48
10	18671	143.43	Concrete Pipe	36" conc pipe	62
11	20610	143.8	Concrete Pipe	24" diameter	70
12	21038	143.88	Timber Box	12” x 14”	32.2
13	21571	143.98	Concrete Pipe	24" diameter	61
14	22040	144.07	Concrete Pipe	36" diameter	67.5
15	22965	144.24	Concrete Pipe	24" diameter	48.8
16	23790	144.4	Concrete Pipe	24" diameter	33.4
17	24245	144.48	Concrete Pipe	24" diameter	46.2
18	24770	144.58	Concrete Pipe	24" diameter	47
19	25665	144.75	Concrete Pipe	36" diameter	57.4
20	26181	144.85	Concrete Pipe	30" diameter	49.3
21	28650	145.32	Concrete Pipe	24" diameter	36.6
22	31811	145.92	Concrete Pipe	36" diameter	41.6
23	32919	146.13	Concrete Pipe	36" diameter	62.4
24	33644	146.26	Timber Box	12” x 24”	30
25	33931	146.32	Concrete Pipe	36" diameter	37.9
26	34467	146.42	Concrete Pipe	36" diameter	31.2
27	34892	146.5	CMP	12" diameter	15

[2] This list is representative of culverts on the segment and has not been updated for possible replacements.

Culvert No.	Station	MP	Material/Type	Dimensions	Length (ft)
28	34892	146.5	Timber Box	12” x 12”	12
29	35060	146.53	Timber Box	24” x 24”	20
30	37158	146.93	Concrete Pipe	24" diameter	41.5
31	39215	147.32	Concrete Pipe	36" diameter	41
32	40006	147.47	Timber box	12" x 24"	24
33	44951	148.41	Timber Box	2 -8” x 12”	18
34	47075	148.81	Concrete Pipe	36" diameter	40.7
35	47881	148.96	CMP	24" diameter	18
36	48150	149.01	Concrete Pipe	36" diameter	41.6
37	54424	150.2	Concrete Pipe	36" diameter	36
38	53730	150.07	Timber box	12" x 24"	16
39	54883	150.29	Timber box	12" x 12"	12
40	55308	150.37	Concrete Pipe	24" diameter	23.6
41	55448	150.39	Timber Box	12” x 24”	16
42	55710	150.44	CMP	12" diameter	20
43	56639	150.62	Timber box	12" x 18"	15.6
44	59728	151.2	Concrete Pipe	36" diameter	54
45	60580	151.37	Timber box	12" x 24"	20
46	61200	151.48	Concrete Pipe	24" diameter	23
47	61744	151.59	Concrete Pipe	24" diameter	30
48	65430	152.28	Concrete Pipe	24" diameter	76
49	66025	152.4	Timber Box	12” x 24”	86
50	66240	152.44	CMP	18" diameter	81
51	66353	152.46	CMP	16" diameter	20
52	66934	152.57	Concrete Pipe	36" diameter	56.8

The lack of culvert maintenance over the last 24 years was evident in the field inspection. In general, culvert inlets need clearing of debris and sedimentation and repair of headwalls and wingwalls; and in many cases outlets require repair or installation of headwalls and wingwalls and have erosion that requires remediation, including riprap and possible tight lining down embankments. Based on the evidence of railroad track over-topping and review of drainage watersheds, some culverts are undersized, which is prevalent in railroads constructed in the early 1900’s.

The determination of cost for culvert rehabilitation is based on field inspection, careful review of high-definition aerial photography, LiDAR, and the importance of drainage to track condition. The following work is included:

- All culverts will need to be located and cleared of obstructions
- Small timber culverts require replacement
- 50% of the pipe culverts require headwall and wing wall repairs/replacements to address erosion
- The final program will require a detailed inspection of all culverts after removal of vegetation
- All culvert sizes need to be reviewed for capacity based on watershed hydraulics

Photo 9 Example of ineffective headwall

Photo 10 Case of culvert outlet erosion and possible culvert under sizing

Track Ditching

In addition to the 9,610 feet (1.8 miles) of ditching listed to address geotechnical hazards in the Geotechnical Assessment, there is an additional 59,030 feet of mainline track in this 13-mile segment that was evaluated for ditching. Track drainage is one of the most significant factors of track integrity and safety. The ditching depth is assumed to range between three- to six-feet to maintain drainage to culverts. The work will require a hi-rail backhoe with a 3-person crew with spoils placed on the right-of-way at appropriate locations.

Rail and Tie program

Field inspection of the rail revealed that the rail is in fair condition with minimal signs of wear and sufficient for freight rail service at 10 mph with the grades and curves on this 13-mile segment.

The ties on this segment are in very poor condition reflecting the 24 years the track has been out of service. The track bed ballast is very fouled, and vegetation growth includes trees with 6" to 8" diameters and mature shrubs. The fouled ballast has accelerated tie deterioration and the vegetation removal process will destroy many ties. Before a tie program is implemented it is assumed that vegetation and ditching would be complete.

The estimated cost for track rehabilitation to FRA Class I standards will include a tie program of 1,500 ties per mile. This number could increase upon detailed inspection due to interior rot. As the result of the heavily fouled ballast, a ballast program of 4" to 8" is required. The 8" ballast lift and tamp is needed from MP 149 to 151 where there has been very poor drainage, poor sub ballast and little to no shoulders. The entire line will need surfacing and regulating after the installation of the tie program.

From MP 145.9 to 146.5 the track was subjected to a large forest fire. The fire destroyed all ties for this 0.6 miles of track. In this area the most economical rehabilitation is a complete replacement of the track ties and ballast. Field observations indicated that much of the ballast does not meet railroad ballast specifications. The rail was visually inspected, and it appears that the heat of the fire did not impact the rail and it can be relayed. The rebuild of this segment assumes removal of the rail to be set aside and relayed, replacement of 100% of the ballast (existing non-compliant ballast stockpiled for other use) and installation of all new ties. The rail would be relayed and the ties would be surfaced and regulated. See photos below of fire damaged area, tie damage and substandard ballast.

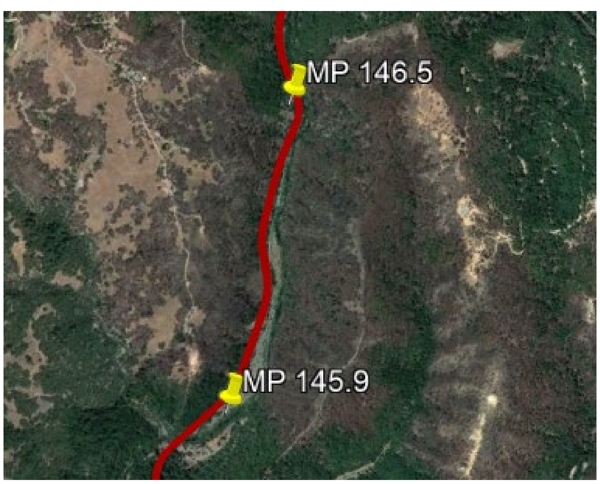

Photo 11 Area of fire damage

Photo 14 Fire damaged track and substandard ballast.

4. Bridge Assessment

There are twenty-two bridges on this segment. The bridges include a combination of timber trestles, deck plate girders and riveted trusses as shown in Table 4 Bridge Inventory.

Table 4 – Bridge Inventory

Item No.	Bridge Type	MP	No. Spans	Length Ft	Crossing	Station
1	BDT	139.73	4	60	Willits Creek	
2	ODT	140.54	4	60	Mill Creek	3459.2
3	ODT	141.29	14	195.6	Upp Creek	7386.6
4	BDT	141.79	1	10	Wild Oat Canyon	10009.5
5	BDT	142.10	1	15	Drainage	11645
6	DPG	143.07	3	180	Outlet Creek	16778.9
7	BDT	143.10	14	192	Outlet Creek	16960.5
8	BDT	143.66	1	13	Drainage	19880
9	BDT	145.08	1	16	Ryan Creek	27369
10	Rail Top	145.18	1	10	Drainage	27894
11	TRT	145.62	2	200	Outlet Creek	30247
12	TBS	146.67	1	10	Drainage	35794
13	DPG	147.19	2	140	Outlet Creek	38521.8
14	DPG	147.68	2	160	Outlet Creek	41109.3
15	DPG	148.10	3	240	Outlet Creek	43310
16	Rail Top	148.50	1	10	Drainage	45442
17	BDT	148.67	1	13	Tomkl Creek	46367.9
18	TPG	149.18	3	210	Outlet Creek	49045.2
19	TBS	150.56	1	13	Drainage	56344.1
20	TBS	150.70	1	13	Drainage	57089.5
21	DPG	151.06	3	180	Outlet Creek	58969
22	DPG	151.99	6	400	Outlet Creek	63867.9

The eight Deck Plate Girder bridges have multiple spans with concrete piers and abutments all spanning Outlet Creek. These crossings of Outlet Creek are frequently subjected to very high flows resulting in scour around concrete piers. Exacerbating the impact, many of the piers are skewed to the high flows. During the December 2021 inspection, Outlet Creek was overflowing its banks. See photos below of Bridge at MP 151.99.

Photo 15 Bridge 151.99 Outlet Creek heavy flow

Photo 16 Bridge 151.99 Outlet Creek overflowing banks

In general, the steel bridges are in fair condition with minimal signs of corrosion. The main concern for some of these bridges is their timber decks that require bridge tie replacements and walkway and railing repairs. The timber trestles also require timber deck repairs as well as timber stringer and timber bents repairs.

FRA 49 CFR Ch. II Part 237 Bridge Safety Standards requires that any railroad bridge that has been out of service for the previous 540 days must be inspected in accordance with the requirements of Part 237 prior to resumption of rail service.[3] The reinstatement of service would require an update to the existing Bridge Management Program, all bridges to have a detailed inspection including any appropriate underwater and/or scour inspection, and the determination of each bridge's safe load capacity. These activities would be required to be conducted under the review of a Railroad Bridge Engineer.

Below is a summary table of required repairs for startup of freight service that would require updating after the above required inspections and load ratings are completed.

Table 5 – Bridge Assessment Summary

Bridge	Deficiencies	Crossing	Notes
139.73	Timber bent piles and cap beams, deck and walkway, backwalls and vegetation removal	Willits Creek	Multiple tracks and three switches on bridge, fire damage
140.54	Timber bent piles and cap beams, deck and walkway, backwalls and vegetation removal	Mill Creek	Multiple tracks
141.29	Timber bent piles and cap beams, deck and walkway, backwalls and vegetation removal	Upp Creek	Vandalized bents
141.79	Erosion and scour abatement	Wild Oat Canyon	Large up-stream watershed
142.10	Deck, walkway and vegetation removal	Under Grade	Abandoned farm crossing
143.07	Bridge ties, guard timbers, walkway repairs, and vegetation removal	Outlet Creek	
143.10	Bridge ties, guard timbers, walkway repairs, and vegetation removal	Outlet Creek	
143.66	Stringer replacements, ballast retainers	Drainage	Concrete abutments
145.08	Stringer replacements, ballast retainers	Ryan Creek	Concrete abutments
145.18	Scour abatement	Drainage	
145.62	Vegetation removal	Outlet Creek	Skewed concrete piers
146.67	Stringer replacements, ballast retainers	Drainage	Concrete abutments
147.19	Bridge ties	Outlet Creek	
147.68	Bridge ties	Outlet Creek	
148.10	Bridge ties, guard timbers and walkway repairs	Outlet Creek	

[3] Section 237.101 (d) states, "Any railroad bridge that has not been in railroad service and has not been inspected in accordance with this section within the previous 540 days shall be inspected and the inspection report reviewed by a railroad bridge engineer prior to the resumption of railroad service."

Bridge	Deficiencies	Crossing	Notes
148.50	Heavy flows, Concrete Abutments scour	Drainage	Concrete abutments
148.67	Scour abatement	Tomkl Creek	
149.18	Bridge ties, guard timbers and walkway repairs	Outlet Creek	
150.56	Stringer replacements, ballast retainers	Drainage	Concrete abutments
150.70	Stringer replacements, ballast retainers	Drainage	Concrete abutments
151.06	Bridge ties, guard timbers and walkway repairs	Outlet Creek	
151.99	Bridge ties, guard timbers, walkway repairs, and vegetation removal	Outlet Creek	

5. Crossings Public & Private

Public Road Crossings

There are three public crossings: State Highway 101 at MP 141.20, Reynolds Highway at MP 143.91, and Covelo Road at MP 152.2. There are no current railroad signals at these public crossings. The warning devices have been removed at both Highway 101 and Covelo Road except for the cantilevers at Highway 101. The physical crossings including rail, ties, and ballast were removed because of unsafe conditions at Highway 101 and Covelo Road and a lack of funds for the required repairs. The inspection of the crossing at Reynolds Highway showed no indication that it has ever had railroad warning signs. The roadway alignment at all three of these crossings is at a high skew, increasing the safety risk of the crossings due to line-of-sight. The skew also increases the length of the physical track crossing increasing the cost to maintain and repair the crossing.

The California Public Utility Commission (CPUC) has jurisdiction over safety mitigations at all public railroad crossings. The three public crossings will require a formal on-site diagnostic to finalize the required railroad crossing warning measures for public safety. Implementation of the warning measures will require a formal approval process through the submittal of a GO 88B form to the CPUC. This document is requiring to be signed by the agency that owns the roadway, agreeing to the safety measures to be implemented.

The cost associated with these crossings includes the submittal of GO 88B’s, reconstructing each of the track roadway crossings, the installation of required signals, approach warning signs, pavement markings, and roadway traffic control. Below is a brief description of each crossing with photos.

Table 6 – Public Crossings Assessment

Crossings	Mile Post	Recommendation	Comments	Photo
Highway 101	MP 141.2	Install 200-foot curved track crossing with concrete panels, Install active constant warning devises including gates and cantilevers, approach roadway signs and address driveway entrance that lays within the crossing.	Tree removals along highway will be required to improve train crew line of site. Crossing skewed 60 degrees.	
Reynolds Highway	MP 143.91	Reconstruct existing very poor 24-foot timber crossing with a concrete panel crossing, add appropriate approach warning signs.	Tree Trimming required S.W. & N.E. Quadrants. Crossing skewed 30 degrees.	
Covelo Road	MP 116.96	Install 100-foot crossing with concrete panels, Install active constant warning devises including gates and cantilevers, approach roadway signs.	Covelo Road west approach is highly curved and may require advanced warning signal.	

Private Road Crossings

Field inspections and aerial photography identified 12 private crossings. However, the heavy vegetation in the project area makes it difficult to conclude all private crossing were found. Two of the locations identified appear to be crossings added over the last 24 years by locals filling in railroad crossing areas with gravel.

There are a variety of uncertainties regarding ownership and responsibility for repair costs at the twelve private crossings. According to current DOT crossing Inventory, there are several private crossings that are not listed and will require DOT Inventory sheets to be submitted and DOT Numbers assigned. Private crossing records have not been found to assist with the determination of responsibilities for maintenance. None of the crossings inspected in the field had crossing warning signs.

The rehabilitation costs for the private crossings include effort to submit inventory sheets and obtain DOT Numbers, reconstruction of each crossing, the installation of required private crossing signage, and the vegetation clearing for line of sight. Table 7 summarizes the information for identified private crossings.

Table 7 – Private Crossings Assessment

Crossings	Mile Post	Recommendation	Comments	Photo
Located in Willits Yard	MP 140.00	Crossing in good condition. Constructed as part of Highway 101 Bypass. Crossing signs required	Tree removal on west approach to railroad may require additional tree removal for line of site.	
Private Resident	MP 141.40	Reconstruct existing very poor 24-foot timber crossing with a concrete panel crossing, add appropriate approach warning signs.	One residence	

Crossings	Mile Post	Recommendation	Comments	Photo
Mendocino Forest Products Crossing	MP 142.03	Heavy truck usage, earthwork activities. Crossing parallel to 101 with wide angle egress and entrance roads to crossing from 101. Signing and reconstruction of paved over crossing required	This will be a costly repair.	
Serves Several private residences	MP 142.68	Poor condition Rail exposed		
Private Residence may include addition homes	MP 142.77	Crossing in poor condition. Gravel track buried		

Crossings	Mile Post	Recommendation	Comments	Photo
Serving two residences	MP 145.13	Crossing in poor condition. Gravel track buried	.	
Gravel over track, Appears to be serving two residences	MP 145.17	Crossing in poor condition. Gravel track buried	.	
Appears to be serving two residences	MP 145.34	Gravel over track, very skewed. crossing in poor condition	.	

Crossings	Mile Post	Recommendation	Comments	Photo
One Resident	MP 145.60	Crossing in poor condition. Gravel track buried	Timber crossing planks in very poor condition	
Serving one parcel	MP 148.34	Crossing in poor condition. Gravel track buried.	.	
Serving one residence	MP 148.41	Crossing in poor condition. Gravel track buried		

Crossings	Mile Post	Recommendation	Comments	Photo
Serving one parcel	MP 149.40	Crossing in poor condition. Gravel track buried		

6. Maintenance

In an interview of a former train crew member that worked this segment 40 years ago, he stated, "there were daily train stops to address obstructions like fallen trees and rock." This type of activity is covered in the Operations Assessment report. Items listed below are related to preventative measures and items related to routine required safety inspections of track and structures. These include chemical spraying for weed control, routine brush cutting, tree trimming, culvert maintenance, bridge repairs based on annual inspections, and track repairs based on required routine track inspections. See table below of expected annual maintenance.

Table 8 – Annual Maintenance Cost Estimate

Work Item	Maintenance Item	Frequency	Cost
Timber Bridges	Examples: stringer replacements, cap replacements, bridge tie replacements, erosion mitigation	Annual	$100,000
All Bridges	Bridge inspection as required under Part 237	Annual	$25,000
Culverts	Debris and sediment removal, erosion mitigation	Pre- and Post-rainy season, and any significant storm	$25,000
Weed Control	Spray pre-emergent and weed spraying	Spring and Fall	$40,000
Vegetation Management	Brush cutting and tree trimming	Annual	$26,250
Track Maintenance	Track ties, OTM – tie plates, anchors, rail joints	As required to maintain track safety	In Operations Cost
Drainage Management	Track ditching	Annual	$150,000
		Total Annual Maintenance	$366,250

7. Rehabilitation Costs

The following table summarizes the rehabilitation costs based on the assumptions outlined in the previous sections.

Table 9 – Rehabilitation Cost Estimate

Scope of Work	Quantity	Unit	Unit cost	Estimated cost
Yard Rehabilitation				
Willits Yard Rehab	1	LS	$150,000	$150,000
Longvale Yard Rehab	1	LS	$115,000	$115,000
			Subtotal Yard Rehabilitation	*$265,000*
Public Crossings				
Highway 101	1	LS	$1,750,000	$1,750,000
Reynolds Highway	1	LS	$84,000	$84,000
Covelo Road	1	LS	$1,250,000	$1,250,000
GO88-B	3	LS	$7,500	$22,500
			Subtotal Public Crossings	*$3,106,500*
Private Crossings[4]				
Mendocino Forest Products Crossing (56')	1	LS	$216,000	$216,000
4 - 12 ft Crossings	48	LF	$3,500	$168,000
1 -14 ft Crossing	14	LF	$3,500	$49,000
3 - 16 ft Crossings	48	LF	$3,500	$168,000
1 - 18 Ft Crossing	18	LF	$3,500	$63,000
2 - 20 ft Crossings	40	LF	$3,500	$140,000
Standard Crossing Signage	12	LS	$2,500	$30,000
Crossing Agreements/DOT Inventory Numbers	12	LS	$1,500	$18,000
			Subtotal Private Crossings	*$852,000*
Bridge Repairs				
Bridge Ties	343	EA	$650	$222,857
Yard Bridge Walkways	400	FT	$150	$60,000
Yard Bridge Timber Railing	400	FT	$150	$60,000
Guard Timbers	1,000	FT	$50	$50,000
Timber Stringers	32	EA	$15,000	$480,000
Timber Bents	5	EA	$18,000	$92,700
Vegetation removal at Bridges	22	EA	$7,500	$165,000
Detailed Inspection per FRA Part 237	22	EA	$1,800	$39,600
Bridge Rating per FRA Part 237	22	EA	$3,500	$77,000
			Subtotal Bridge Repairs	*$1,247,157*
Geotechnical Hazards				
Tunnel 11	1	LS	$7,259,000	$7,259,000
Tunnel 12	120	LF	$110	$13,200

[4] Work on private crossings should be required to be paid by users. New crossing agreements will be required.

Scope of Work	Quantity	Unit	Unit cost	Estimated cost
Slide Area Ditching / Shoulder Cleaning / Debris Removal	3,797	CY	$75	$284,775
Shoulder Retaining Wall	1,270	LF	$1,400	$1,778,000
Rock Slope Scaling	80	HRS	$1,104	$88,320
Catchment Walls (K-Rail Barrier)	125	LF	$185	$23,125
Geotechnical Support During Tunnel & Shoulder Wall Construction	1	LS	$451,850	$451,850
			Subtotal Geotechnical	*$9,898,270*
Track - Rehabilitation to Class 1 - 12.4 miles (excludes fire damaged area 0.6 miles)				
Ditching	29,515	CY	$25	$737,875
Ties Program 1500 ties/mile	18,600	EA	$220	$4,092,000
Tie disposal	18,600	EA	$12	$223,200
Ballast 4" Lift and Tamp	8,277	CY	$45	$372,486
Ballast 8" Lift and Tamp	3,184	CY	$45	$143,264
Regulating & Surfacing	10	Days	$2,000	$20,000
			Subtotal Track Rehab to Class 1 (12.4 miles)	*$5,588,825*
Track - Reconstruct Fire Damaged Area (0.6 miles)				
Ties	1,810	EA	$200	$362,057
Ballast 12"	1,447	CY	$45	$65,102
Regulating & Surfacing	4	Days	$2,000	$8,000
Removal of existing track bed	1,408	CY	$15	$21,120
			Subtotal Track Reconstruction (0.6 miles)	*$456,279*
Track Vegetation & Signing & Testing- 13 miles				
Vegetation Removal	60	Days	$8,750	$568,750
Milepost and Whistle Signs/Posts	1	LS	$7,500	$7,500
Rail testing	13	Miles	$2,000	$26,000
			Subtotal Track Rehabilitation - 13 miles	*$602,250*
Culvert Rehabilitation				
Clear debris & sedimentation	22	EA	$2,500	$55,000
Clear and Repair	16	EA	$7,125	$114,000
Culvert Replacement	14	EA	$22,250	$311,500
			Subtotal Culvert Rehabilitation	*$480,500*
			Rehabilitation Cost	**$ 22,496,781**

8. Contributing Authors:

- David Anderson, P.E. of American Rail Engineers Corporation (ARE) served as Project Manager and Senior Engineer in ARE's capacity as prime consultant for the project. He is licensed as a Professional Engineer in California and has worked with the state agencies overseeing the NWP corridor for over 20 years. Mr. Anderson's roles for this project included senior-level reviewer and editor of this report.
- Carl Belke, P.E. of D&H Rail Consulting prepared the Operations Assessment. Carl serviced as President and Chief Operating Officer for the Western New York & Pennsylvania Railroad for 10 years, General Manager and Vice President of Canadian Operations for Genesee & Wyoming for 7 years and has more than 40 years' experience in railroad operations for a dozen of short line railroads with responsibility for labor management, fleet management, bankruptcy reorganizations, and mergers and acquisitions.
- Lon Van Gemert advised on Class 1 track requirements and rehabilitation costs. Van Gemert has over 55 years in the railroad industry, starting his career in 1967 as a section laborer and semi-retiring as CEO of several short line railroads headquartered in the Midwest. In this capacity, he has been responsible for capital planning and maintenance budgets as well as overall profit and loss.
- Steve McMullen served as S&W's project manager and primary author of the report. He has been part of S&W's railroad services group for 29 years. Mr. McMullen is licensed as a Professional Civil Engineer in Washington, Idaho, Montana, North Dakota, and South Dakota. He is also a Licensed Engineering Geologist in Washington. Mr. McMullen has over 20 years of experience with the Northwestern Pacific Railroad corridor having performed geotechnical and geological evaluations of corridor segments in 1999, 2002, 2005, 2007, and 2021.
- Klaus Winkler prepared the tunnel assessment and repair portions of the report including the estimated costs in Table 2. He also provided cost information for the geotechnical repairs on Table 1. Mr. Winkler is a Licensed Engineering Geologist in Washington. He has been with S&W for 25 years working almost exclusively on railroad tunnel and rock slope projects for the last 20 years.
- David O'Malley prepared the geologic conditions section of the report, contributed to the geotechnical site list and recommendations in Table 1, and edited the report. Mr. O'Malley is a Licensed Engineering Geologist in Washington with over 32 years of professional experience.

Appendix A

SUBMITTED TO:
Mr. David Anderson
ARE Corporation
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BY:
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GEOTECHNICAL & TUNNELS ASSESSMENT REPORT

Northwestern Pacific Rail Corridor Milepost 139.5 to 152.5

WILLITS TO LONGVALE, CALIFORNIA

September 7, 2022

Shannon & Wilson No: 107934-002

SHANNON & WILSON

Submitted To: Mr. David Anderson
ARE Corporation
Kansas City, MO 64111

Subject: GEOTECHNICAL & TUNNELS ASSESSMENT REPORT, NORTHWESTERN PACIFIC RAIL CORRIDOR
MILEPOST 139.5 TO 152.5 WILLITS TO LONGVALE, CALIFORNIA

This report provides preliminary repair recommendations for tunnels and locations with geotechnical-related damage along the Northwestern Pacific Railroad corridor between Willits and Longvale, California. Shannon & Wilson prepared this report and participated in this project as a subconsultant to American Rail Engineers Corporation (ARE).

We appreciate the opportunity to be of service to you on this project. If you have questions concerning this report, please contact us.

Sincerely,

SHANNON & WILSON

Steve R. McMullen
Vice President

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Appendices

1 INTRODUCTION

American Rail Engineers Corporation (ARE) retained Shannon & Wilson, Inc. (S&W) as a subconsultant to assess geotechnical-related damage to the railroad track, embankment, and tunnels from Milepost 139.5 to 152.5 of the Northwestern Pacific Railroad corridor between Willits and Longvale, California.

This report summarizes geologic conditions in this 13-mile-long segment of the corridor, impacts to the railroad caused by landslides and erosion, and conditions of Tunnels 11 and 12. It describes previous geotechnical and tunnel assessments, the methods used in the assessments, and preliminary recommendations for improvements and repairs. The intent of the recommendations is to improve conditions along the alignment such that freight trains can safely operate at speeds up to 10 miles per hour (FRA Class 1).

This report was prepared by S&W and ARE with contributions from the following personnel:

- David Anderson, P.E. of ARE Corporation served as Project Manager and Senior Engineer in ARE's capacity as prime consultant for the project. He is licensed as a Professional Engineer in California and has worked with the state agencies overseeing the NWP corridor for over 20 years. Mr. Anderson's roles for this project included senior-level reviewer and editor of this report.
- Steve McMullen served as S&W's project manager and primary author of the report. He has been part of S&W's railroad services group for 29 years. Mr. McMullen is licensed as a Professional Civil Engineer in Washington, Idaho, Montana, North Dakota, and South Dakota. He is also a Licensed Engineering Geologist in Washington. Mr. McMullen has over 20 years of experience with the Northwestern Pacific Railroad corridor having performed geotechnical and geological evaluations of corridor segments in 1999, 2002, 2005, 2007, and 2021.
- Klaus Winkler prepared the tunnel assessment and repair portions of the report including Table 2. Mr. Winkler is a Licensed Engineering Geologist in Washington. He has been with S&W for 25 years working almost exclusively on railroad tunnel and rock slope projects for the last 20 years.
- David O'Malley prepared the geologic conditions section of the report, contributed to the geotechnical site list and recommendations in Table 1, and edited the report. Mr. O'Malley is a Licensed Engineering Geologist in Washington with over 32 years of professional experience.

2 SITE AND PROJECT DESCRIPTION

The Northwestern Pacific Railroad (NWP) railroad extends north for over 300 miles from Lombard, California, to Arcata, California. The area covered by this report extends from Willits at Milepost (MP) 139.5 to Longvale at MP 152.5.

From a few miles north of Willits, the railroad follows Outlet Creek north to its confluence with the Eel River. The railroad has suffered extensive storm damage such that trains have not operated within the project area since 1998.

3 PREVIOUS WORK

S&W has previously performed geotechnical assessments of the NWP railroad and are briefly summarized here, including:

- In 1999, S&W assessed the alignment from MP 68 to 284. We summarized our findings in a report titled, "Geotechnical Recommendations for Repair of Northwestern Pacific Railway, MP 68.0 to 284.1, Healdsburg to Eureka, California," and dated June 22, 1999. The 1999 work included field reconnaissance and a tabulation of sites with geotechnical-related damage.
- In 2002, S&W performed a field reconnaissance from MP 11 to MP 291 and updated the 1999 assessment. The 2002 work also included a condition assessment of the tunnels. Our geotechnical and tunnel assessments were summarized in the Capital Assessment Report (CAR) prepared in July 2002 by Willdan and HNTB. In the CAR, we noted track and supporting infrastructure damage from landslides and erosion at 260 sites with 199 of those sites located between Willits and South Fork.
- In 2007, S&W performed a field reconnaissance and updated the previous assessment from about MP 142.5 to MP 237.3. Our findings were summarized in a report titled, "Geotechnical and Tunnel Assessment, Northwestern Pacific Railroad, MP 142.5 to MP 237.3, Willits to South Fork, California," project no. 21-1-20603-001, dated January 28, 2009. Geotechnical-related damage was documented at nearly 290 sites along the railroad alignment from Willits at MP 142.5 to South Fork at MP 237.3 during the 2007 reconnaissance.

4 GEOLOGIC CONDITIONS

North of Willits (MP 139.5), the railroad parallels Highway 101 and Outlet Creek along the western margin of Little Lake Valley. A few miles north of Willits (MP 142), the railroad curves west, diverging away from Highway 101. The rail alignment continues to follow

Outlet Creek, transitioning from alluvial soils in the valley to terraces and benches along the toe of steep slopes in a relatively narrow, incised valley. As Outlet Creek flows to the northwest, it cuts across ridges and curves around hills in sharp bends past Tunnel 11 (MP 145.49) and Bridge 145.69. North of the bridge, the creek and railroad follow a relatively straight course along the toe of a ridge to MP 148 where they rejoin Highway 101. From MP 148 to the Highway 162 turnoff near Longvale (MP 152.5), the highway, Outlet Creek and the railroad curve and cross twice in the narrow valley. The railroad continues to follow Outlet Creek to its confluence with the Eel River near MP 159.5.

Detailed discussions of the regional geology and hydrology across the entire railroad alignment are presented in the references such as the 1998 report by URS Greiner Woodward Clyde (URS).

Within the project area, the railroad traverses rocks of the Franciscan Complex (see Exhibit 4-1). The Franciscan Complex consists of Mesozoic and Cenozoic age, slightly metamorphosed, sheared and fractured, mostly deep-water marine sedimentary rocks that formed along the west coast of California and were accreted onto the continental plate during subduction of the oceanic plate. The Franciscan Complex also contains fragments of volcanic and metamorphic rocks from the crust and mantle of the oceanic plate. The Franciscan Complex is subdivided into three broad belts that become younger to the west, each separated by a series of faults; the Eastern, Central, and Coastal belts.

Between MP 142 and MP 152, Outlet Creek and the railroad cut through and traverse an elongate, northwest-southeast trending exposure mapped as the Coastal Terrane geologic unit (TKfs), part of the Coastal Belt of the Franciscan Complex. Northeast of MP 152, the alignment is within Late Jurassic to Middle Cretaceous rocks of the Central Belt of the Franciscan Complex Mélange (KJfm). This Franciscan Mélange unit consists predominantly of highly fractured, highly sheared argillite. The Coastal Terrane and Central Terrane Mélange units are both highly susceptible to landsliding.

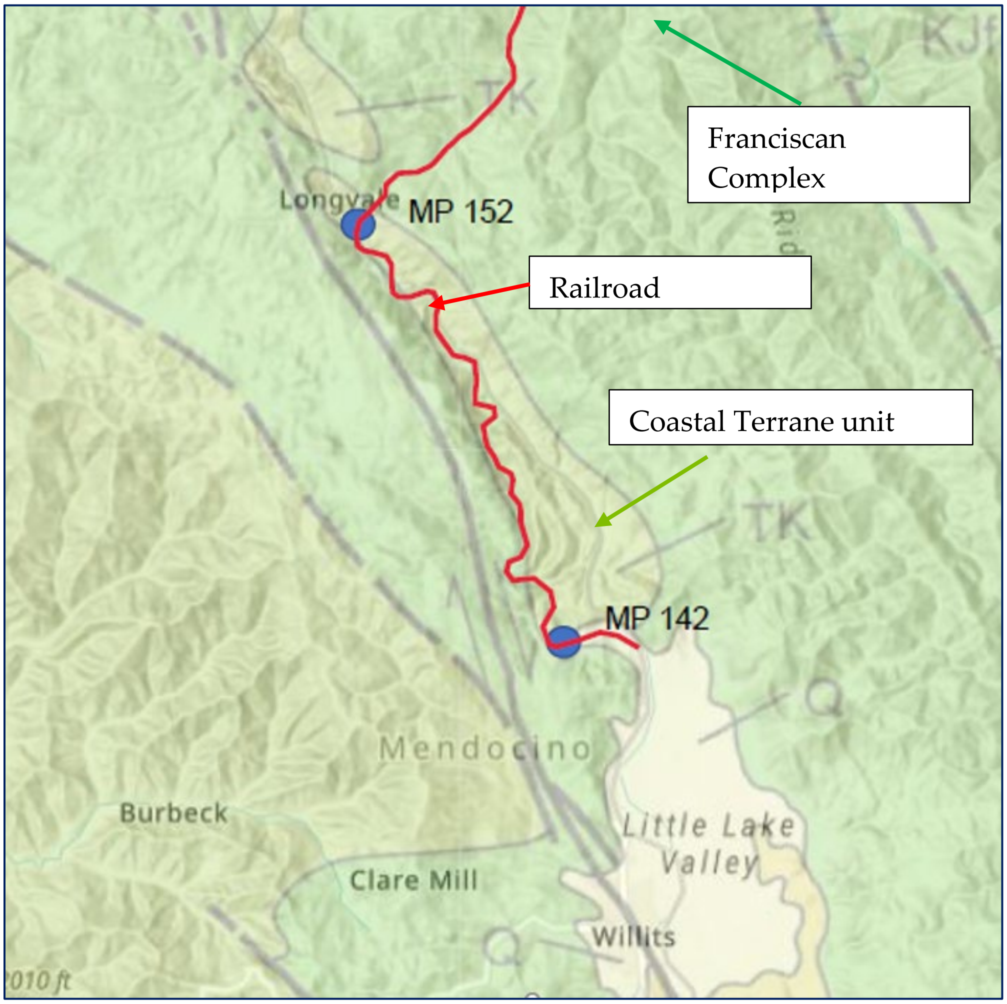

Exhibit 4-1 – Excerpt from the online interactive Geologic Map of California

The Coastal Terrane unit (TKfs) or "broken formation" is Late Cretaceous to Early Eocene age and consists mainly of thickly bedded sandstone (see Exhibit 4-2), with siltstone and shale interbeds with zones of brittle shears, folding, and faulting (see Exhibits 4-3, 4-4 and 4-5). It also contains sections of deep-water marine argillite, and lesser amounts of limestone and pillow basalts.

Exhibit 4-2 – Photo 60 – Blocky sandstone rock slope at approx. MP 147.5

Exhibit 4-3 – Photo 65 – Fragments of highly fractured siltstone and mudstone raveling from rock slope at approx. MP 147.3

The massive, hard sandstone and conglomerate outcrops commonly represent relatively intact blocks of rock bounded by shear zones (see Exhibit 4-4).

Exhibit 4-4 - Photo 95 – Highly fractured siltstone and mudstone interbedded with blocky sandstone exposed on slope at approx. MP 146

Exhibit 4-5 - Photo 15 – Folded and fractured sandstone and siltstone rock slope at approx. MP 151.87

The intact blocks tend to form hard ridges of steep, sharp-crested topography (see Exhibits 4-6 and 4-7) with a well-incised system of irregular sidehill drainage.

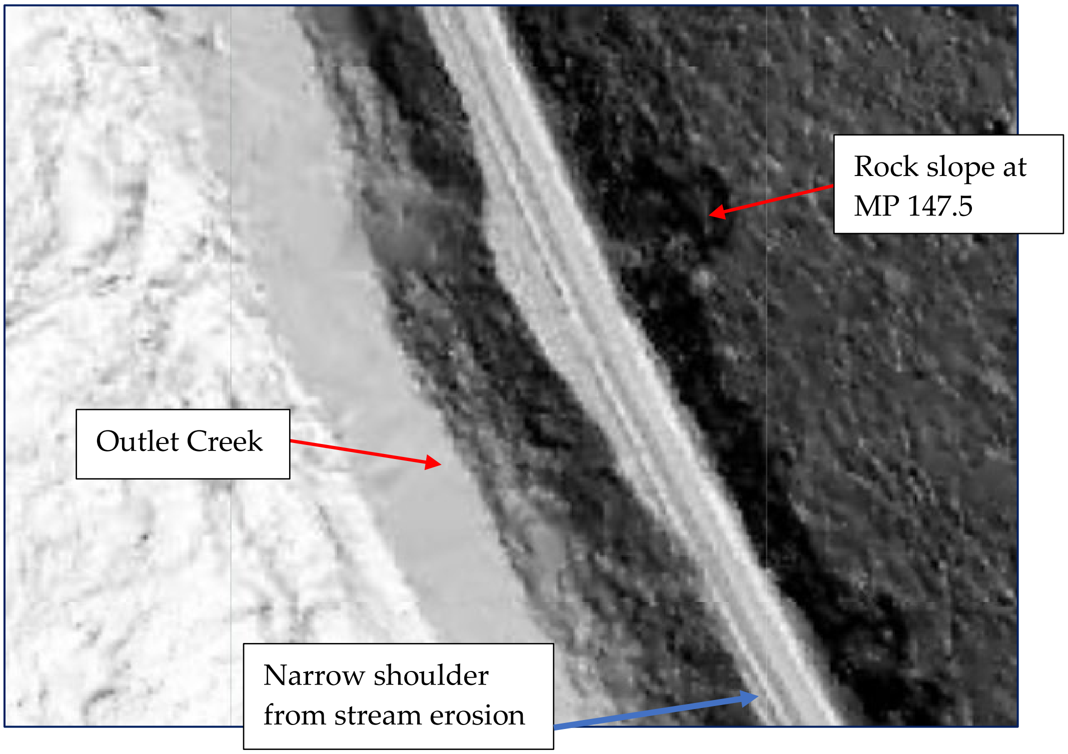

Exhibit 4-6 – LIDAR image of rock slope at about MP 147.5 (see Exhibit 2)

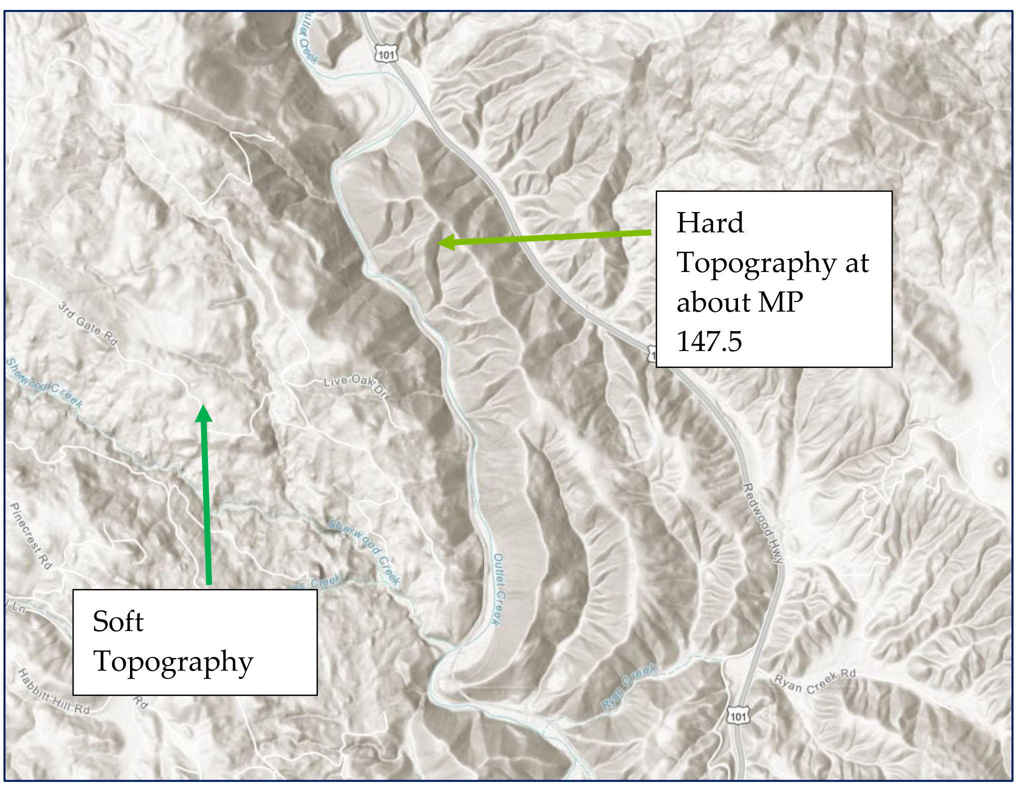

Exhibit 4-7 – LIDAR image snip from USGS National Map – Showing "Hard and soft topography" areas

The weak sheared zones consist of fissile mudstones that easily disaggregate, commonly forming talus deposits at the slope base (see Exhibits 4-3 and 4-4). These shear zones typically create soft topography of gently sloping and rounded, lumpy, and irregular, poorly-incised topography, or irregular topography lacking well-incised sidehill drainages (see Exhibits 4-7 and 4-8).

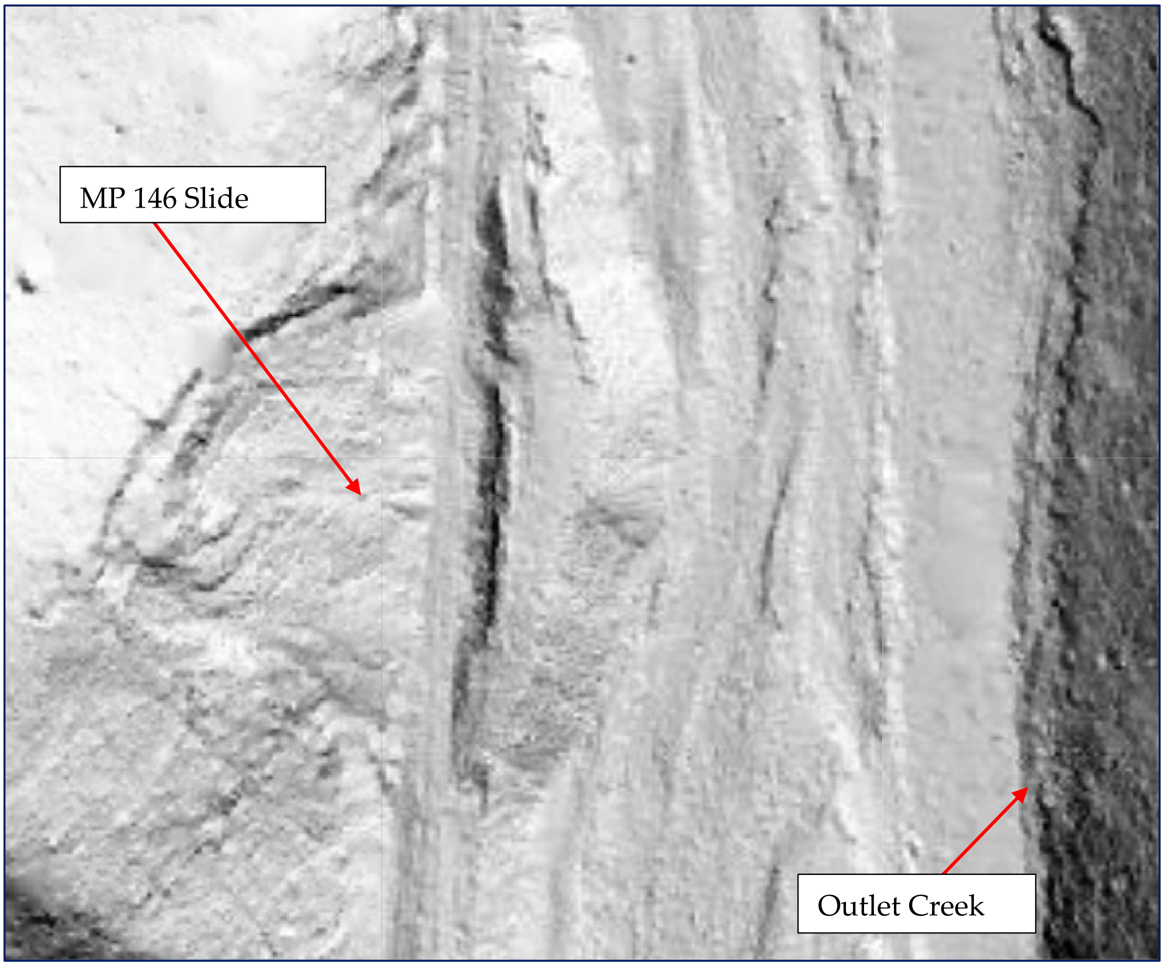

Exhibit 4-8 – LIDAR image of rock slope and landslide at about MP 146 (see Exhibit 4-4)

Streams generally lie in the less competent sheared zones. The massive and hard sandstone blocks form steep slopes, bounded by weak shear zones with landslides of large intact blocks of rock." (CGS, 2014)

As a result of the location of the railroad, landsliding on steep slopes along the railroad deposit landslide debris onto the railroad (see Exhibits 4-3 and 4-4) and stream flow in Outlet Creek erodes the railroad embankment (see Exhibits 4-6 and 4-9).

Exhibit 4-9 - Photo 17 – Narrow shoulder and derailed cars at MP 151.9

5 GEOTECHNICAL ASSESSMENT

5.1 General

Damage to the track roadbed (the soil and rock materials that provide foundation support for the track) caused by severe storms has occurred along the railroad throughout its life. Continued weathering and the lack of maintenance and repairs have resulted in increased damage to the railroad.

The current assessment was performed to document any new geotechnical-related damage to the railroad, to update conditions at sites documented previously, and to provide an estimate of the cost to repair the railroad.

5.2 Assessment Methodology

Passage through the NWP corridor north of Willits has become increasingly difficult over the years due to Tunnel 11 collapse, culvert washouts, debris slides, vegetation, and other damage.

Assessment of the railroad conditions in 2021 and 2022 was performed during field reconnaissance work and by aerial reconnaissance. Aerial mapping was the primary method of evaluating damage from landslides, washouts, and other geohazards. To assess the existing conditions of tunnels, bridges and track components required closer examination. Therefore, we performed a limited ground reconnaissance consisting of six days in the field. The objective of the field reconnaissance was to visit tunnels and bridges that could be accessed easily from existing roads. Based on the conditions of these structures, and changed conditions since previous inspections, we would make some general assessments that would apply to similar but less accessible structures.

5.2.1 Aerial Reconnaissance

ARE under contract with the North Coast Railroad Authority hired GEO1 to collect high resolution photograph and LiDAR data. LiDAR was collected by a Riegl VQ480II sensor rigged to a helicopter flying at an altitude of 500ft AGL. The LiDAR was collected at 200 points per square meter with a swath width of 800ft. Imagery was collected at 800ft AGL (.45"GSD) along with a high pass at 2000ft AGL (1.8"GSD)with a Phase One iXM-RS150F.

The LiDAR was classified to filter the points into ground and above ground points. Bare earth models were created to visualize areas where landslides might be present under vegetation. The rails were also classified in the LiDAR data where the imagery and shadows obscured the track.

5.2.2 Ground Reconnaissance

S&W with ARE performed field reconnaissance of the railroad from December 14 – 19, 2021. ARE performed independent ground reconnaissance from July 6 - 8, 2022. The reconnaissance in the project area focused on segments from MP 144 to MP 148, MP 150 to MP 151, and MP 151.5 to MP 152.5.

The field observations enabled us to make the following general conclusions regarding conditions of the railroad track and structures.

- Vegetation was extremely dense through nearly every alignment segment that we hiked along. Fallen trees, branches, and dense blackberry vines were common. Trees up to 6 inches in diameter were observed growing between ties. Clearing vegetation, just to make the alignment accessible on foot will be significant.

- Tunnels – we observed both Tunnels 11 and 12. Tunnel 11 has collapsed near both portals and Tunnel 12 was in good condition.
- Landslides and Erosion – We observed locations with landslides and erosion problems that were not documented during previous assessments. At previously documented sites, we noted changes in the site dimensions and conditions.
- Rail & Ties – rails were in generally good condition and appear suitable for re-use or relay. Ties on the other hand have suffered from damage due to the ballast becoming entirely fouled with vegetative matter and mud, and by vegetation growing through the roadbed. The track has significant fire damage from MP 145.9 to MP 146.5.

5.3 Assessment Findings

5.3.1 Observations and Causes of Damage

Within the project limits, the track generally follows Outlet Creek and is constructed on a bench in the slope above the creek. There are many areas where the railroad is located on the outer bend of the river. During high river flows, the river actively erodes the toe of the slope, decreasing stability of the track and in some cases the entire hillside

The majority of the roadbed and slope instabilities observed along the railroad were caused by one or more of the following:

- Deposition of debris on the track, shoulders, and ditches from rockfalls and slides.
- Erosion of the toe of the slope or embankment by Outlet Creek.
- Overwhelming of drainage systems or inadequate handling of surface water during storm events.
- Erosion of the slope below a culvert outlet.
- Failure of the track shoulder.

Table 1 describes each geotechnical-related damage site documented during the field reconnaissance or based on review of the aerial mapping data. The recommendations and other information in Table 1 may change due to the inability to access all sites in the field.

5.4 Recommendations

The intent of the geotechnical recommendations presented in this report is to provide practical, geotechnical-engineered designs that will enable restoration of the railroad for Class 1 traffic (10 mph maximum) and reduce the potential for future erosion and damage to the railroad through the implementation of best management practices. We developed the recommendations based on our observations and experience with similar railroad embankment and slope failures. The recommendations do not include any work outside the right-of-way (ROW) which is generally 50 feet on each side of track centerline through the project area. The roadbed restoration and geohazard mitigation methods that in our opinion are applicable to the current project area are described below and listed for each site in Table 1.

The recommendations generally consist of the following work items:

- Removing soil and rock debris from track shoulders, ditches and from the track itself. The source of this debris is from intermittent rockfalls from the adjacent slopes, occasional landslides involving larger volumes of debris, and deposition of soil and rock debris from erosion of the adjacent slopes.
- Scaling of rock slopes is recommended at specific locations identified in Table 1 where loose cobbles, boulders, trees, and other debris were observed to have the potential to foul the track when they fail.
- Shoulder retaining walls are recommended at four locations, but the necessary length of these walls should be verified based on measurements of remaining shoulder widths. The walls are assumed to consist of a cast-in-place concrete or shotcrete wall supported on vertical micropiles installed from the roadbed.
- Catchment walls consisting of precast concrete K-rail segments are recommended at two locations where rockfall tends to foul the track.

5.4.1 Estimated Quantities

During the ground reconnaissance and review of aerial mapping data, we visually estimated the sizes of debris piles that need to be excavated and other site dimensions. Based on these dimensions, we estimated earthwork volumes for each site.

Excavation volumes include soil and rock debris that covers the track, was deposited on the shoulders, or filled the ditches. The volumes do not include general ditch cleaning spoils outside geotechnical sites, excess material from culvert installation, or spoils from roadbed grading.

Rock scaling quantities are based on the number of hours we estimate would be required for a 6-person hand-scaling crew to mitigate the rockfall hazard to an acceptable risk through the individual milepost segment.

6 TUNNELS ASSESSMENT

6.1 General

Two tunnels are located within the project area, Tunnel 11 (MP 145.49) and Tunnel 12 (MP 149.94). Measurements indicate that Tunnel 11 is approximately 704 feet long and Tunnel 12 is approximately 895 feet long. S&W previously performed field reconnaissance of the tunnels in 2002 and 2007, and again in 2021.

6.2 Assessment Findings

During previous field reconnaissance of Tunnel 11 in 2002 and 2007, S&W observed that damage to the timber sets had occurred, and sections of the tunnel liner had collapsed. In 2021, S&W was not able to enter Tunnel 11 as collapses at both portals had blocked the tunnel. Tunnel 12 has remained open and in good condition. No repairs are necessary for Tunnel 12 at this time with the exception of ditch cleaning.

Table 2 presents the results of the tunnel condition assessment. The table includes relevant observations from previous assessments. The table provides updated repair recommendations for Tunnel 11. Repair types are described in the notes at the end of Table 2.

6.3 Rehabilitation Measures

Tunnel 11 has collapses at both ends of the tunnel. It is assumed that large portions of the 700-foot-long tunnel have also collapsed and require mining to reopen the tunnel.

Remining of Tunnel 11 (Type 1 repairs) would consist of using a top heading and bottom heading sequence, advancing through the collapsed tunnel using steel sets installed at 4-ft spacing with C-channel and grouted hollow bar spiling between sets for temporary overhead ground support. Shotcrete may be needed for temporary ground support at the heading of the excavation. Final lining consists of placing steel channel lagging between the steel sets and backfilling behind the lagging with concrete. Tunnel sections that have not collapsed and where steel sets have been installed previously are completed by placing steel channel lagging between the steel sets and backfilling behind the lagging with concrete (Type 2 repairs). In areas where the original timber liner is still present, the timber sets and timber lagging is replaced with steel sets, steel channel lagging and backfilling behind the lagging with concrete (Type 4A repairs).

7 LIMITATIONS

The conclusions and recommendations presented in this report are based on site conditions as they existed at the time of our visit. We have not performed subsurface explorations but have made assumptions as to the subsurface conditions. If subsurface conditions different from those assumed are observed or appear to be present during construction, we should be advised at once so that we can review those conditions and reconsider our recommendations. If there is a substantial lapse of time between submission of our report and the start of work, if conditions have changed because of natural forces or human activity, or if conditions appear to be different from those described in our report, we recommend that we review this report to determine the applicability of the conclusions and recommendations.

No subsurface explorations or slope stability calculations have been performed for this assessment. Unanticipated conditions are commonly encountered and cannot be fully determined by merely reviewing surface conditions. Such unexpected conditions frequently require additional services to achieve a properly constructed project. Some contingency fund is recommended to accommodate such potential extra costs.

The scope of our services did not include environmental assessment or evaluation regarding the presence or absence of wetlands or hazardous/toxic materials in the soil, surface water, groundwater, or air, on or below the site, or for the evaluation/disposal of contaminated soils or groundwater, should any be encountered.

We have prepared the document "Important Information About Your Geotechnical Report" to assist you and others in understanding the use and limitations of this report. Please read this document to learn how you can lower your risks for this project.

TABLE 1 - GEOHAZARD MITIGATION LOCATIONS
Milepost 139.5 - 152.5

Milepost (S&W GIS) (2007)	Milepost (Track Chart) (1982 rev.)	Track Length (ft.)	Track Side (R or L)	Feature & Description	Recommendations[1]	Quantities		
						Work Item	Work Item Quantity	Unit
139.5	**139.5**			Commercial St., Willits	none	None	n/a	n/a
143.26 - 143.34	143.43 - 143.51	400	L	Steep embankment slope and narrow shoulder due to bank erosion along outside bend of Outlet Creek.	Field-verify shoulder width. Visually monitor for toe erosion and shoulder loss.	None[2]	n/a	n/a
143.57	143.72	130	L	Tributary to Outlet Creek flows under MP 143.72 bridge, then makes 90 degree turn and flows to the west along toe of embankment for 130 ft.	Visually monitor for toe erosion / embankment instability	None[2]	n/a	n/a
143.9	144.05	130	L	Excavation for a road between the railroad embankment and Outlet Creek may have over-steepened the embankment slope causing erosion, shallow sliding, and shoulder loss. Min. shoulder width is ~10 ft.	Visually monitor for embankment instability	None[2]	n/a	n/a
143.97 - 143.99	144.12 - 144.14	70	L	Possible setdown / scarp on shoulder	Check for embankment instability	None[2]	n/a	n/a
144.02-144.08	144.17 - 144.23	300	L	Steep embankment slope and shoulder loss due to bank erosion along Outlet Creek.	Field-verify shoulder width. Visually monitor for toe erosion and shoulder loss.	None[2]	n/a	n/a
144.31-144.41	144.46 - 144.56	550	L	Steep embankment slope and shoulder loss due to bank erosion along outside bend of Outlet Creek. Narrow shoulder for about 100' at MP 144.56.	Field-verify shoulder width. Visually monitor for toe erosion and shoulder loss.	None[2]	n/a	n/a

TABLE 1 - GEOHAZARD MITIGATION LOCATIONS
Milepost 139.5 - 152.5

Milepost (S&W GIS) (2007)	Milepost (Track Chart) (1982 rev.)	Track Length (ft.)	Track Side (R or L)	Feature & Description	Recommendations[1]	Quantities		
						Work Item	Work Item Quantity	Unit
144.44	144.59	60	L	Possible slump / slide extending from shoulder to toe in Outlet Creek about 50 feet downslope; sag in track noted during 2007 reconnaissance, but not observed during 2021 reconnaissance	Visually monitor for track settlement, ground cracks, other evidence of slide movement	None[2]	n/a	n/a
144.52 - 144.55	144.67 - 144.70	150	L	Steep embankment slope and narrow shoulder due to bank erosion along Outlet Creek.	Field-verify shoulder width. Visually monitor for toe erosion and shoulder loss.	None[2]	n/a	n/a
144.65 - 144.92	144.80 - 145.07	1400	L	Steep embankment slope and shoulder loss due to bank erosion along outside bend of Outlet Creek. Narrow shoulder in three segments totals about 600 LF.	Field-verify shoulder width. Visually monitor for toe erosion and shoulder loss.	None[2]	n/a	n/a
145.35	145.48	100	R	Landslide at South Portal Tunnel 11; mix of soil and rock fragments (up to 12-in.-diam. typical) buries track for approx. 80-100 LF; Soil and rock debris will continue to erode from head scarp located about 80 ft. upslope of track.	Excavate slide debris to restore roadbed and ditch; construct a catchment wall	Excavation	1550	CY
"	"	"	"	"	"	Catchment Wall (K-rail Barrier)	100	LF
145.36 - 145.54 Tunnel 11	145.49 - 145.60 Tunnel 11	704		Tunnel 11	See Table 2 for Tunnel 11 conditions and repair recommendations	See Table 2	n/a	n/a
145.74 - 145.80	145.76 - 145.82	320	L	Steep, rough slope with possible head scarp set back ~30 ft. from crest. Rock fragments accumulate along toe of cut slope. Wide bench on right side projecting into Outlet Creek channel suggests a large hill was excavated for railroad construction; cut slope may be marginally stable	Clean debris from shoulder / ditch along toe of rock slope Visually inspect for head scarp / ground cracks at top of slope.	Ditch / Shoulder Cleaning	133	CY
145.86 - 145.89	145.88 - 145.91	200	L	Shallow slide with head scarp extending up to 150 ft. from track	Clean debris from shoulder / ditch along toe of slope	Ditch / Shoulder Cleaning	133	CY

TABLE 1 - GEOHAZARD MITIGATION LOCATIONS
Milepost 139.5 - 152.5

Milepost (S&W GIS) (2007)	Milepost (Track Chart) (1982 rev.)	Track Length (ft.)	Track Side (R or L)	Feature & Description	Recommendations[1]	Quantities		
						Work Item	Work Item Quantity	Unit
145.95 - 146.01	145.97 - 146.03	220	L	Shallow landslide with head scarp up to 130 ft. from track. Dipslope failure of highly fractured sandstone with adverse bedding (dips toward track). Active rockslide zone as evidenced by the pile of slide debris from previous toe and ditch excavations located on R side; pile measures approx. 24' x 60' x 8' Accumulation of slide debris along toe since 2002 and 2007 site visits is estimated to be less than 50 CY, however additional rockfall and slides will occur from loose material in head scarp and flanks of slide; boulders up to several feet in diameter observed along scarp and in debris pile.	Scale loose rock from head scarp, flanks, and slope surface. Clean L side ditch along toe of slope to improve catchment and drainage. Clean R side ditch along toe of debris pile to improve clearance. Apparent low frequency of boulders or large volumes of slide debris fouling the track may not warrant a slide fence or catchment wall; limited horizontal clearance to rock slope may also prevent construction of a catchment wall; could consider a rockfall barrier fence installed about 20 ft upslope from toe. Rock debris could be used as fill to restore shoulder at erosion locations.	Scale Loose Rock from Slope	20	HRS
"	"	"	"	"	"	Ditch / Shoulder Cleaning - Left	228	CY
"	"	"	R	"	"	Ditch / Shoulder Cleaning - Right	65	CY
"	"	"	L	"	"	Catchment Wall (K-rail Barrier)	200	LF
146.01-146.1	146.03 - 146.12	500	L	Several shallow slide zones on rock slope	Clean debris from shoulder / ditch along toe of slope	Ditch / Shoulder Cleaning	37	CY
146.25 - 146.29	146.27 - 146.31	250	L	Stream with depositional fan deposits on slope on L side (west) of track for about 70 LF; loose fan deposits may be susceptible to slope instability and erosion. Shallow slide to the north of fan extends about 75 ft. along the track; head scarp is about 75 ft. from track.	Clean debris from ditch / shoulder	Ditch / Shoulder Cleaning	37	CY
146.30 - 146.33	146.32 - 146.35	160	L	Shallow slides from rock slope between drainage channels	Clean debris from ditch / shoulder	Ditch / Shoulder Cleaning	36	CY

TABLE 1 - GEOHAZARD MITIGATION LOCATIONS
Milepost 139.5 - 152.5

Milepost (S&W GIS) (2007)	Milepost (Track Chart) (1982 rev.)	Track Length (ft.)	Track Side (R or L)	Feature & Description	Recommendations[1]	Quantities		
						Work Item	Work Item Quantity	Unit
146.48 - 146.52	146.50 - 146.54	175	L	Landslide has appearance of rotational slump; head scarp approx. 230 ft. from track; hummocky ground surface with irregular drainage patterns. Slide debris piled on R side shoulder above Outlet Creek measures about 160' x 50'. Track and shoulders have very small accumulation of slide debris and a large portion of the slope is grass-covered, suggesting the slide area is relatively stable at present. Debris piled on R side shoulder indicates it was an active slide zone in the past. Roads at the top of the slope may be directing surface water into slide area.	Clean ditches on both sides of track through slide area. Slide debris piled on R side could be used as fill to restore shoulder at erosion locations.	Ditch / Shoulder Cleaning	104	CY
146.66 - 146.71	146.68 - 146.73	250	L	Shallow slide / unstable slope; wide shoulder (~30 ft.) suggests slide debris deposited at the toe of the slope has been excavated and placed on the shoulder above Outlet Creek.	Clean debris from ditch / shoulder	Ditch / Shoulder Cleaning	222	CY
146.84 - 146.86	146.86 - 146.88	70	L	Unstable slope / slide area just north of drainage channel; head scarp located about 40 ft. from toe of slope at track	Clean debris from ditch / shoulder	Ditch / Shoulder Cleaning	21	CY
146.88-146.92	146.90 - 146.94	200	L	Slide areas on very steep (60-70 deg.) sandstone slope on L side; head scarp located ~60 ft. from track; toe of slope is about 3 ft. from end of tie. Slide debris piles spaced intermittently along toe of rock slope, possibly below shear zones. Slide debris piled on R shoulder across track from slide area for about 200 ft.	Clean debris from L side ditch / shoulder	Ditch / Shoulder Cleaning	44	CY
146.95	146.97	170	L	Landslide with head scarp ~90 ft. from track	Clean debris from ditch / shoulder	Ditch / Shoulder Cleaning	25	CY

TABLE 1 - GEOHAZARD MITIGATION LOCATIONS
Milepost 139.5 - 152.5

Milepost (S&W GIS) (2007)	Milepost (Track Chart) (1982 rev.)	Track Length (ft.)	Track Side (R or L)	Feature & Description	Recommendations[1]	Quantities		
						Work Item	Work Item Quantity	Unit
147.1	147.12	150	L	Slide debris in ditch at toe of very steep (60-70 deg.) sandstone slope; head scarp ~110' from track. Toe of slope is about 3-4 ft. from rail. Slide debris piled on R shoulder; pile is ~100' x 25'	Clean debris from L side ditch along toe of rock slope Slide debris piled on R side could be used as fill to restore shoulder at erosion locations.	Ditch / Shoulder Cleaning	3	CY
147.3 - 147.7	147.3 - 147.7	2000	R	Large landslides are not apparent upslope of the track along this segment, but debris from the cut slopes accumulates on the track shoulder / ditch. From MP 147.3, the cut slope on R side consists of fragmented, highly disturbed rock; the shoulder / ditch is filled with rock fragments forming talus slopes for about 500 ft. to ~ MP 147.4; slope becomes steeper as more massive, less weathered/disturbed sandstone is exposed for ~800 ft. to MP 147.56; less debris in ditch, but angular, cobble-size, sandstone blocks are common; ditch / shoulder narrows to a few feet wide in this segment. Slope angle flattens to ~40 deg. with few outcrops exposed for ~800 ft. north to MP 147.7.	Clean rock slope debris from R side ditch / shoulder	Ditch / Shoulder Cleaning	220	CY
147.37-147.67	147.37 - 147.67	1500	L	Outlet Creek flows through a long, straight reach with a steep bank up to the track. Shoulders appear narrow in several segments.	Field-verify shoulder width. Visually monitor for toe erosion and shoulder loss.	None[2]	n/a	n/a
147.8 - 147.85	147.80 - 147.85	200	L	Landslides between track and roadcut upslope of the track.	Clean L side ditch	Ditch / Shoulder Cleaning	22	CY
148.92-148.98	148.92 - 148.98	270	L	Steep embankment slope and shoulder loss due to bank erosion along outside bend of Outlet Creek.	Shoulder width to be field-verified; appears sufficiently narrow for a retaining structure. Construct a micropile-supported retaining wall and backfill with relatively lightweight fill (screened rock from slide debris stockpiles may be useable as fill).	Shoulder Retaining Wall	270	LF

TABLE 1 - GEOHAZARD MITIGATION LOCATIONS
Milepost 139.5 - 152.5

Milepost (S&W GIS) (2007)	Milepost (Track Chart) (1982 rev.)	Track Length (ft.)	Track Side (R or L)	Feature & Description	Recommendations[1]	Quantities		
						Work Item	Work Item Quantity	Unit
150.0 - 150.19 Tunnel 12	149.94 - 150.12 Tunnel 12	895		Tunnel 12	See Table 2 for Tunnel 12 conditions. Clean ditches to improve drainge through tunnel.	Ditch / Shoulder Cleaning	200	CY
150.2 - 150.7	150.13 - 150.63	2500	L	Rock slopes on the L side of track are typically covered with trees, shrubs, woody debris, moss, and forest litter. Visible rock outcrops are few. In general, the slopes appear to be stable with isolated zones of rockfall. The ditch along the toe of the slopes was free of debris in many segments, but had standing water due to multiple blockages by woody debris and slide material. Dense vegetation made assessment of the rockfall hazard difficult, but a higher potential for rockfalls was noted between MP 150.33 and 150.53 based on more outcrops / boulders visible on the slopes, a 2.5-ft.-diam. boulder that came to rest on the track; and larger volumes of rock debris in the ditch.	Perform a detailed reconnaissance to assess rockfall hazard and identify loose rocks and potential rockfall areas. Clear trees, brush, woody debris, and slide material from track, shoulder, ditch, lower slope. Identify and remove hazard trees. Remove loose rock that could potentially foul the track. Hand scaling with prybars, picks, shovels, airbags, etc. should be sufficient to remove most to all high risk rock.	Rock Slope Scaling	50	HR
"	"	"	"	"	"	Ditch / Shoulder Cleaning	444	CY
150.25	150.18			Pile of rock debris on R side shoulder likely comprised of ditch cleaning spoils and slide debris deposited at the toe of the rock slope to the north; pile measures about 110' x 25' x 8'	Slide debris piled on R side could be used as fill to restore shoulder at erosion locations.	None	n/a	n/a
150.35	150.28	40	R	Bank erosion along an outside bend of Outlet Creek causing steep slopes an dpossible shoulder loss. Apparent minimum shoulder width occurs where a tributary stream flows through a 3-ft.-diam. concrete culvert. A 3-ft.-diam. CMP culvert situated higher up in the embankment was dry.	Field-verify shoulder width. Visually monitor for toe erosion and shoulder loss.	None[2]	n/a	n/a

TABLE 1 - GEOHAZARD MITIGATION LOCATIONS
Milepost 139.5 - 152.5

Milepost (S&W GIS) (2007)	Milepost (Track Chart) (1982 rev.)	Track Length (ft.)	Track Side (R or L)	Feature & Description	Recommendations[1]	Quantities		
						Work Item	Work Item Quantity	Unit
150.49 - 150.52	150.42 - 150.45	170	R	Steep slope and narrow shoulder due to bank erosion along Outlet Creek.	Field-verify shoulder width. Visually monitor for toe erosion and shoulder loss.	None[2]		
150.67 - 150.71	150.60 - 150.64	175	R	Steep slope and narrow shoulder due to bank erosion along outside of sharp bend in Outlet Creek just south of Arnold Overpass (Highway 101).	Field-verify shoulder width. Visually monitor for toe erosion and shoulder loss.	None[2]		
150.97 - 151.06	150.89 - 150.98	1000	R	Steep slope and narrow shoulder due to bank erosion along Outlet Creek; minimum shoulder width for approx. 200 LF is 4.5 ft. as measured from near rail to top of Outlet Creek bank slope.	Shoulder width through 1000-ft.-long segment to be field-verified; anticipate 200-ft.-long narrow shoulder segment will increase in length to justify a retaining structure for 500 LF. Construct a micropile-supported retaining wall and backfill with relatively lightweight fill (screened rock from slide debris stockpiles may be useable as fill).	Shoulder Retaining Wall	500	LF
151.3 - 151.4	151.18 - 151.28	200	R	Track crosses toe of large earthflow about 500 ft. wide along track; head scarp is approx. 2,000 ft. upslope of track; cut slope on R side from MP 151.19 to 151.23 appears over-steepened at south end; possibly slumping at north end. Drainage channel along north flank of earthflow routes water to culvert at MP 151.28; possible erosion gully on bank between culvert and Outlet Creek	Evaluate stability of cut slope and erosion at MP 151.28 culvert. Assume ditch needs to be cleaned.	Ditch / Shoulder Cleaning	36	CY
151.54	151.42	50	R	Drainage gully upslope of track appears to deposit sediment on track; no culvert is present under track.	Clean R side ditch	Ditch / Shoulder Cleaning	15	CY

TABLE 1 - GEOHAZARD MITIGATION LOCATIONS
Milepost 139.5 - 152.5

Milepost (S&W GIS) (2007)	Milepost (Track Chart) (1982 rev.)	Track Length (ft.)	Track Side (R or L)	Feature & Description	Recommendations[1]	Quantities		
						Work Item	Work Item Quantity	Unit
151.56 - 151.64	151.44 - 151.52	420	L	Steep slope and narrow shoulder due to bank erosion along Outlet Creek.	Shoulder width to be field-verified; appearsa sufficiently narrow for a retaining structure approx 80 ft. long. Construct a micropile-supported retaining wall and backfill with relatively lightweight fill (screened rock from slide debris stockpiles may be useable as fill) to retain and widen shoulder.	Shoulder Retaining Wall	420	LF
151.71 - 151.74	151.59 - 151.62	150	L	Steep slope and narrow shoulder due to bank erosion along Outlet Creek.	Field-verify shoulder width. Visually monitor for toe erosion and shoulder loss.	None[2]	n/a	n/a
151.78 - 151.82	151.66 - 151.70	180	L	Steep slope and narrow shoulder due to bank erosion along Outlet Creek. Derailed boxcars lie on the slope between the track and Outlet Creek. Shoulder is low and narrow upslope of the boxcars.	Shoulder width to be field-verified; appears to be sufficiently narrow for a retaining structure approx 80 ft. long. Construct a micropile-supported retaining wall and backfill with relatively lightweight fill (screened rock from slide debris stockpiles may be useable as fill) to retain and widen shoulder.	Shoulder Retaining Wall	80	LF
151.82 - 151.98	151.70 - 151.86	1000	R	Rock and soil debris ravels and erodes from the slope and piles up on the shoulder.	Clean debris from shoulder to restore catchment and improve drainage.	Ditch / Shoulder Cleaning	222	CY
152.62	**152.5**			Longvale	none	none	n/a	n/a

Notes:

(1) It is assumed that vegetation clearing, track removal, roadbed grading, and track laying will be required, but are not included in the recommendations, quantities and costs.

(2) Site conditions should be field-verified, but stabilization and repair work are not anticipated based on the available information.

TABLE 2
TUNNEL 11 & TUNNEL 12
REPAIR RECOMMENDATIONS

Tunnel No.	Milepost at South Portal Length (ft) Curvature	Tunnel Segment				Observations / Recommendations	
		From Station	To Station	Length (LF)	Type of Liner / Portal	Damage (Dec. 2021 observations in black text) (2007 observations in green text) (2002 observations in blue text)	Repair Type (Description of Repair Types on Page 3)
11	145.49 658 (track chart) 704 (measured) 10^{o} curve right	South Portal			Concrete headwall and wingwalls dated 1910 & 1960 (Track chart shows 589.3' timber, 25' gunite, and 43.5' conc.) (26 steel sets are stacked outside the south portal)	Landslide outside South Portal (see Geotech Table)	none
		0+00	0+42		Concrete (corbel arch)	Concrete in good condition 2002 - Poor tunnel drainage, ditches blocked	Concrete portal structure does not need work
		0+42	0+75	33	Steel sets and timber lagging	Tunnel collapse about 40' inside south portal due to deterioration of timber lining between steel sets; debris extends to crown; tunnel completely blocked	Type 1
		0+75	1+20	45	Steel sets; sparse timber lagging	Could not observe in 2021 due to collapses at north and south ends - tunnel could be collapsed in this segment from timber lining deterioration Moderate rockfall between sets	Type 2
		1+20	3+00	180	Arch has full timber lagging	Could not observe in 2021 due to collapses at north and south ends - tunnel could be collapsed in this segment from timber lining deterioration 2002 - Moderate rockfall between sets	Type 2
		3+00	3+54	54	Timber sets and partial lagging to 3+36; steel sets between timber sets with timber lagging from 3+36 to 3+54	Could not observe in 2021 due to collapses at north and south ends - tunnel could be collapsed in this segment due to timber lining deterioration noted in 2007 (see below) 2007 - Tunnel partially blocked by rockfall (~40 CY) near center (~Sta 3+00 to 3+50) from E sidewall and arch due to failure of charred timber lining section 2002 - Fire damage: timber sets and lagging are charred	Type 1

TABLE 2
TUNNEL 11 & TUNNEL 12
REPAIR RECOMMENDATIONS

Tunnel No.	Milepost at South Portal Length (ft) Curvature	Tunnel Segment				Observations / Recommendations	
		From Station	To Station	Length (LF)	Type of Liner / Portal	Damage (Dec. 2021 observations in black text) (2007 observations in green text) (2002 observations in blue text)	Repair Type (Description of Repair Types on Page 3)
Tunnel 11 (cont.)	145.49 658 (track chart) 704 (measured) 10° curve right	3+54	4+10	56	Timber sets and partial lagging	Could not observe in 2021 due to collapses at north and south ends - tunnel could be collapsed in this segment from timber lining deterioration 2002 - Fire damage: timber sets are charred and lagging burned through in places	Type 1
		4+10	4+34	24	Steel sets and newer timber lagging	Could not observe in 2021 due to collapses at north and south ends - it's possible this segment is intact due to newer timber lagging and steel sets	Type 2
		4+34	4+71	37	Timber sets and partial lagging	Could not observe in 2021 due to collapses at north and south ends - tunnel could be collapsed in this segment from timber lining deterioration 2002 - Lagging burned through in crown	Type 1
		4+71	6+00	139	Timber sets (2-ft spacing) and full timber lagging	Tunnel completely blocked by debris from collapse at approx. Sta. 6+00; south end of collaps zone is unknown 2002 - Fire damage ends at 4+71	Type 1
		6+00	6+75	75	Timber sets (2-ft spacing) and full timber lagging	Partial collapse of crown from approx. Sta. 6+60 to Sta. 6+75 2007 - Collapse in crown at N end of timber-lined segment (Sta. 6+75), just S of gunite section, collapse daylights to ground surface; collapse is ~12.5 ft. long (5 sets missing); ~20 CY soil debris on invert.	Type 4A
		6+75	7+04		Gunite over steel sets (10 sets)	Debris (soil / small rock fragments) from partial collapse noted above is piled on invert (~20 CY) Excavate soil and rock debris from invert (cost is incidental to collapsed segmetn repair)	none
		North Portal			Gunite and steel set structure	Good condition	none

TABLE 2
TUNNEL 11 & TUNNEL 12
REPAIR RECOMMENDATIONS

Tunnel No.	Milepost at South Portal Length (ft) Curvature	Tunnel Segment				Observations / Recommendations	
		From Station	To Station	Length (LF)	Type of Liner / Portal	Damage (Dec. 2021 observations in black text) (2007 observations in green text) (2002 observations in blue text)	Repair Type (Description of Repair Types on Page 3)
12	149.94 881 (track chart) 895 (measured) 8° curve left	South Portal			Gunite over steel sets	Gunite & steel set lining is in good condition; wet gunite patches in crown, arch, and sidewalls; lots of drips from crown Clean ditches to improve drainage (see Geotech Table) 2002 & 2007 - No damage observed during inspections - lining elements in good condition	No Repairs Needed
		0+00	8+82		Gunite over steel sets	Good condition	"
		8+82	8+95		Concrete	Good condition	"
		North Portal			Concrete headwall	Good condition	"

Tunnel 11 Repair Types
Type 1 Repairs - Excavate collapsed material; remove timber lining and replace with steel sets, install C-channel lagging between steel sets, and backfill with concrete; may require top-heading & bottom-heading excavation, may require spiling and backfill of daylighted area with lightweight concrete
Type 2 Repairs - Install C-channel lagging between existing steel sets and backfill with concrete
Type 3 Repairs - Apply shotcrete (not used)
Type 4A Repairs - Remove timber lining, install steel sets, install C-channel lagging between steel sets, and backfill with concrete
Type 4B Repairs - Remove timber lining, install steel sets, and apply shotcrete (not used)
Type 5 Repairs - Remove timber lining, install C-channel lagging between existing steel sets, and backfill with concrete

IMPORTANT INFORMATION

Important Information

About Your Geotechnical Report

CONSULTING SERVICES ARE PERFORMED FOR SPECIFIC PURPOSES AND FOR SPECIFIC CLIENTS.

Consultants prepare reports to meet the specific needs of specific individuals. A report prepared for a civil engineer may not be adequate for a construction contractor or even another civil engineer. Unless indicated otherwise, your consultant prepared your report expressly for you and expressly for the purposes you indicated. No one other than you should apply this report for its intended purpose without first conferring with the consultant. No party should apply this report for any purpose other than that originally contemplated without first conferring with the consultant.

THE CONSULTANT'S REPORT IS BASED ON PROJECT-SPECIFIC FACTORS.

A geotechnical report is based on a subsurface exploration plan designed to consider a unique set of project-specific factors. Depending on the project, these may include the general nature of the structure and property involved; its size and configuration; its historical use and practice; the location of the structure on the site and its orientation; other improvements such as access roads, parking lots, and underground utilities; and the additional risk created by scope-of-service limitations imposed by the client. To help avoid costly problems, ask the consultant to evaluate how any factors that change subsequent to the date of the report may affect the recommendations. Unless your consultant indicates otherwise, your report should not be used (1) when the nature of the proposed project is changed (for example, if an office building will be erected instead of a parking garage, or if a refrigerated warehouse will be built instead of an unrefrigerated one, or chemicals are discovered on or near the site); (2) when the size, elevation, or configuration of the proposed project is altered; (3) when the location or orientation of the proposed project is modified; (4) when there is a change of ownership; or (5) for application to an adjacent site. Consultants cannot accept responsibility for problems that may occur if they are not consulted after factors that were considered in the development of the report have changed.

SUBSURFACE CONDITIONS CAN CHANGE.

Subsurface conditions may be affected as a result of natural processes or human activity. Because a geotechnical report is based on conditions that existed at the time of subsurface exploration, construction decisions should not be based on a report whose adequacy may have been affected by time. Ask the consultant to advise if additional tests are desirable before construction starts; for example, groundwater conditions commonly vary seasonally.

Construction operations at or adjacent to the site and natural events such as floods, earthquakes, or groundwater fluctuations may also affect subsurface conditions and, thus, the continuing adequacy of a geotechnical/environmental report. The consultant should be kept apprised of any such events and should be consulted to determine if additional tests are necessary.

MOST RECOMMENDATIONS ARE PROFESSIONAL JUDGMENTS.

Site exploration and testing identifies actual surface and subsurface conditions only at those points where samples are taken. The data were extrapolated by your consultant, who then applied

IMPORTANT INFORMATION

judgment to render an opinion about overall subsurface conditions. The actual interface between materials may be far more gradual or abrupt than your report indicates. Actual conditions in areas not sampled may differ from those predicted in your report. While nothing can be done to prevent such situations, you and your consultant can work together to help reduce their impacts. Retaining your consultant to observe subsurface construction operations can be particularly beneficial in this respect.

A REPORT'S CONCLUSIONS ARE PRELIMINARY.

The conclusions contained in your consultant's report are preliminary, because they must be based on the assumption that conditions revealed through selective exploratory sampling are indicative of actual conditions throughout a site. Actual subsurface conditions can be discerned only during earthwork; therefore, you should retain your consultant to observe actual conditions and to provide conclusions. Only the consultant who prepared the report is fully familiar with the background information needed to determine whether or not the report's recommendations based on those conclusions are valid and whether or not the contractor is abiding by applicable recommendations. The consultant who developed your report cannot assume responsibility or liability for the adequacy of the report's recommendations if another party is retained to observe construction.

THE CONSULTANT'S REPORT IS SUBJECT TO MISINTERPRETATION.

Costly problems can occur when other design professionals develop their plans based on misinterpretation of a geotechnical report. To help avoid these problems, the consultant should be retained to work with other project design professionals to explain relevant geotechnical, geological, hydrogeological, and environmental findings, and to review the adequacy of their plans and specifications relative to these issues.

BORING LOGS AND/OR MONITORING WELL DATA SHOULD NOT BE SEPARATED FROM THE REPORT.

Final boring logs developed by the consultant are based upon interpretation of field logs (assembled by site personnel), field test results, and laboratory and/or office evaluation of field samples and data. Only final boring logs and data are customarily included in geotechnical reports. These final logs should not, under any circumstances, be redrawn for inclusion in architectural or other design drawings, because drafters may commit errors or omissions in the transfer process.

To reduce the likelihood of boring log or monitoring well misinterpretation, contractors should be given ready access to the complete geotechnical engineering report prepared or authorized for their use. If access is provided only to the report prepared for you, you should advise contractors of the report's limitations, assuming that a contractor was not one of the specific persons for whom the report was prepared, and that developing construction cost estimates was not one of the specific purposes for which it was prepared. While a contractor may gain important knowledge from a report prepared for another party, the contractor should discuss the report with your consultant and perform the additional or alternative work believed necessary to obtain the data specifically appropriate for construction cost estimating purposes. Some clients hold the mistaken impression that simply disclaiming responsibility for the accuracy of subsurface information always insulates them from attendant liability. Providing the best available information to contractors helps prevent costly construction problems and the adversarial attitudes that aggravate them to a disproportionate scale.

IMPORTANT INFORMATION

READ RESPONSIBILITY CLAUSES CLOSELY.

Because geotechnical engineering is based extensively on judgment and opinion, it is far less exact than other design disciplines. This situation has resulted in wholly unwarranted claims being lodged against consultants. To help prevent this problem, consultants have developed a number of clauses for use in their contracts, reports, and other documents. These responsibility clauses are not exculpatory clauses designed to transfer the consultant's liabilities to other parties; rather, they are definitive clauses that identify where the consultant's responsibilities begin and end. Their use helps all parties involved recognize their individual responsibilities and take appropriate action. Some of these definitive clauses are likely to appear in your report, and you are encouraged to read them closely. Your consultant will be pleased to give full and frank answers to your questions.

The preceding paragraphs are based on information provided by the ASFE/Association of Engineering Firms Practicing in the Geosciences, Silver Spring, Maryland

Attachment G

September 12, 2022

Operations Assessment Report Longvale to Willits and Willits to Fort Bragg

American Rail Engineers

300 E 39th Street

Kansas City MO 54111

Contact: Dave Anderson, (714) 943-4068

Introduction

ARE's subconsultant Carl Belke assembled operating requirements and costs based on his 40 years' experience with responsibility for shortline railroad operations. Key factors used to establish operations costs include:

- Track geometry and grades for the 13-mile segment from Longvale to Willits and the 39-mile segment from Willits to Fort Bragg.
- Tonnage based on the *Market Analysis of Transportation Alternatives for Major Commodities Between the Cities of Fort Bragg and Willits*, prepared by Marie Jones Consulting.
- Crew size and operations base
- Equipment requirements

The operating expenses are based on assumptions concerning the maximum amount of product that may be available for shipment at Longvale for shipment onward to Willits and to Fort Bragg. This is not an admission that such amounts in fact will be made available for shipment. It is simply an effort to compose a scenario maximally favorable to Mendocino Railway should it initiate freight service. For simplicity of presentation, the analysis assumes the shipments are all aggregate, but this assumption is not critical to the analysis. Service cannot currently take place because the line from Longvale to Willits is embargoed. To lift the embargo substantial rehabilitation is required as outlined in ARE's *Railroad Rehabilitation Assessment Willits MP 139.5 to Longvale MP 152.5* report dated September 12, 2022. In addition, the Skunk Line requires track repairs and tunnel reconstruction.

Carl Belke, P.E. of D&H Rail Consulting prepared the following Operations Assessment. Carl serviced as President and Chief Operating Officer for the Western New York & Pennsylvania Railroad for 10 years, General Manager and Vice President of Canadian Operations for Genesee & Wyoming for 7 years and has more than 40 years' experience in railroad operations for a dozen of short line railroads with responsibility for labor management, fleet management, bankruptcy reorganizations, and mergers and acquisitions.

Summary of Operating Expense

Scenario	Cars	Cubic Yards	Cost per Car	Cost per Cubic Yard
1A	1,313	70,000	$2,754.25	$51.66
1B	1,688	90,000	$2,142.38	$40.18
2A	656	35,000	$4,142.50	$77.67
2B	844	45,000	$3,221.95	$60.41

Scenario 1

Scenario 1 - Maximum Traffic includes 70,000 cubic yards of aggregate from the Grist Creek facility from Longvale to Fort Bragg and an additional 20,000 cubic yards of gravel aggregate from Willits to Fort Bragg. The Longvale to Willits traffic is modeled in Scenario 1A and all the traffic is modeled in Scenario 1B.

The assumptions, modeling, and cost estimate for Scenario 1 follows.

Narrative Summary

Traffic assumptions

Scenario 1A

- 70,000 Cu. Yd. per year of river gravel aggregate hauled from Longvale to Willits
- 70,000 Cu. Yd. per year of river gravel aggregate hauled from Willits to Fort Bragg

Scenario 1B

- 70,000 Cu. Yd. per year of river gravel aggregate hauled from Longvale to Willits
- 70,000 Cu. Yd. per year of river gravel aggregate hauled from Willits to Fort Bragg
- 20,000 Cu. Yd. per year of gravel aggregate hauled from Willits to Fort Bragg

Freight car assumption

- 56 Cu. Yd., 80 ton capacity, 24 ft. ore jennie
- based on two sets of 6 cars cycling Longvale - Willits - Fort Bragg and on car cycling Willits to Fort Bragg and two repair spares = 15 total

Train crew labor

- all crews based at Willits
- 5 day per week, 2-person turn crew from Willits takes empties to Longvale, awaits gravel loading and returns to Willits
- 5 day per week, 2-person turn crew from Willits to Fort Bragg with loaded train, unloads train, meets relief crew from Willits, returns to Willits by highway
- 5 day per week, 2-person turn crew from Willits drives to Fort Bragg, relieves original crew from Willits, returns to Willits with empty train
- total of 6 regular train crew members plus 1 relief person to cover sickness, vacations

Fuel/Locomotives/Physical Characteristics

- based upon 2 units per train of models shown on the locomotive sheet
- based on the effort to be exerted (throttle setting) for the grades encountered and curve compensation

- based on 4 units on property - 1 assigned Willits - Longvale; 2 assigned Willits - Fort Bragg; 1 spare

Mechanical labor

- based on two person crew to maintain locomotives and freight cars
- expectation that they will also spend time with MOW crew

Track labor

- based on 4 person crew to maintain track, drainage structures, ditches, brush, bridges, tunnels
- assisted by mechanical crew

Mendocino Railway OFA MP 139.5 to 152.5
Traffic

SCENARIO 1A - by Weight **Mendocino Railway OFA MP 139.5 to 152.6**
Freight traffic analysis

Commodity	CY / Year	CY Conversion to Tons	Total product weight (tons)	Total car loads @80 tons / car	Total weight of cars @28 tons each	Total wght of traffic in cars (tons)	Tonnage/ day @250 train days	Average cars / day	Comments
Aggregates	70,000	1.5	105,000	1,313	36,750	141,750	567	6	Longvale to Willits to Fort Bragg
			Weekday train - Longvale to Willits				567	6	
			Weekday train - Willits to Fort Bragg				567	6	

SCENARIO 1A - by Volume **Mendocino Railway OFA MP 139.5 to 152.6**
Freight traffic analysis

Commodity	CY / Year	CY Conversion to Tons	Total product weight (tons)	Total car loads @56CY / car	Total weight of cars @28 tons each	Total wght of traffic in cars (tons)	Tonnage/ day @250 train days	Average cars / day	Comments
Aggregates	70,000	1.5	105,000	1,250	35,000	140,000	560	5	Longvale to Willits to Fort Bragg
			Weekday train - Longvale to Willits				560	5	
			Weekday train - Willits to Fort Bragg				560	5	

SCENARIO 1B - by Weight **Mendocino Railway OFA MP 139.5 to 152.6**
Freight traffic analysis

Commodity	CY / Year	CY Conversion to Tons	Total product weight (tons)	Total car loads @80 tons / car	Total weight of cars @28 tons each	Total wght of traffic in cars (tons)	Tonnage/ day @250 train days	Average cars / day	Comments
Aggregates	70,000	1.5	105,000	1,313	36,750	141,750	567	6	Longvale to Willits to Fort Bragg
Aggregates - other	20,000	1.5	30,000	375	10,500	40,500	162	2	Willits to Fort Bragg
			Weekday train - Longvale to Willits				567	6	
			Weekday train - Willits to Fort Bragg				729	7	

SCENARIO 1B - by Volume **Mendocino Railway OFA MP 139.5 to 152.6**
Freight traffic analysis

Commodity	CY / Year	CY Conversion to Tons	Total product weight (tons)	Total car loads @56CY / car	Total weight of cars @28 tons each	Total wght of traffic in cars (tons)	Tonnage/ day @250 train days	Average cars / day	Comments
Aggregates	70,000	1.5	105,000	1,250	35,000	140,000	560	5	Longvale to Willits to Fort Bragg
Aggregates - other	20,000	1.5	30,000	357	10,000	40,000	160	2	Willits to Fort Bragg
			Weekday train - Longvale to Willits				560	5	
			Weekday train - Willits to Fort Bragg				720	7	

CY = cubic yard

Mendocino Railway OFA MP 139.5 to 152.5
Train Crew Labor

Zone	Position	Weeks Per year	Days Per week	Working Days Per year	Working hours Per day	Working hours Total hrs	Number Persons	Number Total hrs	rate per hour	Yearly cost
Longvale - Willits	Engineer	52	5	260	8	2080	1	2080	$38.50	$80,080
Longvale - Willits	Conductor	52	5	260	8	2080	1	2080	$32.50	$67,600
Willits - Fort Bragg	Engineer	52	5	260	8	2080	2	4160	$38.50	$160,160
Willits - Fort Bragg	Conductor	52	5	260	8	2080	2	4160	$32.50	$135,200
Relief/spare	Engineer	52	5	260	8	2080	1	2080	$38.50	$80,080
									Total	$523,120

Fuel Usage

Zone	Weeks Per year	Days Per week	Working Days Per year	Working hours Per day	Working hours Total hrs	Number of units	Total hrs	Gallons per hour	Total Gallons	Yearly cost $6.40
Longvale - Willits	52	5	260	4	1040	2	2080	20	41,600	$266,240
Willits - Fort Bragg	52	5	260	10	2600	2	5200	45	234,000	$1,497,600
									Total	$1,763,840

Locomotive capabilities

Model	HP	Weight	STE	CTE	Annual Rental	Max Loads Longvale to Willits	Units required per train	Max Loads Willits to Ft. Bragg	Units required per train	Spare/ repair units required	Total units required	Total locomotive expense
SW1500	1500	248,000	62,000	38,000	$40,000	20		5				$0
GP-9	1750	249,000	62,750	44,600	$25,000	25	1	7	2	1	4	$80,000
RS-11	1800	257,300	66,000	35,000	$25,000	20		5				$0

Physical Characteristics

Location	Milepost	Location	Milepost	Distance between miles	Max % grade	Max degree of curvature	Operating Speed - MPH
Longvale	152.5	Willits	139.5	13.0	0.7	10	10
Willits	39.0	Fort Bragg	0	39.0	4.6	24	10

Mendocino Railway OFA MP 139.5 to 152.5
Operating Costs Scenario 1

MAINTENANCE OF WAY AND STRUCTURES		
Track Labor	$	250,000
Materials and Equipment		100,000
Programmed Maintenance of Roadbed		75,000
Fringe Benefits		35,000
Grade Crossing Expenses		25,000
TOTAL MAINTENANCE OF WAY AND STRUCTURES	$	485,000
MAINTENANCE OF EQUIPMENT		
Mechanical Labor	$	144,000
Locomotive Repairs		45,000
Fringe Benefits		20,160
Car Repair Expenses		25,000
Track Equipment Repairs		10,000
TOTAL MAINTENANCE OF EQUIPMENT	$	244,160
TRANSPORTATION		
Locomotive Lease Expense	$	80,000
Car Lease Expense		72,000
Train Crew Labor		523,120
Fuel		1,763,840
Transload terminal manager		45,000
Fringe Benefits		79,537
Transload facility maintenance		20,000
Automobile for Fort Bragg crew change		13,000
Car Hire Costs		0
Other - PPE and Comms Equip		25,000
TOTAL TRANSPORTATION	$	2,621,497
GENERAL ADMINISTRATION		
Administrative Personnel	$	132,000
Fringe Benefits		18,480
Insurance – General Liability		35,000
Insurance – Fire and Auto		5,000

GENERAL ADMINISTRATION (continued)		
Information Services		4,000
Contracted marketing services		12,000
FRA compliance - Manuals, timetables, D&A testing		8,000
Rules, Safety & FRA training - CFR 243, RWP		5,000
Audit		12,000
Legal		8,000
Payroll Service		3,000
Telephone		7,200
Repairs and Maintenance		2,000
Utilities		3,000
Dues and Subscriptions		1,000
Property Taxes		5,000
Conferences		1,000
Office Supplies, Postage and Other		4,000
TOTAL GENERAL ADMINISTRATION	$	265,680
GRAND TOTAL OPERATING EXPENSE	**$**	**3,616,337**
SCENARIO 1A Cost/Car	**$**	**2,754.25**
SCENARIO 1A Cost/CY	**$**	**51.66**
SCENARIO 1B Cost/Car	**$**	**2,142.38**
SCENARIO 1B Cost/CY	**$**	**40.18**

Scenario 2

Scenario 2 – Assumes half of the traffic modeled in Scenario 1.

The assumptions, modeling, and cost estimate for Scenario 2 follows.

Narrative Summary

Traffic assumptions
Scenario 2A

- 35,000 Cu. Yd. per year of river gravel aggregate hauled from Longvale to Willits
- 35,000 Cu. Yd. per year of river gravel aggregate hauled from Willits to Fort Bragg

Scenario 2B

- 35,000 Cu. Yd. per year of river gravel aggregate hauled from Longvale to Willits
- 35,000 Cu. Yd. per year of river gravel aggregate hauled from Willits to Fort Bragg
- 10,000 Cu. Yd. per year of gravel aggregate hauled from Willits to Fort Bragg

Freight car assumption

- 56 Cu. Yd., 80 ton capacity, 24 ft. ore jennie
- based on two sets of 6 cars cycling Longvale - Willits - Fort Bragg and on car cycling Willits to Fort Bragg and two repair spares = 15 total

Train crew labor

- all crews based at Willits

- 3 days per week (M,W,F), 2-person turn crew from Willits takes empties to Longvale, awaits gravel loading and returns to Willits
- 3 days per week, (T,Th, Sa) 2-person turn crew from Willits to Fort Bragg with loaded train, unloads train, meets relief crew from Willits,
  returns to Willits by highway
- 3 days per week (T,Th,Sa), 2-person turn crew from Willits drives to Fort Bragg, relieves original crew from Willits, returns to Willits with empty train
- total of 4 regular train crew members plus 1 relief person to cover sickness, vacations

Fuel/Locomotives/Physical Characteristics

- based upon 2 units per train of models shown on the locomotive sheet
- based on the effort to be exerted (throttle setting) for the grades encountered and curve compensation
- based on 3 units on property - 2 working daily, 1 spare

Mechanical labor

- based on two person crew to maintain locomotives and freight cars
- expectation that they will also spend time with MOW crew

Track labor

- based on 4 person crew to maintain track, drainage structures, ditches, brush, bridges, tunnels
- assisted by mechanical crew

Mendocino Railway OFA MP 139.5 to 152.5
Traffic

SCENARIO 2A - by Weight

Mendocino Railway OFA MP 139.5 to 152.6
Freight traffic analysis

Commodity	CY / Year	CY Conversion to Tons	Total product weight (tons)	Total car loads @80 tons / car	Total weight of cars @28 tons each	Total wght of traffic in cars (tons)	Tonnage/day @250 train days	Average cars / day	Comments
Aggregates	35,000	1.5	52,500	656	18,375	70,875	284	3	Longvale to Willits to Fort Bragg
			Weekday train - Longvale to Willits				284	3	
			Weekday train - Willits to Fort Bragg				284	3	

SCENARIO 2A - by Volume

Mendocino Railway OFA MP 139.5 to 152.6
Freight traffic analysis

Commodity	CY / Year	CY Conversion to Tons	Total product weight (tons)	Total car loads @56CY / car	Total weight of cars @28 tons each	Total wght of traffic in cars (tons)	Tonnage/day @250 train days	Average cars / day	Comments
Aggregates	35,000	1.5	52,500	625	17,500	70,000	280	3	Longvale to Willits to Fort Bragg
			Weekday train - Longvale to Willits				280	3	
			Weekday train - Willits to Fort Bragg				280	3	

SCENARIO 2B - by Weight

Mendocino Railway OFA MP 139.5 to 152.6
Freight traffic analysis

Commodity	CY / Year	CY Conversion to Tons	Total product weight (tons)	Total car loads @80 tons / car	Total weight of cars @28 tons each	Total wght of traffic in cars (tons)	Tonnage/day @250 train days	Average cars / day	Comments
Aggregates	35,000	1.5	52,500	656	18,375	70,875	284	3	Longvale to Willits to Fort Bragg
Aggregates - other	10,000	1.5	15,000	188	5,250	20,250	81	1	Willits to Fort Bragg
			Weekday train - Longvale to Willits				284	3	
			Weekday train - Willits to Fort Bragg				365	4	

SCENARIO 2B - by Volume

Mendocino Railway OFA MP 139.5 to 152.6
Freight traffic analysis

Commodity	CY / Year	CY Conversion to Tons	Total product weight (tons)	Total car loads @56CY / car	Total weight of cars @28 tons each	Total wght of traffic in cars (tons)	Tonnage/day @250 train days	Average cars / day	Comments
Aggregates	35,000	1.5	52,500	625	17,500	70,000	280	3	Longvale to Willits to Fort Bragg
Aggregates - other	10,000	1.5	15,000	179	5,000	20,000	80	1	Willits to Fort Bragg
			Weekday train - Longvale to Willits				280	3	
			Weekday train - Willits to Fort Bragg				360	3	

CY = Cubic Yards

Mendocino Railway OFA MP 139.5 to 152.5
Train Crew Labor

Zone	Position	Weeks Per year	Days Per week	Working Days Per year	Working hours Per day	Working hours Total hrs	Number Persons	Number Total hrs	rate per hour	Yearly cost
Longvale - Willits (M,W) Willits-Fort Bragg (T,Th,Sa)	Engineer	52	5	260	8	2080	1	2080	$38.50	**$80,080**
Longvale - Willits (M,W) Willits-Fort Bragg (T,Th,Sa)	Conductor	52	5	260	8	2080	1	2080	$32.50	**$67,600**
Longvale - Willits (F) Willits-Fort Bragg (T,Th,Sa)	Engineer	52	4	208	8	1664	1	1664	$38.50	**$64,064**
Longvale - Willits (F) Willits-Fort Bragg (T,Th,Sa)	Conductor	52	4	208	8	1664	1	1664	$32.50	**$54,080**
Relief/spare	Engineer	52	4	208	8	1664	1	1664	$38.50	**$64,064**
									Total	**$329,888**

Fuel Usage

Zone	Weeks Per year	Days Per week	Working Days Per year	Working hours Per day	Working hours Total hrs	Number of units	Total hrs	Gallons per hour	Total Gallons	Yearly cost $6.40
Longvale - Willits	52	3	156	4	624	2	1248	20	24,960	**$159,744**
Willits - Fort Bragg	52	3	156	10	1560	2	3120	45	140,400	**$898,560**
									Total	**$1,058,304**

Locomotive Capabilities

Model	HP	Weight	STE	CTE	Annual Rental	Max Loads Longvale to Willits	Units required per train	Max Loads Willits to Ft. Bragg	Units required per train	Spare/ repair units required	Total units required	Total Loco-motive expense
SW1500	1500	248,000	62,000	38,000	$40,000	20		5				**$0**
GP-9	1750	249,000	62,750	44,600	$25,000	25	1	7	2	1	3	**$108,000**
RS-11	1800	257,300	66,000	35,000	$25,000	20		5				**$0**

Physical Characteristics

Location	Milepost	Location	Milepost	Distance between miles	Max % grade	Max degree of curvature	Operating Speed - MPH
Longvale	152.5	Willits	139.5	13.0	0.7	10	10
Willits	39.0	Fort Bragg	0	39.0	4.6	24	10

Mendocino Railway OFA MP 139.5 to 152.5
Operating Costs

MAINTENANCE OF WAY AND STRUCTURES		
Track Labor	$	250,000
Materials and Equipment		100,000
Programmed Maintenance of Roadbed		75,000
Fringe Benefits		35,000
Grade Crossing Expenses		25,000
TOTAL MAINTENANCE OF WAY AND STRUCTURES	$	485,000
MAINTENANCE OF EQUIPMENT		
Mechanical Labor	$	144,000
Locomotive Repairs		45,000
Fringe Benefits		20,160
Car Repair Expenses		25,000
Track Equipment Repairs		10,000
TOTAL MAINTENANCE OF EQUIPMENT	$	244,160
TRANSPORTATION		
Locomotive Lease Expense	$	108,000
Car Lease Expense		72,000
Train Crew Labor		329,888
Fuel		1,058,304
Transload terminal manager		45,000
Fringe Benefits		52,484
Transload facility maintenance		20,000
Automobile for Fort Bragg crew change		13,000
Car Hire Costs		0
Other - PPE and Comms Equip		25,000
TOTAL TRANSPORTATION	$	1,723,676
GENERAL ADMINISTRATION		
Administrative Personnel	$	132,000
Fringe Benefits		18,480
Insurance – General Liability		35,000
Insurance – Fire and Auto		5,000

GENERAL ADMINISTRATION (continued)		
Information Services		4,000
Contracted marketing services		12,000
FRA compliance - Manuals, timetables, D&A testing		8,000
Rules, Safety & FRA training - CFR 243, RWP		5,000
Audit		12,000
Legal		8,000
Payroll Service		3,000
Telephone		7,200
Repairs and Maintenance		2,000
Utilities		3,000
Dues and Subscriptions		1,000
Property Taxes		5,000
Conferences		1,000
Office Supplies, Postage and Other		4,000
TOTAL GENERAL ADMINISTRATION	$	265,680
GRAND TOTAL OPERATING EXPENSE	**$**	**2,718,516**
Scenario 2A Cost/Car	**$**	**4,142.50**
Scenario 2A Cost/CY	**$**	**77.67**
Scenario 2B Cost/Car	**$**	**3,221.95**
Scenario 2B Cost/CY	**$**	**60.41**

Attachment I

Verification of Minimum Purchase Price

For OFA Purposes

In STB Docket AB 1305X

I, Caryl Hart, state that I am the Chair of Great Redwood Trail Agency (GRTA), formerly named North Coast Railroad Authority, an agency of the State of California; that I am authorized to make this verification; that I have read the foregoing "Certification of Filing and Service" prepared on behalf of Great Redwood Trail Agency; and that the minimum purchase price and other facts asserted therein are true and accurate as stated to the best of my knowledge, information, and belief.

The foregoing verification and certification is made on behalf of GRTA under penalties for perjury under the laws of the United States by the undersigned after due and careful investigation of the matters herein verified and certified and is based on the best of the undersigned's knowledge, information and belief.

For filing: September 15, 2022

Caryl Hart

Caryl Hart, Chair

Attachment I

Verification of Engineering-Related Analyses by David Anderson, P.E.

For Purposes of Section 1152.27 (OFA)

In STB Docket AB 1305X

I, David Anderson, state that I am a licensed civil engineer in the State of California and recently retired CEO/President of ARE Corp (https://are-corp.com/), a company which provides rail civil engineering services, including line inspections, rehabilitation and NLV evaluations, and operations analysis. I have personally served for the past twenty years as the civil engineering consultant for North Coast Railroad Authority ("NCRA"), now re-named the Great Redwood Trail Agency ("GRTA"). I have repeatedly examined the entire NCRA/GRTA right-of-way (portions of which are now owned by SMART) from its northern endpoint (Samoa, in Humboldt County, CA) to interconnection with the national freight rail network at American Canyon in Marin County, CA. My resume has already been submitted in this proceeding. At the request of GRTA, I participated in the preparation (either as author or co-author) of a series of reports (Attachments E, F, and G) to the "Certification and Filing" filed by GRTA in this proceeding. All facts in the referenced reports are based on my personal inspection of the rail line between MP 139.5 (Willits) and MP 152.5 (Longvale) and review of relevant documentation. All opinions expressed are based on my expert judgment and are within my expertise. I have also reviewed the aforementioned "Certification and Filing" and the calculations set forth therein for rehabilitation costs for MP 139.5 to MP 152.5, annual maintenance costs, operational costs for a system involving that segment under the scenarios stated, and Net Liquidation Value for track. All such calculations are true and correct to the best of my knowledge, expertise, information and belief.

Pursuant to 28 U.S.C. 1746, I declare and verify under penalty of perjury under the laws of the United States of America that the foregoing is true and correct.

____

David Anderson, PE

Dated: September 14, 2022