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TECHNICAL MEMORANDUM

DATE: January 13, 2010

TO: Rod Lentz – Forest Service

FROM: Timothy L. Otis, P.E. – Cascade Earth Sciences

SUBJECT: Existing Monte Cristo Road Evaluation Summary

Cascade Earth Sciences (CES) has prepared the following Condition Assessment of the Monte Cristo Road between the confluence of Weden Creek with the South Fork Sauk River and the Monte Cristo Townsite. The purposed of this assessment is to identify required repairs and priorities associated with needed equipment access to the Townsite. On June 20, 2009, approximately three miles of road was surveyed and assessed by Mr. Timothy Otis, P.E. and Ryan Tobias of CES. Survey categories include:

1) Road structure (sub-grade, surfacing, wheel ruts)
2) Cut and fill slope stability
3) Existing erosion issues
4) Ditch condition
5) Ditch relief culvert condition and spacing
6) Stream crossing structures
7) Landslide risk
8) Vegetation encroachment
9) Vertical or horizontal alignment issues
10) Curve widening and turnouts

In addition, this assessment includes a review of the equipment access needs to the former United Companies (Monte Cristo) Concentrator and the Rainy Mine. The proposed equipment access is located approximately 0.25 miles east of the terminus of the existing road (location of the footbridge to the Townsite) adjacent to the north of Glacier Creek.

The existing road is generally in good repair for the purposes of access for the proposed non-time critical Removal Action (RA) to be conducted under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). Eight specific sites were identified as needing repairs during the Condition Assessment. These include the following, which are outlined on Figure 1:

- Three stream-adjacent slope failures (Sites 1, 3, and 6)
- Two culvert crossings (Sites 2 and 8)
- Three areas of sediment transport/deposition (Sites 4, 5, and 7)

Specific site repairs are proposed to the road, as described below. The remainder of the road appears to be in adequate condition for equipment access with respect the ten categories listed above. Figure 2 is the field data sheet prepared for these sites.

Site 1

A South Fork of the Sauk River meander at this location has undercut the toe of the slope below the road, resulting in bank erosion and loss of a portion of the roadway (see Photographs 1 and 2). The recommended repair includes re-alignment of the roadway approximately 25-30 feet (ft) upslope to the north (see Figure 1). The 65 ft of eroded roadway will require approximately 100 ft of replacement road, plus 100 ft transitions at each end, for a total of 300 ft of road construction. The forested area of road relocation will require clearing and grubbing, and some cut and disposal of excavation to minimize vertical alignment change. The proposed horizontal alignment change concept is shown in Figure 3.

Site 2

Site 2 contains a 36 inch by 50 ft long high density polyethylene (HDPE) culvert (see Photograph 4) which has filled with sediment and experienced both erosion along the culvert alignment and deposition across approximately 110 ft of roadway (see Photographs 3 and 5). The recommended repair is to remove the culvert, re-grade the roadway, side-casting the material on downslope (south) side of the road, and add and compact 6 inches of 3 inch (minus) crushed rock. This crossing is in a sediment transport and deposition zone, and will require periodic maintenance following runoff/deposition events. No culvert or other drainage structure is recommended due to the large volume of sediment located upslope from this site.

Site 3

Site 3 is in a depositional outwash area of a seasonal drainage. The original rails of the Monte Cristo Railway are exposed under approximately 4 ft of sediment (see Photograph 6). The South Fork of the Sauk River meander has undercut the southern section of the roadway (see Photograph 7), causing a collapse of the entire roadway into the river. The recommended repair is similar to Site 1, moving the roadway approximately 25-30 ft north, for a total of 300 ft of road construction, including transitions (see Figure 3).

Site 4

Approximately 265 linear ft of the roadway in this area has been overlain by gravel and cobble debris flows of depths up to about 4 ft (see Photographs 8, 9, and 10). The upslope drainage lacks a defined channel, making future deposition possible across any of the previous outwash areas. The recommended repair, similar to Site 2, is to re-grade the roadway, side-casting the material on downslope (south) side of the road, and add and compact 6 inches of 3-inch (minus) crushed rock. This crossing is in a sediment transport and deposition zone, and will require periodic maintenance following runoff/deposition events. No culvert or other drainage structure is recommended due to the large volume of sediment located upslope from the site.

Site 5

Site 5 is similar to Site 4, and appears to be a part of the same depositional delta, with approximately 65 linear ft of the roadway overlain by gravel and cobble debris flows to a depth of about 2 ft (see Photographs 11, 12, and 13). The recommended repair, similar to Site 2, is to re-grade the roadway, side-casting the material on downslope (south) side of the road, and add and compact 6 inches of 3-inch (minus) crushed rock. This crossing is in a sediment transport and deposition zone, and will require periodic maintenance following runoff/deposition events. No culvert or other drainage structure is recommended due to the large volume of sediment located upslope from the site.

Site 6

Similar to Site 1, the South Fork of the Sauk River meander at this location has undercut the toe of the slope below the road, causing bank erosion and loss of a portion of the roadway (see Photographs 14 and 15). The recommended repair includes re-alignment of the roadway approximately 25-30 ft upslope to the north. The 160 ft of eroded roadway requires approximately 200 ft of replacement road, plus 100 ft long transitions at each end, for a total of 400 ft of road construction. The forested area of road relocation will require clearing and grubbing, and some cut and disposal of excavation to minimize vertical alignment change. The proposed horizontal alignment change concept is shown in Figure 3.

Site 7

Site 7 is located at a perennial stream crossing of the roadway (see Photographs 16 and 17). The recommended repair is to construct a road dip and an armored ford for the stream crossing. The largest of the available boulders can be used to construct a 12 ft wide by 15 ft long armored ford section. This should be constructed to allow lowest flows to move among the armoring boulders. The downstream side of the road should be armored with a gabion weir to control loss of roadway materials during high flows. The remainder of the disturbed roadway (60 linear ft) should be graded smooth and finished by placing and compacting 6 inches of 3-inch (minus) crushed rock. This crossing is in a sediment transport and deposition zone, and will require periodic maintenance following runoff/deposition events.

Site 8

Site 8 contains an ephemeral stream crossing with a proper functioning culvert installation, constructed in a rolling dip section to remove road surface drainage and pass high stream flows (see Photograph 19). The two 48-inch corrugated metal culverts are partially blocked by sediment and woody debris at the upstream (north) end, which should be removed (see Photograph 20). The multiple pipe design tends to accumulate debris and should be periodically checked and maintained. There is evidence of high flows overtopping the roadway, but upstream armoring and road surfacing remain intact.

Concentrator Site Access

Access to the Monte Cristo Concentrator should be completed from the north stream bank of Glacier Creek, approximately 1,500 ft east of the terminus of the existing road., Equipment can follow the existing access road for approximately 1,500 ft to the proposed ford location on Glacier Creek (see Photograph 22). This ford location was utilized by CES for equipment access during sampling activities at the Concentrator in July 2006. A temporary roadway can be rented, from one of several manufacturers, for the approximate 400 ft long crossing. Design and specifications for this crossing should be developed as a part of the RA.

Rainy Mine Access

Access to the Rainy Mine should be coordinated with the location of the centralized repository and RA activities at the Ore Collector. Two options for access are:

- Construct approximately 1,500 ft of roadway between the Concentrator access crossing and the Rainy Mine along the northern streambank of Glacier Creek. There is no known roadbed between the crossing and Rainy Mine. As such, clearing and grubbing activities would be required, and cut material could potentially be utilized as clean cover for the repository.

- Construct approximately 1,500 ft of roadway between the Concentrator and Rainy Mine on the south side of Glacier Creek and install a second temporary road crossing across the creek, similar to the one at the Concentrators Site access.
- Since access to the centralized repository and cleanup of the Ore Collector will be affected by this road location, final location of the crossing should be considered as part of the RA.

If you have any questions about the information presented in this memo, please contact me at (541) 821-6621. Thank you for the opportunity to provide these services.

TLO/sjr

Att: Figures 1-3
Photographs 1-22
c: Dustin Wasley - CES
PN: 2923017
Doc: Existing Road Evaluation Tech Memo.docx

Figure 1. GPS Site Locations

Figure 2. Field data sheets for surface drainage and stream crossing details

Road Name/Number: USFS/Monte Cristo Road **Road Use:** Inactive **Surface:** Old Rock

Road Location: Valley, S. Fork Sauk River **Average Width:** 12' **Ditch:** Yes **Outslope** No

Inventoried by: Otis/Tobias **Date:** 6/30/2009 **Geology/Soils:**

Identification			Surface Drainage					Culvert Detail					Stream Crossing Detail						
Station ID	Feature	Attention	Grade (%)	Ditch	Cut Slope	Surface	Delivery	Diam/ span	Material	Condition	% Open	Outlet Drop (ft)	Fish Presence	Diversion Potential	Fill Height (ft)	Sediment Filtering	Culvert Slope %	Outlet Drop (ft)	Resting Pool
Site 1	IA	Yes	0	-	S	G	Y	-	-	-	-	-	-	-	-	-	-	-	-
Site 2	IA	Yes	4	-	S/R	G	Y	1-36"	HDPE	S	0%	2	Dry	H	6	NU	15	2	A
Site 3	IA	Yes	2	G	S	R	Y	-	-	-	-	-	-	-	-	-	-	-	-
Site 4	IA	Yes	-5	G	S	G	Y	-	-	-	-	-	-	-	-	-	20	-	-
Site 5	IA	Yes	-5	G	S	G	Y	-	-	-	-	-	-	-	-	-	-	-	-
Site 6	IA	Yes	0	-	S	E	N	-	-	-	-	-	-	-	-	-	-	-	-
Site 7	IA	Yes	0	G	S	E	Y	-	-	-	-	-	-	H	1	NU	10	-	-
Site 8	DP/SC	Yes	12	G	R	G	P	2-48"	CMP	R/W	75%	0	Dry	M	8	NU	17	0	A
	Comments																		
Site 1	65 ft of road repair/relocation upslope																		
Site 2	110 ft of road repair, failed culvert (50 ft long), sediment depositional area																		
Site 3	110 ft of road repair/ relocation upslope, exposed old rail tracks in eroded bank, sediment depositional area																		
Site 4	265 ft of road repair																		
Site 5	65 ft of road repair																		
Site 6	160 ft of road repair/ relocation upslope																		
Site 7	75 ft. of road reconstruction, 50 ft. of drainage course or culvert improvement																		
Site 8	Clean sediment from upstream end of culvert																		

Header Options		Identification				Surface Drainage							
		Feature Codes		Attention Codes		Ditch Codes		Cutslope Codes		Surface Codes		Delivery Codes (of sediment to stream)	
Location	Ridge, Midslope, Valley	BR	Bridge	Y	Yes	G	Good	G	Good	G	Good	Y	Yes
Road use	Active, Inactive, Orphaned	CC	Cross drain Culvert	N	No	C	Cutting	R	Ravel	R	Rutted	P	Possible
Width	Outside edge to base of cut slope	DP	Dip			D	Diverted	S	Slides	B	Bermed	N	No
Surface	Asphalt, clean rock, old rock, dirt	DR	Ditch Relief (other)			F	Full			E	Eroded	B	Bypass
Ditch	Yes or No	GB	Grade Break										
Outslope	Yes or No	GT	Gate										
		IA	Immediate Attention										
		JN	Road Junction										
		LD	Landing										
		PC	Pump Chance										
		PN	Log Puncheon										
		SC	Stream crossing Culvert										
		WB	Water Bar										

Culvert and Stream Crossing Codes													
Material		Condition		Fish Presence		Diversion Potential		Fill Height	Sediment Filtering		Outlet Drop	Resting Pool	
CMP	Corrugated Metal Pipe	A	Animal	F	Fish Use	H	High	Distance from channel bottom to road surface at downstream end	UT	Utilized	Distance from bottom of pipe to elevation of pool	G	Good
		B	Bottom out	U	Unknown fish use	M	Medium		NU	Not Utilized		F	Fair
HDPE	High Density Polyethelyne	C	Collapse	N	No fish use	L	Low		NA	Not Available		A	Absent
Conc	Concrete	G	Good	A	Anadromous use								
		M	Mechanical damage										
		N	Natural Bottom										
		R	Rusted										
		S	Sediment blockage										
		W	Wood blockage										

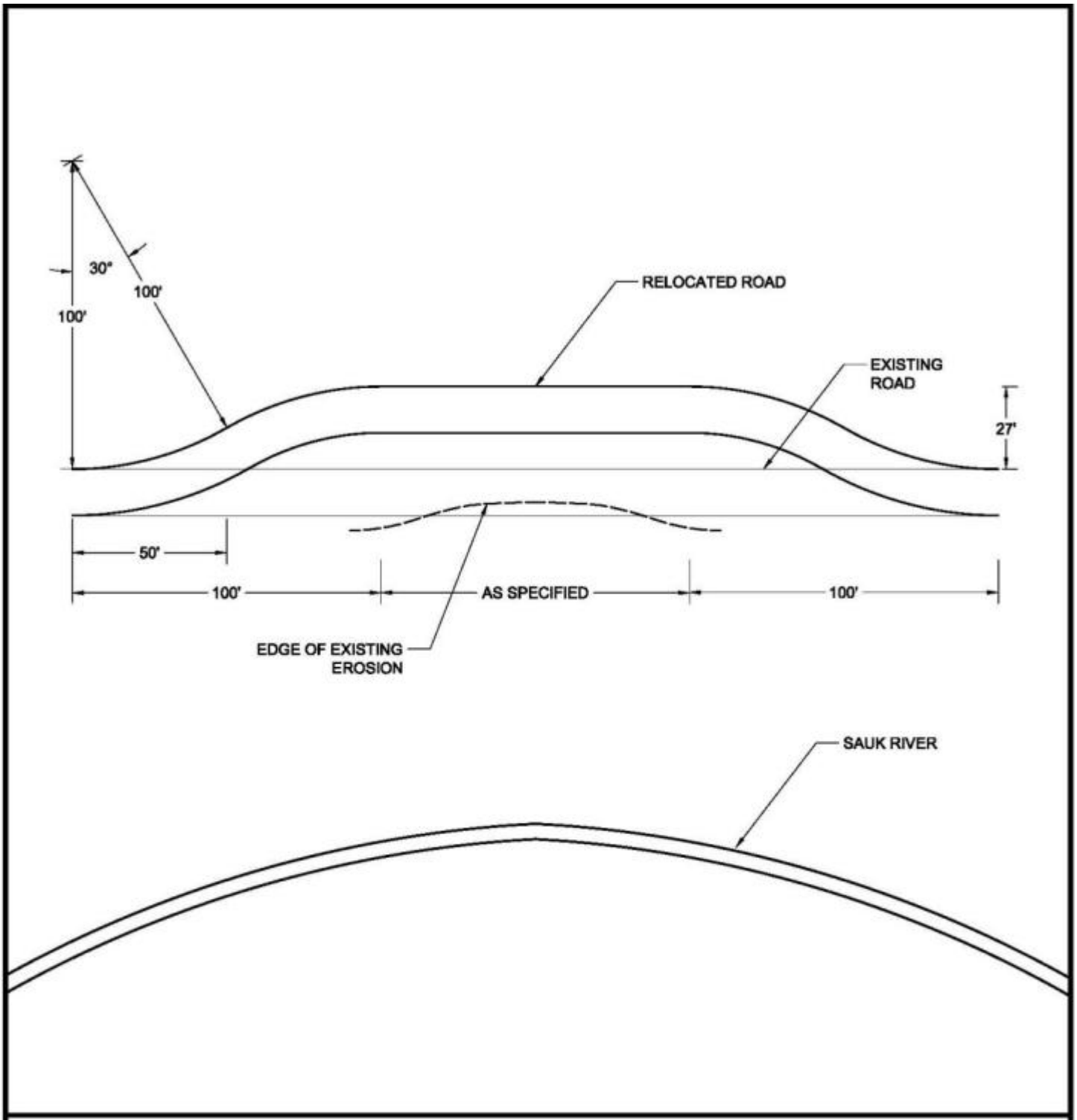

Figure 3. Proposed Road Improvements

(Not to Scale)

PROJECT NUMBER: 2923017	Existing Road Evaulation
DATE: 12/30/2009	
DWG BY: KCS / DWG NO: 2723017F1.dwg	Monte Cristo
PROJECT MANAGER: TLO	
REVISED:	CES CASCADE EARTH SCIENCES, A Valmont Industries Company

Photograph 1. Site 1A
Looking northwest down roadway.

Photograph 2. Site 1B
Stream bank erosion encroaching on roadway, with log barriers, looking southeast.

Photograph 3. Site 2A
Sediment deposition and erosion, looking northwest.

Photograph 4. Site 2B
36 inch culvert blocked with sediment.

Photograph 5. Site 2C
Sediment deposition, looking southeast.

Photograph 6. Site 3A
Former railway tracks, sediment deposition, and streambank erosion.

Photograph 7. Site 3B
View of tracks from bypass trail above roadway.

Photograph 8. Site 4A
Looking southeast to sediment which has flowed down roadway.

Photograph 9. Site 4B
Looking upslope across road to northeast.

Photograph 10. Site 4C

Photograph 11. Site 5A
Looking southeast.

Photograph 12. Site 5B
View across roadway to Northeast.

Photograph 13. Site 5C
Looking northwest.

Photograph 14. Site 6A
Looking southeast.

Photograph 15. Site 6B
Looking southeast, backpack in roadway for scale.

Photograph 16. Site 7A
Roadway looking northwest.

Photograph 17. Site 7B
Looking downstream across road.

Photograph 18. Site 7C
Roadway looking upstream to the northwest.

Photograph 19. Site 8A
Roadway looking southeast.

Photograph 20. Site 8B
Inlet end of culverts.

Photograph 21. Site 8C
Outlet end of culverts.

Photograph 22.
Equipment crossing site across Glacier Creek, looking approximately north from the Concentrator Site.