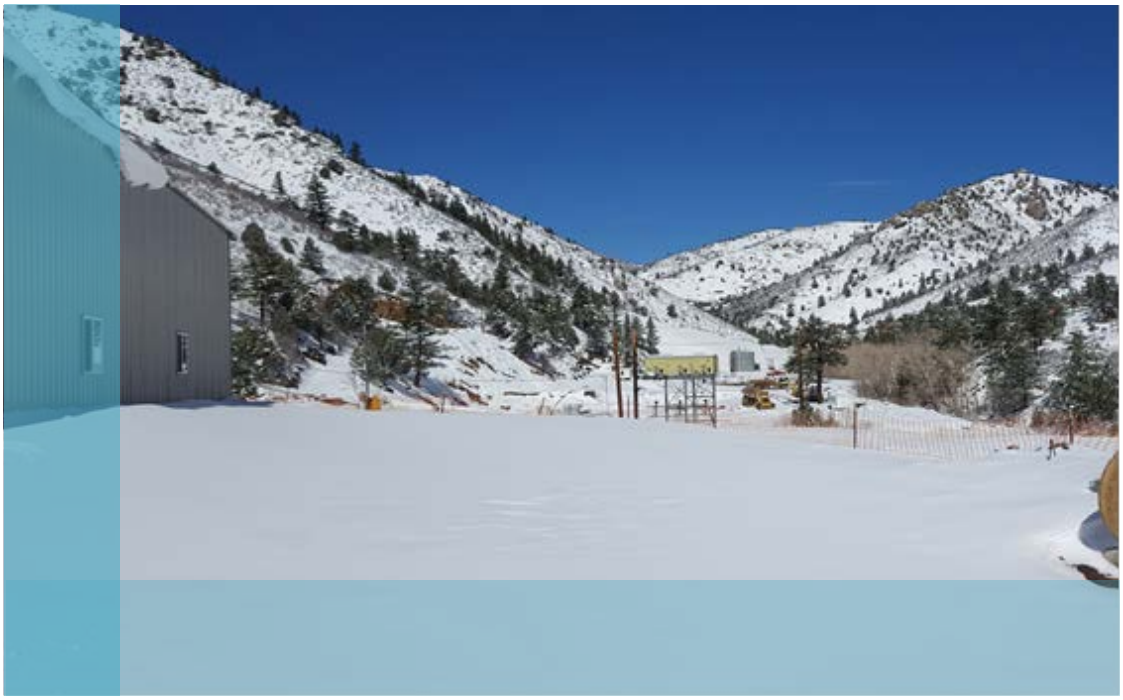
TECHNICAL REVISION 26

SCHWARTZWALDER MINE

MINE PERMIT NO. M-1977-300

JEFFERSON COUNTY, GOLDEN, COLORADO



MAY 2018

COLORADO LEGACY LAND

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ALEXCO WATER & ENVIRONMENT

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1 INTRODUCTION

Technical Revision 23 amended Amendment 04 to allow for alluvial materials to be placed on the existing North and South Waste Rock Piles, and allowed for some materials to be placed into the Minnesota Adit for final disposal. Technical Revision 23 included a specified list of materials and estimated quantities to be placed in the Minnesotal Adit. This list was amended by Technical Revision 25 to include alluvial materials associated with the Schwartzwalder Mine, Radioactive Materials License (RML 369-06) issued by the Colorado Department of Public Health and Environment (CDPHE). Colorado Legacy Land, LLC (CLL) is submitting this Technical Revision 26 to add additional items to the inventory of materials that will be disposed of in the Minnesota Adit.

2 TECHNICAL INFORMATION

Attachment F of Technical Revision 23 presented a list of materials designated for disposal in the Minnesota Adit; the total expected volume was 4,749 cubic yards (Cotter, 2017a). Technical Revision 25 amended this volume by adding approximately 7,200 cubic yards of alluvial materials from area RML #2, as specified in the CLL Schwartzwalder Mine RML 369-06 (Cotter, 2017b). CLL conservatively seeks to add an additional 90 cubic yards of reverse osmosis (RO) membranes and cartridge filters and 10 cubic yards of incidental contaminated waste to the Attachment F inventory (see Appendix A).

2.1 DESCRIPTION OF MATERIALS

CLL operates a water treatment system as described in Technical Revision 24 (Cotter, 2017c). This system is located outside the Steve Adit at the south end of the mine site. CLL treats both mine water and groundwater, collected by the sump system, using RO with an ion exchange (IX) polish. Clean water effluent is discharged to an outfall permited by the CDPHE (Permit CO-0001244). Reject, or the brine, generated from RO treatment is returned to the mine.

Three types of solid waste are generated from the treatment process: spent cartridge filters, RO membranes, and incidental contaminated waste. Cartridge filters are located in canisters placed upstream of the RO units and remove particles greater than 1 micron in diameter. Filtering such particles is necessary to allow the RO membranes to function properly and increase duration.

RO membranes remove constituents on a molecular scale. The clean water resulting from this process contains very low dissolved solids and is slightly acidic. CLL is required to use various types of backflushing and washes to maintain membrane efficiency. CLL assumes these membranes, under the current system configuration will be replaced approximately every three to four months; however, operational changes may reduce this frequency.

CLL tested both the cartridge filters and the RO membranes for uranium content to determine if the uranium content meets the definition of source material under CDPHE's radiation protection regulations. Regulations in 6 CCR 1007-1 Part 3 state that source material concentrations (uranium and/or thorium) below 0.05 percent or 500 parts per million (ppm) are exempt from regulation. Table 1 presents results from 2016 that indicate both cartridge filters and RO membranes are not source material.

Table 1. Chemical Analyses of RO Membranes and Cartridge Filters

Collection Date	Medium	Parameter	Unit	Result
27-Oct-16	Cartridge Filter	Uranium	ug/g	370
27-Oct-16	Cartridge Filter	Radium-226	pCi/g	400
27-Oct-16	RO Membrane	Radium-226	pCi/g	166
27-Oct-16	RO Membrane	Uranium	ug/g	180

In addition to the filters and membranes discussed above, incidental contaminated solid waste is generated. Such wastes include cardboard inserts from the membrane boxes, tyvex suits, disposable gloves, etc. These wastes are stored in large plastic trash bags.

2.2 DISPOSAL VOLUMES

Currently, CLL is storing approximately 11 cubic yards of RO membranes and cartridge filters and approximately 1.4 cubic yards of incidental solid waste. Over the course of the project, CLL expects to generate a maximum of 90 cubic yards of membranes and cartridge filters and possibly 10 cubic yards of incidental solid waste. CLL expects the rate of filter and membrane changes to slow dramatically because of two reasons. First, CLL intends to only operate the treatment system for six months each year. Also, CLL is considering design changes that could eliminate the need for the cartridge filters and extend the life of the membranes. Appendix A contains a revised Technical Revision 25, Attachment F, which is a list of materials to be disposed in the Minnesota Adit.

2.3 IMPACT ON PROJECT

CLL does not expect this technical revision request to impact the Schwartzwalder mine reclamation project. The additional disposal volume requested is approximately 0.8% of the volume approved in Technical Revision 25. Furthermore, the radioactive nature of the filters and membranes is similar to those materials already approved for disposal in the Minnesota Adit. Furthermore, the Minnesota Adit will provide a safe and secure disposal facility.

2.4 SCHEDULE OF ACTIVITIES

CLL would start disposing of the existing membranes and cartridge filters immediately after DRMS approves this Technical Revision. Membrane and cartridge filter disposal will occur approximately 3 to 4 times annually depending upon the number of filter and cartridge changes that occur during the year.

3 REFERENCES

Cotter 2017a. Letter from Cotter to DRMS Transmitting a Revised Technical Revision 23, Attachment F. March 16, 2017.

Cotter 2017b. Technical Revision 25, Amendment to Technical Revisions -23 and -24, June 2, 2007.

Cotter 2017c. Technical Revision 24, Technical Revision 24 ("TR-24") - Correction of Permit Boundary Discrepancy and Relocation of Water Treatment Building; Schwartzwalder Mine, Golden, Colorado, Mine Permit M-1977-300

APPENDIX A

REVISED TECHNICAL REVISION 26, ATTACHMENT F

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ATTACHMENT F - INVENTORY OF MINNESOTA ADIT MATERIALS

Table Number	Table Title	Summary of All Material	
		Trucked Placement Volume (cu. ft.)	Trucked Placement Volume (cu. yd.)
Table 1	Boneyard	2,269	84
Table 2	Old WTP Area	88,035	3261
Table 3	Hillside Adits	3,560	132
Table 4	New WTP	21,314	789
Table 5	Valley Floor Sites	210,149	7783
	Total Volume:	**325,327**	**12,049**

Table 1 - Boneyard			
	Item	**Trucked Placement Volumet (cu. ft.)**	**Description**
1	Building, Domestic Well	119	Metal Siding
2	Building, Domestic Well Vault	307	Concrete
3	Foundation, Domestic Well Vault	450	Concrete
4	Bridge	95	Steel
5	Stairs, Steel	68	Steel
6	Water Heater	6	Steel
7	Rock Grizzly	48	Steel
9	Concrete, Wing Walls	972	Concrete
9	Culvert, 3ft dia	56	Steel
10	Culvert, 5ft dia	78	Steel
11	Planks, Plates	70	Steel
	Total	**2,269**	

Table 2 - Old Water Treatment Plant			
	Item	**Trucked Placement Volume (cu. ft.)**	**Description**
1	Building, WTP	18,900	Steel - structural + Siding + Interior equipment
2	Building Foundation, WTP	12,960	Concrete
3	Concrete Containment Ponds- Sides	2,700	Concrete
4	Concrete Containment Ponds - Floor	28,200	Concrete
5	Fencing	15,667	Steel
6	Pump House Foundation	384	Concrete
7	Pump Support + Electrical	50	Steel
8	Monitor Well	0	Steel
9	Monitor Well Foundation	2	Concrete
10	Empty Propane Tanks, 1000 gal.	85	Steel
11	Empty Propane Tanks, 500 gal.	28	Steel
12	Concrete Box (Sides)	38	Concrete
13	Concrete Box (Bottom)	32	Concrete
14	Receiver Tank	23	Steel
15	Pipe	175	PVC
16	Empty 60,000 Gal Tank (Creek Water)	641	Steel
17	Foundation, 60,000 Gal Tank (Creek)	754	Concrete
18	Pipe, PVC to WTP	3	PVC
19	Empty Septic Tank	180	PVC
20	Power Poles	13	Steel
21	"Old" WTP Foundation	7,200	Concrete
	Total	**88,035**	

Table 3 - Hillside Adits			
	Item	**Trucked Placement Volumet (cu. ft.)**	**Description**
Minnesota Adit			
1	Pipe, PVC, Misc.	963	PVC-Plastic
2	Steel, Misc.	1,650	Concrete
3	Portal Gate	75	Steel
4	Portal Steel	150	Steel
5	Portal Walls, Steel	23	Steel
CV Adit			
1	Vent Riser	47	Steel
2	Portal Steel	203	Steel
3	Telephone Poles	16	Steel
4	Power Cable	2	Steel
Sunshine Adit			
1	Power Cable	7	Copper + Ins
2	Steel, Misc.	38	Steel
3	Portal Walls, Sheet Steel	25	Steel
Pierce Adit			
1	Portal Steel	27	Steel
2	Culvert	34	Steel
3	Monitor Well	2	Steel
4	Monitor Well Foundation	2	Concrete
Black Forest Adit			
1	Gate	183	Steel
2	Steel, Misc., Lift	28	Steel
3	Fence	30	Steel
4	East Portal Entrance - Culvert	51	Steel
5	Monitor Well	2	Steel
6	Monitor Well Foundation	2	Concrete
	Total	**3,560**	

Table 4 - New Water Treatment Plant			
	Item	**Trucked Placement Volume (cu. ft.)**	**Description**
1	Building, Steel Frame	5,760	Steel - Structural + Siding
2	Building, Concrete Foundation	5,760	Concrete
3	Fan + Frame	180	Steel
4	Fan Duct	53	Steel
5	Liner, PVC	179	PVC-Plastic
6	Empty Mix Tanks, Tall	848	Fiberglass
7	Empty Mix Tanks, Short	157	Fiberglass
8	Pipe, Misc.	40	PVC-Plastic
9	Power Box	7	Steel
10	Clarifiers	1,008	Steel
11	Clarifier stairs	450	Steel
12	Empty Tanks	2,651	Fiberglass
13	Empty Tanks, Clear Water	353	Fiberglass
14	Empty Tank, Plastic - Potable Water	79	Plastic
15	Rock, Dirt and Debris	1,089	Rock
16	Spent RO Membranes and Cartridge Filters	2,430	Plastic
17	Incidental Solid Waste from Filter Changes	270	Paper, Plastic
	Total	**21,314**	

Table 5 - Valley Floor			
	Item	Trucked Placement Volume (cu. ft.)	Description
Valley Creek Pipe			
1	Pipe, PVC	4,665	PVC
2	Electric Cable	58	Copper + Ins
3	Electrical Panel	7	Steel
4	Power Boxes	13	Steel
Sump 4			
1	Power Panel	16	Steel
2	Sump	30	Steel
Office Trailer			
1	Trailer	650	Steel Siding
Substation			
1	Building	343	Steel
2	Foundation, Concrete	720	Concrete
3	Step, Concrete	7	Concrete
4	Transformer Enclosure	432	Steel
5	Transformer Pad, Concrete	96	Concrete
6	Electrical Apparatus	216	Steel
7	Wall, Concrete	60	Concrete
8	Fence	363	Steel
Ore Sorter Area			
1	Electrical Boxes	44	Steel
2	Electrical Boxes	12	Steel
3	Electrical Box Support	148	Steel
4	Scale Posts	2	Steel
5	Pipe, PVC	682	PVC
6	Culverts	424	Steel
7	Culvert Scrap	4,158	Steel
8	Elbow, Vent	79	Steel
Creek Head Gate			
1	Pipe, Creek Discharge Pipe	754	Steel
2	Gate, Creek Discharge Pipe	13	Steel
3	Gate Mounting, Creek	64	Steel
Discharge Pipe			
1	Control Panel	11	Steel
2	Control Panel Foundation	24	Concrete
3	Concrete, Dam Wall	900	Concrete
Old Emergency Storage Pond			
1	Electrical Box	13	Steel
2	Electrical Cable	9	Copper + Ins
3	Monitor Well	2	Steel
4	Monitor Well Foundation	2	Concrete
5	Sump	15	Steel
Entry Gate Area			
1	Gate	30	Steel
2	Gate Posts	8	Concrete

Table 5 - Valley Floor			
	Item	**Trucked Placement Volume (cu. ft.)**	**Description**
3	Stairs, Metal - BPL	54	Steel
4	Monitor Well	2	Steel
5	Monitor Well Foundation	2	Concrete
6	Monitor Well	1	Steel
7	Monitor Well Foundation	2	Concrete
8	Creek Sump	81	Steel
9	Old Sumps	151	Steel
10	Electric Panel Skids	192	Steel
11	Concrete Sump - Walls	50	Concrete
12	Concrete Sump - Floor	144	Concrete
RML #2			
1	Alluvial Material Exceeding Cleanup Criteria	194,400	Alluvial Fill
	Total	**210,149**	

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