BARR

Surface Water Management Plan

Leadwood Mine Tailings Site

Prepared for
The Doe Run Company

July 2014

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STATE OF MISSOURI
TY L.
MORRIS
NUMBER
E-2002003210
REGISTERED PROFESSIONAL ENGINEER

7/2/14

1.0 Background

1.1 Site Description

The Leadwood Mine Tailings Site is located on the Flat River 7.5-Minute U.S. Geological Survey (USGS) quadrangle map as shown on Figure 1. The legal description is Section 4, 5, 8, 9, and 16 Township 36 North, Range 4 East in St. Francois County, Missouri. The facility occupies approximately 1,100 acres and is located west of State Highway 32 between the towns of Frankclay, Wortham, and Leadwood, Missouri.

1.2 History of Mining/Milling Operations

Mining activities at the site commenced at and near the Leadwood site about 1894. Early operations included mining, milling, and roasting. Ore feed for the Leadwood mill was from multiple mineshafts or mines in nearby areas. Ore was hauled to the mill from remote locations by rail, aboveground (early), and underground (later). Some roasting of ores may have continued at Leadwood through approximately 1920. The Leadwood mill was modernized and enlarged on occasion, until it was permanently closed in approximately 1965 (Barr, 2005).

1.3 Summary of Removal Activities Completed to Date

The Leadwood Mine Tailings Site was divided into four areas in the *Engineering Evaluation/Cost Analysis Report* (EE/CA) (Barr, 2005). These areas were the Chat Pile Area, the Tailings Area, the Dam/Spillway Area, and the East Seep and Erosion Area. The removal action activities completed for the previously referenced four areas were completed in accordance with the *Removal Action Work Plan* (Barr, 2007) and are listed below.

1.3.1 Chat Pile Area

The Chat Pile Area is the 35-acre area on the northern portion of the site located at the east end of Eaton Dam. Removal action activities on the Chat Pile Area focused on removing or stabilizing low strength materials, regrading areas to flatten the slopes, and the demolition of the remaining foundations from the mill facility and associated structures.

Work on the chat pile included removing all of the material above approximately Elevation 865 and regrading the pile to match into the upstream and downstream slopes of Eaton Dam, as well as the area to the east of the Chat Pile Area. Once grading activities were completed, the regraded chat pile was covered with a minimum of 12 inches of slope protection rock.

The low strength materials located in the area identified as the slimes area were excavated to a minimum of 3 feet below the final subgrade contours. For the portion of this area outside of the grading plan, slimes were excavated to a minimum of 3 feet below the surrounding grades. The excavated materials were placed in the disposal area. Over excavated areas were backfilled with general fill or slope fill. Once backfilling and grading activities were completed, the excavated area was covered with a minimum of 12 inches of slope protection rock. The portion of the slimes area south of the grading plan was covered with a minimum of 12 inches of cover soil.

Removal action activities in the slimes area also included the demolition of a decant tower located on the south side of the slimes area. Demolition activities lowered this structure to a minimum of 3 feet below the final subgrade. The portion of the decant tower deeper than 3 feet was left in place, backfilled with general fill to a minimum of 3 feet below the final subgrade elevations and covered. Debris from the demolition of the decant tower was placed in the disposal area.

Removal action activities in the Chat Pile Area also included demolishing the remnants of the structures that remained from the former milling operations. These structures were demolished down to a minimum of 2 feet below the existing ground surface. Any portion of the structure extending deeper than 2 feet below the final subgrade elevations was left in place. Debris from the demolition activities was buried in place or disposed of in the disposal area. The portion of the area affected by demolition activities located in the Chat Pile Area was covered with a minimum of 12 inches of the slope protection rock. The portion of the area affected by the demolition activities located in the mill area was covered with a minimum of 12 inches of cover soil and vegetated.

Removal action activities in the Chat Pile Area also focused on the area identified as the sugar bowl. This area was used as the onsite disposal area for unsuitable materials, including miscellaneous fill, debris encountered around the site, demolition debris, and the burned remains of cleared and grubbed materials. Once filled, the sugar bowl was graded and covered with a minimum of 12 inches of slope fill. The sugar bowl was also covered with a minimum of 12 inches of slope protection rock.

1.3.2 Tailings Area

Removal action activities on the Tailings Area included improving the stormwater detention time upstream of Wortham Road, demolition of the remaining structures from operations in the portion of the Tailings Area south of the Chat Pile Area and in the Southern Mine Shaft Area, and reducing the potential for tailings migration due to wind or water.

Removal action activities on the portion of the Tailings Area south of Wortham Road included constructing a 1,400-foot-long stormwater control structure directly upstream of Wortham Road to temporarily detain the 100-year, 24-hour storm event for this watershed. This structure was constructed with a 20-foot wide crest at an elevation of 862.0 that drains towards the south at a five percent grade. The upstream slope of the structure has a gradient of 4H:1V and was constructed to tie-in with contours of the tailings basin to the south of the structure. The downstream slope, constructed with a gradient of 10H:1V, included a ditch between Wortham Road and the structure. This ditch captures the runoff from Wortham Road and discharges it into the original culverts under the road located near the east end of the structure. The original culverts, located near the east end of the structure, were cleaned out, covered, and blocked so that only water from the road ditch is discharged through them to the north side of Wortham Road. New culverts were installed during the construction of the structure on the western end of the structure. These culverts discharge to a swale that was constructed on the north side of Wortham Road.

The swale, constructed on the north side of Wortham Road, was built to direct stormwater from south of Wortham Road to the creek located on the western side of the site. This swale was constructed to match into the existing ground contours on its eastern end and have a gradient towards the west of

approximately 0.5 percent. Since the creek flows perpendicular to the swale, grading activities were completed on the banks of the creek and the western end of the swale to allow the swale to discharge into the creek without causing excessive erosion.

Removal action activities in the Tailings Area also included the demolition of two decant towers. These structures were demolished to a minimum of 2 feet below the surrounding existing ground elevation and backfilled with general fill to match the surrounding ground elevations. Demolition activities were also completed on the remnants of the structures that remained from the former mining operations around the shaft identified as Desloge Consolidated Lead Company (DCLC) #6 in the portion of the Tailings Area identified as the Southern Mine Shaft Area. These activities demolished the structures down to a minimum of 2 feet below the existing ground surface and backfilled with cover soil to match the surrounding ground elevations.

Work in the Southern Mine Shaft Area also included stripping contaminated materials and chat that had been deposited in the area. The materials that were unsuitable for use were taken to the sugar bowl and placed in the disposal area. The materials that were suitable for use in the construction activities were utilized around the site. Upon removal of these materials, the areas that were stripped were graded to drain and vegetated or covered with 12 inches of slope protection rock.

Removal action activities on the Tailings Area also included regrading areas that were steeper than 4H:1V or areas that had been eroded by surface water running across the site. Upon finishing the regrading activities, a minimum of 6 inches of cover soil was placed on the regraded areas except for those areas that have been eroded by surface water. These areas were covered with a minimum of 12 inches of slope protection rock.

Removal action activities on the Tailings Area also included vegetating the mine waste. Areas of mine waste that were barren or sparsely vegetated were covered with a minimum of 6 inches of cover soil. These areas, along with the areas where established vegetation existed, were seeded and fertilized.

1.3.3 East Seep and Erosion Area

The East Seep and Erosion Area is the relatively flat approximately 50-acre secondary tailings basin located east of the Tailings Area. This area is bounded to the south by the Southern Mine Shaft Area, to the north by the mill facility and the town of Leadwood, and the east by Davis Crossing Road (Barr, 2007). The focus of work on this area was to increase the stormwater detention time for this drainage area and buttress the upper portion of the downstream slope.

Removal action activities on the East Seep and Erosion Area included raising the crest of the downstream slope to temporarily detain the 75 percent probable maximum precipitation (PMP) event for this watershed. This structure was regraded to match into the existing ground contours on the north and south ends of the area. The water retained by this structure will temporarily pond around the existing decant tower through which stormwater will be discharged. The tower, which has an invert elevation of 847.0, had all of the original concrete above approximately 850.0 removed and replaced with a new inclined inlet that was constructed on the top of the original tower. Upon finishing the regrading

activities, the areas affected by the removal action activities were covered with a minimum of 12 inches of slope protection rock.

In addition, a broad-crested emergency overflow was constructed in the crest of the slope where the raised slope abuts natural ground on the southwestern portion of the East Seep and Erosion Area. Water discharging from this overflow will enter the drainage basin to the south of the area and will rejoin the water discharged from the decant tower in the unnamed tributary to Big River on the east side of Davis Crossing Road.

Removal action activities also included retrieving mine waste that migrated into the woods at the base of the slopes and from the Hall property to the east of the East Seep and Erosion Area. This work included stripping the area to natural ground and removing mine waste to the extent possible. At the landowner's request, the stripping activities on the Hall property were completed in a manner that expanded the pond already located on the property. The areas that were stripped at the toe of the slope in the East Seep and Erosion Area were covered with a minimum of 12 inches of slope protection rock.

Removal action activities on the East Seep and Erosion Area also included vegetating the mine waste. Areas of mine waste that were barren or sparsely vegetated were covered with a minimum of 6 inches of cover soil. These areas, along with the areas where established vegetation existed, were seeded and fertilized.

1.3.4 Dam/Spillway Area

The Dam/Spillway Area is located on the northern portion of the site. This area includes Eaton Dam, Leadwood Dam, the area between the two dams, and the area between Leadwood Dam and the Big River. The focus of the work on the Dam/Spillway Area was to retrieve materials that have migrated downstream of Leadwood Dam and to cover areas of barren or sparsely vegetated tailings.

1.3.4.1 Eaton Dam

Removal action activities on Eaton Dam included covering the portions of the upstream and downstream slopes not covered during the completion of the previous activities in 1994. These areas were covered with a minimum of 12 inches of slope protection rock.

Removal action activities on Eaton Dam also included regrading areas beyond the toe of the upstream and downstream slopes steeper than 4H:1V, or those areas that were being eroded by the surface water running across the site. These areas were regraded to a gradient of 4H:1V or flatter. Upon finishing the regrading activities, these areas were covered with a minimum of 12 inches of slope protection rock.

1.3.4.2 Leadwood Dam

Removal action activities on Leadwood Dam focused on regrading areas between the two dams steeper than 4H:1V or those areas being eroded by the surface water running across the site. These areas were regraded to a gradient of 4H:1V or flatter. Upon finishing the regrading activities, a minimum of 6 inches of cover soil was placed on the regraded areas except for those areas that have been eroded by surface water. These areas were covered with a minimum of 12 inches of slope protection rock.

Removal action activities on the Leadwood Dam area also included covering the upstream and downstream slopes of the dam. These areas were covered with a minimum of 12 inches of slope protection rock.

1.3.4.3 Spillway

This portion of the Dam/Spillway Area is located downstream of Leadwood Dam between the dam and the Big River. This area includes the area between Leadwood Dam and old Missouri Highway 8 (West North Street), the area between old Missouri Highway 8 and new Missouri Highway 8, and the area between new Missouri Highway 8 and Huntsford Road. Doe Run was unable to obtain access to the portion of this area downstream of Huntsford Road from the landowner so no work was completed on that portion of the area.

Removal action activities in the portion of the spillway between Leadwood Dam and old Missouri Highway 8 focused on retrieving materials that had migrated downstream of the dam. This work included stripping the area to natural ground. Once this area was stripped to natural ground, the natural soils were tested to determine if the natural soils had been contaminated. Soil that exceeded the established standards for the site was removed. Soils that did not exceed the standard were regraded to drain towards the creek channel. Areas where stripping activities were completed along the creek channel were covered with a minimum of 12 inches of slope protection rock.

As the stripping activities were completed, the slope of Leadwood Dam was extended at the existing gradient to match into the natural ground below the mine waste. In addition, material was left in place adjacent to old Missouri Highway 8 to protect a sewer line, as well as along the eastern side of the area to maintain a haul road. The areas where the slope of the dam was extended, as well as where tailings were left in place, were covered with a minimum of 12 inches of slope protection rock.

Removal action activities in the portion of the spillway between old Missouri Highway 8 and new Missouri Highway 8 included regrading the mine waste located in this area to drain towards Eaton Creek. Upon finishing the regrading activities, a minimum of 12 inches of cover soil was placed on the regraded area except for those areas that have been or are likely to be eroded by surface water. These areas were covered with a minimum of 12 inches of slope protection rock. The areas covered with cover soil were seeded and fertilized.

Removal action activities in this portion of the spillway also included removing mine waste from Eaton Branch Creek. This work consisted of excavating materials from the creek, regrading the eastern slope of the creek, and cleaning out the culverts under old Missouri Highway 8 and new Missouri Highway 8. Regrading activities were also completed on the western slope of the creek to minimize erosion, but these regrading activities were minimized, as that slope was primarily made of natural soil and relatively well vegetated. The materials removed from the creek and culverts were used in the regrading activities described above. Regrading activities on the eastern slope of the creek regraded the slopes to 4H:1V or flatter. Once regrading activities were completed, this slope was covered with a minimum of 12 inches of slope protection rock.

Removal action activities in the portion of the spillway downstream of Missouri Highway 8 focused on retrieving materials that migrated downstream of the dam between Missouri Highway 8 and Huntsford Road. This work included stripping the area to natural ground including the stream channel. The natural soils were tested to determine if the natural soils have been contaminated. If the soil exceeded the standards, material was removed. If the soil did not exceed the standards, the area was regraded to match into the surrounding natural ground contours, seeded, and fertilized. Areas where removal was completed that had a gradient of 4H:1V or steeper were covered with a minimum of 12 inches of slope protection rock.

2.0 Supplemental Work for Surface Water Quality Improvement

This section of the report describes additional, supplemental work that is intended to be implemented to minimize the volume and improve the water quality discharging from the Leadwood site. The Leadwood Tailings Area is located within the Owl Creek-Big River Watershed (HUC 071401040111) and has a drainage area of 2,179 acres that is located upstream from the Eaton and Leadwood Dams, respectively. Discharges from the Eaton and Leadwood Dams flow to Eaton Branch and ultimately to the Big River some three-fourths mile downstream. During certain runoff conditions, the Leadwood Tailings Area receives significant volumes of surface water flow from offsite areas. This additional run-on volume of water contributes to saturated tailings and the phreatic water surface of the tailings basin, which in-turn contributes to seeps at the toe of the Eaton and Leadwood Dams, respectively.

Doe Run is planning the implementation of additional work that is intended to reduce and better manage the run-on and infiltration of stormwater into and on the Tailings Area. This additional surface water is believed to ultimately contribute to zinc containing seepage from the tailings dams and exterior slopes of the tailings pile. The remedial measures are segregated into the East Seep and Erosion Area and the areas upstream of the Eaton and Leadwood Dams. Supplemental work for the East Seep and Erosion Area is planned for implementation during calendar year 2014 and described in the following section. Implementation plans for supplemental work in the area upstream of the Eaton and Leadwood Dams including seepage from the toe of the dams will be finalized and a schedule for implementation developed once the soil repository issues have been resolved with the United States Environmental Protection Agency (USEPA).

2.1 East Seep and Erosion Area

2.1.1 Low Permeability Cover

Supplemental work in the East Seep and Erosion Area will focus on covering the tailings as shown in Construction Drawing C-10A with a minimum of 12 inches of low permeability cover soil. Many of the tailings in this area have some vegetation established, but little to no cover soil. Consequently, a significant portion of the precipitation that falls onto this area infiltrates into the underlying tailings, which contributes to the seepage at the toe of the slope of this area. The addition of soil cover for this area is intended to minimize infiltration and promote runoff rather than infiltration of any precipitation into the existing tailings.

Completion of this work will include the clearing and grubbing of the vegetation that is growing on the tailings in this area. Once that has been finished, grading activities will be completed, as allowed by the tailings material, to smooth the ground surface and promote drainage towards the southwest. This will be done in a manner that will generally follow the contours shown on Construction Drawing C-10A. Once grading activities have been completed, cover soil will be placed to bring the elevation to final grade. The cover soil, which will have significant clay content, will experience a certain amount of compaction as it is placed, but a specific permeability or compaction specification will not be required. It is also likely that

the cover soil thickness will exceed 12 inches in many areas due to the compressibility of the underlying tailings and the need to bring in additional clay material to reach the final grade.

The source area for the cover soil is anticipated to be one of a couple of onsite areas that are relatively close to the East Seep and Erosion Area. Upon completion of the grading activities, the area will be fertilized, limed (as needed), and seeded.

2.1.2 Grading, Surface Water Collection, and Monitoring

As shown on Construction Drawing C-10A, the area will be graded to drain to a low-flow channel that will be constructed to discharge through the existing emergency overflow structure on the southwest corner of the area. This new low-flow channel, as shown on Construction Drawings C-10A and C-20, will have a minimum bottom width of 10 feet and a minimum depth of 4 feet with 5H:1V side-slopes. The rock used for erosion control in the channel will conform to standard Missouri Department of Transportation (MoDOT) Type 2 Rip-rap specifications. The channel will extend to the south and east and surface water that enters the channel will eventually drain to the southeast to a county road ditch and culvert that crosses under Davis Crossing Road. Monitoring of the discharge from the new low-flow channel is not planned since water discharging through this channel will not have come into contact any tailings or chat.

The newly constructed cover and low-flow channel provide similar surface water management control as the existing decant tower and culvert. As was done in the design for the existing decant tower and culvert, hydrologic modeling was completed for the revised design using two hypothetical storms. The first event was the 100-year 24-hour storm. The new low-flow channel was been designed to handle runoff flows from this event, which amounts to approximately 7.2 inches of precipitation over a 24-hour period, without overtopping. The second event was the 72-hour, 75 percent PMP storm event. As was previously the case for this area, this event, which amounts to 31.5 inches over a period of 72 hours, resulted in water discharging through the emergency overflow. The 75 percent hyetograph that was developed for the *Removal Action Work Plan* (Barr, 2007) was utilized for critical flow periods during the 75 percent PMP storm event.

2.1.3 Decant Tower and Pipe/Culvert

The existing decant tower, installed during the operation of the facility, has dimensions of approximately 5 feet x 5 feet with a depth of approximately 42 feet. As part of the removal action activities, the structure was modified to be used to convey stormwater that collects on the surface of the East Seep and Erosion Area to the stormwater pond that discharges through the culverts under Davis Crossing Road. The condition of this structure is not well documented; however, historic observations have identified apparent structural defects of the vertical tower and horizontal pipe/culvert. It is believed that these defects provide a preferential flow path that allows surface water direct communication with the tailings and contribute to the seeps at the toe of the slope of the East Seep and Erosion Area.

As part of the supplemental work, the remaining aboveground portion of the vertical tower will be removed. The lower 3 feet of the tower will be filled with quarry rock. The remaining portion of the tower will be filled with concrete to an elevation that is level with the existing ground surface. At least 3 feet of

low permeability soil will be placed over the concrete and blended into the final contours of the cover soil for the area. At this time, the horizontal pipe, which is located at the base of the vertical tower, will remain open to allow existing water in the tailings to drain. In the future, the horizontal pipe component of the tower may be pressure grouted and sealed once drainage has significantly slowed or ceased.

2.1.4 Seep Pond Discharge

Monitoring of the discharge of the seep pond will continue during and after the implementation of the cover for the East Seep and Erosion Area. Concentration and volume/rate of the discharge will be monitored and a treatment/long-term management strategy will be proposed for the discharges from the seep pond once the effect that the cover and surface water alterations will have on the seepage rate and concentration of the discharge has been established.

2.2 Eaton and Leadwood Dams Area

The Doe Run Company and the USEPA are currently in discussions regarding the establishment of a soil repository in the Tailings Area upstream of the Eaton and Leadwood Dams. The establishment of a soil repository has the potential to significantly alter the surface water hydrology of the area including the infiltration and run-on, which might significantly affect the volume and concentration of seepage at the toe of the Eaton and Leadwood Dams. The establishment of additional remedial measures is premature at this time, considering the potential impact a soil repository might have on surface water hydrology. Monitoring of the seeps and surface water will continue while resolution of the soil repository is pending. Once complete, The Doe Run Company will propose additional remedial measures and a long-term management strategy for the site.

3.0 Summary/Conclusion

The Doe Run Company is proposing a phased approach to the implementation of additional remedial measures that are designed to reduce infiltration into the tailings and thereby reduce the volume of seep discharges. Additional monitoring of seeps and surface water discharges will also occur during this period while the long-term issues of the soil repository are resolved. Once those issues have been resolved, additional remedial measures will be evaluated and proposed for the areas of the Eaton and Leadwood Dams.

4.0 References

Barr Engineering Co., 2007. *Removal Action Work Plan (RAWP), Leadwood Mine Tailings Site, Leadwood, Missouri,* Prepared for The Doe Run Company. March 2007.

Barr Engineering Co., 2005. *Engineering Evaluation/Cost Analysis Report, Leadwood Mine Tailings Site, Park Hills, Missouri,* Prepared for The Doe Run Company. September 2005.

Figures

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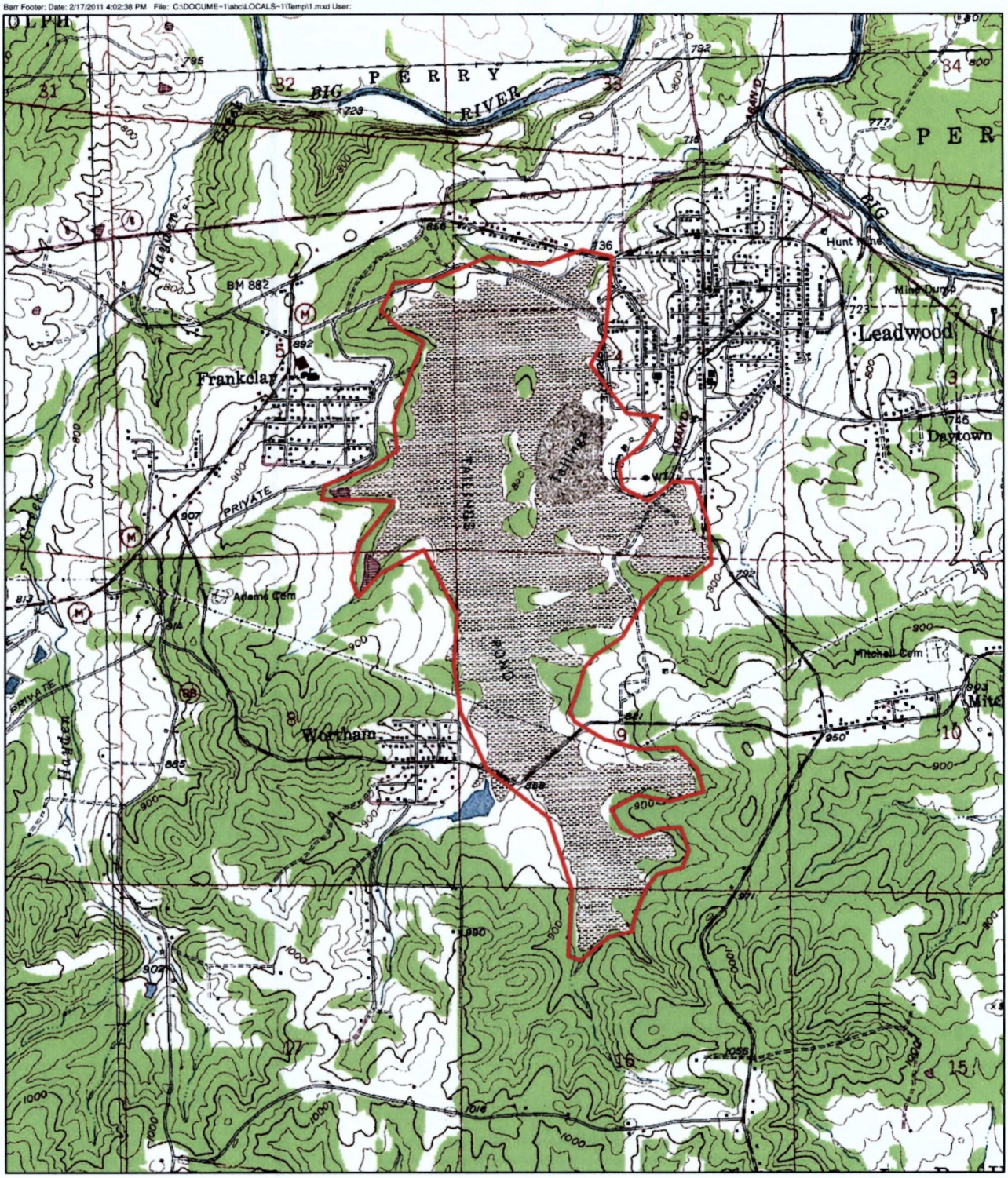

Legend

Site Outline

Feet
0 1,000 2,000 3,000 4,000

Meters
0 250 500 750 1,000

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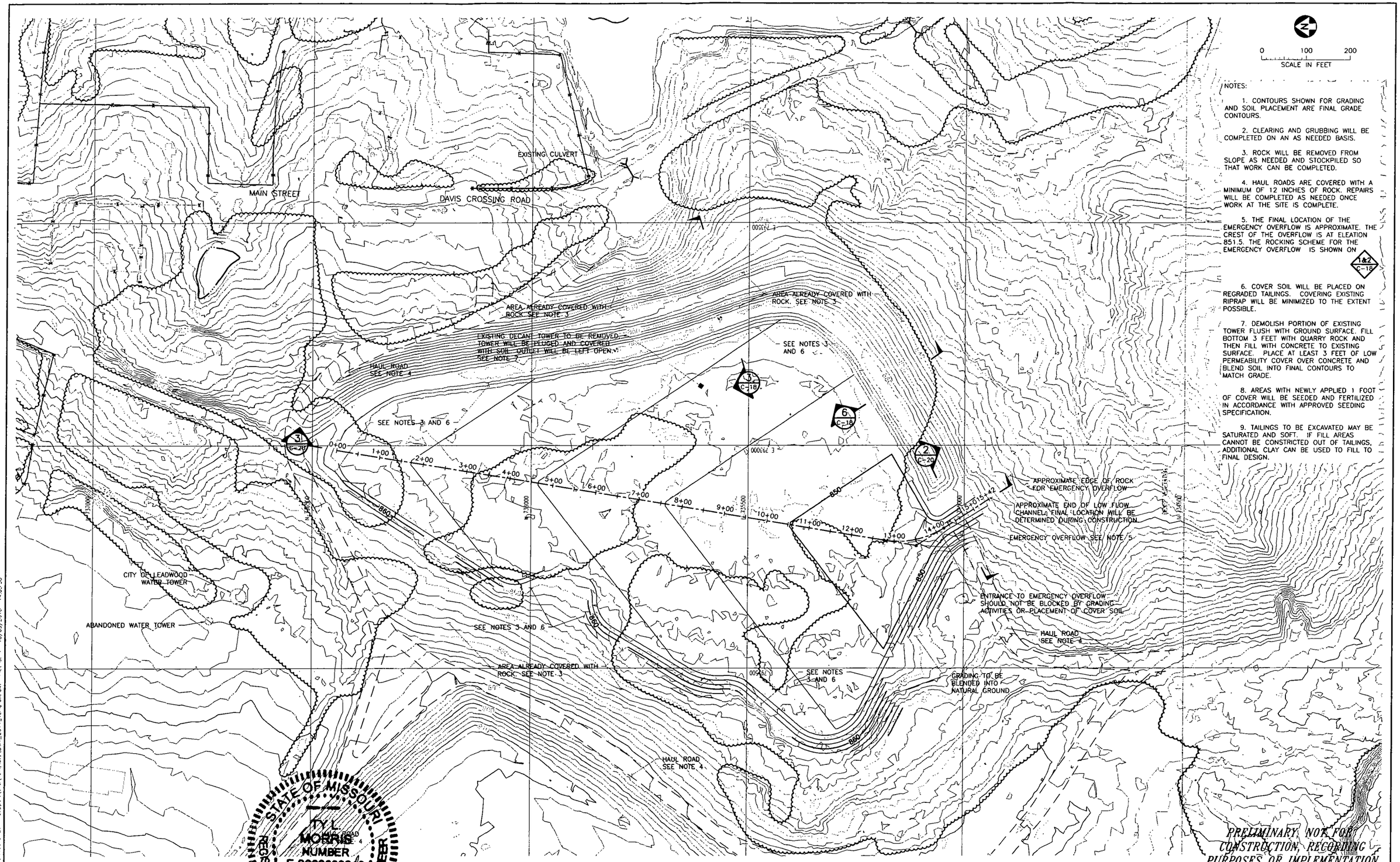
Figure 1

Location Map
Leadwood Mine Tailings Basin
The Doe Run Company
St. Louis, Missouri

Appendix A

Construction Drawings



NOTES:

1. CONTOURS SHOWN FOR GRADING AND SOIL PLACEMENT ARE FINAL GRADE CONTOURS.

2. CLEARING AND GRUBBING WILL BE COMPLETED ON AN AS NEEDED BASIS.

3. ROCK WILL BE REMOVED FROM SLOPE AS NEEDED AND STOCKPILED SO THAT WORK CAN BE COMPLETED.

4. HAUL ROADS ARE COVERED WITH A MINIMUM OF 12 INCHES OF ROCK. REPAIRS WILL BE COMPLETED AS NEEDED ONCE WORK AT THE SITE IS COMPLETE.

5. THE FINAL LOCATION OF THE EMERGENCY OVERFLOW IS APPROXIMATE. THE CREST OF THE OVERFLOW IS AT ELEATION 851.5. THE ROCKING SCHEME FOR THE EMERGENCY OVERFLOW IS SHOWN ON 1&2 / C-1B

6. COVER SOIL WILL BE PLACED ON REGRADED TAILINGS. COVERING EXISTING RIPRAP WILL BE MINIMIZED TO THE EXTENT POSSIBLE.

7. DEMOLISH PORTION OF EXISTING TOWER FLUSH WITH GROUND SURFACE. FILL BOTTOM 3 FEET WITH QUARRY ROCK AND THEN FILL WITH CONCRETE TO EXISTING SURFACE. PLACE AT LEAST 3 FEET OF LOW PERMEABILITY COVER OVER CONCRETE AND BLEND SOIL INTO FINAL CONTOURS TO MATCH GRADE.

8. AREAS WITH NEWLY APPLIED 1 FOOT OF COVER WILL BE SEEDED AND FERTILIZED IN ACCORDANCE WITH APPROVED SEEDING SPECIFICATION.

9. TAILINGS TO BE EXCAVATED MAY BE SATURATED AND SOFT. IF FILL AREAS CANNOT BE CONSTRICTED OUT OF TAILINGS, ADDITIONAL CLAY CAN BE USED TO FILL TO FINAL DESIGN.

STATE OF MISSOURI
TYLER L. MORRIS
NUMBER E-2002003210
REGISTERED PROFESSIONAL ENGINEER
7/2/14

NO.	BY	CHK.	APP.	DATE	REVISION DESCRIPTION

CLIENT	6/16/14							
BID								
CONSTRUCTION								
EPA								
RELEASED TO/FOR	A	B	C	0	1	2	3	DATE RELEASED

BARR
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Scale	AS SHOWN
Date	6/16/14
Drawn	CMS2
Checked	AJN
Designed	AJN
Approved	TLM

THE DOE RUN COMPANY

LEADWOOD MINE TAILINGS SITE
LEADWOOD, MISSOURI

REMOVAL ACTION
EAST SEEP AND EROSION AREA

BARR PROJECT No. 25/86-013 TLM2
CLIENT PROJECT No.
DWG. No. C-10A
REV. No. A

CADD USER: Ashley Monroe FILE: M:\DESIGN\25860013.00\25860013.00_ C-10A.DWG PLOT SCALE: 1:2 PLOT DATE: 7/2/2014 10:31 AM
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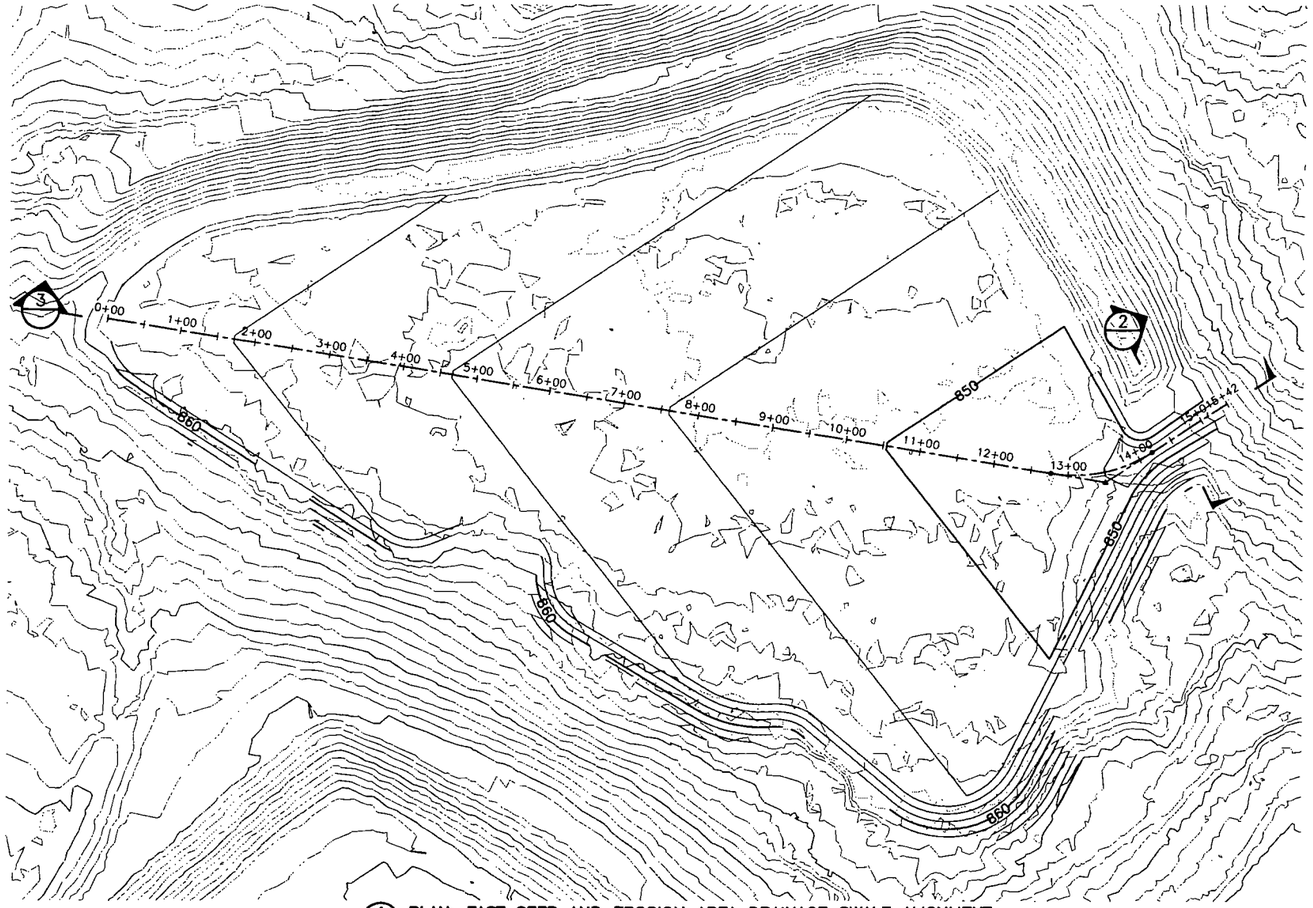
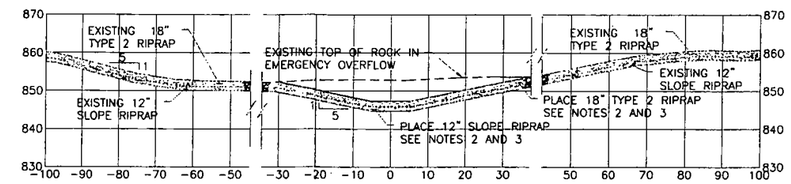


1 PLAN: EAST SEEP AND EROSION AREA DRAINAGE SWALE ALIGNMENT

0 100 200
SCALE IN FEET



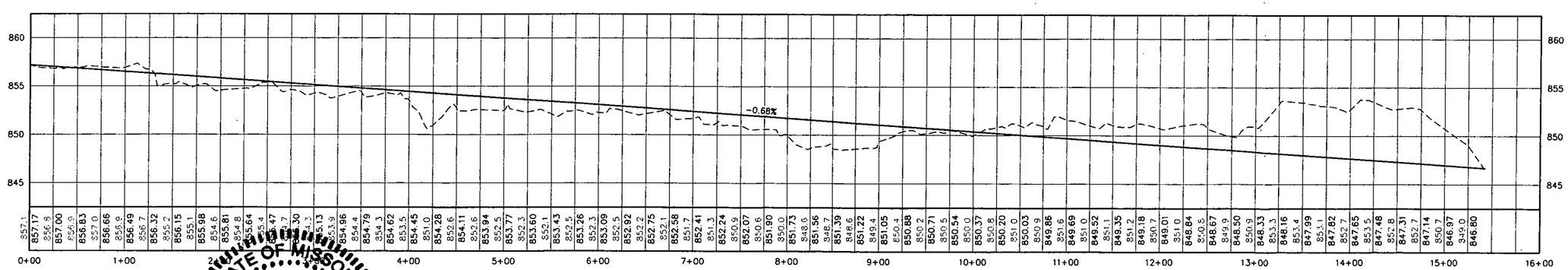
2 C-10A SECTION: EAST SEEP AND EROSION AREA EMERGENCY OVERFLOW AND LOW FLOW SWALE

NOTES:

1. EXISTING ROCK WILL BE REMOVED FROM THE PORTION OF THE EMERGENCY OVERFLOW WHERE CONSTRUCTION ACTIVITIES WILL BE COMPLETED TO CONSTRUCT THE LOW FLOW SWALE.

2. LOW FLOW SWALE TO BE COVERED WITH ROCK AS SHOWN, UNLESS BEDROCK IS ENCOUNTERED.

3. ANY PORTION OF LOW FLOW SWALE CONSTRUCTED ON BEDROCK WILL NOT BE COVERED WITH QUARRY ROCK. ROCKING SCHEME WILL TIE INTO BEDROCK BUT NOT COVER BEDROCK.



3 C-10A SECTION: EAST SEEP AND EROSION AREA DRAINAGE SWALE

0 60 120 SCALE IN FEET HORIZONTAL
0 6 12 SCALE IN FEET VERTICAL

PRELIMINARY, NOT FOR CONSTRUCTION, RECORDING PURPOSES OR IMPLEMENTATION

STATE OF MISSOURI
TY L. MORRIS
NUMBER E-20020032100
REGISTERED PROFESSIONAL ENGINEER
7/2/14

NO.	BY	CHK.	APP.	DATE	REVISION DESCRIPTION

CLIENT	6/26/14
BID	
CONSTRUCTION	
EPA	
RELEASED TO/FOR	A B C 0 1 2 3
	DATE RELEASED

BARR
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Scale	AS SHOWN
Date	6/16/14
Drawn	CMS2
Checked	AJN
Designed	AJN
Approved	TLM

THE DOE RUN COMPANY

LEADWOOD MINE TAILINGS SITE
LEADWOOD, MISSOURI

REMOVAL ACTION
PROFILE AND SECTIONS EAST SEEP AND EROSION AREA

BARR PROJECT No. 25/86-013 TLM2
CLIENT PROJECT No.
DWG. No. C-20
REV. No. A