FINAL RECLAMATION PLAN

SECTION 12 MINE
MCKINLEY COUNTY, NEW MEXICO
Rev. 2

SOUTHWEST RESOURCES INC.

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1 INTRODUCTION

The Section 12 Mine is located at 35° 27' 17"N, 107° 51' 01"W in T14N, Rl0W, SW 1/4 of Section 12, McKinley County, New Mexico (Figure 1). This underground uranium mine was developed by Cobb Resources, and it operated intermittently in 1959 and 1962 then from approximately 1974 to the early 1982; the mine is currently inactive and owned by Southwest Resources Inc. (SRI). The financial interests of SRI, including reclamation of the Section 12 Mine, are being managed by Empire Trust, Inc.

Although it is adjacent to ephemeral Ambrosia Lake, the mine was operated as a dry mine, encountered no ground water during operations, and did not discharge radiological effluent from the mine workings.

The years of mine operation pre-dated the New Mexico Mining Act (Title 19, Chapter 10 NMAC), so the mine did not have a permit. However, SRI submitted an application for a minimal-impact mine permit to New Mexico Energy, Minerals, and Natural Resources Department's Mining and Minerals Division (MMD) on January 14, 2014. That application was denied, and under the New Mexico Mining Act the mine has been classified as a regular existing mine subject to the requirements in Part 5 of the Act. Subsequently, SRI performed an economic analysis of the mine and determined that, considering the recent history of the uranium market and the limited remaining uranium resources, the mine will not be operating in the future, and SRI will not seek a mine permit and will undertake reclamation of the Section 12 Mine.

Upon SRI's decision not to seek a mine permit under 19.10.5 NMAC, the Director of MMD issued a draft Order of Abatement on Consent that required SRI to prepare a Conceptual Reclamation Plan (CRP). The CRP, dated 6/28/2019, was submitted in July 2019, and MMD provided comments on the CRP to SRI on 8/28/2019 and required SRI to prepare a Final Reclamation Plan (RP). The Final RP was submitted in compliance with the New Mexico Mining and Minerals Division (MMD) Director's Order of Abatement on Consent (Order, MMD 2019) issued on December 16, 2019 by MMD and signed by Empire Trust Inc. on January 14, 2020. The Order required the Reclamation Plan to satisfy requirements for a closeout plan under NMAC 19.10.5.506 and responds to the environmental standards of the MMD/ NMED *Joint Guidance for the Cleanup and Reclamation of Existing Uranium Mining Operations in New Mexico*.

The initial effort on the RP was identification of reclamation objectives, which are described in Section 2. With these objectives delineated, a work plan was prepared that describes the tasks leading up to the RP. Although some of the tasks were initiated before that date, the work plan was completed on 10/4/2019. The remaining work plan tasks were initiated immediately after that, starting with preparation of a Health and Safety Plan (HASP), soil sampling and testing, and a video survey of the shaft on 10/17/2019.

This RP describes the reclamation objectives, the existing conditions, and the reclamation activities, both those already performed and those planned, to satisfy the requirements of the MMD Order and the reclamation objectives.

2 RECLAMATION OBJECTIVES

The Section 12 Mine reclamation objectives are:

- Satisfaction of the *State of New Mexico Radiation Cleanup Criteria* in Section 2 of the *Joint Guidance for the Cleanup and Reclamation of Existing Uranium Mining Operations in New Mexico* (MMD/NMED, 2016), namely:

  1) The concentration of Ra-226 in land averaged over any area of 100 square meters ("m^2") shall not exceed the background level by more than 5 pCi/g, averaged over the first 15 cm of soil below the surface, and 15 pCi/g, averaged over 15 cm thick layers of soil more than 15 cm below the surface.

  2) Site post-reclamation radiation level ("PRRL") for gamma radiation should not exceed the site-specific value of gamma radiation that correlates to 5 pCi/g Ra-226 above background at the 95^{th} percentile value.

  3) Cover material for the covered waste consolidation area must limit radon flux to not more than 20 $pCi/m^2/s$
- Satisfaction of the requirements under NMAC 19.10.5.506A & B, 507A, as modified by MMD
- Satisfaction of the requirements under ¶ 32 of the Order , as modified by MMD

3 EXISTING CONDITIONS

According to the Director's Order Findings of Fact, #13 "The surface disturbance at the Mine Property exceeds 10 acres, excluding permanent roads" and #14 "A mine building, a hoist house, a main shaft, and two subsidiary vent shafts with or without headframes, piles of waste rock that contains low grade uranium mineralization, piles of rock mineralized with uranium that were intended for milling, and soils contaminated by uranium mineralization exist on the Mine Property. The Mine Property also contains roads, drainage ditches, and miscellaneous mining equipment." Additional descriptions of existing site conditions are provided in the following sections, in Table 1, on Figures 2 and 3, and in photos in Appendix A.

3.1 Existing Terrain

The mine site is located at the east side of Ambrosia Lake, an ephemeral lake that occupies a bolson or deflation basin formed primarily by wind erosion of the underlying Mancos Formation. Water-borne and residual clay soil covers the lake bed, and during mining

some of the waste rock was placed at the edges of the lake basin. During wet periods, runoff collects in the basin from local sheet flow and, during extreme runoff events, from overflow from Arroyo del Puerto (Martin Draw) west of the mine site. This overflow from the lake leaves through a drainage point on the west edge of the lake basin to Arroyo del Puerto.

Covering most of the SW ¼, SW ¼ of Section 12 is a north-south ridge, the north end of Don Andres Hill. Otherwise, the SW ¼ of Section 12 rises nearly uniformly, except for lake bed and waste rock fills from the mine, from west to east at grades of less than 1%, so the rise in elevation from west to east is less than 10 feet. This terrain will affect location of the waste rock covered waste consolidation area as well as borrow locations for cover soil. The existing terrain is illustrated in Figure 2.

3.2 Mine Facilities

The Section 12 mine is inactive, and SRI has no employees at the mine. Almost all equipment and supplies have been removed from the site; remaining structures are listed on Table 1 and shown on Figures 2 and 3 and in photos in Appendix A. Two durable steel-frame and metal-siding buildings, the hoist house and the mine office/ change room building, remain. A small wooden frame pump house remains next to the headframe. The main shaft and its headframe remain intact, but the shaft collar is blocked by a temporary wooden cover. Two small vent shafts remain, both with steel casing extending approximately five feet above ground surface; one of these has been backfilled previously and the other has been covered with a bat-accessible cage. The mine site is accessed by an unpaved two-track road extending northward to the mine approximately one mile from old Route 509.

3.3 Ground Water

There is no ground water in the mine area and within the depth of the mine workings, and there are no wells on the mine site. The closest wells are 2.03 miles west-northwest and 1.15 miles south-southeast of the Section 12 Mine (see Figure A1-14, *EPA Grants Mining District Information Meeting and Negotiations Update, October 2, 2019* and OSE well locations records).

Absence of ground water at the mine site was evident from the lack of wells, water impoundments, or water storage facilities other than a 2000 gallon tank next to the pump shack that was used to hold imported water for use underground for dust suppression and drilling. Absence of ground water has been confirmed by video survey of the shaft in 2019 (see photos in Appendix A)

3.4 Existing Radiological Contamination

Waste rock excavated from the mine and shaft contains Technically Enhanced Naturally Occurring Radiological Material (TENORM) that remains at a number of locations in small piles on the mine surface. Radiological surveys by Environmental Restoration Group (ERG, 2017; Appendix B) indicated that natural soil Ra-226 levels in the Background Reference Area (BRA) north of the mine average 1.41 pCi/g and the Ra-226 levels in waste rock and affected soils average 17.3 pCi/g. According to the MMD/NMED Joint Guidance (MMD/NMED, 2016), waste rock and soil containing Ra-226 levels above background plus 5 pCi/g exceed the Post-Reclamation Radiation Level (PRRL) and should be removed or

otherwise isolated from the accessible environment. The PRRL for the Section 12 Mine is 5 plus 1.41, or 6.41 pCi/g Ra-226. That Ra-226 level corresponds to a gamma radiation rate of approximately 24,520 counts per minutes (cpm) and a predicted exposure rate of 22.1 µR/h. The surface extent of radiological contamination is shown on Figure 3. Permits West made estimates of the depths of contamination from six inches to eight feet based on visual examination of trenches (Appendix C).

3.5 Existing Vegetation

A vegetation survey was performed in the autumn of 2019 by Kevin Branum of Enchanted Agro-management Solutions in a reference area in the SE ¼, NW ¼ of Section12, north of the mine area, overlapping part of the radiological BRA. The survey plan and report are included in Appendix D.

In the reference area, the average bare ground per transect was 46.25%, average litter per transect was 17.75%, and average gravel was 2%.

Average vegetative cover was 34%. The dominant species were Blue Grama and Sideoats Grama.

4 RECLAMATION ACTIVITIES

Reclamation activities already completed (Site Investigations) are described in Section 4.1, and the planned reclamation activities remaining to be performed are illustrated on Figures 4 and 5 and described in the remainder of Section 4. The relevant paragraphs in the Order are referenced in parentheses for each activity.

4.1 Site Investigations (Order ¶32a, 32b, 32j)

Because of the age of the mine and absence of records of mine construction and operations, the following site investigations have been performed. The initial action was to plan and perform site investigations to augment studies performed by ERG (2017) and Permits West Inc. (Tierney, 2018) and to collect additional information needed for final reclamation planning. Site investigations needed for reclamation planning were initiated in 2017 and completed in November 2019.

4.1.1 Baseline Radiological Characterization (*Joint Guidance* Section 5.2)

Prior to the initiation of RP activities, in 2017 Environmental Restoration Group (ERG) conducted surveys and soil sampling and testing for both background radiation and mine site radiation levels in accordance with *Joint Guidance for the Cleanup and Reclamation of Existing Uranium Mining Operations in New Mexico* (MMD/NMED, 2016). The radiological surveys extended in all directions from the mine as far as the gamma levels indicated contamination. The berm and ditch on the north and west sides of Ambrosia Lake were not specifically targeted but were included in the extent of coverage of the survey as far as elevated gamma levels were detected; only the eastern-most part of the berm had gamma levels indicating radium above the clean-up standard. ERG's report (*Baseline Radiological Characterization of the Section 11/12 Mine – Phase 1*, 2017) documents the background radiation levels and mine-site radiation levels associated with radium content of soil and

waste rock as well as the lateral (X and Y) distributions of radium. The ERG report is included in Appendix B and the results are shown on Figure 3.

The waste rock is the source of radiological contamination at ground surface and is classified as Technically Enhanced Naturally Occurring Radiological Material (TENORM), according to the EPA (see https://www.epa.gov/radiation/technologically-enhanced-naturally-occurring-radioactive-materials-tenorm). The TENORM, referred to in this RP as *radwaste*, includes soils with radiological contamination above 6.41 pCi/g Ra-226 and remains at a number of locations on the mine surface. The ERG survey indicates that:

- natural soil Ra-226 levels in the Background Reference Area (BRA) north of the mine average 1.41 pCi/g,
- Ra-226 levels in waste rock and affected soils (collectively radwaste) average 17.3 pCi/g,
- the Post-Reclamation Radiation Level (PRRL) for the Section 12 Mine is 5 plus 1.41, or 6.41 pCi/g Ra-226 with a gamma radiation rate of approximately 24,520 counts per minutes (cpm) and a predicted exposure rate of 22.1 µR/h.

No additional radiological characterization is necessary, but gamma scanning will be conducted during construction to confirm achievement of clean-up.

4.1.2 Waste Characterization (Order ¶32a, 32f, 32j; *Joint Guidance*, Section 3.2)

Permits West performed initial visual waste characterization field studies in trenches across the mine areas that had been previously identified by ERG as containing radiological contamination. The Permits West report, *Waste Characterization Study – Phase 2, October 2018,* included in Appendix C, has been submitted previously to MMD and NMED.

Permits West Inc. (Tierney, 2018) performed waste characterization to determine the physical properties and depth of waste rock and contaminated soil (radwaste) in the mine site. Their report has been submitted previously to MMD and NMED. With MMD participation, Permits West excavated 13 trenches within the mine area to determine depth of radwaste and physical descriptions of both radwaste and the underlying clean soil. Permits West found that waste rock and related contaminated soils were distributed across the area of contamination identified by ERG to depths of up to eight feet in mounds of waste rock but typically 0.5 feet to 1.5 feet in other locations. Waste rock and soil in the trenches were visually classified in the field for color, texture, soil structure, and by hand-held gamma detector for gamma emission. Once the characterizations in each trench were completed, the trench was backfill to original grade. Additional details of the Permits West waste characterization are contained in their report (Tierney, 2018).

During 2019, Alan Kuhn Associates LLC visually examined the radwaste at the site to evaluate the geotechnical properties that would affect excavation and placement of radwaste in one or more covered waste consolidation area locations (Appendix E). Although somewhat variable in sand, silt and clay content with some gravel to cobble size sandstone fragments, the waste rock is primarily a sand-clay mixture with USCS classification of SC, SM, SP-SM, and CL in diminishing order. This information was used to plan and conduct geotechnical sampling and testing of potential cover sources available on site (Figure 6).

4.1.3 Mine Facilities Inventory (Order ¶32c, 32d, 32e)

SRI contractors performed an inventory to identify types and quantities of building, shaft, and headframe materials that will be left in place expect for selected structural steel in the ore chute and hopper on the headframe that may be used for shaft cap construction. Table 1 lists the structures and materials identified by the inventory. The hoists and hoist motors were removed from the site in 2022-2023., The headframe and the two steel-frame buildings will be left in place for use by the subsequent landowner. ;. Non-compressible mine debris including steel, concrete, wire, and hoses will be left in place.

The hoist house contained sixteen 55-gallon steel drums. Four of these contained charcoal and the other 12 contained resin loaded with 12000 mg/kg uranium. The drums came from an unidentified off-site source and had not been discovered until the recent inventory. SRI arranged with Energy Fuels Resources Corporation to transport the loaded drums to the White Mesa Uranium Mill. a facility licensed to take the drums containing the uranium-loaded resin. The drums have been removed from the site, and copies of manifests and chain of custody records for the resin shipments will be included in the reclamation completion report.

4.1.4 GPS Mapping (Order ¶32f, 32g, 32h, 32i, 32j)

Global Positioning (GPS) methods were used to establish coordinates and elevations for ground control and create terrain models of ground that will be excavated or filled during reclamation. The GPS topographic data collected by Edward Loescher, PE, included 1200 data points collected on 9/17-9/18/2019 with Trimble RTK Survey equipment. Using existing historical maps and the results of the GPS mapping, a base map of the mine area was prepared and used in planning earthwork, grading, and vegetation and in later documentation of site reclamation records.

Terrain models of existing terrain before excavation and the subsequent terrain model after excavation provided the basis for calculating earthwork volumes for final waste pile and cover design and for payment quantities. These models are illustrated in Figures 2 and 7. Due to the uncertainty of estimating volumes inherent in any earthwork for removal of contaminated soil and placement in the shaft and a single waste rock pile, the model of the projected site terrain at completion of reclamation is the best estimate based on information available before reclamation. After the earthwork is finished, an as-built terrain drawing will be prepared based on a final GPS survey of impacted land surfaces.

4.1.5 Shaft Video Survey

On 10/17/2019, a video survey was performed by Jet West Geophysical Services with hoisting assistance by Stewart Brothers Drilling Company on the mine shaft from the collar to the bottom of the shaft. Both a continuous video recording of the entire shaft and a number of photographs documented the condition of the shaft. Representatives of MMD and NMED MECS were on site to observe the survey. All in attendance observed that no water was present at any depth in the shaft, confirming other observations that the shaft is dry. Selected photos from the video survey are included in Appendix A; however, due to the extremely large file size, the video and all photographic images of the shaft were previously submitted separately to MMD.

4.1.6 Cover Soil Characterization

Characterization of soil for the geotechnical and agronomic properties related to cover performance was performed by Alan Kuhn Associates in February, September and October 2019. A total of 28 grab samples of soil were collected from potential locations of borrow soil (Figure 6) to be used in construction of both the radon barrier (clay) cover and the vegetative medium (loam). Soil testing was performed by Daniel B. Stephens and Associates Inc. and NV5 Inc. The results of the soils investigations are compiled in Appendix E and, together with the findings of the radiological survey (Appendix B), provide the input necessary for the RADON model (Appendix F) used in design of the radwaste covered waste consolidation area and cover.

As described below in Sections 4.2.5 and 4.2.6, the proposed method of radwaste disposal, stabilization and long-term management is consolidation of radwaste in the shaft and an on-site, above-grade covered waste consolidation area with a clay rich soil cover. Figure 6 shows the soil sampling locations and the estimated borrow sources for the two types of soil that may be used in reclamation construction. The borrow soil investigations indicate that high-plasticity clay (CH) exists at shallow depths (0 to 2.0 feet) over most of the mine footprint, including Ambrosia Lake basin and most of the area between the lake basin and the east fence. Loam soil (clay loam, sandy clay loam) exists in the southeast corner of the mine property (SW1/4 of Section 12) as well as the lower part of the northeast slope of Don Andres Hill. The estimated volumes of these soils available on the mine property should be sufficient for cover construction.

4.1.7 Reference Vegetation Survey (Order ¶32j, 32k, 32o)

A qualified vegetation specialist, Kevin Branum, performed a reference area vegetation survey in the area shown on Figure 2 and Appendix D to identify local natural vegetation species and natural diversity, ground cover, and vegetation density for setting success criteria for the revegetation plan. The results of the reference survey are recorded in Appendix D.

In the primary reference area, A, the predominant vegetation species are blue grama and sideoats grama.

4.2 Reclamation (Order ¶33, 34, 35, 36)

SRI used the information and data collected in site investigations to refine and add detail to the Conceptual Reclamation Plan and the Draft Final Reclamation Plan submitted previously to finalize the designs contained in this Reclamation Plan (RP). The implementation of this design will be directed by drawings and a specification signed and sealed by a licensed Professional Engineer and as modified by MMD (cite MMD reference document).. The RP will include tasks to be performed in approximately the following sequence.

4.2.1 Materials Decontamination

The initial on-the-ground task of reclamation was determination of the extent of radiological contamination of existing structures and materials at the mine. The drums of uranium-loaded resin (Section 4.1.3), the primary potential source of radiological exposure on the site, were removed first. . The hoist house. office building and headframes materials

have been decontaminated and will be left in place for use by the subsequent landowner. . Demolition debris and other non-recyclable materials will not be decontaminated and will be disposed in the shaft or within the covered waste consolidation area footprint (Section 4.1.3).

4.2.2 Demolition of Ore Hopper and Chute

The two remaining salvageable buildings on site, the hoist house and the office/ change house, are sheet metal buildings and will be left in place. The ore chute and hopper on the south side of the headframe will be removed, and the steel beams, angles, channels, and plate will be used in construction of the shaft cap. The small wood-frame pump house and water tank next to the shaft will be demolished

4.2.3 Hoisting Equipment Removal

The two hoists and their motors have been removed from the site. The remaining hoisting equipment includes two skips, hoisting ropes, and headgear including sheave wheels that supported the two skips. The upper skip has been dropped to the bottom of the shaft. The lower skip will be left in the shaft.

4.2.4 Shaft Headframe

The main shaft headframe will remain in place. However, if another party wants to remove the headframe at a later date, SRI or a subsequent owner may allow removal of the headframe, provided that its removal must not damage the shaft cap. The ore hopper and chute, attached to the south side of the headframe, will be removed to provide the steel beams and sheet metal that will be used in construction of the shaft cap (see section 4.2.6 below).

4.2.5 Contaminated-Material Excavation

Waste rock and radiologically-contaminated soil (radwaste) will be excavated from all mine areas except the designated covered waste consolidation area (CWCA) location and placed in compacted lifts within the CWCA footprint at that location. The location for the CWCA is the area east of the mine access road and west of the fence along the east side of the mine area, where substantial radwaste is already in place (Figure 3). Radwaste with the highest radiological content and other radwaste located closest to the shaft will be placed as backfill in the shaft concurrently with contaminated material identified in Section 4.2.1 above. The remaining radwaste will be excavated first from the most distal locations and carried directly to the CWCA , working progressively toward the CWCA.

The Bureau of Reclamation (BLM) has given approval in writing for SRI to access the west end of Section 7, R 9 W, T 14 N for removal of soil contamination from the mine (Figure 3). SRI has given assurance to BLM that the disturbed ground will be reclaimed to the same standards as the mine site.

All existing radwaste is within a few hundred feet of the proposed CWCACWCA location. This short haul distance will make it feasible to:

- Excavate by dozer and push most of the radwaste directly to the CWCA or the shaft, and

- Excavate by wheel loader and load trucks to carry radwaste to the CWCA, or both excavate and haul radwaste by wheel loader to the CWCA or shaft from distances beyond efficient dozer push.

The choice of excavation equipment will be left to the contractor.

Radwaste excavation will follow a procedure that has been used successfully at other radiologically contaminated facilities. It consists of removing contaminated rock and soil in successive lifts until the ground surface appears to be clean, then performing gamma surveys of the exposed surface, and repeating the excavation-and-scan steps until the ground surface gamma emission is at or below the clean-up standard.

SRI plans to excavate first those areas with the highest gamma signature so that those materials are placed in the deepest part of the shaft and of the waste CWCA. Otherwise, excavation and radiological surveying by gamma meter will advance progressively toward the CWCA so that each excavated area will be verified to be clean before moving to the next area closer to the CWCA.

4.2.6 Shaft Backfill and Capping

The video survey of the mine shaft performed on 10/17/2019 confirmed what previous information had indicated – the shaft is dry and there is no recent evidence of ground water in the shaft or the mine. Therefore, there is no need for measures to protect ground water during shaft or vent closure

The shaft will be backfilled with radwaste to -2 ft. of collar level. Radwaste backfill will be dropped free-fall from the shaft collar to improve backfill compaction. The shaft backfill will be given time during reclamation to settle, then topped off to the top of the shaft collar with clean soil that will be supplemented as necessary during site reclamation.

A structural cap will be constructed across the top of the backfilled shaft. The cap will include a rectangular grid of steel beams and plate salvaged from demolition of the ore hopper structure, then filled with minimum 2000 psi concrete that will cover the steel by at least two inches (Figure 9).

Two vent shafts are located northwest of the main shaft (Figure 2). Both vents have five-foot diameter shafts with steel casings that extend to four feet above ground surface. The west vent has been backfilled previously. The east vent is open to full depth and has been equipped with a steel grid cover that is spot-welded to the top of the casing. The east vent cover provides easy ingress/egress for bats.

4.2.7 CWCA Construction

The CWCA will be located as shown on Figures 3, 5, and 7. This is the optimal location for both vertical and horizontal separation from Ambrosia Lake. SRI estimated the elevation of the maximum water level of Ambrosia Lake to be elevation 7068.5 ft. AMSL based on the high water mark indicated by vegetation contrasts. The current lowest elevation (outfall point) of the lake perimeter, 7068.5 ft. AMSL, sets the maximum water level of the lake, as shown on Figure 2. The CWCA site was selected to be as far above 7068.5 ft. and as far horizontally as possible from the lake basin.

The specification for CWCA construction is included in Appendix G. Construction drawings,

identified in the specification and to be prepared upon approval of this Reclamation Plan, will show the reclamation work illustrated in Figures 3, 5, and 7. CWCA construction will include subgrade preparation where necessary to ensure that clay forms a continuous natural liner, placement and compaction of radwaste, and placement and compaction of soil cover. These activities will be conducted in accordance with construction drawings and specifications identified in Appendix G as modified in response to MMD the HASP (Appendix H), and the CQMP (Appendix I as amended). Application of the CQMP will be under the direction of SRI's Site Supervisor/ Site Reclamation Manager (SRM), with assistance of the QC Inspector and the Professional Engineer.

4.2.7.1 Radwaste Placement

CWCA construction will include subgrade preparation, placement and compaction of radwaste, and placement and compaction of soil cover.

The subgrade across the entire footprint of the CWCA consists of high-plasticity clay (CH, clay). The soil surface will be stripped of vegetation, which will be burned, then the exposed clay soil will be compacted to a uniform, stable surface.

The CWCA will be shaped approximately like a truncated pyramid, with sides sloped not steeper than approximately 20% or 5H:1V and top surface sloped toward the sides at approximately 1% grade (Figure 7). The size will be sufficient to contain all contaminated materials that exceed the capacity of the shaft.. Because the actual volume of radwaste cannot be determined until excavation is complete, the radwaste will be placed in a sequence that incrementally expands the footprint and increases the height of the CWCA.

Radwaste will be placed in loose lifts of 8-10 inches and compacted by multiple passes of earthwork equipment. The most contaminated materials will be preferentially placed in the middle of the lower lifts, to optimize radon attenuation through the overlying and less contaminated materials.

4.2.7.2 Covered Waste Consolidation Area Cover

After placement of radwaste in the CWCA is complete, and gamma surveys verify that the site is otherwise cleared of radwaste, a soil cover will be constructed over the CWCA. The cover will serve as both a radon barrier component and a seeding medium component (Figure 8). The thickness of the cover needed to limit radon flux at the cover surface to not more than 20 $pCi/m^2/s$ has been calculated by the RADON computer model (the Windows-compatible version of the RAECOM model per NUREG Guide 3.64 developed for design of uranium tailing covers) with site-specific material property values as input. The RADON model files (Appendix F) and results of the model, listed on Table 2, show that either the clay soil or the loam soil, or a combination of the two soils, can be used to attenuate radon to meet the 20 $pCi/m^2/s$ flux limit.

Based on this information, SRI may use the soil that satisfies both the radon attenuation function and the growth medium function with the least amount of land disturbance and construction cost.. MMD has approved 1.0 feet of soil The more likely scenario, because most of the area where waste rock will be removed (and the ground will be already disturbed) is underlain by clay, is that clay, being more abundant and accessible for borrow material than the loam soil, will constitute most of the cover. Note that vegetation grows in clay soils everywhere on the site and appears to have no problem with rooting into clay.

Cover soil will be obtained from on-site locations that 1) minimize the area of land disturbance, and 2) utilize areas where the appropriate soils exist at ground surface. Since lake areas that have radiological contamination will have to be disturbed to remove contamination anyway, using those exposures in the lake as borrow sources satisfies both criteria.

Cover soil will be placed in loose lifts of 8-10 inches and compacted by multiple passes of earthwork equipment. Each lift will be compacted by not fewer than four passes of self-propelled sheepsfoot or tamping rollers with operating weight of not less than 22,000 pounds.

Cover construction is addressed in the specification included in Appendix G.

Soil investigations documented in Appendix E indicate that sufficient clean soil is available on site in the SE ¼ of the SW ¼ of Section 12 for cover construction. Since lake areas that have radiological contamination will have to be disturbed to remove contamination anyway, using those exposures in the lake as borrow sources satisfies the primary criteria. SRI does not plan to disturb the existing berm or ditch north and west of the mine; the local surface water drainage patterns have adjusted to these features that were not part of the mine. Before the CWCA cover is deemed complete, the radon attenuation performance of the cover will be verified by radon canister measurements.

4.2.8 Site Grading

After the CWCA is constructed and the cover is in place, final grading of the site will be performed to achieve a free-draining surface that will prevent ponding of water in the CWCA area and minimize concentration of runoff that would cause rills or other conditions leading to scour. The re-graded contours are estimated to be approximately those shown on Figure 7 and will be shown, along with surveys requirements, on construction drawings identified in Appendix G.

SRI has no plans to alter runoff to Ambrosia Lake or Arroyo del Puerto, and nothing to be done in mine reclamation will affect any water rights connected to Arroyo del Puerto. SRI does not plan to disturb the existing berm or ditch north and west of the mine; the local surface water drainage patterns have adjusted to these features that were not part of the mine. Except for grading to direct runoff away from the CWCA, whatever flow paths of surface water runoff that have existed since cessation of mining in 1982 will be unchanged by reclamation of the Section 12 Mine.

The site grading plan will be based on the topography remaining after removal of waste rock and contaminated soil. Grading will direct surface water away from the CWCA and toward Ambrosia Lake or other natural water courses west of the mine site. The existing discharge point of Ambrosia Lake, , will be left undisturbed at elevation 7068.5 feet so that the maximum standing water level in the lake will be limited to that elevation and lake water will not rise to the elevation of the base of the CWCA.

With the exception of that part of the access road with contaminant levels above clean-up standards, the road will be left intact for post-mining land use, expected to be grazing and/ or equipment storage. The portion of the road that is excavated for contaminant removal will not be restored but will be graded and re-vegetated with the rest of the disturbed areas.

Waste rock and contaminated soil will be isolated in the CWCA where they will be protected from erosion. Site grading will direct runoff away from the CWCA and toward the lake basin, where it naturally goes presently. There will be no new drainage courses that would convey drainage off-site or trigger actions under the Clean Water Act (CWA) for permitting under Section 404 or NPDES. SRI believes that, because the reclamation of the mine area will produce no pollutants and will be not involve dredging or filling of a waterway, neither of these CWA sections will apply.

4.2.9 Revegetation

Using site-specific vegetation data from the Reference Vegetation Survey and appropriate MMD guidance, the vegetation consultant prepared a plan to revegetate ground that has been disturbed by mining or reclamation (Appendix D).

Native species, primarily Blue Grama and Sideoats Grama, will be planted. Applications of soil carbon, microbiology inoculant and organic fertilizer along with cover crop will allow the soil biology to build before seeding native grass mix. The application of soil carbon and microbiology inoculant can be done with one single product. The organic nitrogen can be applied as a pelleted chicken manure to provide a high- carbon, slow-release nitrogen product that does not encourage annual weeds and is more favorable of native grasses.

4.2.10 Fencing and Signage

The mine site is presently mostly fenced, and repairs and extensions will be made as needed to enclose the revegetated areas and maintain exclusion of livestock from those areas for at least two years. A three-strand barbed-wire fence will be installed at the toe of the CWCA slope. During shaft backfilling and cap construction, a safety barrier will be placed around the shaft, followed after construction by a permanent three-strand barbed-wire fence. Signage will be attached to the fence and gates warning of radiological hazards within the fenced areas.

5 CONSTRUCTION SCHEDULE (Order ¶32r, 35)

The proposed schedule for Section 12 Mine reclamation is illustrated on Table 5 and the flow chart for the reclamation activities is shown on Figure 4. The primary factors that will impact the actual performance of the reclamation tasks are:

a) Volume of radwaste found,
b) Weather,
c) Regulatory approvals

The volume of radwaste has been estimated from the ERG radiological survey and field measurements of waste rock pile heights. Radwaste depth measurements are not yet sufficient to support a more robust estimate of radwaste volume, but SRI's estimate is 50,000 cubic yards (CY), of which 10,000 to 15,000 CY is already located within the CWCA footprint, leaving 35,000 to 40,000 CY to be excavated. At 1000 CY per day, excavation of radwaste would take 35 to 40 working days.

Weather conditions will have two types of impact – wet conditions preventing earthwork and thunderstorms causing shutdown of all activity. The clay-rich soils of the site become impassible during and for days after precipitation events.

The proposed schedule assumes that MMD comments on the Reclamation Plan will be made in not more than 30 days from submittal and that approval of the Final Reclamation Plan will be received not more than 30 days after submittal.

6 MONITORING

Reclamation activities performed under this RP will comply with relevant requirements and practices contained in the Health and Safety Plan (HASP, Appendix H) and the Construction Quality Management Plan (CQMP, Appendix I).

Post-reclamation performance of the waste CWCA, shaft closures, erosion controls, and vegetation will be measured and documented annually for not less than five years after completion of the reclamation of the site. In addition to annual vegetation surveys on the reseeded ground, this monitoring will include visual inspections, possibly UAV-based, of indications of erosion by wind or water, grazing or burrowing impacts, and structural stability of the CWCA and backfilled shaft and shaft cap..

6.1 Documentation and Reporting

Prior to reclamation construction, a Construction Quality Control (CQC) program will be developed and then applied during construction to:

- Establish the construction standards and procedures to be used in achieving the Reclamation Objectives,
- Guide construction with specifications and drawings,
- Measure and test the reclamation elements for conformance with the specifications and drawings,
- Document the reclamation elements as evidence of conformance and of satisfaction of requirements in the Order, and

CQC personnel will be independent of the construction contractor and will report directly to SRI or its designated representative.

6.2 Reclamation Summary Report

The Reclamation Summary Report, required under ¶ 36 of the Order, will be prepared upon completion of the reclamation work and after results of confirmatory radiological testing are available, approximately 90 days after the last task is finished. The report will include the chronology of reclamation activities, as-built drawings, description of variances and deviations from the approved plan, documentation of QC records, and photographs of the reclamation work.

7 REFERENCES

Energy, Minerals & Natural Resources Department Mining and Minerals Division (MMD), draft 2019, *Director's Order of Abatement on Consent with Findings of Fact and Conclusions of Law* in the Matter of Southwest Resources Inc.'s Section 12 Mine

Energy, Minerals & Natural Resources Department Mining and Minerals Division (MMD), and New Mexico Environment Department Mining Environmental Compliance Section (MECS), 2016, *Joint Guidance for the Cleanup and Reclamation of Existing Uranium Mining Operations in New Mexico*

EPA Grants Mining District Information Meeting and Negotiations Update, October 2, 2019

Environmental Restoration Group, Inc. (ERG), 2017, *Baseline Radiological Characterization of the Section 11/12 Mine – Phase 1* prepared for Permits West, Inc.

Tierney, R., 2018, *Waste Characterization Study – Phase 2, Section 12 Mine (Mine Permit Application - NM MK046RE)* prepared by Permits West for Southwest Resources, Inc.

Table 1 – Inventory and Disposition of Existing Facilities and Materials

Facility or Material	Composition	Disposition	Comments
Access road	native soil and crushed rock	retain for PMLU	maintain throughout reclamation
Mine shaft, 14 ft. diameter	concrete, steel	backfill with waste rock, broken concrete, selected debris	may include solid, un-contaminated mine debris
Ore- and man- skips	steel	remove and scrap or drop to bottom of shaft	completed
Shaft headframe	steel	,	remains in place except for ore hopper and chute
Ore hopper and chute	steel		salvage for shaft cap steel
Sheaves (2)	steel		leave in place
Hoists – double barrel	steel	remove, scrap, re-cycle	completed
Hoisting electrical and controls	steel		Leave in place
Hoisting rope	1 1/4" steel cable	remove, scrap or drop in shaft	completed
Drums of uranium-loaded resin (12)	steel	remove and ship off-site for uranium recovery	completed
Drums of charcoal (4)	steel	remove to licensed landfill	completed
Hoist house	steel frame, metal roof and siding	Leave in place	post-mining use by buyer
Office and dry building	steel frame, metal roof & siding	leave in place	post-mining use by buyer
Pump house	wood frame, metal roof & siding	leave in place	post-mining use by buyer remove, drop in shaft
Water tank	steel		post-mining use by buyer remove, drop in shaft
East vent	steel casing	Fabricate a bat-compatible cap	completed
Building foundations	reinforced concrete		leave in place
Chain link fencing	galvanized steel wire		Salvage for shaft cap enclosure

Various debris	Sheet metal, plastic, wood, rubber, glass, paper, etc.	leave in place	

NOTES:

Table 2 - RADON Model for Cover Design

SECTION 12 MINE

Input values for all models:	Ra 226, pCi/g	Rn 222 Emanation Fraction	Porosity	Moisture Content, %	Minus #200 fraction	Rn 222 diffusion coeff.
Natural Ground[1]	1.5	0.35	0.47	27	0.85	default
Waste rock[2]	17.3	0.35	0.43	5.5	0.5	default
Clay Soil	6.5	0.35	0.47	27	0.85	default
Loam Soil	6.5	0.35	0.45	11.7	0.37	default

	Model #					
Layer Thickness, m	**1**	**2**	**3**	**4**	**5**	**6**
Natural Ground	4.57	4.57	4.57	4.57	4.57	4.57
Waste rock[3]	3.048	3.048	3.048	3.048	3.048	3.048
Clay	0.6096	0.3048	0.15	0.001	0.3048	0.001
Loam	0.6096	0.6096	0.6096	0.6096	0.6096	0.6096
Waste rock Ra 225, pCi/g	**17.3**	**17.3**	**17.3**	**17.3**	**370** [2]	**30** [2]
Exit flux, top of cover, pCi/m²/s	**4.8**	**5.1**	**5.7**	**12.5**	**19.84**	**19.45**

1) Natural ground is assumed to have background Ra 226 of 1.5 pCi/g
2) Waste rock is assigned the average Ra 226 concentration of 17.3 pCi/g based on page 18 in ERG report, *"Baseline Radiological Characterization of the Section 11/12 Mine – Phase 1".* Higher values in models #5 and #6 were used to determine upper limits of source term for clay layer thicknesses.
3) Waste rock thickness in the CWCA is expected to be not more than 10 feet; average will be less.

Input soil parametric values based on soil tests by DBSA laboratory and references cited.

See Appendix F for details.

Table 3 - Cover Amendments

Product	Manufacturer	Rate Per Acre
Carbon Angel	Sterling Pacific	66lbs/Acre
Pelleted Chicken Manure	Pacific Blend	2000lbs/Acre

Table 4 - Native Species and Seeding Rates

Species	Lbs per acre	Percent by Volume	Seeds Per Lb	Seeds Per Acre	Percent by Seeds
Blue Grama	2.0	8%	800,000	1,600,000	48%
Sideoats Grama	1.0	4%	190,000	190,000	6%

Table 5 Proposed Reclamation Schedule, Section 12 Mine

Task #	RP Section #	Task Description	Months from RP approval		Comments
			Start	Finish	
1	NA	Bid Package Preparation	RP approval	2	for tasks #4,5,6,7,8, and 9-13 plus QC and radiation survey
2	NA	Contracting	2	3.5	includes pre-bid meeting and 30 days to submit bid
3	NA	Award and Mobilization	3.5	5	
4	4.2.1	Materials Decontamination	NA-	NA-	Completed
5	4.2.3	Hoisting Equipment Removal	NA	NA	Completed - Completed
6	4.2.2	Demolition of Ore Hopper and Chute	5	6	pump house, water tank, ore chute and hopper only
7	4.2.5	Contaminated-Material Excavation	5	9	
8	4.2.6	Shaft backfill and capping and closure	5	7	Includes cap construction
9	4.2.7.1	CWCA Construction	7	10	
10	4.2.7.2	CWCA Cover	10	12	
11	4.2.8	Site Grading	12	13	
12	4.2.9	Revegetation	13	15	seasonal limitations
13	4.2.10	Fencing	13	15	
14	6	Monitoring	15	periodic	ongoing but intermittent; quarterly through 3rd year, then annual
15	6.1.1	Documentation and Reporting	15	16	completion of project files
16	6.1.2	Reclamation Summary Report	16	17	Includes all data files