

CONCEPTUAL RECLAMATION PLAN

SECTION 12 MINE, MCKINLEY COUNTY, NEW MEXICO

Rev. 0, 6/28/2019

1 INTRODUCTION

This Conceptual Reclamation Plan (CRP) is the initial submittal in the mine reclamation process for the Section 12 Mine located at 35° 27' 17"N, 107° 51' 01"W in T14N, R10W, SW 1/4 of Section 12, McKinley County, New Mexico adjacent to ephemeral Ambrosia Lake. This underground uranium mine was 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).

SRI submitted an application for a minimal-impact mine permit to MMD on January 14, 2014. However, 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 on Part 5 of the Act. Subsequently, SRI performed an economic analysis of the mine and determined that, considering the current uranium market and the limited remaining uranium resources, the mine will not be operating in the future.

Following SRI's decision, the New Mexico Mining and Minerals Division (MMD) issued a Director's Order of Abatement on Consent (Order, MMD 2019) that requires Southwest Resources Inc. to reclaim the mine. The Order requires a Reclamation Plan (RP) that satisfies requirements for a closeout plan under NMAC 19.10.5.506 and the environmental standards of the MMD/ NMED Joint Guidance for the Cleanup and Reclamation of Existing Uranium Mining Operations in New Mexico.

As the first step in reclamation of the Section 12 Mine, SRI is required by ¶ 31 of the Order to prepare a Conceptual Reclamation Plan. This CRP responds to that requirement. The following sections of this CRP describe the existing conditions, the reclamation objectives, and the reclamation activities, illustrated in Figure 1, planned to reach those objectives.

2 EXISTING CONDITIONS

2.1 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. The two remaining buildings, the hoist house and the mine office/ change room building, are locked. The main shaft and its headframe remain intact, but the shaft collar is blocked by a temporary wooden cover. Two small vent shafts remain.

2.2 Existing Radiological Contamination

Waste rock excavated from the mine and shaft contain 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) indicate 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 must 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.

2.3 Existing Terrain

Permits West Inc. (Tierney, 2018) performed an initial investigation of the site.

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 Arroyo del Puerto (Martin Draw) and local sheet flow, and the overflow leaves from the southwest corner of Ambrosia Lake via Arroyo del Puerto.

The SW 1/4 of Section 12 rises nearly uniformly, except for 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 repository as well as borrow locations for cover soil.

3 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 (“m²”) 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 95th percentile value.

3) Cover material for the repository must limit radon flux to not more than 20 pCi/m²/s.

- Satisfaction of the requirements under NMAC 19.10.5.506A & B, 507A.
- Satisfaction of the requirements under Order ¶ 32 of the Order.

4 RECLAMATION ACTIVITIES

The planned reclamation activities are illustrated on Figure 1. The relevant paragraphs in the Order are referenced in parentheses for each activity.

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

The initial action is to plan and perform site investigations to augment studies performed by Permits West Inc. (Tierney, 2018) and to collect additional information needed for final reclamation planning. Because of the age of the mine and absence of records of mine construction and operations, the following site investigations will be performed:

4.1.1 Shaft Video and/or Water Level Probe (Order ¶ 30)

SRI will contract for a video survey of the main shaft to document presence or absence of water in the main shaft and/ or the vent shafts, depending on accessibility. This investigation will use a downhole video camera with recorder. If the video equipment is not able to determine if water is present, an electric galvanometer water probe will be lowered in the shaft from ground surface by a hoisting rig. Because of the importance of ground water in determining what reclamation and long-term monitoring measures will be needed, this task takes priority in the site investigations.

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

Global Positioning (GPS) methods will be used to establish coordinates and elevations for ground control and create terrain models of ground that will be excavated or filled during reclamation. The terrain model before excavation and the subsequent terrain model after excavation provide the basis for calculating earthwork volumes for final waste pile and cover design and for payment quantities.

Using existing historical maps and the results of the GPS mapping, a base map of the mine area will be prepared and used in planning earthwork, grading, vegetation and in documentation of site reclamation records.

4.1.3 Waste Rock and Cover Soil Characterization (Order ¶32a, 32f, 32j)

Samples will be collected and tested to determine physical and radiological properties of waste rock and potential cover soil. The primary radiological reference is the 2017 ERG report. Waste rock and soil will be tested for grain size, plasticity, and compaction; the results will be used in selecting borrow sources and compaction standards.

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

A qualified vegetation specialist will perform surveys to identify local natural vegetation species and natural diversity, ground cover, and vegetation density for setting success

criteria for the revegetation plan. A professional vegetation consultant will plan and perform this survey.

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

SRI contractors will perform an inventory to identify types and quantities of building, shaft, and headframe materials that will be demolished and removed from the site or buried on the site, and to include the necessary volumes in reclamation planning and cost estimating.

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

The Reclamation Plan will use the information and data collected in site investigations to refine and add detail to the conceptual plan described below. The Final Reclamation Plan (FRP) will include tasks to be performed in approximately the following sequence.

4.2.1 Hoisting Equipment Removal

The main hoist and related motors and control equipment remain in the hoist house. This equipment will be removed and either sold for use elsewhere or stored off site until their disposition can be determined.

4.2.2 Building Demolition

The two remaining buildings on site, the hoist house and the office/ change house, are sheet metal buildings of undetermined re-sale or scrap value. In any case they will be removed from the site after the hoisting equipment has been removed. After removal of the building superstructures, the concrete foundations will be demolished.

4.2.3 Shaft Closure

The main shaft headframe will be demolished and removed. Structural steel will be recycled to another mine or sold for scrap. If site investigations show that there is no ground water in the shaft, after the headframe is removed the shaft will be backfilled with waste rock to collar level topped by a clean earth mound with rock cover. If backfilling is not feasible and there is ground water in the shaft, a structural cap will be designed to close and safeguard the shaft. Shaft backfill may also include crushed concrete from building foundation demolition and waste rock, dropped free-fall from the shaft collar.

Two vent shafts are located northwest of the main shaft. These are small diameter shafts with steel plate or timber temporary caps that, if dry, will be backfilled with waste rock or local soil. Otherwise, they will be closed at ground surface with steel and concrete plugs. It is not yet clear if these shafts were used exclusively for the Section 12 Mine or if they were jointly used by the Dysart Mine. If the latter, some joint responsibility issues may need to be resolved.

4.2.4 Contaminated-Material Excavation

Waste rock and radiologically-contaminated soil will be excavated from all mine areas except the designated repository location and placed in compacted lifts within the repository footprint at that location. The most likely location for the repository is the area east of the mine access road and west of the fence along the east side of the mine area, where substantial waste rock is already in place. An alternative location is the area that includes the present shaft and hoist house, if this area is determined to be outside of the

lake floodplain. The waste rock and contaminated soil will be excavated first from the most distal locations and carried directly to the repository, working progressively toward the repository. Radiological surveying by gamma meter will accompany the excavation to verify that each excavated area is clean before moving to the next area closer to the repository.

Waste rock and contaminated soil 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. Mine debris (e.g.; roof bolts, vent bags, timbers) that is too large or too compressible to include in the lifts of waste rock will be sorted and placed either in the shaft or in a debris pit within the repository, where it will be flooded with a soil-cement slurry (flowable fill) for solidification.

4.2.5 Repository Construction

Repository construction will include subgrade preparation, placement and compaction of waste rock and contaminated soil, and placement and compaction of soil cover. The repository will be shaped approximately like a truncated pyramid, with sides sloped at approximately 20% or 5H:1V and top surface sloped toward the sides at approximately 1% grade. The size will be sufficient to contain all contaminated materials, including mine and demolition debris, that are not placed in the shaft. The cover will have a radon barrier component (clay soil) up to 2.0 feet thick and a seeding medium (loam). The thickness of the radon barrier will be calculated by the RADON computer model developed for design of uranium tailing covers, then verified by radon canister measurements before placement of the seeding medium (loam).

Based on a preliminary site reconnaissance in January 2019, it appears that sufficient clean soil is available on site for construction of both the radon barrier and the seeding medium. The implementation of this design will be directed by drawings and a specification signed and sealed by a licensed Professional Engineer. The vegetation consultant will advise on the selection and placement of the seeding medium.

4.2.6 Site Grading

After the repository 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 and minimize concentration of runoff that would cause rills or other conditions leading to scour. 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 repository and toward natural water courses west of the mine site. To reduce the potential for inundation by flooding in Ambrosia Lake, the plan will probably include creation of a shallow swale from the area south of the existing hoist to the west-southwest

4.2.7 Revegetation

Using site-specific vegetation data from the Reference Vegetation Survey and appropriate MMD guidance, the vegetation consultant will prepare the plan to revegetate ground that has been disturbed by mining or reclamation. The seed mix will be consistent with local natural vegetation. If seeding occurs other than during the ideal planting season, fast-

germinating annual grasses will be included to establish to temporary vegetative cover. Ground preparation, planting methods, seed application rates, amendments (if any), and mulching will be planned and overseen by the vegetation consultant. The plan will propose success criteria including species diversity, density, and ground cover that will be measured for at least five years after seeding.

4.2.8 Monitoring

Performance of the waste repository, shaft closures, erosion controls, and vegetation will be measured and documented 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 repository and backfilled shaft.

4.2.9 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 that conformance and of satisfaction of requirements in the Order

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

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.

5 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

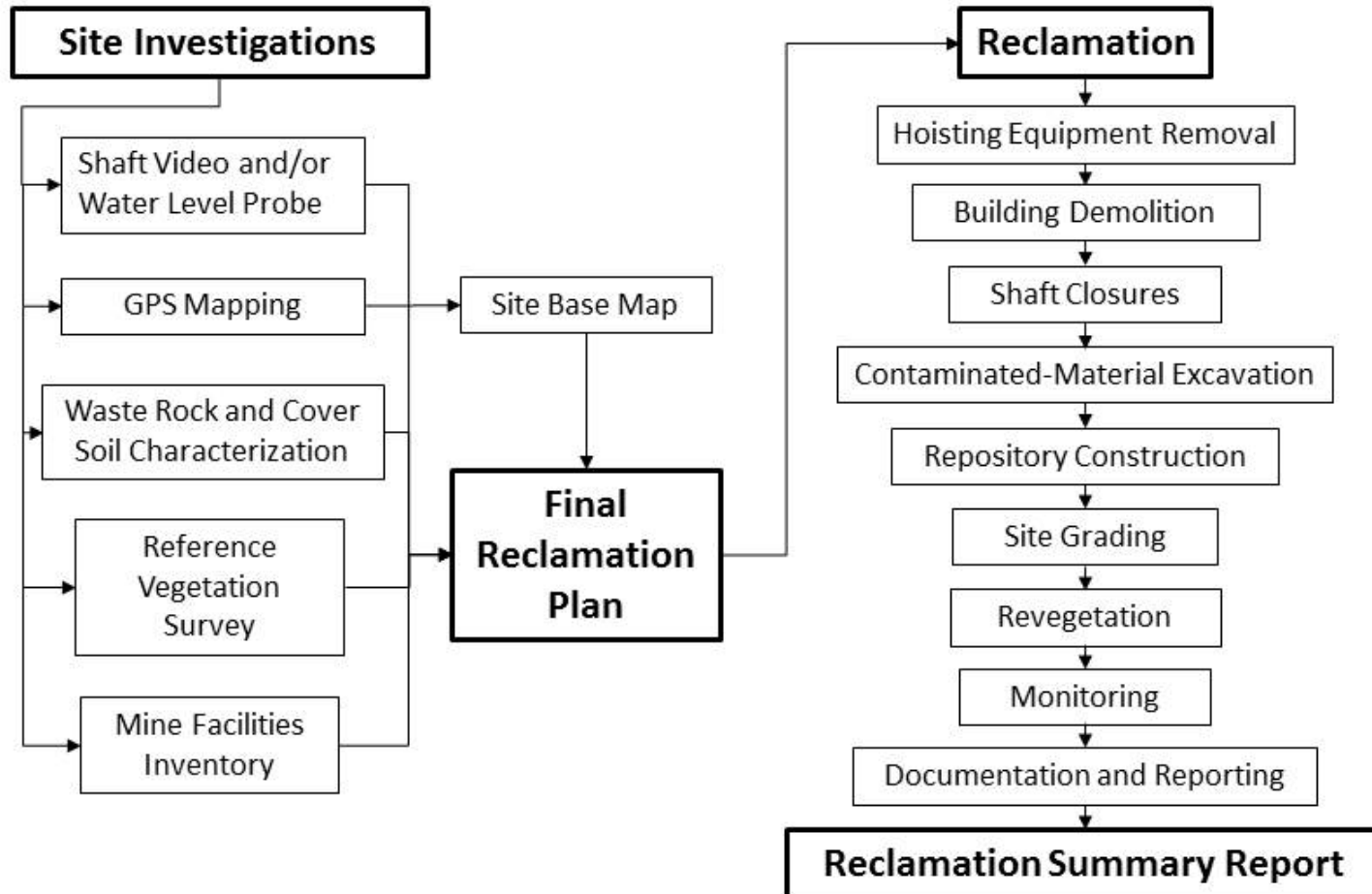
(MECS), 2016, *Joint Guidance for the Cleanup and Reclamation of Existing Uranium Mining Operations in New Mexico*

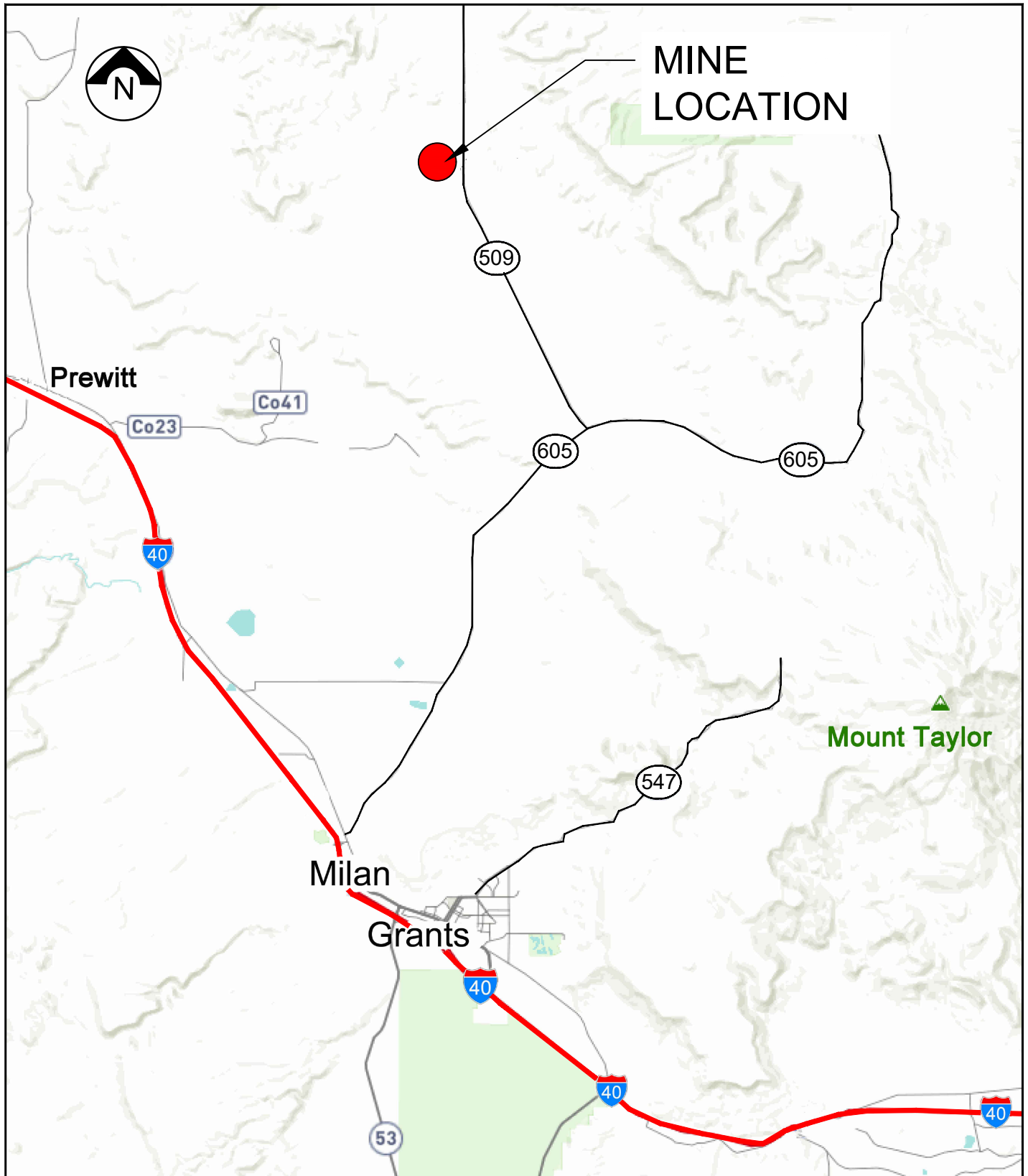
Environmental Restoration Group, Inc. (ERG), 2017, *Baseline Radiological Characterization of the Section 11/12 Mine – Phase 1* prepared for Permits West, Inc.

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

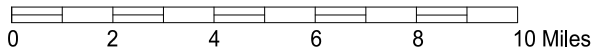
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Figure 1. Conceptual Reclamation Plan - Sequence of Activities





GRAPHIC SCALE



SOUTHWEST
RESOURCES

Prepared By:

Alan Kuhn Associates LLC

FIGURE 2

MINE LOCATION

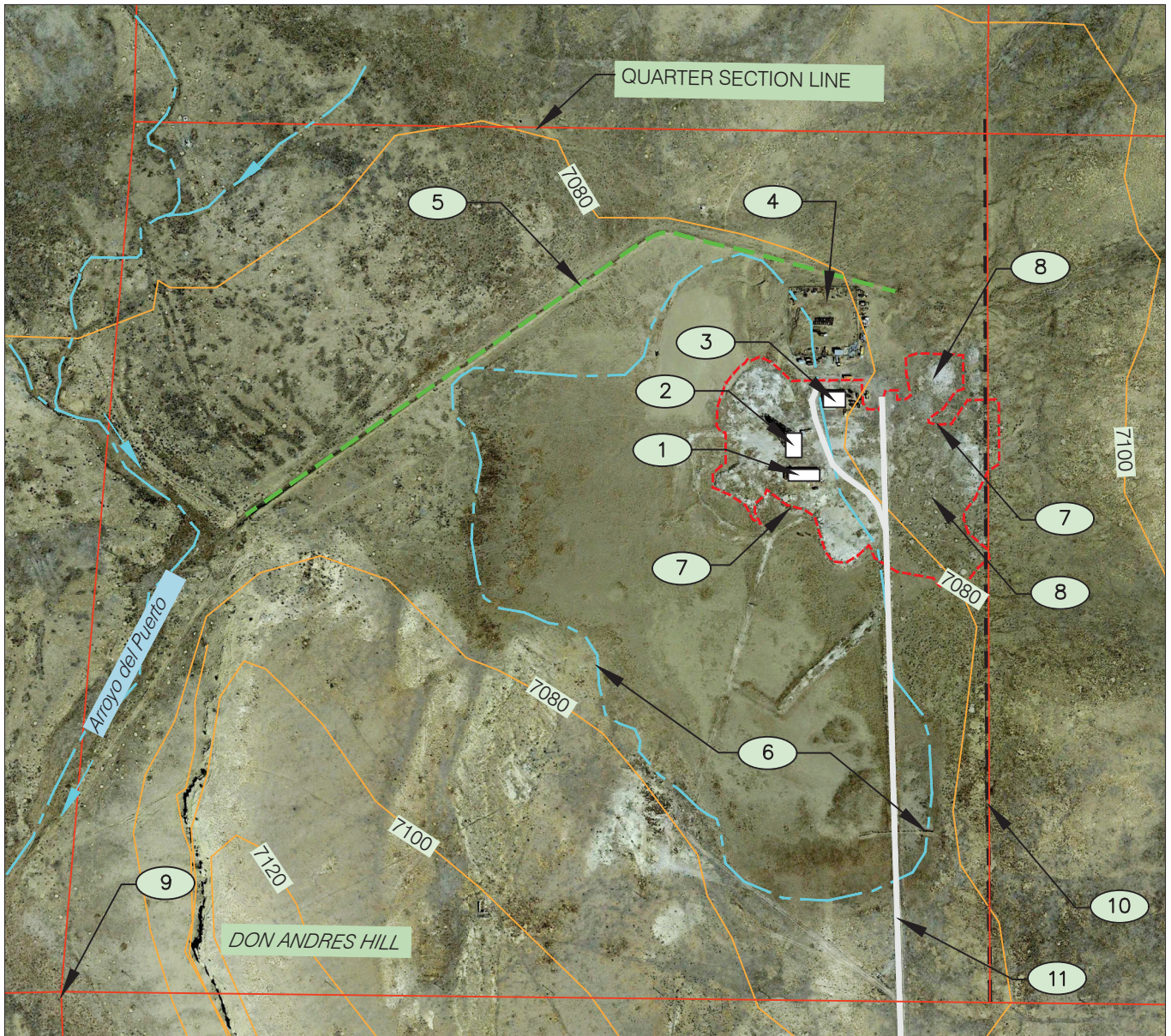
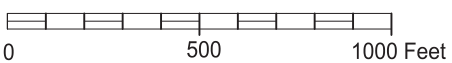


IMAGE FROM GOOGLE EARTH

NOTES

- | | |
|-----------------------------------|---|
| (1) HOIST HOUSE | (7) APPROXIMATE EXTENTS OF CONTAMINATED SOILS |
| (2) HEAD FRAME AND SHAFT | (8) WASTE ROCK PILES |
| (3) SERVICE BUILDING | (9) SOUTHWEST QUARTER SECTION 12 |
| (4) STORAGE YARD | (10) FENCE LINE AND PROPERTY BOUNDARY |
| (5) DIVERSION BERM | (11) GRAVEL ACCESS ROAD |
| (6) USGS EXTENTS OF AMBROSIA LAKE | |

GRAPHIC SCALE



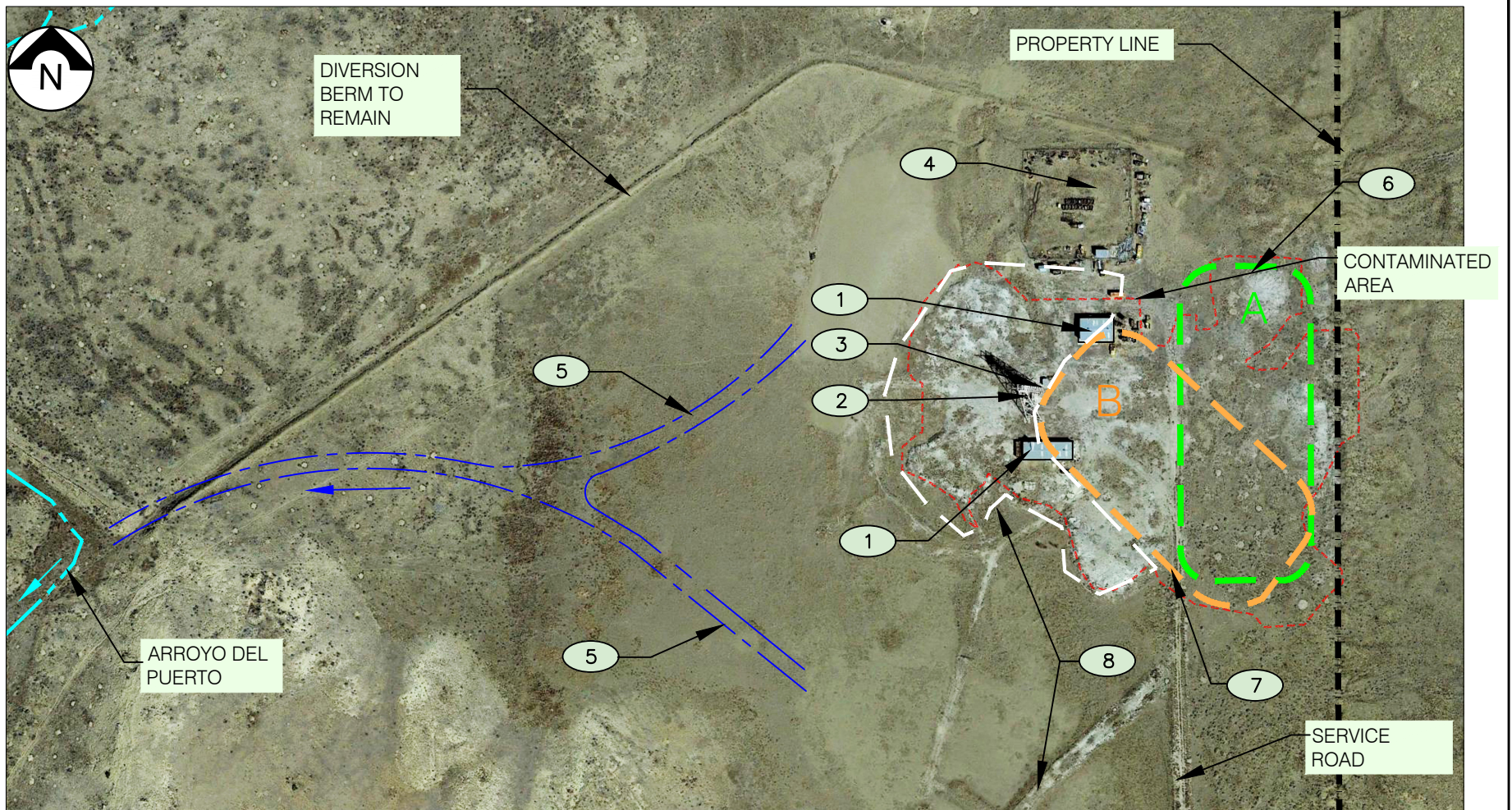
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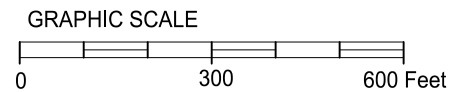
FIGURE 3

MINE FEATURES



RECLAMATION FEATURES

- | | | | |
|---|-----------------------|---|--|
| ① | DEMOLISH BUILDINGS | ⑥ | REPOSITORY LOCATION "A" |
| ② | DEMOLISH HEAD FRAME | ⑦ | REPOSITORY LOCATION "B" |
| ③ | BACKFILL SHAFT | ⑧ | REMOVE WASTE ROCK AND PLACE IN REPOSITORY. REGRADE TO ORIGINAL PRE-MINE ELEVATIONS |
| ④ | CLEAN UP STORAGE YARD | | |
| ⑤ | CREATE DRAINAGE SWALE | | |



 SOUTHWEST RESOURCES	Prepared By: _____
	Alan Kuhn Associates LLC

FIGURE 4
RECLAMATION
FEATURES