REPORT

REVISED

SAMPLING AND ANALYSIS PLAN

FOR THE LA JARA MESA PROJECT

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Project No. 083-93385SA

A world of capabilities delivered locally

Golder Associates

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1.0 INTRODUCTION

In the United States, nuclear sources provide about 21 percent of our electrical energy supply compared to 70 percent for carbon-based (oil, coal, and natural gas) and 9 percent for renewable sources (wind, solar, hydropower). As concerns related to carbon emissions increase, greater emphasis is being given to nuclear and renewable sources. Laramide Resources (USA) Inc. (Laramide) proposes to develop an underground uranium mine in northwestern New Mexico. The La Jara Mesa Project is located in the Ambrosia Lake Mining District approximately 10 miles northwest of Grants, NM (Figure 1-1).

As part of the New Mexico Mining Act (NMMA) permit application process (Subsection D.12 of 19.10.6.602), the New Mexico Mining and Minerals Division (MMD) requires the development of a sampling and analysis plan (SAP) detailing the methods proposed for the collection of baseline data specified in Subsection D.13 of 19.10.6.602. Laramide retained Golder Associates (Golder) to prepare a SAP to collected pertinent baseline data for the La Jara Mesa Project. This ***revision to the original*** plan ***submitted June 8, 2009 incorporates changes to address agency comments concerning administrative completeness in their letter to Laramide dated August 11, 2009. The changes between documents are shown in bold italics. This submittal*** complements additional information that is required in the NMMA permit application process.

1.1 Project Overview

Laramide submitted a Plan of Operations for the La Jara Mesa Project to the USDA-Forest Service and the MMD. The plan of operations provides a detailed description of the proposed mine operations and reclamation plan. A summary of the operational and reclamation plans is provided below.

The proposed mine portal and surface facilities are located on Forest Service lands at the base of La Jara Mesa (Plate 1). The mine portal and miner change house (dry), administration office, maintenance facility, and fuel and explosives storage areas will be located at about 7,300 feet in the NE¼ of Section 15, T12N, R9W. An escape raise will be about one mile east of the portal on top of the mesa in Section 11, T12N, R9W (Figure 1-2). The ore zones are located about 600 feet below the surface of mesa in the portions of Sections 1, 2, 11, 12, 13 and 14, T12N, R9W.

A total of about 16 acres of surface disturbance is anticipated in association with the portal, mine facilities, and escape raise (Plate 2). An existing road that crosses private, Bureau of Land Management and Forest Service land will be upgraded and used to access State Highway 605. Water and electric power utility lines will parallel the road in the MMD Permit Area on Forest Service lands. Because the ore will be hauled to a licensed mill, no ore processing (milling) or mill tailing disposal areas are associated with this project.

The La Jara Mesa Project will develop two parallel, low-angle inclines for access to the ore while providing for ventilation. The inclines will be about 12 feet wide and 15 feet high and 5,000 feet long.

The main incline will be for mining access and second incline will be used primarily for ventilation and as a contingency access and escape route. Once the inclines are complete, the escape raise (an approx. 8 foot in diameter borehole) will be developed from the underground mining area to surface of the mesa. Waste rock from the escape raise boring will fall into the underground working and will then be hauled out the main incline to the waste rock stockpile. Other than drill cuttings from a small diameter pilot hole, no waste rock is anticipated to be produced or stored on the top of the mesa.

The La Jara Mesa Project will be developed using a room and pillar mining technique. The overburden and barren (un-mineralized) rock produced during construction of the inclines, escape raise, and mine development will be placed just west of the portal. A flat pad area will be constructed from overburden and waste rock that will be used as a foundation for the mine buildings and facilities. Storm water diversions and sediment ponds will be constructed to control and contain surface water. A compacted clay-lined area with internal drainage controls will be constructed for temporary ore storage.

During the first phase of mining, an estimated 40,000 to 50,000 tons of ore will be removed for bulk mill testing. Under full production, the mine is anticipated to yield an average of 500 tons per day. The ore will be transported to the surface in mine trucks and placed on a compacted clay liner to prevent mixing of the waste rock and ore. The ore will be periodically loaded and transported in 40-ton highway trucks to a licensed mill for processing.

After the cessation of operations, Laramide will reclaim the site to meet the requirements of NMAC 19.10.6.603. The major components of the reclamation involve permanently closing the mine workings (inclines) and escape raise, demolishing and removing the buildings, reestablishing hydrologic balance of the surface water system, and covering and revegetating the overburden and waste rock piles. The access road on Forest Service land will be decommissioned and revegetated. The overall purpose of the reclamation is to return surface disturbed areas to a stabilized and self-sustaining condition that is consistent with the post-mining land use and surrounding ecosystem.

1.1.1 Proposed Permit Area

The proposed MMD Permit boundaries for the La Jara Mesa Project are shown on Plate 1. The main mine facilities Permit Area occupies about 77 acres with a projected disturbance area of 16 acres. The disturbance area will be associated with surface water diversions and sedimentation controls, topsoil and waste rock storage areas, buildings, and roads. The access road right-of-way and utility corridor occupies about 30 acres, which will include about 6 acres of disturbance associated with the upgrading the existing road. The escape raise portion of the permit area is 0.25 acre with the actual disturbance area of about 0.10 acre. Thus, the proposed Permit Area for the La Jara Project is 107 acres with a projected disturbance area of about 22 acres, including the existing access road and utility corridor.

1.1.2 SAP Objectives and Structure

The objective for assembling the baseline data is to describe the Permit Area and potential affected area to the extent practicable. The requirements for the collection of baseline data are broadly defined under 19.10.6.602.D.13 NMAC, with the level of detail determined by the location, size, scope, and type of mining operation at the discretion of the MMD Director. The NMMA allows the use of existing data where appropriate, but requires a minimum of 12 months of site-specific data associated with the evaluation of water quality and quantity, wildlife, and vegetation.

The SAP developed herein is predicated on providing a comprehensive description of the critical environmental factors considering the limited size and scope of the activities and disturbance that will be associated with the La Jara Mesa Project. The plan is structured in sections that address the major baseline parameters required by the MMD including, climate (Section 2), topography (Section 3), vegetation (Section 4), wildlife (Section 5), soils (Section 6), ore body and geology (Section 7), surface water (Section 8), groundwater (Section 9), background radiation (Section 10), prior mining operations (Section 11), historic and cultural properties (Section 12), and land use (Section 13).

The individual sections of this document provide the type of data/information to be collected/obtained and the numbers and frequency of samples to be collected. Quality assurance protocols for data collection and management are discussed in the attached Quality Assurance Project Plan (Appendix A).

2.0 CLIMATE

Climate is an important determinant of site ecological potential and a major consideration in operational and reclamation engineering designs. The climate of the La Jara Project area is broadly categorized as cool and dry. Mean annual temperature is near 50°F and precipitation averages about 10 inches per year in the portal area. Because of the elevation difference, the climate conditions at the escape raise are likely to be somewhat cooler and wetter than the lower elevation mine facilities.

2.1 Objective

The objective for collecting baseline climatic data is to provide a representation of the conditions that may occur in the Permit Area. The data will include an assessment of the normal and extreme conditions, which are important for assessing reclamation and engineering designs.

2.2 Sampling Design and Methods

In the southwestern United States, weather conditions are highly variable from year to year. Because of the wide range in seasonal and annual conditions in this region, the collection of site-specific data during the baseline period (e.g., 12 months) is expected to have limited value. Thus, Laramide proposes to compile historic data from the ***four*** stations to describe the climate of the site.

The ***Homestake Mill***, Grants, San Mateo, and McGaffey stations were selected to represent the project site from a geographic and elevation perspective (Figure 2-1). The La Jara Mesa Project is about 10 miles from the Grants and San Mateo Stations and occurs at a similar elevation. The McGaffey Station is about 40 miles northwest of the La Jara Mesa Project, but was selected because it is similar in elevation (8,000 feet) to the escape raise portion of the Permit Area. Table 2-1 lists summary information about the proposed stations. The sampling frequency for the data collected from the Homestake station, during the one year baseline period, is expected to be daily. The historic records from the other stations are expected to be monthly. If available, daily records will be compiled for the baseline period.

Data from these stations will be compiled and summarized to provide an understanding of the distribution, probable ranges, and extremes in precipitation and temperature that might be expected in the mine area. In addition, we will compile data relevant for engineering purposes (e.g., 100-year 24 hour distributions). ***The measurements at the Homestake Mill meteorological station include the following:***

TABLE 2-1
HOMESTAKE MILL METEOROLOGICAL STATION EQUIPMENT

Parameter	Equipment	Serial Number
Wind Direction	Brunton 5008 Pocket Transit	5060803362
	Met One Model 040 Direction Template	NA
	Waters Torque Watch 366-1M	3950
Wind Speed	RM Young Model 18811 Anemometer Drive	CA01889
	Waters Torque Watch 366-3M	3618
Temperature	Brooklyn Digital Model 6661	C404690
Precipitation	Pyrex 100 ml graduated cylinder	3024
	Kimax 50 ml graduated cylinder	NA
Relative Humidity	Vaisala Model HMP45AC	W1630084
Barometric Pressure	Vaisala Model PTB101B	A1950021
Solar Radiation	LiCor Model 200x	PY56373

Notes:
NA – Not applicable

The meteorological tower at the Homestake Mill is owned and operated by Homestake Mining Company in Grants, New Mexico to meet U.S. Environmental Protection Agency Prevention of Significant Deterioration (PSD) quality assurance requirements. Homestake conducts at least annual meteorological instrument performance audits at the meteorological monitoring station in accordance with: 1) EPA's Ambient Monitoring Guidelines for Prevention of Significant Deterioration (PSD), 1987; and 2) Quality Assurance Handbook for Air Pollution Measurement Systems, Volume IV: Meteorological Measurements, March 2008. An example of the Quality Assurance Performance Audit that is conducted on the Homestake Mill station in included in Appendix C.

TABLE 2-2
LA JARA MESA PROJECT AREA CLIMATE STATIONS AND SUMMARY

Weather Station	Distance and direction from Portal (mi)	Elevation (ft)	Period of Record		Mean Annual Temperature (°F)	Mean Annual Precipitation (inches)
Grants Airport	10 SW	6,530	5/1/1953	12/31/2005	50.3	10.34
San Mateo	10 NE	7,300	4/1/1918	2/29/1988	48.1	8.66
McGaffey 5SE	40 NW	8,000	1/1/1923	12/31/2005	43.1	18.72
Homestake Mill	***4***	***6,600***	***1997***	***present***	***TBD***	***TBD***

3.0 TOPOGRAPHY

Topographic considerations are important in the mine planning process for assessing engineering and drainage related issues. Plate 1 provides an overview of the Permit Area and surrounding topography. The main mine facilities occur near the base of the La Jara Mesa escarpment (Plate 2). This area is characterized as a gently to steeply sloping, dissected, pediment that ranges in elevation from about 6,800 to 7,600 ft above mean sea level (AMSL). An access road and utility corridor will extend south from the portal to the Forest Service boundary. The road crosses gently sloping dissected pediment and alluvial fan surfaces that parallel the escarpment. The escape raise and associated generator housing will be sited on the surface of the nearly level mesa top at an elevation of about 8,060 feet AMSL.

3.1 Objective

The objective for collecting topographic data is to provide a basis for establishing permitting boundaries and the locations of mine facilities and surrounding structures. Topographic considerations also figure prominently in the development of operational and reclamation plans and the development of costs associated with these activities.

3.2 Sampling Design and Methods

Laramide recently procured aerial photography and developed site-specific topography for the main mine facilities area. The air photos were interpreted to provide contour maps with intervals of 5 feet. United States Geological Survey (USGS) quadrangle data are available outside the permit area. The available topographic information is considered adequate for this phase of mine and reclamation planning and no additional topographic information is contemplated as part of the baseline data collection. ***The Laboratory and Field Quality Assurance Plan are not applicable for developing the baseline Topography.***

4.0 VEGETATION

Vegetation conditions in the Permit Area prior to mining are important for establishing expectations for revegetation success for post-mining land uses. In addition, it is important to determine whether Federal or State status threatened and endangered plants occur at the site.

The distribution of vegetation surrounding the La Jara Mesa Project reflects the combined influences of environmental gradients (soils and climate), disturbance history (mineral development, fire, grazing) and other management practices. The major structural characteristics of vegetation are controlled primarily by the prevailing environment gradients. The vegetation in the La Jara Mesa Project Permit Area is broadly classified as Pinyon-Juniper woodland. Within the project area, the specific composition of the vegetation and amount of ground cover vary as a function of the topography and soils. Plant species that are likely to occur in the Permit Area are listed in Table 4-1.

4.1 Objective

Baseline vegetation data is intended to support revegetation success analyses and to determine if sensitive or threatened and endangered plants are present within the disturbance area.

4.2 Sampling Design and Methods

The following sections detail the methods for determining baseline vegetation information including the type and frequency of data collection. The plant inventory is discussed in Section 4.21. The methods of vegetation classification are discussed in Section 4.2.2. The proposed approach to determining cover, density and production is outlined in Section 4.2.3. Section 4.2.4 deals with T&E species. ***The sampling frequency is discussed in Section 4.2.1.***

4.2.1 Plant Inventory

An ecologist will conduct a ground survey of the entire permit area including the road/utility corridor and escape raise ***(Plate 1)***. This effort will allow the development of a comprehensive plant list for the project. The survey will be conducted in the late-summer and spring to facilitate recognition of the short-lived annuals. ***Therefore, the sampling frequency will be twice during the one year baseline period. All field work will be completed consistent with the Laboratory and Field Quality Assurance Plan in Appendix A.***

4.2.2 Vegetation Mapping

The vegetation communities will be differentiated on the basis of species dominance and structure. Abrupt changes in environmental gradients have resulted in distinct types of vegetation with clear boundaries. The field investigations and mapping of the vegetation will be complemented by the interpretation of color aerial photographs.

The vegetation will be classified using the nomenclature and hierarchical classification of the United States National Vegetation Classification (USNVC) system (Grossman et al., 1998). The vegetation will be classified and mapped at the Alliance level, which represents the sixth tier in a seven-tiered hierarchy. The Alliance category is roughly equivalent to the series level used by the Forest Service (Pfister and Arno, 1980; USDA, 1997), except that it tends to emphasize existing dominants rather than end-member climax species (Grossman et al., 1998). ***All field work will be completed consistent with the Laboratory and Field Quality Assurance Plan in Appendix A.***

4.2.3 Canopy Cover, Shrub Density, and Production

Canopy cover, shrub density, and production data are typically used to establish revegetation success criteria, particularly if a site-specific reference area approach is adopted. Alternatively, under a grazing post-mining land use (PMLU), information from the U.S. Department of Agriculture may be used to establish vegetation success standards. Pending concurrence from the Forest Service, grazing is the most likely PMLU that will be designated for the Permit Area.

Because of the small size of the Permit Area, lack of grazing capacity in portions of the permit area (e.g., talus and steep slopes), and the vegetation disturbance associated with existing roads within the main Permit Area, canopy cover, shrub density and production will be obtained from existing information available from the Forest Service. Because the Forest Service data has been collected from a broader area and longer periods of time, they are expected to provide better estimates of cover and productivity than data collected from the Permit Area alone. The long-term nature of the Forest Service data makes it desirable with respect to accounting for the climatic variability that is inherent in this region. In other words, the collection of data from one growing season may have limited value for future comparison.

Thus, data will be compiled from the Forest Service and/or Natural Resource Conservation Service to establish baseline vegetation conditions for cover and production. This assessment will be coupled with semi-quantitative field confirmation of the cover and production targets. ***All field work will be completed consistent with the Laboratory and Field Quality Assurance Plan in Appendix A.***

4.2.4 Floral T&E Surveys

The Forest Service biologist for the Mt. Taylor Ranger District indicated that T&E plant species are unlikely to occur in the project area. Nonetheless, a ground survey and database search will be conducted. The T&E evaluation will involve assessing the State and Federal databases and comparing them to the plant inventory data collected from the site. Field work will be conducted in association with the inventory described in Section 4.2.1. ***All field work will be completed consistent with the Laboratory and Field Quality Assurance Plan in Appendix A.***

TABLE 4-1
PLANT SPECIES LIST FOR THE LA JARA MESA PROJECT AREA

Common Name	Scientific Name
Grasses	
Spike Dropseed	*Sporobolus contractus*
Little Bluestem	*Schizachyrium scoparium*
Bluegrass	*Poa*
Sand Dropseed	*Sporobolus cryptandrus*
Prairie Junegrass	*Koeleria macrantha*
James' Galleta	*Pleuraphis jamesii*
Pinyon Ricegrass	*Piptochaetium fimbriatum*
Western Wheatgrass	*Pascopyrum smithii*
Spike Muhly	*Muhlenbergia wrightii*
Ring Muhly	*Muhlenbergia torreyi*
Common Wolfstail	*Lycurus phleoides*
Muttongrass	*Poa fendleriana*
Sleepygrass	*Achnatherum robustum*
Cutleaf Coneflower	*Rudbeckia laciniata*
New Mexico Feathergrass	*Hesperostipa neomexicana*
Indian Ricegrass	*Achnatherum hymenoides*
Threeawn	*Aristida*
Poverty Threeawn	*Aristida divaricata*
Purple Threeawn	*Aristida purpurea*
Cane Bluestem	*Bothriochloa barbinodis*
Sideoats Grama	*Bouteloua curtipendula*
Blue Grama	*Bouteloua gracilis*
Sedge	*Carex*
Pine Dropseed	*Blepharoneuron tricholepis*
Needle And Thread	*Hesperostipa comata*
Squirreltail	*Elymus elymoides*
Forbes	
Rough Menodora	*Menodora scabra*
Sunflower	*Helianthus*
Hoary False Goldenaster	*Heterotheca canescens*
Red Bluet	*Houstonia rubra*
Fineleaf Hymenopappus	*Hymenopappus filifolius*
Pingue Rubberweed	*Hymenoxys richardsonii*
Flaxflowered Ipomopsis	*Ipomopsis longiflora*
Flatspine Stickseed	*Lappula occidentalis*
Gordon'S Bladderpod	*Lesquerella gordonii*
Plains Flax	*Linum puberulum*
Hoary Tansyaster	*Machaeranthera canescens*

TABLE 4-1
PLANT SPECIES LIST FOR THE LA JARA MESA PROJECT AREA

Common Name	Scientific Name
Rockcress	*Arabis*
Lacy Tansyaster	*Machaeranthera pinnatifida*
Spurge	*Euphorbia*
Four O'Clock	*Mirabilis*
Colorado Four O'Clock	*Mirabilis multiflora*
Pony Beebalm	*Monarda pectinata*
Bristly Nama	*Nama hispidum*
Clustered Broomrape	*Orobanche fasciculata*
Lemonscent	*Pectis angustifolia*
Beardtongue	*Penstemon*
Beardlip Penstemon	*Penstemon barbatus*
Toadflax Penstemon	*Penstemon linarioides*
Upright Blue Beardtongue	*Penstemon virgatus*
Varileaf Phacelia	*Phacelia heterophylla*
Slender Goldenweed	*Machaeranthera gracilis*
Woolly Prairie Clover	*Dalea lanata var. terminalis*
Carruth'S Sagewort	*Artemisia carruthii*
Tarragon	*Artemisia dracunculus*
White Sagebrush	*Artemisia ludoviciana*
Milkvetch	*Astragalus*
Ragleaf Bahia	*Bahia dissecta*
Mustard	*Brassica*
Wholeleaf Indian Paintbrush	*Castilleja integra*
Rose Heath	*Chaetopappa ericoides*
Goosefoot	*Chenopodium*
Fetid Goosefoot	*Chenopodium graveolens*
Birdbill Dayflower	*Commelina dianthifolia*
Dakota Mock Vervain	*Glandularia bipinnatifida*
Thicksepal Cryptantha	*Cryptantha crassisepala*
Firewheel	*Gaillardia pulchella*
Purple Prairie Clover	*Dalea purpurea*
Tansymustard	*Descurainia*
Touristplant	*Dimorphocarpa wislizeni*
Shieldpod	*Dithyrea*
Fleabane	*Erigeron*
Spreading Fleabane	*Erigeron divergens*
Trailing Fleabane	*Erigeron flagellaris*
Annual Buckwheat	*Eriogonum annuum*
James' Buckwheat	*Eriogonum jamesii*

TABLE 4-1
PLANT SPECIES LIST FOR THE LA JARA MESA PROJECT AREA

Common Name	Scientific Name
Sanddune Wallflower	*Erysimum capitatum*
Slimleaf Plainsmustard	*Schoenocrambe linearifolia*
Canadian Horseweed	*Conyza canadensis*
White Milkwort	*Polygala alba*
Prickly Russian Thistle	*Salsola tragus*
Rocky Mountain Zinnia	*Zinnia grandiflora*
Juniper Globemallow	*Sphaeralcea digitata*
Globemallow	*Sphaeralcea*
Ragwort	*Senecio*
Shrubs	
Banana Yucca	*Yucca baccata*
Pricklypear	*Opuntia*
Tree Cholla	*Opuntia imbricata*
Plains Pricklypear	*Opuntia polyacantha*
Wavyleaf Oak	*Quercus pauciloba*
Soapweed Yucca	*Yucca glauca*
Spineless Horsebrush	*Tetradymia canescens*
Red Barberry	*Mahonia haematocarpa*
Alderleaf Mountain Mahogany	*Cercocarpus montanus*
Skunkbush Sumac	*Rhus trilobata*
Pale Desert-Thorn	*Lycium pallidum*
Winterfat	*Krascheninnikovia lanata*
Pingue Rubberweed	*Hymenoxys richardsonii*
Broom Snakeweed	*Gutierrezia sarothrae*
Spinystar	*Escobaria vivipara*
Echinocactus	*Echinocactus*
Fourwing Saltbush	*Atriplex canescens*
Prairie Sagewort	*Artemisia frigid*
Sand Sagebrush	*Artemisia filifolia*
Trees	
Rubber Rabbitbrush	*Ericameria nauseosa*
Twoneedle Pinyon	*Pinus edulis*
Oneseed Juniper	*Juniperus monosperma*

Source:
USDA Forest Service- Terrestrial Ecosystem Survey of Mt. Taylor Ranger District

5.0 WILDLIFE

The La Jara Mesa Project occurs within the Arizona-New Mexico Mountains Ecoregion (REF-NMGF). The Permit Area is broadly classified as Pinyon-Juniper woodland and does not display any unique habitat features, such as permanent water sources or riparian ecosystems. Outside the Permit Area, cliffs occur below the rim of La Jara Mesa that may provide nest sites for raptors. Thus, the wildlife cohort in the Permit Area is expected to be consistent with species that normally inhabit Pinyon-Juniper woodlands in northwestern New Mexico.

5.1 Objective

The sampling objectives are to map and describe habitat types within the proposed permit area and assess the potential value for calving/fawning, nesting, foraging, and wintering areas. ***At a minimum the data collected will be shown for the Permit Area (Plate 1).*** The data collection effort is intended to support a determination of the potential direct and indirect impacts from the proposed operation from both a short- and long-term perspective. The area will be further evaluated to assess the potential for occurrence of Federal Threatened, Endangered, or Candidate wildlife species and State Threatened, Endangered, and Sensitive wildlife species.

5.2 Sampling Design and Methods

This section provides the methods for conducting the deer pellet group count (Section 5.2.1) and bird diversity surveys (Section 5.2.2). ***The sampling frequency will be twice within the one year baseline period as discussed in Section 5.2.1 and 5.2.2.***

5.2.1 Pellet Group Count Survey

Pellet group counts are a standard, cost-effective way to determine relative abundance estimates and distribution of ungulates (Anderson et al., 1972; Eberhardt and Van Etten, 1956; Freddy and Bowden, 1983a and 1983b; Fuller, 1991 and 1992; Neff, 1968; White, 1992). This method will be used to assess deer and elk activity in the Main Facilities Permit Area.

The pellet counts will coincide with the spring bird surveys proposed in Section 3.2. To account for variability in pellet distribution, three transects will be assessed in the Main Facilities Permit Area (Plate 1). The location and compass direction of transects will be surveyed and plotted. Once established, the transect origin will be marked in the field to eliminate the need to re-establish transects for subsequent sample periods. The individual transects will be 202-meters (m) long and 2-m wide for a total sample area of 404 square meters (approximately 0.1 acre). ***Proposed transects are shown in Figure 5-1.***

A topographic map that shows the transect locations and major land features will be used during the field surveys. Standard datasheets will be used to record the survey information. At a minimum, the forms record the date; weather; start time; finish time; names of the observers; transect number; GPS locations for the start and end points; habitat type; species four letter codes (e.g., mule deer = MUDE); and location

of the pellet groups. In addition, information will be collected concerning incidental wildlife sightings, tracks, scat, nests, burrows, and other signs of wildlife. Supplies that may be used during the survey include a map of suitable scale, GPS unit, compass, 2-m rod or stick, clip board, and camera.

The surveyors will be familiar with what constitutes a pellet group and how to distinguish between recent versus older pellet groups (only pellet groups from the current year are of interest). Pellet count surveys may be conducted during any part of the day. Surveyors will walk each transect with a 2-m rod held perpendicular to the direction of the transects and level with the ground surface. All pellet groups found within 1 m on either side of the center line will be counted as a pellet group. Pellet groups falling partly or wholly within the transect area will also be counted. As each pellet group is encountered, the survey information is recorded (transect number, habitat type, species, and any wildlife sightings). After the count has been recorded, the pellets will be cleared from the transect area to avoid recounting in subsequent years. At completion of the field survey, the total number of pellet groups per transect and the total pellet groups for all transects in the reclamation unit will be tallied.

Pellet group density will be calculated for each transect within each area to provide a mean and variance for the area. Pellet group density is the number of pellet groups divided by the area of the transects. The pellet locations provide an indication of use patterns. Ultimately, the relative abundance estimates can be compared to wildlife trends following reclamation in the Permit Area. ***All field work will be completed consistent with the Laboratory and Field Quality Assurance Plan in Appendix A.***

5.2.2 Bird Diversity Surveys

The purpose of this study is to provide an estimate of bird species diversity and relative abundance prior to mining. A combination of standard point count and transect count techniques are recommended as they provide accurate information using methods that are repeatable, unbiased, and simple to execute (Ralph et al., 1995 and Verner, 1985). ***Proposed transects are shown in Figure 5-1.***

Survey sessions will be scheduled twice per year: once in January for overwintering species and once during the peak breeding season of late-May to early June. Two survey periods each year are sufficient to assess species diversity and relative abundance changes over time. The transects will be monitored over 3 consecutive days during both the winter and spring survey periods.

The transect locations will be the same as for the pellet group surveys. Experienced biologists will perform the surveys. A topographic map that shows the transect locations and major land features will be used during the field surveys. At a minimum, the field survey forms will be used to record the date, weather, start time, finish time, names of the observers, species encountered, and distance of the bird from the observer. Additional information concerning wildlife sightings (e.g., scat, tracks, and burrows) will be recorded. Supplies that may be used during the survey include a compass, clipboard, field glasses, camera, and tape recorder.

Each daily survey will be started 30 minutes before dawn and completed by mid-morning (approximately 9:30 or 10:00 AM). Survey teams may start on either end of the transect line, but each transect should be located as far as possible from the next transect that is to be surveyed to reduce the chances of affecting the results at other survey sites if birds were flushed during the previous survey.

At the start of the transect, a fixed-distance circular point count will be completed before walking through the transect and flushing the birds. Standard point counts are 5-minute counts within a 100-m radius, where all birds are identified by sight and/or sound (Ralph et al., 1995). Distance of the bird from the observer and the time of the observation will be recorded. Counts will not be conducted in rain or high winds, as inclement weather could affect detection of birds.

Once the point count is completed, the transect line will be walked at a normal pace and all birds that can be seen or heard will be recorded. Species, sex (if known), distance from observer, behavior, and location will be recorded. If the birds cannot be identified immediately, an accurate description of the bird's physical features and characteristics will be used to identify the birds at a later time. ***All field work will be completed consistent with the Laboratory and Field Quality Assurance Plan in Appendix A.***

5.2.3 Wildlife Sightings

Wildlife sighting surveys will be made in the 2-hour period before sunset on the days that bird diversity surveys are conducted. Wildlife sightings and observations of sign (e.g., scat and tracks) made during the pellets and bird diversity surveys will be recorded in the daily notes***. All field work will be completed consistent with the Laboratory and Field Quality Assurance Plan in Appendix A.***

5.2.4 Faunal T&E Survey

Based on preliminary discussions with the Forest Service biologist on the Mt. Taylor Ranger District, the Permit Area does not support Federal Threatened and Endangered wildlife species or State of New Mexico Threatened, Endangered, and Sensitive wildlife species. Nonetheless, a list of USFS Management Indicator Species (MIS) and species protected by the Migratory Bird Treaty Act (MBTA) will be developed. Surveys will be conducted to evaluate habitat conditions relative to the listings. Surveys for protected wildlife species will be conducted over 100% of the Permits Area in association with the winter and spring bird diversity surveys. ***All field work will be completed consistent with the Laboratory and Field Quality Assurance Plan in Appendix A.***

6.0 SOILS

Reclamation of the waste rock pile and disturbed areas will be completed once the facilities are no longer needed or following closure of the mine. Laramide proposes to salvage and stockpile soils that will ultimately be used as a soil cover to reclaim the waste rock pile.

The Forest Service mapped the soils in the area around the La Jara Mesa Project using the Southwestern Region Terrestrial Ecosystem Survey (TES) approach. The distribution of TES units in the Permit Area and surrounding lands is shown on Figure 6-1. The soils in the main disturbance area are formed in eolian deposits (dunes) and are sandy and excessively well drained.

The TES data provides important information on the soil qualities, but lacks some of the chemical and physical data needed for evaluating soil suitability for reclamation purposes. Thus, additional testing of the soils is proposed.

6.1 Objective

The objective for collecting baseline soils data is to provide a basis for determining the suitability of the materials as reclamation substrates. This information will be used to develop salvaging strategies to determine if sufficient volumes of suitable material will be available at closure.

The MMD's reclamation performance standards require that native soils and other soil resources be characterized to determine their suitability for vegetation establishment. Mine operators are also required to salvage, store, and redistribute suitable soil materials for revegetation of mine-related disturbances. The soils investigation will document and quantify soil resources in support of mine permitting and reclamation planning in accordance with the MMD guidelines.

6.2 Methods

Soils in the proposed disturbance area will be characterized with the objective of determining the suitability of the soils for reclamation. All soil data will be collected in compliance with applicable guidance including the MMD Closeout Guidelines and the U.S. Department of Agriculture (USDA) National Cooperative Soil Survey (NCSS). Conforming to these widely recognized standards will ensure that the soil survey is defensible and data utility is maximized.

Samples will be collected from three locations to characterize the chemical and physical properties of soils in the projected disturbance areas. The proposed location of sample sites are provided on Figure 6.2, but test pit locations will ultimately be determined at the discretion of the field soil scientist. Three to five samples will be collected at each sampling location.

Soil profiles (pedons) will be described in the field using standard soil morphological terminology (Soil Survey Staff, 1993). Field descriptions will include horizon designations, depth interval, soil texture, color,

structure, consistence, roots, reaction with weak acid, rock fragment content and other important accessory characteristics (e.g. slope, aspect, general vegetation). Soils will be classified to the family level according to Soil Taxonomy (Soil Survey Staff, 2006). All sampling sites will be photographed. Soil pedons will be sampled by genetic horizon and samples will generally be collected from horizons greater than three inches thick. Horizons less than three inches thick may be sampled with a similar adjacent horizon unless the horizon is the only A-horizon present.

Soil samples collected for fine-earth characterization (particles < 2mm in diameter) will be 5 to 10 kg placed in 1-gallon plastic bags and the larger rock fragments (>75 mm) will be removed. The soil analyses will be conducted using standard methods that are consistent with the 1996 MMD Draft Closeout Plan Guidelines (MMD, 1996). All samples will be stored in a suitable container as soon as practicable following collection. Samples will be shipped to Energy Laboratories in Billings, MT for laboratory analyses. The bulk soil samples collected for fine-earth analysis will be air-dried and passed through a 2 mm sieve at the laboratory. The less than 2 mm soil fraction will be analyzed for the parameters listed in Table 6-1. The primary references for the analytical techniques include Agricultural Handbook No. 60 (Salinity Laboratory Staff [SLS], 1954) and Methods of Soil Analysis (Agron 9, 1982).

TABLE 6-1
ANALYTICAL METHODS FOR CHEMICAL AND PHYSICAL SOIL CHARACTERIZATION

Analysis	Source-Method
Saturated Paste pH	SLS, Method 2 and 21a
Electrical Conductivity	SLS, Method 3a and 4b
$CaCO_3$ equivalent percent (lime)	SLS, Method 23c
Saturation percentage	SLS, Method 27a
Ca, Mg and Na extracts and Sodium adsorption ratio	SLS, Method 3a and 20b
Particle Size Distribution, including very fine sand	Gee and Bauder (1986)
Rock Fragment	Dry sieve/gravimetric
Nitrogen (as Nitrate)	Agron 9, Method 10-2.3.2
Extractable Potassium	Agron. 9, Method 13-3.5
Available Phosphorus	Agron. 9, Method 24-5.4
Selenium (hot water soluble)	Agron. 9, Method 80/3.2.1
Boron (hot water soluble)	Agron. 9, Method 75-4
AB-DTPA extraction	Agron. 9: Method 3-5.2
AB-DTPA extractable metals (As, Cd, Cu, Hg, Pb, Mn, Mo and Ni)	EPA Method 6010/6020
Acid-Base Account, Total sulfur*	Sobek et al., 1978
Neutralization potential	Sobek et al., 1978

Note:
* Phased to include sulfur forms if needed

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7.0 OREBODY AND GEOLOGY

The geochemical nature and reactivity of the overburden, waste rock, and ore are important considerations with respect to development of reclamation plans. Understanding the structure and character of the rocks and configuration of the mine workings relative to groundwater are important for assessing mining activities relative to potential environmental impacts.

The La Jara Mesa Project is located in the Ambrosia Lake mining district, which has been extensively described (Rautman, 1980; Kelley, 1963). The geologic units of interest in the La Jara Mesa area range in age from Permian to Quaternary, and are dominated by Jurassic and Cretaceous rocks that are exposed in the slopes of the mesa. The mesa is capped by Tertiary volcanic rocks. A geologic map and stratigraphic section are shown in Figure 7-1.

The uranium mineralization is restricted to unnamed sandstone units in the in the Poison Canyon tongue of the Brushy Basin Member of the Morrison Formation (Laramide, 2008). The uranium-enriched zone is similar to many other sandstone-hosted uranium deposits in the Grants area. The average depth to the uranium mineralized sandstone zone is about 650 to 700 feet below the surface of the mesa.

7.1 Objective

The objectives for characterizing the overburden, waste rock, and ore are twofold: 1) to determine if the materials exposed as part of the mining process have the potential to generate excess acidity and/or react with water to produce conditions that could degrade surface or groundwater quality or hinder reclamation; and 2) to allow tailoring of waste management strategies, if necessary.

7.2 Sampling Design and Methods

Representative samples of the geologic units will be selected from existing drill core and outcrop to adequately represent the range of materials that will be associated with the waste rock and ore piles at the mine. The various geologic units that are expected to comprise the significant portions of the waste rock are identified along with their relative volume percentages in Table 7-1. Representative number of samples of these units will be collected for analytical testing; as indicated, most of these samples will come from existing drill core, with the exception of the Bluff Sandstone. The number of samples of each unit is proportional to the expected volumes in the piles.

7.2.1 Geology and Stratigraphy

The geology and stratigraphy of La Jara Mesa will be described relative to springs and groundwater. Descriptions of the geologic units will developed from published sources complemented by data from the exploration activities and ground surveys within the Permit Area. Maps and cross-section will be presented to show the relationship of the mining area to the groundwater and springs system.

7.2.2 Geochemistry and Reactivity

The mining process at the La Jara Mesa Project is expected to result in increased exposure of the waste rock to surface weathering conditions. Leachate may be produced from the infiltration of direct natural precipitation falling on these disturbed natural materials. Samples of key geologic materials will be tested to assess the interaction of the waste rock under surface conditions. During operations, water from direct natural precipitation will enter waste rock pile, which will be composed of disturbed geologic materials. The Synthetic Precipitation Leaching Procedure (SPLP; extraction by EPA Method 1312) will be used to evaluate the potential for generating leachate that could degrade surface or ground water. Acid generation potential will be evaluated through the use of static testing methods (Sobek et al, 1978).

Based on the current mine plan the waste rock pile will be composed primarily of Bluff Sandstone and the Westwater Canyon Member of the Morrison Formation (Table 7-1). The Recapture (shale) and Brushy Basin (shale and sandy shale) Members of the Morrison Formation will represent lesser components of the waste rock pile. Also included are minor volumes of Dakota Sandstone, Mancos Shale, and Tertiary volcanics (tuff, and basalt), which will be generated in the development of the escape raise. As indicated earlier, the uranium-bearing Poison Canyon unit will be segregated from the waste rock and hauled to a licensed mill for processing.

Subsamples from existing exploration core will be obtained for geochemical and acid generation potential testing based on availability and prevalence in the waste rock pile. Representative samples of the uranium-mineralized Poison Canyon unit will also be sampled and analyzed by the same methods. Core samples from Laramide's recent exploration activities are available for the Brushy Basin, Poison Canyon, Westwater Canyon, and Recapture units. Limited quantities of the Recapture shale are available because the exploration drilling did not consistently extend into the unit. Core from the Dakota Sandstone, Mancos Shale, Tertiary volcanic were not retained because they lacked mineralization. Table 7-1 lists the number of samples that will be tested for the dominant components of the waste rock pile. Samples of the Bluff Sandstone will be collected from surface exposures.

A geologist will evaluate the core samples for uniformity and select sections that are representative of the formation. The core will be split and composited at the discretion of geologist after evaluation of the core. Bluff Sandstone is exposed in several areas on the mesa escarpment near the proposed portal location. Bluff Sandstone outcrops will be excavated to remove surface weathered material and to expose fresh rock. A composite section of the face will be sampled at each exposure. The exposures will be described and photographed.

The core and surface samples will be shipped to the laboratory in either one-gallon plastic bags or sealed in 5-gallon buckets, depending on the size of the sample. The samples will be crushed and homogenized in the laboratory prior to analyses. The samples will be analyzed as summarized in Table 7-2. ***All field***

work will be completed consistent with the Laboratory and Field Quality Assurance Plan in Appendix A.

TABLE 7-1
PREDICTED WASTE ROCK/ORE VOLUMES BY GEOLOGIC UNIT - LA JARA MESA PROJECT

Geologic Unit	Dominant Lithology	Volume (yd^3)	Vol % of Total	Number of Samples	Sample Source
Basalt	Basalt	140	<1%	-	NA
Ash	Tuff	660	<1%	-	NA
Mancos Shale	Shale	510	<1%	-	NA
Dakota Sandstone	Sandstone	200	<1%	-	NA
Upper Brushy Basin	Shale/ Sandy Shale	170	<1%	3	Core
Poison Canyon waste rock	Sandstone	140	<1%	3	Core
Poison Canyon ore		NS		3	
Lower Brushy Basin	Shale	12,300	5%	3	Core
Westwater Canyon	Sandstone	151,900	56%	5	Core
Recapture Shale	Shale	17,380	6%	3	Core
Bluff Sandstone	Sandstone	86,600	32%	5	Surface
Total		**270,000**	**100%**	**25**	

Notes:
NA = Not available
NS = Not specified

TABLE 7-2
WASTE ROCK SYNTHETIC PRECIPITATION LEACHING PROCEDURE*
ANALYTICAL SUITE

Analyte	Method	Detection Limit, mg/L
Aluminum	EPA 200.8	0.1
Arsenic	EPA 200.8	0.005
Barium	EPA 200.8	0.1
Boron	EPA 200.7	0.1
Cadmium	EPA 200.7	0.001
Chromium	EPA 300	1.0
Chloride	EPA 200.8	0.01
Cobalt	EPA 200.8	0.01
Copper	EPA 200.8	0.01
Fluoride	EPA 300.0	0.1
Iron	EPA 6010	0.03
Lead	EPA 200.8	0.002
Manganese	EPA 200.8	0.01
Mercury	EPA 200.8	0.0001
Molybdenum	EPA 200.8	0.005
Nickel	EPA 200.8	0.01
Selenium	EPA 200.8	0.005
Silver	EPA 200.8	0.01
Uranium	EPA 200.8	0.0005
Vanadium	EPA 200.8	0.1
Zinc	EPA 6010C	0.01
Adjusted Gross Alpha	EPA 900.0	2.0 pCi/L
Radium 226 & 228	EPA 904.0	1.0 pCi/L

Note:
* Extraction procedure - EPA Method 1312

8.0 SURFACE WATER

The main mine facilities, portal, and escape raise occur in a poorly integrated, ephemeral watershed that terminates in a dune field about 3 miles west of La Jara Mesa. The access road and utility corridor drain areas that are tributary to Lobo Creek, which flows to San Mateo Creek. The surface water regime surrounding the site is influenced by the arid-to-semiarid climate of the region, the relatively medium-to-high permeability of the soils, and the exposed bedrock units within the watersheds. San Mateo Creek is an ephemeral stream throughout much of its length, flowing in direct response to precipitation or snow melt events. San Mateo Creek is a tributary of the Rio San Jose, which discharges to the Rio Puerco, and ultimately the Rio Grande.

Surface water in La Jara Mesa Project area is limited to ephemeral drainages that flow episodically during late-spring and summer storm events. The ephemeral drainages in the vicinity of the site originate on top of La Jara Mesa and flow to the southwest, past the proposed mine facility area (Figure 8-1). These drainages ultimately terminate in the valley, approximately 3 to 4 miles west of the top of the mesa without contributing to other surface-water bodies. Additional minor surface water features are located in the vicinity of the proposed mine site, including potential ponding areas on top of La Jara Mesa, water tanks west of the site, and springs south/southeast of the site that would not be affected by the proposed mine development and subsequent operational activities.

Preliminary delineation of the drainage basin boundary associated with the La Jara Mesa Project was developed from USGS 7.5 minute topographic maps (Dos Lomas and San Mateo Quadrangles) and from recent digital topographic maps of the proposed main mine facility area provided by Laramide. The drainage basin covers an area of approximately 2,600 acres and extends from the top of La Jara Mesa to approximately 3 to 4 miles southwest of the crest of the mesa (Figure 8-1). Because some uncertainty exists on the surface water flow patterns on top of La Jara Mesa (associated with the 20-foot contour USGS topographic maps), a field reconnaissance will be conducted to further refine or confirm the drainage basin boundary conditions for this particular area.

8.1 Objectives

The primary objectives of the surface water sampling and analysis program are to establish baseline data for surface water quality and channel sediment characteristics within the ephemeral channel that drain the proposed Permit Area. Additionally, as part of the surface water sampling and analysis program, the drainage basin encompassing the project area site will be further refined. The data and proposed sampling program are presented in Table 8-1. The information obtained in this effort will supplement existing information and will provide the information necessary to assess the baseline conditions in the area and the potential affects of mining on the surface water features in the area.

The primary requirements for characterizing the ephemeral drainages crossing the proposed mine permit area and any other surface water features that may exist in the area are identified NMAC 19.10.6.602

which describes the requirements for sampling and analysis plans and baseline data requirements, and in NMAC 20.6.4 which establishes water quality standards for all surface waters of the state and an anti-degradation policy for these waters.

8.2 Sampling Designs and Methods

Specific details of the sampling design and methods for the critical baseline requirements required by the MMD are provided below. The nature and extent of surface water in the project area is discussed in Section 8.2.1. The methods for assessing surface water quality are detailed in Section 8.2.2. Stream channel sediment characterization is discussed in Section 8.2.3. The methods and procedures for identifying springs and other surface water feature is presented in Section 8.2.4.

8.2.1 Nature and Extent of Flows within Ephemeral Drainages

Determining the nature and extent of historical flows in the ephemeral channels draining the proposed mine area is important because the channels are apparently not integrated with the regional surface system. Confirming the termination point(s) of the ephemeral drainages will help to define the extent of potential affected surface water or channel sediments downgradient of the proposed mine area. The nature and extent of flow will be determined using available historical aerial photographs and subsequent field reconnaissance of the drainages. The analysis will determine the presence or absence of water or distinct channels associated with the individual drainages, degree of channel incision, identification of sediment deposition areas, and the nature of the channel bed materials. Additionally, as part of the field reconnaissance, potential historic mining features that could potentially contribute sediment to the identified surface water features in the area and the potential pathways of stormwater runoff from these facilities (if any) will be identified. Downgradient surface water and streambed sample locations described below may be adjusted based on the information obtained from this analysis.

8.2.2 Baseline Surface Water Quality

Diversions and stormwater controls are planned in and around the main mine facilities. The planned surface water control systems are intended to limit interactions of the stormwater and ore and to retain the water and sediment on site. Surface water quality monitoring will be conducted in representative channels that could, force majeure or upset conditions, receive stormwater discharges from the main mine facilities area. These downstream channels constitute potential affected areas. Surface water quality monitoring will be conducted quarterly for a period of one year at four surface water monitoring points located within the ephemeral drainages crossing the proposed main mine facility area (Figure 8-1). Four surface water monitoring points were identified based on preliminary analysis of topographic maps and the current proposed mine facility layout provided by Laramide. The proposed sampling locations include: (1) an ephemeral drainage running west of the facility area immediately downgradient of the proposed main mine facility area (LJM-2009-01); (2) an ephemeral drainage immediately upgradient of the proposed stormwater containment basin (LJM-2009-02); (3) at the downgradient confluence of the

three primary ephemeral drainages crossing the proposed mine permit area (LJM-2009-03); and (4) upgradient of the main mine facility area near the crest of La Jara Mesa (LJM-2009-04).

Quarterly surface water monitoring will be conducted for a 12 month period. To the extent practical, the monitoring will be performed during periods of storm activity to increase the probability of the presence of surface water. However, it is anticipated that surface water may not be present at each sample location during the quarterly monitoring events. If flow is not present at proposed sampling points, scheduled dates for quarterly sampling events may be adjusted to attempt to collect samples during rainfall and runoff events. As a contingency, siphon samplers will be installed at each of the sample locations that will allow for the collection of stormwater (Appendix B).

The siphon samplers will be checked for the presence of water during each quarterly monitoring event or after significant storm events. If water has collected in the sample container at a particular sample location, and there is no surface water present during the quarterly monitoring event, field parameter measurements will be obtained from the sample and it will be submitted for laboratory analyses. If surface water is present at a particular sample location during a quarterly monitoring event, the field parameter measurements and individual samples for laboratory analysis would be collected directly from the surface water source. In any event, excess water within the siphon sampler (if present) would be emptied back into the drainage following the collection of the samples. The container will be rinsed with de-ionized water between sampling events.

Water sampling, field parameter measurements and laboratory analyses will be performed on all source-distinct surface waters to establish the baseline quality in and around the proposed mine permit area. Water samples will be analyzed for total dissolved and suspended solids, pH, and dissolved metals, and primary anions and cations (Table 8-1). Field parameter measurements will include temperature, conductance, pH and turbidity. Water quality samples will be collected in containers supplied by a certified analytical laboratory using preservation techniques set forth in EPA protocols prescribed for analytical method. Samples collected for analysis of metals will be field filtered and placed in nitric acid-stabilized bottles and analyzed for dissolved metals (Appendix A). All samples will be placed on ice immediately after collection and chilled to maximum $4^{o}C$ during transport to the laboratory under proper chain of custody documentation and protocol.

8.2.3 Stream Sediment Characteristics

Because the alluvium downstream of the Permit Area was derived from potentially mineralized materials from natural sources and past mining activities, it is important to understand the geochemical characteristics of the sediments prior to the initiation of mining by Laramide. To address this data need, stream sediment samples will be collected at a minimum of eight (8) locations downstream from the Permit Area.

A minimum of four (4) samples will be collected from the surface water quality monitoring stations during the installation of the siphon samplers. Four (4) additional samples will be collected from areas that are representative of the drainages downstream of the proposed mine area. The approximate locations of the siphon samplers are shown on Figure 8-1. The location of the additional samples will be determined during the field reconnaissance (see Section 8.2.1). The sediment characterization will be coordinated with the background radiological investigation discussed in Section 10. Streambed sediment sample points will be surveyed with a portable GPS unit during sample collection.

Streambed surface sediment samples will be collected (surface to 12 inches deep) within the ordinary high water mark of the channels. The samples will be described using standard methods (Soil Survey Staff, 1993). The samples will be directly placed in 1-gallon plastic bags and shipped to a certified analytical laboratory under proper chain of custody documentation and protocols. All sampling equipment will be decontaminated prior to sample collection with an Alconox^{TM} solution followed by a rinse with distilled water. Alternatively, disposable sampling trowels may be used for sample collection. The sediment samples will be analyzed for paste pH, paste EC and the total metals listed in Table 8-4.

8.2.4 Springs and Surface Water Features

Any springs or other surface water features located within the La Jara Mesa site drainage basin that are identified on USGS topographic maps, Laramide maps, and/or aerial photographs will be cross checked in the field. The nearest springs currently identified in the vicinity of the site are Pumice Spring and Cliff Spring located approximately 3 miles southeast of the site. Other surface water features currently identified in the area include a pond/tank located approximately 1.4 miles northwest of the site, Roundy Stock Tank located approximately 3 miles south of the site, and Lobo Creek located approximately 2.1 miles south of the site. All of the springs and surface water features are located outside of the La Jara Mesa site drainage basin (Figure 8-1). This information will be further verified through additional analysis of the available maps and aerial photographs, and field verification of these data.

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TABLE 8-1
SURFACE WATER AND GROUNDWATER SAMPLE ANALYTICAL SUITE, METHODS AND DETECTIONS LIMITS

Analyte	WQCC Standard Groundwater * (mg/L or as noted)	WQCC Standard Surface Water – Livestock (mg/L or as noted)	WQCC Standard Surface Water - Irrigation (mg/L)	U.S. EPA MCL (mg/L or as noted)	Analytical Methods	Detection Limits (mg/L or as noted)
Alkalinity	N.A.	N.A.	N.A.	N.A.	EPA 310	10.0
Aluminum	5.0	N.A.	5.0	N.A.	EPA 200.8	0.1
Antimony	N.A.	N.A.	N.A.	0.006	EPA 200.8	0.003
Arsenic	0.1	0.200	0.10	0.01	EPA 200.8	0.005
Barium	1.0	N.A.	N.A.	2.0	EPA 200.8	0.1
Boron	0.75	5.0	0.75	N.A.	EPA 200.7	0.1
Cadmium	0.01	0.050	0.01	0.005	EPA 200.7	0.001
Calcium	N.A.	N.A.	N.A.	N.A.	I-3485	1.0
Chloride	250.0	N.A.	N.A.	N.A.	EPA 300	1.0
Chromium	0.05	1.0	0.10	0.1	EPA 200.8	0.01
Cobalt	0.05	1.0	0.050	N.A.	EPA 200.8	0.01
Copper	1.0	0.50	0.20	1.3	EPA 200.8	0.01
Cyanide	0.2	N.A.	N.A.	0.2	ASTM D2036	0.005
Fluoride	N.A.	N.A.	N.A.	4.0	EPA 300.0	0.1
Iron	1.0	N.A.	N.A.	0.3	EPA 6010	0.03
Lead	0.05	0.10	5.0	0.015	EPA 200.8	0.002
Magnesium	N.A.	N.A.	N.A.	N.A.	EPA 6010C	1.0
Manganese	0.2	N.A.	N.A.	0.05	EPA 200.8	0.01
Mercury	0.002	0.010	N.A.	0.002	EPA 200.8	0.0001
Molybdenum	1.0	N.A.	1.0	N.A.	EPA 200.8	0.005
Nickel	0.2	N.A.	N.A.	0.1	EPA 200.8	0.01
Nitrate, as N	10.0	N.A.	N.A.	10.0	EPA 300.0	0.05
Nitrite, as N	N.A.	N.A.	N.A.	1	EPA 300.0	0.05
Nitrate+Nitrite	N.A.	132	N.A.	N.A.	EPA 300.0	0.01

TABLE 8-1
SURFACE WATER AND GROUNDWATER SAMPLE ANALYTICAL SUITE, METHODS AND DETECTIONS LIMITS

Analyte	WQCC Standard Groundwater * (mg/L or as noted)	WQCC Standard Surface Water – Livestock (mg/L or as noted)	WQCC Standard Surface Water - Irrigation (mg/L)	U.S. EPA MCL (mg/L or as noted)	Analytical Methods	Detection Limits (mg/L or as noted)
Potassium	N.A.	N.A.	N.A.	N.A.	I-3631	1.0
Selenium	0.05	0.05	0.13 – 0.25	0.05	EPA 200.8	0.005
Silicon	N.A.	N.A.	N.A.	N.A	EPA 6010C	0.1
Sodium	N.A.	N. A.	N.A.	N.A	EPA 6010C	1.0
Sulfate	600.0	N.A.	N.A.	250.0	EPA 300	1.0
TDS	1000.0	N.A.	N.A.	N.A.	EPA 160.1	10.0
Zinc	10.0	25.0	2.0	5.0	EPA 6010C	0.01
pH	6.0-9.0 s.u.	6.0-9.0 s.u.	6.0-9.0 s.u.	6.5-8.5 s.u.	EPA 150.1	0.1 s.u.
Uranium	0.03	N.A.	N.A.	0.03	EPA 200.8	0.0005
Vanadium	N.A.	0.10	0.10	N.A.	EPA 200.8	0.1
Gross Alpha	N.A.	15 pCi/L	N.A.	15 pCi/L	EPA 900.0	1.0 pCi/L
Gross Beta & Photon	N.A.	N.A.	N.A.	4 mrem/yr	EPA 900.0	4.0 piC/L
Radium-226 + 228	30.0 pCi/L	30.0 pCi/L	N.A.	5.0 pCi/L	EPA 904.0	1.0 pCi/L
Radon-222*	N.A.	N.A.	N.A.	300 pCi/L	ASTM D5072-92	200.0 pCi/L
TSS	N.A.	N.A.	N.A.	N.A.	E160.2	10

Notes:
s.u. = standard units
* analysis in groundwater samples only

TABLE 8-2
SEDIMENT SAMPLE ANALYTICAL SUITE, ANALYTICAL METHODS AND DETECTION LIMITS

Analysis	Standard-Method	Detection Limit
Saturated Paste pH	SLS, Method 2 and 21a	0.01 standard units
Electrical Conductivity	SLS, Method 3a and 4b	0.01 mmhos/cm
Saturation percentage	SLS, Method 27a	0.1 wt %
Particle Size Distribution	Gee and Bauder (1986)	0.1 wt %
Rock Fragment	Dry sieve/gravimetric	2 wt %
Arsenic	SW3050, EPA200.8	5 mg/kg
Barium	SW3050, EPA200.8	5 mg/kg
Cadmium	SW3050, EPA200.7	1 mg/kg
Chromium	SW3050, EPA200.8	5 mg/kg
Cobalt	SW3050, EPA200.8	5 mg/kg
Copper	SW3050, EPA200.8	5 mg/kg
Lead	SW3050, EPA200.8	5 mg/kg
Manganese	SW3050, EPA200.8	5 mg/kg
Mercury	SW7471, EPA200.8	1 mg/kg
Molybdenum	SW3050, EPA200.8	5 mg/kg
Nickel	SW3050, EPA200.8	5 mg/kg
Selenium	SW3050, EPA200.8	5 mg/kg
Silver	SW3050, EPA200.8	5 mg/kg
Uranium	SW3050, EPA200.8	5 mg/kg
Vanadium	SW3050, EPA200.8	5 mg/kg
Zinc	SW3050, EPA6010C	5 mg/kg
Gross Alpha	SW3050, EPA 900.0	pCi/L
Gross Beta	SW3050, EPA 900.0	pCi/L
Radium 226 + 228	SW3050, EPA 904.0	pCi/L

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9.0 GROUNDWATER

Understanding groundwater conditions in relation to the mining operation are important for determining the probable hydrologic consequences of the mining activity in the Permit Area and potential affected area. The proposed La Jara Mesa mining operations are in unsaturated rocks situated nearly 600 feet above the shallowest regional aquifers in the area. The portal and waste rock pile will be more than 300 feet above these saturated zones.

The mining operation is not expected to have any water quality impacts to aquifers in the Permit Area because the mine workings will be entirely in unsaturated rocks, no processing solutions will be used and the ore will be segregated and contained on-site before being hauled offsite to licensed mill. Water supply for the mine will come from an offsite production well (Plate 1) and the use of water at the mine will be restricted to drilling uses for cooling and lubricating, underground and surface dust control and for sanitary uses by the mine workers.

9.1 Objective

The objectives of the groundwater baseline assessment include 1) describing the groundwater regime in the Permit Area and potential affected area with emphasis on identifying the character and location of water bearing units and the direction of groundwater flow; and 2) developing a baseline inventory of wells, springs and groundwater uses within a one-mile radius of the mine facilities portion of the Permit Area.

9.1.1 Hydrogeologic Regime

The hydrogeologic regime of the aquifers in the Permit Area and potential affected area will be described from published sources, well data, and State of New Mexico and U.S. Geological Survey and other available records. The lithology and thickness of the geologic units in the permit area will be described using geologic maps, well records, geologic cross-sections and other available data. Wells and water bearing units will be evaluated relative to groundwater flow directions, aquifer recharge and discharge areas. Cross sections will be developed to illustrate the relationship between the proposed mining facilities and the overall hydrogeologic regime.

9.1.2 Aquifer Characteristics and Water Quality

Pertinent characteristics of the aquifers and groundwater quality will be determined and described. Transmissivity, storativity, depth to the water table, and water quality data will be collected or compiled from existing sources.

One (1) water sample will be collected from the proposed water supply well ***during the one year baseline period. The location of the existing well is shown in Plate 1.*** The well is equipped with a pump that will be used to evacuate a minimum of three well volumes of water prior to sample collection. The water sampling, field parameter measurements and laboratory analyses will be performed to

establish the baseline quality of the water supply. The sample will be analyzed for total dissolved solids, pH, and dissolved metals, and primary anions and cations (Table 8-1). Field parameter measurements will include temperature, conductance and pH. Water quality samples will be collected in containers supplied by the certified analytical laboratory using preservation techniques set forth in EPA protocols prescribed for analytical method. Samples collected for analysis of metals will be field filtered and placed in nitric acid-stabilized bottles and analyzed for dissolved metals (Appendix A). All samples will be placed on ice immediately after collection and chilled to maximum 4^{o}C during transport to the laboratory under proper chain of custody documentation and protocol. ***All field work will be completed consistent with the Laboratory and Field Quality Assurance Plan in Appendix A.***

9.1.3 Inventory of Wells and Springs

An inventory will be performed of all known wells and springs within a one-mile radius of the main facilities in the Permit Area ***shown in Plate 1.*** This information will be obtained from existing information in the Office of the State Engineer, USGS, other records and site reconnaissance. An attempt will be made to locate the documented features in the field and describe and photograph them. Efforts will be made to determine current water levels in existing wells and compile any available historical water-level data for the features.

10.0 SOIL RADIOLOGICAL SURVEY

Ionizing radiation from natural sources including terrestrial radiation from radionuclides in the soil and cosmic radiation that originates in outer space constitutes background radiation. Radionuclides found in natural soils in significant quantities are Carbon-14 (^{14}C), Pottassium-40 (^{40}K), Rubidium-87 (^{87}Rb) and some members of the uranium (^{238}U, ^{230}Th, ^{226}Ra, ^{222}Rn, and ^{210}Pb), actinium (^{235}U and ^{231}Pa), and thorium (^{232}Th) series. Because the La Jara Mesa Project is in a region that may contain naturally elevated levels of uranium and its progeny, the background concentrations of radionuclides are expected to be higher than in un-mineralized terrains. The distribution of surface radionuclides in project area soils and sediment are expected to be a function of the contributions from parent rocks and post-depositional weathering.

10.1 Objective

The objective of the gamma-ray surveys and soil radiochemical characterization is to provide baseline information for the proposed La Jara Mesa Project and potentially affected areas. It is important to develop an understanding of the background and pre-project radiological conditions at the site to establish appropriate reclamation requirements.

10.2 Sampling Design and Methods

A combination of real-time gamma-ray surveys, soil sampling and conventional laboratory analysis will be used to establish surface background radionuclide levels. The gamma surveys will be used to assess the general variations in gross activity in the Permit Area and the potential downstream affected areas. The conventional laboratory analysis will be used to establish the site-specific range of selected radionuclide's in the soils. Archive soil samples will be collected to allow for future laboratory characterization, if needed.

The gamma-ray surveys methods are described in following sections. The radiological surveys will focused in the four areas listed below with approach specified in subsequent sections.

- Main Facilities Permit Area
- Road and utility corridor
- Potential downstream affected area, and
- Discretionary Analysis of Disturbed and Anomalous Areas.

10.2.1 Gamma-Ray Surveys

Gamma-ray measurements will be made with a GPS-enabled sodium iodide (NaI) scintillation detector (e.g., Ludlum 44-10 coupled with a Ludlum 2221 rate meter) held approximately 1 m above the soil surface. Data from the NaI detector will be automatically downloaded to the Trimble data logger as integrated 2-second counts and linked to corresponding X, Y, Z and time parameters. The survey will

be conducted in accordance with standard protocols (NUREG/CR 5849, 1992; Whicker et al, 2008; Johnson et al., 2006) and will consist of traversing the study areas and collecting a continuous gamma-ray scan. Terrain permitting, a walking rate of about 0.5 meters per second will be maintained. The data will be used to determine the general conditions on the site and locations of anomalous areas. If anomalous areas are identified, they will be flagged and mapped on field sheets for further investigation.

The Ludlum 44-10 will be used to make point counts at the soil surface at discrete locations. The probe will be shielded to reduce complicating effects from surrounding areas. This approach is intended to improve the relationship between the gamma-ray measurements and soil radiochemical concentrations determined by conventional analysis recognizing that contributions from vertical anisotropies cannot be explicitly accounted for in the gamma-ray measurements. Triplicate six-second (0.1 min) gamma rate counts will be obtained using the lead-shielded NaI detector placed directly in contact with the soil. Surface vegetation and debris will removed for the measurement point to reduce potential interferences.

10.2.2 Soil Sampling Methods

Soil samples will be collected at each site where point count gamma-ray measurements are taken. Bulk samples will be collected by mixing the soil excavated from a 30 cm^2 area, 15 cm deep, in a stainless steel container and then placing the subsample in a 1-gallon zipper sealed bags. An archive sample will be collected and placed in a glass jar with lid sealed with tape. A signed and dated custody seal will be fixed across the lid of jar. The storage protocols for the archive samples will be further defined in consultation with regulatory agencies. The intent in collecting the archive samples is that they would be available for future chemical analysis if necessary. The stainless steel container compositing container will be cleaned using a wet-wipe to remove any soil.

The bulk samples will be taken to a controlled indoor environment to make gamma-ray readings to complement the field gamma-ray measurements. The results of the indoor gamma readings will be evaluated to select samples for conventional laboratory radiochemical analysis. The samples to be analyzed will be selected to represent the range field and controlled gamma-ray readings. The samples will be shipped to a qualified laboratory at ambient temperature for analyses (Appendix A). The analytical methods are summarized in Table 10-2.

10.2.3 Main Facilities Permit Areas

The Main Facilities Permit Area consists of a dissected pediment overlain by a sand sheet and dunes at the base of a steep escarpment. The escarpment is armored by a nearly continuous cover of basalt fragments with occasional outcrops of the bedrock. The nearly continuous cover of basalt fragments complicates the measurement of soil radionuclides with the gamma-ray survey equipment. Furthermore, terrain constraints limit the use of real-time gamma surveys in the escarpment portion of the main facilities Permit Area. For these reasons and because the majority of the disturbance and reclamation will occur

in the lower elevation sand dune section, comprehensive gamma-ray surveys will be limited to the western half of the Permit Area (Figure 10-1).

An unbiased random approach will be used to select sampling sites in the Main Facilities Permit Area. A map of the investigation area will be overlain with a 3 m by 3 m grid and 30 sampling locations will be selected at random. The center of the gird (measurement point) will be located in the field using a GPS. Sampling grids may be changed in the field the pending results of the archeological investigations.

Vegetation and woody debris will be cleared from the measuring point and the shielded NaI detector will be placed in direct contact with the soil. Data collection at the site will include exposure rates and replicate (n = 3) six-second gamma rate counts, GPS X, Y coordinates, elevation, time, date, and weather conditions. A soil sample will be collected from upper 15 cm of soil.

10.2.4 Road and Utility Corridor

Gamma emissions will be measured along the road and utility corridor portion of the Permit Area (Figure 10-1). This will be accomplished initially by performing a walkover survey using the GPS-enabled sodium iodide (NaI) scintillation detector to assess the general conditions along the corridor. The corridor will be surveyed down the centerline of the existing road and walking the opposing sides of the road. An offset of 20 feet from the road centerline will followed for the corridor survey.

Point measurements will be made in the western offset (west side of the road) at 1,200 intervals. Bulk and archive soil samples will be collected at each point measurement site. About 11 point measurements and soil samples will be collected in the road and utility corridor.

10.2.5 Potential Downstream Affected Areas

During operations, surface water controls will be constructed to retain all sediment from the ore storage area, which will contain elevated uranium concentrations. However, in the event of force majeure or upset conditions, surface water discharges could enter the ephemeral stream channels that terminate about 3 miles from the base of the escarpment. These channels and floodplains represent the most likely areas that could be considered affected areas. Walkover surveys of the channels and surrounding floodplains the GPS-enabled NaI detector to assess general background conditions and the occurrence of anomalous areas. The surveys will be made down the center line of the channel and on the opposing stream terrace treads bounding the channel. Additional surveys will be made in the obvious sediment deposition areas outside of the channel. The general range of readings will be noted and anomalous areas will be flagged for further investigation.

A systematic sampling approach will be used to assess the background conditions downstream of the Main Facilities Permit Area. Point measurements with the shielded NaI detector will be spaced roughly 1,200 feet apart down the major channels leaving the Main Facilities Permit Area (Figure 10-1).

Sediment samples will be collected at specified points along drainages. About 14 measurements will be made in the main downstream drainages (Figure 10-1). Samples will be collected and analyzed in a similar manner as the samples collected for the proposed Permit Area including obtaining replicate (n = 3) six-second gamma rate counts for both the surface and subgrade at each location The radiological testing will be coordinated with the sediment sampling and analysis discussed in Section 8.

10.2.6 Discretionary Analysis of Disturbed and Anomalous Areas

Disturbances associated with pre-existing roads, prospects, and mining activities will be evaluated using a judgmental approach whereby, surveys and sampling are conducted in disturbed areas at the discretion of the investigators in the field. The walkover surveys will provide a general understanding of the activity in the disturbed areas. Selected samples of materials associated with previous exploration, prospecting and mining activities will be sampled (n =5). Samples will be collected and analyzed in the same manner as the other soil samples. Discretionary sampling may be used in areas noted as anomalous during the walkover surveys.

10.2.7 Soil Radiochemical Analyses

Twenty percent of all samples collected will be analyzed for total uranium, total thorium, isotopic radium (Ra-226 and Ra-228) and gross beta/alpha. In the laboratory, the samples will air-dried and, crushed to pass a 2 mm sieve prior to extraction and analysis. Table 10-2 provides the analytical methods and extraction procedure for the soil radionuclides.

TABLE 10-1
NUMBER AND FREQUENCY OF GAMMA-RAY MEASUREMENTS AND SOIL SAMPLES

Location	Gamma –Ray Survey	Point Gamma-Ray Readings	Soil Samples	Soil Samples Analyzed
Main Facilities Permit Area	Complete- terrain permitting	30	30	6
Road and Utility Corridor	Complete- 3 Passes	11	11	3
Downstream Sediment	Complete- 3 Passes	14	14	3
Disturbed Areas	TBD	TBD	TBD	TBD

TABLE 10-2
ANALYTICAL METHODS FOR RADIONUCLIDE CHEMISTRY OF SOILS AND SEDIMENT

Radionuclide Analyte	Analytical Method Hot Digest*	Detection Limit
Uranium, total-238	EPA 6020, ICP-MS	0.01 mg kg^{-1}
Radium 226	EPA 903.1	0.5 pCi g^{-1}
Radium 228	EPA 9320	3.0 pCi g^{-1}
Thorium, total-232	EPA 6020, ICP-MS	0.1 mg kg^{-1}
Gross alpha/beta	EPA 9310	4.0 pCi g^{-1}

Notes:
* Extraction = US EPA Method 3050B (hot acid digestion for soils, wastes and sediments).

11.0 PRIOR MINING OPERATIONS

Uranium was discovered in the Grants mining in the early 1950s. Exploration and prospecting commenced on La Jara Mesa and other parts of the Ambrosia Lake mining district during this time, although no mining was undertaken within the Permit Area. There are historic disturbances associated with exploration (drill pads, holes and prospect pits) and access roads in and around the Permit Area and the potential affected area. There has also been considerable historical exploration, prospecting and development of mine workings associated with uranium mineralization immediately north, west and south of the Permit Area (Plate 1). Some of the known mining impacts include:

- *Uranium Mineralization in Poison Canyon Units* - In the early 1950s, about 110 tons of ore were produced from outcrops of uranium mineralization in the Poison Canyon sands exposed on the west side of the La Jara Mesa, just north of the Permit Area (Laramide); and
- *Uranium Mineralization in Todilto Limestone* – In the 1950s, exploration and development of uranium deposits occurred in the Todilto Limestone near the Permit Area and within the potential affected area. This includes numerous mine workings of various size and level of development in Sections 4, 9, 15 and 21 of T12N, R9W (McLaughlin, 1963).

11.1 Objective

Describe and delineate any prior exploration and mining operations that may have affected the Permit Area. ***Compile information from available references and reports.***

11.2 Sampling Design and Methods

Aerial photographs, topographic maps, and ground surveys will be used to delineate disturbances associated with prior mining and exploration within the Permit Area. ***Information collected during the ground surveys will include available records and information from the New Mexico Bureau of Geology and Mineral Resources.*** The disturbances will be delineated on topographic maps. Documentation will include descriptions of the nature of the disturbance and estimates of the amount of area involved. The report will be complemented by photographs ***and descriptions*** of representative features. ***All field work will be completed consistent with the Laboratory and Field Quality Assurance Plan in Appendix A.***

12.0 HISTORIC AND CULTURAL PROPERTIES

Federal Section 106 of the National Historic Preservation Act and New Mexico Administrative Code Title 4, Chapter 10.4.10.15 require that cultural resource inventories to be conducted in association with the La Jara Mesa Project. The intent of the inventories is to determine if cultural or historic resources could be adversely impacted by the mining operation ***within the Permit Area shown in Plate 1.***

12.1 Objective

Cultural resources inventories are required to comply with Federal Section 106 requirements and New Mexico Administrative Code Title 4, Chapter 10.4.10.15.

12.2 Sample Design and Methods

The cultural resource inventories will be conducted in consultation with the Forest Service and New Mexico State Historic Preservation Office (SHPO) ***for the Permit Area shown in Plate 1.*** Data collection will involve records review and pedestrian field surveys. Prior to conducting the fieldwork, a records search will be conducted to review all available publications, manuscripts, site records, state files, NMCRIS files, and files available at the Cibola National Forest Supervisor's Office. In particular, the records associated with previous Forest Service fieldwork in the vicinity of the project area.

A 100 percent sampling would be conducted with a records review (Class I) and intensive cultural heritage resources survey (Class III) to identify all archaeological sites and historic structures within the Permit Area. The sampling procedure will include the Class I study records review and the results of previously conducted cultural studies within one mile of the project area. This would be followed by a Class III intensive cultural resources pedestrian field survey of the Permit Area.

The Class I and III studies would inventory all archaeological sites within the project area, as per directives from the USFS and SHPO to comply with Federal Section 106 and New Mexico Administrative Code Title 4, Chapter 10.4.10.15. All sites will be recorded on New Mexico Cultural Resources Information System (NMCRIS) forms.

12.2.1 Field Investigation

Sites that have previously been recorded will be revisited and an update site form will be completed noting any changes to the site. All archaeological sites within the project area will be fully recorded or updated. Surveys along roads will be surveyed 110 feet (30 m) from the center line or as required by USFS and SHPO and the surveys will cover an area of approximately 110 feet on each side of the center line of the road, with the exception of areas of 40% (2 1/2:1 ratio) or greater slope on land adjacent to the road.

The surveys will locate, identify, describe, and document heritage resource sites and isolated occurrences observed as ground surface manifestations for any newly identified cultural resources. All sites requiring updated information will be documented using the Laboratory of Anthropology site inventory update form. Sites already determined not eligible for NRHP listing will not be re-evaluated, nor will update site forms be completed. Heritage resource sites will be recorded in 100 percent compliance with the USFS, Region 3, Cultural Resources Handbook; and according to New Mexico HPD-ARMS guidelines and standards, particularly Chapters 4 and 5 and procedures of the NMCRIS for submitting archaeological records.

Site location(s) will be recorded on USGS 7.5' maps. Sites larger than one (1) acre will be represented/documented by polygons that reflect the site boundaries. Sites less than one (1) acre will be represented/documented by a GPS point taken at the site datum or represented by polygons that reflect the site boundaries. For all sites a GPS point will be taken at the site datum. Sketch maps will accurately depict and label all the recorded features keying them to site form descriptions, as well as identification of artifact concentrations and the locations of key diagnostic artifacts. All diagnostic formal tools and features will be drawn and/or photographed, and keyed to the sketch map. The site datum and corresponding Universal Transverse Mercator (UTM) location will be shown on the map. The site boundary will be marked with pink or white flagging tape clearly identifying the location of the site including flagging trees on the perimeter of the site so the site is inter-visible and not obscured by branches or foliage. Site boundaries marked on the ground will represent the mapped boundary. A datum will be placed on a tree or other convenient, fairly permanent object as near to the center of the site as possible or next to a prominent feature of the site. An aluminum tag with the site number will be attached to the datum at head height with an aluminum nail on the north side of the tree. The site datum will also be identified by placing two bands of white flagging tape around the tree. Photographs of all sites (overviews) and features at a minimum will be taken.

Isolated occurrences (IO) will be GPS-point located and will be taken and accurately plotted on the appropriate 7.5 minute USGS map with locations, descriptions of artifacts, distributions of artifacts, number of artifacts, and photographs and drawing of diagnostic artifacts provided on the IO form. IOs will be documented using the Cibola National Forest IO form or a form otherwise identified by the USFS.

Parameters: For the survey, an archaeological site is defined as a locus of purposeful prehistoric or historic human activity. An activity is considered to have been purposeful if it resulted in a deposit of cultural material beyond the level of one or a few accidentally lost artifacts. Loci of human activity not classifiable as sites by this definition should be considered an IO.

Heritage resources, which include at least one of the following, are hereby defined as sites: one or more features; one formal tool, if associated with other cultural material or more than one formal tool; an occurrence of cultural material (e.g., shards, lithic debris, historic artifacts) that contain one of the

following: a.) three or more types of artifacts or material; b.) two types of artifacts or material in a density of, at least 10 items per 100 square meters; and c.) a single type of artifact or material in a density of, at least 25 items per 100 square meters.

Historic remains are those at least 50 years old.

Evaluations of each heritage resource site and recommendations regarding its eligibility will be provided according to the NRHP criteria listed in 36 CFR 60.6, U.S. Department of the Interior (USDOI), National Register Bulletin 15, including all appropriate site, feature, and artifact documentation as required by SHPO and as justification for a determination of eligibility. Unevaluated recommendations will be justified, when eligibility is inconclusive based on surface observations.

NRHP eligibility recommendations, methods closely following the guidelines established by the USDOI will be used. Of particular importance are National Register Bulletins 15 and 16 (National Park Service [NPS] 1991a and 1991b). According to these bulletins, a property (or site) must possess historic significance and integrity to be listed on the NRHP. According to National Register Bulletin 15 (NPS 1991a:2), the criteria by which sites are determined significant are as follows:

- *Criterion A:* Properties, associated with events that have made a significant contribution to the broad patterns of our history.
- *Criterion B:* Properties, associated with the lives of persons significant in our past.
- *Criterion C:* Properties that embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction.
- *Criterion D:* Properties that have yielded, or may be likely to yield, information important to prehistory or history.

The property must also retain integrity of those features necessary to convey its significance (NPS 1991a:3). Seven qualities of integrity are defined: location, design, setting, materials, workmanship, feeling, and association (NPS 1991a:44-45). For archaeological sites, integrity is “based on the degree to which remaining evidence can provide important information. All seven qualities do not need to be present…” (NPS 1991a:4).

Sampling Locations/Maps: Sampling Frequency: 100 percent sample

Supplies will include 7.5 minute maps showing project boundaries, Form R3-FS-2300-4, Inventory Standards and Accounting Form, Isolated Occurrence recording form, aluminum site tags to be stamped by contractor and attached to datum tree and flagging to delineate site boundaries.

All field work will be completed consistent with the Laboratory and Field Quality Assurance Plan in Appendix A.

13.0 LAND USE

The Lara Mesa Project Permit Area ***shown in Plate 1*** is located entirely on Forest Service land. Land uses in the vicinity of the project area include grazing, mining, watershed, and recreation.

13.1 Objective

The objective for collecting baseline land use data is to provide information on post-mining land uses and to evaluate potential productivity and planned reclamation activities.

13.2 Sampling Design and Methods

Forest Service records will be evaluated to determine the primary land use designations for the Permit Area and surrounding areas. The Natural Resource Conservation Service (NRCS) and New Mexico Bureau of Mines will be consulted to determine land use on the surrounding private lands. Soil Survey information will accessed to determine the land capability classification. ***The Laboratory and Field Quality Assurance Plan are not applicable for developing the baseline Land Use.***

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