BASELINE DATA REPORT

Section 6.0

Topsoil

JANUARY 2011

Revision 1

Submitted To:

New Mexico Mining and Minerals Division
&
U.S. Forest Service (Cibola National Forest)
&
New Mexico Environment Department

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6.0 Topsoil

NMAC §19.10.6.602 D.(13) (e)

Baseline data shall include, as applicable:
If revegetation is part of the reclamation plan, provide a description of the thickness and nature of the topsoil, if any, over the proposed permit area. A soil survey and soil analyses conducted in accordance with standard methods acceptable to the Director may be required to show variations in topsoil depth and suitability. Where the applicant proposes to use something other than topsoil, the application shall provide the results of analyses as necessary to determine the suitability of the proposed materials to use as topdressing.

6.1 Introduction

A successful reclamation program is dependent, in part, upon the quantity and quality of topsoil available for use during the reclamation process. The reclamation program begins during the construction phase of the mine and surface facilities by removing and stockpiling the topsoil for re-use during site closure. Roca Honda Resources, LLC (RHR) assessed the quantity and suitability of topsoil present at the permit area in two ways. First, current literature concerning soil characteristics was reviewed to make a general determination of site-specific soil characteristics. General information about the soils present on the Roca Honda permit area was obtained from two separate soil surveys. The level of detail varies in the two surveys; however, both contain a recommendation on topsoil suitability. The first survey was conducted by the USFS (USFS 2007) and covered Sections 9 and 10 of the permit area. The second survey covered Section 16 of the permit area and was conducted by the U.S. Department of Agriculture, Natural Resources Conservation Service (NRCS) in cooperation with the Bureau of Land Management, the Bureau of Indian Affairs, and the New Mexico Agricultural Experiment Station (NRCS 2006). The results of the two surveys and their respective areas are shown in Figure 6–1. The soil types appear disconnected on the Section 9 and Section 16 border. This disparity is due to the two separate surveys conducted by the two different agencies. The USFS uses observational soil identifications while the NRCS uses defined soil complex identifications. Section 6.2 of the October 2009 BDR included the soil characteristics from the USFS and the NRCS. That discussion can be found in Appendix 6-A to this section and is supported with the field investigation results.

RHR contracted the services of SWCA Environmental Consultants to perform the soil survey proposed by RHR in it's SAP for the project. The results of the survey and soil analysis are attached as Appendix 6-A. In summary, the conclusion of this report is that 50.2% of the disturbed area provides an average of 60.2 inches of soil, 45.9% of the disturbed area provides an average of 20.8 inches of soil, 1.6% of the disturbed area provides an average of 11.0 inches of soil and 0.5% of the disturbed area provides an average of 60 inches of suitable topsoil. Therefore 98.2% of the disturbed area provides an average depth of 41 inches of suitable topdressing. Reclamation will require a minimum of 12 inches of suitable topdressing to cover the disturbed area. Therefore there is sufficient soil to support the reclamation plan.

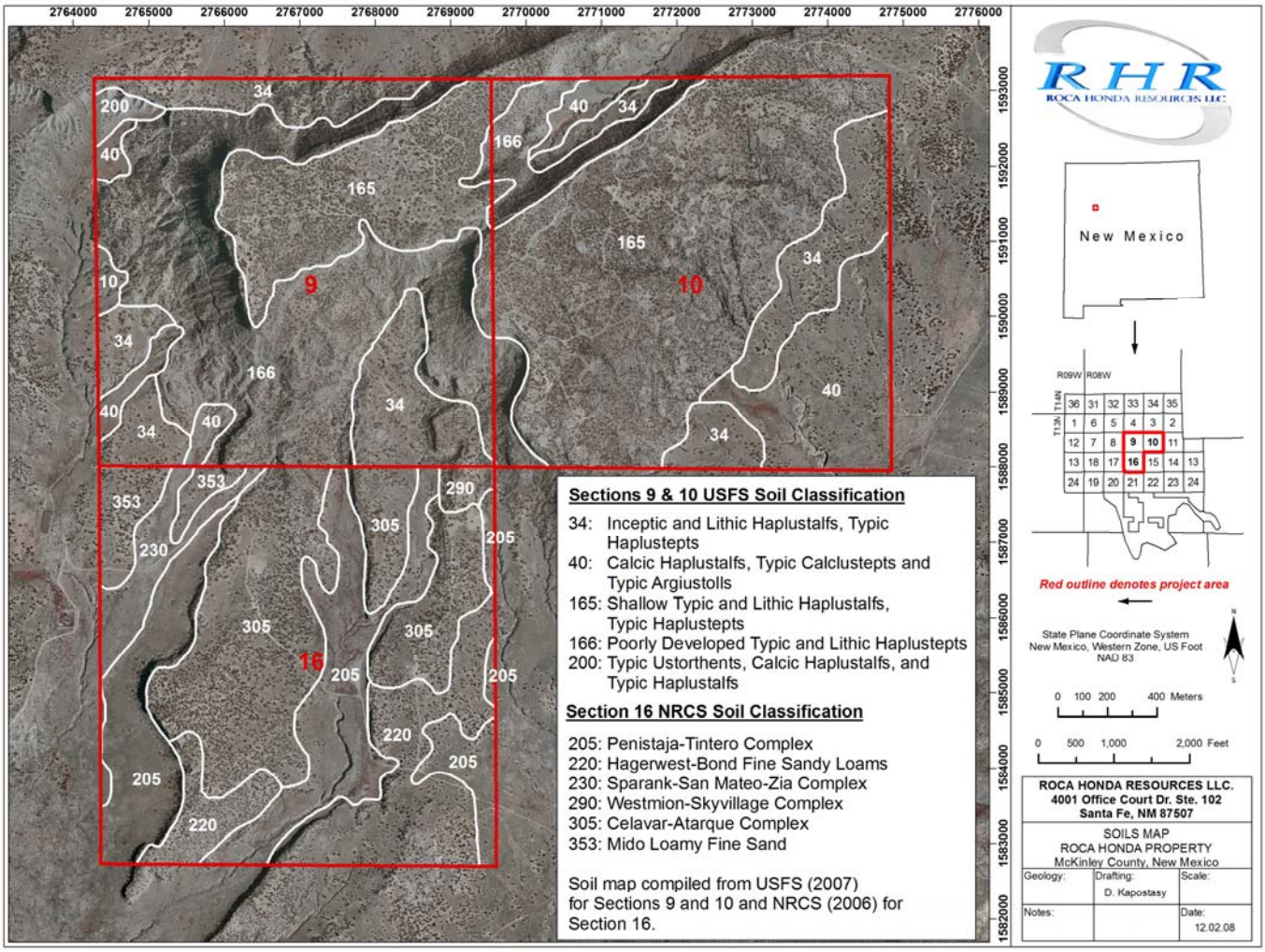

Figure 6-1. Roca Honda Permit Area Soil Survey

RHR's October SAP identified data needs to further develop it's understanding of existing soil conditions at the site (see Table 6-1 of RHR's October 2009 SAP). Additional discussions with NM MMD resulted in an approved soils characterization plan. Completion of the detailed soils survey contained in Appendix 6-A fills these data needs. Soil depths in the disturbed areas were identified and soil samples were obtained and analyzed to determine topsoil characteristics and suitability. Based on the data compiled, it was determined that it was unnecessary to identify and characterize potential borrow areas.

6.2 Alternative Top Dressings

At this time, RHR does not anticipate the need for using any form of alternative top dressings. The Reclamation Plan contained in this mine permit application will discuss topsoil and "suitable soils" use and the potential need for soil amendments in reclaiming the disturbed areas.

6.3 References

NRCS (Natural Resources Conservation Service), 2006. *Soil Survey of McKinley County Area, New Mexico, McKinley County and Parts of Cibola and San Juan Counties*, U.S. Department of Agriculture, Natural Resources Conservation Service, in cooperation with U.S. Department of Interior, Bureau of Land Management and Bureau of Indian Affairs, and the New Mexico Agricultural Experiment Station.

USFS (US Forest Service), 2007. *Terrestrial Ecosystems Survey of the Cibola National Forest and National Grasslands,* USDA Forest Service, Southwestern Region.

Appendix 6-A

Soil Baseline Characterization for Roca Honda Mine, McKinley County, New Mexico

SWCA®
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Soil Baseline Characterization for Roca Honda Mine, McKinley County, New Mexico

Prepared for

Roca Honda Resources, LLC

Prepared by

SWCA Environmental Consultants

January 2011

SWCA Project Number 16580.01-ABQ

SOIL BASELINE CHARACTERIZATION FOR ROCA HONDA MINE, MCKINLEY COUNTY, NEW MEXICO

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1.0 INTRODUCTION

Per Roca Honda Resources, LLC (RHR) approved Sampling and Analysis Plan and subsequently NM MMD approved detailed soils characterization plan, SWCA Environmental Consultants (SWCA) has prepared this assessment of the existing soil baseline for the proposed Roca Honda Mine permit area. Primary objectives of the soil baseline assessment are to provide the following information that has been requested by the New Mexico Mining and Minerals Division (MMD): 1) confirmation of the accuracy of previous soil mapping that has been conducted in the project area by the US Forest Service (USFS) and Natural Resources Conservation Service (NRCS); 2) confirmation of similar/dissimilar soils in adjoining sections due to different mapping approaches (USFS versus NRCS); 3) estimates of salvageable volume of suitable soil across the (planned) disturbed areas based on field sampling, and 4) gross estimates of salvageable volume of suitable soil across the permit area based on previous mapping/descriptions that have been confirmed.

Due to the Mt. Taylor Traditional Cultural Property (TCP) designation on certain USFS property including Sections 9 and 10 of the Roca Honda permit area, and a portion of Section 16, the state property portion of the permit area, any surface disturbance over 1 square meter (cumulative) would constitute an undertaking requiring cultural consultation for approval. This consultation would have significantly delayed completion of the soils survey in a timely manner. RHR and SWCA consulted extensively with New Mexico Mining and Minerals Division (MMD) and USFS representatives to arrive at a consensus on methods for performing field observations on soils and obtaining samples for laboratory analyses. Based on these consultations, the proposed sampling plan was designed to meet the objectives listed above while minimizing surface disturbance on USFS land.

The purpose of this report is to summarize the results of the soil baseline studies for the Roca Honda Mine Permit Area, and provide information on sampling methods, analyses, soils characterization procedures, and results of field investigations and laboratory analyses. Appendix A identifies the soil map units, facility locations, and soils sample locations. Appendix B contains the completed soil profile forms, and Appendix C contains the laboratory results.

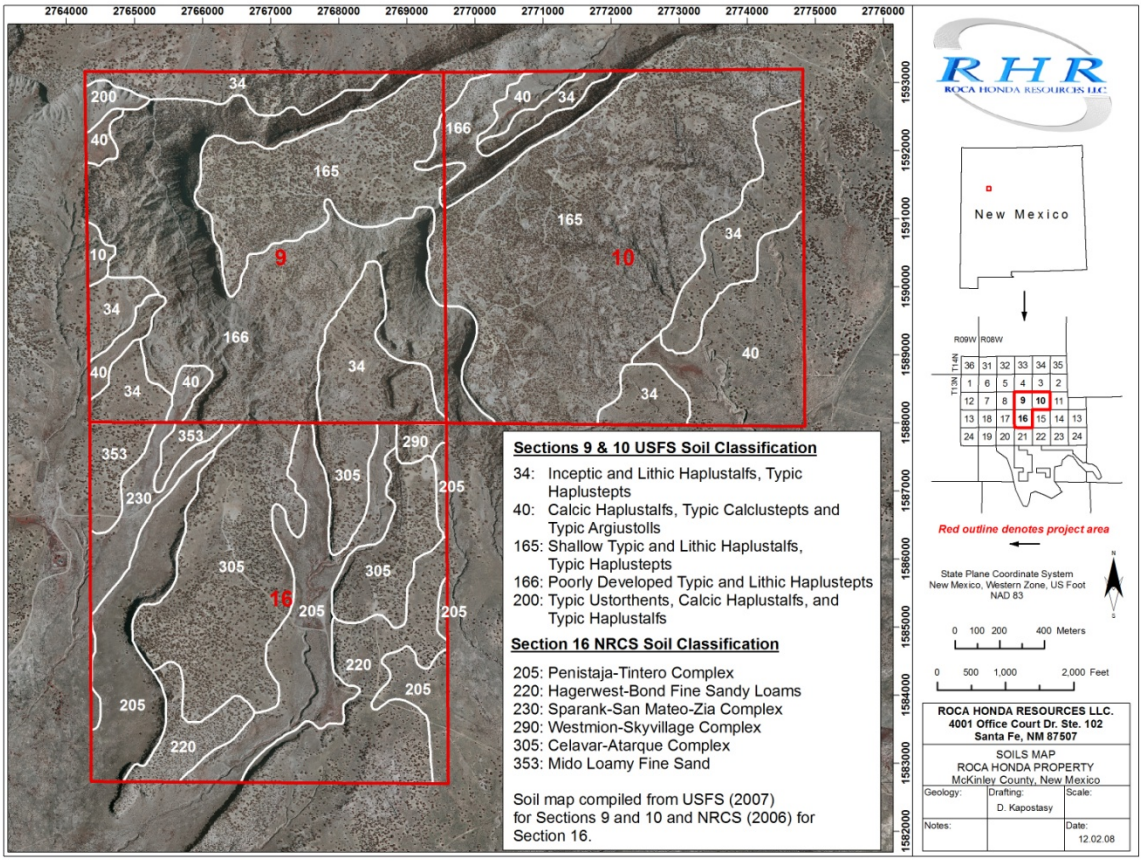
2.0 METHODS

2.1 Literature Review

Preliminary soils information had been previously compiled by Roca Honda Resources for their new mine permit application, including their Baseline Data Report, Section 6.0, Topsoil (October 2009), and their Sampling and Analysis Plan, Section 6.0, Topsoil (October 2009). Sections 9 and 10 were mapped in the Cibola National Forest *Terrestrial Ecosystems Analysis* (USFS 2007). This analysis delineates the soil taxonomic units that occur within ecological map units. Section 16 was mapped by the NRCS (NRCS 2006) and delineates soils by soil series complex (Figure 1). For determining potential soil sampling locations, soil units/associations as mapped by the NRCS and USFS were digitized and overlaid using ArcGIS with the proposed Roca Honda Mine facility layout to determine the anticipated extent of projected disturbance by soil map unit. Figure A-1 in Appendix A represents the projected footprint of the facility sites. In addition, locations of known cultural resources sites were included on field maps to ensure

avoidance of the sites for test pits and auger holes. The cultural sites are not shown on the maps to protect the location of the sites. Soil maps units and facility locations are illustrated on Maps 1 through 3 (Appendix A).

Figure 1. USFS and NRCS Soil Classification for Sections 9, 10, and 16



2.2 Field Sampling

Field sampling was conducted by RHR staff, an SWCA Range Scientist, and a Certified Professional Soil Scientist and Soil Classifier, Bruce Buchanan, PhD, using methods summarized in the following subsections.

2.2.1 Identification of Soil Sampling Locations

Following discussions with MMD and USFS, soil sampling locations were restricted to minimize surface disturbance. During a site reconnaissance conducted in June 2010, SWCA identified existing arroyo cuts and auger sample locations where soils could potentially be observed and sampled while minimizing surface disturbance. In all cases, proposed soil sampling sites were located to avoid known cultural resources sites on both state and USFS land.

After completion of the initial soils reconnaissance and soil sampling proposal (SWCA 2010a, 2010b), RHR was informed that surface disturbance for soil sampling would be acceptable on

NM state land outside the TCP. This allowed the addition of soil pits to the proposed sampling procedures. Therefore, soils observations were made and soil samples were collected from three types of sites: 1) existing vertical soil profiles, primarily arroyo cuts, where soil profiles could be observed and sampled vertically; 2) limited hand auger sampling, primarily in USFS to limit surface disturbance; and 3) hand-dug soil pits to observe representative profiles, on NM state land only. Where feasible, soil pits were located close to the USFS boundary to correlate NRCS and USFS soil mapping. Based on field conditions, some proposed sample site locations were adjusted at the recommendation of Dr. Buchanan to ensure that sample sites were representative of published soil mapping. Any adjusted samples were located to avoid impacts to cultural resource sites.

2.2.2 Confirmation of Previous Soil Mapping

RHR, SWCA, and Dr. Buchanan surveyed the proposed Roca Honda mine permit area to evaluate previous soil mapping. This survey included walking transects across the permit area to observe surface and topographic features, and examination of soil profiles through hand-dug soil pits, hand auger samples, and observations of soil profiles in existing arroyo cuts.

Transects focused on section boundaries especially near areas of proposed soil disturbance, to attempt to correlate soil types across the two previous mapping efforts. Arroyo profiles and sampling were also used to evaluate variability within map units for key parameters such as soil depth. Visual transects and field sampling were used to identify areas where similar soils occur within the areas mapped by the two agencies, focusing on areas where soil disturbance is projected for the Roca Honda Mine project.

2.2.3 Vertical Soil Sampling

Soil profile observations and collection of soil samples was conducted within existing arroyo cuts where soil profiles were deemed to be representative of the soil map units. Field scientists cleaned the profile with a trowel and completed soil profile description forms for each sample site (Appendix B). The description included horizon depths, field texture, color, volume of coarse fragments, and depth to bedrock or rocky layer. For soil types where calcium carbonate accumulation may be an indicator, a field effervescence test was performed using hydrochloric acid. Soil samples were collected by horizon along the existing vertical cuts, collecting the minimum sample volume needed to perform necessary laboratory analyses (approximately ½ of a gallon sample bag).

The soil collected from each horizon layer was placed in a sample bag and labeled with soil type, sample identification number, horizon, and date collected. This information was also recorded on chain-of-custody forms submitted to the laboratory.

2.2.4 Hand Auger Sampling

For areas where representative soil profiles were not identified within existing arroyo cuts, a hand auger was used to collect data on soil horizons and depth, and to collect soil samples. A 3-inch diameter bucket auger was used. Auger samples were collected in approximately 12-inch increments, pulled from the hole and examined to identify horizon intervals. The core sample

was separated into horizon layers (according to such factors as organic matter content, color, and texture), and soil profile description forms were completed for each site noting horizon depths, field texture, color, volume of coarse fragments, and overall sample depth (Appendix B). For soil types where calcium carbonate accumulation may be an indicator, a field effervescence test was performed using hydrochloric acid.

Soil samples were collected from each horizon layer and bagged separately (approximately ½ of a gallon sample bag). Auger samples were collected to the depth of lithic contact or other impenetrable layer or to a maximum depth of 60 inches.

As mentioned above additional auger or shovel digging was approved and performed in Section 16, i.e. the state land, to collect additional information on soil depth and variability across map units. Some field adjustments of sample locations were made where areas of high variability or major deviations from published soil mapping were encountered. Any adjusted samples were located to avoid impacts to cultural sites.

2.2.5 Soil Pit Sampling

Hand-dug soil pits were used on the state land only to observe representative soil profiles and collect soil samples. Where feasible, soil pits were located close to the USFS boundary to assist with correlating NRCS and USFS soil mapping. Soil pits were approximately 2 feet wide by 4 feet long, and dug to the depth of bedrock or other impenetrable layer. A hand trowel was used to clean one wall of the soil pit to observe horizon layers, which were identified according to such factors as organic matter content, color, and texture. A soil profile description form was completed for each site noting horizon depths, field texture, color, volume of coarse fragments, and overall sample depth (Appendix B). For soil types where calcium carbonate accumulation may be an indicator, a field effervescence test was performed using hydrochloric acid. Soil samples were collected from the pit wall for each horizon layer and bagged separately (approximately ½ of a gallon sample bag).

2.3 Laboratory Analysis

Soil samples were packaged and shipped in accordance with laboratory recommendations and standard analytical procedures. Chain-of-custody forms were completed and the samples submitted to Energy Laboratories, Casper, Wyoming. Table 1 identifies the soil geochemical parameters and procedures used for the laboratory analysis:

Table 1. Soil Laboratory Analysis Parameters and Methods

Parameter	Extraction Method	Analysis Method
pH	Saturated paste ASA10-3.2	pH meter
Texture (hydrometer)	ASA15-5	Hydrometer
Texture (medium, fine and very fine sands, #35, #60 and #140 sieves, respectively)	ASA15-5	Sieve
Salinity (EC, electrical conductivity)	Saturated Paste ASA 10-3	Conductivity meter
Sodicity (SAR, sodium absorption ratio) (paste Ca, Mg and Na me/L)	Saturated Paste ASA10-3.4	E6010.20
Organic matter content	Organic Carbon ASA 29-3	Spectrophotometer
Inorganic carbon (to nearest 0.1% CaCO3 equivalent)	USDA23c	Titration
Boron (hot-water soluble)	ASA 25-9	E6010.20
Selenium (ABDPTA extractable)	ASA 3-5.2	E6010.20
Total Uranium	ASA	E6010.20
Total Radium (Ra 226)	SW3050B	E903.0

Method references: American Society of Agronomy (ASA) Monograph #9; US Department of Agriculture (USDA) Handbook 60; Environmental Protection Agency (EPA) Method SW 3050B.

3.0 PROJECT AREA DESCRIPTION

3.1 Topography and Drainage

The Roca Honda permit area is located in the northern half of the U.S. Geological Survey (USGS) San Mateo 7.5-minute topographic quadrangle and extreme southern half of the USGS San Lucas Dam quadrangle (see Figure A-1 in Appendix A). Topography within the permit area consists of higher elevations to the north with elevations generally decreasing to the south and southeast. Major landforms consist of the "Jesus Mesa," located in the north-central area of Section 9, at a maximum elevation of over 7,800 feet above mean sea level (msl) surrounded by relatively steep canyons and arroyos draining to the south. The most topographic relief occurs at the boundary of Sections 9 and 10 where the Jesus Mesa drains into two main canyons; one to the northeast and one to the south-southwest. The Jesus Mesa exhibits more gradual topographic relief to the southeast- creating two unnamed ephemeral drainages. Elevations are lowest near the southern area of Section 16, reaching approximately 7,100 feet msl, with landforms consisting of a network of valley arroyos.

3.2 Geologic Setting

Surface geology exposed within the permit area is mapped as mostly Upper Cretaceous Formations and consists of mostly sandstones and shale. Table 2 summarizes information from RHR's Geology Baseline Data Report, Section 7.0, Geology (January 2011).

Table 2. Summary of Geologic Setting

Period	Formation	Member	Characteristics	Thickness	Outcrop location
Quaternary	Alluvium and Colluvium	-	Unconsolidated sands and silts	Up to 80 feet	Throughout permit area; eastern and southeastern areas of Section 10 and 16
Upper Cretaceous	Menefee	Clearly Coal	Sandstones with interbedded coal	-	Beneath colluvial deposits in southeastern Section 10
Upper Cretaceous	Point Lookout Sandstone	-	Light gray-thickbedded, very fine to medium grained sandstone	Up to 120 feet	Top of Jesus Mesa and east of Jesus Mesa
Upper Cretaceous	Crevasse Canyon	Gibson Coal	Coal	Up to 240 feet	Steep slopes and cliffs of Jesus Mesa
		Dalton Sandstone	Sandstone	Up to 100 feet	Slopes and valley floor of Sections 9 and 16
		Borrego Pass Lentil	Sandstone	Up to 40 feet	
Upper Cretaceous	Mancos Shale	Mulatto Tongue	Shale and silty sandstone	Up to 300 feet	Southwestern slopes of Section 9

3.3 Published Soil Map Unit Descriptions and Field Observations

As discussed above, Sections 9 and 10 were mapped in the Cibola National Forest *Terrestrial Ecosystems Analysis* (see Figure 1, page 2). This analysis delineates the soil taxonomic units that occur within ecological map units. Section 16 was mapped by the NRCS and delineates soils by soil series complex. Table 3 lists the major soil taxonomic units previously mapped within the proposed disturbance area.

Table 3. Soil Names/Taxonomic Classifications from NRCS and USFS Mapping

Section	Map Unit Number	Map Unit Name	Mapped by	Taxonomic Classification
16	305	Celevar-Atarque Complex	NRCS	Celevar: Mesic Aridic Haplustalfs Atarque: Mesic Lithic Haplustalfs
9 & 10	40	N/A	USFS	Calcic Haplustalfs, Typic Calclustepts and Typic Argiustolls
16	205	Penistaja-Tintero Complex	NRCS	Penistaja: Mesic Ustic Haplargids Tintero: Mesic Ustic Haplargids
9 & 10	34	N/A	USFS	Inceptic and Lithic Haplustalfs, Typic Haplustepts
9 & 10	165	N/A	USFS	Shallow Typic and Lithic Haplustalfs, Typic Haplustepts
9 & 10	166	N/A	USFS	Poorly developed Typic and Lithic Haplustepts
16	230	Sparank-San Mateo-Zia Complex	NRCS	Sparank: Mesic Ustic Torrifluvents San Mateo: Mesic Ustic Torrifluvents Zia: Mesic Ustic Torriorthents
16	220	Hagerwest-Bond Fine Sandy Loams	NRCS	Hagerwest: Mesic Ustic Haplargids Bond: Lithic Ustic Haplargids
16	353	Mido Loamy Fine Sand	NRCS	Mesic Ustic Torripsamments

Based on the published soil mapping, the proposed Roca Honda Mine facilities would occur within nine soil map units or soil associations as summarized in Table 4.

Table 4. Anticipated Maximum Disturbance by Soil Association

Map Unit Number	Map Unit Name/Description	Disturbance Area (acres)	Proportional Extent (%)
305	Celevar-Atarque Complex	78	42.6
40	Calcic Haplustalfs, Typic Calclustepts and Typic Argiustolls	60	32.8
205	Penistaja-Tintero Complex	30	16.4
34	Inceptic,and Lithic Haplustalfs, Typic Haplustepts	6	3.3
165	Shallow Typic and Lithic Haplustalfs, Typic Haplustepts	3	1.6
166	Poorly developed Typic and Lithic Haplustepts	2	1.1
230	Sparank-San Mateo-Zia Complex	2	1.1
220	Hagerwest-Bond Fine Sandy Loams	1	0.6
353	Mido Loamy Fine Sand	1	0.6
	TOTAL	183	100

The anticipated disturbance areas summarized in Table 4 and illustrated on Figure A-1 and Maps 1 through 3 (see Appendix A) represent the projected footprint of facility sites. As shown in Table 4, the majority of disturbed area would occur within three soil map units: 305, 40, and 205.

Descriptions of the soil map units as presented in the published NRCS soil survey and USFS *Terrestrial Ecosystems Analysis* are summarized below, with information from field observations provided for each map unit.

Unit 305

Published Description. The majority of Section 16 is mapped as Celavar-Atarque complex, with roughly 50 percent of the unit comprised of Celavar soils, 35 percent Atarque soils, and 15 percent other minor components. The depth to bedrock for Celavar soils in this area ranges from 20 to 40 inches. Depth to bedrock for Atarque soils ranges from 10 to 20 inches. These soils are well drained and have sandy clay loam and clay-loam textures. This soil does not contain rock fragments within the mapped horizons. Slopes range from 1 to 8 percent. Topsoil suitability is rated "poor" to "fair" due to depth to bedrock. The typical salinity of the soil measures between 0.0 to 2.0 mmhoms/cm.

Field Observations. Based on field observations, including soil pits and auger samples, this unit as mapped in the Roca Honda Mine permit area contains soils fitting the descriptions of both the Celavar and Atarque components of this map unit, and had depths to rock layer (or auger refusal) ranging from 14 to 24 inches. Two of our samples sites within this map unit, Site 001 and Site 015, did not fall within the typical range of parameters for the mapped soils. Soils at these two sites were more in line with the descriptions of map unit 205, and were 50 to 72 inches in depth. Field observations also indicated that map unit 34 as mapped by USFS is similar to map unit 305 as mapped by NRCS.

Unit 40

Published Description. The southwestern corner of Section 10 and small portions of Section 9 are mapped as Calcic Haplustalfs (approximately 50 percent), Typic Calclustepts (approximately 40 percent) and Typic Argiustolls (approximately 10 percent). These soils are fine loamy to fine. Topsoil suitability may be limited by high alkalinity. The *Terrestrial Ecosystems Analysis* does not provide information on depth to bedrock, which indicates depth is not typically a limiting factor. Soils in this unit occur in valleys and are formed from alluvium derived from tuff or blown sand. Topsoil suitability is rated as "poor" for alkalinity; however, as discussed below laboratory analysis results for pH were mostly classified as "good."

Field Observations. Field observations showed that map unit 40 soils are deep (we were able to sample to at least 60 inches deep on all sites in the map unit). Based on field observations these soils were classified as Inceptisols, Usticrepts, Typic Haplugerds or Typic Haplustalfs, and resemble soils mapped in Section 16 by NRCS as Tintero soils (or poorly developed Tintero soils).

Unit 205

Published Description. Two long, narrow bands of Penistaja-Tintero complex (205) soils run north-south through Section 16. Approximately 45 percent of this complex is Penistaja and similar soils, 40 percent is Tintero and similar soils, and 15 percent is formed of other minor soil components. Depth to bedrock for both Penistaja and Tintero soils is 60 inches or more. This soil does not contain rock fragments within the mapped horizons. These soils are in well drained to excessively well drained areas on 1 to 10 percent slopes. Topsoil suitability is rated "good". Typical salinity for Penistaja soils ranges from 0.0-0.2 mmhoms/cm. Salinity for the Tintero soils from 0 to 16 inches is 0.0 mmhoms/cm, but ranges from 0.0 to 2.0 mmhoms/cm from 16 inches to 56 inches.

Field Observations. Observations from sample sites in the 205 map unit were within the range of published descriptions, with some sites resembling the Penistaja series and other resembling the Tintero series. As discussed above, site 001 also was more in line with the published descriptions of soils mapped as unit 205, and as shown on Map 3, this sample site is located close to the map unit boundary, where the 305 and 205 soil types likely intergrade. Field samples in unit 205 indicated these soils are at least 60 inches deep, with most horizons having 1 percent or less rock fragment composition.

Unit 34

Published Description. Small areas throughout Sections 9 and 10 are mapped as Inceptic Haplustalfs (approximately 70 percent), Typic Haplustepts (approximately 20 percent), and Lithic Haplustalfs (approximately 10 percent) Haplustalfs. Texture ranges from fine-loamy to coarse-loamy to sandy. These soils are primarily in valleys on low slopes of 4 to 6 percent and are highly susceptible to wind erosion when vegetation is removed. Topsoil suitability is rated "poor" due to either being too alkaline or too sandy.

Field Observations. Based on field observations, areas mapped as unit 34 by the USFS are similar to areas mapped as unit 305 by the NRCS. Unit 34 sample sites were classified based on field observations as Inceptisols or Inceptic Alfisols.

Unit 165

Published Description. Most of Section 10 and a large portion in the northeast part of Section 9 are mapped as shallow fine Typic Haplustalfs (approximately 35 percent), fine-loamy Typic Haplustalfs (approximately 25 percent), loamy Lithic Haplustalfs (approximately 25 percent), coarse-loamy typic Haplustepts (approximately 5 percent) and rock outcrop (approximately 10 percent). These soils generally occur on 0 to 15 percent slopes. These soils are formed from residuum and/or eolian derived from sandstone. Bedrock occurs within 20 to 39 inches of the surface for the Typic Haplustalfs and within 20 inches for the Lithic Haplustalfs component.

Field Observations. Based on field observations, unit 165 in the permit area was classified as loamy Lithic Haplustalfs. Unit 165 in the Roca Honda permit area is sloping with extensive rock outcrop, and soils in this area were observed to be shallow (approximately 11 inches to bedrock,

based on auger sampling). Thus our field observations indicate unit 165 soils in the permit area resemble the lithic component of this unit as mapped by USFS.

Unit 166

Published Description. The majority of Section 9 and portions of the northwest and southwest area of Section 10 are mapped as poorly developed Typic (approximately 65 percent) and Lithic (approximately 25 percent) Haplustepts with approximately 10 percent rock outcrop. These soils are coarse-loamy to fine soils on steep slopes of about 55 percent. Soil depth to sandstone bedrock typically varies from 20 to 40 inches. Rock fragments comprise approximately 65 percent of this soil type. The potential for soil erosion in this area is severe because of the steep slopes. Topsoil suitability is rated "poor" due to steep slopes. These soils are formed from colluvium and/or residuum derived from sandstone.

Field Observations. Field observations indicate that the majority of this map unit is rock outcrop with no appreciable soil material that could be feasibly salvaged. Surface material outside of the rock outcrop consists of fine, loose blown sand. Sample 028 collected near the section boundary and adjacent to the area mapped as 166 was comparable to soils mapped as unit 205. This indicates that the downslope area of map unit 166 generally appears to have deeper soils than were observed upslope in Section 9.

Unit 230

Published Description. The northwest portion of Section 16 is mapped as Sparank-San Mateo-Zia complex. This complex is approximately 40 percent Sparank, 35 percent San Mateo, 20 percent Zia, and 5 percent other minor soil components. Depth to bedrock for this soil complex is 60 inches or more, and this soil is well drained to excessively well drained. Soil textures include silty clay loam, clay loam, sandy loam, and fine sandy loam. This soil does not contain rock fragments within the mapped horizons. This complex generally occurs on 0 to 3 percent slopes. Topsoil suitability is rated "poor" to "fair" due to sodium content or being too clayey. The typical salinity of the soil measures between 0.0 to 4.0 mmhoms/cm.

Field Observations. Field observations along the existing road indicate unit 230 contains clayey soils, indicating the area proposed to be disturbed most closely resembles the Sparank component of this association.

Unit 220

Published Description. Two areas in Section 16 are mapped as Hagerwest-Bond fine sandy loams. Approximately 50 percent of this area is Hagerwest and similar soils, 35 percent Bond and similar soils, and 15 percent minor components. Depth to bedrock for Hagerwest soils ranges from 20 to 40 inches, and for the Bond soils ranges from 10 to 20 inches. Both soils have textures of fine sandy loam, sandy loam, and sandy clay loam. These soils do not contain rock fragments except for the Bond soil, from 5 to 14 inches, is mapped as having up to 15 percent fragments between 3 and 10 inches below the surface. Slopes range from 1 to 8 percent. Topsoil suitability is rated "poor" to "fair" due to depth to bedrock and presence of rock fragments. The typical salinity of the soil measures 0.0 to 2.0 mmhoms/cm

Field Observations. Due to the small amount of proposed disturbance, samples were not collected for this map unit.

Unit 353

Published Description. The northwest portion of Section 16 is mapped as Mido loamy fine sand, which is typically comprised of 90 percent Mido loamy fine sand and 10 percent other minor components. Depth to bedrock is 60 inches or more. This soil does not contain rock fragments within the mapped horizons. This soil is excessively well drained and occurs on 1 to 6 percent slopes. Topsoil suitability is rated "poor" due to being too sandy. The typical salinity of the soil measures 0.0 mmhoms/cm.

Field Observations. A soil pit was dug in the northern part of unit 353 adjacent to the Section 16/Section 9 boundary, and based on field observations was also determined to be representative of map unit 34. Like the sites observed for unit 305 and 34, soils at this site exhibited sandy loam textures, although were deeper than was typically observed for the other units, with a depth to bedrock of 60 inches. The profile observed in the field was more similar to units 305 and 34 based on texture, somewhat deeper than the typical published descriptions for these units, but not as deep as the published description of the Mido series.

4.0 RESULTS

As discussed above, based on the published soil descriptions and field observations of site conditions within the proposed permit area, similarities were observed in soil units mapped by the USFS and NRCS. Based on these similarities, soil samples collected for laboratory analysis are believed to be representative for the published map units as summarized in Table 5 below. The sampling locations are illustrated on Maps 1 through 3 (Appendix A).

Table 5. Sample Site Number and Type of Soil Sample Collected for Laboratory Analysis

Map Unit	Sample Site	Sample Type
305/34	008	Auger
	012	Auger
	015	Soil pit
	018	Soil pit
	022	Soil pit
	023	Soil pit
	032	Auger
	033	Soil pit
40/205	001	Arroyo
	010	Arroyo
	013	Auger
	014	Arroyo
	020	Arroyo
	024	Auger
	026	Auger
	027	Soil pit
166/205	028	Auger
165	034	Auger
353/34	031	Soil pit

4.1 Confirmation of Soil Mapping

As discussed in Section 3.3, field observations of soil samples generally agreed with map unit descriptions, with a few exceptions. Sample sites 001, 015, and 028 did not closely fit in with the typical profile description for the mapped unit, with all exhibiting greater depths than would be expected for the map unit. As shown on Maps 1 through 3, site 001 and 015 are located close to map unit boundaries and likely represent areas where adjacent soil types intergrade. Site 028 is located in Section 16 at the topographic low just south of map unit 166 in Section 9. Based on field observations, the majority of map unit 166 exhibited rock outcrop and/or very shallow soils and would not provide a suitable source for salvage of topdressing. Thus, sample site 028 was judged to be more representative of map unit Tintero component of map unit 205.

4.2 Soil Suitability

Results of laboratory analyses are provided in Appendix C. For the purpose of evaluating soil suitability parameters, soil samples were grouped based on the map units for which they most closely resembled the published descriptions (as summarized in Table 5 above). Table 6 below summarizes laboratory results for key soil parameters relative to published NM mine closeout guidelines (MMD 1996).

Table 6. Summary of Laboratory Analysis Results

Map Units	Depth to Bedrock (inches)[1]	Surface Texture	pH	EC (mmhos/ cm)	SAR	B (mg/kg-dry)	Se (mg/kg-dry)
305/34	Mean: 20.8 Min: 14.0 Max: 24.0	cl to sl	Mean: 7.6 Min: 6.2 Max: 8.0	Mean: 0.60 Min: 0.28 Max: 1.92	Mean: 0.6 Min: 0.1 Max: 1.7	Mean: 0.4 Min: 0.2 Max: 0.7	Mean: 0.02 Min: 0.01 Max: 0.03
205/40/166	Mean: 60.2 Min: 50.0 Max: 72.0	cl to lfs	Mean: 7.8 Min: 7.1 Max: 8.3	Mean: 0.80 Min: 0.19 Max: 4.12	Mean: 0.4 Min: 0.1 Max: 1.8	Mean: 0.3 Min: 0.2 Max: 0.8	Mean: 0.02 Min: 0.01 Max: 0.06
165	Mean: 11.0 Min: 11.0 Max: 11.0	l	Mean: 7.1 Min: 6.8 Max: 7.4	Mean: 0.60 Min: 0.40 Max: 0.77	Mean: 0.8 Min: 0.5 Max: 1.0	Mean: 0.3 Min: 0.2 Max: 0.3	Mean: 0.04 Min: 0.04 Max: 0.05
353/34	Mean: 60.0 Min: 60.0 Max: 60.0	lfs	Mean: 7.5 Min: 6.6 Max: 8.2	Mean: 0.40 Min: 0.26 Max: 0.76	Mean: 0.3 Min: 0.1 Max: 0.8	Mean: 0.3 Min: 0.2 Max: 0.4	Mean: 0.02 Min: 0.01 Max: 0.04
Closeout Guidelines[2]	N/A	Good: sl, l, sil, scl, vfsl, fsl Fair: cl, sicl, sc, ls, lfs	Good: 6.1-8.2 Fair: 5.1-6.1; 8.2-8.4	Good: 0-2 Fair: 2-8	Good: 0-4 Fair: 5-10	Good: <5.0 Un-acceptable: >5.0	Good: <0.1 Un-acceptable: >0.1

[1]Min: Lowest observed value; Max: Highest observed value.
[2]Poor and Unacceptable values are not listed, as none of the results for the Roca Honda Mine permit area fell into these categories

As shown in the laboratory results and summarized in Table 6, the majority of the soil samples fell into the range defined as "good" in the closeout guidelines, for the parameters of texture, pH, EC and SAR. A few samples fell into the "fair" range for EC and SAR; all of these samples were sampled in map unit 205. Similarly, for soil texture most of the sampled soils had textures that would be rated as "good," with a few horizons exhibiting clay loam or loamy sand textures

that are defined as "fair" by the closeout guidelines. Results for selenium and boron were all well within the range defined as "good" in the closeout guidelines. Based on the results observed, no soil suitability concerns were identified.

4.3 Soil Depth

Results for soil depths based on field observations are provided in Table 7. As this table illustrates, approximately 50 percent of the area proposed to be disturbed contains soils with depths averaging over 60 inches, while approximately 46 percent of the area to be disturbed contains soils averaging 20.8 inches in depth.

Table 7. Summary of Soil Depth Observations for Grouped Map Units

Map Units	Disturbed Area (acres)	Proportional Extent (%)	Depth to Bedrock (inches)
305/34	84	45.9	Mean: 20.8 Min: 14.0 Max: 24.0
205/40/166	92	50.2	Mean: 60.2 Min: 50.0 Max: 72.0
165	3	1.6	Mean: 11.0 Min: 11.0 Max: 11.0
353	1	0.5	Mean: 60.0 Min: 60.0 Max: 60.0

5.0 SUMMARY AND CONCLUSIONS

SWCA, with the assistance of Bruce Buchanan, PhD, prepared this assessment of the existing soil baseline for the proposed Roca Honda Mine permit area. Results of the field investigations indicate that existing soil mapping is generally representative of conditions on the site, and that soil map units as mapped by USFS and NRCS exhibited similar soil profiles across section boundaries. Field observations and laboratory results are within the expected ranges based on the previous soil mapping.

Suitable soil material, as determined from the field observations and laboratory analyses, occurs within proposed disturbance area and permit area and can be obtained from several soil units within the disturbed area with typical excavation methods.

Based on the information provided in this report, estimates of suitable salvageable soil can be determined for the proposed disturbed area, and gross estimates of salvageable soil can be determined for the permit area in general based on previous soil mapping (see Figure A-1 and the section maps in Appendix 6-A). In summary, 50.2% of the area provides an average of 60.2 inches of suitable soil material, 45.9% of the area provides an average of 20.8 inches of suitable

soil material, 1.6% of the area provides an average of 11.0 inches of suitable soil material, and 0.5% of the area provides an average of 60 inches of suitable soil material. Therefore, 98.2% of the area provides an average depth of 41 inches of suitable topdressing. The actual quantity of topsoil stockpiled and the quantity required for site reclamation will be calculated for the Mine Operations Plan and the Reclamation Plan when the 60% design is completed.

6.0 REFERENCES

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New Mexico Energy, Minerals and Natural Resources Department, Mining and Minerals Division. 1996. Closeout Plan Guidelines for Existing Mines, Attachment 1 – Soil and Topsoil Suitability Ratings. Mining Act Reclamation Bureau, Santa Fe, New Mexico. April 30, 1996.

SWCA Environmental Consultants. 2010a. Soil Sampling Reconnaissance for Roca Honda Mine, McKinley County, New Mexico. Prepared for Roca Honda Resources, LLC. 28 June 2010.

SWCA Environmental Consultants. 2010b. Soil Sampling Proposal for Roca Honda Mine, McKinley County, New Mexico. Prepared for Roca Honda Resources, LLC. 31 August 2010.

USFS (US Forest Service). 2007. *Terrestrial Ecosystems Survey of the Cibola National Forest and National Grasslands,* USDA Forest Service, Southwestern Region.

APPENDIX A

MAPS

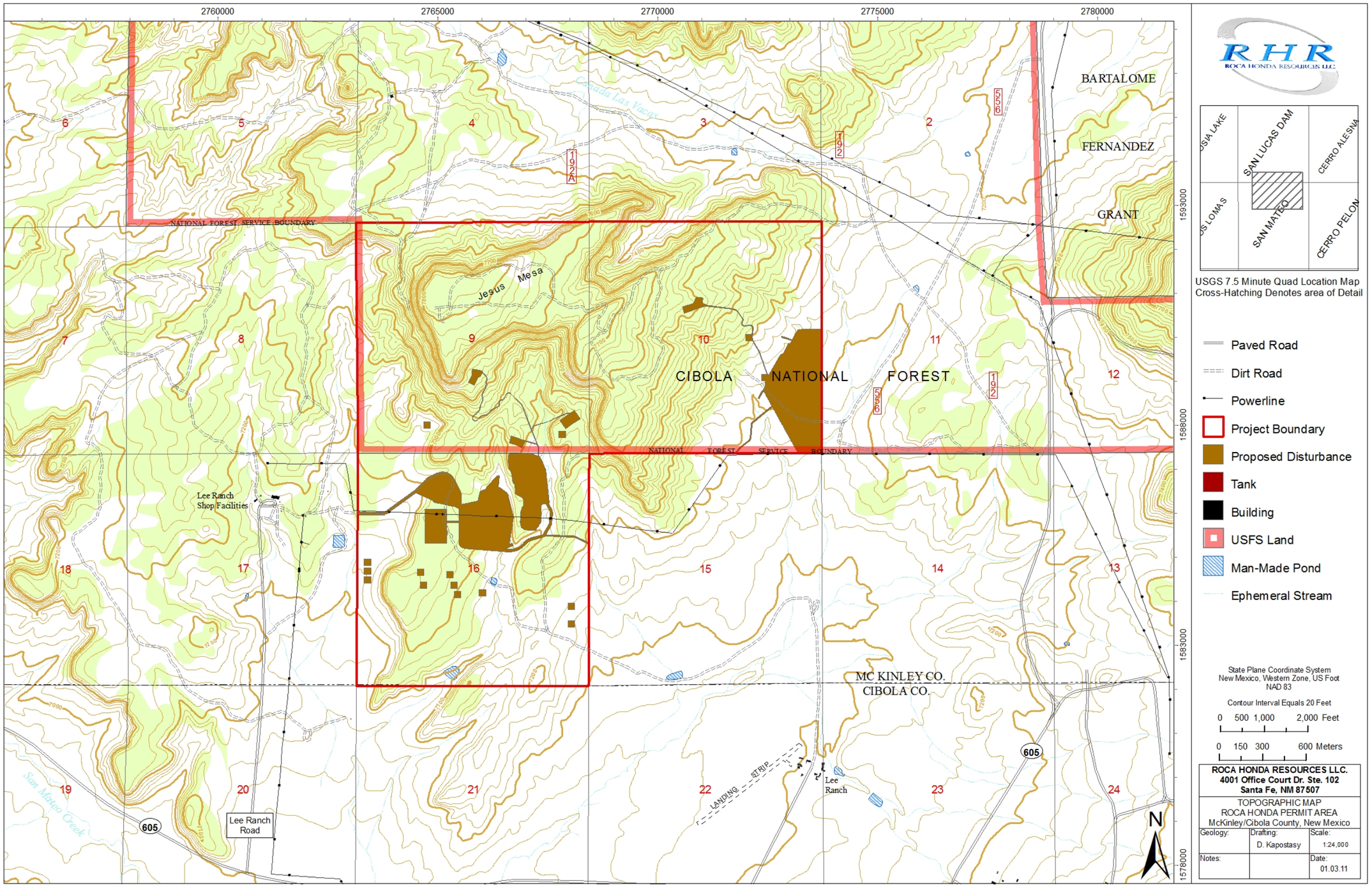
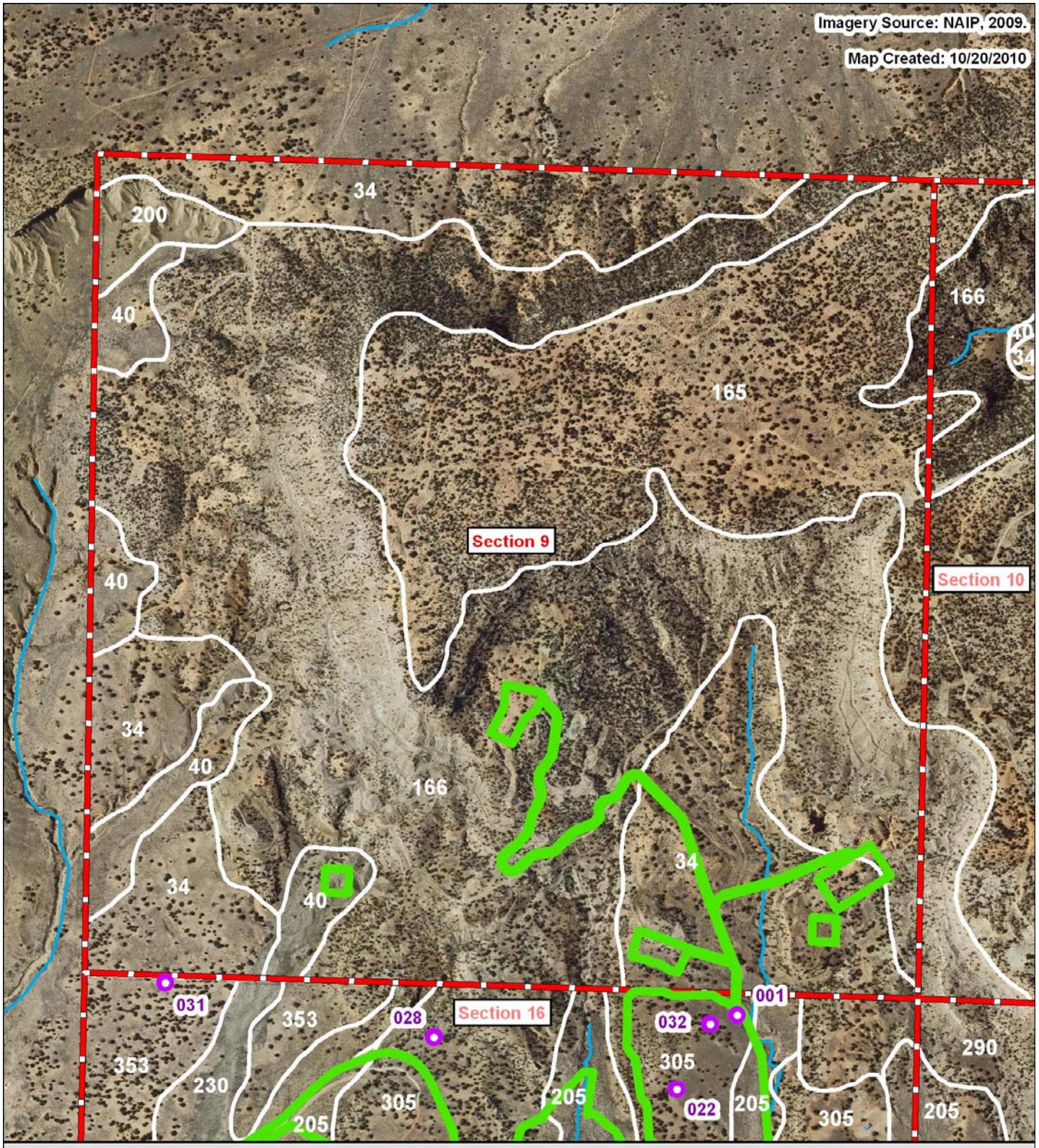


Figure A- 1. Proposed Roca Honda Mine Facility Locations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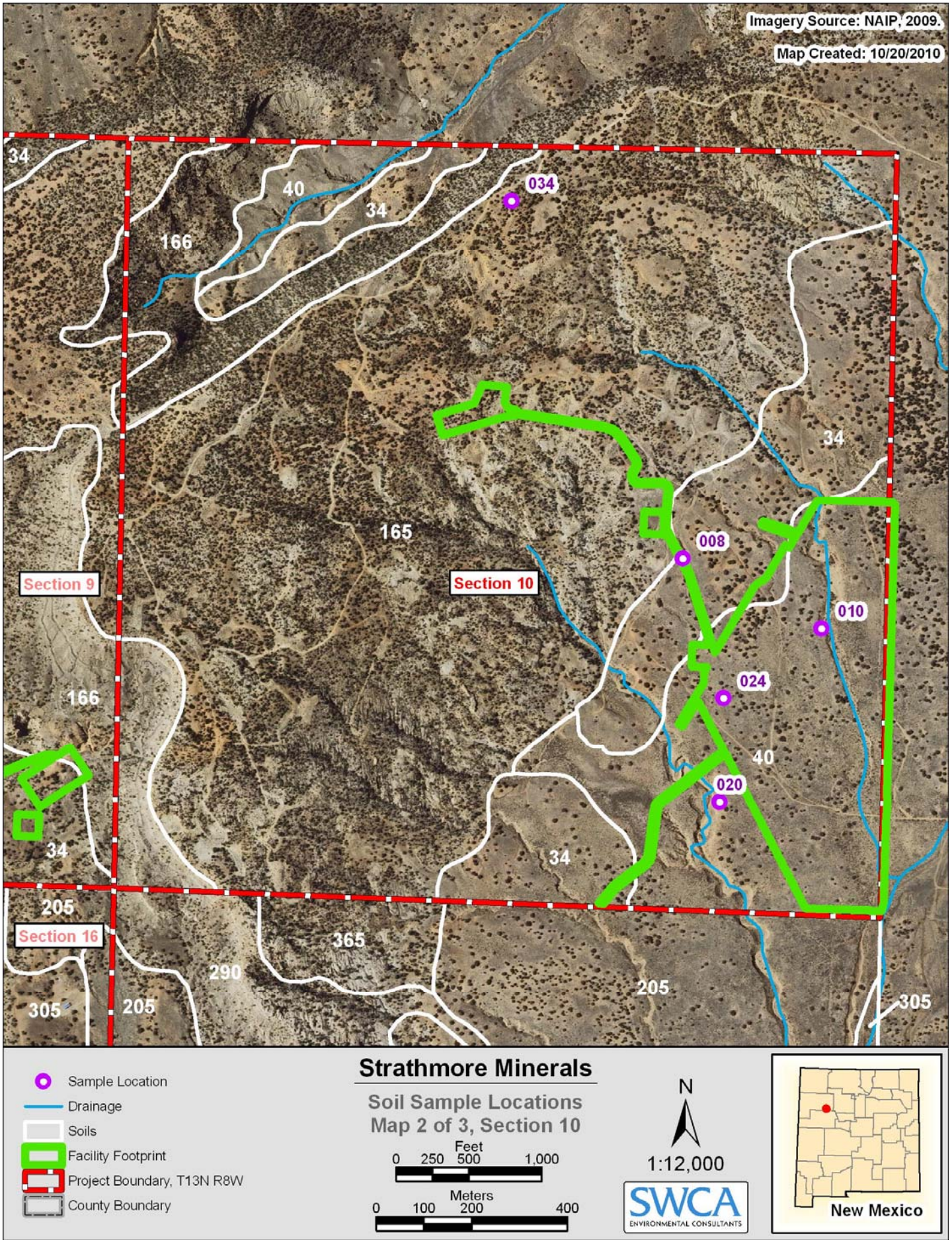
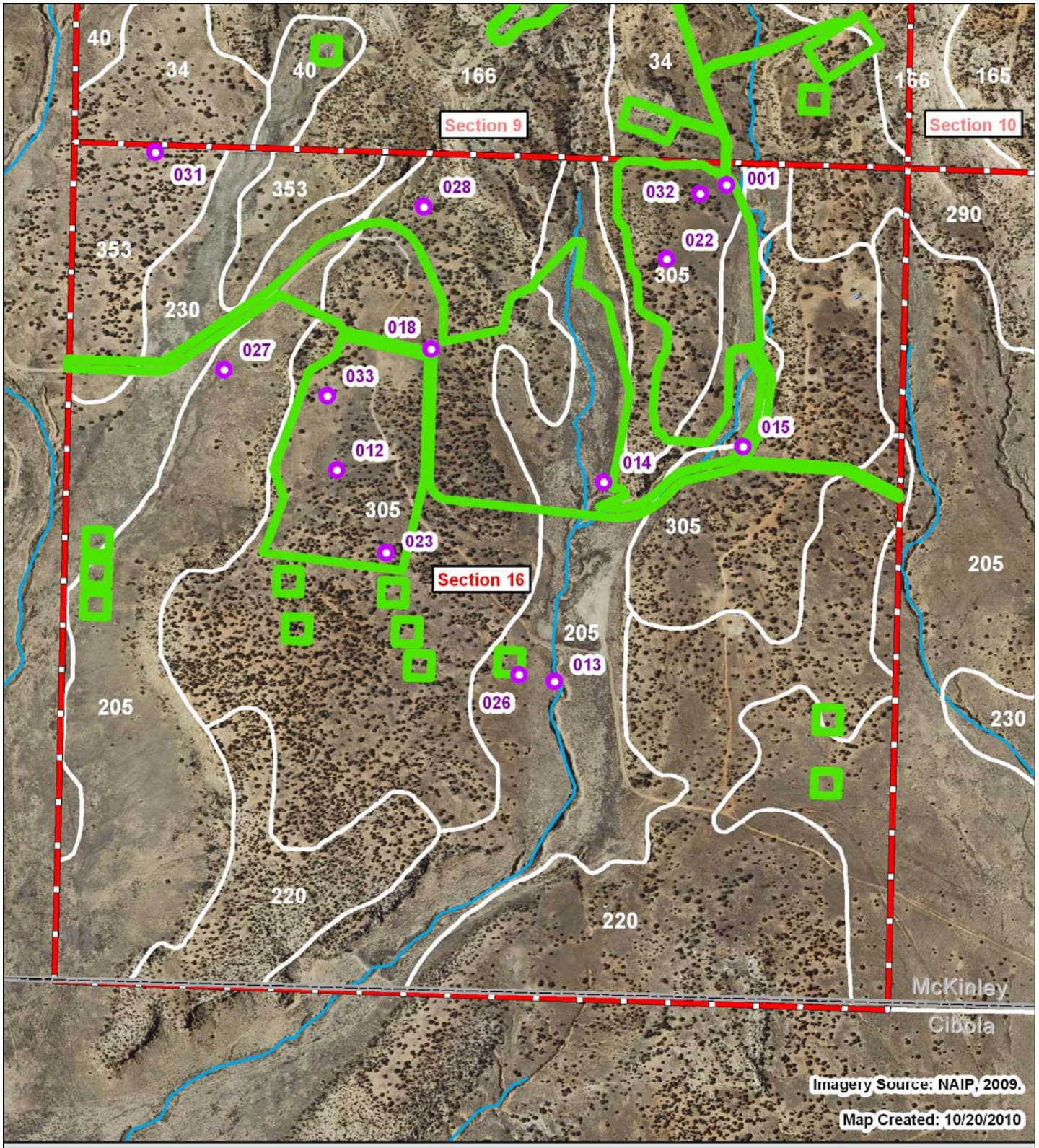
Map Created: 10/20/2010
34
200
40
166
165
Section 9
Section 10
40
34
40
166
34
40
031
353
028
Section 16
032
001
353
230
305
205
205
305
022
205
305
290
205
Sample Location
Drainage
Soils
Facility Footprint
Project Boundary, T13N R8W
County Boundary
Strathmore Minerals
Soil Sample Locations
Map 1 of 3, Section 9
Feet
0 250 500 1,000
Meters
0 100 200 400
N
1:12,000
SWCA
ENVIRONMENTAL CONSULTANTS
New Mexico


Imagery Source: NAIP, 2009.
Map Created: 10/20/2010
034
008
010
024
020
Section 9
Section 10
Section 16
34
40
166
165
205
365
290
305
Sample Location
Drainage
Soils
Facility Footprint
Project Boundary, T13N R8W
County Boundary
Strathmore Minerals
Soil Sample Locations
Map 2 of 3, Section 10
Feet
0 250 500 1,000
Meters
0 100 200 400
N
1:12,000
SWCA
ENVIRONMENTAL CONSULTANTS
New Mexico



Sample Location
Drainage
Soils
Facility Footprint
Project Boundary, T13N R8W
County Boundary

Strathmore Minerals

Soil Sample Locations
Map 3 of 3, Section 16

Feet
0 250 500 1,000

Meters
0 100 200 400

N

1:12,000

SWCA ENVIRONMENTAL CONSULTANTS

APPENDIX B

COMPLETED SOIL PROFILE DESCRIPTION FORMS

Soil Description

Soil Type 205 (SITE 013) auger (shifted out of arroyo) File No. RH10

Area	Sect 16	Date 9/28/10	Stop No.
Classification			
Location			
N. veg. (or crop)		Climate	
Parent Material			
Physiography			
Relief	level	Drainage	Salt or Alkali
Elevation		Gr. Water	Stoniness
Slope	0-1	Moisture	
Aspect		Root distrib.	
Erosion			
Permeability			
Additional notes:			
Samples (depth inches)	A 0-4		
	Bt1 4-16		
	Bt2 16-24		
	C1 24-36		
	C2 36-60		

inches

Pit Depth (60")
Bedrock ( )
Topsoil ( )

Horizon	Depth inches	Color Dry	Color Moist	Texture	Structure	Consistence Dry	Consistence Moist	Consistence Wet	Reaction	Boundary	G %	C %	S %	B %
A	0-4		7.5YR 5/3	SL	GR	S	VFR	PO/SO	SL		1			
Bt1	4-16		7.5YR 5/3	SL	SBK	SH	FR	PO/SO	NE		5			
Bt2	16-24		7.5YR 5/2	SL	SBK	MH	FR	SP/SS	NE		1			
C1	24-36		10YR 5/2	CL	MA	HA	VFI	MP/MS	NE		2			
C2	36-60		10YR 5/3	CL	MA	HA	VFI	MP/MS	NE		2			

Soil Description

Soil Type 205 (SITE 026) shifted downslope File No. RH9

Area	Sect 16	Date 9/28/10	Stop No.
Classification	Tinloy		
Location			
N. veg. (or crop)	snakeweed, SpCr, SpAi	Climate	
Parent Material			
Physiography			
Relief	0-1	Drainage	Salt or Alkali
Elevation		Gr. Water	Stoniness
Slope	0-1%	Moisture	
Aspect		Root distrib.	
Erosion			
Permeability			
Additional notes:			
Samples (depth inches)	A 0-5		
	Bt 5-18		
	C1 18-36		
	C2 36-48		
	C3 48-60		
	5YR 4/6		

inches

Pit Depth	(60")
Bedrock	( )
Topsoil	( )

Horizon	Depth inches	Color Dry	Color Moist	Texture	Structure	Consistence Dry	Consistence Moist	Consistence Wet	Reaction	Boundary	G %	C %	S %	B %
A	0-5		7.5YR 4/3	SL	GR	S	VFR	PO/SO			<1			
Bt	5-18		7.5YR 4/4	SL	SBK	SH	FR	SP/SS			<1			
C1	18-36		5YR 5/6	FSL	mA	mH	FI	PO/SO	VE		<1			
C2	36-48		7.5YR 6/4	FSL	mA	mH	FI	PO/SO	VE		<1			
C3	48-60		7.5YR 4/4	FSL	mA	mH	FI	PO/SO	VE		<1			

Soil Description

Soil Type 205 (SITE 014) ARROYO File No. RH 8

Area Sect 16 Date 9/28/10 Stop No.

Classification Tinlero

Location

N. veg. (or crop) Climate

Parent Material

Physiography

Relief Drainage Salt or Alkali

Elevation Gr. Water Stoniness

Slope Moisture

Aspect Root distrib.

Erosion

Permeability

Additional notes:

Samples (depth inches) A 0-3
Bt 3-19
C1 19-36
C2 36-60

inches

Pit Depth ( )

Bedrock ( )

Topsoil ( )

Horizon	Depth inches	Color Dry	Color Moist	Texture	Structure	Consistence Dry	Consistence Moist	Consistence Wet	Reaction	Boundary	G %	C %	S %	B %
A	0-3		10YR 5/3	CL	GR	S	VFR	SO/SS	NE		1			
Bt	3-19		10YR 5/3	FSL	SBK	MH	FI	PO/SO	NE		1			
C1	19-36		7.5YR 5/2	FSL	MA	HA	VFI	PO/SO	NE		1			
C2	36-60		7.5YR 5/2	LFS	MA	VH	VFI	PO/SO	NE		1			

Soil Description

Soil Type 705 (mapped as 305) Site 001 Arroyo File No. RH 6

Area	Sect 16	Date 9/28/10	Stop No.
Classification	Penestaja		
Location			
N. veg. (or crop)		Climate	
Parent Material			
Physiography			
Relief		Drainage	Salt or Alkali
Elevation		Gr. Water	Stoniness
Slope 3		Moisture	
Aspect E		Root distrib.	
Erosion			
Permeability			
Additional notes:			
Samples (depth inches)	A 0-4		
	Bt 4-19		
	Btk 19-48		
	C 48-72		

inches

Pit Depth (72")
Bedrock (est 80)
Topsoil ( )

Horizon	Depth inches	Color Dry	Color Moist	Texture	Structure	Consistence Dry	Consistence Moist	Consistence Wet	Reaction	Boundary	G %	C %	S %	B %
A	0-4		7.5YR 5/4	L 12%C	GR	S	VFR	PO/SO	NE		1			
Bt	4-19		7.5YR 5/4	SCL 17%C	SBK	SH	FI	SP/SS	ST		1			
Btk	19-48		7.5YR 5/3	SCL 18%C	SBK	HA	VFI	SP/SS	ST		2			
C	48-72				MA	HA	VFI	SP/SS			2			

Soil Description

Soil Type 205 (site 027) File No. RH 11

Area Sec 4 16		Date 9/29/10	Stop No.
Classification Tinfero			
Location			
N. veg. (or crop)		Climate	
Parent Material			
Physiography swale			
Relief	Drainage		Salt or Alkali
Elevation	Gr. Water		Stoniness
Slope 0-1	Moisture		
Aspect	Root distrib.		
Erosion			
Permeability			
Additional notes:			
Samples (depth inches) A 0-4			
B 4-16			
C1 16-24			
C2 24-~~36~~ 48"			
C3 ~~36~~-60			
48			

inches

Pit Depth (24") 65"

Bedrock ( )

Topsoil ( )

Horizon	Depth inches	Color Dry	Color Moist	Texture	Structure	Consistence Dry	Consistence Moist	Consistence Wet	Reaction	Boundary	G %	C %	S %	B %
A	0-4		10YR 5/4	FSL 12%C	GR	SH	FR	PO/SO	NE		<1			
B	4-16		10YR 5/4	FSL 16%C	SBK	MH	FR	SP/SS	NE		1			
C1	16-24		10YR 5/4	FSL 15%C	MA	MH	FR	PO/SO	NE		1			
C2	24-~~36~~ 48"		10YR 6/4	FSL	MA	MH	FR	PO/SO	VS		1			
C3	~~36~~-60		10YR 6/4	LFS	MA	MH	FR	PO/SO	VS		1			
	48-													

Soil Description

Soil Type 305 (site 012) Auger File No. RH 1

Area	Sect 16	Date	Stop No.
Classification	Atwayne		
Location			
N. veg. (or crop)		Climate	
Parent Material			
Physiography			
Relief		Drainage	Salt or Alkali
Elevation		Gr. Water	Stoniness
Slope	1-2	Moisture	
Aspect		Root distrib.	
Erosion			
Permeability			
Additional notes:			
Samples (depth inches)	A 0-4		
	Bt, BtK } 4-13		

inches

Pit Depth (24)
Bedrock (22)
Topsoil (4)

Horizon	Depth inches	Color Dry	Color Moist	Texture	Structure	Consistence Dry	Consistence Moist	Consistence Wet	Reaction	Boundary	G %	C %	S %	B %
A	0-4		10YR 4/3	L	GR	VFR	~~SP/SS VFR~~	SH	ST		2			
Bt	4-10		10YR 4/3	CL	SBK	FR	~~MP/SS FR~~	MH	ST		2			
Btk	10-13		10YR 4/3	CL	SBK	FI	~~MP/SS FI~~	HA	VE		5			
CR/R	13-22		10YR 5/3	L	sand stone									

Soil Description

Soil Type 305 (SITE 015) File No. RH 4

Area	Sect 16	Date	9 | 28 | 10	Stop No.	
Classification					
Location					
N. veg. (or crop)	Valve grama	Climate			
Parent Material					
Physiography					
Relief		Drainage		Salt or Alkali	
Elevation		Gr. Water		Stoniness	
Slope	5	Moisture			
Aspect	W	Root distrib.			
Erosion					
Permeability					
Additional notes:					
Samples (depth inches)	0-6" A				
	6-19" Bt				
	19-35" C				inches
	35-50" IIC			Pit Depth	( )
				Bedrock	( )
				Topsoil	( )

Horizon	Depth inches	Color Dry	Color Moist	Texture	Structure	Consistence Dry	Consistence Moist	Consistence Wet	Reaction	Boundary	G %	C %	S %	B %
A	0-6		10YR 4/3	L 12% c	GR	S	VFR	PO/SO	NE		1	-	-	-
Bt	6-19		10YR 5/3	CL/L 18-19% C	SBK	HA	FI	PS/SS	NE		1	-	-	-
C. (weak argillic)	19-35		10YR 17	CL/L 18% c	MA	HA	VFI	PS/SS	VS		2	-	-	-
IIC	35-50					VH	VFI	PS/SS	VS		3	-	-	-

Soil Description

Soil Type 305 (SITE 018) File No. RHR 3

Area		Date 9/28/10	Stop No.
Classification	Argiustoll		
Location			
N. veg. (or crop)	blue grama, juniper	Climate	
Parent Material			
Physiography			
Relief	Drainage		Salt or Alkali
Elevation	Gr. Water		Stoniness
Slope 3-5	Moisture		
Aspect E	Root distrib.		
Erosion			
Permeability			
Additional notes:			
Samples (depth inches) A 0-6"			
Btk 6-16"			

inches

Pit Depth ( )
Bedrock (16)
Topsoil ( )

Horizon	Depth inches	Color Dry	Color Moist	Texture	Structure	Consistence Dry	Consistence Moist	Consistence Wet	Reaction	Boundary	G %	C %	S %	B %
A	0-6	10YR 5/4	10YR 4/4	L 18% C	GR	SH	FR	SP/SS	VS		1			
Btk	6-16		2.5YR 5/3	CL 24% C	SBK	MA	VFI	MP/MS	ST		2			
CR/R	16-21										35			
R	21													

Soil Description

Soil Type 305 (SITE 032) NEW File No. RH 7

Area Sect 16 Date 9/28/10 Stop No.

Classification Celavar

Location

N. veg. (or crop) blue grama, juniper, 4W Climate

Parent Material

Physiography

Relief Drainage Salt or Alkali

Elevation Gr. Water Stoniness

Slope Moisture

Aspect NNE Root distrib.

Erosion

Permeability

Additional notes:

Samples (depth inches) 0-6" A

6-24" Bt

PO/SO

inches

Pit Depth ( )

Bedrock ( )

Topsoil ( )

Horizon	Depth inches	Color Dry	Color Moist	Texture	Structure	Consistence Dry	Consistence Moist	Consistence Wet	Reaction	Boundary	G %	C %	S %	B %
A	0-6		7.5 YR 4/2	SL	GR	S	VFR	SO/PO	NE		1			
Bt	6-24		7.5 YR 4/4 19-20% C	H CL	SBK	MH	FI	SP/SS	VE		3-5			

Soil Description

Soil Type 305 (SITE 033) new File No. RH 12

Area	Sect 16	Date 9/29/10	Stop No.
Classification	Alfargues		
Location			
N. veg. (or crop)	blue grama, juniper	Climate	
Parent Material			
Physiography			
Relief		Drainage	Salt or Alkali
Elevation		Gr. Water	Stoniness
Slope	2-3	Moisture	
Aspect		Root distrib.	
Erosion			
Permeability			
Additional notes:			
Samples (depth inches)	A 0-3		
	Bt1 3-14		

	inches
Pit Depth	(14)
Bedrock	( )
Topsoil	( )

Horizon	Depth inches	Color Dry	Color Moist	Texture	Structure	Consistence Dry	Consistence Moist	Consistence Wet	Reaction	Boundary	G %	C %	S %	B %
A	0-3		10YR 4/4	SL 14-15% C	GR	S	VFR	PO/SO	NE		1			
Bt1	3-7		7.5YR 5/3	CL-L 20% C	SBK	MH	FI	SP/SS	SL		5			
Bt2	7-14		5YR 6/4	SCL 25% C	SBK	HA	VFI	MP/MS	ST		15			

Soil Description

Soil Type 305 (SITE 022) File No. RHS

Area Date 9/28/10 Stop No.

Classification Atarque

Location

N. veg. (or crop) Blue grama, pinon pine Climate

Parent Material

Physiography

Relief Drainage Salt or Alkali

Elevation Gr. Water Stoniness

Slope 5 Moisture

Aspect E Root distrib.

Erosion

Permeability

Additional notes:

Samples (depth inches) A 0-4"

Bt 4-16"

inches

Pit Depth ( )

Bedrock (18")

Topsoil ( )

Horizon	Depth inches	Color Dry	Color Moist	Texture	Structure	Consistence Dry	Consistence Moist	Consistence Wet	Reaction	Boundary	G %	C %	S %	B %
A	0-4		10YR 5/4	L 14% C	1GR	S	VFR	PO/SO	ST		1			
Bt	4-16		10YR 4/4	CL 18% C	SBK	MH	FI	SP/SS	VE		3			
Cr	16-20													
R	20													

Soil Description

Soil Type 305 (SITE 023) File No. RH 2

Area		Date 9/28/10	Stop No.
Classification	Celeavar		
Location			
N. veg. (or crop)		Climate	
Parent Material			
Physiography			
Relief		Drainage	Salt or Alkali
Elevation		Gr. Water	Stoniness
Slope 4-5		Moisture	
Aspect E		Root distrib.	
Erosion			
Permeability			
Additional notes:			
Samples (depth inches)	0-7 A		
	7-17 Bt		
	17-24 C		

inches

Pit Depth ( )

Sandstone Bedrock R (23)

Topsoil ( )

Horizon	Depth inches	Color Dry	Color Moist	Texture	Structure	Consistence Dry	Consistence Moist	Consistence Wet	Reaction	Boundary	G %	C %	S %	B %
A	0-7		7.5YR 4/2	SL 9% C	GR	S	VFR	PO/SO	NE		1	-	-	-
Bt	7-17		5YR 5/4	SCL 20% C	SBK	MH	FI	SP/SS	VS		2	-	-	-
C	17-24		5YR 5/4	SCL 20% C -21%	MA	HA	VFI	SHP/MS	SL		4	-	-	-

Soil Description

Soil Type 166 out of 305 (site 028) File No. RH 13

Area	Sect 16	Date 9/29/10	Stop No.
Classification	Tinaro		
Location			
N. veg. (or crop)	blue grama, juniper	Climate	
Parent Material			
Physiography			
Relief		Drainage	Salt or Alkali
Elevation		Gr. Water	Stoniness
Slope	2-3	Moisture	
Aspect	S	Root distrib.	
Erosion			
Permeability			
Additional notes:			
Samples (depth inches)	A 0-5		
	Bt 5-13		
	Btk 13-21		
	Bk ~~C~~ 21-36		
	C ~~36~~ 36-60		

inches

Pit Depth (30) 60" 40" auger

Bedrock ( )

Topsoil ( )

Horizon	Depth inches	Color Dry	Color Moist	Texture	Structure	Consistence Dry	Consistence Moist	Consistence Wet	Reaction	Boundary	G %	C %	S %	B %
A	0-5		10YR 5/4	SL 14% C	GR	S	VFR	PO/SO	NE		1			
Bt	5-13		10 YR 5/4	SL 18% C	SBK	SH	FR	SP/SS	SL		1			
Btk	13-21		10 YR 6/6	FSL	SBK	MH	FI	PO/SO	ST		1			
Bk	21-36		10YR 5/4	SL	SBK	MA	VFI	PO/SO	ST		1			
C	36-60		10 YR 5/4	~~LFS~~ FSL	MA	MA	VFI	PO/SO	SL		1			
	shale @ 60				[illegible]									

Soil Description

Soil Type 34 (SITE 008 shifted) File No. RH 18

Area Sect 10 Date 9/29/10 Stop No.

Classification Inceptisol

Location

N. veg. (or crop) blue grama, saltbush 4w Climate

Parent Material

Physiography

Relief Drainage Salt or Alkali

Elevation Gr. Water Stoniness

Slope 4% Moisture

Aspect Root distrib.

Erosion

Permeability

Additional notes:

Samples (depth inches) A 0-6
Bw 6-20
Bk 20-36
Bw1 36-48
Bw2 48-60

inches

Pit Depth (60")

Bedrock ( )

Topsoil ( )

Horizon	Depth inches	Color Dry	Color Moist	Texture	Structure	Consistence Dry	Consistence Moist	Consistence Wet	Reaction	Boundary	G %	C %	S %	B %
A	0-6		10YR 5/3	SL	GR	S	VFR	PO/SO	NE		<1			
Bw	6-20		10YR 5/3	SL	SBK	mH	FR	SO/PO	NE		1			
Bk	20-36		10YR 5/3	SL 12% C	SBK	mH	FI	SP/SS	ST-V		2			
Bw1	36-48		10YR 4/3	SL	SBK	HA	FI	SP/SS	V		3			
Bw2	48-60		7.5YR 5/4 5/3	SL- ↓ a little heavier	SBK	mH	FR	SO/SO	V		3			

Soil Description

Soil Type 40 (site 010) shifted Arroyo cut File No. RH15

Area Sect 10		Date 9/29/10	Stop No.
Classification			
Location			
N. veg. (or crop)		Climate	
Parent Material			
Physiography			
Relief	Drainage		Salt or Alkali
Elevation	Gr. Water		Stoniness
Slope	Moisture		
Aspect	Root distrib.		
Erosion			
Permeability			
Additional notes:			
Samples (depth inches)			

inches

Pit Depth ( )

Bedrock ( )

Topsoil ( )

Horizon	Depth inches	Color Dry	Color Moist	Texture	Structure	Consistence Dry	Consistence Moist	Consistence Wet	Reaction	Boundary	G %	C %	S %	B %
0-4	A		10 YR 4/3	LFS	GR	S	VFR	PO/SO	NE		1			
4-12	Bw1		10 YR 4/3	SL 9% C	SBK	SH	FR	PO/SO	NE		1			
12-22	Bw2		10 YR 4/3	FSL 10% C	SBK	MH	FR	PO/SO	NE		1			
22-48	Bw3		10 YR 4/3	SL 10% C	SBK	MH	FI	PO/SO	NE		2			
48-60	Bk		10 YR 5/3	SL 10% C	mA	HA	VFI	PO/SO	ST		2			

Soil Description

Soil Type 40 site 020 (relocated) File No. RH 16

Area	Sect 10	Date 7/22/10	Stop No.
Classification	Typic haplargid // typic haplustalf (Timbre)		
Location			
N. veg. (or crop)		Climate	
Parent Material			
Physiography			
Relief	Drainage		Salt or Alkali
Elevation	Gr. Water		Stoniness
Slope	Moisture		
Aspect	Root distrib.		
Erosion			
Permeability			
Additional notes:			
Samples (depth inches)	0-6 A		
	6-14 AB/Bw		
	14-30 Bt		
	30-42 Btk		
	42-60 Bk/C		

inches

Pit Depth ( )
Bedrock ( )
Topsoil ( )

Horizon	Depth inches	Color Dry	Color Moist	Texture	Structure	Consistence Dry	Consistence Moist	Consistence Wet	Reaction	Boundary	G %	C %	S %	B %
A	0-6		10YR 4/3	FSL 8%C	GR	S	VFR	PO/SO	NE		<1			
AB/Bw	6-14		10YR 4/3	FSL 10%C	SBK	SH	FR	PO/SO	NE		<1			
Bt	14-30		7.5YR 4/3	FSL 13%C	SBK	MH	FR	PO/SS	NE		<1			
Btk	30-42		10YR 4/3	SL 12%C	SBK	MH	FR	PO/SO	SL		<1			
Bk	42-46		10YR 4/4	SL 10%C	MA	HA	VFI	PO/SO	ST		<1			
C	46-60		10YR 4/4	LFS 5%C	MA	MH	FR	PO/SO	SL		<1			

Soil Description

Soil Type 40 SITE 024 File No. RH 17

Area		Date 9/29/10	Stop No.
Classification	Tinhero (poorly developed)		
Location	Coarse Loamy	Ustorept	
N. veg. (or crop)		Climate	
Parent Material			
Physiography			
Relief	Drainage		Salt or Alkali
Elevation	Gr. Water		Stoniness
Slope 2-3	Moisture		
Aspect	Root distrib.		
Erosion			
Permeability			
Additional notes:			
Samples (depth inches)	0-5 A		
	5-14 Bw1		
	14-26 Bw2		
	26-36 C1		
	36-60 C2		

inches

Pit Depth ( )
Bedrock ( )
Topsoil ( )

Horizon	Depth inches	Color Dry	Color Moist	Texture	Structure	Consistence Dry	Consistence Moist	Consistence Wet	Reaction	Boundary	G %	C %	S %	B, %
A	0-5		10YR 4/3	SL	GR	S	VFR	Po/So	NE		21			
Bw1	5-14		10YR 4/4	SL	SBK	SH	FR	Po/So	NE		c1			
Bw2	14-26		10YR 4/4	SL	SBK	SH	FR	Po/So	NE		c1			
C1	26-36	4/4-5/4	10YR	LS	MA	MH	FI	↓	ST		c1			
C2	36-60		10YR 4/3	LS	MA	MH	FI	↓	ST		c1			

Soil Description

Soil Type 165 SITE 034 (new) File No. RH 19

Area Sect 10 Date 9/29/10 Stop No.

Classification Loamy lithic halplusalfs

Location

N. veg. (or crop) Climate

Parent Material

Physiography

Relief Drainage Salt or Alkali

Elevation Gr. Water Stoniness

Slope 12-15 Moisture

Aspect E Root distrib.

Erosion

Permeability

Additional notes:

Samples (depth inches) A 0-2

2-11

inches

Pit Depth ( )

Bedrock (11)

Topsoil ( )

Horizon	Depth inches	Color Dry	Color Moist	Texture	Structure	Consistence Dry	Consistence Moist	Consistence Wet	Reaction	Boundary	G %	C %	S %	B %
A	0-2		7.5YR 4/3	L	GR	S	VFR	SP/SS	NE		10			
Bt	2-11		7.5YR 5/3	CL	SBK	MH	FR	MP/MS	VE		15			
R														

APPENDIX C

SOIL LABORATORY ANALYSIS RESULTS

LABORATORY ANALYTICAL REPORT

Client: SWCA
Project: Roca Honda Mine
Workorder: C10100185

Report Date: 12/01/10
Date Received: 10/05/10

	Analysis	No_ 140 Sieve,	No_ 35 Sieve,	No_ 60 Sieve,	Pan	pH SatPst	EC SatPst	Ca SatPst	Mg SatPst	Na SatPst	SAR	Lime as CaCO3	Organic Matter	Se-ABDPTA
	Units	%	%	%	%	s_u_	mmhos/cm	meq/L	meq/L	meq/L	unitless	%	%	mg/kg-dry
Sample ID	Client Sample ID	Results	Results	Results	Results	Results	Results	Results	Results	Results	Results	Results	Results	Results
C10100185-001	PR Sec 24, Site 001, A	36	0	3	61	7.0	0.44	2.43	1.25	0.15	0.1	0.68	1.2	0.04
C10100185-002	PR Sec 24, Site 001, B	36	0	3	60	7.3	0.31	1.87	0.80	0.17	0.1	0.82	0.74	0.05
C10100185-003	PR Sec 24, Site 001, C	43	0	3	54	7.6	0.30	1.81	0.85	0.19	0.2	0.72	0.55	0.03
C10100185-004	PR Sec 24, Site 002, A	11	0	2	87	8.1	0.44	3.44	0.62	0.16	0.1	6.06	0.68	0.02
C10100185-005	PR Sec 24, Site 002, BT	11	0	0	88	8.0	0.39	2.89	0.61	0.32	0.2	5.77	0.33	0.01
C10100185-006	PR Sec 24, Site 002, BK	11	12	2	75	7.6	2.16	25.8	2.91	0.63	0.2	8.93	0.55	0.01
C10100185-007	PR Sec 24, Site 002, C	9	8	2	82	7.5	2.12	23.4	3.63	1.11	0.3	7.38	0.68	0.01
C10100185-008	PR Sec 24, Site 003, A	16	1	2	81	8.1	1.22	5.92	3.17	0.23	0.1	6.22	2.1	0.02
C10100185-009	PR Sec 24, Site 003, B	19	1	0	79	7.7	2.94	21.3	12.2	0.71	0.2	7.01	0.90	0.02
C10100185-010	PR Sec 24, Site 003, C	18	0	0	80	7.8	3.88	25.7	23.9	2.56	0.5	7.89	0.62	< 0.01
C10100185-011	PR Sec 24, Site 004, A	1	0	0	98	7.8	2.85	12.0	5.26	0.44	0.2	5.69	4.6	0.04
C10100185-012	PR Sec 24, Site 004, B1	2	0	0	97	7.7	1.17	7.16	1.67	0.34	0.2	4.92	3.3	0.03
C10100185-013	PR Sec 24, Site 004, B2	5	0	0	95	7.8	0.33	1.58	0.35	0.84	0.9	5.52	1.4	0.02
C10100185-014	PR Sec 24, Site 004, C1	9	0	0	91	7.6	0.31	2.17	0.38	0.22	0.2	6.18	0.87	0.02
C10100185-015	PR Sec 24, Site 004, C2	8	0	0	92	7.7	0.37	2.57	0.47	0.15	0.1	5.70	0.84	0.01
C10100185-016	RHR Sec 10, Site 020, A	58	0	16	26	7.6	0.50	3.71	0.95	0.09	< 0.1	0.35	0.62	0.02
C10100185-017	RHR Sec 10, Site 020, AW/BW	58	0	15	27	7.9	0.34	2.68	0.44	0.14	0.1	0.48	0.43	0.01
C10100185-018	RHR Sec 10, Site 020, BT	55	0	20	25	7.9	0.44	3.03	0.72	0.21	0.2	0.45	0.43	0.02
C10100185-019	RHR Sec 10, Site 020, BTK	56	0	20	23	8.0	0.48	3.02	0.85	0.35	0.2	2.16	0.24	0.01
C10100185-020	RHR Sec 10, Site 020, BK/C	56	1	28	14	8.2	0.40	2.07	1.11	0.19	0.1	1.51	0.21	< 0.01
C10100185-021	RHR Sec 10, Site 010, A	38	1	30	30	7.4	0.39	1.73	0.91	< 0.04	< 0.1	0.37	1.0	0.02
C10100185-022	RHR Sec 10, Site 010, BW1	30	2	40	28	7.7	0.32	1.72	0.72	0.08	< 0.1	0.32	0.71	0.02
C10100185-023	RHR Sec 10, Site 010, BW2	33	2	42	23	7.9	0.30	1.65	0.65	0.06	< 0.1	0.30	0.49	< 0.01
C10100185-024	RHR Sec 10, Site 010, BW3	37	0	31	31	7.9	0.59	4.00	1.18	0.40	0.3	0.48	0.52	< 0.01
C10100185-025	RHR Sec 10, Site 010, BK	36	0	38	26	7.9	1.28	8.83	3.39	0.88	0.4	1.00	0.39	< 0.01
C10100185-026	RHR Sec 16, Site 031, A	29	2	37	32	6.6	0.26	1.76	0.60	0.07	< 0.1	0.28	0.90	0.03
C10100185-027	RHR Sec 16, Site 031, B	31	2	34	33	7.2	0.39	2.63	0.92	0.16	0.1	0.40	0.58	0.04
C10100185-028	RHR Sec 16, Site 031, C	25	4	46	24	7.7	0.37	2.43	0.98	0.35	0.3	0.27	0.52	0.02
C10100185-029	RHR Sec 16, Site 031, C2	45	2	36	17	8.2	0.38	2.20	0.84	0.50	0.4	0.49	0.30	0.01
C10100185-030	RHR Sec 16, Site 031, C3	45	2	35	18	8.0	0.76	4.23	1.62	1.40	0.8	0.52	0.24	< 0.01
C10100185-031	RHR Sec 16, Site 028, A	43	0	10	46	7.8	0.57	4.34	1.06	0.54	0.3	2.04	1.1	0.01
C10100185-032	RHR Sec 16, Site 028, BT	44	1	10	45	7.7	0.40	3.40	0.61	0.17	0.1	0.94	0.99	0.02
C10100185-033	RHR Sec 16, Site 028, BTK	42	1	15	42	7.9	0.53	2.58	0.82	1.44	1.1	1.58	0.71	< 0.01
C10100185-034	RHR Sec 16, Site 028, BK	41	0	5	54	7.9	0.45	2.12	0.81	1.54	1.3	1.78	0.68	< 0.01
C10100185-035	RHR Sec 16, Site 028, C	9	0	0	90	7.8	1.92	12.6	6.60	3.42	1.1	2.80	0.65	0.02

LABORATORY ANALYTICAL REPORT

Client: SWCA
Project: Roca Honda Mine
Workorder: C10100185

Report Date: 12/01/10
Date Received: 10/05/10

		Analysis	U Chemical	B-CACL2	Ra226 Chemical	Ra226 ± Chemical	Ra226 MDC	Sand	Silt	Clay	Texture
		Units	mg/kg-dry	mg/kg-dry	pCi/g-dry	pCi/g-dry	pCi/g-dry	%	%	%	%
Sample ID	Client Sample ID		Results	Results	Results	Results	Results	Results	Results	Results	Results
C10100185-001	PR Sec 24, Site 001, A		0.6	0.6	0.8	0.1	0.08	56	22	22	SCL
C10100185-002	PR Sec 24, Site 001, B		0.5	0.7	0.8	0.1	0.08	56	16	28	SCL
C10100185-003	PR Sec 24, Site 001, C		< 0.5	0.4	0.6	0.1	0.09	58	14	28	SCL
C10100185-004	PR Sec 24, Site 002, A		0.7	0.6	0.7	0.1	0.07	50	26	24	SCL
C10100185-005	PR Sec 24, Site 002, BT		0.7	0.4	0.7	0.1	0.07	56	24	20	SCL
C10100185-006	PR Sec 24, Site 002, BK		0.7	0.5	0.7	0.1	0.06	54	22	24	SCL
C10100185-007	PR Sec 24, Site 002, C		1.0	0.5	1	0.1	0.07	48	20	32	SCL
C10100185-008	PR Sec 24, Site 003, A		0.5	1.5	0.7	0.1	0.1	58	22	20	SCL
C10100185-009	PR Sec 24, Site 003, B		0.6	0.9	0.6	0.1	0.07	56	20	24	SCL
C10100185-010	PR Sec 24, Site 003, C		0.6	0.8	0.6	0.1	0.09	54	22	24	SCL
C10100185-011	PR Sec 24, Site 004, A		0.9	2.0	1.1	0.1	0.08	16	48	36	SiCL
C10100185-012	PR Sec 24, Site 004, B1		0.8	0.9	0.9	0.1	0.08	22	40	38	CL
C10100185-013	PR Sec 24, Site 004, B2		0.9	0.5	1	0.1	0.08	12	40	48	C
C10100185-014	PR Sec 24, Site 004, C1		0.8	0.4	0.8	0.1	0.08	26	38	36	CL
C10100185-015	PR Sec 24, Site 004, C2		0.7	0.4	0.7	0.1	0.08	36	34	30	CL
C10100185-016	RHR Sec 10, Site 020, A		< 0.5	0.3	0.2	0.08	0.08	82	6	12	SL
C10100185-017	RHR Sec 10, Site 020, AW/BW		< 0.5	0.3	0.3	0.09	0.09	80	8	12	SL
C10100185-018	RHR Sec 10, Site 020, BT		< 0.5	0.2	0.6	0.1	0.09	80	8	12	SL
C10100185-019	RHR Sec 10, Site 020, BTK		< 0.5	< 0.2	0.3	0.09	0.09	80	10	10	SL
C10100185-020	RHR Sec 10, Site 020, BK/C		< 0.5	< 0.2	0.2	0.08	0.08	88	4	8	LS
C10100185-021	RHR Sec 10, Site 010, A		< 0.5	0.5	0.3	0.09	0.08	80	10	10	SL
C10100185-022	RHR Sec 10, Site 010, BW1		< 0.5	0.8	0.6	0.1	0.08	80	8	12	SL
C10100185-023	RHR Sec 10, Site 010, BW2		< 0.5	0.7	0.3	0.09	0.09	78	12	10	SL
C10100185-024	RHR Sec 10, Site 010, BW3		< 0.5	0.4	0.6	0.1	0.09	74	11	15	SL
C10100185-025	RHR Sec 10, Site 010, BK		< 0.5	0.3	0.3	0.09	0.09	80	8	12	SL
C10100185-026	RHR Sec 16, Site 031, A		0.6	0.4	0.6	0.1	0.09	76	16	8	SL
C10100185-027	RHR Sec 16, Site 031, B		< 0.5	0.3	0.4	0.1	0.09	68	15	17	SL
C10100185-028	RHR Sec 16, Site 031, C		< 0.5	< 0.2	0.4	0.1	0.08	78	11	11	SL
C10100185-029	RHR Sec 16, Site 031, C2		< 0.5	< 0.2	0.3	0.09	0.09	86	5	9	LS
C10100185-030	RHR Sec 16, Site 031, C3		< 0.5	0.3	0.3	0.09	0.08	84	6	10	LS
C10100185-031	RHR Sec 16, Site 028, A		0.6	< 0.2	0.8	0.1	0.08	64	16	20	SCL
C10100185-032	RHR Sec 16, Site 028, BT		0.7	0.2	0.7	0.1	0.08	70	16	14	SL
C10100185-033	RHR Sec 16, Site 028, BTK		0.7	< 0.2	0.7	0.1	0.08	62	19	19	SL
C10100185-034	RHR Sec 16, Site 028, BK		1	0.3	0.8	0.1	0.09	40	41	19	L
C10100185-035	RHR Sec 16, Site 028, C		1.1	0.4	1	0.1	0.08	40	33	27	CL

LABORATORY ANALYTICAL REPORT

Client: SWCA
Project: Roca Honda Mine
Workorder: C10100185

Report Date: 12/01/10
Date Received: 10/05/10

	Analysis	No_ 140 Sieve,	No_ 35 Sieve,	No_ 60 Sieve,	Pan	pH SatPst	EC SatPst	Ca SatPst	Mg SatPst	Na SatPst	SAR	Lime as CaCO3	Organic Matter	Se-ABDPTA
	Units	%	%	%	%	s_u_	mmhos/cm	meq/L	meq/L	meq/L	unitless	%	%	mg/kg-dry
Sample ID	**Client Sample ID**	**Results**	**Results**	**Results**	**Results**	**Results**	**Results**	**Results**	**Results**	**Results**	**Results**	**Results**	**Results**	**Results**
C10100185-036	RHR Sec 10, Site 034, A	53	0	14	32	6.8	0.40	2.32	0.80	0.66	0.5	0.37	1.2	0.04
C10100185-037	RHR Sec 10, Site 034, 4-11A	28	0	9	62	7.4	0.77	4.59	1.30	1.78	1.0	4.86	1.7	0.04

LABORATORY ANALYTICAL REPORT

Client: SWCA
Project: Roca Honda Mine
Workorder: C10100163

Report Date: 11/29/10
Date Received: 10/05/10

	Analysis	No_ 140 Sieve,	No_ 35 Sieve,	No_ 60 Sieve,	Pan	pH SatPst	EC SatPst	Ca SatPst	Mg SatPst	Na SatPst	SAR	Lime as CaCO3	Organic Matter	Se-ABDPTA
	Units	%	%	%	%	s_u_	mmhos/cm	meq/L	meq/L	meq/L	unitless	%	%	mg/kg-dry
Sample ID	Client Sample ID	Results	Results	Results	Results	Results	Results	Results	Results	Results	Results	Results	Results	Results
C10100163-001	RHR Sec 10, Site 008, A	39	2	27	32	6.2	0.37	2.65	0.78	0.15	0.1	0.35	0.82	0.03
C10100163-002	RHR Sec 10, Site 008 BW	41	0	23	35	6.9	0.50	3.49	0.94	0.19	0.1	0.62	0.46	0.02
C10100163-003	RHR Sec 10, Site 008 BK	32	1	31	36	7.2	0.44	2.27	0.99	0.58	0.5	1.75	0.36	0.02
C10100163-004	RHR Sec 10, Site 008 BW1	36	0	32	32	7.3	0.99	5.61	2.75	1.73	0.8	1.37	0.23	0.02
C10100163-005	RHR Sec 10, Site 008 BW2	32	0	32	35	7.3	0.86	4.59	1.85	2.35	1.3	1.99	0.26	0.01
C10100163-006	RHR Sec 10, Site 024, A	35	1	26	38	7.1	0.40	3.21	0.42	0.18	0.1	1.05	0.62	0.02
C10100163-007	RHR Sec 10, Site 024, BW1	46	0	26	27	8.1	0.47	3.88	0.59	0.40	0.3	0.45	0.33	0.02
C10100163-008	RHR Sec 10, Site 024, BW2	45	1	31	22	7.9	0.93	6.35	1.52	0.34	0.2	1.47	0.26	0.02
C10100163-009	RHR Sec 10, Site 024, C	46	0	31	22	8.0	0.81	5.56	1.50	0.42	0.2	0.73	0.13	0.01
C10100163-010	RHR Sec 10, Site 024, C2	49	1	28	22	8.2	0.44	2.91	1.04	0.35	0.2	1.13	0.07	< 0.01
C10100163-011	RHR Sec 16, Site 001, A	35	1	27	37	7.5	0.33	2.32	0.75	0.07	< 0.1	0.44	0.59	0.03
C10100163-012	RHR Sec 16, Site 001, BT	43	1	26	30	8.1	0.27	1.24	0.48	0.56	0.6	0.66	0.33	0.02
C10100163-013	RHR Sec 16, Site 001, BTK	42	2	22	34	8.2	0.44	1.91	1.00	1.04	0.9	1.64	0.10	0.01
C10100163-014	RHR Sec 16, Site 001, C	46	2	25	27	7.9	3.57	16.9	12.4	6.8	1.8	1.77	< 0.02	0.02
C10100163-015	RHR Sec 16, Site 014, A	10	3	6	82	7.1	4.12	23.2	11.3	0.3	< 0.1	1.63	4.6	0.06
C10100163-016	RHR Sec 16, Site 014, BT	28	0	13	59	7.6	0.95	7.08	1.53	0.19	< 0.1	1.28	2.3	0.04
C10100163-017	RHR Sec 16, Site 014, C1	40	1	25	34	7.6	0.78	6.13	1.27	0.41	0.2	0.59	0.75	0.03
C10100163-018	RHR Sec 16, Site 014, C2	44	2	23	30	7.5	1.29	9.57	2.76	0.82	0.3	0.62	0.56	0.02
C10100163-019	RHR Sec 16, Site 022, A	44	2	8	47	7.8	0.42	3.95	0.44	0.20	0.1	3.43	1.8	0.02
C10100163-020	RHR Sec 16, Site 022 BT	37	2	10	51	7.8	0.39	3.11	0.74	0.24	0.2	7.63	1.1	0.02
C10100163-021	RHR Sec 16, Site 032, A	49	0	10	41	7.8	0.37	3.44	0.44	0.17	0.1	1.14	0.65	0.01
C10100163-022	RHR Sec 16, Site 032, BT	30	0	3	67	7.8	0.63	3.26	0.86	2.20	1.5	7.00	0.82	0.02
C10100163-023	RHR Sec 16, Site 027, A	45	0	9	46	7.6	0.42	2.86	1.04	0.15	0.1	1.54	1.1	0.02
C10100163-024	RHR Sec 16, Site 027, B	44	0	14	41	8.0	0.37	2.22	0.73	0.30	0.2	2.44	0.36	0.01
C10100163-025	RHR Sec 16, Site 027, C1	46	0	16	38	8.0	0.62	3.71	1.05	1.08	0.7	2.11	0.33	< 0.01
C10100163-026	RHR Sec 16, Site 027, C2	35	0	13	52	7.6	2.64	25.5	5.35	1.84	0.5	2.28	0.62	0.02
C10100163-027	RHR Sec 16, Site 027, C3	36	1	32	31	7.7	2.40	23.5	5.03	1.04	0.3	1.97	0.20	< 0.01
C10100163-028	RHR Sec 16, Site 033, A	38	0	14	47	6.8	0.28	1.55	0.68	0.14	0.1	0.43	1.2	0.02
C10100163-029	RHR Sec 16, Site 033 B	20	1	23	55	7.8	0.35	2.29	1.02	0.35	0.3	1.55	1.0	0.02
C10100163-030	PR Sec 24, Site 005, A	47	0	1	52	8.6	0.76	2.03	1.40	0.28	0.2	4.40	1.3	0.02
C10100163-031	PR Sec 24, Site 005, BT	25	0	4	70	7.7	3.78	11.0	6.65	0.36	0.1	4.91	0.65	0.02
C10100163-032	PR Sec 24 Site 005, C	41	0	2	56	7.8	1.88	15.4	5.43	1.01	0.3	6.12	0.46	< 0.01
C10100163-033	RHR Sec 16, Site 013, A	23	3	33	42	7.3	0.19	1.07	0.28	0.12	0.1	0.55	0.74	0.02
C10100163-034	RHR Sec 16, Site 013, BT	30	10	25	34	7.9	0.42	2.63	0.96	0.38	0.3	2.27	1.6	0.01
C10100163-035	RHR Sec 16, Site 013,BT2	30	9	31	30	7.9	0.41	2.29	0.91	0.55	0.4	1.58	1.0	< 0.01
C10100163-036	RHR Sec 16, Site 013, C1	21	3	12	64	7.8	1.51	8.79	3.18	1.68	0.7	2.05	1.2	0.05
C10100163-037	RHR Sec 16, Site 013, C2	24	1	3	72	7.8	1.12	7.58	1.97	1.31	0.6	1.88	1.4	0.05

LABORATORY ANALYTICAL REPORT

Client: SWCA
Project: Roca Honda Mine
Workorder: C10100163

Report Date: 11/29/10
Date Received: 10/05/10

		Analysis	U Chemical	B-CACL2	Ra226 Chemical	Ra226 ± Chemical	Ra226 MDC	Sand	Silt	Clay	Texture
		Units	mg/kg-dry	mg/kg-dry	pCi/g-dry	pCi/g-dry	pCi/g-dry	%	%	%	%
Sample ID	Client Sample ID		Results	Results	Results	Results	Results	Results	Results	Results	Results
C10100163-001	RHR Sec 10, Site 008, A		< 0.5	0.3	0.5	0.1	0.08	72	17	11	SL
C10100163-002	RHR Sec 10, Site 008 BW		< 0.5	0.6	0.6	0.1	0.07	71	12	17	SL
C10100163-003	RHR Sec 10, Site 008 BK		< 0.5	0.5	0.5	0.1	0.07	68	14	18	SL
C10100163-004	RHR Sec 10, Site 008 BW1		< 0.5	0.7	0.5	0.1	0.08	72	12	16	SL
C10100163-005	RHR Sec 10, Site 008 BW2		< 0.5	0.7	0.5	0.1	0.08	76	10	14	SL
C10100163-006	RHR Sec 10, Site 024, A		< 0.5	0.3	0.6	0.1	0.07	66	19	15	SL
C10100163-007	RHR Sec 10, Site 024, BW1		< 0.5	< 0.2	0.4	0.1	0.09	78	9	13	SL
C10100163-008	RHR Sec 10, Site 024, BW2		< 0.5	< 0.2	0.3	0.09	0.09	82	10	8	LS
C10100163-009	RHR Sec 10, Site 024, C		< 0.5	< 0.2	0.3	0.1	0.1	80	8	12	SL
C10100163-010	RHR Sec 10, Site 024, C2		< 0.5	0.2	0.3	0.09	0.09	76	10	14	SL
C10100163-011	RHR Sec 16, Site 001, A		0.5	< 0.2	0.5	0.1	0.09	68	18	14	SL
C10100163-012	RHR Sec 16, Site 001, BT		< 0.5	0.4	0.4	0.1	0.1	72	10	18	SL
C10100163-013	RHR Sec 16, Site 001, BTK		< 0.5	< 0.2	0.4	0.1	0.1	72	12	16	SL
C10100163-014	RHR Sec 16, Site 001, C		< 0.5	0.6	0.4	0.1	0.1	72	12	16	SL
C10100163-015	RHR Sec 16, Site 014, A		2.1	0.6	1.5	0.2	0.08	24	39	37	CL
C10100163-016	RHR Sec 16, Site 014, BT		1.1	< 0.2	0.6	0.1	0.08	54	24	22	SCL
C10100163-017	RHR Sec 16, Site 014, C1		0.7	< 0.2	0.4	0.1	0.08	62	18	20	SCL
C10100163-018	RHR Sec 16, Site 014, C2		0.5	< 0.2	0.6	0.1	0.08	70	11	19	SL
C10100163-019	RHR Sec 16, Site 022, A		0.7	< 0.2	1	0.1	0.08	66	16	18	SL
C10100163-020	RHR Sec 16, Site 022 BT		0.6	< 0.2	0.7	0.1	0.08	58	22	20	SCL
C10100163-021	RHR Sec 16, Site 032, A		< 0.5	0.3	0.4	0.1	0.09	71	17	12	SL
C10100163-022	RHR Sec 16, Site 032, BT		0.8	0.5	0.7	0.1	0.09	44	26	30	CL
C10100163-023	RHR Sec 16, Site 027, A		0.8	0.3	0.8	0.1	0.08	60	20	20	SCL
C10100163-024	RHR Sec 16, Site 027, B		0.6	0.3	0.5	0.1	0.09	67	15	18	SL
C10100163-025	RHR Sec 16, Site 027, C1		0.7	< 0.2	0.7	0.1	0.08	61	19	20	SCL
C10100163-026	RHR Sec 16, Site 027, C2		0.7	0.3	0.6	0.1	0.08	55	23	22	SCL
C10100163-027	RHR Sec 16, Site 027, C3		< 0.5	< 0.2	0.3	0.1	0.09	70	13	17	SL
C10100163-028	RHR Sec 16, Site 033, A		0.7	< 0.2	0.7	0.1	0.08	67	22	11	SL
C10100163-029	RHR Sec 16, Site 033 B		< 0.5	0.6	0.7	0.1	0.09	56	19	25	SCL
C10100163-030	PR Sec 24, Site 005, A		< 0.5	2.1	0.5	0.1	0.08	63	24	13	SL
C10100163-031	PR Sec 24, Site 005, BT		0.5	0.8	0.6	0.1	0.09	52	28	20	L
C10100163-032	PR Sec 24 Site 005, C		0.6	0.2	0.9	0.1	0.09	51	28	21	L
C10100163-033	RHR Sec 16, Site 013, A		< 0.5	< 0.2	0.5	0.1	0.07	69	18	13	SL
C10100163-034	RHR Sec 16, Site 013, BT		0.8	0.2	0.8	0.1	0.08	67	15	18	SL
C10100163-035	RHR Sec 16, Site 013,BT2		0.7	< 0.2	0.5	0.1	0.08	67	16	17	SL
C10100163-036	RHR Sec 16, Site 013, C1		1.0	0.4	0.7	0.1	0.09	57	9	34	SCL
C10100163-037	RHR Sec 16, Site 013, C2		1.0	0.5	0.9	0.1	0.08	37	50	13	SiL

LABORATORY ANALYTICAL REPORT

Client: SWCA
Project: Roca Honda Mine
Workorder: C10100163

Report Date: 11/29/10
Date Received: 10/05/10

	Analysis	No_ 140 Sieve,	No_ 35 Sieve,	No_ 60 Sieve,	Pan	pH SatPst	EC SatPst	Ca SatPst	Mg SatPst	Na SatPst	SAR	Lime as CaCO3	Organic Matter	Se-ABDPTA
	Units	%	%	%	%	s_u_	mmhos/cm	meq/L	meq/L	meq/L	unitless	%	%	mg/kg-dry
Sample ID	**Client Sample ID**	**Results**	**Results**	**Results**	**Results**	**Results**	**Results**	**Results**	**Results**	**Results**	**Results**	**Results**	**Results**	**Results**
C10100163-038	RHR Sec 16, Site 026, A	41	4	28	28	7.1	0.26	1.61	0.41	0.08	< 0.1	0.64	0.52	0.01
C10100163-039	RHR Sec 16, Site 026, BT	35	4	43	19	8.0	0.26	2.11	0.40	0.12	0.1	0.46	0.21	< 0.01
C10100163-040	RHR Sec 16, Site 026, C1	42	5	29	25	8.3	0.19	1.45	0.28	0.21	0.2	0.62	0.27	< 0.01
C10100163-041	RHR Sec 16, Site 026, C2	32	1	15	52	7.9	0.37	2.31	0.84	0.67	0.5	2.08	0.36	< 0.01
C10100163-042	RHR Sec 16, Site 026, C3	36	2	19	43	8.0	0.30	2.36	0.58	0.37	0.3	1.61	0.39	0.01
C10100163-043	RHR Sec. 16, Site 012, A	18	2	6	74	7.8	0.55	4.63	0.88	0.19	0.1	8.42	1.9	< 0.01
C10100163-044	RHR Sec. 16, Site 012, BT & BK	14	2	6	77	7.8	0.65	4.76	1.62	0.87	0.5	11.0	2.0	0.02
C10100163-045	RHR Sec. 16, Site 015, A	32	2	11	55	7.5	0.46	3.61	1.00	0.12	< 0.1	0.62	1.0	0.03
C10100163-046	RHR Sec. 16, Site 015, BT	31	1	16	52	7.7	0.45	2.90	0.93	0.48	0.3	< 0.01	0.99	0.01
C10100163-047	RHR Sec. 16, Site 015, C1	30	3	23	45	8.0	0.43	2.12	0.73	0.96	0.8	0.91	0.58	0.02
C10100163-048	RHR Sec. 16, Site 015, C2	36	1	21	42	7.9	0.83	4.81	1.33	1.88	1.1	1.40	0.30	0.01
C10100163-049	RHR Sec. 16, Site 018, A	22	1	7	70	7.6	0.40	2.94	0.70	0.30	0.2	1.54	1.2	0.03
C10100163-050	RHR Sec. 16, Site 018, BTK	5	0	2	93	7.9	0.48	2.80	0.67	1.47	1.1	10.3	1.8	0.03
C10100163-051	RHR Sec. 16, Site 023, A	24	6	41	29	7.6	0.40	3.90	0.73	0.17	0.1	0.56	1.5	0.02
C10100163-052	RHR Sec. 16, Site 023, BT	18	6	36	40	8.0	0.80	5.38	1.96	1.45	0.8	0.84	0.62	0.03
C10100163-053	RHR Sec 16, Site 023, C	22	7	39	32	7.9	1.60	8.89	3.70	4.29	1.7	1.04	0.62	0.03

LABORATORY ANALYTICAL REPORT

Client: SWCA
Project: Roca Honda Mine
Workorder: C10100163

Report Date: 11/29/10
Date Received: 10/05/10

	Analysis	U Chemical	B-CACL2	Ra226 Chemical	Ra226 ± Chemical	Ra226 MDC	Sand	Silt	Clay	Texture
	Units	mg/kg-dry	mg/kg-dry	pCi/g-dry	pCi/g-dry	pCi/g-dry	%	%	%	%
Sample ID	**Client Sample ID**	**Results**	**Results**	**Results**	**Results**	**Results**	**Results**	**Results**	**Results**	**Results**
C10100163-038	RHR Sec 16, Site 026, A	< 0.5	< 0.2	0.3	0.09	0.08	75	13	12	SL
C10100163-039	RHR Sec 16, Site 026, BT	< 0.5	0.2	0.2	0.08	0.08	81	7	12	SL
C10100163-040	RHR Sec 16, Site 026, C1	< 0.5	< 0.2	0.3	0.08	0.07	60	17	23	SCL
C10100163-041	RHR Sec 16, Site 026, C2	< 0.5	0.3	0.6	0.1	0.07	59	16	25	SCL
C10100163-042	RHR Sec 16, Site 026, C3	< 0.5	0.4	0.6	0.1	0.08	64	17	19	SL
C10100163-043	RHR Sec. 16, Site 012, A	0.8	0.5	1.0	0.1	0.08	44	27	29	CL
C10100163-044	RHR Sec. 16, Site 012, BT & BK	1	0.7	1.0	0.1	0.08	43	27	30	CL
C10100163-045	RHR Sec. 16, Site 015, A	0.5	< 0.2	0.6	0.1	0.08	55	28	17	SL
C10100163-046	RHR Sec. 16, Site 015, BT	< 0.5	0.4	0.5	0.1	0.07	57	22	21	SCL
C10100163-047	RHR Sec. 16, Site 015, C1	< 0.5	0.7	0.6	0.1	0.08	55	22	23	SCL
C10100163-048	RHR Sec. 16, Site 015, C2	< 0.5	0.3	0.5	0.1	0.07	61	19	20	SCL
C10100163-049	RHR Sec. 16, Site 018, A	0.5	0.2	0.8	0.1	0.09	45	30	25	L
C10100163-050	RHR Sec. 16, Site 018, BTK	0.8	0.4	1.1	0.2	0.1	24	42	34	CL
C10100163-051	RHR Sec. 16, Site 023, A	< 0.5	0.4	0.4	0.1	0.08	76	12	12	SL
C10100163-052	RHR Sec. 16, Site 023, BT	< 0.5	0.6	0.4	0.1	0.08	68	12	20	SCL
C10100163-053	RHR Sec 16, Site 023, C	< 0.5	0.3	0.5	0.1	0.08	64	12	24	SCL