BAR XX ENVIRONMENTAL SERVICES, LLC
12599 BIGHORN ROAD
WHITEWOOD, SD., 57793

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MAR 18 2013
MINERALS & MINING PROGRAM

March 15, 2013

Mr. Mike Cepak
Minerals and Mining Program
SD Department of Environment and Natural Resources
523 E. Capitol
Pierre, SD 57501-3181

RE: VMC LLC Deadwood Standard Project Notice of Intent and Request for Final Designation of Special, Exceptional, Critical, or Unique Lands.

Dear Mr. Cepak:

Enclosed find a Notice of Intent to Operate and a Request for Final Designation of Special, Exceptional, Critical or Unique Lands for VMC, LLC's Deadwood Standard Project located in Lawrence County. Copies of this Notice have been sent to the other agencies and I will forward the return receipts to you when I receive them.

If you have any questions, please contact me

Sincerely,

Myron Andersen

Myron Andersen
Bar XX Environmental Services, LLC
Permit Manager
Deadwood Standard Project

SD EForm - 0475 V1

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PMB 2020
Department of Environment and Natural Resources
Minerals and Mining Program
523 E Capitol Ave
Pierre, SD 57501-3182
Telephone: (605) 773-4201 Fax: (605) 773-5286

REQUEST FOR DETERMINATION SPECIAL, EXCEPTIONAL, CRITICAL, OR UNIQUE LANDS AND NOTICE OF INTENT TO OPERATE

Name of Operator: VMC LLC

Office Address: 2509 Windmill Dr. #305
Spearfish, SD 57783

Telephone: (605) 222-6235

Local Address: Same as above

Telephone:

Legal Description

Please see attached legal description

County: Lawrence

Name and Address of Surface Owner

Please see attached list of surface and minerals owners

Name and Address of Mineral Owner

Please see attached list of surface and minerals owners

Name and Address of Surface Owners Within 500 Feet of the Proposed Mining Operation

Please see attached list of surface owners within 500 feet of proposed project area

I declare and affirm under the penalties of perjury that this claim (petition, application, information) has been examined by me, and to the best of my knowledge and belief, is in all things true and correct.

Signature: Mark Thu

Title: Managing Member

Date: 3-12-13

FOR DEPARTMENT USE ONLY

The land described in this Request for Determination of Special, Exceptional, Critical, or Unique Lands and Notice of Intent to Operate ( ) is ( ) is not eligible for inclusion on the list of special, exceptional, critical, or unique lands.

_____ Date _____

Secretary, Department of Environment and Natural Resources

Operator Appeal Date _____

Intervenor Contest Date _____

The land described in this Request for Determination of Special, Exceptional, Critical, or Unique Lands and Notice of Intent to Operate ( ) is ( ) is not eligible for inclusion on the list of special, exceptional, critical, or unique lands.

_____ Date _____

Chairman, SD Board of Minerals and Environment

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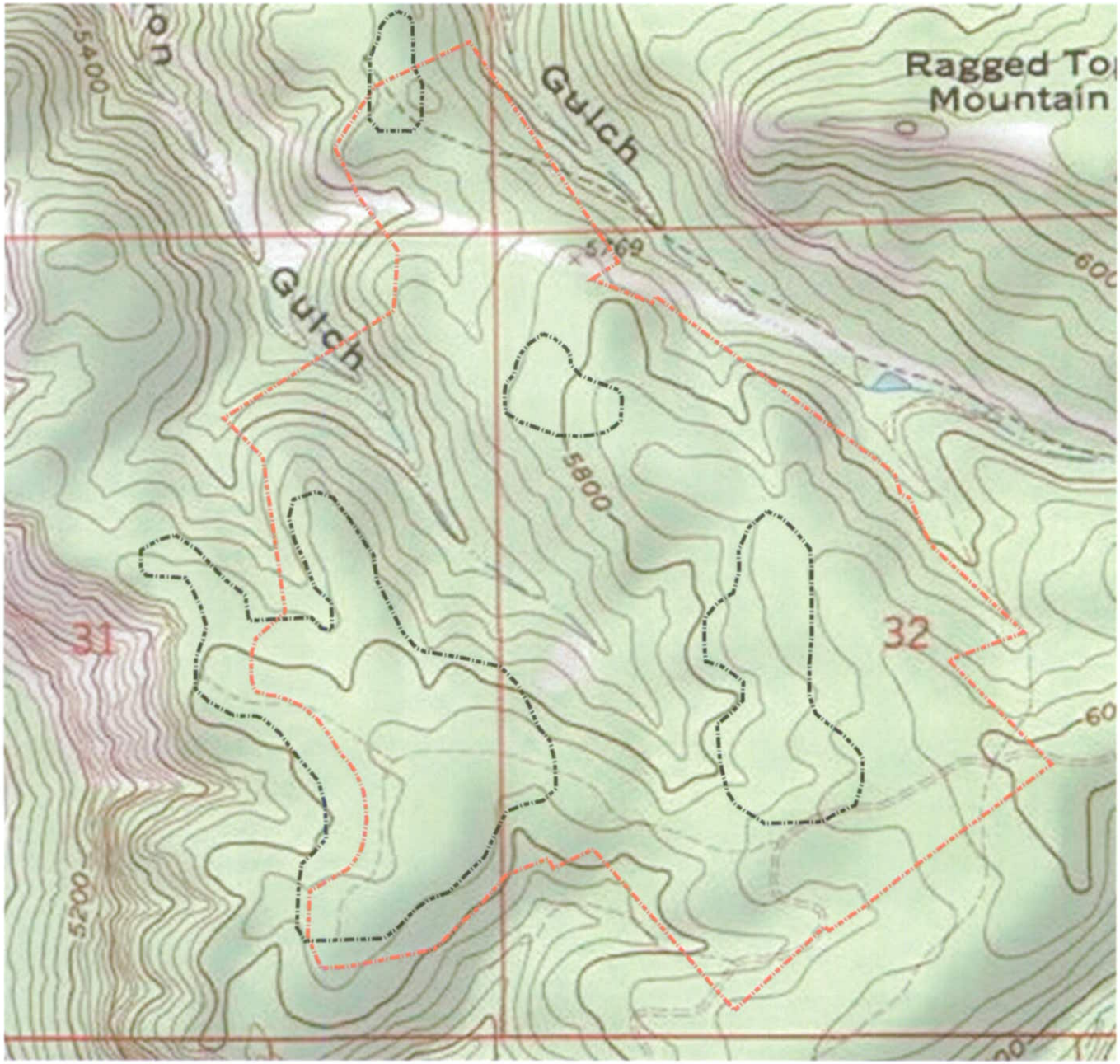
Legal Description

Portions of Sections 29, 30, 31 and 32, Township 5 North, Range 2 East, Black Hills Meridian, Lawrence County, South Dakota as shown on Exhibit 1, excluding those areas encompassed by the clearing limits of Large Scale Mine Permit 416.



Legend

Proposed Project Area Boundary

Permit 416 Clearing Limits

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DEADWOOD STANDARD PROJECT

Location: Sections 29, 30, 31, 32
Township 5 North, Range 2 East
Black Hills Meridian

N

0 500 1,000
Feet

Deadwood Standard Project
Lawrence County, South Dakota

Exhibit 1

Location Map

Design: M. Nelson, CPG	Approved:
Date: January, 2013	Revised:

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List of Surface and Minerals Owners

The surface and minerals owners for lands encompassed by the proposed project area are shown on the attached land map and additional information is listed below.

Lands designated as VMC LLC on attached land map
Surface and Minerals:
VMC LLC
Mr. Dana Bender
2509 Windmill Dr., #305
Spearfish, SD 57783

Lands designated as Salmen/Aye on attached land map
Surface:
G&L Properties now known as Limestone LLC
Mr. Gary Salmen
6301 S. Grand Prairie Drive
Sioux Falls, South Dakota 57108

Minerals:
G&L Properties now known as Limestone LLC
Mr. Gary Salmen
6301 S. Grand Prairie Drive
Sioux Falls, South Dakota 57108

The Aye Family Trust
Mr. John Aye
829 Woodbury Street
Miles City, Montana 59301

Lands designated as Salmen on attached land map
Surface and minerals:
G&L Properties now known as Limestone LLC
Mr. Gary Salmen
6301 S. Grand Prairie Drive
Sioux Falls, South Dakota 57108

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Lands designated as Bradsky on attached land map

Surface and minerals:

Bradsky West Boulevard Corporation
Mr. Paul Bradsky
927 Main Street
Rapid City, South Dakota 57701

Ms. Nancy Bradsky
299 Enchantment Road
Rapid City, South Dakota 57701

Mr. Keith Smit
PO Box 729
Sturgis, South Dakota 57785

Jerry Chaffee Revocable Trust
PO Box 762
Sturgis, South Dakota 57785

Louise Chaffee Revocable Trust
Mr. Kirk Chaffee
PO Box 762
Sturgis, South Dakota 57785

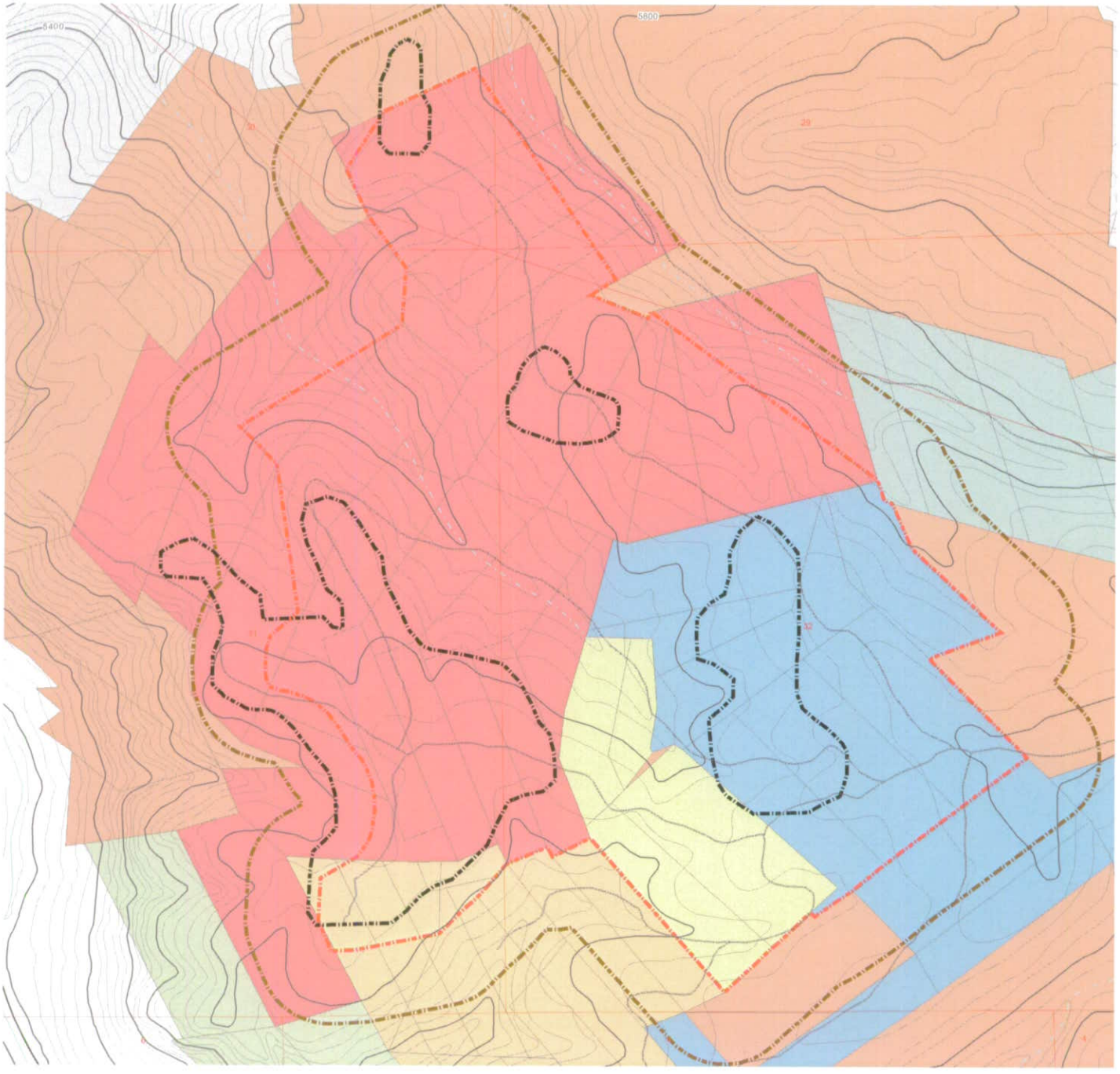
Lands designated as US on attached land map

Surface:

Federal lands managed by
US Forest Service
Northern Hills Ranger District
1019 North 5th Street
Spearfish, South Dakota

Minerals:

Public domain



Legend

Land Owner

- Bradsky
- Dodds
- Paisley
- Salmen
- Salmen/Aye
- US
- VMC

- 500 foot buffer
- Project area boundary
- Permit 416 clearing limits

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DEADWOOD STANDARD PROJECT

Location: Sections 29, 30, 31, 32
Township 5 North, Range 2 East
Black Hills Meridian

N

0 500 1,000
Feet

Deadwood Standard Project
Lawrence County, South Dakota

Exhibit 2

Land Ownership Map

Design: M. Nelson, CPG	Approved:
Date: January, 2013	Revised:

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Surface Owners within 500 feet of Proposed Mining Operation

Private land within 500 feet of the proposed project area is owned by several landowners as shown on the attached land map. Contact information for these landowners is provided below:

Lands designated as VMC LLC on Land Map
VMC LLC
Mr. Dana Bender
2509 Windmill Drive, #305
Spearfish, SD 57783

Lands designated as Salmen/Aye on Land Map
G&L Properties now known as Limestone LLC
Mr. Gary Salmen
6301 S. Grand Prairie Drive
Sioux Falls, South Dakota 57108

Lands designated as Dodds on Land Map
Loren and Betty Dodds
8705 Sommers Place
Anchorage, Alaska 99502

Lands designated as Bradsky on Land Map
Bradsky West Boulevard Corporation
Mr. Paul Bradsky
927 Main Street
Rapid City, South Dakota 57701

Ms. Nancy Bradsky
299 Enchantment Road
Rapid City, South Dakota 57701

Mr. Keith Smit
PO Box 729
Sturgis, South Dakota 57785

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Jerry Chaffee Revocable Trust
PO Box 762
Sturgis, South Dakota 57785

Louise Chaffee Revocable Trust
Mr. Kirk Chaffee
PO Box 762
Sturgis, South Dakota 57785

Lands designated as US on Land Map
Federal lands managed by
US Forest Service
Northern Hills Ranger District
1019 North 5th Street
Spearfish, South Dakota

Lands designated as Paisley on Land Map
James W. Paisley
12677 Eden Road
Whitewood, South Dakota 57793

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Request for Determination of Special, Exceptional, Critical or Unique Lands and Notice of Intent to Operate

Deadwood Standard Project

Lawrence County, South Dakota

DEADWOOD
STANDARD
PROJECT

Prepared For:

South Dakota Department of Environment and Natural Resources
Pierre, South Dakota

Submitted By:

VMC LLC
2509 Windmill Dr., #305
Spearfish, SD 57783

Date:

March 12, 2013

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MINERALS & MINING PROGRAM

Assessment of Potential Special, Exceptional, Critical or Unique Characteristics

Deadwood Standard Project

Lawrence County

South Dakota

Prepared for:

South Dakota Department of Environment and Natural Resources

Pierre, South Dakota

Prepared By:

VMC LLC

Spearfish, South Dakota

Date:

March 2013

Table of Contents

Section 1 Introduction 1
1.1 Location 1
1.1 Purpose 1
Section 2 Project Description 2
2.1 Mining 2
2.2 Mineral Processing 3
2.3 Reclamation 3
Section 3 Assessment of Potential Special Exceptional Critical and Unique Characteristics 4
3.1 Ecological Role 4
3.2 Influence on Total Ecosystem 5
3.3 Other Criteria of SDCL 45-6B-33.3 5
3.3.1 Scenic 5
3.3.2 Historical, Cultural, Archeological, and Ethnological 7
3.3.3 Topographic 8
3.3.4 Geological 8
3.4 Scientific Characteristics 9
3.4.1 Vegetation 9
3.4.2 Soils 10
3.4.3 Wildlife 11
3.4.4 Water 13
3.4.5 Recreation 13
Section 4 Summary 13
Section 5 References 15

Exhibits

Exhibit 1. Photo Showing Typical View within Project Area

List of Figures

Figure 1. General Location of Deadwood Standard Project

Figure 2. Comparison of Permit 416 Clearing Limits with proposed Deadwood Standard Project Area Boundary

Figure 3. Location of Historic Mines and Mills

Figure 4. Hydrogeologic Framework

Table of Contents (Continued)

List of Appendices

Appendix A- Visual Effects Analysis

Appendix B- Cultural and Archeological Resources Study

Appendix C- Environmental Characteristics of Deadwood Standard Deposit

Appendix D- 2012 Vegetation Baseline Description, Deadwood Standard Project

2012 Threatened & Endangered Plant Species Survey, DSP

Appendix E- Deadwood Standard Wildlife Baseline Report

List of Acronyms

§	Section
ARSD	Administrative Rules of South Dakota
BHNF	Black Hills National Forest
ft	Feet
mi	Miles
NOI	Notice of Intent to Operate
NRCS	Natural Resources Conservation Service
SCS	Soil Conservation Service
SDCL	South Dakota Codified Law
SDGF&P	South Dakota Department of Game, Fish and Parks
SDSM&T	South Dakota School of Mines and Technology
SECU	Special, Exceptional, Critical or Unique
T&E	Threatened or Endangered
USGS	United Sates Geological Survey

1.0 Introduction

South Dakota laws require an operator that seeks a Large-Scale Mine Permit to address South Dakota Codified Law (SDCL) 45-6B and Administrative Rules of South Dakota (ARSD) 74:29. VMC LLC's Deadwood Standard Project is seeking a large-scale mining permit located in Lawrence County. State mine permit #416, already permitted for mining, lies within the proposed permit boundary and in some instances outside the newly proposed permit boundary as shown in Figure 1. The purpose of this document is to address the required permits and licences of large-scale mines on lands that are not within the confines of State Mine Permit 416. SDCL section (§) 45.6B.33.3 and ARSD §74:29:10 require an operator to address the rules concerning Special, Exceptional, Critical, or Unique Lands. This document is intended to provide a Notice of Intent to Operate and to seek the final designation of lands on the preliminary list of Special, Exceptional, Critical, or Unique Lands, ARSD §74:29:10:25. This *Assessment of Potential Special, Exceptional, Critical or Unique Characteristics* describes attributes of the proposed project area that relate to potential classification of the area as Special, Exceptional, Critical or Unique (SECU) lands .

1.1 Location

The Deadwood Standard project is located in Lawrence County in western South Dakota, near the mining community of Lead. The project area is approximately 7 miles (mi.) west of Lead. The project area is located on a limestone plateau east of Spearfish Canyon within the Ragged Top mining district. The topography is flat to gently rolling, and lies between approximately 5,500 feet (ft.) and 5,900 ft. above mean sea level (AMSL). The project area is within portions of Sections 29, 30, 31, and 32, Township 5 North, Range 2 East, Black Hills Meridian (Figure 1). As stated previously, State Mine Permit 416 is within the project area.

1.2 Purpose

South Dakota law mandates that new mining permits be reviewed to evaluate the suitability of the land for mining (SDCL §45-6B-33). As stated earlier, the purpose of the document is to provide a Notice of Intent to Operate (NOI) and seek the final designation of lands on the preliminary list of SECU lands. The following assessment is submitted in regard to determining whether lands in the proposed project area are finally designated as SECU.

An existing South Dakota Large Scale Mine Permit, Permit 416, is in place at the property. Permit 416, referred to as the Ragged Top Project, was issued to Homestake Mining Company in 1984. This permit authorizes disturbance of 122 acres in areas encompassed by the Deadwood Standard Project. The proposed Large Scale Mine Permit for the Deadwood Standard Project would encompass the approved disturbance area of Permit 416, with minor modifications. The Deadwood Standard Project's proposed project area is approximately 172 acres. The permitted clearing limit approved by Permit 416 is shown in relation to the project area boundary in Figure 2. Lands within the approved clearing limits of Permit 416 were under permit prior to the effective date of ARSD 74:29:10, and therefore are exempt from the provisions of ARSD 74:29:10. Final designation of SECU determination on lands on the Preliminary list within the proposed project boundary is requested for the areas not already cleared under Permit 416.

The contents of this assessment are presented to help in the determination that this project area is not SECU and should be finally removed from the preliminary list and allow this proposed operation to proceed.

2.0 Project Description

The Deadwood Standard project would excavate a shallow flat-lying ore body from a limestone plateau in the upper portion of the Pahasapa Limestone. Ore would be transported to an on-site enclosed mineral processing facility where gold would be recovered. The spent ore would be neutralized and then backfilled into mined areas with the overburden and reclaimed to approximate original contours. The project is expected to provide a mine life of over 10 years, with an overall project life of 15 to 17 years. The project is described in further detail in the following sections, which are focused on:

- Mining
- Mineral Processing
- Reclamation

2.1 Mining

The natural geological and geochemical characteristics of gold ore at the Deadwood Standard project provide for horizontal mining of non-acid generating overburden and ore. The ore occurs as one, and in some areas two, sub-horizontal layers of gold-bearing rock. The ore layers range in thickness from approximately 4 to 20 feet (ft). These layers gently undulate and vary in thickness, but are relatively shallow. The depth of mining would range from 2 to 72 ft, with an average depth of approximately 24 ft. During mining, the overburden would be removed to expose the ore, the ore would be excavated, and the mining area would be backfilled with either spent ore or overburden. Because the ore occurs as thin horizontal layers, mining would progress laterally rather than vertically, which provides for concurrent reclamation and reclamation to approximate original contours. The mining process would be similar to quarrying operations in the Rapid City and Spearfish area, which remove an approximately 30-ft. thick layer of limestone called the Minnekahta Limestone for use in construction aggregate, and lime and cement manufacture.

Most mining would be completed using conventional quarrying methods including mechanical excavation and haulage to the mineral processing plant. As a portion of the deposit is located relatively close to Spearfish Canyon, efforts have been taken to study potential effects to the canyon. An engineering analysis conducted by South Dakota School of Mines and Technology (SDSM&T) concluded that blasting during mining does not pose a risk to Spearfish Canyon (Kliche and Anderson 1988). Additional sound and seismic testing was conducted in December of 2012 by Dr. Charles Kliche of SDSM&T. Three blasts were conducted at different areas in the proposed mine area to record seismic and sound data. These results confirmed the data from 1988. A blast conducted at a distance of approximately 500 feet from the rim was not audible at the canyon bottom and seismic data showed no impact to the canyon walls. The final report will be furnished in the state mine permit application..

The geological nature of the deposit allows for sequential mining and reclamation. Concurrent mining and reclamation would provide for direct haulage of overburden from active mining areas and placement as backfill into previously mined areas. Likewise, soil resources that would be recovered prior to mining in a given area would be direct hauled and placed onto backfilled areas during concurrent reclamation.

3.2 Mineral Processing

Ore processing would be conducted in a covered vat leach facility which provides a system that can more efficiently manage potential water balance issues. The gold recovery process could include the following components.

- Crushing of ore to an optimum size.
- Placing ore within covered leaching vats
- Leaching ore with a dilute cyanide solution to dissolve gold
- Rinsing of ore with water and hydrogen peroxide or by other methods to remove or destroy cyanide and other products of leaching
- Removal of spent ore from vat
- Haulage of spent ore to repositories in previously mining areas

After leaching the ore with a dilute cyanide solution, a pregnant solution would be formed, which contains the dissolved gold. The pregnant solution would be run through a series of on-site operations to produce a gold-rich precipitate that would be collected and shipped off-site for final processing and refining.

Rinsing of spent ore with water and hydrogen peroxide is a technology utilized in the Black Hills for several decades, which has proven effective at removing cyanide to acceptable levels. This is the preferred method to breakdown cyanide however other methods may have merit.

2.3 Reclamation

The reclamation process would begin with clearing of trees and brush in areas to be mined. The depth of topsoil would be determined, and this soil would be stripped and salvaged with the appropriate equipment. The amount of topsoil present would determine the depth of replacement on reclaimed areas. Concurrent mining would include the topsoil salvaging process to maximize direct placement of fresh topsoil on reclaimed areas. Topsoil would be directly placed on approximate original contours. This allows for viable seeds and propagules to immediately become reestablished. This method also allows the soil microfauna and microflora to survive and persist onto the newly reclaimed site. Site preparation of the overburden and placement of topsoil would be done to maximize micro-topographic diversity. These methods would limit compaction and enhance infiltration of water which is beneficial to plant growth and establishment.

A post-mining land use for this specific site would be an open canopy area within the forested surroundings that would be beneficial to wildlife, especially for ruffed grouse. As this site was logged of the marketable timber recently, it is currently in a successional stage similar to an open canopy ectotone. A grass, forb, shrub, half-shrub community would provide an edge effect for the wildlife in the area. Reseeding of the reclaimed sites would be accomplished with best management techniques to be determined in the mine permit phase. A seed mix would be developed that has a mix of grasses with both cool and warm season species. A diverse forb-wildflower mix would be developed to attain season-long flowering. Shrubs added to a reclamation mix would correlate with species observed in the vegetation baseline survey conducted in 2012 by Bar XX Environmental Services, LLC. This report is in Appendix D.

3.0 Assessment of Potential Special Exceptional Critical and Unique Characteristics

Lands classified as SECU lands must possess one or more of the following characteristics (SDCL §45-6B-33.3):

- The land is so ecologically fragile that, once it is adversely affected, it could not return to its former ecological role in the reasonably foreseeable future
- The land has such a strong influence on the total ecosystem of which it is a part that even temporary effects felt by it could precipitate a system-wide ecological reaction of unpredictable scope or dimension
- The land has scenic, historic, archaeological, topographic, geologic, ethnologic, scientific, cultural, or recreational significance

Detailed discussions of these criteria, along with supporting documentation, are provided next to assist in the determination process.

3.1 Ecological Role

Ecology is often defined as the relationship between organisms and their environment. As such, numerous natural and man-caused activities serve to alter ecological relationships. Natural events that result in an alteration of the ecosystem include fire, flood, earthquakes and disease and infestations, such as the pine bark beetle outbreak ongoing in the Black Hills. Man-cause activities which also have the potential to alter the ecosystem include livestock grazing, logging, mining, recreation, and development. For the purpose of this discussion, it is reasonable that all other natural or man-caused occurrences must be treated as a constant since they would occur regardless of the proposed mining activities. In addition, since ecosystems are dynamic and continually changing, it is reasonable to define the former ecological role at the site in terms of the recent past.

Since the late part of the nineteenth century and continuing to the present, metal mining and exploration activities have been significant in the proposed mine area. Figure 3 depicts the major known

historic mine sites in the mine SECU area. In addition to those sites shown, other numerous exploration trenches, shafts, and disturbances are located within the SECU boundaries. Mining has already played a significant role in defining the ecological role within the proposed mine area.

No federal endangered or threatened animals or plants were found in field surveys conducted in 2012 on the project area. A peregrine falcon, listed as a State endangered species, was observed flying within the canyon during wildlife surveys in 2012. No nests of raptors were found in the project area. Disturbances are not planned for areas in the 'rim to rim' area of Spearfish Canyon, as such, no impacts are anticipated to any portions of the canyon. The American dipper, listed as state threatened, does not occur on the project area. As no disturbance is planned for areas in the 'rim to rim' area of Spearfish Canyon, the creek itself and its associated species and habitat will not be disturbed. Species of local concern are discussed in the scientific section of this report and the included 2012 vegetation and wildlife surveys.

The proposed mine area is located on a limestone plateau region with gently rolling hills and meadows. According to the Lawrence County Soil Survey, 45% of the county is in the soil map unit present on the site. This map unit is the Citadel-Vanocker-Grizzly unit (See Section 3.4.2). The site vegetation community is a Ponderosa Pine-Common Juniper vegetation habitat type. This habitat type is common in the Black Hills (See Section 3.4.1). Extensive logging of the site also occurred in the 1980's reducing the Ponderosa pine component and stimulating the aspen and birch component of the overstory on the site. These ecological/successional processes are indicative of a natural system behaving normally. Historic mining activities in the area have rehabilitated without reclamation efforts and current reclamation of mining in the region has provided evidence that the areas can be returned to their former ecological role. The land is not so ecologically fragile that, once it is adversely affected, it could not return to its former ecological role in the reasonably foreseeable future.

3.2 Influence on Total Ecosystem

Historic mining in the area has occurred for over a century and no adverse effects on the total ecosystem from the historic mining have been documented. The proposed project area does not have wetlands or perennial streams that would be affected by the mining operations and the proposed mine operation will not be located within the canyon of Spearfish Creek. Due to the commonality of the soils and vegetation and the lack of perennial surface waters on the project site, a system-wide adverse ecological reaction is not expected.

3.3 Other Criteria of SDCL §45-6B-33.3

This section summarizes and qualifies other criteria that are used to evaluate if the site has special, exceptional, critical, or unique significance. Discussions are presented for scenic, historic, archaeological, topographic, geologic, ethnologic, scientific, or recreational characteristics. Detailed documentation is provided in the appendixes of this report.

3.3.1 Scenic

VMC, LLC conducted an examination of the potential effects of the proposed Deadwood Standard Project to scenic resources in areas where concern about visibility of the project would exist. Areas of

concern that were examined included the Terry Peak area where extensive skiing occurs and the Spearfish Canyon area where driving, motorcycling, hiking, fishing, biking, and snowmobiling are frequent activities.

From the Terry Peak summit road, the proposed project area would not be seen by the general public, because of dense forest cover and the presence of a forested northeast/southwest trending ridge and Elk Mountain located between Terry Peak and the proposed project area. Views from the Terry Peak chair lift show small areas of the Wharf mine and portions of the Deadwood Standard Project area could be seen in the background approximately 3.5 miles distant. The project area would not be visible from sites within Spearfish Canyon. The visual examination included two sites in the Savoy area, and three sites in the canyon at the confluences of Spearfish Creek with Johnson Gulch, Calamity Gulch, and No Name Gulch. The high visual angle, presence of a steep rocky rim and existing trees along the rim prevents any views over the top of the rim towards the project area. Sporadic views of the project area can be seen from the west across the canyon on FS road 134. These limited viewings require an opening in the vegetation near the road to glimpse the project area that lies approximately on the same elevation four miles distant across the canyon. Visual screening by trees in the proposed buffer zone near the rim will further obscure the visibility of the project.

The scenic attributes of the proposed project area lands on the site are similar to the limestone plateau topography of the region. Exhibit 1 below shows a typical view from within the project area.

Exhibit 1. Photo showing typical view within project area.

Additional information regarding potential effects to scenic resources in the area is presented in the Visual Effects Analysis in Appendix A.

3.3.2 Historical, Cultural, Archeological, and Ethnological

While historic, cultural, archaeological, and ethnologic studies often have separate goals, they are interrelated disciplines. Therefore, discussions on these topics have been combined in this section. A cultural and archaeological survey encompassing the project area and a surrounding larger area was completed by Dr. Steve Cassells (Plano Archeological Consultants 1983). The study covered over 370 acres and is presented in Appendix B of this report for detailed review.

As described earlier, the proposed project area was mined for over a century before initiation of this project. Historic mining consisted of shafts, prospect pits, process facilities, overburden piles and roads. The Deadwood Standard Mill site (site 39LA298) is located within the project area in the headwaters of Johnson Gulch. This site, founded by the Deadwood Standard Gold Mining and Milling Company, was in operation sporadically from 1900 to 1904, from 1912 to 1916. The company extracted gold from limestone and conducted a cyanide recovery process. Workings dot the north sloping valley with an ore car grade crossing the slope and leading to the mill site. Below this area is a concentration of timbers and cement boiler engine footings. Historic tailings are present along the upper valley floor of Johnson Gulch. The sites present condition is in total ruin and historically significant features do not exist. The site is not eligible for placement on the National Register of Historic Places according to the Plano report.

The Spearfish Cyanide mine site (site 39LA296) is located in the upper reaches of Calamity Gulch on the north end of the project area. It was first claimed in 1899 by the Spearfish Gold Mining and Reduction Company and continued working until 1906. The site consisted of a dry-crushing cyanide mill, ore shaft, boiler, tailings, railroad grade, school, post office, and a few houses. While there still are a few foundations, dugouts, and tailings, the site condition is in total ruin. The Spearfish Cyanide is not eligible for placement on the National Register of Historic Places according to the Plano report. According to the Plano report, post-abandonment salvage of materials is the probable reason for much of the poor condition and total ruin of these two sites.

The Balmoral town site (39LA295) referenced in the Plano report is outside the Deadwood Standard project area and therefore will not be affected. The Preston site is also outside of the Deadwood Standard project area.

Ethnologically, the site appears to have been used largely by Euro-Americans during the mining days. No artifacts or evidence of pre-historic activity was found at the site. No historic sites eligible for placement on the National Register of Historic Places are located within the project area or access areas, according to the Plano report. The site does not have historic, cultural, archaeological, or ethnologic significance, according to the Plano report.

3.3.3 Topographic

The project is located on the limestone plateau east of Spearfish Canyon and west of Elk Mountain and the existing Wharf Mine. The limestone plateau physiographic region in the Black Hills encompasses approximately 360 square miles extending from the Spearfish Canyon area south to the Pringle area. The topography of limestone plateau areas encompassed by the proposed Deadwood Standard Project is not significantly different from other areas of limestone plateau in the Black Hills. The rim and cliffs of Spearfish Canyon near the Deadwood Standard Project would not be affected by the Deadwood Standard Project. Private lands within the rim-to-rim area of Spearfish Canyon are prohibited from mining by SDCL §45-6B-104 and §45-6B-105, and public lands along the rim and within the canyon west of the Deadwood Standard project area are acquired lands effectively prohibited from mining by the BHNF Land and Resources Management Plan (BHNF 2005). Therefore, these lands are not included in this assessment.

The rim of Spearfish Canyon is located approximately 500 feet west of the proposed permit area boundary. Topographic relief in the area is approximately 800 feet from the rim down to Spearfish Creek. However, this area is not within the proposed permit area boundary and will not be disturbed by the Deadwood Standard Project. In addition, areas relatively close to the canyon rim within the proposed permit area boundary of the Deadwood Standard Project area are currently permitted for mining under Permit 416, and are not subject to SECU determination. The proposed project area does not have unique topographic characteristics.

3.3.4 Geological

The Deadwood Standard deposit occurs in the uppermost strata of the Pahasapa Limestone formation. The Pahasapa Limestone is a Palaeozoic sedimentary rock. The flat tabular gold mineralized zones occur in distinct stratigraphic positions within approximately 72 feet of the land surface. In contrast to Tertiary igneous rocks mined at other deposits in the Black Hills, the host rock does not have a mineralogical composition that can lead to acid rock drainage. Due to the expanse of the limestone plateau in the Black Hills, this geologic strata is not unique except for the fact that it contains the gold mineralization sought by the applicant of this notice of intent.

The Deadwood Standard deposit does not have potential to cause acid rock drainage. Acid rock drainage is caused by oxidation of sulfide minerals such as pyrite, marcasite and pyrrhotite. The methods used to assess the potential presence of sulfide minerals in rock from the Deadwood Standard deposit included macroscopic examination by a qualified geologist, laboratory analyses for acid-base accounting, and electron microprobe analysis. In laboratory acid base accounting tests, no pyritic or total sulfur was identified, and no sulfide minerals were identified in hand lens examination of drill cuttings from 150 drill holes by a qualified geologist. One microscopic grain of pyrite encapsulated in fluorite was observed in electron microprobe analysis (Ford 1993); however, this is a very minor mineralogical component of the deposit. Acid rock drainage is mitigated by the presence of carbonate minerals such as limestone and dolomite. The ore and overburden at the Deadwood Standard contain very high quantities of acid neutralizing minerals. Additional information regarding examination of the deposit for sulfide minerals is included in Appendix C.

3.4 Scientific Characteristics

This section provides a discussion of various scientific characteristics including vegetation, soils, wildlife, surface water, and groundwater.

3.4.1 Vegetation

General Vegetation Characteristics

A ponderosa pine-common juniper habitat type encompasses the entire study area (Bar XX Environmental Services, LLC, 2012a). The overstory cover in this study is co-dominated by *Pinus pondersoa* (ponderosa pine) (15.5% cover), *Populus tremuloides* (Quaking aspen) (27.6% cover) and *Betula papyrifera* (Paper birch) (7.8% cover). Open space was 48.6% of the canopy cover. The 48.6% open space and 35.4% cover from quaking aspen and paper birch is indicative of the timber harvesting for ponderosa pine that has occurred on the site. The dominant shrub species are: *Juniperus communis* (common juniper), *Rubus parviflorus* (thimbleberry), *Amelanchier alnifolia* (serviceberry), *Prunus virginiana* (chokecherry), and *Ceanothus velutinus* (snowbrush Ceanothus). Quaking aspen also provided 3.2% of the understory cover as a small tree or sapling. Dominant half-shrubs are: *Arctostaphylos uva-ursi* (bearberry), *Spiraea betulifolia* (spirea), Rosa *arkansana* (prairie rose), Berberis *repens* (Oregon grape), and *Symphoricarpos albus* (snowberry). The fern ally *Pteridium aquilinum* (bracken fern) is quite common. The most prevalent forbs were: *Fragaria virginiana* (strawberry), *Eurybia conspicua* (showy aster) and *Lathyrus ochroleucus* (cream-colored peavine). The dominant graminoids present were *Phleum pratense* (timothy), *Carex* spp. and *Poa pratensis* (Kentucky bluegrass).

Historically mined sites blend seamlessly into the surrounding undisturbed vegetation community. The historically mined sites in the study area consist of a series of small excavations, rock dumps and roadways that have been encroached upon equally well by ponderosa pine, quaking aspen, paper birch and other understory species.

Small rock outcrops are a minor category within the ponderosa pine-common juniper community. These limestone outcrops lie on a variety of aspects. Species observed specifically on these outcrops were: *Cheilanthes feei* (slender lip fern), *Cystopteris fragilis* (brittle fern), *Pellaea atropurpurea* (purple cliff-brake), *Heuchera sanguinea* (Richardson's alumroot), *Clematis tenuiloba* (rock clematis), *Phlox hoodii* (Hood's phlox), *Sedum lanceolatum* (spearleaf stonecrop), *Antennaria microphylla* (littleleaf pussytoes) and *Toxicodendron rydbergii* (poison ivy).

Additional Information regarding vegetation is included in Appendix D.

Target Plant Species

A review of the Heritage Program list of targeted plant species for Lawrence County identified the following list of plant species that were extensively searched for on the site (Bar XX Environmental Services, LLC, 2012b). These species were selected because they were determined to be the most likely to occur on the project area.

Asplenium viride	green spleenwort
Calypso bulbosa	fairy slipper orchid
Corallorrhiza odonthorhiza	autumn coral-root
Cypripedium parviflorum	yellow ladyslipper
Polystichum lonchitis	northern holly-fern
Moneses uniflora	one-flowered Pyrola
Pyrola picta	white-veined wintergreen
Platanthera orbiculata	round-leaved orchid
Saxifraga occidentalis	western saxifrage
Vaccinium membranaceum	Mountain huckleberry

The result of the surveys was that none of these species were found within the proposed project area with the exception of *Cypripedium parviflorum* (yellow ladyslipper). One plant identified as *Cypripedium parviflorum* was found growing on an old roadway in the historical Deadwood Standard mined area. This individual plant was in the northwest quarter or the southwest quarter of Section 32, T5N R2E.

The Ponderosa pine-common juniper vegetative habitat type is common in the Black Hills and therefore not unique. The presence of the yellow lady slipper was reported to the Heritage Database. Upon further investigation, while not common, yellow lady slipper occurs throughout the limestone regions of the northern Black Hills. The inclusion of this species as a track species on the Heritage database is primarily due to its rarity in the eastern regions of the state.

3.4.2 Soils

The soils in the Ragged Top Project permit area were mapped by the US Department of Agriculture Soil Conservation Service (SCS, now known as the Natural Resources Conservation Service (NRCS) in the early 1980's and updated by Rimcon, LLC in 2012. The SCS mapped the soils to the association level and described the soils down to the series level. Published NRCS soil maps for the site were used as the base maps for the soil investigation. As stated above, these maps were drawn to the soil association level. That is, at the scale of investigation, individual soil series were not delineated on the maps. The dominant soil associations for the site were the Citadel-Vanocker complex, 3 to 12 percent slopes, the Vanocker-Citadel complex, 10 to 60 percent slopes, Vanocker- Rock Outcrop complex, 10 to 60 percent slopes, and the Grizzly-Virkula, Rock Outcrop complex, 10 to 60 percent slopes.

The dominant soil association type within the proposed project area boundary and within planned disturbance areas is the Citadel-Vanocker complex, 2 to 12 percent slopes. The Citadel soil comprises about 50 percent of the association. The Citadel series, developed from residuum weathered limestone, is comprised dominantly of silt loam textures with depths ranging up to 80 inches. The soil is well drained, non-saline/sodic, and highly productive. The Vanocker soils comprise up to 30 percent of the association. Like the Citadel series, the Vanocker soils can range up to 80 inches deep and, also derived from limestone. The top few inches of this soil are loam textures. With depth, the soils are comprised of channery to very channery loam and silty clay loam textures. Vanocker soils are also well drained, non-saline/sodic, and productive. Other minor units of this association are rock outcrops.

Soil will be salvaged prior to mining for use in reclamation. As noted, the Citadel soil is deep and highly productive. It will comprise the majority of topsoil and coversoil to be stockpiled or direct applied to regraded landscapes. Sufficient volumes of the Citadel soil exist for salvage and reclamation purposes. The Vanocker soil is also productive but the presence of the channery rock fragments limits its value as topsoil. However, the Vanocker soil does has value for use as suitable cover over regraded overburden piles and as sub-soil materials. As with the Citadel soil, the Vanocker soil will be salvaged prior to mining.

The soil on the proposed mine area is typical of the surrounding Black Hills area. Salvage prior to mining and reapplication to reclaimed areas assures that the resulting reclamation vegetation community will be productive and diverse. These soils do not exhibit any special, exceptional, critical, or unique properties.

3.4.3 Wildlife

Wildlife habitats within the Deadwood Standard survey area are generally common in the Black Hills region of South Dakota (ICF International 2012). With the exception of the canyon walls and Spearfish Creek in the extreme western portion of the wildlife survey area, no unique or unusual wildlife habitats were documented during the baseline surveys in 2012. The survey area is dominated by the ponderosa pine-common juniper habitat type, with scattered patches of aspen, birch, and an occasional Black Hills spruce. Bottomland habitat, which often supports considerable wildlife diversity, is limited in the Deadwood Standard project area, as none of the drainages within it maintain persistent flow. However, Spearfish Creek is present within the extended survey area to the west and hosts a permanent water source year-round. The absence of perennial streams or other water sources within the Deadwood Standard permit area preclude any fisheries or riparian/wetland habitat from being directly affected by the project. Additional information regarding wildlife baseline conditions is included in Appendix E.

Searches for upland game birds within the Deadwood Standard survey area in spring 2012 resulted in documentation of drumming sites for ruffed grouse and wild turkey, and several observations/detections of both species. These game birds are prevalent on the site, as well as elsewhere in the region.

Searches for raptor nests within the Deadwood Standard survey area in spring and summer 2012 resulted in the documentation of two inactive raptor nests of unknown species and one active Cooper's hawk territory southeast of the project area. Both confirmed nest sites were in good to fair condition, suggesting they had been used in the recent past, but not likely as recent as 2011 or 2012. Although no precise nest location was identified in the Cooper's hawk territory, defensive responses at multiple locations indicated that the territory was active in 2012. None of the identified nests or territories is located within the Deadwood Standard project area, and therefore, no nests will be physically disturbed by the project.

Two additional raptor species (red-tailed hawk and peregrine falcon) were recorded within the Deadwood Standard survey area and two others (northern goshawk and broad-winged hawk) were seen just beyond the survey area during 2012. None of the species appeared to be associated with an

active nest during the 2012 nesting season. The red-tailed hawk and broad- winged hawk are common raptor species in the region; however, the goshawk and falcon are less common.

No targeted surveys were conducted for breeding owls in 2012 based on direction from Stan Michals, South Dakota Department of Game, Fish and Parks (SDG&P), but results from owl surveys conducted at the adjacent Wharf mine located east of the Deadwood Standard project in spring 2010 resulted in documentation of only one owl species (northern saw-whet owl). Although no owl species were detected within the Deadwood Standard survey area in 2012, the northern saw- whet owl appears to be relatively common in pine and mixed-forest habitats throughout the Black Hills and was documented at three of the six sites sampled at the Wharf mine in 2010.

No federally listed endangered, threatened, proposed, candidate or petitioned vertebrate species were documented for the Deadwood Standard wildlife baseline conducted by ICF International. It is unlikely that any of those species would rely on the habitats present within the survey area. No designated critical or crucial habitats for any threatened or endangered (T&E) species occur in the area. The Cooper's hawk is listed as a South Dakota Natural Heritage Program species and one active territory was documented within the Deadwood Standard survey area during the baseline study period. This species is relatively common in the region. The only other SDNHP-listed species recorded during that time was the peregrine falcon, which is less common in the area. Although the falcon was not confirmed nesting within the Deadwood Standard survey area, the canyon walls that border Spearfish Creek are typical of the preferred habitat for this species.

A site assessment survey for bat species was conducted in January 2013 by a regional bat researcher. This initial survey for bat hibernacula during the winter hibernation period was conducted to provide information to formulate a monitoring plan in moving forward. The results of this survey found that 5 or 6 species of bats were found hibernating in abandoned underground mine workings on the project site. Two of these species, Townsend's big-eared bat (*Corynorhinus townsendii*) and northern myotis (*Myotis septentrionalis*) are listed as track species on the SDGF&P Heritage database. The location of these underground workings in relation to proposed disturbances has yet to be determined. Additional seasonal surveys and recommendations will determine a proposed course of action in regard to bat species.

Incidental sightings of the reptilian track species Smooth green snake (*Opheodrys vernalis*) or Black Hills redbelly snake *(Storeria occipitomaculata pahasapae)* were not recorded. Incidental sightings of the gastropod track species Cooper's Rocky Mountain Snail *(Oreohelix strigosa cooperi)* was noted. Since this species requires wet areas, of which this project area does not have, minimal impacts are expected upon the Cooper's Rocky Mountain Snail.

In summary, the Deadwood Standard project area and surrounding vicinity supports wildlife habitats and species common to the limestone plateau region of the northern Black Hills. Given the topographic and floral characteristics of the project area described above, no significant impacts to wildlife are anticipated from the proposed mining operations and the subsequent reclamation of the Deadwood Standard project.

3.4.4 Water

The proposed permit area is located within the Spearfish Creek Watershed, which encompasses a drainage area of 165 square miles upstream from the US Geological Survey (USGS) gauging station *Spearfish Creek at Spearfish* (USGS station 06431500). This gauge is located near the mouth of Spearfish Canyon just upstream from the city of Spearfish. The hydrology of Spearfish Canyon is affected by both natural and man-made factors, which affect stream flows and beneficial uses of surface water in the area. The proposed disturbance area associated with the Deadwood Standard Project is 173 acres, which is equivalent to approximately 0.3 square miles, a small fraction of the overall watershed area that contributes flow to Spearfish Creek.

Groundwater

The Deadwood Standard Project is located on a limestone plateau east of Spearfish Canyon in a geological formation called the Pahasapa Limestone. This exposed, isolated block of limestone is not saturated with water in the project area nor connected to the Madison aquifer (Carter et al. 2002). The Pahasapa Limestone in the project area is dissected by Spearfish Canyon, which prevents accumulation of groundwater within the Pahasapa Limestone in the project area. Baseline groundwater investigations in the project area indicate that the depth to groundwater ranges from approximately 450 to 630 ft, which is below the base of the Pahasapa Limestone (Adrian Brown Consultants Inc. 1988).

The Pahasapa Limestone is underlain by the Englewood Formation, which is a confining layer that restricts groundwater movement. The Englewood Formation is underlain by limestone of the Whitewood Formation and the Roughlock Sandstone of the Winnipeg Formation. Groundwater within the proposed permit boundary is within a local aquifer hosted by the Roughlock Sandstone and the Whitewood Formation (Adrian Brown Consultants Inc. 1988). These units are underlain by the Icebox Shale Member of the Winnipeg Formation, a confining layer, and the Deadwood Formation, an aquifer. Groundwater flow directions in the project area are towards the west as shown on Figure 4 (Galloway et al. 2000).

Surface Water

Although the Pahasapa Limestone is not saturated in the proposed project area, the geological unit is relatively permeable and precipitation that falls on the surface generally infiltrates rather than running off. This is observed in limestone plateau regions throughout the Black Hills, and sustained stream flow is very uncommon in limestone plateau areas (Carter et al. 2002). Because the proposed project area is located on the limestone plateau, perennial streams are not present. Spearfish Creek is located approximately 2,100 ft west at an elevation 800 ft below the the western extent of the project area. Spearfish Creek is perennial in this area, and receives flow from surface water and groundwater. From this area, Spearfish Creek flows northward to the small town of Maurice where it enters an intake diversion for the historic hydroelectric power plant now owned by the city of Spearfish. An aqueduct for the power plant conveys this water over the natural loss zone in Spearfish Creek and conserves the water for electrical power generation and downstream uses such as aquatic habitat and irrigation. Some of this water is diverted past the town of Maurice to provide for stream flow between Maurice and the

loss zone to support aquatic habitat within the canyon. This diverted water likely infiltrates into the Madison Aquifer at the stream loss zone during most periods of the year.

The groundwater and surface water characteristics of the project area are typical of the limestone plateau regions that surround the entire Black Hills.

3.4.5 Recreation

Some recreation activities do occur on the property by persons trespassing on private land. This area has trails that are used by ATV's and other motorized traffic. Hunting and sight-seeing are uses probable on the area. These uses are typical of the Black Hills and therefore not unique to this project site.

4.0 Summary

South Dakota law requires that mining permits be reviewed to determine the suitability of that land for mining (SDCL §45-6B-33). Specifically, SDCL §45-6B-33.3 defines lands that could be deemed SECU. VMC, LLC's Deadwood Standard Project proposes to mine lands that have been placed on the preliminary SECU list. This document seeks to petition the South Dakota Board of Mineral and Environment to make a final designation of the lands on the preliminary list within the Deadwood Standard project area and to determine that these lands are not Special, Exceptional, Critical, or Unique. This document also serves as the official Notice of Intent to mine for the proposed operation.

The ecological role of the area has been strongly influenced by historic mining activities. Mining in the future will be consistent with the former ecological role of the site. In addition, through mining reclamation efforts and, through state and federal permit regulations, conditions, and oversight, the influence of the proposed project on the total ecosystem will be insignificant.

Documentation and discussion of the significance of scenic, historic, archaeological, topographic, geologic, ethnologic, cultural, scientific, and recreational disciplines has been provided in this document. These qualities are not unique or significant to the proposed mine area or to the Northern Black Hills in general.

VMC, LLC requests that the South Dakota Board of Mineral and Environment evaluate this document, and make a final designation of lands on the preliminary list (ARSD 74:29:10:25) for the lands in the Deadwood Standard project area. Based upon the contents of this assessment,VMC,LLC, requests a favorable determination that allows this proposed operation to proceed. The Deadwood Standard project area may not be the same as the proposed permit boundary, which will be defined in the mine permit application. The proposed permit boundary will be the same size or smaller that the project area boundary.

5.0 References

Adrian Brown Consultants, 1988, Hydrogeologic Investigation: Descriptive Report for the Minerva Project, Lead, South Dakota.

Bar XX Environmental Services LLC, 2012a Vegetation Baseline Description, Deadwood Standard Project. November 2012.

Bar XX Environmental Services LLC, 2012b Threatened & Endangered Plant Species Survey, Deadwood Standard Project. November 2012.

Black Hills National Forest (BHNF), 2005, Phase II Amendment to Land and Resources Management Plan, October.

Carter, J.M., Driscoll, D.G., Williamson, J.E., Linquist, V.A., 2002, *Atlas of Water Resources in the Black Hills Area, South Dakota*, US Geological Survey Hydrologic Investigations Atlas HA-747.

Ford, 1993, *Rock Descriptions and Gold Characterization from Johnson Gulch*, unpublished memorandum, LAC Minerals (USA) Inc.

Galloway, J., Hamade, G., Jarrell, G., 2000, *Potentiometric Surface Contours for the Deadwood Aquifer, Black Hills Area, South Dakota*, US Geological Survey Open File Report OFR00-471.

ICF International. VMC,LLC Deadwood Standard Wildlife Baseline Report. Nov. 2012.

Kliche and Anderson, 1988, *Blast Design Study for Minerva Mining Company*, South Dakota School of Mines and Technology, Rapid City.

Plano Archaeological Consultants, E. Steve Cassells. Cultural Resource Survey of the Ragged Top Area. 1983.

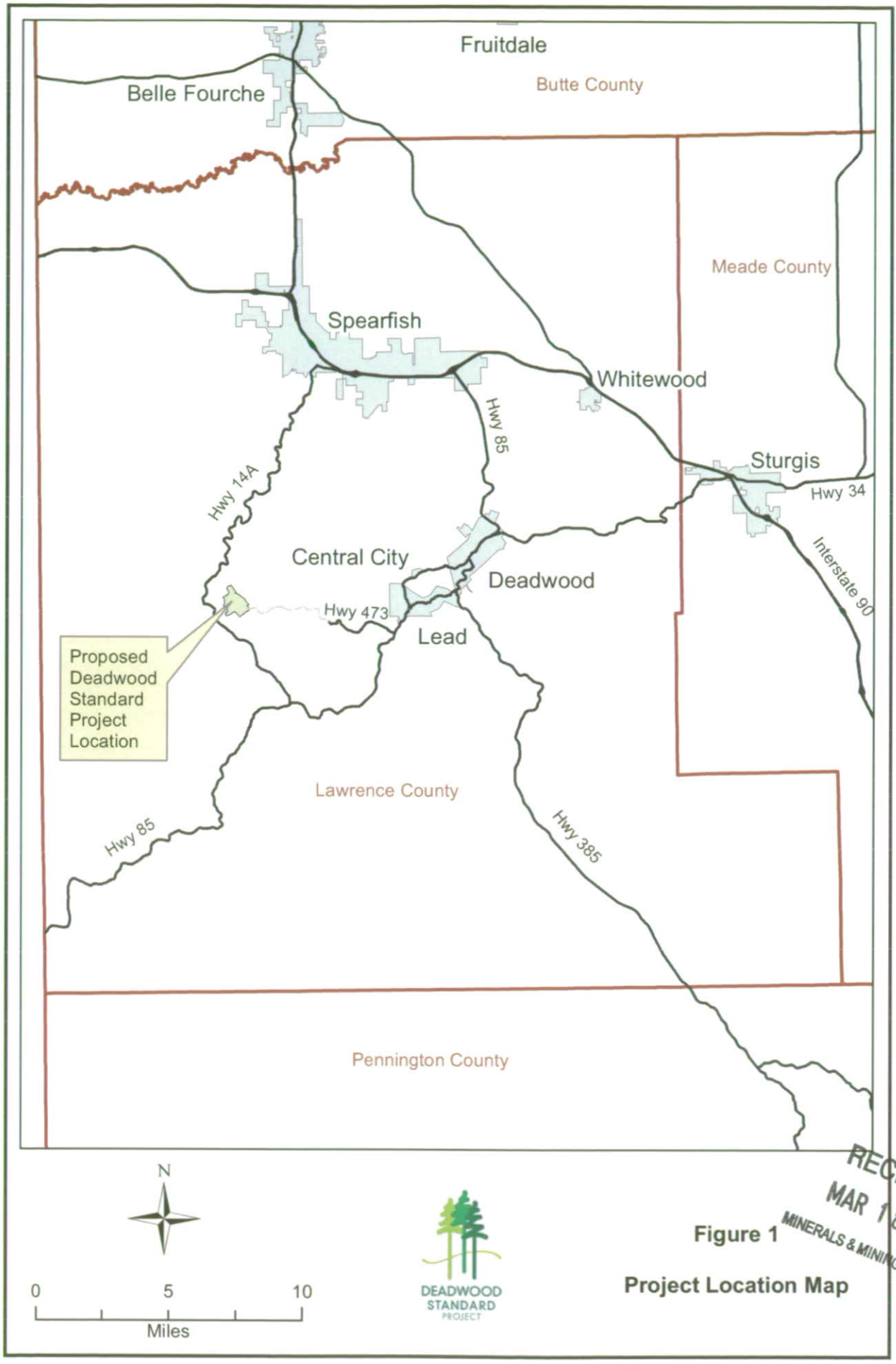

Figure 1

Project Location Map

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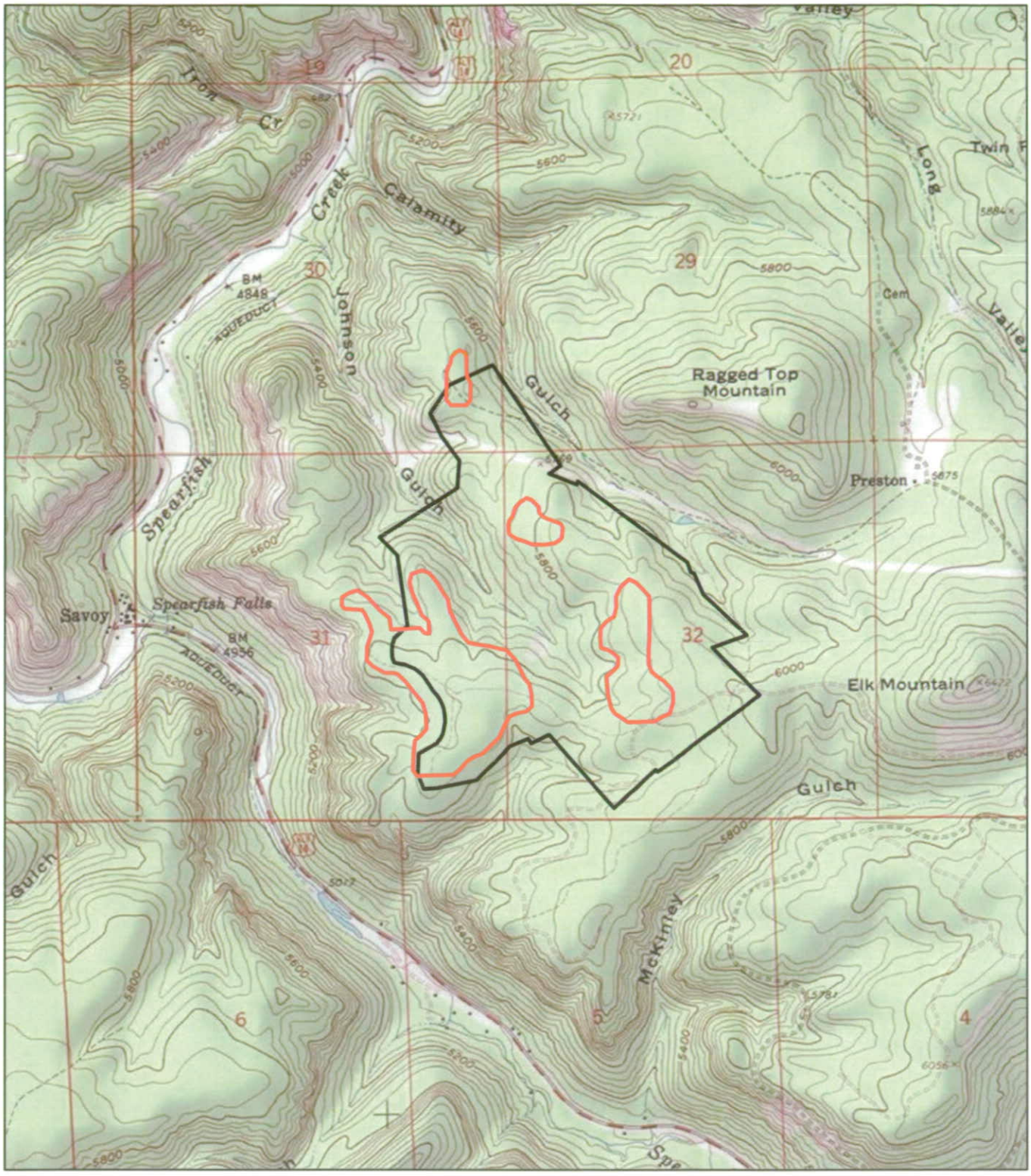
MAR 18 2013
MINERALS & MINING PROGRAM



Legend

- Proposed Deadwood Standard Project Area Boundary
- Permit 416 Clearing Limits

DEADWOOD STANDARD PROJECT

N

0 0.25 0.5
Miles

Figure 2

Comparison of Permit 416 Clearing Limits with Proposed Deadwood Standard Project Area Boundary

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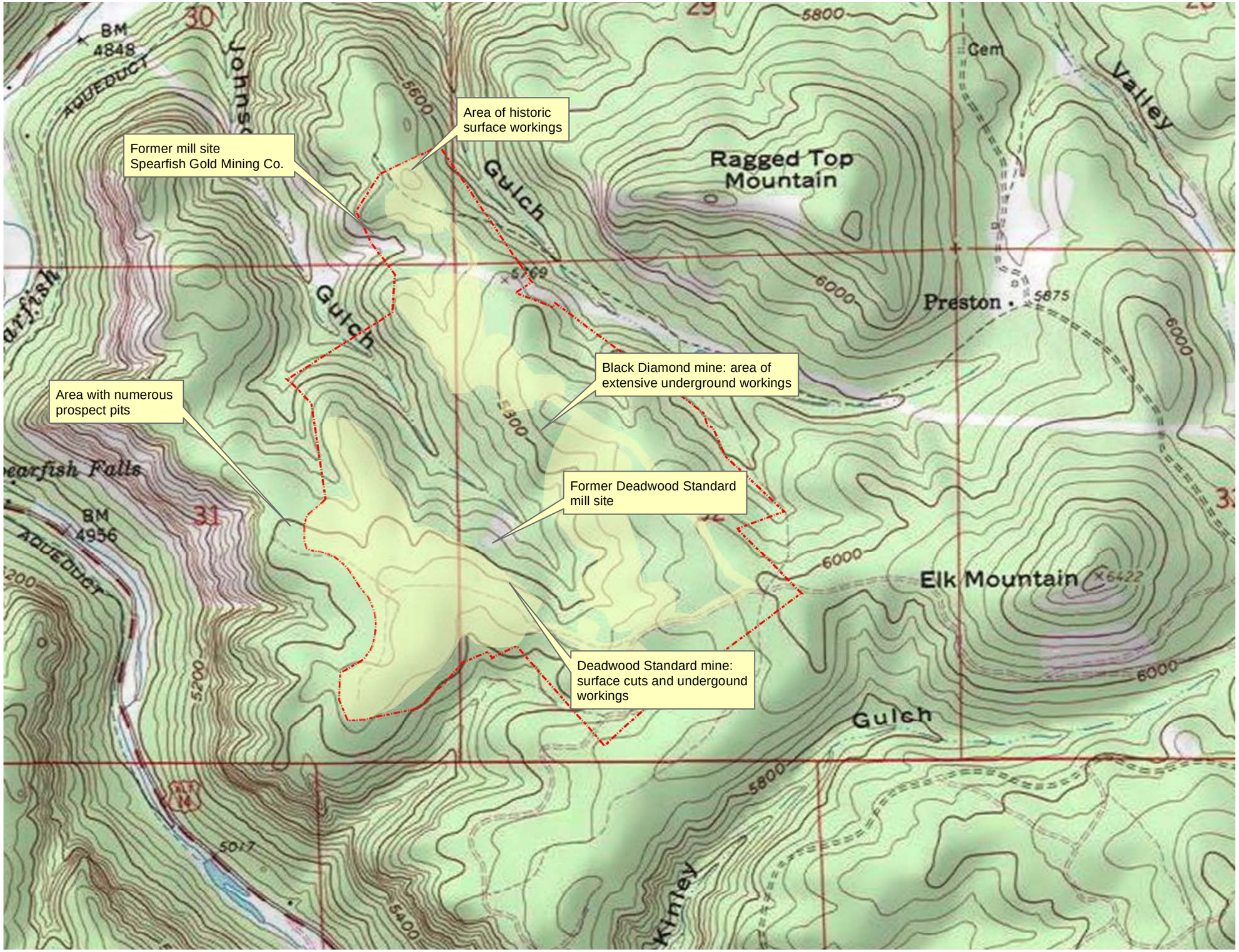
MINERALS & MINING PROGRAM



Legend

Proposed permit area boundary

Proposed affected areas

DEADWOOD STANDARD PROJECT

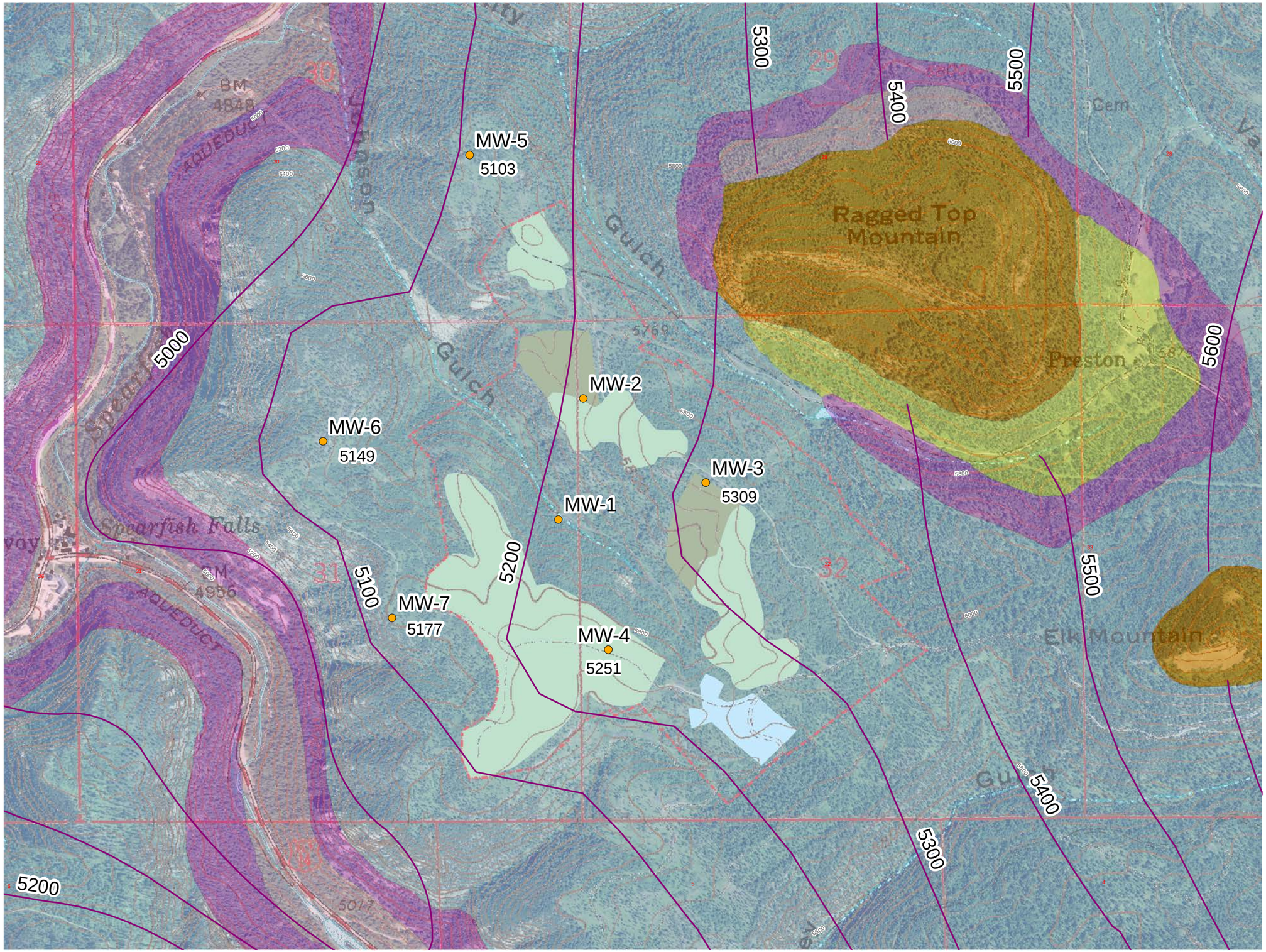
Location: Sections 29, 30, 31, 32
Township 5 North, Range 2 East
Black Hills Meridian

N

0 1,000 2,000
Feet

Figure 3

Location of Historic Mines and Mills



Legend

Proposed Areas of Distrbance

- Development Rock Area
- Prosess Area
- Excavation and Backfill Area

Boundaries

- Proposed Permit Area

Hydrogeologic Units

- Quaternery Alluvium
- Tertiary intrusives
- Missippian Pahasapa Limestone and Devonian Englewood Formation
- Ordivician Whitewood and Winnepeg Formations
- Deadwood Formation

Potentiometric Surface Deadwood Aquifer

Location:
Township 4 and 5 North,
Range 1 and 2 East
Black Hills Meridian

Hydrogeologic Data:
Unpublished VMC LLC Files and USGS Black Hills Hydrology Study

N

0 500 1,000 2,000

Feet

Deadwood Standard Project

Lawrence County, South Dakota

Figure 4

Hydrogeologic Framework

Design:	M. Nelson, CPG	Approved:	
Date:	February, 2012	Revised:	

Appendix A- Visual Effects Analysis

VISUAL EFFECTS ANALYSIS

DEADWOOD STANDARD PROJECT

LAWRENCE COUNTY

SOUTH DAKOTA

DEADWOOD
STANDARD
PROJECT

Prepared By:

VMC LLC

2509 Windmill Dr., #305

Spearfish, SD 57783

February, 2013

1.0 Introduction

The Deadwood Standard Project will be located on nearly flat to rolling topography on a limestone plateau east of Spearfish Canyon in the Ragged Top Mining District. The site will be approximately 1 mile west of the current Wharf Resources Mine located northwest of Lead, South Dakota. The project area is within portions of Sections 29, 30, 31, and 32, Township 5 North, Range 2 East, Black Hills Meridian. The site is comprised of a ponderosa pine / common juniper habitat, with the deciduous trees quaking aspen and paper birch interspersed throughout on a variety of aspects.. This mix of vegetation is similar to that found on thousands of acres of forested land throughout the Black Hills. Some logging of the proposed site has been done within the past 20 years. Since the mine will be located east of the Spearfish Canyon Rim, it is important that the proposed mine activities do not alter the scenic nature of the canyon area. VMC LLC has proposed that a 500-foot canyon rim buffer of tall pine trees will be maintained between the rim and any proposed activity.

This report documents the potential views of the proposed mine from various vantage points throughout the area. Particular attention was paid to views from Terry Peak and from along Spearfish Creek in the canyon. Locations of the various photographed vantage points and view directions are shown on Figure 1. Limited views of the project area can be seen from across the canyon travelling along FS 134. These sporadic breaks in the vegetation along the road provide a glimpse of the project area at a distance of approximately 4 miles across the canyon.

2.0 Scenic View Photos and Discussion

Vantage Point 1 – Photos #1. Taken from the top of the Terry Peak summit road looking northwest toward the proposed site. Latitude N 44°19.655′, Longitude W 103°50.205′. Elevation 6967 feet (ft). This site was accessed from the Terry Peak Summit Road. Although the elevation of this point is considerably higher than the surrounding area and the proposed mine site (elevation 5500 to 5900 ft. (MSL), the mine property was obscured by vegetation from the Terry Peak summit road.

Photograph #2 is taken from the Terry Peak Chair Lift. The view from this vantage shows small areas of the Wharf mine visible in the foreground and portions of the Deadwood Standard project area that can be seen in the background approximately 3.5 miles distant.

Photo #1

View from Terry Peak looking northwest toward the site. The ridge in the background obscures views of the proposed site.

Photo #2

View from the Terry Peak Chair Lift looking west toward the mine site

Vantage Point 2 – Photos #3, #4, #5, and #6. Taken looking due east from the parking lot of the Latchstring Inn along Spearfish Creek in Savoy. Latitude N 44°21.172', Longitude W 103°55.819'. Elevation 4984 ft. Refer to Figure 1 for the location and the view direction of this vantage point. This area around the Latchstring Inn and the Spearfish Canyon Lodge is a popular destination for hiking, fishing, biking, photography, and snowmobiling. The following photographs were taken to demonstrate that the proposed mine site will not be visible from the Savoy area.

Photos #3, #4, and #5 show a depiction of the Spearfish Canyon rim looking due east from Savoy. Note the line of trees on the edge of the rim, obscuring any view beyond the rim. VMC LLC has proposed a 500 foot canyon rim buffer of pine trees between the rim and any disturbance. The proposed mining activities will not be visible from the floor of Spearfish Canyon.

Photo #6 shows a zoom close-up of the rim above Savoy. Note that even with zoom photography, the views above the rim are blocked by the steep canyon walls and the tree-line buffer.

Photo #3

View of the Spearfish Canyon rim from the Latchstring Inn parking lot along Spearfish Creek.

Photo #4

View looking east from Savoy in the Latchstring Inn parking lot. Again, note the tree line obscuring views beyond the rim.

Photo #5

View of the rim from the parking lot of the Latchstring Inn in Savoy.

Photo #6

Zoom close-up of the rim above Savoy. Note the lack of visibility beyond the rim.

Vantage Point 3 – Photo #7. Taken from along Spearfish Creek north of Savoy looking southeast up Johnson Gulch. Latitude N 44°22.155′, W 103°55.257′. Elevation 4818 ft. Johnson Gulch drains from the vicinity of the proposed mine site into Spearfish Creek. This photo was taken looking up the gulch toward the mine area. Johnson Gulch will not be disturbed during mining. The presence of the rock rim, heavy timber and brush at the top of the rim prevents any view of the mine area. The mine will not be seen from the Johnson Gulch area along Spearfish Creek. Refer to Figure 1 for the location of this photo.

Photo #7

Looking up Johnson Gulch from along Spearfish Creek in the Canyon.

Vantage Point 4 – Photo #8. Taken along Spearfish Creek just north of Vantage Point 3 looking southeast up Calamity Gulch. Latitude N 44°22.284', Longitude W 103°55.148'. Elevation 4812 ft. Calamity Gulch flows from the southeast to northwest down from the rim into Spearfish Creek. It runs parallel to Johnson Gulch and enters the creek near the confluence of Johnson Gulch and Spearfish Canyon. Photo #8 is taken looking up the gulch to the southeast from along Spearfish Creek. As with the Johnson Gulch photo, the drainage is heavily timbered and the view to the top of the gulch is obscured. Observers will not be able to view the mine operations from the bottom of the gulch along Spearfish Creek.

Photo #8

View looking up Calamity Gulch from Spearfish Creek.

Vantage Point 5 – Photo #9. Taken along Spearfish Creek south of Savoy at No Name Gulch facing northeast. Latitude N 44°20.420′, Longitude W 103°55.036′. Elevation 5023 ft. This photo was taken just off of Billie Lane south of Savoy, and the location can be seen on Figure1. The view is looking up No Name Gulch toward the northeast. As with the two previous vantage points, the proposed mine site cannot be seen from the bottom of the gulch along Spearfish Creek.

Photo #9

View from Spearfish Creek looking northeast up No Name Gulch.

Vantage Point 6 – Photo #10. Taken along Spearfish Creek just north of Vantage Point 5 looking north/northeast. This photo is similar to Vantage Point 2, except the view is looking to the north. Refer to Figure 1 for the location of this site. As with Vantage Point 2, the rock rim and the tree line at the top of the rim prevent any view of the proposed mine site. The proposed forest buffer around the mine site will further assure that the site will not be visible.

Photo #10

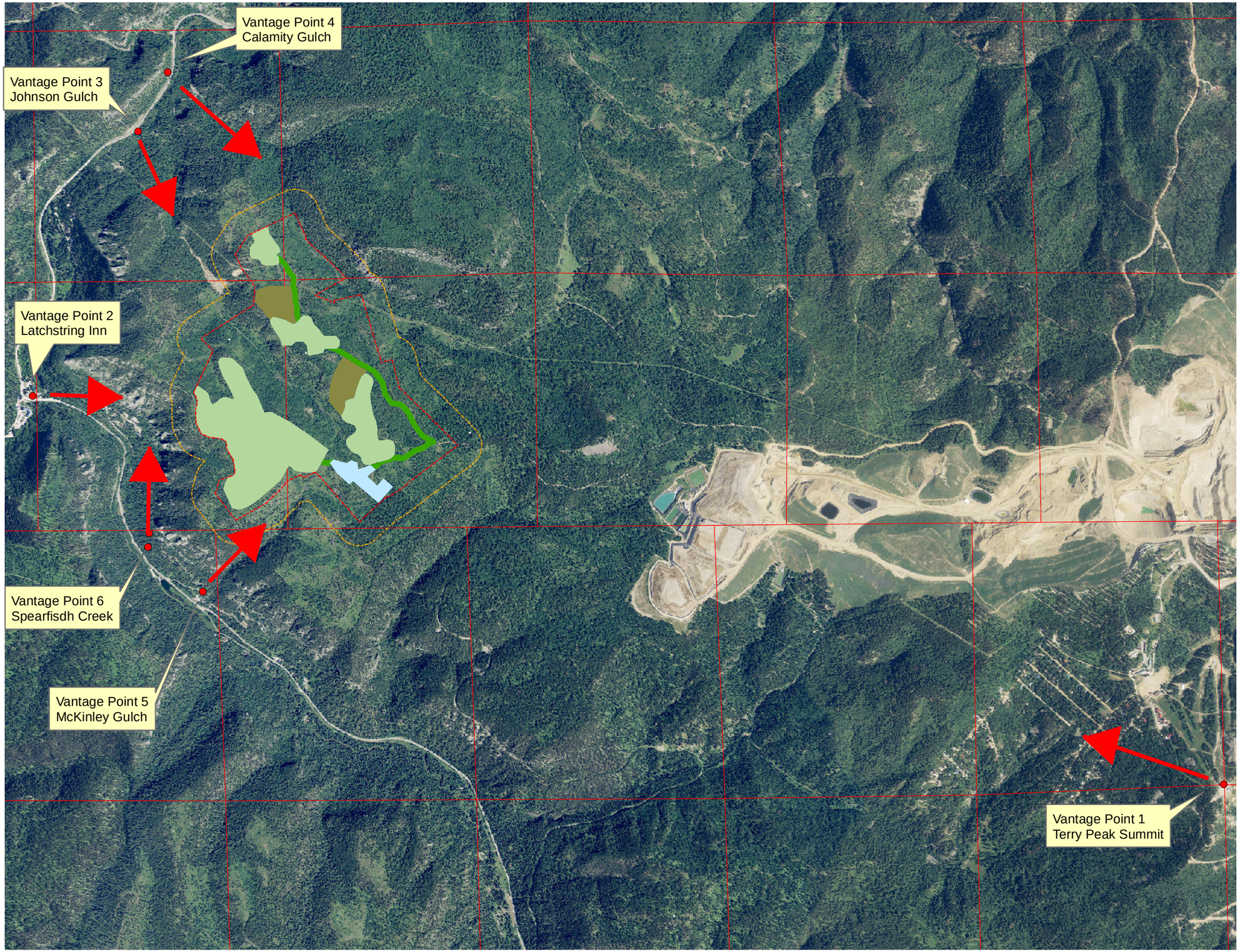
View looking north/northeast towards the Spearfish Canyon Rim in an area south of Savoy.

3.0 Summary

VMC LLC conducted a visual examination of the proposed Deadwood Standard Project mine site in areas where concern about the visibility of the mine site would exist. Areas of concern that were examined included the Terry Peak area, where extensive skiing occurs, and the Spearfish Canyon area where hiking, fishing, biking, and snowmobiling are frequent activities.

From the top of the Terry Peak Summit road, the proposed mine site area could not be seen by the general public due to dense forest cover and to the presence of a forested northeast/southwest trending ridge located between Terry Peak and the site. The proposed project area could be seen from the Terry Peak Chair Lift in the background of approximately 3.5 miles distant. All vantage points in Spearfish Canyon, along Spearfish Creek, did not provide views of the proposed mine. These sites included the Savoy area, Johnson Gulch, Calamity Gulch and No Name Gulch drainages. The presence of the steep, rocky rim and the tree line along the rim prevented any views over the top of the rim. The proposed 500 foot canyon rim buffer along the rim will ensure that the mine site cannot be viewed from

within Spearfish Canyon. Limited views of the project area can be seen from across the canyon on FS road 134. These are distant views from approximately four miles away.



Legend

Proposed Disturbance

- Development Rock Area
- Haul Road
- Process Area
- Surface Mining Disturbed

Boundaries

- Proposed Permit Area
- 500 Ft. Buffer

DEADWOOD STANDARD PROJECT

Location: Sections 29, 30, 31, 32
Township 5 North, Range 2 East
Black Hills Meridian

N

0 1,000 2,000 4,000
Feet

Deadwood Standard Project
Lawrence County, South Dakota

Scenic Assessment

Figure 1

Design: M. Nelson, CPG	Approved:
Date: February, 2012	Revised:

Appendix B- Cultural and Archeological Resources Study

3.10 - CULTURAL RESOURCES

During July and August 1983, a cultural resource survey was completed on approximately 370 acres in the Ragged Top Project area. The survey was performed by Plano Archaeological Consultants. A complete copy of the report, Cultural Resource Survey of the Ragged Top Area, is included for reference, at Attachment 3.10-1.

The survey revealed the presence of six historic sites, the majority of which were related to previous mining activities. With the exception of a single jasper flake found in 39LA295 (Balmoral), prehistoric evidence was lacking.

The Balmoral townsite, 39LA295, appears to be the only site that retains enough integrity to be eligible to the National Register of Historic Places. The cemetery, 39LA294, located between Balmoral and Dacy, appears to date from the early mining days of the Ragged Top district. Cemeteries, as such, are generally not considered eligible to the National Register, and there is nothing about this particular site to warrant an exception of Standards. The remaining sites: 39LA293 (Dacy); 39LA296 (Spearfish Cyanide); 39LA297 (Homestead); and 39LA298 (Deadwood Standard), lack physical integrity to the degree that would seem to preclude their eligibility to the National Register.

The six historic sites identified will be avoided during development and mining at the Ragged Top Project. No impact to cultural resources in the Ragged Top area should therefore result from Project activities.

Appendix C- Environmental Characteristics of Deadwood Standard Deposit

ENVIRONMENTAL CHARACTERISTICS OF THE DEADWOOD STANDARD PROJECT LAWRENCE COUNTY SOUTH DAKOTA

DEADWOOD STANDARD PROJECT

Prepared for:

Lawrence County Planning and Zoning Department

90 Sherman St.

Deadwood, SD

Prepared By:

Mark R. Nelson CPG

March, 2012

1.0 Introduction

A study of the potential for ore samples from the Johnson Gulch deposit to generate acid rock drainage (ARD) was conducted by the author in the spring of 1993. This report summarizes the results of this study including the distribution, alteration and lithology of the samples, and corresponding acid base accounting (ABA) analyses conducted at Energy Labs in Billings, Montana. The data indicate that the Deadwood Standard deposit has a strong neutralization potential ranging from 279 to 997 T/KT $CaCO_3$ equivalent with an average neutralization potential of 621.4 T/KT $CaCO_3$ equivalent. No detectable sulfur was identified in any of the samples indicating that no acid potential is present at the Deadwood Standard project.

2.0 Geologic Description of Sampled Intervals

Eighteen samples were split from reverse circulation drill cuttings collected in a 1992 drill program conducted by LAC Minerals (USA) Inc. (LAC). These samples were collected from ore intervals and selected to be representative of the various ore types present at the Deadwood Standard deposit. The samples were selected to be representative all of the ore types that occur at the deposit.

The samples were split from four-foot intervals, which were sampled during reverse circulation drilling using a center return hammer bit. The depths of the samples ranged from six feet to forty-six feet. The spatial distribution of the drill holes encompassed all of the major mineralized areas at the Deadwood Standard property. These drill holes were completed as part of a seventy-five hole twinning program conducted by LAC Minerals to validate results of previous drilling at the Deadwood Standard deposit completed by Homestake Mining Company and Minerva Exploration in the mid to late eighties.

The geology of the samples included Pahasapa Formation dolomites, solution breccias, and jasperoid as well as various degrees of alteration. The alteration, mineralization and host units present at Johnson Gulch are described by Duex et al. (1993). The ore zones occur in sub-horizontal zones of karst related permeability and brecciation related to primary sedimentological features of the upper Pahasapa Formation. Alteration present at the deposit includes silicification, carbonitization, fluoritization and ubiquitous supergene oxidation. Sampled alteration assemblages included various ranges of silicification, carbonitization, and some fluoritization. No pyrite or other sulfide minerals were identified

in any of the samples. The gold values of the samples ranged from 0.002 to 0.380 ounces per ton (opt). Lithological descriptions of the samples are included in Table 1.

Additional information regarding the mineralogy of ore samples from the Deadwood Standard deposit based on petrologic microscope and electron microprobe analysis is included in Appendix A. These data show that no pyrite or other sulfide minerals were identified even at high magnifications using the petrologic microscope and electron microprobe.

3.0 ABA Analysis Procedure

ABA analyses are widely used to evaluate the potential for mine materials and soils to generate ARD. ABA analyses used the modified Sobek method (EPA 1978), which is a laboratory analysis method intended to estimate the potential for a sample to generate acid at some time in the future. The propensity for a rock to generate acid drainage is dependent on both the acid-generating and acid-neutralizing potential of a rock. Acid generation results from oxidation of sulfide minerals, such as pyrite (FeS_2). Acid neutralization results from minerals that will neutralize acid, such as calcium carbonate ($CaCO_3$) and dolomite ($CaMg(CO_3)_2$). Numerous other minerals have the potential to neutralize acid; however, they dissolve slowly and are less effective at preventing acid rock drainage. ABA is not a quantitative method, and correct data interpretation requires an understanding of the mineralogy of the rock as well as assumptions inherent in the specific ABA method used (Jambor et al. 2003).

In ABA analyses, acid potential is estimated based on a series of sulfur analyses. Sulfur is analyzed in fractions of the sample that are soluble in water, hydrochloric acid, and/or nitric acid. A total sulfur analysis is also performed. Sulfur measured in the various digestions is interpreted to represent different types of sulfur-containing minerals. It is important to understand that the ABA method does not measure the content of any specific minerals. The content of the different types of sulfur-containing minerals is estimated based on interpretations of the sulfur digestions in relation to the mineralogy of the rock.

The quantity of "sulfide sulfur" (e.g., sulfur present in the minerals such as pyrite is estimated based on sulfur that reports to the nitric acid plus residual digestions. These sulfur fractions from the ABA test are assumed to represent the acid potential (AP) of the sample. Generally, all sulfide is assumed to be pyrite

which is a conservative assumption. The quantity of sulfur in the water or hydrochloric acid digestion is commonly assumed to be gypsum ($CaSO_4 \cdot 2H_2O$), other non-acid-generating sulfate minerals.

Estimating NP of ABA samples is completed using a titration method. NP is estimated by adding a known quantity of hydrochloric acid to the ground sample followed by titration of the solution back to a pH of 8.3 standard units (su) using sodium hydroxide. The quantity of remaining acid is estimated based on the amount of sodium hydroxide necessary to raise the pH back to a value of 8.3 su. The quantity of acid consumed by the sample is the NP, which is estimated by difference and expressed in units of tons per kiloton calcium carbonate equivalent (t/kt CaCO3 eq).

The ABA method has a basic assumption that pyrite is the only sulfide mineral present and that the pyrite is oxidized by oxygen producing 4 moles of hydrogen (H+) per mole of pyrite as shown below:

$$FeS_2 + 3.75O_2 + 3.5H_2O \rightarrow Fe(OH)_3 + 2SO_4^{2-} + 4H^+$$

The four protons generated in this reaction are then assumed to be neutralized by calcite as described below:

$$2CaCO_3 + 4H^+ \rightarrow 2Ca^2 + 2H_2CO_3$$

In interpretation of ABA analyses, acidity produced by 1 mole of pyrite is assumed to be neutralized by 2 moles of calcite, which results in a stoichiometric conversion factor of 31.25 t/kt CaCO3 eq. per percent pyritic sulfur. This allows both the AP and NP of a sample to be expressed in equal units of t/kt CaCO3 eq. The assumed neutralization path for neutralization of acidity by calcite is not unique, and up to 4 moles of calcite may be required to neutralize the acidity formed by oxidation of 1 mole of FeS2 (i.e., the required amount of calcite may be two times that assumed in reaction 2 [Rose and Cravotta 1994]). Pyrite oxidation by dissolved ferric iron (Fe+3) is also common, and the quantity of acid generated per mole of pyrite varies based on the reaction path. In addition, other sulfide or sulfosalt minerals are commonly present, which may or may not generate acid.

4.0 Discussion

ABA data for the Deadwood Standard samples are shown in Table 1. No detectable sulfur was identified in any of the samples, which indicates that the samples have no potential to generate ARD. In addition, the samples have a high neutralization potential and would have substantial capacity to neutralize ARD. Based on this evaluation it is very unlikely that mining of the Deadwood Standard Project would cause ARD or other water quality effects associated with oxidation of sulfide minerals.

5.0 References

Duex, T.A., Nelson, M.R. and Miller, J.C., 1994, *Geology and History of the Johnson Gulch Area of the Ragged Top Mining District, Lawrence County, South Dakota*, in Fifth Western Regional Conference on Precious Metals, Coal and the Environment, Society of Mining, Metallurgy and Exploration.

Jambor, et. al. 2003, *Environmental Aspects of Mine Wastes*, Short Course Series Volume 31. Prepared by the Mineralogical Association of Canada.

Rose, A.W. and Cravotta, C.A. 1994. *Geochemistry of Coal Mine Drainage, Coal Mine Pollution Prevention on Pennsylvania, Pennsylvania Department of Environmental Quality.*

Sobek, A.A., Schuller, W.A., Freeman, J.R., and Smith, R.M., 1978, *Field and Laboratory Methods Applicable to Overburdens and Minesoils*, Environmental Protection Agency, Cincinnati, Ohio, EPA 600/2-78-054.

Table 1
Acid Base Accounting Data
Deadwood Standard Deposit
Lawrence County, South Dakota

Drill Hole	Depth (feet)	Sample Number	Gold (opt)	Total Sulfur (%)	Neutralization Potential (T/KT CaCO3 eq.)	Acid Potential (T/KT CaCO3 eq.)	Geologic Description
JG-92-1	30-34	307378	0.12	0	458	0	Dolomite, 70% s silic, 2.5% FeOX
JG-92-4	26-30	307427	0.05	0	621	0	Dolomite, m-s silic, 2% FeOX
JG-92-8	34-38	307479	0.38	0	279	0	Jasperoid, Tr Calc V, 2% Fe0x
JG-92-12	10-Jun	307552	0.054	0	573	0	Dolomite, 2% FeOx
JG-92-14	14-18	307594	0.168	0	570	0	Breccia, m silic, 2.5%FeOX
JG-92-17	14-18	307634	0.02	0	513	0	Dolomite, 1% FeOx
JG-92-20	10-Jun	307662	0.048	0	647	0	Dolomite, 5% gry chert, 1.5% FeOx
JG-92-23	34-38	307729	0.036	0	837	0	Dolomite, 50% m silic, 1.5% FeOX
JG-92-24	30-34	307738	0.042	0	716	0	Dolomite, m silic, 2% FeOX
JG-92-28	10-Jun	308412	0.032	0	622	0	Dolomite, 1.5% FeOx, Tr calc v
JG-92-37	14-Oct	308653	0.078	0	732	0	Dolomite, 40% s silic, 2% FeOX
JG-92-44	14-Oct	308683	0.1	0	628	0	Dolomite, 2% Fluor, 20% silic, 1% FeOx
JG-92-52	18-22	308865	0.05	0	478	0	60% Dolomite, 40% jasperoid, Tr. drusy calc
JG-92-63	18-22	309125	0.004	0	904	0	Dolomite, Tr silic
JG-92-66	18-22	309185	0.058	0	407	0	Jasperoid, 3% FeOX
JG-92-67	18-22	309205	0.056	0	482	0	Jasperoid
JG-92-70	42-46	309261	0.01	0	721	0	Dolomite
JG-92-73	14-18	309304	0.002	0	997	0	Dolomite, s silic

Abbreviations:
%- percent
opt- troy ounce per ton
T/KT CaCO3 eq.- tons per kiloton calcium carbonate equivalent
silic.- silicification
FeOX- iron oxide
Fluor.- fluorite
Calc.-calcite
Tr- trace
M- moderate
S- strong
V- vein

Appendix A

Petrologic Microscope and Electron Microprobe Mineralogical Analyses

RECEIVED MAR 1 9 1993

LAC

To: Todd Duex, Chief Geologist, Richmond Hill, Inc.

From: Craig Ford, Petrographer/Petrologist

Date: March 17, 1993

Subject: Rock descriptions and gold characterization from Johnson Gulch

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MAR 1 8 2013
MINERALS & MINING PROGRAM

Memorandum

Further to our phone conversation of March 9, here are the results of the petrographic and microprobe work on the four Johnson Gulch samples. Detailed petrologic descriptions are appended to the end of this memo. I've also enclosed a copy of a paper on gold-ore mineralogy and its bearing on metallurgy. The numbers in brackets refer to our lab designations.

202119 (93-72)

This jasperoid sample consists mainly of microcrystalline quartz, with FeO_x, minor TiO_x, trace MnO_x and gold. Alteration consists of pervasive silicification and formation of disseminated pyrite, followed by replacement of pyrite by FeO_x during supergene(?) oxidation. Intense silicification has obliterated any indication of protolith composition.

In the microprobe, gold was observed as anhedral grains up to 2 x 5 μ in size encapsulated by quartz. No silver was noted in any of the six analyzed grains. These grains were roughly aligned, although no discrete microfracture was observed. Low recoveries are possibly the result of silica encapsulation, although coatings of FeO_x and MnO_x on gold can also cause problems. Increased CN^- retention time in the column test probably contributes to the increase in recovery. This suggests a problem with gold coatings, rather than silica encapsulation, particularly in the absence of gold in microfractures.

369120 (93-73)

This brecciated jasperoid sample consists mainly of silicified limestone(?) fragments in a carbonate + fluorite matrix, with minor FeO_x and opaque minerals, and trace barite, orpiment and gold. Quartz forms the majority of the sample as fine-grained replacement of breccia fragments. Individual grains are generally euhedral, especially when near or within the carbonate-rich matrix. Coarse-grained calcite forms the majority of the breccia matrix, although it is also found throughout the silicified fragments, commonly in association with fluorite. Trace siderite ($FeCO_3$) was identified optically and with the microprobe, and forms anhedral grains surrounded and locally replaced by calcite. Sub- to euhedral fluorite is abundant within the carbonate matrix and is often concentrated along fragment margins. It is also located within silicified fragments, along with calcite. Fluorite is cut by siderite and calcite veinlets. Trace, fine-grained, Sr-bearing barite was identified by microprobe. FeO_x forms fine-grained, anhedral grains disseminated throughout the sample and also within carbonate, along fragment margins. Opaques consist mainly of TiO_x which forms anhedral grains that are often included by fluorite. Anhedral arsenic sulphide, tentatively identified as orpiment, was identified in the microprobe, and occurs as inclusions in fluorite. One

gold grain, 4 x 3 μ in size, was detected in the microprobe. This occurs as an inclusion in matrix calcite.

The presence of orpiment in this sample could help explain extremely low gold recoveries in this sample. Experimental studies demonstrate that orpiment dissolution consumes significant amounts of cyanide (Henley, 1975).

369121 (93-74)

This sample consists of dominant carbonate, with minor quartz and FeO_x, and trace MnO_x and apatite. This rock is a fractured, weakly silicified, micritic dolostone. Much of the sample is composed of fine-grained dolomitic carbonate, with locally preserved biogenic debris forming thin layers. Grains are generally < 0.05 mm in diameter. An XRD pattern to confirm dolomite is pending. Quartz forms isolated, anhedral grains up to 0.4 mm in diameter included by dolomite, and rare radiating structures, similar to spherulites in igneous rocks. The process of dolomitization can result in 15% volume reduction, and it is considered likely that voids have been filled by secondary, feathery quartz. Most quartz occurs as 0.05 mm grains that form narrow, cross-cutting veinlets. Minute, euhedral carbonate grains occur on the margins of these veinlets; microprobe analysis shows these are siderite and a Ca + Mn + Ba carbonate, although the latter may be intergrown Fe- and Mn-oxide minerals within quartz veinlets. No gold grains were discovered with the 12-hour automated gold find program on the microprobe.

369125 (93-75)

The majority of this sample consists of a fine-grained mosaic of interlocking quartz grains < 0.05 mm in diameter. Quartz also forms widely scattered lenses composed of grains that average 0.08 mm in diameter. These grains have curved boundaries. Trace minerals are FeO_x, TiO_x, white mica, possible smectite and gold. The sample also features casts of an unknown mineral. FeO_x forms anhedral clots within the silicified groundmass, and locally is concentrated on the margins of casts. It likely forms pseudomorphs after disseminated pyrite. TiO_x is fine-grained, anhedral particles scattered throughout the sample. White, K-bearing mica forms minute, randomly oriented laths intergrown with fine-grained quartz. One lath of an iron-bearing sheet silicate was observed with the microprobe, and it is tentatively identified as smectite.

A total of 41 gold grains were identified with the microprobe; four by hand and 37 using the automated gold find program. Twenty-four of these grains are located in two FeO_x aggregates close to each other. The average size of all grains is ~ 1.5 μ diameter, although some reach 5 μ in length. Thirty-two of the 41 grains are included in FeO_x aggregates; the remainder are all encapsulated by fine-grained quartz. Quartz encapsulation of gold probably helps explain the low recoveries in this sample, although most of the gold appears to be in favorable sites for liberation. It is possible that this sample is not representative in terms of the proportion of gold in FeO_x vs. that encapsulated by quartz. FeO_x coating gold may also contribute to the low recoveries.

REFERENCES

Henley, K.J., 1975, Gold-ore mineralogy and its relation to metallurgical treatment: *Minerals Sci. Engng*, v. 7, p. 289-312.

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PETROGRAPHIC REPORT

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MAR 18 2013
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Sample #: 202119 (93-72) **Submitted by:** T. Duex

Property: Johnson Gulch **Petrographer:** Craig Ford

Date: March 15, 1993

Rock type: Jasperoid (silicified limestone?)

Alteration: pervasive hypogene silicification, sulfidation, supergene oxidation. Protolith textures have been obliterated at the microscopic scale.

Mineral	%	Textural Relationships
quartz	90	Microcrystalline quartz forms most of the sample as grains < 0.01 mm in diameter. Also forms 0.1 mm grains within cross-cutting veinlets; some comb-textured grains are located at veinlet margins.
FeO_x	10	Fine-grained, semi-translucent blebs and as anhedral pseudomorphs after pyrite cubes.
TiO_x	tr	Fine-grained anhedral blebs included in quartz.
MnO_x	tr	Fine-grained anhedral grains widely scattered throughout the sample.
gold	tr	Anhedral grains up to 5 x 2 μ in size encapsulated in quartz. Most grains average 1-2 μ in diameter. Grains are Au-rich with no detectable Ag. Six grains are located within $\sim$50 μ of MnO_x $\pm$ TiO_x grains, and appear to be roughly aligned.

Summary:

This jasperoid sample represents pervasively silicified limestone(?), with accessory, disseminated pyrite that has been oxidized, resulting in formation of FeO_x minerals. Pervasive alteration has destroyed any textural evidence of protolith composition. Gold occurs as minute, anhedral particles encapsulated in quartz, providing an explanation for relatively low recoveries ($\sim$60%). FeO_x and/or MnO_x coatings on gold could also be important, due to the increased recoveries in the column test.

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PETROGRAPHIC REPORT

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Sample #: 369120 (93-73) **Submitted by:** T. Duex

Property: Johnson Gulch **Petrographer:** Craig Ford

Date: March 15, 1993

Rock type: Brecciated jasperoid

Alteration: Pervasive silicification, followed by brecciation, followed by carbonatization and veining, followed by supergene oxidation.

Mineral	%	Textural Relationships
quartz	52	Forms the majority of the silicified limestone(?) breccia fragments as 0.02 mm sub- to euhedral grains. Many euhedra project into the carbonate breccia matrix, and are included in carbonate and fluorite. Also forms coarser, subhedral, often elongate grains intergrown with fluorite. Rarely forms sub-rounded "spherulites", that consist of feathery, radiating quartz grains. These likely represent secondary, quartz-filled vugs.
carbonate minerals	25	Two types identified: (1) coarse calcite grains up to 4.2 mm in diameter that form the majority of the breccia matrix. Cross-cuts matrix fluorite and coarse-grained quartz, and partially replaces these. Also forms small lenses within breccia fragments, where it is intergrown with fluorite, and (2) minor siderite occurring in fractures in fluorite and within calcite. Siderite is often surrounded and replaced by calcite.
fluorite	15	Sub- to euhedral grains that average 0.25 mm in diameter that are most abundant within the carbonate breccia matrix, where they are cut and replaced by carbonate minerals. Fluorite also occurs within breccia fragments, intergrown with fine-grained quartz and within some calcite pods.
FeO_x	7	Fine-grained, anhedral grains disseminated throughout and locally concentrated in the carbonate matrix near fragment margins. Also occurs along fractures.

Sample # (cont'd): 369120 (93-73)

Mineral	%	Textural Relationships
opaques	1	Opaque minerals TiO_x, orpiment/realgar, pyrite and gold are minor components of this sample. TiO_x occurs as fine-grained inclusions in fluorite. Anhedral orpiment/realgar was identified with the microprobe and forms minute grains included in fluorite. A pyrite grain was noted in fluorite. One 4 x 3 μ gold grain occurred as an inclusion in the calcite matrix.
barite	tr	A minute Sr-bearing barite grain identified with the microprobe occurred as an inclusion in fluorite.
zircon	tr	One zircon grain was identified by microprobe, and was located within a silicified breccia fragment.

Summary:

This sample consists of silicified fragments in a carbonate + fluorite matrix. Fragments may have been limestone prior to alteration, and these were replaced prior to brecciation. Brecciation and deposition of the carbonate + fluorite matrix was probably contemporaneous. Most of the orpiment/realgar and gold are associated with fluorite, suggesting that the carbonate + fluorite event is responsible for the current sites of gold in this sample.

The poor recoveries are difficult to ascribe to gold encapsulation, given that only one gold grain was identified, and this was included by calcite. Experimental studies demonstrate that dissolution of orpiment is a consumer of cyanide; it is possible that this phenomenon is partially responsible for low recoveries.

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PETROGRAPHIC REPORT

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Sample #: 369121 (93-74) **Submitted by:** T. Duex

Property: Johnson Gulch **Petrographer:** Craig Ford

Date: March 15, 1993

Rock type: Fractured, weakly silicified, micritic dolostone

Alteration: Weak, fracture-controlled silicification, followed by supergene oxidation.

Mineral	%	Textural Relationships
carbonate minerals (mostly dolomite)	90	Most forms an interlocking mosaic of grains < 0.05 mm in diameter and appears to be micritic, with some layers containing scattered biogenic debris. Microprobe analysis indicates this carbonate is dolomitic, which probably formed during diagenesis. Dolomitization results in a net volume reduction of up to 15%, and can cause significant porosity to develop. XRD analysis is pending. Also forms euhedral grains that project into quartz pods and veinlets and is sometimes located adjacent to fractures. This analyzed as siderite and possibly an Mn + Ba ± Ca ± Mg ± Fe carbonate species. These may be intergrown on a sub-microscopic scale with FeO_x and MnO_x.
quartz	7	Forms isolated, anhedral grains up to 0.4 mm in diameter within micritic dolomite, and also as rare "spherulitic" structures composed of feathery, radiating quartz. These probably represent secondary quartz deposited in voids that may have been created during dolomitization. Most quartz forms 0.05 mm diameter grains that fill irregular lenses and fractures. Some lenses are polycrystalline. Fractures locally resemble styolites, pressure solution features common in carbonate rocks.
FeO_x/MnO_x	3	Fine-grained, wispy masses that are generally adjacent to quartz-bearing fractures and lenses. Intergrown with minor MnO_x.
apatite	tr	Minute, anhedral grains widely scattered throughout.

Sample # (cont'd): 369121 (93-74)

Summary:

This is a weakly altered carbonate rock that has undergone silicification along narrow fractures. No gold was discovered in this sample, although the automated gold find program analyzed 30 grains that had the appropriate brightness. These are accounted for by the presence of fine-grained, disseminated monazite and possibly zircon.

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PETROGRAPHIC REPORT

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Sample #: 369125 (93-75) **Submitted by:** T. Duex

Property: Johnson Gulch **Petrographer:** Craig Ford

Date: March 15, 1993

Rock type: Jasperoid

Alteration: Pervasive silicification and sulfidation, followed by supergene oxidation.

Mineral	%	Textural Relationships
quartz	90	Fine-grained, randomly oriented, sub- to anhedral crystals averaging ~ 0.05 mm in diameter that form an interlocking mosaic. Some form widely scattered, often polycrystalline lenses that contain grains that average 0.08 mm in diameter. Grain boundaries are curved.
FeO_x	9	Forms anhedral clots within the silicified groundmass. Zones of concentrated FeO_x correlate with more abundant, coarser-grained quartz lenses and slight increase in white mica content. Some FeO_x forms pseudomorphs after pyrite cubes, and some is concentrated on the margins of casts.
white mica	1	This K-bearing white mica forms minute, randomly oriented laths scattered throughout the silicified groundmass. Their abundance increases somewhat near FeO_x concentrations.
smectite	tr	One lath identified with the microprobe, intergrown with quartz in the groundmass.
apatite	tr	Anhedral grains, locally intergrown with zircon in the groundmass. Identified with the microprobe.
zircon	tr	Subhedral, minute grains locally intergrown with apatite in the groundmass. Identified with the microprobe.
TiO_x	tr	Scattered anhedral particles throughout the sample. Identified with the microprobe.

Sample # (cont'd): 369125 (93-75)

Mineral	%	Textural Relationships
gold	tr	A total of 41 individual gold grains were found, although 24 of these were found in two small areas close to each other. Four were found manually with the microprobe, the other 37 were located using the automated gold find program. Most grains average 1-1.5 μ in diameter, although a few reach 5 μ in length. 32 of the 41 grains are included in FeO_x aggregates that appear to pseudomorph pyrite. Nine grains are encapsulated by fine-grained quartz.

Summary:

This jasperoid sample represents pervasively silicified limestone(?), although there is no textural evidence to indicate protolith composition. Deposition of pyrite and gold accompanied silica introduction; pyrite was subsequently oxidized and much of its contained gold was incorporated as inclusions in FeO_x minerals. Based on this sample, a minor amount of gold is encapsulated by quartz, which helps account for poor gold recovery. No evidence for the mineralogical precursor to the casts was encountered. Gold does not appear to be associated with microfractures. The higher recoveries in the 3/4" bottle roll test are probably the result of improved liberation at the smaller grain size.

Appendix B

Laboratory Acid Base Accounting Data

ENERGY LABORATORIES

ENERGY LABORATORIES, INC.
P.O. BOX 30916 • 1107 SOUTH BROADWAY • BILLINGS, MT 59107-0916 • PHONE (406) 252-6325
FAX (406) 252-6069 • 1-800-735-4489

LABORATORY REPORT

TO: Todd Duex
ADDRESS: Bond Gold Richmond Hill, Inc.
P.O. Box 892
Lead, SD 57754

LAB NO: 93-17922 -24
DATE: 05/19/93 crp

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SOIL ANALYSIS

Submitted 05/06/93

Sample No.	17922	17923	17924
Location	307378	307427	307479
	84146	84172	84205
	Au 0.120	0.050	0.380
Lime, % as CaCO3	45.8	62.1	27.9
Neut. Pot., T/1000 Tons (1)	458	621	279
Acid Pot., meq/100g	0	0	0
Acid Pot., T/1000 Tons (1)	0	0	0
Acid/Base Pot., T/1000 Tons (1)	458	621	279
Total Sulfur %	<0.01	<0.01	<0.01
Hot H20 Extractable Sulfur %	<0.01	<0.01	<0.01
HCl Extractable Sulfur %	<0.01	<0.01	<0.01
HNO3 Extractable Sulfur %	<0.01	<0.01	<0.01
Residual Sulfur, %	<0.01	<0.01	<0.01

(1) T CaCO3/1000 Tons Soil

ENERGY LABORATORIES

ENERGY LABORATORIES, INC.
P.O. BOX 30916 • 1107 SOUTH BROADWAY • BILLINGS, MT 59107-0916 • PHONE (406) 252-6325
FAX (406) 252-6069 • 1-800-735-4489

LABORATORY REPORT

TO: Todd Duex
ADDRESS: Bond Gold Richmond Hill, Inc.
P.O. Box 892
Lead, SD 57754

LAB NO: 93-17925 -27
DATE: 05/19/93 crp

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MAR 18 2013
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SOIL ANALYSIS

Submitted 05/06/93

Sample No.	17925	17926	17927
Location	307552	307594	307634
	84245	84275	84304
Au	0.054	0.168	0.020
Lime, % as CaCO3	57.3	57.0	51.3
Neut. Pot., T/1000 Tons (1)	573	570	513
Acid Pot., meq/100g	0	0	0
Acid Pot., T/1000 Tons (1)	0	0	0
Acid/Base Pot., T/1000 Tons (1)	573	570	513
Total Sulfur %	<0.01	<0.01	<0.01
Hot H20 Extractable Sulfur %	<0.01	<0.01	<0.01
HCl Extractable Sulfur %	<0.01	<0.01	<0.01
HNO3 Extractable Sulfur %	<0.01	<0.01	<0.01
Residual Sulfur, %	<0.01	<0.01	<0.01

(1) T CaCO3/1000 Tons Soil

ENERGY LABORATORIES

ENERGY LABORATORIES, INC.
P.O. BOX 30916 • 1107 SOUTH BROADWAY • BILLINGS, MT 59107-0916 • PHONE (406) 252-6325
FAX (406) 252-6069 • 1-800-735-4489

LABORATORY REPORT

TO: Todd Duex
ADDRESS: Bond Gold Richmond Hill, Inc.
P.O. Box 892
Lead, SD 57754

LAB NO: 93-17928 -30
DATE: 05/19/93 crp

RECEIVED
MAR 18 2013
MINERALS & MINING PROGRAM

SOIL ANALYSIS

Submitted 05/06/93

Sample No.	17928	17929	17930
Location	307662	307729	307738
	84326	84376	84385
Au	0.048	0.036	0.012
Lime, % as CaCO3	64.7	83.7	71.6
Neut. Pot., T/1000 Tons (1)	647	837	716
Acid Pot., meq/100g	0	0	0
Acid Pot., T/1000 Tons (1)	0	0	0
Acid/Base Pot., T/1000 Tons (1)	647	837	716
Total Sulfur %	<0.01	<0.01	<0.01
Hot H20 Extractable Sulfur %	<0.01	<0.01	<0.01
HCl Extractable Sulfur %	<0.01	<0.01	<0.01
HNO3 Extractable Sulfur %	<0.01	<0.01	<0.01
Residual Sulfur, %	<0.01	<0.01	<0.01

(1) T CaCO3/1000 Tons Soil

ENERGY LABORATORIES

ENERGY LABORATORIES, INC.
P.O. BOX 30916 • 1107 SOUTH BROADWAY • BILLINGS, MT 59107-0916 • PHONE (406) 252-6325
FAX (406) 252-6069 • 1-800-735-4489

LABORATORY REPORT

TO: Todd Duex
ADDRESS: Bond Gold Richmond Hill, Inc.
P.O. Box 892
Lead, SD 57754

LAB NO: 93-17931 -33
DATE: 05/19/93 crp

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SOIL ANALYSIS

Submitted 05/06/93

Sample No.	17931	17932	17933
Location	308412	308653	308683
	85082	85243	85290
	Au 0.032	0.078	0.100
Lime, % as CaCO3	62.2	73.2	62.8
Neut. Pot., T/1000 Tons (1)	622	732	628
Acid Pot., meq/100g	0	0	0
Acid Pot., T/1000 Tons (1)	0	0	0
Acid/Base Pot., T/1000 Tons (1)	622	732	628
Total Sulfur %	<0.01	<0.01	<0.01
Hot H20 Extractable Sulfur %	<0.01	<0.01	<0.01
HCl Extractable Sulfur %	<0.01	<0.01	<0.01
HNO3 Extractable Sulfur %	<0.01	<0.01	<0.01
Residual Sulfur, %	<0.01	<0.01	<0.01

(1) T CaCO3/1000 Tons Soil

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LABORATORY REPORT

TO: Todd Duex
ADDRESS: Bond Gold Richmond Hill, Inc.
P.O. Box 892
Lead, SD 57754

LAB NO: 93-17934 -36
DATE: 05/19/93 crp

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SOIL ANALYSIS

Submitted 05/06/93

Sample No.	17934	17935	17936
Location	308865	309125	309185
	83440	85574	85696
Au	0.050	0.004	0.058
Lime, % as CaCO3	47.8	90.4	40.7
Neut. Pot., T/1000 Tons (1)	478	904	407
Acid Pot., meq/100g	0	0	0
Acid Pot., T/1000 Tons (1)	0	0	0
Acid/Base Pot., T/1000 Tons (1)	477	904	407
Total Sulfur %	<0.01	<0.01	<0.01
Hot H20 Extractable Sulfur %	<0.01	<0.01	<0.01
HCl Extractable Sulfur %	<0.01	<0.01	<0.01
HNO3 Extractable Sulfur %	<0.01	<0.01	<0.01
Residual Sulfur, %	<0.01	<0.01	<0.01

(1) T CaCO3/1000 Tons Soil

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LABORATORY REPORT

TO: Todd Duex
ADDRESS: Bond Gold Richmond Hill, Inc.
P.O. Box 892
Lead, SD 57754

LAB NO: 93-17937 -39
DATE: 05/19/93 crp

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SOIL ANALYSIS

Submitted 05/06/93

Sample No.	17937	17938	17939
Location	309205	309261	309304
	85708	85747	85783
Au	0.056	0.010	0.002
Lime, % as CaCO3	48.2	72.1	99.7
Neut. Pot., T/1000 Tons (1)	482	721	997
Acid Pot., meq/100g	0	0	0
Acid Pot., T/1000 Tons (1)	0	0	0
Acid/Base Pot., T/1000 Tons (1)	481	721	997
Total Sulfur %	<0.01	<0.01	<0.01
Hot H20 Extractable Sulfur %	<0.01	<0.01	<0.01
HCl Extractable Sulfur %	<0.01	<0.01	<0.01
HNO3 Extractable Sulfur %	<0.01	<0.01	<0.01
Residual Sulfur, %	<0.01	<0.01	<0.01

(1) T CaCO3/1000 Tons Soil

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LABORATORY REPORT

TO: Todd Duex
ADDRESS: Bond Gold Richmond Hill, Inc.
P.O. Box 892
Lead, SD 57754

LAB NO: 93-17907 -39
DATE: 05/19/93 crp

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QUALITY ASSURANCE - CONTROL SOIL ANALYSIS

This Quality Assurance - Control Soil Analysis was run with Lab Nos. 93-17907 to 93-17939 with the following results:

Sample No. Location	CONTROL SOIL ANALYSIS	TARGET RANGE
Lime, % as CaCO3	6.2	2.8 - 8.5
Neut. Pot., T/1000 Tons (1)	62	33 - 84
Acid Pot., meq/100g	2	0 - 12
Acid Pot., T/1000 Tons (1)	1	0 - 6
Acid/Base Pot., T/1000 Tons (1)	62	30 - 81
Total Sulfur %	0.03	0.02 - 0.25
Hot H20 Extractable Sulfur %	<0.01	<0.01
HCl Extractable Sulfur %	<0.01	<0.01
HNO3 Extractable Sulfur %	0.03	0.01 - 0.20
Residual Sulfur, %	<0.01	<0.01

(1) T CaCO3/1000 Tons Soil

ENERGY LABORATORIES

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LABORATORY REPORT

TO: Todd Duex
ADDRESS: Bond Gold Richmond Hill, Inc.
P.O. Box 892
Lead, SD 57754

LAB NO: 93-17910, 20, 30 dup
DATE: 05/19/93 crp

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QUALITY ASSURANCE - DUPLICATE ANALYSIS

Submitted 05/06/93

Sample No.	17910DUP	17920DUP	17930DUP
Location	056 0252 29575	426 4903 51549	307738 84385
Lime, % as CaCO3	0.2	<0.1	71.4
Neut. Pot., T/1000 Tons (1)	2	<1	714
Acid Pot., meq/100g	2	289	0
Acid Pot., T/1000 Tons (1)	1	145	0
Acid/Base Pot., T/1000 Tons (1)	1	-145	714
Total Sulfur %	0.03	4.71	<0.01
Hot H20 Extractable Sulfur %	<0.01	0.08	<0.01
HCl Extractable Sulfur %	0.01	<0.01	<0.01
HNO3 Extractable Sulfur %	0.02	4.37	<0.01
Residual Sulfur, %	<0.01	0.26	<0.01

(1) T CaCO3/1000 Tons Soil

ENERGY LABORATORIES

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LABORATORY REPORT

TO: Todd Duex
ADDRESS: Bond Gold Richmond Hill, Inc.
P.O. Box 892
Lead, SD 57754

LAB NO: 93-17907 -39
DATE: 05/19/93 crp

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QUALITY ASSURANCE - CONTROL SOIL ANALYSIS

This Quality Assurance - Control Soil Analysis was run with Lab Nos. 93-17907 to 93-17939 with the following results:

Sample No. Location	CONTROL SOIL ANALYSIS	TARGET RANGE
Lime, % as CaCO3	6.2	2.8 - 8.5
Neut. Pot., T/1000 Tons (1)	62	33 - 84
Acid Pot., meq/100g	2	0 - 12
Acid Pot., T/1000 Tons (1)	1	0 - 6
Acid/Base Pot., T/1000 Tons (1)	62	30 - 81
Total Sulfur %	0.03	0.02 - 0.25
Hot H20 Extractable Sulfur %	<0.01	<0.01
HCl Extractable Sulfur %	<0.01	<0.01
HNO3 Extractable Sulfur %	0.03	0.01 - 0.20
Residual Sulfur, %	<0.01	<0.01

(1) T CaCO3/1000 Tons Soil

Appendix D- 2012 Vegetation Baseline Description

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2012 VEGETATION BASELINE DESCRIPTION

DEADWOOD STANDARD PROJECT

LAWRENCE COUNTY, SOUTH DAKOTA

Prepared by:

BAR XX ENVIRONMENTAL SERVICES
12599 BIGHORN ROAD
WHITEWOOD, SOUTH DAKOTA

NOVEMBER 2012

INTRODUCTION

The Deadwood Standard Project's proposed large scale gold mine is in the Johnson Gulch area of Lawrence County. It is located in Sections 29, 30, 31 and 32 of T5N R2E of the Black Hills Meridian. This is in the same general location as the Ragged Top project that received a mine permit in the 1980's. The vegetation baseline provided for the Ragged Top permit is inadequate for the current requirements of the South Dakota Department of Environment and Natural Resources (DENR) and the South Dakota Department of Game Fish & Parks (GF&P). The following vegetation baseline description was developed by Bar XX Environmental Services. A current classification system developed by Hoffman and Alexander 'Forest Habitat Classification for the Black Hills' (1987) was used for the description of the vegetation community. Methods to quantify vegetation communities have been updated since the original Ragged Top permit was issued. The methods used for the current assessment are devised to be more relevant for baseline characterization and are described below. Bar XX conducted the field work for this report throughout the spring and summer of 2012.

SCOPE

The scope of work for this project is to provide a mapping unit of the vegetation communities in the proposed disturbance area within the permit boundary. The mapping unit was surveyed to provide overstory and understory cover data, shrub density data and a plant species list. Also, provided is a separate report on a comprehensive search and documentation of any Threatened and Endangered plant species.

METHODS

Mapping

Identification of plant community types using Hoffman and Alexander criteria was determined by extensive on- the- ground field reconnaissance. Fifteen transects were subjectively located throughout the proposed disturbance area to create a representative sample of the one vegetation community identified. These locations were marked with a GPS handheld device and used to generate a transect location map in Appendix A.

Cover

Percent Cover is obtained by the use of a point-intercept scope based on a sampling program described by Buckner (1985). Transects are 100 meters long. Readings are taken every meter. At every meter one reading is taken 'up' and one reading is taken 'down'. The up reading, above 4 ft. in height from the

ground, records an overstory cover value. The down reading, below 4 ft. in height from the ground, records an understory cover value. The total number of readings per transect is 100 up and 100 down, so the sum of the readings equals a percentage. Cover is expressed as relative cover in that only the first "hit" is recorded which means that cover adds up to a total of 100% for the understory and the overstory cover. The understory relative cover categories are: live vegetation by species and life form, litter, bare ground, rock, wood and moss-lichen. The overstory relative cover categories are trees and open canopy. Other types of cover are not discussed in this 2012 report.

Density

Determining the best method for obtaining relevant shrub density data requires a review of plant morphology and established density collection methods. Various shrub types require different sampling techniques for best results. The following is a description of four shrub types occurring on this project and the subsequent sampling technique employed to obtain a representative density value.

SHRUBBY

This type is characterized by multi-branched ascending or decumbent plants. This is your typical 'shrub' with relatively low stem count compared to high canopy cover. Species that fall into this category are Common Juniper, *(Shepherdia canadensis)* Russet buffaloberry, and *(Ceanothus velutinus)* Snowbrush Ceanothus. The method used for this category is a 1m x 30m belt transect. These transects were located in areas where there is a preponderance of these species types.

RHIZOMOTOUS

This type is characterized by singular, erect stems that originate belowground and culminate in a solitary stem. This type of shrub usually has high stem count and high canopy coverage due to large leaf areas. *(Rubus parviflorus)* Thimbleberry and *(Corylus cornuta)* beaked hazelnut are the two shrubs that fall into this category. The fern ally *(Pteridium aquilinum)* Bracken also displays this form of growth pattern but is not included in shrub density results. The quadrat system is the best method to evaluate this type. A 3m x 3m quadrat was used for these species in areas where they existed.

COMBINATION

This type of shrub can display characteristics of both the above attributes. These shrubs generally have high stem counts with relatively low canopy cover. On this project, (*Prunus virginiana)* Chokecherry exhibits this growth pattern, whereas it typically can exhibit a shrubby or thicket forming behavior elsewhere. The other shrub that falls into this category is *(Amelanchier alnifolia)* Serviceberry. Belt transects were used to obtain densities for these species, but quadrats could be equally useful.

HALF-SHRUBS

This long recognized category of shrubs is not included in density determination. Species that fall into this category are *(Arctostapholos uva-ursi)* bearberry, *(Spirea betulifolia)* Spirea, *(Berberis repens)* Oregon grape, *(Symphoricarpus albus)* Snowberry, and *(Rosa arkansana)* Prairie rose. Methods to reliably quantify half-shrubs has had limited success and therefore are not included in this report.

Species Composition

A species list is obtained from the vegetation transects. Additional species observed from extensive field surveys are included in the discussion. The report from the original Ragged Top permit by Western Technology and Engineering, Inc. provides a good listing of species found in the transects on the west side of Elk Mountain.

Reference area

A transect was located in an area that is not to be disturbed which will be used as a reference area. Its location is on the Transect location map. This transect was not surveyed. Other reference area transects or replacement transects could be established later if the need arises. Reference areas can be especially helpful for future comparisons.

RESULTS

Mapping

Aerial photographs indicate that the topography is generally flat to gently rolling in the entire study area. Field reconnaissance verifies that these features, along with uniform soils, produce a vegetative community that is uniform. The identified plant community within the proposed permit boundary is a *Pinus ponderosa-Juniperus communis* (Ponderosa pine-Common Juniper) habitat type. The acreage of the proposed disturbance area is 173 acres. Fifteen baseline transects with coordinates were located in the proposed disturbance area and one reference area with coordinates was located outside the proposed disturbance area. These coordinates were loaded onto a GPS handheld unit and used to generate the transect location map.

Vegetation Community

The ponderosa pine-common juniper habitat type encompasses the entire study area. The overstory cover in this study is co-dominated by ponderosa pine (15.5% cover), *Populus tremuloides* (Quaking aspen) (27.6% cover) and *Betula papyrifera* (Paper birch) (7.8% cover). Other tree species present but very sparingly are *Picea glauca* (Black Hills Spruce), *Quercus macrocarpa* (Bur oak) and *Salix scouleriana* (Scoulers willow). Open space was 48.6% of the canopy cover. The 48.6% open space and 35.4% cover from quaking aspen and paper birch is indicative of the timber harvesting for ponderosa pine that has occurred on the site. Shrub species in order of coverage percentage are: common juniper (4.4%), *Rubus parviflorus* (thimbleberry) (3.4%), *Amelanchier alnifolia* (serviceberry) (3.4%), *Prunus virginiana* (chokecherry) (1.6%), *Ceanothus velutinus* (snowbrush Ceanothus) (1.3%), and *Corylus cornuta* (beaked hazelnut) (1.3%). Quaking aspen also provided 3.2% of the understory cover as a small tree or sapling. Half-shrubs in order of cover percentages are: *Arctostaphylos uva-ursi* (bearberry) (6.1%), *Spiraea betulifolia* (spirea) (3.7%), Rosa *arkansana* (prairie rose) (3.7%), Berberis *repens* (Oregon grape) (2.9%), and *Symphoricarpos albus* (snowberry) (2.7%). The fern ally *Pteridium aquilinum* (bracken fern) provided 9.4% cover. Most prevalent forbs over 2% cover were: *Fragaria virginiana* (strawberry) (2.7%), *Eurybia conspicua* (showy aster) (2.5%) and *Lathyrus ochroleucus* (cream-colored peavine) (2.1%). Graminoids present were *Phleum pratense* (timothy) (2.3%), *Carex* spp. (1.5%) and *Poa pratensis* (Kentucky bluegrass) (1%).

Historically mined sites blend into the surrounding undisturbed vegetation community. The mined sites in the study area consist of a series of small excavations, rock dumps and roadways that have been encroached upon equally well by ponderosa pine, quaking aspen and paper birch. A distinguishing characteristic of these sites is the lack of a robust understory. In successional terminology, it appears that the trees are the pioneer species. Different species that occur on these sites include: *Potentilla fruticosa* (shrubby cinquefoil), and the invasive species *Centaurea maculosa* (spotted knapweed), *Cirsium arvense* (Canada thistle), *Hypericum perforatum* (St. Johnwort) and *Tanacetum vulgare* (tansy). Other species with specific microhabitat requirements also have been found on these sites. Members of the wintergreen and orchid families present are *Chimaphila umbellata* (Prince's pine), *Orthilia secunda* (one-sided wintergreen), *Pyrola chlorantha* (green shinleaf), *Pyrola assarifolia* (pink shinleaf), *Goodyera oblongifolia* (rattlesnake plantain) and *Cypripedium parviflorum* (yellow lady slipper).

Rock outcrops are a minor category within the ponderosa pine-common juniper community. These limestone outcrops lie on a variety of aspects. Species observed specifically on these outcrops were: *Cheilanthes feei* (slender lip fern), *Cystopteris fragilis* (brittle fern), *Pellaea atropurpurea* (purple cliff-brake), *Heuchera sanguinea* (Richardson's alumroot), *Clematis tenuiloba* (rock clematis), *Phlox hoodii* (Hood's phlox), *Sedum lanceolatum* (spearleaf stonecrop), *Antennaria microphylla* (littleleaf pussytoes) and *Toxicodendron rydbergii* (poison ivy).

Cover

The fifteen cover transects were located on areas that were not disturbed and on areas of historic disturbance. The detailed results are in Appendix A. The transect locations are on Map A.

The overstory cover averages are listed below.

Pinus ponderosa	15.5%
Populus tremuloides	27.6%
Betula papyrifera	7.8%
Picea glauca	0.3%
Quercus macrocarpa	0.1%
Salix scouleriana	0.1%
Total vegetation	51.4%
Open space	48.6%

The understory live cover values by major category are listed below.

Shrub-tree	21.3%
Half-shrub	19.7%
Fern allies	9.4%
Forb	19.8%
Graminoids	7.6%
Moss-lichen	0.3%

Species in the shrub-tree category

Juniperus communis	4.4%
Rubus parviflorus	3.4%
Amelanchier alnifolia	3.4%
Populus tremuloides	3.2%
Prunus virginiana	1.6%
Ceanothus velutinus	1.3%
Corylus cornuta	1.3%
Total shrub-tree	21.3%

Species in the half-shrub category over 1% cover

Arctostaphylos uva-ursi	6.1%
Spiraea betulifolia	3.7%
Rosa arkansana	3.7%
Berberis repens	2.9%
Symphoricarpos albus	2.7%
Total half-shrub	19.7%

Species in the fern ally category

Pteridium aquilinum	9.4%

Species in the forb category over 1% cover

Fragaria virginiana	2.7%
Eurybia conspicua	2.5%
Lathyrus ochroleucus	2.1%
Trifolium pratense	1.5%
Aster ciliolatus	1.5%
Achillea millefolium	1.5%
Monarda fistulosa	1.1%
Aster laevis	1.0%
Total forbs	19.8%

Species in the Graminoids category over 1% cover

Phleum pratense	2.3%
Carex spp.	1.5%
Poa pratensis	1.0%
Total Graminoids	7.6%

Total understory cover data*

Litter	18.6%
Wood	3.1%
Moss-lichen	0.3%
Rock >3/4 inch	0.6%
Bare ground	0.4%
Total live cover	77.9%
Total herbaceous cover	96.5%

*percentages may not add correctly due to rounding

Density

Estimates of densities of species in the 'shrubby' group are as follows. Belt transects were located where common juniper, russet buffaloberry and snowbrush Ceanothus were found.

Species	Plants/m^2	Plants/acre
Juniperus communis	0.08 plants/m^2	324 plants/acre
Shepherdia canadensis	0.03 plants/m^2	121 plants/acre
Ceanothus velutinus	0.03 plants/m^2	121 plants/acre

The common juniper density value of 324 plants/acre was obtained from DSP-3 transect where its corresponding cover value was 3%. The russet buffaloberry and snowbrush Ceanothus densities were obtained outside established transects in areas where they were prevalent.

Estimates of densities of species in the 'rhizomatous' group were obtained from Transect DSP-11. 3 X 3 meter quadrats were used in areas of high frequency of *Rubus parviflorus* and *Corylus cornut*a.

Species	Stems/m^2	Stems/acre	Cover %
Rubus parviflorus	2.1/m^2	8499/acre	24%
Corylus cornuta	1.6/m^2	6475/acre	12%

Estimates of densities of species in the 'combination' group were obtained from Transect DSP-2 and DSP-3. 1m X 30m belt transects were used to arrive at the corresponding densities.

Species	Stems/m^2	Stems/acre	Cover %
Amelanchier alnifolia	2.8/m^2	11,332/acre	2%
Prunus virginiana	1.15/m^2	4654/acre	3.5%

Density values in the shrubby and rhizomatous groups can be assumed to be near an optimum number for these species in this study area. The location of these groups is not ubiquitous and therefore not indicative of the entire region. However, the combination group could be inferred to be ubiquitous and indicative of their potential throughout the study site.

Species Composition

The following is a list of plant species observed on the site during field surveys and reconnaissance. Also, included in this list are species mentioned in the WESTECH Inc. report provided in the Ragged Top mine permit application.

Trees

Pinus ponderosa	ponderosa pine
Populus tremuloides	quaking aspen
Betula papyrifera	paper birch
Picea glauca	Black Hills spruce
Quercus macrocarpa	bur oak
Salix scouleriana	Scoulers willow

Shrubs

Juniperus communis	common juniper
Juniperus scopulorum	Rocky Mountain juniper
Rubus parviflorus	thimbleberry
Rubus idaeus	raspberry
Amelanchier alnifolia	serviceberry
Prunus virginiana	chokecherry
Ceanothus velutinus	snowbrush Ceanothus
Corylus cornuta	beaked hazelnut
Shepherdia canadensis	Russet buffaloberry
Lonicera dioica	wild honeysuckle
Salix perrostrata	smooth Bebb's willow
Rubus pubescens	creeping blackberry
Potentilla fruticosa	shrubby cinquefoil
Ribes aureum	golden current
Toxicodendron rydbergii	poison ivy

Half-shrub

Arctostaphylos uva-ursi	bearberry
Spiraea betulifolia	spirea
Berberis repens	Oregon grape

Half-shrubs continued

Symphoricarpos albus	snowberry
Rosa arkansana	prairie rose
Vaccinium scoparium	grouse whortleberry
Actaea rubra	baneberry
Cornus canadensis	bunchberry

Ferns and fern allies

Pteridium aquilinum	bracken
Cheilanthes feei	slender lip fern
Cystopteris fragilis	brittle fern
Pellaea atropurpurea	purple cliff-brake

Forbs

Achillea millefolium	common yarrow
Antennaria microphylla	littleleaf pussytoes
Antennaria neglecta	field pussytoes
Aralia nudicaulis	sarsaparilla
Apocynum androsaemifolium	dogbane
Arnica cordifolia	heartleaf arnica
Artemisia campestris	western sagewort
Artemisia ludoviciana	cudweed sagewort
Asclepias spp.	Milkweed
Aster ciliolatus	Lindley's aster
Aster laevis	smooth blue aster
Campanula rotundifolia	harebell
Castilleja sulphurea	sulfur paintbrush
Centaurea maculosa	spotted knapweed
Chimaphilla umbellata	prince's pine
Chrysanthemum leucanthemum	oxeye daisy
Circium arvense	Canada thistle
Clematis tenuiloba	rock clematis

Forbs continued

Comandra umbellata	bastard toadflax
Corallorhiza maculata	spotted coralroot
Cynoglossum officinale	houndstongue
Cypripedium parviflorum	yellow lady slipper
Disporum trachycarpum	fairy bells
Epilobium angustifolium	fireweed
Erigeron subtrinervis	3-nerve fleabane
Eurybia conspicua	showy aster
Fragaria virginiana	wild strawberry
Fragaria vesca	woodland strawberry
Fraseria speciosa	showy fraseria
Galium boreale	northern bedstraw
Gentiana amarelle	dwarf gentian
Geranium richardsonii	Richardson's geranium
Goodyera oblongifolia	rattlesnake plantain
Halenia deflexa	spurred gentian
Heuchera sanguinea	Richardson's alumroot
Hypericum perforatum	St. Johnswort
Lathyrus ochroleucus	cream-colored peavine
Liatris ligulistylis	Rocky Mountain gayfeather
Linaria vulgaris	butter & eggs
Lithophragma parviflorum	prairie star
Linum lewisii	wild blue flax
Lilium philadelphicum	Wood lily
Lupinus argenteus	silver lupine
Linnaea borealis	twinflower
Maianthemum canadense	wild lily-of-the-valley
Medicago lupulina	black medic
Microseris cuspidate	sharppoint microseris
Monarda fistulosa	horsemint
Orthillia secunda	one-sided wintergreen
Osmorhiza depauperata	sweetroot
Oxytropis lambertii	Lambert's crazyweed

Forbs continued

Penstemon glaber	smooth beardtongue
Potentilla norvegica	rough cinquefoil
Phlox hoodii	Hood's phlox
Platanthera hyperborea	northern bog orchid
Pterospora andromedea	pinedrops
Polygala senega	Seneca snakeroot
Pyrola assarifolia	pink shinleaf
Pyrola chlorantha	green shinleaf
Rudbeckia hirta	blackeyed Susan
Sanicula marilandica	Maryland sansickle
Sedum lanceolatum	spearleaf stonecrop
Smilacina stellata	false Solomon's seal
Solidago nemoralis	gray goldenrod
Solidago spathulata	
Stellaria longifolia	stitchwort
Spiranthes romanzoffiana	ladies tresses
Tanacetum vulgare	tansy
Taraxacum officinale	dandelion
Thalictrum venulosum	meadowrue
Trifolium pratense	red clover
Trifolium repens	white clover
Vicia Americana	American vetch
Viola adunca	longspur violet
Viola canadensis	Canada violet
Verbascum thapsus	mullein
Zigadenus elegans	showy death camas
Zizia aptera	heartleaf alexanders

Graminoids

Agropyron dasystachyum	Thickspike wheatgrass
Agropyron repens	quackgrass
Agropyron subsecundum	bearded slender wheatgrass
Agrostis alba	redtop

Graminoids continued

Bromus inermis	smooth bromegrass
Carex spp.	Sedge species
Danthonia spicata	poverty oatgrass
Leymus innovatus	fuzzyspike wildrye
Oryzopsis asperfolia	rough-leaved ricegrass
Pascopyron smithii	western wheatgrass
Phleum pratense	timothy
Poa pratensis	Kentucky bluegrass
Poa compressa	Canada bluegrass
Stipa columbiana	Columbia needlegrass

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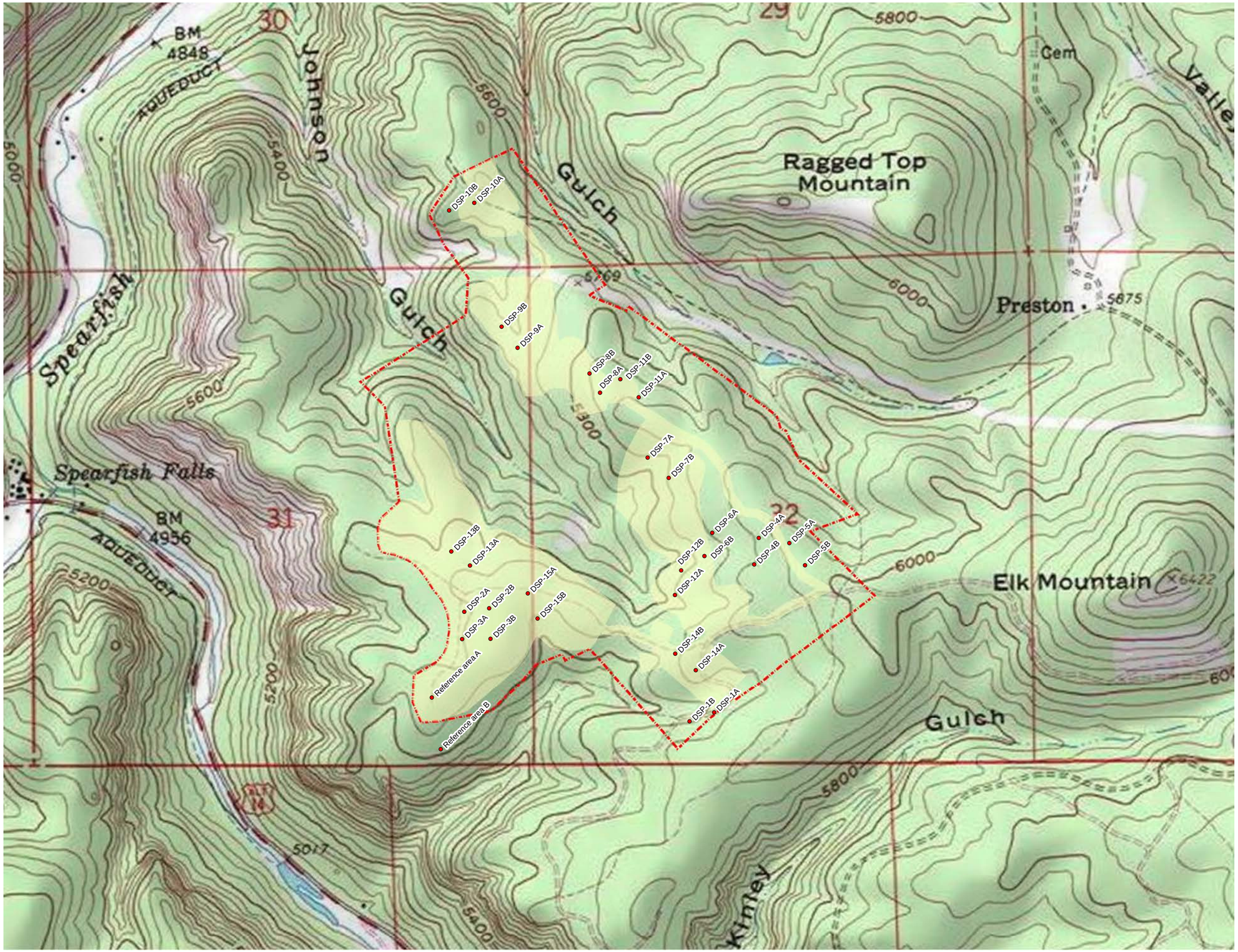

Legend

- Proposed permit area boundary
- Proposed affected areas
- Vegetation trasnsect points

Location: Sections 29, 30, 31, 32
Township 5 North, Range 2 East
Black Hills Meridian

N

0 1,000 2,000
Feet

Figure 1

Transect Location Map

Note: all units are percent cover

OVERSTORY

Transect Number			DSP-1	DSP-2	DSP-3	DSP-4	DSP-5	DSP-6	DSP-7	DSP-8	DSP-9	DSP-10	DSP-11	DSP-12	DSP-13	DSP-14	DSP-15	Mean
OVERSTORY	Total Vegetative		55	53	18	82	73	61	42	40	63	23	99	46	44	22	50	51.4
	Pinus	ponderosa	6	9	18	5	30	18	23	31	13	19	2	1	27	15	15	15.5
	Populus	tremuloides	42	40	0	42	43	34	0	5	45	4	65	35	17	7	35	27.6
	Betula	papyrifera	7	0	0	35	0	9	19	3	5	0	30	9	0	0	0	7.8
	Picea	glauca	0	4	0	0	0	0	0	0	0	0	0	1	0	0	0	0.3
	Quercus	macrocarpa	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0.1
	Salix	scouleriana	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0.1
	Open		45	47	82	18	27	39	58	60	37	77	1	54	56	78	50	48.6

UNDERSTORY

Transect Number			DSP-1	DSP-2	DSP-3	DSP-4	DSP-5	DSP-6	DSP-7	DSP-8	DSP-9	DSP-10	DSP-11	DSP-12	DSP-13	DSP-14	DSP-15	Mean
SHRUBS-TREES	Total		21	18	10	15	8	33	27	20	9	14	40	33	21	20	30	21.3
	Juniperus	communis	2	1	3	4	3	17	13	0	0	1	0	7	4	9	2	4.4
	Shepherdia	canadensis	0	0	1	0	0	1	1	1	0	6	0	1	0	0	1	0.8
	Ceanothus	velutinus	0	0	2	0	0	0	0	7	1	0	0	10	0	0	0	1.3
	Corylus	cornuta	5	0	0	2	0	0	0	0	0	0	12	0	0	0	0	1.3
	Lonicera	dioica	0	0	0	0	0	2	0	0	0	0	1	0	0	0	0	0.2
	Rubus	parviflorus	7	0	0	8	0	2	0	0	5	0	24	4	0	0	1	3.4
	Rubus	idaeus	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3
	Prunus	virginiana	0	5	2	0	1	1	0	2	0	3	2	3	3	0	2	1.6
	Amelanchier	alnifolia	0	2	2	0	3	4	8	3	3	4	1	2	8	2	9	3.4
	Populus	tremuloides	3	6	0	0	1	2	0	4	0	0	0	4	6	8	14	3.2
	Pinus	ponderosa	0	0	0	0	0	4	4	0	0	0	0	1	0	1	1	0.7
	Betula	papyrifera	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0.1
	Picea	glauca	0	3	0	1	0	0	0	0	0	0	0	1	0	0	0	0.3
	Salix	perrostrata	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1
	Quercus	macrocarpa	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0.1
HALF-SHRUBS	Total		15	31	36	9	25	12	19	15	14	16	15	17	21	25	26	19.7
	Rosa	arkansana	6	6	6	0	2	1	1	2	6	4	4	1	6	3	8	3.7
	Actaea	rubra	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1
	Berberis	repens	1	3	3	0	9	2	3	4	1	2	0	4	4	4	3	2.9
	Symphoricarpos	albus	0	4	2	2	9	1	2	2	3	6	1	0	5	0	3	2.7
	Spiraea	betulifolia	7	9	3	3	4	5	2	3	1	0	10	2	3	0	4	3.7
	Vaccinium	scoparium	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0.3
FERNS	Total		0	0	0	48	0	29	1	0	22	0	20	21	0	0	0	9.4
	Pteridium	aquilinum	0	0	0	48	0	29	1	0	22	0	20	21	0	0	0	9.4
	Total		42	22	29	4	16	12	29	26	15	26	7	6	18	26	19	19.8
	Achillea	millefolium	1	0	0	0	2	2	3	1	2	0	0	0	3	2	1	1.1
	Antennaria	neglecta	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0.1
	Anaphalis	margaritacea	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0.1
	Apocynum	androsaemifolium	0	0	1	0	0	0	0	0	0	4	0	0	0	1	0	0.4
	Aralia	nudicaulis	3	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0.4
	Aster	ciliolatus	0	0	0	2	4	2	0	1	1	0	1	0	4	3	5	1.5
	Aster	laevis	0	0	0	0	0	0	1	3	3	5	0	1	0	2	0	1
	Cirsium	arvense	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0.1
	Disporum	trachycarpum	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0.1

Transect Number			DSP-1	DSP-2	DSP-3	DSP-4	DSP-5	DSP-6	DSP-7	DSP-8	DSP-9	DSP-10	DSP-11	DSP-12	DSP-13	DSP-14	DSP-15	Mean
	Eurybia	conspicua	0	0	2	0	4	0	11	6	1	0	0	1	2	1	9	2.5
	Fragaria	virginiana	2	5	9	1	0	2	0	2	2	3	0	0	2	12	1	2.7
	Fraseria	speciosa	0	2	0	0	0	0	0	0	0	0	0	2	0	0	0	0.3
	Galium	boreale	0	0	0	0	0	2	0	0	0	0	0	0	3	0	0	0.3
	Geranium	richardsonii	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1
	Halenia	deflexa	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0.1
	Lathyrus	ochroleucus	11	9	4	0	1	1	1	1	0	0	0	0	2	0	1	2.1
FORBS	Linaria	vulgaris	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0.1
	Linium	lewisii	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0.1
	Lithophragma	parviflorum	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2
	Maianthemum	canadense	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2
	Medicago	lupulina	0	0	0	0	0	0	1	2	0	1	0	1	0	0	0	0.3
	Monarda	fistulosa	0	1	2	0	1	0	6	0	0	3	0	1	0	2	0	1.1
	Potentilla	norvegica	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0.1
	Rudbeckia	hirta	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0.1
	Sanicula	marilandica	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0.1
	Solidago	nemoralis	3	0	0	0	0	0	1	0	0	3	0	0	1	0	0	0.5
	Stellaria	longifolia	4	0	2	0	2	0	0	0	0	0	0	0	0	0	0	0.5
	Taraxacum	officinale	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0.1
	Trifolium	pratense	1	2	2	0	1	3	4	1	2	3	0	0	1	1	1	1.5
	Trifolium	repens	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0.1
	Vicia	americana	1	1	1	0	0	0	1	0	1	0	0	0	0	0	1	0.4
	Viola	adunca	1	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0.2
	Viola	canadensis	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0.1
	Zigadenus	elegans	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0.1
	Unidentified	forb	0	0	3	0	0	0	0	7	0	0	0	0	0	0	0	0.7
	Total		18	8	8	5	16	3	3	9	9	3	2	3	11	8	8	7.6
	Agropyron	subsecundum	0	0	0	0	0	0	2	0	0	0	1	0	3	0	0	0.4
	Carex	spp.	5	4	3	0	5	0	0	0	0	0	0	1	3	1	1	1.5
	Bromus	inermis	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2
	Danthonia	spicata	0	0	3	0	0	0	0	3	0	0	0	0	1	2	1	0.7
GRAMINOIDS	Leymus	innovatus	2	2	1	0	0	0	0	0	2	0	0	0	0	0	0	0.5
	Oryzopsis	asperifolia	0	0	0	0	0	1	1	1	0	0	1	1	0	0	1	0.4
	Pascopyrum	smithii	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0.1
	Phleum	pratense	6	2	1	2	1	2	0	5	4	1	0	1	4	3	3	2.3
	Poa	pratensis	2	0	0	3	5	0	0	0	2	0	0	0	0	2	1	1
	Poa	compressa	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0.1
	Stipa	columbiana	0	0	0	0	4	0	0	0	0	1	0	0	0	0	0	0.3
								Other										
MOSS-LICHEN			0	1	0	0	0	0	0	2	1	0	0	0	0	0	0	0.3
LITTER			7	20	14	16	32	8	16	24	26	28	15	13	28	17	15	18.6
WOOD			3	0	3	3	2	1	7	1	4	8	1	6	1	4	2	3.1
ROCK			0	0	0	0	1	2	2	3	0	1	0	0	0	0	0	0.6
BARE GROUND			0	0	0	0	0	0	1	0	0	4	0	1	0	0	0	0.4

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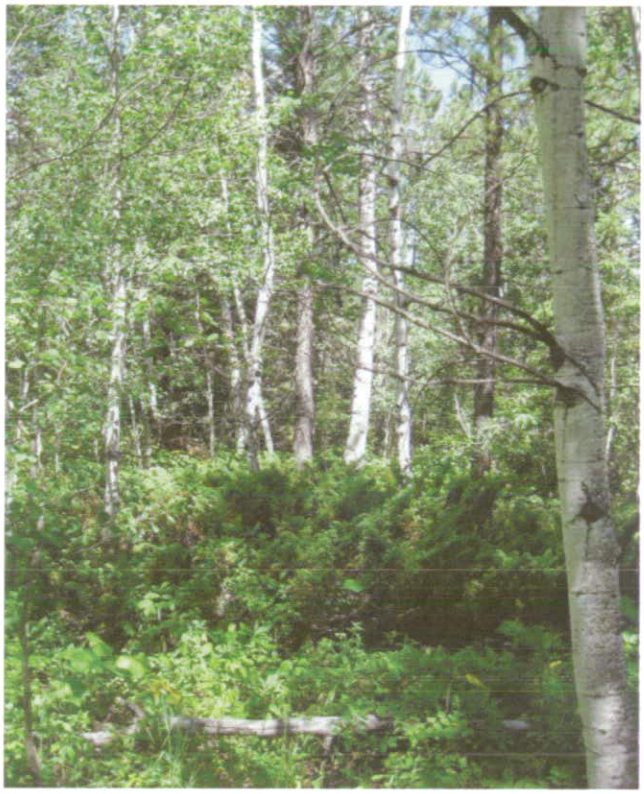
MINERALS & MINING PROGRAM

2012 THREATENED & ENDANGERED PLANT SPECIES SURVEY

DEADWOOD STANDARD PROJECT

LAWRENCE COUNTY, SOUTH DAKOTA



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NOVEMBER 2012

INTRODUCTION

The Deadwood Standard Project's proposed large scale gold mine is in the Johnson Gulch area of Lawrence County. It is located in Sections 29, 30, 31 and 32 of T5N R2E of the Black Hills Meridian. This is in the same general location as the Ragged Top project that received a mine permit in the 1980's. The following is the result of a search for endangered or threatened plant species recognized by the South Dakota Natural Heritage Program. Preparation for this survey included review of the SD GF&P Natural Heritage Program list and the Biologic Assessment, Threatened and Endangered Species section of the 2001USDA Black Hills National Forest Service Land and Resource Management Plan. The research and surveys were conducted by Myron Andersen of Bar XX Environmental Services. Other sources of information used are various reports and surveys done for gold mines in the region by Bar XX Environmental Service and other consulting firms. Assistance from Dave Ode and Stan Michals of SDGF&P, and Grace Kostel and Mark Gabel, curators of the Black Hills State University Herbarium is noted and appreciated.

METHODS

A field reconnaissance of the proposed permit boundary was conducted to identify sites where species of concern are likely to occur. Sites looked for were riparian areas, rock outcrops, and north to northeasterly aspects under heavy cover. No riparian areas were found. Extensive reconnaissance was performed on the northeast aspects and the rock outcrops.

RESULTS

The review of the Heritage Program list for Lawrence County and the BHNF Biologic Assessment identified the following species that would be searched for in the northeast aspects and rock outcrops.

Asplenium viride	green spleenwort
Calypso bulbosa	fairy slipper orchid
Corallorrhiza odonthorhiza	autumn coral-root
Cypripedium parviflorum	yellow ladyslipper
Polystichum lonchitis	northern holly-fern
Moneses uniflora	one-flowered Pyrola
Pyrola picta	white-veined wintergreen
Platanthera orbiculata	round-leaved orchid

Saxifraga occidentalis	western saxifrage
Vaccinium membranaceum	Mountain huckleberry

The result of the surveys was that none of these species were found within the proposed permit boundary with the exception of *Cypripedium parviflorum* (yellow ladyslipper) G5S3?. One plant identified as *Cypripedium parviflorum* was found growing on an old roadway in the historical Deadwood Standard mined area. This individual plant was in the NW1/4 SW1/4 of Section 32, T5N R2E. A rare plant report card was completed and sent to the South Dakota Natural Heritage Program. This area is within the permit boundary but not in areas proposed for disturbance.

Other members of the wintergreen and orchid families that were observed in the northern aspects on the site were *Chimaphila umbellata* (Prince's pine), *Orthilia secunda* (one-sided wintergreen), *Pyrola chlorantha* (green shinleaf), *Pyrola assarifolia* (pink shinleaf), *Goodyera oblongifolia* (rattlesnake plantain), *Corallorhiza maculata* (spotted coralroot),and *Platanthera hyperborea* (northern bog orchid). Species found on the rock outcrops were *Cheilanthes feei* (slender lip fern), *Cystopteris fragilis* (brittle fern, *Pellaea atropurpurea* (purple cliff-brake), *Heuchera sanguinea* (Richardson's alumroot), *Clematis tenuiloba* ((rock clematis) and *Phlox hoodii* (Hood's phlox).

Appendix E- Standard Wildlife Baseline Report

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VMC, LLC
DEADWOOD STANDARD
WILDLIFE BASELINE REPORT

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November 2012

TEXT:

1.0 INTRODUCTION 1
2.0 SURVEY AREA DESCRIPTION 2
3.0 METHODS 5
3.1 UPLAND GAME BIRDS 5
3.2 RAPTOR NESTS 6
3.3 OWLS 7
3.4 THREATENED, ENDANGERED, AND OTHER SENSITIVE SPECIES 7
3.5 OTHER ANIMALS 8
4.0 RESULTS AND DISCUSSION 8
4.1 HABITAT ASSESSMENT 9
4.1.1 Ponderosa Pine-Common Juniper 9
4.1.2 Other Minor Habitats 10
4.2 UPLAND GAME BIRDS 11
4.2.1 Ruffed Grouse 11
4.2.2 Wild Turkey 14
4.2.2 Other Upland Game Birds 14
4.3 RAPTOR NESTS 15
4.4 OWLS 17
4.5 THREATENED, ENDANGERED, AND OTHER SENSITIVE SPECIES 18
4.6 OTHER ANIMALS 19
5.0 CONCLUSIONS 20
6.0 REFERENCES 22
ATTACHMENT I A-1

TABLES:

Table 1. Ruffed grouse display (drumming) sites recorded in 2012 for the Deadwood Standard wildlife baseline. 13
Table 2. The location, status, and nearest disturbance for each raptor nest/territory in 2012 for the Deadwood Standard wildlife baseline 16

EXHIBIT:

Exhibit 1: Deadwood Standard Baseline Wildlife Features (2012)

1.0 INTRODUCTION

The Valentine Mining Company, LLC (VMC) is proposing to develop and operate a new precious metal mine located approximately 6 miles west of Lead, in central Lawrence County, South Dakota. The permit area for the proposed Deadwood Standard Mine encompasses approximately 422 acres and includes portions of Sections 29-32, Township (T) 5 North and Range (R) 2 East (E).

In support of the permitting process, VMC has contracted ICF International (ICF) to conduct all required baseline wildlife surveys and a wildlife habitat assessment for the proposed permit area and surrounding vicinity. The Deadwood Standard baseline wildlife survey area (hereafter, survey area) consists of the permit area and a surrounding 0.5-mile perimeter (Exhibit 1). The objective of the baseline study was to collect both quantitative and qualitative data on vertebrate occurrence, abundance, diversity, and general habitat affinity in the survey area. This included identification of habitats that could support Threatened and Endangered (T&E) species and other high value or unusual wildlife, as well as a review of data from previous or adjacent monitoring activities in order to compile a full history of wildlife use in the vicinity of the proposed permit area. Based on guidance from South Dakota Game, Fish, and Parks (SDGFP) (Biologist, Stan Michals) in spring 2012, wildlife baseline surveys for the Deadwood Standard permit area and surrounding 0.5-mile perimeter included searches for upland game bird breeding sites, particularly ruffed grouse (*Bonasa umbellus*) display (drumming) sites, and raptor nests. No other wildlife surveys were required or conducted for the baseline effort; however, the SDGFP Biologist did request that recent (2010) owl occurrence data collected for a separate baseline at the adjacent gold mine to the east of the Deadwood Standard project be included in the results discussion.

In particular, no standardized surveys were conducted for big game, furbearers or predators, lagomorphs, small mammals, bats, breeding birds, waterfowl or shorebirds, reptiles, amphibians, fish, or invertebrates (benthic or terrestrial) as part of the baseline study. Nevertheless, ICF biologists watched for all of these species and/or their sign during all surveys and documented all individual species occurrences within the survey area throughout the entire baseline period.

Some historical wildlife occurrence data is available for the Deadwood Standard survey area. Past wildlife information provided in a previous permit application (Homestake Mining Company, 1984) was collected for a former mine project called the Ragged Top Project, which overlaps most of the current Deadwood Standard permit area. Additionally, annual wildlife monitoring has been conducted by ICF at the adjacent mine to the east (Wharf Mine) during all periods of operation since 1994. The extended survey area for that mine (also approximately a 0.5-mile perimeter) overlaps the eastern extent of the Deadwood Standard survey area and a portion of the actual permit area. In most of the years from 1994 to 2002, annual monitoring at the Wharf Mine included standardized wildlife surveys for upland game birds, breeding birds, and nesting raptors. After 2009, standardized annual surveys were primarily limited to raptor nest surveys, although baseline surveys in 2010 for a permit amendment also included bat and owl surveys. Regardless of the year, all incidental animal species (including any federally listed species and other species of concern listed under the South Dakota Natural Heritage Program [SDNHP]) were recorded within the mine survey area annually, providing a rather extensive long-term database of wildlife use information for the general area.

The Deadwood Standard permit area and surrounding wildlife baseline survey area are described below, along with a description of the baseline survey methods and results. Survey methods and results are presented by animal group.

2.0 SURVEY AREA DESCRIPTION

The proposed Deadwood Standard permit area is located 5.7 miles west of Lead, Lawrence County, South Dakota and occupies a total of 422.2 acres in Sections 29-32, T5N:R2E. The expanded wildlife survey area includes the entire Deadwood Standard permit area and a surrounding 0.5-mile perimeter (Exhibit 1), as per SDGFP (Biologist, Stan Michals) guidance. The entire proposed permit area is owned by VMC, but surface ownership within the extended survey area is a mixture of private and federal (U.S. Forest Service [USFS]) land. The proposed Deadwood Standard site is located approximately 0.8 mile east of the existing Wharf Mine. The current principal land uses in the general area are mineral extraction, recreation, logging, and residences. The area has a long history of mineral extraction, as it was part of an active underground mining district in the past. Numerous occupied residences and tourist lodges are

located west of the Deadwood Standard project along Spearfish Creek and just beyond the survey area to the southeast (Terry Peak Ski Lodge).

The wildlife survey area lies primarily at the head of several named drainages, all of which are tributaries of Spearfish Creek. Johnson Gulch and Calamity Gulch both flow to the northwest through the central and northern portions, respectively, of the survey area. McKinley Gulch flows to the south and southwest through the extreme southeastern extent. All three of these waterways eventually flow into Spearfish Creek, which flows northwest through the southwest margin of the survey area. With the exception of Johnson Gulch and its associated slopes, the permit area is largely composed of relatively gentle to moderate terrain situated on a plateau above the Spearfish Canyon rim to the west. In contrast, the far western and southern extents of the survey area include precipitous elevation changes and steep cliff walls that descend from the canyon rim down to Spearfish Creek. Additional topographic features include Ragged Top Mountain and Elk Mountain in the far northeastern and eastern margins of the survey area, respectively.

Elevations throughout the entire survey area range from approximately 4,960 to 6,320 feet above sea level. Spearfish Creek is a permanent stream, but additional water availability throughout the majority of the survey area is limited to the ephemeral drainages associated with Calamity Gulch, Johnson Gulch, and McKinley Gulch. The climate is temperate, averaging 27.1 inches of precipitation annually, with approximately 73% occurring between March and September. The 30-year mean maximum and minimum temperatures in July and January were 71.7 degrees Fahrenheit (°F) and 14.4 °F, respectively (Western Regional Climate Center, n.d.).

Vegetation communities and habitats within the survey area were assessed in the field and generally described below as they apply to wildlife use. However, an in-depth baseline vegetation assessment was completed by Bar XX Environmental Services. The detailed results from that study are available in a separate vegetation report (Bar XX Environmental Services 2012).

The principal habitat in the wildlife survey area is characterized as ponderosa pine (*Pinus ponderosa*)-common juniper (*Juniperus horizontalis*). This habitat is described in greater detail in the Deadwood Standard vegetation baseline report (Bar XX Environmental Services 2012),

but is primarily dominated by a ponderosa pine, quaking aspen (*Populus tremuloides*), and paper birch (*Betula papyrifera*) overstory. Other tree species that occur sparingly include the Black Hills or white spruce (*Picea glauca*), bur oak (*Quercus macrocarpa*), and Scouler's willow (*Salix scouleriana*).

Ponderosa pine stands generally occupy the ridges and upper elevations and the south- and west-facing slopes. This tree species is the dominant canopy species, although quaking aspen, paper birch, and white spruce are locally abundant in some pine habitats. In many areas, the pine stand understory is generally low and open or sparse, with relatively few shrubs or herbaceous plants.

Quaking aspen and paper birch habitat has a more clustered distribution than pine, with many stands being composed of dense saplings and younger trees. This habitat is present across much of the permit area and the surrounding plateau where logging has historically occurred. Additional stands are present on some north- and east-facing slopes, and at the head of Johnson Gulch. This habitat generally contains a diverse shrub and herbaceous strata as well.

Like aspen, white spruce habitat exists primarily on north- and east-facing slopes, but is much more limited in its distribution. Understory characteristics vary according to stand development. Older stands that have undergone self-thinning include a mixture of pine and spruce, and support relatively diverse understory strata. The closed canopy of younger spruce stands tends to limit understory species.

Other minor habitats present within the baseline study area include small meadows, primarily marginal riparian habitat, cliffs and rock outcrops, and a few unreclaimed areas from previous mining disturbance. Meadow habitat is widely distributed in small patches among old logging areas, but is relatively limited in the total acreage across the entire permit area and extended survey area. Meadow habitat is characterized by the general lack of woody overstory and an abundance of grasses and forbs. Limited riparian habitat and occasional pools of retained water are present along the minor, ephemeral drainages of Johnson Gulch and Calamity Gulch. However, the vast majority of riparian habitat within the survey area is located along the corridor of Spearfish Creek in the extreme southwest. The canyon walls associated with Spearfish Creek represent the majority of rocky substrate in the survey area, but there are additional rock outcrops and exposed peaks or ridgelines that occur primarily in the northeast. Disturbed areas associated

with previous mining activities are characterized by a complete or nearly complete absence of vegetation, and are present immediately northwest of the permit area. Other disturbed habitats include the primary access roads within the permit area and the state highway in the western margin of the survey area.

3.0 METHODS

All baseline wildlife surveys followed standard survey requirements and protocols used and approved by the SDGFP and United States Fish and Wildlife Service (USFWS). Biologists also conducted a wildlife habitat assessment to search for high value, unusual, or critical habitats that could support T&E species or other species of special concern throughout the survey area. These tasks were accomplished by using binoculars and spotting scopes to make observations while traveling throughout the survey area. Universal Transverse Mercator (UTM NAD27, Zone 13N) coordinates for all wildlife and habitat features were recorded using a handheld global positioning system (GPS) unit. Qualitative descriptions of the vegetation and topography were made throughout the project area to assess whether or not present habitats would likely support species of interest.

Standard field guides and references (Burt and Grossenheider 1976, Baxter and Stone 1980, Jones et al. 1983, Sharps and Benzon 1984, Houtcooper et al. 1985, Stebbins 1985, Clark and Stromberg 1987, USFS 1988, Peterson 1990, South Dakota Ornithologists' Union 1991, Stokes & Stokes 1996) were used to identify animals and their sign. These resources, as well as the USFS Region 2 Sensitive Species (USFS 2011) and the SDNHP (SDGFP 2009) lists were used to generate a potential species list for the area (Attachment I). Species' habitat requirements and availability were considered when the species list was developed.

3.1 UPLAND GAME BIRDS

The wild turkey (*Meleagris galopavo*) and ruffed grouse are common upland game bird species in the Black Hills, and both have been documented within the survey area in the past (Homestake Mining Company, 1984). Searches for breeding turkeys, grouse drumming sites, and suitable upland game bird habitats within the survey area were conducted on three consecutive mornings in spring 2012 (May 9 through May 11). Those visits included a systematic search of the entire wildlife survey area and were conducted only when favorable weather conditions (no

precipitation with little or no wind) prevailed. Searching was conducted from approximately 0.5 hour before to 3 hours after sunrise. Biologists surveyed roads and trails throughout the wildlife survey area either on foot or from a vehicle (truck or ATV). During vehicular surveys, biologists stopped approximately every 0.25 mile to listen for grouse drumming and turkey vocalizations. At each stop, the biologists turned off the vehicle and listened for at least 5 minutes. Observations of game birds and their sign were documented during all fieldwork, and included notes on location, species, age and sex when possible, number of individuals, and habitat. Locations of all new display sites and observations of upland game birds documented throughout the duration of the baseline study were recorded.

3.2 RAPTOR NESTS

Raptor nest searches were conducted during several site visits on May 9-11, May 31, June 13, and July 18 and 19, 2012. During each survey, biologists watched and listened for evidence of nesting raptors within the survey area. Nest searches involved systematic walking and/or driving throughout the wildlife survey area while looking for raptors and nests, and by using recorded raptor calls (broad-winged hawk [*Buteo platypterus*], northern goshawk [*Accipiter gentilis*], Cooper's hawk [*Accipiter cooperii*], and great horned owl [*Bubo virginianus*]) in an attempt to elicit a defensive responses, especially in heavily wooded areas where visibility was limited. During and after calling, biologists watched and listened for raptors for several minutes with the vehicle engine turned off to enhance the opportunity to hear a response. Areas where raptors were observed were thoroughly searched on foot. The distance to nearest regular human disturbance was estimated for each intact nest recorded. Each nest site identified early in the baseline survey period was also checked later in the nesting season to confirm occupancy and/or activity. Early in the breeding season, nests were observed from a parked vehicle using a spotting scope or briefly on foot from a hidden vantage point with binoculars to avoid disturbing the nest sites (Grier and Fyfe 1987). The coordinates for nest were recorded and the nest tree was flagged later in the nesting season, once it was confirmed unoccupied, with solid pink survey tape and marked "WILDLIFE TREE--DO NOT CUT."

Biologists also watched for raptors or sign of activity during all other surveys and documented all sightings within the survey area throughout the baseline period.

3.3 OWLS

Surveys for breeding owls were not specifically conducted for the Deadwood Standard project; however, owl surveys were completed for a mine amendment at the properties immediately east of the project in spring 2010. Territorial owl calls were broadcast at six listening points spaced approximately 0.5 mile apart, ranging from approximately 2.1 to 4.2 miles from the Deadwood Standard permit area. The six call sites encompassed all major habitats (ponderosa pine, white spruce, and aspen) similarly found within the Deadwood Standard survey area. As per SDGFP guidance, survey protocols established by the Rocky Mountain Bird Observatory (RMBO) for annual owl surveys throughout the Black Hills of South Dakota were followed at each of the six listening points. The protocol consisted of playing a pre-recorded CD containing the territorial calls of northern saw-whet owl (*Aegolius acadicus*), eastern screech-owl (*Otus asio*), boreal owl (*Aegolius funereus*), flammulated owl (*Otus flammeolus*), and long-eared owl (*Asio otus*), in that order. Each call was played for 30 seconds and was separated by 30 seconds of silence. For each owl that was heard or seen, pertinent information such as species, detection type (visual or aural), the duration or extent of the response and the approximate location of the bird was recorded. Weather information at each survey location was recorded prior to the survey, and surveys were conducted only on calm nights without precipitation.

3.4 THREATENED, ENDANGERED, AND OTHER SENSITIVE SPECIES

The USFWS has identified only one federally listed (T&E) and one candidate vertebrate species, the whooping crane (*Grus americana*) (endangered) and Sprague's pipit (*Anthus spragueii*) (candidate), which could occur in Lawrence County and would require monitoring (USFWS 2012) in project development. However, the whooping crane is generally associated with low-elevation wetlands and rivers, and the Sprague's pipit prefers large patches of native grassland with relatively tall, dense cover dominated by grasses and sedges. Neither of these habitats occurs within the proposed Deadwood Standard survey area. Detailed information regarding vegetation communities and surveys conducted for federally listed plants within the proposed permit area can be found in the vegetation baseline report (Bar XX Environmental Services 2012).

Due to the lack of suitable habitat and/or the unlikely occurrence of T&E vertebrate species in the Deadwood Standard survey area, specific surveys targeting these species were not required or

conducted for this project. Nevertheless, biologists watched for all federally listed vertebrate species (including endangered, threatened, petitioned, and candidate species) and habitats that could support them while conducting all surveys.

In 2009, the SDNHP updated the *Rare, Threatened, or Endangered Animals Tracked by the South Dakota Natural Heritage Program* list. Additionally, the USFS Region 2 also updated their *Region 2 Regional Forester's Sensitive Species* list in 2011. Both lists were current through 2012, and were obtained and reviewed prior to commencing field surveys.

Specific surveys for other federal or state (SDNHP) species of concern were not required for the proposed permit area during 2012. However, biologists watched for all sensitive species of concern and habitats that could support them while conducting all surveys. In addition, all wildlife sightings (including notes on the number of individuals, sex and age when possible, location, associated habitat, and activity) were recorded during all surveys.

3.5 OTHER ANIMALS

No quantitative surveys for big game, mammalian predators, furbearers, lagomorphs, small mammals, bats, breeding birds, waterfowl, reptiles, amphibians, fish, or invertebrates (benthic or terrestrial) were required or conducted specifically for the Deadwood Standard wildlife baseline study. However, all sightings of non-target animals within the survey area were recorded, and a species list was maintained during the full baseline survey period (May 2012 through July 2012) to document wildlife use of the entire Deadwood Standard survey area.

4.0 RESULTS AND DISCUSSION

Attachment I, included at the end of this document, presents summary tables for all wildlife species (including SDNHP listed species) and that could potentially reside within or pass through (during migration) the Deadwood Standard survey area and nearby vicinity. Notations for the individual species that were documented within or near the Deadwood Standard survey area during the 2012 baseline wildlife surveys are also included in Attachment I.

4.1 HABITAT ASSESSMENT

4.1.1 Ponderosa Pine-Common Juniper

The ponderosa pine-common juniper habitat is the predominant vegetation community throughout the majority of the Deadwood Standard wildlife survey area. The overstory is dominated by ponderosa pine, quaking aspen, and paper birch. Black Hills spruce, bur oak, and Scouler's willow are also present in the overstory, but are not dominant. The dominant shrubs and half-shrubs in the understory include common juniper, thimbleberry (*Rubus parviflorus*), serviceberry (*Amelanchier alnifolia*), chokecherry (*Prunus virginiana*), snowbrush (*Ceanothus velutinus*), beaked hazelnut (*Corylus cornuta*), bearberry or kinnikinnick (*Arctostaphylos uva-ursi*), spirea (*Spiraea betulifolia*), prairie rose (*Rosa arkansana*), Oregon grape (*Mahonia repens*), and snowberry (*Symphoricarpos albus*). Quaking aspen also provides significant understory cover in places as stands of young trees or saplings. Common grasses that are present in the understory include timothy (*Phleum pratense*), *Carex* spp., and Kentucky bluegrass (*Poa pratensis*). Common forbs include strawberry (*Fragaria virginiana*), showy aster (*Eurybia conspicua*), cream-colored peavine (*Lathyrus ochroleucus*), and bracken fern (*Pteridium aquilinum*).

Although ponderosa pine-common juniper habitat dominates the Deadwood Standard survey area, historically disturbed sites from past mining activities are subtly evident in the undisturbed, surrounding vegetation community. At these locations, the understory is less robust and includes a few different species, such as shrubby cinquefoil (*Potentilla fruticosa*), spotted knapweed (*Centaurea maculosa*), Canada thistle (*Cirsium arvense*), St. John's wort (*Hypericum perforatum*), and tansy (*Tanacetum vulgare*). Species of the wintergreen and orchid families are also present, including Prince's pine (*Chimaphila umbellata*), sidebells wintergreen (*Orthilia secunda*), green shinleaf (*Pyrola chlorantha*), pink shinleaf (*Pyrola assarifolia*), rattlesnake plantain (*Goodyera oblongifolia*), and yellow lady's slipper (*Cypripedium calceolus*).

Ponderosa pine habitats, especially those with greater understory cover, support a relatively high diversity of wildlife species. These habitats generally host several levels of open canopy cover that can provide for an array of different species, while also allowing for easy movement between canopy levels for greater utilization of the overall habitat. Mammalian species such as

white-tailed deer (*Odocoileus virginianus*), squirrels, and chipmunks are common. Avian species such as nuthatches, chickadees, warblers, and woodpeckers are abundant in this habitat as well. Ponderosa pine is the preferred nesting habitat for broad-winged hawks and northern goshawks.

Aspen and birch stands, which occur among the pine habitat, tend to be more open and less complex than areas with contiguous pine habitat. Therefore, wildlife species that utilize them may be less diverse or spend less time in them, as they tend to offer less cover for refuge. However, certain components of this habitat, such as aspen buds and/or the greater diversity of understory species that result from additional sunlight exposure, can be attractive to certain wildlife species, such as grouse. Aspen and birch habitats in the Deadwood Standard survey area tend to occur in small patches within larger areas of ponderosa and, as a result, many of the species common to the pine habitat are also found in aspen and birch stands.

Spruce habitats generally host relatively dense canopy cover that provides adequate refuge for many species. However, dense overstory may also limit the accessibility for many animals and restrict sunlight exposure to the understory, which can limit plant diversity and overall wildlife use for activities such as foraging. Nevertheless, small mammals such as squirrels and weasels tend to be more common in spruce habitat than in other communities. Avian species found within spruce habitat can include kinglets (*Regulus* spp.), brown creeper (*Certhia americana*), and several species of woodpeckers. Ruffed grouse are also frequently found in mature spruce forests that include an understory of young deciduous trees.

4.1.2 Other Minor Habitats

Narrow riparian habitats associated with portions of Johnson Gulch and Calamity Gulch and small patches of meadow habitat interspersed throughout the survey area are limited in their extent and are generally similar in composition to the woodland habitats (described above) that neighbor them. Although generally temporary, the availability of water resources associated with riparian habitats can attract many wildlife species from the neighboring areas and often concentrate an abundance of animals in this habitat. However, given the limited extent of riparian and meadow habitat, the species diversity tends to be similar to that of the surrounding

habitat with little opportunity to fully support more specialized grassland, riparian, or wetland species.

An exception is the riparian corridor associated with Spearfish Creek in the extreme southwestern extent of the survey area. This habitat provides a perennial source of water and hosts more significant stands of shrubs and mesic vegetation, which can attract greater diversity and particular species not likely to occur in other portions of the survey area. For example, several species associated with aquatic microhabitats, such as the smooth green snake (*Opheodris vernalis*), western terrestrial garter snake (*Thamnophis elegans*), and American dipper (*Cinclus mexicanus*), have been documented near the Deadwood Standard survey area along Spearfish Creek (SDGFP 2012).

With the exception of the cliffs adjacent to Spearfish Creek, limited rocky outcrops and exposed peaks or ridgelines are scattered throughout the Deadwood Standard survey area. Among those, some of the larger outcrop areas are concentrated in the northeastern (Ragged Top Mountain) and eastern (Elk Mountain) portion. However, the canyon walls that border the western extent of the survey area along Spearfish Creek easily represent the majority of rocky substrate in the area. These cliff walls provide numerous crevices and rock ledges that are unique to the remaining portion of the survey area. This habitat is unlikely to support a large diversity of wildlife, but can host several species that are specialized in using it, such as mountain goat (*Oreamnos americanus*), mountain lion (*Puma concolor*), falcons (*Falco* spp.), and eagles.

Disturbed habitats are characterized by a complete or nearly complete absence of vegetation and are, therefore, less valuable to wildlife species. Diversity and abundance of wildlife species can be extremely low, if not absent in these habitats. However, given their limited extent and, in most cases, the complexity of the surrounding habitats, it's not uncommon to observe some species briefly using or passing through these habitats.

4.2 UPLAND GAME BIRDS

4.2.1 Ruffed Grouse

Long-term annual monitoring at the adjacent mine east of the Deadwood Standard project has confirmed from 1 to 18 ruffed grouse drumming sites annually between 1994 and 2002 and from

2006 through 2009 (ICF Jones & Stokes 2009). Although none of the previously identified sites are located within the Deadwood Standard survey area, habitats that support the species are clearly present in the general vicinity. Ruffed grouse were also documented in the Deadwood Standard survey area during past data collection efforts for the Ragged Top Project (Homestake Mining Company, 1984).

Searches for ruffed grouse within the Deadwood Standard survey area in spring 2012 resulted in the documentation of seven new drumming sites (I-VII; Table 1 and mapped in Exhibit 1), clustered in four general groups (I-III, IV, V and VI, and VII). Displaying males were recorded on at least one occasion at sites I, IV, V, and VII during spring 2012. Grouse droppings, feathers, and/or cecal deposits were recorded at all other locations, indicating that these sites were also used in the recent past for displaying. All seven sites were located within young, short, dense stands of aspen, which included several fallen logs of sufficient size (10 to 24 inches in diameter) lying horizontal along the ground. The topography associated with these sites was relatively level. Of the seven total drumming sites discovered during the baseline survey period, only two (sites V and VI) are located beyond the proposed Deadwood Standard permit area (Exhibit 1).

Despite a variety of limitations and biases, a comparison of annual displaying male counts at the adjacent Wharf Mine between 1994 and 2002 and from 2006 through 2009 (ICF Jones & Stokes 2009) provides a basis for assessing the grouse populations in the general vicinity of the proposed Deadwood Standard permit area. However, because of extreme variations in both the size of the grouse survey area and annual search efforts over time, the data should be interpreted with caution. Annual counts for grouse drumming sites within the Wharf Mine wildlife survey area gradually increased from 4 sites in 1994 to 18 sites in 1999, and then decreased slightly each year through 2002 (11 sites). The grouse survey area was reduced in future years, but the number of total sites documented each year between 2006 and 2009 (no surveys were conducted in 2003, 2004, or after 2009) ranged from one (in 3 years) to eight sites (in 1 year). The number of drumming sites recorded in those years cannot be compared directly with the results from previous years due to the reduced survey coverage, but the significant absence of activity in most years suggests a much lower use and/or number of grouse from 2006 through 2009.

Table 1. Ruffed grouse display (drumming) sites recorded in 2012 for the Deadwood Standard wildlife baseline.

Map Label and Location ¼ ¼ Section, T(N):R(E)	UTM X	UTM Y	Confirmed Activity	Other Evidence of Use
	(UTM NAD27, Zone 13N)			
I (NE SW 32, 5:2)	587620	4910976	Displaying Male Present	Concentrated, fresh pellets
II (NE SW 32, 5:2)	587632	4910987	---	Old pellets with cecal deposits
III (NE SW 32, 5:2)	587611	4911020	---	Minimal but fresh pellets
IV (NE SE 31, 5:2)	586724	4911196	Displaying Male Present	Concentrated, fresh pellets
V (SW NE 31, 5:2)	586329	4911418	Displaying Male Present	Concentrated, fresh pellets
VI (SW NE 31, 5:2)	586342	4911418	---	Old pellets
VII (SE NW 32, 5:2)	587623	4911346	Displaying Male Heard	Fresh pellets

Based on the 2012 results from the Deadwood Standard baseline surveys, it appears that: 1) the habitats within the associated survey area are more suitable than recent conditions at the Wharf Mine, 2) the grouse population numbers have rebounded since 2009, or 3) a combination of the two previous conditions and possibly other factors are supporting a more robust population of grouse. Given the relatively small survey area associated with the Deadwood Standard project, the number of active sites documented in 2012 is comparable to the higher past count years at the Wharf Mine (ICF Jones & Stokes 2009). The density of active drumming sites is worth noting as well, with all four active sites being located within 0.12 square miles.

In addition to the ruffed grouse recorded at the active drumming sites, one other grouse observation was documented in 2012 (Exhibit 1). On July 19, one grouse (sex and age

undetermined) was flushed from the dense understory and spruce stands on the north-facing slope at the head of McKinley Gulch in SE SE Section 32, T5N:R2E.

4.2.2 Wild Turkey

No systematic, long-term annual monitoring for wild turkeys has occurred in the area, but incidental detections at the adjacent mine east of the Deadwood Standard project has regularly confirmed the species in the vicinity during monitoring between 1994 and 2009 (ICF Jones & Stokes 2009). During that time, turkeys and their sign have been found primarily in mixed pine-aspen stands, but in a variety of other habitats and successional vegetation stages as well. Evidence of breeding turkeys has also been documented on a few occasions with observations of hens with poults or depredated turkey eggs found in the survey area. The wild turkey was also documented in the Deadwood Standard survey area during past data collection efforts for the Ragged Top Project (Homestake Mining Company, 1984).

Wild turkeys were heard or observed on several occasions during the Deadwood Standard wildlife baseline surveys in 2012 (Exhibit 1). Most significantly, one male was observed on May 9 displaying for quite some time just south of the access road in a small grassy opening surrounded by pine habitat in NE SE Section 31, T5N:R2E (site VIII; Exhibit 1). No males were seen at this location later in the spring, but several were heard calling in the vicinity to the south of the road on additional survey dates in May. Two males were also heard calling on May 10 in pine habitats in NE NE Section 31 and SE NW Section 32, and three males were observed walking and foraging within a stand of young aspen in SW NE Section 31, T5N:R2E on that same day.

4.2.2 Other Upland Game Birds

No other upland game bird species were recorded in the Deadwood Standard wildlife baseline survey area during 2012. However, the mourning dove (*Zenaida macroura*) was documented in the survey area during past data collection efforts for the Ragged Top Project (Homestake Mining Company, 1984). Although the mourning dove is adapted to a wide variety of habitats, its preferred habitat of woodland/grassland edges with minimal ground cover is limited in the Deadwood Standard survey area.

4.3 RAPTOR NESTS

A review of the historical raptor nest database documented at the adjacent mine east of the Deadwood Standard project revealed previous nest records for four species of raptors, including the red-tailed hawk (*Buteo jamaicensis*), broad-winged hawk, Cooper's hawk, and great horned owl (*Bubo virginianus*) (ICF 2011). Although none of the previously identified nest sites are located within the Deadwood Standard survey area, habitats that support these species are clearly present in the general vicinity. Three of these species, not including the broad-winged hawk, were also documented in the Deadwood Standard survey area during past data collection efforts for the Ragged Top Project (Homestake Mining Company, 1984), though it's not clear whether those records include breeding or nesting attempts or were merely occurrence observations/detections alone. The sharp-shinned hawk (*Accipiter striatus*), Swainson's hawk (*Buteo swansoni*), and golden eagle (*Aquila chrysaetos*) were also documented within the survey area during past data collection efforts for the Ragged Top Project (Homestake Mining Company, 1984).

Searches for raptor nests within the Deadwood Standard survey area in spring and summer 2012 resulted in the documentation of two inactive raptor nests of unknown species (UNK1 and UNK2) and one active Cooper's hawk territory (COHA1) (Exhibit 1). The location, status, and distance from each site to the nearest source of human disturbance in 2012 are provided in Table 2. All three confirmed and potential nest sites documented during the 2012 wildlife baseline surveys for the Deadwood Standard project are located in the extended survey area; no other nests or territories were identified within the permit area (Exhibit 1).

Both confirmed nest sites were situated near the top of ponderosa pines and were in good to fair condition, suggesting they had been used in the recent past. However, no feathers, mutes, or other fresh sign were present at either site to indicate that they were likely occupied or tended as recently as 2012 or probably even the previous year. Both were located within moderately dense pine stands on level to gently sloping terrain near openings in the overstory canopy associated with nearby, primitive two-track roads. Both nests were labeled as "UNK" (unknown raptor species) since they were unoccupied in 2012, but the nest orientation, placement, material, and the surrounding site conditions suggest that they were likely built by broad-winged hawks.

Table 2. The location[1], status, and nearest disturbance for each raptor nest/territory in 2012 for the Deadwood Standard wildlife baseline.

Map Label and Location ¼ ¼ Section, T(N):R(E)	UTM X (UTM NAD27, Zone 13N)	UTM Y (UTM NAD27, Zone 13N)	Substrate	2012 Status/ Productivity	Nearest Disturbance (Type and Distance)
UNK1 (NW SE 32, 5:2)	587620	4910976	PP	I	Recreational trail; 55 feet
UNK2 (SW SE 32, 5:2)	587632	4910987	PP	I	Recreational trail; 45 feet
COHA1 (SW SE 32, 5:2)	~587611	~4911020	Unknown	A/1+	Recreational and logging trail; 595 feet

[1] The coordinates of the COHA1 territory correspond to a particular location of the defending, breeding adult recorded in 2012, but do not represent the precise nest site. The precise nest location could not be determined.

Species Codes	Nest Substrate Codes	Nest Status Codes
COHA = Cooper's hawk	PP = Ponderosa pine	I = Inactive
UNK = Unknown raptor species	Unknown = substrate not confirmed	A = Active
		+ = Minimum confirmed

In addition, a single adult Cooper's hawk was observed on July 19 in SW SE 32, T5N:R2E, demonstrating territorial behavior (alarm calling) indicative of an established nest in the area. From three separate locations within a small area (approximately 5 acres, Exhibit 1), the hawk responded with territorial displays to recorded broadcast calls. Fledgling calls were also heard at one point near the northeastern extent of the area, but it could not be confirmed whether the fledglings were stationary or mobile (i.e., still at the nest or already fledged from the nest). The habitat within the area is dominated by ponderosa pine stands on the south-facing slope of McKinley Gulch and mixed pine-spruce-aspen stands on the north-facing slope. The mature pine and aspen stands at this location could provide particularly suitable substrate for nesting Cooper's hawks, and the setting near the bottom of a primary drainage is typical of other Cooper's hawk nests and territories documented during annual monitoring at the adjacent mine east of the Deadwood Standard project. Although the area was thoroughly searched for a significant amount of time, the actual nest location could not be determined. Future monitoring may help determine the precise existence of a nest(s) within the apparent territory.

Aside from the previously discussed raptor observation, four other raptor species and one additional Cooper's hawk observation were documented within or near the Deadwood Standard survey area in spring/summer 2012. On May 9, one adult Cooper's hawk was gliding at a fairly high altitude from west to east over pine habitats in NW NE Section 31, and on a separate occasion that day, one adult red-tailed hawk was soaring over Johnson Gulch in SE NE Section 31, T5N:R2E. Neither individual could be observed for much time before continuing east and northwest, respectively, and flying out of sight. A second adult red-tailed hawk was also observed soaring over scattered pine habitats in NE NW Section 5, T4N:R2E on July 18. While leaving the survey area on May 10, one adult northern goshawk followed by one adult broad-winged hawk were seen just east of the survey area in NW SE Section 33, T5N:R2E. The broad-winged hawk was flying at tree-top level and mobbing (i.e., alarm calling) the goshawk as it flew northwest, just above ground level, through the pine habitats in the area. On May 31, one adult peregrine falcon (*Falco peregrinus*) was recorded hunting and soaring over Spearfish Creek and the nearby canyon walls in NE SW Section 31, T5N:R2E. The falcon perched in a pine snag about half-way between the east side of the creek and the canyon rim and called several times, and then stooped and attacked a small mammal on the canyon wall, but was unsuccessful. The falcon then flew northwest along the canyon and out of site. Although the observation period lasted for a significant amount of time (approximately 20 minutes) and the canyon cliffs were scanned from multiple vantage points during and after the falcon observation, no nests could be identified in the area. Additional searches later in the summer also resulted in a lack of any identified nests along the cliff walls within the Deadwood Standard survey area, and no other falcons were documented during the baseline survey period.

4.4 OWLS

During nocturnal, broadcast call surveys at the adjacent mine east of the Deadwood Standard project in spring 2010, only one owl species (northern saw-whet owl) was recorded. The northern saw-whet owl was detected at three of the six survey sites that year, including the site closest (2.1 miles) to the Deadwood Standard permit area. No owls were detected visually during those efforts, but territorial call responses that lasted the entire survey period were documented at several sites. Although no owl species were detected within the Deadwood Standard survey area in 2012, these previous survey results suggest that the northern saw-whet owl may be fairly common species, and is likely breeding and nesting in the general area.

4.5 THREATENED, ENDANGERED, AND OTHER SENSITIVE SPECIES

No current T&E vertebrate species were documented within the Deadwood Standard survey area during wildlife baseline surveys conducted in spring and summer 2012, and no records exist from the historical accounts of either the Ragged Top Project (Homestake Mining Company, 1984) or the adjacent Wharf Mine east of the Deadwood Standard project (ICF 2011). Likewise, no candidate, petitioned, or proposed T&E vertebrate species were recorded during recent baseline surveys or previous annual monitoring. Information regarding the potential and documented occurrence of plant T&E species is provided in the vegetation baseline report (Bar XX Environmental Services 2012).

The single listed vertebrate T&E species (whooping crane) that may be expected to occur in Lawrence County, South Dakota is associated with low-elevation wetland or open water habitats. The only candidate, petitioned, or proposed vertebrate T&E species (Sprague's pipit) that may be expected to occur in Lawrence County, South Dakota prefers large patches of native grassland with relatively tall, dense cover dominated by grasses and sedges. Neither of these habitats occurs within the Deadwood Standard permit area and its surrounding 0.5-mile perimeter. Information regarding these species' habitat needs and/or recovery efforts can be found in their respective USFWS recovery or conservation plans (Canadian Wildlife Service and USFWS 2007 and Jones 2010).

Attachment I lists all potential vertebrate species that could occur in the area, including all sensitive species tracked by the SDNHP. Attachment I also provides a brief description of each species' protection status and records of their occurrence (historical and 2012) in the vicinity of the Deadwood Standard project.

Only two avian species included on the SDNHP list, the Cooper's hawk and peregrine falcon, were detected within the Deadwood Standard survey area during baseline wildlife surveys completed in 2012. No other species of additional wildlife taxa included on the SDNHP list were documented during that period. However, historical accounts within the survey area (Homestake Mining Company, 1984) also include records of the meadow jumping mouse (*Zapus hudsonius*), northern goshawk, sharp-shinned hawk, Swainson's hawk, golden eagle, brown creeper, and Cassin's finch (*Carpodacus cassanii*). The Cooper's hawk, peregrine falcon,

northern goshawk, sharp-shinned hawk, Swainson's hawk, and golden eagle were discussed in the previous *Raptor Nests* section. The meadow jumping mouse prefers moist grasslands with high herbaceous cover and thick vegetated areas near streams, ponds, or marshes. The brown creeper and Cassin's finch are both associated with mature coniferous forests.

4.6 OTHER ANIMALS

Incidental sightings of animals not targeted by systematic surveys were recorded during all wildlife monitoring efforts in and within 0.5 mile of the Deadwood Standard permit area during spring and summer 2012 (Attachment I). During that time, five mammal species and 31 bird species were documented within the Deadwood Standard wildlife survey area. Of the 36 species, only 2 (Cooper's hawk and peregrine falcon) are included on the SDNHP list of rare, threatened, or endangered species.

White-tailed deer (*Odocoileus virginianus*) and mule deer (*Odocoileus hemionus*) were the only big game species observed within the Deadwood Standard permit area and 0.5-mile perimeter. Both species were observed in forested habitats and small meadow openings throughout the survey area during the entire baseline survey period. Red squirrels (*Tamiasciurius hudsonicus*) and least chipmunks (*Tamias minimus* spp.) were also commonly observed throughout the forested habitats within the wildlife survey area. One yellow-bellied marmot (*Marmota flaviventris*) was also recorded along the access road in NE SE Section 31, T5N:R2E during the July surveys.

Additional avian species recorded in the Deadwood Standard survey area included many forest species typical of the Black Hills regions, such as the black-capped chickadee (*Poecile atricapillus*), chipping sparrow (*Spizella passerine*), red-naped sapsucker (*Sphyrapicus nuchalis*), Swainson's thrush (*Catharus ustulatus*), red-breasted nuthatch (*Sitta canadensis*), dark-eyed junco (*Junco hyemalis*), yellow warbler (*Setophaga petechia*), yellow-rumped warbler (*Setophaga coronata*), and ovenbird (*Seiurus aurocapilla*). Other common, but less visible species, included the western tanager (*Piranga ludoviciana*), warbling vireo (*Vireo gilvus*), red-eyed vireo (*Vireo olivaceus*), cedar waxwing (*Bombycilla cedrorum*), and red crossbill (*Loxia curvirostra*).

No reptile or amphibian species were documented within the wildlife survey area during the baseline survey period. However, habitat exists within the survey area and surrounding vicinity to support some of these species (see Attachment I).

5.0 CONCLUSIONS

Wildlife habitats within the Deadwood Standard survey area are generally common in the Black Hills region of South Dakota. With the exception of the canyon walls and Spearfish Creek in the extreme western portion of the wildlife survey area, no unique or unusual wildlife habitats were documented during the baseline surveys in 2012. The survey area is dominated by ponderosa pine habitats, but other scattered woodlands, such as aspen, birch, and spruce, are also present throughout the region. Bottomland habitat, which often supports considerable wildlife diversity, is limited in the Deadwood Standard permit area, as none of the drainages within it maintain persistent flow. However, Spearfish Creek is present within the extended survey area to the west and hosts a permanent water source year-round. The absence of perennial streams or other water sources within the Deadwood Standard permit area prevent any fisheries or riparian/wetland habitat from being directly affected by the project, but ephemeral tributaries of Spearfish Creek within the permit area do not preclude indirect influences.

The Deadwood Standard survey area has experienced various levels of human disturbance in the past, including some that are still currently present. The area is adjacent to ongoing mining activity to the east and has a long history of past mining activity that originally occurred throughout most of the current permit area. Existing recreational and residential development also occurs along Spearfish Creek to the west. Additional disturbances in the area include passive and active recreation, transportation (i.e., state highway), logging, and mine reclamation activities.

Searches for upland game birds within the Deadwood Standard survey area in spring 2012 resulted in the documentation of seven new drumming sites for ruffed grouse (I-VII), one displaying site for wild turkey (VIII), and several additional observations/detections of both species (Exhibit 1). Displaying male ruffed grouse were recorded on at least one occasion in 2012 at four of the seven documented sites; all others were identified by concentrated sign (e.g., feathers, pellets, and cecal deposits) alone. All seven ruffed grouse drumming sites were located

within young, short, dense stands of aspen, with several fallen logs present. The wild turkey display site was located just south of the access road in a small grassy opening surrounded by pine habitat in NE SE Section 31, T5N:R2E. Only two of the eight total display sites (grouse and turkey) discovered during the baseline survey period (sites V and VI) are located beyond the proposed Deadwood Standard permit area (Exhibit 1).

Searches for raptor nests within the Deadwood Standard survey area in spring and summer 2012 resulted in the documentation of two inactive raptor nests of unknown species (UNK1 and UNK2) and one active Cooper's hawk territory (COHA1). Both confirmed nest sites were in good to fair condition, suggesting they had been used in the recent past, but not likely as recent as 2011 or 2012. Although no precise nest location was identified in the COHA1 territory (southeast of the permit area), defensive responses at multiple locations indicated that the territory was active in 2012. None of the identified nests or territories are located within the Deadwood Standard permit area (Exhibit 1), and therefore, no nests will be physically disturbed by the project.

Two additional raptor species (red-tailed hawk and peregrine falcon) were recorded within the Deadwood Standard survey area and two others (northern goshawk and broad-winged hawk) were seen just beyond the survey area during 2012. None of the species appeared to be associated with an active nest during the 2012 nesting season. The red-tailed hawk and broad-winged hawk are common raptor species in the region; however, the goshawk and falcon are less common.

No targeted surveys were conducted for breeding owls in 2012, but results from owl surveys conducted at the adjacent mine to the east of the Deadwood Standard project in spring 2010 resulted in the documentation of only one owl species (northern saw-whet owl). Although no owl species were detected within the Deadwood Standard survey area in 2012, the northern saw-whet owl appears to be relatively common in pine and mixed-forest habitats throughout the Black Hills and was documented at three of the six sites sampled in 2010.

No endangered, threatened, proposed, candidate, or petitioned vertebrate species were documented for the Deadwood Standard wildlife baseline, and it is unlikely that any of those species would rely on the habitats present within the survey area. No designated critical or

crucial habitats for any T&E species occur in the area. The Cooper's hawk is listed as a SDNHP species and one active territory was documented within the Deadwood Standard survey area during the baseline study period. This species is relatively common in the region. The only other SDNHP-listed species recorded during that time was the peregrine falcon, which is less common in the area. Although the falcon was not confirmed nesting within the Deadwood Standard survey area, the canyon walls that border Spearfish Creek are typical of the preferred habitat for this species.

In summary, the Deadwood Standard permit area and surrounding vicinity support an array of common wildlife habitats and species. Other than the habitats associated with Spearfish Canyon, no unique or unusual wildlife habitats or T&E species were documented in the Deadwood Standard survey area during the baseline surveys. Given the physical and faunal characteristics of the area described above, no significant impacts to wildlife or their habitats are anticipated from the proposed mining operations and reclamation of the Deadwood Standard project.

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ATTACHMENT I

DEADWOOD STANDARD WILDLIFE BASELINE REPORT: POTENTIAL AND DOCUMENTED SPECIES OCCURRENCE LISTS

POTENTIAL† AND DOCUMENTED MAMMALIAN SPECIES LIST

Common name	Scientific Name	Recorded within the Deadwood Standard Survey Area in 2012	Recorded in vicinity ††	Special Status Designation†††
Insectivores				
Masked shrew	*Sorex cinereus*	---	X	---
Hayden's shrew	*Sorex haydenii*	---	X	---
Merriam's shrew	*Sorex merriami*	---	---	*
Bats				
Small-footed myotis	*Myotis ciliolabrum*	---	X	---
Long-eared myotis	*Myotis evotis*	---	---	*
Northern myotis	*Myotis septentrionalis*	---	X	*
Little brown myotis	*Myotis lucifugus*	---	X	---
Fringe-tailed myotis	*Myotis thysandoes*	---	---	*
Long-legged myotis	*Myotis volans*	---	---	---
Keen's myotis	*Myotis keeni*	---	---	---
Red bat	*Lasirus borealis*	---	---	---
Hoary bat	*Lasirus cinereus*	---	X	---
Silver-haired bat	*Lasionycteris noctivagans*	---	X	*
Big brown bat	*Eptesicus fuscus*	---	X	---
Townsend's big-eared bat	*Plecotus townsendii*	---	X	*
Hares and Rabbits				
Desert cottontail	*Sylvilagus audubonii*	---	---	---
Mountain cottontail	*Sylvilagus nuttallii*	---	X	---
Cottontail species	*Sylvilagus* spp.	---	X	---
White-tailed jackrabbit	*Lepus townsendii*	---	X	---
Rodents				
Least chipmunk	*Tamias minimus*	X	X	---
Yellow-bellied marmot	*Marmota flaviventris*	X	X	---
Thirteen-lined ground squirrel	*Spermophilus tridecemlineatus*	---	---	---
Red squirrel	*Tamiasciurus hudsonicus*	X	X	---
Northern flying squirrel	*Glaucomys sabrinus*	---	X	*
Northern pocket gopher	*Thomomys talpoides*	---	X	---
White-footed mouse	*Peromyscus leucopus*	---	X	---
Deer mouse	*Peromyscus maniculatus*	---	X	---

POTENTIAL† AND DOCUMENTED MAMMALIAN SPECIES LIST (CONTINUED)

Common name	Scientific Name	Recorded within the Deadwood Standard Survey Area in 2012	Recorded in vicinity ††	Special Status Designation†††
Rodents (Continued)				
Bushy-tailed woodrat	*Neotoma cinerea*	---	X	---
Southern red-backed vole	*Clethrionomys gapperi*	---	X	---
Long-tailed vole	*Microtus longicaudus*	---	X	---
Prairie vole	*Microtus ochrogaster*	---	---	---
Meadow vole	*Microtus pennsylvanicus*	---	X	---
Norway rat	*Rattus norvegicus*	---	X	---
House mouse	*Mus musculus*	---	---	---
Meadow jumping mouse	*Zapus hudsonius*	---	X	*
Porcupine	*Erethizon dorsatum*	---	X	---
Carnivores				
Coyote	*Canis latrans*	---	X	---
Red fox	*Vulpes vulpes*	---	---	---
Gray fox	*Urocyon cinereoargentus*	---	---	---
Black bear	*Ursus americanus*	---	---	*
Raccoon	*Procyon lotor*	---	X	---
Pine marten	*Martes americana*	---	X	---
Ermine	*Mustela ermine*	---	X	---
Long-tailed weasel	*Mustela frenata*	---	X	---
Mink	*Mustela vison*	---	---	---
Badger	*Taxidea taxus*	---	---	---
Eastern spotted skunk	*Spilogale putorius*	---	---	---
Striped skunk	*Mephitis mephitis*	---	X	---
Mountain lion	*Puma concolor*	---	X	*
Lynx	*Lynx canadensis*	---	---	LT
Bobcat	*Lynx rufus*	---	---	---
Ungulates				
Elk	*Cervus elaphus*	---	X	---
Mule deer	*Odocoileus hemionus*	X	X	---
White-tailed deer	*Odocoileus virginianus*	X	X	---
Pronghorn	*Antilocapra americana*	---	X	---

POTENTIAL† AND DOCUMENTED AVIAN SPECIES LIST

Common name	Scientific Name	Recorded within the Deadwood Standard Survey Area in 2012	Recorded in vicinity ††	Special Status Designation†††
Loons and Grebes				
Common loon	*Gavia immer*	---	X	*
Pied-billed grebe	*Podilymbus podiceps*	---	---	---
Horned grebe	*Podiceps auritus*	---	---	*
Eared grebe	*Podiceps nigricollis*	---	X	---
Herons and Bitterns				
American bittern	*Botaurus lentiginosus*	---	---	---
Great blue heron	*Ardea herodias*	---	X	*
Black-crowned night heron	*Nycticorax nycticorax*	---	---	*
Ibises				
White-faced ibis	*Plegadis chihi*	---	---	*
Swans, Geese, and Ducks				
Snow goose	*Chen caerulenscens*	---	---	---
Canada goose	*Branta canadensis*	---	X	---
Green-winged teal	*Anas crecca*	---	X	---
Mallard	*Anas platyrhynchos*	---	X	---
Northern pintail	*Anas acuta*	---	---	---
Blue-winged teal	*Anas discors*	---	X	---
Cinnamon teal	*Anas cyanoptera*	---	---	---
Northern shoveler	*Anas clypeata*	---	X	---
Gadwall	*Anas strepera*	---	X	---
American wigeon	*Anas ~~A~~americana*	---	---	---
Canvasback	*Aythya valisineria*	---	X	---
Redhead	*Aythya americana*	---	X	---
Ring-necked duck	*Aythya collaris*	---	X	---
Lesser scaup	*Aythya affinis*	---	X	---
Bufflehead	*Bucephala albeola*	---	X	*
Common merganser	*Mergus merganser*	---	X	*
Vultures				
Turkey vulture	*Cathartes aura*	X	X	---

POTENTIAL† AND DOCUMENTED AVIAN SPECIES LIST (CONTINUED)

Common name	Scientific Name	Recorded within the Deadwood Standard Survey Area in 2012	Recorded in vicinity ††	Special Status Designation†††
Diurnal Raptors				
Bald eagle	*Haliaeetus leucocephalus*	---	X	ST
Northern harrier	*Circus cyaneus*	---	X	*
Sharp-shinned hawk	*Accipiter striatus*	---	X	*
Cooper's hawk	*Accipiter cooperii*	X	X	*
Northern goshawk	*Accipiter gentilis*	---	X	*
Broad-winged hawk	*Buteo platypterus*	---	X	*
Swainson's hawk	*Buteo swainsoni*	---	X	*
Red-tailed hawk	*Buteo jamaicensis*	X	X	---
Ferruginous hawk	*Buteo regalis*	---	X	*
Rough-legged hawk	*Buteo lagopus*	---	---	---
Golden eagle	*Aquila chrysaetos*	---	X	*
Osprey	*Pandion haliaetus*	---	X	ST
American kestrel	*Falco sparverius*	---	X	---
Merlin	*Falco columbarius*	---	X	*
Peregrine falcon	*Falco peregrines*	X	X	SE
Prairie falcon	*Falco mexicanus*	---	X	*
Grouse and Turkey				
Ruffed grouse	*Bonasa umbellus*	X	X	---
Sharp-tailed grouse	*Tympanuchus phasianellus*	---	X	---
Wild turkey	*Meleagris gallopavo*	X	X	---
Cranes				
Sandhill crane	*Grus canadensis*	---	X	---
Whooping crane	*Grus americana*	---	---	LE, SE
Coots, Gallinules, and Rails				
Virginia rail	*Rallus limicola*	---	X	---
Sora	*Porzana carolina*	---	---	---
American coot	*Fulica americana*	---	---	---
Shorebirds, Gulls, and Terns				
Killdeer	*Charadrius vociferus*	---	X	---

POTENTIAL† AND DOCUMENTED AVIAN SPECIES LIST (CONTINUED)

Common name	Scientific Name	Recorded within the Deadwood Standard Survey Area in 2012	Recorded in vicinity ††	Special Status Designation†††
Shorebirds, Gulls, and Terns (Continued)				
American avocet	*Revurvirostra americana*	---	X	---
Greater yellowlegs	*Tringa melanoleuca*	---	---	---
Lesser yellowlegs	*Tringa flavipes*	---	---	---
Solitary sandpiper	*Tringa solitaria*	---	---	---
Willet	*Tringa semipalmatus*	---	---	---
Spotted sandpiper	*Actitis macularia*	---	X	---
Upland sandpiper	*Bartramia longicauda*	---	---	---
Wilson's snipe	*Gallinago delicate*	---	---	---
Wilson's phalarope	*Phalaropus tricolor*	---	X	---
Pigeons and Doves				
Rock pigeon	*Columba livia*	---	X	---
Mourning dove	*Zeniada macroura*	---	X	---
Cuckoos				
Black-billed cuckoo	*Coccyzus erythropthalmus*	---	---	---
Yellow-billed cuckoo	*Coccyzus americanus*	---	---	---
Owls				
Eastern screech owl	*Megascops asio*	---	X	---
Flammulated owl	*Otus flammeolus*	---	---	*
Long-eared owl	*Asio otus*	---	---	*
Great horned owl	*Bubo virginianus*	---	X	---
Northern saw-whet owl	*Aegolius acadicus*	---	X	*
Goatsuckers				
Common nighthawk	*Chordeilus minor*	---	---	---
Common poorwill	*Phalaenoptilus nuttallii*	---	X	*
Swifts				
White-throated swift	*Aeronautes saxatalis*	---	X	---
Hummingbirds				
Calliope hummingbird	*Stellula calliope*	---	---	---
Broad-tailed hummingbird	*Selasphorus platycercus*	---	X	---

POTENTIAL† AND DOCUMENTED AVIAN SPECIES LIST (CONTINUED)

Common name	Scientific Name	Recorded within the Deadwood Standard Survey Area in 2012	Recorded in vicinity ††	Special Status Designation†††
Hummingbirds (Continued)				
Rufous hummingbird	*Selasphorus rufus*	---	---	---
Kingfishers				
Belted kingfisher	*Ceryle alcyon*	---	X	---
Woodpeckers				
Lewis' woodpecker	*Melanerpes lewis*	---	---	*
Red-headed woodpecker	*Melanerpes erythrocephalus*	---	X	---
Red-naped sapsucker	*Sphyrapicus nuchalis*	X	X	---
Yellow-bellied sapsucker	*Sphyripicus varius*	---	X	---
Hairy woodpecker	*Picoides villosus*	X	X	---
Downy woodpecker	*Picoides pubescens*	X	X	---
American three-toed woodpecker	*Picoides tridactylus*	---	X	*
Black-backed woodpecker	*Picoides arcticus*	---	X	*
Northern flicker	*Colaptes auratus*	X	X	---
Flycatchers				
Olive-sided flycatcher	*Contopus cooperi*	---	X	*
Western wood pewee	*Contopus sordidulus*	X	X	---
Least flycatcher	*Empidonax minimus*	---	X	---
Hammond's flycatcher	*Empidonax hammondii*	---	X	---
Dusky flycatcher	*Empidonax oberholseri*	---	X	---
Cordilleran flycatcher	*Empidonax occidentalis*	X	X	---
Eastern phoebe	*Sayornis phoebe*	---	---	---
Say's phoebe	*Sayornis saya*	---	---	---
Western kingbird	*Tyrannus verticalis*	---	X	---
Eastern kingbird	*Tyrannus tyrannus*	---	---	---
Larks				
Horned lark	*Eremophila alpestris*	---	X	---
Swallows				
Tree swallow	*Tachycineta bicolor*	---	X	---
Violet-green swallow	*Tachycineta thalassina*	---	X	---

POTENTIAL† AND DOCUMENTED AVIAN SPECIES LIST (CONTINUED)

Common name	Scientific Name	Recorded within the Deadwood Standard Survey Area in 2012	Recorded in vicinity ††	Special Status Designation†††
Swallows (Continued)				
Cliff swallow	*Hirundo pyrrhonota*	---	X	---
Barn swallow	*Hirundo rustica*	---	X	---
Jays, Magpies, and Crows				
Gray jay	*Perisoreus canadensis*	X	X	---
Blue jay	*Cyanocitta cristata*	---	X	---
Pinyon jay	*Gymnorhinu cyanocephalus*	---	X	---
Clark's nutcracker	*Nucifraga columbiana*	---	---	*
Black-billed magpie	*Pica hudsonia*	---	X	---
American crow	*Corvus brachyrhynchos*	---	X	---
Chickadees				
Black-capped chickadee	*Poecile atricapillus*	X	X	---
Nuthatches				
Red-breasted nuthatch	*Sitta canadensis*	X	X	---
White-breasted nuthatch	*Sitta carolinensis*	X	X	---
Pygmy nuthatch	*Sitta pygmaea*	---	---	*
Creepers				
Brown creeper	*Certhia americana*	---	X	*
Wrens				
Rock wren	*Salpinctes obsoletus*	---	X	---
Canyon wren	*Catherpes mexicanus*	---	X	---
House wren	*Troglodytes aedon*	---	X	---
Dippers				
American dipper	*Cinclus mexicanus*	---	X	ST
Gnatcatchers and Kinglets				
Golden-crowned kinglet	*Regulus satrapa*	---	X	---
Ruby-crowned kinglet	*Regulus calendula*	---	X	---
Thrushes				
Eastern bluebird	*Sialia sialia*	---	X	---
Mountain bluebird	*Sialia currucoides*	---	X	---

POTENTIAL† AND DOCUMENTED AVIAN SPECIES LIST (CONTINUED)

Common name	Scientific Name	Recorded within the Deadwood Standard Survey Area in 2012	Recorded in vicinity ††	Special Status Designation†††
Thrushes (Continued)				
Townsend's solitaire	*Myadestes townsendi*	X	X	---
Veery	*Catharus fuscescens*	---	X	*
Swainson's thrush	*Catharus ustulatus*	X	X	---
American robin	*Turdus migratorius*	X	X	---
Mockingbirds and Thrashers				
Gray catbird	*Dumetella carolinensis*	---	---	---
Brown thrasher	*Toxostoma rufum*	---	---	---
Wagtails and Pipits				
American pipit	*Anthus rubescens*	---	X	---
Waxwings				
Bohemian waxwing	*Bombycilla garrulous*	---	X	---
Cedar waxwing	*Bombycilla cedrorum*	X	X	---
Shrikes				
Northern shrike	*Lanius excubitor*	---	X	---
Loggerhead shrike	*Lanius ludovicianus*	---	X	---
Starlings				
European starling	*Sturnus vulgarus*	---	---	---
Vireos				
Plumbeous vireo	*Vireo plumbeus*	---	X	---
Bell's vireo	*Vireo bellii*	---	X	---
Warbling vireo	*Vireo gilvus*	X	X	---
Red-eyed vireo	*Vireo olivaceus*	X	X	---
Warblers				
Tennessee warbler	*Oreothlypis peregrina*	---	X	---
Orange-crowned warbler	*Oreothlypis celata*	---	X	---
Blackburnian warbler	*Setophaga fusca*	---	X	---
Yellow warbler	*Setophaga petechia*	X	X	---
Yellow-rumped warbler	*Setophaga coronata*	X	X	---

POTENTIAL† AND DOCUMENTED AVIAN SPECIES LIST (CONTINUED)

Common name	Scientific Name	Recorded within the Deadwood Standard Survey Area in 2012	Recorded in vicinity ††	Special Status Designation†††
Warblers (Continued)				
Townsend's warbler	*Setophaga townsendi*	---	X	---
Blackpoll warbler	*Setophaga striata*	---	X	---
Black-and-white warbler	*Mniotilta varia*	---	---	*
American redstart	*Setophaga ruticilla*	---	X	---
Ovenbird	*Seiurus aurocapillus*	X	X	---
MacGillivray's warbler	*Oporornis tolmiei*	---	X	---
Common yellowthroat	*Geothlypis trichas*	---	X	---
Wilson's warbler	*Cardellina pusilla*	---	---	---
Yellow-breasted chat	*Icteria virens*	---	X	---
Tanagers				
Western tanager	*Piranga ludoviciana*	X	X	---
Grosbeaks and Buntings				
Rose-breasted grosbeak	*Pheucticus ludovicianus*	---	---	---
Black-headed grosbeak	*Pheucticus melanocephalus*	---	X	---
Blue grosbeak	*Guiraca caerulea*	---	---	---
Evening grosbeak	*Coccothraustes vespertinus*	---	X	---
Lazuli bunting	*Passerina amoena*	---	---	---
Indigo bunting	*Passerina cyanea*	---	---	---
Dickcissel	*Spiza americana*	---	---	---
Towhees, Sparrows, Juncos, and Longspurs				
Spotted towhee	*Pipilo maculatus*	---	X	---
American tree sparrow	*Spizella arborea*	---	---	---
Chipping sparrow	*Spizella passerine*	X	X	---
Clay-colored sparrow	*Spizella pallid*	---	---	---
Field sparrow	*Spizella pusilla*	---	---	---
Vesper sparrow	*Pooecetes gramineus*	---	X	---
Lark sparrow	*Chondestes grammacus*	---	X	---
Lark bunting	*Calamospiza melanocorys*	---	X	---

POTENTIAL† AND DOCUMENTED AVIAN SPECIES LIST (CONTINUED)

Common name	Scientific Name	Recorded within the Deadwood Standard Survey Area in 2012	Recorded in vicinity ††	Special Status Designation†††
Towhees, Sparrows, Juncos, and Longspurs (Continued)				
Song sparrow	*Melospiza melodia*	---	X	---
White-throated sparrow	*Zonotrichia albicollis*	---	---	---
White-crowned sparrow	*Zonotrichia leucophrys*	---	---	---
Harris' sparrow	*Zonotrichia querula*	---	X	---
Dark-eyed junco	*Junco hyemalis*	X	X	---
Chestnut-collared longspur	*Calcarius ornatus*	---	X	---
Snow bunting	*Plectrophenax nivalis*	---	X	---
Blackbirds, Meadowlarks, and Orioles				
Red-winged blackbird	*Agelaius phoeniceus*	---	X	---
Western meadowlark	*Sturnella neglecta*	---	X	---
Brewer's blackbird	*Euphagus cyanocephalus*	---	X	---
Common grackle	*Quiscalus quiscula*	---	X	---
Brown-headed cowbird	*Molothrus ater*	X	X	---
Orchard oriole	*Icterus spurius*	---	---	---
Bullock's oriole	*Icterus bullockii*	---	X	---
Finches				
Gray-crowned rosy-finch	*Leucosticte tephrocotis*	---	X	---
Pine grosbeak	*Pinicola enucleator*	---	X	---
Purple finch	*Carpodacus purpureus*	---	---	---
Cassin's finch	*Carpodacus cassinii*	---	X	*
Red crossbill	*Loxia curvirostra)*	X	X	---
White-winged crossbill	*Loxia leucoptera*	---	---	---
Common redpoll	*Acanthis flammea*	---	X	---
Pine siskin	*Spinus pinus*	X	X	---
American goldfinch	*Spinus tristis*	---	X	---
Weaver Finches				
House sparrow	*Passer domesticus*	---	---	---

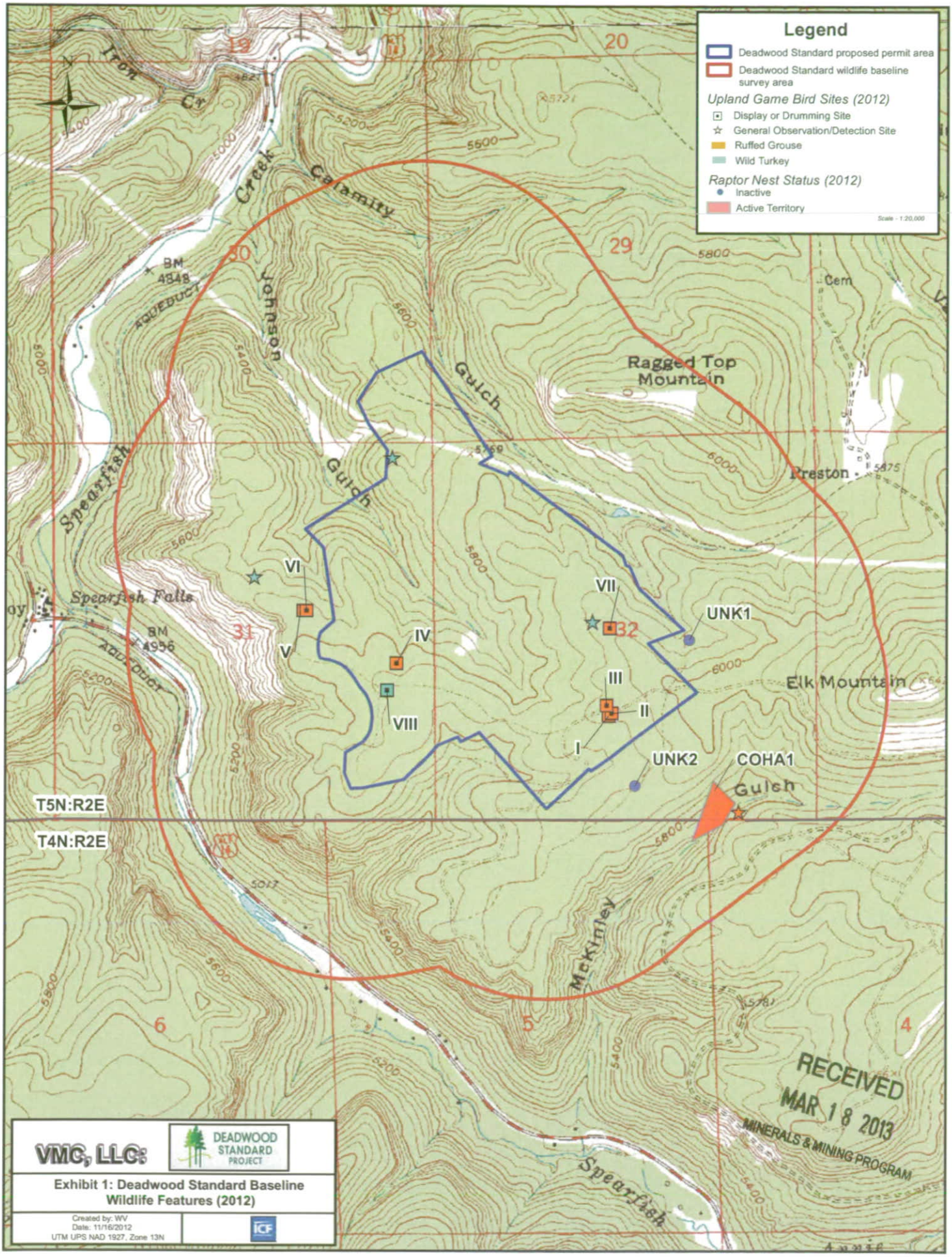
POTENTIAL† AND DOCUMENTED REPTILE AND AMPHIBIAN SPECIES LIST

Common name	Scientific Name	Recorded within the Deadwood Standard Survey Area in 2012	Recorded in vicinity ††	Special Status Designation†††
Salamanders				
Tiger salamander	*Ambystoma tigrinum*	---	---	---
Frogs and Toads				
Northern leopard frog	*Rana pipiens*	---	X	---
Boreal chorus frog	*Pseudacris triseriata*	---	X	---
Lizards				
Short-horned lizard	*Phrynosoma hernandesi*	---	---	*
Snakes				
Eastern yellowbelly racer	*Coluber constrictor*	---	---	---
Smooth green snake	*Liochlorophis vernalis*	---	X	*
Black hills redbelly snake	*Storeria occipitomaculata pahasapae*	---	---	*
Pale milk snake	*Lampropeltis triangulum multistriata*	---	---	---
Bullsnake	*Pituophis melanoleucas sayi*	---	---	---
Western terrestrial (wandering) garter snake	*Thamnophis elegans*	---	X	---
Common garter snake	*Thamnophis sirtalis*	---	---	---

† POTENTIAL OCCURRENCE--list derived from range and habitat information in Sharps and Benzon (1984), SDOU (1991), and Peterson (1990). The species listed include those which might pass through the study area, or vicinity, during migration.

†† RECORDED IN VICINITY--based on observations in the area from the following sources: Wharf Mine baseline or annual monitoring, Ragged Top Project baseline, and SDNHP element occurrence reports.

††† LT = federally-listed, threatened; LE = federally-listed, endangered; ST = state-listed, threatened; SE=state-listed, endangered. * = species is included on the SDNHP list of rare, threatened, or endangered species.


Legend
Deadwood Standard proposed permit area
Deadwood Standard wildlife baseline survey area
Upland Game Bird Sites (2012)
Display or Drumming Site
General Observation/Detection Site
Ruffed Grouse
Wild Turkey
Raptor Nest Status (2012)
Inactive
Active Territory
Scale - 1:20,000
Iron Cr
Calamity Creek
Johnson Gulch
Spearfish Gulch
Spearfish Falls
Ragged Top Mountain
Preston
Elk Mountain
Gulch
McKinley
Spearfish
Cem
BM 4848
BM 4956
AQUEDUCT
I
II
III
IV
V
VI
VII
VIII
UNK1
UNK2
COHA1
T5N:R2E
T4N:R2E
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RECEIVED
MAR 18 2013
MINERALS & MINING PROGRAM
VMC, LLC:
DEADWOOD STANDARD PROJECT
Exhibit 1: Deadwood Standard Baseline Wildlife Features (2012)
Created by: WV
Date: 11/16/2012
UTM UPS NAD 1927, Zone 13N
ICF