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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, UNIQUE LANDS AND NOTICE OF INTENT TO OPERATE

Name of Operator: Simon Contractors of South Dakota Inc.

Office Address: 3975 Sturgis Rd.
Rapid City, SD 57702

Telephone: (605) 394-3300

Local Address: Same as above.

Telephone: (605) 394-3300

Legal Description

Sections 33 and 34, Township 5S, Range 4E, Custer County, South Dakota; see attached map for quarry boundary (Appendix A).

County: Custer

Name and Address of Surface Owner

Simon Contractors of South Dakota Inc. (address above) is the surface owner of the Loring Quarry.

Name and Address of Mineral Owner

Simon Contractors of South Dakota Inc. (address above) owns the minerals within the entire project boundary.

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

Eudy, Sheri - 26527 SD Highway 89, Custer, SD 57730-8154
Steier, Kenneth & Leetta - 651 Palm Beach Rd. Dickinson, ND 58601-7309
USDA Black Hills National Forest - 1019 N. 5th St., Custer, SD 57730
SD Department of Transportation - Becker-Hansen Bldg., 700 E. Broadway Ave., Pierre, SD 57501

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: Timothy Foerster

Title: Manufacturing Manager

Date: March 29, 2021

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

Scenic & Unique Document

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Supplemental Information to Request for Determination of Special, Exceptional, Critical or Unique Lands for Simon's Loring Quarry

1.0 Project Map (ARSD 74:29:10:03(3))

Project maps showing the quarry boundary, access route and nearby landowners for Simon's Loring Quarry can be found in Appendix A.

2.0 General Description of Mining (ARSD 74:29:10:03(5))

Simon Contractors of SD, Inc. (Simon) currently owns and operates the Loring Quarry under a mine license and proposes to apply for a large scale mine permit. The quarry is located in Sections 33 and 34, Township 5S, Range 4E, Custer County, South Dakota. Simon owns two parcels, with the current disturbance in parcel 006251 (~45 acres). Parcel 006252 is relatively undisturbed with an area of ~126 acres (see General Area Map in Appendix A). Both parcels are part of this Request for Determination and should both be considered for the large scale mine permit application. The Landowner Map (Appendix A) shows the entire mine boundary. All potential disturbance from the mining operation will be contained within this boundary. The quarry is located approximately five miles southwest of Pringle, SD. The quarry was purchased from J. Erpelding by Northwest Engineering (Hills Materials) in 1963, and was already a quarry at that time. Simon then acquired Hills Materials in 2015. The quarry is an open pit limestone quarry with reserves estimated up to 30 years or more. A total disturbance of 60-70 acres is anticipated west of the Michelson Trail, with the potential to disturb another 30 acres east of the trail in the long term (40 plus years out).

Limestone mining begins with stripping the mining area of any topsoil, or overburden, above the limestone deposit using dozers or scrapers, depending on the layout. Typically, only enough area is stripped to allow for 1-3 years of reserves. Topsoil is stockpiled or placed according to the reclamation plan.

Once topsoil and/or overburden are removed, drilling and blasting begins. Drilling is conducted by Simon, while blasting operations are contracted out. Blasting only occurs when in production, and the last shot was done in December 2019. After blasting, material is loaded into the crusher where it is sized into different products. No tailings or spoils are produced during mining operations. All potential disturbance from mining operations will be contained within the quarry boundary.

Once the material has been processed by the crusher, it is stockpiled onsite via conveyors or loaders. Finally, the product is loaded onto trucks using a loader and shipped to customers. Limestone is used as a crushed stone for road base and railroad ballast. It is used as an aggregate in concrete and is an important component of cement. Limestone (ag-lime) from this mine will also be sold for use in agricultural applications such as a soil amendment or as a feed supplement. Sugar manufacturing quality limestone will also be mined from this location to be utilized in sugar beet processing.

Reclamation occurs as soon as possible behind mining, and is an on-going process during mining activities. Usually topsoil and overburden are placed in their final resting place designated by the

reclamation plan, and is done where reserves have been exhausted and where it won't prohibit continued mining processes.

Although Simon is applying for a large scale mining permit, the actual mining operations currently conducted under the existing mine license will not change. Approval of the large scale mine permit will provide the ability to sell limestone projects to an agricultural consumer base.

3.0 Special, Exceptional, Critical or Unique Land Determination (ARSD 74:29:10:03(6))

Environmental baseline studies do not indicate that the quarry area is special, exceptional, critical or unique. The land is not ecologically fragile and can return to its former ecological role in the reasonably foreseeable future. The land does not have a unique or strong influence on the total ecosystem of which it is a part. Environmental summaries from each survey are below, and complete survey reports and supporting documents are included in Appendix B.

3.1 Scenic, Historic, Archaeologic, Topographic, Geologic, Ethnologic, Scientific, Cultural, or Recreational (SDCL 45-6B-33.3)

3.1.1 Scenic

The project area is already an operating quarry with some rangeland pasture. This area is similar to surrounding lands and does not exhibit unique scenic or aesthetic qualities.

Some quarry activities are visible to occasional motorists traveling on State Highway 89, just east of the project area. This quarry has been in existence since the 1960's and should not have any new impact on the scenic nature of the area.

A private residence is located approximately 0.35 mile southwest of the quarry boundary, and is the closest residence to the quarry. The viewshed from the residence should not be impacted by continued mining of the quarry based on viewshed modeling.

3.1.2 Historic, Archaeologic, Ethnologic and Cultural

A Class III cultural resources inventory survey was conducted by ICF Jones & Stokes, Inc. (ICF) over the project area, excluding the existing quarry area. The survey was conducted on July 28 and 29, 2020 and included the revisitation of two previously recorded historic built environmental resources. Review of the historical record show the project area has been modified through early-20th century logging, early and mid-20th century homesteading and quarry development.

The two previously recorded historic built environmental resources (39CU2000 and CU00000034) were revisited during the survey. Resource 39CU2000 is listed in the National Register of Historic Places (NRHP) but has since been converted to a trail system. No track was present in the project area and only the grading remains. Because the State Historic Preservation Office (SHPO) determined that the segment of 39CU20000 does contribute to the site's NRHP eligibility, consultation between Simon; South Dakota Game, Fish and Parks; SHPO; and the Archaeological Research Center (ARC) would be required to determine adequate avoidance, minimization, or mitigation measures for proposed project activities and result in a finding of no adverse effect. Mining operations will not impact the trail. Site CU00000034

was not located during the survey. No evidence of the structure remained at or near the recorded location of the historic built environment resource.

Three historic-period artifact scatters, two isolates and two historic built environment resources were recorded during the survey. The newly recorded properties were entered into the appropriate databases. The three artifact scatters and two isolates were submitted to ARC for Smithsonian Trinomial site numbers and the two historic built environment resources were submitted to SHPO for standing structure numbers. Based on NRHP eligibility analysis (under Criteria A, B, C and D), all seven resources do not appear to convey historic significance, and are therefore, recommended not eligible for the NRHP.

No pre-contact or prehistoric archaeological resources were observed during the survey. This refers to a timeframe beginning with the arrival of humans in the region approximately 12,000 years before present and ends with the arrival of European Americans into the region in the early 1800s.

Due to heavy historical modification of the project area through logging, homesteading and quarry development; the underlying landform in the project area dating to the late Cretaceous; and no surface evidence of prehistoric features or artifacts in the SHPO file search or the Class III inventory; it is unlikely continued operation and expansion of the quarry would affect any intact subsurface cultural deposits, if any exist. However, mine staff and crew will be made aware of potential archaeological materials, and Simon will notify SHPO if any unanticipated archaeological discoveries occur during mining operations.

3.1.3 Topographic

The project area is located in the Black Hills of Custer County, South Dakota. The area has low hills of slight to moderately steep slopes covered with grasses and clusters of Ponderosa pine trees. Average elevation of the quarry area is 4,750 ft. Historical records show that the proposed area was modified through early-20th century logging, early to mid-20th century homesteading and mining. There are no special or unique topographical features in or close to the mine area.

3.1.4 Geologic

The Loring Quarry sits on a dome of Madison limestone near Minnelusa formation with alluvial deposits along Cold Brook. This limestone deposit has reserves estimated up to 30 years or more. The area has operated as a quarry for approximately 60 years. Continued mining at the quarry will consist of limestone recovery and material storage. There are no special or unique geologic features in or close to the mine area.

Drilling and survey results indicate limestone depths of approximately 50-60 ft. with 0-15 ft. of overburden depending on location within the quarry. Drilling/survey results can be made available for review.

3.1.5 Recreational

The project area consists of the existing quarry and pasture, which is occasionally used for cattle grazing. There are no unusual or aesthetic features which would suggest it be classified as a recreational site. While the George S. Mickelson Trail (approximately 0.40 miles) passes through the east side of the property, mining operations will not disturb the trail.

Two man-made entrances to a grotto are located in the quarry pit area (see Recreation Map in Appendix A). Access to the grotto will continue at Simon's discretion. Hunting would be the only other recreational activity, and access would also be at Simon's discretion. Reclamation will occur concurrently with mining and as soon as possible after mining, and will restore what recreational value exists within the mine boundaries.

3.1.6 Scientific

Soils

A soil survey was conducted by ICF on the Loring Quarry from June 29 through June 30, 2020. An Order 3 soil survey was conducted within the project area, and a total of twenty-eight samples from eight soil pedons were collected for laboratory analysis. Soil series descriptions, sample locations and laboratory results can be found in the full report in Appendix B.

Pits/quarry and Rapidcreek cobbly loam comprise the majority of the project area, and these soil map units are not considered to be unusual or unique although moderate to high erosion hazards require best management practices during reclamation and revegetation. Soil salvage suitability depths were determined and no unsuitable parameters were noted in the laboratory analysis based on Wyoming Department of Environmental Quality (WDEQ) Guideline 1A.

Vegetation

A vegetation survey was conducted by ICF on the Loring Quarry from June 29 through June 30, 2020, in conjunction with the soil survey. Line-point intercept sampling was carried out on three vegetation communities identified within the quarry area. Vegetation community distribution and sampling locations can be found in the full report in Appendix B. No threatened, endangered or rare plant species were observed during the field survey. A search of the South Dakota Natural Heritage Database did not find any documented records for threatened, endangered or rare plant species within the quarry boundary. No observations of critical vegetation resources were noted during the field survey.

The results of the vegetation survey indicates the quarry area lacks any special, exceptional, critical or unique features or habitats. The Loring Quarry does not appear to be ecologically fragile. Plant species here are adapted to withstand wide ranges of fluctuation in temperature, moisture, sunlight and wind. It is not expected that the continued mining operation will have a strong influence on the total ecosystem.

Water Resources

Cold Brook (an intermittent drainage) runs roughly from north to south across the northern portion of the Loring Quarry. This was an area of focus for the soil and vegetation surveys and those results were submitted to the U.S. Army Corps of Engineers as part of a Request for Corps Jurisdictional Determination (JD). The approved JD found that the review area was comprised entirely of dry land (i.e., there are no waters or water features, including wetlands, of any kind in the entire review area). They determined

that the drainage noted as Cold Brook consisted of an upland swale, with vegetation and soil results confirming that no wetlands were present. The approved JD can be found in Appendix B.

Cold Brook was also monitored for surface water flow after precipitation events greater than 0.25 in. and was also checked for flow during soil, vegetation and wildlife surveys. Precipitation was tracked using a weather station (Meso Wet PRIS2) located in Pringle, SD. Precipitation tracking began April 27, 2020 and multiple events greater than 0.25 in. were recorded. Cold Brook was consistently visited following these events and no surface water flow was ever observed. Visits were recorded and photo documented and are available for review.

A search of the SD DENR database (https://apps.sd.gov/nr68welllogs/) identified 2 wells (1 stock; and 1 domestic water well) within ½ mile of the quarry boundary (see Water Resources Map in Appendix A). There are no water wells in the quarry area. After reviewing the hydrology of the area and upon consultation with Roberta Hudson of the SD Minerals and Mining Program, it was determined that these two wells would be sampled for pH, conductivity, total dissolved solids (TDS), total suspended solids (TSS) and nitrates. Wells were sampled on July 21, 2020 along with a spring fed well that was identified by one of the landowners. Results were shared with the respective landowners. Field parameters are listed in Table 1 and laboratory results can be found in Appendix B. Total dissolved solids (TDS) were below the EPA National Secondary Drinking Water Regulations (NSDWR) of 500 mg/L. Nitrate results were below the EPA drinking water standard of 10mg/L. Total suspended solids (TSS) were below the method detection limit. Field pH readings were all within the EPA's Secondary Standards range, and conductivity was considered good for drinking water in all samples.

Table 1: Well Field Parameters

	pH	EC (uS)
67605 Domestic Well	7.53	355
Spring Fed Well	7.46	302.4
61831 Stock Well	7.72	434

There do not appear to be any special, exceptional, critical, or unique water resources within the Loring Quarry area, and operations do not appear to have impacted nearby water wells.

Starting in March 2021, continued monthly sampling of the domestic well and spring fed well resumed per State requirements. The owner of the stock well declined to allow continued sampling. Results from the additional monitoring will be provided with the large scale mine permit application. Cold Brook will continue to be monitored for surface flow, as described above, while groundwater sampling is ongoing.

Wildlife

Wildlife surveys and habitat assessments were conducted by ICF beginning in April 2020 and continued through December 2020. All surveys were conducted in accordance with applicable South Dakota Department of Natural Resources (SD DENR), South Dakota Game, Fish and Parks (SDGFP) and U.S. Fish and Wildlife Service (USFWS) guidelines. The wildlife survey plan was approved by Stan Michals, Energy and Minerals Coordinator for SDGFP. The Loring Quarry was visited a minimum of once each season (i.e.

spring, summer, fall and winter) to assess wildlife use during the year. Targeted surveys were also conducted for species of concern tracked by the South Dakota Natural Heritage Program (SDNHP), as well as for bats and reptiles. Habitat distribution, observation data and species assessments can be found in the full report in Appendix B.

No federally listed species were observed during the surveys. Seven SDNHP sensitive species were recorded and include: three diurnal raptors and four bat species. One Golden Eagle and one Bald Eagle were observed flying over the quarry on a single occasion. Neither eagle landed in the project area and were not observed again. One Merlin was recorded perched on a wooden post within the project area on a single occasion as well. While each of the three raptors were only observed on a single occasion, and the eagles were not utilizing the project area, direct impacts to these species could include the potential for injury or mortality to individual birds foraging in the area due to collisions with mine-related equipment or electrocutions by overhead power lines.

Eight bat species were identified acoustically during the spring and fall surveys and, of those eight species, four are SDNHP sensitive species (Townsend's big-eared bat, silver-haired bat, long-eared myotic and fringe-tailed bat). One area was evaluated as potential bat hibernaculum habitat. Two rounds of surveys were conducted at this location and no bats were observed emerging from either the highwall or man-made grotto entrance during the surveys. The number of bat passes (echolocations) recorded cannot be used to correlate the number of bats in the area, since a single bat can be recorded multiple times. No bats were observed emerging from the highwall or man-made grotto entrance during the surveys. A single bat was observed flying along the highwall during the September 15 and October 13 surveys, but was not observed entering or exiting any of the crevices in the highwall.

No baseline or long-term wildlife observational data exists for the area and, given the age of the quarry, it is difficult to determine if the current mine operation has impacted SDNHP species. It could generally be assumed that species such as eagles, merlin and tree-roosting bat species could have been impacted if trees were removed during mining operations in the past. If bats used the grotto entrances or crevices in the highwalls as roosting or hibernacula sites, blasting operations would have affected them.

Future impacts to SDNHP species could include displacement of individuals due to direct (habitat loss) or indirect (mining and traffic activity, noise, reduction in forage) causes. Potential take of individuals could occur through collisions with equipment or infrastructure or during pit expansion. Activities that could cause these impacts have been present, continuous and ongoing for several decades. It is possible that displacement of individuals from the area has occurred in the past.

Surveys indicated that the area is infrequently utilized by state sensitive avian species, therefore impacts to these species should be minimal. Should species choose to nest in the area, they would be demonstrating a tolerance for such activities. If a sensitive species nests in an area that will be directly impacted by quarry activities, Simon will contact SDGFP for guidance. Sensitive bat species have a higher change of being impacted, as they were more often detected during acoustic surveys. However, avoidance and impact mitigation measures suggested in the complete wildlife report (Appendix B) would

minimize impacts to these species. Suitable roost and hibernacula habitat are present beyond the permit area, providing alternate habitat for displaced individuals.

No significant impacts to wildlife are anticipated from continued mining and reclamation activities at the quarry. The majority of habitats found within the quarry boundaries are typical of the region, and no unique or unusual wildlife features are present. Existing agency databases, multiple site visits and targeted surveys all indicate that the Loring Quarry and surrounding area are occupied by a wide variety of common wildlife species. Animals in the area have indicated a tolerance for mining activities given the continued operations at the quarry over the past several decades.

3.2 Summary

The project area does not have unique scenic, historic, archeologic, topographic, geologic, ethnologic, scientific, cultural or recreational features of significance. While the George S. Mickelson Trail passes through the east side of the property, mining operations will not disturb the trail. The land is not ecologically fragile and can return to its former ecological role in the reasonably foreseeable future. The land does not have a unique or strong influence on the total ecosystem of which it is a part.

The baseline vegetation, soil and wildlife surveys did not indicate the mine area has any unique scientific significance. No threatened, endangered or sensitive vegetation was observed in the project area. No threatened, endangered or rare plant species were observed during the field survey. A search of the South Dakota Natural Heritage Database did not find any documented records for threatened, endangered or rare plant species within the quarry boundary. No observations of critical vegetation resources were noted during the field survey. Soil salvage suitability depths were determined and no unsuitable parameters were noted in the laboratory analysis. There do not appear to be any special, exceptional, critical, or unique water resources within the Loring Quarry area, and operations do not appear to have impacted nearby water wells. Nothing in the vegetation or soil surveys indicated any factors that one might reasonably expect to impact reclamation potential. Additional procedures are in place to aid in reclamation success and include: seeding topsoil stockpiles for erosion control, implementation of a Storm Water Pollution Prevention Plan, and noxious weed control by a third party contractor.

The quarry and surrounding area are occupied by a wide variety of common wildlife species. Although seven SDNHP sensitive species were recorded during wildlife surveys, it is likely that displacement of individuals has already occurred due to the age of the quarry. Mitigation efforts such as timing tree removal and blasting can reduce potential impacts to these species, specifically bats. Habitats found within the quarry boundary are typical of the region, and no unique or unusual wildlife features are present. It is not expected that the continued mining operation will have a strong influence on the total ecosystem.

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Appendix A

Project Maps

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SIMON

General Area Map
Loring Quarry

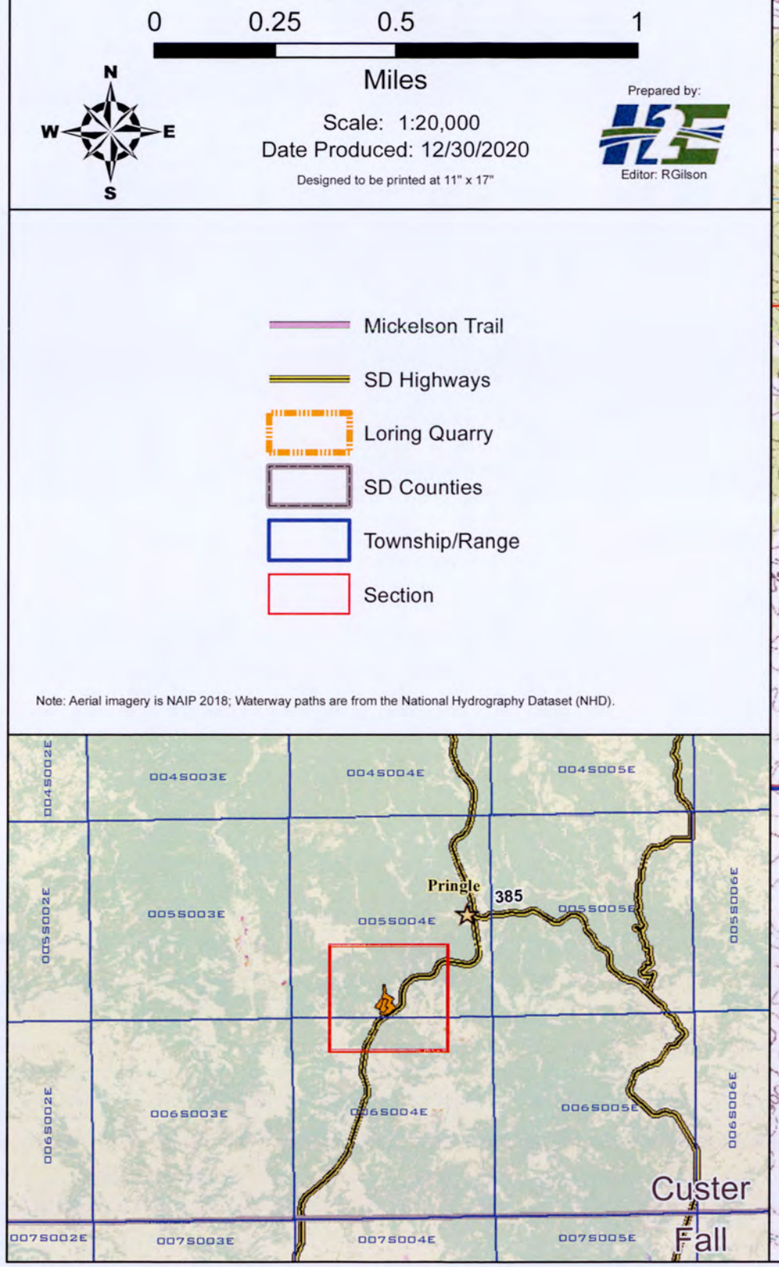
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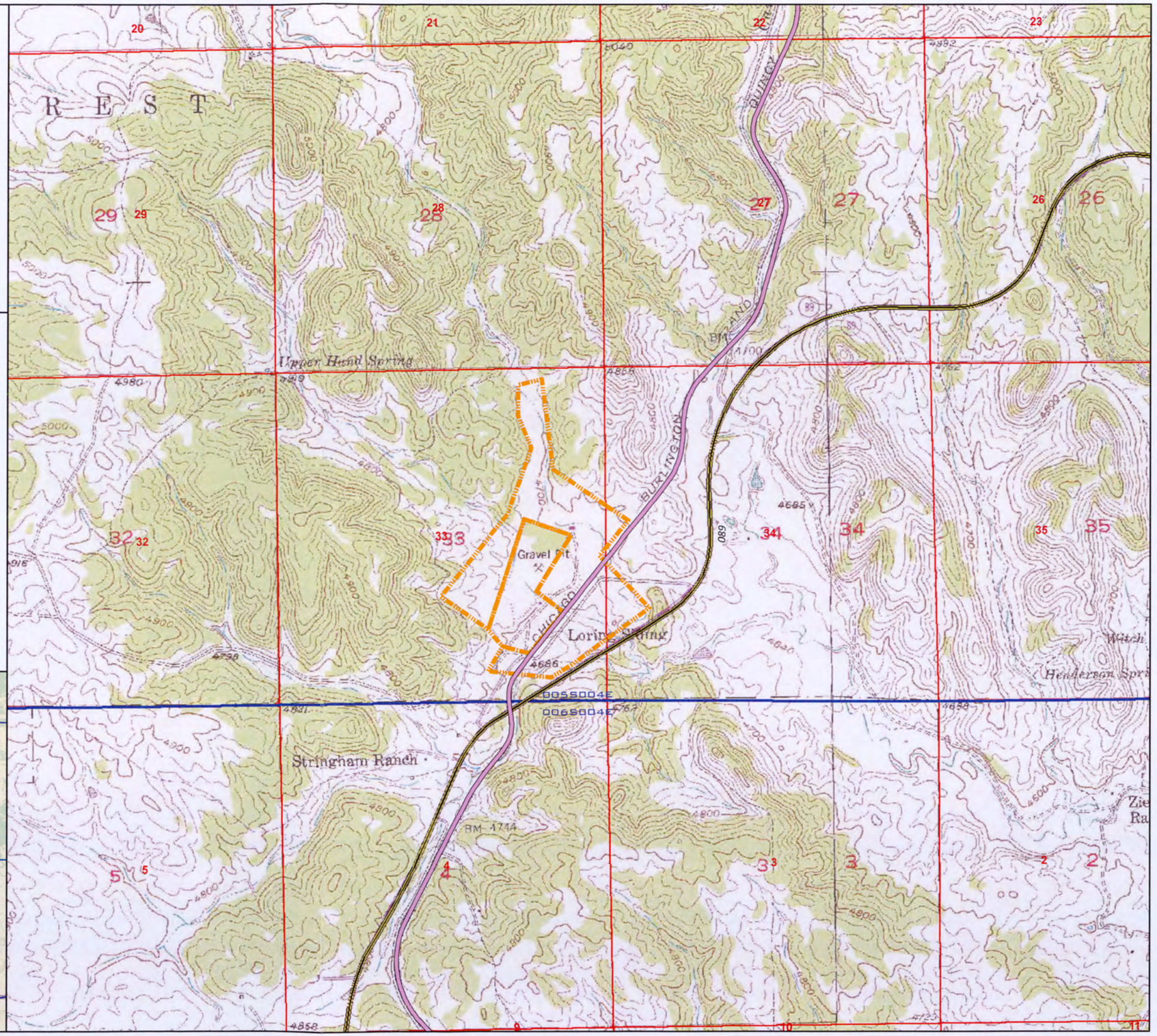
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Prepared by:
Editor: RGilson

- Mickelson Trail
- SD Highways
- Loring Quarry
- SD Counties
- Township/Range
- Section

Note: Aerial imagery is NAIP 2018; Waterway paths are from the National Hydrography Dataset (NHD).





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SIMON

Landowner Map

Loring Quarry

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Miles

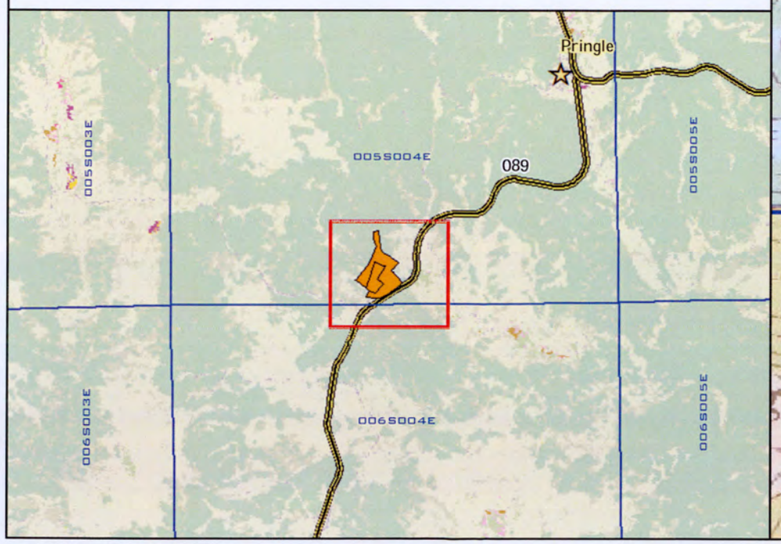
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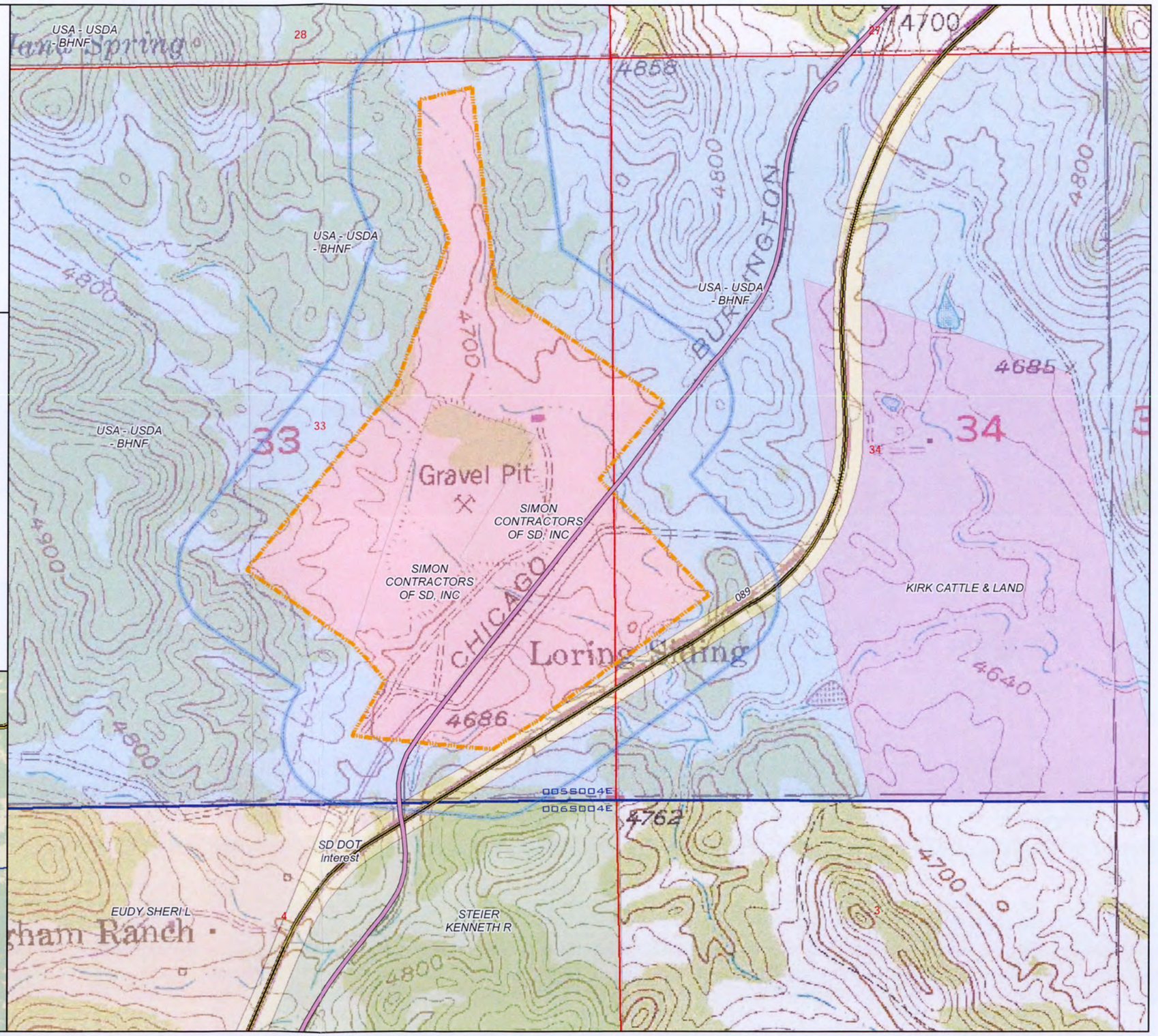
Designed to be printed at 11" x 17"

Prepared by:
Editor: RGilson

- Mickelson Trail
- SD Highways
- Loring Quarry Mine Boundary
- SD Counties
- Township/Range
- Section
- EUDY SHERI L
- KIRK CATTLE & LAND
- SD DOT Interest
- SIMON CONTRACTORS OF SD, INC
- STEIER KENNETH R
- USA - USDA - BHNF
- 500 ft Buffer

Note: Aerial imagery is NAIP 2018; Waterway paths are from the National Hydrography Dataset (NHD).





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SIMON

Recreation Map

Loring Quarry

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N W E S

Scale: 1:9,000
Date Produced: 12/30/2020

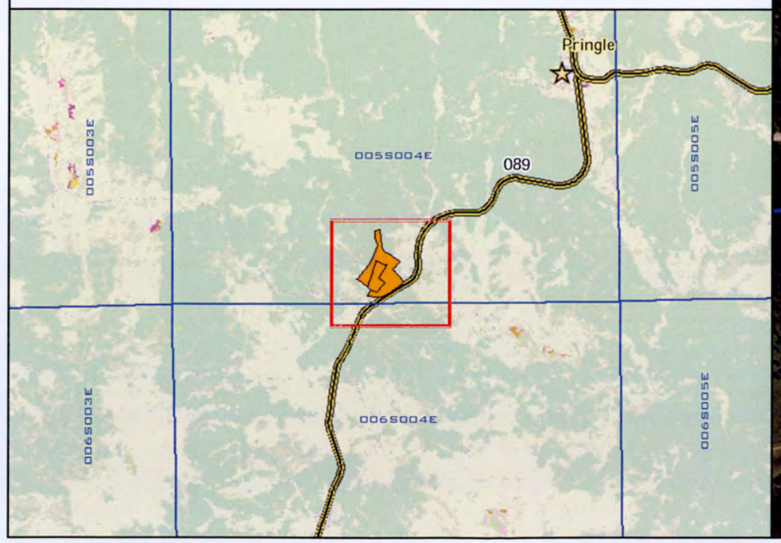
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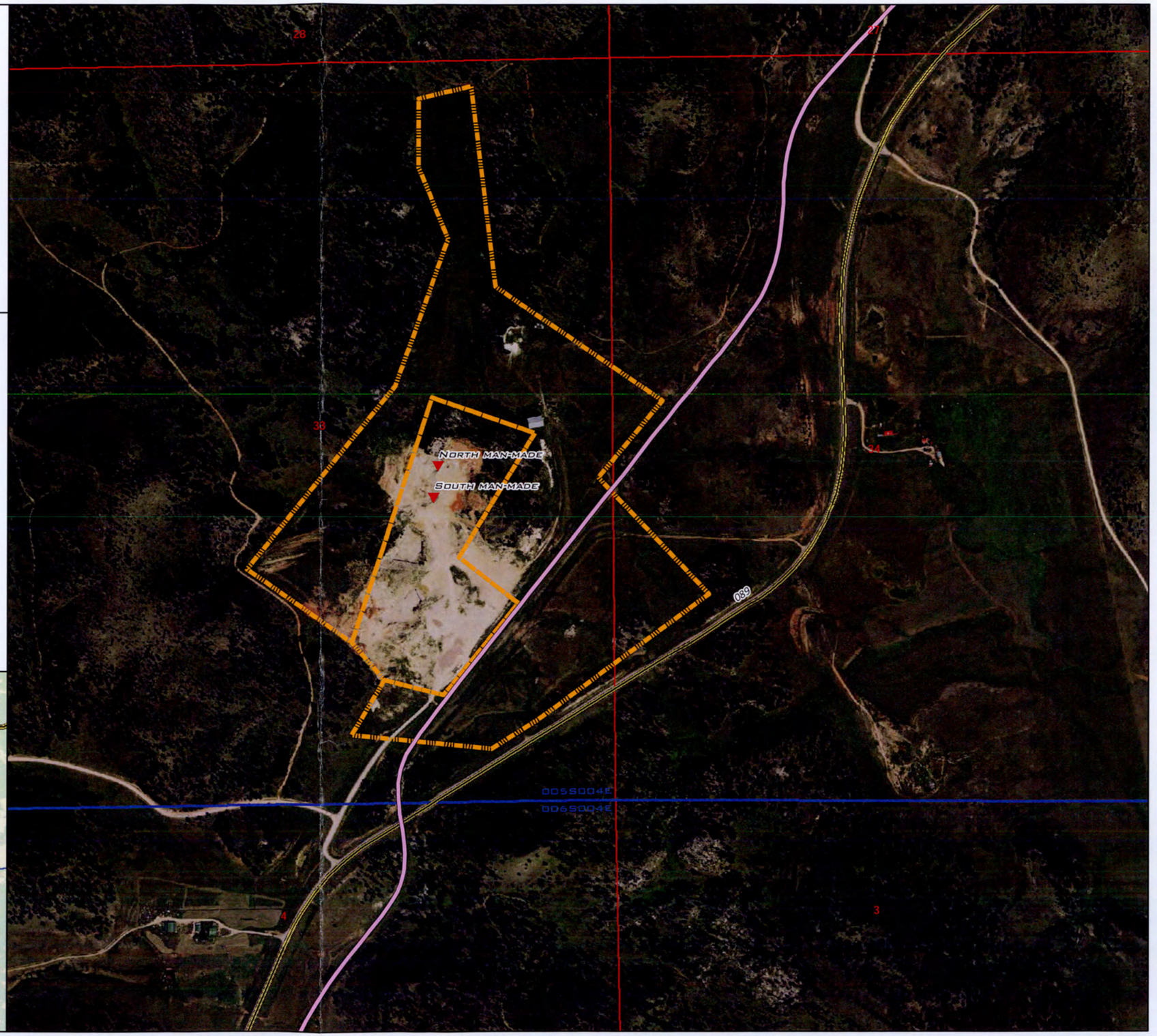
Prepared by:

Editor: RGilson

- Grotto Entrances
- Mickelson Trail
- SD Highways
- Loring Quarry
- SD Counties
- Township/Range
- Section

Note: Aerial imagery is NAIP 2018; Waterway paths are from the National Hydrography Dataset (NHD).





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SIMON
Water Resources

Loring Quarry

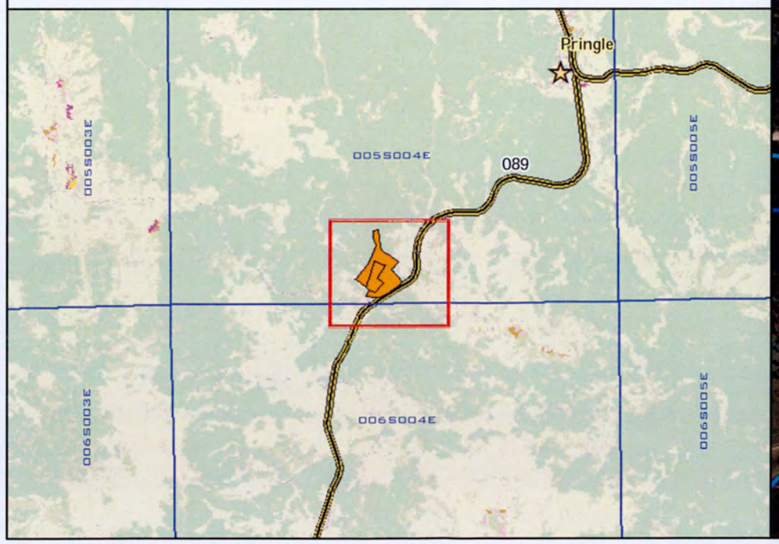
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Date Produced: 12/30/2020
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Prepared by:
Editor: RGilson

- Spring
- Domestic
- Stock
- Sample - Upstream
- Sample - Downstream
- Loring Quarry
- Lake/Pond/Reservoir
- SD Counties
- Township/Range
- Section
- Mickelson Trail
- SD Highways
- NHD Flowline

Note: Aerial imagery is NAIP 2018; Waterway paths are from the National Hydrography Dataset (NHD).





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Appendix B

Supporting Environmental Reports

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FINAL

SIMON CONTRACTORS LORING QUARRY SOIL SURVEY SITE SUMMARY

PREPARED FOR:

H2E, Inc.
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Contact: Becky Morris, Ph.D.
(307) 696-7007

PREPARED BY:

ICF
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Gillette, WY 82718
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(307) 687-4770

September 2020

ICF

ICF. 2020. *Simon Contractors Loring Quarry Soil Survey Site Summary*. Final. September. (ICF 00374.20) Gillette, WY. Prepared for H2E, Inc. Gillette, WY.

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Resume of Personnel

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Introduction

Simon Contractors of SD, Inc. (Simon) is in need of applying for a large-scale mine permit for its Loring Quarry (limestone) from the state of South Dakota. The project area is located approximately 4 miles south of Pringle along highway 89 in Custer County, South Dakota and occurs on land privately held by Simon. The mine includes approximately 162 acres throughout portions of Section 33 and 34, T5S:R4E. This area encompasses the current mine parcel (45 acres) in Section 33, a large portion of which (approximately 40 acres, 89%) is currently disturbed by the existing quarry or other man-made features.

Simon will be applying for a large scale mine permit with the South Dakota Department of Environment and Natural Resources (SD DENR) Minerals and Mining Program. H2E, Inc (H2E), on behalf of Simon, awarded and contracted the baseline soil survey to ICF in June 2020. The baseline soil survey report detailing survey data and results will be included with the permit documents compiled and submitted by H2E.

This report presents baseline information regarding Natural Resource Conservation Service (NRCS) soil series, soil map units and ecological site characteristics within the project area. The information gathered from field sampling will be used by the applicant and the SD DENR to develop the reclamation plan for the project area.

Methods

Soil survey and sampling procedures were modeled after the National Soil Survey Handbook (USDA 2019), Soil Survey Manual (USDA 2017), Field Book for Describing and Sampling Soils (USDA 2012) and Wyoming Department of Environmental Quality (WDEQ) Guideline No. 1A (WDEQ 2015). An Order 3 soil survey was conducted within the project area. The sampling methods were determined by ICF prior to on-site sampling. One team of two biologists from ICF completed field sampling at the project area between June 29 and 30, 2020. The majority of sample locations were accessed by foot.

Prior to fieldwork the project area was reviewed using aerial imagery and existing Natural Resources Conservation Service (NRCS) soil map units, soil series, and ecological site descriptions.

Soil profiles (hereafter, soil pedon or pedon) were described in a total of eight soil pits, all excavated by hand using a 72.0-inch-long by 3.0-inch-diameter soil bucket auger. The soil pits established the range and variability of soil types and depths of suitable soil for reclamation for each map unit. A photo was taken at each soil pit and a photo board was used to label the pictures; this included site name, sample location, and date. Latitude and longitude data were collected using an iPad with ArcGIS Collector software at each soil sample location.

Soil pedon descriptions, methods, and nomenclature followed the Soil Survey Manual (USDA 2017) and the Keys to Soil Taxonomy Edition 12 (USDA 2014) was used for soil classification. Soil color was determined visually in the field. Profile characteristics such as horizon arrangement and depth, texture, structure, color, consistence, course fragments, reaction to 10% hydrochloric acid, and other diagnostic characteristics were recorded on a soils form. Other soil and nonsoil observations were made and noted at most soil sample locations.

Each soil pedon sample location was collected for laboratory analysis to characterize the chemical and physical properties of the soils. Soil sampling collection followed guidelines according to Field Book for Describing and Sampling Soils (USDA 2012). Samples were collected from each soil pedon and separated by field determined horizon. Samples were placed in Ziploc bags, and the sample ID, depth interval, and date were written on each bag. The samples were hand delivered by ICF to Pace Analytics, in Gillette, Wyoming for transmittal to the laboratory in Sheridan, Wyoming for analysis.

Based on the interpretation of aerial imagery, soil descriptions, laboratory analysis, and classification of soil pedons observed during the field survey, present soil series and map units were verified, and their major components described. Classification activities were not performed to the degree that is carried out by the NRCS and formal correlation or the development of new soil series was not undertaken. The main emphasis of the soil survey was to define, describe, and delineate suitable soils in the survey area for use as plant growth medium during reclamation.

Twenty eight samples from eight soil pedons were submitted to Pace Analytics to determine physical and chemical properties of soils within the project area. The results of the laboratory analysis and case narrative are provided in Addendum 4.

Soil suitability for use in reclamation was determined for each soil type in the project area according to criteria in WDEQ Guideline No. 1A (see Table 1). In some instances, the field interpretations were adapted based on professional judgement of site-specific conditions. Selenium and boron were not analyzed, and therefore were not used for evaluating soil suitability. Laboratory analysis of coarse fragments were not analyzed; however, field observations of coarse fragments within the soil pedon were noted.

Surveys for critical soil resources within the project boundary were also completed. Critical soil resources include high erosion and low revegetation potentials.

Table 1. WDEQ Guideline 1A: Criteria to Establish Suitability of Soil or Soil Substitutes

Parameter	Suitable	Marginal [1/]	Unsuitable
pH	5.5-8.5	5.0-5.5 8.5-9.0	<5.0 >9.0
EC (mmhos/cm)	0-8	8-12	>12
Saturation Percent	25-80	<25 >80	
Texture		c, sic, s [2/]	
SAR 3/	0-10	10-12 [4/] 10-15	>12 [4/]
Selenium (ppm)	<0.3	>0.3-0.8 [5/]	
Boron (ppm) [6/]	<5.0		>5.0
Coarse Fragments (% Vol.)	<25	25-35	>35

Source: WDEQ Guideline 1A 2015.
1/ Evaluated on an individual basis for suitability;
2/ Clay (c), sic (silty clay), s (sand);
3/ As an alternative to SAR calculations, ESP (exchangeable sodium percentage) can be determined;
4/ For fine textured soils (clay >40%);
5/ Preferred extraction is with AB-DPTA which extracts water soluble and exchangeable species of Se (However, hot water extractable methods are acceptable for coal mines that have historical data collected using this procedure). These marginally suitable values of 0.3 to 0.8 ppm in the regraded spoil are keyed to sampling vegetation at bond release. Vegetation >5 ppm Se is considered unsuitable. Generally, selenium is more pervasive in the spoil material compared to the soil. Please refer to Guideline 1B for specifics on sampling intensity of regraded spoils;
6/ Boron analysis is recommended for mining operations in Sweetwater County and for bentonite operations.

Results

General

Twenty-eight samples from eight soil pedons were collected for laboratory analysis. See Addendum 1 for Results Tables and Official Soil Series Descriptions, Addendum 2 for Figures of the project area and sample locations, Addendum 3 for Photos of the soil samples, and Addendum 4 for Laboratory Analysis.

The project area is in the Black Hills region of South Dakota. It is located within the Major Land Resource Area (MLRA) 62 – Black Hills (USDA 2006). The area ranges in elevation from 3,600 to 6,565 feet with moderately sloping hills and ridges. Annual average precipitation is between 16 and 37 inches and increases or decreases with the elevation from west to east and north to south. The annual snowfall ranges from about 60 inches at the lower elevations to as much as 140 inches at the higher elevations. The average annual temperature is 36 to 48 degrees F. The freeze free period averages 125 days and ranges from 85 to 165 days (USDA 2006).

The project area supports open areas to dense forest vegetation and pine and spruce species grow at higher elevations. Cool and warm season grasses are the most common under open forest stands along with forb and subshrub/shrub species. The project area is primarily used as a limestone quarry and pasture for cattle grazing with incidental use for wildlife habitat.

The center of the Black Hills is a plutonic mass of granite with steeply dipping metamorphic rocks, primarily slate and schist, directly surrounding it. A plateau of Mississippian limestone surrounds the igneous and metamorphic rock center. This Pahasapa (Madison) limestone is broken around the outer edges of the uplifted area. The Permian Minnekahta limestone forms the outermost boundary of the area. Many other tilted sandstone, shale, and limestone units are exposed like a bathtub ring inside the steeply dipping Pahasapa limestone (USDA 2006).

The dominant soil orders in this MLRA are Alfisols and Mollisols. The soils in the area dominantly have a frigid or cryic soil temperature regime, a udic or ustic soil moisture regime, and mixed, micaceous, or smectitic mineralogy. They are shallow to very deep, generally well drained, and loamy or clayey. Hapludalfs (Buska, Citadel, Pactola, Vanocker, and Virkula series), Haplocryalfs (Stovho and Trebor series), and Ustorthents (Sawdust series) formed in residuum on mountains. In some areas the residuum is mixed with alluvium or colluvium. Haplustalfs (Mocmont series) formed in colluvium or alluvium on fans, hills, and mountains. Haplustolls formed in alluvium on fan aprons and piedmonts (Cordeston series) and in residuum on mesas and hills (Paunsaugunt series). Rock outcrop is common throughout this area (USDA 2006).

Table 2 illustrates the soil sample name, latitude and longitude. Table 3 illustrates the soil map unit symbols and names along with acreage and percentage of each within the project area. Table 4 illustrates the soil series, ecological site, and taxonomic class of the soils within the project area.

Descriptions of the soil map units occurring within the project area are found below. Soil salvage suitability depths and reasoning along with soil critical resources are found in the Discussion section.

Table 2. Loring Quarry Project Area Summary of Soil Sample Locations

Soil Sample Name	Latitude/Longitude	Map Unit	Field Identified Soil Series
Soil1	43.575975, -103.64304	Rapidcreek cobbly loam, dry, 2 to 10 percent slopes rarely flooded	Colombo
Soil2	43.574301, -103.642753	Rapidcreek cobbly loam, dry, 2 to 10 percent slopes rarely flooded	Rapidcreek
Soil3	43.573064, -103.640182	Rockerville-Gurney complex, 2 to 15 percent slopes	Gurney
Soil4	43.571607, -103.639194	Rapidcreek cobbly loam, dry, 2 to 10 percent slopes rarely flooded	Barnum
Soil5	43.570466 -103.645679	Rockerville-Gurney complex, 2 to 15 percent slopes	Rockerville
Soil6	43.571225, -103.642223	Sawdust-Vanocker, dry-Rockerville complex, 10 to 40 percent slopes	Vanocker, dry
Soil7	43.569425, -103.638506	Rapidcreek cobbly loam, dry, 2 to 10 percent slopes rarely flooded	Colombo
Soil8	43.568931, -103.637931	Rapidcreek cobbly loam, dry, 2 to 10 percent slopes rarely flooded	Rapidcreek

Table 3. Loring Quarry Project Area Soil Map Units, Ecological Site, and Acres

Map Unit Symbol	Map Unit Name	Ecological Site	Acres in Project Area	Percent of Project Area
Q0645C	Rapidcreek cobbly loam, dry, 2 to 10 percent slopes rarely flooded	R062XC020SD – Loamy Overflow 17-22	59.2	36.6%
Q0658D	Rockerville-Gurney complex, 2 to 15 percent slopes	R062XC010SD – Loamy 62C	29.2	18.0%
Q0659E	Rockerville-Rock outcrop complex, 6 to 30 percent slopes	R062XC024SD – Shallow Loamy 62C	5.9	3.6%
Q0665E	Sawdust-Vanocker, dry-Rockerville complex, 10 to 40 percent slopes	R062XY012SD – Thin Upland	16.9	10.4%
Q0702F	Pits, quarry	N/A	50.7	31.4%
Total			161.8	100.0%

Table 4. Loring Quarry Project Area Soil Series and Taxonomic Class

Soil Series	Taxonomic Class
Barnum	Fine-loamy, mixed, superactive, calcareous, mesic Ustic Torrifluvents
Colombo	Fine-loamy, mixed, mesic Torrifluventic Haplustolls
Gurney	Fine-loamy, mixed, superactive, frigid Typic Argiustolls
Rapidcreek	Loamy-skeletal over sandy or sandy-skeletal, mixed, superactive, calcareous, frigid Typic Udifluvents
Rockerville	Loamy-skeletal, mixed, superactive, frigid Lithic Calciustolls
Sawdust*	Loamy-skeletal, mixed, superactive, calcareous, frigid Typic Ustorthents
Vanocker	Loamy-skeletal, mixed, superactive, frigid Inceptic Hapludalfs
Pits	---
Rock outcrop	---

Source: USDA NRCS 2020

Map Unit Descriptions (USDA 2020a)

Q0645C – Rapidcreek cobbly loam, dry, 2 to 10 percent slopes rarely flooded

This map unit consists of shallow, somewhat excessively drained soils formed on alluvial flood plains, stream terraces, and terraces. This map unit is found at elevations of 3,640 to 5,600 feet with slopes typically from 2 to 10 percent. Mean annual precipitation is 17 to 24 inches and the mean annual air temperature is 37 to 46 degrees F. Map unit is not within prime farmland.

Permeability within the Rapidcreek cobbly loam is moderately high to high. The available water capacity is low (4.6 inches). Runoff class is low and frequency of flooding is rare, none. The hazard of water erosion is moderate and wind erosion hazard is moderate.

This map unit composition consists of approximately 85% Rapidcreek, rarely flooded, and similar soils, and 15% minor components (8% Barnum, cool and 7% Colombo, cool).

Q0658D – Rockerville-Gurney complex, 2 to 15 percent slopes

This map unit is found at elevations of 3,700 to 5,800 feet with slopes typically from 2 to 15 percent. Mean annual precipitation is 17 to 22 inches and the mean annual air temperature is 41 to 45 degrees F. Map unit is not within prime farmland.

Rockerville consists of shallow, somewhat excessively drained soils formed on residuum weathered from limestone on ridges and knolls. Gurney consists of moderately deep, well drained soils formed on residuum weathered from sedimentary rock on mountain slopes.

Permeability within Rockerville is very low to moderately low. The available water capacity is very low (1.2 inches). Runoff class is medium and frequency of flooding is none. The hazard of water erosion is moderate and wind erosion hazard is low. Permeability within Gurney is very low to moderately high. The available water capacity is low (5.1 inches). Runoff class is medium and frequency of flooding is none. The hazard of water erosion is moderate and wind erosion hazard is low.

This map unit complex consists of approximately 50% Rockerville and similar soils, 35% Gurney and similar soils, and 15% minor components (4% Ziggy, cool, moist, 4% Hilger, cobbly, 4% Sawdust, and 3% Rock outcrop, sandstone).

Q0659E – Rockerville-Rock outcrop complex, 6 to 30 percent slopes

This map unit is found at elevations of 3,610 to 5,000 feet with slopes typically from 6 to 30 percent. Mean annual precipitation is 16 to 22 inches and the mean annual air temperature is 39 to 48 degrees F. Map unit is not within prime farmland.

Rockerville consists of shallow, somewhat excessively drained soils formed on loamy residuum weathered from limestone on dip slopes. Rock outcrop is excessively drained formed on hard limestone on dip slopes.

Permeability within Rockerville is moderately low to high. The available water capacity is very low (1.9 inches). Runoff class is very high and frequency of flooding is none. The hazard of water erosion is moderate and wind erosion hazard is low. Permeability within Rock outcrop is very low to high. The available water capacity is very low (0.0 inches). Runoff class is very high. The hazard of water erosion is moderate and wind erosion hazard is low.

This map unit complex consists of approximately 50% Rockerville and similar soils, 35% Rock outcrop, and 15% minor components (8% Sawdust, and 7% Tilford, cool).

Q0665E – Sawdust-Vanocker, dry-Rockerville complex, 10 to 40 percent slopes

This map unit is found at elevations of 3,700 to 5,800 feet with slopes typically from 10 to 40 percent. Mean annual precipitation is 17 to 22 inches and the mean annual air temperature is 41 to 45 degrees F. Map unit is not within prime farmland.

Sawdust consists of shallow, well drained soils formed on gravelly colluvium derived from limestone and sandstone on mountain slopes. Vanocker, dry consists of moderately deep to deep well drained soils formed on residuum weathered from limestone and sandstone on mountain slopes. Rockerville consists of shallow, somewhat excessively drained soils formed on residuum weathered from limestone on mountain slopes.

Permeability within Sawdust is moderately high to high. The available water capacity is low (4.4 inches). Runoff class is high and frequency of flooding is none. The hazard of water erosion is moderate and wind erosion hazard is moderate. Permeability within Vanocker, dry is very low to moderately high. The available water capacity is low (5.4 inches). Runoff class is high and frequency of flooding is none. The hazard of water erosion is moderate and wind erosion hazard is moderate. Permeability within Rockerville is very low to moderately low. The available water capacity is very low (1.8 inches). Runoff class is high and frequency of flooding is none. The hazard of water erosion is moderate and wind erosion hazard is moderate.

This map unit complex consists of approximately 40% Sawdust and similar soils, 25% Vanocker, dry and similar soils, 15% Rockerville and similar soils, and 20% minor components (5% Rock outcrop, limestone, 5% Citadel, dry, 5% Hickok, dry, and 5% Gurney).

Q0702F – Pits, quarry

This map unit is found at elevations of 3,440 to 6,890 feet. Mean annual precipitation is 16 to 31 inches and the mean annual air temperature is 37 to 48 degrees F. Map unit is not within prime farmland. This map unit formed on igneous and sedimentary rock on mountain slopes. The hazard of water erosion is moderate and wind erosion hazard is low.

This map unit composition consists of approximately 90% pits and 10% minor components (5% Rock outcrop, sedimentary and 5% Rock outcrop, igneous).

Discussion

Soil suitability limiting factors across all soil map units were coarse fragments and gravel noted within the soil pedon. Field cutoff determinations were made based on this factor as well as visually observed soil color and effervescence reaction to 10% hydrochloric acid.

Map units Rapidcreek cobbly loam, dry, 2 to 10 percent slopes rarely flooded and Sawdust-Vanocker, dry-Rockerville complex, 10 to 40 percent slopes were rated as moderate in the wind erosion group (WEG) (USDA 2020a). Ratings range from low, moderate, and high. All map units were rated as moderate with pits, quarry rated as moderate/high for water erosion potential using the K factor (Kf) in the Revised Universal Soil Loss Equation, Version 2 (RUSLE2) (USDA 2020a). Ratings range from low, moderate, and high.

Map units with rock outcropping (Q0659E Rockerville-Rock outcrop complex, 6 to 30 percent slopes) or pits, quarry (Q0702F (Pits, quarry) were noted to have low revegetation potential due to the lack of available suitable salvage soil.

Q0645C – Rapidcreek cobbly loam, dry, 2 to 10 percent slopes rarely flooded

Soil samples Soil1, Soil2, Soil4, Soil7, and Soil8 were sampled within this map unit. Soil samples Soil1 and Soil7 were identified as soil series Colombo. Soil samples Soil2 and Soil8 were identified as soil series Rapidcreek, and soil sample Soil4 was identified as soil series Barnum.

- Soil1 – Colombo – suitable soil salvage depth = 60.00 inches
- Soil2 – Rapidcreek – suitable soil salvage depth = 16.00 inches
- Soil4 – Barnum – suitable soil salvage depth = 4.00 inches
- Soil7 – Colombo – suitable soil salvage depth = 62.00 inches
- Soil8 – Rapidcreek – suitable soil salvage depth = 24.00 inches

This map unit can be split into two subsets Rapidcreek cobbly loam and Rapidcreek cobbly loam – drainage). Please see Figure 2-1 for the drainage inclusion identified during the field survey. This map unit is a suitable source of soil salvage to a weighted average of 5.08 feet outside of the drainage and 1.22 feet within the drainage. One marginal parameter for Soil2 was noted. Saturation percent was recorded at 81.2%, 1.2% over the parameter to be suitable. No unsuitable parameters were noted in the laboratory analysis based on WDEQ Guideline 1A.

Q0658D – Rockerville-Gurney complex, 2 to 15 percent slopes

Soil samples Soil3 and Soil5 were sampled within this map unit. Soil sample Soil3 was identified as soil series Gurney. Soil sample Soil5 was identified as soil series Rockerville.

- Soil3 – Colombo – suitable soil salvage depth = 40.00 inches
- Soil5 – Rockerville – suitable soil salvage depth = 14.00 inches

This map unit is a suitable source of topsoil to a weighted average of 2.25 feet. Soil sample Soil3 within the soil series Colombo has more salvageable material than Soil5 within the Rockerville soil series. Discretion and operator judgment should be used during the topsoil and subsoil stripping activity. No marginal or unsuitable parameters were noted in the laboratory analysis based on WDEQ Guideline 1A.

Q0659E – Rockerville-Rock outcrop complex, 6 to 30 percent slopes

No soil samples were collected in this map unit. An attempt was made, during the field survey by ICF biologists, to extract a soil sample from this map unit, however, ground conditions were too rocky to collect material.

This map unit is an unsuitable source of soil salvage due to its rock outcropping and has a weighted average of 0.00 feet.

Q0665E – Sawdust-Vanocker, dry-Rockerville complex, 10 to 40 percent slopes

Soil samples Soil6 was sampled within this map unit. Soil sample Soil6 was identified as soil series Vanocker.

- Soil6 – Vanocker – suitable soil salvage depth = 4.00 inches

This map unit is a marginally suitable source of topsoil to a weighted average of 0.33 feet. No marginal or unsuitable parameters were noted in the laboratory analysis based on WDEQ Guideline 1A.

Q0702F – Pits, quarry

This map unit is an unsuitable source of soil salvage due to its existing surface disturbance and has a weighted average of 0.00 feet.

References

United States Department of Agriculture Natural Resource Conservation Service (USDA NRCS). 2019 *National soil survey handbook, title 430-VI.* http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/ref/?cid=nrcs142p2_054242. Accessed June 2020

USDA NRCS. 2006. *Land Resource Regions and Major Land Resource Areas of the United States, the Caribbean, and the Pacific Basin.* U.S. Department of Agriculture Handbook 296.

USDA NRCS Soil Survey Staff. 2014. *Keys to Soil Taxonomy.* Twelfth Edition. USDA-NRCS, Washington, DC. https://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/survey/class/taxonomy/?cid=nrcs142p2_053580. Accessed June 2020.

USDA NRCS. Soil Survey Staff. 2020a. *Web Soil Survey*. Available online at the following link: http://websoilsurvey.sc.egov.usda.gov/. Accessed August 2020.

USDA NRCS. Soil Survey Staff. 2020. *Official Soil Survey Descriptions (OSDs)*. Available online at the following link:https://www.nrcs.usda.gov/wps/portal/nrcs/detailfull/soils/survey/class/data/?cid=nrcs142p2_053587. Accessed August 2020.

USDA Schoeneberger, P.J., D.A. Wysocki, E.C. Benham, and Soil Survey Staff. 2012. *Field book for describing and sampling soils, Version 3.0*. Natural Resources Conservation Service, National Soil Survey Center, Lincoln, NE. https://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/ref/. Accessed June 2020.

USDA Soil Science Division Staff. 2017. *Soil survey manual*. C. Ditzler, K. Scheffe, and H.C. Monger (eds.). USDA Handbook 18. Government Printing Office, Washington, D.C. https://www.nrcs.usda.gov/wps/portal/nrcs/detailfull/soils/ref/?cid=nrcs142p2_054262. Accessed June 2020.

Wyoming Department of Environmental Quality – Land Quality Division (WDEQ – LQD). 2015. *Guideline No. 1A Topsoil and Subsoil*. Last Revised – August 2015. http://deq.wyoming.gov/media/attachments/Land%20Quality/Guidelines/Guideline_1A_Topsoil_Subsoil_(8_2015).pdf. Accessed June 2020.

Addendum 1
Result Tables and Official Soil Series Descriptions

Addendum 1-1. Loring Quarry Soils Laboratory Analysis Suitability Summary based on WDEQ Guideline 1A

Sample ID	Sampled	Depth	pH s.u.	Sat. %	EC dS/m	OM %	CaCO3 %	Ca meq/L	Mg meq/L	Na meq/L	SAR	Sand %	Silt %	Clay %	Texture
Soil #1	6/29/20	0-4	6.3	71.7	0.80	6.3	0.7	4.42	1.33	0.22	0.13	35.0	49.0	16.0	Loam
Soil #1	6/29/20	4-18	7.1	52.5	0.87	3.4	13.1	5.50	1.29	0.18	0.10	29.0	47.0	24.0	Loam
Soil #1	6/29/20	18-26	7.7	45.9	0.50	2.2	14.1	2.13	1.82	0.40	0.28	22.0	52.0	26.0	Silty Loam
Soil #1	6/29/20	26-42	7.9	48.1	1.04	1.7	14.9	2.31	4.16	1.88	1.04	29.0	49.0	22.0	Loam
Soil #1	6/29/20	42-60	7.9	42.2	2.78	1.3	7.5	2.98	6.19	13.4	6.26	24.0	57.0	19.0	Silty Loam
Soil #2	6/29/20	0-8	6.6	81.2	1.65	8.6	1.5	8.81	2.23	0.27	0.12	28.0	47.0	25.0	Loam
Soil #2	6/29/20	8-16	7.1	60.0	2.41	4.4	10.3	14.6	2.59	0.45	0.15	40.0	38.0	22.0	Loam
Soil #3	6/29/20	0-6	7.1	54.4	1.41	5.1	7.5	9.55	1.15	0.10	<0.05	41.0	41.0	18.0	Loam
Soil #3	6/29/20	6-12	7.1	46.3	1.55	3.8	16.2	10.0	1.25	0.21	0.09	41.0	37.0	22.0	Loam
Soil #3	6/29/20	12-18	7.5	31.3	0.78	1.6	37.2	4.80	1.00	0.23	0.13	62.0	22.0	16.0	Sandy Loam
Soil #3	6/29/20	18-26	7.6	30.7	1.06	1.1	26.6	4.62	1.63	0.31	0.17	56.0	30.0	14.0	Sandy Loam
Soil #3	6/29/20	26-35	7.8	43.7	0.85	1.6	8.7	2.37	2.49	1.40	0.90	29.0	47.0	24.0	Loam
Soil #3	6/29/20	35-40	8.1	50.8	0.67	2.4	9.0	1.08	1.43	2.82	2.52	22.0	48.0	30.0	Clay Loam
Soil #3	6/29/20	40-46	8.2	46.3	0.67	1.6	12.0	0.77	1.16	3.78	3.84	33.0	41.0	26.0	Loam
Soil #4	6/29/20	0-4	7.2	68.2	1.03	7.8	16.6	7.07	0.78	0.13	0.06	25.0	51.0	24.0	Silty Loam
Soil #5	6/29/20	0-3	7.1	72.2	1.68	8.3	21.6	12.1	0.75	0.19	0.07	42.0	36.0	22.0	Loam
Soil #5	6/29/20	3-8	7.1	65.3	1.05	5.8	23.2	7.75	0.52	0.12	0.06	31.0	39.0	30.0	Clay Loam
Soil #5	6/29/20	8-14	7.1	60.4	1.37	4.7	38.4	9.41	0.53	0.17	0.08	18.0	51.0	31.0	Silty Clay Loam
Soil #6	6/30/20	0-4	7.1	56.9	1.32	5.8	24.3	10.4	0.59	0.18	0.08	42.0	38.0	20.0	Loam
Soil #7	6/30/20	0-4	7.3	63.5	1.08	5.9	5.6	7.10	0.99	0.11	0.05	35.0	49.0	16.0	Loam
Soil #7	6/30/20	4-10	7.2	55.8	1.05	3.7	5.5	6.54	1.11	0.20	0.10	32.0	48.0	20.0	Loam
Soil #7	6/30/20	10-18	7.4	51.1	1.56	3.0	17.4	8.29	2.93	0.37	0.16	35.0	45.0	20.0	Loam
Soil #7	6/30/20	18-50	7.9	41.7	0.73	1.8	21.8	2.45	2.64	0.59	0.37	40.0	40.0	20.0	Loam
Soil #7	6/30/20	50-62	8.7	58.0	2.84	1.9	9.6	1.01	4.78	15.3	8.99	24.0	52.0	24.0	Silty Loam
Soil #8	6/30/20	0-3	7.1	75.6	1.22	7.8	11.6	8.28	1.00	0.28	0.13	36.0	47.0	17.0	Loam
Soil #8	6/30/20	3-12	7.2	46.9	1.24	3.4	23.4	7.97	0.91	0.18	0.09	53.0	31.0	16.0	Sandy Loam
Soil #8	6/30/20	12-20	7.5	43.2	0.76	3.1	23.7	4.81	0.74	0.18	0.11	52.0	34.0	14.0	Sandy Loam

Sample ID	Sampled	Depth	pH s.u.	Sat. %	EC dS/m	OM %	CaCO3 %	Ca meq/L	Mg meq/L	Na meq/L	SAR	Sand %	Silt %	Clay %	Texture
Soil #8	6/30/20	20-24	7.6	40.5	0.72	2.3	23.3	4.51	0.65	<0.05	<0.05	52.0	34.0	14.0	Sandy Loam

Marginal suitability per WDEQ Guideline 1A
Unsuitable per WDEQ Guideline 1A
Coarse fragments, selenium and boron not analyzed.

Addendum 1-2. Loring Quarry Project Area Approximate Soil Suitability Salvage Depths and Volume

Map Unit Symbol	Map Unit Name	Soil Series	Acres in Project Area	Percent of Project area (acres)	Suitability Salvage Depth (Average) (feet)	Total Volume of Salvageable Soil (acre-feet)
Q0645C	Rapidcreek cobbly loam, dry, 2 to 10 percent slopes rarely flooded	Colombo	59.20	4.14	5.08	21.07
		Barnum		4.74	1.22	67.29
		Rapidcreek		50.32		
Q0658D	Rockerville-Gurney complex, 2 to 15 percent slopes	Gurney	29.20	14.60	3.33	48.67
		Rockerville		14.60	1.17	17.03
Q0665E	Sawdust-Vanocker, dry-Rockerville complex, 10 to 40 percent slopes	Vanocker	16.90	16.90	0.33	5.58
Q0659E	Rockerville-Rock outcrop complex, 6 to 30 percent slopes	---	5.90	5.90	0.00	0.00
Q0702F	Pits, quarry	---	50.70	40.70	0.00	0.00
Total			161.80		2.23	159.63[1]

[1] 159.63 acre-feet of salvageable soil = 257,536 cubic yards

Addendum 1-3. Loring Quarry Project Area Soil Restoration Potential

Map Unit Symbol	Map Unit Name	Soil Restoration Potential[1]
Q0645C	Rapidcreek cobbly loam, dry, 2 to 10 percent slopes rarely flooded	High
Q0658D	Rockerville-Gurney complex, 2 to 15 percent slopes	Moderate
Q0659E	Rockerville-Rock outcrop complex, 6 to 30 percent slopes	Moderate
Q0665E	Sawdust-Vanocker, dry-Rockerville complex, 10 to 40 percent slopes	High
Q0702F	Pits, quarry	High

[1]This interpretation rates each soil for its inherent ability to recover from degradation, which is often referred to as soil resilience. The ability to recover from degradation means the ability to restore functional and structural integrity after a disturbance. "High potential" indicates that the soil has features that are very favorable for recovery. Good performance can be expected. "Moderate potential" indicates that the soil has features that are generally favorable for recovery. Fair performance can be expected. "Low potential" indicates that the soil has one or more features that are unfavorable for recovery. Poor performance can be expected. (USDA NRCS 2020a).

Addendum 1-4. Loring Quarry Project Area Wind and Water Erosion Hazards

Map Unit Symbol	Map Unit Name	Wind Erosion Group (WEG) Rating[1]	Water Erosion Hazard (RUSLE2) Kf[2]
Q0645C	Rapidcreek cobbly loam, dry, 2 to 10 percent slopes rarely flooded	5 (moderate)	Rapidcreek, rarely flooded: 0.28 (moderate)
Q0658D	Rockerville-Gurney complex, 2 to 15 percent slopes	7 (low)	Rockerville: 0.37 (moderate) Gurney: 0.24 (moderate)
Q0659E	Rockerville-Rock outcrop complex, 6 to 30 percent slopes	7 (low)	Rockerville: 0.32 (moderate) Rock outcrop: NA
Q0665E	Sawdust-Vanocker, dry-Rockerville complex, 10 to 40 percent slopes	5 (moderate)	Sawdust: 0.28 (moderate) Vanocker, dry: 0.28 (moderate) Rockerville: 0.37 (moderate)
Q0702F	Pits, quarry	8 (low)	Pits, quarry: 0.43 (moderate/high)

[1]WEG Rating: Low: 6-8; Moderate: 3-5; High: WEG 1-2 (USDA 2020a)
[2]The K Factor (Kf) is an index which quantifies the relative susceptibility of the soil to sheet and rill erosion. Kf is used in the RUSLE2 soil loss prediction equation. Values range from 0.02 for the least erodible soils to 0.64 for the most erodible. (USDA 2020a).

Addendum 1-5. Loring Quarry Project Area Official Soil Series Descriptions (NRCS 2020)

Official Series Description - BARNUM Series

LOCATION BARNUM WY+SD UT

Established Series
Rev. PSD/MCS
11/2005

BARNUM SERIES

The Barnum series consists of very deep, well drained soils formed in calcareous alluvium from red bed sediments. Barnum soils are on flood plains and alluvial terraces. Slopes are simple and range from 0 to 8 percent. The mean annual precipitation is about 12 inches, and the mean annual temperature is about 47 degrees F.

TAXONOMIC CLASS: Fine-loamy, mixed, superactive, calcareous, mesic Ustic Torrifluvents

TYPICAL PEDON: Barnum very fine sandy loam-rangeland. (Colors are for dry soil unless otherwise stated.)

A--0 to 4 inches; reddish brown (5YR 5/4) very fine sandy loam, reddish brown (5YR 4/4) moist; moderate very fine granular structure; soft, very friable; slightly effervescent, calcium carbonate disseminated; moderately alkaline (pH 8.2); clear smooth boundary. (3 to 6 inches thick)

C--4 to 60 inches; reddish brown (2.5YR 5/5) loam stratified with thin lenses of fine sandy loam and light clay loam, reddish brown (2.5YR 4/5) moist; massive with lenses of unaltered parent sediment; slightly hard, very friable; strongly effervescent, calcium carbonate disseminated and as soft masses in some lenses; moderately alkaline (pH 8.4).

TYPE LOCATION: Johnson County, Wyoming; NW1/4, NE1/4 of sec. 6, T. 41 N., R. 83 W. 43 degrees 33 minutes 22 seconds north latitude and 106 degrees 51 minutes 34 seconds west longitude.

RANGE IN CHARACTERISTICS: These soils typically contain free carbonates throughout but may be leached a few inches in some pedons. Organic carbon ranges from .6 to 3 percent in the upper 10 inches and decreases irregularly with depth. The mean annual soil temperature is about 47 to 53 degrees F. The particle size control section is highly stratified and typically averages loam or light clay loam with 18 to 35 percent clay and more than 15 percent fine or coarser sand. Strata of sandy loam, silt loam, silty clay loam, and fine sandy loam are common. Rock fragments are variable between strata but average from 0 to 10 percent pebbles. Exchangeable sodium ranges from 4 to 15 percent throughout the soil. EC typically ranges from

2 to 8 mmhos throughout under natural conditions but may range to 16 mmhos where poorly irrigated.

The A horizon has hue of 7.5YR through 2.5YR, value of 4 through 6 dry, 3 through 5 moist, and chroma of 2 through 6. Reaction is slightly through strongly alkaline.

The C horizon has hue of 5YR through 10R, value of 4 through 7 dry, 3 through 5 moist, and chroma of 2 through 6. Some strata have visual accumulations of salts and carbonates which are typically discontinuous throughout the extent of the pedon. Reaction is slightly through strongly alkaline. Some pedons may have buried horizons below 40 inches.

COMPETING SERIES: These are the Haverdad, Haverson, Haysham, Manikan, Panitchen, San Mateo, and Suwanee soils. Haverdad, Haverson, and San Mateo soils have hue of 10YR or yellower throughout. Hysham soils are very strongly alkaline and have compact subsurface horizons with hard consistence. Manikan and Suwanee soils are intermittently moist in July through September, and December through February. Panitchin soils have hues of 5Y through 7.5YR in the C horizon.

GEOGRAPHIC SETTING: Barnum soils are on flood plains and alluvial terraces. These soils formed in calcareous alluvium derived from red beds containing siltstone, shale, and sandstone. Slopes are 0 to 8 percent. Elevations are 4,000 to 6,600 feet. The mean annual precipitation is about 12 inches and ranges from 10 to 14 inches with about half falling as snow or rain in April, May, and early June. The mean annual temperature is about 43 to 49 degrees F. The frost-free season is estimated to range from 110 to 135 days depending upon elevation, aspect, and air drainage.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the Neville and Redbank soils and the competing Haverdad soils. Neville soils have uniform textures and a uniform decrease in organic carbon. Redbank soils are coarse-loamy.

DRAINAGE AND PERMEABILITY: Well drained; medium and low runoff; permeability is moderate or moderately slow because of stratification.

USE AND VEGETATION: Rangeland, wildlife habitat, and irrigated farming. Native vegetation consists of basin wildrye, green needlegrass, western wheatgrass, blue grama, rubber rabbitbrush, and silver sagebrush.

DISTRIBUTION AND EXTENT: Central Wyoming, western South Dakota, and eastern Utah. The series is of moderate extent.

MLRA SOIL SURVEY REGIONAL OFFICE (MO) RESPONSIBLE: Denver, Colorado

SERIES ESTABLISHED: Butte County, South Dakota; 1970.

REMARKS: Diagnostic horizons and features recognized in this pedon are:

Ochric epipedon - 0 to 4 inches (A)

MLRR- G

SIRs- WY0004, WY0865

National Cooperative Soil Survey
U.S.A.

Official Series Description - COLOMBO Series

LOCATION COLOMBO CO+SD WY

Established Series
Rev. JC/RHM
8/89

COLOMBO SERIES

The Colombo series consists of deep, well drained soils that formed in calcareous loamy alluvium. Colombo soils are on flood plains and terraces and have slopes of 0 to 6 percent. The mean annual precipitation is about 12 inches and the mean annual air temperature is about 48 degrees F.

TAXONOMIC CLASS: Fine-loamy, mixed, mesic Torrifluventic Haplustolls

TYPICAL PEDON: Colombo clay loam - irrigated cropland. (Colors are for dry soil unless otherwise noted.)

Ap--0 to 14 inches; dark grayish brown (10YR 4/2) clay loam, very dark grayish brown (10YR 3/2) moist; weak medium granular structure; slightly hard, friable, slightly effervescent; moderately alkaline; clear smooth boundary. (10 to 20 inches thick)

C1--14 to 21 inches; pale brown (10YR 6/3) stratified clay loam and loam, brown (10YR$ 5/3) moist; weak coarse subangular blocky structure grading to massive; slightly hard, friable; strongly effervescent; moderately alkaline; gradual smooth boundary. (4 to 12 inches thick)

C2--21 to 60 inches; very pale brown (10YR 7/3) loam stratified with thin lenses of fine sandy loam, fine sand, medium sand and clay loam, pale brown (10YR 6/3) moist; massive; slightly hard, friable; strongly effervescent; moderately alkaline.

TYPE LOCATION: Weld County, Colorado; 2,350 feet north, 2,000 feet east of the SW corner of Sec. 4, T. 5 N., R. 64 W.

RANGE IN CHARACTERISTICS: Usually these soils are calcareous throughout, but may be leached to a depth of 10 to 18 inches. The control section lacks continuous subhorizons of secondary calcium carbonate and/or sulfate but some pedons have some visible accumulation. The mollic epipedon ranges from 8 to 16 inches thick. The 10- to 40- inch control section is usually loam or light clay loam stratified with thin lenses of sand and clay loam. It averages 18 to 35 percent clay, 15 to 50 percent silt, and 20 to 60 percent sand. Rock fragments range from 0 to 15 percent by volume and are mainly 1/2 to 10 inches in diameter.

The A horizon has hue of 2.5YR through 7.5YR, value of 4 or 5 dry, 2 or 3 moist, and chroma of 1 through 3. It is mildly or moderately alkaline.

The C horizon has hue of 2.5Y through 7.5YR. It is moderately or strongly alkaline.

COMPETING SERIES: These are the Haverson, Mill, and Uncom series. Haverson soils lack a mollic epipedon. Mill soils are coarse-loamy and have hue of 5YR or redder in a majority of subhorizons. Uncom soils are coarse-loamy and have the lower part of their moisture control section moistened by a fluctuating water table or its capillary fringe.

GEOGRAPHIC SETTING: Colombo soils are on flood plains, terraces, and drainageways. Slopes range from 0 to 6 percent. The soils formed in thick, stratified, calcareous, predominantly medium to moderately fine textured, mixed alluvium. At the type location, the mean annual precipitation is about 12 inches with peak periods of precipitation occurring in the spring and early summer. Mean annual temperature is 48 degrees F, mean summer temperature is 70 degrees F. The frost-free season is about 130 to 160 days.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the Glenberg soils and the competing Haverson soils. Glenberg soils lack a mollic epipedon.

DRAINAGE AND PERMEABILITY: Well drained; slow to medium runoff; moderate permeability.

USE AND VEGETATION: These soils are used as grazing land, cropland, and native meadow. Native vegetation is sagebrush, blue grama, and native bluegrass.

DISTRIBUTION AND EXTENT: Northeastern and western Colorado. This series is of moderate extent.

MLRA SOIL SURVEY REGIONAL OFFICE (MO) RESPONSIBLE: Denver, Colorado

SERIES ESTABLISHED: Weld County, Colorado, 1976.

REMARKS: Last updated by the state 7/76.

National Cooperative Soil Survey
U.S.A.

Official Series Description - GURNEY Series

LOCATION GURNEY SD

Established Series
Rev. EHE-DDH-KEC
10/98

GURNEY SERIES

The Gurney series consists of moderately deep, well drained soils formed in residuum weathered from sedimentary rocks on open prairies in mountains. Permeability is moderate. Slopes range from 0 to 25 percent. Mean annual precipitation is about 18 inches, and mean annual temperature is about 40 degrees F.

TAXONOMIC CLASS: Fine-loamy, mixed, superactive, frigid Typic Argiustolls

TYPICAL PEDON: Gurney silt loam - on a south-facing slope of 7 percent under native grassland at 5380 feet elevation. When described, the soil was moist to 9 inches and dry below. (Colors are for dry soil unless otherwise noted.)

A--0 to 5 inches; dark brown (10YR 4/3) loam, very dark grayish brown (10YR 3/2) moist; moderate fine and medium granular structure; soft, very friable; slightly acid; clear smooth boundary. (4 to 8 inches thick)

Bt1--5 to 9 inches; brown (7.5YR 4/4) loam, dark reddish brown (5YR 3/4) moist; moderate fine and medium subangular blocky structure; soft, very friable; neutral; clear smooth boundary.

Bt2--9 to 16 inches; brown (7.5YR 5/4) clay loam, dark brown (7.5YR 4/3) moist; weak medium prismatic structure parting to moderate medium blocky; hard, friable; neutral; abrupt wavy boundary. (Combined Bt horizons is 6 to 16 inches thick.)

Bk1--16 to 22 inches; light yellowish brown (10YR 6/4) clay loam, dark yellowish brown (10YR 4/4) moist; moderate medium subangular blocky structure; very hard, friable; few fine and medium accumulations of carbonates; strong effervescence; slightly alkaline; gradual wavy boundary. (4 to 10 inches thick)

Bk2--22 to 28 inches; light yellowish brown (10YR 6/4) channery clay loam, dark yellowish brown (10YR 4/4) moist; weak medium subangular blocky structure; very hard, friable; 20 percent by volume of fragments of rock; common fine accumulations of carbonates; violent effervescence; moderately alkaline; abrupt smooth boundary. (0 to 10 inches thick)

R--28 to 60 inches; red (2.5YR 5/6) indurated sandstone; strong effervescence.

TYPE LOCATION: Custer County, South Dakota; about 9 miles west and 7 miles south of Custer; 2100 feet north and 1300 feet east of southwest corner sec. 32, T. 4 S., R. 3 E.

RANGE IN CHARACTERISTICS:
Depth to carbonates typically is 12 to 18 inches, but ranges from 10 to 24 inches. Rock fragments which are dominantly channers or flagstones. Depth to consolidated limestone or sandstone typically is from 24 to 32 inches, but ranges from 20 to 40 inches.

The A horizon has hue of 5YR, 7.5YR, or 10YR; value of 3 or 4 and 2 or 3 moist; and chroma of 1 to 3. It is silt loam, loam, channery silt loam, or channery loam. It ranges from moderately acid to neutral.

The Bt horizon has hue of 2.5YR to 7.5YR, value of 4 to 6 and 3 or 4 moist, and chroma of 3 or 4. It is silt loam, loam, silty clay loam or clay loam and contains up to 20 percent by volume of rock fragments. It averages between 20 to 35 percent clay. It is slightly acid or neutral.

The Bk horizon has hue of 2.5YR to 10YR, value of 5 to 8 and 4 to 7 moist, and chroma of 3 or 4. It is silt loam, loam, clay loam, or channery clay loam and contains up to 35 percent by volume of rock fragments. It has few to many accumulations of carbonates. It is slightly or moderately alkaline.

Some pedons have a C horizon.

COMPETING SERIES: These are the Bullflat, Dooley, Empedrado, Fairfield, Farnuf, Felor, Greenway, Hangdo, Lefor, Lininger, Livona, Martinsdale, Moen, Reeder, Trag, Vida, Watrous, Wemple, Williams, and Yegen in the same family. Bookcliff soils have hard bedrock at depths of 40 to 60 inches. Bullflat, Dooley, Empedrade, Fairfield, Farnuf, Felor, Greenway, Hangdo, Livona, Martinsdale, Trag, Vida, Wemple, Williams, and Yegen do not have bedrock within a depth of 60 inches. In addition, Dooley soils contain more sand and formed in glacial till; Fairfield soils have carbonates within 10 inches of the surface; Felor soils contain more sand; Hangdo soils have carbonates below depths of 40 inches; Trag soils do not have carbonates; Vida and Williams formed in glacial till and Legen soils contain more sand. Lefor, Lininger, and Reeder soils have soft bedrock within depths of 20 to 40 inches. Moen soils do not have carbonates and overlie granite. Watrous soils have yellower hue in the argillic horizon.

GEOGRAPHIC SETTING: Gurney soils are nearly level to moderately steep on open prairies in mountains at elevations of 3600 to 6200 feet. Slope gradients range from 0 to 25 percent. These soils formed in residuum or colluvial sediments weathered from sedimentary rock. Mean annual temperature ranges from 37 to 45 degrees F. Mean annual precipitation ranges from 18 to 26 inches.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the competing Bullflat series and the Hilger, Paunsaugunt, Vanocker, and Sawdust series. The Bullflat soils are on the lower parts of the landscape. The Hilger soils are skeletal and are on outer margins of broad terraces. The Paunsaugunt soils are shallow to bedrock and are on higher convex parts of the landscape. The Vanocker and Sawdust soils are skeletal and are on forested ridges and side slopes.

DRAINAGE AND PERMEABILITY: Well drained. Permeability is moderate. Runoff is medium or high.

USE AND VEGETATION: Used mainly for grazing, wildlife and recreation. Native vegetation is primarily prairire junegrass, western wheatgrass, needleandthread, blue grama and sedges.

DISTRIBUTION AND EXTENT: Mountainous areas of the Black Hills in South Dakota and Wyoming especially on the sedimentary formations. The series is of small extent.

MLRA SOIL SURVEY REGIONAL OFFICE (MO) RESPONSIBLE: Denver, Colorado

SERIES ESTABLISHED: Custer County, South Dakota, 1985.

REMARKS: Diagnostic horizons and features recognized in this pedon are: mollic epipedon - the zone from the surface of the soil to a depth of about 5 inches (A horizon); argillic horizon - the zone from about 5 to 16 inches (Bt1, Bt2 horizons).

ADDITIONAL DATA: Laboratory data NSSL 83T7230-31.

National Cooperative Soil Survey
U.S.A.

Official Series Description - RAPIDCREEK Series

LOCATION RAPIDCREEK SD+WY

Established Series
JWW/DJB
09/2011

RAPIDCREEK SERIES

The Rapidcreek series consists of very deep, well or somewhat excessively drained soils that formed in mixed alluvium derived from sedimentary and igneous sources. Rapidcreek soils are on flood plains and terraces. Slopes range from 1 to 10 percent. Mean annual precipitation is about 560 mm (22 inches) and the mean annual temperature is about 6 degrees C (43 degrees F).

TAXONOMIC CLASS: Loamy-skeletal over sandy or sandy-skeletal, mixed, superactive, calcareous, frigid Typic Udifluvents

TYPICAL PEDON: Rapidcreek gravelly loam, on a southwest facing, linear slope of 2 percent in mixed forest-grassland vegetation at an elevation of about 1,345 meters. (Colors are for moist soil unless otherwise noted.) When described on July 9, 2004 the soil was moist throughout.

A--0 to 4 cm (0 to 2 inches); very dark grayish brown (10YR 3/2) gravelly loam, dark grayish brown (10YR 4/2) dry; weak medium and moderate fine granular structure; soft, very friable, slightly sticky; many very fine, common fine and medium roots; about 15 percent subrounded limestone gravel and subangular channers; slight effervescence; slightly alkaline; abrupt smooth boundary. (2 to 15 cm thick [0.8 to 6 inches])

C1--4 to 20 cm (2 to 8 inches); about 80 percent stratified dark grayish brown (10YR 4/2) very gravelly loam, light brownish gray (10YR 6/2) dry, and 20 percent grayish brown (10YR 5/2) fine sandy loam, light brownish gray (10YR 6/2) dry; weak medium platy structure; slightly hard, friable, moderately sticky and moderately plastic; many very fine, common fine and medium roots; about 40 percent subangular and subrounded gravel, 2 percent subrounded cobble; strong effervescence; moderately alkaline; clear wavy boundary.

C2--20 to 38 cm (8 to 15 inches); about 80 percent brown (10YR 4/3), pale brown (10YR 6/3) dry, and 20 percent dark brown (10YR 3/3), brown (10YR 5/3) dry very gravelly fine sandy loam; massive; slightly hard, friable, slightly sticky and slightly plastic; many very fine, common fine and medium roots; about 43 percent subangular and subrounded gravel and 2 percent subrounded cobbles; strong effervescence; moderately alkaline; clear wavy boundary. (Combined thickness of the C horizon is 25 to 51 cm [10 to 20 inches])

2C3--38 to 53 cm (15 to 21 inches); dark grayish brown (10YR 4/2) very gravelly loamy coarse sand, light brownish gray (10YR 6/2) dry; massive; soft, very friable, nonsticky and nonplastic; common very fine and fine and few medium roots; about 50 percent subangular and subrounded gravel; violent effervescence; moderately alkaline; clear wavy boundary.

2C4--53 to 157 cm (21 to 62 inches); brown (10YR 4/3) extremely cobbly loamy coarse sand, pale brown (10YR 6/3) dry; single grain; loose; common very fine and few fine and medium roots; about 70 percent mixed sedimentary fragments, of which 35 percent are rounded cobbles, 30 percent subrounded and rounded gravel, and 5 percent rounded stones; strong effervescence; moderately alkaline; clear wavy boundary.

3C5--157 to 173 cm (62 to 68 inches); 60 percent dark grayish brown (10YR 4/2) gravelly fine sandy loam, grayish brown (10YR 5/2) dry, and 40 percent very dark grayish brown (10YR 3/2) gravelly very fine sandy loam, dark grayish brown (10YR 4/2) dry; massive; soft, very friable; few very fine and fine roots; 30 percent mixed sedimentary fragments, of which 20 percent are subrounded gravel and 10 percent rounded cobble; violent effervescence; moderately alkaline; clear wavy boundary. (0 to 20 cm [0 to 8 inches] thick)

2C4'--173 to 200 cm (68 to 80 inches); brown (10YR 4/3) extremely cobbly loamy coarse sand, pale brown (10YR 6/3) dry; single grain; loose; few very fine roots; 60 percent mixed sedimentary fragments, of which 40 percent are rounded cobble and 20 percent rounded gravel; strong effervescence; moderately alkaline. (Combined thickness of the 2C horizon is 102 to 171 cm [20 to 67 inches])

TYPE LOCATION: Lawrence County, South Dakota; about 0.5 miles north of Maurice, between Highway 14A and Spearfish Creek; about 1,000 feet north and 1,700 feet west of the southeast corner of Sec. 8, T. 5 N., R. 2 E.; Maurice USGS topographic quadrangle, South Dakota; GPS 44 degrees 24 minutes 20.3 seconds north latitude and 103 degrees 53 minutes 53.2 seconds west longitude; NAD 83.

RANGE IN CHARACTERISTICS:
Depth to effervescence: 0 to 15 cm (0 to 6 inches)
Depth to contrasting particle-size class or lithologic discontinuity: 30 to 60 cm (12 to 24 inches)

A horizon:
Hue: 5YR to 10YR
Value: 3 or 4, 4 to 6 dry
Chroma: 2 to 4
Texture: GR-L, CB-L
Clay content: 18 to 27 percent
Rock fragments: 15 to 35 percent gravel and/or cobble
Reaction: neutral or slightly alkaline

C horizon:
Hue: 5YR to 10YR
Value: 3 to 6, 5 to 7 dry
Chroma: 2 to 6
Texture: stratified LS, SL, FSL, VFSL, L, SIL, CL (fine-earth fraction)
Clay content: 15 to 27 percent horizon average; individual strata may contain more or less

Rock fragments: 35 to 60 percent rounded and subrounded, mixed sedimentary and igneous fragments; 20 to
45 percent gravel and 2 to 40 percent cobble
Calcium carbonate equivalent: 2 to 15 percent
Reaction: slightly alkaline or moderately alkaline

2C horizon:
Hue: 7.5YR or 10YR
Value: 4 or 5, 5 or 6 dry
Chroma: 2 to 4
Texture: stratified LS, S, LCOS, COS (fine-earth fraction)
Clay content: 3 to 10 percent horizon average
Rock fragments: 50 to 80 percent rounded and subrounded, mixed sedimentary and igneous fragments; 20 to
50 percent cobble, 10 to 40 percent gravel, and 0 to 10 percent stones
Calcium carbonate equivalent: 1 to 5 percent
Reaction: slightly alkaline to moderately alkaline

3C horizon (when present):
Hue: 10YR
Value: 3 or 4, 4 or 5 dry
Chroma: 2 or 3
Texture: L, FSL, VFSL (fine-earth fraction)
Clay content: 15 to 25 percent
Rock fragments: 15 to 35 percent rounded and subrounded gravel and/or cobble
Calcium carbonate equivalent: 2 to 10 percent
Reaction: moderately alkaline or strongly alkaline

COMPETING SERIES: There are no competing series in this taxonomic class.

GEOGRAPHIC SETTING:
Parent material: Alluvium derived primarily from mixed sedimentary sources, but also including minor components of igneous- and metamorphic-derived material
Landform: flood plains and low terraces in mountain valleys and canyon floors
Slopes: 1 to 10 percent
Elevation: 1,158 to 1,830 meters (3,799 to 6,004 feet)
Mean annual air temperature: 6 to 9 degrees C (43 to 48 degrees F)
Mean annual precipitation: 455 to 710 mm (18 to 28 inches)
Precipitation pattern: Over half of the average annual precipitation falls as rain and snow from March through July
Frost-free period: 100 to 140 days.

GEOGRAPHICALLY ASSOCIATED SOILS:
Bullflat, Cordeston, and Marshbrook - have mollic epipedons and are fine-loamy. In addition, Bullflat soils have an argillic horizon, Cordeston soils have a cumulic mollic epipedon, and Marshbrook soils have a aquic moisture regime. Bullflat soils occur on higher landscape

positions and Cordeston soils occur on slightly higher and Marshbrook soils on slightly lower landscape positions than Rapidcreek soils.

DRAINAGE AND SATURATED HYDRAULIC CONDUCTIVITY: Well to somewhat excessively drained; saturated hydraulic conductivity is high over very high; low to medium runoff; rarely to occasionally flooded for very brief to brief periods during the months of April through August.

USE AND VEGETATION: Rapidcreek soils have a riparian or mixed woodland and grassland ecological community and are utilized for livestock grazing, wildlife habitat, recreation, and limited homesite development. Common vegetation present on most areas includes Timothy, Kentucky bluegrass, smooth brome, sedges, cottonwood, boxelder, green ash, and occasional ponderosa pine and Black Hills spruce.

DISTRIBUTION AND EXTENT: Rapidcreek soils occur in valleys and canyons on the Limestone Plateau physiographic area in the Black Hills of South Dakota and Wyoming; LRR G, MLRA 62; the series is of small extent.

MLRA SOIL SURVEY REGIONAL OFFICE (MO) RESPONSIBLE: Denver, Colorado

SERIES PROPOSED: Update Soil Survey of Lawrence County, South Dakota, 2006. The name is taken from Rapid Creek.

REMARKS:
Diagnostic horizons and features recognized in this pedon are:
Particle-size control section: The zone from 25 to 100 cm (10 to 39 inches) (C2, C3, and 2C4 horizons)
Ochric epipedon: The zone from 0 to 4 cm (0 to 2 inches) (A horizon)
Strongly contrasting particle-size classes: At the lower boundary of the C2 horizon
Lithologic discontinuity: At the upper boundary of the 2C3 horizon and at the upper boundary of the 3C5 horizon.

Other features: Fluventic suborder, an irregular decrease in organic matter

The assignment of the cation-exchange activity class is derived from lab data from the typical pedon.

Taxonomic Version: Keys to Soil Taxonomy, Eleventh Edition, 2010

ADDITIONAL DATA:

National Cooperative Soil Survey
U.S.A.

Official Series Description - ROCKERVILLE Series

LOCATION ROCKERVILLE SD+WY

Established Series
Rev. JWW
09/2011

ROCKERVILLE SERIES

The Rockerville series consists of shallow, well drained soils that formed in residuum derived from sedimentary rocks. Rockerville soils are on mountain and ridges. Slopes range from 2 to 60 percent. Mean annual precipitation is about 510 mm (20 inches) and the mean annual air temperature is about 7 degrees C (45 degrees F).

TAXONOMIC CLASS: Loamy-skeletal, mixed, superactive, frigid Lithic Calciustolls

TYPICAL PEDON: Rockerville channery silt loam, on a northeast facing, slightly convex slope of 20 percent, in a vegetative community consisting of an overstory of ponderosa pine and an understory of mixed grasses, forbs, and low shrubs, at an elevation of about 1,180 meters (3,871). (Colors are for dry soil unless otherwise noted.) When described on June 3, 2004 the soil was slightly moist throughout.

Oi--0 to 2 cm (0 to 0.8 inches); slightly decomposed forest litter consisting of ponderosa pine needles, cones, twigs, and detached roots. (0 to 4 cm [0 to 2 inches] thick)

A1--2 to 9 cm (0.8 to 4 inches); dark gray (10YR 4/1) channery silt loam, very dark gray (10YR 3/1) moist; weak medium and moderate very fine and fine granular structure; soft, very friable, slightly sticky and slightly plastic; many very fine, common fine, and few medium roots; about 20 percent subangular limestone fragments; slight effervescence; slightly alkaline; clear smooth boundary.

A2--9 to 18 cm (4 to 7 inches); dark gray (10YR 4/1) channery silt loam, very dark gray (10YR 3/1) moist; weak fine and medium subangular blocky structure parting to moderate very fine and fine granular; soft, very friable, slightly sticky and moderately plastic; common very fine and fine and few medium roots; about 25 percent subangular limestone fragments; about 7 percent calcium carbonate equivalent; strong effervescence; slightly alkaline; clear smooth boundary. (Combined thickness of the A horizon is 2 to 23 cm [0.8 to 9 inches])

ABk--18 to 37 cm (7 to 15 inches); dark grayish brown (10YR 4/2) extremely flaggy silt loam, very dark grayish brown (10YR 3/2) moist; moderate fine and very fine granular structure; soft, very friable, slightly sticky and moderately plastic; common very fine, few fine roots; about 85 percent limestone fragments, of which 60 percent are subangular flagstones and 25 percent are subangular channers; calcium carbonate disseminated throughout; thin continuous calcium carbonate coatings on the bottom of rock fragments; about 16 percent calcium carbonate

equivalent; violent effervescence; slightly alkaline; clear smooth boundary. (0 to 20 cm [0 to 8 inches] thick)

R--37 to 200 cm (15 to 79 inches); very pale brown (10YR 7/3) to white (10YR 8/1) hard, fractured limestone bedrock; fractures are typically about 0.5 cm wide at the narrowest part; distance between fractures ranges from about 40 to more than 90 cm (16 to 35 inches).

TYPE LOCATION: Meade County, South Dakota; about 0.5 miles southwest of Tilford; located about 1,450 feet south and 2,250 feet east of the northwest corner of Sec. 19, T. 4 N., R. 6 E.; Tilford USGS quadrangle; 44 degrees 17 minutes 49 seconds north latitude and 103 degrees 26 minutes 35 seconds west longitude; NAD 83

RANGE IN CHARACTERISTICS:
Soil moisture: ustic moisture regime bordering on udic
Depth to calcic horizon: 12 to 35 cm (5 to 14 inches)
Thickness of the mollic epipedon: 18 to 38 cm (7 to 15 inches) and constitutes over one-third the thickness of the soil above bedrock

Particle-size control section (weighted average):
Clay content: 15 to 27 percent
Sand content: 10 to 20 percent fine sand and coarser
Rock fragments: 35 to 85 percent limestone rock fragments

A horizon:
Hue: 7.5YR or 10YR
Value: 3 to 5, 2 or 3 moist
Chroma: 1 to 3
Texture: L, SIL (fine-earth fraction)
Rock fragments: 5 to 35 percent angular and subangular limestone channers or subrounded gravel
Reaction: neutral or slightly alkaline

ABk horizon:
Hue: 7.5YR to 10YR
Value: 4 or 5, 3 or 4 moist
Chroma: 2 or 3
Texture: L, SIL (fine-earth fraction)
Rock fragments: 20 to 50 percent subangular channers or subrounded gravel; 0 to 50 percent subangular cobbles; 0 to 60 percent angular or subangular flagstones; fragments typically consist of hard limestone and/or calcareous sandstone
Calcium carbonate equivalent: 15 to 25 percent
Reaction: slightly alkaline

Bk and/or Ck horizon (when present):
Hue: 5YR to 10YR
Value: 5 to 7, 4 or 5 moist

Chroma: 2 to 4
Texture: Loam or silt loam (fine-earth fraction)
Clay content: 15 to 27 percent
Rock fragments: 20 to 50 percent subangular channers or subrounded gravel; 0 to 50 percent subangular cobbles; 0 to 60 percent angular or subangular flagstones; fragments typically consist of hard limestone and/or calcareous sandstone
Calcium carbonate equivalent: 15 to 25 percent
Reaction: slightly alkaline or moderately alkaline

R horizon:
Hue: 5YR to 2.5Y
Value: 6 to 8
Chroma: 1 to 4
Texture: Hard fractured limestone or calcareous sandstone; fractures typically contain fine-earth material in the upper 20 to 50 cm (8 to 20 inches); fine-earth material consists of less than 5 percent of the total volume of this horizon

COMPETING SERIES:
Tyzak and Tyzut - are at elevations above 2440 meters (8,005 feet) and have Typic-Ustic and Aridic-Ustic soil moisture regimes, respectfully.

GEOGRAPHIC SETTING:
Parent material: Typically residuum derived from limestone or, less commonly, calcareous sandstone
Landform: Bedrock-controlled dipslopes and ridges in mountains
Slopes: 2 to 60 percent
Elevation: 1,160 to 1,830 meters (3,806 to 6,004 feet)
Mean annual temperature: 5 to 7 degrees C (42 to 45 degrees F)
Mean annual precipitation: 430 to 660 mm (17 to 26 inches)
Precipitation pattern: In most years, half or more of the normal annual precipitation falls as rain and/or snow in the spring and early summer.
Frost-free period: 110 to 140 days.

GEOGRAPHICALLY ASSOCIATED SOILS:
Gurney and Pesowyo - are moderately deep and occur below Rockerville soils. Additionally the Gurney soils have an argillic horizon and are fine-loamy.
Hopdraw, Sawdust, and Vanocker - are deep or very deep and occur below the Rockerville soils. Additionally, Hopdraw soils are sandy-skeletal; Sawdust lack a mollic epipedon and a calcic horizon; and Vanocker soils have an argillic horizon.

DRAINAGE AND SATURATED HYDRAULIC CONDUCTIVITY: Well drained; saturated hydraulic conductivity is moderately high to high; runoff is slow to very rapid, depending on slope.

USE AND VEGETATION: Rockerville soils are used for livestock grazing and wildlife habitat. Vegetation consists of light to moderate stands of ponderosa pine, with an understory of

little bluestem, sedge, bluegrass, bearberry, ground juniper, and snowberry. The site index for ponderosa pine is less than 50.

DISTRIBUTION AND EXTENT: Rockerville soils occur on the Low Limestone Plateau physiographic area of the Black Hills of South Dakota and Wyoming; LRR G, MLRA 62; the series is extensive.

MLRA SOIL SURVEY REGIONAL OFFICE (MO) RESPONSIBLE: Denver, Colorado

SERIES PROPOSED: Lawrence County, South Dakota.

REMARKS:
Diagnostic horizons and features recognized in this pedon are:
Particle-size control section: The zone from 18 to 37 cm (ABk horizon)
Mollic epipedon: The zone from 2 to 37 cm (0.8 to 15 inches) (A1, A2, ABk horizons)
Calcic horizon: The zone from 18 to 37 cm (7 to 15 inches) (ABk horizon)
Lithic contact: The contact with hard limestone bedrock at 37 cm (15 inches) (R horizon)

The assignment of the cation-exchange activity class is inferred from lab data from similar soils in the surrounding area.

The Rockerville series is established to replace the Paunsaugunt series previously correlated in the Black Hills, MLRA 62

Taxonomic Version: Keys to Soil Taxonomy, Eleventh Edition, 2010

ADDITIONAL DATA:

National Cooperative Soil Survey
U.S.A.

Official Series Description - SAWDUST Series

LOCATION SAWDUST SD

Established Series
Rev. LDZ-EHE-KEC
11/98

SAWDUST SERIES

The Sawdust series consists of very deep, well drained soils formed in residuum and colluvial sediments from calcareous sandstone and limestone on mountain slopes. Permeability is moderate. Slopes range from 6 to 80 percent. Mean annual precipitation is about 18 inches, and mean annual air temperature is about 40 degrees F.

TAXONOMIC CLASS: Loamy-skeletal, mixed, superactive, calcareous, frigid Typic Ustorthents

TYPICAL PEDON: Sawdust channery loam - on a south-facing slope of 34 percent under sparse pine and native grass at 5460 feet elevation. When described, the soil was dry throughout. (Colors are for dry soil unless otherwise noted).

A--0 to 4 inches; dark grayish brown (10YR 4/2) channery loam, very dark brown (10YR 2/2) moist; weak fine granular structure; soft, very friable; 30 percent coarse fragments; strong effervescence; slightly alkaline; gradual wavy boundary. (2 to 10 inches thick)

AC--4 to 8 inches; pale brown (10YR 6/3) very channery loam, brown (10YR 4/3) moist; weak medium subangular blocky structure; soft, friable; 50 percent coarse fragments; strong effervescence; moderately alkaline; gradual wavy boundary. (0 to 8 inches thick)

C1--8 to 15 inches; light yellowish brown (10YR 6/4) very channery loam, dark yellowish brown (10YR 4/4) moist; massive; soft, friable; 60 percent coarse fragments; many partially weathered limestone pebbles; strong effervescence; moderately alkaline; gradual wavy boundary.

C2--15 to 26 inches; very pale brown (10YR 7/4) extremely channery loam, light yellowish brown (10YR 6/4) moist; massive; soft, friable; 70 percent coarse fragments; strong effervescence; moderately alkaline; gradual wavy boundary.

C3--26 to 60 inches; yellow (10YR 7/6) extremely channery sandy loam, brownish yellow (10YR 6/6) moist; massive; soft, friable; 85 percent coarse fragments; strong effervescence; moderately alkaline.

TYPE LOCATION: Custer County, South Dakota; about 9 miles west and 5 miles south of Custer; 2600 feet north and 1900 feet east of southwest corner sec. 20, T. 4 S., R. 3 E.

RANGE IN CHARACTERISTICS: The Sawdust soils typically have carbonates to the surface but some pedons are leached to a depth of 4 inches. The depth to bedrock is more than 40 inches. Rock fragments which are dominantly pebbles and channers range from 5 to 45 percent by volume in the upper 10 inches.
They range from 35 to 90 percent by volume in the control section and are dominantly channers and flagstones. Some pedons have a thin O horizon.

The A horizon has 7.5YR or 10YR hue, value of 3 to 6 dry and 2 to 4 moist, and chroma of 1 to 3. It typically is gravelly loam, gravelly silt loam or channery loam, but is loam or silt loam, channery silt loam, very channery loam, very gravelly loam or very gravelly silt loam in some pedons. It is neutral or slightly alkaline.
When the A horizon is thicker than 6 inches, the lower part has value of 5 or 6 dry and 4 moist.

The AC horizon has 5 YR, 7.5YR, or 10YR hue; value of 5 to 7 dry and 4 or 5 moist; and chroma of 2 to 5. It is loam or silt loam and contains up to 50 percent coarse fragments of rock. It is slightly or moderately alkaline.

The C horizon has 2.5YR through 10YR hue, value of 5 to 8 dry and 4 to 7 moist, and chroma of 3 to 6. It is sandy loam, silt loam, silty clay loam, loam or clay loam and contains 35 to 90 percent coarse fragments. It is slightly or moderately alkaline.

COMPETING SERIES: These are the Pathead series that have bedrock at depths of 20 to 40 inches.

GEOGRAPHIC SETTING: The Sawdust soils are on moderately sloping to very steep mountain side slopes at elevations of 3600 to 6200 feet. Slope gradients range from 6 to 80 percent. These soils formed in colluvial or residuum weathered from calcareous limestone or sandstone. Mean annual temperature ranges from 37 to 45 degrees F. Mean annual precipitation ranges from 18 to 26 inches.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the Gurney, Hopdraw, Paunsaugunt and Vanocker soils. The Gurney soils have bedrock at depths between 20 and 40 inches and have an argillic horizon and are in open areas. The Hopdraw soils contain more sand and are on similar landscapes. The Paunsaugunt soils are shallow to bedrock and are on higher convex areas in the landscape. The Vanocker soils have an argillic horizon and are on similar landscapes with a more dense cover of trees.

DRAINAGE AND PERMEABILITY: Well drained. Permeability is moderate. Runoff is medium or high.

USE AND VEGETATION: Used mainly for grazing, timber production, wildlife and recreation. Native vegetation is sparse stand of ponderosa pine with an understory of little bluestem, big bluestem, needlegrass, sideoats grama, junegrass, western wheatgrass, stiff sunflower, prairie clover, juniper, snowberry, rose and sedges.

DISTRIBUTION AND EXTENT: Mountainous areas of the Black Hills in South Dakota and Wyoming especially on the sedimentary formations. The series is of moderate extent.

MLRA SOIL SURVEY REGIONAL OFFICE (MO) RESPONSIBLE: Denver, Colorado

SERIES ESTABLISHED: Custer County, South Dakota, 1985.

National Cooperative Soil Survey
U.S.A.

Official Series Description - VANOCKER Series

LOCATION VANOCKER SD+WY

Established Series
Rev. TJO-KEC-JWW
06/2011

VANOCKER SERIES

The Vanocker series consists of deep to very deep, well drained soils formed in residuum and colluvium from sedimentary rocks. Vanocker soils are on gently sloping to very steep ridges and hillslopes in mountains. They have moderately low and moderately high saturated hydraulic conductivity. Slopes range from 2 to 80 percent. The mean annual precipitation is about 585 mm (23 inches) and the mean annual temperature is about 6 degrees C (43 degrees F).

TAXONOMIC CLASS: Loamy-skeletal, mixed, superactive, frigid Inceptic Hapludalfs

TYPICAL PEDON: Vanocker gravelly silt loam, on a west-facing, linear slope of 38 percent under ponderosa pine forest at an elevation of 1,432 meters. When described on June 1, 1976 the soil was dry throughout. (Colors are for moist soil unless otherwise noted).

0e--0 to 2.5 cm (0 to 1 inches); forest litter and partially decomposed forest litter consisting of mixed coniferous and deciduous residue. (1 to 6 cm [0.4 to 3 inches] thick)

A--2.5 to 7.5 cm (1 to 3 inches); black (10YR 2/1) and very dark grayish brown (10YR 3/2) gravelly silt loam, very dark grayish brown (10YR 3/2) and dark grayish brown (10YR 4/2) dry; weak very fine granular structure; soft, very friable, slightly sticky and slightly plastic; many fine, medium, and coarse roots; 30 percent by volume subangular limestone gravel; neutral; abrupt wavy boundary. (0 to 8 cm [0 to 3 inches] thick)

Bt--7.5 to 18 cm (3 to 7 inches); brown (10YR 4/3) very gravelly silty clay loam, brown (10YR 5/3) dry; moderate fine subangular blocky structure; slightly hard, friable, moderately sticky and moderately plastic; many fine, medium and coarse roots; many faint continuous clay films on faces of peds; 40 percent by volume subangular limestone gravel; disseminated calcium carbonate throughout; very slight effervescence; slightly alkaline; clear wavy boundary. (7 to 25 cm [3 to 10 inches] thick)

Btk--18 to 40 cm (7 to 16 inches); brown (10YR 4/3) very gravelly clay loam, brown (10YR 5/3) dry; moderate ffine and medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common fine, medium, and coarse roots; 55 percent by volume subangular limestone gravel; common medium and coarse accumulations of calcium carbonate throughout and on the bottom of rock fragments; slight effervescence; slightly alkaline; clear wavy boundary. (0 to 38 cm [0 to 15 inches] thick)

Bk1--40 to 104 cm (16 to 41 inches); brown (10YR 5/3) very gravelly loam, light gray (10YR 7/2) dry; weak fine and medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few medium and coarse roots; 55 percent by volume subangular limestone gravel; few (3 percent) fine threads of calcium carbonate in soil matrix and medium and coarse calcium carbonate coatings on the bottom of rock fragments; strong effervescence; moderately alkaline; gradual wavy boundary. (10 to 76 cm [4 to 30 inches] thick)

Bk2--104 to 152 cm (41 to 60 inches); brown (10YR 4/3) extremely gravelly silt loam, brown (10YR 5/3) dry; weak fine and medium subangular blocky structure; slightly hard, friable, slightly sticky and nonplastic; few medium and coarse roots; 65 percent by volume subangular limestone gravel; few (3 percent) fine threads of calcium carbonate in matrix and continuous calcium carbonate coatings on faces of peds; violent effervescence; moderately alkaline.

TYPE LOCATION: Meade County, South Dakota; about 4 miles south and 2 miles west of Sturgis; about 1,500 feet east and 100 feet south of the northwest corner of Sec. 5, T. 4 N., R. 5 E.; Deadman Mountain USGS quadrangle; 44 degrees 20 minutes 37 seconds north latitude, and 103 degrees 32 minutes 49 seconds west longitude; NAD 83.

RANGE IN CHARACTERISTICS:
Soil moisture: Typic-udic soil moisture regime.
Depth to secondary calcium carbonate: 10 to 38 cm (4 to 15 inches)

Particle-size control section (weighted average):
Clay content: 18 to 35 percent
Sand content: typically 5 to 15 percent fine and coarser sand; ranges to 35 percent in some pedons

A horizon:
Hue: 7.5YR or 10YR
Value: 3 to 6, 2 to 4 moist
Chroma: 2 or 3
Texture: L, SIL, FSL, VFSL (fine-earth fraction)
Clay content: 8 to 27 percent
Rock fragments: 5 to 35 percent total volume of non-flat subangular or subrounded gravel, or flat subangular or subrounded channers, and 0 to 5 percent cobble
Reaction: moderately acid to neutral

An E horizon is present in place of the A in a few pedons; it has properties similar to the A except that moist and dry colors are one value lighter.

Bt horizon:
Hue: 2.5YR, 5YR, 7.5YR, 10YR, or 2.5Y
Value: 5 to 7, 4 to 6 moist
Chroma: 2 to 4
Texture: CL, SICL, SCL (fine-earth fraction)

Clay content: 25 to 35 percent
Rock fragments: 30 to 45 percent total volume of non-flat subangular or subrounded gravel or flat, subangular or subrounded channers, and 0 to 15 percent cobble
Calcium carbonate equivalent: 0 to 10 percent
Reaction: moderately acid to slightly alkaline

Btk horizon:
Hue: 2.5YR, 5YR, 7.5YR, 10YR, or 2.5Y
Value: 5 to 7, 4 to 6 moist
Chroma: 2 to 6
Texture: L, SIL, CL, SICL, SCL (fine-earth fraction)
Clay content: 20 to 35 percent
Rock fragments: 30 to 45 percent total volume of non-flat subangular or subrounded gravel or flat ,subangular or subrounded channers, and 0 to 15 percent cobble
Calcium carbonate equivalent: 10 to 20 percent
Reaction: slightly alkaline

Bk horizon:
Hue: 2.5YR, 5YR, 7.5YR, 10YR, or 2.5Y
Value: 5 to 8, 4 to 7 moist
Chroma: 2 to 6
Texture: L, CL, SIL, SICL, SL, FSL, SCL (fine-earth fraction)
Clay content: 15 to 35 percent
Rock fragments: 20 to 55 percent total volume of non-flat subangular or subrounded gravel, or flat subangular or subrounded channers, 5 to 30 percent cobble, and/or 0 to 20 percent flagstones
Calcium carbonate equivalent: 15 to 40 percent
Reaction: slightly alkaline or moderately alkaline

Some pedons contain a C horizon

COMPETING SERIES:
Marquette - have fine-earth textures of fine sandy loam or coarser throughout; additionally they formed in glacial outwash

GEOGRAPHIC SETTING:
Parent material: colluvium and/or residuum derived primarily from limestone and/or calcareous sandstone
Landform: ridges, ridge shoulders, and hillslopes of mountains
Slopes: 2 to 80 percent
Elevation: 1,095 to 1,890 meters (3,583 to 6,200 feet)
Mean annual temperature: 4 to 7 degrees C (39 to 45 degrees F)
Mean annual precipitation: 510 to 760 mm (20 to 30 inches)
Precipitation pattern: over one-half the mean annual precipitation falls as snow and rain during the period
March through July
Frost-free season: 60 to 110 days

GEOGRAPHICALLY ASSOCIATED SOILS: These are the Citadel, Hopdraw, Rockerville(T), Sawdust, and Tollflat (T) soils.
Citadel and Tollflat (T) - are fine-textured; they generally occur below Vanocker soils on the landscape
Hopdraw - are sandy-skeletal and lack argillic horizons; they occur on similar landscape positions as Vanocker soils
Rockerville(T) - are shallow to a lithic contact; they generally occur above Vanocker soils on the landscape
Sawdust - lack argillic horizons; on similar landscape positions as Vanocker

DRAINAGE AND SATURATED HYDRAULIC CONDUCTIVITY: Well drained; medium to very high runoff, depending on slope; moderately low to moderately high hydraulic conductivity.

USE AND VEGETATION: Used for timber production, recreation and wildlife habitat, and for grazing. Native vegetation is dominantly ponderosa pine with lesser amounts of aspen, birch, and bur oak. Understory species include Kentucky bluegrass, needlegrass, timber oatgrass, roughleaf ricegrass, and little bluestem. Shrubs include bearberry, oregon-grape, common juniper, buffaloberry, and snowberry.

DISTRIBUTION AND EXTENT: Low Limestone Plateau physiographic area of the Black Hills in western South Dakota and northeastern Wyoming; LRR G, MLRA 62. The series is extensive.

MLRA SOIL SURVEY REGIONAL OFFICE (MO) RESPONSIBLE: Denver, Colorado

SERIES ESTABLISHED: Meade County, South Dakota, Southern Part, 1974.

REMARKS: Diagnostic horizons and features recognized in this pedon are:
Ochric epipedon - 2.5 to 7.5 cm (1 to 3 inches) (A horizon)
Argillic horizon - 7.5 to 40 cm (3 to 16 inches) (Bt and Btk horizons)

The classification of the series was revised from Typic Eutroboralfs to Inceptic Hapludalfs due to changes in Soil Taxonomy (02/1999).

Taxonomic Version: Keys to Soil Taxonomy, Eleventh Ed., 2006

ADDITIONAL DATA:

National Cooperative Soil Survey
U.S.A.

Addendum 2
Figures

Addendum 2-1. Figure 2-1. Loring Quarry Soil Map Units and Sample Locations

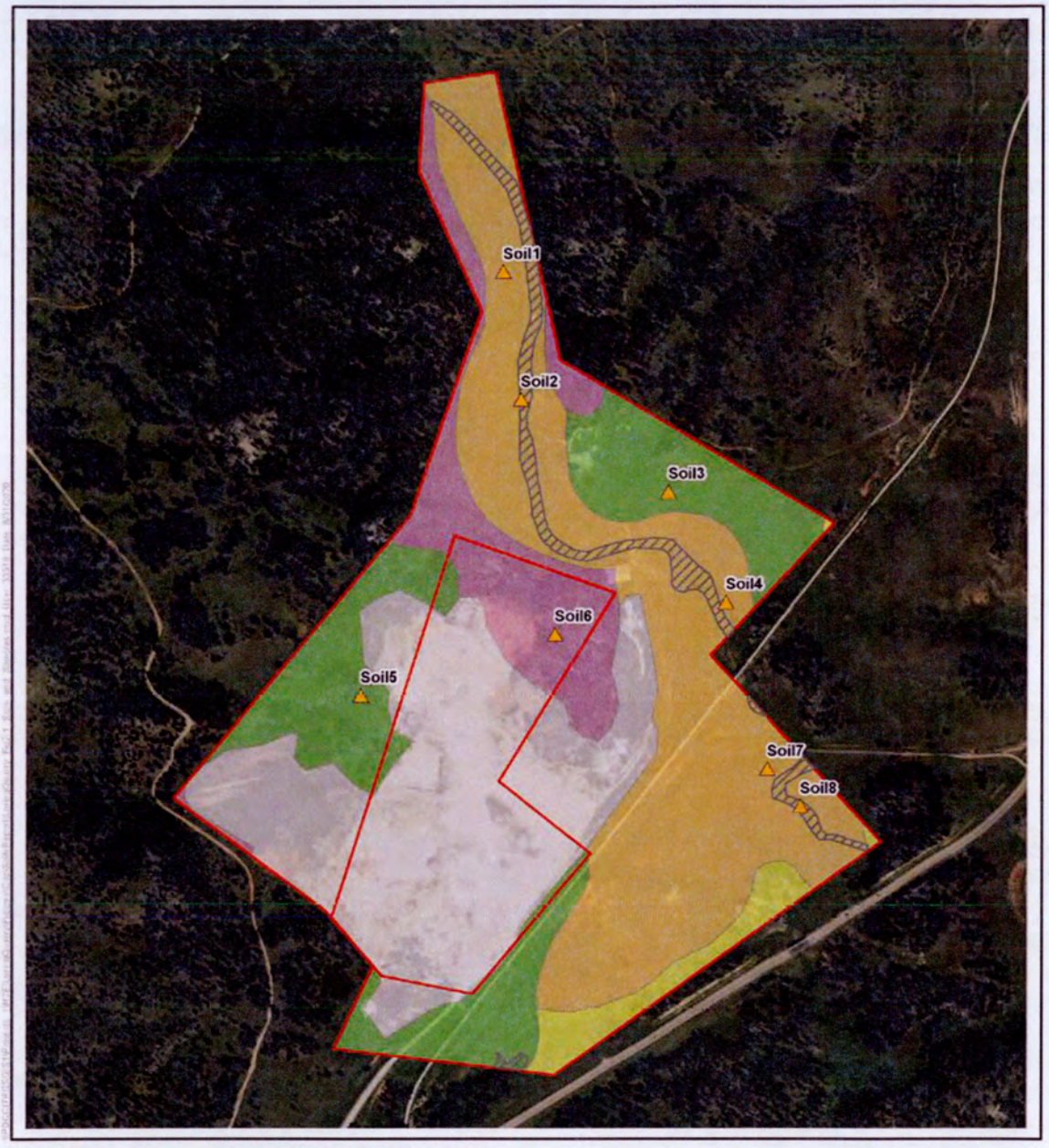


Figure 2-1
Soils Map Units and Sample Locations

Addendum 2-2. Figure 2-1. Loring Quarry Ecological Sites and Soil Sample Locations



Figure 2-2
Ecological Site Descriptions and Soil Samples

Addendum 3
Photos

Addendum 3-1. Loring Quarry Soil Sample Pedon Photos



Photo 1. Soil1; Date: 6/29/20; Colombo series; Described to 60 inches



Photo 2. Soil2; Date: 6/29/20; Rapidcreek series; Described to 20 inches



Photo 3. Soil3; Date: 6/29/20; Gurney series; Described to 48 inches



Photo 4. Soil4; Date: 6/29/20; Barnum series; Described to 4 inches



Photo 5. Soil5; Date: 6/29/20; Rockerville series; Described to 38 inches



Photo 6. Soil6; Date: 6/30/20; Vanocker, dry series; Described to 13 inches



Photo 7. Soil7; Date: 6/30/20; Colombo series; Described to 62 inches



Photo 8. Soil8; Date: 6/30/20; Rapidcreek series; Described to 24 inches

Addendum 4
Laboratory Analysis

Addendum 4-2. Loring Quarry Laboratory Analysis

Pace Analytical® Formerly Inter-Mountain Laboratories
1673 Terra Avenue Sheridan, WY 82801 ph: (307) 672-8945

Date: 7/31/2020

CLIENT: H2E, Inc.
Project: Loring Quarry
Lab Order: S2007178

CASE NARRATIVE
Report ID: S2007178001

Samples Soil #1, Soil #2, Soil #3, Soil #4, Soil #5, Soil #6, Soil #7 and Soil #8 were received on July 1, 2020.

Samples were analyzed using the methods outlined in the following references:

U.S.E.P.A. 600/2-78-054 "Field and Laboratory Methods Applicable to Overburden and Mining Soils", 1978
American Society of Agronomy, Number 9, Part 2, 1982
USDA Handbook 60 "Diagnosis and Improvement of Saline and Alkali Soils", 1969
Wyoming Department of Environmental Quality, Land Quality Division, Guideline No. 1, 1984
New Mexico Overburden and Soils Inventory and Handling Guideline, March 1987
State of Utah, Division of Oil, Gas, and Mining: Guidelines for Management of Topsoil and Overburden for Underground and Surface Coal Mining, April 1988
Montana Department of State Lands, Reclamation Division: Soil, Overburden, and Regraded Spoil Guidelines, December 1994
State of Nevada Modified Sobek Procedure
Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW846, 3rd Edition

All Quality Control parameters met the acceptance criteria defined by EPA and Pace Analytical (Formerly Inter-Mountain Laboratories) except as indicated in this case narrative.

Qualifiers by sample

S2007178-018 - Saturated Paste Cations by EPA 200.7/Magnesium - RPD outside accepted recovery limits

Reviewed by: Crystal Herman
Crystal Herman, Soil Analyst

Page 1 of 1

Pace Analytical Formerly Inter-Mountain Laboratories
1673 Terra Avenue Sheridan, WY 82801 ph: (307) 672-8945

Soil Analysis Report

H2E, Inc.

405 West Boxelder Road, Suite A5
Gillette, WY 82718

Report ID: S2007178001

Project: Loring Quarry
Date Received: 7/1/2020

Date Reported: 7/31/2020
Work Order: S2007178

Lab ID	Sample ID	Depths Inches	pH s.u.	Saturation %	Electrical Conductivity dS/m	Organic Matter %	CaCO3 %	Calcium PE meq/L	Magnesium PE meq/L	Sodium PE meq/L	SAR
S2007178-001	Soil #1	0-4	6.3	71.7	0.80	6.3	0.7	4.42	1.33	0.22	0.13
S2007178-002	Soil #1	4-18	7.1	52.5	0.87	3.4	13.1	5.50	1.29	0.18	0.10
S2007178-003	Soil #1	18-26	7.7	45.9	0.50	2.2	14.1	2.13	1.82	0.40	0.28
S2007178-004	Soil #1	26-42	7.9	48.1	1.04	1.7	14.9	2.31	4.16	1.88	1.04
S2007178-005	Soil #1	42-60	7.9	42.2	2.78	1.3	7.5	2.98	6.19	13.4	6.26
S2007178-006	Soil #2	0-8	6.6	81.2	1.65	8.6	1.5	8.81	2.23	0.27	0.12
S2007178-007	Soil #2	8-16	7.1	60.0	2.41	4.4	10.3	14.6	2.59	0.45	0.15
S2007178-008	Soil #3	0-6	7.1	54.4	1.41	5.1	7.5	9.55	1.15	0.10	<0.05
S2007178-009	Soil #3	6-12	7.1	46.3	1.55	3.8	16.2	10.0	1.25	0.21	0.09
S2007178-010	Soil #3	12-18	7.5	31.3	0.78	1.6	37.2	4.80	1.00	0.23	0.13
S2007178-011	Soil #3	18-26	7.6	30.7	1.06	1.1	26.6	4.62	1.63	0.31	0.17
S2007178-012	Soil #3	26-35	7.8	43.7	0.85	1.6	8.7	2.37	2.49	1.40	0.90
S2007178-013	Soil #3	35-40	8.1	50.8	0.67	2.4	9.0	1.08	1.43	2.82	2.52
S2007178-014	Soil #3	40-46	8.2	46.3	0.67	1.6	12.0	0.77	1.16	3.78	3.84
S2007178-015	Soil #4	0-4	7.2	68.2	1.03	7.8	16.6	7.07	0.78	0.13	0.06
S2007178-016	Soil #5	0-3	7.1	72.2	1.68	8.3	21.6	12.1	0.75	0.19	0.07
S2007178-017	Soil #5	3-8	7.1	65.3	1.05	5.8	23.2	7.75	0.52	0.12	0.06
S2007178-018	Soil #5	8-14	7.1	60.4	1.37	4.7	38.4	9.41	0.53	0.17	0.08
S2007178-019	Soil #6	0-4	7.1	56.9	1.32	5.8	24.3	10.4	0.59	0.18	0.08
S2007178-020	Soil #7	0-4	7.3	63.5	1.08	5.9	5.6	7.10	0.99	0.11	0.05

These results apply only to the samples tested.

Abbreviations for extractants: PE= Saturated Paste Extract, H20Sol= water soluble,AB-DTPA= Ammonium Bicarbonate-DTPA, AAO= Acid Ammonium Oxalate
Abbreviations used in acid base accounting: T.S.= Total Sulfur, AB= Acid Base, ABP= Acid Base Potential, PyrS= Pyritic Sulfur, Pyr+Org= Pyritic Sulfur + Organic Sulfur, Neutral. Pot.= Neutralization Potential
Miscellaneous Abbreviations: SAR= Sodium Adsorption Ratio, CEC= Cation Exchange Capacity, ESP= Exchangeable Sodium Percentage, TOC=Total Organic Carbon

Reviewed by: Crystal Herman
Crystal Herman, Soil Analyst

Pace Analytical

Formerly Inter-Mountain Laboratories

1673 Terra Avenue Sheridan, WY 82801 ph: (307) 672-8945

Soil Analysis Report

H2E, Inc.

405 West Boxelder Road, Suite A5

Gillette. WY 82718

Report ID: S2007178001

Project: Loring Quarry

Date Received: 7/1/2020

Date Reported: 7/31/2020

Work Order: S2007178

Lab ID	Sample ID	Depths Inches	Sand %	Silt %	Clay %	Texture
S2007178-001	Soil #1	0-4	35.0	49.0	16.0	Loam
S2007178-002	Soil #1	4-18	29.0	47.0	24.0	Loam
S2007178-003	Soil #1	18-26	22.0	52.0	26.0	Silty Loam
S2007178-004	Soil #1	26-42	29.0	49.0	22.0	Loam
S2007178-005	Soil #1	42-60	24.0	57.0	19.0	Silty Loam
S2007178-006	Soil #2	0-8	28.0	47.0	25.0	Loam
S2007178-007	Soil #2	8-16	40.0	38.0	22.0	Loam
S2007178-008	Soil #3	0-6	41.0	41.0	18.0	Loam
S2007178-009	Soil #3	6-12	41.0	37.0	22.0	Loam
S2007178-010	Soil #3	12-18	62.0	22.0	16.0	Sandy Loam
S2007178-011	Soil #3	18-26	56.0	30.0	14.0	Sandy Loam
S2007178-012	Soil #3	26-35	29.0	47.0	24.0	Loam
S2007178-013	Soil #3	35-40	22.0	48.0	30.0	Clay Loam
S2007178-014	Soil #3	40-46	33.0	41.0	26.0	Loam
S2007178-015	Soil #4	0-4	25.0	51.0	24.0	Silty Loam
S2007178-016	Soil #5	0-3	42.0	36.0	22.0	Loam
S2007178-017	Soil #5	3-8	31.0	39.0	30.0	Clay Loam
S2007178-018	Soil #5	8-14	18.0	51.0	31.0	Silty Clay Loam
S2007178-019	Soil #6	0-4	42.0	38.0	20.0	Loam
S2007178-020	Soil #7	0-4	35.0	49.0	16.0	Loam

These results apply only to the samples tested.

Abbreviations for extractants: PE= Saturated Paste Extract, H20Sol= water soluble,AB-DTPA= Ammonium Bicarbonate-DTPA, AAO= Acid Ammonium Oxalate

Abbreviations used in acid base accounting: T.S.= Total Sulfur, AB= Acid Base, ABP= Acid Base Potential, PyrS= Pyritic Sulfur, Pyr+Org= Pyritic Sulfur + Organic Sulfur, Neutral. Pot.= Neutralization Potential

Miscellaneous Abbreviations: SAR= Sodium Adsorption Ratio, CEC= Cation Exchange Capacity, ESP= Exchangeable Sodium Percentage, TOC=Total Organic Carbon

Reviewed by: Crystal Herman

Crystal Herman, Soil Analyst

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Soil Analysis Report

H2E, Inc.

405 West Boxelder Road, Suite A5
Gillette, WY 82718

Report ID: S2007178001

Project: Loring Quarry
Date Received: 7/1/2020

Date Reported: 7/31/2020
Work Order: S2007178

Lab ID	Sample ID	Depths Inches	pH s.u.	Saturation %	Electrical Conductivity dS/m	Organic Matter %	CaCO3 %	Calcium PE meq/L	Magnesium PE meq/L	Sodium PE meq/L	SAR
S2007178-021	Soil #7	4-10	7.2	55.8	1.05	3.7	5.5	6.54	1.11	0.20	0.10
S2007178-022	Soil #7	10-18	7.4	51.1	1.56	3.0	17.4	8.29	2.93	0.37	0.16
S2007178-023	Soil #7	18-50	7.9	41.7	0.73	1.8	21.8	2.45	2.64	0.59	0.37
S2007178-024	Soil #7	50-62	8.7	58.0	2.84	1.9	9.6	1.01	4.78	15.3	8.99
S2007178-025	Soil #8	0-3	7.1	75.6	1.22	7.8	11.6	8.28	1.00	0.28	0.13
S2007178-026	Soil #8	3-12	7.2	46.9	1.24	3.4	23.4	7.97	0.91	0.18	0.09
S2007178-027	Soil #8	12-20	7.5	43.2	0.76	3.1	23.7	4.81	0.74	0.18	0.11
S2007178-028	Soil #8	20-24	7.6	40.5	0.72	2.3	23.3	4.51	0.65	<0.05	<0.05

These results apply only to the samples tested.

Abbreviations for extractants: PE= Saturated Paste Extract, H20Sol= water soluble,AB-DTPA= Ammonium Bicarbonate-DTPA, AAO= Acid Ammonium Oxalate
Abbreviations used in acid base accounting: T.S.= Total Sulfur, AB= Acid Base, ABP= Acid Base Potential, PyrS= Pyritic Sulfur, Pyr+Org= Pyritic Sulfur + Organic Sulfur, Neutral. Pot.= Neutralization Potential
Miscellaneous Abbreviations: SAR= Sodium Adsorption Ratio, CEC= Cation Exchange Capacity, ESP= Exchangeable Sodium Percentage, TOC=Total Organic Carbon

Reviewed by: Crystal Herman
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Page 3 of 4

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Report ID: S2007178001

Project: Loring Quarry
Date Received: 7/1/2020

Date Reported: 7/31/2020
Work Order: S2007178

Lab ID	Sample ID	Depths Inches	Sand %	Silt %	Clay %	Texture
S2007178-021	Soil #7	4-10	32.0	48.0	20.0	Loam
S2007178-022	Soil #7	10-18	35.0	45.0	20.0	Loam
S2007178-023	Soil #7	18-50	40.0	40.0	20.0	Loam
S2007178-024	Soil #7	50-62	24.0	52.0	24.0	Silty Loam
S2007178-025	Soil #8	0-3	36.0	47.0	17.0	Loam
S2007178-026	Soil #8	3-12	53.0	31.0	16.0	Sandy Loam
S2007178-027	Soil #8	12-20	52.0	34.0	14.0	Sandy Loam
S2007178-028	Soil #8	20-24	52.0	34.0	14.0	Sandy Loam

These results apply only to the samples tested.

Abbreviations for extractants: PE= Saturated Paste Extract, H20Sol= water soluble,AB-DTPA= Ammonium Bicarbonate-DTPA, AAO= Acid Ammonium Oxalate
Abbreviations used in acid base accounting: T.S.= Total Sulfur, AB= Acid Base, ABP= Acid Base Potential, PyrS= Pyritic Sulfur, Pyr+Org= Pyritic Sulfur + Organic Sulfur, Neutral. Pot.= Neutralization Potential
Miscellaneous Abbreviations: SAR= Sodium Adsorption Ratio, CEC= Cation Exchange Capacity, ESP= Exchangeable Sodium Percentage, TOC=Total Organic Carbon

Reviewed by: Crystal Herman
Crystal Herman, Soil Analyst

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Addendum 5
Raw Soil Survey Data

Addendum 5-3. Loring Quarry Raw Soils Data

Site	Plot	Pit Label	Total Soil I	Pit Notes
LQ	Lowland	Soil2	20	Color dark brown; 0-2 inch organic layer.
LQ	Lowland	Soil4	6	Soil color brown. Rock at bottom of profile. Initial sample was moved due to rocks.
LQ	Lowland	Soil8	24	Soil color brown. Rock at 24", prevented further digging.
LQ	Upland	Soil1	60	Area used for pasture, possibly tilled.
LQ	Upland	Soil3	48	Upland area, grazing
LQ	Upland	Soil7	62	Hay meadow; likely cultivated. Color
LQ	Woodland	Soil5	38	Soil color red; red/white at bottom of pedon.
LQ	Woodland	Soil6	13	Soil color brown/red. Rock prevented further digging.

Site	Plot	Pit Label	Upper Depth	Lower Depth	Horizon	Color	Texture	Frag Type 1	Frag Vol 1	Frag Type 2	Frag Vol 2	Total Rock Fragments (vol)	Effervescence	Struct
LQ	Lowland	Soil2	0	2	A	Dry	C					0	NE	GR
LQ	Lowland	Soil2	2	8	A	Dry	C					0	NE	GR
LQ	Lowland	Soil2	8	16	BC	Dry	C	Gravel	10			10	SL	GR
LQ	Lowland	Soil2	16	20	C	Dry	C	Gravel	70			70	ST	GR
LQ	Lowland	Soil4	0	4	A	Dry	SIC					0	SL	GR
LQ	Lowland	Soil4	4	6	CA	Dry	SIC	Gravel	60			60	VE	GR
LQ	Lowland	Soil8	0	3	A	Dry	SIL					0	NE	ABK
LQ	Lowland	Soil8	3	12	A	Dry	SL					0	SL	GR
LQ	Lowland	Soil8	12	20	B/C	Dry	SC	Gravel	20			20	ST	GR
LQ	Lowland	Soil8	20	24	B/C	Dry	SC	Gravel	20			20	SL	GR
LQ	Upland	Soil1	0	4	A	Dry	C					0	NE	GR
LQ	Upland	Soil1	4	18	B	Dry	SIC					0	VE	ABK
LQ	Upland	Soil1	18	26	B	Dry	SIC					0	VE	ABK
LQ	Upland	Soil1	26	42	B	Dry	SIC					0	ST	ABK
LQ	Upland	Soil1	42	60	B	Dry	C					0	ST	GR
LQ	Upland	Soil3	0	1	O	Dry	SIC					0	NE	ABK
LQ	Upland	Soil3	1	6	A	Dry	SIC					0	NE	GR
LQ	Upland	Soil3	6	12	B	Dry	SIC					0	VS	GR
LQ	Upland	Soil3	12	18	B/C	Dry	C	Gravel	25	Cobble	20	45	ST	GR
LQ	Upland	Soil3	18	26	B/C	Dry	SIC					0	VE	SBK
LQ	Upland	Soil3	26	35	B	Dry	SIC					0	ST	ABK
LQ	Upland	Soil3	35	40	B	Dry	C					0	SL	ABK
LQ	Upland	Soil3	40	46	BC	Dry	C	Gravel	10			10	ST	GR
LQ	Upland	Soil3	46	48	B/C	Dry	C	Cobble	40			40	ST	GR
LQ	Upland	Soil7	0	4	A	Dry	SICL					0	NE	GR
LQ	Upland	Soil7	4	10	B	Dry	SICL	Gravel	10			10	VS	GR
LQ	Upland	Soil7	10	18	B	Dry	C					0	VE	GR
LQ	Upland	Soil7	18	50	B	Dry	C					0	ST	GR
LQ	Upland	Soil7	50	62	B	Dry	C					0	SL	GR
LQ	Woodland	Soil5	0	3	A	Dry	C	None	0			0	SL	GR
LQ	Woodland	Soil5	3	8	AB	Dry	C	Gravel	10			10	ST	GR
LQ	Woodland	Soil5	8	14	C/B	Dry	C					0	VE	ABK
LQ	Woodland	Soil5	14	28	C	Dry	C					0	VE	ABK
LQ	Woodland	Soil5	28	38	C	Dry	C	Gravel	40			40	VE	GR
LQ	Woodland	Soil6	0	4	A	Dry	SIC	Gravel	2	Cobble	8	10	NE	GR
LQ	Woodland	Soil6	4	13	BC	Dry	SIC	Gravel	30	Cobble	10	40	VE	GR

Texture: C=clay, SIC=silty clay, SICL= silty clay loam, SC=sandy clay, SIL=silty loam, SL=sandy loam
Effervescence: NE=non, VS=very slightly, SL=slight, ST=strong, VS=violent
Structure: ABK=angular blocky, SBK=subangular blocky, GR=granular

Addendum 6
Resumes of Personnel

JEFFREY ABPLANALP

Wildlife Biologist

Jeff Abplanalp is a wildlife biologist with 10 years of experience. He specializes in providing terrestrial and aquatic wildlife and habitat mitigation consulting to the oil, natural gas, coal mining, wind farm, and uranium industries. He has extensive experience conducting ground based and aerial surveys for sage grouse, raptors, big game, and threatened and endangered species. He has contributed to several largescale oil and gas projects conducting pre-construction baseline wildlife and habitat inventory surveys. Jeff also has extensive experience in wildlife conflict, disease, and population management.



Years of Experience

- Professional start date: 05/2008
- ICF start date: 04/2013

Education

- BS, Wildlife and Fisheries Management and Biology, University of Wyoming, 2009

Professional Memberships

- Wildlife Society, 2007-2009
- American Fisheries Society, 2007-2009

Certifications/Other

- Site-Specific Hazard Training (Surface Coal, Metal, Non-metal, Mine Safety and Health Administration

Area of Expertise

- Terrestrial and aquatic wildlife and habitat baseline surveys

Project Experience

Oil and Natural Gas

Moneta Divide—Aethon Energy/Encana Oil and Gas and Burlington Resources, Fremont and Natrona Counties, WY, 04/2013 – 06/2013, 04/2014 – 06/2014

Field Biologist. Conduct ground based and aerial wildlife and habitat baseline inventory surveys for proposed natural gas project. Primary species surveyed include Greater sage-grouse, raptors, mountain plovers, big game, herptiles, and white-tailed prairie dog colonies.

Powder River Basin North—EOG Resources, Campbell and Johnson Counties, WY, 04/2019 – 06

Field Biologist. Conduct ground based and aerial wildlife and habitat surveys for proposed natural gas project. Primary species surveyed include greater sage-grouse, raptors, herptiles, and black-tailed prairie dog colonies.

Leavitt-Underwood—Devon Energy Corporation, Campbell County, WY, 04/2019 – Present

Field Biologist. Conduct ground-based wildlife surveys as part of plan of development. Primary species surveyed included raptors, mountain plovers, and black-tailed prairie dog colonies.

Cosner Fuller TLE—Devon Energy Corporation, Campbell County, WY, 04/2019 – Present

Field Biologist. Conduct ground-based wildlife surveys as part of plan of development. Primary species surveyed included raptors, mountain plovers, and black-tailed prairie dog colonies.

Mines and Quarries

Surface Coal Mine Wildlife Monitoring and Reporting—Navajo Transitional Energy Company, Antelope Mine, Campbell and Converse Counties, WY, 01/2020 – Present

Field Biologist. Conduct wildlife monitoring as part of mine and state DEQ monitoring and mitigation plan. Primary surveys conducted include golden eagle nest monitoring, bald eagle winter roost surveys, big game, lagomorph, and prairie dog colony surveys. Helped with drafting an avian mitigation plan and annual monitoring and conducted analysis of field data.

Surface Coal Mine Wildlife Monitoring and Reporting—Eagle Specialty Materials, Eagle Butte & Belle Ayr Mines, Campbell County, WY. 09/2020--Present

Field Biologist. Conduct wildlife monitoring as part of mine and state DEQ monitoring and mitigation plan. Primary surveys conducted include golden eagle nest monitoring, bald eagle winter roost surveys, big game, aquatic, lagomorph, and prairie dog colony surveys. Helped with drafting an avian mitigation plan and annual monitoring and conducted analysis of field data.

Willow Creek Uranium ISR Project Annual Wildlife Monitoring—Uranium One, Campbell and Johnson Counties, WY. 04/2019 – 06/2019

Field Biologist. Conduct wildlife monitoring as part of mine and state DEQ monitoring and mitigation plan. Primary surveys included Greater sage-grouse lek and raptor nest surveys. Helped with drafting annual monitoring and conducted analysis of field data.

Wind Energy Development

Maestro Wind Project—BayWa, Carbon County, WY. 08/2019-Present

Field Biologist. Conduct baseline wildlife surveys prior to wind farm development. Primary species surveyed included raptors, black-footed ferrets, and swift foxes.

Employment History

ICF. Wildlife Biologist. Gillette, WY. 04/2019 – Present.

Wyoming Game and Fish Department. Wildlife Damage Technician. Cody, WY. 05/2011 – 01/2019.

Big Horn Environmental Consultants. On-call Wildlife Biologist. Sheridan, WY. 04/2017 – 06/2017, 04/2018 – 06/2018.

Wyoming Game and Fish Department. Bird Farm Technician. Yoder, WY. 4/2015.

ICF. On-call Wildlife Biologist. Gillette, WY. 04/2013 – 06/2013, 04/2014 – 06/2014.

Wyoming Game and Fish Department. Aquatic Invasive Species Technician. Casper, WY. 5/2010 – 9/2010.

Wyoming Game and Fish Department. Fish Hatchery Technician. Boulder, WY. 05/2009 – 08/2009.

University of Wyoming. Fisheries Technician. Laramie, WY. 05/2008 – 10/2008.

KATIE WILSON

Project Role: Senior Biologist

Katie Wilson is a senior biologist specializing in wetland and vegetation assessments. She performs natural resource-based fieldwork to include field sampling, map review, global positioning systems (GPS) data collection, and technical report completion. Her fieldwork experience includes baseline vegetation, soil and wetland assessments, threatened and endangered (vegetation) surveys and habitat assessments, reclamation monitoring, and wetland delineations. Katie is responsible for data analysis and report writing for all aspects of fieldwork. She works extensively with different stakeholders to include: U.S. Bureau of Land Management (BLM), USDA Forest Service (Forest Service), Wyoming Department of Environmental Quality (WDEQ), U.S. Army Corps of Engineers (USACE); oil, gas, coal, and uranium mine operators; and private landowners to assess and mitigate the potential impacts of activities on regional flora, including federally threatened and endangered species and other species of management concern.

Prior to joining ICF, Katie spent 11 years as a wetland specialist and vegetation ecologist, as well as operations manager at a consulting firm in Gillette, Wyoming. Her duties included project management, managing budgets, client correspondence, data gathering, map review, field surveys, results analysis, data presentation, and report compilation. She has worked extensively on projects to conduct special-status plant surveys, floristic inventories, baseline assessments, reclamation monitoring, vegetation community mapping, wetland delineations, and soil map unit mapping and sampling.

Selected Project Experience

Moneta Divide Biological Assessment—Fremont, Natrona, and Sweetwater Counties, Wyoming. 12/2019.

Senior Biologist. Katie completed a biological assessment for Ute ladies'-tresses for proposed oil and gas development in south-central Wyoming. She completed the biological assessment document for submittal to the Lander BLM Field Office.

Coeur Wharf Mine Rare Plant Survey—Lawrence County, South Dakota. 08/2019.

Senior Biologist. Katie complete a rare plant inventory for proposed development at the Wharf Mine located within the Black Hills. As project manager, she performed fieldwork per the direction of the South Dakota Department of Game, Fish, and Parks. Additionally, she completed a report summary of the field survey findings.



Years of Experience

- Professional start date: 05/2005
- ICF start date: 03/2017

Education

- BS, Biology, Bemidji State University, 2005
- AA, Liberal Arts, Thief River Falls, Minnesota, 2002

Professional Membership

- Society for Wetland Science

Training Certificates

- MSHA Annual Refresher, 2019
- OSHA General Industry 10 hr., 2014
- Safeland USA, 2010

Professional Development

- Assessment, Inventory, and Monitoring (AIM) Terrestrial Field Methods, U.S. Department of the Interior (DOI)
- Phase I and Phase II Environmental Site Assessment, ASTM International
- Wetland Delineation Training and Certification, USACE
- Emphasis on Soil and Hydrology, Wetland Training Institute (WTI)
- Federal Wetland/Waters Regulatory Policy, WTI

Transmission and Wind Facility Projects—Various Companies Wyoming. 07/2018 – 09/2019.

Vegetation Ecologist. As the field manager, Katie developed scopes of work to conduct baseline evaluations using the Assessment, Inventory, and Monitoring (AIM) program on BLM administered lands for proposed plans of development. She managed and coordinated a team of field biologists, served as field surveyor, and primary author of technical reports.

Katie also developed weed management plans for submittal to Albany and Carbon County Weed and Pest Offices along with reclamation plans to the Industrial Siting Council for the Wyoming Department of Environmental Quality and the Rawlins BLM Field Office.

Vegetation Assessments for Various Oil and Gas Projects—Various Clients, Wyoming. 05/2005 – 08/2016.

Vegetation Ecologist. While employed by BKS Environmental, Katie developed scopes of work and project budgets to conduct special-status plant species surveys and vegetation assessments for proposed plans of development. Her responsibilities included overall management of client contracts, safety compliance, and correspondence with clients and applicable state or federal agencies. She managed a team of field biologists, and served as field surveyor, primary author and/or reviewer of technical reports.

Threatened and Endangered Plant Surveys for Various Coal Mines—Various Clients, Northeastern Wyoming. 05/2005 – 08/2013.

Senior Vegetation Ecologist. While employed by BKS Environmental, Katie completed Ute ladies'-tresses (*Spiranthes diluvialis*) and Barr's milkvetch (*Astragalus barrii*) habitat and species surveys on the U.S. Forest Service in the Thunder Basin National Grasslands for various coal mine locations. Her responsibilities included overall management of client contracts, safety compliance, and correspondence with clients and applicable state or federal agencies. She developed scopes of work and project budgets to conduct special-status plant species surveys and assessments for proposed plans of development. Katie also managed a team of field biologists and was primary author and/or reviewer of technical reports and biological assessments/biological evaluations (BAs/Bes).

Bear Lodge and Upton Plant Site Wetland Delineation—Rare Earth Elements, Crook and Weston Counties, Wyoming. 05/2012 – 12/2015.

Project Manager and Senior Wetland Specialist. While employed by BKS Environmental, Katie developed scope of work and project budget for the completion of an aquatic resource inventory for proposed rare earth mine and plant development located on the U.S. Forest Service in the Black Hills National Forest. She performed fieldwork in compliance with Section 404 federal permitting process and state and local regulations for jurisdictional wetlands. Katie completed nationwide permit process for submission to the USACE. Responsibilities for this project also included management of the client contract, safety compliance, and correspondence with client and federal agencies. Katie also prepared a PowerPoint presentation for the client and USFS staff regarding the vegetation, soils, and wetlands surveyed at the project area.

RECEIVED
APR 2 7 2021
MINERALS & MINING PROGRAM

FINAL

SIMON CONTRACTORS LORING QUARRY VEGETATION SURVEY SITE SUMMARY

PREPARED FOR:

H2E, Inc.
801 East 4th Street, Suite 5
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Contact: Becky Morris, Ph.D.
(307) 696-7007

PREPARED BY:

ICF
405 West Boxelder Road, Suite A-5
Gillette, WY 82718
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(307) 687-4770

March 2021

ICF. 2021. *Simon Contractors Loring Quarry Vegetation Survey Site Summary*. Final. March. (ICF 00374.20) Gillette, WY. Prepared for H2E, Inc. Gillette, WY.

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Introduction

Simon Contractors of SD, Inc. (Simon) is in need of applying for a large-scale mine permit for its Loring Quarry (limestone) from the state of South Dakota. The project area is approximately 4 miles south of Pringle along Highway 89 in Custer County, South Dakota and occurs on land privately held by Simon. The mine includes approximately 162 acres throughout portions of Section 33 and 34, T5S:R4E. This area encompasses the current mining parcel (45 acres) in Section 33, a large portion of which (approximately 40 acres, 89 percent) is currently disturbed by the existing quarry or other man-made features.

Simon will be applying for a large-scale mine permit with the South Dakota Department of Environment and Natural Resources (SD DENR) Minerals and Mining Program. H2E, Inc (H2E), on behalf of Simon, awarded and contracted the baseline vegetation survey to ICF in June 2020. The baseline vegetation survey report detailing survey data and results will be included with the permit documents compiled and submitted by H2E.

This report presents baseline information regarding vegetation and ecological site characteristics within the project area. The information gathered from field sampling will be used by the applicant and the SD DENR to develop the reclamation plan for the project area.

Methods

Vegetation sampling procedures were modeled after the Bureau of Land Management (BLM) Assessment, Inventory, and Monitoring (AIM) Strategy (USDA-ARS 2017). The sampling methods were determined by ICF prior to the on-site survey. One team of two biologists from ICF completed the vegetation surveys at the project area between June 29 and 30, 2020. The majority of sample points were accessed by foot.

Prior to fieldwork the project area was mapped with aerial imagery to delineate vegetation communities. The mapped vegetation communities were field verified prior to sampling. Existing Natural Resources Conservation Service (NRCS) soil map units and descriptions of the ecological sites were available and reviewed for the project area prior to the on-site survey. Based on mapping from aerial imagery, field verification, and existing ecological site descriptions, the following vegetation communities were determined to be present: Upland Grassland, Lowland Grassland, and Woodland. Transects were selected within each vegetation type that best represented the community and were within the proposed project area boundary. Three transects were collected within each vegetation community.

Sample points consisted of three 25.0-meter transects orientated at random compass directions but within the mapped vegetation community and proposed project area boundary. Collected along each transect were data from a line-point intercept at 0.5-meter intervals for a total of 50 hits. Top layer (first hit), lower layers (second and third hits), basal hits, and soil surface were recorded at each interval. A species inventory was completed within 0.5-meters on either side of the vegetation transect to create a 25.0-meter square belt. Site characterizations and observations at each sample point were recorded.

A photo was taken at each transect. A photo board was used at each transect to label the pictures; this included the site name, date, transect name, and degree orientation. Latitude and longitude data were collected using an iPad with ArcGIS Collector software at each transect location.

All field data collected were entered into the Database for Inventory, Monitoring, and Assessment (DIMA), a customizable software tool for data collection, management, and interpretation. DIMA reports were generated to interpret the field data collected.

During the transect data collection, critical vegetation resources were surveyed for within the project area boundary. Critical vegetation resources include riparian zones, mountain meadows, wetlands, and threatened or endangered species.

General

Nine plots within three vegetation communities were collected for vegetation site information. Three plots were collected in the Upland Grassland (UPL1, UPL2, UPL3), three plots in the Lowland Grassland (LL1, LL2, LL3), and three plots in the Woodland (WL1, WL2, WL3). See Addendum 1 for the result tables, Addendum 2 for figures of the project area and sample locations, and Addendum 3 for photos of the transects and general views.

The project area is in the Black Hills region of South Dakota. It is within the Major Land Resource Area (MLRA) 62 – Black Hills (USDA NRCS 2006). The area ranges in elevation from 3,600 to 6,565 feet with moderately sloping hills and ridges. Annual average precipitation is between 16 and 37 inches and increases or decreases with the elevation from west to east and north to south. The annual snowfall ranges from about 60 inches at the lower elevations to as much as 140 inches at the higher elevations. The average annual temperature is 36 to 48 degrees Fahrenheit. The freeze free period averages 125 days and ranges from 85 to 165 days (USDA NRCS 2006).

The project area supports open areas to dense forest vegetation and pine and spruce species grow at higher elevations. Cool and warm season grasses are the most common under open forest stands along with forb and shrub species (USDA NRCS 2006). The project area is primarily used as a quarry and pasture for cattle grazing with incidental use for wildlife habitat.

Table 1 illustrates the transect name, latitude and longitude, and azimuth. Table 2 shows each vegetation community type and disturbance and acreage of each. Table 3 illustrates the ecological sites within the project area and the associated acreages.

Table 1. Loring Quarry Project Area Summary of Transects

Area Description	Transect Name	Latitude/Longitude	Azimuth
Lowland Grassland	LL1	43.574311, -103.642752	180
	LL2	43.571603, -103.639276	320
	LL3	43.568923, -103.637903	158
Upland Grassland	UPL1	43.575852, -103.643091	325
	UPL2	43.573026, -103.640071	120
	UPL3	43.5704, -103.643962	242
Woodland	WL1	43.570009, -103.64532	292
	WL2	43.571224, -103.642221	60
	WL3	43.567473, -103.638751	4

Table 2. Loring Quarry Project Area Acreages by Vegetation Type and Disturbance

Area Description	Acreages	Percent
Lowland Grassland	5.2	3
Upland Grassland	82.5	51
Woodland	24.0	15
Disturbed Grassland	4.1	2
Disturbed – Infrastructure, gravel piles	15.9	10
Disturbed – Pit	15.7	10
Disturbed – Spoil, topsoil, etc.	14.4	9
Total	161.8	

Table 3. Loring Quarry Project Area Acreages by Ecological Site

Area Description	Acreages
Loamy Overflow 17-22	59.2
Shallow Loamy 62C / Loamy 62C	29.2
Shallow Loamy 62C / Non-Site	5.9
Thin Upland / No Data / Shallow Loamy 62C	17.4
Non-site (disturbed area)	50.7
Total	161.8

Lowland Grassland

Line-point intercept sampling was carried out at three transects within the Lowland Grassland vegetation community. Vegetation cover was recorded at 89 percent of the first hits along the transects. Smooth brome (*Bromus inermis*) represented the majority (47%) of vegetated first hits along the three transects followed by Kentucky bluegrass (*Poa pratensis*) (21%). No bare ground hits were recorded.

Lowland transects, LL1, LL2, and LL3 are identified within the Loamy Overflow 17-22 ecological site as mapped by the NRCS. The Loamy Overflow ecological site for the project area (MLRA 60 – Black Hills) is incomplete or has not undergone quality control and quality assurance review (NRCS 2020). However, Overflow ecological site, adjacent to the project area (MLRA 61 –Black Hills Foot Slopes), was available. These sites are located on nearly level lowlands and drainageways. The soils are moderately well to well drained and formed in alluvium with a surface layer of 4 to 10 inches thick of silt loam to fine sandy loam. Vegetation changes are subject to weather deviations, management actions (such as grazing) and impacts of native and or foreign plant and animal species to the site (NRCS 2020).

Upland Grassland

Line-point intercept sampling was carried out at three transects within the Upland Grassland vegetation community. Vegetation cover was recorded at 79 percent of the first hits along the transects. Crested wheatgrass (*Agropyron cristatum*) represented the majority (58 percent) vegetated first hits along the three transects followed by western wheatgrass (*Pascopyrum smithii*) (11 percent). No bare ground hits were recorded.

Upland transects UPL1 and UPL3 are identified within the Loamy Overflow 17-22 ecological site and UPL2 was identified within the Shallow Loamy 62C / Loamy 62C ecological site as mapped by the NRCS. The Shallow Loamy ecological sites are located on upland landscapes with shallow soils and have a loamy surface layer ranging from 2 to 6 inches in depth. Slopes range from 2 to 60 percent and the site does not receive additional water from runoff or overflow. Vegetation is generally warm season grass species with cool season species also present. Forbs are common and diverse but never dominant. Ponderosa pine (*Pinus ponderosa*) can be found scattered throughout these sites (NRCS 2020).

The Loamy ecological sites are located on upland landscapes. The site has a loamy surface layer with a thickness less than 15 inches in depth. Most soils have calcium carbonates in the profile and are typically located 12 inches or greater in depth. Slopes range from 0 to 15 percent and the site does not receive additional water from runoff or overflow. Vegetation generally consists of both cool and warm season grasses. Forbs are common and diverse but never dominant and shrubs are often present in the vegetation community. The site is vulnerable to pine encroachment from adjacent areas (NRCS 2020).

Woodland

Line-point intercept sampling was carried out at three transects within the Woodland vegetation community. Vegetation cover was recorded at 74 percent of the first hits along the transects. Ponderosa pine represented the majority (30 percent) vegetated first hits along the three transects followed by blue grama (*Bouteloua gracilis*) (10 percent). One bare ground hit was recorded (2 percent).

Figure 3-3 in Addendum 3 illustrates tree canopy cover within the Woodland vegetation type found within the project area. Tree canopy cover in the project area was calculated by using United States Geological Survey (USGS) Landscape Fire and Resource Management Planning Tools (LANDFIRE) Remap Forest Canopy Cover. The forest canopy cover shows the vertical projections of tree canopy onto an imaginary horizonal surface that represents the ground surface (USGS 2020).

Woodland transect WL1 was identified within Shallow Loamy 62C / Loamy 62C ecological, WL2 was identified within Thin Upland / No Data / Shallow Loamy 62C ecological site, and WL3 was identified within the Shallow Loamy 62C / Non-Site ecological site as mapped by the NRCS.

The Thin Upland ecological sites are located on upland landscapes with shallow soils and have a loamy surface layer ranging from 2 to 6 inches in depth. Slopes range from 2 to 60 percent and the site does not receive additional water from runoff or overflow. Vegetation is generally warm season grass species with cool season species also present. Forbs are common and diverse but never dominant. Ponderosa pine can be found scattered throughout these sites (NRCS 2020).

Disturbed Grassland

An area to the west and south of the pit is classified by ecological site mapping as a Non-Site. Aerial imagery and the on-site field visit confirmed that that area had previously been disturbed by mining. Upland vegetation is present at the site with scattered ponderosa pine saplings. The area appears to have been stripped and overburden was piled to the west of the area. The overburden pile is also vegetated with perennial and annual grasses, forbs to include wavyleaf thistle (*Cirsium undulatum*), upright prairie cone flower (*Ratibida columnifera*), curlycup gumweed (*Grindelia squarrosa*), and ponderosa pine saplings.

Threatened, Endangered, and Rare Plant Species and Critical Vegetation Resources

No threatened, endangered, and rare plant species were observed during the field survey. A search of the South Dakota Natural Heritage Database did not find any documented records for threatened, endangered, or rare plants species within the project area boundary. No observations of critical vegetation resources were noted during the field survey.

References

South Dakota Department of Agriculture. 2020. *County Noxious Weed and Pest List.* https://sdda.sd.gov/ag-services/weed-and-pest-control/weed-pest-control/county-noxious-weed-pest-list-and-distribution-maps/default.aspx Accessed August 2020.

South Dakota Department of Agriculture. 2020. *State Noxious Weed and Pest List.* https://sdda.sd.gov/ag-services/weed-and-pest-control/weed-pest-control/sd-state-noxious-weed-declared-pest-list-and-distribution-maps/. Accessed August 2020.

South Dakota Natural Heritage Program. 2018. R*are Plants of South Dakota*. South Dakota Game, Fish and Parks, Pierre, South Dakota. https://gfp.sd.gov/rare-plants/. Accessed June 2020.

United States Department of Agriculture – Agricultural Research Service (USDA-ARS). 2017. Assessment, Inventory, and Monitoring (AIM) Strategy. *Monitoring Manuals for Grasslands, Shrublands, and Savanna Ecosystems*. Second Edition Volume I: Core Methods. https://jornada.nmsu.edu/monit-assess/manuals/monitoring Accessed June 2020.

United States Department of Agriculture – Agricultural Research Service (USDA-ARS) Jornada Experimental Range. 2020. *Database for Inventory, Monitoring, and Assessment (DIMA)*. https://jornada.nmsu.edu/monit-assess/dima. Accessed July 2020.

United States Department of Agriculture – Agricultural Research Service (USDA-ARS) Jornada Experimental Range. 2020a. *Ecosystems Dynamics Interpretive Tool (EDIT).* https://edit.jornada.nmsu.edu/catalogs/esd. Accessed August 2020.

United States Department of Agriculture Natural Resources Conservation Service (USDA NRCS). 2006. *Land Resource Regions and Major Land Resource Areas of the United States, the Caribbean, and the Pacific Basin*. U.S. Department of Agriculture Handbook 296. https://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_050898.pdf Accessed June 2020.

United States Department of Agriculture Natural Resources Conservation Service (USDA NRCS). 2020. *Ecological Site Descriptions.* https://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/landuse/rangepasture/?cid=stelprdb1068392. Accessed August 2020.

United States Department of Agriculture Natural Resources Conservation Service (USDA NRCS). 2020a. *The PLANTS Database*. http://plants.usda.gov. August 2020. National Plant Data Team, Greensboro, NC 27401-4901 USA. Accessed August 2020.

United States Geological Survey (USGS). 2020. LANDFIRE Remap Forest Canopy Cover [ArcGIS].

Addendum 1
Result Tables and Raw Data

Addendum 1-1. Loring Quarry Line-Point Intercept Summary by Vegetation Type and Transect

Vegetation Type	Line	Foliar Cover	Bare Ground	Basal Cover	Total Ground Cover	Ground Cover Between-Plant Cover	Ground Cover Under-Plant Cover	Total Litter	Litter Between-Plant Cover	Litter Under-Plant Cover
Lowland	1	41	0	0	50	9	41	49	8	41
Lowland	2	45	0	0	50	5	45	50	50	45
Lowland	3	48	0	0	50	2	48	50	2	48
	Average:	45	0	0	50	5	45	50	5	45
Upland	1	31	0	0	50	19	31	49	19	30
Upland	2	39	0	1	48	10	38	47	10	37
Upland	3	48	0	0	50	2	48	50	2	48
	Average:	39	0	0	49	10	39	49	10	38
Woodland	1	40	0	0	50	10	40	50	10	40
Woodland	2	39	0	0	50	11	39	50	11	39
Woodland	3	32	1	1	42	17	25	34	12	22
	Average:	37	0	0	47	13	35	45	11	34

Foliar Cover - # of hits with a "real plant code" in the top layer
Bare Ground - # of hits with "none" in top layer and no subsequent layer hits.
Basal Cover - # of hits with a "real plant code" as the soil surface.
Ground Cover - # of hits with litter, rock, and/or basal.
Count, N=50 total points

Ground Cover Between Plant Cover – # of hits between ground cover and layer hits
Ground Cover Under Plant Cover - # of hits noted under the top layer hit
Total Litter - # of hits with either "litter" or "woody litter"
Litter Between Plant Cover – # of hits with litter under top layer and ground cover
Litter Under Plant Cover - # of hits with litter under top layer hit

Addendum 1-2. Loring Quarry Line-Point Intercept Summary Percentage by Vegetation Type and Transect

Vegetation Type	Line	% Foliar Cover	% Bare Ground	% Basal Cover	% Total Ground Cover	% Ground Cover Between-Plant Cover	% Ground Cover Under-Plant Cover	% Total Litter	% Litter Between-Plant Cover	% Litter Under-Plant Cover
Lowland	1	82	0	0	100	18	82	98	16	82
Lowland	2	90	0	0	100	10	90	100	10	90
Lowland	3	96	0	0	100	4	96	100	4	96
	Average:	89	0	0	100	11	89	99	10	89
Upland	1	62	0	0	100	38	62	98	38	60
Upland	2	78	0	2	96	20	76	94	20	74
Upland	3	96	0	0	100	4	96	100	4	96
	Average:	79	0	1	99	21	78	97	21	77
Woodland	1	80	0	0	100	20	80	10	20	80
Woodland	2	78	0	0	100	22	78	100	22	78
Woodland	3	64	2	2	84	34	50	68	24	44
	Average:	74	1	1	95	25	69	89	22	67

Foliar Cover - # of hits with a "real plant code" in the top layer
Bare Ground - # of hits with "none" in top layer and no subsequent layer hits.
Basal Cover - # of hits with a "real plant code" as the soil surface.
Ground Cover - # of hits with litter, rock, and/or basal.
Count, N=50 total points

Ground Cover Between Plant Cover – # of hits between ground cover and layer hits
Ground Cover Under Plant Cover - # of hits noted under the top layer hit
Total Litter - # of hits with either "litter" or "woody litter"
Litter Between Plant Cover – # of hits with litter under top layer and ground cover
Litter Under Plant Cover - # of hits with litter under top layer hit

Addendum 1-3. Loring Quarry Lowland Grassland Species Inventory

Species Code	Scientific Name	Common Name	Lifeform	Transect
AF05	---	Unknown forb	Annual forb	1, 2, 3
ACHY	*Achnatherum hymenoides*	Indian ricegrass	Perennial grass	1
ACMI2	*Achillea millefolium.*	Common yarrow	Perennial forb	2
AGCR	*Agropyron cristatum*	Crested wheatgrass	Perennial grass	2, 3
APAN2	*Apocynum androsaemifolium*	Spreading dogbane	Perennial forb	2
ARLU	*Artemisia ludoviciana*	White sagebrush	Perennial subshrub	1, 2, 3
BRAR5	*Bromus arvensis*	Field brome	Annual grass	1, 2, 3
BRIN2	*Bromus inermis*	Smooth brome	Perennial grass	1, 3
BRTE	*Bromus tectorum*	Cheatgrass	Annual grass	2, 3
CAREX	*Carex*	Carex	Grass-like	1
CHLE4	*Chenopodium leptophyllum*	Narrowleaf goosefoot	Annual forb	1, 2, 3
COAR4*	*Convolvulus arvensis*	Field bindweed	Biennial forb	1, 2, 3
ECAN2	*Echinacea angustifolia*	Blacksamson echinacea	Perennial forb	3
IRMI	*Iris missouriensis*	Rocky Mountain iris	Perennial forb	1, 2, 3
MELU	*Medicago lupulina*	Black medick	Annual forb	3
MESA	*Medicago sativa*	Alfalfa	Perennial forb	1, 2, 3
NAVI4	*Nassella viridula*	Green needlegrass	Perennial grass	2, 3
PASM	*Pascopyrum smithii*	Western wheatgrass	Perennial grass	1, 2, 3
PEAR6	*Pediomelum argophyllum*	Silverleaf Indian breadroot	Perennial forb	1, 3
POPR	*Poa pratensis*	Kentucky bluegrass	Perennial grass	1, 2, 3
ROWO	*Rosa woodsia*	Woods' rose	Perennial subshrub	1, 2, 3
RACO3	*Ratibida columnifera*	Upright prairie coneflower	Perennial forb	3
RUAQ	*Rumex aquaticus*	Western dock	Perennial forb	1
SILA21	*Silene latifolia*	Bladder campion	Biennial forb	3
THAR5	*Thlaspi arvense*	Field pennycress	Annual forb	2
THRH	*Thermopsis rhombifolia*	Prairie thermopsis	Perennial forb	1
VEST	*Verbena stricta*	Hoary verbena	Annual forb	1, 2, 3

*Local Noxious Weed
Total Species Observed Transect 1 – 17
Total Species Observed Transect 2 – 17
Total Species Observed Transect 3 – 20

Addendum 1-4. Loring Quarry Upland Grassland Species Inventory

Species Code	Scientific Name	Common Name	Lifeform	Transect
AF05	---	Unknown forb	Annual forb	2
AF19	---	Unknown forb	Annual forb	2
AGCR	*Agropyron cristatum*	Crested wheatgrass	Perennial grass	1, 2, 3
ARFR4	*Artemisia frigida.*	Prairie sagewort	Perennial subshrub	1, 2
BRAR5	*Bromus arvensis*	Field brome	Annual grass	1
BRTE	*Bromus tectorum*	Cheatgrass	Annual grass	1
COAR4*	*Convolvulus arvensis*	Field bindweed	Perennial forb	1, 2, 3
DEPI	*Descurainia pinnata*	Western tansymustard	Biennial forb	1
ECAN2	*Echinacea angustifolia*	Blacksamson echinacea	Perennial forb	1, 2
ERST3	*Erigeron strigosus*	Prairie fleabane	Biennial forb	2
GRSQ	*Grindelia squarrosa*	Curlycup gumweed	Biennial forb	2
GUSA2	*Gutierrezia sarothrae*	Broom snakeweed	Perennial shrub	2
HECO26	*Hesperostipa comata*	Needle and thread	Perennial grass	2
IRMI	*Iris missouriensis*	Rocky Mountain iris	Perennial forb	2
MELU	*Medicago lupulina*	Black medic	Annual forb	1, 2, 3
MESA	*Medicago sativa*	Alfalfa	Perennial forb	1, 2, 3
PASM	*Pascopyrum smithii*	Western wheatgrass	Perennial grass	1, 3
PEAR6	*Pediomelum argophyllum*	Silverleaf Indian breadroot	Perennial forb	1, 2
POPR	*Poa pratensis*	Kentucky bluegrass	Perennial grass	1, 2, 3
RACO3	*Ratibida columnifera*	Upright prairie coneflower	Perennial forb	2
SILA21	*Silene latifolia*	Bladder compion	Biennial forb	1
SPCO	*Sphaeralcea coccinea*	Scarlet globemallow	Biennial forb	1, 2
TRDU	*Tragopogon dubius.*	Yellow salsify	Biennial forb	1
VIAM	*Vicia americana*	American vetch	Perennial forb	1

*Local Noxious Weed
Total Species Observed Transect 1 – 16
Total Species Observed Transect 2 – 17
Total Species Observed Transect 3 – 6

Addendum 1-5. Loring Quarry Woodland Species Inventory

Species Code	Scientific Name	Common Name	Lifeform	Transect
AF05	---	Unknown forb	Annual forb	2, 3
AF10	---	Unknown forb	Annual forb	1
AF11	---	Unknown forb	Annual forb	1
AF14	---	Unknown forb	Annual forb	2
AF17	---	Unknown forb	Annual forb	3
AF18	---	Unknown forb	Annual forb	3
AF19	---	Unknown forb	Annual forb	3
ACMI2	*Achillea millefolium*	Common yarrow	Perennial forb	2
APAN2	*Apocynum androsaemilfolium*	Spreading dogbane	Perennial forb	2, 3
ARFR4	*Artemisia frigida*	Prairie sagewort	Perennial subshrub	2, 3
ARLU	*Artemisia ludoviciana*	White sagebrush	Perennial subshrub	2, 3
BOGR2	*Bouteloua gracilis*	Blue grama	Perennial grass	3
BRAR5	*Bromus arvensis*	Field brome	Annual grass	3
BRIN2	*Bromus inermis*	Smooth brome	Perennial grass	1, 2, 3
CAFI	*Carex filifolia*	Threadleaf sedge	Grass-like	3
CARO2	*Campanula rotundifolia*	Bluebell bellflower	Perennial forb	3
CHLE4	*Chenopodium leptophyllum*	Narrowleaf goosefoot	Annual forb	1, 2
CIUN	*Circium undulatum*	Wavyleaf thistle	Biennial forb	3
DEPI	*Descurainia pinnata*	Western tansymustard	Annual forb	2
ECAN2	*Echinacea angustifolia*	Blacksamson echinacea	Perennial forb	2
ERSTS3	*Erigeron strigosus*	Prairie fleabane	Biennial forb	1, 2
ERFL4	*Eriogonum flavum*	Alpine golden buckwheat	Perennial forb	3
HECO26	*Hesperostipa comate*	Needle and thread	Perennial grass	2, 3
KOMA	*Koeleria macrantha*	Prairie Junegrass	Perennial grass	2
MELU	*Medicago lupulina*	Black medick	Annual forb	2, 3
NAVAR	*Navarretia*	Pincushion plant	Annual forb	3
NAVI4	*Nassella viridula*	Green needlegrass	Perennial grass	1, 2, 3
OPPO	*Opuntia polyacantha*	Plains pricklypear	Perennial shrub	3
PASM	*Pascopyrum smithii*	Western wheatgrass	Perennial grass	1, 2, 3
PEAR6	*Pediomelum argophyllum*	Silverleaf Indian breadroot	Perennial forb	1, 2, 3
PHHO	*Phlox hoodia*	Spiny phlox	Perennial forb	3
PIPO	*Pinus ponderosa*	Ponderosa pine	Tree	1, 2, 3
PLPA2	*Plantago patagonica*	Wooly plantain	Annual forb	3
POAL4	*Polgala alba*	White milkwort	Perennial forb	2
POPR	*Poa pratensis*	Kentucky bluegrass	Perennial grass	1, 2, 3
RHAR4	*Rhus aromatic*	Fragrant sumac	Perennial shrub	2, 3
RIOX	*Ribes oxyacanthoides*	Canadian gooseberry	Perennial shrub	2, 3
ROWO	*Rosa woodsia*	Woods' rose	Perennial subshrub	1, 3
SCSC	*Schizachyrium scoparium*	Little bluestem	Perennial grass	3

Species Code	Scientific Name	Common Name	Lifeform	Transect
SILA21	*Silene latifolia*	Bladder campion	Biennial forb	1, 2, 3
SPCO	*Sphaeralcea coccinea.*	Scarlet globemallow	Biennial forb	2
TEAC	*Tetraneuris acaulis*	Stemless four-nerve daisy	Perennial forb	3
VIAM	*Vicia Americana*	American vetch	Perennial forb	1, 2
LICHEN*	*Lichen*	Lichen	Nonvascular	3

Total Species Observed Transect 1 – 13
Total Species Observed Transect 2 – 25
Total Species Observed Transect 3 – 32
*LICHEN – not included in raw data.

Addendum 1-6. Loring Quarry Lowland Grassland Line-Point Intercept Transect Data

Species Code	Average Number of 1st Hits	% of 1st Hits	Average Number of Overall Hits	Relative % of Overall Hits
AF05	0.013	1%	0.033	3%
AGCR	0.033	3%	0.040	4%
APAN2	0.027	3%	0.040	4%
ARLU	0.007	1%	0.020	2%
BRAR5	0.007	1%	0.007	1%
BRIN2	0.497	47%	0.513	51%
BRTE	0.007	1%	0.013	1%
CHLE4	0.007	1%	0.033	3%
COAR4	0.007	1%	0.027	3%
IRMI	0.013	1%	0.020	2%
MELU	0.007	1%	0.013	1%
MESA	0.007	1%	0.007	1%
NAVI4	0.020	2%	0.020	2%
PASM	0.053	5%	0.080	8%
PEAR6	0.007	1%	0.007	1%
POPR	0.207	21%	0.320	32%
ROWO	0.007	1%	0.007	1%
Ave Total Foliar Hits	0.893	89%	0.913	91%
Ave Total Litter Hits	0.000	0%	0.993	99%
Ave Total Non-veg Litter Hits	0.000	0%	0.007	1%
Ave Total Rock Hits	0.000	0%	0.027	3%
Ave Total Bare Soil	0.000	0%	0.000	0%
Ave Total Ground Cover	0.000	0%	1.000	100%

1st Hit Ave. – sum of line averages where X indicator occurred only in the top layer for all the lines in the plot / total number of lines
Any Hit Ave. – sum of line averages where X indicator occurred in any layer once for all the lines in the plot / total number of lines

Addendum 1-7. Loring Quarry Upland Grassland Line-Point Intercept Transect Data

Species Code	Average Number of 1st Hits	% of 1st Hits	Average Number of Overall Hits	Relative % of Overall Hits
AGCR	0.580	58%	0.647	65%
ARFR4	0.013	1%	0.033	3%
BRAR5	0.007	1%	0.007	1%
BRTE	0.000	0%	0.007	1%
COAR4	0.027	3%	0.033	3%
MELU	0.020	2%	0.060	6%
MESA	0.013	1%	0.020	2%
PASM	0.107	11%	0.187	19%
POPR	0.020	2%	0.027	3%
SPCO	0.000	0%	0.013	1%
VIAM	0.000	0%	0.007	1%
Ave Total Foliar Hits	0.787	79%	0.920	92%
Ave Total Litter Hits	0.000	0%	0.967	97%
Ave Total Non-veg Litter Hits	0.000	0%	0.020	2%
Ave Total Duff Hits	0.000	0%	0.007	1%
Ave Total Rock Hits	0.000	0%	0.027	3%
Ave Total Basal Hits	0.000	0%	0.007	1%
Ave Total Bare Soil	0.000	0%	0.000	0%
Ave Total Ground Cover	0.000	0%	1.000	100%

1st Hit Ave. – sum of line averages where X indicator occurred only in the top layer for all the lines in the plot / total number of lines

Any Hit Ave. – sum of line averages where X indicator occurred in any layer once for all the lines in the plot / total number of lines

Addendum 1-8. Loring Quarry Woodland Line-Point Intercept Transect Data

Species Code	Average Number of 1st Hits	% of 1st Hits	Average Number of Overall Hits	Relative % of Overall Hits
AF05	0.000	0%	0.007	1%
AF14	0.007	1%	0.013	1%
AF17	0.007	1%	0.007	1%
APAN2	0.013	1%	0.020	2%
ARFR4	0.013	1%	0.020	2%
BOGR2	0.100	10%	0.107	11%
BRIN2	0.040	4%	0.100	10%
HECO26	0.027	3%	0.047	5%
MELU	0.000	0%	0.007	1%
NAVI4	0.047	5%	0.053	5%
PASM	0.040	4%	0.100	10%
PIPO	0.300	30%	0.300	30%
POPR	0.073	7%	0.173	17%
ROWO	0.000	0%	0.007	1%
SCSC	0.067	7%	0.073	7%
SILA21	0.007	1%	0.007	1%
TEAC	0.000	0%	0.007	1%
Ave Total Foliar Hits	0.740	74%	0.780	78%
Ave Total Litter Hits	0.000	0%	0.893	89%
Ave Total Woody Litter Hits	0.000	0%	0.033	3%
Ave Total Rock Hits	0.000	0%	0.087	1%
Ave Total Basal Hits	0.000	0%	0.007	1%
Ave Total Bare Soil	0.000	0%	0.007	1%
Ave Total Ground Cover	0.000	0%	0.947	95%

1st Hit Ave. – sum of line averages where X indicator occurred only in the top layer for all the lines in the plot / total number of lines

Any Hit Ave. – sum of line averages where X indicator occurred in any layer once for all the lines in the plot / total number of lines

Addendum 1-9. Loring Quarry Raw Line-Point Intercept Transect Data

Site	Plot	Line	Date	PointLoc	PointNbr	TopCanopy	Lower1	Lower2	Lower3	Lower4	SoilSurface
LQ	Lowland	1	6/29/2020	0.5	1	IRMI	BRIN2	PASM	L		S
LQ	Lowland	1	6/29/2020	1	2	BRIN2	L				S
LQ	Lowland	1	6/29/2020	1.5	3	BRIN2	L				S
LQ	Lowland	1	6/29/2020	2	4	CHLE4	L				S
LQ	Lowland	1	6/29/2020	2.5	5	None	L				S
LQ	Lowland	1	6/29/2020	3	6	BRIN2	L				S
LQ	Lowland	1	6/29/2020	3.5	7	None	L				S
LQ	Lowland	1	6/29/2020	4	8	BRIN2	POPR	L			S
LQ	Lowland	1	6/29/2020	4.5	9	BRIN2	POPR	L			S
LQ	Lowland	1	6/29/2020	5	10	BRIN2	L				S
LQ	Lowland	1	6/29/2020	5.5	11	None	L				S
LQ	Lowland	1	6/29/2020	6	12	BRIN2	POPR	L			S
LQ	Lowland	1	6/29/2020	6.5	13	None	L	BRIN2	L		S
LQ	Lowland	1	6/29/2020	7	14	BRIN2	COAR4	L			S
LQ	Lowland	1	6/29/2020	7.5	15	AFOS	L				S
LQ	Lowland	1	6/29/2020	8	16	BRIN2	L				S
LQ	Lowland	1	6/29/2020	8.5	17	BRIN2	L				S
LQ	Lowland	1	6/29/2020	9	18	BRIN2	L				S
LQ	Lowland	1	6/29/2020	9.5	19	POPR	L				S
LQ	Lowland	1	6/29/2020	10	20	APAN2	PASM	POPR	L		S
LQ	Lowland	1	6/29/2020	10.5	21	BRIN2	L				S
LQ	Lowland	1	6/29/2020	11	22	BRIN2	L				S
LQ	Lowland	1	6/29/2020	11.5	23	BRIN2	L				S
LQ	Lowland	1	6/29/2020	12	24	POPR	L				S
LQ	Lowland	1	6/29/2020	12.5	25	BRIN2	L				S
LQ	Lowland	1	6/29/2020	13	26	BRIN2	L				S
LQ	Lowland	1	6/29/2020	13.5	27	BRIN2	L				S
LQ	Lowland	1	6/29/2020	14	28	BRIN2	L				S
LQ	Lowland	1	6/29/2020	14.5	29	BRIN2	POPR	L			S
LQ	Lowland	1	6/29/2020	15	30	BRIN2	L				S
LQ	Lowland	1	6/29/2020	15.5	31	BRIN2	L				S
LQ	Lowland	1	6/29/2020	16	32	None	NL				S
LQ	Lowland	1	6/29/2020	16.5	33	POPR	L				S
LQ	Lowland	1	6/29/2020	17	34	BRIN2	L				S
LQ	Lowland	1	6/29/2020	17.5	35	None	L				BY
LQ	Lowland	1	6/29/2020	18	36	POPR	L				S
LQ	Lowland	1	6/29/2020	18.5	37	POPR	L				S
LQ	Lowland	1	6/29/2020	19	38	POPR	L				S
LQ	Lowland	1	6/29/2020	19.5	39	PASM	POPR	L			S
LQ	Lowland	1	6/29/2020	20	40	None	BRIN2	L			S
LQ	Lowland	1	6/29/2020	20.5	41	BRIN2	L				S
LQ	Lowland	1	6/29/2020	21	42	POPR	L				S
LQ	Lowland	1	6/29/2020	21.5	43	POPR	L				S
LQ	Lowland	1	6/29/2020	22	44	POPR	L				S
LQ	Lowland	1	6/29/2020	22.5	45	APAN2	POPR	L			S
LQ	Lowland	1	6/29/2020	23	46	PASM	POPR	L			S
LQ	Lowland	1	6/29/2020	23.5	47	None	L				S
LQ	Lowland	1	6/29/2020	24	48	None	L				BY
LQ	Lowland	1	6/29/2020	24.5	49	POPR	COAR4	L			ST
LQ	Lowland	1	6/29/2020	25	50	BRIN2	L				ST

LQ	Lowland	2	6/29/2020	0.5	1	BRAR5	AF05	L	S
LQ	Lowland	2	6/29/2020	1	2	PASM	L		S
LQ	Lowland	2	6/29/2020	1.5	3	None	L		S
LQ	Lowland	2	6/29/2020	2	4	PASM	POPR	L	S
LQ	Lowland	2	6/29/2020	2.5	5	ROWO	ARLU	POPR L	S
LQ	Lowland	2	6/29/2020	3	6	POPR	L		S
LQ	Lowland	2	6/29/2020	3.5	7	PASM	AF05	L	S
LQ	Lowland	2	6/29/2020	4	8	BRIN2	POPR	L	S
LQ	Lowland	2	6/29/2020	4.5	9	POPR	BRIN2	L	S
LQ	Lowland	2	6/29/2020	5	10	AF05	POPR	L	S
LQ	Lowland	2	6/29/2020	5.5	11	None	L	PASM L	S
LQ	Lowland	2	6/29/2020	6	12	IRMI	AGCR	L	S
LQ	Lowland	2	6/29/2020	6.5	13	AGCR	L		S
LQ	Lowland	2	6/29/2020	7	14	PASM	BRTE	L	S
LQ	Lowland	2	6/29/2020	7.5	15	BRTE	L		S
LQ	Lowland	2	6/29/2020	8	16	AGCR	L		S
LQ	Lowland	2	6/29/2020	8.5	17	None	L		S
LQ	Lowland	2	6/29/2020	9	18	AGCR	L		S
LQ	Lowland	2	6/29/2020	9.5	19	POPR	L		S
LQ	Lowland	2	6/29/2020	10	20	AGCR	POPR	L	S
LQ	Lowland	2	6/29/2020	10.5	21	POPR	L		S
LQ	Lowland	2	6/29/2020	11	22	BRIN2	L		S
LQ	Lowland	2	6/29/2020	11.5	23	None	L		S
LQ	Lowland	2	6/29/2020	12	24	AGCR	L		S
LQ	Lowland	2	6/29/2020	12.5	25	ARLU	BRIN2	L	S
LQ	Lowland	2	6/29/2020	13	26	POPR	ARLU	CHLE4 L	S
LQ	Lowland	2	6/29/2020	13.5	27	POPR	CHLE4	L	S
LQ	Lowland	2	6/29/2020	14	28	POPR	L		S
LQ	Lowland	2	6/29/2020	14.5	29	POPR	L		S
LQ	Lowland	2	6/29/2020	15	30	POPR	L		S
LQ	Lowland	2	6/29/2020	15.5	31	COAR4	L		S
LQ	Lowland	2	6/29/2020	16	32	POPR	CHLE4	L	S
LQ	Lowland	2	6/29/2020	16.5	33	NAVI4	L		S
LQ	Lowland	2	6/29/2020	17	34	NAVI4	L		S
LQ	Lowland	2	6/29/2020	17.5	35	POPR	L		S
LQ	Lowland	2	6/29/2020	18	36	POPR	L		S
LQ	Lowland	2	6/29/2020	18.5	37	POPR	PASM	L	S
LQ	Lowland	2	6/29/2020	19	38	None	L		S
LQ	Lowland	2	6/29/2020	19.5	39	POPR	AF05	L	S
LQ	Lowland	2	6/29/2020	20	40	POPR	L		S
LQ	Lowland	2	6/29/2020	20.5	41	POPR	APAN2	POPR L	S
LQ	Lowland	2	6/29/2020	21	42	POPR	COAR4	L	S
LQ	Lowland	2	6/29/2020	21.5	43	NAVI4	APAN2	POPR L	S
LQ	Lowland	2	6/29/2020	22	44	APAN2	IRMI	POPR L	S
LQ	Lowland	2	6/29/2020	22.5	45	POPR	BRIN2	L	S
LQ	Lowland	2	6/29/2020	23	46	POPR	L		S
LQ	Lowland	2	6/29/2020	23.5	47	PASM	POPR	L	S
LQ	Lowland	2	6/29/2020	24	48	PASM	CHLE4	L	S
LQ	Lowland	2	6/29/2020	24.5	49	APAN2	L		S
LQ	Lowland	2	6/29/2020	25	50	POPR	L		S

LQ	Lowland	3	6/30/2020	1	2	BRIN2	L		S
LQ	Lowland	3	6/30/2020	1.5	3	BRIN2	L		S
LQ	Lowland	3	6/30/2020	2	4	BRIN2	L		S
LQ	Lowland	3	6/30/2020	2.5	5	MESA	L		S
LQ	Lowland	3	6/30/2020	3	6	BRIN2	L		S
LQ	Lowland	3	6/30/2020	3.5	7	BRIN2	L		S
LQ	Lowland	3	6/30/2020	4	8	BRIN2	L		S
LQ	Lowland	3	6/30/2020	4.5	9	BRIN2	L		S
LQ	Lowland	3	6/30/2020	5	10	BRIN2	L		S
LQ	Lowland	3	6/30/2020	5.5	11	BRIN2	L		S
LQ	Lowland	3	6/30/2020	6	12	BRIN2	L		S
LQ	Lowland	3	6/30/2020	6.5	13	BRIN2	L		S
LQ	Lowland	3	6/30/2020	7	14	BRIN2	L		S
LQ	Lowland	3	6/30/2020	7.5	15	BRIN2	L		S
LQ	Lowland	3	6/30/2020	8	16	BRIN2	L		S
LQ	Lowland	3	6/30/2020	8.5	17	BRIN2	L		S
LQ	Lowland	3	6/30/2020	9	18	POPR	L		S
LQ	Lowland	3	6/30/2020	9.5	19	BRIN2	L		S
LQ	Lowland	3	6/30/2020	10	20	BRIN2	L		S
LQ	Lowland	3	6/30/2020	10.5	21	None	L		S
LQ	Lowland	3	6/30/2020	11	22	BRIN2	L		S
LQ	Lowland	3	6/30/2020	11.5	23	BRIN2	POPR	L	S
LQ	Lowland	3	6/30/2020	12	24	MELU	L		S
LQ	Lowland	3	6/30/2020	12.5	25	BRIN2	L		S
LQ	Lowland	3	6/30/2020	13	26	BRIN2	L		S
LQ	Lowland	3	6/30/2020	13.5	27	BRIN2	L		S
LQ	Lowland	3	6/30/2020	14	28	BRIN2	L		S
LQ	Lowland	3	6/30/2020	14.5	29	BRIN2	MELU	L	S
LQ	Lowland	3	6/30/2020	15	30	BRIN2	L		S
LQ	Lowland	3	6/30/2020	15.5	31	None	L		S
LQ	Lowland	3	6/30/2020	16	32	BRIN2	L		S
LQ	Lowland	3	6/30/2020	16.5	33	BRIN2	L		S
LQ	Lowland	3	6/30/2020	17	34	BRIN2	L		S
LQ	Lowland	3	6/30/2020	17.5	35	BRIN2	L		S
LQ	Lowland	3	6/30/2020	18	36	BRIN2	L		S
LQ	Lowland	3	6/30/2020	18.5	37	BRIN2	L		S
LQ	Lowland	3	6/30/2020	19	38	BRIN2	L		S
LQ	Lowland	3	6/30/2020	19.5	39	BRIN2	L		S
LQ	Lowland	3	6/30/2020	20	40	BRIN2	L		S
LQ	Lowland	3	6/30/2020	20.5	41	BRIN2	L		S
LQ	Lowland	3	6/30/2020	21	42	BRIN2	L		S
LQ	Lowland	3	6/30/2020	21.5	43	BRIN2	L		S
LQ	Lowland	3	6/30/2020	22	44	BRIN2	L		S
LQ	Lowland	3	6/30/2020	22.5	45	BRIN2	L		S
LQ	Lowland	3	6/30/2020	23	46	BRIN2	L		S
LQ	Lowland	3	6/30/2020	23.5	47	BRIN2	L		S
LQ	Lowland	3	6/30/2020	24	48	BRIN2	L		S
LQ	Lowland	3	6/30/2020	24.5	49	PEAR6	BRIN2	L	S
LQ	Lowland	3	6/30/2020	25	50	BRIN2	L		S

Site	Plot	Line	Date	PointLoc	PointNbr	TopCanopy	Lower1	Lower2	Lower3	Lower4	SoilSurface
LQ	Upland	1	6/29/2020	0.5	1	AGCR	NL				S
LQ	Upland	1	6/29/2020	1	2	PASM	L				S
LQ	Upland	1	6/29/2020	1.5	3	None	L	PASM			S
LQ	Upland	1	6/29/2020	2	4	None	L				S
LQ	Upland	1	6/29/2020	2.5	5	None	L	PASM			S
LQ	Upland	1	6/29/2020	3	6	None	L				S
LQ	Upland	1	6/29/2020	3.5	7	PASM	L				S
LQ	Upland	1	6/29/2020	4	8	None	L				S
LQ	Upland	1	6/29/2020	4.5	9	PASM	BRTE	L			S
LQ	Upland	1	6/29/2020	5	10	BRAR5	L				S
LQ	Upland	1	6/29/2020	5.5	11	None	L	PASM	L		S
LQ	Upland	1	6/29/2020	6	12	None	L	PASM	L		S
LQ	Upland	1	6/29/2020	6.5	13	None	L	PASM			S
LQ	Upland	1	6/29/2020	7	14	None	L	PASM	L		S
LQ	Upland	1	6/29/2020	7.5	15	PASM	L				S
LQ	Upland	1	6/29/2020	8	16	None	L	PASM	L		S
LQ	Upland	1	6/29/2020	8.5	17	None	L	PASM	L		S
LQ	Upland	1	6/29/2020	9	18	None	L	AGCR	L		S
LQ	Upland	1	6/29/2020	9.5	19	None	L				S
LQ	Upland	1	6/29/2020	10	20	MELU	L				S
LQ	Upland	1	6/29/2020	10.5	21	AGCR	L				S
LQ	Upland	1	6/29/2020	11	22	PASM	MELU	L			S
LQ	Upland	1	6/29/2020	11.5	23	AGCR	L				S
LQ	Upland	1	6/29/2020	12	24	PASM	L				S
LQ	Upland	1	6/29/2020	12.5	25	None	L	PASM	L		S
LQ	Upland	1	6/29/2020	13	26	None	L	PASM	L		S
LQ	Upland	1	6/29/2020	13.5	27	PASM	L				S
LQ	Upland	1	6/29/2020	14	28	PASM	L				S
LQ	Upland	1	6/29/2020	14.5	29	AGCR	MELU	L			S
LQ	Upland	1	6/29/2020	15	30	None	L	PASM	AGCR	L	S
LQ	Upland	1	6/29/2020	15.5	31	None	L	AGCR	L		S
LQ	Upland	1	6/29/2020	16	32	AGCR	L				S
LQ	Upland	1	6/29/2020	16.5	33	AGCR	L				S
LQ	Upland	1	6/29/2020	17	34	AGCR	VIAM	L			S
LQ	Upland	1	6/29/2020	17.5	35	AGCR	L				S
LQ	Upland	1	6/29/2020	18	36	AGCR	L				S
LQ	Upland	1	6/29/2020	18.5	37	AGCR	L				S
LQ	Upland	1	6/29/2020	19	38	PASM	L				S
LQ	Upland	1	6/29/2020	19.5	39	AGCR	L				S
LQ	Upland	1	6/29/2020	20	40	POPR	L				S
LQ	Upland	1	6/29/2020	20.5	41	AGCR	L				S
LQ	Upland	1	6/29/2020	21	42	AGCR	L				S
LQ	Upland	1	6/29/2020	21.5	43	PASM	L				S
LQ	Upland	1	6/29/2020	22	44	PASM	L				S
LQ	Upland	1	6/29/2020	22.5	45	None	L	POPR	L		S
LQ	Upland	1	6/29/2020	23	46	PASM	L				S
LQ	Upland	1	6/29/2020	23.5	47	PASM	L				S
LQ	Upland	1	6/29/2020	24	48	None	L	PASM			S
LQ	Upland	1	6/29/2020	24.5	49	AGCR	L				S
LQ	Upland	1	6/29/2020	25	50	PASM	L				S

LQ	Upland	2	6/29/2020	0.5	1	None	L		S
LQ	Upland	2	6/29/2020	1	2	None	L		S
LQ	Upland	2	6/29/2020	1.5	3	AGCR	L		S
LQ	Upland	2	6/29/2020	2	4	AGCR	L		S
LQ	Upland	2	6/29/2020	2.5	5	AGCR	ARFR4	L	S
LQ	Upland	2	6/29/2020	3	6	AGCR	L		S
LQ	Upland	2	6/29/2020	3.5	7	None	L		S
LQ	Upland	2	6/29/2020	4	8	AGCR	L		S
LQ	Upland	2	6/29/2020	4.5	9	AGCR	L		S
LQ	Upland	2	6/29/2020	5	10	None	L		S
LQ	Upland	2	6/29/2020	5.5	11	None	L		S
LQ	Upland	2	6/29/2020	6	12	None	L	AGCR L	S
LQ	Upland	2	6/29/2020	6.5	13	None	L		S
LQ	Upland	2	6/29/2020	7	14	AGCR	L		S
LQ	Upland	2	6/29/2020	7.5	15	AGCR	L		S
LQ	Upland	2	6/29/2020	8	16	AGCR	L		S
LQ	Upland	2	6/29/2020	8.5	17	COAR4	L		S
LQ	Upland	2	6/29/2020	9	18	POPR	ARFR4		ARFR4
LQ	Upland	2	6/29/2020	9.5	19	AGCR	L		S
LQ	Upland	2	6/29/2020	10	20	AGCR	SPCO	L	S
LQ	Upland	2	6/29/2020	10.5	21	COAR4	L		S
LQ	Upland	2	6/29/2020	11	22	None	L		S
LQ	Upland	2	6/29/2020	11.5	23	AGCR	SPCO	NL NL	S
LQ	Upland	2	6/29/2020	12	24	AGCR	L		S
LQ	Upland	2	6/29/2020	12.5	25	None	AGCR	NL NL	S
LQ	Upland	2	6/29/2020	13	26	POPR	L		S
LQ	Upland	2	6/29/2020	13.5	27	AGCR	L		S
LQ	Upland	2	6/29/2020	14	28	AGCR	L		S
LQ	Upland	2	6/29/2020	14.5	29	AGCR	L		S
LQ	Upland	2	6/29/2020	15	30	AGCR	MELU	L	S
LQ	Upland	2	6/29/2020	15.5	31	ARFR4			D
LQ	Upland	2	6/29/2020	16	32	COAR4	L		S
LQ	Upland	2	6/29/2020	16.5	33	AGCR	L		S
LQ	Upland	2	6/29/2020	17	34	AGCR	L		S
LQ	Upland	2	6/29/2020	17.5	35	AGCR	L		S
LQ	Upland	2	6/29/2020	18	36	None	L		S
LQ	Upland	2	6/29/2020	18.5	37	AGCR	L		S
LQ	Upland	2	6/29/2020	19	38	None	L	AGCR L	S
LQ	Upland	2	6/29/2020	19.5	39	AGCR	L		S
LQ	Upland	2	6/29/2020	20	40	AGCR	MESA	L	S
LQ	Upland	2	6/29/2020	20.5	41	AGCR	L		S
LQ	Upland	2	6/29/2020	21	42	AGCR	L		S
LQ	Upland	2	6/29/2020	21.5	43	MELU	L		S
LQ	Upland	2	6/29/2020	22	44	MELU	L		S
LQ	Upland	2	6/29/2020	22.5	45	COAR4	AGCR	L	S
LQ	Upland	2	6/29/2020	23	46	AGCR	L		S
LQ	Upland	2	6/29/2020	23.5	47	MESA	AGCR	L	S
LQ	Upland	2	6/29/2020	24	48	AGCR	L		S
LQ	Upland	2	6/29/2020	24.5	49	ARFR4	COAR4	L	S
LQ	Upland	2	6/29/2020	25	50	AGCR	ARFR4	L	S

LQ	Upland	3	6/30/2020	1	2	AGCR	L			S
LQ	Upland	3	6/30/2020	1.5	3	AGCR	L			S
LQ	Upland	3	6/30/2020	2	4	AGCR	L			S
LQ	Upland	3	6/30/2020	2.5	5	AGCR	L			S
LQ	Upland	3	6/30/2020	3	6	AGCR	L			S
LQ	Upland	3	6/30/2020	3.5	7	AGCR	L			S
LQ	Upland	3	6/30/2020	4	8	AGCR	L			S
LQ	Upland	3	6/30/2020	4.5	9	AGCR	MELU	L		S
LQ	Upland	3	6/30/2020	5	10	AGCR	L			S
LQ	Upland	3	6/30/2020	5.5	11	AGCR	L			S
LQ	Upland	3	6/30/2020	6	12	AGCR	L			S
LQ	Upland	3	6/30/2020	6.5	13	PASM	L			S
LQ	Upland	3	6/30/2020	7	14	AGCR	L			S
LQ	Upland	3	6/30/2020	7.5	15	AGCR	L			S
LQ	Upland	3	6/30/2020	8	16	AGCR	L			S
LQ	Upland	3	6/30/2020	8.5	17	AGCR	L			S
LQ	Upland	3	6/30/2020	9	18	PASM	MELU	L		S
LQ	Upland	3	6/30/2020	9.5	19	AGCR	L			S
LQ	Upland	3	6/30/2020	10	20	AGCR	L			S
LQ	Upland	3	6/30/2020	10.5	21	AGCR	L			S
LQ	Upland	3	6/30/2020	11	22	AGCR	L			S
LQ	Upland	3	6/30/2020	11.5	23	AGCR	L			S
LQ	Upland	3	6/30/2020	12	24	AGCR	L			S
LQ	Upland	3	6/30/2020	12.5	25	AGCR	L			S
LQ	Upland	3	6/30/2020	13	26	AGCR	L			S
LQ	Upland	3	6/30/2020	13.5	27	AGCR	L			S
LQ	Upland	3	6/30/2020	14	28	AGCR	L			S
LQ	Upland	3	6/30/2020	14.5	29	AGCR	L			S
LQ	Upland	3	6/30/2020	15	30	MESA	L			S
LQ	Upland	3	6/30/2020	15.5	31	AGCR	L			S
LQ	Upland	3	6/30/2020	16	32	AGCR	L			S
LQ	Upland	3	6/30/2020	16.5	33	AGCR	L			S
LQ	Upland	3	6/30/2020	17	34	None	L	AGCR	L	S
LQ	Upland	3	6/30/2020	17.5	35	AGCR	L			S
LQ	Upland	3	6/30/2020	18	36	AGCR	L			S
LQ	Upland	3	6/30/2020	18.5	37	AGCR	L			S
LQ	Upland	3	6/30/2020	19	38	AGCR	MELU	L		S
LQ	Upland	3	6/30/2020	19.5	39	AGCR	L			S
LQ	Upland	3	6/30/2020	20	40	AGCR	L			S
LQ	Upland	3	6/30/2020	20.5	41	AGCR	L			S
LQ	Upland	3	6/30/2020	21	42	AGCR	L			S
LQ	Upland	3	6/30/2020	21.5	43	None	L	AGCR	L	S
LQ	Upland	3	6/30/2020	22	44	AGCR	L			S
LQ	Upland	3	6/30/2020	22.5	45	AGCR	L			S
LQ	Upland	3	6/30/2020	23	46	AGCR	L			S
LQ	Upland	3	6/30/2020	23.5	47	AGCR	L			S
LQ	Upland	3	6/30/2020	24	48	AGCR	L			S
LQ	Upland	3	6/30/2020	24.5	49	AGCR	L			S
LQ	Upland	3	6/30/2020	25	50	AGCR	L			S

Site	Plot	Line	Date	PointLoc	PointNbr	TopCanopy	Lower1	Lower2	Lower3	Lower4	SoilSurface
LQ	Woodland	1	6/29/2020	0.5	1	None	POPR	L			S
LQ	Woodland	1	6/29/2020	1	2	PASM	L				S
LQ	Woodland	1	6/29/2020	1.5	3	None	L				S
LQ	Woodland	1	6/29/2020	2	4	None	L	WL			S
LQ	Woodland	1	6/29/2020	2.5	5	None	L				S
LQ	Woodland	1	6/29/2020	3	6	PASM	L				S
LQ	Woodland	1	6/29/2020	3.5	7	POPR	L				S
LQ	Woodland	1	6/29/2020	4	8	None	L				S
LQ	Woodland	1	6/29/2020	4.5	9	NAVI4	L				ST
LQ	Woodland	1	6/29/2020	5	10	BRIN2	POPR	L			S
LQ	Woodland	1	6/29/2020	5.5	11	None	L				S
LQ	Woodland	1	6/29/2020	6	12	SILA21	L				S
LQ	Woodland	1	6/29/2020	6.5	13	POPR	L				S
LQ	Woodland	1	6/29/2020	7	14	POPR	L				S
LQ	Woodland	1	6/29/2020	7.5	15	POPR	L				S
LQ	Woodland	1	6/29/2020	8	16	None	L				S
LQ	Woodland	1	6/29/2020	8.5	17	BRIN2	L				S
LQ	Woodland	1	6/29/2020	9	18	BRIN2	L				S
LQ	Woodland	1	6/29/2020	9.5	19	PIPO	BRIN2	POPR	L		S
LQ	Woodland	1	6/29/2020	10	20	PIPO	POPR	L			S
LQ	Woodland	1	6/29/2020	10.5	21	PIPO	BRIN2	PASM	L		S
LQ	Woodland	1	6/29/2020	11	22	PIPO	L				S
LQ	Woodland	1	6/29/2020	11.5	23	PIPO	POPR	L			S
LQ	Woodland	1	6/29/2020	12	24	PIPO	BRIN2	BRIN2	L		S
LQ	Woodland	1	6/29/2020	12.5	25	PIPO	L				S
LQ	Woodland	1	6/29/2020	13	26	PIPO	L	BRIN2	L		S
LQ	Woodland	1	6/29/2020	13.5	27	POPR	L				S
LQ	Woodland	1	6/29/2020	14	28	POPR	L				S
LQ	Woodland	1	6/29/2020	14.5	29	POPR	L				S
LQ	Woodland	1	6/29/2020	15	30	POPR	L				S
LQ	Woodland	1	6/29/2020	15.5	31	PIPO	L				S
LQ	Woodland	1	6/29/2020	16	32	PIPO	POPR	L			S
LQ	Woodland	1	6/29/2020	16.5	33	PIPO	L				S
LQ	Woodland	1	6/29/2020	17	34	PIPO	PIPO	PASM	L		S
LQ	Woodland	1	6/29/2020	17.5	35	PIPO	PIPO	POPR	L		S
LQ	Woodland	1	6/29/2020	18	36	PIPO	PIPO	L			S
LQ	Woodland	1	6/29/2020	18.5	37	PIPO	L				S
LQ	Woodland	1	6/29/2020	19	38	PIPO	L				S
LQ	Woodland	1	6/29/2020	19.5	39	PIPO	L				S
LQ	Woodland	1	6/29/2020	20	40	PIPO	ROWO	L			S
LQ	Woodland	1	6/29/2020	20.5	41	PIPO	PASM	L			S
LQ	Woodland	1	6/29/2020	21	42	PIPO	PASM	POPR	L		S
LQ	Woodland	1	6/29/2020	21.5	43	PIPO	L				S
LQ	Woodland	1	6/29/2020	22	44	PIPO	L				S
LQ	Woodland	1	6/29/2020	22.5	45	None	L				S
LQ	Woodland	1	6/29/2020	23	46	None	L				S
LQ	Woodland	1	6/29/2020	23.5	47	None	L				S
LQ	Woodland	1	6/29/2020	24	48	PIPO	PASM	L			S
LQ	Woodland	1	6/29/2020	24.5	49	PIPO	PIPO	L			S
LQ	Woodland	1	6/29/2020	25	50	PIPO	POPR	L			S

LQ	Woodland	2	6/30/2020	0.5	1	None	WL	L		S
LQ	Woodland	2	6/30/2020	1	2	BRIN2	L			S
LQ	Woodland	2	6/30/2020	1.5	3	BRIN2	L			S
LQ	Woodland	2	6/30/2020	2	4	APAN2	L			S
LQ	Woodland	2	6/30/2020	2.5	5	PIPO	L	WL		S
LQ	Woodland	2	6/30/2020	3	6	PIPO	BRIN2	L		S
LQ	Woodland	2	6/30/2020	3.5	7	PIPO	POPR	L		S
LQ	Woodland	2	6/30/2020	4	8	PIPO	BRIN2	POPR	L	S
LQ	Woodland	2	6/30/2020	4.5	9	PIPO	L	PASM	L	S
LQ	Woodland	2	6/30/2020	5	10	PIPO	PASM	L		S
LQ	Woodland	2	6/30/2020	5.5	11	PIPO	L			S
LQ	Woodland	2	6/30/2020	6	12	PIPO	NAVI4	APAN2	L	S
LQ	Woodland	2	6/30/2020	6.5	13	PIPO	L			S
LQ	Woodland	2	6/30/2020	7	14	PIPO	L			S
LQ	Woodland	2	6/30/2020	7.5	15	POPR	L			S
LQ	Woodland	2	6/30/2020	8	16	None	L	POPR	L	S
LQ	Woodland	2	6/30/2020	8.5	17	POPR	L			S
LQ	Woodland	2	6/30/2020	9	18	None	L			S
LQ	Woodland	2	6/30/2020	9.5	19	APAN2	L			S
LQ	Woodland	2	6/30/2020	10	20	NAVI4	L			S
LQ	Woodland	2	6/30/2020	10.5	21	PASM	L			S
LQ	Woodland	2	6/30/2020	11	22	PASM	L			S
LQ	Woodland	2	6/30/2020	11.5	23	HECO26	L			S
LQ	Woodland	2	6/30/2020	12	24	AF14	HECO26	L		S
LQ	Woodland	2	6/30/2020	12.5	25	None	L			S
LQ	Woodland	2	6/30/2020	13	26	HECO26	L			S
LQ	Woodland	2	6/30/2020	13.5	27	HECO26	AF05	L		S
LQ	Woodland	2	6/30/2020	14	28	None	L			S
LQ	Woodland	2	6/30/2020	14.5	29	POPR	AF14	L		S
LQ	Woodland	2	6/30/2020	15	30	HECO26	L			S
LQ	Woodland	2	6/30/2020	15.5	31	PASM	L			S
LQ	Woodland	2	6/30/2020	16	32	NAVI4	L			S
LQ	Woodland	2	6/30/2020	16.5	33	None	L	POPR	L	S
LQ	Woodland	2	6/30/2020	17	34	None	L	HECO26	L	S
LQ	Woodland	2	6/30/2020	17.5	35	PASM	HECO26	L		S
LQ	Woodland	2	6/30/2020	18	36	NAVI4	L			S
LQ	Woodland	2	6/30/2020	18.5	37	None	L			S
LQ	Woodland	2	6/30/2020	19	38	None	L	POPR	L	S
LQ	Woodland	2	6/30/2020	19.5	39	None	L	PASM	L	S
LQ	Woodland	2	6/30/2020	20	40	None	L			S
LQ	Woodland	2	6/30/2020	20.5	41	PIPO	PASM	L		ST
LQ	Woodland	2	6/30/2020	21	42	PIPO	BRIN2	L		S
LQ	Woodland	2	6/30/2020	21.5	43	PIPO	L			S
LQ	Woodland	2	6/30/2020	22	44	PIPO	L			S
LQ	Woodland	2	6/30/2020	22.5	45	PIPO	BRIN2	L		S
LQ	Woodland	2	6/30/2020	23	46	PIPO	BRIN2	L		S
LQ	Woodland	2	6/30/2020	23.5	47	PIPO	L			S
LQ	Woodland	2	6/30/2020	24	48	PIPO	L			S
LQ	Woodland	2	6/30/2020	24.5	49	PIPO	L			S
LQ	Woodland	2	6/30/2020	25	50	PIPO	L			S
LQ	Woodland	3	6/30/2020	0.5	1	BOGR2	L			S

LQ	Woodland	3	6/30/2020	1	2	BOGR2	WL		BY
LQ	Woodland	3	6/30/2020	1.5	3	NAVI4	L		S
LQ	Woodland	3	6/30/2020	2	4	None			GR
LQ	Woodland	3	6/30/2020	2.5	5	None	L		S
LQ	Woodland	3	6/30/2020	3	6	BOGR2	L		S
LQ	Woodland	3	6/30/2020	3.5	7	NAVI4			S
LQ	Woodland	3	6/30/2020	4	8	NAVI4	TEAC	L	S
LQ	Woodland	3	6/30/2020	4.5	9	None	L		S
LQ	Woodland	3	6/30/2020	5	10	None	L		S
LQ	Woodland	3	6/30/2020	5.5	11	SCSC	L		S
LQ	Woodland	3	6/30/2020	6	12	None	L		CB
LQ	Woodland	3	6/30/2020	6.5	13	BOGR2			S
LQ	Woodland	3	6/30/2020	7	14	AF17	L		S
LQ	Woodland	3	6/30/2020	7.5	15	None			S
LQ	Woodland	3	6/30/2020	8	16	BOGR2	L		S
LQ	Woodland	3	6/30/2020	8.5	17	SCSC	L		S
LQ	Woodland	3	6/30/2020	9	18	ARFR4	L		S
LQ	Woodland	3	6/30/2020	9.5	19	SCSC	MELU	L	S
LQ	Woodland	3	6/30/2020	10	20	BOGR2	L		S
LQ	Woodland	3	6/30/2020	10.5	21	BOGR2	L		S
LQ	Woodland	3	6/30/2020	11	22	SCSC			SCSC
LQ	Woodland	3	6/30/2020	11.5	23	SCSC	POPR	L	S
LQ	Woodland	3	6/30/2020	12	24	None	WL		S
LQ	Woodland	3	6/30/2020	12.5	25	SCSC	BOGR2		S
LQ	Woodland	3	6/30/2020	13	26	BOGR2	L		S
LQ	Woodland	3	6/30/2020	13.5	27	None	L		S
LQ	Woodland	3	6/30/2020	14	28	None	L		S
LQ	Woodland	3	6/30/2020	14.5	29	SCSC	ARFR4	L	S
LQ	Woodland	3	6/30/2020	15	30	SCSC	L		GR
LQ	Woodland	3	6/30/2020	15.5	31	None	L		GR
LQ	Woodland	3	6/30/2020	16	32	SCSC	L		S
LQ	Woodland	3	6/30/2020	16.5	33	BRIN2	L		S
LQ	Woodland	3	6/30/2020	17	34	None			BY
LQ	Woodland	3	6/30/2020	17.5	35	None	L		LC
LQ	Woodland	3	6/30/2020	18	36	None			GR
LQ	Woodland	3	6/30/2020	18.5	37	SCSC			GR
LQ	Woodland	3	6/30/2020	19	38	None	L		LC
LQ	Woodland	3	6/30/2020	19.5	39	None	L		GR
LQ	Woodland	3	6/30/2020	20	40	ARFR4	SCSC	L	S
LQ	Woodland	3	6/30/2020	20.5	41	BOGR2	L		S
LQ	Woodland	3	6/30/2020	21	42	BOGR2			GR
LQ	Woodland	3	6/30/2020	21.5	43	BOGR2	L		S
LQ	Woodland	3	6/30/2020	22	44	None			BY
LQ	Woodland	3	6/30/2020	22.5	45	None			LC
LQ	Woodland	3	6/30/2020	23	46	BOGR2			S
LQ	Woodland	3	6/30/2020	23.5	47	BOGR2			S
LQ	Woodland	3	6/30/2020	24	48	BOGR2			S
LQ	Woodland	3	6/30/2020	24.5	49	None	L		M
LQ	Woodland	3	6/30/2020	25	50	BOGR2			S

Notes: BY=boulder CB=cobble; D=duff; GR=gravel; L=herbaceous litter; LC=Lichen; M=moss; R=rock S=soil; ST=stone

Addendum 1-10. Loring Quarry Raw Species Richness Belt Transect Data

SiteID	SiteName	PlotID	FormDate	LineID	SubPlotID	SubPlotDesc	SpeciesCount
LQ	Loring Quarry	Lowland	06/29/20	1	1	Belt Transect 1	17
ACHY	Achnatherum hymenoides (Roem. & Schult.) Barkworth						
AF05							
ARLU	Artemisia ludoviciana Nutt.						
BRAR5	Bromus arvensis L.						
BRIN2	Bromus inermis Leyss.						
CAREX	Carex L.						
CHLE4	Chenopodium leptophyllum (Moq.) Nutt. ex S. Watson						
COAR4	Convolvulus arvensis L.						
IRMI	Iris missouriensis Nutt.						
MESA	Medicago sativa L.						
PASM	Pascopyrum smithii (Rydb.) Ã‚LÃ¶ve						
PEAR6	Pediomelum argophyllum (Pursh) J. Grimes						
POPR	Poa pratensis L.						
ROWO	Rosa woodsii Lindl.						
RUAQ	Rumex aquaticus L.						
THRH	Thermopsis rhombifolia (Nutt. ex Pursh) Nutt. ex Richardson						
VEST	Verbena stricta Vent.						
LQ	Loring Quarry	Lowland	06/29/20	2	1	Belt Transect 2	17
ACMI2	Achillea millefolium L.						
AF05							
AGCR	Agropyron cristatum (L.) Gaertn.						
APAN2	Apocynum androsaemifolium L.						
ARLU	Artemisia ludoviciana Nutt.						
BRAR5	Bromus arvensis L.						
BRTE	Bromus tectorum L.						
CHLE4	Chenopodium leptophyllum (Moq.) Nutt. ex S. Watson						
COAR4	Convolvulus arvensis L.						
IRMI	Iris missouriensis Nutt.						
MESA	Medicago sativa L.						
NAVI4	Nassella viridula (Trin.) Barkworth						
PASM	Pascopyrum smithii (Rydb.) Ã‚LÃ¶ve						
POPR	Poa pratensis L.						
ROWO	Rosa woodsii Lindl.						
THAR5	Thlaspi arvense L.						
VEST	Verbena stricta Vent.						
LQ	Loring Quarry	Lowland	06/30/20	3	1	Belt Transect 3	20
AF05							
AGCR	Agropyron cristatum (L.) Gaertn.						
ARLU	Artemisia ludoviciana Nutt.						
BRAR5	Bromus arvensis L.						
BRIN2	Bromus inermis Leyss.						
BRTE	Bromus tectorum L.						
CHLE4	Chenopodium leptophyllum (Moq.) Nutt. ex S. Watson						
COAR4	Convolvulus arvensis L.						
ECAN2	Echinacea angustifolia DC.						
IRMI	Iris missouriensis Nutt.						
MELU	Medicago lupulina L.						
MESA	Medicago sativa L.						
NAVI4	Nassella viridula (Trin.) Barkworth						
PASM	Pascopyrum smithii (Rydb.) Ã‚LÃ¶ve						
PEAR6	Pediomelum argophyllum (Pursh) J. Grimes						
POPR	Poa pratensis L.						
RACO3	Ratibida columnifera (Nutt.) Wooton & Standl.						
ROWO	Rosa woodsii Lindl.						
SILA21	Silene latifolia Poir.						
VEST	Verbena stricta Vent.						

SiteID	SiteName	PlotID	FormDate	LineID	SubPlotID	SubPlotDesc	SpeciesCount
LQ	**Loring Quarry**	**Upland**	**06/29/20**	**1**	**1**	**Belt Transect 1**	**16**
AGCR	Agropyron cristatum (L.) Gaertn.						
ARFR4	Artemisia frigida Willd.						
BRAR5	Bromus arvensis L.						
BRTE	Bromus tectorum L.						
COAR4	Convolvulus arvensis L.						
DEPI	Descurainia pinnata (Walter) Britton						
ECAN2	Echinacea angustifolia						
MELU	Medicago lupulina L.						
MESA	Medicago sativa L.						
PASM	Pascopyrum smithii (Rydb.) Ã¤LÃ¶ve						
PEAR6	Pediomelum argophyllum (Pursh) J. Grimes						
POPR	Poa pratensis L.						
SILA21	Silene latifolia Poir.						
SPCO	Sphaeralcea coccinea (Nutt.) Rydb.						
TRDU	Tragopogon dubius Scop.						
VIAM	Vicia americana Muhl. ex Willd.						
LQ	**Loring Quarry**	**Upland**	**06/29/20**	**2**	**1**	**Belt Transect 2**	**17**
AF05							
AF19							
AGCR	Agropyron cristatum (L.) Gaertn.						
ARFR4	Artemisia frigida Willd.						
COAR4	Convolvulus arvensis L.						
ECAN2	Echinacea angustifolia DC.						
ERST3	Erigeron strigosus Muhl. ex Willd.						
GRSQ	Grindelia squarrosa (Pursh) Dunal						
GUSA2	Gutierrezia sarothrae (Pursh) Britton & Rusby						
HECO26	Hesperostipa comata (Trin. & Rupr.) Barkworth						
IRMI	Iris missouriensis Nutt.						
MELU	Medicago lupulina L.						
MESA	Medicago sativa L.						
PEAR6	Pediomelum argophyllum (Pursh) J. Grimes						
POPR	Poa pratensis L.						
RACO3	Ratibida columnifera (Nutt.) Wooton & Standl.						
SPCO	Sphaeralcea coccinea (Nutt.) Rydb.						
LQ	**Loring Quarry**	**Upland**	**06/30/20**	**3**	**1**	**Belt Transect 3**	**6**
AGCR	Agropyron cristatum (L.) Gaertn.						
COAR4	Convolvulus arvensis L.						
MELU	Medicago lupulina L.						
MESA	Medicago sativa L.						
PASM	Pascopyrum smithii (Rydb.) Ã¤LÃ¶ve						
POPR	Poa pratensis L.						

SiteID	SiteName	PlotID	FormDate	LineID	SubPlotID	SubPlotDesc	SpeciesCount
LQ	Loring Quarry	Woodland	06/29/20	1	1	Belt Transect 1	13
AF11							
BRIN2	Bromus inermis Leyss.						
CHLE4	Chenopodium leptophyllum (Moq.) Nutt. ex S. Watson						
ERSTS2	Erigeron strigosus Muhl. ex Willd. var. strigosus						
NAVI4	Nassella viridula (Trin.) Barkworth						
PASM	Pascopyrum smithii (Rydb.) Ã‰LÃ¶ve						
PEAR6	Pediomelum argophyllum (Pursh) J. Grimes						
PIPO	Pinus ponderosa Lawson & C. Lawson						
POPR	Poa pratensis L.						
ROWO	Rosa woodsii Lindl.						
SILA21	Silene latifolia Poir.						
VIAM	Vicia americana Muhl. ex Willd.						
LQ	Loring Quarry	Woodland	06/30/20	2	1	Belt Transect 2	25
ACMI2	Achillea millefolium L.						
AF05							
AF14							
APAN2	Apocynum androsaemifolium L.						
ARFR4	Artemisia frigida Willd.						
ARLU	Artemisia ludoviciana Nutt.						
BRIN2	Bromus inermis Leyss.						
CARO2	Campanula rotundifolia L.						
CHLE4	Chenopodium leptophyllum (Moq.) Nutt. ex S. Watson						
DEPI	Descurainia pinnata (Walter) Britton						
ECAN2	Echinacea angustifolia DC.						
HECO26	Hesperostipa comata (Trin. & Rupr.) Barkworth						
KOMA	Koeleria macrantha (Ledeb.) Schult.						
MELU	Medicago lupulina L.						
NAVI4	Nassella viridula (Trin.) Barkworth						
PASM	Pascopyrum smithii (Rydb.) Ã‰LÃ¶ve						
PEAR6	Pediomelum argophyllum (Pursh) J. Grimes						
PIPO	Pinus ponderosa Lawson & C. Lawson						
POAL4	Polygala alba Nutt.						
POPR	Poa pratensis L.						
RHAR4	Rhus aromatica Aiton						
RIOX	Ribes oxyacanthoides L.						
SILA21	Silene latifolia Poir.						
SPCO	Sphaeralcea coccinea (Nutt.) Rydb.						
VIAM	Vicia americana Muhl. ex Willd.						

LQ	Loring Quarry	Woodland	06/30/20 3	1 Belt Transect 3	31
AF05					
AF17					
AF18					
AF19					
APAN2	Apocynum androsaemifolium L.				
ARFR4	Artemisia frigida Willd.				
ARLU	Artemisia ludoviciana Nutt.				
BOGR2	Bouteloua gracilis (Willd. ex Kunth) Lag. ex Griffiths				
BRAR5	Bromus arvensis L.				
BRIN2	Bromus inermis Leyss.				
CAFI	Carex filifolia Nutt.				
CARO2	Campanula rotundifolia L.				
CIUN	Cirsium undulatum (Nutt.) Spreng.				
ERFL4	Eriogonum flavum Nutt.				
HECO26	Hesperostipa comata (Trin. & Rupr.) Barkworth				
MELU	Medicago lupulina L.				
NAVAR	Navarretia Ruiz & Pav.				
NAVI4	Nassella viridula (Trin.) Barkworth				
OPPO	Opuntia polyacantha Haw.				
PASM	Pascopyrum smithii (Rydb.) Ã¿LÃ¶ve				
PEAR6	Pediomelum argophyllum (Pursh) J. Grimes				
PHHO	Phlox hoodii Richardson				
PIPO	Pinus ponderosa Lawson & C. Lawson				
PLPA2	Plantago patagonica Jacq.				
POPR	Poa pratensis L.				
RHAR4	Rhus aromatica Aiton				
RIOX	Ribes oxyacanthoides L.				
ROWO	Rosa woodsii Lindl.				
SCSC	Schizachyrium scoparium (Michx.) Nash				
SILA21	Silene latifolia Poir.				
TEAC	Tetraneuris acaulis (Pursh) Greene				

Addendum 2
Figures

Addendum 2-1. Figure 2-1. Loring Quarry Vegetation Communities and Transects



Figure 2-1
Vegetation Communities and Transect Locations

Addendum 2-2. Figure 2-2. Loring Quarry Ecological Site Descriptions and Transect Locations



Figure 2-2
Ecological Site Descriptions and Transects

Addendum 2-3. Figure 2-3. Loring Quarry Tree Canopy Cover



Figure 2-3
Tree Canopy Cover

Addendum 3
Photos

Addendum 3-1. Loring Quarry Lowland Grassland Transects and General View

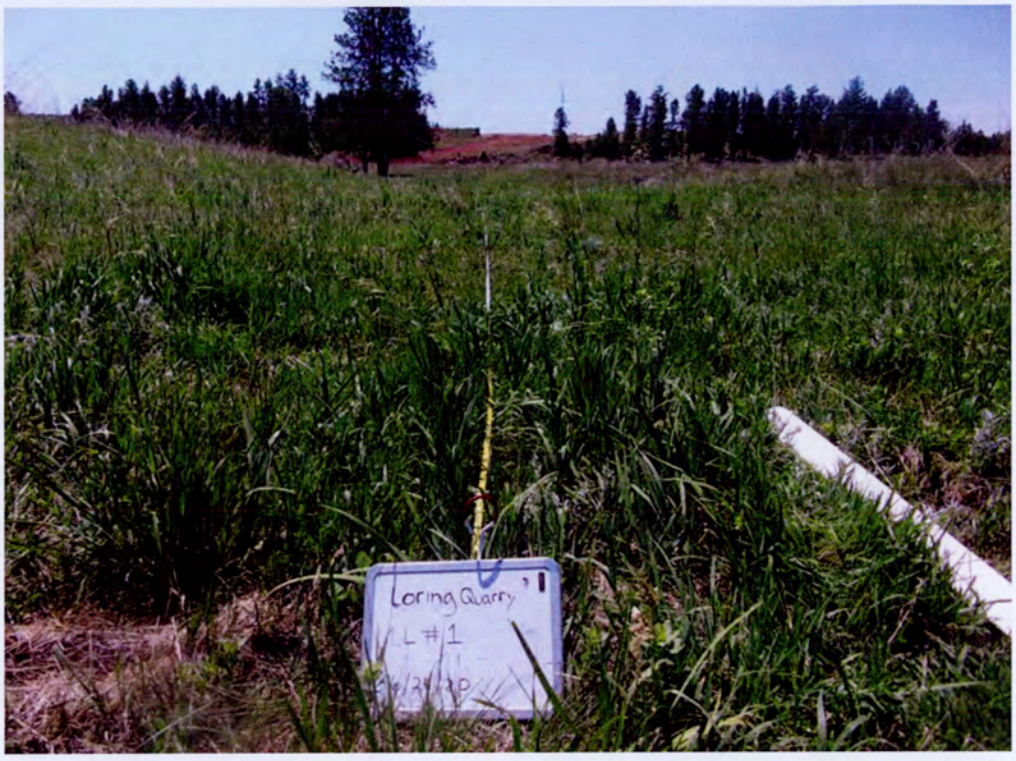


Photo 1. Transect: LL1, Date: 6/29/20



Photo 2. Transect LL1- General view northeast



Photo 3. Transect LL1- General view southeast

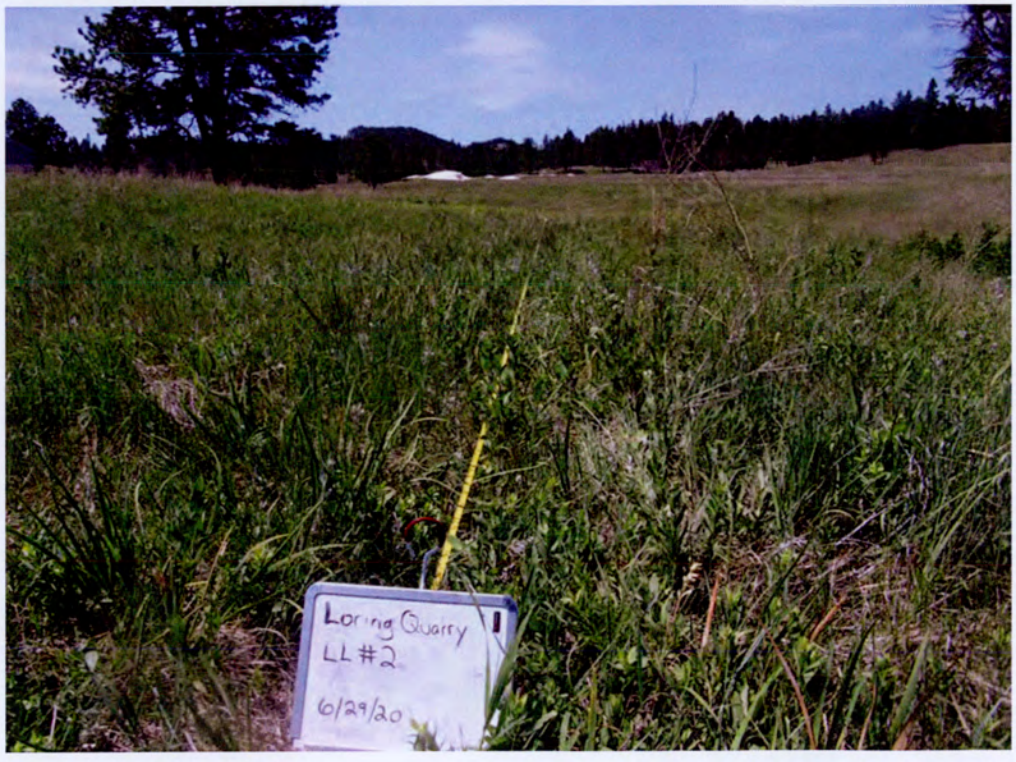


Photo 4. Transect: LL2, Date: 6/29/20



Photo 5. Transect LL2 –General view west



Photo 6. Transect LL2 –General view southeast



Photo 7. Transect: LL3, Date: 6/30/20



Photo 8. Transect LL3 –General view southwest

Addendum 3-2. Loring Quarry Upland Grassland Transects and General View



Photo 1. Transect: UPL1, Date: 6/29/20



Photo 2. Transect UPL1 – General view north.



Photo 3. Transect UPL1 – General view south



Photo 4. Transect: UPL2, Date: 6/29/20



Photo 5. Transect UPL2 – General view north



Photo 6. Transect UPL2 – General view west



Photo 7. Transect UPL2 – General view south



Photo 8. Transect: UPL3, Date: 6/30/20

Addendum 3-3. Loring Quarry Woodland Transects and General Views



Photo 1. Transect: WL1, Date: 6/29/20



Photo 2. Transect WL1- General view north



Photo 3. Transect WL1- General view south



Photo 4. Transect: WL2, Date: 6/30/20



Photo 5. Transect WL2- General view north



Photo 6. Transect WL2- General view south



Photo 7. Transect WL3, Date: 6/30/20



Photo 8. Site: Transect WL3 – General view south

Addendum 3-4. Loring Quarry General Views



Photo 1. Waypoint Vegetation 1, General view north, upland grassland



Photo 2. Waypoint Vegetation 1, General view south, upland grassland



Photo 3. Waypoint Disturbed Vegetation 1, General view southeast, disturbed area upland grassland



Photo 4. Waypoint Disturbed Vegetation 1, General view west, disturbed area upland grassland



Photo 5. Waypoint Disturbed Vegetation 1, General view northwest, disturbed area upland grassland

Addendum 4
Resumes

JEFFREY ABPLANALP

Wildlife Biologist

Jeff Abplanalp is a wildlife biologist with 10 years of experience. He specializes in providing terrestrial and aquatic wildlife and habitat mitigation consulting to the oil, natural gas, coal mining, wind farm, and uranium industries. He has extensive experience conducting ground based and aerial surveys for sage grouse, raptors, big game, and threatened and endangered species. He has contributed to several largescale oil and gas projects conducting pre-construction baseline wildlife and habitat inventory surveys. Jeff also has extensive experience in wildlife conflict, disease, and population management.



Years of Experience

- Professional start date: 05/2008
- ICF start date: 04/2013

Education

- BS, Wildlife and Fisheries Management and Biology, University of Wyoming, 2009

Professional Memberships

- Wildlife Society, 2007-2009
- American Fisheries Society, 2007-2009

Certifications/Other

- Site-Specific Hazard Training (Surface Coal, Metal, Non-metal, Mine Safety and Health Administration

Area of Expertise

- Terrestrial and aquatic wildlife and habitat baseline surveys

Project Experience

Oil and Natural Gas

Moneta Divide—Aethon Energy/Encana Oil and Gas and Burlington Resources, Fremont and Natrona Counties, WY, 04/2013 – 06/2013, 04/2014 – 06/2014

Field Biologist. Conduct ground based and aerial wildlife and habitat baseline inventory surveys for proposed natural gas project. Primary species surveyed include Greater sage-grouse, raptors, mountain plovers, big game, herptiles, and white-tailed prairie dog colonies.

Powder River Basin North—EOG Resources, Campbell and Johnson Counties, WY, 04/2019 – 06

Field Biologist. Conduct ground based and aerial wildlife and habitat surveys for proposed natural gas project. Primary species surveyed include greater sage-grouse, raptors, herptiles, and black-tailed prairie dog colonies.

Leavitt-Underwood—Devon Energy Corporation, Campbell County, WY, 04/2019 – Present

Field Biologist. Conduct ground-based wildlife surveys as part of plan of development. Primary species surveyed included raptors, mountain plovers, and black-tailed prairie dog colonies.

Cosner Fuller TLE—Devon Energy Corporation, Campbell County, WY, 04/2019 – Present

Field Biologist. Conduct ground-based wildlife surveys as part of plan of development. Primary species surveyed included raptors, mountain plovers, and black-tailed prairie dog colonies.

Mines and Quarries

Surface Coal Mine Wildlife Monitoring and Reporting—Navajo Transitional Energy Company, Antelope Mine, Campbell and Converse Counties, WY, 01/2020 – Present

Field Biologist. Conduct wildlife monitoring as part of mine and state DEQ monitoring and mitigation plan. Primary surveys conducted include golden eagle nest monitoring, bald eagle winter roost surveys, big game, lagomorph, and prairie dog colony surveys. Helped with drafting an avian mitigation plan and annual monitoring and conducted analysis of field data.

Surface Coal Mine Wildlife Monitoring and Reporting—Eagle Specialty Materials, Eagle Butte & Belle Ayr Mines, Campbell County, WY. 09/2020--Present

Field Biologist. Conduct wildlife monitoring as part of mine and state DEQ monitoring and mitigation plan. Primary surveys conducted include golden eagle nest monitoring, bald eagle winter roost surveys, big game, aquatic, lagomorph, and prairie dog colony surveys. Helped with drafting an avian mitigation plan and annual monitoring and conducted analysis of field data.

Willow Creek Uranium ISR Project Annual Wildlife Monitoring—Uranium One, Campbell and Johnson Counties, WY. 04/2019 – 06/2019

Field Biologist. Conduct wildlife monitoring as part of mine and state DEQ monitoring and mitigation plan. Primary surveys included Greater sage-grouse lek and raptor nest surveys. Helped with drafting annual monitoring and conducted analysis of field data.

Wind Energy Development

Maestro Wind Project—BayWa, Carbon County, WY. 08/2019-Present

Field Biologist. Conduct baseline wildlife surveys prior to wind farm development. Primary species surveyed included raptors, black-footed ferrets, and swift foxes.

Employment History

ICF. Wildlife Biologist. Gillette, WY. 04/2019 – Present.

Wyoming Game and Fish Department. Wildlife Damage Technician. Cody, WY. 05/2011 – 01/2019.

Big Horn Environmental Consultants. On-call Wildlife Biologist. Sheridan, WY. 04/2017 – 06/2017, 04/2018 – 06/2018.

Wyoming Game and Fish Department. Bird Farm Technician. Yoder, WY. 4/2015.

ICF. On-call Wildlife Biologist. Gillette, WY. 04/2013 – 06/2013, 04/2014 – 06/2014.

Wyoming Game and Fish Department. Aquatic Invasive Species Technician. Casper, WY. 5/2010 – 9/2010.

Wyoming Game and Fish Department. Fish Hatchery Technician. Boulder, WY. 05/2009 – 08/2009.

University of Wyoming. Fisheries Technician. Laramie, WY. 05/2008 – 10/2008.

KATIE WILSON

Project Role: Senior Biologist

Katie Wilson is a senior biologist specializing in wetland and vegetation assessments. She performs natural resource-based fieldwork to include field sampling, map review, global positioning systems (GPS) data collection, and technical report completion. Her fieldwork experience includes baseline vegetation, soil and wetland assessments, threatened and endangered (vegetation) surveys and habitat assessments, reclamation monitoring, and wetland delineations. Katie is responsible for data analysis and report writing for all aspects of fieldwork. She works extensively with different stakeholders to include: U.S. Bureau of Land Management (BLM), USDA Forest Service (Forest Service), Wyoming Department of Environmental Quality (WDEQ), U.S. Army Corps of Engineers (USACE); oil, gas, coal, and uranium mine operators; and private landowners to assess and mitigate the potential impacts of activities on regional flora, including federally threatened and endangered species and other species of management concern.

Prior to joining ICF, Katie spent 11 years as a wetland specialist and vegetation ecologist, as well as operations manager at a consulting firm in Gillette, Wyoming. Her duties included project management, managing budgets, client correspondence, data gathering, map review, field surveys, results analysis, data presentation, and report compilation. She has worked extensively on projects to conduct special-status plant surveys, floristic inventories, baseline assessments, reclamation monitoring, vegetation community mapping, wetland delineations, and soil map unit mapping and sampling.

Selected Project Experience

Moneta Divide Biological Assessment—Fremont, Natrona, and Sweetwater Counties, Wyoming. 12/2019.

Senior Biologist. Katie completed a biological assessment for Ute ladies'-tresses for proposed oil and gas development in south-central Wyoming. She completed the biological assessment document for submittal to the Lander BLM Field Office.

Coeur Wharf Mine Rare Plant Survey—Lawrence County, South Dakota. 08/2019.

Senior Biologist. Katie complete a rare plant inventory for proposed development at the Wharf Mine located within the Black Hills. As project manager, she performed fieldwork per the direction of the South Dakota Department of Game, Fish, and Parks. Additionally, she completed a report summary of the field survey findings.



Years of Experience

- Professional start date: 05/2005
- ICF start date: 03/2017

Education

- BS, Biology, Bemidji State University, 2005
- AA, Liberal Arts, Thief River Falls, Minnesota, 2002

Professional Membership

- Society for Wetland Science

Training Certificates

- MSHA Annual Refresher, 2019
- OSHA General Industry 10 hr., 2014
- Safeland USA, 2010

Professional Development

- Assessment, Inventory, and Monitoring (AIM) Terrestrial Field Methods, U.S. Department of the Interior (DOI)
- Phase I and Phase II Environmental Site Assessment, ASTM International
- Wetland Delineation Training and Certification, USACE
- Emphasis on Soil and Hydrology, Wetland Training Institute (WTI)
- Federal Wetland/Waters Regulatory Policy, WTI

Transmission and Wind Facility Projects—Various Companies Wyoming. 07/2018 – 09/2019.

Vegetation Ecologist. As the field manager, Katie developed scopes of work to conduct baseline evaluations using the Assessment, Inventory, and Monitoring (AIM) program on BLM administered lands for proposed plans of development. She managed and coordinated a team of field biologists, served as field surveyor, and primary author of technical reports.

Katie also developed weed management plans for submittal to Albany and Carbon County Weed and Pest Offices along with reclamation plans to the Industrial Siting Council for the Wyoming Department of Environmental Quality and the Rawlins BLM Field Office.

Vegetation Assessments for Various Oil and Gas Projects—Various Clients, Wyoming. 05/2005 – 08/2016.

Vegetation Ecologist. While employed by BKS Environmental, Katie developed scopes of work and project budgets to conduct special-status plant species surveys and vegetation assessments for proposed plans of development. Her responsibilities included overall management of client contracts, safety compliance, and correspondence with clients and applicable state or federal agencies. She managed a team of field biologists, and served as field surveyor, primary author and/or reviewer of technical reports.

Threatened and Endangered Plant Surveys for Various Coal Mines—Various Clients, Northeastern Wyoming. 05/2005 – 08/2013.

Senior Vegetation Ecologist. While employed by BKS Environmental, Katie completed Ute ladies'-tresses (*Spiranthes diluvialis*) and Barr's milkvetch (*Astragalus barrii*) habitat and species surveys on the U.S. Forest Service in the Thunder Basin National Grasslands for various coal mine locations. Her responsibilities included overall management of client contracts, safety compliance, and correspondence with clients and applicable state or federal agencies. She developed scopes of work and project budgets to conduct special-status plant species surveys and assessments for proposed plans of development. Katie also managed a team of field biologists and was primary author and/or reviewer of technical reports and biological assessments/biological evaluations (BAs/Bes).

Bear Lodge and Upton Plant Site Wetland Delineation—Rare Earth Elements, Crook and Weston Counties, Wyoming. 05/2012 – 12/2015.

Project Manager and Senior Wetland Specialist. While employed by BKS Environmental, Katie developed scope of work and project budget for the completion of an aquatic resource inventory for proposed rare earth mine and plant development located on the U.S. Forest Service in the Black Hills National Forest. She performed fieldwork in compliance with Section 404 federal permitting process and state and local regulations for jurisdictional wetlands. Katie completed nationwide permit process for submission to the USACE. Responsibilities for this project also included management of the client contract, safety compliance, and correspondence with client and federal agencies. Katie also prepared a PowerPoint presentation for the client and USFS staff regarding the vegetation, soils, and wetlands surveyed at the project area.

DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS, OMAHA DISTRICT
SOUTH DAKOTA REGULATORY OFFICE
28563 POWERHOUSE ROAD, ROOM 118
PIERRE, SOUTH DAKOTA 57501-6174

REPLY TO
ATTENTION OF

October 28, 2020

RECEIVED
APR 27 2021
MINERALS & MINING PROGRAM

South Dakota Regulatory Office
28563 Powerhouse Road, Room 118
Pierre, South Dakota 57501

H2E, Incorporated
Attn: Becky Morris
801 East 4th Street, Suite 5
Gillette, Wyoming 82716

Dear Ms. Morris:

Reference is made to the information received September 15, 2020, concerning Section 404 of the Clean Water Act permit requirements. The review area is located in the northeast quarter of Section 33, Township 5 South, Range 4 East, Custer County, South Dakota.

Based on the information provided, we have determined that there are no waters of the United States (i.e. jurisdictional waters) located within the review area. Therefore, activities within the review area are not subject to Department of the Army regulatory authorities and no permit pursuant to Section 404 of the Clean Water Act is required from the Corps of Engineers.

An approved jurisdictional determination (JD) has been completed for your project. This JD is valid for 5 years from the date of this letter. The JD is enclosed and also may be viewed at our website. The link to the website is shown below. The JD will be available on the website within 30 days. If you are not in agreement with the JD, you may request an administrative appeal under Corps of Engineers regulations found at 33 C.F.R. 331. Enclosed you will find a Notification of Administrative Appeal Options and Process and Request for Appeal form (RFA). Should you decide to submit an RFA form, it must be received by the Corps of Engineers Northwestern Division Office within 60 days from the date of this correspondence (by December 27, 2020). It is not necessary to submit a RFA if you do not object to the JD.

You can obtain additional information about the Regulatory Program from our website:
http://www.nwo.usace.army.mil/Missions/RegulatoryProgram/SouthDakota.aspx

If you have any questions, please feel free to contact this office at the above Regulatory Office address, or telephone Jeff Breckenridge at (605) 341-3169, ext. 3621 and reference action ID NWO-2020-01738-PIE.

Sincerely,

Steven E. Naylor
Regulatory Program Manager,
South Dakota

Enclosures

RECEIVED
APR 27 2021
MINERALS & MINING PROGRAM

U.S. ARMY CORPS OF ENGINEERS
REGULATORY PROGRAM
APPROVED JURISDICTIONAL DETERMINATION FORM (INTERIM)
NAVIGABLE WATERS PROTECTION RULE

I. ADMINISTRATIVE INFORMATION

Completion Date of Approved Jurisdictional Determination (AJD): 10/26/2020
ORM Number: NWO-2020-01738-PIE
Associated JDs: N/A
Review Area Location[1]: State/Territory: SD City: N/A County/Parish/Borough: Custer
Center Coordinates of Review Area: Latitude 43.57459 Longitude -103.64079

II. FINDINGS

A. Summary: Check all that apply. At least one box from the following list MUST be selected. Complete the corresponding sections/tables and summarize data sources.

- ☒ The review area is comprised entirely of dry land (i.e., there are no waters or water features, including wetlands, of any kind in the entire review area). Rationale: The feature evaluated consisted of an upland swale. A vegetation survey and a soils survey confirmed that no wetlands are present.
- ☐ There are "navigable waters of the United States" within Rivers and Harbors Act jurisdiction within the review area (complete table in Section II.B).
- ☐ There are "waters of the United States" within Clean Water Act jurisdiction within the review area (complete appropriate tables in Section II.C).
- ☐ There are waters or water features excluded from Clean Water Act jurisdiction within the review area (complete table in Section II.D).

B. Rivers and Harbors Act of 1899 Section 10 (§ 10)[2]

§ 10 Name	§ 10 Size		§ 10 Criteria	Rationale for § 10 Determination
N/A.	N/A.	N/A	N/A.	N/A.

C. Clean Water Act Section 404

Territorial Seas and Traditional Navigable Waters ((a)(1) waters):[3]				
(a)(1) Name	(a)(1) Size		(a)(1) Criteria	Rationale for (a)(1) Determination
N/A.	N/A.	N/A.	N/A.	N/A.

Tributaries ((a)(2) waters):				
(a)(2) Name	(a)(2) Size		(a)(2) Criteria	Rationale for (a)(2) Determination
N/A.	N/A.	N/A.	N/A.	N/A.

Lakes and ponds, and impoundments of jurisdictional waters ((a)(3) waters):				
(a)(3) Name	(a)(3) Size		(a)(3) Criteria	Rationale for (a)(3) Determination
N/A.	N/A.	N/A.	N/A.	N/A.

Adjacent wetlands ((a)(4) waters):				
(a)(4) Name	(a)(4) Size		(a)(4) Criteria	Rationale for (a)(4) Determination
N/A.	N/A.	N/A.	N/A.	N/A.

[1] Map(s)/figure(s) are attached to the AJD provided to the requestor.
[2] If the navigable water is not subject to the ebb and flow of the tide or included on the District's list of Rivers and Harbors Act Section 10 navigable waters list, do NOT use this document to make the determination. The District must continue to follow the procedure outlined in 33 CFR part 329.14 to make a Rivers and Harbors Act Section 10 navigability determination.
[3] A stand-alone TNW determination is completed independently of a request for an AJD. A stand-alone TNW determination is conducted for a specific segment of river or stream or other type of waterbody, such as a lake, where upstream or downstream limits or lake borders are established. A stand-alone TNW determination should be completed following applicable guidance and should NOT be documented on the AJD Form.

U.S. ARMY CORPS OF ENGINEERS
REGULATORY PROGRAM
APPROVED JURISDICTIONAL DETERMINATION FORM (INTERIM)
NAVIGABLE WATERS PROTECTION RULE

D. Excluded Waters or Features

Excluded waters ((b)(1) – (b)(12)):[4]				
Exclusion Name	Exclusion Size		Exclusion[5]	Rationale for Exclusion Determination
N/A.	N/A.	N/A.	N/A.	N/A.

III. SUPPORTING INFORMATION

A. Select/enter all resources that were used to aid in this determination and attach data/maps to this document and/or references/citations in the administrative record, as appropriate.

☒ Information submitted by, or on behalf of, the applicant/consultant: SIMON CONTRACTORS LORING QUARRY VEGETATION SURVEY SITE SUMMARY and SIMON CONTRACTORS LORING QUARRY SOIL SURVEY SITE SUMMARY, Prepared by ICF, September 2020.

This information is sufficient for purposes of this AJD.

Rationale: N/A

☐ Data sheets prepared by the Corps: Title(s) and/or date(s).

☒ Photographs: Aerial and Other: Google Earth various years, 2020 Site Photos from the consultant.

☐ Corps site visit(s) conducted on: Date(s).

☐ Previous Jurisdictional Determinations (AJDs or PJDs): ORM Number(s) and date(s).

☐ Antecedent Precipitation Tool: *provide detailed discussion in Section III.B*.

☒ USDA NRCS Soil Survey: See file for Soils Hydric Rating Map/Report.

☐ USFWS NWI maps: Title(s) and/or date(s).

☒ USGS topographic maps: Argyle 24K.

Other data sources used to aid in this determination:

Data Source (select)	Name and/or date and other relevant information
USGS Sources	N/A.
USDA Sources	N/A.
NOAA Sources	N/A.
USACE Sources	N/A.
State/Local/Tribal Sources	N/A.
Other Sources	N/A.

B. Typical year assessment(s): N/A

C. Additional comments to support AJD: The upland swale shows no evidence of surface water flow.

[4] Some excluded waters, such as (b)(2) and (b)(4), may not be specifically identified on the AJD form unless a requestor specifically asks a Corps district to do so. Corps districts may, in case-by-case instances, choose to identify some or all of these waters within the review area.

[5] Because of the broad nature of the (b)(1) exclusion and in an effort to collect data on specific types of waters that would be covered by the (b)(1) exclusion, four sub-categories of (b)(1) exclusions were administratively created for the purposes of the AJD Form. These four sub-categories are not new exclusions, but are simply administrative distinctions and remain (b)(1) exclusions as defined by the NWPR.

Addendum 2-1. Figure 2-1. Loring Quarry Soil Map Units and Sample Locations

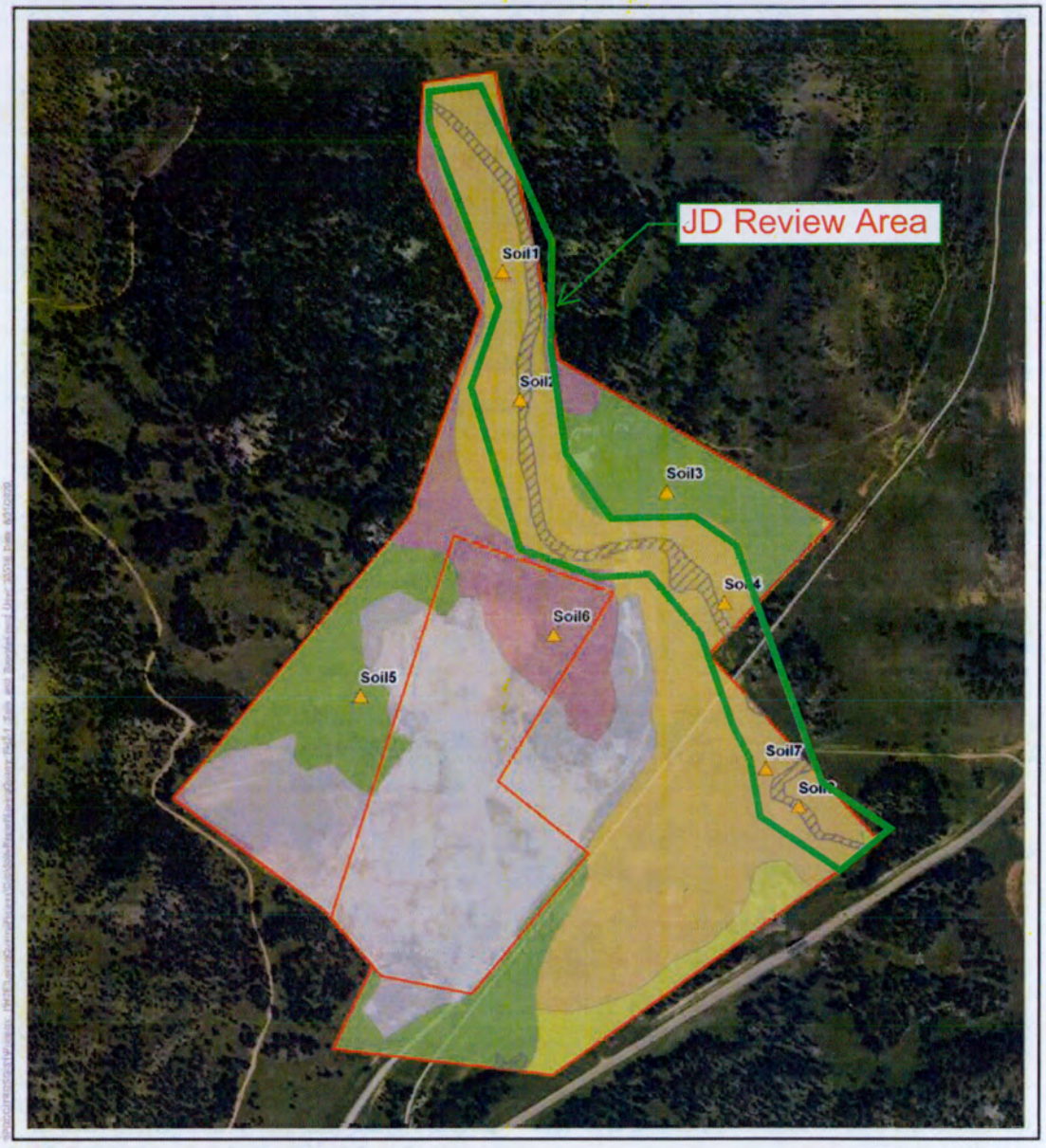


Figure 2-1
Soils Map Units and Sample Locations

Water Well
Lab Results

MIDCONTINENT
TESTING LABORATORIES, INC.

2381 South Plaza Drive P.O. Box 3388 Rapid City, SD 57709
(605) 348-0111 -- www.thechemistrylab.com

RECEIVED
APR 27 2021
MINERALS & MINING PROGRAM

Sample Site: Eudy Spring
Project Name: Loring Quarry
Sampled: 07/21/20 at 09:27 AM by John Jarding
Sample Matrix: Water

Lab ID#: 20200722306
Received: 07/21/20 at 12:30 PM by Dean Aurand
Account: 9511 - Simon Contractors

BOB ROBERTS
SIMON CONTRACTORS
3975 STURGIS RD.
RAPID CITY, SD 57702

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date
Physical Properties							
Total Dissolved Solids	365	mg/L	100ml	14.7	50.0	SM 2540 C	JNM 07/22/20
Total Suspended Solids	< 10.0	mg/L	100ml	3.49	10.0	SM 2540 D	JNM 07/22/20
Non-Metallics							
Nitrogen, Nitrate (NO3)	4.82	mg/L	5	0.045	0.250	SM 4500-NO3 F	BLL 07/22/20

Notes:
Copy to: Becky Morris bmorris@H2Eincorporated.com

Report Approved By:

Report Approved On: 7/23/2020 12:33:03 PM

MIDCONTINENT
TESTING LABORATORIES, INC.

2381 South Plaza Drive P.O. Box 3388 Rapid City, SD 57709
(605) 348-0111 -- www.thechemistrylab.com

Sample Site: Eudy Domestic Well
Project Name: Loring Quarry
Sampled: 07/21/20 at 09:48 AM
by John Jarding
Sample Matrix: Water

Lab ID#: 20200722307
Received: 07/21/20 at 12:30 PM
by Dean Aurand
Account: 9511 - Simon Contractors

BOB ROBERTS
SIMON CONTRACTORS
3975 STURGIS RD.
RAPID CITY, SD 57702

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst	Date
Physical Properties								
Total Dissolved Solids	375	mg/L	100ml	14.7	50.0	SM 2540 C	JNM	07/22/20
Total Suspended Solids	< 10.0	mg/L	100ml	3.49	10.0	SM 2540 D	JNM	07/22/20
Non-Metallics								
Nitrogen, Nitrate (NO3)	6.11	mg/L	5	0.045	0.250	SM 4500-NO3 F	BLL	07/22/20

Notes:
Copy to: Becky Morris bmorris@H2Eincorporated.com

Report Approved By:

Report Approved On: 7/23/2020 12:33:03 PM

MIDCONTINENT
TESTING LABORATORIES, INC.

2381 South Plaza Drive P.O. Box 3388 Rapid City, SD 57709
(605) 348-0111 -- www.thechemistrylab.com

Sample Site: Kirk Stock Tank
Project Name: Loring Quarry
Sampled: 07/21/20 at 10:29 AM
by John Jarding
Sample Matrix: Water

Lab ID#: 20200722308
Received: 07/21/20 at 12:30 PM
by Dean Aurand
Account: 9511 - Simon Contractors

BOB ROBERTS
SIMON CONTRACTORS
3975 STURGIS RD.
RAPID CITY, SD 57702

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst	Date
Physical Properties								
Total Dissolved Solids	442	mg/L	100ml	14.7	50.0	SM 2540 C	JNM	07/22/20
Total Suspended Solids	< 10.0	mg/L	100ml	3.49	10.0	SM 2540 D	JNM	07/22/20
Non-Metallics								
Nitrogen, Nitrate (NO3)	3.66	mg/L	5	0.045	0.250	SM 4500-NO3 F	BLL	07/22/20

Notes:
Copy to: Becky Morris bmorris@H2Eincorporated.com

Report Approved By:

Report Approved On: 7/23/2020 12:33:03 PM

MIDCONTINENT
TESTING LABORATORIES, INC.

2381 South Plaza Drive P.O. Box 3388 Rapid City, SD 57709
(605) 348-0111 -- www.thechemistrylab.com

Lab Numbers: 20200722306 - 20200722308

QC Sample Report

Parameter	Lab#	QC Value	Smp Value	Spike	DF	Result	Limits	Method	
Spike									
TDS	0722307	1400	375	1000	100ml	102.3 %	(87.21) - (112.4)	SM 2540 C	
TSS	0722307	49.0	< 10.0	50.0	100ml	98.0 %	(87.16) - (113.2)	SM 2540 D	
TSS	0721927	42.4	16.8	20.0	250ml	128.0 %	(87.16) - (113.2)	SM 2540 D	X
- Non-homogenous sample.									
N, Nitrate	0721840	0.772	0.373	0.400	1	99.75%	(87.37) - (105.9)	SM 4500-NO3 F	
N, Nitrate	0722106	225	144	0.400	200	101.5 %	(87.37) - (105.9)	SM 4500-NO3 F	
N, Nitrate	0722303	0.419	0.004	0.400	1	103.8 %	(87.37) - (105.9)	SM 4500-NO3 F	
Matrix Spike Duplicate									
N, Nitrate	0722106	229	225		200	1.90%	(-4.770) - (4.894)	SM 4500-NO3 F	
N, Nitrate	0721840	0.751	0.772		1	-2.76%	(-4.770) - (4.894)	SM 4500-NO3 F	
N, Nitrate	0722303	0.417	0.419		1	-0.478%	(-4.770) - (4.894)	SM 4500-NO3 F	
Duplicate									
TDS	0722308	465	442		100ml	5.07%	(-10.14) - (11.78)	SM 2540 C	
TDS	0722306	370	365		100ml	1.36%	(-10.14) - (11.78)	SM 2540 C	
TSS	0721921	26.0	25.2		250ml	3.13%	(-27.16) - (37.73)	SM 2540 D	
TSS	0722306	< 10.0	< 10.0		100ml	0.00%	(-27.16) - (37.73)	SM 2540 D	
N, Nitrate	0721918	3.66	3.61		5	1.46%	(-3.653) - (4.794)	SM 4500-NO3 F	
N, Nitrate	0722308	4.92	4.83		5	1.80%	(-3.653) - (4.794)	SM 4500-NO3 F	
N, Nitrate	0722112	21.8	22.2		20	-2.17%	(-3.653) - (4.794)	SM 4500-NO3 F	
Initial Calibration Verification									
N, Nitrate		1.05	1.00		1	5.30%	(-5.195) - (10.37)	SM 4500-NO3 F	
Continuing Calibration Verification									
TDS		947	1000		100ml	-5.30%	(-9.403) - (2.093)	SM 2540 C	
TSS		48.0	50.0		100ml	-4.00%	(-13.47) - (7.669)	SM 2540 D	
N, Nitrate		1.05	1.00		1	4.90%	(-5.772) - (7.562)	SM 4500-NO3 F	
N, Nitrate		1.01	1.00		1	0.900%	(-5.772) - (7.562)	SM 4500-NO3 F	
N, Nitrate		1.06	1.00		1	6.30%	(-5.772) - (7.562)	SM 4500-NO3 F	
Initial Calibration Blank									
N, Nitrate		- 0.013	0.00		1	0.013	(-0.0119) - (0.0256)	SM 4500-NO3 F	
Continuing Calibration Blank									
TDS		0.00	0.00		100ml	0	(-1.442) - (1.242)	SM 2540 C	
TSS		0.00	0.00		100ml	0	(-3.739) - (2.539)	SM 2540 D	

Lab Numbers: **20200722306 - 20200722308**

Parameter	Lab#	QC Value	Smp Value	Spike	DF	Result	Limits	Method
Continuing Calibration Blank								
N, Nitrate		- 0.004	0.00		1	0.004	(-0.0102) - (0.0192)	SM 4500-NO3 F
N, Nitrate		- 0.010	0.00		1	0.01	(-0.0102) - (0.0192)	SM 4500-NO3 F
N, Nitrate		0.00	0.00		1	0	(-0.0102) - (0.0192)	SM 4500-NO3 F

Approved By: _____

Approved On: 07/23/2020 12:33 PM

MIDCONTINENT TESTING LABORATORIES, INC.

2381 S. Plaza Dr. • P.O. Box 3388 • Rapid City, SD 57709
(605) 348-0111 • www.TheChemistryLab.com

CHAIN OF CUSTODY RECORD

Company	~~H2E~~ Login & Bill to Simon ~~Simon Contractors~~
Project Name / Mgr.	Loring Quarry ~~Mike~~ / Mike Lee
Project Number	
Sampled by	Signature
Sampled by	Print John Jarding

ANALYSES REQUESTED	TDS	TSS	Nitrates								
PRESERVED WITH											
FILTERED (Y/N)	N	N	N								
REFRIGERATED (Y/N)	Y	Y	Y								

FOR LAB USE ONLY

Seal Intact (Y/N)/Number	
Sample Condition	on ice
Temperature of Container	2 to 5 C

REQUESTED TURN AROUND

STANDARD X RUSH

	SAMPLE NAME	DATE	TIME	MATRIX	NO. OF CONTAINERS									COMMENTS	LAB #
1	Eudy Spring	7/21/2020	9:27	W	2	X	X	X	306					pH = 7.46 EC = 302.4 spec uS/cm	
2	Eudy Domestic Well	7/21/2020	9:48	W	2	X	X	X	307					pH = 7.53 EC = 355.0 spec uS/cm	
3	Kirk Stock Well	7/21/2020	10:29	W	2	X	X	X	308					pH = 7.22 EC = 434 spec uS/cm	
4															
5															
6														copy to:	
7														Becky Morris	
8														@ H2E	
9															
10															
11															
12															

7/22

RELINQUISHED BY (Signature)	COMPANY NAME	DATE	TIME	RECEIVED BY (Signature)	COMPANY NAME	DATE	TIME
John Jarding	H2E Inc	7/21/2020	12:30		MCT	7/21/20	12:3x

FORM 113D

MIDCONTINENT TESTING LABORATORIES

SAMPLE RECEIPT CHECKLIST

Company Name: Simon Contractors / HZE Inc. Date/Time Received: 7-21-20 (Date) / 1230 (Time)

Project: Loring Quarry Received by: Dean Burnard

Lab Number(s): 3006-3056 7-22-20 Carrier Name: John Tendling

UNPACKING

Yes	No		Initials
☐	☐	1. Shipping container in good condition? NA	
☐	☐	2. Custody seals present on shipping container? NA Condition: Intact ☐ Broken ☐	
☑	☐	3. Ice / Blue Ice (circle one) present in shipping container? Container(s) Temp. 1. 2.5c 2. _____ 3. _____ 4. _____	
☐	☑	4. Bottles broken and/or leaking? (Photograph broken bottles.)	
☐	☐	5. Custody seals on sample bottles? Condition: Intact ☐ Broken ☐ NA	

LABELING

Yes	No		Initials
☑	☐	6. Chain of custody Present?	
☑	☐	7. Chain of custody includes signatures, dates, and times when relinquished and received?	
☑	☐	8. Chain of custody agrees with bottle count?	
☑	☐	9. Chain of custody agrees with labels?	
☑	☐	10. Samples received within holding times?	
☑	☐	11. Samples in proper container?	
☑	☐	12. Sufficient sample volume for indicated tests?	

PRESERVATIVE

Yes	No		Initials	Yes	No		Initials
☐	☐	13. Metals bottle(s) pH < 2?		☐	☐	17. TOC bottle(s) pH < 2?	
☑	☐	14. Nutrient bottle(s) pH < 2?		☐	☐	18. Oil & Grease bottle(s) pH < 2?	
☐	☐	15. Cyanide bottle(s) pH > 12?		☐	☐	19. Volatiles pH < 2?	
☐	☐	16. Sulfide bottle(s) pH > 9?					

COMMENTS: Copy to: Bealy Morris at HZE. 307-686-7007
bmorris@HZEincorporated.com

RECEIVED
APR 27 2021
MINERALS & MINING PROGRAM

FINAL

SIMON CONTRACTORS LORING QUARRY BASELINE WILDLIFE SURVEY REPORT

PREPARED FOR:

H2E, Inc.
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December 2020

ICF

ICF. 2020. Simon Contractors Loring Quarry Baseline Wildlife Survey Report. Draft. December. (ICF 374.20.) Gillette, WY. Prepared for H2E, Inc, Gillette, WY.

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Appendix I **Potential and Observed Terrestrial Species List in the Loring Quarry Wildlife Baseline Study Area**

Appendix II **Vertebrate Wildlife Species Federal and State Species of Concern**

Appendix III **Representative Photographs from the Loring Quarry Project Area**

Appendix IV **Bat Avoidance and Mitigation Measures**

Appendix V **Resumes**

Acronyms and Abbreviations

ACOs	artificial cover objects
E	East
ESA	Endangered Species Act of 1973
GPS	global positioning system
H2E	H2E, Inc
IPaC	Information Planning and Conservation
OMNRF	Ontario Ministry of Natural Resources and Forestry
Pd	*Pseudogymnoascus destructans*
project area	Entire proposed permit area (current as of December 2020) with additional surveys conducted on adjacent lands for certain species of concern
R	Range
S	South
SD DENR	South Dakota Department of Environment and Natural Resources
SDGFP	South Dakota Game, Fish and Parks
SDNHP	South Dakota Natural Heritage Program's
Simon	Simon Contractors of SD, Inc.
T&E	threatened and endangered
T	Township
USFWS	U.S. Fish and Wildlife Service
UTM	Universal Transverse Mercator
VE	visual encounter
WNS	White-Nose Syndrome

Introduction

Simon Contractors of SD, Inc. (Simon) is planning to submit an application for a large-scale mine permit for its current small-scale mine operation, Loring Quarry (limestone). The Loring Quarry project area is approximately 4.0 miles south of Pringle along Highway 89 in Custer County, South Dakota and is on land privately held by Simon. The mine permit plan includes approximately 162 acres throughout portions of Section 33 and 34, T5S:R4E. This area encompasses the current mining parcel (45 acres) in Section 33, a large portion of which (approximately 40 acres, 89 percent) is currently disturbed by the existing quarry or other man-made features.

Simon will be applying for a large-scale mine permit with the South Dakota Department of Environment and Natural Resources (SD DENR) Minerals and Mining Program. H2E, Inc (H2E), on behalf of Simon, awarded and contracted the baseline vegetation survey to ICF in June 2020. The baseline wildlife survey report detailing survey data and results will be included with the permit documents compiled and submitted by H2E.

This report presents baseline information regarding wildlife observations and habitat characteristics within the project area. The information gathered from field sampling will be used by the applicant and the SD DENR to develop the reclamation plan for the project area.

Ecological baseline studies for fauna were conducted in accordance with applicable SD DENR, South Dakota Game, Fish and Parks (SDGFP), and U.S. Fish and Wildlife Service (USFWS) guidelines. Appropriate agencies were consulted prior to initiating field studies to ensure that adequate objectives, survey methodologies, and data collection techniques were employed.

ICF conducted the baseline wildlife inventories for this project. The objectives of the study were to: describe wildlife habitats within the proposed permit area; collect data on faunal diversity, abundance, and habitat affinity; and determine the potential impacts of Simon operations on terrestrial wildlife. Baseline information was collected for the project from April 2020 through December 2020. The project area included the entire proposed permit area (current as of December 2020) with additional surveys conducted on adjacent lands for certain species of concern. Per the SDGFP-approved study plan (ICF 2020), specific surveys were conducted for threatened and endangered species and their habitats, raptors, bats, amphibians, and reptiles. Information on other animal groups (big game, gamebirds, passerine birds, wading birds, waterfowl and shorebirds, mammal species not previous listed, and aquatic invertebrates and fish) was obtained primarily through opportunistic observation in and near the project area. Available wildlife habitats within the proposed permit area were also delineated.

Survey methods and results are presented by animal group, below. S. Kane supervised all wildlife surveys for the Loring Quarry baseline inventory and conducted a portion of them. J. Abplanalp and A. Harris conducted the field surveys. L. Allen analyzed the bat echolocation data. S. Kane, and J. Abplanalp, and L. Allen drafted the baseline report. All work for ICF and staff resumes are provided as an attachment to this report.

Permit Area Description

Simon is proposing to expand the permit area of their Loring Quarry, a surface limestone quarry in southwestern South Dakota near the town of Pringle in Custer County. The proposed expansion includes 162 acres (0.25 mile) throughout portions of Sections 33 and 34, Township (T) 5 South (S): Range (R) 4 East (E). This area encompasses the current permit parcel (45 acres) in Section 33, T5S:R4E, a large portion of which (approximately 40 acres, 89%) is currently disturbed by the existing quarry or other man-made features.

The permit area is in the Black Hills region of South Dakota. The elevation within the area ranges from approximately 3,600 feet to 6,565 feet with moderately sloping hills and ridges. Annual average precipitation is between 16 and 37 inches and increases or decreases with the elevation from west to east and north to south. The annual snowfall ranges from about 60 inches at the lower elevations to as much as 140 inches at the higher elevations. The average annual temperature is 36 to 48 degrees Fahrenheit. The freeze-free period averages 125 days and ranges from 85 to 165 days (USDA NRCS 2006).

The Loring Quarry survey area (permit area and a surrounding half-mile perimeter) supports open areas to dense forest vegetation, and pine and spruce species grow at higher elevations. Cool and warm season grasses are the most common under open forest stands, along with forb and shrub species (USDA NRCS 2006). The permit area is composed of a seven main habitat types: Upland Grassland, Lowland Grassland, Woodland, Disturbed Grassland, Disturbed – infrastructure and gravel piles, Disturbed – pit, and Disturbed – spoil, topsoil, etc. Four habitat types (Upland Grassland, Lowland Grassland, Woodland, and Disturbed Grassland) were defined during the baseline vegetation assessment conducted by ICF in June 2020 (Figure 1). That assessment is included as a separate report in the permit application package for the Loring Quarry Project.

Ponderosa pine *(Pinus ponderosa)* dominates the higher elevation hilltops and breaks along the edges and central portion of the permit area, and it was the only tree species documented in the permit area. The only recorded shrub species was Wood's rose (*Rosa woodsii)*; it was documented in the shallow drainage in the northern and east portions of the permit area.

The permit area is composed entirely of private lands owned by Simon but is adjacent to the Black Hills National Forest. Land use in the area includes a limestone quarry and ranch lands managed primarily for livestock (cattle) grazing. Several unimproved (two-track) roads pass through the permit area and surrounding perimeter. One improved bike path (the Mickelson Trail) currently runs through the southeastern portion of the permit area from northeast to southwest. South Dakota Highway 89 runs roughly parallel to the bike path through the survey area.

Wildlife baseline surveys were conducted by ICF, of Gillette, Wyoming. All baseline wildlife monitoring protocols were based on the guidelines required for permitting and environmental analysis through state and federal agencies (primarily SDGFP). Each wildlife baseline survey included the proposed Loring Quarry project area and up to a 0.5-mile survey perimeter.

Prior to initiating field surveys, a comprehensive effort was made to gather information about the occurrence, abundance, and natural history of all terrestrial vertebrate species that could occur in the project area. This included data requests through the South Dakota Natural Heritage Program's (SDNHP) Resource Information System, and the USFWS's Information Planning and Conservation (IPaC) tool. A potential species list was developed for the project area that included those species recorded during the field visits conducted throughout the baseline survey period.

Current baseline wildlife information was collected for the project from April 2020 through December 2020 to meet agency requirements for one year (i.e., four seasons) of baseline data. Survey protocols and timing were developed collaboratively with SDGFP to meet species-specific requirements. Surveys and documentation of occurrence conducted in the project area included other vertebrate species of concern tracked by the SDNHP, as well as bats and reptiles. In addition to these targeted efforts, incidental observations of all vertebrate wildlife species seen within the permit area were recorded during each site visit during the baseline survey period.

All surveys were conducted by qualified biologists using standard field equipment and appropriate field guides. Most terrestrial data were collected from vantage points during pedestrian or vehicular surveys to avoid disturbing wildlife. Raptor nests and other features or points of special interest were mapped in the field using a hand-held global positioning system (GPS) receiver to record the Universal Transverse Mercator (UTM) coordinates.

The project area was visited a minimum of once each season (i.e., spring, summer, fall, winter) to assess wildlife use during the year. Biologists conducted habitat assessments over a course of 11 days: 6 visits in spring and summer, 4 in fall, and 1 in winter. Habitat assessments were completed concurrently with or on the same day as other surveys. All surveys were conducted during favorable weather conditions (no precipitation with little or no wind).

Habitat Mapping

General wildlife habitats within the proposed permit area were outlined in the field with the aid of ESRI ArcGIS aerial maps. Habitats were described in terms of physical and vegetative characteristics, in keeping with classifications identified by ICF staff during their baseline vegetation assessment. Special emphasis was placed on documenting any high value, unusual, or critical wildlife habitats.

Mammals

Big Game

SDGFP did not require big game surveys for the Loring Quarry Project. Therefore, big game use of the permit area was largely determined through biologists recording all observations made during site visits from April through December 2020. Data recorded typically included the species and number of animals seen, location in UTMs, behavior, and habitat association. Personnel also noted herd activity, and sex and age composition, when possible.

Small Mammals

SDGFP did not require small mammal trapping for the Loring Quarry Project. Therefore, biologists watched for and recorded sightings of all mammals and their sign during wildlife baseline surveys and seasonal habitat assessments. Observation notes included species, number, habitat association, and location in UTMs.

Surveys for sensitive bats species were conducted concurrently with surveys for northern long-eared bats (*Myotis septentrionalis*). Survey methods for these species are discussed in the *Northern Long-eared Bat* section.

Lagomorphs

SDGFP did not require lagomorph surveys for the Loring Quarry Project. Occurrence of lagomorphs within the project area was documented through incidental observation. Observation notes included species, number, habitat association, and location in UTMs.

Medium and Large-Sized Mammals

The occurrence of mammals such as predators and furbearers within the Loring Quarry project area was documented through incidental observation. Formal surveys for these species were not required by the SDGFP. Biologists watched for and recorded sightings of all mammals and their sign. All large burrows encountered were examined closely to determine if they were used recently. Large predators (e.g., cougar, bobcat, and bear) were opportunistically documented when conditions presented themselves (e.g., observation or tracks in mud/snow). Observation notes included species, number, habitat association, and location in UTMs.

Avifauna

Game Birds

SDGFP did not require game bird surveys for the Loring Quarry Project. Biologists watched for and recorded sightings of all gamebirds and their sign during wildlife baseline surveys. Observation notes included species, number, age and sex if possible, habitat association, and location in UTMs.

Raptors

Ground-based searches for raptor nests were conducted on at least 3 days from late April through June 2020 within the survey area and within line of site of the permit area. New nests were located

by examining typical nesting habitat (trees, cliffs, man-made structures, etc.) and watching for breeding behavior (territory defense, courtship flights, prey deliveries, etc.) during all site visits. All active nests were monitored from the ground to assess productivity, and monitoring followed guidelines contained in Rosenfield et al. (2007) to prevent nest abandonment and injury to eggs or young. Nest productivity checks were conducted throughout June 2020 for all active nests located during the previous surveys. All nest observations included species, substrate, location in UTMs, and distance and line-of-sight to the proposed project boundary.

Bald and Golden Eagles

No targeted surveys were conducted for Bald Eagles (*Haliaeetus leucocephalus*) or Golden Eagles (*Aquila chrysaetos*) during baseline surveys. Any incidental sightings of this species were recorded, including notes on the number of individuals, location, habitat, and activity.

Breeding Birds

No breeding bird surveys were required by SDGFP for the Loring Quarry wildlife baseline assessment. Biologists watched for and recorded sightings of all passerine birds and their sign during wildlife baseline surveys. Biologists were permitted to use call playbacks to aid in detection of SDGFP sensitive woodpecker species if stands of burned or beetle-killed trees were encountered.

Wading Birds, Shorebirds, and Waterfowl

No water features (i.e., ponds, lakes, or streams) occur within the project area. Regardless, wildlife biologist watched for and recorded waterfowl, wading birds, and shorebirds during all wildlife surveys. Any incidental observations of waterfowl and shorebirds included species, number, habitat association, and location in UTMs.

Amphibians and Reptiles

Amphibians

No water features (i.e., ponds, lakes, or streams) occurred within the project area; therefore, no targeted surveys for such species were proposed. Any incidental observations of amphibians included species, number, habitat association, and location in UTMs.

Reptiles

Artificial cover objects (ACOs) and visual encounter (VE) surveys were conducted for reptiles over the course of 7 days, starting in late April. Surveys were conducted throughout the permit area and occurred in April through June, and September 2020. ACOs were made of 2.0-foot by 2.0-foot plywood that was 0.75 inch thick, as recommended by the Ontario Ministry of Natural Resources and Forestry (OMNRF) (2016). ACO placement was based on guidelines established by the Iowa Department of Natural Resources (2016) for surveying amphibians and reptiles. ACOs were placed in five identified microhabitats (disturbed – pit, disturbed – other, woodland, grassy-riparian drainages, and grassland) and spaced approximately 200 meters apart, when possible. ACOs were not placed in roads or trails but were placed in a vegetated unused parking area and near gravel piles. Placement in representative habitats took priority over ACO spacing,

so spacing was adjusted as needed. However, there was still a minimum of seven ACOs/26 acres of surveyed habitat (as stipulated in the Iowa guidelines). ACOs were placed 2 weeks prior to beginning surveys and were checked twice a month in May, June, and September (Iowa Department of Natural Resources 2016; OMNRF 2016).

Targeted VE surveys were conducted with every ACO survey as biologists moved between ACO sites. VE protocols followed those established by the OMNRF's *Survey Protocol for Ontario's Species at Risk Snakes* (2016). Biologists walked slowly through suitable habitat in the area watching for snakes or snake shed skins. Areas such as woodpiles and exposed rock outcrops were searched, and biologists checked under logs, rocks and other locations that could provide shelter. On colder sunny days biologists looked to places where the sun had warmed the ground, and on hotter days and cloudy days biologists focused on areas that provide thermal cover.

VE surveys also occurred during habitat assessments and other species surveys. Suitable habitat for other reptile species (i.e., lizards) was searched as they were encountered. All reptile species encountered during habitat assessments were recorded, and observations included species, number, habitat association, and location in UTMs.

Aquatic Invertebrates and Fish

No water features (i.e., ponds, lakes, or streams) occurred within the project area.

Federally Listed and State Sensitive Species

Throughout the course of all field surveys, biologists watched for species that are listed as endangered or threatened under the Endangered Species Act of 1973 (ESA), or species that are proposed or candidates for listing under the ESA. Habitats in or within the survey area that could support those species were also documented. As of December 2020, a three targeted species were listed under the ESA, as amended, 16 U.S.C 1531 *et seq.*, for Custer County, South Dakota (USFWS 2020a and 2020b): black-footed ferret (*Mustela nigripes*), Rufa Red Knot (*Calidris canutus rufa*), and Whooping Crane (*Grus americana*).

The proposed surveys targeted a variety of taxa, combined with comprehensive listing of detected species throughout the baseline survey period. This approach was determined to be adequate to detect the occurrence of species of special concern defined by the SDNHP, SDGFP, and USFWS.

Appropriate habitat does not occur for most species listed by the SDGFP (2016) or USFWS (2017 and 2020a) as threatened or endangered in Custer County or the project area. However, wildlife biologists watched for and recorded all listed species if they were encountered during other wildlife baseline surveys.

Black-Footed Ferret

No targeted surveys were conducted for the black-footed ferret during baseline surveys, as they are no longer required by the USFWS throughout most of the species range (USFWS 2013). Any incidental sightings of this species were recorded, including notes on the number of individuals, location, habitat, and activity.

Red Knot

No targeted surveys were conducted for red knot (*Calidris canutus*) during base line surveys. Any incidental sightings of this species were recorded, including notes on the number of individuals, location, habitat, and activity.

Whooping Crane

No targeted surveys were conducted for whooping crane (*Grus americana*) during baseline surveys. Any incidental sightings of this species were recorded, including notes on the number of individuals, location, habitat, and activity.

Northern Long-Eared Bat

Northern long-eared bats (*Myotis septentrionalis*) are known to occur in Custer County, SD (USFWS 2020a), and hibernacula with confirmed White-Nose Syndrome (WNS)/ *Pseudogymnoascus destructans* (Pd) also occur in that county (USFWS 2020c). As such, the Loring Quarry Project falls within the WNS Zone per the northern long-eared bat Final 4(d) Rule that accompanied the species listing (80 FR 17674).

Habitats in the project area consisted of a few small stands of ponderosa pine forest, open grassland, and a quarry pit with exposed rock highwalls, one of which has holes and crevices. Two man-made entrances to a grotto located beneath the quarry occur on the eastern edge of the quarry pit. While no perennial creeks or ponds exist in the project area, water present seasonally in drainages or in pools in the quarry pit may provide a water source for a least a portion of the year.

The survey protocols were based on guidelines recommended by the SDGFP, the USFWS's *Range-wide Indiana Bat Survey Guidelines* (hereafter, USFWS *Guidelines*; 2020d), the USFWS *Northern Long-eared Bat Interim Conference and Planning Guidance* (hereafter, USFWS *Interim Guidance*; 2014), or the USFWS's *Indiana Bat* (Myotis sodalis) *Survey Protocol for Assessing Use of Potential Hibernacula* (2019).

Habitat Assessments and Summer Presence/Absence Surveys

Habitat assessments for maternity roost and winter hibernacula sites occurred June 2020. Two biologists conducted the surveys on 1 day. Habitats within 150 feet of the permit area (hereafter bat survey area) were searched for potential roost and hibernacula sites (i.e., cavities, crevices located in rock outcrops or trees). Any potential sites were marked using flagging, and UTM NAD83 (North American Datum 83, Zone 13N) coordinates were recorded using a GPS unit. Qualitative descriptions, including substrate and distances from the permit area, were recorded. Photographs of the sites were also taken.

Passive acoustic surveys were conducted for summer presence/absence near identified potential roost sites and near any open bodies of water in appropriate habitat. Wildlife Acoustics SM4BAT full-spectrum bat echolocation detectors equipped with single omni-directional ultrasonic microphones (*Wildlife Acoustics*, MA) were placed throughout the bat survey area near potential bat roost locations, including an abandoned barn, near tree snags, and in the quarry pit near the vuggy highwall on the north end of the pit.

Detector units were mounted to t-posts, and microphones were positioned 3 meters above ground level. Specific detector locations were chosen in accordance with recommendations made in the USFWS *Guidelines*.

Detectors were deployed for 7 consecutive nights, which satisfied SDGFP recommendations (Michals pers. comm. April 7, 2020) and exceeded recommendations by the *Guidelines*. This was to account for potential poor weather conditions (e.g., prolonged precipitation, low temperatures, and sustained winds) while detectors were deployed. Extended weather forecasts were consulted prior to deployment in an attempt to reduce the chance of poor weather during surveys. Recording periods began 30 minutes before sunset and conclude the following morning at sunrise. Calls were recorded directly to media cards located within the detector units.

Potential Hibernaculum Surveys

Pre-survey assessments (i.e., communication with Simon) and the June habitat assessment indicated the holes and crevices located in the quarry pit wall and/or the grotto entrances have suitable characteristics to be a hibernaculum entrance. Therefore, ICF conducted potential winter hibernaculum surveys at these sites. A combination of passive acoustic surveys and active count monitoring were used, per USFWS *Indiana Bat* (Myotis sodalis) *Survey Protocol for Assessing Use of Potential Hibernacula*. Studies by Lemen et al. (2016a and 2016b) indicate that passive acoustic detection is a reliable method of detecting long-eared bats emerging from hibernaculum. One Wildlife Acoustics SM4BAT full-spectrum bat echolocation detector equipped with single omni-directional ultrasonic microphones (*Wildlife Acoustics*, MA) was placed according to the USFWS *Guidelines* near the potential hibernacula entrances. Detector units were mounted to t-posts and microphones were positioned 3 meters above ground level.

Two rounds of surveys were conducted in September and October 2020, and each round was separated by a minimum of 2 weeks (USFWS *Interim Guidance*). Detectors were deployed for two consecutive nights during each round, which exceeds the USFWS *Interim Guidance* minimum of two nights total per site. Recording began 30 minutes before sunset and concluded the following morning at sunrise. Calls were recorded directly to media cards located within the detector unit.

One night per each round, a wildlife biologist monitored the potential hibernaculum entrance, using a heterodyne bat detector and/or a night-vision/infrared video recording device to record bats entering and exiting openings. The monitoring period began 30 minutes before sunset and lasted 5 hours. The biologist followed protocols established by USFWS *Indiana Bat* (*Myotis sodalis*) *Survey Protocol for Assessing Use of Potential Hibernacula*. The biologist was in a position such that they did not interfere with the passive acoustic detector. Data recorded included the number of bat passes per hour during the period, the frequency peak of each pass, and notes describing the bat activity throughout the period.

Data Analysis

Recordings of bat echolocation calls were downloaded from each monitor and processed using Sonobat version 4.2.2. Each recording was initially processed through the Sonobat program using the vetting function which identified calls recording to species when possible. There are generally three types of echolocation sequences: search phase, approach phase, and terminal phase. Search phase calls are used when searching for prey (i.e., insects) which are longer,

lower frequency calls. Approach phase and terminal phase calls used when approaching and closing in on prey, respectively, become much more frequent and higher frequency. As a bat gets nearer to an insect the calls become shorten to detect the quick movements of the insect (Feldhamer et. al. 2007). Due to the variation in approach and terminal phase calls, echolocation calls are identified to species best by the search phase recordings. These types of calls generally have a consistent structure throughout the call sequence and usually have species-specific characteristics (Fenton and Bell 1981; O'Farrell et al. 1999 as cited by Murray et al.).

Each of the calls Sonobat identified to species were then manually assessed to determine if the identification to species was accurate. Although search phase calls are typically consistent in structure, species within the same frequency range can be similar in the different echolocation phases and can be misidentified within the program automation identification. Species that were identified by Sonobat as only a "high frequency" call where briefly assessed and determine to be exclusively myotis calls; however, they quality was too poor to determine to a specific species.

Aquatic Resources

The Loring Quarry project area does not contain any perennial water sources; therefore, no aquatic surveys were required.

Appendix I lists all species observed that could reside in the vicinity of the Loring Quarry permit area or pass through during migration. Species recorded in or adjacent to the property are noted. Appendix II lists Federal and State listed that could occur in the vicinity (Custer County, SD) of the permit area. Appendix III provides representative photographs of the project area and wildlife species observed there during the baseline survey period. Appendix IV includes resumes for the biologists who completed surveys for the project.

Habitat Mapping

Prior to fieldwork the project area was mapped with aerial imagery to delineate vegetation communities and habitat types. The mapped vegetation communities and habitat types were field verified prior to sampling. ICF biologists classified seven primary habitat types within the Loring Quarry project area: Upland Grassland, Lowland Grassland, Woodland, Disturbed Grassland, Disturbed-infrastructure and gravel pits, Disturbed – pit, and Disturbed – spoil, topsoil, etc. A general description of the extent and characteristics of each habitat type is described below.

Upland Grassland

Upland grassland covers approximately 82.5 acres and comprises approximately 51.0 percent of the total acreage of the permit area. Grassland areas are characterized by moderately dense cover with little bare ground. Various native short-to mid-grass species dominate this habitat type, with numerous forbs scattered throughout the area. Grass species commonly encountered during field surveys included crested wheatgrass *(Agropyron cristatum)* and western wheatgrass *(Pascopyrum smithii).*

Woodland

Approximately 24.0 acres of the permit area is comprised of woodland habitat. This habitat type covers approximately 14.8 percent of the permit area. Ponderosa pine *(Pinus ponderosa)* is the dominant tree species of the woodland habitat within the project area. The grass species most encountered in woodland habitat was blue grama (*Bouteloua gracilis).*

Lowland Grassland

Lowland grassland habitat covered approximately 5.2 acres, which comprised 3.2 percent of the total acreage of the permit area. The most common grasses found in lowland grassland habitat were smooth brome *(Bromus inermis)* and Kentucky bluegrass *(Poa pratensis).*

Disturbed Grassland

Approximately 2.5 percent of the permit area is comprised of disturbed grassland habitat. This habitat type comprises approximately 4.1 acres of the permit area. The area appears to have been stripped and overburden was piled to the west of the area. Upland vegetation is present at the site with scattered ponderosa pine saplings. The overburden pile is also vegetated with perennial

and annual grasses, forbs to include wavyleaf thistle (*Cirsium undulatum*), upright prairie cone flower (*Ratibida columnifera*), curlycup gumweed (*Grindelia squarrosa*), and ponderosa pine saplings.

Disturbed – Other

Three other disturbed habitat types occurred at Loring Quarry. These types included infrastructure and gravel piles (15.9 acres/9.8% of permit area), pit (15.7 acres/9.7% of permit area), and spoil, topsoil, etc. (14.4 acres/1.9% of permit area). Each of these disturbed habitat types contained primarily bare ground and sparse vegetation.

Mammals

Big Game

No crucial big game habitats or migration corridors are recognized by the SDGFP in the Loring Quarry permit area or surrounding one-mile perimeter (Michals pers. comm. December 30, 2020). Crucial range is defined as any particular seasonal range or habitat component that has been documented as the determining factor in a population's ability to maintain and reproduce itself at a certain level.

Mule deer *(Odocoileus hemionus)* and white-tailed deer *(Odocoileus virginianus)* regularly occur in the Loring Quarry project area, and both are considered year-round residents. Elk *(Cervus elaphus)* are also present in the survey area, but only in small herds. All three species can be seen in the survey area year-round but may be more common during certain seasons.

Mule deer use nearly all habitats, but prefer sagebrush-grassland, rough breaks, and riparian bottomland (Jones et al. 1983). Browse is an important component of the mule deer's diet throughout the year, comprising as much as 60 percent of total intake during autumn, while forbs and grasses typically make up the rest of their diet (Fitzgerald et al. 2011). In the project area, mule deer were observed as individuals or in small herds in ponderosa pine habitat along the northern reaches of the project area, and in the grassland habitat in northern region of the permit area. Fresh tracks and droppings were found throughout all habitats of the permit area and adjacent ponderosa pine habitats. They are considered year-round residents in the survey area.

By nature, elk are shy animals that are less accepting of human disturbance than pronghorn (Fitzgerald et al. 2011) or deer. No elk were observed during the baseline survey period, but multiple fresh tracks and droppings were observed in the grassland habitat of the northern reaches of the permit area and ponderosa pine habitat just outside the permit area.

White-tailed deer are typically associated with forests, woodlands, and treed galleries along streams (Fitzgerald et al. 2011). Small numbers of white-tailed deer were observed in the project area during the baseline survey period. White-tailed deer were primarily observed in the grassland and pine habitat of the western and northern sections of the permit area.

Small Mammals

Small mammals were not systemically surveyed as part of the Loring Quarry baseline inventory surveys. However, three species of small mammals were observed incidentally during baseline

surveys: black-tailed prairie dog (*Cynomys ludovicianus*), least chipmunk (*Tamias minimus*) and red squirrel (*Sciurus vulgaris*). One active black-tailed prairie dog colony was discovered on September 15, 2020 in the grassland habitat of the northern permit area (Figure 3, Photo 11). Least chipmunks and red squirrels were found throughout the ponderosa pine habitat of the project area. Least chipmunks were also observed in the blasting pit area of the quarry.

Bats

Habitat Assessments and Presence/Absence Surveys

Habitat assessments for all bat species occurred throughout the baseline surveys, with targeted searched for roost and hibernacula occurring on June 5, 2020. Potential roost and hibernacula habitat are present in the abandoned barn, tree snags in the woodland habitat, and crevices in the vuggy highwall on the north end of the quarry pit. Tree snags were limited within the permit area, with only one present, but more prevalent in the survey area where woodland habitat is more predominant.

Target presence/absence surveys for bats occurred in June. Five Wildlife Acoustics SM4BAT full-spectrum bat echolocation detectors equipped with single omni- directional ultrasonic microphones (*Wildlife Acoustics*, MA) were placed throughout the bat survey area (Figure 2), starting on June 5. The five locations included:

- One near an unused barn located northeast of the current quarry pit (SE NE Section 33, T5S:R4E; Monitor 5-Spring)
- One near the two grotto entrances and the vuggy rock highwall with holes and crevices located at the north end of the quarry pit (NW SE Section 33, T5S:R4E; Monitor 4-Spring); all locations were within 100 yards of each other
- Two detectors in the south half of NE Section 33 in or near forest habitat, both near a pine snag with roost characteristics (i.e., loose bark and cavities) (Monitors 1-Spring and 5-Spring)
- One detector near some partially filled cattle stock tanks (NW SW Section 34, T5S:R4E; Monitor 3-Spring).

Detectors were placed for a span of 7 days, and audio data downloaded for later analysis.

Two rounds of targeted presence/absence surveys were also conducted during the 2020 fall surveys, one round from September 21 through 23 and one round from October 12 through 14. Detectors were located near the vuggy rock highwall in the north end of the quarry pit (NW SE Section 33, T5S:R4E; Monitors 1 and 2-Fall, Figure 2).

A total of eight bat species were identified acoustically during both the spring and the fall surveys: Townsend's big-eared bat (*Corynorhinus townsendii*), big brown bat (*Eptesicus fuscus*), hoary bat (*Lasiurus cinereus*), silver-haired bat (*Lasionycteris noctivagans*), western small-footed bat (*Myotis ciliolabrum*), long-eared myotis (*Myotis evotis*), little brown bat (*Myotis lucifugus*), and fringe-tailed bat (*Myotis thysanodes*). Of these species, four are listed by the SDNHEP has species of concern: Townsend's big-eared bat, silver-haired bat, long-eared myotis, and fringe-tailed bat. Table 1. describes the general habitat and current state and federal status of each species.

Table 1. Status and Habitat Description of Species Detected During Spring and Fall Surveys

Scientific Name Common Name	Status[1]	General Habitat Description
Townsend's big-eared bat *Corynorhinus townsendii*	G4, S2S3	Typical habitat is arid western desert scrub and pine forest regions. Maternity colonies form in mines, caves, or buildings, but males roost individually.[1] Roost sites and hibernacula are selected in areas with minimal human intervention and relatively stable, cool temperatures. Hibernacula also occur in mines and caves. Foraging primarily occurs along forested edges or in the canopy. [2]
Big brown bat *Eptesicus fuscus*		Found in a variety of habitats ranging from timberline meadows to lowland deserts, though it is most abundant in deciduous forest areas. Typically form maternity colonies beneath loose bark and in small cavities of pine, oak, and other trees. Maternity roosts also occur in buildings and bridges[1], and have been documented in buildings, trees, railway tunnels, mines, caves, and at least one metal electrical fuse box within the Black Hills. Found in a variety of hibernacula with varying microclimates, in caves, mines and in buildings[3].
Hoary bat *Lasiurus cinereus*		Solitary roosting species, except during the maternity season when females roost with young in foliage along forest edges or in fencerows, generally 12 to 40 feet above ground. Occurs in arid deserts and ponderosa pine forests of the western U.S., most abundant on the edges of croplands and deciduous forests of the Plains States. It is a fast flier that commonly feeds at treetop level above the forest canopy.[4]
Silver-haired bat *Lasionycteris noctivagans*	G3G4, S4	Dependent upon roosts in Old Growth areas. Form maternity colonies almost exclusively in tree cavities or small hollows and will switch roosts throughout the maternity season. Typical hibernation roosts include small tree hollows, beneath exfoliating bark, in wood piles, and in cliff faces. Occasionally silver-haired bats will hibernate in cave entrances, especially in northern regions of their range. Feed predominantly in disturbed areas, sometimes at tree-top level, but often in small clearings and along roadways or water courses.[1]
Myotis ciliolabrum Western small-footed bat		Located in arid habitats with cliffs, talus fields, and prairies containing clay buttes and steep banks along rivers[2]. Maternity roosts in cliff-face crevices, erosion cavities, and beneath rocks on the ground. Some females care for their pups alone, while others form small groups. These bats can also be found hibernating in caves or mines.[1] Foraging occurs 1 to 3 m above ground over cliffs or clay buttes. [2]

Long-eared myotis *Myotis evotis*	G5, S1	Located in coniferous forests, typically only at higher elevations in southern areas (between 7,000 and 8,500 feet)[1] or arid badlands of the Great Plains.[2] Roost sites include live or dead trees (beneath bark), abandoned buildings, mines or caves, sinkholes, or cliff fissures. Winter hibernacula include primarily caves or mines. Foraging typically occurs over tree canopy, ponds, or streams.[2]
Little brown bat *Myotis lucifugus*		Mainly in mountainous and riparian areas in a wide variety of forest habitats; from tree-lined xeric-scrub to aspen meadows. Maternity colonies often form in buildings, attics, and other man-made structures. Also roosts in tree cavities and crevices[1] as well as caves and mines.[2] Main prey consists of aquatic insects, and typical foraging habitat is over water. Will also feed over forest trails, cliff faces, meadows, and farmland.[1]
Fringe-tailed bat *Myotis thysanodes*	G5, S1	Mostly found in dry habitats where open areas (e.g., grasslands and deserts) are interspersed with mature forests (usually ponderosa pine, pinyon-juniper, or oak), creating complex mosaics with ample edges and abundant snags[5]. Day roosts include caves, mines, and buildings (typically abandoned). Hibernacula include caves and buildings, but not much is known about their wintering whereabouts[1,6].

[1]Status as listed by the South Dakota Natural Heritage Program. 2018. https://gfp.sd.gov/rare-animals/. Accessed December 29, 2020. A description of rankings can be found in Appendix II.

[2]Bat Conservation International 2020

[3]South Dakota Bat Working Group 2004

[4]Tigner and Stukel 2003

[5]Tuttle 1995

[6]Keinath 2004

Big brown bat, hoary bat, and silver-haired bat were detected at all locations during both the springs and fall surveys. Long-eared myotis was detected at the fewest locations and was the only species not detected during both spring and fall surveys. Myotis species with ranges which occur within the vicinity of the project area emit echolocation calls generally within the same frequency range. Species specific call characteristics can be difficult to determine with poor quality calls. At most locations, high frequency calls were recorded; however, due to the poor quality of the recording, species could not be identified. All species recorded during spring and fall surveys, and their locations are depicted in Table X. In some cases, species identification could not definitively be made, for the reasons previously discussed. However, if characteristics were present that pointed to one species over another this was noted as most likely that species.

Additionally, the number of echolocation calls recorded cannot be used to correlate the number of bats of that species in the area or the recordings. Each time a call is emitted within range of the detector, a recording is created. Therefore, it is possible for a single bat can be recorded multiple times if it is foraging for an extended period within range of the detector.

Monitor 1-Spring was placed in a sparsely forested are near a snag (Figure 2, Photo 1). Big brown bat and silver-haired bat, recorded at this location, are both species known to roost in tree cavities, crevices and under exfoliating bark. This location could be a potential roost site for these species and emergence (or out flight) surveys would determine if these species are using this snag. The remaining two species recorded at this site, fringe-tailed bat and hoary bat, were not likely roosting at these locations but rather utilizing this area for foraging.

Monitor 2-Spring occurred in an area near an abandoned barn(Figure 2, Photo 2). Three of the species detected at this location, Townsend's big-eared bat, big brown bat, and little brown bat, are all know to roost within manmade structures. Townsend's big-eared bat are sensitive to disturbance and are typically only found in buildings within little to no human activity. Since this building as long since been abandoned, it is possible for this species to be roosting inside.

Monitor 3-Spring was placed in an open field adjacent to stock tanks (Figure 2, Photo 3). This location recorded foraging species, though it is possible that some species have roosts within the vicinity. This location produced poor quality calls, making species identification more difficult. Myotis species were recorded and the most likely species included western small-footed bat, long-eared myotis, and little brown bat. Similarly, poor quality lower frequency bat calls were also recorded at this location. These calls exhibited characteristics that represent Townsend's big-eared bat, but due to the quality of the call this is only a likely determination and not definitive.

Monitor 4-Spring was placed near a treed are with water in the northwest corner of the quarry pit. (Figure 2, Photo 4). This was also in the vicinity of cave openings that potentially connect to an underground grotto (Photo 5). Seven of the eight species detected during the spring surveys were detected at this location. Big brown bat, western small-footed bat, long-eared myotis, little brown bat, and fringe-tailed bat are known to roost within caves and mines. This location could be a roost for these species and emergence surveys would confirm the presence of roosting bats.

Table 1. Species Recorded at each monitoring location during both Spring and Fall Surveys[1].

Species Recorded	Monitors						
	1-Spring	2-Spring	3-Spring	4-Spring	5-Spring	1-Fall	2-Fall
Townsend's big-eared bat *Corynorhinus townsendii*		X	X*			X	X
Big brown bat *Eptesicus fuscus*	X	X	X	X	X	X	X
Hoary bat *Lasiurus cinereus*	X	X	X	X	X	X	X
Silver-haired bat *Lasionycteris noctivagans*	X	X	X	X	X	X	X
Western small-footed bat *Myotis ciliolabrum*		X	X*	X	X*	X	X
Long-eared myotis *Myotis evotis*				X	X*		
Little brown bat *Myotis lucifugus*		X	X*	X	X	X	X
Fringe-tailed bat *Myotis thysanodes*	X		X*	X	X	X	

[1] The long-eared myotis was the only bat species not detected during both spring and fall surveys.

* Likely the species recorded, but due to the poor quality of the recording definitive identification could not be made

Monitor 5-Spring was placed near a single tree snag in a dry creek bed (Figure 2, Photo 6). Five positively identified species were recorded at this location and two myotis species, western small-footed bat and long-eared myotis, are likely to have been recorded. This location provides potentially suitable roosting habitat for big brown bat, silver-haired bat, long-eared myotis, and fringe-tailed bat. Additionally, species are likely foraging within the vicinity.

Fall Monitors 1 and 2 were placed in the same location, with Monitor 1 data collection occurring in September and Monitor 2 in October. The placement of the monitors occurred within close proximity of the mine where suitable roost features were present (Figure 2, Photo 7). These surveys occurred following the maternity season, when young are presumably all volant, or capable of flight, and prior to the hibernation period. Surveyors were present at these locations conducting emergence surveys in conjunction with the acoustic surveys. Townsend's big-eared bat, big brown bat, hoary bat, silver-haired bat, and little brown bat were recorded during both surveys. Additionally, fringe-tailed bat was recorded during the September survey and western small-footed bat in October. This location has roosting potential for Townsend's big-eared bat, big brown bat, little brown bat and fringe-tailed bat; however, no bats were observed exiting this location during the surveys. It is likely species recorded during the surveys were using the area for foraging.

The avoidance and minimization measures presented in Appendix IV would avoid direct impacts to roosting bat species at this location.

Potential Hibernaculum Surveys

One area within the Loring Quarry permit area was identified as potential bat hibernaculum habitat, the grotto located beneath the quarry pit and its associated entrances (Photos 8 and 14). Two rounds of acoustic monitoring surveys were conducted in the fall, one from September 21 through 23, and one from October 12 through 14. Emergence surveys were conducted at the vuggy highwall on September 15 and October 13, and at the northern man-made grotto entrance on October 12. To aid with active bat detection after sundown, a Elekon Heterodyne BatScanner (*Elekon*, Switzerland) and infrared-capable videorecorder were used. To aid with species identification, a Wildlife Acoustics SM4BAT full-spectrum bat echolocation detector equipped with single omni- directional ultrasonic microphones (*Wildlife Acoustics*, MA) was set-up near the vuggy highwall for two nights during each acoustic monitoring survey round. Results of these surveys are presented in Table 1 and discussed in the Habitat Assessments and Presence/Absence Survey results.

No bats were observed emerging from either the highwall or man-made grotto entrance during the surveys. One bat was observed flying along the highwall during the September 15 survey, but was not observed entering or exiting any of the crevices in the highwall. The site was surveyed again on October 13; one bat was seen flying in front of the highwall, but no bats were observed entering or exiting the crevices. The northern man-made grotto entrance also fits the characteristics of potential hibernaculum opening and was surveyed October 12. No bats were observed using the entrance.

The highest number of bat passes (bat echolocations) recorded occurred during the September 15 survey, with a total of 340 passes recorded. In contrast, only 1 bat was detected during the October 13 survey of the same location. Fourteen bat passes were recorded during the October 12 survey of the north man-made grotto entrance. It is important to note that the number of bat

passes recorded cannot be used to correlate the number of bats of in the area. Each time a call is emitted within range of the detector, the BatScanner picks up the echolocation and translates it into a sound. Therefore, it is possible for a single bat can be recorded multiple times if it is foraging for an extended period within range of the scanner. As no bats were observed exiting this location during the surveys. It is likely species recorded during the surveys were using the area for foraging.

Lagomorphs

Lagomorphs were not systemically targeted as part of the Loring Quarry baseline inventory survey. Although mountain cottontail (*Sylvilagus nuttallii*), desert cottontail (*Sylvilagus audubonii*), and white-tailed jackrabbit (*Lepus townsendii*) potentially occur in the region, none were recorded in the project area.

Medium and Large-sized Mammals

A variety of medium-sized mammalian species have the potential to occur in the Loring Quarry survey area. These potential species include a variety of common predators and furbearers such as the coyote (*Canis latrans*), red fox (*Vulpes vulpes*), raccoon (*Procyon lotor*), bobcat (*Lynx rufus*), badger (*Taxidea taxus*), striped skunk (*Mephitis mephitis*), and porcupine (*Erethizon dorsatum*). Large carnivores such as black bear (*Ursus americanus*) and mountain lion (Felis concolor) may potentially be found in the region as well. The only medium-sized mammal documented was coyote, which was observed on September 14, 2020 in grassland habitat of the permit area. Coyote scat was also periodically found on site. A complete list of the mammalian species that were observed during surveys in and near the Loring Quarry property during the baseline survey period can be found in Appendix 1.

Avifauna

Game Birds

The Wild Turkey *(Meleagris gallopavo)* was the only upland game bird species observed in the Loring Quarry survey area during baseline inventories. Three hens with 20 chicks were recorded in grassland habitat in the western edge of the permit area on June 30, 2020. No other game birds were recorded during baseline surveys. The woodland habitat in the area is suitable to host Ruffed Grouse (*Bonasa umbellus*).

Raptors

Raptor species observed during the Loring Quarry baseline wildlife surveys included Red-tailed Hawk *(Buteo jamaicensis),* Golden Eagle (*Aquila chrysaetos*), Merlin (*Falco columbarius*), American Kestrel (*Falco sparverius*), Bald Eagle, and Turkey Vulture (*Cathartes aura*). Other raptor species (Appendix 1) could also occur in the survey area, particularly as seasonal migrants, but were not seen during the baseline survey.

Raptor sightings were recorded most often in ponderosa pine and grassland habitats. Red-tailed Hawk observations were the most common and occurred along the eastern edge and northern reaches of the permit area over grassland and pine habitat during multiple surveys. A variety of behavior was recorded, including hunting, perching in trees, on power poles, tending

nests, incubating eggs, and exhibiting nest defense behavior. Multiple American Kestrels were observed perched on power lines in the grassland of the southeast region of the permit area. One Merlin was recorded on September 15, 2020 perched on a wooden post in grassland within the permit area (SE SE Section 33, T5S:R4E). Turkey vultures were also observed during multiple surveys flying over pine and grassland habitats.

One occupied and previously undocumented Red-tailed Hawk nest (Photo 9) was found in the Loring Quarry project area during the baseline survey period (Figure 3) The nest was discovered on May 13, 2020 in a ponderosa pine approximately 85 feet east (and within line-of-site) of the southeastern permit boundary. One adult Red-tailed Hawk was observed incubating in nest while another adult soared around nest site exhibiting defensive behavior. Both adults would exhibit defensive behavior during subsequent surveys. On June 30, 2020, one chick was observed in the nest. No other raptor nests were recorded within the project area during baseline surveys.

Bald and Golden Eagles

The USFWS removed (delisted) the Bald Eagle from protection under the ESA in July 2007 (Federal Register, July 9, 2007), and the ruling became effective that August. However, both species continue to be protected under the Bald and Golden Eagle Protection Act and the Migratory Bird Treaty Act, as well as any applicable state regulations. No targeted Bald of Golden Eagle surveys were required for the Loring Quarry Project. One Golden Eagle was observed on May 13, 2020 soaring along the eastern edge of the survey area (E½ Section 33, T5S:R4E) over grassland and agricultural habitats. One Bald Eagle was recorded flying north over the permit area (NE NE Section 33, T5S:R4E) on December 22, 2020 during the winter habitat and wildlife survey. The Bald Eagle did not land in or near the permit area and not observed again during the survey.

Breeding Birds

Breeding birds were not systematically surveyed as part of the Loring Quarry baseline inventory surveys. However, several species that are potential occupants in the region (Appendix 1) were recorded incidentally. The most common species recorded in grassland habitat included the Western Meadowlark (*Sturnella neglecta*), Vesper Sparrow (*Pooecetes gramineus*), Grasshopper Sparrow (*Ammodramus savannarum*) and Mountain Bluebird (*Sialia currucoides*). Multiple species were also found in pine habitat such as American Robin (*Turdus migratorius*), Blue jay (*Cyanocitta cristata*), Northern Flicker (*Colaptes auratus*), and Black-capped Chickadee (*Poecile atricapillus*). The disturbed and pit areas also contained multiple species such as Cliff Swallow (*Petrochelidon pyrrhonota*), Rock Wren (*Salpinctes obsoletus*), and Rock Dove (*Columba livia*).

Other Avian Observations

Targeted surveys for waterfowl and shorebirds were not required for the Loring Quarry Project. Nevertheless, biologists recorded all birds seen during the survey period. No waterfowl species were documented within the project area. Killdeer (*Charadrius vociferus*), a shorebird species, was recorded on multiple surveys in disturbed ground near the quarry entrance in the southern portion of the permit area.

Amphibians and Reptiles

Potential habitat for amphibian species is limited in the permit area. No perennial water sources occur in the area. Potential intermittent water could occur in the drainages during higher precipitation events, but these were dry during the 2020 baseline surveys. A small seasonal wet area was located in the northwest end of the pit during surveys, and while it had shallow water in the spring and summer surveys it was dry by September. Stock tanks present in the could also provide temporary mesic habitat. Habitat for reptile species is more prevalent throughout the area, and included slash piles, grassy slopes, and mine spoil piles.

Artificial coverage objects were placed at 41 locations across the 5 initial identified habitat types in the area. While multiple species of amphibians and reptiles potentially occur in the region (Appendix 1), only one species was recorded. On June 30, 2020 one plains spadefoot toad (*Spea bombifrons*) (Photo 10) was found underneath the artificial cover object placed in the northwest corner of the quarry pit.

Federally Listed and State Sensitive Species

Prior to initiating field surveys, biologists reviewed the list of rare, threatened, or endangered (T&E) vertebrate species tracked by the SDNHP that could occur as permanent or seasonal residents on or within the vicinity of the Loring Quarry project area, based on each species' range and the habitats present in that area. As expected, the SDNHP database includes State- and Federally listed threatened and endangered species. However, many SDNHP species are not actually rare; some are merely at the edge of their natural range. A listing by the SDNHP is often an indication of possible concern, and the need for more information on a species' range and habitat requirements within the state of South Dakota.

Appendix II presents a summary of current Federal (USFWS) and State (SDGFP) vertebrate species of concern that potentially reside in Custer County, SD. No federally listed species were observed during surveys. Seven vertebrate sensitive species or species of local concern were documented within the Loring Quarry project area during the baseline survey period: Townsend's big-eared bat (*Corynorhinus townsendii*), silver-haired bat (*Lasionycteris noctivagans*), long-eared myotis (*Myotis evotis*), fringe-tailed bat (*Myotis thysanodes*), Merlin, Bald Eagle, and Golden Eagle. The three raptor species were previously discussed in the Raptors results section, while the bat species were discussed in the Small Mammal – Bat results.

Black-Footed Ferret

The USFWS initially listed the black-footed ferret under the ESA in 1967 (32 FR 4001). The agency later issued a block clearance for black-footed ferrets surveys in black-tailed prairie dog colonies throughout most of South Dakota prior to 2007, and throughout most of the species range in 2013 (USFWS 2013). Consequently, ferret surveys are no longer recommended statewide in South Dakota, including the Loring Quarry permit area in Custer County. No surveys were required for the Loring Quarry Project and no ferrets or evidence of their presence (e.g., trenching, tracks, or scat) were observed during the Loring Quarry survey period. While one black-tailed prairie dog colony does occur within the project area, its small size and relative isolation precludes it from being considered adequate black-footed ferret habitat.

Red Knot

The USFWS listed the Rufa Red Knot as Threatened on December 11, 2014 (79 FR 73706) and indicates it as a possible migrant for South Dakota (USFWS 2020a). Targeted surveys were not required for Red Knot (*Calidris canutus*) during baseline surveys. This species has not been documented in the Loring Quarry project area. The Red Knot feeds primarily on hard-shelled aquatic invertebrates, and as such tends to utilize marine habitats such as salt marshes, lagoons, coastal impoundments, sandy or gravel shorelines, mudflats, or tidal zones during migration (USFWS 2015). No red knots were recorded in the project area and no adequate habitat for this species occurs in the permit area.

Whooping Crane

The USFWS recognized the Whooping Crane as endangered on March 11, 1967 (32 FR 4001) and indicates it as a possible migrant for South Dakota (USFWS 2020a). In addition, the SDGFP lists the species as a State Endangered Species (SDGFP 2016). Targeted surveys were not required for Whooping Crane (*Grus americana*) during baseline surveys. This species has not been documented in the Loring Quarry project area. The Whooping Crane's preferred habitats include wet/moist meadows and marshes where it feeds upon fish, small mammals, crustaceans, insects, roots, berries, and grain (Orabona et al. 2012). No whooping cranes were recorded in the project area, and no adequate habitat for this species occurs in the permit area.

Northern Long-eared Bat

The final rule listing the northern long-eared bat as threatened was published on April 2, 2015 (80 FR 17974). While this species has been documented in Custer County (USFWS 2020a), it has not been documented in the Loring Quarry project area. Potential adequate habitat for northern long-eared bat maternal roost and hibernacula occurs both within the Loring Quarry permit area and within the surrounding survey area. One large ponderosa pine snag occurs in the central portion of the permit area north of the quarry pit, and two other smaller snags occur in the permit area could be used as maternal roosts in the summer (Photos 1 and 6). Crevices in the vuggy highwall could also potentially provide roost and hibernacula habitat, especially if they connect to the grotto beneath the quarry (Photos 5 and 7). An abandoned barn just northeast of the pit also provides adequate bat roosting habitat (Photo 2). Suitable maternal roost habitat in the form of tree snags is also located throughout the woodland habitat in the areas beyond the permit area.

No northern long-eared bats were observed or identified during the 2020 baseline surveys. Myotis species with ranges which occur within the vicinity of the project area emit echolocation calls generally within the same frequency range. Species specific call characteristics can be difficult to determine with poor quality calls. At most locations, high frequency calls were recorded; however, due to the poor quality of the recording, species could not be identified.

Aquatic Resources

Benthic Invertebrates

Aquatic resource surveys were not required by the SDGFP. The drainages within the permit area were dry during surveys and no sign of water was observed.

Conclusions

The Loring Quarry permit area encompasses approximately 162 contiguous acres and has been operating since at least 1963. Because much of the area has existing disturbance and is small, topsoil stripping and other habitat impacts are reduced to relatively small areas needed for the quarry expansion, access roads, and other supporting infrastructure. Despite the relatively limited surface disturbance associated with a project of this size, operations can have direct and indirect impacts on local wildlife populations. These impacts are both short-term (until successful reclamation is achieved) and long-term (persisting beyond successful completion of reclamation). However, the latter category is not expected to be substantial due to the relatively limited habitat disturbance associated with the permitted disturbance area.

The direct impacts of a quarry on wildlife include: 1) injuries and mortalities caused by collisions with project-related traffic and infrastructure, or habitat removal actions, such as topsoil stripping, particularly for smaller species with limited mobility, such as some rodents and herptiles; and 2) restrictions on wildlife movement due to construction of fences. The likelihood for the impacts resulting in injury or mortality is greatest during the construction and topsoil stripping phases due to increased levels of traffic and physical disturbance during those periods. Overall traffic will increase from current levels and will persist during production, but should occur at a reduced, and possibly more predictable level than during the construction phase. Speed limits would be enforced during all construction and maintenance operations to reduce impacts on wildlife throughout the year, but particularly during the breeding season.

As indicated, most of the habitat disturbance associated with the quarry operation will consist of removal of topsoil or with creation of topsoil and overburden piles, as is the case with other surface mining operations. Therefore, most indirect impacts would relate to the displacement of wildlife due to increased noise, traffic, or other disturbances associated with the development and operation of the Loring Quarry Project, as well as from small reductions in existing or potential cover and forage due to habitat alteration, fragmentation, or loss. Indirect impacts typically persist longer than direct impacts. However, because smaller quarry mine operations result in fewer large-scale habitat alterations, the need for reclamation actions that may result in dramatic differences between pre-construction and post-construction vegetative communities is also reduced.

No significant impacts on wildlife are anticipated from the construction of infrastructure, mining, and reclamation of these lands. The majority of habitats in the proposed permit area are typical of the region, and no unique or unusual wildlife features are present. The site currently is subject to regular human activity beyond normal ranching operations, as the area is still accessed by construction personnel picking up gravel. Occasional bike traffic on the Mickelson Trail, vehicular traffic associated with either the quarry or ranch, and cattle do occur in the area. Multiple site visits and targeted surveys conducted over the last year, combined with existing agency databases that encompass the project area, indicate that the Loring Quarry permit area and surrounding vicinity are occupied by a wide variety of common wildlife species, with only a few species of concern occurring in the area.

The most notable species of interest were the four species of bat recorded during targeted acoustic surveys. Three additional SDNHP species were documented in or within 0.5 mile of the

permit area during baseline surveys. However, most of those observations consisted of limited observations of birds perched in or flying over the permit area, or sightings made in the surrounding survey perimeter.

As indicated, suitable nesting habitat (trees and native uplands) for some SDNHP species is present in the permit area. However, the location of the quarry permit area and the presence of apparently suitable alternate nesting habitat (due to low density of other nesting individuals) throughout the permit area and perimeter combine to minimize the potential for both direct and indirect impacts for species of concern, and others that require similar habitats.

Other wildlife species of concern, such as other nesting raptors, that occur in the area may also experience direct and/or indirect impacts from increased travel and noise in the area during project construction and operation. The presence of potential alternate nesting and foraging habitat in the immediate vicinity, the mobility of those species, and the location of most relative to planned and existing disturbance combine to reduce impacts on most nesting SDNHP birds as well as other species of interest.

The vegetative communities (Upland Grassland and Woodland) with the greatest species richness baseline surveys will experience physical impacts from construction or operation of the proposed Loring Quarry Project. These two communities account for 51% and 15% of available habitat, respectively. Some vegetation communities, such as the Woodland type, can be difficult to reestablish through artificial planting, and natural re-seeding of those species could take many years. While physical impacts on these areas cannot be avoided, the ample availability of both habitat types throughout the region will help mitigate the habitat loss. The low density of nesting efforts relative to habitat presence in that area (based on observations during surveys) suggests that species' populations as a whole will experience minimal negative impacts from the Loring Quarry Project. Advanced planning of construction activities in concert with continued monitoring can further reduce impacts and assist with the development of mitigation options, if necessary. Adjusting activities associated with topsoil disturbance to periods outside of breeding seasons will further reduce potential impacts.

Big game could be displaced from portions of the Loring Quarry project area to adjacent habitats when disturbance activities would be greatest (e.g., during topsoil stripping and blasting activities). Disturbance levels would decrease resource recovery and processing and would consist primarily of vehicular traffic on new and existing improved and unimproved (two-track) roads throughout the project area. Similar disturbance is already present in the area due to existing haulage of aggregate materials from the site, ranching operations, and traffic on the nearby highway. Mule deer, white-tailed deer, and elk would not be substantially affected given their somewhat limited use of these lands, and the availability of suitable habitat in adjacent areas. The SDGFP does not consider the project area to be within the crucial habitat range of mule deer or any other big game species. Sightings of other species in that vicinity are often seasonal and less common.

Medium-sized mammals (such as prairie dogs, lagomorphs, canids, and badgers) may be temporarily displaced to other habitats during topsoil disturbance activities. Direct losses of some small mammal species (e.g., voles, ground squirrels, mice) may be higher than for other wildlife due to their more limited mobility and likelihood that they would retreat into burrows when disturbed, and thus potentially experience impacts from topsoil scraping or staging activities. However, given the incremental disturbance pattern and relatively small and limited

area of impact from the Loring Quarry Project, such effects would not be expected to result in major changes or reductions in mammalian populations for small or medium-sized animals in the area. Most mammalian species known to be, or potentially be, present in the project area have shown an ability to adapt to human disturbance in varying degrees, as evidenced by their continued presence in other mining and residential areas of similar, or greater, disturbance levels elsewhere in the region. Additionally, small mammal species in the area have a high reproductive potential and tend to reoccupy and adapt to altered and/or reclaimed areas quickly. Advanced planning for topsoil stripping activities, such as timing them in the fall after the young are weaned and mobile, could reduce impacts to these species.

Bat species may be displaced to other habitats during quarry expansion. Several potential summer roost and winter hibernacula locations were identified during surveys. These included tree snags, an abandoned barn, and crevices in the quarry highwall, particularly in the northern portion. Bat species recorded at or near each of the selected survey sites that were placed near these locations. Expansion of the quarry could directly impact potential bats and their summer roost and winter hibernacula locations for the bat species identified in the area. Such effects could be minimized by implementing avoidance and impact mitigation measures like those recommended in Appendix IV. Suitable roost and hibernacula habitat are present beyond the permit area, providing alternate habitat for displaced individuals. Advanced planning of construction activities in concert with continued monitoring can further reduce impacts and assist with the development and implementation of impact avoidance and mitigation options.

Resource recovery in the Loring Quarry project area would not result in impacts on regional raptor populations, though individual birds or pairs may be affected. Mining activity could cause raptors to abandon nest sites near disturbance, particularly if activities encroach on active nests during a given breeding season. Other potential direct impacts would be injury or mortality due to collisions with mine-related vehicular traffic. Construction activities that occur within or near active raptor territories could also cause indirect impacts such as reduction or avoidance of foraging habitats for nesting birds. However, surface disturbance will only occur in a small percentage of the overall permit area at any given time, and the low density of nesting raptors relative to the apparent availability of suitable habitat suggests that alternate nesting habitat is available for all known nesting raptor species in the Loring Quarry project area. Advanced planning of topsoil disturbance and blasting activities in concert with continued monitoring can further reduce impacts and assist with the development of mitigation or monitoring options, if necessary.

While Ruffed Grouse and other upland game birds may be displaced to other habitats during topsoil disturbance activities, resource recovery in the Loring Quarry project area would not impact regional populations. Mining activity could cause upland birds to abandon mating territories or nest sites proximate to disturbance, particularly if activities encroach on active nests during a given breeding season. Other potential direct impacts would be injury or mortality due to collisions with mine-related vehicular traffic. Construction activities that occur within or near occupied habitat could also cause indirect impacts such as reduction or avoidance of mating, nesting, or foraging habitats. However, the presence of ample suitable year-round habitat for these species in the region provides alternatives for displace individuals. Advanced planning of topsoil disturbance and blasting activities can reduce impacts.

Construction and operation of the Loring Quarry Project would have no effect on migrating and breeding waterfowl and shorebirds. Existing habitat for these species does not occur in the

project area, so these species will rarely, if ever, use the area. Habitat disturbance in drainages or other potential water sources would be reclaimed once productive operations have ceased.

As with waterfowl, potential habitat for aquatic and semi-aquatic amphibians is limited within the proposed Loring Quarry permit area and is associated with mobile stock tanks in the area. Those herptile species residing in rocky outcrops located in potential disturbance area could experience impacts from construction and maintenance operations. However, no non-aquatic herptile species were observed in the permit area and surrounding perimeter. Any impacts that might occur would affect individuals but would not likely affect the population as a whole.

As described in the preceding sections of this document, no federally listed vertebrate species were documented in the Loring Quarry survey area (permit area and 0.5-mile perimeter) during the survey period. Additionally, the USFWS has issued a block clearance for black-footed ferrets in all black-tailed prairie dog colonies in South Dakota (except northern Custer County). That clearance indicates that ferrets do not currently and are not expected to occupy the Loring Quarry project area. Only one occupied black-tailed prairie dog colony was present within the permit area itself during the 2020 baseline surveys. Consequently, licensing the Loring Quarry Project will have no direct, indirect, or cumulative effects on black-footed ferrets.

Mining within the Loring Quarry Project is not likely to adversely affect eagle species. Only two eagles were documented during baseline surveys for this project, and they were recorded flying over the area. While no eagles were recorded utilizing the project area, direct impacts on eagles could include the potential for injury or mortality to individual birds foraging in the project area due to collisions with mine-related equipment during construction or operation of the Loring Quarry Project, or due to electrocutions on new or current overhead power lines.

Given the low number of wintering and nesting Bald Eagles and other raptor species in the project area, potential negative direct impacts of the proposed project would be limited to individuals rather than a large segment of the population. The use of existing or overlapping right-of-way corridors, along with current Avian Power Line Interaction Committee (APLIC 2006) recommendations for new power line construction, would help minimize potential direct impacts associated with overhead power lines. If necessary, the majority of other potential direct impacts could be mitigated if construction activities were conducted outside the breeding season and/or winter roosting months, or outside the daily roosting period, should raptors or eagles be present within 1.0 mile of construction. Any Bald Eagles that might roost or nest in the area once the mine is operational would be doing so despite continuous and ongoing human disturbance, indicating a tolerance for such activities.

Indirect impacts such as area avoidance could result from increased noise and human presence associated with mine-related operations. Potential winter foraging habitat could be further fragmented by linear disturbances such as overhead power lines and new roads associated with the project. Given the size of the proposed project, those disturbances would occur within narrow corridors over relatively short distances. Nevertheless, the use of common right-of-way corridors to consolidate new infrastructure would help reduce these potential indirect impacts. Three avian species tracked by the SDNHP were recorded during baseline surveys for the Loring Quarry Project (Merlin, Bald Eagle, and Golden Eagle). While only the Merlin was recorded within the permit area, all three species are highly mobile, and likely would utilize the permit area.

While habitats within the Loring Quarry Project area are adequate to host several of the species listed by the SDNHP, only seven were recorded. SDNHP-listed species that utilize these habitats could potentially experience the same type of direct and/or indirect impacts from activities associated with the proposed mining operation as those described previously for other species (e.g., injury, mortality, avoidance, displacement, and increased competition for resources). Those potential impacts would be minimized by the timing, extent, and duration of the quarry operations and associated activities. Animals occurring in the area have indicated a tolerance for such activities due to their presence during continued operations at the quarry, which began at least 57 years ago. Once resource recovery activities increase, animals remaining in the project area would be demonstrating an acclimation and tolerance to those disturbances.

Printed References

Avian Power Line Interaction Committee (APLIC). 2006. *Suggested Practices for Avian Protection on Power Lines: The State of the Art in 2006.* Edison Electric Institute, APLIC, and the California Energy Commission. Washington, D.C. and Sacramento, CA. 207pp.

Bat Conservation International. 2020. Bat Profiles. Available Online: https://www.batcon.org/about-bats/bat-profiles/

Burt, W. H. and R. P. Grossenheider. 1976. A field guide to the mammals. Houghton Mifflin Company, Boston. 284pp.

Clark, T. W. and M. R. Stromberg. 1987. Mammals in Wyoming. University ofKansas, Museum of Natural History, Lawrence, KS. 314pp.

Federal Register. March 11, 1967. Endangered Species List – 1967. Volume 32, No. 48, Page 4001: https://ecos.fws.gov/docs/federal_register/fr18.pdf

———. July 9, 2007. Endangered and Threatened Wildlife and Plants; Removing the Bald Eagle in the Lower 48 states From the List of Endangered and Threatened Wildlife. Final Rule: Volume 72, No. 130, Pages 37345-37372: www.gpoaccess.gov/fr/.

———. December 11, 2014. Endangered and Threatened Wildlife and Plants; Threatened Species Status for the Rufa Red Knot. Final Rule: Volume 79, No. 238, Pages 73706-73748: https://www.govinfo.gov/content/pkg/FR-2014-12-11/pdf/2014-28338.pdf#page=1

———. January 14, 2015. Endangered and Threatened Wildlife and Plants; Threatened Species Status for the Northern Lon-eared Bat with 4(d) Rule. Final Rule, and Interim Rule with Request for Comments. Volume 80, No. 63, Pages 17974-18033: https://www.fws.gov/midwest/endangered/mammals/nleb/pdf/FRnlebFinalListing02April2015.pdf

Fitzgerald, J.P., C.A. Meaney, and D.M. Armstrong. 2011. *Mammals of Colorado.* Denver Museum of Natural History, Denver, Colorado.

ICF. 2020. Simon Contractors of SD, Inc.: Loring Quarry Large Scale Permit Revision – Wildlife Baseline Survey Plan. ICF. Gillette, WY.

Iowa Department of Natural Resources. 2016. Amphibian and Reptile Monitoring Protocol.

Jones, J. K., Jr., D. M. Armstrong, R. S. Hoffmann, and C. Jones. 1983. Mammals of the Northern Great Plains. University of Nebraska Press, Lincoln. 379pp.

Keinath, D. A., 2004. Fringed Myotis (*Myotis thysanodes*): A Technical Conservation Assessment. USDA Forest Service, Rocky Mountain Region. Available: https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5181913.pdf

Lemen, C. A., P. W. Freeman, & J.A. White. 2016a. Acoustic Evidence of bats using rock crevices in winter: A call for more research on winter roosts in North America. *Transactions of the*

Nebraska Academy of Sciences and Affiliated Societies. 506. http://digitalcommons.unl.edu/tnas/506

Lemen, C. A., P. W. Freeman, & J.A. White. 2016b. Winter activity of *Myotis septentrionalis*: Role of temperature in controlling emergence from a hibernaculum. *Transactions of the Nebraska Academy of Sciences and Affiliated Societies*. 504. http://digitalcommons.unl.edu/tnas/504

Orabona, A., C. Rudd, M. Grenier, Z. Waller, S. Patla, and B. Oakleaf (eds.). 2012. Atlas of Birds, Mammals, Amphibians, and Reptiles in Wyoming. Lander, Wyoming. Wyoming Game and Fish Department Nongame Program.

Ontario Ministry of Natural Resources and Forestry. 2016. Survey Protocol for Ontario's Species at Risk Snakes. Ontario Ministry of Natural Resources and Forestry, Species Conservation Policy Branch. Peterborough, Ontario. ii + 17 pp.

Rosenfield, R. N., J. W. Grier, & R. W. Fyfe. 2007. Reducing management and research disturbance. In D. M. Bird, K. L. Bildstein, D. R. Barber, & A. Zimmerman (eds.), *Raptor Research and Management Techniques* (pp. 351–364). Raptor Research Foundation. Hancock House Publishers.

Sharps, J. C., and T. A. Benzon. 1984. *A Compiled List of South Dakota Wildlife*. South Dakota Department of Game, Fish, and Parks. Rapid City, SD.

South Dakota Bat Working Group. 2004. South Dakota Bate Management Plan. Wildlife Division Report 2004-2008. Available: https://gfp.sd.gov/UserDocs/nav/bat-managment-plan.pdf

South Dakota Game Fish and Parks (SDGFP). 2016. State and Federally Listed Threatened, Endangered and Candidate Species Documented in South Dakota by County. Updated July 19, 2016. Available: https://gfp.sd.gov/userdocs/docs/ThreatenedCountyList.pdf

South Dakota Natural Heritage Program. 2018. Rare Animals of South Dakota. South Dakota Game, Fish and Parks, Pierre, South Dakota. https://gfp.sd.gov/rare-animals/ Accessed 12/04/2020

Tigner, J. and E.D. Stukel. 2003. Bat of the Black Hills: A Description of Status and Conservation Needs. South Dakota Department of Game, Fish, and Park. Wildlife Division Report 2003-05. Available: http://sdbwg.org/resed/BlackHillsBats.pdf

Tuttle, M. D. 1995. *The Little-Known World of Hoary Bats.* Bats Magazine. 13(4). Available at: https://www.batcon.org/article/the-little-known-world-of-hoary-bats/

U.S. Department of Agriculture Natural Resources Conservation Service (USDA NRCS). 2006. *Land Resource Regions and Major Land Resource Areas of the United States, the Caribbean, and the Pacific Basin*. U.S. Department of Agriculture Handbook 296. https://www.nrcs.usda.gov/

U.S. Fish and Wildlife Service (USFWS). 2013. Recovery Plan for the Black-Footed Ferret (*Mustela nigripes*). U.S. Fish and Wildlife Service, Denver, Colorado. 130 pp.

———. 2014. *Northern Long-eared Bat Interim Conference and Planning Guidance*. January 6, 2014. Available: https://www.fws.gov/northeast/virginiafield/pdf/NLEBinterimGuidance6Jan2014.pdf

———. 2015. Status of the Species – Red Knot. November. Retrieved from <https://www.fws.gov/verobeach/StatusoftheSpecies/20151104_SOS_RedKnot.pdf>

———. 2019. Indiana Bat (*Myotis sodalis*) Survey Protocol for Assessing Use of Potential Hibernacula. Date last updated: May 29. 2019. Retrieved from https://www.fws.gov/midwest/endangered/mammals/inba/inba_srvyprtcl.html

———. 2020a. South Dakota Listed Species by County List. Updated December 9, 2020. <https://www.fws.gov/mountain-prairie/es/southdakota/species.php>

———. 2020b. IPaC Trust Resources Report – Simon Contractors of SD, Inc's Loring Quarry. February 20, 2020. Updated December 29, 2020. IPaC v3.0.0. https://ecos.fws.gov/ipac/

———. 2020c. White-nose Syndrome Occurrence Map – by Year (2020). Date last updated July 26, 2020. Version 2.1.4. Accessed December 28, 2020. Available: https://www.whitenosesyndrome.org/resources/map

———. 2020d. U. S. Fish and Wildlife Service Range-wide Indiana Bat Survey Guidelines. Retrieved from: https://www.fws.gov/midwest/endangered/mammals/inba/surveys/pdf/2019_Rangewide _IBat_Survey_Guidelines.pdf

Personal Communication

Michals, Stan, Energy and Minerals Coordinator. South Dakota Game, Fish, and Parks. April 7, 2020—Letter to Stephanie Kane, Biologist, ICF, Gillette, Wyoming.

Michals, Stan, Energy and Minerals Coordinator. South Dakota Game, Fish, and Parks. December 30, 2020—Email to Stephanie Kane, Biologist, ICF, Gillette, Wyoming.

Figures

Figure 1. Wildlife Habitat Communities

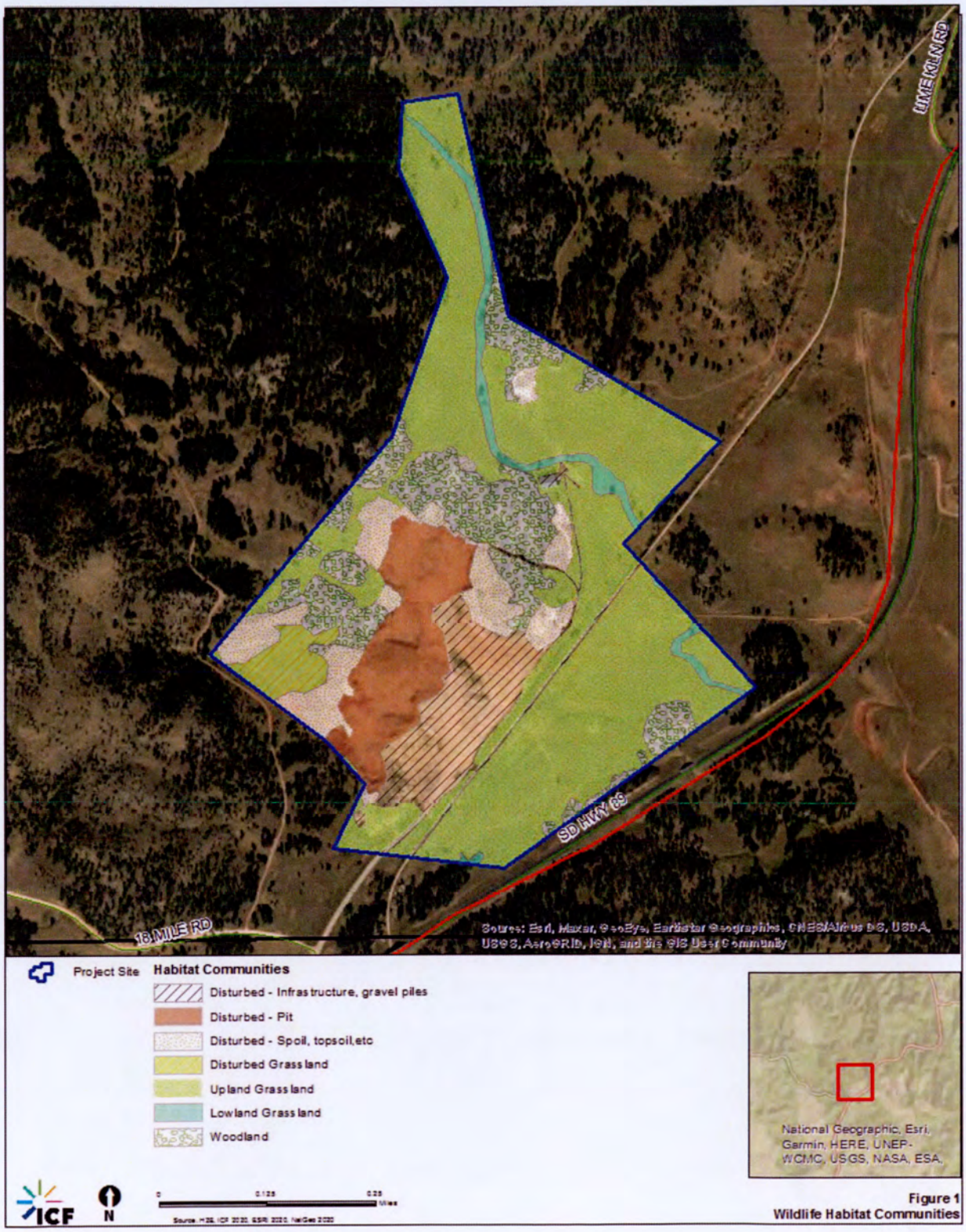


Figure 2. Herptile and Bat Survey Locations

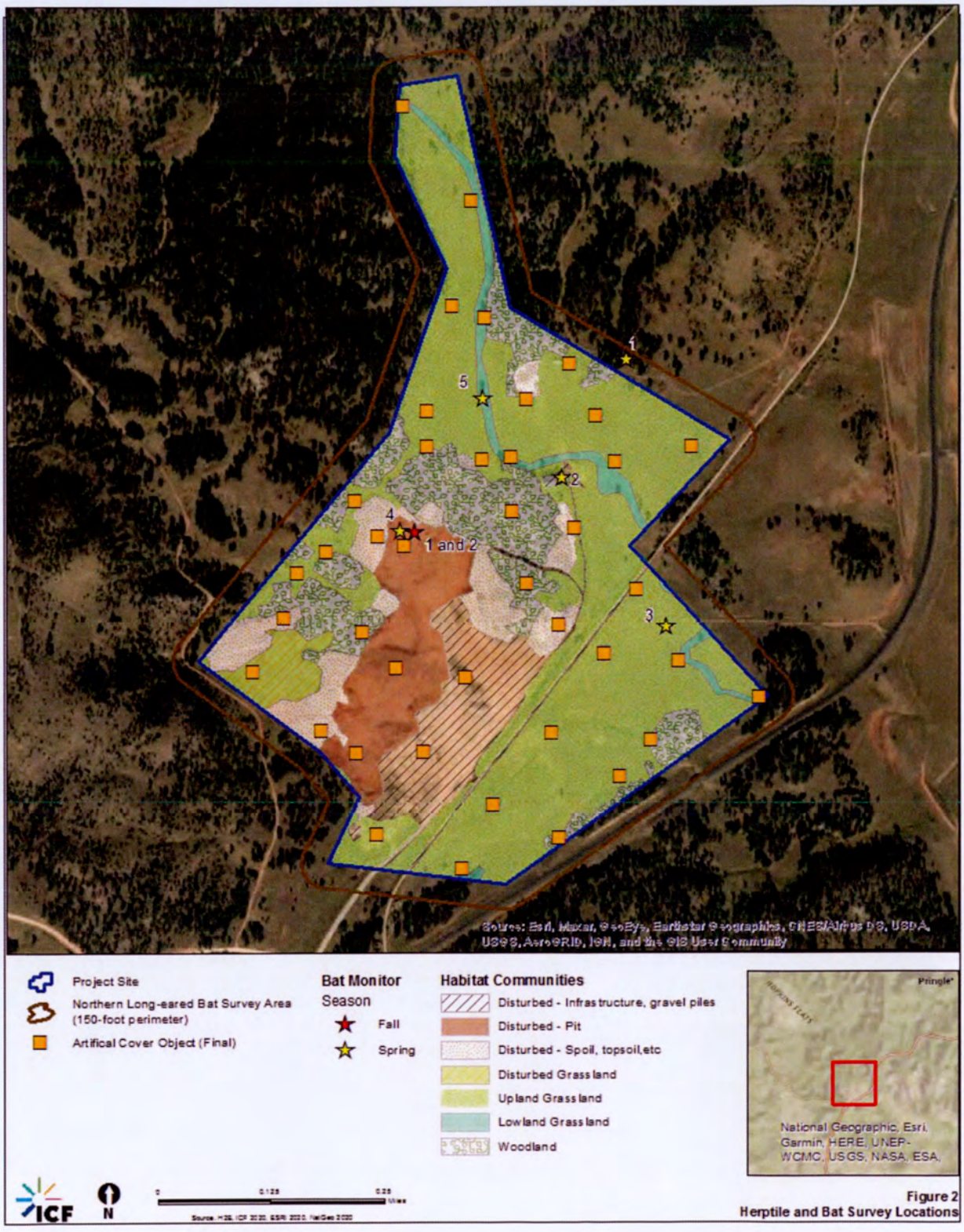


Figure 2
Herptile and Bat Survey Locations

Figure 3. Wildlife Features and Raptor Search Area

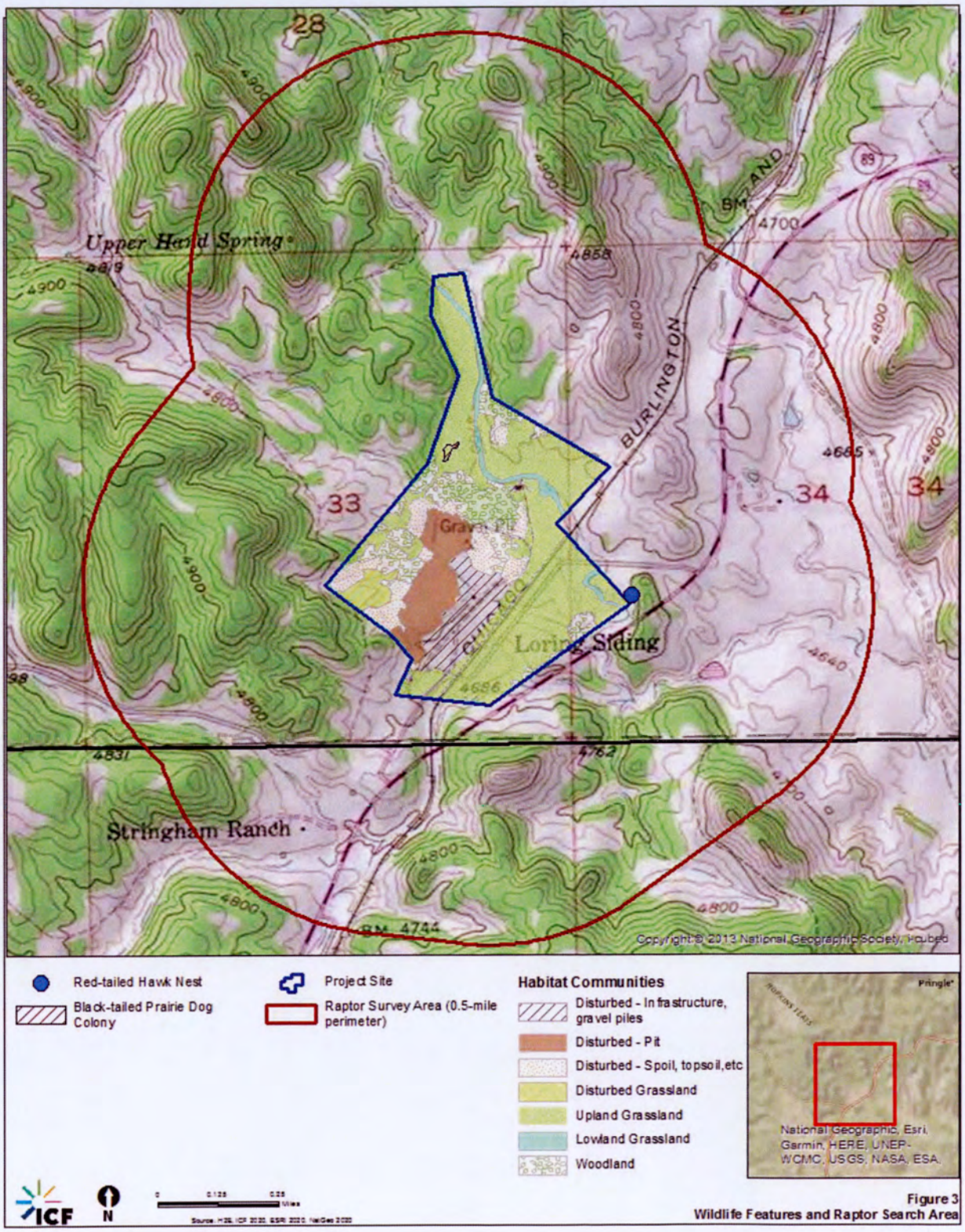


Figure 3
Wildlife Features and Raptor Search Area

Appendix I

Potential and Observed Terrestrial Species List in the Loring Quarry Wildlife Baseline Study Area

Table I-1. Potential[1] and Observed Mammalian Species in the Loring Quarry Wildlife Survey Area

Common Name[2]	Latin Name	Recorded in Permit Area	Recorded in Vicinity [3]
Insectivores			
Hayden's shrew	*Sorex haydeni*	---	---
Masked shrew	*Sorex cinereus*	---	---
Merriam's shrew	*Sorex merriami*	---	---
Bats			
Big brown bat	*Eptesicus fuscus*	X	---
Fringe-tailed bat	*Myotis thysanodes*	X	---
Hoary bat	*Lasiurus cinereus*	X	---
Keen's myotis	*Myotis keenii*	---	---
Little brown bat	*Myotis lucifugus*	X	---
Long-eared myotis	*Myotis evotis*	X	---
Long-legged myotis	*Myotis volans*	---	---
Northern long-eared bat	*Myotis septentrionalis*	---	---
Red bat	*Lasiurus borealis*	---	---
Silver-haired bat	*Lasionycteris noctivagans*	X	---
Western small-footed bat	*Myotis ciliolabrum*	X	---
Townsend's big-eared bat	*Plecotus townsendii*	X	---
Unknown bat species		X	---
Hares and Rabbits			
Desert cottontail	*Sylvilagus audubonii*	---	---
Mountain cottontail	*Sylvilagus nuttallii*	---	---
White-tailed jackrabbit	*Lepus townsendii*	---	---
Cottontail species	*Sylvilagus spp.*	---	---
Rodents			
Black-tailed prairie dog	*Cynomys ludovicianus*	X	---
Bushy-tailed woodrat	*Neotoma cinerea*	---	---
Deer mouse	*Peromyscus maniculatus*	---	---
House mouse	*Mus musculus*	---	---
Least chipmunk	*Tamias minimus*	X	X
Long-tailed vole	*Microtus longicaudus*	---	---
Meadow jumping mouse	*Zapus hudsonius*	---	---
Meadow vole	*Microtus pennsylvanicus*	---	---
Northern flying squirrel	*Glaucomys sabrinus*	---	---
Northern pocket gopher	*Thomomys talpoides*	---	---
Norway rat	*Rattus norvegicus*	---	---
Porcupine	*Erethizon dorsatum*	---	---
Prairie vole	*Microtus ochrogaster*	---	---
Red squirrel	*Tamiasciurus hudsonicus*	X	---
Southern red-backed vole	*Clethrionomys gapperi*	---	---

Common Name[2]	Latin Name	Recorded in Permit Area	Recorded in Vicinity [3]
Thirteen-lined ground squirrel	*Spermophilus tridecemlineatus*	---	---
Vole species	*Microtus* spp.	---	---
White-footed mouse	*Peromyscus leucopus*	---	---
Yellow-bellied marmot	*Marmota flaviventris*	---	---
Carnivores			
Badger	*Taxidea taxus*	---	---
Black bear	*Ursus americanus*	---	---
Bobcat	*Lynx rufus*	---	---
Coyote	*Canis latrans*	X	---
Eastern spotted skunk	*Spilogale putorius*	---	---
Ermine	*Mustela erminea*	---	---
Gray fox	*Urocyon cinereoargenteus*	---	---
Long-tailed weasel	*Mustela frenata*	---	---
Lynx	*Lynx canadensis*	---	---
Mink	*Mustela vison*	---	---
Mountain lion	*Felis concolor*	---	---
Pine marten	*Martes americana*	---	---
Raccoon	*Procyon lotor*	---	---
Red fox	*Vulpes*	---	---
Striped skunk	*Mephitis*	---	---
Weasel species	*Mustela spp.*	---	---
Ungulates			
Elk	*Cervus elaphus*	X	X
Mule deer	*Odocoileus hemionus*	X	X
Pronghorn	*Antilocapra americana*	---	---
White-tailed deer	*Odocoileus virginianus*	X	X
Bighorn Sheep	*Ovis canadensis*	---	---

[1] POTENTIAL OCCURRENCE—list derived from range and habitat information in South Dakota Game Fish and Parks (2016), Sharps and Benzon (1984), Jones et al. (1983), Clark and Stromberg (1987), and Burt and Grossenheider (1976).
[2] Species in **bold** indicate rare species tracked by the South Dakota Natural Heritage Program (2018).
[3] RECORDED IN VICINITY-animal or sign observed within 0.5-mile of the proposed permit area by ICF biologists or during baseline surveys.

Table I-2. Potential[1] and Observed Avian Species in the Loring Quarry Survey Area

Common Name[2]	Latin Name	Recorded in Permit Area	Recorded in Vicinity
Loons and Grebes			
Common loon	*Gavia immer*	---	---
Eared grebe	*Podiceps nigricollis*	---	---
Horned grebe	*Podiceps auritus*	---	---
Pied-billed grebe	*Podilymbus podiceps*	---	---
Herons and Bitterns			
American bittern	*Botaurus lentiginosus*	---	---
Black-crowned night heron	*Nycticorax*	---	---
Great blue heron	*Ardea herodias*	---	---
Ibises			
White-faced ibis	*Plegadis chihi*	---	---
Swans, Geese, and Ducks			
American wigeon	*Anas Americana*	---	---
Blue-winged teal	*Anas discors*	---	---
Bufflehead	*Bucephala albeola*	---	---
Canada goose	*Branta Canadensis*	---	---
Canvasback	*Aythya valisineria*	---	---
Cinnamon teal	*Anas cyanoptera*	---	---
Common merganser	*Mergus merganser*	---	---
Gadwall	*Anas strepera*	---	---
Green-winged teal	*Anas crecca*	---	---
Lesser scaup	*Aythya affinis*	---	---
Mallard	*Anas platyrhynchos*	---	---
Northern pintail	*Anas acuta*	---	---
Northern shoveler	*Anas clypeata*	---	---
Redhead	*Aythya Americana*	---	---
Ring-necked duck	*Aythya collaris*	---	---
Ruddy duck	*Oxyura jamaicensis*	---	---
Snow goose	*Chen caerulescens*	---	---
Vultures			
Turkey vulture	*Cathartes aura*	X	X
Diurnal Raptors			
American kestrel	*Falco sparverius*	X	---
Bald eagle	*Haliaeetus leucocephalus*	X	---
Broad-winged Hawk	*Buteo platypterus*	---	---
Cooper's Hawk	*Accipiter cooperii*	---	---
Ferruginous hawk	*Buteo regalis*	---	---
Golden eagle	*Aquila chrysaetos*	---	X
Merlin	*Falco columbarius*	X	---
Northern Goshawk	*Accipiter gentilis*	---	---

Common Name[2]	Latin Name	Recorded in Permit Area	Recorded in Vicinity
Northern harrier	*Circus cyaneus*	---	---
Osprey	*Pandion haliaetus*	---	---
Peregrine falcon	*Falco peregrines*	---	---
Prairie falcon	*Falco mexicanus*	---	---
Red-tailed Hawk	*Buteo jamaicensis*	X	X
Rough-legged hawk	*Buteo lagopus*	---	---
Sharp-shinned hawk	*Accipiter striatus*	---	---
Swainson's hawk	*Buteo swainsoni*	---	---
Gallinaceous Birds			
Ruffed grouse	*Bonasa umbellus*	---	---
Sharp-tailed grouse	*Tympanuchus phasianellus*	---	---
Wild turkey	*Meleagris gallopavo*	X	---
Cranes			
Sandhill crane	*Grus canadensis*	---	--
Whooping crane	*Grus americana*	---	---
Coots, Gallinules, and Rails			
American coot	*Fulica americana*	---	---
Sora	*Porzana carolina*	---	---
Virginia rail	*Rallus limicola*	---	---
Shorebirds, Gulls, and Terns			
American avocet	*Recurvirostra americana*	---	---
Common snipe	*Gallinago*	---	---
Greater yellowlegs	*Tringa melanoleuca*	---	---
Killdeer	*Charadrius vociferus*	X	---
Lesser yellowlegs	*Tringa flavipes*	---	---
Solitary sandpiper	*Tringa solitaria*	---	---
Spotted sandpiper	*Actitis macularia*	---	---
Upland sandpiper	*Bartramia longicauda*	---	---
Willet	*Catoptrophorus semipalmatus*	---	---
Wilson's phalarope	*Phalaropus tricolor*	---	---
Pigeons and Doves			
Mourning dove	*Zenaida macroura*	---	---
Rock dove	*Columba livia*	X	---
Cuckoos			
Black-billed cuckoo	*Coccyzus erythropthalmus*	---	---
Yellow-billed cuckoo	*Coccyzus americanus*	---	---
Owls			
Eastern screech owl	*Otus asio*	---	---
Great Horned Owl	*Bubo virginianus*	---	---
Long-eared owl	*Asio otus*	---	---
Northern saw-whet owl	*Aegolius acadicus*	---	---

Common Name[2]	Latin Name	Recorded in Permit Area	Recorded in Vicinity
Goatsuckers			
Common nighthawk	*Chordeiles minor*	X	---
Common poorwill	*Phalaenoptilus nuttallii*	---	---
Swifts			
White-throated swift	*Aeronautes saxatalis*	---	---
Hummingbirds			
Broad-tailed hummingbird	*Selasphorus platycercus*	---	---
Calliope hummingbird	*Selasphorus calliope*	---	---
Rufous hummingbird	*Selasphorus rufus*	---	---
Kingfishers			
Belted kingfisher	*Megaceryle alcyon*	---	---
Woodpeckers			
Black-backed woodpecker	*Picoides arcticus*	---	---
Downy woodpecker	*Picoides pubescens*	---	---
Hairy woodpecker	*Picoides villosus*	---	---
Lewis' woodpecker	*Melanerpes lewis*	---	---
Northern flicker	*Colaptes auratus*	X	X
Red-headed woodpecker	*Melanerpes erythrocephalus*	---	---
Red-naped sapsucker	*Sphyrapicus nuchalis*	---	---
Three-toed woodpecker	*Picoides tridactylus*	---	---
Yellow-bellied sapsucker	*Sphyripicus varius*	---	---
Flycatchers			
Cordilleran flycatcher	*Empidonax occidentalis*	---	---
Dusky flycatcher	*Empidonax oberholseri*	---	---
Least flycatcher	*Empidonax minimus*	---	---
Eastern kingbird	*Tyrannus*	---	---
Eastern phoebe	*Sayornis phoebe*	---	---
Hammond's flycatcher	*Empidonax hammondii*	---	---
Olive-sided flycatcher	*Contopus cooperi*	---	---
Say's phoebe	*Sayornis saya*	---	---
Western kingbird	*Tyrannus verticalis*	---	---
Western wood pewee	*Contopus sordidulus*	X	---
Larks			
Horned lark	*Eremophila alpestris*	X	---
Swallows			
Barn swallow	*Hirundo rustica*	---	---
Cliff swallow	*Hirundo pyrrhonota*	X	---
Tree swallow	*Tachycineta bicolor*	---	---
Violet-green swallow	*Tachycineta thalassina*	---	---
Jays, Magpies, and Crows			
American crow	*Corvus brachyrhynchos*	X	---

Common Name[2]	Latin Name	Recorded in Permit Area	Recorded in Vicinity
Black-billed magpie	*Pica*	---	---
Blue jay	*Cyanocitta cristata*	X	---
Clark's nutcracker	*Nucifraga columbiana*	---	---
Common Raven	*Corvus corax*	---	---
Gray jay	*Perisoreus canadensis*	---	---
Pinyon jay	*Gymnorhinus cyanocephalus*	---	---
Chickadees			
Black-capped chickadee	*Parus atricapillus*	X	---
Pygmy nuthatch	*Sitta pygmaea*	---	---
Red-breasted nuthatch	*Sitta canadensis*	X	---
White-breasted nuthatch	*Sitta carolinensis*	---	---
Creepers			
Brown creeper	*Certhia americana*	---	---
Wrens			
Canyon wren	*Catherpes mexicanus*	---	---
House wren	*Troglodytes aedon*	X	---
Rock wren	*Salpinctes obsoletus*	X	---
Winter wren	*Troglodytes*	---	---
Dippers			
American dipper	*Cinclus mexicanus*	---	---
Gnatcatchers and Kinglets			
Blue gray Gnatcatcher	*Polioptila caerulea*	---	---
Golden-crowned kinglet	*Regulus satrapa*	---	---
Ruby-crowned kinglet	*Regulus calendula*	---	---
Thrushes			
American robin	*Turdus migratorius*	X	X
Eastern bluebird	*Sialia sialis*	---	---
Mountain bluebird	*Sialia currucoides*	X	---
Swainson's thrush	*Catharus ustulatus*	---	---
Townsend's solitaire	*Myadestes townsendi*	---	---
Veery	*Catharus fuscescens*	---	---
Mimic Thrushes			
Brown thrasher	*Toxostoma rufum*	---	---
Gray catbird	*Dumetella carolinensis*	---	---
Northern Mockingbird	*Mimus polyglottos*	---	---
Wagtails and Pipits			
American pipit	*Anthus rubescens*	---	---
Sprague's pipit	*Anthus spragueii*	---	---
Waxwings			
Bohemian waxwing	*Bombycilla garrulus*	---	---

Common Name[2]	Latin Name	Recorded in Permit Area	Recorded in Vicinity
Cedar waxwing	*Bombycilla cedrorum*	---	---
Shrikes			
Northern shrike	*Lanius excubitor*	---	---
Loggerhead shrike	*Lanius ludovicianus*	---	---
Starlings			
European starling	*Sturnus vulgaris*	---	---
Vireos			
Bell's vireo	*Vireo bellii*	---	---
Red-eyed vireo	*Vireo olivaceus*	---	---
Plumbeous Vireo	*Vireo plumbeus*	---	---
Solitary vireo	*Vireo solitarius*	---	---
Warbling vireo	*Vireo gilvus*	---	---
Warblers			
American redstart	*Setophaga ruticilla*	---	---
Black-and-white warbler	*Mniotilta varia*	---	---
Blackburnian warbler	*Dendroica fusca*	---	---
Blackpoll warbler	*Dendroica striata*	---	---
Common yellowthroat	*Geothlypis trichas*	X	---
MacGillivray's warbler	*Oporornis tolmiei*	---	---
Orange-crowned warbler	*Vermivora celata*	---	---
Ovenbird	*Seiurus aurocapillus*	---	---
Tennessee warbler	*Vermivora peregrina*	---	---
Townsend's warbler	*Dendroica townsendi*	---	---
Wilson's warbler	*Wilsonia pusilla*	---	---
Yellow warbler	*Setophaga petechia*	---	---
Yellow-breasted chat	*Icteria virens*	---	---
Yellow-rumped warbler	*Dendroica coronata*	---	---
Tanagers			
Western tanager	*Piranga ludoviciana*	---	---
Grosbeaks and Buntings			
Black-headed grosbeak	*Pheucticus melanocephalus*	---	---
Blue grosbeak	*Guiraca caerulea*	---	---
Dickcissel	*Spiza americana*	---	---
Indigo bunting	*Passerina cyanea*	---	---
Lazuli bunting	*Passerina amoena*	---	---
Rose-breasted grosbeak	*Pheucticus ludovicianus*	---	---
Towhees, Sparrows, Juncos, and Longspurs			
American tree sparrow	*Spizella arborea*	---	---
Baird's sparrow	*Ammodramus bairdii*	---	---
Chestnut-collared longspur	*Calcarius ornatus*	---	---
Chipping sparrow	*Spizella passerina*	X	---

Common Name[2]	Latin Name	Recorded in Permit Area	Recorded in Vicinity
Clay-colored sparrow	*Spizella pallida*	---	---
Dark-eyed junco	*Junco hyemalis*	X	---
Field sparrow	*Spizella pusilla*	---	---
Grasshopper sparrow	*Ammodramus savannarum*	X	---
Harris' sparrow	*Zonotrichia querula*	---	---
Lark bunting	*Calamospiza melanocorys*	---	---
Lark sparrow	*Chondestes grammacus*	X	---
Snow bunting	*Plectrophenax nivalis*	---	---
Song sparrow	*Melospiza melodia*	---	---
Spotted towhee	*Pipilo maculatus*	X	---
Vesper sparrow	*Pooecetes gramineus*	X	---
White-crowned sparrow	*Zonotrichia leucophrys*	---	---
White-throated sparrow	*Zonotrichia albicollis*	---	---
Blackbirds, Meadowlarks, and Orioles			
Brewer's blackbird	*Euphagus cyanocephalus*	X	---
Brown-headed cowbird	*Molothrus ater*	X	---
Common grackle	*Quiscalus quiscula*	---	---
Northern oriole	*Icterus galbula*	---	---
Orchard oriole	*Icterus spurius*	X	---
Red-winged blackbird	*Agelaius phoeniceus*	---	---
Western meadowlark	*Sturnella neglecta*	X	---
Finches			
American goldfinch	*Carduelis tristis*	X	---
Cassin's finch	*Carpodacus cassinii*	---	---
Common redpoll	*Carduelis flammea*	---	---
Evening grosbeak	*Coccothraustes vespertinus*	---	---
House finch	*Carpodacus mexicanus*	---	---
Pine grosbeak	*Pinicola enucleator*	---	---
Pine siskin	*Carduelis pinus*	---	---
Purple finch	*Carpodacus purpureus*	---	---
Red crossbill	*Loxia curvirostra*	---	---
Rosy finch	*Leucosticte arctoa*	---	---
White-winged crossbill	*Loxia leucoptera*	---	---
Weaver Finches			
House sparrow	*Passer domesticus*	---	---

[1] POTENTIAL OCCURRENCE—list derived from range and habitat information in South Dakota Game Fish and Parks (2016), Peterson (2020), Robbins et al. (2001), Stokes et al. (2013).

[2] Species in **bold** indicate rare species tracked by the South Dakota Natural Heritage Program (2018).

[3] RECORDED IN VICINITY-animal or sign observed within 0.5-mile of the proposed permit area by ICF biologists or during baseline surveys.

Table I-3. Potential[1] and Observed Avian Species in the Loring Quarry Survey Area

Common Name[2]	Latin Name	Recorded in Permit Area	Recorded in Vicinity
Salamanders			
Tiger salamander	*Ambystoma tigrinum*	---	---
Frogs and Toads			
Boreal chorus frog	*Pseudacris triseriata*	---	---
Plains spadefoot toad	*Spea bombifrons*	X	---
Northern leopard frog	*Rana pipiens*	---	---
Lizards			
Northern sagebrush lizard	*Sceloporus graciousus*	---	---
Short-horned lizard	*Phrynosoma hernandesi*	---	---
Snakes			
Black hills redbelly snake	*Storeria occipitomaculata pahasapae*	---	---
Bullsnake	*Pituophis melanoleucas sayi*	---	---
Common garter snake	*Thamnophis sirtalis*	---	---
Eastern yellowbelly racer	*Coluber constrictor*	---	---
Pale milk snake	*Lampropeltis triangulum multistriata*	---	---
Smooth green snake	*Liochlorophis vernalis*	---	---
Western terrestrial (wandering) garter snake	*Thamnophis elegans*	---	---

[1] POTENTIAL OCCURRENCE—list derived from range and habitat information in South Dakota Game Fish and Parks (2016), Kiesow (2006).

[2] Species in **bold** indicate rare species tracked by the South Dakota Natural Heritage Program (2018).

[3] RECORDED IN VICINITY-animal or sign observed within 0.5-mile of the proposed permit area by ICF biologists or during baseline surveys.

References for Potential and Observed Species Lists (Appendix I)

All Species

Sharps, J. C., and T. A. Benzon. 1984. *A Compiled List of South Dakota Wildlife*. South Dakota Department of Game, Fish, and Parks. Rapid City, SD.

South Dakota Game Fish and Parks. 2016. State and Federally Listed Threatened, Endangered and Candidate Species Documented in South Dakota by County. Updated July 19, 2016. Available: <https://gfp.sd.gov/userdocs/docs/ThreatenedCountyList.pdf>.

South Dakota Natural Heritage Program. 2018. Rare Animals of South Dakota. South Dakota Game, Fish and Parks, Pierre, South Dakota. Accessed December 29, 2020. https://gfp.sd.gov/rare-animals/

Mammals

Burt, W. H. and R. P. Grossenheider. 1976. A field guide to the mammals. Houghton Mifflin Company, Boston. 284pp.

Clark, T. W. and M. R. Stromberg. 1987. Mammals in Wyoming. Univ. of Kansas, Museum of Natural History, Lawrence, KS. 214pp.

Jones Jr., J.K, D.M. Armstrong, RS. Hoffmann, and C. Jones. 1983. Mammals of the northern Great Plains. University of Nebraska Press, Lincoln, NE.

Avian

Peterson, R. T. 2020 Field Guide to Birds of Western North America. Houghton Mifflin Co., Boston. 480 pages.

Robbins, C. S., B. Bruun, and H. S. Zim. 2001. Birds of North America: A guide to field identification. Golden Press, New York. 360pp.

Stokes, D.W., and Stokes, L.Q. 2013. Field guide to birds: western region. Little, Brown and Co., New York.

Amphibians and Reptiles

Kiesow, AM. 2006. Field Guide to Amphibians and Reptiles of South Dakota. South Dakota Game, Fish and Parks. Pierre, SD.

Appendix II
Vertebrate Wildlife Species Federal and State Species of Concern

Table II-1. Current Federal (U.S. Fish and Wildlife Service Listing within Custer County, SD [SDGFP 2016]), Loring Quarry IPaC Report (USFWS 2020a), State Vertebrate Species of Concern that potentially occur in Custer County, SD[1]

Common Name (Latin Name)	Federal Status, State Status, State Rank†
BIRDS	
American Dipper (*Cinclus mexicanus*)	ST, S2B
American Three-toed Woodpecker (*Picoides dorsalis*)	S2B
Baird's sparrow (*Ammodramus bairdii*)	S2B
Bald eagle (*Haliaeetus leucocephalus*)	S4B
Black and White Warbler (*Mniotilta varia*)	S1B
Black-backed woodpecker (*Picoides arcticus*)	S2B
Blue-gray Gnatcatcher (*Polioptila caerulea*)	S2B
Brown Creeper (*Certhia americana*)	S2B
Cassin's Finch (*Haemorhous cassinii*)	S1B
Clark's Nutcracker (*Nucifraga columbiana*)	S2B
Common Poorwill (*Phalaenoptilus nuttallii*)	S1B
Ferruginous Hawk (*Buteo regalis*)	S3B
Golden Eagle (*Aquila chrysaetos*)*	O, S3B
Great Blue Heron (*Ardea herodias*)	S4B
Lark bunting (*Calamospiza melanocorys*)	C
Lewis's woodpecker (*Melanerpes lewis*)	S2B
Long-eared Owl (*Asio otus*)	S3B
Merlin (*Falco columbarius*)*	SUB
Northern Goshawk (*Accipiter gentilis*)	S3B
Northern Mockingbird (*Mimus polyglottos*)	S1B
Northern Saw-whet Owl (*Aegolius acadicus*)	S2B
Osprey (*Pandion haliaetus*)	S3B
Prairie falcon (*Falco mexicanus*)	S3S4B
Pygmy Nuthatch (*Sitta pygmaea*)	S1B
Red-headed Woodpecker (*Melanerpes erythrocephalus*)	O
Rufa Red Knot (*Calidris canutus rufa*)	FT
Ruffed Grouse (*Bonasa umbellus*)	C
Sharped-shinned Hawk (Accipiter striatus)	S3B
Whooping crane (*Grus americana*)	FE, SE, SZA
MAMMALS	
Black bear (*Ursus americanus*)	C
Black-footed ferret (*Mustela nigripes*)	FE, SE, S1
Fringe-tailed bat (*Myotis thysanodes pahasapensis*)*	S2
Northern Long-eared bat (*Myotis septentrionalis*)	FT, S3
Northern river otter (*Lontra canadensis*)	S2
Silver-haired bat (*Lasionycteris noctivagans*)*	S4
Swift fox (*Vulpes velox*)	ST, S3

Townsend's big-eared bat (*Corynorhinus townsendii*)*	S2S3
AMPHIBIANS AND REPTILES	
Black Hills redbelly snake (*Storeria occipitomaculata pahasapae*)	S3
Sagebrush lizard (*Sceloporus graciosus*)	S2
Smooth green snake (*Opheodrys vernalis*)	S4
FISHES	
Blacknose shiner (*Notropis heterolepis*)	SE, S1
Longnose sucker (*Catostomus catostomus*)	ST, S1
Sturgeon chub (*Macrhybopsis gelida*)	ST, S2

*Species recorded during the 2020 baseline surveys.

1 Michals, Stan, Energy and Minerals Coordinator. South Dakota Game, Fish, and Parks. February 14, 2020—Letter to Katie Wilson, Biologist, ICF, Gillette, Wyoming.

C Species listed at county level

FC Federally listed (for Custer County, SD), candidate

FE Federally listed (for Custer County, SD), endangered

FT Federally listed (for Custer County, SD), threatened

O Listed for the area in the USFWS IPaC report (2020), due to species listing in the Breeding Birds of Conservation Concern Report for the region (2008).

SE State Endangered

ST State Threatened

† State Rank: Separate rank given for breeding (B) and non-breeding (N) seasons (if different).

S1 Critically imperiled because of extreme rarity (five or fewer occurrences or very few remaining individuals) or because of some factor(s) making it especially vulnerable to extinction within South Dakota.

S2 Imperiled because of rarity (six to 20 occurrences or few remaining individuals) or because of some factor(s) making it very vulnerable to extinction throughout its range within South Dakota.

S3 Either very rare and local throughout its range within South Dakota or found locally (even abundantly at some of its locations in a restricted range) or vulnerable to extinction throughout its range because of other factors (in the range of 21 to 100 occurrences).

S4 Apparently secure within South Dakota, though it may be quite rare in parts of its range, especially at the periphery; cause for long-term concern.

SZ No definable occurrences for conservation purposes, usually assigned to migrants.

Appendix III

Representative Photographs from the Loring Quarry Project Area

2020 Loring Quarry Photos



Photo 1

Bat Monitor 1 near potential tree snag roost site.



Photo 2

Bat Monitor 2 near potential roost site at old barn.



Photo 3

Bat Monitor 3 near stock tanks filled with water.



Photo 4

Bat Monitor 4 near wet area in west side of blasting pit.



Photo 5

Bat Monitor 4's location in relation to the vuggy highwall in blasting pit.



Photo 6

Potential bat roost snag where Bat Monitor 5 was placed.



Photo 7

Crevices in highwall in blasting pit. Bat monitor site for Fall surveys was located in the lower left of the photo.



Photo 8

North man-made grotto entrance in blasting pit.



Photo 9

Occupied Red-tailed Hawk nest in ponderosa pine near east edge of permit area (center of photo, just up from fork in tree).



Photo 10

Plains spadefoot toad (*Spea bombifrons*) discovered underneath artificial cover object (ACO) placed in blasting pit.



Photo 11

Black-tailed prairie dog colony in grassland habitat in central portion of proposed permit area.



Photo 12

Typical woodland habitat in and near the Loring Quarry permit area.



Photo 13

South pit area.



Photo 14

North pit area looking towards highwall with crevices and north man-made grotto entrance.

Appendix IV
Bat Avoidance and Mitigation Measures

MM-1: Conduct Emergence Surveys Prior to Construction Activities

If identified suitable day roost habitat would be affected by construction activities presence/absence surveys will be conducted for bats prior to the start of construction. The survey will consist of a daytime search for potential roosting habitat and evening emergence surveys to determine if the structure is being used as a roost. Work will be performed by qualified biologists who have knowledge of the natural history of the bat species that could occur in the project area and experience conducting emergence surveys and using full spectrum acoustic equipment. During evening emergence surveys, biologists will avoid unnecessary disturbance of occupied roosts. Evening (i.e., dusk) emergence surveys will consist of at least one biologist stationed on at different vantage points from the structure, watching for emerging bats from a half hour before sunset to 1-2 hours after sunset or until visibility is no longer optimal. All emergence surveys will be conducted during favorable weather conditions (no rain or high winds, night temperatures above 55° F).

If surveys are positive for roosting bats and will be impacted by construction, installation of exclusion devices or tree removal may occur outside of the maternity and hibernating period (i.e., during September 16-October 15 and March 16-April 30) to preclude bats from occupying structure/feature. Exclusionary devices will only be installed by or under the supervision of an experienced bat biologist.

MM-2: Removal of Potential Bat Tree and Snag Roost Habitat

If trees, including snags, with bat roost potential require removal or trimming during the maternity season (May 1-September 15), a qualified bat biologist will conduct a one night emergence survey during acceptable weather conditions (no rain or high winds, night temperatures above 55° F) or if conditions permit, physically examine the roost for presence or absence of bats (such as with lift equipment) before the start of construction/removal. If the roost is determined to be occupied during this time, the tree will be avoided until after the maternity season when young are self-sufficiently volant. If trees with bat roost potential require removal during the winter months when bats are torpor or hibernation (October 16-March 15, but is dependent on specific weather conditions), a qualified bat biologist will physically examine the roost if conditions permit for presence or absence of bats (such as with lift equipment) before the start of construction. If the roost is determined to be occupied during this time, the tree will be avoided until after the winter season when bats are once again active.

If trees with a potential bat roost require trimming or removal it will be conducted following a two-day process, in coordination with any necessary permits or ordinances. On Day 1, for trees with cavities, crevices, and exfoliating bark, removal of branches and limbs with no cavities will be removed by hand (e.g., using chainsaws). This will create a disturbance (noise and vibration) and physically alter the tree. Bats already roosting in the tree, which may not have been detected during the preconstruction survey, will either abandon the roost immediately (rarely) or, after emergence, avoid returning to the roost. For foliage roosting bats, such as hoary bats, Day 1 would be to remove adjacent, smaller, or non-habitat trees to create noise and vibration disturbance that would cause abandonment. On Day 2 under the supervision of a qualified

biological monitor, the tree may be removed. Trees that are only to be trimmed and not removed would be processed in the same manner; if a branch with a potential roost must be removed, all surrounding branches would be trimmed on Day 1 under supervision of a qualified bat biologist and then the limb with the potential roost would be removed on Day 2. All downed roost trees shall be searched for dead and injured bats. If any bat species of special concern are dead or injured then the biologist shall report the find to South Dakota Game and Fish (SDGFP) and/or U.S. Department of Fish and Wildlife (USFWS).

If it is determined that trees or structures in the project area are being used by bats as roost sites, the following protective measures shall be implemented:

Disturbance of active roosting structures or trees (e.g., structure removal, construction equipment operation near roosts, tree trimming or removal) will not occur between the maternity period (May 15 and the following September 15) or hibernation period (October 15-March 15). This will avoid impacts on reproductively active females and active maternity roosts (whether colonial or solitary) and hibernating bats. The roosts will remain undisturbed from the time it is located until outside the maternity or hibernation period (as applicable) or a qualified biologist has determined the roost is no longer active. No construction work will occur at the roost or within a 100-foot-wide buffer zone (or an alternative width, as determined in consultation with NDGF) until it is outside those periods.

MM-3: Removal and Eviction of Potential Bat Cave and Mine Roost Habitat-

If potential cave and mine bat roost habitat will be impacted, a qualified bat biologist will conduct a one-night emergence survey during acceptable weather conditions (no rain or high winds, night temperatures above 55° F) or if conditions permit, physically examine the roost for presence or absence of bats. Qualified bat biologist will conduct a one-night emergence survey during acceptable weather conditions (no rain or high winds, night temperatures above 55° F) or if conditions permit, physically examine the roost for presence or absence of bats (such as with lift equipment) before the start of construction/removal. If the roost is determined to be occupied during this time, it will be avoided until after the maternity season when young are self-sufficiently volant. If a mine or cave with bat roost potential require will be impacted during the winter months when bats are torpor or hibernation (October 15- March 15, but is dependent on specific weather conditions), a qualified bat biologist will physically examine the roost if conditions permit for presence or absence of bats (such as with lift equipment) before the start of construction. If the roost is determined to be occupied during this time, impacts will be avoided until after the winter season when bats are once again active.

If surveys are positive for roosting bats and will be impacted by construction, exclusion devices may be installed outside of the maternity (i.e., during March 16-April 30) and hibernating period (i.e., during September 16-October 15) to preclude bats from occupying structure/feature Exclusion devices may be installed outside of the maternity period (i.e., between September 16 and April 14) to preclude bats from occupying mines/features during construction. Exclusionary devices will only be installed by or under the supervision of an experienced bat biologist and in consultation with NDGF. If bat roosts need to be impacted during the hibernation period (October 15- March 15), emergence surveys should occur during September 1 through October 15, when successful eviction is feasible. Exclusionary devices should only be installed by or under the supervision of an experienced bat biologist. Once in the hibernation period, seasonally torpid bats and hibernating bats are not active, therefore eviction methodologies would not be successful or feasible. Emergence surveys conducted

between October 15 and March 15, during heavy rains, and when day and/or night temperatures drop below 52 degrees Fahrenheit (° F) cannot definitively determine if potential day roost habitat is unoccupied. Once temperatures fall below 52° F and/or there is rainfall, bats may enter torpor very quickly and may not emerge. The October 15 date may be extended or the March 15 date reduced if rains are absent and night temperatures remain above 52° F. If a feature cannot be visually inspected and confirmed to be unoccupied, the potential roost will be avoided until weather permits to conduct an accurate emergence survey.

Appendix V
Resumes

- Stephanie Kane
- Lisa Allen
- Jeff Abplanalp
- Ashlynn Harris

STEPHANIE KANE

Project Role: Senior Wildlife Biologist



Stephanie Kane is a project manager and wildlife biologist with more than 10 years of experience. She provides environmental consulting expertise to regional coal, coal bed methane, and oil companies, providing wildlife surveys and related reports to the companies on a contract basis. Stephanie manages both surface coal mine and coal bed natural gas/petroleum projects for northeastern Wyoming and southern Montana and helps with surveys for utilities/transmission line projects. She has managed utilities/transmission and rock quarry projects. As project manager, she manages the majority of tasks associated with contracted projects: providing yearly cost estimates for each project; conducting necessary wildlife surveys and making sure the surveys meet federal and state wildlife and environment regulations; ensuring the project stays on schedule and within budget; providing written reports of wildlife survey findings; and solving any problems encountered during the project. Her mine projects also include writing raptor nest mitigation plans and activities associated with the physical mitigation of the nests.

Years of Experience

- Professional start date: 08/2003
- ICF start date: 03/2013

Education

- MS, Biology, Fort Hays State University, 2011
- BS, Zoology, Colorado State University, 2005

Professional Memberships

- Kansas, Cooper and Wilson Ornithological Societies, Student Member
- The Association of Field Ornithologists
- Society for Range Management, 2010

Certifications

- Chapter 10, Wyoming Game and Fish Department (WGFD)
- Chapter 33, WGFD
- Wetland Delineations, WTI 2019
- Projects WET & WILD, Kansas, 2011

Selected Project Experience

Surface Gold Mine Wildlife Monitoring and Reporting—Coeur Wharf Resources (USA) Inc., Wharf Mine, Lawrence County, South Dakota. 2016 - Present.

Senior Biologist and Project Director. As senior biologist manages annual monitoring at the Wharf Mine, helps with field surveys, and provides area expertise. Surveys encompass a variety of terrestrial vertebrates, including threatened and endangered (T&E) and Sensitive Species (USFWS and SDNHP species), raptors and songbirds. As project director, manages staff, ensures the project is on task, schedule and budget, and meets with client, and coordinates with SDWFP.

Surface Coal Mine Wildlife Monitoring and Reporting—Navajo Transitional Energy Company, Antelope Mine, Campbell and Converse County, Wyoming. 2016 - Present.

Lead biologist and project manager. As lead biologist, designs, manages, and conducts annual monitoring at the Antelope Mine. Surveys encompass a variety of terrestrial vertebrates, including (T&E) and Sensitive Species (USFWS, BLM, and WGFD species), big game, lagomorphs, aquatics, raptors, upland game birds, waterfowl, shorebirds, and songbirds. Helped draft the current *Avian Species of Management Concern and Raptor Monitoring and Mitigation Plan*. Regularly works with the USFWS on an ongoing golden eagle nest monitoring project, and on lease modifications. As project manager, creates and manages annual budgets, meets with client, and coordinates field surveys.

Surface Coal Mine Wildlife Monitoring and Reporting—Eagle Specialty Materials, Eagle Butte & Belle Ayr Mines, Campbell County, Wyoming. 2014 - Present.

Lead biologist and project manager. As lead biologist, designs, manages, and conducts annual monitoring at the Eagle Butte and Belle Ayr Mines. Surveys encompass a variety of terrestrial vertebrates, including T&E and Sensitive Species (USFWS, BLM, and WGFD species), big game, lagomorphs, aquatics, raptors, upland game birds, waterfowl, shorebirds, and songbirds. Helped draft the current *Avian Species of Management Concern and Raptor Monitoring and Mitigation Plan*. As project manager, creates and manages annual budgets, meets with client, and coordinates field surveys.

Decker Mine Annual Wildlife Monitoring and Amendment Baseline Biological Surveys—Lighthouse Resources, Decker Coal Company, Big Horn County, Montana. 2015 - Present.

Lead biologist and project manager. As lead biologist, designed, managed, and conducted baseline inventory surveys at existing mines and baseline inventories for expansions of existing properties. Surveys encompassed a variety of terrestrial vertebrates, including threatened and endangered and Sensitive Species (USFWS, BLM, and MFWP species), big game, lagomorphs, raptors, upland game birds, waterfowl, shorebirds, reptiles and amphibians, songbirds, prairie dogs, and aquatics/fishery surveys. Prepared baseline and species of special interest reports to be submitted to multiple federal and state agencies as part of permit application packages. As project manager, created and manages project budget, meets with client, consults with agencies, and coordinates field surveys. Annual wildlife monitoring and reporting for the mine are on-going.

Hondo Federal 11-15 Northern Long-eared Bat Surveys and Big Jake 13-7 Greater Sage-Grouse Surveys—Stephens Production Company, Campbell County, Wyoming. 2019.

Project Manager and Field Biologist. As a field biologist for the Hondo Federal 11-15 (Campbell County, Wyoming), Stephanie planned and coordinated maternity roost searches and set-up bat monitoring surveys as required by the BLM Buffalo Field Office and U.S. Fish and Wildlife Service prior to project construction. Tasks as a project manager included: coordinating with federal agencies prior to surveys, developing a survey plan for agency approval, creating a project budget and scope of work, coordinating project staff, and submitting a technical report of the survey results.

Rawhide Mine Wildlife Monitoring—Peabody Energy, Campbell County, Wyoming. 2017.

Lead biologist and project manager. Designs, manages, and conducts annual monitoring; Surveys include T&E and Sensitive Species (USFWS, BLM, and WGFD species), big game, lagomorphs, raptors, upland game birds, waterfowl, shorebirds, and song birds; Prepares and reviews annual wildlife reports, raptor mortality reports, mitigation plan supplemental letters, and USFWS permit annual reports; GIS/AutoCAD mapping; Implements raptor nest mitigation activities including raptor nest monitoring and relocation; Handles wildlife emergencies including raptor mortalities and injuries; Creates and manages annual budgets and meets with client.

State 36 Scoria Pit—Earth Works Solutions, LLC, Campbell County, Wyoming. 2016.

Field Biologist. As a field biologist, designed and conducted baseline inventory surveys for a proposed expansion to a scoria pit. Surveys encompassed T&E and Sensitive Species (USFWS, BLM, and WGFD species), raptors, upland game birds, and songbirds. Prepared baseline study plan and wrote baseline report to be submitted to federal and state agencies as part of the permit application package.

LISA ALLEN

Project Role: Senior Wildlife Biologist/Bats

Lisa has ten years of experience as a wildlife biologist. She has completed focused surveys for nesting birds, as well as special status species including burrowing owl, least Bell's vireo, and coastal California gnatcatcher. She has conducted other biological surveys for small mammals, southwestern pond turtle, desert tortoise, Mojave fringe-toed lizard, Nelson's bighorn sheep, Lane Mountain milk-vetch, and desert cymopterus. Lisa has also conducted habitat assessments and emergence surveys for bat in southern California in additional to attending field workshops for survey techniques, handling of bats, and for acoustic monitoring using Sonobat software. She is familiar with ArcPad and QGIS. Lisa has written an avian monitoring plan for the National Training Center at Fort Irwin, California, as well as several habitat assessments, focused survey reports, and biological sections for Environmental Impact Reports, Environmental Impact Statements, and Natural Environmental Study (Caltrans NES) reports. She has project management experience as well as managing and coordinating large field efforts and data collection and organization.



Years of Experience

- Professional start date: 11/2009
- ICF start date: 07/2010

Education

- BS, Wildlife Management and Conservation, Humboldt State University, California, 2009

Professional Memberships

- Bat Conservation International
- The Wildlife Society

Certifications/Other

- California of Fish and Wildlife (CDFW) Scientific Collecting Permit, No. SC-11914
- U.S. Fish and Wildlife Service (USFWS) 10(a)(1)(A) Permit, for least Bell's vireo nest monitoring, California gnatcatcher presence/absence surveys, No. TE-601151B-0 *(Expires 3/2021)*
- Letter of Concurrence for Flat-tailed Horned Lizard, CDFW, Issued August 20, 2012

Training

Southwestern Desert Bats 2014, Dr. Pat Brown, Anza-Borrego Foundation, Borrego Springs, CA, April 11-13, 2014

Discussion of desert species biology, ecology, and conservation efforts. Discussion of habitat assessments and survey techniques, including setting mist and acoustic equipment.

Conservation and Ecology of California Bats, Dr. Szewczak, San Francisco State University Sierra Nevada Field Campus, CA, August 5-9, 2013.

Learned the biology, ecology, and conservation efforts for California bats. Learned survey techniques for bats including mist netting, acoustic monitoring, assessing habitat and roosts, and passive emergence surveys. Identified and handled 15 individuals of 6 species including *Myotis evotis, Myotis californicus, Myotis thysanodes, Myotis yumanenis, Myotis volans, Antrozous pallidus,* and *Lasionycteris noctivagans.* Also observed maternity roost for *Corynorhinus townsendii* and identified *Euderma maculatum* in flight.

Noninvasive Acoustic Monitoring and Species Identification of Bats with SonoBat software, Dr. Szewczak, Field Techniques Workshop, Davenport, CA, May 14-18, 2012.

Learned to use acoustic recording equipment to record echo location calls of a variety of bat species. Used Sonobat software to positively identify species.

Selected Project Experience

Restoration

Tehachapi Renewable Transmission Project (TRTP)—Southern California Edison (SCE), California, 07/2010 – 12/2015

Biologist and Assistant to Work Package Manager. In addition to assisting the work package manager in daily duties, was tasked with managing preconstruction surveys, including general preconstruction surveys, as well as focused surveys (burrowing owls and bat assessments). Bat habitat assessments consisted of mapping potential day roosting habitat in various habitats along the right of way.

Water and Wastewater

Machado Lake Ecosystem Rehabilitation Project—City of Los Angeles Bureau of Engineering, Los Angeles, California, 2013–2014

Lead Bat and Lead Avian Biologist. Independently conducted bat roost habitat assessment and mapping of the project area. Lead biologist conducting emergence surveys for bats with acoustic monitoring. Led nesting bird surveys and in charge of keeping track of all surveys, active nests, and coordinating with GIS. All species were recorded based on visual and auditory detections. Authoring the survey methodology and habitat assessment results reports.

Wilmington Drain Construction Biological Compliance Services—City of Los Angeles Bureau of Engineering/Arcadis US, Los Angeles, California, 2013 –2014

Lead Bat and Lead Avian Biologist. Conducted preconstruction focused bat habitat assessment and emergence surveys for the restoration of Wilmington Drain. All species were recorded based on visual and auditory detections. Authored the preconstruction nesting bird and roosting bat survey results report.

Transportation—Roads, Bridges, and Highways

Monte Vista Avenue Grade Separation Project— Caltrans, City of Monclare, California— 9/2017-10/2017

Bat Biologist. Analyzed acoustic data collected from two Pettersson D500X units. A single poor-quality call was retrieved from the detectors and could not be definitely identified.

San Diego Freeway (I-405) Improvement Project — OC 405 Partners, Santa Ana, California— 08/2017-09/2017

Bat Biologist. Analyzed acoustic data collected using Pettersson D500X units at five separate locations. Yuma myotis (*Myotis yumanensis*) was positively identified using Sonobat. Some Myotis calls were of poor quality and could not be identified. Calls in the lower range of Mexican free-tailed bat (*Tadarida*

brasiliensis), silver-haired bat (*Lasionycteris noctivagans*; tree roosting species), and big brown bat (*Eptesicus fuscus*) were also recorded but were of poor quality and could not be definitively identified.

Hamner Avenue Bridge Replacement Project—Caltrans, City of Norco, Riverside County, California—09/2017

Bat Biologist. Analyzed acoustic data collected using Pettersson D500X units at four separate locations. Calls were of poor quality and definitive identification could not be made. Almost all calls were within the frequency of myotis species, specifically Yuma myotis (*Myotis yumanensis*) and California myotis (*M. californicus*), with the clearer calls making Yuma myotis the most likely bat observed. Several lower range calls were picked up as well but were also of low quality, not allowing for exact identification. These lower calls where in the range of Mexican-free tailed bat (*Tadarida brasiliensis*) and western yellow bat (*Lasiurus xanthinus*).

Cajalco Road Widening and Safety Enhancement Project—Caltrans, Riverside, California, 08/2012 - 10/2017

Lead Bat Biologist. Assisted in authoring the Natural Environmental Statement (NES). Served as a lead bat biologist. Coordinated and led habitat assessment for project alternatives. Located one active roost and documented several rock outcrops that are suitable roost habitat. Led emergence surveys for suitable roosting habitat. Also deployed acoustic monitoring equipment. Analyzed acoustic data identifying the following species: western yellow bat (*Lasiurus xanthinus*), canyon bat (*Parastrellus hesperus*), Mexican free-tailed bat (*Tadarida brasiliensis*), Yuma myotis (*Myotis yumanensis*), and hoary bat (*Lasiurus cinereus*).

State Route (SR) 91 Santa Ana River Bridge Widening Project—Caltrans, Orange County, California, 2013 -2016

Project Manager and Biologist. Conducted emergence and count surveys for bats within suitable features of the bridge for California Department of Transportation. Over 500 Mexican free-tailed bats (*Tadarida brasiliensis*) bats were observed emerging from the bridge. Conducted follow-up surveys for night roosting of bats on the bridge. Conducted weekly nesting bird surveys. Ongoing project management.

SR 74 Shoulder Widening Safety Improvement Project—Caltrans, San Juan Capistrano, California, 2014

Lead Biologist. Supported bat expert conducting evening emergence surveys for day roosts as well as night roosts. Assisted in acoustic analysis of echolocation calls using Sonobat. Scheduled support biologist and coordinated with Caltrans biologist.

Mount Vernon Grade Separation Project—Caltrans, Colton, California, 2014

Biologist. Conducting habitat assessment for bats including special status species within the Project limits. Documented potential roosting features within the bridge and surrounding habitat.

North First Avenue Grade Separation and Bridge Replacement Project—City of Barstow and Caltrans, Barstow, California, 2014

Biologist. Conducting habitat assessment for bats including special status species. Lead bat biologist conducting emergence surveys and acoustic monitoring. Identified emerging bats from the

habitat. Conducted emergence surveys for features determined to be suitable for roosting bats.

Employment History

ICF International. Senior Biologist. 07/2010–Present.
QinetiQ North America. Natural Resource Specialist. Fort Irwin, California. 11/2009–06/2010.

JEFFREY ABPLANALP

Wildlife Biologist

Jeff Abplanalp is a wildlife biologist with 10 years of experience. He specializes in providing terrestrial and aquatic wildlife and habitat mitigation consulting to the oil, natural gas, coal mining, wind farm, and uranium industries. He has extensive experience conducting ground based and aerial surveys for sage grouse, raptors, big game, and threatened and endangered species. He has contributed to several largescale oil and gas projects conducting pre-construction baseline wildlife and habitat inventory surveys. Jeff also has extensive experience in wildlife conflict, disease, and population management.



Years of Experience

- Professional start date: 05/2008
- ICF start date: 04/2013

Education

- BS, Wildlife and Fisheries Management and Biology, University of Wyoming, 2009

Professional Memberships

- Wildlife Society, 2007-2009
- American Fisheries Society, 2007-2009

Certifications/Other

- Site-Specific Hazard Training (Surface Coal, Metal, Non-metal, Mine Safety and Health Administration

Area of Expertise

- Terrestrial and aquatic wildlife and habitat baseline surveys

Project Experience

Oil and Natural Gas

Moneta Divide—Aethon Energy/Encana Oil and Gas and Burlington Resources, Fremont and Natrona Counties, WY, 04/2013 – 06/2013, 04/2014 – 06/2014

Field Biologist. Conduct ground based and aerial wildlife and habitat baseline inventory surveys for proposed natural gas project. Primary species surveyed include Greater sage-grouse, raptors, mountain plovers, big game, herptiles, and white-tailed prairie dog colonies.

Powder River Basin North—EOG Resources, Campbell and Johnson Counties, WY, 04/2019 – 06

Field Biologist. Conduct ground based and aerial wildlife and habitat surveys for proposed natural gas project. Primary species surveyed include greater sage-grouse, raptors, herptiles, and black-tailed prairie dog colonies.

Leavitt-Underwood—Devon Energy Corporation, Campbell County, WY, 04/2019 – 12/2020

Field Biologist. Conduct ground-based wildlife surveys as part of plan of development. Primary species surveyed included raptors, mountain plovers, and black-tailed prairie dog colonies.

Cosner Fuller TLE—Devon Energy Corporation, Campbell County, WY, 04/2019 – 12/2020

Field Biologist. Conduct ground-based wildlife surveys as part of plan of development. Primary species surveyed included raptors, mountain plovers, and black-tailed prairie dog colonies.

Mines and Quarries

Surface Coal Mine Wildlife Monitoring and Reporting—Navajo Transitional Energy Company, Antelope Mine, Campbell and Converse Counties, WY, 01/2020 – Present

Field Biologist. Conduct wildlife monitoring as part of mine and state DEQ monitoring and mitigation plan. Primary surveys conducted include golden eagle nest monitoring, bald eagle winter roost surveys, big game, lagomorph, and prairie dog colony surveys. Helped with drafting an avian mitigation plan and annual monitoring and conducted analysis of field data.

Surface Coal Mine Wildlife Monitoring and Reporting—Eagle Specialty Materials, Eagle Butte & Belle Ayr Mines, Campbell County, WY. 09/2020--Present

Field Biologist. Conduct wildlife monitoring as part of mine and state DEQ monitoring and mitigation plan. Primary surveys conducted include golden eagle nest monitoring, bald eagle winter roost surveys, big game, aquatic, lagomorph, and prairie dog colony surveys. Helped with drafting an avian mitigation plan and annual monitoring and conducted analysis of field data.

Willow Creek Uranium ISR Project Annual Wildlife Monitoring—Uranium One, Campbell and Johnson Counties, WY. 04/2019 – 06/2019

Field Biologist. Conduct wildlife monitoring as part of mine and state DEQ monitoring and mitigation plan. Primary surveys included Greater sage-grouse lek and raptor nest surveys. Helped with drafting annual monitoring and conducted analysis of field data.

Wind Energy Development

Maestro Wind Project—BayWa, Carbon County, WY. 08/2019-Present

Field Biologist. Conduct baseline wildlife surveys prior to wind farm development. Primary species surveyed included raptors, black-footed ferrets, and swift foxes.

Employment History

ICF. Wildlife Biologist. Gillette, WY. 04/2019 – Present.
Wyoming Game and Fish Department. Wildlife Damage Technician. Cody, WY. 05/2011 – 01/2019.
Big Horn Environmental Consultants. On-call Wildlife Biologist. Sheridan, WY. 04/2017 – 06/2017, 04/2018 – 06/2018.
Wyoming Game and Fish Department. Bird Farm Technician. Yoder, WY. 4/2015.
ICF. On-call Wildlife Biologist. Gillette, WY. 04/2013 – 06/2013, 04/2014 – 06/2014.
Wyoming Game and Fish Department. Aquatic Invasive Species Technician. Casper, WY. 5/2010 – 9/2010.
Wyoming Game and Fish Department. Fish Hatchery Technician. Boulder, WY. 05/2009 – 08/2009.
University of Wyoming. Fisheries Technician. Laramie, WY. 05/2008 – 10/2008.

Ashlynn Koral Harris

54 Corthell Road Laramie, Wyoming 82070
Phone: 307-460-1691
E-mail: aharri42@uwyo.edu

Education

December 2019	Bachelor of Science: Wildlife Fisheries Biology and Management, University of Wyoming, Laramie, WY (Cumulative GPA 3.199)
May 2016	High School Diploma: Cienega High School, Vail, AZ (Weighted GPA 5.058)

Experience

- **Field Technician – ICF:** Conduct ground based and aerial wildlife and habitat surveys for proposed natural gas projects in northeastern Wyoming. Primary species surveyed include greater sage-grouse, raptors, herptiles, and black-tailed prairie dog colonies.

- **Disease/Biologist Technician for Wyoming Game and Fish Department:** In charge of raising 3 pronghorn fawns and five bighorn sheep lambs at the Tom Thorne and Beth Williams Wildlife Research Facility. Followed a set protocol and feeding schedule. Experience working in a remote area mostly alone, dosing and giving antibiotics, treating injuries, making decisions in emergency situations, keeping records of health, including food, mineral, and antibiotic intake. Participated in sampling elk and bighorn sheep for on going wildlife research projects specifically taking fecal, blood, tear, and saliva samples from elk. As well as sampling fecal matter, blood, and taking swabs of the nose, tonsils, and ears of bighorn sheep. Assisted with facility maintenance (repairing and making improvements to wildlife enclosures, general facility upkeep such as cleaning buildings and mowing) and daily feedings to meet nutritional requirements for adult resident species at the facility (including elk, bison, and bighorn sheep). (April 2019- December 2019)

- **University of Wyoming's Wildlife Society**: Participated in conducting biannual river otter surveys as a team. Searching for signs of river otters (scat, tracks, latrine sites, etc), collecting data in riparian areas (location, incline of slope used by otters, width of river, percent cover of overstory, general description of area), and navigating riparian areas. Hiking over 8 hours on uneven terrain (including marshy areas, crossing rivers, over logs, rocky areas, and inclines at elevations greater than 7,000 feet). Use of Garmin GPS Units, forest densiometer, portable transmitter and receiver. (April 2018-December 2019)

- **Wyoming Game and Fish Department Volunteer:** Volunteered to assist Wyoming Game and Fish Department biologists with sampling hunter kills for chronic wasting disease, entering and recording data into a database with the check station app, checking hunting licenses, and talking to hunters. (October 2019)

- **University of Wyoming Chipmunk Project:** Chipmunk trapping, tracking, and handling for the University of Wyoming PHD student research. Experience setting up small mammal trap grids and flagging in remote areas. Experience using and communicating with team members over handheld transmitter and receivers. Setting, securing, and baiting small mammal traps for chipmunks (tomahawk and havahart traps). Recording data on trapped chipmunks in the field including weight, sex, age, sexual reproduction status, and pit tag number. Setting up trail cameras for capturing chipmunk activity at trap sites. Utilizing radio telemetry to track chipmunks with GPS collars through dense forest terrain and sage brush. (September 2019-October 2019)

- **Summer Moose Day:** Assisted with biannual moose surveys for the University of Wyoming Biodiversity Institute and Wyoming Cooperative Fish and Wildlife Research Unit. Participated

in a training for surveying moose. Survey involved searching for signs of moose in the snowy range (bed sites, tracks, scat, actual moose sightings.), recording, identifying, and measuring signs of moose. Furthermore Aging, identifying sex, and apparent health (making note of ticks, ear cropping, and blood in tracks or feces) of moose. (July 2019)

- **Legends Ranch**: Worked with a team to raise 78 bottle-fed white tail fawns. Assisted with handling wildlife, collecting data and keeping records of health, food intake, and medication administered as well as amount administered. Participated in administering medication, loading and giving syringes (under the skin and in the muscle), drenches, in feed/water/milk, fluids (lactated ringer), vaccinations. Assisted with cleaning wounds and removal of antlers and broken tines, and safely tube fed fawns under supervision. Performed kennel maintenance, regularly checked feed and water, met dietary needs of white tail fawns as they aged. Sticking with a schedule, checking/ assessing health of deer. Observed use of all-terrain vehicles and tractors. Instructed members of the general public and answering questions on how to safely interact with and feed fawns. (May 2018- August 2018)

- **Montana Fish, Wildlife, and Parks:** Assisted in trapping, handling, locating and collecting data on tagged snapping and spiny softshell turtles with telonics telemetry systems. Aided in collecting measurements and data for vegetation at points on GPS for overgrazed land. Utilized VHS telemetry to locate tagged sage grouse. Worked over 8-hour days in the field starting at various times in the day with changing schedules. (May 2017-August 2017)

- **Montana Fish, Wildlife, and Parks:** Assisted in checking vitals during a bear immobilization clinic, and in relocating a successfully rehabilitated bear. Checked for production rate success and activity at peregrine falcon nest sites. (June 2015)

Training

- Introductory Wildlife Handling and Chemical Immobilization Training with Wyoming Game and Fish Department: experience using dart guns, blow darts, calculating doses of appropriate drugs to immobilize wildlife, taking samples of immobilized wildlife and recording data, and walking through immobilization and capture scenarios.
- Introductory Disease and Necropsy Training with Wyoming Game and Fish: experience performing a necropsy on deceased wildlife, recognizing signs of parasites, and identifying different mammalian diseases on deceased wildlife.
- Summer Moose Day Survey Training

CORRESPONDENCE

RECEIVED
APR 2 7 2021
MINERALS & MINING PROGRAM

April 22, 2021

Mr. Eric Holm
Department of Environment & Natural Resources
Minerals & Mining Program
523 East Capitol Avenue
Pierre, SD 57501-3182

RE: Request for Determination of Special, Exceptional, Critical or Unique Lands for Simon Contractor's Loring Quarry

Mr. Holm,

H2E, Inc. (H2E) has prepared the enclosed Request for Determination of Special, Exceptional, Critical or Unique Lands on behalf of Simon Contractors of South Dakota Inc. (Simon). The package includes the application form, maps, description of the mining operation, summary of environmental findings and all supporting reports/documentation.

If you have any questions or concerns, please feel free to contact me via email at bmorris@h2eincorporated.com or by phone at 307-696-7007.

Sincerely,
H2E, Inc.

Becky Morris, Ph.D.
Environmental Scientist

Enclosure