CORNERSTONE INDUSTRIAL MINERALS, INC.
TUCKER HILL PERLITE
MINE EXPANSION PROJECT
PLAN OF OPERATIONS AMENDMENT No. 7

Environmental Impact Statement
DOI-BLM-ORWA-L050-2016-0001-EIS

August 2018

U.S. Department of the Interior
Bureau of Land Management
Lakeview Resource Area
Lakeview District
Lakeview, Oregon

Estimated Costs Associated with Developing and Producing this DEIS: $499,000

Lakeview District, Lakeview Resource Area

United States Department of the Interior

BUREAU OF LAND MANAGEMENT
Lakeview District Office
1301 South G Street, Lakeview, OR 97630
www.blm.gov/lakeview

In Reply Refer To:
3809 (L050)

Dear Reader:

In accordance with the National Environmental Policy Act, the Bureau of Land Management (BLM) has prepared the attached draft Environmental Impact Statement (EIS) for a proposal to expand existing perlite mining operations at Tucker Hill. The Draft EIS analyzes the potential environmental impacts of the proposed mine expansion and three other alternatives on approximately 340 acres of BLM-administered lands in central Lake County, Oregon. This analysis will be used as the basis for approving, modifying, or denying the claimant's proposed amendment to their existing mining plan of operation.

I would appreciate your comments on the adequacy of this analysis. The following types of comments would be the most helpful in the decision-making process; comments that:

1. Are as specific as possible,
2. Address the appropriateness of the range of alternatives,
3. Identify unaddressed issues,
4. Provide new information or data,
5. Identify errors in the data or analysis.

Comments on the draft EIS must be submitted to me in writing within 45 days from the date that the U.S. Environmental Protection Agency publishes its Notice of Availability of the EIS in the *Federal Register* or by OCT 2 2 2018; whichever is later. Comments must be submitted to the following address:

Lakeview District
Bureau of Land Management
1301 South G Street
Lakeview, OR 97630

At this time, no public meeting/hearing is planned. However, a public meeting/hearing meeting may be held if there is sufficient interest. Any person desiring a public meeting/hearing must request one in writing and provide sufficient reason(s) for the need for such a meeting/hearing.

Comments on the draft EIS, including names and street addresses, will be made available for public review at the Lakeview District office during regular business hours (7:45 am to 4:30 pm; Monday through Friday, except holidays). Comment letters may also be published in the final EIS. Respondents may request confidentiality. However, if you wish to withhold your name or address

from public review or from disclosure under the Freedom of Information Act, you must state this prominently at the beginning of your written comment. Such requests will be honored to the extent allowed by law. All submissions from organizations and businesses, and from individuals identifying themselves as representatives or officials of organizations or businesses, will be made available for public inspection in their entirety.

Questions or comments concerning the proposal may be directed to Mr. Phil D'Amo or Mr. Paul Whitman at the address above, or by telephoning (541) 947-2177. Additional copies of the draft EIS may also be obtained by contacting the Lakeview District office.

Thank you for your interest in the management of these public lands.

Sincerely,

J. Todd Forbes
District Manager

Enclosure

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ENVIRONMENTAL IMPACT STATEMENT

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ABBREVIATIONS AND ACRONYMS

ACEC	Area of Critical Environmental Concern
AKWA	Area of Known Wolf Activity
ANFO	Ammonium Nitrate and Fuel Oil
APE	Area of Potential Effect
AUM	Animal Unit Month
BATF	Bureau of Alcohol, Tobacco, Firearms, and Explosives
BLM	Bureau of Land Management
BMP	Best Management Practice
CCAA	Candidate Conservation Agreements with Assurances
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
Cornerstone	Cornerstone Industrial Minerals, Inc.
DEQ	Oregon Department of Environmental Quality
DOGAMI	State of Oregon Department of Geology and Mineral Industries
EA	Environmental Assessment
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
FLPMA	Federal Land Policy and Management Act of 1976
GHG	greenhouse gas
GHMA	General Habitat Management Area
GRSG	Greater Sage-Grouse
HPTP	Historic Properties Treatment Plan
ID	Interdisciplinary
IPCC	Intergovernmental Panel on Climate Change
KOP	Key Observation Point
LRA	Lakeview Resource Area
MDs	Management Decisions
MLRR	Mineral Land Regulation & Reclamation
MOU	Memorandum of Understanding
MSHA	Mine Safety and Health Administration
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act of 1969
NGB	Northern Great Basin
NLAA	Not Likely to Adversely Affect
NRCS	Natural Resource Conservation Service
NRHP	National Register of Historic Places
NOAA	National Oceanic and Atmospheric Administration
ODA	Oregon Department of Agriculture
ODFW	Oregon Department of Fish and Wildlife
OHV	Off-Highway Vehicle
OR-GAP	Oregon GAP Analysis Program
ORS	Oregon Revised Statutes
OWRD	Oregon Water Resources Department

PAC	Priority Area of Conservation
PARs	Pesticide Application Records
PUR	Pesticide Use Report
PDE	Project Design Element
PHMA	Priority Habitat Management Area
PM	Particulate Matter
Plan Amendment	Plan of Operations Amendment No. 7
RDFs	Required Design Features
REA	Rapid Ecoregional Assessment
RMP	Resource Management Plan
RMPA	Resource Management Plan Amendment
ROD	Record of Decision
SAIC	Science Application International Corporation
SHPO	State Historic Preservation Office
SWCD	Soil and Water Conservation District
US	United States
US 395	US Highway 395
USDA	US Department of Agriculture
USFWS	US Fish and Wildlife Service
USGS	US Geological Survey
VRM	Visual Resource Management
WB&M	Willamette Baseline and Meridian
WRCC	Western Regional Climate Center
WSA	Wilderness Study Area

EXECUTIVE SUMMARY

ES. 1 Introduction

The Project Area is located in Lake County, Oregon, on public land administered by the Bureau of Land Management (BLM) Lakeview Resource Area (LRA) Lakeview District and private land in all or portions of Sections 25 through 27, 35 and 36, Township 34 South, Range 19 East (T34S, R19E), Willamette Baseline and Meridian (WB&M) (Project Area). The Project Area is approximately 862 acres.

Cornerstone proposes to expand their existing mining operations by mining in an area known as Poachers Ridge, which is to the east of the existing mining operations. The proposed Poachers Ridge Quarry Expansion Area is located outside the previously approved disturbance areas analyzed in the April 1996 EIS, the February 2008 Environmental Assessment (EA), and the January 2013 EA. The Poachers Ridge Quarry Expansion Area is located in Sections 25, 26, 35 and 36, T34S, R19E, WB&M and would encompass up to 340 acres of federal and state mineral estate.

ES.2 Purpose and Need

ES.2.1 Need

In accordance with the requirements of 43 CFR 3809, Surface Management Regulations, the Mining Law of 1872, the FLPMA, and the Mining and Minerals Policy Act of 1970, Cornerstone has submitted a Plan Amendment to expand the existing mining operations with a new quarry to meet on-going and future demand for products made from perlite in the western U.S. and Canada.

The need for the action is set forth in Section 302 of the FLPMA and the BLM Surface Management Regulations at 43 CFR 3809, which establish the BLM's responsibility to respond to a plan of operations proposal that would allow an operator to prospect, explore, and assess locatable mineral resources on public lands, and to take any action to prevent unnecessary or undue degradation of the public lands.

ES.2.2 Purpose

The Secretary of the Interior is responsible for complying with NEPA when administering programs under the Secretary's authority (30 U.S.C. § 21a). As per 43 CFR 3809.1, the primary purpose of the subpart is to prevent unnecessary or undue degradation of public lands by operations authorized by the mining laws. Anyone intending to develop mineral resources on the public lands must prevent unnecessary or undue degradation, as defined in 43 CFR 3809.5, of the land and reclaim disturbed areas. This subpart establishes procedures and standards to ensure that operators and mining claimants meet this responsibility.

The primary purpose of the action is to address the Plan Amendment submitted by Cornerstone. Following completion of BLM's review of the Plan Amendment, including the analysis under NEPA and public comment, the BLM may:

1) Approve the Plan as submitted (43 CFR 3809.411(d)(1));
2) Approve the Plan subject to changes or conditions necessary to meet the performance standards at 43 CFR 3809.420 and to prevent unnecessary or undue degradation (43 CFR 3809.411 (d)(2)); or
3) Disapprove or withhold approval of the Plan because the Plan:
    a. does not meet the applicable content requirements of 43 CFR 3809.401; or
    b. proposes operations that would result in unnecessary or undue degradation of public lands.

A second purpose is to determine if the proposal conforms to the governing land use plans in accordance with the FLPMA (43 CFR 1610.5-3; refer also to section 1.4).

ES.3 Public Involvement

A Notice of Intent to prepare this EIS was published in the *Federal Register* and a news release was posted on the BLM website and in the *Lake County Examiner* in January 2016. Public scoping letters and tribal consultation letters were mailed out to individuals, groups, agencies, and tribal governments with a known interest in the project area in January 2016. The 30-day scoping period began January 21, 2016, and ended February 19, 2016. There were no formal public scoping meetings. Comments from four entities were received through electronic mail, regular mail, or telephone conversation during the scoping period. Comments were used to define the relevant issues that would be analyzed through this EIS.

ES.4 Planning Issues

A summary of the issues raised in the comments have been categorized in the following section. Those that are substantive and applicable to the project are addressed further in the EIS.

Purpose and Need

- Provide clarification of approval authorities of other agencies, as well as how approval and permitting processes are coordinated among agencies;
- Provide a clear and concise purpose and need statement;

Alternatives

- Outline the physical design of current and proposed facilities;
- Consider a smaller sized mine expansion;

Effects

- Address hydrology (water movement and balance), surface water features, wetlands, water quality (including 303(d) listed waterbodies), water management, and potential impacts to surface and groundwater;
- Address baseline air quality data and applicable air quality requirements that may be subject to new source permitting; Address impacts to air quality, especially particulate matter;
- Address the physical and chemical characteristics of ore and waste rock as part of

projecting potential waste water and solid waste produced by the project;
- Address the risks of hazardous waste transportation incidents, appropriate responses, and monitoring;
- Avoid, minimize, and mitigate impacts to key ecological resources (streams, wetlands, and old-growth trees) and soil, water, carbon weeds, wildlife habitat;
- Address impacts to species listed under the Endangered Species Act; If such species are present, summarize the biological assessment in the EIS.
- Address noxious weed management measures including BMPs, consistent with E.O. 13112 and BLM weed management guidance;
- Address impacts to historic and cultural resources;
- Address an adaptive management strategy for responding to unforeseen circumstances that, coupled with monitoring, could be used to mitigate for uncertainties and risks, and ensure that post-mining land use objectives can be achieved and sustained;
- Include a cumulative effects analysis using the best available science and a watershed approach;
- Address the effects of all connected actions such as roads and transportation;
- Address greenhouse gas emissions and practical measures to reduce such emissions;
- Address the economic effects mine expansion would have by increasing area employment and providing greater economic benefits to area communities;

Reclamation and Monitoring
- Summarize project monitoring conducted to date and discuss how the information is used in the EIS to characterize current conditions;
- Include a monitoring plan with defined goals and objectives;
- As a component of monitoring, include an evaluation of methods for determining performance;
- Require a reclamation bond;
- Address the estimated reclamation costs and financial assurance mechanisms;

Coordination and Consultation
- Consult with affected tribal governments in accordance with E.O. 13175 and document consultation efforts in the analysis;

In addition to public scoping, internal scoping was conducted within the BLM Interdisciplinary (ID) Team in summer of 2015. The BLM ID Team identified the following resources or issues to be analyzed in the EIS:

Climate Change
- The analysis should be focused on quantifying carbon dioxide emissions;

Cultural Resources and Native American Concerns
- Additional cultural resource inventory would need to be completed and consultation with appropriate native American tribal governments conducted in order to fully address potential cultural impacts and religious concerns within the analysis;

Wildlife

- The existing disturbance area falls within ODFW "low density" sage-grouse habitat, but the proposed expansion area does not fall within sage-grouse PHMA or GHMA;
- Raptor nests exist along the outer edge of the Tucker Hill formation. Additional monitoring would be needed to determine if these sites are currently occupied by Bald or Golden Eagles;

Special Status Species

- Surveys for special status plant species need to be completed and the results described in the analysis;

Range/Livestock Grazing

- The surrounding Tucker Hill Allotment is currently vacant (not grazed), but there has been interest by several parties in applying for a permit to graze the allotment in the future. If a grazing application is received and a permit issued, a temporary fence may need to be constructed around the mining area to keep livestock out;

Weeds and Invasive Non-Native Species

- Appropriate weed and invasive, nonnative species prevention and monitoring measures need to be included in the reclamation plan; the plan also needs to disclose and address the potential effects of treatments, including herbicides that may be used on BLM lands during mine operation and reclamation activities;
- Mediterranean sage exists in the area and needs to be addressed/treated;

Visual Resource Management

- The mine area falls within VRM class III. Major to moderate impacts are allowable within this VRM class. However, the area falls within a scenic corridor designated in the Lakeview Resource Management Plan (RMP) and portions visible from Highway 31 have higher visual standards. In addition, the Highway 31 corridor was designated as the Oregon Outback National Scenic Byway;
- A visual analysis needs to be completed using a number key observation points (KOPs) to estimate the visibility of the proposed mine expansion and associated overburden and topsoil piles;
- Visual mitigation measures should be addressed including:
    - Authorizing no more storage of reject perlite material in visible portions of the scenic corridor due to the visual impacts of the white, highly-contrasting color of the material;
    - Consider staining the exposed pit wall, if visible, using measures similar to those employed in the 2012 EA;

Recreation

- Some hunting, biking, and little to no camping may occur in the area due to limited public access. Potential impacts to recreation may need to be addressed, but does not represent a primary issue;

Cumulative Effects

- Address potential cumulative impacts of Clover Flat sagebrush habitat restoration project currently in the planning stages and located to the south of the project area; and
- The cumulative impact assessment boundary could potentially vary by resource value.

ES.5 Alternatives

ES.5.1 Alternative 1 –No Action

Under the No Action Alternative, the BLM would not approve the proposed Plan amendment and the proposed 340-acre Poachers Ridge Expansion Quarry area would not be mined. However, the Project Area would continue to be subject to mining activities as authorized under prior plans of operation previously approved by the BLM (1996a; 2013). A summary of the plan of operations and subsequent amendments describing existing mining activities in the Project Area is summarized in Table 1.7-1. There is also an additional 8.4 acres of pre-1996 disturbance and 0.4 acre of unauthorized disturbance in the Project Area, for a total of 97.5 acres of existing and proposed disturbance that would be subject to reclamation.

ES.5.2 Alternative 2-Proposed Plan of Operations (Proposed Action)

Alternative 2 is the Plan of Operations Proposal (Tucker Hill Perlite Project, Lakeview District, Oregon, Plan of Operations Amendment No. 7 August 2011, Revised January 2013 and Revised May 2015) originally submitted to the BLM by Cornerstone in August 2011. The Plan of Operations includes a 340-acre expansion quarry on Poachers Ridge including a Reclamation Plan, tall berms for visual mitigation and a mine management area.

Cornerstone is currently mining the Tucker Hill Quarry, and is reaching the limit of the currently permitted area and associated reserves. Cornerstone has proposed to expand its mining activities to include the Poachers Ridge Expansion Quarry area where quality perlite has been identified. The area where the proposed new mining activities would occur covers approximately 340 acres (Map 2.1.2). Concurrent reclamation activities would occur by placing off-specification material and stockpiling screened material in the mined-out areas of the proposed quarry.

Cornerstone would develop the 340-acre Poachers Ridge Expansion Quarry by the same conventional mining methods currently used for the Tucker Hill area, which include: drilling; blasting; loading; and hauling. Cornerstone anticipates mining up to 340,000 tons per year, consisting of approximately 170,000 tons for direct sales, approximately 70,000 tons for further processing, and approximately 100,000 tons of screened material to be stockpiled for future sales. Mining operations would occur on a year-round basis and quarried material would be stockpiled in place on the quarry floor prior to hauling off site for further processing. The stockpiled ore would be hauled daily by trucks from the pit via the existing upgraded access road to State Highway 31, and then south to the town of Lakeview for processing at the existing ore mill facility. Hauling would occur year-round. Trucks would depart from the quarry at a rate of approximately one truck load every thirty minutes between 5:00 a.m. and 10:00 p.m. Each haul would be approximately 32 tons at a rate of approximately 40 loads per day, between four and five days per week.

ES.5.3 Alternative 3-Decreased Disturbance Area Alternative, with Mine Management Area

Alternative 3 is similar to Alternative 2, except that:

- The expansion area would be limited to approximately 300 acres and exclude many areas exhibiting rock stack features and active golden eagle nest sites; and
- Mulch would be applied with the seed mix to steep slopes to aid in seed establishment and reduce soil erosion during seed establishment.

ES.5.4 Alternative 4-BLM Preferred Alternative

Alternative 4 is similar to Alternative 3 except that:

- The expansion area would be limited to approximately 262 acres and would exclude additional areas with rock stack features of cultural significance and all areas with known raptor nest sites including historic and active nests;
- No mine management area would be included; and

Additional mitigation measures would be provided in the Reclamation Plan, which include more completely back-filling and re-contouring the existing Tucker Hill Quarry area.

Table ES-1 - Existing/Authorized and Proposed Disturbance:

Disturbance Component	Land Status	Pre-1996 Existing Acres	1996 Authorized Acres	2008 Authorized Acres	2012 Authorized Acres	Proposed Expansion Acres (Alternative 1)	Proposed Expansion Acres (Alternative 2)	Proposed Expansion Acres (Alternatives 3)	Proposed Expansion Acres (Alternatives 4)
Main Haul Road	Public/ Private	3.7	4.0	0	0	0	0	0	0
Waste Rock Dump Sites[1]	Public	0	0	17.9	0	0	0	0	0
Tucker Hill Quarry Area	Public	0	20.0	0	45.0	0	0	0	
Poachers Ridge Expansion Quarry Area[2]	Public	0	0	0	0	0	340	300	262
Growth Media Stockpiles/ Safety Berms (Mine Management Area)	Public	0	0.5	0	2.0	0	38	38	0
1994 Drill Access	Public	0.4	-0.4	0	0	0	0	0	0
Exploration Roads	Public	2.2	0	0	0	0	0	0	0
Bulk Sample Sites	Public	2.1	-0.8	0	0	0	0	0	0
Total		**8.4**	**23.3**	**17.9**	**47.0**	**0**	**340.0**	**300**	**262**

1: The table does not include past waste rock disposal disturbance on private land. Private land disturbance is discussed in the cumulative impacts section of this EIS.
2: The Poachers Ridge Expansion Quarry Area encompasses the growth media stockpile and safety berms.

ES.6 Affected Environment

The existing quarry within the Project Area has been mined for perlite resources for the past 22 years. Within the Project Area 20 cultural and Native American sites are located. Of the sites located in the Project Area, ten are determined eligible for listing on the NRHP under Criterion D. Wildlife resources located within the Project Area include the greater sage-grouse, golden eagles and three sensitive bat species.

ES.7 Environmental Consequences

Alternative 1, the No Action Alternative, would allow the existing, approved mining operations (70 acres surface disturbance) to continue, but would not allow for mine expansion. Impacts to wildlife, visual quality, and cultural/native American values would not exceed those evaluated in previous analyses and have been mitigated to the extent possible (BLM 1996b, 2013).

Alternative 2, Proposed Plan of Operations, would allow for expanded mining of perlite resources (340 acres surface disturbance), in addition to the existing, approved mining operations. This alternative would negatively impact visual quality, wildlife, and cultural and Native American resources and includes no mitigation of impacted values. This Alternative would provide longer employment and economic benefits than Alternative 1.

Alternative 3, Decreased Disturbance Area Alternative with Mine Management Area, would allow for expanded mining of perlite resources (300 acres of surface disturbance) in addition to the existing, approved mining operations. This alternative would negatively impact visual quality, wildlife, and cultural and Native American values and includes limited mitigation of impacted values. This Alternative would provide longer employment and economic benefits than Alternative 1.

Alternative 4, BLM Preferred Alternative, would allow for expanded mining of perlite resources (262 acres of surface disturbance), in addition to the existing, approved mining operations. This alternative would negatively impact visual quality, wildlife, and cultural and Native American values, and includes mitigation of impacted values to the extent feasible. This Alternative would provide longer employment and economic benefits than Alternative 1.

Detailed descriptions of impacts of the four alternatives are provided in Chapter 4, along with a discussion of the cumulative impacts, irretrievable and irreversible commitments of resources, and unavoidable adverse impacts of the alternatives.

ES.8 Next Steps

The comment period on this Draft EIS will extend for 45 days following publication of the U.S. Environmental Protection Agency's Notice of Availability in the *Federal Register*. After comments are received they will be evaluated. Substantive comments could lead to changes in one or more of the alternatives, or in the analysis of environmental consequences. A Final EIS will then be completed and released for 30 day review. The Record of Decision will be subject to appeal in accordance with 43 CFR Part 4.

CORNERSTONE INDUSTRIAL MINERALS, INC.
TUCKER HILL PERLITE
MINE EXPANSION PROJECT
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ENVIRONMENTAL IMPACT STATEMENT

1 INTRODUCTION / PURPOSE OF AND NEED FOR ACTION

1.1 Introduction

Cornerstone Industrial Minerals, Inc. (Cornerstone) currently operates a perlite quarry on top of Tucker Hill. Perlite is utilized for the manufacture of ceiling tiles for building construction (improving insulation), as a filter aid, and for a variety of agricultural purposes, including potting soil. The existing Tucker Hill Quarry has been providing a close and relatively inexpensive source of perlite for west coast markets.

The Tucker Hill Perlite Mine Expansion Project Plan of Operations Amendment No. 7 (Project) is located in south-central Oregon approximately 50 miles north of the California state line and approximately 35 miles northwest of Lakeview, Oregon. The Project can be accessed by traveling north from Lakeview, Oregon, 22 miles on United States (US) Highway 395 (US 395), then 11 miles north on State Highway 31 to the junction of the Tucker Hill Haul Road. The Project is located in Lake County, Oregon, on public land administered by the Bureau of Land Management (BLM) Lakeview Resource Area (LRA) Lakeview District and private land in all or portions of Sections 25 through 27, 35 and 36, Township 34 South, Range 19 East (T34S, R19E), Willamette Baseline and Meridian (WB&M) (Project Area). The Project Area is approximately 862 acres (Map 1.1.1).

The BLM originally approved a mining Plan of Operations (Plan) for the quarry in April 1996 (BLM 1996a), based upon analysis contained in an Environmental Impact Statement (EIS) (BLM 1995; 1996b). Since that time, the Plan has been amended six times as further detailed in Section 1.7. Previous Plan amendments dealt with minor modifications including the use of a portable, on-site crusher in 1999; minor changes to pit development design, including a blasting schedule revision in 2001; haul road modification in 2006; in 2008 the use of a new waste rock disposal site; and in 2013 an expansion of the Tucker Hill quarry from approximately 23 acres to 70 acres. Map 1.2.1 shows the authorized facilities.

Cornerstone proposes to expand their existing mining operations by mining in an area known as Poachers Ridge, which is to the east of the existing mining operations. The proposed Poachers Ridge Quarry Expansion Area is located outside the previously approved disturbance areas analyzed in the April 1996 EIS, the February 2008 Environmental Assessment (EA), and the January 2013 EA. The Poachers Ridge Quarry Expansion Area is located in Sections 25, 26, 35 and 36, T34S, R19E, WB&M and would encompass up to 340 acres of federal and state mineral estate (Map 1.2.1).

The specifics of the Proposed Action are outlined in Plan of Operations Amendment No. 7 (Plan Amendment) originally submitted to the BLM in August 2011 and revised in January 2013, May 2015, and June 2015 (Cornerstone 2015). The Plan is available for review at the BLM LRA office in Lakeview, Oregon, during normal business hours (Monday – Friday, 7:45 am to 4:30 pm). The proposed amendment would extend the life of the Project approximately 20 years (2036), depending on market conditions and the delineation of additional reserves. Mining would occur for approximately 12 years, followed by ore processing for approximately three years after mining operations ceased. Reclamation and site closure activities would occur for approximately five years following each mining and processing facility closure.

The proposed mining activities, which would be located on public land, are subject to BLM review and approval pursuant to the Federal Land Policy and Management Act of 1976 (FLPMA) and surface management regulations at 43 Code of Federal Regulations (CFR), Subpart 3809. The BLM has determined that review and approval of the proposed Plan is a major federal action and that an EIS must be prepared to fulfill the BLM's National Environmental Policy Act of 1969 (NEPA) requirements. To comply with NEPA and its implementing regulations, the BLM is preparing this EIS and will make a decision on the proposed expansion on public land.

The EIS is prepared in compliance with NEPA and in accordance with the BLM NEPA Handbook H-1790-I (BLM 2008a), and Council on Environmental Quality regulations (40 CFR 1500), as well as current guidance on the analysis of cumulative impacts and greenhouse gas emissions and climate change. This EIS discloses the potential impacts on the human environment associated with implementation of several alternatives, including the Proposed Action.

1.2 Purpose and Need for Action

Need

In accordance with the requirements of 43 CFR 3809, Surface Management Regulations, the Mining Law of 1872, the FLPMA, and the Mining and Minerals Policy Act of 1970, Cornerstone has submitted a Plan Amendment to expand the existing mining operations with a new quarry to meet on-going and future demand for products made from perlite in the western U.S. and Canada.

The need for the action is set forth in Section 302 of the FLPMA and the BLM Surface Management Regulations at 43 CFR 3809, which establish the BLM's responsibility to respond to a plan of operations proposal that would allow an operator to prospect, explore, and assess locatable mineral resources on public lands, and to take any action to prevent unnecessary or undue degradation of the public lands.

Purpose

The Secretary of the Interior is responsible for complying with NEPA when administering programs under the Secretary's authority (30 U.S.C. § 21a). As per 43 CFR 3809.1, the primary purpose of the subpart is to prevent unnecessary or undue degradation of public lands by operations authorized by the mining laws. Anyone intending to develop mineral resources on the public lands must prevent unnecessary or undue degradation, as defined in 43 CFR 3809.5, of the land and

reclaim disturbed areas. This subpart establishes procedures and standards to ensure that operators and mining claimants meet this responsibility.

The primary purpose of the action is to address the Plan Amendment submitted by Cornerstone. Following completion of BLM's review of the Plan Amendment, including the analysis under NEPA and public comment, the BLM may:

4) Approve the Plan as submitted (43 CFR 3809.411(d)(1));
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    b. proposes operations that would result in unnecessary or undue degradation of public lands.

A second purpose is to determine if the proposal conforms to the governing land use plans in accordance with the FLPMA (43 CFR 1610.5-3; refer also to section 1.4).

1.3 BLM and Non-BLM Policies, Plans, and Programs

The following list includes the statutes, policies, plans, and programs most pertinent to the Proposed Action and alternatives:

- FLPMA;
- Mining and Minerals Policy Act of 1970;
- General Mining Law of 1872;
- 2008 Energy and Mineral Policy;
- National Environmental Policy Act of 1969
- National Historic Preservation Act (NHPA), as amended;
- American Indian Religious Freedom Act 1978;
- Archaeological Resources Protection Act of 1979;
- Clean Air Act, as amended;
- Bald and Golden Eagle Protection Act of 1940, as amended;
- Endangered Species Act of 1973, as amended;
- Oregon Greater Sage-Grouse Approved Resource Management Plan Amendment (GRSG Plan Amendment) (BLM 2015a);
- Migratory Bird Treaty Act of 1918, as amended;
- Locatable minerals surface management regulations (43 CFR 3809);
- State of Oregon Department of Geology and Mineral Industries (DOGAMI) Mineral Land Regulation & Reclamation (MLRR);
- Lakeview RMP/ROD (BLM 2003a, 2003b); and
- Surface Management Handbook H-3809.

1.4 Land Use Plan Conformance

1.4.1 Lakeview Resource Management Plan

The FLPMA requires that proposed management actions conform with the appropriate land use plan(s). The *Lakeview Resource Management Plan/Record of Decision* (RMP/ROD) is the primary governing land use plan for this area and contains the following applicable management goals, direction, Best Management Practices (BMPs), and specific stipulations and guidelines for locatable mineral exploration and development (BLM 2003b, p. 88-89, p. A-4, p. A-6, and p. A-177 to A-179)). The applicable BMPs and stipulations and guidelines to this Project are listed in Appendix B.

Energy and Mineral Resources Management Goal 1 – Provide opportunity for the exploration, location, development, and production of locatable minerals in an environmentally sound manner.

Management Direction

A plan of operations is required for all mining activity that is not casual use, regardless of the number of acres disturbed. A plan is also required for all exploration activities that disturb over 5 acres, bulk sampling which will remove 1,000 tons or more of presumed ore for testing, or for any surface-disturbing operations greater than casual use in certain SMAs and lands/waters that contain federally proposed or listed threatened or endangered species or their proposed or designated critical habitat. The approval of plans of operations is a Federal action that requires NEPA compliance. Mining claim use and occupancy under 43 CFR 3710 also requires further NEPA compliance (p. 89, as maintained).

The proposed mine expansion area falls within an area that is open to locatable mineral development, but is subject to several protective stipulations including the need to prepare a plan of operations, … and special visual design measures (p. 90 and Map M-10, as maintained).

BMPs are land and resource management techniques designed to maximize beneficial results and minimize negative impacts of management actions. BMPs are implemented as necessary, based on site-specific conditions to meet water, soil, and watershed objectives. Potential BMPs associated with surface disturbing activities, mining, and noxious weed management that were considered are listed in Appendix D (pages A-4 to A-7) of the Lakeview RMP/ROD (BLM 2003b). Potential BMPs associated with road and sediment delivery are listed in BLM IM OR-2011-074 for a revision to Appendix D of the RMP/ROD (BLM 2011a). Following an ID team review, applicable BMPs were incorporated into the Proposed Action design or reclamation description above with the following cross reference notations:

- *Road (R) and Sediment Delivery*
- *Surface-Disturbing (SD) Activities*
- *Mining (M)*
- *Noxious Weed (NW) Management*

1.4.2 Oregon Greater Sage-Grouse Approved Resource Management Plan Amendment

The previously approved quarry boundary is within an area identified by the GRSG Plan Amendment (BLM 2015a) as General Habitat Management Area (GHMA). The Project Area is both within and outside the GHMA.

Since the proposed Poachers Ridge Expansion Quarry area would occur entirely outside of GRSG habitat, the GRSG Plan Amendment would not specifically apply to this primary component of the Proposed Action. However, the revised reclamation plan associated with the Project proposes to completely backfill, re-contour, and re-establish vegetation at the previously approved 70-acre Tucker Hill Quarry. While the previously approved reclamation plan for the quarry did address some backfilling with mine/mill waste rock and re-contouring of the highwall along the existing quarry perimeter, along with an additional 47 acres of off-site habitat enhancement (see Chapter 2, BLM 2013b), it did not anticipate complete backfilling of the quarry. Cornerstone agrees to conduct reclamation activities for the previously approved 70-acre Tucker Hill quarry according to the GRSG Plan Amendment (BLM 2015a). Applicable management decisions (MDs) and required design features (RDFs), as applies to locatable minerals associated with roads and locatable mineral development are identified in Appendix B.

1.5 Authorizing Actions

Approval of a mine Plan does not authorize the start of mine expansion operations. The operator must also obtain all necessary permits from various federal, state, and local agencies with jurisdiction over certain aspects of the proposed Project before beginning mine plan activities. Table 1.5-1 lists the main required permits or approvals that are already in place or would be obtained and the responsible regulatory agencies. Additional permits or approvals may be required. Cornerstone is responsible for amending existing permits, and applying for and acquiring additional permits, as needed. They must also obtain a reclamation bond sufficient to pay a third-party contractor for reclamation of the proposed disturbances (43 CFR 3809.412).

Table 1.5-1: Major Permits and Authorizations Required for Project Development

Permit/Authorization	Regulatory Agency
Plan of Operations, Record of Decision	United States Department of the Interior, BLM
Reclamation Permit	DOGAMI MLRR
Explosives Permit	United States Bureau of Alcohol, Tobacco, Firearms and Explosives (BATF)
Hazardous Waste Identification Number	United States Environmental Protection Agency
Note: This permit list is not all inclusive. All permits are the responsibility of Cornerstone.	

1.6 Scoping and Issues

A Notice of Intent to prepare this EIS was published in the *Federal Register* and a news release was posted on the BLM website and in the *Lake County Examiner* in January 2016. Public scoping letters and tribal consultation letters were mailed out to individuals, groups, agencies, and tribal governments with a known interest in the project area in January 2016. The 30-day scoping period began January 21, 2016, and ended February 19, 2016. There were no formal public scoping meetings. A scoping comment summary report was prepared to document the scoping process and

summarize the issues and concerns identified (Enviroscientists 2016). Comments from four entities were received through electronic mail, regular mail, or telephone conversation during the scoping period. A summary of the issues raised in the comments have been categorized in the following section. Those that are substantive and applicable to the project are addressed further in the EIS.

Purpose and Need

- Provide clarification of approval authorities of other agencies, as well as how approval and permitting processes are coordinated among agencies;
- Provide a clear and concise purpose and need statement;

Alternatives

- Outline the physical design of current and proposed facilities;
- Consider a smaller sized mine expansion;

Effects

- Address hydrology (water movement and balance), surface water features, wetlands, water quality (including 303(d) listed waterbodies), water management, and potential impacts to surface and groundwater;
- Address baseline air quality data and applicable air quality requirements that may be subject to new source permitting; Address impacts to air quality, especially particulate matter;
- Address the physical and chemical characteristics of ore and waste rock as part of projecting potential waste water and solid waste produced by the project;
- Address the risks of hazardous waste transportation incidents, appropriate responses, and monitoring;
- Avoid, minimize, and mitigate impacts to key ecological resources (streams, wetlands, and old-growth trees) and soil, water, carbon weeds, wildlife habitat;
- Address impacts to species listed under the Endangered Species Act; If such species are present, summarize the biological assessment in the EIS.
- Address noxious weed management measures including BMPs, consistent with E.O. 13112 and BLM weed management guidance;
- Address impacts to historic and cultural resources;
- Address an adaptive management strategy for responding to unforeseen circumstances that, coupled with monitoring, could be used to mitigate for uncertainties and risks, and ensure that post-mining land use objectives can be achieved and sustained;
- Include a cumulative effects analysis using the best available science and a watershed approach;
- Address the effects of all connected actions such as roads and transportation;
- Address greenhouse gas emissions and practical measures to reduce such emissions;
- Address the economic effects mine expansion would have by increasing area employment and providing greater economic benefits to area communities;

Reclamation and Monitoring

- Summarize project monitoring conducted to date and discuss how the information is used in the EIS to characterize current conditions;
- Include a monitoring plan with defined goals and objectives;
- As a component of monitoring, include an evaluation of methods for determining performance;
- Require a reclamation bond;
- Address the estimated reclamation costs and financial assurance mechanisms;

Coordination and Consultation

- Consult with affected tribal governments in accordance with E.O. 13175 and document consultation efforts in the analysis;

In addition to public scoping, internal scoping was conducted within the BLM Interdisciplinary (ID) Team in summer of 2015. The BLM ID Team identified the following resources or issues to be analyzed in the EIS:

Climate Change

- The analysis should be focused on quantifying carbon dioxide emissions;

Cultural Resources and Native American Concerns

- Additional cultural resource inventory would need to be completed and consultation with appropriate native American tribal governments conducted in order to fully address potential cultural impacts and religious concerns within the analysis;

Wildlife

- The existing disturbance area falls within ODFW "low density" sage-grouse habitat, but the proposed expansion area does not fall within sage-grouse PHMA or GHMA;
- Raptor nests exist along the outer edge of the Tucker Hill formation. Additional monitoring would be needed to determine if these sites are currently occupied by Bald or Golden Eagles;

Special Status Species

- Surveys for special status plant species need to be completed and the results described in the analysis;

Range/Livestock Grazing

- The surrounding Tucker Hill Allotment is currently vacant (not grazed), but there has been interest by several parties in applying for a permit to graze the allotment in the future. If a

grazing application is received and a permit issued, a temporary fence may need to be constructed around the mining area to keep livestock out;

Weeds and Invasive Non-Native Species

- Appropriate weed and invasive, nonnative species prevention and monitoring measures need to be included in the reclamation plan; the plan also needs to disclose and address the potential effects of treatments, including herbicides that may be used on BLM lands during mine operation and reclamation activities;
- Mediterranean sage exists in the area and needs to be addressed/treated;

Visual Resource Management

- The mine area falls within VRM class III. Major to moderate impacts are allowable within this VRM class. However, the area falls within a scenic corridor designated in the Lakeview Resource Management Plan (RMP) and portions visible from Highway 31 have higher visual standards. In addition, the Highway 31 corridor was designated as the Oregon Outback National Scenic Byway;
- A visual analysis needs to be completed using a number key observation points (KOPs) to estimate the visibility of the proposed mine expansion and associated overburden and topsoil piles;
- Visual mitigation measures should be addressed including:
    - Authorizing no more storage of reject perlite material in visible portions of the scenic corridor due to the visual impacts of the white, highly-contrasting color of the material;
    - Consider staining the exposed pit wall, if visible, using measures similar to those employed in the 2012 EA;

Recreation

- Some hunting, biking, and little to no camping may occur in the area due to limited public access. Potential impacts to recreation may need to be addressed, but does not represent a primary issue;

Cumulative Effects

- Address potential cumulative impacts of Clover Flat sagebrush habitat restoration project currently in the planning stages and located to the south of the project area; and
- The cumulative impact assessment boundary could potentially vary by resource value.

1.7 Mine History and Existing and Approved Facilities

Mineral interest in the Tucker Hill area goes back to 1949 when a group of local prospectors staked claims on outcropping perlite located in the northwestern portion of the present Project Area. A bulk sample expansion test was favorable, and small-scale mining was conducted until 1954.

Mining was concentrated on an area that was easily accessible but contained a high percentage of obsidian nodules. Adjacent areas of high-purity perlite went unrecognized.

In the early 1980s, geologists conducting reconnaissance in the area identified high-quality perlite south of the old mine. After continued evaluation through core drilling and bulk sampling the presence of a significant resource of commercial grade perlite was confirmed. The evaluation of the property continued through to the mid-1990s. As a result of the evaluation, a decision was made to move forward with development of a perlite mining operation. Cornerstone, a public company, was formed and construction of the processing plant in Lakeview, Oregon, began in 1996, with production commencing in February 1997 (Cornerstone 2012).

The BLM originally approved a mining Plan for the quarry in April 1996 (BLM 1996a), based upon analysis contained in an Environmental Impact Statement (EIS) (BLM 1995; 1996b). The 1996 Plan of Operations and Reclamation Plan for the Tucker Hill Perlite Project was approved for the development of a 15- to 20-acre perlite quarry and associated waste material dump and haul road over a ten-year time period. Total disturbance proposed was 37.7 acres. The 1996 mining Plan was considered an amendment to the original exploration plan of the mid 1990's, as both plans included the Tucker Hill area.

Multiple minor amendments to the plan were approved over the following two decades. The 1998 amendment was approved for locating a portable jaw crusher at the mine site. The 2001 amendment was approved for the addition of two travel-trailers and modifications to blasting operations. The 2006 amendment was approved for minor modifications to the haul road. The 2008 amendment approved the development of a new waste material disposal area in an abandoned gravel pits in close proximity to the original waste material dump analyzed in the 1996 EIS. The 2013 amendment expanded the Tucker Hill quarry from 23 to 70 acres. The quarry continues to operate under the Plan, as last amended in 2013.

Table 1.7-1 shows a summary of the plan of operations and subsequent amendments describing existing mining activities in the Project Area. The proposed operations being analyzed in this EIS incorporate the plan and amendments.

Table 1.7-1: Mining History for the Tucker Hill Project

Plan	Approval Date	Acreage	Areas of disturbance	Disturbance Activity	Associated NEPA Reference
Plan of Operations	July 16, 1996	23.3	Tucker Hill	Perlite quarry, waste rock dump, growth media stockpiles, drill access, exploration roads, and bulk sample sites.	Final Environmental Impact Statement BLM/OR/WA_PL-96/003-1792
Portable Crusher Plan Amendment	January 1999	0	Existing pit area	Set up portable crusher in existing quarry.	Plan conformance and NEPA Compliance Review
Occupancy and Pit/Blasting Modification Plan Amendment	October 2001	0	Existing pit area	Adjust timing of blasting operations.	Determination of NEPA Adequacy
Haul Road Modification Plan Amendment	January 2006	0	Existing haul road	Repair and maintain existing haul road.	Categorical Exclusion OR-010-2006-10
New Waste Material Disposal Area Plan Amendment	January 2008	17.9	County Gravel pits along Highway 31	Backfill gravel pits	Environmental Assessment OR-010-2008-01
Tucker Hill Quarry Plan Amendment	January 2013	47.0	Tucker Hill Quarry	Expansion of Tucker Hill quarry, growth media stockpiles	Environmental Assessment OR-L050-2012-09

2 DESCRIPTION OF THE PROPOSED ACTION AND ALTERNATIVES

2.1 Alternative 1 - No Action

Under the No Action Alternative, the BLM would not approve the proposed Plan amendment and the proposed 340-acre Poachers Ridge Expansion Quarry area would not be mined. However, the Project Area would continue to be subject to mining activities as authorized under prior plans of operation previously approved by the BLM (1996a; 2013). A summary of the plan of operations and subsequent amendments describing existing mining activities in the Project Area is summarized in Table 1.7-1. There is also an additional 8.4 acres of pre-1996 disturbance and 0.4 acre of unauthorized disturbance in the Project Area, for a total of 97.5 acres of existing and proposed disturbance that would be subject to reclamation (Map 2.1.1).

2.2 Alternative 2 - Plan of Operations Proposal (Proposed Action)

Under Alternative 2, BLM would approve the Plan of Operations Proposal (Tucker Hill Perlite Project, Lakeview District, Oregon, Plan of Operations Amendment No. 7 August 2011, Revised January 2013 and Revised May 2015) originally submitted to the BLM by Cornerstone in August 2011. The Plan of Operations includes a 340-acre expansion quarry on Poachers Ridge including a Reclamation Plan, tall berms for visual mitigation and a mine management area.

Cornerstone is currently mining the Tucker Hill Quarry, and is reaching the limit of the currently permitted area and associated reserves. Cornerstone has proposed to expand its mining activities to include the Poachers Ridge Expansion Quarry area where quality perlite has been identified. The area where the proposed new mining activities would occur covers approximately 340 acres (Map 2.1.2). Concurrent reclamation activities would occur by placing off-specification material and stockpiling screened material in the mined-out areas of the proposed quarry.

Cornerstone would develop the 340-acre Poachers Ridge Expansion Quarry by the same conventional mining methods currently used for the Tucker Hill area, which includes for example: drilling; blasting; loading; and hauling. Cornerstone anticipates mining up to 340,000 tons per year, consisting of approximately 170,000 tons for direct sales, approximately 70,000 tons for further processing, and approximately 100,000 tons of screened material to be stockpiled for future sales. Mining operations would occur on a year-round basis and quarried material would be stockpiled in place on the quarry floor prior to hauling off site for further processing. The stockpiled ore would be hauled daily by trucks from the pit via the existing upgraded access road to State Highway 31, and then south to the town of Lakeview for processing at the existing ore mill facility. Hauling would occur year-round. Trucks would depart from the quarry at a rate of approximately one truck load every thirty minutes between 5:00 a.m. and 10:00 p.m. Each haul would be approximately 32 tons at a rate of approximately 40 loads per day, between four and five days per week.

Based on available drilling information, Cornerstone expects that the depth of the proposed quarry would be up to approximately 100 feet.

Table 2.4-1 lists the approximate acreage of disturbance, both existing and proposed, for each component associated with the quarry in the Project Area. There would be a total of approximately 340 acres of surface disturbance.

2.2.1 Growth Media Management

Prior to expansion of the quarry, the available growth media of limited loose soil, gravely material and overburden that can feasibly be obtained with standard equipment would be removed separately and stockpiled along the perimeter of the quarry. Growth media would be excavated to a depth of approximately six inches from the top of the quarry, and a berm approximately seven feet in height would be constructed with a ten-foot setback around the inside of the quarry boundary to preserve the integrity of the soil for use in reclamation. Approximately 1.5 feet of material under the growth media would be excavated and stockpiled as an approximately 61 feet wide by 13 feet high berm set back 25 feet inside of the shorter berm to provide visual screening of mining activities (BMPs M-2 and M-3). Berms around the perimeters of the quarry would have approximately 2.6 horizontal (H) to one vertical (V) (2.6H:1V) ratio slopes stabilized during the operational phase by seeding with the seed mix determined by the BLM. The application of a BLM-approved temporary seed mix would occur at a time conducive to seed germination (BMP M-5) to help stabilize the soil and minimize visual impacts.

Monitoring of berms and growth media stockpiles would include the detection and appropriate treatment of any invasive or noxious weed species. Appropriate weed control would be implemented after consultation with representatives of the BLM, including possible treatment methods outlined in the *Integrated Invasive Plant Management for the Lakeview Resource Area Revised Environmental Assessment* (BLM 2015b). If necessary, application of brown soil obtained from within the Poachers Ridge quarry would occur to help minimize visual impacts.

2.2.2 Quarry Development

The Poachers Ridge Expansion Quarry would be constructed east of the current quarry using the same conventional methods that consist of drilling, blasting, loading, and hauling. Drilling would be conducted with diesel-powered drills on 10 to 12 foot centers, depending on material type. The holes would be loaded with a blasting agent composed of a mixture of ammonium nitrate (fertilizer) and fuel oil (ANFO), and blasted in accordance with the regulations of the federal Mine Safety and Health Administration (MSHA). Typical quarry cross sections are displayed in Maps 2.2.1 through 2.2.3.

During blasting activity, flammable material storage and rolling equipment would be removed from the blast area, a water truck would be standing by, and the pit area would be cleared and closed by mine personnel. The ANFO would be brought on site immediately prior to the blasting periods and would be stored in sealed containers. Blasting would occur three or four times per year by certified personnel trained in handling explosives. Bench heights would range from 20 to 25 feet high during active mining. Blasting operations would be controlled to minimize flyrock by utilizing drill cuttings as stemming material, which is utilized to ensure the blast does not exceed the intended shot area.

The Lakeview Interagency Fire Center, the Field Manager, and District Geologist would be notified of the Project blasting schedule a minimum of two days prior to any blasting.

Shallow development and production drilling would be completed, as needed, prior to mining in portions of the proposed pit area. Drilling would also be used to determine optimum mine bench designs and to better define the lower boundary of minable reserves in areas where they are

currently poorly defined for sampling in ore zones being mined, and for quality assurance/quality control sampling and testing prior to mining. Drill holes not consumed by the pit would be abandoned in accordance with Oregon Water Resources Department (OWRD) regulations and standards for hole abandonment.

Mining, blasting, and in-pit crushing would be conducted on a year-round basis. Broken material from the mine benches would be transported from the active mining area, using mechanized loaders, to the portable crusher/screening plant on site, where the material would be crushed and screened to a top size of 1.5 inches. Crushed and sized ore would be stockpiled in a staging area in the quarry. Crushed ore would continue to be hauled for further processing and shipment approximately 33 miles to Cornerstone's existing mill in Lakeview, Oregon, via the existing access road to State Highway 31, and then south to the town of Lakeview.

2.2.3 Off-Specification Rock Management

Off-specification rock consists of perlite that does not meet specifications for market demand. Off-specification material would be used as a portion of the backfill material for the proposed Poachers Ridge Expansion Quarry. As the life of the mine progresses, additional off-specification material that is unused post-process material would be transported back to the mine and used as backfill to reclaim mined out areas. Similar to the reclamation objectives set forth in the 1996 EIS (BLM 1996b) and approved reclamation plan (BLM 1996a), off-specification material would be mixed with finer mill tailings and returned to the mine for use in concurrent reclamation. This finer material would be interbedded with the larger grained mined material to reduce fugitive dust. The processed perlite has the same chemistry as the mined mineral, and no chemicals would be added during processing, which would make it suitable for reclamation use. The backhauling of the off-specification materials from the Lakeview processing plant was approved in the 1996 Plan of Operations and the 2008 amendment (BLM 1996a; BLM 2008b) for previously authorized activities; however, a new approval would be required to backhaul off-specification materials needed for reclamation for the proposed activities.

2.2.4 Mining Scenario and Cross Sections

Conceptual drawings and cross sections are displayed in Maps 2.2.1, 2.2.2 and 2.2.3. The number of years that the mine would be in operation would depend on the amount of material that is mined each year, and this would be determined by market demand.

2.2.5 Equipment

The following types of equipment could be utilized for the Project:

- Four 32-ton haul trucks
- Two 50-ton haul trucks
- One D9 or equivalent dozer
- Two 980 or equivalent front-end loaders
- One drill rig (Cat MD5090 Hydraulic Rock Drill)
- One 4,700-gallon water truck
- One 2,000-gallon fuel tank
- Up to four light vehicles (pick-up trucks)
- One office trailer

- One generator (V12 Detroit or Caterpillar equivalent) or cat.
- Four conveyors
- One jaw crusher unit
- Three screens
- Two cone crusher units
- One road grader

2.2.6 Work Force

The proposed work force would consist of a maximum of five full-time people in the quarry four or five days a week, in addition to the 30 people employed at the processing facility in Lakeview. There would be up to four trucks averaging ten trips per day, per truck, working a 10-hour shift between the hours of 5:00 a.m. to 10:00 p.m. The hauling would occur year-round. Weather shutdowns are possible mostly due to precipitation events softening the road, which could deteriorate the internal haul roads with heavy truck use. Snow removal would occur if necessary.

2.2.7 Haul Road Access

The Project would continue to be accessed using the existing 3.3-mile haul road. The road has been resurfaced with crushed stone or gravel, where necessary, to provide for an all-weather travel surface. Turn-outs have been constructed where appropriate to provide for safety. During operations, the road would be graded and watered by Cornerstone to maintain the surface and control fugitive dust (Locatable Mining Road RDF 6). The existing road was, under the current Plan of Operations, expanded to an approximate running width of 18 feet, and the total disturbance width has not exceeded 32 feet. There is a maximum cutback height of approximately six feet. The portion of the haul road located on the private land directly south of State Highway 31 was an existing two-track road that has been upgraded to match the road configurations on BLM land. One additional haul road would be constructed within the boundary of the proposed quarry and would link the main haul road with the top of Poachers Ridge (Map 2.1.2). There would be no additional disturbance associated with the proposed haul road as it would be located within the proposed quarry area.

2.2.8 Access Control

Public access to the quarry area is restricted because the haul road entrance is located on private land that is gated. Cornerstone is provided access by a right-of-way easement lease allowing Cornerstone to cross the private ranch property, which is subject to renewability on a five-year basis. Warning signs are posted at strategic locations, advising of the danger associated with the operations. Access is provided to individuals or groups through the quarry area for such purposes as education, research or cultural/religious practices. However, there is no legal public access on that portion of the haul road that crosses private land. The quarry may potentially be accessed on foot from adjacent public lands. During periods of mining, Cornerstone would control access to the mine during blasting and ensure security in the area by utilizing a gate closure. During periods of non-operation, Cornerstone would post appropriate signage.

In accordance with 43 CFR 3809.900, if requested by any member of the public, the BLM may sponsor and schedule a public visit to the mine once each year. The purpose of the visit is to give the public an opportunity to view the mine site and associated facilities. Visits would include surface areas and surface facilities ordinarily made available to visitors on public tours. BLM

would schedule visits during normal BLM business hours at the convenience of Cornerstone to avoid disruption of operations. Cornerstone must allow the visit and must not exclude persons whose participation BLM authorizes. BLM may limit the size of a group for safety reasons. Cornerstone's representative must accompany the group on the visit. Cornerstone must make available any necessary safety training that they provide to other visitors. BLM would provide the necessary safety equipment if Cornerstone is unable to do so. Cornerstone does not have to provide transportation within the project area, but if it does not, it must provide access for BLM-sponsored transportation.

2.2.9 General Schedule of Operations

Cornerstone would continue to conduct mining activities within previously authorized facility boundaries (Tucker Hill Quarry; Map 2.1.2). Following BLM approval of the Project, submission of approved financial guarantee, and obtaining all other required State and Federal permits, Cornerstone would commence work to mine at the Poachers Ridge Expansion Quarry area. The proposed mining activities under this Project, including the Tucker Hill Quarry and Poachers Ridge Expansion Quarry areas, would last over the life of the mine (estimated at 15 years), but would depend upon market conditions and the delineation of additional reserves.

2.2.10 Surface Occupancy

Occupancy is defined as full- or part-time residence on the public lands (43 CFR 3710 Subpart 3715.0-5). Activities that involve residency include the construction, presence, or maintenance of temporary or permanent structures that may be used for such purposes, or the use of a watchman or caretaker for the purpose of monitoring activities. Residence or structures include, but are not limited to: barriers to access; fences; tents; motor homes; trailers; cabins; houses; buildings; and storage of equipment or supplies. No additional structures to the Project Area are proposed beyond what currently exists.

As needed, equipment and facilities listed in Section 2.1.4 would be moved from the existing Tucker Hill Quarry to the proposed Poachers Ridge Expansion Quarry. Occupancy would move from the Tucker Hill Quarry to the proposed Poachers Ridge Expansion Quarry, by movement temporary or permanent structures in accordance with the definitions in 43 CFR 3710 Subpart 3715.0-5.

2.2.11 Water Management Plan

There are no perennial surface water bodies located in the arid Project Area. The nearest surface water is in the Chewaucan Marsh, located approximately one mile east of the base of Tucker Hill. There are no perennial drainages or springs located in the Project Area, and ground water is reported in water wells at a depth greater than 300 feet below the playa lake surface, some 600 feet below the summit of Tucker Hill. No ground water has been found in exploration drill holes, which have been drilled to a depth of 100 feet along the upper surfaces of the Poachers Ridge area.

The current mining operation uses water from a private well. The Proposed Project would continue water use from a private well, primarily for dust suppression activities.

2.2.12 Drainage and Sediment Control Plan

The goal of the Drainage and Sediment Control Plan is to convey runoff from reclaimed areas and up-gradient undisturbed areas through the Project Area in a manner that would protect the reclaimed areas and prevent degradation of down-gradient water quality. The Drainage and Sediment Control Plan is designed to require minimal maintenance (BMPs R071, R075, R077).

The main method of drainage and sediment control in the Project Area would be the revegetation of all disturbed areas. The main haul road would continue to be maintained by Cornerstone to prevent degradation from erosion. Drainage on this road has been and would continue to be by ditching, installation of waterbars and, where appropriate, culverts. If any of these activities go outside of areas of existing disturbance of the main haul road, an archaeological/cultural survey/evaluation would be required. Running surfaces of the haul road have been rocked to reduce erosion and sediment runoff. Drainage facilities would be designed to accepted road engineering standards.

During operation, the quarry would be a topographic depression and all precipitation falling onto the quarry surface area would be contained on site. Construction by this method would help control potential erosion from site runoff. No watershed exists up-gradient of the quarry, therefore, the only inflow to the quarry area would be from direct precipitation. The surface collection of water would be controlled by evapotranspiration and quarry floor fracture infiltration.

There would be no surface discharge from quarry. The relatively small amount of runoff from the surrounding land surfaces and precipitation directly into the quarry would either evaporate or percolate into the exposed bedrock in the quarry bottom.

2.2.13 Waste Management

Solid wastes, including scrap, trash, and unusable equipment, would be removed on a daily or weekly basis and disposed of in accordance with federal and state regulations and laws. Portable chemical toilets would also be used on the Project site for human waste disposal and would be supplied and maintained by an Oregon-based contractor on a weekly basis. No waste would be buried on site.

2.2.14 Reclamation Plan

The operator will carry out the following reclamation activities, or BLM will hire a contractor to carry them out, to be paid out of the operator's reclamation bond. Cornerstone would begin reclamation within the mine areas when mining is complete, or the disturbance is no longer needed for mining or development activities. Reclamation would continue as approved in the 1996 Plan, and would include the following: recontouring; redistribution of stockpiled growth media; reseeding; use of drainage control ditches, installation of water bars and culverts as necessary; and rock armor for erosion control. Reclamation would be completed for haul and access roads and would include recontouring and seeding. The pit floor would be reclaimed by placement of growth media and then seeded (drill seeding where possible). In coordination with the BLM, Cornerstone would evaluate the need to rip the pit floor where areas of compaction have occurred. Seeded areas would be monitored for stability and revegetation success, during the spring or fall, for three years or until revegetation is determined successful by the BLM and DOGAMI. Cornerstone would coordinate reclamation activities with the BLM.

Revegetation of exploration roads and pads not located within the mining component boundary would take place during the mining of the Project. The BLM and DOGAMI would consider reclamation successful when the disturbed sites are stabilized, secondary plant succession is established, and the conditions are met to realize the land use objectives.

Once the quarry has been filled with waste material and growth media, the surface of the reclaimed area would be regraded and seeded. This finer material would be interbedded with the mine waste to reduce fugitive dust. The processed perlite has the same chemistry as the mined mineral, and no chemicals are added during processing, which makes it suitable for reclamation use. The proposed reclamation would be initiated as soon as practicable.

2.2.14.1 Project Reclamation Schedule

Reclamation would be performed upon termination of operations. Reclamation of existing exploration/development-related disturbances outside of the new quarry area would be reclaimed during the life of the proposed quarry operations. Concurrent reclamation of the quarry would occur after a portion of the quarry has been mined out and as mining activities proceed to the north.

2.2.14.2 Revegetation

The revegetation methods described at this time are generally based on common industry practices. Seeds from a native seed bank, if possible, would be obtained for reclamation. The seed mix utilized for reclamation of this Project would be based on known soil and climatic conditions and selected to establish a plant community that would support post-mining land uses such as recreational activities and wildlife habitat as prescribed by the BLM. The seed mix would be designed to provide species able to become established in the environment of south central Oregon, proven species for vegetation, and/or native species found in the plant communities prior to disturbance. Potential seed mixes are included in Appendix L of the RMP/ROD (BLM 2003a).

The seed to be used for final reclamation would be certified weed free and approved by the BLM prior to the seeding operation. A monitoring program would be established for noxious weed invasion, which would include inventory every year during the life of the Project for three years after closure of the Project. If noxious weeds are found, the preferred treatment would be physical or manual extermination with selective chemical treatment as the least preferred method of eradication.

Timing of revegetation activities is critically important to the overall success of the program. Seeding activities would be timed to take advantage of optimal climatic periods and would be coordinated with other reclamation activities. In general, earthwork and drainage control would be completed in the summer or early fall. Seedbed preparation would generally be completed in the fall, either concurrently with or immediately prior to seeding. Seeds would be sown in late fall to take advantage of winter and spring precipitation and optimum spring germination. Early spring seeding (drill seeding where possible) may be utilized for areas not seeded in the fall. In either case, seeding would be avoided when the ground is frozen or snow covered.

2.2.14.3 Quarry Reclamation

The quarry walls would be left with overall slopes with benches approximately 20 to 25 feet vertical by approximately 20 to 25 feet horizontal. This would provide a very stable final slope.

Mill waste material would be interbedded with the non-spec waste material to reduce fugitive dust. Once the quarry has been back filled with mill waste material and non-spec material, the area would be covered with growth media and seeded.

Prior to final reclamation, public safety concerns would be evaluated with the BLM and the DOGAMI. If determined to be necessary by the agencies, Cornerstone would construct a safety berm using mostly rock or waste material approximately five feet high with a one-foot top and 1.5 Horizontal: 1 Vertical (1.5H:1V) side slopes along the margin of the pit approximately 25 feet back from the highwall edge. Growth media would also be incorporated into sections of the berm in order to be utilized during reclamation of the quarry areas and quarry floor. The safety berm would be posted with warning located in from of the berm and spaced every 200 feet. The permanent waste material berm or weather resistant metal signs would provide for public safety for many years following mining. Safety berms would be seeded with the approved seed mix to reduce visual impacts of the quarry due to color contrasts.

2.2.14.4 Monitoring and Maintenance of Reclaimed Areas

Environmental monitoring of the Project Area would consist of both operational and post-reclamation monitoring. Operational monitoring would extend for the duration of operations and would cease when operations are terminated. Noxious weed and invasive species monitoring would occur as described in the Revegetation Section 2.2.14.2. Post-reclamation monitoring would commence on any reclaimed area following completion of the reclamation work for the area and would occur along with, or following, operational monitoring until reclamation work has been determined by the BLM and DOGAMI to be completed and permanent vegetation has been established. Once reclamation has been determined complete, including vegetation, the Project's reclamation bond would be released to Cornerstone. Annual reports on the progress of the reclamation would be submitted to BLM and DOGAMI.

The BLM and DOGAMI would consider reclamation successful when the disturbed areas are stabilized, secondary plant succession is established, and the conditions are set to realize the land use objectives described in Section 2.3.1.5. The type and frequency of monitoring applicable is described in Table 2.2-1.

Table 2.2-1: Monitoring Program and Schedule

Type of Monitoring*	Operational Frequency	Post-Operational Frequency
Condition of drainage and sediment control	Monthly	Annually until released
Condition of reclaimed areas	Annually	Annually until released
Noxious weed monitoring	Annually	Annually until released

*The Project would be monitored for noxious weed invasions throughout the life of the mine operation and reclamation activities (BMP W-2).

2.2.14.5 Isolation, Removal, and/or Control of Acid-Forming, Toxic or Deleterious Materials

There are no natural occurring acid-forming, toxic or deleterious materials associated with perlite. Mining operations are conducted 12 months per year; however, should there be a temporary shutdown, all fuel, lubrication oil, and waste oil tanks located within the Project Area would be emptied. All valves in the fuel and lube island containment structures would be left in the closed positions. All chemical agents, such as WD-40, or Brake Kleen would be secured inside the flammable containers cabinet located inside the trailer that remains locked when the mine area is not occupied. Grease and other lubricants would be stored either inside the locked storage container or the locked trailer. No other toxic chemicals or deleterious materials are kept on site.

2.2.14.6 Removal or Stabilization of Building, Structures, and Support Facilities

Several structures would be utilized during the life of the Project. All equipment and supplies would be decommissioned and removed following completion of the Project. Other materials, including scrap, trash, and unusable equipment, would be removed on a daily or weekly basis and disposed of in accordance with federal and state regulations and laws.

2.2.14.7 Drill Hole Plugging

Drill holes would be abandoned in accordance with established OWRD standards and regulations.

2.3 Alternative 3 - Decreased Disturbance Area Alternative, with Mine Management Area

Under Alternative 3 (Map 2.1.3), BLM would approve the Plan amendment, subject to changes and conditions. Alternative 3 is similar to Alternative 2, except that:

- The expansion area would be limited to approximately 300 acres and exclude many areas exhibiting rock stack features and active golden eagle nest sites; and
- Mulch would be applied with the seed mix to steep slopes to aid in seed establishment and reduce soil erosion during seed establishment (BMP SD-1; Reclamation RDF 5).

2.4 Alternative 4 - BLM Preferred Alternative

Under Alternative 4 (Map 2.1.4), BLM would approve the Plan amendment, subject to changes and conditions. Alternative 4 is similar to Alternative 3 except that:

- The expansion area would be limited to approximately 262 acres and would exclude additional areas with rock stack features of cultural significance and all areas with known raptor nest sites including historic and active nests;
- No mine management area would be included; and
- Additional measures would be included in the Reclamation Plan (2.4.1), which include more completely back-filling and re-contouring the existing Tucker Hill Quarry area (Map 1.2.1). Applicable best management practices (BMPs) and required design features (RDFs) from the governing land use plans (BLM 2003b, 2015a), and project design elements (PDEs; Appendix B) would be applied to reduce potential environmental effects and prevent unnecessary and undue degradation.

2.4.1 Alternative 4 Reclamation Plan with Additional Project Design Features

2.4.1.1 Overview

Reclamation would begin on all disturbed surfaces within the mine areas when mining is complete, or the disturbance is no longer needed for mining or development activities. Reclamation in the Poachers Ridge Expansion Quarry area would continue similar to the process approved in the 1996 Plan, and would include the following: recontouring; redistribution of stockpiled growth media and off-specification material; reseeding; use of drainage control ditches; installation of water bars and culverts, as necessary; and rock armor for erosion control. The pit floor would be reclaimed by placement of growth media and then seeded (drill seeding where possible). In coordination with the BLM, Cornerstone would evaluate the need to rip the pit floor where areas of compaction have occurred. Seeded areas would be monitored for stability and revegetation success, during the spring or fall, for three years or until revegetation is determined successful by the BLM and DOGAMI. Reclamation activities would be coordinated with the BLM, as necessary.

Once the off-specification material and growth media are placed in the existing Tucker Hill mined out quarry, the surface of the reclaimed area would be regraded and seeded. See the Plan of Operations (Cornerstone 2015) for details regarding the placement of the off-specification material and the growth media.

The proposed reclamation would be initiated as soon as practicable, and would be completed within 6 months of mining activity termination (BMPs M-1 and SD-4).

The BLM and DOGAMI would consider reclamation successful when the disturbed sites are stabilized, the desired plant communities have been established, and the conditions meet post-mining land use plan objectives.

2.4.1.2 Revegetation

The revegetation methods for the Project are generally based on common industry practices. Drill seeding would be the preferred method. Broadcast seeding could be used followed by a harrow or disk to incorporate seed into the soil and promote better germination. Seeds from a native seed bank or other commercial source would be obtained for reclamation (Operations RDF 9). The seed mix utilized for reclamation of this Project would be based on known soil and climatic conditions and selected to establish a plant community that would support post-mining land use objectives including livestock grazing and wildlife habitat. The seed mix would be designed to provide species able to become established in the environment typical of south central Oregon, proven species for vegetation, and/or native species found in the plant communities prior to disturbance. Potential seed mixes are included in Appendix L of the RMP/ROD (BLM 2003a). Mulch would be applied with the seed mix to steep slopes to aid in seed establishment and reduce soil erosion during seed establishment (BMP SD-1; Reclamation RDF 5).

The seed and mulch used for final reclamation would be certified weed free (BMP NW-4) and provided by the BLM through a Memorandum of Understanding (MOU) with Cornerstone prior to the seeding operation.

Timing of revegetation activities is critically important to the overall success of the program. Seeding activities would be timed to take advantage of optimal climatic periods and would be

coordinated with other reclamation activities. In general, earthwork and drainage control would be completed in the summer or early fall. Seedbed preparation would generally be completed in the fall, either concurrently with or immediately prior to seeding. Seeds would be sown in late fall to take advantage of winter and spring precipitation and optimum spring germination (BMP M-10). Early spring seeding (drill seeding where possible) may be utilized for areas not seeded in the fall.

2.4.1.3 Additional Monitoring

Monitoring would be conducted as described in Section 2.2.14.2. However, a monitoring program would be established for noxious weeds and other invasive non-native species, which would include inventory every year during the life of the Project and for three years after closure of the Project. If noxious weeds or invasive non-native species are found, they would be reported to the Lakeview BLM. Treatments of the noxious weeds would be coordinated through the BLM and would follow an approved Pesticide Use Proposal and all of the BLM's Standard Operating procedures for herbicide application. All Pesticide Applications Records (PARs) would be submitted to the BLM for review. An end of the year Pesticide Use Report (PUR) would be provided to the BLM documenting all chemical use for the year. Cornerstone or an approved contractor operating on behalf of Cornerstone would conduct these treatments using a licensed applicator or could choose to reimburse BLM for the costs associated with these treatments.

2.4.1.4 Prevention of Unnecessary or Undue Degradation

The Reclamation Plan has been developed in accordance with BLM Handbook 3042-1, "Solid Minerals Reclamation Handbook." Details of the Reclamation Plan would be monitored and administered by the DOGAMI, as well as the BLM. Design, construction, operation, and final reclamation of the Project facilities would incorporate performance standards per 43 CFR 3809.420 to prevent unnecessary or undue degradation of the environment.

2.4.1.5 Post Operational Land Uses

The objectives of the Reclamation Plan include preventing or minimizing safety hazards, stabilizing disturbed areas, preventing undue and unnecessary degradation, and providing for post operation surface conditions that would be consistent with the long-term multiple uses identified in applicable land use plans (BLM 2003a, 2015b). This would include reclamation of both the Poachers Ridge and Tucker Hill quarry areas such that vegetation could provide forage and support potential grazing use in the future. Should BLM receive an application for grazing use on the surrounding Tucker Hill Allotment, Cornerstone would need to construct a temporary fence to keep livestock out of the mining area during operation and reclamation phases. In addition, reclamation of the Tucker Hill Quarry area would put that area on a trend of providing functional Sage-Grouse habitat over the long-term.

2.4.1.6 Haul Road Reclamation

Long-term management of the haul road after mining operations have ceased and reclamation has been completed at the mine would be determined as part of the final reclamation process in conjunction with the BLM and DOGAMI. Possible options include the following:

- Permanently close the road, bring the road bed back to the original contour as closely as possible, and revegetate the road corridor. Fill material, enhanced with available growth

media, would be pulled onto the roadbed to restore the slope to the original contour as needed. Compaction would be relieved by ripping and smoothing the surface with the excavator bucket (BMPs R-082, R-083, R-092, R-093, SD-3, SD-5, and M-8). This process would help inhibit soil loss from runoff and provide a suitable seedbed. Revegetation of the recontoured area would be consistent with methods described under Section 2.4.14.2 Revegetation;

- Re-grading and re-contouring of the haul road to return the road bed to its pre-mining primitive road configuration; or

- Leave the road open for future public/Tribal use, if BLM can obtain legal access through or around the private land.

2.4.1.7 Quarry Reclamation

The quarry walls would be left with overall slopes at the angle of repose, or flatter with a 4H:1V slope. This would provide a stable final slope.

Mill tailings from the processing plant would be backhauled to the Tucker Hill Quarry and Poachers Ridge Expansion Quarry areas. Mill off-specification material would be interbedded with the off-specification mined material to reduce fugitive dust. Once the quarries have been backfilled with mill off-specification material and off-specification mined material and re-contoured (BMPs R-069, SD-1 and M-8; Reclamation RDF 3), the disturbed areas would be covered with a relatively uniform layer of growth media 6-12 inches in depth (BMPs M-3 and M-9) and left in a roughened condition (BMP M-9). Soil tests would be conducted to determine if the growth media is within an appropriate pH range and has adequate nutrient levels to support seed germination and growth. Soil amenities such as fertilizer would be applied (BMP SD-1; Reclamation RDF 5) based on soil test results and then the area would be seeded as described in the Revegetation Section 2.4.14.2.

Prior to final reclamation, public safety concerns would be evaluated with the BLM and the DOGAMI. If determined to be necessary by the agencies, Cornerstone would construct a safety berm using mostly rock or off-specification mined material approximately ten feet high with 2H:1V ratio side slopes along the margin of the pit approximately 25 feet back from the highwall edge. Growth media would also be incorporated into sections of the berm to be utilized during reclamation of the quarry areas and quarry floor. The safety berm would be constructed with a dozer and a loader when highwalls are established. This berm would be posted with warning signs located in front of the berm and spaced every 200 feet. The permanent off-specification material berm or weather resistant metal signs would provide for public safety for many years following mining. Safety berms would be seeded with the approved seed mix to reduce visual impacts of the quarry due to color contrasts (BMP SD-1; Operations RDF 9).

2.4.1.8 Isolation, Removal, and/or Control of Acid-Forming, Toxic or Deleterious Materials

There are no natural occurring acid-forming, toxic or deleterious materials associated with perlite. Mining operations are conducted 12 months per year; however, should there be a temporary shutdown, all fuel, lubrication oil, and waste oil tanks located within the Project Area would be emptied. All valves in the fuel and lube island containment structures would be left in the closed positions. All chemical agents, such as WD-40, or Brake Kleen would be secured inside the flammable containers cabinet located inside the trailer that remains locked when the mine area is

not occupied. Grease and other lubricants would be stored either inside the locked storage container or the locked trailer. No other toxic chemicals or deleterious materials are kept on site.

2.4.1.9 Removal or Stabilization of Building, Structures, and Support Facilities

Several structures would be utilized during the life of the Project. All structures, equipment, and other supplies would be decommissioned and removed from the site following completion of the Project.

2.4.1.10 Drill Hole Plugging

Drill holes would be abandoned in accordance with established OWRD standards and regulations.

Table 2.4-1: Estimated Area of Disturbance by Alternative

Disturbance Component	Proposed Expansion Acres (Alternative 1)	Proposed Expansion Acres (Alternative 2)	Proposed Expansion Acres (Alternatives 3)	Proposed Expansion Acres (Alternatives 4)
Main Haul Road	0	0	0	0
Waste Rock Dump Sites	0	0	0	0
Tucker Hill Quarry Area	0	0	0	
Poachers Ridge Expansion Quarry Area[1]	0	340	300	262
Growth Media Stockpiles/ Safety Berms (Mine Management Area)	0	38	38	0
1994 Drill Access	0	0	0	0
Exploration Roads	0	0	0	0
Bulk Sample Sites	0	0	0	0

1: The Poachers Ridge Expansion Quarry Area encompasses the growth media stockpile and safety berms.

2.5 Applicable Oregon Greater Sage-Grouse RMPA Requirements (Tucker Hill Quarry Reclamation Area - Alternatives 3 and 4 Only)

Approximately 236 acres of the 862-acre Project Area is identified as a sage-grouse GHMA (Map 1.3.1). While no new mining activity is proposed within the GHMA, reclamation of the existing 70.3-acre Tucker Hill quarry would occur as part of this Project. The existing Tucker Hill Quarry falls within GHMA and reclamation activities would need to comply with applicable MDs and RDFs outlined in the GRSG Plan Amendment (BLM 2015a).

These MDs and applicable RDFs have been incorporated into the Proposed Action specifically as it relates to the reclamation of the existing 70-acre Tucker Hill Quarry.

2.6 Alternatives Considered but not Analyzed in Detail

2.6.1 Limited Scale Mining Expansion

One commenter suggested consideration of a mining expansion alternative that was more limited in scale in order to leave more space and time in the project area for native plant and animal communities to thrive within the project area. This alternative was considered, but eliminated from detailed analysis because it is substantially similar to the Alternative 4 and the impacts would fall within the range of alternatives already being analyzed in detail.

2.6.2 Seed Collection from Poachers Ridge Expansion Quarry

Another commenter suggested considering seed collection from plant sources on the proposed Poachers Ridge Expansion Quarry prior to disturbance, for use in revegetating the reclamation area of the Tucker Hill Quarry. The commenter further recommended the area should be seeded with native grasses, forbs and sagebrush, during reclamation as it is potential sage-grouse habitat. This alternative was not analyzed in detail because sufficient native plant material is not present at the Poachers Ridge Expansion Quarry, as the area burned in 2010 and has not adequately regenerated for collection. The burned area does not contain sagebrush for collection due to the burn. However, seed was collected from the Tucker Hill quarry area prior to mining for use in reclamation of that area. This seed source would also be available for use in reclamation of the Poachers Ridge mine expansion area even though it is not sage-grouse habitat (refer to Reclamation Plan section). This alternative is thus not technically feasible.

3 AFFECTED ENVIRONMENT

3.1 INTRODUCTION

The affected environment for the proposed quarry area covers Sections 25, 26, 35, and 36, T34S, R19E, WB&M, located on public lands administered by the BLM and state mineral estate approximately 35 miles northwest of Lakeview, Oregon (Map 1.1.1). The Proposed Action (Alternative 2) disturbance would consist of a 340-acre expansion quarry on Poachers Ridge (Table 2.4-1). This chapter will incorporate by reference, in accordance with the BLM NEPA Handbook H-1790-1 (Section 5.2.1), the affected environment section in Chapter 3 of the Draft EIS for *Atlas Perlite, Inc.'s Tucker Hill Perlite Project* (BLM 1995), where applicable.

Supplemental Authorities that are subject to requirements specified by statute or Executive Order (EO) must be considered in all BLM environmental documents. The elements associated with the supplemental authorities listed in the NEPA Handbook (BLM 2008a, Appendix 1) are listed in Table 3.1-1. The table lists the elements and the determination whether the element is present in

Table 3.1-1: Elements Associated with Supplemental Authorities and Rationale for Detailed Analysis for the Proposed Action

Supplemental Authority Element	Not Present	Present/ Not Affected	Present/May Be Affected	Rationale/Reference Section
Air Quality/Climate Change			X	See Section 3.2.
Areas of Critical Environmental Concern	X			The Red Knoll ACEC is located to the south, but outside the Project Area.
Cultural Resources			X	See Section 3.3.
Environmental Justice		X		Based on a review of existing baseline data, no minority or low-income groups would be disproportionately affected by health or environmental effects as a result of the Proposed Action as these groups are not in or near the Project Area. Therefore, this element is not further analyzed in this EIS.
Farm Lands, Prime or Unique	X			This element is not present within the Project Area and is not further analyzed in this EIS.
Fish Habitat	X			This element is not present within the Project Area or vicinity and is not further analyzed in this EIS.
Floodplains	X			There are no floodplains mapped by the Federal Emergency Management Agency in the Project Area. In addition, EO 11988, "Floodplain Management," defines the term floodplain as "the lowland and relatively flat areas adjoining inland and coastal waters

Supplemental Authority Element	Not Present	Present/ Not Affected	Present/May Be Affected	Rationale/Reference Section
				including flood prone areas of offshore islands, including at a minimum, that area subject to a one percent or greater chance of flooding in any given year." Based on this definition, the Project Area does not contain any floodplains.
Forests and Rangelands (Healthy Forests Restoration Act [HFRA] projects only)	X			This Project does not meet the requirements to qualify as an HFRA project; therefore, this element is not further analyzed in this EIS.
Migratory Birds			X	See Section 3.12.
Native American Concerns			X	See Section 3.3.
Noxious Weeds, Invasive and Non-native Species			X	See Section 3.9.
Threatened or Endangered Species			X	See Section 3.13.
Wastes, Hazardous or Solid		X		This is addressed through the development and implementation of the Spill Contingency Plan located in the Plan of Operations (Appendix C of the Plan). This element is not further analyzed in this EIS.
Water Quality - Surface and Ground		X		See Section 3.11.
Wetlands and Riparian Zones	X			This element is not present within the Project Area or vicinity and is not further analyzed in this EIS.
Wild and Scenic Rivers	X			This element is not present within the Project Area or vicinity and is not further analyzed in this EIS.
Wilderness/Wilderness Study Areas	X			This element is not present within the Project Area or vicinity and is not further analyzed in this EIS.

the Project Area and whether the element would be affected by the Proposed Action.

In addition to the elements listed under supplemental authorities, the BLM considers other resources and uses that occur on public lands and the issues that may result from the implementation of the Proposed Action. Other resources or uses of the human environment that have been considered for this EIS are listed in Table 3.1-2.

Table 3.1-2: Other Resource Values or Uses

Other Resources or Uses	Not Present	Present/ Not Affected	Present/ May Be Affected	Reference Section
Rangeland Management			X	See Section 3.4.
Recreation/Access			X	See Section 3.5.
Socioeconomics			X	See Section 3.6.
Soils			X	See Section 3.7.
Special Status Plant Species	X			There were no special status plant species observed in the Project Area during field surveys. This resource is not further analyzed in this EIS.
Special Status Wildlife Species			X	See Section 3.13.
Vegetation			X	See Section 3.8.
Visual Resources Management			X	See Section 3.10.
Wildlife			X	See Section 3.12.

3.2 Air Quality/Climate Change

Air Quality

Ambient air quality emissions of air pollutants are regulated under both federal and state laws and regulations. Potential air quality consequences are important for the preservation of high quality visual values for the region. National Ambient Air Quality Standards (NAAQS) were established by the 1963 Clean Air Act and subsequent amendments to protect the public health and welfare from adverse impacts associated with the presence of pollutants in the ambient air. In December 2012, the U.S. Environmental Protection Agency (EPA) strengthened the annual $PM_{2.5}$ standard by lowering the level from 15 mg/m^3 (milligrams per cubic meter) to 12 mg/m^3 and retained the daily (24 hour) $PM_{2.5}$ standard of 35 mg/m^3 (NAAQS and 71 FR 61144). Areas in violation of the $PM_{2.5}$ standard (based on the most recent three years of monitoring data) are designated as "nonattainment areas" by the EPA. The Oregon Department of Environmental Quality's (DEQ) Air Quality Division is delegated the responsibility for implementing a state implementation plan to set emission limits and allocated pollution control responsibility to meet the NAAQS among other tasks.

South-central Oregon can experience very strong nighttime inversions that break up with daytime solar heating. In the wintertime, arctic air masses frequently move over the area valleys. Temperatures can remain below freezing for several weeks at a time. Winter nights are commonly clear and cool in the valleys. Under these conditions, inversions and air stagnation can occur for many days in a row over valleys in Lake County.

The two major factors affecting air quality in south-central Oregon are the use of wood burning stoves for home heating in the winter months and wildfire and prescribed burning activities throughout the burning season. In the Project Area there are no air quality restriction areas (Class 1 air sheds, non-attainment areas, or special protection areas).

Windblown particulate matter on federally-administered lands originates from several sources including road dust, wildfire, and prescribed burning. Although smoke from fire is a natural part of the ecosystem, it can potentially affect human health because of particulate matter concentrations and is, therefore, an issue of concern.

Air quality is a sensitive issue in Lake County primarily because of the town of Lakeview's recent efforts to avoid a designation as nonattainment area for the fine particulate matter 2.5 ($PM_{2.5}$) standard. $PM_{2.5}$ is can be emitted into the air as a solid or liquid particle and its chemical form is stable. It occurs in soot from diesel engines, fuel combustion products from residential fireplaces and woodstoves, and smoke from pile and forest burning.

Climate and Meteorology

Weather describes the conditions of the atmosphere at a certain place and time regarding temperature, pressure, humidity, wind, and other key parameters (meteorological elements); the presence of clouds and precipitation; and the occurrence of phenomena such as thunderstorms, dust storms, and tornadoes. Climate is the average weather, or statistical description of the mean and variability of surface variables such as temperature, precipitation, and wind over a period of time ranging from months to thousands or millions of years (Intergovernmental Panel on Climate Change [IPCC] 2013).

The Project Area is located to the east and northeast of Tucker Hill in the eastern rain shadow of the Cascade Mountains. The elevations within the Project Area range from 4,420 feet above mean sea level (amsl) to 4,904 feet amsl. According to the Western Regional Climate Center (WRCC), the average maximum temperature in the town of Lakeview, Oregon, located approximately 27 miles south-southeast of the Project Area, is approximately 84 degrees (°) Fahrenheit (F) in July, and the average minimum temperature is approximately 18.5° F in January. The average annual precipitation is approximately 14 inches and tends to peak in January in the form of snow and rain (WRCC 2017).

Greenhouse Gas Emissions

Greenhouse gases (GHGs) are both natural and anthropogenic gaseous constituents of the atmosphere that absorb and emit radiation at specific wavelengths within the spectrum of long-wave radiation emitted by the earth's surface, the atmosphere itself, and clouds. The primary GHGs in the Earth's atmosphere include: water vapor; carbon dioxide; nitrous oxide; methane; and ozone. Several GHGs are entirely man-made such as halocarbons, and other chlorine- and

bromine-containing substances. Other GHGs include sulfur hexafluoride, hydrofluorocarbons, and perfluorocarbons (IPCC 2013).

Sources of GHG emissions in the vicinity of the Project Area are wildfires and prescribed burns, vehicles (including OHVs), construction and operation for mineral development, and grazing livestock and wild horses. To the extent that these activities increase, GHG emissions are also likely to increase.

Though most climate scientists agree that average global temperatures have generally been rising over the past century, there is substantial regional variation. Mote (2003) studied climate across the Pacific Northwest and though he found that temperatures have increased over the last century, the rates differed by climatic zone. The central zone, which included eastern Oregon, experienced an average annual temperature increase of 1.5 degrees Fahrenheit during this timeframe. This study noted that the 1990s were the warmest decade of the 20th century. However, average global temperature anomalies actually leveled off between 1998 and 2013 before rising further in 2014-2015 (NOAA 2016).

While many factors are known to have an effect on temperature (i.e. long-lived greenhouse gases, ozone, aerosols, water vapor, aviation contrails, surface albedo, and solar irradiance), not all have been studied at the same level of detail (Forster *et al.* 2007, Taylor 2009). Greenhouse gas levels represent one factor that has been widely studied in recent years. Forster *et al.* (2007) reviewed scientific information on atmospheric constituents and radiative forcing and concluded that human-caused increases in greenhouse gas emissions since 1750 are extremely likely (95% confidence level) to have exerted a "substantial" warming influence on climate. Based on its own review of available science, the National Oceanic and Atmospheric Administration (NOAA) estimates that 50% or more of the recent global warming is likely due to greenhouse gas increases caused by humans (NOAA 2010, 2016). This implies that up to 50% of the recent global warming trend may be attributed to other causes, including natural fluctuations.

There is still debate and uncertainty as to the timing and magnitude of temperature change and its potential effect on future regional and global precipitation and weather patterns. Predictions of future climate conditions are based on outputs from broad-scale computer modeling studies. These predictions vary greatly depending upon which model is used and the data and assumptions that are plugged into the model. BLM has completed two regional environmental impact statements (EISs) which summarized the science regarding climatic trends, predictive modelling study results, and sources of uncertainty in the Pacific Northwest (BLM 2010, 2015c). One summary states that the climate in Oregon in future decades is predicted to generally be warmer, but not significantly wetter (BLM 2010, page 169). The other summary states that eastern Oregon is predicted to become warmer and effectively drier over time (BLM 2015c, page 3-162). These analyses are hereby incorporated by reference in their entirety. While such modelling efforts may help predict future climatic conditions, the results are somewhat inconsistent, and the validity of the results cannot be tested in real time.

The U.S. Geological Service (USGS 2008) reviewed the applicable science on greenhouse gas emissions and concluded that it is beyond the scope of existing science to identify any specific source of greenhouse gas emissions or sequestration (storage) and designate it as the cause of specific climate impacts at any specific location. The Council on Environmental Quality (CEQ 2014) has also noted that it is difficult to attribute specific climate impacts to individual projects and recommends using greenhouse gas emissions and changes in carbon sequestration/storage as proxies for assessing potential impacts to climate.

The most common greenhouse gases include (in descending order of atmospheric composition): water vapor, carbon dioxide, methane, and nitrous oxide. Of the four, water vapor is the most abundant and important, representing over 90% of all greenhouse gases present in the atmosphere (Forster *et al.* 2007; Taylor 2009). Methane and nitrous oxide emissions represent a very small percentage of all greenhouse gases in the U.S. and have declined between 1990 and 2007 (USEPA 2009). None of the alternatives analyzed would have any measureable effect on atmospheric water vapor, nitrous oxide, or methane, and therefore, these specific gasses will not be discussed or analyzed further. For these reasons, BLM will focus its analysis on quantifying potential changes in carbon dioxide emissions and carbon sequestration processes that may result from the alternative actions (see Chapter 4).

Current Conditions

The BLM published the final Rapid Ecoregional Assessment (REA) for the Northern Great Basin (NGB) in June 2013 (Science Applications International Corporation [SAIC] 2013). REAs look across an ecoregion to more fully understand ecological conditions and trends, natural and human influences, and opportunities for resource conservation, restoration, and development. The REAs provide regional information that can inform local management efforts (BLM 2016).

Most precipitation in the NGB occurs in winter and spring with orographic enhancements in the mountains. June is a transition to generally dry summer months. In July and August, the North American monsoon can locally enhance summer precipitation, but those effects are most pronounced to the south of the NGB. Average temperatures are generally around freezing or below freezing in the winter, slightly above freezing in the valleys and slightly below freezing in the uplands in the spring, hot in the valleys and warm in the uplands in the summer, and cool in the fall (SAIC 2013).

3.3 Cultural Resources and Native American Concerns

Cornerstone began baseline studies in 2015, including cultural resource inventory and testing efforts within the Plan boundary for the proposed Poachers Ridge Quarry Expansion (Project). Enviroscientists, Inc., now EM Strategies, Inc. (EM Strategies), subcontracted ASM Affiliates, Inc. (ASM), on behalf of Cornerstone to conduct a Class III cultural resources inventory according to methods outlined in a Historic Properties Treatment Plan (HPTP) titled *Archaeological Survey, Testing, and Data Recovery Treatment Plan for the Poachers Ridge Perlite Project, Lake County, Oregon* (Iverson 2014). At the request of the BLM, ASM coordinated with the Klamath Tribes

and the Burns Paiute Tribe to enlist Native American monitors during all survey and testing phases for the Project. The results of this effort are summarized in a report titled *Archaeological Survey and Testing for the Poachers Ridge Perlite Quarry Project, Lake County Oregon* (Sprengeler et al. 2015).

The cultural Area of Potential Effect (APE) consists of approximately 340 acres and includes the proposed Poachers Ridge Quarry Expansion Area, located within the Project Area boundary. Based on the results of the cultural resources inventory conducted by ASM (Sprengeler et al. 2015), there are 16 previously recorded archaeological sites (35LK2991, 35LK3040, 35LK3041, 35LK3042, 35LK3043, 35LK3044, 35LK3045, 35LK3046, 35LK3047, 35LK3048, 35LK3052, 35LK3060, 35LK3061, 35LK3062, 35LK3063, and 35LK3064), four newly identified archaeological sites (35LK5080, 35LK5081, 35LK5082, and 35LK5083), and seven isolates located within the APE. Cultural resources within the APE include prehistoric simple flaked stone sites, stacked rock/rock placement sites, quarry sites, habitation sites, and ceremonial sites. All seven isolates are prehistoric lithic artifacts.

Of the 16 previously recorded sites, four sites (35LK2991, 35LK3042, 35LK3048, and 35LK3062) had been previously determined eligible for listing on the National Register of Historic Places (NRHP) under Criterion D. The remaining 12 previously recorded sites that had been left unevaluated were tested and evaluated during ASM's 2015 field effort. Three (35LK3040, 35LK3060, and 35LK3061) contained important scientific information and were determined to be eligible for listing on the NRHP under Criterion D. The remaining nine sites (35LK3041, 35LK3043, 35LK3044, 35LK3045, 35LK3046, 35LK3047, 35LK3052, 35LK3063, and 35LK3064) were tested and evaluated and were found not to contain important or new scientific information and, for that reason were determined not eligible for listing on the NRHP under any evaluation criteria.

Of the four newly identified sites, three sites (35LK5081, 35LK5082, and 35LK5083) were tested, evaluated, contained important or new scientific information, and were determined eligible for listing on the NRHP under Criterion D. while one site (35LK5080) did not contain important or new information and was determined not eligible for listing on the NRHP under any evaluation criteria. All seven isolates are categorically not eligible for NRHP inclusion.

Native American Concerns

With respect to traditional values and cultural/historic preservation needs, the existence of places of cultural and religious importance on Tucker Hill and the surrounding area, including Chewaucan Marsh, is of direct concern to the Burns Paiute Tribe, Fort Bidwell Indian Community, Confederated Tribes of Warm Springs, and Klamath Tribes. This concern about traditional values and cultural/historic preservation needs was thoroughly documented in the report *Tribal Ethnographic Study Compilation Report for the Poachers Ridge Quarry Expansion Project* (Bengston 2018) and through direct consultation with the four tribes.

Since the mid-1990s, previous environmental assessments for the Tucker Hill Quarry have

generated a few archaeological reports for the Tucker Hill area. These are reviewed in Sprengeler et al. (2015) and will not be discussed in this document. On March 15, 2016 and at the request of the BLM, EM Strategies mailed certified letters to the Chairs of the Klamath Tribes, Confederated Tribes of Warm Springs, Fort Bidwell Indian Community, and Burns Paiute Tribe. Because the tribes had requested to conduct their own ethnographic studies, the letter asked them for recommendations for qualified personnel to complete this study. Between August 11, 2016 and February 13, 2017, all four tribes submitted proposals to either conduct their own studies or select non-tribal ethnographers to conduct their studies on their behalf. The primary focus for the Tucker Hill Quarry Expansion Project ethnographic studies were seven archaeological sites that contained stacked rock features (35LK2991, 35LK3040, 35LK3060, 35LK3061, 35LK5081, 35LK5082, and 35LK5083) identified during ASMs Class III cultural resources inventory (Sprengeler 2015). However, additional stacked and placed rocks are present within the APE, namely at two additional sites – 35LK3042 and 35LK3062.

The Burns Paiute Tribe elected to conduct its own Poachers Ridge Project ethnographic study with the assistance of the tribe's Cultural and Heritage Department. Diane Teeman was assisted by Cerinda Survant (Burns Paiute Tribe Culture and Heritage Department Cultural Anthropologist) throughout the study. The Fort Bidwell Indian Community selected Archaeological Investigations Northwest, Inc. (AINW) to conduct the tribe's ethnographic study for the proposed Poachers Ridge Project. Dr. John Fagan (AINW senior archaeologist) and Dr. Ron L. Adams (AINW supervising archaeologist/ethnologist) conducted the study on behalf of the Fort Bidwell Indian Community. The Confederated Tribes of Warm Springs elected to have Warm Springs Geo Visions, an enterprise of the tribe, to conduct their ethnographic study. Dr. Kathleen Sloan (Warm Springs Geo Visions Manager) oversaw the work for the tribe's study. The Klamath Tribes selected Dr. Douglas Deur to conduct the tribe's ethnographic study as a private subcontractor. Dr. Deur served as Principal Investigator for the study and was assisted with scoping and planning of tasks by Perry Chocktoot (Klamath Tribes Culture and Heritage Department Director) and Orin "Buzz" Kirk (Klamath Tribes Culture and Heritage Department Tribal Liaison).

The BLM, Lakeview District Office coordinated and participated in two field tours to the Project Area for representatives from the Burns Paiute Tribe, Confederated Tribes of Warm Springs, Fort Bidwell Indian Community, and Klamath Tribes. The first field tour was on May 11, 2016; the second, May 11, 2017.

In his 1995 report, Winthrop concluded that the Tucker Hill area was culturally significant to the Klamath and Northern Paiute people. He reported that the rich resources of the Chewaucan Marsh-Lake Abert-Tucker Hill area were used jointly by Klamath and Northern Paiute groups in the past for subsistence purposes. The tribes contacted for the 1995 study (Klamath Tribes, Burns Paiute Tribe, Fort Bidwell Indian Community, and Confederated Tribes of Warm Springs) considered the Tucker Hill area to be of cultural and spiritual importance. At the end of his study, Winthrop (1995) recommended that, based on the available information, Tucker Hill did not appear to meet the criteria for nomination eligibility to the NRHP as a traditional cultural property. However, he (1995:31) noted "Given the nature of available data and the historical conditions that have deterred Indian use of the Chewaucan Marsh area, the government-to-government relationship may provide

a better avenue for assessing the cultural importance and sensitivity of Tucker Hill than the National Historic Preservation Act."

Perhaps the most important finding from the four reports generated for the current EIS involves the continuity of the cultural significance of the Chewaucan Marsh-Tucker Hill area to the members of the Burns Paiute Tribe, Fort Bidwell Indian Community, and Confederated Tribes of Warm Springs (Adams and Fagan 2017; Deur 2017; Hylton 2017; Teeman and Survant 2017). Although the tribes may have not physically visited the area for a very long time, it is still very important to them. The past environmental assessment work involving the Tucker Hill Quarry helped to reconnect the tribes with the area. Members of the Burns Paiute Tribe, Fort Bidwell Indian Community, Klamath Tribes, and Confederated Tribes of Warm Springs still consider the Chewaucan Basin-Abert Rim-Tucker Hill area to be culturally and spiritually important to them. Some of the tribes reported that the features may have been used for hunting blinds and drives (Adams and Fagan 2017; Deur 2017; Teeman and Survant 2017). Others said that, when compared to similar areas, they were likely used for spiritual or ceremonial purposes, like vision quests or power quests (Adams and Fagan 2017; Teeman and Survant 2017) or may be associated with burials or cremations (Adams and Fagan 2017). Others said the stacked rock features may have served as trail markers (Adams and Fagan 2017). Stacked rock features, such as those found on Tucker Hill, are strongly associated with oral traditions that describe rock-stacking activities by tribal deities.

The Fort Bidwell Indian Community and Confederated Tribes of Warm Springs believe that the stacked rock features are eligible for nomination to the NRHP as independent sites (Adams and Fagan 2017; Hylton 2017); however, both tribes indicated that the features were associated with the larger Chewaucan Basin-Tucker Hill landscape. On behalf of the Klamath Tribe, Deur (2017) determined that the eligibility of Tucker Hill itself for nomination to the NRHP was debatable, but the findings of the other tribes needed to be taken into consideration.

Culturally Important Plant Species

Several plant species found in the Project Area are important to Native Americans for the maintenance of their culture. Based on ethnographic documentation of the Project Area, the following species are culturally important for food and fiber and may occur within the general Project Area: Sego lily (*Calochortus macrocarpus*); gray desert parsley/biscuit root (*Lomatium macrocarpum*); desert celery (*Lomatium nevadense*); Canby's desert parsley (*Lomatium canbyi*); spiked wheat grass (*Agropyron spicatum*); Indian onion (*Allium parvum*); big sagebrush; Great Basin wildrye; juniper (*Juniperus* sp.); Indian asparagus (*Orobanche fasciculata*); squaw currant (*Ribes cereum*); white-stemmed stickleaf (*Mentzelia albicaulis*); and tumble mustard (*Sisymbrium altissimum*) (BLM 1995; page 54).

3.4 Rangeland Management

The Project Area is in the Tucker Hill Allotment (00409). This allotment is located on approximately 3,644 acres of public land administered by the BLM and 327 acres of private land.

Currently, there is no permit for livestock grazing use on the Tucker Hill Allotment, but several parties have expressed interest in obtaining a grazing permit in recent years. The allotment is listed as "ungrazed". One hundred thirty-six animal unit months (AUMs) of livestock forage are available on the allotment. Twenty wildlife AUMs are allocated within this allotment, with 15 AUMs for mule deer (*Odocoileus hemionus*)/pronghorn antelope (*Antilocapra americana*) and five for other wildlife (BLM 2003b).

3.5 Recreation/Access

Direct access to the Project Area is limited through an entry gate on private land. There is no legal public access directly to the Poacher's Ridge Quarry Area from State Highway 31. Indirect access to the Project Area can be obtained from the south via primitive dirt roads off County Road 2-10A. Recreation within the Project Area is limited based on land resources present and limited access. Activities include hunting for big game species and upland game birds. There are no developed trails or campsites in the Project Area. Some off-highway vehicle use might occur surrounding the Project Area. There is potential for dispersed non-motorized activities as well (BLM 1995).

The previously approved quarry boundary is within an area identified as GHMA where motorized vehicle use is limited to existing routes (BLM 2015a). The proposed Poachers Ridge Expansion Quarry area is entirely outside of the GHMA and open to motorized vehicle use (see Map R-7, BLM 2003b, as maintained).

Recreation occurring within both the previously approved quarry boundary and proposed Poachers Ridge Expansion Quarry falls within the "Semi-Primitive Motorized" Recreation Opportunity Spectrum class. This class is characterized by a predominantly natural or natural-appearing environment that offers a moderate probability of experiencing isolation, closeness to nature, and self-reliance in outdoor skills. There is evidence of other users and a few isolated structures, but user interaction is low (see Map R-3, BLM 2003b)

3.6 Socioeconomics

As of 2015, the population for the state of Oregon had grown to an estimated 4,028,977. Lake County's population decreased by 0.8 percent between 2010 and 2015 from a population of 7,895 to a population of 7,829 (US Census Bureau 2017). The population trend since 1980 in the County has fluctuated with a decrease between 1980 and 1990 of approximately five percent, an increase between 1990 and 2000 of approximately three percent, and another increase between 2000 and 2010 of approximately six percent (Oregon Office of Economic Analysis 2017).

Between 2011 and 2015, approximately 51.3 percent of the Lake County population 16 years and over were in the labor force compared to 62.1 percent for the state, and 63.3 percent for the country (US Census Bureau 2017). Per capita income between 2011 and 2015 for Lake County was $20,142, below the state of Oregon average of $27,684 (US Census Bureau 2017).

The median value of Lake County homes between 2011 and 2015 was $129,100 compared to $237,300 for the state of Oregon. A total of 4,396 housing units were accounted for in the 2011-2015 survey (US Census Bureau 2017).

Cornerstone is the fifth largest employer in Lake County, Oregon, and is the largest shipper on the Lake County Railroad, moving the highest volume of rail cars on the Lakeview Branch Line (greater than 60 percent) (BLM 2008b). At the present time, Cornerstone has 30 employees.

3.7 Soils

Information regarding soils in the Project Area was obtained from the US Department of Agriculture (USDA) Natural Resource Conservation Service (NRCS). The NRCS has classified soils in the Project Area as follows: Lorella gravelly sandy loam, low precipitation, two to 15 percent slopes; Redcanyon-Rock outcrop complex, 30 to 50 percent north slopes; Redcanyon-Rock outcrop complex, 30 to 50 percent south slopes; and McConnel very gravelly sandy loam, two to 15 percent slopes (Figure 3.10.1 and Table 3.10-1).

Table 3.10-1: Soil Series in Project Area

Soil Type	Erosion Hazard		Flooding Frequency	Permeability	Suitability as Roadfill	Suitability as Topsoil
	Water	Wind				
Lorella gravelly sandy loam, low precipitation, two to 15 percent slopes (145C)	Moderate	Moderate	None	Slow	Poor	Poor
Redcanyon-Rock outcrop complex, 30 to 50 percent north slopes (221F)	Severe	Severe	None	Moderate	Poor	Poor
Redcanyon-Rock outcrop complex, 30 to 50 percent south slopes (222F)	Severe	Severe	None	Moderate	Poor	Poor
McConnel very gravelly sandy loam, two to 15 percent slopes (153C)	Slight	Slight or moderate	None	Moderately rapid over very rapid	Good	Poor

Source: NRCS 1999; 2017.

Lorella gravelly sandy loam, low precipitation, two to 15 percent slopes, occurs in approximately 212 acres of the Project Area. The Lorella series consists of shallow, well-drained soils that formed in colluvium and residuum derived from tuff and basalt. Lorella soils are located on hills, mountains, and tablelands. Typically, the top eight inches are a very dark brown gravelly sandy loam (NRCS 1999).

The Redcanyon-Rock outcrop complex is comprised of 50 percent Redcanyon soils and 35 percent rock outcrop. This complex (both north and south slopes) occurs in approximately 59 acres of the Project Area. The Redcanyon series consists of moderately deep, well-drained soils that formed in colluvium derived from basalt and tuff. Redcanyon soils are located on hills and are associated with escarpments. Typically, the top eight inches are a dark brown extremely bouldery loam (NRCS 1999).

McConnel very gravelly sandy loam, two to 15 percent slopes, occurs in approximately two acres of the Project Area. The McConnel series consists of very deep, somewhat excessively drained soils that formed in gravelly alluvium derived from basalt and tuff. McConnel soils are located on lake terraces and fans. Typically, the top ten inches are a dark yellowish brown very gravelly sandy loam (NRCS 1999).

3.8 Vegetation

Baseline botanical surveys were conducted within the Project Area on May 12 and 13, 2015. Anthropogenic impacts within the Project Area were recorded to convey current site conditions, and the vegetation communities were also field-verified utilizing the Oregon GAP Analysis Program (OR-GAP) vegetation community nomenclature (Kiilsgaard 1999). Prominent topographic features (e.g., rock outcrops, drainages, open areas, and disturbed landscapes), and key soil types (e.g., sandy soils, boulder fields, talus, desert pavement, alkali flats, and lacustrine deposits), were targeted during surveys, unless safety issues prevented an area from being surveyed.

In 2002, the Tucker Fire burned the entire Project Area with the exception of a small portion along the northwest boundary (BLM 2013). Consequently, the entire Project Area is classified as a Recently Disturbed or Modified vegetation community (Kiilsgaard 1999). The Recently Disturbed or Modified vegetation community comprising the entire Project Area was primarily dominated by the following three plant species: cheatgrass (*Bromus tectorum*); tall tumblemustard (*Sisymbrium altissimum*); and rubber rabbitbrush (*Ericameria nauseosa*). Both cheatgrass and tall tumblemustard are annual, invasive, and nonnative plant species. Rubber rabbitbrush is a native shrub species that is known as an early successor within recently disturbed landscapes in the Intermountain West (McArthur and Taylor 2004). In addition to the three dominant plant species, native bunchgrasses were also prevalent throughout the Project Area and included the following species: bluebunch wheatgrass (*Pseudororegneria spicata* ssp. *spicata*); Sandberg bluegrass (*Poa secunda*); squirreltail (*Elymus elymoides*); and Thurber's needlegrass (*Achatherum thurberianum*). A variety of forb species also occurred within the Project Area. The most common native perennial forbs included basalt milkvetch (*Astragalus filipes*), cushion buckwheat (*Eriogonum ovalifolium*), foothill deathcamas (*Zigadenus paniculatus*), and twolobe larkspur (*Delphinium nuttallianum*). The most abundant nonnative and invasive annual forbs within the Project Area included jagged chickweed (*Holosteum umbellatum*) and spring draba (*Draba verna*). Both of these annual forb species were completely desiccated during the time of the botanical survey. A variety of shrub species were also documented within the Project Area; however, the cover of shrub species across the landscape was likely reduced due to the disturbance produced by the Tucker Fire in 2002. The

charred remains of mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) were observed at various locations within the Project Area. Yellow rabbitbrush (*Chrysothamnus viscidiflorus*) was the only additional shrub species that was common throughout the Project Area. A comprehensive list of plant species observed within the Project Area during the May 2015 surveys is provided in Table 3.11-1.

Table 3.11-1: Plant Species in the Project Area

Scientific Name	Common Name
Trees and Shrubs	
Amelanchier alnifolia	Saskatoon serviceberry
Artemisia tridentata ssp. *vaseyana*	Mountain big sagebrush
Atriplex canescens	Fourwing saltbush
Chrysothamnus viscidiflorus	Yellow rabbitbrush
Ericameria nauseosa	Rubber rabbitbrush
Grayia spinosa	Spiny hopsage
Gutierrezia sarothrae	Broom snakeweed
Juniperus occidentalis	Western juniper
Prunus virginiana	Chokecherry
Ribes cereum	Wax currant
Tetradymia canescens	Spineless horsebrush
Forbs	
Agoseris grandiflora	Bigflower agoseris
Antennaria dimorpha	Low pussytoes
Astragalus curvicarpus	Curvepod milkvetch
Astragalus filipes	Basalt milkvetch
Astragalus purshii var. lagopinus	Woollypod milkvetch
Bromus brizaeformis	Rattlesnake brome
Castilleja angustifolia	Northwestern Indian paintbrush
Chaenactis douglasii	Douglas' dustymaiden
Crepis acuminata	Tapertip hawksbeard
Crepis occidentalis	Western hawksbeard
Cryptantha pterocarya	Wingnut cryptantha
Delphinium nuttallianum	Twolobe larkspur
Descurainia pinnata	Western tansymustard
Erigeron bloomeri	Scabland fleabane
Erigeron linearis	Desert yellow fleabane
Eriogonum ovalifolium	Cushion buckwheat
Galium aparine	Stickywilly
Layia gladulosa	Whitedaisy tidytips
Leymus cinereus	Basin wildrye
Linanthus pungens	Granite prickly phlox
Linum lewisii	Lewis flax
Lithospermum ruderale	Western stoneseed
Lomatium macrocarpum	Bigseed biscuitroot
Lupinus brevicaulis	Shortstem lupine
Medicago sativa	Alfalfa
Mentzelia albicaulis	Whitestem blazingstar
Microseris lindleyi	Lindley's silverpuffs
Nothocalais troximoides	Sagebrush false dandelion

Scientific Name	Common Name
Packera cana	Woolly groundsel
Penstemon humilis	Low beardtongue
Phacelia hastate	Silverleaf phacelia
Phacelia linearis	Threadleaf phacelia
Phlox longifolia	Longleaf phlox
Plectritis macrocera	Longhorn plectritis
Pleiacanthus spinosus	Thorn skeletonweed
Senecio integerrimus	Lambstongue ragwort
Zigadenus paniculatus	Foothill deathcamas
Grasses	
Achnatherum hymenoides	Indian ricegrass
Achnatherum thurberianum	Thurber's needlegrass
Agropyron cristatum	Crested wheatgrass
Elymus elymoides	Squirreltail
Elymus lanceolatus ssp. *lanceolatus*	Thickspike wheatgrass
Poa secunda	Sandberg bluegrass
Pseudoroegneria spicata ssp. *spicata*	Bluebunch wheatgrass

Source: Enviroscientists 2015

3.9 Noxious Weeds, Invasive and Non-native Species

A noxious weed is defined as "a terrestrial, aquatic or marine plant designated by the State Weed Board under ORS [Oregon Revised Statutes] 569.615 as among those representing the greatest public menace and as a top priority for action by weed control programs" (Oregon Department of Agriculture [ODA] 2016). A noxious weed survey was conducted in the Project Area on May 12 and 13, 2015. One noxious weed species was observed within the south-central portion of the Project Area: Mediterranean sage (*Salvia aethiopis*) (Enviroscientists 2015). The Mediterranean sage is classified as a B-listed weed by the ODA. Limited to intensive control of B-listed weeds at the state, county or regional level vary on a site-specific, case-by-case basis, biological control is the primary control method for large uncontrollable infestations when implementation of a statewide management plan is not feasible (ODA 2016). If the infestation is not large and uncontrollable the site will be controlled through manual and herbicide methods.

Mediterranean sage was recorded as 11 polygons and four points (Figure 4). Each point denotes the occurrence of a single Mediterranean sage plant, and a polygon delineates occurrences of Mediterranean sage that contain multiple individuals within the range of two to 14 plants. A total of 60 Mediterranean sage individuals were documented within the Project Area during the botanical survey. Due to the duration of Mediterranean sage as a biennial or short-lived perennial plant, and the timing of the botanical survey, all 60 of the Mediterranean sage individuals were in a basal rosette growth stage, and many of these individuals were obscured from view by thick canopies of cheatgrass (*Bromus tectorum*) and tall tumblemustard (*Sisymbrium altissimum*). Additionally, more Mediterranean sage individuals may germinate later during the 2015 growing season. For these reasons, it is possible that more than the 60 documented Mediterranean sage individuals may be present within the Project Area (Enviroscientists 2015).

Invasive and nonnative plant species observed within the Project Area that are not classified as noxious weeds in the state of Oregon included: pale madwort (*Alyssum alyssoides*); bristly fiddleneck (*Amsinckia tessellata*); cheatgrass; curveseed butterwort (*Ceratocephala testiculata*); pitseed goosefoot (*Chenopodium berlandieri*); herb sophia (*Descurainia sophia*); spring draba (*Draba verna*); redstem stork's bill (*Erodium cicutarium*); jagged chickweed (*Holosteum umbellatum*); prickly lettuce (*Lactuca serriola*); clasping pepperweed (*Lepidium perfoliatum*); prickly Russian thistle (*Salsola tragus*); tall tumblemustard; and yellow salsify (*Tragopogon dubius*) (Enviroscientists 2015).

3.10 Visual Resources

Regional Visual Character

The Proposed Project is located adjacent to an existing and active perlite quarry on top of Tucker Hill. Current mining activities on Tucker Hill are intermittently visible while traveling south along Highway 31 – Oregon Outback Scenic Byway. Exposed light-colored soils and light-colored growth media are noticeable depending on lighting conditions and viewer position, but are not visually dominant within the landscape. The adjacent landscape character is a mix of undeveloped natural areas, irrigated crop and pasture lands and scattered residential development. Distinct natural features visible in the area include Coglan Buttes to the east and the Upper and Lower Chewaucan Marshes, which surround the base of Tucker Hill to the north and south.

Visual Resource Management (VRM) System

The BLM uses the Visual Resource Management (VRM) System to classify and manage visual resources on lands under its jurisdiction. The VRM System involves inventorying scenic values, establishing management objectives for those values through the resource management planning process, and then evaluating proposed activities to determine whether they conform to the management objectives (BLM 1986). The assignment of one of four VRM classes (Table 3.12-1) is an important component of the BLM's resource management plan (RMP) for the area.

There are approximately 235 acres of the Project Area that occur within Scenic Quality Class B as determined by the analysis conducted according to the BLM manual (1986), and VRM Class III managed lands.

National Scenic Byways

Within the analysis area there is one designated national scenic byway. Highway 31 - Oregon Outback Scenic Byway, which traverses the analysis area in a northwest-southeast direction east of Proposed Project. The Oregon Outback National Scenic Byway begins in La Pine, Oregon and follows Highway 31 for approximately 170 miles to its terminus at the Oregon/ California state line south of Lakeview, Oregon. In addition, the 2003 RMP specifies that all developments, land alterations, and vegetative manipulations within a 3-mile buffer (6-mile total corridor width) of all major travel routes and recreation use areas will be designed to minimize visual impacts (unseen areas within these zones will not be held to this standard) (BLM 2003a). State Highway 31 is one

Table 3.12-1: BLM Visual Resource Management Class Objectives

Class	Description
I	The objective of this class is to preserve the existing character of the landscape. This class provides for natural ecological changes; however, it does not preclude very limited management activity. The level of change to the characteristic landscape should be very low and must not attract attention.
II	The objective of this class is to retain the existing character of the landscape. The level of change to the characteristic landscape should be low. Management activities may be seen, but should not attract the attention of the casual observer. Any change must repeat the basic elements of form, line, color, and texture found in the predominant natural features of the landscape.
III	The objective of this class is to partially retain the existing character of the landscape. The level of change to the character should be moderate. Management activities may attract attention, but should not dominate the view of the casual observer. Changes should repeat the basic elements found in the predominant natural features of the characteristic landscape.
IV	The objective of this class is to provide for management activities which require major modification of the existing character of the landscape. The level of change to the characteristic landscape can be high. Management activities may dominate the view and be the major focus of viewer attention. However, every attempt should be made to minimize the impact of these activities through careful location, minimal disturbance, and repeating the basic elements.

Source: BLM 1986.

of these major travel corridors in which the 3-mile buffer applies. The proposed disturbance is located within the 3-mile visual impact buffer.

3.11 Water Quality

There are no perennial streams or water bodies located in the project area. During operation, the quarry would be a topographic depression and all precipitation falling onto the quarry surface area would be contained on site. Construction by this method would help control potential erosion from site runoff. No watershed exists up-gradient of the quarry, therefore, the only inflow to the quarry area is from direct precipitation. The surface collection of water would be controlled by evapotranspiration and quarry floor fracture infiltration. Only the precipitation falling directly onto the quarry area could be infiltrated. However, the site is arid, annual evaporation exceeds precipitation, and the perlite is fractured allowing infiltration of the water into underlying rock layers. These factors would lead to rapid infiltration or evaporation of precipitation. Consequently, it is highly unlikely that any water would pond in the bottom of the quarry. The proposed Poachers Ridge quarry lies within a 2.6- to 2.8-inch isopluvials of a 100-year, 24-hour precipitation event. Ponding of water under the circumstance of a 100-year event would be short-term, if at all.

The mining company would obtain water from a private ground water well at the ZX Ranch. It is estimated that the Project would require up to 18,800 gallons of water per day primarily for dust suppression activities, with one 4,700-gallon water truck making between two to four trips per day. The private ground water well has adequate capacity to deliver the amount of needed water.

3.12 Wildlife

Habitat in the Project Area has been extensively altered because of a wildland fire in 2002 and on-going mining activities. Available wildlife habitat within the Project Area is marginalized and

consists primarily of the invasive species cheatgrass and tall tumblemustard, and the native shrub species rubber rabbitbrush. These vegetation communities represent potential breeding habitat for small mammals and foraging habitat for medium-sized mammals (BLM 1995). Mammal species that may occur in the Project Area include: weasels (*Mustela* spp.), desert woodrat (*Neotoma lepida*), kangaroo rats (*Dipodomys* spp.), Great Basin pocket mouse (*Perognathus mollipilosus*), black-tailed jackrabbit (*Lepus californicus*), mountain lion (*Puma concolor*), coyote (*Canis latrans*), bobcat (*Lynx rufus*), mule deer (*Odocoileus hemionus*), and pronghorn antelope (*Antilocapra americana*) (BLM 1995). Reptile species potentially present may include: gopher snake (*Pituophis melanoleucus*), racer (*Coluber constrictor*), and horned lizards (*Phrynosoma spp.*). The Project Area does not contain any wetlands, meadows, or riparian areas, so any species dependent upon such ecosystems would not occur.

Big Game

The Project Area is within ODFW designated mule deer winter range and occupied bighorn sheep habitat. Despite the designation, the Project Area lacks large areas of preferred browse species and hiding cover for mule deer, such as bitterbrush. Bighorn sheep typically stay to the east of Hwy 31, where more rugged terrain is present. The Project Area is not within elk winter range.

Migratory Birds

Raptor species that potentially could utilize the Project Area include: burrowing owls (*Athene cunicularia*), American kestrel (*Falco sparverius*), red-tailed hawk (*Buteo jamaicensis*), prairie falcon (*Falco mexicanus*), barn owl (*Tyto alba*) and northern harrier (*Circus cyaneus*). Other birds that have the potential to occur in the Project Area include, but are not limited to: common raven (*Corvus corax*), western meadowlark (*Sturnella neglecta*), mountain bluebird (*Sialia currucoides*), house finch (*Carpodacus mexicanus*), and northern flicker (*Coaptes auratus*). Cliff faces within the Project Area can be occupied by Canada geese (*Branta canadensis*), rock pigeons (*Columba livia*) and cliff swallows (*Hirunrdo pyrrhonota*) (BLM 1995; BLM 1996b).

3.13 Special Status Wildlife Species

BLM special status species are species listed or proposed for listing under the Endangered Species Act (ESA) and species requiring special management consideration to promote their conservation and reduce the likelihood and need for future listing under the ESA, which are designated as Bureau sensitive by the State Director (Lakeview ROD/RMP; BLM 2003b). All Federal candidate species, proposed species, and delisted species in the five years following delisting are considered Bureau sensitive.

Threatened, Endangered and Candidate Species

The gray wolf (*Canis lupus*) has been documented on the Lakeview Resource Area. Although the Project Area is not in an Oregon Department of Fish and Wildlife (ODFW) designated Area of Known Wolf Activity (AKWA), dispersing individuals may travel through the vicinity of the

Project Area. No other known threatened, endangered, or candidate species occur in the Project Area or the immediate vicinity.

BLM made a determination of "No Effect" on wolves for all alternatives because the Project Area is not located within or near a current ODFW Area of Known Wolf Activity (AKWA). Individual wolves passing through or by does not meet the requirements to be designated an AKWA. It is also highly improbable that a den or rendezvous site would be established within a mile of the mining activities in the project area due to the existing, ongoing human activity. Therefore, this species will not be affected by any alternative and will not be carried further for analysis.

BLM Sensitive Species

Greater Sage-Grouse
Greater Sage-Grouse (GRSG) in this area are within the Northern Great Basin Management Zone (MZ) V (Stiver et al. 2006) and are not part of a Priority Area of Conservation (PAC). The nearest known occupied GRSG (*Centrocercus urophasianus*) lek is approximately 5.5 miles south of the Project Area. This lek is occupied and active. A pending lek (inactive or not surveyed since 1980) is located about 4 miles to the northeast of the Project Area. The southwestern portion of the Permit Area contains approximately 236 acres of GHMA (Map 1.3.1), and includes the entire Tucker Hill Quarry area. None of the currently proposed Poachers Ridge Expansion Quarry area is in GHMA. Applicable GRSG Plan Amendment MDs and RDFs are included in Appendix B of this EIS.

Golden and Bald Eagles
Golden (*Aquila chrysaetos*) and bald eagles (*Haliaeetus leucocephalus*) are protected by the Migratory Bird Treaty Act of 1918 (as amended) and the Bald and Golden Eagle Protection Act of 1940 (as amended) (USFWS 1918; USFWS 1940), both of which prohibit taking of migratory birds, their parts, nests, eggs, and nestlings without a permit.

Nesting, roosting and foraging habitat for the golden eagle is present in the Project Area. One golden eagle breeding area with six nests is located on the ridge immediately below the eastern edge of the proposed Poachers Ridge Expansion Quarry area (approximately 0.1 mile from the proposed berm). All nests are located outside of the line of sight of the Project and are alternate nests for one breeding pair. In 2013 and 2017 the pair successfully raised 1 eaglet. In 2015 and 2016, 2 adult breeding-age eagles were observed, but the outcome was unknown. In 2012 and 2014, the site was occupied with evidence of eggs, but the attempts failed. In 2011, the site was occupied with evidence of eggs and the outcome was unknown. Golden eagles are year-round residents in the general area of Tucker Hill (personal communication, Todd Forbes, BLM Assistant Field Manager, December 13, 2011).

There are no known bald eagle (*Haliaeetus leucocephalus*) breeding areas in the vicinity of the Project Area. Bald eagles are known to forage in the vicinity of the Project Area.

Peregrine Falcon

Peregrine falcons (*Falco peregrinus*) are known to nest near Tucker Hill. Peregrine falcons have been hacked (raised and released to the wild) approximately 25 miles northwest of Tucker Hill and have been known to occasionally forage over the Chewaucan Marsh (BLM 1995; page 59). Based on 22 years of operation and monitoring at the Tucker Hill Quarry area, falcons would not be impacted and therefore, do not need to be carried forward for analysis.

Pygmy Rabbits

Pygmy rabbits inhabit areas of tall dense sagebrush cover and are highly dependent on sagebrush to provide food and shelter. Ninety-nine percent of the pygmy rabbits' winter diet is sagebrush (USFWS 2015). Habitat for pygmy rabbits has been marginalized within the Project Area as a result of a 2002 wildland fire that altered the vegetative community structure, removing the sagebrush component. Since habitat is unavailable, pygmy rabbits are not expected to inhabit the Project Area and would therefore not be impacted by any of the alternatives. Therefore, this species will not be carried forward for further analysis. Alternative 1.

Bats

The pallid bat (*Antrozous pallidus*), Townsend's big-eared bat (*Corynorhinus townsendii*), fringed myotis (*Myotis thysanodes*), and spotted bat (*Euderma maculatum*) have potentially suitable roosting habitat within the Project Area.

Other Special Status Species

Other special status species that may potentially occur within the Project Area and vicinity include: western bumblebee (*Bombus occidentalis*) and kit fox (*Vulpes macrotis*).

BLM sensitive shorebird, waterfowl, and rail species that utilize the Chewaucan Marsh would not be negatively impacted by activities associated with the No Action Alternative. There is no suitable wetland habitat located within the Tucker Hill area and no impacts from the No Action Alternative would affect the larger Chewaucan drainage or habitat contained therein. Suitable potential habitat for other special status species, such as the kit fox, is limited within the Tucker Hill area and the species has not been documented in the vicinity. Therefore, kit fox will not be carried forward for further analysis. There would be no impacts to western bumblebees because this alternative would continue to operate in the same footprint. No western bumblebees have been documented in the Tucker Hill Area. Therefore, impacts to these other special status species would not occur under the No Action Alternative and are not carried further for analysis.

4 ENVIRONMENTAL CONSEQUENCES

4.1 Introduction

The direct and indirect effects of the Alternative 1 (No Action), Alternative 2 (Proposed Plan of Operations), Alternative 3 (Decreased Area with Mine Management Area) and Alternative 4 (BLM Preferred Alternative) on resources present in the area are discussed in this section. Cumulative impacts are discussed separately in Section 4.14. Direct effects are caused by the action and occur at the same time and place. Indirect effects are caused by the action and are later in time or farther removed in distance but are still reasonably foreseeable (40 CFR 1508.8).

This chapter describes the site-specific direct and indirect impacts of constructing a new expansion quarry on Poachers Ridge, as described in Alternatives 2, 3 and 4 in Chapter 2. The impacts associated with Alternative 1 (No Action) which included the development and subsequent operation of a 23-acre perlite quarry on top of Tucker Hill were previously analyzed in an EIS completed in 1996, as well as the expansion of that quarry to 70 acres in an EA completed in 2013. Although the Tucker Hill Quarry is in a different disturbance area than Poacher's Ridge Expansion Quarry, they are located within the same state permit boundary. Where appropriate, the analysis incorporates by reference the analysis of environmental consequences in Chapter 4 of the EIS for *Atlas Perlite, Inc.'s Tucker Hill Perlite Project* (BLM 1995; 1996b) or from the EA for the *Cornerstone Industrial Minerals, Inc. Tucker Hill Quarry Plan Amendment* (BLM 2013). Page numbers referring to the specific section of the EIS or EA are included in resource impact discussions, as applicable (BLM 1995; 1996b; 2013).

For purposes of this analysis, under the No Action Alternative, the Poacher's Ridge Expansion Quarry would not be developed. However, mining would continue at the existing Tucker Hill Quarry until the perlite ore is exhausted and reclamation is completed.

4.2 Air Quality/Climate Change

4.2.1 Alternative 1 (No Action)

The potential impacts to air quality as a result of the No Action Alternative would be due to existing mining activities that have direct short-term and long-term impacts to air quality in the general area of Tucker Hill for 15 years. Fugitive dust emissions would result from the quarrying process, including the use of haul roads. Water sprays would be used to reduce dust emissions on haul roads and during other surface disturbing activities. Haul trucks would contribute to fugitive dust emissions as a result of transport. However, haul trucks are to be tarped or otherwise covered during transport which therefore reduces fugitive dust emissions. Fugitive dust impacts to air quality from haul trucks are considered negligible, since they are covered during hauling. Long-term impacts would include fugitive dust emissions as a result of general surface disturbance within the Tucker Hill area that would subside as a result of successful reclamation of the quarry.

The annual estimate of carbon dioxide emission from all quarry operations including hauling and road maintenance activities is about 0.001623 million metric tons. This represents no more than 0.000091 percent of all annual U.S. transportation related emissions and no more than 0.000028 percent of all U.S. human-related emissions (Table 4.2-1) (USEPA 2016).

Table 4.2-1: Project Carbon Dioxide Emissions and the U.S.

Activities	Carbon Dioxide Emissions	Units
U.S. all human-related*	5,730.31	million metric tons
U.S. Transportation*	1,776.40	million metric tons
Project	0.001623	million metric tons
Project's contribution to the U.S. all human-related	0.000028	percent
Project's contribution to the U.S. Transportation	0.000091	percent

*Note: Information from 2010 EPA data

Haul trucks an heavy equipment would also emit small quantities of hydrocarbons, nitrous oxide, carbon monoxide, and particulate matter from diesel fuel consumption. However, these emissions would not be expected to exceed appropriate engine emission standards (USEPA 2016).

Under the No Action Alternative, there would be no Indirect Effects as fugitive dust would be contained on site.

4.2.2 Alternative 2 (Proposed Plan of Operations), Alternative 3 (Decreased Area with Mine Management Area) and Alternative 4 (BLM Preferred Alternative)

Proposed activities at the existing quarry pit are expected to have air quality impacts within the Project Area that, on an annual basis would be comparable to, but more than, the No Action Alternative. Specifically, existing levels of fugitive dust, nitrous oxide, carbon monoxide, particulate matter, and hydrocarbon emissions from trucks would continue for an additional 30 years beyond the Alternative 1 timeframe. Alternative 3 and 4 would be slightly less duration than Alternative 2, but still approaching additional 30 years beyond Alternative 1. During the Project, fugitive dust from haul roads would be minimized using APDE 1, which calls for sufficient water availability for dust abatement. Haul trucks would contribute to fugitive dust emissions as a result of transport. However, haul trucks are to be tarped or otherwise covered during transport, which therefore reduces fugitive dust emissions. Growth media stockpiles would be seeded to reduce fugitive dust. Following reclamation, all areas but the highwalls would be revegetated minimizing fugitive dust emissions. Long-term impacts, which would continue until reclamation is complete and approved, to the air quality of the quarrying site would be minimized by the reclamation of the waste rock site and haul road to eliminate the majority of fugitive dust emissions.

Greenhouse Gases

Carbon dioxide would be generated during quarry operations primarily by equipment use (generators, dozers, track drill rigs, excavators, graders, loaders, etc.) and vehicle travel (haul trucks, water trucks, etc.). Generation of carbon dioxide would also occur during blasting

operations utilizing ANFOs. This Project would have no effect on carbon storage/sequestration processes. For this reason, the remainder of this discussion focuses on estimating carbon dioxide emissions.

Based on the calculations in Table 4.2-2 and Table 4.2-3, the total carbon dioxide emissions

Table 4.2-2: Carbon Dioxide Emissions from Proposed Mining Equipment

Emission Unit	Emission Factors[1] (lbs/gal)	Fuel Consumption (gal/hr)	Operational Hours (hr/yr)	No. of Units	CO_2 Emissions (lbs/yr)	CO_2 Emissions (tons/yr)
Loader 938911 CAT	22.23	4.50	1200	1	1.20E+05	60
Loader 980H CAT	22.23	8.10	1500	1	2.70E+05	135
Dozer D9T CAT	22.23	19.50	1200	1	5.20E+05	260
Grader 12M CAT	22.23	4.50	700	1	7.00E+04	35
Excavator 320 CL CAT	22.23	3.70	700	1	5.76E+04	29
Skidsteer 226 B2 CAT	22.23	2.02	700	1	3.14E+04	16
Driller	22.23	6.00	120	1	1.60E+04	8

[1] 40 CFR 600.113-78 gives carbon content values of 2,778 grams C/gallon for diesel fuel. Heat Contents from the Annual Energy Review 2002, DOE/EIA 0384 (2002), US Department of Energy, Energy Information Administration, Washington, DC, October 2003. Unit Conversion, Emission Factors and Other Reference Data, EPA 2004.

Table 4.2-3: Carbon Dioxide Emissions from On-Site Vehicles

Emission Unit	Emission Factors[2] (lbs/gal)	Fuel Rate (miles/gal)	VMT (miles/yr)	Fuel Consumption (gal/yr)	No. of Units	CO_2 Emissions (lbs/yr)	CO_2 Emissions (tons/yr)
Haul Truck	22.23	5	115,400	23,088	4	2.05E+06	1,026
Service Truck	19.37	5.5	23,400	4,255	1	8.24E+04	41
Pickup Truck	19.37	18	18,200	1,011	1	1.96E+04	10
Water Truck	22.23	5	9,100	1,820	1	4.05E+04	20

[2] 40 CFR 600.113-78 gives carbon content values of 2,421 grams C/gallon for gasoline and 2,778 grams C/gallon for diesel fuel. Heat Contents from the Annual Energy Review 2002, DOE/EIA 0384 (2002), US Department of Energy, Energy Information Administration, Washington, DC, October 2003. Unit Conversion, Emission Factors and Other Reference Data, EPA 2004.

associated with mining equipment would be about 492.6 metric tons annually and the total carbon dioxide emissions associated with the on-site vehicles would be about 996 metric tons annually. The total diesel fuel consumption for the Detroit V12 Diesel Generator of the project is about 45 gallons per hour with 1,500 hours of annual operation. Carbon dioxide emissions from the generator would be about 78 metric tons annually. The annual ANFO used for the blasting operations for the project is 75,000 pounds per year. The explosive is estimated to release about 1.67 pounds of carbon dioxide per one pound of ANFO (Climate Mitigation Services 2007). Carbon dioxide emissions from the blasting operations would be about 57 metric tons annually.

These air quality impacts are expected to be similar across Alternatives 2, 3, and 4 because the proportion of the area mined at any one time and the intensity of the operation (number of vehicles, etc.) is expected to be similar under the 3 alternatives. However, the total carbon released over the life of the project would be highest under Alternative 2, because the mine would have the

longest operating life (45 years total) under this alternative. Slightly less total emissions would occur under Alternative 3 and 4, as compared to Alternative 2 due to a shorter duration of mine operation (44 years total).

4.3 Cultural Resources and Native American Concerns

A total of ten NRHP-eligible cultural resources are located within the APE (35LK2991, 35LK3040, 35LK3042, 35LK3048, 35LK3060, 35LK3061, 35LK3062, 35LK5081, 35LK5082, and 35LK5083) (Sprengeler et al. 2015). The eligible sites are all prehistoric in age and consist of simple flaked stone sites, stacked rock/rock placement sites, quarry sites, habitation sites, and ceremonial sites. All ten sites have been determined eligible for listing to the NRHP under Criterion D and Criterion A (36 CFR 60.4). Potential impacts to these ten sites as a result of the four alternative actions are discussed below and summarized in Table 4.4-1.

Inadvertent discoveries during mining of previously undetected cultural resources would be treated as required under 43 CFR 10.4 and 43 CFR 3908.420(8)(b). Any such discovery would be immediately reported to the authorized BLM officer. All operations in the immediate area of the discovery would be suspended, and the site would be protected until the authorized officer could develop an appropriate plan for management of the resource. Through implementation of Project Design Elements (PDEs) outlined in Appendix B, no appreciable impact to inadvertent discoveries is expected.

4.3.1 Alternative 1 (No Action)

Under the No Action Alternative, a section of the main haul road and one growth media stockpile, both authorized in 1996 as a part of the original Tucker Hill perlite project, would continue to negatively impact one NRHP-eligible site. The boundary of this site was extended to the west during ASM's (2015) field study. Given that facilities (i.e., the haul road and growth media stockpile) are currently operating within the boundaries of this site, the No Action Alternative would not result in any additional impacts to this, or other cultural resources, within the APE beyond those already addressed in previous NEPA analyses (BLM 1996, 2013). The No Action Alternative would not result in any new direct impacts to any of the nine sites containing stacked rock features.

4.3.2 Alternative 2 (Proposed Plan of Operations)

Under this Alternative, a total of ten NRHP-eligible cultural resources (35LK2991, 35LK3040, 35LK3042, 35LK3048, 35LK3060, 35LK3061, 35LK3062, 35LK5081, 35LK5082, and 35LK5083) would be adversely impacted. Seven (35LK3040, 35LK3042, 35LK3060, 35LK3061, 35LK5081, 35LK5082, and 35LK5083) would be destroyed by the proposed quarry, while only a portion of the remaining three sites (35LK2991, 35LK3048, and 35LK3062) would be destroyed. All but one site (35LK3048) have stacked or placed rock features that are considered to be culturally and spiritually significant to the Burns Paiute Tribe, Fort Bidwell Indian Community, Confederated Tribes of Warm Springs, and Klamath Tribes (Bengston 2018).

Specific mitigation measures for these nine sites are detailed in the Historic Properties Treatment Plan and Table 4.4-1. Additionally, mitigation in the form of archaeological data recovery is proposed for five sites (35LK2991, 35LK3040, 35LK3042, 35LK3048, and 35LK3062). The remaining ten sites located within the APE that would be destroyed were tested, evaluated, and the data recovered, but since the data was not scientifically important, and the sites were not eligible for listing on the NRHP[1], they do not require additional mitigation. Effects to cultural values would be mitigated to the extent feasible; however, in the views of the Native American tribes, the impacts to cultural and religious values of the area cannot be mitigated.

4.3.3 Alternative 3 (Decreased Area with Mine Management Area)

Alternative 3 is similar to Alternative 2, except the expansion area would be limited to approximately 300 acres. Under this Alternative, adverse impacts to NRHP-eligible cultural resources would be very similar to those under Alternative 2, with the exception of two sites (35LK2991 and 35LK5081). Alternative 3 would avoid site 35LK2991 entirely, while site 35LK5081 would only be partially destroyed. Under this Alternative, mitigation measures would be identical to those required under Alternative 2, except archaeological data recovery would not be required at one site (35LK2991) as the proposed quarry area and proposed berm have been reduced in size to avoid this site. While site 35LK2991 would not be directly impacted under Alternative 3, given its proximity to the proposed disturbance activities, it would be indirectly impacted, because the stacked rock features within the site are considered to be culturally and spiritually significant to the Burns Paiute Tribe, Fort Bidwell Indian Community, Confederated Tribes of Warm Springs, and Klamath Tribes (Bengston 2018).

Specific mitigation measures for these nine sites with stacked rock features within the APE are detailed in the Historic Properties Treatment Plan and Table 4.4-1. Effects to cultural values would be mitigated to the extent feasible; however, in the views of the Native American tribes, the impacts to cultural and religious values of the area cannot be mitigated.

4.3.4 Alternative 4 (BLM Preferred Alternative)

Under Alternative 4 the expansion area would be limited to approximately 262 acres, excluding areas with archaeological sites containing stacked rock features. Additionally, no mine management area would be included. Four NRHP-eligible sites containing stacked rock features within the APE (35LK3040, 35LK3060, 35LK3061 and 35LK3062) would be partially destroyed; however, the stacked rock features themselves would be avoided by employing a 150-foot buffer. The remaining five NRHP-eligible sites containing stacked rock features (35LK2991, 35LK3042, 35LK5081, 35LK5082, and 35LK5083) would be avoided. Additionally, rock stack features that

[1] Those archaeological or historic sites that were not eligible for listing on the National Register of Historic Places (NHRP) were also found to lack important public or scientific uses and, therefore failed to meet the definition of a cultural resource (see definition in H-3809-1 Surface Management Handbook, p. G-9, 2012) subject to the performance standards in 43 CFR 3809.420(b)(8).

likely represent historic mining-related features (i.e., mine claims, cairns) at two sites that are not eligible for listing on the NRHP (35LK3044 and 35LK3046) would also be avoided. All rock stacks recorded within the APE, whether prehistoric or historic in age, would be avoided by employing a 150 feet buffer. Mitigation measures under Alternative 4 would include complete avoidance of stacked rock features in nine sites (35LK2991, 35LK3040, 35LK3042, 35LK3060, 35LK3061, 35LK3062, 35LK5081, 35LK5082, and 35LK5083). Four sites with stacked rock features (35LK3040, 35LK3060, 35LK3061, and 35LK3062) would be indirectly affected because of their proximity to the proposed disturbance activities and the stacked rock features within these sites are considered to be culturally and spiritually significant to the Burns Paiute Tribe, Fort Bidwell Indian Community, Confederated Tribes of Warm Springs, and Klamath Tribes (Bengston 2018).

Specific mitigation measures for the seven sites within the APE are detailed in the Historic Properties Treatment Plan and Table 4.4-1. Effects to cultural values have been mitigated to the extent feasible; however, in the views of Native American tribes, the impacts to cultural and religious values of the area cannot be mitigated.

Table 4.4-1. Mitigation Measures for Cultural Resources within the APE

Site No. (35LK)	Rock Stacks ?	NRHP Eligibility (Criterion)	Mitigation Measures			
			Alternative 1	Alternative 2	Alternative 3	Alternative 4
2991	Y	Eligible (D)	Not Impacted	Data Recovery; TBD*	Site Avoidance; TBD*	Site Avoidance; TBD*
3040	Y	Eligible (D)	Not Impacted	Data Recovery; TBD*	Data Recovery; TBD*	Data Recovery; Avoidance of Rock Stacks; TBD*
3041	N	Not Eligible	Not Impacted	Data Recovered	Data Recovered	Data Recovered
3042	Y	Eligible (D)	Not Impacted	Data Recovery; TBD*	Data Recovery; TBD*	Site Avoidance; TBD*
3043	N	Not Eligible	Not Impacted	Data Recovered	Data Recovered	Data Recovered
3044	N	Not Eligible	Not Impacted	Data Recovered	Data Recovered	Avoidance of Rock Stacks
3045	N	Not Eligible	Not Impacted	Data Recovered	Data Recovered	Data Recovered
3046	N	Not Eligible	Not Impacted	Data Recovered	Data Recovered	Avoidance of Rock Stacks
3047	N	Not Eligible	Not Impacted	Data Recovered	Data Recovered	Data Recovered
3048	N	Eligible (D)	Not Impacted	Data Recovery	Data Recovery	Data Recovery
3052	N	Not Eligible	Not Impacted	Data Recovered	Data Recovered	Data Recovered
3060	Y	Eligible (D)	Not Impacted	TBD*	TBD*	Avoidance of Rock Stacks; TBD*
3061	Y	Eligible (D)	Not Impacted	TBD*	TBD*	Avoidance of Rock Stacks; TBD*
3062	Y	Eligible (D)	Not Impacted	Data Recovery; TBD*	Data Recovery; TBD*	Data Recovery; Avoidance of Rock Stacks; TBD*
3063	N	Not Eligible	Not Impacted	Data Recovered	Data Recovered	Data Recovered
3064	N	Not Eligible	Not Impacted	Data Recovered	Data Recovered	Data Recovered

5080	N	Not Eligible	Not Impacted	Data Recovered	Data Recovered	Data Recovered
5081	Y	Eligible (D)	Not Impacted	TBD*	TBD*	Site Avoidance; TBD*
5082	Y	Eligible (D)	Not Impacted	TBD*	TBD*	Site Avoidance; TBD*
5083	Y	Eligible (D)	Not Impacted	TBD*	TBD*	Site Avoidance; TBD*

Note: Y = Yes; N = No; TBD = To Be Determined; * = Additional Mitigation Measures to address Native American Traditional Values with respect to stacked rock features are discussed in further detail in Appendix B and will be included in the Historic Properties Treatment Plan.

4.4 Rangeland Management

4.4.1 Alternative 1 (No Action)

Currently under the No Action Alternative there would be no impacts on livestock grazing or rangeland management, as there is no existing permit authorizing grazing on the surrounding Tucker Hill Allotment. However, current mining operations have disturbed about 70.3 acres within the allotment resulting in an estimated forage loss of less than one livestock AUM. Mining activities occurring in the area would likely drive the animals to other areas within the allotment to forage. However, should livestock prove to be a hazard within the mining area, the mine operator would need to construct a temporary fence to exclude livestock from area. A temporary fence would also be needed to keep livestock out of the area during reclamation activities.

4.4.2 Alternative 2 (Proposed Plan of Operations), Alternative 3 (Decreased Area with Mine Management Area) and Alternative 4 (BLM Preferred Alternative)

The Project would disturb up to an additional 340 acres, or about 9.6 percent of the allotment. While the Tucker Hill Allotment is not currently grazed by livestock, should the BLM receive a request for grazing in the future, the permit would have to be reduced from the base allocation until reclamation activities have been completed and sustainable forage is available within the reclaimed area.

Under Alternative 2, up to a total of 12 AUMs (8.6%) of forage would be lost. Under Alternative 3, up to a total of 10 AUMs (7.6%) of forage would be lost. Under Alternative 4, up to a total of 9 AUMs (6.6%) of forage would be lost.

Should livestock prove to be a hazard within the expanded mining area, the mine operator would need to construct a temporary wildlife-friendly fence to exclude livestock from area. A temporary, fence would also be needed to keep livestock out of the area during reclamation activities.

Direct effects on range resources would be minimized during the re-seeding efforts outlined in the reclamation plan by utilizing native seed source and re-vegetating the mined areas. .

4.5 Recreation/Access

4.5.1 Alternative 1 (No Action)

This alternative would limit impacts to ongoing mining activities authorized under existing PoOs. Surface disturbance would not exceed current levels (76.3 acres) and the operator would be required to reclaim the quarry area upon conclusion of their operations. Hunting opportunities would continue to be limited by low quality habitat for big game and upland game bird species due to the 2002 wildfire that occurred within the Tucker Hill area. Overall, visitor satisfaction and existing recreational opportunities would be retained at their current levels.

As Alternative 1 allows motor vehicle use only on existing routes, it would not impact motor vehicle use for recreation because no existing routes would be closed.

4.5.2 Alternative 2 (Proposed Plan of Operations), Alternative 3 (Decreased Area with Mine Management Area) and Alternative 4 (BLM Preferred Alternative)

Alternatives 2, 3, and 4 would result in 340 acres, 300 acres, and 262 acres respectively of surface disturbance within the Project Area. Quarry expansion and haul road construction under all three alternatives would amplify visitor exposure to mining operations, which may negatively impact all forms of recreational activity known to occur within and adjacent to the mining area. Of these three alternatives, Alternative 2 would have the greatest impact due to the size of the expansion and its less intensive reclamation measures. Alternative 4 would have the least impact due to its reduced size and requirement that the quarry area be more completely backfilled and recontoured during reclamation. Impacts associated with Alternative 3 would fall between those identified for Alternatives 2 and 4.

All three alternatives would subsequently reduce potential habitat for big game and upland game bird species and hunting opportunities. However, these impacts would occur within relatively poor-quality game habitat, and would therefore would have a minor impact to existing recreational opportunities within the Project Area or on immediately adjacent BLM-administered lands.

The direct effects to recreation/access by motor vehicles would be similar for Alternatives 2, 3, and 4. As the Project Area is managed for a "semi-primitive motorized" Recreation Opportunity Spectrum class and the user interaction is low, the implementation of Alternatives 2, 3, or 4 would not decrease the user interaction or existing access routes.

4.6 Socioeconomics

4.6.1 Alternative 1 (No Action)

Under the No Action Alternative, the Poacher's Ridge Expansion Quarry would not be developed. Mining would continue in the existing Tucker Hill Quarry area until all available perlite material is depleted or is no longer economical to mine. The work force under the No Action Alternative consists of a maximum of 25 people in the quarry four or five days per week. The No Action Alternative would provide up to 15 years additional mining for perlite at the Tucker Hill Quarry. Positive economic benefits to the local economy would continue for another 15 years.

4.6.2 Alternative 2 (Proposed Plan of Operations), Alternative 3 (Decreased Area with Mine Management Area) and Alternative 4 (BLM Preferred Alternative)

Alternatives 2, 3, and 4 would result in a maximum of 340 acres of surface disturbance within the Project Area. The work force under Alternatives 2, 3, and 4 may employ one additional person at the mine site compared to the No Action Alternative. At a mining rate of approximately 340,000 tons per year, mining could last approximately 45 years, which would continue to provide economic benefits to the local economy over a longer period of time compared to Alternative 1. As many as 31 employees would continue to have jobs over this longer period of time. The rate of mining activity is expected to remain the same for Alternatives 2, 3, and 4. Therefore, Alternatives 2, 3, and 4 would have a positive impact on the socioeconomics of the area by providing employment longevity and an additional position.

4.7 Soils

4.7.1 Alternative 1 (No Action)

Mining activities would occur within about 70.3 acres of the Lorella gravelly sandy loam, low precipitation, 2 to 15 percent slopes soil association. Construction activities would likely contribute to the wind and water erosion potential of this soil (BLM 1995; page 77). Soil erosion protection measures similar to those outlined in the 1996 EIS would be implemented during Project-related activities to minimize the impact of the No Action Alternative on soils. Soil erosion control measures include seeding the existing stockpiled soils with aggressive native plant species such as squirreltail grass that would minimize erosion of growth media and potentially out-compete invasive weed infestations (BLM 1995; page 77). Wind erosion associated by fugitive dust would be controlled by water sprays, cyclones, and a baghouse (BLM 1996b; page 13). Additionally, the salvage of growth media and reclamation outside of the active quarry, which would include re-seeding, would minimize impacts to soils and reduce potential surface erosion.

4.7.2 Alternative 2 (Proposed Plan of Operations), Alternative 3 (Decreased Area with Mine Management Area) and Alternative 4 (BLM Preferred Alternative)

Alternatives 2, 3, and 4 would result in a maximum of 340 acres of surface disturbance within the Project Area. Quarry development activities would occur primarily within the Lorella gravelly sandy loam, low precipitation, two to 15 percent slopes soil association (145C) and the Red canyon-Rock outcrop complex (221F and 222F). The Lorella soil is shallow (less than 12 inches) and subject to moderate rates of erosion, and the Red canyon soil is moderately deep (less than 31 inches) and is subject to severe rates of erosion. Construction activities would likely contribute to the wind and water erosion potential of these soils.

Direct effects to soils would vary slightly across Alternatives 2, 3, and 4 with less acreage disturbed in Alternative 3 (300 acres) and Alternative 4 (262).

Soil erosion protection measures outlined in Appendix B Project Design Elements would be implemented during Project-related activities to minimize the impact of the Project action on soils. Some of these measures include applying water to reduce surface soil loss from wind erosion and construction activities, and reseeding disturbed areas with weed-free seed.

4.8 Vegetation

4.8.1 Alternative 1 (No Action)

Vegetation communities on Tucker Hill have been extensively altered and replaced with post-fire species that include cheatgrass and some native grasses. Disturbance associated with the No Action Alternative would result in the removal of existing plant species that include native and invasive species on about 70.3 acres. The majority of the disturbance would continue to occur within the

quarry and its associated waste rock site. Seeding with native species during reclamation would minimize long-term impacts to vegetation.

4.8.2 Alternative 2 (Proposed Plan of Operations), Alternative 3 (Decreased Area with Mine Management Area) and Alternative 4 (BLM Preferred Alternative)

Alternatives 2, 3, and 4 would result in additional surface disturbance of 340, 300, and 262 acres respectively within the Project Area. As a result of the 2002 wildland fire within the Project Area, sagebrush-dominated vegetation communities have been altered and replaced with post-fire species that predominantly include weeds like cheatgrass, tall tumblemustard, and the native rubber rabbitbrush. Most of the Project-related disturbance would occur within the proposed Poachers Ridge Expansion Quarry and would result in the removal of post-fire plant species that include these invasive species.

Seeding with native species during reclamation would minimize long-term impacts to vegetation, and potentially result in the establishment of vegetation communities that occurred in the Project Area prior to the 2002 fire. These reclamation activities would improve vegetation communities on approximately 70 acres of Tucker Hill Quarry area in the near future, with the remaining reclamation (266 to 340 acres) starting approximately 15 years in the future as the Poachers Ridge Expansion Quarry is mined. Reclamation would take approximately 5 years in the Tucker Hill Quarry area, and would be ongoing while the Tucker Hill Quarry mining continued at the Poachers Ridge Expansion Quarry. The reclamation reseeding would re-establish a shrub component to the reclamation area including sagebrush.

Under Alternative 4, in addition to the reseeding within the Tucker Hill Quarry Area, enhanced reclamation activities would occur including recontouring and replacement of topsoil in the mined area. The replacement of topsoil and recontouring of the surface of the formerly mined area would enhance the site potential for native vegetation. This, in turn, will provide for more successful recruitment of native seedings.

4.9 Noxious Weeds, Invasive Nonnative Species

4.9.1 Alternative 1 (No Action)

Disturbance on Tucker Hill could promote a risk of future noxious weed infestations. The potential risk for Tucker Hill has been evaluated in accordance with the BLM Handbook 9015—Integrated Weed Management and is considered low. Cornerstone would implement several protection measures to reduce the risk the spread and proliferation of noxious weeds within the Project Area. Seeding of squirreltail grass would provide temporary stability of the soil and would reduce the potential spread of noxious weeds. Reclamation would be conducted with a BLM certified weed-free mix. Cornerstone would continue to implement a noxious weed monitoring program that would include an inventory on an annual basis and for three years after the closure of the Project. Should weeds be discovered during monitoring, Cornerstone would be required to report them to the BLM and treat them in coordination with the BLM in accordance with BLM's current integrated weed treatment plans.

Under the No Action Alternative, there would be relatively low risk of noxious weed and invasive nonnative species spreading outside of the Project Area. As Cornerstone is addressing and abating noxious weed and invasive nonnative species within the Project Area, infestations are not expected to spread to areas outside, but adjacent to the Project Area.

4.9.2 Alternative 2 (Proposed Plan of Operations), Alternative 3 (Decreased Area with Mine Management Area), Alternative 4 (BLM Preferred Alternative)

Alternative 2, 3, and 4 would result in a maximum of approximately 340, 300 and 262 acres respectively of additional surface disturbance within the Project Area. This additional disturbance could promote an increased risk of future noxious weed infestations, as disturbed soil tends to allow for establishment and growth of noxious weeds and invasive plant species.

Under these alternatives, Cornerstone would implement several measures to prevent the spread and proliferation of noxious weeds and invasive plant species within the Project Area. Reclamation would be conducted with a BLM certified weed-free mix. Cornerstone would continue to implement a noxious weed monitoring program that would include an inventory on an annual basis and for three years after the closure of the Project. Should weeds be discovered during monitoring, Cornerstone would report the noxious weeds to the BLM and would in coordination with the BLM treat the infestations in accordance with BLM's current integrated weed treatment plan, (BLM 2015b, 2015d, 2016b, 2017a, 2018). Cornerstone would also implement the PDEs listed in Appendix B to help reduce the potential for and spread of noxious weed infestations.

4.10 Visual Resources Management

The methodology used to analyze the impacts to visual resources from the construction and operation of the Proposed Project followed three primary steps: 1) establishing existing visual character and inherent scenic quality and identifying locations where people commonly view the landscape; 2) assessing the change to the landscape and the effects on views from key locations; and 3) determining compliance with visual resource management objectives.

A visibility analysis was performed using ArcView Spatial Analyst to identify all areas that would have visibility of the Proposed Project within the analysis area. The ability to discern change in the landscape primarily depends on distance (BLM 1986). For this analysis, the foreground-middle ground distance zone is defined as the area up to 5 miles from the Proposed Project or stationary KOPs. Background is considered to be beyond 5 miles but still visible, generally up to 15 miles away.

For this project-level analysis, the factors evaluated include visibility conditions, angle of view (relative viewer position and view orientation), duration of view (in time or distance), and scale and spatial relationship (degree of contrast) of the Proposed Project in relation to sensitive viewing platforms (BLM 1986). An environmental factors evaluation was completed for each stationary and linear platform (Simpson 2017).

4.10.1 Alternative 1 (No Action)

Under the No Action Alternative, the Poachers Ridge Expansion Quarry would not be developed. However, mining would continue at the exiting Tucker Hill Quarry. The Tucker Hill Quarry area lies within a VRM Class III designation. Five KOPs located along Highway 31 were established to rate the degree of visual contrast with the Tucker Hill Quarry and growth media stockpile around the edge of the quarry. The quarry itself cannot be seen from any of the KOPs, but the existing stockpiled material is visible from some of the KOPs. There were no visual simulations prepared for KOP #1, and impacts to KOP #s 2 through 5 would be minimal. The recontouring of the quarry and revegetation with native seed would help minimize impacts to the form, line, texture, and color of the area, and would meet the objectives of VRM Class III.

4.10.2 Alternative 2 (Proposed Plan of Operations)

The Project Area lies within a VRM Class III designation. Eight KOPs were established for the Project to rate the degree of visual contrast that would occur under Alternative 2. The Proposed Action includes the construction of Poachers Ridge Expansion Quarry and a growth media stockpile (berm) around the edge of the quarry. The KOPs are located along Highway 31, northwest and southeast of the Project Area, and along a county road to the southwest. Visual contrast rating sheets (Form 8400-4) were prepared to describe the existing landscape and the proposed activities. Contrast ratings were then determined for the features of land/water body, vegetation, and structures. The degree of contrast was evaluated for the following elements under each feature: form, line, color, and texture.

With the implementation of Alternative 2, residual adverse impacts to visual resources would be anticipated even with the implementation of the Visual PDEs' outlined in Appendix 2. Expansion of existing mining operations would create open patches in disharmony with the natural landscape. Visitors to the area would be introduced to vertically and horizontally aligned disturbances that contrast with the original characteristics of the area. These adverse impacts could be mitigated by modification of the project and associated elements such as:

- Reduction in area where contrast in color, texture, form, and line is visually evident;
- Utilization of existing boulders and large excavation debris to mimic existing form and texture within the landscape to reduce visual contrast;
- Phased or concurrent reclamation of mined out areas as the quarry expands into undisturbed areas; and
- Recontouring the disturbed area to mimic the original topography and reduce form, line, color, and texture contrast caused by the surface disturbance.

4.10.3 Alternative 3 (Decreased Area with Mine Management Area)

The disturbed area in Alternative 3 is 40 acres less than the disturbed area in Alternative 2. The exclusion of these acres removes some, but not all, of the rock stack features and cliff faces from the Project Area. The rock stack features and cliff faces are the primary locations where contrast in color, texture and form is visually evident. By removing some of the areas, Alternative 3 has

less adverse impacts on visual resources than Alternative 2, even with the implementation of the Visual PDEs.

4.10.4 Alternative 4 (BLM Preferred Alternative)

The disturbed area in Alternative 4 is 78 acres less than the disturbed area in Alternative 2. The exclusion of these acres removes all of the rock stack features and cliff faces from the Project Area. The rock stack features and cliff faces are the primary locations where contrast in color, texture and form is visually evident. By removing the rock stack features and cliff faces from the mine area, Alternative 4 would have less adverse impacts on visual resources than Alternative 2, even with the implementation of the Visual PDEs.

Full implementation of the additional mitigation measures outlined under this alternative would integrate disturbed areas back into the natural landscape by mimicking the natural form, line, color, and texture of the landscape. Recontouring disturbed areas would restore the site's form and lines and revegetation of disturbed areas with native seed mix would reduce the size and number of open patches and restore the natural color and texture of the shrub-steppe setting over the long-term.

4.11 Water Quality

4.11.1 Alternative 1 (No Action), Alternative 2 (Proposed Plan of Operations), Alternative 3 (Decreased Area with Mine Management Area) and Alternative 4 (BLM Preferred Alternative)

During operation, the quarry would form a topographic depression and all precipitation falling onto the quarry surface area would be contained on site. Construction by this method would help control potential erosion from site runoff. The surface collection of water would be controlled by evapotranspiration and quarry floor fracture infiltration. The site is arid, annual evaporation exceeds precipitation, and the perlite is fractured allowing infiltration of the water into underlying rock layers. These factors would lead to rapid infiltration or evaporation of precipitation. Consequently, it is highly unlikely that any water would pond in the bottom of the quarry. As no water would leave either the Tucker Hill Quarry or Poachers Ridge Expansion Quarry, there would be no impacts to water quality off-site from effluent from the mining operations.

4.12 Wildlife

Mining activities occur at three levels and can be classified as follows:

- Blasting;
- Moderate activities, such as hydraulic drilling; and
- Light activities, such as crushing or haul truck driving.

Mining activities would impact wildlife species at different degrees, especially during nesting season. When these impacts vary by mining activity levels, the impact analysis was conducted separately for each mining activity level to determine the extent of the impacts.

Additionally, impacts are potentially realized from direct and indirect habitat loss within the disturbance area of the mine.

4.12.1 Alternative 1 (No Action)

Under the No Action Alternative, the Poachers Ridge Expansion Quarry would not be developed and mining would continue at the Tucker Hill Quarry. As a result of the wildland fire in 2002, habitat for sagebrush-steppe wildlife within the area has been extensively marginalized. This habitat is largely unavailable as breeding habitat for small sagebrush obligate songbirds, mammals and reptiles [e.g. sage thrasher (*Oreoscoptes montanus*), Brewer's sparrow (*Spizella breweri*), sagebrush vole (*Lemmiscus curtatus*), sagebrush lizard (*Sceloporus graciosus*)] and as foraging habitat for larger mammals. Habitat at the Tucker Hill Quarry would not naturally, recover following mining without active management, as sagebrush communities have a low regeneration rate, in excess of 20 to 30 years post-fire (Bakker et al., 2011).

Impacts to wildlife would be minimized by reclaiming disturbed areas as quickly as practicable. Reclamation would occur at the end of the Tucker Hill Quarry mining period, in approximately 15 years. Wildlife habitat in the Tucker Hill Quarry area would be improved over the long-term as a result of reseeding the reclaimed area with native species.

4.12.2 Alternative 2 (Proposed Plan of Operations)

Alternative 2 would result in an additional 340 acres of surface disturbance within the Project Area. As a result of the 2002 wildland fire within the Project Area, sagebrush-dominated vegetation communities have been altered and replaced with post-fire species that predominantly include cheatgrass, tall tumblemustard, and rubber rabbitbrush. These species do not provide breeding habitat for sagebrush obligate birds, mammals and reptiles or quality foraging habitat for larger mammals. Most of the Project-related disturbance would occur within the proposed Poachers Ridge Expansion Quarry area and would result in the removal of post-fire plant species that include these invasive species.

In addition, impacts to wildlife would include harassment or displacement due to noise from blasting, drilling, equipment, and hauling. These impacts from noise could cause stress, decreased reproductive success, potential increase in mortality due to inability to hear predators, and decreased resistance to disease due to heightened stress levels. However, these impacts would be reduced or eliminated with implementation of Project Design Elements listed in Appendix 2.

4.12.3 Alternative 3 (Decreased Area with Mine Management Area)

The effects of Alternative 3 would be similar to Alternative 2, except that it would avoid approximately 40 acres of existing escape cover for rodents and lizards. This 40 acre exclusion, which includes cliff faces, reduces the direct impact to the nesting and roosting habitat, but does not eliminate the direct impacts entirely as some of the cliff face features are still included in the Alternative 2 footprint.

In addition, impacts to wildlife would include harassment or displacement due to noise from blasting, drilling, equipment, and hauling. However, these impacts would be reduced or eliminated with implementation of Project Design Elements listed in Appendix 2.

4.12.4 Alternative 4 (BLM Preferred Alternative)

The effects of Alternative 4 would be similar to Alternative 2, except that it would avoid approximately 78 acres of cliff face habitat, which are favored by prairie falcon (*Falco mexicanus*), Canada geese (*Branta canadensis*), rock pigeons (*Columba livia*) and cliff swallows (*Hirunrdo pyrrhonota*) for nesting and roosting habitat would be avoided. This exclusion would decrease the direct impact to the nesting and roosting habitat.

Seeding with native species during reclamation would minimize long-term impacts to wildlife habitat, and potentially result in the improvement of habitat and vegetation types that occurred in the Project Area previously.

The reclamation reseeding would re-introduce a shrub component to the reclamation area including sagebrush. Once successfully re-established, sagebrush would provide thermal cover and browse for wintering mule deer. Other species potentially occuring in the Project Area [burrowing owls (*Athene cunicularia*), American kestrel (*Falco sparverius*), red-tailed hawk (*Buteo jamaicensis*), barn owl (*Tyto alba*) and northern harrier (*Circus cyaneus*), common raven (*Corvus corax*), western meadowlark (*Sturnella neglecta*), sage thrasher (*Oreoscoptes montanus*), sage sparrow (*Amphispiza belli*), Brewer's sparrow (*Spizella breweri*), mountain bluebird (*Sialia currucoides*), house finch (*Carpodacus mexicanus*), and northern flicker (*Coaptes auratus*)] could also benefit from the reclamation.

In addition, impacts to wildlife would include harassment or displacement due to noise from blasting, drilling, equipment, and hauling. However, these impacts would be reduced or eliminated with implementation of Project Design Elements listed in Appendix 2.

4.13 Special Status Wildlife Species

4.13.1 Alternative 1 (No Action)

BLM Sensitive Species

Greater Sage Grouse

In a letter dated December 19, 2011, the Oregon Department of Fish and Wildlife (ODFW) reviewed a proposed 47-acre expansion of the Tucker Hill Quarry and determined that the Tucker Hill area was in low density greater sage-grouse habitat (ODFW 2011). However, the letter also acknowledged that because of a wildland fire in 2002, greater sage-grouse habitat within the area had been extensively marginalized, and the potential occurrence of greater sage-grouse in the area was unlikely. The ODFW recommended a 1:1 mitigation ratio based on the Oregon greater sage-grouse conservation policy in place at the time. Following approval of that expansion in 2013, Cornerstone removed young, invasive juniper trees from 47 acres of sagebrush-steppe habitat

located to the southwest of the Tucker Hill Quarry area to benefit greater sage-grouse as a habitat mitigation measure.

Golden Eagles
Golden eagles may be temporarily disturbed by blasting activities under the No Action Alternative. However, these activities are unlikely to affect golden eagles as the nest sites are located out of the line of site in areas that would not be directly impacted by blasting activities such as fly-rock, pressure waves, or excessive noise. Therefore, impacts to golden eagles under the No Action Alternative are not expected to occur.

Bats
Impacts to the pallid bat, Townsend's big-eared bat, fringed myotis, and the spotted bat have potential to occur as a result of activities associated with the No Action Alternative. However, habitat for these species is extremely marginal, and no roost sites have been located within the Tucker Hill area (BLM 2011c). Furthermore, the infrequency of blasting would not impact to bat maternity colonies.

4.13.2 Alternative 2 (Proposed Plan of Operations)

BLM Sensitive Species

Greater Sage Grouse
The potential impacts to, and mitigation for sage-grouse habitat at the existing Tucker Hill Quarry would remain the same as Alternative 1. As the Poachers Ridge Expansion Quarry is outside a sage grouse management area, no additional mitigation would be needed.

Golden Eagles
Impacts to golden eagles have the potential to occur as a result of activities associated with Alternative 2, due to the proximity of nests to the Project Area.

However, due to the implementation of Wildlife PDEs in Appendix 2 (which address monitoring for nest activity, timing of Project activities, and buffer distances), golden eagles would not be adversely impacted by the activities associated with Alternative 2.

Bats
Impacts to the pallid bat, Townsend's big-eared bat, fringed myotis, and the spotted bat have potential to occur as a result of activities associated with Alternative 2. Habitat for these species is extremely marginal, but does include potential roosting sites on cliff faces which would be negatively impacted under Alternative 2. Although Alternative 2 has the potential to impact individuals through displacement, it would not impact known maternity colonies, resulting in no negative impacts to these species at the population level.

4.13.3 Alternative 3 (Decreased Area with Mine Management Area)

BLM Sensitive Species

Greater Sage Grouse
The effects of Alternative 3 would be similar to Alternative 2 in regards to sage-grouse.

Golden Eagles
Impacts to golden eagles have the potential to occur as a result of activities associated with Alternative 3 due to the proximity of nests to the Project Area. However, due to the implementation of Wildlife PDEs in Appendix 2 (which address monitoring for nest activity, timing of Project activities, and buffer distances), golden eagles would not be adversely impacted by the activities associated with Alternative 2.

Bats
Impacts to the pallid bat, Townsend's big-eared bat, fringed myotis, and the spotted bat have potential to occur as a result of activities associated with Alternative 3. Habitat for these species is extremely marginal. Some, but not all, of the potential roosting sites on the cliff faces were excluded from mining under Alternative 3. Therefore, Alternative 3 has less potential than Alternative 2 to displace individuals. This alternative would not impact known maternity colonies, resulting in no negative impacts to these species at the population level, or contributing to a need for Federal ESA listing.

Other Special Status
Alternative 3 would impact 40 fewer acres of potentially suitable forbs which could be used by western bumblebees compared to Alternative 2. However, because the species is not documented in the Project Area, Alternative 3 would not impact western bumblebees.

4.13.4 Alternative 4 (BLM Preferred Alternative)

BLM Sensitive Species

Greater Sage Grouse
The effects of Alternative 4 would be similar to Alternative 2 in regards to sage-grouse. Alternative 4 also provides positive impacts to sage grouse habitat, in that the disturbed GHMA area (approximately 70 acres) within the Tucker Hill Quarry will be reclaimed and revegetated with native shrubs and forbs conducive to suitable sage grouse habitat.

Golden Eagles
Impacts to golden eagles have the potential to occur as a result of activities associated with Alternative 4 due to the proximity of nests to the Project Area. However, with the implementation of Wildlife PDEs in Appendix 2 (which address monitoring for nest activity, timing of Project activities, and buffer distances), golden eagles would not be adversely impacted by the activities associated with Alternative 4.

Bats
Impacts to the pallid bat, Townsend's big-eared bat, fringed myotis, and the spotted bat have potential to occur as a result of activities associated with Alternative 4. Habitat for these species is extremely marginal. All of the potential roosting sites on the cliff faces were excluded from mining under Alternative 4. Therefore, Alternative 4 has even less potential than Alternative 2 and 3 to displace individuals. This alternative would not impact known maternity colonies, resulting in no negative impacts to these species at the population level, or contributing to a need for Federal ESA listing.

Other Special Status
Alternative 4 impacts 78 fewer acres than alternative 2 and 38 fewer acres than alternative 3, thus disturbing the least amount of ground with potentially suitable forbs for pollinators such as the BLM sensitive western bumblebee. This alternative would also have no impact on the species, as it is not documented on the Project Area.

4.14 Cumulative Impacts

4.14.1 Past and On-Going Actions

The current conditions on the land affected by the Proposed Action resulted from a multitude of natural and human actions that have taken place over many decades. A catalogue and analysis, comparison, or description of all individual past actions and their effects which have contributed to the current environmental conditions would be difficult to compile. Cataloguing the effects of each of these individual past actions would not provide a clearer understanding of the existing environmental conditions. It is possible to implement more accurate ways to obtain the information concerning those past actions which are necessary for an analysis of the "impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions." (See definition of "cumulative impact" in 40 CFR 1508.7).

A description of the current state of the affected environment inherently includes the effects of past actions and serves as a more accurate and useful starting point for a cumulative effects analysis, rather than attempting to establish such a starting point by "adding up" the described effects of all individual past actions. The importance of "past actions" is to set the context for understanding the incremental effects of alternative actions. This context is determined by combining the current conditions with available information on the expected effects of other present and reasonably foreseeable future actions. Here the cataloguing and analysis of the effects of other similar present and reasonably foreseeable actions is necessary and has been described below. By comparing the total effect of the no action alternative to the effects described when adding the Proposed Action or any action alternative, one can discern the incremental cumulative impact resulting from a given alternative.

Further, the information available on individual past actions is largely anecdotal and does not constitute a scientifically acceptable methodology capable of illuminating or predicting the direct or indirect effects of the Proposed Action and its alternatives. The basis for predicting the direct and indirect effects of the Proposed Action and its alternatives should be based on generally

accepted scientific methodologies such as empirical research. That said, a brief discussion of the types of past mineral exploration and development activities that have occurred in the Lakeview Resource Area is included in the *Lakeview Proposed RMP/Final EIS* (BLM 2003b), pages 2-90 to 2-95. This analysis provides a broader (resource area scale) context within which to consider the potential incremental cumulative impacts of alternatives. Mining activity occurs in three distinct categories governed by different mining laws and regulations: salable, leasable, and locatable. The proposed mining plan of operation amendment falls under the locatable mineral category. A discussion of the cumulative impacts of all three mineral activities at the resource area scale is included below.

Appendix N1 of the *Draft Lakeview RMP/EIS* (BLM 2001), pages A-292 and A-293, summarized historic mineral activity within the resource area. In 1997 and 1998, 34 historic mining districts and two isolated prospect areas were inventoried to document historic, abandoned, or unreclaimed mining sites. A total of 491 small, individual abandoned workings was found, each generally under an acre in size. Abandoned mine workings are currently being reclaimed within the Lakeview Resource Area under the abandoned mine lands program at a rate of one or two sites each year based on site priority and funding. When new mineral development occurs in one of these old, abandoned sites, they are also reclaimed when the recent mineral development is done.

A detailed discussion of historic salable mineral activity is included in Appendix N1, pages A-292 to A-297 (BLM 2001). For salable minerals, there are an estimated 50 to 100 existing sand, gravel, rock, and cinder pits scattered across the Lakeview Resource Area (Map M-3). These sites disturb an average of approximately 15 to 20 acres of land each, but may be as large as 40 acres. The *Lakeview Proposed RMP/Final EIS* (BLM 2003b) estimated and analyzed opening 15 to 30 new salable mineral sites over the life of the plan. This represents 600 to 1,200 acres of potential additional mining disturbance (based on an estimated average size of 40 acres), the impacts of which are discussed in the secondary, indirect, and cumulative impacts section on page 4-139. Since the Lakeview Proposed RMP/Final EIS was completed, six new pits have been analyzed or approved for development (Walnut Orchard, Rabbit Hills, West Gulch, Winter Rim, Miners Draw, and Pitcher Lane). These new pits represent approximately 195 additional acres of surface disturbance.

Leasable mineral activity includes all energy minerals and sodium. In 1999, there was no leasable mineral activity in the Lakeview Resource Area. The Lakeview Proposed RMP/Final EIS (BLM 2003b), pages 2-90 to 2-95, and Appendix N2, pages A-215 to A-219, estimated that two to four oil and gas leases or geophysical activities would occur per year in the resource area disturbing up to 670 acres. Up to four geothermal exploration actions per year were expected with approximately 12 acres of disturbance. Currently, four geothermal leases totaling 250 acres are active and were issued in 2007, south of Paisley, Oregon.

A discussion of locatable mineral exploration and development and historical activity is also included in the *Lakeview Proposed RMP/Final EIS* (BLM 2003b), pages 2-90 to 2-95, and in Appendix N2, pages A-209 to A-219. As of September 1999 (immediately prior to initiation of the Lakeview RMP), there were 368 active mining claims recorded in the resource area. Eighty percent of those claims were located in the Rabbit Basin sunstone area. The remaining claims were in the Tucker Hill perlite area and Christmas Valley diatomaceous earth area. In 2012, the total

number of mining claims on the Lakeview Resource Area has increased to 439. In 1999, activity on these claims included 67 mining notices and two mining plans of operations. Disturbance for mining notices averaged 2.3 acres per notice. Disturbance for mine development requiring mining plans of operation ranged from five to several hundred acres. The *Lakeview Proposed RMP/Final EIS* (BLM 2003b) estimated an average of 67 mining notices and two mining plans would be open at any point in time during the life of the plan (with a total estimated disturbance ranging from 160 to 660 acres). As of September 2016, there were about 708 active claims on the Lakeview Resource Area totaling about 4,368 acres. Currently, there are 14 open notices and 32 open mining plans of operation totaling about 220 acres of active disturbance across the resource area. Of the 32 mining plans of operations only 5 exceed 5 acres in size: Tucker Hill Perlite Mine, Oregon State Gems Mine, Sunstone Mine, Sunstones Inc. Mine, and Dust Devil Sunstone Mine. Most active locatable mining disturbances occur in the sunstone mining area. The current level of mining related disturbance on BLM-administered lands in the resource area are summarized in Table 4.16-1.

Table 4.16-1: Total Acres of Mining Related Disturbance on BLM-administered lands in the Lakeview Resource Area

	Historic (pre-RMP)	Expected after the RMP (2003)	Actual to Date (post-RMP)
Abandoned Mine Lands	**<500**	**0**	**0**
Salable	**750–2,000 acres**	**600-1,200 acres**	
			73
Walnut Orchard (2004b)			**11**
Rabbit Basin (2004c)			**5**
Winter Rim (2006b)			**1**
West Gulch (2005)			**45**
Lake County Miners Draw (2006c)			**14**
BLM Miners Draw (2010b)			**65**
Pitcher Lane (2006a)			**30**
Soda Lake (2004b, 2011a)			
Locatable			
Sunstone Expl./Dev.			
9 New PoOs (2018)	**65**[1]	**130-660 acres**	**343**[2]
Diatomaceous Earth	**210**	**0**	**24.3**[2]
Tucker Hill (1996)	**29.3**	**0**	**0**
Tucker Hill Disposal sites on BLM (2008)		**0**	**29.3**
			9.2
Tucker Hill Expansion (2013)		**0**	**47**
			18.2
Tucker Hill disposal sites (private lands)			
Leasable	**0**	**Up to 682 acres**	**0**
Total	**<2595**	**1442-2542**	**716**

[1] Represents historic or past sunstone mining activities that are in various stages of reclamation as of Dec. 2017.
[2] Estimate includes associated temporary access roads.

In addition, cumulative impacts associated with the Tucker Hill Perlite Quarry were also analyzed at the basin scale in the previous EIS (BLM 1995; 1996b). The reader should refer to this EIS for a more detailed discussion. The following section addresses the incremental or additive cumulative

impacts that have been identified in addition to the direct impacts described by specific resource sections earlier in Chapter 4.

As described in Tucker Hill Perlite Quarry EIS (BLM 1995; page 93), the landscape within the 322,000-acre Chewaucan River basin has been modified greatly. The marshes have been drained and used for agriculture along with the development of two small communities and roads. Tucker Hill has been explored for minerals since 1948 with intensive exploration beginning in 1982. The landscape on Tucker Hill has been modified as the result of road construction, drill site construction, and perlite mining. Previous exploration has been rehabilitated; however, evidence of previous and current exploration is visible. A recent reject material disposal site is located in an area of past and present gravel quarry operations managed by various state, county, and private operators. In addition, Cornerstone has utilized 2 other sites for disposal of reject material totaling less than 30 acres on private lands.

The surrounding Tucker Hill area is part of the larger Chewaucan River Basin that was historically important for Native Americans based on previous archaeological inventories in the Area and communication with tribal members. Tucker Hill was utilized in conjunction with other areas in the river basin as an important source of obsidian and was utilized for a variety of traditional activities.

Impacts to the Native American spiritual/religious values of the Tucker Hill formation have occurred in the vicinity of the Project area due to past quarry development. Continued operation of the perlite mine would continue to produce visual and auditory impacts to traditional use areas outside of the Project Area. Access to traditional use areas on Tucker Hill, which is limited due to mine operations and concerns for safety, as well as private property issues, would continue to exist. The Red Knoll ACEC located immediately to the south was established in part to provide an alternative area for Native American plant gathering, hunting, and religious practices which have been lost at Tucker Hill.

4.14.2 Cumulative Impact Analysis Boundary

The analysis area for cumulative effects is depicted in Map 4.1. The wildlife analysis area was established by a 2 mile buffer from the Project Area boundaries, with an additional 2 mile buffer on any known raptor nests within the Project buffer. The other resources were analyzed using the larger impact area, which is defined as the visual resource KOPs buffered at five miles, excluding the areas out of line of site (over the ridge crest away from the Project Area).

4.14.3 Reasonably Foreseeable Future Actions

The BLM would conduct noxious weed and invasive non-native species treatments using a variety of methods within the area as necessary to address existing or new weed infestations, both during and subsequent to mining operations. While the quantity or aerial extent of such future treatments is not possible to predict accurately, the effects of such treatments would be similar to those previously addressed in other analyses (BLM 2004, 2007, 2010, 2015b). In particular, BLM would continue to implement its recent *Integrated Invasive Plant Management for the Lakeview Resource Area Revised Environmental Assessment* (BLM 2015b) and associated Decision Record.

The impact analysis contained in this EA is herein incorporated by reference in its entirety. In summary, the impacts of these treatments would include increased soil disturbance in the short-term and reductions in noxious weeds and invasive, non-native annual grasses, improved native plant communities, and improved wildlife habitats over the long-term (BLM 2015b, pages 78-82, 89-94, 112-128, and 174-177). Continued monitoring and treatment is expected to continue in future years, but vary as funding and staffing allows. Specific acres of treatments in future years would be identified through the preparation of annual treatment plans (BLM 2015d, 2016b, 2017a, 2018).

The exact locations or durations of road maintenance activities cannot be determined at this time and would likely occur regardless of which alternative is selected. For analytical purposes, BLM assumes that an additional five to ten miles of roads/primitive roads within the analysis area could receive some spot maintenance or minimal level of re-grading over the analytical timeframe. However, these maintenance activities would generally be limited to the existing roadbed footprint and would not create new ground disturbance.

Up to 3,233 acres of juniper treatments could occur on adjacent private lands in the analysis area through Candidate Conservation Agreements with Assurances (CCAA) with Lake County Soil and Water Conservation District (SWCD). Some private land owners have completed or are currently planning future juniper removal treatments without CCAAs.

The Fremont-Winema National Forest is planning a landscape restoration within the Thomas Creek watershed. The project is a holistic approach that uses vegetation management, fuel reduction, hardwood restoration, meadow and riparian restoration, and road management to restore the landscape within the Thomas Creek watershed to a condition more in line with its historic range of variability. The project encompasses approximately 127,000 acres southwest of the Tucker Hill Quarry.

There would be an additional temporary disturbance of an estimated 8,201 acres by various sagebrush habitat restoration treatments in the Clover Flat area (BLM 2017c). The incremental impacts of these treatments on BLM-administered lands, in combination with treatments on adjacent private lands would include larger temporary displacement impacts to various wildlife species, but over the long-term these projects provide a larger area of sagebrush habitat restoration and additional connectivity between sagebrush habitat blocks. This would provide additional benefits to shrub-steppe dependent wildlife species in the region such as sage-grouse.

4.14.4 Alternative 1 (No Action)

This alternative would result in no additional or incremental acres of mining related surface disturbance within the analysis area. The total area of disturbance within the cumulative impact analysis area would not change.

4.14.5 Alternative 2 (Proposed Plan of Operations)

This alternative would result in an additional or incremental 340 acres of mining surface disturbance within the cumulative impact analysis area.

4.14.5 Alternative 3 (Decreased Area with Mine Management Area)

This alternative would result in an additional or incremental 300 acres of mining surface disturbance within the cumulative impact analysis area.

4.14.6 Alternative 4 (BLM Preferred Alternative)

This alternative would result in an additional or incremental 262 acres of mining surface disturbance within the cumulative impact analysis area.

4.15 Irreversible/Irretrievable Impacts

Irreversible/irretrievable impacts associated with the Project include Native American Traditional Uses, Archeological Resources, Visual Resources, and Mineral Resources include:

- Native American Traditional Uses – The impacts of the proposed Project would permanently impact between 0 and 340 additional acres located at Tucker Hill. The impacts to Native American religious values cannot be mitigated through PDEs.

- Archaeological Resources – Any physical removal of archeological resources would result in a permanent impact to archeological resources.

- Visual Resources – The expansion of the quarry would be consistent with the objectives prescribed for a Visual Resources Management Class III area. Irreversible impacts on visual resources, including the Oregon Outback National Scenic Byway, would be mitigated to the extent possible and cannot be completely eliminated.

- Mineral Resources – The Project would result in the permanent removal of perlite from the Project Area. These impacts would be confined to the existing quarry and proposed quarry expansion.

5 CONSULTATION AND PUBLIC INPUT

5.1 List of Preparers

This EIS was prepared under a third-party contract by Rabe Consulting with input from EM Strategies, Inc., Applied Cultural Ecology, LLC, Douglas Deur, PhD, LLC, Warm Springs Geo Visions, Archaeological Investigations Northwest, Inc, Cultural and Heritage Department of Burns Paiute Tribe and Logan Simpson.

- NEPA Project Lead/Invasive Plants, Noxious Weeds/Vegetation—Andréa Rabe, Rabe Consulting
- NEPA Editor/Writer—Ally Lutes, Rabe Consulting
- Project Principal—Richard DeLong, EM Strategies, Inc.
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- Native American Concerns—Douglas Duer, Douglas Deur, PhD, LLC
- Native American Concerns—Kathleen Sloan, Ph.D., Warm Springs Geo Visions
- Native American Concerns—John L. Fagan, Archaeological Investigations Northwest, Inc.
- Native American Concerns—Diane L. Teeman, Cultural and Heritage Department of Burns Paiute Tribe
- Cultural Resources—Emily S. Whorton, EM Strategies, Inc.

Though the EIS was prepared by a contractor, the BLM has the responsibility for assuring that the documentation meets NEPA and BLM requirements.

The following BLM resource specialists were responsible for providing guidance, resource data, and/or evaluation of the document:

- Interdisciplinary Team Leader/Mining/Soils— Phil D'Amo
- Planning and Environmental Coordinator—Paul Whitman
- Cultural Resources/Native American Concerns—Bill Cannon
- Noxious Weeds, Invasive Plants—Grace Haskins
- Vegetation—John Klock
- Rangeland Management —Lori Crumley
- Recreation/Access/Visual Resources—Chris Bishop
- Water Quality—James Leal
- Wildlife/Special Status Wildlife Species—Kate Yates

5.2 Persons, Groups and Agencies Contacted

Agencies, Tribes, and Individuals contacted included, but are not limited to:

- Klamath Tribes
- Burns Paiute Tribe
- Fort Bidwell Indian Community
- Confederated Tribes of Warm Springs Reservation
- U.S. Fish and Wildlife Service

- U.S. Environmental Protection Agency, Region 10
- Oregon Department of Geology and Mineral Industries
- Oregon Department of Environmental Quality
- Oregon Department of Fish and Wildlife
- Advisory Council on Historic Preservation
- State Historic Preservation Office
- Minerals Management Service
- Natural Resources Conservation Service
- Lake County Commissioners
- U.S. Representative Greg Walden
- U.S. Senator Jeff Merkley
- U.S. Senator Ron Wyden
- Oregon Wild
- Cornerstone Industries, LLC

A complete compendium of people, agencies, and groups contacted is available for review at the BLM Lakeview office.

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