Final Reformatted

Hard Rock Operating Permit Application

Butte Highlands Project
Silver Bow County, Montana

Prepared for:

Montana Department of Environmental Quality

Environmental Management Bureau
Hard Rock Mining Program
P.O. Box 200901
Helena, Montana 59620-0901
(406) 444-4953

Prepared by:

Butte Highlands Joint Venture

P.O. Box 4959
Butte, Montana 59702

January 2013

Page left blank intentionally.

TABLE OF CONTENTS

INTRODUCTION **1**

1.0 ENVIRONMENTAL BASELINE CHARACTERIZATION **2**

1.1 Climate and Air Quality 2
1.1.1 Introduction 2
1.1.2 Climate and Meteorology 2
1.1.3 Air Quality 3
1.2 Water Resources 8
1.2.1 Introduction and Study Area 8
1.2.2 Water Monitoring Program 10
1.2.3 Surface Water Resources 10
1.2.4 Ground Water Resources 16
1.2.5 Water Balance 27
1.2.6 Groundwater Modeling 28
1.3 Wetlands 30
1.3.1 Introduction and Study Area 30
1.3.2 Methods 30
1.3.3 Results 31
1.3.4 Potential Impacts to Wetlands 31
1.4 Wildlife 34
1.4.1 Introduction and Study Area 34
1.4.2 Methods 34
1.4.3 Results 35
1.4.4 Discussion 37
1.5 Aquatic Habitat and Biology 37
1.5.1 Introduction and Study Area 37
1.5.2 Methods 38
1.5.3 Results 38
1.5.4 Discussion 42
1.6 Vegetation 42
1.6.1 Introduction and Study Area 42
1.6.2 Methods 42
1.6.3 Results 43
1.6.4 Discussion 46
1.7 Soils 47
1.7.1 Introduction and Study Area 47
1.7.2 Methods 47
1.7.3 Results 48
1.7.4 Discussion 49
1.8 Land Use 49
1.8.1 Introduction and Study Area 49
1.8.2 Methods 49

1.8.3 Results 50
1.8.4 Discussion 52
1.9 Visual Resources 52
1.9.1 Visual Absorption Capability 52
1.9.2 Scenic Attractiveness and Integrity Objectives 53
1.10 Socioeconomics 53
1.10.1 Existing Socioeconomic Setting 53
1.11 Cultural Resources 56
1.11.1 Introduction and Study Area 56
1.11.2 Methods 56
1.11.3 Results 57
1.11.4 Discussion 58
1.12 Additional Studies 60
2.0 PROJECT DESCRIPTION AND OPERATING PLAN 61
2.1 General Description of Project 61
2.1.1 Introduction 61
2.1.2 Existing Approvals 62
2.1.3 General Project Description 62
2.1.4 Permit and Proposed Disturbance Area Boundaries 63
2.1.5 Surface and Mineral Ownership 64
2.2 Mining Plan 70
2.2.1 General 70
2.2.2 Geology and Mineral Deposit 70
2.2.3 Preproduction and Operational Development 73
2.2.4 Mine Plan 74
2.2.5 Surface Disturbance 75
2.2.6 Waste Rock Management/Disposal 77
2.2.7 Backfilling 83
2.2.8 Equipment 84
2.2.9 Drilling and Blasting 84
2.2.10 Ventilation 85
2.2.11 Subsidence 85
2.2.12 Ore Handling 86
2.2.13 Shotcrete Plant 86
2.2.14 Exploration/Delineation Drilling 86
2.3 Ore Processing 87
2.3.1 Off-Site Processing 87
2.3.2 Ore Transportation 87
2.4 Support Facilities 88
2.4.1 Existing Facilities 88
2.4.2 Laydown Areas 90
2.4.3 Fresh Water Distribution and Supply 90
2.4.4 Sewage Treatment and Solid Waste Disposal 90

2.4.5 Assay Laboratory 90
2.5 Personnel 90
2.5.1 Pre-Production Phase 91
2.5.2 Production Phase 91
2.5.3 Reclamation Phase 91
2.6 Soil Management 91
2.6.1 Soil Salvage and Replacement 91
2.6.2 Topsoil Stockpiles 92
2.6.3 Soil Protection Measures 92
2.7 Water Management 92
2.7.1 Water Balance/Mine Dewatering Rate 94
2.7.2 Water Disposal/Use 94
2.7.3 Current Mine Dewatering Facilities 94
2.7.4 Treatment System 96
2.7.5 Grouting 98
2.8 Transportation 98
2.8.1 Access Routes 98
2.8.2 Vehicle Use 99
2.8.3 Road Maintenance 99
2.9 Power 100
2.9.1 Existing Power 100
2.9.2 Additional Power 100
2.10 Fire Protection 100
2.11 Public Nuisance 101
2.12 Noise 102
2.12.1 Noise Impacts 102
2.13 Protection of Archaeological Values 103
2.14 Prevention of Wind Erosion 103
2.15 Protection of Flora and Fauna 103
2.16 Activities in Non-Disturbed Areas 104
2.17 Monitoring Program 104
2.17.1 Groundwater Monitoring 105
2.17.2 Surface Water Monitoring 105
2.17.3 Waste Rock Monitoring 108
2.17.4 Data Handling and Quality Assurance 112
2.17.5 Aquatic Monitoring 112
2.17.6 Aquatic Baseline Information Summary 112
3.0 RECLAMATION PLAN 115
3.1 Existing Reclamation Plan 115
3.1.1 Initiation of Reclamation 121
3.1.2 Post-Mining Land Use 121
3.1.3 Site Facility Removal 121
3.1.4 Surface Facility Reclamation 123
3.1.5 Underground Mine Closure and Water Management Plan 124

3.1.6 Land Application Disposal Areas and MPDES Discharge Pipes 129
3.1.7 Ventilation Raise 130
3.1.8 Hydrology Holes 130
3.1.9 Revegetation Efforts 130
3.1.10 Bond Release 131
3.2 Proposed Reclamation Plan 131
3.2.1 Initiation of Reclamation 131
3.2.2 Post-Mining Land Use 131
3.2.3 Site Facility Removal 131
3.2.4 Surface Facility Reclamation 132
3.2.5 Portal Plugging 132
3.2.6 Land Application Disposal Areas 132
3.2.7 Ventilation Raise 132
3.2.8 Hydrology Drill Holes 132
3.2.9 Revegetation Efforts 132
3.2.10 Bond Release 132
3.2.11 Reclamation Monitoring 133

LIST OF TABLES

Table 1.1.1. Monthly Climate Summary, Butte FAA Airport Station 241318, Western Regional Climate Center. Period of Record 10/22/1880 to 8/31/2009 3
Table 1.1.2. Butte Highlands Exploration Program Permitting Point Sources and BACT Measures 5
Table 1.1.3. Butte Highlands Exploration Program Fugitive Sources and BACT Measures 7
Table 1.1.4. Butte Highlands Emissions Under Permit #4449-03 8
Table 1.2.1. Surface Water Monitoring Sites 10
Table 1.2.2. Water Quality Parameters 11
Table 1.2.3. Baseline Surface Water Flow Data 13
Table 1.2.4. Summary of Test Holes at Butte Highlands Project Site 18
Table 1.2.5. Exploration Drillhole and Monitoring Well Static Water Level Measurements (in feet) 20
Table 1.3.1. Measured Size of Wetlands Within the Butte Highlands Project Claim Boundaries 31
Table 1.4.1. Potential Special Status Wildlife Species of the Butte Highlands Project Area ... 36
Table 1.6.1. Vegetation Species of Concern for Silver Bow County Located in the Highland Mountains (Lesica, 1993) 44
Table 1.6.2. Noxious Weeds of Silver Bow County 46
Table 1.10.1. Major Categories of Industry Employment in Silver Bow County 53
Table 1.10.2. Largest Employers for Silver Bow County 54
Table 1.10.3. Payroll Costs for Employers 54
Table 1.10.4. Schools in the Silver Bow County 55
Table 1.11.1. Previously Recorded Cultural Sites in the Literature Area of the Butte Highlands Project 59
Table 1.12.1. List of Additional Baseline Studies in Progress for Butte Highlands Mine 60
Table 2.1.1. Surface and Mineral Ownership within Permit Boundary and Within ½ Mile Radius of Permit Boundary 65

Table 2.2.1. Summary of Existing or Approved Disturbance 76
Table 2.2.2. Proposed New Disturbance and Total Disturbance 76
Table 2.2.3. Meagher Humidity Cell Data Summary 78
Table 2.2.4. Wolsey Humidity Cell Data Summary....79
Table 2.2.5. Comparison of Kinetic Test Results to Montana Circular 7 Water Quality Standards 80
Table 2.2.6. Acid/Base Characterization of Meagher/Wolsey Material 81
Table 2.2.7. Waste Rock Generation/Backfill Requirement Comparison....83
Table 2.17.1. Water Quality Parameters....106
Table 2.17.2. Parameter List for Water Mobility and Leach Testing 111
Table 3.1.1. Summary of Reclamation Plans for Individual Facilities and Equipment at Butte Highlands Mine 116
Table 3.1.2. Disturbance Footprint and Reclaimed Acres at Butte Highlands Mine....120
Table 3.1.3. Seed Mix for Butte Highlands Joint Venture Reclamation 130

LIST OF FIGURES

Figure 1. General Location Map
Figure 2. Proposed Permit Boundaries
Figure 3. Project Area
Figure 4. Water Monitoring Sites
Figure 5. Habitat Types
Figure 6. Perennial and Intermittent Stream Reaches
Figure 7. Land Use Investigation Study Area
Figure 8. Visual Screen
Figure 9. Cultural Resources Literature Review Area
Figure 10. Approved Activities
Figure 11. Proposed and Existing Disturbance
Figure 12. Surface and Mineral Ownership
Figure 13. Ore Zones
Figure 14. Underground Working Plan View
Figure 15. Cross-Section Looking Northwest
Figure 16. Long-Section Looking Northeast
Figure 17. Existing Portal Site Facilities
Figure 18. Existing LAD Sites
Figure 19. Proposed Portal Site Facilities
Figure 20. Access Route Alternatives
Figure 21. Haulage Road Location/Ownership
Figure 22. Typical Road Cross Sections
Figure 23. Reclaimed Site
Figure 24. Portal Plug
Figure 25. Noise Levels at Permit Boundary
Figure 26. Dewatering Cone of Depression, Wetlands, and MPDES Outfalls
Figure 27. Piezometers and Dewatering Well
Figure 28. Ore Transfer Facility Schematic
Figure 29. Conceptual Map of Post-Closure Drainage Pipeline to LAD System

LIST OF APPENDICES

A. Carter Lake Consulting, LLC. Timberline Resources Corporation Butte Highlands Project, Application for Montana Air Quality Permit. July 2009.

B. Montana Department of Environmental Quality, Permitting and Compliance Division. Montana Air Quality Permit #4449-00. October 6, 2009.

C. AMEC Geomatrix Inc. Hydrogeologic Characterization Report, Butte Highlands Mine Project, Montana. January 2009.

D. Savor Environmental Services, LLC and Klepfer Mining Services, LLC. Water Quality Data and Summary Report for the Butte Highlands Project. March 2010.

E. AMEC Geomatrix Inc. Technical Memo - Groundwater Study Update – Butte Highlands Mine Project, Montana. August 31, 2009.

F. AMEC Geomatrix Inc. Updated Hydrogeologic Characterization Report, Butte Highlands Mine Project, Montana. April 2009.

G. AMEC Earth and Environmental, Inc. December 2010. Wetland Delineation Report for the Butte Highlands Project.

H. Kline Environmental Research, LLC and Klepfer Mining Services, LLC. Review of Existing Wildlife Data and July 2009 Wildlife and Habitat Observations for the Butte Highlands Project. January 14, 2010.

I. Kline Environmental Research, LLC and Klepfer Mining Services, LLC. July 2009 Stream Habitat Survey for the Butte Highlands Project. January 15, 2010.

J. Kline Environmental Research, LLC and Klepfer Mining Services, LLC. Review of Existing Vegetation Data and July 2009 Field Observations for the Butte Highlands Project. January 13, 2010.

K. AMEC Geomatrix Inc. Baseline Report For Soil Resources, Butte Highlands Project, Silver Bow County, Montana. December 2009.

L. Kline Environmental Research, LLC and Klepfer Mining Services, LLC. Land Use Investigation for the Butte Highlands Project. March 31, 2010.

M. Western Cultural Resource Management. A File and Literature Search of the Proposed Butte Highland Exploration Project in Silver Bow County, Montana. February 24, 2010.

N. Klepfer Mining Services. Timberline Resources Corporation, Butte Highlands Project Amended Underground Exploration Plan, Decision Plan. August 2009. and MDEQ Approval Letter for Exploration License 00680. August 2009. and MDEQ Letter for Approval of Modified LAD 2. November 2009.

O. Timberline Resources Corporation. Geologic and Sulfide Characteristics of the Butte Highlands Project Lithologies

P. Klepfer Mining Services, LLC. Waste Characterization Test Report. December 2009.

Q. Kline Environmental Research, LLC and Klepfer Mining Services, LLC. Stream Monitoring Plan for the Butte Highlands Project. March 16, 2010.

R. Memorandum of Understanding Between Butte Highlands Joint Venture and Golden Sunlight Mine. January 5, 2010.

S. Water Quality Data for Surface and Underground Monitoring Sites.

T. Tetra Tech, Inc. Technical Memo - Butte Highlands Mine 2010 Geochemical / PAR Monitoring. October 4, 2010.

U. AMEC Earth and Environmental, Inc. Butte Highlands JV, Butte Highlands Project Waste Dump Extension, Phase 1 Design Report. October 28, 2010.

V. Water & Environmental Technologies. Technical Memo - Butte Silver Bow County Septic Permit for Butte Highlands Project. September 9, 2009. and Permit to Install an Individual Sewer System #1027. September 15, 2009.

W. Philip Joggerst, MPH. Butte Highlands - Noise Study. January 2012.

X. Tetra Tech, Inc. Technical Memo - Butte Highlands Mine 2010 Geochemical / PAR Monitoring. March 1, 2011.

Y. AMEC. Soil Sampling in LAD Areas, Butte Highlands Mine Project, Montana. August 23, 2011.

Z. ITASCA Denver, Inc. Hydrogeologic Characterization and Numerical Groundwater Modeling for the Butte Highlands Underground Mine. Revised January 2012.

AA. AMEC Earth and Environmental, Inc. Butte Highland Project Non-Title V Permit Modification, Permit Number: 4449-03, SO2 Emissions Estimate Update. April 9, 2011. AMEC Earth and Environmental, Inc. Butte Highlands Joint Venture, Butte Highlands Project, Application for Montana Air Quality Permit for Stationary Sources. December 2010.

AB. Montana Department of Environmental Quality, Permitting and Compliance Division. Montana Air Quality Permit #4449-03. October 29, 2011.

AC. AMEC Geomatrix Inc. Technical Memo - LAD System Operation and Monitoring, Butte Highlands Mine Project, Montana. March 29, 2011.

AD. AMEC Earth and Environmental, Inc. Fish & Aquatics Report, Fall 2011, Butte Highlands Mine, Silver Bow County, Montana. February 2012.

AE. Tetra Tech, Inc. Technical Memo - Butte Highlands Mine Response to Deficiency Review Comments Regarding Ore Stockpile (First Deficiency Review Comment # 49, Second and Third Deficiency Review Comment #24). May 4, 2011.

AF. Tetra Tech, Inc. Bench Scale Feasibility Analysis Report, Butte Highlands Mine Water Treatment March 19, 2012.

AG. Arcadis U.S., Inc. Initial Site-Wide Water Balance, Butte Highlands Joint Venture Gold project. September 2012.

AH. AMEC Environmental and Infrastructure, Inc. Western Toad Survey Report, Butte Highlands Mine Project, Silver Bow County, Montana. September 2012.

AI. Tetra Tech, Inc. Technical Memorandum. Notification of Potential Wetland Dewatering Activity. October 23, 2012.

AJ. Tetra Tech, Inc. Technical Memorandum. Geomorphological Investigation of Various Channels Near Butte Highland Mine. October 23, 2012.

AK. Butte Highlands JV, LLC. Storm Water Pollution Prevention Plan. Butte Highlands Project. Silver Bow County, Montana. January 4, 2012.

INTRODUCTION

This Hard Rock Operating Permit Application is being submitted for the Butte Highlands Project (Project) near Butte, Montana (Figures 1, 2, and 3). The Project is currently authorized to complete underground exploration activities and the Butte Highlands Joint Venture (BHJV) is interested in converting this into an operating gold project. There is little surface disturbance which will have to occur in order for the Project to convert from exploration to mining.

The following information describes the proposed action required. The document is divided into three main sections: the first section provides an environmental baseline characterization of several key components of the environment around the immediate Project area; the second section provides specific details of the Project and its operating plan; and the third and final section provides information on the reclamation of the Project when activities are complete.

1.0 ENVIRONMENTAL BASELINE CHARACTERIZATION

1.1 Climate and Air Quality

1.1.1 Introduction

In accordance with MDEQ Air Resources Management Bureau regulations (ARMB), an Air Quality Permit was required to be obtained by Timberline Resources in order to pursue their exploration program. This permit was prepared and submitted by Carter Lake Consulting LLC in July of 2009 (Appendix A). Following ARMB review and approval, Montana Air Quality Permit #4449-00 was issued in October 2009 (Appendix B). Following the approval of this Hard Rock Application, The BHJV will have to obtain an additional air quality permit to cover any emission sources not covered by Permit #4449-00. This section will briefly describe the air quality and climate around the proposed project area, as well as provide a brief synopsis of the content of Permit #4449-00.

1.1.2 Climate and Meteorology

The following overview of the climate near the proposed Project area was developed in part from information provided by the Western Regional Climate Center (WRCC). The proposed Project area lies in Silver Bow County, Montana within an area of the Continental Divide, which dissects the Project in an almost horizontal fashion. The northern half of the Project lies on the western side of the Divide, while Project areas to the southwest and southeast lie on the eastern half of the Divide. The Continental Divide can exert dramatic influence on the surrounding climate of adjacent areas; however given the small size of this Project area, the climate is uniform throughout, and typical of coniferous mountains of western Montana. Generally, in the western area of the state winters tend to be a bit milder, summers a bit cooler, winds are lighter, and precipitation is more common throughout the year than the eastern side of the state. The western side also offers a bit more cloudiness, humidity and a shorter growing season than the east.

In the winter months, cold snaps can occur and last for short periods, but the most severe weather typically occurs in the plains of eastern Montana, where temperatures can fall to -50º F or lower. Periods of warm and windy weather occur in the winter months typically along the eastern slopes of the Divide. These wind events, known as “Chinook” winds, frequently reach speeds between 25 and 50 mph and can last several days. The “Chinook” belt area extends from the north in the Browning area to the southeast toward the Yellowstone Valley above Billings. In the summer months, hot weather occurs regularly, with temperatures over 100º F sometimes occurring near the Divide. Because of the nighttime cooling that takes place, summer heat waves rarely become oppressive with average nighttime summer lows averaging around 60º F.

Precipitation can vary throughout much of the state largely due to topographic influences. Mountain ranges are usually the wettest, with the western side of the Divide being the wettest in the state. Most of the rainfall occurs from May through July. A SNOTEL station located in the upper Basin Creek watershed at an elevation of 7,180 feet shows a 30yr annual average precipitation of 24.5 inches with about 10 inches occurring as snow-water equivalent (NRCS 2008). Average snowfall can vary throughout the state as well, with some western mountainous regions receiving over 300 inches annually, to some eastern areas receiving only around 20. Most snowfall occurs from November to March, with some occurring as early as mid-September

or as late as early May in higher areas. Heavy spring rains that occur over a melting winter snowpack contribute to the largest volume of flow in Montana's streams and rivers.

Table 1.1.1 displays data from the Western WRCC's Butte FAA Airport weather station, a station just outside of Butte Montana to the north of the Project area. The table displays averages for climate conditions such as temperature, snowfall, and precipitation taken from 1880 to 2009.

Table 1.1.1. Monthly Climate Summary, Butte FAA Airport Station 241318, Western Regional Climate Center. Period of Record 10/22/1880 to 8/31/2009

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average Max. Temperature (F)	30	34	41	51	61	69	80	78	67	55	41	32	53.3
Average Min. Temperature (F)	7.3	11	18	27	35	42	47	45	37	29	18	9.8	27.1
Average Total Precipitation (in.)	0.6	0.5	0.8	1.1	1.9	2.3	1.3	1.2	1.1	0.8	0.6	0.6	12.74
Average Total Snow Fall (in.)	8.5	7.3	10	6.9	3.7	0.5	0	0.1	1.1	3.7	6.5	8.4	56.8
Average Snow Depth (in.)	4	4	2	0	0	0	0	0	0	0	1	3	1

Percent of possible observations for period of record. Max. Temp.: 86.9% Min. Temp.: 86.7% Precipitation: 87.1% Snowfall: 87.1% Snow Depth: 54.6%. Source: http://www.wrcc.dri.edu/cgi-bin/cliMAIN.pl?mt1318

1.1.3 Air Quality

In accordance with MDEQ regulations for preparing the Exploration Plan, Timberline Resources submitted an Air Quality Permit Application to MDEQ's Air Resources Management Bureau. This permit application provided an inventory of the emissions that will occur as a result of activities and equipment operation for the exploration Project. The Exploration Project is anticipated to last approximately two years. The Permit application was prepared by Carter Lake Consulting in July 2009 (Appendix A), followed by the issuance of MDEQ-ARMB Permit #4449-00 in October 2009 (Appendix B).

Butte Highlands JV applied for and received approval for three modifications to the Air Quality Permit. The modifications included changes to the generators and compressor and the addition of a crushing and screening plant. The most recent Air Quality Permit modification application was prepared by AMEC Earth & Environmental, Inc. in April 2011 (Appendix AA), followed by the issuance of MDEQ ARMB Permit #4449-03 in October 2011 (Appendix AB).

The proposed Project area lies to the south of the Butte PM_{10} non-attainment area. The majority of emissions anticipated as a result of this Project will be fugitive in nature. Fugitive emissions tend to have only localized impacts, and diminish quickly with distance. PM_{10} concentrations from the Butte Highlands Project are expected to have negligible impacts to the non-attainment area. The Project will maintain compliance with applicable air quality standards.

The Project area also lies within unit boundaries for the Montana-Idaho Airshed Group, which is an organization made up of federal, state, tribal and private land managers who utilize

prescribed fire in Idaho and Montana, as well as the public health and regulatory agencies. This group works cooperatively to prevent smoke impacts to air quality while using prescribed fire to accomplish land management objectives. The Butte Highlands Project area lies within Smoke Management Units (SMU) 5 and 7. SMU 5 contains the northern portion of Silver Bow County above the Continental Divide, and SMU 7 contains the half south of the Divide. The goal of a SMU is to forecast smoke dispersal conditions and coordinate smoke emissions by other members. The SMU has an Airshed Coordinator, whose responsibility is to monitor air quality data and post daily recommendations for burning during the prescribed burning season. Membership in the Airshed Group is limited to landowners or agencies charged with maintaining public lands or air pollution control efforts, and in Montana, landowners must manage over 5,000 acres and use fire as a management tool. As this Project lies on a small area where prescribed fire use is not planned, membership in the Montana-Idaho Airshed Group is not applicable.

Allowable emission rates, which are discussed in the following sections, are below the modeling thresholds given in the State of Montana's Guidelines for Air Quality Permit Applications (Nov. 2007 draft). Dispersion modeling was performed for the MDEQ ARMB Permit #4449-03 application.

Several actions for the Project were identified in the air quality permit application which identified emission sources. Emission generating activities include wet drilling and blasting, transport of ore and development rock, loading and unloading of materials at the surface, wind erosion from stockpiles at the surface, crushing and screening, operation of the cement rock fill and shotcrete plants, diesel engine use, and road use.

A crushing and screening plant, a cement rock fill plant, and a shotcrete plant will operate at the surface to support underground operations. These plants will require development rock, aggregate, cement slurry, and water which will be loaded into hoppers using a front end loader or will be pumped into the hoppers. End products will be transported underground via truck. Underground actions will include drilling and blasting, and their end products will be transported to the surface and stockpiled. Development rock will be unloaded to a permanent stockpile, and ore will be temporarily stockpiled and then transported offsite.

Emission calculations for all sources were calculated for values such as particulate matter, nitrogen oxides, sulfur dioxide, volatile organic compounds, carbon monoxide and lead content. The details of these values and calculations, as well as manufacturer's emission rates and specifications are shown in the air quality permit applications in Appendix A and Appendix AA. The results of two ore analyses which were used to derive an average lead content are included in the same appendix.

The following sections will provide additional detail on the permitted point sources and fugitive sources that are covered under Permit #4449-03.

1.1.3.1 Permitting Point Sources

This section will briefly describe the point sources that are permitted under the current Air Quality Permit #4449-03 guidelines. As mentioned previously, Timberline Resources received the air quality permit for the exploration program in October 2009, and Butte Highlands received the most current modification in October 2011. The permit applications discussed the individual point sources of the exploration program and also described Best Available Control Technology Measures (BACT) that will be used for each of those sources. Table 1.1.2 shows the individual point sources and BACT measures for each. More information on these sources is available in

the Air Quality Permit Application and the Air Quality Permit included as Appendix A and Appendix AA.

Table 1.1.2. Butte Highlands Exploration Program Permitting Point Sources and BACT Measures

Description	Emitting Unit	BACT Control Measure
Cement Silo Unloading	11	Baghouse
Shotcrete Plant Cement Feed Auger to Mix Tank	13	Water Spray
CRF Plant Cement Feed Auger to Mixing Hopper	15	Process Water Added
Caterpillar Diesel Generator - 924 hp	18	EPA Tier 2 Certified. Good Operating Practices
Emergency Backup Diesel Generator - 475 hp	19	EPA Tier 2 Certified. Good Operating Practices
Diesel Air Compressor - 275 hp	20	EPA Tier 1 Certified. Good Operating Practices
Diesel Welder – 26hp	21	EPA Tier 2 Certified. Good Operating Practices

Cement Plant Silo – Emitting Unit 11
The silo at the cement plant will be equipped with a baghouse designed by the manufacturer to carry a grain loading of 0.01 grain/scf, which would provide a 99.99% particulate control efficiency.

Shotcrete Plant Feed Auger – Emitting Unit 13
The entrance of the auger outlet to the mixing tank is equipped with a water spray. This will provide 99% particulate control efficiency for the shotcrete plant.

Cement Plant Feed Auger – Emitting Unit 15
The point where cement is moved into the mixing tank at the cement plant is considered an uncontrolled source. To control this emission, process water will be added at the entrance point of material from the auger to the mixing hopper which will control particulate emissions.

365kW Diesel Generator – Emitting Unit 18
This generator is currently being used for power generation during the Exploration Project. The diesel internal combustion engine is EPA Tier 2 certified, which is the BACT control measure. Best management practices will also be used.

350kW Diesel Generator – Emitting Unit 19
This generator is currently being used for power generation during the Exploration Project. The diesel internal combustion engine is EPA Tier 2 certified, which is the BACT control measure. Best management practices will also be used.

540hp Diesel Air Compressor – Emitting Unit 20
This compressor will be installed in lieu of the existing compressor, equipped with an EPA Tier 2 certified engine that is currently being used under the Exploration Permit. The 540hp diesel internal combustion engine is EPA Tier 3 certified, which is the BACT control measure. Best management practices will also be used.

Diesel Welder – Emitting Unit 21
The welder is permitted for use under the Exploration Permit. The welder engine is Tier 2, which meets the BACT for this source.

Extec Crusher - CAT9 350hp – Emitting Unit 25
The Extec crushing plant will be used to crush mine waste rock for backfill aggregate. Water sprays will be directed into the crusher feed to control dust emissions. The Extec crusher engine is Tier 3, which meets the BACT for this source.

Sandvik Screener - 100.4hp – Emitting Unit 21
The Sandvik Screening plant will be equipped with water sprays to control dust emissions. The Sandvik Screener engine is Tier 3, which meets the BACT for this source.

1.1.3.2 Fugitive Sources

Unpaved road surfaces, blasting, and loading of ore and materials for the concrete and shotcrete plants are all examples of anticipated fugitive sources for the proposed Project. To reduce the impacts of these emissions, routine visual inspections of the facility will be conducted and best management practices will be utilized. BACT measures to be employed will include wetting road surfaces, minimizing drop height while unloading or loading materials, and supplying water to ore or development rock during mucking procedures. The fugitive dust sources listed in the permit application are shown again in Table 1.1.3.

1.1.3.3 Air Quality Controls Under Permit #4449-03

Butte Highlands submitted and received approval from MDEQ for a modification to the construction permit to add generators and other equipment to the site. The calculated potential emissions from all the sources at the facility will be below major source thresholds except for nitrogen oxides (NOx) and carbon monoxide (CO). MDEQ required impact modeling for nitrogen dioxide and judged the other criteria pollutant emissions to be below levels of concern. Dispersion modeling using the EPA approved AERMOD model was performed for nitrogen dioxide to determine the offsite concentrations. Modeling predicted nitrogen dioxide levels at the fence line and beyond would not exceed the National Ambient Air Quality Standard and would therefore not be a hazard to the surrounding population or the environment.

Air quality controls on the current and proposed equipment at the site consist of the use of low sulfur fuel and high tier rated engines (tier 2 or tier 3) for the combustion sources and the application of water and/or surfactants for fugitive dust control. Low sulfur fuel reduces the emission of sulfur dioxide (SO_2) and sulfates, which can also form secondary aerosol particles, from vehicles and combustion equipment. High tier rated engines meet stringent EPA emission requirements and significantly reduce emissions of nitrogen oxides, carbon monoxide, and volatile organic compounds over lower tier rated engines. Manufacturers are beginning to offer tier 4 engines in certain size ranges. However the additional costs required for tier 4 engines including operational costs associated with ammonia injection are prohibitive given the location and life expectancy of the project. Add on controls for lower tier engines such as selective catalytic reduction (SCR) were also found to not be cost effective controls. As part of the air permit application a best available control technology (BACT) analysis detailing the available control measures and cost effectiveness was completed and the proposed tier 2 and tier 3 engines with low sulfur fuel and good operating practices were judged to be the most cost effective control method available.

Table 1.1.3. Butte Highlands Exploration Program Fugitive Sources and BACT Measures

Description	Emitting Unit	BACT Measure
Wet Drilling	1	Good operating practices. Water introduced in wet drilling
Blasting – Particulate	2	Good operating practices
Blasting – Gaseous	3	Good operating practices
Underground Ore Loading	4	Good operating practices. Water introduced in mucking activities
Underground Development Rock Loading	5	Good operating practices. Water introduced in mucking activities
Ore Unloading	6	Good operating practices. Material wet from underground
Development Rock Unloading	7	Good operating practices. Material wet from underground.
Ore Haul Truck Loading	8	Good operating practices. High material surface moisture from underground.
Ore haul Truck Travel	9	Regular water application
Unloading to Sand Storage Area	10	Good operating practices. Minimize drop height
Shotcrete Plant Sand Transfer to mixing Pit	12	Good operating practices. Minimize drop height
CRF Plant Aggregate Hopper Loading	14	Good operating practices. Minimize drop height.
Front End Loader Travel	16	Regular water application
Shotcrete and CRF Truck Transport Underground	17	Regular water application
Fuel Storage	22	Maintain shell condition. Store only diesel fuel.
Wind Erosion	23	Water application to active areas.

Air quality controls for fugitive sources such as temporary material storage, vehicle travel on roads, and material handling will consist of the application of water and/or surfactants to the material, exposed surfaces, and disturbed surfaces as necessary. BHJV is required to maintain opacity levels at regulatory standards which will dictate the application material and frequency for fugitive dust control.

1.1.3.4 Emissions Under Permit #4449-03

Potential emissions were calculated as part of the construction permit application. The total estimated emissions approved by MDEQ from the proposed equipment, the previously approved emission limits, and the change in emissions are summarized in Table 1.1.4.

Table 1.1.4. Butte Highlands Emissions Under Permit #4449-03

Pollutant	Previous MDEQ Permitted Limits (tons/year)	MDEQ Permitted Limits (tons/year)	Change in Emissions (tons/year)
PM	75.40	143.33	67.93
PM_{10}	23.69	48.77	25.08
$PM_{2.5}$	5.92	9.90	3.98
NOx	83.77	186.01	102.24
CO	63.00	113.92	50.92
SO_2	15.95	22.45	6.50
VOC	19.56	28.75	9.19

PM = particulate matter
PM_{10} = particulate matter less than 10 microns
$PM_{2.5}$ = particulate matter less than 2.5 microns
NOx = nitrogen oxides
CO = carbon monoxide
SO_2 = sulfur dioxide
VOC = volatile organic compounds

1.2 Water Resources

1.2.1 Introduction and Study Area

The following is a summary of the Water Resources Baseline Investigation of the Butte Highlands Project in Silver Bow County, Montana. This investigation was developed and performed by AMEC Geomatrix (AMEC), Klepfer Mining Services, and the Butte Highlands Joint Venture, in conjunction with the Montana Department of Environmental Quality (MDEQ), and the Beaverhead-Deerlodge National Forest. This baseline investigation began in late 2008, following MDEQ's approval of Timberline's Amended Underground Exploration Plan (August 2009) and based upon the monitoring plan contained within that plan. The Exploration Plan can be found in Appendix N. Water quality and quantity monitoring continues in the Project area.

Information in this section was also obtained from AMEC's "Hydrogeologic Characterization Report on the Butte Highlands Mine Project (January 2009)" located in Appendix C and the update to that report located in Appendix F. These reports also include a conceptual hydrologic model of the Butte Highlands Project site. Although historical water resources data exist for this Project area, it is not included nor discussed in detail in this application.

The Butte Highlands Project site is located within the headwaters of three separate watersheds: (1) Fish Creek on the east side; (2) Basin Creek to the north and (3) Moose Creek on the west site (refer to Figure 2). The Project site is located on the Continental Divide, therefore, surface water from this area flows either west-northwest to the Clark Fork River basin (Basin Creek) or east-northeast to the Missouri River basin (Fish Creek and Moose Creek). Prior to joining the Clark Fork River, Basin Creek joins Silver Bow Creek near Butte. Basin Creek flows north into the Basin Creek Reservoir, which is a water supply for the city of Butte. Prior to joining the

Missouri River, Moose Creek is a tributary to the Big Hole River, and Fish Creek flows into the Jefferson River.

Two of the streams in the Project area (Fish Creek and Moose Creek) are classified as B-1, which means that the water is to be maintained suitable for drinking, culinary and food processing purposes after conventional water treatment (ARM 17.30.607 & 610& 623). Basin Creek is classified as A-Closed because it is a water supply for the City of Butte. This classification means that the water is to be maintained suitable for drinking, culinary, and food processing purposes after simple disinfection, as well as other purposes (ARM 17.30.607 & 621). Streams classified as A-Closed also typically have access restrictions to protect the water for public health. Two of the streams in the Project area (Fish Creek and Moose Creek) are considered "impaired" by 2008 Section 303(d) list of impaired water bodies in Montana (USEPA 2008). Fish Creek is impaired from its headwaters to mouth (26.6 miles) for the following: a.) alteration of streamside vegetative cover, b.) low flow alterations, and c.) sedimentation/siltation. Probable sources of the impairment conditions include grazing in riparian zones, flow alterations from diversions or irrigation systems, and forest roads. Moose Creek is impaired from its headwaters to mouth (12.3 miles) for alterations to flow, most likely caused by irrigation systems.

According to Montana regulations, groundwater at the Butte Highlands Project site is considered Class I because natural specific conductance is less than or equal to 1,000 microSeimens per centimeter (µS/cm) (ARM 17.30.1006(1)). In accordance with these regulations, a person may not cause a violation of the human health standards for groundwater listed in Circular DEQ-7 (MDEQ 2008). Precipitation in the Project area is approximately 24-26 inches per year, with about 10 inches occurring as snow-water equivalent during October thru April. Additional information on the climate of the Project area is discussed above in this Application and in AMEC's "Hydrogeologic Characterization Report on the Butte Highlands Mine Project" (January 2009) located in Appendix C and the update to that report from April 2010, located in Appendix F.

Surface water monitoring stations have been established throughout the Project area in the following general areas:

- Basin Creek – one station near the historic Highlands Mine adit discharge area and northwest of the Project area, and a second station downstream of the historic mine's discharge area;
- Fish Creek - four stations in Fish Creek and its tributaries east of the Project area and downstream of LAD 1;
- Middle Fork Moose Creek - one station southwest of the Project area and downstream from LAD 2, and a second station at the uppermost headwaters of the Middle Fork of Moose Creek.

Groundwater test wells have been completed within several key proposed Project areas, including the ventilation raise, portal, proposed road corridors, and LAD areas. Refer to Figure 4 for surface water and groundwater monitoring locations. Furthermore, the LAD Areas will be monitored for new springs at least weekly.

1.2.2 Water Monitoring Program

As mentioned above, The BHJV has been conducting an ongoing water monitoring program as a part of the approved exploration plan. The following baseline water monitoring actions have been initiated:

- Surface Water Monitoring (Quality and Quantity – conducted monthly)
- Groundwater Monitoring (Test Well installation completed, quarterly depth measurements; Monthly water quality collection at monitor wells began in March 2010.)
- Water Balance (conceptual model and predicted adit inflow rates were completed)

Results of the monitoring program are discussed below.

1.2.3 Surface Water Resources

1.2.3.1 Surface Water Analysis Area

The baseline water monitoring program at the Butte Highlands Project began in the fall of 2008 and continues as a part of the exploration program. Eight surface water sites have been established and include sample stations in Basin Creek, Fish Creek, and Middle Fork Moose Creek, as well as a sampling location just below the historic Highlands Mine adit discharge. The sampling sites are listed below in Table 1.2.1 and shown in Figure 4. Photos of the sampling sites are included in AMEC's Hydrogeologic Characterization report for the Butte Highlands Mine Project (January 2009) located in Appendix C and the update to that report located in Appendix F.

Table 1.2.1. Surface Water Monitoring Sites

Stream	Site Description	Site ID
Basin Creek	Highland Mine Adit Discharge, northwest side of Project	WS-1
Fish Creek	Upper Fish Creek, southern channel, southeast side of Project	WS-2
Fish Creek	Upper Fish Creek, combined channels, northeast of Project	WS-3
Fish Creek	Upper Fish Creek, middle channel, east side of Project	WS-4
Fish Creek	Upper Fish Creek, northern channel, northeast of Project	WS-5
Middle Fork Moose Creek	Middle Fork Moose Creek, upper middle fork, southwest of Project	WS-6
Basin Creek	Basin Creek, downstream of Highlands Mine adit	WS-7

1.2.3.2 Historic Highland Adit Surface Water Discharge

One of the more significant surface water features in the Project area is flow from the historic Highland Mine adit. Near the northwest part of the Project area, the adit discharges water to upper Basin Creek, and a monitoring station (WS-1) has been established to monitor this water. It is estimated that approximately 90% of the flow at this station is attributed to adit discharge. This 600-foot level adit is at an elevation of about 7,300 feet.

Flow measured from the Highland adit discharge at station WS-1 ranged in 2008 from approximately 90 gallons per minute (gpm) to approximately 140-150 gpm in 2009. This increase in flow is similar to the range reported in 1993. The increased flow may be a reflection of seasonal or yearly fluctuations in precipitation. This adit extends approximately 2300 feet to the ore body with additional underground workings in the ore zone over a 550-ft vertical extent. As shown on the geology map (Appendix C, Figure 3), the main Highland adit crosses several faults which could be the primary conduits of groundwater flow that discharge from the portal.

1.2.3.3 Surface Water Sample Collection

Surface water samples were collected on a monthly basis using typical grab-sampling techniques and protocols. Water was collected directly into sample containers and preserved as necessary. Chain of custody protocols were used when collecting and shipping water samples to the lab. Pace Analytical Labs in Billings, MT was used for analysis purposes. **Table** 1.2.2 shows the parameters that were analyzed and their detection or reporting limits. Information in MDEQ Circular DEQ-7 (February 2008) was used to develop the minimum reporting values. Each sample was analyzed for metals (total recoverable and/or dissolved), common ions, nutrients and general parameters listed in the table. It is expected that after a certain period of data collection has occurred, this list may be modified to eliminate parameters that are of no issue or concern.

Table 1.2.2. Water Quality Parameters

Parameter (1)	Aquatic Life Standard (2)		Human Health Standard (2)		Required Reporting Value	Project Laboratory Detection Limit
	Acute	Chronic	Surface Water	Ground Water		
Lab & Field pH (s.u.)	---	6.5 - 9.0*	6.5 - 8.5* s	6.5 - 8.5* s	---	0.1
Field Temperature (C)	---	---	---	---	---	0.1
Lab & Field EC (µmhos/cm)	---	---	---	---	---	5
Lab & Field Turbidity (NTU)	---	---	---	---	1.0	0.05
Field DO (mg/l)	>4.0 - 9.5	>4.0 - 9.5	---	---	0.05	---
TSS (mg/l)	---	---	---	---	---	0.5
TDS (mg/l)	---	---	---	500* s	---	5.0
Alkalinity, total (mg/l CaCO3)	---	---	---	---	---	2.5
Bicarbonate (mg/l CaCO3)	---	---	---	---	---	2.5
Carbonate (mg/l CaCO3)	---	---	---	---	---	2.5
Chloride (mg/l)	860*	230*	250 s	250 s	---	0.086
Sulfate (mg/l)	---	---	250 s	250 s	---	0.19
Fluoride (mg/l)	---	---	4.0	4.0	0.1	0.023
Hardness (mg/l CaCO3)	---	---	---	---	---	0.18
Ammonia, as N (mg/l)	---	---	---	---	0.05	0.008
Total Kjeldahl Nitrogen (mg/l)	---	---	---	---	---	0.038

Parameter (1)	Aquatic Life Standard (2)		Human Health Standard (2)		Required Reporting Value	Project Laboratory Detection Limit
	Acute	Chronic	Surface Water	Ground Water		
Nitrate+Nitrite, as N (mg/l)	---	---	10	10	0.01	0.0042
Nitrate, as N (mg/l)	---	---	10	10	0.01	0.0050
Nitrite, as N (mg/l)	---	---	1.0	1.0	0.01	0.00047
Orthophosphate (mg/l)	---	---	---	---	---	0.00050
Phosphorus, total (mg/l)	---	---	---	---	0.001	0.00016
Calcium (mg/l)	---	---	---	---	---	0.025
Magnesium (mg/l)	---	---	---	---	---	0.012
Potassium (mg/l)	---	---	---	---	---	0.0051
Sodium (mg/l)	---	---	---	---	---	0.012
Aluminum (mg/l)	0.75	0.087	---	---	0.03	0.002
Antimony (mg/l)	---	---	0.0056	0.006	0.003	0.00016
Arsenic (mg/l)	0.34	0.15	0.01	0.01	0.003	0.000062
Barium (mg/l)	---	---	1.0	1.0	0.005	0.000043
Beryllium (mg/l)	---	---	0.004	0.004	0.001	0.000069
Boron (mg/l)	---	---	---	---	---	0.00018
Cadmium (mg/l)	0.00322 h	0.000365 h	0.005	0.005	0.00008	0.000020
Chromium (mg/l)	2.5 (III)	0.12 (III)	0.1	0.1	0.001	0.00024
Cobalt (mg/l)	---	---	---	---	---	---
Copper (mg/l)	0.02051 h	0.01319 h	1.3	1.3	0.001	0.0002
Iron (mg/l)	---	1.0	0.3 s	0.3 s	0.05	0.0045
Lead (mg/l)	0.1368 h	0.005331 h	0.015	0.015	0.0005	0.00002
Manganese (mg/l)	---	---	0.05 s	0.05 s	0.005	0.00005
Mercury (mg/l)	0.0017	0.00091	0.00005	0.002	0.00001	0.000021
Molybdenum (mg/l)	---	---	---	---	---	---
Nickel (mg/l)	0.661 h	0.0735 h	0.1	0.1	0.01	0.00019
Platinum (mg/l)	---	---	---	---	---	---
Selenium (mg/l)	0.02	0.005	0.05	0.05	0.001	0.00010
Silver (mg/l)	0.008152	---	0.1	0.1	0.0005	0.000071
Strontium (mg/l)	---	---	4.0	4.0	---	0.000078
Thallium (mg/l)	---	---	0.00024	0.002	0.0002	0.000050
Tin (mg/l)	---	---	---	---	---	---
Titanium (mg/l)	---	---	---	---	---	---
Uranium (mg/l)	---	---	0.03	0.03	---	0.00025

Parameter (1)	Aquatic Life Standard (2)		Human Health Standard (2)		Required Reporting Value	Project Laboratory Detection Limit
	Acute	Chronic	Surface Water	Ground Water		
Vanadium (mg/l)	---	---	---	---	---	---
Zinc (mg/l)	0.169 h	0.169 h	2.0	2.0	0.01	0.0013

NOTES:
(1) s.u. = standard units of pH; C = degrees Celsius; EC = electrical conductivity; µmhos/cm = micromhos per centimeter; NTU = nephelometric turbidity units; DO = dissolved oxygen; mg/l = milligrams per liter; TSS = total suspended solids; TDS = total dissolved solids; CaCO3 = calcium carbonate; N = nitrogen.

(2) Standards from Circular DEQ-7: Montana Numeric Water Quality Standards (August 2010); s = secondary standard; h = hardness dependent (for this table, values are presented based on hardness of 150 mg/l)

* federal USEPA standard. --- no standard or reporting limit.

MT aquatic life standards apply to total recoverable metals in surface water (except for aluminum).

Human health standards apply to dissolved metals in groundwater and to total recoverable metals in surface water.

1.2.3.4 Surface Water Flow

In late November 2008, surface water flow was measured by AMEC at six of the surface water monitoring locations. A portable flume was used at all sites, except WS-2 and WS-6 due to flows that were too low for the flume or within coarse-grained streambed material. At those locations, calibrated containers and a stopwatch were used to estimate flow. AMEC's report shows a comparison with flow data collected by the Montana Bureau of Mines and Geology (MBMG) at three sites in August of 1993.

The MBMG sites were as follows: Highland Mine adit discharge; seep area flow in small channel below the tailings piles and garbage dumps; and, Basin Creek downstream of confluence of adit discharge and small channel.

Table 1.2.3 summarizes the flow measurements by AMEC in November 2008 and MBMG in August 1993.

Table 1.2.3. Baseline Surface Water Flow Data

Location	Flow (gpm)
MBMG Aug. 1993	
Highland Mine	110
Seep (below tailings and dump)	12
Basin Creek (below adit)	300
AMEC Nov. 2008	
Highland Adit @ WS-1	90
Fish Creek @ WS-2	48
Fish Creek @ WS-4	8
Fish Creek @ WS-5	64
Fish Creek @ WS-3	92
Middle Fork Moose Creek @ WS-6	0.4

1.2.3.5 Surface Water Quality Results

A detailed report of surface water quality laboratory results is in Appendix D, which includes data from all samples, as well as summary statistics for each parameter (minimum and maximum values, and number of samples collected). Data are presented by sample site, with parameters grouped into general parameters, ions, and metals. MDEQ water quality standards from Circular DEQ-7 are also listed in Appendix D.

WS-1 (Basin Creek - Historic Highland Adit Discharge)
Based on nine surface water samples collected for this sample site from September 2008 to February 2010, values for select parameters were recorded in the following ranges:

Lab pH (s.u.):	7.6 – 8.0
TDS (mg/L):	164 – 388
TSS (mg/L):	0.51 - 0.87
Alkalinity, Total (mg CaCO3/L):	152 – 195
Hardness (mg CaCO3/L):	186 – 210
Sulfate (mg/L):	12.9 – 21
Ammonia (mg/L):	0.02 (same result for two detected values)
Nitrate + Nitrite (mg/L):	0.133 – 0.19

Low or non-detect concentrations were measured for most metals in dissolved and total recoverable concentrations. There were no exceedances of water quality standards. The following metals were not detected above the method detection limit during sampling: cobalt (only analyzed in one sample) and vanadium (only analyzed in one sample).

WS-2 (southern channel of Upper Fish Creek)
Based on eight surface water samples collected for this sample site from September 2008 to February 2- 10, values for select parameters were recorded in the following ranges:

Lab pH (s.u.):	6.9 - 7.8
TDS (mg/L):	ND – 83
TSS (mg/L):	ND – 7.0
Alkalinity, Total (mg CaCO3/L):	23.5 - 37
Hardness (mg CaCO3/L):	19.5 - 29
Sulfate (mg/L):	ND - 4.7
Ammonia (mg/L):	0.02 (only one sample had a detected value)
Nitrate + Nitrite (mg/L):	0.009 - 0.056

Low or non-detect concentrations were measured for most metals in dissolved and total recoverable forms. The following metals were not detected above the method detection limit during sampling: cadmium, molybdenum (analyzed in only one sample), selenium, silver, thallium, and vanadium (analyzed in only one sample).

WS-3 (combined channels of Upper Fish Creek)
Based on seven surface water samples collected for this sample site from September 2008 to December 2009, values for select parameters were recorded in the following ranges:

Lab pH (s.u.):	8 - 8.4
TDS (mg/L):	63 - 148
TSS (mg/L):	ND - 2.6
Alkalinity, Total (mg CaCO3/L):	82.7 – 148

Hardness (mg CaCO3/L):	79.3 – 163
Sulfate (mg/L):	6.6 – 11
Ammonia (mg/L):	ND – 0.02
Nitrate + Nitrite (mg/L):	0.06 - 0.16

Low or non-detect concentrations were measured for most metals in dissolved and total recoverable forms. There were no exceedances of water quality standards. The following metals were not detected above the method detection limit during sampling: beryllium, cadmium, cobalt, molybdenum (analyzed in only one sample), selenium, silver, thallium, and vanadium (analyzed in only one sample).

WS-4 (middle channel of Upper Fish Creek)
Based on six surface water samples collected for this sample site from November 2008 to February 2010, values for select parameters were recorded in the following ranges:

Lab pH (s.u.):	7.6 – 8
TDS (mg/L):	31 – 203
TSS (mg/L):	0.51 - 12.6
Alkalinity, Total (mg CaCO3/L):	27.6 – 200
Hardness (mg CaCO3/L):	24.8 – 197
Sulfate (mg/L):	3.3 – 5
Ammonia (mg/L):	0.02 (only one sample had a detected value)
Nitrate + Nitrite (mg/L):	0.01 - 0.37

Low or non-detect concentrations were measured for most metals in dissolved and total recoverable forms. The following metals were not detected above the method detection limit during sampling: beryllium, cadmium, selenium, silver, and thallium.

WS-5 (northern channel of Upper Fish Creek)
Based on five surface water samples collected for this sample site from November 2008 to December 2009, values for select parameters were recorded in the following ranges:

Lab pH (s.u.):	8.1 - 8.4
TDS (mg/L):	145 - 185
TSS (mg/L):	1.7 - 3.5
Alkalinity, Total (mg CaCO3/L):	149 - 163
Hardness (mg CaCO3/L):	144 - 161
Sulfate (mg/L):	8.8 - 14.5
Ammonia (mg/L):	ND - 0.02
Nitrate + Nitrite (mg/L):	0.09 - 0.16

Low or non-detect concentrations were measured for most metals in dissolved and total recoverable forms. There were no exceedances of water quality standards. The following metals were not detected above the method detection limit during sampling: beryllium, selenium, silver, and thallium.

Based on seven surface water samples collected for this sample site from November 2008 to February 2010, values for select parameters were recorded in the following ranges:

WS-6 (upper Middle Fork Moose Creek)
Based on seven surface water samples collected for this sample site from November 2008 to February 2010, values for select parameters were recorded in the following ranges:

Lab pH (s.u.):	7.5 - 8.3
TDS (mg/L):	213 – 278
TSS (mg/L):	ND – 34.7
Alkalinity, Total (mg CaCO3/L):	212 – 260
Hardness (mg CaCO3/L):	209 – 264
Sulfate (mg/L):	6.8 - 10.7
Ammonia (mg/L):	ND - 0.02
Nitrate + Nitrite (mg/L):	ND – 0.03

Low or non-detect concentrations were measured for most metals in dissolved and total recoverable forms. There were no exceedances of water quality standards. The following metals were not detected above the method detection limit during sampling: cobalt (analyzed in only one sample), molybdenum (analyzed in only one sample), silver, strontium (analyzed in only one sample), thallium, and vanadium (analyzed in only one sample).

WS-7 (Basin Creek – downstream of Historic Highland Mine adit)
Based on six surface water samples collected for this sample site from September to February 2010, values for select parameters were recorded in the following ranges:

Lab pH (s.u.):	8.3 - 8.5
TDS (mg/L):	167 – 225
TSS (mg/L):	2.7 - 81.4
Alkalinity, Total (mg CaCO3/L):	182 - 199
Hardness (mg CaCO3/L):	176 - 197
Sulfate (mg/L):	12.7 - 17.1
Ammonia (mg/L):	ND - 0.02
Nitrate + Nitrite (mg/L):	0.14 – 0.16

Low or non-detect concentrations were measured for most metals in dissolved and total recoverable forms. The following metals were not detected above the method detection limit during sampling: beryllium and silver.

1.2.4 Ground Water Resources

1.2.4.1 Analysis Area

Hydrogeological investigation of the proposed Project area began in 2008 as a part of the monitoring plan included in the approved Exploration Plan. AMEC conducted a groundwater investigation to provide insight into groundwater quantity and quality of the ore body and surrounding area. Since December of 2008, six test wells (five vertical and one angle) have been installed in the proposed mine area at the Project site. The angular drill hole has since been abandoned. Three additional water monitoring wells have been drilled to monitor groundwater quality near the LAD areas, and one additional well has been drilled as a water supply source. Refer to Figure 4 for the location of these wells. Additional wells may be installed as the Project advances to monitor water quality/quantity pending agency analysis. The groundwater monitoring program for the exploration program requires quarterly monitoring of static water level from the exploration drill holes, and monthly water quality from the monitoring wells. Additional water quality data may be collected from the exploration wells as needed to supply data for the Project. Results of the investigation are summarized below and included in the AMEC report, “Hydrogeologic Characterization Report on the Butte Highlands Mine Project (January 2009; updated February 2010, Appendix C)” and the memo “Groundwater Study Update – Butte Highlands Mine Project, Montana (August 2009)” located in Appendix E.

Groundwater in the Project area flows primarily in bedrock formations, with some flow in unconsolidated alluvial deposits along the stream channels. Little historical information is available for groundwater quantity and quality in the Butte Highlands Project area.

1.2.4.2 Test Well Installation and Data Collection

As mentioned above, borehole drilling and test well installation began in December 2008 in the proposed mine area. The following sections will describe the results of borehole drilling for each of the six boreholes that have been installed in the proposed mine area. Locations for completing the test wells were selected to extend through rock units that would be intercepted by the exploration decline. See Table 1.2.4 for specific information obtained for each borehole during the drilling process.

O'Keefe Drilling Company of Butte, Montana, drilled the boreholes using air-rotary techniques. In general, drilling procedures consisted of first drilling a 12-inch diameter borehole to a target depth for installing the steel casing. The 8-inch diameter steel casing was then installed and cemented into the borehole. After the cement hardened, a 6-inch diameter borehole was drilled below the casing to total depth. This portion of the borehole was left open without casing. This type of completion will allow for ongoing monitoring of groundwater at these locations (i.e., depth to water measurements and water sample collection).

At changes in lithology or apparent water yield during drilling, the borehole was developed by airlifting for 20 to 30 minutes, followed by measuring water yield as water was discharging from the cyclone attached to the drill rig. This airlift information is used to estimate groundwater yield from the geologic formation(s) intercepted by the borehole. The Meagher dolomite (including marble) and Wolsey shale (including hornfels and skarn) are the two primary geologic units encountered at the Project site. Depth to groundwater also was measured in each test well after completion of drilling.

Groundwater samples were collected in clean calibrated containers from the end of the cyclone unit attached to the drill rig, then transferred into sampling containers, filtered, and preserved as necessary for submittal to the laboratory. Samples were also collected and analyzed in the field for selected parameters using on-site field instruments. The groundwater samples were submitted under chain-of-custody procedures to Energy Laboratories in Helena, Montana, for analysis. The samples were analyzed for metals (dissolved and total recoverable), common ions, nutrients and general parameters listed in Table 1.2.2.

Table 1.2.4. Summary of Test Holes at Butte Highlands Project Site

Drill Hole ID and Type	Northing & Easting Coordinates and Surface Elevation (ft)	Total Depth Drilled (ft bgs)	Total Depth Cased (ft bgs)	Water Yield from Air Lift Test	Static Water Level (ft btc) & Measurement Date	Water Quality Sample Depth (ft bgs)	Geology	Date Drilled
BHMW08-01 (Exploration)	N: 16640905 E: 1255915 7977 ft	1,167 ft (vertical)	600 ft (8-in steel)	<1 gpm at 685 ft 8 gpm at 805 ft 12 gpm at 1065 ft 12 gpm at 1085 ft 12 gpm at 1167 ft	620.1 ft (12/11/09)	805 ft 1,085 ft	Dolomite: 0-1040 ft Skarn/Hornfels: 1040-1167 ft	Dec. 2008
BHMW09-01 (Exploration)	N: 16640255 E: 1255940 7823 ft	820 ft (vertical)	5 ft (6-in steel)	2 gpm at 240 ft 2 gpm at 400 ft 3.5 gpm at 500 ft 3.75 gpm at 600 ft 12 gpm at 820 ft	265.7 ft (2/23/10)	820 ft	Dolomite: 0-225 ft Skarn/Hornfels: 225-820 ft	July 2009
BHMW09-02 (Exploration)	N: 16640633 E: 1255565 7849 ft	980 ft (vertical)	545 ft (6-in steel)	6.5 gpm at 600 ft 10 gpm at 860 ft 23 gpm at 880 ft 30 gpm at 955 ft 30 gpm at 980 ft	433.4 ft (12/10/09)	600 ft	Dolomite: 0-260 ft Clay Zone: 260-272 ft Skarn/Hornfels: 272-980 ft	Aug. 2009
BHMW09-03 (Exploration)	N: 16640546 E: 1253985 7444 ft	500 ft* (45° angle)	Abandoned	5 gpm at 200 ft 15 gpm at 400 ft 22 gpm at 500 ft	Not Measured (angle hole)	No Sample	Dolomite: 0-265 ft Marble: 265-280 ft Dolomite: 280-360 ft Marble: 360-370 ft Dolomite 370-440 ft Quartzite/Skarn: 440-500 ft	Aug. 2009
BHMW09-04 (Exploration)	N: 16641078 E: 1255059 7897 ft	1,120 ft (vertical)	620 ft (6-in steel)	1.5 gpm at 460 ft 25 gpm at 800 ft 25-30 gpm at 900 ft 25-30 gpm at 1020 ft 30 gpm at 1120 ft	560.85 ft (12/10/09)	1,120 ft	Shale: 0-490 ft Dolomite: 490-1070 ft Skarn: 1070-1120 ft	Oct.-Nov. 2009

Table 1.2.4. Summary of Test Holes at Butte Highlands Project Site

Drill Hole ID and Type	Northing & Easting Coordinates and Surface Elevation (ft)	Total Depth Drilled (ft bgs)	Total Depth Cased (ft bgs)	Water Yield from Air Lift Test	Static Water Level (ft btc) & Measurement Date	Water Quality Sample Depth (ft bgs)	Geology	Date Drilled
BHMW09-05 (Exploration)	N: 16641125 E: 1255897 8048 ft	1,285 ft (vertical)	680 ft (6-in steel)	1 gpm at 200 ft 5 gpm at 320 ft 1 gpm at 430 ft 20-23 gpm at 600 ft 20-23 gpm at 720 ft 25 gpm at 800 ft 28 gpm at 1000 ft 30 gpm at 1285 ft	697.4 ft (2/23/10)	No Sample	Shale/Limestone: 0-230 ft Shale: 230-340 ft Shale/Dolomite: 340-385 ft Shale: 385-615 ft Shale/Dolomite: 615-775 ft Marble: 775-1170 ft Skarn/Hornfels: 1170-1285 ft	Dec. 2009 – Jan. 2010
Water Supply Well	N: 1254049 E: 16640538 7445 ft	480 ft (vertical)	480 ft	30 gpm at 280 ft 130 gpm at 360 ft 250 gpm at 420 ft	108 ft (2/2010)	Not Reported	Geology not reported. Hole drilled in a fault zone.	Oct. 2009
LAD1MW (Monitoring)	N: 1252333 E: 16639704 7298 ft	65 ft	60 ft (4-in slotted pvc)		23.56 (3/16/10)	Est 03/10	Overburden: 0-2 ft Clay/Weathered Shale: 2-35 ft Qtzite/Shale Float: 35-65 ft	9/17-9/21/2009
LAD2MW (Monitoring)	N: 16638530 E: 1251159 7190 ft	60 ft	60 ft (2-in slotted pvc)		8.21 (3/16/10)	Est 03/10	Overburden: 0-10 ft Unconsolidated: 20-35 ft Dolo/Shale/Qtzite: 35-60 ft	01/2010
LAD3MW (Monitoring)	N: 16640229 E: 1255375 7791 ft	67 ft	60 ft (2-in slotted pvc)		64.85 ft (3/16/10)	Est 03/10	Unconsolidated: 0-25 ft Qtzite: 25-35 ft Qtzite/Calc-silicates: 35-45 ft Calc-silicates/Qtzite: 45-55 ft Calc-silicates: 55-67 ft	9/22-9/23/2009

Note: ft = feet; bgs = below ground surface; btc = below top of casing; gpm = gallons per minute. *Angle hole depth is drilled depth and not feet below ground surface.

1.2.4.3 Groundwater Data Results

A detailed report of laboratory results for groundwater samples is in Appendix D, which includes data from all samples, as well as summary statistics for each parameter (minimum and maximum values, and number of samples collected). Data are presented by sample site, with parameters grouped into general parameters, ions, and metals. MDEQ water quality standards from Circular DEQ-7 are also listed in Appendix D.

In addition to analysis of water quality in the field and by a laboratory, depth to groundwater was measured in the test wells, and airlift tests were performed at various depths during drilling to estimate groundwater yield. Results of these measurements are summarized in Table 1.2.4.

1.2.4.4 Exploration Wells

As previously mentioned, the water monitoring program approved in the exploration program has determined that quarterly static water level measurements will be obtained from these wells. Additionally, the BHJV has collected water quality data from a few of these wells, which will be discussed below in detail.

Static Water Level

As part of the monitoring plan described in the exploration plan, BHJV is responsible for collecting static water levels from exploration wells on a quarterly basis. Water quality and levels will be collected from the water monitoring wells on a monthly basis. Table 1.2.5 shows static water level measurements that have been collected since exploration drilling began.

Table 1.2.5. Exploration Drillhole and Monitoring Well Static Water Level Measurements (in feet)

DATE	BHMW08-01	BHMW09-01	BHMW09-02	BHMW09-04	BHMW09-05	LAD1MW	LAD2MW	LAD3MW
08/17/09	618.80	- - -	- - -	- - -	- - -	- - -	- - -	- - -
09/01/09	618.50	- - -	428.00	- - -	- - -	- - -	- - -	- - -
09/11/09	618.70	- - -	428.20	- - -	- - -	- - -	- - -	- - -
12/10/09	- - -	- - -	433.40	560.85	*	21.90	- - -	- - -
12/11/09	620.10	- - -	- - -	- - -	- - -	- - -	- - -	- - -
02/23/10	- - -	265.70	- - -	- - -	697.40	- - -	8.27	- - -
03/16/10	620.55	274.20	442.33	586.80	*	23.56	8.21	64.85

Note: All measurements were taken from top of casing. - - - no measurement taken. * An obstruction exists at 720 ft for test hole BHMW09-05. Water depth was below 720 ft.

Exploration Well BHMW08-01

Borehole BHMW08-01 was drilled in December 2008 to a total depth of 1,167 feet. After first drilling a 12-inch diameter borehole to a depth of 600 feet, an 8-inch diameter steel casing was installed and cemented in the borehole. A 6-inch diameter open borehole was then drilled from 600 to 1,167 feet below ground surface.

Measured airlift groundwater yield during drilling at various depths was (steel casing set to depth of 600 feet):

685 ft	= 0.3 gpm
805 ft	= 23 gpm
1,065 ft	= 12 gpm
1,085 ft	= 12 gpm
1,167 ft	= 12 gpm (total depth)

The historic Highland adit that discharges near surface water station WS-1 is located at a depth of about 685 feet below ground surface in the vicinity of this borehole.

The geologic units encountered in this borehole were Meagher Dolomite to a depth of about 1,040 feet and metamorphosed Wolsey Shale (skarn and hornfels) from 1,040 feet to the total borehole depth of 1,167 feet. No significant faults or fracture zones were noted during drilling.

Based on two samples collected in December 2008 from test well BHMW08-01 at depths of 805 and 1,085 feet, values for select parameters were within the following ranges:

Lab pH (s.u.):	8.4 – 8.5
TDS (mg/L):	180 - 185
TSS (mg/L):	115 - 408
Alkalinity, Total (mg $CaCO_3$/L):	200 (both samples)
Hardness (mg $CaCO_3$/L):	194 (both samples)
Sulfate (mg/L):	6 - 7
Ammonia (mg/L):	0.1 (both samples)
Nitrate + Nitrite (mg/L):	0.54 – 0.98

Metals at low concentrations were detected in dissolved concentrations for the following: aluminum, barium, chromium, iron, and manganese. For dissolved forms, all metal detections were in very low concentrations relative to groundwater standards. The following metals were not detected above the method detection limit during either sampling event: antimony, arsenic, beryllium, cadmium, mercury, molybdenum, selenium, silver, thallium, and vanadium.

Exploration Well BHMW09-01

Borehole BHMW09-01 was drilled in July 2009 to a total depth of 820 feet. This vertical borehole was drilled the entire depth with a 6-inch diameter bit and was left as an open hole with 5 feet of surface steel casing.

Airlift groundwater flow measurements during drilling were recorded as follows (steel casing set to a depth of 5 feet):

240 ft	= 2 gpm
400 ft	= 2 gpm
500 ft	= 3.5 gpm
600 ft	= 3.75 gpm
780 ft	= 6 gpm
820 ft	= 12 gpm (total depth)

The geologic units encountered in this borehole were Meagher Dolomite to a depth of about 225 feet and metamorphosed Wolsey Shale (skarn and hornfels) from 225 feet to the total depth of 820 feet. No significant faults or fractures were noted during drilling.

Groundwater quality was analyzed from a sample collected in July of 2009 at the total depth of 820 feet:

Lab pH (s.u.):	8.5
TDS (mg/L):	172
TSS (mg/L):	663
Turbidity (mg/L):	215
Alkalinity, Total (mg $CaCO_3$/L):	190
Hardness (mg $CaCO_3$/L):	154
Sulfate (mg/L):	20
Ammonia (mg/L):	0.1
Nitrate + Nitrite (mg/L):	0.54

Dissolved metal concentrations were low relative to groundwater standards for the following: aluminum, antimony, arsenic, copper, iron, manganese, molybdenum and zinc. The following metals were not detected above the method detection limit during sampling: cobalt, mercury, and silver.

Exploration Well BHMW09-02

Vertical borehole BHMW09-02 was drilled in August 2009 to a total depth of 980 feet. The 6-inch diameter steel casing was first installed in the 10-inch diameter borehole and cemented to a total depth of 545 feet. After the cement hardened, a 6-inch diameter borehole was drilled to a total depth of 980 feet and left as an open hole in bedrock.

Airlift groundwater flow measurements during drilling were recorded as follows (steel casing set to a depth of 545 feet):

420 ft	= 2 gpm
580 ft	= 8 gpm
600 ft	= 6.5 gpm
700 ft	= 8 gpm
860 ft	= 10 gpm
880 ft	= 23 gpm
955 ft	= 30 gpm
980 ft	= 30 gpm (total depth)

The geologic units encountered in this borehole were Meagher Dolomite from 0 to 260 feet, clay zone from 260 to 272 feet, and metamorphosed Wolsey Shale (skarn and hornfels) from 272 feet to the final depth of 980 feet. No significant faults or fractures were noted during drilling.

One sample collected from a depth of 600 feet in borehole BHMW09-02 in August 2009 had the following results:

Lab pH (s.u.):	8.3
TDS (mg/L):	184
TSS (mg/L):	938
Turbidity (mg/L):	75.5
Alkalinity, Total (mg $CaCO_3$/L):	190
Hardness (mg $CaCO_3$/L):	151
Sulfate (mg/L):	15
Ammonia (mg/L):	0.1
Nitrate + Nitrite (mg/L):	0.49

Metals at low values were detected in dissolved concentrations for the following: arsenic, barium, copper, manganese, and molybdenum. All metal detections were very low with no exceedances of water quality standards. The following metals were not detected above the method detection limit by the laboratory: aluminum, antimony, beryllium, cadmium, chromium, cobalt, iron, lead, mercury, nickel, selenium, silver, strontium, thallium, vanadium, and zinc.

Exploration Well BHMW09-03

Located near the proposed portal entrance, borehole BHMW09-03 was drilled as an angle borehole and drilled to a total depth of 500 feet. Approximately 80 feet of steel casing was installed in the hole mostly in unconsolidated material down to bedrock.

Airlift groundwater flow measurements during drilling were recorded as follows (steel casing set to a depth of 80 feet):

200 ft	= 5 gpm
400 ft	= 15 gpm
500 ft	= 22 gpm

The geologic units encountered within this angle borehole were Meagher Dolomite from 0 to 265 feet, Marble from 265 to 280 feet, Meagher Dolomite from 280 to 360 feet, Marble from 360 to 370 feet, Meagher Dolomite from 370 to 440 feet, Quartzite and Skarn from 440 to 490 feet, and Quartzite from 490 feet to the final depth of 500 feet. A fracture zone was encountered at about 420 feet, which resulted in an increased flow rate to approximately 22 gpm. A water quality sample was not collected from BHMW09-03. This exploration well has been abandoned and monitoring from this site will no longer occur.

Exploration Well BHMW09-04

Borehole BHMW09-04 is was drilled in October-November 2009 to a total depth of 1,120 feet. Steel casing (6-inch diameter) was installed to depth of 620 feet, with an open borehole from the bottom of the casing to the total depth drilled.

Airlift groundwater flow measurements during drilling were recorded as follows (steel casing set to a depth of 620 feet):

460 ft	= 1.5 gpm
800 ft	= 25 gpm
900 ft	= 25-30 gpm
1,020 ft	= 25-30 gpm
1,120 ft	= 30 gpm (total depth)

The geologic units encountered in this borehole were Wolsey Shale from 0 to 490 feet, Meagher Dolomite from 490 to 1,070 feet, and Skarn from 1,070 feet to the final depth of 1120 feet.

One sample collected from the total depth of 1,120 feet in borehole BHMW09-04 in November 2009 had the following results:

Lab pH (s.u.):	8.3
TDS (mg/L):	119
TSS (mg/L):	184
Turbidity (mg/L):	62.5
Alkalinity, Total (mg $CaCO_3$/L):	170
Hardness (mg $CaCO_3$/L):	178
Sulfate (mg/L):	16
Ammonia (mg/L):	0.1
Nitrate + Nitrite (mg/L):	0.34

Metals at low values were detected in dissolved concentrations for the following: antimony, barium, manganese, selenium, and thallium. For the measured dissolved metal concentrations, all detections were very low. The following metals were not detected above the method detection limit during sampling: beryllium, mercury, molybdenum, nickel, silver, strontium, and vanadium.

Exploration Well BHMW09-05

Borehole BHMW09-05 was drilled in December 2009 and January 2010 to a total depth of 1,285 feet. Steel casing (6-inch diameter) was installed and cemented to a depth of 680 feet. A 6-inch diameter open borehole was then drilled to the total depth.

Airlift groundwater flow measurements during drilling were recorded as follows:

200 ft	= 1 gpm
320 ft	= 5 gpm
430 ft	= 1 gpm
600 ft	= 20-23 gpm
720 ft	= 20-23 gpm
800 ft	= 25 gpm
1,000 ft	= 28 gpm
1,285 ft	= 30 gpm (total depth)

Geologic units encountered within this borehole were Shale/Limestone from 0 to 230 feet, Shale from 230-340 feet, Shale/Dolomite from 340-385 feet, Shale from 385-615 feet, Shale/Dolomite from 615-775 feet, Marble from 775-1,170 feet, and Skarn/Hornfels from 1,170 to the final drill depth of 1,285 feet. A water quality sample was not collected from BHMW09-05.

1.2.4.5 Groundwater Monitoring and Water Supply Wells

Three water quality wells have been drilled for the purpose of monitoring water quality near the LAD areas. The drilling information for these wells is available in Table 1.2.4. As mentioned previously, the monitoring requirement for the exploration program specifies quarterly monitoring of static water levels from the exploration drillholes, which were discussed in the

previous section. In addition to these wells, BHJV has implemented a water quality collection program from three additional wells near the LAD areas. Water quality will be collected on a monthly basis for these wells. At the time this application was written, water quality samples had been collected, but results were unavailable. Information on the three monitoring wells will be discussed below. Their locations are available on Figure 4.

LADMW-1

This monitoring well was drilled in September of 2009 to a total depth of 65 feet. The well is cased for 60 feet of 4-inch slotted PVC pipe. Water quality sampling occurred in March 2010.

LADMW-2

This monitoring well was drilled in January 2010 to a total depth of 60 feet. The well is cased its entire depth with 2-inch slotted PVC pipe. Water quality sampling occurred in March 2010.

LADMW-3

This monitoring well was drilled in September 2009 to a total depth of 67 feet. The well is cased for 60 feet with 2-inch slotted PVC pipe. Water quality sampling occurred in March 2010.

Water Supply Well

A water supply wells was also drilled near the proposed portal site. This well was reported drilled vertically to a depth of 480 feet, with a maximum water yield reported to be around 250 gallons per minute.

Sample Results

Water samples from two LAD monitoring wells (LAD1MW & LAD2MW) have been collected monthly since March 2010. Water from underground was first sent to LAD 2 on April 12, 2010 and to LAD 1 on May 17, 2010. The third LAD monitoring well (LAD3MW) has either been dry or only has a few inches of water in the bottom. LAD 3 has not been constructed yet, so it has not been used for application of excess water from the Butte Highlands project.

These three LAD wells are each completed to a depth of 60 feet and are shown on Figure 4. In March and early April 2010, depth to water in wells LAD1MW and LAD2MW were approximately 23 and 8 feet below ground surface (bgs), respectively. Beginning in late April 2010, the water levels in LAD1MW and LAD2MW rose to about 16 and 5 feet bgs, respectively. Since that time, the water level in LAD2MW has remained about the same; however, the water level in LAD1MW continued to rise to the current level of about 12 feet bgs.

A summary of available water quality for these wells is presented in Appendix S. Results of groundwater samples collected from wells LAD1MW and LAD2MW show the following with respect to groundwater quality standards:

- Iron (dissolved): Exceeded secondary standard (0.3 mg/L) in one sample from LAD1MW collected in May 2010 (1.2 mg/L).
- Total suspended solids (TSS): Exceeded secondary standard (500 mg/L) in one sample from LAD1MW collected in March 2010 (1,140 mg/L); TSS was also elevated in April 2010 (348 mg/L) from LAD1MW and then declined in subsequent samples down to 6 mg/L in August 2010.

Some of the total metals concentrations from wells LAD1MW and LAD2MW exceeded surface water standards for aquatic life. However, after TSS decreased to less than 15 mg/L in samples collected after May 2010, none of the LAD groundwater samples exceeded aquatic life standards for surface water.

Groundwater samples have been collected from the underground exploration tunnel at the following locations:

- Sample MAR-635 (collected 4/14/10) and sample MAR-852 (collected 5/27/10), both from the underground Main Access Ramp; these samples were collected directly from water coming out of rock fractures 635 feet and 852 feet from the portal entrance.
- Sample PV (collected 4/14/10, 5/11/10, and 5/25/10) from the Pump Vault which is located at the downstream end of the outside settling ponds where the pond water is then pumped to the LAD area.
- Sample W-3 (collected 4/14/10) is an underground sample also collected from groundwater issuing from the wall rock in the Main Access Ramp (MAR) 610 feet from the portal entrance.

A summary of available water quality for the underground mine samples (MAR-635, MAR-852, PV, and W-3) is presented in Appendix S. The PV-samples best represent water that has been pumped to the LAD area since mid-April 2010. Results of these groundwater samples show the following with respect to groundwater quality standards:

- Nitrate (total): Exceeded primary standard (10 mg/L) in PV sample collected in April 2010 (22.4 mg/L). This exceedence was most likely due to use of bulk emulsion underground for explosives. BHJV switched to packaged emulsion explosive to reduce nitrate concentrations after the April 14th sample analysis wereasceived.
- pH: Exceeded upper pH limit (8.5 pH units) in PV sample collected in May 2010 (10 pH units); this was most likely due to cement grouting that affected the water pH.

The aquatic life standards for four metals (total recoverable copper, iron, lead, and manganese) were exceeded in the May 2010 sample for MAR-852; however, the TSS concentration (45.6 mg/L) was elevated in this sample.

The LAD area at Butte Highlands is located in the upper Middle Fork Moose Creek drainage. Surface water monitoring station WS-6 is located in this stream down gradient of the LAD area, near monitoring well LAD2MW. Monthly flow measurements at WS-6 from September 2009 to September 2010 show low flows of less than 10 gal/min in the winter through April, and flows in the range of 30 to 60 gal/min in May through September 2010. Surface water station WS-8 (the only seep or spring inventoried or monitored at the site), located in the uppermost segment of Middle Fork Moose Creek near monitoring well LADMW1 was added to the monitoring program in April 2010. Monthly flow measurements at WS-8 show 20 to 30 gal/min through June 2010, dropping to 1 to 2 gal/min in July through September 2010. Surface water stations WS-6 and WS-8 are shown on Figure 4.

A summary of available water quality data for surface water sites WS-6 and WS-8 is presented in Appendix S. Results of monthly surface water samples collected from WS-6 during the period September 2009 through August 2010 show the following with respect to surface water quality standards:

- Copper (total): Exceeded aquatic life standard (0.00285 mg/L) in one sample collected from WS-6 in November 2009 (0.078 mg/L).
- Lead (total): Exceeded aquatic life standard (0.000545 mg/L) in two samples collected from WS-6 in November 2009 (0.00089 mg/L) and April 2010 (0.00061 mg/L).

At WS-8, surface water standards were not exceeded in the monthly samples collected and analyzed from April through August 2010.

It is also noted that the nitrate concentrations at WS-6 from September 2009 to April 2010 were 0.06 mg/L or less; whereas, the concentrations from April through August 2010 were in the range of about 0.10 to 0.25 mg/L. The nitrate concentration in the April 2010 sample from WS-8 was 0.95 mg/L; whereas, subsequent samples were less than 0.03 mg/L. It is also noted that none of the parameters listed above that exceed standards are carcinogenic parameters (i.e. arsenic, beryllium, uranium).

1.2.4.6 Underground Dewatering Test Well and Piezometers

An underground dewatering well and four underground piezometers were installed for hydrology test work. The locations of the dewatering well DWW10-01and the piezometers UGPZ-01, UGPZ-02, UGPZ-03, and UGPZ-04 are shown relative to the underground workings in Figure 27. The dewatering well was initially drilled from the surface at 7,887 feet elevation as a 12 inch diameter bore to a depth of 600 feet and lined with a cemented 10 inch diameter steel casing. A 10 inch diameter bore was then drilled from 600 feet to a depth of 980 feet below the surface and lined with an 8 inch diameter steel casing to 952 feet. The 8 inch casing was perforated between 520 feet and 935 feet depth. The underground workings were then advance to intercept the well at 7,370 feet elevation, thus creating an underground well 435 feet deep, with a collar at 7,370 feet elevation, and perforated from 7,367 feet elevation down to 6,952 feet elevation. The portion of the borehole above the old workings was capped at the surface and underground at back level. A pump capable of lifting 400 gallons per minute was installed in the underground well.

Water quality data from DW10-01 is summarized in Appendix S. Water flow data from the test dewatering well is summarized in the *Hydrogeologic Characterization and Numerical Groundwater Model for the Butte Highlands Underground Mine* by Itasca Denver, January 2012 found in Appendix Z.

Four underground piezometers were installed. UGPZ-01 and UGPZ-02 are grouted core holes with three pressure transducers in the each hole and were installed in support of the hydrology test work described in Appendix Z. UGPZ-03 and UGPZ-04 are open core holes that are used for water sampling and water level measurements. UGPZ-03 is located in the footwall of the orezone about 400 feet from the old workings. It is uncased, but has a stand-pipe with valve grouted in the top 10 feet of the hole. UGPZ-04 passes through the old working below the water table. A one inch diameter PVC pipe has been installed from the collar down to and passing through the old stope. The bottom 20 feet of the PVC casing is slotted where it passes through the old stope. Water quality data from UGPZ-03 and UGPZ-04 is summarized in Appendix S.

1.2.5 Water Balance

During underground exploration activities in the Butte Highlands mine, groundwater inflows to the main access and the upper access ramps were measured at rates up to 340 gpm. Inflows to the 600 ft deep inclined shaft in the historic Highlands mine were reported to have been as

much as 600 gpm. To obtain a better understanding of the quantity of groundwater inflow that may be encountered during development and mining of the proposed Butte Highlands mine, hydrogeologic investigations, including a long-term constant-rate pumping test, were undertaken.

Preparations for the constant rate pumping test included installation of an underground prototype dewatering/test well and three piezometers. The prototype dewatering well, DWW10-01, was drilled to a depth of 980 ft (6,907 ft NGVD) and equipped with 8-inch steel casing which was perforated from a depth of 520 ft (7,367 ft NGVD) to a depth of 935 ft (6,952 ft NGVD). The well was equipped with an electric submersible pump capable of producing 400 gpm. A variable frequency drive (VFD) and a flow meter were installed so that the well production rate could be controlled and measured.

Two underground piezometers, UGPZ-01 and UGPZ-02, equipped with grouted-in vibrating wire pressure transducers were installed at distances of 57 and 528 ft from the dewatering well. Each was equipped with three transducers placed to monitor groundwater pressures in separate geologic formations.

A third underground piezometer, UGPZ-03, was installed near the end of the upper access ramp. This is an open hole drilled to a length of 200 ft and equipped with a cemented surface casing, flow control valve, and pressure gauge.

Following a step-drawdown test to determine the performance characteristics of the test well, a 10-day constant rate pumping test was conducted. The test indicated:

- The hydrogeologic system at the Butte Highlands project is complex and is characterized by a wide range of hydraulic heads, hydraulic gradients, and rock hydraulic properties.
- The groundwater system in the project area is divided into compartments that are separated by faults and/or different rock types/formations.
- From the standpoint of mine dewatering, rock permeability is governed by secondary permeability (i.e., most of the permeability is associated with fractured rock induced by faulting and/or jointing).
- The flooded workings of the old Highlands mine are hydraulically connected to the Butte Highlands mine.

1.2.6 Groundwater Modeling

Elevations reported in this section (1.2.6) are depicted on cross-section (Figure 15 and Figure 16.

1.2.6.1 Mine Dewatering

A three-dimensional numerical groundwater flow model of the Butte Highlands mine and surrounding area was constructed using the finite-element code MINEDW. The model was used to simulate mine dewatering to assess the quantity of water that will have to be pumped from underground dewatering wells to maintain dry conditions in the ramps and stopes. A technical report summarizing the groundwater flow model and simulations is included as Appendix Z.

Model simulations indicate that dewatering at a steady rate of 750 gpm will dewater the ground surrounding the ore zones in advance of mine development and maintain the groundwater level at least 50 feet below the scheduled mine development (elevation 6,300 feet) throughout the active mining life of the project. Figure 26 illustrates the predicted extent of the 10-ft water-table drawdown contour after four years of mine dewatering. The shape of the contour is influenced by faults and intrusive bodies which are simulated as low conductivity features. The 10-ft drawdown contour encompasses the currently flooded historic Highlands Mine workings and portal. Drainage from the portal of this mine is monitored at surface-water monitoring station WS-1. WS-1 is predicted to stop flowing within days of the beginning of mine dewatering as evidenced by the cessation of flow during the DWW10-01 pump test.

1.2.6.2 Mine Flooding

After mining is completed, and the mine is allowed to flood, water levels in the mine area will begin to recover from the dewatered elevation of 6,300 feet. Modeling results predict water to rise systematically over a period of 7 to 8 years to an elevation of about 7,339 feet, where it reaches the spill over point to flow down the gently inclined historic Highland Mine adit to a point of discharged at 7,300 feet When this historical adit is sealed with a water tight plug as is proposed in the mine closure phase of the new Butte Highlands mine, water will again rise and flood the workings to an elevation of 7,435 feet where it would begin to discharge from the new Butte Highland Mine portals. Closure of these portals will also be with either a conventional plug or a water tight plug depending on the expected hydrostatic head at the time of closure.

Historical data from a report by W.B. Carroll (Carroll, undated document[1]) concerning mine workings (presumably from a shaft) on Nevin Hill (the hill below which the historic Highland mine is situated) and prior to the construction of the historic Highland adit, states that “the mines were worked to a water level at 500 feet below the surface of the hill….”. Based on this information the uppermost elevation of the historic water table under Nevin Hill would have been about 7,465 feet.

Another piece of information available to estimate of the length of time required for mine flooding is that in driving one of the new exploration decline headings for the new Butte Highland Mine, water was first encountered at 7,339 feet above sea level (the spillover level of water into the historic Highland Mine adit). The decline was driven to an elevation of 7,283 feet, at which point it was taking on water at a rate of about 340 gallons per minute (gpm). The inflow of water was decreased to about 34 gpm using underground fracture grouting techniques. Subsequently this exploration decline heading was abandoned and a new incline was driven above the water table from which to conduct additional exploration drilling. The abandoned decline filled to the original water level, a vertical distance of 56 feet in less than one month. If we assume similar rates of filling from the spill over point of the old Highland adit (7,339 feet) to the pre-mining water level of 7,465 feet (a distance of 125 feet) we might expect this upper portion of the mine to fill in two to three months (as filling rates typically decrease as a stable regional groundwater table is approached). This would imply that the filling of the Butte Highland

[1] Carroll, W.B. unknown date. Report of W.B. Carroll, Mining Engineer and Consulting Geologist, Formerly Associated with the Montana School of Mines. Prepared for the Butte Highlands Mining Company, Butte, Montana. 8 p.

Mine from the maximum depth of dewatering (6,300 feet) to the likely pre-mining water level (7,465 feet) would take approximately 7 to 8 years.

1.3 Wetlands

1.3.1 Introduction and Study Area

The following is a summary of the wetlands delineation for the Butte Highlands Project. The wetlands delineation was conducted by AMEC Earth and Environmental, Inc. to assess the potential for project activities to impact wetlands. The project area was evaluated for the presence and extent of wetlands using the standard methods described in the 1987 Corps of Engineers Wetlands Delineation Manual (Environmental Laboratory 1987) and the Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys, and Coast Region (USACE 2010). The complete wetlands delineation report entitled "Wetland Delineation Report, Butte Highlands Project, Silver Bow County, Montana" is provided in Appendix G.

The objectives of AMEC's assessment were to:

- Identify areas on the claims meeting the U. S. Army Corps of Engineers; (USACE) criteria for wetlands or other waters of the U. S.,
- Delineate the boundaries of all identified wetlands according to USACE methods, and
- Prepare a delineation report that identifies and describes the existing wetland resources that were located in the proposed project area.

The study area for the wetlands assessment is located in Silver Bow County, Montana, approximately 15 miles south of Butte (Appendix A, Figure 1). The Project straddles the Continental Divide within the upper portion of the drainages of Basin Creek, Fish Creek, and Middle Fork Moose Creek. The wetlands baseline investigation included all areas within the Pony Placer Claim and areas of proposed mining activity in the other claims.

1.3.2 Methods

Prior to the field survey, the following information sources were investigated:

- USGS quadrangle maps (1:24,000 scale Mount Humbug and Pipestone Pass quadrangles);
- Aerial photography;
- Natural Resources Conservation Service maps;
- National Wetland Inventory maps.

The project area was evaluated for wetlands using the routine level-2 determination method described in the *1987 Corps of Engineers Wetlands Delineation Manual* (Environmental Laboratory 1987) and the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys, and Coast Region* (USACE 2010). The routine, level-2 determination method includes a review of existing data in addition to conducting an on-site field investigation.

1.3.3 Results

The wetland delineation assessment recorded 12 wetlands in the study area, 11 within the Pony Placer claim and one on the Main Ripple Claim (Appendix G, Figure 2). Wetlands 1, 3, and 12 are likely jurisdictional and subject to regulation by the USACE in accordance with Section 404 of the Clean Water Act. The remainder are likely not jurisdictional and subject to regulation by the USACE in accordance with Section 404 of the Clean Water Act since they are isolated and do not have a significant nexus with downstream receiving water. Table 1.3.1 summarizes the findings of the wetlands delineation assessment, depicting the measured size of wetlands within the Project Area. For more information on each of these sites, please refer to the Wetland Delineation Report, Butte Highlands Project, Silver Bow County, Montana contained in Appendix G.

Table 1.3.1. Measured Size of Wetlands Within the Butte Highlands Project Claim Boundaries

	Area		Perimeter	
Wetland Number	**Acres**	**Square Meters**	**Feet**	**Meters**
1	5.33	21,563	8,858	2,700
2	0.20	798	614	187
3	7.25	29,343	11,245	3,428
4	0.03	140	162	49
5	0.33	1,332	656	200
6	0.14	568	477	145
7	0.04	142	164	50
8	1.05	4,251	1,167	356
9	0.19	779	516	157
10	0.05	197	314	96
11	0.08	337	336	102
12	0.09	365	482	147
Total	**14.78**	**59,814**	**24,991**	**7,617**

1.3.4 Potential Impacts to Wetlands

The only proposed Project facilities that are physically located near wetlands are LADs on the Pony Placer claim (Appendix G, Figure 2). In this area, the LAD site design and actual construction were laid out to avoid wetlands, thus avoiding any direct impact to wetlands. Monitoring of wetlands in the LAD area is being conducted by periodically analyzing samples of water that is discharged to the LAD areas. To date, no metals concentrations from LAD water (3 Pump Vault (PV) samples) have exceeded either the groundwater human health standards (dissolved metals) or the surface water aquatic life standards (total metals). Groundwater samples also are collected from the two monitoring wells (LAD1MW & LAD2MW) located in the

LAD area. There are no anticipated direct impacts to wetlands (dredging, excavating or filling) at the project site that result from the proposed action in the Operating Permit Application.

With the exception of the very small wetland near the Highland Mine portal (Wetland 12, Appendix G, Figure 2), none of the wetlands identified in the project area directly overly the area of water table draw-down (cone of depression) predicted to result from mine dewatering (Figure 26). This suggests that the mine dewatering operations may have only minimal impact to the existing wetlands, particularly if the regional ground water table is not depressed beneath the wetland areas. However, it is possible that potential impacts to wetlands could also occur as a result of dewatering of the block of ground located up-gradient of the wetlands (Figure 26).

For the most part, MPDES outfalls are located downstream of, and are therefore not a potential direct source of water supply to wetlands. The exception to this is wetland W4 that lies downstream of Outfall 004 and would therefore provide water to supply this wetland (Figure 26).

There are two other potential sources of water that may have established and continue to maintain the project area wetlands. One source is a lateral source of water that moves down topographic gradients through alluvial/colluvial materials and forms wetlands in these materials in basins or flat lying areas along the lower transmissivity bedrock contact or colluvial interface. This is the type of source that could be impacted and effect the sustainability of area wetlands due to dewatering of the up-gradient water source in the vicinity of topographically high areas overlying proposed underground workings. The area and depth of the predicted cone of depression in the local groundwater table is shown on Figure 26.

Another potential water source that may sustain project area wetlands is the vertical (upward) migration of water from the regional groundwater table or the intersection of the regional groundwater table with the topographic surface. Again, hydrologic modeling suggests the cone of depression of the regional groundwater table will not extend as far southwest, such that it underlies the existing wetlands. If this is the case, dewatering of the mine should have little impact on the area wetlands. It is also possible that the water to sustain wetland comes from both lateral and vertical migration of shallow groundwater.

In order to evaluate which of these groundwater source models is operating, and to provide baseline data against which to quantify potential future impacts to wetland water levels that could result from mine dewatering, BHJV has initiated a pre-mining groundwater investigation. This investigation will establish existing fluctuations in groundwater levels in area wetlands and evaluate lateral and vertical gradients in bedrock and colluvium using five sets of paired piezometers constructed in different wetland areas located in the Basin, Fish, and Moose Creek drainages. One piezometer of each pair was completed in near surface groundwater (0-10 feet) and the other in bedrock if possible, or at a minimum depth of 20 feet depending on the accessibility of the wetlands by vehicle mounted drilling equipment. Water levels in each of these wetland areas are being monitored using transducers. Additional piezometers to measure water levels in the wetlands could be installed at a later date (but prior to the initiation of dewatering) to supplement the data set and document the aerial impact of potentially lower groundwater levels that might result from mine dewatering. Installation of the piezometers was completed in late summer 2012 and an interim report of the data will be prepared and submitted to DEQ in late 2012 or early 2013. Final data acquisition and reporting is scheduled for late spring 2013 after the anticipated peak of the seasonal hydrograph.

Another component of wetland monitoring could include periodic documentation of plant types and condition at several transects located in the wetlands. Descriptions of wetland conditions would be recorded for several quadrants within each transect. This monitoring would help

determine if any changes to wetland vegetation might be occurring due to LAD water introduction or mine dewatering.

If in fact there is a future lowering of shallow groundwater levels in the vicinity of the existing wetlands as a result of dewatering, it would likely affect the size and functionality of the wetland areas. With severe enough groundwater level decreases it is unlikely the that wetlands would be sustained over the

8 year mine life and the additional 7-8 years of water table rebound (once mining ceases and dewatering is stopped) without introducing a supplementary supply of water to the wetlands. To mitigate any future potential impacts should they be identified, BHJV commits to maintaining groundwater levels in existing wetlands within the range of elevations established in the baseline study period using treated, collected or pumped (from water supply well) water additions to the wetlands, until such time as the regional groundwater table has rebounded to near current levels. Ultimately in closure when the new Butte Highland Mine adits are plugged, groundwater levels should rise to even higher levels, such as those that existed prior to mining of the historic Highland Mine.

Plugging of the historic Highland Mine adit as is proposed in the new Butte Highlands Mine closure plan will eliminate direct discharge from the adit to Basin Creek. This discharge represents a small component of the overall water sources reporting to the Basin Creek watershed and may support wetlands that did not exist prior to mining. Therefore, elimination of this flow would likely not have significant impacts on the overall watershed or Basin Creek Park Reservoir however any wetlands that formed in response to discharge from the historic adit would likely not be sustained after the adit is plugged. The US Army Corps of Engineers (Corps) was notified of the potential to impact these wetlands and stated that no Corps permitting would be required as no dredging or filling of wetlands are proposed as part of the Butte Highlands mine project (Appendix AI).

Down-gradient of the Highland Mine, the Basin Creek drainage contains the Basin Creek Park Reservoir, which has been used as a public water supply for the city of Butte in the past (Timberline Resources hold the water right for the discharge from the adit). In this regard, it is of interest to note that the construction of the Basin Creek Park Reservoir had been completed prior to 1917 (from existing historical photographs, researching actual date of construction) at least 13 year prior to the development of the historic Highland adit. This would indicate that the initial filling of the reservoir was expected to occur by recharge with surface water run-off and ground water recharge from the Basin Creek drainage basin prior to mining of the historic Highlands Adit.

Elevated groundwater levels ultimately established in closure of the new Butte Highland Mine adits by constructing the adit plugs and flooding of the mine workings, should provide quantities of water similar to those that existed prior to mining in areas of the various drainage basins through seeps and springs, surface water run-off, wetlands, and natural recharge of groundwater base flow into surface water channels. Figure 26 shows the present location of the Fish, Moose, and Basin Creek topographic drainage basin divides and drainage basins to which elevated groundwater levels resulting from mine flooding of the new Butte Highlands Mine would report. In addition, Figure 26 illustrates the location of the axis of the cone of depression developed at the peak of mine dewatering and as such provides an additional qualitative look at where groundwater recharge resulting from mine flooding may report. It is not possible to accurately quantify the respective volumes reporting to each drainage basin, but under the

conditions resulting from new Butte Highland Mine flooding, water recharge to the basins should return to a natural pre-mining condition after a period of 7 to 8 years.

1.4 Wildlife

1.4.1 Introduction and Study Area

The following is a summary of the wildlife baseline investigation for the Butte Highlands Project. The wildlife baseline investigation was developed to assess the potential for Project activities to impact wildlife. This investigation summarizes extensive species distribution maps and habitat association information that were available through the Montana Natural Heritage Program, Montana Department of Fish, Wildlife, and Parks, and the U.S. Fish and Wildlife Service. When combined with field observations that were made during 2009, this information allowed assessment of potential species occurrence in the Project area. The complete wildlife baseline investigation report was compiled by Kline Environmental Research, LLC and is provided in Appendix H as the "Review of Existing Wildlife Data and July 2009 Wildlife and Habitat Observations for the Butte Highlands Project". An additional report describing field survey activities and results for western toads was conducted in summer 2012 as described by AMEC in Appendix AH.

The objectives of the wildlife baseline investigation were to:

- Summarize existing information pertaining to wildlife in the Project area;
- Document wildlife observations that were made while conducting stream and wetland surveys during July 2009.

The study area for the wildlife baseline investigation centers on the Project area in Silver Bow County, Montana, approximately 15 miles south of Butte (Figure 3). The Project straddles the Continental Divide within the upper portion of the drainages of Basin Creek, Fish Creek, and Middle Fork Moose Creek. All wildlife species whose reported range includes or is near the Project location were considered as potentially occurring within the Project boundaries. The resulting species list was refined to be more Project-specific, as described below.

1.4.2 Methods

The following information sources were investigated:

- Montana Natural Heritage Program (http://mtnhp.org/default.asp)
- Montana Department of Fish, Wildlife, and Parks (http://fwp.mt.gov/doingBusiness/reference/gisData/download.aspx)
- Montana Field Guide (http://fieldguide.mt.gov/)
- U.S. Fish and Wildlife Service (http://www.fws.gov/mountain-prairie/mt.html).

A search of the Montana Department of Environmental Quality web site and a keyword internet search using the names of previous operators and local geographic descriptors did not provide additional information.

The Montana Field Guide included maps of distribution for vertebrate species that occur in the state. Using these maps, a list of all vertebrate species that could potentially occur at the

Project site and species conservation status was compiled (Table 1.4.1). The potential status of species included exotic species, MT Species of Concern, MT Comprehensive Fish and Wildlife Conservation Strategy status, Partners in Flight status, and designations of the U.S. Fish and Wildlife Service (FWS), Forest Service (FS), and Bureau of Land Management (BLM). The Montana Department of Fish, Wildlife, and parks web site also included distribution maps for some species.

Many of the species whose reported range included the Project area were determined to be unlikely to occur on the site because their required habitat types do not occur there. Although no specific efforts were made to document wildlife sign or habitat during field work that was conducted during July 2009, general habitat observations allowed many species to be omitted from the list of potential species in the Project area. Several wildlife sightings were also noted including western toads observed during a species specific field survey in 2012.

1.4.3 Results

The Project area includes a mosaic of forested and non-forested habitats (Figure 5). Forested portions are dominated by fir, pine, and spruce. Unforested areas are densely to moderately vegetated with a variety of shrubs, forbs, and grasses. The Pony Placer claim is mainly unforested and gently sloping with scattered, wet meadows and stands of aspen and spruce. Riparian wetlands exist along reaches of Middle Fork Moose Creek and tributaries that flow through the claim. The Main Ripple claim is steep, forested mainly with conifers, and includes the origin of Basin Creek, but does not include significant riparian habitat. The other claims are mainly steep, have no wetland or stream habitat, and conifer coverage ranging from sparse to dense.

Based on the Montana Field Notebook distribution maps, the Project area is within the range of 3 amphibian species, 285 bird species, 78 mammal species, and 7 reptile species. This list was reduced to 18 species that have special conservation status and habitat requirements that may occur in the immediate Project area (Appendix H, Table 1). Examples of habitat requirements, based on the Montana Field Notebook, that do not occur in the Project area and were used to exclude some species are large bodies of water, agricultural fields, cliffs above timberline, and beaches.

As of September 2009, no terrestrial vertebrate species listed under the Endangered Species Act as endangered, threatened, proposed, or candidate occurred in Silver Bow County. The nearest neighboring county to the Project is Madison County, where Canada lynx (*Lynx canadensis*) and grizzly bear (*Ursus arctos horribilis*) are listed as threatened. The distribution map in the Montana Field Guide indicated that the Project area is within the year-round range of Canada lynx and the historic range of grizzly bear. The September 2009 USFWS update states that the list "…identifies the counties where one would reasonably expect the species to occur…" Apparently, different criteria were used for the Montana Field Guide distribution maps for Canada lynx. According to the USFWS update, Silver Bow County does not include critical habitat for Canada lynx.

Table 1.4.1. Potential Special Status Wildlife Species of the Butte Highlands Project Area

Class	Common name	Genus species	Range	MT Rank*	USFWS	USFS	BLM
Amphibian	Western Toad	*Bufo boreas*	year-round	S2		sensitive	sensitive
Bird	Cassin's Finch	*Carpodacus cassinii*	year-round	S3			
	Northern Goshawk	*Accipiter gentilis*	year-round	S3			sensitive
	Golden Eagle	*Aquila chrysaetos*	year-round	S3			sensitive
	Great Blue Heron	*Ardea herodias*	year-round	S3			
	Pinyon Jay	*Gymnorhinus cyanocephalus*	year-round	S3			
	Clark's Nutcracker	*Nucifraga columbiana*	year-round	S3			
	Flammulated Owl	*Otus flammeolus*	summer	S3B		sensitive	sensitive
	Mountain Plover	*Charadrius montanus*	summer	S2B			sensitive
	Grasshopper Sparrow	*Ammodramus savannarum*	summer	S3B			
	Pileated Woodpecker	*Dryocopus pileatus*	year-round	S3			
	Black-Backed Woodpecker	*Picoides arcticus*	year-round	S3		sensitive	sensitive
	American Three-Toed Woodpecker	*Picoides dorsalis*	year-round	S4			sensitive
Mammal	Hoary Bat	*Lasiurus cinereus*	summer	S3			
	Long-Eared Myotis	*Myotis evotis*	year-round	S4			sensitive
	Long-Legged Myotis	*Myotis volans*	year-round	S4			sensitive
	Canada Lynx	*Lynx canadensis*	year-round	S3	threatened	threatened	special status
	Pygmy Rabbit	*Brachylagus idahoensis*	year-round	S3		sensitive	Sensitive

*MT rank definitions:

S2 - At risk because of very limited and/or potentially declining population numbers, range and/or habitat, making it vulnerable to global extinction or extirpation in the state.

S3 - Potentially at risk because of limited and/or declining numbers, range and/or habitat, even though it may be abundant in some areas.

S4 - Apparently secure, though it may be quite rare in parts of its range, and/or suspected to be declining.

B - Breeding. Rank refers to the breeding population of the species in Montana. Appended to the state rank, e.g. S2B,S5N = At risk during breeding season, but common in the winter.

The following observations were made during July 2009 (Appendix H, Figure 3 and Photographs). Nest or brood protection behavior was displayed by a ruffed grouse (*Bonasa umbellus*), redwing blackbird (*Agelaius phoeniceus*), and green wing teal (*Anas crecca*) near or within the Pony Placer claim. A western toad (*Bufo boreas*) and Columbia spotted frog (*Rana luteiventris*) were seen in upper Middle Fork Moose Creek near or within the Pony Placer claim. A mule deer (*Odocoileus hemionus*) buck and antlerless mule deer were seen in the Red Mountain claim. A herd of elk (*Cervus canadensis*) was seen near the Pony Placer claim. A gray wolf (*Canis lupus*) or domestic canine paw track was seen near the Murphy claim.

In 2012 (Appendix AH) western toads were observed in three locations downstream of the mining claim boundary along Fish Creek but were not observed in Moose Creek or its tributaries nor along Basin Creek.

1.4.4 Discussion

The impact of the Project to wildlife will be minimal. No critical habitat is known to occur within the claim boundaries. In addition: the area of proposed facilities and activities is typical of the broader area surrounding the Project site; proposed disturbance sites include or are very near existing roads; the area is used for cattle grazing and recreation. As such, any additional displacement of wildlife resulting from the Project will be minimal due to the small Project footprint and existing uses.

1.5 Aquatic Habitat and Biology

1.5.1 Introduction and Study Area

The following is a summary of the aquatic habitat and biology baseline investigation for the Butte Highlands Project. The aquatic habitat and biology baseline investigation was developed to assess the potential for Project activities to impact streams, which are the only aquatic habitat type in the immediate Project area. This investigation summarizes fish species distribution information that was available through the Montana Fisheries Information System (MFISH) database and results of stream surveys that were conducted during 2009. Taken together, this information allowed assessment of potential fish species occurrence in the Project area. The complete stream baseline investigation report is provided in Appendix I.

The objectives of the stream baseline investigation were to:

- Summarize existing information pertaining to streams in the Project area;
- Document baseline conditions of stream habitat in the Project area based on field surveys that were conducted during July 2009.

The study area for the stream baseline investigation is located in Silver Bow County, Montana, approximately 15 miles south of Butte (Figure 3). The Project straddles the Continental Divide within the upper portion of the drainages of Basin Creek, Fish Creek, and Middle Fork Moose Creek. All drainages within and down-gradient of the patented claim boundaries were surveyed, from the upper limit of evidence of water flow to perennial stream habitat at varying distances downstream from the Project boundaries, see **Error! Reference source not found.**. Tributaries in neighboring drainages were also surveyed. Additional figures displaying the results of the baseline field surveys can be found in Appendix I.

1.5.2 Methods

1.5.2 Methods

The stream survey was conducted during July 6-12, 2009. Relevant features were photographed, described, and located using GPS. These features included general descriptions of stream and riparian habitat, observed fish, fish passage barriers, erosion, culverts, and other features. All field notes and photographs were tabulated along with GPS coordinates.

1.5.3 Results

Basin Creek

Basin Creek is a tributary to Silver Bow Creek, in the Upper Clark Fork River basin on the west side of the continental divide. It is 16.1 stream miles in length. Basin Creek is reported to support introduced brook trout from stream mile 12.5 (3.4 stream miles downstream of the Project) to its confluence with Silver Bow Creek. Native, genetically pure westslope cutthroat trout are reported to occur in the upper 6.9 stream miles of Basin Creek, including the upper 0.2 stream miles that are within the Main Ripple Claim (Appendix I, Figure 3). Both species are reported to be common, year-round residents.

To the contrary, results of the 2009 stream survey indicated that fish are unlikely to occur in the upper 0.27 mile section of Basin Creek. The channel was often braided or split into two or three shallow channels. Depths of 1 to 3 inches were common. While there were short segments that offered potential fish holding and spawning habitat in this reach, overall, it offered poor fish habitat due to shallow water, heavily embedded substrate, isolated reaches due to cascades, culverts, and braiding, and an absence of deep pools.

The lower 0.31 stream miles of the surveyed reach (stream mile 15.50 to 15.81) provided suitable habitat for a resident fish population. Riparian vegetation ranged from conifer stands of varying ages to sedge and horsetail meadows. Canopy coverage was generally moderate to light. With the exception of one short braided segment, the reach was a single channel. Depths of 4 to 8 inches and wetted widths of 4 feet were common, narrowing to 1 foot where the stream was incised in meadows. There was ample holding cover in the form of undercut banks, overhanging vegetation, and some large woody debris. A variety of habitat types were present, including high gradient riffles, runs, glides, plunge pools, and low gradient riffles, which were the most prevalent habitat type. Sand and gravel substrate dominated this reach. Sand would limit the use of this reach for spawning, although some spawning gravels were present. There were no deep pools, which would limit the use of this reach for overwintering. Three tributaries entered this reach, with one contributing approximately the same discharge as Basin Creek (stream mile 15.59). A significant barrier occurred at stream mile 15.66. The vertical drop was 3.5 feet, the plunge pool was 8 inches deep, and the landing was 4 inches wide, making the launch and landing challenging and thus probably presenting a barrier to most fish at the discharge that occurred during the survey.

Middle Fork Moose Creek

Middle Fork Moose Creek is mapped as originating in the Red Mountain Claim and flowing 2.7 stream miles to its confluence with Moose Creek (MFISH). It is reported to support a year-round resident population of introduced, hybridized Yellowstone cutthroat trout (unreported cross species) and to be used for spawning and rearing by introduced Yellowstone/westslope cutthroat trout hybrids. The abundance of these fish is unknown and their presence in the stream is presumably extrapolated from surveys that were conducted in Moose Creek. No

population or genetic survey data for Middle Fork Moose Creek was found. An unnamed tributary from the south crosses the Pony Placer Claim and enters Middle Fork Moose 0.5 stream miles downstream of the claim boundary. No information was found regarding the potential for this drainage to provide perennial stream habitat.

Reaches with dominant discharge and the highest potential for providing fish habitat in upper Middle Fork Moose Creek and its tributaries are misrepresented in the MFISH maps and database. The MFISH stream mile map shows the stream originating at stream mile 2.7, up-gradient from FS Road 8250. The 2009 stream survey revealed that Middle Fork Moose Creek originates down-gradient from FS Road 8250 in the Pony Placer Claim. Middle Fork Moose Creek was surveyed from its confluence with Moose Creek to the upper limit of a definable drainage (Appendix I, Figure 4). This limit occurred at stream mile 2.18, which was down-gradient from FS Road 8250.

The area above FS Road 8250 was surveyed and found not to include perennial or intermittent stream habitat. Only short, isolated segments of storm water runoff channels were located. Two culverts within the stream basin under FS Road 8250 were dry and did not have eroded channels or wetlands associated with them.

In addition, Tributary 1 and Tributary 1A provide a far greater quality and abundance of fish habitat than does the upper reach of Middle Fork Moose Creek. Tributary 1 (1.27 stream miles) was surveyed from the confluence with Middle Fork Moose Creek to a culvert under FS Road 8250, where it still had considerable flow but was unlikely to support fish (see below). Tributary 1A (0.61 stream miles) was surveyed from its origin, down-gradient of FS Road 8250, to the confluence with Tributary 1.

Between the confluence with Moose Creek and Tributary 1, Middle Fork Moose Creek (stream mile 0 to 0.71) was deeply incised (1 to 3 feet to the water surface) in a wetland. Riparian vegetation was mainly sedge and other non-woody wetland species. Canopy coverage was generally absent, except for some segments that flowed near bushes and scattered conifers. The reach was sometimes a single, dominant channel, but was often split into multiple channels or dispersed in a wetland. Depths of 1 to 3 feet and wetted widths of 1 to 2 feet were common. Holding cover in the form of undercut banks and overhanging vegetation was prevalent. Habitat types were mainly glides and runs, with some pools. The substrate was mainly organic detritus, sand, and silt with little or no spawning habitat. Deep, overwintering habitat was plentiful.

Upstream of the confluence with Tributary 1A (stream mile 0.79 to 1.42), Middle Fork Moose Creek flowed through a wetland; however, no definable channel was present through most of this reach. Within this reach, a large berm formed a pond (stream mile 1.03). Up-gradient from this pond, except for short segments with visible flow, the stream was totally dispersed within wetland habitat and no fish habitat was located. A small berm was present that appeared to direct the majority of the flow toward the pond. Without the small berm, it appeared possible that the majority of the discharge would flow to the south, where a minor portion of the flow was present during the survey.

From stream mile 1.42 to 1.89, there was a wide variety of stream conditions, most of which could potentially provide habitat for fish. However, several locations had conditions that fragmented the fish habitat into isolated segments, including an 18 m long segment that was dry, a 3 foot vertical barrier, debris jams, and dispersion in wetlands.

From stream mile 1.89 to the up-gradient extent of a defined drainage (stream mile 2.18), there was too much dispersion and insufficient discharge to provide fish habitat under the conditions that occurred during the survey.

Tributary 1 to Middle Fork Moose Creek was the only reach in the Project area where a fish was observed (stream mile 0.29). Based on a fleeting glimpse, the fish appeared to be a salmonid that was approximately 5 inches in length. The lower 0.15 stream miles of Tributary 1 was a meandering single channel through a wetland. Much of this segment had a gravel substrate and undercut banks, offering more consistent and higher quality fish habitat than the lower reach of Middle Fork Moose Creek. Wetted widths were generally between 2 and 4 feet. Typical water depth ranged from 4 to 24 inches. Upstream of stream mile 0.15, the gradient increased, resulting in a mix of low gradient riffles, high gradient riffles, and plunge pools. Habitat diversity was high, with holding cover in the form of large substrate, root wads, large woody debris, overhanging vegetation, undercut banks, and turbulence. Gravel and cobble substrate predominated. Riparian vegetation varied between wetland plants and conifers, resulting in widely varying canopy coverage. In wooded segments, wetted widths were generally 2 to 4 feet and depths were 3 to 6 inches. In wetland segments, wetted widths were reduced and depths were greater. Tributary 1A entered Tributary 1 at stream mile 0.64. Tributary 1 flowed as a single channel through a wetland upstream of this confluence until a berm was reached at stream mile 0.72.

Tributary 1 was dispersed for 0.1 stream miles upstream of this location, offering no fish habitat and blocking passage. Fish habitat resumed at stream mile 0.82, but was intermittent. There were segments of clean gravel, cobble, riffles, 12 inch deep pools, varying canopy coverage, and undercut banks. Between segments of good fish habitat were segments with high embeddedness, siltation, subsurface flow, dispersion, split channels, and a 4 foot barrier at stream mile 1.18. Significant flow continued upstream of a FS Road 8250 culvert and through a culvert that is approximately 0.3 stream miles upstream, under Fish Creek Road. The stream was not surveyed upstream of FS Road 8250.

Tributary 1A provided continuous habitat that may support a resident fish population. However, a barrier that would restrict upstream movement of small fish was 0.1 stream miles upstream of the confluence with Tributary 1. The barrier was 4 vertical feet and had a 16 inch deep plunge pool. In addition, while riparian and stream habitat diversity was high in Tributary 1A, overall fish habitat quality was reduced by high levels of substrate embeddedness. Tributary 1A originated in a wetland, down-gradient of FS Road 8250.

Fish Creek

Fish Creek flows 25.6 stream miles from its origin to the Jefferson River. Two unnamed tributaries to Fish Creek originate near the Project area (Appendix C, Figure 5). Tributary 1 is down-gradient from the Murphy Claim and enters Fish Creek at stream mile 25.2. Tributary 2 is fed by Tributary 2A, which crosses the southeast corner of the Main Chance Claim, joins with Tributary 2B, which is not potentially impacted by the Project, and enters Fish Creek at stream mile 24.8. The upper limits of fish distribution in Fish Creek are reported to be 0.1 stream miles downstream of the confluence of Tributary 2, based on surveys that were conducted, most recently, during 2007 downstream of stream mile 22.1. Introduced brook trout and native westslope cutthroat trout are reported to be year-round residents, but rare, in this portion of Fish Creek. Westslope cutthroat trout are considered potentially unaltered, genetically, with no record of stocking between stream mile 22.7 and 24.6 (1994 sampling), and are considered 90

to 99.9% pure based on genetic analysis of fish collected between stream mile 14.0 and 22.7 (MFISH, 2007 sampling).

Fish Creek was surveyed from an arbitrary location at stream mile 24.40 to the upper limits of a definable drainage (Appendix I, Figure 5). This limit occurred at stream mile 25.32. Two tributaries that originated down-gradient of the mine site were also surveyed. Tributary 1 (0.40 stream miles) was surveyed from the confluence with Fish Creek to the upper limits of a definable drainage. Tributary 2 (0.35 stream miles) was surveyed from the confluence with Fish Creek to the confluence of Tributaries 2A and 2B. Tributary 2A was surveyed to the upper limits of a definable drainage. Tributary 2B was surveyed to a culvert under Fish Creek Road, where it still had considerable flow.

The lower survey reach of Fish Creek (stream mile 24.40 to 24.66) was comprised of low gradient and high gradient riffles, runs, and pools that were typically 12 to 15 inches deep. Wetted widths of the riffles were 4 to 8 feet and depths were generally 5 to 8 inches. Conifers provided moderate canopy coverage, with some short open segments. High velocity flows through most of the reach maintained a gravel and cobble substrate that was low in fine sediments on substrate surfaces, but often highly embedded with sand. Plumes generated from walking indicated the presence of buried fine sediments in some locations. Holding cover was plentiful in the form of undercut banks, large substrate, and turbulent plunge pools. Much of the flow in this reach was derived from Tributary 2 at stream mile 24.66.

Existence of a fish population in Fish Creek is less likely upstream of the Tributary 2 confluence at stream mile 24.68, due initially to a 67 foot long cascade and low flow, which probably blocks all upstream fish passage under the survey conditions. Upstream of this cascade, Fish Creek offered intermittent fish habitat, but was often heavily silted, impounded, or segmented by wetlands or cascades. Populations of fish may exist that are isolated from the lower reach, downstream of Tributary 2, although highly embedded substrate and siltation would severely limit the availability of spawning habitat. The stream flowed intermittently subsurface in its headwaters and appeared to originate from a wetland at stream mile 25.32.

Tributary 1 entered Fish Creek at stream mile 25.12. Flows were generally too low to provide fish habitat, except for possibly the lower 22 feet of Tributary 1. Short segments of developed channel along its 0.40 mile length indicated that minimal fish habitat during high flows may be available.

Tributary 2 had similar or greater discharge than Fish Creek at their confluence. It probably supports fish through stream mile 0.06. At this point, a 100 foot long cascade probably blocks upstream passage for most fish. Upstream of this cascade, suitable habitat for spawning, rearing, and holding existed, despite numerous locations where the channel split and rejoined the main channel. The stream passed through a culvert at steam mile 0.12. The entire stream followed the path of a gravel road for a short segment where Tributaries 2A and 2B joined at stream mile 0.35.

Tributary 2A (0.74 stream miles) offered short, isolated segments of fish habitat and probably did not support any fish during the survey. Water was often only 1 to 2 inches deep, and disappeared in sand in places. There were impounded areas of sediment in the upper reaches and evidence of impounded sediment that had washed out.

Tributary 2B was similar to the main branch of Tributary 2. Low gradient riffles, high gradient riffles, cascades, and pools were common. Large cobble substrate and gravel predominated, although embeddeness was often high. Large woody debris was abundant, particularly in the

upper portion of the reach. A conifer canopy varied from light to heavy. There was significant flow through the culvert under Fish Creek Road where the survey ended.

1.5.4 Discussion

Streams in the Project area will not be directly impacted by proposed surface activities. The MFISH topographic map is incorrect in showing Middle Fork Moose Creek as extending under FS Road 8250 into the upper portion of the Pony Placer Claim. No intermittent or perennial stream habitat occurs in this area.

1.6 Vegetation

1.6.1 Introduction and Study Area

The following is a summary of the vegetation baseline investigation for the Butte Highlands Project. The vegetation baseline investigation was developed to assess the potential for Project activities to impact sensitive species of vegetation and promote the spread or introduction of noxious weeds. This investigation summarizes extensive information that was available through the Montana Natural Heritage Program and the Montana Department of Fish, Wildlife and Parks. In addition, a report on a vegetation survey that was conducted in the Highland Mountains (Lesica 1993) and an update for portions of the 1993 report (Mincemoyer 2005) were located. Information pertaining to noxious weeds was located on the web site of the Montana Department of Agriculture. When combined with field observations that were made during 2009, this information allowed assessment of potential species occurrence in the Project area. The complete vegetation baseline investigation report is provided in Appendix J.

The objectives of the stream baseline investigation were to:

- Summarize existing information pertaining to streams in the Project area;
- Document baseline conditions of stream habitat in the Project area based on field surveys that was conducted during July 2009.

The study area for the vegetation baseline investigation centers on the Project area in Silver Bow County, Montana, approximately 15 miles south of Butte (Figure 3). The Project straddles the Continental Divide within the upper portion of the drainages of Basin Creek, Fish Creek, and Middle Fork Moose Creek. All vegetation species located by Lesica (1993) were considered as potentially occurring within the Project boundaries. Lesica surveyed USFS lands and private inholdings above 6,000 ft, south of Pipestone Pass and Highway 10, west of the Jefferson River valley, and east and north of the Big Hole River valley. His survey was concentrated in five areas: Moose Town/Burton Park; Fish Creek/Limekiln Mountain; Red Mountain/Table Mountain; Moffet Mountain; Hells Canyon Creek. The species list in Lesica (1993) was refined to be more Project-specific, as described below.

1.6.2 Methods

In addition to the sources named above, the following datasets were investigated:

- Potential Natural Vegetation (PNV) Classification for Western and Central Montana and Northern Idaho;
- National Land cover Dataset for Montana;

- Montana Gap Analysis Project 90 meter Land Cover Data;
- Montana Climax Vegetation (NRCS source);
- 1Km AVHRR Land Cover Grid for Montana (EROS source);
- USFS vegetation layer;
- USFS timber layer.

The list of species reported by Lesica (1993) was compared to the current Montana Species of Concern /Potential Species of Concern list. Using this information, a list of all plant species that could potentially occur at the Project site and species conservation status was compiled. The potential status of species was included and showed the status of MT Species of Concern, and designations of the U.S. Fish and Wildlife Service (FWS), Forest Service (FS), and Bureau of Land Management (BLM).

Some information that was collected during 2009 is included below, including a map of areas of similar topography and vegetation (Figure 5). Relevant data from Kline's 2009 baseline investigations for wetlands and stream habitat (Appendices G and I, respectively) was also incorporated.

1.6.3 Results

The Project area includes a mosaic of forested and non-forested habitats (Figure 5). Forested portions are dominated by fir, pine, and spruce. Unforested areas are densely to moderately vegetated with a variety of shrubs, forbs, and grasses. The Pony Placer claim is mainly unforested and gently sloping with scattered, wet meadows and stands of aspen and spruce. Riparian wetlands exist along reaches of Middle Fork Moose Creek and tributaries that flow through the claim. The Main Ripple claim is steep, forested mainly with conifers, and includes the origin of Basin Creek, but does not include significant riparian habitat. The other claims are mainly steep, have no wetland or stream habitat, and conifer coverage ranging from sparse to dense.

Lesica (1993) offered the following description of the Project area and surrounding areas.

> "Vegetation of the Highland Mountains is predominantly coniferous forest dominated by Douglas fir (*Pseudotsuga menziesii*) and lodgepole pine (*Pinus contorta*). Spruce (*Picea engelmannii*) is common along streams and higher cool slopes. Whitebark pine (*Pinus albicaulis*) dominates subalpine and timberline forests. Limber pine (*P. flexilis*) is locally common on outcrops of calcareous parent material in the Moose Town and Fish Creek areas. Where granite is the parent material, coniferous forest generally dominates all aspects (narrow mesas above Hells Canyon Creek are an exception). On soils derived from metasediments, steppe dominated by sagebrush (*Artemisia tridentate*), rabbit brush (*Chrysothamnus* spp.), shrubby cinquefoil (*Potentilla fruticosa*) and Idaho fescue (*Festuca idahoensis*), occurs on warm slopes. Meadows dominated by tufted hairgrass (*Deschampsia cespitosa*) and sedges (*Carex* spp.) are common in Moose Town and Burton Park. Swamp and carr vegetation dominated by bog birch (*Betula glandulosa*) and willows (*Salix* spp.) are found along many drainages and in large areas of Moose Town. Groves of aspen (*Populus tremuloides*) occur sporadically in the Moose Town area."

1.6.3.1 Special Status Species of the Highland Mountains

Lesica (1993) identified 526 species of vascular plants in the Highland Mountains. Seven of these are Montana Species of Concern or Potential Species of Concern, currently considered present in Silver Bow County (MNHP), and located in the Highland Mountains. Five of the Species of Concern are classified as sensitive by the FS or BLM. None are listed under the Endangered Species Act. More recent surveys on BLM lands managed by the Butte Field Office (Mincemoyer 2005), which includes areas in the vicinity of the Project, did not reveal any changes to the findings of Lesica (1993). The following Table 1.6.1 lists the seven vegetative species of concern for Silver Bow County according to Lesica's study, followed by descriptions of each species and their habitat associations.

Table 1.6.1. Vegetation Species of Concern for Silver Bow County Located in the Highland Mountains (Lesica, 1993)

Genus species	Common name	Status*
Arabis fecunda	Sapphire rockcress	SOC, FS, BLM
Carex idahoa	Idaho sedge	SOC, FS, BLM
Draba densifolia	Dense-leaf draba	SOC
Erigeron gracilis	Slender fleabane	PSOC
Juncus hallii	Hall's rush	SOC, FS
Penstemon lemhiensis	Lemhi beardtongue	SOC, FS, BLM
Thlaspi parviflorum	Small-flowered pennycress	SOC, BLM

* SOC - MT Species of Concern, PSOC - MT Potential Species of Concern, FS - Forest Service, Sensitive, BLM - Bureau of Land Management, Sensitive.

Sapphire Rockcress - Arabis fecunda

Lesica (1993) located Sapphire Rockcress in the Moose Town and Fish Creek areas. Additional details on the locations are provided in Appendix A. It was found in mineral soil on south- or west-facing slopes, associated with sparse grasses or very open limber pine woodlands. The Montana Field Guide (January 13, 2010) describes habitat for this species as areas of relatively sparse vegetation on steep slopes with periodic natural erosion.

Idaho sedge - Carex idahoa

Lesica (1993) located Idaho sedge in the Moose Town and Fish Creek areas. Additional details on the locations are provided in Appendix A. It was found in drier ecotonal areas of wet meadows along streams in areas influenced by calcareous parent material. This is consistent with a description in the Montana Field Guide (November 30, 2009): "Idaho sedge inhabits moist alkaline meadows, often along streams (Vanderhorst and Lesica 1994). It most often occupies ecotonal areas between wet meadow and sagebrush steppe (Lesica 1998), and appears to be restricted to nearly level sites in the high valleys of southwest Montana." This is similar to some areas in the Pony Placer claim.

Dense-leaf draba - Draba densifolia

Lesica (1993) located this species near Interstate Highway 90 in coarse, sandy, granite-derived soil on a steep, south-facing bank. The Montana Field Guide (November 30, 2009) describes habitat for this species as, gravelly, open soil of rocky slopes and exposed ridges in the montane to alpine zones. This habitat type is not common within the Project claims.

Slender fleabane - Erigeron gracilis

Lesica (1993) located this species in the Moffet Mountain, Moose Town, and Fish Creek/Limekiln Hill areas. The plant appeared to be widespread throughout much of the Highland Mountains in silty to loamy soils of mesic to moist steppe and grasslands. The Montana Field Guide (January 13, 2010) describes habitat for this species as meadows, rocky slopes and talus in the subalpine and alpine zones.

Hall's rush - Juncus hallii

Lesica (1993) located this species in the Moose Town area. The habitat was described as moist soil on the drier margins of a wet meadow. According to the Montana Field Guide (November 30, 2009), this species occurs in subalpine parklands and moist meadows and slopes in the montane zone. This habitat type is common in the Pony Placer claim.

Lemhi beardtongue - Penstemon lemhiensis

Lesica (1993) located this species in the Moose Town and Fish Creek areas. The habitat was described as open exposure on a concave slope, dry on a residual mountain slope, sandy soil, and calcareous parent material. Additional details of the locations and habitat are provided as an appendix in Kline's "Review of Existing Vegetation Data and July 2009 Field Observations for the Butte Highlands Project" (Appendix J). Lesica considered this species to be probably enhanced by moderate levels of disturbance, but also threatened by mining and grazing. According to the Montana Field Guide (November 30, 2009), "In Montana, Lemhi beardtongue occurs on moderate to steep, east- to southwest-facing slopes, often on open soils. In Beaverhead County, it generally grows below or near the lower extent of Douglas-fir and/or lodgepole pine forest, in habitat dominated by big sagebrush and bunchgrasses, including western wheatgrass and Idaho fescue. Within these habitats, Lemhi beardtongue prefers areas that are more sparsely vegetated (Shelly 1990). In the northeastern Pioneer Mountains, it inhabits forb-dominated openings in lodgepole pine and to a lesser extent Douglas-fir forest; big sage is typically not present, and prominent forbs include Astragalus miser, Pedicularis contorta and Townsendia parryi. The species is not restricted to any particular geological substrate, and has been found on granitic soils as well as limestone and other sedimentary substrates. Soils are often very gravelly, however soil texture is highly variable and ranges from sand to fine clay. Field surveys from 1986-1989 indicate that it is most commonly found on gravelly loams. Some populations grow partially or entirely on roadbanks."

Small-flowered pennycress - Thlaspi parviflorum

Lesica (1993) located this species on an open exposure slope and a moist area of a flood plain. According to the Montana Field Guide (November 30, 2009), "In Montana it is known from Beaverhead, Carbon, Madison, Park and Silver Bow counties, where it is found from mid-elevation grasslands to alpine turf (6,500 to 10,000 feet). It most often inhabits sagebrush steppe dominated by Artemisia tridentata ssp. vaseyana and Festuca idahoensis." This habitat is not common within the Project claims.

The following taxa were used to varying degrees during July 2009 as indicators of wetlands in the Project area: sedge (Carex sp.); rush (Juncus sp.); willow (Salix sp.); wild iris (Iris missouriensis); shrubby cinquefoil (Dasiphora floribunda). Stands of Engelmann spruce (Picea engelmanni) and aspen (Populus tremuloides) occurred within or near some wetlands. In addition, larkspur (Delphinium bicolor) was located in a moist area (UTM 12 T 381898 E

5071621 N) in the Pony Placer claim. Photographs of this finding were included in Appendix J to allow reviewers to determine if these were the more common little larkspur or limestone larkspur (Delphinium bicolor var. calcicola), a Potential Species of Concern.

1.6.3.2 Noxious Weeds

The Montana Department of Agriculture lists 18 species of noxious weeds that occur in Silver Bow County (Table 1.6.2). Three of these were added during 2009. Four were located in the Highland Mountains during 1992 (Lesica 1993), including tall buttercup, which was considered to be recently introduced or rapidly spreading during 2008 (Category 2).

Table 1.6.2. Noxious Weeds of Silver Bow County

Genus Species	Common Name	State Weed Category	Reported in the Highland Mountains (Lesica, 1993)
Cardaria draba	hoary cress	1	
Carum carvi	caraway	NC	
Centaurea diffusa	diffuse knapweed	1	
Centaurea maculosa	spotted knapweed	1	
Centaurea repens	Russian knapweed	1	
Chrysanthemum leucanthemum	oxeye-daisy	1	
Cirisum arvense	Canada thistle	1	X
Convolvulus arvensis	field bindweed	1	
Cynoglossum officinale	houndstongue	1	X
Euporbia esula	leafy spurge	1	
Gypsophila paniculata	baby's breath	NC	
Isatis tinctoria	dyers woad	2	
Lepidium latifolium	perennial pepperweed	2	
Linaria dlamatica	dalmation toadflax	1	
Linaria vulgaris	yellow toadflax	1	X
Lycium halimifolium	matrimony vine	NC	
Ranunculus acris	tall buttercup	2	X
Tanacetum vulgare	common tansy	1	

Source: Montana Department of Agriculture. http://agr.mt.gov/weedpest/noxiousweeds.asp. Category 1. Currently established and generally widespread. Category 2. Recently introduced or rapidly spreading. NC - Not categorized. Added to County list during 2009.

1.6.4 Discussion

The risk of impacts from the Project to sensitive plant species is minimal. None of the locations of sensitive plants species that were found by Lesica (1993) were within the Project claim boundaries. In addition: the area of proposed facilities and activities is typical of the broader area surrounding the Project site; proposed disturbance sites include or are very near existing roads; the area is used for cattle grazing and recreation. As such, any additional disturbance of

vegetation resulting from the Project will be minimal due to the small Project footprint and existing uses. The operator will develop a weed management control plan with the agencies input and Silver Bow County approval.

1.7 Soils

1.7.1 Introduction and Study Area

The following is a summary of the soil resources baseline investigation for the Butte Highlands Project. The soil resources baseline investigation was developed to support decisions regarding management of mine water and closure/reclamation of disturbed areas. This investigation summarizes the NRCS Soil Resource Report for the Project area and the results of a 2009 field survey. The complete soil resources baseline investigation report as completed by AMEC and is provided in Appendix K as "Baseline Report for Soil Resources, Butte Highlands Project, Silver Bow County, Montana".

- The objectives of the soil resources baseline investigation were to:
- Summarize existing information pertaining to soils in the Project area;
- Evaluate the suitability of soil in the Project area for use as plant growth medium in reclamation, or as low-permeability capping material.

The study area for the soil resources baseline investigation centers on the Project area in Silver Bow County, Montana, approximately 15 miles south of Butte (Figure 3). The Project straddles the Continental Divide within the upper portion of the drainages of Basin Creek, Fish Creek, and Middle Fork Moose Creek. The study area for soil resources encompasses the area to be disturbed by proposed mine development and the immediate vicinity. Additional figures from the soils test work are available in Appendix K.

1.7.2 Methods

Ten test pits were excavated during August 2009 at locations of proposed disturbance throughout the site (Appendix K, Figure 3):

- Two in each of the three LAD areas;
- Two in the Main Surface Facilities area;
- Two at locations of proposed mine roads.

Samples from the ten test pits were analyzed for agronomic properties and metals. Geotechnical testing for properties relevant to water permeability was also performed on samples from the test pits in proposed areas of disturbance. The bulk samples from test pits outside the Main Surface Facilities were analyzed for particle size distribution and Atterberg Limits.

In addition, a small area of intensive test pitting was investigated on the southwest portion of the Pony Placer claim (Appendix K, Figure 2). Twenty four test pits were excavated 200 feet apart in this area. Soil observations were recorded in these pits during September 2009.

1.7.3 Results

Laboratory Analyses

Electrical conductivity of all samples was low, ranging from 0.14 to 0.70 mS/cm. For most samples (26 of 33), measured pH values were near neutral and in the range of 6.0 to 8.0. Seven results were in the pH range from 5.0 to 6.0. No pH values were below 5.0 or above 8.0. Except for coarse fragment content, all individual agronomic results indicated either ideal or moderate reuse potential for the associated soil; therefore coarse fragment content was the parameter that showed the greatest differences between soils, and was used to identify soils with fair or poor reuse potential. Geotechnical results are provided in the complete soil resources baseline investigation report (Appendix K).

Erodibility Parameters

All test pits contained soil with a low or medium degree of water erodibility (< 0.40 Kw). Surface runoff class ranged from low to high, depending on the combination of permeability and slope at the test pit locations. Wind erodibility was highest for test pits that had a sandy loam texture to the surface mineral soil and <15% coarse fragment content. Wind erodibility was lowest for test pits that had loam surface textures and >35% coarse fragments.

Soil Map Unit Designations

There are four NRCS soil map units that cover the majority of the Project area. Map unit *Hanson-Tiban families-Rubble land complex, steep ridges and mountain slopes* (51CH2) is located on the highest elevation portions of the Project area. The properties of 51CH2 soils, such as slope, drainage class, and saturated hydraulic conductivity, generally correspond with the observed shallow soil with prevalent coarse material encountered in two of the test pits.

Map unit *Cryofluvents-Finn family-Water complex, rolling stream terraces and flood plains* (64GJI) is located in low-lying areas adjacent to Middle Fork Moose Creek. Standing water was observed in test pits in 64GJI at depths of <60 inches. The soil observed in one of the test pits in 64GJI and adjacent pits in the intensive pitting area generally corresponded with the cryofluvents component of this map unit. Small willow trees and surface channels indicated the seasonally saturated conditions that occur at the ground surface in this area. The other test pit in 64GJI generally corresponded with the Finn component of this map unit, displaying saturated gravelly material at depths of <60 inches.

Map unit *Windyridge-Como-Hiore families, complex low relief mountain slopes and ridges* (75GB2) is located on the backslope areas facing west above FS Road 8250, covering the Main Surface Facilities area of the Pony Placer claim, the lower elevation areas of the upper claims, and the FS land that separates the lower and upper claims. Test pits in 75GB2 did not correspond well with the NRCS soil descriptions with regard to parent material and slope shape, possibly because the map unit consists of almost one third minor components.

Map unit *Kurrie-Goldflint-Warwood families, complex low relief mountain slopes and ridges* (75GD2) is located in footslope and toeslope areas below FS Road 8250, but generally above the areas of seasonal stream channels in map unit 64GJI. Observed conditions in two test pits in this map unit were somewhat similar to the Finn component, whereas one test pit was similar to the Kurrie component. It is possible that NRCS did not notice that the sparsely treed and open areas in portions of this map unit were not in their natural condition. Sun-bleached stumps

indicated that logging may have occurred before the most current NRCS soil survey for the region.

1.7.4 Discussion

Soil samples collected from several LAD area test pits constructed in 2009 were analyzed for total metals (arsenic, cadmium, copper, manganese, molybdenum, nickel, selenium, and zinc) (AMEC Geomatrix 2009). Results show that arsenic is elevated in most samples in the uppermost horizons (up to 88 mg/kg). Copper manganese, nickel, and zinc were also commonly detected at concentrations above the laboratory reporting limits. Some of the arsenic concentrations are above the MDEQ (2005) Generic Action Level of 40 mg/kg for arsenic in soil. None of the metals concentrations, however, are above the upper range limit of background concentrations reported for the western United States (Shacklette and Boerngen 1984).

On August 4, 2011, seven soil samples were collected in and near LAD#1, LAD#2, and LAD#4 and submitted to the laboratory for analysis of 11 metals using the Synthetic Precipitation Leaching Procedure (SPLP). The metals include: arsenic, cadmium, copper, lead, manganese, molybdenum, nickel, selenium, silver, thallium, and zinc. Results of SPLP soil analysis show that all seven soil samples were non-detectable for the 11 metals analyzed. Laboratory reporting limits are 0.1 mg/L for cadmium and selenium; 0.5 mg/L for arsenic, copper, lead, manganese, molybdenum, nickel, silver, and thallium; and 1.0 mg/L for zinc. See Appendix Y for a summary of the soil sampling and SPLP test program.

Due to shallow depths of root restriction and the relatively permanent nature of these restrictions, soil in the Project area requires a high degree of protection from erosion in order to maintain productivity as a plant-growth medium. This consideration will be factored into BMPs and reclamation plans.

1.8 Land Use

1.8.1 Introduction and Study Area

The Butte Highlands Project will be developed on patented mining claims located within the Deerlodge National Forest. The land use investigation included a search for available information pertaining to public and private jurisdictions and uses (Figure 7). For more information, see the figures in Appendix L.

The study area for the land use investigation is located in Silver Bow County, Montana, approximately 15 miles south of Butte (Figure 3). The Project straddles the Continental Divide within the upper portion of the drainages of Basin Creek, Fish Creek, and Middle Fork Moose Creek. A 2-mile radius circle, centered on the Project, was selected as the study area for the land use analysis.

1.8.2 Methods

The revised U.S. Forest Service Land and Resource Management Plan for the Beaverhead-Deerlodge National Forest was approved on January 14, 2009, and establishes guidance for all resource management activities on lands that directly border the Project (USDA 2009). In addition, the following information sources were investigated or contacted:

- USGS quadrangle maps (1:24,000 scale Mount Humbug and Pipestone Pass quadrangles);

- Aerial photography;
- Natural Resources Conservation Service maps;
- Tim O'Neil, GIS Coordinator, Beaverhead-Deerlodge National Forest;
- Federal, state, and local government documents.

1.8.3 Results

1.8.3.1 Ownership and Jurisdictions

There are two USFS Ranger Districts within the study area that are separated by the Fish Creek divide; the Butte District to the west and the Jefferson District to the east. There are also two USFS Landscapes in the study area. Uses and objectives for Management Areas within these landscapes are discussed below. The study area is within Montana Department of Fish, Wildlife, and Parks Commission District 2 and Administrative Region 3.

In addition to the Butte Highlands Project patented mining claims, several private inholdings occur in the study area. North of the project, a narrow strip of land that follows Basin Creek is owned by Silver Bow Water Inc. Individual or family-owned parcels occur to the east and southwest of the Project. A private parcel also surrounds the Basin Creek public parking and rest room area. The nearest residences to the Project are several miles to the north, beyond the study area. For more information, see Appendix L, Figure 2.

1.8.3.2 Utility, Communication, and Other Facilities

There are no utility or communication sites within the study area. The following facilities are located within the study area:

- Basin Creek and Fish Creek SNOTEL stations;
- Basin Creek public parking area and rest rooms.

1.8.3.3 Projects

Three projects within the study area are listed in the USFS Schedule of Proposed Actions.

- The Forcella Irrigation Ditch Project, which was cancelled, was to maintain an irrigation ditch on USFS land.
- The Roadside Safety Tree Removal Project is to remove dead and mountain pine beetle infested lodgepole pine trees along several USFS roads, including roads 84 and 8520.
- The Divide, Little Camp, And Moose Creek Improvements Project is located west and southwest of the Pony Placer Claim. This project is to cut standing Douglas fir and lodgepole pine trees to put in streams to protect stream banks and willows from herbivore damage.

The Montana Department of Environmental Quality (DEQ) plans to launch the Highland Mine Reclamation Project during the summer of 2010. A design plan is being prepared and a request for bids is planned for the spring of 2010. The Highland Mine operated from the 1930's through 1942. The DEQ Abandoned Mine Section will reclaim approximately 10,800 cubic yards of

waste rock and tailings and other materials left from past gold mining and milling in and around the Main Ripple claim. There is also a DEQ high priority abandoned hardrock mine site (Middle Fork Mill Site) west of the Pony Placer claim that is not currently scheduled for reclamation.

1.8.3.4 Grazing

The majority of the study area is an active grazing allotment. Exceptions to this are private inholdings and most of the area that is north of the continental divide. This latter area is the Basin Creek Management area, which is managed to protect water quality within the Basin Creek watershed. See Appendix L, Figure 3 for the grazing allotments within the study area.

1.8.3.5 Timber

Nearly all present conifer stands in and around the study area are regenerated clear-cuts. The majority of the study area is not suitable for timber harvest. Forestry activities within the study area within the last 10 years have included:

- piling and burning of material;
- pre-commercial and commercial thinning;
- stocking surveys;
- plantings;
- vegetation competition surveys;
- certification of natural regeneration with and without site preparation.

See Appendix L, Figure 4 for Timber Harvest Allocations.

1.8.3.6 Recreation and Management Areas

Recreational uses of forest lands in the study area include hunting, fishing, camping, firewood collection, snowmobiling, sightseeing, and hiking, including the Continental Divide National Scenic Trail (CDNST). The CDNST will extend 3,100 miles, in its entirety, from Canada to Mexico. Traveling from north to south, the CDNST crosses the upper Project claims, leads to the Basin Creek public parking and rest room area, and continues to the northwest. See the Visual Resources section for more information on the CDNST. The study area also includes several management areas within the Jefferson River and Upper Clark Fork USFS Landscapes. Recreational management of these areas is discussed below and information on summer and winter recreation allocations is available in Appendix L, Figures 5 and 6.

The Burton Park Management Area is managed for a variety of recreational opportunities and for secure winter wildlife habitat. Recreation takes place in a range of roaded to semi-primitive, non-motorized settings. Winter closures provide secure habitat for wildlife and accessible winter recreation activities. Visitors may encounter vegetation changes from timber harvest or fire, motor vehicles on roads and trails in summer and fall, skiers, and livestock.

The Humbug Management Area is managed for timber production, livestock grazing, and dispersed recreation in a roaded setting with a mix of modified and natural appearing scenery. Recreation use is heavy during fall hunting seasons. The area is used by snowmobiles in the winter. A non-motorized summer and winter area on the east edge of the unit below Red

Mountain provides yearlong wildlife security for species including bighorn sheep. Visitors may encounter vegetation changes from timber harvest or fire, roads for timber harvest, motor vehicles on roads and trails in summer, fall, and winter, historic mining remnants, active mining or reclamation, and livestock.

The Table Mountain Recommended Wilderness Management Area is managed to protect wilderness characteristics and to provide yearlong non-motorized recreation with high levels of challenge and solitude. Hunting is one of the predominant activities in the area. Visitors may encounter quiet natural landscapes, native vegetation changes from fire and other natural events, wildlife including mountain goats and bighorn sheep, and livestock.

The Basin Creek Management Area is managed to protect water quality within the Basin Creek watershed. None of the watersheds in the study area have fisheries or restoration emphasis. Entry into a portion of the area is prohibited yearlong. The setting in the Basin Creek Management Area is a mix of roaded and semi-primitive. Recreation use is not encouraged. Winter non-motorized allocations provide wildlife security and protect water quality. Visitors may encounter vegetation changes from timber harvest or fire. The Basin Creek Management Area includes a Research Natural Areas (RNA). RNA's are managed to protect the primary features for which they were identified. The primary features of the Basin Creek RNA are subalpine forest, riparian, and herbaceous type, and spruce.

1.8.4 Discussion

Public land in the study area is used for logging, grazing, recreation, watershed protection, wildlife management, and mineral exploration. The Butte Highlands Project is consistent with these uses. The study area includes small portions of four USFS Management Areas. As such, the above descriptions of the Management Areas suggest a wider variety of uses than actually exist in the study area.

1.9 Visual Resources

The following is a summary of baseline conditions for visual resources in the immediate area of the Butte Highlands Project. The Project is surrounded by landscapes that display various levels of impacts from past and present mining, logging, grazing, and recreation. The private property where the Project is located includes a mosaic of regrown forest and non-forested habitats. Forested portions are dominated by fir, pine, and spruce. Unforested areas are densely to moderately vegetated with a variety of shrubs, forbs, and grasses. The Pony Placer claim is mainly unforested and gently sloping with scattered, wet meadows and stands of aspen and spruce. The Main Ripple claim is steep and forested mainly with conifers. The upper claims are mainly steep, with conifer coverage ranging from sparse to dense.

1.9.1 Visual Absorption Capability

Visual Absorption Capability (VAC) is the capability of the landscape to absorb visual change or landscape modification. High VAC levels are assigned to areas most capable to absorb visual change. When viewed from public land, the combination of slopes and forest cover provide an interrupted visual screen throughout most of the Project area. While VAC values were not located for the Project area, they would presumably be moderate to high due to topography and vegetation.

An example of this visual screen is provided in Figure 8 from the vantage point of the Basin Creek public parking and rest room area at eye level. This example is typical of the view from

public land from the Continental Divide National Scenic Trail (CDNST) as it passes through the Project area. Traveling from north to south, the CDNST crosses the upper Project claims, leads to the Basin Creek public parking and rest room area, and continues to the northwest. This dip into the Project area would result in approximately 1 mile of interrupted views of the Project from the CDNST. See Appendix L for figures of the CNDST.

1.9.2 Scenic Attractiveness and Integrity Objectives

USFS scenic attractiveness GIS layers are not presented because they are in draft form (personal communication, Tim O'Neil, GIS Coordinator, Beaverhead-Deerlodge National Forest). Minimum Scenic Integrity Objectives (SIO) for the public lands surrounding the Project are moderate, with the exception of the Table Mountain recommended Wilderness Management Area, which has a high SIO (USDA 2009). Projects in foreground areas of scenic byways, national scenic trails or wild and scenic rivers are to be designed to meet the SIO of at least High. This standard applies to projects on public land, but not to the Butte Highlands Project because it is on private land. Visitors to the CDNST are informed to expect to observe various management activities, such as logging, mining, and grazing on public and private land along the trail.

1.10 Socioeconomics

1.10.1 Existing Socioeconomic Setting

Silver Bow County is located in the U.S. in the state of Montana. The county occupies approximately 719 square miles and has a population of about 33,892 (United States Census Bureau 2002). Employment for the area is 25,998 which consist of people 16 years of age and over. Of the 25,998 it is said that 65 percent of the people are in the labor force (United Census Bureau, American Community Survey 3-year Estimates 2006-2008). The mineral development in Silver Bow County historically has been a significant aspect of the economic climate for the community. It continues to be important but plays a lesser role then it has in the past. Table 1.10.1 shows the 8 main categories of jobs under the Industrial/labor force category (65% of 25,998).

Table 1.10.1. Major Categories of Industry Employment in Silver Bow County

Work Categories	Number Employed
Agriculture and Forestry	128
Mining, Quarrying, and Oil & Gas Extraction	270
Construction	1,220
Manufacturing	552
Wholesale Trade	320
Retail Trade	2,608
Transportation, Warehousing, and Utilities	983
Educational Services, Health Care and Social Assistance	4,366

Note: U.S. Census Bureau – 2006 to 2008, American Community Surveys

The median household income for the area is $24,205 (United Census Bureau, American Community Survey 3-year Estimates 2006-2008). The average house cost for a single family

owner occupied house in 2000 was about $75,900. Silver Bow County has a total of 15,833 housing units 89.3 percent of these units are occupied. Vacant units for the area are about 1,698. About 70.1 percent or 9,914 of the units are owner-occupied and approximately 29.9 percent or 4,221 of the units are renter-occupied (United States Census Bureau, 2000). These numbers are expected to have changed significantly due to the recent housing market changes which have occurred in 2009, for which data has not been reported.

Employment in 2000 was 25,998 as of November 2009 Silver Bow unemployment level has dropped to about 5.4 percent. (Montana Department of Labor & Industry). The largest employers in the Silver Bow area during 2005 consisted of 9 businesses (Table 1.10.2). Silver Bow County has projected the payroll costs for employers in this area and is projected to be similar for 2010 as they were in 2009 (Table 1.10.3).

Table 1.10.2. Largest Employers for Silver Bow County

Employers	Number Employed
Montana Tech	676
Butte School District No. 1	658
St. James Community Hospital	535
Northwestern Energy	511
Wal-Mart	430
Butte-Silver Bow Local Government	412
Community Counseling and Correctional	275
Advanced Silicon Materials	232
M.S.E. Inc.	200

Source: City-data.com/city/Butte-Silver-Bow-Montana.html

Table 1.10.3. Payroll Costs for Employers

Collected Taxes	Tax Rate	Wage Base
Social Security	6.20%	$106,800
Medicare	1.45%	No Limit
FUTA	0.80%	$7,000
UI	0.6-6.3%	$26,000

Source: Montana Department of Labor & Industry

According to the United States Census Bureau- 2006-2008 American Community Survey asked approximately 15,528 people how they commuted to work. The total workers polled were 16 years and older. The 3 categories are personal vehicle, carpooling with co-workers/neighbors/friends or \public transportation (not including taxicabs). The main means of transportation is personal vehicle 12,398 people use their own car to commute to work. The second form of transportation is carpooling which consists of about 1,463. Carpooling is common with industry based employment such as mining. The third type of transportation is public transportation which about 75 of the polled employed population use.

The schools in the area consist mainly of public schools but there are some private schools available in the area. The school information can be found in Table 1.10.4. In Silver Bow County there are 3 high schools, 3 secondary schools and 13 elementary schools. A survey was taken from a group of 25 to 65 years old people, 16,585 people were surveyed to get educational statistics. Of those surveyed, 1,139 people do not have a high school diplomas, 6,291 people are high school graduates, 5,245 people have attended some college or have attained an associate's degree and 3, 910 people have attained a bachelor's degree or higher.

Table 1.10.4. Schools in the Silver Bow County

High Schools	**Public**	**Private**	**Grades**	**Number of Students Attending**
Butte High School	x		9th-12th	1533
Butte Central High School- Catholic School		x	9th-12th	138
Capstone Christian Academy		x	Preschool-12th	N/A
Secondary Schools				
East Middle School	x		7th-8th	731
Butte Central Junior High School	x		7th-8th	N/A
Capstone Christian Academy		x	Preschool-12th	N/A
Elementary Schools				
Emerson Elementary	x		Preschool-6th	408
Hillcrest Elementary	x		Kindergaten-6th	399
Butte Central Elementary School	x		Kindergaten-6th	N/A
Kennedy Elementary	x		Kindergaten-6th	298
Margaret Leary Elementary	x		Kindergaten-6th	315
West Elementary	x		Kindergaten-6th	424
Whittier Elementary	x		Kindergaten-6th	400
Divide School	x		Preschool-6th	6
Ramsay School	x		Preschool-6th	108
Melrose School District #5	x		Preschool-6th	14
Butte-Silver Bow Montessori School		x	Preschool-6th	81
Webster Garfield Complex	x		Kindergaten-6th	N/A
Capstone Christian Academy		x	Preschool-12th	N/A

Note: http://www.co.silverbow.mt.us/schools.asp

The socioeconomic impact from the Butte Highlands Project would be felt mostly in the town of Butte. This is the largest and closest town to the Project with significant housing, employment base and local services. Economic impacts, both positive and negative, would be relatively small compared to the overall tax base for the county and the state.

1.11 Cultural Resources

1.11.1 Introduction and Study Area

In September 2009, Klepfer Mining Services (KMS) retained the resources of Western Cultural Resource Management, Inc (WRCM) to conduct a thorough literature review of available materials to assess the cultural resources that may exist on or near the proposed Butte Highlands Project.

It is widely known that the proposed Project area has an extensive mining history. Although the Project area lies on private land where state and federal preservation laws do not specifically apply, the intention of the company was to gain a better understanding of any cultural resources of significance that may exist near the property. Authorized under the guidelines of the National Historic Preservation Act of 1966, as amended, the process of recording and registering a property on the National Register of Historic Places is defined. It's partially through the findings of this list and others that an inventory of the Project area was conducted. While the listing of a cultural resource on the National Register provides historical recognition of a significant resource, it does not interfere with the rights of a private landowner to alter or use that land in any way permitted under local land use laws. Likewise, having resources listed on the National Register does not obligate an owner to make any repairs or improvements to those resources. Currently, there is no reason for The BHJV Resources to expect to undergo Section 106 consultation under the National Historic Preservation Act.

An area of approximately one mile around the 211 acre Project area footprint was selected to be the study area for the literature review (Figure 9). This survey area included Sections 31 and 32 in Township 1 North and Range 7 West on patented mining claims: Pony Placer Claim, Red Mountain Claim, Purchance Claim, Only Chance Claim, J.B. Thompson Claim, and the Murphy Claim. WCRM conducted file and records searches through the Montana State Historic Preservation Office (SHPO), the Beaverhead-Deerlodge National Forest, and the General land Office records held by the U.S. Bureau of Land Management. WCRM completed their report in January 2010 (Appendix M).

1.11.2 Methods

A thorough review for available records was undertaken by WCRM, who used the following as sources of information: the Montana SHPO at the Montana Historical Society including the National Register of Historic Places (NRHP); archaeological and historical documents and records using the Cultural Resources Information System (CRIS); and the Cultural Resource Annotated Bibliography System (CRABS). Relevant site forms and reports were acquired from the Montana Archaeological Records Office at the University of Montana. In the case where a site was partially located on national forest system lands, WCRM followed the university's Records Office's protocol to obtain the Forest Archaeologist's permission to receive copies of documentation.

The Montana SHPO Cultural Records Office was contacted by WCRM for a records search in August 2009. The search resulted in identifying 27 reports and 15 resources. The SHPO does not maintain a GIS database for Silver Bow County and shape files for the resources could not be obtained. The 27 reports resulting from the SHPO search included 18 annual administrative activity summaries issued by the Deerlodge NF (and later the Beaverhead-Deerlodge NF), however, these reports do not provide information of the type needed for this review and were not researched further.

WCRM completed online searches at the Government Land Office's site to obtain historic information on cadastral survey plats, the historic indices of the homestead, mineral survey, and other land records for the file search area. Copies of pertinent mineral surveys and plats were ordered from the Bureau of Land Management, Montana State Office Public Room. Results of this search are provided in Table 3 of the WCRM report (Appendix M).

Further online research of the Historic Highlands Mining District was also obtained from the Montana DEQ's Montana Abandoned Mine Lands' website. This information is included as an appendix to the WCRM report and provides significant detail of the history of the mining district (Appendix M).

1.11.3 Results

1.11.3.1 History

As mentioned this area is rich in mining history that goes back to the late 1800's. Placer gold was first discovered by prospectors in Fish Creek in 1866. A rush of mining activity resulted in the formation of the Highland Mining District. Lode mining soon followed, with the earliest successful lode claims at the Murphy and Only Chance claims. Two towns were established in the area following the prosperity of the mines, Highland City and Red Mountain City.

After the easiest worked deposits were exhausted, in the early 1870's, the mines went nearly dormant for more than 50 years. The Highland District experienced a second boom during the 1930's. It was during this period that the District's largest mine, the Highlands Mine, worked the combined Only Chance, Murphy and J.B. Thompson properties. According to information provided by MDEQ's online narrative for Montana's Abandoned Mine Lands, the Highlands Mining District shipped 600 tons of firstclass ore in 1932. A 100 ton cyanide mill was rebuilt in 1932 on the Moose Creek side of the Divide so as to avoid Basin Creek, which provided water to the city of Butte. The mine and mill shut down the following year.

In 1937, the mine and mill reopened following reorganization of the company, and treated almost 18,000 tons of ore and old tailings. The new mine and mill operated using electrical power and compressed air drills. A crew of 65 miners produced approximately sixty tons of ore. Both mine and mill shut down in 1942 due to war-time regulations. In 1947, production continued, and twenty tons of gold were shipped from the mine. Operation at the mine continued sporadically through the 1960's. Throughout the historic period, this district produced in excess of 63,000 ounces of gold, with production in excess of $2,000,000.

1.11.3.2 Literature Review Results

As a result of the literature review, several previously recorded sites were discovered in the file search area. Out of the 15 previously recorded sites, 14 related to mining history, two of which are pertinent to the Project area. No pre-historic sites were discovered as a result of the search. The two sites of interest to the Project will be discussed further, while the remaining sites have information displayed in Table 1.11.1. The two sites of interest are the Highland Mining Historic District - 24SB187, and The Highland Mine and Mill Site – 24SB589. The Highland Mining District is eligible to the NHRP.

<u>The Highland Mining Historic District - 24SB187</u>

The definition of the Highland Historic Mining District began with the initial recording of site 24SB187 by the University of Montana (undated form). That recording did not give any details

about the on-the-ground historic resources within the district and it did not offer boundaries. The 1988 report, Cultural Resource Inventory of Selected Drill Hole Sites in the Highland Mountains, Montana, by Connie Moore and Lynn Fredlund said that “boundaries of the Historic District have not been determined because of the small amount of inventory conducted” (WCRM 2010). Their study intended to complete an intensive level survey, but due to the density of the resources in the survey area the methodology was amended and no formal recording took place. The report identified 26 localities related to the mining boom of 1865-1870 and a subsequent revival period from 1930 to 1942.

A second report by CGM, Addendum to: Cultural Resource Inventory of Selected Drill Hole Sites in the Highland Mountains, Montana (WCRM 2010), focused on defining a boundary for the Highland Historic Mining District. The district boundary proposed in the addendum report included approximately seven sections (~4,480acres). Richard Periman, the Deerlodge National Forest Archaeologist in 1990, did further study of the proposed historic district boundary and offered revisions that reduced the size of the district to approximately 900 acres. He argued that the previous boundary encompassed lands that lacked the sufficient density of mining resources with integrity to be considered part of the district. He further argued that the main concentration of district-related resources was found in the Fish Creek drainage. The Montana SHPO concurred with Periman’s recommended district boundaries in a letter dated August 7, 1990. Periman’s boundary is shown in Figure 9. Much of the northern portion of the proposed Project area lies within this historic mining district boundary.

<u>The Highland Mine and Mill Site – 24SB589</u>

In 1997 Mary E. McCormick described the significance of artifacts located at the head of Basin Creek which are remnants of the historic Highland Mine and Mill Site (24SB589) in her report entitled Highland Mine and Mill Site. Her report describes the site as being a part of the Highland Mining Historic District, and being composed of several individual mining properties, as well as historic occupation sites in the upper Fish Creek drainage. The site consists of over thirty industrial and domestic features largely in association with the Highland Mine, in operation by the Butte Highlands Mining Company from the 1930’s to early 1940’s. The main industrial features include a collapsed portal to the Highlands Mine adit, the remnants of the flotation mill, and probable remains of a cyanide plant that was likely never put into operation. Most of the other former industrial structures at the site are largely in ruins, or have been removed off-site. McCormick also went on to state while the site was historically the home of the largest lode mine in the Highlands, the features at the site are in such poor condition that their historic function cannot be determined. She went on to recommend that the site no longer has sufficient archeological integrity, as relatively few artifacts were identified, and that the site is not eligible for an individual listing with the National Register of Historic Places, nor can it be considered a contributing element to the Highland Mining Historic District. On 15 April 2010, Josef Warhank of the Montana State Historic Preservation Office concurred with McCormick's recommendation.

<u>Other Previously Recorded Sites</u>

As previously mentioned, the literature search performed by WCRM identified 15 previously recorded historical sites in their survey area (Figure 9). General information on those sites is listed below in Table 1.11.1.

1.11.4 Discussion

As expected, the majority of cultural features found as a result of the literature search were related to the area’s rich mining history. Of the 15 previously recorded sites, 14 related to

mining, and two of those were within the proposed Project area. Site 24SB187, Highland Historic Mining District, encompasses an area of approximately 900 acres, of which a portion lies on the proposed Project area.

The site contains several historic mining features, concentrated mostly in the Fish Creek area. Site 24SB589, the Highland Mine and Mill Site contains several artifacts from the historic mine, but lacks the integrity to have an individual listing on the National Register of Historic Places. WCRM acknowledged that the lack of prehistoric sites in the search area was curious, which may be due to the level of historic disturbance in the area. As stated previously, the proposed actions for the Butte Highlands Project are contained completely on private land, and Section 106 consultation is not expected to occur. The Highland Mining District is eligible to the NRHP.

Table 1.11.1. Previously Recorded Cultural Sites in the Literature Area of the Butte Highlands Project

Site	Site Type	Site Type 2	Time Period	Owner	National Register Status
24SB0064	Historic Mining	N/A		Forest Service	Undetermined
24SB0065	Historic Mining	N/A		Forest Service	Undetermined
24SB0066	Historic Euro-American Site	N/A		Forest Service	Undetermined
24SB0067	Historic Mining	N/A	Historic Period	Forest Service	Undetermined
24SB0187	Historic Mining	N/A		Combination	Eligible
24SB0357	Historic Placer Mine	N/A		Private	Undetermined
24SB0443	Water Pipeline	N/A	Historic Period	Combination	Eligible
24SB0589	Historic Hard Rock Mine	Historic Irrigation System		Combination	Unresolved
24SB599	Cribbed Log Structure	Historic Timber Harvesting		Forest Service	Undetermined
24SB600	Historic Railroad, Stage Route, Travel	Historic Timber Harvesting		Forest Service	Undetermined
24SB601	Historic Timber Harvesting	N/A		Forest Service	Undetermined
24SB0602	Historic Political / Government	N/A		Forest Service	Contributes to District
24SB0605	Historic Mining	Historic Architecture		Forest Service	Undetermined
24SB0706	Historic Mining	N/A	Historic Multi-Decade	Private	Undetermined
24SB0802	Historic Mining	Historic Log Structure	Historic Period	Forest Service	Undetermined

** File Search was conducted by Western Resource Cultural Management in September 2009. Sites 24SB187 and 24SB589 are located within the proposed Butte Highlands Mine Project Area.*

1.12 Additional Studies

A number of additional studies are currently in progress to further evaluate baseline conditions at the mine site. These studies will be completed for consideration during future environmental impact analysis and/or to support future mine decision making. These studies are listed below in Table 1.12.1.

Table 1.12.1. List of Additional Baseline Studies in Progress for Butte Highlands Mine

Study	Status	Expected Completion Date
Fluvial Geomorphology	Complete. Provided as new Appx AI	Not Applicable
Wetland Hydrology/Piezometer Interim Study	Data collection in progress	December 2012
Wetland Hydrology/Piezometer 2012/2013 Study	Data collection in progress	July 2013
Supplemental Waste Rock Geochemistry Study	Data collection in progress	December 2012
Cemented Rock Backfill Geochem/Geotech Study	To commence in November 2012	February 2013

2.0 PROJECT DESCRIPTION AND OPERATING PLAN

2.1 General Description of Project

2.1.1 Introduction

The Butte Highlands deposit is a high grade gold skarn deposit. The area has a rich mining history that includes placer mining, underground mine activities, a processing mill, and large community. Gold was first discovered in the district in 1866 when placer mining activities occurred in the area. In 1870 placer mining ended and the district was quiet for many years until 1930 when the Butte Highlands Mining Company initiated the construction and operation of an underground mine. The mine operated through 1942 when Federal Order L-208 ceased all mine activities in the district.

The district remained relatively inactive until the 1980s when major exploration activities were initiated. Major companies such as Placer Dome, Battle Mountain Gold, ASARCO, and other companies drilled 178 drill holes (61,338 feet) into the Nevin Hill area which is where the ore deposit is situated during the 1980s and 1990s. In 2007 Timberline Resources Corporation (TRC) acquired the property and initiated surface drilling activities.

TRC submitted an exploration permit application to the agency to amend the surface exploration permit to allow underground exploration. The State of Montana issued the approval for the underground work in 2009. The final exploration plan and MDEQ Exploration License 00680 are included as Appendix N. Development of the underground exploration activities is underway. Currently approved activities are shown in Figure 10.

The operator and owner of the Butte Highlands project is Butte Highlands JV, LLC (BHJV). BHJV is jointly owned (50% each) by Timberline Resources Corporation and Highland Mining, LLC. BHJV is a limited liability company (LLC) managed by Ron Guill.

The pertinent names and addresses are:

Butte Highlands JV, LLC (a Limited Liability Company)
101 E. Lakeside Avenue
Coeur d'Alene, ID 83814

Timberline Resources Corporation (a public company incorporated in Delaware)
101 E. Lakeside Avenue
Coeur d'Alene, ID 83814

Highland Mining, LLC
967 East ParkCenter Boulevard #396
Boise, ID 83702

Ron Guill
967 East ParkCenter Boulevard #396
Boise, ID 83702

This submittal proposes to advance the Butte Highlands Project from its current approved exploration phase into full scale mine production.

TRC is currently approved to complete an extensive underground exploration program. This provides a significant basis for advancing towards mine production without significant additional facilities or surface disturbance.

This application will describe the proposed mine operations and minor changes to the exploration program to support the mine operations.

2.1.2 Existing Approvals

General Mining Act of 1872

The legal right to mine is granted by the General Mining Act of 1872 which authorizes Timberline Resources to hold the mineral rights to land affected by the operating permit via patented and unpatented mineral lode claims and to conduct mining on this land.

MDEQ Exploration License 00680

In August of 2009, Timberline Resources received MDEQ approval to amend their existing exploration program. Under the newly amended program, Timberline and the BHJV are continuing to advance the Project to further stages of development by gaining a better understanding of their resource through additional drilling, technical investigations for mine planning, and metallurgical testing. A modification to this permit was submitted by BHJV and approved by MDEQ in November 2009 for minor adjustments to the orientation of the land application site LAD 2 (Appendix N).

MDEQ Air Quality Permit 4449-00

In accordance with MDEQ regulations for preparing the Exploration Plan, Timberline Resources submitted an Air Quality Permit Application to MDEQ's Air Resources Management Bureau. The Permit application was prepared by Carter Lake Consulting in July 2009 (Appendix A), followed by the issuance of MDEQ-ARMB Permit #4449-00 in October 2009 (Appendix B).

MDEQ General Permit for Stormwater Discharges Associated with Construction Activity

In accordance with MDEQ regulations for discharge of stormwater from a construction site, Timberline Resources submitted a Notice Of Intent (NOI MTR 103517) and a Storm Water Pollution Prevention Plan (SWPPP) to the MDEQ (Appendix AK). This authorizes the project to discharge stormwater in accordance with the limitations, monitoring requirements, and other provisions set forth by the General Permit. The SWPPP would be updated as needed to address stormwater discharges from new disturbances proposed under this Application such as new sections of road and an ore-transfer facility.

USFS Special Use Permit (Road Use)

The USFS issued a Special Use Permit for the exploration activities to permit year round road use of those roads managed by this agency. The agency authorized the use of the Highland Road to access the property along with two USFS roads that are adjacent to the patented claims.

2.1.3 General Project Description

The Butte Highlands Project is located on the Continental Divide approximately 15 miles south of Butte, Montana. The Project is situated on patented lands surrounded by the Deer Lodge

National Forest within Sections 31 and 32, Township 1 North Range 7 West; Sections 5 and 6 Township 1 South Range 7 West; and Section 1 Township 1 South Range 8 West, Montana Principal Meridian. See Figures 1 and 2 for the location of the Project.

BHJV proposes to expand underground activities from the approved exploration program to advance mine development to support a small scale underground mine operation. With the exception of underground development and increased rates for various operating equipment, only a small amount of surface disturbance will be required to support the mine operation beyond those currently disturbed or authorized under the exploration plan. Figures 10 and 11 show the location of the existing and proposed new disturbances for the Project.

BHJV proposes to use the existing portal and decline to access the general underground workings for the Project. The approved underground exploration development will be used for ventilation and other activities to support mine operations.

No milling activities are proposed for the Project and BHJV intends to ship ore directly to a custom milling facility. No tailings impoundment will be required to support the Project.

The mine life is approximately five years and it will likely take one year for underground development before mining starts. Additional resources could be identified which could extend the mine life.

Access to the Project will use existing public roads and highways. A Plan of Operations will be submitted to the United States Forest Service (USFS) to use road managed by this agency. The remaining roads are either Silver Bow County or Montana State highways.

2.1.4 Permit and Proposed Disturbance Area Boundaries

Under Exploration License No. 00680 there was an approval to use 51.4 acres for exploration activities. An additional 17.7 acres have been approved by modifications under Exploration License No. 00680. Only small amount of additional surface disturbance will be required to support mine operations. Approximately 0.5 acres of additional disturbance for a laydown area and 11 acres for an ore haulage road and transfer facility will be required. Tables 2.1.1 and 2.1.2 provide a breakdown of the existing and new disturbance required. Figure 17 and Figure 18 show the existing disturbance boundaries. Figure 19 shows the proposed new disturbance boundary. All existing and proposed disturbance is located on private lands.

The proposed underground mining activities will be located within the patented claims held or controlled by BHJV. This includes the following patented mining claims:

Pony Placer Claim	Only Chance
Red Mountain	Atlantic
Murphy	Barnard
Purchance	Island
J.B. Thompson	Main Chance
Main Ripple	

The mineral deposits are situated primarily on the Murphy, Only Chance, Purchance, and Red Mountain patented claims and is where the focus on mine development would be located

(Figure 12). The decline is currently authorized and is the only feature that is located on unpatented mining claims (BHC-1 and BHC-2 unpatented claims).

2.1.5 Surface and Mineral Ownership

The BHJV owns and controls the surface and mineral rights over the majority of the permit boundary in the vicinity of the adit (Figure 12). Table 2.1.1 provides a breakdown of the ownership in this area and the remaining permit boundary areas that encompass the ore haulage route and ore transfer facility.

Names and addresses of private surface and mineral rights owners are as follows:

Butte Highlands JV, LLC (a Limited Liability Company)
101 E. Lakeside Avenue
Coeur d'Alene, ID 83814

All other land and mineral rights within ½ mile of the permit boundary at the mine adit is under USFS ownership. All other land and mineral rights within ½ mile of the ore haulage road and transfer facility is under the ownership of entities included in Table 2.1.1. There are no contracts for deed in place for any of the properties listed in Table 2.1.1 at the time of this writing.

Table 2.1.1. Surface and Mineral Ownership within Permit Boundary and Within ½ Mile Radius of Permit Boundary

Claim Name / Geocode	Land Status	Mineral Rights	Land Ownership	Address	City	State	Zip
Main Ripple	Patented	BHJV	BHJV	967 E. Parkcenter Blvd.	Boise	ID	83706
Murphy/01-0992-31-1-01-03-MINE	Patented	BHJV	BHJV	967 E. Parkcenter Blvd.	Boise	ID	83706
J. B. Thompson/01-0992-31-1-01-01-MINE	Patented	BHJV	BHJV	967 E. Parkcenter Blvd.	Boise	ID	83706
Purchance/01-0992-32-1-01-01-MINE	Patented	BHJV	BHJV	967 E. Parkcenter Blvd.	Boise	ID	83706
Only Chance/01-0992-32-1-01-03-MINE	Patented	BHJV	BHJV	967 E. Parkcenter Blvd.	Boise	ID	83706
Red Mountain/01-0992-32-1-01-02-MINE	Patented	BHJV	BHJV	967 E. Parkcenter Blvd.	Boise	ID	83706
Island01-0992-31-1-01-08-MINE	Patented	BHJV	Richardson Family Trust	283 W. Front St. Ste 103	Missoula	MT	59802
Main Chance/01-0992-31-1-01-07-MINE	Patented	BHJV	Richardson Family Trust	283 W. Front St. Ste 103	Missoula	MT	59802
Barnard/01-0992-31-1-01-06-MINE	Patented	Richardson Family Trust	Richardson Family Trust	283 W. Front St. Ste 103	Missoula	MT	59802
Atlantic/01-0992-31-1-01-09-MINE	Patented	Richardson Family Trust	Richardson Family Trust	283 W. Front St. Ste 103	Missoula	MT	59802
Pony Placer/01-0992-31-3-01-02-0000	Patented	BHJV	BHJV	967 E. Parkcenter Blvd.	Boise	ID	83706
BHC-1	Unpatented	BHJV	USFS	1400 Independence Ave. SW	Washington	DC	20250
BHC-2	Unpatented	BHJV	USFS	1400 Independence Ave. SW	Washington	DC	20250
BHC-3	Unpatented	BHJV	USFS	1400 Independence Ave. SW	Washington	DC	20250
BHC-4	Unpatented	BHJV	USFS	1400 Independence Ave. SW	Washington	DC	20250

Table 2.1.1. Surface and Mineral Ownership within Permit Boundary and Within ½ Mile Radius of Permit Boundary

Claim Name / Geocode	Land Status	Mineral Rights	Land Ownership	Address	City	State	Zip
BHC-5	Unpatented	BHJV	USFS	1400 Independence Ave. SW	Washington	DC	20250
BHC-6	Unpatented	BHJV	USFS	1400 Independence Ave. SW	Washington	DC	20250
BHC-7	Unpatented	BHJV	USFS	1400 Independence Ave. SW	Washington	DC	20250
BHC-9	Unpatented	BHJV	USFS	1400 Independence Ave. SW	Washington	DC	20250
BHC-10	Unpatented	BHJV	USFS	1400 Independence Ave. SW	Washington	DC	20250
BHC-11	Unpatented	BHJV	USFS	1400 Independence Ave. SW	Washington	DC	20250
BHC-12	Unpatented	BHJV	USFS	1400 Independence Ave. SW	Washington	DC	20250
BHC-13	Unpatented	BHJV	USFS	1400 Independence Ave. SW	Washington	DC	20250
BHC-14	Unpatented	BHJV	USFS	1400 Independence Ave. SW	Washington	DC	20250
BHC-15	Unpatented	BHJV	USFS	1400 Independence Ave. SW	Washington	DC	20250
BHC-16	Unpatented	BHJV	USFS	1400 Independence Ave. SW	Washington	DC	20250
BHC-17	Unpatented	BHJV	USFS	1400 Independence Ave. SW	Washington	DC	20250
BHC-18	Unpatented	BHJV	USFS	1400 Independence Ave. SW	Washington	DC	20250
BHC-19	Unpatented	BHJV	USFS	1400 Independence Ave. SW	Washington	DC	20250
BHC-20	Unpatented	BHJV	USFS	1400 Independence Ave. SW	Washington	DC	20250
BHC-21	Unpatented	BHJV	USFS	1400 Independence Ave. SW	Washington	DC	20250

Table 2.1.1. Surface and Mineral Ownership within Permit Boundary and Within ½ Mile Radius of Permit Boundary

Claim Name / Geocode	Land Status	Mineral Rights	Land Ownership	Address	City	State	Zip
BHC-22	Unpatented	BHJV	USFS	1400 Independence Ave. SW	Washington	DC	20250
BHC-23	Unpatented	BHJV	USFS	1400 Independence Ave. SW	Washington	DC	20250
BHC-25	Unpatented	BHJV	USFS	1400 Independence Ave. SW	Washington	DC	20250
BHC-39	Unpatented	BHJV	USFS	1400 Independence Ave. SW	Washington	DC	20250
BHC-40	Unpatented	BHJV	USFS	1400 Independence Ave. SW	Washington	DC	20250
BHC-41	Unpatented	BHJV	USFS	1400 Independence Ave. SW	Washington	DC	20250
BHC-42	Unpatented	BHJV	USFS	1400 Independence Ave. SW	Washington	DC	20250
BHC-43	Unpatented	BHJV	USFS	1400 Independence Ave. SW	Washington	DC	20250
BHC-44	Unpatented	BHJV	USFS	1400 Independence Ave. SW	Washington	DC	20250
BHC-51	Unpatented	BHJV	USFS	1400 Independence Ave. SW	Washington	DC	20250
BHC-52	Unpatented	BHJV	USFS	1400 Independence Ave. SW	Washington	DC	20250
BHC-54	Unpatented	BHJV	USFS	1400 Independence Ave. SW	Washington	DC	20250
BHC-55	Unpatented	BHJV	USFS	1400 Independence Ave. SW	Washington	DC	20250
BHC-56	Unpatented	BHJV	USFS	1400 Independence Ave. SW	Washington	DC	20250
BHC-57	Unpatented	BHJV	USFS	1400 Independence Ave. SW	Washington	DC	20250
BHC-58	Unpatented	BHJV	USFS	1400 Independence Ave. SW	Washington	DC	20250

Table 2.1.1. Surface and Mineral Ownership within Permit Boundary and Within ½ Mile Radius of Permit Boundary

Claim Name / Geocode	Land Status	Mineral Rights	Land Ownership	Address	City	State	Zip
BHC-41A	Unpatented	BHJV	USFS	1400 Independence Ave. SW	Washington	DC	20250
BHC-41B	Unpatented	BHJV	USFS	1400 Independence Ave. SW	Washington	DC	20250
BHC-53B	Unpatented	BHJV	USFS	1400 Independence Ave. SW	Washington	DC	20250
BHC-54A	Unpatented	BHJV	USFS	1400 Independence Ave. SW	Washington	DC	20250
01-0884-02-1-01-01-0000	Real Property	N/A	Robert D Kearns	P.O. Box 144	Melrose	MT	59743
01-0884-03-1-01-01-0000	Real Property	N/A	Moose & Camp Creek Stock Association	P.O. Box 130	Melrose	MT	59743
01-0884-03-1-01-01-MINE	Patented	N/A	Peter S Antonioli Revocable Living Trust	P.O. Box 791	Butte	MT	59703
01-0991-35-3-01-01-0000	Real Property	N/A	Jean & Dean S & Hayden Marcella	27 E. Center St.	Butte	MT	59701
01-0991-27-4-01-01-0000	Real Property	N/A	Jean & Dean S & Hayden Marcella	27 E. Center St.	Butte	MT	59701
01-0991-26-3-01-01-0000	Real Property	N/A	Jean & Dean S & Hayden Marcella	27 E. Center St.	Butte	MT	59701
01-0991-27-1-01-01-0000	Real Property	N/A	Gozden-Mcdermott Cattle Company	203 Black Angus Ln.	Butte	MT	59701
01-0991-22-3-01-01-0000	Real Property	N/A	Moose & Camp Creek Stock Association	P.O. Box 130	Melrose	MT	59743
01-0991-21-1-01-01-MINE	Patented	N/A	P LazyY Acerage LLC	8790 US Highway 10	Butte	MT	59701
01-0991-20-4-01-02-0000	Real Property	N/A	Garrison Ranches Inc	P.O. Box 320006	Glen	MT	59732
01-0991-28-2-01-01-0000	Real Property	N/A	P LazyY Acerage LLC	8790 US Highway 10	Butte	MT	59701
01-0991-20-4-01-01-0000	Real Property	N/A	P LazyY Acerage LLC	8790 US Highway 10	Butte	MT	59701
01-0991-29-1-01-01-0000	Real Property	N/A	P LazyY Acerage LLC	8790 US Highway 10	Butte	MT	59701

Table 2.1.1. Surface and Mineral Ownership within Permit Boundary and Within ½ Mile Radius of Permit Boundary

Claim Name / Geocode	Land Status	Mineral Rights	Land Ownership	Address	City	State	Zip
01-0991-29-2-01-01-000	Real Property	N/A	Raul F Diaz	705 Missoula Ave.	Butte	MT	59701
01-0991-19-1-01-01-0000	Real Property	N/A	P LazyY Acerage LLC	8790 US Highway 10	Butte	MT	59701
01-0990-24-1-01-01-0000	Real Property	N/A	P LazyY Acerage LLC	8790 US Highway 10	Butte	MT	59701
01-0990-24-2-01-01-0000	Real Property	N/A	Garrison Ranches Inc	P.O. Box 320006	Glen	MT	59732
01-0991-18-3-01-01-0000	Real Property	N/A	P LazyY Acerage LLC	8790 US Highway 10	Butte	MT	59701
01-0991-18-1-01-01-000	Real Property	N/A	Don R & Lisa G Kelly	171 Northview Ridge Ln.	Bozeman	MT	59715
01-0990-13-3-01-01-0000	Real Property	N/A	Garrison Ranches Inc	P.O. Box 320006	Glen	MT	59732
01-0990-13-1-01-01-000	Real Property	N/A	Don R & Lisa G Kelly	171 Northview Ridge Ln.	Bozeman	MT	59715
01-0990-14-1-01-01-0000	Real Property	N/A	Garrison Ranches Inc	P.O. Box 320006	Glen	MT	59732
01-0990-12-1-01-01-000	Real Property	N/A	Don R & Lisa G Kelly	171 Northview Ridge Ln.	Bozeman	MT	59715
01-0990-12-3-01-01-0000	Real Property	N/A	Garrison Ranches Inc	P.O. Box 320006	Glen	MT	59732
01-0990-11-1-01-01-0000	Real Property	N/A	Garrison Ranches Inc	P.O. Box 320006	Glen	MT	59732
01-0990-11-2-01-01-0000	Real Property	N/A	Divide Creek Cattle Company Inc.	P.O. Box 86	Divide	MT	59727

Note: Richardson claims are controlled under a mineral lease agreement.

2.2 Mining Plan

2.2.1 General

The deposit is a high grade gold skarn system that BHJV proposes to develop and extract ore using underground mining methods. The exploration infrastructure developed during exploration will be used to support the mine operations and will continue to provide the primary infrastructure necessary for the Project.

BHJV has certain requisite permits in-hand, or in application with regulators to allow mining. Major remaining permits include an MPDES Permit and Hard Rock Operating Permit (HROP). The former is targeted for issuance by Q4, 2012 and the latter by mid-2013. Final construction would be initiated immediately after issuance of the HROP and is targeted for July, 2013. The mine life is projected to be approximately five years with underground development taking approximately one year for a total mine life of 6 to 7 years. Initial production rates will play a role in determining the actual mine life. There are other resources existing on the claim block and additional drilling could identify additional resources that could be mined extending the mine life.

Because of the relatively small resource, BHJV will use contract miners to perform all mining activities. Hauling of ore and other Project aspects will be completed by out-side contractors.

2.2.2 Geology and Mineral Deposit

<u>Regional</u>

The Project area lies within a sequence of rocks ranging from Proterozoic Belt Super-group to Cambrian sediments on the margins of the Cretaceous Boulder Batholith. Regionally the Proterozoic rocks include fine grained clastic and carbonate rocks of the Missoula group and Helena Formations overlying Archean basement schist and gneiss of the Cherry Creek Formation. A series of Paleozoic clastic and carbonate rocks overlie the Belt rocks. From the bottom up these include the Flathead, the Wolsey, the Meagher, the Park, the Pilgrim, the Dry Creek, The Jefferson, the Three Forks, the Madison, the Amsden, the Quadrant and the Phosphoria Formations. All these sequences have been intruded by a variety of intrusive rocks which are all part of or related to the Boulder Batholith. The intrusive rocks are all Cretaceous or younger in age and include large plutons, small stocks, dikes and sills of varying composition. Diorite is common within the border phase intrusive rocks but often grades to gabbro.

A sequence of Cambrian stratigraphy underlies the immediate Project area. Cretaceous or younger intrusive (primarily diorite and gabbro) have intruded the sedimentary formations. The sequence from oldest to youngest consists of the Flathead Sandstone (quartzite), the Wolsey shale, the Meagher limestone (dolomite), the Park Formation, and the Pilgrim limestone (marble). Underlying the Cambrian sequence are metamorphosed sediments of the Belt Supergroup. The deposit lies within the Wolsey and Meagher formations.

Structural geology throughout the region is very complex. Intense folding of the sedimentary rocks is common. Large trans-continental scale lineaments transect and help form the regional geology. The Trans-Challis - Great Falls Tectonic Zone is a large scale feature likely formed during the Archean with subsequent recurrent movement from the Proterozoic into the Tertiary.

Project Geology/Lithologies

The Wolsey Shale overlies the Flathead Quartzite and is the main host to mineralization and is a thick sequence of inter-layered dolomitic mud and shale with some silt and carbonates. In the deposit area the Wolsey is always altered to some degree. The result is a sequence of variable skarn, hornfels and re-crystallized dolomitic marble. Such a variable thickness and variety of rock type changes is likely due to structural thickening either folding and/or faulting.

Overlying the Wolsey is the Meagher Formation. At the Butte Highlands Project area this unit is a ± 200m thick sequence of buff white generally dolomitic marble. The unit is very often bleached and sanded to a very soft friable dolomite. Bedding can be difficult to discern on the surface but at a few localities thin limonitic lines that may represent bedding planes have been folded into tight asymmetric minor folds. This may indicate the overall deformation of this unit. The unit contains little to no sulfides but may contain fine disseminated limonite casts after pyrite. There are also zones of limonite and jasperiod along structures that represent oxidized sulfide replacement mineralization. These zones where historically mined for their gold and base metal content but overall represent a small portion of this lithology.

Waste rock monitoring was initiated immediately upon starting the exploration decline and will persist as project development continues. The waste rock monitoring program consists of collecting representative samples throughout the length of the drift. Samples are shipped to three labs for analysis and include the following: (ALS Chemex Labs) whole rock geochemical analysis, (RJ Lee Labs) asbestiform mineral screening; (Energy Labs) acid/base potential.

Analytical results received from these labs are reviewed by Butte Highland staff and an environmental consulting firm, Tetra Tech, Inc. To date only two sets of waste rock samples, both from the Meagher dolomite lithology, have been sent to the laboratories for testing using the analytical protocol proposed in Section 2.17.3. Only one set of results has been returned from the labs to date. These results are from seven samples of dolomite rock selected from waste areas mined to date in the exploration decline of the Butte Highlands mine.

Samples were collected as part of the operational waste rock monitoring program discussed with DEQ personnel (KMS 2010) and revised in draft by BHJV and TetraTech (included in Appendix T). These samples have been analyzed for whole rock geochemistry, acid-base accounting, SPLP metal mobility testing and for the presence of asbestiform mineral. No asbestiform minerals were detected in the dolomite rock sampled to date.

Rock from contact zones where potential asbestiform rock (PAR) mineralization is most likely to occur was collected. The samples were submitted for polarized light microscopy (PLM) analysis in order to determine the presence or absence of asbestiform minerals. All samples were composed of 100 % nonfibrous material. As PLM results did not indicate the presence of PAR, no TEM analysis was necessary or performed. These data and additional results from other testing methods are reported in the Tetra Tech report dated 10/4/2010 included in Appendix T.

Additional samples of this and other waste rock materials (based on lithology, alteration and mineralization) encountered in the exploration decline and in future core drilling will be routinely submitted for PAR testing. The Tetra Tech report will be kept up-to-date as new samples of other waste materials (based on lithology, alteration and mineralization) are tested.

Testing of samples of other rock types such as limonite, jasperoid, and non-gold bearing massive sulfide will be collected and analyzed as they are encountered in the exploration program.

Mineralization

The primary mineralization type at the Butte Highlands Project can be classified as a magnesian gold skarn. The overall skarn mineralogy is dominated by forsteritic olivine, pyroxene and serpentine. This deposit is unusual in its distinct lack of iron oxides and sulfides.

The prograde skarn is dominated by the forsteritic olivine with lesser pyroxene and minor phlogopite. The retrograde alteration of the olivine and pyroxenes results in a mineral assemblage of serpentine, talc, phlogopite, amphibole (tremolite) ± actinolite ± calcite ± pyrrhotite ± chlorite ± magnetite. Not necessarily in that order or containing all of the above minerals. The retrograde alteration is likely staged resulting in several combinations of the above mineralogy. Gold is associated with retrograde alteration. Gold occurs with phlogopite and pyrrhotite then with clay, chlorite and pyrrhotite in these skarn systems. From casual observation of drill core compared to the drill hole assays, it appears gold can occur with tremolite only, tremolite and talc, and in other retrograde assemblages lacking in sulfides. Also the areas with abundant to massive sulfide formation within the skarn are often very low in gold. This suggests that areas with pyrrhotite and ore grade gold occurring together may be a zonation characteristic where the conditions for gold and pyrrhotite deposition overlap.

The skarn formation tends to favor the Wolsey Formation and particularly the contact zone between Wolsey and overlying Meagher. Faulting with clay development is sometimes associated with higher grade gold mineralization at or near the contact zone. This may be due to bedding plane slip features at that contact. The mineralization appears to be somewhat strata-form within the Wolsey. There are often repetitions of mineralized skarn ± fine grained hornfels with marble sequences. At this time the understanding does not point to a set pattern that is correlative throughout the deposit area. This suggests the repetition may be due to folding or faulting and not to a set stratigraphic assemblage.

There are several limited areas within the Meagher Formation that contain minor sulfide replacement style mineralization. These areas are small and likely occur along structural zones. The mineralization is usually completely oxidized. Historic mining activity concentrated on this type of mineralization. As this style of mineralization was and is not the target of the more modern operators little recent study has been focused on it.

Potential Asbestiform Minerals

Serpentine, tremolite, and actinolite all may exist in asbestiform varieties. These minerals may exist in the ore zone and also in rock outside the ore body that has been subject to metamorphism. To avoid potential health and safety problems for miners and for the general public, periodic screening of waste rock for potential asbestiform rock (PAR) content is currently taking place and is summarized in Appendix X. To date no asbestos has been detected.

All site workers with the potential to be exposed to airborne concentrations of asbestos will be trained in asbestos awareness (hazard communication). Training topics will include; an overview of what asbestos is and the health effects associated with exposures, methods for detecting asbestos and assessing exposures, engineering controls and work practices for minimizing exposures, medical surveillance, and proper decontamination procedures.

Ore Zones

Within the Wolsey/Meagher zones, a mineral deposit has been identified. The deposit is made up of several “pods” of mineralization that are distributed between the formation and contact

areas. There are at least six separate mineralized zones, and Figure 13 shows the potential mineralized zones that are currently identified and may be developed. The Contact Zone shown in Figure 13, Figure 14, and Figure 15 contains most of the potential ore tonnage. Other zones will be mined if economically feasible. Exploration/delineation activities are on-going and are projected to continue throughout the early stages of mine activities and will likely refine these boundaries (expand and decrease).

The average distance from the surface to the top of the ore zones ranges from 1,000 to 1,200 feet. The deepest ore zone is approximately 1,500 feet below the surface. The top of MI_OCB ore zone falls about 280 feet below the surface and is the closest zone to the surface. BHJV proposes to maintain at least a 300 foot buffer zone to minimize the risk of surface subsidence.

The mineral resource being developed is approximately 1,200,000 tons that will be developed over the life of the Project. More discussion on the ore zones and mining method are presented in this application.

2.2.3 Preproduction and Operational Development

BHJV intends to use the approved underground workings as the primary starting point for mine production. Figure 14 shows the approved mine development planned for exploration activities. This will consist of the following:

- Main Portal
- Ventilation Raise
- Decline/Ramp – Approximately 6,700 feet

No additional portals or ventilation raise to the surface are proposed.

Development will be focused on access to the various ore zones and ventilation requirements. The main access ramp will be extended at the same orientation. Two spiral stope access ramps will be used to access the ore zone. One ramp will access the ore zones above the decline and a second ramp will be driven from the end of the decline to access the deeper ore zones. A series of attack ramps will be driven from various locations along the spiral ramp system towards the ore zones. Figures 13, 14, and 15 provide a general arrangement of the spiral ramp and attack ramps. A short internal raise will be required to support ventilation of the lower ore zones. The following are the approximately footage required for mine development:

- Extension of the Main Ramp – 1,550 feet
- Stope Access Ramps – 6,300 feet
- Attack Ramps – 7,000 feet
- Internal Raise – 350 feet
- Exploration Drilling Development – 1,000 feet/year

As part of the on-going development/exploration drilling program, drill stations will be developed along all ramp systems. Approximately 1,000 feet/year of development will also be needed beyond the ramp system to provide approximate drill access. The location of this development will be determined on a year by year basis and is subject to the previous year's drilling activity.

Development work will be an on-going activity that will occur in advance of mining. Therefore, only enough mine development will be completed during the pre-production phase to support development of the initial mining areas.

Underground development will also include the construction of muck bays, drilling stations, water management systems, pump stations, and other similar infrastructure necessary to support mine activities.

During preproduction approximately 2,500 feet of development are planned but could change based on mine conditions and final mine design. The underground drifts will vary in size and may be modified as required but will generally follow these dimensions:

- Access Ramp – 15 feet wide by 16 feet high
- Stope Access Ramps – 15 feet wide by 16 feet high
- Attack Ramps – 10 ft. wide by 10 ft. high – 15 ft. wide by 15 ft. high
- Raises – 10 feet in diameter
- Exploration Development – 15 feet wide by 16 feet high

The attack ramp sizes could very significantly and will be based on the dimensions of the stope. These dimensions will not significantly change waste rock generated from development. Some of the planned development could occur in ore reducing the actual quantity of waste rock generated.

2.2.4 Mine Plan

BHJV intends to develop the deposit by mining underground. The deposit is shaped and orientated so that a cut and fill mining method can be efficiently employed. The nominal mining rate will be approximately 800 tons per day of ore and waste. The ore rates will vary but are expected to be approximately 400 tons per day and waste production rates are expected to also be approximately 400 tons per day.

The cut and fill mining method is particularly well suited to mine irregular orebodies. Overhand and underhand cut and fill will be the primary mining method that will be best suited for the Butte Highland Project. Backfilling of waste material will be an integral part of the mining sequence. Mine development (waste rock) will be used as backfill material. Some areas may not have to be filled or will only require partial backfill to allow extraction of the ore but the majority of the ore zones will be backfilled to some degree. More discussion on backfilling is discussed in Section 2.2.7.

The planned stopes would intersect the historic workings. Probe holes would be drilled ahead of the mining face to define the location, shape, and condition of the historic workings and to ensure that the stored water has drained off. Based on the probe hole data, a small pillar or proper ground support systems would be designed and installed to ensure the safety of the miners and the integrity of the mine.

Each potential orezone varies in shape and size. The orezone geometry, when defined, will dictate the specific details of the stope dimensions and mining sequence. Figure 12, Figure 13, and Figure 14 show the ore zones that are currently identified and are planned to be mined.

Multiple stopes and work faces will be developed to support the mining rate. Ore mined from the faces would be loaded into haul trucks and transported to the surface where it would be stockpiled. The haul trucks would back haul fill material (cemented rock fill or waste rock) to be placed into mined out stopes when waste rock from the surface or cemented rock fill was required. When appropriate, development rock would be hauled directly from the working face to the stope for disposal. The rate of backfilling will be dictated by stope size, mining rate and other factors.

Based on the expected mining rate of 800 tons per day ore and waste, the mine life is approximately 5 years; depending on the time it takes to get up to full production. It is anticipated that additional ore could be identified extending the mine life.

2.2.5 Surface Disturbance

Additional proposed surface disturbance to support the expansion of mine activities into full production includes a 0.5 acre expansion of the laydown area and about 11 acres of additional disturbance associated with an ore-transfer facility and a new ore haulage road. Figure 11 shows the existing disturbance footprint. Figure 11 shows the proposed increase in disturbance at the portal pad area. Disturbance associated with the ore-transfer facility and haulage road are depicted in Figure 21. Table 2.2.1 provides a breakdown of the existing disturbance, Table 2.2.2 shows the proposed new disturbance and summary of total disturbance acreage for the Project.

Most clearing and grubbing necessary for the project has been largely completed under the Exploration License. 34,800 cubic yards of topsoil has been salvaged and is stored in the topsoil stockpile. Approximately 800 cubic yards of topsoil and growth media would be generated when the proposed laydown area is cleared. Topsoil and growth media would be stockpiled adjacent to the laydown area and seeded (Figure 19).

Approximately 34,600 cubic yards of additional soil would be salvaged prior to construction of the ore-transfer facility and private haulage road. Topsoil and subsoil salvaged from the transfer facility would be stockpiled at the facility while soil salvaged from the private ore-haulage road would be stored in a windrow adjacent to the road. All salvaged soil would be seeded.

The warehouse, shop, lube bay, and other facilities, previously permitted under the exploration permit, will remain as surface facilities. The primary underground magazine, which includes approximately 90 linear feet of development drift previously built under the exploration permit, would remain underground. As mining moves deeper, a new magazine of equivalent size would be excavated nearer the stopes.

A new laydown area is required. The new disturbance will be located on the Pony Placer claim just south of Forest Road (8520). A buried pipeline between the existing mine portal and the middle fork of Moose Creek would be required to deliver water to the Moose Creek discharge points specified in the MPDES permit application. The pipe would be a 4 inch or 6 inch diameter HDPE pipe buried a minimum of five feet deep. A small valve box would be installed where the pipeline divides between the two tributaries of the middle fork of Moose Creek. Another buried pipeline between the top of the existing DWW10-01 borehole and a tributary of Fish Creek would be required to deliver water to the Fish Creek discharge point specified in the MPDES permit application. The pipe would be a 4 inch or 6 inch diameter HDPE pipe buried a minimum of five feet deep. The pipeline locations are shown on Figure 11.

A monitoring well would be constructed down gradient of LAD 4 on the Pony Placer.

Surface disturbance will also be required to improve the USFS access road and will be dependent on the USFS road specifications required. Because the road improvements are to a public road, it is expected that the road will remain after mining to support public traffic use. Since the road improvements will likely remain after mine activities cease, no disturbance acreage for the road is included in Table 2.2.2. Similarly, a 0.5 acre disturbance consisting of a building and access road/driveway will be created for the ore-transfer facility.

Table 2.2.1. Summary of Existing or Approved Disturbance

Activity	Acres of Disturbance	
Approved – Surface Exploration		**1.5**
Approved Underground Exploration Plan		
Hydrology Drill Holes (4)		
Road Access	0.6	
Drill Pads	0.8	
Subtotal – Hydrology Drilling		1.4
Surface Facilities		20.2
LAD Sites		
LAD 1 (*acreage change approved by DEQ 10Mar10)	12.3	
LAD 2 (*acreage change approved by DEQ 03Nov09)	11.0	
LAD 3	6.7	
LAD 4	12.6	
Access Road (LAD 1 & 2)/Pipeline	2.3	
Access Road (LAD 3)	0.1	
Subtotal – LAD Areas		45.0
Total Approved Disturbance Acres (Existing/Approved)		**68.1**

Table 2.2.2. Proposed New Disturbance and Total Disturbance

Activity	Acres of Disturbance
Proposed New Disturbance	
Laydown Area	0.5
MPDES Discharge Pipelines	1.7
Ore Transfer Facility	0.5
Private Ore Haulage Road	10
Total Proposed New Disturbance Acres	**12.7**
Approved Exploration Disturbance	**68.1**
Total Surface Disturbance Acres	**80.8**

2.2.6 Waste Rock Management/Disposal

Waste rock will primarily be generated from development of the ramp and stope development/access; however, it is anticipated that some of the development footage detailed in Section 2.2.3 could be completed in ore and as such would report to the ore stockpile reducing the projected quantities of waste generated for the Project.

The proposed cut/fill mining method is anticipated to consume the majority of the waste rock generated during mine operations. Waste generated that is not required to be backfilled to support ore extraction will likely still be disposed of underground in mined out voids. More discussion on backfilling is covered in Section 2.2.7 Backfilling.

Under the exploration plan, the waste rock stock pile will hold approximately 150,000 tons of waste rock as shown in Figure 17. The waste stockpile has been redesigned to hold 250,000 tons as shown on Figure 19 and the Butte Highlands Project Waste Dump Expansion, Phase 1 Design Report by AMEC included in Appendix U. There are currently no plans to store more than 250,000 tons of waste rock on the waste rock stock pile.

2.2.6.1 Waste Characterization

Two reports have been completed that discuss waste characterization. The first report (Geologic and Sulfide Characteristics of the Butte Highlands Project Lithologies – Feb. 2009, Glover) is included in Appendix O and initially assessed the geologic logging of sulfides from previous drilling activities and historic sulfur/sulfide information contained in the drill logs. The correlation of observed sulfur/sulfide content was highly variable and was difficult to distinguish and is likely due to the number of individuals and companies that were previously involved with the Project and the inconsistency of drill hole logging.

Sulfide content does appear to vary significantly throughout the ore body and geologic units, according to the report completed by TRC. In general terms, the Wolsey Formation has the highest visual estimate of sulfide content followed by diorite, transitional diorite, Park Formation, Meagher, and finally the Pilgram formation. The Wolsey and Meagher Formations are the primary geologic units that will be intercepted by mine development.

While the first analyses completed by TRC provided an overview and suggests the project has a low potential for acid rock drainage issues, additional testwork was initiated by TRC on representative drill core samples. A report was prepared that discusses the sample selection and test results completed (Butte Highlands Waste Rock Test Report – Dec. 2009 – KMS) and is included in Appendix O. Whole Rock, Acid Base Accounting, and Kinetic Tests were completed on the two formations. Tables 2.2.3 and 2.2.4 show the kinetic test results. Appendix P contains the full waste characterization report for the information shown in Table 2.2.3 thru Table 2.2.6.

Table 2.2.3. Meagher Humidity Cell Data Summary

CM09 Meagher	Min Value mg/l	Max Value mg/l	Geometric Avg. mg/l	Arithmetic Avg. mg/l
Aluminum, dissolved	<0.03	0.06	0.036	0.038
Antimony, dissolved	0.0006	0.0011	0.0009	0.0010
Arsenic, dissolved	0.0012	0.0124	0.0046	0.005
Barium, dissolved	0.005	0.015	0.008	0.008
Beryllium, dissolved	<0.002	0.002	0.002	0.002
Boron, dissolved	<0.01	0.09	0.024	0.028
Cadmium, dissolved	<0.0001	<0.001	0.00012	0.00016
Calcium, dissolved	5.2	8.2	6.3	6.3
Chromium, dissolved	<0.01	<0.01	0.01	0.01
Copper, dissolved	<0.01	<0.01	0.01	0.01
Iron, dissolved	<0.02	0.04	0.022	0.022
Lead dissolved	<0.0001	0.0002	0.0002	0.0002
Magnesium, dissolved	1.9	5.3	3.3	3.4
Manganese, dissolved	<0.005	<0.005	0.005	0.005
Mercury, dissolved	<0.0002	<0.0004	0.00021	0.00021
Nickel, dissolved	<0.01	<0.01	0.01	0.01
Potassium, dissolved	1.1	3.5	1.9	2.0
Selenium, dissolved	<0.0001	<0.001	0.0002	0.0003
Silver, dissolved	<0.01	<0.01	0.01	0.01
Sodium, dissolved	<0.3	1.2	0.43	0.5
Thallium, dissolved	<0.0001	0.004	0.00013	0.00034
Zinc, dissolved	0.03	0.13	0.06	0.06
Bicarbonate as CaCO3	21	37	27.6	27.9
Carbonate as CaCO3	<2	3	2.04	2.1
Conductivity @25C	47	101	68.5	70.3
Hydroxide as CaCO3	<2	<2	2.0	2
pH	8.5	9.3	9.0	9.0
Sulfate	<1	10	2.1	3.2
Total Alkalinity	23	37	28.5	28.7

Table 2.2.4. Wolsey Humidity Cell Data Summary

CW09 Wolsey	Min Value mg/l	Max Value mg/l	Geometric Avg. mg/l	Arithmetic Avg. mg/l
Aluminum, dissolved	<0.03	0.33	0.125	0.14
Antimony, dissolved	<0.0004	0.001	0.0006	0.0006
Arsenic, dissolved	<0.0005	0.0115	0.003	0.005
Barium, dissolved	<0.0003	0.008	0.003	0.004
Beryllium, dissolved	<0.002	0.002	0.002	0.002
Boron, dissolved	<0.01	0.05	0.03	0.035
Cadmium, dissolved	<0.0001	<0.0001	0.0001	0.0001
Calcium, dissolved	6.1	11.2	7.8	7.9
Chromium, dissolved	<0.01	<0.01	0.01	0.01
Copper, dissolved	<0.01	<0.01	0.01	0.01
Iron, dissolved	<0.02	0.32	0.04	0.07
Lead dissolved	<0.0001	0.0002	0.0002	0.0002
Magnesium, dissolved	2.8	5.8	4.2	4.2
Manganese, dissolved	<0.005	0.006	0.005	0.005
Mercury, dissolved	<0.0002	0.001	0.00023	0.0003
Nickel, dissolved	<0.01	<0.01	0.01	0.01
Potassium, dissolved	3.7	6.1	4.7	4.7
Selenium, dissolved	<0.0001	0.0007	0.0002	0.0002
Silver, dissolved	<0.01	<0.01	0.01	0.01
Sodium, dissolved	<0.3	4.1	1.1	1.3
Thallium, dissolved	<0.0001	0.004	0.0001	0.0003
Zinc, dissolved	0.02	0.14	0.05	0.06
Bicarbonate as CaCO3	10	26	16.4	17.2
Carbonate as CaCO3	<2	<2	2	2
Conductivity @25C	70	149	103.8	105.5
Hydroxide as CaCO3	<2	<2	2	2
pH	8.2	9	8.7	8.7
Sulfate	13	34	18.3	21.1
Total Alkalinity	10	26	16.4	17.2

A comparison of the kinetic test results to the aquatic and groundwater standards from DEQ Circular 7 are shown in Table 2.2.5. The information is conservative as some of the data are "non-detect" lab results but carried at the non-detect value for comparison purposes.

Table 2.2.5. Comparison of Kinetic Test Results to Montana Circular 7 Water Quality Standards

Parameter	Montana Standards		Wolsey Avg.	Meagher Avg.
	Aquatic mg/l	Groundwater mg/l		
Aluminum	0.087	--	0.14	0.038
Antimony	--	0.006	0.0006	0.001
Arsenic	0.15	0.01	0.005	0.0058
Barium	--	1	0.004	0.008
Beryllium	--	0.004	0.002	0.002
Boron	--	--	0.035	0.028
Cadmium	0.000365	0.005	0.0001	0.00016
Calcium	--	--	7.9	6.3
Chromium (III)	0.12	--	0.01	0.01
Copper	0.013	1.3	0.01	0.01
Iron	1	0.3	0.07	0.022
Lead	0.0053	0.015	0.0002	0.00013
Magnesium	--	--	4.2	3.4
Manganese	--	0.05	0.005	0.005
Mercury	0.00091	0.002	0.0003	0.00021
Nickel	0.0735	0.1	0.01	0.01
Potassium	--	--	4.7	2
Selenium	0.005	0.05	0.0002	0.0003
Silver	0.0081	0.1	0.01	0.01
Sodium	--	--	1.3	0.37
Thallium	--	0.002	0.0003	0.00034
Zinc	0.169	2.0	0.06	0.06
Bicarbonate as CaCO3	--	--	17.2	27.8
Carbonate as CaCO3	--	--	2	2.1
Hydroxide as CaCO3	--	--	2	2
pH	6.5 - 9.0	6.5 - 8.5	8.7	8.9
Sulfate	--	250	21.1	3.2
Total Alkalinity	--	--	17.2	28.6

Hardness dependent standards calculated for 150 mg/L hardness.

The high carbonate content of both the Wolsey and the Meagher reduced the potential acid generating capacity of both units. When combined there is even lower potential to generate an acid condition. Table 2.2.6 provides the results from the acid/base accounting tests.

Table 2.2.6. Acid/Base Characterization of Meagher/Wolsey Material

Analytes	Units	Meagher	Wolsey
Acid Generation Potential (calc on Sulfur total)	Tons CaCO3/Kt	2	229
Acid Neutralization Potential (calc)	Tons CaCO3/Kt	976	279
Acid-Base Potential (calc on Sulfur total)	Tons CaCO3/Kt	974	50
Neutralization Potential as CaCO3	Percent	97.6	27.9
Solids, Percent	Percent	99.8	100
Sulfur HCl Residue	Percent	0.02	0.96
Sulfur HNO3 Residue	Percent	<0.01	0.48
Sulfur Organic Residual Mod	Percent	<0.01	0.48
Sulfur Pyritic Sulfide	Percent	0.02	0.48
Sulfur Sulfate	Percent	0.04	6.36
Sulfur Total	Percent	0.06	7.32
Total Sulfur minus Sulfate	Percent	0.02	0.96

2.2.6.2 Monitoring

As discussed in the Section 2.2.6.1 the waste rock testing shows little or no acid rock drainage (ARD) capabilities. Characterization of waste generated during exploration activities will be completed to document the actual characteristics of the waste. Based on the humidity cell tests of representative Wolsey and Meagher formation waste rock, on-going ARD are limited.

BHJV proposes to continue to operate the waste rock facilities as approved in the exploration plan and will be as follows:

If high sulfide development rock is encountered during development of the exploration decline, that material can be segregated to minimize acid rock drainage (ARD) issues. The following waste rock characterization/monitoring will be implemented:

- Geologic mapping;
- Maintain tonnage estimate by lithology;
- Collect representative rock samples for testing;
- Documentation of sample collection
- Characterization of waste rock (as appropriate)
  - Metal content
  - Acid/Base accounting

    - Net neutralizing and net acid potential
    - Static/kinetic testing (Select samples)
- Minimum of one sample per rock unit; and/or
- One sample per 1,000 feet of development
- Segregate ARD rock where possible
    - Place back underground
    - Develop an encapsulation plan if significant ARD waste is encountered
- Sample run-off from the waste pile

For the decline construction phase of exploration BHJV has defined high-sulfide content waste rock as containing greater than 1% visible sulfide. This sulfide content is being used to designate waste rock that will be segregated to minimize and localize potential ARD effects from the waste rock. Actual acid-base accounting (ABA) data will be available as sampling of mine wastes encountered in the exploration decline continues over time. This data will allow quantification of the ABA data to clearly define the ARD potential of mined waste and to accurately determine if it needs to be segregated or not.

Waste rock characterization sampling completed to date indicates that Meagher Dolomite is a net-neutralizing, non-acid generating rock. Future underground pre-production development in other rock types such as Wolsey-skarn, intrusive diorite, or Belt quartzite with 1% or greater sulfide content will be segregated in a high-sulfide waste stockpile for use as underground backfill.

Run-off from the development rock pile will be collected at the toe of the facility in a diversion ditch where it will be directed to the sediment pond. The diversion ditch will incorporate BMPs to reduce sediment addition into the mine pond. Run-off from the development rock area will be either re-used in the mine operations and/or disposed at the LADs.

Twice per year after large storms, ponded water from the run-on ditch and also from the storm water collection ditch at the base of the waste rock dump will be sampled and analyzed.

If ARD material is encountered, it will be segregated as currently approved and will be prioritized to be used for cemented rock fill (backfill) for mining. BHJV will propose to place all ARD material underground that is encountered. With the overall net neutralizing potential of much of the waste, a small quantity of ARD material will not present a significant issue for post-closure. Table 2.2.7 provides the rock quantity summary anticipated.

BHJV fully anticipates consuming (including disposal underground) all waste rock during mine operations; however, it is being proposed that the waste rock pile approved for exploration be retained. This will provide flexibility if mine plans change and some material needs to remain on the surface. Bonding and closure activities for this waste pile have been authorized in the exploration plan approval.

Table 2.2.7. Waste Rock Generation/Backfill Requirement Comparison

Source	Tonnage
Exploration Development Rock	150,000
Preproduction Period Development Rock	50,000
Production Period Development Rock	110,000
Total Development Rock Generated	**310,000**
Underground Disposal: Backfill / Store	**310,000**

Note: Backfill quantities estimated

2.2.7 Backfilling

As described earlier in this document backfilling of the mine voids is an important aspect of the mining process. Backfilling design criteria will be set on a stope by stope basis, and that decision will determine if bulk waste rock backfilling or cemented rock fill is required. The amount of each will be based on the mine plan and structural stability of the adjacent rock units. Some stopes may not receive any backfill material and will be driven by the final mine design.

With cemented rock fill (CRF), waste rock will be mixed with cement and aggregate to the proper mix ratio to meet backfill design specifications. Cement addition rates will vary but are expected to range from 2 to 7 percent. Aggregate will be supplied by waste rock. A portion of the waste rock will be crushed to a 3 inch minus product size. The existing CRF plant will be used to generate the backfill. The CRF plant process feeds cement from the silo to a mixing tank where a slurry cement/aggregate mixture is produced. This slurry will be added to the waste rock and thoroughly mixed in the mix pit.

The batch plant is described in the Butte Highlands Amended Underground Exploration Plan (included in Appendix N) and is listed as an existing facility in Section 2.4.1 of the Hard Rock Application.

The slurry plant is a self-contained modular unit installed in a 20 foot Conex box as shown in Appendix N, Figure 14-1. It is fed cement from the silo via an auger, mixes the cement and water at a prescribed rate, and discharges on demand to the mixing pit as shown in Appendix N, Figure 14-3. Crushed rock aggregate and slurry are mixed in the mixing pit. The cement silo and slurry plant are modular facilities that will not be moved during the life of the project. The locations of the cement silo, slurry plant, and mixing pit are shown on Figure 17.

The product will be loaded into haul trucks and placed into the mined out voids in the underground workings. As mining progresses deeper, it may become more efficient to use a mixing site centrally located underground for batching the CRF. The mixing site location would be selected near the center of the lower portion of the deposit. Run-of-mine rock would be used for the backfill aggregate. Slurried cement would be produced at the surface slurry plant and piped underground to the mixing site. CRF would be thoroughly mixed in the underground mixing pit.

The CRF plant will produce up to 210,000 tons of CRF per year. The CRF plant was permitted under the Butte Highlands Project Amended Underground Exploration Plan, refer to pages 9 - 10, Appendix N. The plant was permitted for a peak operating level of over 1,000 tons per day

so that backfilling could occur rapidly when needed. The average backfilling rate will range from 600 to 700 tons per day.

Geotechnical designs may dictate that a finer fraction of material be used to supplement and/or replace waste rock as aggregate. In this case, locally available aggregate may be imported to support this need. The crushing and screening plant would be located adjacent to the CRF/shotcrete plant.

The CRF plant, the shotcrete plant, and the cement silo are modular units in fixed locations as shown on Figure 17. It is expected that they will remain in these locations for the duration of the project.

The crushing and screening plant would be mobile plants, but would stay located on the waste rock stock pile in approximately the location shown on Figure 17.

2.2.8 Equipment

The following equipment will be required to support mine operations:

UG Loaders	Personnel Tractors
UG Haul Trucks	Grader
Shotcrete Boom Truck	Pickup/Crew Vans
Fork Lift	Compressor
Surface Loader	Generators
Powder Truck	Welder
Bulldozer	UG Fuel/Lube Truck
Jackleg Drills	Jumbo Drills
Bolter	Core Drill Rigs
Cubex Drill Rigs	

The number and type of equipment required may change to meet approved Project activities.

2.2.9 Drilling and Blasting

Drilling and blasting will be an integral part of the mine development and mining activities for the Project. Conventional blasting methods will be employed following all MSHA safety regulations for the handling and storage of explosives.

Explosives will be stored on the surface at the Project in two separate explosives magazines. One magazine will be for initiation devices and one will be for high explosives. The surface magazines will be located and constructed in accordance with applicable regulations. The magazines will be surrounded on three sides with large berms. Figure 17 shows the existing magazine locations. These were authorized under the exploration permit and will be retained for mine operations. Once mine operations are underway, the primary storage of explosives will occur underground.

Powder magazines will also be located underground consistent with exploration activities. Explosives may be delivered directly to the underground powder magazines or temporarily stored in the surface explosive magazines. The location of the underground powder magazines will change periodically as the mine activities progress to support mine operations.

It is expected that emulsion will continue to be the primary explosive used for underground blasting. Depending on the rock encountered, stick powder, slurries or other similar water resistant explosives products may be used with or instead of emulsion. Emulsion will be stored in 3,000 pound totes at an appropriate distance from the magazines. Totes will be used to deliver powder to the underground powder magazines and working faces.

BHJV will implement the following measures to manage explosive and minimize the potential release of elevated nitrates to waste rock and mine water. They include:

- Proper housekeeping and spill cleanup;
- Employee training – equipment, handling, and protocols;
- Proper explosives use – wet holes etc.
- Overloading holes, minimizing spills etc. and
- Education on nitrate issues.

Ore and waste drilling will be slightly different due to rock characteristics, drift dimensions, and different rock fracturing requirements. For waste, a typical blast will consist of 50 to 60 holes and use 400 to 450 pounds of bulk emulsion. Waste blasting will require an average of 3 to 4 shots per day.

Ore blasts on the average would be smaller than development blasts with 40 to 60 holes per round, using approximately 300 to 450 pounds of emulsion. Ore zone widths will dictate the number of rounds required per day but BHJV estimates 5 to 8 rounds per day will be necessary to support the mine production rate planned. Blasting will occur 7 days per week and could occur during all shifts.

2.2.10 Ventilation

Mine ventilation will be required to provide fresh air to the mine workings and will be consistent with the current ventilation activities employed for the exploration activities. Primary fresh air will enter the mine through the mine portal and exhaust out the planned ventilation portal. A main fan located near the exhaust air/secondary escapeway portal, additional booster fans, and other ventilation mechanisms and devices will be used to direct air to support mine operations as required. The ventilation circuit is planned to draw fresh air in through the existing Main Access Ramp, ventilate the stopes using booster fans, and discharge air out through the exhaust air/secondary escapeway portal.

No additional surface disturbance will be required for mine ventilation during operations. The ventilation portal will also serve as the secondary escapeway for miners in the event of an emergency that would block the decline.

Planned development (ramps and raises) will be utilized to manage ventilation needs for the mine as appropriate to meet operational needs and MSHA standards.

2.2.11 Subsidence

The deposit is described in Section 2.2.2 Geology and Ore Deposit. The average depth from the surface to the ore zone is in excess of 1,500 feet. BHJV intends to use backfilling of the mine voids which will significantly add to structural support. At this time, the majority of the known

resources are far removed from surface topography and pose little or no threat for surface subsidence. If ore zones are identified that are close to the surface, these areas will be core drilled before any mining. The core will be analyzed for rock mass quality and geotechnical structure that could affect stope stability. Each stope will be geotechnically evaluated to ensure that the planned mining method, stope width, and ground support design will provide a safe working condition and prevent surface subsidence.

Because of the distance from the ore zone to the surface is so deep, the issue of subsidence is extremely remote and highly improbable. Because backfilling is a significant aspect of the mining process, the available mining voids are reduced. Without void zones, there is no opportunity to cause large scale rock failures that could carry to the surface. If small scale failures occur in mined out sections, swelling factor will further reduce the opportunity to cause major subsidence that could extend over 1,500 feet to the surface.

Backfilling, to the planned extent affectively results in a “non-yielding” pillar design for the Project. All of the criteria and plans described above significantly reduce the overall potential for mine subsidence in the near and long term for this Project.

2.2.12 Ore Handling

Ore will be mucked from the various working faces throughout the mine. Load Haul Dump (LHD) units will pick up broken ore and load them into haul trucks. These trucks will transport the ore up the access ramp to a stockpile located adjacent to the portal in the current surface facility footprint (Figure 17).

The ore stockpile will hold approximately 5,000 tons of ore. A front-end loader will load run-of-mine ore into highway trucks that will transport the ore to the custom milling facility.

2.2.13 Shotcrete Plant

BHJV intends to continue to use shotcrete in the mine and the associated facilities that were authorized in the exploration permit. The shotcrete plant will operate at the same rate as projected in exploration and is an approximate rate of 24 cubic yards per day. A maximum annual production of 8,400 cubic yards is anticipated. In addition to the cement silo, there is a sand storage area that will contain approximately 100 tons of blended shotcrete aggregate.

2.2.14 Exploration/Delineation Drilling

Exploration and delineation drilling will be an on-going activity for the Project. Exploration drilling will target expansion of known resources and new potential ore zones. Delineation drilling will be required to better define the mining zones. Both exploration and delineation drilling will occur annually during the life of the Project.

It is estimated that approximately 20,000 feet of exploration drilling will occur throughout the underground workings on the patented and unpatented mining claims controlled by BHJV. The number of holes, orientation, and length of the holes will be dependent on the ultimate drilling platform and the exploration target.

Delineation drilling will also occur annually but is focused on converting an exploration target into a mineable ore zone. Not all exploration targets will result in finding and delineating an economic ore zone; however, when exploration targets have sufficient grade or thickness, more detailed drilling will be required. The delineation effort currently defined by the known ore zones

will require approximately 70,000 feet of core drilling per year, using between 200 and 300 drill holes. BHJV is using this drilling rate as a projection necessary to continually advance ore development annually for the life of the Project.

During operations, continued exploration activities will occur. As discussed previously, approximately 1,000 feet of development could be completed each year to establish drill stations. It is estimated that exploration drilling could amount to 20,000 feet of core holes per year. The location of the development will be dependent on the exploration targets identified. Hole length will vary depending on the exploration target. These values will change depending on exploration success and target locations.

Exploration and delineation drilling will be accomplished using track or skid mounted core rigs. These are electric drilling rigs that can drill 3 to 4 inch holes with a depth range of approximately 1,000 feet. Depending on the depth of the drill hole, other units may be brought in that are better designed for the intended type and depth of drilling required. BHJV envisions that 2 drill rigs could be at the Project during the year. Drilling schedules will be consistent with the mine operating hours.

2.3 Ore Processing

Gold ore produced from the Butte Highlands mine can be processed using conventional cyanide gold recovery methods, but on-site processing of the BHJV ore is not being proposed.

2.3.1 Off-Site Processing

Currently BHJV has a Memorandum of Understanding (MOU) with Golden Sunlight to process gold ore from the mine. Appendix R includes the MOU between the companies. The MOU is not a formal contract to process ore but provides the agency with the acknowledgment that Golden Sunlight is a possible site and is willing to enter into a contract to process Butte Highlands' ore. Golden Sunlight is currently approved to use conventional gold extraction methods at their Project. If BHJV identifies other potential off-site milling opportunities, these will be provided to the agency before initiating shipments to the site.

2.3.2 Ore Transportation

In order to use off-site processing, ore will have to be hauled from the mine operation to the mill facility. A combination of off-road and highway trucks and trailers would be used to haul ore to the Golden Sunlight mill facility. Figure 20 shows the transportation and access route proposed for the Project.

Ore would be brought from underground to the surface, placed in the stockpile location, and then hauled to the Golden Sunlight mill within a few days. The ore stockpile location, shown on Figure 19, would be located on the waste rock stockpile. Ore would be loaded from the stockpile into 30 ton center-articulated trucks, hauled west for 42,600 feet via the Highland Road to the U. S. Forest Service boundary, then across a 19,800-foot private road, and 3,500 feet of County road to the ore transfer facility located adjacent to the I-15 Feely interchange, as shown in Figure 2 and Figure 20. Signs would be posted at each end of the private section of road to alert the public that the road is within the BHJV permit area and that public use is not allowed. Traffic pullouts would not be required on the private section of road as public access would not be allowed and haul truck traffic would be sequenced such that trucks would not pass in opposite directions at any time. Signs alerting the public to the presence of haul truck traffic

would be posted on County and USFS sections of the haul road. Pullouts would be constructed on the USFS section of the haul road in accordance with the requirements of the Special Use Permit to be issued by the USFS. This permit will also specify maintenance requirements, such as dust control measures, which will be provided to the DEQ when available.

At the ore transfer facility, ore would be unloaded from the center-articulated trucks and reloaded into highway trucks. The ore transfer facility would be a 120 ft. by 100 ft. covered structure, with the entire unloading and reloading process taking place under the covered structure. The ore transfer site is not an ore storage site. Ore would be hauled from the mine site to ore transfer site on a Monday through Friday schedule, and ore would be hauled from the ore transfer site to Golden Sunlight on a Monday through Friday schedule. It is anticipated that no more than 400 tons of ore would accumulate at the ore transfer storage site. Figure 28 shows the layout of the ore transfer facility including access roads, topsoil stockpile, and storm water run-on and run-off ditches.

Soils in the area of the ore transfer site are of the Philipsburg Series and consist of deep, well drained, fine textured loams. It is estimated that 2,400 cubic yards of topsoil will be stripped from the site before the access roads and building are constructed.

The highway trucks would be loaded within legal load limits and would employ tarps to control dust while hauling ore. The highway trucks would turn right onto the frontage road, enter I-15 at the Feely interchange, follow I-15 and I-90 to the Cardwell exit east of Whitehall on I-90, and then follow Highway 2 to the Golden Sunlight Mine road. Trucking of ore would be contracted locally, and the type of highway units would be determined by availability and prevailing laws.

Ore would be hauled from the Butte Highlands Mine to the ore transfer facility year-round, Monday through Friday, approximately 20 trips per day. Haulage is planned two shifts per day, with road maintenance and snow removal also being done during the night shift. Ore would be hauled from the ore transfer facility to the Golden Sunlight Mill on a schedule so as to arrive at the Golden Sunlight Mine site during the hours that Golden Sunlight accepts ore shipments. Golden Sunlight currently accepts ore Monday through Friday, 7:30AM through 4:00PM.

2.4 Support Facilities

The only new support facilities that would be added would include a mobile assay lab, two 15,000 gallon fuel tanks, an additional land application site, and another laydown area. A fourth land application disposal, LAD 3 has been permitted under the exploration permit. Figure 11 shows the proposed new disturbance.

2.4.1 Existing Facilities

All existing Project facilities are shown on Figure 17 and Figure 18. Facilities permitted under Exploration License #00680, but not constructed yet are shown as "(future)" facilities on the Figures. The following is a list of existing facilities at the site:

Office/Dry Facility – Two modular trailers (24 feet by 66 feet) are used to provide offices and dry facilities.

Core Shed – A building was constructed to house the core generate during exploration. This building will remain and be used for operations.

Septic System – A septic system was installed to manage domestic waste water for the Project. The system was sized for 49 workers on site during a 24 hour period.

Shop Facility – A 50 ft by 80 ft building (fabric) was constructed for exploration and will be used for the same purposes during mine operations.

Generators – Two generators were authorized and air permits issued for exploration. These units will be used for mine operations and include two primary units. These are housed in Conex boxes.

Fuel/Oil Storage/Wash Pad – A 50 ft by 80 ft building (fabric) with a concrete pad was constructed at the site to hold fuel, oils and lubes, antifreeze, and a vehicle wash pad. Secondary containment is designed into the facility and a water recycling sump is included, sized appropriately. The following fuels /lubricants are stored at this facility:

- 1- 6,000 gallon double walled tank (diesel)
- 2000 gallons oil/lubricants - various bulk sizes

Distribution of fuel will remain the same as during the exploration activities. A fuel and lubricant truck will be used to dispense fuel to mobile equipment and a fueling station is included at this site as well.

Methods of spill prevention and response are described in the project Storm Water Pollution Prevention Plan required as part of the project Notice Of Intent (NOI MTR 103517) to proceed with construction activities under the Statewide General Stormwater Permit.

As before, no fuel will be stored in the underground workings. Used oil will either be used on site as a fuel source for on-site heaters or sent to an appropriate facility off-site for re-use.

Silo, Batch Plant, Sand Pile, and Shotcrete Plant – A cement silo, slurry plant, and shotcrete plant were all installed during the exploration phase. Sand for shotcrete production is stored in a pile approximately 40 feet in diameter. A CRF backfill plant will also be installed under the exploration license.

Mine Ponds – Two ponds were constructed to manage site run-off and mine water. The mine ponds have a combined capacity of approximately 2.5 million gallons plus 561,000 gallons stormwater (25yr- 24hr event) for a total capacity of approximately 1.9 million gallons. Pond levels are maintained to ensure the storm capacity is always available.

Land Application Disposal (LAD) – Approximately 42.7 acres of LAD areas are approved in the exploration plan and consist of four separate sites (LAD 1, 2, 3, and 4). Each site is divided into cells.

LAD 1 was modified (approved by MDEQ) for sprinkler use, LAD 2 site was modified (approved by MDEQ) to provide winter LAD and includes buried pipe, LAD 3 will be a drip-emitter site as detailed in the Exploration Plan, and LAD 4 was added to the exploration plan by a modification (approved by MDEQ) and is a snowmaking site including seven tower mounted Super Polecat Snowmakers.

2.4.2 Laydown Areas

Increased materials, equipment, and other activities will require an expansion of available area to store idle equipment, and mine supplies. A new laydown area is proposed on the Pony Placer Claim. Figure 11 shows the location. The laydown area would result in approximately 0.5 acres of new disturbance.

2.4.3 Fresh Water Distribution and Supply

There will be no change in how water is distributed for the Project. A water supply well is located near the portal that supplies potable water to the operations (Figure 17). This well has sufficient capacity to provide domestic water needs for the Project. BHJV will use mine water collected underground for any water needed for drilling water, dust suppression, and other water needs underground.

Prior to exceeding the regulator limits of 25 employees, BHJV will submit an application for the potable water system to Montana DEQ. It is expected that no change will occur in the water distribution system to obtain approval for the full staffing level planned for the Project.

2.4.4 Sewage Treatment and Solid Waste Disposal

A septic system was installed as part of the exploration activities and was approved by Silver Bow County. The Butte Highlands Mine septic system is designed and permitted for up to 49 people on site in a 24 hour period. The total work force will not exceed 49 people on site in a 24 hour period, thus no septic system expansion is planned. A copy of the current Butte Silver Bow (BSB) County Septic Permit and approval for the Butte Highlands Project is attached in Appendix V.

2.4.5 Assay Laboratory

A small assay laboratory will be located on site to support the mine operations. This will be a standard assay facility that will be located in a trailer that will be placed adjacent to the existing office facilities. This facility will be located within the permitted disturbed area; therefore, no new disturbance would be required for this facility.

The assay lab would consist of a small jaw crusher and pulverizer to prepare the ore samples for assaying. Drying ovens, furnaces, and other equipment required to perform assay determinations at the Project will be located in the assay lab. The furnaces will either be LP gas or electric.

Hazardous waste from the assay lab would be sent via a Licensed Hazardous Waste Hauler such as Paul Thomas Enviro Trans to a Licensed Hazardous Waste Treatment Facility such as U. S. Ecology in Grand View, Idaho.

2.5 Personnel

The BHJV will increase manpower for the Project over that used for the exploration plan. There will be generally three phases for the Project which include Pre-Production, Production, and Reclamation periods.

2.5.1 Pre-Production Phase

This phase of the Project will be staffed similar to the exploration phase and will likely involve 25 to 30 employees. This number could fluctuate seasonally by 5 to 10 people and is dependent on when mine operations commence.

The pre-production phase will involve mine development that is necessary to access the ore zones, ventilate the mine, handle ore, and other functions prior to full scale mine operation. It is not expected that the pre-production phase will extend beyond 6 months.

2.5.2 Production Phase

Staffing levels for this Project are expected to be relatively stable. During the production phase, mine staffing will be increased to support both mine development and mine operations. In addition, technical and administrative staff will be required to support the operations.

The BHJV will have up to nine employees working at the site. BHJV employees will include geologists, Project management, environmental and other operational positions. The mine contractor will have up to 45 employees for the Project. This includes four supervisors and 41 hourly employees. Underground development and mining will continue 24 hours per day, seven days per week. Two 12 hour shifts will be worked each day. Crew sizes and shift rotation will dictate the total number of employees at the site at any given time.

The total employment for the Project will be 54 employees.

2.5.3 Reclamation Phase

During this phase of the Project, limited staffing will be required. An estimated 10 people will be required for closure and would include contractors and BHJV staff. During the long-term post-closure monitoring, staffing levels will vary depending on the monitoring and other activities that may be required.

2.6 Soil Management

Soil from disturbance associated with the exploration activity has been salvaged and is stored at the site. The proposed disturbance is small and will not result in a large quantity of soil to be stockpiled.

2.6.1 Soil Salvage and Replacement

All available topsoil or growth medium will be removed prior to commencing construction activities on new areas. BHJV will salvage soil from the laydown areas and will stockpile the soil in the same area. Soil salvaged from the ore-transfer facility would be stockpiled at the facility and soil salvaged during construction of the private ore-haulage road would also be stockpiled on private property near the road. Salvaged soil will be stored until such time that reclamation will be initiated and soil replaced onto disturbed areas. A survey of the soil stockpiles will be completed to inventory soil quantities salvaged.

BHJV plans to replace soil as part of the reclamation activities as outlined in Section 3.0 Reclamation.

LAD disturbance will not result in large scale surface impacts but rather only that which is required to bury distribution lines and other water management systems. Soil will be replaced immediately after construction of the LAD is completed and the site will be seeded. Therefore, only temporary storage of soil from the LAD site will be needed and will occur adjacent to the excavation work required.

2.6.2 Topsoil Stockpiles

Topsoil stockpiles would be placed down gradient of the new disturbances to serve as stormwater and erosion berms. Soil stockpiles at the ore-transfer facility would be located at the facility and soil salvaged from the private ore haulage road would be stored in windrows adjacent to the road.

2.6.3 Soil Protection Measures

Once soil is salvaged, it is anticipated that concurrent reclamation will not occur for most of the mine life. Therefore, protection of soil resources will be important to ensure successful reclamation and the following measures will be taken:

- Soil will be placed in stockpiles as soon as possible after site disturbance
- Berms will be constructed around the soil stockpiles to reduce soil loss from erosion;
- Seeding will occur on stockpiled soil to minimize noxious weed invasion (Seeding will occur either late in the fall or early spring); and
- Weed management – inspections and treatment (if needed).

2.7 Water Management

BHJV completed several hydrologic drill holes to assess the hydrogeologic conditions that could be encountered during the exploration phase of the Butte Highlands Project. As part of baseline data collection, samples were collected by BHJV and AMEC Geomatrix Inc. from the Highlands Mine Adit and air lift pump tests conducted immediately after the holes were drilled. This information was used by AMEC Geomatrix to assess and estimate mine inflow rates. They completed reports based on the exploration activities (Appendix C and E). Using this information and the current mine plan, AMEC Geomatrix assessed the potential mine inflow rates that consider the mine voids (Appendix F).

The AMEC Geomatrix Inc. hydrogeologic investigations involved the development of a conceptual hydrologic model for the project area. The area is relatively small and is situated on the Continental Divide with very localized influences to recharge and discharge expected for the project. Amec Geomatrix developed a water budget for the project that accounts for inflow, outflow, and possible changes in storage capacity.

Three independent methods of calculating mine inflow were completed for the project. They included the USFS Method, the Gooman Method, and the LEI Method. The following are the results of the estimates:

- USFS Method - 140 to 450 gallons per minute
- Goodman Method – 160 – 430 gallons per minute

- Lei Method – 130-440 gallons per minute

These methods have limitations and the upper ranges of mine inflow predictions for each method generates a value that exceeds the water budget projected for the watershed area of the mine. Amec Geomatrix (Appendix F) suggests a steady-state rate approaching 240 gallons per minute could be realized.

Historic water inflow data from the 1930's and current water inflow data collected while driving the exploration decline in 2010 indicate that the AMEC Geomatrix estimate is too low. Therefore, Itasca Denver, Inc. was contracted to conduct a hydrolgeologic characterization of the proposed Butte Highlands Mine. The Itasca study (Appendix Z) included aquifer tests, hydraulic conductivity estimation, and numerical modeling.

Aquifer tests included pumping from a prototype dewatering well capable of producing 400 gallons per minute and measuring response in eight piezometer holes instrumented with an array of pressure transducers and data collectors. A step-drawdown test and a 10 day constant rate pumping test were conducted in January 2011.

Hydraulic conductivities (K) of the geologic formations were estimated from data collected during the pumping and recovery phases of the test using analytical techniques. A 3-D numerical groundwater flow model of the Butte Highlands Mine and the surrounding area was constructed by Itasca using finite element code and the best geologic data available. K values were assigned to each formation, fault zone, or geologic zone. The model was then calibrated to steady-state conditions before the drawdown test and to transient conditions during the drawdown test.

Mine dewatering was simulated by Itasca using the numerical model to assess the quantity of water that would have to be pumped from underground dewatering wells to maintain "dry" conditions in the mine development and in the stopes. The predicted dewatering rate for the Butte Highlands Mine was estimated to be about 750 gallons per minute throughout the first 4 ½ years of the mine life as the mine development is extended down to 6300 feet elevation and the dewatering level advances at least 50 feet lower than the mine development level. The model predicts that pumping rates can be reduced to about 500 gallons per minute to maintain the water level at 6,300 feet elevation.

BHJV intends to install additional underground dewatering wells to effectively dewater the planned mine development and production areas ahead of mine development. As the mine extends deeper, more underground wells will be drilled to replace those that are no longer productive. Water from the dewatering wells will be pumped either to settling sumps or directly to a water treatment plant. After treatment, the water will be discharged to Fish Creek, the Middle Fork of Moose Creek, and Basin Creek under a Montana Pollution Discharge Elimination System (MPDES) permit.

Water quality from the historic Highlands Mine provides insight into the potential groundwater quality that will be encountered during mine development operations. Samples were also collected from the dewatering well (DWW10-01) and two of the underground piezometers (UGPZ-03 and UGPZ-04) during 2011. Water quality data from the dewatering well and piezometer samples were used for MPDES permit calculations.

The Project is currently authorized to use land application for the disposal of mine water. The LAD sites will be kept as back-up systems during mine operations which will require BHJV to file

an application for a Class V UIC permit with EPA Region 8. The application will be filed and when obtained, a copy of the permit will be provided to DEQ.

2.7.1 Water Balance/Mine Dewatering Rate

Because BHJV is not proposing to operate a mill and tailings impoundment, the water balance for the Project is straight forward and focuses on predicted mine inflow. All drill water and other water used for mine operations will be obtained from sources underground. Since this water will come from the dewatering system, there is no new water added to the circuit that would increase the water balance and need for additional disposal.

An updated site wide water balance model was developed by Arcadis in 2012 (Appendix AG). Components of water use and supply accounted for in the model include dewatering wells and underground seepage, the water treatment plant, runoff, sediment and recycle ponds, cemented rock fill, dust suppression and drilling, the historic Highlands adit, and the domestic well and septic system. The model was used to evaluate the operational water management strategy and confirmed that discharge from the mine could be maintained at or below 750 GPM by managing the dewatering pumping rate based on storm events as discussed in Appendix AG.

2.7.2 Water Disposal/Use

The Project currently uses land application for the disposal of mine water. This system includes underground sumps, surface settling ponds, and three LAD sites. Under the proposed Operating Plan, BHJV intends to install underground dewatering wells, dewater the mine area ahead of mine development, treat the dewatering water, and discharge it under a MPDES permit.

2.7.3 Current Mine Dewatering Facilities

The Project currently uses land application for the disposal of mine water. This system includes underground sumps, surface settling ponds, and three LAD sites. Water from the underground workings is pumped through a series of underground sumps to settle out sediment from mine activities. Flocculent is sometimes added at the sumps to assist in settling sediment.

Hydrocarbon booms are used in the underground sumps to remove hydrocarbon contamination. Water from the underground sumps is pumped to the mine ponds located below the development rock storage area. Two ponds were built with a combined capacity of approximately 2.5 million gallons. At a de-watering rate of 100 gallons per minute, this results in approximately 2 weeks of retention time in the ponds.

Water from the mine and waste rock stockpile area reports to the Sediment Pond, which has a capacity of approximately 1.5 million gallons. Run-off from the waste pile is gravity fed to the ponds while the mine water is pumped up the decline through a pipe to the pond. This pond is the secondary sediment removal process in the circuit. Water decants from the Sediment Pond and flows to the second pond, which has a capacity of approximately 1.0 million gallons. Water from the second pond is sent to the land application disposal areas.

The mine ponds are designed to hold the 25 yr-24 hr storm event from the waste rock area. The catchment area is approximately 400,000 ft2. The amount of rain for this storm event is approximately 2.5 inches of precipitation in a 24 hour period. With a run-off coefficient of 90 the storm storage required is approximately 561,000 gallons. The total pond capacity is 2.5 million gallons of water.

Pond Design Capacity	2,500,000 gallons
25yr-24hr Event	561,000 gallons
Operating Capacity	1,939,000 gallons

Pond levels will be maintained to ensure the 561,000 gallons of storm capacity is available at all times. The LAD piping system is sized to handle a minimum of 200 gallons per minute which would be sufficient to handle larger storm events occurring at the site. Additional cells would be activated to bring the pond levels back into compliance should a large storm event occur.

2.7.3.1 Land Application Disposal

Under the current Land Application Disposal (LAD) plan, water is sent from the mine pond and delivered to one of four LAD areas at the Project. LAD 1, LAD 2, and LAD 4 have been constructed under the Butte Highlands Exploration License. An additional 7 acres of LAD area are permitted with LAD 3 located on the Red Mountain Patented Claim. LAD 3 would include drip emitters and be divided into cells with dimensions of approximately 200 feet by 200 feet for each cell.

Water is delivered to the LAD 1, 2, and 4 via a three buried pipelines. These main distribution lines pass under the Fish Creek Road to gain access to the LAD 1, 2 and 4 sites. Valves control water flow to the desired cell(s).

Regular rotation of the LAD cells is necessary to apply water appropriately to meet design expectations. The rotation permits the cells to rest and evapotranspiration to occur.

A groundwater monitoring well is located below each LAD area and monitored for any water quality changes. Refer to Figure 4 for the locations of the LAD monitor wells. WS-8, defined as the uppermost spring in the Middle Fork of Moose Creek, is located down gradient of LAD 1 and LAD 2. WS-8 will be sampled monthly. The LAD sites are visually inspected to ensure surface ponding and run-off is not occurring. Seasonal adjustments are required to the amount/time water is applied to each cell(s) in an LAD.

LAD water disposal options include sprinkling on LAD 1 during warmer weather, all-season disposal at LAD 2, or snowmaking on the Pony Placer during cold weather.

The underground perforated pipes in LAD 2 are used during weather that precludes the use of LAD sites 1 and 3 subject to the following conditions:

- water discharged through LAD 2 meets Montana Groundwater Standards,
- sampling in the LAD 2 monitoring wells and surface monitoring sites demonstrate that groundwater and surface water quality are not being impacted by the LAD 2 site, or
- water discharged through LAD 2 would be treated before discharge.

If LAD sites were to be used for untreated water under the proposed permit, daily inspections and nitrate accounting would be completed in accordance with Appendix AC and documented on forms similar to Table 3 of Appendix AC.

2.7.3.2 MPDES Permit

BHJV has applied for a Montana Pollution Discharge Elimination System permit that proposes mine water treatment and discharge to outfalls located on Fish Creek, the Middle Fork of Moose Creek, and Basin Creek (Figure 26).

The water table would be locally depressed through underground dewatering wells in advance of underground mine development. Water produced from the dewatering wells and any excess water reporting to the underground workings would be treated using a Reverse Osmosis (RO) plant to meet the non-degradation standards of the MPDES permit. The RO plant is proposed to be located underground.

Water would be discharged to Basin Creek via the historic Butte Highlands Mine portal. The historic Butte Highlands tunnel would be accessed from the current mine workings at a point approximately 1,600 feet in from the historic portal. A 4 inch or 6 inch HDPE pipe would be installed from the RO plant to the historic Butte Highlands tunnel and extending far enough down the tunnel to ensure that the treated water does not re-enter current mine workings. A flow rate of 350 gallons per minute to Basin Creek is proposed. This flow rate includes 150 gallons per minute to continue the historic flow from the portal, which was demonstrated during the dewatering tests to diminish to practically no flow within days of beginning dewatering.

Water would be discharged to two tributaries of the Middle Fork of Moose Creek via 4 inch or 6 inch HDPE buried pipe extending from the current mine portal across the BHJV owned Pony Placer claim to the two discharge points located on the Pony Placer claim. Flow rates of 60 gallons per minute to one tributary and 140 gallons per minute to the other tributary are proposed.

Water would be discharged to a tributary Fish Creek at a location on the patented Barnard claim. A pipeline system would extend from the RO plant through 4 inch or 6 inch HDPE pipe to the bottom of the cased borehole that extends from the surface down to DWW10-01. The pipeline system would extend up to the surface through the unused portion of the borehole. A buried 4 inch or 6 inch HDPE pipe would extend from the collar of the borehole following existing roads on BHJV owned or leased patented claims to the Fish Creek tributary discharge point.

The potential for augmented flow conditions to destabilize the stream channels was evaluated as part of a fluvial geomorphology study (Appendix AJ). Results of this study indicate that the current stability of receiving streams would not change as a result of the increased flow planned as part of the MPDES discharge.

2.7.4 Treatment System

BHJV contracted Tetra Tech to investigate treatment options for the water from the proposed Butte Highlands Mine dewatering system. A conceptual evaluation of high recovery membrane (HRM) water treatment using RO membranes was performed by Tetra Tech. Results of the conceptual evaluation were very favorable; therefore, BHJV contracted Tetra Tech to perform a bench scale HRM treatment test using a representative 220 gallon sample of water collected from DWW10-01, UGPZ-03, and UGPZ-04 at the Butte Highlands exploration project. The bench test summary and results are included in Appendix AF.

The Butte Highlands Mine dewatering stream is anticipated to be processed through a HRM system in conjunction with a proprietary and proven Interstage Precipitation Reactor (IPR)

treatment method. The proposed IPR concept is capable of further processing the concentrate streams from HRM systems, allowing for high removal of constituents of concern required for the intended surface water discharge of the resulting treatment system effluent while maximizing overall water recovery.

The HRM membrane process separates metal salts and other constituents in the feed water by passing the flow through high efficiency semi-permeable membranes. The membrane process substantially rejects the constituents of concern allowing the treated water to pass through the membrane for discharge. Because the HRM system has some limitations, the waste stream of the initial stage HRM (concentrate) is consolidated and further processed through the IPR to maximize total water recovery as described below.

The treated water recovery of the initial stage of HRM is limited by precipitation of super-saturated inorganic salts within the concentrate stream, most typically calcium sulfate and calcium carbonate, which traditionally have been addressed with “antiscalant” chemical additives. The IPR technology proposed for this project further processes the concentrated waste stream from the HRM system without specific reliance on “antiscalants” by converting super-saturated constituents in the HRM concentrate streams to an equilibrium state. This unique process allows for further treatment with additional stages of HRM to minimize the treatment waste stream while maintaining the water quality levels necessary to meet the designated discharge standards for the project.

A second and typical limiting factor for recovery in HRM systems is silica content. While the levels of silica observed from preliminary testing for the Butte Highlands Mine are not currently of concern, that silica will react with the calcium and magnesium in the water and form polymers, which can effectively plug HRM membranes and inhibit effective contaminant removal and recovery of the water being treated. The IPR process effectively removes excess silica and, thereby, allows for further membrane processing. The net result is higher recoveries than are typically possible with the use of conventional “antiscalants” alone. Recoveries of the volume of mine water treated in currently operating HRM systems of this type been proven to generally exceed 99 percent.

The system employed in preliminary testing for the Butte Highlands project utilized a two stage HRM system with high efficiency, low pressure reverse osmosis membranes and a single IPR between the two stages. The primary water treatment concept was validated through initial testing to achieve the anticipated water quality discharge standards, illustrates the primary treatment concept. The permeate from the HRM is directed for blending with the permeate from subsequent HRM stages as necessary.

The concentrate stream is then directed to the first stage IPR for additional processing and the concentrations of the constituents are reduced in the IPR process to levels amenable for feed to additional stage(s) of HRM for subsequent treatment. The IPR concentrated waste stream can be potentially utilized in mining operations as a component to cemented backfill for example or dewatered to a solid and disposed of as necessary. With a two stage process as shown above, 90 percent recovery for each stage has been verified through initial testing, with a combined overall process recovery of 99 percent. It is possible based on the results from project preliminary testing that a second stage IPR and third stage HRM will further increase the recovery of the system to levels in excess of 99 percent while maintaining the required discharge standards required for this project.

2.7.5 Grouting

BHJV intends to grout water bearing faults and fractures as a means to control and minimize inflow of groundwater to the mine workings. Grouting, longholing, and other techniques will be used to intercept and direct groundwater before it enters mine workings which will prevent or reduce water impacts.

Grouting is a process of sealing a small water producing fracture in the rock encountered in the mine workings. Various techniques are available for the site specific conditions. Drilling will proceed mine development activities and will delineate potential water producing fractures. This will be accomplished using a long-hole technique drilled from the mine face. The hole length will vary but will likely be 100 feet. If water is encountered, the water producing unit will be pressure grouted. This will reduce inflow during mine development through this 100 foot section.

As mine development progresses and exposes fractures in the rock walls, additional grouting will be completed to seal the fractures reducing water inflow. This sequence will be the standard method of identifying water producing units prior to mine development into that particular mine area. The grouting system will be integral to the overall water management program for the mine.

2.8 Transportation

This section describes the planned transportation routes, vehicle use, maintenance, and other provisions for road use. All access to the Project site must use roads managed by Butte-Silver Bow County and the USFS. BHJV is in the process of securing permits from the Butte-Silver Bow County and the USFS for road access to the site. Lease agreements are in place with three private landowners to construct a segment of private road to use as an ore hauling route located between the USFS boundary and I-15.

2.8.1 Access Routes

Two routes are being permitted for access to and from the Butte Highlands Project and are shown on Figure 20. The Roosevelt Drive/Highlands Road access route would involve the use of the following:

- Roosevelt Drive
- Highland Road (FR 84)
- FR 8520

The Highlands Road to I-15 access route would involve the use of the following:

- FR 8520 and Highland Road (FR 84) (42,600 feet)
- 19,800 feet of private Roads (Figure 21 and Figure 22)
- A 3,500-foot section of Curly Gulch Road (County Road)

The Roosevelt Drive/Highlands Road route would be used for mine personnel access and for material and supply deliveries. The Highlands Road to I-15 route would be used for ore haulage.

2.8.2 Vehicle Use

Vehicle use on the Roosevelt Drive/Highlands Road route would include, but is not limited to the following types of vehicles:

- Passenger Cars
- Pickup Trucks
- On Highway Trucks/Trailers
- Light Truck
- Delivery Vans

Below are the estimated trips on Roosevelt Drive per day and per week for each basic vehicle type for the Project.

Vehicle Type	Trips/Day	Trips/Week
Passenger/Light Vehicles	10-15	60-90
Vendor Trucks/Trailers etc.	1	5
Weekly Fuel/Lubricants		3
Miscellaneous (All Types)	4	24
Total	15-20	92-122

Vehicle use on the Highlands Road to I-15 route would include 20 haul trucks per day, five days per week.

2.8.3 Road Maintenance

Road maintenance requirements will be dependent on the agreements with Butte-Silver Bow County the USFS, and private landowners for respective segments of the roads. BHJV is committed to properly maintaining the road surface for safe operations for both mine vehicles and the general public use. BHJV will work with the USFS and Butte-Silver Bow County to work out an equitable road maintenance agreement. BHJV will perform snow removal on the Highland Road beginning where the County stops plowing for school bus access and on FR 8520 between the Highland Road and the mine site. BHJV will perform dust suppression on all mine access roads. Dust control on roads would rely on application of water using water trucks or, if necessary, magnesium chloride. Maintenance of private road segments is described in lease agreements with the private landowners and includes provisions for noxious weed control, erosion control, and culvert and ditch maintenance.

Road improvements necessary on the USFS Highlands Road west of the mine site would likely include pullouts approximately at regular intervals and where visibility requires, resurfacing a portion of the road where homes are located, widening the road in a few segments, and other improvements that would be required for safe use of this road. Specific improvements are currently being determined by the USFS and would be stipulated in the Road Use Permit that the USFS plans to issue to BHJV for use of this segment of road. Berms would be constructed on all portions of the ore haulage road where needed to meet MSHA requirements.

2.9 Power

BHJV is currently obtaining power from generators and a small overhead powerline. Increased power consumption will be required to support mine operations.

2.9.1 Existing Power

An air permit issued by the State of Montana (MAQP #4449-00) for the project. This permit authorizes the use of two generators to supply power. As mentioned above, an existing powerline provides limited power to the project.

2.9.2 Additional Power

Additional power will be required for the Project. At this time the power is being evaluated and will be dependent on pumping requirements and other mine criteria. Preliminary estimates indicate the following will be the minimum requirement:

3-365kW diesel generators

1- 325kW diesel generator – backup unit

BHJV will prepare a permit modification to permit the change in planned generator capacity for the Project.

2.10 Fire Protection

A fire protection system will be an integral part of the Butte Highlands Project and will include protection of buildings, firefighting equipment, and cooperation with local fire departments. BHJV will work with local fire districts to establish a standard protocol for those districts to report off-site incidences that may impact the mine or mine access routes.

All buildings will be equipped with fire alarms and smoke detectors where required and appropriate. The systems will be designed to provide early warning and protection to site employees and the ability for employees to provide a quick response. Additionally, communications procedures, telephone numbers, and other pertinent fire reporting information will be kept readily available. Mine employees will be trained on standard reporting protocol for both structural and wildland fires that occur at or near the site. All personnel will comply with all MSHA, local and State fire regulations. Fire prevention and control methods will be part of the overall employee training programs, and some of the mine staff will be trained as firefighters for the site. During emergency situations, mine employees and equipment may be available to provide another level of support to local fire districts.

Dedicated water capacity for firefighting will be maintained in the water tank. Water trucks, bulldozers, other equipment, and trained employees will be available to fight fires at the Project site.

As mentioned above, mine employees will comply with MSHA, State and local fire regulations and restrictions that may apply to activities at the site. All vehicles used throughout the Project area and commuting to and from Butte, Montana will have dry fire extinguishers, shovels, and buckets for early response to fire at the site or on the main access route from town. Fire extinguishers at the mine site will be located at strategic locations (i.e. shop, fuel tanks)

throughout the Project. Employees will be trained on fire extinguisher use. Mine vehicles traveling to the mine will have radio communications to report fires along the main access road.

Mine employees will be aware of the current fire danger rating during fire season, and will communicate with local fire districts throughout the season for current fire information and restrictions, if implemented. Mine operations during periods of high fire danger will incorporate procedures that will manage activities such as welding to minimize potential fire hazard. This will include moving activities into a building.

Where this isn't possible, the following actions will be taken:

- Work in areas where vegetation has been removed;
- Relocate equipment to mine disturbed area;
- Apply water to the work area before and after activities;
- Retain a water truck near the work area until the work is complete;
- Provide site inspection after completion of work to ensure fire potential is clearly eliminated;
- Defer work if possible; and/or
- Incorporate other actions as necessary to minimize risk of potential fire hazards.

BHJV's effort is focused on employee training, fire prevention, and control of mine activities to minimize the threat of fires resulting from mining activities.

2.11 Public Nuisance

The Butte Highlands Project is located in a remote location on private land surrounded by public land. BHJV is committed to using private land to advance the development of the mineral resource in a manner that is not inconsistent with multiple land use of the surrounding public lands.

Efforts will be made to maintain an orderly operation and coexistence with residences along the access road and public land users. Most of the mine activity will be underground virtually eliminating the public nuisance issue.

Surface operations will be done to meet permit compliance, maintain and control fugitive dust, and respectfully share the use of public roads to access the Project site. BHJV has recognized the road use issue and will work closely with the USFS to establish appropriate road use periods to cooperatively share the use of the public roads while meeting operations' needs.

BHJV is committed to work collaboratively with local residents and USFS personnel to attempt to address conflicts that may occur. Highway speeds for mine vehicles will be controlled to ensure company vehicles are obeying traffic speeds.

Outside illumination lights will be shielded and aimed downwards.

2.12 Noise

BHJV is not aware of any federal, state or local regulations that exist in regard to noise level standards. The primary mining activities will be located underground where noise issues will not be realized by people using public lands adjacent to the Project. There are unavoidable noises associated with mining operations, many of which are requirements of Mine Safety and Health Administration (MSHA) dealing with backup alarms.

The mine will operate 24 hours per day 7 days per week and elimination of industrial noise from the operation is not possible. BHJV will minimize noise impacts to the surrounding area when and where practicable.

2.12.1 Noise Impacts

The primary noise source for the surface operations will be the following:

- Equipment Backup Alarms;
- Ventilation Fans;
- Rock/Ore Handling; and
- Industrial Site Standard Noise Levels.

Backup alarms must meet certain decibel levels by MSHA regulations. There is little room for noise reduction in this area. As for the other surface activities there is little opportunity to modify the equipment or activities to reduce noise levels. Ventilation fan manufacturers have improved noise levels associated with these fans but they will still have audible sound levels at the property boundary.

Since most of the infrastructure will remain from the exploration activities, little construction activity will occur. Therefore, noise levels will not be significantly different during pre-production and production phases of the Project.

Topography, wind, and weather can all play an important role in residual sound levels and how far noise can travel. Topography of the area and private land boundaries will help to reduce the noise level noticed on adjacent public lands.

Noise levels were measured during normal operations at nine locations around the permit boundary as shown on Figure 25. The test period at each location was approximately 15 minutes. A Quest Technologies Q400 Noise Dosimeter set at "A" weighted, slow response was used for the measurements.

The estimated noise level at the permit boundary adjacent to the compressor and generator site when the crushing and screening plant, the 1502 horsepower generator, and the new compressor are operating would be 81 dB(A). This location would exhibit the highest noise level of any location along the permit boundary.

The noise level survey and associated calculations and noise level projections are included in Appendix W, Butte Highlands - Noise Study.

2.13 Protection of Archaeological Values

The patented mining claims held by the BHJV are evidence of a very long history of mining in this district dating back to the late 1800s and into the early 1930s. BHJV recognizes the value of retaining mining history and supports preserving this where practicable. The areas planned for mining activities with this proposal are not known to contain any significant historical mining features and are all located on private land. Because the area was intensely mined over a very long period, it is expected that little pre-historic features remain.

If BHJV were to discover any archaeological sites while disturbing the small amount of private land requested, they will salvage the articles and retain those for future use. Depending on the value of the items discovered, BHJV will decide at the time the best means to archive these items. They may consider donating the item(s) to Montana Tech or other historical venue where the general public could benefit from the information.

2.14 Prevention of Wind Erosion

The Project will disturb a small amount of area, the majority of which could be prone to wind erosion and increased dust. Wind can also cause a loss of soil from the soil stockpiles that result in lost and degraded soil available for reclamation.

BHJV will implement dust control measures to minimize the impacts from wind erosion. The most effective mitigation measure will involve watering of the high traffic areas that can create dust and wind can increase blowing dust. The company will also keep ore and waste stockpiles watered when necessary to minimize dust while loading or unloading material. Monitoring by site personnel during each shift will ensure watering is done to the level that reduces dust at the operation. If dust management becomes an issue, the use of chemicals could be employed on high traffic areas to better control dust problems.

The best approach to wind erosion on soil stockpiles is to establish a vegetative cover on the pile once soil placement has been completed. During the interim period of placing soil in the pile, water could be used to minimize dust from wind erosion.

2.15 Protection of Flora and Fauna

BHJV has developed the Project with the smallest footprint possible and still meet the overall Project objectives. Measures will be taken to manage run-on and run-off from the Project site that will provide protection for surface water but also for vegetation and animals. Dust control measures will reduce the amount of dust that could leave the Project area settling on adjacent undisturbed areas.

A weed control program will occur at the Project site to reduce the potential of spreading of noxious weeds. Regular inspections and treatment will occur as required to control weeds on the site.

BHJV will implement a waste management plan that will minimize refuse that would be an attractant to wildlife. Employees will be discouraged from feeding wildlife in the mine site and strict company policy will be implemented with respect to guns in company vehicles on mine property.

Employee awareness programs will be implemented into the overall training program of all employees about wildlife issues. Mine activities are expected to be sufficient that wildlife will not enter the mine area.

Fencing around the mine ponds provides protection to wildlife from attempting to enter the pond area. A perimeter four strand barbed wire fence around the primary facilities will eliminate cattle entering the mine area from the adjacent grazing allotment on public lands.

2.16 Activities in Non-Disturbed Areas

BHJV owns the private land associated with the Project and has identified areas that will be impacted by mine operations. There are no proposed activities that will occur on non-disturbed lands that will be connected to mine activities. Other activities may and will likely occur as part of BHJV's management and use of private lands unrelated to mining activities.

2.17 Monitoring Program

BHJV is currently monitoring resources as part of baseline data collection and exploration permit compliance monitoring. BHJV believes this monitoring program identified important Project activities and/or environmental receptors and believes this remains the correct focus as developed by the agency. The current monitoring program provides long and short term trends to assist in assessing compliance with permit provisions.

The existing monitoring required by the exploration permit is as follows:

- Water Balance – a water balance will be developed on a yearly basis to include an estimate of mine inflow and discharge rates for the Project;
- Water Quality – Monthly
  - Mine Ponds
- Surface Water Sites
  - Highlands Discharge (WS-1)
  - South Fork Fish Creek (WS-2)
  - Fish Creek Above Confluence of S. Fork (WS-5)
  - Middle Fork Moose Creek (WS-6)
  - Basin Creek (WS-7)
  - Middle Fork of Moose Creek (WS-8) (seep or spring)
- Groundwater Quality – Quarterly
  - LAD Monitor Wells
  - Hydrology Groundwater Exploration Holes – Depth Only
- LAD Areas - Weekly

- Monitor for New Springs

A valve and spigot for sampling will be installed in the pipeline feeding LAD 3 and LAD 4.

Figure 4 shows the locations of the monitoring sites. Table 2.17.1 shows the detection levels and parameter list that are used to meet MDEQ's Circular 7 for the Project.

2.17.1 Groundwater Monitoring

BHJV expects to develop several underground water monitoring piezometers that will be converted from exploration drill holes. The holes will be selected to provide observation points for various locations of the underground mine. These piezometers will be monitored to assess any changes in groundwater conditions during mining. If applicable and practicable water levels will be completed on a quarterly basis. The monitoring frequency is proposed as quarterly and could be increased or decreased through a Minor Revision to the Permit, based on the data obtained and the consistency of the data collected. BHJV will provide a hydrology assessment report to the agencies that will incorporate the hydrologic investigation completed on exploration drill. The exploration drilling has not commenced.

It is also proposed that the sampling at the hydrology monitor holes shown on Figure 4 will continue on a quarterly basis as well, which includes monitoring of groundwater wells from the LAD areas.

2.17.2 Surface Water Monitoring

BHJV currently monitors all the surface water associated with the Project and includes Basin, Fish, and Middle Fork Moose Creeks. The Highland Mine discharge is also part of the required monitoring program. BHJV proposes to continue the surface water monitoring as outlined by our existing exploration permit and at the same frequency. Table 2.17.1 dictates the parameter list and detection levels for surface and groundwater monitoring during exploration work. This list will be adhered to initially during operations however BHJV would consult with DEQ if monitoring data support the removal of any constituent from the list of analyzed parameters.

- Water Balance – a water balance will be developed on a yearly basis to include an estimate of mine inflow and discharge rates for the Project;
- Water Quality – Monthly
  - Mine Ponds
- Surface Water Sites
  - Highlands Discharge (WS-1)
  - South Fork Fish Creek (WS-2)
  - Fish Creek Above Confluence of S. Fork (WS-5)
  - Middle Fork Moose Creek (WS-6)
  - Basin Creek (WS-7)
  - Middle Fork of Moose Creek (WS-8) (seep or spring sampling site)

Table 2.17.1. Water Quality Parameters

Parameter (1)	Aquatic Life Standard (2)		Human Health Standard (2)		Required Reporting Value	Project Laboratory Detection Limit
	Acute	Chronic	Surface Water	Ground Water		
Lab & Field pH (s.u.)	---	6.5 - 9.0*	6.5 - 8.5* s	6.5 - 8.5* s	---	0.1
Field Temperature (C)	---	---	---	---	---	0.1
Lab & Field EC (µmhos/cm)	---	---	---	---	---	5
Lab & Field Turbidity (NTU)	---	---	---	---	1.0	0.05
Field DO (mg/l)	>4.0 - 9.5	>4.0 - 9.5	---	---	0.05	---
TSS (mg/l)	---	---	---	---	---	0.5
TDS (mg/l)	---	---	---	500* s	---	5.0
Alkalinity, total (mg/l CaCO3)	---	---	---	---	---	2.5
Bicarbonate (mg/l CaCO3)	---	---	---	---	---	2.5
Carbonate (mg/l CaCO3)	---	---	---	---	---	2.5
Chloride (mg/l)	860*	230*	250 s	250 s	---	0.086
Sulfate (mg/l)	---	---	250 s	250 s	---	0.19
Fluoride (mg/l)	---	---	4.0	4.0	0.1	0.023
Hardness (mg/l CaCO3)	---	---	---	---	---	0.18
Ammonia, as N (mg/l)	---	---	---	---	0.05	0.008
Total Kjeldahl Nitrogen (mg/l)	---	---	---	---	---	0.038
Nitrate+Nitrite, as N (mg/l)	---	---	10	10	0.01	0.0042
Nitrate, as N (mg/l)	---	---	10	10	0.01	0.0050
Nitrite, as N (mg/l)	---	---	1.0	1.0	0.01	0.00047
Orthophosphate (mg/l)	---	---	---	---	---	0.00050
Phosphorus, total (mg/l)	---	---	---	---	0.001	0.00016
Calcium (mg/l)	---	---	---	---	---	0.025
Magnesium (mg/l)	---	---	---	---	---	0.012
Potassium (mg/l)	---	---	---	---	---	0.0051
Sodium (mg/l)	---	---	---	---	---	0.012
Aluminum (mg/l)	0.75	0.087	---	---	0.03	0.002
Antimony (mg/l)	---	---	0.0056	0.006	0.003	0.00016

Table 2.17.1. Water Quality Parameters

Parameter (1)	Aquatic Life Standard (2)		Human Health Standard (2)		Required Reporting Value	Project Laboratory Detection Limit
	Acute	Chronic	Surface Water	Ground Water		
Arsenic (mg/l)	0.34	0.15	0.01	0.01	0.003	0.000062
Barium (mg/l)	---	---	1.0	1.0	0.005	0.000043
Beryllium (mg/l)	---	---	0.004	0.004	0.001	0.000069
Boron (mg/l)	---	---	---	---	---	0.00018
Cadmium (mg/l)	0.00322 h	0.000365 h	0.005	0.005	0.00008	0.000020
Chromium (mg/l)	2.5 (III)	0.12 (III)	0.1	0.1	0.001	0.00024
Cobalt (mg/l)	---	---	---	---	---	---
Copper (mg/l)	0.02051 h	0.01319 h	1.3	1.3	0.001	0.0002
Iron (mg/l)	---	1.0	0.3 s	0.3 s	0.05	0.0045
Lead (mg/l)	0.1368 h	0.005331 h	0.015	0.015	0.0005	0.00002
Manganese (mg/l)	---	---	0.05 s	0.05 s	0.005	0.00005
Mercury (mg/l)	0.0017	0.00091	0.00005	0.002	0.00001	0.000021
Molybdenum (mg/l)	---	---	---	---	---	---
Nickel (mg/l)	0.661 h	0.0735 h	0.1	0.1	0.01	0.00019
Platinum (mg/l)	---	---	---	---	---	---
Selenium (mg/l)	0.02	0.005	0.05	0.05	0.001	0.00010
Silver (mg/l)	0.008152	---	0.1	0.1	0.0005	0.000071
Strontium (mg/l)	---	---	4.0	4.0	---	0.000078
Thallium (mg/l)	---	---	0.00024	0.002	0.0002	0.000050
Tin (mg/l)	---	---	---	---	---	---
Titanium (mg/l)	---	---	---	---	---	---
Uranium (mg/l)	---	---	0.03	0.03	---	0.00025
Vanadium (mg/l)	---	---	---	---	---	---
Zinc (mg/l)	0.169 h	0.169 h	2.0	2.0	0.01	0.0013

NOTES:

(1) s.u. = standard units of pH; C = degrees Celsius; EC = electrical conductivity; µmhos/cm = micromhos per centimeter; NTU = nephelometric turbidity units; DO = dissolved oxygen; mg/l = milligrams per liter; TSS = total suspended solids; TDS = total dissolved solids; $CaCO_3$ = calcium carbonate; N = nitrogen.

(2) Standards from Circular DEQ-7: Montana Numeric Water Quality Standards (August 2010); s = secondary standard; h = hardness dependent (for this table, values are presented based on hardness of 150 mg/l)

* federal USEPA standard. --- no standard or reporting limit.

MT aquatic life standards apply to total recoverable metals in surface water (except for aluminum). Human health standards apply to dissolved metals in groundwater and to total recoverable metals in surface water.

- Groundwater Quality – Quarterly
  - LAD Monitor Wells
  - Hydrology Groundwater Exploration Holes – Depth Only
- LAD Areas - Weekly
  - Monitor for New Springs

Observations from the weekly inspections for new springs below the LAD Areas will be summarized in the annual report submitted to DEQ.

2.17.3 Waste Rock Monitoring

Waste rock monitoring will be completed to characterize waste generated on an on-going basis for the Project. Monitoring will include geochemical testing analyses to better understand waste rock composition, acid/base potential and other important elements to assist in proper management of waste during exploration activities. The following represents the data to be collected for waste rock characterization:

- Map geologic units along with faults/fracture zones;
- Sample collection
  - Minimum of one sample for each rock unit encountered and/or
  - Every 1,000 feet of the decline/workings
- Analyses
  - Whole Rock Analyses
  - Asbestos Testing
  - Acid Base Accounting
  - AGP and ANP
  - Meteoric Water Mobility Test (Selected Samples)
  - Kinetic Testing (Selected Samples)

Sample Collection

Samples of waste rock generated during development will be completed to provide a representative set of samples of the material and geology of the rock encountered. A waste rock sample will be collected every 1,000 feet of decline/development excavated. A minimum of one sample for each rock unit will be collected in the event the encountered length is less than 1,000 feet.

A geologist knowledgeable about the deposit will supervise the collection of representative samples. Documentation of the sample collection process will be maintained and include

sample location, geology/rock unit sampled, and other pertinent information. Sample labels will be directly correlated to lab samples and test results completed.

Depending on the drilling results, core samples may be tested using the same protocols to assess ore/waste characterization during operations. Samples may be collected to supplement waste characterization data collected from excavation for mine workings during exploration.

Mined Rock Environmental Geochemistry SAP

Sampling Protocol

Baseline sampling- minimum 7-10 samples per material type (lithology, alteration, mineralization). Test for statistical representation of sample number.

Hand specimen mineralogical description – all samples described to identify material types. Material types linked to volumes and approximate sequencing in the mine plan.

Analytical Protocol

Whole Rock Geochemistry - ALS Chemex MEMS 41 (aqua regia) measures solubility of environmentally mobile elements. Metal suite defined in Section 2.17.3.

Acid Base Account - Modified SOBEK method – measure of acid generation potential and sulfur speciation. Select appropriate sulfur species based on mineralogy.

Statistical analysis of ABA and total element data – Evaluate population characteristics by material type, Determine sampling adequacy. Plot distributions, calculate central tendency, descriptive statistics. Also used to guide selection of samples for metal mobility and kinetic test samples.

Potential Asbestiform Rock (PAR) presence – samples tested by Polarized Light Microscopy (PLM) and Transmission Electron Microscopy (TLM) if necessary based on PLM.

Metal Mobility – EPA Method 1312 – Synthetic Precipitation Leachability Procedure

Specify suite of metals and detection limits to complement regulatory compliance criteria.

Metal suite presented in Table 2.17.2.

Optional Testing (only if necessary based on results of sampling above)

Humidity cell kinetic testing – (If necessary pending ABA results) ASTM D5744 - 07e1

Standard Test Method for Laboratory. Weathering of Solid Materials Using a Humidity Cell

Specify suite of metals and detection limits to complement regulatory compliance criteria.

Metal suite presented in Table 2.17.2

Quantitative Mineralogy - (if necessary) Particle Size Analysis to Support Data

Interpretation. More site specific in situ characterization of mineralogy, mineral surface area, etc.

Whole Rock Analyses

Whole rock analyses will be completed on the samples as the preliminary assessment of the geochemical composition of the sample. The multi-element analysis will follow standard methods and protocols for sample preparation and analyses.

A third party laboratory will be used to complete the whole rock analyses that are anticipated to use an ICP analyses. The following suite of parameters will be analyzed:

Aluminum	Antimony	Arsenic	Barium	Beryllium	Bismuth
Boron	Cadmium	Calcium	Chromium	Cobalt	Copper
Gallium	Iron	Lead	Lithium	Magnesium	Manganese
Mercury	Molybdenum	Nickel	Potassium	Scandium	Selenium
Strontium	Thallium	Tin	Titanium	Vanadium	Zinc

Acid Base Accounting (ABA Testing)

Samples will also be tested for their ability to generate acid and neutralizing potential. Standard EPA methods will be used for:

- Acid generation potential (calc. on sulfur total)-M600/2-78-054 1.3
- Acid neutralizing potential (calc) - M600/2-78-054 1.3
- Acid/base potential (calc. on sulfur total) - M600/2-78-054 1.3
- Neutralization Potential (calc on sulfur total) – M600/2-78-054 1.3
- Sulfur Forms – M600/2-78-054 3.2.4-MOD
- NP/AP Ratio

The ABA tests will also provide sulfur specifications so that sulfide content can be calculated. The lab will measure total sulfur and sulfate.

Meteoric Water Mobility Tests or Synthetic Precipitation Leaching Process

Meteoric Water Mobility Test (MWMT) or the Synthetic Precipitation Leaching Process (SPLP) will be completed on the samples as well. They both have similar EPA Methods and BHJV believes the MWMT test better represents material size in a waste dump pile. The suite of

parameters is typically selected to meet Project specific issues. The parameters listed in Table 2.17.2 will be used as a starting list and may be modified based on whole rock analyses and ABA test results using the DEQ Circular 7 as a guideline.

Table 2.17.2. Parameter List for Water Mobility and Leach Testing

Parameter	DEQ 7		Required Reporting Value (mg/l)
	Aquatic Life Standard	GW	
Aluminum	0.087	- - -	0.030
Antimony	---	0.006	0.003
Arsenic	0.15	0.01	0.003
Barium	---	1	0.005
Beryllium	---	0.004	0.001
Cadmium	0.000365	0.005	0.00008
Chromium (III)	0.12	---	0.001
Copper	0.01319	1.3	0.001
Fluoride	---	---	0.1
Iron	1.0	0.3	0.05
Lead	0.00533	0.015	0.0005
Manganese	---	0.05	0.005
Mercury	0.00091	0.002	0.00001
Nickel	0.0735	0.1	0.01
Phosphorus	---	---	0.001
Selenium	0.005	0.05	0.001
Silver	0.00815	0.1	0.0006
Sulfate	---	250	1.0
Thallium	---	0.002	0.0002
Uranium	---	0.03	0.00003
Zinc	0.169	2.0	0.1

Hardness dependent standards calculated based on 150 mg/L hardness.

Kinetic Testing (Humidity Cell Tests)

Kinetic testing will be completed on representative samples of each geologic unit unless the whole rock, ABA, and MWMT/SPLP tests suggest otherwise. Composites and/or individual samples may be selected to develop the sample(s) for kinetic testing. Documentation will be prepared on the sample selection process. This information will be important to represent waste encountered and the quantity stored on the surface.

Additional samples may be completed based on the results of the whole rock, ABA, and MWMT/SPLP test results to provide additional data where needed to support the waste rock management plan, reclamation closure, and technical information to support operational permit development. If the humidity cell data demonstrates waste rock issues, a water management plan should be incorporated to address the issues. Water management could involve water treatment to address water discharges to the LAD.

As with the MWMT/SPLP tests, the kinetic tests will use the list of parameters and reporting limits shown above as a starting point for effluent collected from the tests. Modifications may be made to reflect results from other geochemical tests.

The data collected for waste rock characterization and management would be submitted to the agencies as part of the annual report prepared for the Project.

Humidity cell tests will provide important information with respect to acid generation and potential metals mobility from the waste piles. Documentation of waste rock volumes, mine water pond water quality, and other critical information should be used in conjunction with the humidity cell tests to determine the potential to generate acid and metal mobility. If this demonstrates an issue exists, The BHJV would utilize a contingency plan at closure to install a low permeability cap at closure as a mitigation measure for remaining waste rock.

The data will be provided annually to the agency and provide information pertaining to sampled materials, test work completed, and results of tests.

2.17.4 Data Handling and Quality Assurance

BHJV will develop procedures and protocols for all sampling and monitoring programs to ensure proper documentation and consistency in monitoring results. This will include calibration of monitoring equipment, where applicable. Data will be managed properly to ensure important monitoring information is maintained. Electronic copies of lab results and other important information will be maintained as well.

BHJV will implement a QA/QC program to ensure accuracy in data entry and periodically submit duplicates and blanks to the laboratory. BHJV will use certified laboratories to perform all outside analyses.

2.17.5 Aquatic Monitoring

Kline Environmental Research LLC developed an aquatic monitoring program for the Project (Appendix Q). Monitoring methods and timing are also included in the Aquatic Monitoring Plan. While dewatering impacts from the mine operation are expected to be insignificant, the aquatic monitoring program will assure that aquatic habitat is not being impacted by the Project.

Aquatic monitoring will occur in Basin Creek, Middle Fork Moose Creek, and Fish Creek. Certain existing conditions have been established through baseline data collection. Standardized methods for the region that are designed to detect the potential impacts and can be used in the 1st and 2nd order streams in the Project area were selected. Assessment of impacts will be based on comparison of data that is collected before, during, and after construction and operation of the Project, comparison to a reference reach in Tributary 1A of Middle Fork Moose Creek, and comparison to MDEQ biotic indices for similar streams in Montana. Fish and fish habitat surveys will be used to monitor the potential impact of dewatering in all monitoring reaches. Benthic macroinvertebrates will be used as biological indicators of potential impacts to water quality in Basin Creek and tributaries 1 and 1A to Middle Fork Moose Creek because their diversity and life histories provide the opportunity to detect a variety of acute and chronic stressors, and because of their dependence on primary productivity and role as fish prey. The fish habitat survey methods will include collection of data for assessment of sediment loading.

2.17.6 Aquatic Baseline Information Summary

The fisheries, benthic macroinvertebrate, and periphyton data was collected in eight stream reaches on Basin Creek, Middle Fork Moose Creek, Unnamed Tributary, Wood Creek, and Fish

Creek to serve as a baseline reference to use as a benchmark for future fisheries/aquatics monitoring.

2.17.6.1 Fish Population Surveys

Basin Creek (BC1) supported a small population of nine WCT, ranging from YOY to adults. Middle Fork Moose Creek (MC2) supported a population of seven YCT ranging in length from 121 to 212 mm. Unnamed Tributary (UT2) had a small population of nine YCT ranging in length from 96 to 164 mm. One age-1 WCT was caught in the 100-meter section of Fish Creek (FC2). No fish were caught in the 100-meter sections of Middle Fork Moose Creek (MC1), Unnamed Tributary (UT1), Fish Creek (FC1), and Wood Creek (WC1).

Basin Creek (BC1), Unnamed Tributary (UT2), and Fish Creek (FC2) showed evidence of spawning within the stream reaches or in close proximity. Basin Creek (BC1) had seven WCT YOY in the reach ranging in length from 40 to 52 mm. Unnamed Tributary (UT2) and Fish Creek (FC2) each had age-1 fish present (less than or equal to 100 mm in length), which would indicate spawning occurred the previous year (2010). Based on the length frequency histograms developed, the trout in the Study Area streams grow slower and are likely a year older than trout populations of similar length groups at lower elevations. Growth rates of fish in headwater streams are reduced due to elevation, water temperature, population size, age structure, competition, and stream productivity.

At Basin Creek (BC1), the mean condition factor for the two WCT trout greater than 100 mm was 0.98. At Middle Fork Moose Creek (MC2), the seven YCT over 100 mm in length had an average condition factor of 0.85. At Unnamed Tributary (UT2), the eight YCT over 100 mm in length had a mean condition factor of 0.92. A condition factor of 1.0 is considered average for trout species.

Suitable overwintering habitat (pool habitat) appears to be a limiting factor in the stream reaches sampled and is likely a reason for the low numbers of fish observed. Additionally, fine sediments in the streambed and areas of erosion along the banks from past and present disturbances are likely limiting trout reproduction.

2.17.6.2 Fish Habitat Survey

Basin Creek (BC1), Unnamed Tributary (UT2), and Fish Creek (FC2) were the only stream habitat sections **Supporting** Biological Health with scores of 155, 147, and 156, respectively. The range for **Supporting** Biological Health is 147-176.

Middle Fork Moose Creek (MC1), Unnamed Tributary (UT1), Fish Creek (FC1), and Wood Creek (WC1) were all assessed as **Partially Supporting** Biological Health with scores of 123, 137, 130, and 133, respectively. The range for **Partially Supporting** Biological Health is 117-146.

Middle Fork Moose Creek (MC2) is the only stream section that was assessed as **Non-Supporting** Biological Health with a score of 103, with a score of less than 116 considered **Non-Supporting**. It must be noted however, that this stream section supported a small population of seven YCT.

2.17.6.3 Benthic Macroinvertebrates

Fish Creek (FC2) had the highest taxa richness with 31 benthic macroinvertebrate species, followed by Basin Creek (BC1) with 29 species. Middle Fork Moose Creek (MC1) had the lowest taxa richness with 23 species, followed by Fish Creek (FC1) with 24 species.

Middle Fork Moose Creek (MC1) had the highest EPT Index with 92 percent, followed by Wood Creek (WC1) with 88.2 percent. Conversely, Basin Creek (BC1) had the lowest EPT Index with 36.4 percent, followed by Middle Fork Moose Creek (MC2) with 54.9 percent.

The percent Chironomidae was highest at Fish Creek (FC2) with 11.9 percent, followed by Basin Creek (BC1) with 9.6 percent. Conversely, Fish Creek (FC1) had the lowest percentage of Chironomidae with 0.4 percent, followed by Middle Fork Moose Creek (MC1) with 2.8 percent.

The percent of order Coleoptera was highest at Basin Creek (BC1) with 43.2 percent, followed by Unnamed Tributary (UT1) with 28.9 percent. The lowest value for percent Coleoptera was 0.0 percent for Wood Creek (WC1), followed by Middle Fork Moose Creek (MC1) with 1.7 percent.

The percent of order Ephemeroptera was highest at Wood Creek (WC1) with 43.2 percent, followed by Middle Fork Moose Creek (MC2) with 40.6 percent. Conversely, the lowest values were recorded for Fish Creek (FC2) with 13.8 percent and Basin Creek (BC1) with 15.4 percent.

The percent of order Plecoptera was highest at Fish Creek (FC1) with 52.4 percent, followed by Middle Fork Moose Creek (MC1) with 46.6 percent. Conversely, the lowest value was recorded at Middle Fork Moose Creek (MC2) with 8.2 percent and Unnamed Tributary (UT1) with 10.3 percent.

The percent of order Trichoptera was highest at Unnamed Tributary (UT2) and Unnamed Tributary (UT1) with 24.0 and 17.7 percent, respectively. Conversely, Fish Creek (FC1) had the lowest value at 5.7 percent, followed by Middle Fork Moose Creek (MC2) with 6.1 percent.

2.17.6.4 Periphyton

Based on the metric values calculated for each sampled stream reach, an overall BioIndex rating was given to each stream section, with Basin Creek (BC1) and Fish Creek (FC2) rated as **good**, the Middle Fork Moose Creek (MC1), Unnamed Tributary (UT2), Fish Creek (FC1), and Wood Creek (WC1) all rated as **fair**, and Unnamed Tributary (UT1) rated as **poor**.

Basin Creek (BC1) had the highest values for both Mountains General Increasers Taxa and Mountains Sediment Increasers Taxa at 38.88 and 18.75 percent, respectively. Wood Creek (WC1) had the highest values for both Mountains Metals Increasers Taxa and Mountains Nutrient Increasers Taxa with 15.50 and 27.00 percent, respectively. Conversely, Unnamed Tributary (UT1) had the lowest values for three out of the four taxa groups: Mountains General Increasers Taxa, Mountains Metals Increasers Taxa, and Mountains Sediment Increasers Taxa at 4.88, 1.38, and 0.50 percent, respectively. Middle Fork Moose Creek (MC1) had the lowest value for Mountains Nutrient Increasers Taxa at 2.63 percent.

3.0 RECLAMATION PLAN

This section outlines the proposed reclamation activity that would be carried out for the Project when mining activities are complete. The current approved Exploration License (No. 00680) has an accepted reclamation plan and bond calculation approved by the agency. A small amount of additional disturbance necessary to support full scale mine operations would be reclaimed under the plan described in this section. BHJV would not depart from this reclamation plan without written approval from DEQ.

All activities and facilities, with exception of the transportation corridor are located on private lands. Some facilities may have value to the private landowner after mining ceases and these facilities would remain in place after reclamation activities are completed. Two phases of reclamation are envisioned, the first being an interim reclamation phase (temporary mine closure) during which a number of facilities would be retained rather than reclaimed in order to facilitate resumption of mining activities at some later date. The second phase of reclamation is the final closure phase when all facilities would be reclaimed except those remaining for post-mining use by the private land owner.

Table 3.1.1 lists the facilities and equipment used at the Butte Highlands mine, identifies the method used to reclaim each item, and also reports whether the item would be reclaimed during the temporary and/ or final closure phase, or retained for future use. Table 3.1.2 compares approved disturbance acreage with the acreage that would be reclaimed during both temporary and final closure phases of the Project.

3.1 Existing Reclamation Plan

A reclamation plan was completed and approved for the exploration phase of the Project. Reclamation methods described in the approved plan would remain valid and reclamation of the new acreage would follow the same provisions and procedures outlined in the plan. These methods are described by disturbance area in the following sections.

Table 3.1.1. Summary of Reclamation Plans for Individual Facilities and Equipment at Butte Highlands Mine

Item or Facility	Description	Reclamation Method	Status During Reclamation Phase	
			Temporary Closure	Final Closure
Underground Mine and Pad Area				
Main Access Adit Portal	16' high x 15' wide	Cemented rock fill, cement plug, or locking gates/air doors	Reclaimed (with locking gates)	Reclaimed
Secondary (Ventilation) Adit Portal	16' high x 15' wide			
Laydown/Yard Area	Flat graded area 2.7 acres during exploration, 3.2 acres at full build out	Minor regrading and scarify, spread top soil 12" deep, and reseed.	Reclaimed	Reclaimed
250,000 Ton Waste Rock Dump	Waste dump is continuous and to the west of Laydown Area. 250,000 tons is maximum size that would occur	Regrade slopes to 2.5:1, cover soil placement, revegetate. Cover soil depth 12".	Reclaimed	Reclaimed
Sediment Ponds				
Sediment Pond	Approximately 120' x 270' rectangular pond, lined with 80 mil liner	Cut and bury liner, backfilled with Recycle Pond dike material.	**Retained**	Reclaimed
Recycle Pond	Approximately 120' x 150' triangular pond lined with 80 mil liner.	Cut and bury liner, push embankments into Sediment Pond	**Retained**	Reclaimed
Culvert	Approximately 60' culvert (8" diameter) connecting Sediment Pond to Recycle Pond	Removal	**Retained**	Reclaimed
Fencing	1,350 feet of "hog wire" fencing around ponds, 8' tall.	Removal	**Retained**	Reclaimed
Soil Stockpiles				
Sediment Pond Spoil/Subsoil Stockpile	12,000 cubic yards	Used for growth media	Reclaimed	Reclaimed
Topsoil Stockpile	35,600 cubic yards	Used for growth media	Reclaimed	Reclaimed
Shotcrete and Slurry Plants				
Mixing Pit Area	35' x 35' x 5' unlined pit	Backfill and revegetate	Reclaimed	Reclaimed
Shotcrete Plant	8' x 16'	Removal	Reclaimed	Reclaimed
Slurry Plant	8' x 20' conex container	Removal	Reclaimed	Reclaimed
Crushing and Screening Plant	Portable equipment	Removal	Reclaimed	Reclaimed

Table 3.1.1. Summary of Reclamation Plans for Individual Facilities and Equipment at Butte Highlands Mine

Item or Facility	Description	Reclamation Method	Status During Reclamation Phase	
Power Generation				
Compressor	Skid/trailer mounted equipment	Removal	Reclaimed	Reclaimed
546 HP Compressor	Skid/trailer mounted equipment	Removal	Reclaimed	Reclaimed
563 Compressor	Skid/trailer mounted equipment	Removal	Reclaimed	Reclaimed
Transformer	Skid/trailer mounted equipment	Removal	Reclaimed	Reclaimed
Panel	Skid/trailer mounted equipment	Removal	Reclaimed	Reclaimed
Structures and Associated Infrastructure				
Lamp House	8’ x 20’ conex container	Removal	Reclaimed	Reclaimed
Wash/Fuel Pad	Quonset tent on 50’ x 75’ concrete foundation 8” thickness	Tent removed, slab broken and buried (12” cover-soil)	**Retained**	Reclaimed
Surface Shop	Quonset tent on 50’ x 75’ concrete foundation 8” thickness	Tent removed, slab broken and buried (12” cover-soil)	**Retained**	Reclaimed
Office	Double-wide trailer on level ground at laydown area (no slab)	Removal	**Retained**	Reclaimed
Dry Building	Double-wide trailer on level ground at laydown area (no slab)	Removal	**Retained**	Reclaimed
Core Shed	25’ x 45’ metal shed on a foundation 6” thickness	Retained in place on private land	**Retained**	**Retained**
Septic Tanks	Two concrete underground septic tanks ~2,200 gallons each	Retained in place on private land	**Retained**	**Retained**
Leach Field	30’ x 100’ leach field	Retained in place on private land	**Retained**	**Retained**
Potable Water Well	Well located about 150’ east of Wash/Fuel Pad	Retained in place on private land	**Retained**	**Retained**
Fencing and Gate	Approximately 4,000’ of fence and steel gate	Retained in place on private land	**Retained**	**Retained**
Run-On and Run-Off Control				
Portal Pad Run-On Diversion	Approximately 1,000’ ditch on south east of office area 4’ wide by 18” deep	Regraded and revegetated once site is stabilized	**Retained**	Reclaimed
Portal Pad Run-Off Diversion	Approximately 900’ ditch and collection ponds west of Laydown/Waste Rock area	Regraded and revegetated once site is stabilized	**Retained**	Reclaimed
LAD 2 Diversion Ditches	Approximately 1,300’ of ditches (two ditches) located north and east of LAD 2	Regraded and revegetated once site is stabilized	**Retained**	Reclaimed
Culverts	One approximately 60’ culvert and one approximately 100’ culvert (15” diameter) emptying into Sediment Pond	Removal	**Retained**	Reclaimed

Table 3.1.1. Summary of Reclamation Plans for Individual Facilities and Equipment at Butte Highlands Mine

Item or Facility	Description	Reclamation Method	Status During Reclamation Phase	
Land Application Discharge Areas and MPDES Discharge Pipes				
Culvert (leading to to Pump Vault)	Two approximately 135' culverts 8" diameter between Recycle Pond and LAD Pump Vault	Plug and leave buried in place	**Retained**	Reclaimed
Pump Vault	10' diameter by 14'tall steel vault	Removal	**Retained**	Reclaimed
LAD 1 Mainline (6" HDPE)	Approximately 650' of HDPE piping leading to 4" Sprinkler System (40' buried, the rest is on surface)	Removal	**Retained**	Reclaimed
LAD 1 Sprinkler System (4" HDPE) and sprinkler heads	Approximately 2,000' of 6" and 4" HDPE piping on surface	Removal	**Retained**	Reclaimed
LAD 2 Mainline	Approximately 2,850' of buried 6" HDPE	Cut and plug ends, remains buried in place	**Retained**	Reclaimed
LAD 2 Valve Vault	10' diam by 14' tall steel	Removal	**Retained**	Reclaimed
LAD 2 Laterals	Approximately 18,700' of buried 2" HDPE	Remains buried in place	**Retained**	Reclaimed
LAD 4 Mainline	Approximately 2,260' of buried 8.5" steel pipe	Cut and plug ends, remains buried in place	**Retained**	Reclaimed
LAD 4 Pump House	20' x 20' steel building on 4' concrete slab	Remove	**Retained**	Reclaimed
LAD 4 Lateral	Approximately 960' of buried 3.5" steel pipe	Remains buried in place	**Retained**	Reclaimed
LAD 4 Snow Guns and Pads	Seven snow guns each located on separate 4' diameter x 5" deep concrete foundations	Snow guns removed and concrete foundations buried in place	**Retained**	Reclaimed
Reverse Osmosis System	Trailer mounted equipment	Removal	Reclaimed	Reclaimed
MPDES Pipeline	Approximately 9500' of buried 4" and 6" HDPE	Cut and plug ends, remains buried in place	**Retained**	Reclaimed
Roads				
Main Access Road	Road from north side of Camp Creek Road to office area	Retained in place on private land	**Retained**	**Retained**
Access Roads to LAD 1 and 2	Approximately 2,000' of road from south side of Camp Creek Road to LAD 1 and LAD 2 areas	Lightly scarified and revegetated/reclaimed as 2-track road	**Retained**	Reclaimed
Exploration Drill Roads	Approximately 5,700' of road	Regraded to original contour and revegetated	**Retained**	Reclaimed
Private Ore Haulage Road	Approximately 20,000' (10 acres) of road	Regraded to original contour and revegetated	**Retained**	Reclaimed

Table 3.1.1. Summary of Reclamation Plans for Individual Facilities and Equipment at Butte Highlands Mine

Item or Facility	Description	Reclamation Method	Status During Reclamation Phase	
Wells and Piezometers				
LAD Monitoring Wells (3)	8” diameter and 65’ deep, downgradient of LAD 1, 2, 3, and 4	Plugged and abandoned in accordance with applicable laws	**Retained**	Reclaimed
Exploration Bore Hole (1)	12” diameter boring 540 feet deep drilled from surface into mine workings	Plugged and abandoned in accordance with applicable laws	Reclaimed	Reclaimed
Hydrology Testing Wells (5)	8”diameter and approximately 1,000’ deep in vicinity of mine workings	Plugged and abandoned in accordance with applicable laws	**Retained**	Reclaimed
Piezometers (14)	4” diameter and 5’ deep PVC at end of LAD 2 laterals	Remove	**Retained**	Reclaimed
Reverse Osmosis System				
Reverse Osmosis System	Located underground in mine workings	Remove	**Retained**	Reclaimed
Ore Transfer Facility				
Ore Transfer Building	100’ x 120’ covered structure	Dismantle and remove. Break and bury concrete foundation/pad	**Retained**	Reclaimed
Access Road	Appx 215 lineal feet of 40-foot wide access road leading to and from the Ore Transfer building	Regraded to original contour and revegetated	**Retained**	Reclaimed
Soil Stockpile Area	100’ x 120’ area for topsoil and subsoil stockpiles	Use for reclamation and revegetate footprint	**Retained**	Reclaimed

Table 3.1.2. Disturbance Footprint and Reclaimed Acres at Butte Highlands Mine

Item or Facility	Approved Disturbance[1]	Proposed New Disturbance[2]	Reclaimed During Temporary Closure	Reclaimed During Final Closure
Wells and Borings				
Surface Exploration Drill Pads/Roads	1.5	0.0	1.5	1.5
Hydrology Testing Wells	1.4	0.0	0	1.4
Total Wells and Borings	**2.9**	**0.0**	**1.5**	**2.9**
Surface Facilities / Portal Pad Area / Ore Transfer Facility				
Laydown/Yard Area[3]	2.5	0.5	3.0	3.0
Waste Rock Dump[4]	3.3	0.0	3.3	3.3
Structures[5]	0.2	0.0	0	0.2
Sediment Pond	0.8	0.0	0	0.8
Recycle Pond	0.5	0.0	0	0.5
Sediment Pond Spoil/Subsoil Stockpile	1.0	0.0	1.0	1.0
Topsoil Stockpile	1.6	0.0	1.6	1.6
Portal Pad Run-On Diversion	0.2	0.0	0	0.2
Portal Pad Run-Off Diversion	0.8	0.0	0	0.8
Main Access Road	0.6	0.0	0	0
Private Ore Haulage Roads	0	10	0	10
Ore Transfer Facility	0	0.5	0	0.5
Other[6]	8.7	0.0	8.2	8.2
Total Surface Facilities Area	**20.2**	**11.0**	**17.1**	**30.1**
Land Application Discharge Areas and MPDES Discharge Pipes[7]				
LAD 1	12.3	0.0	12.3	12.3
LAD 2	10.8	0.0	10.8	10.8
LAD 2 Diversion Ditches	0.2	0.0	0.2	0.2
LAD 3	6.7	0.0	6.7	6.7
LAD 4	12.6	0.0	12.6	12.6
Access Road to LAD 1 and 2	2.3	0.0	2.3	2.3
Access Road to LAD 3	0.1	0.0	0.1	0.1
MPDES Discharge Pipelines	0	1.7[8]	TBD[8]	TBD[8]
LAD Area/MPDES Discharge Pipes Total	**45.0**	**1.7**	**45.0**	**45.0**
Total Disturbance				
Total Disturbance	**68.1**	**12.7**	**63.6**	**78.0**

[1] One acre of disturbance is approved for ventilation raise although raise would not be constructed. Ventilation raise acreage is not included in this table.

[2] Shaded cells indicated proposed increase of disturbance

[3] Laydown/Yard Area acreage includes mine portals, parking lot, power generation equipment, and shotcrete/slurry plant.

[4] Waste Rock Dump acreage includes crushing/screening plant which would be located on surface of dump.

[5] Structures include Lamp House, Wash/Fuel Pad, Surface Shop, Office, Dry Building, and Core Shed. Core Shed would remain on-site after final closure.

[6] "Other" acreage includes permitted disturbance within portal pad area that is not dedicated to specific facility or equipment (i.e. buffer areas or area between sediment ponds and Waste Rock Dump, etc).

[7] Land Application acreage includes LAD monitoring wells and piezometers.

[8] Disturbance associated with MPDES Pipeline is To Be Determined (TBD) based on final water treatment design and permitting.

3.1.1 Initiation of Reclamation

BHJV would initiate reclamation of the exploration facilities if a decision to proceed with operations does not occur within a two year period after completion of exploration activities. The decision to initiate temporary closure or final closure would be based on economic conditions at that time. BHJV would notify the agencies of the intent to initiate reclamation at the site.

3.1.2 Post-Mining Land Use

The private land currently supports grazing, logging, recreation, wildlife habitat, and other similar rural land uses. BHJV anticipates retaining the pre-mining land uses after mine operations. To maintain the private land value and use, some mine constructed features would be retained for private land management activities.

Reclamation activities would be implemented to meet mine closure requirements, site stability, minimize erosion, and provide a self-sustaining vegetative plant community. Meeting these objectives would support post-mining land uses.

3.1.3 Site Facility Removal

BHJV is the owner of the private property currently used for exploration activities that would also be used for proposed mining activities. For this reason, BHJV would retain certain roads on the property to provide access. This would include:

- Main Access to the Surface Facilities; and
- Access to the LAD 1 & 2 Sites.

While the access road to the LAD 1 & 2 sites would be retained it would be lightly scarified and revegetated in order to provide a two-track road after reclamation. Roads and drill pads associated exploration drilling would be reclaimed as part of the reclamation effort.

In addition, all equipment and supplies would be removed from the site when no longer required to support reclamation activities (Figure 23). Some structures and other items have value to BHJV and private land management (e.g. the private landowners leasing the land where the ore transfer facility and ore haulage road would be located) and would therefore be retained on the site following reclamation. Items retained on site consist of the:

- Geologic Core Shed Building;
- Water Well;
- 1-Water Tank (Potable);
- Septic System/Leach field;
- Gate/Fence; and
- Covered Ore Transfer Facility and the associated access drive (if requested by the private landowner)

Reclamation plans for those items not retained on site are described in the following sections and are summarized in Table 3.1.1. Table 3.1.1 also indicates whether specific items would be reclaimed during temporary or final closure.

Most equipment and the majority of facilities at the mine consist of portable units that would be loaded onto trailers and hauled away or which could be loaded onto trailers after dismantling (e.g. the reverse osmosis system). These items include the following skid or trailer mounted equipment:

- Three air compressors (including a 546 HP and a 563 HP compressor);
- A power transformer;
- An electrical supply control panel; and
- Reverse Osmosis Water Treatment Equipment.

Other portable equipment is housed in 8’ x 20’ or 8’ by 16’ conex containers:

- Lamp House;
- Shotcrete Plant; and
- Slurry Plant.

Two double-wide trailers would be removed which currently house the:

- Office; and
- Dry Building.

Portable equipment used for crushing and screening operations would also be removed from the site.

Two 50’ x 75’ steel-framed temporary buildings house the Surface Shop and Wash/Fuel Pad. These structures would be dismantled, loaded onto trucks and moved off-site during final closure. The covered structure at the ore transfer facility would also be dismantled and removed and the concrete foundation broken and buried unless the private landowner decided to retain the structure.

3.1.3.1 Underground RO Water Treatment System During Temporary Closure

Mine pool discharge during any temporary closure is unlikely if the closure lasts less than the 7-8 years required for mine pool water to reach the elevation needed for a discharge from the Highland Mine adit. Therefore operation of a water treatment system would not be needed until a decision was reached to reactivate the mine facility. Also in a temporary closure situation, since water treatment would resume prior to discharge from the Highland Mine adit, water levels within the mine would never reach an elevation that risked flooding of the underground water treatment system. For these reasons, the RO system would remain in place in the underground mine workings during temporary closure.

If the temporary closure were to last longer than 7-8 years and a discharge was imminent, the water in the mine pool would likely need to be treated rather than allowing it to discharge through Highland Mine adit, until a permanent closure decision was reached.

Temporary closure of the water treatment system through any period of cold weather where there was a risk of freezing, or any other time that the system were to be inactivated for a period of more than a couple of months, requires removal of the filters from the RO system and their storage in a heated (not-freezing environment), complete pressurized dewatering of the piping system, and removal of the green sand filter media from the pre-treatment filtration system. Restarting the system after a period of temporary shutdown would require only the reinstallation of the filtration components and reactivating the power. During temporary closure the system could be accessed by authorized personnel entering the mine through locking portal gates.

3.1.4 Surface Facility Reclamation

Once the buildings and other equipment have been removed, regrading of the portal pad area would be completed. The majority of regrading would occur on the waste rock dump where side slopes would be reduced to a 2.5:1 slope. The surface would be graded away from the regraded slopes to promote proper stormwater run-off.

Sections of the ore haulage road located on private property would be regraded to original contour and reseeded with a MDEQ approved seed mix.

Additional regrading would occur at the Sediment and Recycle Pond location. The two 80-mil liners within the Recycle and Sediment Ponds would first be cut and buried in place so as not to retain water. Two 15” diameter culverts that discharge into the Sediment Pond as well as the 8” diameter culvert connecting the Sediment Pond to the Recycle Pond would be removed and hauled off-site. The mine ponds would then be regraded to eliminate their ability to store water and regrading would occur in such a manner as to blend and match the adjacent topography. Approximately 10,000 cubic yards of material from the Recycle Pond embankment would be pushed with a dozer to backfill and regrade the Recycle Pond and Sediment Pond. The fences installed around the mine ponds would be removed as part of closure activities.

The two 50’ x 75’ concrete pads from beneath the Wash/Fuel and Surface Shop buildings would be broken up and buried in place with a minimum of three feet of overlying fill material. All exposed rebar would be removed from the concrete before burial. All pipelines ends would be exposed, capped, and buried for final closure.

The yard area and laydown area would be scarified to eliminate soil compaction that occurred during operations. Only a minor amount of regrading would be completed to preserve the generally flat topography of the area for future post-mining land use.

Once all regrading activities are completed, soil placement would occur. There are currently 12,000 cubic yards of subsoil (excavated during construction of the Sediment and Recycle Ponds) and 35,600 cubic yards of topsoil stockpiled near the portal pad. The current soil stockpile should be sufficient to place a 7” subsoil cover and approximately 22” of topsoil across the portal pad, waste rock dump, sediment/recycle ponds, and soil stockpile areas. Alternatively, there is enough material to place 4.5” of subsoil and 13” of topsoil across the entire 20.2 acres permitted for the Portal Pad / Surface Facilities area. During clearing of the proposed laydown area, ore-transfer facility, and private haulage road, BHJV would salvage an additional 35,400 cubic yards of topsoil and growth media (800 CY from the laydown expansion, 2,400 CY from the ore-transfer facility, and 32,200 from the private haulage road), which would

be used to reclaim these areas. More cover material may be needed to reclaim smaller disturbances associated with the LAD system (e.g., snow gun pads and minor excavations for pipe plugging), diversion ditches, and other miscellaneous areas. If it is determined that thicker soil placement is required in certain areas BHJV would assess the various areas and prioritize soil placement to maximize revegetation opportunities. Some areas may get a thinner soil horizon to ensure adequate soil is available for higher priority areas. Amendments and other means would be reviewed and considered to enhance the opportunity for revegetation success on these areas.

Sediment control structures would remain until the site demonstrated erosional stability, at which time; the portal pad run-on and run-off diversions would be regraded and reclaimed.

3.1.5 Underground Mine Closure and Water Management Plan

This Underground Mine Closure and Water Management section contains sub-sections concerned with mine flooding; plugging of the historic Highland Mine Adit and the new Butte Highland Mine adits; water sampling during groundwater recovery and flooding of the backfilled mine; and water management during closure and post-closure. These components are described from the lower levels to the upper levels of the mine and through the closure process.

Dewatering operations are expected to stem the flow of water from the historic Highland Mine Adit portal shortly after pumping is initiated, probably within the first two weeks based on aquifer test data. Under an MPDES permit, BHJV proposes to replace the existing flow from the Butte Highland adit to Basin Creek with treated water at a rate of 150 – 350 gallons per minute. Operationally, this water would be piped from the water treatment plant, underground where it would be released through the historical adit for discharge at the portal to Basin Creek. This will minimize the risk of potential freezing problems with surface discharge lines during the winter months.

3.1.5.1 Mine Flooding

Once mining is completed, and prior to flooding of the workings and plugging any of the adits, all mobile equipment, unused supplies, explosives, and other similar items would be removed. No equipment, fluids, or materials, other than installed ground support and hangers, would be left underground at permanent closure. The pumps would be turned off and the workings permitted to flood. Operationally, the lowest level of mine dewatering would be an elevation of about 6,300 feet (Figure 14 and Figure 15). During mine flooding, the upper level new Butte Highlands Mine portals will be closed with locking gates and air doors to prevent public access to the mine. These barriers will permit authorized access to the mine for direct observation and sampling as appropriate during flooding. Once flooding is complete, and if needed based on final water level and/or adit seepage quality, the portals could be closed with a cemented rock fill plug as discussed in Section 3.1.5.3.

During mine flooding, the voids and pore spaces in the cemented waste rock backfill in the mined out workings are expected to be filled by regional groundwater moving both vertically and laterally from sources outside of the mineralized zone into the backfilled mine workings and the de-watering cone of depression (Figure 26). This groundwater's composition should reflect regional groundwater quality, probably similar to that currently discharging from the historic Highland Mine adit. (The adit discharge is presently being used as one component of the background water quality against which the MPDES permit non-degradation criteria would be developed and compared). The volume of fractured rock required to be refilled with groundwater within the cone of depression would be at least 250 times larger than that required

to be refilled within the backfilled mine workings, which suggests that considerable dilution of water in the mined out zone should take place.

The water level in the mine should rise to an elevation of about 7,340 feet over a period of seven to eight (7 to 8) years (based on the groundwater model presented in Appendix Z) before it would flow down the historic Highland Mine adit to discharge at the portal at an elevation of about 7,300 feet (Figure 14 and Figure 15). It is expected that water that might discharge from the historic adit would at best meet surface and groundwater quality standards, as the existing adit discharge does. It is possible that the discharged water would not meet non-degradation standards with respect to pre-mining discharge water quality because of chemical changes resulting from grouting of mine inflows and backfilling of portions of the mine workings using cemented mine wastes. As such, BHJV proposes installation of a hydraulic plug in the Historic Highland Mine Adit for permanent closure.

3.1.5.2 Historic Highland Mine Adit Plug

BHJV proposes to control the flow of water from the historic Highland Mine adit at closure through construction of a water-tight hydraulic plug(s) in the adit. Because of the inability to access the 2,300-foot long historic (70 to 100 year old) Highland Mine adit from the surface to evaluate ground conditions from the portal to the proposed plug stations, adit barrier plugs would be installed from underground after dewatering activities during the closure period within either new or rehabilitated mine workings. These plugs would likely be 15 to 20 feet in length and keyed into solid bedrock at locations with good rock mass quality. The plug(s) would be a mix of rebar reinforced concrete and aggregate, with very high cement content. They would be designed to contain water with greater than the 125 feet of hydrostatic head (55 psi) expected to develop behind this plug once the mine is flooded in full closure. If needed, high-pressure grouting of the bedrock adjacent to the plug would be undertaken to minimize the risk of water from the mine pool flowing through fractures in the host rock adjacent to the plug. The areas adjacent to the plugs would be backfilled with mine waste to minimize the risk of any future mine collapse damaging the water-tight plugs. It is noted that this plug closure will eliminate any possibility of future discharge from the historic Highland Mine adit to Basin Creek. It will also serve to reduce the flow of water through the exposed mined out and backfilled zones during flooding, thereby reducing the availability of oxygen and potential additional metals load to Basin Creek.

At other mines where this closure method has been applied (i.e., World's Fair Mine, Patagonia Arizona, Kirk and others 2011[2], and the Glengarry Mine in the New World District, Kirk and others 2012[3]), water moves laterally from the regional groundwater system to fill the mine void. In the case of the Glengarry Mine, significant improvement in local groundwater quality has

[2] Kirk, Allan R., Wetter, M., Stormzand, N., and Curiel, E., 2011. Hydraulic Adit Plug Closure, World's Fair Mine, Patagonia, Arizona US Forest Service, Region 3, Coronado National Forest. Published abstract and presentation at National Association of Abandoned Mine Lands Programs (NAAMLP) Annual Conference, Squaw Valley, CA. 1p.

[3] Kirk, Allan R., Bogert, H., and Marks M.B., 2012, Reduced flow and improved groundwater quality resulting from hydraulic adit plug closure, Glengarry Mine, New World District, Montana. Published abstract and presentation at the Mine Design, Operations and Closure Conference, May 2012, Fairmont Hot Springs, MT, 1p.

been observed over a short period of time with groundwater discharges occurring along reestablished pathways in pre-mining fracture systems that in turn reactivate historic pre-mining seeps and springs. Significant improvement in surface water quality down-gradient of the closed adit discharge is also observed at the Glengarry site. At the World's Fair Mine 100% of the adit discharge was eliminated; however, there are no groundwater monitoring wells in the vicinity of the mine to be used to compare changes in groundwater quality.

3.1.5.3 New Butte Highland Mine Main Access and Secondary Portal/Adit Plugs

After the historic Highland Mine adit is plugged, BHJV anticipates that water would continue to rise through the cone of depression and backfilled mine workings until reaching an estimated elevation of 7,435 feet at the new Butte Highland Mine adits (decline) portals. The final elevation of mine water is not certain, however, so, water levels in the main access and secondary (ventilation) portals would be monitored and the portals sealed prior to any release of water from the underground workings. Based on a pre-mining water level of 7,465 feet (Figure 14 and Figure 15) (see evidence presented in section 1.2.6.2 Mine Flooding above), it is unlikely that a barrier plug would be needed for adit closure with an elevation difference of as little as 30 feet (13 psi). BHJV thus proposes to construct a cemented rock filled (CRF) plug at or near each of the two portals in mine closure. A water-tight barrier plug would be designed and specified for use if future monitoring during closure and flooding of the underground workings indicates a risk of high pressure discharge from the access and secondary portals. The decision of which closure method is necessary will be most accurate if made at the time of closure based on direct observation of water level changes.

The plug proposed for the new Butte Highlands adits would use either CRF or a conventional cement plug. Under the CRF approach, a 10-20 foot zone of cemented rock would be placed into the opening. Timber or other similar structure would be used to temporarily hold the CRF material until the cement has cured, thereby forming a solid rock plug. This method would be cost effective and timely, as equipment and materials necessary to construct the plug should be readily available.

Alternatively, if groundwater pressure conditions warrant, BHJV may install conventional hydraulic barrier concrete plugs. It is assumed the conventional barrier plug would be located reasonably close to the portal. The remaining decline that is open to the surface would be backfilled with waste rock.

Boulders could be placed over each portal as a final security measure, if available on site. The barrier plug would be designed to contain any anticipated hydrostatic head while stemming any potential discharge from the portals. Based on the discussion provided in Section 1.2.6.2 it is expected that the mine may take as little as an additional 2 to 3 months to fill the remaining 125 vertical feet from the historic Highland Mine adit level (7,339) to the reported pre-mining groundwater level of 7,465 feet (Figure 14 and Figure 15). Therefore, the total estimated time required for groundwater to reestablish itself from the 6,300 foot base of dewatering to the pre-mining groundwater surface is estimated to be less than eight (8) years.

Elevated groundwater levels ultimately established in closure of the Butte Highland Mine should provide quantities of water similar to those that existed prior to mining (of the historic Highland Mine) in the areas of the various drainage basins through seeps and springs, surface water run-off, wetlands, and natural recharge of groundwater base flow into surface water channels (see additional discussion in Section 1.3.4 Potential Impacts to Wetlands).

For either portal plug method used, fill material would be placed over the CRF material/boulders as a final cover for revegetation. The fill would be placed with an approximately 3:1 slope. Figure 24 shows a typical concrete portal plug.

3.1.5.4 Water Sampling during Groundwater Recovery and Mine Flooding

BHJV proposes to monitor water quality and groundwater elevation as the underground workings refill. Monitoring would take place in a screened well in the vicinity of the spiral access ramps (Figure 14 and Figure 15). These spiral ramps are not currently proposed for backfilling, so water quality samples would represent a zone of mixing of regional groundwater and water from the grouted and backfilled mine workings. Changes in water levels would be continuously recorded using a transducer during this period of time. Samples of the mine water would be collected semi-annually and analyzed for the same list of parameters that is currently used for groundwater monitoring wells (Table 1.2.2, or a list approved by DEQ in closure) to document changes in water quality over time. If needed, as the water elevation changes, water levels could also be measured and samples collected semi- annually by accessing the mine through the portal gates and air doors proposed for temporary closure.

Following rebound of groundwater to an elevation above the spill over elevation in the historic Highland Mine adit (7,339 feet), the down-gradient areas in the vicinity of the mine would be inventoried for the re-establishment of seeps and springs. It is proposed that this inventory be conducted annually from mid-July through mid-August within one mile of the portal area of the new Butte Highlands Mine. If seeps or springs are discovered their flow and water quality would be measured.

Sampling would need to be continued both in the mine pool and from any seeps and springs that formed until at least a year after a maximum and stable groundwater table elevation was established. The decision to terminate this portion of the monitoring program would be made in consultation with DEQ.

It is likely; however, due to the plugging of historical mine workings and the backfilling/grouting of new workings, that water quality in these established surface discharges will meet beneficial use standards. During the gradual filling of the mine, the groundwater quality and flow data can be used to reevaluate this assumption.

Because BHJV has no information concerning the existence, location or water quality of any pre-mining seeps and springs, BHJV cannot assume that seeps and springs resulting from historic discharge of regional groundwater would necessarily have met the non-degradation criteria established for the MPDES permit, and therefore believes that regulation of future discharges on this basis will be problematic. BHJV proposes to work with the DEQ to establish a protocol for determining an acceptable measure of background groundwater quality in the vicinity of the mine. This quality would be used as guide against which to compare the quality of any newly developed seeps and springs that may form. BHJV would also assume that it would be possible to work with the DEQ Water Quality Bureau to establish alternative water quality guidelines for acceptable discharges from any developing seeps and springs (i.e., background regional ground water quality or water quality surface and/or groundwater standards).

3.1.5.5 Water Management

Based on past experience at other mines, installation of the proposed adit and portal plugs in closure would minimize if not eliminate any discharge from the mine portals. If minor water discharges of less than a few gallons per minute from the portal continue in closure, BHJV

proposes to direct this flow through a buried piping system originating inside the portal to a near-portal sub-surface gravel lined infiltration basin just outside the portal.

Plugging of the Historic Highlands adit may result in the formation of seeps or springs as water currently discharging from the adit is redirected into fractures and pre-mining flow paths are reestablished. Rates of flow from these new water sources would depend on their number and elevation relative to the ultimate post-mining water level (i.e. reduced head if they form above the level of the Historic adit). The combined flow from these seeps and springs would not exceed the current flow from the Historic adit of about 150 GPM and is possible that no seeps or springs would form at all. Other components of the post-mining site-wide water balance would be approximately the same as pre-mining conditions reflecting regional precipitation, evaporation, and run-off rates. It is likely that run-off would be somewhat reduced due to increased infiltration resulting from the installation of BMPs and regrading during reclamation.

If no seeps or springs have developed in the inventory area, once regional groundwater levels have stabilized, then no surface discharge will exist and nothing will need to be done to manage groundwater from the vicinity of the mine. In addition, if seeps and springs develop that meet the closure guidelines for water quality, then no management will be required. If however, seeps and springs develop that do not meet water quality closure guidelines, BHJV will evaluate options to maintain the post mining groundwater table at an elevation that would not support discharge through the seeps or springs.

One such option would be to drill a shallow dipping inclined well into the spiral ramp area of the workings at an elevation as close as possible, but lower than the newly formed seeps and springs, collect this water via gravity flow and divert it through a buried piping system either into the existing active underground drain-field system, into a newly constructed underground drain-field (LAD) system or both (Figure 29). This type of system should allow for reduced discharge with a minimum amount of required maintenance to insure its continued operation. Inflows to the mine at these elevations are expected to be much less the 34 gpm observed during mine dewatering in the new Butte Highlands mine declines.

During the underground drilling exploration phase of the new Butte Highlands Mine project, the underground drain-field system proved itself capable of handling sustained flows of as much as 120 gallons per minute without development of surface seeps or springs and with no direct discharge to surface waters.

Alternatively, BHJV could construct a portal closure at one of the new Butte Highlands adits that includes a flow-through pipe to allow water to bypass the portal plug and be collected into a drain-field system as described above. Another option to address seep or spring flow that does not meet closure guidelines would be to construct infiltration basins downgradient of the seep/spring to intercept and infiltrate water to prevent it from discharging directly to surface water receptors.

BHJV would develop the details of any mitigation strategy in conjunction with DEQ Hard Rock and Water Quality Bureaus at the time of closure when the actual need for and specific objectives of such strategies would be clear. The passive mitigation strategies presented above would be capable of operating in perpetuity if needed. Based on the amount of time that elapsed between mining of the Historic Highlands adit and the discharge of water that is considered to represent background conditions at that location, it is believed that water discharging from seeps, springs, and/or the new Butte Highlands adit would meet water quality closure guidelines within 0 to 70 years.

3.1.5.6 Water Rights Implications

Cessation of flow from the Historic Highland adit and the possible formation of new seeps and springs following closure of the adit may have implications for water rights in the area. BHJV water rights are subject to and governed by Montana water law. BHJV intends to maintain its water rights for mining purposes for so long as it deems necessary. At some point in the future, in the event that BHJV (or any successor) no longer uses all or some portion of its water for that purpose (and no change has been authorized), Montana water law will govern the disposition of any such unused water. Depending on the facts and circumstances at that time, such unused water may become available for appropriation by others. With respect to "new seeps and springs" (in the event that there are any) BHJV understands that any "new water" may, subject to Montana water law, be available for appropriation.

Based on the pre-mining water levels determined during exploration drilling, it is not anticipated that a water-tight barrier plug would be required for adit closure. Therefore a non-water tight plug would be installed at or near each of the two portals if needed based on the ultimate post mining water level. A water tight barrier plug would be designed and specified if future data collection indicates the need.

The non-water tight plug would include the use of either cemented rock fill (CRF) or a conventional cement plug. Under the CRF approach, a 10-20 foot zone of cemented rock would be placed into the opening. Timber or other similar structure would be used to temporarily hold the CRF material until the cement has cured forming a solid rock plug. This method would likely be the most cost effective and timely approach as equipment and materials necessary to construct the plug would be available immediately after the cessation of ore production.

Alternatively, BHJV may choose to install conventional cement plugs. In this case, rebar on 3 foot centers would be used and tied in to the adjacent rock. A 6-inch thick concrete plug would be installed. It is assumed the conventional portal plug would be located reasonably close to the portal. The remaining decline that is open to the surface would be backfilled with waste rock. Boulders would be placed over each portal as a final security measure, if available on site.

For either portal plug method used, fill material would be placed over the CRF material/boulders as a final cover for revegetation. The fill would be placed with an approximately 3:1 slope. Figure 24 shows a typical cement portal plug.

3.1.6 Land Application Disposal Areas and MPDES Discharge Pipes

Three land application disposal areas (LADs) are currently in place to the south of the portal pad and a fourth (LAD 3) would be installed under the proposed mining plan of operations. All four LADs would be decommissioned during final closure unless needed for passive treatment of mine discharge.

Surface pipelines, snow guns, and other surface equipment used for land disposal would be removed from the site. At LAD 4, seven 4' diameter concrete pads used to support snow guns would be broken and buried in place beneath 3' of fill material and revegetated.

The ends of the buried LAD and MPDES discharge pipeline would be exposed, plugged with either PVC caps or cement, and buried. Ground disturbances from this work would be revegetated but it is not anticipated that any work would be required to reclaim the actual

disposal area. Watering over the operational period of the LAD areas should have established a very good stand of vegetative cover.

Reclamation would be completed on roads and monitoring wells associated with the LAD areas. Two LAD area monitoring wells would be plugged in accordance with applicable laws by filling the casings with bentonite chips, cutting the casing below ground surface, backfilling and revegetating the disturbance. The 14 five-foot deep piezometers monitoring the LAD 2 area would be reclaimed by removing the casing, excavating/backfilling the boring, and revegetating the disturbance at each piezometer location.

Approximately 2,000 feet of access road connects Camp Creek Road to the LAD 1 and LAD 2 sites. This road would be reclaimed by lightly scarifying and reseeding in order to maintain the road in a stable “two-track” condition.

3.1.7 Ventilation Raise

A ventilation raise was proposed in the initial exploration plan. The mining plan has since changed and the ventilation raise is no longer needed. Instead, a second adit will be constructed near the main access adit at the portal pad area.

3.1.8 Hydrology Holes

Five drill holes were developed to test hydrologic conditions during exploration. These borings, and one exploration boring drilled to the surface, would be plugged according to applicable laws and the casing cut off below ground level. The drill pad areas would be regraded and scarified prior to placing soil over the surface. Road access to the sites would also be regraded and scarified prior to soil placement and reseeding.

3.1.9 Revegetation Efforts

Disturbed areas would be reseeded as soon as possible once they are regraded and receive cover soil placement. This will limit the ability of weed species to become established on reclaimed sites. A DEQ approved seed mix would be applied at the rate of 50 pounds (pure live seed) per acre (Table 3.1.3).

Table 3.1.3. Seed Mix for Butte Highlands Joint Venture Reclamation

Species	Application Rate (pounds pure live seed per acre)
Sodar Streambank Wheatgrass	10
Certified Critana Thickspike Wheatgrass	15
Pryor Slender Wheatgrass	10
Paddock Meadow Brome	2.5
Bromar Mountain Brome	1.25
MX86 Sheep Fescue	5
Sherman Bluegrass	1.25
Lewis Blue Flax	5
Total	**50**

3.1.10 Bond Release

BHJV would request bond release at various milestone stages of reclamation (regrading, revegetation, etc.) when each appropriate activity has been completed. It is expected that bond release criteria will be part of the operating permit and BHJV will work with the agency to establish an appropriate set of release criterion that meet post-mining land use objectives.

3.2 Proposed Reclamation Plan

The proposed action results in approximately 11 acres of additional disturbance that would be required for full scale mine operations. The acreage is associated with expansion of the laydown area, construction of the ore haulage road, and construction of the ore transfer facility, the reclamation plans for which are summarized in Tables 3.1.1 and 3.1.2 above. Therefore, the currently approved reclamation plan remains valid and the new acreage would follow the same provisions and procedures outlined and approved in the current requirements. BHJV would not depart from this reclamation plan without written approval from DEQ. Below is a section by section discussion of the reclamation plan:

3.2.1 Initiation of Reclamation

BHJV would initiate final reclamation closure once mine activities are completed. Temporary reclamation closure would occur if warranted based on economic factors. The BHJV would notify the agencies of the intent to initiate reclamation at the site.

3.2.2 Post-Mining Land Use

Post closure land use described in the existing reclamation plan remains the same for the new acreage proposed for disturbance.

3.2.3 Site Facility Removal

BHJV is the owner of the private property used for the exploration activities. The items retained to support private land use after mine closure would remain the same. This would include:

- Main Access to the Surface Facilities; and
- Access to the LAD 1 & 2 Sites.

BHJV would still retain the following structures:

- Geologic Core Shed Building;
- Water Well;
- 1-Water Tank (Potable);
- Septic System/Leach field; and
- Gate/Fence.

Unless requested by the private landowner, the covered building at the ore-transfer facility would be dismantled and removed from the site. The concrete foundation/pad would be broken

and buried on site. The area would be regraded to original contour, salvaged soil reapplied, and a DEQ approved seed mix used to revegetate the site.

As described in the approved reclamation plan, these items have value for use associated with the private land after mining.

3.2.4 Surface Facility Reclamation

There would be no change to the approved reclamation of surface facilities however additional work would occur to reclaim the private section of the ore-haulage road. This work would be in accordance with the lease agreements between BHJV and the landowners. Specifically, BHJV would remove culverts, restore the road to original contour, replace topsoil, and reseed the disturbed areas with the DEQ approved seed mix (Table 3.1.3). BHJV would continue reseeding if necessary and noxious weed control for three years after completion of reclamation earthwork.

County and USFS sections of the ore-haulage road would be constructed to County/USFS standards and would not require reclamation after mining is completed.

3.2.5 Portal Plugging

There is no proposed change to the approved portal plug.

3.2.6 Land Application Disposal Areas

There is no proposed change to reclaim the LAD sites.

3.2.7 Ventilation Raise

The ventilation raise will not be constructed and therefore no reclamation of this facility would be required.

3.2.8 Hydrology Drill Holes

There is no change to this section.

3.2.9 Revegetation Efforts

There is no proposed change to the DEQ recommended seed mixture.

3.2.10 Bond Release

There is no proposed change to bond release plan for the areas currently permitted under the Exploration Permit. Reclamation bond agreements are in place with two private landowners for reclamation of the ore haulage road. BHJV is posting a total reclamation bond of $125,634 with the two lessors. Terms of the lease agreements for the haulage road stipulate that that BHJV will recover 90% of the bond amount upon completion of reclamation earthwork and the remaining 10% three years after completion of earthwork and upon successful completion of reseeding. This acreage (about 10 acres) would additionally require bonding with the State.

No bond agreement is in place with the lessor of the land proposed for construction of the ore transfer facility. BHJV agrees to bond this ~2 acre site (0.5 acres of which is planned for

disturbance) with the State for reclamation of the transfer facility site after mining. Alternatively, it is understood that a negotiated transfer of the facility may be completed with the Lessor.

The County and USFS sections of the ore-haulage road may not require reclamation depending on the type of improvements made and the terms of the Special Use Agreement with the USFS and the agreement between the County and BHJV. Reclamation bonds would be posted with these Agencies if required.

3.2.11 Reclamation Monitoring

A monitoring program will be developed in consultation with Montana DEQ to evaluate revegetation success, erosion control effectiveness, and to identify the presence or absence of water quality impacts. These data would be used to identify when bond release milestone are met and/or to trigger contingency measures. Contingency measures could include further actions to promote revegetation (e.g. reseeding, additional soil amendment, and herbicide application), erosion control, or other measures as determined through consultation with DEQ. Water quality monitoring as described in sections 2.17 and 3.1.5.4 would continue after closure and any modifications to sampling frequency or the parameter list would occur after gaining approval from DEQ.

FIGURES

Figure 1. **General Location Map**

Figure 2. **Proposed Permit Boundaries**

Figure 3. **Project Area**

Figure 4. **Water Monitoring Sites**

Figure 5. **Habitat Types**

Figure 6. **Perennial and Intermittent Stream Reaches**

Figure 7. **Land Use Investigation Study Area**

Figure 8. **Visual Screen**

Figure 9. **Cultural Resources Literature Review Area**

Figure 10. **Approved Activities**

Figure 11. **Proposed and Existing Disturbance**

Figure 12. **Surface and Mineral Ownership**

Figure 13. **Ore Zones**

Figure 14. **Underground Working Plan View**

Figure 15. **Cross-Section Looking Northwest**

Figure 16. **Long-Section Looking Northeast**

Figure 17. **Existing Portal Site Facilities**

Figure 18. **Existing LAD Sites**

Figure 19. **Proposed Portal Site Facilities**

Figure 20. **Access Route Alternatives**

Figure 21. **Haulage Road Location/Ownership**

Figure 22. **Typical Road Cross Sections**

Figure 23. **Reclaimed Site**

Figure 24. **Portal Plug**

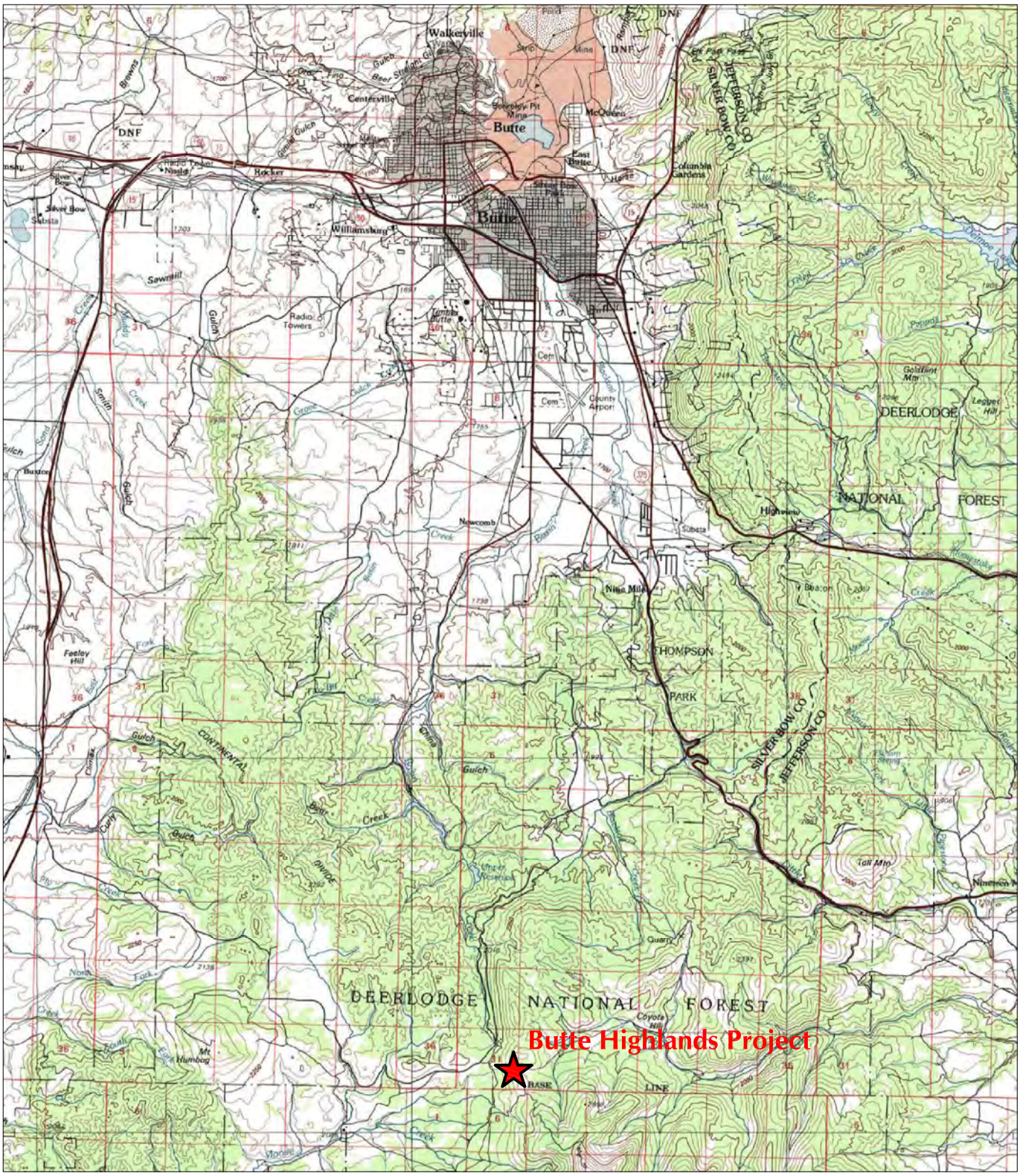
Figure 25. **Noise Levels at Permit Boundary**

Figure 26. **Dewatering Cone of Depression, Wetlands, and MPDES Outfalls**

Figure 27. **Piezometers and Dewatering Well**

Figure 28. Ore Transfer Facility Schematic

Figure 29. Conceptual Map of Post-Closure Drainage Pipeline to LAD System



Map Source: USGS 100,000 Topographic Maps: Butte North and South, Montana (presented at 1:150,000 scale)

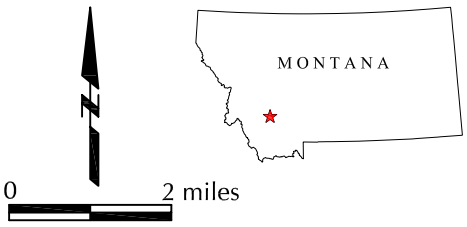
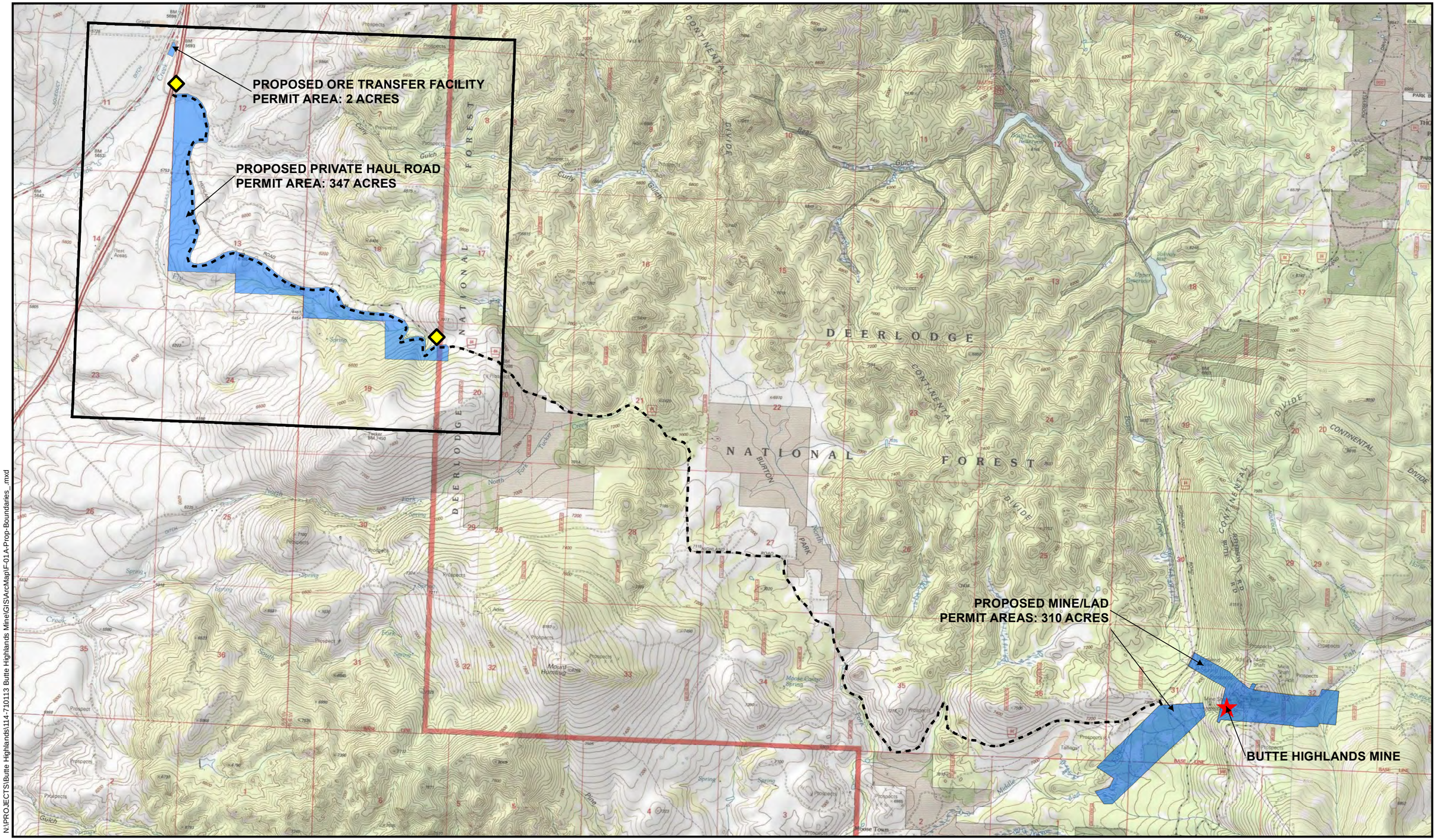


Figure 1	Hard Rock Operating Permit Application	
Klepfer Mining Services	DATE: April 2010	SCALE: As Shown
	DRAWN: Jasper Geographics	
Butte Highlands Joint Venture	Butte Highlands Project **General Location Map** Silver Bow County, Montana	



N:\PROJECTS\Butte Highlands\114-710113 Butte Highlands Mine\GIS\ArcMap\F-01A-Prop-Boundaries_.mxd

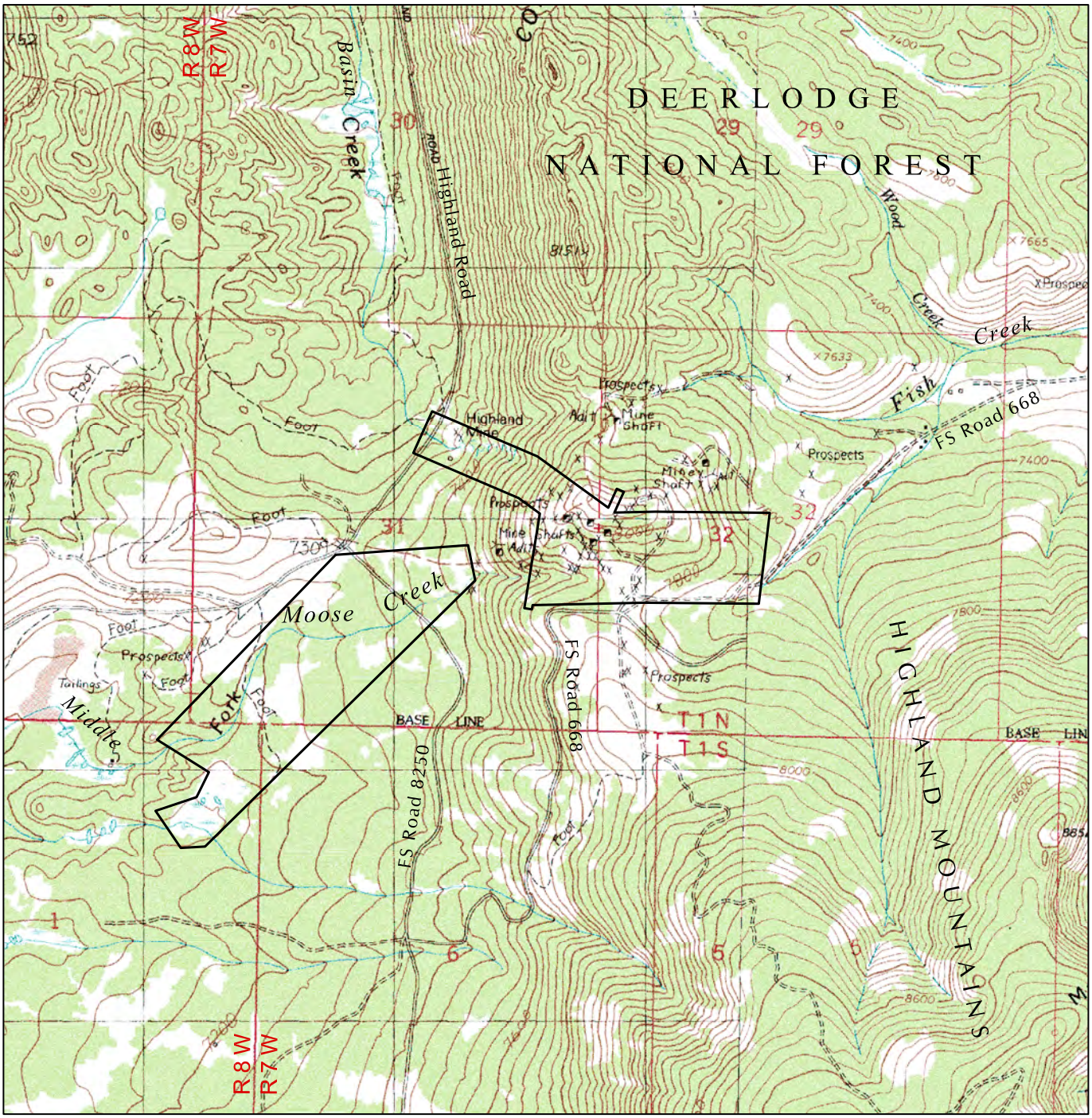
N
W E
S
0 875 1,750 3,500 Feet

Haulage Road

Proposed Permit Boundaries

Private Road Signage

Proposed Permit Boundaries
Butte Highlands
Silver Bow County, Montana
FIGURE 2

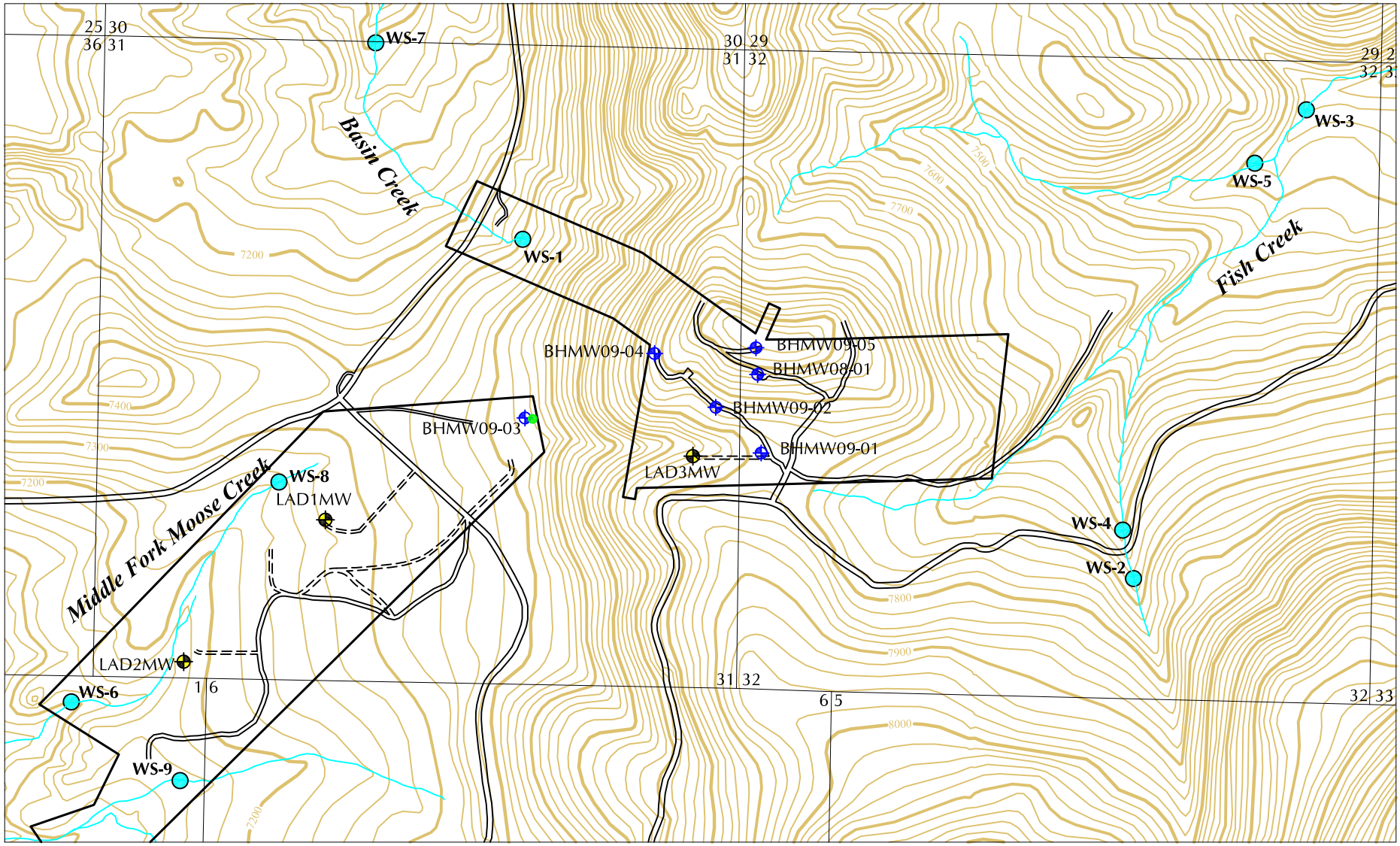


Map Source: USGS 7.5 minute Topographic Maps: Mt. Humbug and Pipestone Pass, Montana (1996)

Patented Claims

0 2000 ft

Figure 3	Hard Rock Operating Permit Application	
Klepfer Mining Services	DATE: April 2010	SCALE: As Shown
	DRAWN: Jasper Geographics	
Butte Highlands Joint Venture	Butte Highlands Project **Project Area** Silver Bow County, Montana	

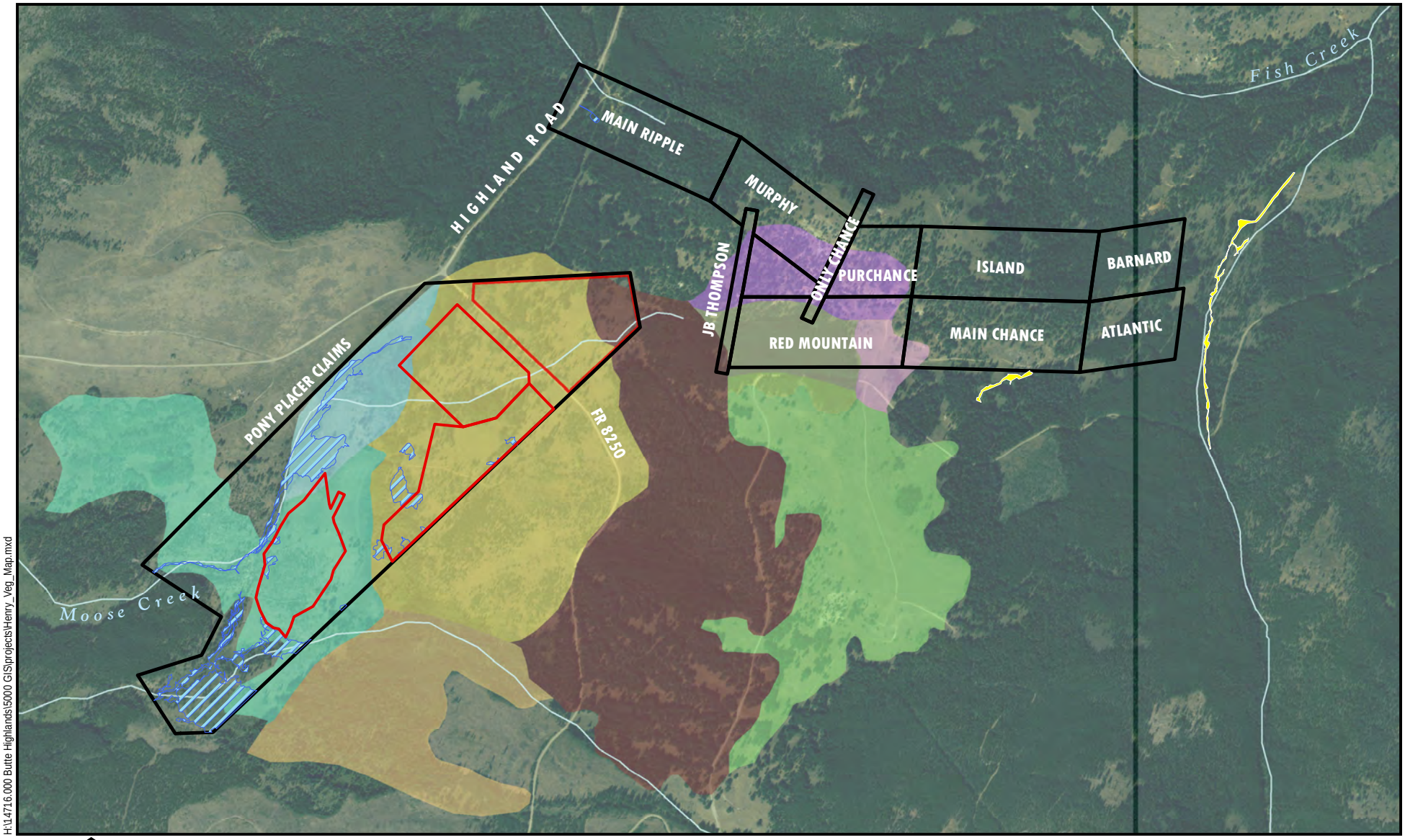


Legend

- Water Supply Well
- Groundwater Monitoring Site (LAD Well)
- Groundwater Drill Hole Location
- Surface Water Sample Location
- Patented Claims

0 1200 feet

Figure 4	Hard Rock Operating Permit Application
	DATE: March 2012 / SCALE: As Shown
	DRAWN: Jasper Geographics
Butte Highlands Joint Venture	Butte Highlands Project **Water Monitoring Sites** Silver Bow County, Montana



H:\14716.000 Butte Highlands\5000 GIS\projects\Henry_Veg_Map.mxd

N

0 Feet 1,000

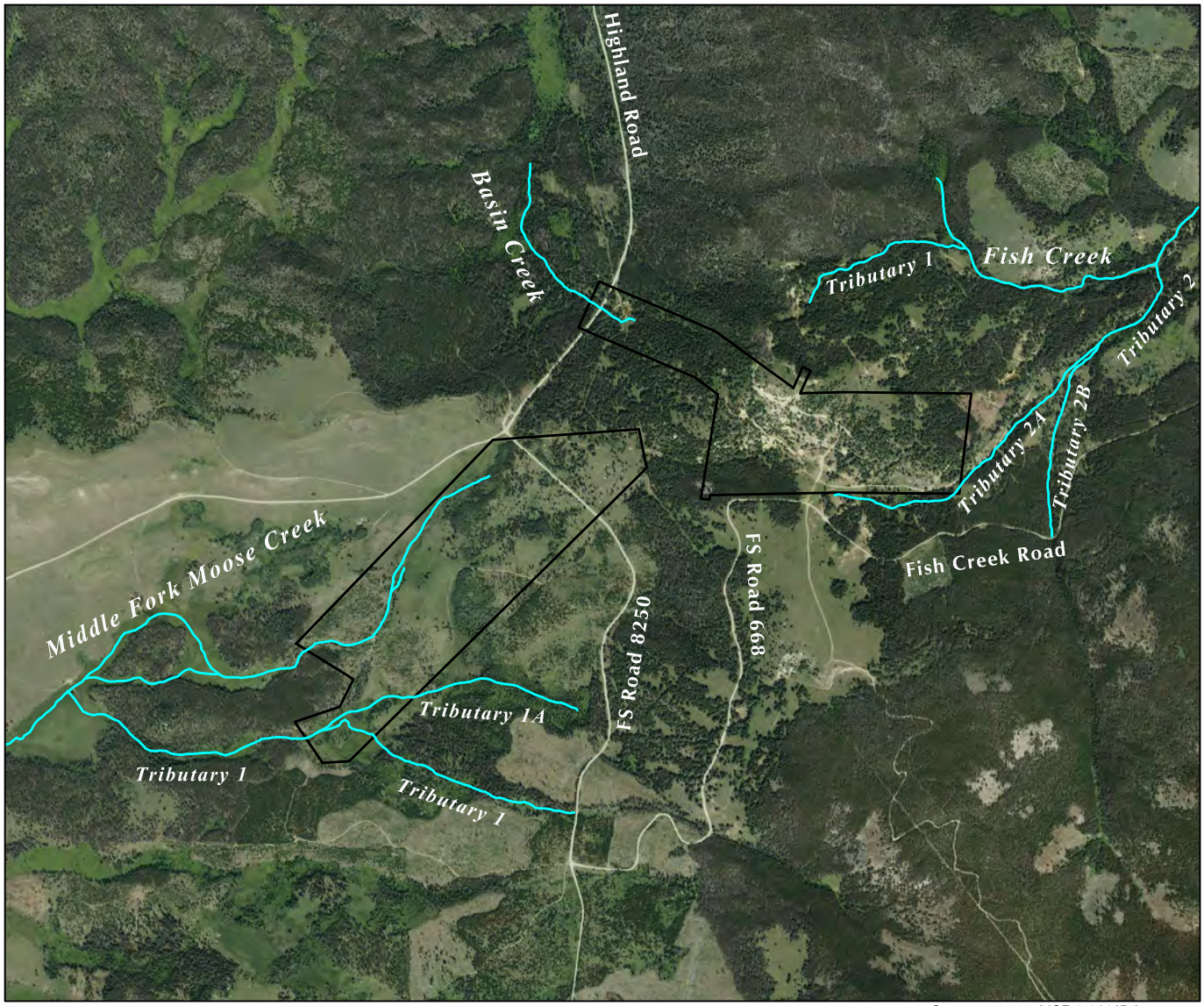
Source: NAIP 2005, NRIS

Topography and Vegetation Units

- Fir-Larch Backslope
- Footslope, Aspen-Fir Groves and Logged Areas
- North-Facing Lodgepole Forest
- Ridge Meadow
- Saddle Forest
- Saddle Meadow
- Seasonal Channels
- South-Facing Slope
- Steep, West-Facing Fir-Spruce Backslope
- Toeslope Meadow
- Mapped Wetlands (AMEC Geomatrix 2011)
- Mapped Wetlands (AMEC Geomatrix 2010)
- Claim Boundaries
- Disturbed Areas

March 2012

Habitat Types
Butte Highlands Project
Silver Bow County, Montana
FIGURE 5



Source: 2009 USDA NAIP Imagery
Kline, 2010 Stream Report

Explanation

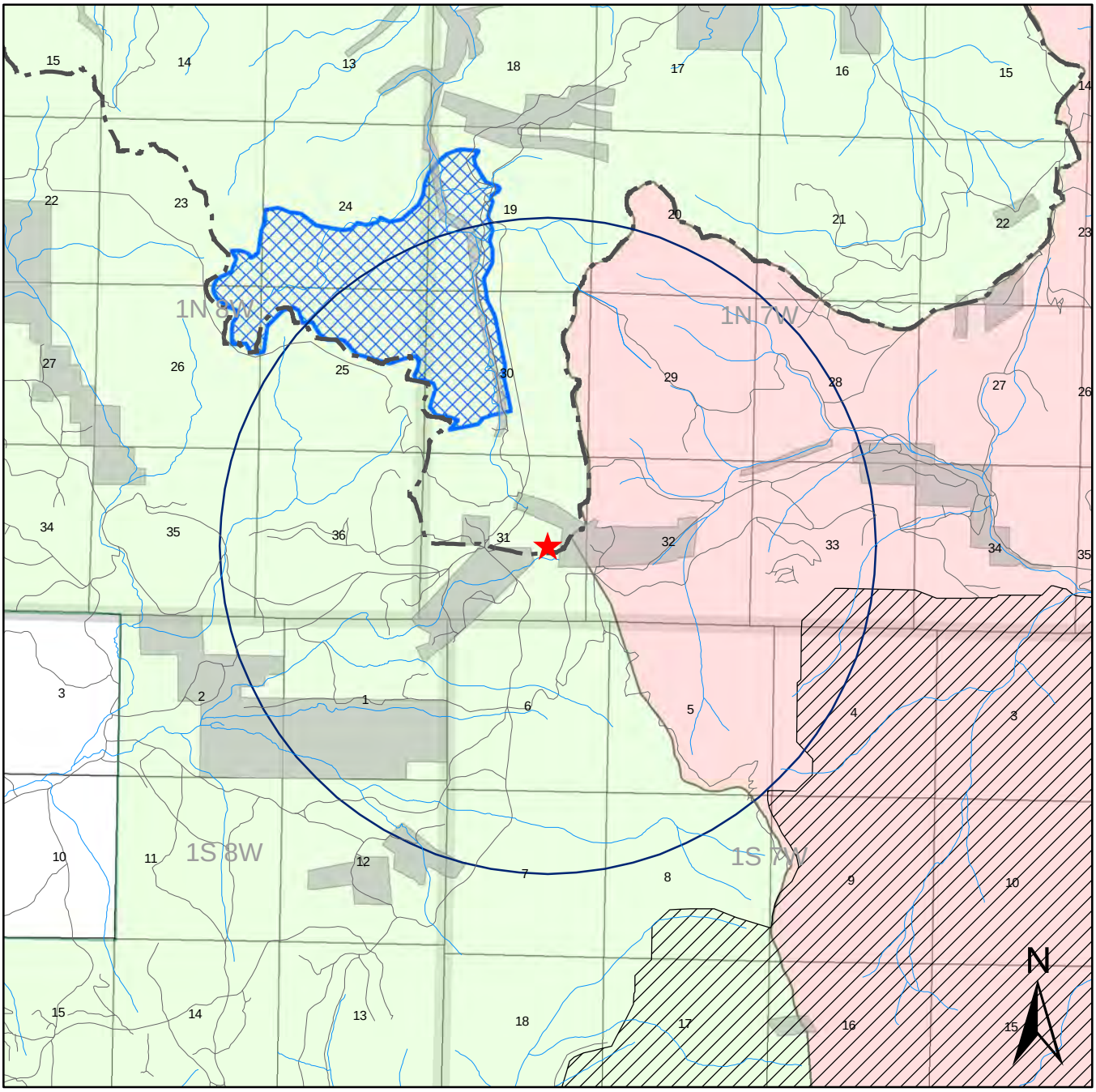
Patented Claims

Perennial and Intermittent Stream Reaches

N

0 2000 ft

Figure 6	Hard Rock Operating Permit Application	
Klepfer Mining Services	DATE: April 2010	SCALE: As Shown
	DRAWN: Jasper Geographics	
Butte Highlands Joint Venture	Butte Highlands Project **Perennial & Intermittent Stream Reaches** Silver Bow County, Montana	



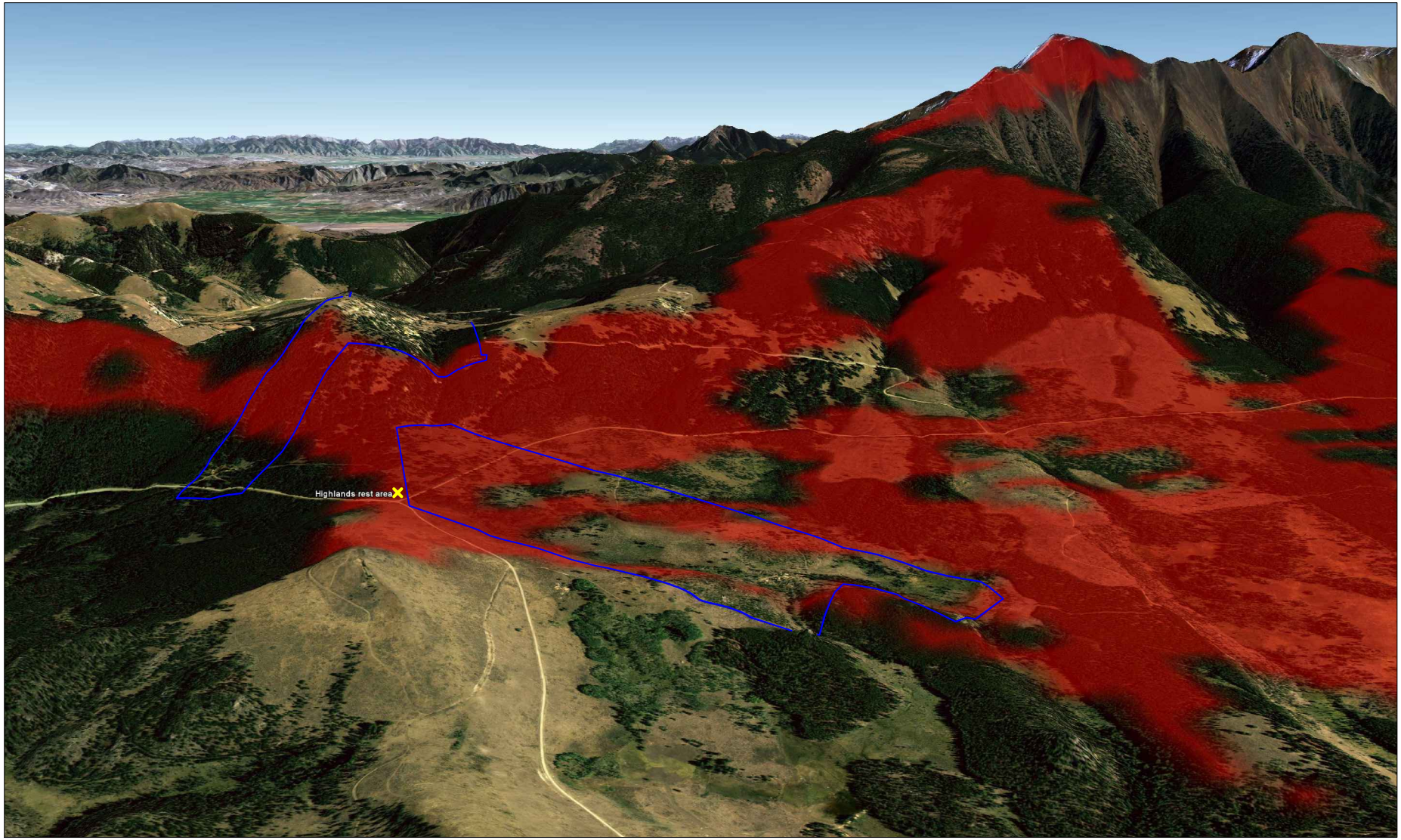
Legend

- Butte Highlands Project Center
- Continental Divide
- TableMtnRWA
- BasinCreekRNA
- Inholdings within USFS Land
- Butte Ranger District
- Jefferson RangerDistrict
- **2 Mile Radius**

Miles
0 1 2

Source: Beaverhead-Deerlodge National Forest 2009 Management Plan

Figure 7	Hard Rock Operating Permit Application	
Klepfer Mining Services	DATE: April 2010	SCALE: As Shown
	DRAWN: Jasper Geographics	
Butte Highlands Joint Venture	Butte Highlands Project **Land Use Investigation Study Area** Silver Bow County, Montana	

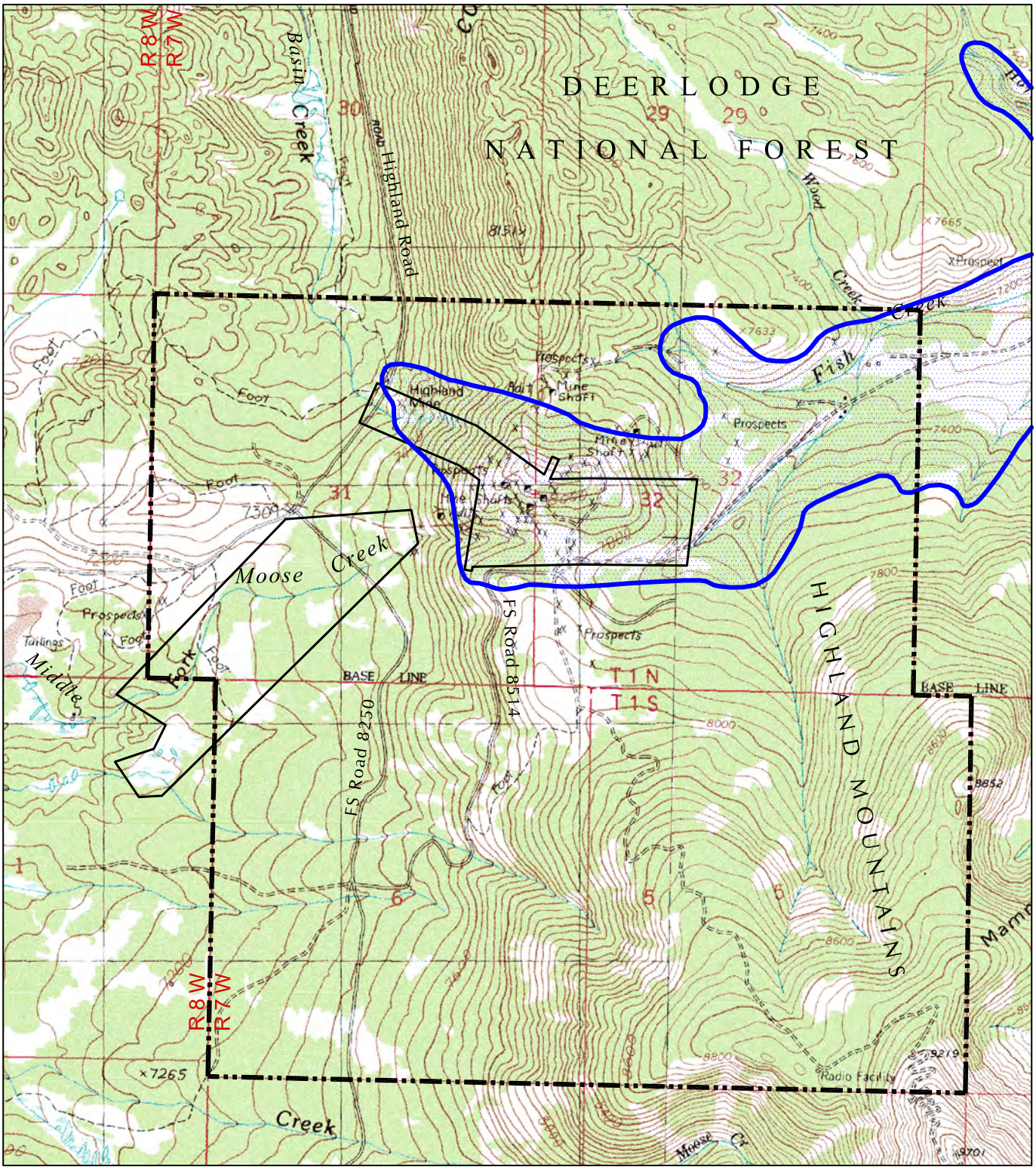


Source: Digital Globe 2005 imagery; Visibility Cloak generated by heywhatsthat.com
View: Looking East

Legend

- Patented Claims Outlines
- Highland Rest Area
- Visibility Cloak (areas visible from eye level at Highlands Rest Area)

Figure 8	Hard Rock Operating Permit Application	
Klepfer Mining Services	DATE: April 2010	SCALE: As Shown
	Kline Environmental Research LLC	DRWN: Jasper Geographics
Butte Highlands Joint Venture	Butte Highlands Project **Visual Screen** Silver Bow County, Montana	



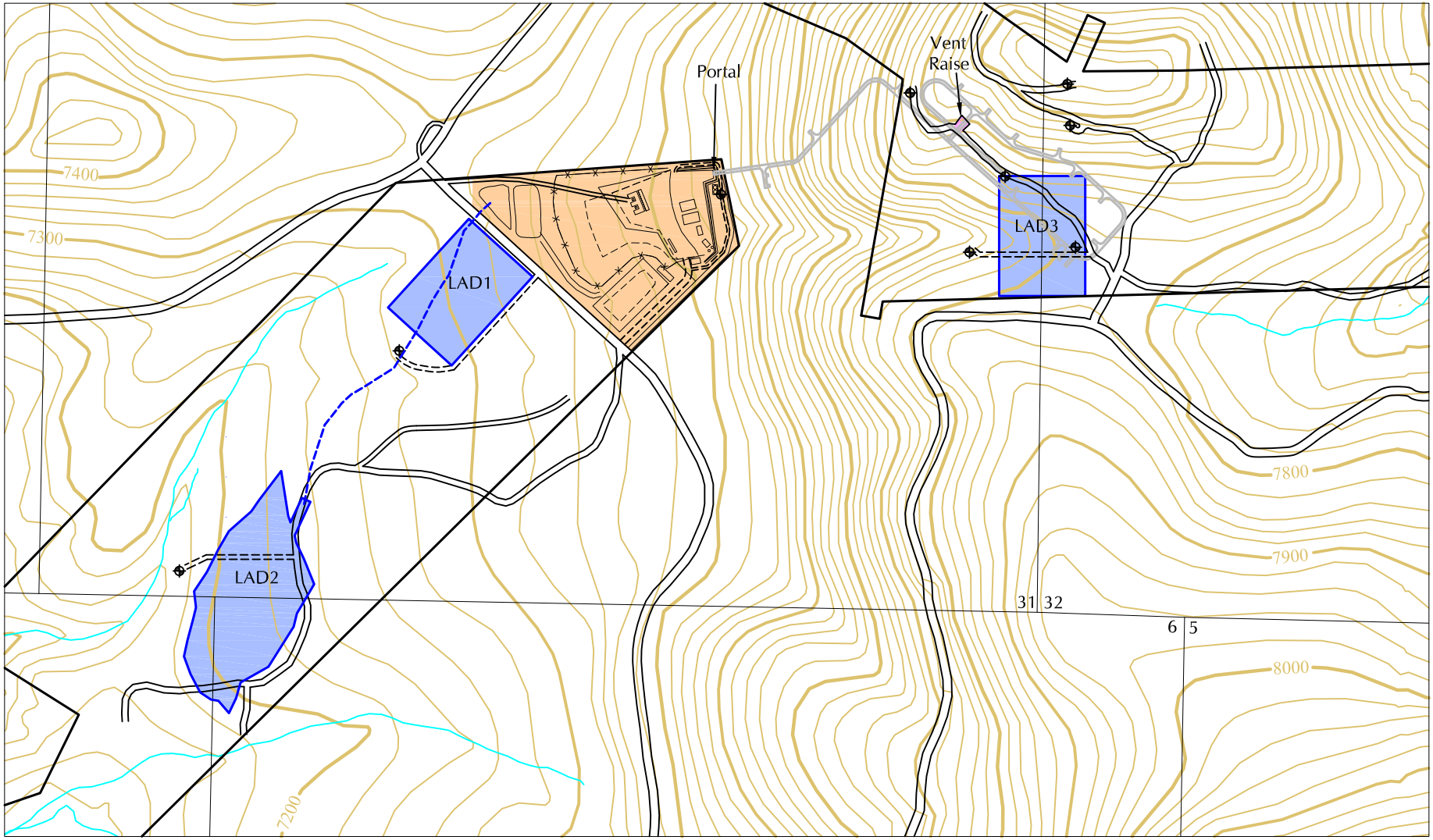
Map Source: USGS 7.5 minute Topographic Maps: Mt. Humbug and Pipestone Pass, Montana (1996)

Legend

- Patented Claims
- Historic Highland Mining District
- File Search Area

0 2000 ft

Figure 9	Hard Rock Operating Permit Application	
Klepfer Mining Services	DATE: April 2010	SCALE: As Shown
	DRAWN: Jasper Geographics	
Butte Highlands Joint Venture	Butte Highlands Project **Cultural Resources Review Area** Silver Bow County, Montana	



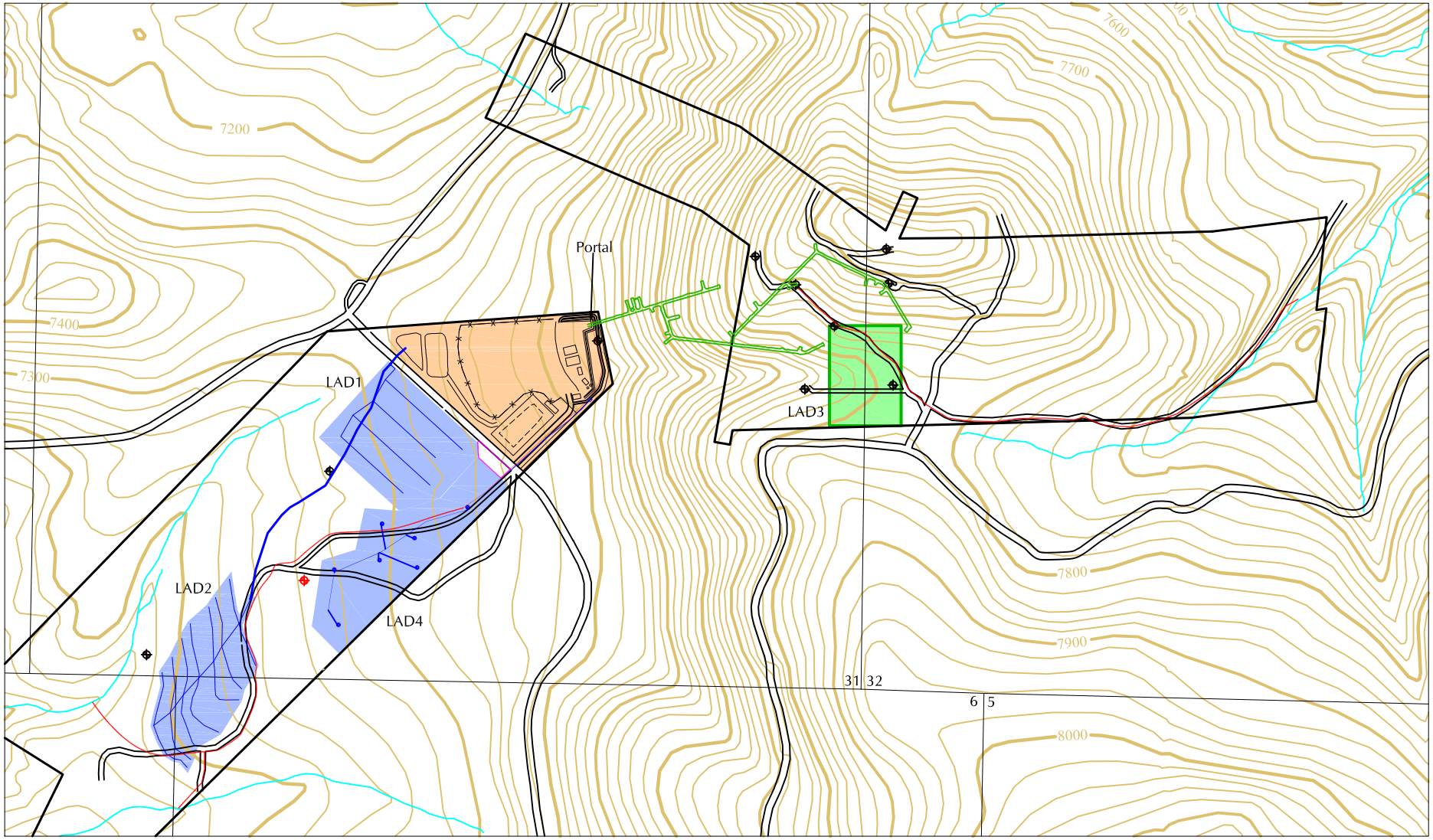
Explanation

- Claim Boundaries
- Existing Roads
- Proposed Roads
- Wells
- Underground Workings
- Main Surface Facilities
- LAD
- Pipeline
- Vent Raise

N

0 800 ft

Figure 10	Hard Rock Operating Permit Application
Klepfer Mining Services	DATE: April 2010 / SCALE: As Shown
	DRAWN: Jasper Geographics
Butte Highlands Joint Venture	Butte Highlands Project
	Approved Activities
	Silver Bow County, Montana



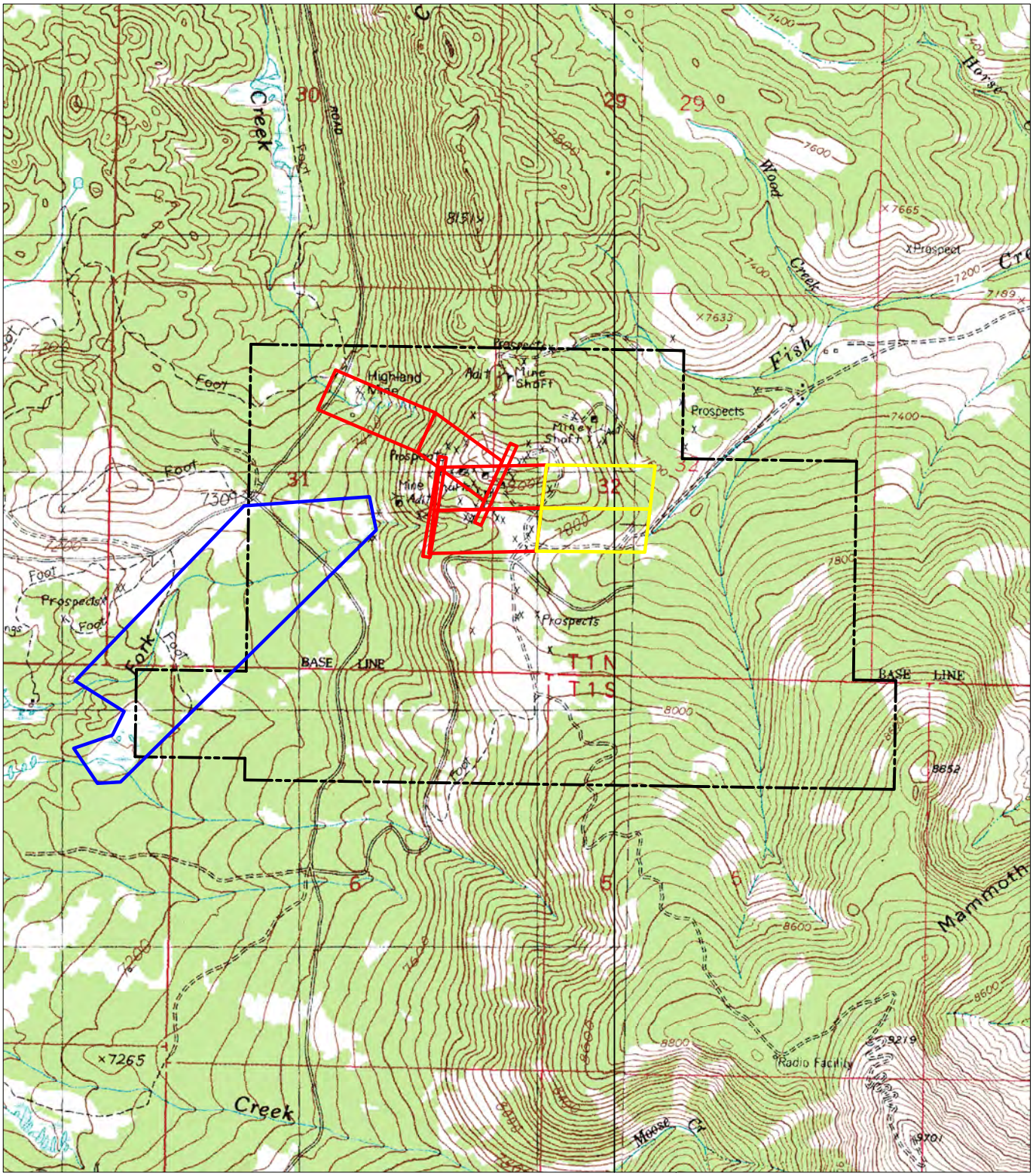
Explanation

- Claim Boundaries
- Existing Roads
- Existing Drifts
- Wells
- Proposed Well
- Pipeline
- Proposed Pipeline
- Main Surface Facilities
- Existing Approved LAD
- Unconstructed Approved LAD
- Proposed Laydown Area

N

0 800 ft

Figure 11	Hard Rock Operating Permit Application	
Klepfer Mining Services	DATE: March 2012	SCALE: As Shown
	DRAWN: Jasper Geographics	
Butte Highlands Joint Venture	Butte Highlands Project **Proposed & Existing Disturbance** Silver Bow County, Montana	



Map Source: USGS 7.5 minute Topographic Maps: Mt. Humbug and Pipestone Pass, Montana (1996)

BHC Claims 2007

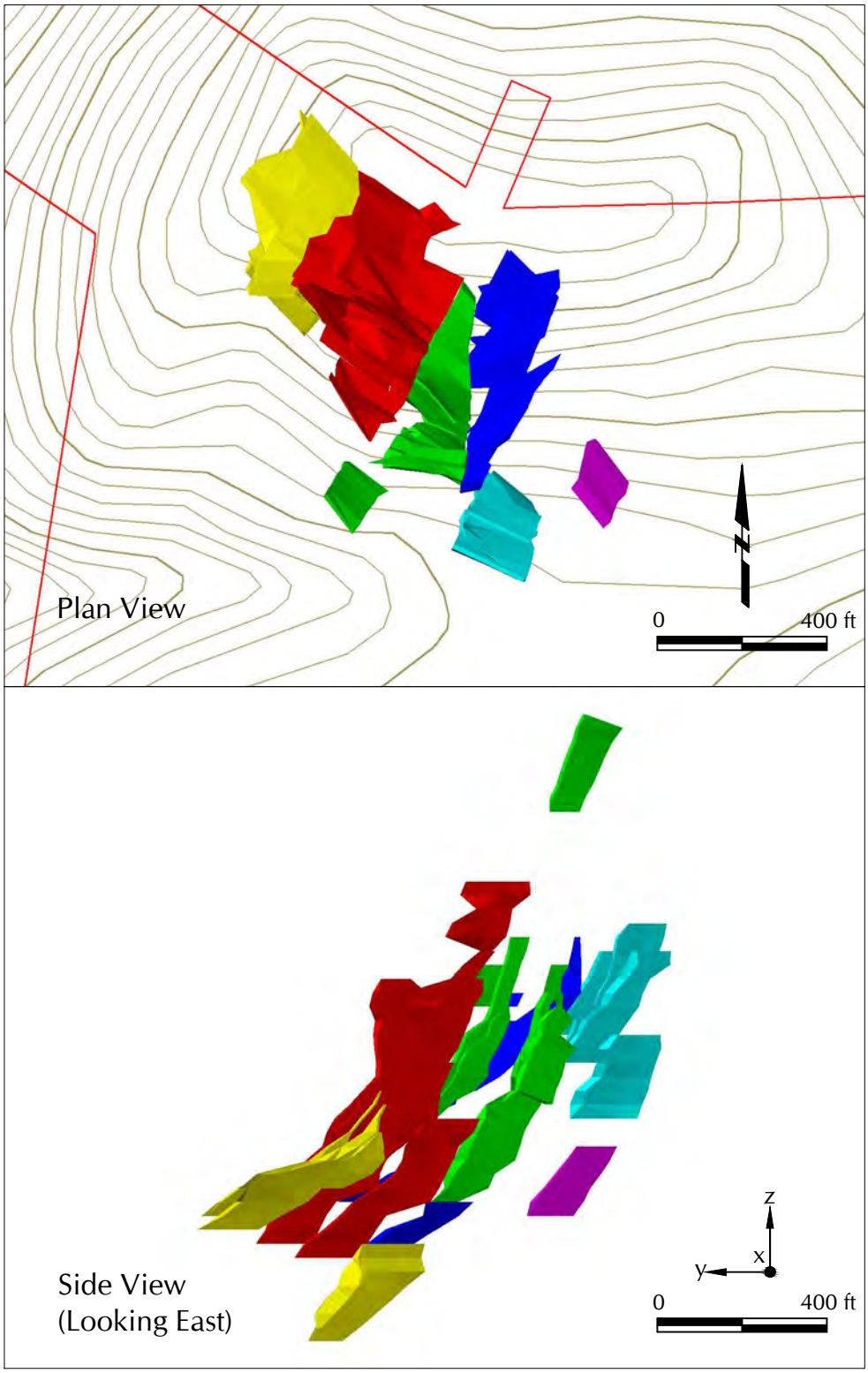
Patented Mineral & Land Rights

Patented Mineral Rights Only

Patented Pony Placer Claim

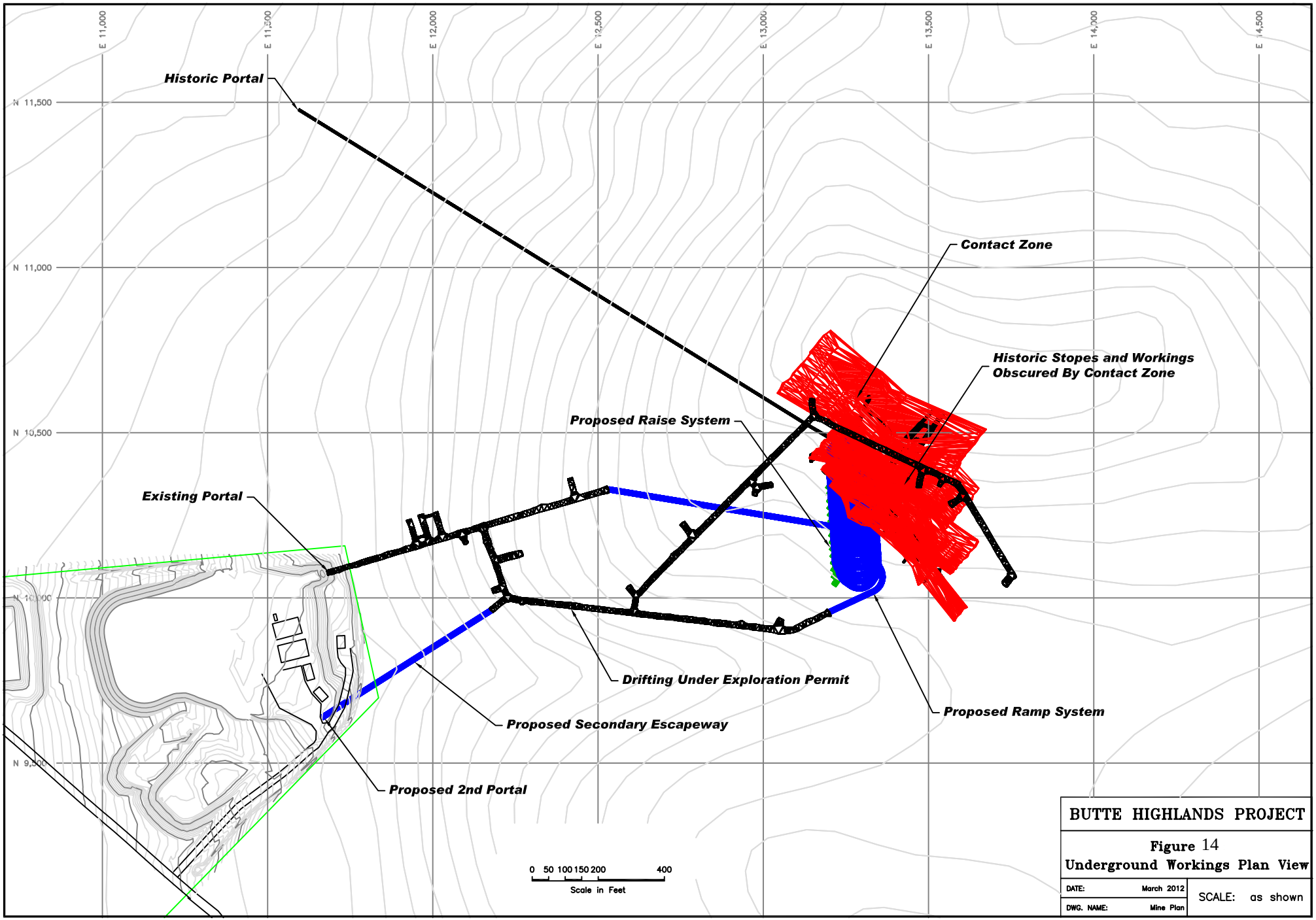
0 2000 feet

Figure 12	Hard Rock Operating Permit Application	
Klepfer Mining Services	DATE: April 2010	SCALE: As Shown
Butte Highlands Joint Venture	DRAWN: Jasper Geographics	
	Butte Highlands Project **Surface & Mineral Ownership** Silver Bow County, Montana	



Source:
CAD drawings by Henry Bogert
February 2010

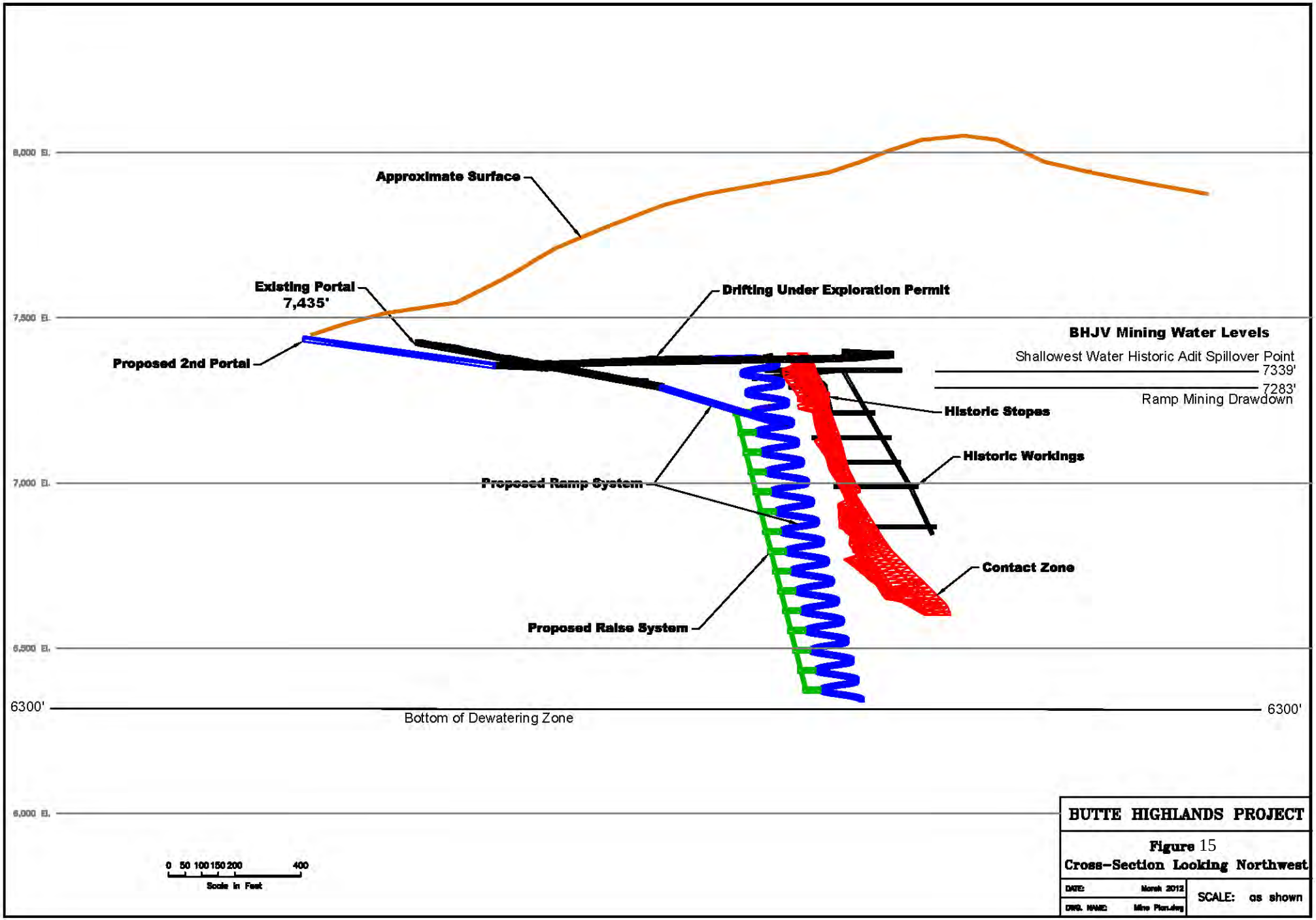
Figure 13	Hard Rock Operating Permit Application	
Klepfer Mining Services	DATE: April 2010	SCALE: As Shown
	DRAWN: Jasper Geographics	
Butte Highlands Joint Venture	Butte Highlands Project **Ore Zones** Silver Bow County, Montana	

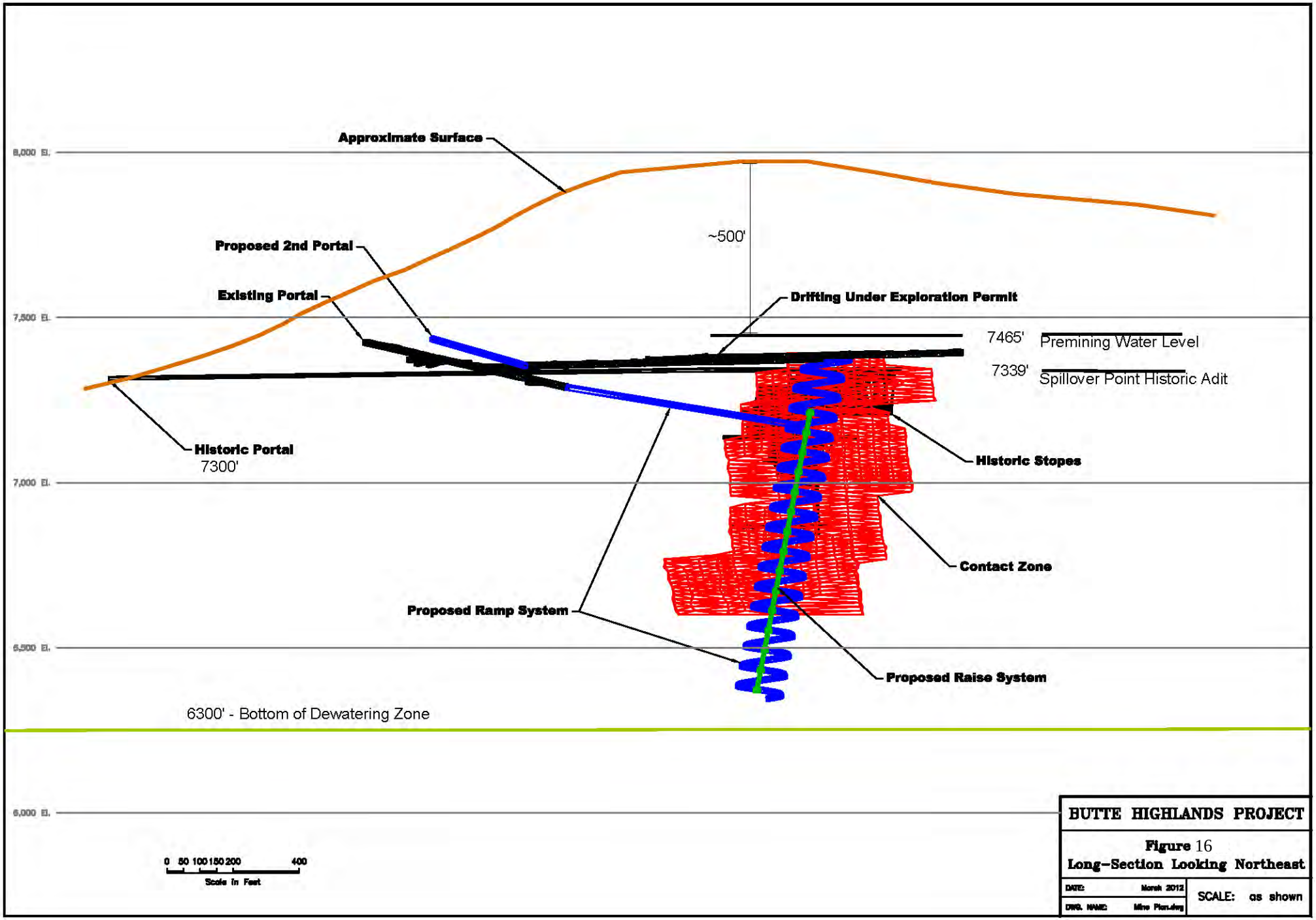


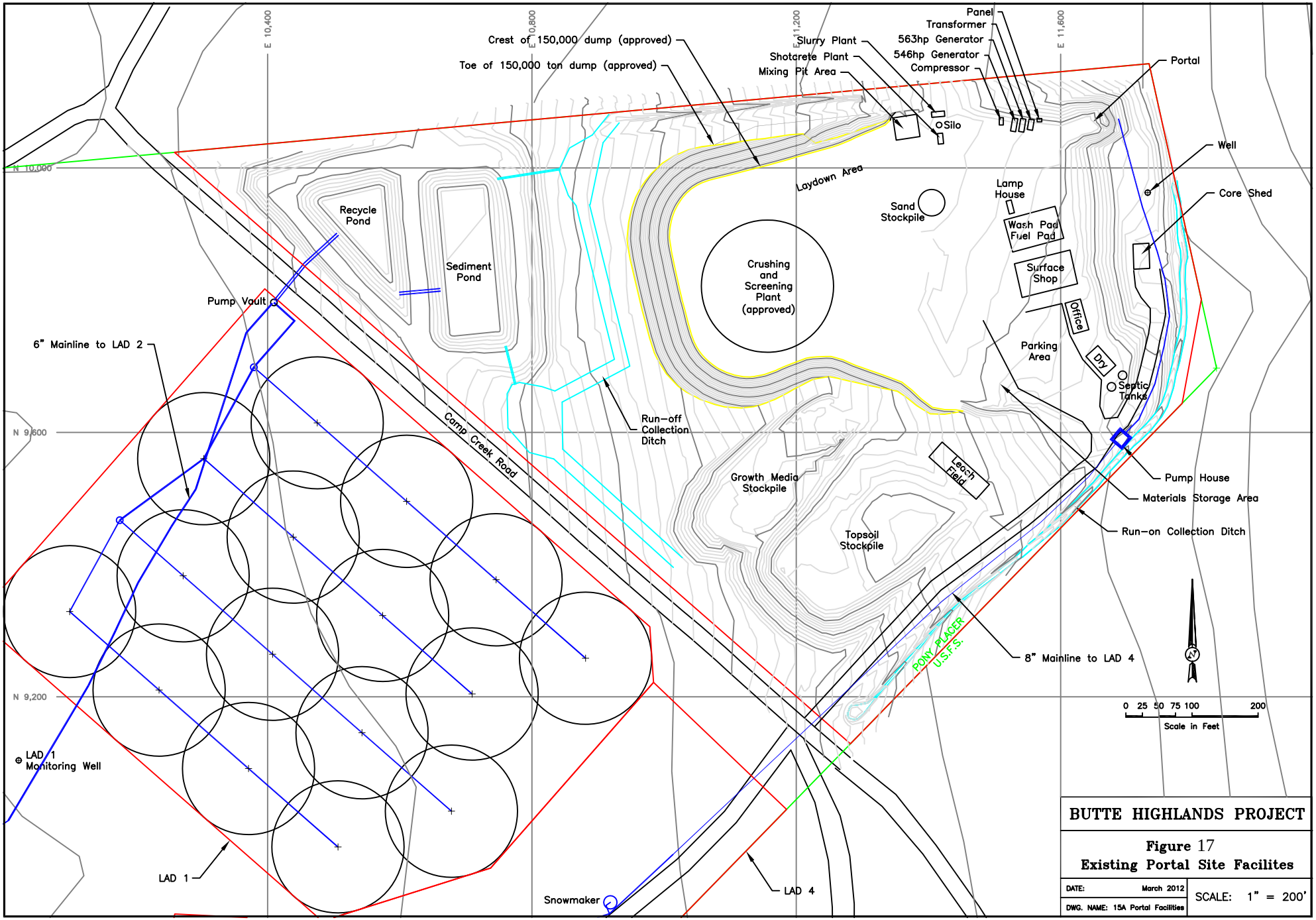
BUTTE HIGHLANDS PROJECT

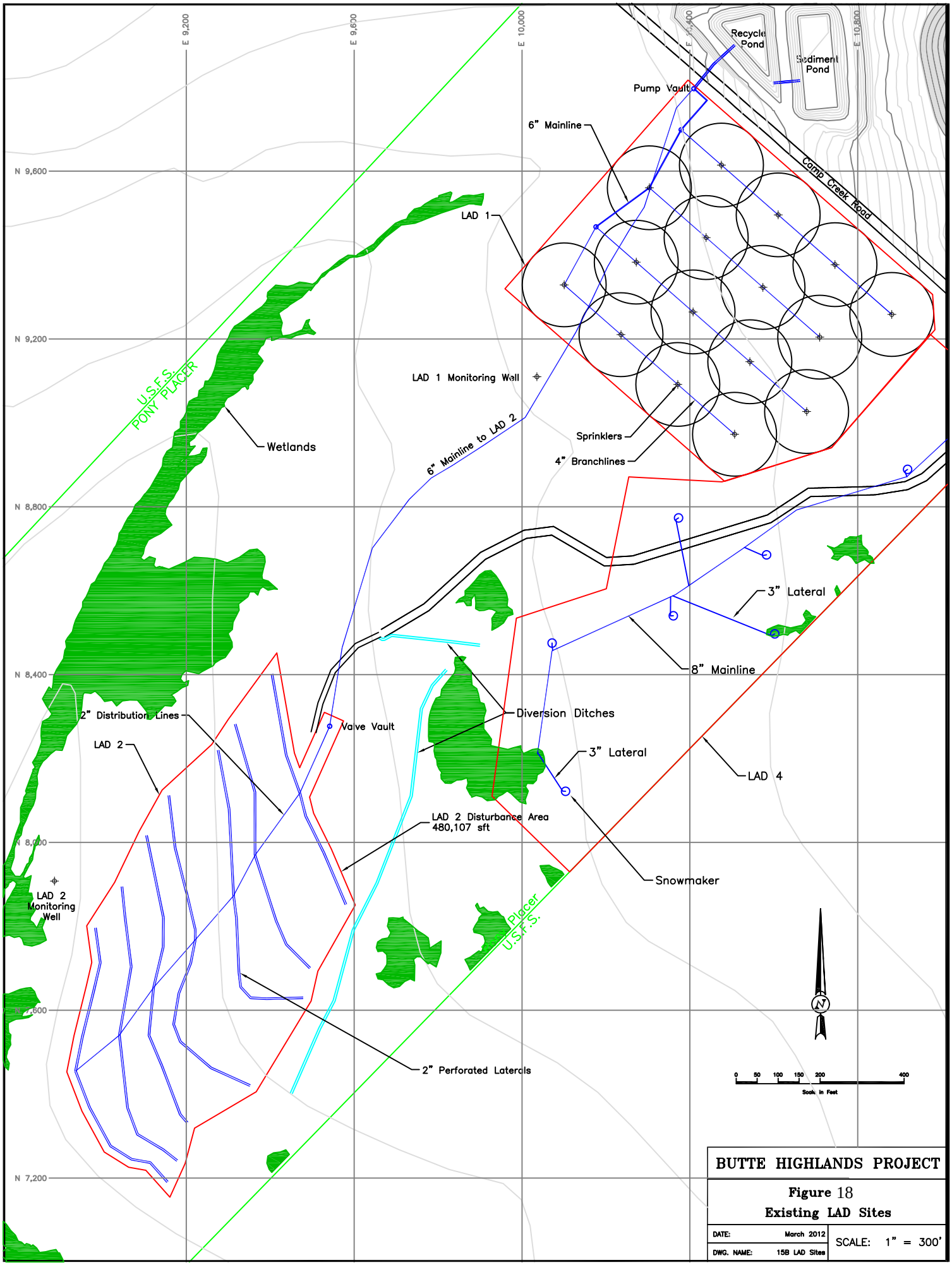
Figure 14
Underground Workings Plan View

DATE:	March 2012	SCALE: as shown
DWG. NAME:	Mine Plan	


8,000 El.
7,500 El.
7,000 El.
6,500 El.
6,000 El.
Approximate Surface
Existing Portal
7,435'
Proposed 2nd Portal
Drifting Under Exploration Permit
BHJV Mining Water Levels
Shallowest Water Historic Adit Spillover Point
7339'
7283'
Ramp Mining Drawdown
Historic Stopes
Historic Workings
Proposed Ramp System
Contact Zone
Proposed Raise System
6300'
Bottom of Dewatering Zone
6300'
0 50 100 150 200 400
Scale in Feet
BUTTE HIGHLANDS PROJECT
Figure 15
Cross-Section Looking Northwest
DATE: March 2012
DWG. NAME: Mine Plan.dwg
SCALE: as shown


Approximate Surface
8,000 El.
~500'
Proposed 2nd Portal
Existing Portal
Drifting Under Exploration Permit
7,500 El.
7465'
Premining Water Level
7339'
Spillover Point Historic Adit
Historic Portal
7300'
Historic Stopes
7,000 El.
Contact Zone
Proposed Ramp System
6,500 El.
Proposed Raise System
6300' - Bottom of Dewatering Zone
6,000 El.
0 50 100 150 200 400
Scale in Feet
BUTTE HIGHLANDS PROJECT
Figure 16
Long-Section Looking Northeast
DATE: March 2012
DWG. NAME: Mine Plan.dwg
SCALE: as shown


E 10,400
E 10,800
E 11,200
E 11,600
N 10,000
N 9,600
N 9,200
Crest of 150,000 dump (approved)
Toe of 150,000 ton dump (approved)
Slurry Plant
Shotcrete Plant
Mixing Pit Area
Panel
Transformer
563hp Generator
546hp Generator
Compressor
Silo
Portal
Well
Core Shed
Laydown Area
Sand Stockpile
Lamp House
Wash Pad
Fuel Pad
Surface Shop
Office
Dry
Septic Tanks
Parking Area
Crushing and Screening Plant (approved)
Recycle Pond
Sediment Pond
Pump Vault
6" Mainline to LAD 2
Camp Creek Road
Run-off Collection Ditch
Growth Media Stockpile
Leach Field
Topsoil Stockpile
Pump House
Materials Storage Area
Run-on Collection Ditch
PONY PLACER
U.S.F.S.
8" Mainline to LAD 4
N
0 25 50 75 100 200
Scale in Feet
LAD 1 Monitoring Well
LAD 1
Snowmaker
LAD 4
BUTTE HIGHLANDS PROJECT
Figure 17
Existing Portal Site Facilites
DATE: March 2012
DWG. NAME: 15A Portal Facilities
SCALE: 1" = 200'

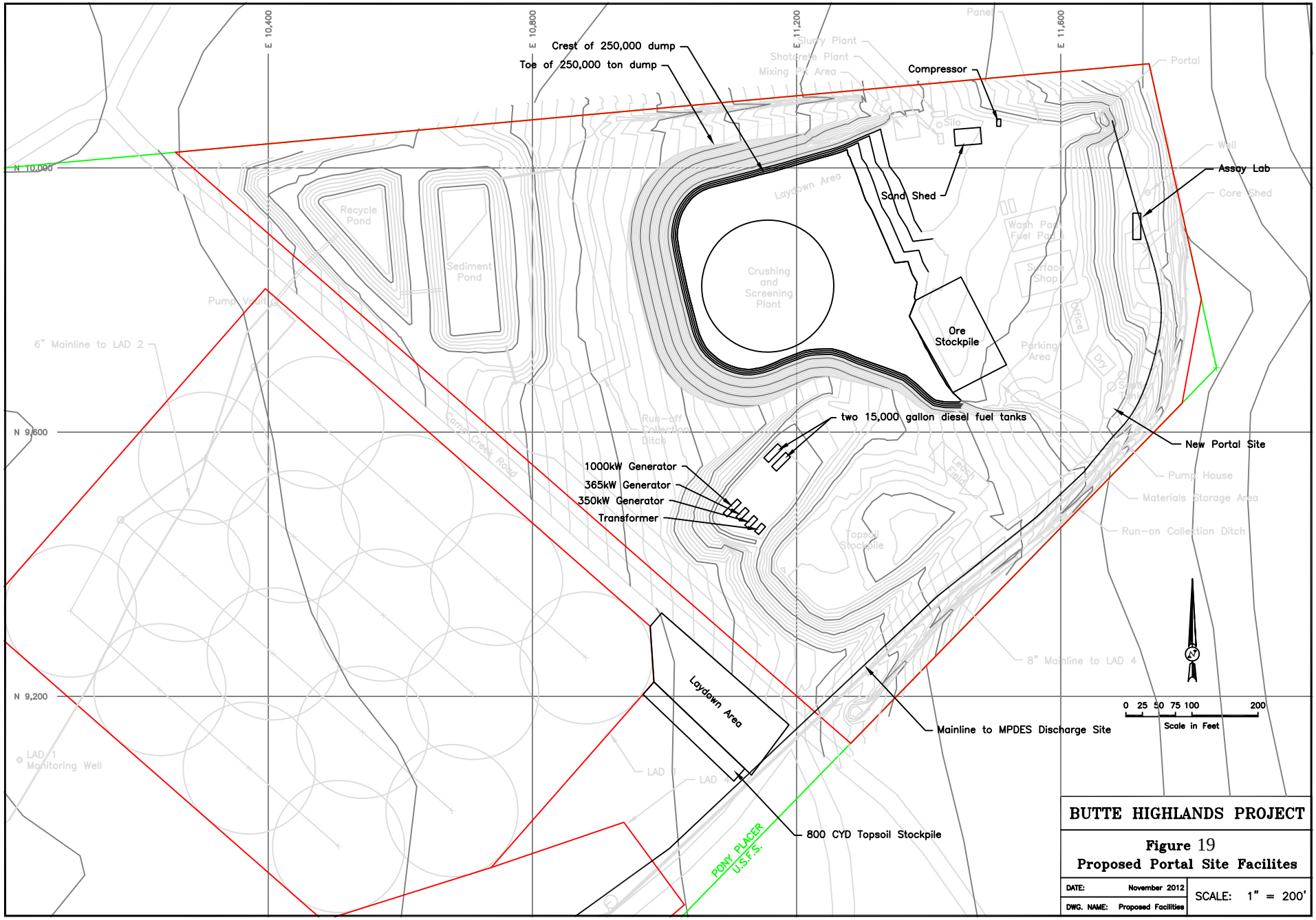


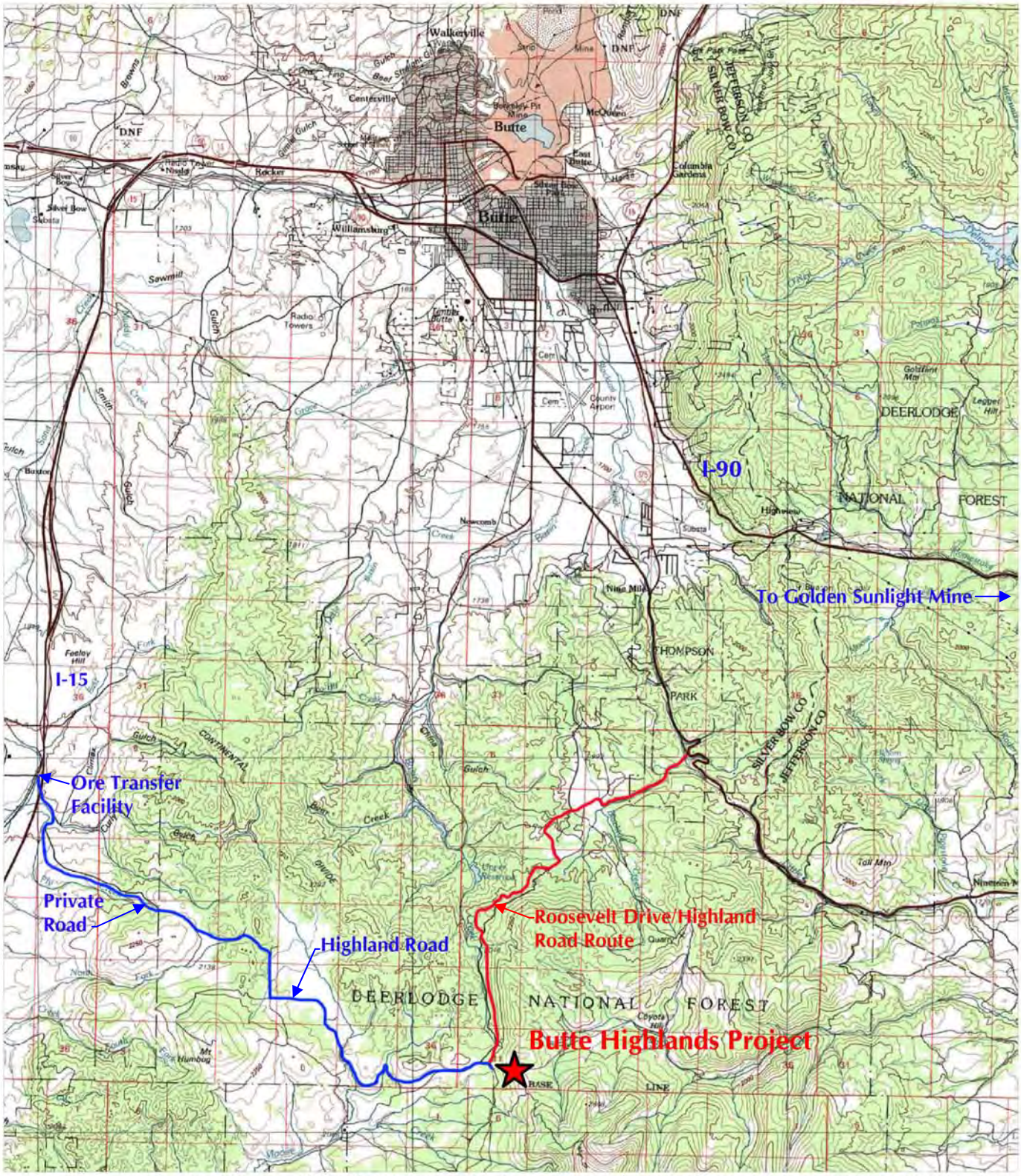
BUTTE HIGHLANDS PROJECT

Figure 18

Existing LAD Sites

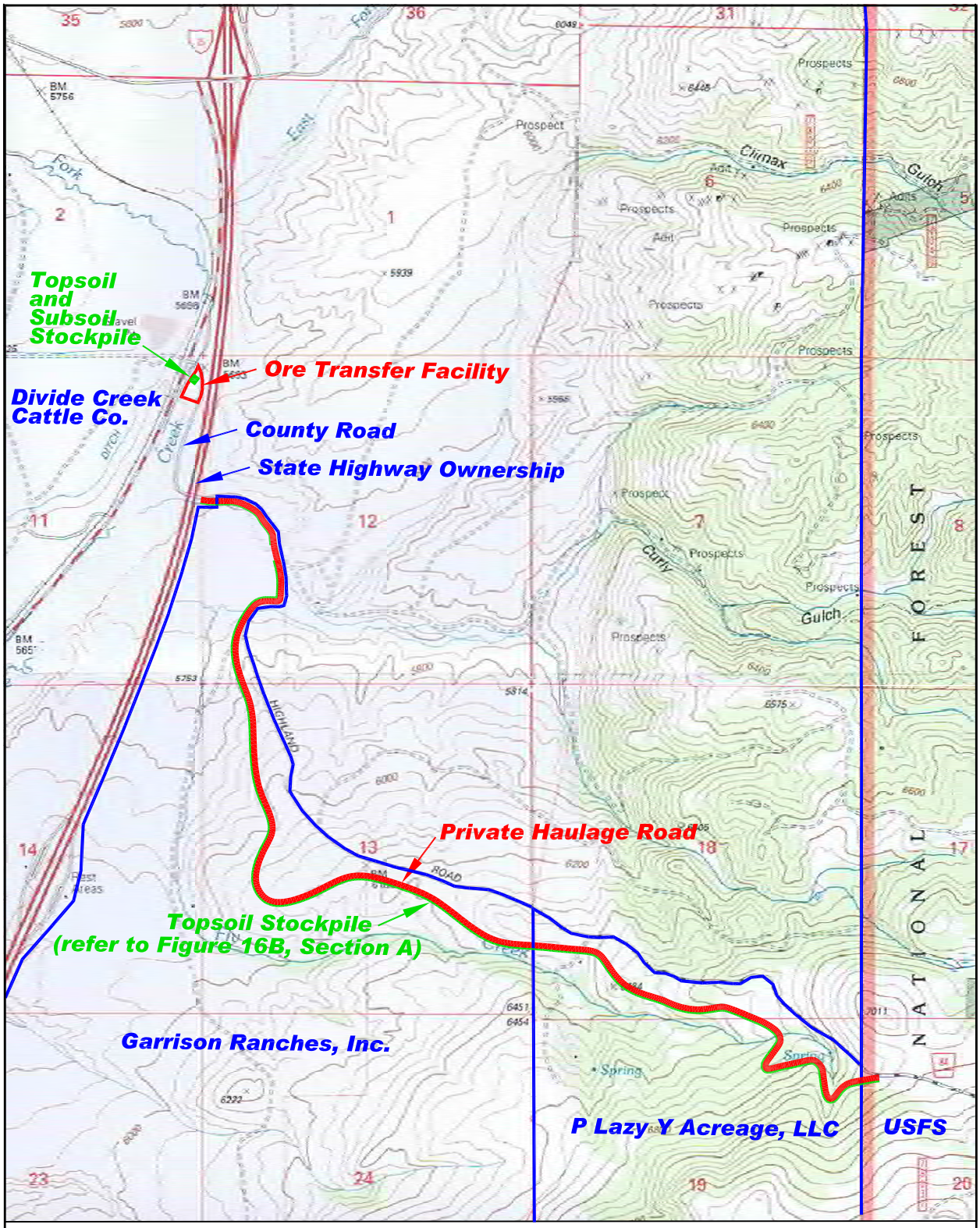
DATE:	March 2012	SCALE: 1" = 300'
DWG. NAME:	15B LAD Sites	


E 10,400
E 10,800
E 11,200
E 11,600
N 10,000
N 9,600
N 9,200
Crest of 250,000 dump
Toe of 250,000 ton dump
Compressor
Sand Shed
Assay Lab
Ore Stockpile
two 15,000 gallon diesel fuel tanks
New Portal Site
1000kW Generator
365kW Generator
350kW Generator
Transformer
Laydown Area
Mainline to MPDES Discharge Site
800 CYD Topsoil Stockpile
PONY PLACER U.S.F.S.
Recycle Pond
Sediment Pond
Crushing and Screening Plant
Slurry Plant
Shotcrete Plant
Mixing Pit Area
Silo
Portal
Well
Core Shed
Wash Pad
Fuel Pad
Surface Shop
Office
Parking Area
Dry
Septic
Leach Field
Topsoil Stockpile
Pump House
Materials Storage Area
Run-on Collection Ditch
8" Mainline to LAD 4
6" Mainline to LAD 2
Pump Vault
Camp Creek Road
Run-off Collection Ditch
LAD 1
LAD 2
LAD 1 Monitoring Well
0 25 50 75 100 200
Scale in Feet
BUTTE HIGHLANDS PROJECT
Figure 19
Proposed Portal Site Facilites
DATE: November 2012
DWG. NAME: Proposed Facilities
SCALE: 1" = 200'



Map Source: USGS 100,000 Topographic Maps: Butte North and South, Montana (presented at 1:150,000 scale)

Figure 20	Hard Rock Operating Permit Application	
	DATE: July 2012	SCALE: As Shown
Butte Highlands Joint Venture	Butte Highlands Project **Access Route Map** Silver Bow County, Montana	



LEGEND

Road/Facility Location

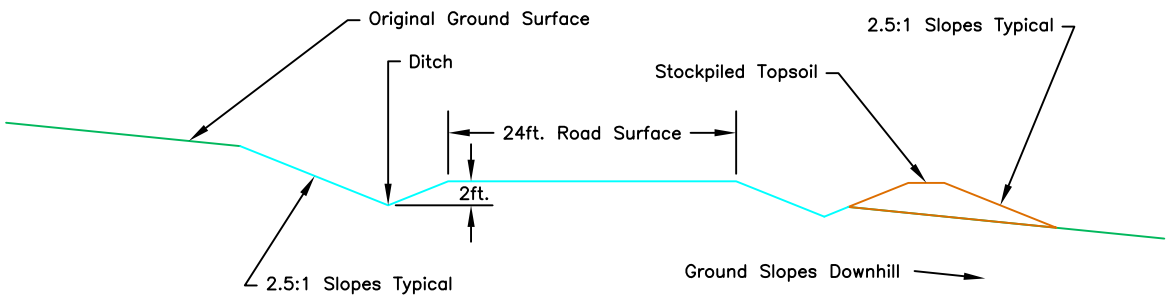
Property Ownership

Topsoil/Subsoil Stockpile

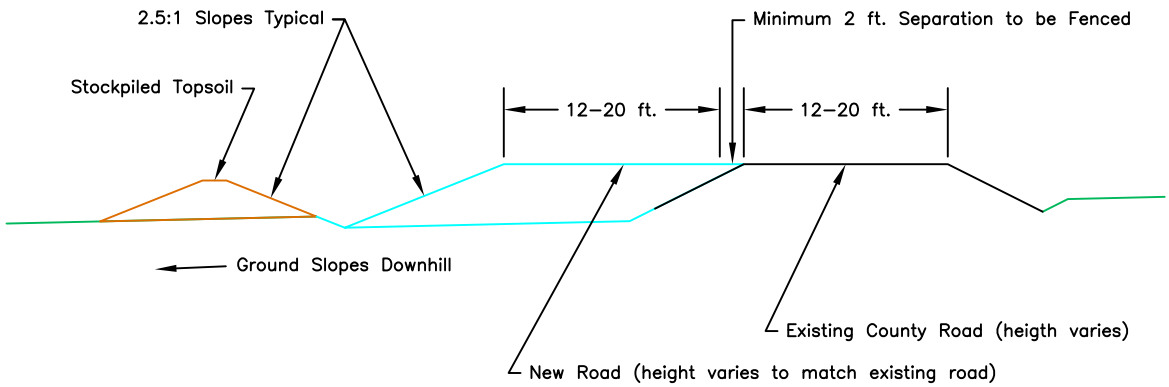
0 1000 2000 3000 4000 8000

Scale in Feet

BUTTE HIGHLANDS PROJECT	
Figure 21 Haulage Road Location/Ownership	
DATE: November 2012	SCALE: as noted
DWG. NAME: Figure 16A	



Section A: Cross Section of New Road



Section B: Cross Section of New Road Adjacent to County Road

LEGEND

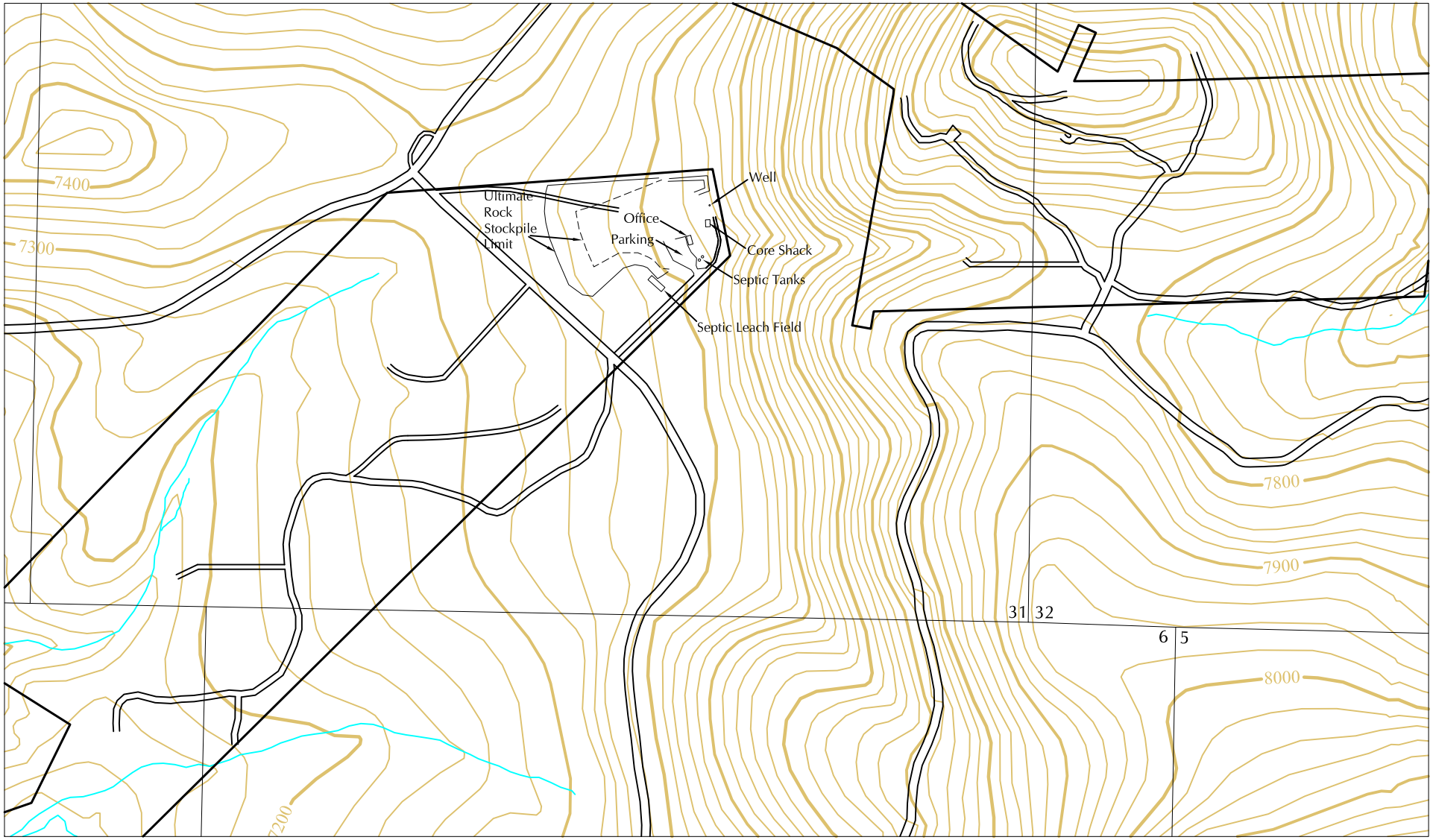
- Existing Road
- New Road
- Stockpiled Topsoil
- Ground Surface

BUTTE HIGHLANDS PROJECT

Figure 22

Typical Road Cross Sections

DATE: November 2012	SCALE: none
DWG. NAME: Figure 16B	



Explanation

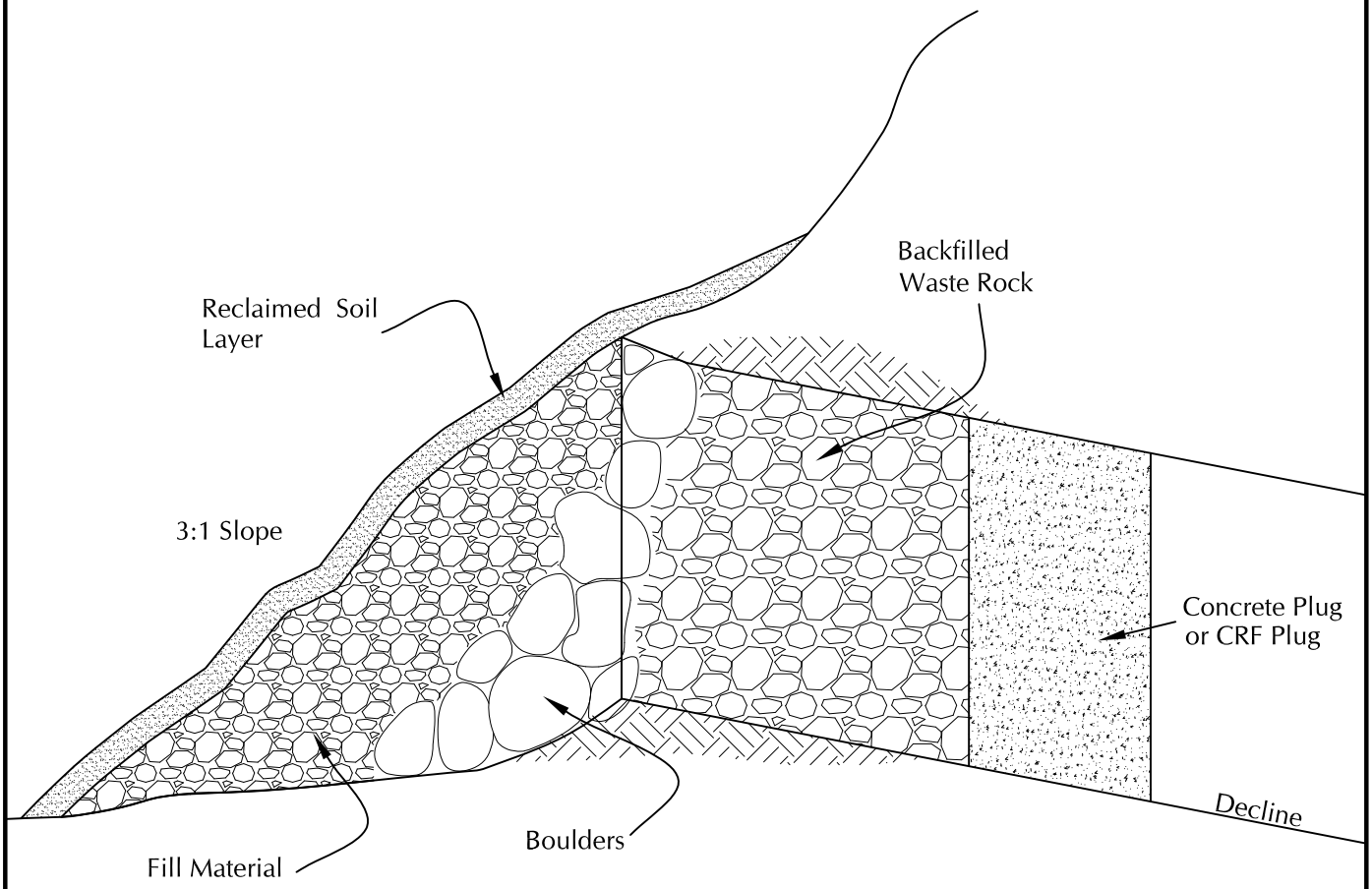
Claim Boundaries

Existing Roads

N

0 800 ft

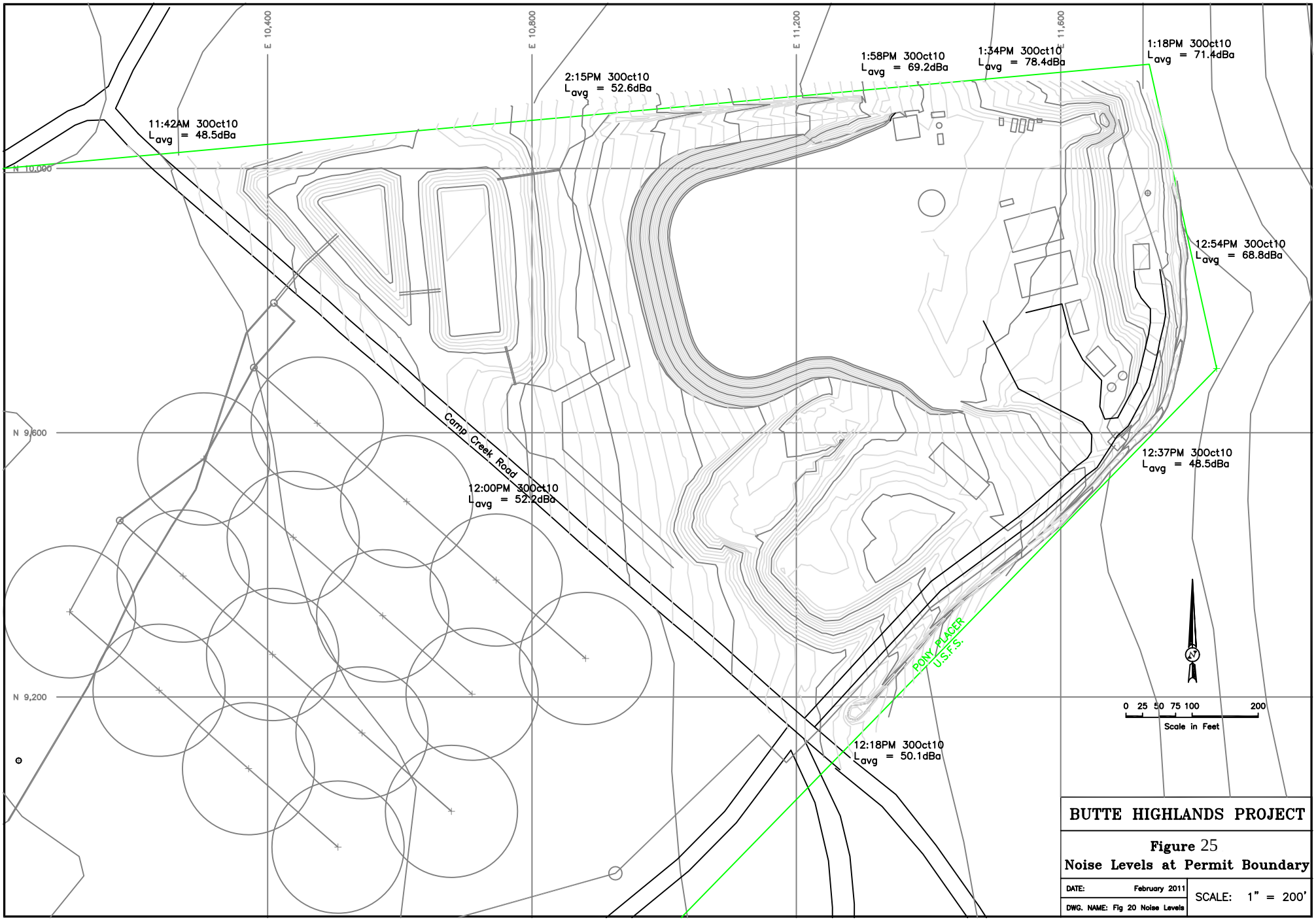
Figure 23	Hard Rock Operating Permit Application
	DATE: February 2011 / SCALE: As Shown
	DRAWN: Jasper Geographics
Butte Highlands Joint Venture	Butte Highlands Project **Reclaimed Site** Silver Bow County, Montana

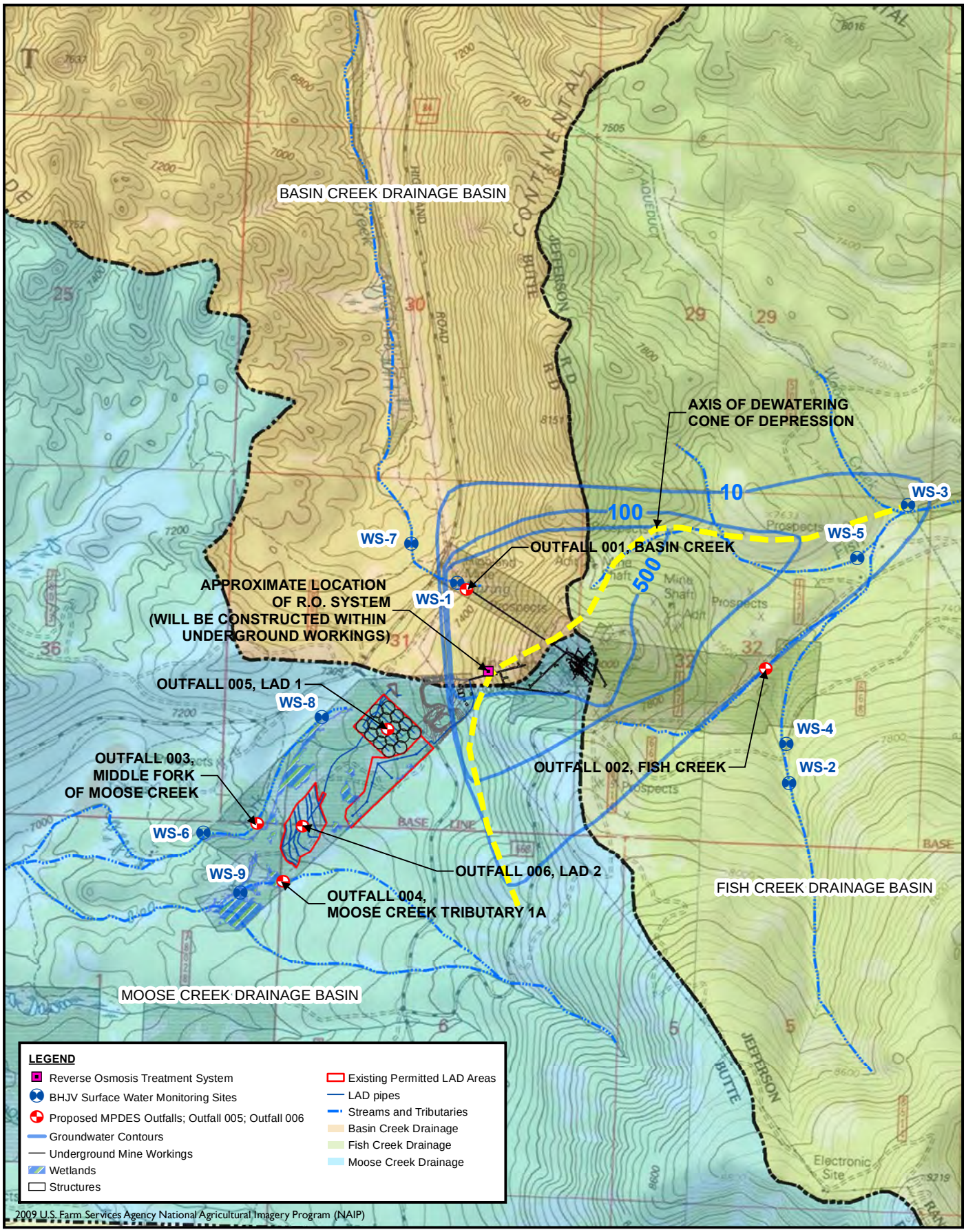


Barrier Plug to be located in the area of best Rock Mass Quality, approximatley 100 feet in from portal.

Not to Scale - For representation only

Figure 24	**Hard Rock Operating Permit Application**	
Klepfer Mining Services	DATE: July 2012	SCALE: As Shown
	DRAWN: Jasper Geographics	
Butte Highlands Joint Venture	Butte Highlands Project **Barrier Plug** Silver Bow County, Montana	


E 10,400
E 10,800
E 11,200
E 11,600
N 10,000
N 9,600
N 9,200
11:42AM 30Oct10
L_{avg} = 48.5dBa
2:15PM 30Oct10
L_{avg} = 52.6dBa
1:58PM 30Oct10
L_{avg} = 69.2dBa
1:34PM 30Oct10
L_{avg} = 78.4dBa
1:18PM 30Oct10
L_{avg} = 71.4dBa
12:54PM 30Oct10
L_{avg} = 68.8dBa
12:37PM 30Oct10
L_{avg} = 48.5dBa
12:18PM 30Oct10
L_{avg} = 50.1dBa
12:00PM 30Oct10
L_{avg} = 52.2dBa
Camp Creek Road
PONY PLACER
U.S.F.S.
0 25 50 75 100 200
Scale in Feet
BUTTE HIGHLANDS PROJECT
Figure 25
Noise Levels at Permit Boundary
DATE: February 2011
DWG. NAME: Fig 20 Noise Levels
SCALE: 1" = 200'

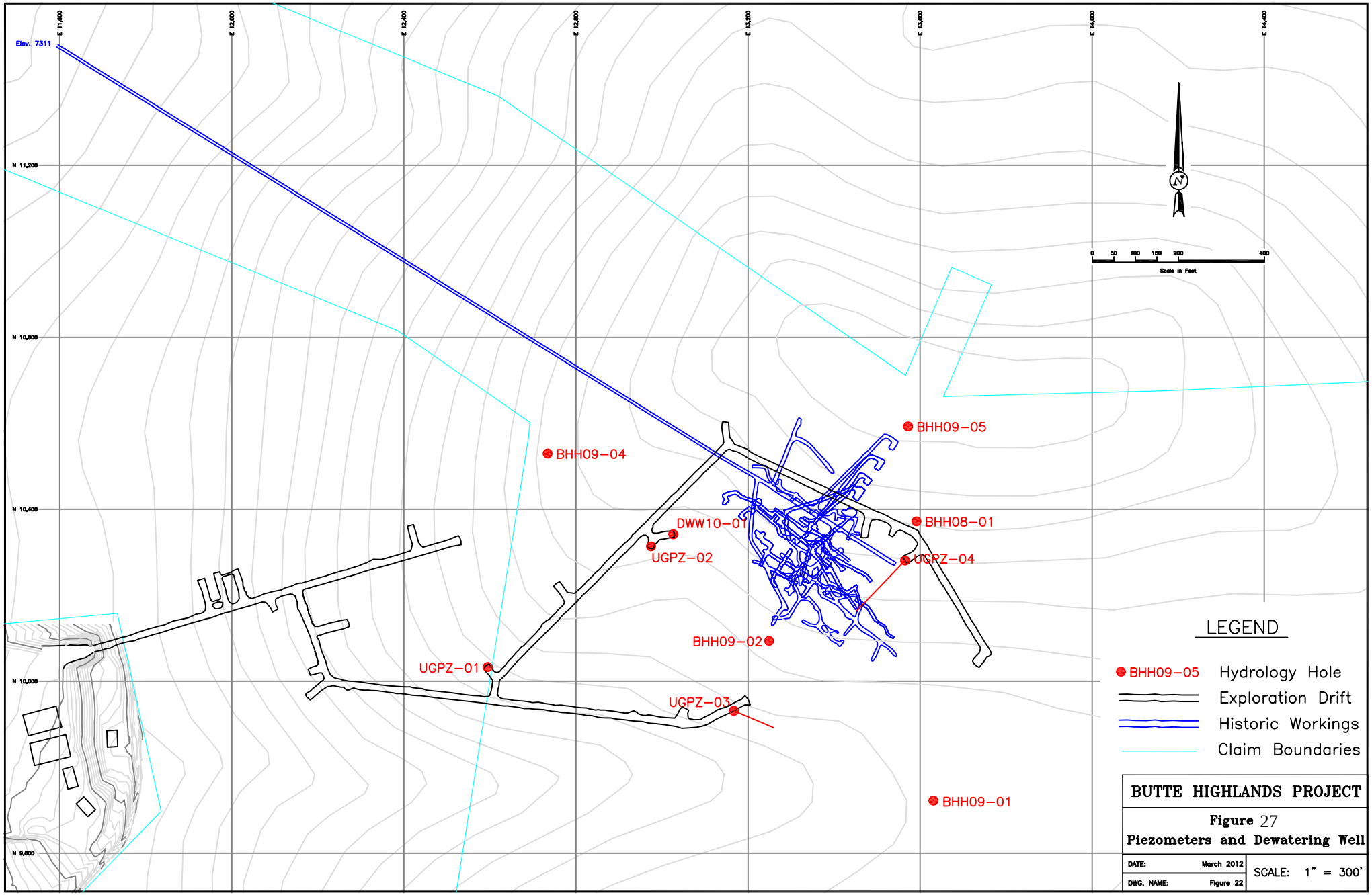


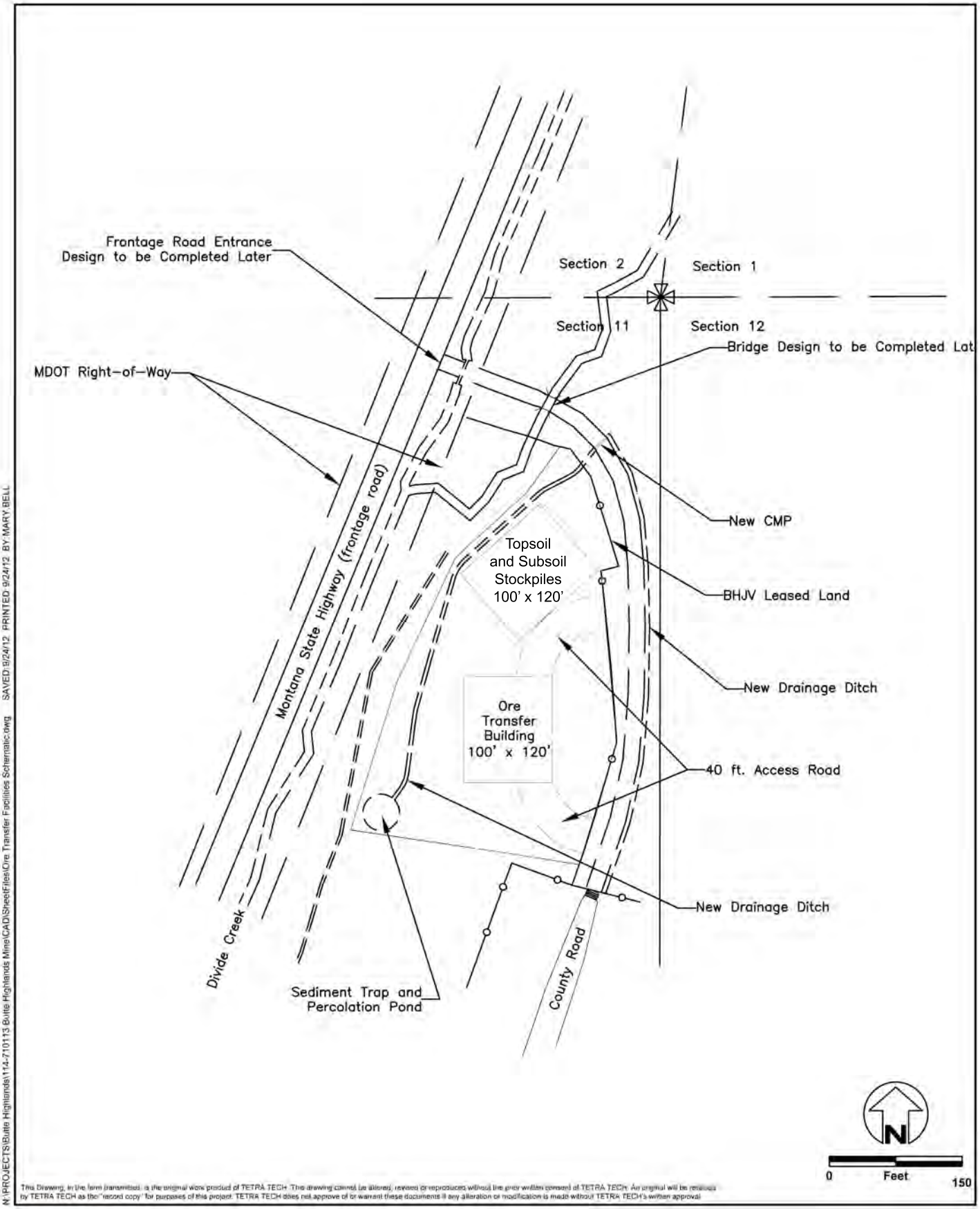
N:\PROJECTS\Butte Highlands\114-710113 Butte Highlands Mine\GIS\ArcMap\BH_PropMPDES Outfalls_Drainages.mxd

N
W E
S

0 500 1,000 2,000 Feet

Wetlands Map Showing
De-Watering Cone of Depression, Wetlands, and MPDES Outfalls
Butte Highlands Project
Silver Bow County, Montana
FIGURE 26

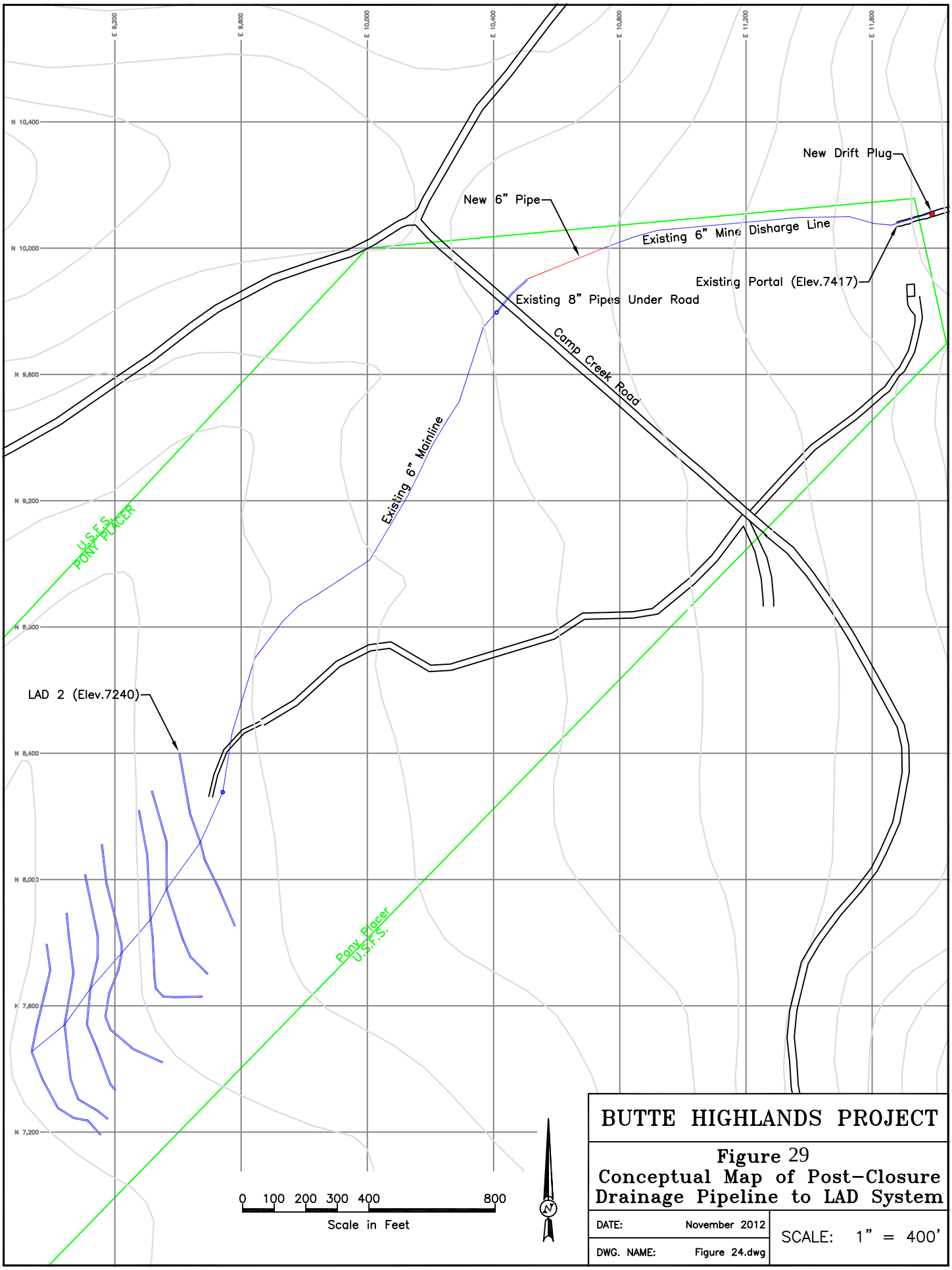

Elev. 7311
E 11,600
E 12,000
E 12,400
E 12,800
E 13,200
E 13,600
E 14,000
E 14,400
N 11,200
N 10,800
N 10,400
N 10,000
N 9,600
0 50 100 150 200 400
Scale in Feet
BHH09-05
BHH09-04
DWW10-01
UGPZ-02
BHH08-01
UGPZ-04
BHH09-02
UGPZ-01
UGPZ-03
BHH09-01
LEGEND
BHH09-05 Hydrology Hole
Exploration Drift
Historic Workings
Claim Boundaries
BUTTE HIGHLANDS PROJECT
Figure 27
Piezometers and Dewatering Well
DATE: March 2012
DWG. NAME: Figure 22
SCALE: 1" = 300'



This Drawing, in the form transmitted, is the original work product of TETRA TECH. This drawing cannot be altered, reused or reproduced without the prior written consent of TETRA TECH. An original will be retained by TETRA TECH as the "record copy" for purposes of this project. TETRA TECH does not approve of or warrant these documents if any alteration or modification is made without TETRA TECH's written approval.

N:\PROJECTS\Butte Highlands\114-710113 Butte Highlands Mine\CAD\SheetFiles\Ore Transfer Facilities Schematic.dwg SAVED 9/24/12 PRINTED 9/24/12 BY MARY BELL

Ore Transfer Facility Schematic
Butte Highlands Mine
Silver Bow County, Montana
FIGURE 28



BUTTE HIGHLANDS PROJECT

Figure 29
Conceptual Map of Post-Closure Drainage Pipeline to LAD System

DATE:	November 2012	SCALE: 1" = 400'
DWG. NAME:	Figure 24.dwg	