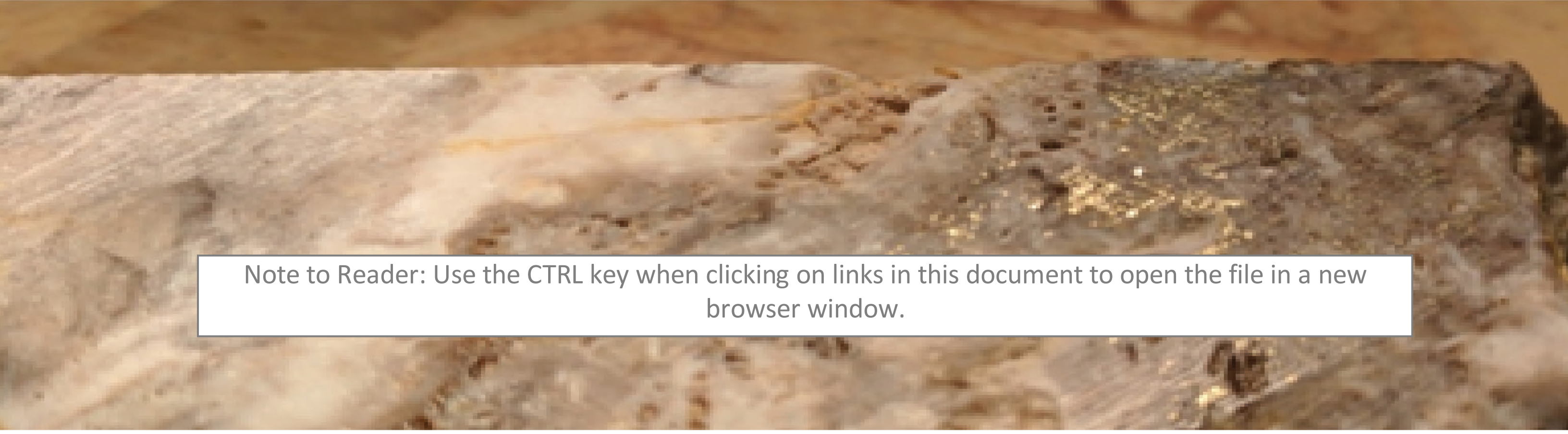

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GRASSY MOUNTAIN MINE PROJECT

Consolidated Permit Application

Submitted to:

Department of Geology and Mineral Industries
229 Broadalbin St. SW
Albany, Oregon 97321 USA

Prepared by:

Calico Resources USA Corp.
665 Anderson Street
Winnemucca, Nevada 89445

December 2021

CONTENTS

1. GENERAL INFORMATION – 43 CFR 3809.401(b)(1) 1
1.1 Organizational Information 1
1.1.1 Applicant Information – 43 CFR 3809.401(b)(1), OAR 632-037-0050(1), ORS 517.971(2) 1
1.1.2 Legal Structure and Residence – OAR 632-037-0050(3), ORS 517.971(3) 1
1.1.3 Project Name, Location, and Access – 43 CFR 3809.401(b)(2)(i), OAR 632-037-0050(5), OAR 632-037-0050(6), ORS 517.971(1) 2
1.1.4 Name(s) and Address(es) of all Landowners of the Surface and Mineral Estate – 43 CFR 3809.401(b)(1), OAR 632-037-0050(2) 3
1.1.5 Authorized Field Representative – 43 CFR 3809.401(b)(1) 4
1.2 Surface Ownership and Disturbance – ORS 517.971(4) 4
1.2.1 Land Status 4
1.2.2 Agreements and Encumbrances 4
1.3 Project Overview – OAR 632-037-0050(4), 632-037-0050(7) 5
1.4 Reclamation Assurance – OAR 632-037-0070, OAR 632-030-0027 6
1.5 Frequently Used Acronyms, Abbreviations, Definitions, and Units of Measure 8

2. EXISTING ENVIRONMENT – OAR 632-037-0055(1), ORS 517.971(5) 14
2.1 Air Quality Resources – OAR 632-037-0055(1)(c) 14
2.2 Aquatic Resources – OAR 632-037-0055(1)(d) 16
2.3 Areas of Critical Environmental Concern/Research Natural Areas – OAR 632-037-0055(1)(q), ORS 517.971(7)(o) 16
2.4 Cultural Resources – OAR 632-037-0055(1)(m) 16
2.5 Environmental Justice – OAR 632-037-0055(1)(o) 18
2.6 Geochemistry – OAR 340-043-0140, OAR 632-037-0055(1)(i), OAR 632-037-0055(j) 21
2.6.1 Sampling and Testing 22
2.6.2 Summary of Results – OAR 340-043-0030(2)(h) 24
2.6.2.1 Waste Rock and Ore 24
2.6.2.2 Tailings – OAR 340-043-0130 24
2.6.2.3 Road Cut and Borrow Material 25
2.6.2.4 Cemented Rock Fill 25
2.7 Geology and Soils – OAR 632-037-0055(1)(b), OAR 632-037-0055(1)(h), OAR 632-037-0055(1)(i), OAR 340-043-0030(2)(b) 26
2.8 Grazing Management – OAR-632-037-0055(l) 33
2.9 Groundwater – OAR 632-037-0055(1)(g), OAR 340-043-0030(2)(d), OAR 340-043-0030(2)(e), OAR 340-043-0030(2)(f) 35
2.9.1 Overview of Field Investigation Activities 35
2.9.2 Data Interpretation and Hydrogeochemical Conceptual Site Model 38
2.9.2.1 Site Setting 38
2.9.2.2 Regional and Local Geology 38
2.9.2.3 Groundwater Occurrence and Flow 39
2.9.2.4 Aquifer Hydraulic Properties 41

2.9.2.5 Water Quality ... 41
2.9.3 Mine Dewatering and Groundwater Production ... 43
2.9.3.1 Mine Dewatering ... 43
2.9.3.2 Groundwater Production ... 44
2.10 Land Use – OAR 632-037-0055(l), OAR 632-037-0077(11) ... 44
2.11 Noise – OAR 632-037-0055(1)(k) ... 45
2.12 Oregon Natural Heritage Areas – OAR 632-037-0055(1)(q)(d), ORS 517.971(7)(o) ... 48
2.13 Outstanding Natural Areas – OAR 632-037-0055(1)(q)(c), ORS 517.971(7)(o) ... 49
2.14 Recreation ... 49
2.15 Socioeconomics – OAR-632-037-0055(1)(o) ... 50
2.16 Surface Water – OAR 632-037-0055(1)(g), OAR 340-043-0030(2)(c), OAR 340-043-0030(2)(d), OAR 340-043-0030(2)(e) ... 52
2.17 Terrestrial Vegetation – OAR 632-037-0055(1)(a) ... 58
2.18 Transportation ... 59
2.19 Visual Resources ... 61
2.20 Wetlands – OAR 632-037-0055(1)(e) ... 62
2.21 Wild, Scenic, or Recreational Rivers – OAR 632-037-0055(p) ... 63
2.22 Wildlife Resources – OAR 632-037-0055(1)(e) ... 63
2.22.1 Large and Small-Plot Avian Surveys ... 64
2.22.2 Large and Small-Plot Avian Surveys ... 65
2.22.3 Raptor Nest Surveys ... 65
2.22.4 Golden Eagle Nest Monitoring ... 67
2.22.5 Greater Sage-Grouse Surveys ... 68
2.22.6 Leporid Surveys ... 68
2.22.7 Acoustic Bat Surveys ... 69
2.22.8 General Wildlife Observations ... 69

3. OPERATING PLAN – 43 CFR 3809.401(b)(2), OAR 632-037-0060, OAR 632-037-0077(1), ORS 517.971(7)(h) ... 71

3.1 Project Summary ... 71
3.1.1 Estimated Disturbance Acreage ... 71
3.2 Mine Design and Mining Methods – OAR 632-037-0050(4), OAR 632-037-0060(1), OAR 340-043-0040(2)(a), ORS 517.971(6)(a) ... 73
3.2.1 Geotechnical Considerations – OAR 632-037-0060(10) ... 73
3.2.2 Underground Mining Method ... 74
3.2.2.1 Mine Access ... 76
3.2.2.2 Mining Method Sequence ... 76
3.2.2.3 Mining Description and Mining Equipment Selection ... 78
3.2.2.4 Backfill ... 79
3.2.2.5 Cemented Rockfill ... 79
3.2.2.6 Rockfill ... 80
3.2.3 Mine Drainage/Seepage ... 80
3.2.3.1 Underground Infrastructure and Services ... 80
3.2.4 Aggregate Mining ... 82
3.2.5 Mining Rate ... 82

3.2.6 Underground Production Schedule ... 85
3.3 Milling and Processing Methods – OAR 632-037-0060(1), AOR 340-043-0100, ORS 517.971(7)(b) ... 86
3.3.1 General Foundation Recommendations for Ore Process Facilities: ... 86
3.3.2 Overview of the Ore Processing Circuit ... 86
3.3.3 Key Design Criteria ... 88
3.3.4 Crushing Circuit ... 90
3.3.5 Grinding Circuit ... 91
3.3.6 CIL Leaching ... 93
3.3.7 Carbon Elution ... 93
3.3.8 Gold Room ... 93
3.3.9 Cyanide Detoxification and Tailings Deposition ... 94
3.3.10 Reagent Handling and Storage ... 94
3.3.11 Surface Contact Water – 43 CFR 3809.401(b)(2)(iii), OAR-632-037-0060(4)(c), OAR 632-037-0060(8), OAR 632-037-0120(1), ORS 517.971(7)(g) ... 94
3.4 List of Equipment – OAR 632-037-0060(2) ... 95
3.5 General Schedule of Construction and Operation – OAR 632-037-0060(3) ... 96
3.5.1 Work Force ... 97
3.5.2 Local Hire Policy ... 98
3.6 Tailings Storage Facility – OAR 632-037-0060(4)(h), OAR 632-037-0060(9)(d), OAR 632-037-0077(4), OAR 340-043-0100, OAR 340-043-0130, OAR 340-043-0140, OAR 340-043-0020, ORS 517.971(8)(e) ... 98
3.6.1 Geotechnical Considerations – OAR 340-043-0030(2)(g), OAR 632-037-0060(9)(d) ... 98
3.6.2 Tailings Disposal ... 102
3.6.3 Design Criteria – OAR 340-043-0090 ... 103
3.6.4 TSF Design Summary – OAR 632-037-0060(4)(b) ... 106
3.6.4.1 Site Layout ... 106
3.6.4.2 Hazard Classification ... 106
3.6.4.3 Embankments ... 106
3.6.4.4 Lining System ... 107
3.6.4.5 Water Management ... 108
3.7 Waste Rock Management – OAR 632-037-0060(4)(b), OAR 340-043-0040, OAR 340-043-0050 ... 113
3.7.1 Lining System – OAR 632-037-0060(4)(f), OAR 340-043-0000(2)(a) ... 114
3.7.2 Underdrain Collection System – OAR 632-037-0060(4)(f) ... 115
3.7.3 Leakage Detection System – OAR 632-037-0060(4)(f), OAR-340-043-0000(2)(a) ... 116
3.7.4 Waste Rock Storage Stability – OAR 340-043-0030(2)(g), OAR 632-037-0060(9)(b) ... 116
3.8 Chemical Storage and Use – OAR 632-037-0060(4)(i), OAR 632-037-0060(11), OAR 632-037-0060(13), ORS 517.971(7)(j) ... 117
3.8.1 Reagents ... 119
3.8.1.1 Hydrated Lime ... 119
3.8.1.2 Sodium Hydroxide ... 120

3.8.1.3 Sodium Cyanide ... 120
3.8.1.4 Sodium Metabisulphite ... 120
3.8.1.5 Copper Sulfate (Pentahydrate) ... 121
3.8.1.6 Hydrochloric Acid ... 121
3.8.1.7 Low Pressure Air ... 122
3.8.1.8 Plant and Instrument Air ... 122
3.8.2 Petroleum-Contaminated Soils Management – OAR 340-093-0170, OAR 340-093-0190 ... 122
3.8.3 Waste Disposal Management – OAR 340-093-0170, OAR 340-093-0190, OAR 340-093-0210 ... 122
3.8.4 Explosive Storage and Use ... 123
3.8.5 Cyanide Management ... 123
3.9 Mine Site Infrastructure ... 123
3.9.1 Haul and Access Roads ... 123
3.9.2 Power Supply ... 124
3.9.2.1 Onsite Power Generation ... 124
3.9.2.2 Line Power ... 124
3.9.2.3 Site Power Distribution ... 129
3.9.2.4 Underground Mine Power Distribution ... 129
3.9.3 Water Supply and Management – OAR 632-037-0060(5)(c) ... 129
3.9.3.1 Raw Water ... 130
3.9.3.2 Potable Water ... 130
3.9.3.3 Gland Water ... 130
3.9.3.4 Process Water ... 130
3.9.4 Stormwater and Sediment Control Structures – OAR 632-037-0060(4)(d), OAR 340-043-0040(2)(b), ORS 517.971(8)(d) ... 130
3.9.5 Quarry – OAR 632-037-0060(4)(g), OAR 632-037-0077(1), OAR 632-037-0077(3) ... 131
3.9.6 Fencing ... 131
3.9.7 Infrastructure and Ancillary Facilities ... 132
3.9.7.1 Support Facilities ... 132
3.9.7.2 Assay and Metallurgical Laboratory and Quality Control ... 133
3.9.7.3 Fuel Supply, Storage, and Distribution ... 133
3.9.7.4 Compressed Air Supply ... 134
3.9.7.5 Communications ... 134
3.9.7.6 Transportation ... 134
3.9.7.7 Buildings ... 134
3.9.8 Waste Disposal Systems – OAR 632-037-0060(4)(e), OAR 632-037-0077(4), OAR 340-043-0030(2)(i),OAR 340-045-0015, ORS 517.971(8)(j) ... 136
3.9.9 Stockpiles – Topsoil or Suitable Growth Media – OAR 632-037-0060(4)(f), OAR 632-037-0060(9)(c), OAR 632-037-0120(2) ... 137
3.9.10 Stockpiles – Mined Ore Stockpile – OAR 632-037-0060(9)(e) ... 137
3.10 Water Management – OAR 632-037-0060(5), OAR 632-037-0077(2), ORS 517.971(7)(c), ORS 517.971(8)(c) ... 137
3.10.1 Precipitation and evaporation data – OAR 340-043-0030(2)(a), OAR 632-037-0060(5)(a) ... 137
3.10.2 Site Water Balance – OAR 632-037-0060(5)(b) ... 138

3.10.3 Mine Dewatering Estimate ... 140
3.10.4 Makeup Water from Production Wells – OAR 632-037-0060(5)(c) ... 140
3.10.5 Surface Contact Water ... 141
3.10.6 Water Management Plan ... 141
3.10.7 Summary of Water Storage and Treatment ... 143

3.11 Temporary Closure (Seasonal or Other) – OAR 632-037-0060(6), ORS 517.971(7)(l) ... 143

3.11.1 Target Seasonal or Temporary Storage Volumes and Total System Storage Capacity – OAR 632-037-0060(6)(a), OAR 632-037-0060(6)(b) ... 143
3.11.2 Procedures to Handle Volumes of Water in Excess of Seasonal or Temporary Storage Capacities – OAR 632-037-0060(6)(c) ... 144
3.11.3 Estimated Schedule for Closure – OAR 632-037-0060(6)(d) ... 144
3.11.4 Monitoring and Reporting Programs – OAR 632-037-0060(6)(e) ... 144

3.12 Operational Monitoring – OAR 632-037-0060(7), ORS 517.971(7)(e) ... 144

3.12.1 Fully Detailed Monitoring and Reporting Programs ... 144

3.13 Chemicals, Waste and Safety ... 145

3.13.1 Chemicals – OAR 632-037-0060(11), 517.971(7)(i) ... 145
3.13.2 Transportation of Chemicals – OAR 632-037-0060(13), ORS 517.971(7)(j) ... 145
3.13.3 Emergency Response Plan – OAR 632-037-0060(15), OAR 340-043-0040(2)(g), ORS 517.971(7)(m) ... 145
3.13.4 Characterization and Management Plan – OAR 632-037-0060(16), ORS 517.971(i) ... 145
3.13.5 Employee Safety Training Plan – OAR 632-037-0060(14), ORS 517.971(7)(k) ... 146
3.13.6 Wildlife Protection Plan – OAR 340-043-0110, OAR 632-037-0125, OAR 635-420-0020, OAR 635-420-0030, OAR 635-420-0040, OAR 635-420-0050, OAR 635-420-0070, OAR-635-420-0080, ORS 517.956, ORS 517.971(7)(d) ... 146
3.13.7 Wildlife Mitigation Plan – OAR 632-037-0125, OAR 635-415-0025, OAR 635-420-0060, ORS 517.971(7)(d) ... 147
3.13.8 Inadvertent Discovery Plan for Paleontological and Archaeological Resources – ORS 358.905 through ORS 358.955 ... 147

4. RECLAMATION AND CLOSURE PLAN – 43 CFR 3089.401(b)(3), OAR 632-037-0070, OAR 340-043-0025, OAR 340-043-0040(2)(e), OAR-340-043-0160, ORS 517.971(7)(f) ... 149

4.1 Schedule for Reclamation ... 149
4.2 Topography and Vegetation – OAR 632-037-0070(1), OAR 632-037-0070(2), OAR 632-037-0070(3), OAR 632-037-0070(8), OAR 632-037-0120(2) ... 151
4.3 Facilities ... 152

4.3.1 Procedures for Decommissioning Mine Facilities – OAR 632-037-0070(12) ... 152
4.3.2 Procedures for Removal of all Process Chemicals – OAR 632-037-0070(12)(c) ... 152
4.3.3 Procedures for the Removal or Disposal of all Equipment, Refuse, Structures and Foundations from the Permit Area – OAR 632-037-0070(10) ... 152
4.3.4 Characterization and Management Plan – OAR 632-037-0070(4) ... 153

4.3.5 Procedures for Appropriate Isolation or Removal of Waste Material – OAR 632-037-0070(12)(d), OAR 340-043-0000(c) 153

4.4 Monitoring – OAR 632-037-0070(12)(e), ORS 517.971(n) 153

4.5 Watercourses and Drainage – OAR 632-037-0070(3) 154

4.6 Reclamation Security – OAR 632-037-0070(13), OAR 632-037-0135(6)(p), ORS 517.987 155

5. ALTERNATIVE ANALYSIS – OAR 632-037-0075 156

5.1 Alternative Locations for Mine Facilities – OAR 632-037-0075(2)(a) 156

5.2 Alternative Designs, Processes (including chemical processes), Operations and Scheduling for Mine Facilities and Operations – OAR 632-037-0075(2)(b) 156

5.3 Alternative Water Supply – OAR 632-037-0075(2)(c) 158

5.4 Alternative Power Supply – OAR 632-037-0075(2)(d) 159

5.5 Alternative Reclamation Procedures – OAR 632-037-0075(2)(e) 159

6. REFERENCES 161

TABLES

Table 1. Tax Lots and Ownership of Permit Area ... 2
Table 2. Ambient Pollutant Concentration Summary ... 15
Table 3. Quarterly and Annual Means for Meteorological Parameters ... 15
Table 4. Race and Ethnicity for Oregon, Malheur County, and the Environmental Justice Study Area ... 19
Table 5. Income Summary for Oregon, Malheur County, and the Environmental Justice Study Area ... 20
Table 6. Poverty Summary for Oregon, Malheur County, and the Environmental Justice Study Area ... 20
Table 7. Employment Summary for People Living in Poverty in Oregon, Malheur County, and the Environmental Justice Study Area ... 21
Table 8. Soil Survey Map Legend ... 30
Table 9. Erosion Factors of Surface Soils ... 31
Table 10. Soil Suitability Ratings ... 31
Table 11. Growth Media Salvaged and Available ... 33
Table 12. Pasture Allotments in the Grazing Management Study Area ... 34
Table 13. Well Completion Details ... 36
Table 14. List of Springs with GPS Coordinates ... 37
Table 15. Ambient Noise Summary (dBA) ... 46
Table 16. Representative Ambient Noise Levels Measured at Noise Sensitive Properties ... 48
Table 17. Proposed Ambient Noise Limits for the Project ... 48
Table 18. Recreation Opportunity Spectrum Classifications in the Recreation Study Area ... 49
Table 19. List of Water Quality Analytes ... 53
Table 20. Flow and Elevation Data from Surface Water Sites ... 55
Table 21. Field Water Quality ... 56
Table 22. Water Quality Results ... 57
Table 23 Traffic Count Data in the Transportation Study Area ... 60
Table 24. BLM Visual Resources Management Classes in the Visual Resources Study Area ... 61
Table 25. Key Observation Points ... 62
Table 26. Proposed Surface Disturbance ... 72
Table 27. Underground Mining Equipment ... 79
Table 28. Mine Production Summary ... 83
Table 29. Material to the Mill ... 84
Table 30. Development Schedule ... 84
Table 31. Grassy Mountain Process Design Criteria ... 89
Table 32. Mine Mobile Equipment Requirements ... 95
Table 33. Project Schedule ... 96
Table 34. Summary of Critical TSF Stability Analysis Results ... 101
Table 35. General TSF Design Criteria Table ... 104
Table 36. Division–20 - Dam Safety Minimum Design Criteria Table ... 104
Table 37. Chemical Mining Minimum Containment Design Criteria Table ... 105
Table 38. Stage Capacity Relationship Summary ... 107
Table 39. TWRSF Design Criteria Table ... 114
Table 40. Summary of Critical TWRSF Stability Analysis Results ... 116
Table 41. Fuels and Reagents Volumes and Shipments ... 118

Table 42. Cross-Reference for the Water Management Plan 141
Table 43. Proposed Action and Alternative Designs........ 157

FIGURES

Figure 1. Stratigraphic Column of the Mine and Process Area Geology 27
Figure 2. Geologic Cross Sections 28
Figure 3. Grassy Mountain Mine Cross Section Looking North 75
Figure 4. Proposed Grassy Mountain Mine Plan (plan view) 75
Figure 5. Detailed level Sequence for a Typical Level 77
Figure 6. Mining Lifts........ 77
Figure 7. Mine Production Schedule (tons by period) 85
Figure 8. Mine Production Schedule (ounces by period) 85
Figure 9. Grassy Mountain Process Flowsheet........ 88
Figure 10. Similar Crushing Plant 91
Figure 11. Example Ball Mill 92
Figure 12. Example Cyclone 92
Figure 14. Life of Mine Work Force 97
Figure 15. Planned Line Pole Configurations, 3-0 Tangent – 10' Crossarm 2-Up 125
Figure 16. Planned Line Pole Configurations, Deadend – Corner for 336 or 795........ 126
Figure 17. Planned Line Pole Configurations, 3-0 Angle – Double Deadend 3-Up 127
Figure 18. Planned Line Pole Configurations, 3-0 Angle – Double Crossarm 3-Up 128
Figure 19. Site Water Balance Schematic 140

MAPS

Map 1. Location Map
Map 2. Vicinity and Access Map
Map 3. Tax Lots and Mining Claims
Map 4. General Arrangement
Map 5. Soil Map Units
Map 6. Flood Plains Hazard Area

APPENDICES

Note to Reader: Use the CTRL key when clicking on the link below to open the file in a new browser window.

Appendix A: Patented / Unpatented Mining Claims

Appendix B: Baseline Data Reports

- B1. Air Quality Resources Baseline Report
- B2. Aquatic Resources Baseline Report
- B3. Areas of Critical Environmental Concern Research Natural Areas Baseline Report
- B4. A Cultural Resource Inventory of 830 Acres for the Grassy Mountain Mine Project – withheld from public review
- B5. Environmental Justice Baseline Report
- B6. Baseline Geochemical Characterization Report
- B7. Geology and Soils Baseline Report
- B8. Grazing Management Baseline Report
- B9. Grassy Mountain Gold Project Baseline Groundwater Reports
- B10. Land Use Baseline Report
- B11. Noise Baseline Report
- B12. Oregon Natural Heritage Resources Baseline Report
- B13. Outstanding Natural Areas Baseline Report
- B14. Recreation Baseline Report
- B15. Socioeconomics Baseline Report
- B16. Surface Water Baseline Report
- B17. Terrestrial Vegetation Baseline Report
- B18a. Transportation Baseline Report
- B18b. Transportation Baseline Traffic
- B18c. Transportation Baseline Trip Generation
- B19. Visual Resources Baseline Report
- B20. Wetland Delineation Report
- B21. Wild, Scenic, or Recreational Rivers Baseline Report
- B22. Wildlife Resources Baseline Report
- B23. Work Plans, Environmental Baseline Study

Appendix C: Design Reports

- C1. Road Design Report
- C2. Portal Design Report
- C3. Mill Design Report
- C4. Tailings Design Report
- C5. Well Field Design Report
- C6. Wastewater Facilities Preliminary Engineering Report

Appendix D: Management Plans
- D1. Reclamation Plan
- D2. Tailings Chemical Monitoring Plan
- D3. Waste Management Plan
- D4. Stormwater Pollution Control Plan
- D5. Quality Assurance Plan
- D6. Emergency Response Plan
- D7. Toxic and Hazardous Substances Transportation and Storage Plan
- D8. Cyanide Management Plan
- D9. Petroleum-Contaminated Soil Management Plan
- D10. Interim Management Plan
- D11. Inventory of Project Monitoring Plans
- D12. Monitoring Proposal for Groundwater and Facilities
- D13. Safety Training Plan
- D14. Wildlife Protection Plan
- D15. Wildlife Mitigation Plan
- D16. Inadvertent Discovery Plan
- D17. Noxious Weed Monitoring and Control Plan

Appendix E: Permit Applications – OAR 632-037-0077
- E1. Malheur County Land Use Compatibility Statement (LUCS)
- E2. Abbreviated Operating Permit Application – Grassy Mountain Basalt Borrow Quarry
- E3. Abbreviated Operating Permit Application – Grassy Mountain Closure Cover Borrow Areas Quarry
- E4. ODEQ Storm Water Permit Application
- E5. Grassy Mountain Tailings Dam, Approval of the TSF Revision 0 Plans and Specification
- E6. Permit Application for the Water Pollution Control Facility-Onsite facility (septic tank permit)
- E7. Conditional Approval Water System ID #4195624
- E8. OWRD Water Rights Amendment
- E9. ODEQ Water Pollution Control Facility Application and Division 43 Application

Appendix F: Ecological Risk Assessment: Numerical Prediction of Tailings, Supernatant Pond and Reclaim Pond Chemistry for the Grassy Mountain Project

Appendix G: Certificate of Liability Insurance

Appendix H: Alternatives Analysis Assessment

1. GENERAL INFORMATION – 43 CFR 3809.401(b)(1)

1.1 ORGANIZATIONAL INFORMATION

1.1.1 APPLICANT INFORMATION – 43 CFR 3809.401(b)(1), OAR 632-037-0050(1), ORS 517.971(2)

Operator Name:	Calico Resources USA Corp.
Mailing Address:	665 Anderson Street Winnemucca, Nevada 89445
Phone Number:	(775) 625-3600
Taxpayer Identification Number	45-2188867
Registered Agent:	CT Corporation System 780 Commercial St SE, Ste 100 Salem, Oregon 97301-3465

1.1.2 LEGAL STRUCTURE AND RESIDENCE – OAR 632-037-0050(3), ORS 517.971(3)

Calico Resources USA Corp.
665 Anderson Street
Winnemucca, Nevada 89445

Registry Number: 78127694

Principal Place of Business:
665 Anderson Street
Winnemucca, Nevada 89445

Mailing Address:
665 Anderson Street
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President:
Glen van Treek
665 Anderson Street
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Secretary:
Glen van Treek
665 Anderson Street
Winnemucca, Nevada 89445

Registered Agent:
CT Corporation System
780 Commercial St. SE, Ste 100
Salem, Oregon 77301-3465

1.1.3 PROJECT NAME, LOCATION, AND ACCESS – 43 CFR 3809.401(b)(2)(i), OAR 632-037-0050(5), OAR 632-037-0050(6), ORS 517.971(1)

The Project is located in Malheur County, Oregon, approximately 22 miles south-southwest of Vale, Oregon, and consists of two areas: the Mine and Process Plant Area and the Project Access Area (Permit Area) (Map 1 and Map 2). The Permit Area shown in all maps and text shows and describes the boundary of the proposed Project. The Mine and Process Plant Area extends north to the Water Supply Wells where the Project Access Area extends north along the Malheur County Road named Dripping Springs Road to the Malheur County Road named Cow Hollow Road and north to the Malheur County Road named Russell Road.

The Mine and Process Area is located on three patented lode mining claims and unpatented lode mining claims that cover an estimated 886 acres (Map 3). These patented and unpatented lode mining claims are part of a larger land position that includes 455 unpatented lode mining claims and nine Mill Site claims on lands administered by the U.S. Bureau of Land Management (BLM) Vale District Office (Map 3). All proposed mining would occur on the patented claims, with some mine facilities on unpatented claims. The project area subject to the permitting process includes 90 lode mining claims, 9 Mill Site claims and 3 patented claims. Eleven of the 90 lode mining claims are subject to a lease by Calico USA from Cryla, LLC (Map 3). The Mine and Process Area is in all or portions of Sections 5 through 8, T22S, R44E, Willamette Base & Meridian (WB&M).

Russell Road is a Malheur County road that is used as part of the main access route from the city of Vale. Russell Road connects from U.S. 20 to Cow Hollow Road. Cow Hollow Road is part of the main access route connecting Russell Road to Twin Spring Road. Cow Hollow Road is also a Malheur County road that crosses through undeveloped land, privately owned.

Land ownership is denoted in the tax lot and ownership information in Table 1 and in **Error! Reference source not found.**. The Project Access Area is located on public land administered by the BLM, and private land controlled by others. A portion of the Project Access Area is a Malheur County Road named Twin Springs Road. The Project Access Area extends north from the Mine and Process Plant Area to Russell Road, a paved Malheur County Road. The Project Access Area is in portions of Section 5, T22S, R44E, Sections 3, 10, 11, 14, 15, 21 through 23, 28, 29, and 32, T21S, R44E, Sections 1, 12 through 14, 23, 26, 27, and 34, T20S, R44E, Sections 6 and 7, T20S, R45E, and Sections 22, 23, 26, 35, and 36, T19S, R44E (WB&M).

Table 1. Tax Lots and Ownership of Permit Area

Tax Lot	Reference Number	Ownership	Permit Area
100	17021	USA (BLM)	Within
100	17090	USA (BLM)	Within
101	19743	CALICO RESOURCES USA CORP	Within
200	17091	USA (BLM)	Adjacent
300	16951	USA (BLM)	Within
100	9387	WEGNER, DANIEL P TRUST ETAL	Adjacent
200	10089	WEGNER, DANIEL P TRUST ETAL	Adjacent
1005	14354	WEGNER, DANIEL P TRUST ETAL	Adjacent

Tax Lot	Reference Number	Ownership	Permit Area
901	14339	WEGNER, DANIEL P TRUST ETAL	Adjacent
400	14334	BLAKE, JONATHAN M & LACY A	Adjacent
600	14336	KEZNO FUKIAGE BYPASS TRUST 47%	Adjacent
6200	14432	KEZNO FUKIAGE BYPASS TRUST 47%	Adjacent
500	15604	STANDAGE ENTERPRISES LLC	Adjacent

The width of the Project Access Area is 300 feet (ft; 150 ft on either side of the access road centerline) to accommodate possible minor widening or rerouting, and a powerline adjacent to the access road, as presented in the *Road Design Report* in Appendix C1. There are several areas shown that are significantly wider than 300 ft on the Permit Area Map (Map 2), which are areas where the final alignment has not yet been determined. The final engineering of the road will be consistent throughout, and within the Permit Area. The Project Access Area also includes a buffer on either side of the proposed road width for the collection of environmental baseline data.

The road corridor will be approximately 30 ft wide, which includes a 20-ft-wide road travel width (10 ft on either side of the road centerline), 2-ft-wide shoulders on each side of the road, minimum 1-ft-wide ditches on each side of the road, and appropriate cut and fill. All existing and planned roads are shown in Maps 1 and 2.

The study area is defined as the geographical area in which the potential direct and indirect socioeconomic effects of the Project are realized. The purpose of documenting the socioeconomic setting of the study area is to provide an understanding of the social and economic forces that have shaped the area and to provide a frame of reference necessary to estimate the social and economic effects of the Project as well as understanding potential effects on low-income and minority populations.

Malheur County is Oregon's second largest county in the area but is largely undeveloped. The County is in the southeastern corner of the State of Oregon and is crossed by two major rivers, the Snake River and the Malheur River. Ninety-four percent of the County is undeveloped rangeland, most of which is federally owned and administered by the BLM. Developed areas along the Snake and Malheur Rivers support agricultural production areas and agriculture-focused communities.

1.1.4 NAME(S) AND ADDRESS(ES) OF ALL LANDOWNERS OF THE SURFACE AND MINERAL ESTATE – 43 CFR 3809.401(b)(1), OAR 632-037-0050(2)

Surface Rights

U.S. Bureau of Land Management Vale District Office
100 Oregon Street
Vale, Oregon 97918
(541) 473-3144

Calico Resources USA Corp.
665 Anderson Street
Winnemucca, Nevada 89445

Mineral Rights

Calico Resources USA Corp.
665 Anderson Street
Winnemucca, Nevada 89445
(775) 625-3600

(775) 625-3600

1.1.5 AUTHORIZED FIELD REPRESENTATIVE – 43 CFR 3809.401(b)(1)

Calico personnel, or their agents, will be on site during all Project-related activities, and will be responsible for implementing and ensuring that all activities are completed in accordance with this Permit.

Point of Contact for this Permit

Glen van Treek
665 Anderson Street
Winnemucca, Nevada 89445
Phone (775) 625-3600

Corporate Point of Contact

Carlo Buffone
665 Anderson Street
Winnemucca, Nevada 89445
Phone (775) 625-3600

1.2 SURFACE OWNERSHIP AND DISTURBANCE – ORS 517.971(4)

1.2.1 LAND STATUS

Calico holdings at the Grassy Mountain property consist of 455 unpatented lode claims, 9 unpatented mill site claims, 3 patented claims, and a land lease for 28 unpatented lode mining claims covering all or portions of Sections 11 through 15 and 24 of T22S, R43E; portions of Sections 3 through 10 and 16 through 20, T22S, R44E; Sections 31 through 34, T21S, R44E; and Section 36, T21S, R43E, as shown in Map 3. Patented claims were individually surveyed at the time of location. Unpatented claim and Fee land boundaries were established initially by Global Positioning System (GPS) handheld units and in 2011 by on-site survey work. Mining claim information is shown in Appendix A.

The project area subject to the permitting process includes 90 lode mining claims, 9 Mill Site claims and 3 patented claims. Within the 90 lode mining claims, 11 claims are subject to a lease by Calico USA from Cryla, LLC.

Paramount owns the surface rights in the Grassy Mountain deposit area. The deposit is located within three patented mining claims. The surrounding surface rights associated with the locations of the planned Project surface facilities belongs to the Federal government and are managed by the Vale District office of the Bureau of Land Management. The surface rights controlled by Calico are subject to applicable Federal and State environmental regulations and the agreements outlined below.

The facility is not sited in the 100-year floodplains or wetlands. Map 6 depicts the floodplains hazard area from the Federal Emergency Management Agency's (FEMA) 2017 and 1984 flood mitigation assessment, last updated April 27, 2021 (FEMA, 2017).

1.2.2 AGREEMENTS AND ENCUMBRANCES

Paramount's 100 percent ownership of the Project is subject to the underlying agreements and royalties summarized in the following subsections.

Seabridge Gold Corporation (Seabridge): Seabridge retains a 10 percent Net Profits Interest (NPI) in the Project pursuant to the Deed of Royalties between Calico and Seabridge dated February 5, 2013 and modified in 2015. Pursuant to the Deed of Royalties, within 30 days following the day that Calico makes a production decision and construction financing is secured, Seabridge may elect to cause Calico to purchase the 10 percent NPI for $10 million Canadian. Otherwise, Seabridge will retain the 10 percent NPI.

Sherry & Yates Inc. (Sherry & Yates): On February 14, 2018, Calico exercised their option to purchase, whereby Sherry & Yates agreed to sell to Calico all right, title, and interest in the 3 patented and 37 unpatented mining claims. The 2004 lease and agreement with Sherry & Yates was terminated. The royalty attributed to Sherry & Yates has decreased from 6 percent to 1.5 percent.

Exploration and Option to Purchase Agreement Cryla Project (Cryla Agreement): In 2018, Calico signed a lease agreement with Cryla that applies to 28 unpatented lode mining claims located to the west of the Grassy Mountain deposit (Figure 4-3 in Ausenco, 2020). Calico is required to make an annual lease payment of $60,000. After June 2020, Calico may elect to acquire the property for $560,000 plus $3/oz of gold reserves, as defined by a pre-feasibility or higher confidence-level study. Additionally, Cryla retains a royalty for mineral produced from their claims.

The Project covers a portion of the Calico land holdings. The Permit Area, which is the basis of this permit application is shown in Map 2 (Section 1.1.3). The legal description of the Mine and Process Area includes all or portions of the following:

T22S, R44E
SW ¼ OF SECTION 5
S ½ OF SE ¼ OF SECTION 5 NW ¼ OF SECTION 5
SE ¼ OF SE ¼ OF SECTION 6 SE ¼ OF SECTION 7
S ½ OF NE ¼ OF SECTION 7 NE ¼ OF NE ¼ OF SECTION 7
NW ¼ OF SECTION 8
NE ¼ OF SECTION 8
SW ¼ OF SECTION 8
SE ¼ OF SECTION 8

T21S, R44E
W ½ OF SE ¼ OF SECTION 32
E ½ OF SW ¼ OF SECTION 32
W ½ OF NE ¼ OF SECTION 32
E ½ OF NW ¼ OF SECTION 32
SW ¼ OF SE ¼ OF SECTION 29

1.3 PROJECT OVERVIEW – OAR 632-037-0050(4), 632-037-0050(7)

Calico Resources USA Corp. (Calico), a wholly-owned subsidiary of Paramount Gold Nevada Corp. (Paramount), owns and controls 100 percent of the mineral tenure of the unpatented mining claims, patented mining claims, and mining leases that comprise the Project. The Project consists of two claims groups that are situated near the western edge of the Snake River Plain in eastern Oregon, 22 miles south-southwest of Vale, Oregon, and about 70 miles west of Boise, Idaho. The Project site location is presented in Map 1.

Calico proposes to mine approximately 2.07 million short tons (US) (Mst) of mill-grade ore and 0.27 Mst of waste rock for a Mine life of approximately 7.8 years; however, the Tailings Storage Facility (TSF) has been sized to contain 3.64 Mst should additional reserves be identified. The material (both ore and waste) will be extracted from an underground mine using conventional underground mining techniques, including drilling, blasting, mucking, loading, and hauling at a rate of approximately 1,200 short tons per day (stpd), four days per week. Calico will use hydraulic loaders to load the ore and waste into haul trucks. The haul trucks will transport the waste rock to the Temporary Waste Rock Storage Facility (TWRSF) near the TSF and transport the ore to the Run of Mine (ROM) ore stockpile adjacent to the crushing and milling facilities. The ore will be crushed and leached in a carbon-in-leach (CIL) processing plant at a rate of 750 stpd, seven days per week. The leached tailings will go through a detoxification process, then be pumped in a slurry to the TSF, with supernatant solution recovered and pumped back to the Mill.

In general, the proposed mining and metal processing operations will consist of an underground mine and ore processing facilities, including a conventional mill and TSF, a TWRSF, and other support facilities. The Project will include the following major components:

- An underground mine, with Mine portal, decline, and ventilation shaft;
- TSF with Tailings Embankment, Tailings Impoundment, and Reclaim Pond;
- TWRSF;
- Process Plant Area, which includes the Process Plant building, control room, crushing facilities, conveyors, ore bins, control rooms, CIL processing plant, reagent storage building (including chemical and reagent storage), gold room, and Collection Pond;
- Infrastructure and ancillary facilities that include Project site main gate and guard house, administration office and change house, assay laboratory and sample preparation area, truck workshop and warehouse, wash pads, Process Plant workshop and warehouse, meteorological station, explosive magazines, parking areas, ore stockpiles, solid and liquid hazardous waste storage, and fuel storage and dispensing area;
- Roads, including upgrades to the Twin Springs and Cow Hollow roads, and construction of the Mine access, internal access, and Mine haul roads;
- Yards and laydown areas;
- Growth Media Stockpiles;
- Water supply, including Production Wellfield, water pipeline, raw water storage tank, and Potable Water Treatment Plant;
- Power supply that includes a power substation, upgraded 14.4 kilovolt (kV) overland power transmission system, new 14.4 kV overland power transmission system, onsite power lines, and generators;
- Permanent and temporary stormwater diversion channels;
- Other areas, including the exploration areas, septic system, and perimeter fence;
- Quarry; and
- Reclamation Borrow Areas.

1.4 RECLAMATION ASSURANCE – OAR 632-037-0070, OAR 632-030-0027

The mineral and surface rights on the Mine and Process Area portion of the Permit Area are controlled by Calico Resources USA Corp.

The surface rights on the public land portion of the Mine and Process Area portion of the Permit Area are controlled by the BLM, Vale District Office.

Mining Claims are provided in Appendix A.

The *Reclamation Plan*, required under the Plan of Operations and approval process with BLM, and the State of Oregon for new chemical mining projects, for expansions of existing operations, and for quarries, is provided in Appendix D1. The *Reclamation Plan* includes the objectives, implementation for each facility, post-closure care and maintenance, cost estimate and schedule.

1.5 FREQUENTLY USED ACRONYMS, ABBREVIATIONS, DEFINITIONS, AND UNITS OF MEASURE

<	less than
>	greater than
±	plus or minus
≤	less than or equal to
≥	greater than or equal to
°C	degrees Celsius
°F	degrees Fahrenheit
µmhos/cm	micromhos per centimeter
AADT	average annual daily traffic
ACEC	Area of Critical Environmental Concern
AGP	acid generating potential
ANFO	ammonium nitrate and fuel oil
ATV	all-terrain vehicle
BATFE	United States Bureau of Alcohol, Tobacco, Firearms, and Explosives
bgs	below ground surface
Bison	Bison Engineering, Inc.
BLM	United States Bureau of Land Management
BV	bed volume
$CaCO_3$	calcium carbonate
Ca-HCO_3	calcium bicarbonate
Calico	Calico Resources USA Corp.
CCC	Criterion Continuous Concentration
CES	Cascade Earth Sciences
CFR	Code of Federal Regulations
cfs	cubic feet per second
CIL	carbon-in-leach
cm/sec	centimeters per second
CMC	Criterion Maximum Concentration
CO	carbon monoxide
COOP	Cooperative Observer Network

CPE	corrugated polyethylene
CPT	Cone Penetration Test
CRF	cemented rock fill
Cryla Agreement	Exploration and Option to Purchase Agreement Cryla Project
d x EGL	diameter by effective grinding length
dB	decibel
dBA	A-weighted decibel
De	equivalent dimension
DOGAMI	Oregon Department of Geology and Minerals Industries
dS/m	deciSiemens per meter
DSHA	deterministic seismic hazard analysis
DSL	Department of State Lands
EFU	Exclusive Farm Use
EM Strategies	EM Strategies, Inc.
EOU	Eastern Oregon University
EPA	United States Environmental Protection Agency
ERA	Ecological Risk Assessment
ERP	Emergency Response Plan
ERU	Exclusive Range Use
ESD	Education Service District
ESR	excavation support ratio
FEMA	Federal Emergency Management Agency
FOS	factors of safety
ft	feet
ft/d	feet per day
ft/hr	feet per hour
ft^2	square feet
ft^3	cubic feet
g	gravity
GCL	geosynthetic clay liner
gpm	gallons per minute
GPS	Global Positioning System

H:V	horizontal to vertical
HCT	humidity cell test
HDPE	high-density polyethylene liner
HDR	HDR Engineering, Inc.
HHC	Human health criteria
HLP	heap leach pad
HSEC	Health, Safety, and Environmental Compliance
ILR	intensive-leach reactor
IMS	IMS, Inc.
k	seismic coefficient
K-Factor	Soil Erodibility Factor
kg	kilogram
kg/t	kilogram per ton
km	kilometer
KOP	key observation point
kV	kilovolt
L_1	noise levels exceeded for 1 percent of each hour
L_{10}	noise levels exceeded for 10 percent of each hour
L_{50}	noise levels exceeded for 50 percent of each hour
Lb	length of the bolts
lbs/ton	pounds per ton
LCRS	leak collection and recovery system
Ldn	day-night noise levels
Leq	hourly average levels
LHD	Load-haul-dump vehicle
L_{max}	hourly maximum levels
L_{min}	hourly minimum levels
LUCS	Land Use Compatibility Statement
MCC	Malheur County Code
MCE	Maximum Credible Earthquake
MCL	maximum contaminant level
MDA	Mine Development Associates

MDL	minimum detection limit
mg/L	milligrams per liter
MRA	Malheur Resource Area
MSHA	Mine Safety and Health Administration
Mst	million short tons
MW	megawatt
N/A	not applicable
$Na/K-HCO_3$	sodium/potassium bicarbonate
$Na/K-SO_4$	sodium/potassium sulfate
ng/L	nanograms per liter
NNP	Net Neutralization Potential
NO_2	nitrogen dioxide
NP	Neutralization Potential
NPI	Net Profits Interest
NPR	Neutralization Potential Ratio
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NSHM	National Seismic Hazard Model
NWC	Northwest Wildlife Consultants, Inc.
NWI	National Wetland Inventory
O_3	ozone
OAR	Oregon Administrative Rule
OBE	operational basis earthquake
ODEQ	Oregon Department of Environmental Quality
ODFW	Oregon Department of Fish and Wildlife
OED	Oregon Employment Department
ODT	Oregon Department of Transportation
OGWQG	Oregon Groundwater Quality Guidelines
OHA	Oregon Health Authority
ONA	Outstanding Natural Area
OPDR	Oregon Partnership for Disaster Resilience
OSP	Oregon State Police

OWRD	Oregon Water Resources Department
Paramount	Paramount Gold Nevada Corp.
Permit Area	Mine and Process Area and the Access Area
PFD	Process Flow Diagram
PGA	peak ground acceleration
$PM_{2.5}$	particulate matter less than 2.5 microns in aerodynamic diameter
PM_{10}	particulate matter less than 10 microns in aerodynamic diameter
PRISM	PRISM Climate Group
Project	Grassy Mountain Mine Project
PSHA	probabilistic seismic hazard analysis
PUBH	palustrine, unconsolidated bottom, permanently flooded)
PUSCh	palustrine, unconsolidated shore, seasonally flooded, diked/impounded
PUSCx	palustrine, unconsolidated shore, excavated
PVC	polyvinyl chloride
Q	rock mass quality
QA/QC	quality assurance and control
Qal	unconsolidated alluvial and colluvial deposits
RAWS	Remote Automated Weather Stations
RCE	Reclamation Cost Estimate
RCRA	Resource Conservation and Recovery Act
RNA	Research Natural Area
ROM	Run of Mine
ROS	Recreation Opportunity Spectrum
S.U.	significant unit
Seabridge	Seabridge Gold Corporation
SEM	Scanning Electron Microscopy
SEORMP	Southeastern Oregon Resource Management Plan and Record of Decision
SHA	seismic hazard analysis
Sherry & Yates	Sherry & Yates Inc.
SHPO	State Historic Preservation Office
SLM	sound level meter
SMBS	sodium meta-bisulfite

SMCL	secondary maximum contaminant level
SO_2	sulfur dioxide
SRCE	Nevada Standardized Reclamation Cost Estimator
SRK	SRK Consulting
SSI	Supplemental Security Income
st	short ton, equivalent to 907.2 kg
st/d	short tons per day
st/hr	short tons per hour
stpd	short tons per day
Tgb	Grassy Mountain Basalt
Tgs	Grassy Mountain Formation – undifferentiated arkose, siltstone, conglomerate
Tgsn	Grassy Mountain Formation - Hot spring sinter deposits
THSTP	Toxic and Hazardous Substances Transportation and Storage Plan
TIC	total inorganic carbon
ton/hr	tons per hour
tonne	metric ton, equivalent to 1000 kg
TRT	Technical Review Team
TSF	Tailings Storage Facility
TWRSF	Temporary Waste Rock Storage Facility
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
VRM	Visual Resources Management
VWP	vibrating wire piezometer
WB&M	Willamette Base & Meridian
WEG	Wind Erodibility Group
WPCF-N	New Water Pollution Control Facilities Individual Permit
WPCF-OS	New Water Pollution Control Facilities Individual Onsite Permit
WPP	Wildlife Protection Plan
WRSF	Waste Rock Storage Facility
XRD	X-Ray Diffraction Analysis
yd^3	cubic yard

2. EXISTING ENVIRONMENT – OAR 632-037-0055(1), ORS 517.971(5)

The following are summaries of the baseline studies, which describe the existing environment. The baseline studies are incorporated in this application as Appendices B1 through B22. The full baseline studies in Appendices B1 through B22 should be referenced for the methodologies used, study areas, and data collected for each of the respective resources. Appendix B23 also includes the Environmental Baseline Study Work Plans (EM Strategies, 2017).

2.1 AIR QUALITY RESOURCES – OAR 632-037-0055(1)(c)

The *Grassy Mountain Mine Project Air Quality Resources Baseline Report* (Appendix B1) was submitted to the Oregon Department of Geology and Minerals Industries (DOGAMI) on January 18, 2018. The report was accepted by the Technical Review Team (TRT) on February 28, 2018, as conforming to the Environmental Baseline Study Work Plans (EM Strategies, 2017), which were accepted by the TRT on December 7, 2017. An air quality monitoring station was established by HDR Engineering, Inc. (HDR) in July 2014 west of the Mine and Process Area portion of the Permit Area to monitor particulates (i.e., particulate matter less than 2.5 microns in aerodynamic diameter [$PM_{2.5}$] and particulate matter less than 10 microns in aerodynamic diameter [PM_{10}]). A meteorological station was installed in August 2014 to monitor wind speed, wind direction, standard deviation of wind direction, temperature at 9 and 2 meters, delta temperature, relative humidity, barometric pressure, solar radiation, and precipitation. Data collection occurred between October 2014 and September 2015.

No monitoring has been performed within the Local Air Quality Study Area for ambient concentrations of carbon monoxide (CO), nitrogen dioxide (NO_2), ozone (O_3), or sulfur dioxide (SO_2), nor do regulatory agencies specify background concentrations for these pollutants. In the absence of major population centers, commercial activity, or highways near the proposed Mine, the background concentrations of CO, NO_2, and SO_2 at the Permit Area boundary are expected to be very low. Taking into consideration the surrounding settings (terrain, land use, and proximity of sources), the ambient monitoring data collected at the St. Luke's Meridian station (16-001-0010) in Meridian, Idaho, were used to provide conservative background concentrations for the Project. This station is the closest monitoring station by proximity to the Local Air Quality Study Area. Due to its semi-urban location and proximity to the City of Boise, the data collected at this station were used as extremely conservative values as compared to the isolated and rural setting of the Local Air Quality Study Area. The background concentrations are shown in Table 2 and the meteorological station data are shown in Table 3.

Table 2. Ambient Pollutant Concentration Summary

Standard	Concentration	Source	Method
Carbon Monoxide 8-Hour	0.244 ppm	16-001-0010 Meridian, ID	2014-2016 (annual mean)
Carbon Monoxide 1-Hour	0.244 ppm	16-001-0010 Meridian, ID	2014-2016 (annual mean)
Lead 3-Month Average	1.99E-04	16-001-0010 Meridian, ID	2014-2016 (annual mean divided by 4)
Nitrogen Dioxide 1-Hour	43.63 ppb	16-001-0010 Meridian, ID	2014-2016 (average 98th percentile)
Nitrogen Dioxide Annual	10.72 ppb	16-001-0010 Meridian, ID	2014-2016 (annual mean)
Ozone 8-Hour	.063 ppm	16-001-0010 Meridian, ID	2014-2016 (Annual Fourth High Average)
$PM_{2.5}$ 24-Hours	21 ug/m^3	Site Collected Data	Oct.2014-Sept.2015 Second High (less dates affected by wildfire smoke)
$PM_{2.5}$ Primary Annual	4.6 ug/m^3	Site Collected Data	Oct.2014-Sept.2015 Adjusted Annual Average (less dates affected by wildfire smoke)
PM_{10} 24-Hours	23 ug/m^3	Site Collected Data	Oct.2014-Sept.2015 Second High (less dates affected by wildfire smoke)
Sulfur Dioxide 1-Hour	4.17 ppb	16-001-0010 Meridian, ID	2014-2016 (average 99th percentile)
Sulfur Dioxide 3-Hours	.623 ppb	16-001-0010 Meridian, ID	2014-2016 (annual mean)

Source: U.S. Environmental Protection Agency (EPA), 2017; Bison Engineering, Inc. (Bison), 2015
ppb = parts per billion; ppm = parts per million; µg/m^3 = micrograms per cubic meter

Table 3. Quarterly and Annual Means for Meteorological Parameters

Quarter	Wind Speed (mph)	Wind Direction (Degrees)	Temp 9 meters (°F)	Temp 2 meters (° F)	Relative Humidity	BP (In Hg)	Solar Radiation (Wm2)	Total Precipitation (In)
2014 3rd	7.0	340	68.1	68.0	38.2	26.48	224	0.85
2014 4th	7.3	284	41.7	41.2	68.9	26.56	91	3.22
2015 1st	6.6	300	39.4	39.0	74.2	26.65	116	2.18
2015 2nd	7.7	344	60.9	60.9	43.6	26.45	274	2.22
2015 3rd	7.2	295	71.9	71.8	33.9	26.48	254	1.64
Oct. 1, 2014 – Sept. 30, 2015	7.2	311	53.6	53.3	54.8	26.53	184	9.26

Source: Bison, 2015
mph = miles per hour; °F = degrees Fahrenheit; BP = barometric pressure; In = inches; Hg = mercury; Wm^2 = watts per square meter

2.2 AQUATIC RESOURCES – OAR 632-037-0055(1)(d)

The *Grassy Mountain Mine Project Aquatic Resources Baseline Report* (Appendix B2) was originally submitted to DOGAMI on January 11, 2018, then again on August 24, 2018. The report was accepted by the TRT on December 14, 2018, as conforming to the Environmental Baseline Study Work Plans (EM Strategies, 2017), which were accepted by the TRT on December 7, 2017. A review of existing information from Oregon Department of Fish and Wildlife (ODFW) indicated that fish are unlikely to occur within the Aquatic Resources Study Area partially due to a fish barrier downstream at Rye Field Reservoir, and the ephemeral nature of the drainages in the Aquatic Resources Study Area. The information review yielded a list of five special status amphibian species that occur in southeastern Oregon: blotched tiger salamander (*Ambystoma tigrinum melanosticum*), a BLM special status species; Columbia spotted frog (*Rana luteiventris*), a U.S. Fish and Wildlife Service (USFWS) Species of Concern and Sensitive-Critical ODFW species; northern leopard frog (*Rana pipiens*), a BLM sensitive species; western toad (*Anaxyrus boreas*), a BLM special status and ODFW sensitive species; and woodhouse toad (*Bufo woodhousii*), a BLM special status species.

Field surveys were conducted in May and October 2014 by HDR in the Aquatic Resources Study Area. Habitat suitable for fish was limited and the 18 sites visited showed no connection to perennial streams. Electrofishing in May 2014 was only feasible in limited reaches of Negro Rock Canyon; no fish were captured. Fish surveys were not conducted in October 2014 as there was no flowing water observed.

Only 10 of the 18 sites included standing or flowing water during the May 2014 field surveys; therefore, only the 10 sites were surveyed for amphibians. No special status amphibian species were observed; however, Pacific treefrog (*Pseudacris regilla*), a common species in Oregon, were observed at several sites in May 2014. The presence of treefrogs may be indicative of habitat suitability for other species with similar breeding requirements, which may have limited populations in the Aquatic Resources Study Area.

2.3 AREAS OF CRITICAL ENVIRONMENTAL CONCERN/RESEARCH NATURAL AREAS – OAR 632-037-0055(1)(q), ORS 517.971(7)(o)

The *Grassy Mountain Mine Project Areas of Critical Environmental Concern/Research Natural Areas Baseline Report* (Appendix B3) was submitted to DOGAMI on May 30, 2018. The report was accepted by the TRT on July 19, 2018, as conforming to the Environmental Baseline Study Work Plans (EM Strategies, 2017), which were accepted by the TRT on December 7, 2017. The Permit Area is in the Malheur Resource Area (MRA). There are 17 combined Areas of Critical Environmental Concern (ACECs)/Research Natural Areas (RNAs) and 11 ACECs in the MRA. There are no ACECs/RNAs or ACECs in the Permit Area. The closest ACEC or ACEC/RNA to the Permit Area is the Owyhee River Below The Dam ACEC.

2.4 CULTURAL RESOURCES – OAR 632-037-0055(1)(m)

A cultural resource inventory was conducted for the Permit Area in 2017, and resulted in a baseline report that was finalized in December 2019. The State Historical Preservation Office (SHPO) reviewed this report and submitted its findings to the BLM in a letter dated March 12, 2020. DOGAMI will submit the TRT for the project with a recommendation to formally accept the report as complete, per the governing rules (OAR 632-037) for chemical process mining. Based on the baseline report findings, consultation with SHPO, and consultation with the Burns Paiute Tribe, the BLM is developing a work plan with the Tribe to assess National Register of Historic Places (NRHP) eligibility, assess effects, and develop mitigation measures for cultural resources (Theisen, 2021 personal communication).

The inventory included an examination of previous research and identified resources and a cultural resource field survey. This effort concentrated on the Project's Area of Potential Effect, which consists of a total of 1,762 acres; 932 acres were previously inventoried during previous iterations of the Project. In November 2017, a cultural resource field inventory survey was conducted in the remaining 830 acres.

The results of this inventory were discussed in a cultural resources inventory report submitted to the BLM on November 21, 2018. The BLM provided comments on the draft report on February 8, 2019. A revised draft was submitted on April 26, 2019; the BLM accepted the revised draft and submitted the draft to the SHPO on June 28, 2019. On August 9, 2019, the SHPO sent a letter to the BLM stating they finished their review of the built environment portion of the report, and subsequently provided preliminary comments on the archaeological portion of the report in a letter sent to the BLM on August 14, 2019. A final report was completed December 2019, and submitted to the SHPO January 2020 (Felling, 2019). The BLM accepted this report as final (Theisen, 2021 personal communication). In a letter dated March 12, 2020, the SHPO responded to the BLM. In all but a few cases, the SHPO concurred with the report's recommendations regarding NRHP eligibility of the resources discussed in the report (Griffin, 2020).

A total of 8 new archaeological resources, 14 built resources, and 20 isolated finds were identified during the inventory of the Survey Area. Additionally, five previously recorded archaeological resources within the survey area were visited and inventoried. Of the eight newly identified archaeological resources, five are prehistoric simple flaked stone sites, two are prehistoric complex flaked stone sites, and one is a historic berm and ditch site associated with the historic Lowe Reservoir. SHPO concurred with the eligibility recommendations for 45 of the 47 cultural resources discussed in the report.

Felling (2019) recommended the historic berm and ditch site (35ML2229) as not eligible for listing in the NRHP under any evaluation criteria; however, the SHPO did not concur with this recommendation, stating that too little information was presented in the report to support that finding. SHPO noted that the site, as a segment of a larger linear resource, needed to be evaluated with respect to the entire resource. One of the newly recorded prehistoric sites (35ML2222) was recommended as eligible for listing in the NRHP under Criterion D. Similar with the case of 35ML2229, SHPO stated there was too little data to support the eligibility recommendation. The SHPO considers sites such as 35ML2222 as "unevaluated and treated as eligible" and stated that if the project cannot avoid this site testing of the portion of site that would be impacted would be necessary.

The SHPO did not concur with the interpretation of JS-ISO-09, one of the 20 isolates presented in the report. At this locale, five prehistoric flakes from four different source materials were collected and interpreted as an isolated find of simple core reduction activities in an area of limited soil depth. SHPO found the report provided insufficient information supporting the description that the area had little chance of soil depth, and that subsurface testing was needed to determine whether this is an isolated find or a buried archaeological site.

SHPO concurred with the following recommendations in the report. The remaining six newly recorded prehistoric sites were recommended to be considered unevaluated for listing in the NRHP. Of the 14 newly recorded built resources, 12 are historic road segments, 1 is a segment of a historic canal, and 1 is the historic Grassy Mountain Reservoir. All 14 built resources were recommended as not eligible for listing in the NRHP under any evaluation criteria. Of the six previously recorded archaeological sites, one is a prehistoric simple flaked stone sites, two are prehistoric basic habitation sites, and one is a multicomponent site including prehistoric complex flaked stone and historic prospecting components. One of the previously recorded prehistoric sites was recommended as eligible for listing in the NRHP under Criterion D, while the historic component of the previously recorded multicomponent site was recommended as not eligible for the NRHP under any evaluation criteria. The prehistoric component of the multicomponent site and the remaining four previously recorded prehistoric sites were recommended to be considered unevaluated for the listing in the NRHP until further subsurface investigations are completed. The nineteen remaining isolated artifacts identified were recommended as not eligible for listing in the NRHP under any evaluation criteria. These isolates consist of six prehistoric, 12 historic, and one multicomponent find.

Through Section 106 of the NRHP consultation, BLM is working with the Burns Paiute Tribe to develop a Tribal Study. The study would help address the SHPO's eligibility concerns for precontact cultural resources and assist in assessing effects and associated mitigation measures for these resources. While in the March 2020 letter, SHPO advocated for further testing of precontact sites, through consultation, the Tribe has advocated for no testing and no artifact collection. These acts are considered adverse effects.

2.5 ENVIRONMENTAL JUSTICE – OAR 632-037-0055(1)(o)

The *Grassy Mountain Mine Project Environmental Justice Baseline Report* (Appendix B5) was submitted to DOGAMI on February 23, 2018. The report was accepted by the TRT on July 20, 2018, as conforming to the *Environmental Baseline Study Work Plans* (EM Strategies, 2017), which were accepted by the TRT on December 7, 2017. The Environmental Justice Study Area includes Malheur County and incorporates census tracts 9702, 9703, 9704, 9705, 9706, 9707, 9709, and 9400. Census tracts 9702, 9703, and 9704 include portions of the City of Ontario. Census Tract 9705 includes the City of Nyssa and community of Cairo. Census Tract 9706 includes the City of Vale and smaller communities of Willowcreek and Jamieson. The City of Adrian, and the communities of Kingman and Owyhee are included in Census Tract 9707. Census Tract 9709 encompasses the majority of the remainder of Malheur County, except for a small portion of the Fort McDermitt Indian Reservation (Census Tract 9400) at the southern border of the County that is shared with Nevada.

Table 4 summarizes information about race and ethnicity for the Environmental Justice Study Area from the U.S. Census Bureau. The table includes data for Malheur County and Oregon as a whole for comparison. Malheur County is a very large geographic area and its statistics do not necessarily provide good measures of income and poverty for the Environmental Justice Study Area.

Table 4. Race and Ethnicity for Oregon, Malheur County, and the Environmental Justice Study Area

Race or Ethnicity	Percent of Population								
	Oregon	Malheur County	9702	9703	9704	9705	9706	9707	9709
Race									
White Alone	85.1	85.7	80.9	89.8	78.9	89.1	91.5	90.5	82.6
Black or African American Alone	1.8	1.2	0.4	0.8	0.6	1.4	0.2	0	3.7
American Indian and Alaska Native Alone	1.2	0.8	0.7	0.6	0.2	0.2	0.7	1.5	1.8
Asian Alone	4.0	1.6	2.5	1.7	1.5	1.2	0.9	2.3	1.8
Native Hawaiian and Other Pacific Islander Alone	0.4	0	0.2	0	0	0	0	0	0
Some other race alone	3.4	6.6	9.2	3.7	14.2	5.6	5.6	3.1	4.0
Two or more races	4.1	4.0	6.0	3.4	4.7	2.6	1.3	2.6	6.0
Ethnicity									
Hispanic or Latino (of any race)	12.3	32.7	37.1	30.8	49.9	48.3	20.9	14.4	18.0
Not Hispanic or Latino	87.7	67.3	62.9	69.2	50.1	51.7	79.1	85.6	82.0

Source: U.S. Census Bureau, 2016a

The American Community Survey (U.S. Census Bureau, 2016a) data show that people living in all geographies are predominantly white alone. The U.S. Census Bureau collects information about Hispanic and Latino ethnicity separately from information about race. People of Hispanic or Latino origin might not feel like they belong in any of the race categories and thus identify with *some other race alone* or *two or more races*. Together these other categories comprise most of the racial minorities in the Study Area. All the communities in the Environmental Justice Study Area, except for Jordan Valley, have higher proportions of Hispanic or Latino residents when compared to the state as a whole. The cities of Vale and Adrian have lower proportions of Hispanic or Latino residents when compared to the entire County.

Census data and information available from the State of Oregon indicate that there are minority populations living in Census Tract 9709, the tract that contains the Project, as well as in adjacent census tracts. Census Tract 9709 contains the largest percentage of Black or African American persons; however, Census Tract 9709 is also the largest tract by size in the Environmental Justice Study Area, so the minority population could be spread throughout the Census Tract. The largest percentage of Asian persons live near the City of Ontario.

Table 5 summarizes the information about household income for the Environmental Justice Study Area from the U.S. Census Bureau. The table includes data for Malheur County and Oregon as a whole for comparison.

Table 5. Income Summary for Oregon, Malheur County, and the Environmental Justice Study Area

Income Type	Oregon	Malheur County	9702	9703	9704	9705	9706	9707	9709
Mean Income (dollars)	69,040	48,070	51,620	45,779	35,172	51,738	47,130	62,615	54,382
Median Income (dollars)	51,243	35,418	42,132	28,831	26,399	44,597	37,033	42,434	42,826
People with Earnings (percent of population)	75.6	71.6	67.4	61.7	70.7	78.3	72.9	73.6	81.7

Source: U.S. Census Bureau, 2016b

Using the mean and median incomes for the Environmental Justice Study Area shown in Table 5, the U.S. Census Bureau income data suggest that the mean and median incomes for the Environmental Justice Study Area are above the U.S. Census Bureau poverty threshold for a five-person household and primarily above the U.S. Department of Health and Human Services poverty guidelines; however, the mean income in Census Tract 9704 is above the threshold for a six-person household, the median income in Census Tract 9703 is above the threshold for a six-person household, and the median income in Census Tract 9706 is above the threshold for a seven-person household.

Table 6 summarizes poverty information for the Environmental Justice Study Area from the U.S. Census Bureau. The table includes data for Malheur County and Oregon as a whole for comparison. The average family size is from the U.S. 2010 Census, as there are no current data available.

Table 6. Poverty Summary for Oregon, Malheur County, and the Environmental Justice Study Area

Income Type	Oregon	Malheur County	9702	9703	9704	9705	9706	9707	9709
Families									
Average Family Size (number of people)	3.0	3.24	3.13	3.03	3.60	3.52	3.17	3.09	2.93
Families Living in Poverty in the Last 12 Months (percent of population)	11.2	18.1	12.4	29.2	27.0	17.7	13.5	8.4	13.0
Individuals									
Average Household Size (number of people)	2.51	2.62	2.63	2.46	2.43	2.99	2.70	2.57	2.51
Individuals living in poverty in the last 12 months (percent of population)	16.5	25.5	25.2	31.9	36.2	24.4	21.4	11.8	15.4
People receiving Supplemental Security Income (SSI) (percent of population)	4.6	8.4	7.4	11.6	12.1	4.1	8.4	3.9	8.0
People Receiving Food Stamps in Last 12 Months (percent of population)	19.2	27.6	15.0	42.6	43.3	33.5	18.1	17.0	8.7

Source: U.S. Census Bureau 2010, 2016b, 2016c, 2016d

Table 7 summarizes employment information for the Environmental Justice Study Area for persons living in poverty from the U.S. Census Bureau. The table includes data for Malheur County and Oregon as a whole for comparison.

Table 7. Employment Summary for People Living in Poverty in Oregon, Malheur County, and the Environmental Justice Study Area

Employment Type	Oregon	Malheur County	9702	9703	9704	9705	9706	9707	9709
Individuals Living in Poverty in the Last 12 Months (percent of population for whom poverty is determined)	16.5	25.5	25.2	31.9	36.2	24.4	21.4	11.8	15.4
Individuals who worked full time in last 12 months (percent of population in poverty)	3.1	7.6	10.3	6.3	7.8	8.5	2.9	4.3	11.5
Individuals who did not work in last 12 months (percent of population in poverty)	22.5	30.6	31.8	36.2	41.8	27.1	26.5	16.5	21.0

Source: U.S. Census Bureau, 2016c

In general, the Census data suggest that the Environmental Justice Study Area could support low-income populations. Mean and median incomes in the Environmental Justice Study Area are the lowest in Census Tract 9704, which mainly encompasses the urban center of the City of Ontario. The proportions of families and individuals living in poverty are higher in the Census Tracts surrounding the City of Ontario than the rest of the Environmental Justice Study Area. The rate of individuals that did not work in the last 12 months is also highest in the City of Ontario.

2.6 GEOCHEMISTRY – OAR 340-043-0140, OAR 632-037-0055(1)(i), OAR 632-037-0055(j)

The geochemical baseline characterization studies were developed to define the potential geochemical reactivity and chemical stability of mined materials that will be produced by the proposed Project (i.e., ore, waste rock, quarry rock and tailings). The results of the geochemical characterization program assist in determining the potential for acid rock drainage and metal leaching associated with the Project. Data produced during this study were also used in the Project design process and as an operational tool for identifying material types that require special handling during operations.

The most recent version of the *Geochemistry Baseline Study* (SRK, 2021) is included in Appendix B6. The study addresses the Geochemistry Study Area, which was established to encompass the Mine area and project facilities as well as to provide background data, and includes an area encompassing the Permit Area. The subsections below summarize the approach and results of the *Geochemistry Baseline Study*.

The *Geochemistry Baseline Study* report includes all data collected to date for this Project relevant to geochemistry. The study conforms to the *Environmental Baseline Study Work Plans* (EM Strategies, 2017; Appendix B23), which were accepted by the TRT on December 7, 2017, and addresses subsequent requests regarding geochemistry from the TRT. The *Geochemistry Baseline Study* has also been revised per comments received with the Completeness Review by DOGAMI.

The *Geochemistry Baseline Study* meets the following regulatory requirements:

- Oregon DOGAMI Division 37 Chemical Process Mining;
- Oregon Administrative Rule (OAR) 632-037-0055 and OAR 632-037-0085 (Environmental Evaluation);

- Oregon Department of Environmental Quality (ODEQ) Division 43 Chemical Mining Rules, OAR 340-043

In addition, the geochemical characterization program follows guidelines set forth in the BLM Instruction Memorandum NV-2013-046, *Nevada Bureau of Land Management Rock Characterization Resources and Water Analysis Guidance for Mining Activities* (BLM, 2013).

The geologic setting, groundwater, surface water, and Mine plan are critical to selection of geologic samples to test and types of testing to be performed. SRK Consulting (SRK) developed a conceptual geochemical model based on the deposit geology, local hydrogeology, and the proposed mining and processing plans to develop the field characterization program. The conceptual model is refined as data are gathered and provides a basis for decision-making throughout the process.

The study addresses geologic materials that will be used for construction (i.e., borrow for fill, Mine backfill, or exposed cuts access and haul roads), mined ore, and Mine wastes (tailings and waste rock). The Mine backfill materials are noteworthy as the Project includes using cemented rock fill as structural support in the underground Mine. For a variety of reasons, waste rock is typically used in cement rock backfill. However, since this fundamentally returns the waste rock to the underground environment where it will remain in perpetuity, the geochemical reactivity of the cement backfill is important to characterize for understanding potential future impacts due to mining.

Testing is complete for all materials other than the cemented rock backfill materials. Testing of cemented rock backfill made with waste rock is underway and has not been completed. However, the backfill is not an element of the baseline characterization. The characterization of cemented waste rock (and cemented basalt) for backfill is used in assessing potential impacts due to operations of the Mine.

There are six general geologic material types that will be mined at the Grassy Mountain site. The term “material type” typically denotes a unique combination of lithology, alteration, and oxidation state. Silicic alteration is pervasive in the Grassy Mountain deposit and is essentially the only type of alteration at this site. Also, the area to be mined is mostly oxidized. Therefore, material types are delineated solely based on lithology. The six material types that were characterized are siltstone/mudstone, sandstone, sinter, soils (clay/mud/silt/sand/sediment), breccia, and basalt. The basalt is primarily taken from the quarry and will be used as backfill and/or construction material. The soils are primarily produced as a result of cut and fill activities during construction. All material types are present in the area of the deposit. There are other general material types (e.g., tuff) that are present at the site but will not be mined or disturbed.

2.6.1 SAMPLING AND TESTING

The Geochemical Baseline Study included testing of a representative number of samples for each material type. The samples were collected by a geologist selecting from exploration drill core material at the site. The number and types of samples collected are based primarily on the occurrence and abundance of each material type expected within the Mine. Professional judgment and sound geological knowledge of the deposit were used to determine the number and types of samples selected.

For characterization of tailings, samples were collected from tailings generated from metallurgical testing programs. Samples of the tailings water (supernatant) were also collected and analyzed.

Tailings characterization also included testing of tailings material treated to render the tailings non-acid generating. To treat the tailings, hydrated lime was added to the tailings samples to generate material representative of amended tailings. The results of the ABA tests from the original samples were used to determine the quantity of hydrated lime to be added to meet the criteria specified in the OAR 340-043-0130(2).

The samples of each material type were subjected variously to the following analyses:

- ABA/TIC - Acid base accounting/total inorganic carbon testing is used to determine the acid generating potential (AGP) and Neutralization Potential (NP) of the material. The AGP and NP are then used to calculate the Net Neutralization Potential (NNP = NP – AGP) and the Neutralization Potential Ratio (NPR = NP/AGP). The NNP and NPR are compared against guidelines to characterize the material as acid generating, non-acid generating, or uncertain. The analytical method determines the concentrations of the different forms of sulfur in the rock as well as the abundance of neutralizing minerals such as carbonates.
- MWMP – The Meteoric Water Mobility Procedure is one of several "leaching" tests used to characterize the potential for the material to leach metals by contact with surface or groundwater. This test uses water passed through a column of crushed material with a solids to liquids ratio of 1:1 w/w.
- Modified SPLP – Synthetic Precipitation Leaching Procedure is another leaching procedure where the material is mixed with water in a solids to liquids ratio of 1:20 w/w and shaken for a period of time;
- Multi-element analysis – used to determine total metal and metalloid concentrations in the material (for both solids and liquids)
- Mineralogy – Minerals present and their abundance are determined using X-Ray Diffraction Analysis (XRD), petrography and Scanning Electron Microscopy (SEM);
- HCT – Humidity Cell Tests are performed on an as-needed basis, usually to confirm a material is acid generating or non-acid generating, or to further characterize material in the uncertain category. The HCT evaluates temporal changes in leachate chemistry through the sequential leaching of the rock weathered in a regular cycle of exposure to dry and wet air in a controlled laboratory environment. These cycles simulate and accelerate the chemical weathering rates observed under field conditions, using test conditions that are specifically designed to target oxidation of sulfide minerals; and
- NAG Test – Net Acid Generation is an alternative static test for establishing if a material will be acid generating, non-acid generating, or uncertain.

As is typical of geochemical characterization testing for mining projects, not all samples are subjected to all test methods. In particular, samples were selected for MWMP, SPLP, mineralogy and HCT testing based on the results of the ABA/TIC and NAG test results, the abundance of the particular rock type in the mined material, and the professional judgement and experience of the geochemist performing the test.

2.6.2 SUMMARY OF RESULTS – OAR 340-043-0030(2)(h)

This subsection summarizes the most salient findings of the geochemical characterization. The *Baseline Geochemical Characterization Report* included in Appendix B6 presents a detailed discussion of the results of the geochemical characterization, including tables of analytical results and meaningful charts showing relationships between different parameters measured. The report in the appendix also presents comparisons of the results with contextual criteria such as BLM guidelines (BLM, 2004) for acid generation, Oregon Groundwater Quality Guidelines (OGWQG) for concentrations in leachate and supernatant water, and average crustal abundances for trace metals concentrations in the bulk rock.

2.6.2.1 Waste Rock and Ore

- The characterization results for the ore grade material are comparable to the waste rock material.
- The results of the geochemical characterization program indicate that the majority of the waste rock and unprocessed ore material will generate acid and leach metals under long term weathering conditions. The exception is the sinter material that shows the lowest sulfide concentration and a low potential for acid generation.
- The most likely constituents to be elevated in acidic mine water and leachate are sulfate, arsenic, copper, iron, and manganese.
- Each material type has a wide range of sulfide content and predicted acid generation from the static (ABA/TIC and NAG) test results. Mudstone was the highest and sinter was the lowest.
- The waste rock and ore materials have a low TIC content and very limited neutralization potential.
- With the very limited neutralizing capacity, the potential for net acid generation is directly related to acid generation potential (i.e., the concentration of sulfide minerals).
- The waste rock and ore are not so much acid generating as they are non-neutralizing.
- Eight of the nine HCTs for waste rock and ore generated acidic leachate throughout the test and indicate that samples with an uncertain potential for acid generation from the ABA will generate acid under long term weathering conditions.

2.6.2.2 Tailings – OAR 340-043-0130

- The untreated (no lime treatment for neutralization) tailings material has a potential to generate acid. As with the waste rock and ore, the potential for acid generation is mostly due to a very low neutralization potential; the sulfide sulfur concentration in the tailings is relatively low.
- Under low pH conditions, iron, manganese, and copper concentrations were greater than the contextual values. Results of HCTs indicate there was an initial flush of several other constituents, including sulfate, aluminum, cadmium, fluoride, nickel, selenium, sulfate, and zinc, which likely reflects the dissolution of soluble oxidation products from the tailings.
- The tailings supernatant water samples had slightly alkaline pH and concentrations exceeded the contextual values for arsenic, selenium, sulfate, and TDS.
- The Oregon Chemical Mining regulations [OAR 340-043-0130(2)] require tailings to be treated so that both the NPR > 3 and the NNP > 20 kilogram (kg) $CaCO_3$/t. Because of the low acid

generation and neutralization potentials indicated by the ABA results for the tailings, the requirement to reach the NNP > 20 kg $CaCO_3$/t requires significantly more treatment reagent (lime in this case) than the requirement for NPR > 3. Because of the excess of lime, the results of leach testing indicate very alkaline (pH ~ 12) conditions in the leachate.

- It is important to note that the very alkaline leachate is partly due to the regulatory requirement to meet both the NPR > 3 and NNP > 20 kg $CaCO_3$/t criteria. If the regulatory requirement was to meet one or the other criteria, the treated tailings would still be non-acid generating but less lime would need to be added and the leachate would not be as alkaline.
- The tailings require treatment with lime or some other source of acid neutralization to achieve non-PAG characteristics. Further testing and evaluation are underway to identify an approach that will neutralize the tailings but not produce the very alkaline tailings water. Also, a *Tailings Chemical Monitoring Plan*, provided in Appendix D2 was developed to monitor the geochemistry of the tailings during operations and to assure proper treatment/neutralization.
- Leach test results for the treated tailings samples indicate that selenium is leached under alkaline conditions at concentrations above the contextual values. Sulfate and chromium were also slightly elevated above their respective values in one sample.

2.6.2.3 Road Cut and Borrow Material

- The borrow material from the proposed basalt quarry has no potential for acid generation with total sulfur values below the detection limit of 0.01 percent for all samples.
- All samples were classified as near-neutral, low metal waters in the MWMP tests and all parameters were below contextual values.
- The results for the road cut materials (soils and basalt) were similar to the borrow material and total sulfur values were below the detection limit of 0.01 percent.
- All road cut samples were classified as near-neutral, low metal waters in the MWMP tests and all parameters were below the contextual values.
- Based on these results, the basalt and soil are considered non-acid generating and very inert (i.e., little potential to cause water quality impacts due to release of metals or metalloids).

2.6.2.4 Cemented Rock Fill

The Mine plan for the Grassy Mountain Project requires backfilling production drifts with cemented rock fill (CRF) to provide stability. CRF is Portland cement mixed with aggregate, and test data to date indicate the mix of cement will be 5 percent to 7 percent.

Sources of aggregate for the CRF include the borrow material (i.e., basalt) and waste rock. The Feasibility Study (Ausenco, 2020) indicates there will be approximately 2.1 million tons of ore processed (which becomes tailings that are permanently disposed in the Tailings Storage Facility [TSF]) and approximately 0.27 million tons of waste rock produced. Considering the bulking of volume caused by mining and removing the waste rock and ore (typically on the order of 30 percent) and assuming that all the waste rock would be used as CRF with the remaining required volume being filled by basalt CRF, the waste rock CRF would be on the order of 10 percent to 15 percent of the total backfill volume (the remainder being basalt CRF). Note also that the total amount of Portland cement that would be used for cement backfill is on the order of 100,000 tonnes and cement provides substantial neutralization potential. The cement for the backfill would also isolate the waste rock aggregate from oxygen and water (the additional reactants for acid generation) to a degree.

As indicated by the results of the Geochemical Baseline Study, the basalt from the quarry is geochemically inert. Basalt CRF placed back in the Mine is not anticipated to cause any environmental impacts. Based on the waste rock characterization program described herein, the majority of the waste rock associated with the Project has a potential to generate acid and leach metals.

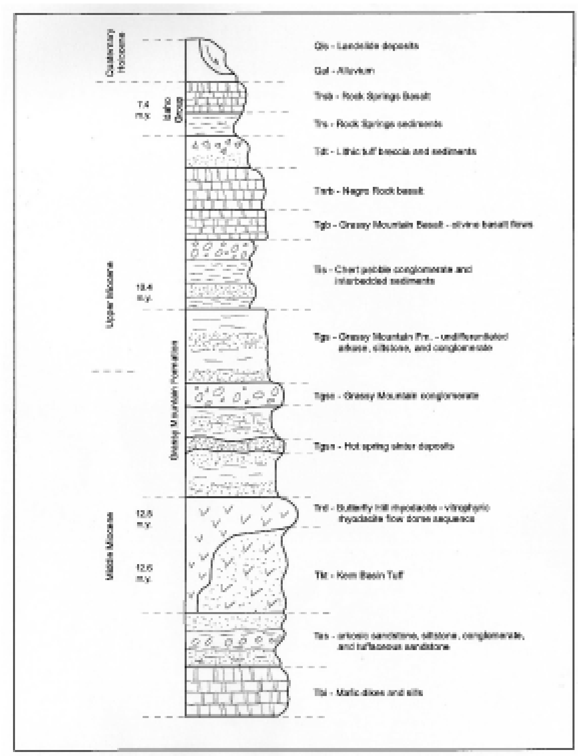
As mentioned earlier in this section, additional testing is being performed to determine the geochemical characteristics of CRF made with waste rock. The results will be used to establish backfill plans to mitigate potential impacts, if necessary. The backfill plans may include measures such as assuring that CRF made with waste rock is mixed with CRF made from basalt, disposing of all the waste rock CRF either above or below the predicted post-closure phreatic surface in the Mine area, or not using waste rock as CRF (i.e., permanently storing the waste rock in an engineered disposal cell on the surface).

2.7 GEOLOGY AND SOILS – OAR 632-037-0055(1)(b), OAR 632-037-0055(1)(h), OAR 632-037-0055(1)(i), OAR 340-043-0030(2)(b)

The *Grassy Mountain Mine Project Geology and Soils Baseline Report* (Appendix B7) was originally submitted to DOGAMI on October 18, 2018. The report was accepted by the TRT on December 17, 2018 as conforming to the *Environmental Baseline Study Work Plans* (EM Strategies, 2017; Appendix B23), which were accepted by the TRT on December 7, 2017. The Geology Study Area includes the Mine and Process Area with a 4,000-meter buffer and the entire Access Road. The Soils Study Area includes the entire Permit Area (Mine and Process Area and Access Area).

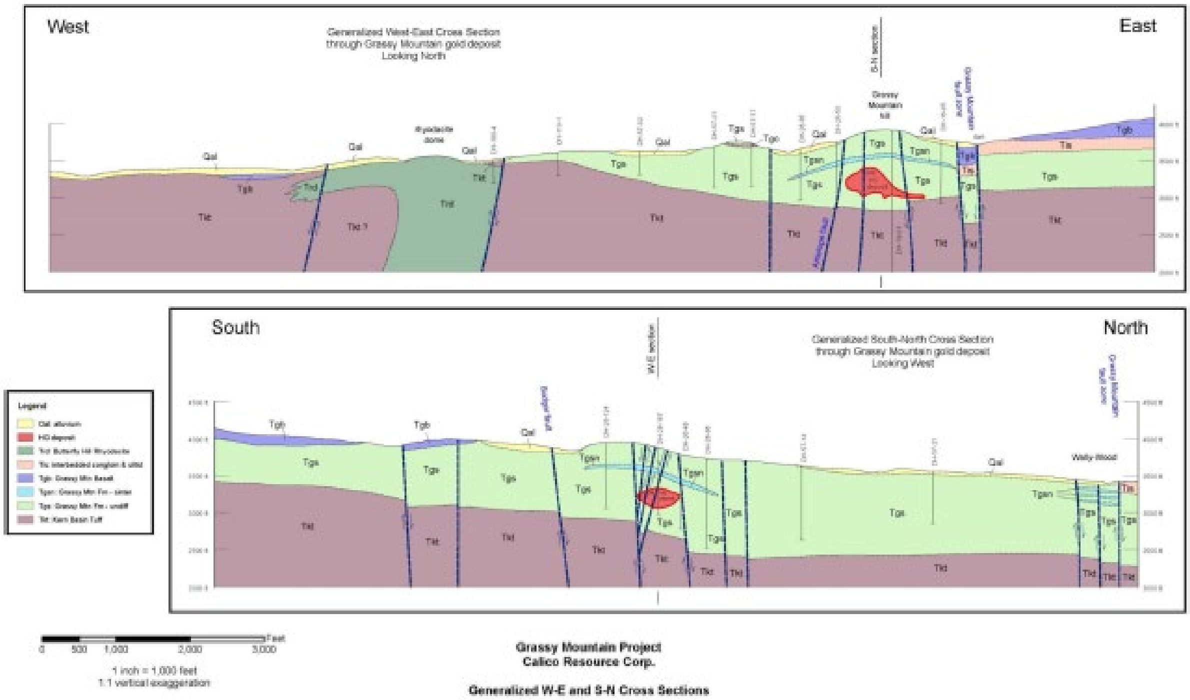
Grassy Mountain is the largest of 12 recognized epithermal hot spring precious metal deposits of the Lake Owyhee volcanic field. The Lake Owyhee volcanic field occurs at the intersection of three tectonic provinces: the buried cratonic margin; the northern basin and range; and the Snake River Plain. During the mid-Miocene, large volume, peralkaline, caldera volcanism occurred in response to large, silicic magma chambers emplaced in the shallow crust throughout the region. The volcanic field includes several caldera-sourced ash-flow sheets and rhyolite tuff cones that were deposited from 15.5 to 15 million years ago. Volcanism during the mid to late Miocene is evidenced by small volume, metaluminous, high-silica rhyolite domes and flows, and small volume basalt flows and mafic vent complexes in north- and northwest-trending basin and range-type fracture zones and ring structures related to resurgent calderas. Regional extension and subsidence facilitated the formation of through-going fluvial systems and extensive lacustrine basins. Large volumes of fluvial sediments, sourced from the exhumed Idaho Batholith to the southeast, were deposited in conjunction with volcanism and hot spring activity during the waning stages of volcanic field development. The resulting regional stratigraphic section is a thick sequence of mid-Miocene volcanic rocks and coeval-to-Pliocene age non-marine lacustrine, volcaniclastic, and fluvial sedimentary rocks.

Error! Reference source not found. is the stratigraphic column at Grassy Mountain and **Error! Reference source not found.** shows North-South and East-West cross sections showing the local geology and mineralization. Bedrock outcrops near the Mine and Process Area are typically composed of olivine-rich basalt and siltstones, sandstones, and conglomerates of the late Miocene Grassy Mountain Formation (Tgb, Tgsn, and Tgs). These rocks are locally covered with relatively thin, unconsolidated alluvial and colluvial deposits (Qal). Erosion-resistant basalts cap local topographic highs. Arkosic sandstones have been encountered at the surface and at depth but have not been correlated across the vicinity of the Mine and Process Area, in part due to lateral discontinuity associated with sedimentary facies changes and structural offset. Surface and drill-defined stratigraphy near the Mine and Process Area reveals complex facies that were produced during the waning stages of deposition of the Lake Owyhee volcanic field.



Note: Figure prepared by MDA, 2020, modified after RQV, 2015.

Figure 1. Stratigraphic Column of the Mine and Process Area Geology



Note: Figure prepared by MDA, 2020, modified after RQV 2015.

Figure 2. Geologic Cross Sections

The Grassy Mountain gold-silver deposit is located within an interpreted horst block that has been raised 50 to 200 ft in a region of complex block faulting and rotation. Faults at the Grassy Mountain deposit are mainly post-mineral 30 degrees west of north (N30°W) to 10 degrees east of north (N10°E), striking normal faults developed during basin and range extension. On the northeast side of the deposit, these faults progressively downdrop mineralization beneath post-mineral cover. These offsets are suggested by interpreted offsets of a prominent white sinter bed in drill holes, as well as drill intersections with fault gouge. Silicification in the form of sinters and disseminated quartz is a prominent alteration type at Grassy Mountain and is largely controlled by hot-spring vents. Silicification occurs both pervasively as silica flooding, and as cross-cutting veins and stockworks. The silicified envelope has plan dimensions up to 3,000 ft (north-south) by 2,500 ft (east-west). Silicification is surrounded by widespread, barren, clay-rich (20- to 40-percent montmorillonite), tuffaceous siltstone and arkose with minor disseminated pyrite. Many of the sinters occur as sheets instead of mounds, which suggest that they are related to vents along faults rather than point sources. Potassic alteration occurs as adularia flooding with destruction of biotite. Orthoclase is unaffected by potassic alteration, and plagioclase is replaced by adularia.

Mineralization of the Grassy Mountain deposit includes: 1) low grade gold associated with hot springs silicification; 2) high grade gold associated with multi-stage quartz-adularia-gold-silver veins and stockworks; and 3) late remobilization within sub-vertical rubble zones defined by clay matrix breccias. The deposit is characterized by stacked sinter terraces capping acid-leached sediments and multiple generations of quartz veins, which suggest repeated eruption, brecciation, breeching, and sealing of the hydrothermal system. Ore minerals include native gold (50 to 600 microns), electrum, and minor pyrite (up to 80 microns). Gangue minerals include quartz, calcite, chlorite, epidote, orthoclase, plagioclase, illite, sericite, chalcedony, montmorillonite, goethite, and jarosite.

At a local scale and within the immediate vicinity of the Grassy Mountain gold deposit, fault orientations can be grouped into two major sets: 20 degrees west of north to 10 degrees east of north (N20°W to N10°E) striking faults, and 70 degrees east of north (N70°E) striking faults. Joint and fractures orientations fall into three major groups: 1) strikes of north to 20 degrees east of north (N to N20°E) dipping to the east-southeast; 2) strikes of a general south direction with dips to the west; and 3) strikes with a general west direction dipping to the north.

Geologic Hazards evaluated in this study include seismicity/earthquake hazards, slope failures/landslides, volcanic eruptions and unsuitable soil/soil erosion. The Geology Study Area is located in a region of low seismic risk. No active or potentially active faults are known in the Geology Study Area. The closest fault with historic surface rupture, the Lost River Fault, is located near Challis, Idaho, approximately 110 miles northeast of the Geology Study Area. The closest potential Holocene age faults are located over 20 miles north of the Geology Study Area. The probability of the occurrence of an earthquake with a magnitude greater than 5.0 over the next ten years is less than 0.03.

Within a 50-mile radius of the Geology Study Area, only a few earthquakes have been recorded since 1900 (USGS, 2018). Only two earthquakes within a 50mile radius of the Geology Study Area were associated with known fault systems: a magnitude 3.2 earthquake associated with the Squaw Creek Fault in April 1978 (approximately 47 miles from the Permit Area); and a magnitude 3.2 earthquake associated with the Cottonwood Mountain fault in July 2009 (approximately 31 miles from the Permit Area). Approximately 27 miles southeast of the Permit Area, there was a 2.9 magnitude earthquake in November 2012, and it's close to the Owyhee Mountains fault system. There were three other earthquakes that occurred within 50 miles of the Geology Study Area since 1900 that were not associated with any known faults or fault systems.

Using the United States Geological Survey (USGS) National Seismic Hazard Mapping Database, the peak ground acceleration at the facility resulting from a seismic event from one of the seismic sources was calculated. An earthquake that has a 10-percent probability of exceedance in 50 years (a nominal 500-year recurrence interval) is the maximum probable earthquake. An earthquake with a nominal 2,500-year recurrence interval (a 2-percent probability of exceedance in 50 years) is the maximum considered earthquake.

There are no known existing active landslides in the Geology Study Area.

Numerous volcanoes exist in the Cascade Range located approximately 200 to 250 miles west and northwest of the Geology Study Area. The recently active volcanoes are Mount Hood, Mount Jefferson and Mount Mazama (Crater Lake). Mount Hood has erupted three times over the past 2,000 years and has been active as recently as 400 years ago. Within the Geology Study Area, the most recent volcanic activity is dated at 7.4 million years before present. The most likely volcanic hazard that could occur in the Geology Study Area would be from effects of a volcanic eruption from one of the Cascade volcanos. The Geology Study Area could possibly be covered by volcanic ash if the prevailing winds were directed toward the area.

Soil surveys were performed by IMS, Inc. (IMS) near the Mine and Process Area and southern portion of the Access Area in 1989 and 1991. Eleven map units, comprised of seven soil types and one undifferentiated soil group, were identified in the soil surveys performed by IMS (1989 and 1991). Soil surveys were performed in June 2018 by Cascade Earth Sciences (CES) in the remainder of the Permit Area/Soils Study Area. Six additional soil types were identified during the June 2018 surveys. All 17 map unit descriptions are presented in Table 8, and shown on Map 5. Each map unit description provides basic information about the map unit such as predominant soil or soils of the unit, slope, and rock fragment content.

Table 8. Soil Survey Map Legend

Map Unit	Name - Description
1[1]	Farmell-Rock outcrop complex, 8% to 30% slopes
2[1]	Farmell-Chardoton very cobbly soil, 15% to 30% slopes
3[1]	Farmell-Chardoton very cobbly soil, 4% to 15% slopes
4[1]	Farmell-Chardoton extremely stony soil, 4% to 15% slopes
5[1]	Farmell-Chardoton soil, 8% to 15% slopes
6[1]	Ruckles very stony loam, 8% to 30% slopes
7[1]	Shano silt loam, 2% to 6% slopes
8[1]	Soil A extremely gravelly sandy loam, 15- to 30% slopes
9[1]	Virtue loam, 2% to 8% slopes
10[1]	Xeric Torriorthents, 8% to 30% slopes
11[1]	Soil B very gravelly sandy loam, 8% to 30% slopes
12[2]	Nyssa silt loam, 2% to 6% slopes
13[2]	Drewsey very fine sandy loam, 2% to 6% slopes
14[2]	Ruclick cobbly loam, 4% to 15% slopes
15[2]	Drewsey-Quincy-Solarview complex, 8% to 30% slopes
16[2]	Owsel silt loam, 2% to 6% slopes
17[2]	Powder silt loam, 0% to 3% slopes

Source: [1]IMS 1989, 1991; [2]CES 2018

Erionite is a fibrous zeolite-group mineral often occurring as microscopic acicular, prismatic crystals in altered volcanic tuffs of late Cenozoic age. Erionite can also occur as bedded zeolites within a lacustrine environment containing sediments high in calcium and magnesium. Less commonly erionite occurs in vesicles or cavities within volcanic rocks such as basalt, andesite or rhyolite. Numerous studies have been conducted concerning the occurrence of zeolites in Oregon. Not all zeolite minerals are considered hazardous. A December 2011 report, *Naturally Occurring Hazardous Materials,* Final Report SPR 686 (DOGAMI, 2011), identifies numerous occurrences of zeolites and erionite in Oregon. The erionite localities closest to the Project are Durkee in Baker County, and Rome in southern Malheur County. Durkee is approximately 65 miles north of the Project while Rome is approximately 60 miles to the south-southwest. The erionite study was carried out by SRK and is incorporated in the *Baseline Geochemical Characterization Report* (Appendix B6).

The Wind Erodibility Group (WEG) is an arbitrary grouping of soils based on texture, structure, and carbonate content. WEG values range from 1 to 8 with the lower values indicating greater susceptibility to wind erosion. The WEG is typically applied only to the surface layer of a soil. Classes are defined by the Natural Resources Conservation Service's (NRCS) *National Soil Survey Handbook*, Part 618, Subpart B (NRCS, 2017). Table 9 shows the calculated K-factors and WEG values for each soil type.

Table 9. Erosion Factors of Surface Soils

Soil Series	WEG (Wind Erosion Group)	K-Factor (Soil Erodibility Factor)
Chardoton[1]	8	0.13
Farmell[1]	8	0.10
Ruckles[1]	8	0.10
Shano[1]	5	0.37
Soil A[1]	8	0.07
Soil B[1]	8	0.07
Virtue[1]	5	0.16
Nyssa[2]	5	0.61
Drewsey[2]	3	0.34
Ruclick[2]	8	0.37
Owsel[2]	5	0.46
Powder[2]	5	0.52

Source: [1]IMS, 1989, 1991; [2]CES, 2018

In all the areas where mining and processing will take place, suitable topsoil will be stripped and stockpiled for reclamation. A topsoil suitability rating table was developed by IMS (1991) for the three dominant soils within the Soils Study Area. The locations were selected to most accurately represent the Pedon sampled and its landscape position. (Pedon is a three-dimensional body of soil with dimensions large enough to permit the study of individual soil horizons.) Topsoil suitability for the soil types identified during the June 2018 surveys were also tested. Laboratory analyses results for soil samples were compared to suitability criteria for topsoil developed at Colorado State University's soil testing laboratory (Soltanpour and Workman, 1981). These criteria are presented in Table 10.

Table 10. Soil Suitability Ratings

Parameter	Testing Method	Good Suitability	Marginal Suitability	Unsuitable
pH	S-2-10	6.0 to 8.4	5.5 to 6.0, 8.4 to 8.8	<5.5, >8.8
EC (dS/m)	S-2.10	<4.0	4.0 to 12.0	>12.0
Texture	S-14.10 ASTM D6913	Loamy sand, sandy loam, loam, silt; soil with <35% clay	Sand, loamy coarse sand; soil with <45% clay	Soils with >45% clay
Saturation %	S-10.20	25 to 80	25 to 80	<25 and/or >80
$CaCO_3$ %	Fizz	0 to 15	15 to 30	>30
Rock fragments %	Field Estimated	<35	35 to 60	>60
Erosion factor K	Calculated	<0.37	>0.37	
Organic Matter	S-9.10			

Source: IMS, 1989, 1991; CES, 2018

In general, the topsoil sampled in and near the Mine and Process Area during the IMS surveys (IMS 1989, 1991) has a higher clay content and is shallower in the soil profile. This soil generally meets the "Marginally Suitable" category. The topsoil throughout the June 2018 survey area appear generally suitable for reclamation. The primary limitation is surficial and subsurface coarse fragments, which were encountered on ridge sides and summits. The Ruclick soils and Drewsey-Quincy-Solarview Complex exhibited high surface and subsurface coarse fragments. Steep slopes also limit reclamation suitability. The Drewsey and Owsel soils, which generally occur on the valley floors, exhibited marginal limitations for reclamation due to pH level and/or soil erodibility. The Nyssa soil, also located on valley floors, have unsuitable subsurface soil horizons that are cemented and exhibit increased sodium and carbonate levels (CES, 2018).

Salvageable growth media from the Project surface disturbance will be stockpiled at three centralized locations, as shown on **Error! Reference source not found.**. Growth media will be salvaged for reclamation activities at the commencement of construction of each Project component. Soil will be salvaged to a depth of up to 0.5 ft. The properties of the soil stockpiles will be managed during the project to assist with assessing future use of the stockpiles. Growth media will consist of soils and alluvium stripped prior to surface-disturbance activities.

As outlined in Table 11, approximately 147,436 bank cubic yards (bcy) of growth media will be salvaged from the footprints of the Project facilities. Facilities on the ground surface or near surface within the soil horizon that will have growth media salvaged include: TSF, TWRSF, Quarry, and Stormwater Diversion Channels. Other facilities that will not have growth media salvaged include: the water supply production wellfield and pipeline, groundwater monitoring wells, perimeter fence, Growth Media Stockpiles, and exploration areas.

Two Growth Media Borrow Areas will also be developed to support the reclamation of the Project encompassing approximately 55.9 acres and generating up to approximately 1,089,000 bcy of growth media. This volume could change based on actual field conditions encountered during growth media salvage. On sloped terrain, some soil may be salvaged by pushing available natural growth media cover downhill with a dozer to construct toe berms to prevent rocks from scattering on the hillside below the stockpile toes.

Based on the soil survey completed in the Project Area, the following amounts of growth media, as outlined in Table 8, are available and will be salvaged from various Mine facilities prior to component construction.

Table 11. Growth Media Salvaged and Available

Facility	Area (acres)	Growth Media Depth (ft)[1]	Volume (cy[2])
Underground Mine	6.7	0	-
TSF	99.8	0.5	80,528
TWRSF	5.7	0.5	4,611
Process Plant	2.5	0	-
Infrastructure & Ancillary Facilities	17.8		-
Roads	34.9	0.5	28,190
Yards & Laydown Areas	10.0	0	-
Growth Media Stockpiles	7.7	0	-
Water Supply	7.9	0	-
Power Supply	61.1	0	-
Stormwater Diversion Channels	11.8	0.5	9,521
Quarry	48.2	0.5	38,842
Reclamation Borrow Areas	55.9	Variable	1,089,000
Monitoring	0.0	0	-
Exploration	10.0	0	-
Disturbed Areas	107.8	0	-
Total	**487.9**	**-**	**1,250,691**

1 The growth media depth on the perimeter fence, water tank, water wells and pipeline, Growth Media Stockpiles, and the exploration is set at zero because the construction of these facilities will incorporate the soils into the construction and reclamation, and there will be no growth media applied. The diversion ditches and sediment basins and the borrow pit will be permanent features, and no growth media will be applied. Any remaining waste rock in the TWRSF would be moved to the TSF as part of reclamation and the Site reclaimed at the original grade.

2 The maximum available growth media identified at the two Reclamation Borrow Areas.

Any growth media remaining in the stockpiles for one or more planting seasons will be seeded with an interim seed mix to stabilize the material to reduce erosion and minimize the establishment of undesirable weeds. The seed mix, application rate, and application method will be the same that is currently being utilized for the reclamation of disturbances associated with exploration and the same as proposed for long-term reclamation and is detailed in the *Reclamation Plan* (Appendix D1).

2.8 GRAZING MANAGEMENT – OAR-632-037-0055(l)

The *Grassy Mountain Mine Project Grazing Management Baseline Report* (Appendix B8) was submitted to DOGAMI on January 11, 2018. The report was accepted by the TRT on March 9, 2018, as conforming to the *Environmental Baseline Study Work Plans* (EM Strategies, 2017; Appendix B22), which were accepted by the TRT on December 7, 2017. There are three grazing allotments in the Grazing Management Study Area: Nyssa (10403); Sourdough (10404); and Dry Creek (10411). The Nyssa Allotment includes four pastures and six enclosures or exclosures that occur partly or wholly within the Grazing Management Study Area. The Sourdough Allotment includes three pastures that occur partly or wholly within the Grazing Management Study Area. The Dry Creek Allotment includes three pastures and one exclosure that occur partly within the Grazing Management Study Area. These allotments and their pastures are shown in Table .

Table 11. Pasture Allotments in the Grazing Management Study Area

Allotment Number	Allotment Name	Pasture Number	Pasture Name	Grazing System	Management Strategy	Total Pasture Acres	Pasture Acres within Study Area
10403	Nyssa	4	Sagebrush	Deferred	Improve	11,877.2	544.5
10403	Nyssa	5	Ryefield Seeding	Deferred rotation	Improve	3,720.3	3,471.3
10403	Nyssa	6	Grassy Mountain Seeding	Deferred rotation	Improve	3,035.5	1,771.4
10403	Nyssa	7	Grassy Mountain	Deferred	Improve	29,764.2	8,099.1
10403	Nyssa	9	Ryefield Reservoir Exclosure	Riparian exclosure	Improve	19.7	19.7
10403	Nyssa	15	North Grassy Mountain Reservoir Exclosure	Reservoir enclosure	Improve	4.3	4.3
10403	Nyssa	30	Ryefield Seeding Test Plot	Management exclosure	Improve	2.4	2.4
10403	Nyssa	31	Owyhee Ridge Trough Exclosure	Reservoir enclosure	Improve	1.8	1.8
10403	Nyssa	32	Government corral	Reservoir enclosure	Improve	0.2	0.2
10403	Nyssa	34	Grassy Reservoir Exclosure	Reservoir enclosure	Improve	1.2	1.2
10404	Sourdough	4	Canyon	Deferred rotation	Maintain	21,121.1	624.9
10404	Sourdough	7	Freezeout Lake	Deferred rotation	Maintain	22,214.8	443.5
10404	Sourdough	10	Rye Field Fenced Federal Range	Custodial area	Maintain	1,439.7	372.4
10411	Dry Creek	1	Cow Hollow Seeding	Deferred rotation	Maintain	1,598.5	17.5
10411	Dry Creek	2	Double Mountain	Deferred rotation	Maintain	12,639.6	285.1
10411	Dry Creek	5	Russell Fenced Federal Range	Custodial area	Maintain	5,386.0	146.0
10411	Dry Creek	10	Little DM Spring Exclosure	Riparian exclosure	Maintain	3.1	1.3

2.9 GROUNDWATER – OAR 632-037-0055(1)(g), OAR 340-043-0030(2)(d), OAR 340-043-0030(2)(e), OAR 340-043-0030(2)(f)

A revised *Grassy Mountain Groundwater Baseline Report* (Appendix B9) is being submitted with this Consolidated Permit Application. The revised Groundwater Reports include all hydrogeological and water quality data relevant to the characterization of baseline conditions in the Groundwater Resources Study Area. The Groundwater Resources Study Area was established to develop an environmental baseline for assessing potential impacts from Project facilities and to provide background data. The Groundwater Resources Study Area encompasses the Mine and Process Area and surrounding areas in the vicinity of the Mine. All baseline well and spring sites are located within the Groundwater Resources Study Area.

The groundwater baseline study conforms to the Environmental Baseline Study Work Plans (EM Strategies, 2017), which were accepted by the TRT on December 7, 2017. The revised baseline study also addresses supplemental information and evaluations requested by DOGAMI and other stakeholder agencies and comments presented in the Completeness Review (DOGAMI, 2020) from all stakeholder agencies.

The subsections below present summaries of the characterization activities, results, and interpretation of the groundwater baseline investigation, including groundwater flow modeling. The details of the investigation are provided in the Groundwater Reports in Appendix B9.

2.9.1 OVERVIEW OF FIELD INVESTIGATION ACTIVITIES

Groundwater levels were measured and groundwater quality samples were collected at new and existing monitoring wells within the study area. Existing production wells within the study area were also included in the investigation. The locations of the wells are shown in the figure titled "Grassy Mountain baseline monitoring wells and springs" in Appendix B9, Volume I, *Groundwater Baseline Report*; well construction details are presented in Table . There are shallow and deep wells, and wells within the silicified zone as well as in distal areas in the basin. Vibrating wire piezometers were also installed in boreholes within the area of the deposit to characterize groundwater levels in the deposit area.

Flow rates were measured and water quality samples were collected at springs in the vicinity of the site. The locations of springs are shown in the figure titled, "Groundwater Elevation Contours in Feet (2017 Q1)" in Appendix B9, Volume II, *Groundwater Characterization Report*, and the coordinates and elevations of the springs are presented in Table .

There were several sampling events performed as part of the baseline investigation. Historical water quality, spring flow, and groundwater level data from previous investigations were also assembled and included in the database as appropriate (i.e., when the earlier data meets current data quality objectives).

Hydrogeologic testing was also performed as part of the site characterization activities. The hydrogeologic testing included performing pumping tests at selected wells. In addition, the results of historical pumping and slug tests were reviewed and summarized.

Table 12. Well Completion Details

Calico Well ID	OWRD Well Tag Number	OWRD Name	Alternate Name	Drill Method	Depth of First Water (ft)	Well Const. Depth (ft)	Screened Interval (ft)	Well Casing Diameter (in)	TOC Elevation[4]	Elevation Screened Interval (ft)	Water Level Elevation (9/26/2018)	Production (gpm)[2]	Screened Lithology[1]
59760	107462	MALH 2974	Middle Sweizer, TW-1	air rotary	160	203	163-203	6	3762.1	3599-3559	3673.43	+10	fractured basalt
59761	109400	MALH 2993	Lower Sweizer, MW-2	air rotary	100	118	97-117	4	3762.2	3665-3645	3673.48	+50	fractured basalt
59762	109371	MALH 2976, 2985	MW-3	air rotary	626	700	550-660	4	3724.8	3175-3065	3103.4	<1	siltstone
59763	109356	MALH 2994	TW-4	air rotary	277	323	293-323	6	3519.4	3226-3196	3239.03	+5	fractured volcanics
59764	107466	MALH 2986	MW-5	air rotary	270	300	279-299	4	3511.9	3233-3213	3238.24	+10	fractured sandstone
59765		MALH 2979	MW-6	air rotary	29	36	28-36	4	3446.5	3418-3410	dry	dry	shallow sandstone
59766	107468	MALH 2980	MWS-8	air rotary	only damp when drilled	45	25-45	4	3459.7	3435-3415	3426.68	+10	shallow sandstone
59767		MALH 2995	MWS-9	air rotary	dry	40	20-40	4	3495.3	3475-3455	dry	dry	shallow sandstone
59768		MALH 54197	MWS-10	air rotary	21	25	10-25	4	3480.6	3471-3456	3463.46	0.5	shallow sandstone
59770		MALH 2983	MW-11	air rotary	dry when drilled	424	374-424	4	3389.0	3015-2965	3241.71	+0.5	volcanic tuff
59772	109352	MALH 2984	Upper Sweizer, MWS-13	air rotary	125	207	165-205	4	3768.2	3603-3563	3673.5	+50	fractured basalt
26-092-915	109354	MALH 54071		unknown	unknown	915	228-268	2	3710.0	3482-3442	3633.55	unk	unk
57-1		MALH 54195		unknown	unknown	765	108-138	1.25	3770.6	3663-3633	3699.1	unk	unk
57-10		MALH 54196		unknown	unknown	500	126-156	1	3681.1	3555-3525	3635.67	unk	unk
89-2	109360	MALH 54072		unknown	200	425	386-406	2	3293.5	2907-2887	3235.54	unk	unk
Bishop	None	MALH 54046	Rye Field	cable	unknown	482	135-145	12	3391.5	3257-3247	3281	50	coarse gravel
BLM	109398	MALH 2277	Owyhee Ridge	cable	unknown	175	159-166	6	3579.6	3421-3414	3423.95	+12	white sand
GMW17-31	125168	MALH 54404		air rotary	dry when drilled	498	458-498	5	3722.0	3262-3222	3222.6	0	siltstone, sinter, clay
GMW17-32	125169	MALH 54405		air rotary	244	718	678-718	5	3702.1	3026-2986	3082.1	<1	Arkose, siltstone, Clay
GMW17-33	125170	MALH 54406		air rotary	243	338	238-338	5	3702.7	3465-3365	3452.16	<30	sinter, siltstone, tuff
GMW18-34	130031	MALH 54437		air rotary	dry	950	830-890	5	3953.3	3127-3067	dry	dry	Arkose, siltstone, Clay
GW-1	107469	MALH 2281	47-1	air rotary	140	155.5	135.5-155.5	4	3709.1	3573.5-3553.5	3654.18	60	gravel
GW-2	109357	MALH 2279	47-2	air rotary	dry when drilled	325	290-320	4	3827.5	3537-3507	3662.91	0	blue and grey clay
GW-3	107467	MALH 2278	47-3	air rotary	dry when drilled	350	320-350	4	3633.6	3314-3284	3401.68	<1	blue and grey clay
GW-3A		MALH 2579		air rotary	dry	420	380-420	2	3655	3275-3235	dry	dry	silt and clay
GW-3B		MALH 2576		air rotary	dry	340	80-100	2	3626	3546-3526	dry	dry	clay
GW-4	107460	MALH 54073		unknown	50	370	280-350	4	3342.7	3063-2993	3260.85	100	sandstone, congl, clay
GW-5		MALH 54194		air rotary	unknown	265	204-224	2	3413.0	3209-3189	3221.45	<1	tuff, clay
GW-6	109368	MALH 2578		air rotary	145	340	300-340	2	3377.3	3077-3037	3236.16	3-4	sandstone, congl, clay
Prod 1	107457	MALH 2275, 2511		air rotary	145	425	145-255, 325-355, 380-420	6	3436.4	3291-3181, 3111-3081, 3056-3016	3436.41	30-100[3]	sandstone, blue clay, and hard sandstone
PW-1	109353	MALH 2276		air rotary	320	520	320-340, 400-420	6	3709.1	3389-3369, 3309-3289	3654.66	25-35[3]	brown clay and sand; coarse sandstone
PW-4	109351	MALH 2206		air rotary	280	375	280-300, 340-360	6	3341.4	3061-3041, 3001-2981	3261.39	175-250[3]	sandstone and conglomerate

1 - as reported on the drillers log
2 - based on short-term testing by driller during or following construction
3 - based on long-term test pumping
4 - surveyed with the exception of GW-3A, GW-3, GMW-17-31, GMW17-32, GMW17-33, and GMW18-34

Source: Appendix B9, Volume I, *Groundwater Baseline Data Report*.

Table 13. List of Springs with GPS Coordinates

Type	Site Name	Northing (ft, OR State Plane South)	Easting (ft, OR State Plane South)	MP Elevation (ft amsl)
Baseline Springs	Deposit Stock Tank	748376.460	5750879.694	3552 77
	Government Corral	756975.556	5757863.847	3456 01
	Grassy Spring	741738.614	5750275.765	3822 84
	Lowe Spring	761799.478	5753456.679	3278 96
	Poison Spring	759368.751	5740634.211	3213 85
	Sagebrush Spring	759029.757	5761380.835	3481 86
	Sourdough Lower	737582.250	5731598.434	3565 36
	Sourdough Upper	737587.997	5728058.732	3754 05
	Twin Springs North	726474.288	5737016.696	3240 02
	Twin Springs South	725277.033	5737632.836	3210 32
	Whiskey Spring	725895.946	5746824.847	3230 .04
	Bull Spring Tank	731798.684	5730323.895	3727
	Central Grassy Mountain Spring	737920.331	5756588.347	3489
	Dark Rock Well	756210.058	5732296.357	3391
	East Grassy Mountain Spring	738055.897	5757538.706	3489
	Flowing Well	761550.474	5727332.014	3532
	Negro Rock Canyon Spring	767800.835	5735633.314	3117
Background Springs and Wells (coordinates from non-survey grade GPS, elevations estimated using Google Earth)	Negro Rock Spring Tank	754844.533	5737277.024	3319
	Oxbow Spring Tank	729591.481	5756563.613	3065
	Oxyoke Spring Tank	726801.090	5757094.644	3029
	Red Tank #3	756212.707	5753206.759	3389
	Spring 1n Sec 13 T2 2S R44E	739203.805	5773378.134	3005
	Spring 1n Sec 23 T2 1S R43E	769162.951	5732244.787	3297
	Spring North of Lowe Reservoir	764826.923	5752193.554	3247
	Spring South of Poison Spring	758410.107	5741317.082	3232
	Tank E of Negro Rock	752204.327	5742408.207	3273
	West Grassy Mountain Spring	738802.552	5755880.217	3619
	West Whiskey Spring	757611.371	5728513.411	3547
	Wildcat Spring	757839 .970	5732821.848	3366

Source: Appendix B9, Volume I, *Groundwater Baseline Data Report*.

2.9.2 DATA INTERPRETATION AND HYDROGEOCHEMICAL CONCEPTUAL SITE MODEL

2.9.2.1 Site Setting

The Project is in the Sourdough Basin/Negro Rock Canyon watershed, which drains to the north. Grassy Mountain, located southeast of the Project, serves as the hydrologic divide between the Sourdough Basin/Negro Rock Canyon watershed and the watersheds draining south to the Owyhee River.

No perennial surface water features are located within the Groundwater Study Area. However, there are numerous local springs and seeps, which range from seasonal wet areas to perennial flows that supply stock watering tanks. See the figure titled, "Groundwater Elevation Contours in Feet (2017 Q1)" in Appendix B9, Volume II. There are also a couple of stock tanks/reservoirs in the area that contain water seasonally.

The Koppen Geiger climate classification for the area is *Bsk: Cold semi-arid.* This climate type is generally characterized as having warm to hot dry summers, and cold winters with occasional snow. In the cold semi-arid climate, the average annual precipitation is low, and monthly precipitation is spread pretty evenly through the year. The average annual precipitation is estimated to be approximately 9.8 inches per year. The average annual lake evaporation rate is estimated to be approximately 45 inches per year.

2.9.2.2 Regional and Local Geology

The geologic setting of the Project and surrounding area is an important factor in the hydrogeologic baseline characterization. The regional and local geology and soils are discussed in Section 2.7 of this CPA and in the *Geology and Soils Baseline Characterization Report* (Appendix B7).

The Grassy Mountain Formation is the main water-bearing zone within the Study Area. The Grassy Mountain Formation consists of undifferentiated sandstone, siltstone, conglomerates, and arkose. These lithified sedimentary rocks originated from lacustrine deposits. Within the lacustrine sediments, there are volcanic intrusions (basalt). Groundwater flow occurs primarily in fractures and areas that are less lithified. The various lithologic materials are discontinuous and heterogeneous.

Of key importance with regard to the hydrogeology of the site is that the area within the immediate vicinity of the ore deposit that will be mined is strongly silicified with lenses of sinter and the occurrence of quartz veins and other silicic alteration (e.g., arkose). The silicified zones represent barriers to groundwater flow. There are other silicified zones within the study area, but silicification appears to be less extensive in the other areas.

Steeply-dipping faults have also been identified in the vicinity of the ore deposit, and these faults can be both conduits and barriers to groundwater flow within the silicified zone. In the immediate area of the proposed Mine and the ore deposit, there is a higher occurrence of faulting. There are also other faults and fault zones throughout the Study Area that also appear to influence baseline groundwater flow and quality.

2.9.2.3 Groundwater Occurrence and Flow

In general, the findings of the Groundwater Baseline Study support a single aquifer system on a basin-wide, regional scale. The heterogeneity of lithic facies and faulting in the area result in partially-connected local zones or compartments within the aquifer that are separated by negative barriers to flow.

Within the silicified zone in the immediate vicinity of the proposed Mine, the data support that there is little groundwater and very limited flow. Most of the boreholes and vibrating wire piezometers (VWPs) installed in the silicified zone did not encounter any water. Some of the wells installed in or near the silicified zone are dry or recover very slowly when pumped down. This is attributed to low connectivity of fracture sets within the silicified rocks, and also to two faults on the upgradient side of the silicified zone (the Schweizer and Badger Faults) that appear to be barriers to groundwater flow and a fault zone originating near the mineralized deposit area and extending northwest through the area of the BLM well and well 59766 possibly acting as a preferred flow path that acts as a drain (see discussion below regarding the piezometric surface).

Surface recharge of precipitation is the principal source of groundwater. The low annual rainfall and relatively thick clayey and silty alluvium in the unsaturated zone result in low recharge rates, estimated to be between 0.5 and 1 inches per year. There are also small seasonal reservoirs/stock tanks within the Study Area (e.g., Schweizer Reservoir locations just east of the Mine area) that represent small sources of seasonal groundwater recharge.

Discharge from the aquifer occurs at the springs located throughout the Study Area. However, based on the balance of the approximate total combined annual flow of the springs (estimated to be 30 gallons per minute [gpm]) with the 0.5 to 1 inch per year throughout the approximately 40 square-mile basin that encompasses the springs, there must also be subsurface flow out of the basin occurring, probably along the northern boundary of the Study Area.

Wells with deep completions and comparison of water levels in wells in close proximity to each other that have screens at different elevations indicate generally downward vertical gradients. The downward gradient is supporting evidence that there is subsurface flow out of the basin, although regional data for deeper wells is sparse.

Water Level Trends

Water level monitoring data indicate that most of the shallow wells (<500 ft total depth) in the area have relatively stable water levels through any particular year (± 1 ft change) although water levels generally rose during the monitoring period of the baseline study (2013 – 2018). There are some exceptions to this general trend described in detail in the Groundwater Baseline Reports that are attributed to specific conditions or activities (e.g., drawdown caused by nearby groundwater pumping, increases during excessive precipitation, and sometimes problems with the well).

Groundwater levels at wells within the silicified zone are highly correlated with elevation of the screened zone, supporting the lack of connectivity in this area caused by silicification.

Groundwater Elevation Contours

The Groundwater Baseline Reports include maps with contours of groundwater elevations across the site (the piezometric surface or water table). Various maps were prepared with data during the monitoring period (2014 through 2017), and they all have the same general appearance. See Appendix B9, Volume I, *Groundwater Baseline Data Report.* An example is provided in the figure titled, "Groundwater Elevation Contours in Feet (2017 Q1)" in Appendix B9, Volume II. The contours generally follow the topography of the Study Area with higher groundwater elevations to the east and south on Grassy Mountain and lower groundwater elevations in the main drainage pathway through the middle of the watershed.

The piezometric surface indicates the groundwater elevation varies from over 3700 ft amsl on the east side of the Study Area to 3220 ft amsl to the west and northwest. The apparent horizontal groundwater gradients are much steeper on the east side of the Study Area ranging from 5 to 10 percent in the vicinity of the deposit. On the west side, the apparent gradient is much lower and nearly flat near the center of the basin (e.g., 1 ft of difference in elevation between wells GW-6 and 89-2, which are approximately 0.75 miles apart).

The pattern of groundwater flow in the maps in Appendix B9, Volume I, *Groundwater Baseline Data Report*, suggest persistent local variations to the general southeast to northwest flow. Notably, there is ridge of high groundwater in the vicinity of well 57-1 located west of the deposit, a trough located in the vicinity of 59764/59763 and GW-6 located further to the west, and a trough extending into a ridge oriented northwest from the deposit in the vicinity of the deposit through GW-3, the BLM well, and 59766. These variations are attributed to the presence of faults, fractures, lithologic facies changes, vertical gradients, or some combination of these influences. The locations of faults are shown on the figure titled, "Groundwater Elevation Contours in Feet (2017 Q1)" in Appendix B9, Volume II, and some cross or align with the features described above.

The trough extending into a ridge oriented northwest from the deposit is particularly noteworthy. Figure G5 in Appendix B9, Volume I, presents a more detailed interpretation of the piezometric surface. Contours shown in figures titled, "Water Level Contours – 100 ft Intervals (2017 Mean)" and "Water Level Contours – 50 ft Intervals (2017 Mean)," in Appendix B9, Volume II*,* consider all available water level data, including VWP and drill hole data (contour figures cited above in Appendix B9, Volume II, are based only on monitoring well data). The contours in Appendix B9, Volume II, indicate a groundwater depression in the silicified zone around the deposit. Discussion in the Groundwater Baseline Reports hypothesizes that there may be deep fracturing of brittle silicified tuff beneath the deposit that was caused by fault movement. However, based on the spatial distribution of the water level measurements, the elevations of various screened intervals, and the general downward gradient, the depression could also be interpreted as a trough extending from the deposit area along a fault zone that extends northwest through the area near wells GW-3, BLM, and 59766 (i.e., the fault zone may be a preferred flow pathway that drains the deposit area).

2.9.2.4 Aquifer Hydraulic Properties

Aquifer hydraulic properties in the vicinity of the Project were estimated from aquifer pumping tests conducted during the late 1980s and early 1990s and more recently on 59762, GMW17-32 and GMW17-33 in 2017. The latter wells are located near the Project. Detail of the historic and recent pumping tests are included in the Groundwater Reports (Appendix B9). Overall, the historic and recent aquifer testing indicates that portions of the aquifer with higher transmissivity occur locally in the vicinity of the pumping wells and that, as testing progresses over time, lower transmissivity regions are encountered based on negative boundary effects. These results suggest the conductive portions of the aquifer system are either compartmentalized or limited, with flow provided to wells initially via permeable zones (i.e., sand, sandstone, fractured basalt, etc.) that are limited in spatial extent.

Hydraulic conductivity in the Study Area increases to the north away from the deposit, likely due to decreasing silicification with distance from the deposit area. Testing of the most northern well, PW-4, suggests a hydraulic conductivity of approximately 3 ft per day (ft/d). Testing of PW-1, near the deposit, suggests a hydraulic conductivity 100 times lower, approximately 0.03 ft/d. The deep wells 59762 and GMW17-32 exhibit low transmissivity and hydraulic conductivity assumed to representative of the silicified sediments at or near the deposit area, with hydraulic conductivities ranging from 0.0004 ft/d (GMW17-32) to 0.02 ft/d (59762). Estimates of hydraulic conductivity are sensitive to the assumed saturated aquifer thickness, with lower values obtained for thicker saturated aquifer extents. For the deep wells, the aquifer thickness is difficult to estimate as there is no information from drilling or lithology to develop an estimate. Based on previous investigations, aquifer thickness typically has been estimated on the order of 200 ft to 300 ft.

Drilling, test pumping, water level monitoring, and geophysical data all indicate that average hydraulic conductivities and corresponding aquifer transmissivities in the vicinity of the Project are very low. As a result, groundwater flow into the proposed Mine workings should also be low.

2.9.2.5 Water Quality

Well and spring water quality results were compared to both primary drinking water standards and secondary drinking water standards as part of the Groundwater Baseline Study. The primary drinking water standards are legally enforceable standards due to potential human health concerns and are expressed as maximum contaminant levels (MCLs). The MCL is the highest level of an analyte allowed in drinking water. Secondary drinking water standards are non-enforceable recommended standards established to limit cosmetic or aesthetic effects (not health-related) in drinking water, expressed as secondary maximum contaminant levels (SMCLs). Spring water quality data is also compared to ODEQ water quality standards as described in OAR 340-041.

Arsenic is present in groundwater within the Grassy Mountain vicinity. Concentrations exceeded the MCL at all of the 15 sampled well locations and at eight of the ten sampled spring locations. Arsenic concentrations greater than three times the 0.010 mg/L MCL are common in groundwater within the basin. Naturally occurring elevated arsenic concentrations in groundwater are often associated with areas that have undergone hydrothermal alteration, which is well-documented to have occurred within the Study Area (see Section 2.7 of this CPA and in the *Geology and Soils Baseline Characterization Report* [Appendix B7]).

Other exceedances of MCLs included antimony (two samples), chromium (GMW17-32 prior to additional development), and lead (three samples, including one from GMW17-32 prior to additional development). Numerous samples from wells and springs exceeded the drinking water SMCLs for aluminum, iron, manganese, TDS, and sulfate. Most, but not all, exceedances for aluminum and iron appear to be associated with sediment in groundwater samples.

Groundwater within the Grassy Mountain vicinity exhibits three different geochemical types (Ca-HCO_3, Na/K-HCO_3, or Na/K-SO_4). The spatial distribution of the different water quality types is presented in Figure G5 in Appendix B9, Volume I. The predominant water types appear to have a spatial distribution attributed to local geologic conditions and areas of recharge/discharge. Predominantly Ca-HCO_3 water types are noted at wells to the east of proposed Grassy Mountain Mine that are generally completed in basalt and at springs to the northeast. Groundwater at wells located directly downgradient of the proposed Grassy Mountain Mine and near the highly silicified areas exhibit Na/K-SO_4 water types. The wells and springs located in the northern and western areas of the Study Area exhibit Na/K-HCO_3 water types. The presence of calcium may be attributed to areas with basalt deposits, and sodium may be associated with volcanic tuff and sedimentary deposits. Sulfate in the area immediately downgradient and in the immediate vicinity of the mineralized ore body is attributed to oxidation and leaching of sulfides in the mineralized zone.

The wells downgradient of or within the deposit area that have Na/K-SO4 geochemical type (BLM, 59766, GMW17-32, GMW17-33, 59763, and 59762) also exhibit elevated concentrations of arsenic, iron, manganese, boron, molybdenum, and nickel relative to other baseline monitoring locations. The results of the *Baseline Geochemical Characterization Report* (Appendix B6) demonstrate that these constituents leach from ore and waste rock collected in the deposit area. The geochemical signature at these wells (the particular suite of elevated constituent concentrations) indicates the influence of the mineralized deposit area on water quality.

The pH at the BLM well and to a lesser degree at 59766 is also slightly depressed relative to other monitoring locations (6 to 7.9 versus typically >8). The BLM well also has the highest arsenic concentrations in the Study Area (ranging from 1.46 to 4.54 mg/L; i.e., >100x the MCL of 0.01 mg/L), as well as the highest dissolved iron and manganese, TDS, and sulfate levels. Well 59766 also has concentrations of these constituents significantly elevated above concentrations measured at locations away from the mineralized deposit area. The water chemistry conditions at these two wells support the hypothesis of a preferred groundwater flow path along a fault zone extending northwest from the deposit area described in Section 2.9.2.4 above.

Overall, the results of the Groundwater Baseline Study indicate that groundwater quality is poor throughout the Study Area (arsenic exceeds the MCL at nearly every location). The results also indicated degraded water quality downgradient of the mineralized zone (significantly higher sulfate, TDS, arsenic, manganese, and iron and, at two locations, slightly depressed pH) is a baseline condition.

2.9.3 MINE DEWATERING AND GROUNDWATER PRODUCTION

Underground Mine workings developed as part of the proposed Grassy Mountain Mine will intercept the regional water table and require dewatering. Pumping from wells outside the Mine area to supply Mine water demands will result in water table drawdown outside of the Mine. While they are not part of characterization of the existing environment or baseline conditions, the *Groundwater Baseline Study* also includes an assessment of potential impacts due to production of groundwater for Mine use and estimates of dewatering rates for the proposed Mine using three-dimensional groundwater flow models. The details of the modelling are described in Volume III of the Groundwater Baseline Study (Appendix B9). The results are summarized below.

2.9.3.1 Mine Dewatering

Theoretical groundwater inflow rates into the Mine workings are on the order of 20 gpm to 100 gpm for sustained pumping, and up to 500 gpm for short-durations when larger water-bearing fracture sets are intercepted. Actual inflow rates of several tens to a few hundred gpm should be anticipated based on median aquifer parameters and model assumptions. Based on drilling observations (within the resource) and aquifer testing performed (outside the resource) to date, the higher-end range of potential inflow rates (associated with higher hydraulic conductivity) are unlikely to be encountered during mining activities and, if encountered, the associated high dewatering rates would be anticipated for relatively short durations (i.e., likely on the order of days or weeks). Due to the proposed underground mining approach, the entire groundwater table will not be intercepted at once. Rather, the exposure to groundwater is anticipated to be restricted to subsurface workings that encounter groundwater; where groundwater is present, such inflow can be managed or mitigated as the conditions arise.

The lower range of inflow rates represents longer-term predicted dewatering as steady-state conditions are approached and reflects lower overall permeability of the aquifer system over a greater area (and likely within the resource). The higher inflow rates reflect shorter-duration flow rates resulting from dewatering of zones with higher permeability that appear to be laterally discontinuous throughout the area based on borehole drilling and aquifer testing. Based on borehole drilling and well (aquifer) testing performed in the vicinity of the ore body, higher permeability areas are thought to more likely be encountered away from the silicified ore body (i.e., to the north of the ore deposit and in basin areas characterized by greater amounts of sediment as compared to silicified and/or competent bedrock deposits). Direct long-term testing of aquifer properties within the ore body has not been performed to date as verification, but extensive anecdotal evidence from mineral exploration drilling and the drilling on GMW18-34 supports the concept of low permeability materials within the near vicinity of the ore body.

The Groundwater Baseline Study includes an independent assessment of Mine dewatering rates, also using computer groundwater flow modeling, by Lorax Environmental. This independent assessment estimates that the dewatering rates will be in the range of 10 to 80 gpm. The best calibration of the Lorax model was achieved with a somewhat higher hydraulic conductivity for a fault zone oriented toward the northwest from the deposit area, and the dewatering rate estimated from this configuration of the model ranged from 65 to 80 gpm.

2.9.3.2 Groundwater Production

Potential water level impacts caused by groundwater pumping for Mine water supply were assessed based on an assumed water demand of 320 gpm for ten years. Currently, the estimated demand is more on the order of 50 gpm (see Section 3.6 of this CPA), so the results are conservative. The water level changes are projected to range from approximately zero to 12 ft of drawdown at the named spring closest to the main production wells (Lowe Spring). The high end of impact is possible if Lowe Spring is directly connected to the Grassy Mountain Formation aquifer from which the water is being produced, and there are no compartmentalization affects caused by faulting. Drawdown effects are observed up to approximately 2 miles from the current highest producing well (PW-4), using a threshold of 0.5 ft of drawdown.

2.10 LAND USE – OAR 632-037-0055(l), OAR 632-037-0077(11)

The *Grassy Mountain Mine Project Land Use Baseline Report* (Appendix B10) was submitted to DOGAMI on January 26, 2018. The report was accepted by the TRT on July 19, 2018, as conforming to the *Environmental Baseline Study Work Plans* (EM Strategies, 2017; Appendix B23), which were accepted by the TRT on December 7, 2017. Seventy-one percent of the land in Malheur County is federal land that is administered by the BLM (Oregon Partnership for Disaster Resilience [OPDR], 2014). The 2002 Southeastern Oregon Resource Management Plan and Record of Decision (SEORMP) indicates that the Land Use Study Area does not include any BLM administered land that the BLM has identified for disposal. The SEORMP shows that the Land Use Study Area supports the Oregon-Idaho Graben, which is an area that the USGS identifies as most likely to contain large gold deposits. A BLM-identified transportation and utility corridor passes along the southern limit of the Land Use Study Area. There is one recreation area near the Land Use Study Area, a primitive campground at Twin Springs. Dispersed recreation is allowed throughout the Land Use Study Area. The SEORMP indicates that the mining and processing proposed as part of the Project would be an allowable use of BLM-administered land.

The Land Use Study Area is zoned Exclusive Range Use (ERU) and Exclusive Farm Use (EFU) in the Malheur County Code (MCC). The County's land use zone maps reflect these designations (C-A1: EFU, and C-A2: ERU). The Oregon Revised Statutes 215.283 and 215.296 define the allowable uses on ERU designated land; allowable uses are reiterated in the MCC. In some cases, the allowable uses are conditional and must receive a conditional use authorization from the County within which the ERU land is located. The County approved Calico's Conditional Use Permit on May 23, 2019 (Appendix E1). Land in and near the Land Use Study Area is currently used for grazing and dispersed recreation and supports an existing road network that provides local access. Grazing is a farm use and is allowed by right in the Land Use Study Area. The state and local statutes do not address dispersed recreation (the MCC addresses developed recreation facilities such as parks and playgrounds). Most of the land is administered by the BLM, so dispersed recreation is managed in accordance with BLM policies.

The BLM has not yet identified any potential issues with the SEORMP or other specific requirements for implementing the portions of the Project that are on BLM-administered land and subject to BLM authorization. Mining and accessory infrastructure proposed as part of the Project is an allowed use of BLM-administered land in and near the Land Use Study Area if the Project can be developed in a manner that protects other sensitive resources, per the SEORMP energy and mineral resource objectives. A review of the resource information and SEORMP indicates that the Land Use Study Area does not support any areas of critical environmental concern, wild and scenic rivers, wilderness study areas, sage grouse lek sites, or riparian conservation areas. Information in the SEORMP indicates that portions of the Land Use Study Area are in or near areas that are open to mining but subject to operational timing limitations. Factors that would affect the operational timing limitations include proximity to occurrences of special status plants and mule deer winter range. Surveys of the Permit Area and a -2-mile radius did not locate any threatened or endangered species.

OAR 632 Division 37 requires the Project proponent to receive an operating permit from DOGAMI to establish the Mine and related processing facilities. A baseline study is one of several studies that the proponent must complete as part of its application for an operating permit. As it reviews the proposed Project, DOGAMI will identify potential issues, and the proponent would work with DOGAMI and other state agencies to address such issues, such as ensuring the proposed uses are compatible with surrounding land uses and develop and implement mitigation for potential conflicts, if necessary.

DOGAMI can only issue a permit if the proposed Project also receives local approval. In the case of this Project, the local approval involves upgrades to county-maintained roads. By working closely with the state and Malheur County, the proponent will develop an operating and reclamation plan that avoids or minimizes land use conflicts at the time of Mine operation and in the years following closure.

The most substantial potential for conflict with local land use policies and regulation is related to how the proposed Project would affect ongoing grazing use that is a by-right use of ERU-zoned land upon which the Project is located. All potential Project conflicts with ERU use would be addressed through the Project's permitting processes.

As it considers the proposed Project, the County will apply guidance in the Comprehensive Plan (relate Project findings to County policy and ordinances) and evaluate whether the proposed Project would not interfere with current ranching practices, and that it complies with the County code. The County approved the Conditional Use Permit on May 23, 2019 and issued the Land Use Compatibility Statement (LUCS) to Calico on July 30, 2019 (Appendix E1).

2.11 NOISE – OAR 632-037-0055(1)(k)

The *Grassy Mountain Mine Project Noise Baseline Report* (Appendix B11) was originally submitted to DOGAMI on October 5, 2018, then again on December 6, 2018, and February 13, 2019. The report was accepted by the TRT on March 1, 2019, as conforming to the *Environmental Baseline Study Work Plans* (EM Strategies, 2017; Appendix B23), which were accepted by the TRT on December 7, 2017. The following four ambient noise monitoring sites were chosen to represent the ambient noise environment in the Noise Study Area: Site A – an undeveloped location on BLM land approximately 170 ft west of Twin Springs Road and approximately 3 miles south of the intersection of Twin Springs Road and Cow Hollow Road; Site B – Lake Owyhee State Park, approximately 250 ft west of Fisherman Road (the access road into Indian Creek Campground) and approximately 600 ft south of the gate entrance into Indian Creek Campground; Site C – a site within the Mine and Process Area, approximately 375 ft southwest of the entrance gate and 150 ft west of an unnamed access road; and Site D – a residence located at 2025

Bishop Road, approximately 250 ft east of Russell Road. Table summarizes the ambient noise measurement results.

Table 14. Ambient Noise Summary (dBA)

Metric	L_{eq}	L_{max}	L_{min}	L_1	L_{10}	L_{50}
Site A: Undeveloped location along Twin Springs Road						
Daytime Minimum	27.2	49.4	17.4	35.8	26.6	19.2
Daytime Average	35.9	58.3	19.0	45.7	39.1	30.3
Daytime Maximum	49.0	73.8	24.8	59.8	53.2	40.0
Nighttime Minimum	20.6	40.2	17.1	27.7	19.7	17.8
Nighttime Average	29.1	51.4	19.0	38.2	31.0	24.8
Nighttime Maximum	39.8	65.4	22.3	50.1	43.5	37.5
Site B: Lake Owyhee State Park						
Daytime Minimum	22.4	37.9	17.3	29.4	25.0	20.3
Daytime Average	28.1	49.7	20.2	37.9	28.5	24.0
Daytime Maximum	41.6	71.9	26.3	54.7	37.3	35.2
Nighttime Minimum	19.3	32.1	17.2	23.4	20.3	18.1
Nighttime Average	29.9	45.4	23.6	34.9	32.1	28.3
Nighttime Maximum	38.1	55.8	31.4	48.6	43.7	37.0
Site C: Grassy Mountain Mine and Process Area						
Daytime Minimum	32.5	55.5	17.1	44.2	28.8	20.7
Daytime Average	40.4	67.3	20.6	51.7	40.7	31.2
Daytime Maximum	56.7	94.4	31.9	64.7	56.0	46.8
Nighttime Minimum	19.3	40.8	16.9	23.8	20.2	17.9
Nighttime Average	26.6	50.7	18.4	34.2	27.4	22.5
Nighttime Maximum	48.8	81.3	21.9	53.4	41.7	30.2
Site D: 2025 Bishop Road, Vale, Oregon						
Daytime Minimum	30.8	52.1	20.2	40.5	32.0	26.2
Daytime Average	37.8	60.0	24.5	47.1	39.8	33.2
Daytime Maximum	50.7	77.7	36.4	58.9	54.2	48.2
Nighttime Minimum	28.6	48.6	23.3	33.1	30.1	27.3
Nighttime Average	40.8	58.9	30.3	48.4	41.8	37.4
Nighttime Maximum	69.8	92.5	36.0	86.2	50.6	45.1

dBA = A-weighted decibel; L_{eq} = hourly average levels; L_{max} = hourly maximum levels; L_{min} = hourly minimum levels; L_1 = noise levels exceeded for 1 percent of each hour; L_{10} = noise levels exceeded for 10 percent of each hour; L_{50} = noise levels exceeded for 50 percent of each hour
Daytime = 7:00 A.M. to 10:00 P.M.
Nighttime = 10:00 P.M. to 7:00 A.M.

At Site A, the undeveloped location along Twin Springs Road, the primary noise contributors included atmospheric (wind) movement, vegetation movement caused by the wind, occasional vehicular traffic, and bird activity (song and movement).

At Site B, Lake Owyhee State Park, the primary noise contributors included atmospheric (wind) movement, vegetation movement caused by the wind, vehicular traffic, boating activity on the lake, occupied campground activity, and bird activity (song and movement). At night, an added contributor was insect activity around the lake and although audible, was not excessive in loudness nor duration and should not have an impact on the proposed ambient noise limits.

At Site C, within the Permit Area, the primary noise contributors included atmospheric (wind) movement, vegetation movement caused by the wind, and bird activity (song and movement). Although not necessarily quantifiable by the weather data obtained at ground level, some fluctuations in the measurement data can be explained by upper atmospheric wind gusts/turbulence. There were no anthropogenic noise sources in the vicinity of Site C when the measurements were taken.

At Site D, the residential site along Russell Road, the primary noise contributors included atmospheric (wind) movement, vegetation movement caused by the wind, vehicular traffic along Russell Road and some along Bishop Road, and agricultural activity including irrigation pumping equipment and field implements. On two separate occasions, an irrigation pump was in operation, at 6:00 A.M. on the second day and at 6:00 A.M. on the third day, both instances for less than a one-hour measurement interval. The noise contributions from the irrigation pump can be seen in the L_{10} data as a 3 decibel (dB) increase on the second day and a 5 dB increase on the third day, and in the L_{50} data as a one dB increase on the second day and a 3 dB increase on the third day. At 4:00 P.M. and 5:00 P.M. on the third day, a tractor worked in a field to the southwest of the irrigation pump. These noise contributions can be seen in the L_{10} data as a 7 dB to 12 dB increase, and in the L_{50} data as an 8 dB to 10 dB increase. Over the course of 72 single hour duration measurements at Site D, the irrigation pump only impacted two intervals, and the tractor activity also only impacted two intervals; therefore, noise from these two sources would only occur sporadically.

The results show that there is both diurnal variability and a reasonable amount of general variability from hour to hour within both the daytime and nighttime periods at all sites. L_{max} levels are typically higher during the daytime, indicating that the loudest noise sources are likely to be man-made sounds. Average daytime L_{eqs} are lowest at the Lake Owyhee State Park and highest in the proposed Mine and Process Area. Nighttime average L_{eqs} are lowest in the proposed Mine and Process Area and highest at the Bishop Road site. Average daytime and nighttime observed L_{50} levels at all sites range from approximately 22 dBA in the proposed Mine and Process Area to 37 dBA at the Bishop Road site.

Generally, noise levels in the Permit Area are low with L_{eq} levels at 57 dBA or below at all times, except for a nighttime spike at the residential site on Bishop Road, which occurred at 6:00 A.M. with the use of farming equipment near the road. The quietest site is at Lake Owyhee State Park, with the Mine and Process Area being the quietest during daytime hours, and the Bishop Road site being the loudest during nighttime hours. The calculated day-night noise levels (L_{dn}) at the residential site on Bishop Road was approximately 51 dBA for the first 48-hour period, with the calculated L_{dn} rising to 66 dBA on the third day due to the use of farming equipment.

A review of the lowest measured ambient noise levels indicates that only a few measured values approach the self-noise limits of the sound level meter (SLM). The SLM self-noise limit was measured at approximately 18 dBA. At three of the four monitoring locations (sites A, B, and C), the lowest nighttime L_{50} measured was between 17.8 dBA and 18.1 dBA. These values approach the self-noise limit of the SLM; therefore, actual ambient sound levels could have been quieter than the data indicate during those periods. However, at the two measurement locations that are near noise sensitive properties (Sites B and D), there were only three measured nighttime L_{50} values below 20 dBA (18.1, 19.0, and 19.2 dBA), all of which occurred at Site B. Only one of those hours approached the self-noise limit of the SLM, so the measurements are deemed to provide a valid representation of the existing ambient noise levels for the Project.

The representative ambient noise levels measured at the only two identified noise sensitive properties near the Noise Study Area are summarized in Table . The values in Table 16 were obtained using the statistical 5th percentile in each data category. The statistical 5th percentile was used rather than the L_{min} in each data category so that the representative levels would approach the lowest levels measured at each site without being biased by outlying quiet hours that occurred over the three-day measurement period. The proposed limits at the two sites (Table) are the representative ambient noise levels with the 10-dBA increase described in the ODEQ regulations.

Table 16. Representative Ambient Noise Levels Measured at Noise Sensitive Properties

Site	Daytime		Nighttime	
	L_{10}	L_{50}	L_{10}	L_{50}
Site B	25.6	22.4	21.3	19.1
Site D	34.0	26.7	30.2	28.1

Table 17. Proposed Ambient Noise Limits for the Project

Site	Daytime		Nighttime	
	L_{10}	L_{50}	L_{10}	L_{50}
Site B	35.6	32.4	31.3	29.1
Site D	44.0	36.7	40.2	38.1

2.12 OREGON NATURAL HERITAGE AREAS – OAR 632-037-0055(1)(q)(d), ORS 517.971(7)(o)

The *Grassy Mountain Mine Project Oregon Natural Heritage Resources Baseline Report* (Appendix B12) was submitted to DOGAMI on May 30, 2018. The report was accepted by the TRT on August 15, 2018, as conforming to the *Environmental Baseline Study Work Plans* (EM Strategies, 2017; Appendix B23), which were accepted by the TRT on December 7, 2017. There are no natural heritage resources in the Permit Area. The closest natural heritage resource to the Permit Area is the Succor Creek State Natural Area approximately 16 miles from the Permit Area. The next closest is the Crooked Creek State Natural Area approximately 61 miles from the Permit Area.

2.13 OUTSTANDING NATURAL AREAS – OAR 632-037-0055(1)(q)(c), ORS 517.971(7)(o)

The *Grassy Mountain Mine Project Outstanding Natural Areas Baseline Report* (Appendix B13) was submitted to DOGAMI on May 30, 2018. The report was accepted by the TRT on June 29, 2018, as conforming to the *Environmental Baseline Study Work Plans* (EM Strategies, 2017; Appendix B23), which were accepted by the TRT on December 7, 2017. The BLM list identifies only one Outstanding Natural Area (ONA) in Oregon: the Yaquina Head ONA, located along the coast in Newport, Oregon (BLM, 2016). Additional internet searches also identified the Diamond Craters ONA (BLM, 2018). The Diamond Craters ONA is located approximately 77 miles southwest of the Permit Area.

2.14 RECREATION

The *Grassy Mountain Mine Project Recreation Baseline Report* (Appendix B14) was submitted to DOGAMI on January 11, 2018. The report was accepted by the TRT on March 15, 2018, as conforming to the *Environmental Baseline Study Work Plans* (EM Strategies, 2017; Appendix B23), which were accepted by the TRT on December 7, 2017. The Recreation Opportunity Spectrum (ROS) is a BLM-created conceptual framework for recreation managers to inventory, plan, and manage recreation resources on BLM land. The ROS provides a way to characterize either the capability of a resource to provide an experience, or the demand for an experience in terms of the activity opportunity and setting opportunity provided or demanded. There are two ROS classes in the Recreation Study Area: Rural and Semi-primitive Motorized. These classes are described in Table .

Table 18. Recreation Opportunity Spectrum Classifications in the Recreation Study Area

Classification	Description
Rural	This is a substantially modified environment. Resource modifications and utilization practices are to enhance specific recreation activities. Facilities are designed for use by a larger number of people. Motorized use and parking opportunities are available. The probability of user interaction is moderate to high, as is the convenience of sites and opportunities. These factors are generally more important than the physical setting. Wildland challenges and testing of outdoor skills are generally important. Activities may include interpretive services, swimming, bicycling, recreation cabin use, and skiing.
Semi-primitive Motorized	This is a predominately natural or natural-appearing environment of moderate to large size. User interaction is low, but there is evidence of other users. Minimum on-site controls and restrictions may be present. Use of motorized vehicles is permitted. There is a moderate probability of experiencing isolation, closeness to nature, and self-reliance in outdoor skills. Activities may include boating, motor biking, specialized landcraft use, mountain climbing, driving for pleasure, camping, and picnicking.

Resource-dependent recreation use, including driving for pleasure, camping, picnicking, hiking, hunting, scenery viewing, nature studies, rockhounding, and all-terrain vehicle (ATV) use are all popular activities occurring within the Recreation Study Area. Twin Springs Campground is the only designated recreation site in the vicinity of the Study Area, and it is commonly used for dispersed recreation activities such as hunting, rockhounding, and ATV use; however, the campground is located outside the Recreation Study Area boundaries.

2.15 SOCIOECONOMICS – OAR-632-037-0055(1)(o)

The *Grassy Mountain Mine Project Socioeconomics Baseline Report* (Appendix B15) was submitted to DOGAMI on February 21, 2018. The report was accepted by the TRT on July 20, 2018, as conforming to the *Environmental Baseline Study Work Plans* (EM Strategies, 2017; Appendix B23), which were accepted by the TRT on December 7, 2017. The Socioeconomics Study Area is Malheur County, which includes the cities of Vale, Nyssa, Ontario, Adrian, Jordan Valley, and other unincorporated communities. Malheur County is Oregon's second largest county in the area but is largely undeveloped. The County is in the southeastern corner of the State of Oregon and is crossed by two major rivers, the Snake River and the Malheur River. Ninety-four percent of the County is undeveloped rangeland, most of which is federally administered by the BLM. Developed areas along the Snake and Malheur Rivers support agricultural production areas and agriculture-focused communities.

The County's population centers consist mostly of its incorporated cities (Ontario, Vale, Nyssa, Adrian, and Jordan Valley). Several unincorporated communities are also located within the County. Malheur County's population has grown slowly and includes periods of net population gain and loss.

Malheur County has a slightly higher percentage of people 18 years of age and younger than the State as a whole, but its proportion of residents age 65 and older is about the same as the State. Females make up a smaller proportion of the population than the State as a whole. The County is not very racially diverse; 86 percent of residents are white. Median household incomes are substantially lower in Malheur County than in the State as a whole, and median values of owner-occupied homes are lower in Malheur County than the State. Approximately 38 percent of residents have a high school diploma and approximately 34 percent have completed some college. The rates of residents having a high school diploma are higher than the State as a whole, but the rates of residents having completed some college are lower than the State as a whole. The rate of college graduates is lower than the State as a whole (U.S. Census Bureau, 2016e).

Most residents speak English at home. Approximately 24 percent of the County's residents primarily speak a foreign language, with Spanish the most prevalent. Approximately 32 percent of County residents identify themselves as being of Hispanic or Latino ethnicity (regardless of race). This rate is higher than the State, which reports a Hispanic or Latino proportion as approximately 12 percent of the total population.

The County has 11,629 housing units, with 88.5 percent occupied and 11.5 percent vacant. These rates are similar to those for the State as a whole. Of the occupied households in the County, 59.7 percent are owner-occupied, and 40.3 percent are renter occupied. Owner-occupied homes have a slightly higher average household size than renter-occupied units. Approximately 40 percent of all housing units are in Ontario (U.S. Census Bureau, 2016f). Single family housing units are the most common type of housing in the County, comprising approximately 65 percent of the total. Multifamily housing units make up approximately 17 percent and mobile homes comprise approximately 18 percent of the total units in the County.

The median age of Malheur County real estate is 41 years, which is only four years older than the national median age of 37 (Sperling's Best Places, 2017). Over half of the householders in the County and statewide have been in the same home since the 2000 through 2009 period. When compared to the state, Malheur County has a higher proportion of long-time householders in the same home (since 1980 or earlier) (U.S. Census Bureau, 2016f). The median home sale price peaked in February 2009 at $174,100 (Zillow, 2017). Most owner-occupied homes in the County are valued between $50,000 and $99,999, with the median home value being $127,000. These values are significantly lower than the same metrics for the state as a whole. The statewide median value is over $100,000 more at $237,300 (U.S. Census Bureau, 2016g).

The median rent for Malheur County ($604) is lower than the state median ($907). Most renters (approximately 63 percent) in the County pay between $500 and $999 per month. Statewide, most renters (about 51 percent) also pay between $500 and $999 per month. When compared to statewide renters, a larger proportion of Malheur County renters pay less than $500 per month (approximately 32 percent for County renters compared to approximately 9 percent of statewide renters) (U.S. Census Bureau, 2016f).

For 2016, the U.S. Census Bureau estimated that the total civilian labor force (people aged 16 years and older and able to work) in Malheur County was approximately 11,936 people. Of these people, most of the unemployed individuals were age 16 to 19 years; approximately 28 percent of this population was estimated to be unemployed. People aged 20 to 24 years had the second highest unemployment rate, with approximately 18 percent of them being unemployed. For people living in poverty, the unemployment rate was approximately 31 percent in 2016. For disabled persons, approximately 21 percent were unemployed in 2016 (U.S. Census Bureau, 2016h).

Malheur County October 2017 labor market information from the Oregon Employment Department (OED) shows that over-the-year employment increasing for manufacturing, professional/business services, retail trade, and mining/logging/construction services. The trends show reductions in private education/health services and local government (OED, 2017a). In 2016, the average annual wage was $33,851, which is the lowest of the three southeastern Oregon counties (Grant, Harney, and Malheur) (OED, 2017b).

The County does not provide water and sewer services. For unincorporated areas of the County, the Environmental Health Department issues on-site septic system permits, runs the Licensed Facility Program and Drinking Water Program, and oversees the County Solid Waste Program. The Cities of Ontario, Nyssa, and Vale provide specific services to their residents such as domestic water, wastewater, storm drain, and/or garbage collection services.

Fire protection in Malheur County is provided by the following districts, departments, and agencies: Ontario Fire & Rescue; Nyssa Fire Department; Vale Fire & Ambulance; Adrian Rural Fire Protection District; Jordan Valley Volunteer Fire Department; and BLM. The BLM has been integrated with the U.S. Forest Service since 1995 for fire and aviation management in the Pacific Northwest and is managed cooperatively between the two agencies and in close collaboration with the Pacific Northwest Wildfire Coordinating Group.

The Malheur County Sherriff's Office is the primary provider of law enforcement services to residents of Malheur County. The Ontario Police Department and Nyssa Police Department also provide law enforcement services to residents in those jurisdictions. The Oregon State Police (OSP) is a multi-disciplined organization that enforces traffic laws on state roadways, investigates and solves crime, conducts post-mortem examinations and forensic analysis, and provides background checks and law enforcement data. The OSP also regulates gaming, the handling of hazardous materials and fire codes, and educates the public on fire safety and enforce fish, wildlife, and natural resource laws (OSP, 2016).

The Malheur Education Service District (ESD) provides a supporting infrastructure to the local school districts. The Malheur ESD supports 10 local school districts containing 27 schools. These include eight high schools, three middle schools, nine elementary schools, and seven schools that service kindergarten through eighth grade (Malheur ESD, 2017).

2.16 SURFACE WATER – OAR 632-037-0055(1)(g), OAR 340-043-0030(2)(c), OAR 340-043-0030(2)(d), OAR 340-043-0030(2)(e)

The revised *Grassy Mountain Gold Project Surface Water Baseline Report* (Appendix B16) was submitted to DOGAMI on June 5, 2018, and again on August 14, 2018. The report was accepted by the TRT on January 14, 2019 as conforming to the *Environmental Baseline Study Work Plans* (EM Strategies, 2017; Appendix B23), which were accepted by the TRT on December 7, 2017. The Surface Water Resources Study Area was established to develop an environmental baseline for assessing potential impacts from Project facilities, potential impacts of surface runoff from Project facilities, and to provide background data on the Owyhee River and Lake. The Surface Water Resources Study Area includes the Mine and Process Area and two separate and non-contiguous, areas on the Owyhee River/Lake. One location is on the Owyhee River, 4 miles downstream of Owyhee Dam, and the other location is upstream of the dam and Permit Area on the Owyhee River/Lake at Leslie Gulch.

No perennial surface water features are located within the immediate vicinity of the Surface Water Resources Study Area; therefore, the following five surface water sampling sites were selected and consisted of the closest perennial surface water bodies:

- Dry Creek Arm of Lake Owyhee;
- Owyhee River downstream of Owyhee Dam;
- Owyhee River/Lake upstream of Owyhee Dam at Leslie Gulch;
- Negro Rock Canyon Creek at the northern border of Study Area; and
- Twin Springs Creek upstream of Dry Creek.

Lake Owyhee and the Owyhee River are the predominant drainage features for the region, flowing south to north and ultimately discharging to the Snake River near the Oregon-Idaho border. Lake Owyhee, created in 1932 with construction of the Owyhee River Dam, is approximately 6 miles southeast of the Project. Tributary stream flow is typically ephemeral or intermittent (Orr, Orr, and Baldwin, 1992; Baldwin, 1959). Drainages in the Project Area do not flow directly into the Owyhee River or Lake Owyhee.

The main Surface Water Resources Study Area boundary includes a sampling site on Dry Creek Arm of Lake Owyhee, downstream from where Dry Creek and Twin Springs Creek enter the lake. The Surface Water Resources Study Area also includes the two separate and non-contiguous, areas on the Owyhee

River/Lake: Owyhee River downstream of Owyhee Dam and Owyhee River upstream of Owyhee Dam at Leslie Gulch.

The Owyhee River/Lake sampling sites were selected to provide background surface water data in the vicinity of the Project. However, no impacts to Owyhee River/Lake are anticipated from the proposed Project because the Owyhee River drainage is in a different watershed than the Project site.

The Project is in the Sourdough Basin/Negro Rock Canyon watershed, which drains to the north. Grassy Mountain, located southeast of the Project, serves as the hydrologic divide between the Sourdough Basin/Negro Rock Canyon watershed and the watersheds draining to the Owyhee River.

The five surface water sites located within the Surface Water Resources Study Area were visited bi-annually during the second and fourth quarters of 2013 and the second quarter of 2014. Water quality samples were collected from four of these five sites during the three sampling events. Samples were not collected at Twin Springs Creek upstream of Dry Creek because this site was dry during each visit.

Surface water conditions were considered steady state and only one set of field parameters (pH, electrical conductivity, specific conductance, dissolved oxygen) were collected. The sensors for the pH meter, conductivity meter, and dissolved oxygen meter were placed directly in the surface water for data collection. Readings were recorded once the measurements stabilized.

Water-quality samples collected from surface water were analyzed for the list of approved water quality analytes. Table lists the approved analytes, as well as the laboratory testing method, the laboratory minimum detection limit (MDL), and the reporting limit (five times the MDL). For metals, samples for both total and dissolved metals were collected. For the other parameters, only total samples were collected.

Table 19. List of Water Quality Analytes

Parameter	Laboratory Method of Analyses	Detection Limit	Reporting Limit	Sample Type
Aluminum	EPA 200.7	0.03 mg/L	0.15 mg/L	total and dissolved
Arsenic	EPA 200.8	0.0002 mg/L	0.001 mg/L	total and dissolved
Barium	EPA 200.7	0.003 mg/L	0.015 mg/L	total and dissolved
Cadmium	EPA 200.8	0.0001 mg/L	0.0005 mg/L	total and dissolved
Calcium	EPA 200.7	0.1 mg/L	0.5 mg/L	total and dissolved
Chromium	EPA 200.8	0.0005 mg/L	0.002 mg/L	total and dissolved
Copper	EPA 200.8	0.0005 mg/L	0.0025 mg/L	total and dissolved
Iron	EPA 200.7	0.02 mg/L	0.05 mg/L	total and dissolved
Lead	EPA 200.8	0.0001 mg/L	0.0005 mg/L	total and dissolved
Magnesium	EPA 200.7	0.2 mg/L	1 mg/L	total and dissolved

Parameter	Laboratory Method of Analyses	Detection Limit	Reporting Limit	Sample Type
Manganese	EPA 200.8	0.0005 mg/L	0.0025 mg/L	total and dissolved
Mercury	1631E	0.2 ng/L	1.0 ng/L	total and dissolved
Nickel	EPA 200.8	0.0006 mg/L	0.003 mg/L	total and dissolved
Potassium	EPA 200.7	0.2 mg/L	1.0 mg/L	total and dissolved
Selenium	EPA 200.8	0.0001 mg/L	0.0005 mg/L	total and dissolved
Silver	EPA 200.8	0.00005 mg/L	0.00025 mg/L	total and dissolved
Sodium	EPA 200.7	0.2 mg/L	1.0 mg/L	total and dissolved
Zinc	EPA 200.7	0.01 mg/L	0.05 mg/L	total and dissolved
Antimony	EPA 200.8	0.0004 mg/L	0.002 mg/L	total and dissolved
Beryllium	EPA 200.8	0.00005 mg/L	0.00025 mg/L	total and dissolved
Bismuth	EPA 200.7	0.04 mg/L	0.2 mg/L	total and dissolved
Boron	EPA 200.8	0.01 mg/L	0.05 mg/L	total and dissolved
Cobalt	EPA 200.8	0.00005 mg/L	0.00025 mg/L	total and dissolved
Gallium	EPA 200.7	0.1 mg/L	0.5 mg/L	total and dissolved
Lithium	EPA 200.7	0.008 mg/L	0.04 mg/L	total and dissolved
Molybdenum	EPA 200.8	0.0005 mg/L	0.0025 mg/L	total and dissolved
Scandium	EPA 200.7	0.1 mg/L	0.5 mg/L	total and dissolved
Strontium	EPA 200.7	0.005 mg/L	0.03 mg/L	total and dissolved
Thallium	EPA 200.8	0.0001 mg/L	0.0005 mg/L	total and dissolved
Tin	EPA 200.8	0.0001 mg/L	0.0005 mg/L	total and dissolved
Titanium	EPA 200.7	0.005 mg/L	0.025 mg/L	total and dissolved
Vanadium	EPA 200.8	0.0002 mg/L	0.001 mg/L	total and dissolved
Uranium	EPA 200.8	0.0001 mg/L	0.0005 mg/L	total and dissolved
Nitrate+Nitrite (as N)	EPA 353.2	0.02 mg/L	0.1 mg/L	total
Ammonia Direct (as N)	EPA 350.1	0.05 mg/L	0.25 mg/L	total
Alkalinity	SM 2320B	2 mg/L	10 mg/L	total
Bicarbonate	SM 2320	2 mg/L	10 mg/L	total
Carbonate	SM 2320	2 mg/L	10 mg/L	total
Chloride	EPA 300.0	0.5 mg/L	2.5 mg/L	total

Parameter	Laboratory Method of Analyses	Detection Limit	Reporting Limit	Sample Type
Conductivity	SM 2510B	1 µmhos/cm	5 µmhos/cm	total
Cyanide, Total	EPA 335.4	0.003 mg/L	0.015 mg/L	total
Cyanide, WAD	SM 4500	0.003 mg/L	0.015 mg/L	total
Fluoride	EPA 300.0	0.05 mg/L	0.25 mg/L	total
Hardness	SM 2340B	0.8 mg/L	4.0 mg/L	total
pH	SM 4500-H B	0.1	0.5	total
Sulfate	EPA 300.0	0.5 mg/L	2.5 mg/L	total
Total Dissolved Solids	SM 2540C	10 mg/L	50 mg/L	total
Total Suspended Solids	SM 2540D	5 mg/L	25 mg/L	total
Total Phosphorus	EPA 365.1	0.01 mg/L	0.05 mg/L	total

mg/L = milligrams per liter; ng/L = nanograms per liter; µmhos/cm = micromhos per centimeter

Out of the five surface water sites that were visited bi-annually that serve as background water quality monitoring locations, flow was only directly measured at one of these sites during the sampling period, Negro Rock Canyon Creek. At the three Lake Owyhee/River sites, flow could not be directly measured. Instead, flow was estimated from available USGS gauging sites, and lake elevation was obtained for the Dry Creek Arm site above Owyhee Dam from the Bureau of Reclamation. Flow and lake elevation data are summarized in Table . Flow data for the Owyhee River downstream of Owyhee Dam was obtained from USGS gauge 13183000, located 0.8 mile downstream of the dam (located between the dam and the sampling site).

Table 20. Flow and Elevation Data from Surface Water Sites

Quarter (Q)	Parameter	Negro Rock Canyon Creek	Dry Creek Arm of Lake Owyhee	Owyhee River Downstream of Owyhee Dam	Owyhee River Upstream of Owyhee Dam at Leslie Gulch
Q2 2013	Date/Time	6/26/13 12:00	6/27/13 14:20	6/26/13 17:00	6/27/13 9:00
Q2 2013	Flow (cfs)	0.04	N/A	152	119
Q2 2013	Elevation (ft)	N/A	2,622.22	N/A	2,622.22
Q4 2013	Date/Time	11/21/13 14:55	11/23/13 15:50	11/20/13 15:10	11/20/13 11:00
Q4 2013	Flow (cfs)	0.01 – 0.02	N/A	21	141
Q4 2013	Elevation (ft)	N/A	2,597.13	N/A	N/A
Q2 2014	Date/Time	6/24/14 10:55	6/23/14 15:20	6/19/14 15:45	6/19/14 12:30
Q2 2014	Flow (cfs)	0.01 – 0.02	N/A	165	105
Q2 2014	Elevation (ft)	N/A	2,602.69	N/A	N/A

ft = feet; cfs = cubic feet per second; N/A = not applicable

Flow data for the Owyhee River upstream of Owyhee Dam at Leslie Gulch was obtained from USGS gauge 13181000, identified as Owyhee River near Rome, Oregon. This gauge is approximately 50 river miles upstream of the sampling location but is the closest gauge upstream of the dam. Flow data from this gauge, therefore, is not a reliable representation of flow at the sampling site. However, flow at this gauging location does provide a reference point to associate with the sampling event and may be used to identify relationships between flow and water quality data as additional flow and water quality are collected. The Owyhee Dam at Leslie Gulch sample site is within the pool of Lake Owyhee at high lake levels. At lower lake levels, the Owyhee River flows past the site. During the Q2 2013 event, the sample site was within the backwater of Lake Owyhee. During the Q4 2013 and Q2 2014 events, the Owyhee River was flowing at Leslie Gulch.

Field water quality data collected during surface water sampling are presented in Table and represent the complete field water quality dataset, as only one set of field parameters were measured.

Table 21. Field Water Quality

Site Name	Sampling Period	pH S.U.	EC µS/cm	SC µS/cm at 25 °C	Temp C	DO mg/L	DO Saturation %
Dry Creek Arm of Lake Owyhee	Q2 2013	8.74	230	243	22	8.5	113
	Q4 2013	7.92	217	328	7.3	11.0	100
	Q2 2014	8.57	263	275	22.8	8.7	112
Negro Rock Canyon Creek	Q2 2013	6.86	395	482	15.4	4.2	49
	Q4 2013	7.23	ND	592	9.9	5.71	50
	Q2 2014	7.35	393	490	14.6	6.6	78
Owyhee River Downstream of Owyhee Dam	Q2 2013	8.67	187	239	13.3	10.7	116
	Q4 2013	8.84	187	292	6.1	11.8	105
	Q2 2014	8.81	230	289	14.3	10.4	116
Owyhee River Upstream of Owyhee Dam at Leslie Gulch	Q2 2013	8.08	330	349	22.1	8.0	99
	Q4 2013	8.43	239	357	7.7	10.2	95
	Q2 2014	8.59	306	351	18.2	8.00	99

µS/cm = microSiemens per centimeter; S.U. = significant unit

The pH of the Owyhee River and Lake Owyhee sampling sites consistently ranged between 8.0 and 9.0. The pH of Negro Rock Canyon Creek was lower, ranging from 6.86 to 7.35.

The specific conductance of the Owyhee River and Lake Owyhee sites ranged between 239 and 357 µS/cm at 25 °C. Negro Rock Canyon Creek had consistently higher values, ranging from 482 to 592 µS/cm at 25 °C.

The dissolved oxygen concentration at the Dry Creek Arm and Owyhee River upstream of Owyhee Dam at Leslie Gulch ranged between 8 and 11 mg/L, with values above 10 mg/L during the 4th Quarter of 2013 (November). The Owyhee River downstream of Owyhee Dam had higher dissolved oxygen concentrations, ranging from 10.4 to 11.8 mg/L, with the higher value measured during the 4th Quarter of 2013. Dissolved oxygen is higher when water temperature is lower. The dissolved oxygen concentrations measured at Negro Rock Canyon Creek were lower than the Owyhee River sites, with values ranging from 4.2 to 6.6 mg/L. The percent oxygen saturation was consistently at or above 100 percent at the Owyhee River sites but ranged from 49 to 78 percent at Negro Rock Canyon Creek.

Surface water analytical results were compared to ODEQ water quality standards as described in OAR 340-041. Water quality in the Owyhee Basin is managed to protect the designated beneficial uses including public and private domestic water supply, fish and aquatic life, and fishing.

For the aquatic life criteria, the standards are presented as Criterion Maximum Concentration (CMC) and Criterion Continuous Concentration (CCC), which indicate the maximum allowable average 1-hour and 96-hour average contaminant concentrations, respectively. Sampling results were compared to both the CMC and CCC values.

Human health criteria (HHC) are presented as "organism only" for areas in which fishing is the designated use and as "water + organism" for areas in which water supply and fishing are designated uses. In the Owyhee Basin, designated beneficial uses include water supply and fishing so the "water + organism" criteria apply.

The water quality results collected at each site for each parameter are included in the *Surface Water Baseline Report* (Appendix B16). Table displays the results that exceeded ODEQ's water quality standards.

Table 22. Water Quality Results

Sample Location	Arsenic, dissolved (mg/L) (CMC – 0.34, CCC – 0.15, HHC – 0.0021)			Arsenic, total (mg/L) (CCC – 0.34, CCC – 0.15, HHC – 0.0021)			Iron, total (mg/L) (CCC – 1.0)			Mercury, total (mg/L) (CMC – 2,400, CCC – 12.0)		
	Q2 2013	Q4 2013	Q2 2014	Q2 2013	Q4 2013	Q2 2014	Q2 2013	Q4 2013	Q2 2014	Q2 2013	Q4 2013	Q2 2014
Dry Creek Arm	0.0057	0.0072	0.0063	0.0057	0.0076	0.0064	--	1.16	1.45	--	--	--
Negro Rock Creek	0.0246	0.0231	0.0258	0.0243	0.0237	0.0268	--	--	--	--	--	--
Owyhee River DS	0.0059	0.0059	0.0063	0.0054	0.0059	0.0061	--	--	--	--	--	--
Leslie Gulch	0.0111	0.01	0.011	0.0114	0.0102	0.0108	1.15	--	1.22	23	13.2	19.9

Arsenic was the only water quality parameter where the HHC standard was exceeded at any of the surface water sampling sites. Arsenic was detected above the HHC limit of 0.0021 mg/L at all four of the surface water sampling sites during each of the three sampling events. Negro Rock Canyon Creek and Owyhee River upstream of the dam at Leslie Gulch consistently had the highest arsenic concentrations. At Negro Rock Canyon Creek, the total arsenic concentrations were consistent, ranging from 0.0237 to 0.0268 mg/L. At Leslie Gulch, the total arsenic concentrations were consistent but lower compared to Negro Rock Canyon Creek, ranging from 0.0102 to 0.0114 mg/L.

Total iron was detected above the aquatic life CCC standard of 1.0 mg/L on two occasions at both the Dry Creek Arm of Lake Owyhee and at the Owyhee River upstream of the Owyhee Dam at Leslie Gulch. At Dry Creek Arm, the first exceedance was 1.16 mg/L during the 4th Quarter of 2013 and the second exceedance was 1.45 mg/L during the 2nd Quarter of 2014. For the Leslie Gulch sampling location, the total iron concentration was 1.15 mg/L during the 2nd Quarter of 2013 and 1.22 mg/L during the 2nd Quarter of 2014.

Total mercury was detected above the aquatic life CCC standard of 12.0 mg/L at Leslie Gulch during all three of the surface water sampling events. Mercury was detected at 23 mg/L during the 2nd Quarter of 2013, 13.2 mg/L during the 4th Quarter of 2013, and 19.9 mg/L during the 2nd Quarter of 2014.

2.17 TERRESTRIAL VEGETATION – OAR 632-037-0055(1)(a)

The *Grassy Mountain Mine Project Terrestrial Vegetation Baseline Report* (Appendix B17) was originally submitted to DOGAMI on January 29, 2018, then again on October 2, 2018. The report was accepted by the TRT on October 23, 2018, as conforming to the *Environmental Baseline Study Work Plans* (EM Strategies, 2017; Appendix B23), which were accepted by the TRT on December 7, 2017. Field surveys were conducted in a portion of the Terrestrial Vegetation Study Area by HDR in 2014 and 2015 (2014/2015 Survey Area). Additional field surveys were conducted in the remaining portion of the Terrestrial Vegetation Study Area by EM Strategies in 2017 (2017 Survey Area). Between the field surveys conducted in 2015 and 2017, there were six field-verified vegetation communities documented in the Terrestrial Vegetation Study Area: Agricultural; Bluebunch Wheatgrass/Cheatgrass/Annual; Burned Yellow Rabbitbrush/Bluebunch Wheatgrass; Crested Wheatgrass Seeding; Wyoming Big Sagebrush/Bluebunch Wheatgrass; and Wyoming Big Sagebrush/Crested Wheatgrass.

There were four transects established in the Wyoming Big Sagebrush/Crested Wheatgrass community during the 2014/2015 field surveys in the Terrestrial Vegetation Study Area, and three additional transects established during the 2017 field surveys, one each in the Bluebunch Wheatgrass/Cheatgrass/Annual community, the Crested Wheatgrass Seeding community, and the Wyoming Big Sagebrush/Crested Wheatgrass community. These transects were established to verify the mapped vegetation communities.

There were seven Daubenmire sampling locations established during the 2014/2015 field surveys in the Terrestrial Vegetation Study Area; six within the Wyoming Big Sagebrush/Bluebunch Wheatgrass community and one within the Crested Wheatgrass Seeding community. Seven additional Daubenmire sampling locations were established during the 2017 field surveys; two within the Bluebunch Wheatgrass/Cheatgrass/Annual community, one within the Crested Wheatgrass Seeding community, two within the Wyoming Big Sagebrush/Bluebunch Wheatgrass community, one within the Burned Yellow Rabbitbrush/Bluebunch Wheatgrass community, and one within the Wyoming Big Sagebrush/Crested Wheatgrass community. These sampling locations were established to determine the dominant plant species within each community.

The USFWS Information for Planning and Consultation species list reported that no federal threatened or endangered plant species are known to occur within the 2017 Survey Area. No federally threatened or endangered plant species were observed during the 2017 field surveys, or during the HDR 2014/2015 surveys.

A list of rare, threatened, and endangered plants was obtained from the Oregon Biodiversity Information Center in April 2017 for the 2017 Survey Area. Two plant species were reported to occur within 2 miles of the Terrestrial Vegetation Study Area: Cronquist's stickweed (*Hackelia cronquistii*), a State Threatened species and a federal Species of Concern; and Mulford's milk-vetch (*Astragalus mulfordiae*), a State Endangered species and a federal Species of Concern. No State-listed species were observed during the 2017 or 2014/2015 field surveys.

The Final Oregon/Washington State Director's Special Status Species List, July 13, 2015, which lists BLM sensitive plant species suspected or documented to occur with the Vale District was reviewed. No BLM sensitive plant species were observed during the 2017 or 2014/2015 surveys.

A list of noxious weeds for Malheur County, Oregon, was obtained from the Malheur County Weed Advisory Board. Malheur County has prioritized control and/or eradication of noxious weeds by A, B, and C classes, with Class A having the highest priority. Two noxious weed species were observed during the 2017 surveys: nodding thistle (*Carduus nutans*), a Class B species observed along the northern portion of the 2017 Terrestrial Vegetation Study Area in the Access Area; and cheatgrass (*Bromus tectorum*), the most dominant species observed throughout the Terrestrial Vegetation Study Area. The following species were observed during the 2014/2015 surveys: Austrian peaweed (*Sphaerophysa salusula*), a Class A species observed adjacent to the Access Area; Canada thistle (*Cirsium arvense*), a Class B species observed near the northern portion of the Mine and Process Area; and three class C species – cheatgrass, medusahead (*Taeniatherum caput-medusae*), and field bindweed (*Convoculus arvensis*). Class A species are subject to mandatory control/eradication where found. Class B species are required to be controlled within 50 ft of all property lines, easements, and rights-of-way. Class C species can be treated at the landowner's discretion.

2.18 TRANSPORTATION

The *Grassy Mountain Mine Project Transportation Baseline Report* (Appendix B18a) was originally submitted to DOGAMI on January 18, 2018, then again on July 12, 2018. The report was accepted by the TRT on July 19, 2018, as conforming to the *Environmental Baseline Study Work Plans* (Appendix B23; EM Strategies, 2017; Appendix B23), which were accepted by the TRT on December 7, 2017. The Main Access Road used for the Transportation Study Area includes portions of U.S. Highways 20 and 26 (U.S. 20 and U.S. 26, respectively), County-maintained Russell Road, and BLM-maintained Cow Hollow Road and Twin Springs Road.

Mine Development Associates (MDA) provided an estimate on November 13, 2018 (Appendix B18b) for the amount of Mine traffic that would use the access road from Vale, Oregon, to the Mine site. This information was provided for use in a traffic study to determine the design requirements for the access road and to document the estimated Mine traffic along the access road. The estimate excludes any Mine traffic associated with the construction of the Mine and does not include any public traffic not related to the mining activities.

On January 25, 2019, Clemow Associates LLC provided a transportation analysis letter (Appendix 18c) to support the Project, including: property description and background information, development trip generation, consideration of transportation policies, and summary of conclusions.

An emergency access route has been identified as a portion of Oregon State Route 201, and County-owned Mitchell Butte Road and Owyhee Avenue. Owyhee Avenue is part of the main access to Owyhee Reservoir, which is a popular destination for recreationists. The emergency access route would share approximately 4 miles of Owyhee Avenue with this type of recreation-focused traffic.

Oregon Department of Transportation (ODT) traffic count data from 2015 show that the average annual daily traffic (AADT) for U.S. 20 and U.S. 26 through Vale ranges between 2,501 and 5,000 vehicles. The volume decreases east and west of Vale and ranges between 1,001 to 2,500 AADT. An ODT traffic counter located west of the point where the main access route intersects U.S. 20 shows an AADT of approximately 1,900 for 2015 (ODT, 2017).

In coordination with the Malheur County surveyor, traffic counts (PicoCount 2500, Version 2.25) were taken at two locations in the Transportation Study Area in fall 2014 and again in spring 2015 to record existing two-way road and trail usage on Russell Road and Twin Springs Road. The traffic counters do not reliably record lighter vehicles, like all-terrain vehicles and dirt bikes, so the data can only be said to reflect full-size vehicles. Table summarizes the data collected.

Table 23 Traffic Count Data in the Transportation Study Area

Counter Number	Location	X Coordinate	Y Coordinate	Data Gathering Start Date	Data Gathering End Date	Total Recorded Vehicles
1	Russell Road (fall 2014)	475475	4862111	9/21/14	10/22/14	2,591
	Russell Road (spring 2015)			4/7/15	4/16/15	413
2	Twin Springs Road (fall 2014)	471910	4840599	9/21/14	10/22/14	564
	Twin Springs Road (spring 2015)			4/7/15	4/16/15	27

Note: coordinates are in NAD 83, UTM Zone 11 North, meters

2.19 VISUAL RESOURCES

The *Grassy Mountain Mine Project Visual Resources Baseline Report* (Appendix B19) was submitted to DOGAMI on December 22, 2017. The report was accepted by the TRT on February 28, 2018, as conforming to the *Environmental Baseline Study Work Plans* (EM Strategies, 2017; Appendix B23), which were accepted by the TRT on December 7, 2017. The BLM's Visual Resources Management (VRM) system provides a method to identify visual resource values, establishes objectives for managing these values, and provides information to evaluate the visual effects of the proposed projects on public lands. The inventory of visual values combines evaluations of scenic quality, sensitivity levels, and distance zones to establish visual resource inventory classes, which are "informational in nature and provide the basis for considering visual values in the land use planning process. They do not establish management direction and should not be used as a basis for constraining or limiting surface disturbing activities" (BLM, 1986).

VRM classes are typically assigned to public land units through the use of the visual resource inventory classes in the BLM's land use planning process. Two out of four VRM classes occur in the Visual Resources Study Area. Table displays the two classes and the objectives of each class.

Table 24. BLM Visual Resources Management Classes in the Visual Resources Study Area

VRM Class	Description
III	The objective of this class is to partially retain the existing character of the landscape. The level of change to the character should be moderate. Management activities may attract attention but should not dominate the view of the casual observer. Changes should repeat the basic elements found in the predominant natural features of the characteristic landscape.
IV	The objective of this class is to provide for management activities which require major modification of the existing character of the landscape. The level of change to the characteristic landscape can be high. Management activities may dominate the view and be the major focus of viewer attention. However, every attempt should be made to minimize the impact of these activities through careful location, minimal disturbance, and repeating the basic elements.

Four key observation points (KOPs) were chosen to describe the existing visual elements within the Visual Resources Study Area in the context of form, line, color, and texture associated with the characteristic landscape, and to capture views that represent the existing landscape where Project activities are being proposed. Brief descriptions of the views at each KOP are provided in Table . Detailed descriptions of the form, line, color, and texture and photographs at each KOP are included in the *Visual Resources Baseline Report* (Appendix B19).

Table 25. Key Observation Points

KOP	Location Description	VRM Class	View Description
1	End of Access Road facing south in Mine and Process Area	IV	Gently rolling hills with rock outcroppings in middleground and background. Sagebrush/bunchgrass vegetation has fine to medium texture. Linear elements include access road tire tracks.
2	Western portion of Mine and Process Area facing northeast	IV	Gently rolling hills. Sagebrush/bunchgrass vegetation creates a mottled, fine to medium texture across the landscape. Linear elements include access road tire tracks.
3	Intersection of Access Area and Twin Springs Road facing south toward Mine and Process Area	IV	Relatively flat valley bottom. Gently rolling hills are visible in the middleground and background near the Mine and Process Area. Vegetation is relatively homogeneous. The color and texture of the access road contrasts sharply with the adjacent, undisturbed landscape.
4	Along Twin Springs Road facing south toward Mine and Process Area	IV	Terrain slopes gently toward the south toward the Mine and Process Area. Slightly undulating landforms are visible in the middleground and background. Landscape is mottled with fine textured grass species. The color and texture of Twin Springs Road contrasts sharply with the adjacent, undisturbed landscape.

2.20 WETLANDS – OAR 632-037-0055(1)(e)

The *Grassy Mountain Mine Project Draft Wetland Delineation Report* (Appendix B20) was submitted to the Oregon Department of State Lands (DSL) on March 1, 2018, and DSL concurrence was received May 3, 2018. On July 24, 2018, the TRT accepted the DSL concurrence as conforming to the *Environmental Baseline Study Work Plans* (EM Strategies, 2017; Appendix B23), which were accepted by the TRT on December 7, 2017. An additional letter from DOGAMI was received February 11, 2019, which repeated the acceptance by the TRT. The report was finalized and is included as Appendix B20. Existing literature was reviewed to evaluate the physical features of the Wetland Study Area, including USGS maps, aerial imagery, National Wetland Inventory (NWI) maps, and the National Hydrography Dataset. The data review facilitated the identification of potential wetland areas and prioritization of field survey areas.

NWI mapping indicated the presence of two emergent wetlands and three ponds within or partially within the Wetland Study Area. The NWI describes the wetlands as PEM1Ch (palustrine, emergent, persistent, seasonally flooded, diked/impounded) and PEM1B (palustrine, emergent, persistent, saturated). The ponds are described as PUBH (palustrine, unconsolidated bottom, permanently flooded), PUSCx (palustrine, unconsolidated shore, excavated), and PUSCh (palustrine, unconsolidated shore, seasonally flooded, diked/impounded). The third pond, designated PUSCh, corresponds to Schweizer Reservoir on USGS maps. Two palustrine emergent wetlands, two springs, and one impounded area (Schweizer Reservoir) were identified during the 2015 and 2017 field investigations.

HDR surveyed a portion of the Wetland Study Area in 2012 (identified as Tax Lot 101), and an additional area in 2015. EM Strategies surveyed another portion in 2017. There were no surface waters observed during the 2012 surveys in Tax Lot 101. Between the 2015 and 2017 surveys, a total of two wetlands, two springs, one pond, one artificial waterway, and ten tributary drainages were observed in the Wetland Study Area. Three tributary drainages and one pond (Schweizer Reservoir) were observed within the area surveyed in 2015. Two wetlands, two springs, one artificial waterway (J-H Canal), and ten tributary drainages were observed within the area surveyed in 2017. The three tributary drainages surveyed in 2015 were contiguous with three of the ten drainages surveyed in 2017.

The Oregon DSL concurred with the findings on May 3, 2018. The purpose of the concurrence was to evaluate the features for the state Removal-Fill Law, which determined that the two wetlands and artificial waterway (J-H Canal) are subject to the permit requirements of the Removal-Fill Law. A separate determination by the Army Corps of Engineers may be conducted for purposes of complying with the Clean Water Act.

2.21 WILD, SCENIC, OR RECREATIONAL RIVERS – OAR 632-037-0055(p)

The *Grassy Mountain Mine Project Wild, Scenic, or Recreational Rivers Baseline Report* (Appendix B21) was submitted to DOGAMI on May 30, 2018. The report was accepted by the TRT on July 19, 2018, as conforming to the *Environmental Baseline Study Work Plans* (EM Strategies, 2017; Appendix B23), which were accepted by the TRT on December 7, 2017. There are no designated wild, scenic, or recreational rivers in the Permit Area. The closest nationally designated wild, scenic, or recreational river is the Owyhee River, located approximately 31 miles to the south of the southernmost tip of the Permit Area. There are two portions of the Owyhee River included in the Oregon Scenic Waterway system: a portion of the main stem of the river, from Crooked Creek to Birch Creek, and a portion of the South Fork, from the Idaho border to the Three Forks area. These two segments total approximately 26 miles.

2.22 WILDLIFE RESOURCES – OAR 632-037-0055(1)(e)

The *Grassy Mountain Mine Project Wildlife Resources Baseline Report* (Appendix B22) was originally submitted to DOGAMI on April 18, 2018, October 16, 2018, and January 30, 2019. The TRT determined that the January 2019 report needed additional information to conform to the Calico *Environmental Baseline Study Work Plans* (EM Strategies, 2017; Appendix B23); a request for additional information and a revised baseline report were provided to Calico in a letter on February 19, 2020. On October 20, 2020, DOGAMI received a revised report titled *Calico Resources USA Corp., Grassy Mountain Mine Project, Malheur County, Oregon, Wildlife Resources Baseline Report*. The TRT Wildlife Subcommittee reviewed the revised report and confirmed that it contains all the information required by the 2017 Work Plans and that the accuracy and completeness of the data are satisfactory. On February 2, 2021, the TRT voted to approve the final report and DOGAMI accepted the final report.

Field surveys were conducted in a portion of the Wildlife Study Area by Northwest Wildlife Consultants, Inc. (NWC) between June 24, 2013, and May 30, 2014 and in the remaining portion of the Wildlife Study Area by EM Strategies between April 18, 2017, and February 6, 2018. Based upon comments from the TRT, additional aerial surveys were conducted in 2020 by Wildlife Resource Consultants LLC. Surveys were conducted in a 0.5-Mile Buffer Study Area or a Two-Mile Buffer Study Area, dependent on the species. In the 0.5-Mile Buffer Study Area, the following species were surveyed: pygmy rabbits

(*Brachylagus idahoensis*) and white-tailed jackrabbit (*Lepus townsendii*); bats; burrowing owls (*Athene cunicularia hypugaea*); landbirds; and general wildlife encounters were documented. In the Two-Mile Buffer Study Area studies included a greater sage-grouse (*Centrocercus urophasianus*) habitat assessment and lek surveys, a golden eagle (*Aquila chrysaetos*) nest survey, a nesting raptor survey, and general observations of specials status species and nonlisted species occurred.

2.22.1 LARGE AND SMALL-PLOT AVIAN SURVEYS

Seventeen avian species were detected during large-plot avian surveys conducted by NWC at five plots between June 2013 and May 2014. Three of these species, horned lark (*Eremophila alpestris*), western meadowlark (*Sturnella neglecta*), and common raven (*Corvus corax*), were found during all seasons and accounted for 137 of the 171 individuals detected. Golden eagles were detected during all seasons. Ferruginous hawks (*Buteo regalis*), a BLM Sensitive species, were detected during summer and spring (and found nesting during the 2014 raptor nest survey). The burrowing owl, also a BLM Sensitive species, was detected in the summer and fall of 2013 but was not found during any subsequent surveys. Other raptors detected outside of the large-plot surveys were northern harrier (*Circus cyaneus*), red-tailed hawk (*Buteo jamaicensis*), rough-legged hawk (*Buteo lagopus*), short-eared owl (*Asio flammeus*), long-eared owl (*Asio otus*), and prairie falcon (*Falco mexicanus*). The prairie falcon was confirmed nesting within the Two-Mile Buffer Study Area; northern harrier was believed to be nesting within the Two-Mile Buffer Study Area in 2014, and long-eared owl was estimated to have bred successfully in 2013.

Forty-seven avian species were detected during small-plot avian surveys conducted by NWC at eight plots between June 2013 and May 2014. Of these, 25 were found only at plot 6, which was more than a mile from the Permit Area and contained habitats not found in the Permit Area. Together, the pond, marsh, and riparian trees at plot 6 constituted an oasis that attracted not only waterfowl, marsh birds, and riparian obligates (some of which nested there) but also migrants (including passerines) that used this taller, denser vegetation for cover and foraging during stopovers. Twenty-two species were detected at the other seven plots in habitat that is found within the Permit Area. Horned lark and western meadowlark were each found at six of the seven small plots, the only species found during all four survey seasons, and the most commonly detected species. Rock wren (*Salpinctes obsoletus*) was detected during spring, summer, and fall seasons (at the three plots containing a small amount of exposed rock). Six species were detected multiple times during spring and summer seasons; these were Brewer's sparrow (*Spizella breweri*), lark sparrow (*Chondestes grammacus*), loggerhead shrike (*Lanius ludovicianus*), Say's phoebe (*Sayornis saya*), sagebrush sparrow (*Artemisiospiza nevadensis*), and sage thrasher (*Oreoscoptes montanus*). All these birds are presumed to breed in or near the Permit Area, and active nests of horned lark, lark sparrow, and common nighthawk (*Chordeiles minor*) were found incidentally during other surveys. Mountain bluebirds (*Sialia currucoides*) were detected at two plots, but these detections occurred on a single fall survey day. Twelve other species were detected on a single occasion and at a single plot: ferruginous hawk, California quail (*Callipepla californica*), mourning dove (*Zenaida macroura*), common raven, barn swallow (*Hirundo rustica*), canyon wren (*Catherpes mexicanus*), black-throated sparrow (*Amphispiza bilineata*), white-crowned sparrow (*Zonotrichia leucophrys*), dark-eyed junco (*Junco hyemalis*), Brewer's blackbird (*Euphagus cyanocephalus*), and house finch (*Haemorhous mexicanus*).

2.22.2 LARGE AND SMALL-PLOT AVIAN SURVEYS

Three raptor nests were active in 2013. One of these, a common raven nest, was active again in 2014. A burrowing owl nest was identified by the presence of an adult owl and an abundance at the burrow entrance of pellets and excrement of this species. Only a single individual was ever seen at any one time, however, so whether a breeding attempt occurred remains uncertain. (Surveys did not begin in 2013 until after breeding would be expected to be complete.) A successful breeding attempt by long-eared owls was documented by the presence at the pond of three young of this species and a stick nest in a tree with pellets and excrement in and beneath it. This nest was likely originally built by black-billed magpies (*Pica hudsonia*).

One active ferruginous hawk nest was observed within the Two-Mile Buffer Study Area during the April 27, 2014, aerial raptor nesting survey performed by NWC (NWC, 2014). Within 10 meters of the active ferruginous hawk nest, there was an inactive alternate nest. There were also two older inactive nests built by ferruginous hawks approximately 2 and 3 kilometers to the northeast and east-northeast of the active nest. These nests likely represented a separate ferruginous hawk breeding territory from the past. Three active common raven nests were also located during the aerial survey. These nests could be used in future years by raptors, especially by great horned owl (*Bubo virginianus*) or prairie falcon, both of which will use stick nests constructed by other species. There were two other inactive stick nests (besides those of ferruginous hawk) identified during the aerial survey.

2.22.3 RAPTOR NEST SURVEYS

Raptor nest surveys were flown within the Two-Mile Buffer Study Area on April 21 and 28, 2017, in conjunction with the greater sage-grouse lek surveys. Potential nesting sites for raptors were surveyed from 100 ft to 350 ft from the aircraft. Nest site transect routes were flown along likely habitat on rock outcroppings, cliff faces, trees, and powerline structures. No occupied raptor nests were recorded during the aerial survey. A single red-tailed hawk was observed on two occasions during the surveys south of Grassy Mountain along the rimrock. Although there were many perch sites, no nests were found in the area. It is suspected the hawk may be resident of the Owyhee Canyon cliff faces immediately south of Grassy Mountain, as both times the hawk departed the area in the direction of the canyon to the south. A red-tailed hawk was also observed perched on a power transmission pole southeast of the Permit Area.

Seven raptor nests were recorded during the June 21 through 23, 2017, ground surveys. Two stick raptor nests were recorded on a southeast oriented rock outcrop in Sagebrush Gulch: a large raptor nest was approximately 25 ft from the ground on an approximately 35-ft-high outcrop; and a small raptor nest is situated east of the larger nest at approximately the same height. No raptors were observed at or near the nests during visits on June 21 and 22, 2017. No evidence of occupancy such as recent whitewash and/or feathers was observed at the larger nest. However, one old pellet, possibly from a red-tailed hawk, as well as a few old bleached rabbit bones were found below the nest. The small raptor nest had abundant whitewash on the rock face below the nest and a few dark downy feathers were visible in sticks above the nest bowl. It is possible a common raven used the nest at one time; however, no raven pellets or feathers were found below the nest. A pair of red-tailed hawks was observed perched and flying near the golden eagle nest OR GE 1327. The birds were observed in courtship behavior during the

May 27, 2017, survey. Numerous perch sites were found on several rocks and sagebrush on the ridge line approximately 750 ft southeast of the nest location with abundant whitewash, molted feathers, and prey remains of rabbits. No further breeding activity at this nest was observed during the June and July 2017 surveys. A female Cooper's hawk (*Accipiter cooperii*) was recorded on June 23, 2017, in the cottonwood trees that surround the pond below Sagebrush Spring. At least three small stick nests were observed in the trees. The hawk gave an alarm call but remained in the cover of the trees while the biologist surveyed the site for sage-grouse broods from approximately 100 meters away. No Cooper's hawks were observed during site visits on July 4 and 5, 2017, and it is unlikely any of the nests were used by Cooper's hawks. On June 22, 2017, an inactive large raptor nest was recorded in a cottonwood tree at No Name Springs. Two adult red-tailed hawks were observed soaring approximately 0.25 mile south of the nest tree. No raptors were observed perched in or near the tree during a one-hour observation period. No sign (e.g., whitewash, scat, feathers, prey remains, pellets) was found below or near the nest. On June 23, 2017, an inactive prairie falcon nest was recorded on a rock outcrop at the south end of Double Mountain. No falcons were observed during a 1.5-hour monitoring session. Molted feathers, old eggshells, and pellets were present beneath the nest ledge. No downy feathers, recent prey remains, or scat, which could suggest use in 2017, were found. Two pairs of rock doves (*Columbia livia*) were nesting in a horizontal ledge in the outcrop. A hive of bees occupied a pothole in the outcrop. Two closed-leghold trap sets were also located along the base of the outcrop.

No burrowing owls or burrowing owl nests were found during the three broadcast surveys conducted in 2017. No evidence of burrowing owl presence within the 0.5-Mile Buffer Study Area, such as pellets, feathers, tracks, and scat, were found during surveys conducted for other wildlife species. Potentially suitable breeding habitat is present along the access road in locations dominated by grass and low shrubs. Numerous burrows dug by ground squirrels (*Urocitellus* spp.), badgers (*Taxidea taxus*), and coyotes (*Canis latrans*), which could provide potential nest sites, are found throughout the 0.5-Mile Buffer Study Area.

Observations of raptors and raptor nests were recorded January 25 and February 6, 2018, while flying aerial winter greater sage-grouse surveys in the Two-Mile Buffer Study Area. A red-tailed hawk was observed perched at a large raptor nest in a cottonwood tree along the Malheur River. A second red-tailed hawk was observed perched at a large raptor nest in a cottonwood tree next to a farmhouse. A pair of ferruginous hawks was recorded at a platform nest in the foothills south of the J H Canal. One bird was perched on the platform and the other bird flushed from the ground near the platform. A ferruginous hawk nest was recorded upslope of Cow Hollow on a low relief rock outcrop approximately 10 ft above the ground. A pair of prairie falcons was recorded at the nest identified in 2017 on a rock outcrop at the south end of Double Mountain.

Aerial surveys for raptor nests were flown May 7 and June 12, 2020. The surveys encompassed a 2-mile buffer of the Permit Area. On the first aerial survey, an intensive nest search was conducted to locate all golden eagle and raptor nests. The aerial surveys focused on potential nesting habitats, including rock outcrops, cliffs, patches of riparian woodlands, cottonwood trees, and manmade structures such as powerline poles. All nests encountered during the intensive nest search were recorded, including common raven nests. In addition, the 2018 nest inventory was used to navigate to previously recorded nests. During the first aerial survey, all nests were closely inspected for evidence of occupation this year, including repair and decoration, or extensive mutes (whitewash or droppings). All raptor nests were visited on the second survey.

Red-tailed hawks, prairie falcons, barn owls (*Tyto alba*), long-eared owls, turkey vultures (*Cathartes aura*), and northern harriers were observed during the aerial surveys. The long-eared owl was observed in two locations and both were flushed from cover. The northern harrier was a female flushed from the margin of a pond; no male harrier was observed.

2.22.4 GOLDEN EAGLE NEST MONITORING

The golden eagle nests located and monitored by NWC in the 2014 aerial survey are outside of the Two-Mile Buffer Study Area, and therefore, are not discussed in the baseline wildlife report. An aerial survey was conducted of the Two-Mile Buffer Study Area on April 21 and 28, 2017, in conjunction with the greater sage-grouse lek survey. No occupied golden eagle nests were observed. Golden eagle nest OR GE 1327, which is within the Two-Mile Buffer Study Area, was observed from the ground for a 4-hour period on May 27, 2017. A pair of redtailed hawks was engaged in courtship behavior near the nest, however no golden eagles were observed.

Observations of golden eagles were recorded during the aerial survey for winter use by greater sage-grouse in the Two-Mile Buffer Study Area. Golden eagle nest OR GE 1327 was observed from the air on both January 24 and February 6, 2018; no golden eagles were observed near the nest nor were recent greens present in the nest. Two golden eagle nests were recorded on a pinnacle rock outcrop approximately 0.75mile upslope of Sagebrush Gulch. An adult golden eagle flushed from the rock outcrop. One nest is approximately 30 ft above the ground while the other nest is approximately 40 ft above the ground on a 60-ft rock outcrop. Both nests are located on ledges. One eagle was observed perched on the outcrop on January 24, 2018, while a pair of eagles was observed at the outcrop during the February 6, 2018, survey. The eagles were variously seen flying together or perched on the outcrop with nests. In addition, observations of four adults and one immature golden eagle were recorded during both the January 24 and February 6, 2018, flights at locations that were not associated with nest sites.

Aerial surveys for golden eagles were conducted on May 7 and June 12, 2020. The primary objective of this survey was to determine nest occupancy status and territory (or breeding area) distribution. Forty-nine stick nests were observed in or near the 2-mile buffer survey area, and 18 of these were classified as occupied. In order to be classified as occupied, a nest must contain eggs, young, or an incubating bird; or, the nest has a pair of birds on or near it or has been recently repaired or decorated (Postupalsky, 1974; Millsap et al., 2015). One nest was occupied by golden eagles, five were occupied by ferruginous hawks, five were occupied by red-tailed hawks, one was occupied by prairie falcons, and one was occupied by barn owls. There were also five occupied common raven nests in the survey area.

Based on aerial survey data, it is estimated that there are five golden eagle nesting territories that contain nests within the survey area. In order to be classified as occupied, a territory had to meet one or more of the following conditions: Contain a nest where a breeding attempt occurred; contain an occupied nest; or have eagle presence observed at or near a nest within the territory (Steenhof and Newton, 2007). According to these criteria, two nesting territories were designated as occupied. The remaining three golden eagle nesting territories were unclassified, as surveys were conducted too late in the breeding season to detect territory occupancy by eagles that did not breed or had a failed nesting attempt.

2.22.5 GREATER SAGE-GROUSE SURVEYS

Greater sage-grouse brood-rearing surveys were conducted on June 25, 2013, and July 25, 2013. No sign of use of the Two-Mile Buffer Study Area by greater sage-grouse was detected. No birds were encountered, nor were any feathers, tracks, or scat found. No greater sage-grouse or their sign were encountered during any other field surveys. Scat of this species can persist for many months and even years; therefore, the lack of such sign is indicative of little or no use of the Two-Mile Buffer Study Area by this species in recent years. Winter use surveys were conducted on December 20, 2013, and January 14 and 15, 2014; the latter were done under ideal conditions, clear days with a covering of snow on the ground. No sign of use of the survey area by greater sage-grouse was detected. No birds were encountered, nor were any feathers, tracks, or scat found. No greater sage-grouse leks are known to exist within the Two-Mile Buffer Study Area (Milburn, 2014). No sign of this species was found during any surveys prior to the April 2014 lekking season; therefore, there were no areas of potential concentration to be checked for leks. Listening for drumming males during the hour before and after sunset (on April 10 and April 28, 2014) yielded no detections of greater sage-grouse or their leks.

No sage-grouse hens and chicks or evidence of sage-grouse presence (e.g., scat, tracks, feathers) were found in any of the surveyed spring locations during the June and July 2017 surveys. No greater sage-grouse were detected during the two aerial winter-use surveys in January and February 2018. No leks were found during ten hours of aerial transect surveys in April 2017.

2.22.6 LEPORID SURVEYS

No potentially suitable pygmy rabbit habitat was identified within the 0.5-Mile Buffer Study Area. The most nearly suitable areas were surveyed on November 26, 2013, and May 30, 2014. No pygmy rabbits or their sign (scat or burrows) were detected. No pygmy rabbits or their sign were detected during any of the other surveys conducted within the Two-Mile Buffer Study Area. No potentially suitable white-tailed jackrabbit habitat was identified within the 0.5-Mile Buffer Study Area. The most nearly suitable areas were surveyed on November 26, 2013, and May 30, 2014. No white-tailed jackrabbits were encountered, and all jackrabbit pellets found were in habitat more characteristic of the widespread congeneric black-tailed jackrabbit (*Lepus americanus)*. No white-tailed jackrabbits were detected during any of the surveys conducted within Two-Mile Buffer Study Area.

No pygmy rabbits or their sign (e.g., burrows, scat, tracks) were found in the 0.5-Mile Buffer Study Area along the access road during the May and July 2017 surveys. Potentially suitable habitat is present in the extensive patch of sagebrush that extends from DM Spring south approximately 2.5 miles. Within this area, surveys focused on patches of sagebrush that were uneven in height and density and in drainages. The sagebrush habitat in the other mapped patches lacks the shrub density and canopy cover characteristic of occupied pygmy rabbit habitat as described by Ulmschneider et al. (2004). Small scats produced by juvenile cottontail rabbits (*Sylvilagus nuttallii*) in summer can be similar in size to those of pygmy rabbits. To confirm species attribution of these scats, three samples were collected and submitted for species identification via DNA analysis to the University of Idaho Laboratory for Ecological, Evolutionary and Conservation Genetics. The scats were from mountain cottontails, not pygmy rabbits. During the 2017 surveys, no white-tailed jackrabbits were observed in any of the survey areas. The large lagomorph scats found were typical of black-tailed jackrabbit not the larger scats produced by white-tailed jackrabbits. This species can also be readily observed during aerial surveys, but none were detected during the low-elevation 2018 winter aerial surveys conducted for sage-grouse. Potential habitat is present in the sagebrush steppe habitat in the southern portion of the 0.5Mile Buffer Study Area along the access road.

2.22.7 ACOUSTIC BAT SURVEYS

No caves or Mine adits were found during the 2013-2014 field surveys, and no areas with potential to concentrate bat roosting or maternal colonies were identified within the Permit Area. Bat detectors were operational from before sunset to after sunrise at each of five detector locations during a total of 21 nights between June 24 and October 25, 2013, and between April 8 and May 30, 2014. Ten species of bats were detected over the course of the study. Small-footed myotis (*Myotis ciliolabrum*) appears to be present near the Permit Area from at least April through September. Canyon bat (*Parastrellus merican*) and California myotis (*Myotis californicus*) are also likely present in the Permit Area through a majority of the survey season, with the latter having a slightly more protracted period of presence. Silver-haired bat (*Lasiomycteris noctivagans*) appears to move through the area during spring and late summer migration with some regularity. The other species detected are uncommon or rare, with the possible exception of pallid bat (*Antrozous pallidus*), for which there were detections at three locations and on several nights in July and August 2013.

Three bat species were detected during the 2017 acoustic surveys: California myotis; smallfooted myotis; and silver-haired bat. Three of the six survey locations did not have any recordings. All equipment was working. Fewer species were detected in 2017 as compared to 2014 likely due to only five survey nights. In addition, the 0.5-Mile Buffer Study Area along the access road provides little structural diversity that can provide day-roosting habitat for bats. Potential day-roosting habitat consists of a few rock outcrops and the deciduous trees at DM Spring. The three sites with recordings had water that probably attracted bats for foraging and drinking.

2.22.8 GENERAL WILDLIFE OBSERVATIONS

Wildlife species and habitats occurring within and adjacent to the 0.5-Mile Buffer Study Area are consistent with desert areas of the Great Basin and consist of desert-rangeland type habitat where sagebrush and grasses are the dominant species. Mule deer and pronghorn antelope (*Antilocapra americana*) are present in the 0.5-Mile Buffer Study Area year-round, but in low densities. ODFW-designated mule deer winter range is bisected by approximately 5 miles of the north end of the Permit Area. There is no other big game winter range that intersects the Permit Area (ODFW, 2015). During the NWC surveys in 2014, the largest herds of mule deer and pronghorn antelope were observed at the northern end of the Permit Area along the access road where they presumably feed in the alfalfa fields. During the 2017 EMS surveys, mule deer and pronghorn antelope were observed primarily in the vicinity of springs. Elk (*Cervus canadensis*) scat was noted in a few locations near springs and one bull elk was observed near an unnamed spring east of Sagebrush Gulch. During the 2018 aerial winter sage-grouse surveys, groups of mule deer were recorded throughout the Two-Mile Buffer Study Area while a herd of 30 pronghorn antelope was observed in Cow Hollow. No elk were observed.

Use of the 0.5-Mile Buffer Study Area is low by water-dependent species, such as the migratory waterfowl and shorebirds that travel within the Pacific Flyway. Lake Owyhee, located 6 miles to the southeast of the site, attracts several species of migrating waterfowl, shorebirds, and passerines. Many of these birds cross the 0.5-Mile Buffer Study Area in transit. Sagebrush-dependent species, like the sagebrush sparrow, occur in the 0.5-Mile Buffer Study Area, but in low numbers due to the high degree of disturbance to the existing habitat and the dominance of cheatgrass. Raptor use is common.

During the NWC surveys, the Pacific chorus frog (*Pseudacris regilla*) was detected numerous times at the single pond within the Permit Area and at DM Spring. The sagebrush lizard (*Sceloporus graciosus*) and western fence lizard (*Sceloporus occidentalis*) were generally associated with small rock outcrops, like those at Small Avian Plots 1 through 3. The long-nosed leopard lizard (*Gambelia wislizenii*), Great Basin collared lizard (*Crotaphytus bicinctores*), western whiptail (*Cnemidophorus tigris*), desert horned lizard (*Phrynosoma platyrhinos*), and pygmy short-horned lizard (*Phrynosoma douglasi*) were encountered primarily in sagebrush shrub steppe and in sandy soil types.

Ground squirrels, especially Merriam’s (*Urocitellus canus*), were extremely abundant in the 0.5-Mile Buffer Study Area. They provide an important source of prey for the raptor species that breed in the area. Both badger and coyote were present; these species prey on the abundant ground squirrels, create their own burrows and expand those of their prey, and provide potential burrows for burrowing owls and other wildlife. A bobcat (*Lynx rufus*) was encountered on one occasion during the NWC survey, and tracks were found during winter surveys. Porcupines (*Erethizon dorsatum*) were observed in several locations within the 0.5-Mile Buffer Study Area.

3. OPERATING PLAN – 43 CFR 3809.401(b)(2), OAR 632-037-0060, OAR 632-037-0077(1), ORS 517.971(7)(h)

An abbreviated operating permit application limited to the Project's Basalt Borrow Quarry is provided in Appendix E2 while the abbreviated operating permit application limited to the Project's Closure Cover Borrow Areas Quarry is provided in Appendix E3.

3.1 PROJECT SUMMARY

Calico proposes to mine approximately 2.07 Mst of mill-grade ore and 0.27 Mst of waste rock for a Mine life of approximately 7.8 years; however, the TSF has been sized to contain 3.64 Mst should additional reserves be identified. The material (both ore and waste) will be extracted from an underground mine using conventional underground mining techniques, including drilling, blasting, mucking, loading, and hauling at a rate of approximately 1,200 stpd, four days per week. Calico will use hydraulic loaders to load the ore and waste into haul trucks. The haul trucks will transport the waste rock to the TWRSF near the TSF and transport the ore to the ROM ore stockpile adjacent to the crushing and milling facilities. The ore will be crushed and leached in a CIL processing plant at a rate of 750 stpd, seven days per week. The leached tailings will go through a cyanide detoxification process, amended with lime, then be pumped in a slurry to the TSF, with supernatant solution recovered and pumped back to the Mill.

The crushed ore will be ground by a ball mill in closed circuit with a hydro-cyclone cluster. The hydro-cyclone overflow flows to a CIL recovery circuit via a pre-aeration tank. Gold and silver leached in the CIL circuit will be recovered onto activated carbon and eluted in a pressurized Zadra-style elution circuit and then recovered by electrowinning in the gold room. The gold–silver precipitate will be dried in a mercury retort oven and then mixed with fluxes and smelted in a furnace to pour doré bars. Carbon will be re-activated in a carbon regeneration kiln before being returned to the CIL circuit. CIL tails will be treated for cyanide destruction prior to pumping to the TSF for disposal.

Leach pads will not be constructed or operated at the Site [OAR 632-037-0060(4)(a)].

3.1.1 ESTIMATED DISTURBANCE ACREAGE

The Project would result in approximately 487.9 acres of proposed surface disturbance for the Project. Table 26 describes the proposed surface disturbance, by disturbance component, for the Project.

Table 26. Proposed Surface Disturbance

Component	Public Acres	Private Acres	Total Acres
Underground Mine	0.5	6.2	6.7
TSF	99.8	0.0	99.8
TWRSF	5.7	0.0	5.7
Process Plant[1]	2.5	0.0	2.5
Infrastructure & Ancillary Facilities[2]	17.8	0.0	17.8
Roads	31.6	3.3	34.9
Yards & Laydown Areas	9.9	0.1	10.0
Growth Media Stockpiles	7.7	0.0	7.7
Water Supply[3]	7.9	0.0	7.9
Power Supply[4]	61.1	0.0	61.1
Stormwater Diversion Channels	11.6	0.2	11.8
Quarry	48.2	0.0	48.2
Reclamation Borrow Areas[5]	55.9	0.0	55.9
Monitoring	0.0	0.0	0.0
Exploration[6]	10.0	0.0	10.0
Disturbed Areas[7]	98.6	9.1	107.8
Total	469.0	18.9	487.9

[1] This includes the mill, refining plant, administrative building, parking lot, security building, mining contractor yard, reagent storage, assay laboratory, and substation.
[2] Includes the perimeter fence at 22,176 ft with a 20-ft construction disturbance width.
[3] Includes the water supply pipeline at 16,164 ft with a 20-ft construction disturbance width and well locations each at 0.25 acre.
[4] Includes 20-ft area of disturbance for the 25.2 miles of new powerline.
[5] The area of disturbance for the Reclamation Borrow Area is the maximum area of disturbance.
[6] The actual location of the exploration activities within the Project Area is currently unknown and is assumed to be equally on public and private lands.
[7] Disturbed Area is a 50-ft buffer on the mining facilities excluding the Reclamation Borrow Areas.

3.2 MINE DESIGN AND MINING METHODS – OAR 632-037-0050(4), OAR 632-037-0060(1), OAR 340-043-0040(2)(a), ORS 517.971(6)(a)

3.2.1 GEOTECHNICAL CONSIDERATIONS – OAR 632-037-0060(10)

Ausenco conducted an overview of the geotechnical data analysis and underground support recommendations that is presented in the feasibility study (Ausenco, 2020). Ausenco confirms the presence of rock mass varying from poor to fair quality, which is considered suitable for selective underground mining methods and limited sizes, such as mechanized cut and fill. The ground support designs considered industry-standard empirical guidelines and the experience of qualified professionals in variable ground conditions. There will likely be geotechnical optimization of some aspects of the extraction sequence based on actual conditions observed during mining, and additional analysis or design may be required, as is typical for projects like this, for future design stages and facility operation.

The Grassy Mountain deposit is situated in a horst block, which has been raised 50 ft to 200 ft in a region of complex block faulting and rotation. Faulting is dominated by post-mineral N30W to N10E striking normal faults developed during Basin and Range extension. On the northeast side of the deposit, these faults progressively down-drop mineralization beneath post-mineral cover. The North and Grassy faults are significant fault structures that pose a risk to the stability of mining methods such as open stoping. The proposed mining method of mechanized cut-and-fill, where conditions can be well-controlled and the backfill provides stability, is suitable for the conditions at Grassy Mountain.

Time-dependent drill core degradation has previously been identified at Grassy Mountain. In general, degraded zones are contained within siliceous sinter bodies, conglomerates, and interbedded tuff beds within the Grassy Mountain Formation. Degradation is strongest in intervals that are observed or interpreted as having contained silicic and potassic alteration. Degradation of Grassy Mountain Formation lithologic units results in difficult mining conditions that can be mitigated through additional ground support. The principal ground support measures proposed are fiber-reinforced shotcrete with rock bolts.

Stress measurements are not currently available. In the absence of this information, a stress regime based on the World Stress Map was used to obtain a range of estimates. Based on the shallow depth, ground stress is relatively low, and rock damage due to higher mining-induced stress concentrations is only anticipated in high-extraction or sequence closure areas and weaker rock mass areas. However, a reduction in the mining stresses around excavations is likely to adversely affect the stability of large open-span areas. Tensile failure and gravity-induced unraveling are foreseen as the main failure mechanisms. Enhanced ground support is included for these areas. Enhanced ground support includes thicker shotcrete with a smaller bolt spacing and Swellex-type bolting. Cable bolts will be considered in certain over-stressed areas.

The Grassy Mountain deposit is in a structurally complex, clay-altered, epithermal environment. Rock mass conditions in the infrastructure and production areas vary from Poor to Fair quality (RMR 20–45; RMR mean 40–45) with the poorest conditions within major structures that run longitudinally through and bound the deposit. Outside of these fault areas, rock mass conditions are generally Fair. However, localized zones of Poor rock mass potentially associated with secondary structures or locally elevated alteration intensity are present throughout the planned mining area.

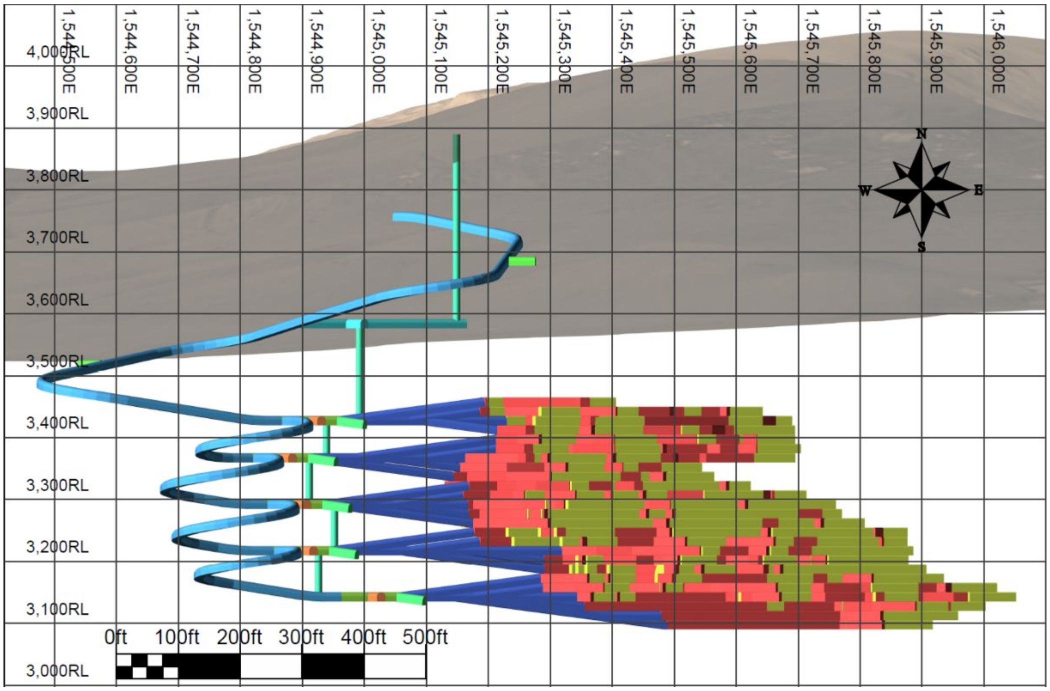
Excavation stability assessments were completed using industry-accepted empirical relationships, with reference to analog operational mines where possible. The rock mass conditions (Poor to Fair) are considered suitable only for a selective underground mining methods and limited sizes, such mechanized cut and fill.

Subsidence caused by extraction could cause dilation or fracturing above the deposit and an increase in hydraulic conductivities and water inflows to the Mine. Some level of dilation of fault and joint systems within the Grassy Mountain Formation can be expected as a result of mining. Under the current extraction sequence, this is expected to occur during the initial stages of mining. The ground surface presents contour displacements of around 0.4 to 9.8 inches from Year 1 to Year 5 (increasing in lineal proportion), but from Year 5 to Year 8, the contour displacements are projected to stabilize at around 9.8 inches.

The degree of subsidence occurs directly above the Mine where there is no Mine infrastructure. Because of the small amount of subsidence predicted plus the lack of a consequence from subsidence, no subsidence control plan is necessary.

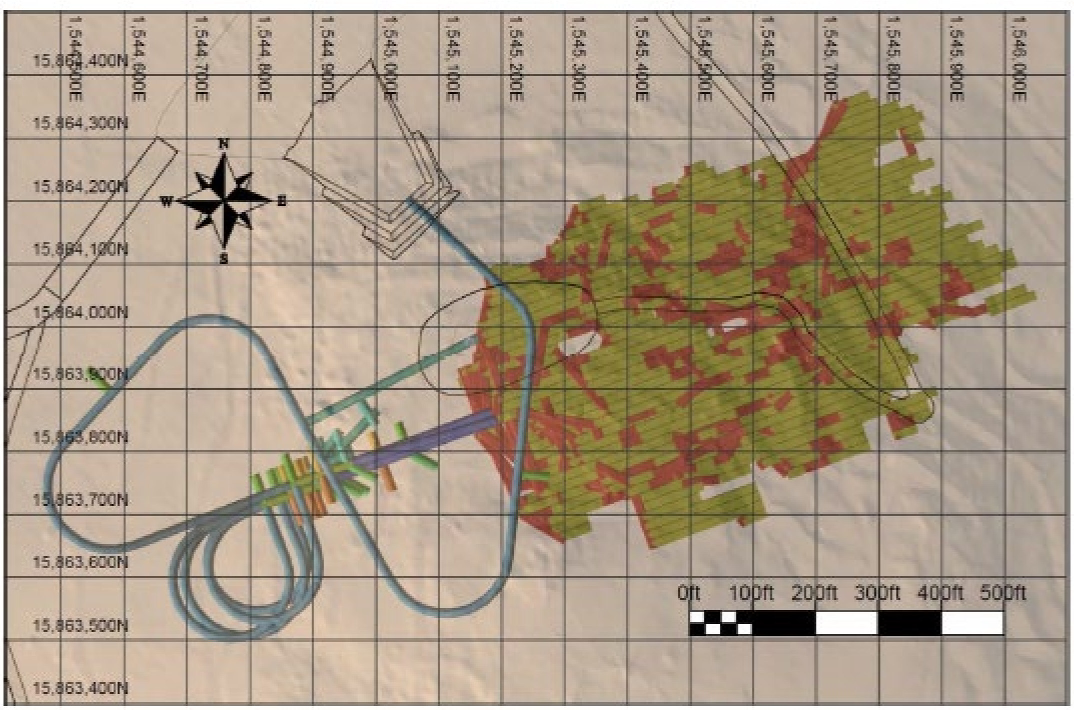
3.2.2 UNDERGROUND MINING METHOD

The Grassy Mountain Mine will be an underground mechanized cut and fill mining operation in which ore will be accessed via a decline and a system of internal stopes. From the decline, which is a spiral shaped stope that is in waste rock material, there will be five Level Stations that are at a defined elevation (elevations 3420, 3360, 3285, 3210, and 3135) or levels. Access from each Level Station to each Production Drift will be via Level Access Ramps, with a maximum gradient of 12.5 percent. Ventilation will be provided through a series of vent raises, which connect each level to a ventilation shaft that daylights on surface, and also provides for a secondary means of egress. The proposed Grassy Mountain Mine is shown in Figures 3 and 4.



Note: Figure prepared by MDA, 2020. Mining activity types shown by the same colors used in Figures 4 and 5.

Figure 3. Grassy Mountain Mine Cross Section Looking North



Note: Figure prepared by MDA, 2020. Mining activity types of workings shown by the same colors used in Figures 4 and 5.

Figure 4. Proposed Grassy Mountain Mine Plan (plan view)

The mechanized cut-and-fill method involves accessing the ore from a main ramp or decline to the mineralized area, generally in a 15 ft by 15 ft stope. Mining of the ore in the Production Levels will be performed using topcuts and undercuts that are typically 15 ft high and vary from 15 to 30 ft wide. The Production Levels will be backfilled with a CRF and/or RF that provides structural integrity of that backfilled void while the mineralized zone under that area is mined out, backfilled, and the process repeated.

The current Mine plan includes approximately 2.07 Mst of ore and 0.27 Mst of waste, with approximately 1.5 Mst of CRF and RF being placed back underground. The underground mine design was based on an average production rate of 1,200 tons per day for approximately 7.8 years, using a four-day-on and three-day-off schedule, and operating on two 12-hour shifts per day. This will provide sufficient material to feed 750 stpd to the mill on a seven day per week basis.

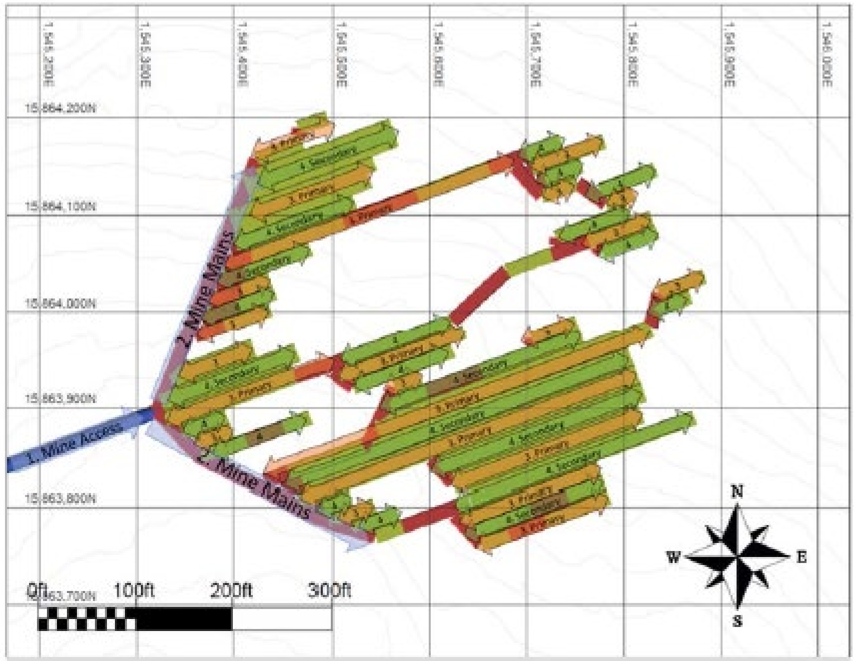
3.2.2.1 Mine Access

The main access portal will be located approximately 750 ft south of the primary crusher, at an approximate elevation of 3,749 ft, as presented in the *Portal Design Report* (Appendix C2). The portal pad was designed with a 1-percent inclination toward outside, to allow storm water to flow away from the portal and toward the storm water drainage ditches. The portal pad will have sufficient space to install the required ventilator infrastructure to be used during the excavation of the decline ramp, construction facilities, and to allow safe transit of the development equipment. The pad area was expanded from the initial area designed during the Consolidated Permits process to allow more space for facilities. In addition, the general cut design was updated, increasing the total area of the portal and the excavation volume.

The portal is designed to allow access to the underground Mine facilities while providing adequate space for equipment and vehicles. Additional work is proposed to bring the design to construction level, including numerical modeling of the excavation sequence and site investigation such as geotechnical mapping, portal slope re-design (if necessary) followed by a second numerical model of the excavation.

3.2.2.2 Mining Method Sequence

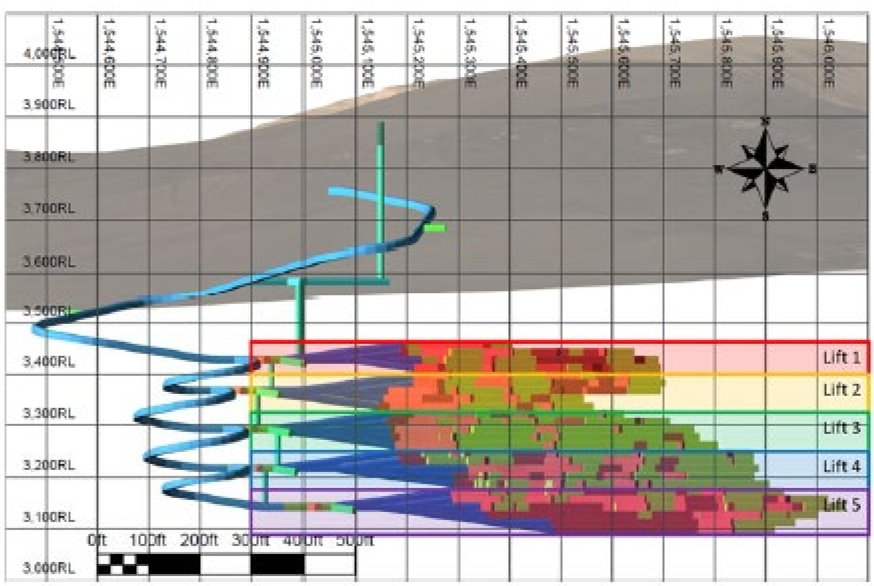
From the decline, the Level Station will be mined first, followed by the Level Access Ramps. Typically, two Level Access Ramps will be mined at the same time providing multiple mining locations for a level. After the Level Access Ramps are mined, the Production Drifts will be mined in an underhand sequence. The Production Drifts will be sequenced with primaries and secondaries. The primaries will be mined and backfilled first, allowing for a backfill minimum cure time of 14 days between the primaries and secondaries. This will continue until the entire level is complete. After the entire level is complete, the level access will be backfilled and a 28-day delay for the cure time applied. After the cure time is complete the level below will start. A detailed level sequence for a typical level is shown in Figure 5.



Note: Figure prepared by MDA, 2020.

Figure 5. Detailed level Sequence for a Typical Level

The underhand sequence starts at the top and works down in elevation and is grouped into lifts as shown in Figure 6.



Note: Figure prepared by MDA, 2020.

Figure 6. Mining Lifts

3.2.2.3 Mining Description and Mining Equipment Selection

The mining cycle involves drilling, blasting, and mucking for the development and production access. The final part of the mining cycle is to backfill the stopes.

Once the drilling cycle is complete, the emulsion blasting agent will be loaded into the holes with the respective nonel blasting cap and booster. Emulsion will be used for most production blasting and development rounds. Boosters, primers, detonators, detonation cord, and other ancillary blasting supplies will also be required. Bulk explosives will be stored in a secure powder magazine. The storage of explosives is discussed in Section 3.8.4.

Blasting will occur on-demand throughout the shift. Before blasting occurs, any affected areas will be cleared of personnel and the blasting location will be announced over the Mine communication system. After the blast, an appropriate amount of time must pass to provide adequate ventilation to any affected areas before mining can resume.

The blasted material will be transported to the underground stockpile located on the level station using a loader. The material will then be loaded into haul trucks at the truck loading bay using the same loader. The material will then be transported to surface. The truck loading bay section will be excavated to a height of 16 ft to provide clearance to load the trucks.

The underground truck haulage fleet will be conventional load-haul-dump (LHD) low-profile underground-mining trucks with a nominal 22-ton capacity equipped with ejector beds. The LHDs will be loaded with ore material underground and haul the material to surface. After the underground haul truck dumps the ore on surface in a stockpile near the Mine portal, the underground haul truck will be loaded on surface with CRF. The underground haul truck will then haul the CRF underground and place it in a backfilling location.

Ground support will be provided with sprayed concrete lining (fiber-reinforced shotcrete) with bolts installed through the concrete.

The estimate of the fleet size was based on first principles and equipment running-time requirements to achieve the Mine production plan. Maximum permanent equipment quantities are summarized in Section 3.3 including underground and surface operations.

Table 27. Underground Mining Equipment

Underground Mining Equipment	Model	Quantity
Dual (drill + bolter)	Resemin Troidon 88 Dual	3
LHD 5.2 cubic yards	CAT R1600	4
Front-end loader	CAT 962H	1
Truck with ejector bed	CAT AD22	3
Emulsion loader	CAT 440	1
Telehandler	JCB 540-170	2
Dozer	CAT D6T	1
Motor grader	Paus PG5HA	1
4WD twin cab truck	Ford F-150	1
Mine rescue truck	Ford F-150	1
Diamond drilling	Hydracore Gopher	1
Shotcrete sprayer	Normet Spraymec 8100 VC	1
Shotcrete truck	Normet Utimec SF 300	1
Lube truck	Normet Multimec MF 100	1
Water truck	Normet Multimec MF 100	1
Van man-transport	Ford F150 Van	3

3.2.2.4 Backfill

The underground workings will be backfilled with CRF and RF to provide stability to the drifts and to control dilution associated with ore extraction. It is assumed that the underground truck haulage fleet will be loaded with ore material underground and haul the material to surface. After the underground haul truck dumps the ore on surface in a stockpile near the Mine portal, the underground haul truck will be loaded on surface with CRF or RF. The underground haul truck will haul the CRF or RF underground and place it in a backfilling location.

Rock from the Quarry will be processed as aggregate and utilized as RF. The basalt generated from the Quarry will also be utilized as CRF. Waste rock generated from the underground operations, temporarily stored on the TWRSF will be utilized as CRF. A small stockpile of rock (basalt from the Quarry and/or waste rock from the TWRSF) will be located adjacent to the backfill plant near the underground Mine Portal to feed the plant and provide basalt from the Quarry for RF.

3.2.2.5 Cemented Rockfill

An Eagle 4000 backfill plant will be constructed near the portal. The basalt generated from the Quarry and waste rock from underground operations will be used for CRF. The plant will produce approximately 3,000 tons of CRF per day. The maximum amount of backfill required on a single day in the Mine place is 1,200 tons. The plant is oversized to ensure that the backfill plant will not be a bottle neck in the mining operation. Laboratory tests were conducted to define CRF strength. Based on geotechnical tests, Calico selected the following CRF mix design:

- Cement: 7 percent;
- Water / Cement (ratio): 0.70 to 0.85;
- Basalt /Waste Rock: 85 percent to 90 percent; and
- Nominal Size: 6 inches.

However, future work will be performed to assess samples composed of 3 percent cement and 2 percent fly ash, and 4 percent cement and 3 percent fly ash.

3.2.2.6 Rockfill

RF will only be utilized for areas that will not be accessible from below or besides and CRF will be the primary means of backfilling. Only basalt material from the Quarry on the east side of the Project will be used, which is not acid generating (Appendix B6).

RF material will be hauled and placed at the ROM size, approximate nominal size of 6 inches. During initial construction where more material is needed, the borrow mining will use larger equipment, while smaller equipment will be used during production when the amount of material required is reduced.

3.2.3 MINE DRAINAGE/SEEPAGE

Any Mine drainage will be collected and used in the drilling and mining process and pumped to the surface to be utilized in the backfilling process and the milling process. The dewatering system was designed for 200 gpm, which will accommodate both the maximum inflow rates (78 gpm) and the equipment water requirements rates (76 gpm) in the event that water is not recirculated to the equipment. The water management activities and site water balance are described in Section 3.10.

3.2.3.1 Underground Infrastructure and Services

Ventilation

The ventilation network was designed to comply with US ventilation standards for underground mines to control air quality for worker safety. Airflow of 100,000 cubic feet per minute (cfm) was selected as a minimum reference for the ventilation design of each level in order to meet the MSHA ventilation standards.

Required airflows were determined at multiple stages during the Mine life, using equipment numbers and utilization rates, specific engine types and exhaust output, and the number of personnel expected to be working underground.

The planned ventilation will use a push/pull system and will require two exhaust fans on surface. A raise bore will be used to construct ventilation raises between level stations and connecting to the surface fans.

Each vent raise will have a diameter of 12 ft, will be steel lined and have an escape ladder. Auxiliary fans will take air from the main circuit and push the air to the working face on the level using vent ducting and vent bag. Each level will have an auxiliary fan at the level station.

Underground Dewatering

Water at the working face will be pumped to the station sump. From the station sump, the water will either be used for equipment water supply or pumped out to the plant for use in the process circuit. When used for equipment water supply, the sediments will be removed at the station sump. Excess water at the station sump will be pumped up to the next station sump. The water will continue to be pumped up to the next station until it is pumped out of the underground Mine.

Underground Power

An underground 480 V transformer will be placed near the entrance to the Mine portal at the start of mining. This will supply power to electrical equipment used to develop the main decline and to portable fans. A main power line will be installed along the rib of the decline to carry 1.4 kV when development has advanced far enough that carrying power at 480 V becomes too inefficient. This line will be connected to a transformer that will be moved underground. Upon completion of the decline to the 3420 level, a second transformer will be installed

Line power will extend to the ventilation shaft to supply power to the ventilation fans.

Underground Communications

Inside the Mine, a leaky-feeder very high frequency (VHF) radio system will be used as the primary means of communication. The system will allow for communications between the underground Mine and surface operations.

Underground Refuge and Escape Ways

Two emergency refuge stations will be necessary in case of fire or rockfalls that would block access and prevent full evacuation of personnel. These refuges stations will allow the staff to remain safe in the underground Mine for 48 hours. The refuges are mobile, each can accommodate up to 20 people within the protected chamber, and they will be located so that they are always no more than 1,000 ft areas where the Mine operation personnel are located.

The primary route for evacuation will be the decline. The secondary route for evacuation will be the vent raises. All vent raises will be steel lined and equipped with an escape way ladder for secondary evacuation.

3.2.4 AGGREGATE MINING

The Quarry will be developed in single benches that will consist of 40 ft vertical faces separated by 60 ft horizontal benches. The maximum vertical depth to be mined below existing ground is approximately 125 ft and the lowest elevation will be no lower than 3,800 ft above mean sea level (amsl). The mining method will be drill and blast, similar to the mining method for the underground; however, mining equipment will not be restricted by the dimensions of the underground allowing for larger equipment for the loading and hauling of materials.

3.2.5 MINING RATE

The following discussion of the Mining Rate is taken from the 2020 FS commissioned by Paramount (Ausenco, 2020). The Qualified Person used the Proven and Probable mineral reserves to create a Mine production schedule using Deswik Scheduler (version 2019.4), which allows for the scheduling of both underground development and production. The primary inputs used to develop the schedule include:

- The resource block model with defined material types;
- Development centerlines drawn in the direction of mining;
- Solids representing the stopes or production areas to be mined;
- Attributes to define activity types, material types, profiles, etc.;
- Mining sequence among developments and production areas;
- Development and production rates by location; and
- Definition of the periods to be used.

The naming convention for material types considered either ore or waste. Ore was assigned to two categories based on grade: high-grade or low-grade. High-grade is material that is above the economic cut-off grade. Low-grade is material that is below the mining economic cut-off grade, but above the resource cut-off grade. The basic assumption is that a stope that is economic to be mined will be processed in its entirety. Thus, if internal waste in an economic stope is classified as Measured or Indicated Mineral Resources, these resources will be converted to Proven or Probable Mineral Reserves, respectively, and will contribute to the revenue stream.

Waste comprises:

- Material classified as Measured or Indicated Mineral Resources that is below both the mining cut-off grade and the resource cut-off grade;
- Material classified as Inferred Mineral Resources.

Waste is considered to be internal dilution within a stope, which would be mined and sent to the Process Plant. Waste material is considered to have zero grade and therefore does not contribute to the revenue stream.

The final production scheduled was calculated in Deswik Scheduler and then summarized in Excel. The Mine production summary is presented in Table 28. The material to be sent to the mill is summarized in Table 29. The development schedule is summarized in Table 30.

Table 28. Mine Production Summary

Year	Year -1	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Total
Mined M&I Resource Above Cut-off Grade										
Tons (tons x 1,000)	—	158	203	198	201	205	235	205	126	**1,532**
Grade (oz Au/ton)	—	0.26	0.22	0.23	0.26	0.22	0.22	0.22	0.24	**0.23**
Ounces (oz Au x 1,000)	—	42	44	46	53	45	51	45	30	**356**
Grade (oz Ag/ton)	—	0.35	0.28	0.29	0.33	0.32	0.30	0.32	0.34	**0.31**
Ounces (oz Ag x 1,000)	—	56	57	57	66	66	71	65	43	**481**
Mined M&I Resource Subgrade										
Tons (tons x 1,000)	—	52	61	51	59	55	45	37	19	**380**
Grade (oz Au/ton)	—	0.06	0.06	0.06	0.06	0.07	0.07	0.07	0.07	**0.06**
Ounces (oz Au x 1,000)	—	3	4	3	4	4	3	3	1	**24**
Grade (oz Ag/ton)	—	0.21	0.18	0.17	0.18	0.19	0.20	0.21	0.20	**0.19**
Ounces (oz Ag x 1,000)	—	11	11	9	11	11	9	8	4	**72**
Total Mined to Stockpile										
Tons (tons x 1,000)	—	210	265	249	260	260	281	242	144	**1,911**
Grade (oz Au/ton)	—	0.21	0.18	0.20	0.22	0.19	0.19	0.19	0.22	**0.20**
Ounces (oz Au x 1,000)	—	45	48	49	57	48	54	47	31	**380**
Grade (oz Ag/ton)	—	0.32	0.26	0.26	0.30	0.29	0.29	0.30	0.32	**0.29**
Ounces (oz Ag x 1,000)	—	67	68	66	77	76	80	73	47	**554**
Total with Ore Loss & Dilution										
Tons (tons x 1,000)	—	230	288	267	281	278	304	266	156	**2,070**
Grade (oz Au/ton)	—	0.20	0.17	0.19	0.21	0.18	0.18	0.18	0.21	**0.19**
Ounces (oz Au x 1,000)	—	46	50	51	58	50	56	48	32	**390**
Grade (oz Ag/ton)	—	0.30	0.25	0.26	0.29	0.29	0.28	0.29	0.31	**0.28**
Ounces (oz Ag x 1,000)	—	70	71	68	80	80	84	76	49	**578**
Waste										
Waste tons (tons x 1,000)	62	65	31	17	28	28	6	17	17	**272**
Backfill										
Cemented rockfill tons (tons x 1,000)	—	136	174	210	199	204	200	194	144	**1,463**
Footage										
Lateral footage (ft)	3,800	17,400	18,100	15,300	15,900	15,400	15,600	14,200	9,000	**124,700**
Vertical footage (ft)	500	200	100							**800**
Total footage (ft)	4,300	17,600	18,200	15,300	15,900	15,400	15,600	14,200	9,000	**125,500**

Note: subgrade refers to Measured and Indicated (M&I) Mineral Resources with grades greater than the resource cut-off grade, but lower than the stope economic cut-off grade.

Table 29. Material to the Mill

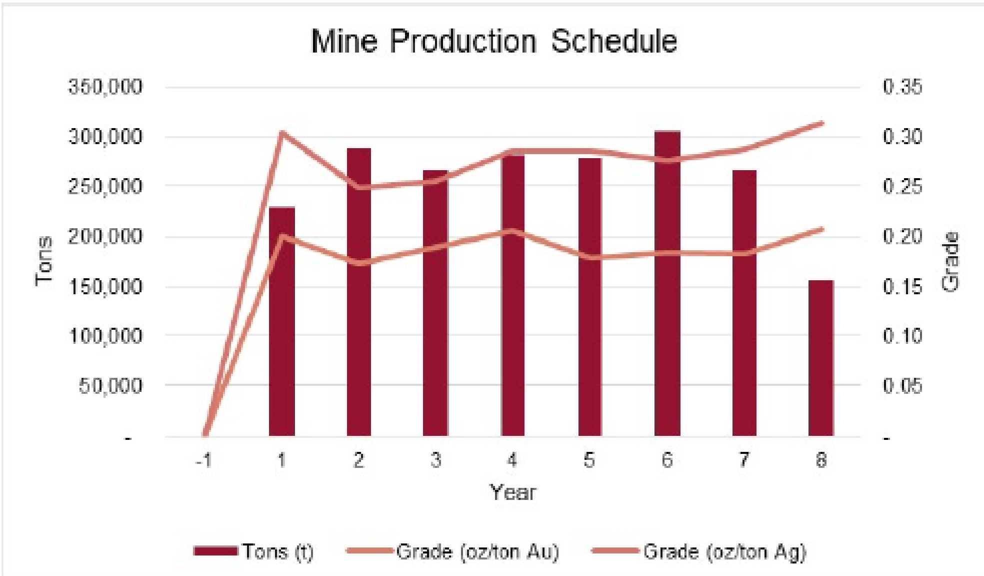
Year	Year -1	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Total
Low-Grade Material										
Tons (tons x 1,000)	—	56	66	55	64	59	50	40	21	**411**
Grade (oz Au/ton)	—	0.06	0.06	0.06	0.06	0.07	0.07	0.07	0.07	**0.06**
Ounces (oz Au x 1,000)	—	3	4	3	4	4	3	3	1	**26**
Grade (oz Ag/ton)	—	0.20	0.17	0.17	0.18	0.19	0.20	0.20	0.19	**0.19**
Ounces (oz Ag x 1,000)	—	11	11	9	11	11	10	8	4	**76**
High-Grade Material										
Tons (tons x 1,000)	—	174	222	212	217	219	255	226	135	**1,659**
Grade (oz Au/ton)	—	0.24	0.20	0.22	0.25	0.21	0.21	0.20	0.23	**0.22**
Ounces (oz Au x 1,000)	—	43	45	47	54	46	53	46	31	**364**
Grade (oz Ag/ton)	—	0.33	0.27	0.28	0.32	0.31	0.29	0.30	0.33	**0.30**
Ounces (oz Ag x 1,000)	—	58	60	59	69	69	74	68	45	**502**
Total to Plant										
Tons (tons x 1,000)	—	230	288	267	281	278	304	266	156	**2,070**
Grade (oz Au/ton)	—	0.20	0.17	0.19	0.21	0.18	0.18	0.18	0.21	**0.19**
Ounces (oz Au x 1,000)	—	46	50	51	58	50	56	48	32	**390**
Grade (oz Ag/ton)	—	0.30	0.25	0.26	0.29	0.29	0.28	0.29	0.31	**0.28**
Ounces (oz Ag x 1,000)	—	70	71	68	80	80	84	76	49	**578**

Table 30. Development Schedule

Year	Year -1	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Total
Development Type										
Main Decline (ft)	3,000	1,890	250							5,140
Level Station (ft)	260	760	260							1,280
Level Development Waste (ft)	60	1,170	1,270	1,000	1,670	1,630	350	1,040	1,000	9,190
Level Development Ore (ft)		13,280	16,190	14,290	14,230	13,820	15,270	13,130	7,990	108,200
Vent Drift (ft)	490	330	100							920
Vent Raise (ft)	470	210	70							750
Total Development (ft)	***4,280***	***17,640***	***18,140***	***15,290***	***15,900***	***15,450***	***15,620***	***14,170***	***8,990***	***125,480***

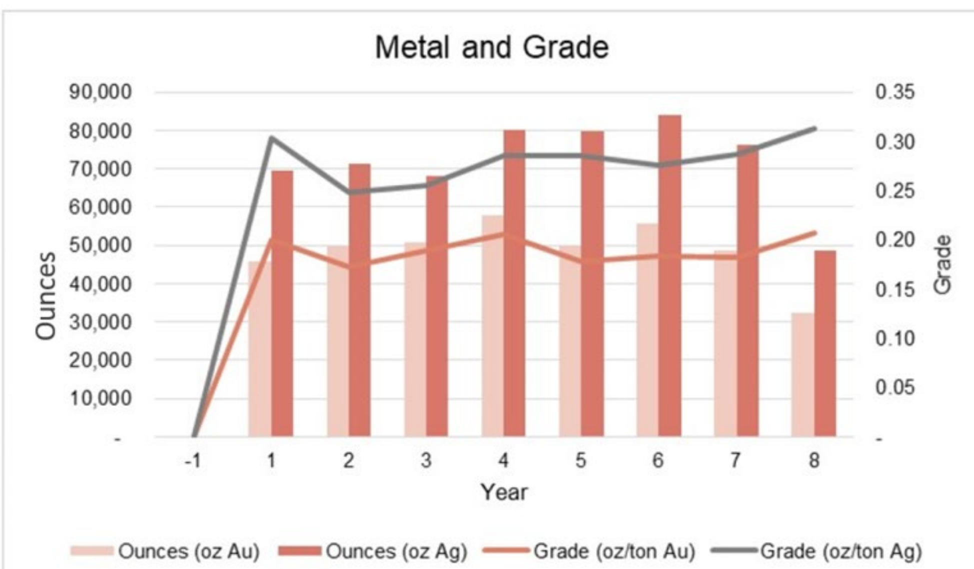
3.2.6 UNDERGROUND PRODUCTION SCHEDULE

Figures 7 and 8 show the proposed yearly production schedule in terms of tons and gold and silver ounces for the LOM.



Note: Figure prepared by MDA, 2020.

Figure 7. Mine Production Schedule (tons by period)



Note: Figure prepared by MDA, 2020.

Figure 8. Mine Production Schedule (ounces by period)

3.3 MILLING AND PROCESSING METHODS – OAR 632-037-0060(1), AOR 340-043-0100, ORS 517.971(7)(b)

3.3.1 GENERAL FOUNDATION RECOMMENDATIONS FOR ORE PROCESS FACILITIES:

Mine process and support facilities are situated directly north of the proposed Mine Portal as shown on the Design Drawings in the *Mill Design Report* in Appendix C3. These facilities will include office buildings, truck maintenance facilities, crushers, mill, and additional structures. Based on the subsurface exploration, the subsurface beneath the proposed location for the Mine facilities can generally be separated into two areas as summarized below:

- East portion: Approximately 5 ft to 20 ft of Quaternary deposits comprising lean to fat clay soils and clayey sands overlying lacustrine clays.
- West portion: About 3 ft to 10 ft of Quaternary deposits comprising lean to fat clays and poorly graded gravel to silty sand overlying sandstone bedrock encountered at depths ranging from 3.5 ft to 10 ft below ground surface (bgs).

In general, planned structures may be founded on conventional shallow foundations. Foundations may be supported by undisturbed medium dense to very dense granular, native alluvium/colluvium or weathered sandstone, or properly placed engineered fill. Lacustrine and overburden clay soils are not suitable to support foundations.

Topsoil, soil supporting plant growth, or loose soils are not considered suitable for the support of floor slabs, footings, or mat foundations, and should be removed from the site prior to grading.

Due to the presence of clay with a high potential for swelling, a minimum of 4 ft of separation between the bottom of foundations and the clay soils is recommended. If clay soils are located within 4 ft of the base of foundations and slabs-on-grade, the clays are to be over-excavated and replaced with granular engineered fill.

The extent of over-excavation will depend on final grades established for the area. Maintaining positive site drainage away from foundations will be imperative to reduce the potential for swelling of the clays that may affect performance of the foundations. This is particularly important for the truck wash and other areas where water is likely to be present with an increased risk of ponding.

3.3.2 OVERVIEW OF THE ORE PROCESSING CIRCUIT

The following is a summary of the *Mill Design Report*, which is included with all drawings in Appendix C3.

The intent of this section is to summarize the processes proposed for Grassy Mountain. It will address the following items from Chapter 340, Division 43 – Chemical Mining, by the Oregon Department of Environmental Quality:

- Description of the facilities to be constructed, including tanks, pipes, and other storage and conveyance means for processing chemicals, solutions, and wastewaters;

- Description of all chemical process and facilities for mixing, distribution, and application of chemicals associated with on-site mining operations, ore preparation, and beneficiation facilities;
- Description of all chemical conveyances (ditches, troughs, pipes, etc.) and the requisite equipment with secondary containment and leak detection means for preventing and detecting release of chemicals to surface water, groundwater, and soils.

The Process Plant will consist of a 750 stpd, two-stage crushing, ball mill, CIL, elution and electrowinning circuit, all of which are well known, conventional, processing unit operations. The plant will operate with two shifts per day, 365 days per year, and will produce doré bars.

The process flowsheet is comprised of the following:

- Two-stage crushing circuit;
- Grinding circuit;
- Hybrid leach-CIL circuit with pre-aeration;
- Mercury removal circuit;
- Cyanide destruction; and
- Lime addition.

The simplified overall flowsheet is shown in Figure 9. The Process Plant Area is shown in Map 4.

The ore will be hauled from the underground Mine to a stockpile near the Mine portal, and then trammed to the mobile crushing facility that includes a jaw crusher as the primary stage and a cone crusher for secondary size reduction. The crushed ore will then be ground in a ball mill in closed circuit with a hydro-cyclone cluster. The hydro-cyclone overflow with P80 of 150 mesh (106 micrometers [µm]) will flow to a leach–CIL recovery circuit via a pre-aeration tank.

Gold and silver leached in the CIL circuit is adsorbed onto activated carbon which is recovered and conveyed to the elution circuit. A pressure Zadra-style elution circuit strips the gold and silver from the activated carbon and is then precipitated by electrowinning in the gold room. The gold–silver precipitate will be dried in a mercury retort oven and then mixed with fluxes and smelted in a furnace to pour doré bars. Carbon will be re-activated in a carbon regeneration kiln before being returned to the CIL circuit. Mercury is collected and shipped off site.

CIL tailings will be treated for cyanide destruction prior to pumping in slurry to the TSF for disposal. Supernatant water collected at the TSF and underflow from the Reclaim Pond will be pumped back to the mill for re-use.

Figure 9 also shows the key Process Plant facility components.

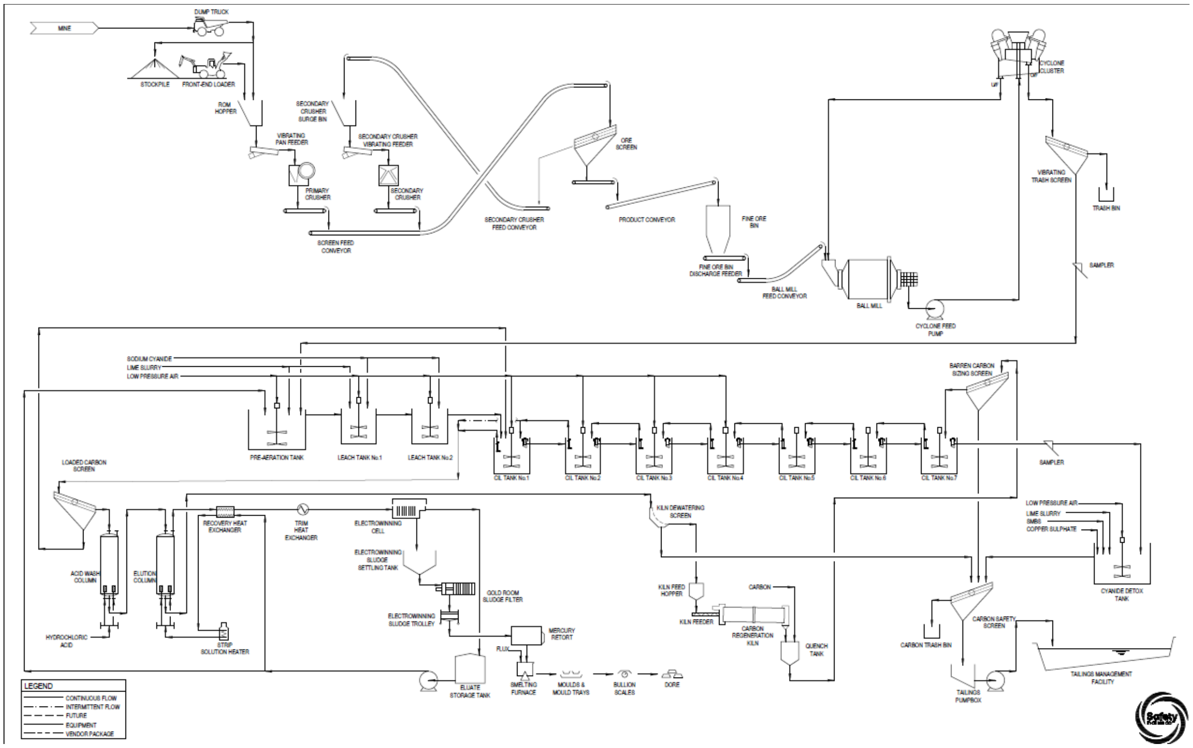


Figure 9. Grassy Mountain Process Flowsheet

3.3.3 KEY DESIGN CRITERIA

The key criteria selected for the plant design are:

- Average plant treatment rate of 770 short tons per day (st/d) on a solids basis
- Design crushing plant operating time of 70 percent (crushing/screening/conveying)
- Design Process Plant operating time of 91.3 percent (milling/leaching and adsorption/detoxification/elution/refining).

Drawing 101768-0000-F-001 in the *Mill Design Report* in Appendix C3 shows the basic process design circuits and the selection of major equipment for the Process Plant.

The major process design criteria developed for the Project are outlined in Table 31.

Table 31. Grassy Mountain Process Design Criteria

Description	Units	Value
Ore Throughput, LOM average	short tons/y	248,365
Design Grade – Au	oz/short ton	0.266
Design Grade – Ag	oz/short ton	0.280
Operating Schedule		
Crusher Availability	%	70
Plant Availability	%	91.3
Throughput, Daily	stpd	750
Plant capacity, Hourly	short ton/h	34.2
Crushing (Two Stage)		
Primary Crusher	type	Single Toggle Jaw Crusher
Secondary Crusher	type	Cone Crusher
Fine Ore Bin Residence Time – Live	h	8
Grinding		
Circuit Type		Ball mill
Bond Ball Mill Work Index	kWh/short ton	26.9
Ball Mill, Dimensions	ft x ft	12 x 16
Ball Mill Required Power	hp	1,021
Ball Mill Installed Power	hp	1,341
Feed Particle Size, F80	in	0.26
Product Particle Size, P80	U.S. mesh	150
Carbon-in-Leach		
Total Leach Time Required	h	24
Number of Tanks	#	1 pre-aeration + 2 leaching + 7 adsorption
Cyanide Addition	lb/short ton	0.68
Lime Addition	lb/short ton	2.1
Carbon Concentration	lb/gal	0.21
Carbon Loading (Au + Ag)	oz/short ton	187
Carbon consumption	lb/short ton	0.06
Desorption		
Carbon batch size	short ton	2.2
Elution CIL strips per week	#	7
Furnace capacity, Au + Ag	lb/smelt	57.5
Cyanide Destruction		
Method	-	SO_2 / Air
Residence time, max for design	min	90
CN_{WAD} in feed, max for design	ppm	200
CN_{WAD} not-to-exceed value	ppm	30

Description	Units	Value
CN_{WAD} discharge target for design	ppm	15
SO_2 addition	lb/lb CN_{WAD}	6.4
Hydrated lime addition	lb/lb CN_{WAD}	10.8
Cu addition	lb/lb CN_{WAD}	0.11
Tailings Neutralization Potential Augmentation		
Hydrated lime addition	g Ca(OH)2/kg	19

The descriptions in the following sections include references to Process Flow Diagrams (PFDs), which are included in Appendix B of the *Mill Design Report* (Appendix C3).

3.3.4 CRUSHING CIRCUIT

The crushing facility will be a two-stage crushing circuit that will process the ROM ore at an average rate of 45 short tons/hour. The major equipment and facilities at the ROM receiving and crushing areas will include:

- Ore stockpile;
- ROM hopper;
- Vibrating pan feeder;
- Primary jaw crusher;
- Coarse ore screen;
- Secondary crusher surge bin;
- Secondary crusher vibrating feeder;
- Secondary cone crusher;
- Fine ore bin;
- Feed and product conveyors.

Ore will be trucked from underground and dumped directly into the ROM hopper or onto the outdoor stockpile during crushing circuit downtime. A front-end loader will move ore from the stockpile to the ROM hopper as necessary.

The ROM hopper will continuously feed a vibrating pan feeder, which will discharge into the primary jaw crusher. After primary crushing, the ore conveyor will bring the ore to a coarse ore screen.

Oversize material from the screen will be transferred by conveyor to the secondary crusher surge bin. Ore from the secondary crusher surge bin will pass over the second crusher vibrating feeder and into the secondary crusher. After secondary crushing, the ore will be recirculated to the coarse ore screen in combination with ore from the primary jaw crusher.

Undersize from the coarse ore screen will be taken by the product conveyor to the fine ore bin. The product conveyor will have a weightometer to monitor the crushing circuit throughput.

The fine ore bin discharge feeder will feed ore from the fine ore bin onto the ball mill feed conveyor and over to the grinding circuit. The feed conveyor will also have a weightometer to provide data for feed-rate control to the grinding circuit.

The crushing plant is skid mounted and anchored on concrete foundations. The crushing plant includes a primary jaw crusher – Metso Outotec Model C80, which weighs approximately 16,870 lbs., and a secondary cone crusher – Metso Outotec HP200, which weights approximately 26,800 lbs. The crushing plant will be assembled and disassembled with a crane. A similar crushing plant is presented in Figure 10.

Figure 10. Similar Crushing Plant

3.3.5 GRINDING CIRCUIT

The grinding circuit will have an average feed rate of 34.2 short tons/hour and will consist of a ball mill and a cyclone cluster in a closed circuit. The grinding circuit will be designed for a product size P80 of 150 mesh. The major equipment in the primary grinding circuit will include:

- One 12-ft diameter (inside shell) by 16-ft effective grinding length (EGL) single-pinion ball mill driven by a single 1,341 horsepower (hp) fixed-speed drive motor; and
- One hydro-cyclone cluster.

As necessary, steel balls will be added into the ball mill using a ball bucket and ball charging chute to maintain grinding efficiency.

Crushed ore will travel along the ball mill feed conveyor and discharge directly into the ball mill via the mill feed chute. Process water will be added to reach a pulp density of 72 percent solids (by weight) through the ball mill, which will then discharge to the cyclone feed pump box. Additional process water will be added to the cyclone feed pump box to achieve a density of 63.5 percent solids, which will then be pumped to the hydro-cyclone cluster. The cyclone underflow will recirculate to the mill feed chute. The cyclone overflow will discharge at 45 percent solids and report to a trash screen. Trash screen oversize will be sent to a trash bin. The slurry will then flow by gravity to the pre-aeration tank.

The ball mill weights approximately 132 short tons and will be constructed on a concrete foundation. An example of the ball mill is presented in **Error! Reference source not found.**.

Figure 11. Example Ball Mill

The cyclone cluster is an arrangement consisting of 4 operating and 2 standby, 250 millimeter cyclones approximately 12 ft in height and weighing approximately 6615 lbs. The cyclone cluster will be constructed on a concrete foundation. An example of the cyclone is presented in **Error! Reference source not found.**.

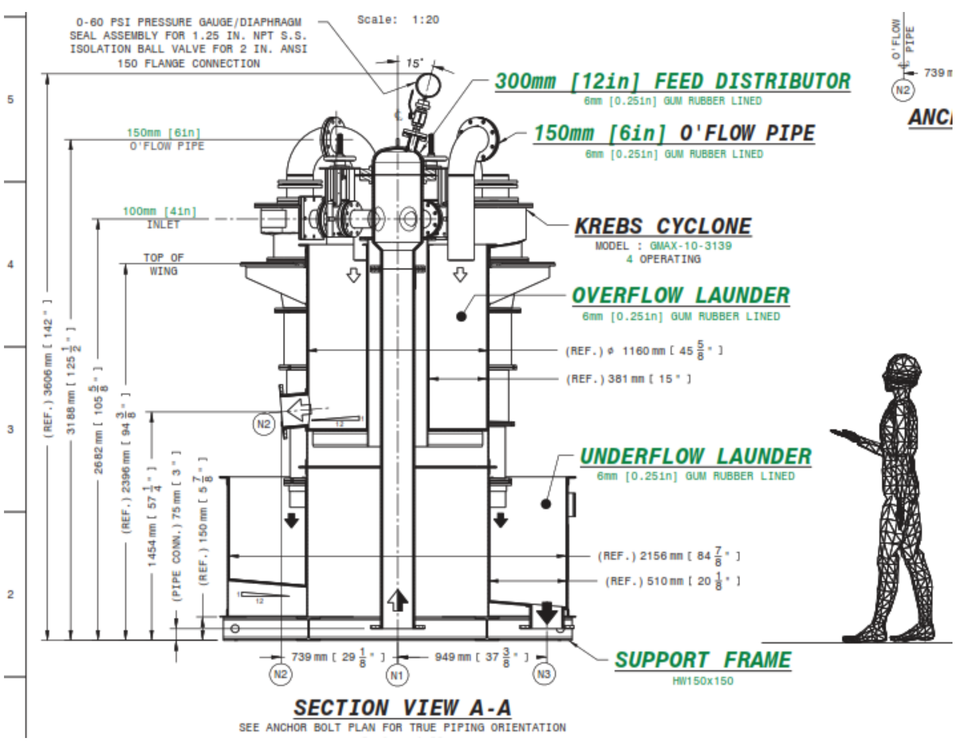


Figure 12. Example Cyclone

3.3.6 CIL LEACHING

A pre-aeration tank will be ahead of the leach circuit. The pre-aeration tank reduces consumption of cyanide and improves gold recovery. Low-pressure air is bubbled through the ground ore slurry in the pre-aeration tank. Slurry will overflow the pre- aeration tank to the first leach tank, where lime will be added at a rate of 2.1 lb/ton of feed. Cyanide is added to both leach tanks at a rate of 0.68 lb/ton of feed, together with low-pressure air.

The slurry will then overflow from the leach tanks into a series of seven CIL tanks. The first four CIL tanks will also be fed low-pressure air. Barren activated carbon is added to the last CIL tank and will travel up through the circuit in the opposite direction from the slurry flow (counter-current flow). Loaded carbon will be pumped from the first CIL tank to the elution loaded-carbon screen, which will separate the carbon from slurry.

Leached tails will overflow the last tank to the detox tank (described below), which in turn will overflow to the carbon safety screen. The safety screen collects carbon that would otherwise be lost to the tailings in the event of a hole in one of the inter-stage screens.

3.3.7 CARBON ELUTION

Gold and silver are stripped from the carbon in the elution circuit. A pressure Zadra circuit has been designated. Strip solution (eluate) is made up in the strip-solution tank using raw water dosed with 2 percent sodium hydroxide and 0.2 percent cyanide to form an electrolyte for the electrowinning process. This solution is circulated through the elution column via an eluate heater, which heats the solution, the carbon, and the column to 275°F. The elution system is pressurized to keep the solution from flashing to steam in the heater or elution column. The eluent is cooled in a heat exchanger and then sent to the electrowinning circuit. The stripped/barren carbon is sent to a kiln for reactivation and recycled through the CIL circuit.

3.3.8 GOLD ROOM

The gold room houses the electrowinning cell, smelting furnace, and associated support equipment within a secured area.

One day a per week, the electrowinning cell will be opened so that gold-bearing sludge can be cleaned out manually with a high-pressure water hose. Sludge from the clean-up will gravity flow to the sludge settling tank and into the gold room sludge filter press to be dewatered. Dewatered sludge will then be transported manually to the mercury retort oven for mercury removal as well as simultaneous drying. Mercury collected will be sent off site as detailed in the *Waste Management Plan* (Appendix D3).

Dried sludge is removed from the oven the following day and combined with fluxes in a flux mixer before reporting to the smelt furnace. Once the mixture has fully melted, the slag is poured into a conical slag pot. The liquid metal is then poured into doré molds. Cooled doré is then cleaned, weighed, and stamped. The doré is stored in a vault to await shipment to a refinery.

3.3.9 CYANIDE DETOXIFICATION AND TAILINGS DEPOSITION

A cyanide-destruction circuit reduce the cyanide concentration of the tailings slurry prior to disposal in the TSF. The sulfur dioxide (SO_2)/air process is the proposed detoxification method. The objective of detoxification is to reduce weak-acid dissociable (WAD) cyanide levels to less than 15 milligrams per liter (mg/L); 30 mg/L maximum.

The CIL tailings are pumped to the cyanide detoxification tank, where lime is added to buffer pH, then copper sulfate is added as a reaction catalyst, and sodium meta-bisulfite (SMBS) is added as an SO_2 source.

Detoxified slurry will overflow to the tailings pump box and then pumped to the TSF. At the TSF, the tailings will be deposited using spigot manifolds positioned along the rim of the impoundment. The position of the spigot manifolds will be moved periodically to produce an even beach and to push the pool towards the decant system. A pontoon-mounted decant-return water pump will be provided to pump decant water back to the process-water tank for re-use in the plant.

3.3.10 REAGENT HANDLING AND STORAGE

Reagents will be prepared and stored in separate self-contained areas within the Process Plant and delivered to the required addition points through piping by individual metering pumps or centrifugal pumps. See Section 3.8 for details of chemical storage and use.

3.3.11 SURFACE CONTACT WATER – 43 CFR 3809.401(b)(2)(iii), OAR-632-037-0060(4)(c), OAR 632-037-0060(8), OAR 632-037-0120(1), ORS 517.971(7)(g)

The *Stormwater Pollution Control Plan* (Appendix D4) provides a detailed description of contact water management and the design of water management structures. The stormwater permit application is included as Appendix E4.

Stormwater Diversion ditches will be constructed above plant infrastructure where required to prevent runoff from entering the Process Plant areas. Precipitation that falls directly on the pad will be collected in a system of ditches and culverts and directed by gravity towards the Collection pond. The ditches and culverts located within the Process Plant areas are sized to contain the 100-year, 24-hour storm event.

The Collection Pond is also sized to contain the runoff from a 100-year 24-hour storm event. Additionally, a 2-ft dead storage allowance for siltation and pump suction at the bottom of the pond and a 2-ft freeboard allowance, measured from the top of the high-water level to the pond crest have been included, external to the indicated pond capacity.

The pond will have a minimum 14-ft-wide crest around the outside with internal and external batter slopes of 3H:1V. The liner system is composed of two liners, an upper liner of 80-mil high-density polyethylene liner (HDPE) and Geonet, and a lower liner of 60-mil HPDE over non-woven geotextile. Sand bedding below the lower liner is included where necessary to create a smooth base.

A leak detection zone of drainage gravel is included between the liners. The leak detection system is found on the pond base and sides and is connected to down-batter leak monitoring wells and sumps, provided with sensors and the capacity to recover the leaked solution.

No spillway is designed for the contact water catchment pond as overflow is not permitted.

3.4 LIST OF EQUIPMENT – OAR 632-037-0060(2)

Mine operations at Grassy Mountain will utilize mobile mining equipment suitable for underground mines as specified in Table 32. The estimate of the fleet size was based on equipment running-time requirements to achieve the Mine production plan.

Table 32. Mine Mobile Equipment Requirements

Equipment	Model	Quantity
4WD twin cab truck	Ford F-150 - diesel	1
4wd twin cab utility	Light Vehicle 4WD Twin Cab Utility 1/2 ton	1
All Terrain Crane	Terex RT 35-1 or equivalent	1
Articulated haul trucks	Cat 745C	1
Blast hole drill	CAT MD5150C	1
Crushing Area Bobcat	Bobcat S7 or equivalent	1
Diamond drilling	Hydracore Gopher	1
Dozer	CAT D6T	1
Dual (drill + bolter)	Resemin Troidon 88 Dual	3
Elevated Work Platform	ZX-135/70 Genie, or equivalent	1
Emulsion loader	CAT 440	1
Forklift	CAT DP30NM	1
Front-end loader	CAT 962H	2
Hiab Truck	SINOTRUK Small Truck Mounted Crane, 5-10 tons	1
LHD 5.2 cubic yards	CAT R1600	4
Lube truck	Normet Multimec MF 100	1
Mine rescue truck	Ford F-150	1
Mine rescue truck	Ford F-150 - diesel	1
Motor grader	Paus PG5HA	1
Motor Grader	Cat 160M	1
Pipe Fusing Machine	McElroy TRACSTAR® 28 SERIES 2 or equivalent	1
Shotcrete sprayer	Normet Spraymec 8100 VC	1
Shotcrete truck	Normet Utimec SF 300	1
Telehandler	JCB 540-170	2
Truck with ejector bed	CAT AD22	3
Van man-transport	Ford SPLODER - diesel	3
Water truck	Normet Multimec MF 100	1
Water Truck	CAT 777G	1

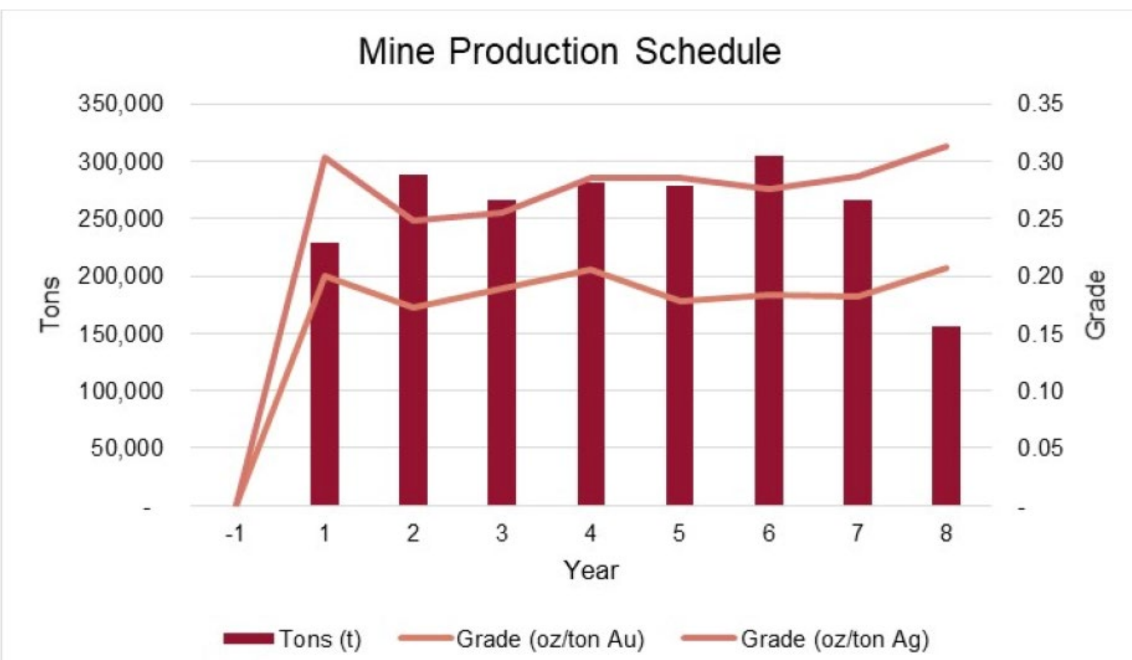
3.5 GENERAL SCHEDULE OF CONSTRUCTION AND OPERATION – OAR 632-037-0060(3)

The proposed Project, which currently is proposed to begin in 2023, will be active for approximately 10 years, which includes 2 years of pre-production (including construction activities) and 8 years of mining and processing. Four years of closure and reclamation are estimated with 26 years beyond anticipated for groundwater monitoring. This schedule may be modified based on the rate of mining and future commodities prices. Table 33 and Figure 13, respectively, show detailed schedules.

Table 33. Project Schedule

Year	Year -1	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Total
Development Type										
Main Decline (ft)	3,000	1,890	250							5,140
Level Station (ft)	260	760	260							1,280
Level Development Waste (ft)	60	1,170	1,270	1,000	1,670	1,630	350	1,040	1,000	9,190
Level Development Ore (ft)		13,280	16,190	14,290	14,230	13,820	15,270	13,130	7,990	108,200
Vent Drift (ft)	490	330	100							920
Vent Raise (ft)	470	210	70							750
Total Development (ft)	***4,280***	***17,640***	***18,140***	***15,290***	***15,900***	***15,450***	***15,620***	***14,170***	***8,990***	***125,480***

Source: SLR, Plan of Operations. November 2019.



Note: Figure prepared by MDA, 2020.

Figure 13. Detailed Operational Schedule

3.5.1 WORK FORCE

Personnel requirements for the Life of Mine (LOM) are shown in Figure 14, which includes the Mine; Process Plant; administration; security; parking lot; and Health, Safety, and Environmental Compliance (HSEC). The administrative personnel shift system is planned to be four days on and three days off, at 10 hours per day. Production-related mining personnel (operators, fitters, electricians, and assistants) will work a shift system of four days on and three days off in two teams. Each team will work 12 hours per day so the Mine can operate 24 hours per day, four days per week. Processing will work 24 hours per day, seven days a week. Some personnel may work additional overtime through weekends for care-and-maintenance requirements, as needed. The operating calendar is based on 360 operating days per year.

Employees will be transported to the Mine via bus shuttle service provided by Calico, intended to minimize traffic on the Malheur County roads and the Mine Access Road and thereby reducing impacts to the environment and the public utilizing the county roads. The parking lot at the Mine can accommodate up to 24 light vehicles, consisting of operations vehicles and a minimal number of authorized vehicles from off site.

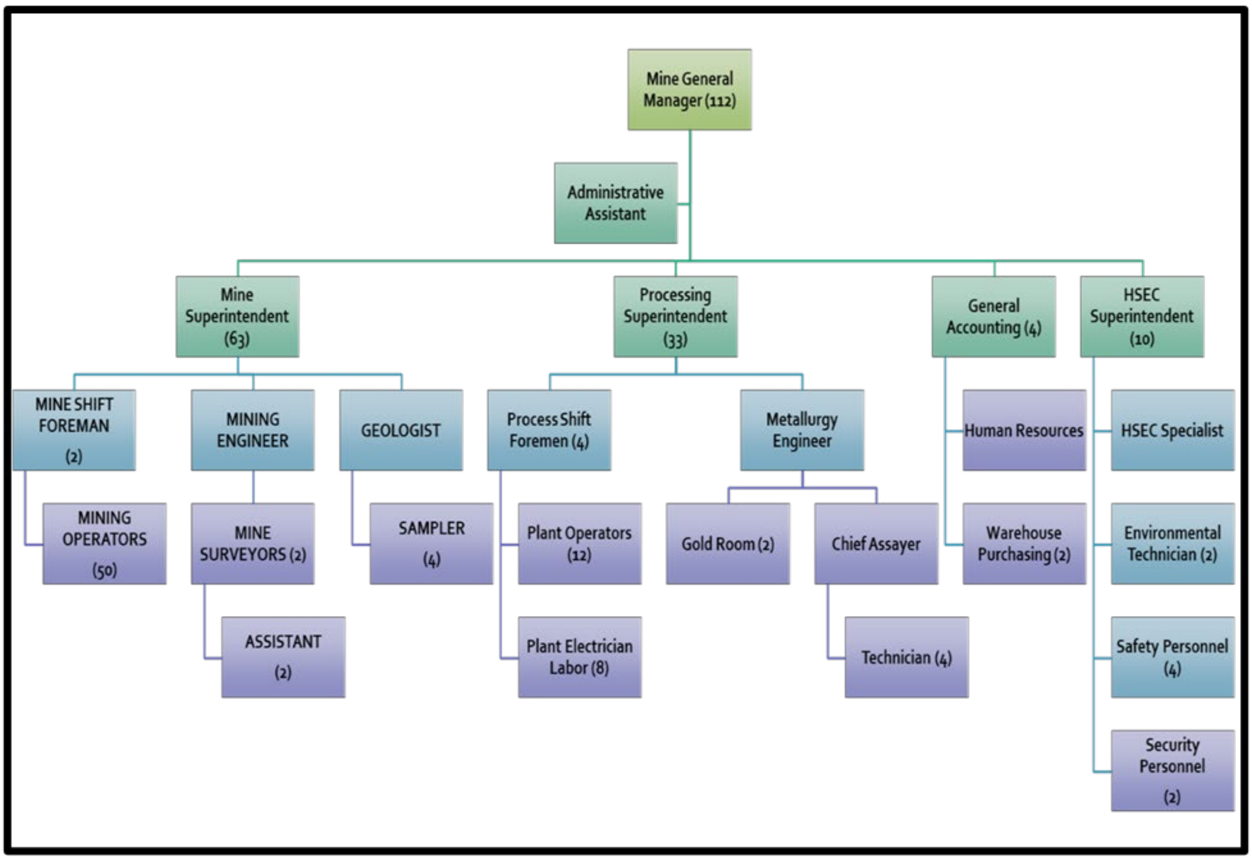


Figure 14. Life of Mine Work Force

3.5.2 LOCAL HIRE POLICY

Calico plans to implement a proactive community involvement and consultation process including: 1) local-hire preference; 2) local contracting and purchasing where practicable; and 3) mine-worker job training to provide an experienced work force.

Mining and milling jobs are expected to be sourced to local communities where possible, with limited relocation to supply the expertise reinforcing the local experience level. Calico also has plans to further partnerships with local community colleges and vocational schools, whereby “mining expertise” can be developed through “partnership curriculums.” These partnerships are likely to include Treasure Valley Community College in Ontario, Eastern Oregon University in LaGrande, and the College of Western Idaho in Boise. The Project will employ approximately 100 to 120 people.

The Project will create many jobs within Malheur County. This would enable economic development during the 2-year construction period and the estimated 14-year Project life. Currently, Malheur County is the poorest County in Oregon, with an unemployment rate of 10.7 percent and a recent job growth rate of -2.10 percent. The economy of the County would increase with the new high-paying jobs provided by Calico. Workers will commute daily to the Project from surrounding towns.

3.6 TAILINGS STORAGE FACILITY – OAR 632-037-0060(4)(h), OAR 632-037-0060(9)(d), OAR 632-037-0077(4), OAR 340-043-0100, OAR 340-043-0130, OAR 340-043-0140, OAR 340-043-0020, ORS 517.971(8)(e)

The TSF receives the treated tails from the Process Plant and allows for material to settle while water is decanted and recovered and pumped to the process water tank for re-use in the Process Plant. Two centrifugal pumps (1 duty/1 standby) located on a barge at the TSF return water through a decant water pipeline, which runs in the same containment trench used for the tailings discharge pipeline, and therefore provides double containment. The TSF and associated infrastructure are located within the perimeter fence, which excludes the public, livestock, and wildlife from accessing the Site and this facility.

The TSF also allows for the natural degradation of remaining trace cyanide. Degradation is achieved through exposure to UV light from the sun and metabolic processes of microorganisms native to the environment in the water of the supernatant pool.

The TSF design is described in detail in Section 2.9.3 and in the *TSF Design Report* (Appendix C4), and the approval for the construction and operation of the TSF by the OWRD is provided in Appendix E5.

3.6.1 GEOTECHNICAL CONSIDERATIONS – OAR 340-043-0030(2)(g), OAR 632-037-0060(9)(d)

The following sections present the general subsurface soil and groundwater conditions at the site along a summary of the stability and settlement analyses performed for the TSF embankment. Slope stability analyses were conducted to evaluate performance of the north TSF embankment for long-term, post-closure conditions based on design criteria of the facility.

Settlement analyses were conducted to evaluate potential impacts of settlement within native and engineered materials on performance of the underdrain collection piping beneath the embankment. Brief summaries on stability and settlement analyses are presented in the following section, and presented in detail in the *TSF Design Report* Appendix C4.

Geotechnical Investigations: Subsurface geotechnical investigations were performed throughout the design of the TSF, which included:

- December 2017 – 15 geotechnical boreholes, 44 test pits and 6 in-situ field falling head permeability tests on native subgrade materials;
- March 2019 – 6 geotechnical boreholes;
- July 2019 – 11 cone penetrations test soundings.

Geotechnical laboratory testing was performed on selected soil samples deemed representative of the materials encountered during the investigation. The laboratory testing program focused on providing information for the more critical aspects of the design. These included the north TSF embankment and potential borrow areas, with a majority of the laboratory tests performed on the lacustrine clay deposits within the footprint of the north embankment. Laboratory testing completed on the lacustrine foundation clays included moisture content, grain size analyses, Atterberg Limits, consolidated-undrained triaxial, and one-dimensional consolidation tests.

To further support the selection of materials strength parameters used in the stability analyses, a Cone Penetration Test (CPT) program was completed within the foundation of the TSF embankments and basin. This program further refined the material properties of the lacustrine clay deposits below the embankments including pre-consolidation, saturation level, stiffness, grain size distribution, and pore-pressure dissipation potential.

General Subsurface Soil and Groundwater Conditions: Subsurface soil and water conditions are described in detail in *TSF Design Report* in Appendix C4.

In general, topsoil was generally observed to be about 0.5 ft thick across the majority of the TSF site. The topsoil is underlain by near surficial alluvial and colluvial deposits across the site with depths ranging from about 0.5 ft to 25 ft bgs. These deposits were generally unconsolidated Generally, the upper portion of the deposit was classified as fine-grained soils classified as lean and fat clay with varying amounts of sand and gravel and were underlain by coarse-grained soils classified as clayey- to silty-sand, clayey- to silty-gravel, and poorly- to well-graded sand and gravel.

Lacustrine deposits were encountered across a majority of the TSF site and primarily classified as lean to high plasticity clay with varying sand content. Abundant evaporites were often found in the upper 3 ft of the deposit and continued in limited amounts throughout. Based on similar units in the region, these units are estimated to be Miocene-age deposits. This horizon was encountered up to depths of 120 ft bgs (maximum depth of exploration) within the footprint of the TSF and may extend deeper.

Relatively shallow (less than 15 ft) weathered arkosic sandstone was observed within the north-central portion of the TSF and west portion of the Mine process facilities. The sandstone is similar to a silty- to poorly graded sand. In general, the west portion of the Mine process facilities consisted of Quaternary deposits underlain by weathered arkosic sandstone, and the east portion of the Mine process facilities area consisted of Quaternary deposits overlying lacustrine fat clay deposits.

No subsurface water was encountered during the field exploration with boreholes extending to a maximum depth of approximately 120 ft bgs. In the *Groundwater Resources Baseline Data Report* prepared by SPF Water Engineering, LLC (SPF) it was reported that the groundwater depth beneath the southern portion of the TSF basin ranged between 155 ft at the BLM well located within the TSF footprint and 232 ft at the GW-3 well located just southwest of the TSF (SPF, 2019). Inferred groundwater contours presented in the same report indicate groundwater beneath the reclaim pond area may be as shallow as 55-feet, however, no groundwater was encountered in any of the boreholes.

Groundwater depths in this area will be refined after the installation of proposed groundwater monitoring wells as presented in SPF's report, *Well Field Design Report*, provided in Appendix C5. In addition, no springs were observed in the TSF or Mine facility areas during the field investigation. However, fluctuations in precipitation may occur that could affect subsurface water conditions at the sites.

Seismic Hazard Analysis: Golder completed a seismic hazard analysis (SHA) for the Project site and is presented in *TSF Design Report* in Appendix C4. The purpose of the SHA was to identify faults that have the potential for surface rupture and to estimate earthquake ground motions for the operational and closure design earthquakes at the site for input into stability modelling. The Grassy Mountain site is located in the Columbia Plateau, a region of relatively low historical earthquake activity.

A probabilistic seismic hazard analysis (PSHA) using the USGS 2014 National Seismic Hazard Model indicates that the earthquakes for the 475-year return period has a mean peak ground accelerations (PGAs) of 0.08 gram. The complete SHA has been included in *TSF Design Report* in Appendix C4.

A deterministic seismic hazard analysis (DSHA) indicates that the Cottonwood Mountain fault is the controlling Maximum Credible Earthquake (MCE) for the Project TSF. The Cottonwood Mountain fault has a surface trace mapped about 18 miles (28 km) from the TSF at its closest approach and generates an MCE M7.2 earthquake. Using the geometric mean of four equally weighted ground motion models, the median PGA value for the MCE is 0.15 g. The median deterministic PGA has return periods estimated from the 2014 USGS National Seismic Hazard Model (NSHM) at about 1,500 years.

By comparing the PSHA and DSHA, Golder selected the PGA resulting from the median MCE as determined by the DSHA as the design seismic event for the Project TSF for operation and closure. The event results in a PGA of 0.15g.

A seismic coefficient (k) of 0.075 g (one half the peak acceleration) was utilized for the pseudo-static slope stability analysis to model the earthquake loading of the embankment. This reduction in PGA is in line with the commonly accepted state-of-practice by Hynes-Griffin and Franklin (1984).

Embankment Slope Stability: Slope stability of the north and west TSF embankments were analyzed along cross sections that were considered to be the critical embankment section based on anticipated geotechnical conditions in the embankment foundation and the current design configuration (e.g., embankment height, slope angles, and existing topography).

For the north embankment, downstream critical failure surfaces were analyzed at the ultimate Stage 3 height of the 3.64 Mst capacity TSF through the natural drainage. The analysis considered both drained effective stress and undrained strength considering both circular and block-type failures. Circular failures included both global failures through the embankment and foundation soils and shallow 'sloughing' failures of the downstream slope. Block-type failures were assumed to occur at the interface between the embankment fill and the underlying foundation material. Based on the stability analyses, the controlling scenario for geotechnical stability is a deep foundation circular failure using drained effective stress parameters for the clay foundation. Therefore, block-type failures are not presented.

All calculated FOS values were found to be above the minimum criterion (FOS ≥1.5 for static, FOS ≥1.1 for pseudo-static) as summarized in the Table 34. Based on the stability analyses, the controlling scenario for geotechnical stability is a deep foundation circular failure using drained effective stress parameters for the clay foundation.

Table 34. Summary of Critical TSF Stability Analysis Results

Analysis Method	TSF Stage	Static FOS (Target design minimum = 1.5)		Pseudo-static FOS (k = 0.075 g) (Target design minimum = 1.1)	
		North Embankment Section A	West Embankment Section D	North Embankment Section A	West Embankment Section D
Effective Stress	1	1.5	1.9	1.2	1.4
	2	1.5	1.7	1.2	1.3
	3	1.5	1.5	1.2	1.2
Total Stress	1	2.1	-	1.7	-
	2	1.8	-	1.3	-
	3	1.5	-	1.1	-

Settlement: Settlement analysis was performed to evaluate impacts to the integrity and performance of the underdrain collection piping due to settlement of engineered fills and native foundation materials below the facility. Material properties for settlement calculations were estimated from Golder's geotechnical field and laboratory testing programs presented in *TSF Design Report* in Appendix C4. Subsurface soils generally consist of alluvium and colluvium Quaternary deposits of varying thickness (approximately 2 ft to 25 ft) overlying over-consolidated, lean to fat clays with varying sand content. Clays below the embankment were generally stiff to hard and settlement in both the engineered fills and native materials was evaluated using elastic theory.

Post-settlement grades along the underdrain collection piping must remain adequately steep for positive solution flow. To maintain this flow, underdrain collection pipes are designed to be installed at steeper grades and expected to flatten as the dam is constructed and tailings deposition progresses.

In order to achieve a minimum post-settlement of 1 percent, the underdrain outlet pipes will be installed at grades between 1 and 2.5 percent. Results of the settlement analysis indicate that beneath the upstream and main portions of the north embankment, the underdrain outlet pipes will have a post settlement grade of 1 percent and beneath the downstream portion of the main embankment, the underdrain outlet pipes will have a post settlement grade between 1.4 and 2.5 percent. See the *TSF Design Report* in Appendix C4 presents detailed foundation settlement calculations of the TSF embankment and minimum underdrain collection pipe design grades below the North Embankment.

3.6.2 TAILINGS DISPOSAL

The TSF will be located in the broad valley immediately west of the Mine Portal and Process Plant. The TSF will fill the native valley and requires staged embankment construction on the north and west sides. The embankments will be constructed in stages using downstream construction techniques. At an average deposition rate of 680 stpd and total available tailings capacity of 3.64 Mst constructed in three overall stages, the facility will have an ultimate approximate design operating life of 15 years, although the current plan anticipates 7.8 years of active operation. The overall disturbance area is approximately 108 acres at completion of operation. Total disturbance will include the following:

- Embankments constructed of benign basalt generated from the Quarry,
- Geomembrane-lined tailings impoundment area,
- Process water and tailings delivery pipelines,
- Leakage collection system,
- Leakage detection system,
- Light vehicle access roads,
- Stormwater Diversion Channels, and
- Reclaim Pond.

The fundamental objectives of the TSF design are as follows:

- Tailings disposal will be consistent with OAR 340-043-0130;
- Zero-discharge facility;
- Designed for closure;
- Permanent and secure storage of all tailings;
- Protection of the Project area’s groundwater and surface water;
- Diversion of surface water flows around the facility to the maximum extent practicable during operation and closure;
- Achievement of a stable, drained inert tailings mass that will be suitable for reclamation soon after operations cease, and will not pose a long-term threat to downstream water quality; and
- Routing of surface water over the TSF closure cover with no contact with the tailings.

The TSF will be a 100 percent geomembrane-lined facility with continuous primary and secondary leakage collection and leak detection systems where process solutions are expected to be localized. Process solution will be managed with two independent return water systems that return collected water from the TSF back to the Process Plant for reuse in the process circuit.

Freeboard water at the TSF surface will be collected and managed at the supernatant pool via a floating barge. A tailings Leakage Collection System above the primary geomembrane liner will convey underdrain flows via gravity to the Reclaim Pond at the northern downstream toe of the facility where the water is pumped back to the Process Plant for use in the process circuit. A secondary leakage detection system located below the primary geomembrane layer and above a secondary geomembrane layer will also convey underdrain flows via gravity to the Reclaim Pond or reuse. The anticipated maximum flow rates for each system are estimated using a monthly time-step deterministic water balance. The supernatant pool will be maintained away from the embankments on the eastern side of the facility as shown on the Design Drawings in *TSF Design Report* in Appendix C4.

The TSF has been designed as a zero-discharge facility capable of storing the 500-year, 24-hour storm and an allowance for wave action above the anticipated normal operation pool. Permanent Stormwater Diversion Channels will collect and divert stormwater runoff around the facility to a natural drainage north of the TSF or released to the environment. Stormwater that contacts tailings will be contained within the supernatant pool and pumped to the Process Area for use in the process circuit.

Adjacent to the TSF, the TWRSF, a geomembrane lined storage area has been designed to provide temporary containment of waste rock produced during ongoing mining operations. The design of the TWRSF is discussed in Section 3.7. Design concepts for containment leak detection, and underdrain collection systems for the TWRSF are the same as those for the TSF. The underdrain collection piping system will be hydraulically separate from the TSF, and collected underdrain flows will be routed to the TSF Reclaim Pond through a solid wall pipe for independent monitoring and sampling.

3.6.3 DESIGN CRITERIA – OAR 340-043-0090

The design criteria presented below are based on OAR regulations, requirements of the Project as defined by Calico, and Golder's experience designing and constructing TSFs in similar environments. The following OAR Divisions have been used to develop acceptable design levels:

- OWRD, Dam Safety Regulations, OAR 690, Division 20;
- DOGAMI, Chemical Process Mine Regulations, OAR 632, Division 37;
- ODFW, Chemical Process Mining Consolidated Application and Permit Review Standards, OAR 635, Division 420; and
- ODEQ, Chemical Mining, OAR Chapter 340, Division 43.

The following TSF design criteria tables (Table 35 through Table 37) present the design criteria proposed for the Project TSF and the corresponding OAR regulation or guideline.

Table 35. General TSF Design Criteria Table

Parameter	Value	Reference or Regulation
Capacity - Cumulative	3.64 million dry st	Calico
Storage for Stage 1A	0.40 million dry st	Golder, 2021
Storage for Stage 1B	0.58 million dry st	Golder, 2021
Storage for Stage 2	1.06 million dry st	Golder, 2021
Storage for Stage 3	1.60 million dry st	Golder, 2021
Life of Mine	~14 years	Calico
Average Tailings Deposition Rate	680 tons/day	Ausenco, 2020
Tailings Slurry Concentration	42.4% solids (by weight)	Ausenco, 2020
Settled Tailings Density	-80 lb/ft^3	Golder, 2021
Slope of Tailings Surface	1.0%	Golder, 2021
Dam Construction Method	Staged Downstream Construction	Golder, 2021
Dam Construction Material	Heterogeneous RF and/or soil fill	Golder, 2021
Tailings Deposition System	Subaerial discharge spigots	Golder, 2021
Reclaim Water System	Decant pumping and gravity underflow Reclaim Pond	Golder, 2021
Supernatant Pool Location	East side hill, not in contact with dam	Golder, 2021

Table 36. Division–20 - Dam Safety Minimum Design Criteria Table

Parameter	Value	Reference or Regulation
Embankment Geometry		
Upstream Slope Angle	Overall 3 horizontal to 1 vertical (3H:1V), or flatter local slopes 2.5H:1V	OAR 690-020-0038
Downstream Slope Angle	2.5H:1V	OAR 690-020-0038
Geotechnical Criteria		
Hazard Classification	Low	OAR 690-020-0100, Golder recommended
Design Earthquake, Operational	Median Maximum Credible Earthquake (MCE)	Exceeds OAR 690-020-0038 for Low Hazard Dams
Peak Ground Acceleration, PGA	0.15 g	Golder, 2021
Horizontal PGA Factor, k, for pseudo-static stability analyses	½ of the PGA	Hynes-Griffin and Franklin (1984), and Seed (1982)
Static Stability, Factor of Safety	1.5 (minimum)	Golder, 2021
Closure Seismic Stability (pseudo-static), Factor of Safety Hazard Classification	1.1 (minimum) Low	Golder, 2021 OAR 690-020-0100
Impoundment Storage Requirement		
Watershed and Hydrologic Inflows	Precipitation on TSF, small area of run-on into impoundment	Golder, 2021
Minimum Freeboard Above Supernatant Pool	3 ft above maximum operating water surface elevation for peak design storm event and wave action	Golder, 2021 Partial OAR 690-020-0042
Minimum Freeboard Above Tailings Beach	2 ft against dam embankment	Golder, 2021

Parameter	Value	Reference or Regulation
Peak Design Storm Event	500-year, 24-hour plus wave run-up above supernatant pool operating depth	Exceeds OAR 690-020-0037 and OAR 340-043-0090
Water Conveyance		
Tailings Underflow Collection System	Perforated and solid CPE and HDPE gravity draining piping network	OAR 690-020-0038

H:V = horizontal to vertical

Table 37. Chemical Mining Minimum Containment Design Criteria Table

Parameter	Value	Reference or Regulation
Containment and Leak Detection		
Facility Discharge	Zero discharge facility	Calico, Golder, 2021 OAR 340-043-0000
TSF Basin Containment System (top to bottom)	Continuous 80-mil HDPE geomembrane, GCL, prepared subgrade	Golder, 2021 OAR 340-043-0130
TSF Reclaim Pond Containment System (top to bottom)	Continuous 80-mil HDPE geomembrane, geonet leak collection and recovery system (LCRS), 60-mil HDPE geomembrane	Golder, 2021
Overall TSF and WRD Leak Detection System	Perforated 2-inch-diameter Schedule 80 PVC pipe network and monitoring/evacuation ports	OAR 340-043-0000
Underdrain Channel Leak Detection System	Geomembrane lined channel will provide secondary containment, leak detection will be visual	Golder, 2021
Reclaim Pond Leak Detection System	LCRS between two geomembranes, and evacuation port	Golder, 2021
Process Water Management		
Tailings Underflow Collection System	Perforated and solid CPE and HDPE gravity piping network in 18-inch-thick drainage layer 6-inch-thick filter layer Gravity flow to Reclaim Pond	Golder, 2021 OAR 340-043-0050
Tailings Delivery and Distribution System	4-inch-diameter HDPE DR17 carrier pipe inside 8-inch-diameter HDPE DR17 containment pipe Pumping system, if any (designed by others)	Ausenco, 2020 (others)/Golder, 2021
Supernatant Water	Decant pumping system (designed by others) 4-inch-diameter HDPE DR17 carrier pipe inside 8-inch-diameter HDPE DR17 containment pipe	Ausenco, 2020 (others)/Golder, 2021
Reclaim Water System	Pumping system (designed by others) 4-inch-diameter HDPE DR17 carrier pipe inside 8-inch-diameter HDPE DR17 containment pipe	Ausenco, 2020 (others)/Golder, 2021
Surface Water Management		
Perimeter Diversion Channels	100-year, 24-hour storm event plus 9-inch freeboard or 500-year, 24-hour storm event to channel crest	OAR 340-043-0090
Temporary Diversions Channels	25-year, 24-hour storm event plus 9-inch freeboard, or 100-year, 24-hour storm event to channel crest	Golder, 2021

3.6.4 TSF DESIGN SUMMARY – OAR 632-037-0060(4)(B)

3.6.4.1 Site Layout

The proposed TSF is located in the broad valley immediately west of the Mine Portal and Process Plant facilities. Native slopes within the valley range between approximately one and 20 percent. Embankments will be constructed on the north and west sides to impound the tailings. The north embankment will span the width of the valley (generally east to west) while the smaller west embankments will be used to bridge saddles along the western ridge. The TSF will cover an approximate area of 108 acres and has been designed to accommodate 3.64 M st of tailings. An overall layout of the site is presented on the TSF Design Drawings in the *TSF Design Report* in Appendix C4.

One groundwater well, BLM Well, is currently located within the footprint of the TSF and is currently utilized as a water supply for livestock. Prior to construction of the TSF, the BLM Well will be abandoned in compliance with State of Oregon regulations to prevent potential contamination of water resources in accordance with OAR 690-220.

3.6.4.2 Hazard Classification

The Project TSF is designed to meet or exceed the minimum OAR design requirements for a hazard rating of "Low" in accordance with OAR 690-020-0022(22). This classification is based on OWRD's definition of a low hazard classification as, "if the dam were to fail, loss of life would be unlikely and damage to property would not be extensive."

Although a dam breach analysis is not required for a low hazard dam, one was performed and is presented in *TSF Design Report* in Appendix C4. The approval for the construction and operation of the TSF by the OWRD is provided in Appendix E5.

3.6.4.3 Embankments

As shown on the Design Drawings in *TSF Design Report* in Appendix C4, embankments will be constructed to impound the tailings along the north and west sides. The main embankment will cross the natural drainage to the north, and small secondary embankments will be constructed across saddles along the western ridge. The embankments with have a maximum overall upstream slope of 3H:1V with a downstream slope of 2.5H:1V. The north and west embankments will have a maximum height of 84 ft and 30 ft, respectively. The crest width of the north embankment will be 50 ft, with 30-ft-wide crests for the smaller west embankments. The upstream slope of the embankments will be geomembrane-lined to maintain the continuous lining within the facility. A discussion on the embankment lining system is presented in the *TSF Design Report* in Appendix C4.

The TSF will be constructed in a maximum of three stages utilizing downstream construction techniques. Embankment construction materials will be soil and benign basalt sourced from the Quarry and during impoundment grading operations. Viable growth media will be salvaged during construction for use at reclamation. A detailed discussion on construction materials and construction quality assurance and quality control (QA/QC) is presented in *TSF Design Report* in Appendix C4, and a Project *Quality Assurance Plan* is provided in Appendix D5.

Staged construction will provide incremental increases to the facility's storage capacity. The staged storage capacity has been calculated based on a measured settled dry density of 80 lb/ft^3. Table 38 presents a summary of the storage capacity relationship of the TSF.

Table 38. Stage Capacity Relationship Summary

Stage	Main Embankment Crest Elevation (ft)	Maximum Tailings Surface Elevation (ft)	Maximum Tailings Surface Area (acres)	Stage Storage Capacity (Mst)	Cumulative Storage Capacity (Mst)
1A	Varies (Max. 3583)	3581	42	0.40	0.40
1B	Varies (Max 3595)	3593	44.7	0.58	0.98
2	Varies (Max. 3609)	3607	59.5	1.06	2.04
3	Varies (Max. 3622)	3620	83.0	1.60	3.64

3.6.4.4 Lining System

The TSF impoundment area and upstream slopes of each embankment will be continuously lined with both primary and secondary lining systems to provide continuous containment of process solution. The overall lining system will vary depending on the location within the facility. The proposed lined areas are presented on the Design Drawings in *TSF Design Report* in Appendix C4.

Golder performed an evaluation to compare an alternative lining system to the one prescribed in OAR 340-043-0130(3). The OAR guidelines for secondary containment are "*an engineered, stable, soil/clay bottom liner (maximum coefficient of permeability of 10^{-7} cm/sec) have a minimum thickness of 36 inches.*"

The evaluation compared the OAR guideline with both a standard GCL and an enhanced GCL. Both GCLs consist of a sodium bentonite layer between two geotextiles needle-punched together. The enhanced GCL contains an additional laminated thin flexible membrane barrier to offer an increased level of hydraulic performance (decreased hydraulic conductivity). To perform the comparison, the potential fluid travel time through each of the lining systems was evaluated for the following scenarios:

- Comparison of secondary containment alternatives alone (soil/clay liner versus GCL),
- Comparison of a 60-mil primary containment geomembrane liner with the secondary containment, and
- Comparison of an 80-mil primary containment geomembrane liner with the secondary containment.

Using the comparison of fluid travel times, the standard GCL did not meet the same performance standard as the soil/clay secondary layer (OAR requirement); however, the enhanced GCL exceeded the performance based on fluid travel time for all three scenarios. The enhanced GCL in place of the soil/clay secondary liner is proposed. The detailed evaluation is presented in *TSF Design Report* in Appendix C4.

Within the impoundment, the lining system will consist of (from bottom to top) a 6- to 12-inch-thick native prepared subgrade, a 300-mil-thick enhanced GCL, 80-mil HDPE geomembrane liner, an 18-inch-thick drainage layer, and a 6-inch-thick filter layer. Perforated piping will be located within the drainage layer to promote drainage of the tailings and to reduce hydraulic head on the lining system.

On the upstream embankment slopes, the lining system will be the same but without the overlying piping, drainage layer, and filter layer. Placement of a drainage layer above the geomembrane on the upstream embankment slopes is impractical due to the relatively steep side slopes and erosion potential of a cover from tailings deposition. Additionally, the TSF underdrain channel, TWRSF underdrain channel, and tailings delivery channel from the Process Plant will utilize the same lining system as the TSF embankment slopes providing secondary containment.

3.6.4.5 Water Management

Process Fluid Circuit

Water is used in the process circuit for both the metallurgical process and transportation of the tailings to the TSF. Tailings are thickened in the mill after metals extraction. Prior to transport, water is added back into the tailings slurry to decrease the solids concentration and allow for pumping. Based on rheological requirements for transport, the tailings will be deposited into the TSF at an average solids concentration of 46 percent solids by weight.

Tailings are discharged into the lined TSF impoundment through evenly spaced spigots. As tailings are deposited into the impoundment, the solids separate from the slurry. A portion of the separated water flows to a low point within the impoundment to form the supernatant pool. The remaining water within the tailings mass will drain down to the underdrain collection and lining system. Both the drain and supernatant water are pumped to the Process Plant for reuse.

All piping and pumping systems are comprised of HDPE pipes that are either dual containment pipelines or are located within geomembrane-lined channels. Leak detection is performed by visually monitoring flows within the secondary containment systems.

Tailings Distribution System

Tailings will be delivered to the TSF from the Process Plant via a dual containment HDPE tailings delivery pipe. The tailings delivery pipe consists of a 4-inch-diameter DR17 HDPE carrier pipe and an outer 8-inch-diameter DR17 HDPE containment pipe. The tailings delivery pipe will be parallel to the proposed reclaim water pipe located along the access road from the Process Plant to the TSF as shown on the Design Drawings in *TSF Design Report* in Appendix C4.

The tailings delivery pipe will tie into a 4-in-diameter DR17 HDPE tailings distribution pipe routed along the TSF perimeter access road where tailings will be deposited via evenly spaced spigots. Spigots are 1-inch-diameter HDPE drop pipes with manual control valves to allow for tailings deposition as needed to maintain the appropriate supernatant pool configuration and location.

The tailings distribution pipe and spigots are located above the TSF basin containment system, providing dual containment at all times.

Supernatant Pool

Water collecting in the supernatant pool is comprised of free water produced during tailings deposition and precipitation falling on the impoundment surface. The supernatant pool will be maintained on the eastern side of the facility away from the facility embankments as shown on the Design Drawings in *TSF Design Report* in Appendix C4. As outlined in Section 3.2.9, the tailings discharged to the TSF will be detoxified to minimize cyanide concentration of the water in the supernatant pool. An *Ecological Risk Assessment* (ERA) of the constituents in the supernatant pool was completed and is incorporated in the application as Appendix F. The ERA shows the supernatant pool would not be detrimental to wildlife.

Water from the supernatant pool will be extracted via barge pumping and delivered back to the Process Plant for reuse through a return water pipe. The supernatant pool is designed to fluctuate seasonally depending on climatological conditions. The supernatant pool will have an average operating depth of 5 ft that is controlled by the pumping system and is deep enough to prevent drawing tailings solids from the pool bottom.

The return water pipe will combine the flows from the supernatant pool and the Reclaim Pond. The combined flows will be pumped in a single, dual containment, return water pipe consisting of a 4-inch-diameter DR17 HDPE carrier pipe and an outer 8-inch-diameter DR17 HDPE containment pipe that will parallel the tailings delivery pipe located along the access road from the Process Plant to the TSF as shown on the Design Drawings in *TSF Design Report* in Appendix C4.

Underdrain Collection System

As deposition continues, the tailings will consolidate due to increased vertical pressure as the tailings surface elevation increases. In addition to water bleeding upward into the tailings surface and the supernatant pool, water will also be released from the tailings downward into the underdrain. The intent of the underdrain collection system is to reduce the hydraulic head on the liner system and to promote drainage of the tailings for long-term closure.

This network of perforated pipes in the underdrain will capture and convey underflow via gravity to the Reclaim Pond located downstream of the main embankment as shown on the Design Drawings in *TSF Design Report* in Appendix C4. The underdrain collection system will consist of variable diameter and pipe types depending on their location and vertical pressure. In general, primary and secondary collection pipes will be perforated 6-inch-diameter double-wall CPE, and tertiary collection pipes will be 4-inch-diameter double-wall CPE. Tertiary collection pipes will be installed with greater density adjacent to the north embankment and beneath the supernatant pool.

The primary collection pipes will transition to solid wall HDPE outlet pipes and then penetrate through the geomembrane liner at the upstream toe of the north embankment and pass under the dam via solid wall HDPE gravity conveyance pipelines to the Reclaim Pond. For redundancy, the primary collection pipes will interconnect within the TSF basin and flow to the Reclaim Pond.

Where the underdrain outlet pipes pass beneath the embankment, the pipes will be encased in reinforced concrete to protect against deformation and maintain the integrity of the pipes. The pipes and reinforced concrete will be located above a geomembrane-lined channel below the embankment to provide further protection and containment of the system. Beyond the Stage 3 downstream toe, the reinforced concrete encasement will terminate, and the outlet pipes and geomembrane-lined channel will continue to the Reclaim Pond.

Prior to discharging into the Reclaim Pond, each underdrain pipe will enter a monitoring flume. Valves will be located upstream of the monitoring flumes to restrict flows or be closed in the event that flows to the pond need to be limited for short periods of time for maintenance or emergencies.

Leakage Detection System

Independent leak detection and LCRS will be installed to monitor and manage potential leakage between primary and secondary containment layers within the TSF.

Below the primary geomembrane liner of the TSF, perforated 2-inch-diameter schedule 80 PVC piping will be installed immediately below the primary collection pipes and primary geomembrane (above the secondary GCL) as shown on the Design Drawings provided in *TSF Design Report* in Appendix C4 to monitor potential leaks where concentrated flows are expected. Along the alignment of the leak detection pipes, an additional layer of 80-mil HDPE geomembrane liner will be installed immediately below the GCL.

As perforated leak detection piping continues downgradient toward the downstream toe of the north embankment of the TSF, the pipes transition to solid wall and additional perforated piping will start at each transition to provide leakage isolation to different areas within the TWRSF and TSF.

Each leak detection pipe will report to an independent leak detection riser near the Reclaim Pond as shown on the Design Drawings provided in *TSF Design Report* in Appendix C4. The leak detection risers will provide access for both monitoring of leakage flows and allow for the installation of small submersible pumps to evacuate any observed flows if necessary

Reclaim Pond – OAR 632-037-0060(4)(c)

The Reclaim Pond will be a double-lined pond north of the main embankment and will contain the TSF and TWRSF underdrain flows as shown on the Design Drawings in *TSF Design Report* in Appendix C4. The lining system for the Reclaim Pond will consist of (from bottom to top): a native prepared subgrade, 60-mil HDPE secondary geomembrane liner, 2-ft deep by 15-ft square leak detection sump, HDPE geonet, and 80-mil HDPE geomembrane primary liner.

The Reclaim Pond was sized to contain, at a minimum, the total volume of water generated during the following:

- 500-year, 24-hour design storm event falling on the surface of the pond;

- Gravity underdrain flow from the TSF and TWRSF for the duration of a 48-hour power outage; and
- Volume of water within the entire length of the reclaim water pipe between the Reclaim Pond and the Process Plant.

The Reclaim Pond has a storage capacity of 146,000 gallons to the underdrain channel invert elevation, which is 3.6 ft below the pond crest. The total storage capacity of the Reclaim Pond is 215,000 gallons while maintaining 2 ft of freeboard beneath the pond crest. In this scenario, water in the Reclaim Pond would also back up into the portion of the lined underdrain channel for additional emergency storage above the minimum required. Pond sizing calculations are presented in *TSF Design Report* in Appendix C4.

Water from the Reclaim Pond will be pumped back to the Process Plant for reuse in the process circuit. The reclaim water pipe provides dual containment and consists of a 4-inch-diameter DR17 HDPE carrier pipe and an outer 8-inch-diameter DR17 HDPE containment pipe. The reclaim water pipe will be installed along the access road downstream of the TSF and along the eastern TSF perimeter access road as shown on the Design Drawings in *TSF Design Report* in Appendix C4. The reclaim water pipe will connect with the supernatant return water pipe where the combined flows will be pumped in a single dual containment pipe installed parallel with the tailings delivery pipe located along the access road from the Process Plant to the TSF.

At all times, process fluid pipelines will be located above secondary containment that consists of either geomembrane liners or concrete containment structures.

Development of Climate Data

Climate data for the Project site was developed using nearby meteorological monitoring station data and regression analysis based on elevation of the TSF dam. For this project, climate data and station metadata of the closest Remote Automated Weather Stations and Cooperative Observer Network stations to the Project site were identified and compared, along with the PRISM Climate Group spatial data, using statistical and regression analyses.

A technical memorandum describing the climate data reviewed for the TSF design is presented in *TSF Design Report* in Appendix C4.

Water Balance

A deterministic spreadsheet-based monthly time step water balance was developed for each stage of the TSF based on a tailings deposition rate of 680 stpd.

Inflows to the system include precipitation and snowmelt above lined areas, stormwater run-on from the catchment areas downgradient of the Stormwater Diversion Channel and water being deposited within the tailings slurry at a rate of 164 gpm. Stormwater run-on from up-gradient catchment areas upgradient of the Stormwater Diversion Channel is diverted around the TSF.

Outflows/losses include evaporation from the tailings beach area, evaporation from the supernatant pool area, interstitial water permanently stored within the tailings mass, and estimated reclaim flow rates to the Process Plant in order to effectively manage water in the supernatant pool.

The average reclaim rate from the supernatant pool is 71 gpm for Stages 1A through 3 and varies between zero during summer months (July and August) to 134 gpm during winter months (December and January). Make-up water required was defined as the rate of evaporation from the tailings beach and supernatant pool (outflow) plus interstitial water loss (outflow) minus precipitation (inflow). The make-up water rate is less than or equal to the rate that water is reporting to the TSF in the tailings slurry. The average make-up water rate is 72 gpm for Stages 1A through 3 and varies between 160 gpm during summer months (July and August) to 3 gpm during winter months (December and January).

The detailed water balance and supporting discussions are presented in *TSF Design Report* in Appendix C4.

TSF Freeboard

For TSFs (non-water impounding structures), freeboard is generally defined separately for the area with free water in the supernatant pool and the dry tailings beach areas. The OAR guidelines do not define these separately. The minimum freeboard definition presented in OAR 690-020-0042 is generally intended for water storage reservoirs where water is in contact with the embankments. However, for tailings storage facilities in arid climates, tailings deposition and reclaim water can be managed to prevent free water from contacting the embankment, which is the approach for the Grassy Mountain TSF, as shown on the Design Drawings in *TSF Design Report* in Appendix C4.

The TSF is designed to provide a minimum freeboard depth of 5 ft above the maximum supernatant pool water surface where it is impounded against the geomembrane-lined southern hillside. This freeboard will provide suitable dam storage height above the maximum water surface elevation to contain wave action above the 500-year, 24-hour storm event falling on the TSF impoundment and the upgradient catchment areas below the permanent and temporary diversion channels. Wave run-up calculations were developed assuming the TSF had experiences of a 500-year, 24-hour storm with waves generated from sustained wind loading using the average wind speed in the prevailing wind direction. Wave run-up calculations have been included in *TSF Design Report* in Appendix C4.

Tailings beach areas are defined as areas where the impoundment surface is free of pooled water and only comprised of drying or dry tailings. The TSF is designed so that only tailings will impound against the embankments. In the tailings beach areas, a minimum freeboard of 2 ft will be provided from the highest beach elevation to the lowest dam crest elevation.

In addition to the above freeboard dimensions, the TSF is designed such that the lowest tailings surface and pool elevation is away from the perimeter embankments. This results in the overall tailings surface sloping away from the perimeter embankments southeast toward the Supernatant Pool and not directly contacting the embankment. Overtopping or freeboard encroachment is not expected with the fluid management for the TSF as presented in *TSF Design Report* in Appendix C4.

At closure, a spillway has been sized to accommodate surface water flows from the surface of the reclaimed TSF while the permanent Stormwater Diversion Channels (discussed below) remain in place. This spillway can be constructed and implement at any point during operation or closure.

Stormwater Control

Permanent and temporary Stormwater Diversion Channels have been included in the design to convey surface water run-off from upgradient catchment areas around the TSF to decrease the amount of run-on water that needs to be managed within the TSF. The stormwater channels are sized to contain the following:

- Permanent channels: 100-year, 24-hour storm event with 9 inches of freeboard or the 500-year, 24-hour storm event without overtopping
- Temporary channels: 25-year, 24-hour storm event with 9 inches of freeboard or 100-year, 24-hour storm event without overtopping

A detailed summary of the hydrologic and channel hydraulic calculations is presented in *TSF Design Report* in Appendix C4.

3.7 WASTE ROCK MANAGEMENT – OAR 632-037-0060(4)(b), OAR 340-043-0040, OAR 340-043-0050

A single TWRSF will be constructed to temporarily store the approximately 0.27 Mst of waste rock generated during operations. A haul road will connect the Mine Portal with the TWRSF. The TWRSF will reach its maximum storage of approximately 0.27 Mst at Year 6 of operations; however, approximately 0.15 Mst will be placed on the TWRSF by Year 1 of operations. This material will primarily be generated prior to operations during the development of the Mine Portal. The design of the TWRSF is included in *TSF Design Report* in Appendix C4.

The design criteria presented below are based on OAR, requirements of the Project as defined by Calico, and Golder's experience designing and constructing lined Mine waste facilities in similar environments. The following OAR Divisions have been used to develop minimum acceptable design levels:

- DOGAMI, Chemical Process Mine Regulations, OAR 632, Division 37;
- ODFW, Chemical Process Mining Consolidated Application and Permit Review Standards, OAR 635, Division 420; and
- ODEQ, Chemical Mining, OAR Chapter 340, Division 43.

The TWRSF design criteria in Table 39 presents the minimum design criteria proposed for the Project waste rock and the corresponding OAR regulation or guideline.

Table 39. TWRSF Design Criteria Table

Parameter	Value	Reference or Regulation
Capacity	0.27 Mst	Ausenco, 2020
TWRSF Containment System (top to bottom)	Continuous 80-mil high-density polyethylene liner (HDPE) geomembrane, geosynthetic clay liner (GCL), prepared subgrade	Golder, 2021
TWRSF Leak Detection System	Perforated 2-inch-diameter Schedule 80 polyvinyl chloride (PVC) pipe network and monitoring ports	OAR 340-043-0000
TWRSF Underflow Collection System	Perforated and solid CPE and HDPE gravity piping network in 18-inch-thick drainage layer 6-inch-thick filter layer Gravity flow to Reclaim Pond	Golder, 2021 and OAR 340-043-0050
TWRSF Design Earthquake, Operational	475-year return period	Golder, 2021
Peak Ground Acceleration, PGA	0.08 g	Golder, 2021
Horizontal PGA Factor, k, for pseudo-static stability analyses	½ of the PGA	Hynes-Griffin and Franklin (1984), and Seed (1982)
Static Stability, Factor of Safety	1.5 (minimum)	Golder, 2021
Seismic Stability (pseudo-static), Factor of Safety	1.1 (minimum)	Golder, 2021

3.7.1 LINING SYSTEM – OAR 632-037-0060(4)(f), OAR 340-043-0000(2)(a)

The TWRSF will be continuously lined with both primary and secondary lining systems to provide dual containment of process solution. The containment system is consistent throughout the facility but the drainage system above the primary geomembrane liner will vary depending on the location as described in the *TSF Design Report* (Golder, 2021) provided in Appendix C4.

To meet the minimum guidelines of OAR 340-043-0130(3), the secondary containment layer of the TWRSF dual containment system will be an enhanced geosynthetic clay liner (GCL) with a maximum hydraulic conductivity of 1 x 10^{-10} cm/sec. The enhanced GCL provides a slower conductivity than a compacted soil with a thickness of 36 inches and permeability of 1 x 10^{-7} cm/sec. Hydraulic conductivity comparison calculations for the enhanced GCL are presented in *TSF Design Report* in Appendix C4. Estimates for leakage through the primary geomembrane liner were prepared for variable quality of installation and construction quality assurance and control in accordance with EPA 530/SW 87-015, Background Document on Proposed Liner and Leak Detection Rule (EPA, 1987). These estimates are based on both the average and maximum anticipated piezometric head on the primary geomembrane liner between collection pipes. Estimates for piezometric head above the geomembrane and leakage through the primary liner are presented in *TSF Design Report* in Appendix C4.

The lining system will consist of (from bottom to top) a 6- to 12-inch-thick native prepared subgrade, a 300-mil thick enhanced GCL, 80-mil HDPE geomembrane liner, an 18-inch-thick drainage layer, and a 6-inch-thick filter layer. Perforated piping will be located within the drainage layer to promote drainage of the tailings. This lining system is the same as described above for the TSF.

The TWRSF pad is designed to capture and convey precipitation infiltrating the waste rock to the TSF reclaim pond for independent monitoring and management. Generally, the TWRSF pad slopes from south to north at an approximate one percent grade.

3.7.2 UNDERDRAIN COLLECTION SYSTEM – OAR 632-037-0060(4)(f)

An underdrain collection system will be installed above the geomembrane liner. The collection system will consist of a series of perforate pipes installed within the drainage layer above the geomembrane liner. A single perforated 6-inch-diameter double-wall corrugated polyethylene (CPE) primary collection pipe will capture flows from 4-inch-diameter double-wall CPE pipes within the drainage layer.

Prior to exiting the TWRSF, the perforated 6-inch CPE primary collection pipe will transition to a solid wall dual containment 6-inch-diameter HDPE DR17 by 10-inch-diameter DR17 pipe. The dual containment underdrain outlet pipe will penetrate through the lined perimeter berm of the TWRSF and travel above ground between the TWRSF and the edge of the TSF Stage 1A geomembrane liner limits.

At the Stage 1 TSF basin liner limits, the 10-inch-diameter containment pipe will terminate, and the 6-inch-diameter carrier pipe will continue to the TSF reclaim pond above the TSF basin geomembrane liner. The TWRSF underdrain collection system is presented in detail in *TSF Design Report* in Appendix C4.

The TWRSF drain pipe is one of four primary collection pipes across the TSF basin and that report to the Reclaim Pond. The primary collection and underdrain outlet pipes have a full flow capacity of 249 gpm at the minimum 1 percent post-settlement grade below the north embankment of the TSF. A maximum design flow rate of 99 gpm to account for potential pipe deformation and long-term scale build-up was utilized in the design. The flow rate anticipated from the TWRSF will be comprised solely of precipitation falling directly on the TWRSF and as a result is significantly lower than the design flow rate for each pipe.

Because the primary collection pipes are perforated to the upstream toe of the north embankment of the TSF, each pipe provides redundant capacity to the others in the event that one or more become blocked. Hydraulic sizing of the primary collection and underdrain outlets pipes is presented in *TSF Design Report* in Appendix C4. As embankment construction and tailings deposition progresses, the primary underdrain outlet pipes will experience grade flattening due to foundation settlement of the embankments. Foundation settlement is discussed in detail in *TSF Design Report* in Appendix C4.

Where the underdrain outlets pipes pass beneath the embankment, they are located above a geomembrane-lined channel that provides secondary containment. Within this underdrain outlet channel, the outlet pipes are encased in reinforced concrete to protect against deformation and maintain the integrity of the pipes. Design of the reinforced concrete encasement is presented in *TSF Design Report* in Appendix C4.

The underdrain outlet pipes will continue to the Reclaim Pond within the geomembrane lined underdrain channel. Prior to discharging into the Reclaim Pond, each underdrain pipe will enter a flume where flows can be measured and monitored. Additionally, upstream of the monitoring flumes, 6-inch-diameter knife gate valves will be installed that can be used to restrict flow or closed in case of emergency. The water conveyed from the TWRSF to the Reclaim Pond will be utilized as make-up water for the mining operation.

3.7.3 LEAKAGE DETECTION SYSTEM – OAR 632-037-0060(4)(f), OAR-340-043-0000(2)(a)

Independent leak detection and leakage collection and recovery systems (LCRS) will be installed to monitor and manage potential leakage between primary and secondary containment layers within the TWRSF containment pad.

Below the primary geomembrane liner of the TWRSF (and the TSF), perforated 2-inch-diameter schedule 80 polyvinyl chloride (PVC) piping will be installed immediately below the primary collection pipes and primary geomembrane (above the secondary GCL) as shown on the Design Drawings provided in *TSF Design Report* in Appendix C4 to monitor potential leaks where concentrated flows are expected. Along the alignment of the leak detection pipes, an additional layer of 80-mil HDPE geomembrane liner will be installed immediately below the GCL.

As perforated leak detection piping continues downgradient toward the downstream toe of the north embankment of the TSF, the pipes transition to solid wall and additional perforated piping will start at each transition to provide leakage isolation to different areas within the TWRSF and TSF.

Each leak detection pipe will report to an independent leak detection riser near the Reclaim Pond and the TWRSF containment berm as shown on the Design Drawings provided in *TSF Design Report* in Appendix C4. The leak detection risers will provide access for both monitoring of leakage flows and allow for the installation of small submersible pumps to evacuate any observed flows if necessary.

3.7.4 WASTE ROCK STORAGE STABILITY – OAR 340-043-0030(2)(g), OAR 632-037-0060(9)(b)

The TWRSF is designed to remain in place during operation only. Due to the temporary nature of the TWRSF, geotechnical stability of the TWRSF was performed for static and pseudo-static conditions using an operational basis earthquake with a return period of 475 years. The site-specific hazard assessment for the Project is presented in *TSF Design Report* in Appendix C4. Table 40 presents the geotechnical stability analysis results for the TWRSF.

Table 40. Summary of Critical TWRSF Stability Analysis Results

Analysis Method	Static FOS (Target design minimum is 1.5)		Pseudo-static FOS (k = 0.04 g) (Target design minimum is 1.1)	
Effective Stress	Failure through Foundation	Waste Rock Slide over the Liner	Failure through Foundation	Waste Rock Slide over the Liner
	1.8	1.6	1.6	1.4

FOS = factors of safety

Detailed discussions on analyses and construction-level design of the TWRSF containment system are presented in *TSF Design Report* in Appendix C4.

3.8 CHEMICAL STORAGE AND USE – OAR 632-037-0060(4)(l), OAR 632-037-0060(11), OAR 632-037-0060(13), ORS 517.971(7)(j)

The volume and shipment frequency of fuels and reagents used in process is shown in the Fuels and Reagents Volumes and Shipments table below (Table 41). Acid solutions, caustic soda, and concentrated cyanide solutions will be delivered to the Site in liquid form. Containment of process solutions is based on 110 percent of the largest containment volume for each reagent. Anti-scalant is included in Table 41 below and in the *Emergency Response Plan* (ERP; Appendix D6).

Acid will be stored in the absorption, desorption, and refining (ADR) building and limited to individual totes or barrels that are used in the acid area and will not exceed 1,300 gallons. The volume of acid stored in the building will be less than the largest acid tank, which will be the acid wash vessel having a volume of 2,320 gallons.

Caustic soda solution will be received in a 10,000-gallon tank, diluted, and then distributed to the Process Plant. Liquid caustic soda will be delivered to the Mine at 50-percent concentration and diluted to 20-percent concentration for use on site. Transfer of caustic soda solution will occur on the same concrete slab used for cyanide solution.

Hydrocarbon products, including lubricants, oils, antifreeze, and used oil will be stored at the truck workshop, located south of the Process Plant Area (Map 4). Reagents will be transported, stored, and used in accordance with federal, state, and local regulations as outlined in the *Toxic and Hazardous Substances Transportation and Storage Plan* (THSTP; Appendix D7). The transportation, storage, and use of cyanide is outlined in the *Cyanide Management Plan* in Appendix D8. Spill contingency and emergency preparedness measures are outlined in the ERP, included as Appendix D6.

Diesel fuel and hydrocarbon products will be stored in primary (tanks, tote bins, barrels) and secondary containment to prevent release to the environment. Used oil and used containers will be disposed or recycled according to federal, state, and local regulations.

Table 41. Fuels and Reagents Volumes and Shipments

Chemical	Onsite Storage	Anticipated Stored Amount	Estimated Consumption Rate	Shipment Frequency
Mill Ore Processing				
Sodium Cyanide, liquid - Mixed to 30% NaCN	13,000 gallons	13,000 gallons	191 gal/day	1/month
Lime - Dry pebble at 90% CaO	25-ton truckload	100-ton silo	12.9 tons/day	3 - 4/month
Anti-Scalant (liquid surfactant)	240 lb carboy	2 carboys	30 lb/day	2/month
Carbon Acid Wash & Neutralization				
Hydrochloric Acid (HCl) - Liquid 33%	330-gallon HDPE totes	14 totes 3,000 gallons in tank/vessel	107 gal/day	8-9/year
Acid Wash Vessel	2,320 working gallons			
Acid Mix Tank	282 working gallons			
Caustic Soda - Sodium Hydroxide (NaOH) - Liquid, 50%	330-gallon totes	11 totes	136 gal/day	1/month
Cyanide Detoxification				
Copper Sulfate Pentahydrate – 98% by weight, Used at 15% strength	2,750-lb bulk bags 2,955 working gallons	2,955 gallons	35 lbs/day	4-5/year
Sodium Metabisulfite (SMBS)	2750-lb bulk bags	16 bags	2,552 lbs/day	2/month
Fluxes				
Borax (pentahydrate) - Dry	50 lb sacks	20 sacks	10.4 lbs/week	1-5/year
Silica (SiO_2) - Dry	50 lb sacks	10 sacks	51.8 lbs/week	
Niter ($NaNO_3$) - Dry	50 lb sacks	5 sacks	8.6 lbs/week	
Feldspar - Dry	50 lb sacks	5 sacks		
Mercury Control				
Sulfide-impregnated Carbon - Dry	50 lb sacks	40 sacks	42.5 lbs/day	8/year
Mercury Recovered				
Mercury	80 lb flask		5 lbs/day	As needed
Electrolytes				
Sodium Hydroxide (NaOH) - Dry	20 lb sacks	10 sacks	15 lbs/day	3/month
Assay and Met Lab				
Sulfuric Acid (H_2SO_4) Reagent Grade	1 gallon	6 gallons		
Nitric Acid (HNO_3) Reagent Grade	1 gallon	10 gallons	1lb/day	
Hydrofluoric Acid (HFl) Reagent Grade	1 gallon	2 gallons		
Hydrochloric Acid (HCl) Reagent Grade	1 gallon	4 gallons		
Sodium Cyanide (NaCN) Reagent Grade – Dry	5 lb box	10 boxes	1 lb/ day	6/year
Buffer Solution Reagent Grade - Dry	5 lb box	10 boxes		
Lead Nitrate ($PbNO_3$)- Dry	20 lb bag	1 bag		

Chemical	Onsite Storage	Anticipated Stored Amount	Estimated Consumption Rate	Shipment Frequency
Acetylene	Size 45 industrial Acetylene Cylinder	3 in lab/15 in shop	2 cylinders per week	6/year
Fluxes				
Borax Penta - Use Plant Source	50-lb sacks	20 sacks	10 lbs/week	5/year
Silica - Use Plant Source				
Lead Oxide - Reagent Grade	80 lb pail	1 pail	2 lbs/day	*
Methyl Ethyl Ketone (MEK)	5-gallon pail	1 pail		
Silver Inquart	10 lb package	1 pkg		
Fuel/Lube/Oil				
Diesel- Truck Shop	8,250 gallons	Up to 8,250 gal	140 gal/day	1/month
Ammonium Nitrate/Fuel Oil (ANFO)	2,800-lb totes	7 totes	20,000 lbs/month	
30WT Motor Oil	4,000 gallons	Up to 4,000 gal	15-20 gal/day	
Used Motor Oil	4,000 gallons	Up to 4,000 gal	15-20 gal/day	
Antifreeze	2,000 gallons	Up to 2,000 gal	10-15 gal/day	
Hydraulic Fluid	2,000 gallons	Up to 2,000 gal	10-15 gal/day	
90WT Gear Lube	2,000 gallons	Up to 2,000 gal	10-15 gal/day	
Used Antifreeze	2,000 gallons	Up to 2,000 gal	10-15 gal/day	
Grease bins	4 x 120-gallon totes, 4 x 30-gallon drums	Up to 4 totes, Up to 4 drums	5-10 gal /day	

3.8.1 REAGENTS

Given the properties of the reagents and their interactions with each other, design of the reagent preparation area will largely focus on the isolation of the cyanide. The cyanide preparation area is located away from incompatible reagents and in a low traffic area of the Process Plant. The cyanide preparation area will also be separated from the acidic reagents preparation area by the alkaline reagents. In this configuration the basic chemicals act as a buffer to prevent mixing of acidic reagents and sodium cyanide, which would lead to the generation of cyanide gas. See the process flow diagrams in the *Mill Design Report* for details in Appendix C3.

3.8.1.1 Hydrated Lime

Preparation of the hydrated lime will require:

- A bulk storage silo,
- A mixing tank,
- Dosing pumps feeding a ring main, and
- Automatically controlled dosing points from the ring main.

Hydrated lime is used in leaching and detoxification for pH control. The hydrated lime is delivered to the Site by bulk tanker and blown into a bulk storage silo.

When the mixing tank level is low, hydrated lime is added to the tank via a rotary valve and screw feeder. Process water is added at the same time to maintain the mixture strength of 20 percent, forming a milk-of-lime suspension.

Milk-of-lime is distributed to the various dosing points using a ring main that provides constant flow to various destinations. Dosing is accomplished with drop lines off the ring main with automated on-off valves that open when pH is low and close when the operator specified target is reached.

3.8.1.2 Sodium Hydroxide

Preparation of NaOH will require dosing pumps.

NaOH, also known as caustic soda, is used in the elution circuit to prepare the stripping solution used to recover the gold from the loaded carbon. The reagent will be delivered in 330-gallon totes received by truck and unloaded near sodium hydroxide area. The solution is supplied at a concentration of 50 percent by weight basis. A dosing pump is connected directly to the tote and provides the required dosage of sodium hydroxide to the point of use in the elution circuit. Additional totes are stored in secured containers in a bunded Reagents Storage area adjacent to the leach-CIL circuit.

3.8.1.3 Sodium Cyanide

Storage and distribution of sodium cyanide will require:

- A tanker unloading pad;
- A bulk storage tank,
- A ring main, and
- Dosing pumps.

Sodium cyanide is used in leaching as a lixiviant and in elution as a carbon stripping aid. Sodium cyanide is delivered to the Site in liquid form by bulk tanker in 6,400-gallon loads at 30 percent purity and transferred into the sodium cyanide storage tank.

Sodium cyanide is dosed from the storage tank to dosing points via a ring main that provides constant flow to various destinations. For additional information on the equipment and procedures for the handling of cyanide, reference the *Cyanide Management Plan* in Appendix D8.

3.8.1.4 Sodium Metabisulphite

Preparation of SMBS will require:

- A bulk handling system,
- A combined mixing/storage tank, and
- Dosing pumps.

SMBS is the source for SO_2 in the Air/SO_2 process and will be supplied in 2750-lb bulk bags with a minimum quality of 67 percent SO_2. It will be delivered to the Site by truck, offloaded by forklift and stored in the reagent storage area adjacent to the reagents mixing facility. SMBS is mixed and stored in a combined mixing/storage tank laid out such that the mixing tank is directly above the storage tank and mixed solutions drops by gravity into the storage tank.

When the storage tank level is low, an SMBS mix is started by dropping a bulk bag of SMBS onto a bag breaker, which discharges SMBS into the mix tank. The mix tank has been previously filled with sufficient process water to produce a mixture strength of 20 percent. Once mixing is complete, and there is sufficient room in the holding tank, the mixed SMBS solution is transferred by gravity to the holding tank.

SMBS is dosed from the storage tank to the detoxification circuit via a dosing pump. A second pump is provided as an installed spare.

3.8.1.5 Copper Sulfate (Pentahydrate)

Preparation of copper sulfate will require:

- A bulk handling system,
- A combined mixing/storage tank, and
- Dosing pumps.

Copper sulfate (pentahydrate) ($CuSO_2.5H_2O$) is supplied in 2750-ln bulk bags at a purity of 98 percent on a weight basis. It will be delivered to the Site by truck, offloaded by forklift and stored in the reagents storage area adjacent to the reagents mixing facility. Copper sulfate is mixed and stored in a combined mixing/storage tank laid out such that the mixing tank is directly above the storage tank and mixed solution drops by gravity into the storage tank.

When the storage tank level is low, copper sulfate is added to the mixing tank by dropping a bulk bag onto a bag breaker, which discharges copper sulfate into the mix tank. The mix tank has been previously filled with sufficient process water to produce a mixture strength of 15 percent. Once mixing is complete, and there is sufficient room in the holding tank, the mixed copper sulphate solution is transferred by gravity to the holding tank.

Copper sulfate is dosed from the storage tank to the detoxification circuit via duty/standby dosing pumps.

3.8.1.6 Hydrochloric Acid

HCl is used in the elution circuit and is supplied in 330-gallon totes in liquid form at 33-percent concentration on a weight basis. It will be delivered to the Site by truck. The acid will be dosed directly to the acid wash column through a dosing pump. Raw water is added to the HCl to a strength of 3 percent via inline mixing ahead of the acid wash column.

3.8.1.7 Low Pressure Air

The blowers will supply low pressure process air to the pre-aeration, leach, CIL and the cyanide detoxification circuits. The blowers are multiple-stage, centrifugal-type blowers and are used with a "blow-off" arrangement to adapt to fluctuations in air demand.

3.8.1.8 Plant and Instrument Air

Two plant air compressors in a duty standby configuration will provide high pressure compressed air to meet the demand for plant and instrument air requirements.

Wet plant air will be stored in the plant air receivers to account for variations in demand prior to being distributed throughout the plant. Instrument air will be filtered and then dried in an instrument air dryer prior to reporting to the gold room or general plant distribution.

3.8.2 PETROLEUM-CONTAMINATED SOILS MANAGEMENT – OAR 340-093-0170, OAR 340-093-0190

In the event site soils become contaminated with petroleum products due to accidental spills or other activity, the soils will be handled as described in the *Petroleum-Contaminated Soils Management Plan* in Appendix D9.

3.8.3 WASTE DISPOSAL MANAGEMENT – OAR 340-093-0170, OAR 340-093-0190, OAR 340-093-0210

Management of wastes begins before materials are purchased by evaluating the potential environmental impacts of materials considered for use. The Project will minimize the overall generation of waste to the extent practical and minimize the use of materials that are regulated as hazardous waste when they no longer serve their intended purposes. Materials are reused and recycled whenever possible. Materials that cannot be managed onsite, such as liquid waste, hazardous waste, certain items to be recycled or reused, and waste prohibited from disposal in landfills, will be shipped off-site for reuse, recycle, treatment or disposal at appropriate facilities.

Materials will be characterized according to the Resource Conservation and Recovery Act (RCRA) requirements and will be stored appropriately. Calico will obtain a Hazardous Waste Identification Number from the ODEQ to address hazardous waste generated at the Project. The Mine is expected to be in the "small quantity generator" category as defined by the EPA. Waste handling and disposal methods for the specific wastes anticipated at the Project are provided In Calico's *Waste Management Plan* (Appendix D3).

A training program will be implemented to inform employees of their responsibilities in proper waste disposal procedures. RCRA requires this training occur within six months of employment and annually thereafter.

As outlined in the ERP (Appendix D6) Calico will have a trained response team at the Site 24 hours per day to manage potential spills of regulated materials at the Site. Response for transportation-related releases of regulated materials bound for the Site will be the responsibility of the local and regional agencies, as outlined in the THSTP (Appendix D7). However, where appropriate, Calico may assist with response to offsite incidents, including providing resources, based on agency requests.

3.8.4 EXPLOSIVE STORAGE AND USE

Explosive agents will be purchased, transported, stored, and used in accordance with the BATFE, Department of Homeland Security provisions, and MSHA regulations. The primary explosive used will be ANFO. Explosive agents, boosters, primers, detonators, detonation cord, and other ancillary blasting supplies will be stored within a secure powder magazine. Boosters and detonators will be stored in separate storage magazines.

Explosives storage facilities will be constructed at the southwest side of the Project (Map 4). This location uses the hill as a natural barrier between the explosives-storage facility and other infrastructure. The storage facilities will consist of leased powder magazines as per vendor quotation. Earthen berms will be placed around the magazines for additional security.

Explosives will be delivered to the Site by vendors by truck and will be delivered to the working face using stainless-steel totes on flatbed trucks.

3.8.5 CYANIDE MANAGEMENT

Cyanide transporters are expected to comply with the International Cyanide Management Code for the implementation of appropriate emergency response plans and capabilities in the event of a release or spill, and with the Federal Motor Carrier Safety Administration's regulations for transportation of hazardous materials on public highways (49 CFR Part 397). Aqueous sodium cyanide will be delivered to the Project by bulk tanker from Winnemucca, Nevada, with each tanker holding 6,400 gallons. The fluid will be transferred to a 13,000-gallon storage tank in the cyanide storage area, which will be completely fenced and secured, and placed on an impervious concrete slab with walls providing a 110 percent containment. The cyanide solution will be metered to various points throughout the plant. Additional information on cyanide management is in the *Cyanide Management Plan* (Appendix D8).

3.9 MINE SITE INFRASTRUCTURE

3.9.1 HAUL AND ACCESS ROADS

The roads used to access the Mine and Process Plant Area are described in detail in the *Road Design Report* (Appendix C1). The *Road Design Report* describes the design specifications and where the existing road will be upgraded, widened, and realigned. The roads within the Permit Area are shown on Map 1 and Map 2. These roads will be upgraded in accordance with MSHA regulations, and best management practices (BMPs) will be used where necessary to control erosion and impacts to surface water.

3.9.2 POWER SUPPLY

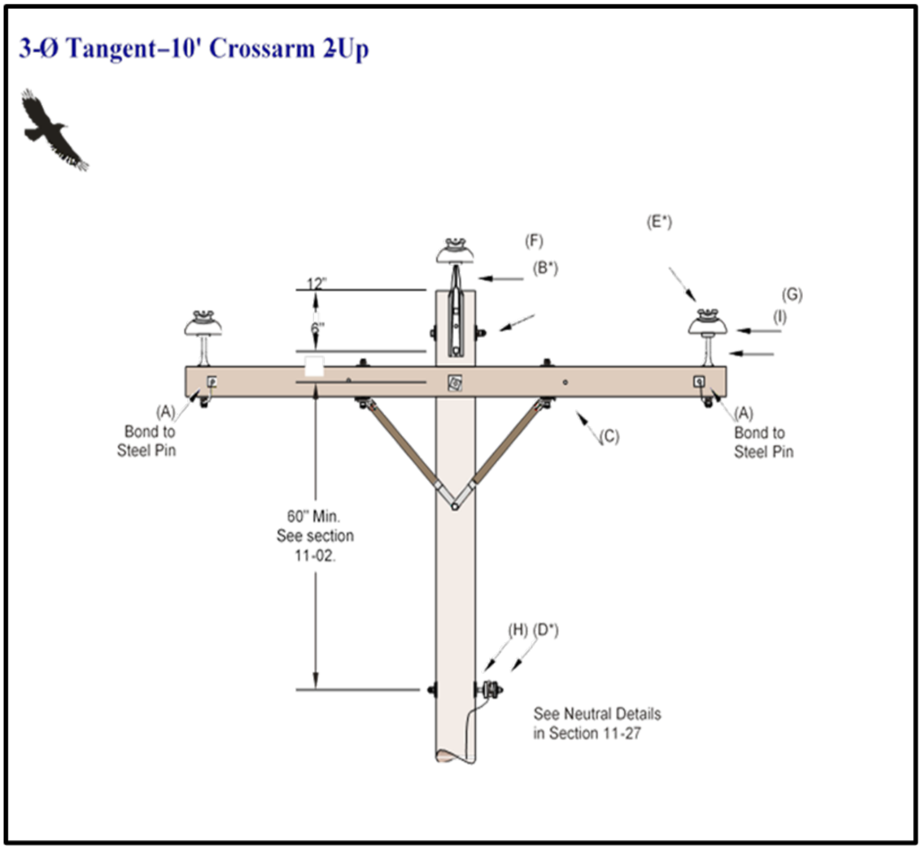
Electrical power will be supplied for the Project via a powerline owned and maintained by Idaho Power. The existing powerline will be upgraded, and a new powerline will be constructed along the BLM and county roads and the Mine Access Road to provide power to the Mine for approximately 25.2 miles. The powerline is shown on Map 2. The power demand will be approximately 5 megawatts (MWs) throughout the LOM and a reduced power demand will remain during reclamation activities. The Idaho Power powerline will connect to the Project substation, located at the Process Plant.

3.9.2.1 Onsite Power Generation

During construction of the powerline, one emergency diesel generator capable of producing 2,000 kilowatts (kW) will be located at the Process Plant. It will be used for slightly more than one year during construction and initial mining of the decline. After the powerline is complete, this generator will provide sufficient emergency power to operate critical components at the facility in the event of a power outage Power generation is estimated based on monthly rates and fuel, as the rate per kilowatt hour (kWh) will vary depending on power consumption.

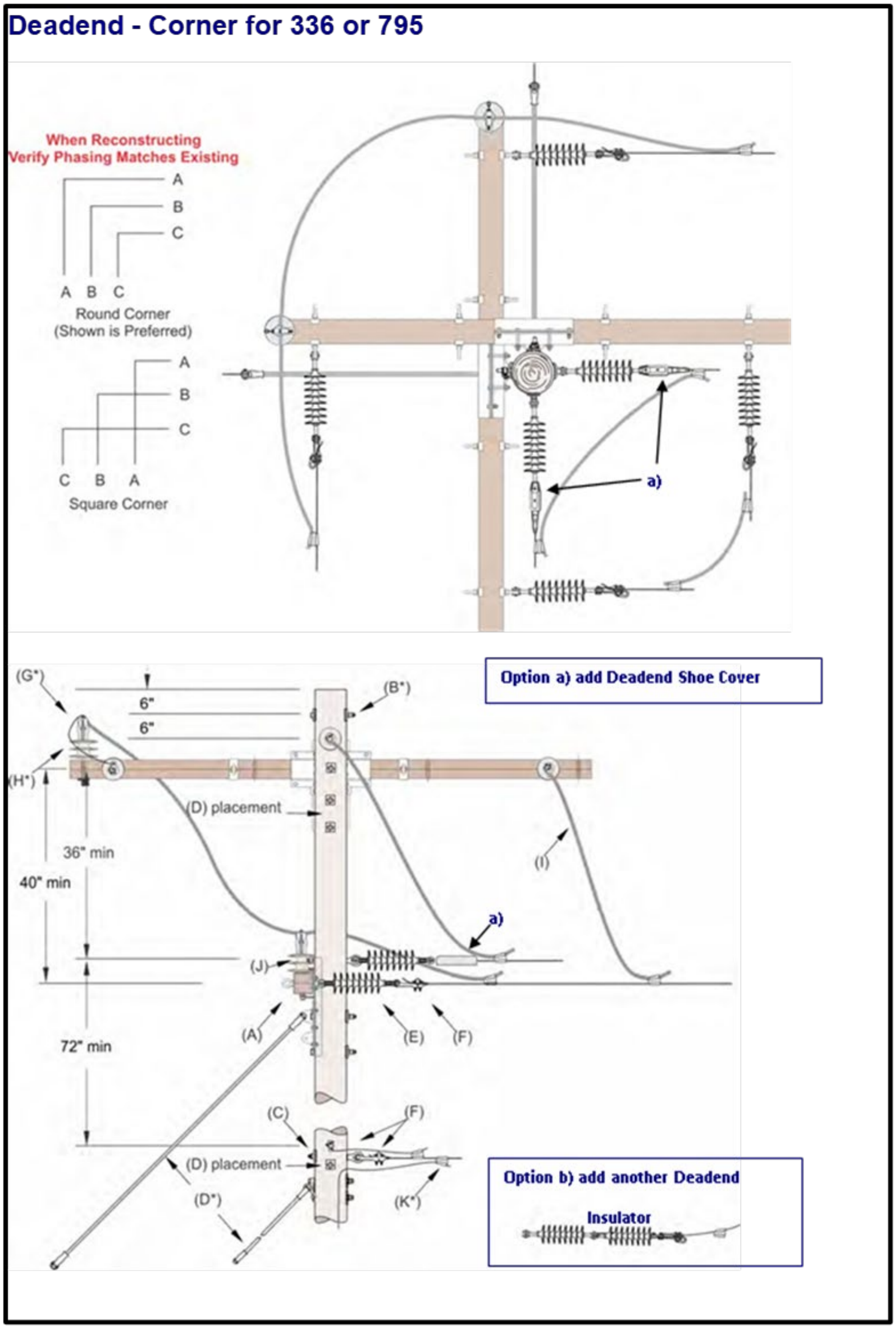
3.9.2.2 Line Power

The design for line power was coordinated with Idaho Power to deliver approximately 5.3 MW of power to the Site, including an approximately 25.2-mile distribution circuit, a new 69/34.5 kV to 14 megavolts transformer, and a new 34.5-kV 167-amp regulator. The powerline would be constructed from the Hope Substation near Vale, Oregon, to the Mine site along the main access road, within the Access Road portion of the Permit Area. Figure 15 through Figure 18 present the planned line pole configurations, using structures designed for Zone 3 avian protection as noted for each figure.



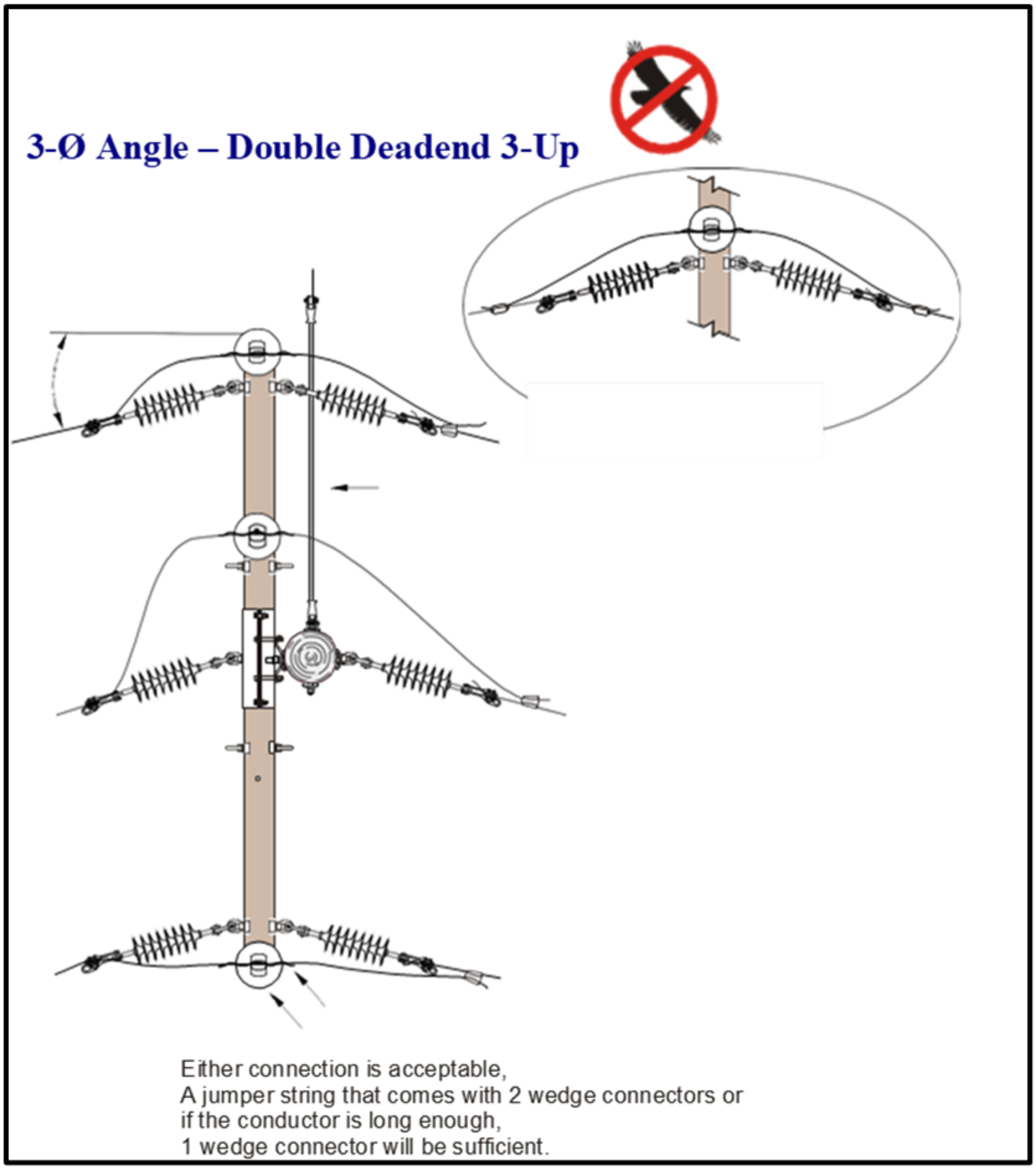
Note: Structures falling under this category will be modified per Idaho Power's Overhead Distribution Manual 11-33-01 to obtain Zone 3 avian protection.

Figure 15. Planned Line Pole Configurations, 3-0 Tangent – 10' Crossarm 2-Up



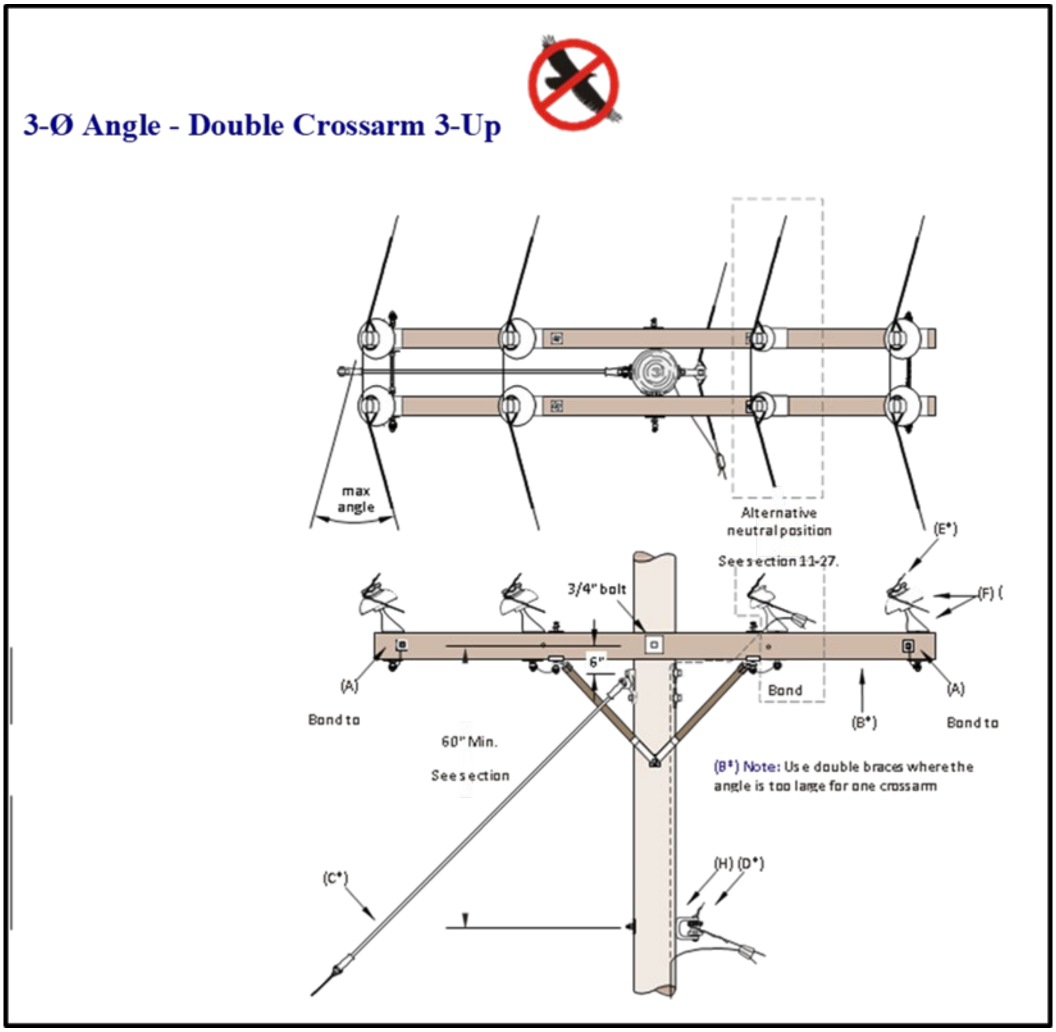
Note: Structures falling under this category will be modified per Idaho Power's Overhead Distribution Manual 11-33-03 to obtain Zone 3 avian protection.

Figure 16. Planned Line Pole Configurations, Deadend – Corner for 336 or 795



Note: Structures falling under this category will be modified per Idaho Power's Overhead Distribution Manual 11-34-05 to obtain Zone 3 avian protection.

Figure 17. Planned Line Pole Configurations, 3-0 Angle – Double Deadend 3-Up



Note: Structures falling under this category will be modified per Idaho Power's Overhead Distribution Manual 11-34-01 and 11-31-03 to obtain Zone 3 avian protection.

Figure 18. Planned Line Pole Configurations, 3-0 Angle – Double Crossarm 3-Up

New power poles will be constructed for approximately 25.2 miles from the connection to the existing powerline to the Mine and distribution powerlines within the Permit Area. The new construction will consist of approximately 525 poles, approximately 40 ft in height, and constructed approximately 0.05 poles per mile. Line power will be utilized following the cessation of mining to support reclamation and post-closure monitoring activities. Both the retrofitted infrastructure along the existing lines and the newly constructed transmission lines will meet Idaho Power's Zone 3 standard for avian protection from electrocution. The Zone 3 standard meets the suggested practices of the Avian Power Line Interaction Committee and the design protects all species of birds including eagles from the risk of electrocution. In addition, to reduce the risk of corvid predation on sage-grouse, new power poles located within 3.3 kilometers of sage-grouse habitat will be fitted with deterrent structures (e.g., Triangular Avian Perch and Nest Diverters).

All new power poles and lines will be demolished and salvaged or disposed of offsite as part of reclamation as described in Section 4 and in the *Reclamation Plan* in Appendix D1.

3.9.2.3 Site Power Distribution

The plant power distribution from the powerhouse will be via overhead powerlines. The distribution voltage to the local electrical rooms will be 14.4 kV. There will be a combination control-room and motor-control-center room, which will be prefabricated and loaded with electrical equipment prior to delivery to the Site. The power distribution from the electrical rooms will be 480 V. The total connected load for the Process Plant is expected to be 4.8 MW, with an average power draw of 3.6 MW.

3.9.2.4 Underground Mine Power Distribution

At the start of mining an underground 480 V transformer will be placed near the entrance to the Mine Portal. This will supply power to electrical equipment used to develop the main decline and operate portable fans. Once development has advanced far enough that carrying power at 480 V becomes too inefficient, a main powerline will be installed along the rib of the decline to carry 1.4 kV and connected to the transformer, which will be moved underground.

Upon completion of the decline to the 33420 level, and the initiation of production-mining activities, a second underground transformer will be installed for use in the lower areas of the Mine.

Line power will also be carried to the location of the ventilation shaft to supply power to the ventilation fans.

3.9.3 WATER SUPPLY AND MANAGEMENT – OAR 632-037-0060(5)(c)

Process water will be provided from the well field, reclaim water from the TSF and TWRSF underdrain systems captured within the Reclaim Pond and recycled process water. The current and proposed water supply areas are described in the *Well Field Design Report* (Appendix C5). Water from the well field will be piped through a combination of underground and above ground steel and HDPE piping to a freshwater tank, located at the Process Plant, after which it will be treated, then distributed accordingly. The *Wastewater Facilities Preliminary Engineering Report* is provided in Appendix C6 and the *Water Pollution Control Facility – Individual Onsite* permit application is provided as Appendix E6. The nominal capacity of the freshwater delivery system will be approximately 750 gpm.

Potable water will be supplied from the freshwater tank. Water will be delivered from the freshwater tank through adsorptive media for arsenic removal followed by chlorination, prior to storage in the potable water tank. Calico secured conditional approval of the proposed potable water treatment system, Public Water System ID #4195624, by Oregon Health Authority in correspondence dated March 2, 2020 (Appendix E7). The approved treatment method uses granular ferric hydroxide for arsenic removal from groundwater. Arsenic will be treated for removal below the MCL of 0.010 mg/L.

Calico has water rights from the OWRD in the amount of 2 cubic feet per second (cfs) (Appendix E8 - Water Rights Amendment). This equates to approximately 900 gpm, which is more than the planned water demand for the Project (see Section 3.10).

The overall water balance/budget as well as the water management plans are discussed in Section 3.10.

3.9.3.1 Raw Water

Raw water will be pumped from Site production wellfield to the raw water tank for distribution throughout the operation. Raw water in the tank is used to supply the following services:

- Reagent preparation water;
- Slurry pumps gland seal water;
- Fire Water;
- Vehicle Wash Station; and
- Potable water treatment plant, potable water is then sent to the potable water tank located at the Process Plant for safety showers and eyewash stations.

3.9.3.2 Potable Water

Potable water is sourced from the Raw Water tank and treated in the potable water treatment plant, after which it is stored in the potable water storage tank. Potable water will be distributed throughout the Process Plant area via two potable water pumps in a duty/standby configuration for use during operation and during Stage 1 through Stage 4 of reclamation. The potable water plant and distribution is shown on Process Flow Diagram 101768-0000-F-015 included in Appendix B of the *Mill Design Report* (Appendix C3), while the location of these buildings is shown on layout drawing 101768-0000-G-102 included in Appendix C of the *Mill Design Report* (Appendix C3). Detailed distribution within each building has not been developed yet.

3.9.3.3 Gland Water

Water for the gland water system is supplied from the raw water tank and distributed to each slurry pump by the gland seal water pumps in a duty/standby configuration.

3.9.3.4 Process Water

Process water is comprised of decant water from the TSF, contact water from the plant water collection pond, and raw water additions. Process water is stored in the process water storage tank and distributed by the process water pumps, in a duty/standby configuration.

3.9.4 STORMWATER AND SEDIMENT CONTROL STRUCTURES – OAR 632-037-0060(4)(d), OAR 340-043-0040(2)(b), ORS 517.971(8)(d)

Stormwater Diversion Channels and ditches will be constructed as necessary around Mine facilities to control stormwater run-on and reduce the volume of non-contact water captured in the process (Map 2). Stormwater control ditches and sediment retention basins will be constructed in accordance with BMPs as outlined in the *Best Management Practices for Reclaiming Surface Mines in Washington and Oregon* (DOGAMI, 1997) and in the *TSF Design Report* (Appendix C4). Permanent diversion ditches are sized to contain a 100-year, 24-hour precipitation event with 9 inches of freeboard, or the 500-year, 24-hour storm event without overtopping. Temporary channels were designed to convey the 25-year, 24-hour storm event with 9 inches of freeboard or the 100-year, 24-hour storm event without overtopping. Primary Stormwater Diversion Channels will remain as permanent features after final reclamation and Mine closure including the Stormwater Diversion Channel upgradient of the TSF and the Quarry.

Run-off control structures include silt traps and fences constructed of certified weed-free straw bales, or geotextile fabric, and sediment retention basins. Sediment control measures are implemented as necessary to reduce soil movement within the Site and to minimize offsite effects. These structures will be maintained throughout the LOM. Soil collected in these structures will be periodically removed and placed in growth medium stockpiles for future use during reclamation.

3.9.5 QUARRY – OAR 632-037-0060(4)(g), OAR 632-037-0077(1), OAR 632-037-0077(3)

One borrow area is located on the east edge of the Project Area and is the basalt Quarry. The DOGAMI *Abbreviated Operating Permit Application – Grassy Mountain Basalt Borrow Quarry Aggregate Application* is provided in Appendix E2, while the abbreviated operating permit application limited to the Project's *Closure Cover Borrow Areas Quarry* is provided in Appendix E3. Borrow material generated from the Quarry will be required for areas that need prepared subgrade materials, drainage materials, pipe bedding materials, road surfacing materials, retarding layer materials, closure cover materials, growth media, underground Mine backfill, and riprap.

The surface mining operation will cover approximately 48 acres, with a maximum depth of 125 ft, with the lowest elevation at 3,790 ft amsl. The estimated volume of material to be excavated is 3.16 million bcy. Quarry benches will be approximately 40 ft vertical faces separated by 60 ft horizontal benches, resulting in an interim sloping configuration of 1.5H:1V. The Permit Boundary setback is 50 ft from all operations. Activities associated with the Quarry surface mining will require drilling and blasting, shovel/loader/scraper for moving the material, crushing, stockpiling, and screening. Water will be used for dust control. Detailed drawings are included in Appendix E2.

Permanent Stormwater Diversion Channels and surface water run-on diversion berms are included in the design of the Quarry to divert stormwater from up-gradient catchment areas upgradient of the Quarry. The primary Stormwater Diversion Channel associated with the Quarry will remain at reclamation. Precipitation that falls directly onto the Quarry footprint will be managed within the Quarry using internal sloping, retention berms and a stormwater management sump, which pumps water to the Process Plant for reuse. Additional BMPs will be implemented to minimize erosion and sedimentation. All stormwater will be managed under the *Stormwater Pollution Control Plan* (Appendix D4). The process material will be stockpiled at the borrow areas until it is needed.

3.9.6 FENCING

A Perimeter Fence, approximately 22,176 ft in length, will be constructed around the Mine and Process Plant Area to prevent access by livestock, wildlife, and the public (Map 2). The perimeter fence consists of an 8-ft-high chain link fence with a 0.5-inch galvanized hardware cloth mesh that extended a minimum of 18 inches below the ground surface and 30 inches above the ground surface (total height 48 inches) and will include signage related to Mine operations and public safety. The area within the

Perimeter Fence is approximately 739 acres. Chain-link fences will also be constructed within the perimeter fence in areas where a higher level of security is needed such as the Gold Room. Chain-link fences will also be constructed around the production wellfield including signage. Gates or cattle guards will be installed along roadways within the Project Area, as appropriate. The perimeter fence will be monitored on a regular basis and repairs made as needed.

3.9.7 INFRASTRUCTURE AND ANCILLARY FACILITIES

Planned ancillary facilities includes laydown areas, maintenance facilities, a meteorological monitoring station, and other support facilities. Map 4 presents the planned Site layout.

3.9.7.1 Support Facilities

Support facilities will consist of the Mine maintenance shop, warehouse and administration buildings. The administration building will be a modular wood-frame structure that will break down into component parts and can be hauled away and re-used. The laboratory will be a number of single-level steel containers that can be hauled away and re-used. The Plant and Truck Workshop/Warehouses are pre-engineered steel frame, metal clad structures that can be similarly dismantled and re-used elsewhere. The mill building is a steel frame and metal clad structure containing process equipment, which will be removed before the frame is dismantled and removed. The electrical rooms are modular structures that can be hauled away and re-used.

Heat will be provided by electric forced air furnaces in the office and personnel buildings and propane gas radiant heat in the maintenance bays. Gas will be provided from a propane tank located near the ADR plant building. Air conditioning will be provided by electrical cooling units.

Mobile equipment maintenance will be performed at the maintenance shop. The maintenance area will consist of an enclosure and concrete pad of appropriate size and an oil/water separator.

Lubricants, antifreeze, and used oil and coolant will be managed and stored in the area in a manner complying with MSHA requirements and other state and federal regulations.

A centralized oil-water separator will be installed adjacent to the truck workshop to treat water from drains located at each maintenance bay and from the wash rack. The floor drains in the truck workshop will be intended for collection of rainwater and snow melt from vehicles and equipment. Wash water from the oil/water separator will be collected in a tank within containment. The wash water will be recycled back to the wash system. The separated oil will be stored either in a double-lined tank or a single-wall tank in a concrete containment and collected by a licensed waste collection contractor for offsite disposal. Solids will be periodically removed from the wash system and containerized pending profiling and disposal as described in the *Waste Management Plan* (Appendix D3).

Security offices will be located at the perimeter fence northwest of the Process Plant as shown on Map 4.

The administrative building will be located at the Process Plant, north of the mill. These offices will house the reception area, offices for administrative staff, a first aid clinic, and a meeting/training room. This building will also be utilized during reclamation and post-reclamation monitoring.

A septic field with the capacity to treat up to 3,920 gpd of domestic wastewater and backwash from the potable water treatment system will be installed to the west of the administration and warehouse buildings (Map 4).

3.9.7.2 Assay and Metallurgical Laboratory and Quality Control

The plant is equipped with automatic samplers to collect shift and routine samples for aqua regia digestion, atomic absorption, and fire assays. Those samples include plant feed, intermediate products, tailings, and final products. The data obtained will be used for product quality control and routine process optimization.

The metallurgical laboratory will perform metallurgical tests for quality control and process flowsheet optimization. The laboratory will include equipment such as laboratory crushers, ball mill, sieve screens, laboratory flotation cells, balances, and pH meters.

The laboratory will be situated adjacent to the process building. The laboratory facility will include areas for sample receiving and preparation, fire assay, weighing room, wet analytical laboratory, dry instrument room, and utilities and storage. The laboratory will house the equipment for assaying, metallurgical, and environmental requirements. Dust collection and gas scrubbing equipment will be located external to the laboratory building. The building will be serviced with power, water, air conditioning and heating, communications, air, and fume hoods.

3.9.7.3 Fuel Supply, Storage, and Distribution

A fuel storage depot will be located at the Process Plant. It will include separate diesel above-ground tanks for fueling of light/intermediate and heavy vehicles. Fuel will be delivered via highway-legal trucks directly to the depot. Drivers off-loading fuel will be certified and trained. Camlock fittings or other appropriate fittings will be located within local containment to collect spilled fuels. A sump will be located at one end of the containment so that spilled fuels can be pumped for appropriate disposal from the containment using a portable pump. Prior to arrival of oil-based products onsite, a Spill Prevention, Control and Countermeasure Plan will be authored and stamped by an Oregon professional engineer. Refer to the ERP (Appendix D6) and to the *Petroleum-Contaminated Soils Management Plan* (Appendix D9).

Two double-walled steel tanks will be used for diesel storage with a total capacity of 8,250 gallons. The fuel will be used by both underground and surface mobile equipment. The surface equipment will primarily be fueled at a fuel island near the storage tanks. The underground-mining equipment includes a fuel truck that will be used to fuel underground equipment as required. This fuel truck may be used to fuel surface equipment as needed.

3.9.7.4 Compressed Air Supply

High-pressure compressed air will be provided by two duty screw compressors, one standby screw compressor, and a duty-plant air receiver. There will be two high-pressure air uses: instrument air and plant air. The instrument air will be filtered then dried prior to reporting to the gold room or for general plant distribution. The plant air will be fed straight from the plant air receiver without a drying step.

Low-pressure air for pre-aeration, leach, CIL and cyanide detoxification circuit requirements will be provided by multiple-stage centrifugal-type blowers.

3.9.7.5 Communications

Onsite communications will comprise of inter-connected mobile and fixed systems, including a land-line telephone network, portable two-way radios, and internet. Access for internet and corporate network connection will be made via satellite connections.

Underground communication with the surface will be via a leaky-feeder system as described in Section 2.11.7.6.

3.9.7.6 Transportation

Main transportation of personnel and supplies will be via the Mine Access Road. Employees will be transported to the Mine via bus shuttle service provided by Calico, which is intended to minimize traffic to and from the Mine. The parking lot at the Mine, located at the Process Plant, can accommodate up to 24 light vehicles consisting of operations vehicles and a minimal number of authorized vehicles from off site. An estimated 50 vehicles will be traveling to the Site on a daily basis including employee personal vehicles, delivery vehicles, and other authorized vehicles from off site.

3.9.7.7 Buildings

A total of nine buildings are planned to be constructed at the Site to support mining, processing, and administrative activities. There will also be a guard house at the main gate to the facility and an explosives magazine south of the Mine Portal.

Administration, Offices and Changehouse Building

The administration building will be a single level modular wood frame, 80 ft by 110 ft for a total footprint of approximately 8,800 square feet (ft^2) and will be positioned east of the Process Plant. It will contain the site management team, including general management, commercial and administration management, engineering, Mine operations, senior processing, and maintenance personnel.

Plant Workshop and Warehouse

The Process Plant workshop and warehouse building will be a pre-engineered steel-frame and metal-clad building of approximately 40 ft by 60 ft for a total footprint of 2,400 ft^2 and will be positioned south of the Administration, Offices and Changehouse. This building will be used to perform maintenance for process equipment, as well as for the storage of equipment spare parts.

Truckshop and Warehouse

The truckshop and warehouse building will be a pre-engineered steel-frame and metal-clad building approximately 110 ft by 50 ft and 25 ft by 25 ft for a total footprint of 6,125 ft^2 and will be positioned near the fuel storage area and ore stockpile. This area will be divided into two sections, one for warehousing spare parts and tool storage and the other for a maintenance workshop. A bridge crane will be included in this building, above the maintenance workshop.

Laboratory

The laboratory will be constructed as a single-level steel containers of approximately 40 ft by 60 ft for a total footprint of 2,400 ft^2 situated between the gold room and plant workshop and warehouse. The laboratory building will house all laboratory equipment for assaying, metallurgical, and environmental requirements. Dust-collection equipment will be located external to the laboratory building.

Reagent Storage Area

The reagent storage area will include 10, 40-ft intermodal containers for dry storage of reagents. The reagent storage area will be located west of the CIL tank containment area.

Process Plant

The Process Plant, approximately 9,800 ft^2, is located in a cast in-situ concrete slab, with bund walls providing secondary containment and will include the reagent mixing area, grinding circuit, acid wash and elution, carbon regeneration and cyanide detoxification processes. The pre-aeration tank, two CIL tanks and seven adsorption tanks are located in a separate secondary containment area, immediately south of the Process Plant.

Electrical Rooms: Crushing Area and Process Plant

Two electrical rooms are planned for the facility. One will be in the crushing area south of the reagent storage area, and the other on the north side of the Process Plant.

Gold Room

The gold room, approximately 40 ft by 24 ft for a total footprint of 960 ft^2, will be located in a cast in-situ concrete slab, with bund walls providing secondary containment. The gold room, located east of the Process Plant, houses the electrowinning cell, mercury retort, smelting furnace, and associated support equipment within a security envelope, which limits access to authorized gold room personnel.

Vehicle Wash-Bay Facility

The vehicle wash-bay facility will be an open-air, 30 ft by 40 ft concrete slab with a fluid-collection sump and will be located adjacent to the truck workshop and warehouse. Wash water will be collected in the sump where settling will occur prior to the water being recirculated back to the wash system. An oil-water separation system will be included in the facility to recover hydrocarbons prior to re-use of the wash water. The recovered hydrocarbons will be collected and shipped off site for disposal in accordance with applicable environmental regulations. Solids and hydrocarbon management from the vehicle wash bay are described in the *Waste Management Plan* (Appendix D3).

3.9.8 WASTE DISPOSAL SYSTEMS – OAR 632-037-0060(4)(e), OAR 632-037-0077(4), OAR 340-043-0030(2)(i),OAR 340-045-0015, ORS 517.971(8)(j)

Used lubricants and solvents will be characterized according to the RCRA requirements and will be stored appropriately. Calico may obtain a Hazardous Waste Identification Number from the ODEQ. The Mine is expected to be in the "small quantity generator" category as defined by the EPA. Used solvents are the only identified potentially hazardous wastes at this time. Calico developed a *Waste Management Plan* (Appendix D3) that identifies the possible wastes generated at the site and their means of disposal.

Used oil and coolant will be stored in secondary containment. These will be either recycled or disposed of in accordance with state and federal regulations. Used containers will be disposed of or recycled according to federal, state, and local regulations.

Solid wastes and industrial solid wastes generated by the Mine and process departments will be collected in dumpsters near the point of generation. A training program will be implemented to inform employees of their responsibilities in proper waste disposal procedures. Solid waste will be disposed offsite at a licensed landfill.

Calico will have a trained response team at the site 24 hours per day to manage potential spills of regulated materials at the site, as described in the ERP (Appendix D6). Response for transportation-related releases of regulated materials bound for the site will be the responsibility of the local and regional agencies. However, where appropriate, Calico may assist with response to off-site incidents, including providing resources, based on agency requests.

Wastewater will be discharged to a large scale absorption system, capable of handling up to 4,920 gallons per day. Discharges to this system will include domestic wastewater from bathrooms, showers and sinks and backflush from the potable water treatment system. The wastewater design is provided in the *Wastewater Preliminary Engineering Design* report in Appendix C6. An individual onsite permit for this system is included as Appendix E6.

3.9.9 STOCKPILES – TOPSOIL OR SUITABLE GROWTH MEDIA – OAR 632-037-0060(4)(f), OAR 632-037-0060(9)(c), OAR 632-037-0120(2)

Suitable growth media will be salvaged and stockpiled during the development of the facilities, during construction of the waste rock storage areas and the TSF, and construction of other Project facilities.

Following stripping, growth media will be stockpiled within the proposed disturbance areas. Growth media stockpiles will be located such that they will not be disturbed by mining operations. The surfaces of the stockpiles will be contoured with slopes no steeper than 2.5H:1V to reduce erosion. To further minimize wind and water erosion, growth media stockpiles will be seeded after contouring with an interim seed mix developed in conjunction with the BLM. Diversion channels and/or berms will be constructed around the stockpiles as needed to prevent erosion from overland runoff. BMPs such as silt fences or staked weed-free straw bales will be used as necessary to contain sediment in runoff.

3.9.10 STOCKPILES – MINED ORE STOCKPILE – OAR 632-037-0060(9)(e)

As described in Section 3.2.4, there is an ore stockpile where the ROM ore is stockpiled temporarily before being fed into the crushing circuit. The typical residence time of material in this stockpile is less than 1 week and during normal operations the maximum amount of time ore will be stored is less than one month. One week or one month is not enough time for the ore to react geochemically to generate acid (these reactions typically take on the order of years), so there will be no acidic or metal-bearing leachate from this stockpile and it will not be lined.

The ore stockpile will be small and the slopes will be at angle of repose. This stockpile will have a lined base pad, with containment berms along each edge of the stockpile, and a sump to collect the contact run-off. The liner is specified as a Geosynthetic Clay Liner plus a 2mm HDPE liner. The pad will be nominally sloped towards the sump to promote drainage. The ore stockpile will have a nominal design capacity of approximately 3,000 tons. The GCL and liner base will cover an area of approximately 14,200 ft^2.

3.10 WATER MANAGEMENT – OAR 632-037-0060(5), OAR 632-037-0077(2), ORS 517.971(7)(c), ORS 517.971(8)(c)

3.10.1 PRECIPITATION AND EVAPORATION DATA – OAR 340-043-0030(2)(a), OAR 632-037-0060(5)(a)

Climate data for the Project site was developed using nearby weather station data and regression analysis based on elevation of the proposed Project TSF dam. For this project, climate data and station metadata of the closest Remote Automated Weather Stations (RAWS) and Cooperative Observer Network (COOP) stations to the Project site were identified and compared, along with the PRISM Climate Group (PRISM) spatial data, using statistical and regression analyses.

Details of the climate model are presented in *TSF Design Report* in Appendix C4.

3.10.2 SITE WATER BALANCE – OAR 632-037-0060(5)(b)

An average annual water balance was developed for the project to summarize the projected the inflows and outflows, to determine if the Project was net water negative (makeup water required) or positive (excess water to be treated and released to the environment). The water balance considers general inflows and outflows to the overall system. Inflows to the system include precipitation and snowmelt falling on lined facilities, runoff from an upstream basin reporting to the TSF, seepage into the underground Mine, and makeup water from the production wellfield as needed. Outflows included evaporation from the tailings surface, supernatant pool and reclaim pond, dust control, cement rockfill plus water lost in the void spaces of the stored tailings.

As the TSF was one of the major water inflow/outflow sources for the site water balance, the following parameters were used in the calculations:

- Tailings are deposited in the TSF at an average rate of 709 tons per day over the entire Mine life
- Tailings settled dry density of 80 lb/ft^3 at a saturation of 90 percent
- Tailings have a specific gravity of 2.65
- Tailings slurry contains 42.4 percent solids by weight

The site water balance considered the water required / available for the following activities:

- Mining
  - Mining equipment requirements. This was estimated to be 76 gpm at steady state conditions. This is generally not a consumptive use (the water is recirculated), however it was assumed once steady state mining conditions were reached, there would be a 10percent loss (8 gpm) that would need to be made up from the underground Mine dewatering.
  - Underground mining dust suppressing. This was estimated to be 3 gpm at steady state conditions.
  - Dewatering associated with the underground mine development. The seepage into the Mine was estimated to be 25 gpm inflow.
  - As-delivered ore water content. The as-delivered water content of the ore was considered an inflow, as it would reduce the amount of water that needed to be added to the process and was estimated to be 7 gpm.
  - CRF. This was estimated to be 9 gpm outflow, based on an average CRF backfill rate of 183 tons per year that required the addition of 8.4 percent water for the cement.
- Mill / TSF
  - Tailings slurry. Approximately 160 gpm of water would be an outflow from the mill to the TSF in the tailings slurry.

- Tailings reclaim. An average of 71 gpm of supernatant tailings (process) water would be reclaimed and pumped back from the TSF and would be an inflow to the mill for re-use in the process circuit.
- Tailings Reclaim pond. An average annual rate of 21 gpm of water collected in the Reclaim Pond would be pumped back to the mill as an inflow for re-use in the process circuit.
- The difference between the tailings slurry and the tailings reclaim represents the net water loss in the TSF, with TSF losses due to water trapped in the tailings and evaporation from the impoundment beach and supernatant pond, and TSF inflows from precipitation accumulating within the impoundment.
- Elution circuit. Approximately 36 gpm of freshwater was estimated as part of the gold recovery; however, once used, this would be end up in the process water circuit.
- Collection Pond. Runoff water contacting industrial facilities is routed to the Collection Pond. The water collected and available as an inflow for re-use at the Collection Pond at the base of the process area was estimated to be 1 gpm.
- Potable water requirements. Potable water for the site was estimated to be 4 gpm inflow to the system, and would need to be from a freshwater source.
- Dust suppression for roads and crushing. This was estimated to be 4 gpm outflow to the system, and would be from a freshwater source.

Based on the inflows and outflows presented above, a site water balance summary was developed that identified an average annual makeup water requirement of approximately 72 gpm, with 46 gpm of freshwater needed for dust suppression, elution circuit and potable water, plus another 26 gpm of freshwater to be added to the process circuit. These flow rates may vary during operations based on variable seepage flows in the underground Mine and meteoric contributions at the surface facilities. These inflows and outflows are shown schematically in Figure 19.

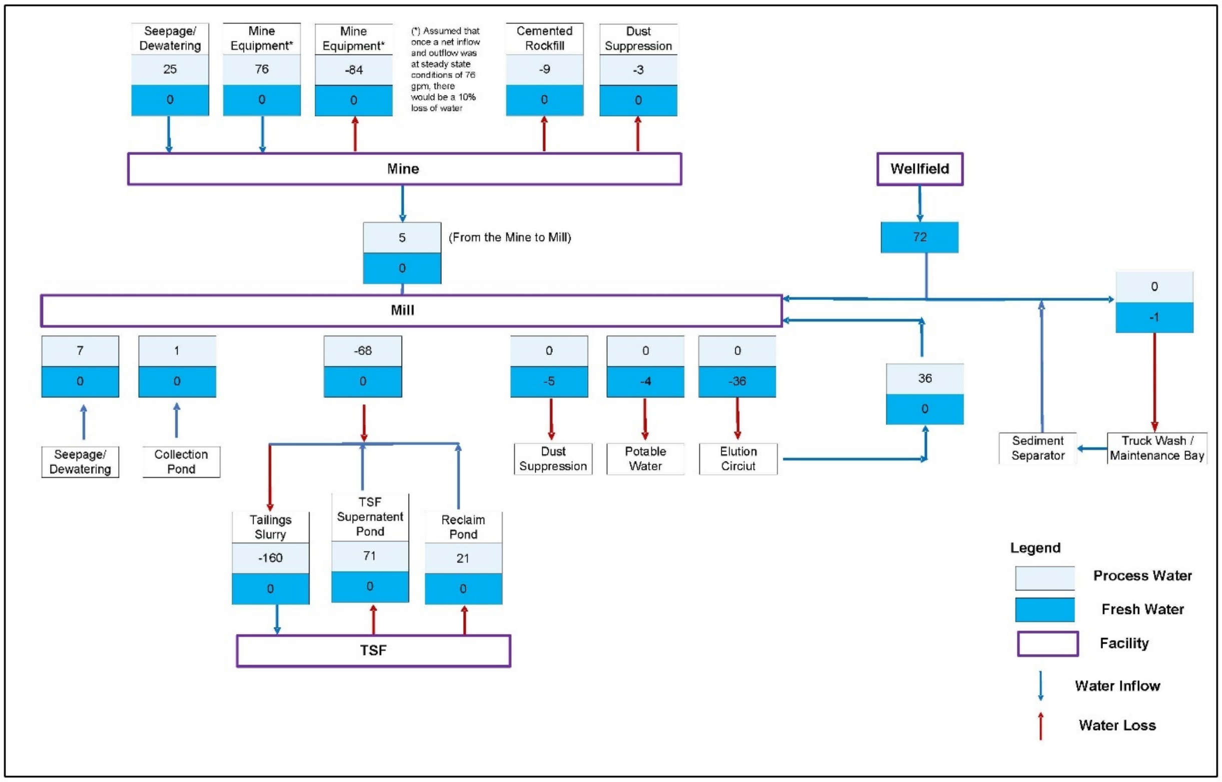


Figure 19. Site Water Balance Schematic

As noted in Figure 19, the overall process has a negative water balance and requires raw water makeup. The source of raw water makeup will be from the site production wells.

3.10.3 MINE DEWATERING ESTIMATE

Ausenco requested Lorax Environmental Services Ltd. (Lorax) provide an assessment of the dewatering effort related to the Project (Lorax, 2020). Lorax developed a conceptual groundwater model, and estimated a low, mid-range and high range of inflows that considered variations in the recharge rate, geology, hydraulic conductivity, water bearing zones, groundwater levels and hydraulic gradients. Lorax estimated an underground mining inflow rate between 12 to 78 gpm with a long-term average of approximately 25 gpm.

3.10.4 MAKEUP WATER FROM PRODUCTION WELLS – OAR 632-037-0060(5)(c)

The water supply for make-up water is discussed in Section 3.9.3.

SPF developed a groundwater model for the production wells. SPF simulated production wells 3, 4, and 5 (Map 2) pumping 107 gpm each for a total of 320 gpm. After 10 years of pumping, the model predicts a little over 2 ft of drawdown at Lowe Spring (1 mile from Well 5) and 0.5 ft drawdown at Poison Spring (approximately 1.75 miles away).

3.10.5 SURFACE CONTACT WATER

Precipitation that falls directly within the Process Plant Area will be collected in a system of ditches and culverts and directed by gravity towards the Collection Pond. See Section 3.2.11 for further information regarding the Collection Pond.

3.10.6 WATER MANAGEMENT PLAN

Table 42 provides a cross reference identifying the title and number of the section and/or appendix of the Plan that satisfy the requirement for a Water Management Plan.

Table 42. Cross-Reference for the Water Management Plan

Item	Plan of Operations Section or Appendix Title	Section or Appendix
Stormwater control	Erosion and Sediment Control	3.9.4
	Stormwater Pollution Control Plan	Appendix D4: Stormwater Pollution Control Plan
	Facility Reclamation	4
Process solutions	TSF Design	Appendix C4: TSF Design Report
	Tailings Disposal	3.62.
	Facility Reclamation	4
	Mill Site	3.2 and Appendix C3: Mill Design Report
	Chemical Storage and Use	3.8
Mine drainage handling	Dewatering	3.10.3 and Appendix B9: Baseline Groundwater Reports – Vol. III, Dewatering Projections and Evaluation of Potential Pumping Impacts
	TSF Design	Appendix C4: TSF Design Report
Establishment of design storm event	Water Management	3.10
	TSF Design	Appendix C4: TSF Design Report
	Facility Reclamation	4
	Process Chemical Containment	3.8 Appendix C3: Mill Design
Determination of runoff from design storm event	TSF Design	Appendix C4: TSF Design Report
	Process Chemical Containment	3.8 Appendix C3: Mill Design
	Facility Reclamation	4
Location and sizing of runoff control structures	Stormwater and Sediment Control Structures	3.9.4
	Stormwater Pollution Control Plan	Appendix D4: Stormwater Pollution Control Plan
Ability to contain leaching solutions during wet periods or extreme precipitation events	Process Chemical Containment	3.8 Appendix C3: Mill Design
	Facility Reclamation	4
Contingency plans for disposal or treatment of excess solutions	Interim Management Plan	Appendix D10: Interim Management Plan

Item	Plan of Operations Section or Appendix Title	Section or Appendix
State/Federal agency permits under National Pollutant Discharge Elimination System (NPDES)	WPCF and Division 43 permits	Appendix E9: Division 43 Permit Application and Application for New Water Pollution Control Facilities Individual Permit (WPCF-N)
	Stormwater General Discharge Permit	Appendix E4: ODEQ Application for New NPDES General Permit 1200-Z
	Septic permit (Onsite WPCF)	Appendix E6: WPCF-OS Application for New Water Pollution Control Facilities Individual Onsite Permit
	Permit to Appropriate Water	Appendix E8: OWRD Water Rights Amendment (Final Order T-13157 to Replace Permit G-10994 with Permit G-18306)
Dredge and fill permit under USACE 404 permit program	Not applicable	--
Coordination with Regional Water Control Board during development of Water Management Plan	Groundwater Baseline Report **Water Resources Commission, East Commissioner:** Bruce Corn **Water Resource District, East Region Manager:** Jason Spriet Baker County Courthouse 1995 3rd Street, Suite 180 Baker City, OR 97814 541-523-8224 Jason.D.Spriet@oregon.gov **Water Resource Watermaster, District -09:** Jered Hoshaw Malheur County Courthouse #4 251 B Street West Vale, OR 97918 541-473-5130 Jered.L.Hoshaw@oregon.gov	Appendix B9: Baseline Groundwater Reports: Vol. I Groundwater Baseline Data Report, Vol. II Groundwater Characterization Report, and Vol. III Dewatering Projections and Evaluation of Potential Pumping Impacts
Other State regulations and standards:	Not applicable	--
■ Detailed plans for water treatment	SPF Well Field Design Report, SPF Wastewater Design Report	Appendix C5: SPF Well Field Design report Appendix C6: SPF Wastewater Design report
■ Treatment Methods	Water Supply and Management	3.10.4 Appendix C5: SPF Well Field Design report Appendix C6: SPF Wastewater Design report Appendix E7: Oregon Health Authority Conditional Approval of Public Water System ID #4195624, dated March 2, 2020
■ System Design	Water Supply and Management	3.10.4 Appendix C6: SPF Wastewater Design report
■ Outfalls	Not applicable	--
■ Rates	Water Supply and Management	3.10.4
■ Treatment threshold	Water Supply and Management	3.10.4
■ Duration of treatment	Not applicable	--

Item	Plan of Operations Section or Appendix Title	Section or Appendix
■ State/Federal permits needed for operation of treatment system	Oregon Health Authority (OHA) Non-transient, Non-Community	3.10.4 Appendix E7: Oregon Health Authority Conditional Approval of Public Water System ID#4195624, dated March 2, 2020

3.10.7 SUMMARY OF WATER STORAGE AND TREATMENT

Based on the average annual site water balance and the estimated fresh makeup water required for freshwater consumption and process water requirements, SPF has developed a production wellfield design that can support the Project needs. However, additional work is needed to verify if there is sufficient makeup water available for seasonal variations (i.e., summer months when higher makeup water requirements are needed).

As part of the FS design, Calico understands that a nominal 237,000-gallon storage tank (total volume) will be installed to address water demands for the Project. Approximately 78,000 gallons of water will be dedicated for fire suppression, with the remaining 159,000 gallons available for makeup water (note that this would provide approximately 37 hours capacity for a makeup water demand of 72 gpm).

Potable water will be supplied from the freshwater tank. Water quality is expected to meet drinking water standards. Water will gravity flow from the freshwater tank to the potable water tank. Calico has received Condition Approval from Oregon Health Authority for New Public Water System, Plan Review #11-2020, Calico Grassy Mountain Mine, Public Water System ID #4195624 (Appendix E7), and will secure appropriate permits for the potable water system.

Calico has water rights from the OWRD in the amount of 2 cfs (see Appendix E8 – Water Rights Amendment). This equates to approximately 900 gpm, which is more than the planned water demand for the Project.

3.11 TEMPORARY CLOSURE (SEASONAL OR OTHER) – OAR 632-037-0060(6), ORS 517.971(7)(l)

Procedures that will be implemented during temporary closure of the facility, whether due to seasonal activity, weather events, major system failure, or other interruptions, are described in the *Interim Management Plan* provided in Appendix D10 with key points summarized in the section below.

3.11.1 TARGET SEASONAL OR TEMPORARY STORAGE VOLUMES AND TOTAL SYSTEM STORAGE CAPACITY – OAR 632-037-0060(6)(a), OAR 632-037-0060(6)(b)

The storage capacity at the facility is designed to accommodate stormwater runoff resulting from a 100-year, 24-hour storm event.

3.11.2 PROCEDURES TO HANDLE VOLUMES OF WATER IN EXCESS OF SEASONAL OR TEMPORARY STORAGE CAPACITIES – OAR 632-037-0060(6)(c)

Water generated from the TSF or TWRSF will be collected by the Reclaim Pond and pumped to the surface of the TSF, resulting in a closed loop system.

3.11.3 ESTIMATED SCHEDULE FOR CLOSURE – OAR 632-037-0060(6)(d)

No temporary or seasonal closures of the facility are planned. However, if temporary closure is necessary, Calico will notify DOGAMI, ODEQ, and BLM within 30 days of the temporary closure, including a description of the procedures and controls that have been, or will be, initiated to maintain and control process components and process fluids. Calico will also provide DOGAMI, ODEQ, and BLM with a list of supervisory personnel with responsibility to oversee the Project and support staff required in each department to maintain the Project during the temporary closure. Standard security procedures will remain in place for the duration of a temporary closure. If the interim closure period exceeds 180 days, Calico will petition DOGAMI, ODEQ, and BLM for an extension to delay permanent closure or initiate procedures to permanently close process components.

3.11.4 MONITORING AND REPORTING PROGRAMS – OAR 632-037-0060(6)(e)

Calico will adhere to provisions in the WPCF permit, the *Interim Management Plan* and other regulatory requirements during the temporary closure period. Management plans will continue to be followed including the *Stormwater Pollution Control Plan, Waste Management Plan, Monitoring Proposal for Groundwater and Facilities, Cyanide Management Plan, Tailings Chemical Monitoring Plan, Wildlife Mitigation Plan, Wildlife Protection Plan* (WPP), and the *Noxious Weed Monitoring and Control Plan*.

Monitoring will also continue at the production wellfield, perimeter fence and other facilities that remain during the temporary closure. Routine reporting and notification will also continue during this period.

3.12 OPERATIONAL MONITORING – OAR 632-037-0060(7), ORS 517.971(7)(e)

3.12.1 FULLY DETAILED MONITORING AND REPORTING PROGRAMS

The *Inventory of Project Monitoring Plans*, provided in Appendix D11, provides an index of monitoring plans describing inspections and monitoring that will occur at the Project, including air, stormwater, groundwater, waste management, cyanide, spill prevention, noxious weeds, wildlife, and drinking water. In addition, the *Monitoring Proposal for Groundwater and Facilities* in Appendix D12 provides details of well installation, development, and monitoring as well as monitoring of the underdrain systems associated with the TSF and TWRSF.

3.13 CHEMICALS, WASTE AND SAFETY

3.13.1 CHEMICALS – OAR 632-037-0060(11), 517.971(7)(i)

A table of reagents, explosives, cyanide and other materials planned for the Project was provided in Section 3.8. Handling, storage and disposal of materials required for mining or processing are described in the THSTP in Appendix D7 and the *Waste Management Plan* in Appendix D3. These plans also describe handling, storage and disposal procedures for mercury, process water, and evaluation of materials for hazardous waste characteristics. Disposal of waste rock is described in the *TSF Design Report* (Appendix C4). Other acid-forming materials, radioactive, or hazardous materials generated from mining or processing are not anticipated. If spills of petroleum products occur onsite such that soil is contaminated, the petroleum-contaminated soil will be managed as described in Section 3.8.2 and the *Petroleum-Contaminated Soil Management Plan* (Appendix D9).

3.13.2 TRANSPORTATION OF CHEMICALS – OAR 632-037-0060(13), ORS 517.971(7)(j)

Hazardous and toxic chemicals will be transported to the facility in accordance with state and federal regulations. Details of material transport are discussed in the THSTP in Appendix D7. The THSTP fulfills the requirements in ORS 517.971 and OAR 632-037-0060(13) for a plan for transporting and storing toxic chemicals. The THSTP provides a description of requirements for receipt of toxic or hazardous substances at the facility, requirements for storage, initial and annual reporting of toxic or hazardous substances, and specific reporting procedures in the event of an incident during transportation of hazardous or toxic substances.

3.13.3 EMERGENCY RESPONSE PLAN – OAR 632-037-0060(15), OAR 340-043-0040(2)(g), ORS 517.971(7)(m)

The ERP is provided in Appendix D6. The ERP fulfills the requirements in ORS 517.971 for a spill prevention and credible accident contingency plan and the requirements for a spill contingency plan under the BLM Plan of Operations as well incorporates by reference the Malheur County Local Emergency Planning Committee Emergency Response Plan. The ERP provides the operating facility with information needed to properly response to an incident; defines personnel roles for emergencies involving hazardous conditions including the incident command system; reduces the potential for accidental spills and environmental degradation by taking precautionary measures and being prepared for potential emergencies and includes an exercise program to ensure the ERP and related response activities meet environmental protection objectives.

3.13.4 CHARACTERIZATION AND MANAGEMENT PLAN – OAR 632-037-0060(16), ORS 517.971(i)

Characterization and disposal of wastes was discussed in Section 3.8.3. A *Waste Management Plan* for the Project is provided in Appendix D3. The *Waste Management Plan* fulfills the requirements in ORS 517.971 for identifying and managing wastes and the means of disposal available. Calico will adhere to RCRA regulations in 40 CFR 260 to 279 and state regulations in OAR Chapter 340, Divisions 43 and 90 through 113, as applicable. The Oregon rules include provisions for chemical mining, recycling and waste reduction, solid waste, hazardous waste management, identification and listing of hazardous waste, standards applicable to generators of hazardous waste, used oil management and universal waste management.

3.13.5 EMPLOYEE SAFETY TRAINING PLAN – OAR 632-037-0060(14), ORS 517.971(7)(k)

The *Safety Training Plan* developed for the Project to comply with state and federal law is provided in Appendix D13. The *Safety Training Plan* provides a description of health and safety training requirements for Mine employees that comply with the federal MSHA and OSHA requirements, as well as Oregon-specific health and safety training. In accordance with 30 CFR 48.3(a) and (e), a site-specific program for training new miners, training experienced miners, training miners for new tasks, annual refresher training and hazard training for miners will be submitted to, and approved by, the MSHA District Manager prior to opening the Mine. Per 30 CFR 48.3(g), courses will be taught by MSHA-approved instructors. The facility will work with Eastern Oregon University (EOU) in LaGrande, Oregon to develop and provide the MSHA safety training program. EOU has an approved MSHA training plan. EOU will provide four days of in-person training and the fifth day will be provided by onsite health-and-safety personnel qualified to instruct employees on site-specific health and safety procedures and protocols. The annual refresher training program will also be established.

3.13.6 WILDLIFE PROTECTION PLAN – OAR 340-043-0110, OAR 632-037-0125, OAR 635-420-0020, OAR 635-420-0030, OAR 635-420-0040, OAR 635-420-0050, OAR 635-420-0070, OAR-635-420-0080, ORS 517.956, ORS 517.971(7)(d)

Calico will implement a WPP for the Project (Appendix D14) that outlines the measures that Calico will take to comply with the wildlife protection standards described in OAR 635-420-0030. This Plan describes how the Project will meet the State requirement of an objective zero wildlife mortality.

The WPP outlines the location of chemical processing solutions and associated wastewaters, describes how they will be contained (including fencing and covering), identifies any wastewaters that are not contained, and describes the measures that will be implemented to stop wildlife from being exposed to or ingesting chemical processing solutions. The WPP also outlines the measures that Calico will implement to maintain and monitor these wildlife protection measures as well as report wildlife injuries or mortality, should any occur at the Project.

The WPP also includes a plan for minimizing the impact of vehicular traffic or the public on wildlife as a result of the proposed Mine. It includes information about wildlife migration and movement and identifies measures that will be taken to minimize the impact of vehicle traffic (e.g., carpooling, limitations on the use of access roads, speed limits). If necessary, the WPP may be revised to address any failures of wildlife protection measures or to provide additional protection. Finally, the WPP includes the provision for notifying ODFW 30 days prior to completion of the chemical Process Plant to conduct a facility inspection and not commencing use of chemical processing solutions until notified that the inspection is complete.

3.13.7 WILDLIFE MITIGATION PLAN – OAR 632-037-0125, OAR 635-415-0025, OAR 635-420-0060, ORS 517.971(7)(d)

Calico will implement a *Wildlife Mitigation Plan* for the Project (Appendix D15). The purpose of the *Wildlife Mitigation Plan* is to describe the impacts of the proposed Project on wildlife habitat and the proposed mitigation for those impacts. The habitat categorizations and mitigation strategies included in the *Wildlife Mitigation Plan* are preliminary and have not been reviewed by the Oregon Department of Fish and Wildlife (ODFW).

The *Wildlife Mitigation Plan* presents the direct and indirect impacts to wildlife habitats, and details the measures taken to avoid or reduce impacts. It also quantifies the impacts resulting from the Project that remain after avoidance and reduction measures have been implemented and describes the mitigation credits created through the proposed compensatory mitigation projects. Mitigation measures for the Project will be implemented and completed either prior to or concurrent with the Project to maintain consistency with ODFW Habitat Mitigation Policy (OAR 635-415-0025).

3.13.8 INADVERTENT DISCOVERY PLAN FOR PALEONTOLOGICAL AND ARCHAEOLOGICAL RESOURCES – ORS 358.905 THROUGH ORS 358.955

All Inadvertent Discoveries will follow the BLM and Oregon SHPO regulations. Calico will implement an *Inadvertent Discovery Plan* (IDP) for the Project (Appendix D16), which will be used throughout all aspects of the exploration, mining and reclamation activities at Grassy. In the event of an inadvertent discovery of cultural materials, including human remains, pursuant to 43 CFR 10.4(b), (c), and (d), Calico will immediately stop all activities in the vicinity of the inadvertent cultural discovery and immediately notify the responsible federal official – BLM Manager – of the discovery via telephone and followed with written confirmation. Work in the vicinity of the discovery will not commence again for 30 days after certification is received from the BLM-authorized officer, or a binding agreement is executed between the federal agency and the affiliated Indian tribes.

According to 43 CFR 10.d, within three days of receiving the written confirmation of notification, the responsible federal agency will certify receipt of the notification, take any additional necessary steps to secure and protect the inadvertent discoveries, notify any lineal descendants whose ancestors the discoveries are likely associated, initiate consultation on the inadvertent discovery, and follow procedures in 43 CFR 10.3, 10.5, and 10.6, as needed. Consultation following 43 CFR 10 does not replace other required consultation efforts. Federal agencies cannot allow human remains, burial goods, or potentially NRHP eligible sites to be knowingly adversely affected without properly consulting (per 36 CFR 79; 36 CFR 800.5-800.7 and 25 USC 3001-3013) other parties and establishing agreements to mitigate those effects. 3809.420(b)(8).

If otherwise lawful, the activity stopped due to an inadvertent discovery may resume “thirty (30) days after certification by the notified Federal agency of receipt of the written confirmation of notification of inadvertent discovery” [43 CFR 10.4d(2)]. Calico may also resume an otherwise lawful activity once the federal agency and the affiliated Indian tribes or Native Hawaiian organizations execute a written, binding agreement that adopts a recovery plan for the excavation or removal of the human remains, funerary objects, sacred objects, or objects of cultural patrimony following 10.3(b)(1) of these regulations. The disposition of human remains, funerary objects, sacred objects, or objects of cultural patrimony must be carried out following 34 CFR 10.6.

Calico will follow the process outlined in the IDP (Appendix D16). The IDP was developed in consultation with the Tribes and Oregon SHPO.

4. RECLAMATION AND CLOSURE PLAN – 43 CFR 3089.401(b)(3), OAR 632-037-0070, OAR 340-043-0025, OAR 340-043-0040(2)(e), OAR-340-043-0160, ORS 517.971(7)(f)

Reclamation of disturbed areas resulting from proposed mining activities outlined in the *Reclamation Plan* (Appendix D1) will be completed in accordance with the BLM and the State of Oregon DOGAMI and ODEQ regulations. The purpose of 43 CFR 3809 – Surface Management is to prevent unnecessary or undue degradation of public lands by operations authorized by the mining laws. Anyone intending to develop mineral resources on public lands must prevent unnecessary or undue degradation of the land and reclaim disturbed areas. This subpart establishes procedures and standards to ensure that operators and mining claimants meet this responsibility and provide for the maximum possible coordination with appropriate state agencies to avoid duplication and to ensure that operators prevent unnecessary or undue degradation of public lands by operations authorized by the mining laws. The State of Oregon requires that a reclamation plan be developed for any new chemical mining project and for expansions of existing operations (OAR 632-037-0070) and for the quarry (OAR 632-030-0027).

The *Reclamation Plan* detailing the objectives, reclamation implementation, planned reclamation for each facility, post-closure care and maintenance, Reclamation Cost Estimate (RCE), and schedule are provided in Appendix D1.

The Reclamation Bond or alternative security, as required by ORS 517.987, OAR 632-037-0135, and OAR 340-43-0025, will be determined at the time permits are issued and assessed annually. The bonding or alternative security will be based on future discussions with the State. A credible accident failure modes review of the TSF has been incorporated as a part of the ERP (Appendix D6).

The certificate of liability insurance is provided in Appendix G.

4.1 SCHEDULE FOR RECLAMATION

The proposed post-mining land uses for the Project is livestock grazing or range land, wildlife habitat, and recreational land, with opportunities to consider mineral exploration and development when feasible. Where practical, areas impacted by the Project will be returned to conditions that existed prior to mining and mineral processing and provide for the post-mining land uses described above. Post-mining land uses are in conformance with the BLM Vale District Management Plan and Malheur County Land Use Plans. (See the LUCS in Appendix E1.) Baseline studies performed to understand existing conditions and direct reclamation activities include grazing management (Appendix B8), land use (Appendix B10), and terrestrial vegetation (Appendix B17).

The *Reclamation Plan* will be performed in five stages, with various activities and monitoring occurring at and in between each stage. A description of activities for each stage is presented below as follows and detailed in Appendix D1:

- Stage 1 begins immediately following the cessation of mining operations, with activities being performed in this general sequence development:
  - Cessation of ore processing and placement of tailings;
  - Removal of underground Mine equipment and chemicals and reagents;
  - Closure of the Mine Portal;
  - Closure of the Ventilation Shaft;
  - TSF underflow passive evaporation on the surface of the TSF (12-month period);
  - Placement of growth media and revegetation of the TSF Embankment;
  - If present, removal of waste rock from the TWRSF;
  - Closure of the TWRSF;
  - Closure of the ore stockpiles;
  - Removal and disposal of hazardous waste, chemicals, and reagents;
  - Closure of the fuel storage and dispensing area;
  - Closure of the Process Plant buildings and ancillary facilities including foundations and offsite disposal (except the administration building, which will remain through Stage 4);
  - Closure of the Collection Pond;
  - Closure of the parking areas (except the parking lot adjacent to the administration building, which will remain through Stage 4); and
  - Closure of the internal access and haul roads not required for Stage 2 and Stage 3 reclamation activities.

- Stage 2 will commence approximately one year following Stage 1, at the time when the surface of the TSF is suitable for construction activities. The following activities will be performed in this general sequence:
  - Regrading of the entirety of the TSF surface;
  - Closure of approximately 75 percent of the surface of the TSF (the remaining 25 percent will be utilized for evaporation of seepage collected in the Reclaim Pond); and
  - TSF underflow passive evaporation on the surface of the TSF (12-month period).

- Stage 3 will commence approximately two years following Stage 1, at the time when the flow rate from the tailings underflow can be passively managed within the E-Cell, resulting in the final closure of the TSF. The following activities will be performed in this general sequence:
  - Closure of the remaining 25 percent of the surface of the TSF;
  - Conversion of the Reclaim Pond to the E-Cell;
  - Closure of the Quarry;
  - Closure of the Perimeter Fence;
  - Closure of the administration building and adjacent parking lot;
  - Closure of the remaining internal Mine roads;
  - Reduction of Mine Access Road from two lanes to one lane with the exception of the county road that will remain;
  - Closure of the Water Supply, including the Wellfield and associated pipelines, raw water storage tank, and potable water treatment unit;

- Closure of the Power Supply, including lines and poles; and
- Closure of the Growth Media Stockpiles and Reclamation Borrow Areas.

- Stage 4 will commence approximately three years following the completion of Stage 1 and consists of post-closure monitoring and inspections.

- Stage 5 will commence approximately 29 years following the completion of Stage 1, at the conclusion of post-closure monitoring for all mining facilities. The following activities will be performed in this general sequence:

  - Closure of the groundwater monitoring wells, and
  - Closure of the Mine Access Road.

4.2 TOPOGRAPHY AND VEGETATION – OAR 632-037-0070(1), OAR 632-037-0070(2), OAR 632-037-0070(3), OAR 632-037-0070(8), OAR 632-037-0120(2)

Post-closure landforms will be designed to be stable and respond to erosive forces in a similar manner to equivalent naturally-occurring landforms. This is applicable to the TSF, TWRSF, roads, former building locations, yards, and quarry areas.

To the extent practicable, the areas of the Project used for mining and mineral processing will be revegetated to a condition similar to the surrounding area using local native species. Once established, the vegetative cover will be self-sustaining and show progression toward the surrounding undisturbed vegetation in terms of species diversity and plant density.

Salvageable growth media from the Project surface disturbance will be stockpiled at three centralized Growth Medium Stockpiles, as described in the *Reclamation Plan*, Appendix D1. Growth media will be salvaged for reclamation activities at the commencement of construction of each Project component. Soil on slopes of 15 percent or less will be salvaged up to a depth of 2 ft, while soil on slopes greater than 15 percent will be salvaged up to a depth of 1 ft. Growth media will include soils and alluvium stripped prior to surface disturbance activities.

Growth media remaining in the stockpiles for one or more planting seasons will be seeded with an interim seed mix to stabilize the material and reduce erosion as well as minimize the establishment of undesirable weeds. Erosion berms or swaddles will be placed around growth media stockpiles to prevent erosion. The stockpiles will be periodically inspected to monitor stabilization, and if necessary, additional stabilization measures will be employed.

Growth media will be placed on disturbed areas such as the final TSF cover, and the Quarry floor. Revegetation will include scarifying the ground surface or growth media surface, then applying a site-specific, native seed mix to promote establishment of a self-sustaining native ecosystem. Additional details are provided in Appendix D1.

Calico recognizes the economic and environmental impact that can result from the establishment of noxious weeds and has committed to a proactive approach to weed control. A noxious weed monitoring and control plan will be implemented during construction and continuing through operations. The plan, provided as Appendix D17, contains a risk assessment, management strategies, provisions for annual monitoring and treatment evaluation, and provisions for treatment. The results from annual monitoring will be the basis for updating the plan and developing annual treatment programs.

4.3 FACILITIES

4.3.1 PROCEDURES FOR DECOMMISSIONING MINE FACILITIES – OAR 632-037-0070(12)

The *Reclamation Plan* will provide for the long-term physical stability of the post-closure landforms that will remain, specifically the TSF and Quarry. This includes demonstrating that the tailings facilities will be physically stable for the maximum credible earthquake event and the Quarry high walls are reclaimed to comply with OAR 532-030-0027.

Pending confirmation of competent foundation soils, the design slopes of 2.5 horizontal to 1 vertical will be adequate for reclamation stability for the TSF and 1.5 horizontal to 1 vertical for the Quarry, both of which will be constructed at the final stable slope as part of construction/operations.

4.3.2 PROCEDURES FOR REMOVAL OF ALL PROCESS CHEMICALS – OAR 632-037-0070(12)(c)

Chemicals, reagents, and petroleum products, will be sold, used at another site, recycled where possible, or disposed offsite according to local, state, and federal regulatory requirements. Tanks and pipelines will be removed and salvaged, or disposed offsite according to local, state and federal regulatory requirements. Hazardous or toxic materials at the mill that are not salvaged will be removed from the Project and disposed offsite according to state and federal regulations. Concrete that may be contaminated through exposure to chemicals and reagents will be characterized, excavated and disposed offsite according to federal and state regulations.

4.3.3 PROCEDURES FOR THE REMOVAL OR DISPOSAL OF ALL EQUIPMENT, REFUSE, STRUCTURES AND FOUNDATIONS FROM THE PERMIT AREA – OAR 632-037-0070(10)

Generally, buildings will be torn down, reduced to rubble and the debris disposed offsite according to local, state, and federal regulatory requirements. Because most buildings onsite will be constructed on concrete slab foundations, the slabs will be broken and buried, covered with growth media and revegetated. If economically feasible, salvage companies will be encouraged to recycle reusable construction materials, such as steel I-beams, galvanized siding, pipes, electrical gear and some lumber. After buildings and ancillary facilities are removed, the concrete foundations and slabs will be broken using a trackhoe-mounted hydraulic hammer, or similar method, and buried in place under approximately 36 inches of cover material in such a manner that prevents ponding, promotes natural drainage, generally matches native ground, and promotes vegetative growth. After demolition and salvage operations are complete, disturbed areas will be covered with 12 inches of growth media, then revegetated. Additional details are provided in the *Reclamation Plan* in Appendix D1.

4.3.4 CHARACTERIZATION AND MANAGEMENT PLAN – OAR 632-037-0070(4)

The *Waste Management Plan* in Appendix D3 provides further information regarding characterization and disposal of waste materials.

4.3.5 PROCEDURES FOR APPROPRIATE ISOLATION OR REMOVAL OF WASTE MATERIAL – OAR 632-037-0070(12)(d), OAR 340-043-0000(c)

Include closure procedures that will prevent future release of residual potentially toxic chemicals

The tailings distribution pipeline and tailings reclaim water pipeline will be removed and disposed offsite. After approximately one year, tailings are expected to consolidate sufficiently to allow for regrading and cover placement of the tailings impoundment surface. The tailings underflow reporting from the TSF to the Reclaim Pond is expected to be reduced to a level that it can be managed within the footprint of the Reclaim Pond/E-Cell.

The tailings impoundment surface will be regraded to locate the low point of the surface to the northeast corner where a spillway will be constructed. The tailings impoundment surface will provide positive drainage, with a slope of 1.5 to 2 percent. After the surface is complete, the low permeability tailing impoundment cover will be installed, followed by vegetated growth media. Additional details are provided in the *Reclamation Plan* in Appendix D1.

The waste rock generated from the underground mining operation will be used as rock fill amended with cement and returned underground as cemented rock fill. Therefore, no waste rock is anticipated to be present in the TWRSF at closure. If a minor amount of rock remains, the waste rock will be amended with lime, if necessary, then placed on the tailings impoundment surface prior to closure of the TSF. The TWRSF lining system will be cut, removed, and disposed offsite. The underdrain and leakage collection and recovery system will be drained, removed, and disposed offsite. The embankment will be used to regrade the ground surface below the TWRSF to prevent ponding, promote natural drainage, generally match native ground, and promote vegetative growth. After regrading, approximately 12 inches of growth media will be placed, and the area revegetated.

4.4 MONITORING – OAR 632-037-0070(12)(e), ORS 517.971(n)

A detailed post-closure monitoring plan, including monitoring methodology, parameters, and frequencies, will be submitted to the BLM and DOGAMI prior to execution. The post reclamation monitoring and maintenance plan is detailed in the *Reclamation Plan* provided in Appendix D1.

Post-closure monitoring and maintenance performed by Calico will include the following:

- The fence surrounding the E-Cell will be inspected routinely during the post-closure monitoring period. Maintenance may consist of repairs to the fence and fence posts. This activity will be conducted until closure has been approved and the bond released.
- Vegetation monitoring of the reclaimed facilities will be conducted at the various mining facilities at the Project 5 years after revegetation activities have been completed. The

monitoring will involve photo-documentation and be conducted during the "peak green" spring season. This program will be coordinated with the BLM and DOGAMI to facilitate coordination between the agencies. Reclaimed areas not meeting regulatory standards would be evaluated and corrective actions implemented. These measures could include, if necessary, additional soil amendments, reseeding, and installation of erosion control measures, followed by monitoring consistent with what was conducted previously. This obligation will cease when the reclamation goals and requirements have been achieved and upon release of all related reclamation bonds.

- The flow rate of the tailings underflow from the TSF to the Reclaim Pond/E-Cell will be routinely monitored.
- Groundwater quality will be routinely collected, tested, and reported to respective regulatory agencies to demonstrate reclamation compliance in the 15 monitoring wells according to the requirements established by the ODEQ upon approval of the Chemical Mining Permit. This activity will be conducted until closure has been approved and the bond released, estimated to be a period of 30 years. Groundwater monitoring will be conducted in three stages:
  - Stage 1 includes quarterly monitoring for a period of 5 years.
  - Stage 2 includes semi-annual monitoring for a period of 10 years.
  - Stage 3 includes annual monitoring for a period of 15 years.
- Noxious weed monitoring and control will be implemented during operations and for a period of 5 years following the cessation of operation.
- Stormwater diversion channels will be inspected during the reclamation monitoring period to ensure that sediment has not accumulated and that the lining in the channels (riprap, concrete, etc.) has not been compromised, thereby reducing the design capacity of the structure.
- Surface water samples will be collected, tested, and reported to respective regulatory agencies to demonstrate reclamation compliance where necessary.

4.5 WATERCOURSES AND DRAINAGE – OAR 632-037-0070(3)

The goals of water management during and following reclamation will be to minimize environmental impacts to groundwater and achieve passive surface water and stormwater drainage across the Project. The water management ponds for operations will be decommissioned, with the exception of the Reclaim Pond, which will be converted to an E-cell for the management of tailings underflow from the reclaimed TSF. The timing of decommissioning will be contingent on the evaporative potential of the E-Cell.

Permanent stormwater diversion channels will remain in place following reclamation and have been designed to safely convey runoff from the reclaimed facilities to the natural drainages while controlling erosion.

The *Reclamation Plan* will ensure the mining facilities do not contribute to groundwater degradation or contamination during and following reclamation. A low permeability cover will be installed over the tailings in the TSF to impede infiltration and reduce tailings underflow reporting to the Reclaim Pond. Additional details are provided in Appendix D1.

4.6 RECLAMATION SECURITY – OAR 632-037-0070(13), OAR 632-037-0135(6)(P), ORS 517.987

The RCE was developed in accordance with regulations at 43 CFR 3809.522, 3809.553, and Oregon Revised Statute (ORS) 517.810. The Nevada Standardized Reclamation Cost Estimator (SRCE) was used to estimate the RCE. The SRCE model contains standardized cost data to calculate reclamation bonding requirements for the reclamation of Mine sites based on reclamation areas and volumes using geometry parameters defined by the user. The model uses a first-principals approach to reclamation cost estimating, using built-in worksheets with either fixed or user-defined labor and equipment rates for the calculation of reclamation activities that are specific to a mining project.

Calico will use a phased-bonding approach and will work out suitable milestone events with respect to Project development with the BLM and the DOGAMI. Calico will provide a reclamation surety in accordance with regulations at 43 CFR 3809.522, 3809.553, and at ORS 517.810 based on the reclamation tasks at the cessation of mining. Calico will update the surety to reflect the actual disturbance and whatever additional disturbance is planned for the subsequent period. Any changes to equipment, consumable, and labor costs will also be incorporated during the updates.

A total reclamation cost of $11,565,744 has been calculated, including indirect costs such as contingency and contractor profit utilizing the Nevada Standardized Reclamation Cost Estimator (SRCE Beta Version 2.0). This reclamation cost is based on the completion of the Phase II TSF, which aligns with the current Mine plan and resources identified to support the 7.8-year Mine life presented.

The development of this RCE including the SRCE cost output file is detailed in the *Reclamation Plan* provided in Appendix D1.

5. ALTERNATIVE ANALYSIS – OAR 632-037-0075

An Alternatives Assessment was completed to identify and analyze environmental impacts of the proposed mining operation. To support the Alternatives Assessment, conceptual plans were developed to estimate footprints and aerial extents, and the alternatives compared were developed assuming that they would meet local, state, and federal regulatory requirements and guidance, such as the lining of chemical mining processing facilities. The evaluation of alternatives focused on environmental and social impacts including air quality; archaeological resources; cultural and historical resources; existing land use and land use designations; fish, fish habitat, and aquatic biology; geologic hazards, including geology; noise; socioeconomic conditions; threatened, sensitive, or endangered species; surface water and groundwater; vegetation; wildlife, including wildlife habitat; and other resources. A detailed discussion is provided in the *Alternatives Assessment Report* (Appendix H) with a summary presented below.

5.1 ALTERNATIVE LOCATIONS FOR MINE FACILITIES – OAR 632-037-0075(2)(a)

Golder developed a technical memorandum to evaluate tailings siting and tailings deposition options. Five TSF sites were considered for the facility, and a ranking matrix developed that consolidated the advantages and disadvantages of each option.

Technical criteria considered in the evaluation of locations included:

- Volume of earthworks material,
- Ease of construction,
- Complexity and reliability of stormwater management,
- Efficiency of pumping and piping of the tailings to the TSF and return water back to the Mill, and
- Tailings rate of rise.

The current site (Golder's Option 2) was selected as the preferred TSF location because it received the best overall ranking as well as having the best total ranking for technical criteria and human safety and environmental protection.

5.2 ALTERNATIVE DESIGNS, PROCESSES (INCLUDING CHEMICAL PROCESSES), OPERATIONS AND SCHEDULING FOR MINE FACILITIES AND OPERATIONS – OAR 632-037-0075(2)(b)

The alternatives reviewed for mining and processing include an underground mine with TSF (proposed action), an open pit mine with TSF (Alternative 1A), and an open pit mine with heap leach pad (HLP) (Alternative 1B). A summary of each option is presented below in Table 43, with a more detailed discussion provided in Appendix H. The proposed action has the least impacts on air quality, archaeological resources, noise, threatened, sensitive or endangered species, surface water and groundwater, vegetation, and wildlife. Both the proposed action and the two alternatives have similar long-term impacts to existing cultural/historical resources, land use, fish, and geologic hazards.

Alternatives 1A and 1B have a more positive impact on socioeconomic conditions than the proposed action.

Table 43. Proposed Action and Alternative Designs

Detail	Proposed Action	Alternative 1A	Alternative 1B
Description	Underground Mine with TSF	Open Pit Mine with TSF	Open Pit Mine with Heap Leach Pad
Mine Development	Drill and Blast Technique with CRF to backfill production drifts; Ore is hauled via underground trucks to surface stockpile. 750 stpd	Conventional open pit 79.9 Mst and,74 acre footprint Drilling and blasting, excavators/loaders, and haul trucks. 5,000 tons/day	Conventional open pit 109 Mst and 97 acre footprint Drilling and blasting, excavators/loaders, and haul trucks. 15,000 tons/day
Ore Handling	Ore is stockpiled, crushed, then conveyed to the Mill where it is crushed by a ball mill with a hydro-cyclone cluster	Ore is hauled to a three-stage crushing system.	Ore is hauled to a three-stage crushing system.
Processing	• Leach/CIL circuit with pre-aeration; cyanide added to first leach tank; lime added to pre-aeration tank. • Gold and silver are adsorbed onto activated carbon, which is reverse circulated through the CIL tanks. • Loaded carbon is fed to the elution process where gold and silver are stripped from the carbon. • Final processing occurring in the gold room includes electrowinning, mercury retort, flux mixer and, melting furnace. • CIL tailings undergo cyanide detoxification prior to transfer to the TSF.	Gold will be recovered using a CIL recovery circuit, similar to the Proposed Action, but sized to handle 5,000 tons/day.	Crushed ore is placed in a heap leach pad, solution applied then recovered, and gold recovered from the leach solution in the carbon adsorption desorption recovery (ADR) plant.

Detail	Proposed Action	Alternative 1A	Alternative 1B
Tailings Storage	**TSF with TWRSF** • Fill native valley, with staged embankments on north and west sides • TSF is sized to handle 3.7 Mst • TSF covers 99 acres • TSF and TWRSF are geomembrane lined with continuous primary and secondary containment • Leakage collection and detection systems • Supernatant from Supernatant Pool is pumped to Process Plant for re-use. • Tailing underdrain collection system gravity flows to Reclaim Pond then is pumped to Process Plant for re-use. • TWRSF underdrain routes to the Reclaim Pond. • TWRSF contains 0.27 Mst waste rock. Covers 8 acres.	**TSF with WRSF** • Fill native valley, with staged embankments on north and west sides • TSF is sized to handle 22.5 Mst of tailings • TSF covers 216 acres with embankment height of 180 ft. • TSF and WRSF are geomembrane lined • WRSF contains 57.4 Mst waste rock. Covers 215 acres and will be located near the open pit.	**HLP with Internal Process Pond and WRSF** • Fill native valley and require embankment to serve as a buttress to improve HLP stability and provide containment for process solution. • Sized to handle 53.3 Mst of crushed ore. • Covers 147 acres with maximum ore height of 340 ft. • Primary geosynthetic liner, leak detection system and secondary composite liner • Internal pond with geomembrane-liner and continuous primary and secondary containment with leak detection systems. • WRSF contains 53.3 Mst waste rock. Covers 219 acres and will be located near the open pit.
Mine Life and Staffing	7.8 years 100 people	12.7 years 100 people	10 years 130 people

5.3 ALTERNATIVE WATER SUPPLY – OAR 632-037-0075(2)(c)

Two water supply alternatives were evaluated including onsite water wells (proposed action) and a municipal water supply (Alternative 2).

In the proposed action, raw water is pumped from up to four production wells to a raw water storage tank via a 2.8-mile buried pipeline to a raw water storage tank.

Alternative 2 proposes municipal water obtained from the City of Vale, conveyed via a 25.3-mile buried pipeline.

A detailed discussion of the options is provided in Appendix H. Both options result in equivalent long-term impacts for most of the environmental and social factors, except for short-term impacts to local groundwater anticipated to be greater with the proposed action and short-term noise impacts may be greater for Alternative 2.

5.4 ALTERNATIVE POWER SUPPLY – OAR 632-037-0075(2)(d)

Three power supply alternatives were evaluated including an overhead transmission line (proposed action), a combination upgraded overhead and buried transmission line (Alternative 3A), and onsite generators (Alternative 3B).

In the proposed action, power will be supplied to the Project via an upgraded overhead transmission line, along approximately 25 miles from the Hope Substation to the Mine, and addition of approximately 20 miles of new overhead transmission line, with two backup 60 Hz diesel-powered generators supplying power in the event of a short term power loss.

In Alternative 3A, power will be supplied to the Project via a combination of an upgraded transmission line and a buried transmission line, owned and maintained by Idaho Power. The overhead transmission line upgrade is approximately 5 miles, at which point the line would be buried for approximately 20 miles, with two backup 60 Hz diesel-powered generators supplying power in the event of a short-term power loss.

In Alternative 3B, power to the aboveground mining operations would be supplied by three 60 Hz diesel-powered generators and one 60 Hz backup diesel-powered generator located adjacent to the Process Plant. Power to the underground mining operations would be supplied by one 60 Hz diesel-powered generator and one 60 Hz diesel-powered backup generator. The generators would operate 24 hours per day, 365 days per year, with the backup generators running approximately 500 hours per year.

A detailed discussion of options is provided in Appendix H. The proposed action and Alternative 3A have similar impacts to archaeological resources, cultural/historical resources, fish, land use, geologic hazards, socioeconomic conditions, surface water and groundwater and vegetation. The proposed action and Alternative 3A have no or similar impacts to air quality and a potential short-term impact to endangered or threatened species. Alternative 3B has the largest impact to noise and may result in a non-compliance with Cleaner Air Oregon rules. The proposed action would have a greater visual impact that the alternatives.

5.5 ALTERNATIVE RECLAMATION PROCEDURES – OAR 632-037-0075(2)(e)

Two reclamation alternatives were evaluated including infrastructure removal and limited access (proposed action) and post-closure industrial land use (Alternative 4).

In the proposed action, buildings and facilities will be decommissioned, dismantled and materials salvaged, sold, used elsewhere, or removed and disposed offsite in an authorized landfill. Non-movable physical aspects such as the Process Plant footprint and building foundations will be recontoured to match the original site topography and will be revegetated. Project roads, yards, and parking areas will be reclaimed. Infrastructure, including water and power supply will be decommissioned and dismantled and materials will be salvaged, sold, used elsewhere, or removed and disposed offsite in an authorized landfill.

In Alternative 4, the post-closure land use will be changed to an industrial post-closure use that promotes access with the infrastructure and buildings remaining. Reclamation of the major mining facilities (underground Mine, TSF, TWRSF, Quarry, Reclamation Borrow Areas, etc.) will be the same as the proposed action, however, the Project area and infrastructure will be transferred to the BLM or Malheur County, including the buildings, Mine access road, power supply and water supply.

A detailed discussion of options is provided in Appendix H. The proposed action has fewest impacts on air quality, noise, threatened or endangered species, vegetation, and wildlife. Both the proposed action and Alternative 4 have similar impacts to archaeological resources, cultural/historical resources, land use, fish, geologic hazards, and surface water. Alternative 4 has a more positive impact on socioeconomic conditions.

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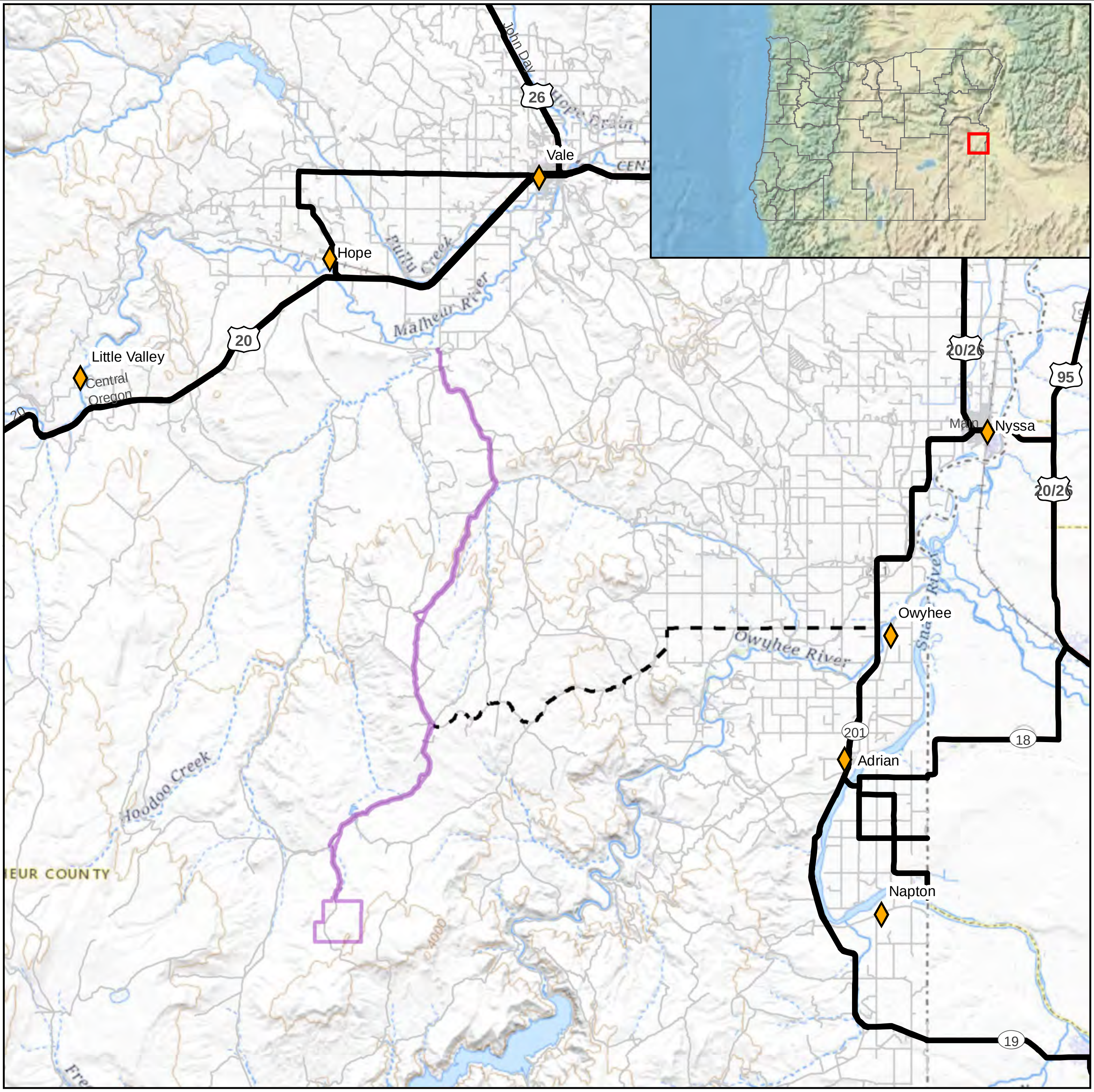
MAPS



Legend

PoO Boundary

Emergency Access Road

Roads

1 ":4 Miles

0 1 2 4Miles

N W E S

Scale as shown when plotted at 8.5"x11".

Notes:

1. Figure references 1983 UTM zone 11N datum.
2. Road and highway system were referenced from the Bureau of land Management.

Site/Report:

Calico Resources USA Corp.
Grassy Mountain Mine

Consolidated Permit Application

Figure:

Location Map

SLR

CALICO RESOURCES

Date:	December, 2021		Figure:
Project No:	108.02203.00001		1
By: MS		Chk'd: TM	

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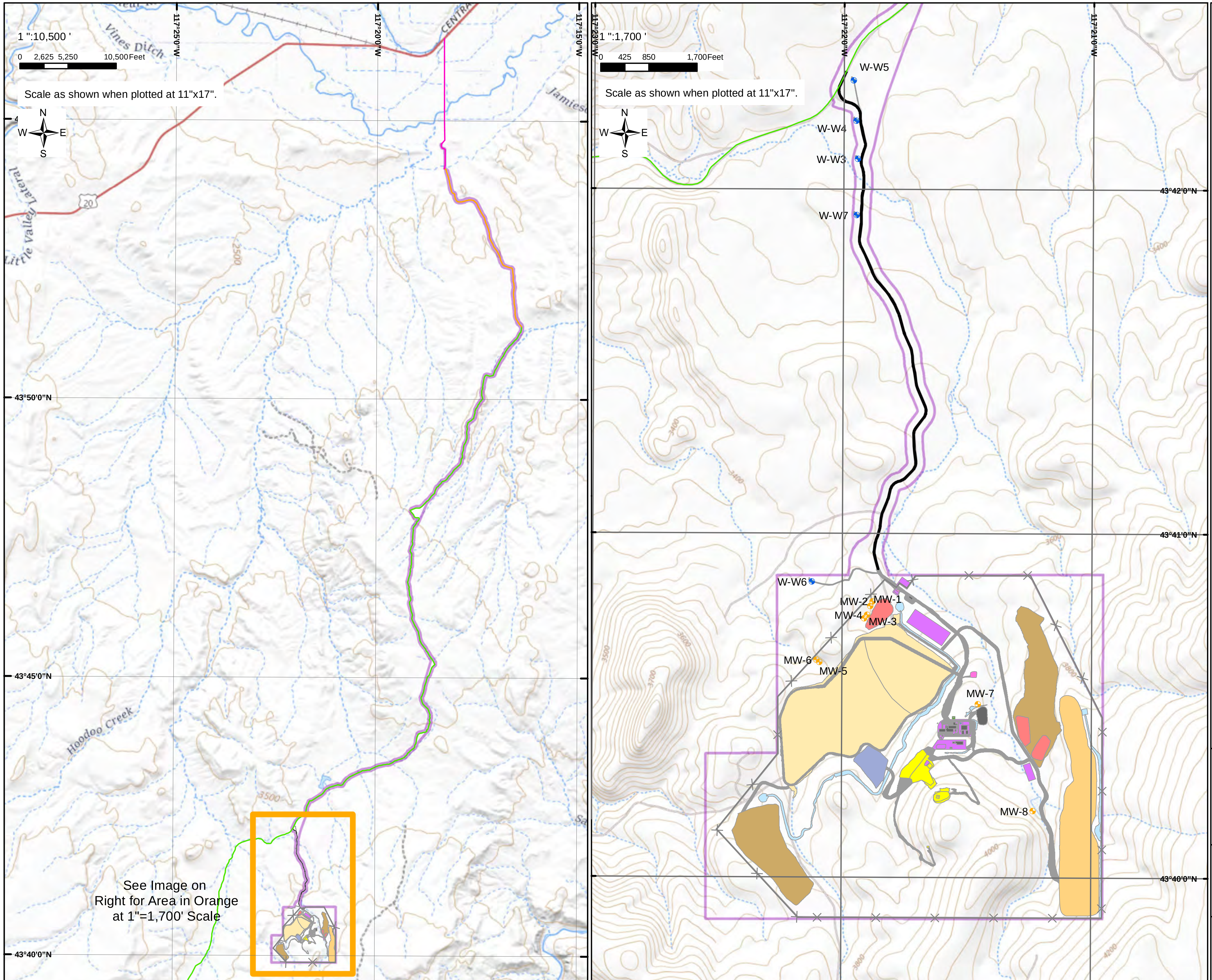

Legend

- PoO Boundary
- Fence Line
- Production Well
- Monitoring Well
- Russell Road (2.75 Miles)
- Cow Hollow Road (4.05 Miles)
- Twin Springs Road (13.46 Miles)
- Mine Access Road (2.48 Miles)
- Quarry
- Reclamation Borrow Areas
- Growth Media Stockpiles
- Yards, Laydown Areas, and Stockpiles
- Underground Mine
- Process Plant
- Infrastructure & Ancillary Facilities
- Power Supply
- Temporary Waste Rock Storage Facility
- Tailings Storage Facility
- Water Supply
- Roads
- Stormwater Diversion Channel

Notes:
1. Figure references 1983 UTM zone 11N datum.
2. Road and highway system was referenced from the Bureau of land Management.
3. Topography and facility layout provided by others.

Site/Report:

Calico Resources USA Corp.
Grassy Mountain Mine

Consolidated Permit Application

Figure:

Vicinity and Access Map

SLR CALICO RESOURCES

Date: December, 2021	Figure: 2
Project No: 108.02203.00001	
By: MS Chk'd: TM	

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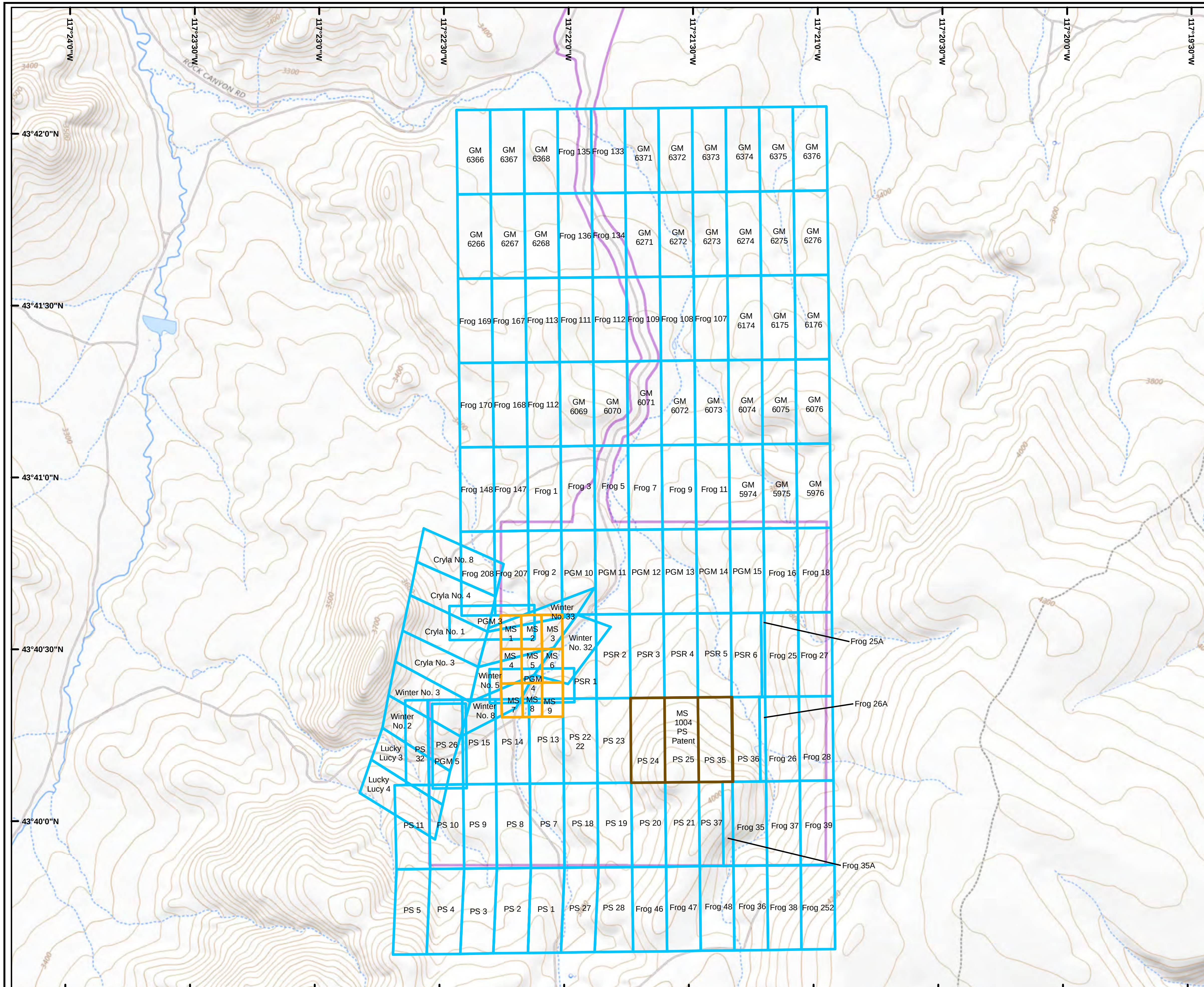

Legend

- PoO Boundary
- Lode Mining Claims
- Mill Site Claims
- Patented Claims

1 ":1,700 '

0 425 850 1,700 Feet

N W E S

Scale as shown when plotted at 11"x17".

Notes:

1. Figure references 1983 UTM zone 11N datum.
2. Topography, facility layout, and site claims provided by others.

Site/Report:

Calico Resources USA Corp.
Grassy Mountain Mine

Consolidated Permit Application

Map:

Tax Lots and Mining Claims

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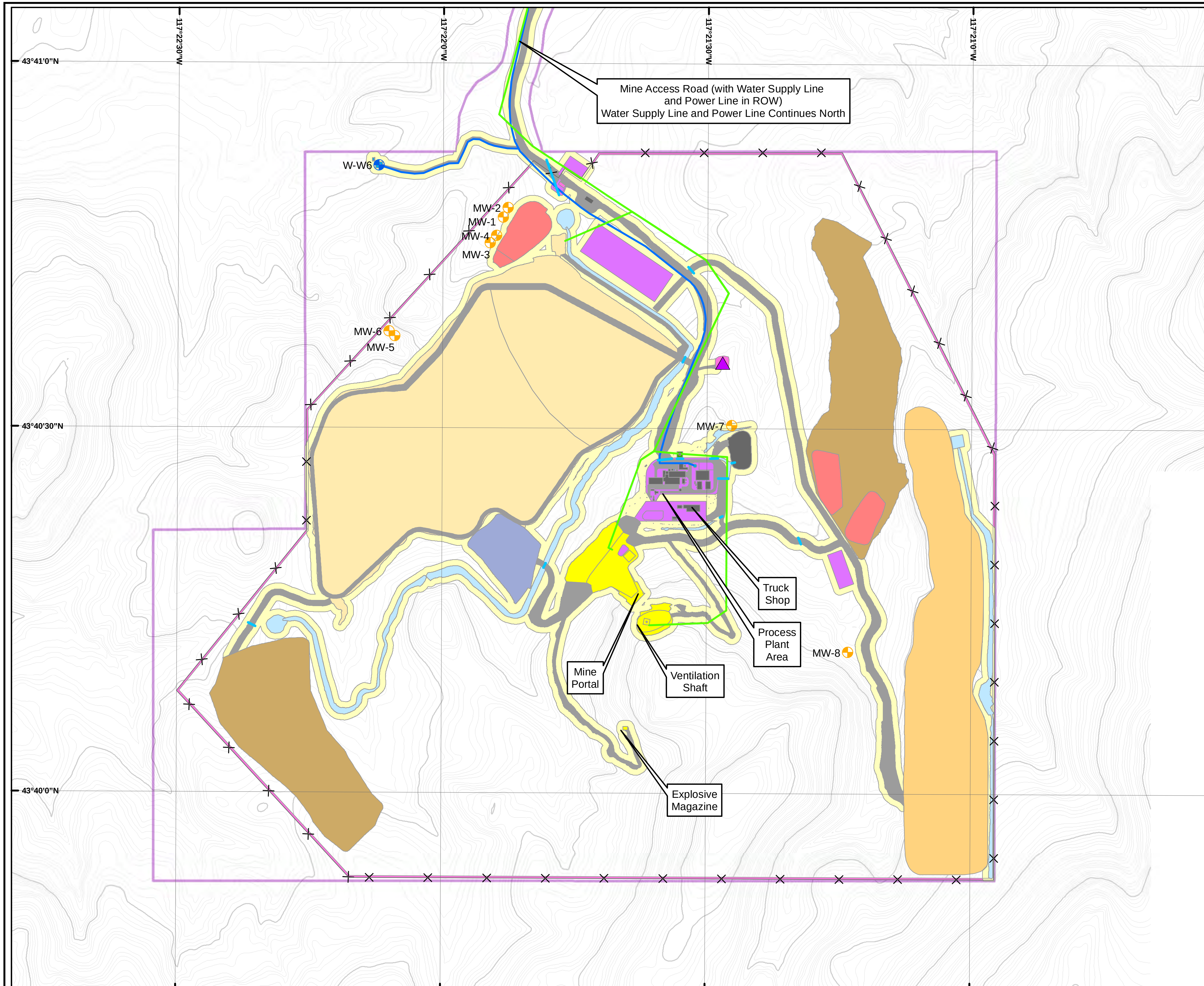
Date:	December, 2021		
Project No:	108.02203.00001		
By:	MS	Chk'd:	TM

Map: 3



Legend

- PoO Boundary
- Fence Line
- Culvert
- Power Line
- Water Supply Line
- Production Well
- Monitoring Well
- MET Station
- Quarry
- Reclamation Borrow Areas
- Growth Media Stockpiles
- Yards, Laydown Areas, and Stockpiles
- Underground Mine
- Process Plant
- Infrastructure & Ancillary Facilities
- Power Supply
- Temporary Waste Rock Storage Facility
- Tailings Storage Facility
- Water Supply
- Roads
- Stormwater Diversion Channel
- Disturbed Area
- Existing 25ft Elevation Contour
- Existing 5ft Elevation Contour

1 ":800 '

0 200 400 800 Feet

N W E S

Scale as shown when plotted at 11"x17".

Notes:

1. Figure references 1983 UTM zone 11N datum.
2. Topography and facility layout provided by others.

Site/Report:

Calico Resources USA Corp.
Grassy Mountain Mine

Consolidated Permit Application

Map:

General Arrangement

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Date:	December, 2021		Map: 4
Project No:	108.02203.00001		
By:	MS	Chk'd: TM	

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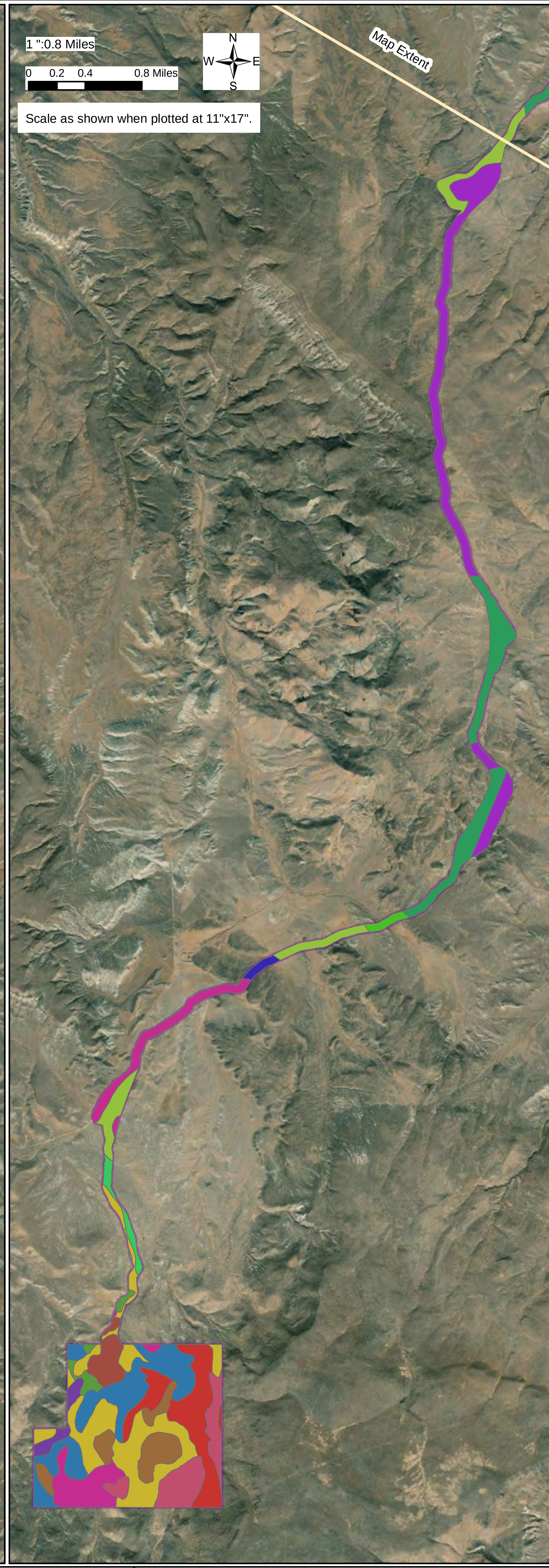

Legend

PoO Boundary	Owsel Silt Loam, 1 to 6 Percent Slopes
Drewsey Very Fine Sandy Loam, 2 to 6 Percent Slopes	Powder Silt Loam, 0 to 3 Percent Slopes
Drewsey-Quincy-Solarview Complex, 8 to 30 Percent Slopes	Ruckles Very Stony Loam, 8 to 30 Percent Slopes
Farmell-Chardoton Extremely Stony Soil, 4 to 15 Percent Slopes	Ruclick Cobbly Loam, 4 to 15 Percent Slopes
Farmell-Chardoton oil, 8 to 15 Percent Slopes	Shano Silt Loam, 2 to 6 Percent Slopes
Farmell-Chardoton Very Cobbly Soil, 15 to 30 Percent Slopes	Soil A Extremely Gravelly Sandy Loam, 15 to 30 Percent Slopes
Farmell-Chardoton Very Cobbly Soil, 4 to 15 Percent Slopes	Soil B Very Gravelly Sand Loam, 8 to 30 Percent Slopes
Farmell-Rock Outcrop Complex, 8 to 30 Percent Slopes	Virtue Loam, 2 to 8 Percent Slopes
Nyssa Silt Loam, 2 to 8 Percent Slopes	Xeric Torriorthents, 8 to 30 Percent Slopes

Notes:
1. Figure references 1983 UTM zone 11N datum.
2. Topography and facility layout, soil survey provided by others.

Site/Report:

Calico Resources USA Corp.
Grassy Mountain Mine

Consolidated Permit Application

Map:

Soil Map Units

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Date:	December, 2021		Map:
Project No:	108.02203.00001		5
By: MS	Chk'd: TM		

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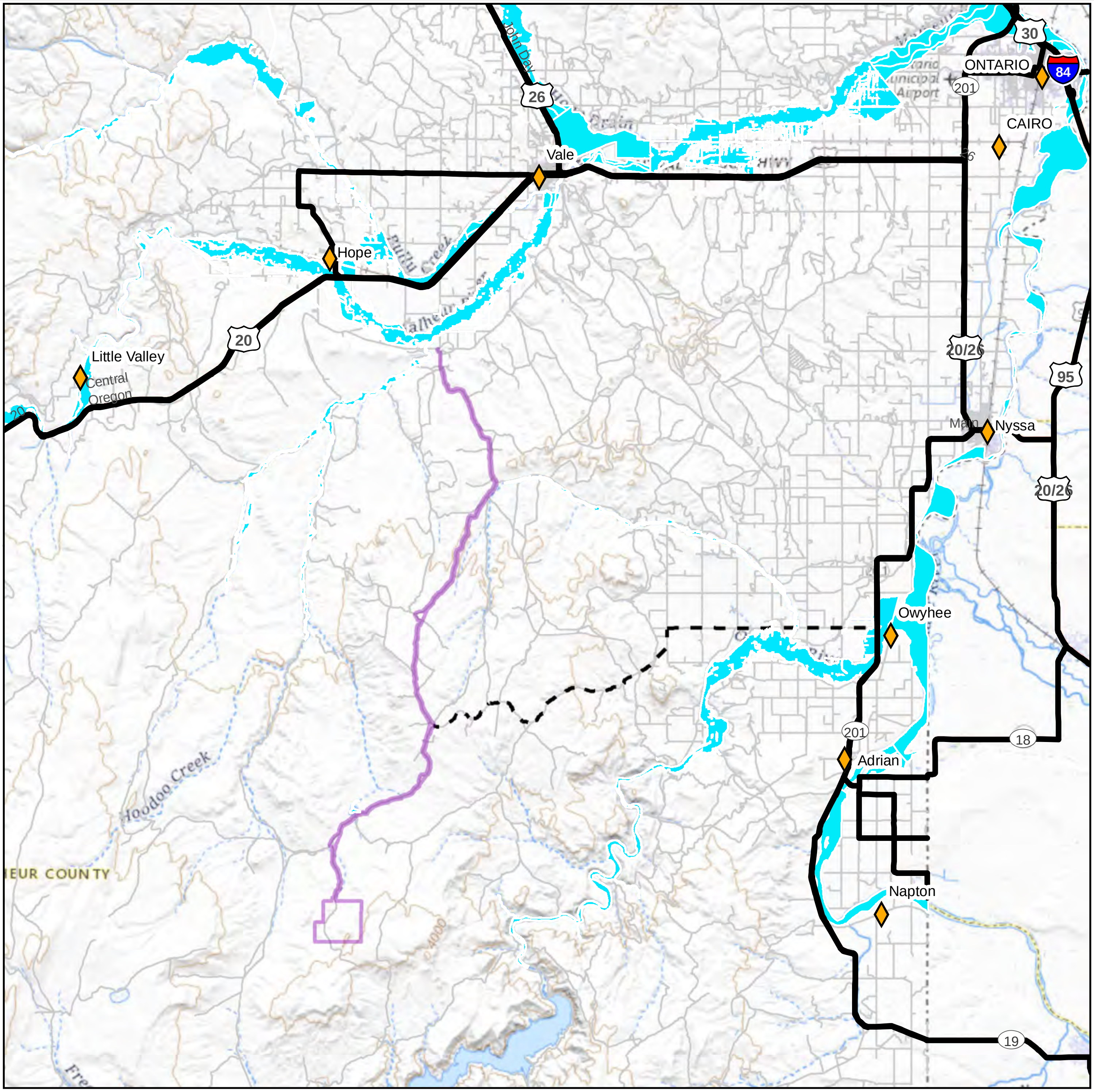

Legend

- PoO Boundary
- Estimated Flood Hazard Area
- Emergency Access Road
- Roads

1 ":4 Miles

0 1 2 4Miles

N W E S

Scale as shown when plotted at 8.5"x11".

Notes:

1. Figure references 1983 UTM zone 11N datum.
2. Road and highway system were referenced from the Bureau of land Management.
3. Flood hazard areas were referenced from FEMA's 2017 and 1984 flood mitigation assessment; last updated April 27th 2021.

Site/Report:

Calico Resources USA Corp.
Grassy Mountain Mine

Consolidated Permit Application

Figure:

Flood Plains Hazard Area
Malheur County, OR

SLR

CALICO RESOURCES

Date: December, 2021		Figure: 6
Project No: 108.02203.00001		
By: MS	Chk'd: TM	

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APPENDICES

APPENDIX A: PATENTED / UNPATENTED MINING CLAIMS

Click here.

APPENDIX B: BASELINE DATA REPORTS

B1. Air Quality Resources Baseline Report

B2. Aquatic Resources Baseline Report

B3. Areas of Critical Environmental Concern Research Natural Areas Baseline Report

B4. A Cultural Resource Inventory of 830 Acres for the Grassy Mountain Mine Project – withheld from public review

B5. Environmental Justice Baseline Report

B6. Baseline Geochemical Characterization Report

B7. Geology and Soils Baseline Report

B8. Grazing Management Baseline Report

B9. Grassy Mountain Gold Project Baseline Groundwater Reports

B10. Land Use Baseline Report

B11. Noise Baseline Report

B12. Oregon Natural Heritage Resources Baseline Report

B13. Outstanding Natural Areas Baseline Report

B14. Recreation Baseline Report

B15. Socioeconomics Baseline Report

B16. Surface Water Baseline Report

B17. Terrestrial Vegetation Baseline Report

B18a. Transportation Baseline Report

B18b. Transportation Baseline Traffic

B18c. Transportation Baseline Trip Generation

B19. Visual Resources Baseline Report

B20. Wetland Delineation Report

B21. Wild, Scenic, or Recreational Rivers Baseline Report

B22. Wildlife Resources Baseline Report

B23. Work Plans, Environmental Baseline Study

APPENDIX C: DESIGN REPORTS

C1. Road Design Report

C2. Portal Design Report

C3. Mill Design Report

C4. Tailings Design Report

C5. Well Field Design Report

C6. Wastewater Facilities Preliminary Engineering Report

APPENDIX D: MANAGEMENT PLANS

D1. Reclamation Plan
D2. Tailings Chemical Monitoring Plan
D3. Waste Management Plan
D4. Stormwater Pollution Control Plan
D5. Quality Assurance Plan
D6. Emergency Response Plan
D7. Toxic and Hazardous Substances Transportation and Storage Plan
D8. Cyanide Management Plan
D9. Petroleum-Contaminated Soil Management Plan
D10. Interim Management Plan
D11. Inventory of Project Monitoring Plans
D12. Monitoring Proposal for Groundwater and Facilities
D13. Safety Training Plan
D14. Wildlife Protection Plan
D15. Wildlife Mitigation Plan
D16. Inadvertent Discovery Plan
D17. Noxious Weed Monitoring and Control Plan

APPENDIX E: PERMIT APPLICATIONS

E1. Malheur County Land Use Compatibility Statement (LUCS)

E2. Abbreviated Operating Permit Application – Grassy Mountain Basalt Borrow Quarry

E3. Abbreviated Operating Permit Application – Grassy Mountain Closure Cover Borrow Areas Quarry

E4. ODEQ Storm Water Permit Application

E5. Grassy Mountain Tailings Dam, Approval of the TSF Revision 0 Plans and Specification

E6. Permit Application for the Water Pollution Control Facility-Onsite facility (septic tank permit)

E7. Conditional Approval Water System ID #4195624

E8. OWRD Water Rights Amendment

E9. ODEQ Water Pollution Control Facility Application and Division 43 Application

APPENDIX F: ECOLOGICAL RISK ASSESSMENT: NUMERICAL PREDICTION OF TAILINGS, SUPERNATANT POND AND RECLAIM POND CHEMISTRY FOR THE GRASSY MOUNTAIN PROJECT

Click here.

APPENDIX G: CERTIFICATE OF LIABILITY INSURANCE

Click here.

APPENDIX H: ALTERNATIVES ANALYSIS ASSESSMENT

Click here.