

2018 Activities

Scope of Work

New World Mining District

Response and Restoration Project

Contract: AG-0343-B-12-0001, AG-0343-K-16-0020

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PRESENTED TO

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TABLE OF CONTENTS

1.0 INTRODUCTION	1
1.1 Site Location and Description	1
1.2 Purpose and Objectives	1
2.0 SCOPE OF WORK.....	2
2.1 Maintain Project Database	2
2.2 Surface Water Quality Monitoring	2
2.3 Groundwater Quality Monitoring	7
2.3.1 New World Repository Monitoring	7
2.4 Prepare Annual Reports.....	11
2.5 Project Management and Agency Liaison	11
3.0 REFERENCES	12

1.0 INTRODUCTION

Tasks completed in conjunction with response and restoration activities for the New World Mining District Response and Restoration Project in Park County, Montana are described in annual work plans prepared between 1999 and 2010 (Maxim, 1999; 2000; 2001; 2002; 2003; 2004; 2005; 2006a; Tetra Tech 2007, 2008, 2009a, 2010).

Following completion of the response and restoration phase of the project, a Site-Wide Long-Term Operations and Maintenance Plan (Tetra Tech, 2012) was prepared. This plan describes annual monitoring tasks that will be completed to evaluate water quality conditions and to determine whether additional maintenance of reclaimed sites and the New World Waste Repository is needed, and estimated costs of site-wide monitoring. This long-term operations and maintenance plan for the project began in 2012 after reclamation actions were complete and covers activities that will occur for the following 20 years (through 2032). This Plan is intended to modify the Overall Work Plan (Maxim, 1999), and the Repository Monitoring Plan (Maxim, 2006b) during the years of its implementation.

1.1 SITE LOCATION AND DESCRIPTION

The New World Mining District falls within the Custer Gallatin National Forest and lies adjacent to Yellowstone National Park's northeast corner. The Absaroka-Beartooth Wilderness Area bounds the District to the north and east, with the Montana-Wyoming state line forming the southern boundary of the District. The District lies entirely within Park County, Montana.

The District covers an area of about 10,360 hectares (25,600 acres) and is located at an elevation that ranges from 2,400 meters (7,900 feet) to over 3,170 meters (10,400 feet) above sea level. The site is snow-covered for much of the year and only one route of travel is open on a year-round basis -- the highway between Mammoth and Cooke City. The Sunlight Basin road accesses the District from northwestern Wyoming during the spring, summer, and fall but only allows access to within a few miles of the District in winter. The Beartooth Highway allows access to the District from the east but is closed during winter.

The topography of the District is mountainous with prominent glacial erosional and depositional features, and is situated at the headwaters of three river systems that all flow into the Yellowstone River. The three tributaries are the Clarks Fork of the Yellowstone, the Stillwater, and the Lamar. The Lamar River flows through Yellowstone Park. The major tributary streams in the District include Daisy, Miller, Fisher, Goose, Sheep, Lady of the Lake, Republic, Woody, and Soda Butte creeks.

1.2 PURPOSE AND OBJECTIVES

The primary purpose of this scope of work is to guide project activities that will be conducted in the District in accordance with the Long-Term Operations and Maintenance Plan (Tetra Tech, 2012) between May 2018 and April 2019. Field activities will be completed by October 2018 however report preparation would likely continue through early 2019.

Primary objectives for work covered in the Long-Term Operations and Maintenance Plan are to document and monitor the effectiveness of reclamation response and restoration actions; to provide for maintenance actions as required to ensure long-term stability of erosion controls and reclamation covers; to monitor surface and groundwater quality and to satisfy the requirements of the rule allowing adoption of temporary water quality standards.

2.0 SCOPE OF WORK

The work for the eighth year (2018) under the Site-Wide, Long-Term Operations and Maintenance Plan (Tetra Tech, 2012) will include the following activities:

- Update the project database and provide query results used for annual reporting.
- Continue monitoring surface water quality in the District as required by the BER for verification that temporary water quality standards are being met.
- Continue monitoring surface water and groundwater quality in the District, including monitoring locations downstream of the Como Basin capped reclamation area, downstream of the closed Glengarry Adit, and downstream and within the capped McLaren Pit. In connection with this monitoring, the USFS will continue to work with the State to determine the actions necessary to support an administrative wrap-up of the temporary water quality standards and the project, such as site specific standards if necessary or other resolution.
- Continue to monitor the New World Waste Repository at the Repository Sump and select groundwater monitoring well locations.
- Prepare an abbreviated annual water resources monitoring report that presents monitoring data gathered in 2018. An annual activities memo will be prepared to summarize work completed during the year and to delineate the work that will be performed the following year, if known.
- Project management and administration.

A more complete description of each of these activities is presented below.

2.1 MAINTAIN PROJECT DATABASE

Environmental data that have been collected at the New World site are cataloged in a Microsoft Access® database, and this database will continue to be updated as new project information is collected in 2018. One copy of the updated database will be provided to the Forest Service on a USB storage device. Queries of the database will be made to support annual report preparation.

2.2 SURFACE WATER QUALITY MONITORING

Surface water quality monitoring will be conducted at the 12 sampling stations identified in the Long-Term Operations and Maintenance Plan (Tetra Tech, 2012). These stations include the seven stations required for monitoring for compliance with temporary water quality standards (Stanley and Maxim 1998; and Maxim 2003c). Sampling sites for surface water during implementation of this scope of work are listed in **Table 1**. Samples will be collected during higher flow conditions in the spring (June/July 2018).

No low flow (September) monitoring would be conducted in 2018. This deviation from the Long-Term Operations and Maintenance Plan (Tetra Tech, 2012) is necessitated by an anticipated contracting delay.

Surface water samples will be collected and analyzed in accordance with procedures and methods described in the Site-Wide Sampling and Analysis Plan (SAP) (Appendix B in Maxim, 1999). In addition to the analytical methods described in the Site-Wide SAP, analysis of dissolved metals will be added to the parameter list for all sites per the Long-Term Operations and Maintenance Plan (Tetra Tech, 2012).

Table 2 lists surface water field parameters and standard operating procedures (SOPs) from the Site-Wide SAP. **Table 3** lists preservation and bottle requirements and **Table 4** lists surface water analytical requirements and practical quantification limits (PQLs).

TABLE 1 SURFACE WATER SAMPLE SITES Long-term Operations and Maintenance Plan		
Site Name	Location	Monitoring Objective
Daisy Creek Drainage		
DCT-8	Daisy Cr. tributary south of McLaren Pit	Measures contribution of impacts from McLaren capped area to Daisy Creek.
DC-2*	Daisy Creek below confluence of McLaren tributaries	Temporary water quality standard required monitoring station.
DC-5*	Daisy Creek above confluence with Stillwater River	Temporary water quality standard required monitoring station
SW-7*	Stillwater River at Stillwater Trail Crossing	Temporary water quality standard required monitoring station
Fisher Creek Drainage		
FCT-11	Tributary below Como Basin	Measures contribution of impacts from Como Basin capped area to Fisher Creek
SW-3*	Fisher Creek below former Glengarry Adit	Temporary water quality standard required monitoring station
SW-4*	Fisher Creek at Lulu Pass Road Crossing	Temporary water quality standard required monitoring station
CFY-2*	Fisher Creek above Clarks Fork confluence	Temporary water quality standard required monitoring station
Clarks Fork River Drainage		
SW-6*	Clarks Fork Yellowstone River at Saw Mill Road	Temporary water quality standard required monitoring station
Soda Butte Creek Drainage		
SBMS-US	Soda Butte Creek above confluence with Miller Creek	Measures water quality in Soda Butte Creek above McLaren tailings and mill-site, and above junction with Miller Creek.
SBC-2	Soda Butte Creek below McLaren Tailings	Measures water quality in Soda Butte Creek below McLaren tailings and mill-site, and below junction with Miller Creek.
SBC-4	Soda Butte Creek at Park Boundary	Measures water quality at the Park Boundary

* Indicates stations required for temporary water quality sampling by BER.

Parameter	SOP Number ⁽¹⁾	SOP Title	Event
Specific Conductance	SOP-05	Field Measurement of Specific Conductance	All
pH	SOP-06	Field Measurement of pH	All
Water Temperature	SOP-07	Field Measurement of Water Temperature	All
Flow	SOP-01	Stream Flow Measurement; Wading Technique	All

¹ Standard Operating Procedures (Appendix B of Maxim 1999)

Parameter	Preparation / Preservation ⁽¹⁾	Bottle Size / Type
Total Recoverable Metals	HNO ₃ to pH < 2; Iced to 4°C	250 milliliter polyethylene
Dissolved Metals	Filtered through 0.45 micron filter; HNO ₃ to pH < 2; Iced to 4°C	250 milliliter polyethylene
Common Ions/Physicochemical	Iced to 4°C	500 milliliter polyethylene

¹ HNO₃ = nitric acid

TABLE 4 SURFACE WATER ANALYTICAL REQUIREMENTS Long-Term Operations and Maintenance Plan			
Parameter	PQL (mg/L) ⁽¹⁾	EPA Method No.	Max. Holding Time
Physicochemical			
Specific Conductivity (mS/cm)	1	2310B	28 days
pH (standard units)	0.1	150.1	Upon arrival at lab
Total Dissolved Solids	1	2340C	7 days
Total Suspended Solids	1	160.2	7 days
Hardness	1	2340B	6 months
Acidity	1	305.1	14 days
Total Recoverable and Dissolved Metals ⁽²⁾			
Aluminum	0.05	200.8/200.7	6 months
Cadmium	0.0001	200.8/200.7	6 months
Copper	0.001	200.8/200.7	6 months
Iron	0.01	200.8/200.7	6 months
Lead	0.001	200.8/200.7	6 months
Manganese	0.003	200.8/200.7	6 months
Zinc	0.01	200.8/200.7	6 months
Common Cations			
Calcium	1.0	200.8/200.7	6 months
Magnesium	1.0	200.8/200.7	6 months
Potassium	1.0	200.8/200.7	6 months
Sodium	1.0	200.8/200.7	6 months
Common Anions			
Sulfate	1.0	375.2	28 Days
Bicarbonate	1.0	2320B	14 Days
Carbonate	1.0	2320B	14 Days
Chloride	1.0	325.3	28 Days
Other			
Cation / Anion Balance	None	Calculation	None

¹ PQL = Practical Quantitation Limit in milligrams per liter (mg/L) unless noted otherwise. If specified PQL is not technologically achievable due to matrix interference etc. then the Method Detection Limit should meet the specified PQL value.

² Surface water will be analyzed for total recoverable (unfiltered) and for dissolved (filtered) metals for all stations.

2.3 GROUNDWATER QUALITY MONITORING

Groundwater monitoring will be conducted in July or August 2018 at the wells listed in **Table 5**. A subset of these wells may be monitored in conjunction with the high flow surface water monitoring event to allow sample collection from wells that typically go dry or non-artesian in July. The groundwater monitoring event would involve measuring water levels, measuring field parameters, and collecting samples for laboratory analysis (**Tables 6, 7, and 8**).

2.3.1 New World Repository Monitoring

Groundwater monitoring at the New World waste repository would be conducted in 2018 at one well pair location (SBGW-107, and -107T) and the Repository Sump in accordance with the methods and procedures described in the Long-Term Operations and Maintenance Plan (Tetra Tech, 2012). Samples collected from the Repository Sump and SBGW-107T samples would also be analyzed for total and dissolved arsenic, iron, and mercury to comply with state of Montana non-degradation rules that would apply to the sump drain field constructed in summer 2017 (**Table 8**).

These locations will be monitored in June during the high flow surface water monitoring event to ensure that the SBGW-107T well contains sufficient groundwater to provide a sample for submittal to the analytical laboratory as this well is typically dry in July.

Monitoring would include maintaining and downloading water level data from the continuous water level instrument installed in the Repository Sump and monitoring well SBGW-107T.

TABLE 5 GROUNDWATER MONITORING WELLS Long-Term Operations and Maintenance Plan				
Well Identification	Year Installed	Completion Formation	Monitoring Event	
			June	July
Daisy Creek / McLaren Area				
DCGW-101S	2001	Colluvium	—	X
DCGW-101D	2001	Lulu Pass Rhyodacite Porphyry	—	X
DCGW-104	2001	Waste Rock	—	X
DCGW-105	2001	Waste Rock	—	X
DCGW-132	2002	Colluvium	—	X
Fisher Creek Area				
EPA-11	1996	Tertiary Intrusive Dike	—	X
EPA-12	1996	Scotch Bonnet Diorite	P	X
FCGW-100	2004	Glengarry Adit Workings	—	X
MW-1	1989	Wolsey Shale	—	X
MW-9A	1990	Alluvium	—	X
MW-9B	1990	Precambrian	—	X
Tracer-5	1997	Fisher Mtn. Intrusive	P	X
Repository Sump	2002	Not Applicable	X, S, W	—
SBGW-107T	1999	Till	X, S, W	—
SBGW-107	1999	Granite	X, S	—

- X Samples collected and analyzed for full suite of laboratory parameters.
- S Repository Sump and SBGW-107T samples submitted for analysis of additional parameters compared to other groundwater samples. Refer to **Table 8**.
- W Continuous water level monitoring.
- Indicates no monitoring.
- P If accessible, these wells would be sampled in June rather than July to ensure sample collection during artesian flow conditions.

Parameter	SOP Number ⁽¹⁾	SOP Title	Event
Specific Conductance	SOP-05	Field Measurement of Specific Conductance	All
pH	SOP-06	Field Measurement of pH	All
Water Temperature	SOP-07	Field Measurement of Water Temperature	All
Oxidation-Reduction	SOP-28	Field Measurement of Redox Potential (Eh)	All
Dissolved Oxygen	SOP-08	Field Measurement of Dissolved Oxygen	All
Depth to Water	SOP-20	Field Measurement of Groundwater Level	All

¹ Standard Operating Procedures (Appendix B of Maxim 1999)

Parameter	Preparation / Preservation ⁽¹⁾	Bottle Size / Type
Dissolved Metals	Filtered through 0.45 micron filter; HNO ₃ to pH < 2; Iced to 4°C	250 milliliter polyethylene
Common Ions/Physicochemical	Iced to 4°C	500 milliliter polyethylene

¹ HNO₃ = nitric acid

**TABLE 8
GROUNDWATER ANALYTICAL REQUIREMENTS
Long-Term Operations and Maintenance Plan**

Parameter	PQL (mg/l) ⁽¹⁾	EPA Method No.	Max. Holding Time
Physicochemical			
Specific Conductivity (mS/cm)	1.0	2310B	28 days
pH (standard units)	0.1	150.1	Upon arrival at lab
Total Dissolved Solids	1.0	2340C	7 days
Hardness	1.0	2340B	6 months
Acidity	1.0	305.1	14 days
Metals (dissolved unless stated otherwise) ⁽³⁾			
Aluminum	0.05	200.8/200.7	6 months
Arsenic (total and dissolved) ⁽²⁾	0.003	200.8/200.7	6 months
Cadmium	0.0001	200.8/200.7	6 months
Copper	0.001	200.8/200.7	6 months
Iron	0.01	200.8/200.7	6 months
Iron (total and dissolved) ⁽²⁾	0.01	200.8/200.7	6 months
Lead	0.001	200.8/200.7	6 months
Manganese	0.003	200.8/200.7	6 months
Mercury (total and dissolved) ⁽²⁾	0.001	245.1	6 months
Zinc	0.01	200.8/200.7	6 months
Common Cations			
Calcium	1.0	200.8/200.7	6 months
Magnesium	1.0	200.8/200.7	6 months
Potassium	1.0	200.8/200.7	6 months
Sodium	1.0	200.8/200.7	6 months
Common Anions			
Sulfate	1.0	300.0	28 Days
Bicarbonate	1.0	300.0	14 Days
Carbonate	1.0	300.0	14 Days
Chloride	1.0	300.0	28 Days
Other			
Cation / Anion Balance	None	Calculation	None

¹ PQL = Practical Quantitation Limit in milligrams per liter (mg/L) unless noted otherwise. If specified PQL is not technologically achievable due to matrix interference etc. then the Method Detection Limit should meet the specified PQL value.

² Shading indicates additional parameters analyzed from Repository Sump and SBGW-107T samples.

³ Groundwater parameters will be analyzed as dissolved constituents as filtered through a 0.45 micron filter.

2.4 PREPARE ANNUAL REPORTS

Two annual project documents will be prepared that include discussions of the items discussed in Section 2.0. These documents are summarized in **Table 10** along with a description of the document contents and approximate delivery schedule.

Deliverable Title	Contents	Estimated Delivery Schedule (of draft documents for USFS review)
Annual Surface Water / Groundwater Monitoring Report	Results and analyses of ongoing surface water and groundwater monitoring.	March 1, 2019
Annual Project Activities Report	Summary of project activities.	March 1, 2019

2.5 PROJECT MANAGEMENT AND AGENCY LIAISON

This work shall include limited project management activities such as budget tracking and progress reporting along with various discussions of technical data and issues at the site, construction issues related to reclamation, and potential implementation of maintenance activities. Technical memos may be requested by the Forest Service to document this work. Data and reports related to TMDL, temporary water quality standards review, and use attainability studies may also need to be prepared for presentation to DEQ, BER, Consent Decree participants, and other interested parties for formal meetings and discussions. Tetra Tech may also attend meetings with USFS and DEQ to facilitate completion of a Use Attainability Study for the District.

Under this Task Order there may be a need for technical coordination and the development of documents in support of DEQ's Use Attainability Analysis or other work in support of administrative wrap-up of the project with regard to temporary water quality standards which are set to expire in 2019.

3.0 REFERENCES

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