2019 Activities
Scope of Work
New World Mining District
Response and Restoration Project

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(GSA Contract GS-00F-168CA)

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PRESENTED TO

USDA Forest Service
Custer Gallatin National Forest
Bozeman, Montana

PRESENTED BY

Tetra Tech
851 Bridger Drive, Suite 6
Bozeman, MT 59715

P +1-406-582-8780
F +1-406-582-8790
tetratech.com

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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 (**Figure 1**) are described in annual work plans prepared between 1999 and 2011 (Maxim, 1999; 2000; 2001; 2002; 2003; 2004; 2005; 2006a; Tetra Tech 2007, 2008, 2009a, 2010, 2011).

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 repository is needed, and estimated costs of site-wide monitoring and maintenance. 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 September 2018 and March 2020. The September 2018, low-flow surface water monitoring event will be completed under this scope of work. Field activities will be completed by October 2019 however report preparation would likely continue through early 2020.

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 (2019) under the Site-Wide, Long-Term Operations and Maintenance Plan (Tetra Tech, 2012) will include the following activities:

- Maintain community relations. It is anticipated that up to two meetings may be held annually. A summer meeting may be held in Cooke City and a winter technical meeting may be held in Bozeman.
- Update and maintain the project database.
- Continue monitoring surface water in the District as required by the state Board of Environmental Review (BER) for verification that temporary water quality standards are being met. 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 monitoring surface water and groundwater quality in the District, including monitoring surface water and groundwater conditions downstream of the Como Basin capped reclamation area, downstream of the closed Glengarry Adit, and downstream and within the capped McLaren Pit.
- 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. 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.

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

2.1 COMMUNITY RELATIONS

A Community Relations Plan was developed for the project and is included in the Overall Project Work Plan (Maxim, 1999c). This plan describes community relation strategies used to share information with the public and obtain timely input on proposed project activities during the response and restoration project.

As many as two public meetings may be held in 2019. At these meetings, summary monitoring data, results, and other items that may be of public interest will be presented as appropriate, and the meeting facilitated by a USFS representative. Tetra Tech will provide the technical support necessary to provide updated site information and any other logistical support for the meetings.

2.2 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 2019. The updated database will be provided annually to the Forest Service on a USB storage device included with the annual water resources monitoring report. Queries of the database will be made available via email or on a USB device upon request from the USFS.

2.3 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. Surface water locations to be monitored during implementation of this Scope of Work are listed in **Table 1**. Three monitoring events will be completed; during low flow conditions in the fall (September) of 2018, during higher flow conditions in the spring (June/July 2019), and during low flow conditions in the fall (September) of 2019.

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 was added to the list of parameters beginning in 2008 to evaluate the contribution of metals from suspended sediment (Tetra Tech, 2007). Total recoverable and dissolved arsenic analysis was requested by the state BER and it has been completed at the site since 2014. There has never been any arsenic detected and therefore we are discontinuing this analysis. Dissolved metals analysis continues during the implementation of the Long-Term Operations and Maintenance Plan (Tetra Tech, 2012) and will continue under this Scope of Work.

Table 2 lists surface water field parameters and standard operating procedures (SOPs) from the Site-Wide SAP. **Table 3** 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.

TABLE 2
SURFACE WATER FIELD PARAMETERS
Long-Term Operations and Maintenance Plan

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)

TABLE 3
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
Arsenic	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
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 [3]			
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 [3]			
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 metals for all stations.

[3] Common cations and anions are to be analyzed as total recoverable for use in determining cation/anion balance.

2.4 GROUNDWATER QUALITY MONITORING

Groundwater monitoring will be conducted in 2019 at the wells listed in **Table 4**. Monitoring of the Repository Sump and downgradient groundwater wells SBGW-107 and SBGW-107T would occur in June while the other monitoring wells would be monitored in July. If wells Tracer-5 and EPA-12 are accessible and exhibit artesian flow in June they would also be monitored at this time to avoid the need to purge prior to sample collection. Otherwise, these wells will be monitored in July.

The groundwater monitoring events would involve measuring water levels, measuring field parameters, and collecting samples for laboratory analysis (**Tables 5**, and **6**).

2.4.1 New World Repository Monitoring

Groundwater monitoring would be conducted in 2019 at the New World waste repository and a pair of downgradient wells (SBGW-107, and -107T) in accordance with the methods and procedures described in the Long-Term Operations and Maintenance Plan (Tetra Tech, 2012). The wells and the repository sump will be monitored in June during the high flow surface water monitoring event in order to ensure that the SBGW-107T well contains sufficient groundwater to provide a sample for submittal to the analytical laboratory.

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

These samples will be analyzed for the same suite of parameters as the other groundwater samples and also for arsenic and mercury per the request of Montana DEQ as a condition of their approval to construct the repository sump drain field which was completed in August, 2017. These parameters are listed in **Table 6**.

TABLE 4
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	—	**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	—	**X**
Repository Sump Area				
Repository Sump	2002	Not Applicable	—	**S, W**
SBGW-107T	1999	Till	**S**	**W**
SBGW-107	1999	Granite	**S**	—

X Samples collected and analyzed for full suite of laboratory parameters.

F Samples collected and monitored for field parameters only.

S Samples from Repository Sump and downgradient wells submitted for analysis of a different analytical suite compared to other groundwater samples. Refer to **Table 6**.

W Continuous water level monitoring.

-- Indicates no monitoring.

TABLE 5
GROUNDWATER FIELD PARAMETERS
Long-Term Operations and Maintenance Plan

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)

TABLE 6
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 [3]			
Aluminum	0.05	200.8/200.7	6 months
Arsenic [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
Lead	0.001	200.8/200.7	6 months
Manganese	0.003	200.8/200.7	6 months
Mercury [2]	0.001	245.1	6 Months
Zinc	0.01	200.8/200.7	6 months
Common Cations [4]			
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 [4]			
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] Shaded parameters only analyzed from Repository Sump, SBGW-107, and SBGW-107T samples.

[3] Groundwater parameters will be analyzed as dissolved constituents as filtered through a 0.45 micron filter. Repository Sump sample analyzed for total recoverable metals in addition to dissolved.

[4] Common cations and anions are to be analyzed as total recoverable for use in determining cation/anion balance.

2.5 MAINTENANCE AND EROSION CONTROL

Maintenance and erosion control work would be conducted as required to address failures or potential failures associated with reclamation work and this task order would be amended to address any additional work. Such work may include, but is not limited to, re-grading, ditch and culvert maintenance, installation of new monitoring wells, repair of old monitoring wells, abandonment of wells no longer needed for the project, re-seeding, and/or installation and maintenance of silt fences and erosion matting. For the purpose of cost estimation, it is assumed that maintenance would require a backhoe and operator for one day. The manhole outside the McLaren Adit will be inspected under this task. Tetra Tech shall visit the site with a Forest Service representative to determine an acceptable method for inspection of the McLaren Adit infiltration system. This method will then be used for future inspections.

2.6 PREPARE ANNUAL REPORTS

Two annual project documents will be prepared that include discussions of many of the items discussed in Section 2.0. These documents are summarized in **Table 7** along with a description of the document contents and approximate delivery schedule. Results of the September 2018 surface water monitoring event would be included in the annual report for 2018 surface and groundwater monitoring which will be prepared under a previous scope of work and submitted in early spring 2019.

TABLE 7
PROJECT DOCUMENT LIST
Long-Term Operations and Maintenance Plan

Deliverable Title	Contents	Estimated Delivery Schedule (of draft documents for USFS review)
2019 Annual Surface Water / Groundwater Monitoring Report	Results and analyses of ongoing surface water and groundwater monitoring.	April 1, 2020
2019 Annual Project Activities Report.	Summary of project activities (e.g. monitoring and maintenance).	April 1, 2020

2.7 PROJECT MANAGEMENT AND AGENCY LIAISON

This work shall include 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 such as abandonment of monitoring wells no longer needed to support project objectives. 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. These meetings / data collection activities will involve both contractor and US Forest Service personnel coordination to produce the required working documents and deliverables. Tetra Tech may also attend meetings with USFS and DEQ to facilitate completion of a Use Attainability Study and site-specific water quality standards for the District.

Technical support related to updates to the USFS-maintained project website or other items may also be required.

3.0 REFERENCES

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