

Good Neighbor Agreement Water Resources Adaptive Management Plan *Development and Implementation*

Nutrient Work Group Meeting – June 22, 2022

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What is an Adaptive Management Plan?

- A tool that provides a structured and iterative process to support decision making when responding to uncertainty or unanticipated outcomes
- GNA AMP
 - Approach developed to detect, respond to, and mitigate groundwater and surface water quality change downgradient of the East Boulder Mine, Stillwater Mine, Hertzler Ranch and Benbow Portal facilities as quickly as possible
 - Ongoing review of water quality data, an established process to assess, respond to and mitigate water quality change.
 - Comprehensive water management, treatment, discharge, and monitoring assessment tool for water quality impacts from SMC operations within one framework that includes all sources of mine discharge, and accounts for cumulative effects to water resources from both point and non- point sources of mine influenced water



The Adaptive Management Plan implements a ‘proactive, precautionary approach’ that captures changes in water quality at the earliest stages of mine-related influence. The AMP requires the mine to take remedial actions to address even small changes in water quality, well before the violation of any state or federal permit standards. It took years of cooperative effort between the company and the community groups to iron out the final details. The AMP is a perfect example of working together through the spirit and letter of the Good Neighbor Agreement to protect Montana’s pristine water.

***- Jerry Iverson
Cottonwood Resource Council***

GNA Water Resources AMP

- GNA is a partnership between Cottonwood Resource Council, Stillwater Protective Association and Northern Plains Resource Council (the Councils) and Stillwater Mining Company
- Implemented for over 20 years as a tool that allows for responsible economic development at the Stillwater and East Boulder Mines while maintaining the rural character of the adjacent communities, and baseline water quality downstream of mine facilities

GNA Water Resources AMP

- GNA includes a comprehensive surface water, groundwater and aquatic resources protection program (water chemistry, physical characteristics and biological monitoring)
- GNA Water Program includes the following objectives:
 - Councils to participate in the development and oversight of SMC water management plans
 - Adopt a proactive precautionary approach for the water management plans at the East Boulder and Stillwater Mines
 - Maintain baseline water quality, biological integrity, and beneficial uses of the East Boulder and Stillwater Rivers and ground waters that may be impacted by SMC mining operations

GNA Water Resources AMP - Development

Developed in response to water quality change


- Nonpoint source water quality impacts observed in response to mine operations were not predicted in original modeling and permitting efforts
- Exceedances of GNA Tiered Trigger Level Framework standards for nitrogen in groundwater and surface water

GNA AMP is a tool to meet goals and objectives of the GNA Water Program

- 3-year development phase, 1-2 year implementation phase
- Multi-stakeholder objectives considered
- Apply the same basis to multiple mine operation areas (not watershed wide)
- Accounts for point and non-point source discharges

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GNA AMP Primary Components

- Water Management and Discharge Reporting
 - GNA Water Resource Monitoring Requirements
 - Data Management and Transmission
 - Data Review and Reporting
 - Tiered Trigger Level Framework for Groundwater and Surface Water
 - Response Framework
 - Process for AMP Evaluation and Updates
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Parameter	Sample Collection Method	Discharge Water			Operational Water	Groundwater and Springs		Surface Water		Reporting Limit	Analysis Method	REGULATORY - 2018 WRMP	
		MPDES Outfall 001 (not constructed)	MPDES Outfall 002A	MPDES Outfall 003A	Operational Water (AditComp, TSF)	AMP TTLF Sites	Groundwater and Springs	EBR-003, EBR-005	East Boulder River and Tributaries			Reporting Limit	Analysis Method
Field Measurements													
Flow	In-Stream Measurement	X	X	X	X (Adit Comp)		X (Springs)	X	X	0.5 gpm	flow meter	0.5 gpm	Marsh McBirney Flow Meter
Wire Weight Gage	In-Stream Measurement									0.01 ft	field measurement		
Static Water Level	In-Stream Measurement					X	X			0.01 ft	field tape		field tape
pH, field	In-Stream Measurement	X	X	X	X	X	X	X	X	0.1 s.u.	field meter		field meter
Temperature	In-Stream Measurement	X			X	X	X	X	X	0.1°C	field meter	0.1°F	field meter
Dissolved Oxygen (DO)	In-Stream Measurement							X	X		field meter		field meter
Specific Conductance, field	In-Stream Measurement	X	X	X	X	X	X	X	X	1 µmhos/cm	field meter	1 µmhos/cm	field meter
General Chemistry and Major Ions													
Specific Conductance, lab	Grab									1 µmhos/cm	EPA 120.1		
Total Dissolved Solids (TDS)	Grab				X	X	X	X	X	5 mg/L	EPA 160.1	5 mg/L	EPA 160.1
Total Suspended Solids (TSS)	Grab			X				X	X	10 mg/L	EPA 106.2		
Alkalinity	Grab				X	X	X	X	X	1 mg/L	EPA 310.1	1 mg/L	EPA 310.1
Carbonate	Grab				X	X	X	X	X	1 mg/L	EPA 310.1	1 mg/L	EPA 310.1
Bicarbonate	Grab				X	X	X	X	X	1 mg/L	EPA 310.1	1 mg/L	EPA 310.1
Hardness	Grab				X	X	X	X	X	1 mg/L	EPA 200.7	1 mg/L	EPA 200.7
Calcium, dissolved	Grab				X	X	X	X	X	1 mg/L	EPA 200.7	1 mg/L	EPA 200.7
Magnesium, dissolved	Grab				X	X	X	X	X	1 mg/L	EPA 200.7	1 mg/L	EPA 200.7
Sodium, dissolved	Grab				X	X	X	X	X	1 mg/L	EPA 200.7	1 mg/L	EPA 200.7
Potassium, dissolved	Grab				X	X	X	X	X	1 mg/L	EPA 200.7	1 mg/L	EPA 200.7
Chloride	Grab				X	X	X	X	X	1 mg/L	EPA 300	1 mg/L	EPA 300
Sulfate	Grab				X	X	X	X	X	1 mg/L	EPA 300	1 mg/L	EPA 300
Nutrients													
Orthophosphate as P	Grab							X (biological monitoring)	X (biological monitoring)	0.003 mg/L	EPA 365.1		
Phosphorus, Total as P	Grab	X			X	X	X	X	X	0.002 mg/L	EPA 365.1	0.005 mg/L	EPA 365.1
Total Ammonia as N	Grab	X	X		X	X	X	X	X	0.05 mg/L	EPA 350.1	0.05 mg/L	EPA 350.1
Nitrate plus Nitrite as N	Grab	X	X		X	X	X	X	X	0.01 mg/L	EPA 353.2	0.02 mg/L	EPA 353.2
Total Kjeldahl Nitrogen as N	Grab	X*	X*	X*	X*	X*	X*	X*	X*	0.3 mg/L	EPA 351.2	0.1 mg/L	EPA 351.2
Total Inorganic Nitrogen (TIN)	Grab	X	X		X	X	X	X	X	0.03 mg/L	Calculated	0.05 mg/L	EPA 353.3
Nitrogen as N (TN)	Grab	X*	X*		X*	X*	X*	X*	X*	0.3 mg/L	Calculated	0.07 mg/L	Calculated
Nitrogen	Grab	X*	X*		X*	X*	X*	X*	X*	0.05 mg/L			
Trace Metals - Low Level - RRVs													
	Grab				X (Adit Comp)	X (3Q2019, then 3Q every 5 years)				0.001 mg/L	EPA 200.7/200.8		
								X (3Q2019, then 3Q every 5 years)		0.001 mg/L	EPA 200.7/200.8		
					X	X	X			0.0005 mg/L	EPA 200.7/200.8		
								X		0.0005 mg/L	EPA 200.7/200.8		

Water Management and Discharge Reporting

- Monthly monitoring
 - Operating Permit, MPDES and GNA requirements
- Monitoring parameters and detection limits defined
- QA/QC

Data Management

- Transmission
- Review
- Reporting

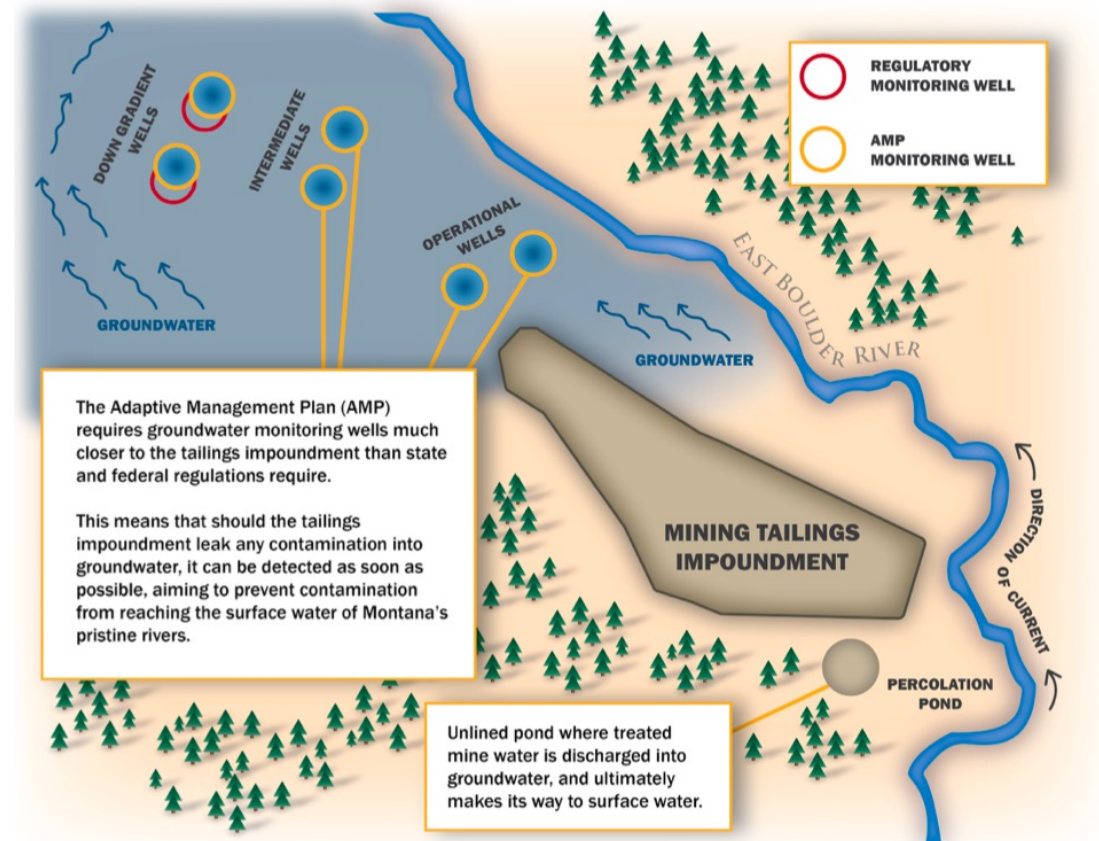


Table 5-1. GNA AMP Data Collection, Transmission and Reporting Timeline.

Task	Deadline	Responsible Party
Sample collection	Fri following the 3 rd Wed of Month 1	SMC
Monthly Data uploaded to Exavault	Fri following the 3 rd Wed of Month 2	SMC
Confirm TTLF Exceedances	Fri following the 4 th Wed of Month 2	GNA
DMR, Non-Deg uploaded to Exavault	No later than the last day of Month 2	SMC
Monthly report to EBOC/SOC	Fri following the 2 nd Wed of Month 3	GNA

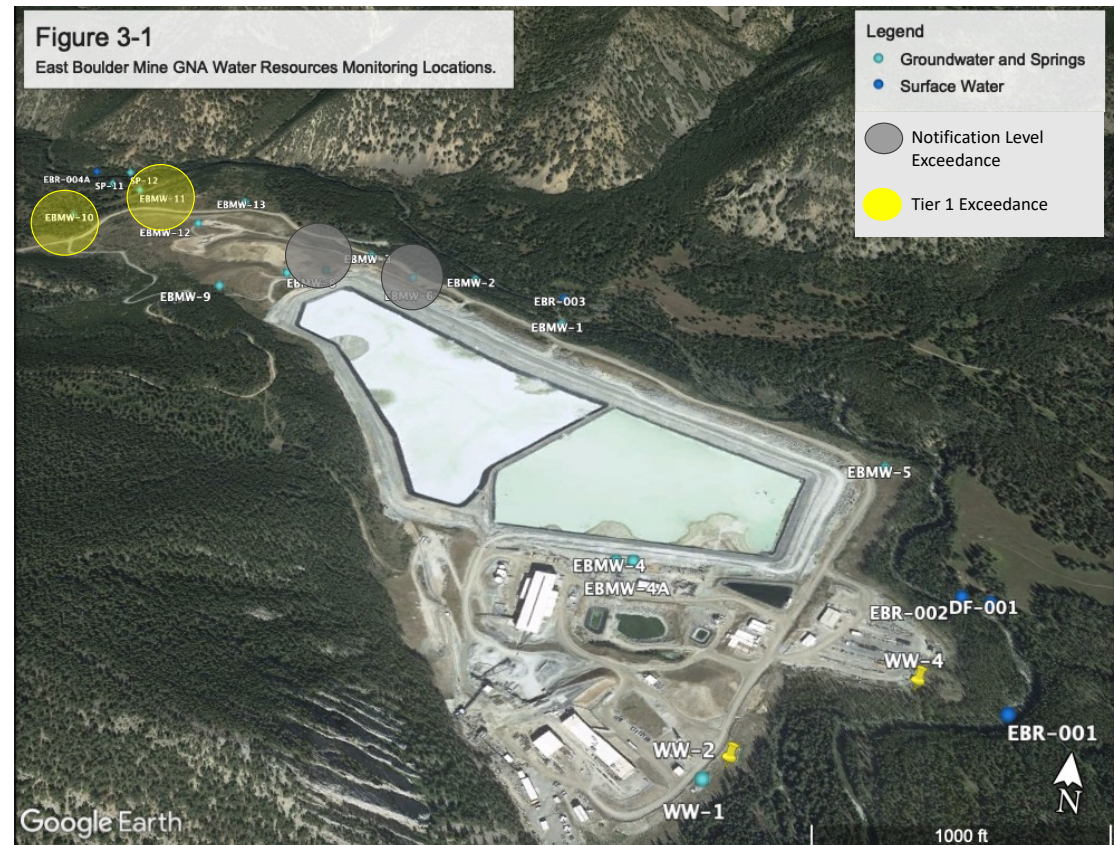
Tiered Trigger Level Framework

Groundwater and Surface Water



Tiered Trigger Level Framework - Groundwater

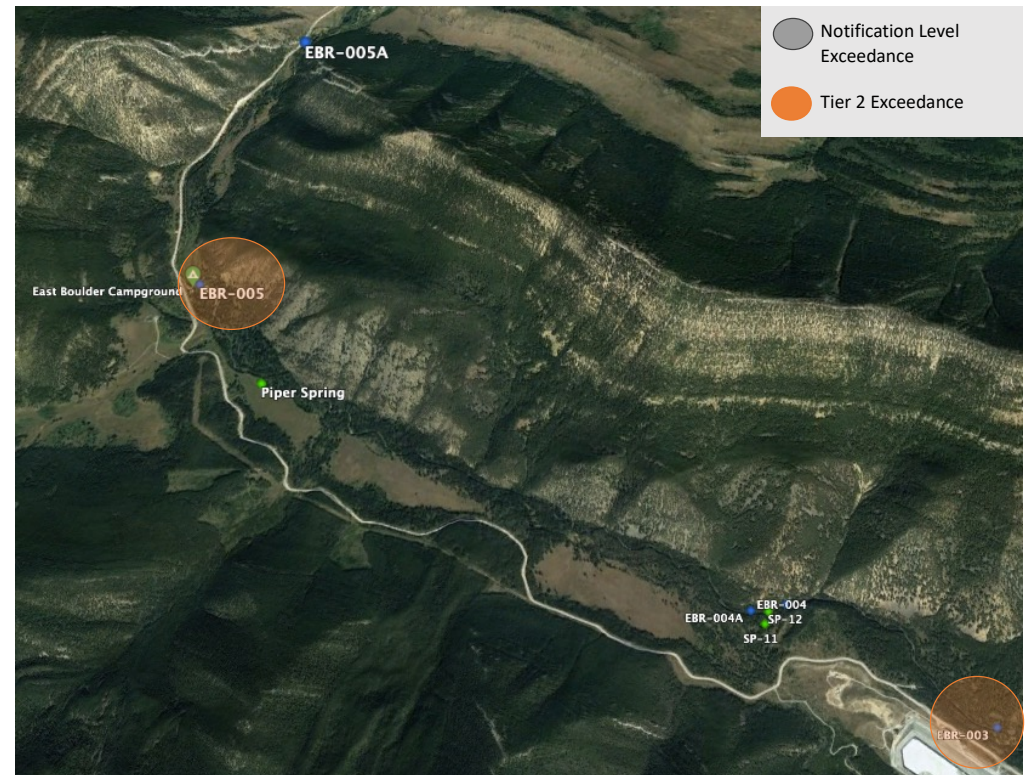
Parameter	Groundwater (mg/L)				
	Operational EBMW-6, EBMW-7	Intermediate EBMW-12, EBMW-13	Downgradient EBMW-10, EBMW-11		
	Notification Level (mg/L)	Intermediate Trigger Level	Tier 1 Trigger Level	Tier 2 Trigger Level	Tier 3 Trigger Level
Total Phosphorus	0.300	0.300	0.014	0.157	0.300
Total Inorganic Nitrogen	7.50	7.50	0.17	3.84	7.50
Arsenic	0.010	0.010	0.002	0.006	0.010
Cadmium	0.005	0.005	0.0001	0.003	0.005
Chromium	0.100	0.100	0.002	0.051	0.100
Copper	1.30	1.30	0.001	0.651	1.30
Iron	1.00	1.00	0.01	0.51	1.00
Lead	0.015	0.015	0.002	0.009	0.015
Manganese	0.050	0.050	0.004	0.027	0.050
Nickel	0.10	0.10	0.01	0.06	0.10
Zinc	2.00	2.00	0.01	1.01	2.00



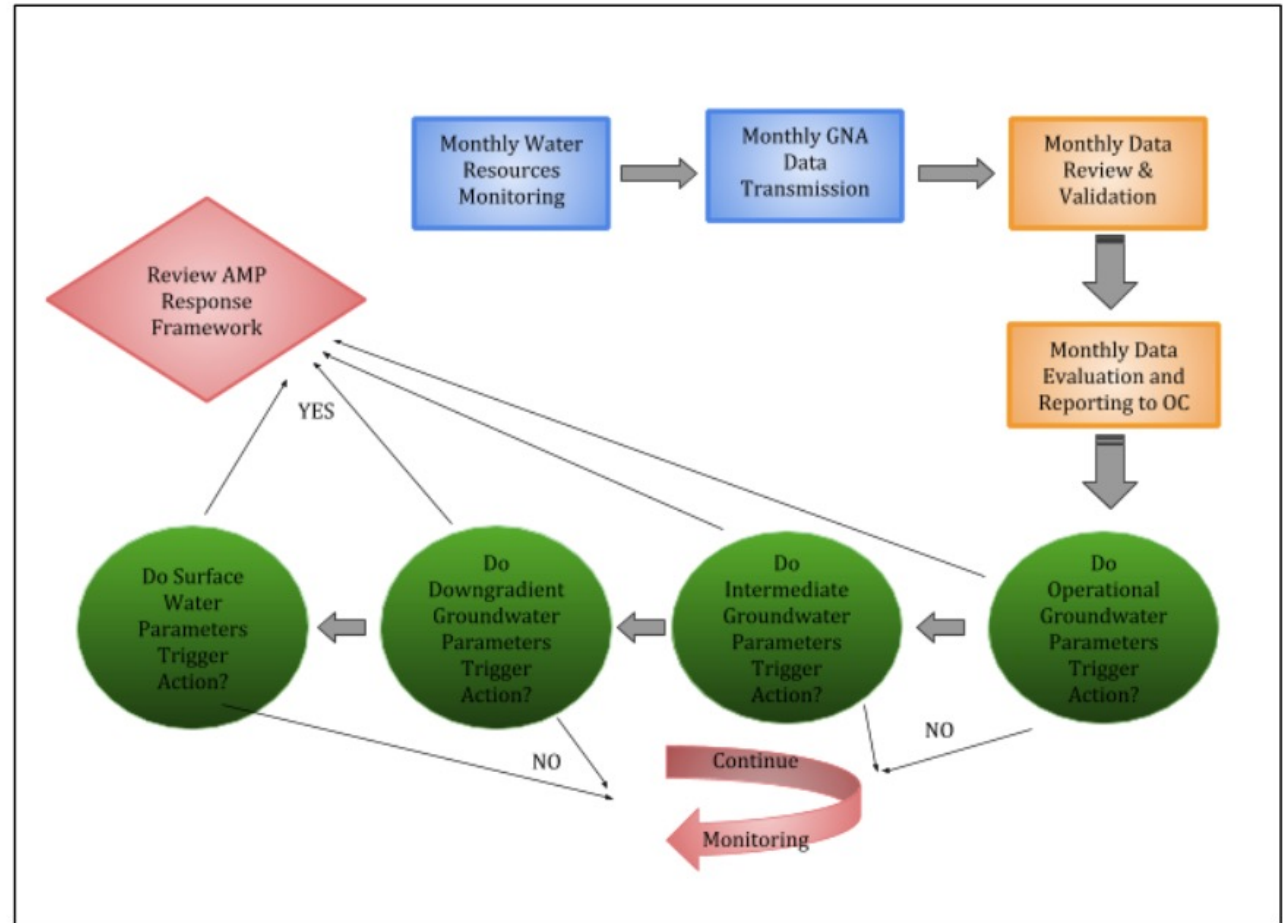
Tiered Trigger Level Framework – Surface Water

Parameter	BWQR Mean (95-99)	Surface Water (mg/L) EBR-003 (upstream), EBR-005 (downstream)		
		Tier 1 Concentration Change	Tier 2 Concentration Change	Tier 3 Trigger Level*
Total Phosphorus	0.010	0.003	0.018	0.033
Total Inorganic Nitrogen	0.10	0.10	0.27	0.44
Arsenic	0.002	0.002	0.006	0.010
Cadmium	0.0001	0.0003	0.0014	0.0025
Chromium	0.001	0.003	0.052	0.100
Copper	0.001	0.003	0.652	1.300
Iron	0.01	0.03	0.52	1.00
Lead	0.003	0.003	0.008	0.014
Manganese	0.005	0.003	0.027	0.050
Nickel	0.021	0.003	0.052	0.100
Zinc	0.01	0.003	0.020	0.037
Temperature				+/-1.0

*TIN and TP Tier 3 Level is a concentration change from October through June



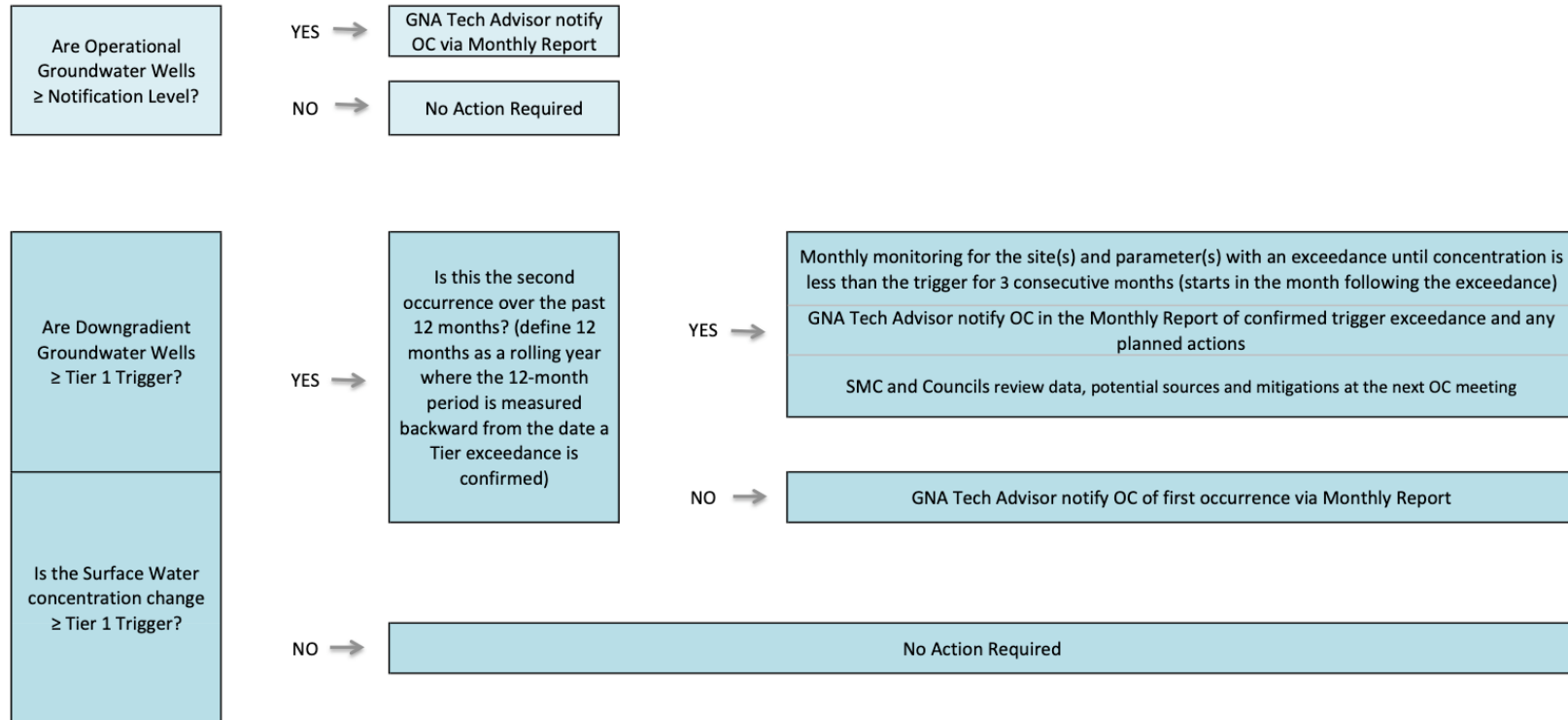
Response Framework



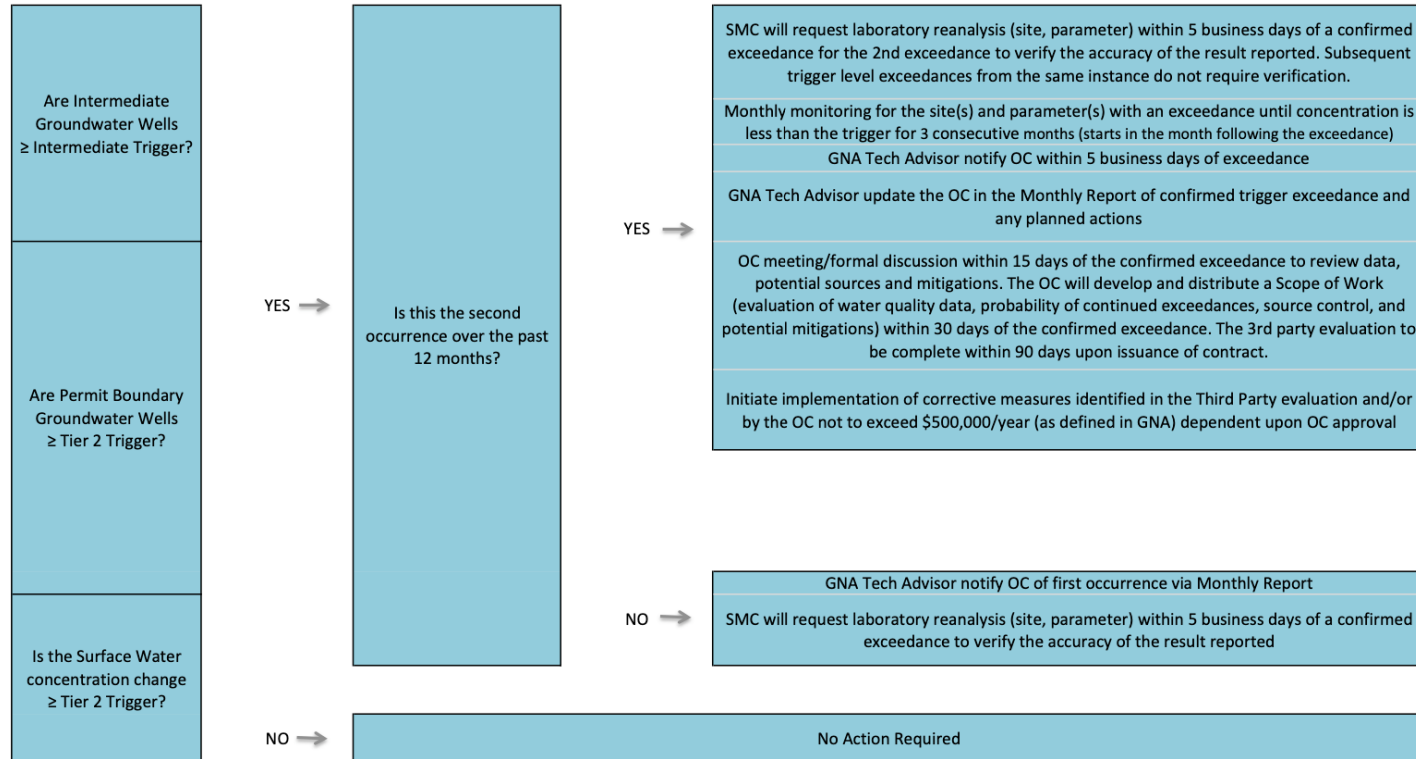
Response Framework

	Contamination Level		
	Exceeds Tier 1 Baseline water quality standard Example: 0.17mg/L of Nitrogen detected	Exceeds Tier 2 50% difference between Tier 1 and Tier 3 Example: 3.84 mg/L of Nitrogen detected	Exceeds Tier 3 Lowest applicable water quality standard Example: 7.50 mg/L of Nitrogen detected
	Action Required of Mine		
Operational Groundwater Wells	Not Applicable	Not Applicable	Notification Flag: requires reporting to community groups
Intermediate Groundwater Wells	Not Applicable	Not Applicable	Monthly Monitoring Third party recommendations and corrective actions taken after Oversight Committee approval
Down Gradient Groundwater Wells	Monthly Monitoring	Monthly Monitoring Third party recommendations and corrective actions taken after Oversight Committee approval	Monthly Monitoring Take corrective actions to return water to baseline quality
Surface Water	Monthly Monitoring	Monthly Monitoring Third party recommendations and corrective actions taken after Oversight Committee approval	Monthly Monitoring Take corrective actions to return water to baseline quality

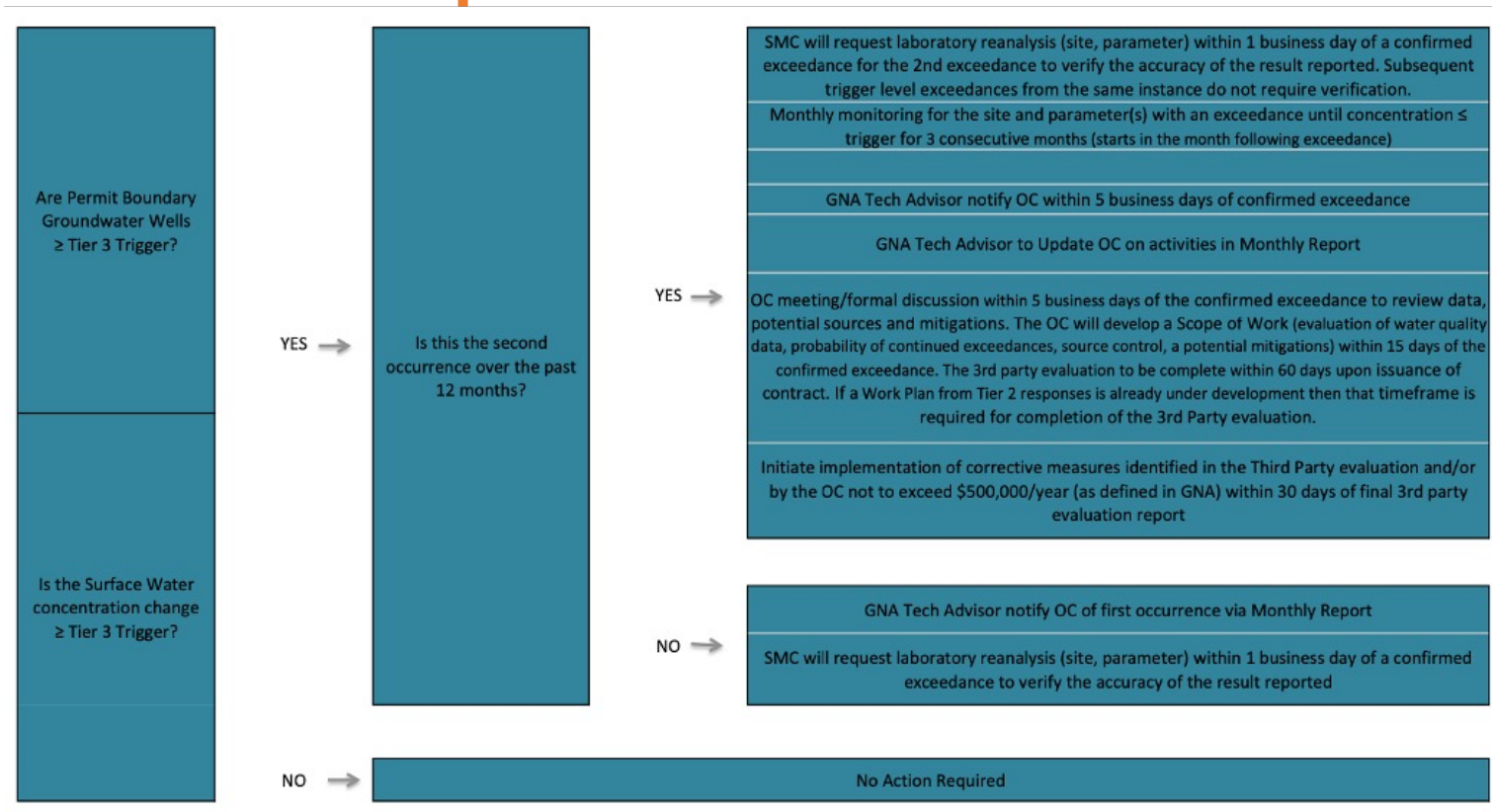
Response Framework - Tier 1



Response Framework - Tier 2



Response Framework - Tier 3



GNA AMP

Annual Review Requirements

- GNA TAs prepare the annual report and submit to the GNA Committee.
 - Summary of water quality data throughout the year, TTLF exceedances, and the subsequent action steps implemented
 - Review of ongoing TTLF exceedances and Response Framework actions taken to determine Response Framework requirements for the following year until concentrations are less than Tier 1 Trigger values.
 - Evaluation of the previous three (3) and five (5) years of water quality data for trend analysis to identify increasing or decreasing trends in water quality
- GNA Committee review and approve recommended AMP modifications, then GNA TAs issue updated Adaptive Management Plan
- Every third year (2023)
 - Annual report will include an analysis of spatial and temporal water quality trends, modifications to mine operations, and other relevant factors
 - Inform recommended updates and modifications to the AMP monitoring, TTLF, and Response Framework requirements

