STATE OF COLORADO

Lennberg - DNR, Patrick <patrick.lennberg@state.co.us>

M-1977-410 -Response to Technical Revision No. 10 (TR-10) Adequacy Review No. 2 -- and Complete copy with revisions of technical revision number 10

1 message

Rmittasch@nedmining.com <Rmittasch@nedmining.com> Tue, Apr 26, 2022 at 11:05 PM
To: "Lennberg - DNR, Patrick" <patrick.lennberg@state.co.us>, "Eschberger - DNR, Amy" <amy.eschberger@state.co.us>
Cc: Daniel Takami <danieltakami@gmail.com>, Sergio Rivera <sergio.rivera@novametallix.com>

Amy / Patrick

here's our response to adequacy review number 2, also we have completely updated the original filings of TR10 with all the changes from adequacy review number one and adequacy review number 2 as well as the updated groundwater monitoring plan and surface water monitoring plan as well as sampling procedures.

if you have any questions, I'm available all day tomorrow via voice or email to assist you in any way.

Kind Regards,

Richard Mittasch, Vice President

Nederland Mining Consultants, Inc.

Phone: 720-893-3749

Mobile: 516 582-0833

Email: Rmittasch@nedmining.com

4415 Caribou Rd, PO Box 3395, Nederland, CO 80466

2 attachments

TR 10 - M-1977-410_TR10 Final Draft - v3rb.pdf
7657K

Response to Technical Revision No. 10 (TR-10) Adequacy Review No. 2 (003).pdf
1257K

Response to: Cross Gold Mine, Permit No. M-1977-410, Technical Revision No. 10 (TR-10), Adequacy Review No. 2

1) DRMS has the following comments pertaining to Figure 1 – Water Management System:

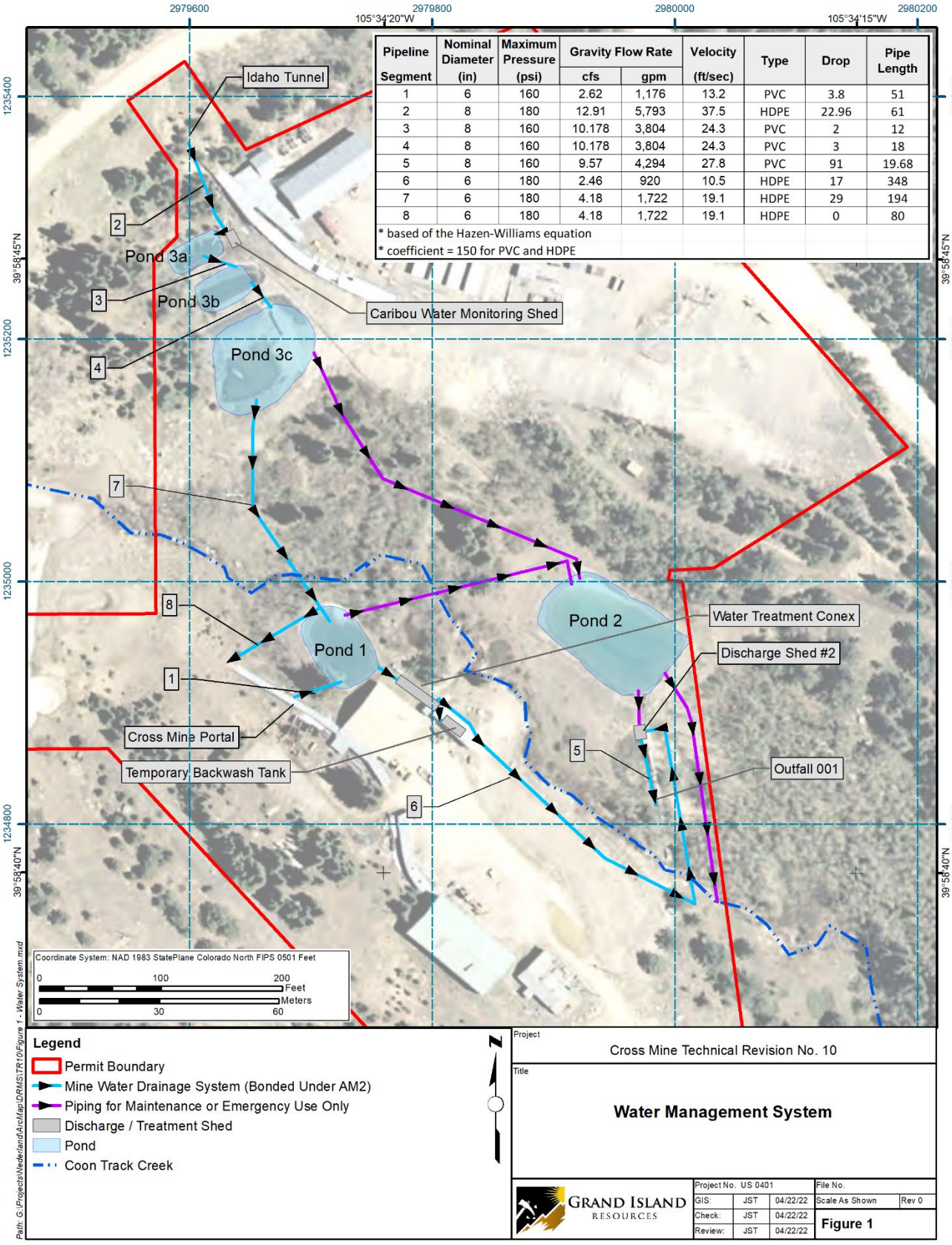
    a. The pipelines shown are said to be "bonded under AM2". This is not entirely accurate. Please review the enclosed Exhibit E – Mining Plan Map approved in AM-2. Note there are some differences between the pipelines approved in AM-2 and the ones shown on this figure. While current plans may not involve the regular use of certain pipeline segments (e.g., pipeline from Pond 3c to Pond 2, pipeline from Pond 1 to Pond 2), if these pipelines will remain in place and potentially be used as overflow pipes, etc., then they should be included on this figure, and differentiated accordingly (e.g., as emergency overflow pipelines).

GIR Comment 1 Response: See new map (figure 1)

    b. Please update this figure and the inset table to reflect the pipeline extension approved by DRMS on April 14, 2022 to divert flows from the existing pipeline conveying water from Pond 3c to Pond 1 into the Cross Mine. If this pipeline is not yet installed, this can be reflected on the figure as "proposed" or "to be installed".

2) Please provide the requested narrative for the pipeline extension approved on April 14, 2022 describing the purpose of the pipeline, its operation, and its length.

GIR Comment 2 Response: See new map (figure 1)



Pipeline Segment	Nominal Diameter (in)	Maximum Pressure (psi)	Gravity Flow Rate cfs	Gravity Flow Rate gpm	Velocity (ft/sec)	Type	Drop	Pipe Length
1	6	160	2.62	1,176	13.2	PVC	3.8	51
2	8	180	12.91	5,793	37.5	HDPE	22.96	61
3	8	160	10.178	3,804	24.3	PVC	2	12
4	8	160	10.178	3,804	24.3	PVC	3	18
5	8	160	9.57	4,294	27.8	PVC	91	19.68
6	6	180	2.46	920	10.5	HDPE	17	348
7	6	180	4.18	1,722	19.1	HDPE	29	194
8	6	180	4.18	1,722	19.1	HDPE	0	80

* based of the Hazen-Williams equation
* coefficient = 150 for PVC and HDPE

Legend

- Permit Boundary
- Mine Water Drainage System (Bonded Under AM2)
- Piping for Maintenance or Emergency Use Only
- Discharge / Treatment Shed
- Pond
- Coon Track Creek

N

Project: Cross Mine Technical Revision No. 10

Title: **Water Management System**

GRAND ISLAND RESOURCES

Project No. US 0401			File No.	
GIS:	JST	04/22/22	Scale As Shown	Rev 0
Check:	JST	04/22/22	**Figure 1**	
Review:	JST	04/22/22		

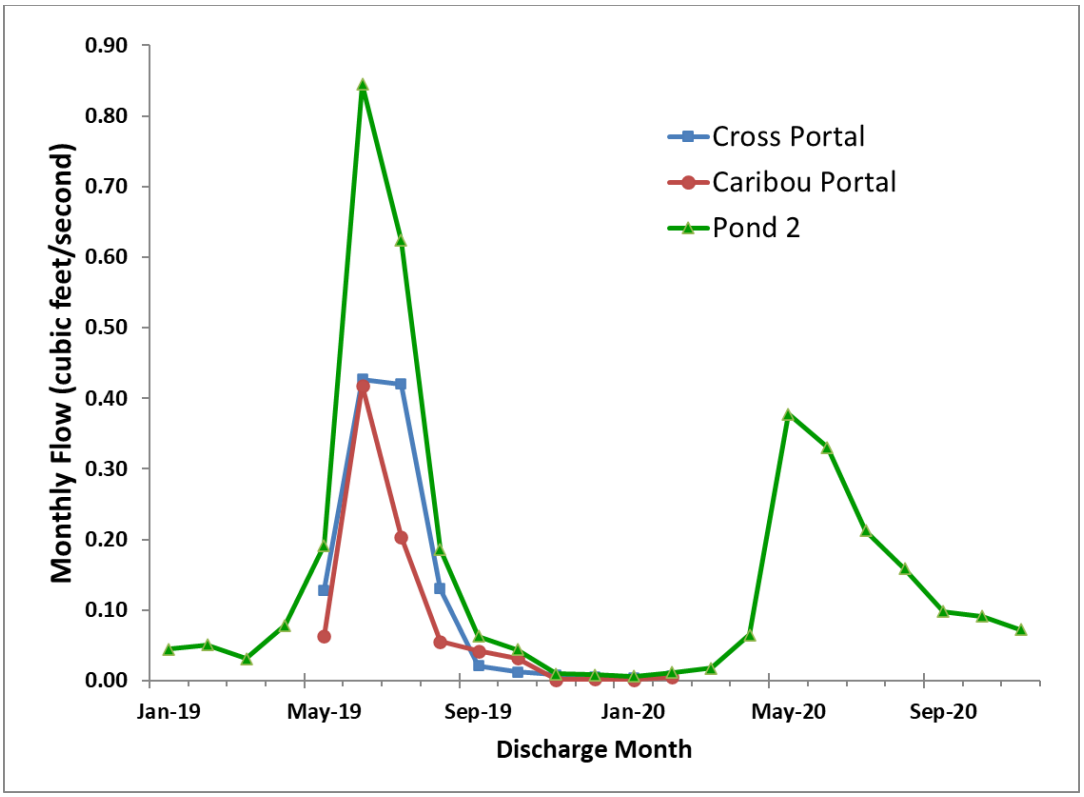
Path: G:\Projects\Nederland\Arcl\Map\DRMS\TR10\Figure 1 - Water System.mxd

3) In its response to Item #8(b), the operator states “spent filter bags are currently stored in totes in the water treatment conex” and “solids contained within the bags will be tested to determine their chemical composition prior to disposal”. Please clarify how many spent bags will be stored on site prior to needing to test the material and begin disposal. Additionally, please commit to providing DRMS the analytical results of the bag samples and a description of how the bags will be disposed of once this information is available.

GIR Comment 3 Response: There are no set number of bags before we do tests, we're currently looking for a good lab that would do the T clip test as soon as we have the material sampled and sent off and receive the results we will be more than happy to send you a memo with the data at that time based on regulations we will dispose of the bags in the appropriate manner. Currently there are only (3) 20-gallon totes of spent bags. At the time of disposal, we will have a full count and include that in the memo.

4) In its response to Item #8(f), the operator described the capacity of the new water treatment system but did not provide a discussion of mine discharge rates throughout the year, as requested. Please provide this information.

GIR Comment 4 Response: The following graph provides influent and effluent flows to and from Water Treatment in 2019 and 2020



5) In its response to Item #8(g), the operator states "the pilot system described above is fully operational and since the installation of continuous 24/7 treatment from December 15, 2021 to the current date". This information seems to contradict what DRMS was told during its January 11, 2022 site inspection, during which, the operator indicated that continuous 24/7 treatment had just been initiated the day before the inspection, which would have been January 10, 2022. Please clarify and/or correct this discrepancy.

GIR Comment 5 Response: Although the water system was on site and was operating it was not fully commissioned with all the PLC and automatic controls until prior to your inspection this was an error from the previous author and let this statement correct but from January 11th to current date the system has been running completely and fully autonomously with only scheduled maintenance and inspections prior to that the system was run by operator control.

6) DRMS has the following comments pertaining to the bond estimate provided for operating and maintaining the water treatment system on an annual basis:

   a. The line item for Filtration Media includes a total cost of $6,240.00 for changing out the 8 bag filters once per week (at $15.00 each). However, in its response to Item #8(a), the operator states "currently filter bags are being replaced twice per week". Therefore, please revise the item to reflect changing out the bag filters twice per week.

GIR Comment 6 a. Response: We will update the master document with these numbers and

this reflects the needed filter bag changeouts when there is activity underground Of a fair amount of work programs.

b. The line item for Polishing Media includes a total cost of $37,500.00 for changing out both polishing vessels every two years (at $25,000.00 each). First, the operator's total cost of
$37,500.00 is confusing based on the unit cost provided. Additionally, in its response to Item #8(c), the operator indicates the second polishing vessel may be used when the first vessel is not functioning properly or is in maintenance, and that both vessels will be used during higher flow events. This means both polishing vessels may be used during the year in order to meet discharge standards. Therefore, please revise this item to reflect the use of both polishing vessels annually (worst-case scenario).

Table 6a - Cross Caribou Water Treatment – Operation, Maintenance and Monitoring Annual Cost Estimate

Cross Caribou Water Treatment
Operations, Maintenance and Monitoring
ANNUAL BASIS - averaged over the last three months of operation

ID	ITEM	QTY.	UNIT	UNIT COST	TOTAL	Notes
C-01	Filtration Media	416	ea.	$ 15.00	$ 6,240.00	Rep. once per week per filter (8 filters)
C-02	Polishing Media	2	ea.	$25,000.00	$ 50,000.00	Rep.every two years (2 vessels)
E-01	Filtration System Equipment	3	ea.	$ 300.00	$ 900.00	Operational Life 20 years
E-02	Polishing System Equipment	3	ea.	$ 1,500.00	$ 4,500.00	Operational Life 20 years
E-03	Control Valves	20	ea.	$ 30.00	$ 600.00	Operational Life 10 years
E-04	In-Plant Piping	50	ft.	$ 1.50	$ 75.00	Operational Life 10 years
E-05	External Piping	600	ft.	$ 1.25	$ 750.00	Operational Life 20 years
E-06	Instrumentation	12	ea.	$ 50.00	$ 600.00	Operational Life 15 years
O-01	Water Quality Sampling and Testing	24	ea.	$ 300.00	$ 7,200.00	Two Effluent Sample per month
O-02	Inspection and Sample Collection	208	hr.	$ 45.00	$ 9,360.00	One visit per week 8 hour day contractor
O-03	Data Processing and Reporting	24	hr.	$ 75.00	$ 1,800.00	4 hours per month contractor
				Total Annual Avg.	**$ 82,025.00**	
				Total Monthly Avg.	**$ 6,835.42**	
C = Consumables, E = Equipment, O = Operations						

t

c. Please clarify whether disposal costs for the filtration and polishing media are included in the total costs provided for each of these line items. If they are not, please incorporate them into these item costs or add a separate line item for disposal costs.

GIR Comment 6 c. Response: The disposal cost is included the media is taken back to the manufacturer whether they reuse it or not as unclear to us that is their responsibility.

d. Please ensure this estimate includes costs for removing any additional pipeline (e.g., extended segment 6, segment 8) not already covered under the AM-2 bond estimate. These costs must cover all existing and proposed pipelines,

including those segments used by the primary system and those used for secondary or emergency use.

GIR Comment 6 d. Response: The segment of the pipe is 80 feet long we estimate the disposal their 80 foot pipe segment would be $200

7) DRMS does not understand the operator's response to Item #20 pertaining to the quarterly reporting deadlines. First quarter sampling occurs during the months of January, February, and March, with the report due by May 1st. Second quarter sampling occurs during the months of April, May, and June, with the report due by August 1st …and so on. If the operator were to begin sampling during the second quarter of 2022 (samples collected in May or June), the report would need to be submitted by August 1st. This report would be considered the first of five reports to help quantify baseline conditions. Please commit to collecting samples no less than 30 days apart and as evenly spaced out through the year as conditions allow.

GIR Comment 7 Response: GIR will collect monthly samples starting in May 2022. Quarterly Reports will be issued to DRMS on August 1, 2022, November 1, 2022, February 1, 2023, May 1, 2023 and August 1, 2023.

8) DRMS has the following comments pertaining to Attachment A – Permit Discharge Limitations, Outfall 001A:

   a. Please add a footnote to this table defining the terms "TR" and "PD".

GIR Comment 8 a.Response: Total recovered metals (TR) includes potentially dissolved and recovered metals as with some metals that are acid resistant this may be different then the potentially dissolved test (PD).

potentially dissolved (PD) provides an acid solution into our water sample any suspended solids would then be brought into solution showing the potentially dissolved numbers.

9) DRMS has the following comments pertaining to Attachment D – Surface Water Monitoring Plan:

   a. Under the Analytical Parameters section, please update the table provided to include the limitations for each analyte which samples will be compared to. Additionally, please include the CDPHE discharge permit number in this section.

GIR Comment 9 a.Response CDPHE Discharge Permit Number and Limits are provided on the following Table

CRI-New Permit-Feb28-2014 Final

Effluent Parameter		Month	Effluent Limitations Maximum Concentrations			Monitoring Requirements		ICIS Code
			30-Day Average	7-Day Average	Daily Maximum	Frequency	Sample Type	
Effluent Flow (MGD)	January	1	0.103		Report	Continuous	Recorder	50050
	February	2	0.103					
	March	3	0.129					
	April	4	0.148					
	May	5	0.374					
	June	6	0.458					
	July	7	0.265					
	August	8	0.148					
	September	9	0.129					
	October	10	0.103					
	November	11	0.103					
	December	12	0.103					
Temp (°C)	Daily Max April-Oct, beginning September 1, 2014				Report	Continuous	Recorder	10
	Daily Max Novv-March, beginning September 1, 2014							
	Temp MWAT April-Oct, beginning September 1, 2014			Report				
	Temp MWAT Nov-March, beginning September 1, 2014							
pH (su)					6.5-9	2 Days/Month	Grab	400
TSS, effluent (mg/l)			30.000	45.000		Monthly	Grab	530
Oil and Grease (visual)					Report	2 Days/Month	Visual	84066
Oil and Grease (mg/l)					10.00	Contingent	Grab	3582
As	TR (µg/l)		Report			Monthly	Grab	978
	PD (µg/l)				Report			1309
Cd	TR (µg/l)		50.000		300.00	Monthly	Grab	1113
	PD (µg/l), until December 31, 2016							
	October through March		1.700		Report	2 Days/Month	Grab	
	April through June		1.600					
	July through September		2.100					
	PD (µg/l), beginning January 1, 2017							
	January	1	0.630		2.30	2 Days/Month	Grab	1313
	February	2	0.630		2.50			
	March	3	0.600		2.40			
	April	4	0.600		2.50			
	May	5	0.620		2.60			
	June	6	0.890		3.70			
	July	7	0.750		3.10			
	August	8	0.820		3.20			
	September	9	0.870		3.00			
	October	10	0.890		3.60			
	November	11	0.690		2.80			
	December	12	0.630		2.20			
Cr+3	TR (µg/l)				Report	Monthly	Grab	4262
	PD (µg/l)		Report					1314
Cr+6	Dis (µg/l)		Report		Report	Monthly	Grab	1220
Cu	TR (µg/l)		150.000		300.00	2 Days/Month	Grab	1119
	PD (µg/l)							
	January	1	13.000		18.00	2 Days/Month	Grab	1306
	February	2	13.000		20.00			
	March	3	13.000		19.00			
	April	4	13.000		20.00			
	May	5	13.000		20.00			
	June	6	13.000		20.00			
	July	7	16.000		25.00			
	August	8	17.000		25.00			
	September	9	19.000		28.00			
	October	10	19.000		28.00			
	November	11	14.000		22.00			
	December	12	13.000		18.00			
Fe	R (µg/l)		Report		NA	Monthly	Grab	980
Pb	TR (µg/l)		300.000		600.00	2 Days/Month	Grab	1114
	PD (µg/l)							
	January	1	3.800		85.00	2 Days/Month	Grab	1318
	February	2	3.800		94.00			
	March	3	3.600		90.00			
	April	4	3.600		94.00			
	May	5	3.800		97.00			
	June	6	5.400		140.00			
	July	7	4.600		118.00			
	August	8	5.000		122.00			
	September	9	5.300		115.00			
	October	10	5.400		135.00			
	November	11	4.200		108.00			
	December	12	3.800		85.00			
Mn	PD (µg/l)		Report		Report	Monthly	Grab	1319
Hg	Tot (µg/l)		1.000		2.00	Monthly	Grab	71900
	Tot (µg/l) (low level)		Report		Report	Quarterly		50286
Ni	PD (µg/l)		Report		Report	Monthly	Grab	1322
Se	PD (µg/l)		Report		Report	Monthly	Grab	1323
Ag	PD (µg/l)							
	January	1	0.120		2.90	2 Days/Month	Grab	1304
	February	2	0.120		3.20			
	March	3	0.110		3.00			
	April	4	0.110		3.10			
	May	5	0.120		3.20			
	June	6	0.170		4.70			
	July	7	0.140		3.90			
	August	8	0.160		4.10			
	September	9	0.170		3.80			
	October	10	0.170		4.50			
	November	11	0.130		3.60			
	December	12	0.120		2.80			
Zn	TR (µg/l)		750.000		1,500.00	Monthly	Grab	1094
	PD (ug/l)							
	January	1	186.000		184.00	2 Days/Month	Grab	1303
	February	2	186.000		203.00			
	March	3	176.000		194.00			
	April	4	176.000		202.00			
	May	5	182.000		208.00			
	June	6	262.000		301.00			
	July	7	221.000		253.00			
	August	8	241.000		263.00			
	September	9	257.000		248.00			
	October	10	262.000		291.00			
	November	11	202.000		232.00			
	December	12	186.000		182.00			
Sulfide as H2S	(mg/l)		Report		NA	Monthly	Grab	51202
WET, chronic	Static Renewal 7 Day Chronic *Pimephales promelas*				NOEC or IC25 > IWC	Quarterly	3 Grabs / Test	TKP6C
	Static Renewal 7 Day Chronic *Ceriodaphnia dubia*				NOEC or IC25 > IWC	Quarterly	3 Grabs / Test	TKP3B

b. The Sample Collection Protocols section is incomplete. Please complete this section, including a reference to collecting QA/QC samples.

GIR Comment 9 b.Response. The QA/QC Sample Protocols Section has been updated in the revised Surface Water Monitoring Plan

10) DRMS has the following comments pertaining to Attachment F – Groundwater, Effluent and Surface Water Locations map:

a. Please identify the proposed compliance monitoring well on this figure.

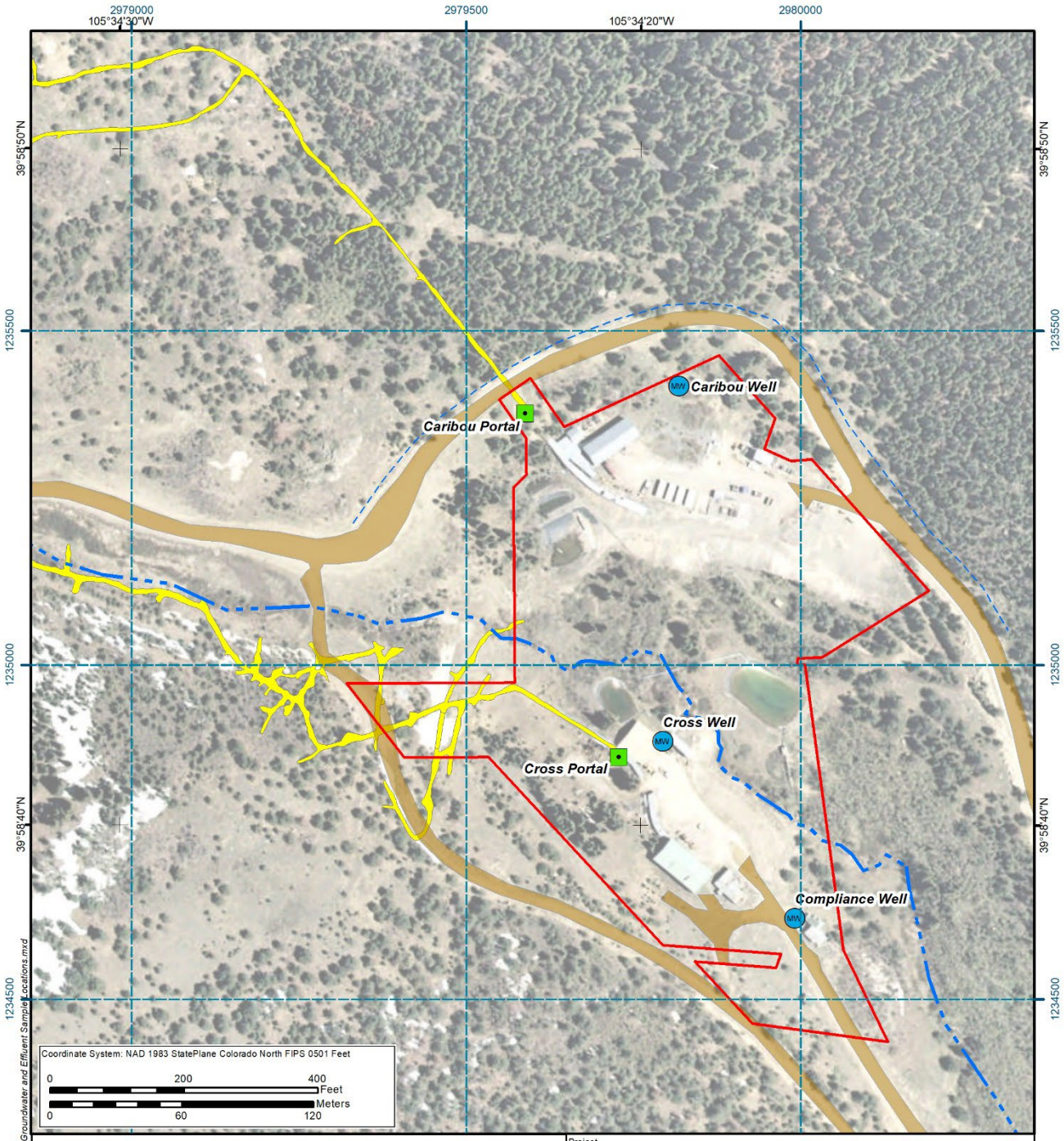
GIR Comment 10 Response – GIR has updatedFigure 1 reflecting that the Cabin Well is the Compliance Monitoring Well

b. Please provide a description of the two proposed "effluent" sampling locations, and an explanation of how these locations were chosen to be representative of the Cross and Caribou mine water prior to treatment. It appears there is substantial distance between the proposed sampling location inside each mine and the mine's discharge to the surface, along which, additional inputs to the effluent may occur.

GIR Comment 10 b.Response. The sampling locations have been reviewed and relocated as follows:

1. The proposed Idaho Tunnel Cofferdam sampling point has been relocated to the outfall from the IdahoTunnel into Pond3a.
2. The Cross sampling point that was located inside the mine has been relocated to the discharge pipe from the Winze pumping system into Pond #1.

The changes are reflected on the following Figure



Permit Boundary (9.6 ac)

Existing Roads

Underground Workings

Mine Effluent (Groundwater) Sampled as Surface Water

MW Groundwater Sampling Location (Caribou, Cross & Cabin wells)

N

Project: Groundwater Monitoring Plan

Title: **Groundwater and Effluent Sample Locations**

GRAND ISLAND RESOURCES

Project No. US 0801			File No.	
GIS:	JST	04/25/22	Scale As Shown	Rev 0
Check:	JST	04/25/22	**Map 6**	
Review:	JST	04/25/22		

Path: G:\Projects\Nederland\ArcMap\GW Plan\Map 6 - Groundwater and Effluent Sample Locations.mxd

c. The proposed downstream surface water sampling location does not appear to be located on property owned by the operator (based on the property ownership map provided in Attachment D). Does the operator have legal access to this area for sampling the creek?

GIR Comment 10 c. Response. Sampling point is adjacent to the road and well within the right away of the road also as the properties in dispute we still have hey active access agreement with the Smith trust.

11) DRMS has the following comments pertaining to Attachment G – Standard Operating Procedure – Groundwater, Surface Water and Effluent Sample Collection and QA/QC:

a. Under the Duplicate Samples section, the operator states that one duplicate sample will be collected for every two primary samples. Please clarify that at least one duplicate sample will be collected for each media sampled (groundwater, effluent, and surface water), for a total of 3 duplicate samples to be collected per sampling event, based on the proposed 3 groundwater sample locations, 2 effluent sample locations, and 2 surface water sample locations.

GIR Comment 11 Response – GIR will collect Duplicate Samples as follows:

one duplicate sample will be collected for each media sampled (groundwater, effluent, and surface water), for a total of 3 duplicate samples to be collected per sampling event; 3 groundwater sample locations, 2 effluent sample locations, and 2 surface water sample locations

12) The operator's response to Item #23(c) did not address DRMS's question regarding how the operation intends to collect the required baseline groundwater data in a manner that ensures groundwater quality at the site is not impacted by site activities in any way during this monitoring period. Additionally, in its response to Item #8(a), the operator mentions plans to return to mining in the coming months. Please note, recommencing with mining activities at the site during the baseline sampling period will invalidate the baseline data, as mining constitutes a disturbance to the site hydrology that will alter any baseline conditions. The plan to recommence with mining operations is also not consistent with the discussion DRMS had with the operator on April 7, 2022.

Please affirm the operator will not commence with active mining operations until such time as baseline sampling has concluded and DRMS has approved numeric protection limits.

GIR Comment 12 Response:

Activities Post-Cease and Desist Order Removal

DRMS and GIR discussed details associated with DRMS comment 12), in their document Cross Gold Mine, Permit No. M-1977-410, Technical Revision No. 10 (TR-10), Adequacy Review No.

2, dated April 22, 2022. The comment pertains to how GIR intends to collect the required baseline groundwater data in a manner that ensures groundwater quality at the site is not impacted by site activities in any way during this monitoring period for the next 5 calendar quarters. DRMS and GIR agreed to address the issue via a written request for approval by GIR and approval by DRMS process whereby, in similar fashion to the current approval process, GIR will issue requests for approval letters to DRMS describing planned underground activities, objectives, methods, expected disturbance and impacts preventions mechanisms prior to commencement of the activities. Upon receiving written approval by DRMS, GIR will implement the actions. In addition GIR agreed to collect monthly groundwater and surface water quality samples as opposed to the previously DRMS requested quarterly

13) In its response to Items #25 and #26, the operator refers to Attachment H, which is inconsistent with the materials provided. The potentiometric maps and conceptual cross sections were provided in Attachment E. Please be sure all references to attachments are accurate.

GIR Comment 3Response – GIR has corrected the references to the Attachments

COLORADO DIVISION OF RECLAMATION, MINING AND SAFETY

1313 Sherman Street, Room 215, Denver, Colorado 80203 ph(303) 866-3567

REQUEST FOR TECHNICAL REVISION (TR) COVER SHEET

File No.: M- 1977-410 Site Name: Cross Gold Mine

County Boulder TR# TR# 10 *(DRMS Use only)*

Permittee: Grand Island Resources, LLC

Operator (If Other than Permittee):

Permittee Representative: Daniel Takami

Please provide a brief description of the proposed revision:

Following the obvious need for a more effective water treatment of mine effluent than the historical lime application and settling pond approach, GIR went through a series of investigations and pilot scale testing programs in 2021 to determine the most reliable manner to achieve discharge compliance under our NPDES permit with CDPHE. The first system did not work as the contractor predicted and later in 2021, a system that does work was assembled and has been in use effectively without any evidence of exceedance of compliance stands. Essentially the system entails a 5 micron filtration for removal of TSS followed by a removal of TDS using a polishing medium called MetSorb.

As defined by the Minerals Rules, a Technical Revision (TR) is: "a change in the permit or application which does not have more than a minor effect upon the approved or proposed Reclamation or Environmental Protection Plan." The Division is charged with determining if the revision as submitted meets this definition. If the Division determines that the proposed revision is beyond the scope of a TR, the Division may require the submittal of a permit amendment to make the required or desired changes to the permit.

The request for a TR is not considered "filed for review" until the appropriate fee is received by the Division (as listed below by permit type). Please submit the appropriate fee with your request to expedite the review process. After the TR is submitted with the appropriate fee, the Division will determine if it is approvable within 30 days. If the Division requires additional information to approve a TR, you will be notified of specific deficiencies that will need to be addressed. If at the end of the 30 day review period there are still outstanding deficiencies, the Division must deny the TR unless the permittee requests additional time, in writing, to provide the required information.

There is no pre-defined format for the submittal of a TR; however, it is up to the permittee to provide sufficient information to the Division to approve the TR request, including updated mining and reclamation plan maps that accurately depict the changes proposed in the requested TR.

Required Fees for Technical Revision by Permit Type - Please mark the correct fee and submit it with your request for a Technical Revision.

Permit Type	**Required TR Fee**	**Submitted** (mark only one)
110c, 111, 112 construction materials, and 112 quarries	$216	☑
112 hard rock (not DMO)	$175	☐
110d, 112d(1, 2 or 3)	$1006	☐

Contents

Section 1: Introduction and Site Description

Technical Revision 10 (TR10) is presented by Grand Island Resources, LLC (GIR) in response to the following:

1. Service of Notice of Violation/Cease and Desist Order (Number IO-211130-1) from Colorado Department of Public Health and Environment (CDPHE) dated November 30, 2021
2. Cease and Desist Orde by DRMS and the Mined Land Reclamation Board Permit No. M-1977-410, (Table 1) and the Corrective Action item (1.) dated February 18, 2022, in relation to Violation No. MV-2021-017.
3. Responses to comments to DRMS Preliminary Adequacy Letter dated March 25, 2022 and Reclamation Board, November 2021 and February 2022, respectively.
4. to Technical Revision No. 10 initial submittal by GIR,
5. Cross Gold Mine, Permit No. M-1977-410, Technical Revision No. 10 (TR-10), Adequacy Review No. 2 by DRMS dated April 22, 2022
6. Topics discussed and conclusions reached during a follow up teleconference calls between DRMS and GIR held on April 12 and April 22, 2022

This document describes the Water Treatment Pilot Test Equipment installed on site, its operations effectiveness and measures implemented by GIR to address water discharge limits compliance. The document also describes actions approved by DRMS and Implemented by GIR of underground features and infrastructure designed to alleviate peak discharge loading during mine operations.

A revised Ground Water Monitoring Plan (GWMP) and a Surface Water Monitoring Plan (SMP) are also presented as required by the NOV/C&D Order and the Preliminary Adequacy letter by DRMS.

The Cross-Caribou mine site is located approximately 4 miles northwest of Nederland, Colorado adjacent to Roosevelt National Forest, at an elevation of ~9,700 ft above mean sea level (MSL). The general location of the property is in Section 9, Township 1 South, Range 73 West of the 6th Principal Meridian, County of Boulder, State of Colorado (Map 1). The current property is an existing hard rock mining operation owned by GIR and at present, no active mining is being conducted. The mine permit M-1977-410 was last revised through Amendment No. 2 (AM-2) and approved in February 2022. The AM2 increased the permit area to the current 9.99 acres and provided an additional financial warranty for reclamation.

The site is bisected by Coon Track Creek, a tributary of Beaver creek which joins with Middle Boulder Creek near its discharge at the Barker Meadows Reservoir. Water effluent from the mines is currently managed via the Treatment System described herein. Treated water discharges into Coon Track Creek (**Figure 1** and **Map 2)** under CDPHE Water Quality Control Division (WQCD) National Pollutant Discharge Elimination System NPDES permit CO-0032751.

Section 2: Water System Timeline and Historical Background

From 1975-1995, The Hendricks Mining Company (HMC), installed and tested a treatment system to meet the requirements of discharge permit CO-0032751. HMC constructed three (3) passive-solids settling ponds to manage suspended solids emanating from the Idaho Tunnel/Caribou Mine (**Appendix A,** locations in **Figure 1**) one Pond to receive pumped water from the Cross Mine (Pond #1) and one pond (Pond #2) to manage pre-environmental release of treated water from the Cross/Caribou Mines into Coon Track Creek. HMC DRMS approved active treatment mechanism consisted exclusively of lime addition (to buffer any potentially dissolved soluble metal ions at a relatively lower pH) These methods were initially successful and met the water quality standards imposed on the operation at that time; however, subsequent and periodical regulatory mandates lowering of metal concentration compliance standards resulted in inconsistent success of the water treatment system. As a result, HMC tested (1995) the suitability of a gravity-fed absorptive medium treatment option consisting of zeolite, with mixed results, particularly during peak discharge (typically during the spring and summer months). HMC became Calais Resources Colorado (CRC), in 1998 CRC continued treating Cross/Caribou effluent with the approved treatment system consisting exclusively of lime addition and sedimentation. Grand Island Resources LLC (GIR) acquired HMC in 1998water treatment mechanisms remained unchanged and GIR continued with lime addition.

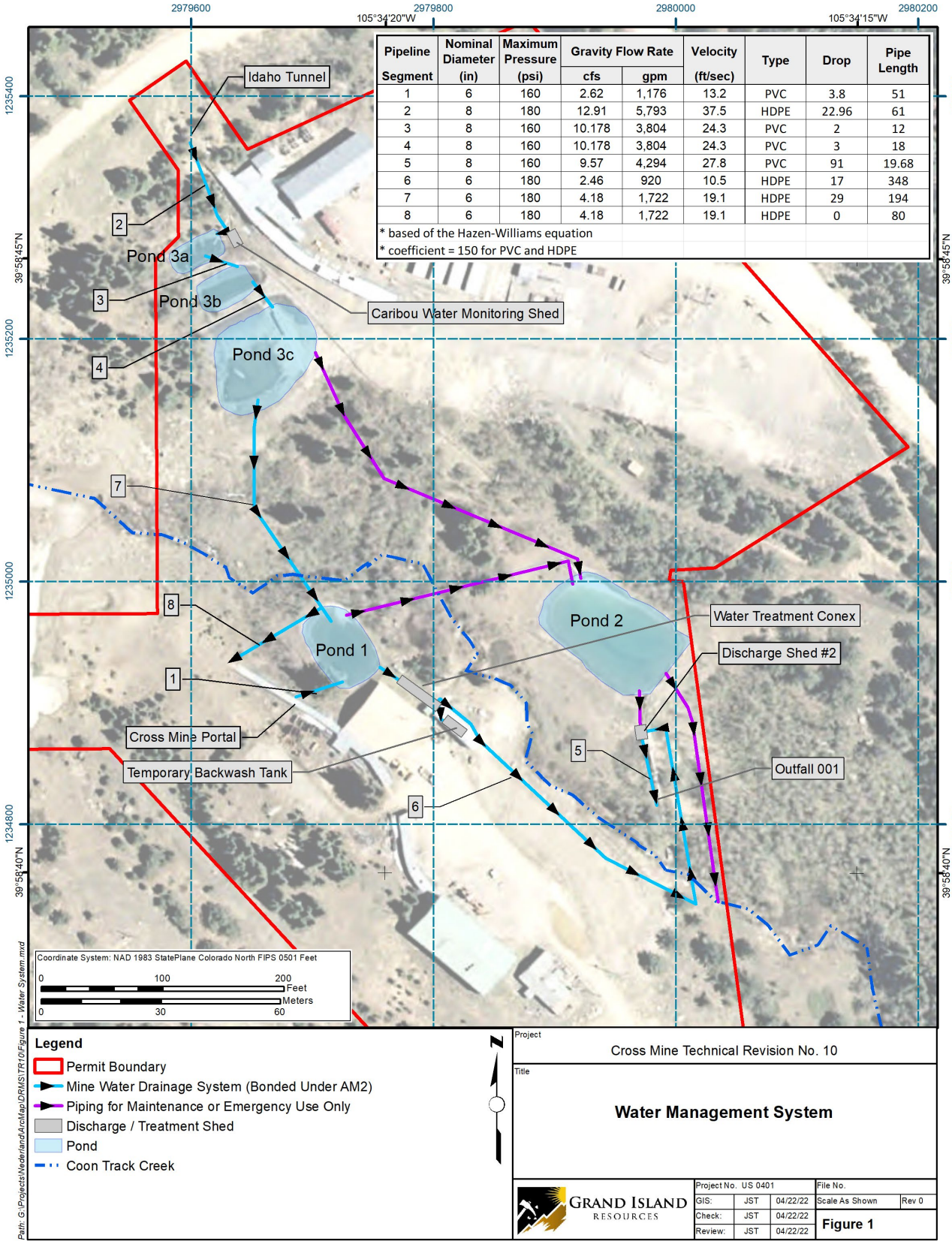
GIR has since undertaken several mining-related activities (including, but not limited to underground construction, infrastructure retrofit, dewatering, and geological exploratory drilling) required to achieve GIR objectives advancing a sustainable and actively producing mine. The development and retrofit activities, performed during two (2) 3-month seasons from 2020-2021 stressed the lime addition treatment system resulting in inconsistently meeting permitted water quality standards. GIR immediately engaged internal and external assessments of treatment alternatives in an effort to identify water treatment strategies without the use of chemicals to meet permitted water quality standards going forward during mine development and ore production.

The following general timeline of GIR's recent activities pertaining to water treatment system upgrades and compliance efforts illustrate GIR's commitments to regulatory compliance:

- *August 2020* – reconstructed and re-lined settling ponds 3A, 3B, and 3C with geomembrane (locations in **Figure 1**) to prevent infiltration and optimize suspended solids settling times (Technical Revision 8)
- *September 2020-present* – conducted underground construction, developing additional sediment management capacity and efficiency; water flow paths were also modified, to reduce sediment concentrations in mine water effluent discharging into the settling ponds system
- *April-June 2021* – sought alternative water treatment packages/systems, conducted in May 2021 a filtration study (**Table 2)** to aid in selection of water treatment packages/systems and applicable contractors
- *July 2021* – GIR contracted OPEL Energy to obtain an ™AmberKleen 1200 mine waste system, and an ™AmberKleen 1250 polishing system. DRMS approved the installation of the OPEL pilot plant,

which operated for approximately 3 months Discharged exceedances from the system in the months of July, August and September 2021 proved the system ineffective to treat the mines raw water, despite a guaranteed performance warranty by the OPEL; therefore, GIR removed the system in October 2021.

- *September 2021* – GIR aggressively pursued alternative treatment vendors, including Environmental Site Solutions, Ensero and Graver;
- *October 2021* – Graver/MetSorb was selected by GIR to perform bench scale testing which proved successful, and therefore GIR engaged a filtration and metal adsorption pilot design
- *November 2021* – 11/15 set as startup date for Ensero particulate filtration and Graver/MetSorb metal polishing pilot systems; pre-dating the Service of Notice of Violation/Cease and Desist Order, Number: IO-211130-1 received from CDPHE issued on November 30, 2021
- *December 2021* – commissioning and start-up of hybrid treatment system encompassing the approved lime addition and the filtration and adsorption system. The hybrid approach was proposed by GIR to ensure compliance during commissioning and transition between the lime addition and the filtration/adsorption treatment. The approach was discussed with and was approved by DRMS
- *January 2022* – Pursuant with Service of Notice of Violation/Cease and Desist Order (Number IO-211130-1) from Colorado Department of Public Health and Environment (CDPHE) dated November 30, 2021, GIR retained Black Fox Mining (Patrick Delaney –Level-One Certified Water Treatment) as qualified operator for water system evaluation and automation implementation of treatment system automation for continual operation.
- *February 2022* – system 100% in compliance according to laboratory tests results of water effluent at outfall permit M1977-410; see **Table 3** for 2022 Quarter 1 compliance samples



Pipeline Segment	Nominal Diameter (in)	Maximum Pressure (psi)	Gravity Flow Rate cfs	Gravity Flow Rate gpm	Velocity (ft/sec)	Type	Drop	Pipe Length
1	6	160	2.62	1,176	13.2	PVC	3.8	51
2	8	180	12.91	5,793	37.5	HDPE	22.96	61
3	8	160	10.178	3,804	24.3	PVC	2	12
4	8	160	10.178	3,804	24.3	PVC	3	18
5	8	160	9.57	4,294	27.8	PVC	91	19.68
6	6	180	2.46	920	10.5	HDPE	17	348
7	6	180	4.18	1,722	19.1	HDPE	29	194
8	6	180	4.18	1,722	19.1	HDPE	0	80

* based of the Hazen-Williams equation
* coefficient = 150 for PVC and HDPE

The General site map (Figure 1) presents locations of the water management features, the inset table provide pipe identification, size and additional relevant information. The Figure is also included in Appendix B.

The following paragraphs provide additional management details:

1. *Cross Mine underground water management strategies include inside the mine water routing to the Juliet raise which can be described as an existing feature (excavation) connecting the lower levels of the Cross mine with the tunnel level where suspended solids concentrations are reduced via gravity settling. Cross Mine underground waters are conveyed to the surface Pond #1 via pumping from the winze. The historical addition of lime to waters conveyed to the Juliet raise was discontinued in 2021.*

2. Lime was added as trial basis on a couple of occasions to the Caribou Water at Pond 3b settling pond (location of Pond 3b in revised Figure 1 above), expected results were not achieved and therefore the practice was stopped.

3. *Pond #1 overflow pipe reports to Pond 2, over the course of 2022, no overflow from Pond #1 to Pond #2 has occurred.*

4. Pond #2 discharge pipe into Coon Track Creek remains operational because Pond #2 is still in service. Currently and as a result of the DRMS approved pipe connection between Pond 3C and Pond #1, all inflow to Pond #2 comes from the treatment system and therefore, Pond #2 overflow discharge would only occur under climatic upsetting conditions.

5. All effluent *discharged into Coon Track Creek consists of treated water.*

6. Commissioning of the recently *DRMS approved pipeline extension from Pond #1 into the Juliet raise in the Cross Mine Pond #1 overflow into Pond #2 and Pond #1 overtopping probability are eliminated (*Section 7)

Section 3: CDPHE Permitted Discharge Limits & Filtration Studies from 2020-2021

GIR Discharge Permit (CO-0032751) specifies discharge limits and reporting frequency at Outfall 001 into Coon Track Creek are provided on Table 1

Table 1 Outfall 001- Permitted Effluent

ICIS Code	Effluent Parameter	Effluent Limitations Maximum Concentrations			Monitoring Requirements	
		30-Day Average	7-Day Average	Daily Maximum	Frequency	Sample Type
50050	Effluent Flow (MGD)					
	January	0.103		Report	Continuous	Recorder
	February	0.103		Report	Continuous	Recorder
	March	0.129		Report	Continuous	Recorder
	April	0.148		Report	Continuous	Recorder
	May	0.374		Report	Continuous	Recorder
	June	0.458		Report	Continuous	Recorder
	July	0.265		Report	Continuous	Recorder
	August	0.148		Report	Continuous	Recorder
	September	0.129		Report	Continuous	Recorder
	October	0.103		Report	Continuous	Recorder
	November	0.103		Report	Continuous	Recorder
	December	0.103		Report	Continuous	Recorder
00010	Temp Daily Max (°C) April-Oct, beginning September 1, 2014			Report	Continuous	Recorder
00010	Temp Daily Max (°C) Nov-March, beginning September 1, 2014			Report	Continuous	Recorder
00010	Temp MWAT (°C) April-Oct, beginning September 1, 2014		Report		Continuous	Recorder
00010	Temp MWAT (°C) Nov-March, beginning September 1, 2014		Report		Continuous	Recorder
00400	pH (su)			6.5-9	2 Days/Month	Grab
00530	TSS, effluent (mg/l)	30	45		Monthly	Grab
84066	Oil and Grease (visual)			Report	2 Days/Month	Visual
03582	Oil and Grease (mg/l)			10	Contingent	Grab
00978	As, TR (µg/l)	Report			Monthly	Grab
01309	As, PD (µg/l)			Report	Monthly	Grab
01113	Cd, TR (µg/l)	50		300	Monthly	Grab

01313	Cd, PD (µg/l), until December 31, 2016					
	October through March	1.7		Report	2 Days/Month	Grab
	April through June	1.6		Report	2 Days/Month	Grab
	July through September	2.1		Report	2 Days/Month	Grab
01313	Cd, PD (µg/l), beginning January 1, 2017					
	January	0.63		2.3	2 Days/Month	Grab
	February	0.63		2.5	2 Days/Month	Grab
	March	0.60		2.4	2 Days/Month	Grab
	April	0.60		2.5	2 Days/Month	Grab
	May	0.62		2.6	2 Days/Month	Grab
	June	0.89		3.7	2 Days/Month	Grab
	July	0.75		3.1	2 Days/Month	Grab
	August	0.82		3.2	2 Days/Month	Grab
	September	0.87		3.0	2 Days/Month	Grab
	October	0.89		3.6	2 Days/Month	Grab
	November	0.69		2.8	2 Days/Month	Grab
	December	0.63		2.2	2 Days/Month	Grab
04262	Cr+3, TR (µg/l)			Report	Monthly	Grab
01314	Cr+3, PD (µg/l)	Report			Monthly	Grab
01220	Cr+6, Dis (µg/l)	Report		Report	Monthly	Grab
01119	Cu, TR (µg/l)	150		300	2 Days/Month	Grab
01306	Cu, PD (µg/l)					
	January	13		18	2 Days/Month	Grab
	February	13		20	2 Days/Month	Grab
	March	13		19	2 Days/Month	Grab
	April	13		20	2 Days/Month	Grab
	May	13		20	2 Days/Month	Grab
	June	13		20	2 Days/Month	Grab
	July	16		25	2 Days/Month	Grab
	August	17		25	2 Days/Month	Grab
	September	19		28	2 Days/Month	Grab
	October	19		28	2 Days/Month	Grab
	November	14		22	2 Days/Month	Grab
	December	13		18	2 Days/Month	Grab
00980	Fe, TR (µg/l)	Report		NA	Monthly	Grab
01114	Pb, TR (µg/l)	300		600	2 Days/Month	Grab
01318	Pb, PD (µg/l)					
	January	3.8		85	2 Days/Month	Grab
	February	3.8		94	2 Days/Month	Grab
	March	3.6		90	2 Days/Month	Grab
	April	3.6		94	2 Days/Month	Grab
	May	3.8		97	2 Days/Month	Grab
	June	5.4		140	2 Days/Month	Grab
	July	4.6		118	2 Days/Month	Grab
	August	5		122	2 Days/Month	Grab
	September	5.3		115	2 Days/Month	Grab

	October	5.4		135	2 Days/Month	Grab
	November	4.2		108	2 Days/Month	Grab
	December	3.8		85	2 Days/Month	Grab
01319	Mn, PD (µg/l)	Report		Report	Monthly	Grab
71900	Hg, Tot (µg/l)	1		2	Monthly	Grab
50286	Hg, Tot (µg/l) (low level)	Report		Report	Quarterly	Grab
01322	Ni, PD (µg/l)	Report		Report	Monthly	Grab
01323	Se, PD (µg/l)	Report		Report	Monthly	Grab
01304	Ag, PD (µg/l)					
	January	0.12		2.9	2 Days/Month	Grab
	February	0.12		3.2	2 Days/Month	Grab
	March	0.11		3	2 Days/Month	Grab
	April	0.11		3.1	2 Days/Month	Grab
	May	0.12		3.2	2 Days/Month	Grab
	June	0.17		4.7	2 Days/Month	Grab
	July	0.14		3.9	2 Days/Month	Grab
	August	0.16		4.1	2 Days/Month	Grab
	September	0.17		3.8	2 Days/Month	Grab
	October	0.17		4.5	2 Days/Month	Grab
	November	0.13		3.6	2 Days/Month	Grab
	December	0.12		2.8	2 Days/Month	Grab
01094	Zn, TR (µg/l)	750		1500	Monthly	Grab
01303	Zn, PD (ug/l)					
	January	186		184	2 Days/Month	Grab
	February	186		203	2 Days/Month	Grab
	March	176		194	2 Days/Month	Grab
	April	176		202	2 Days/Month	Grab
	May	182		208	2 Days/Month	Grab
	June	262		301	2 Days/Month	Grab
	July	221		253	2 Days/Month	Grab
	August	241		263	2 Days/Month	Grab
	September	257		248	2 Days/Month	Grab
	October	262		291	2 Days/Month	Grab
	November	202		232	2 Days/Month	Grab
	December	186		182	2 Days/Month	Grab
51202	Sulfide as H2S (mg/l)	Report		NA	Monthly	Grab
	WET, chronic					
TKP6C	Static Renewal 7 Day Chronic *Pimephales promelas*			NOEC or IC25 ≥ IWC	Quarterly	3 Grabs / Test
TKP3B	Static Renewal 7 Day Chronic *Ceriodaphnia dubia*			NOEC or IC25 ≥ IWC	Quarterly	3 Grabs / Test

Filtration study (May 2021)

The Cross and Caribou Mines effluent waters were sampled, and laboratory tested to identify optimal micro filtration (0.1 µm, 0.45 µm, and 5 µm) to determine if non-compliance of potentially dissolved metals was driven by particulate/sediment solids present in the waters.

The study concluded that removal of particulate materials from the Caribou Mine effluent (Idaho Tunnel), is effective in achieving permitted water discharge standards without additional treatment. The Study indicates that Cross Mine dewatering effluent does not meet effluent standards for dissolved Zinc and Cadmium; therefore, additional treatment is required.

The Results of the Filtration Study (2021) are provided on Table 2 Table 2 – Filtration Study Results (2021)

Filtration Study	Caribou Tunnel Source Water PASS - FAIL Filtration size in microns				Cross Tunnel Source Water PASS - FAIL Filtration size in microns						
COMPLIANCE COMPOUND	Caribou UF	Caribou 5.0	Caribou 0.45	Caribou 0.10	Cross UF	Cross 5.0	Cross 0.45	Cross 0.10	30-Day Average	7-Day Average	Daily Maximum
Total Alkalinity	122.5	118.5	122.2	119.1	77.6	78.5	75.6	76.5			
Bicarbonate	122.5	118.5	122.2	119.1	77.6	78.5	75.6	76.5			
Carbonate											
Chloride	0.5	0.5	0.5	0.5	0.6	0.6	0.6	0.6			
Fluoride	0.1			0.2							
Silica (as Si)	5.5	5.4	5.5	5.5	6.0	6.1	5.9	6.2			
Nitrate Nitrogen	0.5	0.3	0.3	0.3	0.2	0.2	0.2	0.2			
pH	8.0	8.1	8.1	8.1	7.8	7.8	7.8	7.8	6.5-9	6.5-9	6.5-9
Sulfate	12.0	11.9	12.0	11.9	11.1	11.2	11.1	11.2			
Total Suspended Solids	108.0	ND	ND	ND	10.0	ND	ND	ND	30	45	
Turbidity	43.00	0.03	0.04	0.02	5.98	0.08	0.10	0.17			
Total Hardness	132.5	117.2	117.6	118.5	77.3	78.1	77.5	77.2			
Aluminum (ug/L here down)	2,782	2	4	3	148	8	6	9			
Antimony	2	ND	ND	ND	ND	ND	ND	ND			
Arsenic	4	ND	1	1	ND	ND	ND	ND			
Barium	111	53	53	51	58	55	55	55			
Beryllium	0	ND	ND	ND	ND	ND	ND	ND			
Boron	30	30	20	90	ND	ND	ND	ND			
Cadmium	1.30	0.10	ND	ND	2.90	2.80	2.70	2.70	0.60 to 0.89		2.2 to 3.7
Calcium	28,800	25,800	26,000	26,100	19,100	19,500	19,200	19,000			
Chromium	20	ND	ND	ND	ND	ND	ND	ND			
Cobalt	5	ND	ND	ND	1	0	0	0			
Copper	26	ND	ND	ND	8	4	4	4	13 to 19		18 to 28
Iron	5,894	ND	ND	ND	349	ND	ND	8			
Lead	156	0	0	0	20	2	2	2	3.6 to 5.4		85 to 135
Magnesium	14,720	12,850	12,790	12,960	7,200	7,140	7,180	7,220			
Manganese	909	25	25	25	62	45	44	44			
Mercury	NA				NA				1		2
Molybdenum	6	6	6	6	7	6	6	6			
Nickel	11	ND	ND	ND	1	1	1	1			
Potassium	2,800	1,400	1,400	1,400	1,300	1,200	1,200	1,200			
Silver	5.30	ND	ND	ND	0.60	ND	ND	ND	0.11 to 0.17		
Sodium	2,400	2,300	2,300	2,300	1,800	1,800	1,800	1,800			
Strontium	417	380	382	370	143	137	135	135			
Uranium	7	6	6	6	1	1	1	1			
Vanadium	11	ND	ND	ND	2	ND	ND	ND			
Zinc	251	18	21	16	343	325	319	316	176 to 262		182 to 301

Section 4: Selection Criteria for Pilot Treatment System

Graver Technologies (MetSorb©) bench-scale testing:

Upon failure of the OPEL pilot system and technical discussions with the manufactures of MetSorb© HMRG proprietary adsorbent media. Metsorb© , GIR contacted and retained Graver Technologies to conduct bench-scale testing of the untreated water effluent from the Cross-Caribou The media was represented as having polymetallic adsorption capabilities and with a proven history of effectively treating water from similar constituents.

Water samples filtered to 5 µm were sent by GIR to Graver's facility in Glasgow, Delaware for scale bench testing. Graver conducted kinetic and equilibrium bench-scale testing of MetSorb© adsorbent addressing the removal of Cadmium, Zinc and other elements of interest present in the Cross Mine water. The results of the testing and data analysis from Graver are provided in **Appendix C**

The results were satisfactory and therefore, GIR proceeded with the installation of the pilot system subject of this Technical Revision.

Graver concluded the following (verbatim):

Graver has investigated the ability of MetSorb® HMRG to remove Cd and Zn from the water at the Nederland mine Cross site. MetSorb® HMRG has a capacity of over 15 mg/g for Zn and over 0.14 mg/g for Cd. The low concentration of Cd makes the HMRG kinetically hindered; a contact time of 10 minutes is not only practical but may be sufficient to remove the Cd. The kinetic data on Zn removal shows that 40% of the Zn can be removed within 10 minutes. In a full-scale vessel, this should be sufficient to remove a significant portion of the Zn from the Cross water. The major recommendation of this report is that a pilot test be conducted. A pilot test with a lead-lag configuration and appropriate sampling would provide a more complete evaluation of the media's ability to remove both Cd and Zn to the necessary requirements for the Cross site.

Based on the results of the May 2021 Filtration Study and the Metsorb© bench scale test results, GIR engaged three companies, namely Ensero and Environmental Solutions Systems and Graber, to package a pilot treatment system, mobilize and installed on site on priority basis. The system has been operational on site since November of 2021. Details of the system are provided on Section 6.

Section 6: Pilot (Current) Treatment System

Pilot system and water flow path:

As presented in Section 5, the pilot test system was commissioned on site on November 2021.

The GIR site groundwater management and pilot treatment System consists of the following:

1. Groundwater effluent from the Caribou/Idaho tunnel reports to the permitted lined pond system known as Ponds 3A, 3B and 3C system, were water flow cascades downgradient from Pond 3A through 3B to 3C where a permitted gravity pipeline conveys all flows to Pond #1
2. The gravity pipeline splits into two sections just upgradient of Pond #1 via a two-way valve operated via float, where normal flows discharge into Pond #1 until pond #1 is full. Excess and continued flow is conveyed via permitted pipeline to the Cross-underground workings known as the Joliet Raise.
3. As a result of 2 above, Caribou groundwater effluent suspended solids are settled within the Cross Mine underground workings. Caribou and Cross underground waters are thereby comingled. This is effectively the same water comingling that takes place under normal operations of Pond #1 were Caribou effluent from Pond 3C and Cross Mine groundwater from the pumping system described under 4 below, are mixed prior to treatment.
4. Cross Mine dewatering is achieved via pumping from the Winze to Pond #1. The pumping system dewater the Cross Mine to the lowest underground workings (400 Level).
5. A submersible pump installed in Pond #1 supplies the ENSERO Filtration System (Appendix D) and the MetSorb© HMRG media vessel -closed and continuous feed- (Appendix E).
6. The ENSERO Filtration System consists of 4 inline filtration units with 5 µm filtration bags. Pressure drop across the filtration units is monitored to determine if the filtration bags have reached solids saturation
7. The post filtration effluent enters the MetSorb© HMRG Treatment Media (the polishing and treatment elements).
8. Effluent from the MetSorb© HMRG Treatment Media vessels is conveyed via gravity pipeline to permitted Outfall 001 where it is discharged into Coon Track Creek.
9. GIR has implemented several sediment reduction management strategies within the underground workings. Those activities have been approved by DRMS on an on-going basis.

The Pilot Treatment System and Features are described in the following paragraphs:

The Pilot Plant treats waters from the Caribou Mine (Idaho Tunnel) portal effluent and the Cross Mine Dewatering.

Cross Mine dewatering is achieved via a submersible pump installed in the Winze. Pump is currently placed at the 4th level. The pump automatically controlled via a Level Transducer, Programable Logic Controller and Electronic Flow Meter, which adjust the Pilot Plant inflow rate.

Caribou Mine (Idaho Tunnel) portal effluent that is conveyed via collection and pumping system (sump) from the mine into Pond 3a. During December 2021 and January 2022, a cofferdam was constructed inside the Caribou Mine, upgradient of the sump pump. The coffer dam functions as a settling basin. From

Pond 3A, a 6" diameter HDPE pipe conveys water from Pond 3A through Pond 3b and 3c to Pond #1, where Caribou Effluent commingles with Cross Mine dewatering effluent. Pond #1, via a pumping system feeds the Pilot Treatment Plant.

Appendix D provides details of the Pilot Plant Filtration System. Post 5 µm filtration, the water is treated in sealed vessels packed with Graver MetSorb© HMRG media (Appendix E). Effluent from the system meets regulatory permitted discharge standard; therefore, water is discharged into the Coon Track Creek Permitted Outfall 001.

The Pilot Plant was installed and commission in November 2021 is located just to the southeast of Pond #1, approximately 15 feet from the pond margin. The pilot system is housed in an insulated Connex trailer with automated freeze protection.

The Pilot Plant treats the combined Caribou and Cross mines effluent from Pond #1 via four (4) stainless steel, skid-mounted filter housings fitted with 5µ filtration bags (Ensero). A series of 4" schedule-80 PVC pipe interconnect the filter housings and the Treatment Vessels. Inlet and Outlet Pressures of the filtration system are measured and recorded. Pressure differential inform the operator of filtration bags replacement needs. Filter bags normal operating pressure is 8 psi.

Filtration effluent is conveyed in a closed system via a 2"diameter hose into the pressure vessel loaded with the Metsorb© adsorbent. Final polishing takes place in the ESS vessels through the Metsorb© media.

In the normal configuration, the treated water is discharged from the vessel through a 2" diameter hose for final environmental release through the monitoring shed which is located approximately 100 yards southeast of the Connex through an 8" schedule-40 PVC to the permitted Outfall 001 to Coon Track Creek.

Monitoring, including a pH and temperature probe, Total Dissolved Solids (TDS) meter and a discharge flow meter are located in the discharge shed (Figure 1).

The Pilot Plant current treats up to 150 gpm. The treatment capacity will be increase to handle the maximum monthly average allowable discharge of approximately 300 gpm.

Pilot system automation features:

The Pilot Plant has been automated to increase predictability, consistency, reliability and control of operations. The primary features of this automation system are a Variable Frequency Drive (VFD), which controls the power and speed of the electrical motor systems (e.g., Pond #1 pump), and a Programable Logic Controller (PLC), which allows a user to interface with and edit the settings of the systems described below remotely.

The primary feature of the PLC is a real-time computer site display (Walchem) which reads and displays measurements of the Cross Mine flow meter, Pond 1 pump speed and Pond 1 water level (controlled by a pressure transducer), and measurements collected by the pressure transmitters before and after the filter bag housings. The pressure drop between the influent source water and effluent (post-filtration) water determines the frequency of filter bag changes (i.e., when to remove old, spent filter bags to be replaced with fresh filter bags). While the manufacturer recommends a bag change at a drop of 2 psi, GIR has found that the filter bags will last significantly longer than a 2 psi drop without either break-through or sediment release. Analytics support extending the bag life and GIR will continue to monitor for optimal

treatment as well as consumables cost. The PLC (photograph in **Appendix A**) also displays variable versus time graphs which aid in real-time visualization of changes to the system, assisting the operator to make quick changes to the system if/when necessary. All measurement data and graphs are viewable remotely via the Walchem Fluent website. Additional changes and features are programable on the PLC, and additional meters and measurements will be displayed upon their installation. These upgrades will provide additional data collection points and aid in making changes to the system quickly and as needed. Alarm features have also been programed into the PLC, which send a text message and email to alert the operators in the case that urgent changes must be made.

The pilot Plant described above has been fully operational and since the installation of continuous 24/7 treatment from December 15, 2021, through the last compliance sample reported in March, has produced consistent results that are 100% in compliance samples with GIR's discharge permit (**Table 2**). The pilot system in place has proven to be successful, and GIR will continue to make improvements and upgrades to the system as needed. GIR is committed to meeting compliance standards and looks forward to working with the State in the future to ensure success for the future.

Table 2

Outfall 001A Compliance Sample Results														
Test/ Analyte	Test type	Unit	29-Dec-21	13-Jan-22	27-Jan-22	Jan 2022 30-day avg	Permitted Jan 30-day avg Max	Permitted Jan Daily Max	15-Feb-22	28-Feb-22	Feb 2022 30-day avg	Permitted Feb 30-day avg Max	Permitted Feb Daily Max	15-Mar-22
Physical Properties														
pH	N/a	s.u.	Min=7.6 Max=8.8	--	--	Min=6.7 Max=8.5	Not Required	6.5 - 9	--	--	Min=7.6 Max=8.4	Not Required	6.5 - 9	--
Solids, TSS	N/a	mg/L	ND	--	ND	0	30	Not Required	ND	--	0	30	Not Required	ND
Temp	N/a	°C	--	--	--	3.37	Not Required	Not Required	--	--	3.64	Not Required	Not Required	-
Organics														
Oil & Grease	HEM	mg/L	N/a	N/a	N/a	N/a	Not Required	10	N/a	N/a	N/a	Not Required	10	N/a
Inorganics														
Sulfide as H_2S	N/a	mg/L	ND	--	ND	0	Report	N/a	ND	--	0	Report	N/a	ND
Metals														
Ag	PD	ug/L	ND	ND	ND	0	0.12	2.9	ND	0.056	0.028	0.12	3.2	ND
As	PD	ug/L	ND	--	ND	0	Not Required	Report	ND	--	0	Not Required	Report	ND
As	TR	ug/L	ND	--	ND	0	Report	Not Required	ND	--	0	Report	Not Required	ND
Cd	PD	ug/L	ND	ND	ND	0	0.63	2.3	ND	ND	0	0.63	2.5	ND
Cd	TR	ug/L	ND	--	ND	0	50	300	0.19	--	0.19	50	300	0.19
Cr 3+	PD	ug/L	ND	--	ND	0	Report	Not Required	ND	--	0	Report	Not Required	ND
Cr 3+	TR	ug/L	ND	--	ND	0	Not Required	Report	ND	--	0	Not Required	Report	ND
Cr 6+	Dissolved	mg/L	ND	--	ND	0	Report	Report	0.005	--	0.005	Report	Report	ND
Cu	PD	ug/L	ND	ND	ND	0	13	18	ND	1.3	0.65	13	20	ND
Cu	TR	ug/L	ND	ND	ND	0	150	300	ND	--	0	150	300	0.84
Fe	TR	ug/L	46	--	24	24	Report	N/a	ND	--	0	Report	N/a	23
Hg	Tot	ug/L	ND	--	ND	0	1	2	ND	--	0	1	2	ND
Hg	Tot, low level	ug/L	--	ND	--	0	Report low level	Report low level	0.003	--	0.003	Report low level	Report low level	ND
Mn	PD	ug/L	ND	--	ND	0	Report	Report	4.7	--	2.35	Report	Report	12
Ni	PD	ug/L	ND	--	ND	0	Report	Report	ND	--	0	Report	Report	0.56
Pb	PD	ug/L	1	ND	ND	0	3.8	85	0.86	3.3	2.08	3.8	94	0.98
Pb	TR	ug/L	1	ND	ND	0	300	600	0.9	0.86	0.88	300	600	0.95
Se	PD	ug/L	ND	--	ND	0	Report	Report	ND	--	0	Report	Report	ND
Zn	PD	ug/L	ND	ND	ND	0	186	184	16	12	14	186	203	31
Zn	TR	ug/L	14	--	ND	0	750	1500	10	--	10	750	1500	22

Section 7: Additional Information Related to DRMS Adequacy Review Letters (Preliminary and #2)

On March 25, 2022, DRMS provided GIR with Cross Gold Mine, Permit No. M-1977-410, Technical Revision No. 10 (TR-10), Preliminary Adequacy Review Letter.
On April 21, 2022, GIR submitted responses to the DRMS Preliminary Adequacy Review Letter.
On April 22 2022, DRMS issued to GIR Cross Gold Mine, Permit No. M-1977-410, Technical Revision No. 10 (TR-10), Adequacy Review No. 2
On April 25, 2022 GIR submitted responses to DRMS Adequacy Review No.2.

This section addresses key topics include in DRMS' Adequacy Review Letters and subsequent conference call agreements GIR response letters are provided in Appendix F.

Bonding Estimate for Operation and Maintenance of Water Treatment System: The following table outlines the bond estimate costs of the water treatment system, requested by DRMS (Table 3):

Table 3 Cross Caribou Mines Water Treatment – Operations, Maintenance and Monitoring Annual Cost Estimate

Cross Caribou Water Treatment
Operations, Maintenance and Monitoring
ANNUAL BASIS - averaged over the last three months of operation

ID	ITEM	QTY.	UNIT	UNIT COST	TOTAL	Notes
C-01	Filtration Media	416	ea.	$ 15.00	$ 6,240.00	Rep. once per week per filter (8 filters)
C-02	Polishing Media	2	ea.	$25,000.00	$ 50,000.00	Rep.every two years (2 vessels)
E-01	Filtration System Equipment	3	ea.	$ 300.00	$ 900.00	Operational Life 20 years
E-02	Polishing System Equipment	3	ea.	$ 1,500.00	$ 4,500.00	Operational Life 20 years
E-03	Control Valves	20	ea.	$ 30.00	$ 600.00	Operational Life 10 years
E-04	In-Plant Piping	50	ft.	$ 1.50	$ 75.00	Operational Life 10 years
E-05	External Piping	600	ft.	$ 1.25	$ 750.00	Operational Life 20 years
E-06	Instrumentation	12	ea.	$ 50.00	$ 600.00	Operational Life 15 years
O-01	Water Quality Sampling and Testing	24	ea.	$ 300.00	$ 7,200.00	Two Effluent Sample per month
O-02	Inspection and Sample Collection	208	hr.	$ 45.00	$ 9,360.00	One visit per week 8 hour day contractor
O-03	Data Processing and Reporting	24	hr.	$ 75.00	$ 1,800.00	4 hours per month contractor
				Total Annual Avg.	**$ 82,025.00**	
				Total Monthly Avg.	**$ 6,835.42**	

C = Consumables, E = Equipment, O = Operations

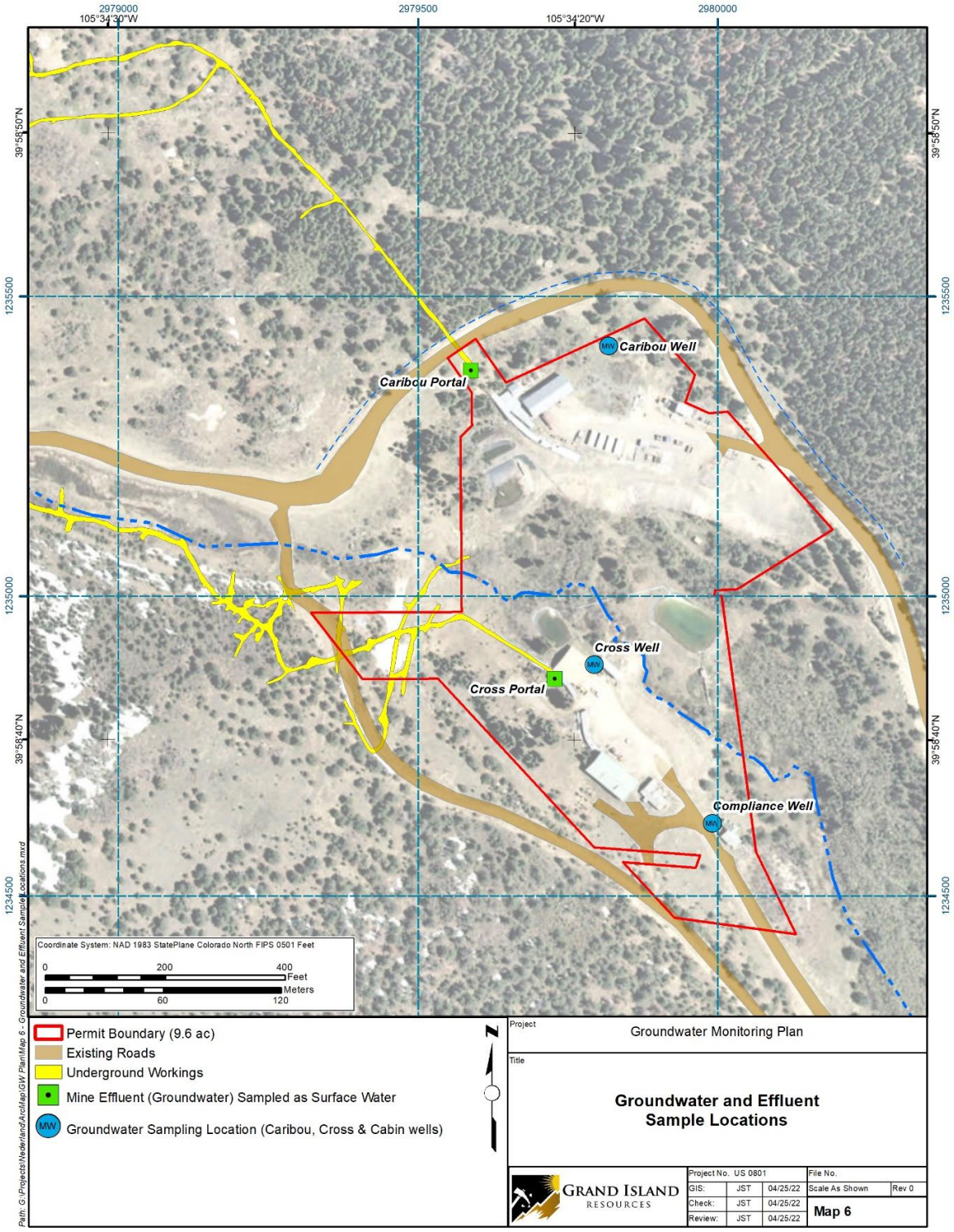
Surface Water and Groundwater Monitoring Plans:

A revised Groundwater Monitoring Plan is provided in Appendix G. The revised plan revises the previously submitted interpretation and indicates that: *the suggested Junction Ranch fault down-gradient from the mine does not appear to exist at the mines based on drilling. Water flow and storage between the Cross and Caribou mine is also influenced by the unmapped Potosi Mine between the Cross and Idaho tunnel. Resistivity surveys conducted last summer show extensive stopping created massive voids that fill from snow melt as access shafts are still open. This makes the fracture flow regime more complicated than simply citing a divide between the two mines and Coon Track Creek*

A Surface Water Monitoring Plan is provided in Appendix H. The Plan. The SMP addresses Hydrology and Water Quality of the prevailing hydrologic balance of the GIR permitted. The site consists of a Historic Mining District and, therefore, the surface facilities have existed for decades. Characterization data will be obtained from ambient surface water along Coon Track Creek which traverses the site and constitutes the only surface water outfall from the currently active operations area in the property and it is anticipated that the collected information will be used as Baseline Water Quality conditions for the site. Two Sample Points labelled 2022-01 and 2022-02 were agreed upon with DRMS, the first sample point is located upstream of the facilities and second sample point is located downstream of the facility. The upper watershed from the top of the divide to Sample Point 2022-01 comprises 0.54 square mile basin, and, from Sample Point 2022-01 downstream to Sample Point 2022-02 the watershed has an area of 0.79 square miles (i.e., an additional 0.25 square mile basin over sample point 2022-01).

The locations of Water Quality Sampling Points for Groundwater (wells) and Surface Water are provided on the following Figure 2.

Figure 2 – Permit Boundary and Baseline Sample Locations (also Groundwater Monitoring Plan – Map 6)



Pond #1 Overtopping Management

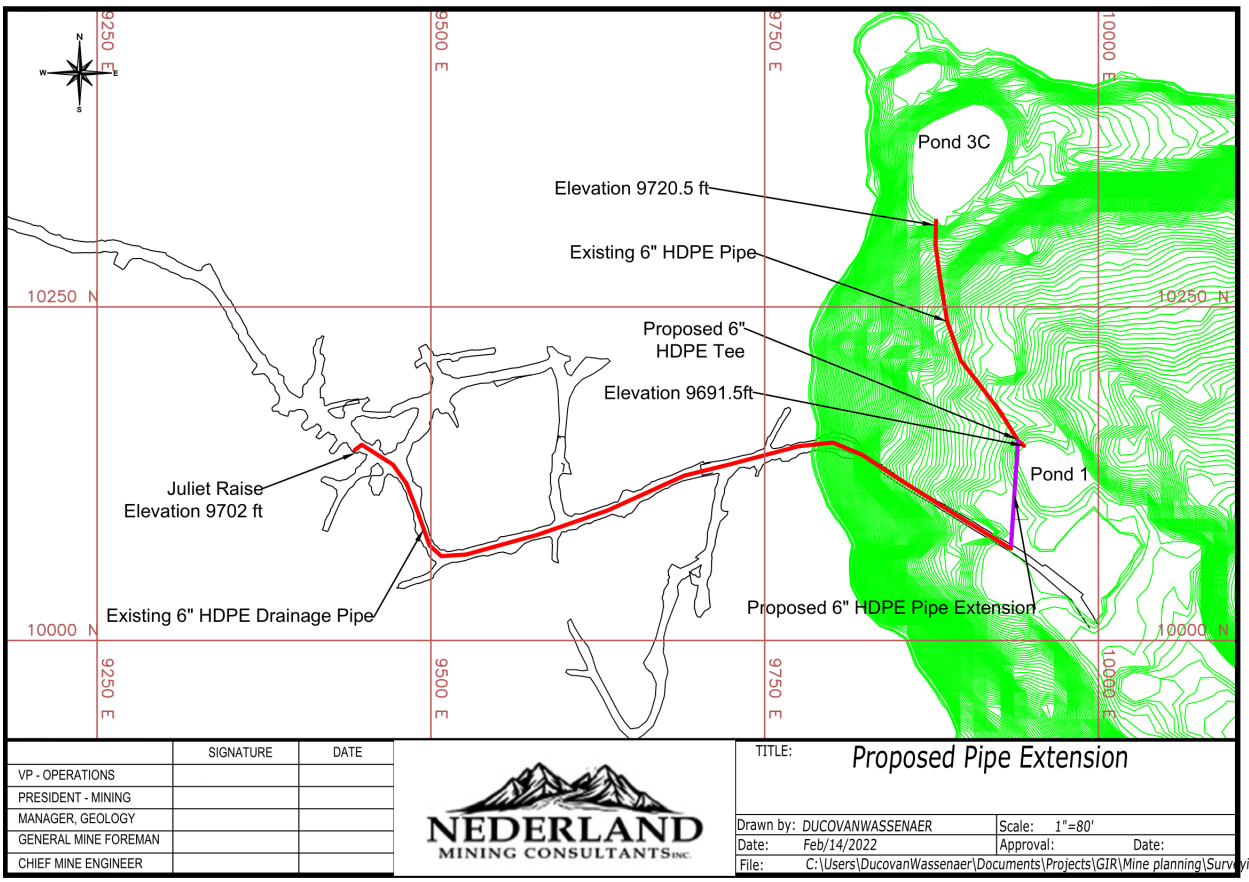
As referenced in the caption for Figure 1, The primary purpose of the pipeline extension is to preclude potential overtopping of Pond #1 via a pipeline conveying flows that would exceed the capacity of Pond #1 into an existing Juliet ventilation raise. The Juliet Raise vertically intercepts the 2nd, 3rd, and 4th levels of the Cross Mine.

The Juliet Raise is already serving as a water passageway to the lower levels of the Cross mine water from the Apache/Potosi working area. A secondary benefit of the application would be an increase of solids settling time contained in Caribou water.

The currently installed system comprises a 194 ft long 6" pipe conveying Pond #3C Caribou effluent into Pond #1 behind the Cross Shop. The proposed extension would incorporate a 6" HDPE T-fitting at the end of the existing pipe, where automated float valves would shutoff discharges into Pond #1 and divert the flow into the Joliet Raise. The extension requires approximately 80 ft of 6" HDPE pipe.

GIR submitted to DRMS on April 14, 2022, a request for approval from DRMS pursuant with Mined Land Reclamation Board Cease and Desist Order, for the installation of the pipeline which would extend the pipeline that currently conveys water from Pond #3C to Pond #1 into the Cross Mine underground workings known as the Juliet Raise. DRMS granted authorization on April 14, 2022 and requested that details of the installation were presented in this Technical Revision. A schematic figure of the piping change is shown below (Figure 3).

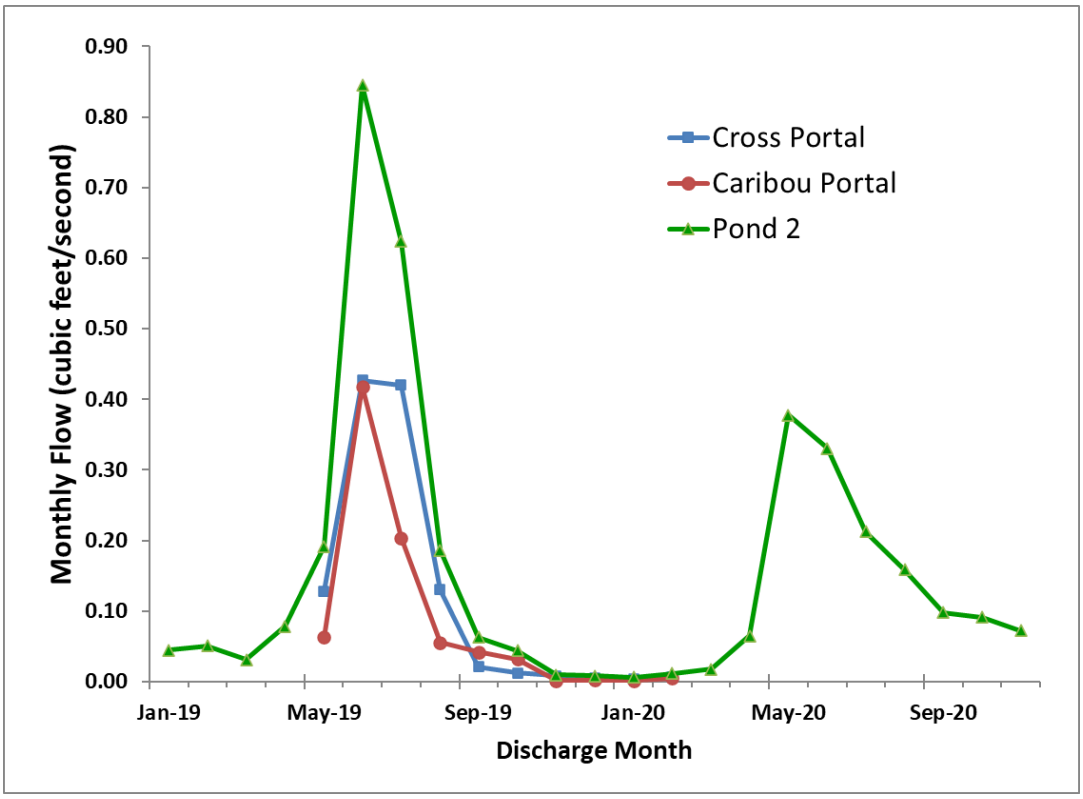
Figure 3 – Schematic Pipeline from Caribou Mins/Idaho Tunnel to Pond #1 and Cross Mine Juliet Raise



Activities Post-Cease and Desist Order Removal

DRMS and GIR discussed details associated with DRMS comment 12), in their document Cross Gold Mine, Permit No. M-1977-410, Technical Revision No. 10 (TR-10), Adequacy Review No. 2, dated April 22, 2022. The comment pertains to how GIR intends to collect the required baseline groundwater data in a manner that ensures groundwater quality at the site is not impacted by site activities in any way during this monitoring period for the next 5 calendar quarters. DRMS and GIR agreed to address the issue via a written request for approval by GIR and approval by DRMS process whereby, in similar fashion to the current approval process, GIR will issue requests for approval letters to DRMS describing planned underground activities, objectives, methods, expected disturbance and impacts preventions mechanisms prior to commencement of the activities. Upon receiving written approval by DRMS, GIR will implement the actions. In addition GIR agreed to collect monthly groundwater and surface water quality samples as opposed to the previously DRMS requested quarterly

GIR Comment 4 Response: The following graph provides influent and effluent flows to and from Water Treatment in 2019 and 2020



Appendices

Appendix A – Site Pictures

Appendix B – Site and System Maps

Appendix C – Graver/Metsorb

Appendix D – Ensero

Appendix E – Environmental Site Solutions (ESS)

Appendix F – Groundwater and Surface Water Monitoring Plans

Appendix G – SOP's and O&M's

Appendix A – Site Pictures

Caribou Ponds

Figure 1 Ponds 3A and 3B (Frozen)

Figure 2 Pond 3C Frozen

Cross Ponds

Figure 3 Pond 2 (Frozen) Emergency Overflow Only

Figure 4 Pond 1 (Frozen) With Submersible Pump and Float

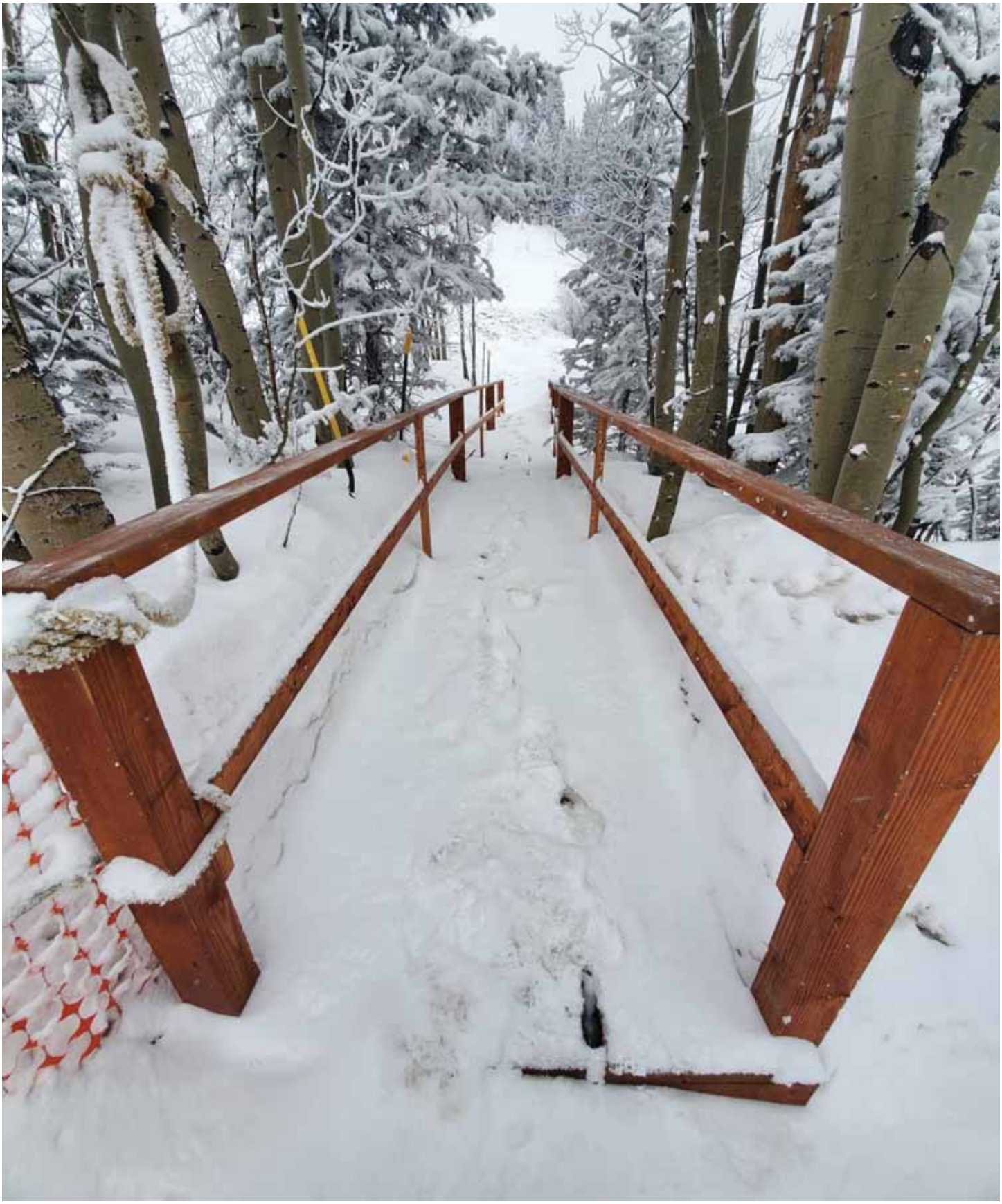


Figure 5 Walking Bridge over Coon Track Creek

Cross Discharge Sheds 1 and 2

Figure 6 Cross Discharge Sheds 1 and 2. Cross Effluent Discharge Pipe to Coon Track Creek

Figure 7 - 6" Gravity Discharge Pipe and Monitoring Equipment in Shed 2

Figure 8 Cross Winze Pump VFD/Enclosure and Cross Discharge Meter

Figure 9 Cross Winze Valve Upgrade

Treatment Trailer and System

Figure 10 - 40'L x 8'W x 9'6"H Storage Conex

Figure 11 Treatment System Discharge Pipe and Intake Hose

Figure 12 Skid Mounted Filtration System (provided by Ensero)
4 Stainless Steel Vessels – Housing 5-Micron Filtration Bags

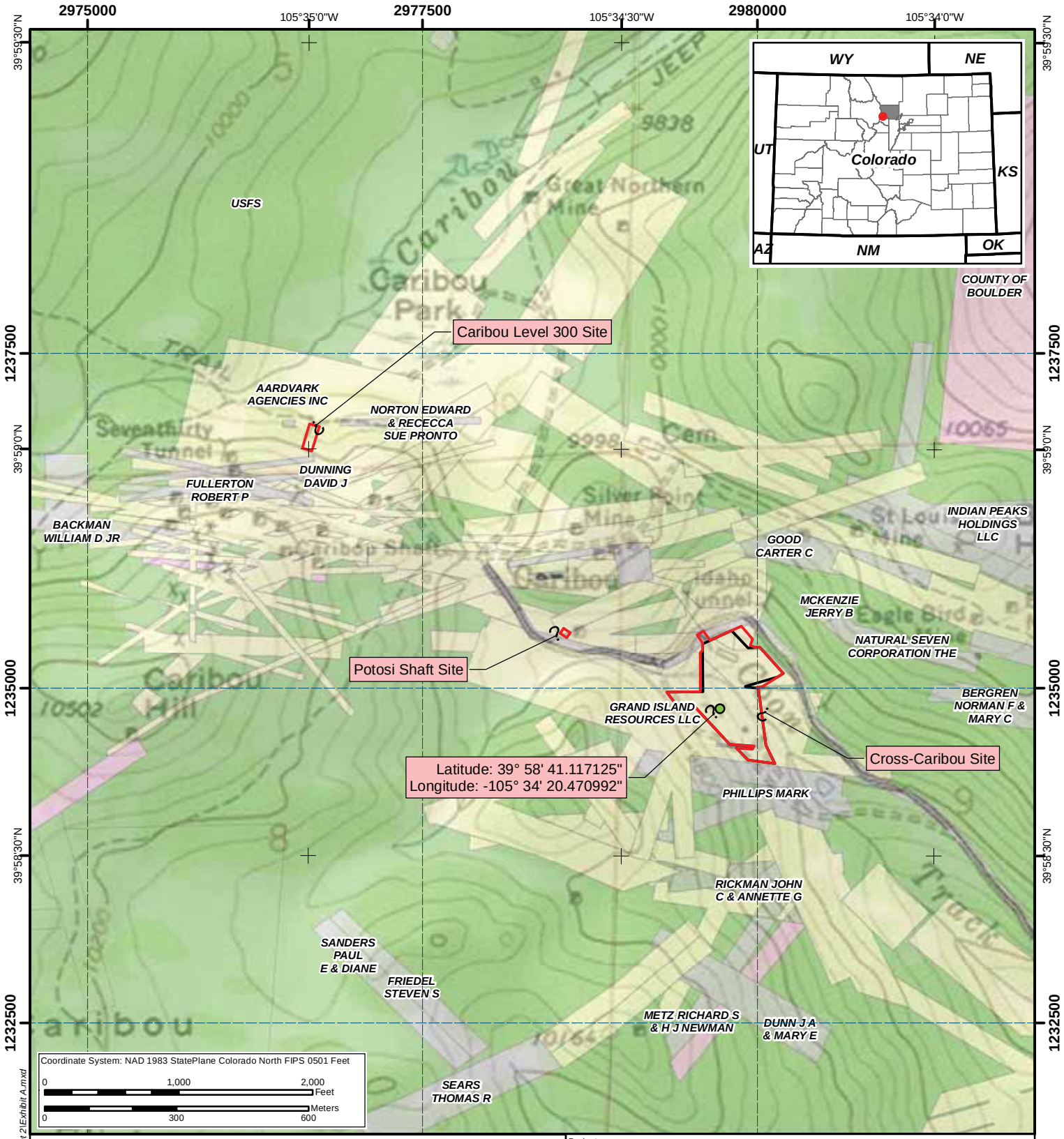
Figure 13 Vessels (provided by ESS) housing Metsorb Adsorptive Media (provided by Graver)

Figure 14 Isolation Valve and Previous Backwash Tank

Figure 15 Programmable Logic Center (PLC) and Variable Frequency Drive (VFD)

Figure 16 Current Backwash and Settling Tank

Appendix B – Site and System Maps



Legend

- Permit Boundary - Modified (9.99 ac)
- Permit Boundary - Current (8.95 ac)

Assessor Data

- Grand Island Resources
- Private Land Owners
- Boulder County
- US Forest Service

Project: DRMS Amendment 2

Title: **Proposed Permit Boundary Modifications**

Project No. 0801			File No.	
GIS:	JST	01/25/21	Scale As Shown	Rev 0
Check:	JST	01/25/21	**Exhibit A**	
Review:	DP	01/25/21		

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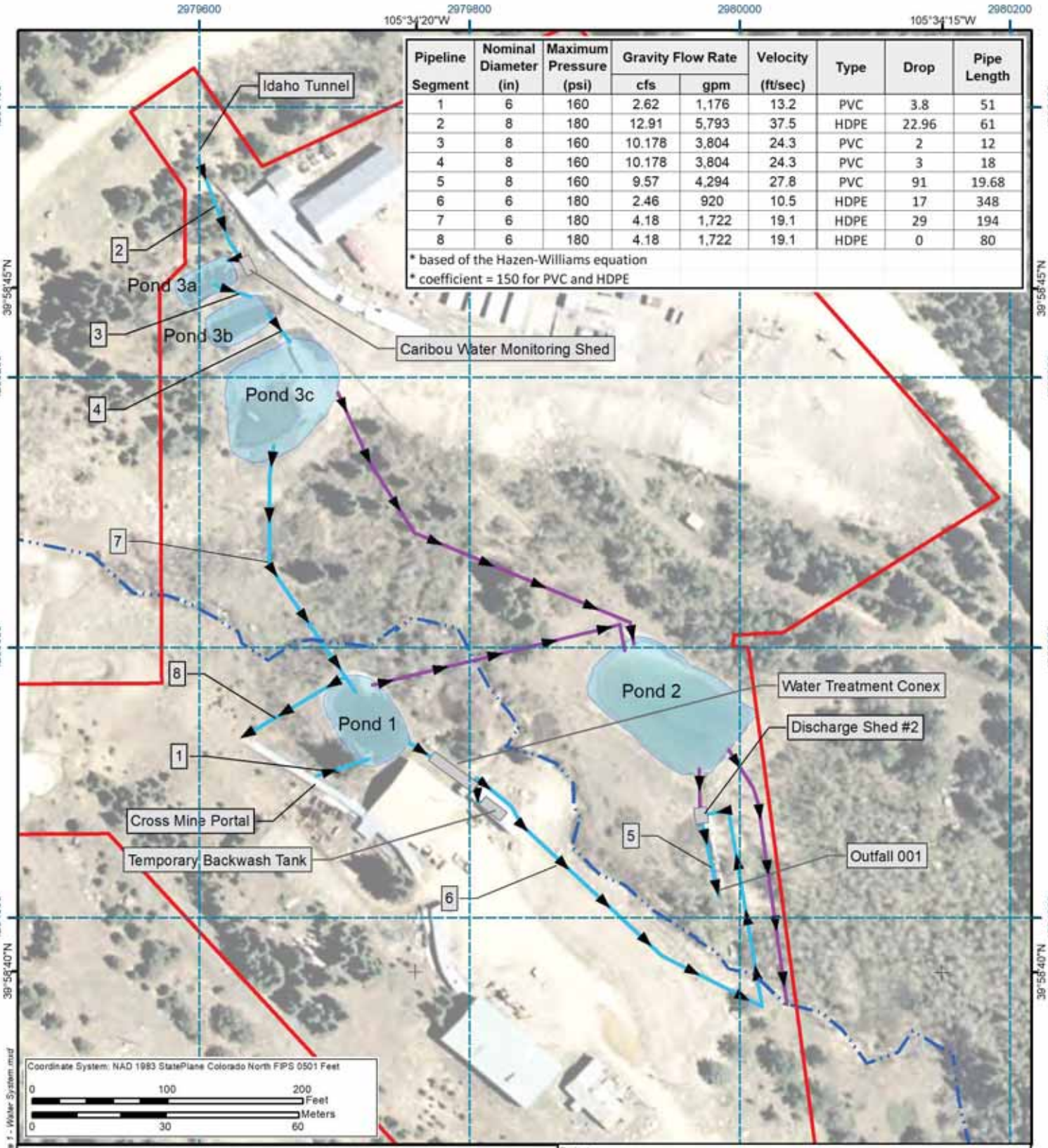

Pipeline Segment	Nominal Diameter (in)	Maximum Pressure (psi)	Gravity Flow Rate cfs	Gravity Flow Rate gpm	Velocity (ft/sec)	Type	Drop	Pipe Length
1	6	160	2.62	1,176	13.2	PVC	3.8	51
2	8	180	12.91	5,793	37.5	HDPE	22.96	61
3	8	160	10.178	3,804	24.3	PVC	2	12
4	8	160	10.178	3,804	24.3	PVC	3	18
5	8	160	9.57	4,294	27.8	PVC	91	19.68
6	6	180	2.46	920	10.5	HDPE	17	348
7	6	180	4.18	1,722	19.1	HDPE	29	194
8	6	180	4.18	1,722	19.1	HDPE	0	80

* based of the Hazen-Williams equation
* coefficient = 150 for PVC and HDPE

Legend

- Permit Boundary
- Mine Water Drainage System (Bonded Under AM2)
- Piping for Maintenance or Emergency Use Only
- Discharge / Treatment Shed
- Pond
- Coon Track Creek

N

Project: Cross Mine Technical Revision No. 10

Title: **Water Management System**

GRAND ISLAND RESOURCES

Project No. US 0401			File No.	
GIS:	JST	04/22/22	Scale As Shown	Rev 0
Check:	JST	04/22/22	**Figure 1**	
Review:	JST	04/22/22		

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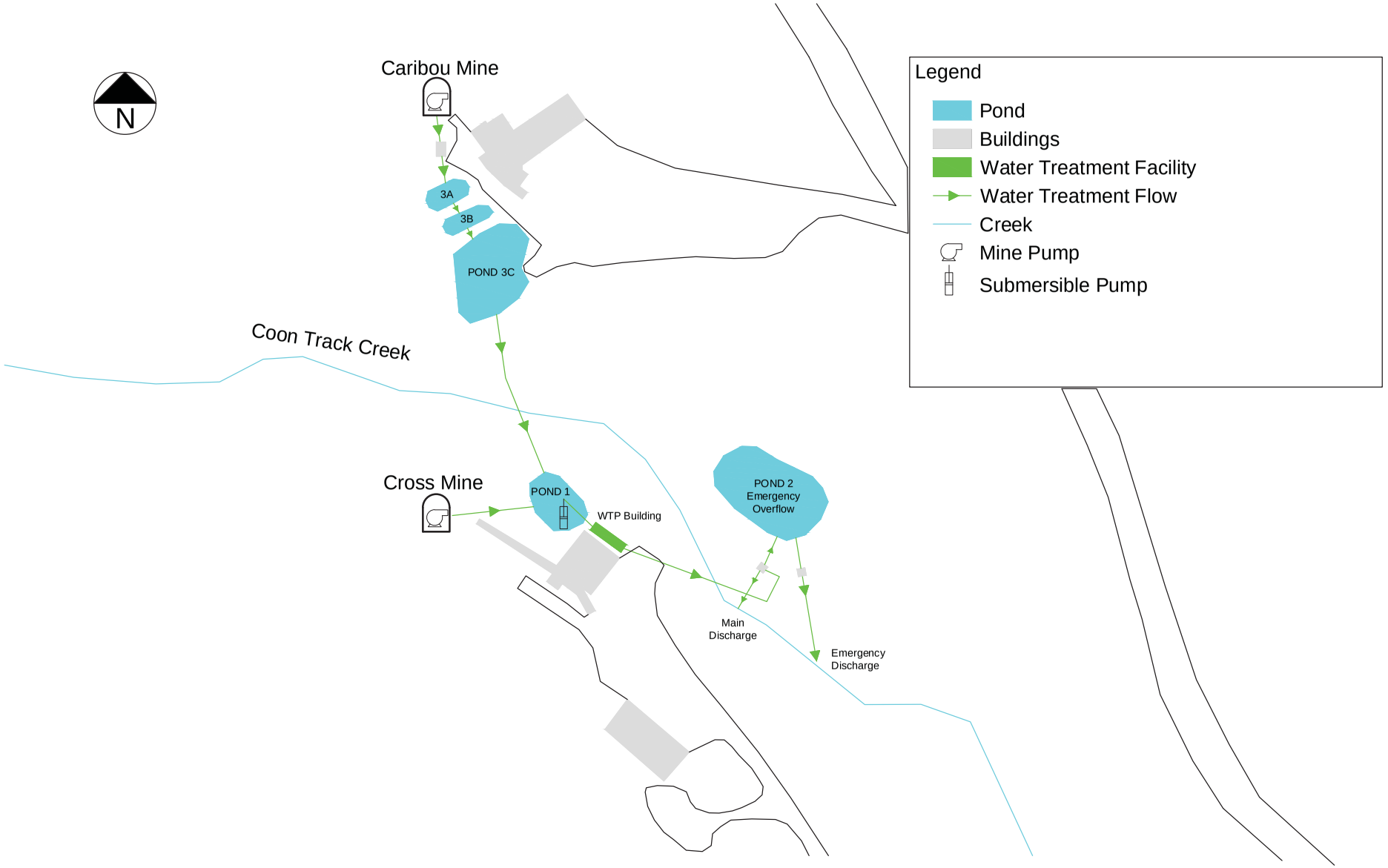

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	Drawn By:
	Checked By:
	Engineered By:
	Approved By:
File Name:	Revision: 2

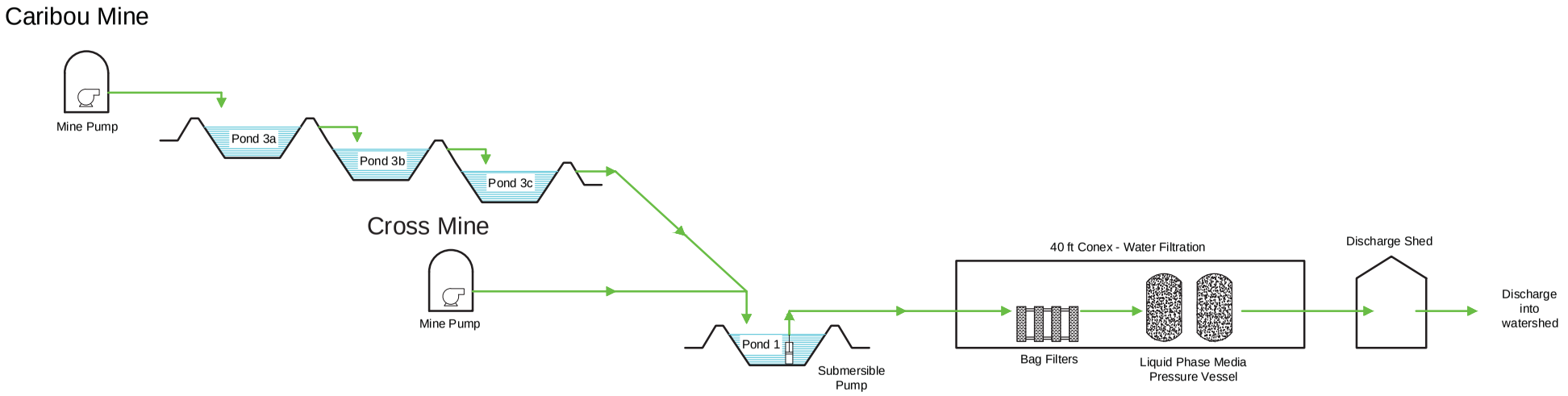
BLACK FOX MINING LLC
MATT COLLINS, PE, QP
1508 Ridge Rd, Nederland, CO, 80466
Phone: (303) 303-570-6269
Email: mcollins@blackfoxmining.com

Cross-Caribou Project

WTP System

DWG #

Sheet # 1 of 2



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	Date: 2/22/22		
	Drawn By: GML		
	Checked By:		
	Engineered By:		
	Approved By:		
File Name: CC Flow Sheet	Revision: 2		DWG # Sheet # 2 of 2

Appendix C – Graver/Metsorb

Preliminary Investigation in Nederland Mine (Cross) Water Treatment by MetSorb® HMRG

1.0 Summary

Environmental Site Solutions is working with Nederland to remove zinc (Zn) and cadmium (Cd) from their mining sites to meet regulatory limits. MetSorb® HMRG, an adsorbent by Graver Technologies, has historically been able to treat water for both Cd and Zn. Contaminated water from the Cross mine was sent to Graver's facility in Glasgow, DE, USA for testing. A series of batch tests (kinetic and equilibrium) were conducted to evaluate the capacity and kinetics of MetSorb® HMRG for removing Cd and Zn present in the Cross water. In the Cross water MetSorb® HMRG was found to have a capacity of over 15 mg/g for Zn and over 0.14 mg/g for Cd. Typical contact time for HMRG is usually between 1.5 – 3 minutes. The low concentration of Cd in the Cross water makes the HMRG kinetically hindered; a contact time of 10 minutes is not only practical but should be sufficient to remove the Cd. The kinetic data on Zn removal shows that 40% of the Zn can be removed within 10 minutes. In a vessel configuration (lead-lag), this should be sufficient to remove a significant portion of the Zn from the Cross water. The major recommendation of this report is that a pilot test be conducted. A pilot test with a lead-lag configuration and appropriate sampling would provide a more complete evaluation of the media's ability to remove both Cd and Zn to the necessary requirements for the Cross site.

2.0 Introduction:

Environmental Site Solutions and Nederland contacted Graver Technologies to determine if mine water containing cadmium, zinc, and other contaminants could be treated by MetSorb® products. There are two sites that can be compared based on the data presented to Graver. Site 1 is the Caribou Tunnel Site. Site 2 is the Cross Tunnel Site (Cross).

Both water chemistries have been analyzed by Nederland. Both water samples were treated by filtration: a 5 um, 0.45 um and a 0.1 um filter. The samples for Caribou show that filtration removes all of the contaminants including cadmium, zinc, copper, lead, and silver. This indicates that contamination in the Caribou water is mostly solid. Filtration alone should clean the water from the site. The same filtration was carried out on the Cross water. The Cross water, however, did not filter as well. The cadmium was mostly soluble with ~ 93% of the concentration passing through the filters. The zinc was also mostly soluble with 92% of the concentration passing through the filters. Lead and silver were removed completely.

MetSorb® products have been known and used to treat many ions. Cadmium, one of the contaminants of concern, should be mostly Cd^{2+} in a pH of 0-7. Above 7, the Cd may convert to

Graver Technologies

cadmium hydroxide ($Cd(OH)_2$).[1] Other Pourbaix diagrams show the conversion of Cd to other species around a pH of 8.5 or higher. These Pourbaix diagrams are guiding documents to determine how media may adsorb the contaminant. Zinc, the other major contaminant at Cross is also mostly Zn^{2+} at a pH of 0-7.5. After 7.5, the zinc starts converting to zinc oxide. [2]

MetSorb® HMRG is known to remove both cations and anions, depending on the specific water chemistry. There are several case studies and experimental results that show MetSorb® HMRG can remove both cadmium and zinc.

One case study for cadmium removal concluded:

> "Despite being at a significantly lower concentration than the other metals, cadmium adsorption performance also followed a trend of steady concentration decrease over time. The fine (0.1µm) filtration step reduced the starting concentration by 13% indicating the presence of insoluble cadmium . The separate granular activated carbon (GAC) filtration step removed only 5% of the cadmium present and not much more than the (2.7um) pre-filter used prior to beginning the stirred batch equilibrium testing. The stirred batch equilibrium testing demonstrated the selectivity of MetSorb® HMRG for cadmium in this wastewater matrix despite the much higher concentration of other metals present. Due to the evidenced selectivity, it is clear that cadmium removal will occur and that the extent of reduction will be a function of media volume and contact time."

This study was conducted at a customer site with over 350 ppb of cadmium.

In testing for zinc removal, one experimental study showed that HMRP (the powdered version of MetSorb® HMRG) could remove 97% of the zinc from a pH 6.5 and a pH 8.5 solution. The zinc had initial concentrations from 291-815 ppb. The measured capacity of the media for this test was 0.768 mg Zn/ dry gram of media. Other media specifically designed for cation removal resulted in higher percent removal and capacities.

Another case study tested both MetSorb® HMRG and MetSorb® STG for the removal of multiple metals. Both HMRG and STG removed Cd and Zn at over 7,000 bed volumes (BVs) before Zn broke through (~ 800 ppb initial) and over 8,000 BVs before Cd broke through (~550 ppb initial).

Testing was conducted on the Cross water to confirm the capacity and effectiveness of MetSorb® HMRG media relative to the specific water conditions at the Cross site.

3.0 Method:

3.1 Equilibrium batch testing - Efficiency

To a 125 mL polypropylene container was added 1.0 dry grams of MetSorb® HMRG and 100 mL of water from Cross. This is a volume to mass ratio of 100 mL of solution per dry gram of media.

[1] https://boris.unibe.ch/109643/1/1.4980127.pdf
[2] https://commons.wikimedia.org/wiki/File:Zn-pourbaix-diagram.svg

The sample was capped and placed on a shaker table. The sample was contacted at 250 rpm overnight for a total of about 22 hours. The water was removed and filtered with a 0.45 um syringe filter. Samples were preserved with nitric acid and then analyzed by inductively coupled plasma mass spectrometry (ICP-MS).

3.2 Kinetic batch testing.

3.2.1Ratio of 100,000 mL/g

To a 4 L plastic beaker was added 5050 g of water from Cross. A stir bar was added, and the sample was stirred for 2 minutes. 40 g of water was removed and designated as “Time 0”. To the beaker was added 51.0 dry milligrams of MetSorb® HMRG (moisture of 10.39%). 40 mL samples were removed from the container at the following intervals: 1 minute, 5 minutes, 10 minutes, 30 minutes, 60 minutes and > 18 hours. When a sample was removed, it was filtered with a 0.45 um filter and preserved with nitric acid. Samples were analyzed by ICP-MS.

3.2.1Ratio of 50,000 mL/g

To a half-gallon plastic container was added 2040 g of water from Cross. A stir bar was added, and the sample was stirred for 2 minutes. 40 g of water was removed and designated as “Time 0”. To the beaker was added 43.9 dry milligrams of MetSorb® HMRG (moisture of 10.39%). 40 mL samples were removed from the container at the following intervals: 1 minute, 5 minutes, 10 minutes, 60 minutes and > 18 hours. When a sample was removed, it was filtered with a 0.45 um filter and preserved with nitric acid. Samples were analyzed by ICP-MS.

3.2.1Ratio of 1,000 mL/g

To a one-liter plastic container was added 943.5 g of water from Cross. The sample was manually stirred. 40 g of water was removed and designated as “Time 0”. To the container was added 896.7 dry milligrams of MetSorb® HMRG (moisture of 10.39%). The container was placed on a shaker table at 250 rpm. The shaker table was stopped prior to and restarted after samples were collected. 40 mL samples were removed from the container at the following intervals: 1 minute, 5 minutes, 10 minutes, 60 minutes and > 18 hours. When a sample was removed, it was filtered with a 0.45 um filter and preserved with nitric acid. Samples were analyzed by ICP-MS.

3.3 Analytical

All samples were analyzed by Graver Technologies and an independent third-party laboratory, Eurofins Test America. Both techniques used an ICP-MS to evaluate the results. Graver’s results were used to quickly determine the analyte concentrations, while the Eurofins Test America results were used based on their knowledge and expertise as a certified laboratory running tests under EPA method 6020B.

Graver Technologies

4.0 Results and Discussion

Two samples of water were received by Graver Technologies in October 2021. One sample was from the Cross site and the other was from the Caribou site. Since the Cross site was contaminated with water that was ionic (not filterable) only water from the Cross site was utilized in testing.

4.1 Removal Efficiency Testing

Removal efficiency testing was conducted on the Cross water to demonstrate that the Cd and the Zn could be removed using the media. Removal efficiency is defined as percent removal and does not provide useful data with regard to the capacity of a media. This test was conducted at a V/m ratio of 100 mL of solution to 1 dry gram of media. The results of both the Cd and Zn tests showed non-detected levels.

The calculated results are limited by the non-detect levels as reported by Eurofins Test America. For this test, the Cd detection limit was 0.39 ppb, and the Zn detection limit was 6.5 ppb. The percent removal was > 67.5% for Cd and > 95.3% for Zn. These values are relatively low, because the EPA method contains statistical analyses that limit the detection level. Graver's preliminary data was based on raw data generated from the ICP. The limit of detection based on the Graver ICP-MS was not only smaller, but the initial concentrations of the Zn and Cd in the Cross water were higher. The percent removal using the Graver analysis was > 99% for Cd and Zn.

4.2 Total Capacity Estimation

Section 3.2 describes kinetic batch testing. However, when an overnight contact time is used the reactions are typically considered to be "at equilibrium". Samples of the reactions at > 18 hours with different V/m ratios were combined to generate an isotherm. Isotherms can be used to show the capacity of the media. These capacities do not show breakthrough (bed volumes). Instead, they show what may be the maximum loading of the contaminants on the media at the tested concentration of water.

In the Cross water, zinc was present at 169.5 ppb, on average (Eurofins TA data). It is estimated that the capacity for Zn of HMRG on the Cross site will be approximately 15 mg of Zn per dry gram of media (mg/g). The capacity of MetSorb® HMRG for Zn is expected to be higher than 15 mg/g as a full isotherm curve could not be fully evaluated.

The cadmium capacities will be lower than zinc because the Cross water had a much lower concentration of Cd (1.55 ppb, on average). The maximum measured capacity of MetSorb® HMRG for Cd was 0.14 mg/g. Again, the capacity is expected to be higher than reported as the curve could not be fully evaluated.

Isotherm tests typically generate nice visible curves based on the equilibrium concentration (*x*-axis) and the calculated capacities (*y*-axis). In this case, the equilibrium concentrations were skewed by the method detection limit reported by Eurofins Test America. The graphical analysis could not be completed and used to extrapolate a maximum capacity. Instead, the capacities reported are based on the very high V/m ratio of 100,000 mL/g. Since the equilibrium

concentration of these samples was not near the initial concentration of either Cd or Zn, the capacities are likely to be larger than the reported values.

These equilibrium batch isotherm tests serve as guidance to initial capacity estimates. They do not factor in or correct for capacity changes with respect to kinetic or other engineering effects. The best way to gauge the capacity of the media is to perform a pilot test and get the real capacity of the media under actual process conditions.

4.3 Kinetic Testing Evaluation

Kinetic evaluations of the media were conducted by extracting a small amount of water out of a single reaction at specific intervals. For the sake of this test, samples were taken at 1 minute, 5 minutes, 10 minutes, 60 minutes and overnight (equilibrium contact). After careful evaluation, the results appear best in the V/m ratio of 1000 mL/g. At this ratio, there is sufficient contact with the media during the kinetic testing that an effect can be evaluated.

The cadmium data show that only about slightly more than 0% of the Cd is removed at 5 minutes of contact. At 10 minutes of contact, the removal percentage goes up to about 10% (Figure 1). At 60 minutes of contact, the removal is over 70%. The actual reduction should be higher, but the calculation is limited by the ICP-MS detection limit.

The data from the Zn analysis shows that less than 40% of the Zn is removed at 10 minutes. At 60 minutes, the percent removal increases to 86% (Figure 2).

The media appears kinetically hindered for both Zn and Cd removal. The Cd is probably hindered due to the lower concentrations; it takes longer for the ions to find the surface of the media and to be sufficiently adsorbed.

Graver Technologies

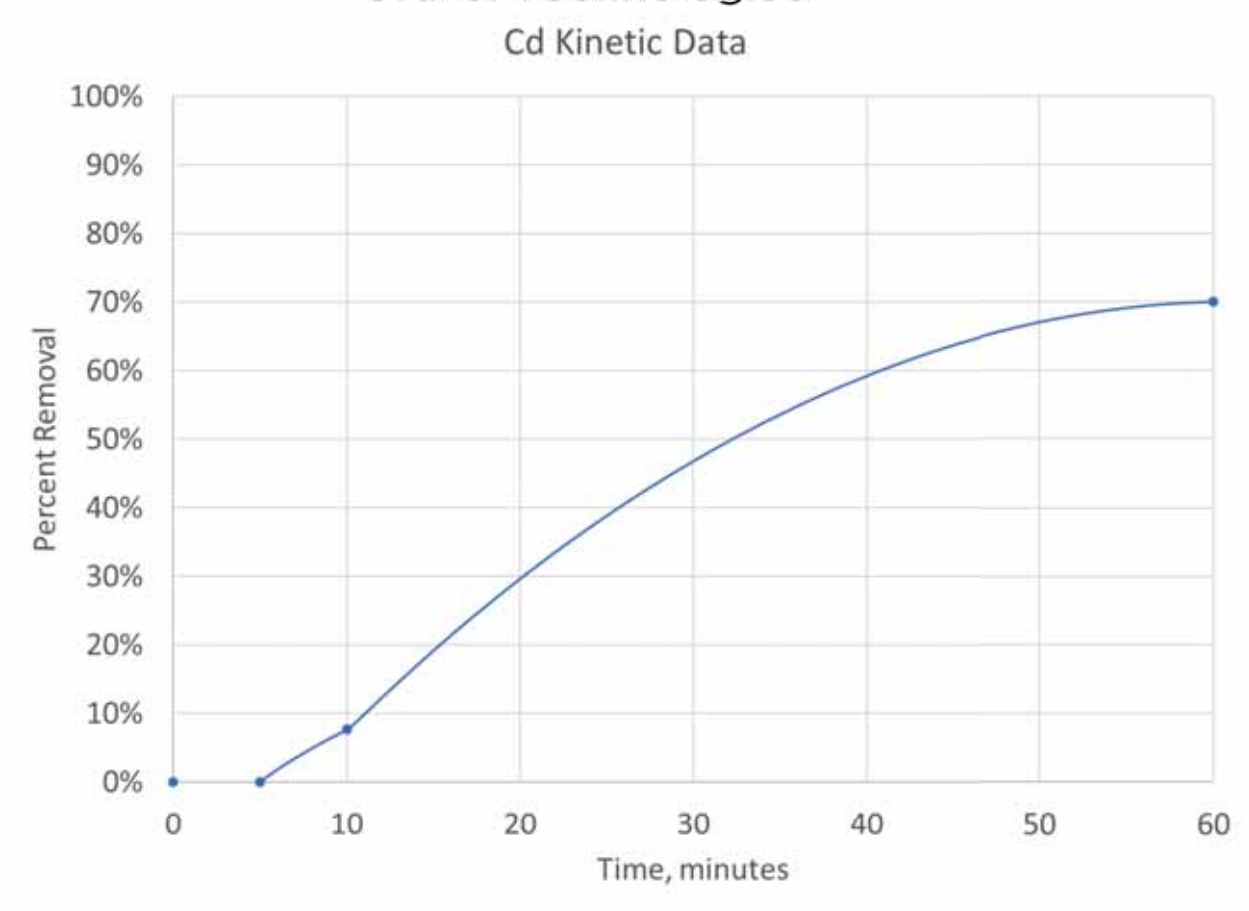


Figure 1. The Cd kinetic test at a V/m ratio of 1000 mL/dry gram of media. The test is limited by the method detection limit. A 10-minute contact time (at a very low concentration) only removes about 10% of the contaminant. At 60 minutes the % removal is much higher, but the calculation is limited by the detection limit. Note that the lines drawn are just connecting the dots to emphasize the change in efficiency. The connecting line is not a fit for the data; it is just a visual cue.

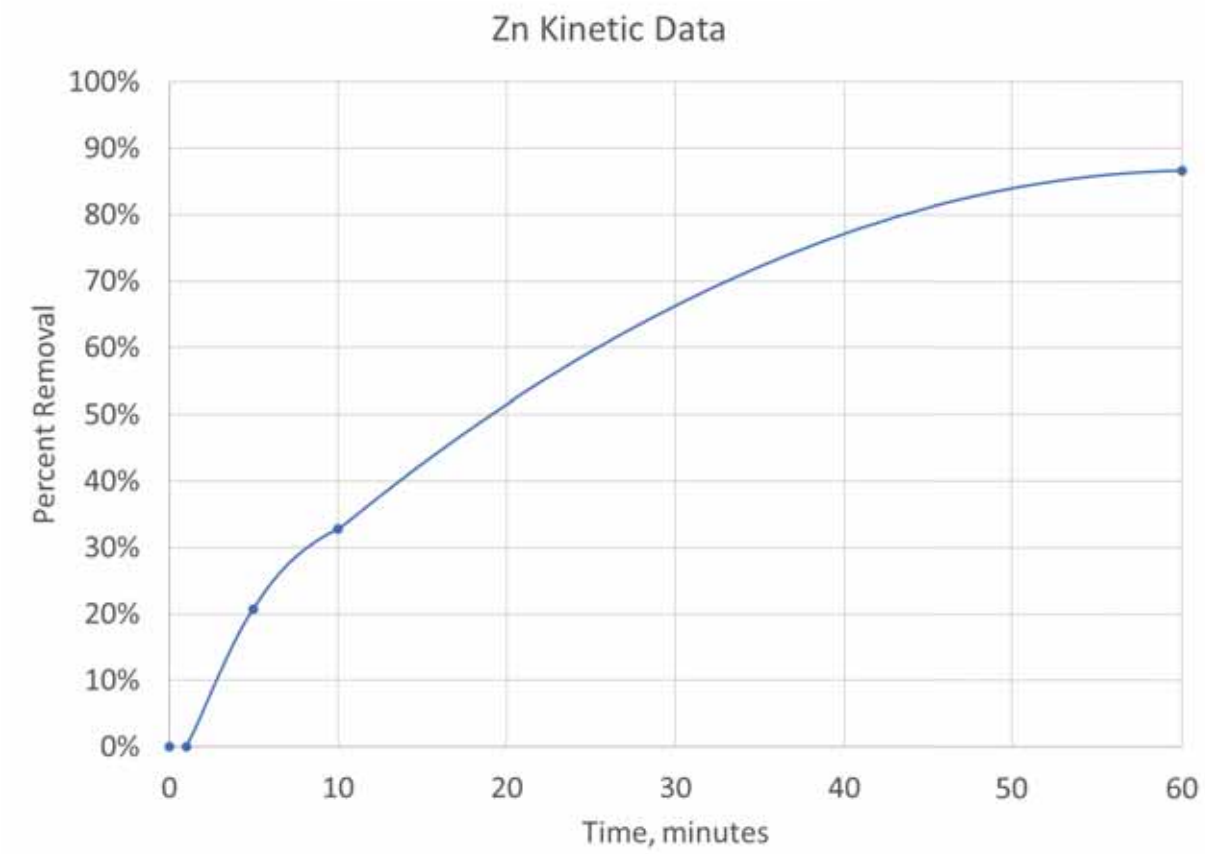


Figure 2. The Zn kinetic test at a V/m ratio of 1000 mL/dry gram of media. The test is limited by the method detection limit. A 10-minute contact time (at a very low concentration) only removes about 32% of the contaminant. At 60 minutes the % removal is much higher, ~85%. Note that the lines drawn are just connecting the dots to emphasize the change in efficiency. The connecting line is not a fit for the data; it is just a visual cue.

This analysis demonstrates that the media does remove a significant amount of both Cd and Zn but may have some kinetic hinderance. These tests were completed in a batch-like style which is not as efficient as a column test. In a column test, media is not distributed randomly in the fluid. Instead, the fluid passes through a bed, making the removal significantly more efficient. Based on the data gathered, the standard recommendation of one to three minutes empty bed contact time (EBCT) for HMRG is not likely to be effective. A ten-minute contact time shows some removal and is more practical than a 60-minute contact time. A pilot study with a 10-minute EBCT is recommended to increase confidence in the ability for the media to successfully remove the contaminants with the desired engineering design.

5.0 Conclusions

Graver has investigated the ability of MetSorb® HMRG to remove Cd and Zn from the water at the Nederland mine Cross site. MetSorb® HMRG has a capacity of over 15 mg/g for Zn and over 0.14 mg/g for Cd. The low concentration of Cd makes the HMRG kinetically hindered; a contact time

of 10 minutes is not only practical but may be sufficient to remove the Cd. The kinetic data on Zn removal shows that 40% of the Zn can be removed within 10 minutes. In a full-scale vessel, this should be sufficient to remove a significant portion of the Zn from the Cross water. The major recommendation of this report is that a pilot test be conducted. A pilot test with a lead-lag configuration and appropriate sampling would provide a more complete evaluation of the media's ability to remove both Cd and Zn to the necessary requirements for the Cross site.

Graver Technologies

200 Lake Drive
Glasgow, DE 19702

MetSorb® HMRG (Heavy Metal Removal Granules) – 16/60 US Mesh

Recommended Operational Design Parameters

OPERATING PARAMETER	MetSorb® HMRG 16/60
Service Flow Rate (Hydraulic Loading)	3-12 gpm/ft^2
Flow Direction	Typically Downward (Up-flow under certain conditions)
Empty Bed Contact Time (EBCT)	1.5-3.0 Minutes (Water Quality Dependent)
Maximum System Pressure	100 psi
Backwash Flow Rate	3-7 gpm/ft2
Backwash Bed Expansion	40%
Backwash Volume	5-7 Bed Volumes
Vessel Freeboard	50% of Bed Depth
Typical Minimum Bed Depth	22 Inches
Maximum Continuous ORP	400 mV
Sanitization Chlorine Concentration	25-50 ppm (for max 24 hr. hold)
Incoming Chlorine Concentration	0.5 ppm

MetSorb® HMRG is a highly effective granular adsorbent that reduces Arsenic III & V and a wide variety of heavy metals including Lead, Uranium, Antimony, Zinc, Radium, Cadmium, Copper, Chromium and Vanadium from drinking water and process solutions. For more information on MetSorb® adsorptive media, please contact Bennett Buchsieb at 302-383-9310 or by email at bbuchsieb@gravertech.com

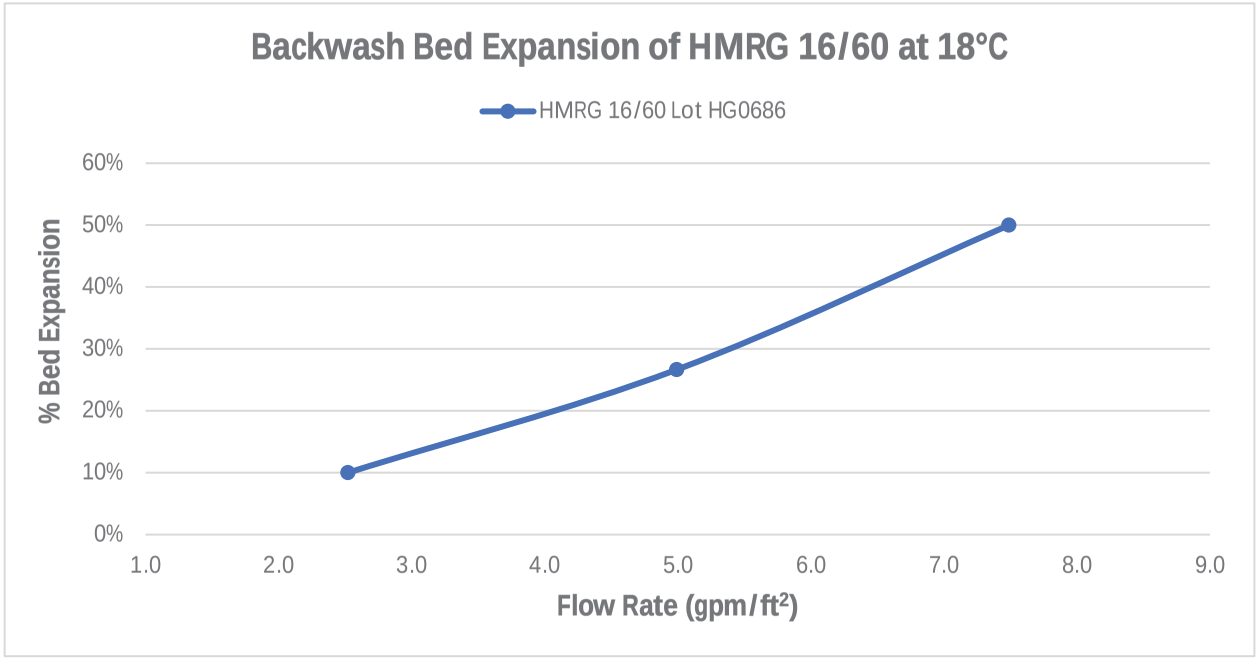
Graver Technologies - HMRG 16/60 Backwash Study at 18°C

HMRG 16/60 Lot HG0686

Temperature held at 18.0 ± 0.5°C using a Fisher Scientific Isotemp Refrigerated Circulator, Model 910

Column Diameter	1	inch
	0.785	square inches
	0.005451389	square feet
Initial Media Bed Height	7.5	inches

Target Flux (gpm/ft^2)	Target Flow Rate (mL/min)	Actual Flow Rate (mL/min)	Actual Flux (gpm/ft^2)	Bed Expansion (inches)	Bed Expansion %
2.5	51.6	52	2.521	8.25	10.0%
5.0	103.2	103	4.993	9.50	26.7%
7.5	154.8	155	7.490	11.25	50.0%



SAFETY DATA SHEET

MetSorb® HMRG, HMRP

Prepared to U.S. OSHA, CMA, ANSI, Canadian WHMIS, Australian WorkSafe, Japanese Industrial Standard JIS Z 7250:2000, and European Union REACH Regulations

Graver Technologies

SECTION 1 - PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME:	**MetSorb® HMRG, HMRP**
CAS NUMBER:	Mixture
PRODUCT USE:	Various
U.N. NUMBER:	Not Applicable
U.N. DANGEROUS GOODS CLASS:	Non-Regulated Material
SUPPLIER/MANUFACTURER'S NAME:	**Graver Technologies LLC**
ADDRESS:	200 Lake Drive, Glasgow, Delaware 19702-3319 USA
EMERGENCY PHONE:	**800-249-1990**
BUSINESS PHONE:	(302) 731-1700
BUSINESS FAX:	(302) 731-1707
DATE OF CURRENT REVISION:	July 23, 2015
DATE OF LAST REVISION:	October 20, 2011

SECTION 2 - HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW: This product is a dry, white powder or granules (solid) with no odor. Exposure can be irritating to eyes, respiratory system and skin. May be harmful if swallowed. It is a non-flammable solid. Excessive airborne dust creates a dust explosion hazard. The Environmental effects of this product have not been investigated, however this product is not expected to have any adverse effects.

US DOT SYMBOLS	CANADA (WHMIS) SYMBOLS	EUROPEAN and (GHS) Hazard Symbols
Non-Regulated	Complies with WHMIS 2015	 Signal Word: **Warning!**

GHS LABELING AND CLASSIFICATION:

This product does meet the definition of a hazardous substance or preparation as defined by 29 CFR 1910. 1200 AND the European Union Council Directives 67/548/EEC, 1999/45/EC, 1272/2008/EC and subsequent Directives.

Classification of the substance or mixture according to Regulation (EC) No1272/2008 Annex VI
EC# 236-675-5 This substance is not classified in the Annex I of Directive 67/548/EEC
EC# 243-744-3 This substance is not classified in the Annex I of Directive 67/548/EEC
CAS# 9002-89-5 This substance is not classified in the Annex I of Directive 67/548/EEC

GHS Hazard Classification(s):
Eye Damage/Irritation Category 2B

Hazard Statement(s):
H320:Causes eye irritation

Precautionary Statement(s):
P264: Wash hands thoroughly after handling
P280: Wear protective gloves/protective clothing/eye protection/face protection.

Hazard Symbol(s):
[Xi] Irritant

Risk Phrases:
R36: Irritating to eyes

Safety Phrases:
S24/25: Avoid contact with skin and eyes

HEALTH HAZARDS OR RISKS FROM EXPOSURE:

ACUTE: Exposure can be irritating to eyes, respiratory system and skin.
INHALATION: Inhalation of dusts may cause nose, throat and respiratory tract irritation.
EYE: Direct contact causes irritation with pain and redness.
SKIN: Prolonged or repeated contact may cause skin irritation with redness.
INGESTION: Ingestion may cause irritation to gastrointestinal tract

CHRONIC: None known

TARGET ORGANS: ACUTE: Eye, Respiratory System, Skin CHRONIC: None Known

SECTION 3 - COMPOSITION and INFORMATION ON INGREDIENTS

HAZARDOUS INGREDIENTS:	CAS #	EINECS #	ICSC #	WT %	HAZARD CLASSIFICATION; RISK PHRASES
Titanium Dioxide	13463-67-7	236-675-5	0338	30 - 100%	HAZARD CLASSIFICATION: [Xi] Irritant RISK PHRASES: R36
Titanium Hydroxide	20338-08-3	243-744-3	Not Listed	0 – 30%	HAZARD CLASSIFICATION: [Xi] Irritant RISK PHRASES: R36
Ethenol Homopolymer	9002-89-5	Not Listed in ESIS	Not Listed	0 – 10%	HAZARD CLASSIFICATION: Not Classified RISK PHRASES: None
Balance of other ingredients are non-hazardous or less than 1% in concentration (or 0.1% for carcinogens, reproductive toxins, or respiratory sensitizers).					

NOTE: ALL WHMIS required information is included in appropriate sections based on the ANSI Z400.1-2004 format. This product has been classified in accordance with the hazard criteria of the CPR and the SDS contains all the information required by the CPR, EU Directives and the Japanese Industrial Standard *JIS Z 7250: 2000*.

SECTION 4 - FIRST-AID MEASURES

Contaminated individuals of chemical exposure must be taken for medical attention if any adverse effect occurs. Rescuers should be taken for medical attention, if necessary. Take copy of label and SDS to health professional with contaminated individual.

EYE CONTACT: If product enters the eyes, open eyes while under gentle running water for at least 15 minutes. Seek medical attention if irritation persists.

SKIN CONTACT: Wash skin thoroughly after handling. Seek medical attention if irritation develops and persists. Remove contaminated clothing. Launder before re-use.

INHALATION: If breathing becomes difficult, remove victim to fresh air. If necessary, use artificial respiration to support vital functions. Seek medical attention.

INGESTION: If product is swallowed, call physician or poison control center for most current information. If professional advice is not available, do not induce vomiting. Never induce vomiting or give diluents (milk or water) to someone who is unconscious, having convulsions, or who cannot swallow. Seek medical advice. Take a copy of the label and/or MSDS with the victim to the health professional.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Pre-existing skin, respiratory system or eye problems may be aggravated by prolonged contact.

RECOMMENDATIONS TO PHYSICIANS: Treat symptoms and reduce over-exposure.

SECTION 5 - FIRE-FIGHTING MEASURES

FLASH POINT: Non-Flammable

AUTOIGNITION TEMPERATURE: Not Applicable

FLAMMABLE LIMITS (in air by volume, %): Lower (LEL): NA Upper (UEL): NA

FIRE EXTINGUISHING MATERIALS: As appropriate for surrounding fire. Carbon dioxide, foam, dry chemical, halon, or water spray. Do not release runoff from fire control methods to sewers or waterways.

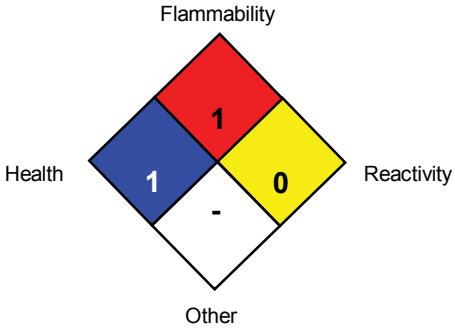
UNUSUAL FIRE AND EXPLOSION HAZARDS: High dust concentration may form explosive mixtures with air, which can be ignited by spark, flame or static discharge.

Explosion Sensitivity to Mechanical Impact: Not Sensitive.

Explosion Sensitivity to Static Discharge: Sensitive (Air/Dust mixtures)

SPECIAL FIRE-FIGHTING PROCEDURES: Incipient fire responders should wear eye protection. Structural firefighters must wear Self-Contained Breathing Apparatus and full protective equipment. Isolate materials not yet involved in the fire and protect personnel. Move containers from fire area if this can be done without risk; otherwise, cool with carefully applied water spray. If possible, prevent runoff water from entering storm drains, bodies of water, or other environmentally sensitive areas.

NFPA RATING SYSTEM



HMIS RATING SYSTEM

HAZARDOUS MATERIAL IDENTIFICATION SYSTEM	
HEALTH HAZARD (BLUE)	1
FLAMMABILITY HAZARD (RED)	1
PHYSICAL HAZARD (YELLOW)	0

PROTECTIVE EQUIPMENT			
EYES	RESPIRATORY	HANDS	BODY
	See Sect 8		See Sect 8

For Routine Industrial Use and Handling Applications

Hazard Scale: **0** = Minimal **1** = Slight **2** = Moderate **3** = Serious **4** = Severe * = Chronic hazard

SECTION 6 - ACCIDENTAL RELEASE MEASURES

SPILL AND LEAK RESPONSE: Personnel should be trained for spill response operations.
SPILLS: Contain spill if safe to do so. Prevent entry into drains, sewers, and other waterways. Sweep, shovel or vacuum (HEPA vacuum) spilled material and place in an appropriate container for re-use or disposal. Avoid dust generation if possible. For large spills, use wet methods and dike far ahead of any liquid spill. Do not release into sewers or waterways.
Dispose of in accordance with applicable Federal, State, and local procedures (see Section 13, Disposal Considerations).

SECTION 7 - HANDLING and STORAGE

WORK PRACTICES AND HYGIENE PRACTICES: As with all chemicals, avoid getting this product ON YOU or IN YOU. Wash thoroughly after handling this product. Do not eat, drink, smoke, or apply cosmetics while handling this product. Avoid breathing dusts generated by this product. Use in a well-ventilated location. Remove contaminated clothing immediately. Do not enter places where bulk material is used or stored until adequately ventilated to prevent asphyxiation.

As with all finely divided materials, precautions should be taken to avoid inhalation and eye contact. Ground all transfer, blending and dust collecting equipment to prevent static discharge in accordance with NFPA 70, "National Electric Code;" NFPA 499, "Recommended Practice for the Classification of Combustible Dusts and of Hazardous (classified) Locations for Electrical Installations in Chemical Process Areas;" NFPA 654, "Standard for the Prevention of Fire and Dust Explosions from the Manufacturing, Processing, and Handling of Combustible Particulate Solids" and OSHA Combustible Dust standards. Remove all ignition sources from material handling, transfer and processing areas where dust may be present.

STORAGE AND HANDLING PRACTICES: Containers of this product must be properly labeled. Store containers in a cool, dry location away from heat, flame and incompatible materials. Keep container tightly closed when not in use.

SECTION 8 - EXPOSURE CONTROLS - PERSONAL PROTECTION

EXPOSURE LIMITS/GUIDELINES:

Chemical Name	CAS#	ACGIH TWA	OSHA TWA
Titanium Dioxide	13463-67-7	10 mg/m³ Dust	15 mg/m³ Total Dust
Titanium Hydroxide	20338-08-3	Not Listed	Not Listed
Ethenol Homopolymer	9002-89-5	Not Listed	Not Listed

Currently, International exposure limits are established for the components of this product. Please check with competent authority

in each country for the most recent limits in place.

VENTILATION AND ENGINEERING CONTROLS: Use with adequate ventilation to ensure exposure levels are maintained below the limits provided below. Use local exhaust ventilation to control airborne dust. Ensure eyewash/safety shower stations are available near areas where this product is used.

The following information on appropriate Personal Protective Equipment is provided to assist employers in complying with OSHA regulations found in 29 CFR Subpart I (beginning at 1910.132) or equivalent standard of Canada, or standards of EU member states (including EN 149 for respiratory PPE, and EN 166 for face/eye protection), and those of Japan. Please reference applicable regulations and standards for relevant details.

RESPIRATORY PROTECTION: Maintain airborne contaminant concentrations below guidelines listed above, if applicable. If necessary, use only respiratory protection authorized in the U.S. Federal OSHA Respiratory Protection Standard (29 CFR 1910.134), equivalent U.S. State standards, Canadian CSA Standard Z94.4-93, the European Standard EN149, or EU member states.

EYE PROTECTION: Safety glasses are recommended. If necessary, refer to U.S. OSHA 29 CFR 1910.133 or appropriate Canadian Standards.

HAND PROTECTION: Use protective gloves to minimize skin contact. If necessary, refer to U.S. OSHA 29 CFR 1910.138 or appropriate Standards of Canada.

BODY PROTECTION: Use body protection appropriate to prevent contact (e.g. lab coat, overalls). If necessary, refer to appropriate Standards of Canada, or appropriate Standards of the EU, Australian Standards, or relevant Japanese Standards.

SECTION 9 - PHYSICAL and CHEMICAL PROPERTIES

PHYSICAL STATE:	Powder or Granular (Solid)
APPEARANCE & ODOR:	White powder or granular with no odor.
ODOR THRESHOLD (PPM):	Not Available
VAPOR PRESSURE (mmHg):	Not Applicable
VAPOR DENSITY (AIR=1):	Not Applicable.
PACKING DENSITY:	Not Available
EVAPORATION RATE (nBuAc = 1):	Not Applicable.
BOILING POINT (C°):	2,500 – 3,000°C (4,532 - 5,432°F)
MELTING POINT (C°):	1,855°C (3,371°F)
pH:	6 – 7 (Slurry)
SPECIFIC GRAVITY 4°C: (Water = 1)	4.26
SOLUBILITY IN WATER (%)	Insoluble in water
VOC:	0

SECTION 10 - STABILITY and REACTIVITY

STABILITY: Product is stable

DECOMPOSITION PRODUCTS: Thermal decomposition (burning) may produce irritating and toxic fumes of carbon (carbon dioxide, carbon monoxide).

MATERIALS WITH WHICH SUBSTANCE IS INCOMPATIBLE: None known

HAZARDOUS POLYMERIZATION: Will not occur.

CONDITIONS TO AVOID: Dust generation.

SECTION 11 - TOXICOLOGICAL INFORMATION

TOXICITY DATA: There is no available data for the product

CAS# 13463-67-7 LD50, Oral - Rat >10,000 mg/kg

SUSPECTED CANCER AGENT: One or more of the ingredients are found on the following lists: FEDERAL OSHA Z LIST, NTP, CAL/OSHA, IARC and therefore is considered to be, nor suspected to be a cancer-causing agent by these agencies.

Titanium Dioxide CAS# 13463-67-7 ACGIH A4, IARC Group 3

IRRITANCY OF PRODUCT: Contact with this product can be irritating to exposed skin, eyes and respiratory system.

SENSITIZATION OF PRODUCT: This product is not considered a sensitizer.

REPRODUCTIVE TOXICITY INFORMATION: No information concerning the effects of this product and its components on the human reproductive system.

SECTION 12 - ECOLOGICAL INFORMATION

ALL WORK PRACTICES MUST BE AIMED AT ELIMINATING ENVIRONMENTAL CONTAMINATION.

ENVIRONMENTAL STABILITY: The ecological characteristics of this product have not been fully investigated. The product should not be discharged unmonitored into the environment.

EFFECT OF MATERIAL ON PLANTS or ANIMALS: No evidence is currently available on this product's effects on plants or animals.

EFFECT OF CHEMICAL ON AQUATIC LIFE: No Data Available for this product at this time.

SECTION 13 - DISPOSAL CONSIDERATIONS

PREPARING WASTES FOR DISPOSAL: Waste disposal must be in accordance with appropriate Federal, State, and local regulations, those of Canada, Australia, EU Member States and Japan.

SECTION 14 - TRANSPORTATION INFORMATION

US DOT; IATA; IMO; ADR:

THIS PRODUCT IS NOT HAZARDOUS AS DEFINED BY 49 CFR 172.101 BY THE U.S. DEPARTMENT OF TRANSPORTATION.

PROPER SHIPPING NAME: Non-Regulated Material

HAZARD CLASS NUMBER and DESCRIPTION: Not Applicable

UN IDENTIFICATION NUMBER: Not Applicable

PACKING GROUP: Not Applicable.

DOT LABEL(S) REQUIRED: Not Applicable

NORTH AMERICAN EMERGENCY RESPONSE GUIDEBOOK NUMBER (2004): Not Applicable

U.S. DEPARTMENT OF TRANSPORTATION (DOT) SHIPPING REGULATIONS:

This product is not classified as dangerous goods, per U.S. DOT regulations, under 49 CFR 172.101.

TRANSPORT CANADA, TRANSPORTATION OF DANGEROUS GOODS REGULATIONS:

This product is not classified as Dangerous Goods, per regulations of Transport Canada.

INTERNATIONAL AIR TRANSPORT ASSOCIATION (IATA):

This product is not classified as Dangerous Goods, by rules of IATA:

INTERNATIONAL MARITIME ORGANIZATION (IMO) DESIGNATION:

This product is not classified as Dangerous Goods by the International Maritime Organization.

EUROPEAN AGREEMENT CONCERNING THE INTERNATIONAL CARRIAGE OF DANGEROUS GOODS BY ROAD (ADR):

This product is not classified by the United Nations Economic Commission for Europe to be dangerous goods.

SECTION 15 - REGULATORY INFORMATION

UNITED STATES REGULATIONS

SARA REPORTING REQUIREMENTS: This product is not subject to the reporting requirements of Sections 302, 304 and 313 of Title III of the Superfund Amendments and Reauthorization Act., as follows: None

TSCA: All components in this product are listed on the US Toxic Substances Control Act (TSCA) inventory of chemicals.

SARA 311/312:

Acute Health:	Yes	Chronic Health:	No	Fire:	No	Reactivity:	No

U.S. SARA THRESHOLD PLANNING QUANTITY: There are no specific Threshold Planning Quantities for this product. The default Federal MSDS submission and inventory requirement filing threshold of 10,000 lb (4,540 kg) may apply, per 40 CFR 370.20.

U.S. CERCLA REPORTABLE QUANTITY (RQ):

CERCLA Reportable Quantity (RQ), Sodium Hydroxide CAS# 1310-73-2 1,000 Lb RQ

CLEAN WATER ACT:

None of the chemicals in this product are listed as Hazardous Substances under the CWA.

STATE REGULATIONS:

None.

CALIFORNIA SAFE DRINKING WATER AND TOXIC ENFORCEMENT ACT (PROPOSITION 65): One or more of the ingredients are on the California Proposition 65 lists.

WARNING! This product contains ingredients known by the State of California to cause cancer or reproductive harm.

CANADIAN REGULATIONS:

CANADIAN DSL/NDSL INVENTORY STATUS: All of the components of this product are on the DSL Inventory

CANADIAN ENVIRONMENTAL PROTECTION ACT (CEPA) PRIORITIES SUBSTANCES LISTS: No component of this product is on the CEPA First Priorities Substance Lists.

CANADIAN WHMIS CLASSIFICATION and SYMBOLS: Complies with WHMIS 2015

EUROPEAN ECONOMIC COMMUNITY INFORMATION:

EU LABELING AND CLASSIFICATION:

Classification of the mixture according to Regulation (EC) No1272/2008. See section 2 for details.

AUSTRALIAN INFORMATION FOR PRODUCT:

AUSTRALIAN INVENTORY OF CHEMICAL SUBSTANCES (AICS) STATUS: All components of this product are listed on the AICS.

STANDARD FOR THE UNIFORM SCHEDULING OF DRUGS AND POISONS: Not applicable.

JAPANESE INFORMATION FOR PRODUCT:

JAPANESE MINISTER OF INTERNATIONAL TRADE AND INDUSTRY (MITI) STATUS: The components of this product are not listed as Class I Specified Chemical Substances, Class II Specified Chemical Substances, or Designated Chemical Substances by the Japanese MITI.

INTERNATIONAL CHEMICAL INVENTORIES:

Listing of the components on individual country Chemical Inventories is as follows:

Asia-Pac:	Listed
Australian Inventory of Chemical Substances (AICS):	Listed
Korean Existing Chemicals List (ECL):	Listed
Japanese Existing National Inventory of Chemical Substances (ENCS):	Listed
Philippines Inventory if Chemicals and Chemical Substances (PICCS):	Listed
Swiss Giftliste List of Toxic Substances:	Listed
U.S. TSCA:	Listed

SECTION 16 - OTHER INFORMATION

PREPARED BY: Paul Eigbrett MSDS Compliance PLUS

Appendix D - Ensero

Environmental Site Solutions, LLC

DATE	:	11-03-2021
TO	:	Danny Pollock / Greg Miller
COMPANY	:	Grand Island Resources LLC - Nederland Mine
FROM	:	Mike Tallering
SUBJECT	:	Phase I & Phase II Temporary Water Treatment Systems
PAGES	:	2 (Including Cover)

Danny / Greg,

Per your request, please see the following revised pricing for supply and delivery of temporary water treatment system for your project while permanent system is designed & fabricated

Phase #1 – Emergency Treatment (7-10 Day Lead Time)

We can provide treatment vessels & Graver Metsorb HMRG media to polish metals and 'pilot' removal efficiency & EBCT.

(2)	**2,000 lb. Media Pressure Vessels for Metsorb Media**		**$975/vessel/mnth**

Additional Fixed Costs:

(1)	**Mobilization & Delivery of Systems to Project Site**		**$5,850**
(1)	**Metsorb HMRG Media for Above Media Filters**	**$24,750/vessel**	**$49,500**
(1)	**End of Project Demob & Delivery back to ESS**		**$5,850**

Note:

- We do not currently have rental pump or bag filter housing but can help you source locally for short term rental

14450 Austin Place ▪ Anacortes, WA 98221 ▪ Phone: 360-503-7299 ▪ mike.tallering@envirositesolutions.com

Phase #2 – Temporary Treatment System (3-5 Week Lead Time)

Rental Pricing for the Below Equipment System: $14,850/month

Includes:

(1) 20' Shipping Container: Insulated with Double Coat Temp Coat 101, Heater (2x), 480V Service Disconnect, Interconnecting Plumbing/Hoses w/ 4" Flanged Inlet/Outlet

(1) 10 HP Pump w/ Controls

(2) Dual Stage Bag Filter Units, Manual Operations Req'd.

(2) 2,000 lb. Media Pressure Vessels for Metsorb Media

Additional Fixed Costs:

(1)	**Mobilization & Delivery of Systems to Project Site**		**$8,750**
(1)	**Metsorb HMRG Media for Above Media Filters**	**$24,750/vessel**	**$49,500**
(1)	**Installation, Start-up & Training** - Includes (3) days on-site, (2) ½-day, & travel & per diem costs		**$5,500**
(1)	**End of Project Demob & Delivery back to ESS**		**$8,750**

Notes:

- Above Pricing is for a minimum of (6) month duration
- Lead time to ship is 3-5 weeks ARO
- System will be manually operated. Permanent system will be automated

Not Included In Above Scope :

- Off-loading at site and placement of containerized system not included in above
- Plumbing from pump to containerized system not included in above
- Electrical work not included in above
- Operation of system not included in above

All pricing is valid for 60 days from above date. Pricing does not include any taxes, duties or applicable fees.

Thank you for the opportunity to provide pricing to you on your activated carbon needs. Please feel free to contact me with any questions or comments that you may have. You can reach me at 360-503-7299 or via email at mike.tallering@envirositesolutions.com.

Mike Tallering
Environmental Site Solutions
mike.tallering@envirositesolutions.com
www.envirositesolutions.com
360-503-7299

SERVICES AGREEMENT

GRAND ISLAND RESOURCES, LLC
&

ENSERO SOLUTIONS US, INC.

TABLE OF CONTENTS

SERVICES AGREEMENT

THIS AGREEMENT is effective the 8th day of November, 2021.

BETWEEN:

GRAND ISLAND RESOURCES with its mailing address at 12567 W CEDAR DR, LAKEWOOD, CO 80228 (the "**Owner**")

AND:

ENSERO SOLUTIONS US, INC., with its mailing address at 12150 E. Briarwood Avenue, Suite 135, Centennial, CO 80112

(the "**Contractor"**)

WHEREAS:

A. the Owner is responsible for the development and operation of the Caribou and Cross mines, located approximately 4.5 miles west of Nederland, CO (the "**Project**");

B. the Owner wishes to engage the Contractor to provide certain services for the Project at the direction of the Owner's designate; and

C. the Owner and the Contractor have agreed to enter into this Agreement to provide for the terms and conditions of such engagement.

THEREFORE in consideration of the agreements and covenants set out in this Agreement the Owner and the Contractor agree as follows:

1. INTERPRETATION

1.1 Definitions

In this Agreement:

"**Affiliate**" means any person which directly or indirectly controls, is controlled by, or is under common control with, a Party;

"**Agreement**" means this agreement, including all Schedules;

"**Business Day**" means any day other than Saturday, Sunday or statutory holiday;

"**Effective Date**" means the date first written above;

"**Fees**" has the meaning set out in Section 3.1;

"**Notice**" has the meaning set out in Section 8.9;

"**Parties**" means the Owner and the Contractor, and "Party" means any one of them;

"**Project**" has the meaning set out in recital A; and

"**Services**" means the services described in Schedule A.

1.2 Construction and Interpretation

In this Agreement, including the recitals to this Agreement, except where expressly stated to the contrary or the context otherwise requires:

(a) the recitals and headings to Sections and Schedules are for convenience only and will not affect the interpretation of this Agreement;

(b) each reference in this Agreement to "**Section**" and "**Schedule**" is to a Section of, and a Schedule to, this Agreement;

(c) each reference to a statute is deemed to be a reference to that statute and any successor statute, and to any regulations, rules, policies and criteria made under that statute and any successor statute, each as amended or re-enacted from time to time;

(d) words importing the singular include the plural and vice versa and words importing gender include all genders;

(e) unless otherwise stated in this Agreement, all references to amounts of money mean lawful currency of the United States;

(f) an accounting term has the meaning assigned to it, and all accounting matters will be determined, in accordance with generally accepted accounting principles consistently applied;

(g) the word "written" includes printed, typewritten, faxed, e-mailed or otherwise capable of being visibly reproduced at the point of reception and "in writing" has a corresponding meaning;

(h) the words "include" and "including" are to be construed as meaning "including, without limitation"; and

(i) this Agreement shall be construed as though both Parties drafted it.

1.3 Governing Law

This Agreement will be governed by and construed in accordance with the laws of Colorado and the laws of the United States applicable in therein.

2. PROJECT SERVICES

2.1 Appointment

The Owner hereby appoints the Contractor, and the Contractor hereby accepts the appointment, to perform the Services set out in Schedule A at the direction of the Owner's Representative. For greater certainty, nothing in this Agreement will purport to grant any right, power or authority, on behalf of or in the name of the Owner, to participate in the management, direction or control of the Owner or to relieve the Owner of its obligations.

2.2 Term

This Agreement will be effective from the Effective Date until the earlier of:

(a) the date on which each of the Contractor and the Owner have fulfilled their obligations pursuant to this Agreement;

(b) the date as of which this Agreement is terminated by mutual written agreement of the Parties; and

(c) the date this Agreement is terminated in accordance with Section 4.

2.3 Standard of Care

The Contractor will perform the Services with a level of effort indicated by the budget and a degree of care, skill and diligence normally provided by a qualified and experienced practitioner performing services similar to the Services in relation to projects similar to the Project.

2.4 Compliance with Laws

In performing the Services, the Contractor will comply in all material respects with all applicable laws.

2.5 Reports

Any report prepared by the Contractor in connection with the Services (a "**Report**") will upon full payment of the Services be for the exclusive use of the Owner, and for the limited purpose as may be expressly set out in Schedule A. The Contractor will not release or distribute, or permit the release of distribution of any Report to any other person without the Owner's written approval not to be unreasonably withheld.

2.6 Qualified Personnel

The Contractor will provide professional personnel who have the qualifications, experience and capabilities to perform the Services.

2.7 Independent Contractor

The Parties acknowledge that in entering into this Agreement and in performing the Services, the Contractor has and will have the status of an independent contractor and that nothing in this Agreement will contemplate or constitute the Contractor or any subcontractor as a partner or employee of the Owner for any purpose.

3. FEES AND PAYMENT

3.1 Fees

The Owner will pay to the Contractor the fees and disbursements described in Schedule B (the "**Fees**") plus applicable taxes.

3.2 Payment Terms

The Contractor will submit monthly invoices to the Owner for Fees (plus all applicable taxes) related to Services provided in the previous month. The Owner will pay all invoices within 30 days of the date of receipt of the invoice. All invoiced amounts not paid when due shall bear interest from the required payment date of the corresponding invoice at the rate of 1.5% per month, compounding monthly until paid.

If the Owner disputes any portion of an invoice, then the Owner shall notify the Contractor with 7 Business Days of receipt of such invoice with details of the disputed amount and the Owner may withhold the disputed amount and pay the outstanding amount by the due date. If the Owner and Contractor cannot resolve such disputed amounts; then the issue shall be referred to Section 6, Dispute Resolution.

If the undisputed portion of any invoice is not paid by the Owner by its due date and the Owner does not rectify within 7 Business Days of notification by the Contractor, the Contractor may suspend performance of the Services and withhold documentation until all outstanding amounts are paid and received.

3.3 Records

If the Owner reasonably requests, then the Contractor shall provide the Owner daily, weekly, or monthly reports of labour hours by task, equipment hours, subcontractor hours and materials chargeable to the Owner in accordance with Schedule B in connection with the Services. The Owner shall approve or dispute

in part or in whole such reports within 48 hours of receipt of the report otherwise it shall be deemed to be accepted.

The Contractor will prepare and maintain proper records related to the Services, including records, receipts and invoices relating to disbursements. On request from the Owner, the Contractor will make the records available open to audit examination by the Owner at any time during regular business hours during the time the Contractor is providing the Services and for a period of 1 year after the expiry of the Term.

4. TERMINATION

4.1 Termination by Owner

The Owner may terminate this Agreement if the Contractor is adjudged bankrupt, or makes a general assignment for the benefit of creditors because of its insolvency, or if a receiver is appointed because of its insolvency, the Owner may, without prejudice to any other right or remedy the Owner may have, terminate this Agreement by giving the Contractor or receiver or trustee in bankruptcy written notice; or if the Contractor materially breaches its obligations under this Agreement and any such breach is not remedied to the reasonable satisfaction of the Owner within 20 Business Days after delivery of written notice from the Owner to the Contractor (or such longer period as may be agreed to by the Owner), then the Owner may, without prejudice to any other right or remedy the Owner may have, terminate this Agreement by giving the Contractor further written notice.

4.2 Termination by Contractor

The Contractor may terminate this Agreement if the Owner is adjudged bankrupt, or makes a general assignment for the benefit of creditors because of its insolvency, or if a receiver is appointed because of its insolvency, the Contractor may, without prejudice to any other right or remedy the Contractor may have, terminate this Agreement by giving the Owner or receiver or trustee in bankruptcy written notice; or if the Owner materially breaches its obligations under this Agreement and any such breach is not remedied to the reasonable satisfaction of the Contractor within 20 Business Days after delivery of written notice from the Contractor to the Owner (or such longer period as may be agreed to by the Contractor), then the Contractor may, without prejudice to any other right or remedy the Contractor may have, terminate this Agreement by giving the Owner further written notice.

4.3 Payment on Termination

Upon termination of this Agreement in accordance with Sections 4.1 or 4.2, the Owner will pay the Contractor Fees for services rendered by the Contractor up to the effective date of termination, plus all costs associated with demobilization and cancellation of third-party contracts.

5. INDEMNITY AND INSURANCE

5.1 Indemnification by Contractor

The Contractor will indemnify and save harmless the Owner, their respective subsidiary and affiliated companies, and all of its directors, officers, employees, agents, representatives and indemnities, from and against all claims, demands, causes of action, suits, losses, damages and costs, liabilities, expenses and judgments (including all actual legal costs) which any of the indemnified Parties incur, suffer or are put to arising out of or in connection with:

(a) any failure, breach, misrepresentation, breach of representation or warranty or non-fulfillment of any covenant or obligation on the part of the Contractor under this Agreement or any wrongful or negligent act, error or omission of the Contractor or any official, director, employee, agent, sub-Contractor, representative or subcontractor of the Contractor; and

(b) any and all claims, actions, suits, proceedings, demands, assessments, judgments, costs and legal and other expenses arising from third parties or incident to any of the matters in Section 5.1(a), except to the extent caused or contributed by breach of any provision of this Agreement by the Owner, its directors, officers, employees, agents or representatives or any negligent act, omission or willful misconduct of or by any of them.

5.2 Indemnification by Owner

The Owner will indemnify and save harmless the Contractor and all of its directors, officers, employees, agents, representatives and indemnities, from and against all claims, demands, causes of action, suits, losses, damages and costs, liabilities, expenses and judgments (including all actual legal costs) which the indemnified Parties incur, suffer or are put to arising out of or in connection with:

(a) any failure, breach, misrepresentation, breach of representation or warranty, or nonfulfillment of any covenant or obligation on the part of the Owner under this Agreement;

(b) any wrongful or negligent act of the Owner or any official, employee, agent of the Owner (other than the Contractor and its subcontractors); and

(c) any and all claims, actions, suits, proceedings, demands, assessments, judgments, costs and legal and other expenses arising from or incident to any of the matters in Section 5.2(a), except to the extent caused or contributed by breach of any provision of this Agreement by or any negligent act, omission or willful misconduct of or by the Contractor, its directors, officers, employees, agents or representatives, indemnities or any of them.

5.3 Insurance

The Contractor will at its own cost and expense at all times during the term of this Agreement maintain adequate and appropriate insurance needed to perform the Services. Proof of insurance will be provided to the Owner upon request.

5.4 No Consequential Damages

The liability of each Party with respect to a claim against the other under this Agreement is limited to direct damages only and neither Party will have any liability whatsoever for consequential or indirect loss or damage (such as, but not limited to, claims for loss of profit, revenue, production, business, contracts or opportunity and increased cost of capital, financing or overhead) incurred by the other Party. In no event shall the Contractor's maximum liability to the Owner with respect to the Services or otherwise relating to this Agreement exceed an amount equal to 100% of the aggregate amount of Fees paid by the Owner the Contractor under this Agreement in respect of the Services (as described on Schedule A) to which the applicable losses or liabilities relate.

6. DISPUTE RESOLUTION

6.1 Referral

If any dispute or difference between the Parties arises with respect to this Agreement, with the exception of any issue regarding non or late payment of undisputed invoice(s) or portions thereof, which is not settled informally or by mediation within a reasonable time, the Parties or their respective successors and assigns, will refer such dispute or difference to arbitration in accordance with the terms of this Agreement.

6.2 Appointment of Arbitrators and Procedure

The Party desiring to refer a matter to arbitration will notify the other Party of its intention to do so. If the Parties cannot agree upon a single arbitrator within fourteen (14) days of such notice, then each Party will

appoint an arbitrator and the two appointed arbitrators will together select a third neutral arbitrator. Except as specifically provided in this Section, the arbitration will be conducted in the exclusive jurisdiction of Denver, Colorado, in accordance with the American Arbitration Association rules of commercial disputes. The arbitration award will be binding upon the Parties to this Agreement.

7. CONFIDENTIALITY

Confidential Information means all non-public information, whether disclosed before or after the effective date of this Agreement, that is conveyed from the one Party to the other, orally or in electronic or tangible form, or otherwise obtained by the receiving Party through observation or examination of the disclosing Party's operations or Confidential Information, and (i) is marked as "confidential," (ii) is orally designated by as "confidential" and confirmed in writing within thirty (30) days of disclosure, or (iii) due to the circumstances surrounding its disclosure would be reasonably construed as "confidential." Confidential Information does not include any information which (a) was rightfully in the possession of the Contractor prior to receiving it from the Owner, (b) is independently developed by the Contractor without use of or reliance upon the Confidential Information from the Owner, (c) was in the public domain at or subsequent to the time of disclosure (through no breach of the Contractor) or (d) is obtained in good faith from a third Party not under any obligation of confidentiality.

The Contractor acknowledges it has acquired and will acquire Confidential Information of the Owner in connection with the performance of the Services. The Contractor shall:

(a) during the term of this Agreement and indefinitely thereafter, treat Confidential Information as strictly confidential and shall not disclose or permit the disclosure of Confidential Information except to those officers and employees of the Contractor with a need to know, and upon whom confidentiality obligations have been imposed, or except as required by law;

(b) during the term of this Agreement and for two years thereafter, not make use of Confidential Information other than as required for the sole and exclusive purpose of performing the Services; and

(c) promptly return to the Owner, upon written request, or provide confirmation of destruction of, all Confidential Information.

8. GENERAL

8.1 Entire Agreement

This Agreement contains the entire agreement of the Parties regarding the performance of the Services and no understandings or agreements, oral or otherwise, exist between the Parties except as expressly set out in this Agreement.

8.2 Amendment

This Agreement may be amended only by agreement in writing, signed by both Parties.

8.3 Changes

Changes to Schedule A – Services and Schedule B – Fees may occur from time to time, provided that such changes shall be amended by the use of a Change Order signed by both Parties.

8.4 Assignment and Enurement

This Agreement shall not be assigned by either Party, without the prior consent of the other Party which shall not to be unreasonably withheld**.** This Agreement shall be binding upon the Parties respective administrators, trustees, receivers, successors and permitted assigns.

8.5 Unenforceability

If any provision of this Agreement is invalid or unenforceable, it will be severed from the Agreement and will not affect the enforceability or validity of the remaining provisions of the Agreement.

8.6 Waiver

No waiver by either Party of any breach by the other Party of any of its covenants, obligations and agreements will be a waiver of any subsequent breach or of any other covenant, obligation or agreement, nor will any forbearance to seek a remedy for any breach be a waiver of any rights and remedies with respect to such or any subsequent breach.

8.7 Force Majeure

Event of Force Majeure means acts of God or public enemy, wars (declared or undeclared), revolution, riots, insurrections, civil commotions, fires, floods, slides, earthquakes, epidemics, pandemics, quarantine restrictions, strikes or lockouts, including illegal work stoppages or slowdowns, or stop work orders issued by a court or statutory authorities (providing that such orders are not issued nor any such labour disputes occasioned as a result of an act or omission of either Party, or any one employed or retained by either Party), freight embargoes or power failures, or any event or circumstance which reasonably constitutes a material disabling event or circumstance, which is beyond the reasonable control of a Party, which does not arise from the neglect or default of a Party, and which results in material delay, interruption or failure by a Party in carrying out its duties, covenants or obligation under this Agreement, but which does not mean or include any delay caused by a Party's lack of funds or financial condition.

If any Party is bona fide delayed or hindered in or prevented from the performance of any obligation, covenant or other act required under this Agreement, by reason of an Event of Force Majeure, the said Party will be relieved from the fulfillment of such obligation, covenant or act during the period of such interruption and the period for the performance of any such obligation, covenant or other act will be extended for a period equivalent to the period of such delay.

8.8 Language

All communication and documentation will be in English unless agreed otherwise.

8.9 Notices

Any notice, approval, election, demand, direction, consent, designation, request, agreement, instrument, certificate, report or other communication required or permitted to be given or made under this Agreement (each, a "**Notice**") to a Party must be given in writing. A Notice may be given by delivery to an individual or electronically by email, and will be validly given if delivered on a Business Day at the following address, or, if transmitted on a Business Day by email addressed to the following Party:

To the Owner:	To the Contractor:
GRAND ISLAND RESOURCES, LLC	Ensero Solutions US, Inc.
Attention: Danny Pollock	12150 E. Briarwood Avenue, Suite 135
Email: dpollock@nedmining.com	Centennial, CO 80112
	Attention: Billy Ray
	Email: bray@ensero.com

or to any other address, email address or individual that the Party designates in writing in accordance with this Section.

8.10 Time

Time is of the essence of this Agreement.

8.11 Counterparts; Execution

This Agreement may be executed and delivered electronically and in counterparts, and any such documents shall be deemed to be an original, and one and the same instrument.

IN WITNESS WHEREOF the Parties have duly executed this Agreement as of the Effective Date.

GRAND ISLAND RESOURCES, LLC

Per: _____

Name: Anthony R Russo

Title: Chief Financial Officer

ENSERO SOLUTIONS US, INC.

Per: _____

Name: Paul Barnes

Title: Chief Operating Officer

SCHEDULE A

SERVICES

Contractor shall provide services for the following scopes of work:

The Scope of work will include the design, installation, and commissioning of a TSS filtration system in support of the water management at the Caribou/Cross mines as defined in the Ensero proposal dated November 6, 2021.

SCHEDULE B

FEES

The project will be invoiced monthly on a Time and Materials basis using the Contractor's standard 2021 unit rate schedule. A detailed cost estimate is provided in Ensero's proposal dated November 6, 2021.

Appendix E – Environmental Site Solutions (ESS)

2K Liquid Phase Media Pressure Filter

Product Description

These units are designed for the efficient purification of contaminated water or liquid streams. These filters have the ability to remove contaminants to non-detectable levels. The vessels are constructed of heavy-duty mild steel and are lined with a double-layer epoxy coating.

Technical Data

Weights and Measures

Max. Flowrates	100 gpm
Max. Pressure	75 psi
Max. Temperature	150°F
Height	94"
Diameter	48"

Shipping Weight*
Vessel Only *1,100 lbs*
Vessel & Media (Media Dependent) 3100 lbs. – 5100 lbs.

Wetted Materials *for material compatibility check*

Carbon Steel*	Shell and heads
PVC	Bottom underdrain
Neoprene	Manway gaskets
Carboline Plasite 4110	Internal Liner

* Theoretically if the vessel has an interior liner, no carbon steel should be exposed to the liquid. However, if there are areas of thin or missing liner, bare carbon steel will be exposed. It is always a good idea to check compatibility of carbon steel even if the vessel interior is lined.

Filter Media

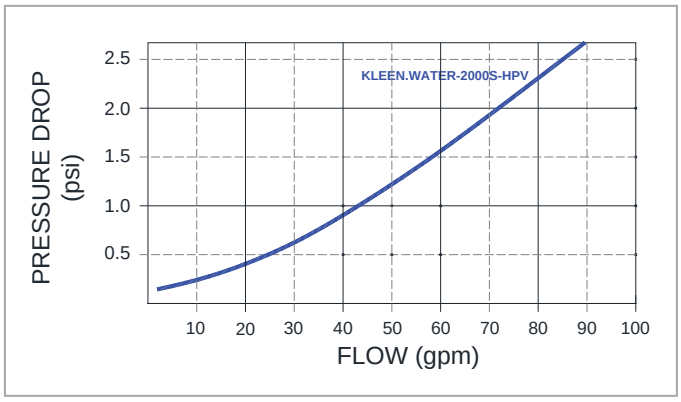
Types	• Activated Carbon • Organoclay • Ion Exchange Resin • Specialty Media
Volume	68 cu. ft
Weight	2000 lbs. – 4000 lbs. *(media dependent)*

Miscellaneous Data

Inlet	4" Female NPT
Outlet	4" Female NPT
Interior Coating	Double-layered epoxy coating
Internals	PVC underdrain
Media Access	Top & side 12"x16" manways *(neoprene gaskets)*

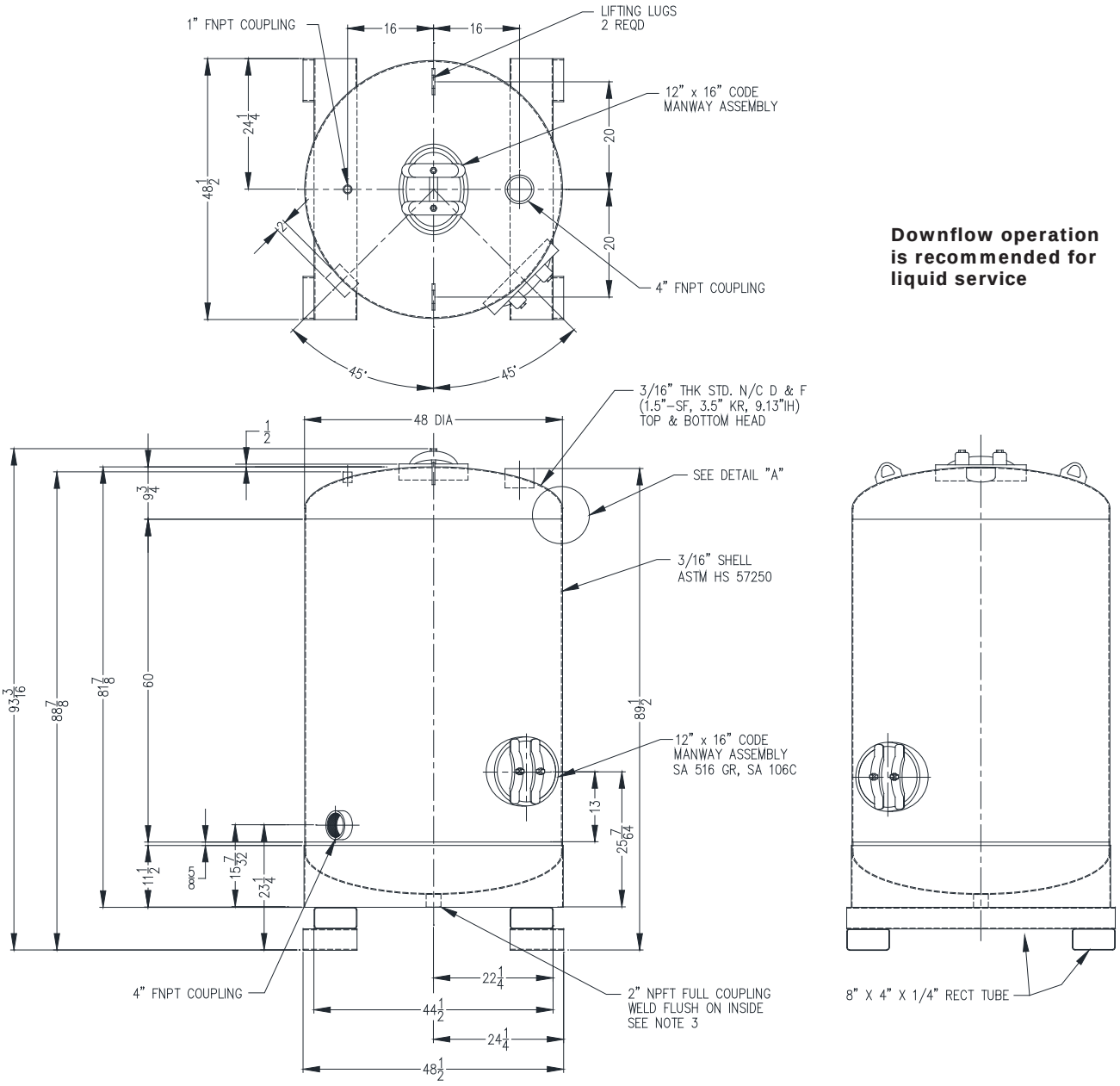
⚠ NOTE: Wet activated carbon preferentially removes oxygen from air. In closed or partially closed containers and vessels, oxygen depletion may reach hazardous levels. If workers are to enter a vessel containing carbon, appropriate procedures for potentially low oxygen spaces must be followed, including all federal and state requirements.

Pressure Drop Data



Data Sheet

2K Liquid Phase Media Pressure Filter



Downflow operation is recommended for liquid service

Appendix F – Ground Water and Surface Water Monitoring Plans (GWMP and SWMP)

REVISED GROUNDWATER MONITORING PLAN CROSS GOLD MINE NEDERLAND, COLORADO

Grand Island Resources LLC
P.O. Box 3395
4415 Caribou Road
Nederland, Colorado 80466

April 25 2022

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1 INTRODUCTION

This is a groundwater monitoring plan (GWMP) for the Grand Island Resources LLC (GIR) Cross Gold Mine operating under Colorado Permit M1977-410. The plan is required by Colorado Division of Reclamation, Mining and Safety (DRMS) rules and is being submitted in partial requirements for the current permit. The DRMS guidance document “Groundwater Monitoring and Protection Technical Bulletin” of November 19, 2019 was used in preparation of this site-specific monitoring plan and this plan conforms to DRMS guidance. Tables, Maps, and Figures follow the main body of the plan. Supplementary documents are attached as Appendices. This plan was originally written in 2021 and it has been revised in accordance to DRMS comments made to the document in its March 25, 2022 letter and other technical review criteria that is known about site specific conditions. Edits have also been made to the geologic sections as the prior author missed some local controls on infiltration and water storage.

The Cross Mine surface site is located within Sections 5, 8, and 9, in Township 1 South and Range 73 West or 39°58'41.3"N latitude and 105°34' 20.9"W longitude (UTM coordinates 4,425,324N and 548,861W, Zone 48, N), being approximately 3 miles west of Nederland, Colorado. The street address of the facility is 4415 Caribou Road, Nederland, CO 80466. The general location of the property is depicted in Map 1 and the features of the property are displayed in Map 2.

Two small areas separate from the main mine site (not shown in the Figures) have been added to the M1977-410 permit disturbance area; the Caribou 300 Level Portal and the Potosi Shaft. These two parcels, totaling 0.39 acre combined, are intended for future use as mine ventilation and access. Use of these areas is not reasonably expected to alter the hydrologic balance or water quality at the site, or beyond, and they are not included in the groundwater monitoring plan for that reason. The groundwater monitoring plan is to monitor groundwater quality within the 9.60-acre disturbance area depicted in Map 2. The DRMS disturbance boundary in Map 2 is proposed here as the compliance boundary with respect to groundwater monitoring.

Colorado hard rock mining operations have requirements to minimize degradation of the hydrologic environment. The DRMS has primacy for groundwater monitoring at hard rock mines. DRMS is the implementing agency for groundwater monitoring compliance standards and regulations set by the Colorado Department of Public Health and Environment (CDPHE) Water Quality Control Commission (WQCC - standards setting) and the Water Quality Control Division (WQCD - technical evaluation and enforcement) at hard rock mines. Groundwater monitoring planning, implementation and reporting by the mine must conform to WQCD Regulation No. 41 – The Basic Standards for Groundwater, and Regulation No. 42 Site-Specific Water Quality Classifications and Standards for Groundwater.

The CDPHE WQCC has not established Regulation 42 use classifications or site-specific numerical standards for groundwater quality beneath the mine; other than applicable state-wide standards. The Cross Mine is subject to the state-wide water

quality standards for drinking water found in Rule 41 as the mine is not located in a classified area found in Rule 42.

Based on site-specific conditions, regional to local studies of surface and groundwater quality, baseline sampling for this plan, and the lack of observations of acid-rock drainage or seepage over the 150-year history of the Caribou and Grand Island mining districts, GIR does not believe that operations at the Cross Gold Mine have the potential to impact water quantity, or groundwater quality beyond standards imposed by the WQCC.

The site-wide hydrogeologic characterization is ongoing at the property. The current understanding is sufficient to support development of a groundwater monitoring plan as it covers areas and activities currently permitted at the Cross Gold Mine. GIR is expanding the characterization by:

- collecting existing water well and in-mine water level data using equipment downloaded at regular intervals,
- testing aquifer properties at water wells and core holes,
- evaluating in-stream flows and groundwater surface water interaction as part of a separate investigation to support water court determinations, and,
- an engineering evaluation of in-mine groundwater flows to be expected under different underground development and mining scenarios.

2 CLIMATE AND PHYSIOGRAPHY

Colorado is divided into two major geographical regions, the Eastern Plains, and the Rocky Mountains. The facility is located along the eastern flank of the Front Range of the Southern Rocky Mountains at an elevation of 9,000 to 10,500 feet above sea level. The facility is located in sub-alpine terrain upslope of the Town of Nederland, Colorado, in the Coon Track Creek sub-basin of Middle Boulder Creek basin. The topography of the mine site is fairly gentle however many of the surrounding mountains are steep and rugged. Similarly, many of the nearby drainages are deeply incised. The hills and ridges are covered mainly by residual soil and glacial till, which is drained by slightly to deeply incised creeks. Rock outcrop is generally rare, perhaps 5% or less over the entire property.

The climate of this sub-alpine zone is cool, with summer highs reaching 75 °F only on the warmest days. Frost may occur any day of the year. High winds are common throughout the year, with potential gusts up to 130 miles per hour. Snow is a common occurrence for most of the year, except for July and August. Average minimum winter temperatures are 20 to 30 °F and maximum summer temperatures are 65 to 75 °F. Annual precipitation averages 18 inches of rain and 139 inches of snow. April and May have the most precipitation; summers are generally dry with brief but intense thunderstorms associated with the Southwestern US Monsoon season.

Vegetation is typical of the Front Range, varying locally between heavy forest and mountain meadows. The north facing slopes are densely wooded with Lodgepole Pine, Engleman Spruce and Douglas fir. The low-lying areas are forested with Quaking Aspen, Western Willow and Red Alder. South facing slopes are lightly wooded with Ponderosa Pine, Lodgepole Pine, Rocky Mountain Juniper and Quaking Aspen (Turnburke, 2007).

The mine portals and auxiliary buildings are located on the south side of a moderately steep valley formed by Coon Track Creek. This drainage separates Caribou Hill to the west and Boulder County Hill to the east. Local relief as measured from the hilltops to the valley floor is approximately 1500 feet.

3 GEOLOGY

3.1 Regional Setting

This portion of Colorado is underlain by basement rocks comprising the North American Craton, which has been intruded by Late Cretaceous igneous units. Deeply rooted structural zones within the Precambrian rocks are linked to the development of the much younger Colorado Mineral Belt. This belt consists of a northeast-southwest regional trend of mineralization and ore deposits that is approximately 250 miles long and 80 miles wide.

The Caribou, or Grand Island, mining district is located near the northeastern exposed limit of the Colorado Mineral Belt. At a smaller scale, the area is part of the Front Range mineral belt on the northern margin of the Idaho Springs-Ralston shear zone of the Colorado lineament. This Precambrian fracture zone localized alkaline and calc-alkaline igneous activity and associated mineral deposits during the Laramide orogeny. Deposits in the district have been described by the U.S. Geological Survey as “polymetallic veins with abundant carbonates or that occur in wallrock altered to contain carbonates.” Confidential mapping of numerous veins, faults and fractures on the Cross Mine property is available for inspection by DRMS at the mine site.

3.2 Geologic Units

The Cross-Caribou Consolidated claims area is underlain by the Precambrian age Idaho Springs Gneiss, Boulder Creek Granodiorite, and Swandyke Hornblende Gneiss, and the Tertiary age Caribou Monzonite. Precious metal veins are located hosted exclusively within the Idaho Springs Gneiss and the Caribou Monzonite. Descriptions of the geologic units and formations presented here are adapted from Moore et al., 1957 and Holland 1994.

The Idaho Springs Gneiss consists of a well-foliated and banded gneiss composed of medium to coarse grained quartz-biotite-plagioclase-orthoclase with accessory magnetite and apatite. The unit has a zebra appearance due to biotite banding. Granite migmatites comprise nearly one-half of its total volume. The migmatite consists of coarse grained, fairly planar bodies which are predominantly parallel to foliation. Mica rich schist units also occur within the gneiss, hosting sillimanite that indicates a high peak metamorphic grade.

The Caribou Monzonite Stock is variable in composition. It consists predominantly of monzonite and quartz-monzonite but also ranges to mafic phases as lenses, pods and dikes. The monzonite phases are composed of medium-grained plagioclase-orthoclase-quartz-biotite-clinopyroxene-hornblende with accessory magnetite and apatite, giving the unit a black color.

The Swandyke Hornblende Gneiss is present approximately one mile south of the Cross Mine in two relatively continuous bodies. It consists of a dark gray to black, medium to fine grained, well-foliated amphibolite unit. Composed primarily of hornblende and plagioclase with lesser pyroxene, biotite and quartz. The unit likely represents small, localized mafic intrusions that were subsequently metamorphosed in the Precambrian.

The Boulder Creek Granodiorite is located approximately one-half mile northeast of the Cross deposit. It consists of a weakly foliated paleo-igneous unit. It is composed of fine to medium-grained quartz-orthoclase-plagioclase-biotite and minor hornblende. It is differentiated from the gneiss mainly by the lack of conspicuous banding but does have well developed foliation near its contacts.

The contact between the Idaho Springs Gneiss and the Caribou Monzonite Stock strikes northwest-southeast through the mine area, dipping near vertical. The Cross Gold Mine is developed in veins near this contact.

3.3 Faults, Veins and Fractures

The Cross Mine site has a complex tectonic history. Forces in the Colorado Front Range have left an overprint of regional to local scale faults and fracture zones through the terrain. The Cross Gold Mine is located in highly faulted and fractured geologic units. At the scale of rock outcrop, and in the underground working, pervasive blocky jointing is noted in all rock types especially in the gneiss.

A published 1969 USGS map maps a fault at the ground surface approximately 700 feet east of the Cross Mine site (Gabel, 1969). Holland (1994) refers to numerous faults encountered underground within the Cross Mine deposit, and many of the veins encountered in the mine are the result of mineralization along fault planes although there is evidence of consolidated mineralized stockwork where fault intersections occur. The major fault structures appear to be oriented along an east-west strike and dip steeply north to vertical however in the gneiss there is extensive development of north-south faults intersection with east-west faults.

Last movement on these faults was associated with the late Laramide orogeny and they are now considered inactive.

Holland (1994) noted two episodes of fault movement. The earliest was left lateral strike-slip movement along the east-west striking structures. This was overprinted by right lateral strike-slip movement along minor east-northeast striking structures. The northeast-trending veins on Caribou Hill are interpreted as occupying shear zones and the east- and west-trending veins are interpreted as occupying tension fractures branching from the shear zones.

Holland (1994) proposed that the structures present at the Cross Gold Mine tie into the regional Arapahoe Pass Fault and the Junction Ranch Fault. The Arapahoe Pass Fault is mapped along strike to the west where it disappears under glacial cover. The Junction Ranch Fault is also mapped along strike but to the southeast.

The veins are distributed within two main sets. One striking north-northeast with most of the veins considered to be open along strike and depth, except where they enter the monzonite. In contrast, the east-west striking veins located west of the historic mine area do not decrease in magnitude where they cross into the monzonite.

Holland (1994) proposed that left lateral movement created a dilatational fault jog between the Arapahoe Pass Fault and the Junction Ranch Fault. This same model is then used to explain the presence of the large open space fill veins at the Cross Mine. The north-northeast striking vein sets appear to be largely dilatational structures. The east-west striking set of veins appear to be localized along earlier fault structures.

Individual steeply dipping veins range in width from inches to tens of feet and consist of open space fill zones containing quartz and disseminated sulfides flanked by mineralized and non-mineralized alteration zones. A late stage of carbonate mineralization was the last emplacement before weathering and supergene enrichment of the upper ore body ore body at Caribou must of which has been eroded at Cross. Weathering has partially oxidized sulfide minerals in the upper 200 ft or so of the deposits. These tend to be high infiltration pathways during snowmelt.

4 HYDROLOGY

4.1 Aquifers and Adjacent Use

The groundwater beneath and adjacent to the Cross Mine is present in a single aquifer, the Mountain Crystalline Bedrock Aquifer as mapped in the ON-010 Colorado Groundwater Atlas (Barkmann et al., 2020). However, water is especially flow may be different in the gneiss where the higher apparent transmissivity occurs. A more comprehensive hydrogeological investigation is needed to verify the aquifer regimes and source water chemistry. Unlike sedimentary rock aquifers, igneous and metamorphic crystalline rocks have no primary porosity; water is stored in fractures and stopes in the older mine working, many of which have been unmapped. Groundwater flow proximal to and within the compliance boundaries is wholly with the Idaho Springs

Gneiss and the Caribou Monzonite Stock geologic units. Within the subalpine and alpine basins of the facility area ground water use is restricted to private wells (Flynn, 2003, Bruce and O'Riley, 1997). Other than the onsite wells there are no state-permitted wells within one mile of the compliance boundary. The closest public water supplies (Nederland, Boulder) rely on surface water sources (Weritz, 2015).

4.2 Generalized Conceptual Model

The hydrology of alpine and subalpine basins in the Colorado Front Range has been a topic of research since the 1920's. Recent research using naturally occurring chemical tracers and groundwater dating has refined the conceptual model for recharge, groundwater flow, and surface water groundwater interaction (Frisbee et al., 2011).

Hydrologic and climatic conditions cause the majority of precipitation to be released as spring and summer snowmelt which drains rapidly from the mountain front and shallow aquifers to streams and wetlands over the course of months. The sudden emergence through old workings that intersect the current underground mines suggest a direct pathway to some runoff being funneled into old shafts during run-off. Also, during runoff, it has been observed that significant changes in Coon Tract Creek fill and perhaps overfill a wetland that sits atop the Cross mine. Infiltration of significant volumes of water occur also most as soon runoff occurs with fractures and leached out rock in low points close to the surface. Obviously, these pathways have a very high transmissivity on the level of course sand. Overland flow will occur if the infiltration capacity of the shallow regolith is exceeded.

The sub-alpine hydrology conceptual model indicates that high elevation steep catchments recharge to weather or leached near surface rock and overlying regalith and that all ground water flow returns to the surface due, some in the form of springs and artesian wells and the apparent gaining in surface waters to topographically-driven-flow. This reemergence as surface water happens because of topography-driven- flow and hydraulic conductivity contrasts with depth (Frisbee et al., 2013; Bukoski et al., 2021; Foks et al., 2017; Tóth, 1963).

The time between snowmelt and discharge to streams can be highly variable depending on path, but the steady-state mass balance is nearly complete within sub-alpine basins. Because of the complete discharge to streams and springs, changes in groundwater quality are detectable in surface water quality in sub-alpine basins such as Coon Track Creek.

Groundwater flow at the facility is generally to the south-east, following topography and the track of Coon Track Creek. Water table maps for late July 2021 and late March 2022 are presented as Maps 3 and 4. The water table maps were created by hand-contouring linear interpolations between water level measurements made at the three wells (Table 1) and the water level in the Cross Winze. Conceptual water table contour cross-sections were drawn from these maps, where the surface projections of the cross-section lines are presented in Map 5 and cross-section of the conceptual groundwater

table are presented in Figure 1, at both natural (July 2021) dewatered conditions at the Cross winze (March 2022); dewatered conditions come about due to dewatering related to pumpage from the lower levels of the Cross mine. Non-pumping conditions for the Cross Winze (water table at the collar of the winze) was assumed.

4.3 Groundwater Flow Controls

Groundwater flow at the Cross Gold Mine is controlled by faults, fractures and jointing. The primary porosity of un-weathered igneous and metamorphic crystalline rock is generally too low to meaningfully contribute to flow. Flow is confined to secondary porosity; joints, fractures and faults in the rock units. As previously described and illustrated the fracture and fault density in the Front Range was caused by regional tectonics. Mines in fractured terrain are often located in the most fractured portion of the terrain; this is the case for the Cross Gold Mine. The mapped fault and fracture density at the mining district is higher than areas immediately adjacent (Holland, 1994; Gabel, 1969). Because most veins and associated fracture sets trend east-west or northeast-southwest it is expected that these are preferred flow directions causing significant anisotropy in transmissivity.

With enough fracture and joint density, fractured bedrock hydrology may behave hydro-geologically as a granular aquifer, except the ‘grains’ are fist to boulder sized. This “representative porous media” (RPM) when present in leached rock and fractured bedrock reduces fracture-based anisotropy that simplifies understanding of the system. As the Cross Mine is located in a high fracture density area and leaching near the surface the RPM approach may be usable in the conceptual hydrogeologic model for the site.

The water table is influenced by mine dewatering and stopes from legacy mining between the Cross and Idaho Tunnel/Caribou resulting in large stopes connected to shafts on the surface. The Cross Winze is a near-vertical (70° incline) internal shaft within the Cross Mine that intercepts the Cross Adit (tunnel) at the point projected to the surface in **Figure 6**. The water level in the Cross Winze will quickly rise to the level of the tunnel in snowmelt season if the winze is not pumped to the Coon Track Creek elevation after treatment. The bottom of the Winze is approximately 235 feet below the floor of the tunnel. Pumping the winze has been noted to influence the water level in the Cross Well. A non-pumping condition was assumed for the July 2021 water table map and the water level at the Cross Winze set to the tunnel floor (9,700 feet above mean sea level- amsl). The full influence of pumping and water chemistry will be determined over time.

The shallow ground water system is also seasonally dynamic, being strongly influenced by annual snowmelt. Much of the observed flow within the mine comes from fractures, veins, faults, and legacy stopes/workings changing from just-damp to fully-flowing streams during snowmelt. In the snowmelt season the ground water flow increases greatly and the water table rises. Casual observations of the Cross Mine Winze show tens of feet of water table rise in the snowmelt season.

According to the conceptual model the large increases in streamflow flow and water table rise will be forced by young water from snowmelt. The mine workings lie within this shallow flow zone. A large portion of water in this zone will be displaced by each snowmelt and will have a lithogenic signature that roughly corresponds with its residence time. The time from infiltration to discharge can be roughly estimated to be from 1 month to 100 years for shallow ground water (Frisbee et al., 2013). Residence time is primarily controlled by transmissivity and transmissivity decreases with depth in fractured rock aquifers. Deep ground water circulation in alpine basins can approach 7000 feet in depth and still return to surface within a basin but may take over 5000 years to do so.

Transmissivity estimates are difficult in fractured bedrock due to the discontinuous nature of hydraulic conductivity as compared to granular aquifers. Point estimates from single well tests conducted for well rehabilitation this summer may not be representative if applied over large areas. Transmissivity estimates are being prepared as part of the mine's water rights evaluation with the Colorado Department of Water Resources (DWR) and State Engineers Office (SEO).

A vertically and horizontally averaged estimate of bulk transmissivity is possible using historic dewatering records. Long ago dewatering of the Caribou Mine could be accomplished by pumping 100 gpm, six hours per day (36,000 gallons/day) to keep the mine dry in peak snowmelt (Zulch, 1919). In 1919 the Caribou mine had over 5,000 linear feet of workings below the water table. It extended to a depth of over 1,000 feet below ground surface. Assuming an 8x8 (foot) opening dimension over this length results in 320,000 square feet of discharge area. Using 600 feet of head loss to dewatering (400 level to 1000 level dewatering), a transmissivity of 1.88x10-4 gallon/day/ft^2 is calculated. This is a comparatively low transmissivity for highly fractured rock. The low value may reflect the lower transmissivity of fractured aquifers with depth, particularly over 400-500 feet deep (Freeze and Cherry, 1979).

4.4 Groundwater Discharge

Groundwater discharges to surface water at the mine as Coon Track Creek baseflow, from scattered springs and seeps, and as drainage from the Cross Adit and the Idaho Tunnel of the Caribou mine. Groundwater from the tunnels is treated before discharge to Coon Track Creek. In late summer and fall months the only flow in Coon Track Creek is from treated groundwater discharge from drains (tunnels). This was the condition in late July 2021 when the data for the water table map in Map 3 was collected.

The Middle Boulder Creek basin (containing the Coon Track Creek sub-basin or catchment) has been the location of precious and base metal mining, milling, and smelting for over 150 years. The Cross Gold Mine is the only currently operating mine in the historic district. Much of the district's ore deposits have metals hosted in sulfide minerals. Long-term watershed studies note some increases in dissolved constituents attributed to reaction with rocks in the basin (Murphy et al., 2003). However, decades of unregulated mining on Middle Boulder Creek have not affected in-stream water quality for pH, dissolved solids, or toxic metals (Murphy, 2006).

The water quality is best explained by the mineralogy of the ore and the local geology. Because the deposit is generally low in reactive iron sulfides (e.g. pyrite, pyrrhotite, marcasite, chalcopyrite) as compared to other base metal sulfide deposits, the acid generation is low. Acid-neutralizing-minerals are present in sufficient quantities in the calc-alkaline intrusives that ground water is near neutral to slightly basic pH (Knight Piésold, 2004). Ground water becomes surface water in Front Range catchments like Middle Boulder Creek. The degree of leaching of rocks infiltrated by snowmelt, equivalent to residence time in the aquifer, is determined from sampling and analysis.

The general absence of iron staining in oxygenated environments at the facility suggests that there is a limited quantity of reactive iron pyrites to free acid and dissolved iron in the subsurface, and that the dissolved iron and acid that is created is attenuated before it discharges to the surface. This concept is further borne out by several studies noting the lack of general water quality deterioration related to historic mining in Middle Boulder Creek, other than sulfate (SO_4^{2-}) ions (Murphy et al., 2003. Chpt. 3 & 4). The source of the sulfate increase is attributed to the sulfur in pyrites at mines and ore bodies being oxidized.

5 MONITORING WELL NETWORK

5.1 Overview

The mine has three existing wells on site that are listed in Table 2 and depicted in Map 2. Historically, operations have used the three wells to supply water for domestic and potable use. The three wells used for domestic use (Cross, Cabin, and Caribou) have been re-permitted as domestic/industrial with the Division of Water Resources, applications filed May 5, 2021. The well ownership was changed at that time to Grand Island Resources LLC to align with water rights ownership.

Links to the Department of Water Resources (DWR) well permits are provided in Table 2 and the well drillers logs and construction diagrams, as retrieved from DWR files, are contained in Attachment A. Water rights are provided through a 1/8 share in the Farmers Ditch Company adjudicated and decreed for use from mine workings in case number W-8261-76. A substitute Water Supply Plan was filed May 19, 2021 to allow use of W-8261-76 mine workings water from existing drilled wells.

5.2 Well Evaluation

McGrane Water Engineers, LLC. (MWE) of Lyons, Colorado performed an evaluation of the three existing wells in 2021 (MWE, 2021). The evaluation consisted of:

- Pulling the existing pumps;
- Conducting well videos and evaluating casing condition;
- Performing and evaluating pumping tests;
- Estimation of the well yield and production capacities;

- Recommending permanent pumping systems; and
- Establishing permanent water level monitoring.

The results of the evaluation are found in Table 3**.** There is uncertainty in MWE's yield and production estimate due to:

- Uncertainty in the extent and connected fractures in the bedrock aquifer;
- Variability in seasonal recharge;
- No apparent hydraulic connection to nearby Coon Track Creek on the property.

These uncertainties can be reduced by continued water level and production monitoring, constructing a groundwater model for improved yield and production estimates, and evaluate the estimate's sensitivity to factors described above.

Despite the uncertainties the sustainable yield (GPM) results are significantly higher (2 times or more) than the mean and median yield found by Cain (2003) for wells in the Turkey Creek basin. This suggests that the Coon Track Creek basin has higher fracture density, providing higher average well yields, than some sub-alpine basins in the region.

5.3 Detection Monitoring Well

We had proposed the use one of the three wells, the Cabin Well, for detection monitoring inside the compliance boundary. DRMS in their adequacy comments of the TR10 on March 25, 2022, asked that all three wells be monitored saying that sampling the other wells "could provide valuable data for understanding groundwater at the site (including characterizing potentially impacted water quality". If we accept this recommendation, then we would need to be careful in how the Caribou and Cross well elevations are being interpreted on a daily basis for consumptive use and by pumpage in the Cross winze. Under the presumption that the Caribou well is up-gradient water showing "contamination" might not be an indicate of site caused contamination but baseline conditions. Contaminates in the Cross well while likely a function of being in the ore zone. Existing wells are preferred because they are known to have intercepted water-bearing fractures rather than being completed in low-yielding zones. Because they are used for groundwater withdrawal year-round, they induce gradients in the aquifer, capturing more water of in-situ quality than that obtained by small-diameter monitoring wells that are pumped infrequently.

The Cabin well is an ideal monitoring well because is in good hydraulic connection with the surrounding aquifer (MWE, 2021). The Cabin well is infrequently used and is located downhill and downgradient of the Cross Mine surface complex. It is use is currently limited to manually filling water trucks for on- site construction. The Cabin Well is in an area where flow from other parts of the mine and underground workings converge. The east-west fracture sets intercepted by the Cabin well are sub perpendicular to perpendicular to groundwater flow gradients, allowing the Cabin well to capture a larger area of flow from upgradient areas than if the fracture orientation was different.

All wells on the property are equipped with a new variable frequency drive Grundfos stainless steel pump, epoxy coated steel riser pipe and a recording water level pressure transducer collecting hourly data. The Cross and Caribou wells are also equipped with recording water level pressure transducers, collecting hourly data. Data is downloaded monthly from all three wells. In the December 2021 version of the Groundwater Monitoring Program it was stated that the there is a probable hydrologic divide between the Cross and Idaho Tunnel/Caribou. This conclusion no doubt was a function of the alignment of Coon Track Creek, the difference in elevation of the shafts in respective mines and perhaps the lack of discernable influence of during the pump tests at the Caribou and Cross Wells last November. But at this time GIR would like to retrack that statement as the hydrologist who did the prior report did not take into account that the legacy Potosi mine lies between the two mines and geophysics conducted this past summer suggest some major stopes connected to shafts at the surface. Further while the shaft at the Caribou sore certainly several hundred feet higher in the Caribou than the Cross all these shafts discharge at tunnel level so the true piezometric surface may be much similar. Further, steep groundwater gradients from Caribou Mountain to the south and Silver Point to the north create a convergence where Coon Track Creek is above the mines meaning that while there ultimately is a prevailing groundwater gradient subparallel to Coon Track Creek below the mines, there is not sufficient data as yet to suggest a divide.

5.4 Sampling Frequency

The all wells and mine effluent will be sampled monthly starting in May 2022. for the Analytical Parameters in Table 4. The analytical parameters for effluent will include total and dissolved metals as while groundwater underground it comes to the surface unlike a well.

5.5 Analytical Parameters

DRMS has indicated in its comments of March 25th, 2022, that the Caribou-Cross mine is not classified as yet and therefore must include the most stringent Standards irrespective of it not being and currently unsuitable as an agricultural area. Therefore, GIR has adopted the most stringent standards. A collated list of the Rule 41 Table 1, 2, 3 and 4 analytical parameters is found in Table 4. At this time, we will include the agricultural stands but it is highly inappropriate as there is no or can be no agriculture in the area.

5.6 Reporting

GIR will report sampling results Quarterly and will be issued to DRMS on August 1, 2022, November 1, 2022, February 1, 2023, May 1, 2023 and August 1, 2023.

The reporting will include a potentiometric surface (water table) map constructed from

measurements made during sampling events irrespective of the Caribou and Cross well being impacted by daily domestic use and pumpage in the Cross. Any exceedances of Regulation 41 Table 1-4 water quality standards will be reported. We feel that reporting any exceedance to the groundwater standards within 5-days of observation is inappropriate until baseline conditions are established and non-applicable analytes like those for agriculture are ~~eliminated..~~eliminated.

To be included in all quarterly reports will be a map showing approved groundwater and surface water locations; The laboratory data packages including the Chain of Custody and sheets used for any field parameters collected.

6 BASELINE GROUNDWATER SAMPLING

In the prior groundwater monitoring report, the author reported samples taken during the well pumpage program that were purported to represent background trends. But as DRMS points out in their comments of March 25, 2022 there were procedural issues, lack of field sheets and an incomplete list of analytes. In light of the partial and questionable data, GIR feels that the conclusions reached that these represented background conditions were incorrect. Rather than trying to credible evaluate questionable two sampling events will not use this information. Instead GIR has agreed to measuring all the requisite parameters and analytes for 5 quarters. These 5 quarters will help to understand baseline conditions.

GIR will also do a synoptic sample event for effluent discharge for the same parameters and standards from the Cross and Idaho/Tunnel pre-treatment water with location map showing where the samples were collected.

7 GROUNDWATER SAMPLING AND ANALYSIS

This section describes procedures that will be used at the mine for groundwater sampling and analysis.

7.1 Water Level Measurement

At the start of each monitoring event, GIR will report the depth-to-water prior to sampling. Water levels will be measured within a period of time short enough to avoid temporal variations in groundwater elevation which could prevent an accurate determination of the groundwater flow rate and direction. This will be accomplished by connecting to the In- Situ™ Troll500 data-logging pressure transducer in each well and downloading sufficient time-series data to determine:

- The water level at the well,
- If that water level is representative for the time of year,
- If the water level is representative of static or pumping conditions.

Using the pressure transducer to obtain water levels is preferable to opening the sanitary seal on a drinking water well.

The mine's In-Situ™ M-Scope 300-foot electronic tape used to manually measure water levels is capable of achieving a measurement precision of ±0.01 feet. The procedure for manually measuring water levels in wells is described below.

1. Obtain top of casing (TOC) and ground surface elevations for the well and past readings for the time of year. Record this data on the field data sheet or field notebook used for this sampling round so that it is available at the well.
2. Before any measurement is taken, the water level probe and cable should be properly decontaminated/disinfected.
3. Remove the sanitary seal from the top of the drinking water well and place in a clean and secure location.
4. The measuring point for all wells is at the top of the casing mark on the well casing. The measuring point is marked by permanent marker on the inside of the steel well casings. If no mark is found, measurements will be collected from the top of the north side of the casing.
5. Make a measurement according to manufacturer instructions at the top of casing mark.
6. The static water level depth shall be written down on the field data sheet or field notebook and rechecked before the indicator is removed from the well.
7. If the water level is fluctuating due to pumping make a best estimate of pumping water level and note a best estimate static level based on downloaded data record.
8. The water level depth below the measuring point (in feet) will be subtracted from the measuring point elevation to calculate the elevation of the static water level.
9. Water levels will be compared with past measurements to help verify the reasonableness of readings before completing the measurement process.

7.2 Water Quality Meter Calibration

This sampling plan will use handheld water quality probes (pH, temperature, and specific conductance) to document stabilization of parameters during well purging. Meters are to be operated after the operator is with the manufacturer's instructions. Meter calibration will also follow those same instructions. Conductivity and pH meters will be calibrated daily using fresh buffers and standards. Record calibration results in a field logbook or a sampling sheet. Perform a calibration check at the end of each days use. The digital thermometers used are precise to 0.1 degree and are calibrated by the manufacturer. The meter can be checked for gross errors using ice water.

7.3 Well Purging

Before collecting samples, detection monitoring wells will be purged until a minimum of three well casing volumes have been removed and field parameters have stabilized (i.e., temperature, pH, and conductivity). Specific well purging and sampling requirements for each of the existing wells is provided in Table 7. Approximately 100 gallons will be purged from the existing wells prior to sampling. The wells all have sanitary seals and internal pump wiring making deployment of a portable or dedicated sampling pump difficult. The existing pumps and piping are used for sample collection and samples are collected at a sampling port. If the well is in use during sampling the required purging protocol is still to be followed.

Purging will commence by connecting a garden-type hose to the hose bib located next to each well's pressure tank. Inspect and clean the exterior of the hose bib using decontamination procedures. The purged groundwater will be directed to a 5-gallon bucket or other container of known volume to measure the cumulative amount of water removed from the well. The purge water can be put to ground or discharged to any sanitary drain.

At the beginning of purging and at every 10 gallons, the field sampler will measure the field parameters to confirm that the water chemistry is stabilizing. The sampler will also make note of the water color and clarity. Generally, temperature within 1° Celsius, pH within ± 0.1 units, and conductivity within ± 10 percent for consecutive readings indicate stable water chemistry. Field meters for measuring temperature, pH, and conductivity will be calibrated daily and operated according to the manufacturers' instructions. Purging data is to be recoded on the sampling field sheet or logbook.

The purging garden hose is removed from the hose bib and replaced with a pre-cleaned plastic hose-bib to hose-barb connector (3/4" GHT to 3/8" barb) is used to attach 1-3 feet of new 3/8" inside-diameter Tygon or similar clear plastic tubing to the hose bib. Using a 5-gallon bucket or other container to collect overflow set the hose bib to discharge at a reduced flow rate, 1 GPM or less.

7.4 Sample Collection

The field sampler will don new disposable nitrile gloves after purging for sampling and will fill the laboratory-supplied sample containers directly from the hose bib discharge line. Unfiltered samples are collected first. With the hose bib running fit a disposable 0.45-micron, medium capacity flow through groundwater filter to the 3/8" line and allow to rinse 2-3 filter volumes before filling filtered sample bottles. Obtain groundwater filters from a commercial supplier. Discard sample tubing. Use a fresh hose bib connector and sample tubing at each well.

Groundwater samples are field filtered and preserved as necessary as shown in the analytical table. Sample containers should be filled with minimal turbulence and should not be overfilled to avoid spilling the sample preservative (where applicable). Groundwater samples will be collected in such a way as to minimize potential contamination of the sample. Measures to help prevent contamination will include using dedicated sampling equipment, wearing a new pair of disposable gloves at each well, and decontaminating any reusable equipment (water level indicator) between wells.

Field notes will be kept by sampling personnel either in a field logbook or on groundwater sampling forms. The field notes will include sampler name(s), well identification numbers, the date and time, instrument calibration notes, water-level measurements, well purging volumes, well recharge conditions, and other notable site observations. These records will be maintained by mine personnel.

7.5 Groundwater and Surface Sampling QA/QC

To ensure data defensibility and to prevent any shipping or laboratory error or cross contamination, a trip a field blank of distilled water provide by the laboratory to be taken to the field for each container; a duplicate from one sample location to determine laboratory reproducibility; a field blank at each location using distilled water pour at each respective site and a rinsate blank at each location on field equipment on such tools as electrodes of pH meter to ensure that there is has been proper decontamination and that there is no cross contamination between samples.

So, in summary, each iced cooler shall contain one trip blank; each location shall include one trip blank for a total of five; one duplicate sample will be collected from one of the sample locations and rinsate blanks of all equipment used at each site after decontamination.

7.6 Sample Preservation and Shipment

Sample will be preserved as appropriate, and sample containers will be labeled and placed in appropriate shipping containers. Table 4 lists the required preservative for each analytical constituent. Sample containers will be placed on ice/cold packs following sample collection and during transport to the laboratory. Prior to sample collection, the laboratory will place the preservatives into the bottles used to contain the samples for metals and mercury analysis, or provide pre-measured, containerized, bottle-specific aliquots of preservation compounds. Samples will be transported under chain-of-custody (COC) control to a Colorado State Certified Laboratory or shipped to an alternate appropriately certified laboratory.

7.7 Analytical Procedures

Cabin well samples will be analyzed for the constituents and by the methods shown in Table 4.

7.8 Chain-of-Custody Control

Laboratory standard COC procedures will be followed on all samples collected. Custody is recorded through a series of signatures on the COC form as sample possession changes from one person or organization to another. For each sample location, the sample name, date and time of collection, and requested analyses will be recorded on the COC form. The field sampler will provide the original COC form to the laboratory at the time of sample delivery. COC records will be maintained by the mine.

7.9 Decontamination and Disinfection

Decontaminate water level probes by donning nitrile gloves and safety glasses and wiping them successively with paper towels wetted with mild detergent solution, potable water, and deionized water. Rinse the water level probe with deionized water before use.

Store the water level probe in a plastic bag after decontamination.

When deploying the water level probe into a drinking water well it must be decontaminated first. Use a paper towel wetted with 150 ppm bleach solution (7.5% sodium hypochlorite solution diluted 500:1 with deionized water) to wipe the probe tip and first few feet of probe cable. Deploy cable in well, wiping cable as it comes off the reel with paper towels and bleach solution. If the water level probe is used again immediately in a drinking water well, wipe cable again with fresh paper towels wetted with bleach solution as it is reeled out of the well. Store the water level probe in a plastic bag after disinfection for transport between wells. Do not rinse probe between sterilization and use.

7.10 Field Notes

Documentation of observations and data acquired in the field provide information on sample acquisition, field conditions at the time of sampling, and a permanent record of field activities. Record field observations and data collected during routine monitoring activities with waterproof ink in a permanently bound weatherproof field log book with consecutively numbered pages or on field data sheets (Attachment B).

Field notebook and data sheet entries will include at least the following information. Consult relevant sampling and decontamination SOPs to supplement this list.

- Project name
- Location of sample
- Sampler's printed name and signature
- Data and time of sample collection
- Sample identification numbers

- Description of sample (matrix sampled)
- Sample depth (if applicable)
- Number and volume of samples
- Sample methods, or reference to the appropriate SOP
- Field observations
- Results of any field measurements, such as depth to water, pH, temperature, specific conductance
- Personnel present
- Decontamination procedures

Strike out changes or deletions in the field book or on the data sheets with a single strike mark and be sure that the original information remains legible. Record enough information to allow the sampling event to be reconstructed from the notes alone. Completely fill out field data sheets and do not leave blank lines. Write “Not Applicable” or “NA” on blank lines. All field books will be signed daily by the person who made the entries.

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9 TABLES

Table 1. July 2021 Manual Water Level Measurements

Well	Date	Time	Raw Depth to Water (DTW)	Ground Elev. (GS)	Top of Casing (TOC) Stickup (ft)	DTW BGS (ft)	WT Elevation (ft. amsl)
Caribou	7/30/2021	16:14	22.71	9743.67	2.45	20.26	9723.41
Cross	7/27/2021	16:42	29	9693.49	5.7	23.3	9670.19
Cross	7/28/2021	13:56	23.74	9693.49	0.17	23.57	9669.92
Cabin	7/26/2021	10:30	39	9678.13	1	38	9640.13
Cabin	7/27/2021	13:30	42.7	9678.13	2.35	40.35	9637.78
Cabin	7/28/2021	9:57	42.52	9678.13	3.1	39.42	9638.71
Cross Winze							9700

Table 2. Well Details

Well	Permit Link
Caribou	https://dwr.state.co.us/Tools/WellPermits/0208135
Cross	https://dwr.state.co.us/Tools/WellPermits/0111941B
Cabin	https://dwr.state.co.us/Tools/WellPermits/0111941A

	Permit No.	Q40	Q160	Section	Township	Range	Prime Meridian
Caribou	116655	SW	NW	9	1 S	73 W	6th
Cross	111953	SW	NW	9	1 S	73 W	6th
Cabin	111951	SW	SW	9	1 S	73 W	6th

	UTM X	UTM Y	Latitude	Longitude	Ground Elevation (ft. amsl)	Top of Casing Elevation (ft. amsl)
Caribou	451137	4425647	39.979581	-105.572275	9743.7	9746.12
Cross	451086	4425477	39.978047	-105.572859	9693.5	9694.66
Cabin	451190	4425389	39.977260	-105.571634	9678.1	9679.13

	Drilled Depth (ft. BGS)	Top of Screen (ft. BGS)	Bottom of Screen (ft. BGS)	Drilled Diameter (ft)	Driller Reported Yield (GPM)
Caribou	165	25	165	0.5	12
Cross	205	15	205	0.5	25
Cabin[1]	165	65	165	0.5	25

[1] Cabin well impassable past 135 feet BGS.

Table 3 – Well Test Results and Production Estimates

Test and Forecast Summary

Well	Year Drilled	Test Rate when Drilled (gpm for 1 hr)	2021 Test Rate (gpm)	Test Length (hrs)	7-Day Yield Estimate (gpm) w/ Existing Equipment	7-Day Production Estimate w/ Existing Equipment (gals)	7-Day Production Est. w/ Rehabilitation or Pump Upgrade (gals)	Current VFD Yield Setting (gpm)	Drive Setting
Caribou	1980	12	9.5 and 7.2	5.5	7	70000	Same	7	Constant pressure (60 psi)
Cross	1980	25	15	23.5	10 - 15	100,000 - 150,000	Capable of ~45 gpm (max 450,000 gals/wk) with equipment upgrade	10 - 15 gpm	Constant pressure (60 psi)
Cabin	1979	25	19	20	15	150,000	Expect increase if fill were removed from well	30 gpm for ~100 mins	Constant 35 hz

Pumping Equipment

Well	Well Condition	Pump Type (age)	Design Yield (gpm)	Design TDH (ft)	Horse Power	Variable Speed Drive	Pressure Tank	Setting Depth	Drop Pipe (diameter)
Caribou	Good	Grundfos GM102-10S10 (2019)	7	350	1	Existing	new	148	1-in
Cross	Good	Webtrol10S07 (new)	12.5	185	1.5	Existing	new	174	1.25-in
Cabin	Fill in and around well*	Gould 40S50-15 (new)	30	320	5	New 5 hp	NA	126	1.25-in

*Cabin well has 30 ft of fill in well and accelerated drawdown beyond 63 ft.

Table 4. Cross Gold Mine Semi-Annual Groundwater Sampling Parameter List

Parameter	Standard	Unit	Method	Preservation	Reg. 41 Table
Unfiltered Samples					
pH	6.5 - 8.5	pH units	SM[a] 4500-H-B	≤ 4°C	Table 2
TDS	400	mg/l	SM 2540-C	≤ 4°C	Table 4
Corrosivity	Non Corrosive	Langlier Units	SM 2330-B	≤ 4°C	Table 2
Alkalinity	Non Scaling	mg/l as $CaCO_3$	SM 2320-B	≤ 4°C	Table 2
Cyanide [Free]	0.2	mg/l	EPA 335.4	NaOHpH≥12,≤6°C	Table 1
Chlorophenol	0.0002	mg/l	EPA 420.1	H_2SO_4 pH<2,≤ 4°C	Table 2
Phenol	0.3	mg/l	EPA 420.1	H_2SO_4 pH<2,≤ 4°C	Table 2
Odor	3	odor units	SM 2150 B	≤ 4°C	Table 2
Color	15	color units	SM 2120 A	≤ 4°C	Table 2
Foaming Agents	0.5	mg/l	SM 5540 C	≤ 4°C	Table 2
Asbestos	7,000,000	fibers/liter	EPA 100.1	≤ 4°C	Table 1
30-day Total Coliforms	2.2	org/100 ml	SM 9221-9223	≤ 4°C	Table 1
Max Total Coliforms	23	org/100 ml	SM 9221-9223	≤ 4°C	Table 1
Samples Field-Filtered To 0.45 Micron (re: dissolved)					
Gross Alpha	15	pCi/l	EPA 900.0	≤ 4°C	Table 1
Beta and Photon	4	mrem/year	EPA 900.0	≤ 4°C	Table 1
Aluminum	5	mg/l		HNO_3 pH <2, ≤ 4°C	Table 3
Antimony	0.006	mg/l	EPA 200.8	HNO_3 pH <2, ≤ 4°C	Table 1
Arsenic	0.01	mg/l	EPA 200.8	HNO_3 pH <2, ≤ 4°C	Table 1
Barium	2	mg/l	EPA 200.8	HNO_3 pH <2, ≤ 4°C	Table 1
Beryllium	0.004	mg/l	EPA 200.8	HNO_3 pH <2, ≤ 4°C	Table 1
Boron	0.75	mg/l		HNO_3 pH <2, ≤ 4°C	Table 3
Cadmium	0.005	mg/l	EPA 200.8	HNO_3 pH <2, ≤ 4°C	Table 1
Calcium	NA	mg/l as $CaCO_3$	EPA 200.7	HNO_3 pH <2, ≤ 4°C	Corrosivity [B]
Chloride	250	mg/l		HNO_3 pH <2, ≤ 4°C	Table 2
Chromium	0.1	mg/l	EPA 200.8	HNO_3 pH <2, ≤ 4°C	Table 1

Parameter	Standard	Unit	Method	Preservation	Reg. 41 Table
Cobalt	0.05	mg/l		HNO_3 pH <2, ≤ 4°C	
Copper	0.2	mg/l	EPA 200.8	HNO_3 pH <2, ≤ 4°C	Table 2
Fluoride	2	mg/l		HNO_3 pH <2, ≤ 4°C	Table 3
Iron	0.3	mg/l	EPA 200.7	HNO_3 pH <2, ≤ 4°C	Table 2
Lead	0.05	mg/l	EPA 200.8	HNO_3 pH <2, ≤ 4°C	Table 1
Lithium	2.5	mg/l		HNO_3 pH <2, ≤ 4°C	Table 3
Manganese	0.05	mg/l	EPA 200.8	HNO_3 pH <2, ≤ 4°C	Table 2
Mercury	0.002	mg/l	EPA 200.8	HNO_3 pH <2, ≤ 4°C	Table 1
Molybdenum	0.21	mg/l	EPA 200.8	HNO_3 pH <2, ≤ 4°C	Table 1
Nickel	0.1	mg/l	EPA 200.8	HNO_3 pH <2, ≤ 4°C	Table 1
Selenium	0.02	mg/l	EPA 200.8	HNO_3 pH <2, ≤ 4°C	Table 1
Silver	0.02	mg/l	EPA 200.8	HNO_3 pH <2, ≤ 4°C	Table 1
Thallium	0.002	mg/l	EPA 200.8	HNO_3 pH <2, ≤ 4°C	Table 1
Uranium	0.0168 - 0.03	mg/l	EPA 200.8	HNO_3 pH <2, ≤ 4°C	Table 1
Vanadium	0.1	mg/l		HNO_3 pH <2, ≤ 4°C	Table 3
Zinc	2	mg/l	EPA 200.8	HNO_3 pH <2, ≤ 4°C	Table 1

Notes:
[a] SM methods are from Standard Methods for the Examination of Water and Wastewater (APHA et al. 1998).
[b] Calcium data needed for corrosivity/scaling calculations .

Table 5. November 9, 2021 Groundwater Sampling Results

Parameter	Standard	Caribou	Cross	Cabin	Units
pH	6.5 - 8.5	7.50	7.38	8.27	pH units
TDS	400	32	125	134	mg/l
Corrosivity	Non-Corrosive	**-2.01**	**-0.94**	0.11	Langlier Units
Alkalinity	Non-Scaling	18.0	80.5	83.3	mg/l as $CaCO_3$
Chloride	250	0.5	2.6	0.9	mg/l
Fluoride	4	ND	ND	ND	mg/l
Nitrate	10	0.27	0.22	0.18	mg/l as N
Nitrite	1	ND	ND	ND	mg/l as N
Nitrate+Nitrite	10	0.27	0.22	0.18	mg/l as N
Sulfate	250	2.7	8.3	11.1	mg/l
30-day Total Coliforms	2.2	Absent	Absent	Absent	org/100 ml
Max Total Coliforms	23	Absent	Absent	Absent	org/100 ml

Table 6. December 17, 2021 Groundwater Sampling Results

Parameter	Standard	Caribou	Cross	Cabin	Units
pH	6.5 - 8.5	**5.76**	**6.44**	7.26	pH units
TDS	400	43	107	140	mg/l
Corrosivity	Non-Corrosive	**-3.69**	**-1.89**	**-0.71**	Langlier Units
Alkalinity	Non-Scaling	18.5	62.5	102.6	mg/l as $CaCO_3$
Chloride	250	0.4	4.3	0.6	mg/l
Fluoride	4	0.63	0.56	ND	mg/l
Cyanide [Free]	0.2	ND	ND	ND	mg/l
Nitrate	10	0.08	0.35	ND	mg/l as N
Nitrite	1	ND	ND	ND	mg/l as N
Nitrate+Nitrite	10	0.08	0.35	ND	mg/l as N
Sulfate	250	2.8	15.1	11.8	mg/l
Chlorophenol	0.0002	ND	ND	NA	mg/l
Phenol	0.3	ND	ND	NA	mg/l
Odor	3	NA	NA	NA	odor units
Color	15	NA	NA	NA	color units
Foaming Agents	0.5	NA	NA	NA	mg/l
Asbestos	7,000,000	ND	ND	ND	fibers/liter
30-day Total Coliforms	2.2	Absent	Absent	Absent	org/100 ml

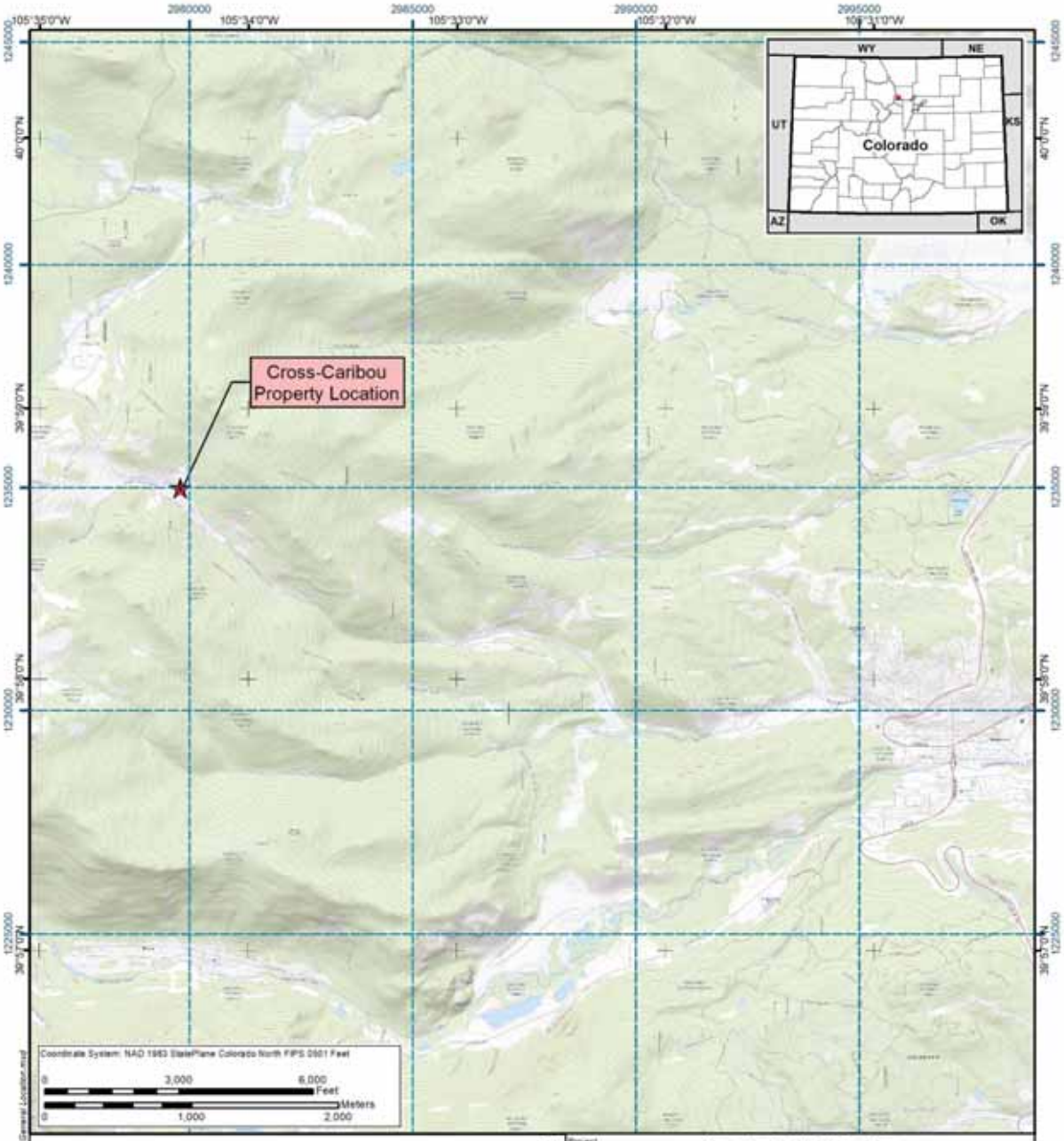
Parameter	Standard	Caribou	Cross	Cabin	Units
Max Total Coliforms	23	Absent	Absent	Absent	org/100 ml
Gross Alpha	15	Pending	Pending	Pending	pCi/l
Beta and Photon	4	Pending	Pending	Pending	mrem/year
Antimony	0.006	ND	ND	ND	mg/l
Arsenic	0.01	ND	ND	ND	mg/l
Barium	2	0.0056	0.0272	0.0980	mg/l
Beryllium	0.004	ND	ND	ND	mg/l
Cadmium	0.005	ND	0.0002	ND	mg/l
Calcium	NA	9.8	44.7	63.6	mg/l as $CaCO_3$
Chromium	0.1	ND	ND	ND	mg/l
Copper	1	**1.2441**	0.0085	ND	mg/l
Iron	0.3 mg/l	0.006	0.006	0.037	mg/l
Lead	0.05	0.0007	0.0018	0.0004	mg/l
Manganese	0.05	ND	0.0067	**0.1369**	mg/l
Mercury	0.002	ND	ND	ND	mg/l
Molybdenum	0.21	ND	0.0006	0.0241	mg/l
Nickel	0.1	ND	ND	ND	mg/l
Selenium	0.05	ND	ND	ND	mg/l
Silver	0.05	ND	ND	ND	mg/l
Thallium	0.002	ND	ND	ND	mg/l
Uranium	0.0168 - 0.03	ND	ND	0.0005	mg/l
Zinc	5	0.013	4.226	0.569	mg/l

ND – Non-Detect, NA – Not Analyzed

Table 7. Well Purging

Name	High Est. Depth to Water (ft)	Drilled Depth (ft. BGS)	Drilled Diameter (ft)	Casing Length (ft)	Casing Volume (gal.)	3 Casing Volumes (gal.)
Caribou	15	165	0.5	150	29	88
Cross	15	205	0.5	190	37	112
Cabin	20	165	0.5	145	28	85

10 MAPS



Project: Groundwater Monitoring Plan

Title: **General Location**

GRAND ISLAND RESOURCES

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Review:	JST	04/07/22		

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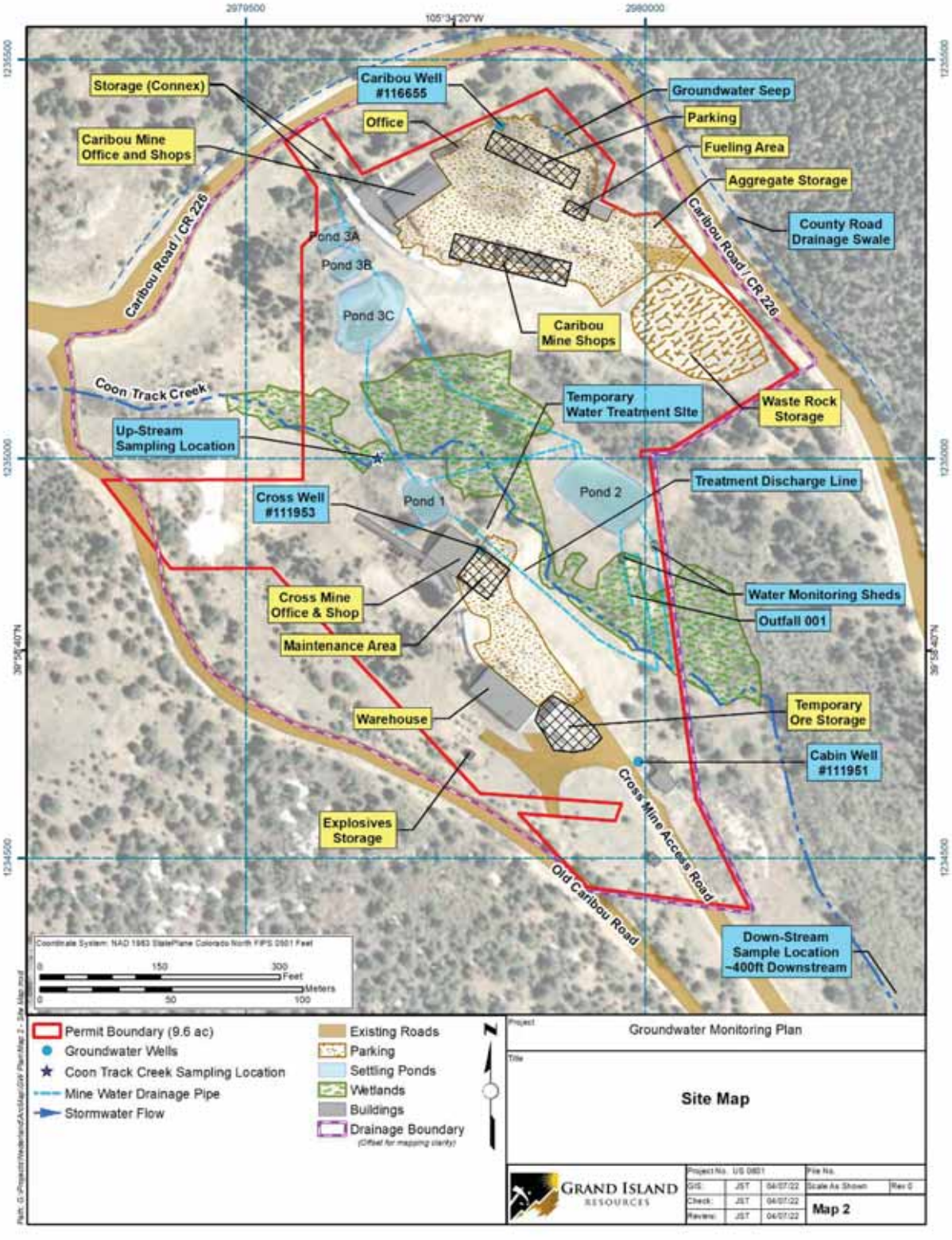
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105°34'20"W
2980000
1235500
1235000
1234500
39°58'40"N
Storage (Connex)
Caribou Well #116655
Office
Groundwater Seep
Parking
Caribou Mine Office and Shops
Fueling Area
Aggregate Storage
Caribou Road / CR 226
Pond 3A
Pond 3B
Pond 3C
County Road Drainage Swale
Caribou Mine Shops
Coon Track Creek
Temporary Water Treatment Site
Waste Rock Storage
Up-Stream Sampling Location
Cross Well #111953
Pond 1
Pond 2
Treatment Discharge Line
Water Monitoring Sheds
Cross Mine Office & Shop
Outfall 001
Maintenance Area
Warehouse
Temporary Ore Storage
Cabin Well #111951
Explosives Storage
Cross Mine Access Road
Old Caribou Road
Down-Stream Sample Location ~400ft Downstream
Coordinate System: NAD 1983 StatePlane Colorado North FIPS 0501 Feet
0 150 300 Feet
0 50 100 Meters
Permit Boundary (9.6 ac)
Groundwater Wells
Coon Track Creek Sampling Location
Mine Water Drainage Pipe
Stormwater Flow
Existing Roads
Parking
Settling Ponds
Wetlands
Buildings
Drainage Boundary
(Offset for mapping clarity)
Project
Groundwater Monitoring Plan
Title
Site Map
GRAND ISLAND RESOURCES
Project No. US 0801
File No.
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Scale As Shown
Rev 0
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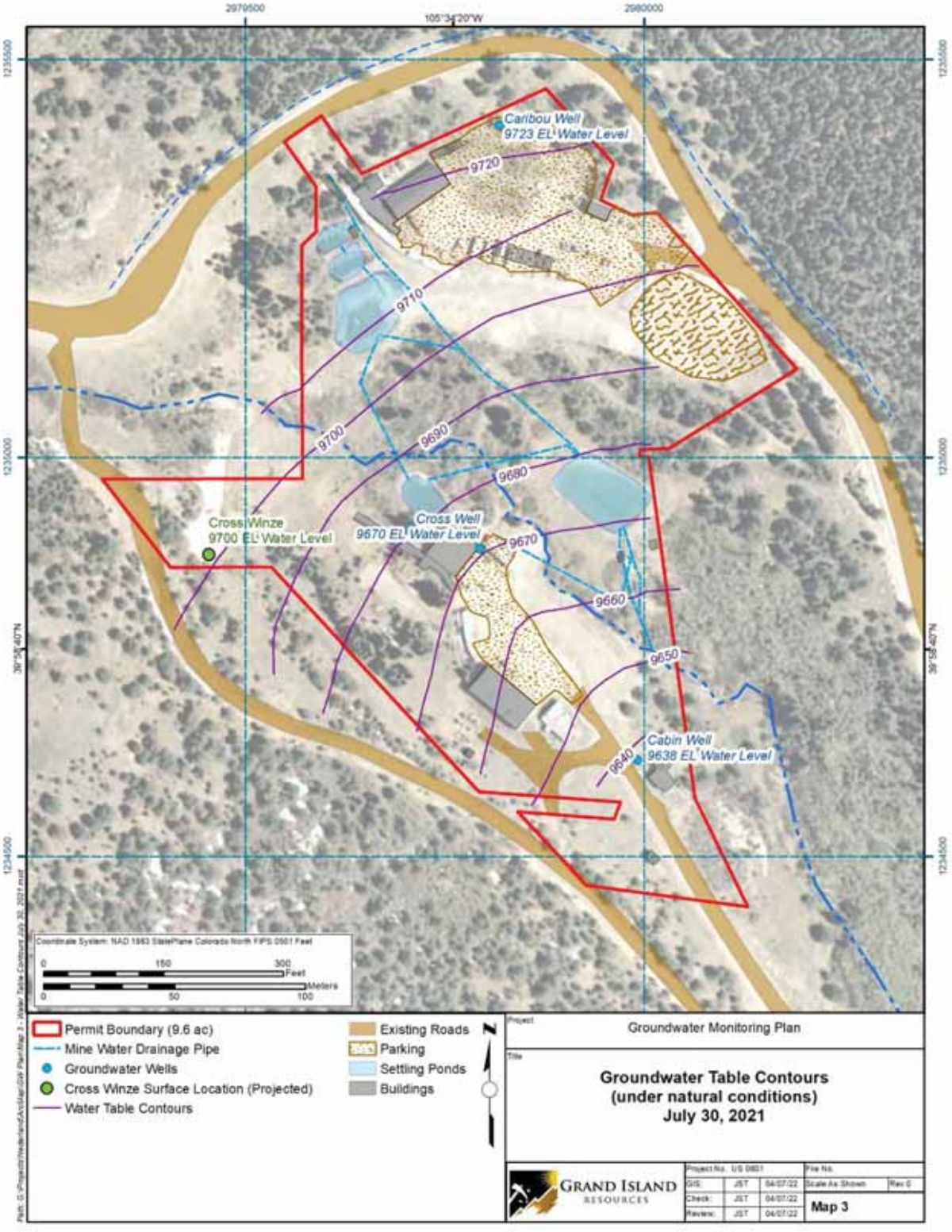
Review: JST 04/07/22
Map 2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1235500
1235000
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39°58'40"N
Caribou Well
9723 EL' Water Level
9720
9710
9700
9690
9680
9670
9660
9650
9640
Cross Winze
9700 EL' Water Level
Cross Well
9670 EL' Water Level
Cabin Well
9638 EL' Water Level
Coordinate System: NAD 1983 StatePlane Colorado North FIPS 0501 Feet
0
150
300
Feet
0
50
100
Meters
Permit Boundary (9.6 ac)
Mine Water Drainage Pipe
Groundwater Wells
Cross Winze Surface Location (Projected)
Water Table Contours
Existing Roads
Parking
Settling Ponds
Buildings
Project
Groundwater Monitoring Plan
Title
Groundwater Table Contours
(under natural conditions)
July 30, 2021
GRAND ISLAND RESOURCES
Project No. US 0801
File No.
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Scale As Shown
Rev 0
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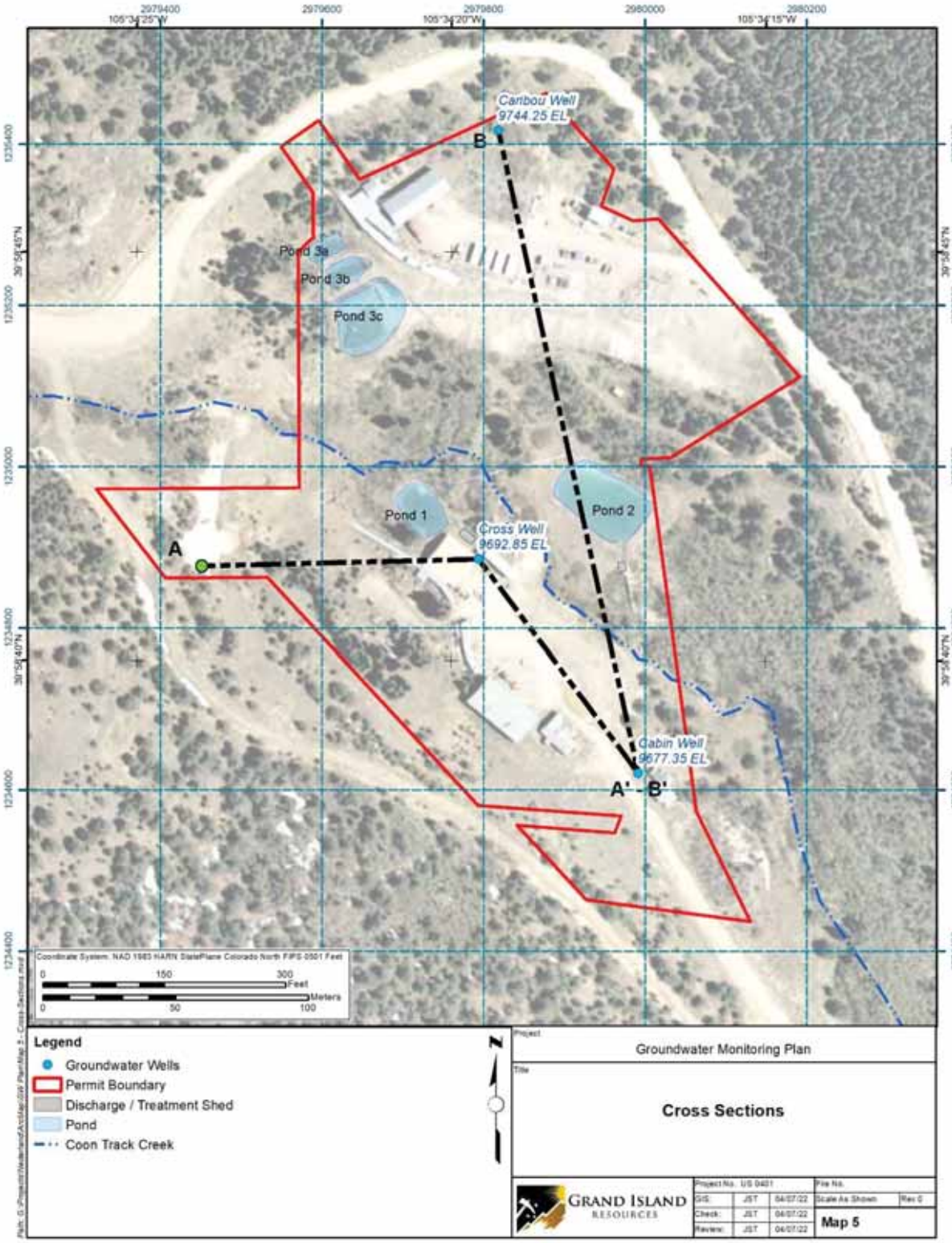
Review: JST 04/07/22
Map 3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2979600
2979800
105°34'20"W
2980000
2980200
105°34'15"W
1235400
1235200
1235000
1234800
1234600
1234400
39°58'45"N
39°58'40"N
Caribou Well
9744.25 EL
B
Pond 3a
Pond 3b
Pond 3c
Pond 1
Pond 2
Cross Well
9692.85 EL
A
Cabin Well
9677.35 EL
A' - B'
Coordinate System: NAD 1983 HARN StatePlane Colorado North FIPS 0501 Feet
0
150
300
Feet
0
50
100
Meters
Legend
Groundwater Wells
Permit Boundary
Discharge / Treatment Shed
Pond
Coon Track Creek
N
Project
Groundwater Monitoring Plan
Title
Cross Sections
GRAND ISLAND RESOURCES
Project No. US 0401
File No.
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Scale As Shown
Rev 0
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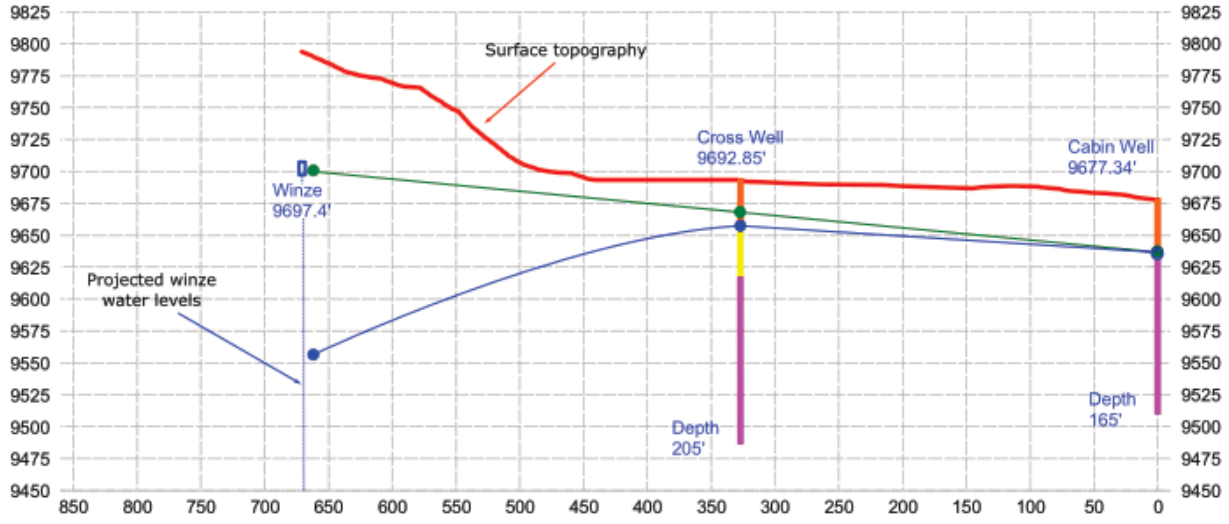
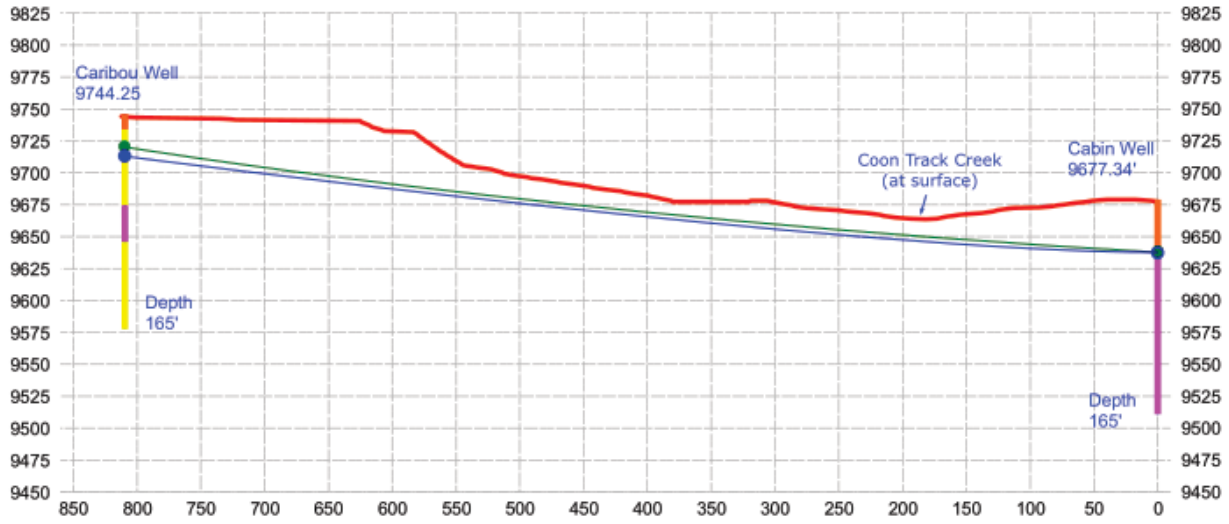
Review: JST 04/07/22
Map 5



Cross Section A-A'
Winze to Cross Well to Cabin Well



Cross Section B-B'
Caribou Well to Cabin Well

Legend

- Depth in well - 07/30/2021 - normal conditions
- Groundwater table - 07/30/2021 - normal conditions
- Depth in well - 03/28/2022 - dewatered conditions
- Groundwater table - 03/28/2022 - dewatered conditions

Well Driller Log Descriptions

Fill/overburden | Granite (monzonite) | Schist (gneiss)

Project: Groundwater Monitoring Plan

Title: **Topographic Sections with Well and Winze Depths and Conceptual Water Table at Natural and Dewatered Conditions**

GRAND ISLAND RESOURCES

Project No. US 0401			File No.	
GIS:	JST	04/07/22	Scale As Shown	Rev 0
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Review:	DAS	04/07/22		

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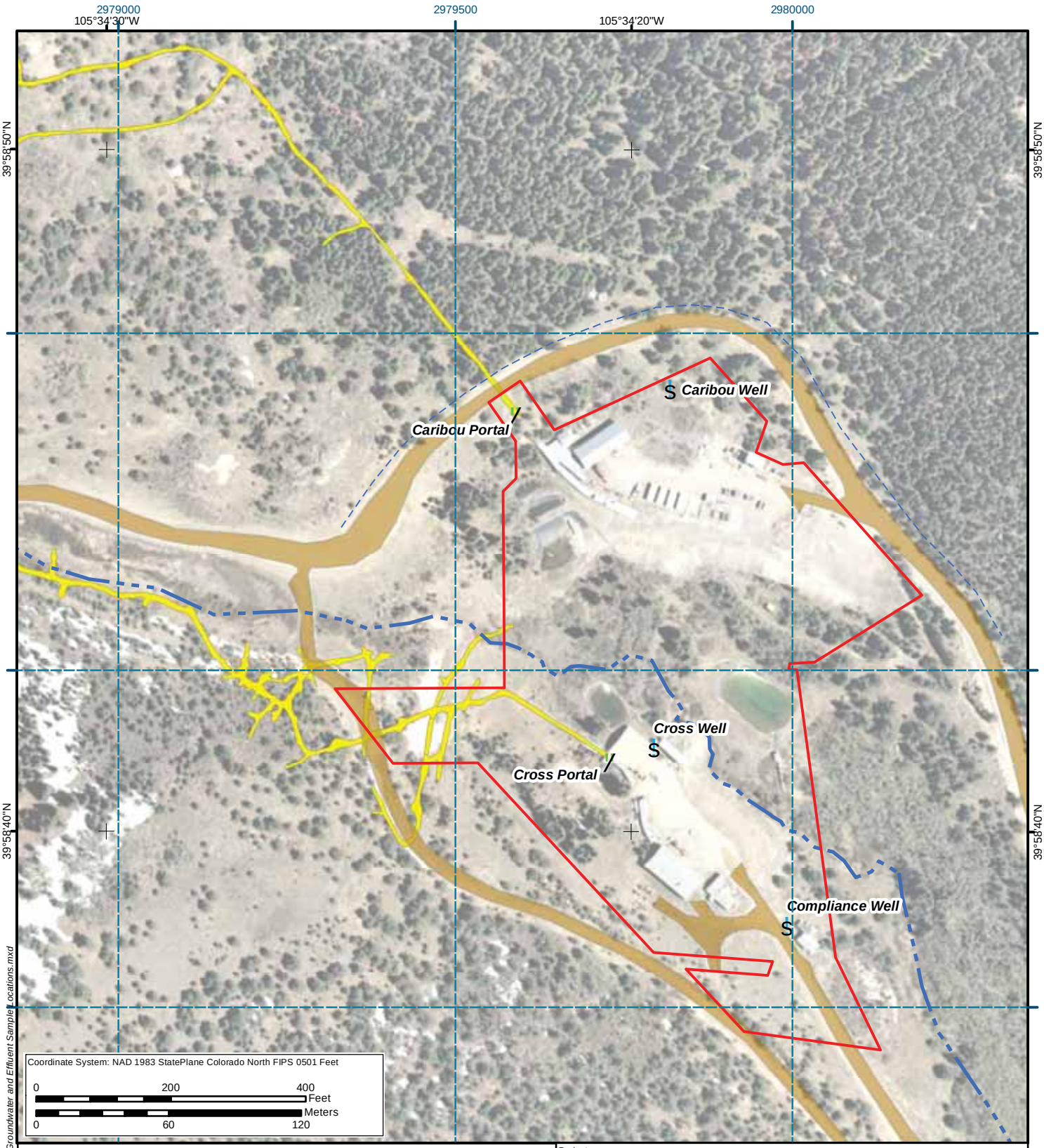


Permit Boundary (9.6 ac)

Existing Roads

Underground Workings

Mine Effluent (Groundwater) Sampled as Surface Water

Groundwater Sampling Location (Caribou, Cross & Cabin wells)

Project: Groundwater Monitoring Plan

Title

Groundwater and Effluent Sample Locations

GRAND ISLAND RESOURCES

Project No. US 0801			File No.	
GIS:	JST	04/25/22	Scale As Shown	Rev 0
Check:	JST	04/25/22	Map 6	
Review:	JST	04/25/22		

Path: G:\Projects\NederlandArcMap\GW PlanMap 6 - Groundwater and Effluent Sample Locations.mxd

Attachment A – Well Logs and Construction Diagrams

E

THIS FORM MUST BE SUBMITTED WITHIN 60 DAYS OF COMPLETION OF THE WORK DESCRIBED HEREON. TYPE OR PRINT IN BLACK INK.

COLORADO DIVISION OF WATER RESOURCES

1313 Sherman Street - Room 818
Denver, Colorado 80203

WELL COMPLETION AND PUMP INSTALLATION REPORT

PERMIT NUMBER 111951

RECEIVED
NOV 13 1980
WATER RESOURCES
STATE ENGINEER
COLO.

WELL OWNER Hendricks Mining Company

ADDRESS P.O. Box 653 Nederland, CO 80466

DATE COMPLETED November 3 , 1980

SW ¼ of the NW ¼ of Sec. 9

T. 1 S , R. 73 W , 6th P.M.

WELL LOG

From	To	Type and Color of Material	Water Loc.

TOTAL DEPTH

Use additional pages necessary to complete log.

HOLE DIAMETER

in. from to ft.

in. from to ft.

in. from to ft.

DRILLING METHOD

CASING RECORD: **Plain Casing**

Size & kind from to ft.

Size & kind from to ft.

Size & kind from to ft.

Perforated Casing

Size & kind from to ft.

Size & kind from to ft.

Size & kind from to ft.

GROUTING RECORD

Material

Intervals

Placement Method

GRAVEL PACK: Size

Interval

TEST DATA

Date Tested , 19

Static Water Level Prior to Test ft.

Type of Test Pump

Length of Test

Sustained Yield (Metered)

Final Pumping Water Level

PUMP INSTALLATION REPORT

Pump Make McDonalds

Type submersible

Powered by 115V HP 1/3

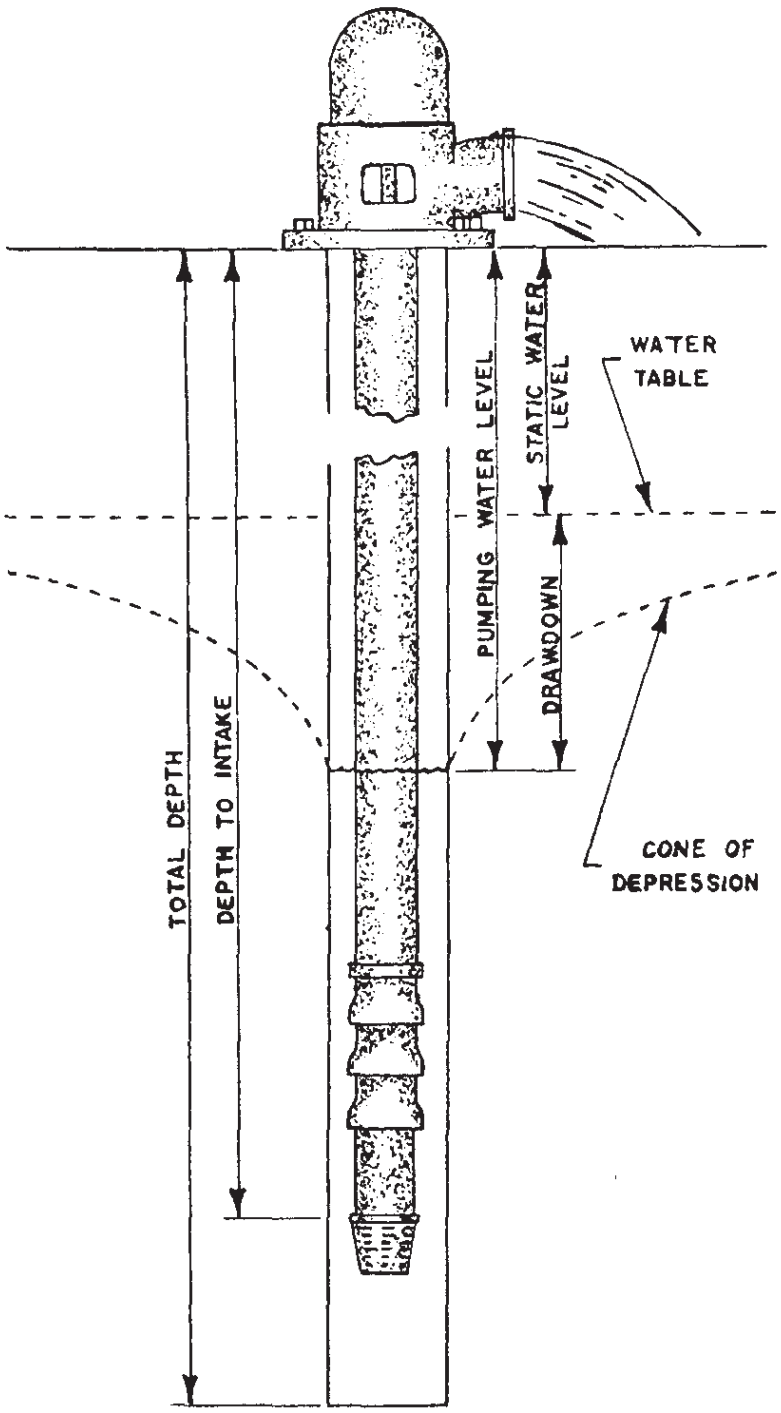
Pump Serial No. J80914S

Motor Serial No. NA

Date Installed September 3, 1980

Pump Intake Depth 150'

Remarks



WELL TEST DATA WITH PERMANENT PUMP

Date Tested not tested

Static Water Level Prior to Test

Length of Test Hours

Sustained yield (Metered) GPM

Pumping Water Level

Remarks

CONTRACTORS STATEMENT

The undersigned, being duly sworn upon oath, deposes and says that he is the contractor of the well or pump installation described hereon; that he has read the statement made hereon; knows the content thereof, and that the same is true of his own knowledge.

Signature Lloyd H Miller License No. 675

State of Colorado, County of Boulder SS

Subscribed and sworn to before me this 11 day of November, 1980.

My Commission expires July 3, 1982

My Commission expires: , 19 .

Notary Public Roxi English

FORM TO BE MADE OUT IN QUADRUPLICATE: WHITE FORM must be an original copy on both sides and signed. WHITE AND GREEN copies must be filed with the State Engineer. PINK COPY is for the Owner and YELLOW COPY is for the Driller.

WATER 20 77

THIS FORM MUST BE SUBMITTED WITHIN 60 DAYS OF COMPLETION OF THE WORK DESCRIBED HEREON. TYPE OR PRINT IN BLACK INK.

COLORADO DIVISION OF WATER RESOURCES

1313 Sherman Street - Room 818
Denver, Colorado 80203

WELL COMPLETION AND PUMP INSTALLATION REPORT

PERMIT NUMBER 111951

RECEIVED
DEC 3 1 1979
WATER RESOURCES
STATE ENGINEER
COLO.

WELL OWNER Tom Hendricks
ADDRESS PO Box 653 Nederland, CO 80466

SW ¼ of the NW ¼ of Sec. 9
T. 1 S , R. 73 N , 6th P.M.

DATE COMPLETED December 21 , 1979

WELL LOG

From	To	Type and Color of Material	Water Loc.
0	3	Fill	
3	42	Overburden	
42	75	Brown granite	
75	80	Granite/quartz	
80	145	Grey granite	
145	150	Quartz	
150	165	Grey granite	
		5 GPM @ 75'	
		20 GPM @ 145'	

The testing of production of water from this well [illegible] by this report, is [illegible] upon conditions [illegible] the date of testing and does not [illegible] any projection as to future production. This [illegible] upon future [illegible]

TOTAL DEPTH 165'

Use additional pages necessary to complete log.

HOLE DIAMETER

9 in. from 0 to 50 ft.
6 in. from 50 to 165 ft.
in. from to ft.

DRILLING METHOD Air percussion

CASING RECORD: Plain Casing

Size 6 5/8& kind Steel from -1 to 50 ft.
Size 4 1/2& kind PVC from 15 to 65 ft.
Size & kind from to ft.

Perforated Casing

Size 4 1/2& kind PVC from 65 to 165 ft.
Size & kind from to ft.
Size & kind from to ft.

GROUTING RECORD

Material Cement
Intervals 15' - 60'
Placement Method Poured

GRAVEL PACK: Size N A
Interval

TEST DATA

Date Tested December 21 , 1979
Static Water Level Prior to Test ft.
Type of Test Pump Air
Length of Test One hour
Sustained Yield (Metered) 25 GPM
Final Pumping Water Level 165'

WRJ 5 Rev. 7/

COLORADO DIVISION OF WATER RESOURCES

818 Centennial Bldg., 1313 Sherman St., Denver, Colorado 80203

RECEIVED
NOV 19 1979

RECEIVED
OCT 10 1979
WATER RESOURCES
STATE ENGINEER
COLO.

PERMIT APPLICATION FORM

Application must be complete where applicable. Type or print in BLACK INK. No overstrikes or erasures unless initialed.

FOR: (X) A PERMIT TO USE GROUND WATER
(X) A PERMIT TO CONSTRUCT A WELL
(X) A PERMIT TO INSTALL A PUMP
( ) REPLACEMENT FOR NO. _____
( ) OTHER _____
WATER COURT CASE NO. _____

(1) APPLICANT - mailing address

NAME Tom Hendricks
STREET PO Box 653
CITY Nederland, CO (State) 80466 (Zip)
TELEPHONE NO. 258-3806

(2) LOCATION OF PROPOSED WELL

County Boulder
SW ¼ of the NW ¼, Section 9
Twp 1 S (N.S) Rng. 73 W (E.W), 6th P.M.

(3) WATER USE AND WELL DATA

Proposed maximum pumping rate (gpm) 15
Average annual amount of ground water to be appropriated (acre-feet): 1
Number of acres to be irrigated. 0
Proposed total depth (feet): 200
Aquifer ground water is to be obtained from: Granite
Owner's well designation _____

GROUND WATER TO BE USED FOR:

(X) HOUSEHOLD USE ONLY no irrigation (0)
( ) DOMESTIC (1)
( ) LIVESTOCK (2)
( ) COMMERCIAL (4)
( ) INDUSTRIAL (5)
( ) IRRIGATION (6)
( ) MUNICIPAL (8)
( ) OTHER (9) _____
DETAIL THE USE ON BACK IN (11)

(4) DRILLER

Name Norris & Sons Drilling Co.
Street 4599 North Broadway
City Boulder, CO (State) 80302 (Zip)
Telephone No. 442-4083 Lic. No. 716

FOR OFFICE USE ONLY: DO NOT WRITE IN THIS COLUMN

Receipt No. 11941 A
Basin _____ Dist. _____

CONDITIONS OF APPROVAL

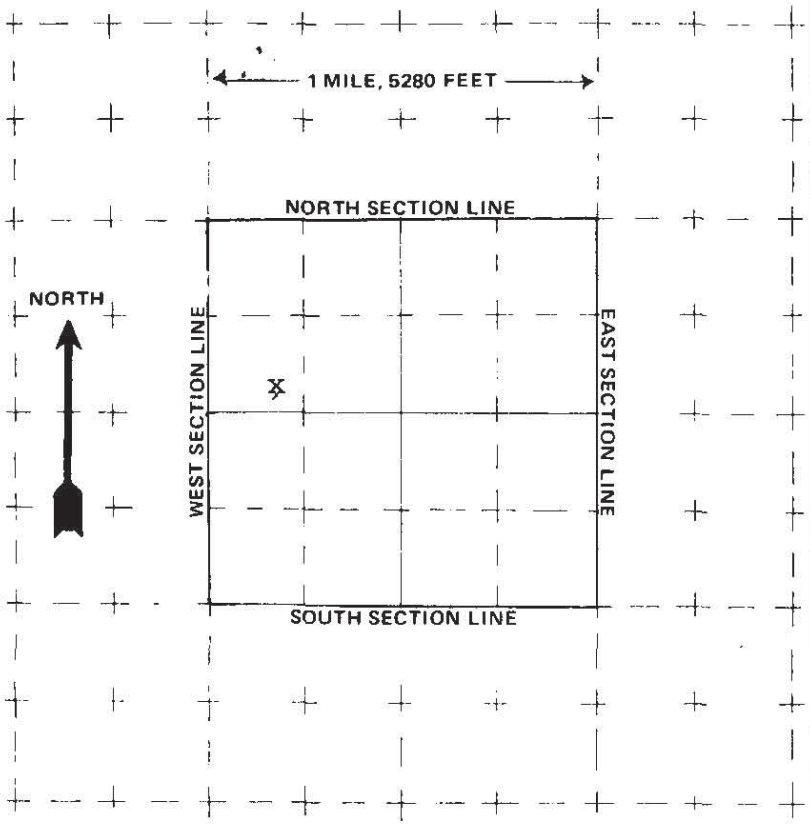
This well shall be used in such a way as to cause no material injury to existing water rights. The issuance of the permit does not assure the applicant that no injury will occur to another vested water right or preclude another owner of a vested water right from seeking relief in a civil court action.

APPROVED FOR HOUSEHOLD USE ONLY, FOR ONE (1) SINGLE FAMILY DWELLING AND NOT TO BE USED FOR IRRIGATION. THE RETURN FLOW FROM THE USE OF THIS WELL MUST BE RETURNED TO THE SAME STREAM SYSTEM IN WHICH THE WELL IS LOCATED.

APPLICATION APPROVED

PERMIT NUMBER 13951
DATE ISSUED NOV 30 1979
EXPIRATION DATE NOV 30 1981
Bruce E. DeBrine (STATE ENGINEER)
DEPUTY
BY R.D. Haubold
ID 166 COUNTY 07

(5) THE LOCATION OF THE PROPOSED WELL and the area on which the water will be used must be indicated on the diagram below. Use the CENTER SECTION (1 section, 640 acres) for the well location.



The scale of the diagram is 2 inches = 1 mile
Each small square represents 40 acres.

WATER EQUIVALENTS TABLE (Rounded Figures)

An acre-foot covers 1 acre of land 1 foot deep
1 cubic foot per second (cfs) . . . 449 gallons per minute (gpm)
A family of 5 will require approximately 1 acre-foot of water per year.
1 acre-foot . . . 43,560 cubic feet . . . 325,900 gallons.
1,000 gpm pumped continuously for one day produces 4.42 acre-feet.

(6) THE WELL MUST BE LOCATED BELOW by distances from section lines.

2200 ft. from North (north or south) sec. line

1000 ft. from West (east or west) sec. line

LOT _____ BLOCK _____ FILING # _____

SUBDIVISION Rare Metals Mill Site #20681-B

(7) TRACT ON WHICH WELL WILL BE LOCATED Owner: Same

No. of acres 5 . Will this be the only well on this tract? Yes

(8) PROPOSED CASING PROGRAM

Plain Casing

6 5/8 in. from -1 ft. to 20 ft.

_____ in. from _____ ft. to _____ ft.

Perforated casing

4 1/2 in. from 15 ft. to 200 ft.

_____ in. from _____ ft. to _____ ft.

(9) FOR REPLACEMENT WELLS give distance and direction from old well and plans for plugging it:

(10) LAND ON WHICH GROUND WATER WILL BE USED:

Owner(s): Tom Hendricks No. of acres: 5

Legal description: SW¼ of NW¼, Sec. 9, T 1S, R 73W

(11) DETAILED DESCRIPTION of the use of ground water: **Household use and domestic wells must indicate type of disposal system to be used.**

Household use only -- septic tank with absorption bed

(12) OTHER WATER RIGHTS used on this land, including wells. Give Registration and Water Court Case Numbers.

Type or right	Used for (purpose)	Description of land on which used
None		

(13) THE APPLICANT(S) STATE(S) THAT THE INFORMATION SET FORTH HEREON IS TRUE TO THE BEST OF HIS KNOWLEDGE.

Thomas S. Hendricks

SIGNATURE OF APPLICANT(S)

Use additional sheets of paper if more space is required.

E

THIS FORM MUST BE SUBMITTED WITHIN 60 DAYS OF COMPLETION OF THE WORK DESCRIBED HEREON. TYPE OR PRINT IN BLACK INK.

COLORADO DIVISION OF WATER RESOURCES

1313 Sherman Street - Room 818
Denver, Colorado 80203

WELL COMPLETION AND PUMP INSTALLATION REPORT

PERMIT NUMBER 111953

RECEIVED
NOV 13 1980
WATER RESOURCES
STATE ENGINEER
COLO.

WELL OWNER Hendricks Mining Company

ADDRESS P.O. Box 653, Nederland, CO 80466

DATE COMPLETED September 3, 1980

SW ¼ of the NW ¼ of Sec 9

T. 1 S, R. 73 W 6th P.M.

WELL LOG

From	To	Type and Color of Material	Water Loc.

TOTAL DEPTH _____

Use additional pages necessary to complete log.

HOLE DIAMETER

_____ in. from _____ to _____ ft.

_____ in. from _____ to _____ ft.

_____ in. from _____ to _____ ft.

DRILLING METHOD _____

CASING RECORD: **Plain Casing**

Size _____ & kind _____ from _____ to _____ ft.

Size _____ & kind _____ from _____ to _____ ft.

Size _____ & kind _____ from _____ to _____ ft.

Perforated Casing

Size _____ & kind _____ from _____ to _____ ft.

Size _____ & kind _____ from _____ to _____ ft.

Size _____ & kind _____ from _____ to _____ ft.

GROUTING RECORD

Material _____

Intervals _____

Placement Method _____

GRAVEL PACK: Size _____

Interval _____

TEST DATA

Date Tested _____, 19 ___

Static Water Level Prior to Test _____ ft.

Type of Test Pump _____

Length of Test _____

Sustained Yield (Metered) _____

Final Pumping Water Level _____

PUMP INSTALLATION REPORT

Pump Make Jacuzzi

Type 3 - wire submersible

Powered by 230V HP 3/4

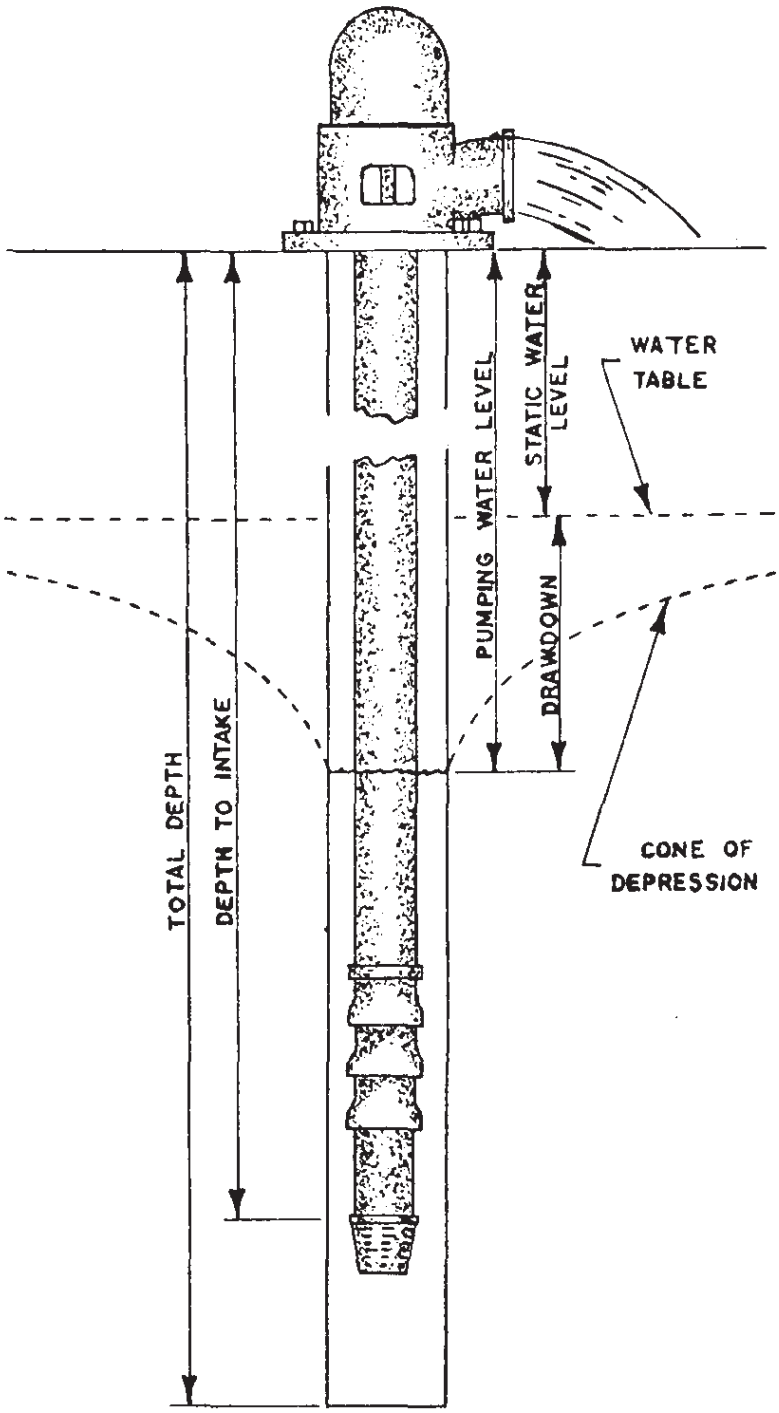
Pump Serial No. 7S4B-S2

Motor Serial No. NA

Date Installed 9/3/80

Pump Intake Depth 190'

Remarks



WELL TEST DATA WITH PERMANENT PUMP

Date Tested not tested

Static Water Level Prior to Test

Length of Test Hours

Sustained yield (Metered) GPM

Pumping Water Level

Remarks

CONTRACTORS STATEMENT

The undersigned, being duly sworn upon oath, deposes and says that he is the contractor of the well or pump installation described hereon; that he has read the statement made hereon; knows the content thereof, and that the same is true of his own knowledge.

Signature Lloyd H Miller License No 625

State of Colorado, County of Boulder SS

Subscribed and sworn to before me this 11 day of November, 19 80.

My Commission expires July 3, 1982

My Commission expires: , 19 .

Notary Public Lori English

FORM TO BE MADE OUT IN QUADRUPLICATE: WHITE FORM must be an original copy on both sides and signed. WHITE AND GREEN copies must be filed with the State Engineer. PINK COPY is for the Owner and YELLOW COPY is for the Driller.

THIS FORM MUST BE SUBMITTED WITHIN 60 DAYS OF COMPLETION OF THE WORK DESCRIBED HEREON. TYPE OR PRINT IN BLACK INK.

COLORADO DIVISION OF WATER RESOURCES

1313 Sherman Street - Room 818
Denver, Colorado 80203

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AUG 01 1980
WATER RESOURCES
STATE ENGINEER
COLO.

RECEIVED
JUN 26 1980
WATER RESOURCES
STATE ENGINEER
COLO.

WELL COMPLETION AND PUMP INSTALLATION REPORT

PERMIT NUMBER 111953

WELL OWNER Hendricks Mining Co.
PO Box 653
ADDRESS Nederland, CO 80466

SW ¼ of the NW ¼ of Sec. 9
T 1 S, R 73 W, 6th P.M.

DATE COMPLETED June 19, 1980

WELL LOG

From	To	Type and Color of Material	Water Loc.
0	39	Overburden	
39	75	Schist with quartz	
75	205	Granite	
		25 GPM @ 175'	

The testing of production of water from this well, as reflected by this report, is totally dependent upon conditions existing as of the date of testing and does not reflect any projection as to future production. This is dependent upon future conditions.

TOTAL DEPTH 205'

Use additional pages necessary to complete log.

HOLE DIAMETER

9 in. from 0 to 40 ft.
5 7/8 in. from 40 to 205 ft.
___ in. from ___ to ___ ft.

DRILLING METHOD Air percussion

CASING RECORD:

Plain Casing

Size 6 5/8 & kind Steel from -1 to 40 ft.
Size ___ & kind ___ from ___ to ___ ft.
Size ___ & kind ___ from ___ to ___ ft.

Perforated Casing

Size 4 1/2 & kind PVC from 15 to 205 ft.
Size ___ & kind ___ from ___ to ___ ft.
Size ___ & kind ___ from ___ to ___ ft.

GROUTING RECORD

Material Cement
Intervals 8' - 40'
Placement Method Poured

GRAVEL PACK: Size N A
Interval ___

TEST DATA

Date Tested June 19, 1980
Static Water Level Prior to Test 35 ft
Type of Test Pump Air
Length of Test One hour
Sustained Yield (Metered) 25 GPM
Final Pumping Water Level 205'

PUMP INSTALLATION REPORT

Pump Make _____

Type _____

Powered by _____ HP _____

Pump Serial No. _____

Motor Serial No. _____

Date Installed _____

Pump Intake Depth _____

Remarks _____

_____

WELL TEST DATA WITH PERMANENT PUMP

Date Tested _____

Static Water Level Prior to Test _____

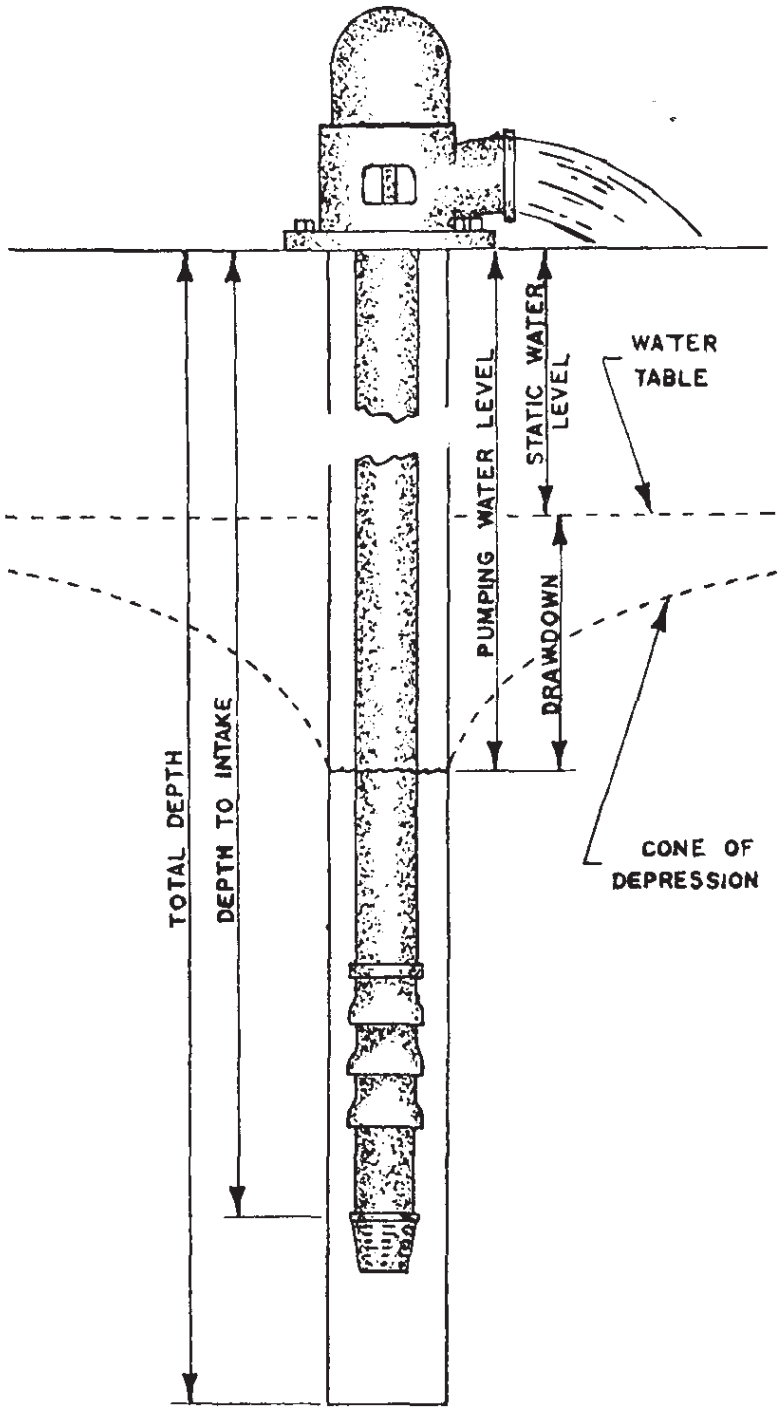
Length of Test _____ Hours

Sustained yield (Metered) _____ GPM

Pumping Water Level _____

Remarks _____

_____



CONTRACTORS STATEMENT

The undersigned, being duly sworn upon oath, deposes and says that he is the contractor of the well or pump installation described hereon; that he has read the statement made hereon; knows the content thereof, and that the same is true of his own knowledge.

Signature Richard R. Wilson License No. 716

State of Colorado, County of Boulder SS

Subscribed and sworn to before me this 23 day of June, 1980.

My Commission expires: Febr. 22, 19 84.

Notary Public Roger H. Williams

FORM TO BE MADE OUT IN QUADRUPLICATE: WHITE FORM must be an original copy on both sides and signed. WHITE AND GREEN copies must be filed with the State Engineer. PINK COPY is for the Owner and YELLOW COPY is for the Driller.

WSJ-S-Rev. 76

COLORADO DIVISION OF WATER RESOURCES

818 Centennial Bldg., 1313 Sherman St., Denver, Colorado 80203

RECEIVED
OCT 19 1979
WATER RESOURCES
STATE ENGINEER
COLO.

RECEIVED
OCT 10 1979
WATER RESOURCES
STATE ENGINEER
COLO.

PERMIT APPLICATION FORM

Application must be complete where applicable. Type or print in BLACK INK. No overstrikes or erasures unless initialed.

FOR: (X) A PERMIT TO USE GROUND WATER
(X) A PERMIT TO CONSTRUCT A WELL
(X) A PERMIT TO INSTALL A PUMP

( ) REPLACEMENT FOR NO. _____
( ) OTHER _____
WATER COURT CASE NO. _____

(1) APPLICANT · mailing address

NAME Hendricks Mining Co.

STREET PO Box 653

CITY Nederland, Colorado (State) 80466 (Zip)

TELEPHONE NO. 258-3806

(2) LOCATION OF PROPOSED WELL

County Boulder

SW ¼ of the NW ¼, Section 9

Twp. 1 S (N.S.) Rng. 73 W (E.W.) 6th P.M.

(3) WATER USE AND WELL DATA

Proposed maximum pumping rate (gpm) 15

Average annual amount of ground water to be appropriated (acre-feet): 1

Number of acres to be irrigated: 0

Proposed total depth (feet): 200

Aquifer ground water is to be obtained from:

Granite

Owner's well designation None

GROUND WATER TO BE USED FOR:

(X) HOUSEHOLD USE ONLY no irrigation (0)
( ) DOMESTIC (1)
( ) LIVESTOCK (2)
( ) COMMERCIAL (4)
( ) INDUSTRIAL (5)
( ) IRRIGATION (6)
( ) MUNICIPAL (8)

( ) OTHER (9) _____

DETAIL THE USE ON BACK IN (11)

(4) DRILLER

Name Norris & Sons Drilling Co.

Street 4599 No. Broadway

City Boulder, CO (State) 80302 (Zip)

Telephone No. 442-4083 Lic. No. 716

FOR OFFICE USE ONLY: DO NOT WRITE IN THIS COLUMN

Receipt No. 11194 B

Basin _____ Dist. _____

CONDITIONS OF APPROVAL

This well shall be used in such a way as to cause no material injury to existing water rights. The issuance of the permit does not assure the applicant that no injury will occur to another vested water right or preclude another owner of a vested water right from seeking relief in a civil court action.

APPROVED PURSUANT TO BRS 1973, 37-92-602 (1)(c) FOR DRINKING AND SANITARY FACILITIES ONLY AT THE CROSS MILL MINING SITE # 20681-B.

AVERAGE DAILY APPROPRIATION FROM THIS WELL SHALL NOT EXCEED 300 GALLONS

APPLICATION APPROVED

PERMIT NUMBER 111953

DATE ISSUED NOV 30 1979

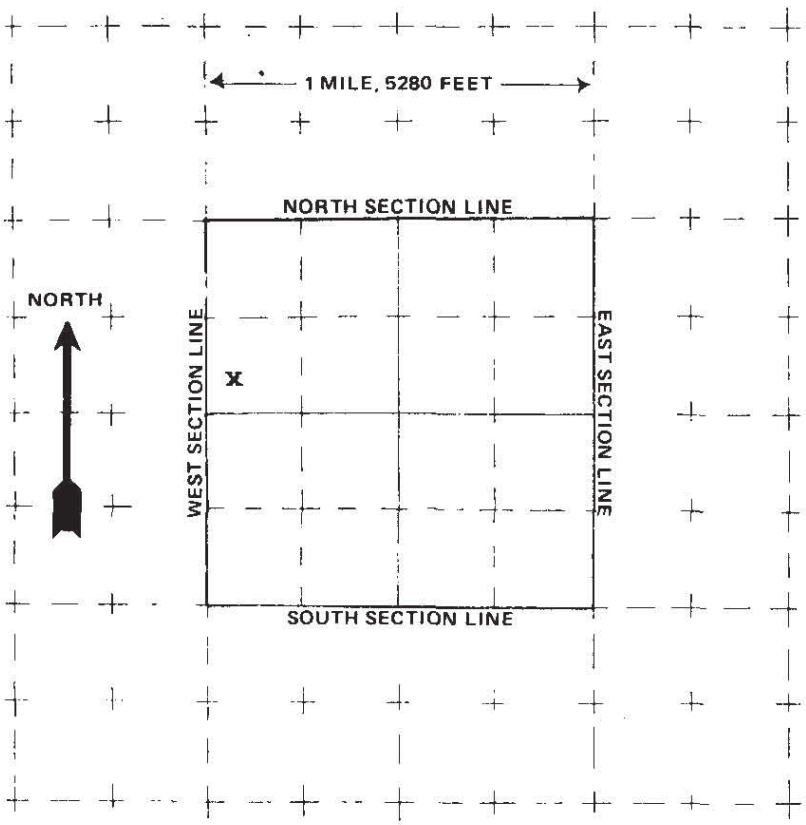
EXPIRATION DATE NOV 30 1981

Bruce E. DeBrine (STATE ENGINEER)

BY DEPUTY R. Hanbold

I.D. 106 COUNTY 07

(5) THE LOCATION OF THE PROPOSED WELL and the area on which the water will be used must be indicated on the diagram below. Use the CENTER SECTION (1 section, 640 acres) for the well location.



The scale of the diagram is 2 inches = 1 mile
Each small square represents 40 acres.

WATER EQUIVALENTS TABLE (Rounded Figures)
An acre-foot covers 1 acre of land 1 foot deep
1 cubic foot per second (cfs) . . . 449 gallons per minute (gpm)
A family of 5 will require approximately 1 acre-foot of water per year.
1 acre-foot . . . 43,560 cubic feet . . . 325,900 gallons.
1,000 gpm pumped continuously for one day produces 4.42 acre-feet.

(6) THE WELL MUST BE LOCATED BELOW by distances from section lines.

1900 ft. from North (north or south) sec. line

650 ft. from West (east or west) sec. line

LOT _____ BLOCK _____ FILING # _____

SUBDIVISION Cross Mill Site #20681-B

(7) TRACT ON WHICH WELL WILL BE LOCATED Owner: Same

No. of acres 5 . Will this be the only well on this tract? Yes

(8) PROPOSED CASING PROGRAM

Plain Casing

6 5/8 in. from -1 ft. to 20 ft.

_____ in. from _____ ft. to _____ ft.

Perforated casing

4 1/2 in. from 15 ft. to 200 ft.

_____ in. from _____ ft. to _____ ft.

(9) FOR REPLACEMENT WELLS give distance and direction from old well and plans for plugging it:

(10) LAND ON WHICH GROUND WATER WILL BE USED:

Owner(s): Hendericks Mining Co. No. of acres: 5

Legal description: SW¼ of NW¼, Sec. 9, T 1S, R 73W

(11) DETAILED DESCRIPTION of the use of ground water: **Household use and domestic wells must indicate type of disposal system to be used.**

Household Use Only -- Septic Tank with Absorption Bed

Sanitary Facilities for Mine

(12) OTHER WATER RIGHTS used on this land, including wells. Give Registration and Water Court Case Numbers.

Type or right	Used for (purpose)	Description of land on which used
None		

(13) THE APPLICANT(S) STATE(S) THAT THE INFORMATION SET FORTH HEREON IS TRUE TO THE BEST OF HIS KNOWLEDGE.

Thomas S. Hendricks

SIGNATURE OF APPLICANT(S)

Use additional sheets of paper if more space is required.

WJR-26-77

E

COLORADO DIVISION OF WATER RESOURCES

1313 Sherman Street - Room 818
Denver, Colorado 80203

THIS FORM MUST BE SUBMITTED WITHIN 60 DAYS OF COMPLETION OF THE WORK DESCRIBED HEREON. TYPE OR PRINT IN BLACK INK.

WELL COMPLETION AND PUMP INSTALLATION REPORT

PERMIT NUMBER 116655

RECEIVED
NOV 13 1980
WATER RESOURCES
STATE ENGINEER
COLO.

WELL OWNER HENDRICKS-GOOD MINING CO.
ADDRESS 3000 N. 63rd Street
Boulder, CO 80301

SW ¼ of the NW ¼ of Sec. 9,
T. 1 S, R. 73 W, 6th P.M.

DATE COMPLETED November 4, 1980

WELL LOG

From	To	Type and Color of Material	Water Loc.
0	10	Clay, gravel, boulders	
10	70	Schist	
70	90	Brown granite/quartz	
90	100	Grey granite	
100	165	Schist	
		12 GPM @ 70' - 90'	

The testing of production of water from this well, as reflected by this report, is totally dependent upon conditions existing as of the date of testing and does not reflect any projection as to future production. This is dependent upon future conditions.

TOTAL DEPTH 165'

Use additional pages necessary to complete log.

HOLE DIAMETER

9 in. from 0 to 26 ft.
6 in. from 26 to 165 ft.
___ in. from ___ to ___ ft.

DRILLING METHOD Air percussion

CASING RECORD:

Plain Casing

Size 6 5/8 & kind Steel from -1 to 26 ft.
Size 4 1/2 & kind PVC from 15 to 25 ft.
Size ___ & kind ___ from ___ to ___ ft.

Perforated Casing

Size 4 1/2 & kind PVC from 25 to 165 ft.
Size ___ & kind ___ from ___ to ___ ft.
Size ___ & kind ___ from ___ to ___ ft.

GROUTING RECORD

Material Cement
Intervals 8' - 26'
Placement Method Poured

GRAVEL PACK: Size N A
Interval

TEST DATA

Date Tested November 4, 1980
Static Water Level Prior to Test 20 ft.
Type of Test Pump Air
Length of Test One hour
Sustained Yield (Metered) 12 GPM
Final Pumping Water Level 165'

PUMP INSTALLATION REPORT

Pump Make _____

Type _____

Powered by _____ HP _____

Pump Serial No. _____

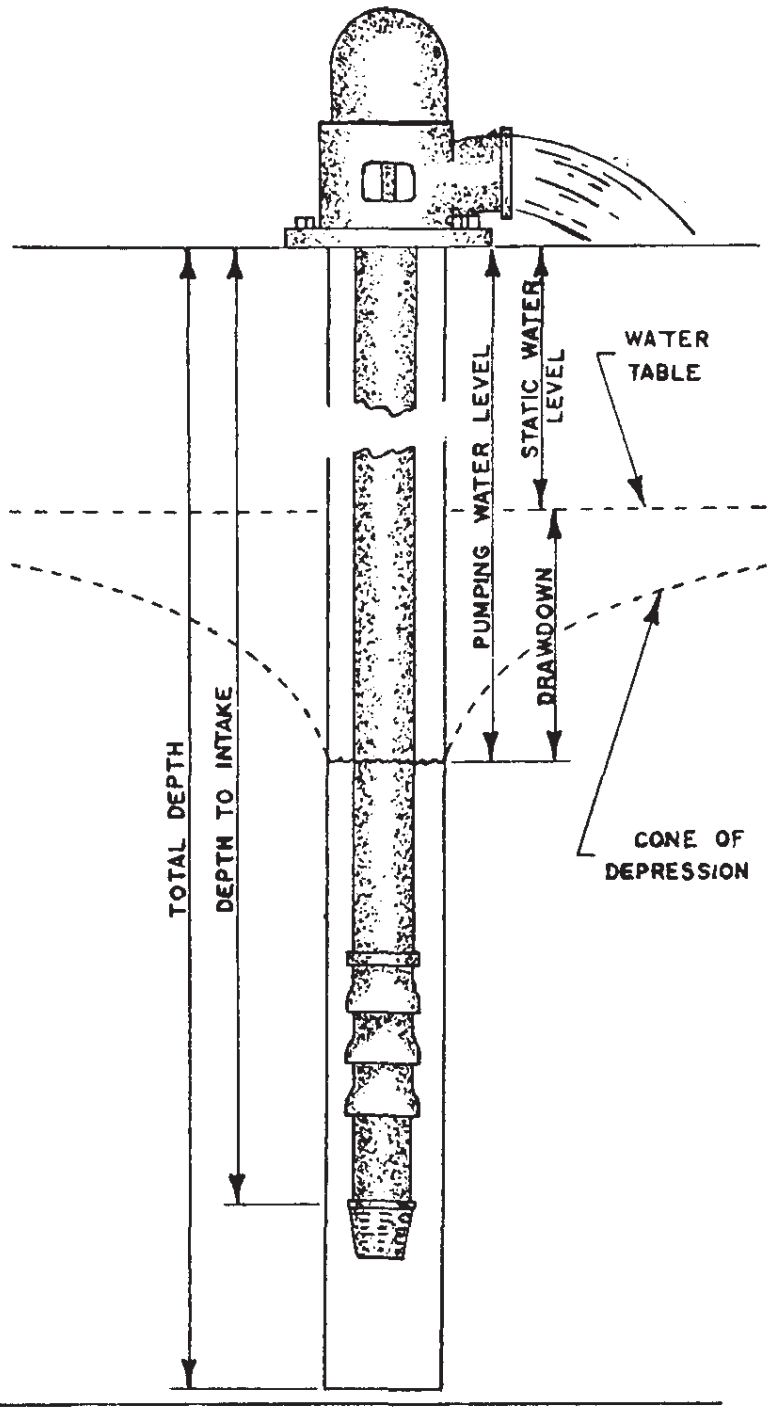
Motor Serial No. _____

Date Installed _____

Pump Intake Depth _____

Remarks _____

_____



WELL TEST DATA WITH PERMANENT PUMP

Date Tested _____

Static Water Level Prior to Test _____

Length of Test _____ Hours

Sustained yield (Metered) _____ GPM

Pumping Water Level _____

Remarks _____

_____

CONTRACTORS STATEMENT

The undersigned, being duly sworn upon oath, deposes and says that he is the contractor of the well or pump installation described hereon; that he has read the statement made hereon; knows the content thereof, and that the same is true of his own knowledge.

Signature Richard R. Williams License No. 716

State of Colorado, County of Boulder SS

Subscribed and sworn to before me this 5 day of November, 1980.

My Commission expires: Febr. 22, 1984.

Notary Public Roger H. Williams

FORM TO BE MADE OUT IN QUADRUPLICATE: WHITE FORM must be an original copy on both sides and signed. WHITE AND GREEN copies must be filed with the State Engineer. PINK COPY is for the Owner and YELLOW COPY is for the Driller.

WJR-26-77

THIS FORM MUST BE SUBMITTED WITHIN 60 DAYS OF COMPLETION OF THE WORK DESCRIBED HEREON. TYPE OR PRINT IN BLACK INK.

COLORADO DIVISION OF WATER RESOURCES

1313 Sherman Street - Room 818
Denver, Colorado 80203

WELL COMPLETION AND PUMP INSTALLATION REPORT

PERMIT NUMBER 116655

RECEIVED
NOV 13 1980
WATER RESOURCES
STATE ENGINEER
COLO.

WELL OWNER Hendricks Mining Company

ADDRESS P.O. Box 653, Nederland, CO 80466

DATE COMPLETED November 10, 1980

SW ¼ of the NW ¼ of Sec. 9,

T. 1 S, R. 73 W, 6th P.M.

WELL LOG

From	To	Type and Color of Material	Water Loc.

TOTAL DEPTH _____

Use additional pages necessary to complete log.

HOLE DIAMETER

_____ in. from _____ to _____ ft.

_____ in. from _____ to _____ ft.

_____ in. from _____ to _____ ft.

DRILLING METHOD _____

CASING RECORD:

Plain Casing

Size _____ & kind _____ from _____ to _____ ft.

Size _____ & kind _____ from _____ to _____ ft.

Size _____ & kind _____ from _____ to _____ ft.

Perforated Casing

Size _____ & kind _____ from _____ to _____ ft.

Size _____ & kind _____ from _____ to _____ ft.

Size _____ & kind _____ from _____ to _____ ft.

GROUTING RECORD

Material _____

Intervals _____

Placement Method _____

GRAVEL PACK: Size _____

Interval _____

TEST DATA

Date Tested _____, 19__

Static Water Level Prior to Test _____ ft.

Type of Test Pump _____

Length of Test _____

Sustained Yield (Metered) _____

Final Pumping Water Level _____

PUMP INSTALLATION REPORT

Pump Make Jacuzzi

Type 3 - wire submersible

Powered by 230V HP 1

Pump Serial No. 1S4C-S2-14

Motor Serial No. 0H8-660706

Date Installed November 10, 1980

Pump Intake Depth 165'

Remarks

WELL TEST DATA WITH PERMANENT PUMP

Date Tested not tested

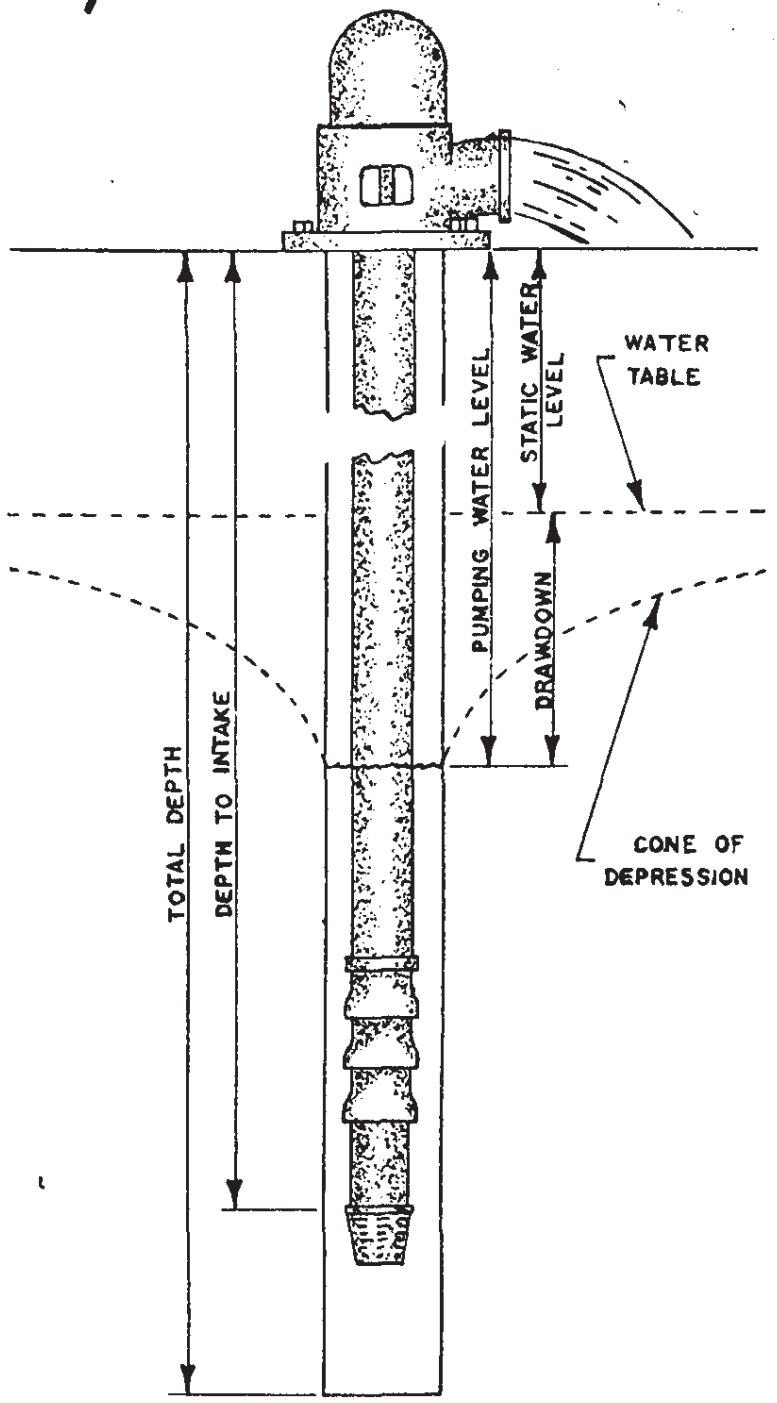
Static Water Level Prior to Test

Length of Test Hours

Sustained yield (Metered) GPM

Pumping Water Level

Remarks



CONTRACTORS STATEMENT

The undersigned, being duly sworn upon oath, deposes and says that he is the contractor of the well or pump installation described hereon; that he has read the statement made hereon; knows the content thereof, and that the same is true of his own knowledge.

Signature Lloyd H Miller License No. 675

State of Colorado, County of Boulder SS

Subscribed and sworn to before me this 11 day of November, 1980.

My Commission expires July 3, 1982

My Commission expires: , 19 .

Notary Public Lori English

FORM TO BE MADE OUT IN QUADRUPLICATE: WHITE FORM must be an original copy on both sides and signed. WHITE AND GREEN copies must be filed with the State Engineer. PINK COPY is for the Owner and YELLOW COPY is for the Driller.

WRJ-5-Rev 76

COLORADO DIVISION OF WATER RESOURCES

818 Centennial Bldg., 1313 Sherman St., Denver, Colorado 80203

RECEIVED
SEP 11 1980
WATER RESOURCES
STATE ENGINEER
COLO.

PERMIT APPLICATION FORM

Application must be complete where applicable. Type or print in BLACK INK. No overstrikes or erasures unless initialed.

FOR: (X) A PERMIT TO USE GROUND WATER
(X) A PERMIT TO CONSTRUCT A WELL
(X) A PERMIT TO INSTALL A PUMP

( ) REPLACEMENT FOR NO. _____
( ) OTHER _____
WATER COURT CASE NO. _____

(1) APPLICANT - mailing address

NAME Hendricks-Good Mining Co.

STREET 3000 N. 63rd St.

CITY Boulder, CO 80301 (State) (Zip)

TELEPHONE NO. 443-1502

(2) LOCATION OF PROPOSED WELL

County Boulder

SW ¼ of the NW ¼, Section 9

Twp. 1 S (N,S), Rng. 73 W (E,W), 6th P.M.

(3) WATER USE AND WELL DATA

Proposed maximum pumping rate (gpm) 15

Average annual amount of ground water to be appropriated (acre-feet): 1

Number of acres to be irrigated: 0

Proposed total depth (feet): 200

Aquifer ground water is to be obtained from:

Granite

Owner's well designation None

GROUND WATER TO BE USED FOR:

(XX) HOUSEHOLD USE ONLY - no irrigation (0)
( ) DOMESTIC (1)
( ) LIVESTOCK (2)
( ) COMMERCIAL (4)
( ) INDUSTRIAL (5)
( ) IRRIGATION (6)
( ) MUNICIPAL (8)

( ) OTHER (9) _____

DETAIL THE USE ON BACK IN (11)

(4) DRILLER

Name Norris & Sons Drilling Co.

Street 4599 No. Broadway

City Boulder, CO 80302 (State) (Zip)

Telephone No. 442-4083 Lic. No. 716

FOR OFFICE USE ONLY: DO NOT WRITE IN THIS COLUMN

Receipt No. 8135 / _____

Basin _____ Dist. _____

CONDITIONS OF APPROVAL

This well shall be used in such a way as to cause no material injury to existing water rights. The issuance of the permit does not assure the applicant that no injury will occur to another vested water right or preclude another owner of a vested water right from seeking relief in a civil court action.

APPROVED FOR HOUSEHOLD USE ONLY, FOR ONE (1) SINGLE FAMILY DWELLING AND NOT TO BE USED FOR IRRIGATION. THE RETURN FLOW FROM THE USE OF THIS WELL MUST BE RETURNED TO THE SAME STREAM SYSTEM IN WHICH THE WELL IS LOCATED.

THE MUNICIPAL OR COUNTY GOVERNMENT SHALL BE CONSULTED WHEN LOCATING THIS WELL, AND THEIR REGULATIONS SHALL BE COMPLIED WITH.

APPLICATION APPROVED

PERMIT NUMBER 116655

DATE ISSUED OCT 16 1980

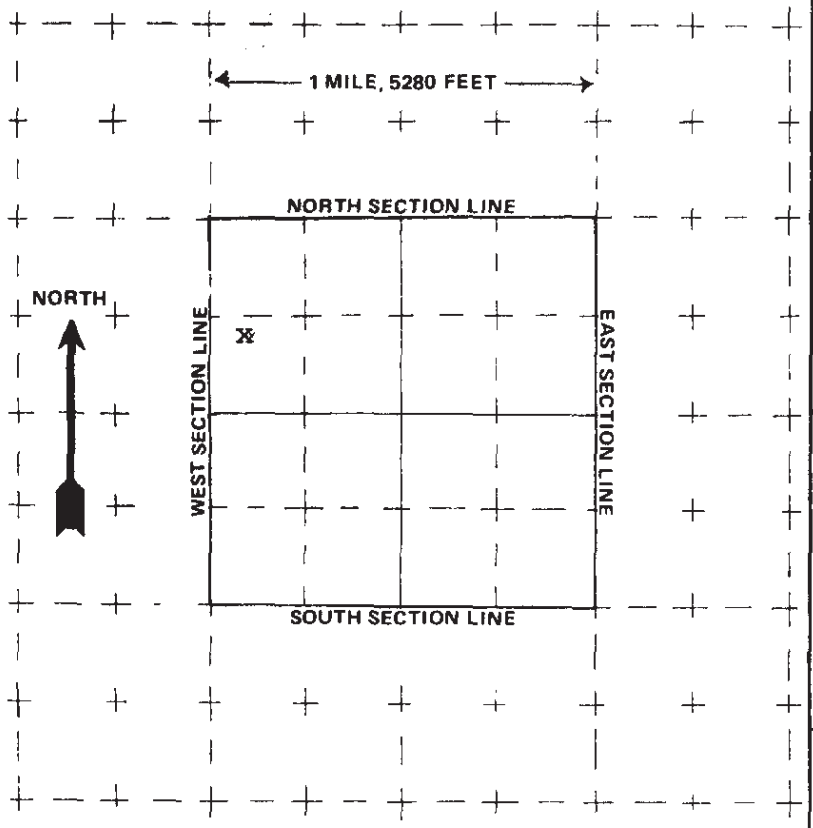
EXPIRATION DATE OCT 16 1982

Bruce E. DeBrine (STATE ENGINEER)

BY DEPUTY DGHaubold

I.D. 1-06 COUNTY 07

(5) THE LOCATION OF THE PROPOSED WELL and the area on which the water will be used must be indicated on the diagram below. Use the CENTER SECTION (1 section, 640 acres) for the well location.



The scale of the diagram is 2 inches = 1 mile
Each small square represents 40 acres.

WATER EQUIVALENTS TABLE (Rounded Figures)

An acre-foot covers 1 acre of land 1 foot deep
1 cubic foot per second (cfs) . . . 449 gallons per minute (gpm)
A family of 5 will require approximately 1 acre-foot of water per year.
1 acre-foot . . . 43,560 cubic feet . . . 325,900 gallons.
1,000 gpm pumped continuously for one day produces 4.42 acre-feet.

(6) THE WELL MUST BE LOCATED BELOW by distances from section lines.

1500 ft. from North (north or south) sec. line

600 ft. from West (east or west) sec. line

LOT -- BLOCK -- FILING # --
SUBDIVISION Brazilian Mill Site, U.S. Survey #13367-B

(7) TRACT ON WHICH WELL WILL BE LOCATED Owner: Same

No. of acres 3.23 . Will this be the only well on this tract? Yes

(8) PROPOSED CASING PROGRAM

Plain Casing

6 5/8 in. from -1 ft. to 20 ft.

4 1/2 in. from 15 ft. to 100 ft.

Perforated casing

4 1/2 in. from 100 ft. to 200 ft.

____ in. from ____ ft. to ____ ft.

(9) FOR REPLACEMENT WELLS give distance and direction from old well and plans for plugging it:

(10) LAND ON WHICH GROUND WATER WILL BE USED:

Owner(s): Hendricks-Good Mining Co. No. of acres: 3.23

Legal description: SW¼ of NW¼, Sec. 9, T 1S, R 73W

(11) DETAILED DESCRIPTION of the use of ground water: **Household use and domestic wells must indicate type of disposal system to be used.**

Household use only -- septic tank with absorption bed

(12) OTHER WATER RIGHTS used on this land, including wells. Give Registration and Water Court Case Numbers.

Type or right	Used for (purpose)	Description of land on which used
None		

(13) THE APPLICANT(S) STATE(S) THAT THE INFORMATION SET FORTH HEREON IS TRUE TO THE BEST OF HIS KNOWLEDGE.

X Thomas S. Hendricks Hendricks-Good Mining Co. Inc.
SIGNATURE OF APPLICANT(S)

Use additional sheets of paper if more space is required.

Attachment B – Sample and December 2021 Groundwater Sampling Data Sheet

GROUND WATER SAMPLING DATA SHEET

IDENTIFICATION Project Number:

Sample Location_____Date_____Start Time_____Stop time_____Page of Sample Control Number_____Samplers_____

WEATHER CONDITIONS

Ambient Air Temperature:_____°C☐ °F☐ Not Measured ☐ **Wind**: Heavy☐ Moderate☐ Light☐

Precipitation: None☐ Rain☐ Snow☐ Heavy☐ Moderate☐ Light☐ Sunny☐ Partly Cloudy☐

INITIAL WELL MEASUREMENTS (Measurements in feet made from top of well casing)

Static Water Level____Total Depth_____Top of Screen_____Filter Pack Interval_____Borehole Diameter(inches)_____

2-inch = 0.1632 gal/ft 4-inch = 0.6528 gal/ft 6-inch = 1.4688 gal/ft Casing Volume:_____gallons

Well Casing ID_____Well Casing OD_____Protective Casing Stickup_____Well Casing Stickup_____Feet of Water_____

Well purged with:

FINAL WELL MEASUREMENTS

Static Water Level___ Total Depth___Total Volume Purged___ Saturated Borehole Volume (gal)____Max Pumping Rate _____

INSTRUMENT CALIBRATION

pH Meter: Meter Number_____ **Conductivity Meter:** Meter Number_____

Buffer___Measured Value_____Temp._____°C Standard_____mS/cm Measured Value_____mS/cm

Temp.___°C Buffer___Measured Value_____Temp.___°C Standard_____mS/cm

Measured Value_____mS/cm Temp.__°C **Turbidity Meter:**_____Standard_____NTU Measured Value_____NTU

Standard__NTU Measured Value_NTU

FIELD PARAMETER MEASUREMENTS DURING PURGING

Time	Volume (gallons)	pH	Cond. (µS/cm)	Temp. °C☐ °F☐	Turbidity Visual Est.☐ Measured☐	Comments

FINAL SAMPLE PARAMETERS

Sample Date	Sample Time	Discharge cfs☐ gpm☐	pH	Cond. (µS/cm)	Temp. (°C)	Turbidity Visual Est.☐ Measured☐		

Notes:

Sampler's Signature

GRAND ISLAND RESOURCES LLC
SURFACE WATER MONITORING PLAN (SMP)
CROSS AND CARIBOU MINES
NEDERLAND, COLORADO

PREPARED BY:
GRAND ISLAND RESOURCES LLC
CROSS AND CARIBOU MINES
4415 CARIBOU ROAD
NEDERLAND, CO 80466

April 26, 2022

GRAND ISLAND
RESOURCES

Table of Contents

1 CERTIFICATION

Name and Location of Project:
Grand Island Resources, LLC
Cross and Caribou Mines
4415 Caribou Road
Nederland, CO 80466

SMP Administrator:
Name: Richard Mittasch
Address: 4415 Caribou Road, Nederland, CO 80466
Phone Number: 720-893-3749

Name, Address, Phone Number, and Email Address
Richard Mittasch – Operator and Administrator
4415 Caribou Road
Nederland, CO 80466
720-893-3749
rmittasch@nedmining.com

2 INTRODUCTION

This Surface Water Monitoring Plan (SMP) was prepared and is submitted by Grand Island Resources (GIR) in compliance with Code of Colorado Regulations, Division of Reclamation, Mining, and Safety (DRMS), Rule 3.1.6 Water – General Requirements. The Plan is included as Part of Technical Revision 10 as mandated by Mined Land Reclamation Board Findings of Fact, Conclusions of Law, and Order, issued to Grand Island Resources on February 18, 2022 (File No. M-1977-410. MV-2021-017), Corrective Action 1.

The SMP addresses Hydrology and Water Quality of the prevailing hydrologic balance of the GIR permitted properties in Nederland, Colorado. The site consists of a Historic Mining District and, therefore, the surface facilities have existed for decades. Characterization data will be obtained from ambient surface water along Coon Track Creek which traverses the site and constitutes the only surface water outfall from the currently active operations area in the property.

Site specific stream flow or surface water quality data are not available for Coon Track Creek or North Beaver Creek into which Coon Track Creek and Hicks Gulch discharge. North Beaver Creek flows into Middle Boulder Creek at Nederland, CO. GIR utilized the USGS StreamStats (v4) to estimate streamflow statistics for the GIR Site watershed; because the site watersheds are less than 1 square mile in area, GIR compared the StreamStats results with Stream flow data from Middle Boulder Creek at Nederland, CO, USGS Station ID 06725500. The estimated values correlated and therefore GIR will use the results for planning purposes.

3 SITE DESCRIPTION

The site is an active gold and silver mine (Colorado Division of Reclamation, Mining, and Safety 110 (2) Permit M1977-410, issued 11/3/1980), located 3 miles west of Nederland, Colorado on lands adjacent to the Roosevelt National Forest, at a mean elevation of approximately 9700 feet, Mean Sea Level (MSL). The permit boundary is located on private land owned or controlled by GIR (Figure 1).

3.1 WATERSHED HYDROLOGIC CHARACTERISTICS

The purpose of this SMP is to address Hydrology and Water Quality of the prevailing hydrologic balance of the property. DRMS requested that GIR collects water quality sample at a location upstream and a location downstream of the permitted area; GIR inspected the watershed reporting and through the site and selected two location based on accessibility and features of Coon Track Creek. The two Sample Points are labelled 2022-01 and 2022-02 for upstream and downstream, respectively. The upper watershed from the top of the divide to Sample Point 2022-01 comprises 0.54 square mile basin, and, from Sample Point 2022-01 downstream to Sample Point 2022-02 the watershed has an area of 0.79 square miles (i.e., an additional 0.25 square mile basin), both are depicted on Figure 1.

The Hydrologic Characteristics of the Watersheds are presented on Table 3.1.1

Table 3.1.1. Watershed Hydrologic Characteristics

Description	Sample Point 2022-01	Sample Point 2022-02	Units
Watershed			
Watershed area	0.54	0.79	square miles
Percentage of barren from NLCD 2011 class 31	0.6%	0.4%	
Percentage of cultivated crops and hay, classes 81 and 82, from NLCD 2011	0.0%	0.0%	
Percentage of developed (urban) land from NLCD 2011 classes 21-24	0.0%	0.0%	
Percentage of forest from NLCD 2011 classes 41-43	40.9%	52.5%	
Percent of area covered by grassland/herbaceous using 2011 NLCD	52.9%	43.2%	
Average percentage of impervious area determined from NLCD 2011 impervious dataset	0.6%	1.5%	
Percent of area covered by shrubland using 2011 NLCD	0.0%	0.0%	
Percent snow and ice from NLCD 2011 class 12	0.0%	0.0%	
Percent of open water, class 11, from NLCD 2011	0.0%	0.0%	
Percentage of wetlands, classes 90 and 95, from NLCD 2011	5.5%	3.7%	
Minimum basin elevation	9,850.0	9,550.0	ft A.M.S.L.
Elevation of the stream outlet in feet above NAVD88	9,845.0	9,552.0	ft A.M.S.L.
Mean Annual Precipitation	32.1	31.7	inches
Runoff-curve number as defined by NRCS (http://policy.nrcs.usda.gov/OpenNonWebContent.aspx?content=17758.wba)	70.3	69.3	dimensionless
Percentage of area of Hydrologic Soil Type A from SSURGO	0.0%	0.0%	
Percentage of area of Hydrologic Soil Type B from SSURGO	2.4%	12.8%	
Percentage of area of Hydrologic Soil Type C from SSURGO	90.5%	74.9%	
Percentage of area of Hydrologic Soil Type D from SSURGO	0.0%	0.0%	
Percentage of clay soils from STATSGO	10.6%	10.6%	
Percent storage (wetlands and waterbodies) determined from 1:24K NHD	0.0%	0.0%	
Time of concentration in hours	0.84	0.98	hours

3.2 VEGETATION

The following vegetation information is taken from the "Cross Mine Vegetation Ecological Site Survey and Assessment" prepared by Walsh Environmental Scientists and Engineers, LLC, March 12, 2008.

This study was conducted to identify, delineate, and describe the plant communities at the Cross Mine, Boulder County, Colorado. The Cross Mine is located five miles west of Nederland, Colorado adjacent to the Roosevelt National Forest, at an elevation of approximately 9,700 ft., MSL. The site is bisected by Coon Track Creek, a

tributary of Beaver Creek which flows into Middle Boulder Creek before delivering flows to Barker Reservoir.

3.2.1 Identification Methods

Walsh ecologists performed a plant community identification via a series of site inspection visits staring with a a kick-off meeting on May 24, 2006. Additional site visits were conducted on June 12 and October 5, 2006. Initial plant community identifications were made from a recent aerial photograph of the site. The site was traversed on foot and these identifications were confirmed or modified with additional observations and information. Confirmed community boundaries were drawn over the aerial photo image and digitized. A brief description of each community was composed, including a list of dominant plant species. Thirteen plant communities (comprising 25.1 acres) were described and mapped. These include 11 upland and two wetland communities. Each community is described below.

3.3 Upland Plant Communities

3.3.1 Aspen Woodland

Aspen woodland is the most widespread plant community on the site, comprising three individual polygons and representing 7.33 acres (29.2 percent) of the site.

This community is dominated by a relatively closed quaking aspen (Populus tremuloides) canopy. A few scattered limber coniferous species contribute a minor component to this canopy and include limber pine (Pinus flexilis) and lodgepole pine (Pinus contorta) as well as subalpine fir (Abies bifolia), Engelmann spruce (Picea engelmannii) and blue spruce (Picea glauca).

A lush understory is dominated by graminoids including mountain brome (Bromus marginatus), Timothy (Phleum pratense), and bluegrasses (Poa spp.) Wood's rose (Rosa woodsii) and shrubby cinquefoil (Pentaphylloides floribunda) represent a limited shrub stratum. A diverse forb component is dominated by Alsike clover (Trifolium hybridum), yarrow (Achillea lanulosa), wild strawberry (Fragaria vesca), silver lupine (Lupinus argenteus), and black-eyed Susan (Rudbeckia hirta).

3.3.2 Limber/Lodgepole Pine Parkland

The limber/lodgepole pine parkland includes three polygons comprising 5.44 acres (21.7 percent) of the site. Parklands refer to areas of scattered trees with canopy cover of 50 percent or less. In these areas, limber and lodgepole pine trees are scattered amidst meadows comprising the same species found in the upland meadow community.

3.3.3 Aspen/Lodgepole Pine Parkland

Aspen/lodgepole pine parkland includes less than a half-acre (1.1 percent) of the site. Aspen and lodgepole pine trees are scattered throughout open meadows with an herbaceous component comprising essentially the same species as found in the upland meadows. This portion of the site represents areas not having vegetation due to on-going mining activities.

3.3.4 Disturbed Upland Meadow

The second-most extensive community of the project site, the disturbed upland meadow area, comprises 4.3 acres (17.3 percent) of the site. It appeared that this community more closely resembles the upland meadow areas. However, the plant community has been modified in response to surface disturbances caused by human activities such as livestock grazing and construction. Fewer native species occur in these areas, which are notably dominated by planted pasture or reclamation grasses such as smooth brome, Timothy, and Kentucky bluegrass (Poa pratensis).

3.3.5 Lodgepole Pine Parkland

The lodgepole pine parkland comprises less than an acre (2.7 percent) of the site. This parkland community is named for the lodgepole pine scattered throughout a generally upland meadow herbaceous community dominated by Timothy and smooth brome, intermixed with yarrow and wild strawberry. Common juniper, shrubby cinquefoil, and mountain snowberry (Symphoricarpos oreophilus) represent a scattered shrub story.

3.3.6 Planted Grasses

This community comprises less than an acre (1.8 percent) of the site. These areas appear to be locations where the native plant community has been completely removed during human activities and replaced by planted pasture and reclamation grasses such as smooth brome, mountain brome, Timothy, and Kentucky bluegrass.

3.3.7 Rocky Outcrop

A rock outcrop includes approximately a tenth of an acre (0.6 percent) in the north portion of the site. This feature supports a few trees and shrubs including subalpine fir, Englemann spruce, lodgepole, limber pine, and broom huckleberry (Vaccinium scoparium). Forbs such as pussytoes and golden banner (Thermopsis montana) were also present.

3.3.8 Spruce/Fir Woodland

Limited spruce/fir woodland occurs in the north part of the site, comprising approximately a third of an acre (1.5 percent of land). This community is characterized by a dense Englemann spruce and subalpine fir canopy with a sparse understory of shrubs including broom huckleberry, twinberry honeysuckle (Lonicera involucrata), fireweed (Chamerion danielsii), whisk broom parsley (Harbouria trachypleura), and heartleaf arnica (Arnica cordifolia).

3.3.9 Upland Meadow

The upland meadow compromises a small portion of the northern part of the site and accounts for less than an acre (2.9 percent of the site). The area is characterized by Kentucky bluegrass and prairie sagewort forb (Artemisia ludoviciana) as co-dominants in a species-rich herbaceous community. Other common grasses include smooth brome (Bromopsis inermis), Timothy, Canada bluegrass (Poa compressa), and sun sedge (Carex pensylvanica subsp. heliophila). The most common forbs include sedum (Amerosedum lanceolatum), pussytoes (Antennaria parviflora), fringed sage (Artemisia frigida), wild geranium (Geranium richardsonii and G. viscossisimum), yarrow (Achillea lanulosa), fringed thistle (Cirsium centaureae) and wild strawberry.

The only weed noted includes scattered small populations of Canada thistle (Breea arvensis) at the community edges where it grades into more mesic areas. (The SWMP includes a commitment to control noxious weeds which may occur within the proposed permit area.). Scattered, low-growing shrubs include Wood's rose, shrubby cinquefoil, broom huckleberry and common juniper (Juniperus communis). Occasional clumps of Scouler's willow (Salix scouleriana) also occur in the upland meadow.

3.3.10 Willow/Spruce/Fir Woodland

The willow/spruce/fir woodland represents an intermediate community that grades into both the spruce/fir woodland as well as the willow woodland. This community represents slightly more than an acre (4.1 percent) of the site. The canopy is dominated by a number of willow species including Geyer (Salix geyeriana), plane-leaf (S. planifolia), mountain (S. montana), and sandbar (S. exigua) intermixed with Colorado blue spruce (Picea pungens) and subalpine fir. This community also supports a diverse shrub story with dense stands of thin-leaf alder (Alnus incana subsp. Tenuifolia) and bog birch (Betula pumila) as well as wax currant (Ribes cereum), prickly currant (R. lacustre), twinberry honeysuckle and Wood's rose.

A lush herbaceous understory includes wild strawberry, wild geranium, large-leaved avens (Geum macrophyllum), yellow bedstraw (Galium verum), bluebells (Mertensia ciliata), dandelion (Taraxacum officinale), clover (Trifolium spp.), and death camas (Zigadenus venenosus).

3.3.11 Willow Woodland, a Wetland Community

The willow woodland community occurs adjacent to the creek channel, in the most mesic portion of the site. This woodland comprises almost a half-acre (1.7 percent) of the site. The area is characterized by a dense willow canopy composed of the same species found in the willow/spruce/fir woodland. The same dense shrub and lush herbaceous components that are present in the willow/spruce/fir woodland also occur in this community.

4 SURFACE WATER FLOW ESTIMATE

The purpose of this SMP is to obtain water quality data from surface water in Coon Track Creek upstream and downstream of the mining complex. Characterization data will be obtained from ambient surface water along the portions of Coon Track Creek traversing the site which constitutes the only surface water outfall from the currently active operations area of the property. Surface water flow data will be collected concurrently with water quality sampling campaigns.

Surface water flow data will also be measured during water quality sampling events. GIR performed (via USGS StreamStats platform) estimates of surface water flow in Coon Track Creek traversing the site. The results, described in the following subsections, indicate high seasonal flow variability. The site watershed reporting through the site is relatively small (0.74 square miles). Located in mountainous terrain with a drainage way characterized by steep gradient which results in a quick response to precipitation and snow melt. Those characteristics were considered in the determination of proper water flow measuring strategies. In consultation with DRMS during a conference call held on April 12, 2022, DRMS and GIR agreed that the installation of flumes or weirs is not essential to DRMS' purpose and therefore, surface water flows will be estimated via bucket and stopwatch.

As indicated under Section 3, GIR selected two Sample Points (namely 2022-01 and 2022-02) to comply with DRMS' mandate to determine surface water quality upstream and downstream of the mining complex.

4.1 MEAN MONTHLY FLOW

The monthly surface water flows on Coon Track Creek through the site vary greatly throughout the year. As an example, the watershed to Sample Point 2022-01 the monthly mean from varies from an estimated ~45 gallons per minute (0.10cfs) to ~ 2,700 gallons per minute (6.04cfs) in February and June, respectively. The following table provide monthly estimates in cubic feet per second for both Sampling Points.

Table 4.1.1. Mean Monthly Surface Water Flow

Description	Sample Point 2022-01	Sample Point 2022-02	Units
Watershed			
Watershed area	0.54	0.79	square miles
Monthly Mean Flow Statistics			
January Mean Flow	0.11	0.16	ft^3/s
February Mean Flow	0.10	0.15	
March Mean Flow	0.10	0.14	
April Mean Flow	0.16	0.25	
May Mean Flow	2.08	2.92	
June Mean Flow	6.04	8.10	
July Mean Flow	2.16	2.90	
August Mean Flow	0.83	1.12	
September Mean Flow	0.40	0.55	
October Mean Flow	0.27	0.38	
November Mean Flow	0.19	0.27	
December Mean Flow	0.13	0.19	

4.2 PEARK FLOW ANNUAL EXCEEDANCE PROBABILITY (AEP) ESTIMATES

The estimated Annual Exceedance Probability (AEP) of instantaneous peak flow for the Coon Track Creek at Sampling Point 2022-01, indicate that peak flow in excess of 5,700 gallons per minute (12.7cfs) are likely to occur while peak flow in excess of 19,500 gallons per minute (43.4cfs) are unlike to occur. These results are used to verify the suitability of the stream gauging station currently installed on site. The table below provide the range of estimated AEP values for both Sampling Points.

Table 4.2.1. Peak-Flow Probability Estimates

Description	Sample Point 2022-01	Sample Point 2022-02	Units
Watershed			
Watershed area	0.54	0.79	square miles
Peak-Flow Statistics (maximum instantaneous flow annual exceedance			
50-percent AEP flood	12.70	17.40	ft^3/s
20-percent AEP flood	18.20	24.70	
10-percent AEP flood	21.60	29.40	
4-percent AEP flood	26.50	35.90	
2-percent AEP flood	31.10	42.20	
1-percent AEP flood	34.50	46.70	
0.5-percent AEP flood	37.20	50.30	
0.2-percent AEP flood	43.30	58.60	

4.3 7-DAY MEAN LOW FLOW RETURN PERIOD

Mean Low Flow statistics reflect estimated of the lowest flow event in the stream that would be expected to occur over a period of record. For this SMP, a 7-day average period was selected by GIR. The recurrence frequency and corresponding flow low estimate for both Sampling Points are provided on the following table.

Table 4.3.1. 7-Day Mean Low Flow Probability Estimates

Description	Sample Point 2022-01	Sample Point 2022-02	Units
Watershed			
Watershed area	0.54	0.79	square miles
Low-Flow Statistics (mean low flow @ return period)			
7 Day 2 Year Low Flow	0.03	0.04	ft^3/s
7 Day 10 Year Low Flow	0.01	0.02	
7 Day 50 Year Low Flow	0.02	0.02	

4.4 7-DAY MEAN MAXIMUM FLOW RETURN PERIOD

Mean Maximum Flow statistics reflect estimated of the highest flow event in the stream that would be expected to occur over a period of record. For this SMP, a 7-day average period. The recurrence frequency and corresponding maximum flow estimate for both Sampling Points are provided on the following table.

Table 4.4.1. 7-Day Mean Maximum Flow Probability Estimates

Description	Sample Point 2022-01	Sample Point 2022-02	Units
Watershed			
Watershed area	0.54	0.79	square miles
Flood-Volume Statistics (mean maximum flow @ return period)			
7 Day 2 Year Maximum	8.41	11.20	ft^3/s
7 Day 10 Year Maximum	11.90	16.10	
7 Day 50 Year Maximum	15.80	21.40	

4.5 FLOW DURATION

Flow duration estimates constitute the percentage of time that flow in a drainageway is likely to equal or exceed certain values. The estimated flow and duration for both Sampling Points in Coon Track Creek are shown on table 4.5.1. As can be expected, small watersheds in steep terrain result in fast response hydrographs; this appears tangible when comparing the 10 percent duration flow with the 20 percent duration flow (i.e., an approximate 4.9 fold reduction in flow).

Table 4.5.1. Flow Duration % of Time

Description	Sample Point 2022-01	Sample Point 2022-02	Units
Watershed			
Watershed area	0.54	0.79	square miles
Flow-Duration Statistics (flow exceedance as percentage of the time)			
10 Percent Duration	2.93	4.00	ft^3/s
25 Percent Duration	0.60	0.84	
50 Percent Duration	0.20	0.28	
75 Percent Duration	0.10	0.14	
90 Percent Duration	0.04	0.07	

5 WATER QUALITY

GIR inspected the watershed upstream and downstream of the currently permitted treated water discharge outfall 001 and determined that two Sample Points (namely 2022-01 and 2022-02) are required to address water quality upstream and downstream of the mining complex.

The Sample Point locations were discussed and agreed upon between DRMS and GIR during a conference call held on April 12, 2022, including the Sampling Frequency and Analytical Parameters

5.1 SAMPLE POINTS AND FLOW GAUGING STATION LOCATIONS

5.1.1 Sample Point 2022-01

Water Quality Sampling Point 2022-01 is located upstream of the GIR Mining Complex encompassing 0.54 square miles of watershed, it is intended to provide surface water quality in Coon Track Creek from undisturbed land. (Latitude 39.97904, Longitude -105.57585). See Figure 1.

5.1.2 Sample Point 2022-02

Water Quality Sampling Point 2022-02 is located downstream of the CDPHE Water Treatment Outfall-001 and downstream of the GIR Mining Complex encompassing 0.74 square miles of watershed. (Latitude 39.975787, Longitude -105.569328). See Figure 1.

5.2 SAMPLE COLLECTION AND REPORTING FREQUENCY

DRMS and GIR agreed to collect and test surface water samples monthly starting in May 2022 for the next five quarters and then go to a quarterly sampling program. should field conditions not allow access to the Sampling Points and/or if no surface water flow is observed in Coon Track Creek samples will not be collected.

GIR will report sampling results to DRMS Quarterly on the following dates: August 1, 2022, November 1, 2022, February 1, 2023, May 1, 2023 and August 1, 2023

5.3 ANALYTICAL PARAMETERS

DRMS and GIR agreed to test surface water constituents to match the parameters prescribed in the current CDPHE Water Quality Division Water Discharge Permit (Permit No.: CO0032751) for the Facility, the parameters are provided on the following table.

Table 5.3.1. Water Quality Parameters

[illegible]

Effluent Parameter		month	Effluent Limitations, Maximum Concentrations: 30-Day Average	7-Day Average	Daily Maximum	Monitoring Requirements: Frequency	Sample Type	EIS Code
Effluent Flow (MGD)	January	1	0.128		Report	Continuous	Recorder	[illegible]
	February	2	0.128					
	March	3	0.133					
	April	4	0.148					
	May	5	0.376					
	June	6	0.459					
	July	7	0.295					
	August	8	0.148					
	September	9	0.133					
	October	10	0.128					
	November	11	0.128					
	December	12	0.128					
Temp (°C)	Daily Max: April-Oct, beginning September 1, 2014				Report	Continuous	Recorder	[illegible]
	Daily Max: Nov-March, beginning September 1, 2014							
	Temp MWAT April-Oct, beginning September 1, 2014			Report				
	Temp MWAT Nov-March, beginning September 1, 2014							
pH (s.u.)					6.5-9	2 Days/Month	Grab	[illegible]
TSS, effluent (mg/l)			30.000	45.000		Monthly	Grab	[illegible]
Oil and Grease (visual)					Report	2 Days/Month	Visual	[illegible]
Oil and Grease (mg/l)					10.00	Contingent	Grab	[illegible]
As	TR (µg/L)		Report			Monthly	Grab	[illegible]
	PD (µg/l)				Report			[illegible]
Cd	TR (µg/L)		50.000		300.00	Monthly	Grab	
	PD (µg/l), until December 31, 2016							[illegible]
	October through March		1.760		Report	2 Days/Month	Grab	
	April through June		1.620					
	July through September		2.160					
	PD (µg/l), beginning January 1, 2017							
	January	1	0.630		2.30	2 Days/Month	Grab	[illegible]
	February	2	0.630		2.50			
	March	3	0.600		2.40			
	April	4	0.600		2.50			
	May	5	0.620		2.60			
	June	6	0.880		3.70			
	July	7	0.750		3.30			
	August	8	0.800		3.30			
	September	9	0.830		3.00			
	October	10	0.880		3.60			
	November	11	0.680		2.80			
	December	12	0.630		2.30			
Cr+3	TR (µg/L)				Report	Monthly	Grab	[illegible]
	PD (µg/l)		Report					[illegible]
Cr+6	Dis (µg/L)		Report		Report	Monthly	Grab	[illegible]
Cu	TR (µg/L)		150000		300.00	2 Days/Month	Grab	[illegible]
	PD (µg/l)							
	January	1	13000		18.00	2 Days/Month	Grab	[illegible]
	February	2	13000		20.00			
	March	3	13000		19.00			
	April	4	13000		20.00			
	May	5	13000		20.00			
	June	6	13000		20.00			
	July	7	16000		25.00			
	August	8	17000		25.00			
	September	9	16000		28.00			
	October	10	16000		28.00			
	November	11	14000		22.00			
	December	12	13000		18.00			
Fe	PI (µg/L)		Report		NA	Monthly	Grab	[illegible]
	TR (µg/L)		300000		500.00	2 Days/Month	Grab	[illegible]
Pb	PD (µg/l)							
	January	1	3.800		85.00	2 Days/Month	Grab	[illegible]
	February	2	3.800		84.00			
	March	3	3.600		80.00			
	April	4	3.600		84.00			
	May	5	3.800		87.00			
	June	6	5.400		140.00			
	July	7	4.600		118.00			
	August	8	5.000		122.00			
	September	9	5.300		125.00			
	October	10	5.400		135.00			
	November	11	4.200		108.00			
	December	12	3.800		85.00			
Mn	PD (µg/l)		Report		Report	Monthly	Grab	[illegible]
Hg	Tot (µg/l)		1.000		2.00	Monthly	Grab	[illegible]
	Tot (µg/l) (low level)		Report		Report	Quarterly		[illegible]
Ni	PD (µg/l)		Report		Report	Monthly	Grab	[illegible]
Se	PD (µg/l)		Report		Report	Monthly	Grab	[illegible]
Ag	PD (µg/l)							
	January	1	0.120		2.80	2 Days/Month	Grab	[illegible]
	February	2	0.120		3.30			
	March	3	0.120		3.00			
	April	4	0.120		3.30			
	May	5	0.120		3.20			
	June	6	0.170		4.70			
	July	7	0.140		3.60			
	August	8	0.180		4.30			
	September	9	0.170		3.80			
	October	10	0.170		4.50			
	November	11	0.130		3.60			
	December	12	0.120		2.80			
	TR (µg/L)		750000		1,500.00	Monthly	Grab	[illegible]
Zn	PD (µg/l)							
	January	1	185000		194.00	2 Days/Month	Grab	[illegible]
	February	2	185000		203.00			
	March	3	175000		194.00			
	April	4	175000		202.00			
	May	5	185000		208.00			
	June	6	263000		301.00			
	July	7	221000		259.00			
	August	8	241000		259.00			
	September	9	237000		248.00			
	October	10	263000		282.00			
	November	11	263000		292.00			
	December	12	185000		192.00			
Sulfide as H2S	(µg/L)		Report		NA	Monthly	Grab	[illegible]
WET, chronic	Static renewal 7 Day Chronic *Pimephales promelas*				NOEC or IC25 ≥ IWC	Quarterly	3 Grabs / Test	[illegible]
	Static renewal 7 Day Chronic *Ceriodaphnia dubia*				NOEC or IC25 ≥ IWC	Quarterly	3 Grabs / Test	[illegible]

6 SAMPLE COLLECTION PROTOCOLS

Surface water flow measurement will be taken, as agreed upon with DRMS, via bucket-and-stopwatch method.

Appendix G provides detailed sampling protocols to be implemented by GIR personnel will collect surface water samples for analytical laboratory test work.

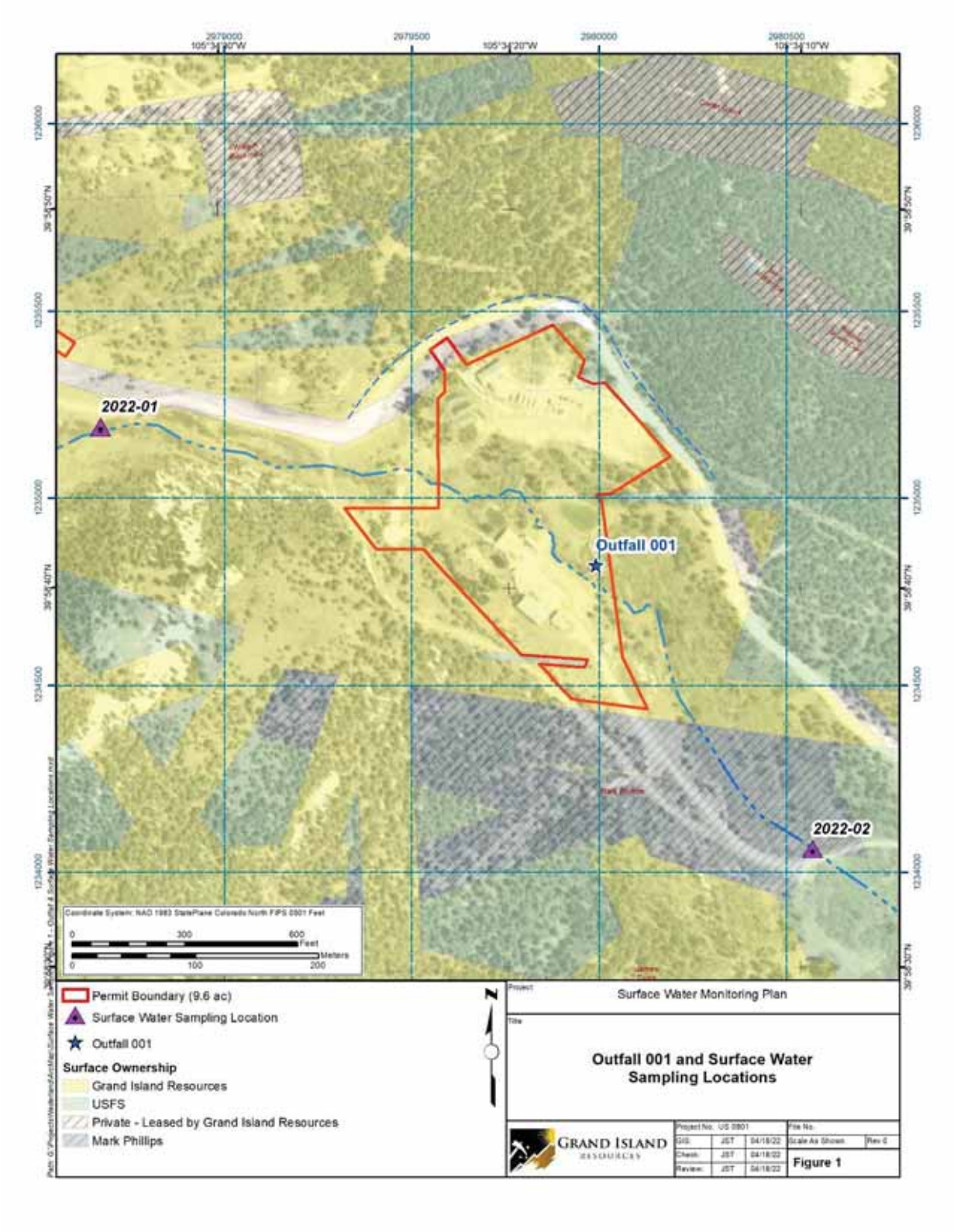


Figure 1: Outfall 001 and Surface Water Sampling Locations, which shows property ownership and permit boundaries.

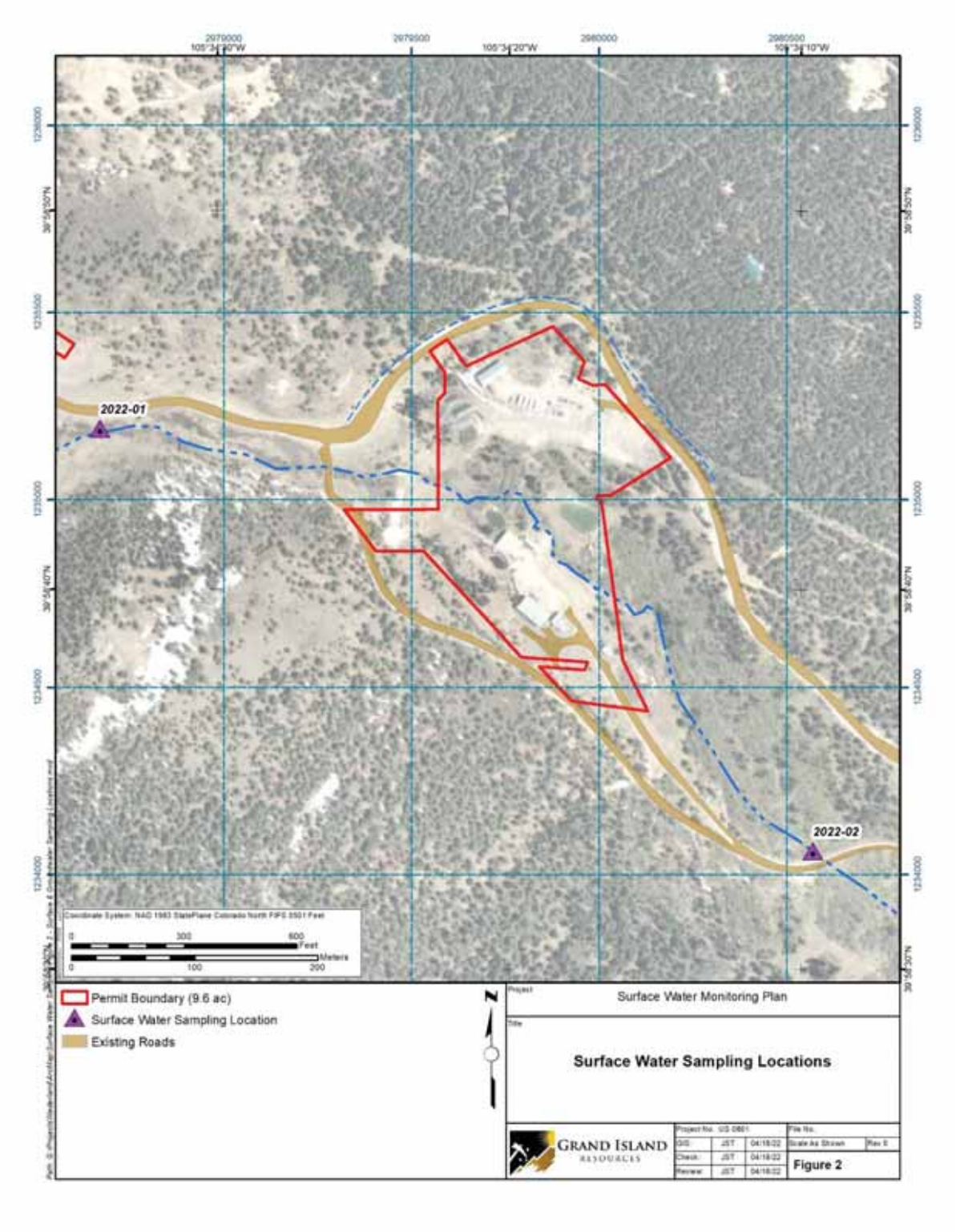


Figure 2: Surface Water Sampling Locations, which shows permit boundaries and the locations of Sample Points 2022-01 and 2022-02, also referenced in the Tables above.

Appendix G – Standard Operating Procedures (SOP's) and Operation & Maintenance (O&M) Manuals

STANDARD OPERATING PROCEDURE

GROUNDWATER, SURFACE WATER AND EFFLUENT SAMPLE COLLECTION AND QA/QC

April 15, 2022

1.0 PURPOSE AND SCOPE

The purpose of this document is to define the standard procedure for collecting groundwater samples from wells and surface water samples from streams and underground effluent. This Standard Operating Procedure (SOP) gives descriptions of equipment, field procedures and quality assurance/quality control (QA/QC) procedures necessary to collect, preserve and document these respective water sample types.

2.0 GENERAL EQUIPMENT

For any of the water sample categories there is common equipment as follows:

- Field logbook, field data sheets, and black pen
- Engineers tape (10ths, 100ths feet)
- Turkey baster for decontamination soapwater
- Paper towels
- Liquinox soap for decontextualization of instrumentation between sample collection
- Distilled or deionized water
- Sprayer filled with deionized water
- Appropriate health and safety equipment, including safety glasses and latex gloves

The following equipment for sample collection, sample labeling, filtering, packing, documentation, and performing chain-of-custody procedures:

- Sample bottles that are specific to the analytes to be tested. Obtaining sample bottles and preservatives from the selected analytical laboratory, including several extra sample bottles in case breakage or other problems occur is the best practice. Sample bottles can be either pre-preserved or preservatives can be added in the field in accordance with laboratory guidelines for the target analytes.
- Laboratory Sample labels

- Field book and data forms
- Chain of Custody Form
- Black permanent markers and pens
- Clear plastic tape
- Fiber tape
- Custody seals
- Large (30 gallon) trash bag
- Gallon ziplock freezer bags
- Ice
- Shipping documentation
- Disposable 0.45-micron filters if filtering samples (re: groundwater and effluent)
- Silicon or Tygon® tubing
- Peristaltic pump.
- Knowledge of the requisite PQL's for the laboratory to determine the appropriate analytical method and MDL's.
- Assorted tools (knife, screwdriver, etc.)
- Gas-powered electric generator for a peristaltic pump for filtering samples if required or access to a vehicle battery
- pH meter (with automatic temperature compensation)
- Specific conductivity meter
- Turbidity meter
- Plastic squeeze bottle filled with deionized water
- Polyethylene or glass container (for field parameter measurements)
- Chemical-free paper towels or Kimwipes
- Calculator
- Field notebook
- Black waterproof pen
- Appropriate health and safety equipment

The following equipment is necessary for performing decontamination between sampling locations:

- Alconox or Liquinox soap (or equivalent)
- Deionized water
- Decontamination buckets/pails
- Paper towels
- Plastic brushes
- Sprayers
- Plastic sheeting

For surface water and effluent sampling, additional equipment may be required as follows:

- Hip boots or waders
- Life jacket
- One litter or more polyethylene sampling beaker on a pole for reaching difficult collection points
- Underground PPE including headlamp and self-rescuer
- Appropriate MSHA training for working underground

The physical location of the investigator when collecting a sample may dictate the equipment to be used. If surface water samples are required, direct dipping of the sample container into the stream is desirable. Collecting samples in this manner is possible when sampling from accessible locations such as stream banks or by wading or from low platforms, such as small boats or piers. Wading or streamside sampling from banks, however, may cause the re-suspension of bottom deposits and bias the sample. Wading is acceptable if the stream has a noticeable current (is not impounded), and the samples are collected while facing upstream. If the stream is too deep to wade, or if the sample must be collected from more than one water depth, or if the sample must be collected from an elevated platform (bridge, pier, etc.), supplemental sampling equipment must be used. To collect a surface water sample from a water body or other surface water conveyance, a variety of methods can be used: • Dipping Using Sample Container • Scoops • Peristaltic Pumps • Discrete Depth Samplers • Bailers • Buckets • Submersible Pumps • Automatic Samplers Regardless of the method used,

precautions should be taken to ensure that the sample collected is representative of the water body or conveyance.

2.1 Field Parameter Measurements

Use the following apparatus and supplies for measuring pH in the field:

- Portable pH Meter or combination portable pH/mV/Temperature Meter Model
- Spare electrolyte cartridge, if required
- Electrode Storage Solution
- Extra batteries
- Beakers
- Buffer solutions of pH 4, 7, and 10
- Deionized or distilled water and wash bottle
- Kimwipes or equivalent.

Use the following apparatus and supplies for measuring conductivity in the field:

- Conductivity Meter or combination Conductivity/TDS Meter
- Extra battery
- Calibration solutions which bracket expected range of measurements
- Deionized water
- Wash bottle
- Kimwipes
- Beakers.

Use the following apparatus and supplies for measuring turbidity in the field:

- Turbidimeter Meter
- Extra battery

3.0 GROUNDWATER SAMPLING PROCEDURES

3.1 Groundwater Well Purging

The objective of purging before sample collection is to thoroughly flush the static ground water from the well and filter pack (i.e., saturated borehole volume) and provide representative formation water for sample collection. The amount of water that that needs to be purged and how to determine that the resulting sample will be representative of the formation is a frequently debated issue. The two most common methods are purging a set number of saturated borehole volumes and/or casing volumes, usually between 3 and 10, and demonstrating the stability of field parameters (e.g., pH, conductivity, temperature, and turbidity) over a specified volume. Although this SOP discusses a minimum purge volume and stability of field parameters, the best procedure to help collect a representative sample requires on-site evaluation of all field conditions, which includes purge volume, stabilization of field parameters, well construction, hydrologic properties of the formation, and parameters of interest. Due to the variability of site conditions, no one procedure can ensure that a representative sample will be collected without the possibility of over- or under-purging some wells.

The purpose of well purging is to (1) remove stagnant water from the well and (2) obtain representative water samples from the geologic formation while minimizing disturbance to the collected samples. In most cases, purge the well three saturated borehole volumes and until field parameters stabilize. If the well has been pumped or bailed dry twice, it has been completely purged. In the case of domestic or industrial wells with transducers, the pumpage rate could be calculation again be calculated against recharge rates derived from pump testing.

Before purging a well, perform the following procedures:

- Before evacuating or sampling, decontaminate all well probes, bailers, and other sampling devices. Do not decontaminate dedicated downhole pumps.
- Place clean plastic sheeting around the well.

- Open the well and measure static water level using the installed transducer.
- Calculate the saturated borehole volume as specified in Section 4.2.
- Calibrate field parameter measurement equipment.
- Obtain an initial sample from the bailer or purge pump for field measurements (e.g., temperature, conductivity, and pH measurements) and observation of water quality.
- Begin purging three saturated borehole volumes of water with a bailer or pump. Take temperature, specific conductance, and pH measurements after evacuating each 1/4 to 1/2 (if practical) saturated borehole volume. Generally, pH values within ± 0.1 pH unit and conductivity within ± 10% throughout one saturated borehole volume indicate good stability of the water chemistry. If the chemistry is not stable, continue purging.
- When evacuating a well using a pump, place the pump intake as follows:
  - for low recovery wells (wells that pump dry at low rates), place the pump intake at the bottom of the screened interval
  - for high recovery wells (wells that experience little drawdown with pumping), place the pump near the top of the water level to ensure the removal of stagnant water from the well bore. Purge the well at a rate that will not significantly draw down the well.
- Bail or pump dry low-yielding wells during evacuation. If possible, let low-yielding wells recover before purging them dry again. If recovery is very slow, obtain samples as soon as sufficient water is available, but samples must be collected within 24 hours.

3.2 Calculating Saturated Borehole Volume

Monitoring wells should be purged before sampling so that representative ground water is sampled, not the potentially biased water stored in the well casing and filter pack. If the quality of purge water is questionable, water should be purged from the monitoring well before collecting samples and directed to an appropriate drain or storage pond for treatment if necessary. Removing all stored water in most cases is not feasible or practical. Therefore, before collecting ground water samples, purge an undetermined amount of water from the monitoring well until representative formation water can be sampled.

The amount of water to purge will vary from well to well based on specific well characteristics. No one method of calculating the required purge volume will always work. The usual method to estimate purge volumes is to calculate a number of casing volumes or saturated borehole volumes. Casing volumes account for only the water in the well casing and does not account for the water in the annular borehole space, which is independent of the casing size. Calculating the saturated borehole volume accounts for all the water within the borehole and casing. If purging procedures were completely efficient, the saturated borehole volume would be the minimum volume of water to purge to remove the potentially biased water from the borehole. Because mixing does occur, the minimum purge volume must be greater than one saturated borehole volume. The degree of mixing within the borehole during purging is difficult to estimate and, therefore, the range of recommended purge volumes varies from 3 to 10 saturated borehole volumes. Three saturated borehole volumes has been selected as the best way to estimate purge volumes. Some wells will require purging more than three saturated borehole volumes and some less.

The basic formula is volume equals pi times the radius squared times depth ($V=\pi r^2 d$). To calculate saturated borehole volume, the casing and borehole radii and the height of water in the casing and the filter pack must be known. Measure the water level in the field and obtain the borehole and casing radii from the well completion data.

4.0 Surface Water and Effluent Sampling Procedures

Access to the intended sampling location must carefully be planned to avoid slips and falls. Coordination of sampling with operations personnel is critical to avoid risks other than those associated naturally such as equipment, blasting, etc. While locations in most instances have been surveyed, marking locations for follow-up surveying is advisable to ensure that sampling at the location in the future is at the same exact location.

Adequate footing is essential and avoidance of standing up flow direction must be avoided, if possible, to ensure that sediment load is not stirred up influencing the TSS of the sample. If waters are inadvertently disturbed, a waiting period of several minutes should be undertaken to allow the natural conditions to stabilize. Decontaminated polyethylene beakers, if necessary, often attached to a pole for extra reach are generally used to collect the sample but avoid dragging the bottom. Often the surface water sample can be collected directly into the contain if not pre-acidified.

4.1 Surface Water and Effluent Sampling Methods

Flush the sample collection beaker or sample bottle several times with the target water to ensure that it is further purged of any decontamination from dust in the wind, pollen, dirt. Decontamination soap and other foreign materials as sticks, grass and detritus. Do NOT collect a sample directly from a water source into a pre-acidified vessel as doing so run the risk of neutralizing the pH. Prior to usage the decontaminated sampling vessel should be inserted and transported in a clean and dedicated plastic baggie that is discarded between decontamination.

Due to changing temperatures associated with transporting a sample outside or underground, temperature and other measurements should be done as soon as the sample is collected. Fill the containers for analysis likewise should be done as soon as possible again to minimize change in water chemistry and oxidation state.

While transfer of surface and effluent samples to collection bottles is similar to groundwater, other parameters in the collection as slightly different and command advanced planning to ensure proper QA/QC.

5.0 Preparation for Obtaining Water Samples

Prior to starting any sampling program, take the time to plan and organize your equipment and procedures. Sample documentation, preservation, handling, packaging, and chain-of-custody and knowledge of sampling procedures are necessary prior to sampling. Collect all water samples as follows:

1. Assemble decontaminated sampling equipment. Assemble the filtering apparatus if filtering the sample is required.
2. Make sure that sample labels have been filled out for each sample bottle.
3. Place labels on bottle and tape over.
4. Retrieve additional samples and slowly fill the sample bottles for all other analyses and QA/QC samples. Cap the sample bottles quickly.
5. Filter samples that require filtration with a disposable filter apparatus and peristaltic pump or electric submersible pump.
6. Slowly pour an unfiltered portion into the sample container for field parameter (e.g., pH, specific conductance, and temperature) analyses, perform the in-field analyses, and record the results.
7. Preserve samples as specified by the laboratory for the analytes to be measured.
8. Place sample bottle in baggies.
9. Place samples on ice in a cooler.
10. Record time of sampling. Where wells are in close proximity attempt to collect synoptic samples or during the same day.
11. Complete field documentation and chain of custody record.

6.0 Field Quality Assurance/Quality Control Procedures and Samples

Quality Assurance/Quality Control samples are critical to evaluate the appropriateness and accuracy of both field and laboratory data. Collect QA/QC samples during water sampling, as specified in the project planning documents. All QA/QC samples should be analyzed at the same time and in the same batches as the primary samples.

QA/QC samples help identify potential sources of sample contamination and help evaluate potential error introduced by sample collection and handling. Label all field QA/QC samples with QA/QC identification numbers (i.e., "02" for duplicate samples, "03" for field blanks, "04" for rinsate samples, and "MS" for matrix spike samples) and send them to the laboratory with the other samples for analyses.

6.1 Duplicate Samples

To check for the natural sample variance and the consistency of field techniques and laboratory analysis, collect duplicate samples side-by-side with primary samples. For ground water sampling, collect a duplicate sample while collecting the primary sample. Fill the primary sample bottle(s) first and the duplicate sample bottle(s) for the same analysis second until all necessary sample bottles for both the primary and duplicate samples have been filled. Use different filter and tubing for the primary and duplicate samples. Handle the duplicate ground water sample in the same manner as the primary sample. Assign the duplicate sample the QA/QC identification number "02"; follow standard procedures for documentation, preservation, handling, packaging, and chain-of-custody procedures; store the sample in an iced cooler; and ship it promptly to the laboratory so that analyses can be performed within required holding times.

Collect one duplicate sample for every 2 primary samples collected so that a rate of at least 5 percent of primary samples collected is achieved. For example, if you collect from 2 or more primary samples during a sampling event, collect one duplicate sample for QA/QC.

Collect duplicate QA/QC samples so that they represent the time of collection, different sampling teams, field conditions, and sampling equipment variability. For example, if ambient conditions are altered that could impact sample quality, the QA/QC sampling frequency may be increased. Collect duplicate samples throughout the sampling event, not just at the end.

6.2 Field Blanks

Collect field blanks by filling sample containers in the field with deionized water from the same source that is used for decontamination. Assign the sample the QA/QC identification number "03"; follow SOP #7 for documentation, preservation, handling, packaging, and chain-of-custody procedures; store the sample in an iced cooler; and ship it promptly to the laboratory so that analyses can be performed within required holding times.

Collect one field blank sample for every 20 samples primary collected, so that a rate of at least 5 percent of primary samples collected is achieved. For example, if you collect from 1 to 20 primary samples during a sampling event, collect one field blank sample; and if you collect from 21 to 40 primary samples during a sampling event, collect two field blank samples.

6.3 Rinsate Samples

An equipment rinsate sample of sampling equipment is intended to be used to check if decontamination procedures have been effective. For the well sampling operation, collect a rinsate sample from the decontaminated sampling equipment (bailer or pump) and filter equipment before using it to obtain the sample. To collect a rinsate sample from a bailer, rinse deionized water over the decontaminated bailer and transfer it to the sample bottles. To collect a rinsate sample from an electric submersible pump, transfer the final deionized water rinse that is pumped through the discharge hose to sample bottles. The same parameters that will be analyzed in the ground water samples will be analyzed in the rinsate samples. Assign the rinsate sample the QA/QC sample identification number "04"; follow SOP #7 for documentation, preservation, handling, packaging, and chain-of-custody procedures; store the sample in an iced cooler; and ship it promptly to the laboratory so that analyses can be performed within required holding times.

Collect one rinsate sample for every 2 primary water samples collected so that a rate for rinsate samples of at least 5 percent of primary samples collected is achieved. Collect rinsate blank samples so that they represent the time of collection, different sampling teams, field conditions, and sampling equipment variability. For example, if ambient conditions are altered that could impact sample quality, the QA/QC sampling frequency may be increased. Collect rinsate blank samples throughout the sampling event, not just at the end. Collect one rinsate blank sample for each type of sampling equipment by a submersible pump, you would collect two rinsate samples — one from the bailer and one from the pump). If the pump is already installed, take the rinsate same of the portal pump used for filtration.

6.4 Matrix Spike Samples

Matrix spike (MS) samples are required to evaluate potential matrix effects on sample analyses for all inorganic parameters. The laboratory will spike matrix spike samples for the inorganic parameters. Depending on the specific laboratory and sample volume collected, the matrix spike samples may be split from an existing sample or may require a separate sample. To samples that you collect specifically for matrix spike analysis, assign the QA/QC identification "MS"; follow SOP #7 for documentation, preservation, handling, packaging, and chain-of-custody procedures; store the sample in an iced cooler; and ship it promptly to the laboratory so that analyses can be performed within required holding times. The samplers will identify all samples selected for matrix spike split analysis on the Chain of Custody Form. Specify one matrix spike sample for each sample shipment group of 20 samples or less.

Some samples may not require Matrix Spike Samples until sufficient data is known about the data to assess that there may be an issue with the precision of the laboratory.

7.0 Documentation

7.1 Water Data Sheets

Complete a groundwater or surface data sheet for all water samples (Appendices A and B) at each sampling location. Be sure to completely fill in the data sheet. If items on the sheet do not apply to a specific location, label the item as not applicable (NA). The information on the data sheet includes the following:

- Well name or site identification number
- Date and time of sampling
- Person performing sampling
- Site conditions such as weather, temperature, barometric pressure, etc
- Depth to water before sampling
- Estimated flow rate, channel depth and width if surface or effluent water
- Volume of water purged if well before sampling
- Conductivity, temperature, pH, and turbidity during evacuation (note number of well volumes)
- Time samples are obtained
- Sample identification number(s)
- QA/QC samples taken (if any)
- Number of pictures taken and direction of the lens of the camera
- How the samples were collected (i.e., bailer and pump).

6.2 Field Notes

Keep field notes in a bound field book. Record the following information using waterproof ink:

- Names of personnel
- Weather conditions
- Date and time of sampling
- Location and well number
- Condition of the well
- Decontamination information
- Initial static water level and total well depth
- Calculations (e.g., calculation of evacuated volume)
- Calibration information, sample methods used, or reference to the appropriate SOP
- Final sample parameters
- Sample control number

Many of these details are provided with others on the groundwater sample data sheets (Attachment A) and the surface water sample data sheets (Attachment B). Many of the parameters in the data sheets will not be necessary and effluent sampling underground may require a specific data sheet to be created as neither the groundwater nor surface water sampling conditions are quite different underground.

ATTACHMENT A

GROUND WATER SAMPLING DATA SHEET

GROUND WATER SAMPLING DATA SHEET

IDENTIFICATION Project Number:

Sample Location_____ Date _____ Start Time _____ Stop time_____ Page__of

Sample Control Number_____ Samplers

WEATHER CONDITIONS

Ambient Air Temperature: _____ °C☐ °F☐ Not Measured ☐ **Wind**: Heavy☐ Moderate☐ Light☐

Precipitation: None☐ Rain☐ Snow☐ Heavy☐ Moderate☐ Light☐ Sunny☐ Partly Cloudy☐

INITIAL WELL MEASUREMENTS (Measurements in feet made from top of well casing)

Static Water Level____ Total Depth_____Top of Screen_____ Filter Pack Interval_____ Borehole Diameter(inches)

2-inch = 0.1632 gal/ft 4-inch = 0.6528 gal/ft 6-inch = 1.4688 gal/ft Casing Volume:_____ gallons

Well Casing ID_____ Well Casing OD_____ Protective Casing Stickup___ Well Casing Stickup____ Feet of Water

Well purged with: _____

FINAL WELL MEASUREMENTS

Static Water Level__ Total Depth___ Total Volume Purged__ Saturated Borehole Volume (gal)___ Max Pumping Rate

INSTRUMENT CALIBRATION

pH Meter: Meter Number_____ **Conductivity Meter:** Meter Number

Buffer____ Measured Value_____ Temp.____ °C Standard_____mS/cm Measured Value_____mS/cm Temp.___°C

Buffer____ Measured Value_____ Temp.____ °C Standard_____mS/cm Measured Value_____mS/cm Temp.___°C

Turbidity Meter:_____ Standard ____NTU Measured Value_____NTU Standard ____NTU Measured Value_____NTU

FIELD PARAMETER MEASUREMENTS DURING PURGING

Time	Volume (gallons)	pH	Cond. (µS/cm)	Temp. °C☐ °F☐	Turbidity Visual Est.☐ Measured☐	Comments

FINAL SAMPLE PARAMETERS

Sample Date	Sample Time	Discharge cfs☐ gpm☐	pH	Cond. (µS/cm)	Temp. (°C)	Turbidity Visual Est.☐ Measured☐		

Duplicate Sample-02 (sample control number/time_____)

Field Blank-03 (sample control number/time_____)

Rinsate Sample-04 (sample control number/time_____)

Matrix Spike-MS (sample control number/time_____)

_____ (sample control number/time_____)

Notes:

Sampler's Signature

ATTACHMENT B

SURFACE WATER SAMPLING DATA SHEET

SURFACE WATER SAMPLING DATA SHEET

SWAMP Field Data Sheet (Water Chemistry & Discrete Probe) - EventType=WQ		TROL BOARD (1-6 JUL 20 08) Entered in d-base (initial/date)	Pg of Pgs
*StationID: ______________	*Date (mm/dd/yyyy): / /	*Group:	*Agency:
*Funding: ___ ___ ___ ___ ___ ___ ___ ___	ArrivalTime: DepartureTime:	*SampleTime (1st sample):	*Protocol:
*Personnel:	*Purpose (circle all that apply): WaterChem WaterTox FieldObs FieldMeasure	*PurposeFailure:	

*Location: Bank Thalweg Midchannel OpenWater		*GPS/DGPS	Lat (dd.ddddd)	Long (ddd.ddddd)	OCCUPATION METHOD: Walk-in Bridge R/V __________ Other
GPS Device:		Target:		-	STARTING BANK (facing downstream): LB / RB / NA
Datum: NAD83	Accuracy (ft / m):	*Actual:		-	Point of Sample (if Integrated, then -88 in dbase)

Field Observations (SampleType = FieldObs)

WADEABILITY: Y / N / Unk

BEAUFORT SCALE (see attachment):

DISTANCE FROM BANK (m):

STREAM WIDTH (m):

WATER DEPTH (m):

SITE ODOR: None,Sulfides,Sewage,Petroleum,Mixed,Other

SKY CODE: Clear, Partly Cloudy, Overcast, Fog

WIND DIRECTION (from):

HYDROMODIFICATION: None, Bridge, Pipes, ConcreteChannel, GradeControl, Culvert, AerialZipline, Other LOCATION (to sample): US / DS / WI /

OTHERPRESENCE: Vascular,Nonvascular,OilySheen,Foam,Trash,Other____

DOMINANTSUBSTRATE: Bedrock, Concrete, Cobble, Gravel, Sand, Mud, Unk, Other________________

PHOTOS (RB & LB assigned when facing downstream; RENAME to StationCode_yyyy_mm_dd_uniquecode):

1: (RB / LB / BB / US / DS / ##)

2: (RB / LB / BB / US / DS / ##)

3: (RB / LB / BB / US / DS / ##)

WATERCLARITY: Clear (see bottom), Cloudy (>4" vis), Murky (<4" vis)

PRECIPITATION: None, Fog, Drizzle, Rain, Snow

WATERODOR: None, Sulfides, Sewage, Petroleum, Mixed, Other_____

PRECIPITATION (last 24 hrs): Unknown, <1", >1", None

WATERCOLOR: Colorless, Green, Yellow, Brown

OBSERVED FLOW: NA, Dry Waterbody Bed, No Obs Flow, Isolated Pool, Trickle (<0.1cfs), 0.1-1cfs, 1-5cfs, 5-20cfs, 20-50cfs, 50-200cfs, >200cfs

Field Measurements (SampleType = FieldMeasure; Method = Field)

	DepthCollec (m)	Velocity (fps)	Air Temp (°C)	Water Temp (°C)	pH	O_2 (mg/L)	O_2 (%)	Specific Conductivity (uS/cm)	Salinity (ppt)	Turbidity (ntu)	Stage Ht (units _____)		
SUBSURF/MID/ BOTTOM/REP													
SUBSURF/MID/ BOTTOM/REP													
SUBSURF/MID/ BOTTOM/REP													
Instrument:													
Calib. Date:													

Samples Taken (# of containers filled) - Method=Water_Grab

Field Dup YES / NO: (SampleType = Grab / Integrated; LABEL_ID = FieldQA; create collection record upon data entry

SAMPLE TYPE: Grab / Integrated

COLLECTION EQUIPMENT: Indiv bottle (by hand, by pole, by bucket); Teflon tubing; Kemmer; Pole & Beaker; Other ____________________

	DepthCollec (m)	Inorganics	Bacteria	Chl a	TSS / SSC	TOC / DOC	Total Hg	Dissolved Mercury	Total Metals	Dissolved Metals	Organics	Toxicity	VOAs
Sub/Surface													
Sub/Surface													

COMMENTS:

Run:										Sample Processing Date:					
Sample ID #:															
	Site Code:														
Yellow +	# Small Wells														
	# Large Wells														
	Empty Wells														
	MPN														
Yellow + Fluorescence (+)	# Small Wells														
	# Large Wells														
	False Positives														
	MPN														
Temp/Time	Start		4Hr. Check			14 Hr. Check			18 Hr. Check			22 Hr. Check, if needed			

	FIELD DUPLICATES				LAB DUPLICATES			
	Normal Sample #				**Normal Sample #**			
	Duplicate Sample #				**Duplicate Sample #**			
		MPN	95% CI Lower	95% CI Upper		MPN	95% CI Lower	95% CI Upper
TOTAL COLIFORM	*Normal*				*Normal*			
	Duplicate				*Duplicate*			
	Mean		Pass	Needs Review	*Mean*		Pass	Needs Review
E. COLI	*Normal*				*Normal*			
	Duplicate				*Duplicate*			
	Mean		Pass	Needs Review	*Mean*		Pass	Needs Review
BLANKS	*Field Sample #*		Pass	Needs Review	*Lab Sample #*		Pass	Needs Review

Mean = Mean of Normal and Duplicate, which is then compared to the individual corresponding CI's to determine acceptability of data

Sampler Signature / Date / Time Arrived:	Placed in Incubator By / Date / Time:	Trays Read By:
Processor / Date / Time:	Pulled from Incubator By / Date / Time:	Entered into database:

NOTES: