STATE OF COLORADO

Eschberger - DNR, Amy <amy.eschberger@state.co.us>

Amendment #2

DPollock@nedmining.com <DPollock@nedmining.com> Wed, Jan 6, 2021 at 2:42 PM
To: "Eschberger - DNR, Amy" <amy.eschberger@state.co.us>
Cc: RICHARD MITTASCH <rmittasch@nedmining.com>, TApodaca <TApodaca@nedmining.com>, Daniel Takami <danieltakami@gmail.com>

Amy,

Attached for your review is GIR's Amendment #2 Application packet. I will be sending an original hard copy to your attention tomorrow afternoon.

I look forward to discussing with you in the near future.

Please do not hesitate to contact me with any questions or concerns.

Thank you,

Daniel Pollock

Director of Regulations and Permitting

Grand Island Resources

Nederland Mining Consultants

720.207.5154 – Office

312.342.6145 – Cell

GIR_M-1977-410_AM2_APP.pdf
9056K

Cross Mine (M1977-410)
Amendment #2

Submitted by:

Grand Island Resources, LLC

Mined Land Reclamation Board

110(2) Limited Impact Permit Amendment Application

Prepared for:

Colorado Division of Reclamation, Mining and Safety

January 6, 2021

Table of Contents

GRAND ISLAND
RESOURCES

P.O. Box 3395
Nederland, CO 80466
January 6, 2021

January 6, 2021

Amy Eschberger
Environmental Protection Specialist
Colorado Department of Natural Resources
Division of Reclamation, Mining and Safety
1313 Sherman Street, Room 215
Denver, CO 80203

RE: File No. M1977-410-110(2) Limited Impact Permit Amendment Application

Ms Eschberger,

Enclosed for your review is a 110(2) Limited Impact Permit Amendment Application form and a complete package of additional information related to the proposed mining operation revision. This is an existing hard rock mining operation owned by Grand Island Resources, LLC (GIR). The entire permit area is on various properties either owned out right by GIR or granted through various lease agreements. This Operation will operate throughout the year, producing ore of various metals to include gold, silver, lead and zinc. The purpose of this amendment is:

- To increase the approved permit area from 8.96 to 9.99 acres and add additional independent parcels, namely the Petosi Shaft and Caribou 300.
- As described in the Boulder County Development Agreement (dated August 22, 2011), GIR will be adding an internal property road between the Cross Gold Mine and the Consolidated Caribou Mine.
- Increase and include the Mine Reclamation Plan for the newly included/created areas.

All other aspects of the mining operation will remain the same. Total annual production of ore and waste rock will not exceed 70,000 tons per year.

1. **The application date is:**

   Wednesday, January 6, 2021

2. **The owner(s) of the property:**

   Grand Island Resources, LLC
   4415 Caribou Road
   Nederland, CO 80466
   Phone: (720) 893-3749

3. The owner(s) of the substance to be mined:

Grand Island Resources, LLC
4415 Caribou Road
Nederland, CO 80466
Phone: (720) 893-3749

4. Name, address and phone number of the Applicant/Owner:

Grand Island Resources, LLC
4415 Caribou Road
Nederland, CO 80466
Phone: (720) 893-3749

The Applicant and Owner are the same.

5. The authorized representative of the Applicant/Operator:

Vice president of Operations
Richard Mittasch
PO Box 3395
Nederland, CO 80466
Phone: (515) 582-0833
Email: rmittasch@nedmining.com

6. The name of the mining operation:

The name of the operation is Grand Island Resources, LLC - Cross Gold Mine.

7. Type of Mining operation and substance to be mined:

The mining operation will consist of one underground hard rock mine. The materials to be mined are gold, silver, lead and zinc.

8. Site Location:

The siter is located approximately 4.5 miles west of Nederland, Colorado, adjacent to the Roosevelt National Forest, at an elevation of 9,700' MSL.

9. Legal description:

The general location is parcels of land in Section 9, Township 1 South, Range 73 West of the 6th Principal Meridian, County of Boulder, State of Colorado.

GRAND ISLAND
RESOURCES

10. **Acres Permitted:**

    8.96

11. **Acres affected:**

    8.96

12. **Estimated life of the operation:**

    50 years.

13. **Mine site access:**

    Mine access is off Boulder county Road 128, also known as Caribou Road.

This project will not substantially modify the intent, purpose or spirit of the land use policy that is currently in effect, and will return the area to forest land and residential use upon completion of mining and reclamation. This amendment is not proposing any changes to the current operational methods previously approved, other than the increase of the approved permit boundary, addition of the internal road and inclusion of the Mine Reclamation plan for the added parcels.

Sincerely,

Daniel V Pollock
Director of Regulations and Permitting
Grand Island Resources, LLC

cc: Boulder County Clerk and Recorder

STATE OF COLORADO

DIVISION OF RECLAMATION, MINING AND SAFETY
Department of Natural Resources

1313 Sherman St., Room 215
Denver, Colorado 80203
Phone: (303) 866-3567
FAX: (303) 832-8106

COLORADO DIVISION OF RECLAMATION MINING & SAFETY

LIMITED IMPACT OPERATION (110(2))

RECLAMATION PERMIT

APPLICATION FORM

CHECK ONE: ☐ New Application (Rule 1.4) ☑ Conversion Application (Rule 1.11)

Permit # M-1977-410 (provide for conversions of existing permits)

The application for a Limited Impact Designated Mining Operation Reclamation Permit contains three major parts: (1) the application form; (2) Exhibits A-J, any required sections of Exhibit S and Geotechnical Stability Exhibit, as required by the Office, and outlined in Rules 6.1, 6.2, 6.3, 6.4.19 and 6.5; and (3) the application fee. When you submit your application, be sure to include one (1) signed and notarized original and one (1) copy of the application form, two (2) copies of Exhibits A-J, appropriate sections of 6.4.19 Exhibit S and 6.5 (Geotechnical Stability Exhibit), as required, and a check for the application fee described under (4) below. Exhibits should not be bound or in a 3-ring binder; maps should be folded to 8 1/2" X 11" or 8 1/2" X 14" size. To expedite processing, please provide the information in the format and order described in this form.

GENERAL OPERATION INFORMATION

Type or print clearly, in the space provided, all information described below

1. **Applicant/operator or company name (name to be used on the permit):** Grand Island Resources, LLC (GIR)
   - 1.1 Type of organization (corporation, partnership, etc.): Partnership
2. **Operation name (pit, mine or site name):** Cross Gold Mine
3. **Permitted acreage (new or existing site):** 9.99 permitted acres
4. **Fees:**
   - 4.1 New Application — **$1,006.00** application fee
   - 4.2 Amendment Application (from 1.10(2))
   - 4.3 Conversion Fee (from 110d to 110(2), (Rule 1.11.2(2)) — **$1,725.00** conversion fee
5. **Primary commodity(s) to be mined:** Gold and Silver
6. **Name of owner to the surface of affected land:** Grand Island Resources, LLC
7. **Name of owner to the subsurface rights of affected land:** Grand Island Resources, LLC
8. **Type of mining operation:** ☐ Surface ☑ Underground ☐ In-situ

9. **Correspondence Information:**

APPLICANT/OPERATOR (name, address, and phone of name to be used on permit):

Contact's Name: Alfred F. Gerriets II Title: CEO

Company Name: Grand Island Resources, LLC

Street: 65 Arikaree Cir. P.O. Box: 3395

City: Nederland

State: CO Zip Code: 80466

Telephone Number: (212) - 920-1941

Fax Number: ( ) -

PERMITTING CONTACT (if different from applicant/operator above):

Contact's Name: Richard Mittasch Title: VP of Operations

Company Name: Grand Island Resources, LLC

Street: 34 Mitchell Ave P.O. Box:

City: Plainview

State: NY Zip Code: 11803

Telephone Number: (516) - 582-0833

Fax Number: ( ) -

INSPECTION CONTACT:

Contact's Name: Daniel V. Pollock Title: Director of Regulations and Permitting

Company Name: Grand Island Resources, LLC

Street: 300 Spruce Way P.O. Box: 0441

City: Nederland

State: CO Zip Code: 80466

Telephone Number: (720) - 207-5154

Fax Number: ( ) -

CC: STATE OR FEDERAL LANDOWNER (if any):

Agency:

Street:

City:

State: Zip Code:

Telephone Number: ( ) -

CC: STATE OR FEDERAL LANDOWNER (if any):

Agency:

Street:

City:

State: Zip Code:

Telephone Number: ( ) -

10. **Location information:** The center of the area where the majority of mining will occur lies in:

COUNTY: Boulder

PRINCIPAL MERIDIAN (check one): [✓] 6th (Colorado) [ ] 10th (New Mexico) [ ] Ute

SECTION (write number): S 9

TOWNSHIP (write number and check direction): T 1 [ ] North [✓] South

RANGE (write number and check direction): R 73 [ ] East [✓] West

QUARTER SECTION (check one): [ ] NE [✓] NW [ ] SE [ ] SW

QUARTER/QUARTER SECTION (check one): [ ] NE [ ] NW [ ] SE [✓] SW

GENERAL DESCRIPTION (miles and direction from nearest town and approximate elevation):

The mine is located 4.5 miles from the town of Nederland, Co the portal is located at an elevation of 9800 feet

11. **Primary Mine Entrance Location** (report in either Latitude/Longitude OR UTM):

Latitude/Longitude:

Example: (N) 39° 44′ 12.98″
(W) 104° 59′ 3.87″

Latitude (N): deg 39 min 58 sec 41.1168 (2 decimal places)

Longitude (W): deg 105 min 34 sec 31.572353 (2 decimal places)

OR

Example: (N) 39.73691°
(W) -104.98449°

Latitude (N) 39.978088 (5 decimal places)

Longitude (W) -105.572353 (5 decimal places)

OR

Universal Tranverse Mercator (UTM)

Example: 201336.3 E NAD27 Zone 13
4398351.2 N

UTM Datum (specify NAD27, NAD83 or WGS 84) WGS 84 Zone 13

Easting 451128.356716 M

Northing 376390.124416 M

12. **Primary future (Post-mining) land use (check one):**

[ ] Cropland(CR)
[ ] Rangeland(RL)
[ ] Residential(RS)
[ ] Developed Water Resources(WR)
[ ] Pastureland(PL)
[✓] Forestry(FR)
[ ] Recreation(RC)
[ ] General Agriculture(GA)
[ ] Wildlife Habitat(WL)
[ ] Industrial/Commercial(IC)
[ ] Solid Waste Disposal(WD)

13. **Primary present land use (check one):**

[ ] Cropland(CR)
[ ] Rangeland(RL)
[ ] Residential(RS)
[ ] Developed Water Resources(WR)
[ ] Pastureland(PL)
[ ] Forestry(FR)
[ ] Recreation(RC)
[ ] General Agriculture(GA)
[ ] Wildlife Habitat(WL)
[ ] Industrial/Commercial(IC)
[✓] Mining(MN)

14. If this operation will use designated chemicals, or will result, or presently has acid mine drainage - you cannot use this application form. You must submit a either a 110d or 112d application form for Designated Mining Operations. In either case, you must list any acidic or toxic-forming materials, exposed or disturbed as a result of the mining operation, and whether the operation will result in or presently has acid mine drainage:

N/A

15. **Description of Conversion:** If you are converting an existing operation, provide a brief narrative describing the proposed change(s):

The changes incurred in this Amendment encompass the following:
An increase in the approved disturbance zone from 8.96 to 8.99 acres.
The addition of a road between the Cross Mine and the Caribou Mine.
Updated ground support and reclamation plan for the Idaho Tunnel Portal at the Caribou mine site.

16. **Maps & Exhibits:** Submit **two (2) complete, unbound copies** of the following application exhibits:

6.3.1 EXHIBIT A - Legal Description and Location Map

6.3.2 EXHIBIT B - Site Description

6.3.3 EXHIBIT C - Mining Plan

6.3.4 EXHIBIT D - Reclamation Plan

6.3.5 EXHIBIT E - Map

6.3.6 EXHIBIT F - List of Other Permits and Licenses Required

6.3.7 EXHIBIT G - Source of Legal Right-to-Enter

6.3.8 EXHIBIT H - Municipalities Within a Two-mile Radius

6.3.9 EXHIBIT I - Proof of Filing with County Clerk

6.3.10 EXHIBIT J - Proof of Mailing Notices of Permit Application

6.3.12 EXHIBIT L - Permanent Man-Made Structures

6.4.19 EXHIBIT S - (as required)

6.5 Geotechnical Stability Exhibit (as required)

Responsibilities as a Permittee:

Upon application approval and permit issuance, this application becomes a legally binding document. Therefore, there are a number of important requirements which you, as a permittee, should fully understand. These requirements are listed below. Please read and initial each requirement, in the space provided, to acknowledge that you understand your obligations. If you do not understand these obligations then please contact this Office for a full explanation.

DST 1. Your obligation to reclaim the site is not limited to the amount of the financial warranty. You assume legal liability for all reasonable expenses which the Board or the Office may incur to reclaim the affected lands associated with your mining operation in the event your permit is revoked and financial warranty is forfeited;

DST 2. The Board may suspend or revoke this permit, or assess a civil penalty, upon a finding that the permittee violated the terms or conditions of this permit, the Act, the Mineral Rules and Regulations, or that information contained in the application or your permit misrepresent important material facts;

DST 3. If your mining and reclamation operations affect areas beyond the boundaries of an approved permit boundary, substantial civil penalties, to you as permittee can result;

DST 4. Any modification to the approved mining and reclamation plan from those described in your approved application requires you to submit a permit modification and obtain approval from the Board or Office;

DST 5. It is your responsibility to notify the Office of any changes in your address or phone number;

DST 6. Upon permit issuance and prior to beginning on-site mining activity, you must post a sign at the entrance of the mine site, which shall be clearly visible from the access road, with the following information (Rule 3.1.12):

a. the name of the operator;

b. a statement that a reclamation permit for the operation has been issued by the Colorado Mined Land Reclamation Board; and,

c. the permit number.

DST 7. The boundaries of the permit boundary area must be marked by monuments or other markers that are clearly visible and adequate to delineate such boundaries prior to site disturbance;

DST 8. It is a provision of this permit that the operations will be conducted in accordance with the terms and conditions listed in your application, as well as with the provisions of the Act and the Mineral Rules and Regulations in effect at the time the permit is issued.

DT 9. Annually, on the anniversary date of permit issuance, you must submit an annual fee (**$259**), and an annual report which includes a map describing the acreage affected and the acreage reclaimed to date (if there are changes from the previous year), any monitoring required by the Reclamation or Environmental Protection Plans to be submitted annually on the anniversary date of the permit approval. Annual fees are for the previous year a permit is held. For example, a permit with the anniversary date of July 1, 1995, the annual fee is for the period of July 1, 1994 through June 30, 1995. Failure to submit your annual fee and report by the permit anniversary date may result in a civil penalty, revocation of your permit, and forfeiture of your financial warranty. It is your responsibility, as an operator, to continue to pay your annual fee to the Office until the Board releases you from your total reclamation responsibility.

DT 10. For joint venture/partnership operators: the signing representative is authorized to sign this document and a power of attorney (provided by the partner(s)) authorizing the signature of the representative is attached to this application.

NOTE TO COMMENTORS/OBJECTORS:

It is likely there will be additions, changes, and deletions to this document prior to final decision by the Office. Therefore, if you have any comments or concerns you must contact the applicant or the Office prior to the decision date so that you will know what changes may have been made to the application document.

The Office is not allowed to consider comments, unless they are written, and received prior to the end of the public comment period. You should contact the applicant for the final date of the public comment period.

If you have questions about the Mined Land Reclamation Board and Office review and decision or appeals process, you may contact the Office at (303) 866-3567.

Certification:

As an authorized representative of the applicant, I hereby certify that the operation described has met the minimum requirements of the following terms and conditions:

1. All necessary approvals from local government have been applied for (Rule 1.6.2(1) and (2));

2. This entire mining operation will not extract more than 70,000 tons of mineral, overburden, or combination thereof in any calendar year (defined in **C.R.S. 34-32-110(2)(a)**);

3. This mining operation will not adversely affect the stability of any significant, valuable and permanent man-made structure(s) located within two hundred (200) feet of the affected lands. (However, where there is an agreement between the applicant/operator and the persons having an interest in the structure that damage to the structure is to be compensated for by the applicant/operator (Section 34-32-115(4)(d), C.R.S. 1984, as amended), then mining may occur within 200 feet. Proof of an agreement must be submitted to the Office prior to the decision date.)

4. No mining operation will be located on lands where such operations are prohibited by law (Section 34-32-115(4)(f), C.R.S. 1984, as amended);

5. As the applicant/operator, I do not have any mining/prospecting operations in this state of Colorado currently in violation of the provisions of the Mined Land Reclamation Act (Section 34-32-120, C.R.S. 1984, as amended) as determined through a Board finding.

6. I understand that statements in the application are being made under penalty of perjury and that false statements made herein are punishable as a Class 1 misdemeanor pursuant to Section 18-8-503, C.R.S 1984, as amended.

This form has been approved by the Mined Land Reclamation Board pursuant to section 34-32-110,C.R.S., of the Mined Land Reclamation Act. Any alteration or modification of this form shall result in voiding any permit issued on the altered or modified form and subject the operator to cease and desist orders and civil penalties for operating without a permit pursuant to section 34-32-123, C.R.S.

Signed and dated this 9 day of December, 2020.

Grand Island Resources, LLC (GIR)
Applicant/Operator

If Corporation Attest (Seal)

By: _____

Title: Executive V.P.

By: _____
Corporate Secretary or Equivalent
Town/City/County Clerk

State of Colorado)
) ss.
County of Boulder)

The foregoing instrument was acknowledged before me this 9th day of December, 2020,
by Daniel Takami as Executive V.P. of Grand Island Resources, LLC.

Carrie Jo Lake
Notary Public
My Commission expires: 8/25/2023

Carrie Jo Lake
NOTARY PUBLIC
STATE OF COLORADO
NOTARY ID 20154033631
MY COMMISSION EXPIRES August 25, 2023

SIGNATURES MUST BE IN BLUE INK

EXHIBIT A

1. 6.3.1 Legal Description and Location Map:

The location is a parcel of land in Sections 8 & 9, Township 1 S, Range 73 W of the 6th Principal Meridian, County of Boulder, State of Colorado, more particularly described as follows:

Starting at the Point of Bearing (POB):

Cross-Caribou

Line No.		Length (ft)	Direction
L1	POB	204.414	N 82° 18’ 56.87” W
L2	Thence	126.268	N 43° 00’ 52.78” W
L3	Thence	121.461	S 85° 35’ 51.79” E
L4	Thence	22.479	N 20° 31’ 56.22” E
L5	Thence	177.625	N 85° 47’ 58.79” W
L6	Thence	383.792	N 42° 47’ 11.84” W
L7	Thence	126.053	S 89° 40’ 40.12” W
L8	Thence	139.869	N 37° 45’ 56.90 W
L9	Thence	251.135	N 89° 40’ 40.11” E
L10	Thence	291.427	N 00° 19’ 19.88” W
L11	Thence	26.840	N 44° 40’ 40.12” E
L12	Thence	55.221	N 00° 19’ 19.88” W
L13	Thence	69.704	N 34° 50’ 24.47” W
L14	Thence	56.697	N 55° 09’ 35.53” E
L15	Thence	88.561	S 34° 50’ 24.46” E

L16	**Thence**	**254.498**	**N 65° 15’ 13.12” E**
L17	**Thence**	**126.268**	**S 41° 46’ 28.81” E**
L18	**Thence**	**48.527**	**S 18° 59’ 37.69” W**
L19	**Thence**	**43.650**	**S 65° 26’ 48.35” E**
L20	**Thence**	**31.020**	**N 85° 04’ 40.17” E**
L21	**Thence**	**262.951**	**S 41° 46’ 28.81” E**
L22	**Thence**	**188.212**	**S 57° 55’ 06.21” W**
L23	**Thence**	**36.387**	**S 86° 49’ 33.08” W**
L24	**Thence**	**8.319**	**S 10° 01’ 04.02” W**
L25	**Thence**	**11.830**	**S 85° 30’ 30.81” E**
L26	**Thence**	**430.712**	**S 07° 39’ 42.79” E**
L27	**Thence**	**152.299**	**S 25° 58’ 47.74” E**

Back to the Point of Beginning (POB) totaling approximately 9.60 acres.

The average elevation of the mine site is 9,700’ MSL.

2. Pit entry Coordinates:

Entrance: Access is made off Boulder County Road 128 (Caribou Road) at two locations.

UTM: Future access #1 N 4,425,947.4 meters, E 450,580.1 meters, Zone 13, NAD 83

Future access #1 N 4,425,190.2 meters, E 451,649.9 meters, Zone 13, NAD 83

(These are the approximate locations of the main entrances to the GIR mining operation).

Cross-Caribou			
Line		Length ft.	Bearing
L1	POB	204.414	N 82° 18' 56.87" W
L2	Thence	126.268	N 43° 00' 52.78" W
L3	Thence	121.461	S 85° 35' 51.79" E
L4	Thence	22.479	N 20° 31' 56.22" E
L5	Thence	177.625	N 85° 47' 58.79" W
L6	Thence	383.792	N 42° 47' 11.84" W
L7	Thence	126.053	S 89° 40' 40.12" W
L8	Thence	139.869	N 37° 45' 56.90" W
L9	Thence	251.135	N 89° 40' 40.11" E
L10	Thence	291.427	N 00° 19' 19.88" W
L11	Thence	26.840	N 44° 40' 40.12" E
L12	Thence	55.221	N 00° 19' 19.88" W
L13	Thence	69.704	N 34° 50' 24.47" W
L14	Thence	56.697	N 55° 09' 35.53" E
L15	Thence	88.561	S 34° 50' 24.46" E
L16	Thence	254.498	N 65° 15' 13.12" E
L17	Thence	126.268	S 41° 46' 28.81" E
L18	Thence	48.527	S 18° 59' 37.69" W
L19	Thence	43.650	S 65° 26' 48.35" E
L20	Thence	31.020	N 85° 04' 40.17" E
L21	Thence	262.951	S 41° 46' 28.81" E
L22	Thence	188.212	S 57° 55' 06.21" W
L23	Thence	36.387	S 86° 49' 33.08" W
L24	Thence	8.319	S 10° 01' 04.02" W
L25	Thence	11.830	S 85° 30' 30.81" E
L26	Thence	430.712	S 07° 39' 42.79" E
L27	Thence	152.299	S 25° 58' 47.74" E

Legend

Permit Boundary - Modified (9.60 ac)

Permit Boundary - Current (8.96 ac)

New Section	Name	Area (ac)
A	Idaho Tunnel & Slope	0.11 ac
B	Oil Building Parking Lot	0.27 ac
C	Pond 2 Water Pipes	0.13 ac
D	Pond 3 & Road	0.13 ac

Project: DRMS Amendment 2

Title: **Proposed Permit Boundary Modifications Cross-Caribou Site**

Project No. 0801			File No.	
GIS:	JST	01/04/21	Scale As Shown	Rev 0
Check:	JST	01/04/21	**Map 2**	
Review:	DP	01/04/21		

Path: G:\Projects\Redefined\ArcMap\DRMS\Amendment 2\Map 2 - Cross-Caribou.mxd

EXHIBIT A

1. 6.3.1 Legal Description and Location Map:

The location is a parcel of land in Sections 8 & 9, Township 1 S, Range 73 W of the 6th Principal Meridian, County of Boulder, State of Colorado, more particularly described as follows:

Starting at the Point of Bearing (POB):

Potosi Shaft

Line No.		Length (ft)	Direction
L1	POB	60.000	N 56° 16' 17.96" W
L2	Thence	45.000	N 33° 43' 42.04" E
L3	Thence	60.000	S 56° 16' 17.96" E
L4	Thence	45.000	S 33° 43' 42.04" W

Back to the Point of Beginning (POB) totaling approximately 0.06 acres.

The average elevation of the mine site is 9,700' MSL.

2. Pit entry Coordinates:

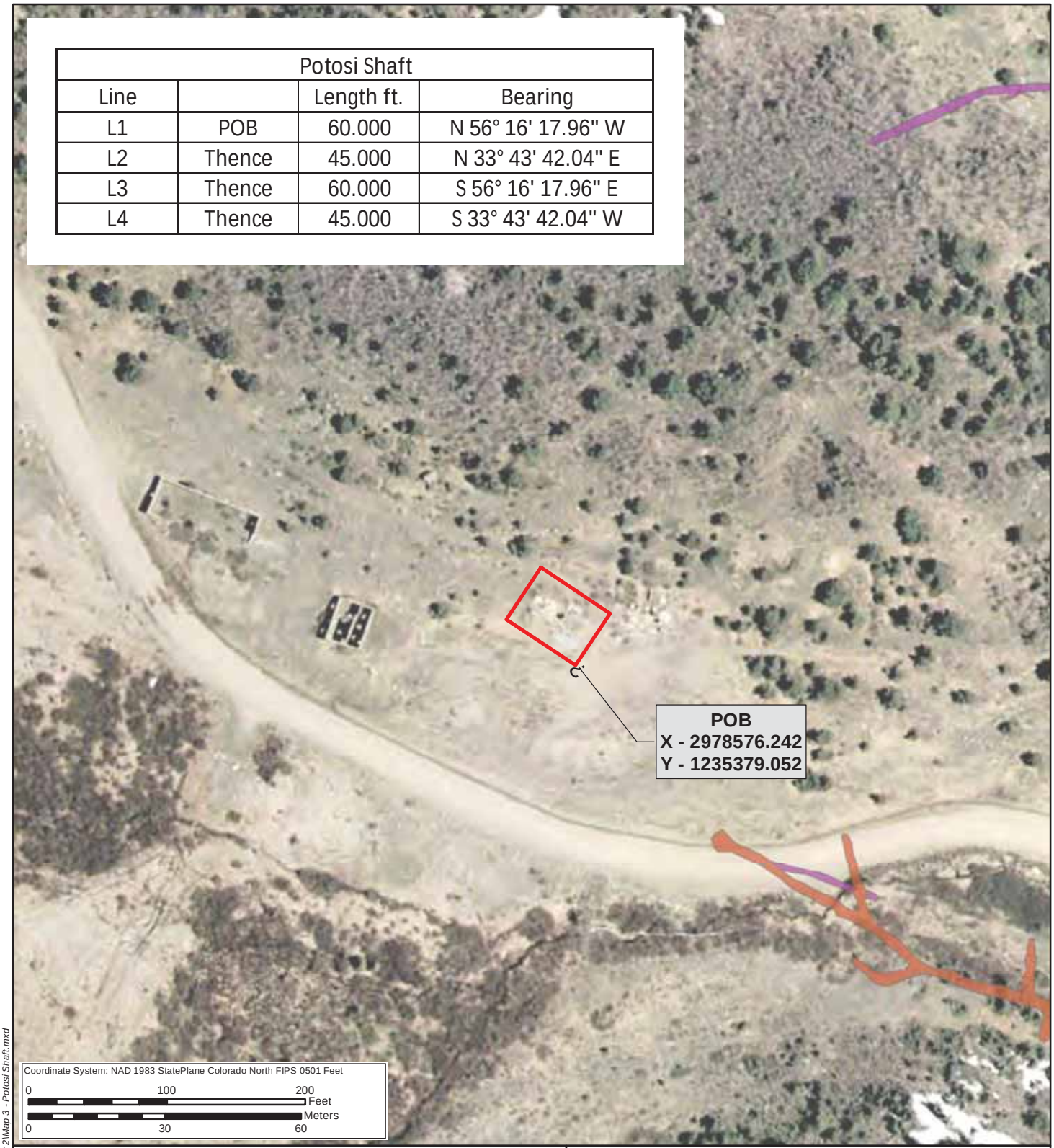
Entrance: Access is made off Boulder County Road 128 (Caribou Road) at two locations.

UTM: Future access #1 N 4,425,947.4 meters, E 450,580.1 meters, Zone 13, NAD 83

Future access #1 N 4,425,190.2 meters, E 451,649.9 meters, Zone 13, NAD 83

(These are the approximate locations of the main entrances to the GIR mining operation).

Potosi Shaft			
Line		Length ft.	Bearing
L1	POB	60.000	N 56° 16' 17.96" W
L2	Thence	45.000	N 33° 43' 42.04" E
L3	Thence	60.000	S 56° 16' 17.96" E
L4	Thence	45.000	S 33° 43' 42.04" W



Permit Boundary - Modified (0.06 ac)

Project: DRMS Amendment 2

Title: **Proposed Permit Boundary Modifications Potosi Shaft SIte**

GRAND ISLAND RESOURCES

Project No. 0801			File No.	
GIS:	JST	12/15/20	Scale As Shown	Rev 0
Check:	JST	12/15/20	Map 3	
Review:	DP	12/15/20		

Path: G:\Projects\NederlandArcMap\DRMS\Amendment 2\Map 3 - Potosi Shaft.mxd

EXHIBIT A

1. 6.3.1 Legal Description and Location Map:

The location is a parcel of land in Sections 8 & 9, Township 1 S, Range 73 W of the 6th Principal Meridian, County of Boulder, State of Colorado, more particularly described as follows:

Starting at the Point of Bearing (POB):

Caribou 300 Level Portal

Line No.		Length (ft)	Direction
L1	POB	75.000	N 72° 40' 24.50" W
L2	Thence	190.000	N 17° 19' 35.50" E
L3	Thence	75.000	S 72° 40' 24.50 E
L4	Thence	190.000	S 17° 19' 35.50 W

Back to the Point of Beginning (POB) totaling approximately 0.33 acres.

The average elevation of the mine site is 9,700' MSL.

2. Pit entry Coordinates:

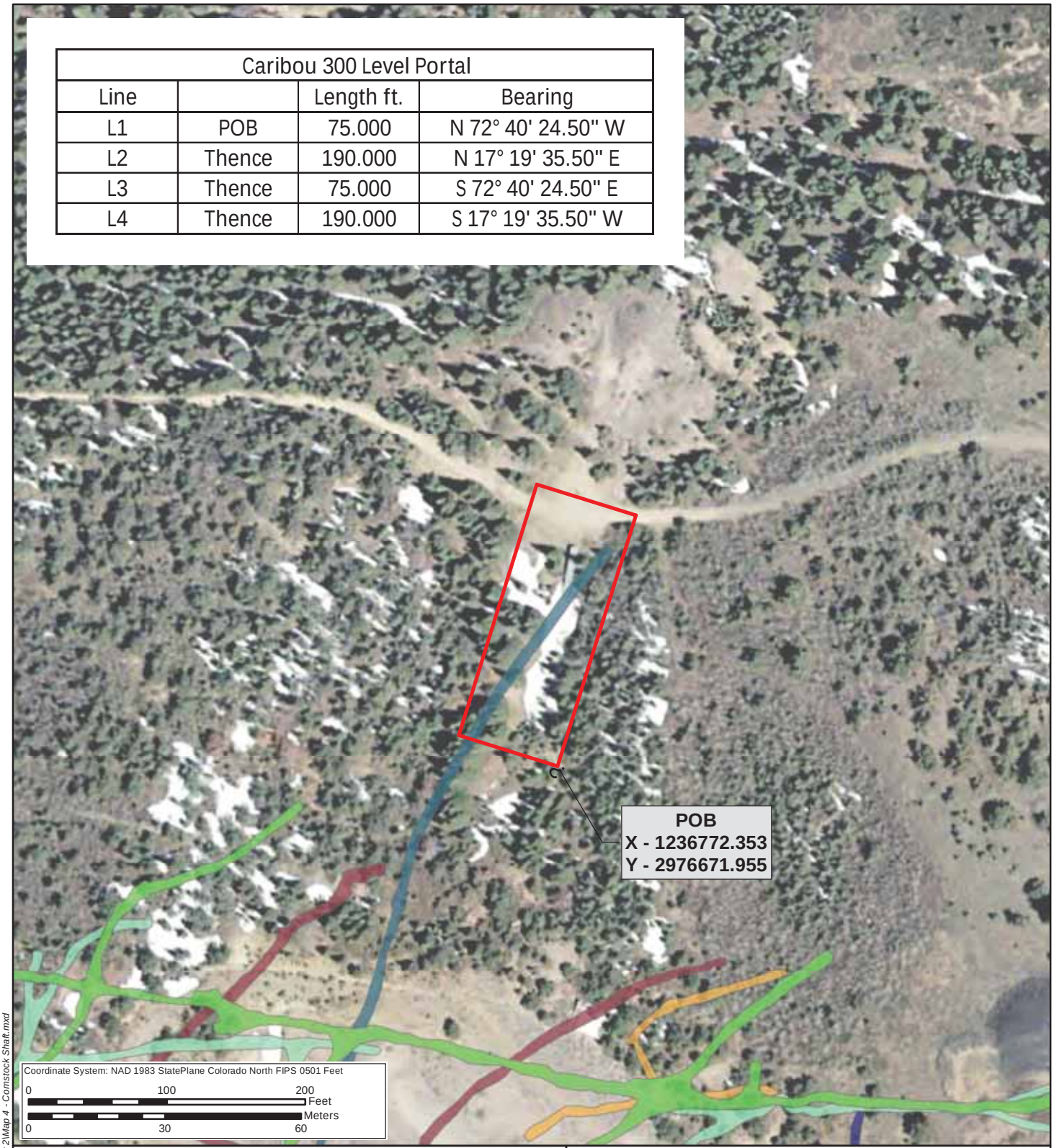
Entrance: Access is made off Boulder County Road 128 (Caribou Road) at two locations.

UTM: Future access #1 N 4,425,947.4 meters, E 450,580.1 meters, Zone 13, NAD 83

Future access #1 N 4,425,190.2 meters, E 451,649.9 meters, Zone 13, NAD 83

(These are the approximate locations of the main entrances to the GIR mining operation).

Caribou 300 Level Portal			
Line		Length ft.	Bearing
L1	POB	75.000	N 72° 40' 24.50" W
L2	Thence	190.000	N 17° 19' 35.50" E
L3	Thence	75.000	S 72° 40' 24.50" E
L4	Thence	190.000	S 17° 19' 35.50" W



Permit Boundary - Modified (0.33 ac)

Project: DRMS Amendment 2

Title: **Proposed Permit Boundary Modifications Caribou 300 Level Portal Site**

GRAND ISLAND RESOURCES

Project No. 0801			File No.	
GIS:	JST	12/15/20	Scale As Shown	Rev 0
Check:	JST	12/15/20	Map 4	
Review:	DP	12/15/20		

Path: G:\Projects\NederlandArcMap\DRMS\Amendment 2\Map 4 - Comstock Shaft.mxd

EXHIBIT B

6.3.2 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 an elevation of 9700 feet, Mean Sea Level (MSL) . (The proposed expanded permit boundary will be on private property owned or controlled by GIR.)

(a) A description of the vegetation and soil characteristics in the area of the proposed operation:

- *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.)

Project Summary:

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 of9,700 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.

Walsh Environmental Scientists and Engineers, LLC (Walsh) ecologists identified and delineated 13 major plant communities totaling 25.1 acres. (Map 5)

Methods:

Walsh ecologists were familiarized with the project site at 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.

RESULTS:

Thirteen plant communities (comprising 25.1 acres) were described and mapped. These include 11 upland and two wetland communities. Each community is described below and illustrated in Map 5.

Upland Plant Communities:

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).*

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.

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.

Developed

This portion of the site represents areas not having vegetation due to on-going mining activities.

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 appears 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).*

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.

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.

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 *(I'hermopsis montana)* were also present

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).*

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 *(Artemisiafrigid),* 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. *(This amendment 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.

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 *(A/nus 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).*

Willow Woodland, A Wetland Plant 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.

(b) Identify any permanent manmade structures within two hundred (200) feet of the affected area and the owner of each structure. Each structure should be located on Exhibit E - Map:

As shown on Exhibit E, the only permanent man-made structures within 200 feet of the affected area are Boulder County, County Road 128 and an Excel power line which supplies power to the mine site and runs somewhat east and west from the site toward Nederland and up onto U.S. Forest Service property. In addition there is a Qwest phone line on the south side of the proposed permit boundary which runs somewhat east and west. These structures have been a feature on and around the mine site for many years during its periods of activity and in-activity.

(c) A description of the water resources in the area of the proposed operation. Identify surface and subsurface waters that would receive drainage directly from the affected area. Provide any available information from publications, or monitoring data on flow rates, water table elevations and water quality conditions:

Surface Water Resources:

Coon Track Creek bisects the proposed permit area. Associated with the drainage are some wetlands on either side of Coon Track Creek. No site specific stream flow data are available for Coon Track Creek. Stream flow rates and surface water quality data are provided in Attachment I for the basin in general.

Wetlands on the Calais Mine property are primarily associated with Coon Track Creek, which is a narrow and well-defined channel that flows through the length of the property

and drains the entire Cross Mine area watershed. Coon Track Creek is a tributary of Beaver Creek, which flows into Middle Boulder Creek above Barker Reservoir. Coon Track Creek exhibits steady low flows year-round below the mine site due to discharges from the Cross and Caribou mines, with high flows during snowmelt runoff.

Waters of the U.S., including associated wetlands, were surveyed within the proposed site boundary and plotted by a Professional Wetland Scientist for Walsh Environmental using a Trimble XT (hand-held GPS unit with ESRI ARC Pad mobile mapping software) and total 1.94- acres (84,506 sq. ft.). This wetland survey is shown on the Site Map, Figure 1 above. A Jurisdictional Determination was approved by US Army Corps of Engineer (US ACE) on February 7, 2008, and the approval letter is provided in Attachment II. No wetlands will be disturbed by the proposed activities until appropriate approvals are obtained from the US ACE.

Coon Track Creek is characterized by steep side slopes and a rocky channel bottom. In the upper and mid-reaches of the creek, the presence of wetland habitat is nominal and only extends beyond the banks in a few isolated, low-lying areas. Two man-made, plastic lined ponds flank the north and west sides of the mining complex. The pond fringes are devoid of vegetation but have been determined to be jurisdictional by the U.S. Army Corps of Engineers as they are hydrologically connected to the creek downstream through a series of PVC pipes. Below the mine structures, the creek meanders along a narrow ravine before exiting the property through a Boulder County maintained culvert under the Cross Mine access road. Wetland habitat associated with the downstream reaches is limited to the riparian corridor and to a wet meadow area on the north bank that is situated just east of pond #2 and extends into the adjacent aspen woodland.

The primary source of hydrology for wetlands is provided by up-slope runoff and flows from the creek. Flows from the Idaho Tunnel are directed into pond #2 and contribute to wetland hydrology in the lower half of the property. Secondary sources are provided by naturally occurring side slope seeps, snowmelt and precipitation events.

Groundwater Resources:

The proposed mine and its expansion area are not impacted by designated floodplains, because the site is located very near the headwaters of Coon Track Creek. Mining will be as presented in the original mine permit application. No impacts to ground water due to the proposed site modifications are expected.

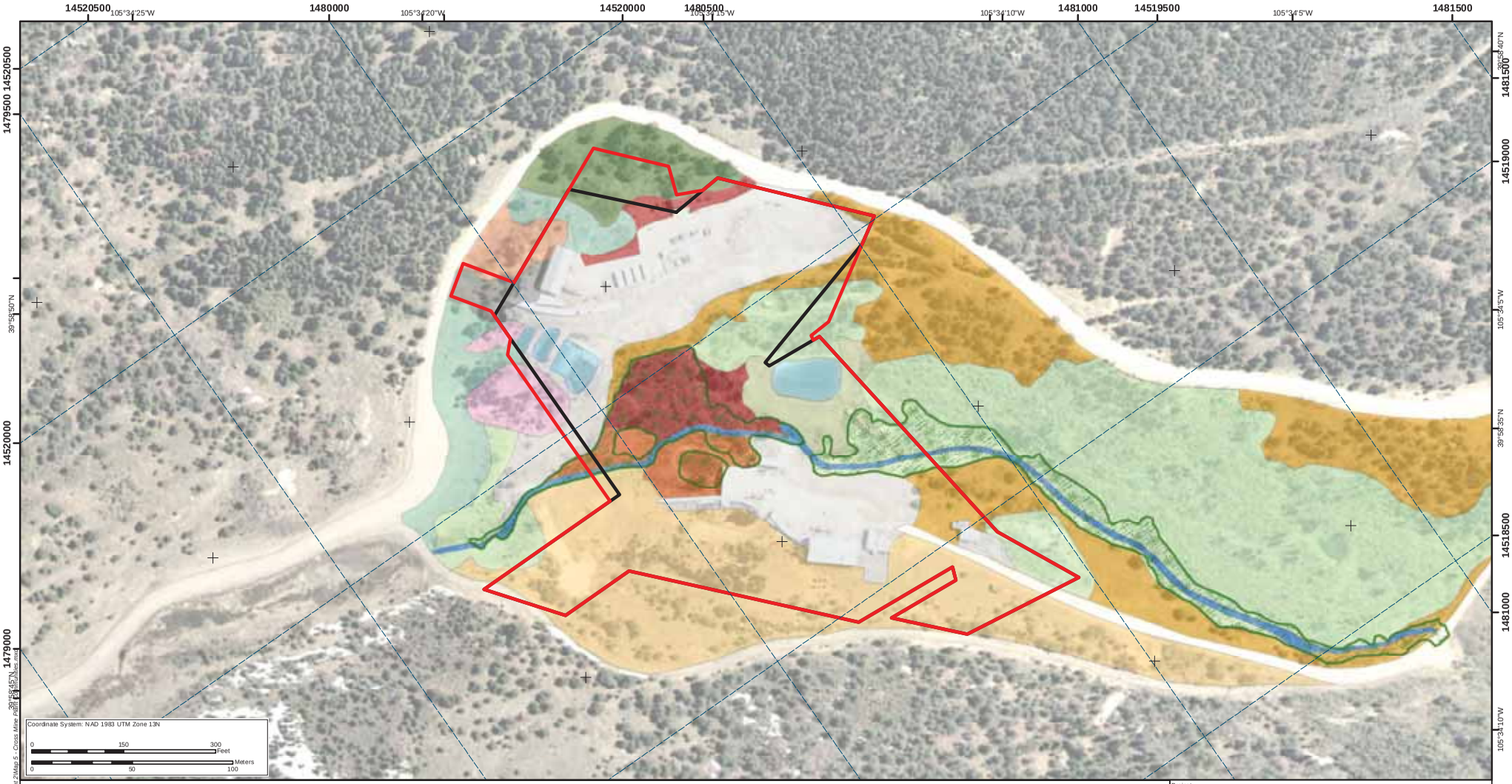
Groundwater at the site is generally controlled by drainage out of the existing mine adits which report to two ponds for the addition of lime and discharge to Coon Track Creek

through a permitted discharge point.

Waste rock analyses previously performed and part of the Division's existing permit file indicate the host rock and ore are non-acid generating. Ground water pH based on three quarters of analysis has been between pH 6.4 and 7.6 in the three baseline ground water monitoring wells.
The waste rock analyses and pH of the ground waters sampled at the three baseline monitoring wells indicate the waste rock is benign and there should not be a ground water quality issue. (The three baseline ground water monitoring well locations have been reviewed during an inspection by the Division and have been found acceptable for gathering baseline ground water information. GIR has recently updated it's *Water Sampling and Analysis Plan* as well as it's *Storm Water Management Plan.* Please see attached M and O).

(d) A wildlife statement prepared by the CDOW if the Operation is a ll0(d) Limited Impact Operation:

The proposed modifications will not result in a Designated Mining Operation or significant impacts to wildlife use. Therefore, a wildlife statement will not be required. However, GIR plans on conducting its mining and reclamation operations in such a manner to prevent significant impacts to wildlife on and near the mine site.



Legend

- Permit Boundary - Modified (9.60 ac)
- Permit Boundary - Current (8.96 ac)
- Wetland

Vegetation

- Coon Track Creek
- Aspen Woodland
- Aspen/Lodgepole Pine Woodland
- Developed
- Disturbed Upland Meadow
- Limber/Lodgepole Pine Parkland
- Lodgepole Pine Parkland
- Planted Grasses
- Pond (Open Water)
- Rock Outcrop
- Spruce/Fir Woodland
- Upland Meadow
- Willow/Spruce/Fir Woodland
- Willow Woodland

Project: DRMS Amendment 2

Title: **Plant Communities Cross-Caribou Site**

GRAND ISLAND RESOURCES

Project No. CO-0801			File No.	
GIS:	JST	01/04/21	Scale As Shown	Rev 0
Check:	BG	01/04/21	**Map 5**	
Review:	BG	01/04/21		

Path: G:\Projects\Redwood\ArcMap\DRMS\Amendment 2\Map 5 - Cross Mine Permit Boundaries.mxd

Custom Soil Resource Report

Arapaho-Roosevelt National Forest Area, Colorado, Parts of Boulder, Clear Creek, Gilpin, Grand, Park and Larimer Counties

6102A--Gateview family-Cryaquolls complex. 0 to 15 percent slopes

Map Unit Setting

Elevation: 8,000 to 9,500 feet
Mean annual precipitation: 20 to 40 inches
Mean annual air temperature: 36 to 45 degrees F
Frost-tree period: 30 to 70 days

Map Unit Composition

Gateview family and similar soils: 60 percent

Cryaquolls and similar soils: 25 percent

Description of Gateview Family Setting

Landform: Alluvial fans. terraces
Parentmaterial: Gravelly alluvium and/or gravelly glaciofluvial deposits derived from igneous. metamorphic and sedimentary rock

Properties and qualities

Slope: 0 to 15 percent
Depth to restrictive feature: More than 80 inches
Drainage Class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: Mora than 80 inches
Frequency flooding: None
Frequency of *ponding:* None
Available water capacity: Low (about 4.1 inches)

Interpretive groups

Other vegetative classification: Quaking aspen/Thurber's fescue (POTR5/FE1H) (00503), Quaking aspen/Fendler's meadowrue (POTR5/THFE) (00512)

Typical profile

0 to 3 inches: Loam
3 to 11 inches: Gravelly sandy loam
11 to 22 inches: Gravelly sandy loam
22 to 34 inches: Very gravelly sandy loam
34 to 54 inches: Extremely gravelly sandy loam
54 to 62 inches: Extremely gravelly sandy day loam

Description of Cryaquolls

Setting

Landform: Flood plains

Parent material: Gravelly alluvium and/or gravelly glaciofluvial deposits derived from igneous, metamorphic, and sedimentary rock.

Properties and qualities

Slope: 0 to 15 percent

Depth to restrictive feature: More than 80 inches

Drainage class: Poorly drained

Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: Occasional

Frequency of ponding: None

Maximum salinity: Nonsaline (0.0 to 2.0 mmhos/cm}

Available water capacity: High (about 11.1 inches)

Interpretive groups

Other vegetative classification: Booth's willow-willow/reedgrass (SAB02-SALIX/ CALAM) (S1498}, Geyer's willow-willow/reedgrass (SAGE2-SAUX/CALAM) (S1495), Geyer's willow-willow/Northwest Territory sedge (SAGE2-SALIX/ CAUT) (S1413)

Typical profile

0 to *4 inches:* Moderately decomposed plant material

4 to 16 inches: Silt loam

16 to 24 inches: Silt loam

24 to 30 inches: Silt loam

30 to 40 inches: Sandy loam

40 to 64 inches: Silt loam

7700B-leighcan family, 5 to 40 percent slopes

Map Unit Setting

Elevation: 9,000 to 11,200 feet

Mean annual precipitation: 20 to 40 inches

Mean annual air temperature: 36 to 39 degrees F

Frost-free period: 30 to 50 days

Map Unit Composition

Leighcan family and similar soils: 85 percent

Description of Leighcan Family

Setting

Landform: Mountain slopes

Parent material: Colluvrium over residuum weathered from igneous and metamorphic rock

Properties and qualities

Slope: 5 to 40 percent

Depth to restrictive feature: More than 80 inches

Drainage class: Somewhat excessively drained

Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Available water capacity. Very low (about 2.7 inches)

Interpretive groups

Other vegetative classification: Subalpine fir - Engelmann spruce/moss (ABLA- PIEN/MOSS) (C0311), Subalpine fir - Engelmann spruce/myrtle whortleberry (ABLA-PIENNAMY2) (C0320), Subalpine fir - Engelmann spruce/grouse whortleberry (ABLA-PIENNASC) (C0321)

Typical profile

0 to 2 inches: Cobbly silt loam
2 to 9 *inches:* Very cobbly silt loam
9 to 28 inches: Very cobbly sandy loam
28 to *45 inches:* Extremely stony loamy sand
45 to *60 inches:* Extremely stony loamy sand

7755B--Leighcan-Catamount families, moist complex, 5 to 40 percent slopes

Map Unit Setting

Elevation: 8,000 to 11,000 feet
Mean annual precipitation: 20 to 40 inches
Mean annual air temperature: 36 to 39 degrees F
Frost-free period: 30 to 50 days

Map Unit Composition

Leighcan family, moist, and similar soils: 45 percent
catamount family, moist, and sim11ar soils: 40 percent

Description of Leighcan Family, Moist

Setting

Landform: Mountain slopes
Parent material: Residuum and/or slope alluvium derived from igneous and metamorphic rock

Properties and qualities

Slope: 5 to 40 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
Capacity of *the most limiting layer to transmit water* ***(Ksat):*** High (2.00 to 6.00 in/hr)
Depth to water table: More than 80 inches

Frequency of *flooding:* None
Frequency of *ponding:* None
Available water capacity: Very low (about 2.7 inches)

Interpretive groups

Other vegetative classification: Subalpine fir - Engelmann spruce/grouse whortleberry (ABLA-PIENNASC) (C0321), Subalpine fir- Engelmann spruce/ myrtle whortleberry (ABLA-PIENNAMY2) (C0320)

Typical profile

0 to 2 inches: Cobbly silt loam
2 to 9 *inches:* Very cobbly silt loam
9 to 28 inches: Very cobbly sandy loam
28 to 45 inches: Extremely stony loamy sand
45 to 60 inches: Extremely stony loamy sand

Description of Catamount Family, Moist

Setting

Landform: Mountain slopes
Parent material: Residuum weathered from igneous and metamorphic rock

Properties and qualities

Slope: 5 to 40 percent
Depth to restrictive feature: 10 to 20 inches to paralithic bedrock; 20 to 40 inches to lithic bedrock
Drainage class: Excessively drained
*capacity of the most limiting layer to transmit water (Ksat)*_ - Very low to moderately low (0.00 to 0_01 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding None
Maximum salinity. Nonsaline (0.0 to 2.0 mmhos/cm)
Available water capacity: Very low (about 0.9 inches)

Interpretive groups

Other vegetative desilication: Subalpine fir - Engelmann spruce/myrtle whortleberry (ABLA-PDENNAMY2) (C0320), Subalpine fir- Engelmann spruce/ grouse whortleberry (ABLA-PIENNASC) (C0321)

Typical profile

0 to 1inches: Slightly decomposed plant material
1 to 2inches: Gravelly loam
2 to *5 inches:* Very gravelly sandy loam
5 to 11 inches: Extremely cobbly sandy loam
11 to 15 inches: Extremely cobbly sandy loam
15 to 26 inches: Weathered bedrock
26 to 30 inches: Unweathered bedrock

7702B-Goosepeak-Catamount families, moist complex, 5 to 40 percent slopes

Map Unit Setting

Elevation: 9,000 to 10,200 feet
Mean annual precipitation: 20 to 40 inches
Mean annual air temperature: 36 to 39 degrees F
Frost-free period: 30 to 50 days

Map Unit Composition

Goosepeak family, moist, and similar soils: 45 percent
Catamount family, moist, and similar soils: 40 percent

Description of Goosepeak Family, Moist

Setting

Landform: Benches
Parent material: Colluvium and/or re55duum derived from sandstone

Properties and qualities

Slope: 5 to 40 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
capacity of the most limiting layer to transmit water (KsatJ: Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 2.0 mmhos/cm)
Available water capacity: Low (about 4.2 inches)

Interpretive groups

Other vegetative classification: Subalpine fir - Engelmann spruce/myrtle whortleberry {ABLA-PIENNAMY2) (C0320), Subalpine fir - Engelmann spruce/ common juniper (ABLA-PIEN/JUCO6) (C0309)

Typical profile

0 to 1 inches: Slightly decomposed plant material
1 to 3 inches: Moderately decomposed plant material
3 to 5 inches: sandy loam
5 to 13 inches: Cobbly fine sandy loam
13 to 32 inches: Very cobbly sandy day loam
32 to 62 inches: Extremely cobbly sandy loam

References

American Association of State Highway and Transportation Officials (AASHTO). 2004. Standard specifications for transportation materials and methods of sampling and testing. 24th edition.

American Society for Testing and Materials (ASTM). 2005. Standard classification of soils for engineering purposes. ASTM Standard 02487-00.

Cowardin, L.M., V. carter, F.C. Golet, and E.T. LaRoe. 1979. Classification of wetlands and deep water habitats of the United States. U.S. Fish and Wildlife Sea-vice FWSJOBS-79/31.

Federal Register. July 13, 1994. Changes in hydric soils of the United States.

Federal Register. September 18, 2002. Hydric soils of the United States.

Hurt, G.W., and LM. Vasilas, editors. Version 6.0, 2006. Field indicators of hydric soils in the United States.

National Research Council. 1995. Wetlands: Characteristics and boundaries.

Soil Survey Division Staff. 1993. Soil survey manual. Soil Conservation Service. U.S. Department of Agriculture Handbook 18. htllp://soils.usda.gov/

Soil Survey Staff. 1999. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. 2nd edition. Natural Resources Conservation Service, U.S. Department of Agriculture Handbook 436. http://soils.usda.gov/

Soil Survey Staff. 2006. Keys to soil taxonomy. 10th edition. U.S. Department of Agriculture, Natural Resources Conservation Service. htllp://soils.usda.gov/

Tiner, R.W., Jr. 1985. Wetlands of Delaware. U.S. Fish and Wildlife Service and Delaware Department of Natural Resources and Environmental Control, Wetlands Section.

United States Army Corps of Engineers, Environmental Laboratory. 1987. Corps of Engineers wetlands delineation manual. Waterways Experiment Station Technical Report **Y-87-1.**

United States Department of Agriculture, Natural Resources Conservation Service. National forestry manual. http://soils.usda.gov/

United States Department of Agriculture, Natural Resources Conservation Service. National range and pasture handbook. http://www.glti.nrcs.usda.gov/

United States Department of Agriculture, Natural Resources Conservation Service. National soil survey handbook, We 43 Vl. http://soils.usclla.gov/

United States Department of Agriculture, Natural Resources Conservation Service. 2006. Land resource regions and major land resource areas of the United States, the Caribbean, and the Pacific Basin. U.S. Department of Agriculture Handbook 296. htllp://soils.usda.gov/

United States Department of Agriculture, Soil Conservation Service. 1961. Land capability classification. U.S. Department of Agriculture Handbook 210.

EXHIBIT C

6.3.3 Mining Plan

(1) The purpose of the mining plan is to describe how mining will affect the permit area for the duration of the operation. This plan is correlated to Exhibit E – Maps 2, 3 and 4:

(a) The estimated dates mining will begin and end. If **the operation is intended to be an intermittent operation as defined in by statute, the Applicant should include in this exhibit a statement that conforms to the provisions of the statutory requirements:**

This is an on-going mining operation. Based on known reserves and mining at 70,000 tons per year, the operation could produce for up to 50 years. We do not anticipate periods of intermittent mining activity.

(b) The estimated depth topsoil will be salvaged, specify how the topsoil will be stockpiled and stabilized with a vegetative cover or other means until used in reclamation. Topsoil stockpiles must be protected from mine operations traffic, stream channels or drainageways. The location is shown on Exhibit E – Maps 7 and 8:

The proposed road between the Cross mine and the Caribou mine is on previously disturbed land. The addition of the new road will not require any topsoil or vegetative cover to be salvaged.

The increased permit boundary includes the Caribou hillside discussed in Technical Revision No. 7 (TR 7). The topsoil, vegetative cover and reclamation plan are covered in detail in TR 7.

(c) Specify the thickness of overburden or quantity of waste rock, if any, to be removed to reach the deposit. The location of any overburden stockpiles or waste rock fill is shown on Exhibit E – Maps 6 and 7:

This is an underground mining operation. Some waste rock will be produced as the new Idaho Tunnel Drift is developed. The amount of waste rock from adit development is estimated at 4,250 cubic yards or 9,562 tons. The waste rock will be made available to Boulder County Road and Bridge Department and the U.S. Forest Service for use on their roads and used on site. The waste rock stockpiles are not anticipated to be long term, needing reclamation at the conclusion of mining activities. *(At least one of the proposed stockpile locations is an existing rocky area located near the proposed upper access road entrance.)* The waste rock pile foot prints may require

reclamation, once mining ceases. The pile foot prints are estimated not to exceed 0.2 acres. Their approximate locations are shown on Exhibit E - Maps 6 and 7.

(d) Specify the thickness of the deposit to be mined:

This is an underground mining operation, producing ore from various near vertical mineralized vems. Therefore, deposit thickness is not applicable.

(e) Describe the major components of the mining operation such as: roads, access routes, pit, office, shop/maintenance buildings, plant, processing facilities, and any underground openings such as adits or ventilation facilities. These components are located on Exhibit E - Map 6:

Exhibit E - Map 6 depicts the major components of the existing mining operation. With the exception of the proposed Idaho Tunnel rehabilitation, the proposed road, and the increase in permit boundary, no other changes are proposed at this time. The proposed road will measure approximately 230 feet in length by 28 feet in width. The increase in acreage to the permit boundary is 1.03 acres. All proposed facility additions are depicted on Exhibit E - Map 6.

(f) Specify the dimensions of any significant disturbance to the land surface such as pit excavations, mine benches, impoundments, stockpiles, waste rock disposal areas, etc:

One waste rock pile will be located adjacent the Cross Ore Building. The other waste rock stockpile will be located at the upper or western entrance to the Caribou mine. Together, the two waste rock piles will encompass approximately 0.3 acres. The lower waste rock pile will only be utilized for waste rock generated from mining development at the Cross mine. The upper waste rock pile will be utilized for the Caribou Mine and the Idaho Tunnel rehabilitation.

(g) Specify the dimensions of any existing or proposed roads that will be used for the mining operation. Describe any improvements necessary on existing roads and the specifications to be used in the construction of new roads. Describe any associated drainage and runoff conveyance structures to include sufficient information to evaluate structure sizing:

As described in the Boulder County Development Agreement (dated August 22, 2011), GIR will be adding an internal property road between the Cross Gold Mine and the Consolidated Caribou Mine. Dimensions of the road are estimated to be 230 feet in length by 28 feet in width, with an additional 5 feet of disturbance on both sides of the road. The total area od the road and disturbance area equals 0.185 acres. (See Exhibit E - Maps 8, 9, 10 and 11).

As noted on Exhibit E - Map 11, two (2) 4 foot concrete culverts will be installed to allow the flow of Coon Track Creek to be continued. 23 inch dirt berms will be installed on the sides of the road to comply with Storm Water Management. GIR is in the process of updating our current Storm Water Management Plan (SWMP) and will include both culverts and berms in the next updated SWMP.

(h) Specify the amount of water that will be used in conjunction with the operation, and the source of the water:

Potable Water:

No changes are proposed as part of this Amendment.

Operational Water:

No changes are proposed as part of this Amendment.

(i) If ground water will be encountered and/or surface water intercepted or disturbed, describe how mining will affect the quantity and quality of the surface or ground water and the methods to be used to minimize disturbance to the surface and ground water systems including proposed dewatering, sediment containment or chemical treatment systems, storm water run-off controls and ground water points of compliance:

Operational Ground Water Quality Impacts:

The waste rock is primarily composed of gneiss and monzonite quartz. These materials are benign and have been analyzed for leachability and acid production by ORMS-approved methods. The results of the analyses demonstrated the materials are non-acid producing and non-metals leaching. Due to the nature of the waste rock generated by mining operations, significant impact to ground water quality is not expected.

Surface Water Quality Impacts:

As with ground water, surface water quality impacts are not expected. Where needed, appropriate Best Management Practice (BMP) storm water controls will be implemented during the construction and reclamation of the proposed activities. No hazardous or toxic chemicals will be used during any of the proposed construction.

Impacts to Water Quantity:

No changes are proposed as part of this Amendment.

Methods to be used to minimize disturbance to the surface and ground water systems including proposed dewatering, sediment containment or chemical treatment systems, storm water run-off controls and ground water points of compliance:

Operational Ground Water Quality and Quantity Controls:

No changes are proposed as part of this Amendment

Stormwater Runoff Controls:

See Storm Water Management Plan for Permit #COR 040242 (Exhibit N).

Points of Compliance:

No points of compliance are proposed at this time but will be addressed in a subsequent permit revision.

(j) Specify how the operation will comply with applicable Colorado water laws and regulations governing injury to existing water rights:

GIR is currently in compliance with existing Colorado water laws and regulations governing injury to existing water rights, under its approved mining and reclamation permit.

(k) Regardless of DMO status, if refuse and acid or toxic producing materials are exposed during mining, describe how they shall be handled and disposed of in a manner that will control unsightliness and protect the drainage system from pollution:

Given the waste rock analyses completed to date, no acid producing material is anticipated.

(l) Describe what measures will be taken to minimize disturbance to the hydrologic balance, prevent off-site damage, and provide for a stable configuration of the reclaimed area consistent with the proposed future use:

GIR currently manages one permitted mine water discharge point, which discharges directly into Coon Track Creek under Colorado Department of Public Health and Environment (CDPHE) Water Quality Control Division (WQCD) National Pollutant Discharge Elimination System (NPDES) Permit CO-0032751.

The permit boundary will be clearly marked to ensure all disturbances are within the approved permit area. No additional areas of disturbance, other than what are proposed as part of this Amendment shall occur. Storm water control measures will adhere to SWMP for all construction

activities, on-going mining and final site reclamation operations. This is an underground mining operation, and all mine waters will be treated to meet applicable water quality standards. These measures will protect against offsite damages.

During site reclamation, described below, the reclaimed areas will be graded so as to blend in with the surrounding topography (Approximate Original Contour (AOC)), topsoiled, revegetated and mulched. It should be noted the post mining land use will be forest land and residential (historic cabin).

(m) Specify whether the deposit/ore will be processed on site. If **the deposit/ore will be processed, then describe the nature of the process, facilities and chemicals utilized. The process area and any structures must be described on Exhibit E - Map:**

Mining Method:

No change under this Amendment.

On-site Processing:

No change under this Amendment. (*Cross Mine ore will be processed at an offsite facility.)*

(n) Identify the primary, secondary and incidental commodities to be mined/extracted by the proposed operation, describe the intended use:

The primary commodities mined are gold, silver, lead, zinc and copper. Secondary commodities are construction aggregate resulting from waste rock. Construction aggregate will be used locally for road construction and maintenance and used on-site.

(o) Specify if explosives will be used in conjunction with the mining or reclamation. Demonstrate per section 6.5(4) under the Geotechnical Stability Exhibit that off site area will not be adversely affected by blasting during mining or reclamation operations:

No change from the existing approved permit.

(2) If tailings ponds are part of the milling process, the mine plan description should address the following:

A tailing pond is not presently planned for the operation.

(a) *Plant Facilities:* **Describe the chemical types and quantities to be utilized, chemical storage and spill containment and emergency response plans for onsite spills. Plant operation details should include tank capacities and**

operating solution volumes:

NA

(b) *Tailings:* **Describe the geochemical constituents of the tailing or leached ore, the chemistry of any leachate, anticipated impacts to ground or surface waters and the design details of liners, ponds and embankments, diversions or chemical treatment facilities to be used to control these impacts, and ground and surface water monitoring systems, to include proposed ground water points of compliance:**

NA

(c) *Drainage Control:* **Describe the measures used to divert upland drainage away from the site both during and after operation. This must include design details demonstrating the capacity of ditches and impoundment structures to contain operating solutions and the volume of water generated by a one hundred (100) year 24-hour rainfall event.**

NA

(d) *Maps and Plans:* **Design drawings must, at a minimum, describe specific design details for tailing ponds and embankments, ponds and ditches, ore and tail transport systems, and ground and surface water monitoring systems:**

NA

Exhibit D

6.3.4 Reclamation plan:

(a) The Reclamation Plan shall describe the timing, procedures, criteria, and materials that will be used to reclaim the affected land to the proposed future land use. This Plan is correlated with Exhibit E – Map 6:

(a) Specify at what point in the mining plan and to what depth(s) overburden will be replaced in relation to ongoing extraction:

There is no overburden removal. Therefore, there will be no overburden to replace. What waste rock is generated may be given to Boulder County Road and Bridge Department and/or the U.S. Forest Service for use in road construction or used on-site. Any waste rock remaining at the conclusion of mining will be reclaimed in place and/or disposed underground, once the appropriate agency approvals are obtained.

(b) Specify the maximum gradient of the reclaimed slopes(horizontal: vertical). If the Application proposes slopes steeper than 3:1, the Operator/Applicant must include a justification that supports steeper slopes for the proposed post mining land use, and demonstrates compliance with the applicable performance standards of Section 3.1:

At the Idaho Tunnel hillside, the vertical slope is currently steeper than 3:1. However, as per approved TR No. 7, the final reclamation of the hillside will meet all slope requirements and Approximate Original Contour (AOC). The proposed road will meet slope requirements. Other than the hillside and the road, there will be no significant areas of reclaimed slopes.

(c) Specify the measures that will be taken to revegetate the site, if applicable, including:

(i) State the thickness of the plant growth medium to be replaced. Sample and analyze available soils sufficiently to establish quantity and quality:

Plant growth medium will be replaced to a depth of between 6 and 8 inches. Most of the plant growth medium available for revegetation will come from soils located uphill, directly south of the surface facilities. This area will likely not be disturbed until final site reclamation. The topsoil removal area will then be regraded, prepared for seeding and seeded and mulched.

The proposed areas of waste rock storage have historically been used for placement of waste rock in the past. As such, there is no topsoil in these areas to remove. In addition, the proposed road will be through an area where no soil is present. The proposed waste rock pile at The Caribou mine will remain a rocky area, as it was prior to mining. The existing access road will be left for the landowner's use.

If there is insufficient topsoil available for site reclamation, topsoil will be purchased to make up any topsoil deficit.

The attached soil survey shows soil unit 6102A with available soils to 22 inches, gravelly sandy loam. Unit 7702B has soil suitable for site reclamation, 0-5 inches sandy loam. The other on-site soil units (7700B and 7755B) are too shallow and rocky to be recoverable (0-2 inches cobbly silt loam). These are high mountain soils in an area of non-acid host rock.

There are no other changes to the existing and approved permit.

(ii) State at what point in the mining plan the site will be seeded. Explain how the seedbed will be prepared to eliminate compacted conditions. State the type, application rate, and soil incorporation methods of fertilizer application, if any:

No site reclamation will begin (other than leach field reclamation) until the underground mining activity is complete. Once site reclamation begins, the mine operational buildings and structures may be removed, or to include the Caribou office/shower building, snow roof, fuel tanks, the new office/dry facility, and Cross ore storage shed. (The sewer line and leach field will be left as constructed). These structures will be dismantled and removed from the site at the cessation of mining operations and before the grounds are graded to final contour and plant growth material replaced. All materials resulting from structure demolition will be hauled to an approved landfill for disposal. All remaining explosives will be disposed according to regulation and approved methods. Any remaining fuels, lubricants, toxic substances (if any) will be disposed in approved facilities. Any concrete foundations and paved areas will be broken up and buried on site. (*GIR reserves the right to retain facilities and structures as part of the post mining land use at the request of the landowner. If facilities and structures are left as part of the post mining land use, they will meet Boulder County building and zoning codes.)*

The remaining disturbances, including the Cross and Caribou surface parking areas, will be ripped and scarified as needed, recontoured, as necessary, for drainage control, and integrated into the surrounding undisturbed topography, then have a plant growth medium replaced. The road will be left for the post mining land use, at the request of the land owner. (*GIR reserves the right to retain all or some of the parking areas at the request of the land owner.)*

If buildings, facilities and parking areas are removed, the ground surfaces will be reclaimed to meet the post-mining land use goal of forest land and residential. The area will be graded to promote drainage. The final surface will be contoured to minimize erosion, ponding, or slope failure. Finally, the area will have a plant growth medium replaced and revegetated on those areas returned to forest land.

Ponds one and two will be removed, including disposal of the pond liner at an off-site, approved facility as requested by Boulder County. Any sediment on the liners will be sampled and removed if required by regulatory requirements and disposed of in an approved facility. The pond areas will be regraded, covered with a plant growth medium and revegetated in the same manner as other disturbed areas at the site. Regrading will occur to provide positive drainage, preventing ponding.

GIR will take measures appropriate to the subgrade where topsoil is being replaced. Such measures may include roughing the surface in order to gain a mechanical bond between the subgrade and the replaced topsoil. Where the subgrade is of acceptable quality, it may include

disc plowing the topsoil and subgrade together, a practice typically used by commercial landscapers.

GIR will replace topsoil in as even a manner as equipment allows. Soil amendments will be as recommended by the local NRCS. Presently, they recommend that if soil tests are not preformed, forty (40) pounds per acre of each of the major nutrients (nitrogen and phosphoric acid (P_2O_5)) be applied. They also recommend a combination of mulch or other organic matter and a nutrient source such as well-cured feedlot or barnyard manure be applied. The recommended application rate should be at least twenty (20) tons per acre, evenly spread. The manure must contain at least 60% (by weight) large chunks, five inches or more in diameter. (Granular or powdery manure will not meet specifications.)

If phosphoric acid is applied, it will be applied on the overburden prior to plant growth medium replacement. This nutrient is not mobile. Placing it in the root zone prior to plant growth medium replacement will ensure optimal utilization by plant roots.

The seedbed will be well settled and firm, but friable enough so the seed can be drilled at the recommended depth. Soils having been compacted by traffic or other equipment will be tilled (deep-chiseled or ripped if necessary) breaking up restrictive or compacted layers, and then harrowed and rolled or packed to produce the required firm seedbed. If the seed is to be broadcast seeded, then the seedbed will be settled and fairly firm, but left rough enough to catch the seed and allow some coverage by soil when tracked in by equipment or harrowed and packed into the soil surface. Seedbed preparation will be avoided when the soil is wet to prevent seedbed compaction. Planting depth will be less than one inch. Drill row spacing will be approximately 8 inches.

(j) State the grass, forb and tree species to be planted and the application quantities. Specify the quantity of each grass and forb species as pounds of pure live seed per acre:

The seed mix recommended by the DRMS Inactive Mine Lands Program for high elevations shall be used to revegetate the site. Please see Section 3.1.10, below.

(k) Specify the application methods for grass and forb seeding, drill seeding or broadcast:

Dependent on the ability to gain access in a safe manner, the revegetated sites will either be drill seeded or broadcast seeded. If an area is broadcast seeded, the seeding rate will be doubled.

(l) If mulch is needed, specify the kind to be used, the crimping method, and rate of application:

Please see Section 6.3.3(1)(c)(ii) above.

(m) Explain the establishment methods for each species of shrub and/or tree, and state the number of each to be established per acre:

No trees or shrubs seeding or planting are proposed as part of the amended reclamation plan.

(n) Specify which ponds, streams, roads and buildings, if any, will remain after reclamation. These features must be shown on the Exhibit E - Map. If ponds are part of the Reclamation Plan, slopes from 5 vertical feet above to 10 vertical feet below the expected average water level cannot be steeper than 3H:1V; remaining slope lengths may not be steeper than 2H:1V. Where wildlife habitat is the proposed future land use, shorelines should be irregularly shaped to promote a diverse wildlife habitat. The Colorado Division of Wildlife (CDOW) must be consulted where wildlife use is the proposed future land use:

The existing access roads will remain as part of the post mining land use, at the request of the landowner. If so, requested various other buildings, structures and parking areas may be left as part of the post mining land use. If building and structures are left, they will meet applicable Boulder County building and zoning codes.

Pond number 2 may be left at the conclusion of the mining operation if requested by the landowner. The proposed post mining land use will be residential and forest land. Wildlife use will be incidental and not part of the post mining land use.

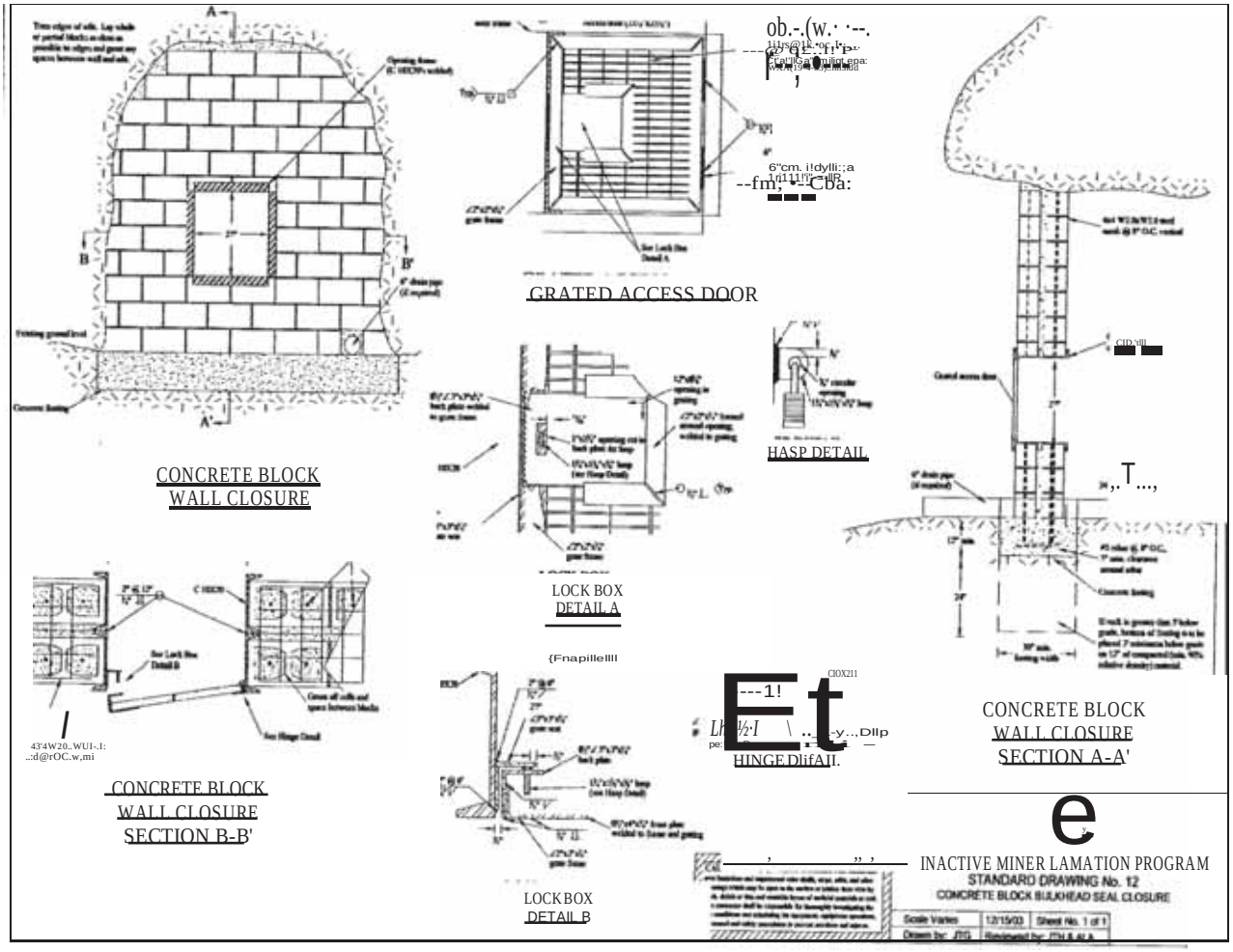
(o) Specify the reclamation treatment of any waste rock dumps, tailing impoundments, underground mine openings, ditches, sediment control facilities, buildings and other features specified in the mine plan but not previously addressed in the Reclamation Plan narrative. These features must be shown on Exhibit E - Map. This should describe the measures taken to minimize disturbance to the hydrologic balance, prevent off site damage, and provide for a stable configuration consistent with the proposed future land use:

All remaining waste rock areas, ditches, sediment control facilities, etc. will be reclaimed following the specifications in this amendment and applicable Mined Land Reclamation Board regulations. The waste rock is non-acid producing. All waste rock will be either used during operations for future road and parking areas and/or stockpiled temporarily for use by Boulder County and/or the U.S. Forest Service for road construction and repair. Any waste rock not needed for post mining uses and not sold or given to local governments will be either disposed underground in the remaining mine workings and/or properly reclaimed on-site. No waste rock will be disposed underground until all appropriate agency approvals are obtained. *(Stockpiled waste rock remaining after mining and other site reclamation may be left for local government use and will be specifically addressed at that time with the appropriate regulatory agencies.)*

All adits, ventilation shafts and openings will be sealed according to approved DRMS Inactive

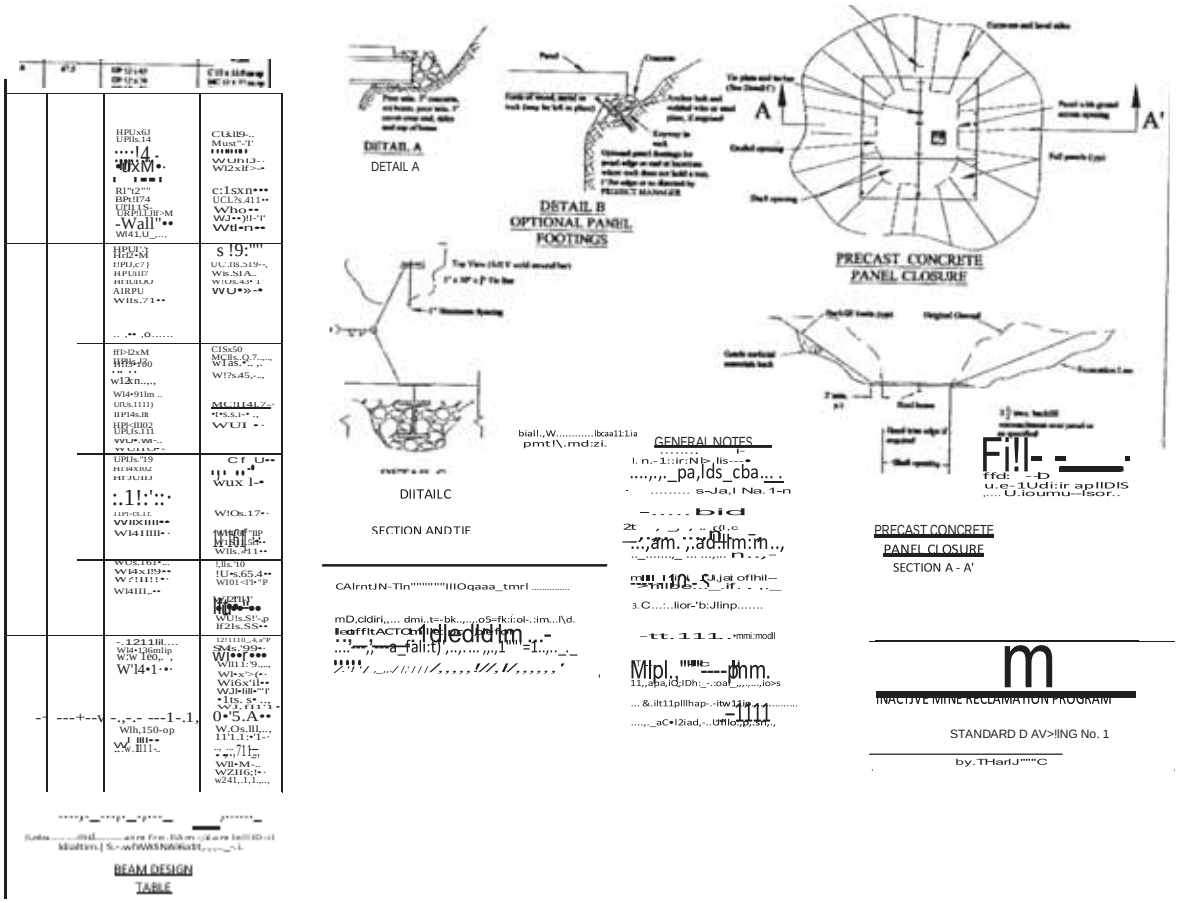
Mine Program standards and specifications. (Please see below) As discussed above, sediment and water quality treatments pond (two) will be reclaimed. All storm water control structures and facilities will be removed and the areas reclaimed once the major areas of site reclamation are successfully revegetated and stabilized so that storm water controls may safely be removed.

The following example of a typical adit closure was obtained from the Inactive Mine Reclamation Program, State of Colorado, Department of Natural Resources. Please note the gated access door is an optional item that may be included at the request of the landowner.



An estimated cost to complete this type of closure in today's dollars for two portals is $6,000. The mining operation is expected to have an operational life of approximately 50 years.

Ventilation and escape way shafts will also utilize either one of the following approved standard methods (From the DRMS, IMP bid specification document):

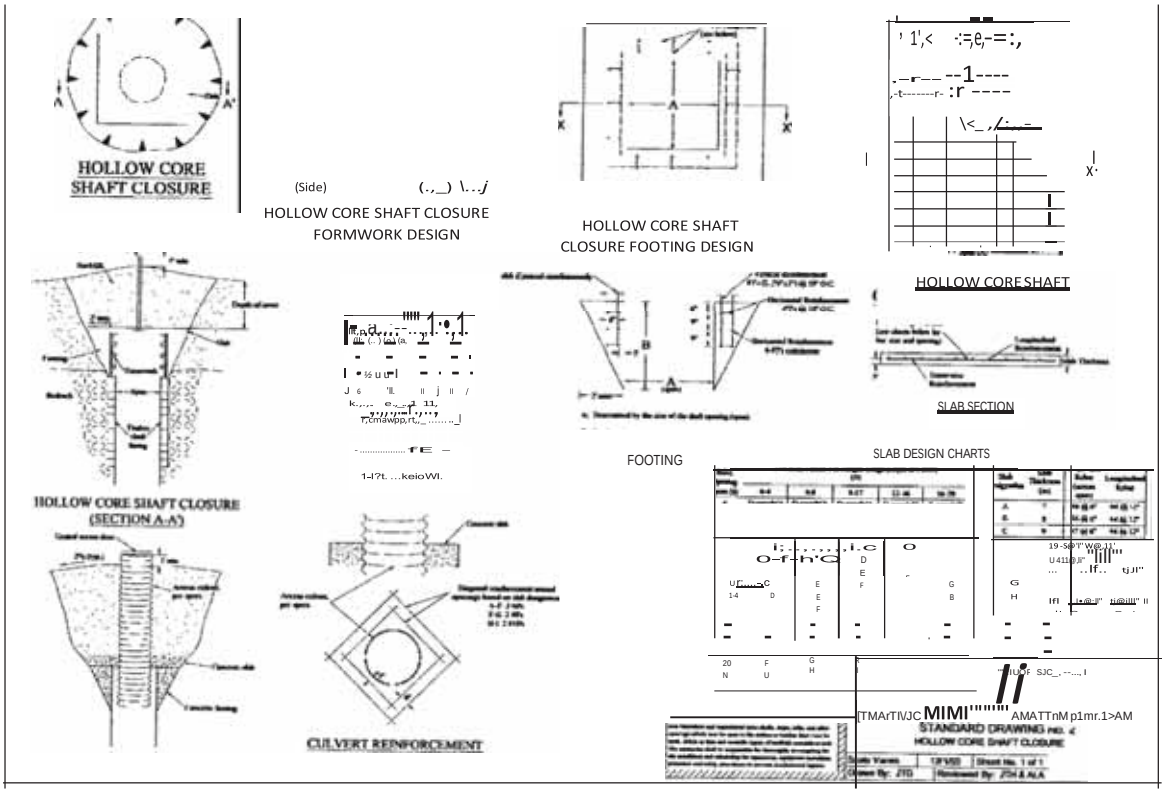


Estimated cost per closure per conversations with DRMS, IMP Section:

- $750.00 per panel X 5 panels = $3,750 for both sites
- $3,000 site prep and installation X 2 sites=$6,000
- Estimated total two shafts= $9,750.00

(Note: Only one shaft will be used as ventilation shaft and secondary escape way. The other is an existing shaft not needed as part of the on-going mining operations.)

OR,



Estimated cost per closure per conversations with DRMS, IMP Section:

- Estimated at $4,500.00 per shaft X 2 shafts= $9,000.00.

We do not anticipate mine drainage or the necessity of a hydraulic plug to prevent mine drainage. The workings will be filled with dewatered tails (paste backfill) with cement added for structural support. Therefore, the proposed entrance closures should be adequate.

(p) An estimate of the actual costs to reclaim the site based on what it would cost the State of Colorado using an independent contractor to complete reclamation:

A general estimate of site reclamation is approximately $31,150 based on the average for other sites of similar nature. The Applicant understands the DRMS prefers to calculate its estimate for site reclamation using its highly detailed and sophisticated bond estimation program.

6.3.5 Proposed Road Reclamation

(1) The new road addition in this amendment which can be reviewed in Exhibit E - Maps 8, 9, 10 and 11 will remain as part of the post mining land use, at the request of the landowner

Section 3.1 Reclamation Performance Standards:

3.1.1The Post Mining Land Use:

State the post mining land use:

The post-mining land uses will be forest land and residential. These land uses are consistent with' land uses in the surrounding areas. Reclamation activities described in this plan are directed toward these future uses on what is private land. The existing private residence (historic cabin) will be retained on site, as well as other yet to be determined structures and facilities as requested by the landowner.

3.1.2 Reclaiming Substituted Land:

No substitute lands are proposed for reclamation.

3.1.3 Time Limit and Phased Reclamation:

(2) All reclamation shall be carried to completion by the Operator with all reasonable diligence, and each phase of reclamation shall be completed within five (5) years from the date the Operator informs the Board of Office that such phase has commenced:

This is an underground mining operation. Once underground mining is complete and the surface facilities are no longer needed, the affected mine site surface areas will be reclaimed within the five-year time period.

3.1.4 Public Use:

On lands owned by the Operator, the Operator may permit the public to use the same for recreational purposes, except in areas where such use is found by the Operator to be hazardous or objectionable:

Other than sanctioned mine tours, the area will not be open to the public. The mine access points will be gated and appropriately marked stating no unauthorized access is permitted.

3.1.5 Reclamation Measures - Materials Handling:

(1) Grading shall be carried on so as to create a final topography appropriate to the final land use selected in the Reclamation Plan:

Where grading is required, slopes shall blend in or match the original surrounding slopes (AOC). However, where possible, regarded slopes will be 3:1 or less.

(2) When backfilling is a part of the plan, the Operator shall replace overburden and waste

materials in the mined area and shall ensure adequate compaction for stability and to prevent leaching of toxic or acid forming materials:

The operation will not conduct backfill operations as one would expect for open pit or strip mine. There is always the possibility some minor backfilling may occur. Where backfilling should occur, it will be done in such a manner that the backfilled material will be appropriately compacted to prevent slippage or settling, provided it can be done in a manner not endangering operators and equipment. No toxic or acid forming material will be backfilled on site.

Therefore, leaching of toxic or acid forming materials shall not occur.

(3) All grading shall be done in a manner to control erosion and siltation of the affected land, to protect areas outside the affected land from slides and other damage. All highwalls shall be eliminated:

Since this is an underground mining operation, there will be no highwalls. There will be some rock faces where adits occur. At least two adits are anticipated (an existing adit and the proposed Cross Mine Decline portal). Grading will be done on the contour where it does not pose a safety hazard to operators and equipment. During site reclamation, BMP storm water control practices will be in place to control erosion and siltation. Slides and other damage should not be a factor since only small areas will likely need to be graded.

(4) All backfilling and grading shall be completed as soon as feasible after the mining process. The Operator shall establish reasonable timetables consistent with good mining and reclamation practices:

Once mining operations are completed, buildings and other structures will be demolished, foundations broken up and buried. (GIR reserves the right to retain buildings and other structures on-site at the request of the land owner. If retained on-site, building and structures will meet applicable Boulder County building and zoning code.) Any necessary backfilling and grading will follow.

(5) All refuse and acid forming or toxic producing materials that have been mined shall be handled and disposed of in a manner that will control unsightliness and protect the drainage system from pollution:

Please see Section 6.3.3(1)(k), above. In addition, any refuse will be disposed off-site at an approved facility.

(6) Any drill or auger holes that are part of the mining operation shall be plugged with non-combustible material, which shall prevent harmful or polluting drainage. Adits and shafts should be closed, and where practicable, backfilled and graded in a manner consistent with the post mining land use:

All adits and ventilation shafts will be closed according to the Inactive Mine Program standards and specifications. We do not anticipate mine drainage or the necessity of a hydraulic plug to prevent mine drainage. The workings will be filled with dewatered tails (paste backfill) with cement added for structural support. Therefore, the proposed entrance closures should be adequate. All drill and auger holes will be plugged with non-combustible material and sealed with grout or neat cement according to DRMS approved methods.

(7) Maximum slopes and slope combinations shall be compatible with the configuration of surrounding conditions and selected land use. In **all cases where a lake or pond is produced as a portion of the Reclamation Plan, all slopes, unless otherwise approved by the Board or Office, shall be no steeper than a ratio of 2:1 (horizontal to vertical ratio), except from 5 feet above to 10 feet below the expected water line where slopes shall be not steeper than 3:1.** If **a swimming area is proposed as a portion of the reclamation Plan, the slopes, unless otherwise approved by the Board or Office, shall be no steeper than 5:1 through the area proposed for swimming, and a slope no steeper than 2:1 elsewhere in the pond:**

With the exception of pond #2, no other ponds will be left as part of the post mining land use. (Pond two will only be left if requested by the landowner prior to site reclamation.) As stated above, slopes will be AOC or less and will blend in with the surrounding topography. In addition, areas adjacent to mine adits will be stable but may be steeper than 2:1. Areas steeper than 2:1 will be kept to a minimum.

(8) If the Operator's choice of reclamation is for agricultural or horticultural crops which normally require the use of farm equipment, the Operator shall grade so that the area can be traversed with farm machinery:

The post mining land use will be forest land and residential uses.

(9) An Operator may backfill structural fill material generated within the MLRB permitted area into an excavated pit within the permit area as provided for in the MLRB Permit. If **an Operator intends to backfill inert structural fill generated outside of the approved permit area, it is the Operator's responsibility to provide the Office notice of any proposed backfill activity not identified in the approved Reclamation Plan in accordance with the provision of Section 3.1.5(9):**

No structural fill will be imported.

(10) All mined material to be disposed of within the affected area must be handled in such a manner so as to prevent any unauthorized release of pollutants to the surface drainage system:

Please see Section 6.3.3(1)(l), above.

(11) No unauthorized release of pollutants to ground water shall occur from any materials mined, handled or disposed of within the permit area:

Please see Section 6.3.3(1)(I), above.

3.1.6 Water- General Requirements:

(1) Hydrology and Water Quality:

Disturbances to the prevailing hydrologic balance shall be minimized:

(a) Compliance with applicable Colorado Water laws and regulations governing injury to existing water rights:

Please see Section 6.3.3(1)(j) above

(b) Compliance with applicable federal and Colorado water quality laws and regulations, including statewide water quality standards and site-specific classificationsand standards adopted by the Water Quality Control Commission:

GIR currently manages and treats one permitted mine water discharge point, which discharges directly into Coon Track Creek under Colorado Department of Public Health and Environment (CDPHE) Water Quality Control Division (WQCD) National Pollutant Discharge Elimination System (NPDES) Permit CO-0032751.

(c) Compliance with applicable federal and Colorado dredge and fill requirements:

Wetlands on the proposed GIR permit area are primarily associated with Coon Track Creek, which is a narrow and well-defined channel that flows through the length of the proposed permit area and drains the watershed. Coon Track Creek is a tributary of Beaver Creek, which flows into Middle Boulder Creek just before Barker Reservoir. Coon Track Creek exhibits steady low flows year-round beginning at the Cross Mine, with high flows during snowmelt runoff.

Waters of the U.S., including associated wetlands, were surveyed within the proposed site boundary and plotted by a Professional Wetland Scientist for Walsh Environmental using a Trimble XT (hand-held GPS unit with ESRI ARC Pad mobile mapping software) and total 1.94- acres (84,506 sq. ft.). This wetland survey is shown on the Site Map, Figure 2 above. A Jurisdictional Determination was approved by US Army Corps of Engineer on February 7, 2008, and the approval letter is provided in Attachment II.

(d) Removing temporary or large siltation structures form drainageways after disturbed areas are revegetated and stabilized, if required by the Reclamation Plan:

Pond one will be removed and the pond liner disposed off-site at an approved facility. (Requested by Boulder County) Pond two may be left at the request of the landowner. If it is removed, it will be removed and reclaimed in the same manner as Pond #1. Any sediment on the liners will be sampled and removed if required by regulatory requirements and disposed of in an approved facility. The pond areas will be regraded, covered with a plant growth medium and revegetated in the same manner as other disturbed areas at the site. Regrading will occur to provide positive drainage, preventing ponding.

(2) Earth dams, if necessary, to impound water, may be constructed if the formation of such impoundments will not damage adjoining property or conflict with water pollution laws, rules or regulations of the federal government, the state of Colorado or with any local government pollution ordinances:

No new earthen dams will be constructed under this Amendment.

(3) All surface areas of the affected land, including spoil piles, shall be stabilized and protected so as to effectively control erosion:

All topsoil piles will be seeded with the approved seed mix as discussed above in Section 6.3.3(1). The waste rock piles will likely be temporary (less than the life of the mining operation). Alternatively, a waste rock pile may be left post mining as a source of construction aggregate for use by local governments. Appropriate storm water controls will used to retain and filter runoff sediment from the piles. Any exposed areas not disturbed by on-going mining operations will be seeded with the topsoil mix (i.e., road berms as requested by Boulder County). All roads and parking areas will be surfaced with appropriately sized waste rock or purchased crushed rock.

(4) The Office *may* require the submission of baseline site characterization data, sufficient to ensure that impacts from *mining* will be detected, prior to the initiation of mining, including but not limited to, ambient ground water and surface water quality data sufficient to characterize potential impacted waters:

No change from the approved application. Available surface water quality data is provided in Attachment I. No site-specific surface water quality data is available. GIR has discussed surface and ground water monitoring programs with the DRMS and is preparing programs to monitor surface and ground water quality. The surface and ground water monitoring programs will be submitted to DRMS as a permit revision separate from this Amendment. *(Ground water monitoring has been discussed with the DRMS during site inspections and meetings with the Division staff. Baseline ground water monitoring is currently underway based on these discussions.)*

(5) Drilling pits used during mining shall be constructed and operated to minimize impacts to public health, safety, welfare and the environment, including soil, waters of the State, including groundwater, and wildlife:

No drill pits are anticipated during mining operations within the limits of the proposed permit boundary. However, if such pits are required, GIR will submit a technical revision at that time, prior to drilling operations.

3.1.7 Groundwater- Specific Requirements:

(2) Standards and conditions applicable to classified and unclassified groundwater:

(b) State wide groundwater quality standards: Operations that may affect groundwater quality shall comply with all state wide groundwater quality standards established by the Water Quality Control Commission:

GIR will comply with all applicable ground water standards established by the Water Quality Control Commission. Appropriate water treatment is being provided at the water treatment pond (#1), sufficient to meet applicable water quality discharge standards, as specified in our Colorado Pollution Discharge Elimination System permit.

N/A- Classified Areas:

(c) Unclassified areas: Operations that may affect the quality of groundwater which have not been classified by the WQCC shall protect the existing and reasonably potential future uses of such groundwater:

No change from the existing permit.

(2) Establishing permit conditions, including numeric protection levels, protective of unclassified groundwater uses:

(d) Pursuant to the procedures in Paragraph 3.1.7 (3), permit conditions shall be established for each operation that may have a reasonable potential to adversely affect the quality of a specified area that has not been classified by the WQCC. Such permit or NOI conditions may be in the form of numeric protection levels, practice-based permit or No conditions, or both:

Will be addressed in a subsequent permit revision.

(e) Points of compliance for numeric protection levels shall be set pursuant to Paragraph 3.1.7 (5):

Will be addressed in a subsequent permit revision.

(3) Any Operator on a voluntary basis, may submit information concerning the protection of the quality of groundwater affected by the operation to the Office. The Operator may submit such information and a plan for monitoring, where appropriate, including monitoring at points of compliance, for the Office's consideration:

Will be addressed in a subsequent permit revision.

(4) Points of Compliance:

(a) In order to evaluate protection afforded groundwater quality, comply with groundwater standards, or to demonstrate compliance with permit or No conditions established by the Office to protect groundwater quality, one or more points of compliance shall be established:

Will be addressed in a subsequent permit revision.

(5) Groundwater Monitoring:

(a) For existing operations through permit modifications a groundwater monitoring program shall be required on a case-by-case basis where an adverse impact on groundwater quality may reasonably be expected:

This is an existing mining operation. We have been in discussion with the DRMS as to the list of parameters to sample and sample point locations.

This program will be submitted to DRMS under a separate permit revision.

Based on this proposed amendment, we believe the proposed revisions will result in no changes to the existing surface and ground water quality.

(b) If groundwater monitoring is required, the Operator shall include the following information as part of a permit application or permit modification:

(i) a map that accurately locates all proposed groundwater sample points and any locations that are proposed as a point of compliance;

To be submitted as parts of a future permit revision.

(ii) the method of monitoring well compliance where monitoring wells are required;

To be submitted as parts of a future permit revision.

(iii) method of sampling, frequency of sampling and reporting to the Office;

To be submitted as parts of a future permit revision.

(iv) parameters analyzed, water quality analysis methods, and quality control and quality assurance methods;

Please see 5(a) above

(v) formations, aquifers or strata to be sampled;

To be submitted as part of a future permit revision.

(vi) Identify the potential sources of groundwater contamination that will be monitored by each point of compliance monitoring report;

To be submitted as part of a future permit revision.

(vii) A time schedule for implementation;

The initial baseline ground water sampling program is taking place under the existing DRMS 110 Limited Impact permit. It has been discussed with the DRMS during meetings and as part of DRMS site inspections. A full and complete program will be submitted to the DRMS for review as part of a future permit revision.

(viii) Ambient groundwater quality data sufficient to characterize potentially impacted groundwater quality;

To be submitted as parts of a future permit revision.

3.1.8 Wildlife:

(1) All aspects of the mining and reclamation plan shall take into account the safety and protection of wildlife on the mine site, at processing sites, and along all access roads to the mine site with special attention given to critical periods in the life cycle of those species which require special consideration (e.g., elk calving, migration routes, peregrine falcon nesting, grouse strutting grounds):

This is a high-altitude mining operation with a very short growing season (30 days or less). Impacts to wildlife have been insignificant due to minimal surface activity associated with this operation. On-going operations under an active underground mining operation will also have minimal impacts to wildlife. Regardless, GIR will make every effort to be aware of wildlife in order to prevent and or mitigate potential impacts.

(2) Habitat management and creation, if part of the Reclamation Plan, shall be directed toward encouraging the diversity of both game and non-game species, and shall provide protection, rehabilitation or improvement of wildlife habitat:

The reclamation plan, though not intended to provide wildlife habitat, is designed to promote use by wildlife to the extent practical. The seed mix proposed for the site is extensive and is suitable for the post mining land use of (Please see the table in Section 3.1.10, below). This seed mix is recommended by the DRMS for high elevation abandoned mine site reclamation and will support use by wildlife.

3.1.9 Topsoiling:

(1) Where it is necessary to remove overburden in order to mine the mineral, topsoil shall be removed and segregated from other spoil. If **such topsoil is not replaced on a backfill area within a time short enough to avoid deterioration of the topsoil, vegetative cover or other means shall be employed so that the topsoil is preserved from wind and water erosion, remains free of any contamination by toxic or acid-forming material, and is a usable condition for reclamation:**

Please see Section 6.3.3(1)(b) above.

(2) Where practicable, woody vegetation present at the site shall be removed from or appropriately incorporated into the existing topsoil prior to excavation with the affected areas. The Operator should make a reasonable effort to ensure that existing vegetation is put to a

beneficial use such as firewood, mulching, lumber, etc.:

The proposed Amendment activities should not result in tree removal. However, if tree removal is necessary, appropriate efforts will be made to remove only those trees and shrubs necessary to provide for an efficient and safe mining operation. Any trees removed during site construction will be made available to the employees for fire wood. Since site reclamation is well into the future, shrubs removed during site development will be hauled to an offsite facility for proper disposal.

(3) Topsoil stockpiles shall be stored in places and configurations to minimize erosion and located in areas where disturbance by ongoing mining operations will be minimized. Such stockpile areas must be included in **the affected areas and subject to all reclamation requirements:**

Please see Section 6.3.3(1)(b) above.

(4) Once stockpiled, the topsoil shall be re-handled as little as possible until replacement on the regarded, disturbed areas:

No topsoil stockpile construction is expected as part of this Amendment. Areas proposed for disturbance have previously been disturbed as part of the site's historic mining operations. If topsoil of sufficient quantity is found, it will be stockpiled onto existing topsoil stockpiles so that rehandling is minimized. On occasion, topsoil may be added or removed from the existing topsoil stockpiles in order to salvage or replace topsoil during mining operations. In addition, topsoil stockpiles will be field identified or marked.

Topsoil will be removed from the site of the proposed leach field and placed adjacent to the site. Once the leach field is constructed, the topsoil will be replaced, prepared for seeding, seeded with the approved seed mix and mulched. (Mulching will only occur if the activity may be done without injury to the leach field drain system.)

(5) The Operator shall take measures necessary to assure the stability of replaced topsoil on graded slopes such as roughing in **final grading to eliminate slippage zones that my develop between the deposited topsoil and heavy textured spoil surfaces:**

Please see Section 6.3.4(1)(c)(ii) above.

(6) Topsoil substitute:

Please see Section 6.3.4(1)(c)(I) above.

(7) When growing media is replaced, it shall be done in as even a manner as possible. Fertilizer or other soil amendments shall be added:

Please see Section 6.3.4(1)(c)(ii) above.

(8) Vegetative piles shall be removed from the area or utilized in accordance with the Reclamation Plan:

Please see Section 3.1.9(2) above.

3.1.10 Revegetation:

(1) In those areas where revegetation is part of the Reclamation Plan, land shall be revegetated in such a way as to establish a diverse, effective, and long-lasting vegetative cover that is capable of self-regeneration without continues dependence on irrigation, soil amendments or fertilizer, and is at least equal in extent of cover the natural vegetation of the surrounding area:

The following seed mix is taken from the General Bid Specifications for areas above 9,000 ft. to timberline, Inactive Mine Program, Division of Reclamation Mining and Safety, Table 20-5.

Table 20-5

Subalpine Vegetation Are-as {9,000 tree-e-line}

The below rates are for drilled seeding. The rates for **broadcast seeding** are double **the drilled rate.**

Species	Scientific Name	Variety	lbs./Acre
Yarrow*	Achillea lanugos		0.1
Grimmest	Senecio stratus		0.1
Lupine	Lupinus campestris		LO
Slender wheatgrass	Elymus tracheales	San Lois	1.4
Nodding brome	Bonus anomalous		2.5
Sheep fescue	Festuclavine	Cover	0.5
Hard fescue	Festuca ovine durustoll	Durra	0.5
Red fescue	Festuca rubra	Penn lawn	0.5
Tufted hairgrass	Deschamps casitas		0.5
Redtop	Agrostis alba		0.1
Blue wildrye	Elymus Glaucus		*1.15*
Mutton grass	Poa Vendlerian		0.5
TOTAL pies lbs./acre (drilled)			**9.45**

(2) If the Operator's choice of reclamation is forest planting, they may, with the approval of the department, select the type of trees to be planted:

No forestry plantings are proposed during mine site reclamation since few, if any trees will be removed during site construction or surface mining activities.

(3) the Operator's choice of reclamation is for range, the land shall be restored to slopes commensurate with the proposed land use and shall not be too steep to be traversed by livestock:

Please see Section 3.1.5(7).

(4) The revegetation plan shall provide for the greatest probability of success in plant establishment and vegetation development by considering environmental factors such as seasonal patterns of precipitation, temperature and wind; soil texture and fertility; slope stability; and direction of slope faces. Similar attention shall be given to biological factors such as proper inoculation of legume seed, appropriate seeding and transplanting practices, care of forest planting stock, and restriction of grazing during initial establishment. The Board or Office, in consultation with the landowner and the local Soil Conservation District, if any, shall determine when grazing may start:

The broad selection of species for reclamation is those recommended by the DRMS for mid to high altitude abandoned mine sites. All planting will take place in the fall of the year to take advantage of spring snow melt, ensuring a satisfactory level of establishment. Where practical, seed will be drilled. Where not practical due to slope steepness, the areas will be broadcast seeded at twice the drill seeding rate. The seeded areas will be mulched and crimped or tackifier to control wind and water erosion. Since these are fertile, mountain soils, we do not intend to routinely take subsoil and topsoil soil samples for analysis. However, where soil amends are necessary, they will be applied as appropriate. No slope will be steeper than 3H:1V to the extent possible. Given the local terrain, stepper slopes may be necessary in order to match the original surrounding slope. (Please see Section 3.1.5(7)) Any legumes planted will be inoculated per seed supplier specifications. No grazing

will be permitted since this is private land. In addition, the National Resource Conservation (NRCS) will be consulted prior to any site reclamation for site specific recommendations.

(5) To ensure the establishment of diverse and long-lasting vegetative cover, the Operator shall employ appropriate techniques of site preparation and protection such as mechanical soil conditioning by discing and ripping; mulching; soil amendments and fertilizers; and irrigation:

Please see Sections 6.3.4(1)(c)(ii) above.

(6) Methods of weed control shall be employed for all prohibited noxious weed species, and whenever invasion of a reclaimed area by other weed species seriously threatens the continued development of the desired vegetation:

Please See Appendix II

(7) When necessary, fire lanes or access roads shall be constructed through the area to be planted:

Given the size of the mine site and the location of the main access road, no other fire lanes or access roads will be needed.

The main mine site access road will remain as part of the post mining land use. It will provide adequate access for site reclamation.

(8) Planting required for reclamation may be delayed, through the period of use related to places of refuse disposal, haulage roads and road cuts. Normal stabilization of surfaces is required:

a. on any affected land being used or proposed to be used by the Operator for the deposit or disposal of refuse until after the cessation of operations productive of such refuse;

b. on lands proposed for future mining;

c. within depressed haulage roads or final cuts while such roads or final cuts are being used or made;

d. where permanent pools or lakes have been formed; and

e. **on any affected land so long as the chemical and physical characteristics of the surface and immediately underlying material of such affected land are toxic, deficient in plant nutrients, or composed of sand, gravel, shale, or stone to such an extent as to seriously inhibit plant growth and such condition cannot feasibly be remedied by chemical treatment, fertilization, replacement of overburden or like measures:**

Other than for stockpile and operational site stabilization, no plantings will occur until final site reclamation.

3.1.11 Buildings and Structures:

If the affected land is owned by a legal entity other than any local, state, or federal entity, and buildings or structures including those constructed or placed on the affected lands in conjunction with the mining operations or which are historic structures as datamined by the State Historic Preservation Office may remain on the affected land after reclamation at the option of the Operator and Landowner if such buildings or structures will not conflict with the post mining land use, and with the approval of the board:

At this point, the only structure to remain as part of the post mining land use is the historic cabin located on the eastern portion of the proposed mining area. All other structures shall be removed during final site reclamation. (GIR reserves the right to retain structures and/or buildings on- site if requested by the landowner. If the structures and/or buildings structures are requested by the landowner, they will meet applicable Boulder County building and zoning codes.)

3.1.12 Signs and Markers:

(1) At the entrance of the mine site the Operator shall post a sign, which shall be clearly visible from the access road, with the following:

A mine identification sign with the following listed information is presently posted at the main entrance to the mining operation. An additional sign with the same required information will be posted at the additional proposed mine access point.

(a) the name of the Operator,

(b) a statement that a reclamation permit for the operator has been issued by the Colorado Mined Land Reclamation Board, and

(c) the permit numbers.

(2) The boundaries of the affected area will be marked by monuments or other markers that are clearly visible and adequate to delineate such boundaries:

Given the nature of the site, some permit comers will be marked with wooden or steel fence posts; other areas will need to be drilled and a marker cemented in place. In any event, the

markers will be permanent for the duration of the mining operation, visible from one post to the next, and painted a color acceptable to Boulder County.

(3) The Office may approve an alternative plan for identifying the boundaries of the affected land if the Operator includes such a plan in the permit application:

At this time GIR intends to install monuments at the permit boundary comers.

EXHIBIT E

Map 1 – Overview

Map 2 - Cross-Caribou

Map 3 - Potosi Shaft

Map 4 – Caribou 300 Level

Map 5 - Cross Mine Plant Communities

Map 6 – Cross Mine Site Plan

Map 7 – Cross Mine Reclamation Plan

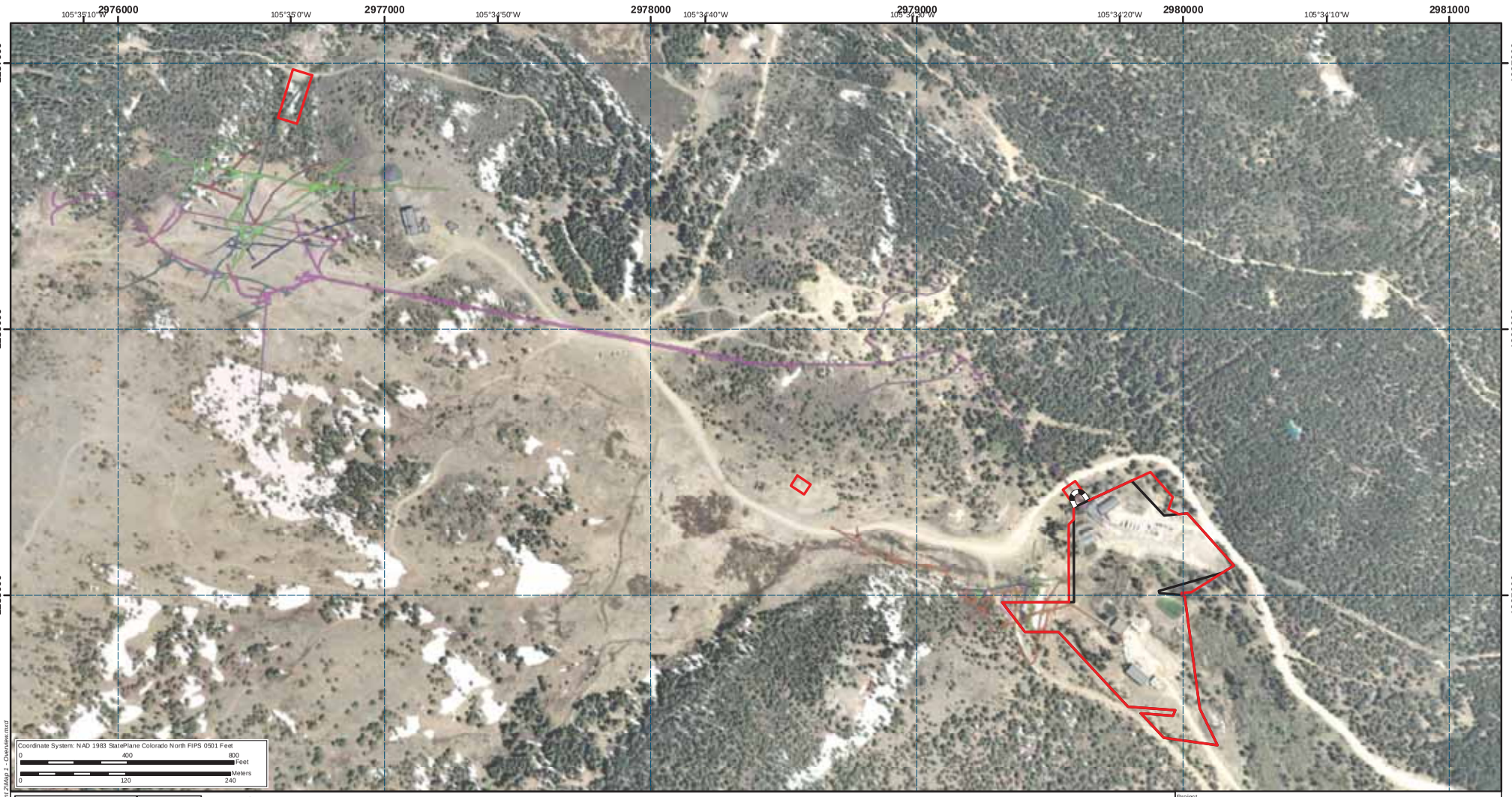
Map 8 - Cross-Caribou Proposed Road Topography

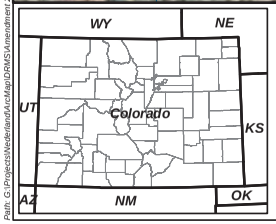
Map 9 - Cross-Caribou Roadway Section Cuts

Map 10 - Cross-Caribou Cross Sections along Roadway

Map 11 – Cross-Caribou Coon Creek and Culvert Crossings

Map 12 - Conex Reclamation





Legend

- Permit Boundary - Modified (9.99 ac)
- Permit Boundary - Current (8.96 ac)

Project: DRMS Amendment 2

Title: **Proposed Permit Boundary Modifications**

Project No. 0801			File No.	
GIS:	JST	12/15/20	Scale As Shown	Rev 0
Check:	JST	12/15/20	**Map 1**	
Review:	DP	12/15/20		

Path: G:\Projects\Wetlands\ArcMap\DRMS\Amendment 2\Map 1 - Overview.mxd

Cross-Caribou			
Line		Length ft.	Bearing
L1	POB	204.414	N 82° 18' 56.87" W
L2	Thence	126.268	N 43° 00' 52.78" W
L3	Thence	121.461	S 85° 35' 51.79" E
L4	Thence	22.479	N 20° 31' 56.22" E
L5	Thence	177.625	N 85° 47' 58.79" W
L6	Thence	383.792	N 42° 47' 11.84" W
L7	Thence	126.053	S 89° 40' 40.12" W
L8	Thence	139.869	N 37° 45' 56.90" W
L9	Thence	251.135	N 89° 40' 40.11" E
L10	Thence	291.427	N 00° 19' 19.88" W
L11	Thence	26.840	N 44° 40' 40.12" E
L12	Thence	55.221	N 00° 19' 19.88" W
L13	Thence	69.704	N 34° 50' 24.47" W
L14	Thence	56.697	N 55° 09' 35.53" E
L15	Thence	88.561	S 34° 50' 24.46" E
L16	Thence	254.498	N 65° 15' 13.12" E
L17	Thence	126.268	S 41° 46' 28.81" E
L18	Thence	48.527	S 18° 59' 37.69" W
L19	Thence	43.650	S 65° 26' 48.35" E
L20	Thence	31.020	N 85° 04' 40.17" E
L21	Thence	262.951	S 41° 46' 28.81" E
L22	Thence	188.212	S 57° 55' 06.21" W
L23	Thence	36.387	S 86° 49' 33.08" W
L24	Thence	8.319	S 10° 01' 04.02" W
L25	Thence	11.830	S 85° 30' 30.81" E
L26	Thence	430.712	S 07° 39' 42.79" E
L27	Thence	152.299	S 25° 58' 47.74" E

Legend

Permit Boundary - Modified (9.60 ac)

Permit Boundary - Current (8.96 ac)

New Section	Name	Area (ac)
A	Idaho Tunnel & Slope	0.11 ac
B	Oil Building Parking Lot	0.27 ac
C	Pond 2 Water Pipes	0.13 ac
D	Pond 3 & Road	0.13 ac

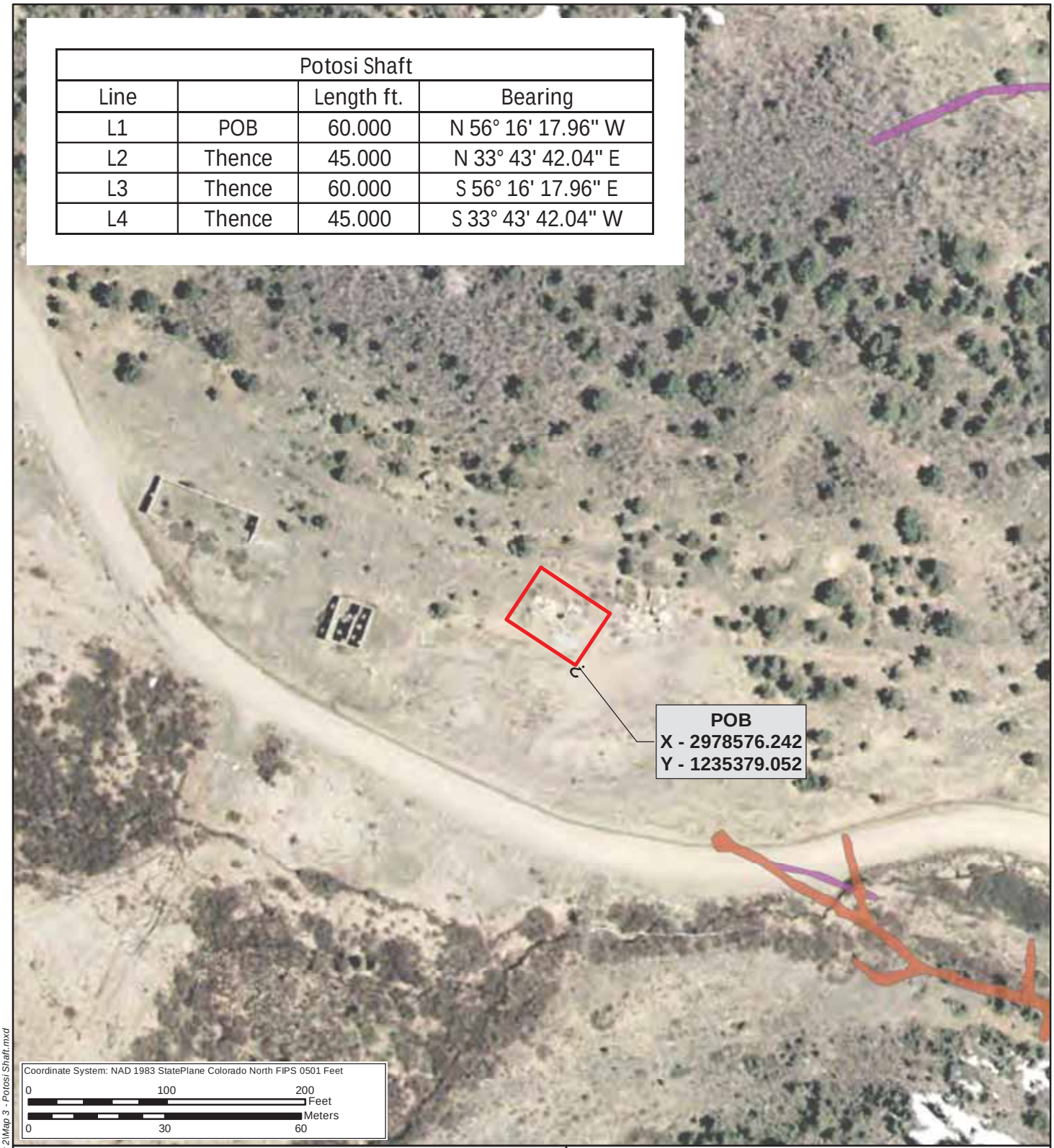
Project: DRMS Amendment 2

Title: **Proposed Permit Boundary Modifications Cross-Caribou Site**

Project No. 0801			File No.	
GIS:	JST	01/04/21	Scale As Shown	Rev 0
Check:	JST	01/04/21	**Map 2**	
Review:	DP	01/04/21		

Path: G:\Projects\Redefined\ArcMap\DRMS\Amendment 2\Map 2 - Cross-Caribou.mxd

Potosi Shaft			
Line		Length ft.	Bearing
L1	POB	60.000	N 56° 16' 17.96" W
L2	Thence	45.000	N 33° 43' 42.04" E
L3	Thence	60.000	S 56° 16' 17.96" E
L4	Thence	45.000	S 33° 43' 42.04" W



Permit Boundary - Modified (0.06 ac)

Project: DRMS Amendment 2

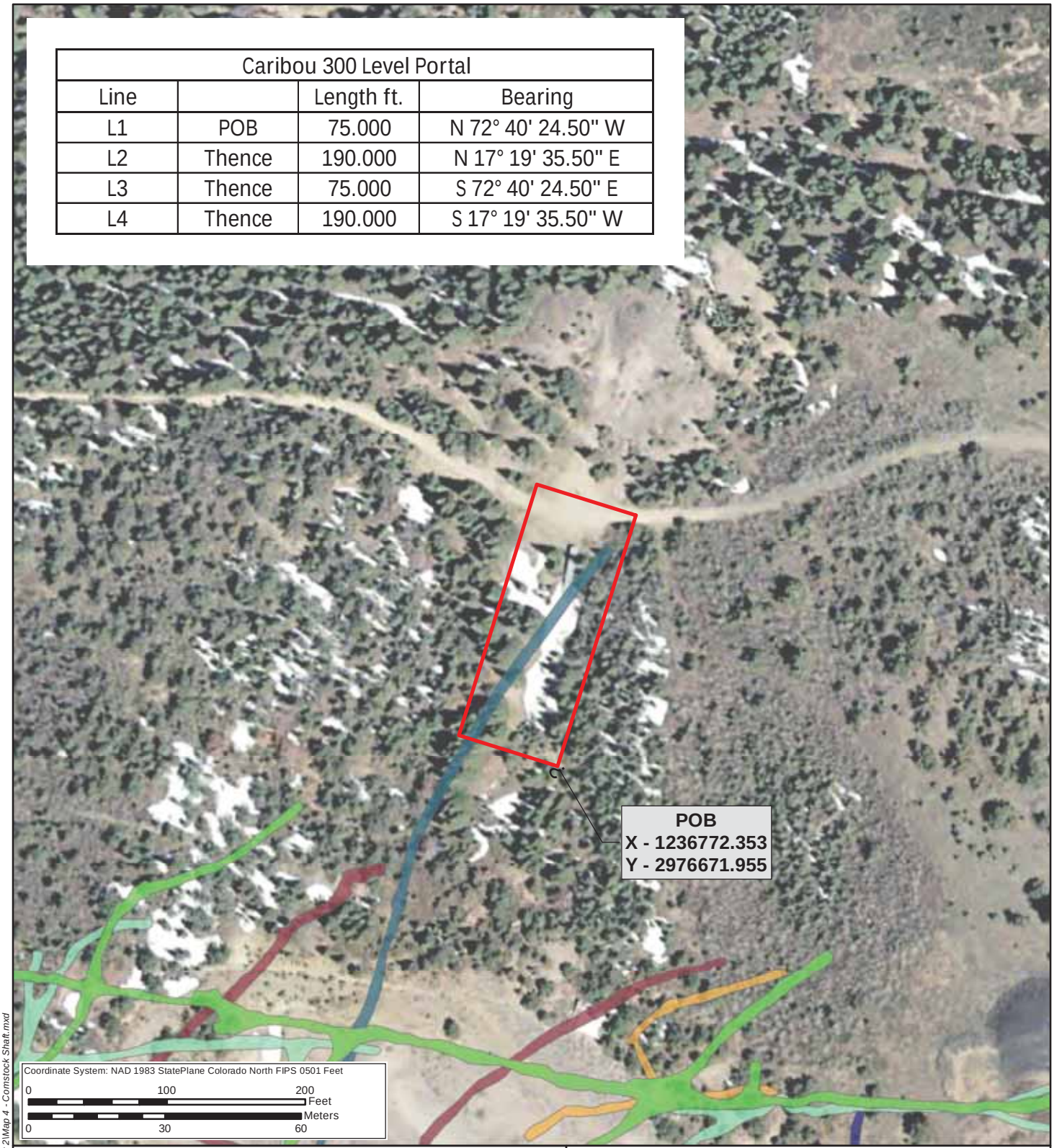
Title: **Proposed Permit Boundary Modifications Potosi Shaft SIte**

GRAND ISLAND RESOURCES

Project No. 0801			File No.	
GIS:	JST	12/15/20	Scale As Shown	Rev 0
Check:	JST	12/15/20	Map 3	
Review:	DP	12/15/20		

Path: G:\Projects\NederlandArcMap\DRMS\Amendment 2\Map 3 - Potosi Shaft.mxd

Caribou 300 Level Portal			
Line		Length ft.	Bearing
L1	POB	75.000	N 72° 40' 24.50" W
L2	Thence	190.000	N 17° 19' 35.50" E
L3	Thence	75.000	S 72° 40' 24.50" E
L4	Thence	190.000	S 17° 19' 35.50" W



Permit Boundary - Modified (0.33 ac)

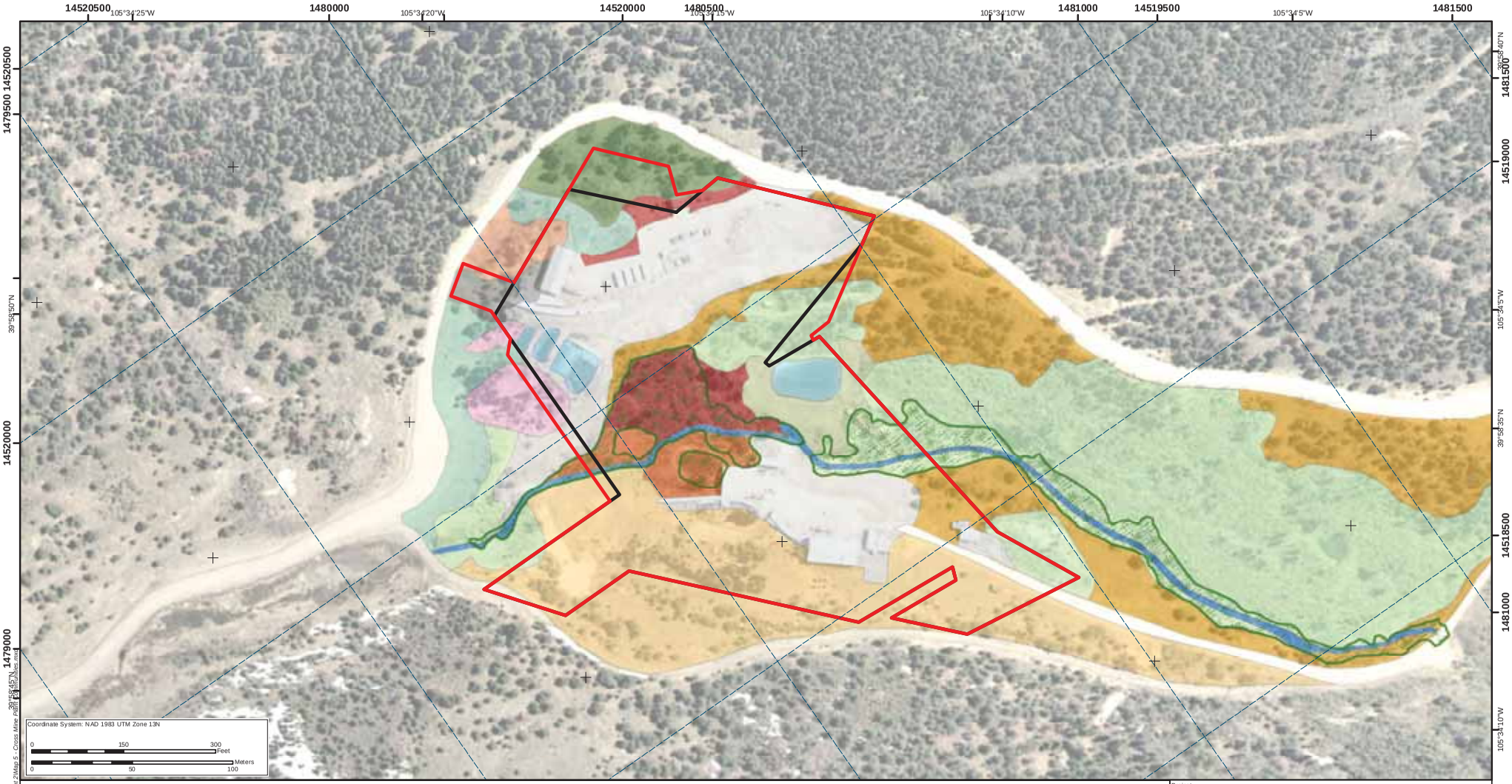
Project: DRMS Amendment 2

Title: **Proposed Permit Boundary Modifications Caribou 300 Level Portal Site**

GRAND ISLAND RESOURCES

Project No. 0801			File No.	
GIS:	JST	12/15/20	Scale As Shown	Rev 0
Check:	JST	12/15/20	Map 4	
Review:	DP	12/15/20		

Path: G:\Projects\NederlandArcMap\DRMS\Amendment 2\Map 4 - Comstock Shaft.mxd



Legend

- Permit Boundary - Modified (9.60 ac)
- Permit Boundary - Current (8.96 ac)
- Wetland

Vegetation

- Coon Track Creek
- Aspen Woodland
- Aspen/Lodgepole Pine Woodland
- Developed
- Disturbed Upland Meadow
- Limber/Lodgepole Pine Parkland
- Lodgepole Pine Parkland
- Planted Grasses
- Pond (Open Water)
- Rock Outcrop
- Spruce/Fir Woodland
- Upland Meadow
- Willow/Spruce/Fir Woodland
- Willow Woodland

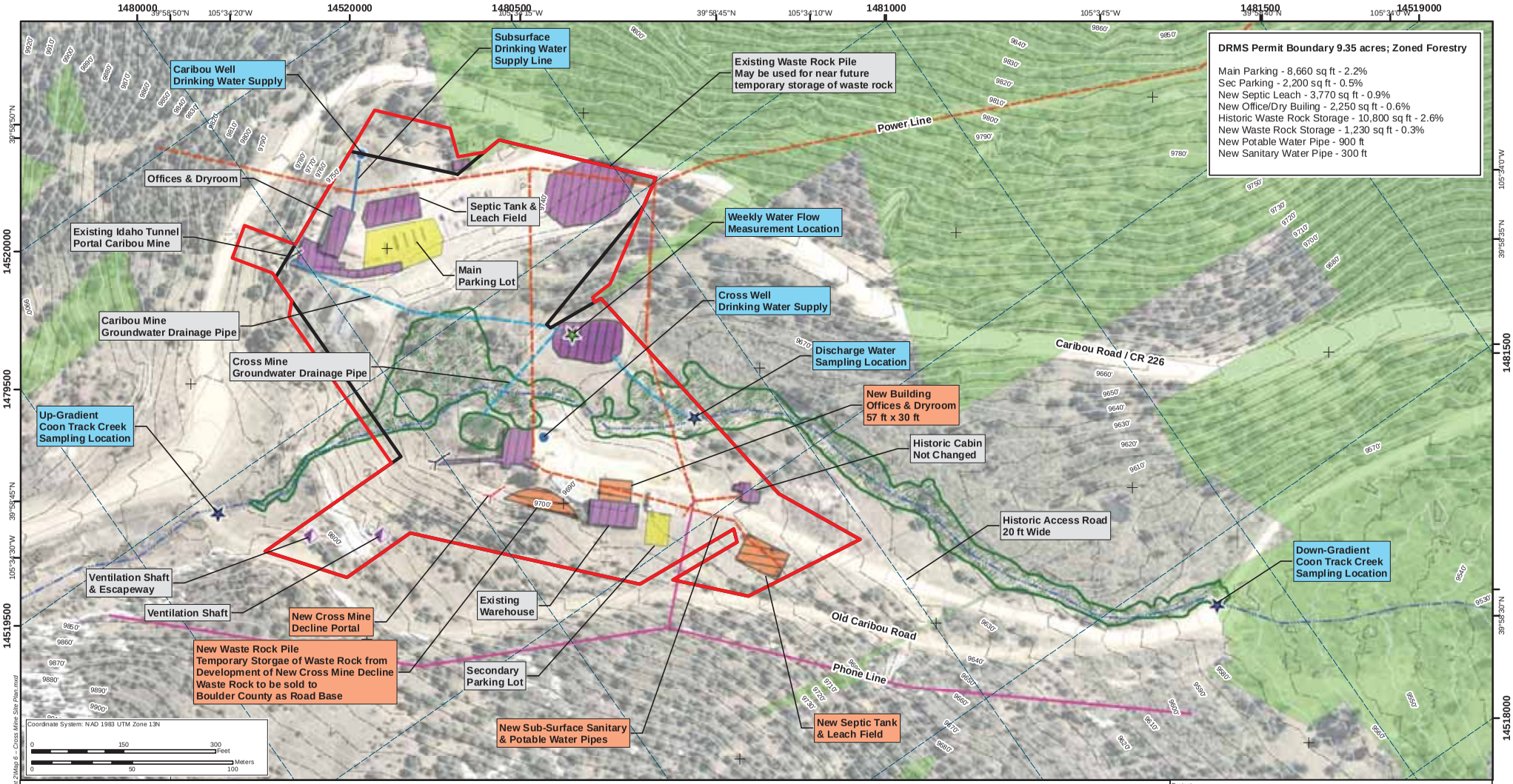
Project: DRMS Amendment 2

Title: **Plant Communities Cross-Caribou Site**

GRAND ISLAND RESOURCES

Project No. CO-0801			File No.	
GIS:	JST	01/04/21	Scale As Shown	Rev 0
Check:	BG	01/04/21	**Map 5**	
Review:	BG	01/04/21		

Path: G:\Projects\Redwood\ArcMap\DRMS\Amendment 2\Map 5 - Cross Mine Permit Boundaries.mxd



Legend

- Permit Boundary - Modified (9.60 ac)
- Permit Boundary - Current (8.96 ac)
- Private
- US Forest Service
- Caribou Well
- Ventilation Shaft & Escapeway
- Existing Cross Mine Portal
- New Cross Mine Decline Portal
- Coon Track Creek Sampling Location
- Weekly Water Flow Measurement
- Drinking Water Supply Line
- Power Line
- Phone Line
- Groundwater Drainage Pipe
- Coon Track Creek
- Historic Features
- New Features
- Parking Area
- Wetland

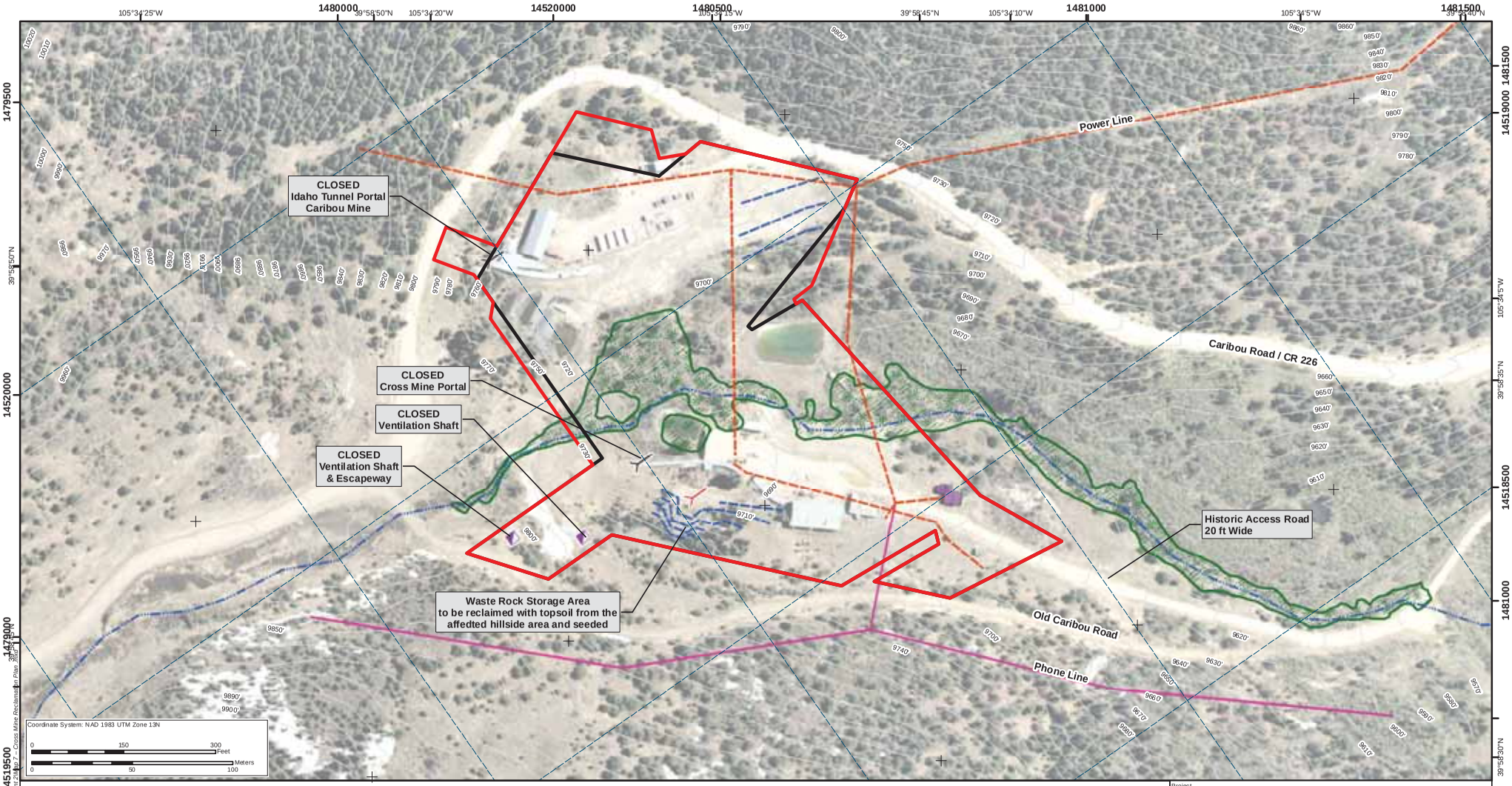
Project: DRMS Amendment 2

Title: **Amendment 1 Permit Disturbance**

GRAND ISLAND RESOURCES

Project No. CO-0801			File No.	
GIS:	JST	01/04/21	Scale As Shown	Rev 0
Check:	BG	01/04/21	Map 6	
Review:	BG	01/04/21		

Path: G:\Projects\Nederland\Arc\Map\DRMS\Amendment 2\Map 6 - Cross Mine Site Plan.mxd



Legend

- Permit Boundary - Modified (9.60 ac)
- Permit Boundary - Current (8.96 ac)
- Ventilation Shaft & Escapeway
- Existing Cross Mine Portal
- New Cross Mine Decline Portal
- Power Line
- Phone Line
- Coon Track Creek
- Reclamation Contour
- Historic Cabin
- Wetland

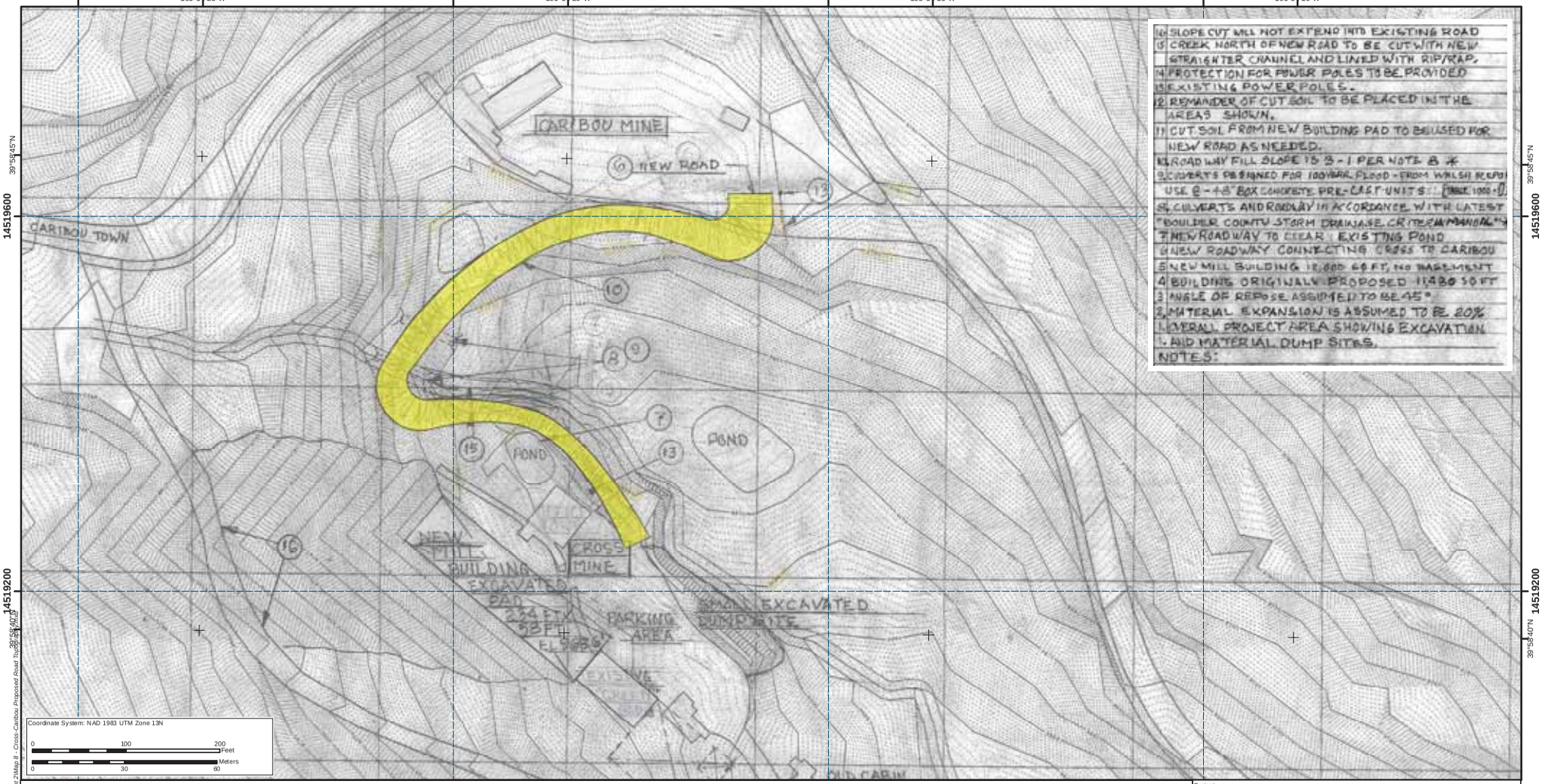
Project: DRMS Amendment 2

Title: **Mine Reclamation Plan**
Cross-Caribou Site

GRAND ISLAND RESOURCES

Project No. CO-0801			File No.		
GIS:	JST	01/04/21	Scale As Shown	Rev 0	
Check:	BG	01/04/21	Map 7		
Review:	BG	01/04/21			

Path: G:\Projects\Nederland\ArcMap\DRMS\Amendment 2\Fig 2 - Cross Mine Reclamation Plan 2.mxd



Legend

Proposed Road

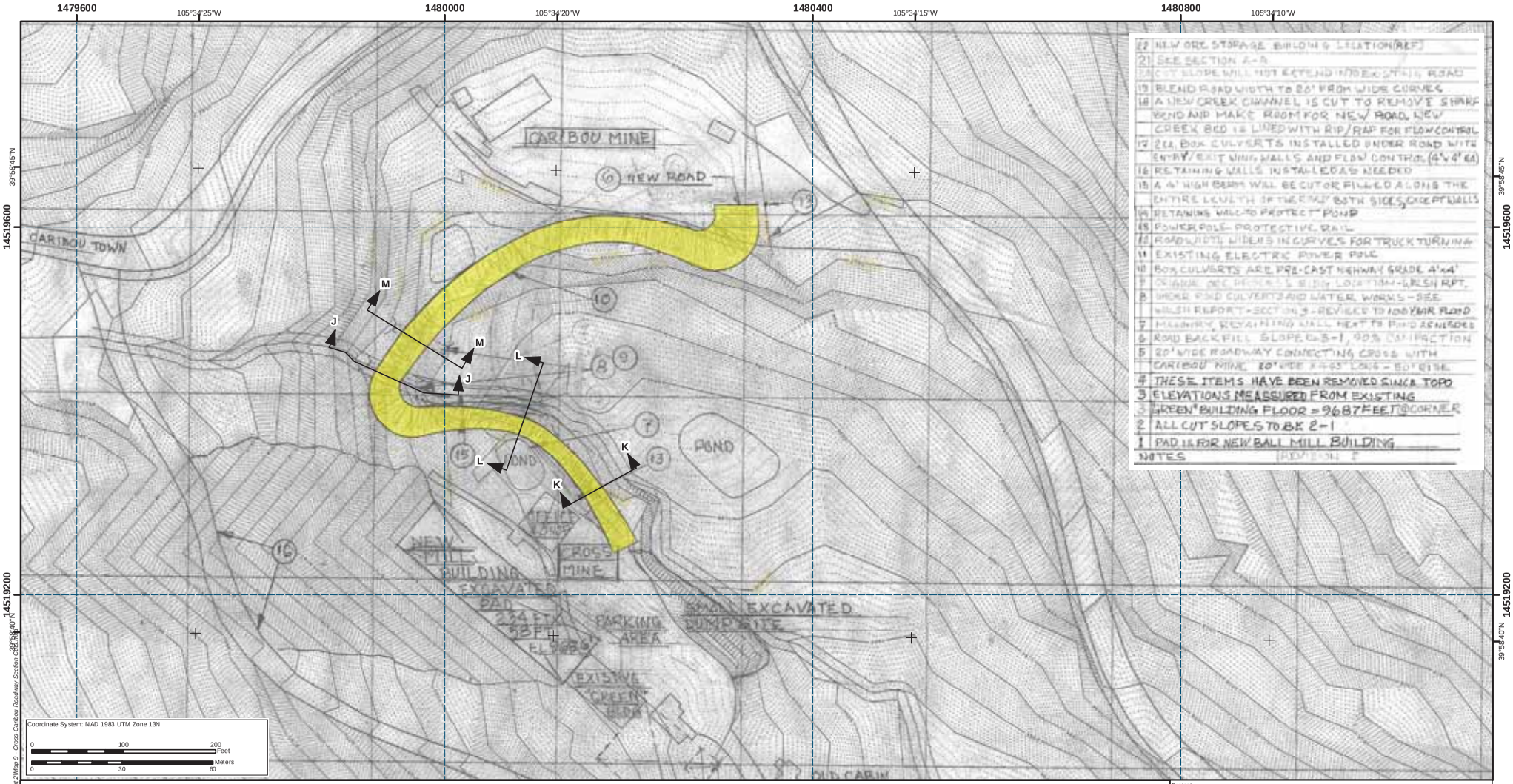
Project: DRMS Amendment 2

Title: **Road Topography Cross-Caribou Site**

GRAND ISLAND RESOURCES

Project No. CO-0801			File No.	
GIS:	JST	01/04/21	Scale As Shown	Rev 0
Check:	BG	01/04/21	**Map 8**	
Review:	BG	01/04/21		

Path: G:\Projects\Nederland\ArcMap\DRMS\Amendment 2\Map 8 - Cross-Caribou Proposed Road Topography.mxd



Legend

Proposed Road

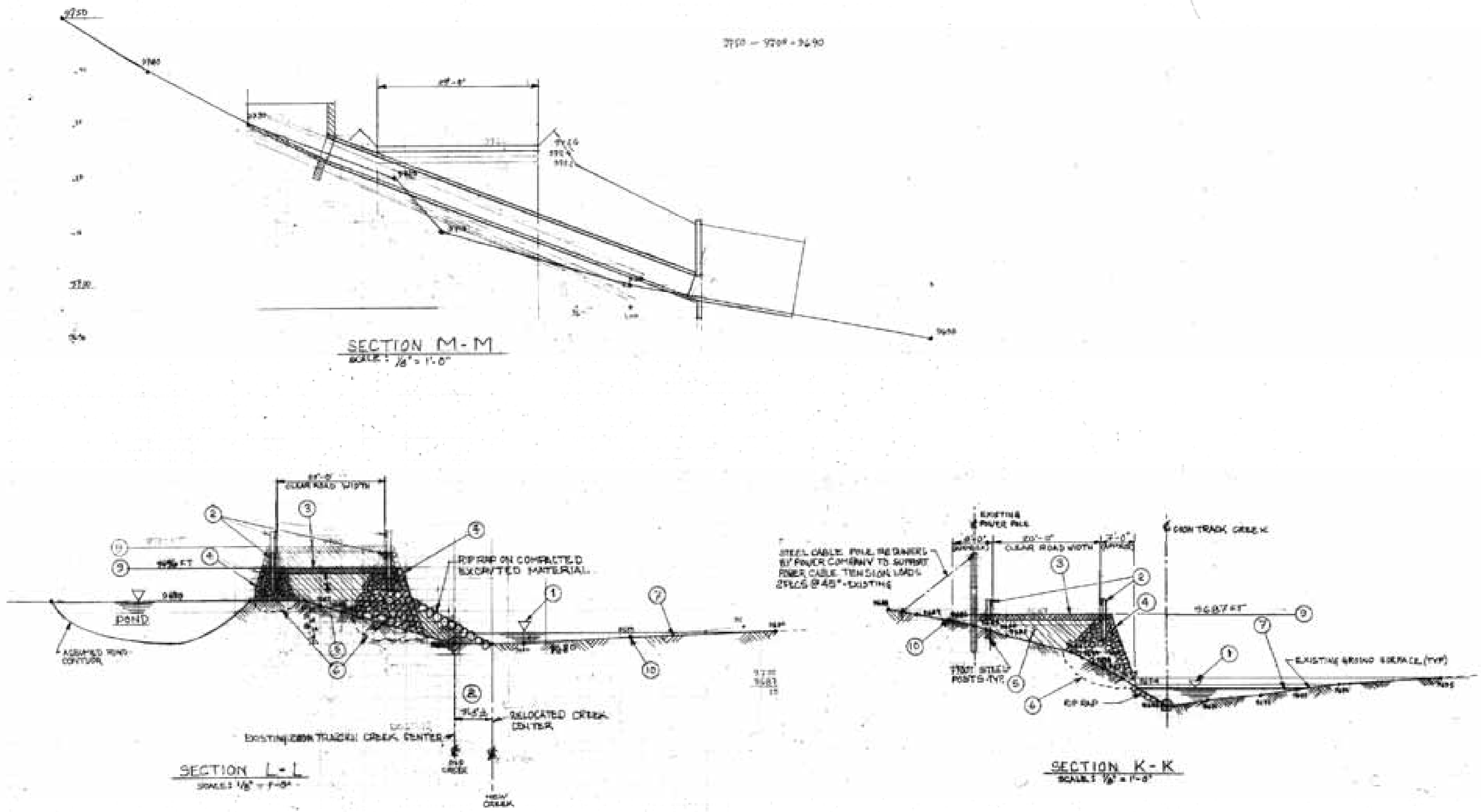
Project: DRMS Amendment 2

Title: **Proposed Roadway Section Cuts Cross-Caribou Site**

GRAND ISLAND RESOURCES

Project No. CO-0801			File No.	
GIS:	JST	01/04/21	Scale As Shown	Rev 0
Check:	BG	01/04/21	**Map 9**	
Review:	BG	01/04/21		

Path: G:\Projects\Nederland\ArcMap\DRMS\Amendment 2\Map 9 - Cross-Caribou Roadway Section CMB.mxd



NOTES:

1. APPROX. WATER LEVEL FOR 100 YR. FLOOD WITH NO DOWNSTREAM (623 ft) RESTRICTIONS.
2. MIDWEST GUARDRAIL SYSTEM (MGS) TYPE 3 W-BEAM 31 INCHES (WITH OFFSET BLOCKS) C-DOT DRAWING D-606-2
3. ENGINEERED CRUSHED AND COMPACTED ROAD SURFACE, MIN 12" THICK TYP. ALL ROAD SURFACES
4. 6" TO 18" MINE TAILINGS RETAINING WALL WITH PORTLAND CEMENT. KEY TO SOLID ROCK BASE. USE EXCAVATED ROCK FROM MOUNTAIN SIDE ALSO.
5. ENGINEERED FILL FROM EXCAVATION MATERIAL - COMPACTED TO 95%
6. POSSIBLE SOIL REMOVAL TO SOLID BASE FOR STONE SUPPORT - USE FOR BACK-FILL (5.)
7. THIS AREA IS A LARGE RELATIVELY FLAT MEADOW
8. THE AMOUNT OF CREEK RELOCATION WILL VARY WITH THE CLEARANCE NEEDED FOR THE NEW ROADWAY - TO BE FIELD VERIFIED.
9. ALL ROADWAY SURFACE ELEVATIONS ARE TO BE FIELD VERIFIED TO PROVIDE EVEN PROPER SLOPE.
10. TYPE ELEVATION POINTS FOR EXIST- SURFACE CONTOURS - TYPICAL

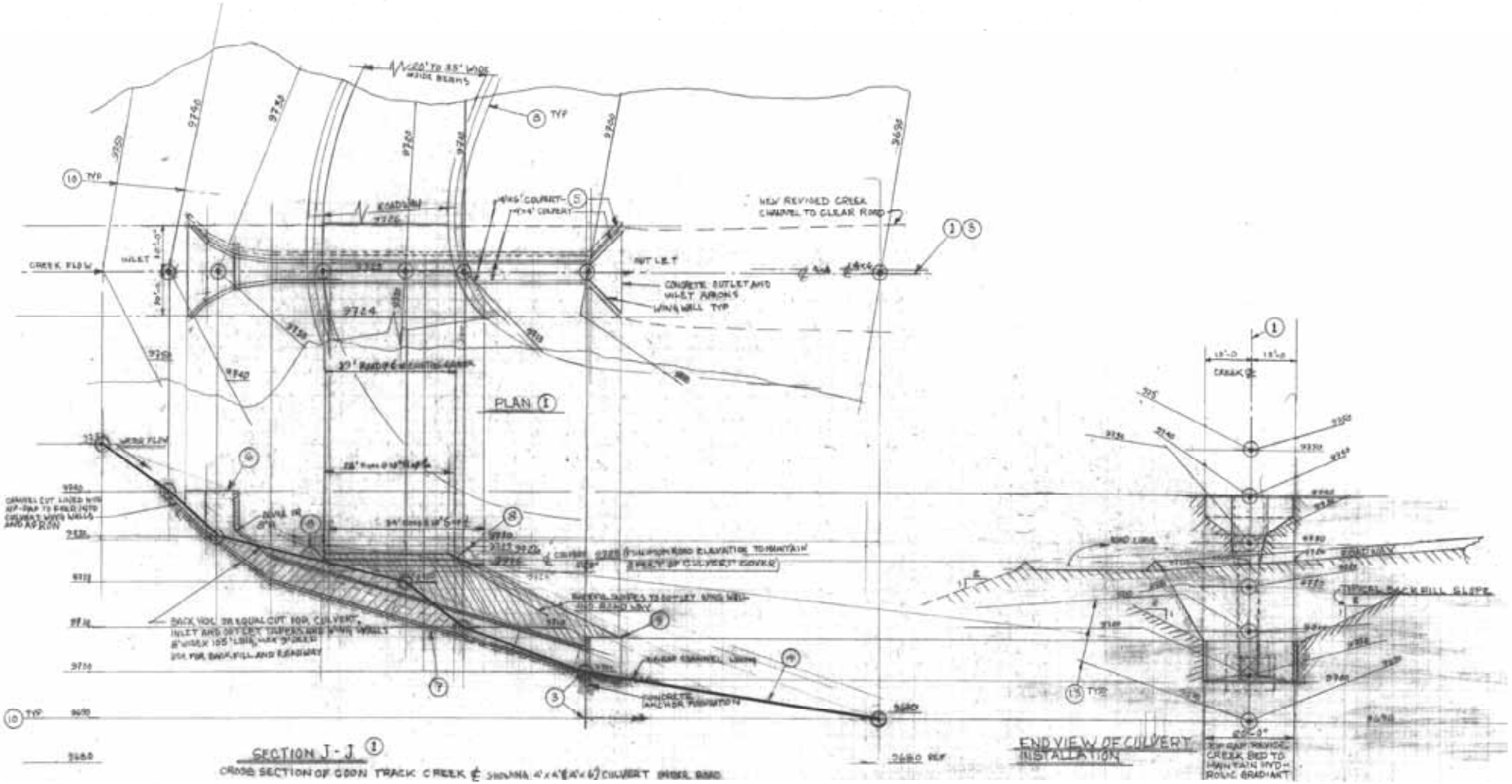
Project: DRMS Amendment 2

Title: **Cross Sections Along Proposed Roadway**
Cross-Caribou Site

GRAND ISLAND RESOURCES

Project No. CO-0801			File No.	
GIS:	JST	01/04/21	Scale As Shown	Rev 0
Check:	BG	01/04/21	Map 10	
Review:	BG	01/04/21		

Path: G:\Projects\Nederland\ArcMap\DRMS\Amendment 2\Map 10 - Cross-Caribou Cros Sections along Roadway.mxd



3. WALL FOR ROADWAY FILL AT CREEK	5. 4'x6'6"W x 4'6" CULVERT SIZE TO BE DETERMINED BY HYDRAULIC CALCULATIONS TO MEET 100 YEAR FLOOD REQUIREMENTS	NOTES
9a. ELEVATION LINES FROM TOPOGRAPHIC MAP TO SHOW ROADWAY AND CULVERT CUTS AND FILLS AT CREEK	6. INLET TO CULVERT SHOWN IS SLOPE TAPERED INLET TO LOWER ROAD SURFACE FOR ACCEPTABLE GRADE FROM CROSS MINE. OTHER OPTIONS MAY BE CONSIDERED. PRECAST CONCRETE	1. SECTION J-J IS A FLATTENED SECTION OF THE CURVED PATH OF COON TRACK CREEK TO ILLUSTRATE THE ROADWAY CULVERT INSTALLATION
9. COMPACT ALL BACKFILL TO 90%	7. CROSS SECK CULVERT SETTING MATERIAL MAY BE CRUSHING SITE EXCAVATED ROCK	2. CULVERT SECTIONS ARE PRE-CAST REINFORCED CONCRETE W/ SMALL INSITE
10. RETAINING WALLS TO BE PROVIDED ALONG COON TRACK CREEK TO SUPPORT NEW ROADWAY.	8. 3:1 HIGH BERM ON ROADWAY SIDES FILL LENGTH OF ROADWAY - USE SCAVENGED MATERIAL.	3. AT COON TRACK CREEK ELEVATION 9700, PATH IS CHANGED TO THE NORTH IN A STRAIGHTER COURSE TO ALLOW FOR THE ROADWAY
11. SLOPES OF EXISTING TERRAIN LEADING TO CREEK PATH CREATES LINE	9. DETAIL WINGWALL PROVIDES RETAINING	4. CENTER LINE OF COON TRACK CREEK ELEVATIONS TO SHOW CUTS AND FILLS FOR CULVERT AND ROADWAY - HEAVY LINE
14. ROAD SLOPES DOWN TO PROVIDE CROSS MINE PARKING LOT AND UP TO CARIBOU MINE PARKING LOT		

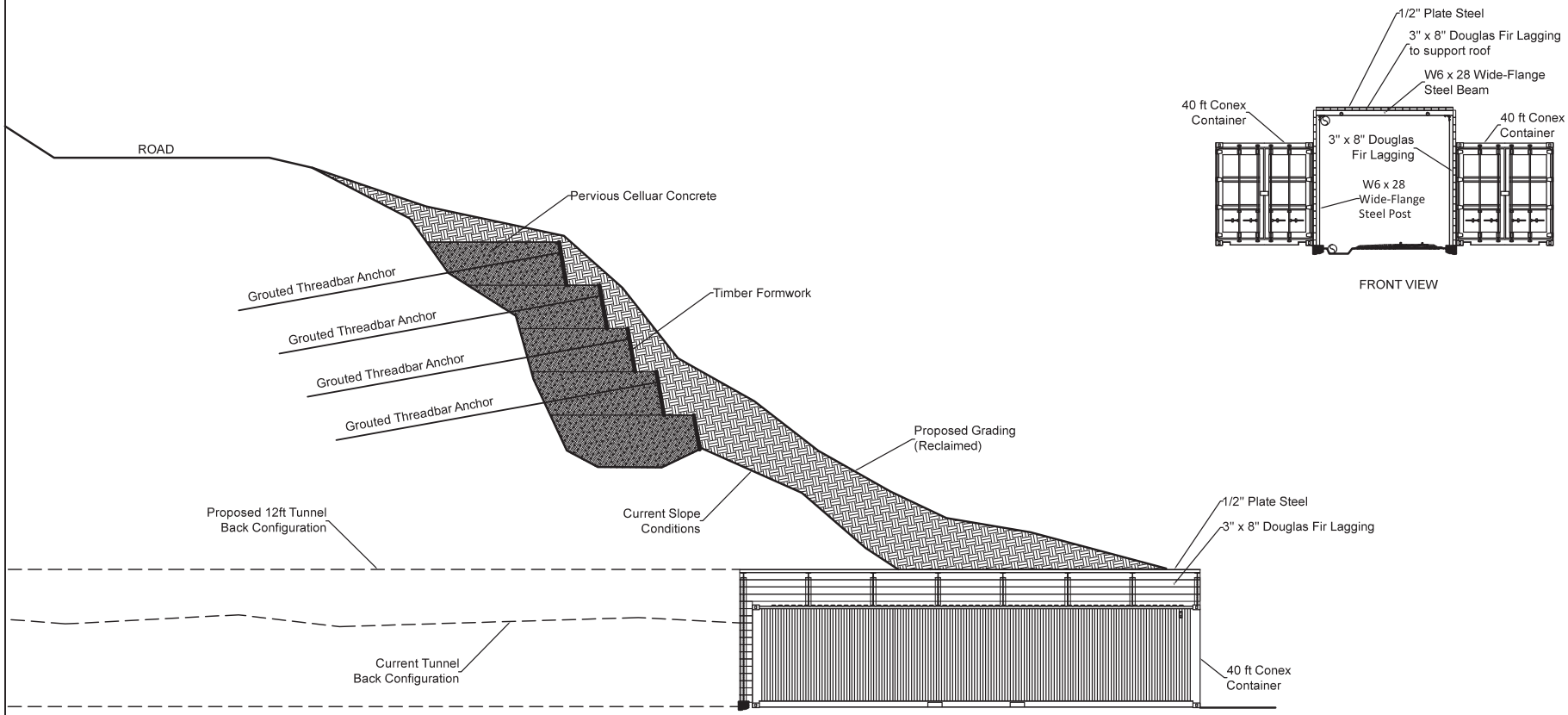
Project: DRMS Amendment 2

Title: **Coon Creek Crossing & Road Culverts**
Cross-Caribou Site

GRAND ISLAND RESOURCES

Project No. CO-0801			File No.	
GIS:	JST	01/04/21	Scale As Shown	Rev 0
Check:	BG	01/04/21	**Map 11**	
Review:	BG	01/04/21		

Path: G:\Projects\Redwood\Arc\Map\DRMS\Amendment 2\Map 11 - Cross Caribou Coon Creek and Culvert Crossing.mxd



PROFILE VIEW

FRONT VIEW

NOTE:

Space between the lagging and final rock surface which is greater than 1" should be filled in with wood cribbing or blocking, muck, grout, polyurethene foam, etc. to form positive contact between the rock surface and steel supports or lagging.

REFERENCE DRAWINGS

DRAWING NO.	TITLE

REVISIONS

NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.
0	07-21-2020	JST	ISSUED FOR RELEASE			

DRMS Amendment 2

Proposed Reclamation of Portal
New Section (A) Idaho Tunnel Slope

GRAND ISLAND RESOURCES

DRAWN BY: JST	DATE: 07-21-2020	ISSUED FOR BID:	SCALE: NONE
CHECKED BY: RM	DATE: 07-21-2020	ISSUED FOR CONSTRUCTION:	
APPROVED BY: RM	DATE: 07-21-2020	DRAWING NUMBER: Map 12	SHEET 1 OF 1

EXHIBIT F

List of Other Permits and Licenses Required:

Provide a statement identifying which of the following permits, licenses and approvals which are held or will be sought in order to conduct the proposed mining and reclamation operations. (Effluent discharge permits, air quality emissions permits, radioactive source material licenses, disposal of dredge and fill material (404) permits, permit to construct a dam, State Historic Preservation Office clearance, highway access permits, U.S. Forest Service permits, Bureau of Land Management permits, county zoning and land use permits, and city zoning and land use permits):

CDPHE

Division of Reclamation, Mining and Safety (DRMS)

- Permit #: M1977-410
    - Amendment #1: Submitted 10/18/2011
    - Amendment #2: Submitted 1/6/2021
- Storm Water Discharge Permit #: COR 040242

Water Quality Control Division

- Discharge Permit #: CO-0032751:

Air Pollution Control Division

- Permit #: 09B00439.XP

Alcohol Tobacco and Firearms

- Federal Explosives/License Permit #: 5-CO-013-33-OH-00625

Mine Safety & Health Administration

- Mine ID #: 0502430 – Cross Gold Mine
- Mine ID #: 0502730 – Consolidated Caribou District

Boulder County

- Special Use Permit #: SU-08-006

EXHIBIT G

Source of Legal Right to Enter:

Provide a description of the basis for the legal right of entry to the site and to conduct mining and reclamation for Owners of Record:

See attached:

Right to Enter Property Under Recorded Agreements

Right to Redeem and Re-Acquire Agreement

RIGHT TO ENTER PROPERTY UNDER RECORDED AGREEMENTS

4. Right of Entry

4.1 Except as otherwise provided in this Agreement, throughout the term of this Agreement, Calais and its servants, agents and independent contractors, shall have the right in respect of the Property to:

(a) Enter in, under and upon the Property;

(b) Have quiet possession of the Property;

(c) Do such prospecting, exploration, development and/or other mining work thereon and thereunder as it in its sole discretion may determine advisable;

(d) Bring upon and erect upon the Property buildings, plants, machinery and equipment as Calais may deem advisable, and to occupy any existing buildings on the Property; and

(e) Remove from the Property and dispose of ores, minerals and metals.

4. Right of Entry

4.1 Except as otherwise provided in this Agreement, throughout the term of this Agreement, Calais and its servants, agents and independent contractors, shall have the right in respect of the Property to:

(a) Enter in, under and upon the Property;

(b) Have quiet possession of the Property;

(c) Do such prospecting, exploration, development and/or other mining work thereon and thereunder as it in its sole discretion may determine advisable;

(d) Bring upon and erect upon the Property buildings, plants, machinery and equipment as Calais may deem advisable; and

(e) Remove from the Property and dispose of ores, minerals and metals.

7. **Obligations of Calais During the Period**

7.1 During the period of this Agreement Calais shall:

(a) Maintain in good standing the Property by the doing and filing of assessment work or the making of payments in lieu thereof, by the payment of property taxes and rentals and the performance of all other actions which may be necessary in that regard and in order to keep the Property free and clear of all liens and other charges arising from Calais' activities thereon except those at the time contested in good faith by Calais; and

(b) Do all work on the Property in a good and minerlike fashion and in accordance with all applicable laws, regulations, orders and ordinances of any governmental authority.

RIGHT TO REDEEM AND RE-ACQUIRE AGREEMENT

RIGHT TO ENTER PROPERTY AS MODIFIED BY MARCH 2004 HARVEY MASTER SETTLEMENT

iii. During the period through August 31, 2011, Calais and its servants, agents, employees, officers, directors, and contractors:

1. May enter in, under, and upon the 1999 Properties and the 2000 Properties;
2. Have quiet possession of the 1999 Properties and the 2000 Properties;
3. Do such prospecting, exploration, development, and/or other mining work thereon and thereunder as Calais, in its sole discretion, may determine advisable;
4. Bring upon and erect upon the 1999 Properties and the 2000 Properties buildings, plants, machinery and equipment as Calais may deem advisable;

5. Remove from the Property and for Calais' own account dispose of ores, minerals, and metals without accounting to any of the Harvey Parties (including, without limitation, AAI) for the value of, or costs associated with, such ores, minerals and metals;
6. May in its sole discretion obtain loans for the exploration, development, or mining of either or both of the 1999 Properties and the 2000 Properties or other property owned by Calais in the Caribou district, and secure such loan by a mortgage or deed of trust encumbering the 1999 Properties and/or the 2000 Properties;
7. Shall maintain adequate liability and other appropriate insurance with respect to the 1999 Properties and the 2000 Properties and Calais' other properties within the Caribou mining district and Calais' operations and activities thereon (whether Calais directly performs such activities or does so through independent contractors or others);
8. Shall maintain in good standing the 1999 Properties and the 2000 Properties by the doing and filing of assessment work or the making of payments in lieu thereof, by the payment of property taxes and rentals, and the performance of all other actions which may be necessary in that regard and in order to keep the 1999 Properties and the 2000 Properties free and clear of all liens and other charges arising from Calais' activities thereon (except those permitted by ¶2(a)(iv)(6) above or those at the time contested by Calais in good faith); and
9. Shall do all work in the 1999 Properties and the 2000 Properties in a good and minerlike fashion and in accordance with all applicable laws, regulations, orders, and ordinances of any governmental authority.

iv. During the period through August 31, 2011, neither Calais nor Aardvark [AEI or AAI?] may transfer, convey, or assign, an interest in either the 1999 Properties or the 2000 Properties (except as permitted by ¶2(a)(iv)(6) above).

v. After August 31, 2011, if Calais has not repurchased either the 1999 Properties and the 2000 Properties from AAI, AAI agrees to extend the repurchase right for an additional ten more years. If Calais elects to take this ten year extension, it also extends the convertibility of the debenture in ¶2(a)(i).

vi. At Calais' request, AAI will execute and deliver for recording in Boulder county, Colorado, a document as may be recommended by counsel to Calais that sets forth the foregoing provisions which will supersede the previously recorded documents providing notice of the previous understanding between the parties.

2195462
Page: 1 of 13
09/11/2001 11:51A
Boulder County Clerk, CO AG R 65.00 D 0.00

2067199
Page: 1 of 12
08/04/2000 01:39P
Boulder County Clerk, CO AG R 60.00 D 0.00

RIGHT TO REDEEM AND RE-ACQUIRE AGREEMENT

COPY

THIS AGREEMENT made of the 20 day of July, ~~1999~~ 2000

BETWEEN:

AARDVARK AGENCIES INC., a Washington corporation having a business office at 1001 4th Avenue Plaza, Suite 3300, Seattle, Washington 98154

("Aardvark")

OF THE FIRST PART

AND:

CALAIS RESOURCES COLORADO, INC., a Nevada corporation having an office for delivery located at Unit 5, 9375 Mary St., Chilliwack, British Columbia V2P 4G9

("Calais")

OF THE SECOND PART

WHEREAS:

A. Calais has transferred to Aardvark an undivided one hundred percent (100%) interest in and to those certain mineral and land interests which are more particularly described in Schedule "A" attached hereto and forming a material part of this Agreement (the "Property"); and

B. Aardvark wishes to grant to Calais the right to redeem the Property and re-acquire the Property on the terms and subject to the conditions as are more particularly set forth herein.

NOW THEREFORE THIS AGREEMENT WITNESSES that in consideration of the mutual covenants and agreements hereinafter contained the parties hereto agree as follows:

CORRECTION DOCUMENT

1. Representations and Warranties

1.1 Each party represents and warrants to the other party hereto that:

(a) The parties have full power and authority to enter into this Agreement and any agreement or instrument referred to or contemplated by this Agreement;

(b) Neither the execution and delivery of this Agreement nor any of the agreements contemplated hereby, nor the consummation of the transactions hereby contemplated, conflict with, or result in the breach of, or accelerate the performance required by any agreement to which they are a party; and

(c) The parties will diligently and in good faith perform their duties and obligations of this Agreement in the event of a party conducting or supervising exploration and development then it shall conduct or supervise the same in a careful, diligent, efficient and professional manner and shall keep the Property in good standing.

1.2 Aardvark represents and warrants to Calais that:

(a) It is the legal owner of all of the land and mineral interests comprising the Property, free and clear of all liens, charges and claims of others, and, except as disclosed herein, no taxes or rentals are due in respect of any thereof, Aardvark has free and unimpeded right of access to the Property and Aardvark has use of the Property surface for the herein purposes; and

(b) The mineral and land interests comprised in the Property have been duly and validly recorded pursuant to the laws of the jurisdiction in which the Property is situate and the Property is in good standing with the Boulder County Clerk and Recorder, on the date of this Agreement.

2. Grant and Maintenance of the Right

2.1 Aardvark hereby gives and grants to Calais the right to redeem the Property in accordance with the terms and conditions of this Agreement (the "Right") and to re-acquire title hereto.

2.2 In order to redeem the Property, Calais shall pay to Aardvark the amount paid to Calais by Aardvark at the time the Property was transferred from Calais to Aardvark, and such payment shall be made within a period of ten (10) years from the date of execution of this Agreement. The amount of the payment shall be $3.5 million (U.S.), less the amount of any note

and deed of trust upon which an amount is still owing by Aardvark to Calais by reason of the original purchase which debt shall be offset at closing.

2.3 During the currency of this Agreement, Calais shall keep the Property in good standing, free and clear of all liens and encumbrances resulting from its activities on the Property, and shall maintain adequate insurance coverage protecting the parties to this Agreement from third party claims. During the currency of the Agreement, Calais shall pay any property or ad valorem taxes which may fall as due from time to time.

3. Acquisition of Interest in the Property

3.1 At such time as Calais has made the required payment in accordance with Paragraph 2.2 above, within the time period specified, Aardvark shall give to Calais a general warranty deed for the property, whereupon Calais shall become the owner of the Property.

4. Right of Entry

4.1 Except as otherwise provided in this Agreement, throughout the term of this Agreement, Calais and its servants, agents and independent contractors, shall have the right in respect of the Property to:

(a) Enter in, under and upon the Property;

(b) Have quiet possession of the Property;

(c) Do such prospecting, exploration, development and/or other mining work thereon and thereunder as it in its sole discretion may determine advisable;

(d) Bring upon and erect upon the Property buildings, plants, machinery and equipment as Calais may deem advisable; and

(e) Remove from the Property and dispose of ores, minerals and metals.

5. Restrictions on Alienation

5.1 Aardvark shall not transfer, convey, assign, mortgage or grant an option in respect of or grant a right to purchase or in any way transfer, encumber or alienate all or any portion of its interest in the Property.

6. Registration and Transfer of Property Interests

6.1 Upon the request of Calais, Aardvark shall assist, when required, Calais to record this Agreement with the appropriate recording offices, and Aardvark shall further provide Calais with such recordable transfers as Calais and its counsel shall require to record their due interests in respect of the Property.

7. Obligations of Calais During the Period

7.1 During the period of this Agreement Calais shall:

(a) Maintain in good standing the Property by the doing and filing of assessment work or the making of payments in lieu thereof, by the payment of property taxes and rentals and the performance of all other actions which may be necessary in that regard and in order to keep the Property free and clear of all liens and other charges arising from Calais' activities thereon except those at the time contested in good faith by Calais; and

(b) Do all work on the Property in a good and minerlike fashion and in accordance with all applicable laws, regulations, orders and ordinances of any governmental authority.

8. Confidential Information

8.1 No information furnished by Calais to Aardvark hereunder in respect of the activities carried out on the Property by Calais, or related to the sale of product derived from the Property, shall be published by Aardvark without the prior written consent of Calais, but such consent in respect of the reporting of factual data shall not be unreasonably withheld, and shall not be withheld in respect of information required to be publicly disclosed pursuant to applicable securities or corporation laws.

9. Notice

9.1 Each notice, demand or other communication required or permitted to be given under this Agreement shall be in writing and shall be sent by prepaid registered mail deposited in a Post Office in Canada or the United States of America addressed to the party entitled to receive the same, or delivered to such party, at the address for such party specified above. The date of receipt of such notice, demand or other communication shall be the date of delivery thereof if delivered, or, if given by registered mail as aforesaid, shall be deemed conclusively to be the third day after the same shall have been so mailed, except in the case of interruption of postal services for any reason whatsoever, in which case the date of receipt shall be the date on which the notice, demand or other communication is actually received by the addressee.

9.2 Either party may at any time and from time to time notify the other party in writing of a change of address and the new address to which notice shall be given to it thereafter until further change.

10. General

10.1 This Agreement shall supersede and replace any other agreement or arrangement, whether oral or written, heretofore existing between the parties in respect of the subject matter of this Agreement.

10.2 The parties have not created a partnership and nothing contained in this Agreement shall in any manner whatsoever constitute any party the partner, agent or legal representative of any other party, nor create any fiduciary relationship between them for any purpose whatsoever. No party shall have any authority to act for, or to assume any obligations or responsibility on behalf of, any other party except as may be, from time to time, agreed upon in writing between the parties or as otherwise expressly provided.

10.3 No consent or waiver expressed or implied by either party in respect of any breach or default by the other in the performance by such other of its obligations hereunder shall be deemed or construed to be a consent to or a waiver of any other breach or default.

10.4 Words used herein importing the singular number shall include the plural, and vice versa, and words importing the masculine gender shall include the feminine and neuter genders and vice versa, and work importing persons shall include firms, partnerships and corporations.

10.5 Time is of the essence of this Agreement.

10.6 The parties shall promptly execute or cause to be executed all documents, deeds, conveyances and other instruments of further assurance which may be reasonably necessary or advisable to carry out fully the intent of this Agreement or to record wherever appropriate the respective interests from time to time of the parties in the Property.

10.7 This Agreement is subject to regulatory approval and the parties agree to make any reasonable amendments hereto as may be required by any regulatory authorities.

10.8 This Agreement shall be construed in accordance with the laws in force from time to time in the Province of British Columbia.

10.9 This Agreement shall enure to the benefit of and be binding upon the parties and their respective successors and permitted assigns.

IN WITNESS WHEREOF the corporate seal of Calais and Aardvark has been hereunto affixed in the presence of its duly authorized officers in that behalf as of the day and year first above written.

THE CORPORATE SEAL of)
AARDVARK AGENCIES, INC.)
was hereunto affixed in the presence of:)
)
)
_____) (c/s)
Authorized Signatory)
)
)
_____)
Authorized Signatory

ATTEST:

_____
Secretary to

THE CORPORATE SEAL of)
CALAIS RESOURCES COLORADO, INC.)
was hereunto affixed in the presence of:)
)
)
_____) (c/s)
Authorized Signatory)
)
)
_____)
Authorized Signatory)

ATTEST:

_____
Secretary to

Province of BC
~~STATE OF COLORADO~~)
City of Chilliwack) ss.
~~COUNTY OF Boulder~~)

The foregoing instrument was acknowledged before me this 20th day of July 2000, ~~1999~~, by Judy Ann Harvey and _____ for Aardvark Agencies, Inc.

Witness my hand and seal.

Notary Public

SCOTT A. SIMPSON * NOTARY PUBLIC * BRITISH COLUMBIA
SCOTT A. SIMPSON
NOTARY PUBLIC
#16 - 45865 Yale Rd.,
Chilliwack BC V2P 2M3

My commission expires: Permanent.

STATE OF COLORADO)
) ss.
COUNTY OF Boulder)

The foregoing instrument was acknowledged before me this 15th day of April, 1999, by Thomas Hendricks and N/A for Calais Resources Colorado, Inc..

Witness my hand and seal.

Sue Marchuk
Notary Public

NOTARY PUBLIC STATE OF COLORADO

My commission expires: 8-19-02.

SCHEDULE "A"

THIS IS SCHEDULE "A" to the Right to Redeem and Re-Acquire Agreement dated the 15 day of June, 1999, between Aardvark Agencies, Inc. and Calais Resources Colorado, Inc.

(See attached pp. 1-5)

2195462
Page: 9 of 13
09/11/2001 11:51A
Boulder County Clerk, CO AG R 65.00 D 0.00

2067199
Page: 9 of 12
08/04/2000 01:39P
Boulder County Clerk, CO AG R 60.00 D 0.00

SCHEDULE A

PARCEL A
THE COMSTOCK LODE MINING CLAIM (UNITED STATES MINERAL SURVEY NO. 52) LOCATED IN THE GRAND ISLAND MINING DISTRICT AND EMBRACING A PORTION OF SECTION 8, TOWNSHIP 1 SOUTH, RANGE 73 WEST OF THE 6TH P.M. AS SET FORTH AND PATENTED IN UNITED STATES PATENT RECORDED OCTOBER 13, 1888 IN BOOK 79 AT PAGE 273

PARCEL B
THE IXL LODE MINING CLAIM (UNITED STATES MINERAL SURVEY NO. 85) LOCATED IN THE GRAND ISLAND MINING DISTRICT AND EMBRACING A PORTION OF SECTION 8, TOWNSHIP 1 SOUTH, RANGE 73 WEST OF THE 6TH P.M. AS SET FORTH AND PATENTED IN UNITED STATES PATENT RECORDED MARCH 17, 1928 IN BOOK 452 AT PAGE 73

PARCEL C
THE STATEN ISLAND LODE MINING CLAIM (UNITED STATES MINERAL SURVEY NO. 124) LOCATED IIN THE GRAND ISLAND MINING DISTRICT AND EMBRACING A PORTION OF SECTIONS 5 AND 8, TOWNSHIP 1 SOUTH, RANGE 73 WEST OF THE 6TH P.M. AS SET FORTH AND PATENTED IN UNITED STATES PATENT RECORDED MAY 20, 1935 IN BOOK 452 AT PAGE 118

PARCEL D
THE PROMISE LODE MINING CLAIM (UNITED STATES MINERAL SURVEY NO. 149) LOCATED IN THE GRAND ISLAND MINING DISTRICT AND EMBRACING A PORTION OF SECTION 5, TOWNSHIP 1 SOUTH, RANGE 73 WEST OF THE 6TH P.M. AS SET FORTH AND PATENTED IN UNITED STATES PATENT RECORDED OCTOBER 2, 1912 IN BOOK 167 AT PAGE 211

PARCEL E
THE MONITOR LODE MINING CLAIM (UNITED STATES MINERAL SURVEY NO. 227) LOCATED IN THE GRAND ISLAND MINING DISTRICT AND EMBRACING A PORTION OF SECTIONS 8 AND 9, TOWNSHIP 1 SOUTH, RANGE 73 WEST OF THE 6TH P.M. AS SET FORTH AND PATENTED IN UNITED STATES PATENT RECORDED IN BOOK 59 AT PAGE 214

PARCEL F
THE MONADNOC LODE MINING CLAIM (UNITED STATES MINERAL SURVEY NO. 274) LOCATED IN THE GRAND ISLAND MINING DISTRICT AND EMBRACING A PORTION OF SECTION 5, TOWNSHIP 1 SOUTH, RANGE 73 WEST OF THE 6TH P.M. AS SET FORTH AND PATENTED IN UNITED PATENT RECORDED . . . . . IN BOOK. . . . . AT PAGE. . . . . .

EXHIBIT A

PARCEL G
THE NEW YORK LODE MINING CLIAM AND NEW YORK MILL SITE CLAIM (UNITED STATES MINERAL SURVEY NO. 344A AND 344B) LOCATED IN THE GRAND ISLAND MINING DISTRICT AND EMBRACING A PORTION OF SECTION 8 AND 9, TOWNSHIP 1 SOUTH, RANGE 73 WEST OF THE 6TH P.M. AS SET FORTH AND PATENTED IN UNITED STATES PATENT RECORDED SEPTEMBER 29, 1898 IN BOOK 204 AT PAGE 113

PARCEL H
THE NORTHWESTERN LODE MINING CLAIM (UNITED STATES MINERAL SURVEY NO. 429) LOCATED IN THE GRAND ISLAND MINING DISTRICT AND EMBRACING A PORTION OF SECTION 5, TOWNSHIP 1 SOUTH, RANGE 73 WEST OF THE 6TH P.M. AS SET FORTH AND PATENTED IN UNITED STAATES PATENT RECORDED . . . . . IN BOOK. . . . . AT PAGE . . . . .

PARCEL I
THE NAUTILIS LODE MINING CLAIM (UNITED STATES MINERAL SURVEY NO. 452) LOCATED IN THE GRAND ISLAND MINING DISTRICT AND EMBRACING A PORTION OF SECTION 8, TOWNSHIP1 SOUTH, RANGE 73 WEST OF THE 6TH P.M. AS SET FORTH AND PATENTED IN UNITED STATES PATENT RECORDED IN BOOK 59 AT PAGE 332

PARCEL J
THE LITTLE EDDIE LODE MINING CLAIM (UNITED STATES MINERAL SURVEY NO. 716) LOCATED IN THE GRAND ISLAND MINING DISTRICT AND EMBRACING A PORTION OF SECTION 8 TOWNSHIP 1 SOUTH, RANGE 73 WEST OF THE 6TH P.M. AS SET FORTH AND PATENTED IN UNITED STATES PATENT RECORDED OCTOBER 7, 1906, IN BOOK 237 AT PAGE 48

PARCEL K
THE NORTH STAR LODE MINING CLAIM (UNITED STATES MINERAL SURVEY NO. 5269) LOCATD IN THE GRAND ISLAND MINING DISTRICT AND EMBRACING A PORTION OF SECTION 5 TOWNSHIP 1 SOUTH, RANGE 73 WEST OF THE 6TH P.M. AS SET FORTH AND PATENTED IN UNITED STATES PATENT RECORDED FEBRUARY 15, 1912 IN BOOK 339 AT PAGE 102

PARCEL L
THE DEVELING LODE MINING CLAIM (UNITED STATES MINERAL SURVEY NO. 13510) LOCATED IN THE GRAND ISLAND MINING DISTRICT AND EMBRACING A PORTION OF SECTIONS 4 AND 5, TOWNSHIP1 SOUTH, RANGE 73 WEST OF THE 6TH P.M. AS SET FORTH AND PATENTED IN UNITED STATES PATENT RECORDED JUNE 9, 1903 IN BOOK 237 AT PAGE 108

PARCEL M
THE EUREKA LODE MINING CLAIM (UNITED STATES MINERAL SURVEY NO. 13685) LOCATED IN THE GRAND ISLAND MINING DISTRICT AND EMBRACING SECTIONS 5 AND 8, TOWNSHIP 1 SOUTH, RANGE 73 WEST OF THE 6TH P.M. AS SET FORTH AND PATENTED IN UNITED STATES PATENT RECORDED JANUARY 25, 1904 IN BOOK 237 AT PAGE 128

PARCEL N
THE LAST CHANCE LODE MINING CLAIM (UNITED STATES MINERAL SURVEY NO. 14246) LOCATED IN THE GRAND ISLAND MINING DISTRICT AND EMBRACING A PORTION OF SECTION 8, TOWNSHIP 1 SOUTH, RANGE 73 WEST OF THE 6TH P.M. AS SET FORTH AND PATENTED IN UNITED STATES PATENT RECORDED DECEMBER 19, 1979 UNDER RECEPTION NO. 375456

PARCEL O
THE PANDORA #1 AND PANDORA #4 LODE MINING CLAIMS (UNITED STATES MINERAL SURVEY NO. 20597) LOCATED IN GRAND ISLAND MINING DISTRICT AND EMBRACING A PORTION OF SECTION 5, TOWNSHIP 1 SOUTH, RANGE 73 WEST OF THE 6TH P.M. AS SET FORTH AND PATENTED IN UNITED STATES PATENT RECORDED MARCH 1, 1961 IN BOOK 1175 AT PAGE 1

THE OPHIR LODE MINING CLAIM (UNITED STATES MINERAL SURVEY NO. 587) LOCATED IN THE GRAND ISLAND MINING DISTRICT AND EMBRACING A PORTION OF SECTIONS 8 AND 9, TOWNSHIP 1 SOUTH, RANGE 73 WEST OF THE SIXTH PRINCIPAL MERIDIAN AS SET FORTH AND PATENTED IN UNITED STATES PATENT RECORDED

AN UNDIVIDED 3/8 INTEREST IN THE CANADIAN LODE MINING CLAIM (UNITED STATES MINERAL SURVEY #666) LOCATED IN THE GRAND ISLAND MINING DISTRICT AND EMBRACING A PORTION OF SECTIN 6, TOWNSHIP 1 SOUTH, RANGE 73 WEST OF THE SIXTH PRINCIPAL MERIDIAN AS SET FORTH AND PATENTED IN UNITED

THE ENTERPRISE LODE MINING CLAIM, SURVEY LOT NO. 19828 IN SECTIONS 4,5 8 AND 9, TOWNSHIP 1 SOUTH, RANGE 73 WEST OF THE 6TH PRINCIPAL MERIDIAN, GRAND ISLAND MINING DISTRICT, EXCEPTING THOSE PORTIONS THEREOF EMBRACED IN RICO LODE MINING CLAIM AND APEX LODE MINING CLAIM, BOTH IN SURVEY LOT NO. 14286, ALSO EXCEPTING THOSE PORTIONS THEREOF EMBRACED IN OPHIR LODE MINING CLAIM SURVEY LOT NO. 587, AND CENTRAL LODE MINING CLAIM SURVEY LOT NO. 481.

(CORRECTION PAGE-OMITTED EXHIBIT)

AN UNDIVIDED 50% INTEREST IN THE FOLLOWING PROPERTIES:

PARCEL A:

THE ANNEX AND THUNDER LODE MINING CLAIMS (U.S. SURVEY NO. 16701) LOCATED IN GRAND ISLAND MINING DISTRICT AND EMBRACING A PORTION OF SECTION 15, 16, 21 AND 22 IN TOWNSHIP 1 SOUTH, RANGE 73 WEST OF THE 6TH P.M., COUNTY OF BOULDER, STATE OF COLORADO,

EXPRESSLY EXCEPTING AND EXCLUDING THAT PORTION OF MINING CLAIM OR U.S. SURVEY NO. 13653 AS EXCEPTED AND EXCLUDED IN PATENT RECORDED FEBRUARY 23, 1905 IN BOOK 288 AT PAGE 14.

PARCEL B:

THE SECOND NATIONAL, THIRD NATIONAL, FOUTH NATIONAL, FIFTH NATIONAL, SIXTH NATIONAL, SEVENTH NATIONAL, EIGHT NATIONAL, NINTH NATIONAL, TENTH NATIONAL, ELEVENTH NATIONAL AND TWELFTH NATIONAL LODE MINING CLAIMS (U.S. SURVEY NO. 12567) LOCATED IN GRAND ISLAND MINING DISTRICT AND EMBRACING A PORTION OF SECTIONS 9, 10, 15 AND 16 IN TOWNSHIP 1 SOUTH, RANGE 73 WEST OF THE 6TH P.M., COUNTY OF BOULDER, STATE OF COLORADO,

EXPRESSLY EXCEPTING AND EXCLUDING THAT PORTION OF ST. JOE LODE CLAIM, UNSURVEYED, AS EXCEPTED AND EXCLUDED IN PATENT RECORDED MARCH 17, 1897 IN BOOK 204 AT PAGE 127.

PARCEL C:

THE ARLET NO. 1, NO. 2, NO. 3 AND NO. 4 LODE MINING CLAIMS AND STANDARD NO. 6 AND NO. 9 LODE MINING CLAIMS (U.S. SURVEY NO. 16705) LOCATED IN THE GRAND ISLAND MINING DISTRICT AND EMBRACING A PORTION OF SECTIONS 9 AND 16 IN TOWNSHIP 1 SOUTH, RANGE 73 WEST OF THE 6TH P.M., COUNTY OF BOULDER, STATE OF COLORADO,

EXPRESSLY EXCEPTING AND EXCLUDING ALL THAT PORTION OF SURVEY NO. 15088 AND NATION NO. 2 AND NATION NO. 3 LODE CLAIM SURVEY NO. 15637, AS EXCEPTED AND EXCLUDED IN PATENT RECORDED APRIL 9, 1991 ON FILM 1668 AS RECEPTION NO. 1096724.

PARCEL D:

STANDARD NO. 1, NO. 2, NO. 3, NO. 4, NO. 5 AND NO. 8 LODE MINING CLAIMS AND COUNTESS LODE MINING CLAIM AND FAIR LODE MINING CLAIM (U.S. SURVEY NO. 15088) LOCATED IN THE GRAND ISLAND MINING DISTRICT AND EMBRACING A PORTION OF SECTIONS 9 AND 16 AND IN TOWNSHIP 1 SOUTH, RANGE 73 WEST OF THE 6TH P.M., COUNTY OF BOULDER, STATE OF COLORADO,

EXPRESSLY EXCEPTING AND EXCLUDING ALL THAT PORTION OF FOURTH NATIONAL LODE CLAIM CURVEY NO. 12567, AS EXCEPTED AND EXCLUDED IN PATENT RECORDED APRIL 9, 1991 ON FILM 1668 AS RECEPTION NO. 1096722.

PARCEL E:

NATIONAL PLACER (U.S. SURVEY NO. 17718) LOCATED IN GRAND ISLAND MINING DISTRICT AND EMBRACING A PORTION OF SECTION 9, TOWNSHIP 1 SOUTH, RANGE 73 WEST OF THE 6TH P.M., COUNTY OF BOULDER, STATE OF COLORADO,

PARCEL F:

PIPE LINE LODE MINING CLAIM (U.S. SURVEY NO. 12567) LOCATED IN GRAND ISLAND MINING DISTRICT AND EMBRACING A PORTION OF SECTIONS 9, 19, 15 AND 16, IN TOWNSHIP 1 SOUTH, RANGE 73 WEST OF THE 6TH P.M., COUNTY OF BOULDER, STATE OF COLORADO,

EXPRESSLY EXCEPTING AND EXCLUDING THAT PORTION OF ST. JOE LODE CLAIM UNSURVEYED, AS EXCEPTED AND EXCLUDED IN PATENT RECORDED MARCH 17, 1897 IN BOOK 204 AT PAGE 127.

EXHIBIT H

Municipalities within a Two Mile Radius:

List the mailing address and telephone number:

There are no municipalities within a two mile radius of the proposed Grand Island Resources, LLC mine site expansion area.

EXHIBIT I

Proof of Filing with County Clerk:

Please see email from Boulder County Clerk and Recorders Office. Due to COVID restrictions, stamped receipts are not currently available.

DPollock@nedmining.com

From:	DPollock@nedmining.com
Sent:	Friday, December 18, 2020 9:42 AM
To:	'recording@bouldercounty.org'
Cc:	'Richard Mittasch'; 'TApodaca'; 'Daniel Takami'
Subject:	Grand Island Resources Recording Request
Attachments:	BOCO ClerkandRecorderCoverLetter 12-18-2020.docx; 12-18-20 BoulderCountyClerkSubmittal.pdf

Boulder County Clerk and Recorder's Office,

Please find attached a cover letter and DRMS permit application to be recorded. Payment instructions are included in the cover letter.

If you have any questions or concerns, please contact me.

Thank you,
Daniel Pollock
Director of Regulations and Permitting
Grand Island Resources
Nederland Mining Consultants
720.207.5154 – Office
312.342.6145 – Cell

GRAND ISLAND
RESOURCES

December, 18 2020

Boulder County Clerk and Recorders Office
1750 33rd St
Boulder, CO 80301
303.413.7700
recording@bouldercounty.org

RE: File No. M1977-410-110(2) Limited Impact Permit Amendment Application

Applicant: Grand Island Resources, LLC

Greetings,

Please find enclosed, to be filed and recorded, a Department of Reclamation, Mining and Safety - Limited Impact Operation 110(2) Reclamation Permit Application Form.

Total # of pages – 7 (not including this cover letter).

Payment Method:
Visa # 4427 4203 4119 4873
Name: Anthony R Russo
Expiration: 02/25
CVV: 887

Please confirm a successful transaction/recording to the following email:
dpollock@nedmining.com

Thank you in advance for your assistance in this matter. Should there be any questions or concerns, please contact me at the information listed below.

Sincerely,

Daniel V Pollock
Director of Regulations and Permitting
Grand Island Resources, LLC
Office – 720.207.5154
Cell – 312.342.6145

DPollock@nedmining.com

From: Recording <recording@bouldercounty.org>
Sent: Monday, December 21, 2020 1:55 PM
To: DPollock@nedmining.com
Cc: 'Richard Mittasch'; 'TApodaca'; 'Daniel Takami'
Subject: RE: Grand Island Resources Recording Request

Good afternoon Daniel,

I have filed your document in our public notices file with the received date of 12/18/2020 since that is when you initially sent it in.
As discussed, public notices such as this are not recorded in the real estate records; they are filed in the public notices to provide public access upon request.

Please let me know if you have any questions.
Regards,
Jennifer

Jennifer Bowser
Recording Division Manager
Boulder County Clerk and Recorder
303.413.7770
recording@bouldercounty.org

From: DPollock@nedmining.com <DPollock@nedmining.com>
Sent: Friday, December 18, 2020 9:42 AM
To: Recording <recording@bouldercounty.org>
Cc: 'Richard Mittasch' <rmittasch@nedmining.com>; 'TApodaca' <TApodaca@nedmining.com>; 'Daniel Takami' <DanielTakami@gmail.com>
Subject: Grand Island Resources Recording Request

Boulder County Clerk and Recorder's Office,

Please find attached a cover letter and DRMS permit application to be recorded. Payment instructions are included in the cover letter.

If you have any questions or concerns, please contact me.

Thank you,
Daniel Pollock
Director of Regulations and Permitting
Grand Island Resources
Nederland Mining Consultants
720.207.5154 – Office
312.342.6145 – Cell

EXHIBIT J

Proof of Notices to Board of County Commissioners and Soil Conservation District:

Please see attached notice documents.

Please see email from Boulder County Board of Commissioners. Due to COVID restrictions, stamped receipts are not currently available.

Rmittasch@nedmining.com

From: Rmittasch@nedmining.com
Sent: Tuesday, January 5, 2021 1:12 PM
To: 'Commissioners@bouldercounty.org'
Subject: Notice for Cross Gold Mine for Grand Island Resources
Attachments: GIR 110(2) Application Executed.pdf

Dear County Commissioners:

As part of our processes for filling our 110 application for our amendment # 2 under DRMS Permit M-1977-410.
We are providing a copy of application for review by the Boulder County, Commissioners (BCCC) and the Boulder County Colorado Soil Conservation District (BCSCD)

If you or any of your office need more information or go over any question please feel free to call or write us at the information below:

Regards,

Richard Mittasch
Grand Island Resources, LLC
4415 Caribou Rd
Nederland, CO 80466
Rmittasch@nedmining.com
(720) 207-5154

Rmittasch@nedmining.com

From: Boulder County Board of Commissioners <commissioners@bouldercounty.org>
Sent: Tuesday, January 5, 2021 1:12 PM
To: Rmittasch@nedmining.com
Subject: Auto-Reply Msg

Thank you for sending your comments, feedback, and/or questions to the Boulder County Commissioners. Your message has been received and will be forwarded to the Board of County Commissioners

COVID-19

If you are writing about COVID-19, we have compiled a list of resources to give clarity around county operations and services and to provide resources to our community members in need. Please visit the following pages to find more information:

- www.boco.org/COVID-19 (Facts and FAQs to help lessen the spread of COVID-19)
- www.boco.org/COVID-19Resources (For those affected by the impacts of COVID-19)

We are working closely with Boulder County Public Health to provide timely communications around COVID-19 actions. Please visit these social media sites for updates:

- **Boulder County Public Health** Facebook & Twitter:@bouldercohealth

Additionally, a partnership between the University of Colorado Boulder (CU), the City of Boulder, and Boulder County Public Health is actively involved in addressing the increase in COVID-19 cases among CU students. For updates and additional information, please visit the following websites:

- **Boulder County Public Health**: www.boco.org/COVID-19
- **City of Boulder**: https://bouldercolorado.gov/coronavirus
- **CU**: www.colorado.edu/covid-19

(See also: "Public Health, CU, and the City of Boulder Respond to Increase in COVID Cases" -- 9/15/2020)

Please note: **Boulder County Public Health (BCPH) is the responsible authority for public health orders in Boulder County concerning COVID-19.** BCPH has statutory authority to direct, amend, or rescind public health orders in coordination with the State of Colorado. *The Board of County Commissioners does not have authority over these public health orders nor does it have authority over CU or the City of Boulder on issues related to COVID-19.*

Other

- **If your email references a specific program, project, or public issue,** your comments will be reviewed by the office or department most closely related to your inquiry or comment and a reply may come directly from them.
- **If your email is regarding a specific planning issue coming before the Board of County Commissioners for public hearing** - such as a Community Planning & Permitting or Parks & Open Space Docket - your remarks will be forwarded to the staff planner collecting all comments for that issue. Your comments will then be included in a packet for the county commissioners to review prior to a public hearing on the matter.
- **Any communication to Boulder County is considered an item of public record** and must be made available by request under the Colorado Open Records Act (CORA). Information contained within the communication will not be redacted or edited for content.
- **If you have questions about an issue or would like to find out when future meetings or hearings are scheduled**, see Board of County Commissioners or view the calendar, or search for the issue on our website at www.BoulderCounty.org.

We sincerely appreciate your interest and engagement with Boulder County.

Thanks again for contacting us.

With best regards,

Boulder County Commissioners
Deb Gardner, Elise Jones, Matt Jones

Boulder County Commissioners' Office
303-441-3500

EXHIBIT L

Permanent Man-made Structures:

Provide information sufficient to demonstrate that the stability of any structures located within two hundred (200) feet of the operation or affected land will not be adversely affected:

The Excel power line and AT&T phone line presently cross or enter the mining operation. These structures have been associated with the mining operation since it was first permitted in 1977. In addition, Boulder County Road 128 runs adjacent to existing structures located just south and east of CR 128. These structures will not be impacted by the proposed activities associated with the permit amendment. Compensation agreements are not part of this amendment since this is an existing mining operation and the structures, as noted above, have been associated with this operation since 1977, if not earlier.

The three water wells are part of the existing mining operations. As such, they do not require compensation agreements.

(Note: No Exhibits O or P)

An example Structure Agreement which meets the requirements of the Statutes is shown below.
****

Structure Agreement

This letter has been provided to you as the owner of a structure on or within two hundred (200) feet of a proposed mine site. The State of Colorado, Division of Reclamation, Mining and Safety ("Division") requires that where a mining operation will adversely affect the stability of any significant, valuable and permanent man-made structure located within two hundred (200) feet of the affected land, the Applicant shall either:

a) Provide a notarized agreement between the Applicant and the Person(s) having an interest in the structure, that the Applicant is to provide compensation for any damage to the structure; or

b) Where such an agreement cannot be reached, the Applicant shall provide an appropriate engineering evaluation that demonstrates that such structure shall not be damaged by activities occurring at the mining operation; or

c) Where such structure is a utility, the Applicant may supply a notarized letter, on utility letterhead, from the owner(s) of the utility that the mining and reclamation activities, as proposed, will have "no negative effect" on their utility. (*Construction Materials Rule 6.3.12 and Rule 6.4.19 & Hard Rock/Metal Mining Rule 6.3.12 and Rule 6.4.20)*

The Colorado Mined Land Reclamation Board ("Board") has determined that this form, if properly executed, represents an agreement that complies with Construction Materials Rule 6.3.12(a), Rule 6.4.19(a), and C.R.S. § 34-32.5-115(4)(e) and with Hard Rock/Metal Mining Rule 6.3.12(a), Rule 6.4.20(a), and C.R.S. § 34-32-115(4)(d). This form is for the sole purpose of ensuring compliance with the Rules and Regulations and shall not make the Board or Division a necessary party to any private civil lawsuit to enforce the terms of the agreement or create any enforcement obligations in the Board or the Division.

The following structures are located on or within 200 feet of the proposed affected area:

1. Boulder County Road CR 226, Caribou Road
2. _____
3. _____
4. _____
5. _____

(*Please list additional structures on a separate page*)

CERTIFICATION

The Applicant, Grand Island Resources, LLC (print applicant/company name), by Daniel Takami (print representative's name), as Manager (print representative's title), does hereby certify that Boulder County, Colorado (structure owner) shall be compensated for any damage from the proposed mining operation to the above listed structure(s) located on or within 200 feet of the proposed affected area described within Exhibit A, of the Reclamation Permit Application for Transfer of Operator/Cross Gold Mine/Caribou Mine (operation name), File Number M-1977-410.

This form has been approved by the Colorado Mined Land Reclamation Board pursuant to its authority under the Colorado Land Reclamation Act for the Extraction of Construction Materials and the Colorado Mined Land Reclamation Act for Hard Rock, Metal, and Designated Mining Operations. Any alteration or modification to this form shall result in voiding this form.

NOTARY FOR PERMIT APPLICANT

ACKNOWLEGED BY:

Applicant GRAND ISLAND RESOURCES, LLC Representative Name DANIEL TAKAMI

Date JUNE 11, 2020 Title MANAGER

STATE OF Colorado)
) ss.
COUNTY OF Boulder)

The foregoing was acknowledged before me this 11th day of JUNE, 2020, by DANIEL TAKAMI as MANAGER of GRAND ISLAND RESOURCES, LLC

Carrie Jo Lake
Notary Public

My Commission Expires: 8/25/2023

Carrie Jo Lake
NOTARY PUBLIC
STATE OF COLORADO
NOTARY ID 20154033631
MY COMMISSION EXPIRES August 25, 2023

NOTARY FOR STRUCTURE OWNER

ACKNOWLEGED BY:

Structure Owner _____ Name Michael A. Thomas

Date June 15, 2020 Title County Engineer

STATE OF Colorado)
) ss.
COUNTY OF Boulder)

The foregoing was acknowledged before me this 15th day of June, 2020, by Mike Thomas as County Engineer of Boulder County.

_____ My Commission Expires: 3/6/22
Notary Public

LAUREN CELY
Notary Public
State of Colorado
Notary ID # 20144010468
My Commission Expires 03-06-2022

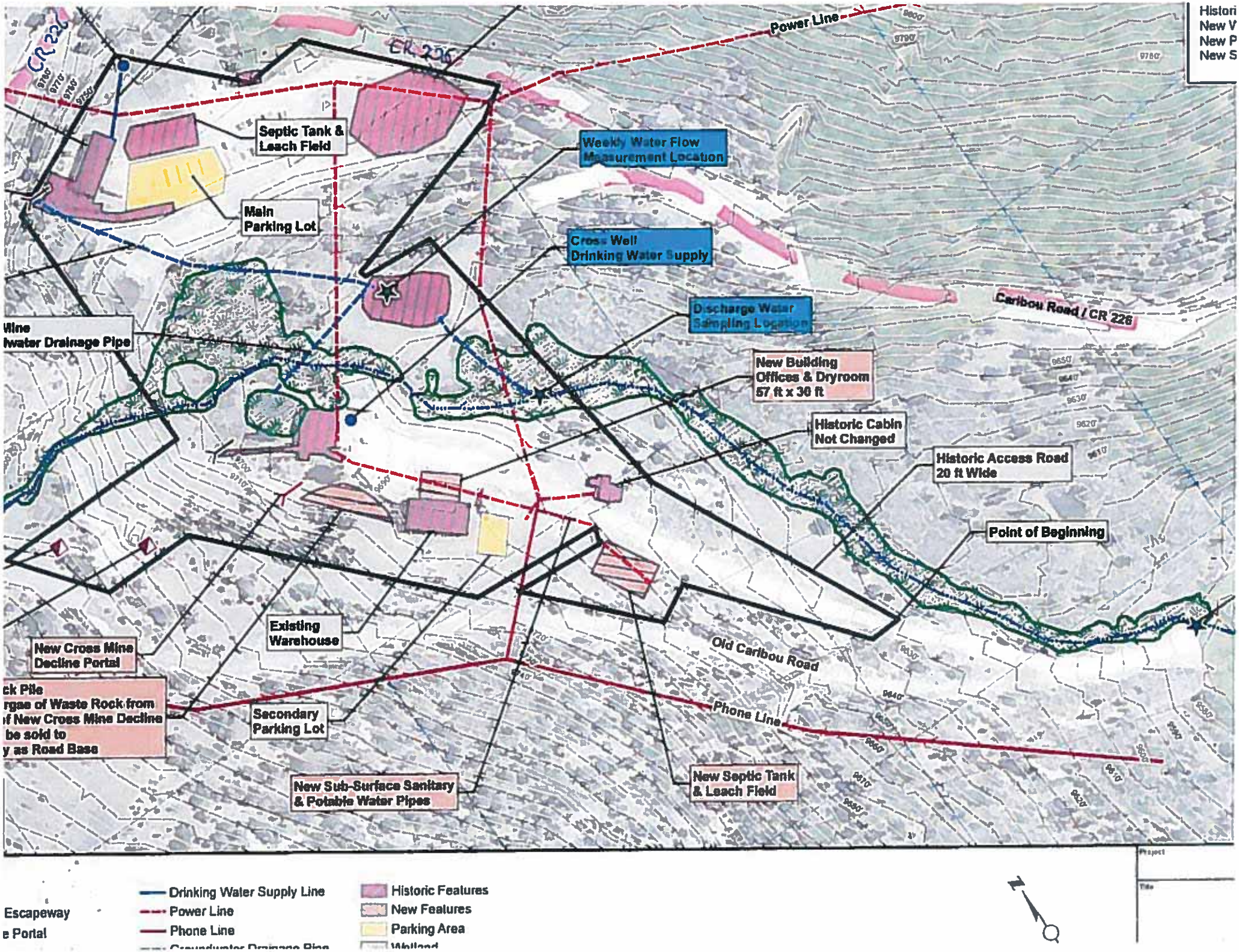

CR 226
CR 226
Power Line
Septic Tank & Leach Field
Weekly Water Flow Measurement Location
Main Parking Lot
Cross Well Drinking Water Supply
Discharge Water Sampling Location
Caribou Road / CR 226
New Building Offices & Dryroom 57 ft x 36 ft
Historic Cabin Not Changed
Historic Access Road 20 ft Wide
Point of Beginning
Existing Warehouse
New Cross Mine Decline Portal
Old Caribou Road
Phone Line
Secondary Parking Lot
New Septic Tank & Leach Field
New Sub-Surface Sanitary & Potable Water Pipes
Drinking Water Supply Line
Power Line
Phone Line
Historic Features
New Features
Parking Area

EXHIBIT M

Water Sampling and Analysis Plan

Water Sampling and Analysis Plan
Grand Island Resources, Inc.
Cross and Caribou Mines

Prepared for

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

Prepared by

Telesto Solutions Inc.
750 14th Street SW
Loveland, Colorado 80537

December 2020

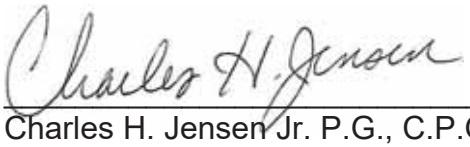
Signature Page

Water Sampling and Analysis Plan

December 2020

Report Authors and Contributors

Telesto Solutions, Inc.



Charles H. Jensen Jr. P.G., C.P.G. – Primary Author

Contributors:

Dacey Zehlman-Fahm
Tim Gerken

Table of Contents

List of Tables

List of Figures

List of Appendices

1.0 INTRODUCTION

GIR performed an internal audit of their environmental programs. The audit found that improvements to the Stormwater Management Plan and the water quality monitoring program (outfall monitoring) is warranted.

This Sampling and Analysis Plan (SAP) describes the sampling and monitoring schedule that will be implemented for the collection of water quality samples and outfall water samples at the Cross and Caribou Mines Operations (Site). GIR strives to ensure compliance and maintain water quality standards.

The site, monitoring and sampling locations, and water management ponds are shown on the attached figure.

2.0 OBJECTIVE

The Cross and Caribou Mines have an existing Colorado Pollutant Discharge Elimination System (CPDES) Permit (#CO0032751) (Appendix A). The permit allows for water to be discharged to Coon Tack Creek at permitted water quality standards. The objective of this SAP is to complement the monitoring and sampling of water quality (and, where necessary, additional characterization) ensuring mining and reclamation activities at the Site do not degrade existing surface and groundwater quality/uses and that the water quality collection methods guarantee data quality. The SAP will also ensure that water quality meets or exceeds water quality at the discharge point (Outfall 01) to Coon Track Creek. Existing water level and quality data was reviewed, a site visit and inspection conducted, and potential data gaps identified to draft this SAP. The SAP includes:

- Discussion of standard operating procedures
- Collection of water samples (Outfall 01)
- Real-time monitoring of water discharge
- Periodic collection of ground water quality data
- Additional collection of surface water quality data
- Documentation of data collection activities
- Sampling data management

3.0 STANDARD OPERATING PROCEDURES

Standard Operating Procedures (SOPs) for water quality monitoring and sampling are provided to GIR and are included in Appendix B. The SOPs are used as *guidelines when necessary* and include:

- SOP #1 Equipment Decontamination
- SOP #2 Monitoring Well Water Level Measurement
- SOP #5 Ground Water Sample Collection
- SOP #6 Surface Water Sample Collection
- SOP #7 Sample Documentation, Handling, Packaging, and Chain of Custody
- SOP #9 Field Parameter Instrument Calibration and Measurement

4.0 DISCHARGE SURFACE WATER SAMPLE COLLECTION (OUTFALL 01)

Under the current CPDES permit, monthly and bimonthly samples are collected at the Outfall 01 location by Grand Island Resources personnel. The Outfall 01 location is the discharge point at Coon Track Creek below settling Pond #2 (see attached map). The samples are documented and sent under a chain-of-custody to Energy Laboratories located in Billings, Montana. A monthly discharge report is filed electronically with the Colorado Department of Public Health and Environment (CDPHE). A copy of the CPDES permit is in Appendix A and lists the analytical parameters, including discharge rate and pH. Any exceedances of parameters are initially addressed by an immediate resample of the Outfall 01 location. Extraneous materials can contaminate water samples during a sampling program. On occasion, laboratory test results of the collected water samples maybe inaccurate due to outside contamination. All equipment that will contact sampled media will be decontaminated. Disposable nitrile gloves are donned and containers received from the laboratory are used to collect the water samples.

The CPDES permit also includes the daily and "real time" monitoring of the discharge water at the Outfall 1 location. An automated system (continuous) is in place to monitor certain water quality parameters. Information is gathered digitally and can be reviewed on a computer and on a smart device through an application called BlueLab app. Parameters

seen in real-time include:

- Total Dissolved Solids (TDS)
- pH
- Water Temp (^{O}C)

In addition to the BlueLab app, GIR can log into the security system to view the following instrumentation:

- Flow (GPH)
- Outside Temperature
- Solar/Inverter/Battery Status
- Equipment Status/Calibration Status

GIR automatically receives notification via text message of the following:

- If pH is out of the following range: 7.4 – 8.9
- Effluent flow > 500 GPM
- Power Failure
- Low Battery Warning

The information collected through the automated system is documented and included in the discharge reporting to the CDPHE.

Standard hydrated lime is used as necessary for water quality treatment of mining process water. GIR adds lime a minimum of once per day by hand. Lime is applied either directly into the pond or add it in a port in the discharge pipe prior to Pond 1. It then heads to Pond 2 for additional residence time and settling. The amount of lime varies based on the time of year as well as conditions and mining activity. The process mentioned will be improved upon as mining activity increases. GIR is installing an automatic lime feeding system.

5.0 GROUND WATER SAMPLE COLLECTION

Data was reviewed from existing water source wells located on the property. There are three water source wells. The Caribou Well is located on the northern portion of the property and is used mainly for washing, toilets and showers. The Cross Well is located near the central office area and is used for washing, toilets and drinking water. The Cabin Well is no longer operational and has not been for some time. GIR will evaluate whether

to keep the well or plug and abandon the well. The water source well locations are identified on the Figure and listed in Table 1.

Data shows water quality to be compliant for drinking water standards. Periodic water quality sampling may be conducted based on changes in observed water quality, i.e., taste, smell, and clarity. Standard well maintenance will be conducted on an as-needed basis. Well pump maintenance should be conducted once every three to five years. If the water source wells are actively used, separate purging of the well is not necessary. If the well is inactive for a period of time, a minimum of three casing volumes will be purged from each well. Field water quality parameters will be measured during purging, and purging will continue until the parameters have stabilized. In instances where it may not be practical to purge three casing volumes, field water quality parameters will be monitored for stability before the three casing volumes are purged.

Once field parameters have stabilized and or three well volumes have been removed, groundwater samples will be collected. Well purging, monitoring of field parameters and sample collection will be performed in accordance with the SOPs listed above. Field analytical parameters (which include pH, specific conductivity, temperature) and groundwater quality parameters to be analyzed are listed in Table 2.

6.0 ADDITIONAL WATER QUALITY MONITORING

Coon Track Creek traverses through the Site. GIR is committed to preserving and maintaining the water quality of Coon Track Creek. GIR may periodically collect baseline/background water samples from Coon Track Creek. Coon Track Creek #1 is located upstream as it flows onto the Site property and Coon Track Creek #2 is located downstream as it flows from the Site property. The sample locations are marked on the attached map. The water samples would be collected during the spring runoff and analyzed for the same parameters outlined in the CPDES discharge permit and compared.

As mining operations continue, GIR may expand water quality monitoring on an as-needed basis. Additional water quality monitoring may include but not limited to:

- Specific holding pond (individual) water quality analysis;

- Specific location/analyte sampling in response to a spill or incident;

- Specific location/analyte sampling in response to major operational changes.

No additional groundwater monitoring wells are recommended at this time. However, as GIR evaluates and pursues a Class V Injection Well permit, groundwater monitoring wells may be warranted. The SAP will be adjusted/amended as necessary.

7.0 SAMPLE DOCUMENTATION, HANDLING, PACKAGING, AND CHAIN OF CUSTODY

The standard operating procedures for sample documentation, handling, packaging, and chain of custody are presented in SOP #7. Sample custody procedures are to be followed to ensure that sample integrity is maintained during collection, transportation, and storage prior to analysis. A minimum number of individuals will handle the samples. The field sampler is personally responsible for collection and custody of the samples until they are transferred to the lab.

8.0 SAMPLING AND DATA MANAGEMENT

Prior to any mining activities exposing groundwater or initiating dewatering operations at the Site, GIR will review and evaluate the need to amend the SAP. GIR is committed to working with the DRMS and the CDPHE to maintaining surface and groundwater quality.

During active mining operations and reclamation, GIR will continue to implement the SAP. The CPDES discharge permit is filed with the CDPHE on a monthly basis. Additional water quality data will be compiled and available upon request. Ongoing water quality monitoring and sampling is an integral part of the mining operations and will assist in future permitting and compliance.

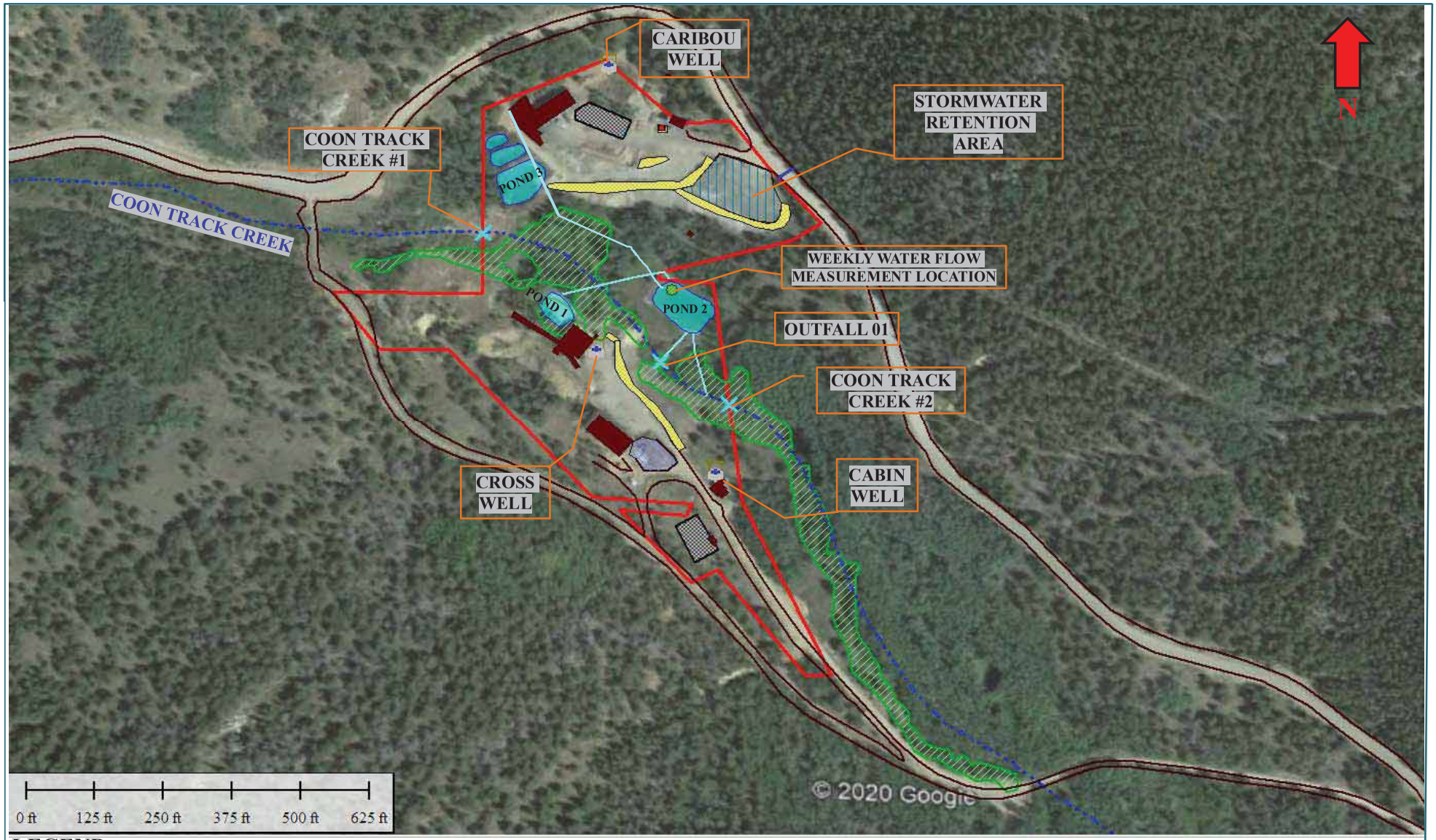
Table 1 - Sampling Locations

Sampling Location	Latitude	Longitude
Outfall 01 (CPDES Permit)	39.977970	-105.571689
Caribou Well	39.979663	-105.572018
Cross Well	39.978147	-105.572103
Cabin Well	39.977410	-105.571313
Coon Track Creek #1	39.978623	-105.573144
Coon Track Creek #2	39.977730	-105.571250

Table 2 – Water Source Well Sampling Parameters

Analytical Parameters*
Total Coliform (absent/present)
E-Coli (absent/present)
Hydroxide (mg/L as CaCO3)
Phosphate – Ortho (as P)
Phosphate – Ortho (as PO4)
Total Alkalinity (as CaCO3)
Bicarbonate (as CaCO3)
Carbonate (as CaCO3)
Chloride
Nitrate Nitrogen
Sulfate
Ammonia Nitrogen
Copper
Iron
Potassium
Manganese
Molybdenum
Calcium
Magnesium
Sodium
Zinc
Fluoride
Total
Copper
Lead
Silver
Uranium
Total Hardness (as CaCO3)
Boron
pH (units)
Sodium Adsorption Ratio (units)
Salinity (umhos/cm)

*mg/L unless otherwise marked



LEGEND

- POND
- DRAINAGE PIPE
- WELL
- BERM
- EXISTING BUILDING
- PERMIT BOUNDARY AREA
- SEPTIC TANK & LEACH FIELD
- WETLAND

PROJECT: 700500	TASK: 001 02
PREPARED BY: TELESTO	

PREPARED FOR: **Grand Island Resources, Inc.**

Water Sampling and Analysis Plan
Cross and Caribou Mines

R:\Boulder County\NederlandMining\Cross Gold Mine\Products\Reports\20201130_Cross and Caribou Mines_GW_SAP_Map

Appendix A
CPDES Discharge Permit CO 0032751

AUTHORIZATION TO DISCHARGE UNDER THE

COLORADO DISCHARGE PERMIT SYSTEM

In compliance with the provisions of the Colorado Water Quality Control Act, (25-8-101 et seq., CRS, 1973 as amended), for both discharges to surface and ground waters, and the Federal Water Pollution Control Act, as amended (33 U.S.C. 1251 et seq.; the "Act"), for discharges to surface waters only, the

Calais Resources Inc.

is authorized to discharge from the Cross and Caribou Mines wastewater treatment facility located **in the SE 1/4 of the NW 1/4 of S9, T1S, R73W; 4415 Caribou Road, Nederland, CO; at 39.978056° latitude North and 105.572194° longitude West**

to **Coon Track Creek**

in accordance with effluent limitations, monitoring requirements and other conditions set forth in Parts I and II hereof. All discharges authorized herein shall be consistent with the terms and conditions of this permit.

The applicant may demand an adjudicatory hearing within thirty (30) calendar days of the date of issuance of the final permit determination, per the Colorado Discharge Permit System Regulations, 61.7(1). Should the applicant choose to contest any of the effluent limitations, monitoring requirements or other conditions contained herein, the applicant must comply with Section 24-4-104 CRS and the Colorado Discharge Permit System Regulations. Failure to contest any such effluent limitation, monitoring requirement, or other condition, constitutes consent to the condition by the Applicant.

This permit and the authorization to discharge shall expire at midnight, March 31, 2019

Issued and Signed this 28th day of February, 2014

COLORADO DEPARTMENT OF PUBLIC HEALTH AND ENVIRONMENT

Janet Kieler, Permits Section Manager
Water Quality Control Division

ISSUED AND SIGNED: FEBRUARY 28, 2014

EFFECTIVE: APRIL 1, 2014

TABLE OF CONTENTS

PART I

A. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

1. Permitted Feature(s)

Beginning no later than the effective date of this permit and lasting through the expiration date, the permittee is authorized to discharge from, and self monitoring samples taken in accordance with the monitoring requirements shall be obtained from permitted feature(s):

001A, prior to mixing with Coon Track Creek, upon exit from the settling pond. 39° 58' 41" N, 105° 34' 19.9" W

The location(s) provided above will serve as the point(s) of compliance for this permit and are appropriate as they are located after all treatment and prior to discharge to the receiving water. Any discharge to the waters of the State from a point source other than specifically authorized by this permit is prohibited.

In accordance with the Water Quality Control Commission Regulations for Effluent Limitations, Section 62.4, and the Colorado Discharge Permit System Regulations, Section 61.8(2), 5 C.C.R. 1002-61, the permitted discharge shall not contain effluent parameter concentrations which exceed the limitations specified below or exceed the specified flow limitation.

2. Limitations, Monitoring Frequencies and Sample Types

In order to obtain an indication of the probable compliance or noncompliance with the effluent limitations specified in Part I.A, the permittee shall monitor all effluent parameters at the frequencies and sample types specified below. Such monitoring will begin immediately and last for the life of the permit unless otherwise noted. The results of such monitoring shall be reported on the Discharge Monitoring Report form (See Part I.D.)

Self-monitoring sampling by the permittee for compliance with the effluent monitoring requirements specified in this permit, shall be performed at the location(s) noted in Part I.A.1 above. If the permittee, using an approved analytical method, monitors any parameter more frequently than required by this permit, then the results of such monitoring shall be included in the calculation and reporting of the values required in the Discharge Monitoring Report Form (DMRs) or other forms as required by the Division. Such increased frequency shall also be indicated.

Oil and Grease Monitoring: For every permitted feature with oil and grease monitoring, in the event an oil sheen or floating oil is observed, a grab sample shall be collected, analyzed, and reported on the appropriate DMR. In addition, corrective action shall be taken immediately to mitigate the discharge of oil and grease. A description of the corrective action taken should be included with the DMR.

Outfall 001A

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 $\geq$ IWC	Quarterly	3 Grabs / Test
TKP3B	Static Renewal 7 Day Chronic *Ceriodaphnia dubia*			NOEC or IC25 $\geq$ IWC	Quarterly	3 Grabs / Test

The above monitoring frequencies for parameters at all outfalls may be exempted during the winter months of each year specifically for times when there are problems with site inaccessibility and due to dangerous travel conditions. The permittee will need to demonstrate and indicate in the DMR that conditions are inaccessible for sampling during these periods.

3. Special Monitoring

Mixing Zone Analyses – Conduct remaining threshold tests for exclusion from further analysis under Mixing Zone Regulations. The second threshold test is the Application of the Mixing Zone Exclusion Tables (p. 20, Colorado Mixing Zone Implementation Guidance, February 2002). Under this action, the permittee will collect the necessary site-specific data, perform the required analysis, and provide a report to the Division by **April 1, 2015.** The report will indicate the findings of this threshold test and, if not excluded, provide the workplan for the next threshold test (i.e., determining of the size of the physical and regulatory mixing zones).

Installation of Temperature Monitoring Equipment - The permittee is to submit a document certifying that continuous temperature and flow monitoring equipment has been installed and is operational by **August 31, 2014.**

B. TERMS AND CONDITIONS

1. Facilities Operation and Maintenance

The permittee shall at all times properly operate and maintain all facilities and systems of treatment and control including all portions of the collection system and lift stations owned by the permittee (and related appurtenances) which are installed or used by the permittee as necessary to achieve compliance with the conditions of this permit. Proper operation and maintenance also includes effective performance, and adequate laboratory and process controls, including appropriate quality assurance procedures. This provision requires the operation of back-up or auxiliary facilities or similar systems when installed by the permittee only when necessary to achieve compliance with the conditions of the permit.

Any sludge produced at the wastewater treatment facility shall be disposed of in accordance with State and Federal guidelines and regulations. The permittee shall take all reasonable steps to minimize or prevent any discharge of sludge use or disposal in violation of this permit which has a reasonable likelihood of adversely affecting human health or the environment. As necessary, accelerated or additional monitoring to determine the nature and impact of the noncomplying discharge is required.

2. Compliance Schedule

Activities to Meet Dissolved Cadmium Final Limits – In order to meet Dissolved Cadmium limitations, the following schedule are included in the permit.

Code	Event	Description	Due Date
43699	Facility Evaluation Plan	Submit a report that identifies sources of cadmium to the wastewater treatment facility and identifies strategies to control these sources or treatment alternatives such that compliance with the final limitations may be attained.	December 31, 2014
00899	Implementation Schedule	Submit a progress report summarizing the progress in implementing the strategies to control sources such that compliance with the final Dissolved Cadmium limitations may be attained.	December 31, 2015
CS017	Achieve Final Compliance with Discharge Limits	Submit study results that show compliance has been attained with the final Dissolved Cadmium limitations.	December 31, 2016

Regulation 61.8(3)(n)(i) states that a report should be submitted to the Division no later than 14 calendar days following each date identified in the schedule of compliance. The 14 days have already been incorporated into the above dates and therefore all reports are due on or before the date listed in the table.

3. Chronic WET Testing -Outfall(s): 001A

a. General Chronic WET Testing and Reporting Requirements

The permittee shall conduct the chronic WET test using *Ceriodaphnia dubia and Pimephales promelas*, as a static renewal 7-day test using three separate composite samples. The permittee shall conduct each chronic WET test in accordance with the 40 CFR Part 136 methods described in Short-term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Water to Freshwater Organisms, Fourth Edition, October 2002 (EPA-821-R-02-013) or the most current edition.

January through March
The following minimum dilution series should be used: 0% effluent (control), 18%, 37%, 73%, 87%, and 100% effluent. If the permittee uses more dilutions than prescribed, and accelerated testing is to be performed, the same dilution series shall be used in the accelerated testing (if applicable) as was initially used in the failed test.

April through June
The following minimum dilution series should be used: 0% effluent (control), 13%, 26%, 52%, 76%, and 100% effluent. If the permittee uses more dilutions than prescribed, and accelerated testing is to be performed, the same dilution series shall be used in the accelerated testing (if applicable) as was initially used in the failed test.

July through September
The following minimum dilution series should be used: 0% effluent (control), 13%, 27%, 53%, 77%, and 100% effluent. If the permittee uses more dilutions than prescribed, and accelerated testing is to be performed, the same dilution series shall be used in the accelerated testing (if applicable) as was initially used in the failed test.

October through December
The following minimum dilution series should be used: 0% effluent (control), 13%, 26%, 52%, 76%, and 100% effluent. If the permittee uses more dilutions than prescribed, and accelerated testing is to be performed, the same dilution series shall be used in the accelerated testing (if applicable) as was initially used in the failed test.

Tests shall be done at the frequency listed in Part I.A.2. Test results shall be reported along with the Discharge Monitoring Report (DMR) submitted for the end of the reporting period when the sample was taken. (i.e., WET testing results for the calendar quarter ending March 31 shall be reported with the DMR due April 28, etc.) The permittee shall submit all laboratory statistical summary sheets, summaries of the determination of a valid, invalid or inconclusive test, and copies of the chain of custody forms, along with the DMR for the reporting period.

If a test is considered invalid, the permittee is required to perform additional testing during the monitoring period to obtain a valid test result. Failure to obtain a valid test result during the monitoring period shall result in a violation of the permit for failure to monitor.

b. Violations of the Permit Limit, Failure of One Test Statistical Endpoint and Division Notification

A chronic WET test is considered a violation of a permit limitation when both the NOEC and the IC25 are at any effluent concentration less than the IWC. The IWC are as follows:
Jan-March: 73%
Apr-Jun: 52%
Jul-Sep: 53%
Oct-Dec: 52%

A chronic WET test is considered to have failed one of the two statistical endpoints when either the NOEC or the IC_{25} are at any effluent concentration less than the IWC. The IWC are as follows:
Jan-March: 73%
Apr-Jun: 52%
Jul-Sep: 53%
Oct-Dec: 52%

In the event of a permit violation, or when two consecutive reporting periods have resulted in failure of one of the two statistical endpoints (regardless of which statistical endpoints are failed), the permittee must provide written notification to the Division. Such notification should explain whether it was a violation or two consecutive failures of a single

endpoint, and must indicate whether accelerated testing or a Toxicity Identification Evaluation or Toxicity Reduction Evaluation (TIE or TRE) is being performed, unless otherwise exempted, in writing, by the Division. **Notification must be received by the Division within 14 calendar days of the permittee receiving notice of the WET testing results.**

c. Automatic Compliance Response

The permittee is responsible for implementing the automatic compliance response provisions of this permit when one of the following occurs:

- there is a violation of the permit limit (both the NOEC and the IC25 endpoints are less than the applicable IWC)
- two consecutive monitoring periods have resulted in failure of one of the two statistical endpoints (either the IC25 or the NOEC)
- the permittee is otherwise informed by the Division that a compliance response is necessary

When one of the above listed events occurs, the following automatic compliance response shall apply. The permittee shall either:

- conduct accelerated testing using the single species found to be more sensitive
- conduct a Toxicity Identification Evaluation (TIE) or a Toxicity Reduction Evaluation (TRE) investigation as described below.

i. Accelerated Testing

If accelerated testing is being performed, testing will be at least once every two weeks for up to five tests, running only one test at a time, using only the IC25 statistical endpoint to determine if the test passed or failed at the appropriate IWC. Accelerated testing shall continue until; 1) two consecutive tests fail or three of five tests fail, in which case a pattern of toxicity has been demonstrated or 2) two consecutive tests pass or three of five tests pass, in which case no pattern of toxicity has been found. Note that the same dilution series should be used in the accelerated testing as was used in the initial test(s) that result in the accelerated testing requirement.

If accelerated testing is required due to failure of one statistical endpoint in two consecutive monitoring periods, and in both of those failures it was the NOEC endpoint that was failed, then the NOEC shall be the only statistical endpoint used to determined whether the accelerated testing passed or failed at the appropriate IWC. Note that the same dilution series should be used in the accelerated testing as was used in the initial test(s) that result in the accelerated testing requirement.

If no pattern of toxicity is found the toxicity episode is considered to be ended and routine testing is to resume. If a pattern of toxicity is found, a TIE/TRE investigation is to be performed. If a pattern of toxicity is not demonstrated but a significant level of erratic toxicity is found, the Division may require an increased frequency of routine monitoring or some other modified approach. The permittee shall provide written notification of the results within 14 calendar days of completion of the Pattern of Toxicity/No Toxicity demonstration.

ii. Toxicity Identification Evaluation (TIE) or Toxicity Reduction Evaluation (TRE)

If a TIE or a TRE is being performed, the results of the investigation are to be received by the Division within 180 calendar days of the demonstration chronic WET in the routine test, as defined above, or if accelerated testing was performed, the date the pattern of toxicity is demonstrated. A status report is to be provided to the Division at the 60 and 120 calendar day points of the TIE or TRE investigation. The Division may extend the time frame for investigation where reasonable justification exists. A request for an extension must be made in writing and received prior to the 180 calendar day deadline. Such request must include a justification and supporting data for such an extension.

Under a TIE, the permittee may use the time for investigation to conduct a preliminary TIE (PTIE) or move directly into the TIE. A PTIE consists of a brief search for possible sources of WET, where a specific parameter(s) is reasonably suspected to have caused such toxicity, and could be identified more simply and cost effectively than a formal TIE. If the PTIE allows resolution of the WET incident, the TIE need not necessarily be conducted in its entirety. If, however, WET is not identified or resolved during the PTIE, the TIE must be conducted within the allowed 180 calendar day time frame.

The Division recommends that the EPA guidance documents regarding TIEs be followed. If another method is to be used, this procedure should be submitted to the Division prior to initiating the TIE.

If the pollutant(s) causing toxicity is/are identified, and is/are controlled by a permit effluent limitation(s), this permit may be modified upon request to adjust permit requirements regarding the automatic compliance response.

If the pollutant(s) causing toxicity is/are identified, and is/are not controlled by a permit effluent limitation(s), the Division may develop limitations the parameter(s), and the permit may be reopened to include these limitations.

If the pollutant causing toxicity is not able to be identified, or is unable to be specifically identified, or is not able to be controlled by an effluent limit, the permittee will be required to perform either item 1 or item 2 below.

l) Conduct an investigation which demonstrates actual instream aquatic life conditions upstream and downstream of the discharge, or identify, for Division approval, and conduct an alternative investigation which demonstrates the actual instream impact. This should include WET testing and chemical analyses of the ambient water. Depending on the results of the study, the permittee may also be required to identify the control program necessary to eliminate the toxicity and its cost. Data collected may be presented to the WQCC for consideration at the next appropriate triennial review of the stream standards;

2) Move to a TRE by identifying the necessary control program or activity and proceed with elimination of the toxicity so as to meet the WET effluent limit.

If toxicity spontaneously disappears in the midst of a TIE, the permittee shall notify the Division within 10 calendar days of such disappearance. The Division may require the permittee to conduct accelerated testing to demonstrate that no pattern of toxicity exists, or may amend the permit to require an increased frequency of WET testing for some period of time. If no pattern of toxicity is demonstrated through the accelerated testing or the increased monitoring frequency, the toxicity incident response will be closed and normal WET testing shall resume.

The control program developed during a TRE consists of the measures determined to be the most feasible to eliminate WET. This may happen through the identification of the toxicant(s) and then a control program aimed specifically at that toxicant(s) or through the identification of more general toxicant treatability processes. A control program is to be developed and submitted to the Division within 180 calendar days of beginning a TRE. Status reports on the TRE are to be provided to the Division at the 60 and 120 calendar day points of the TRE investigation.

If toxicity spontaneously disappears in the midst of a TRE, the permittee shall notify the Division within 10 calendar days of such disappearance. The Division may require the permittee to conduct accelerated testing to demonstrate that no pattern of toxicity exists, or may amend the permit to require an increased frequency for some period of time. If no pattern of toxicity is demonstrated through the accelerated testing or the increased monitoring frequency, the toxicity incident response will be closed and normal WET testing shall resume.

d. Toxicity Reopener

This permit may be reopened and modified to include additional or modified numerical permit limitations, new or modified compliance response requirements, changes in the WET testing protocol, the addition of both acute and chronic WET requirements, or any other conditions related to the control of toxicants.

4. Stormwater Requirements

Pursuant to 5 CCR 1002-61.3(2), facilities classified as Standard Industrial Classifications 10 through 14 (mineral industry) including active or inactive metal mining operations are required to obtain permit coverage for discharges of stormwater associated with industrial activities from the facilities to state waters. The stormwater discharge permit applicable to active and inactive metal mining facilities is the CDPS General Permit for Stormwater Discharges Associated with Metal Mining Operations and Mine-Waste Remediation, which is currently administratively continued.

Division records indicate that Calais Resources Inc applied for and obtained coverage under the CDPS General Permit for Stormwater Discharges Associated with Metal Mining Operations and Mine-Waste Remediation for the Cross and Caribou Mines. The CDPS certification number is COR040242.

C. DEFINITIONS OF TERMS

1. "Acute Toxicity" - The acute toxicity limitation is exceeded if the LC50 is at any effluent concentration less than or equal to the IWC indicated in this permit.

2. "Chronic toxicity", which includes lethality and growth or reproduction, occurs when the NOEC and IC25 are at an effluent concentration less than the IWC indicated in this permit.

3. "Composite" sample is a minimum of four (4) grab samples collected at equally spaced two (2) hour intervals and proportioned according to flow. For a SBR type treatment system, a composite sample is defined as sampling equal aliquots during the beginning, middle and end of a decant period, for two consecutive periods during a day (if possible).

4. "Continuous" measurement, is a measurement obtained from an automatic recording device which continually measures the effluent for the parameter in question, or that provides measurements at specified intervals.

5. "Daily Maximum limitation" for all parameters (except temperature, pH and dissolved oxygen) means the limitation for this parameter shall be applied as an average of all samples collected in one calendar day. For these parameters the DMR shall include the highest of the daily averages. For pH and dissolved oxygen, this means an instantaneous maximum (and/or instantaneous minimum) value. The instantaneous value is defined as the analytical result of any individual sample. For pH and dissolved oxygen, DMRs shall include the maximum (and/or minimum) of all instantaneous values within the calendar month. Any value beyond the noted daily maximum limitation for the indicated parameter shall be considered a violation of this permit. For temperature, see Daily Maximum Temperature.

6. “Daily Maximum Temperature (DM)” is defined in the Basic Standards and Methodologies for Surface Water 1002-31, as the highest two-hour average water temperature recorded during a given 24-hour period. This will be determined using a rolling 2-hour maximum temperature. If data is collected every 15 minutes, a 2 hour maximum can be determined on every data point after the initial 2 hours of collection. Note that the time periods that overlap days (Wednesday night to Thursday morning) do not matter as the reported value on the DMR is the greatest of all the 2-hour averages.

   For example data points collected at:
   08:15, 08:30, 08:45, 09:00, 09:15, 09:30, 09:45, 10:00, would be averaged for a single 2 hour average data point
   08:30, 08:45, 09:00, 09:15, 09:30, 09:45, 10:00, 10:15, would be averaged for a single 2 hour average data point
   08:45, 09:00, 09:15, 09:30, 09:45, 10:00, 10:15, 10:30, would be averaged for a single 2 hour average data point

   This would continue throughout the course of a calendar day. The highest of these 2 hour averages over a month would be reported on the DMR as the daily maximum temperature. At the end/beginning of a month, the collected data should be used for the month that contains the greatest number of minutes in the 2-hour maximum. Data from 11 pm to 12:59 am, would fall in the previous month. Data collected from 11:01 pm to 1:00 am would fall in the new month.

7. "Dissolved (D) metals fraction" is defined in the Basic Standards and Methodologies for Surface Water 1002-31, as that portion of a water and suspended sediment sample which passed through a 0.40 or 0.45 UM (micron) membrane filter. Determinations of "dissolved" constituents are made using the filtrate. This may include some very small (colloidal) suspended particles which passed through the membrane filter as well as the amount of substance present in true chemical solution.

8. “Geometric mean” for *E. coli* bacteria concentrations, the thirty (30) day and seven (7) day averages shall be determined as the geometric mean of all samples collected in a thirty (30) day period and the geometric mean of all samples taken in a seven (7) consecutive day period respectively. The geometric mean may be calculated using two different methods. For the methods shown, a, b, c, d, etc. are individual sample results, and n is the total number of samples.

   Method 1:

   Geometric Mean = $(a*b*c*d*...)^{(1/n)}$ "*" - means multiply

   Method 2:

   Geometric Mean = antilog ([log(a)+log(b)+log(c)+log(d)+...]/n)

   Graphical methods, even though they may also employ the use of logarithms, may introduce significant error and may not be used.

In calculating the geometric mean, for those individual sample results that are reported by the analytical laboratory to be "less than" a numeric value, a value of 1 should be used in the calculations. If all individual analytical results for the month are reported to be less than numeric values, then report "less than" the largest of those numeric values on the monthly DMR. Otherwise, report the calculated value.

For any individual analytical result of "too numerous to count" (TNTC), that analysis shall be considered to be invalid and another sample shall be promptly collected for analysis. If another sample cannot be collected within the same sampling period for which the invalid sample was collected (during the same month if monthly sampling is required, during the same week if weekly sampling is required, etc.), then the following procedures apply:

i. A minimum of two samples shall be collected for coliform analysis within the next sampling period.

ii. <u>If the sampling frequency is monthly or less frequent:</u> For the period with the invalid sample results, leave the spaces on the corresponding DMR for reporting coliform results empty and attach to the DMR a letter noting that a result of TNTC was obtained for that period, and explain why another sample for that period had not been collected.

<u>If the sampling frequency is more frequent than monthly:</u> Eliminate the result of TNTC from any further calculations, and use all the other results obtained within that month for reporting purposes. Attach a letter noting that a result of TNTC was obtained, and list all individual analytical results and corresponding sampling dates for that month.

9. "Grab" sample, is a single "dip and take" sample so as to be representative of the parameter being monitored.

10. “IC25” or “Inhibition Concentration” is a point estimate of the toxicant concentration that would cause a given percent reduction in a non-lethal biological measurement (e.g. growth or reproduction) calculated from a continuous model (i.e. interpolation method). IC25 is a point estimate of the toxic concentration that would cause a 25-percent reduction in a non-lethal biological measurement.

11. "In-situ" measurement is defined as a single reading, observation or measurement taken in the field at the point of discharge.

12. "Instantaneous" measurement is a single reading, observation, or measurement performed on site using existing monitoring facilities.

13. “LC50” or “Lethal Concentration” is the toxic or effluent concentration that would cause death in 50 percent of the test organisms over a specified period of time.

14. “Maximum Weekly Average Temperature (MWAT)” is defined in the Basic Standards and Methodologies for Surface Water 1002-31, as an implementation statistic that is calculated from field monitoring data. The MWAT is calculated as the largest mathematical mean of multiple, equally spaced, daily temperatures over a seven-day consecutive period, with a minimum of three data points spaced equally through the day. For lakes and reservoirs, the MWAT is assumed to be equivalent to the maximum WAT from at least three profiles distributed throughout the growing season (generally July-September).

    The MWAT is calculated by averaging all temperature data points collected during a calendar day, and then averaging the daily average temperatures for 7 consecutive days. This 7 day averaging period is a rolling average, i.e. on the 8th day, the MWAT will be the averages of the daily averages of days 2-8. The value to be reported on the DMR is the highest of all the rolling 7-day averages throughout the month. For those days that are at the end/beginning of the month, the data shall be reported for the month that contains 4 of the 7 days.

    Day 1: Average of all temperature data collected during the calendar day.
    Day 2: Average of all temperature data collected during the calendar day.
    Day 3: Average of all temperature data collected during the calendar day.
    Day 4: Average of all temperature data collected during the calendar day.
    Day 5: Average of all temperature data collected during the calendar day.
    Day 6: Average of all temperature data collected during the calendar day.
    Day 7: Average of all temperature data collected during the calendar day.
    1st MWAT Calculation as average of previous 7 days
    Day 8: Average of all temperature data collected during the calendar day.
    2nd MWAT Calculation as average of previous 7 days
    Day 9: Average of all temperature data collected during the calendar day.
    3rd MWAT Calculation as average of previous 7 days

15. “NOEC” or “No-Observed-Effect-Concentration” is the highest concentration of toxicant to which organisms are exposed in a full life cycle or partial life cycle (short term) test, that causes no observable adverse effects on the test organisms (i.e. the highest concentration of toxicant in which the values for the observed responses are not statistically different from the controls). This value is used, along with other factors, to determine toxicity limits in permits.

16. "Potentially dissolved (PD) metals fraction” is defined in the Basic Standards and Methodologies for Surface Water 1002-31, as that portion of a constituent measured from the filtrate of a water and suspended sediment sample that was first treated with nitric acid to a pH of 2 or less and let stand for 8 to 96 hours prior to sample filtration using a 0.40 or 0.45-UM (micron) membrane filter. Note the "potentially dissolved" method cannot be used where nitric acid will interfere with the analytical procedure used for the constituent measured.

17. “Practical Quantitation Limit (PQL)” means the minimum concentration of an analyte (substance) that can be measured with a high degree of confidence that the analyte is present at or above that concentration. The use of PQL in this document may refer to those PQLs shown in Part I.D of this permit or the PQLs of an individual laboratory.

18. "Quarterly measurement frequency" means samples may be collected at any time during the calendar quarter if a continual discharge occurs. If the discharge is intermittent, then samples shall be collected during the period that discharge occurs.

19. "Recorder" requires the continuous operation of a chart and/or totalizer (or drinking water rotor meters or pump hour meters where previously approved.)

20. "Seven (7) day average" means, with the exception of fecal coliform or *E. coli* bacteria (see geometric mean), the arithmetic mean of all samples collected in a seven (7) consecutive day period. Such seven (7) day averages shall be calculated for all calendar weeks, which are defined as beginning on Sunday and ending on Saturday. If the calendar week overlaps two months (i.e. the Sunday is in one month and the Saturday in the following month), the seven (7) day average calculated for that calendar week shall be associated with the month that contains the Saturday. Samples may not be used for more than one (1) reporting period. **(See the “Analytical and Sampling Methods for Monitoring and Reporting Section in Part I.D.3 for guidance on calculating averages and reporting analytical results that are less than the PQL).**

21. "Thirty (30) day average" means, except for fecal coliform or *E. coli* bacteria (see geometric mean), the arithmetic mean of all samples collected during a thirty (30) consecutive-day period. The permittee shall report the appropriate mean of all self-monitoring sample data collected during the calendar month on the Discharge Monitoring Reports. Samples shall not be used for more than one (1) reporting period. **(See the “Analytical and Sampling Methods for Monitoring and Reporting Section in Part I.D.3 for guidance on calculating averages and reporting analytical results that are less than the PQL).**

22. Toxicity Identification Evaluation (TIE) is a set of site-specific procedures used to identify the specific chemical(s) causing effluent toxicity.

23. "Total Metals" means the concentration of metals determined on an unfiltered sample following vigorous digestion (Section 4.1.3), or the sum of the concentrations of metals in both the dissolved and suspended fractions, as described in Manual of Methods for Chemical Analysis of Water and Wastes, U.S. Environmental Protection Agency, March 1979, or its equivalent.

24. “Total Recoverable Metals” means that portion of a water and suspended sediment sample measured by the total recoverable analytical procedure described in Methods for Chemical Analysis of Water and Wastes, U.S. Environmental Protection Agency, March 1979 or its equivalent.

25. Toxicity Reduction Evaluation (TRE) is a site-specific study conducted in a step-wise process to identify the causative agents of effluent toxicity, isolate the source of toxicity, evaluate the effectiveness of toxicity control options, and then confirm the reduction in effluent toxicity after the control measures are put in place.

26. "Twenty four (24) hour composite" sample is a combination of at least eight (8) sample aliquots of at least 100 milliliters, collected at equally spaced intervals during the operating hours of a facility over a twenty-four (24) hour period. For volatile pollutants, aliquots must be combined in the laboratory immediately before analysis. The composite must be flow proportional; either the time interval between each aliquot or the volume of each aliquot must be proportional to either the wastewater or effluent flow at the time of sampling or the total wastewater or effluent flow since the collection of the previous aliquot. Aliquots may be collected manually or automatically.

27. "Twice Monthly" monitoring frequency means that two samples shall be collected each calendar month on separate weeks with at least one full week between the two sample dates. Also, there shall be at least one full week between the second sample of a month and the first sample of the following month.

28. "Two (2) -Year Rolling Average" - Antidegradation limits apply as the average of all data collected in a two (2) year (24-month) period. These limits become effective upon the effective date of the permit, but are not reportable on a DMR until two years (typically 24 months) of data have been collected. After data has been collected for 24 months, the 30-day averages for each month are then averaged together to determine the two-year rolling average (using data from month 1 to month 24, then month 2 to month 25, month 3 to month 26, etc).

    For ammonia, two-year rolling averages may be set up for individual months, or may be grouped together for several months. For individual months (every month has a different two-year rolling average limit) the two-year average is reportable after two months of data are collected.

    Example: Permit is effective Jan 2010 and there is a two-year rolling average limit specific to the month of January.

    Jan 2010 DMR – Nothing to Report
    Jan 2011 DMR – 2-Year Average of Jan 2010 and Jan 2011
    Jan 2012 DMR – 2-Year Average of Jan 2011 and Jan 2012, etc.

    Where several months have the same two-year average limit, it is reportable on the DMR after two months of data have been collected for every month in the group.

    Example: Permit is effective Jan 2010 and there is a two-year rolling average limit specific to the months of Jan, Feb, June.

    1st Reportable DMR – June 2011 - 2-Year Average Jan 2010 Feb 2010 June 2010 Jan 2011 Feb 2011 June 2011
    2nd Reportable DMR – Jan 2012 - 2-Year Average Feb 2010 June 2010 Jan 2011 Feb 2011 June 2011 Jan 2012
    3rd Reportable DMR – Feb 2012 - 2-Year Average June 2010 Jan 2011 Feb 2011 June 2011 Jan 2012 Feb 2012, etc.

    (See the "Analytical and Sampling Methods for Monitoring and Reporting Section in Part I.D.3 for guidance on calculating averages and reporting analytical results that are less than the PQL).

29. "Visual" observation is observing the discharge to check for the presence of a visible sheen or floating oil.

30. "Water Quality Control Division" or "Division" means the state Water Quality Control Division as established in 25-8-101 et al.)

    Additional relevant definitions are found in the Colorado Water Quality Control Act, CRS §§ 25-8-101 et seq., the Colorado Discharge Permit System Regulations, Regulation 61 (5 CCR 1002-61) and other applicable regulations.

D. GENERAL MONITORING, SAMPLING AND REPORTING REQUIREMENTS

5. Routine Reporting of Data

Reporting of the data gathered in compliance with Part I.A or Part I.B shall be on a **monthly** basis. Reporting of all data gathered shall comply with the requirements of Part I.D. (General Requirements). Monitoring results shall be summarized for each calendar month and reported on Division approved discharge monitoring report (DMR) forms (EPA form 3320-1).

The permittee must submit these forms either by mail, or by using the Division's Net-DMR service (when available). If mailed, one form shall be mailed to the Division, as indicated below, so that the DMR is received no later than the 28th day of the following month (for example, the DMR for the first calendar quarter must be received by the Division by April 28th). If no discharge occurs during the reporting period, "No Discharge" shall be reported.

The original signed copy of each discharge monitoring report (DMR) shall be submitted to the Division at the following address:

Colorado Department of Public Health and Environment
Water Quality Control Division
WQCD-P-B2
4300 Cherry Creek Drive South
Denver, Colorado 80246-1530

The Discharge Monitoring Report forms shall be filled out accurately and completely in accordance with requirements of this permit and the instructions on the forms. They shall be signed by an authorized person as identified in Part I.D.8.

6. Representative Sampling

Samples and measurements taken for the respective identified monitoring points as required herein shall be representative of the volume and nature of the monitored discharge. All samples shall be taken at the monitoring points specified in this permit and, unless otherwise specified, before the effluent joins or is diluted by any other wastestream, body of water, or substance. Monitoring points shall not be changed without notification to and approval by the Division.

7. Influent and Effluent Sampling Points

Influent (if required) and effluent sampling points shall be so designed or modified so that: 1) a sample of the influent can be obtained after preliminary treatment and prior to primary or biological treatment and 2) a sample of the effluent can be obtained at a point after the final treatment process and prior to discharge to state waters. The permittee shall provide access to the Division to sample at these points.

8. Analytical and Sampling Methods for Monitoring and Reporting

The permittee shall install, calibrate, use and maintain monitoring methods and equipment, including biological and indicated pollutant monitoring methods. All sampling shall be performed by the permittee according to specified methods in 40 C.F.R. Part 136; methods approved by EPA pursuant to 40 C.F.R. Part 136; or methods approved by the Division, in the absence of a method specified in or approved pursuant to 40 C.F.R. Part 136.

Numeric Limits

If the permit contains a numeric effluent limit for a parameter, the analytical method and PQL selected for all monitoring conducted in accordance with this permit for that parameter shall be the one that can measure at or below the numeric effluent limit. If all specified analytical methods and corresponding PQLs are greater than the numeric effluent limit, then the analytical method with the lowest PQL shall be used.

When the analytical method which complies with the above requirements has a PQL greater than the permit limit, and the permittee's analytical result is less than the PQL (the PQL achieved by the lab), the permittee shall report "BDL" on the DMR. Such reports will not be considered as violations of the permit limit, as long as the PQL obtained is lower or equal to the PQL in the table below.

When the analytical method which complies with the above requirements has a PQL that is equal to or less than the permit limitation, and the permittee's analytical result is less than the PQL, "< X" (where X = the actual PQL achieved by the laboratory) shall be reported on the DMR. For parameters that have a report only limitation, and the permittee's analytical result is less than the PQL, "< X" (where X = the actual PQL achieved by the laboratory) shall be reported on the DMR.

Report Only Limits

If the permit contains a report only requirement for a parameter, the analytical method and PQL chosen shall be one that can measure at or below the potential numeric effluent limit(s) (maximum allowable pollutant concentration as shown in the WQA or fact sheet). If all analytical methods and corresponding PQLs are greater than the potential numeric effluent limit(s), then the analytical method with the lowest PQL shall be used.

When the analytical method which complies with the above requirements has a PQL that is equal to or less than the permit limitation, and the permittee's analytical result is less than the PQL, "< X" (where X = the actual PQL achieved by the laboratory) shall be reported on the DMR. For parameters that have a report only limitation, and the

permittee's analytical result is less than the PQL, "< X" (where X = the actual PQL achieved by the laboratory) shall be reported on the DMR.

Interim Report Only Followed By a Numeric Limit

If the permit contains an interim effluent limitation (a limit is report until such time as a numeric effluent limit becomes effective) for a parameter, the analytical method and PQL chosen for all monitoring conducted in accordance with this permit for the parameter shall be one that can measure to the final numeric effluent limit. If all analytical methods and corresponding PQLs are greater than the final numeric effluent limit (s), then the analytical method with the lowest PQL shall be used.

While the report only limit is effective, the reporting requirements shall follow those under the Report Only Limits section. Once the numeric limit is effective, the reporting requirements shall follow the numeric limits reporting requirements.

T.I.N.

For parameters such as TIN, the analytical methods chosen shall be those that can measure to the potential or final numeric effluent limit, based on the sum of the PQLs for nitrate, nitrite and ammonia.

Calculating Averages

In the calculation of average concentrations (i.e. daily average, 7- day average, 30-day average, 2-year rolling average) any individual analytical result that is less than the PQL shall be considered to be zero for the calculation purposes. When reporting:

If all individual analytical results are less than the PQL, the permittee shall report either "BDL" or "<X" (where X = the actual PQL achieved by the laboratory), following the guidance above.

If one or more individual results is greater than the PQL, an average shall be calculated and reported. Note that it does not matter if the final calculated average is greater or less than the PQL, **it must be reported as a value**.

Note that when calculating T.I.N. for a single sampling event, any value less than the PQL (for total ammonia, total nitrite, or total nitrate) shall be treated as zero. The T.I.N. concentration for a single sampling event shall then be determined as the sum of the analytical results (zeros if applicable) of same day sampling for total ammonia and total nitrite and total nitrate. From these calculated T.I.N. concentrations, the daily maximum and thirty day average concentrations shall be calculated and must be reported as a value.

PQLs

The present lowest PQLs for specific parameters, as determined by the State Laboratory (November 2008) are provided below. If the analytical method cannot achieve a PQL that is less than or equal to the permit limit, then the method, or a more precise method, must achieve a PQL that is less than or equal to the PQL in the table below. A listing of the PQLs for organic parameters that must meet the above requirement can be found in the Division's Practical Quantitation Limitation Guidance Document, July 2008. This document is available on the Division's website at www.coloradowaterpermits.com.

These limits apply to the total recoverable or the potentially dissolved fraction of metals.

For hexavalent chromium, samples must be unacidified so dissolved concentrations will be measured rather than potentially dissolved concentrations.

Parameter	Practical Quantitation Limits,	Parameter	Practical Quantitation Limits, µg/l
Aluminum	50 µg/l	Mercury	0.1 µg/l
Ammonia	1 mg/l	Mercury (low-level)	0.003 µg/l
Arsenic	1 µg/l	Nickel	50 µg/l
Barium	5 µg/l	N-Ammonia	50 µg/l
Beryllium	1 µg/l	N Nitrate/Nitrite	0.5 mg/l
BOD / CBOD	1 mg/l	N-Nitrate	50 µg/l
Boron	50 µg/l	N-Nitrite	10 µg/l
Cadmium	1 µg/l	Total Nitrogen	0.5 mg/l
Calcium	20 µg/l	Phenols	100 µg/l
Chloride	2 mg/l	Phosphorus	10 µg/l
Chlorine	0.1 mg/l	Radium 226	1 pCi/l
Total Residual Chlorine		Radium 228	1 pCi/l
DPD colorimetric	0.10 mg/l	Selenium	1 µg/l
Amperometric titration	0.05 mg/l	Silver	0.5 µg/l
Chromium	20 µg/l	Sodium	0.2 mg/l
Chromium, Hexavalent	20 µg/l	Sulfate	5 mg/l
Copper	5 µg/l	Sulfide	0.2 mg/l
Cyanide (Direct / Distilled)	10 µg/l	Total Dissolved Solids	10 mg/l
Cyanide, WAD+A47	10 µg/l	Total Suspended Solids	10 mg/l
Fluoride	0.1 mg/l	Thallium	1 µg/l
Iron	10 µg/l	Uranium	1 µg/l
Lead	1 µg/l	Zinc	10 µg/l
Magnesium	20 µg/l	Nonylphenol D7065	10 µg/l
Manganese	2 µg/l	Nonylphenol D7485	0.33 µg/l

9. Records

a. The permittee shall establish and maintain records. Those records shall include, but not be limited to, the following:

i. The date, type, exact place, and time of sampling or measurements;
ii. The individual(s) who performed the sampling or measurements;
iii. The date(s) the analyses were performed;
iv. The individual(s) who performed the analyses;
v. The analytical techniques or methods used; and
vi. The results of such analyses.
vii. Any other observations which may result in an impact on the quality or quantity of the discharge as indicated in 40 CFR 122.44 (i)(1)(iii).

b. The permittee shall retain for a minimum of three (3) years records of all monitoring information, including all original strip chart recordings for continuous monitoring instrumentation, all calibration and maintenance records, copies of all reports required by this permit and records of all data used to complete the application for this permit. This period of retention shall be extended during the course of any unresolved litigation regarding the discharge of pollutants by the permittee or when requested by the Division or Regional Administrator.

10. Flow Measuring Device

If not already a part of the permitted facility, within ninety (90) days after the effective date of the permit, a flow measuring device shall be installed to give representative values of effluent quantities at the respective discharge points. Unless specifically exempted, or modified in Part I.A of this permit, a flow measuring device will be applicable at all designated discharge points.

At the request of the Division, the permittee shall show proof of the accuracy of any flow-measuring device used in obtaining data submitted in the monitoring report. The flow-measuring device must indicate values within ten (10) percent of the actual flow being measured.

11. Signatory and Certification Requirements

a. All reports and other information required by the Division, shall be signed and certified for accuracy by the permittee in accord with the following criteria:

i) In the case of corporations, by a responsible corporate officer. For purposes of this section, the responsible corporate officer is responsible for the overall operation of the facility from which the discharge described in the form originates;

ii) In the case of a partnership, by a general partner;

iii) In the case of a sole proprietorship, by the proprietor;

iv) In the case of a municipal, state, or other public facility, by either a principal executive officer, or ranking elected official. For purposes of this section, a principal executive officer has responsibility for the overall operation of the facility from which the discharge originates;

v) By a duly authorized representative of a person described above, only if:

1) The authorization is made in writing by a person described in i, ii, iii, or iv above;

2) The authorization specifies either an individual or a position having responsibility for the overall operation of the regulated facility or activity such as the position of plant manager, operator of a well or a well field, superintendent, position of equivalent responsibility, or an individual or position having overall responsibility for environmental matters for the company. (A duly authorized representative may thus be either a named individual or any individual occupying a named position); and,

3) The written authorization is submitted to the Division.

b. If an authorization as described in this section is no longer accurate because a different individual or position has responsibility for the overall operation of the facility, a new authorization satisfying the requirements of this section must be submitted to the Division prior to or together with any reports, information, or applications to be signed by an authorized representative.

The permittee, or the duly authorized representative shall make and sign the following certification on all such documents:

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is to the best of my knowledge and belief, true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

PART II

A. NOTIFICATION REQUIREMENTS

1. Notification to Parties

All notification requirements under this section shall be directed as follows:

a. Oral Notifications**,** during normal business hours shall be to:

Water Quality Protection Section - Domestic Compliance Program
Water Quality Control Division
Telephone: (303) 692-3500

b. Written notification shall be to:

Water Quality Protection Section - Domestic Compliance Program
Water Quality Control Division
Colorado Department of Public Health and Environment
WQCD-WQP-B2
4300 Cherry Creek Drive South
Denver, CO 80246-1530

2. Change in Discharge

The permittee shall give advance notice to the Division, in writing, of any planned physical alterations or additions to the permitted facility. Notice is required only when:

a. The alteration or addition could significantly change the nature or increase the quantity of pollutants discharged, or;

b. The alteration or addition results in a significant change in the permittee's sludge use or disposal practices, and such alteration, addition, or change may justify the application of permit conditions that are different from or absent in the existing permit, including notification of additional use or disposal sites not reported pursuant to an approved land application plan.

Whenever notification of any planned physical alterations or additions to the permitted facility is required pursuant to this section, the permittee shall furnish the Division such plans and specifications which the Division deems reasonably necessary to evaluate the effect on the discharge, the stream, or ground water. If the Division finds that such new or altered discharge might be inconsistent with the conditions of the permit, the Division shall require a new or revised permit application and shall follow the procedures specified in Sections 61.5 through 61.6, and 61.15 of the Colorado Discharge Permit System Regulations.

3. Noncompliance Notification

The permittee shall give advance notice to the Division, in writing, of any planned changes in the permitted facility or activity that may result in noncompliance with permit requirements.

a. If, for any reason, the permittee does not comply with or will be unable to comply with any discharge limitations or standards specified in this permit, the permittee shall, at a minimum, provide the Division and EPA with the following information:

i) A description of the noncompliance and its cause;

ii) The period of noncompliance, including exact dates and times and/or the anticipated time when the discharge will return to compliance; and

iii) Steps being taken to reduce, eliminate, and prevent recurrence of the noncomplying discharge.

b. The permittee shall report the following circumstances **orally within twenty-four (24) hours** from the time the permittee becomes aware of the circumstances, and shall mail to the Division a written report containing the information requested in Part II.A.4 (a) **within five (5) working days** after becoming aware of the following circumstances:

i) Circumstances leading to any noncompliance which may endanger health or the environment regardless of the cause of the incident;

ii) Circumstances leading to any unanticipated bypass which exceeds any effluent limitations in the permit;

iii) Circumstances leading to any upset which causes an exceedance of any effluent limitation in the permit;

iv) Daily maximum violations for any of the pollutants limited by Part I.A of this permit as specified in Part III of this permit. This includes any toxic pollutant or hazardous substance or any pollutant specifically identified as the method to control any toxic pollutant or hazardous substance.

c. Unless otherwise indicated in this permit, the permittee shall report instances of non-compliance which are not required to be reported within 24-hours at the time Discharge Monitoring Reports are submitted. The reports shall contain the information listed in sub-paragraph (a) of this section.

4. Transfer of Ownership or Control

The permittee shall notify the Division, in writing, thirty (30) calendar days in advance of a proposed transfer of the permit.

a. Except as provided in paragraph b. of this section, a permit may be transferred by a permittee only if the permit has been modified or revoked and reissued as provided in Section 61.8(8) of the Colorado Discharge Permit System Regulations, to identify the new permittee and to incorporate such other requirements as may be necessary under the Federal Act.

b. A permit may be automatically transferred to a new permittee if:

i) The current permittee notifies the Division in writing 30 calendar days in advance of the proposed transfer date; and

ii) The notice includes a written agreement between the existing and new permittee(s) containing a specific date for transfer of permit responsibility, coverage and liability between them; and

iii) The Division does not notify the existing permittee and the proposed new permittee of its intent to modify, or revoke and reissue the permit.

iv) Fee requirements of the Colorado Discharge Permit System Regulations, Section 61.15, have been met.

5. Other Notification Requirements

Reports of compliance or noncompliance with, or any progress reports on, interim and final requirements contained in any compliance schedule in the permit, shall be submitted on the date listed in the compliance schedule section. The fourteen (14) calendar day provision in Regulation 61.8(4)(n)(i) has been incorporated into the due date.

The permittee's notification of all anticipated noncompliance does not stay any permit condition.

All existing manufacturing, commercial, mining, and silvicultural dischargers must notify the Division as soon as they know or have reason to believe:

a. That any activity has occurred or will occur which would result in the discharge, on a routine or frequent basis, of any toxic pollutant which is not limited in the permit, if that discharge will exceed the highest of the following "notification levels":

i) One hundred micrograms per liter (100 µg/l);

ii) Two hundred micrograms per liter (200 µg/l) for acrolein and acrylonitrile; five hundred micrograms per liter (500 µg/l) for 2.4-dinitrophenol and 2-methyl-4.6-dinitrophenol; and one milligram per liter (1.0 mg/l) for antimony;

iii) Five (5) times the maximum concentration value reported for that pollutant in the permit application in accordance with Section 61.4(2)(g).

iv) The level established by the Division in accordance with 40 C.F.R. § 122.44(f).

b. That any activity has occurred or will occur which would result in any discharge, on a non-routine or infrequent basis, of a toxic pollutant which is not limited in the permit, if that discharge will exceed the highest of the following "notification levels":

i) Five hundred micrograms per liter (500 µg/l);

ii) One milligram per liter (1 mg/l) for antimony; and

iii) Ten (10) times the maximum concentration value reported for that pollutant in the permit application.

iv) The level established by the Division in accordance with 40 C.F.R. § 122.44(f).

6. Bypass Notification

If the permittee knows in advance of the need for a bypass, a notice shall be submitted, at least ten (10) calendar days before the date of the bypass, to the Division. The bypass shall be subject to Division approval and limitations imposed by the Division. Violations of requirements imposed by the Division will constitute a violation of this permit.

7. Bypass

a. "Bypass" means the intentional diversion of waste streams from any portion of a treatment facility.

b. Bypasses are prohibited and the Division may take enforcement action against the permittee for bypass, unless:

i) The bypass is unavoidable to prevent loss of life, personal injury, or severe property damage;

ii) There were no feasible alternatives to bypass such as the use of auxiliary treatment facilities, retention of untreated wastes, or maintenance during normal periods of equipment downtime. This condition is not satisfied if adequate back-up equipment should have been installed in the exercise of reasonable engineering judgment to prevent a bypass which occurred during normal periods of equipment downtime or preventive maintenance; and

iii) Proper notices were submitted in compliance with Part II.A.5.

c. "Severe property damage" as used in this Subsection means substantial physical damage to the treatment facilities which causes them to become inoperable, or substantial and permanent loss of natural resources which can reasonably be expected to occur in the absence of a bypass. Severe property damage does not mean economic loss caused by delays in production.

d. The permittee may allow a bypass to occur which does not cause effluent limitations to be exceeded, but only if it also is for essential maintenance or to assure optimal operation. These bypasses are not subject to the provisions of paragraph (a) above.

e. The Division may approve an anticipated bypass, after considering adverse effects, if the Division determines that the bypass will meet the conditions specified in paragraph (a) above.

8. Upsets

a. "Upset" means an exceptional incident in which there is unintentional and temporary noncompliance with permit effluent limitations because of factors beyond the reasonable control of the permittee. An upset does not include noncompliance to the extent caused by operational error, improperly designed treatment facilities, inadequate treatment facilities, lack of preventative maintenance, or careless or improper operation.

b. Effect of an Upset

An upset constitutes an affirmative defense to an action brought for noncompliance with permit effluent limitations if the requirements of paragraph (b) of this section are met. No determination made during administrative review of claims that noncompliance was caused by upset, and before an action for noncompliance, is final administrative action subject to judicial review.

c. Conditions Necessary for a Demonstration of Upset

A permittee who wishes to establish the affirmative defense of upset shall demonstrate through properly signed contemporaneous operating logs, or other relevant evidence that:

i) An upset occurred and that the permittee can identify the specific cause(s) of the upset; and

ii) The permitted facility was at the time being properly operated and maintained; and

iii) The permittee submitted proper notice of the upset as required in Part II.A.4. of this permit (24-hour notice); and
iv) The permittee complied with any remedial measure necessary to minimize or prevent any discharge or sludge use or disposal in violation of this permit which has a reason able likelihood of adversely affecting human health or the environment.

In addition to the demonstration required above, a permittee who wishes to establish the affirmative defense of upset for a violation of effluent limitations based upon water quality standards shall also demonstrate through monitoring, modeling or other methods that the relevant standards were achieved in the receiving water.

d. Burden of Proof

In any enforcement proceeding the permittee seeking to establish the occurrence of an upset has the burden of proof.

9. Submission of Incorrect or Incomplete Information

Where the permittee becomes aware that it failed to submit any relevant facts in a permit application, or submitted incorrect information in a permit application or in any report to the Division, the permittee shall promptly submit such facts or information.

B. RESPONSIBILITIES

1. Reduction, Loss, or Failure of Treatment Facility

The permittee has the duty to halt or reduce any activity if necessary to maintain compliance with the effluent limitations of the permit. Upon reduction, loss, or failure of the treatment facility, the permittee shall, to the extent necessary to maintain compliance with its permit, control production, control sources of wastewater, or all discharges, until the facility is restored or an alternative method of treatment is provided. This provision also applies to power failures, unless an alternative power source sufficient to operate the wastewater control facilities is provided.

It shall not be a defense for a permittee in an enforcement action that it would be necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit.

2. Inspections and Right to Entry

The permittee shall allow the Division and/or the authorized representative, upon the presentation of credentials:

a. To enter upon the permittee's premises where a regulated facility or activity is located or in which any records are required to be kept under the terms and conditions of this permit;

b. At reasonable times to have access to and copy any records required to be kept under the terms and conditions of this permit and to inspect any monitoring equipment or monitoring method required in the permit; and

c. To enter upon the permittee's premises in a reasonable manner and at a reasonable time to inspect and/or investigate, any actual, suspected, or potential source of water pollution, or to ascertain compliance or non compliance with the Colorado Water Quality Control Act or any other applicable state or federal statute or regulation or any order promulgated by the Division. The investigation may include, but is not limited to, the following: sampling of any discharge and/or process waters, the taking of photographs, interviewing of any person having knowledge related to the discharge permit or alleged violation, access to any and all facilities or areas within the permittee's premises that may have any affect on the discharge, permit, or alleged violation. Such entry is also authorized for the purpose of inspecting and copying records required to be kept concerning any effluent source.

d. The permittee shall provide access to the Division to sample the discharge at a point after the final treatment process but prior to the discharge mixing with state waters upon presentation of proper credentials.

In the making of such inspections, investigations, and determinations, the Division, insofar as practicable, may designate as its authorized representatives any qualified personnel of the Department of Agriculture. The Division may also request assistance from any other state or local agency or institution.

3. Duty to Provide Information

The permittee shall furnish to the Division, within a reasonable time, any information which the Division may request to determine whether cause exists for modifying, revoking and reissuing, or terminating this permit, or to determine compliance with this permit. The permittee shall also furnish to the Division, upon request, copies of records required to be kept by this permit.

4. Availability of Reports

Except for data determined to be confidential under Section 308 of the Federal Clean Water Act and the Colorado Discharge Permit System Regulations 5 CCR 1002-61, Section 61.5(4), all reports prepared in accordance with the terms of this permit shall be available for public inspection at the offices of the Division and the Environmental Protection Agency.

The name and address of the permit applicant(s) and permittee(s), permit applications, permits and effluent data shall not be considered confidential. Knowingly making false statement on any such report may result in the imposition of criminal penalties as provided for in Section 309 of the Federal Clean Water Act, and Section 25-8-610 C.R.S.

5. Modification, Suspension, Revocation, or Termination of Permits By the Division

The filing of a request by the permittee for a permit modification, revocation and reissuance, termination or a notification of planned changes or anticipated noncompliance, does not stay any permit condition.

a. A permit may be modified, suspended, or terminated in whole or in part during its term for reasons determined by the Division including, but not limited to, the following:

   i) Violation of any terms or conditions of the permit;

   ii) Obtaining a permit by misrepresentation or failing to disclose any fact which is material to the granting or denial of a permit or to the establishment of terms or conditions of the permit; or

   iii) Materially false or inaccurate statements or information in the permit application or the permit.

   iv) A determination that the permitted activity endangers human health or the classified or existing uses of state waters and can only be regulated to acceptable levels by permit modifications or termination.

b. A permit may be modified in whole or in part for the following causes, provided that such modification complies with the provisions of Section 61.10 of the Colorado Discharge Permit System Regulations:

   i) There are material and substantial alterations or additions to the permitted facility or activity which occurred after permit issuance which justify the application of permit conditions that are different or absent in the existing permit.

   ii) The Division has received new information which was not available at the time of permit issuance (other than revised regulations, guidance, or test methods) and which would have justified the application of different permit

conditions at the time of issuance. For permits issued to new sources or new dischargers, this cause includes information derived from effluent testing required under Section 61.4(7)(e) of the Colorado Discharge Permit System Regulations. This provision allows a modification of the permit to include conditions that are less stringent than the existing permit only to the extent allowed under Section 61.10 of the Colorado Discharge Permit System Regulations.

iii) The standards or regulations on which the permit was based have been changed by promulgation of amended standards or regulations or by judicial decision after the permit was issued. Permits may be modified during their terms for this cause only as follows:

(A) The permit condition requested to be modified was based on a promulgated effluent limitation guideline, EPA approved water quality standard, or an effluent limitation set forth in 5 CCR 1002-62, § 62 et seq.; and

(B) EPA has revised, withdrawn, or modified that portion of the regulation or effluent limitation guideline on which the permit condition was based, or has approved a Commission action with respect to the water quality standard or effluent limitation on which the permit condition was based; and

(C) The permittee requests modification after the notice of final action by which the EPA effluent limitation guideline, water quality standard, or effluent limitation is revised, withdrawn, or modified; or

(D) For judicial decisions, a court of competent jurisdiction has remanded and stayed EPA promulgated regulations or effluent limitation guidelines, if the remand and stay concern that portion of the regulations or guidelines on which the permit condition was based and a request is filed by the permittee in accordance with this Regulation, within ninety (90) calendar days of judicial remand.

iv) The Division determines that good cause exists to modify a permit condition because of events over which the permittee has no control and for which there is no reasonable available remedy.

v) Where the Division has completed, and EPA approved, a total maximum daily load (TMDL) which includes a wasteload allocation for the discharge(s) authorized under the permit.

vi) The permittee has received a variance.

vii) When required to incorporate applicable toxic effluent limitation or standards adopted pursuant to § 307(a) of the Federal act.

viii) When required by the reopener conditions in the permit.

ix) As necessary under 40 C.F.R. 403.8(e), to include a compliance schedule for the development of a pretreatment program.

x) When the level of discharge of any pollutant which is not limited in the permit exceeds the level which can be achieved by the technology-based treatment requirements appropriate to the permittee under Section 61.8(2) of the Colorado Discharge Permit System Regulations.

xi) To establish a pollutant notification level required in Section 61.8(5) of the Colorado Discharge Permit System Regulations.

xii) To correct technical mistakes, such as errors in calculation, or mistaken interpretations of law made in determining permit conditions, to the extent allowed in Section 61.10 of the Colorado State Discharge Permit System Regulations.

xiii) When required by a permit condition to incorporate a land application plan for beneficial reuse of sewage sludge, to revise an existing land application plan, or to add a land application plan.

xiv) When another State whose waters may be affected by the discharge has not been notified.

xv) For any other cause provided in Section 61.10 of the Colorado Discharge Permit System Regulations.

c. At the request of a permittee, the Division may modify or terminate a permit and issue a new permit if the following conditions are met:

   i) The Regional Administrator has been notified of the proposed modification or termination and does not object in writing within thirty (30) calendar days of receipt of notification,

   ii) The Division finds that the permittee has shown reasonable grounds consistent with the Federal and State statutes and regulations for such modifications or termination;

   iii) Requirements of Section 61.15 of the Colorado Discharge Permit System Regulations have been met, and

   iv) Requirements of public notice have been met.

d. For permit modification, termination, or revocation and reissuance, the Division may request additional information from the permittee. In the case of a modified permit, the Division may require the submission of an updated application. In the case of revoked and reissued permit, the Division shall require the submission of a new application.

e. Permit modification (except for minor modifications), termination or revocation and reissuance actions shall be subject to the requirements of Sections 61.5(2), 61.5(3), 61.6, 61.7 and 61.15 of the Colorado Discharge Permit System Regulations. The Division shall act on a permit modification request, other than minor modification requests, within 180 calendar days of receipt thereof. Except for minor modifications, the terms of the existing permit govern and are enforceable until the newly issued permit is formally modified or revoked and reissued following public notice.

f. Upon consent by the permittee, the Division may make minor permit modifications without following the requirements of Sections 61.5(2), 61.5(3), 61.7, and 61.15 of the Colorado Discharge Permit System Regulations. Minor modifications to permits are limited to:

   i) Correcting typographical errors; or

   ii) Increasing the frequency of monitoring or reporting by the permittee; or

   iii) Changing an interim date in a schedule of compliance, provided the new date of compliance is not more than 120 calendar days after the date specific in the existing permit and does not interfere with attainment of the final compliance date requirement; or

   iv) Allowing for a transfer in ownership or operational control of a facility where the Division determines that no other change in the permit is necessary, provided that a written agreement containing a specific date for transfer of permit responsibility, coverage and liability between the current and new permittees has been submitted to the Division; or

   v) Changing the construction schedule for a discharger which is a new source, but no such change shall affect a discharger's obligation to have all pollution control equipment installed and in operation prior to discharge; or

   vi) Deleting a point source outfall when the discharge from that outfall is terminated and does not result in discharge of pollutants from other outfalls except in accordance with permit limits.

   vii) Incorporating conditions of a POTW pretreatment program that has been approved in accordance with the procedures in 40 CFR 403.11 (or a modification thereto that has been approved in accordance with the procedures in 40 CFR 403.18) as enforceable conditions of the POTW's permits.

g. When a permit is modified, only the conditions subject to modification are reopened. If a permit is revoked and reissued, the entire permit is reopened and subject to revision and the permit is reissued for a new term.

h. The filing of a request by the permittee for a permit modification, revocation and reissuance or termination does not stay any permit condition.

i. All permit modifications and reissuances are subject to the antibacksliding provisions set forth in 61.10(e) through (g).

j. If cause does not exist under this section, the Division shall not modify or revoke and reissue the permit.

6. <u>Oil and Hazardous Substance Liability</u>

Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities, or penalties to which the permittee is or may be subject to under Section 311 (Oil and Hazardous Substance Liability) of the Clean Water Act.

7. State Laws

Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities, or penalties established pursuant to any applicable State law or regulation under authority granted by Section 510 of the Clean Water Act. Nothing in this permit shall be construed to prevent or limit application of any emergency power of the division.

8. Permit Violations

Failure to comply with any terms and/or conditions of this permit shall be a violation of this permit. The discharge of any pollutant identified in this permit more frequently than or at a level in excess of that authorized shall constitute a violation of the permit. Except as provided elsewhere in this permit, nothing in this permit shall be construed to relieve the permittee from civil or criminal penalties for noncompliance (40 CFR 122.41(a)(1)).

9. Severability

The provisions of this permit are severable. If any provisions or the application of any provision of this permit to any circumstances, is held invalid, the application of such provision to other circumstances and the application of the remainder of this permit shall not be affected.

10. Confidentiality

Any information relating to any secret process, method of manufacture or production, or sales or marketing data which has been declared confidential by the permittee, and which may be acquired, ascertained, or discovered, whether in any sampling investigation, emergency investigation, or otherwise, shall not be publicly disclosed by any member, officer, or employee of the Commission or the Division, but shall be kept confidential. Any person seeking to invoke the protection of this Subsection (12) shall bear the burden of proving its applicability. This section shall never be interpreted as preventing full disclosure of effluent data.

11. Fees

The permittee is required to submit payment of an annual fee as set forth in the 2005 amendments to the Water Quality Control Act. Section 25-8-502 (l) (b), and the Colorado Discharge Permit System Regulations 5 CCR l002-61, Section 61.l5 as amended. Failure to submit the required fee when due and payable is a violation of the permit and will result in enforcement action pursuant to Section 25-8-60l et. seq., C.R.S. l973 as amended.

12. Duration of Permit

The duration of a permit shall be for a fixed term and shall not exceed five (5) years. If the permittee desires to continue to discharge, a permit renewal application shall be submitted at least one hundred eighty (180) calendar days before this permit expires. Filing of a timely and complete application shall cause the expired permit to continue in force to the effective date of the new permit. The permit's duration may be extended only through administrative extensions and not through interim modifications.If the permittee anticipates there will be no discharge after the expiration date of this permit, the Division should be promptly notified so that it can terminate the permit in accordance with Part II.B.4.

13. Section 307 Toxics

If a toxic effluent standard or prohibition, including any applicable schedule of compliance specified, is established by regulation pursuant to Section 307 of the Federal Act for a toxic pollutant which is present in the permittee's discharge and such standard or prohibition is more stringent than any limitation upon such pollutant in the discharge permit, the Division shall institute proceedings to modify or revoke and reissue the permit to conform to the toxic effluent standard or prohibition.

14. Effect of Permit Issuance

a. The issuance of a permit does not convey any property or water rights in either real or personal property, or stream flows or any exclusive privilege.

b. The issuance of a permit does not authorize any injury to person or property or any invasion of personal rights, nor does it authorize the infringement of federal, state, or local laws or regulations.

c. Except for any toxic effluent standard or prohibition imposed under Section 307 of the Federal act or any standard for sewage sludge use or disposal under Section 405(d) of the Federal act, compliance with a permit during its term constitutes compliance, for purposes of enforcement, with Sections 301, 302, 306, 318, 403, and 405(a) and (b) of the Federal act. However, a permit may be modified, revoked and reissued, or terminated during its term for cause as set forth in Section 61.8(8) of the Colorado Discharge Permit System Regulations.

d. Compliance with a permit condition which implements a particular standard for biosolid use or disposal shall be an affirmative defense in any enforcement action brought for a violation of that standard for biosolid use or disposal.

PART III
CATEGORICAL INDUSTRIES

Aluminum Forming
Asbestos Manufacturing
Battery Manufacturing
Builders' Paper and Board Mills
Canned & Preserved Fruits and Vegetables Processing
Canned & Preserved Seafood Processing
Carbon Black Manufacturing
Cement Manufacturing
Coal Mining
Coil Coating
Copper Forming
Dairy Products Processing
Electrical and Electronic Components
Electroplating
Explosives Manufacturing
Feedlots
Ferroalloy Manufacturing
Fertilizer Manufacturing
Glass Manufacturing
Grain Mills
Gum and Wood Chemicals Manufacturing
Hospital
Ink Formulation
Inorganic Chemicals Manufacturing
Iron and Steel Manufacturing
Leather Tanning and Finishing
Meat Products
Metal Finishing
Metal Molding and Casting (Foundries)
Mineral Mining and Processing
Nonferrous Metals Manufacturing
Nonferrous Metals Forming and Metal Powders
Oil and Gas Extraction
Organic Chemicals, Plastics, and Synthetic Fibers
Ore Mining and Dressing
Paint Formulation
Paving and Roofing Materials (Tars and Asphalt)
Pesticide Chemicals
Petroleum Refining
Pharmaceutical Manufacturing
Phosphate Manufacturing
Photographic
Plastics Molding and Forming
Porcelain Enameling
Pulp, Paper, and Paperboard Manufacturing
Rubber Manufacturing
Soap and Detergent Manufacturing
Steam Electric Power Generating
Sugar Processing
Textile Mills
Timber Products Processing

PRIORITY POLLUTANTS AND HAZARDOUS SUBSTANCES
ORGANIC TOXIC POLLUTANTS IN EACH OF FOUR FRACTIONS
IN ANALYSIS BY GAS CHROMATOGRAPHY/MASS SPECTROSCOPY (GC/MS)

Volatiles	**Base/Neutral**	**Acid Compounds**	**Pesticides**
acrolein	acenaphthene	2-chlorophenol	aldrin
acrylonitrile	acenaphthylene	2,4-dichlorophenol	alpha-BHC
benzene	anthracene	2,4,-dimethylphenol	beta-BHC
bromoform	benzidine	4,6-dinitro-o-cresol	gamma-BHC
carbon tetrachloride	benzo(a)anthracene	2,4-dinitrophenol	delta-BHC
chlorobenzene	benzo(a)pyrene	2-nitrophenol	chlordane
chlorodibromomethane	3,4-benzofluoranthene	4-nitrophenol	4,4'-DDT
chloroethane	benzo(ghi)perylene	p-chloro-m-cresol	4,4'-DDE
2-chloroethylvinyl ether	benzo(k)fluoranthene	pentachlorophenol	4,4'-DDD
chloroform	bis(2-chloroethoxy)methane	phenol	dieldrin
dichlorobromomethane	bis(2-chloroethyl)ether	2,4,6-trichlorophenol	alpha-endosulfan
1,1-dichlorethane	bis(2-chloroisopropyl)ether		beta-endosulfan
1,2-dichlorethane	bis(2-ethylhexyl)phthalate		endosulfan sulfate
1,1-dichlorethylene	4-bromophenyl phenyl ether		endrin
1,2-dichlorpropane	butylbenzyl phthalate		endrin aldehyde
1,3-dichlorpropylene	2-chloronaphthalene		heptachlor
ethylbenzene	4-chlorophenyl phenyl ether		heptachlor epoxide
methyl bromide	chrysene		PCB-1242
methyl chloride	dibenzo(a,h)anthracene		PCB-1254
methylene chloride	1,2-dichlorobenzene		PCB-1221

PRIORITY POLLUTANTS AND HAZARDOUS SUBSTANCES

ORGANIC TOXIC POLLUTANTS IN EACH OF FOUR FRACTIONS
IN ANALYSIS BY GAS CHROMATOGRAPHY/MASS SPECTROSCOPY (GC/MS)

Volatiles	Base/Neutral	Acid Compounds	Pesticides
1,1,2,2-tetrachloroethane	1,3-dichlorobenzene		PCB-1232
tetrachloroethylene	1,4-dichlorobenzene		PCB-1248
toluene	3,3-dichlorobenzidine		PCB-1260
1,2-trans-dichloroethylene	diethyl phthalate		PCB-1016
1,1,1-trichloroethane	dimethyl phthalate		toxaphene
1,1,2-trichloroethane	di-n-butyl phthalate		
trichloroethylene	2,4-dinitrotoluene		
vinyl chloride	2,6-dinitrotoluene		
	di-n-octyl phthalate		
	1,2-diphenylhydrazine (as azobenzene)		
	fluorene		
	fluoranthene		
	hexachlorobenzene		
	hexachlorobutadiene		
	hexachlorcyclopentadiene		
	hexachloroethane		
	indeno(1,2,3-cd)pyrene		
	isophorone		
	naphthalene		
	nitrobenzene		
	N-nitrosodimethylamine		
	N-nitrosodi-n-propylamine		
	N-nitrosodiphenylamine		
	phenanthrene		
	pyrene		
	1,2,4-trichlorobenzene		

OTHER TOXIC POLLUTANTS (AMMONIA, METALS AND CYANIDE) AND TOTAL PHENOLS

Antimony, Total
Arsenic, Total
Beryllium, Total
Cadmium, Total
Chromium, Total
Copper, Total
Lead, Total
Mercury, Total
Nickel, Total
Selenium, Total
Silver, Total
Thallium, Total
Zinc, Total
Cyanide, Total
Phenols, Total

TOXIC POLLUTANTS AND HAZARDOUS SUBSTANCES

REQUIRED TO BE IDENTIFIED BY EXISTING DISCHARGERS
IF EXPECTED TO BE PRESENT

Toxic Pollutants

Asbestos

Hazardous Substances

Acetaldehyde
Allyl alcohol
Allyl chloride
Amyl acetate
Aniline
Benzonitrile
Benzyl chloride
Butyl acetate
Butylamine
Captan
Carbaryl
Carbofuran
Carbon disulfide
Chlorpyrifos
Coumaphos
Cresol
Crotonaldehyde
Cyclohexane
2,4-D(2,4-Dichlorophenoxy acetic acid)
Diazinon
Dicamba
Dichlobenil
Dichlone
2,2-Dichloropropionic acid
Dichlorvos
Diethyl amine
Dimethyl amine
Dinitrobenzene
Diquat
Disulfoton
Diuron
Epichlorohydrin
Ethanolamine
Ethion
Ethylene diamine
Ethylene dibromide
Formaldehyde
Furfural
Guthion
Isoprene
Isopropanolamine
Keithane
Kepone
Malathion
Mercaptodimethur
Methoxychlor
Methyl mercaptan
Methyl methacrylate
Methyl parathion
Mexacarbate
Monoethyl amine
Monomethyl amine
Naled
Napthenic acid
Nitrotoluene
Parathion
Phenolsulfanate
Phosgene
Propargite
Propylene oxide
Pyrethrins
Quinoline
Resorcinol
Strontium
Strychnine
Styrene
TDE (Tetrachlorodiphenylethane)
2,4,5-T (2,4,5-Trichlorophenoxy acetic acid)
2,4,5-TP [2-(2,4,5-Trichlorophenoxy) propanoic acid]
Trichlorofan
Triethylamine
Trimethylamine
Uranium
Vandium
Vinyl Acetate
Xylene
Xylenol
Zirconium

Appendix B
Grand Island Resources
Standard Operating Procedures
Water Quality Monitoring and Sampling

STANDARD OPERATING PROCEDURE #1

EQUIPMENT DECONTAMINATION

Prepared by:
Telesto Solutions, Inc.
2950 E. Harmony Road, Suite 200
Fort Collins, CO 80528

September, 2009

TELESTO
SOLUTIONS • INCORPORATED

TABLE OF CONTENTS

1.0 PURPOSE AND SCOPE

The purpose of this document is to define the standard procedure for decontamination. The American Society for Testing and Materials (ASTM) Standard Practice for Decontamination of Field Equipment Used at Nonradioactive Waste Sites (D 5088-90) was used as a guide in preparing this Standard Operating Procedure (SOP).

The overall objective of multimedia sampling programs is to obtain samples that accurately depict the chemical, physical, and/or biological conditions at the sampling site. Extraneous contaminants can be brought onto the sampling location and/or be introduced into the medium of interest during the sampling program (e.g., by bailing or pumping ground water with equipment that was previously contaminated at another site). Trace quantities of these contaminants can thus infect a sample and lead to false positive analytical results and, ultimately, to an incorrect assessment of the contaminant conditions at the site. Decontamination of sampling equipment (e.g., bailers, pumps, tubing, and soil and sediment sampling equipment) and field support equipment (e.g., drill rigs and vehicles) is therefore required to ensure that sampling cross-contamination is prevented and that on-site contaminants are not carried off-site.

2.0 RELATED STANDARD OPERATING PROCEDURES

This procedure is intended to be used with the following SOP:

SOP #	Title
7	Sample Documentation, Handling, Packaging, and Chain of Custody

3.0 EQUIPMENT NECESSARY FOR DECONTAMINATION

The following equipment may be needed to perform decontamination:

- Brushes
- Wash tubs (plastic)
- Buckets (plastic)
- Scrapers
- Steam cleaner or hot water washer
- Paper towels
- Liquinox detergent (or equivalent)
- Potable water
- Deionized water
- Garden type water sprayers
- Laboratory wash bottles
- Clean plastic sheeting and/or trash bags.

4.0 DECONTAMINATION PROCEDURES

4.1 General Decontamination Procedures for All Equipment

Decontaminate all equipment that will contact a sampled media. General procedures that apply to most specific decontamination procedures are listed below.

- Dress in suitable safety equipment to reduce personal exposure.
- Wear clean or new rubber or latex gloves during decontamination activities and when handling decontaminated equipment.
- Do not decontaminate new equipment, such as disposable filters and silicon tubing, that is certified clean by the manufacturer.

- Decontaminate all wash/rinse tubs before intial use and between boreholes.

- Replace rinse and detergent waters, unless in garden sprayers, with new solutions between borings or sample locations. In some cases, new solutions may be needed between samples in the same location.

- Following decontamination, place equipment in a clean area or on clean plastic sheeting to prevent contact with contaminated soil. If the equipment will not be used immediately, cover the equipment or wrap it in plastic sheeting or heavy duty trash bags to minimize potential airborne contamination.

4.2 Decontaminating Sampling Equipment

Decontaminate sampling equipment as follows:

1. Scrape off gross contamination from equipment at the sampling or construction site.

2. For equipment that water will not damage, place the equipment in a wash tub containing Liquinox and potable water or spray the equipment with a Liquinox/potable water solution contained within a garden type sprayer, and scrub the equipment with a bristle brush or similar utensil (if possible).

3. In a second wash tub or using a second garden sprayer, triple rinse equipment with potable water to remove the Liquinox solution.

4. Triple rinse the equipment with deionized water from a garden sprayer or laboratory wash bottles, and let the equipment air dry (if possible).

4.3 Decontaminating Submersible Pumps

Decontaminate the insides of an electric submersible pump and discharge hose (e.g., a Redi-Flo 2 pump) as follows:

1. Before performing internal decontamination, remove the Redi-Flo2 internal pump fluid and replace it with deionized water (see the Red-Flo2 owners manual).

2. Pump Liquinox/potable water solution through the pump and hose. Be sure that the volume of solution used is not less than one volume of fluid contained in the

pump and hose. (Note that a Redi-Flo2 pump with 250 feet of 0.5-inch inner-diameter hose contains 2.55 gallons of fluid.)

3. Pump potable rinse water through the pump and hose. Be sure that the volume of solution used is not less than three times the volume of fluid contained in the pump and hose.

4. Pump deionized rinse water through the pump and hose. Be sure that the volume of solution used is not less than three times the volume of fluid contained in the pump and hose.

Decontaminate the outside of the pump and discharge hose as follows:

1. When removing the pump and hose from the well, place the hose reel 10 to 20 feet away from the well to allow the hose to be decontaminated before placing it on the reel. Do not let decontamination fluids enter the well.

2. While removing the pump from the well, wash the outside of the pump and hose with Liquinox/potable water solution and triple rinse it with potable water.

3. Triple rinse the hose with deionized water before placing the hose on the reel and/or triple rinse the hose with deionized water while lowering the pump into the next well. If the pump and hose are exposed to airborn contaminants (e.g., dust and mud), rinse the pump and hose while lowering the pump down the next well.

4.4 Decontaminating Water Level Probes

Decontaminate water level probes by using the general decontamination procedures for sampling equipment (Section 4.2) or by wiping them successively with paper towels wetted with Liquinox 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.

4.5 Decontaminating Delicate Equipment

Carefully wipe clean equipment that water will damage successively with paper towels wetted with Liquinox solution, potable water, and deionized water. Be sure to avoid damaging the equipment.

4.6 Decontaminating Drilling and Heavy Equipment

Decontaminate drilling and heavy equipment as follows:

- Dress in suitable safety equipment to reduce personal exposure.
- With a flat-bladed scraper, scrape gross contamination or drill cuttings off equipment at the sampling or construction site.
- Spray equipment, such as drill rigs, augers, drill bits, and shovels, with a Liquinox/potable water solution using a hot water washer. Be sure to adequately clean the insides of the hollow-stem augers and backhoe buckets.
- Rinse the equipment with potable water.
- Place drilling equipment on the clean drill rig and move it to a clean area. If the equipment will not be re-used immediately, store it in a designated clean area.

4.7 Disposing of Decontamination Solution

Dispose of used wash and rinse solutions at a location that will not bias subsequent samples.

5.0 DOCUMENTATION

Be sure to document the decontamination of sampling and drilling equipment. Record the documentation with black waterproof ink in the sampler's field notebook with consecutively numbered pages. This documentation should include the following:

- The personnel who performed the decontamination
- Date
- Decontamination procedures and observations
- Rinsate sample collection procedure (if collected).

6.0 QUALITY ASSURANCE REQUIREMENTS

To verify the effectiveness of the decontamination procedures, collect equipment rinsate samples from the decontaminated sampling equipment as follows:

- Run deionized water through or over a representative decontaminated sampling tool (such as a split spoon sampler or bailer) and collect the rinsate water in sample bottles.
- Filter, preserve, handle, and analyze rinsate samples for the same parameters as primary samples collected at the site. Refer to SOP #7 for sample documentation, handling, packaging, and chain-of-custody procedures.
- Record the rinsate procedure, including the sample number, in the field notebook.
- Send the bottles to the laboratory for analysis.

Collect equipment rinsate samples at the following frequencies:

- If more than 20 field samples were collected, collect one rinsate sample per 20 field samples collected.
- If less than 20 field samples were collected in the sampling event, collect at least one rinsate sample per sampling method used.
- When using more than one sampling method or type of equipment, collect at least one rinsate sample from each type of device that was used to obtain samples (e.g., if both a bailer and a electric submersible pump were used to collect ground water samples, collect a rinsate sample from both devices at a minimum frequency of 1 each per 20 samples).

7.0 REFERENCES

ASTM D-5088 - 84, Standard Practice for Decontamination of Field Equipment Used at Nonradioactive Waste Sites, *1995 Annual Book of ASTM Standards*, Vol. 04.08.

STANDARD OPERATING PROCEDURE #2

MONITORING WELL WATER LEVEL MEASUREMENT

Prepared by:
Telesto Solutions, Inc.
1601 Prospect Parkway, Suite C
Fort Collins, CO 80525

January, 2005

TELESTO
SOLUTIONS • INCORPORATED

TABLE OF CONTENTS

1.0 PURPOSE AND SCOPE

The purpose of this document is to define the standard procedure for measuring water levels in wells, piezometers, and boreholes. This Standard Operating Procedure (SOP) describes equipment and field procedures necessary to collect water level measurements.

2.0 RELATED STANDARD OPERATING PROCEDURES

This procedure is intended to be used with the following SOP:

SOP #	Title
1	Equipment Decontamination

3.0 NECESSARY EQUIPMENT

The equipment necessary to measure water levels includes:

- Electric water level probe capable of producing measurements to the nearest 0.01 foot
- Replacement batteries for water level probe
- Field logbook, field data sheets, and black pen
- Engineers tape (marked in increments of 10ths and 100ths of a foot)
- Additional stainless steel weight
- Paper cups and/or turkey baster
- Paper towels
- Liquinox soap
- Potable water
- Sprayer filled with deionized water

- Appropriate health and safety equipment, including at least safety glasses and latex gloves.

4.0 WATER LEVEL MEASUREMENT PROCEDURES

This section gives the sequence of events to follow when measuring water levels.

- Before mobilization to the site, obtain the following:
  - — previous water level data and survey data if available (data should include description of measurement point location and survey point description)
  - — well completion data, including total depth, well casing stickup, and protective casing stickup
  - — if wells are locked, obtain the appropriate key.
- Wear appropriate health and safety equipment, as described in the Health and Safety Plan when opening and measuring wells and performing decontamination. At a minimum, wear safety glasses and latex gloves. (Latex gloves are required to prevent cross contamination.)
- To minimize potential cross contamination, measure the wells in order of cleanest to most contaminated.
- Before taking measurements, decontaminate the water level probe according to SOP #1 and Section 5 of this SOP.
- Unlock and open the well. If the water level is above the top of the well and cap, evacuate the water with a paper cup or a turkey baster. Follow all health and safety procedures and if necessary, let the well vent any gasses that may be present in the well casing. If you observe either a negative or positive pressure when opening the well, let the well stabilize before measuring the water level. Stabilization could take several minutes, hours, or days, depending on well characteristics.
- Test the water level probe to verify that it is working properly. Push the circuit test button to verify that the light/buzzer is working. This button tests only the light/buzzer and does not test the other parts of the water level probe. Dip the tip of the water level probe into water to verify that the water level probe is working properly. Note that deionized water, due to its low conductivity, will not trigger a response.

- After opening the well cover, locate the measuring point for water level measurements. The measuring point for the water level is usually the top of the well casing, not the protective casing, but it can vary between wells and programs. Some programs will specify on which side of the well casing (i.e., the north side) to locate the measuring point or will specify the highest point of the casing if it is not cut evenly. If not already marked and described, the measuring point should be marked and described for easy identification. If possible, the measuring point should be the same as the survey point.

- To measure the static water level, lower the water level probe into the well until the buzzer/light indicates that the probe tip has contacted water. By raising and lowering the water level probe and adjusting the sensitivity to indicate when the probe is contacting the water, the depth to water should be measured to the nearest 0.01 foot. Record the water level depth below the measuring point in the field book or data sheet. Then recheck the measurement before removing the water level probe from the well. Compare the most recent measurement with past measurements and verify that the new measurement is reasonable before leaving the well. If the measurement does not seem reasonable, measure the water level again.

- If the well is dry, record the maximum depth measured (e.g., dry to 44.34 feet).

- Measuring the total well depth will help identify the well, indicate if there is well damage or accumulated sediment in the well, and provide data to calculate saturated borehole volume prior to purging the well. If water contacts cuts or nicks in the line and causes a "short" in the line, you may need to repair and/or clean and dry the line before reuse. (Note: Because measuring total depth in deep wells with high water levels can force water around seals in tips and may cause shorting, the tip may need to be disassembled and dried.) The total well depth should be measured unless a recent total depth measurement has been fully documented. If the measuring point on the well probe is not at the tip of the probe, adjust the total depth measurement to account for the distance between the water measurement point and the tip of the probe.

- When raising or lowering the water level probe from the well, exercise great care to avoid pulling the probe wire over the well casing or the protective casing. Even PVC pipe can damage the water level probe if it is not handled properly.

- Especially on deep wells, you may need an additional weight to lower the water level probe to the water level. A non-contaminating, long, narrow weight (e.g., a stainless steel rod) should be used. Tape the weight to the water level probe line with plastic electrical tape only when not measuring organics, and remove the weight prior to decontamination. Excessive weight could damage the water level probe by stretching or even breaking the line.

- Measure the distance that the protective casing sticks up above ground level and the distance from the measuring point on the top of the well casing to the top of the protective casing.

- Wells with submersible pumps or other installed equipment probably should not be measured unless a tube specifically designed for water level measurements is present. The risk of losing the water level probe and/or damaging equipment installed in the well is considerable. Before attempting to measure a water level in a well with any installed equipment, obtain the project manager's approval.

5.0 DECONTAMINATION

Decontaminate the water level indicator before measuring the water level in the first well and after measuring the levels in all wells. Decontaminate the probe according to SOP #1. Decontamination requirements will vary depending on the contaminants present and their concentrations, and some sites may require decontamination of the probe between measurements at each well.

At mining sites where low-level inorganic background parameters are being monitored, the decontamination procedure may consist of the following: (1) wiping the well probe line, as it is removed from the well, successively with paper towels that have been wetted with Liquinox solution, potable water, and deionized water and (2) rinsing the entire reel with deionized water before use. Although this method is efficient, it may not be acceptable at all sites. Other acceptable decontamination procedures are specified in SOP #1. The decontamination procedure used should be approved by the project manager before use.

Once decontaminated, the water level probe should be either placed in a clean plastic bag or used immediately.

If the water level probe has contacted especially corrosive fluids (e.g., water with high or low pH values, high chlorides concentrations, or high TDS concentrations), at a minimum, thoroughly rinse the water level probe immediately after use to protect the water level probe from damage.

6.0 DOCUMENTATION

This section describes the documentation necessary for water level monitoring. Record at least the following information in the field book or on the ground water data sheets for each well:

- Personnel who performed the measurement
- Date
- Time
- Well number
- Depth to water from measurement point
- Depth to well bottom from measurement point
- Distance from the well probe's water level measurement point to the well probe tip to correct total depth measurements
- Distance from top of protective casing to ground surface
- Distance from measuring point on top of the well casing to the top of protective casing
- Description of the measurement point location
- Description of the decontamination procedure
- Well probe's identification number
- All calculations performed.

The field notebook used during water level measurement activities will include any other observations made while measuring water levels.

7.0 CALIBRATION

The water level measurement probe cord should be calibrated at least annually or more often as needed to ensure the desired accuracy. The calibration check consists of laying out 100 feet of steel

tape next to 100 feet of the probe cord. At 2-foot intervals, note any measurement discrepancies between the two. The probe cord shall be rechecked if it may have been stretched or damaged during water level measurements.

Document the procedures followed while calibrating and verifying equipment in the field notebook, along with any calculations. If a correction is required, tag the probe to indicate the correction.

STANDARD OPERATING PROCEDURE #5

GROUND WATER SAMPLE COLLECTION

Prepared by:
Telesto Solutions, Inc.
1601 Prospect Parkway, Suite C
Fort Collins, CO 80525

January, 2005

TELESTO
SOLUTIONS INCORPORATED

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF APPENDICES

Appendix A Ground Water Sampling Data Sheet

1.0 PURPOSE AND SCOPE

The purpose of this document is to define the standard procedure for collecting ground water samples from wells. This Standard Operating Procedure (SOP) gives descriptions of equipment, field procedures and quality assurance/quality control (QA/QC) procedures necessary to collect ground water samples from wells.

2.0 RELATED STANDARD OPERATING PROCEDURES

This procedure is intended to be used with the following SOPs:

SOP #	Title
1	Equipment Decontamination
2	Monitoring Well Water Level Measurement
7	Sample Documentation, Handling, Packaging, and Chain of Custody
8	Quality Assurance/Quality Control Sample Collection
9	Field Parameter Instrument Calibration and Measurement

3.0 NECESSARY EQUIPMENT

3.1 General Equipment Requirements

Equipment that may be used for measuring water levels includes:

- Electric water level probe capable of producing measurements to a precision of 0.01 foot
- Replacement batteries for water level probe
- Field logbook, field data sheets, and black pen
- Well keys
- Engineers tape (10ths, 100ths feet)

- Additional stainless steel weight
- Paper cups and/or turkey baster
- Paper towels
- Liquinox soap
- Potable water
- Sprayer filled with deionized water
- Appropriate health and safety equipment, including at least safety glasses and latex gloves.

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

- Sample bottles. Obtain sample bottles and preservatives from the selected analytical laboratory, including several extra sample bottles in case breakage or other problems occur. Sample bottles can be either pre-preserved or preservatives can be added in the field.
- Sample labels
- Appropriate preservatives
- 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
- Silicon or Tygon® tubing
- Peristaltic pump.

The following equipment may be used during well evacuation and sampling:

- Assorted tools (knife, screwdriver, etc.)
- PVC, teflon, or stainless steel bailer (bottom filling)
- PVC hand pump
- PVC pump discharge hose
- Braided nylon rope
- Bailer tripod
- Gas-powered electric generator
- Stainless steel submersible pump
- Plastic sheeting (for placing around well)
- pH meter (with automatic temperature compensation)
- Specific conductivity 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.

Use the following equipment for performing decontamination:

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

3.2 Field Parameter Measurements

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

- Portable Hach One pH Meter Model 43800-00 with Hach One Combination pH Electrode Model 48600 or the EC10 Portable pH/mV/Temperature Meter Model 50050 with the Combination pH Electrode with Temperature (Gel-filled) Model 50200
- Spare electrolyte cartridge, if required
- Hach pH Electrode Storage Solution, Catalog No. 50301-49
- 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:

- Hach CO150 Conductivity Meter Model 50150 or Hach Conductivity/TDS Meter Model 44600
- 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:

- Hach Portable Turbidimeter Model 2100P
- Extra battery
- Calibration solutions which bracket expected range of measurements
- Silicone oil
- Deionized water
- Wash bottle
- Liquinox solution
- Kimwipes
- Beakers.

4.0 WATER SAMPLING PROCEDURES

4.1 Well Purging Strategy

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.

4.2 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 filterpack. Because the representativeness of stored water is questionable, stored water should be purged from the monitoring well before collecting samples. 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 saturated borehole volume calculation formula is presented in Figure 1. Figure 2 presents a sample saturated borehole volume calculation and a blank form to calculate specific saturated borehole volume. 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.

Figure 2 presents a sample saturated borehole volume calculation, as described below:

- Equation (a) shows how to calculate the casing radius in feet by dividing the nominal casing diameter in inches by 2 (to convert the diameter to a radius) and dividing the result by 12 (to convert inches to feet).

- Equation (b) shows how to calculate the borehole radius in feet by dividing the nominal borehole diameter in inches by 2 (to convert the diameter to a radius) and dividing the result by 12 (to convert inches to feet).

- Equation (c) shows how to calculate the casing volume, given the casing radius and height of water in the casing.

- Equation (d) shows how to calculate the annular volume, given the annular radius and the height of water in the filter pack.

- Equation (e) shows how to calculate the saturated annulus volume by subtracting the casing volume from the borehole volume and multiplying the result by the assumed effective porosity of the annulus.

- Equation (f) shows how to calculate the saturated borehole volume by adding the casing volume to the saturated annulus volume and converting cubic feet to gallons.

In confined wells and unconfined wells that are screened and filter packed below the water table, the height of water in the casing will exceed the height of water in the filter pack (i.e., $h_1 > h_2$). In these cases, calculate the height of water in the filter pack based on the top of the filter pack interval, and not the top of the screen interval. To calculate the saturated borehole volume in these cases, substitute the appropriate height of water in feet into Equations C and D.

Note that wells have variable amounts of filter pack below the bottom of the screen. The volume of water below the bottom of the screen may be a significant portion of the total saturated borehole volume if there is only a few feet of measurable water in the screen and several feet of filter pack below the bottom of the screen. The saturated borehole volume calculation presented in Figures 1 and 2 does not account for the volume of water in the borehole below the screen. For wells with only minimal amounts of water in the screen, evaluate the amount of water within the borehole below the screen and consider it when purging the well.

4.3 Stability of Field Parameters

To demonstrate that you have collected a representative ground water sample, measure field parameters during purging and purge the well until these parameters stabilize. The field parameters measured may include pH, conductivity, temperature, turbidity, Eh, and dissolved oxygen. However, these parameters tend to stabilize at different rates, and field parameters generally stabilize before the chemical parameters that are being sampled. Therefore, the purge volume required for field parameters to stabilize should be considered a minimum purge volume, and laboratory parameters may stabilize only with continued purging.

In order to demonstrate that parameters have stabilized, establish the acceptable range of field parameter values and the volume of water between field parameter measurements. The acceptable range for most field parameter measurements is generally 10 percent of the value for conductivity, temperature, turbidity, Eh, and dissolved oxygen, and 0.1 units for pH. Demonstrate stabilization over a minimum volume of one saturated borehole volume. Document that the measurements do

not fluctuate more than 10 percent or 0.1 pH units between the end points. Collect as many field parameter readings as practical between the end points (i.e., one reading at every 1/4 to 1/2 saturated borehole volume).

Calibrate the pH and conductivity meters before use every day. Record calibration times and appropriate readings in the field notebook. Refer to SOP #9 for specific instructions on calibrating the pH and conductivity meters.

4.4 Purge Rates and Pump Placement

Do not let the purge rate exceed the development rate. If possible, purge wells at or below their recovery rates in order to minimize turbidity and drawdowns. The purge rate should not result in excessive drawdown. Excessive drawdowns can cause water to cascade into the well, resulting in a significant sample bias, excessive turbidity, and entrapment of air in the filter pack, which will cause long-term sample bias.

When purging wells in shallow water tables, locate the pump intake near the top of the water table. Water will enter throughout the screen interval and move toward the pump, flushing all stagnant water from the borehole. If bailers are used, remove the water from the top of the water level.

4.5 Purging Low-Yielding Wells

Monitoring wells incapable of yielding three saturated borehole volumes within 24 hours are considered low-yielding wells. Low-yielding wells may be pumped at or below their recovery rates or purged to practical dryness. Purging the well to practical dryness will evacuate the stagnant water in the borehole, but cascading water and exposing the filter pack to air may bias subsequent samples.

Preferably, purge low-yielding wells at or below the recovery rate so that the saturated filter pack is not exposed to air. Purging at or below the recovery rate can take a considerable amount of time and may not be practical in some cases. Purge volume requirements and stabilization of field

parameters criteria cannot always be applied to low-yielding wells. However, you should still perform saturated borehole volume calculations and field parameter measurement. Purging low-yielding wells can be time-consuming. Identify low-yielding wells during well development so that careful planning and scheduling may be performed to increase efficiency in the field. Based on site-specific conditions and project objectives, evaluate whether to purge a well over an extended period of time or to purge it to dryness and collect a sample when there is sufficient recovery. Purging over time is preferred over dryness if at all practical. Development should provide enough site-specific information to allow the best method to purge a well to be assessed and to acquire representative samples before mobilizing to the field.

5.0 SAMPLING PROCEDURES

This section gives the step-by-step procedures for collecting samples in the field. Record observations made during sample collection in the field notebook and field data sheet, as specified in Section 6 of this SOP.

5.1 Evacuating Well

As stated previously, 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.

Before purging a well, perform the following procedures:

- Before evacuating or sampling, decontaminate all well probes, bailers, and other sampling devices as specified in SOP #1. Do not decontaminate dedicated downhole pumps.
- Place clean plastic sheeting around the well.
- Open the well and measure static water level following SOP #2.

- Calculate the saturated borehole volume as specified in Section 4.2.

- Calibrate field parameter measurement equipment as specified in SOP #9.

- 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 percent 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.

5.2 Obtaining Water Samples

Ground water sample documentation, preservation, handling, packaging, and chain-of-custody procedures are specified in SOP #7. Collect ground water samples as follows:

1. Obtain samples for chemical analysis within two hours after purging is completed, if possible. For slow recovering wells, collect the sample immediately after a sufficient volume of water is available. Collect the water quality samples from within the well screen interval.

2. Assemble decontaminated sampling equipment. If bailers are used, use new nylon rope for each well for each sampling episode. Assemble the filtering apparatus.

3. Make sure that sample labels have been filled out for each sample bottle as specified in SOP #7.

4. Place labels on bottle and tape over.

5. Lower the bailer slowly and gently into contact with the water in the well. Lower the bailer to the same depth in the well each time, within the screened interval. If submersible or bladder pumps are used to collect samples, reduce the discharge rate to about 100 milliliters per minute or as low as possible (Note: Some pumps may overheat at 100 milliliters per minute). Before collecting samples, pump the well at the reduced rate until the volume of water in the discharge hose has been purged.

6. Retrieve the bailer smoothly and empty the water in a slow, steady stream into the sample containers or direct the pump discharge into the sample containers.

7. Retrieve additional samples and slowly fill the sample bottles for all other analyses and QA/QC samples. Cap the sample bottles quickly.

8. Filter samples that require filtration with a disposable filter apparatus and peristaltic pump or electric submersible pump, as specified in SOP #7.

9. 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.

1. Preserve samples as specified in SOP #7.

2. Place samples in baggies.

3. Place samples on ice in a cooler.

4. Record time of sampling.

5. Replace and lock well cap.

6. Complete field documentation and chain of custody record.

5.3 Field Quality Assurance/Quality Control Procedures and Samples

Collect QA/QC samples during ground 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.

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 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 duplicate sample for every 20 primary samples 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 duplicate sample, and if you collect from 21 to 40 primary samples during a sampling event, collect two duplicate QA/QC samples.

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.

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.

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 20 primary water samples collected so that a rate for rinsate samples 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 rinsate blank sample, and if you collect from 21 to 40 samples during a sampling event, collect two rinsate blank samples.

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 used if less than 20 samples are collected (e.g., if 10 samples are collected by a bailer and 10 samples are collected by a submersible pump, you would collect two rinsate samples — one from the bailer and one from the pump).

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.

Laboratory Replicate

Depending on the laboratory conducting the analysis, laboratory replicate samples may be required. Laboratory replicate samples are split from the primary sample in the laboratory and analyzed as part of the laboratory's QA/QC program. The laboratory replicate does not require a separate sample volume. The sample that the laboratory splits must be identified by the samplers on the Chain of Custody Form. One laboratory replicate sample will be specified for each sample shipment group of 20 samples or less.

5.4 Sample Documentation, Preservation, Handling, Packaging, and Chain of Custody

The project work plan specifies sample containers and preservatives. Label and handle samples as described in SOP #7.

6.0 DOCUMENTATION

6.1 Ground Water Data Sheet

Complete a ground water data sheet for ground water samples (Appendix A) 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 number
- Date and time of sampling
- Person performing sampling
- Depth to water before sampling
- Volume of water purged 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)
- 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.

7.0 REFERENCES

ASTM D-4448 - 85a, Standard Guide for Sampling Groundwater Monitoring Wells, *1995 Annual Book of ASTM Standards*, Vol. 04.08.

STANDARD OPERATING PROCEDURE #6

SURFACE WATER SAMPLE COLLECTION AND DISCHARGE MEASUREMENT

Prepared by:
Telesto Solutions, Inc.
1601 Prospect Parkway, Suite C
Fort Collins, CO 80525

January, 2005

TELESTO
SOLUTIONS • INCORPORATED

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF APPENDICES

1.0 PURPOSE AND SCOPE

This document defines the standard operating procedure (SOP) for collecting surface water samples. This SOP describes equipment, field procedures, and quality assurance/quality control (QA/QC) procedures necessary to collect surface water samples.

2.0 RELATED STANDARD OPERATING PROCEDURES

This procedure is intended to be used with the following SOPs:

SOP #	Title
1	Equipment Decontamination
7	Sample Documentation, Preservation, Handling, Packaging, and Chain of Custody

3.0 NECESSARY EQUIPMENT

Before beginning the monitoring program, obtain the equipment listed in the following sections for performing decontamination, surface water sampling, and sample filtration.

3.1 General Equipment Requirements

Use the following general equipment to collect surface water samples:

- Watch
- Backpack
- Field logbook
- Pens, permanent pens, and pencils
- Surface water data sheets (see Appendix A)
- Mobile telephone or radio
- Sampling plan

- Appropriate health and safety equipment
- Camera
- Plastic flagging
- Wood stakes.

3.2 Field Parameter Measurements

Use the following apparatus and supplies to measure pH in the field:

- Portable Hach One pH Meter Model 43800-00 with Hach One Combination pH Electrode Model 48600 or the EC10 Portable pH/mV/Temperature Meter Model 50050 with the Combination pH Electrode with Temperature (Gel-filled) Model 50200
- Spare electrolyte cartridge, if required
- Hach pH Electrode Storage Solution, Catalog No. 50301-49
- 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 to measure conductivity in the field:

- Hach CO150 Conductivity Meter Model 50150, Hach Conductivity/TDS Meter Model 44600, or Hach High Range Conductivity Meter Model {????}
- Extra battery
- Calibration solutions which bracket expected range of measurements
- Deionized water

- Wash bottle
- Kimwipes
- Beakers.

Use the following equipment for decontamination activities:

- Liquinox detergent
- Potable water
- Deionized, metal-analyte-free water
- Decontaminated buckets, pails, and sprayers
- Chemical-free paper towels (Kimwipes or equivalent)
- Plastic brushes
- Disposable latex gloves.

Use the following equipment for sampling surface water:

- Nalgene (or equivalent) beakers of assorted sizes
- Churn splitter or composite sample container
- Peristaltic pump and battery
- Silicon or Tygon® tubing
- 0.45-micron filter.

Equipment used for sample filtration should include the following:

- Disposable filterware with a 0.45-micron filter
- Peristaltic pump
- Silicon or Tygon® tubing.

Equipment for measuring stream discharge shall include the following:

- Cutthroat flume with assorted throat sizes
- Small line level
- Shovel
- Marsh-McBirney flow meter or equivalent and top setting rod
- Fiberglass tape (50 foot)
- Calibrated containers (2 cup and up to 2.5 gallon) to measure flow
- Stop watch
- Rubber boots
- Calibrated buckets (5 and 2.5 gallon) to measure discharge
- Engineers tape, 25 feet long, marked in 10ths and 100ths of a foot.

Other field measurements may be needed (e.g., iron and sulfate). The manufacturer's manual should be consulted for equipment needed.

Use the following equipment for sample labeling, packing, documentation, and performing chain-of-custody procedures:

- Sample bottles
- Sample labels
- Appropriate preservatives
- Data forms
- Chain of custody document
- Black permanent markers and pens
- Clear plastic tape
- Fiber tape

- Custody seals
- Large (30 gallon) trash bag
- Gallon ziplock freezer bags
- Sample shipment coolers
- Ice
- Shipping documentation.

4.0 SURFACE WATER SAMPLING

This section discusses the criteria for selecting sampling methods and equipment. These criteria are based on sample type, flow conditions, and data quality objectives stated in the work plan. Select sampling methods and equipment based on flow conditions as follows:

- If the stream is less than 3 feet wide, collect samples from the center of the flow. Use a dipper or a beaker to collect samples directly into sample containers or into intermediate containers for homogenization.
- If the stream is 3 to 5 feet wide, use the horizontal areal composite method and collect aliquots of sample from three stations spaced evenly across the stream. If the stream is from 5 to 10 feet wide, collect samples at five evenly spaced stations. If the stream is too deep to wade, collect a grab sample from the bank. Combine these aliquots in a decontaminated container or churn splitter, as described below.

The churn splitter is a device that mixes sample aliquots to form a sample composite and then splits the composite into discrete samples. You may take samples from the churn splitter for analysis of all dissolved and suspended inorganic constituents, except for total organic carbon (TOC), fecal coliform, volatile organic analyses (VOAs), and oil and grease (O&G). Do not use the churn bucket as a direct sampling device; instead, collect water in a dipper or beaker and pour it into the churn splitter. Then use the churn splitter to mix the composited liquid while splitting the total volume into the various analyte samples.

4.1 Sampling Procedures

This section gives the step-by-step procedures for collecting surface water samples in the field. Record observations made during sample collection in the field notebook and on the field data collection note (Appendix A).

4.1.1 Decontamination

Before beginning a sampling event and between collecting individual samples, decontaminate sample collection equipment as specified in SOP #1. Wash sampling equipment with Liquinox solution, triple rinse with potable water, triple rinse with deionized water, and let air dry if possible.

4.1.2 Instrument Calibration

Calibrate the pH and conductivity meters before use every day. Record calibration times and appropriate readings in the field notebook. Refer to SOP #9 for specific instructions on calibrating the pH and conductivity meters.

4.1.3 Obtaining Water Samples

Select sampling methods and equipment based on flow conditions as follows:

- If the stream is less than 3 feet wide, collect samples from the center of the flow. Use a decontaminated dipper or a beaker to collect samples directly into sample containers (grab sample) or into an intermediate container for homogenization (composite sample).
- If the stream is from 3 to 5 feet wide, use the horizontal areal composite method and collect aliquots of sample from three stations spaced evenly across the stream. If the stream is from 5 to 10 feet wide, then composite five evenly spaced stations. If the stream is too deep to wade, collect a sample from the bank. Combine these aliquots in a decontaminated container or churn splitter.

Collect surface water samples as follows:

1. Obtain all necessary sample collection and filtering equipment.

2. Decontaminate sampling equipment as specified in SOP #1.

3. Make sure that the sample labels have been filled out for the sampling location. Obtain bottles for filling.

4. Make sure that no activities are occurring or have recently occurred immediately upstream that would affect the integrity of the sample. Wade to the sample collection point from a downstream location. To avoid disturbing stream sediments or otherwise contaminating samples, stand downstream of the water that you collect. When collecting samples in succession, always proceed from downstream to upstream locations.

5. Rinse the water collection device (i.e., beaker, dipper, and churn splitter with sample water.

6. Collect samples from streams, using horizontal composites if appropriate. If grab samples are specified, then fill the sample bottles directly if possible. If composited samples are specified, use a beaker to collect and transfer the sample aliquots into the compositing container. If bottles or beakers cannot be filled due to low water depth, you may use the peristaltic pump and tubing to pump sample water into the appropriate container. Wear clean latex gloves at all times when collecting samples.-

7. For composited samples, fill sample bottles by dispensing the composited water from the compositing container. Fill all bottle sets, such as for the primary, field duplicate, matrix spike, and laboratory replicate samples, for a particular analysis from the same composited sample.

8. Measure field parameters that are not measured in situ from a portion of the unpreserved composite taken from the churn splitter before samples are dispensed.

9. Preserve bottles if they are not pre-preserved.

10. Record time of sampling and complete field documentation.

11. Follow SOP #7 for the remaining procedure.

If discharge will subsequently be measured, collect samples from the same cross section of the stream that will be used to measure discharge. Always collect samples before measuring discharge.

4.1.4 Filtering Samples

Analyses for total metals and other parameters are performed on unfiltered samples. Analyses for cations and dissolved metals are performed on samples that have been filtered in the field. Filter samples in the field with a disposable 0.45-µm membrane filter apparatus and peristaltic pump. Collect filtered samples as follows:

- Assemble the filter device according to manufacturer's instructions.
- Filter the sample by pumping it through an in-line filter with a peristaltic pump. Composited sample remaining in the churn splitter may be used for filtered samples.
- Transfer filtered samples to appropriate preservative-containing sample bottles or unpreserved bottles. Then add preservatives to the bottle.

4.1.5 Field Quality Assurance/Quality Control Samples

Collect quality assurance/quality control (QA/QC) samples during surface 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 are designed to help identify potential sources of sample contamination and evaluate potential error introduced by sample collection and handling. Label all 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, with the other samples, to the laboratory for analysis.

Duplicate Samples

Duplicate samples are collected side-by-side with primary samples to check for natural sample variance and consistency of field techniques and laboratory analysis. When collecting primary surface water samples, collect duplicate sample at the same time. Fill the primary sample bottles

first and the duplicate sample bottles for the same analysis second, and so on until all necessary sample bottles for both primary and duplicate samples have been filled. Use different filter and tubing for the primary and duplicate samples. Handle duplicate surface water samples in the same manner as primary samples. Assign duplicate samples the QA/QC identification number "02," store it in an iced cooler, and ship it promptly to the laboratory so that analyses can be performed within required holding times.

Collect at least one duplicate sample for every 20 samples, for a minimum rate of 5 percent duplicate to primary samples. For example, if you collect from 1 to 20 primary samples during a sampling event, collect one duplicate sample; and if you collect from 21 to 40 primary samples during a sampling event, collect two duplicate samples.

Field Blanks

Collect field blank samples by filling sample containers in the field with deionized water. Assign the sample the QA/QC identification number "03," store it in an iced cooler, and ship it to the laboratory with the other samples. Collect one field blank per sampling event for each medium sampled.

Collect at least one field blank sample for every 20 samples collected, for a minimum rate of 5 percent field blank to primary samples. 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 samples during a sampling event, collect two field blank samples.

Rinsate Samples

An equipment rinsate sample of sampling equipment is intended to check if decontamination procedures have been effective. Before collecting surface water samples, collect a rinsate sample from the decontaminated sampling equipment and filter equipment. To collect a rinsate sample, rinse deionized water over the decontaminated equipment and transferred the water to the sample bottles. The surface water samples and rinsate samples will be analyzed for the same parameters.

Assign the rinsate sample the QA/QC identification number "04," store it in an iced cooler, and ship it promptly to the laboratory so that analyses can be performed within the required holding times.

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

Collect rinsate blank 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, you may increase the QA/QC sampling frequency.

Matrix Spike Samples

Matrix spike (MS) samples are used to evaluate potential matrix effects on sample analysis for all inorganic parameters. The matrix spike samples will be spiked by the laboratory 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. Assign samples collected specifically for matrix spike analysis the QA/QC identification "MS," store it in an iced cooler, and ship it promptly to the laboratory so that analyses can be performed within required holding times. Identify all samples selected for matrix spike analysis on the Chain of Custody Form. Specify one matrix spike sample for each sample shipment group of 20 samples or less.

Laboratory Replicate Samples

Depending on the laboratory conducting the analysis, laboratory replicate samples may be required. Laboratory replicate samples are split from the primary sample in the laboratory and analyzed as part of the laboratory's QA/QC program. The laboratory replicate does not require a separate sample volume. The sample that will be split by the laboratory must be identified by the samples on the Chain of Custody Form. One laboratory replicate sample will be specified for each sample

shipment group of 20 samples or less.

4.2 Sample Handling

Sample containers and preservatives are specified in the project work plan. Label and handle samples as described in SOP #7.

5.0 DISCHARGE MEASUREMENT

Depending on the magnitude of the discharge and the physical conditions at the measurement site, discharge can be measured with a flow meter, cutthroat flume, stopwatch and a bucket, or stopwatch and a tape. When possible, use a cutthroat flume with interchangeable throat widths to measure discharge, provided that the flow is within the measurement parameters of the flume. Measure higher discharges with a flow meter.

The following sections discuss methods for obtaining point-flow measurements in streams, the equipment used to measure the discharge, and the calculations required to determine the total discharge.

5.1 Location of Stream Measurement Sites

The selection of the site to measure stream discharge depends on a number of factors, including data acquisition requirements, site accessibility, and stream flow characteristics. After selecting the site, take all subsequent stream flow measurements at the same site. When flow is measured in conjunction with water-quality sampling, take flow measurements as close as possible to the site of the water-quality samples. To avoid disturbing the sediments or otherwise contaminating samples, measure flow after collecting water-quality samples and immediately downstream of the sample collection point. Stream flow characteristics will determine the exact point where the discharge measurements will be made and the method used for measuring discharge; these characteristics include ease of measurement, channel alignment, flow regime, flow depth, and velocity. Consider the following factors when selecting a site:

1. Ease of measurement. The site should be accessible to wading, and flow should be confined to a definable channel. Because the field sampling team members will wade in the stream to measure the flow, be sure that the flow depth and velocity are sufficiently low to permit safe crossing.

2. Flow regime. Stream flow should be steady and uniform, the stream-bed gradient in the site vicinity should be relatively constant, and flow-lines should be parallel.

3. Backwater effects. The site should be free from backwater caused by downstream obstructions or by the confluence of the stream with a major tributary or other body of water.

5.2 Flow Meters

Before taking discharge measurements with a flow meter, establish intervals at which to measure the area of the cross-section and the flow velocity. Calculate the stream discharge by multiplying the average velocity by the cross-sectional flow area measured at each interval. Calculate the total discharge for the stream by summing the calculated discharge for the individual intervals. The average velocity is typically measured with a current or magnetic velocity meter. Calculate the cross-sectional area for each interval by multiplying the measured flow depth for each interval by the width of the interval.

Equipment that is required to measure stream flows includes a top-setting wading rod, water-velocity meter, and a fiberglass measuring tape long enough to span the stream.

Use the top-setting wading rod to measure the depth of water and adjust the position of the velocity flow meter. Attach the velocity flow meter to the top-setting wading rod on a movable mount so that the sensor can be set at the appropriate depth for velocity measurements. The wading rod should be made of stainless steel and marked with permanent grooves at intervals of 0.1 foot.

A Marsh-McBirney magnetic current meter is recommended for measuring water velocity. The Marsh-McBirney meter provides a direct velocity reading in feet per second, is durable, and rugged for field use. A pygmy meter may also be used, but it is not as user-friendly. Refer to the instrument's operation manuals for directions on using the meter.

Use a fiberglass measuring tape to measure the distance across the stream at which velocity measurements are taken and as a guide along the stream cross-section. Anchor the fiberglass tape to the stream banks to mark the location of the station. The tape should be marked in intervals of 0.1 foot.

5.2.1 Flow Meter Measurement Procedures

When determining the flow velocity, the field sampling team shall perform the following steps:

1. Suspend the tape across the channel perpendicular to the direction of flow.
2. Measure the top width of the stream.
3. Determine suitable increments at which to measure velocity (see below).
4. Measure the flow depth at each increment with the wading rod.
5. Determine the appropriate depth or depths (see below) at which velocity measurements are to be taken, and adjust the flow sensor on the wading rod to the proper depth.
6. Measure the flow velocity using the appropriate method (see below). In general, the sampler should do the following:
   - — Measure flow velocity while wading in the stream, if the depth and velocity of water are sufficiently low
   - — Stand downstream of the measurement point and in a position that least affects the measurements; that is, the sampler should face the bank so that the water flows against the side of the leg
   - — While measuring the velocity, hold the wading rod vertically against the tape and position the meter parallel to the direction of flow.
7. Record the distance from the tape, flow depth, depth of velocity measurement, and velocity.
8. Repeat Steps 4 through 7 at each increment.

9. Repeat Steps 2 through 8 if, during the measurements, the gage height readings change more than 10 percent for depths of flow less than 1 foot or 5 percent for depths greater than 1 foot.

10. Calculate the discharge using the methods described in Section 5.2.2.

The number of increments across the stream at which velocity measurements are performed, as listed in Step 3 above, will depend on the width and flow characteristics of the stream. The number of increments will usually determine the precision and accuracy of the flow measurements. In addition, increasing the number of increments will usually increase the accuracy of the flow measurement. Measurements are usually taken at equal intervals across the stream, such as every 1 or 2 feet. However, if the majority of flow is confined to one section of the stream, such as at the center or to one side of the stream, take the measurements at closer intervals in the majority of the flow and at larger intervals elsewhere across the stream. Individual intervals should not contain more than 10 percent of the total flow and, ideally, less than 5 percent.

For the streams at the site, measure depth and velocity across the stream at intervals of less than 1 foot, and at smaller intervals where the flow is concentrated. You may measure depth and flow at any point or interval in the stream to account for specific conditions; for example, to avoid taking measurements on top of a boulder where the wading rod cannot be properly placed. Record the point at which you take measurements according to the distance shown on the tape line that is suspended across the stream. Take at least 10 measurements in the stream.

As listed in Step 4, measure the depth of flow at each increment with the wading rod. Place the rod vertically in the stream at a specific location along the tape line so that the base plate of the rod rests on the stream bed. Read the depth of water on the graduated rod to the nearest 0.05 foot. The sampler who holds the wading rod should stand downstream in a position that least affects the flow at the sensor.

Several different velocity methods can be used to determine the average flow velocity at a point. Two methods that are appropriate for measuring the average velocity for the streams in the area are the six-tenths depth method and the 2-point method. The selection of the specific method depends on the depth of flow.

The six-tenths method is the preferred method for measuring average velocity whenever the depth of flow is less than 2.5 feet. In this method, place the velocity sensor on the wading rod at a depth below the surface of 0.6 times the depth of the stream, or placing the rod at a depth above the bottom of the stream of 0.4 times. The velocity at this depth is assumed to represent the mean velocity in the horizontal direction.

The 2-point method is used to determine the average velocity when the depth of flow exceeds 2.5 feet. In the 2-point method, measure velocity at locations below the water surface of both 0.2 and 0.8 times the depth of the stream. The average of the two observations represents the mean velocity for the interval.

Record depth measurement data on a Steam Discharge Measurement Data Sheet (Appendix B).

5.2.2 Discharge Calculations

Referring to Figure 1, calculate the partial discharge for any partial section as follows:

$$q_x = V_x \, d_x \left(\frac{b_x - b_{(x-1)}}{2} + \frac{b_{(x+1)} - b_x}{2} \right)$$

$$= V_x \, d_x \left(\frac{b_{(x+1)} - b_{(x-1)}}{2} \right)$$

where:

q_x	=	discharge through partial section x
V_x	=	mean velocity at location x
b_x	=	horizontal distance from initial point to location x
$b_{(x-1)}$	=	horizontal distance from initial point to preceding location
$b_{(x+1)}$	=	horizontal distance from initial point to next location
d_x	=	depth of water at location x.

For example, the discharge through partial section 4 would be:

$$q_4 = V_4 \; d_4 \left(\frac{b_5 - b_3}{2} \right)$$

The procedure is similar when the location x is at a beginning or end section. The "preceding location" at the beginning of the cross-section is the location x. The "next location" at the end of the cross-section is the location n.

Calculate the partial discharge for beginning or end sections as follows:

$$q_1 = V_1 \; d_1 \left(\frac{b_2 - b_1}{2} \right)$$

$$q_n = V_n \; d_n \left(\frac{b_n - b_{(n-1)}}{2} \right)$$

Use the above formula for q_n whenever there is water on only one side of an observation point, such as at piers, abutments, and islands. It will usually be necessary to estimate the velocity at an end section as a percentage of the adjacent section, because it is normally impossible to measure the velocity accurately with the current meter close to a boundary.

Calculate the total discharge by summing up the flow through all the partial sections:

$$q_T = \sum_{x=1}^{n} q_x$$

where: q_T = total discharge for stream
q_x = discharge through section x
n = number of sections.

5.3 Portable Cutthroat Flumes

Use a portable cutthroat flume with interchangeable throat widths typically ranging from 1 to 8 inches to measure most discharges. Set-up and measurement with the cutthroat flume are significantly easier and faster than with a flow meter, and the flume is more accurate when installed properly.

Place a portable cutthroat flume in a section of the stream channel with a bed slope of less than approximately 1 percent for a distance of 4 to 6 feet upstream of the flume. When the proper throat width is used, a pool of water at least twice the front width of the flume should form upstream of the flume. Install, level, plumb, and square the flume. Divert all the flow into the flume inlet. Be careful to ensure that water does not run underneath the flume. After the flow has equilibrated, read the staff gage provided in the flume and record the flow depth. Take and record two identical staff gage measurements 5 minutes apart to demonstrate that the flow has equilibrated. Install the flume so that free-flow occurs (that is, the flow through the flume reaches critical depth) near the minimum width in the flume.

If any leakage occurs through or around the dike, estimate the amount of leakage as a percentage of the total measured flow and then add the estimated leakage to the measured flow in order to calculate the total flow.

5.4 Time and Volume

The time and volume method consists of capturing flow in a container and measuring the time required to fill the container. When using this method, divert the flow through a culvert and measure the discharge at the point of outflow. Alternatively, a small earthen dike can be built to divert spring flow into a container with a known volume through a pipe that has been temporarily placed in the channel. Record the time required to fill the container with a stopwatch.

Repeat the measurement at least three times and average the resulting values. If the variance between the time measurements exceeds 10 percent, repeat the measurement procedure. If any

leakage occurs through or around the dike, estimate the amount of leakage as a percentage of the total measured flow and then add the estimated leakage to the measured flow in order to calculate the total flow.

5.5 Time and Distance

In extreme cases where other measurement procedures fail or are not available, stream discharge may be estimated by measuring the time a floating object takes to travel a known distance through a stream section of known volume. In this method, measure or estimate the area of an average cross section with the procedures described in Section 5.2.1. Measure the time required for a floating object to travel a measured distance (e.g., 10 feet) of a uniform stream section. If possible, select an object that will float immediately below the water surface, because such an object will travel at approximately 90 percent of the actual water velocity. Given the time, distance, cross-sectional area, and the 90 percent correction factor, calculate the discharge.

6.0 DOCUMENTATION

This section provides forms to document the chemical and physical parameters that are measured during sample collection. These parameters include pH, temperature, specific conductivity, and discharge. In this documentation, include the conditions for which the various instruments were calibrated and the conditions in which the measurements were made.

Appendix A presents a Surface Water Data Sheet for spring and surface-water sample collection activities. Field personnel shall use this form to document the following information:

1. Sample identification and location
2. Sample collection date and time
3. Sample party members
4. Weather conditions
5. Stream or spring conditions

6. pH meter used, its calibration, and pH measurements

7. Water temperature

8. Conductivity meter used, its calibration, and conductivity measurement

9. The volume of sample collected and its relative location

10. Whether QA/QC samples were collected at this site (Quality assurance is discussed in Section 4.1.5.)

11. Any additional notes or observations pertinent to this sample, including treatment, preservation, and any deviations from established procedures.

For every sample collected, fill out this form, which provides a checklist of tasks to be accomplished for each sample. This form is a generic form and all spaces may not apply to the site. Fill in all applicable spaces clearly in black ink. If you make an incorrect entry, draw a single heavy line through the entry, make the correct entry, and initial and date the correction. Keep the completed forms in a 3-ring notebook and order the forms chronologically by station.

APPENDIX A

SURFACE WATER SAMPLING DATA SHEET

APPENDIX B

STREAM DISCHARGE MEASUREMENT DATA SHEET

SURFACE 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 ☐

INSTRUMENT CALIBRATION

pH Meter: Meter Number_____

Buffer____ Measured Value_____ Temp.____ °C

Buffer____ Measured Value_____ Temp.____ °C

Conductivity Meter: Meter Number_____

Standard_____mS/cm Measured Value_____mS/cm Temp.____°C

Standard_____mS/cm Measured Value_____mS/cm Temp.____°C

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

SAMPLE LOCATION DESCRIPTION

Notes: _____

_____

SAMPLE COLLECTION PROCEDURE Fill bottles directly in stream ☐ Fill bottles with beaker ☐ Number of bottles _____

Filter with peristaltic pump: Directly from stream ☐ From intermediate sample bottle ☐ From beaker ☐

Decontamination Procedure: _____

Notes: _____

_____

DISCHARGE MEASUREMENT Cutthroat Flume: 1"☐ 2"☐ 4"☐ 8"☐ Marsh McBirney☐ Volume/Time☐ Estimate☐

Discharge _____ cfs☐ gpm☐ Initial staff gauge _____ Final staff gauge (after 5 minutes) _____ Photos _____

Notes: _____

_____

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 _____

STREAM DISCHARGE MEASUREMENT DATA SHEET

Distance From Initial Point (feet)	Width (feet)	Depth (feet)	Observation Depth (feet)	Time (seconds)	Velocity (ft/sec)	Area ($feet^2$)	Discharge (cfs)

APPENDIX 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_____

Buffer____ Measured Value_____ Temp.____ °C

Buffer____ Measured Value_____ Temp.____ °C

Conductivity Meter: Meter Number_____

Standard_____mS/cm Measured Value_____mS/cm 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 _____

STANDARD OPERATING PROCEDURE #7

SAMPLE DOCUMENTATION, PRESERVATION, HANDLING, PACKAGING, AND CHAIN OF CUSTODY

Prepared by:
Telesto Solutions, Inc.
1601 Prospect Parkway, Suite C
Fort Collins, CO 80525

January, 2005

TELESTO
SOLUTIONS • INCORPORATED

TABLE OF CONTENTS

Section Page

1.0 PURPOSE AND SCOPE

This document defines the standard operating procedure (SOP) for sample documentation, handling, packaging, and chain of custody procedures. The American Society for Testing and Materials (ASTM) Standard Practice for Sampling Chain of Custody Procedures (D 4840-88) was used to prepare this SOP.

2.0 RELATED STANDARD OPERATING PROCEDURES

This SOP supplements and is referenced by other SOPs; however, it does not reference any other SOP.

3.0 NECESSARY EQUIPMENT

The following equipment may be used for sample labeling, filtering, packing, documentation, and chain-of-custody procedures:

- Sample bottles
- Sample labels
- Appropriate preservatives
- Field book and data forms
- Chain of custody document
- Black permanent markers, black pens, pencils
- Clear plastic tape
- Fiber tape
- Custody seals

- Large (30 gallon) trash bags
- Gallon ziplock freezer bags
- Ice
- Sample shipment coolers
- Shipping labels
- Federal Express or UPS airbills
- Disposable 0.45-micron filters
- Silicon or Tygon® tubing
- Peristaltic pump
- Watch
- Mobile phone or radio.

4.0 PROCEDURES FOR SAMPLE DOCUMENTATION

4.1 Sample Identification

Assign unique sample identification numbers to collected samples in order to identify the sampling location and sampling sequence for each sample and sample date. These numbers are required for tracking the handling, analysis, and verification or validation status of all samples collected during monitoring. In addition, input the sample identification numbers into the project database to identify analytical results received from the laboratory.

Divide sample identification numbers that are assigned into three fields, as shown in the following examples:

- Telesto1-01-01-011705 (primary sample at Telesto-01)
- CCS-03-02-950318 (duplicate sample at Cottonwood Creek Station 03)
- MW-01-3.5-4.0-01-960216 (primary sample at MW-01 from 3.5 to 4.0 feet).

The first field (e.g., Telesto-01, CCS-03, or MW-01-3.5-4.0) uniquely identifies the specific sample and is usually tied to the location, matrix sampled, and/or specific sample depths. If required, any additional site-specific identification can be encoded within the sample location field. The second field identifies whether the sample is a primary (01), a field duplicate (02), field blank (03), equipment rinsate (04), or matrix spike (MS) sample. The third and final field contains the date in a day month year format to allow data in the analytical database to be sorted easily. For example, the first sample identified above was collected on January 17, 2005

4.2 Sample Labeling

Label each sample that is collected in the field for future identification. Before collecting the sample, a member of the sampling team will fill out sample labels as completely as possible with black waterproof ink. In most cases, sample labels need to be obtained from the analytical company. Each label will contain at least the following information:

- Sampler's company affiliation
- Unique identification number
- Date and time of sample collection
- Analyses required
- Method of preservation used
- Sampler's signature.

After the label is completed and attached to the sample container, place clear tape over the label to protect and secure it to the bottle.

4.3 Sample Containers, Preservatives, Filtration, and Holding Times

4.3.1 Sample Containers

Observe proper sample preparation practices (Section 4.5) to minimize sample contamination and potential repeat analyses due to anomalous analytical results. Before sampling, obtain commercially-cleaned sample containers from the analytical laboratory. Keep all documentation regarding sample bottle decontamination. Label the bottles as described in the Section 4.2. If sample bottles have not been pre-preserved from the laboratory, add preservatives in the field after sample collection.

4.3.2 Sample Preservation

Samples are preserved to prevent or minimize chemical changes that could occur during transit and storage. Preservation methods include placing samples on ice and adding certain chemicals. If sample bottles are not pre-preserved, preserve samples immediately after collecting them to ensure that laboratory results are not compromised by improper coordination of preservation requirements and holding times. If sample bottles are pre-preserved, allow the sample to free fall into the container and do not allow it to overflow. Store samples on ice in coolers before and during shipping. Specific sample preservation requirements will be specified in the project work plan or sample plan and should be discussed with the laboratory before performing the sampling episode.

Verify the proper pH of the sample after preservation. Use disposable pH test strips to quickly and conveniently verify proper preservation. Do not immerse the pH test strips directly into the sample bottle; instead, wet the strips with a small aliquot of the sample.

4.3.3 Sample Filtration

Filter samples that will be tested for dissolved cations and metals through a 0.45-micron filter. Two common filtration methods use either disposable filter cartridges or disposable filters in a reusable filter holder. If possible, use disposable filter cartridges, because these will eliminate both decontamination and the possibility of cross-contamination. Attach the disposable filter cartridge to disposable silicon or Tygon® tubing and connect the combination to a peristaltic pump or directly to the electric submersible pump discharge.

If reusable filter holders are used, be sure to decontaminate the filtration apparatus to avoid cross-contamination. Decontaminate filter holders as specified in SOP #1. Follow manufacturer's operating directions when operating filter holders and/or peristaltic pumps.

Regardless of the filtration method used, flush the filter and tubing with at least 100 milliliters of sample water before collecting samples. An intermediate container may be required to hold the unfiltered sample. For the intermediate container, use a new, unused sample bottle or a container that has been decontaminated before use as specified in SOP #1. Filter samples that require chemical preservation before preserving them.

4.3.4 Sample Holding Times and Analyses

Sample holding times are established to minimize chemical changes in a sample before analysis and/or extraction. A holding time is defined as the maximum allowable time between sample collection and analysis and/or extraction, based on the nature of the analyte of interest and chemical stability factors. Holding times will be specified in the project work plan or sample plan and should be discussed with the laboratory before performing the sampling episode. To minimize the possibility of exceeding holding times, send samples to the laboratory as soon as possible after collection by hand delivery or an overnight courier service.

The chemical constituents, preservation, and holding times for samples will be summarized in the project work plan or sample plan.

4.4 Sample Packaging for Shipping

To maintain the required storage temperature, ship the samples by the quickest route. Do not allow travel time to exceed 24 hours. Inform the analyzing laboratory of the shipment and of the carrier handling the shipment. Ship the samples in a sealed, ice-filled cooler of good quality. Place the appropriate completed chain-of-custody (COC) forms in each cooler.

The field sampling team shall pack non-hazardous samples for shipment as follows:

1. Obtain an appropriately sized cooler of good quality to pack the samples.

2. Line the cooler with a large plastic trash bag.

3. Place each sample bottle in a appropriately sized freezer zip-lock plastic bag, and place the bottle upright in the large plastic trash bag lining the cooler.

4. Double-bag ice in 1-gallon freezer zip-lock plastic bags. Use enough ice to keep the samples cool until they are received by the laboratory. Use more ice in the summer time.

5. If required, use vermiculite or a similar absorbent material to fill voids in the cooler.

6. Verify that all samples in the cooler have been documented on the COC form. Record the number of the Federal Express Air Bill or other shipping record document on the COC form. Sign and date the COC form and retain a copy of it. Place the COC form in a 1-gallon zip-lock plastic bag and tape the COC form to the inside lid of the shipping cooler.

7. Seal the plastic trash bag liner with a signed custody seal. This will maintain the chain-of-custody if the cooler is inadvertently opened during shipment.

8. Seal the cooler and drainhole with plastic or fiber tape.

9. Attach signed custody seals across two sides of the cooler top.

10. Attach an address label with the laboratory address and phone number and with a return address and phone number.

11. Attach a Federal Express Air Bill or another shipping document. Retain a copy of shipping documents with the COC form.

12. Notify the laboratory of the sample shipment.

13. Verify that the laboratory receives the samples and that the samples were received in good condition and were sufficiently cool.

Transfer the samples in a timely fashion. Holding times and instructions for preservation for the parameters to be analyzed will be specified in the work plan. The laboratory must receive the samples as soon as possible to ensure that analysis and, if the need arises, re-analysis can be performed within the required holding time.

Carefully evaluate samples collected at hazardous waste sites to determine if they should be classified as dangerous goods. If they are hazardous, contact the shipping company to determine the proper shipping procedure. In some cases, state department of transportation laws may apply and should be considered.

4.5 Sample Handling

General sample handling procedures will include the following:

- Always make field measurements on a separate sub-sample, not on the sample that is sent to the laboratory for analysis, and discard it after the measurements have been made.
- Sample bottles shall be properly decontaminated if they are not certified clean by the manufacturer or have not been pre-preserved by the laboratory.
- Do not use bottles that have been used in the laboratory to store concentrated reagents as sample bottles.
- Do not allow the inner portion of sample containers and caps to come into contact with bare hands, gloves, or other objects.

- If contact with air would change the concentration or characteristics of a constituent to be determined, secure the sample without contacting it with air and completely fill the container.
- Keep sample containers in a clean environment away from dust, dirt, fumes, and grime. Keep vehicles clean to help eliminate contamination problems.
- Field personnel shall wear disposable latex or nitril gloves when collecting samples.
- Do not let foreign and metal objects contact acids and water samples.
- Do not measure electrical conductivity on a sample that was first used to measure pH. Potassium chloride that diffuses from the pH probe can alter the conductivity of the sample.
- Do not let samples stand in the sun. Store them in a cool place, preferably in ice chests with ice.
- Ship samples to the laboratory without delay.

5.0 SAMPLE DOCUMENTATION AND CHAIN OF CUSTODY

Documentation of the conditions and procedures used to collect, calibrate, treat, and handle samples and field data is one of the most important aspects of any monitoring program. Proper documentation provides sources to determine the integrity and applicability of the data. Carefully document all field activities in a logbook or on data sheets. Logbooks shall be bound with numbered pages and shall be written in with permanent black ink only. Record field activities in sufficient detail so that field activities can later be reconstructed from the notes. Any changes to the notes in the field book shall be made by drawing a single line through the incorrect material and initialing the markout.

The following sections provide procedures and formats for documenting the field data and conditions at the time of sample collection, shipment to the laboratory, and laboratory analysis. While forms are provided to document specific tasks, the field sampling team shall maintain a field book for recording all other events, conditions, and observations during sampling.

5.1 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.

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
- Sample handling including filtration and preservation, as appropriate for separate sample aliquots
- 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.

5.2 Chain Of Custody Procedures

The custody of all samples shall be documented on COC forms provided by the laboratory. The COC forms will document possession of the sample from collection through laboratory analysis.

Follow appropriate sample custody and documentation procedures precisely to preserve sample integrity and to ensure the validity of field and laboratory data. As a result, all sample data will be traceable from the time and location of sample collection through chemical analyses and to the time when data are used. As described above, record initial information concerning sample collection in the field log book or on data sheets. Information on the custody, transfer, handling, and shipping of samples will be recorded on a Chain-of-Custody (COC) Form.

The objective of the custody identification and control system for the samples is to ensure, to the extent practicable, that the following occur:

- All samples scheduled for collection are uniquely identified.
- The correct samples are analyzed and are traceable to their records.
- Important sample characteristics are preserved.

- Samples are protected from loss or damage.
- Any alteration of samples (e.g., filtration, preservation, and dilution) is documented.
- A forensic record of sample integrity is established.
- Legally traceable custody and possession records are maintained.

For this project, a sample is defined as being in an individual's custody if the following conditions occur:

- The sample is in that individual's actual physical possession.
- The sample is in that individual's view after being in their physical possession.
- The sample is in that individual's physical possession and then locked or otherwise sealed so that tampering will be evident.
- The sample is maintained in a secure area that is restricted to authorized personnel only.

General field custody procedures include the following:

- As few people as possible should handle samples.
- The field sampler is personally responsible for the care and custody of the samples collected until they are properly transferred.
- When transferring the samples, the individuals relinquishing and receiving the samples will document the transfer by signing, dating, and writing the time of the transfer on the COC form.
- The person responsible for delivering the samples to the laboratory or to the shipping carrier will sign the COC form, retain the third copy of the form, document the method of shipment, and send the original and the second copy of the form with the samples. Upon arrival at the laboratory, the person receiving the samples will sign the COC form and return the second copy to the Project Manager.
- Custody seals must be attached so that it is necessary to break the seal to open the shipping container. The person affixing the custody seal will sign and date the seal.

Observe general documentation rules, including the use of black ink. Make any changes to the COC form by drawing a single line through the incorrect material and initialing the markout. Put a line through and initial blank lines on the COC form.

Upon receiving the samples, the laboratory's representative shall do the following:

- Sign and keep copies of the air bill.
- Sign the COC form.
- Measure and document the temperature of the samples.
- Document the condition of the sample.
- Notify the project manager if any breakage or improper preservation has occurred or if there is a discrepancy between the COC form, sample labels, and requested analyses.
- Provide copies of the above documentation to the project manager with the final laboratory data package.

6.0 REFERENCES

ASTM D-4840 - 88, Standard Practice for Sampling Chain of Custody Procedures, *1995 Annual Book of ASTM Standards*, Vol. 04.08.

STANDARD OPERATING PROCEDURE #9

FIELD PARAMETER INSTRUMENT CALIBRATION AND MEASUREMENT

Prepared by:
Telesto Solutions, Inc.
1601 Prospect Parkway, Suite C
Fort Collins, CO 80525

January, 2005

TELESTO
SOLUTIONS • INCORPORATED

TABLE OF CONTENTS

LIST OF APPENDICES

1.0 PURPOSE AND SCOPE

This document defines the standard operating procedure (SOP) for field parameter instrument calibration and measurement. This SOP describes the equipment and field procedures necessary to measure field parameters.

Whenever water samples are collected, measure field parameters on a separate aliquot of the sample immediately after collecting the sample. This SOP describes how to properly calibrate instruments and measure pH, temperature, conductivity, and turbidity in the field.

Many types of meters and methods are used to measure field parameters. The following sections: (1) list specific equipment requirements, (2) clarify the objectives of measuring field parameters to help the samplers obtain the proper equipment, and (3) describe the required apparatus for performing the measurements.

2.0 RELATED STANDARD OPERATING PROCEDURES

This procedure is intended to be used with the following SOPs:

SOP #	Title
1	Equipment Decontamination

3.0 pH METER CALIBRATION AND MEASUREMENT

3.1 Required pH Measurement Equipment

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

- Portable Hach One pH Meter Model 43800-00 with Hach One Combination pH Electrode Model 48600 or the EC10 Portable pH/mV/Temperature Meter Model 50050 with the Combination pH Electrode with Temperature (Gel-filled) Model 50200
- Spare electrolyte cartridge, if required

- Hach pH Electrode Storage Solution, Catalog No. 50301-49
- Extra batteries
- Beakers
- Buffer solutions of pH 4, 7, and 10
- Deionized or distilled water and wash bottle
- Kimwipes or equivalent.

Many chemical reactions are pH-dependent; therefore, pH is an important indicator of the state of the water. If possible, determine the pH in situ; if this is not possible, determine the pH from a water sample as soon as possible. Determine the pH by the electrometric method using standard buffer solutions. The electrometric method is the preferred method because of its greater accuracy and ease of measurement. A combination electrode, which combines the glass membrane electrode and the reference electrode, may also be used.

Many portable battery-powered pH meters are available with a variety of features and abilities. The meter selected for field use should be rugged and it should be carried and stored in a foam-lined, water-resistant carrying case. The carrying case should have sufficient room to store extra pH buffers, electrode filling solution, spare electrodes, cables, and batteries.

Meters recommended should automatically compensate for temperature and be capable of calibration with a two-point (two buffers) slope adjustment method. The meter should have a precision of ±0.05 units.

3.2 pH Meter Calibration Procedures

Before collecting samples, calibrate the pH meter in accordance with the manufacturer's instructions using calibration solutions. The field sampling team shall record all pH measurement data, including calibration dates, readings, SMI meter number, and temperatures, on a data sheet or in a

field notebook.

The field sampling team shall be familiar with the meter and shall follow the manufacturer's instructions for calibrating and using the meter. Appendix A presents the manufacturer's manual for the Portable Hach One pH Meter Model 43800-00, Hach One Combination pH Electrode Model 48600, the EC10 Portable pH/mV/Temperature Meter Model 50050, and the Combination pH Electrode with Temperature (Gel-filled) Model 50200. Calibrate the pH meter at the start of each sampling day and, as needed, when measuring waters with different pH values. Thoroughly document all calibrations, including the buffer readings and temperatures in the field book or data sheets. The field sampling team shall do the following when calibrating the meter according to the manufacturer's procedures:

- Condition new pH electrodes by soaking them for one hour in Hach pH Electrode Storage Solution. Do not condition pH electrodes that have been properly stored in Hach pH Electrode Storage Solution.

- One of the buffer solutions used for the slope adjustment should bracket the anticipated pH of the sample, and the other buffer should always have a pH of 7. Ensure that the buffer solutions are at the same temperature and are as close as practical to the temperature of the water to be measured. Use buffer solutions once and then discarded them.

- Before immersing the probe into the buffer or sample, rinse the probe with deionized or distilled water and blot it dry with a clean wipe. Protect the glass tip of the probe from abrasion and scratching.

- Adjust the slope of the meter with two buffer solutions (2-point slope adjustment) at least daily, and preferably twice per day to account for changes in conditions of the probe and meter and, as needed, when measuring waters with different pH values.

- If the slope deviates significantly from its theoretical value, search for a potentially defective electrode or contaminated buffer solution.

3.3 pH Measurement

The sampler shall measure pH in the field as follows:

1. Thoroughly check the pH meter, including the battery, and then calibrate the meter in the laboratory before taking it to the field. The buffers used for calibration should bracket the anticipated pH values to be measured.

2. Recalibrate the meter in the field before use.

3. If the pH is measured in a container, rinse the sample container with deionized water and then rinse it three times with the sample water prior to measurement. Rinse the pH probe with deionized water and, if possible, blot the probe dry with a clean wipe. Be sure to protect the fragile glass bulb at the end of the probe from damage.

4. Immerse the electrode into the water, allow the pH reading to stabilize, and monitor the drift of the instrument. Do not immerse the electrode above the top of the pH probe. When the pH reading stabilizes, record the temperature and the pH reading to the nearest 0.01 unit.

5. Between measurements, store the electrode in pH Electrode Storage Solution.

6. Measure samples within a short period of time after sampling and on a separate aliquot of the sample.

7. For the Hach One Combination pH Electrode Model 48600, dispense electrolyte if the reading becomes unstable, erratic, or if stabilization takes too long. An unstable reading may also indicate an air bubble in the reference line. Depress the dispenser button repeatedly until the bubble is expelled (5 to 10 clicks should be sufficient). Note that it is not necessary to refresh the electrolyte gel at the reference outlet between readings unless the reading is not stable.

8. Short-term electrode storage (between measurements/up to one week) will be in the Hach pH Electrode Storage Solution or cotton soaked in the Hach pH Electrode Storage Solution. Do not store in deionized water, as this will shorten the electrode life.

4.0 CONDUCTIVITY METER CALIBRATION AND MEASUREMENT

Electrical conductivity, or specific conductance, is the ability of water to conduct an electric current and depends on the concentration of ions in solution. The relationship between conductivity and the concentration of dissolved solids is approximately linear for most natural waters. Changes in this

relationship indicate changes in the proportions of different salts and, therefore, changes in the sources of dissolved substances that enter the water body.

Conductivity is usually measured in the field with a hand-held meter that is equipped with a conductivity cell and temperature probe. The meter measures the ability of water to conduct electricity across a specified distance and cross-sectional area.

Numerous types of conductivity meters are available with various features and accessories. For measuring conductivity in the field, use a meter that can also measure temperature, has either a manual or automatic temperature compensator, and that displays conductivity directly in units of microsiemens per centimeter (µS/cm), corrected to a temperature of 25 degrees Centigrade (°C). Carry and store the meter in a foam-lined, water-resistant carrying case. The carrying case should have sufficient room to store extra calibration solution, spare probes, and batteries.

4.1 Conductivity Measurement Equipment

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

- Hach CO150 Conductivity Meter Model 50150, Hach Conductivity/TDS Meter Model 44600, or Oakton® WD-35607-10 Hand-Held Conductivity Meter
- Extra battery
- Calibration solutions which bracket expected range of measurements
- Deionized water
- Wash bottle
- Kimwipes
- Beakers.

4.2 Conductivity Meter Calibration

Before collecting samples, calibrate the conductivity meter using calibration solutions in accordance with the manufacturer's instructions (Appendix B). The sampler shall record all conductivity measurement data, including calibration dates, readings, SMI meter number, and temperatures, on a data sheet or in a field notebook.

Reagent-grade potassium chloride (KCl) or other equivalent solutions are universally used as reference solutions to calibrate conductivity (specific conductance) equipment. The reference solutions are also used to check the accuracy of the meter, usually on a daily basis or, as necessary, at more frequent intervals.

The conductivity of the reference solutions that are used to calibrate the meter should bracket the expected range of the conductivity of the water samples. Commercially prepared calibration standards are available from laboratory suppliers at many standard concentrations.

The sampler shall calibrate the meter as follows:

1. Calibrate the meter according to the manufacturer's instructions.

2. Prepare or obtain standard reference solutions of a known value at a known temperature. Adjust the meter or the calibration solution to the correct temperature.

3. Adjust the meter to read the reference conductivity. Rinse the probe with deionized water and blot the probe dry. Re-immerse the probe in the reference solution and read the measured value to validate the corrected conductivity.

4.3 Conductivity Measurement

Whenever possible, measure conductivity in situ or immediately after a sample is collected. If conductivity is measured within 24 hours, do not filter the conductivity sample beforehand. Record conductivity readings to the nearest 0.1 µS/cm, corrected to 25ºC .

The sampler shall measure conductivity as follows:

1. Check the meter, including the battery, and calibrate the meter before taking it to the field. Buffer solutions used for calibration should bracket the expected conductivity values to be measured.

2. Recalibrate the meter in the field before use.

3. Rinse the probe with deionized water and blot the probe dry with a clean wipe, without wiping the plating on the cell.

4. Insert the probe into the sample solution. Immerse the tip to or beyond the vent holes and agitate the probe vertically. Make sure that air bubbles are not trapped near the temperature sensor. Allow the reading to stabilize before recording measurements. Measure and record the temperature of the sample.

5. During normal use, rinse the probe thoroughly with deionized water between measurements to minimize the buildup of interfering substances on the probe element.

6. Because the Model 44600 Conductivity Meter does not automatically turn itself off, verify that the unit is off before storing it.

5.0 TURBIDITY METER CALIBRATION AND MEASUREMENT

One of the most sensitive and, therefore, the most representative field parameter measured during ground water sample collection is turbidity. Measure turbidity in the field with the Hach Portable Turbidimeter Model 2100P. The Hach Portable Turbidimeter Model 2100P manual is presented in Appendix C.

5.1 Turbidity Measurement Equipment

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

- Hach Portable Turbidimeter Model 2100P
- Extra battery
- Calibration solutions which bracket expected range of measurements
- Silicone oil
- Deionized water

- Wash bottle
- Liquinox solution
- Kimwipes
- Beakers.

5.2 Turbidity Meter Calibration and Measurements

Calibrate the turbidimeter before mobilizing to the field. Once in the field, check the calibration by measuring standards of known turbidity as specified in the calibration and measurement procedures presented in Appendix C. The field sampling team shall record calibration checks, dates, and the SMI meter number on a field data sheet or in the field book.

Note the following operational considerations:

- Avoid prolonged exposure to ultraviolet light and sunlight.
- Do not hold the instrument during measurements; place the instrument on a flat, steady surface.
- Measure samples immediately to prevent temperature changes and settling. Avoid sample dilution when possible. Particles suspended in the original sample may dissolve or otherwise change characteristics when the sample temperature changes or when the sample is diluted, resulting in a non-representative sample measurement.
- Handle measurement cells only by the top to minimize dirt, scratches, and fingerprints in the light path.
- Always cap the sample cell to prevent spillage of sample into the instrument.
- Always close the sample compartment lid during measurement and storage.
- When oiling the sample cells, use only a thin coat of oil. Do not use excessive amounts of oil.

The sampler shall measure turbidity as follows:

1. Thoroughly check the meter, including the battery, and then calibrate the meter in the laboratory before taking it to the field.

2. Measure the turbidity of the standard and compare it to its certified value.

3. Clean the sample cell.

4. Fill the sample cell with sample.

5. Clean and oil the sample cell.

6. Place the cell in the meter.

7. Select the range.

8. Signal average the sample (if necessary).

9. Read and record the turbidity to 0.01, 0.1, or 1.0 NTU, depending on the range of the sample.

1. Empty and clean the sample cell.

APPENDIX A

pH METER AND ELECTRODE OPERATOR'S MANUALS

APPENDIX B

CONDUCTIVITY METER OPERATOR'S MANUALS

APPENDIX C

TURBIDIMETER OPERATOR'S MANUAL

APPENDIX A

pH METER AND ELECTRODE OPERATOR'S MANUALS

TABLE OF CONTENTS

APPENDIX B

CONDUCTIVITY METER OPERATOR'S MANUALS

TABLE OF CONTENTS

APPENDIX C

TURBIDIMETER OPERATOR'S MANUAL

TABLE OF CONTENTS

Appendix C
Grand Island Resources
Cross and Caribou Mines
Quality Assurance and Quality Control

FIELD QUALITY ASSURANCE and QUALITY CONTROL PROCEDURES

Field Parameter Instrument Calibration and Measurement

Field parameter instruments and calibration/measurement procedures are presented in SOP #9. Ground water field parameters include pH, conductivity and temperature. Surface water field parameters include pH, conductivity, and temperature. Field parameter instruments will be calibrated before initial measurements and as needed throughout the day as required to maintain instrument accuracy.

Field Quality Assurance/Quality Control Samples

The primary sample and field quality control samples are listed in Appendix C. Quality control samples will include field duplicates, field blanks and rinsate samples. QA/QC samples help identify potential sources of sample contamination and help evaluate potential error introduced by sample collection and handling. All QA/QC samples will be labeled with QA/QC identification numbers (i.e., "02" for duplicate samples, "03" for field blanks, "04" for rinsate) and sent to the laboratory with the other samples for analyses.

Duplicate Samples

Duplicate samples are collected to check for the natural sample variance and the consistency of field techniques and laboratory analysis. Duplicate samples are collected side-by-side with primary samples. For ground and surface water sampling, a duplicate sample will be collected when collecting the primary sample. Primary sample bottles will be collected first and then the duplicate sample bottles for the same analysis will be collected until all necessary sample bottles for both the primary and duplicate samples are filled. Different filter and tubing will be used for the primary and duplicate samples. The duplicate water sample will be handled in the same manner and analyzed for the same parameters as the primary sample. The duplicate sample will be assigned the QA/QC identification number "02," stored in an iced cooler, and shipped promptly to the laboratory so that analyses can be performed within required holding times. One duplicate sample will be collected quarterly per sampling episode.

Field Blanks

Field blanks will be collected by filling sample containers in the field with deionized water. The sample will be assigned the QA/QC identification number "03," stored in an iced cooler, and shipped to the laboratory with the other samples. One field blank will be collected annually. The collection of one ground water and one surface water field blank is anticipated.

Rinsate Samples

An equipment rinsate sample of sampling equipment will be collected to check if decontamination procedures have been effective. For the well sampling operation, a rinsate sample will be collected from the decontaminated sampling equipment (bailer or pump) and filter equipment before using it to obtain the sample. A rinsate sample

will be collected for ground water sampling by transferring the final deionized water rinse that is pumped through the discharge hose into sample bottles. A rinsate sample will be collected for surface water sampling by transferring the final deionized water rinse from sampling equipment into sample bottles. The same parameters that will be analyzed in the ground and surface water samples will be analyzed in the rinsate samples. The rinsate sample will be assigned the QA/QC sample identification number "04," stored it in an iced cooler, and shipped promptly to the laboratory so that analyses can be performed within the holding times.

One rinsate sample will be collected semi-annually. The collection of one ground water rinsate and one surface water rinsate is anticipated. If disposal bailers or sampling equipment is used during sampling events, rinsate samples will not be collected.

Laboratory Quality Assurance/Quality Control

Matrix Spike Samples

Matrix spike (MS) samples will be analyzed to evaluate potential matrix effects on sample analyses for all inorganic parameters. The laboratory will analyze matrix spike samples for the inorganic parameters. The matrix spike samples will be split from an existing sample by the laboratory.

Laboratory Replicate

Laboratory replicate samples will be split from the primary sample in the laboratory and analyzed as part of the laboratory's QA/QC program. The laboratory replicate will not require a separate sample volume.

EXHIBIT N

Stormwater Management Plan (SWMP)

Stormwater Management Plan (SWMP)

Cross and Caribou Mines
Boulder County, Colorado

COR 040242

Prepared for

Grand Island Resources, Inc.
4415 Caribou Road
PO Box 3395
Nederland, CO 80466

Prepared by

Telesto Solutions Inc.
750 14th Street SW
Loveland, Colorado 80537

December 2020

TELESTO
SOLUTIONS • INCORPORATED

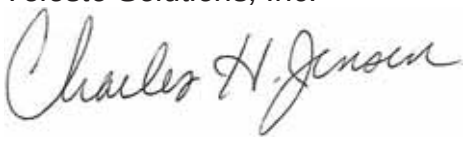
Signature Page

Stormwater Management Plan (SWMP)
Cross and Caribou Mines

December 2020

Report Authors and Contributors

Telesto Solutions, Inc.



Charles Jensen, P.G., C.P.G. – Primary Author

Contributors:

Tim Gerken
Dacey Zehlman-Fahm

Table of Contents

List of Figures

List of Appendices

1.0 INTRODUCTION AND BACKGROUND

This Stormwater Management Plan (SWMP) is for the Cross and Caribou Mines on behalf of Grand Island Resources, Inc (GIR). GIR is preparing to restart mining operations. GIR requested Telesto Solutions, Inc. (Telesto) to prepare the SWMP to meet current requirements of the Colorado Discharge Permit System's General Permit COR040000, Permit for Discharges Associated with Metal Mining Operations and Mine-Waste Remediation (Permit).

1.1 Stormwater Management Plan Administrator

The administrator of the SWMP is:

Mr. Richard Mittasch, VP Operations
Grand Island Resources, Inc.
PO Box 3395
Nederland, Colorado 80466
Phone: (720) 893-3749
Mobile: (516) 582-0833

2.0 FACILITY DESCRIPTION

The Cross and Caribou Mines is located in Sections 8 and 9, Township 1 South, Range 73 West of the Sixth Principal Meridian in Boulder County, Colorado. Site address is 4415 Caribou Road, Nederland, Colorado 80466.

GIR is mining metals, including gold and silver, at the Cross and Caribou Mines. The Cross and Caribou Mines property is approximately 9.99 acres (DRMS Permit Boundary). GIR plans on extracting ore and milling it on location. Post-mill aggregate will be temporarily stockpiled for placement back into mine stopes (under a Class V Injection Permit). The Facility Map shows the mining areas, vegetated areas, overburden/topsoil stockpiles, haul roads, access roads, the parking area for equipment used for extraction and processing of the ore/aggregate, and other site features as described in Section 3.

3.0 STORMWATER MANAGEMENT PLAN FACILITY MAP

Figure 1 (Facility Map) shows the following:

1. *The current mining boundary:* GIR has amended the permit boundary to 9.35 acres.
2. *The location of the facility in relation to surface waters that receive stormwater discharges from the facility:* GIR monitors stormwater which collects at a series of settling ponds. Under a CPDES discharge permit, water is monitored from Pond #2 to Coon Track Creek through Outfall 001-A. Coon Track Creek flows northwest to southeast through the mining property. See Section 3.1.
3. *Significant impervious surfaces within the facility property boundaries:* The impervious area(s) within the permit boundary are building structures and warehouses. The settling ponds on location are lined to prevent seepage.
4. *The locations of all facility stormwater conveyances:*
   a. A series of holding and settling ponds follow the northwest to southeast trend of Coon Track Creek and the topography. Runoff from waste stockpiles is diverted away from Coon Track Creek by earthen diversion berms. Where necessary, straw wattles will be deployed to minimize sediment loss from the waste stockpiles.
   b. A stormwater retention area collects runoff from the northern operation(s) and is connected to a diversion culvert pipe on the north side along the county road.
   c. Borrow ditches (offsite) are located strategically along the county and service roads.
5. *The locations of stormwater inlets and outfalls:* There are no stormwater inlets on-site. The only outfall is Outfall 001-A, located at Coon Track Creek below Pond #2 in the central portion of the facility.
6. *The direction of stormwater flow indicated by arrows:* Stormwater in undisturbed areas generally flows topographically towards the drainage of Coon Track Creek, with some variation as indicated on the Facility Map. Overall flow is to the southeast. Precipitation falling within the Facility is diverted to ponds, roads, or retention area(s) or, flows through undisturbed vegetation to Coon Track Creek.
7. *The areas where mining and processing activities are currently or have previously been conducted, where such activities are exposed to precipitation:* GIR monitors stormwater which collects at a series of settling ponds. Under a CPDES discharge permit, water is monitored from Pond #2 to Coon Track Creek through Outfall 001-A. Runoff from waste stockpiles is diverted away from Coon Track Creek by earthen diversion berms. Where necessary, straw wattles will be deployed to minimize sediment loss from the waste stockpiles.
8. *Locations of all actual or potential pollutant sources associated with mining and processing activities:*
   a. *Vehicle fueling areas:* Vehicle fueling takes place in the parking area, indicated on the Facility Map.
   b. *Overburden stockpiles:* Stockpile(s) are typically located along the berm of

the disturbed area(s) or parking area(s), when possible.

c. *Access and haul roads:* A haul road connects the north and south mining areas.

9. *The location of any and all process water discharge outfalls, including specified locations of mine dewatering operations:* GIR will utilize the series of settling ponds for non-stormwater discharge for the period of mining. The settling pond and Outfall 001-A will accept the mine dewatering discharge.

10. *The location of all structural and applicable non-structural control measured used to meet effluent limits required by the Permit.*

a. The settling pond collects stormwater before discharge to Coon Track Creek.
b. Diversion berms assist in direct flow to Coon Track Creek. Flows are directed to ponds, retention area(s), or access roads.
c. Existing vegetation and wetland(s).
d. Previously mined areas, overburden stockpiles, and channels are revegetated, as needed.

11. *The locations where significant spills or leaks have occurred:* No spills or leaks have occurred on-site. GIR maintains and implements a SPCC Plan.

12. *Location and description of any non-stormwater discharges authorized in Part I.A.1.c or authorized by separate permit coverage:* See #9.

13. *Locations and sources of run-on to the facility from adjacent property that contains significant quantities of pollutants:* Run-on from northern and western property boundaries is minimized by barrow ditches along county and service roads. Vegetation also plays a crucial role in minimizing sediment and pollutant run-on. This run-on is not believed to contain significant quantities of pollutants.

14. *The date the facility site map was prepared and/or amended:* The Facility Map will be updated annually. The current Facility Map was drafted in December 2020.

3.1 Surface Water Characteristics

Coon Track Creek, which flows through the property from northwest to southeast, is a small mountain creek with seasonal inconsistent flow. Flow is directly influenced by snow pack, runoff, and seasonal precipitation. Discharge through Outfall 001A contributes minimally to the flow of Coon Track Creek.

A review of the Boulder County Assessor's mapping data was conducted to identify, if any, flood plain or flood boundary affecting the GIR Facility. The Facility is not located within a flood plain or flood boundary.

4.0 FACILITY INVENTORY AND ASSESSMENT OF POLLUTANT SOURCES

This section identifies all areas associated with industrial activities that have been or may potentially be sources of pollutants, that contribute or have the potential to contribute pollutants to stormwater:

1. *Loading and unloading of materials:* GIR loads haul trucks with aggregate within the mining area. GIR periodically unloads standard hydrated lime on-site. The lime is stored on a pallet in a dry room and covered with a tarp.
2. *Outdoor storage of materials or products:* Waste stockpile(s) are shown on the Facility Map, as described in Section 3.
3. *On-site dust or particulate generating process:* The haul roads and exposed overburden have the potential to generate dust.
4. *Vehicle and equipment fueling, maintenance, and/or cleaning:* GIR personnel or contractors conduct vehicle fueling and maintenance within the parking area shown on the Facility Map.
5. *Immediate access roads used by carriers of raw materials:* Haul trucks use the haul roads and access road to transport ore/tailings.

GIR does not treat, store, or dispose of waste on-site. GIR stores standard hydrated lime on a pallet at both the Cross and Caribou Mines in a dry room under a tarp. There are no roofs or associated surfaces composed of galvanized materials that may be mobilized by stormwater.

4.1 Inventory of Materials

Materials that contribute, or have the potential to contribute, pollutants to stormwater include the following:

1. *Materials handled at the facility that may be exposed to precipitation or runoff and could result in stormwater pollution:* Stormwater runoff can pick-up sediment from stockpiles.
2. *Materials handled at the facility that may leak or spill and be exposed to precipitation or runoff and result in stormwater pollution*: GIR stores, maintains, and refuels equipment, on a limited basis, either in the parking area shown on the Facility Map or off-site.
3. *Potential sources of pollutants from past activities:* There are no potential sources of pollutants from past activities. There have been no reportable spills on-site.

4.2 Assessment of Potential Pollutant Sources

The potential for pollutants associated with mining activities to be present in stormwater runoff is low. GIR conducts all mining within the slurry wall and periodically pumps stormwater that collects within the slurry wall to the settling pond, treating the stormwater before release at Outfall 001-A.

Potential pollution sources within the permit area include:

1. *Outdoor storage of equipment:* Leaks are possible where GIR stores equipment on-site. GIR stores, maintains, and refuels equipment either in the parking area shown on the Facility Map or off-site. The parking area is also located within the slurry wall.
2. *Stockpiles of overburden:* Stormwater runoff can pick-up sediment from stockpiles. Wind can kick-up dust from unvegetated stockpiles.
3. *Routine maintenance activities:* Petroleum spills are possible from refueling. However, GIR refuels either in the parking area or off-site.
4. *Haul roads:* Stormwater runoff can carry sediment from haul roads. Wind can kick-up dust from haul roads.

5.0 DESCRIPTION OF CONTROL MEASURES

The Facility Map shows erosion control measures for the site. The following sections provide details on the control measures.

5.1 Operational Controls

5.1.1 Temporary Channel Diversions

GIR may construct temporary channel diversions around stockpiles, as needed, to route stormwater runoff based on forthcoming mining operations. The need for and the locations of the channel diversions change as the locations of stockpiles change. GIR may pump any stormwater from mining operations to the settling ponds for settling prior to discharge (see Section 5.1.5). GIR would maintain slopes receiving runoff from these diversions as needed.

5.1.2 Revegetation

GIR creates separate, segregated stockpiles of topsoil and of overburden immediately upon commencement of mining. GIR may seed and mulch stockpiles, as needed, for stabilization against water and wind erosion.

GIR may also establish vegetation in drainage channels to minimize erosion.

Reclamation occurs concurrently with the mining operation and therefore revegetation of other disturbed areas also occurs concurrently. Existing vegetation is providing sediment and erosion control and efforts to minimize the disturbance and/or removal of the existing vegetation is paramount.

5.1.3 Straw Bale Barriers/Check Dams

GIR will implement straw bale or wattle barrier(s) around waste stockpiles when necessary. GIR will install additional straw or hay bale check dams if any future drainage swales leave the site, to provide interim sediment control prior to establishment of vegetation.

5.1.4 Vehicle Tracking Control

GIR maintains the gravel service roads and parking areas. Routine grading and leveling is conducted when necessary. Periodic snow removal is also performed and snow placed in places to minimize runoff and erosion of the gravel surfaces. The haul trucks primarily travel on the haul road stabilized with gravel, which minimizes traffic contact with mud and dirt. GIR waters gravel haul roads, as needed, to control dust.

5.1.5 Settling Ponds

GIR maintains a series of settling ponds to manage stormwater and mining process water. The ponds are an integral part of the water treatment and monitoring program prior to discharge under the approved permit at Outfall 01 location. The ponds are lined and are routinely inspected. Flow is continuously measured and reported.

The settling ponds have provided sufficient settling time to achieve water quality standards. GIR samples the discharge effluent pursuant to the Permit.

5.1.6 Borrow Ditches

Borrow ditches are located on either side of the service and county road(s). Stormwater captured from the haul road runs into these ditches and flows along the road(s), where it infiltrates or evaporates. GIR is not responsible for maintaining service or county road BMPs outside of the permit boundary.

5.1.7 Stormwater Retention Area(s)

GIR has engineered a stormwater retention area on the north-central portion of the mining operation. The retention area captures runoff from the northern parking area and potential runoff from offsite. The retention area is connected to a culvert which can divert overflow back across the county road. GIR routinely inspects the stormwater retention area and is maintained when necessary.

5.1.8 Outlet/Outfall Protection

Outfall protection at Outfall 001-A utilizes concrete blocks to dissipate the energy/velocity of the discharged water prior to flowing to Coon Track Creek. This outfall protection has provided adequate erosion control since installation in 2009.

5.2 Reclamation Controls

When GIR completes mining operations, they will reclaim the area with appropriate grading to provide positive drainage as well as seeding and fertilizing to reestablish vegetative growth. Permanent controls will be designed at the time of reclamation.

6.0 ADDITIONAL CONTROL MEASURE REQUIREMENTS

6.1 Minimize Exposure

GIR does not manufacture or process materials on-site. GIR stores standard hydrated lime on a pallet in a dry room under a tarp at both the Cross Mine and the Caribou Mine. GIR

does perform vehicle and equipment fueling, maintenance, and cleaning on-site but implements BMP's as described in Section 6.4. Additionally, concurrent reclamation establishes vegetation to limit exposed surfaces.

6.2 Good Housekeeping

Until completion of reclamation, GIR is responsible to inspect all erosion and sediment controls on a monthly basis and following each heavy precipitation or snowmelt event resulting in runoff. The inspector assesses the adequacy and continued efficiency of the controls, and ensures controls are maintained and repaired as needed.

- GIR removes and properly disposes of any sediment accumulated behind BMP's.
- GIR conducts daily preventative inspections for vehicles located on-site. GIR checks all vehicles for signs of leaks or other potential problems and immediately corrects any problems identified. GIR conducts preventative maintenance for all equipment on a regular basis.
- GIR regularly picks up and disposes of all garbage and waste materials. GIR monitors the perimeter of the site to gather incidental debris that accumulates against the fences.
- Should the approved erosion control plan not function as intended, GIR will provide additional measures to minimize soil erosion and sediment discharged from the site.
- GIR maintains the vegetated areas, settling pond, earthen diversion berms, and haul roads in good condition.

6.3 Maintenance

GIR maintains all control measures used to achieve effluent limits required by the permit in effective operating condition. Maintenance includes preventative and routine maintenance, modification, repair, replacement, or installation of new control measures. GIR documents where maintenance activities are required through site inspections and general site observations and takes corrective actions associated with maintaining control measures with due diligence and as soon as possible after the need is discovered.

6.4 Spill Prevention and Response Procedures

The following materials are present on this site and pose a potential problem in the event of a release:

- Fuel tanks (diesel and gasoline)
- Waste (and overburden) stockpiles

GIR has a written Spill Prevention, Control, and Countermeasure (SPCC) Plan for the Facility. GIR implements BMP's to reduce the risk of stormwater contamination:

- GIR does not store any fuel, oils, or any other materials that are considered hazardous on-site (separate from what is present in vehicles and equipment).
- GIR stores spill clean-up kits aboard equipment and on location.
- GIR uses drip pans for routine maintenance for all on-site machinery to eliminate the potential of fuel, oils, or lubricants from seeping into permeable soils.

GIR has not had a reportable spill at this location but will use the following response procedures in the event of a spill:

- Should a major release occur, company personnel will contain the discharge with the use of materials and equipment located at each site. Any loaders, tankers, materials or other equipment will be made available immediately from other locations or vendors, as needed, to contain all spills that threaten contamination.
- In the event of an accidental fuel spill or equipment leak on-site, GIR will immediately contain the spill in 55-gallons drums and dispose of in a disposal facility certified for receipt of petroleum-product-contaminated soils. If a spill causes violation of any effluent limitation in the general wastewater discharge permit, GIR will report the violation in accordance with that permit – orally within 24-hours, followed by a written report within 5-days.

  Oral Notification:

  Water Quality Protection Section – Industrial Compliance Program
  Water Quality Control Division
  303-692-3500 (during normal business hours)

  Written Notification:

  Water Quality Protection Section – Industrial Compliance Program

Water Quality Control Division
Colorado Department of Public Health and Environment
WQCD-WQP-B2
4300 Cherry Creek Drive South
Denver, CO 80246-1530

Other regulatory agencies that may require reporting include the following:

Environmental Protection Agency (EPA), Region 8
303-312-6132

Colorado Department of Public Health and Environment
Toll-Free 24-hour Environmental Spill Reporting Line
1-877-518-5608

Division of Reclamation Mining and Safety – Dept of Natural Resources
303-866-3567

Colorado Division of Water Resources
303-866-3581

Boulder County Health Department, Emergency Response
970-498-6739

Boulder County Sheriff's Office
970-416-1985 (24-hour non-emergency contact)
970-498-5100

- Should a major release occur, the following GIR personnel will be contacted immediately:

Richard Mittasch, VP Operations	720-893-3749	Office
	516-582-0833	Mobile
Daniel Pollock, Environmental Health and Safety Manager		
	720-207-5154	Office
	312-342-6145	Mobile

- In an emergency, emergency responders will be contacted immediately:

Boulder County Sheriff / Nederland Fire Dept.	911

- The following list of vendors are available and will be contracted on an as needed basis to assist with the containment and clean-up of any release.

1. Custom Environmental Services	800 310-7445

2. Western Cleanup Corp 970 867-9507
3. Restoration Logistics 303 657-1400

- All personnel are to be instructed and rehearsed in spill prevention and counter measure procedures.

6.5 Erosion and Sediment Controls

GIR stabilizes exposed areas and manages runoff using the BMP's discussed in Section 5 of this SWMP.

6.6 Management of Runoff and Pollutant Removal

The settling ponds and earthen berms minimize runoff before it is discharged to Coon Track Creek. When GIR begins mining, groundwater will be pumped to the settling ponds, as well. Borrow ditches located on the county and service roads manage stormwater from outside the permit boundary. Stormwater retention area and a culvert mitigate stormwater on the northern portion of the Facility. Straw wattles and additional earthen berms will be built, as needed, to capture and route runoff from stockpiles or haul roads to the mining operations.

6.7 Employee Training

GIR conducts annual training (and for all new-hires) to cover site-specific control measures used to achieve the effluent limits of the permit, components and goals of the SWMP, monitoring and inspection procedures, and other application requirements of the permit. At a minimum, the following individuals are trained:

1. Employee(s) overseeing implementation of, revising, and amending the SWMP;
2. Employee(s) performing installation, inspection, maintenance, and repair of control measures;
3. Employee(s) who work in areas of industrial activity subject to the permit; and
4. Employee(s) who conduct stormwater discharge monitoring.

6.8 Non-Stormwater Discharges

The only discharges other than stormwater expected to occur at the site will be potential mine dewatering. GIR may pump mine dewatering effluent (groundwater) to the settling pond. The settling pond allows the water to clarify (and be treated) before it enters Coon Track Creek at Outfall 001-A. GIR will sample water discharged to Coon Track Creek and submit monthly discharge reports to the Colorado Department of Public Health and Environment (CDPHE) in accordance with the Permit.

6.9 Waste, Garbage, and Floatable Debris

GIR monitors the interior and the perimeter of the site for garbage and waste materials, which are picked up and disposed of regularly. Garbage bins are stored on-site.

6.10 Dust Generation and Vehicle Tracking of Industrial Materials

GIR stabilizes haul roads on the site with gravel, which minimizes traffic contact with mud and dirt. When needed, GIR uses water trucks on haul roads to minimize dust.

7.0 INSPECTION PROCEDURES AND DOCUMENTATION

GIR personnel make comprehensive quarterly inspections of the stormwater management system at the site each year, except in situations of a weather event, in which case the site is inspected within 24 hours after the end of a storm event. At a minimum, GIR conducts at least one of the inspections during a runoff event (rain or snowmelt). The inspector uses the form (or equivalent) in Appendix D.

8.0 MONITORING PROCEDURES AND DOCUMENTATION

GIR performs and documents visual assessment monitoring and water quality standards monitoring according to the schedules below, when discharges occur.

Visual assessment monitoring reporting identifies:

1. *Monitoring locations:* GIR personnel collect samples at Outfall 001-A.

2. *Staff responsible for conducting stormwater sampling, including signatures:* Dan Pollock – Environmental Health and Safety Manager; Rich Mittasch – VP Operations.
3. *Procedures for sample collection and handling, including any deviations from sampling within the first 30 minutes of a measurable storm event:* GIR personnel conduct the sampling as detailed in the Permit as necessary.
4. *Name of parameter(s) requiring analysis:* GIR personnel visually inspect the sample for color, odor, clarity, floating solids, settled solids, suspended solids, foam, oil sheen, and other obvious indicators of stormwater pollution.
5. *Procedures for sending samples to a laboratory, as applicable:* Not applicable for visual assessment monitoring, unless the inspector obverses an oil sheen or floating oil.
6. *Monitoring schedules:* GIR conducts visual assessment monitoring twice a month for the parameters listed above. In the event the inspector observes oil sheen or floating oil, the inspector collects a grab sample, which is analyzed and reported on the DMR.
7. *The numeric control values applicable to discharges from each outfall:* The daily maximum oil and grease concentration is 10 mg/L, as specified in certification COR040242 (Appendix H).

Water quality standards monitoring reporting identifies:

1. *Monitoring locations:* GIR personnel collect samples at Outfall 001-A.
2. *Staff responsible for conducting stormwater sampling, including signatures.* Dan Pollock – Environmental Health and Safety Manager; Rich Mittasch – VP Operations.
3. *Procedures for sample collection and handling, including any deviations from sampling within the first 30 minutes of a measurable storm event.* GIR samples the discharge effluent pursuant to the Permit.
4. *Name of parameter(s) requiring analysis, the holding times and preservatives, the analytical methods used, and the laboratory quantitation levels:* GIR measures flow, pH, and other constituents listed as specified in certification COR040242 (Appendix H).
5. *Procedures for sending samples to a laboratory, as applicable.* GIR samples the discharge effluent pursuant to the Permit.
6. *Monitoring schedules:* GIR measures flow continuously. The Permit lists the frequency for the other constituents (Appendix H).
7. *The numeric control values applicable to discharges from each outfall:* The maximum 30-day average flow is 0.103 MGD (dependent on the month and spring runoff). The daily maximum pH is 6.5-9.0. Other details are listed in the Permit.

See Appendix H for Certification COR040242 indicating sampling requirements and outfall location.

9.0 CORRECTIVE ACTION DOCUMENTATION

GIR maintains a copy of all Corrective Action reports that document corrective actions taken consistent with the Permit. See Appendix E for the Corrective Action Tracking Form.

10.0 REPORTING AND RECORDKEEPING

GIR documents incidents such as spills and other discharges, along with other information describing the quality and quantity of stormwater discharges in their records. GIR also documents and records all inspections and maintenance activities. The SWMP administration maintains responsibility recordkeeping and interval reporting and keeps a clearly marked file containing all SWMP Documents. GIR uses the forms in Appendices D – G for routine inspections, incident reports, and proposed SWMP changes.

10.1 Routine Reporting of Data

GIR submits monthly Discharge Monitoring Report (DMR) forms to the CDPHE, indicating the data gathered in compliance with the Permit. When the settling pond does not discharge stormwater or process water, GIR reports "No Discharge" on the DMR.

10.2 SWMP Records

GIR retains copies of this SWMP, including modifications made during the term of the permit, documentation related to corrective actions taken, all reports and certifications required by the permit, monitoring data, and records of all data used to complete the application to be covered by this permit, for a period of at least 3 years from the date that coverage under the permit expires or is terminated.

11.0 STORMWATER MANAGEMENT PLAN CERTIFICATION

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is to the best of my knowledge and belief true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

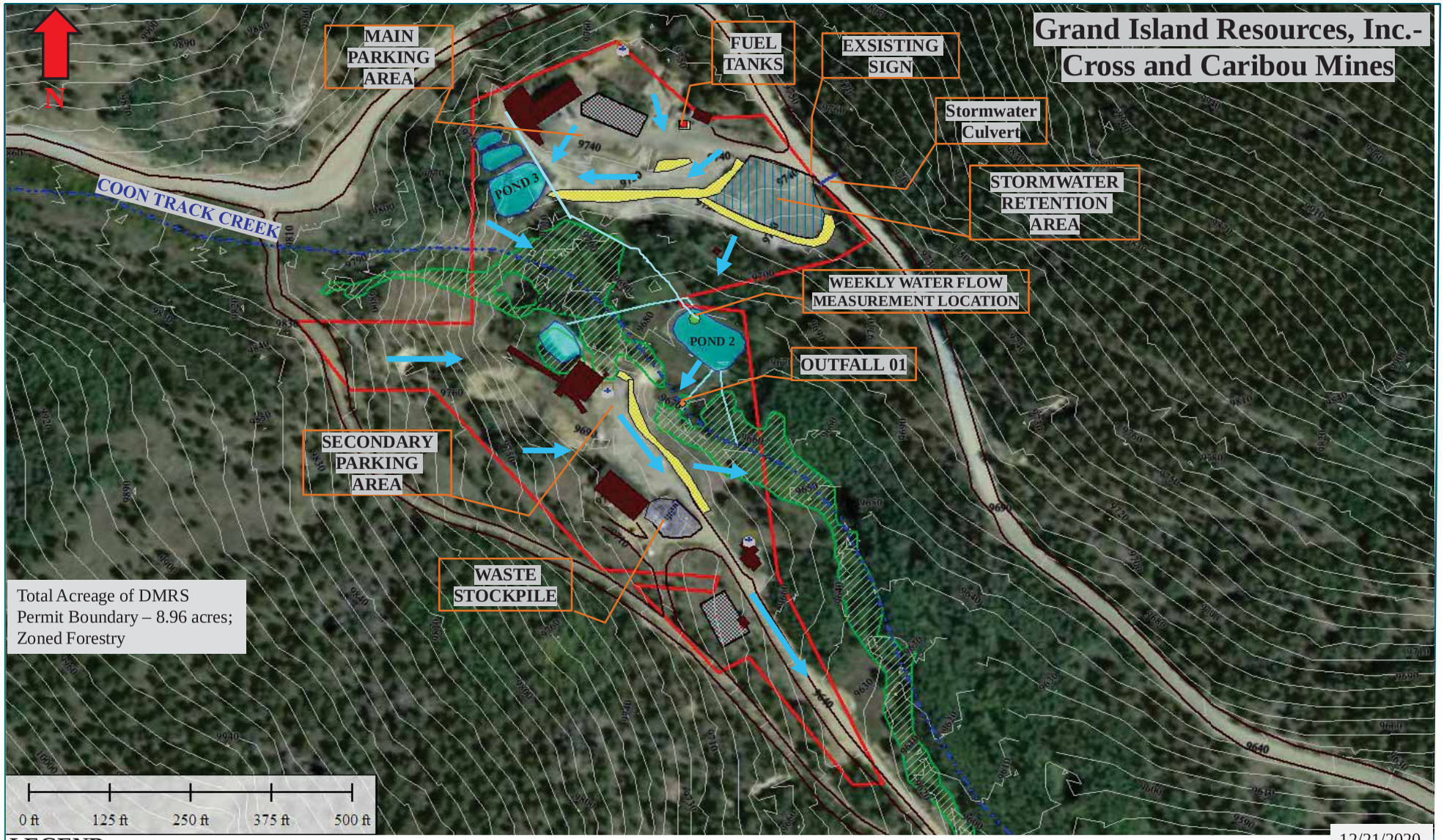
_____ _____

Signature Title

_____

Date

Figure 1A and 1B
Stormwater Management Plan Facility Maps



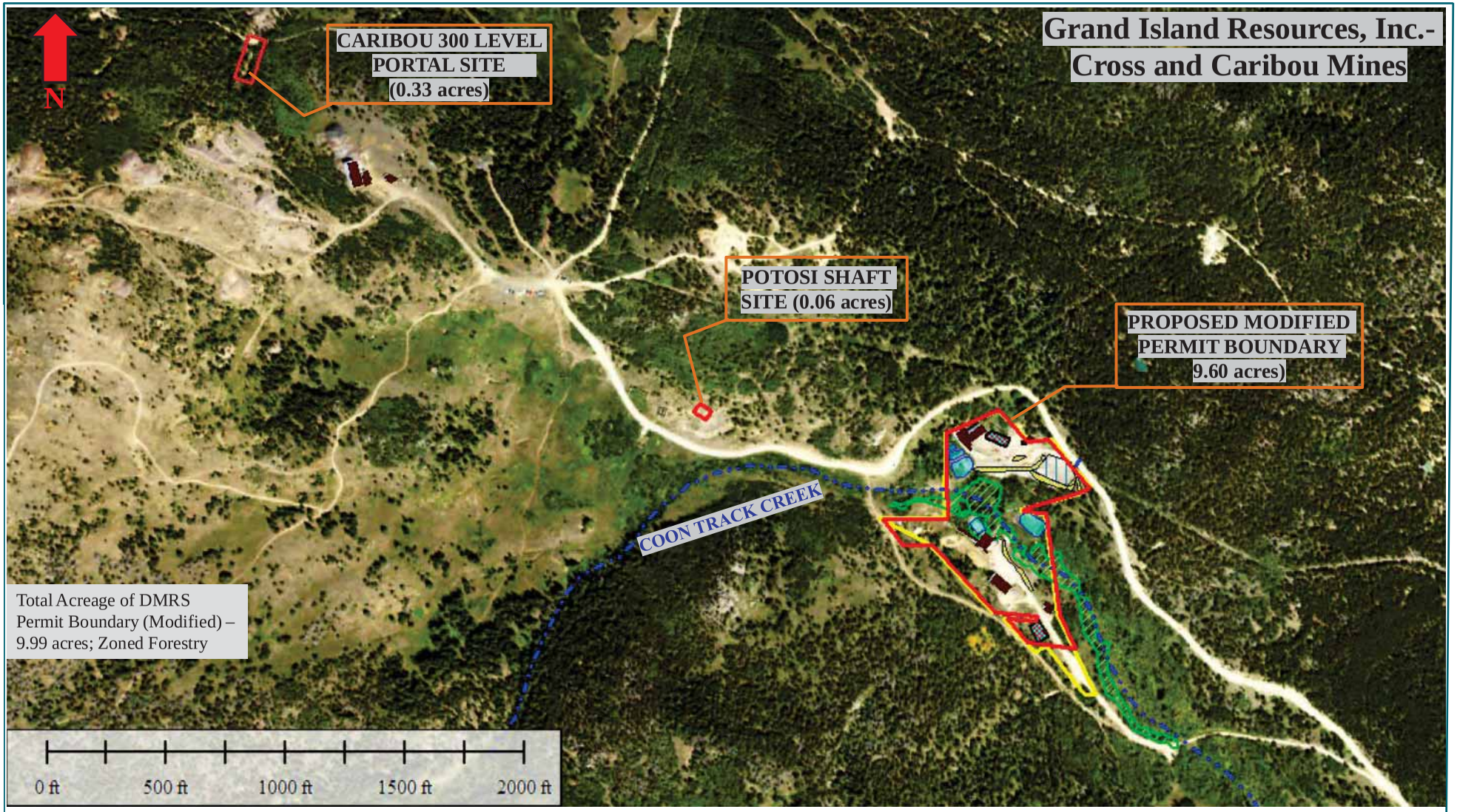
R:\Boulder County\NederlandMining\Cross Gold Mine\Products\Reports\SWMP\20201202_Cross and Caribou Mines_SWMP_Map

PROJECT: 700500	TASK: 001 01
PREPARED BY: TELESTO	

PREPARED FOR: **Grand Island Resources, Inc.**

Figure 1A - Stormwater Management Plan Cross and Caribou Mines

Grand Island Resources, Inc.- Cross and Caribou Mines



LEGEND

- PROPOSED MODIFIED PERMIT BOUNDARY (9.99 acres)
- CURRENT PERMIT BOUNDARY (9.60 acres)
- WETLAND
- POND
- EXISTING BUILDING
- BERM
- SEPTIC TANK & LEACH FIELD

12/21/2020

PROJECT: 700500 TASK: 001 01

PREPARED BY: TELESTO

PREPARED FOR: Grand Island Resources, Inc.

Figure 1B - Stormwater Management Plan Cross and Caribou Mines

R:\Boulder County\NederlandMining\Cross Gold Mine\Products\Reports\SWMP\20201202_Cross and Caribou Mines_SWMP_Map

Appendix A
Employee Training Documents

ANNUAL TRAINING REVIEW for STORMWATER MANAGEMENT PLAN (SWMP)
and
SPILL PREVENTION CONTROL AND COUNTERMEASURE PLAN (SPCC)

All employees at Grand Island Resources, Inc. shall be trained in the operation and maintenance of equipment to prevent and clean up spills; proper reporting and handling of stormwater or process water discharges; spill procedure protocols; general facility operations; current rules, regulations, and pollution control laws; SWMP State permit regulations; and the contents of the SPCC Plan and SWMP for this site.

- This facility is required to prepare and implement an SPCC plan in accordance with Federal rules and regulations established by the EPA.
- This facility has been issued a Wastewater Discharge Permit by the Colorado Department of Health and Environment and is required to prepare and implement a Storm Water Management Plan (SWMP) in accordance with Colorado discharge permit system regulations.
- Any known spill events or failures, malfunctioning components, or recently developed precautionary measures as well as near misses or incidents have been discussed.

Mine Manager - Richard Mittasch _____ Date _____

Employee Signatures (include delivery subcontractors)

_____ date	_____ date
_____ date	_____ date
_____ date	_____ date
_____ date	_____ date
_____ date	_____ date
_____ date	_____ date
_____ date	_____ date
_____ date	_____ date
_____ date	_____ date
_____ date	_____ date
_____ date	_____ date
_____ date	_____ date
_____ date	_____ date
_____ date	_____ date
_____ date	_____ date
_____ date	_____ date

1. SPCC AND SWMP ANNUAL TRAINING REVIEW

    SPILL PREVENTION CONTROL AND COUNTERMEASURE PLAN – SPCC
        Federal Requirement, Rules and Regulations established by EPA
        Any facility with petroleum storage greater than 1320 gallons
    STORM WATER MANAGEMENT PLAN – SWMP
        Colorado Department of Health and Environment - CDPHE
        Requirement of CDPHE Wastewater Discharge Permit
            Permit Number is posted on site.
            Ensures that all process water and stormwater does not leave the mine site.

2. REPORT ANY KNOWN DISCHARGES OR FAILURES, MALFUNCTIONING COMPONENTS
    DIESEL FUEL, UNLEADED GASOLINE
        Storage Tanks and transfer points
    MOTOR OIL, MISCELLANEOUS PETROLEUM PRODUCTS
        Storage Drums larger than 44 gallons and transfer points
        Used oil storage
    Discharge into Coon Track Creek
        Water from the settling ponds that is discharged to the creek is tested monthly, any spills inside the mine area, or unusual discharges should be reported to Mine Manager.

3. OPERATION AND MAINTENANCE OF EQUIPMENT TO PREVENT SPILLS AND DISCHARGES
    O AND M PROCEDURES
        SPCC Manual and SWMP are available for review on site
        Importance of good housekeeping - Insures that stormwater, process water, petroleum or other chemicals do not leave site
        Monthly inspections and maintenance
    SECONDARY CONTAINMENT
        Concrete bunkers, floor curbs, storage sheds
        Secondary Containment around Fuel Tanks
        Berms or other best management practices (straw waddles, silt fences, earthen berms) around stockpiles and site drainage
        Monthly inspections and maintenance

4. DISCHARGE PROTOCOLS

    SPILLS – CLEAN UP AND REPORT
        Small spills clean up and/or report to Mine Manager or other key personnel
        Spill kits or drums on site with material to absorb small spills
        Contain and Clean Up
    LARGE DISCHARGES or “RELEASES” TO PONDS, DITCHES, CREEK
        A “release” is over: 659 gallons from a State Regulated Tank
            1,000 gallons any container
            2 spills of over 42 gallons in one month period
            A Release comes in contact with water and creates a “sheen”
        Must be reported to Mine manager, and other key personnel
        Must be reported to regulatory agencies shown on FIRST RESPONDER CALL LIST

Appendix B
Inspection Form

Grand Island Resources, Inc.

STORMWATER INSPECTION REPORT
(one inspection each quarter)

General Information			
Facility Name	Cross and Caribou Mines		
CDPS Tracking No.	COR040242		
Date of Inspection		**Start/End Time**	
Inspector's Name(s)			
Inspector's Title(s)			
Inspector's Contact Information			
Inspector's Qualifications			

Weather Information
Weather at time of this inspection? O Clear O Cloudy O Rain O Sleet O Fog O Snow O High Winds O Other: Temperature:
Have any previously unidentified discharges of pollutants occurred since the last inspection? O Yes O No **If yes, describe:**
Are there any discharges occurring at the time of inspection? O Yes O No **If yes,**

Control Measures

- *Number the structural stormwater control measures identified in your SWMP on your site map and list them below (add as many control measures as are implemented on-site). Carry a copy of the numbered site map with you during your inspections. This list will ensure that you are inspecting all required control measures at your facility (add more rows if necessary).*
- *Describe corrective actions initiated, date completed, and note the person that completed the work in the Corrective Action Log*

	Structural Control Measure	Control Measure Operating Effectively?	If 'no,' in need of maintenance, repair, or replacement?	Corrective Action needed and notes (identify needed maintenance and repairs, or any failed control measures that need replacement)
1	Temporary Channel Diversions[1]	O Yes O No O N/A	O Maintenance O Repair O Replacement	
2	Revegetation	O Yes O No	O Maintenance O Repair O Replacement	
3	Straw Bale Barriers/ Check Dams	O Yes O No	O Maintenance O Repair O Replacement	
4	Vehicle Tracking Control	O Yes O No	O Maintenance O Repair O Replacement	
5	Sediment Ponds	O Yes O No	O Maintenance O Repair O Replacement	
6	Perimeter Channels/ Ditches	O Yes O No	O Maintenance O Repair O Replacement	
7	Borrow Ditches	O Yes O No	O Maintenance O Repair O Replacement	
8	Vegetation and Wetlands	O Yes O No	O Maintenance O Repair O Replacement	
8	Stormwater Retention Area	O Yes O No	O Maintenance O Repair O Replacement	
9	Outlet/ Outfall Protection	O Yes O No	O Maintenance O Repair O Replacement	

[1]Channel diversions installed as needed (may not always exist)

Non-Compliance

Describe any incidents of non-compliance observed and not described above:

Corrective Action

Provide a summary report and a schedule of implementation of the corrective actions that the permittee has taken or plans to take if the site inspection indicates that the site is out of compliance

Notes

Use this space for any additional notes or observations from the inspection:

CERTIFICATION AND COMPLIANCE STATEMENT

In the judgment of either 1) the person conducting the site inspection, or 2) the permittee or duly authorized representative, the facility is in compliance with the terms and condition of the COG500000 Permit, with respect to Part I.J.2 (Page 20, Inspection Scope):
O Yes O No

"I certify that this report is true, accurate, and complete, to the best of my knowledge and belief."

Inspector: Print name and title

_____

Signature: _____Date:_____

Permittee or Duly Authorized Representative: Print name and title

_____

Signature: _____Date:_____

Visual Monitoring Example Tracking Form

Visual Monitoring (One Sample per Form)		
Year:_____	**Quarter (circle one): 1 2 3 4**	**Date: _____**
Visual monitoring must be conducted once each quarter for the entire permit term. The permittee must collect a stormwater sample from each outfall (or a substantially identical outfall) and conduct a visual assessment of each sample.		
Required Documentation:		
Personnel collecting the sample and performing visual assessment:	**Print Name:**_____ **Title:** _____ **Provide Signature:**_____	
Sample location:		
Sample collection date and time:		
Visual assessment date and time:		
Nature of the discharge (i.e., runoff or snowmelt):		
Results of observations of the stormwater discharge:		
Probable sources of any observed stormwater contamination:		
If applicable, why it was not possible to take samples within the first 30 minutes:		
The visual assessment must be made of a sample in a clean, clear glass, or plastic container, and examined in a well-lit area. The permittee must visually inspect the sample for the presence of the following water quality characteristics, and document the visual assessment results:		
*	Color	
*	Odor	
*	Clarity	
*	Floating Solids	
*	Settled Solids	
*	Suspended Solids	
*	Foam	
*	Oil sheen	
*	Other obvious indicators of stormwater pollution	
Required Documentation Regarding Corrective Action:		
If the visual monitoring indicates the control measures are inadequate or are not being properly operated and maintained, the permittee must conduct corrective actions. ****Use the **Corrective Action Summary Sheet** to provide a summary and schedule of implementation of any corrective action(s) that has or will be taken based on this visual monitoring.		

Corrective Action Summary of Requirements

<table>
<tr><th colspan="5">Summary of Corrective Action Requirements</th></tr>
<tr><th rowspan="2">Permit Ref.
Part:</th><th rowspan="2">Condition</th><th rowspan="2">Required Action</th><th colspan="2">Required Reporting</th></tr>
<tr><th>5-day documentation</th><th>Annual Report</th></tr>
<tr><td>I.K.1.a</td><td>An unauthorized release or discharge (e.g., spill, leak, or discharge of non-stormwater not authorized by this or another permit) occurs</td><td rowspan="4">The permittee must review and revise the selection, design, installation, and implementation of facility control measures to ensure that the condition is eliminated and will not be repeated in the future.</td><td rowspan="6">Within five (5) days of discovery, document the following:
• Identification of the condition triggering the need for corrective action review
• Description of the problem identified
• Date the problem was identified
• Summary of corrective action taken or to be taken (or, for “triggering events” where the permittee determines that corrective action is not necessary, the basis for this determination)
• Notice of whether SWMP modifications are required as a result of this discovery or corrective action
• Date corrective action initiated
• Date corrective action completed or expected to be completed</td><td rowspan="6">Among other requirements, annual reports must include the 5-day corrective action documentation and the status of any outstanding corrective action(s).</td></tr>
<tr><td>I.K.1.b</td><td>Facility control measures are not stringent enough for the discharge to meet applicable water quality standards</td></tr>
<tr><td>I.K.1.c</td><td>Modifications to the facility control measures are necessary to meet the practice-based effluent limits in this permit</td></tr>
<tr><td>I.K.1.d</td><td>The permittee finds in a facility inspection, that facility control measures are not properly selected, designed, installed, operated or maintained</td></tr>
<tr><td>I.K.2.a</td><td>Construction or a change in design, operation, or maintenance at the facility significantly changes the nature of pollutants discharged in stormwater from the facility, or significantly increases the quantity of pollutants discharged</td><td rowspan="2">The permittee must review the selection, design, installation, and implementation of facility control measures to determine the appropriate modifications necessary to attain the effluent limits in this permit.</td></tr>
<tr><td>I.K.2.b</td><td>The average of quarterly sampling results exceeds an applicable benchmark</td></tr>
</table>

Corrective Action Example Tracking Form

Note: Modification of any control measure as part of the corrective action required by Parts I.K.1 and I.K.2 of the permit must be performed consistent with Part I.C (Control Measures) of the permit.

Provide the Permit Reference: *(Example: I.K.1.a)*	Required 5-day documentation						
	Date the problem was identified	**Description of the problem identified (i.e., What's wrong?)**	**The condition triggering the need for corrective action review (i.e., How was this discovered? Example, through visual inspection, Benchmark sampling)**	**Summary of corrective action taken or to be taken (or, for "triggering events" where the permittee determines that corrective action is not necessary, the basis for this determination)**	**Are SWMP modifications are required as a result of this discovery or corrective action? (Yes/No)**	**Date corrective action initiated**	**Date corrective action completed or expected to be completed**

Appendix C
Permit COR040242

AUTHORIZATION TO DISCHARGE UNDER THE

COLORADO DISCHARGE PERMIT SYSTEM

In compliance with the provisions of the Colorado Water Quality Control Act, (25-8-101 et seq., CRS, 1973 as amended), for both discharges to surface and ground waters, and the Federal Water Pollution Control Act, as amended (33 U.S.C. 1251 et seq.; the "Act"), for discharges to surface waters only, the

Calais Resources Inc.

is authorized to discharge from the Cross and Caribou Mines wastewater treatment facility located **in the SE 1/4 of the NW 1/4 of S9, T1S, R73W; 4415 Caribou Road, Nederland, CO; at 39.978056° latitude North and 105.572194° longitude West**

to **Coon Track Creek**

in accordance with effluent limitations, monitoring requirements and other conditions set forth in Parts I and II hereof. All discharges authorized herein shall be consistent with the terms and conditions of this permit.

The applicant may demand an adjudicatory hearing within thirty (30) calendar days of the date of issuance of the final permit determination, per the Colorado Discharge Permit System Regulations, 61.7(1). Should the applicant choose to contest any of the effluent limitations, monitoring requirements or other conditions contained herein, the applicant must comply with Section 24-4-104 CRS and the Colorado Discharge Permit System Regulations. Failure to contest any such effluent limitation, monitoring requirement, or other condition, constitutes consent to the condition by the Applicant.

This permit and the authorization to discharge shall expire at midnight, March 31, 2019

Issued and Signed this 28th day of February, 2014

COLORADO DEPARTMENT OF PUBLIC HEALTH AND ENVIRONMENT

Janet Kieler, Permits Section Manager
Water Quality Control Division

ISSUED AND SIGNED: FEBRUARY 28, 2014

EFFECTIVE: APRIL 1, 2014

TABLE OF CONTENTS

PART I

A. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

1. Permitted Feature(s)

Beginning no later than the effective date of this permit and lasting through the expiration date, the permittee is authorized to discharge from, and self monitoring samples taken in accordance with the monitoring requirements shall be obtained from permitted feature(s):

001A, prior to mixing with Coon Track Creek, upon exit from the settling pond. 39° 58' 41" N, 105° 34' 19.9" W

The location(s) provided above will serve as the point(s) of compliance for this permit and are appropriate as they are located after all treatment and prior to discharge to the receiving water. Any discharge to the waters of the State from a point source other than specifically authorized by this permit is prohibited.

In accordance with the Water Quality Control Commission Regulations for Effluent Limitations, Section 62.4, and the Colorado Discharge Permit System Regulations, Section 61.8(2), 5 C.C.R. 1002-61, the permitted discharge shall not contain effluent parameter concentrations which exceed the limitations specified below or exceed the specified flow limitation.

2. Limitations, Monitoring Frequencies and Sample Types

In order to obtain an indication of the probable compliance or noncompliance with the effluent limitations specified in Part I.A, the permittee shall monitor all effluent parameters at the frequencies and sample types specified below. Such monitoring will begin immediately and last for the life of the permit unless otherwise noted. The results of such monitoring shall be reported on the Discharge Monitoring Report form (See Part I.D.)

Self-monitoring sampling by the permittee for compliance with the effluent monitoring requirements specified in this permit, shall be performed at the location(s) noted in Part I.A.1 above. If the permittee, using an approved analytical method, monitors any parameter more frequently than required by this permit, then the results of such monitoring shall be included in the calculation and reporting of the values required in the Discharge Monitoring Report Form (DMRs) or other forms as required by the Division. Such increased frequency shall also be indicated.

Oil and Grease Monitoring: For every permitted feature with oil and grease monitoring, in the event an oil sheen or floating oil is observed, a grab sample shall be collected, analyzed, and reported on the appropriate DMR. In addition, corrective action shall be taken immediately to mitigate the discharge of oil and grease. A description of the corrective action taken should be included with the DMR.

Outfall 001A

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 $\geq$ IWC	Quarterly	3 Grabs / Test
TKP3B	Static Renewal 7 Day Chronic *Ceriodaphnia dubia*			NOEC or IC25 $\geq$ IWC	Quarterly	3 Grabs / Test

The above monitoring frequencies for parameters at all outfalls may be exempted during the winter months of each year specifically for times when there are problems with site inaccessibility and due to dangerous travel conditions. The permittee will need to demonstrate and indicate in the DMR that conditions are inaccessible for sampling during these periods.

3. Special Monitoring

Mixing Zone Analyses – Conduct remaining threshold tests for exclusion from further analysis under Mixing Zone Regulations. The second threshold test is the Application of the Mixing Zone Exclusion Tables (p. 20, Colorado Mixing Zone Implementation Guidance, February 2002). Under this action, the permittee will collect the necessary site-specific data, perform the required analysis, and provide a report to the Division by **April 1, 2015.** The report will indicate the findings of this threshold test and, if not excluded, provide the workplan for the next threshold test (i.e., determining of the size of the physical and regulatory mixing zones).

Installation of Temperature Monitoring Equipment - The permittee is to submit a document certifying that continuous temperature and flow monitoring equipment has been installed and is operational by **August 31, 2014.**

B. TERMS AND CONDITIONS

1. Facilities Operation and Maintenance

The permittee shall at all times properly operate and maintain all facilities and systems of treatment and control including all portions of the collection system and lift stations owned by the permittee (and related appurtenances) which are installed or used by the permittee as necessary to achieve compliance with the conditions of this permit. Proper operation and maintenance also includes effective performance, and adequate laboratory and process controls, including appropriate quality assurance procedures. This provision requires the operation of back-up or auxiliary facilities or similar systems when installed by the permittee only when necessary to achieve compliance with the conditions of the permit.

Any sludge produced at the wastewater treatment facility shall be disposed of in accordance with State and Federal guidelines and regulations. The permittee shall take all reasonable steps to minimize or prevent any discharge of sludge use or disposal in violation of this permit which has a reasonable likelihood of adversely affecting human health or the environment. As necessary, accelerated or additional monitoring to determine the nature and impact of the noncomplying discharge is required.

2. Compliance Schedule

Activities to Meet Dissolved Cadmium Final Limits – In order to meet Dissolved Cadmium limitations, the following schedule are included in the permit.

Code	Event	Description	Due Date
43699	Facility Evaluation Plan	Submit a report that identifies sources of cadmium to the wastewater treatment facility and identifies strategies to control these sources or treatment alternatives such that compliance with the final limitations may be attained.	December 31, 2014
00899	Implementation Schedule	Submit a progress report summarizing the progress in implementing the strategies to control sources such that compliance with the final Dissolved Cadmium limitations may be attained.	December 31, 2015
CS017	Achieve Final Compliance with Discharge Limits	Submit study results that show compliance has been attained with the final Dissolved Cadmium limitations.	December 31, 2016

Regulation 61.8(3)(n)(i) states that a report should be submitted to the Division no later than 14 calendar days following each date identified in the schedule of compliance. The 14 days have already been incorporated into the above dates and therefore all reports are due on or before the date listed in the table.

3. Chronic WET Testing -Outfall(s): 001A

a. General Chronic WET Testing and Reporting Requirements

The permittee shall conduct the chronic WET test using *Ceriodaphnia dubia and Pimephales promelas*, as a static renewal 7-day test using three separate composite samples. The permittee shall conduct each chronic WET test in accordance with the 40 CFR Part 136 methods described in Short-term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Water to Freshwater Organisms, Fourth Edition, October 2002 (EPA-821-R-02-013) or the most current edition.

January through March
The following minimum dilution series should be used: 0% effluent (control), 18%, 37%, 73%, 87%, and 100% effluent. If the permittee uses more dilutions than prescribed, and accelerated testing is to be performed, the same dilution series shall be used in the accelerated testing (if applicable) as was initially used in the failed test.

April through June
The following minimum dilution series should be used: 0% effluent (control), 13%, 26%, 52%, 76%, and 100% effluent. If the permittee uses more dilutions than prescribed, and accelerated testing is to be performed, the same dilution series shall be used in the accelerated testing (if applicable) as was initially used in the failed test.

July through September
The following minimum dilution series should be used: 0% effluent (control), 13%, 27%, 53%, 77%, and 100% effluent. If the permittee uses more dilutions than prescribed, and accelerated testing is to be performed, the same dilution series shall be used in the accelerated testing (if applicable) as was initially used in the failed test.

October through December
The following minimum dilution series should be used: 0% effluent (control), 13%, 26%, 52%, 76%, and 100% effluent. If the permittee uses more dilutions than prescribed, and accelerated testing is to be performed, the same dilution series shall be used in the accelerated testing (if applicable) as was initially used in the failed test.

Tests shall be done at the frequency listed in Part I.A.2. Test results shall be reported along with the Discharge Monitoring Report (DMR) submitted for the end of the reporting period when the sample was taken. (i.e., WET testing results for the calendar quarter ending March 31 shall be reported with the DMR due April 28, etc.) The permittee shall submit all laboratory statistical summary sheets, summaries of the determination of a valid, invalid or inconclusive test, and copies of the chain of custody forms, along with the DMR for the reporting period.

If a test is considered invalid, the permittee is required to perform additional testing during the monitoring period to obtain a valid test result. Failure to obtain a valid test result during the monitoring period shall result in a violation of the permit for failure to monitor.

b. Violations of the Permit Limit, Failure of One Test Statistical Endpoint and Division Notification

A chronic WET test is considered a violation of a permit limitation when both the NOEC and the IC25 are at any effluent concentration less than the IWC. The IWC are as follows:
Jan-March: 73%
Apr-Jun: 52%
Jul-Sep: 53%
Oct-Dec: 52%

A chronic WET test is considered to have failed one of the two statistical endpoints when either the NOEC or the IC_{25} are at any effluent concentration less than the IWC. The IWC are as follows:
Jan-March: 73%
Apr-Jun: 52%
Jul-Sep: 53%
Oct-Dec: 52%

In the event of a permit violation, or when two consecutive reporting periods have resulted in failure of one of the two statistical endpoints (regardless of which statistical endpoints are failed), the permittee must provide written notification to the Division. Such notification should explain whether it was a violation or two consecutive failures of a single

endpoint, and must indicate whether accelerated testing or a Toxicity Identification Evaluation or Toxicity Reduction Evaluation (TIE or TRE) is being performed, unless otherwise exempted, in writing, by the Division. **Notification must be received by the Division within 14 calendar days of the permittee receiving notice of the WET testing results.**

c. Automatic Compliance Response

The permittee is responsible for implementing the automatic compliance response provisions of this permit when one of the following occurs:

- there is a violation of the permit limit (both the NOEC and the IC25 endpoints are less than the applicable IWC)
- two consecutive monitoring periods have resulted in failure of one of the two statistical endpoints (either the IC25 or the NOEC)
- the permittee is otherwise informed by the Division that a compliance response is necessary

When one of the above listed events occurs, the following automatic compliance response shall apply. The permittee shall either:

- conduct accelerated testing using the single species found to be more sensitive
- conduct a Toxicity Identification Evaluation (TIE) or a Toxicity Reduction Evaluation (TRE) investigation as described below.

i. Accelerated Testing

If accelerated testing is being performed, testing will be at least once every two weeks for up to five tests, running only one test at a time, using only the IC25 statistical endpoint to determine if the test passed or failed at the appropriate IWC. Accelerated testing shall continue until; 1) two consecutive tests fail or three of five tests fail, in which case a pattern of toxicity has been demonstrated or 2) two consecutive tests pass or three of five tests pass, in which case no pattern of toxicity has been found. Note that the same dilution series should be used in the accelerated testing as was used in the initial test(s) that result in the accelerated testing requirement.

If accelerated testing is required due to failure of one statistical endpoint in two consecutive monitoring periods, and in both of those failures it was the NOEC endpoint that was failed, then the NOEC shall be the only statistical endpoint used to determined whether the accelerated testing passed or failed at the appropriate IWC. Note that the same dilution series should be used in the accelerated testing as was used in the initial test(s) that result in the accelerated testing requirement.

If no pattern of toxicity is found the toxicity episode is considered to be ended and routine testing is to resume. If a pattern of toxicity is found, a TIE/TRE investigation is to be performed. If a pattern of toxicity is not demonstrated but a significant level of erratic toxicity is found, the Division may require an increased frequency of routine monitoring or some other modified approach. The permittee shall provide written notification of the results within 14 calendar days of completion of the Pattern of Toxicity/No Toxicity demonstration.

ii. Toxicity Identification Evaluation (TIE) or Toxicity Reduction Evaluation (TRE)

If a TIE or a TRE is being performed, the results of the investigation are to be received by the Division within 180 calendar days of the demonstration chronic WET in the routine test, as defined above, or if accelerated testing was performed, the date the pattern of toxicity is demonstrated. A status report is to be provided to the Division at the 60 and 120 calendar day points of the TIE or TRE investigation. The Division may extend the time frame for investigation where reasonable justification exists. A request for an extension must be made in writing and received prior to the 180 calendar day deadline. Such request must include a justification and supporting data for such an extension.

Under a TIE, the permittee may use the time for investigation to conduct a preliminary TIE (PTIE) or move directly into the TIE. A PTIE consists of a brief search for possible sources of WET, where a specific parameter(s) is reasonably suspected to have caused such toxicity, and could be identified more simply and cost effectively than a formal TIE. If the PTIE allows resolution of the WET incident, the TIE need not necessarily be conducted in its entirety. If, however, WET is not identified or resolved during the PTIE, the TIE must be conducted within the allowed 180 calendar day time frame.

The Division recommends that the EPA guidance documents regarding TIEs be followed. If another method is to be used, this procedure should be submitted to the Division prior to initiating the TIE.

If the pollutant(s) causing toxicity is/are identified, and is/are controlled by a permit effluent limitation(s), this permit may be modified upon request to adjust permit requirements regarding the automatic compliance response.

If the pollutant(s) causing toxicity is/are identified, and is/are not controlled by a permit effluent limitation(s), the Division may develop limitations the parameter(s), and the permit may be reopened to include these limitations.

If the pollutant causing toxicity is not able to be identified, or is unable to be specifically identified, or is not able to be controlled by an effluent limit, the permittee will be required to perform either item 1 or item 2 below.

l) Conduct an investigation which demonstrates actual instream aquatic life conditions upstream and downstream of the discharge, or identify, for Division approval, and conduct an alternative investigation which demonstrates the actual instream impact. This should include WET testing and chemical analyses of the ambient water. Depending on the results of the study, the permittee may also be required to identify the control program necessary to eliminate the toxicity and its cost. Data collected may be presented to the WQCC for consideration at the next appropriate triennial review of the stream standards;

2) Move to a TRE by identifying the necessary control program or activity and proceed with elimination of the toxicity so as to meet the WET effluent limit.

If toxicity spontaneously disappears in the midst of a TIE, the permittee shall notify the Division within 10 calendar days of such disappearance. The Division may require the permittee to conduct accelerated testing to demonstrate that no pattern of toxicity exists, or may amend the permit to require an increased frequency of WET testing for some period of time. If no pattern of toxicity is demonstrated through the accelerated testing or the increased monitoring frequency, the toxicity incident response will be closed and normal WET testing shall resume.

The control program developed during a TRE consists of the measures determined to be the most feasible to eliminate WET. This may happen through the identification of the toxicant(s) and then a control program aimed specifically at that toxicant(s) or through the identification of more general toxicant treatability processes. A control program is to be developed and submitted to the Division within 180 calendar days of beginning a TRE. Status reports on the TRE are to be provided to the Division at the 60 and 120 calendar day points of the TRE investigation.

If toxicity spontaneously disappears in the midst of a TRE, the permittee shall notify the Division within 10 calendar days of such disappearance. The Division may require the permittee to conduct accelerated testing to demonstrate that no pattern of toxicity exists, or may amend the permit to require an increased frequency for some period of time. If no pattern of toxicity is demonstrated through the accelerated testing or the increased monitoring frequency, the toxicity incident response will be closed and normal WET testing shall resume.

d. Toxicity Reopener

This permit may be reopened and modified to include additional or modified numerical permit limitations, new or modified compliance response requirements, changes in the WET testing protocol, the addition of both acute and chronic WET requirements, or any other conditions related to the control of toxicants.

4. Stormwater Requirements

Pursuant to 5 CCR 1002-61.3(2), facilities classified as Standard Industrial Classifications 10 through 14 (mineral industry) including active or inactive metal mining operations are required to obtain permit coverage for discharges of stormwater associated with industrial activities from the facilities to state waters. The stormwater discharge permit applicable to active and inactive metal mining facilities is the CDPS General Permit for Stormwater Discharges Associated with Metal Mining Operations and Mine-Waste Remediation, which is currently administratively continued.

Division records indicate that Calais Resources Inc applied for and obtained coverage under the CDPS General Permit for Stormwater Discharges Associated with Metal Mining Operations and Mine-Waste Remediation for the Cross and Caribou Mines. The CDPS certification number is COR040242.

C. DEFINITIONS OF TERMS

1. "Acute Toxicity" - The acute toxicity limitation is exceeded if the LC50 is at any effluent concentration less than or equal to the IWC indicated in this permit.

2. "Chronic toxicity", which includes lethality and growth or reproduction, occurs when the NOEC and IC25 are at an effluent concentration less than the IWC indicated in this permit.

3. "Composite" sample is a minimum of four (4) grab samples collected at equally spaced two (2) hour intervals and proportioned according to flow. For a SBR type treatment system, a composite sample is defined as sampling equal aliquots during the beginning, middle and end of a decant period, for two consecutive periods during a day (if possible).

4. "Continuous" measurement, is a measurement obtained from an automatic recording device which continually measures the effluent for the parameter in question, or that provides measurements at specified intervals.

5. "Daily Maximum limitation" for all parameters (except temperature, pH and dissolved oxygen) means the limitation for this parameter shall be applied as an average of all samples collected in one calendar day. For these parameters the DMR shall include the highest of the daily averages. For pH and dissolved oxygen, this means an instantaneous maximum (and/or instantaneous minimum) value. The instantaneous value is defined as the analytical result of any individual sample. For pH and dissolved oxygen, DMRs shall include the maximum (and/or minimum) of all instantaneous values within the calendar month. Any value beyond the noted daily maximum limitation for the indicated parameter shall be considered a violation of this permit. For temperature, see Daily Maximum Temperature.

6. “Daily Maximum Temperature (DM)” is defined in the Basic Standards and Methodologies for Surface Water 1002-31, as the highest two-hour average water temperature recorded during a given 24-hour period. This will be determined using a rolling 2-hour maximum temperature. If data is collected every 15 minutes, a 2 hour maximum can be determined on every data point after the initial 2 hours of collection. Note that the time periods that overlap days (Wednesday night to Thursday morning) do not matter as the reported value on the DMR is the greatest of all the 2-hour averages.

   For example data points collected at:
   08:15, 08:30, 08:45, 09:00, 09:15, 09:30, 09:45, 10:00, would be averaged for a single 2 hour average data point
   08:30, 08:45, 09:00, 09:15, 09:30, 09:45, 10:00, 10:15, would be averaged for a single 2 hour average data point
   08:45, 09:00, 09:15, 09:30, 09:45, 10:00, 10:15, 10:30, would be averaged for a single 2 hour average data point

   This would continue throughout the course of a calendar day. The highest of these 2 hour averages over a month would be reported on the DMR as the daily maximum temperature. At the end/beginning of a month, the collected data should be used for the month that contains the greatest number of minutes in the 2-hour maximum. Data from 11 pm to 12:59 am, would fall in the previous month. Data collected from 11:01 pm to 1:00 am would fall in the new month.

7. "Dissolved (D) metals fraction" is defined in the Basic Standards and Methodologies for Surface Water 1002-31, as that portion of a water and suspended sediment sample which passed through a 0.40 or 0.45 UM (micron) membrane filter. Determinations of "dissolved" constituents are made using the filtrate. This may include some very small (colloidal) suspended particles which passed through the membrane filter as well as the amount of substance present in true chemical solution.

8. “Geometric mean” for *E. coli* bacteria concentrations, the thirty (30) day and seven (7) day averages shall be determined as the geometric mean of all samples collected in a thirty (30) day period and the geometric mean of all samples taken in a seven (7) consecutive day period respectively. The geometric mean may be calculated using two different methods. For the methods shown, a, b, c, d, etc. are individual sample results, and n is the total number of samples.

   Method 1:

   Geometric Mean = $(a*b*c*d*...)^{(1/n)}$ "*" - means multiply

   Method 2:

   Geometric Mean = antilog ([log(a)+log(b)+log(c)+log(d)+...]/n)

   Graphical methods, even though they may also employ the use of logarithms, may introduce significant error and may not be used.

In calculating the geometric mean, for those individual sample results that are reported by the analytical laboratory to be "less than" a numeric value, a value of 1 should be used in the calculations. If all individual analytical results for the month are reported to be less than numeric values, then report "less than" the largest of those numeric values on the monthly DMR. Otherwise, report the calculated value.

For any individual analytical result of "too numerous to count" (TNTC), that analysis shall be considered to be invalid and another sample shall be promptly collected for analysis. If another sample cannot be collected within the same sampling period for which the invalid sample was collected (during the same month if monthly sampling is required, during the same week if weekly sampling is required, etc.), then the following procedures apply:

i. A minimum of two samples shall be collected for coliform analysis within the next sampling period.

ii. <u>If the sampling frequency is monthly or less frequent:</u> For the period with the invalid sample results, leave the spaces on the corresponding DMR for reporting coliform results empty and attach to the DMR a letter noting that a result of TNTC was obtained for that period, and explain why another sample for that period had not been collected.

<u>If the sampling frequency is more frequent than monthly:</u> Eliminate the result of TNTC from any further calculations, and use all the other results obtained within that month for reporting purposes. Attach a letter noting that a result of TNTC was obtained, and list all individual analytical results and corresponding sampling dates for that month.

9. "Grab" sample, is a single "dip and take" sample so as to be representative of the parameter being monitored.

10. “IC25” or “Inhibition Concentration” is a point estimate of the toxicant concentration that would cause a given percent reduction in a non-lethal biological measurement (e.g. growth or reproduction) calculated from a continuous model (i.e. interpolation method). IC25 is a point estimate of the toxic concentration that would cause a 25-percent reduction in a non-lethal biological measurement.

11. "In-situ" measurement is defined as a single reading, observation or measurement taken in the field at the point of discharge.

12. "Instantaneous" measurement is a single reading, observation, or measurement performed on site using existing monitoring facilities.

13. “LC50” or “Lethal Concentration” is the toxic or effluent concentration that would cause death in 50 percent of the test organisms over a specified period of time.

14. “Maximum Weekly Average Temperature (MWAT)” is defined in the Basic Standards and Methodologies for Surface Water 1002-31, as an implementation statistic that is calculated from field monitoring data. The MWAT is calculated as the largest mathematical mean of multiple, equally spaced, daily temperatures over a seven-day consecutive period, with a minimum of three data points spaced equally through the day. For lakes and reservoirs, the MWAT is assumed to be equivalent to the maximum WAT from at least three profiles distributed throughout the growing season (generally July-September).

    The MWAT is calculated by averaging all temperature data points collected during a calendar day, and then averaging the daily average temperatures for 7 consecutive days. This 7 day averaging period is a rolling average, i.e. on the 8th day, the MWAT will be the averages of the daily averages of days 2-8. The value to be reported on the DMR is the highest of all the rolling 7-day averages throughout the month. For those days that are at the end/beginning of the month, the data shall be reported for the month that contains 4 of the 7 days.

    Day 1: Average of all temperature data collected during the calendar day.
    Day 2: Average of all temperature data collected during the calendar day.
    Day 3: Average of all temperature data collected during the calendar day.
    Day 4: Average of all temperature data collected during the calendar day.
    Day 5: Average of all temperature data collected during the calendar day.
    Day 6: Average of all temperature data collected during the calendar day.
    Day 7: Average of all temperature data collected during the calendar day.
    1st MWAT Calculation as average of previous 7 days
    Day 8: Average of all temperature data collected during the calendar day.
    2nd MWAT Calculation as average of previous 7 days
    Day 9: Average of all temperature data collected during the calendar day.
    3rd MWAT Calculation as average of previous 7 days

15. “NOEC” or “No-Observed-Effect-Concentration” is the highest concentration of toxicant to which organisms are exposed in a full life cycle or partial life cycle (short term) test, that causes no observable adverse effects on the test organisms (i.e. the highest concentration of toxicant in which the values for the observed responses are not statistically different from the controls). This value is used, along with other factors, to determine toxicity limits in permits.

16. "Potentially dissolved (PD) metals fraction” is defined in the Basic Standards and Methodologies for Surface Water 1002-31, as that portion of a constituent measured from the filtrate of a water and suspended sediment sample that was first treated with nitric acid to a pH of 2 or less and let stand for 8 to 96 hours prior to sample filtration using a 0.40 or 0.45-UM (micron) membrane filter. Note the "potentially dissolved" method cannot be used where nitric acid will interfere with the analytical procedure used for the constituent measured.

17. “Practical Quantitation Limit (PQL)” means the minimum concentration of an analyte (substance) that can be measured with a high degree of confidence that the analyte is present at or above that concentration. The use of PQL in this document may refer to those PQLs shown in Part I.D of this permit or the PQLs of an individual laboratory.

18. "Quarterly measurement frequency" means samples may be collected at any time during the calendar quarter if a continual discharge occurs. If the discharge is intermittent, then samples shall be collected during the period that discharge occurs.

19. "Recorder" requires the continuous operation of a chart and/or totalizer (or drinking water rotor meters or pump hour meters where previously approved.)

20. "Seven (7) day average" means, with the exception of fecal coliform or *E. coli* bacteria (see geometric mean), the arithmetic mean of all samples collected in a seven (7) consecutive day period. Such seven (7) day averages shall be calculated for all calendar weeks, which are defined as beginning on Sunday and ending on Saturday. If the calendar week overlaps two months (i.e. the Sunday is in one month and the Saturday in the following month), the seven (7) day average calculated for that calendar week shall be associated with the month that contains the Saturday. Samples may not be used for more than one (1) reporting period. **(See the “Analytical and Sampling Methods for Monitoring and Reporting Section in Part I.D.3 for guidance on calculating averages and reporting analytical results that are less than the PQL).**

21. "Thirty (30) day average" means, except for fecal coliform or *E. coli* bacteria (see geometric mean), the arithmetic mean of all samples collected during a thirty (30) consecutive-day period. The permittee shall report the appropriate mean of all self-monitoring sample data collected during the calendar month on the Discharge Monitoring Reports. Samples shall not be used for more than one (1) reporting period. **(See the “Analytical and Sampling Methods for Monitoring and Reporting Section in Part I.D.3 for guidance on calculating averages and reporting analytical results that are less than the PQL).**

22. Toxicity Identification Evaluation (TIE) is a set of site-specific procedures used to identify the specific chemical(s) causing effluent toxicity.

23. "Total Metals" means the concentration of metals determined on an unfiltered sample following vigorous digestion (Section 4.1.3), or the sum of the concentrations of metals in both the dissolved and suspended fractions, as described in Manual of Methods for Chemical Analysis of Water and Wastes, U.S. Environmental Protection Agency, March 1979, or its equivalent.

24. “Total Recoverable Metals” means that portion of a water and suspended sediment sample measured by the total recoverable analytical procedure described in Methods for Chemical Analysis of Water and Wastes, U.S. Environmental Protection Agency, March 1979 or its equivalent.

25. Toxicity Reduction Evaluation (TRE) is a site-specific study conducted in a step-wise process to identify the causative agents of effluent toxicity, isolate the source of toxicity, evaluate the effectiveness of toxicity control options, and then confirm the reduction in effluent toxicity after the control measures are put in place.

26. "Twenty four (24) hour composite" sample is a combination of at least eight (8) sample aliquots of at least 100 milliliters, collected at equally spaced intervals during the operating hours of a facility over a twenty-four (24) hour period. For volatile pollutants, aliquots must be combined in the laboratory immediately before analysis. The composite must be flow proportional; either the time interval between each aliquot or the volume of each aliquot must be proportional to either the wastewater or effluent flow at the time of sampling or the total wastewater or effluent flow since the collection of the previous aliquot. Aliquots may be collected manually or automatically.

27. "Twice Monthly" monitoring frequency means that two samples shall be collected each calendar month on separate weeks with at least one full week between the two sample dates. Also, there shall be at least one full week between the second sample of a month and the first sample of the following month.

28. "Two (2) -Year Rolling Average" - Antidegradation limits apply as the average of all data collected in a two (2) year (24-month) period. These limits become effective upon the effective date of the permit, but are not reportable on a DMR until two years (typically 24 months) of data have been collected. After data has been collected for 24 months, the 30-day averages for each month are then averaged together to determine the two-year rolling average (using data from month 1 to month 24, then month 2 to month 25, month 3 to month 26, etc).

    For ammonia, two-year rolling averages may be set up for individual months, or may be grouped together for several months. For individual months (every month has a different two-year rolling average limit) the two-year average is reportable after two months of data are collected.

    Example: Permit is effective Jan 2010 and there is a two-year rolling average limit specific to the month of January.

    Jan 2010 DMR – Nothing to Report
    Jan 2011 DMR – 2-Year Average of Jan 2010 and Jan 2011
    Jan 2012 DMR – 2-Year Average of Jan 2011 and Jan 2012, etc.

    Where several months have the same two-year average limit, it is reportable on the DMR after two months of data have been collected for every month in the group.

    Example: Permit is effective Jan 2010 and there is a two-year rolling average limit specific to the months of Jan, Feb, June.

    1st Reportable DMR – June 2011 - 2-Year Average Jan 2010 Feb 2010 June 2010 Jan 2011 Feb 2011 June 2011
    2nd Reportable DMR – Jan 2012 - 2-Year Average Feb 2010 June 2010 Jan 2011 Feb 2011 June 2011 Jan 2012
    3rd Reportable DMR – Feb 2012 - 2-Year Average June 2010 Jan 2011 Feb 2011 June 2011 Jan 2012 Feb 2012, etc.

    (See the "Analytical and Sampling Methods for Monitoring and Reporting Section in Part I.D.3 for guidance on calculating averages and reporting analytical results that are less than the PQL).

29. "Visual" observation is observing the discharge to check for the presence of a visible sheen or floating oil.

30. "Water Quality Control Division" or "Division" means the state Water Quality Control Division as established in 25-8-101 et al.)

    Additional relevant definitions are found in the Colorado Water Quality Control Act, CRS §§ 25-8-101 et seq., the Colorado Discharge Permit System Regulations, Regulation 61 (5 CCR 1002-61) and other applicable regulations.

D. GENERAL MONITORING, SAMPLING AND REPORTING REQUIREMENTS

5. Routine Reporting of Data

Reporting of the data gathered in compliance with Part I.A or Part I.B shall be on a **monthly** basis. Reporting of all data gathered shall comply with the requirements of Part I.D. (General Requirements). Monitoring results shall be summarized for each calendar month and reported on Division approved discharge monitoring report (DMR) forms (EPA form 3320-1).

The permittee must submit these forms either by mail, or by using the Division's Net-DMR service (when available). If mailed, one form shall be mailed to the Division, as indicated below, so that the DMR is received no later than the 28th day of the following month (for example, the DMR for the first calendar quarter must be received by the Division by April 28th). If no discharge occurs during the reporting period, "No Discharge" shall be reported.

The original signed copy of each discharge monitoring report (DMR) shall be submitted to the Division at the following address:

Colorado Department of Public Health and Environment
Water Quality Control Division
WQCD-P-B2
4300 Cherry Creek Drive South
Denver, Colorado 80246-1530

The Discharge Monitoring Report forms shall be filled out accurately and completely in accordance with requirements of this permit and the instructions on the forms. They shall be signed by an authorized person as identified in Part I.D.8.

6. Representative Sampling

Samples and measurements taken for the respective identified monitoring points as required herein shall be representative of the volume and nature of the monitored discharge. All samples shall be taken at the monitoring points specified in this permit and, unless otherwise specified, before the effluent joins or is diluted by any other wastestream, body of water, or substance. Monitoring points shall not be changed without notification to and approval by the Division.

7. Influent and Effluent Sampling Points

Influent (if required) and effluent sampling points shall be so designed or modified so that: 1) a sample of the influent can be obtained after preliminary treatment and prior to primary or biological treatment and 2) a sample of the effluent can be obtained at a point after the final treatment process and prior to discharge to state waters. The permittee shall provide access to the Division to sample at these points.

8. Analytical and Sampling Methods for Monitoring and Reporting

The permittee shall install, calibrate, use and maintain monitoring methods and equipment, including biological and indicated pollutant monitoring methods. All sampling shall be performed by the permittee according to specified methods in 40 C.F.R. Part 136; methods approved by EPA pursuant to 40 C.F.R. Part 136; or methods approved by the Division, in the absence of a method specified in or approved pursuant to 40 C.F.R. Part 136.

Numeric Limits

If the permit contains a numeric effluent limit for a parameter, the analytical method and PQL selected for all monitoring conducted in accordance with this permit for that parameter shall be the one that can measure at or below the numeric effluent limit. If all specified analytical methods and corresponding PQLs are greater than the numeric effluent limit, then the analytical method with the lowest PQL shall be used.

When the analytical method which complies with the above requirements has a PQL greater than the permit limit, and the permittee's analytical result is less than the PQL (the PQL achieved by the lab), the permittee shall report "BDL" on the DMR. Such reports will not be considered as violations of the permit limit, as long as the PQL obtained is lower or equal to the PQL in the table below.

When the analytical method which complies with the above requirements has a PQL that is equal to or less than the permit limitation, and the permittee's analytical result is less than the PQL, "< X" (where X = the actual PQL achieved by the laboratory) shall be reported on the DMR. For parameters that have a report only limitation, and the permittee's analytical result is less than the PQL, "< X" (where X = the actual PQL achieved by the laboratory) shall be reported on the DMR.

Report Only Limits

If the permit contains a report only requirement for a parameter, the analytical method and PQL chosen shall be one that can measure at or below the potential numeric effluent limit(s) (maximum allowable pollutant concentration as shown in the WQA or fact sheet). If all analytical methods and corresponding PQLs are greater than the potential numeric effluent limit(s), then the analytical method with the lowest PQL shall be used.

When the analytical method which complies with the above requirements has a PQL that is equal to or less than the permit limitation, and the permittee's analytical result is less than the PQL, "< X" (where X = the actual PQL achieved by the laboratory) shall be reported on the DMR. For parameters that have a report only limitation, and the

permittee's analytical result is less than the PQL, "< X" (where X = the actual PQL achieved by the laboratory) shall be reported on the DMR.

Interim Report Only Followed By a Numeric Limit

If the permit contains an interim effluent limitation (a limit is report until such time as a numeric effluent limit becomes effective) for a parameter, the analytical method and PQL chosen for all monitoring conducted in accordance with this permit for the parameter shall be one that can measure to the final numeric effluent limit. If all analytical methods and corresponding PQLs are greater than the final numeric effluent limit (s), then the analytical method with the lowest PQL shall be used.

While the report only limit is effective, the reporting requirements shall follow those under the Report Only Limits section. Once the numeric limit is effective, the reporting requirements shall follow the numeric limits reporting requirements.

T.I.N.

For parameters such as TIN, the analytical methods chosen shall be those that can measure to the potential or final numeric effluent limit, based on the sum of the PQLs for nitrate, nitrite and ammonia.

Calculating Averages

In the calculation of average concentrations (i.e. daily average, 7- day average, 30-day average, 2-year rolling average) any individual analytical result that is less than the PQL shall be considered to be zero for the calculation purposes. When reporting:

If all individual analytical results are less than the PQL, the permittee shall report either "BDL" or "<X" (where X = the actual PQL achieved by the laboratory), following the guidance above.

If one or more individual results is greater than the PQL, an average shall be calculated and reported. Note that it does not matter if the final calculated average is greater or less than the PQL, **it must be reported as a value**.

Note that when calculating T.I.N. for a single sampling event, any value less than the PQL (for total ammonia, total nitrite, or total nitrate) shall be treated as zero. The T.I.N. concentration for a single sampling event shall then be determined as the sum of the analytical results (zeros if applicable) of same day sampling for total ammonia and total nitrite and total nitrate. From these calculated T.I.N. concentrations, the daily maximum and thirty day average concentrations shall be calculated and must be reported as a value.

PQLs

The present lowest PQLs for specific parameters, as determined by the State Laboratory (November 2008) are provided below. If the analytical method cannot achieve a PQL that is less than or equal to the permit limit, then the method, or a more precise method, must achieve a PQL that is less than or equal to the PQL in the table below. A listing of the PQLs for organic parameters that must meet the above requirement can be found in the Division's Practical Quantitation Limitation Guidance Document, July 2008. This document is available on the Division's website at www.coloradowaterpermits.com.

These limits apply to the total recoverable or the potentially dissolved fraction of metals.

For hexavalent chromium, samples must be unacidified so dissolved concentrations will be measured rather than potentially dissolved concentrations.

Parameter	Practical Quantitation Limits,	Parameter	Practical Quantitation Limits, µg/l
Aluminum	50 µg/l	Mercury	0.1 µg/l
Ammonia	1 mg/l	Mercury (low-level)	0.003 µg/l
Arsenic	1 µg/l	Nickel	50 µg/l
Barium	5 µg/l	N-Ammonia	50 µg/l
Beryllium	1 µg/l	N Nitrate/Nitrite	0.5 mg/l
BOD / CBOD	1 mg/l	N-Nitrate	50 µg/l
Boron	50 µg/l	N-Nitrite	10 µg/l
Cadmium	1 µg/l	Total Nitrogen	0.5 mg/l
Calcium	20 µg/l	Phenols	100 µg/l
Chloride	2 mg/l	Phosphorus	10 µg/l
Chlorine	0.1 mg/l	Radium 226	1 pCi/l
Total Residual Chlorine		Radium 228	1 pCi/l
DPD colorimetric	0.10 mg/l	Selenium	1 µg/l
Amperometric titration	0.05 mg/l	Silver	0.5 µg/l
Chromium	20 µg/l	Sodium	0.2 mg/l
Chromium, Hexavalent	20 µg/l	Sulfate	5 mg/l
Copper	5 µg/l	Sulfide	0.2 mg/l
Cyanide (Direct / Distilled)	10 µg/l	Total Dissolved Solids	10 mg/l
Cyanide, WAD+A47	10 µg/l	Total Suspended Solids	10 mg/l
Fluoride	0.1 mg/l	Thallium	1 µg/l
Iron	10 µg/l	Uranium	1 µg/l
Lead	1 µg/l	Zinc	10 µg/l
Magnesium	20 µg/l	Nonylphenol D7065	10 µg/l
Manganese	2 µg/l	Nonylphenol D7485	0.33 µg/l

9. Records

a. The permittee shall establish and maintain records. Those records shall include, but not be limited to, the following:

i. The date, type, exact place, and time of sampling or measurements;
ii. The individual(s) who performed the sampling or measurements;
iii. The date(s) the analyses were performed;
iv. The individual(s) who performed the analyses;
v. The analytical techniques or methods used; and
vi. The results of such analyses.
vii. Any other observations which may result in an impact on the quality or quantity of the discharge as indicated in 40 CFR 122.44 (i)(1)(iii).

b. The permittee shall retain for a minimum of three (3) years records of all monitoring information, including all original strip chart recordings for continuous monitoring instrumentation, all calibration and maintenance records, copies of all reports required by this permit and records of all data used to complete the application for this permit. This period of retention shall be extended during the course of any unresolved litigation regarding the discharge of pollutants by the permittee or when requested by the Division or Regional Administrator.

10. Flow Measuring Device

If not already a part of the permitted facility, within ninety (90) days after the effective date of the permit, a flow measuring device shall be installed to give representative values of effluent quantities at the respective discharge points. Unless specifically exempted, or modified in Part I.A of this permit, a flow measuring device will be applicable at all designated discharge points.

At the request of the Division, the permittee shall show proof of the accuracy of any flow-measuring device used in obtaining data submitted in the monitoring report. The flow-measuring device must indicate values within ten (10) percent of the actual flow being measured.

11. Signatory and Certification Requirements

a. All reports and other information required by the Division, shall be signed and certified for accuracy by the permittee in accord with the following criteria:

i) In the case of corporations, by a responsible corporate officer. For purposes of this section, the responsible corporate officer is responsible for the overall operation of the facility from which the discharge described in the form originates;

ii) In the case of a partnership, by a general partner;

iii) In the case of a sole proprietorship, by the proprietor;

iv) In the case of a municipal, state, or other public facility, by either a principal executive officer, or ranking elected official. For purposes of this section, a principal executive officer has responsibility for the overall operation of the facility from which the discharge originates;

v) By a duly authorized representative of a person described above, only if:

1) The authorization is made in writing by a person described in i, ii, iii, or iv above;

2) The authorization specifies either an individual or a position having responsibility for the overall operation of the regulated facility or activity such as the position of plant manager, operator of a well or a well field, superintendent, position of equivalent responsibility, or an individual or position having overall responsibility for environmental matters for the company. (A duly authorized representative may thus be either a named individual or any individual occupying a named position); and,

3) The written authorization is submitted to the Division.

b. If an authorization as described in this section is no longer accurate because a different individual or position has responsibility for the overall operation of the facility, a new authorization satisfying the requirements of this section must be submitted to the Division prior to or together with any reports, information, or applications to be signed by an authorized representative.

The permittee, or the duly authorized representative shall make and sign the following certification on all such documents:

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is to the best of my knowledge and belief, true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

PART II

A. NOTIFICATION REQUIREMENTS

1. Notification to Parties

All notification requirements under this section shall be directed as follows:

a. Oral Notifications**,** during normal business hours shall be to:

Water Quality Protection Section - Domestic Compliance Program
Water Quality Control Division
Telephone: (303) 692-3500

b. Written notification shall be to:

Water Quality Protection Section - Domestic Compliance Program
Water Quality Control Division
Colorado Department of Public Health and Environment
WQCD-WQP-B2
4300 Cherry Creek Drive South
Denver, CO 80246-1530

2. Change in Discharge

The permittee shall give advance notice to the Division, in writing, of any planned physical alterations or additions to the permitted facility. Notice is required only when:

a. The alteration or addition could significantly change the nature or increase the quantity of pollutants discharged, or;

b. The alteration or addition results in a significant change in the permittee's sludge use or disposal practices, and such alteration, addition, or change may justify the application of permit conditions that are different from or absent in the existing permit, including notification of additional use or disposal sites not reported pursuant to an approved land application plan.

Whenever notification of any planned physical alterations or additions to the permitted facility is required pursuant to this section, the permittee shall furnish the Division such plans and specifications which the Division deems reasonably necessary to evaluate the effect on the discharge, the stream, or ground water. If the Division finds that such new or altered discharge might be inconsistent with the conditions of the permit, the Division shall require a new or revised permit application and shall follow the procedures specified in Sections 61.5 through 61.6, and 61.15 of the Colorado Discharge Permit System Regulations.

3. Noncompliance Notification

The permittee shall give advance notice to the Division, in writing, of any planned changes in the permitted facility or activity that may result in noncompliance with permit requirements.

a. If, for any reason, the permittee does not comply with or will be unable to comply with any discharge limitations or standards specified in this permit, the permittee shall, at a minimum, provide the Division and EPA with the following information:

i) A description of the noncompliance and its cause;

ii) The period of noncompliance, including exact dates and times and/or the anticipated time when the discharge will return to compliance; and

iii) Steps being taken to reduce, eliminate, and prevent recurrence of the noncomplying discharge.

b. The permittee shall report the following circumstances **orally within twenty-four (24) hours** from the time the permittee becomes aware of the circumstances, and shall mail to the Division a written report containing the information requested in Part II.A.4 (a) **within five (5) working days** after becoming aware of the following circumstances:

i) Circumstances leading to any noncompliance which may endanger health or the environment regardless of the cause of the incident;

ii) Circumstances leading to any unanticipated bypass which exceeds any effluent limitations in the permit;

iii) Circumstances leading to any upset which causes an exceedance of any effluent limitation in the permit;

iv) Daily maximum violations for any of the pollutants limited by Part I.A of this permit as specified in Part III of this permit. This includes any toxic pollutant or hazardous substance or any pollutant specifically identified as the method to control any toxic pollutant or hazardous substance.

c. Unless otherwise indicated in this permit, the permittee shall report instances of non-compliance which are not required to be reported within 24-hours at the time Discharge Monitoring Reports are submitted. The reports shall contain the information listed in sub-paragraph (a) of this section.

4. Transfer of Ownership or Control

The permittee shall notify the Division, in writing, thirty (30) calendar days in advance of a proposed transfer of the permit.

a. Except as provided in paragraph b. of this section, a permit may be transferred by a permittee only if the permit has been modified or revoked and reissued as provided in Section 61.8(8) of the Colorado Discharge Permit System Regulations, to identify the new permittee and to incorporate such other requirements as may be necessary under the Federal Act.

b. A permit may be automatically transferred to a new permittee if:

i) The current permittee notifies the Division in writing 30 calendar days in advance of the proposed transfer date; and

ii) The notice includes a written agreement between the existing and new permittee(s) containing a specific date for transfer of permit responsibility, coverage and liability between them; and

iii) The Division does not notify the existing permittee and the proposed new permittee of its intent to modify, or revoke and reissue the permit.

iv) Fee requirements of the Colorado Discharge Permit System Regulations, Section 61.15, have been met.

5. Other Notification Requirements

Reports of compliance or noncompliance with, or any progress reports on, interim and final requirements contained in any compliance schedule in the permit, shall be submitted on the date listed in the compliance schedule section. The fourteen (14) calendar day provision in Regulation 61.8(4)(n)(i) has been incorporated into the due date.

The permittee's notification of all anticipated noncompliance does not stay any permit condition.

All existing manufacturing, commercial, mining, and silvicultural dischargers must notify the Division as soon as they know or have reason to believe:

a. That any activity has occurred or will occur which would result in the discharge, on a routine or frequent basis, of any toxic pollutant which is not limited in the permit, if that discharge will exceed the highest of the following "notification levels":

i) One hundred micrograms per liter (100 µg/l);

ii) Two hundred micrograms per liter (200 µg/l) for acrolein and acrylonitrile; five hundred micrograms per liter (500 µg/l) for 2.4-dinitrophenol and 2-methyl-4.6-dinitrophenol; and one milligram per liter (1.0 mg/l) for antimony;

iii) Five (5) times the maximum concentration value reported for that pollutant in the permit application in accordance with Section 61.4(2)(g).

iv) The level established by the Division in accordance with 40 C.F.R. § 122.44(f).

b. That any activity has occurred or will occur which would result in any discharge, on a non-routine or infrequent basis, of a toxic pollutant which is not limited in the permit, if that discharge will exceed the highest of the following "notification levels":

i) Five hundred micrograms per liter (500 µg/l);

ii) One milligram per liter (1 mg/l) for antimony; and

iii) Ten (10) times the maximum concentration value reported for that pollutant in the permit application.

iv) The level established by the Division in accordance with 40 C.F.R. § 122.44(f).

6. Bypass Notification

If the permittee knows in advance of the need for a bypass, a notice shall be submitted, at least ten (10) calendar days before the date of the bypass, to the Division. The bypass shall be subject to Division approval and limitations imposed by the Division. Violations of requirements imposed by the Division will constitute a violation of this permit.

7. Bypass

a. "Bypass" means the intentional diversion of waste streams from any portion of a treatment facility.

b. Bypasses are prohibited and the Division may take enforcement action against the permittee for bypass, unless:

i) The bypass is unavoidable to prevent loss of life, personal injury, or severe property damage;

ii) There were no feasible alternatives to bypass such as the use of auxiliary treatment facilities, retention of untreated wastes, or maintenance during normal periods of equipment downtime. This condition is not satisfied if adequate back-up equipment should have been installed in the exercise of reasonable engineering judgment to prevent a bypass which occurred during normal periods of equipment downtime or preventive maintenance; and

iii) Proper notices were submitted in compliance with Part II.A.5.

c. "Severe property damage" as used in this Subsection means substantial physical damage to the treatment facilities which causes them to become inoperable, or substantial and permanent loss of natural resources which can reasonably be expected to occur in the absence of a bypass. Severe property damage does not mean economic loss caused by delays in production.

d. The permittee may allow a bypass to occur which does not cause effluent limitations to be exceeded, but only if it also is for essential maintenance or to assure optimal operation. These bypasses are not subject to the provisions of paragraph (a) above.

e. The Division may approve an anticipated bypass, after considering adverse effects, if the Division determines that the bypass will meet the conditions specified in paragraph (a) above.

8. Upsets

a. "Upset" means an exceptional incident in which there is unintentional and temporary noncompliance with permit effluent limitations because of factors beyond the reasonable control of the permittee. An upset does not include noncompliance to the extent caused by operational error, improperly designed treatment facilities, inadequate treatment facilities, lack of preventative maintenance, or careless or improper operation.

b. Effect of an Upset

An upset constitutes an affirmative defense to an action brought for noncompliance with permit effluent limitations if the requirements of paragraph (b) of this section are met. No determination made during administrative review of claims that noncompliance was caused by upset, and before an action for noncompliance, is final administrative action subject to judicial review.

c. Conditions Necessary for a Demonstration of Upset

A permittee who wishes to establish the affirmative defense of upset shall demonstrate through properly signed contemporaneous operating logs, or other relevant evidence that:

i) An upset occurred and that the permittee can identify the specific cause(s) of the upset; and

ii) The permitted facility was at the time being properly operated and maintained; and

iii) The permittee submitted proper notice of the upset as required in Part II.A.4. of this permit (24-hour notice); and
iv) The permittee complied with any remedial measure necessary to minimize or prevent any discharge or sludge use or disposal in violation of this permit which has a reason able likelihood of adversely affecting human health or the environment.

In addition to the demonstration required above, a permittee who wishes to establish the affirmative defense of upset for a violation of effluent limitations based upon water quality standards shall also demonstrate through monitoring, modeling or other methods that the relevant standards were achieved in the receiving water.

d. Burden of Proof

In any enforcement proceeding the permittee seeking to establish the occurrence of an upset has the burden of proof.

9. Submission of Incorrect or Incomplete Information

Where the permittee becomes aware that it failed to submit any relevant facts in a permit application, or submitted incorrect information in a permit application or in any report to the Division, the permittee shall promptly submit such facts or information.

B. RESPONSIBILITIES

1. Reduction, Loss, or Failure of Treatment Facility

The permittee has the duty to halt or reduce any activity if necessary to maintain compliance with the effluent limitations of the permit. Upon reduction, loss, or failure of the treatment facility, the permittee shall, to the extent necessary to maintain compliance with its permit, control production, control sources of wastewater, or all discharges, until the facility is restored or an alternative method of treatment is provided. This provision also applies to power failures, unless an alternative power source sufficient to operate the wastewater control facilities is provided.

It shall not be a defense for a permittee in an enforcement action that it would be necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit.

2. Inspections and Right to Entry

The permittee shall allow the Division and/or the authorized representative, upon the presentation of credentials:

a. To enter upon the permittee's premises where a regulated facility or activity is located or in which any records are required to be kept under the terms and conditions of this permit;

b. At reasonable times to have access to and copy any records required to be kept under the terms and conditions of this permit and to inspect any monitoring equipment or monitoring method required in the permit; and

c. To enter upon the permittee's premises in a reasonable manner and at a reasonable time to inspect and/or investigate, any actual, suspected, or potential source of water pollution, or to ascertain compliance or non compliance with the Colorado Water Quality Control Act or any other applicable state or federal statute or regulation or any order promulgated by the Division. The investigation may include, but is not limited to, the following: sampling of any discharge and/or process waters, the taking of photographs, interviewing of any person having knowledge related to the discharge permit or alleged violation, access to any and all facilities or areas within the permittee's premises that may have any affect on the discharge, permit, or alleged violation. Such entry is also authorized for the purpose of inspecting and copying records required to be kept concerning any effluent source.

d. The permittee shall provide access to the Division to sample the discharge at a point after the final treatment process but prior to the discharge mixing with state waters upon presentation of proper credentials.

In the making of such inspections, investigations, and determinations, the Division, insofar as practicable, may designate as its authorized representatives any qualified personnel of the Department of Agriculture. The Division may also request assistance from any other state or local agency or institution.

3. Duty to Provide Information

The permittee shall furnish to the Division, within a reasonable time, any information which the Division may request to determine whether cause exists for modifying, revoking and reissuing, or terminating this permit, or to determine compliance with this permit. The permittee shall also furnish to the Division, upon request, copies of records required to be kept by this permit.

4. Availability of Reports

Except for data determined to be confidential under Section 308 of the Federal Clean Water Act and the Colorado Discharge Permit System Regulations 5 CCR 1002-61, Section 61.5(4), all reports prepared in accordance with the terms of this permit shall be available for public inspection at the offices of the Division and the Environmental Protection Agency.

The name and address of the permit applicant(s) and permittee(s), permit applications, permits and effluent data shall not be considered confidential. Knowingly making false statement on any such report may result in the imposition of criminal penalties as provided for in Section 309 of the Federal Clean Water Act, and Section 25-8-610 C.R.S.

5. Modification, Suspension, Revocation, or Termination of Permits By the Division

The filing of a request by the permittee for a permit modification, revocation and reissuance, termination or a notification of planned changes or anticipated noncompliance, does not stay any permit condition.

a. A permit may be modified, suspended, or terminated in whole or in part during its term for reasons determined by the Division including, but not limited to, the following:

   i) Violation of any terms or conditions of the permit;

   ii) Obtaining a permit by misrepresentation or failing to disclose any fact which is material to the granting or denial of a permit or to the establishment of terms or conditions of the permit; or

   iii) Materially false or inaccurate statements or information in the permit application or the permit.

   iv) A determination that the permitted activity endangers human health or the classified or existing uses of state waters and can only be regulated to acceptable levels by permit modifications or termination.

b. A permit may be modified in whole or in part for the following causes, provided that such modification complies with the provisions of Section 61.10 of the Colorado Discharge Permit System Regulations:

   i) There are material and substantial alterations or additions to the permitted facility or activity which occurred after permit issuance which justify the application of permit conditions that are different or absent in the existing permit.

   ii) The Division has received new information which was not available at the time of permit issuance (other than revised regulations, guidance, or test methods) and which would have justified the application of different permit

conditions at the time of issuance. For permits issued to new sources or new dischargers, this cause includes information derived from effluent testing required under Section 61.4(7)(e) of the Colorado Discharge Permit System Regulations. This provision allows a modification of the permit to include conditions that are less stringent than the existing permit only to the extent allowed under Section 61.10 of the Colorado Discharge Permit System Regulations.

iii) The standards or regulations on which the permit was based have been changed by promulgation of amended standards or regulations or by judicial decision after the permit was issued. Permits may be modified during their terms for this cause only as follows:

(A) The permit condition requested to be modified was based on a promulgated effluent limitation guideline, EPA approved water quality standard, or an effluent limitation set forth in 5 CCR 1002-62, § 62 et seq.; and

(B) EPA has revised, withdrawn, or modified that portion of the regulation or effluent limitation guideline on which the permit condition was based, or has approved a Commission action with respect to the water quality standard or effluent limitation on which the permit condition was based; and

(C) The permittee requests modification after the notice of final action by which the EPA effluent limitation guideline, water quality standard, or effluent limitation is revised, withdrawn, or modified; or

(D) For judicial decisions, a court of competent jurisdiction has remanded and stayed EPA promulgated regulations or effluent limitation guidelines, if the remand and stay concern that portion of the regulations or guidelines on which the permit condition was based and a request is filed by the permittee in accordance with this Regulation, within ninety (90) calendar days of judicial remand.

iv) The Division determines that good cause exists to modify a permit condition because of events over which the permittee has no control and for which there is no reasonable available remedy.

v) Where the Division has completed, and EPA approved, a total maximum daily load (TMDL) which includes a wasteload allocation for the discharge(s) authorized under the permit.

vi) The permittee has received a variance.

vii) When required to incorporate applicable toxic effluent limitation or standards adopted pursuant to § 307(a) of the Federal act.

viii) When required by the reopener conditions in the permit.

ix) As necessary under 40 C.F.R. 403.8(e), to include a compliance schedule for the development of a pretreatment program.

x) When the level of discharge of any pollutant which is not limited in the permit exceeds the level which can be achieved by the technology-based treatment requirements appropriate to the permittee under Section 61.8(2) of the Colorado Discharge Permit System Regulations.

xi) To establish a pollutant notification level required in Section 61.8(5) of the Colorado Discharge Permit System Regulations.

xii) To correct technical mistakes, such as errors in calculation, or mistaken interpretations of law made in determining permit conditions, to the extent allowed in Section 61.10 of the Colorado State Discharge Permit System Regulations.

xiii) When required by a permit condition to incorporate a land application plan for beneficial reuse of sewage sludge, to revise an existing land application plan, or to add a land application plan.

xiv) When another State whose waters may be affected by the discharge has not been notified.

xv) For any other cause provided in Section 61.10 of the Colorado Discharge Permit System Regulations.

c. At the request of a permittee, the Division may modify or terminate a permit and issue a new permit if the following conditions are met:

   i) The Regional Administrator has been notified of the proposed modification or termination and does not object in writing within thirty (30) calendar days of receipt of notification,

   ii) The Division finds that the permittee has shown reasonable grounds consistent with the Federal and State statutes and regulations for such modifications or termination;

   iii) Requirements of Section 61.15 of the Colorado Discharge Permit System Regulations have been met, and

   iv) Requirements of public notice have been met.

d. For permit modification, termination, or revocation and reissuance, the Division may request additional information from the permittee. In the case of a modified permit, the Division may require the submission of an updated application. In the case of revoked and reissued permit, the Division shall require the submission of a new application.

e. Permit modification (except for minor modifications), termination or revocation and reissuance actions shall be subject to the requirements of Sections 61.5(2), 61.5(3), 61.6, 61.7 and 61.15 of the Colorado Discharge Permit System Regulations. The Division shall act on a permit modification request, other than minor modification requests, within 180 calendar days of receipt thereof. Except for minor modifications, the terms of the existing permit govern and are enforceable until the newly issued permit is formally modified or revoked and reissued following public notice.

f. Upon consent by the permittee, the Division may make minor permit modifications without following the requirements of Sections 61.5(2), 61.5(3), 61.7, and 61.15 of the Colorado Discharge Permit System Regulations. Minor modifications to permits are limited to:

   i) Correcting typographical errors; or

   ii) Increasing the frequency of monitoring or reporting by the permittee; or

   iii) Changing an interim date in a schedule of compliance, provided the new date of compliance is not more than 120 calendar days after the date specific in the existing permit and does not interfere with attainment of the final compliance date requirement; or

   iv) Allowing for a transfer in ownership or operational control of a facility where the Division determines that no other change in the permit is necessary, provided that a written agreement containing a specific date for transfer of permit responsibility, coverage and liability between the current and new permittees has been submitted to the Division; or

   v) Changing the construction schedule for a discharger which is a new source, but no such change shall affect a discharger's obligation to have all pollution control equipment installed and in operation prior to discharge; or

   vi) Deleting a point source outfall when the discharge from that outfall is terminated and does not result in discharge of pollutants from other outfalls except in accordance with permit limits.

   vii) Incorporating conditions of a POTW pretreatment program that has been approved in accordance with the procedures in 40 CFR 403.11 (or a modification thereto that has been approved in accordance with the procedures in 40 CFR 403.18) as enforceable conditions of the POTW's permits.

g. When a permit is modified, only the conditions subject to modification are reopened. If a permit is revoked and reissued, the entire permit is reopened and subject to revision and the permit is reissued for a new term.

h. The filing of a request by the permittee for a permit modification, revocation and reissuance or termination does not stay any permit condition.

i. All permit modifications and reissuances are subject to the antibacksliding provisions set forth in 61.10(e) through (g).

j. If cause does not exist under this section, the Division shall not modify or revoke and reissue the permit.

6. <u>Oil and Hazardous Substance Liability</u>

Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities, or penalties to which the permittee is or may be subject to under Section 311 (Oil and Hazardous Substance Liability) of the Clean Water Act.

7. State Laws

Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities, or penalties established pursuant to any applicable State law or regulation under authority granted by Section 510 of the Clean Water Act. Nothing in this permit shall be construed to prevent or limit application of any emergency power of the division.

8. Permit Violations

Failure to comply with any terms and/or conditions of this permit shall be a violation of this permit. The discharge of any pollutant identified in this permit more frequently than or at a level in excess of that authorized shall constitute a violation of the permit. Except as provided elsewhere in this permit, nothing in this permit shall be construed to relieve the permittee from civil or criminal penalties for noncompliance (40 CFR 122.41(a)(1)).

9. Severability

The provisions of this permit are severable. If any provisions or the application of any provision of this permit to any circumstances, is held invalid, the application of such provision to other circumstances and the application of the remainder of this permit shall not be affected.

10. Confidentiality

Any information relating to any secret process, method of manufacture or production, or sales or marketing data which has been declared confidential by the permittee, and which may be acquired, ascertained, or discovered, whether in any sampling investigation, emergency investigation, or otherwise, shall not be publicly disclosed by any member, officer, or employee of the Commission or the Division, but shall be kept confidential. Any person seeking to invoke the protection of this Subsection (12) shall bear the burden of proving its applicability. This section shall never be interpreted as preventing full disclosure of effluent data.

11. Fees

The permittee is required to submit payment of an annual fee as set forth in the 2005 amendments to the Water Quality Control Act. Section 25-8-502 (l) (b), and the Colorado Discharge Permit System Regulations 5 CCR l002-61, Section 61.l5 as amended. Failure to submit the required fee when due and payable is a violation of the permit and will result in enforcement action pursuant to Section 25-8-60l et. seq., C.R.S. l973 as amended.

12. Duration of Permit

The duration of a permit shall be for a fixed term and shall not exceed five (5) years. If the permittee desires to continue to discharge, a permit renewal application shall be submitted at least one hundred eighty (180) calendar days before this permit expires. Filing of a timely and complete application shall cause the expired permit to continue in force to the effective date of the new permit. The permit's duration may be extended only through administrative extensions and not through interim modifications.If the permittee anticipates there will be no discharge after the expiration date of this permit, the Division should be promptly notified so that it can terminate the permit in accordance with Part II.B.4.

13. Section 307 Toxics

If a toxic effluent standard or prohibition, including any applicable schedule of compliance specified, is established by regulation pursuant to Section 307 of the Federal Act for a toxic pollutant which is present in the permittee's discharge and such standard or prohibition is more stringent than any limitation upon such pollutant in the discharge permit, the Division shall institute proceedings to modify or revoke and reissue the permit to conform to the toxic effluent standard or prohibition.

14. Effect of Permit Issuance

a. The issuance of a permit does not convey any property or water rights in either real or personal property, or stream flows or any exclusive privilege.

b. The issuance of a permit does not authorize any injury to person or property or any invasion of personal rights, nor does it authorize the infringement of federal, state, or local laws or regulations.

c. Except for any toxic effluent standard or prohibition imposed under Section 307 of the Federal act or any standard for sewage sludge use or disposal under Section 405(d) of the Federal act, compliance with a permit during its term constitutes compliance, for purposes of enforcement, with Sections 301, 302, 306, 318, 403, and 405(a) and (b) of the Federal act. However, a permit may be modified, revoked and reissued, or terminated during its term for cause as set forth in Section 61.8(8) of the Colorado Discharge Permit System Regulations.

d. Compliance with a permit condition which implements a particular standard for biosolid use or disposal shall be an affirmative defense in any enforcement action brought for a violation of that standard for biosolid use or disposal.

PART III
CATEGORICAL INDUSTRIES

Aluminum Forming
Asbestos Manufacturing
Battery Manufacturing
Builders' Paper and Board Mills
Canned & Preserved Fruits and Vegetables Processing
Canned & Preserved Seafood Processing
Carbon Black Manufacturing
Cement Manufacturing
Coal Mining
Coil Coating
Copper Forming
Dairy Products Processing
Electrical and Electronic Components
Electroplating
Explosives Manufacturing
Feedlots
Ferroalloy Manufacturing
Fertilizer Manufacturing
Glass Manufacturing
Grain Mills
Gum and Wood Chemicals Manufacturing
Hospital
Ink Formulation
Inorganic Chemicals Manufacturing
Iron and Steel Manufacturing
Leather Tanning and Finishing
Meat Products
Metal Finishing
Metal Molding and Casting (Foundries)
Mineral Mining and Processing
Nonferrous Metals Manufacturing
Nonferrous Metals Forming and Metal Powders
Oil and Gas Extraction
Organic Chemicals, Plastics, and Synthetic Fibers
Ore Mining and Dressing
Paint Formulation
Paving and Roofing Materials (Tars and Asphalt)
Pesticide Chemicals
Petroleum Refining
Pharmaceutical Manufacturing
Phosphate Manufacturing
Photographic
Plastics Molding and Forming
Porcelain Enameling
Pulp, Paper, and Paperboard Manufacturing
Rubber Manufacturing
Soap and Detergent Manufacturing
Steam Electric Power Generating
Sugar Processing
Textile Mills
Timber Products Processing

PRIORITY POLLUTANTS AND HAZARDOUS SUBSTANCES
ORGANIC TOXIC POLLUTANTS IN EACH OF FOUR FRACTIONS
IN ANALYSIS BY GAS CHROMATOGRAPHY/MASS SPECTROSCOPY (GC/MS)

Volatiles	**Base/Neutral**	**Acid Compounds**	**Pesticides**
acrolein	acenaphthene	2-chlorophenol	aldrin
acrylonitrile	acenaphthylene	2,4-dichlorophenol	alpha-BHC
benzene	anthracene	2,4,-dimethylphenol	beta-BHC
bromoform	benzidine	4,6-dinitro-o-cresol	gamma-BHC
carbon tetrachloride	benzo(a)anthracene	2,4-dinitrophenol	delta-BHC
chlorobenzene	benzo(a)pyrene	2-nitrophenol	chlordane
chlorodibromomethane	3,4-benzofluoranthene	4-nitrophenol	4,4'-DDT
chloroethane	benzo(ghi)perylene	p-chloro-m-cresol	4,4'-DDE
2-chloroethylvinyl ether	benzo(k)fluoranthene	pentachlorophenol	4,4'-DDD
chloroform	bis(2-chloroethoxy)methane	phenol	dieldrin
dichlorobromomethane	bis(2-chloroethyl)ether	2,4,6-trichlorophenol	alpha-endosulfan
1,1-dichlorethane	bis(2-chloroisopropyl)ether		beta-endosulfan
1,2-dichlorethane	bis(2-ethylhexyl)phthalate		endosulfan sulfate
1,1-dichlorethylene	4-bromophenyl phenyl ether		endrin
1,2-dichlorpropane	butylbenzyl phthalate		endrin aldehyde
1,3-dichlorpropylene	2-chloronaphthalene		heptachlor
ethylbenzene	4-chlorophenyl phenyl ether		heptachlor epoxide
methyl bromide	chrysene		PCB-1242
methyl chloride	dibenzo(a,h)anthracene		PCB-1254
methylene chloride	1,2-dichlorobenzene		PCB-1221

PRIORITY POLLUTANTS AND HAZARDOUS SUBSTANCES

ORGANIC TOXIC POLLUTANTS IN EACH OF FOUR FRACTIONS
IN ANALYSIS BY GAS CHROMATOGRAPHY/MASS SPECTROSCOPY (GC/MS)

Volatiles	Base/Neutral	Acid Compounds	Pesticides
1,1,2,2-tetrachloroethane	1,3-dichlorobenzene		PCB-1232
tetrachloroethylene	1,4-dichlorobenzene		PCB-1248
toluene	3,3-dichlorobenzidine		PCB-1260
1,2-trans-dichloroethylene	diethyl phthalate		PCB-1016
1,1,1-trichloroethane	dimethyl phthalate		toxaphene
1,1,2-trichloroethane	di-n-butyl phthalate		
trichloroethylene	2,4-dinitrotoluene		
vinyl chloride	2,6-dinitrotoluene		
	di-n-octyl phthalate		
	1,2-diphenylhydrazine (as azobenzene)		
	fluorene		
	fluoranthene		
	hexachlorobenzene		
	hexachlorobutadiene		
	hexachlorcyclopentadiene		
	hexachloroethane		
	indeno(1,2,3-cd)pyrene		
	isophorone		
	naphthalene		
	nitrobenzene		
	N-nitrosodimethylamine		
	N-nitrosodi-n-propylamine		
	N-nitrosodiphenylamine		
	phenanthrene		
	pyrene		
	1,2,4-trichlorobenzene		

OTHER TOXIC POLLUTANTS (AMMONIA, METALS AND CYANIDE) AND TOTAL PHENOLS

Antimony, Total
Arsenic, Total
Beryllium, Total
Cadmium, Total
Chromium, Total
Copper, Total
Lead, Total
Mercury, Total
Nickel, Total
Selenium, Total
Silver, Total
Thallium, Total
Zinc, Total
Cyanide, Total
Phenols, Total

TOXIC POLLUTANTS AND HAZARDOUS SUBSTANCES

REQUIRED TO BE IDENTIFIED BY EXISTING DISCHARGERS
IF EXPECTED TO BE PRESENT

Toxic Pollutants

Asbestos

Hazardous Substances

Acetaldehyde
Allyl alcohol
Allyl chloride
Amyl acetate
Aniline
Benzonitrile
Benzyl chloride
Butyl acetate
Butylamine
Captan
Carbaryl
Carbofuran
Carbon disulfide
Chlorpyrifos
Coumaphos
Cresol
Crotonaldehyde
Cyclohexane
2,4-D(2,4-Dichlorophenoxy acetic acid)
Diazinon
Dicamba
Dichlobenil
Dichlone
2,2-Dichloropropionic acid
Dichlorvos
Diethyl amine
Dimethyl amine
Dinitrobenzene
Diquat
Disulfoton
Diuron
Epichlorohydrin
Ethanolamine
Ethion
Ethylene diamine
Ethylene dibromide
Formaldehyde
Furfural
Guthion
Isoprene
Isopropanolamine
Keithane
Kepone
Malathion
Mercaptodimethur
Methoxychlor
Methyl mercaptan
Methyl methacrylate
Methyl parathion
Mexacarbate
Monoethyl amine
Monomethyl amine
Naled
Napthenic acid
Nitrotoluene
Parathion
Phenolsulfanate
Phosgene
Propargite
Propylene oxide
Pyrethrins
Quinoline
Resorcinol
Strontium
Strychnine
Styrene
TDE (Tetrachlorodiphenylethane)
2,4,5-T (2,4,5-Trichlorophenoxy acetic acid)
2,4,5-TP [2-(2,4,5-Trichlorophenoxy) propanoic acid]
Trichlorofan
Triethylamine
Trimethylamine
Uranium
Vandium
Vinyl Acetate
Xylene
Xylenol
Zirconium

RULE 1.6.2(1)(a)

NOTICE OF FILING AN AMENDMENT APPLICATION TO A COLORADO MINED LAND RECLAMATION PERMIT FOR A LIMITED IMPACT 110(2) HARD ROCK MINING OPERATION NOTICE TO THE BOARD OF COUNTY COMMISSIONERS BOULDER COUNTY

To be filed after application is accepted by DRMS

Rule 1.6.2(1)(b)

Post Notice sign(s) at location of the proposed mine site.

Notices were posted at the entrance to the Cross Mine and the Caribou Mine on December 12, 2020. They are also posted on the exterior of each building as well as inside at office locations.

The following is an example that you may wish to use for the Notice required for Rule 1.6.2(1)(b).

NOTICE

This site is the location of a proposed mining operation. (Name of the Applicant/Operator) Grand Island Resources, LLC (GIR), whose address and phone number is (Address and Phone Number of the Applicant/Operator) 720-893-3749, has applied for a Reclamation Permit with the Colorado Mined Land Reclamation Board. Anyone wishing to comment on the application may view the application at the (County Name) Boulder County Clerk and Recorder's Office, (Clerk and Recorder's Office Address) 1750 33rd Street, Suite 200 Boulder, CO 80301, and should send comments prior to the end of the public comment period to the Division of Reclamation, Mining, and Safety, 1313 Sherman St., Room 215, Denver, Colorado 80203.

Certification:

I, Daniel Takami, hereby certify that I posted a sign containing the above notice for the proposed permit area known as the (Name of Operation) Cross Gold Mine, on (Date Posted) 12 DEC 2020.

SIGNATURE

9 Dec 2020
DATE

RULE 1.6.2 (I)(d)

NEWSPAPER PUBLISHED PUBLIC NOTICE AND NOTICE MAILED TO LANDOWNERS

PUBLIC NOTICE

To be filed after application is accepted by DRMS

RULE 1.6.2(1)(e)

List of Surrounding Land Owners

Permit Area and Adjacent Property Owners within 200 Feet:

The following is a consolidated list of adjacent property owners within 200 feet, for the parcels that encompass that proposed permit area. The list was developed from Boulder County Assessor records.

Adjacent Property Owners within 200 feet of the affected area:

Owner	**Mailing Address**
Grand Island Resources, LLC	PO Box 3395 Nederland, CO 80466
US Government	US Forest Service C/O Land Staff 2140 Yarmouth Boulder, CO 80301
Boulder County (Road Right of Way)	PO Box 471 Boulder, CO 80306

Permitted Area Property Owner(s)

Grands Island Resources, LLC	PO Box 3395 Nederland, CO 80466

RULE 1.6.2(1)(g)

Return Receipts for Proof of Publication and all Required Notices

To be filed after application is accepted by DRMS

Rule 6.5

GEOTECHNICAL STABILITY EXHIBIT

Please refer to Technical Revision No 7 for geotechnical stability information.

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# *(DRMS Use only)*

Permittee: Calais Resources Colorado, Inc.

Operator (If Other than Permittee):

Permittee Representative: Richard Mittasch

Please provide a brief description of the proposed revision:

This Technical Revision has been prepared to present geotechnical stability analyses for the slopes adjacent to the Idaho Tunnel Portal in response to a Minerals Program Inspection Report from DRMS dated March 26, 2020 in conjunction with the Cross Mine, DRMS Permit No. M-1977-410.

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	☐

Cross Mine (M1977-410)
Technical Revision No. 7

Submitted by:

Calais Resources Colorado, Inc.

Prepared for:

Colorado Division of Reclamation, Mining and Safety

May 7, 2020

Technical Memorandum

DATE:	7 May, 2020	**PROJECT:**	Cross Mine
ATTENTION:	Richard Mittasch	**COMPANY:**	Grand Island Resources, LLC
PREPARED BY:	Dave Hallman, PE, PG	**REVIEWED BY:**	RM

SUBJECT: Idaho Tunnel Portal – Slope Stability Analysis

1.0 INTRODUCTION

This Technical Memorandum has been prepared to present geotechnical stability analyses for the slopes adjacent to the Idaho Tunnel Portal in response to a Minerals Program Inspection Report from DRMS dated March 26, 2020 in conjunction with the Cross Mine, DRMS Permit No. M-1977-410. As indicated in the Inspection Report from DRMS, the Idaho Tunnel (at the Caribou Mine) has collapsed creating potential slope stability issues near the northern permit boundary and the adjacent Caribou Road. This is a concern pursuant to Rule 3.1.5(3) and C.R.S. 34-32-116(7)(h) which require areas outside of the affected land to be protected from slides or damage occurring during the mining operation and reclamation.

The stability evaluation presented was based largely on observation and professional judgement as limited engineering data was available. This work was conducted by Mr. David Hallman, a geological engineer with 37 years of experience and licensed as Colorado Professional Engineer (Civil) 26076, as affirmed by the stamp and signature affixed at the end of this document.

1.1 BACKGROUND

1.1.1. Location

The Cross Mine site is located approximately 3 miles west of Nederland, Colorado adjacent to the Roosevelt National Forest, at an elevation of 9700 feet above mean sea level (MSL). The general location is parcels of land in Section 9, Township 1 South, Range 73 West of the 6 Principal Meridian, County of Boulder, State of Colorado. This is an existing hard rock mining operation owned by Grand Island Resources Inc. (GIR), although at present, no active mining is being conducted.

1.1.2. Portal Rehabilitation

Entrance to the Idaho Tunnel at the mine site was in such a state of neglect and disrepair from long-term gradual deterioration that it was not safe to enter and operate the mine water system per the approved permit. In particular, the timber ground supports at the portal were tilted dangerously askew and the ground slopes adjacent to the portal also exhibited signs of shallow slope failures and sloughing, such as titled trees (Photograph 1).

Photograph 1 – Idaho Tunnel Portal prior to Rehabilitation

The timbered tunnel entrance and area around the opening were excavated in November 2019 in order to stabilize the tunnel portal. This effort involved excavating approximately 25 feet into the hillside, installing soil anchors, and applying a layer of shotcrete of variable thickness (Photograph 2). This work was performed by Harrison Western Construction Corporation, a licensed contractor.

The tunnel portal is being enlarged to a nominal 10-ft. x 10-ft. opening in order to replace the existing ground support which is failing and remove the loosened rock surrounding the present opening. The enlarged tunnel opening is supported by steel sets installed at 4-ft center-to-center spacing with full lagging on the back and ribs. The steel sets consist of W6x20 wide-flange I-beams and support posts. The lagging consists of 3-in. x 8-in. Douglas Fir planks. Grouted threadbar spillings were installed at 12-inch spacing above the tunnel opening prior to excavation.

In December 2019 a roof collapse occurred a short distance into the tunnel during initial rehabilitation efforts by Harrison Western. The roof failure occurred in an 11-12 ft section of unsupported ground as the tunnel opening was being enlarged through a section of mixed soil and decomposed gneiss. The collapse completely blocked the mine opening, crushed the pipe carrying the flow of mine water, and daylighted in the slope below County Road 128 (Caribou Road), leaving a large remnant void above the tunnel opening which estimated to be approximately 65 cubic yards.

Photograph 2 – Current Condition of the Idaho Tunnel Portal. The three safety cones and caution tape at the top of the slope mark the edge of Country Road 126 (Caribou Road). The crown hole over the void is visible between the two small trees above the portal.

1.1.3. Collapse Repair

In late February 2020, two additional new steel sets were installed in the area of the tunnel portal beneath the collapse and lined with lagging on the ribs and back. As with the initial two steel sets, these consisted of W6 x20 wide flange steel beams and posts installed on 4-ft center-to-center spacing. Lagging consisted of 3-in. x 8-in. treated Douglas Fir planks. This design and installation were inspected and approved by Mr. David Hallman, a geological engineer with 37 years of experience and registered as Colorado Professional Engineer No. 26076.

The narrow gap between the new ground supports and the existing ground was been closed using pieces of lagging, plywood, polyurethane foam, and caulk to create a tight seal. The remaining void created by the portal collapse will be backfilled with pervious cellular concrete to provide permanent ground support that will stabilize the slope and allow drainage.

The completed cellular concrete backfill will be significantly stronger than the soil which originally comprised the slope while imposing only a fraction of the weight. This will serve to increase stability of the slope below the county road. The flowable nature of the backfill will allow it to completely encapsulate the tunnel lining system in a solid mass to create robust permanent support for the mine entrance. The previous nature of the backfill will allow groundwater to freely drain from the slope in order to ensure long-term stability.

Mix Design Information (per cubic yard):

Cement:	622 lbs
Water	323 lbs
Cellular Foam:	18.7 cf
Air Content:	69%
Unit Weight:	35.0 pcf
water/cement ratio:	0.52
Permeability (ASTM D2434):	8.7×10^{-2} cm/sec

Compressive Strength

7-Day:	100 psi
28-day:	214 psi

Placing the cellular concrete backfill was originally scheduled for April 1, 2020 but was postponed due to the Corona virus and social distancing concerns. At this time, it is not known when the work will resume. Following placement, the cellular concrete backfill will harden rapidly and allow rehabilitation of the tunnel to resume within several days following receipt of the appropriate approvals

This Technical Memorandum presents the results of an engineering evaluation of the geotechnical stability of the overall slopes above and adjacent to the portal slopes, and provides this information to DRMS.

1.2 Geology

1.2.1. Regional

The Caribou area, which is part of the Front Range Mineral Belt, is underlain by igneous and metamorphic rocks of pre-cambrian age. These rocks are and, with the exception of locally covered by unconsolidated quaternary glacial and stream deposits. . is devoid of sedimentary rocks., The pre-Cambrian rocks in the Caribou area and in the adjoining areas to the north and south are intruded by Tertiary igneous rocks which form several small stocks. The three principal rock formations in the Caribou area are the Idaho Springs formation and the Boulder Creek granite of pre-Cambrian age, and the Tertiary monzonite of the Caribou stock. The Caribou stock also contains comprises small bodies of diorite, diabase, gabbro, and ultra-basic rocks. Minor units The Idaho Springs formation consists of include pre-Cambrian amphibolite, mica schist, biotite gneiss, quartz monzonite gneiss and pegmatite.

1.2.2. Roadside Geology

The Caribou Road (County Road 126) above the Idaho tunnel is located entirely in mixed soil and rock colluvium and regolith materials. Fresh gneiss of the Idaho Springs formation is present a short distance above the road and to the south of the tunnel portal.

1.2.3. Tunnel Geology

Figure 1 depicts a 1954 geologic map[1] of the initial portions of the Idaho Tunnel which was annotated by the previous operator and local miner, Tom Hendricks. As depicted on this map the ground conditions starting at the portal consist of "Alluvial Rock" transitioning to "Decomposed Granite" and then "Weak Hard Rock", none of which are proper terms to describe the geology, although they do provide some indications in that regard.

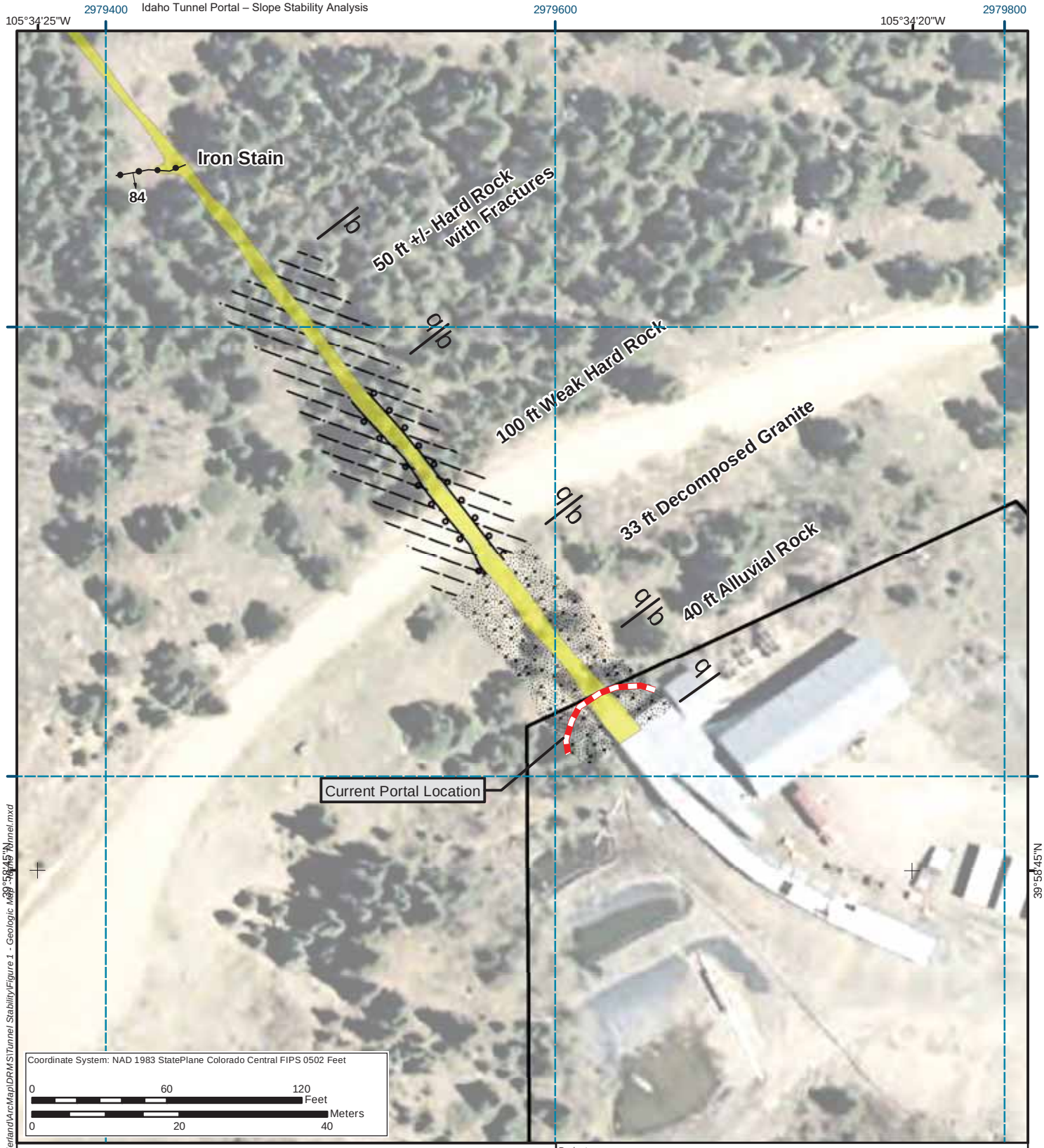
Geology exposed in the initial portal excavation and collapse void includes fractured and weathered blocky gneiss in the left wall or 'rib' when looking into the tunnel (Photograph 3). This material is interpreted as similar to the "Weak Hard Rock" depicted on Figure 1.

Photograph 3 – Weathered and fractured gneiss in the left rib beneath the portal collapse. Green paint marks at 4-ft intervals mark the approximate location for the next steel sets.

The right rib of the portal in the area of the collapse occurs in granular decomposed gneiss overlying deeply weathered blocky gneiss (Photograph 4). This material is interpreted as similar to the "Decomposed Granite" depicted on Figure 1.

Regolith and colluvial soils are exposed in the collapse void above the tunnel horizon (Photograph 5), excavation wing walls (Photograph 6), and the Caribou Road cut. This material is interpreted as similar to the "Alluvial Rock" depicted on Figure 1.

[1] Moore, F.B., Cavender, W.S., and Kaiser, E.P., 1954; "Geology and Uranium Deposits of the Caribou Area, Boulder County, Colorado." US Geological Survey Trace Elements Investigations Report 228, March 1954



Legend

- SWMP Boundary
- Idaho Tunnel
- Portal Location

Geology

- Overburden
- Gneiss and Schist
- Cribbing
- Vein, showing dip; dashed where inferred

Project: Idaho Tunnel Portal Slope Stability

Title: **Geologic Map - Idaho Tunnel**

GRAND ISLAND RESOURCES

Project No. US 0401			File No.	
GIS:	JST	05/06/20	Scale As Shown	Rev 0
Check:	JST	05/06/20	**Figure 1**	
Review:	JST	05/06/20		

Path: C:\Users\jst52\Documents\NMXG\S\Projects\Nederland\ArcMap\DRMS\Tunnel Stability\Figure 1 - Geologic Map - Idaho Tunnel.mxd

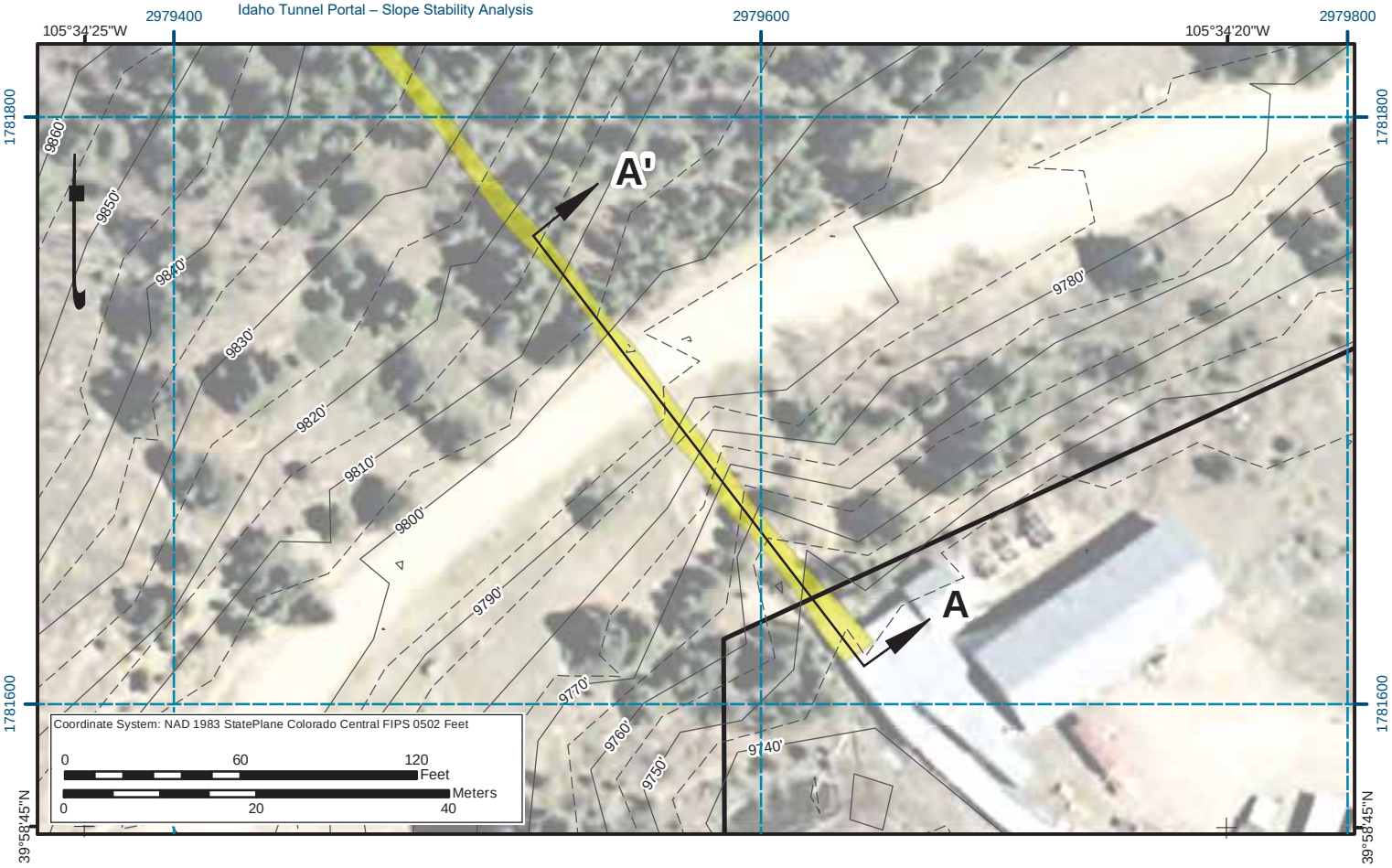
Photograph 4 – Decomposed gneiss overlying weathered and fractured gneiss in the right rib beneath the portal collapse. Green paint marks the approximate location of the next steel sets at 4-ft intervals.

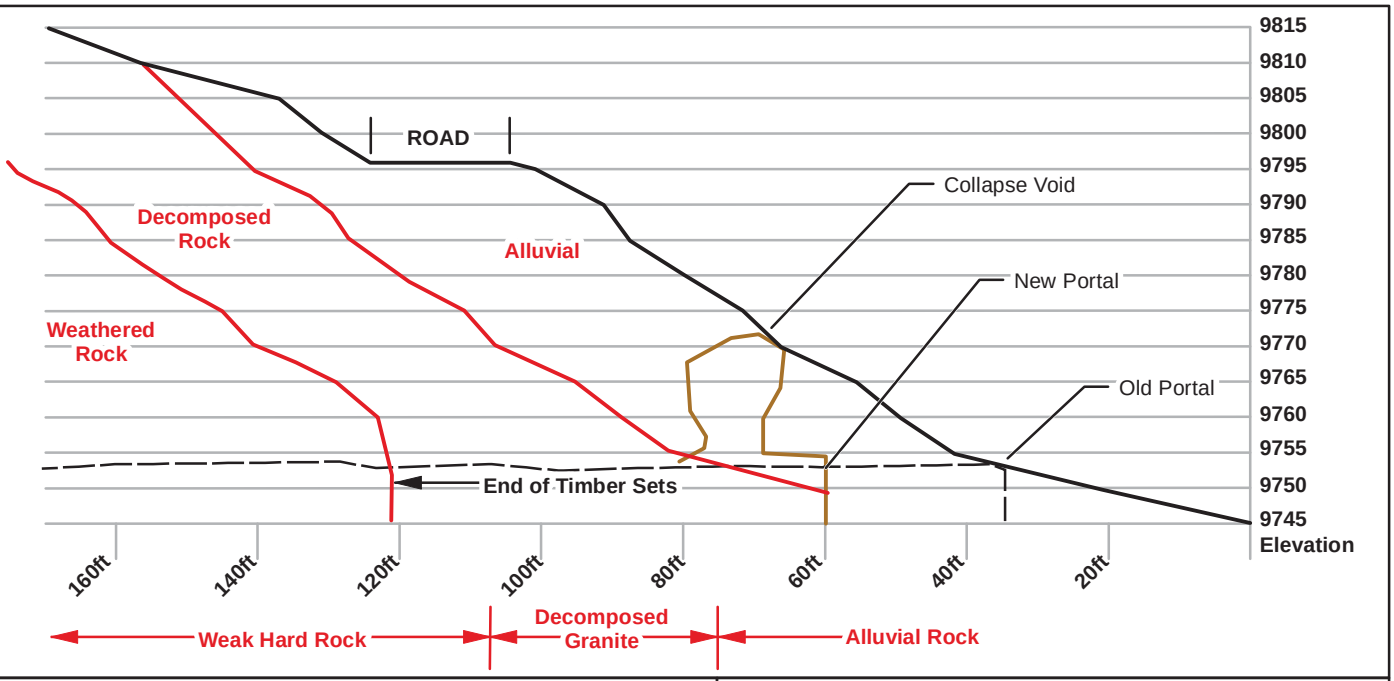
Photograph 5 – Regolith and colluvium exposed in the walls of the collapse void. The threaded bars are some of the spillings which were installed before enlarging the portal excavation.

Photograph 6 – Regolith and colluvium exposed in the right (north) wing wall of the portal excavation.

GIR has explored the first 200 ft of the Idaho Tunnel in order to investigate the corresponding ground conditions that can be anticipated during the rehabilitation efforts. Starting from the back of the last steel set, the existing ground support consists of timber sets with full lagging on the back and ribs for the next 41 ft, followed by rock bolts and chain link mesh. The timber sets retain loose soil and rock, obscuring the undisturbed ground. Loose blocky material has also fallen onto much of the chain link and pulled it from the roof in places. The ground mass and rubble observed consists of granular fragments of decomposed rock mixed with blocky pieces of rock, transitioning more to angular pieces of highly fractured weathered rock with increasing distance into the tunnel. Other than a change in the type ground support previously employed, there does not seem to be a well-defined point in the tunnel at which a change from "Decomposed Granite" to "Weak Hard Rock" occurs. It appears to be a gradual transition with some of each type of material found within the other.

At approximately 200 ft from the new portal there is a collapse after which, the rock exposed in the sides of the tunnel (ribs) appears to be fresh and less fractured gneiss, the tunnel exhibits a more regular 6 ft x 6 ft opening, and there is no ground support visible. This is interpreted as the "Hard Rock with Fractures" indicated on Figure 1.





Legend

- SWMP Boundary
- Idaho Tunnel

NOTE:
Contours were generated using open source LiDAR data collected from *https://www.opentopography.org/*.
Golden Field Services processed the data using Global Mapper and provided ground truthing on site using GPS equipment. Golden Field Services then combine the ground truthing and open source data.

Project: Idaho Tunnel Portal Slope Stability

Title: **Plan and Profile**

GRAND ISLAND RESOURCES

Project No. US 0401			File No.	
GIS:	JST	05/06/20	Scale As Shown	Rev 0
Check:	JST	05/06/20	**Figure 2**	
Review:	JST	05/06/20		

Path: C:\Users\jst52\Documents\MXG\GIS\Projects\Nederland\ArcMap\DRMS\Tunnel Stability\Figure 2 - Plan and Profile.mxd

2.0 PROBLEM DESCRIPTION

Figure 2 presents a plan and profile of the Idaho Tunnel based on 10-ft topographic contours of the original ground surface. Superimposed on this figure are the approximate position of the rehabilitated tunnel portal following excavation.

The material encountered during portal excavation and currently exposed in the wing walls consisted of regolith and colluvium, with some decomposed rock encountered at depth. The excavated slopes stood unsupported following excavation and were dry at the time (Photograph 7). The maximum height at the taller left (south) wing wall is 28 ft, sloping at an angle of 70-80 degrees from horizontal. The top of the excavation is approximately 40 ft from County Road 128 (Caribou Road) at the closest point and 20 ft lower in elevation. This creates potential long-term concerns for stability of the road.

Photograph 7 – Idaho Tunnel Portal following excavation

The excavated slope above the portal opening and wing walls were reinforced with 10- and 20-ft soil nails, 6-gauge wire mesh, and nominal 6-inches of fiber-reinforced shotcrete. Grouted threadbar spillings were also installed at 12-inch spacing above the portal. These were reportedly 35 ft long, extending into harder ground and grouted. Unfortunately, little as-built documentation is available.

As of May 2, 2020, the sink hole above the collapse has grown slightly in size. Otherwise, there are no obvious signs of slope stability issues with the excavation or adjacent slopes, such as cracking or slumping, despite the occurrence of spring thaw and presence of some ground water. Locations which had been seeping water have stopped (Photograph 2) and the ground exposed in the non-shotcrete covered margins of the excavation has dried considerably.

3.0 STABILITY ANALYSIS

3.1 Approach

The stability analyses were conducted as two-dimensional limit-equilibrium analysis using commercially available software. Three cases were considered at which the slope was observed to be stable and therefore must exhibit a Factor of Safety (FoS) greater than unity; at the end of excavation, during spring thaw, and with an open void present. For the end of excavation scenario, the slope reinforcement was neglected in the analysis and the slope was assumed to be fully drained. For the spring thaw scenario, the presence of groundwater in the slope was considered in the analysis. The open collapse void and backfilled void were considered separately.

The actual FoS should be higher than the results presented for 2D analyses section due to the concaved slope orientation and 3D edge effects. Studies have shown that these 3D effects can become significant, often increasing the FoS by 10-20 percent, or even more[2]. This effect tends to become more significant as the amount of slope curvature increases, particularly as the ratio of the slope width to slope height drops below 3. In the case of the Idaho Tunnel Portal, the excavation has a relatively narrow open width of approximately 30 ft at the base of the mouth of the excavation relative to a height ranging from 15 to 28 ft. These effects have been considered qualitatively in the results discussion.

3.2 Software

The stability analyses were conducted using the RocScience SLIDE2 software, a 2D slope stability program for evaluating the safety factor or probability of failure, of circular and non-circular failure surfaces in soil or rock slopes. Slide2 analyzes the stability of slip surfaces using vertical slice or non-vertical slice limit equilibrium methods like Bishop, Janbu, Spencer, and Sarma, among others. Search methods can be applied to locate the critical slip surface for a given slope. The Bishop method of slices for circular failures surfaces while the Janbu method of slices for satisfying both moment and force equilibrium was adopted for non-circular surfaces.

The Slide2 software also allows the effects of slope reinforcement to be included in the analyses.

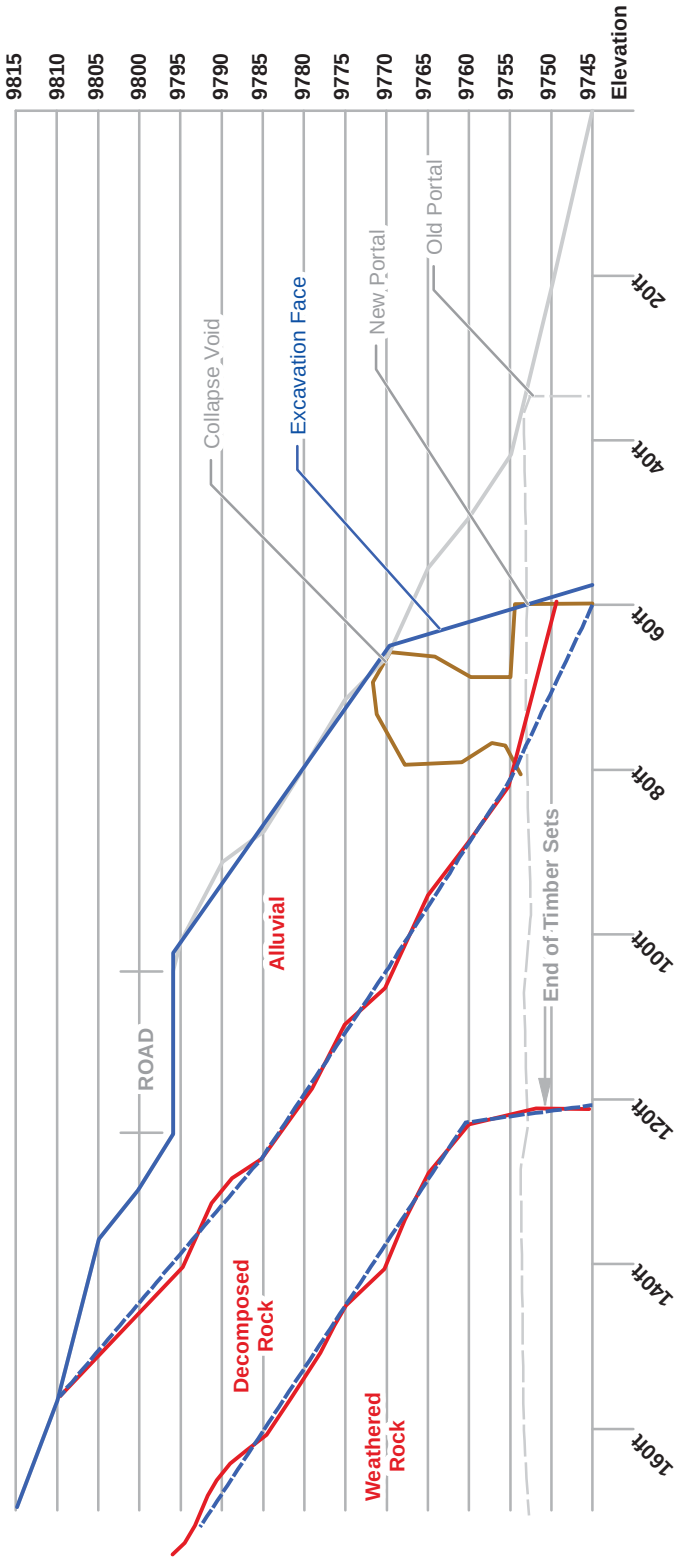
3.3 Model Input

3.3.1. Slope Geometry

An idealized representative two-dimensional cross-section was considered for analysis. This section consisted of the profile along the axis of the tunnel included on Figure 2, at the maximum cut slope on the left (south) side of the portal excavation. The idealized slope consisted of a 28-ft high excavation at an angle of 75-degrees then natural ground sloping at approximately 40 ft to the edge of the 20-ft wide County Road. Figure 3 presents the idealized slope stability cross-section superimposed on the tunnel profile section.

Included on this figure is the assumed material distributions as described in the following section.

[2] Zhang, Y., Chen, G., Zheng, L., Li, Y., and Zhuang, X,. 2013; "Effects of geometries on three-dimensional slope stability." Canadian Geotechnical Journal. Vol. 50, No. 3, pp. 233 – 249.



Project

Idaho Tunnel Portal Slope Stability

Title

Idealized Slope Stability Analysis Section

GRAND ISLAND RESOURCES

Project No. US 0401			File No.	
GIS:	JST	05/06/20	Scale As Shown	Rev 0
Check:	JST	05/06/20	**Figure 3**	
Review:	JST	05/06/20		

Path: C:\Users\jst52\Documents\NMXIG\S\Projects\Nederland\ArcMap\DRMS\Tunnel Stability\Figure 3 - Stabilized Slope.mxd

3.3.2. Material Distribution

An "Alluvial Rock" soil unit was assumed to comprise the first 40 ft of the original tunnel as depicted on Figure 2. Based on the rock materials exposed at the base of the portal excavation (Figure 7) and currently exposed in the tunnel ribs (Photographs 3 and 4), this is a conservative assumption as at least some portions of this interval will include decomposed or weathered rock.

For the stability analysis, the "Decomposed Granite" unit was assumed to comprise the next 33 ft at the tunnel horizon. The transition from "Decomposed Granite" to "Weak Hard Rock" was modeled to coincide with the change in the type of ground support used in the tunnel. This is slightly further into the slope than the geology depicted on Figure 1 and therefore, more conservative.

This layered profile was then carried up the height of the slope for the stability analysis section as depicted on Figure 3. In reality, these layers are likely thickest at the toe of the slope down at the portal level and taper in thickness moving higher up the slope and this assumption will also be conservative.

3.3.3. Material Properties

The analyses incorporated shear strength parameters for the soil material, decomposed rock and weak weathered rock mass separately. Since the slope height is not great, the shear stresses will be low. For the low range of stresses present, equivalent linear Mohr-Coulomb shear strength parameters were assumed.

During excavation the regolith and colluvium "Alluvial Rock" unit was observed to stand near-vertical for up to 28 ft without ground support. From an engineering perspective this material consists of poorly-graded sandy gravel with cobbles, silt and clay (GP). For the purposes of the stability analysis this material was assigned a friction angle of 38 degrees and 500 psf cohesion with a moist unit weight of 125 pcf. Areas which contain a higher proportion of coarse rock fragments will exhibit higher shear strength, and the overall average strength is likely higher, however, if failure were to occur it will tend to pass through the weaker materials which offer less resistance.

From an engineering perspective the "Decomposed Granite" unit consists of rock which has been weathered and decomposed in situ, but has not been disturbed and retains the original rock fabric. This material represents a weak rock mass for which the Hoek-Brown criterion[3] was used to estimate the average rock mass strength across this material based on a large body of empirical data. Assumed rock mass parameters for Decomposed Rock:

Intact Rock UCS = 1000 -2000 ksf (7,000 – 14,000 psi)
GSI = 15 (Disintegrated with highly weathered surfaces with soft clay coatings or infilling)
mi = 25
D = 0

[3] E.Hoek and E.T.Brown, 2018; "The Hoek–Brown Failure Criterion and GSI – 2018 Edition." Journal of Rock Mechanics and Geotechnical Engineering, Volume 11, Issue 3, June 2019, Pages 445-463

The "Weak Hard Rock" unit represents highly fractured rock with some weathering and is quite variable. In some areas the material is quite weathered and grades into fully decomposed rock, while in other areas it more closely resembles fractured hard rock with little weathering present. Assumed rock mass parameters for Weak Hard Rock:

Intact Rock UCS = 1000 -2000 ksf (7,000 – 14,000 psi)
GSI = 45 (Blocky/Disturbed/Seamy with rough, slightly weathered, iron stained surfaces -or- Very Blocky with smooth, moderately weathered and altered surfaces)
mi = 25
D = 0

3.3.4. Ground Support Elements

Due to their relatively short length and irregular pattern of placement, the soil anchors were neglected in the analyses. The shotcrete will have little overall effect on global stability of the slope and was also neglected in the analyses for conservatism. The primary purpose of the shotcrete is to control shallow surface sloughing and raveling.

3.3.5. Idaho Tunnel

Due to the ground support elements that will be employed and its small size relative to the scale of the slope, the tunnel opening was not included in the stability section. Spillings installed above the top of the tunnel opening will become integrated with the cellular concrete void fill to help stabilize the opening and face of the excavation below the County Road. Its is anticipated that additional spillings and possibly forepolling will be required when tunnel rehabilitation resumes. These measures as well as the timely installation of steel sets or shotcrete and mesh as ground support for the tunnel will be employed to prevent additional collapse beneath the road.

3.3.6. Groundwater Conditions

The slope was initially modeled as drained, without groundwater to calibrate the model to conditions which existed as the excavation was completed.

Subsequently, a parametric study was conducted to evaluate the sensitivity to water levels to reflect conditions which may exist during spring thaw. This was conducted by progressively raising a perched water table within the Alluvial Rock unit in 5 ft increments to evaluate the effect this had on the Factor of Safety.

3.3.7. Collapse Void

The open collapse void was neglected in the base case analyses since it is not present everywhere within the slope. However, its inclusion is useful for back analysis to provide constraint on the shear strength of the material comprising the slope.

The 200 psi cellular concrete void fill is much stronger than the soil and rock colluvium material it replaces. Additional runs were made to assess the amount of beneficial effect this mass of stronger material has on stability of the slope in the sections where it will be present.

4.0 ANALYSIS RESULTS

Analysis of the slope under drained conditions indicates a minimum Factor of Safety (FoS) failure surface of 1.36 for a non-circular failure of the excavation slope. The minimum FoS for a failure surface which intersects the County Road was only slightly higher at 1.37. Figure 4 presents a summary of these stability analysis results and includes the critical failure surface as well as a summary plot of all trial failure surfaces color-coded by FoS. These analyses demonstrate that the lower FoS failure surfaces pass entirely through the colluvium and regolith soil materials due to the slope geometry. The position of the weak hard rock and decomposed rock beneath the slope has little to no effect on the overall stability.

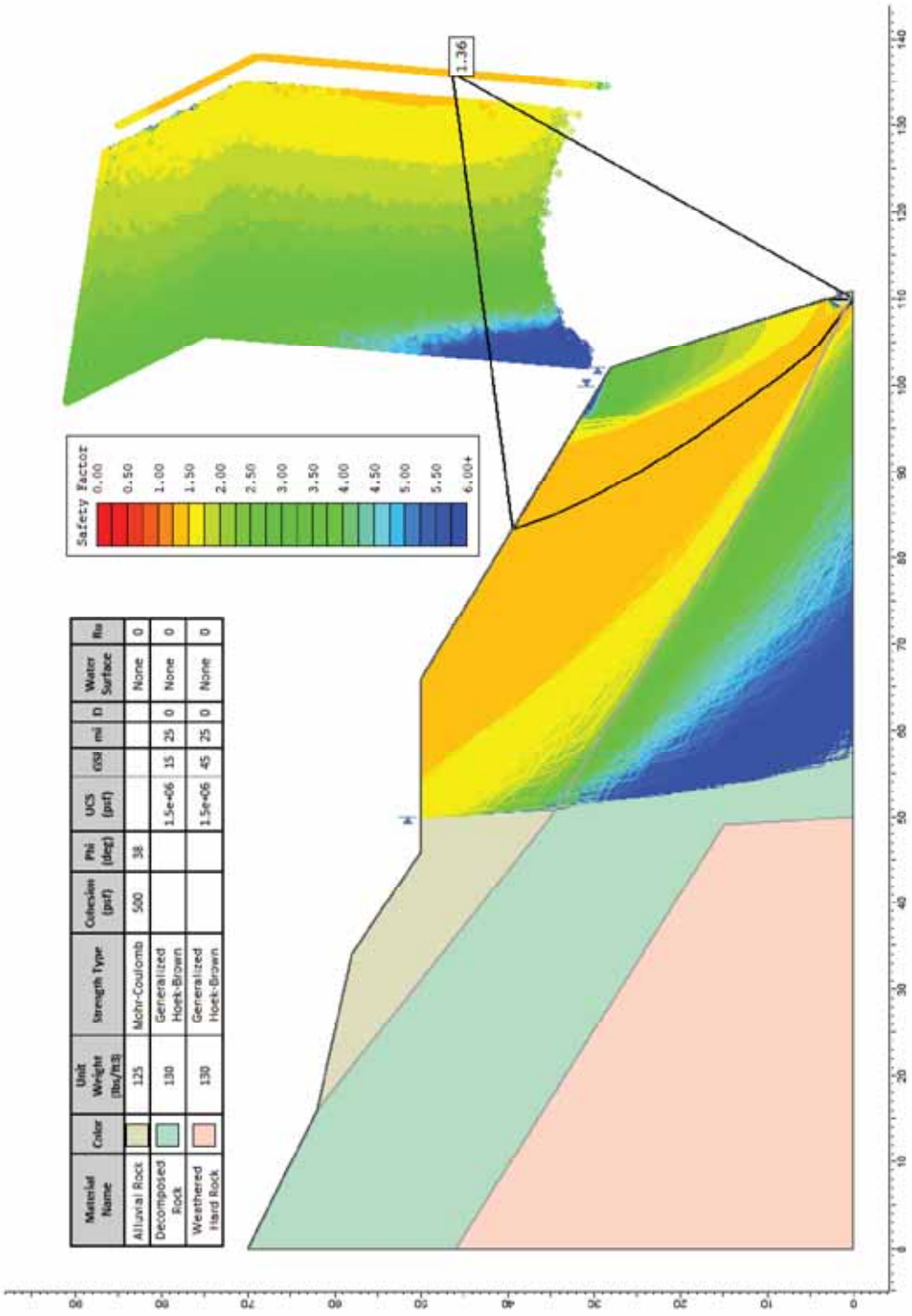
During spring thaw, several areas of seepage were observed coming through the shotcrete facing (Photograph 2). This seepage indicates that portions of the slope may become saturated during snow melt, and soil saturation. The seepage is not present everywhere and does not discharge uniformly from the slope which suggests isolated areas of seepage flow rather than complete saturation. Table 1 presents a summary of perched water depth with the Alluvial Rock unit versus FoS. As indicated in this table, a perched water depth of 15 ft, or about half the thickness of the material, results in a FoS of 1.0. Figure 5 depicts the stability section with the assumed perched water table and critical failure surface from this analysis.

Including the open collapse void in the stability section reduces the minimum FoS to 0.74 for a non-circular and 0.90 for a circular failure surface respectively, indicating a condition of instability. Since the slope was observed to be stable despite the presence of the tunnel and open void, these results serve to demonstrate that the shear strength adopted for the regolith and colluvial soils is conservatively low. These results are presented in the summary included in Table 1.

Including the 200 psi cellular concrete void fill within the stability section increases the FoS considerably. The minimum FoS for all trial failure surfaces passing through the cellular void fill is above 4.0.

Table 1 – Stability Analysis Summary

Model Case	Water Depth (ft)	Minimum FoS	
		Janbu, non-circular	Bishop, circular
Fully Drained	0	1.36	1.46
Perched Water	5	1.32	1.46
Perched Water	10	1.12	1.40
Perched Water	15	1.00	1.24
Open Void	0	0.74	0.90
Cellular Concrete	0	> 4.0	> 4.0



Project

Idaho Tunnel Portal Slope Stability

Title

Stability Analysis Summary
Base Case, Drained, Non-Circular

GRAND ISLAND RESOURCES

Project No. US 0401			File No.	
GIS:	JST	05/06/20	Scale As Shown	Rev 0
Check:	JST	05/06/20	**Figure 4**	
Review:	JST	05/06/20		

Path: C:\Users\jst52\Documents\NMXIGIS\Projects\Nederland\ArcMap\DRMS\Tunnel Stability\Figure 4 - Stability Analysis Summary.mxd

5.0 CONCLUSIONS

For geotechnical stability of the Country Road a required minimum FoS is not defined by the current Boulder County Multimodal Transportation Standards[4]. The Colorado Department of Transportation (CDOT) Geotechnical Design Manual[5] requires a minimum FoS of 1.1 during construction and 1.3 under long term static loading conditions for embankment and cut slopes except where failure or significant deformation will affect bridges or critical facilities. Design for seismic loading conditions is not required by CDOT for non-critical slopes.

The results of the analyses and discussion presented herein are sufficient to demonstrate that the slope meets the CDOT stability criteria for the construction case in its current condition. With a calculated minimum FoS of 1.36 for the slope under drained conditions, the 2D analyses also demonstrate that the slope will meet the CDOT criteria for long-term static loading conditions provided that adequate drainage can be maintained.

The presence of seepage during spring thaw indicates that some saturation of the slope may occur during seasonally high water levels. This can have a significant deleterious effect on stability of the slope. Parametric analyses suggest that should the surficial colluvium and regolith soil materials become saturated over approximately half their thickness then instability could occur. However, seepage from the slope does not appear uniformly which suggests isolated areas of seepage flow through discrete pathways typical in mountainous terrain, rather than complete saturation. The shotcrete facing should be provided with weep holes to prevent the buildup of water pressure in the slope behind the shotcrete.

The Idaho Tunnel also serves as a drain to some extent to limit water pressures in the slope. The collapse void will be mitigated by backfilling it with pervious cellular concrete which will increase this effect. Stability of the slope could be further enhanced with horizontal drains if necessary.

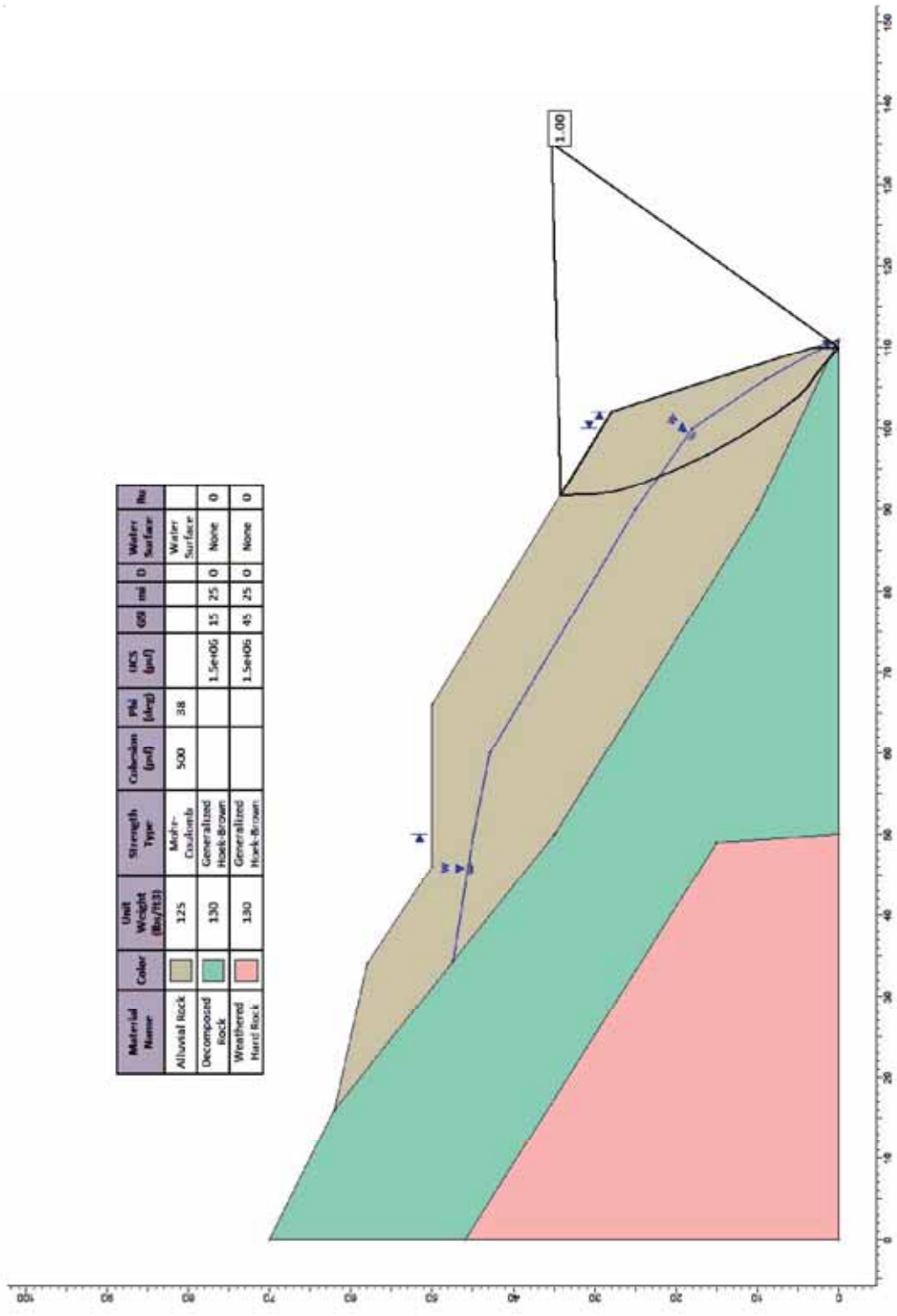
The cellular concrete void fill is much stronger than the colluvial material it replaces and increases the FoS significantly when included in the analyses by imparting a buttressing effect. There are areas of the excavated slope on either side of the portal which would have none of this material in section. However, the actual FoS on these sections should be higher than 2D analyses results due to 3D effects related to the concaved slope orientation and adjacent areas which are buttressed by the cellular concrete void fill.

Spillings installed through the cellular void fill and similar ground control elements installed when rehabilitation of the tunnel resumes will serve to underpin the portion of the slope directly above the Idaho Tunnel and below the County Road. Permanent tunnel lining ground support installed as the tunnel is rehabilitated will ensure that stability of the tunnel itself does not impact the road.

The slope stability evaluation presented was based largely on observation and professional judgement as limited engineering data was available. Data deficiencies at this time include:

- As-built configuration of the portal excavation
- Accurate topographic data for the slope and road
- Subsurface geology beneath the slope

[4] https://assets.bouldercounty.org/wp-content/uploads/2017/02/multi-modal-standards.pdf
[5] https://www.codot.gov/business/designsupport/materials-and-geotechnical/programs/geotech/docs/cdot-gdm



Project

Idaho Tunnel Portal Slope Stability

Title

Stability Analysis Summary
Spring Thaw, Undrained, Non-Circular

GRAND ISLAND RESOURCES

Project No. US 0401			File No.	
GIS:	JST	05/06/20	Scale As Shown	Rev 0
Check:	JST	05/06/20	**Figure 5**	
Review:	JST	05/06/20		

Path: C:\Users\jst52\Documents\NMXIGIS\Projects\Nederland\ArcMap\DRMS\Tunnel Stability\Figure 5 - Stability Analysis Summary.mxd

- Groundwater conditions
- Laboratory testing data to determine the geomechanical properties of the materials comprising the slope
- Shotcrete thickness distribution
- Soil anchor installation details and pullout capacity

This study should be updated and reassessed once additional data such as the as-built slope geometry becomes available. In other cases, the cost and effort required to refine the analyses may be more than the value provided. For example, the cost to accurately characterize the highly variable geologic conditions within the slope may be higher than the cost implications of adopting conservative assumptions, such as those provided herein. Similarly, the cost to accurately characterize and monitor the potential ground water variations would likely be higher than the cost to install horizontal drains to ensure drainage.

Stability analysis of the Idaho Tunnel portal slopes was conducted by Mr. David S. Hallman, licensed as Colorado Professional Engineer (Civil) 26076, as affirmed by the stamp and signature affixed below.

APPENDIX I

DOW WILDLIFE STATEMENT

A Division of Wildlife statement will not be required for this Amendment Application. However, GIR will conduct its mining and reclamation operations so that wildlife resources are properly considered and protected to the extent possible

APPENDIX II

WEED CONTROL PROGRAM

GIR will comply with the State of Colorado and Boulder County Noxious Weed Control Regulations.

In addition, GIR will do routine surveys to identify noxious weeds and make timely arrangements for control and treatment. GIR will keep a record of mine site areas needing and having noxious weed control.

ATTACHMENT I

STREAM FLOW RATES AND SURFACE WATER QULITY DATA

STREAM FLOWS:

Stream Flow data are fro the following source:

- Stream Flow Data for Colorado – Water Year 2008, Colorado Division of Water Resources

No actual stream flow data are available for Coon Track Creek or North Beaver Creek into which Coon Track Creek and Hicks Gulch flow. North Beaver Creek flows into Middle Boulder Creek at Nederland, CO .

PLATTE RIVER BASIN

06725500 MIDDLE BOULDER CREEK AT NEDERLAND, CO

LOCATION.--Lat 39°57'42", long 105°30'16", in NE¼SE¼ sec. 13, T.1 S., R.73 W., Boulder County, Hydrologic Unit 10190005, on left bank at Nederland just downstream from North Beaver Creek at inlet to Barker Reservoir.

DRAINAGE AREA AND PERIOD OF RECORD.--36.2 mi²; June 1907 to present.

GAGE.--Data Collection Platform (DCP), shaft encoder and a continuous chart recorder in a timber shelter and concrete well at a sharp-crested Cipolletti weir with rectangular overflow crests. The primary reference gage is a metal drop tape from an adjustable reference point with a supplemental outside staff gage. City of Boulder maintains the gage and chart recorder.

REMARKS.--Primary record is hourly averages of 15-minute data taken from satellite monitoring with chart back up. Record is complete and reliable, except for December 3, 9-10, 13-14, 23-24, 29-31, 2007, January 1-2, 10-25, 29-31, February 1-2, 6-10, 13-14, 17-19, March 3, 23-25, 2008, when the stage-discharge relation was affected by ice on the weir and inlets freezing. The record is good, except during periods of ice affected record, which are estimated and poor. Flows above 250 cfs (GH = 2.34 ft.) on June 1-5, 18-30, 2008 are considered fair due to lack of definition of the stage-shift relationships at this gage height. Occasionally tree limbs catch on the weir affecting gage heights. Any debris or ice on the control is typically cleared weekly by the City of Boulder operator. Applied datum corrections for debris were only applied for short periods. Station maintained by City of Boulder and record developed by Lee Cunning.

RATING TABLE.--BOCNIDCO07 USED FROM 01-Oct-2007 TO 30-Sep-2008

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2007 TO SEPTEMBER 2008
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	14	19	7.2	7.0	6.0	5.5	5.4	38	286	246	64	31
2	19	18	7.0	7.0	7.0	5.2	5.7	30	323	232	63	29
3	17	15	7.0	6.6	7.4	5.0	6.4	32	324	234	62	28
4	17	17	7.0	5.8	5.9	5.7	5.8	28	291	236	59	27
5	17	16	7.0	5.3	5.3	5.4	6.2	30	269	219	58	27
6	18	15	7.3	5.2	5.0	5.4	6.2	37	215	229	61	25
7	17	14	8.1	5.2	5.0	5.4	6.1	49	211	218	74	23
8	15	13	8.0	5.2	5.0	5.0	5.9	56	229	188	61	23
9	17	13	7.5	5.6	6.0	4.8	6.2	48	180	165	65	21
10	16	13	7.5	6.0	6.0	4.7	6.0	48	186	162	61	20
11	15	12	8.4	6.0	6.7	4.8	5.8	42	205	159	73	23
12	15	13	7.0	6.0	5.7	5.1	5.6	51	151	151	57	34
13	15	12	7.0	6.0	6.0	4.8	6.2	62	129	144	49	31
14	20	11	7.0	6.0	6.0	4.8	8.3	50	154	128	45	29
15	21	8.0	8.1	6.0	5.1	4.8	12	49	201	120	49	26
16	19	13	8.4	6.0	5.0	4.9	12	45	229	122	73	23
17	19	9.7	7.6	6.0	5.0	4.9	11	52	249	120	76	23
18	14	8.8	7.1	6.0	5.0	5.0	9.7	81	267	121	61	29
19	21	8.3	6.9	6.0	5.0	4.9	11	139	293	109	51	33
20	22	8.2	6.6	6.0	5.1	5.3	17	184	304	105	45	32
21	19	5.5	6.5	6.0	4.9	5.1	19	227	289	99	42	37
22	15	7.2	6.0	6.0	4.8	5.4	18	218	274	96	40	32
23	19	9.0	7.0	6.0	4.9	5.0	25	158	269	102	41	30
24	19	9.4	7.0	6.0	4.9	5.0	29	129	274	100	42	28
25	19	9.6	8.2	5.0	4.9	5.0	29	120	280	96	42	27
26	18	7.7	7.6	5.1	5.0	5.2	26	136	273	91	40	26
27	22	7.0	6.9	4.6	5.2	5.4	20	134	284	83	38	26
28	21	6.2	7.0	5.1	5.1	5.0	21	155	285	80	34	26
29	21	8.0	7.0	5.0	5.1	5.7	24	219	276	82	32	25
30	20	7.1	7.0	5.0	---	5.6	31	220	265	73	30	24
31	21	---	7.0	5.0	---	5.3	---	235	---	67	30	---
TOTAL	562	333.7	224.9	177.7	158.0	159.1	398.5	3100	7451	4377	1618	818
MEAN	18.1	11.1	7.25	5.73	5.45	5.13	13.3	100	248	141	52.2	27.3
AC-FT	1110	662	446	352	313	316	790	6150	14780	8680	3210	1620
MAX	22	19	8.4	7.0	7.4	5.7	31	235	324	246	76	37
MIN	14	5.5	6.0	4.6	4.8	4.7	5.4	28	129	67	30	20

CAL YR 2007 TOTAL 18101.4 MEAN 50 MAX 287 MIN 5.0 AC-FT 35900
WTR YR 2008 TOTAL 19377.9 MEAN 52.9 MAX 324 MIN 4.6 AC-FT 38440

MAX DISCH: 385 CFS AT 22:45 ON Jun. 2, 2008 GH 2.85 FT. SHIFT 0.02 FT.
MAX GH: 2.85 FT. AT 22:45 ON Jun. 2, 2008

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

Water Quality:

To the best of our knowledge, no actual stream flow data exists for Coon Track Creek. The following watershed summary is indicative of the upper reaches of the basin.

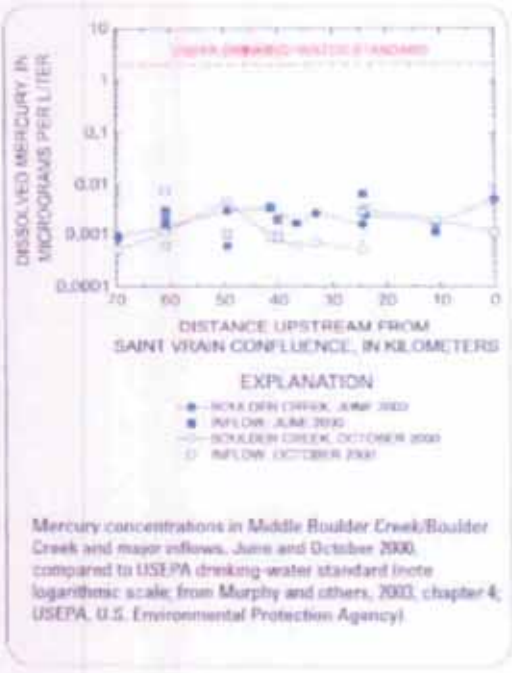
Water Quality of Boulder Creek from Top to Bottom

Water quality in the Boulder Creek Watershed varies substantially. In general, water quality is best in the high-elevation headwaters, where human activity is limited and there are few contaminant sources. Water quality declines downstream as diversions remove water from streams, population density increases, and there are more potential contaminant sources. In lower Boulder Creek, several factors affect water quality, including wastewater, urbanization, and agriculture.

Headwaters and mountains

The headwaters of the Boulder Creek Watershed originate primarily from snowmelt and ground water that has flowed through relatively unreactive bedrock and soil. Therefore, these waters typically have very low concentrations of dissolved solids, alkalinity, and nutrients compared to downstream waters (Murphy and others, 2003, chapters 3, 4, and 8; Verplanck and others, 2003). Surface waters generally have near-neutral pH values, and dissolved oxygen is at or near saturation. The City of Boulder owns a 30-km² (12 mi²) protected watershed property in the headwaters of North Boulder Creek (see map on page 11; public entry is prohibited to protect this high-quality water source. Much of the headwaters of Middle Boulder Creek are within the Indian Peaks Wilderness Area, where motorized vehicles are not permitted. While direct human disturbance is limited, the headwaters are within the "airshed" of the Denver metropolitan area, where coal-fired powerplants, automobiles, and agricultural

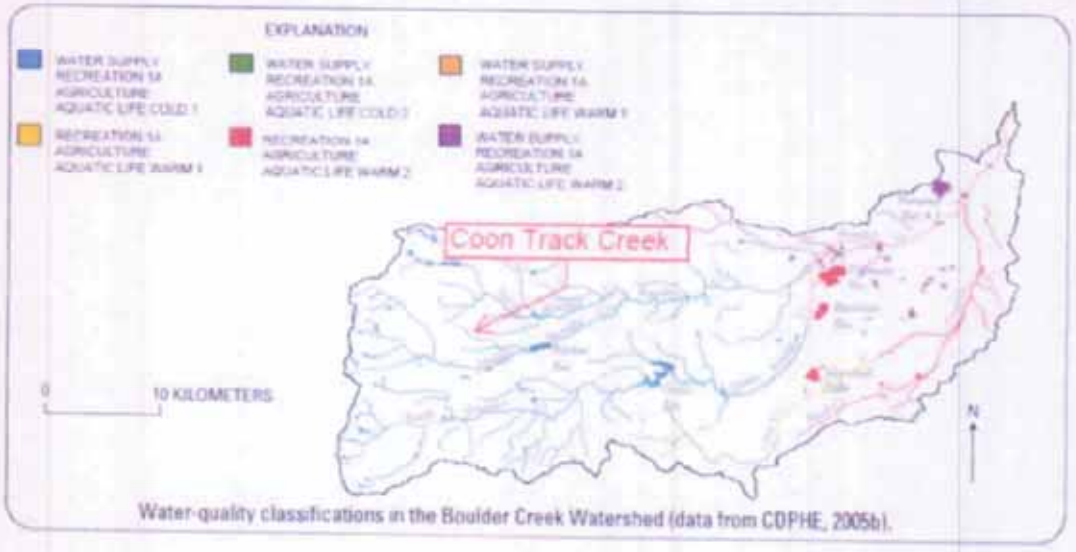
Headwaters of North Boulder Creek (Arapaho Glacier at far left)



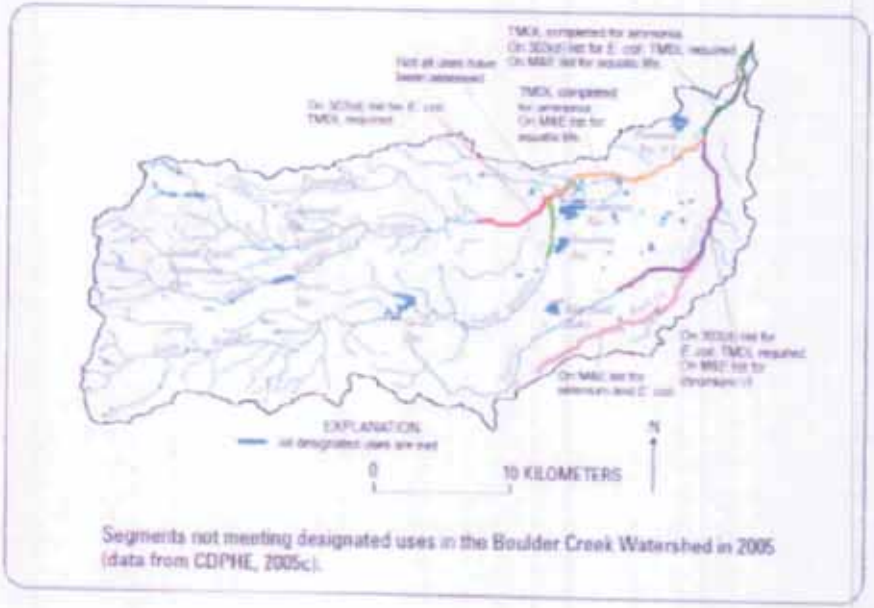
Mercury concentrations in Middle Boulder Creek/Boulder Creek and major inflows, June and October 2000, compared to USEPA drinking-water standard (note logarithmic scale; from Murphy and others, 2003, chapter 4; USEPA, U.S. Environmental Protection Agency).

activities release contaminants (such as sulfate and nitrate) to the atmosphere. These contaminants are carried in the atmosphere to the headwaters area, and returned to the Earth in rain and snow. Deposition of nitrate and sulfate, even in low concentrations, may decrease the pH of the poorly buffered headwaters, causing changes in aquatic ecosystems (Williams and Tonnessen, 2000). Nitrate also can act as a fertilizer, changing the growth rates of plants.

The upper watershed was mined intensively in the past for gold, silver, tungsten, and other metals. Mining can affect water quality when sulfide minerals in waste rock and tailings interact with water and oxygen to produce sulfuric acid, which leaches metals from rock and increases metal toxicity to aquatic organisms. The ore deposits in the Boulder Creek Watershed usually contain small amounts of sulfides, so runoff from old mines and tailings piles is typically not acidic or metal-rich. Metal concentrations in North Boulder and Middle Boulder Creeks, such as mercury and lead, are usually low (Murphy and others, 2003, chapter 4). Some tributaries of South Boulder Creek are acidic and have elevated metal concentrations, but flow in these tributaries is too small to have a substantial effect on the main stem of South Boulder Creek (Asher-Bolinder, 1995; Colorado Riverwatch, 2001).



Water-quality classifications in the Boulder Creek Watershed (data from CDPHE, 2005b).



Segments not meeting designated uses in the Boulder Creek Watershed in 2005 (data from CDPHE, 2005c).

From: *State of the Watershed, Water Quality of Boulder Creek, Colorado*, USGS Circular 1284, U. S. Dept. Interior

ATTACHMENT II COMPOSITE ROCK ANALYSIS

General Site Mineralization:

The mining district is located near the northeastern exposed limit of the Colorado Mineral Belt. The deposits of the Caribou district have been described by the U.S. Geological Survey (USGS) as "polymetallic veins with abundant carbonates or the associated wall rock has been altered to contain carbonates." The vein structures occur as steeply dipping northeast-striking veins that cut the east/west striking veins. The vein mineralization was emplaced during multiple phases (up to seven) and includes early and persistent pyrite, copper, zinc, lead, and silver sulfides and gold. A relatively early carbonate-rich phase resulted in common dolomite, calcite, rhodochrosite, and other carbonate minerals in the veins. These carbonates are indicative of the acid-neutralizing potential of the ore body, and therefore the lack of any acid rock drainage potential. Baseline water sampling over the last twenty years confirms these conclusions with consistently low metal loading and pH levels in the range of 6.4 to 7.6.

Potential for Acid Rock Drainage:

Given the nature of the host rock and ore body, acid rock drainage (ARD) should not occur. (Prior analyses submitted and reviewed by the DRMS have shown the host rock and ore body to be non-acid producing.)