CGRS ENVIRONMENTAL SERVICES

November 29, 2010

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

Subject: Greenback-Produced Water Recovery, LLC
Pending Permit # COG-840002
CGRS Project No. 1-10270-11727aa

Dear Gary:

This letter provides information as required for an amended permit as described in your letter of July 15, 2010, which is attached for reference. Our responses to your information request are addressed by item.

- *Description of the intermittent discharges as to volume, duration, and timing during a representative year* – Surface discharge would only occur as a waste minimization process should the holding ponds become full. We estimate that 10% of 2500 barrels (bbls) per day influx will be treated. This corresponds to 65,000 bbls per year. At a 45 gallons per minute (gpm) permeate we would discharge 3.5 days per month. This equates to 0.065 million gallons per day.

- *Conveyance loss assessment for dry tributary* – The infiltration rate documented for the site was 30 minutes per inch. Water can easily traverse over a ten foot area in the swale bottom. At a 0.0028 feet per minute infiltration rate the resulting volume per 10 square feet would be 0.21 gpm. This value divided into 45 gpm yields 217 feet of dry tributary to infiltrate all of the discharge. This neglects ponding (which increases infiltration), evaporation and other consumptive losses. The distance to Mamm Creek exceeds 12,000 feet and the possibility of discharge water reaching the creek is extremely unlikely unless excessive precipitation occurs during discharge. Soil conditions are consistent throughout the study area. Boring logs generated from a geotechnical investigation are provided as Attachment A. The soils in the vicinity if the discharge outfall will be protected with eight-inch riprap to prevent erosion. Photographs of the dry swale are provided as Attachment B.

- *Any management approach to control flow to preclude entrance into Mamm Creek* – During the first discharge the dry drainage will be observed to confirm anticipated infiltration is occurring. Based on the observed water migration subsequent discharges will be modified (duration and volume) as needed to ensure limited migration from the discharge point. GreenBack will limit discharge during precipitation or snow melt events. As the volume of pond storage is large compared to projected incoming volumes, the operator can be selective in discharge timing and duration. The operator, as a BMP, will monitor the distance of overland flow during discharges to ensure no surface waters reach Mamm Creek. No discharge will encroach within one-half mile of Mamm Creek.

- GreenBack will use a 4,000 gallon buffer tank for post RO treatment storage. Prior to any surface discharge the tank will be sampled for the permit required analytical suite. If required, prior to WET testing the RO discharge will be amended with potassium chloride so that the water has a specific conductivity of between 200 and 600 µS/cm (personal conversation with ESC WET testing lab).

- The water quality of RO permeate was estimated by REMCO Engineering, of Ventura, California. The results of water quality sampling were used for feed water concentrations and the quality of the permeate was estimated from the ionic strength and osmotic pressure required to reduce the dissolved salt content. The analytical output is provided as Attachment C. We have been unable to obtain actual RO permeate data.

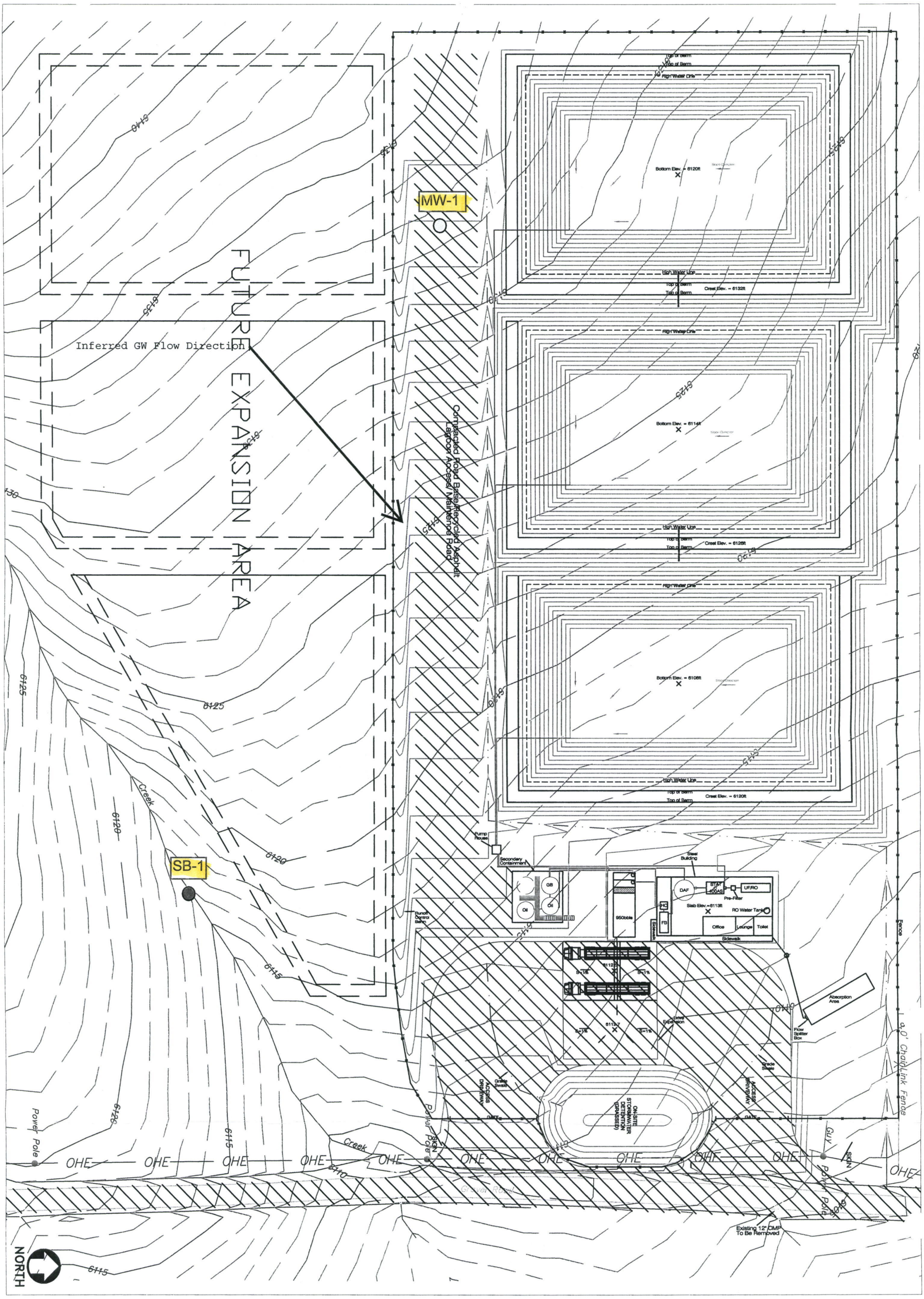
If you have any questions regarding this letter, please contact me at 970-493-7780.

Sincerely,
CGRS, Inc.,

Joby L. Adams, P.G.
Its Vice President

ATTACHMENT A

SOIL BORING LOGS



Sheet No. S103

Figure 2
Soil Boring/Well Location Map

Designed By:
Drawn By: ARG
Checked By:
Date: MARCH 2010
Scale: 1" = 60'
SCALE IN FEET

GREENBACK PRODUCED WATER MANAGMENT

RIFLE, COLORADO

CGRS ENVIRONMENTAL CONSTRUCTION COMPLIANCE
P.O. BOX 1489
FORT COLLINS, CO 80522
Tel. (970) 493-7780
Fax. (970) 493-7986

CGRS .ELD BOREHOLE LOG

BOREHOLE NUMBER
SB-1

PROJECT NUMBER : 1-10270-11727ab
JECT NAME : Greenback
LOCATION : Rifle, CO
DRILLING CO : Shelton Drilling Corporation
DRILLING METHOD : Air Rotary
DRILLER : Delton Cerise
LOGGED BY: TJ Grisel
START: 10/8/2010 **COMPLETED :** 10/8/2010

TOTAL DEPTH : 30'
TOP OF RISER : -
(with cap removed)

STATIC WATER LEVELS (BGS)		
Time	-	-
Date	-	-
Water Level	-	-
Casing Depth	-	-

Sample Type	Sample Number	Blowcounts / Ft	Sample Interval (in.)	Sample Recovery (in.)	DEPTH	DESCRIPTION	Notes (ppm)	LITHOLOGY
					0	SANDY SILTY CLAY: Brown, dry (SP)		
					-5			
5" RC	1	N/A	24	NA	-10	WASATCH FORMATION: Sandstone, argillaceous, tan-brown, dry	0.1 @ 10' bgs	
					-15			
5" RC	2	N/A	24	NA	-20		0.1 @ 20' bgs	
					-25			
RC	3	N/A	24	NA	-30	CLAYSTONE: Brown, moist, some fine-grained sand		
						End of Boring @ 30' bgs		

CGRS — ELD BOREHOLE LOG

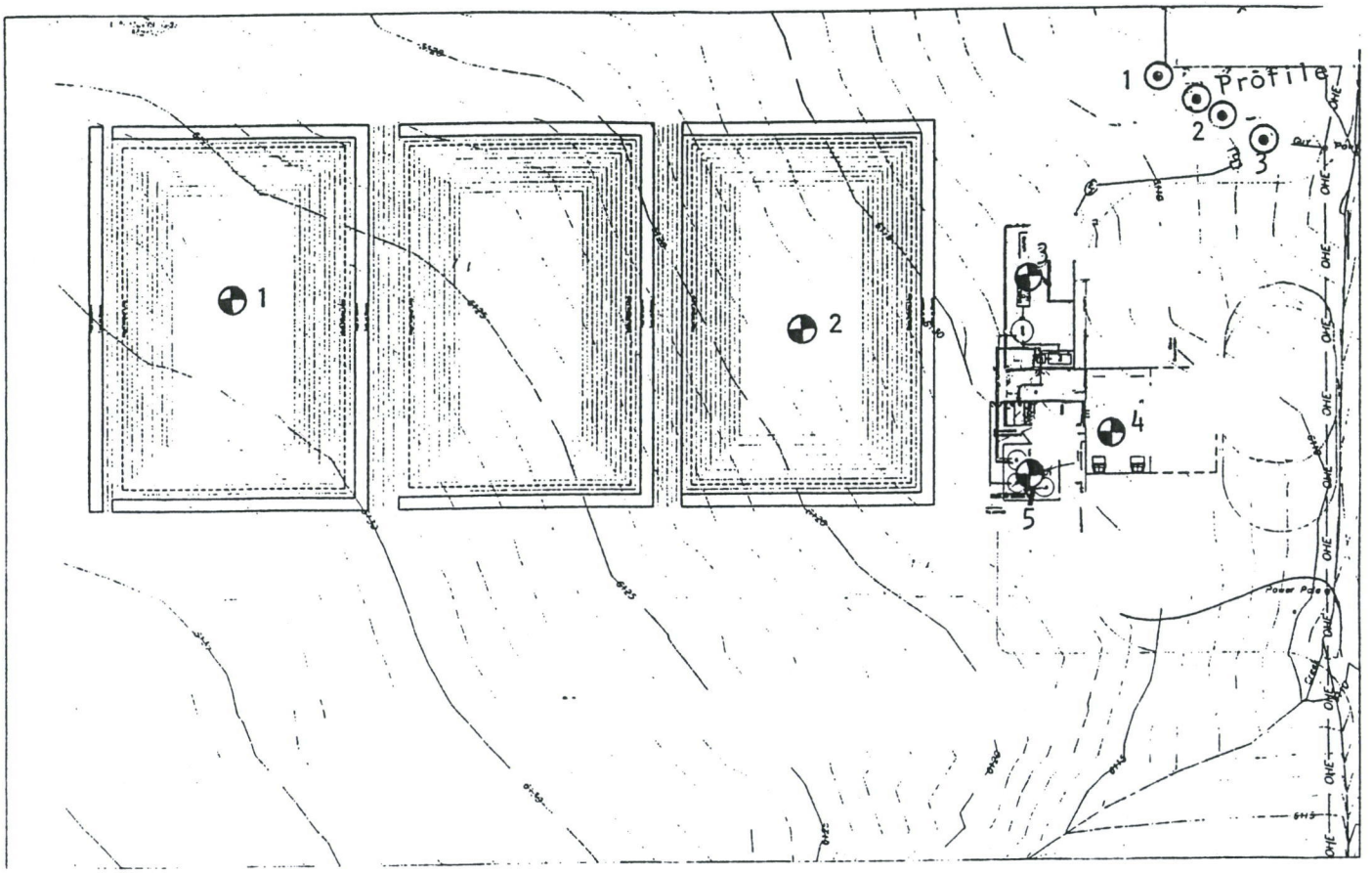
BOREHOLE NUMBER: MW-01

PROJECT NUMBER : 1-10270-11727ab
PROJECT NAME : Greenback
LOCATION : Rifle, CO
DRILLING CO : Shelton Drilling Corporation
DRILLING METHOD : Air Rotary
DRILLER : Delton Cerise
LOGGED BY: TJ Grisel
START: 10/8/2010 **COMPLETED :** 10/8/2010

TOTAL DEPTH : 130'
TOP OF RISER : -

STATIC WATER LEVELS (BGS)			
Time	1410		
Date	10/8/2010		
Water Level	Dry		
Casing Depth	130.75		

Sample Type	Sample Number	Blowcounts / Ft.	Sample Interval (in.)	Sample Recovery (in.)	DEPTH	DESCRIPTION	NOTES (ppm)	LITHOLOGY	WELL CONSTRUCTION / WELL DESIGN
5"	1	NA	NA	NA	0	SANDY SILTY CLAY: Brown, dry, fine-grained	0.0 @ 0' bgs		Lockable Cap; Protective Casing; Concrete
						WASATCH FORMATION: Brown,dry-moist, fine-grained sandstone with gravel and clay	0.0 @ 10' bgs		
5" RC	2	NA	NA	NA			0.0 @ 20' bgs		
5" RC	3	NA	NA	NA	-30		0.1 @ 30' bgs		
5" RC	4	NA	NA	NA			0.3 @ 40' bgs		Bentonite
5" RC	5	NA	NA	NA			0.7 @ 50' bgs		
5" RC	6	NA	NA	NA	-60		0.0 @ 60' bgs		
5" RC	7	NA	NA	NA			0.3 @ 70' bgs		
5" RC	8	NA	NA	NA			0.4 @ 80' bgs		2" SCH. 40 PVC Riser
5" RC	9	NA	NA	NA	-90		0.2 @ 90' bgs		
5" RC	10	NA	NA	NA			0.2 @ 100' bgs		2" Sch 40 PVC Screen
5" RC	11	NA	NA	NA			0.2 @ 110' bgs		10/20 Silica Sand
	12	NA	NA	NA	-120		0.0 @ 120' bgs		
						End of Boring @ 130' bgs			



◓ Indicates approximate test boring locations

⊙ Indicates approximate percolation test boring locations

This sketch was reproduced by information provided by others and is intended to present geotechnical engineering data only

N

NO SCALE

TEST BORING LOCATION SKETCH

Lambert and Associates

Project No.:	G09033GE
Date:	2/16/10
Figure:	2

KEY TO LOG OF TEST BORING

Date Drilled: **Field Engineer:** **Boring Number:**

Location: **Elevation:**

Diameter: **Total Depth:** **Depth to Water at Time of Drilling:**

Symbol	Depth	Sample Type	Sample N	Soil Description	Laboratory Test Results
	0	B		Sand, silty, medium dense, moist, tan (SM) — Unified Soil Classification	Notes in this column indicate tests performed and test results if not plotted.
		B		Indicates Bulk Bag Sample	DD: Indicates dry density in pounds per cubic foot
		C		Indicates Drive Sample	MC: Indicates moisture content as percent of dry unit weight
	5	C		Incicates Sampler Type: C - Modified California; St - Standard Split Spoon; H - Hand Sampler	LL: Indicates Liquid Limit
					PL: Indicates Plastic Limit
			7/12	Indicates seven blows required to drive the sampler twelve inches with a hammer that weighs one hundred forty pounds and is dropped thirty inches.	PI: Indicates Plasticity Index
	10			BOUNCE: Indicates no further penetration occurred with additional blows with the hammer	
				NR: Indicates no sample recovered	
	15			CAVED: Indicates depth the test boring caved after drilling	
				▼ Indicates the location of free subsurface water when measured	
				CLAY SILT SAND GRAVEL CLAYSTONE SANDSTONE — Note: Symbols are often used only to help visually identify the described information presented on the log.	
	20				
	25				

Project Name: CGRS No.1-10270-11727aa **Project Number:** G09033GE **Figure:** A1

Lambert and Associates
CONSULTING GEOTECHNICAL ENGINEERS AND MATERIAL TESTING

LOG OF TEST BORING

Date Drilled: 12/22/2009 **Field Engineer:** DRL **Boring Number:** 1

Location: See test boring location diagram **Elevation:**

Diameter: 4 inches **Total Depth:** 24 feet **Depth to Water at Time of Drilling:** None Encountered

Symbol	Depth	Sample Type	Sample N	Soil Description	Laboratory Test Results
	0			Clay, silty, sandy, stiff, moist, brown, tan, approx. 2 inches organic (CL)	
	5			Wasatch Formation - Claystone, Mudstone, Sandstone and Conglomerate	
	10	C	16/6 19/6		
	15				
	20				
	25			Auger Refusal at 24 feet	

Project Name: CGRS No. 1-10270-11727aa **Project Number:** G09033GE **Figure:** A2

Lambert and Associates

CONSULTING GEOTECHNICAL ENGINEERS AND MATERIAL TESTING

LOG OF TEST BORING

Date Drilled: 12/22/2009 **Field Engineer:** DRL **Boring Number:** 2

Location: See test boring location diagram **Elevation:**

Diameter: 4 inches **Total Depth:** 27 feet **Depth to Water at Time of Drilling:** None Encountered

Symbol	Depth	Sample Type	Sample N	Soil Description	Laboratory Test Results
	0			Clay, silty, sandy, stiff, moist, brown, tan, approx. 2 inches organic (CL)	
	5			Wasatch Formation - Claystone, Mudstone, Sandstone and Conglomerate	
	10	C	23/6 35/6		
	15				
	20				
	27			Auger Refusal at 27 feet	

Project Name: CGRS No. 1-10270-11727aa **Project Number:** G09033GE **Figure:** A3

Lambert and Associates

CONSULTING GEOTECHNICAL ENGINEERS AND MATERIAL TESTING

LOG OF TEST BORING

Date Drilled: 12/22/2009 **Field Engineer:** DRL **Boring Number:** 3

Location: See test boring location diagram **Elevation:**

Diameter: 4 inches **Total Depth:** 14 feet **Depth to Water at Time of Drilling:** None Encountered

Symbol	Depth	Sample Type	Sample N	Soil Description	Laboratory Test Results
	0			Clay, silty, sandy, stiff, moist, brown, tan, approx. 2 inches organic (CL)	
		C	15/6 26/6	Wasatch Formation - Claystone, Mudstone, Sandstone and Conglomerate	Direct Shear Test: DD: 95 pcf MC: 12.2%
	5				
		C	26/6 49/6		Swell/Consolidation Test: DD: 113 pcf MC: 12.8%
	10				
	15			Bottom of Test Boring at 14 feet	
	20				
	25				

Project Name: CGRS No. 1-10270-11727aa **Project Number:** G09033GE **Figure:** A4

Lambert and Associates

CONSULTING GEOTECHNICAL ENGINEERS AND MATERIAL TESTING

LOG OF TEST BORING

Date Drilled: 12/22/2009 **Field Engineer:** DRL **Boring Number:** 4

Location: See test boring location diagram **Elevation:**

Diameter: 4 inches **Total Depth:** 14 feet **Depth to Water at Time of Drilling:** None Encountered

Symbol	Depth	Sample Type	Sample N	Soil Description	Laboratory Test Results
	0			Clay, silty, sandy, stiff, moist, brown, tan, approx. 2 inches organic (CL)	
	5			Wasatch Formation - Claystone, Mudstone, Sandstone and Conglomerate	
	10	C	39/6 50/6		Direct Shear Test: DD: 119 pcf MC: 5.9%
	15			Bottom of Test Boring at 14 feet	
	20				
	25				

Project Name: CGRS No. 1-10270-11727aa **Project Number:** G09033GE **Figure:** A5

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CONSULTING GEOTECHNICAL ENGINEERS AND MATERIAL TESTING

LOG OF TEST BORING

Date Drilled: 12/22/2009 **Field Engineer:** DRL **Boring Number:** 5

Location: See test boring location diagram **Elevation:**

Diameter: 4 inches **Total Depth:** 14 feet **Depth to Water at Time of Drilling:** None Encountered

Symbol	Depth	Sample Type	Sample N	Soil Description	Laboratory Test Results
	0			Clay, silty, sandy, stiff, moist, brown, tan, approx. 2 inches organic (CL)	
	5	C	16/6 20/6		Swell/Consolidation Test: DD: 101 pcf MC: 9.2%
	10			Wasatch Formation - Claystone, Mudstone, Sandstone and Conglomerate	
	15			Bottom of Test Boring at 14 feet	
	20				
	25				

Project Name: CGRS No. 1-10270-11727aa **Project Number:** G09033GE **Figure:** A6

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CONSULTING GEOTECHNICAL ENGINEERS AND MATERIAL TESTING

LOG OF TEST BORING

Date Drilled: 12/22/2009 **Field Engineer:** DRL **Boring Number:** Percolation Profile

Location: See test boring location diagram **Elevation:**

Diameter: 4 inches **Total Depth:** 9 feet **Depth to Water at Time of Drilling:** None Encountered

Symbol	Depth	Sample Type	Sample N	Soil Description	Laboratory Test Results
	0			Clay, silty, sandy, stiff, moist, brown, tan, approx. 2 inches organic (CL)	
	5			Wasatch Formation - Claystone, Mudstone, Sandstone and Conglomerate	
	10			Bottom of Test Boring at 9 feet	
	15				
	20				
	25				

Project Name: CGRS No. 1-10270-11727aa **Project Number:** G09033GE **Figure:** A7

Lambert and Associates

CONSULTING GEOTECHNICAL ENGINEERS AND MATERIAL TESTING

ATTACHMENT B

PHOTOGRAPHS

Looking SW in Dry Tributary

Dry Tributary Looking NW Near Discharge Point

SOIL BORING IN BOTTOM OF DRY SWALE

DRY SWALE SURFACE COVER

ATTACHMENT C

PREDICTED WATER QUALITY

Hydranautics Membrane Solutions Design Software, v. 2010 10/4/2010

BASIC DESIGN

RO program licensed to:						
Calculation created by:	REM					
Project name:	CGRS SOFT					
HP Pump flow:		75.0	gpm	Permeate flow:	45.00	gpm
Feed pressure:		322.7	psi	Raw water flow:	75.0	gpm
Feedwater Temperature:		20.0	C(68F)	Permeate recovery:	60.0	%
Feed water pH:		7.7		Element age:	0.0	years
Chem dose, ppm (100%):		0.0	H2SO4	Flux decline % per year:	7.0	
				Fouling factor:	1.00	
				Salt passage increase, %/yr:	10.0	
Average flux rate:		13.5	gfd	Feed type:	Well Water	

Stage	Perm. Flow	Flow/Vessel Feed	Flow/Vessel Conc	Flux	Beta	Conc.&Throt. Pressures		Element Type	Elem. No.	Array
	gpm	gpm	gpm	gfd		psi	psi			
1-1	45.0	37.5	15.0	13.5	1.06	309.7	0.0	ESPA2	12	2x6

	Raw water		Feed water		Permeate		Concentrate	
Ion	mg/l	CaCO3	mg/l	CaCO3	mg/l	CaCO3	mg/l	CaCO3
Ca	5.0	12.5	5.0	12.5	0.020	0.1	12.5	31.1
Mg	5.0	20.6	5.0	20.6	0.020	0.1	12.5	51.3
Na	3649.6	7933.9	3649.6	7933.9	71.065	154.5	9017.4	19603.1
K	707.0	906.4	707.0	906.4	17.173	22.0	1741.7	2233.0
NH4	0.0	0.0	0.0	0.0	0.000	0.0	0.0	0.0
Ba	0.000	0.0	0.000	0.0	0.000	0.0	0.000	0.0
Sr	26.900	30.7	26.900	30.7	0.110	0.1	67.085	76.6
CO3	3.2	5.3	3.2	5.3	0.006	0.0	8.0	13.3
HCO3	512.0	419.7	512.0	419.7	16.723	13.7	1254.9	1028.6
SO4	252.0	262.5	252.0	262.5	1.155	1.2	628.3	654.4
Cl	5730.4	8082.4	5730.4	8082.4	104.546	147.5	14169.2	19984.7
F	12.4	32.6	12.4	32.6	0.449	1.2	30.3	79.8
NO3	125.0	100.8	125.0	100.8	16.377	13.2	287.9	232.2
B	7.95		7.95		5.166		12.13	
SiO2	0.0		0.0		0.00		0.0	
CO2	15.61		15.61		15.61		15.61	
TDS	11036.5		11036.5		232.8		27241.9	
pH	7.7		7.7		6.2		8.0	

SAR 276 276 8.4 431

	Raw water	Feed water	Concentrate
CaSO4 / Ksp * 100:	0%	0%	0%
SrSO4 / Ksp * 100:	23%	23%	72%
BaSO4 / Ksp * 100:	0%	0%	0%
SiO2 saturation:	0%	0%	0%
Langelier Saturation Index	-0.73	-0.73	0.38
Stiff & Davis Saturation Index	-1.14	-1.14	-0.39
Ionic strength	0.18	0.18	0.45
Osmotic pressure	117.4 psi	117.4 psi	290.0 psi

Permeate SAR =