

Project Name: COGCC - Environmental Support Complaint # 200402859 Permit No: 288643
 Project Number: 25087038 Owner: Tom Morton

Well Owner Survey

Is there a holding tank for the well? Yes X No _____
 Do you have a water softener/treatment system? Yes _____ No X
 Do you have an in-line filter? Yes _____ No X
 Sampling point upstream of pressure tank and treatment system? Yes X No _____

Address: 515 WCR 19
Brighton, CO 80603
 Location: 1N 67W S33
 Date: 4/25/2014
 Weather: slightly cloudy, 70's

Location of well: -30 feet south of sample point/holding tank, NW of house
 Type of pump (jet, submersible, suction): Submersible
 Casing material and diameter: Pump: 1" galvanized pipe, Well: 4.5" steel casing
 Depth to Static Water Table (fluctuations): Depth to water: 631' ; Total depth of well: 840'
 Description of area around well: Backyard, grass land
 Location and description of sample point: NW of house in yard, samples collected just before groundwater enters holding tank
 Pump start time: 12:44 Flow rate -10 gal/min

Time	Volume Purged (gal.)	pH (SI Units)	Spec Cond (µs/cm)	DO (mg/L)	Turbidity (g/L)	Temperature (°C)	Clarity	Other *(ORP mv)
12:48	30	6.95	5452	3.63	4.315	15.73	Clear	-114.2
12:50	60	7.09	5409	2.64	4.222	16.30	Clear	-125.7
12:53	90	7.12	5544	2.23	4.131	18.33	Clear	-124.1
12:55	110	7.13	5825	2.11	4.158	20.34	Clear	-126.7
12:57	130	7.17	5812	1.71	4.127	20.58	Clear	-132.0
12:59	150	7.18	5655	2.10	4.010	20.66	Clear	-126.6
13:02	180	7.18	5432	2.06	3.867	20.90	Clear	-127.8

* odors (if any); effervescence (if any); produced sediment (if any); evidence of bacterial fouling (bioslimes or biofilms).

NA = not analyzed

Field Sample Morton-1 Collection Time: 13:02 Number of Containers: 14
+ ISO
+ BART

Analyte	# of Containers	Container Size	Type	Analytical Method	Preservative	Sampler: <u>SB</u>
Dissolved Methane	3	40 ml	vial	RSK175	4°C	
BTEX	3	40 ml	vial	8260	HCl, 4°C	
TPH: GRO	3	40 ml	vial	8260	HCl, 4°C	
TPH: DRO	1	1000 ml	amber	8015		
Total Metals & Anions/Cations (Ca, Fe, Mn, K Mg, Na, Cl, NO ₂ , NO ₃ , Br, SO ₄ , CO ₃ , HCO ₃ , F, Se, Pb, Ba, Cr, As)	1	500 ml	poly	6010	HNO ₃ , 4° C	
NO ₃ , NO ₂	1	500 ml	amber	353.2	H ₂ SO ₄ , 4° C	
Total Dissolved Solids	1	500 ml	poly	2540C	4° C	
Anions	1	1000 ml	poly	300	4° C	
Specific Conductance at 25°C				2510B	4°C	
pH				SM4500	4°C	
Alkalinity (Carbonate/Bicarbonate)				2320	4°C	
Duplicate Sample Collected?	Yes:		No:	X		

Duplicate ID: None

GPS Coordinates
 Latitude: 40.000842 Longitude: -104.88704

Comments:
 Water in holding tank extremely rusty, layer of unidentified substance on top. Samples collected through a clean hose right as water enters the holding tank from the groundwater well. Owner indicates bad taste in water which has developed over the last few weeks.

**BIOLOGICAL ACTIVITY REACTION TEST RESULTS
MORTON WELL
BRIGHTON, COLORADO**

May 9, 2014

Terracon Consultants, Inc. (Terracon), under direction of the Colorado Oil and Gas Conservation Commission (COGCC), conducted a Biological Activity Reaction Test (BART) at the Morton Well, Receipt Number 288643, located at 515 Weld County Road 19 in Brighton, Colorado. Samples were collected on April 25, 2014. The BART test detects three types of bacteria: iron related bacteria (IRB), sulfate reducing bacteria (SRB), and slime forming bacteria (SLYM). Each container was observed and photographed for eight consecutive days to determine if bacteria are present in the water sample. Observational notes and daily photographs are summarized in Tables 1 and 2, respectively. The estimated colony forming units per milliliter (cfu/mL) are summarized in Table 3. At the end of the eight-day observation period, the following results were observed.

Iron Related Bacteria

During the observation period, the color of the water turned from brown-red to orange-green. A high level of effervescence was observed throughout the entire period. A layer of slime was observed at the base within the first hour of observation, and slime was observed around the ball by the sixth day. Foam was observed around the ball within one hour of observation. The color change and the formation of foam and slime by the first day indicate a very aggressive IRB population. Dominant bacteria appear to be anaerobic, pseudomonads, and enteric bacterium. The estimated IRB population is 140,000 cfu/mL.

Sulfate Reducing Bacteria

During the observation period, the color of the water went from a yellow-brown to mostly clear. A high to moderate level of effervescence was observed throughout the entire period. A white layer of slime at the base formed within an hour of observation, indicative of an aggressive anaerobic bacteria present, but not a positive test for SRB. Foam and black slime began forming around the ball, and black slime began forming at the base and lower walls by the eighth day of observation. The formation of foam and black slime indicate a semi-aggressive, complex bacterial SRB population. The estimated SRB population is 200 cfu/mL.

Slime Forming Bacteria

During the observation period, the color of the water went from a cloudy yellow-orange, to developing a black-green base color. Effervescence was observed as high on the first day, but turned moderate to low from the fourth day on. A red-orange slime began forming at the base within an hour of observation and turned black by the seventh day. A black slime appeared on

Biological Activity Test Results

COGCC - Morton Well ■ Brighton, Colorado
May 9, 2014 ■ Terracon Project No. 25087038



the ball on the eight day. Foam was initially observed around the ball on the first day, but was not observed again until the eight day. The formation of slime around the ball and base, observation of foam, and a positive reaction to an ultraviolet light indicate an aggressive SLYM population. Estimated SLYM population is 350,000 cfu/mL.

Attachments:

Table 1: BART Summary Tables

Table 2: BART Photographic Table

Table 3: BART Population Table

Attachment 1: Site Photographs

TABLE 1
 IRB - IRON RELATED BATERIA
 BART SUMMARY TABLES
 MORTON WELL
 COLORADO OIL AND GAS CONSERVATION COMMISSION

Date:	Color: Tan-red	Effervescence: high	Comments
4/25/2014	Transparency: poor	Nutrients:	
Name:	Slime: dark slime at base	Positive Test: yes	
SB	Foam: yes	Advanced Test Code: BG, BC, RC, FO	
Date:	Color: yellow-green	Effervescence: high	Comments
4/28/2014	Transparency: cloudy	Nutrients:	
Name:	Slime: some at base	Positive Test: yes	
SB	Foam: yes	Advanced Test Code: GC, FO	
Date:	Color: yellow-green	Effervescence: high	Comments
4/29/2014	Transparency: cloudy	Nutrients:	
Name:	Slime: some at base	Positive Test: yes	
SB	Foam: yes	Advanced Test Code: GC, FO	
Date:	Color: orange-green	Effervescence: high	Comments
4/30/2014	Transparency: cloudy	Nutrients:	
Name:	Slime: on ball and base	Positive Test: yes	
SB	Foam: yes	Advanced Test Code: FO, BR, BG, GC	
Date:	Color: orange-green	Effervescence: high	Comments
5/1/2014	Transparency: very cloudy	Nutrients:	
Name:	Slime: on ball and base	Positive Test: yes	
SB	Foam: yes	Advanced Test Code: FO, BR, BG, GC	
Date:	Color: orange-green	Effervescence: high	Comments
5/2/2014	Transparency: very cloudy	Nutrients:	
Name:	Slime: on ball and base	Positive Test: yes	
SB	Foam: yes	Advanced Test Code: FO, BR, BG, GC	
Date:	Color:	Effervescence:	Comments
	Transparency:	Nutrients:	
Name:	Slime:	Positive Test:	
	Foam:	Advanced Test Code:	
Date:	Color:	Effervescence:	Comments
	Transparency:	Nutrients:	
Name:	Slime:	Positive Test:	
	Foam:	Advanced Test Code:	
Date:	Color:	Effervescence:	Comments
	Transparency:	Nutrients:	
Name:	Slime:	Positive Test:	
	Foam:	Advanced Test Code:	
Advanced Test Codes		FO : Foam Around Ball BR : Brown Slime, Ball BG : Brown Slime, Base BC : Brown Clouds	GC : Solution Green-Cloudy RC : Solution Red-Cloudy CL : Solution Cloudy BL : Solution Black

TABLE 1, CONTINUED
 SRB - SULFATE REDUCING BATERIA
 BART SUMMARY TABLES
 MORTON WELL
 COLORADO OIL AND GAS CONSERVATION COMMISSION

Date:	Color: yellow-brown	Effervescence: high	Comments
4/25/2014	Transparency: Very cloudy	Nutrients:	
Name:	Slime: white slime at base	Positive Test: no	
SB	Foam: no	Advanced Test Code: CL	
Date:	Color: white-yellow base	Effervescence: high	Comments
4/28/2014	Transparency: mostly clear	Nutrients:	
Name:	Slime: white slime at base	Positive Test: no	
SB	Foam: no	Advanced Test Code: CL	
Date:	Color: slight orange base	Effervescence: high	Comments
4/29/2014	Transparency: mostly clear	Nutrients:	
Name:	Slime: white slime at base	Positive Test: no	
SB	Foam: no	Advanced Test Code:	
Date:	Color: slight orange base	Effervescence: moderate	Comments
4/30/2014	Transparency: mostly clear	Nutrients:	
Name:	Slime: white slime at base	Positive Test: no	
SB	Foam: no	Advanced Test Code:	
Date:	Color: white base, clear	Effervescence: high	Comments
5/1/2014	Transparency: mostly clear	Nutrients:	
Name:	Slime: white slime at base	Positive Test: no	
SB	Foam: no	Advanced Test Code: BT	
Date:	Color: white base, clear	Effervescence: moderate	Comments
5/2/2014	Transparency: clear	Nutrients:	
Name:	Slime: ball and base	Positive Test: yes	
SB	Foam: yes	Advanced Test Code:	
Date:	Color:	Effervescence:	Comments
	Transparency:	Nutrients:	
Name:	Slime:	Positive Test:	
	Foam:	Advanced Test Code:	
Date:	Color:	Effervescence:	Comments
	Transparency:	Nutrients:	
Name:	Slime:	Positive Test:	
	Foam:	Advanced Test Code:	
Date:	Color:	Effervescence:	Comments
	Transparency:	Nutrients:	
Name:	Slime:	Positive Test:	
	Foam:	Advanced Test Code:	
Advanced Test Codes		BB : Black Slime at Base BT : Black Slime at Ball BA : Black Slime at Base and Ball CL : Cloudy Solution	

TABLE 1, CONTINUED
 SLYM - SLIME FORMING BATERIA
 BART SUMMARY TABLES
 MORTON WELL
 COLORADO OIL AND GAS CONSERVATION COMMISSION

Date:	Color: yellow-orange	Effervescence: high	Comments
4/25/2014	Transparency: very cloudy	Nutrients:	
Name:	Slime: red slime at base	Positive Test: yes	
SB	Foam: yes	Advanced Test Code: DS, CL, SR	
Date:	Color: orange base	Effervescence: moderate	Comments
4/28/2014	Transparency: slightly cloudy	Nutrients:	U.V. positive test
Name:	Slime: orange slime at base	Positive Test: yes	
SB	Foam: no	Advanced Test Code: DS	
Date:	Color: orange base	Effervescence: low	Comments
4/29/2014	Transparency: mostly clear	Nutrients:	
Name:	Slime: slime at base	Positive Test: yes	
SB	Foam: no	Advanced Test Code: DS	
Date:	Color: orange base	Effervescence: low	Comments
4/30/2014	Transparency: clear	Nutrients:	
Name:	Slime: orange slime at base	Positive Test: yes	
SB	Foam: no	Advanced Test Code: DS	
Date:	Color: black-green base	Effervescence: low	Comments
5/1/2014	Transparency: clear	Nutrients:	U.V. positive test
Name:	Slime: black slime at base	Positive Test: yes	
SB	Foam: no	Advanced Test Code: DS	
Date:	Color: black-green base	Effervescence: moderate	Comments
5/2/2014	Transparency: slightly cloudy	Nutrients:	U.V. positive test
Name:	Slime: black at ball and base	Positive Test: yes	
SB	Foam: yes	Advanced Test Code: DS, SR	
Date:	Color:	Effervescence:	Comments
	Transparency:	Nutrients:	
Name:	Slime:	Positive Test:	
	Foam:	Advanced Test Code:	
Date:	Color:	Effervescence:	Comments
	Transparency:	Nutrients:	
Name:	Slime:	Positive Test:	
	Foam:	Advanced Test Code:	
Date:	Color:	Effervescence:	Comments
	Transparency:	Nutrients:	
Name:	Slime:	Positive Test:	
	Foam:	Advanced Test Code:	
Advanced Test Codes		DS : Slime at Base SR : Slime at Ball CL : Cloudy Growth	CP : Layered Plates BL : Blackened Liquid TH : Thread-Like Strands

TABLE 2
BART PHOTOGRAPHIC TABLE
MORTON WELL
COLORADO OIL AND GAS CONSERVATION COMMISSION



-1 hour after sample collected

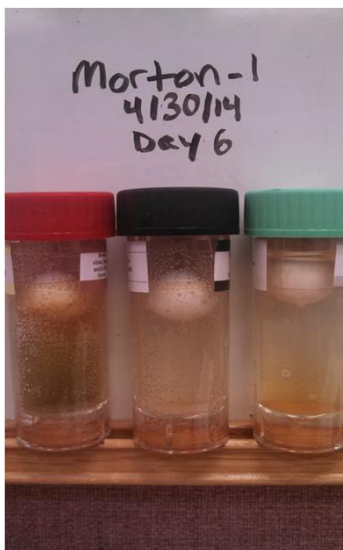
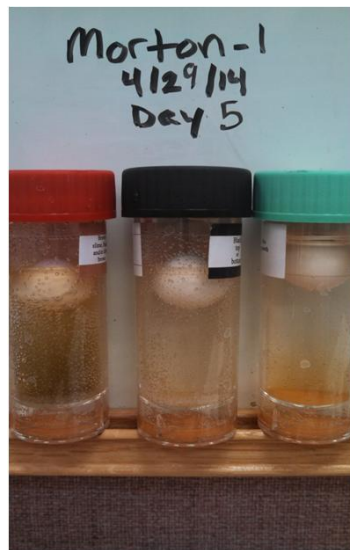


TABLE 3
BART POPULATION TABLE
MORTON WELL
COLORADO OIL AND GAS CONSERVATION COMMISSION

BART Analysis	Approximate Population (cfu/mL)
Iron Related Bacteria (IRB)	140,000
Sulfate Reducing Bacteria (SRB)	200
Slime Forming Bacteria (SLYM)	350,000

Notes:

cfu/mL : Colony forming units per milliliter

< : Less than

ATTACHMENT 1
SITE PHOTOGRAPHS
MORTON WELL
COLORADO OIL AND GAS CONSERVATION COMMISSION

Well and Sample Location

