

PRE - ALWC TREATMENT

**SANGRE DE CRISTO (SDC) LABORATORY, INC.**

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**FEB, SRB, PRB & SLR BACTERIA REPORT**  
CLASSIFICATION-IDENTIFICATION AND ENUMERATION OF BACTERIA

ANALYSES FOR: PLANET RESOURCES  
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SAMPLE RECD: 9/5/14  
REPORT DATE: 9/15/14

COC No: 35059

Sample ID: GH-1 STOCK WELL (9/4/14 @ 3:30 PM)

Bacteria Classification	Test Method	Bacteria Density Thriving <sup>2</sup>	Bacteria Density Mortality <sup>3</sup>
Iron Bacteria	ASTM D932	8.800 M	5.325 M
Manganese Bacteria	ASTM D858	2.500 M	2.400 M
Sulfate-Reducing Bacteria	D4412-84	0.935 M	0.900 M
Slime-Reducing Bacteria	SLYM-BART	6.500 M	5.750 M
Pseudomonades	P17-AOC 9-42	7.450 M	5.500 M

**LABORATORY NOTES**

**Iron Bacteria**

43% of Iron bacteria is classified as Thiobacillus. The iron bacteria in this sample is high. Not only is the iron bacteria elevated but it contains total inorganic iron above 10 mg/L. Sample had to be diluted a factor of 1/100x to perform analyses.

When sample was received, initial microscopic examination indicated that iron bacteria enumeration would be elevated and problematic; this was also true for the Pseudomonad bacteria. Iron bacteria consumes roughly 65% of the sample followed by Pseudomonad. Iron is both ferric and ferrous. Ferrous iron is the most common in domestic water sources. It is also called "clear water iron" because often as it comes out of the tap, it will be clear and not colored. While this sample was yellow when received, 48 hours later it was a gold color as more iron precipitated out of solution. Ferric iron is water that has oxidized (rusted) and now there is presence of tiny iron granules of rust in the water.

Both iron types in this sample is harmful for human consumption, live-stock, plants and plumbing. The maximum contamination limit (MCL) in safe drinking water is 0.3 mg/L. In this water, it exceeds the MCL by 36x; and 21x for livestock and 16x for irrigation suitability. At the current levels, iron is caustic to pipes and well distribution system.

Iron bacteria and Pseudomad bacteria are the controlling bacteria's. The iron bacteria initial count estimates a 15-20% error. That is because initial enumeration upon sample receipt, sample contained iron clusters and bundles that could not be separated. The iron

bacteria count within those clusters and bundles were 'estimates'. Many other tufts could not be separated. The majority of the colonies are older colonies (6 months plus); there was evidence of old cysts suggesting that some of the colony clusters are over one year old. 18% of the colonies are young colonies, less than 6 months old - these colonies were easily crumbled. Left undisturbed, they are very comfortable in their environment feeding from nutrients the water supply. Older iron colonies are extremely aggressive against other bacteria, especially the Pseudomonades. The Pseudomonades, however, are non-yielding and surround the iron in attempts to keep it from multiplying. This was somewhat successful. At sample termination on 9/12/14, due to space restriction placed by the Pseudomonades, iron cells weakened and structures on all ends began to crumble.

#### Manganese Bacteria

Manganese bacteria is slightly elevated. It put out black clouds in attempt to make separation from the iron and Pseudomonades. On the 4th day of incubation, manganese bacteria could not escape the iron and Pseudomonades and quickly became consumed.

Manganese bacteria was both autotrophic and heterotrophic whereby it is aided by carbon and heavy metals.

Manganese concentration in sample exceeds safe drinking water standards by 8.3. Manganese in drinking water in excess is considered the cause of Parkinson disease.

#### Pseudomonades & Slime Related Bacteria

I believe Pseudomonades hold the record in this sample at 7.5 Million colony forming units, followed by 6.5 Million slime related bacteria(s). Pseudomonades are extremely resilient and as indicated by the final count, they out-lived the iron bacteria. The reason for their demise was shortage of food and space. Pseudomonades are very strong and supported by calcification of nutrients in water.

#### Sulfate Reducing Bacteria

SRB is not a huge issue in this sample. Sulfate bacteria is identified as Desulfonema, a single-celled microbe. The sulfate present is primarily sulfur and calcium carbonate deposits. This type of bacteria is typical in many water supplies. The sulfur bacteria is an oxidizing bacteria and also aides populating other bacteria's. However, in this sample it hasn't a chance. Troops are marginal and structurally weak.

If you have questions, please call Evelyn at 719-589-1024.

M = Million

< = Less than

ND = Not Detectable

<sup>2</sup> Number of live micro-organisms at time of sample receipt

<sup>3</sup> Number of micro-organisms dead at the end of test period

Evelyn M. Vigil  
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