ROAD & BRIDGE DEPARTMENT

RYAN RIGHETTI, ROAD SUPERINTENDENT

05/17/2022

Lucas West
Colorado Division of Reclamation and Mine Safety
1001 E 62nd Ave, Room 215
Denver, Colorado 80216

RE: San Miguel County Norwood Pit Groundwater Quality Complaint

Mr. West

This letter is being sent in response to the citizen complaint sent to your office on Wednesday February 16, 2022. Included is the analytical data provided by Mary Ann Gaston as well as additional results, information and data we collected as part of our research. Also included is a list of measures taken to reduce or mitigate any potential impacts from our site.

After receiving the letter dated February 22, 2022, San Miguel County moved forward with the intent to better understand and hopefully identify if any point source of contamination was occurring, beginning with understanding and interpreting the data in Ms. Gaston's well water report. Our office contacted the Town of Telluride and spoke with members of their staff in charge of water quality for the Town's domestic water supply. After reviewing and discussing the results with the staff from Telluride Water Department we had a better understanding on how to read the results and interpret the limits related to the test results of Ms. Gaston's well water. What the staff from Telluride immediately pointed out was that there were several areas where the results were higher than that of the national standard for drinking water. These areas were TDS (Total Dissolved Solids), Hardness and Strontium. This appeared to be the primary concern of Ms. Gaston as well so we chose to focus our attention on those results.

One challenge we were facing is that Ms. Gaston's test was from a new well, there were no previous wells in use at her residence and no previous tests of any water that we were aware of. For this reason, we decided to test adjacent wells and research if any neighboring properties had tested their groundwater wells. We contacted Green Analytical out of Durango Colorado to request kits to perform the same test that Ms. Gaston had performed. Our intent was to compare data that was as similar as possible.

Green Analytical sent several tests that we used to test wells that were as geographically close to Ms. Gaston's well as possible. We also requested test results from other residents who had

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previous tests available. **Please refer to the attached map for the locations of the wells we tested and for the wells we were able to retrieve previous testing results.*

Below is a list of the test results.
Gaston test in red. County tested water in yellow. Others in blue.

WELL TEST RESULTS			
NAME / ADDRESS	TDS	HARDNESS	STRONTIUM
Gaston Well (Subject Test)	4860 mg/L	2700.0 mg/L	10.700 mg/L
1267 CR 44ZN (County Test)	2620 mg/L	1740.0 mg/L	11.900 mg/L
2691 CR AA42 (County Test)	1280 mg/L	247.0 mg/L	3.040 mg/L
2691 CR AA42 (Independent test)	1700 mg/L	190.0 mg/L	0.994 mg/L
Lamers (County Test)	1280 mg/L	1470.0 mg/L	14.810 mg/L
Anne Shaffer (Independent Test)	3440 mg/L	248.0 mg/L	--
1756 CR AA42 (Independent Test)	2100 mg/L	160.0 mg/L	2.100 mg/L
Clinton Booth (Independent Test)	1276 mg/L	882.9 mg/L	--
Jennifer Weed (Independent Test)	1900 mg/L	27.0 mg/L	0.245 mg/L

To better understand these results, we set out to answer the following questions;
This will help us in determining if they are typically naturally occurring or if they are something that is introduced as a point source contaminate.

1) **What are Total Dissolved Solids and how do they get into ground water? What is considered a high number?**

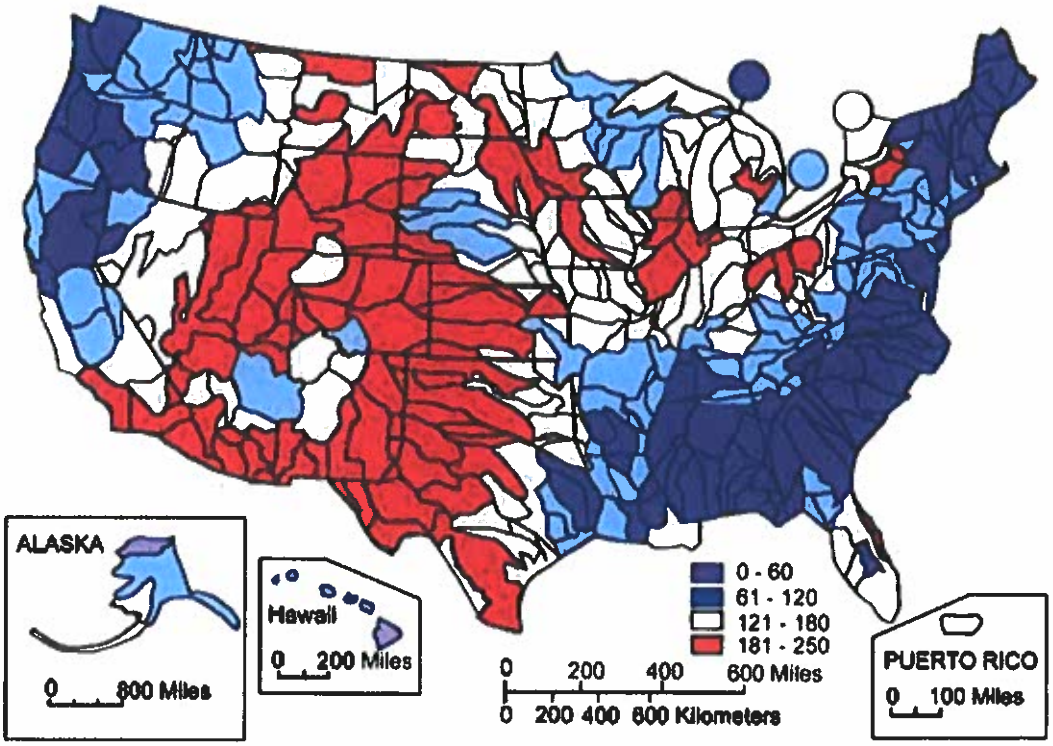
Total dissolved solids (TDS) are the amount of organic and inorganic materials, such as metals, minerals, salts, and ions, dissolved in a particular volume of water; TDS are essentially a measure of anything dissolved in water that is not an H2O molecule. Since water is a solvent, when water encounters soluble material, particles of the material are absorbed into the water, creating total dissolved solids. Total dissolved solids come from many sources, both natural and man-made.
Natural sources of TDS include springs, lakes, rivers, plants, and soil. For example, when water flows underground in a natural spring or aquifer, it absorbs minerals, such as calcium, magnesium, and potassium, from rocks, this is shown by Total Dissolved Solids being more commonly found in groundwater aquifers due to the water passing through the various minerals of the earth.
On the other hand, effects of human activity can also produce total dissolved solids in water. Disturbances of land surfaces, forest fires, logging, mining, pesticides and herbicides from agricultural runoff, wastewater from septic systems, lead may come from old plumbing pipes, and chlorine may come from water treatment plants. Total dissolved solids are even purposefully added to water sometimes, as bottled mineral water you come across in the grocery store may contain mineral additives.

Amounts over 500mg/L is considered above the domestic drinking water range.

1) What is hardness in groundwater, is this natural? What is considered Hard Water?

Hard water contains high levels of dissolved calcium and magnesium ions. Calcium and magnesium occur naturally in soils. As groundwater or surface water comes into contact with these minerals, they may dissolve and enter the water supply. The EPA has not placed calcium or magnesium on either list. Their presence in drinking water is important because both calcium and magnesium are essential to health. Water that is classified as hard will leave mineral deposits on faucets and dishes, and may have a salty taste, but will not negatively affect human health. Some parts of the country have very hard water with typical concentrations of calcium carbonate ranging from 200 to 300 mg/L in drinking water. Colorado's groundwater supplies are naturally high in calcium and magnesium ions, so groundwater is usually classified as being hard. Conversely, surface water sources contain lower concentrations of hardness ions.

CONCENTRATION OF HARDNESS AS CALCIUM CARBONATE, IN MILLIGRAMS PER LITER



Mean hardness as calcium carbonate at NASQAN water-monitoring sites during 1975 water year. Colors represent site data representing streamflow from the hydrologic-unit rea.

(Map edited by USEPA, 2005)

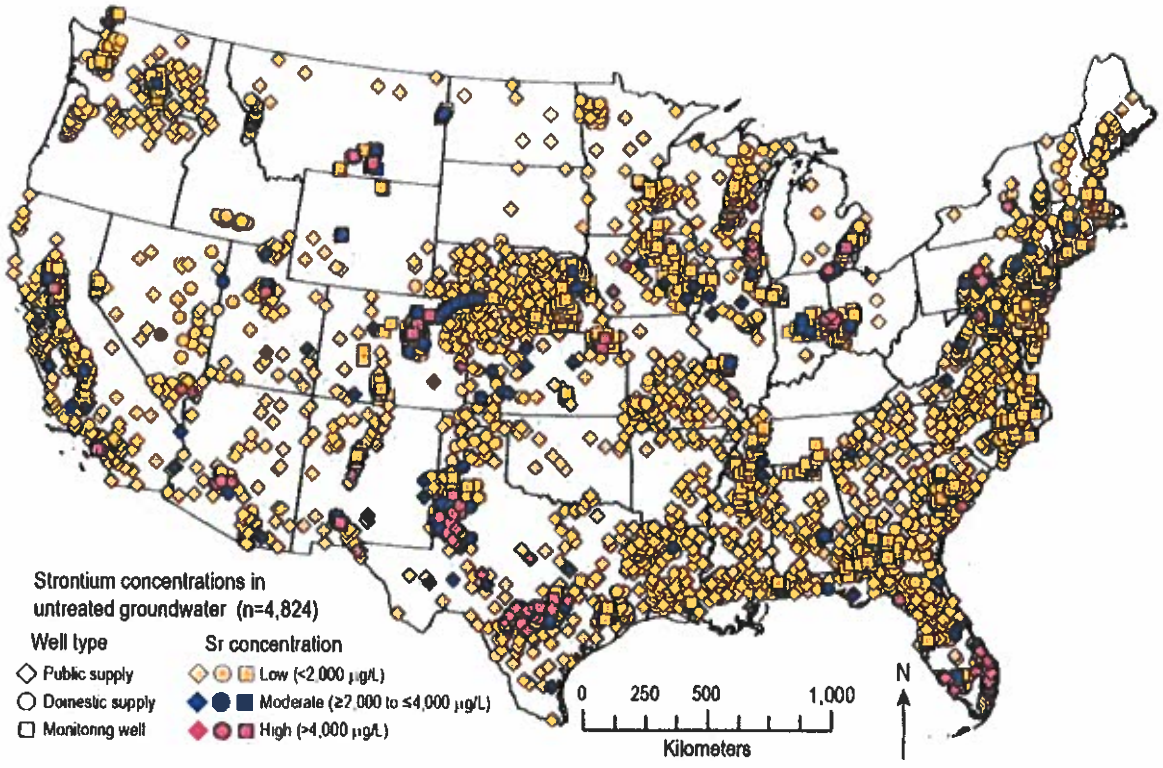
Above 300 mg/L is considered Very Hard Water.

2) Strontium levels in the test results, is this natural or is it cause for concern?

According to the USGS, Strontium occurs naturally in some minerals, including calcium carbonate. If strontium-containing minerals are present in soils, sediments, and rocks, strontium is released to groundwater as those minerals dissolve.

Elevated levels of strontium in groundwater were found primarily in samples of untreated groundwater from drinking-water wells that tap carbonate-rock aquifers, such as in southern Florida and central Texas. Elevated concentrations also were measured in drinking-water wells in areas of naturally upwelling brine that mixes with potable groundwater, such as in the southern High Plains aquifer in west Texas. Additionally, elevated concentrations occurred in shallow monitoring wells in unconsolidated sand and gravel aquifers in the western U.S., for example in Colorado.

Strontium is under consideration by the U.S. Environmental Protection Agency for regulation; currently it has a non-regulatory health-based screening level of 4,000 micrograms (or 4 milligrams) per liter. Elevated strontium concentrations can adversely affect bone development and mineralization. Conventional water treatment processes, such as coagulation/filtration, are largely ineffective at removing strontium from drinking water. However, water-softening treatments such as lime-soda ash or cation-exchange water softeners designed to reduce calcium concentrations also can decrease strontium concentrations.



The non-regulated screening level considers anything above 4 mg/L as high.

Before interpreting the information we collected, we wanted to check the results with an outside, independent professional that specializes in hydrogeology. We wanted to make sure that we did not miss anything in the results of the tests and also to double check if there was anything that pointed to a direct source.

We contacted Bruce Smith, Principal Hydrologist for Western Water and Land, Inc. We asked Mr. Smith if he was familiar with the geologic formation in and around the Norwood area and if he could give us his professional assessment of the test results. His response is as follows:

"WWL is very familiar with the geologic formations that exist in the Norwood area. The well log descriptions and water quality information you provided indicate that this area is underlain by Dakota Sandstone (as bedrock). This formation is well known in the region and is sometimes referred to as a "dirty sandstone". This refers to its carbonaceous nature. Just south of Grand Junction, the formation actually has small accumulations of oil, which has been produced in small quantities."

"Water quality in the Dakota Sandstone can be poor due to high salinity. High salinity is a common characteristic of the water quality results you provided from the wells you sampled and other wells as provided in your data package. It is safe to say that the Dakota Sandstone aquifer (and/or adjoining geologic materials) in the area north of Norwood and at the Norwood Pit is of poor water quality as demonstrated by the broad, consistent results from the sampled wells. This water quality is likely a natural characteristic of the geologic formation. However, the exceedingly high salinity observed at the Gaston well is unusual and may be due to a local variability in the aquifer and/or due to other influences. There is potential for the Norwood Pit to be impacting water quality in the vicinity of the pit. Appropriate hydrogeologic investigations would be needed to assess if the pit is influencing groundwater quality. WWL has provided San Miguel County with a proposal to conduct such hydrogeologic investigations if the County chooses to conduct this work."

The hydrogeologic investigation process proposed by Western Water and Land, Inc. would require an in depth, multi-step, lengthy process with extended field work and multiple reviews. This process will be costly, but will result in additional and more detailed data. However, even with this additional data, we will still be left with a reasonable doubt as to any direct impact the adjacent gravel pits are having on the ground water. This is primarily due to the fact that we have no proof showing that good water existed previously in the aquifer, and no evidence that a point source of contamination is occurring, (meaning that we know exactly what the dissolved solids are, and from what source they are being generated). Because of this, committing funds and resources to this process is difficult for us to justify.

IN CONCLUSION:

After taking into account the data and information we collected, as well as the professional opinion provided during this exercise, it is more likely that the quality of water in Ms. Gaston's well, along with other wells in the area, is the result of, and more directly related to the geologic structure and features of the area, than it is from a point source of contamination from the Norwood Pit. Material processing and storage at our site is consistent with sand and gravel operations throughout the country. Similar to other gravel pit operations, we have implemented multiple BMP's to reduce and prevent contaminants from leaving our site.

It has been noted that Ms. Gaston's test shows extremely high levels in TDS, hardness and Strontium. However, when compared to the data recovered from other wells in the surrounding area, every well consists of extremely high levels, way above the National and State standards. Hardness, Strontium, metals and other minerals are present and in some cases are even higher in the surrounding area and wells. This proves that the fluctuations we see are more likely caused by the diverse makeup and geologic structure of the area and how ground water conveys through it.

With that said, we still recognize that soil erosion caused by the disturbance of land surfaces can contain soluble components that can dissolve and be carried by storm water to surface waters; Therefor, San Miguel County has implemented the following:

- Ensure that all water from the pit conveys to the retention basin and not off site. Grading has been done historically to direct water to the low area located on the Northern portion of the site. Crews recently performed additional grading work to improve this retention area.
- Stockpiles have been moved to create more distance between the retention basin and the location of the stored materials.
- Small berms will be kept in place at the bottom of the stockpiles to serve as a first layer of protection to prevent heavier solids and sediment from entering the retention basin.
- Crews will continue to perform frequent visual observations of the site to ensure that our BMP's are in place and working as intended.

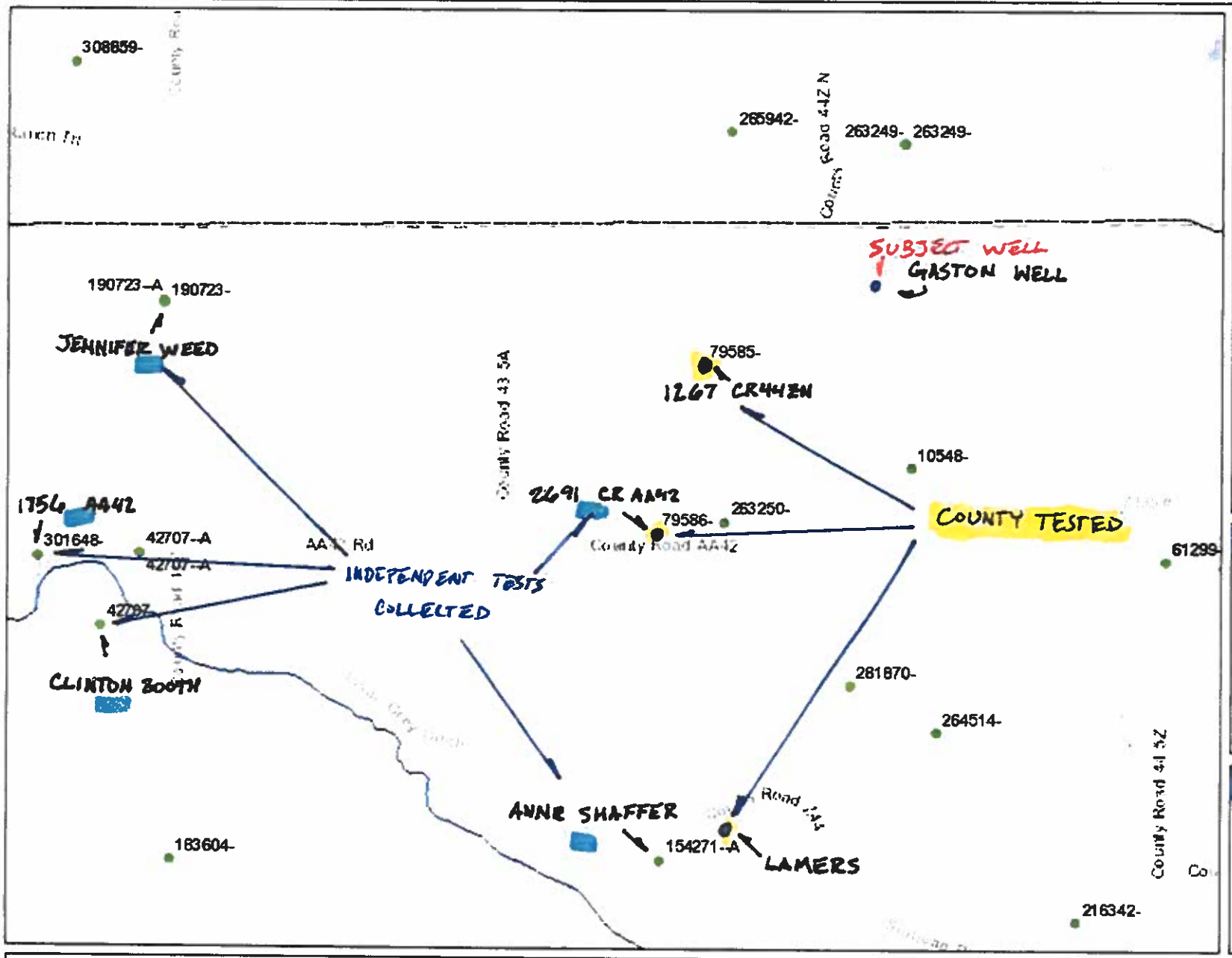
We hope that this information assists with a better understanding of the test results submitted by Ms. Gaston. The challenge that remains is, without the presence of previous test results for Ms. Gaston's well, or methods to compare and track a change or deterioration in water quality, we cannot make a determination that our operation is causing negative impacts to the underground aquifer in the area. Therefore, we are left with the conclusion that the results are likely from natural occurrences associated with water moving through the local geographic formations and not the result of activities in the Norwood Pit.

Sincerely,

Ryan Righetti
Road and Bridge Director
San Miguel County, Colorado

COLORADO'S
Decision Support Systems
CWCB / DWR

Map Viewer



Legend

- Well Constructed
- Confluence Point
- Source Water Route Framewo
- County

Location

Notes

2,339 0 1,169 2,339 Feet

1: 14,032

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