TZA Water Engineers
a Lamp Rynearson Company

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GREATROCK NORTH WATER AND SANITATION DISTRICT
ENGINEER'S REPORT
SEPTEMBER 21, 2015

Concentrate Management Options

As noted at the April 2015 Board meeting, we have shifted our attention from concentrate disposal to concentrate management and are looking at several options. The GridBee mixing equipment to enhance evaporation has been tabled due to questionable case history and additional cost considerations. The beneficial reuse applications by Industrial Water Permitting and Recycling have been placed on hold in light of limited use of any State approvals. In August of 2015, the Board and Altela, Inc. executed a Letter of Intent for establishing a Charter Customer Relationship with respect to the site development, installation, and related systems integration of an AltelaRain Reserve Osmosis Wastewater Concentrator Asset Recovery Facility.

Based upon the Letter of Intent, dated August 7, 2015, and executed by Altela, Inc. on August 17, 2015, the District has initiated efforts on a number of fronts, including:

- Application for a Preliminary Effluent Limitation (PEL) Determination – The PEL request was submitted to the Water Quality Control Division (Division) via e-mail on September 2, 2015, and a hard copy mailed to the Division that day. The Division acknowledged receipt of the hard copy on September 8. The District is awaiting issuance of an invoice from the Division for the PEL determination. Once the Division receives payment for the PEL determination, it will begin preparation of the PEL. The Division's intent is to prepare the PEL within 45 days, beginning with receipt of a complete application and receipt of payment. We have contacted the Division on numerous occasions requesting an invoice from the Division. Those contacts occurred on September 8, September 12, September 16, and September 18.
- Application for an Industrial Individual Wastewater Discharge Permit – The application has been drafted and was being circulated for signatures by John Wyckoff, as Owner, Lisa Johnson, as Applicant, and Wayne Ramey, as Operator, on September 21, 2015.
- Conceptual Floorplan Revisions – I have produced a more detailed conceptual floor plan, taking into consideration an office/meeting room, an operations office, a small lab, a restroom, a chemical room, a room for the distribution pumps, a boiler room, and floor space for two (2) reverse osmosis units, and two (2) AltelaRain units. I have asked Steve Griggs, of Altela, to provide some additional information on the AltelaRain footprint and the boiler footprint.
- Water Testing – Based upon the table of parameters provided in the Application for an Industrial Individual Wastewater Discharge Permit, I will confirm which parameters will be of primary interest to the Division once the permit application is submitted, then discuss those parameters and sampling and analysis protocols with Steve Cummings, of Altela.

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- Adams County Planning Department/Building Department Requirements – Based upon a September 18, 2015 telephone conversation with Adams County Planning, the proposed facility will require a major amendment to the PUD. The vacation of the lot line between Tracts C and F will require a plat correction. Both of these will require a public hearing but can be processed concurrently.

As for the evaporation ponds, attached is a memo from Lauren Goecke summarizing the evaporation pond activity, including a graph of documented pond levels in 2014 and 2015.

Greatrock North Pump Station Improvements

The design of the Greatrock North Pump Station Improvements has been put on temporary hold and may be combined for bidding purposes with the new water treatment facility being contemplated.

Alluvial Well Flow Meter Verifications

On September 4, 2015, TZA Water Engineers tested the accuracy of the flow meters for the two (2) alluvial wells. Copies of the reports to be filed with the Division of Water Resources will be provided to the District Manager once signed by Jeff Rabas.

2016 Water Rates

TZA Water Engineers has initiated a review of the District's water rates as part of the 2016 budget process. I will present my recommendations to the District Manager in advance of the October Board meeting.

Other Activities

Water Quality and Hardness – TZA is tracking the water production data and water quality results from a series of sampling events. Attached is a memo from Lauren Goecke summarizing the water production data, water quality results, and water treatment plant observations. The September water quality data had not been received as of the date of this month's Engineer's Report.

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Reverse Osmosis Condition Assessment – Pure Water Solutions conducted a condition assessment on May 27, 2015 and presented its findings and recommendations to the District on June 12. Those recommendations were discussed at the July Board meeting and my recommendation was that we delay any action on their recommendations pending receipt of additional information from Pure Water Solutions. In response to my request for additional information, Pure Water Solutions indicated the following:

- The sensors are the windows into the system and the replacements are a suggestion. However, maintaining the sensor calibrations helps document the overall RO unit operation.
- They do not have confidence in the current anti-scale chemical and dosing system.
- New membranes will make all the difference in the world.
- Accurate process readings, along with correct chemical and dosing, will helps improve on over-all recovery, but the exact percentages are to-be-determined.
- Lead times on membranes vary from in-stock to 8-10 weeks.

Storage Tank Rule – The Water Quality Control Division has adopted a new version of the Colorado Primary Drinking Water Regulations (Regulation 11). Effective April 1, 2016, the District will be required to have a written plan for finished water storage tank inspections. In addition to quarterly periodic (visual) inspections, the District will need comprehensive inspections to be scheduled at least every five years. Jeff Rabas has been securing proposals for the comprehensive inspections.

New Chlorine Residual Requirements – The Water Quality Control Division has adopted a new version of the Colorado Primary Drinking Water Regulations (Regulation 11). Effective April 1, 2016, the District will be required to maintain a minimum of 0.20 milligrams per liter chlorine residual throughout the distribution system. Ramey Environmental Compliance will record chlorine residuals at the extents of the distribution system for each subdivision on a periodic basis throughout the remainder of 2015, and Jeff Rabas and I will review the data in November of this year.

Warranty Inspections – Ramey Environmental Compliance is tracking the 11-month warranty inspections for the following projects:

- Rocking Horse Farms Pump Station – The warranty inspection was conducted by Jeff Rabas on July 18, 2014.
- Box Elder Creek Ranch Pump Station – The warranty inspection was conducted by Brad Simons on January 26, 2015.
- Rocking Horse Farms Tank Repainting – The improvements were inspected and accepted on June 11, 2014. A preliminary warranty inspection was conducted by Ramey Environmental Compliance on April 24, 2015 and Coblaco addressed some minor surface rust and some isolated coating repairs on August 5, 2015.

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Utility Billings and Energy Costs – TZA is tracking the United Power utility bills and associated water operations on a monthly basis. Attached is a memo from Lauren Goecke summarizing the monthly comparisons for July each year, as well as a summary of the seven-month periods for 2014 and 2015.

Curb Stop Box Specification – The recent issues with curb stop boxes witnessed by Director Wyckoff resulted in a review of the District's Rules and Regulations and the boxes specified. TZA's previous recommendations for a screw-style Buffalo-style box having an arch pattern base and an inside diameter of 2.5 inches has been further reinforced with the recommendation the pending revisions to the Rules and Regulations specify a 6500 Series Screw Type curb box, as manufactured by Castings, Inc. (970-243-3032), having a minimum internal diameter of 2.25 inches, or an approved equal. The part number is "C.I. 95-E" and includes a 30" top section and a 39" bottom section allowing for a bury depth of 41 inches to 64 inches. For deeper installations, Castings Inc. offers extensions in 9" (Item 151), 16" (Item 152), 28" (Item 153), and 30" (Item 154) heights.

Well, Pump, and Motor Replacements – The District has initiated efforts to better understand its well infrastructure and the potential need for replacement of pumps and motors, as well as the well structures themselves. As a part of that effort, TZA Water Engineers will need to work with Bishop-Brogden Associates to compile the historical aspects of the wells constructed, the pumps installed, and any other improvements (i.e. water level measuring devices) integrated at each site. This information will be used to evaluate the benefits of a pump, motor, and well maintenance program to detect changes in well performance. Early detection of deterioration in well performance will allow less expensive repairs, rehabilitation, or treatment procedures in order to maximize production capacity. This preventative maintenance program will be discussed with the District's Manager, and a formal proposal will be brought to the Board if deemed appropriate.

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Control Valves Evaluation – During the 3rd Quarter Operational Review Meeting, conducted on August 17, 2015, it was determined the District should develop a control valve evaluation plan. As the Board may recall, the District contracted with iSiWest in 2014 (July 14-15 and September 19), to inspect and service five (5) control valves, including one (1) at the Box Elder Creek Ranch Pump Station, one (1) at Rocking Horse Farms Pump Station, and three (3) at the Greatrock North Pump Station. On March 6, 2015, the District contracted with Ramey Environmental Compliance's Equipment Services Division to service one (1) pressure relief valve at the Box Elder Creek Ranch Water Treatment Plant. Since the District has an assortment of valves in a variety of locations throughout the District, REC will update the valve inventory in the Allmax software and work with Lisa Johnson, TZA, and the budget committee to prioritize the efforts for 2016 and beyond. A sample of the valves that could be addressed in the Box Elder Creek Ranch Pump Station are tabulated below.

Valve Location	Valve Type	Valve Size
UKA-3 Check	Cla-Val Hytrol	2"
UKA-3 Air/Vacuum	Val-Matic	1/2"
UKA-3 CRL	Cla-Val Pressure Relief	1/2"
LFH-3 Check	Cla-Val Hytrol	3"
LFH-3 Pressure Relief	Cla-Val Series 50	1-1/2"
LFH-3 CRL	Cla-Val Pressure Relief	1/2"
LFH-3 Air/Vacuum	Cla-Val Series 35	1/2"
Alluvial Wells Air/Vacuum	Cla-Val Series 35	2"

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MEMORANDUM

To: Greatrock North Water and Sanitation District

From: TZA Water Engineers

Date: September 21, 2015

Re: Water Quality and Hardness Results

Water Quality and Hardness – Below are tables of water quality data from a series of sampling events:

Month	RO Permeate	Unfiltered UKA Water	Unfiltered ALV Wells
September (09/20/15)	17%	34%	49%
August (08/24/15)	10%	33%	57%
July (07/19/15)	17%	35%	48%
June (06/28/15)	23%	37%	40%
May (05/25/15)	39%	42%	19%
April (04/27/15)	37%	39%	24%
March (03/22/15)	41%	40%	19%

Total Dissolved Solids (TDS)			
Date	BECR Tanks	RHF Tank	GN Tank
September 2015	RESULTS PENDING		
08/19/15	469 mg/l	500 mg/l	482 mg/l
07/10/15	417 mg/l	449 mg/l	468 mg/l
06/11/15	369 mg/l	350 mg/l	341 mg/l
05/11/15	401 mg/l	347 mg/l	366 mg/l
04/13/15	386 mg/l	326 mg/l	322 mg/l
March 2015	274 mg/l	324 mg/l	302 mg/l
02/02/15	350 mg/l	394 mg/l	383 mg/l
01/14/15	350 mg/l	394 mg/l	417 mg/l
12/03/14	417 mg/l	552 mg/l	511 mg/l
10/01/14	538 mg/l	603 mg/l	594 mg/l
07/11/14	565 mg/l	597 mg/l	599 mg/l
03/05/14	586 mg/l	543 mg/l	566 mg/l
01/08/14	553 mg/l	559 mg/l	575 mg/l
10/28/13	677 mg/l	643 mg/l	594 mg/l

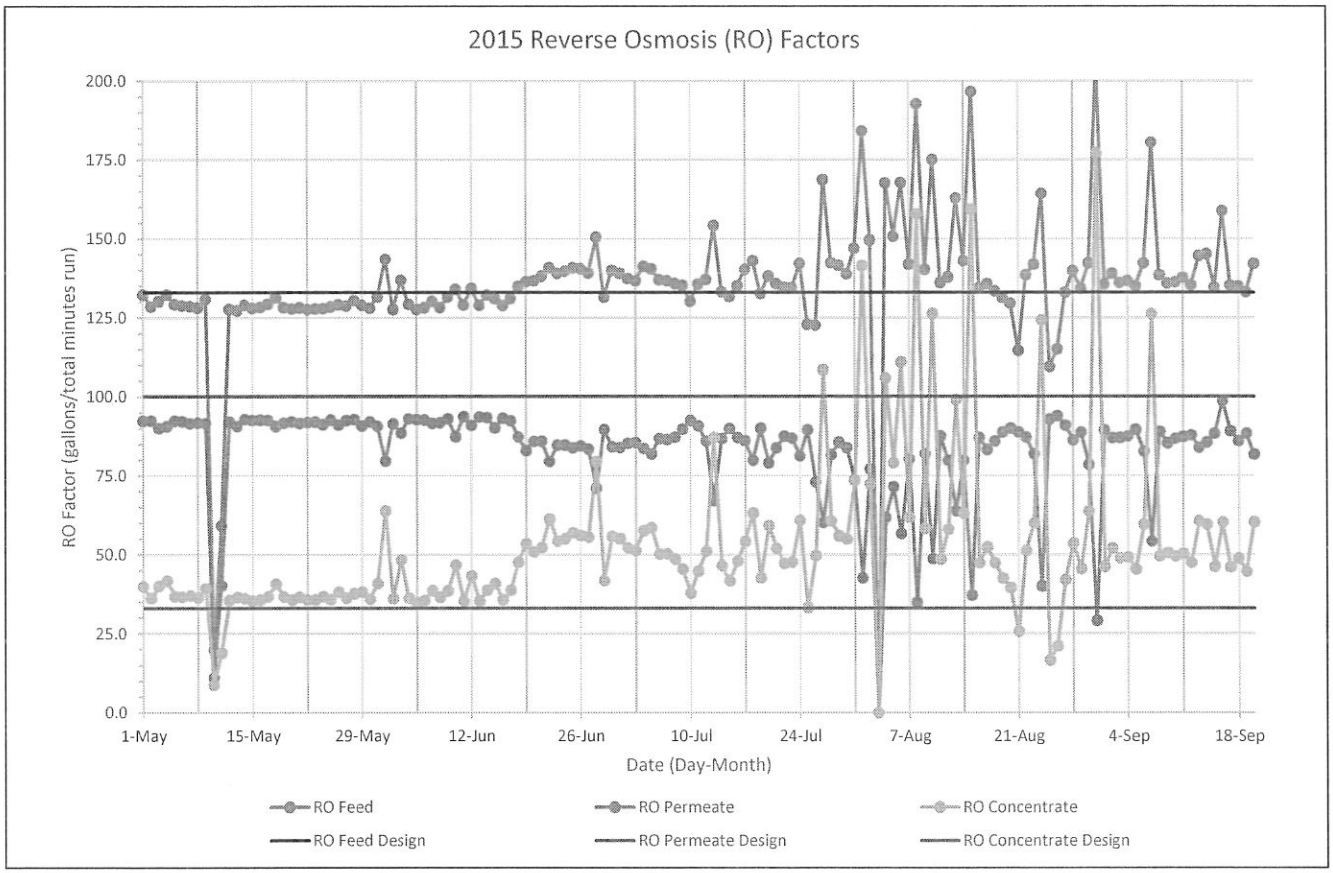
The total hardness results tabulated below reflect a hard water:

Total Hardness (as CaCO3)			
Date	**BECR Tanks**	**RHF Tank**	**GN Tank**
September 2015	RESULTS PENDING		
08/19/15	159.1 mg/l	175.6 mg/l	173.1 mg/l
07/10/15	136.2 mg/l	158.8 mg/l	156.5 mg/l
06/11/15	92.0 mg/l	78.0 mg/l	80.1 mg/l
05/11/15	84.8 mg/l	72.6 mg/l	73.9 mg/l
04/13/15	99.6 mg/l	67.7 mg/l	68.6 mg/l
March 2015	53.7 mg/l	68.3 mg/l	59.1 mg/l
02/02/15	83.4 mg/l	113.8 mg/l	104.6 mg/l
01/14/15	105.2 mg/l	123.0 mg/l	111.7 mg/l
12/03/14	115.3 mg/l	194.5 mg/l	169.8 mg/l
10/01/14	188.8 mg/l	231.7 mg/l	225.6 mg/l
07/11/14	221.5 mg/l	222.7 mg/l	220.4 mg/l
05/16/14	165.2 mg/l	209.6 mg/l	198.1 mg/l

For comparison, hardness values are generally classified as:

Classification	Mg/l
Soft	0 – 60
Moderately hard	61 – 120
Hard	121 – 180
Very hard	GTE 181

The RO production rates since June 18, 2015 have been very inconsistent with the design for the RO system. See the following figure for a graph of the RO feed, permeate, and concentrate so far this summer versus the design points of the system. Jeff Rabas indicated on September 21, 2015 that Mike Atwood is reviewing the data for a better understanding of the reporting and inconsistencies.


2015 Reverse Osmosis (RO) Factors
RO Factor (gallons/total minutes run)
200.0
175.0
150.0
125.0
100.0
75.0
50.0
25.0
0.0
1-May
15-May
29-May
12-Jun
26-Jun
10-Jul
24-Jul
7-Aug
21-Aug
4-Sep
18-Sep
Date (Day-Month)
RO Feed
RO Permeate
RO Concentrate
RO Feed Design
RO Permeate Design
RO Concentrate Design

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MEMORANDUM

To: Lisa Johnson, District Manager

From: Lauren Goecke, EI

Date: September 21, 2015

Re: Greatrock North Water and Sanitation District – Concentrate Management

Project No.: 0414018.01-002

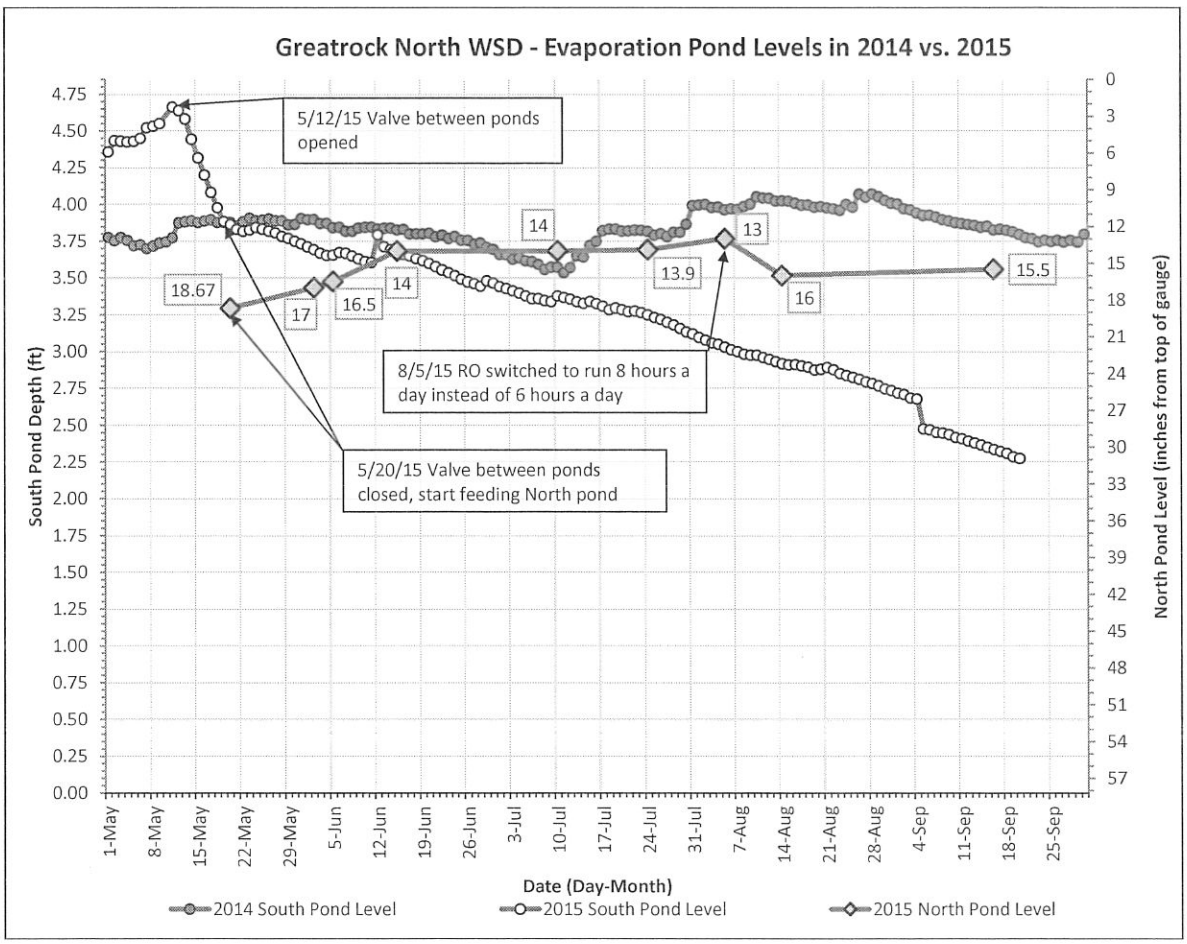
Evaporation Pond Summary: The south pond elevation was at 4.66 feet on May 11, 215 – an estimated 6 inches from overtopping the pond. The valve between the ponds was opened on May 12, 2015 to transfer water from the south pond to the north pond. The south pond was isolated on May 20, 2015 with a water elevation of 3.86 feet and the concentrate flows were directed to the north pond. The elevations in the south pond are tabulated below.

Date	Depth (feet, from daily SCADA report)
May 25, 2015	3.83
June 29, 2015	3.48
July 27, 2015	3.20
August 23, 2015	2.85
September 20, 2015	2.27

Jeff Rabas is providing the north pond elevations from visual observations of a temporary staff gauge:

Date	Measurement (inches, from top of gauge)
May 20, 2015	18"(+)
June 3, 2015	17"
June 8, 2015	16.5"
June 15, 2015	14"
July 10, 2015	14"
July 24, 2015	13.9"
August 5, 2015	13"
August 14, 2015	16"
September 16, 2015	15.5"

The following graph shows a comparison of the south pond levels in 2014, the south pond levels in 2015, and the north pond levels in 2015.


Greatrock North WSD - Evaporation Pond Levels in 2014 vs. 2015
5/12/15 Valve between ponds opened
8/5/15 RO switched to run 8 hours a day instead of 6 hours a day
5/20/15 Valve between ponds closed, start feeding North pond
18.67
17
16.5
14
14
13.9
13
16
15.5
South Pond Depth (ft)
North Pond Level (inches from top of gauge)
Date (Day-Month)
2014 South Pond Level
2015 South Pond Level
2015 North Pond Level

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MEMORANDUM

To: Lisa Johnson, District Manager

From: Lauren Goecke, EI

Date: September 16, 2015

Re: Greatrock North Water and Sanitation District – Utility Billings and Energy Costs

Project No.: 0414018.01-002

TZA is tracking the United Power utility bills and associated water operations on a monthly basis. Below are the monthly comparisons for August each year, as well as a summary of the eight-month periods for 2014 and 2015. The 2015 energy consumption for August is 74% of the 2014 energy consumption for the similar period. The 2015 billings for August are 97% of the 2014 billings for the similar period.

	August 2014 Billings				August 2015 Billings			
	On Peak	Off Peak	Total KWH	Billing	On Peak	Off Peak	Total KWH	Billing
Alluvial	4,646		4,646	$535.42	4,717		4,717	$543.36
BECR	4,400	18,960	23,360	$1,830.72	4,320	17,320	13,720	$1,721.92
GN	2,760	10,240	13,000	$1,070.15	2,520	9,120	10,720	$965.43
RHF	600	2,080	2,680	$237.31	920	2,800	3,360	$330.39
Totals			**43,686**	**$3,673.60**			**32,180**	**$3,561.10**

The 2015 year-to-date energy consumption is 92% of the 2014 energy consumption for the similar period. The 2015 year-to-date billings are 93% of the 2014 billings for the similar period despite the increase in the CTD2 rate from $0.049 per KWH to $0.05858 per KWH (20% increase).

	YTD 2014 Billings (8 months)				YTD 2015 Billings (8 months)			
	On Peak	Off Peak	Total KWH	Billing	On Peak	Off Peak	Total KWH	Billing
Alluvial	26,243		26,243	$3,061.96	24,401		24,401	$2,856.03
BECR	21,560	97,840	119,400	$9,034.76	20,440	98,280	118,720	$9,169.25
GN	12,600	49,000	61,600	$5,039.48	11,320	46,760	58,080	$4,784.96
RHF	9,480	24,840	34,320	$3,108.57	5,720	15,560	21,280	$1,981.53
Totals			**241,563**	**$20,244.77**			**222,481**	**$18,791.77**