



## SECONDARY WATER QUALITY TREATMENT SYSTEM REQUEST

Red Mountain Well #3

NC 03-32-136

WSF ID No: P03

AQUA NORTH CAROLINA, INC.

OFFICIAL COPY

Sep 01 2022

### A. EXECUTIVE SUMMARY

The Red Mountain Master Water System is comprised of 3 approved and active wells, Red Mountain Well #1, 2 and 3, and three points of entry (POE), P01, P02 and P03. The system consists of the following:

#### Well No. 1

1. Well No. 1 equipped with a three-horsepower pump, providing 11 gallons per minute,
2. Wellhouse with wellhead piping and chemical feed equipment for disinfection (hypochlorite) only,
3. One (1) 3,000-gallon ASME-coded hydropneumatic tank equipped with an air compressor and automatic air/water volume control.

#### Well No. 2

4. Well No. 2 equipped with a five-horsepower pump, providing 22 gallons per minute,
5. Wellhouse with wellhead piping and chemical feed equipment for disinfection (hypochlorite) and to sequester iron and manganese (phosphate),
6. One (1) 3,000-gallon ASME-coded hydropneumatic tank equipped with an air compressor and automatic air/water volume control.

#### Well No. 3

7. Well No. 3 equipped with a five-horsepower Goulds Model 55GS50 pump, providing 22 gallons per minute (the well is approved for up to 80 gallons per minute),
8. Wellhouse with wellhead piping and chemical feed equipment for disinfection (hypochlorite) and to sequester iron and manganese (phosphate),
9. One (1) 5,000-gallon ASME-coded hydropneumatic tank equipped with an air compressor and automatic air/water volume control.

#### Distribution System

10. A distribution system consisting of 6-inch, 4-inch and 2-inch waterlines and other appurtenances to serve 117 connections in the Red Mountain Subdivision.

**The latest Mn concentration at Red Mountain Well #3 is 0.378 mg/L on 01/12/2022 which makes it one of Aqua's Group 1 Priority Secondary Water Quality Projects as per the Water Quality Plan.**

Aqua has previously analyzed purchased water (PW) for other systems. Purchase water is not available unless the homeowners all petition for annexation and extension of city sewer service.

Aqua has evaluated if interconnecting with an adjacent Aqua water system is possible. Based on the systems nearby, they too have similar secondary water quality issues. Therefore, Aqua does not believe it would be prudent to invest in interconnecting these systems together at this time.

Capex and Opex estimates are given below in Section D.2.

Aqua proposes installing an oxidation-filtration system at Red Mountain Well #3 in order to remove Fe/Mn below the sMCLs.

**PROPOSED SYSTEM REQUIRING TREATMENT**

- |   |                             |
|---|-----------------------------|
| 1. System Name:   | <u>Red Mountain Well #3</u> |
| 2. PWS ID:  | <u>NC 03-32-136</u>         |
| 3. No. Active Residential Connections, as of February 2022: | <u>67</u>                   |
| 4. No. Permitted Residential Connections:                   | <u>117</u>                  |
| 5. List of DEH/PWSS Approved Wells and Storage              |                             |

**TABLE 1:** Approved and Active Wells in Proposed System\*\*\*

Well Name and No.	Capacity (GPM)			Max, Avg., Min Pump Runtime from Past 12 Months (hrs./day)	Latest POE Inorganic Sampling Results							
	APPC**	Max, Avg, Min from Past 12 Months			Fe (mg/L)*	Mn (mg/L)	Fe/Mn Loading Rate (lbs./day)	Fe/Mn Loading Rate (lbs./yr.)	Average Fe/Mn Loading Rate Per Residential Customer (lbs./yr.)			
Well 1	11	30	21	7	6	2	1	<0.022	0.0118	0.0	2	0.0
Well 2	22	68	30	9	8	3	1	<0.022	0.00433	0.0	2	0.0
Well 3	22	52	33	8	8	3	1	0.167	0.378	0.1	36	0.5

\*Raw samples are taken directly at the wellhead before chemical treatment and point of entry (POE) samples are taken after chemical injection and treatment but before the tank and distribution system

\*\*APPC = Approved Pumping Capacity

\*\*\*Loading calculations based on 12-hour per day runtime.

**TABLE 2:** Existing Storage at Well Sites

Well Name and No.	Storage Description		Most Recent Cleaning Date
	Type	Gallons	Dist. System
Well 1	Hydro	3,000	Aug. 2021
Well 2	Hydro	3,000	Aug. 2021

Well 3	Hydro	5,000	Aug. 2021
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6. Past Three (3) Years Flushing Occurrences, list month/year:

Response: Aug. 2019, Aug. 2020, Aug. 2021

7. Next Planned Distribution System Flushing Occurrence:

Response: This water system will be flushed again by Aug. 2022 and on an ongoing annual basis. Disclaimer: Flushing does not completely remove the mineral accumulation in the distribution mains when utilizing water with exceptionally high levels of iron and manganese in the source water.

8. List of chemicals being used:

**TABLE 3:** Existing Chemicals Used at Well Site

Well Name and No.	State Approved Treatment			
	Disinfectant	Caustic	Sequestrant	Fe/Mn Filter
Well 1	X	N/A	N/A	N/A
Well 2	X	N/A	X	N/A
Well 3	X	N/A	X	N/A

9. Current description of the water treatment system for each well over the past three (3) years, including specific names of chemicals and dates of changes:

Response: Started feeding sequestrant at Well #2 on 10/22/2015 and at #3 on 2/17/2016.

10. Planned changes (if any) for chemical treatment within the next six (6) months:

Response: None.

11. Comments on Approved/Current Well Capacity.

Response: None.

**B. CURRENT SECONDARY WATER QUALITY CONCERNS**

1. How many wells require treatment? \_\_\_\_\_ 1

\*15 A NCAC 18C.1511 and 15 A NCAC 18C.1512 requires systems to provide treatment for concentrations of iron greater than 0.3 mg/L and for manganese greater than 0.05 mg/L.\*

2. Can system operate with single well offline? \_\_\_\_\_ No

3. Are combined Fe/Mn concentrations above 1 mg/L? \_\_\_\_\_ No\*

\*However, the latest POE Mn concentration from Well #3 is over 0.3 mg/L (0.378 mg/L)

4. Date of most recent POE Fe/Mn sampling results 01/12/2022

**TABLE 4:** Past 3 Years Fe/Mn Analysis

Red Mountain Well #1 Laboratory Analysis at POE						
Date	Iron (Fe), mg/L			Manganese (Mn), mg/L		
	Tot.	Sol.	Insol.	Tot.	Sol.	Insol.
05/31/2017	0.0428	-	-	0.129	-	-
04/02/2020	<0.022	-	-	0.0118	-	-
Red Mountain Well #2 Laboratory Analysis at POE						
Date	Iron (Fe), mg/L			Manganese (Mn), mg/L		
	Tot.	Sol.	Insol.	Tot.	Sol.	Insol.
05/31/2017	<0.022	-	-	0.036	-	-
04/02/2020	<0.022	-	-	0.00433	-	-
Red Mountain Well #3 Laboratory Analysis at POE						
Date	Iron (Fe), mg/L			Manganese (Mn), mg/L		
	Tot.	Sol.	Insol.	Tot.	Sol.	Insol.
04/02/2020	0.487	-	-	0.376	-	-
9/14/2021	0.125	0.05	0.075	0.398	0.39	0.008
11/09/2021	0.139	0.05	0.089	0.384	0.334	0.05
12/07/2021	0.123	0.05	0.073	0.376	0.363	0.013
01/12/2022	0.167	0.0317	0.1353	0.378	0.315	0.063

5. Describe previous actions to improve secondary water quality and describe results (i.e., installation of particulate filters and sequestering agents).

Response: Aqua flushes the water mains annually in this system. Started feeding sequestrant at Well #2 on 10/22/2015 and at #3 on 2/17/2016.

**UTILITY COMMISSION REQUIRED INFORMATION**

- 1. Well Location Map Attached
- 2. DEH/PWS Approval Letter Attached

3. Original 24 hr. Pump Status Report Attached
4. Past 36 months of pump status reports Attached
5. Inorganic Analysis Report submitted to DEH for well approval Attached
6. Past 6 yrs. inorganic analysis from each wellhead Attached
7. Past 3 yrs. Fe/Mn analyses, both soluble and insoluble. See Table 4 Above

Note: For item (6) above, provide information on baseline (w/o treatment – raw samples taken at the well head) and point of entry (after treatment).

### C. CUSTOMER COMPLAINT DATA

1. Total number of customer complaints in past 6 months 0
2. Total number of customer complaints in past 12 months 1
3. For past 6 months, do customer secondary water complaints exceed 10% of the number of active customers? No
4. Provide 12-month list of all water quality complaints Attached
5. Provide 12-month list of all completed water quality work orders Attached
6. Describe most common customer complaint over the past 12-month period relating to secondary water quality, i.e., discolored water, taste, or odor.

Response: Customer reported dirty water in tub, not usable for washing clothes, etc.

### D. PROPOSED SECONDARY WATER QUALITY TREATMENT

1. Proposed treatment recommendation: Oxidation-Filtration Treatment System
2. System Capex Estimate:

Filter Capex					
	Total design flow rate =	50	GPM		
TASK	DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL
1	Filter Skid, no recycle, sludge management systems required	1	EACH	\$ 146,000	\$ 146,000
2	Backwash Supply System	1	EACH	\$ 25,800	\$ 25,800
3	Freight (estimate from AdEdge)	1	EACH	\$ 4,700	\$ 4,700
4	Engineering Design, Permitting, Bidding, & CA/CO (based on design costs of similar size filters)	1	EACH	\$ 27,660	\$ 27,660
5	Cost to acquire new driveway access easement to well lot	1	EACH	\$ 6,700	\$ 6,700
6	Construction Bonding, Mobilization and Demobilization	1	EACH	\$ 4,000	\$ 4,000
7	Site Clearing, Grubbing, Grading, Gravel, Erosion Control	1	EACH	\$ 15,000	\$ 15,000
8	Existing Well House Piping Modifications	1	EACH	\$ 3,500	\$ 3,500
9	Filter Equipment Installation-Including but not limited to all water piping, water treatment filter installation, and necessary appurtenances, within the existing filter building. Also includes all extension piping near filter building	1	EACH	\$ 15,000	\$ 15,000
10	Filter Building Construction-Including but not limited to concrete floor slab, well house erection, finishing, and necessary appurtenances	1	EACH	\$ 45,000	\$ 45,000
11	Backwash Supply Tank Installation: Including but not limited to all piping from 12" above grade to 4" air gap, concrete pad, tank setting, electrical, and necessary appurtenances.	1	EACH	\$ 10,000	\$ 10,000
12	Yard Piping-Including but not limited to all underground pipe, fittings, and valve	1	EACH	\$ 10,000	\$ 10,000
13	Electrical/Controls-Including but not limited to all electrical power and controls wiring, conduit, panels, fixtures, electric heaters, thermostats, junction boxes, control equipment not provide by filter manufacturer, and miscellaneous appurtenances	1	EACH	\$ 15,000	\$ 15,000
14	Aqua Direct Cost (payroll, water quality sampling) @	3%			\$ 9,851
<b>TOTAL COST/TREATED GPM:</b>					<b>\$ 6,800</b>
<b>TOTAL ESTIMATED PROJECT COSTS:</b>					<b>\$ 340,000</b>

Note: The above information is for planning purposes only and is subject to change based on further engineering evaluations, water quality analyses, site conditions, and other site-specific discoveries and information

3. Opex Estimate: \$10,000