



## SECONDARY WATER QUALITY TREATMENT SYSTEM REQUEST

**Branston Well #2 NC 40-92-076**

**WSF ID No: TP1**

**AQUA NORTH CAROLINA**

### A. EXECUTIVE SUMMARY

Aqua proposes installing an AdEdge Iron (Fe) and Manganese (Mn) filter system to treat water at the single point of entry (POE) of Branston Well #2, TP1. The Branston Master System is comprised of one active well (#2, TP1) and one single point of entry (POE). **NC DEQ issued a Notice of Deficiency in July 2016 due to Fe and Mn levels exceeding the secondary limits. Mn levels at this well are consistently greater than 0.3 mg/L which makes it one of Aqua's Group 1 Priority Secondary Water Quality Projects as per the 2018 Water Quality Plan.** Based on studies performed by AWWA and other organizations, elevated concentrations of Mn are being linked to cause adverse health effects. Preliminary engineering studies indicate that an Fe/Mn treatment system is the most effective and permanent solution since it physically removes the Fe and Mn.

### B. PROPOSED SYSTEM REQUIRING TREATMENT

- |  |                       |
|--|-----------------------|
| 1. System Name:                                | Branston Well #2, TP1 |
| 2. PWS ID:                                     | NC 40-92-076          |
| 3. No. Total Water Connections:                | 44                    |
| 4. No. Total Connections at Build Out:         | 44                    |
| 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 (hrs./day)	Average POE Inorganic Sampling Results						
	App.	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 #2, TP1	49	67	47	26	8	4	2	0.62	0.37	~0.09	~34	~0.30

\*There are no other wells close enough to Well #2 to consider for possible interconnection and consolidated treatment. See map below.

\*\*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.

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

Well Name and No.	Storage Description		Most Recent Cleaning Date	
	Type	Gallons	Tank	Dist. System
Branston Well #2, TP1	Hydro	5,400	Dec. 2017	Oct. 2018

6. Past Three (3) Years Flushing Occurrences, list month/year:

Response: Nov. 2015, Sept. 2016, July 2017, Aug. 2018.

7. Next Planned Distribution System Flushing Occurrence

Response: Aug. 2019.

8. List of chemicals being used:

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

Well Name and No.	Chemical Description			
	Cl <sub>2</sub>	OP-37	NaOH	SeaQuest
Branston Well #2, TP1	X	N/A	X	X

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: The system switched from OP 37 to SeaQuest in July 2013 to sequester the Fe and Mn and clean the distribution lines, as well as to prevent further mineral accumulation on the pipe walls. Started distribution and POE total and soluble sampling in September 2017; Started raw total and soluble sampling and testing in Dec. 2017; Aqua will continue to flush distribution system annually.

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

Response: None.

11. Comments on Approved/Current Well Capacity.

Response: Well #2 operates near the State approved capacity as seen in Table 1. The 36-month pump status report shows the well flow decreased gradually starting in 4/2016 at ~44 GPM to 3/5/2018 at ~29 GPM. Operations investigated and determined the pump was being clogged by Fe/Mn. On 3/7/18, the well was cleaned with dry ice treatment and a new pump and motor were installed. The next reported well flow rate was ~45 GPM on 3/12/18.

### C. CURRENT SECONDARY WATER QUALITY CONCERNS

1. How many wells require treatment? 1\*  
2. Can system operate with single well offline? No\*

\* Based on the historical demands from the system and that this is a single well system, Well #2 is required to meet demand.

3. Are combined Fe/Mn concentrations above 1 mg/L? Yes\*

\*The latest combined POE concentration is ~1.01 mg/L (Fe+Mn).

4. Date of most recent POE Fe/Mn sampling results 10/12/2018

**TABLE 4:** Most Recent Fe/Mn Inorganic Analysis at POE

Branston Laboratory Analysis						
Date	Iron (Fe) POE, mg/L			Manganese (Mn) POE, mg/L		
	Tot.	Sol.	Insol.	Tot.	Sol.	Insol.
5/7/2018	0.481	0.0348	0.4462	0.392	0.362	0.03
7/12/2018	0.423	< 0.022	0.423	0.431	0.431	0
8/3/2018	0.383	0.0377	0.3453	0.404	0.395	0.009
9/6/2018	0.331	0.0548	0.2762	0.421	0.421	0
10/12/2018	0.644	< 0.022	0.644	0.368	0.368	0

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

Response: The system switched from OP 37 to SeaQuest in July 2013 to sequester the Fe and Mn. Flushed distribution system annually since Sept. 2013 and will continue to flush water mains annually. Aqua began collecting and testing POE total and soluble sampling in Sept. 2017 and the most recent results are noted in Table 4 above. The intent of the sequestering agent is to physically chelate or hold Fe and Mn in a soluble state, ideally decreasing the insoluble concentration and resolving water discoloration issues. Because Fe usually reaches the surface in mostly an insoluble state, it is very challenging to convert insoluble Fe back into a soluble state unless the chemical dose of the sequestering agent is increased heavily. Also, sufficiently long contact time is a necessary criterion to make this happen. Because sequestering does not physically remove Mn, Aqua is concerned that its efforts to reduce total Mn will not be effective without adding a Fe/Mn treatment system or equivalent treatment system such as a those using solid phase Manganese Dioxide.

#### D. UTILITY COMMISSION REQUIRED INFORMATION

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|--|-----------------|
| 1. Well Location Map   | <u>Attached</u> |
| 2. DEH/PWS Approval Letter   | <u>Attached</u> |
| 3. Original 24 hr. Pump Status Report and Well Construction Report | <u>Attached</u> |
| 4. Past 36 months of pump status reports                           | <u>Attached</u> |
| 5. Inorganic Analysis Report submitted to DEH for well approval    | <u>Attached</u> |
| 6. Past 6 yrs. inorganic analysis from each wellhead               | <u>Attached</u> |
| 7. Past 3 yrs. Fe/Mn analyses, both soluble and insoluble.         | <u>Attached</u> |

Note: For item (7) above, provide information on baseline (w/o treatment – raw samples taken at the well head) and point of entry (after treatment).

#### E. CUSTOMER COMPLAINT DATA

- |   |                 |
|---|-----------------|
| 1. Total number of customer complaints in past 6 months   | <u>0</u>        |
| 2. Total number of customer complaints in past 12 months  | <u>2</u>        |
| 3. For past 6 months, do customer secondary water complaints exceed 10% of the number of active customers?  | <u>No</u>       |
| 4. Provide 12-month list of all water quality complaints  | <u>Attached</u> |
| 5. Provide 12-month list of all completed water quality work orders   | <u>Attached</u> |
| 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: Brown water complaints. Even though there were only 2 customer complaints in the past 12 months, the adverse health effects and public health issues resulting from elevated Mn concentrations above 0.3 mg/L make removal by Fe/Mn treatment system the most prudent and responsible step moving forward.

## F. PROPOSED SECONDARY WATER QUALITY TREATMENT

1. Proposed treatment recommendation: AdEdge Water Technologies Treatment system
2. Proposed System Costs: \$274,000.00
3. Estimated annual operating and maintenance expenses: \$1,000.00
4. Comments: The water quality at this well has resulted in a NOD from NCDEQ since July 2016 and the Mn concentration is greater than 0.3 mg/L at the POE, making this well one of Aqua's Group 1 Priority Secondary Water Quality Projects as per the 2018 Water Quality Plan. The elevated level of Mn above 0.3 mg/L also poses a health risk to customers that must be addressed. Once treatment is installed, Well #2 will operate near the approved rate of 49 GPM. Aqua will use 49 GPM as the treatment system design (max) flow rate.

For these reasons, Aqua proposes an AdEdge treatment system for Fe and Mn removal to be installed at Branston Well #2 with no interconnection and consolidated treatment (See footnote in Section B. above).