



SECONDARY WATER QUALITY TREATMENT SYSTEM REQUEST

Southwyck Wells #1,2

NC 43-92-118

WSF ID No: P01, P02

AQUA NORTH CAROLINA, INC.

A. EXECUTIVE SUMMARY

The Southwyck Master Water System is comprised of 2 approved and active wells, Southwyck Wells #1 and #2, and two points of entry (POE), P01 and P02. The master system consists of two (2) wells with a combined yield of 52 gallons per minute, chlorination apparatus and sequestering agent chemical feeding equipment at each well, a 5,000-gallon hydropneumatic storage tank, 6-inch and 4-inch distribution piping, valves and other appurtenances serving Southwyck Subdivision, Phases I, II, and III. **The latest Mn concentration at Southwyck Well #1 is 0.585 mg/L on 11/08/2021 and well #2 averages above 0.3 mg/L for Mn, which makes them both Group 1 Priority Secondary Water Quality Projects as per the latest 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 water and sewer service. The nearest municipal boundary (Fuquay-Varina) is ~2,300 feet away from the southern entrance of the Southwyck subdivision.

Aqua has evaluated if interconnecting with an adjacent Aqua water system is possible. Based on the systems near Southwyck, 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.

Aqua evaluated Alternative 1: interconnecting the two wells and installing a combined filter (~\$775,000), and Alternative 2: filtering each well separately (~\$550,000). The Capex to filter separately is approximately \$225,000 less than Alternative 1. Aqua proposes Alternative 2.

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

Aqua proposes installing separate oxidation-filtration systems at Southwyck Well #1 and #2 in order to remove Fe/Mn below the sMCLs.

PROPOSED SYSTEM REQUIRING TREATMENT

1. System Name:	<u>Southwyck Master</u>
2. PWS ID:	<u>NC 43-92-118</u>
3. No. Active Residential Connections, as of January 2021:	<u>49</u>
4. No. Permitted Residential Connections:	<u>49</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							
	Yield	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.)			
P01	22	23	19	17	12	4	2	0.0963	0.585	0.1	28	0.6
P02	30	41	34	29	5	2	1	0.193	0.262	0.1	34	0.7

\*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

\*\*Loading calculations based on 12 hour per day runtimes

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

Well Name and No.	Storage Description		Most Recent Cleaning Date
	Type	Gallons	Dist. System
P01	Hydro	5,000	Apr. 2021

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

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

7. Next Planned Distribution System Flushing Occurrence:

Response: This water system will be flushed again by Dec. 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
P01	X	N/A	X	N/A
P02	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 the Southwyck wells on 12/9/2015.

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? \_\_\_\_\_ 2

\*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. In addition, the manganese concentrations at both wells are above the Health Advisory Level of 0.3 mg/L. DEQ is also issuing Notice of Deficiencies for systems that have active wells that exceed the EPA HAL. Aqua’s communication with DEQ on this subject has been supplied to the Public Staff. The most recent was the November 29, 2021, submission.

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

\*49 connections require two clean sources of supply. Also, if one of these wells was placed in lag or backup mode, then the offline well could not be used in an emergency, such as a main break or well pump maintenance, until NCDEQ was notified and provided an action plan to address the manganese concentrations.

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

\*The average POE Mn concentration for both wells are over the EPA HAL of 0.3 mg/L

4. Date of most recent POE Fe/Mn sampling results \_\_\_\_\_ 11/8/2021

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

Southwyck Well #1 Laboratory Analysis at POE						
Date	Iron (Fe), mg/L			Manganese (Mn), mg/L		
	Tot.	Sol.	Insol.	Tot.	Sol.	Insol.
4/15/2019	0.256	-	-	0.523	-	-
10/12/2020	0.162	0.078	0.084	0.388	0.369	0.019
01/18/2021	0.347	0.209	0.138	0.680	0.655	0.025
4/26/2021	0.273	0.0954	0.1776	0.479	0.44	0.039

08/16/2021	0.292	0.048	0.244	0.521	0.505	0.016
11/08/2021	0.096	-	0.096	0.585	-	0.585
Southwyck Well #2 Laboratory Analysis at POE						
Date	Iron (Fe), mg/L			Manganese (Mn), mg/L		
	Tot.	Sol.	Insol.	Tot.	Sol.	Insol.
4/15/2019	1.02	-	-	0.188	-	-
10/12/2020	0.258	0.081	0.177	0.614	0.395	0.219
01/18/2021	0.835	0.686	0.149	0.341	0.333	0.008
4/26/2021	0.539	0.364	0.175	0.196	0.189	0.007
08/16/2021	0.324	0.026	0.298	0.572	0.551	0.021
11/08/2021	0.193	-	0.193	0.262	-	0.262

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

Response: See A.9. above. Aqua flushes the water mains annually in this system.

**UTILITY COMMISSION REQUIRED INFORMATION**

- Well Location Map Attached
- DEH/PWS Approval Letter Attached
- Original 24 hr. Pump Status Report Attached
- Past 36 months of pump status reports Attached
- Inorganic Analysis Report submitted to DEH for well approval Attached
- Past 6 yrs. inorganic analysis from each wellhead Attached
- 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**

- Total number of customer complaints in past 6 months 2
- Total number of customer complaints in past 12 months 2
- For past 6 months, do customer secondary water complaints exceed 10% of the number of active customers? No
- Provide 12-month list of all water quality complaints Attached
- Provide 12-month list of all completed water quality work orders Attached
- 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/black/orange dirty water reports.

**D. PROPOSED SECONDARY WATER QUALITY TREATMENT**

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

Filter Capex - Alternative 1 - interconnecting the two wells and installing a combined filter					
	Total design flow rate =	52 GPM			
TASK	DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL
1	Equipment-Only Filter Skid	1	EACH	\$ 125,400	\$ 125,400
2	Backwash Supply System	1	EACH	\$ 27,400	\$ 27,400
	Backwash Recycle System	1	EACH	\$ 37,100	\$ 37,100
	Sludge Management System	1	EACH	\$ 27,200	\$ 27,200
3	Freight (based on shipping costs of similar size filters)	1	EACH	\$ 7,000	\$ 7,000
4	Engineering Design, Permitting, Bidding, & CA/CO (based on design costs of similar size filters)	1	EACH	\$ 50,000	\$ 57,000
5	Construction Mobilization and Demobilization	1	EACH	\$ 5,000	\$ 5,000
6	Site Clearing, Grubbing, Grading, Gravel, erosion control	1	EACH	\$ 60,000	\$ 60,000
	Filter building construction	1	EACH	\$ 45,000	\$ 45,000
7	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	\$ 20,000	\$ 20,000
8	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
9	Yard Piping-Including but not limited to all underground raw water main pipe, fittings, and valves	1	EACH	\$ 275,000	\$ 275,000
12	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	\$ 20,000	\$ 20,000
13	Aqua Direct Cost (payroll, water quality sampling) @	3%			\$ 21,483
14	Contingency @	5%			\$ 36,879
<b>TOTAL COST/TREATED GPM:</b>					<b>\$ 14,904</b>
<b>TOTAL ESTIMATED PROJECT COSTS:</b>					<b>\$ 775,000</b>

<b>Filter Capex - Alternative 2 - filtering each well separately</b>					
	Total design flow rate =	52	GPM		
<b>TASK</b>	<b>DESCRIPTION</b>	<b>QTY</b>	<b>UNIT</b>	<b>UNIT COST</b>	<b>TOTAL</b>
<b>1</b>	Filter Skid for Well 1, no recycle, sludge management systems required since backwash is less than 5,000 gal per week	1	EACH	\$ 100,500	\$ 100,500
<b>2</b>	Filter Skid for Well 2, no recycle, sludge management systems required since backwash is less than 5,000 gal per week	1	EACH	\$ 100,500	\$ 100,500
<b>3</b>	Backwash Supply System for well 1	1	EACH	\$ 19,800	\$ 19,800
<b>4</b>	Backwash Supply System for well 2	1	EACH	\$ 19,800	\$ 19,800
<b>5</b>	Freight (estimate from AdEdge)	2	EACH	\$ 4,700	\$ 9,400
<b>6</b>	Engineering Design, Permitting, Bidding, & CA/CO (based on design costs of similar size filters)	2	EACH	\$ 25,895	\$ 51,790
<b>7</b>	Construction Bonding, Mobilization and Demobilization	2	EACH	\$ 5,000	\$ 10,000
<b>8</b>	Site Clearing, Grubbing, Grading, Gravel, Erosion Control	2	EACH	\$ 20,000	\$ 40,000
<b>9</b>	Existing Well House Piping Modifications	2	EACH	\$ 4,500	\$ 9,000
<b>10</b>	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	2	EACH	\$ 15,000	\$ 30,000
<b>11</b>	Filter Building Construction-Including but not limited to concrete floor slab, well house erection, finishing, and necessary appurtenances	2	EACH	\$ 45,000	\$ 90,000
<b>12</b>	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.	2	EACH	\$ 10,000	\$ 20,000
<b>13</b>	Yard Piping-Including but not limited to all underground pipe, fittings, and valve	2	EACH	\$ 25,000	\$ 50,000
<b>14</b>	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	2	EACH	\$ 20,000	\$ 40,000
<b>15</b>	Erosion and Sedimentation Control	2	EACH	\$ 2,500	\$ 5,000
<b>16</b>	Aqua Direct Cost (payroll, water quality sampling) @	3%			\$ 17,874
<b>17</b>	Contingency @	5%			\$ 30,683
<b>TOTAL COST/TREATED GPM: \$</b>					<b>10,577</b>
<b>TOTAL ESTIMATED PROJECT COSTS: \$</b>					<b>550,000</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