

Virginia Department of Health
Engineering Description Sheet

Date: March 21, 2007

Class: IV

Waterworks Name: Waverly Subdivision Type: Community
County/City: Franklin County
Location: From Route 40 in the Town of Rocky Mount take a left (east) on State Route 122. Turn right onto State Route 616. Waverly is one mile from the intersection of State Routes 616 and 601.
Owner: Petrus Environmental Services
1807 Murry Road, Unit O
P.O. Box 21173
Roanoke, VA 24018
(540) 344-9800
Operator: Class IV required
Permit Number: 5067963
Date Issued: January 19, 1990 Amended
March 21, 2007
Type of Treatment: Chlorination, Iron and Manganese Removal, and Corrosion Control
Source: Two Drilled Wells
Design Capacity: 64,000 gpd

Description of System

This waterworks consists of two drilled wells (Nos. 1 and 2), liquid chemical feed systems for oxidation and corrosion control, three greensand filters, a 35,175-gallon atmospheric tank, a 2,500-gallon hydropneumatic tank and two centrifugal booster pumps.

Well No. 1: This well is located in a wooden building with heat, light and floor drain. The well house, treatment building and storage tank, are on the lot adjacent to Waverly Lane and Island Pointe Lane. The well is drilled to a depth of 220 feet and cased with six inch steel casing and grouted to a depth of 57 feet. A 48-hour pump test on September 26-28, 1988 indicated a yield of 42 gpm. The well is equipped with a submersible pump rated 39.5 gpm at 175 feet TDH and driven by a 5.0 HP motor. The well is equipped with sanitary seal, screened vent and drawdown gauge. The well discharge pipe is equipped with check valve, sample tap, water meter, gate valves, pressure gauge and blow-off.

Well No. 2: This well is located 850 feet northwest of Well No. 1 in a wooden building with heat, light and floor drain. The well is drilled to a depth of 300 feet and cased with six inch diameter steel casing and grouted to a depth of 53 feet. A 48-hour pump test conducted September 29 through October 1, 1988 indicated a yield of 38 gpm. The well is equipped with a submersible pump rated 44 gpm at 294 feet TDH and driven by a 5.0 HP motor. The well is equipped with sanitary seal, screened vent and drawdown gauge. The well discharge pipe is equipped with check valve, sample tap, water meter, gate valves, pressure gauge and blow-off.

Treatment: The treatment system consists of soda ash, sodium hypochlorite and potassium permanganate feed systems and greensand filtration. The soda ash feeder uses a 100 gpd metering pump, 100-gallon chemical solution tank and appurtenances. The chlorination system consists of a 30 gpd metering pump, 55-gallon chemical solution tank and appurtenances. Two metering pumps are provided to allow feeding of the sodium hypochlorite solution to the raw and finished water. The potassium permanganate feeder uses a 30 gpd metering pump, 55-gallon chemical solution tank and appurtenances. A 1,500 gallon tank is used to provide contact time for the chemically treated water before it is filtered by three 42 inch diameter pressure greensand filters. Each greensand filter is provided with 18 inches of manganese greensand media with 18 inches of anthracite on top of the greensand. The greensand filters are provided with the following: sample taps at the top of the filters, greensand and anthracite interface and at the midpoint of the greensand media; pressure gauges on the filters inlets and outlets, meters on each of the filter inlets, filter control valves and meters on backwash lines. The filter backwash waste is discharged into a 1,000 gallon settling tank in series with a second 1,000 gallon settling tank which then flows into a distribution box and a subsurface soil absorption field. The filtered water is delivered to the atmospheric tank.

Atmospheric-Type Storage Tank: The atmospheric tank is a vertically mounted, ground level tank that is 25 feet in diameter and is 10 feet 7 inches in height. The tank's volume is 35,175 gallons. The tank bottom is at an elevation of 900 feet. The well pumps are controlled by the water level in the tank with the pumps activating at elevation 907.6 feet and deactivating at elevation 909.6 feet. It is equipped with a shoe-box type manhole access in the roof, screened vent, and six inch diameter overflow pipe, four inch diameter drain, one shell manhole, portable ladder for access to tank top, insulation for all exposed pipe and water level indicator gauge.

Booster Pumps: Three centrifugal pumps are provided, each rated at 98 gpm at 91 feet TDH and driven by a five HP electric motor. The combined capacity of two pumps is 180 gpm at 95 feet TDH. The pumps deliver finished water from the atmospheric-type tank to the hydropneumatic tank. The booster pumps have the following appurtenances: compound gauges on pump suction lines, pressure gauges and check valves on pump discharge lines, gate valves and sample taps on pump suction and discharge lines.

Hydropneumatic Storage Tank: The hydropneumatic tank is a 2,500 gallon tank fitted with sight glass, pressure gauge, vacuum relief and pressure relief valve, automatic/manual air volume control, 11"x15" access manhole, protected tank drain and tank bypass line. The normal operating range is 30 to 40 psi, with the second pump cutting on at 25 psi and the third pump cutting on at 20 psi.

Evaluation of System

Design Basis: Commonwealth of Virginia *Waterworks Regulations*
One Equivalent Residential Connection (ERC)= 400 gpd

Existing Connections: 130 Residential Connections

Existing System Use: 12,075 gpd (Maximum)

Source Capacity:

Well No.	Well Yield (gpm + 0.5gpm/ERCx400gpd/ERC)		Pump Capacity (gpd) (gpm x 1440 min/day)		Effective Capacity (gpd)
1	42 gpm	33,600 gpd	39.5 gpm	56,880 gpd	33,600 gpd
2	38 gpm	30,400 gpd	44 gpm	63,360 gpd	30,400 gpd
Total Effective					64,000 gpd

Storage Capacity:

	<u>Gross Volume</u>	<u>Effective Volume</u>
Atmospheric Tank	35,175 gallons	35,175 gallons
Hydropneumatic Tank	2,500 gallons * 1/3 =	833 gallons
36,008 gallons/200 gals/ ERC= 180 ERCs or 72,000 gpd		

Booster Pumps:

Estimated Combined Capacity of 180 gpm

Maximum hour domestic demand flow: $Q = 11.4N^{0.544}$ $180 = 11.4N^{0.544}$ $N = 160 \text{ ERCs}$
 $160 \text{ ERCs} * 400 \text{ gal/ERC} = 64,000 \text{ gpd}$

Treatment Capacity:

(3) 42-inch diameter greensand filters @ 3 gpm/ft²

$28.86 \text{ gpm/filter} * 3 \text{ filters} = 85.6 \text{ gpm} * 1440 \text{ min/day} = 124,689 \text{ gpd}$

Backwash 1 filter per day

@ 20 min and 10 gpm/ft² = 1,924 gal + (28.86 gpm * 20min) loss

$124,689 \text{ gpd} - (1,924 + 576) \text{ gallons} = 122,187 \text{ gpd}$

Conclusion:

Therefore, this waterworks is permitted for a capacity of 64,000 gpd based on the above limiting factors.

RLP/nfb