

Virginia Department of Health  
**Engineering Description Sheet**

**Date:** July 19, 2006

**Class:** VI

**Waterworks Name:** Twin Coves Subdivision      **Type:** Community

**County/City:** Franklin County

**Location:** From Hales Point Bridge at Smith Mountain Lake, take State Route 122 south for approximately 2 miles. Turn left onto State Route 666, then left on State Route 978. The waterworks facilities are located at corner of Woodbrook Road and State Route 978.

**Owner:** Petrus Environmental Services, Inc.  
1807 Murry Road, Unit O  
P.O. Box 21173  
Roanoke, VA 24018  
(540) 344-9800

**Operator:** Class VI required

**Permit Number:** 5067950

**Date Issue:** November 21, 2003      Amended  
July 19, 2006

**Type of Treatment:** Chlorination, Blending and Corrosion Control

**Source:** Three Drilled Wells

**Design Capacity:** 52 Existing Residential Connections or 20,800 gpd

**DESCRIPTION OF SYSTEM**

This waterworks consists of three drilled wells (#2, 3, 4), treatment to provide continuous chlorination, blending to reduce combined radium and iron in Well #3, corrosion control, a 10,000-gallon atmospheric tank, a 1,000-gallon hydropneumatic tank and two centrifugal booster pumps. The well discharge lines connect within the waterworks control building. Well #1, located in the control building, was physically disconnected from the system due to poor quality and declining yield.

**Well No. 2:** This well is located in a 10 ft. x 8 ft. x 4 ft. block building with heat, light and 4-inch diameter floor drain. The well is cased with 6-inch steel casing to a depth of 50 feet, drilled to a depth of 400 feet and grouted to a depth of 50 feet. The construction of the well was completed in February 1978. The yield of the well was determined by a simultaneously pump test with Well No. 1 and is recorded as 6 gpm. The well is equipped with a 5.5-gpm submersible pump driven by a 0.75-HP motor. The well is equipped with a sanitary seal, screened vent, and drawdown gauge. The well discharge pipe is equipped with a check valve, sample tap, water meter, gate valves, pressure gauge and blow-off.

**Well No. 3:** This well is located approximately 375 feet northwest of the waterworks building. The well is a Class IIB well, drilled to a depth of 320 feet, cased with 6-inch diameter galvanized steel casing to a depth of 57 feet and grouted to a depth of 54 feet. The depth to bedrock is 54 feet. The well was completed September 25, 1990. In order to be formally approved by this Office, the well was pump tested for 48 hours beginning October 27, 1996 with a yield of 8.8 gpm at a drawdown depth of 134.3 feet. The water level depth after a 2-hour recovery period was 120.5 feet. The well casing extends 12 inches above a concrete slab and is equipped with a sanitary seal, screened vent and drawdown gauge. The well is equipped with a 1.5-HP, 230 volt submersible pump having a capacity of 12 gpm at 354.2 feet TDH. Appurtenances to the 1.25-inch diameter discharge pipe include a check valve, gate valve, water meter, sample tap, grit removal unit, blowoff, and one-inch diameter flow proportional control valve for throttling the well pump to 5.3 gpm that is necessary for blending for combined radium and iron. Electrodes located in the atmospheric-type storage tank control operation of the well pump. The well has a pitless adapter located approximately 42 inches below the concrete slab.

**Well No. 4 (Woodbrook Well):** The well, designated as Well No. 4 is located approximately 200 feet northeast of the intersection of SR 978 and Woodbrook Drive. This well was drilled to a depth of 300 feet and cased with 6-inch diameter steel casing to a depth of 66 feet and grouted to a depth of 66 feet. Construction was completed July 9, 1992 and pump tested for 48 hours beginning July 10, 1992 with a yield of 18 gpm at a drawdown depth of 270 feet. The static water level was 65 feet. The well casing extends 12 inches above a concrete slab and is equipped with a pitless adapter, vented well cap, and a drawdown gauge. A submersible pump having a capacity of 18.5 gpm at 318 feet TDH and driven by a 2-HP motor is installed. The well discharge pipe is equipped with a check valve, pressure relief valve, sample tap, water meter with bypass, gate valves, pressure gauge and blow-off. The well enclosure consists of a small wooden enclosure with a shingled roof and lockable door. The majority of the discharge line appurtenances are located in a series of meter boxes adjacent to the enclosure.

**Booster Pumps:** Two centrifugal pumps are provided and rated at 115 gpm at 120 feet TDH each and driven by 5-HP electric motors. The pumps are controlled by a pressure switch and are provided with inlet gate valves, discharge check and gate valves, and a discharge pressure gauge.

**Atmospheric-Type Storage Tank:** The atmospheric-type tank is a 10-foot diameter by 10-foot long cylindrical steel tank (10,000 gallon) mounted horizontally. It is equipped with a 24-inch diameter access hatch in the roof, a screened vent, and 4-inch diameter overflow pipe with a splash pad. The tank is fitted with a 2-inch-diameter inlet pipe, a 3-inch diameter outlet pipe to the booster pumps, and a 4-inch diameter gravity bypass to the distribution system. A 4-inch diameter drain line to grade is also provided.

**Hydropneumatic Storage Tank:** The hydropneumatic tank is approximately 54-inches in diameter by 10 feet long (1,000 gallon) and is fitted with a sight glass, pressure gauge, vacuum relief and pressure relief valves and is provided with automatic/manual air volume control.

**Treatment:** The corrosion control treatment consists of the addition of an orthophosphate using a 0.50 gph metering pump, 30-gallon dose tank and appurtenances. The chlorination system consists of the addition of sodium hypochlorite solution using a 0.50 gph metering pump, 30-gallon dose tank and appurtenances. The metering pumps are electrically interconnected to the well pumps. The pumped water from Well No. 3 is blended with the pumped water from Wells No. 2 and No. 4. Well No. 3 has total radium and iron levels above the maximum contaminate levels. The treatment technique of blending is intended to reduce the concentration of total radium to less than the Primary Maximum Contaminant Level (PMCL) of 5 pCi/L and reduce the iron concentration to less than the Secondary Maximum Contaminate Level of 0.30 mg/L. To achieve adequate blending, the production from Well No. 3 may not exceed 18% of the total amount of water being produced by the waterworks at any given time.

### **EVALUATION OF SYSTEM**

**Design Basis:**

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

**Existing Connections:**

52 Existing Residential Connections

**Existing System Use:** 2,713 gpd (maximum)

**Source Capacity:**

Well No.	Well Yield (gpm ÷ 0.5gpm/ERCx400gpd/ERC)		Pump Capacity (gpd) (gpm x 1440 min/day)		Effective Capacity (gpd)
2	6.0 gpm	4,800 gpm	5.5 gpm	7,920 gpd	4,800
3	8.8 gpm	7,040 gpm	5.3 gpm	7,632 gpd	7,040
4	18 gpm	14,400 gpm	18.5 gpm	26,640 gpd	14,400
Total Effective					26,240

$$26,240 \text{ gpd} + 400 \text{ gpd/ERC} = 66 \text{ ERCs}$$

**Treatment Technique:**

Well No. 3 is limited to the smaller of 18% of the total well capacity or Well No. 3 effective capacity for blending to meet radium & iron MCLs

$$\text{Well No. 3 (gpd)} = 18\% (4,800 \text{ gpd} + \text{Well No. 3} + 14,400 \text{ gpd})$$

Well No. 3 = 4215 gpd limiting treatment technique capacity

$$\text{Total} = 4,800 \text{ gpd} + 4,215 \text{ gpd} + 14,400 \text{ gpd} = 23,415 \text{ gpd}$$

**Storage Capacity:**

	<u>Gross Volume</u>	<u>Effective Volume</u>
Atmospheric Tank	10,000 gallons	10,000 gallons
Hydropneumatic Tank	1,000 gallons * 1/3 =	333 gallons

$$10,333 \text{ gallons} / 200 \text{ gals/ERC} = 52 \text{ ERCs or } 20,800 \text{ gpd}$$

**Booster Pumps:**

Estimated Capacity of 115 gpm each

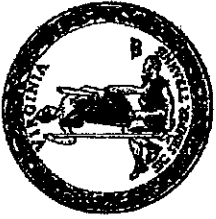
Capacity based on maximum hour domestic demand

$$Q = 11.4N^{0.544} \quad 115 = 11.4N^{0.544} \quad N = 70 \text{ ERCs}$$

$$70 \text{ ERCs} \times 400 \text{ gpd/ERC} = 28,000 \text{ gpd}$$

Therefore, this waterworks is permitted for a capacity of 20,800 gallons per day based on the storage capacity critical value.

RLP:jk



# COMMONWEALTH OF VIRGINIA

## DEPARTMENT OF HEALTH OFFICE OF DRINKING WATER

### WATERWORKS OPERATION PERMIT

Petrus Environmental Services, Inc. Is Hereby Granted Permission To Operate A Class VI Community Waterworks Having A Design Capacity Of 20,800 GPD At Twin Coves Subdivision Located In Franklin County In Accordance With The Provisions Of Title 32.1, Chapter 6, Article 2, Section 32.1-172 or Section 32.1-173 Code Of Virginia, As Amended, And § 12VAC5-590-190 or § 12VAC5-590-260 Of The *Waterworks Regulations Of The Virginia Department Of Health*, As Amended. This Permit Is Issued In Accordance With Previously Issued Operation Permit No. 5067950 Dated November 21, 2003, And With The Understanding That This Owner Will Operate The Waterworks In Accordance With Part II, "Operation Regulations For Waterworks", Of The *Waterworks Regulations Of The Virginia Department Of Health* And Any Variances And/Or Exemptions Noted Below.

Variances And/Or Exemptions Granted ( ☒ ) None ( ) See Attached

An Engineering Description Sheet Is Attached Dated: July 19, 2006

PERMIT NO. 5067950

EFFECTIVE DATE July 19, 2006

(REV 07/05)

APPROVED Ph.D., P.E.  
Director, Office of Drinking Water  
for the State Health Commissioner pursuant to VA Code § 2.2-604