

**REPORT OF THE VIRGINIA DEPARTMENT OF
CONSERVATION AND RECREATION**

**ASSESSMENT OF FEASIBILITY AND
COSTS FOR WATER SYSTEM
MODIFICATIONS AT MASON NECK
STATE PARK**

**TO THE CHAIRS OF THE HOUSE APPROPRIATIONS
COMMITTEE; THE SENATE FINANCE AND
APPROPRIATIONS COMMITTEE; AND THE SENATE
CONSERVATION AND NATURAL RESOURCES
COMMITTEE**



**COMMONWEALTH OF VIRGINIA
RICHMOND
OCTOBER 20**

PREFACE

This report has been prepared in accordance with the requirements of House Bill 30, Chapter 1289, Item 374.N of the 2020 Virginia Acts of Assembly that stipulates “Then Department of Conservation and Recreation, shall assess the feasibility of costs of (i) connecting Mason Neck State Park to a public water supply, and (ii) replacing equipment and providing necessary upgrades to the current well water system. The Director shall report the findings and recommendations of the assessment to the Chairs of the House Appropriations and Senate Finance and Appropriations Committees.”

The Department of Conservation and Recreation contracted with Draper Aden Associates to provide the following attachment providing the findings of the required assessment.

CONCLUSION

A review of the existing water system deficiencies was completed at Mason Neck State Park. Additionally, a review of the location of the public water source was completed by Draper Aden Associates, a consultant for the Department of Conservation and Recreation. The results of the assessment is attached. The capital costs for upgrades to the existing well system is \$438,300. The capital costs for connection to the public water supply, located 2.9 miles outside of the park is \$1,511,600. Due to the implication of costs, DCR recommends upgrading the existing well system at Mason Neck State Park.

Assessment of Feasibility and Costs For The Water System at Mason Neck State Park



Prepared for DCR – State Parks

October 26, 2020

DAA Project Number R16521R-00

3RD PARTY REVIEW

This Report has been subjected to technical and quality reviews by:



10/26/2020

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Associate

Signature

Date



10/26/2020

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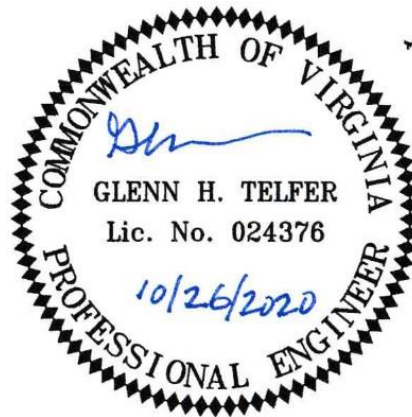


10/26/2020

Name: W. Charles Kreye II, P.E.
Quality Reviewer

Signature

Date



PREFACE

This report has been prepared in accordance with and fulfills the requirements of House Bill 30, Chapter 1289, Item 374.N of the 2020 Virginia Acts of Assembly, which states:

Agency report - The Department of Conservation and Recreation, shall assess the feasibility of costs of (i) connecting Mason Neck State Park to a public water supply, and (ii) replacing equipment and providing necessary upgrades to the current well water system. The Director shall report the findings and recommendations of the assessment to the Chairs of the House Appropriations and Senate Finance and Appropriations Committees.

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1.0 EXECUTIVE SUMMARY

The public water supply at Mason Neck State Park has ongoing issues with water quality related to the natural levels of iron and manganese in the groundwater. While generally not a health risk, the iron and manganese result in taste and staining. In accordance with the direction from the General Assembly, two options were evaluated: connection of the Park to the public water supply and upgrades to the Park's existing public water system to improve treatment. A summary of estimated budgetary capital costs is provided below.

Table 1: Summary of Budgetary Capital Costs

Option	Estimated Budgetary Capital Cost
Connection to Public Water Supply	\$1,511,600
Upgrades to the Existing Water System	\$438,300

2.0 BACKGROUND

2.1 Existing Water System

There is one public water system at the Park which supplies the Visitors Center, Assistant Park Manager's residence, and the restrooms at the picnic area. This system was constructed circa 1983 and consists of a well, equipment building, hydropneumatics tank, and filters. The filters were replaced circa 2011 to provide enhanced iron and manganese removal. This system has a permitted capacity of 24,480 gpd, an average use of 739 gpd, and an estimated peak use of approximately 1,500 gpd. This system supplies only domestic water and does not supply any water for fire hydrants or building fire sprinkler systems.

There are two smaller systems which do not supply public water. The James House system supplies the James House and consists of a well, bladder tank, and water softener system. The Maintenance Area system supplies the Park maintenance building and the Park Manager's residence and consists of a well, bladder tank, and water softener system.

2.2 Water Quality Concerns

The Park has expressed concerns with the levels of iron and manganese in the public system. The Virginia Waterworks Regulations (12VAC5-590-440) establishes limits for iron and manganese at 0.3 mg/L and 0.05 mg/L, respectively, which are primarily associated with nuisance problems such as staining of plumbing fixtures and objectionable taste. The untreated water from the well greatly exceeds the established limits as shown by sampling of the untreated well water. Sampling in 2011 showed levels in the 8-16 mg/L for iron and exceeding 0.18 mg/L for manganese. The water system treats the water to reduce levels by adding chlorine to oxidize the iron and manganese followed by a filter system that is periodically backwashed. Water sampling of the treated water by the Park during 2019 and 2020 shows that the system performance is highly variable with it achieving the allowable thresholds approximately half of the time.

There have also been issues with bacteria in the water main in the past, likely due to water stagnation in the distribution piping during periods of low water use.

3.0 PROPOSED OPTIONS

Two options were evaluated to eliminate the water quality issues.

3.1 Connection to Public Water Supply

The Fairfax County Water Authority (FCWA) has a 12" water main in Gunston Road at the Park entrance. Recently another state agency, Gunston Hall, constructed a connection similar to the Park connection proposed in this report at a location approximately 0.3 miles from the Park. Design information from this project was available for this report. Conversations with FCWA indicate that they are open to the possibility of a connection and provided requirements for backflow and metering.

A proposed water main will be approximately 2.9 miles in length from the Park Visitors Center to the point of connection. The route of the water line will be roughly along the Park entrance road (High Point Road), possibly along the High Point multi-use trail. There are wetlands at several points along the

proposed route, requiring permitting for the construction disturbance. Tree clearing will also be required.

The proposed 4-inch water line is based on all of the existing public and private system demands plus an allowance for future demands as shown on the approved Park Master Plan, excluding water demands from any future fire hydrants or building sprinkler systems. Construction of water mains to supply the two private systems is not included in the budgetary costs.

3.2 Upgrades to the Existing Water System

Based on sampling results, the treatment system should be replaced to provide more consistent treatment. This would consist of a proposed utility building housing an iron and manganese treatment system consisting of chemical feed, oxidation contact tanks, and filters. Also, given the approximate 37-year age of the existing water system, the older components and piping in the water system should be replaced, including the hydropneumatic tank. The utility building would be precast concrete with a brick finish to match the existing building.

These additions to the existing water system would not increase capacity, but the existing capacity is sufficient to meet existing public and private system demands plus an allowance for future demands as shown on the approved Park Master Plan, excluding water demands from any future fire hydrants or building sprinkler systems. Construction of water mains to supply the two private systems is not included in the budgetary costs.

4.0 ESTIMATED BUDGETARY COSTS

4.1 Capital Costs

Opinions of estimated design and construction costs for the two options are attached. Costs are generally based on similar DCR projects at other Parks. A summary of costs is provided in the table below:

Table 2: Summary of Budgetary Capital Costs

Option	Estimated Budgetary Capital Cost
Connection to Public Water Supply	\$1,511,600
Upgrades to the Existing Water System	\$438,300

5.0 CONCLUSIONS

Connection to the public water supply is the more expensive option in terms of one-time capital costs.

PHOTOGRAPHS



Photograph 1 – Well House & Well



Photograph 2 – Interior of Well House



Photograph 3 – Iron & Manganese Treatment System

COST ESTIMATES

Mason Neck State Park - Water Supply

Opinion of Probable Capital Costs

10/26/2020

Option 1 - Connection to Public Water Supply

Contractor General Conditions	1	LS	\$	74,065	\$74,065
Clearing & grubbing	7.0	Ac	\$	10,000	\$70,303
4" Water Main	15,312	LF	\$	55	\$842,160
Site ESC & Restoration	7.0	Ac	\$	8,500	\$59,758
Demolition of existing building	1	LS	\$	12,000	\$12,000
BFP at connection	1	EA	\$	8,000	\$8,000
Automatic flushing valve	1	EA	\$	1,500	\$1,500
PRV's at buildings	3	EA	\$	800	\$2,400
Survey, Design & FCWA permitting	1	LS	\$	163,100	\$163,100
Owner's Inspector	1	LS	\$	20,000	\$20,000
Connection Fee, 2" meter	1	LS	\$	70,840	\$70,840
15% contingency	1	LS	\$	187,509	\$187,509
				Total	\$1,511,635
				Rounded	\$1,511,600

Mason Neck State Park - Water Supply

Opinion of Probable Capital Costs

10/26/2020

Option 2 - Upgrades to the Existing Water System

Contractor General Conditions	1	LS	\$ 22,880	\$22,880
Precast concrete building	1	EA	\$ 80,000	\$80,000
Building piping	1	LS	\$ 22,000	\$22,000
Building power & lighting	1	LS	\$ 25,000	\$25,000
Fe & Mn chemical feed	1	EA	\$ 20,000	\$20,000
Fe & Mn filters & backwash system	1	EA	\$ 42,000	\$42,000
System start up	1	LS	\$ 16,000	\$16,000
Replace hydropneumatic tank (1,000 gal)	1	EA	\$ 30,000	\$30,000
Replace existing piping & controls	1	LS	\$ 20,000	\$20,000
Blowoffs in water main	2	EA	\$ 3,000	\$6,000
Sitework & ESC	1	LS	\$ 25,000	\$25,000
Survey, design & VDH permitting	1	LS	\$ 70,000	\$70,000
Owner's construction materials testing	1	LS	\$ 6,000	\$6,000
15% contingency	1	LS	\$ 53,400	\$53,400
			Total	\$438,280
			Rounded	\$438,300