
Memorandum

To: The City of Virginia Beach
From: Lewis White on behalf of WSP | Parsons Brinckerhoff
Date: May 4, 2017
Subject: **Sherwood Lakes Option for Current Available Funding**

Introduction

The City of Virginia Beach and WSP | Parsons Brinckerhoff met Monday May 1, 2017 to discuss possible solutions for flooding within Sherwood Lakes that can be designed and constructed within the current limited funds committed for the project, approximately 3 million dollars. The previous Memoranda dated November 8, 2016 and April 4, 2017 were referenced during the meeting to facilitate a discussion of possible options to provide flooding relief to both Sherwood Lake North and Sherwood Lake South. The following describes the preferred option from the meeting that provides relief for most major and minor storm events.

Preferred Discussed Option – Place 5 CFS Permanent Pump Station at Each Lake

The first critical action needed for both lakes is getting the normal water surface elevation down to elevation 3 feet NAVD. When normal water surface elevation is down at elevation 3 feet NAVD, both lakes have enough storage capacity for greater than the 100-year storm event. Once the normal water surfaces are drawdown to elevation 3 feet NAVD, bank stabilization will need to be assessed and most likely addressed at each lake.

In order to maintain that normal water surface elevation, a 5 CFS permanent pump station is suggested to be placed at each lake outfall. One at the sanitary sewer pump station site at the western end of Sherwood Lake North and another one at the southwest corner of Sherwood Lake South. Both pump stations would include an intake pipe from their respected lake and a discharge pipe into the existing stream, located between Nottoway Lane and Seaboard Road, which ultimately discharges to the culverts under Seaboard Road. The locations of both pump stations are shown on Exhibit A attached. To provide some interconnection between the pipes, Exhibit A also shows the location of a new storm sewer pipe, under the roadway, from an existing inlet in Nottoway Lane to Sherwood Lake North.

Currently, the Stormwater Operations Division of the Department of Public Works is planning to provide a portable pump capable of pumping at a rate of 13 CFS to be located on a concrete pad at the sanitary sewer pump station site at the western end of Sherwood Lake North. This portable pump will include an intake pipe from Sherwood Lake North and discharge to the northern end of the existing stream located between Nottoway Lane and Seaboard Road which ultimately discharges to the culverts under Seaboard Road. This pump should be used to expedite initial drawdown of the lake as well as during extreme weather events like the extreme back to back storms experienced in September and October 2016.

Groundwater inflow to each of the lakes when the lakes are at normal levels is estimated to be about 1 CFS based on the City of Virginia Beach CDM Smith groundwater study. The proposed pump stations would address the groundwater inflow. During heavy rains, which cause a rise in the lake of more than

0.5 feet, there is no groundwater entering the lake as the hydraulic grade in the lake will then be higher than the groundwater elevation outside the lake.

Sherwood Lake South will rise quicker than Sherwood Lake North due to the ratio of lake area to contributing drainage area. Table 1 describes the drainage areas to each lake and Table 2 provides lake drawdown with the proposed 5 CFS pump stations during storm events.

Table 1 - Drainage Area to Lake Ratios

Location	Drainage Area (Acres)	Lake Area (Acres)	Drainage Area to Lake Area Ratio
Sherwood Lake North	231	88	2.6:1
Sherwood Lake South	133	35	3.8:1

Table 2 - Lake Drawdown with 5 CFS Pumps

Location	Pump Rate	Time to Drawdown 1 foot of Water (Days)	Drawdown per 24 hrs (Inches)
Sherwood Lake North	5 CFS	8.9	1.35
Sherwood Lake South	5 CFS	3.5	3.4

Table 3 shows the operation of the lakes during a 10- and 100-year rainfall event with the 5 CFS pumps as describe above.

Table 3 - Lake Drawdown for 10- and 100-year rainfall events with 5 CFS pumps

Location	6" Rainfall (Rise in feet)	Drawdown Time @ 5 cfs (days)	9" Rainfall (Rise in feet)	Drawdown Time @ 5 cfs (days)
Sherwood Lake North	1.1	9.8	1.8	15.5
Sherwood Lake South	1.6	5.5	2.5	8.8

Notes:

1. 100% runoff over the lake areas
2. 75% runoff over the land areas during the 10-year rain (6")
3. 85% runoff over the land areas during the 100-year rain (9")

Table 4 provides lake drawdown with the proposed 13 CFS portable pump during storm events should it be used alone in emergency situations.

Table 4 - Lake Drawdown with Portable 13 CFS Pump Only

Location	Pump Rate	Time to Drawdown 1' of Water (Days)	Drawdown per 24 hrs (Inches)
Sherwood Lake North	13 CFS	3.4	3.5
Sherwood Lake South	13 CFS	1.4	8.6

Exhibit A: Sherwood Lakes Two Permanent Pump Station Option

1. Pump Station (5 CFS) with additional connection for temporary pump and generator
2. Intake pipe for pump station
3. Discharge Pipe from pump station
4. New storm sewer pipe (to provide some interconnection between the two ponds)

