

Memorandum

To: Mark Dunaski- Windemere Township/Windemere Township Lakes Association
From: Michael M. Opat, PE, CFM
Houston Engineering, Inc.
Subject: Potential Sturgeon Lake Outlet
Date: April 30, 2021

INTRODUCTION

On April 22, 2021, Houston Engineering, Inc. (HEI) provided Mark Dunaski with an informational packet outlining HEI's experience assisting entities like Windemere Township and the Windemere Township Lakes Association with the analysis, development, and successful construction of projects that have addressed impacts due to high water levels on closed basin lakes similar to the situation at Sturgeon Lake. This was followed up with a discussion between Mike Opat (HEI) and Mark Dunaski on April 26, 2021 in which more detail on the specific issues and challenges at Sturgeon Lake were discussed. Through this discussion it was evident that there was mutual interest in potentially working together to address the needs at Sturgeon Lake. At Mr. Dunaski's request, HEI agreed to provide some initial comments on the situation along with a rough outline for a proposed approach to developing a solution.

BACKGROUND

The history of the high water conditions experienced at Sturgeon Lake are documented very well in the Sturgeon Lake High-Water Committee Report (December 2019). Per the Minnesota DNR's website, the lake was at an elevation of 1069.9 feet (NGVD 29 datum) on September 27, 2020, which is 0.8 feet above the ordinary high water level (OHW). The highest recorded elevation was 1070.84 feet (NGVD 29 datum) on October 25, 2019. Due to the absence of a natural outlet, it appears that an artificial outlet will be necessary to draw down and maintain the lake at a lower elevation. While water levels have retreated in recent years, Mr. Dunaski indicated that there remains interest in pursuing a long term solution to the high water issue. Mr. Dunaski also stated that Windemere Township would likely take the lead on a potential project that would address the issue at Sturgeon Lake. At the present time, the township was uncertain as to the funding for the development and future construction of a potential project.

INITIAL REVIEW

As outlined in the informational packet provided by HEI on April 22, 2021, HEI has an extensive amount of experience addressing situations nearly identical to that which stakeholders around Sturgeon Lake are facing. With this experience and expertise in mind, HEI completed a cursory review of the Sturgeon Lake High-Water Committee Report (December 2019) along with other publicly available maps, topographic data, and other information, all supplemented with input from Mark Dunaski. The following is a brief synopsis of HEI's initial review.

The situation at Sturgeon Lake is not unique, as there are many closed basin lakes throughout Minnesota that have experienced, or are currently experiencing, similar issues with water levels exceeding their OHW elevations for extended periods of time, particularly as Minnesota has experienced a wetter climate in recent years. With reference to the examples provided in HEI's informational packet, the high water issues at many of these lakes have been successfully addressed through the construction of outlet improvements that have allowed local entities to manage water levels on the lakes and mitigate the damages caused by periods of high water. Upon an initial review of Sturgeon Lake and the surrounding setting, HEI believes that a successful solution to the issue at Sturgeon Lake can be found.

As summarized in the Committee's 2019 report, various outlet alternatives were identified in the 1970s but were never advanced to final design or construction. While these alternatives may remain viable purely from an engineering standpoint, current regulatory requirements and the presence of Eurasian watermilfoil (EWM) in Sturgeon Lake may render some of the options to be very difficult, if not impossible, to implement. HEI has designed outlets for other lakes with EWM or other aquatic invasive species (AIS), with those projects typically involving pumping systems and mechanical filtration systems that prevent the transfer of AIS to downstream waterbodies. Provided necessary permits and land rights can be obtained, it appears that a similar pump/mechanical filtration system may be a viable option for Sturgeon Lake. There are other options for filtering AIS out of lake water before transferring it downstream, but many of these options present additional challenges in terms of construction footprints, cold weather operation, maintenance and reliability. These options could be investigated further if there was a desire to do so.

Ideally, the route for a project would avoid discharging filtered water from Sturgeon Lake into any of the other landlocked lakes in the area, instead discharging directly into one of the nearby creeks or rivers, or a lake naturally connected to one of those features. More specifically, discharging water into another landlocked lake could result in the need to filter the water again before the water leaves each of those lakes if they would happen to become infested with AIS. This would compound the construction and operation costs, so a direct route to a suitable outlet is generally sought out first.

One of the key considerations for any potential outlet alternative, particularly those that involve pumping systems, is the capacity of the system. Ultimately, the size of the system is based on many factors, including the rate at which water is flowing into the lake, how quickly stakeholders would like the lake drawn down, how far stakeholders would like to lower the water levels, and how well downstream water bodies can handle additional water from the lake. Some of these factors are technical in nature, while others are purely political. HEI took a cursory look at publicly available information on wells in the vicinity of Sturgeon Lake and found there to be consistent presence of clayey soils in the area. Assuming that the high water conditions at Sturgeon Lake are in some part being caused by groundwater inflows, HEI believes that there is a reasonable likelihood that a pumping system can be implemented that will be able to overcome the inflows to the lake without needing to be so large that it is not feasible to construct or operate. This belief is based off HEI's past experience with similar projects that have successfully lowered lake levels in settings with sandier soils and presumably higher rates of groundwater inflows.

As previously noted, HEI does not view the situation at Sturgeon Lake to be unique. Furthermore, we do not envision the eventual solution to the issue to end up being unique, either. Assuming this to be the case, provided that there are no unforeseen issues that arise, the successful completion of similar projects throughout

Minnesota would indicate that necessary permits and regulatory approvals can be acquired to construct a viable and successful project at Sturgeon Lake. This is not to say that there will not be challenges or significant hurdles to overcome, but we believe that there is a pathway to success based off our experience. As noted above, HEI has designed outlet systems for other lakes with AIS, including EWM, and those systems have been approved and permitted by the MNDNR and other regulatory agencies.

POTENTIAL APPROACH

While the situation at Sturgeon Lake may not be entirely unique, each lake offers its own challenges, whether it be related to local politics, topography, water quality, downstream conditions, or any of a multitude of other factors. As such, the approach to solving high water issues at any given lake should be tailored to that specific lake and the goals of each particular group of stakeholders. Regardless of the situation or the desired approach, HEI has the experience and expertise to help stakeholders develop and navigate the process of developing successful solutions.

Should Windemere Township and/or other stakeholders wish to proceed with a potential outlet project, the first step would likely involve an initial feasibility study. The scope, and associated cost, of that study will depend upon the level of detail the stakeholders desire and how far they would like to advance the project before making key decisions. For the purpose of providing some context, an initial feasibility study could range anywhere from \$5,000 to \$100,000 or more, depending on the scope. Thus, further discussions should be had between HEI, Windemere Township, and any other stakeholders that wish to be engaged in the process of scoping out the feasibility study.

As a starting point, HEI would suggest proceeding with a preliminary feasibility study involving a desktop review of the groundwater setting around Sturgeon Lake. This would provide further context to the recharge rate and the potential for water to return to the lake after it is pumped or allowed to flow out of the lake. Combined with a high level analysis of the surface flows into the lake and a basic water balance analysis (i.e., inflows, outflows, precipitation, evaporation, etc.), an order of magnitude estimate can be made in terms of the necessary outlet capacity. This could include a range of outlet sizes tied to a range of potential drawdown periods (i.e., months or years). The study would also include a desktop review of the potential outlets that have already been identified along with new alternatives that may be feasible. This review would include a list of pros, cons and challenges with each alternative. In turn, an order of magnitude estimate of the costs for potential outlet sizes and configurations can be derived from knowledge gained from other similar projects. This information would provide Windemere Township and other stakeholders with some context as far as what a potential might look like, how it would work and what it would potentially cost. From there, if there is a desire to proceed the next steps in the process can be scoped out. The cost for the preliminary feasibility study outlined above would depend up on the level of detail desired by the stakeholders, but it is likely to range between \$15,000 and \$25,000.