1601 Fifth Avenue, Suite 1600 Seattle, WA 98101 206.622.5822 kpff.com

June 8, 2022

Doug Yormick
Associate Environmental Planner
City of Issaquah Department of Planning and Development
PO Box 1307
Issaquah, WA 98027

Subject: Hyla Crossing Pumped Stormwater Discharge
Lake Sammamish Level Study

Dear Doug:

Based on public comment during the City's requested neighborhood environmental review (post Planned Action Ordinance and associated Project level SEPA MDNS) over the Hyla Crossing Pumped Stormwater Discharge (Project) near shore outfall to Lake Sammamish, the city requested Rowley Properties to study the Project's effect on Lake Sammamish's water level. Attached to this letter is the requested analysis by West Consultants, Inc., a respected local hydrologic and water resources engineering firm.

PROJECT DESCRIPTION

Currently, the majority of stormwater runoff from approximately 48 acres of Hyla Crossing is conveyed mostly un-detained via catch basins and pipes to Tibbetts Creek via existing outfalls and the WSDOT I-90 East-Bound ditch. During the preparation of the Hyla Crossing Master Development Agreement, it was determined that traditional buried or surface storm detention was infeasible due to the extremely poor soils and high groundwater table. The solution documented in the Master Development Agreement and approved by a Final SEPA Mitigated Determination of Non-Significance was to pump the equivalent of the storm detention requirement to Lake Sammamish. In essence, the proposed pump station is a substitute for a typical storm detention system.

The Project did consider traditional detention onsite with discharges only to Tibbetts Creek. The detention vault required to achieve the same hydraulic performance as the pump station would contain approximately 558,000-cubic feet of storage. The excavation for this vault would be approximately 20-feet deep to allow gravity flow from upstream storm drain systems. Given the high groundwater table on the site, the uplift pressures on this large of a structure at ±20-foot depth would be infeasibly high to resist with traditional structural methods. Vertical soil anchors were considered to resist uplift on the vault floor; however, the peat soils make those infeasible as well.

Attached appendix contains exhibits that visually explain the scope of the Project.

ENVIRONMENTAL COMPLIANCE

The City of Issaquah drainage manual, as well as all other Western Washington drainage manuals, designate Lake Sammamish as a Flow Control Exempt Receiving Water Body. Essentially, this means that the lake and its outfall have sufficient capacity to accept runoff from current and future developments within its drainage basin with no significant environmental damage. This designation allows for direct discharge of stormwater to the lake from new development without any flow control. Water quality standards are, of course, still applicable to lake discharges.

Tibbetts Creek is listed as a fish bearing water body and is therefore subject to the Flow Control Performance Standard. This standard is intended to mimic forested or wetland conditions that were present prior to original development in which natural land conditions release stormwater runoff slower than developed land conditions. Increased rate of stormwater discharge due to hard surface development cause erosion and sedimentation buildup in the stream channel that harms fish spawning viability.

The Project proposes to divert the excess stormwater generated from new development from the sensitive Tibbetts Creek to the more robust and flow control exempt Lake Sammamish. Base flows to Tibbetts Creek are maintained to preserve its aquatic habitat. By protecting Tibbetts Creek through the diversion of excess flows to Lake Sammamish, the Project is proposing the better environmental solution in compliance with the City of Issaquah drainage manual.

SUMMARY

The residents along the southern shoreline of Lake Sammamish have realized real impacts to their shoreline improvements caused by extreme weather conditions and the way the lake outfall is managed. By bringing this to our attention, we have responded by:

1. Hiring West Consultants to analyze the Project's contribution to the lake level. As shown in the attached study, the Project's contribution to lake level is negligible.

2. Engaging King County to better understand the issues associated with the lake basin. We now understand this year King County will be hiring a consultant to perform a comprehensive lake study to develop recommendations for improvements and managing the lake basin.

Sincerely,

Martin F. Chase, PE
Principal

1800530

Technical Memorandum

WEST Consultants, Inc.
12509 Bel-Red Road, Suite 100
Bellevue, WA 98005-2535
(425) 646-8806 (office)
(425) 646-0570 (fax)
www.westconsultants.com

Date: June 7, 2022
To: Chris Borzio, KPFF
From: Raymond Walton, PhD, PE, D.WRE
Subject: Lake Sammamish Impacts from Hyla Crossing Stormwater Discharges

1. INTRODUCTION

The Hyla Crossing Pumped Stormwater Discharge project is intended to manage flows from a future development of 47.7 acres of Commercial Property in Issaquah, Washington. The project proposes to manage on-site stormwater by pumping the predeveloped base flow runoff directly to Tibbetts Creek and the equivalent of the storm detention requirement pumped directly to Lake Sammamish. Post-developed overflow runoff exceeding the storm detention requirements would gravity flow to Tibbetts Creek similar to a typical storm detention system. In essence, the proposed pump station is a substitute for a typical buried storm detention system.

Concern has been raised that these discharges to Lake Sammamish will ultimately raise levels in Lake Sammamish and negatively alter lakeside structures. The purpose of this technical memorandum is to evaluate these questions below.

From a hydrologic and hydraulic (H&H) point of view, the two questions to be addressed are:

1. Will the discharges from the development cause any increase in water surface elevations (WSELs) in Lake Sammamish compared to existing conditions, and
2. Will the pumped discharge to the small cove to the west of where Tibbetts Creek enters Lake Sammamish significantly elevate WSELs in the cove, and impact the docks of nearby homeowners?

2. Impacts to Water Levels in Lake Sammamish

KPFF is evaluating a design concept in which stormwater runoff from the site is split between a discharge to Tibbetts Creek that mimics a pre-development condition and discharging excess flow to a cove of Lake Sammamish just to the west of where Tibbetts Creek enters Lake Sammamish ("Proposed" Condition). In addition, they are comparing the effects of stormwater detention ("Detention" Condition) to the "Proposed" Condition. In the "Detention" Condition scenario, they

considered a vault that would collect and store stormwater and release it to Tibbetts Creek so as not to exceed the maximum pre-development discharge. The concern expressed by some property owners is that the stormwater discharges from project site to Lake Sammamish could increase water surface elevations (WSELs) in Lake Sammamish.

To evaluate the potential impacts of stormwater discharges on WSELs in Lake Sammamish, KPFF provided output from a hydrologic model run for a 60-year period for "Existing", "Proposed", and "Detention" conditions. The results were provided as hourly discharges. Table 1 lists the average stormwater discharge for each condition modeled. The table also lists the maximum difference in hourly discharges compared to "Existing" conditions. This would be the upper limit of any increase in flow that might be seen at the outlet weir at the north end of Lake Sammamish.

Table 1. Average Stormwater Discharges

Condition	Average Stormwater Discharge	Maximum Hourly Discharge (date)	Maximum Increase in Hourly Discharge	Maximum Increase in 24-hour running average discharges
Existing	0.23 cfs	33.9 cfs (11/4/1998)		
Proposed[1]	0.22 cfs	31.8 cfs (11/4/1998)	0.4 cfs	0.3 cfs
Detention	0.22 cfs	Discharge smoothed	9.4 cfs	4.7 cfs

Note: [1] "Proposed" condition includes discharges to Tibbetts Creek and the pumped runoff to the Cove

Lake Sammamish is about 7.3 miles long and has an average depth of 58 feet. Therefore, the wave celerity (wave speed) is approximately 43.2 ft/sec and the travel time of a gravity wave from the mouth of Tibbetts Creek to the north end of the Lake is approximately 15 minutes. There is an overflow weir in Marymoor Park that controls water levels in Lake Sammamish and outflows to the upper Sammamish River. This travel time is significantly less than the interval (one hour) of the results from the hydrologic model, and therefore we can assume that discharges to the south end of Lake Sammamish are "felt" at the northern end, and the overflow weir, within the resolution of the hydrologic model's output. We can also assume that, to first order, Lake WSELs are essentially flat, in the absence of non-discharge conditions (such as wind).

The average annual discharge at USGS streamflow gauge 12125200, Sammamish River Near Woodinville, is 311 cfs. However, the County believes that discharges from Lake Sammamish are influenced by backwater from Bear Creek. King County has a gauge, M51, located in the Sammamish River but closer to the lake's outlet. Using available M51 data from July 2001 to May 2022, the minimum reported flow is 16.1 cfs. We will assume that this would be a "worst case" low discharge to the Sammamish River during conditions in which stormwater from the Hyla Crossing project is being discharged to Lake Sammamish, as the rainy season will generally see larger flows in the Sammamish River and higher Lake levels.

King County developed a hydraulic model of the Sammamish River and included Lake Sammamish at the upstream extent. The model also includes the outlet weir in Marymoor Park, Redmond that controls WSELs in Lake Sammamish. Table 2 shows the part of the elevation-volume curve developed for the hydraulic model that covers the operating range of Lake Sammamish.

Table 2. Lake Sammamish Elevation-Volume Table

Stage	Volume
20.4 ft NAVD88	238,751 ac-ft
32.6 ft NAVD88	296,143 ac-ft

The maximum hourly difference in stormwater discharges to Lake Sammamish is 0.4 cfs (Table 1). Using the information in Table 2, it would take a discharge of 0.4 cfs about 24 days to increase the Lake level by 0.01 and more than 2 days to increase it by 0.001 feet. And during any long averaging period, the averaged flow difference would decrease. For example, the maximum 2-day difference is 0.23 cfs, which would lengthen the appropriate averaging period.

To evaluate the difference in Lake Sammamish WSELs, we used the King County Sammamish River model to develop a rating curve of elevations versus flow at the outlet weir from Lake Sammamish. From this rating curve, an increase in outflow from the minimum value of 16.1 cfs (reported at King County's M51 gauge) by 0.23 cfs would increase the water surface elevation by only 0.003 feet. Under maximum (but unrealistic) detention basin conditions, the increase would be about 0.06 feet for a maximum daily increase of 0.47 cfs.

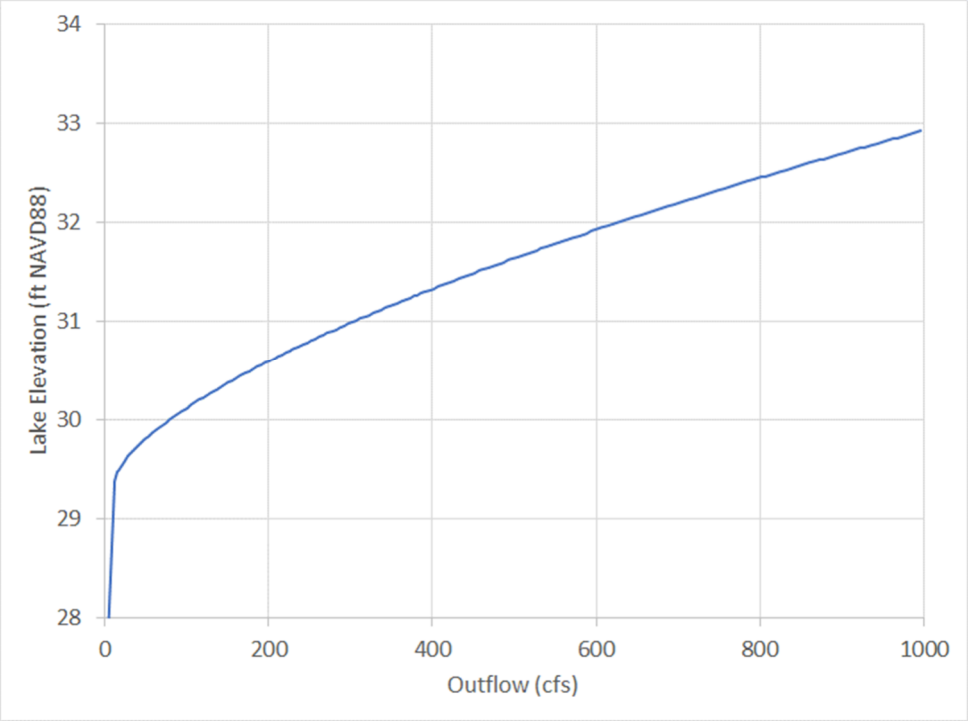

Figure 1. Rating Curve at Lake Sammamish Outlet Weir from King County Model of Sammamish River

This is a conservative estimate of "increases" in Lake Sammamish WSELs, and does not consider many other factors, such as wind and offsetting decreases in Lake WSELs.

3. Effect of Discharges to Cove West of Tibbetts Creek

The results of the hydrologic model show a maximum discharge to the cove at the north side of Lake Sammamish Park of 11.6 cfs. To evaluate the impact of this maximum discharge on WSELs in the cove, we developed a two-dimensional (2D) hydraulic model of the cove using HEC-RAS version 6.2. Figure 2 shows the 2D grid used, developed using a resolution of 20 feet, and the location of boundary conditions. A constant inflow of 11.6 cfs was specified at the inflow boundary and a fixed WSEL of 32 feet specified at the "Cove Boundary". A uniform Manning's *n* roughness value of 0.03 was specified.

The terrain was developed using a combination of (1) a bathymetric survey of part of the cove provided by KPFF, (2) 5-feet contours of the lake developed from soundings obtained by King County, and (3) the most recent LiDAR coverage of the area. These data were "blended" to match the boundary between 5-feet sounding contour data and LiDAR, and then imposing the site bathymetry where measured.

Figure 3 shows the terrain after all three data sources are "blended". As can be seen in the figure, the depths in the bathymetric survey area are up to 15 feet deeper than shown in the terrain developed without the bathymetric survey (Figure 4). As we would expect a greater increase in WSELs for shallower flows, we elected to use the terrain shown in Figure 4, without the bathymetric survey, to be conservative.

The results of the model (Figure 5) show an increase in WSEL of 0.00002 feet at the mouth of the smaller cover near the discharge location and no increase (to 5 decimal places) at the dock closest to the discharge location. These increases are well within the normal "no rise" criterion of 0.00 feet and represent no significant increases in WSELs.

Figure 2. Grid Used to Evaluate Cove Discharge

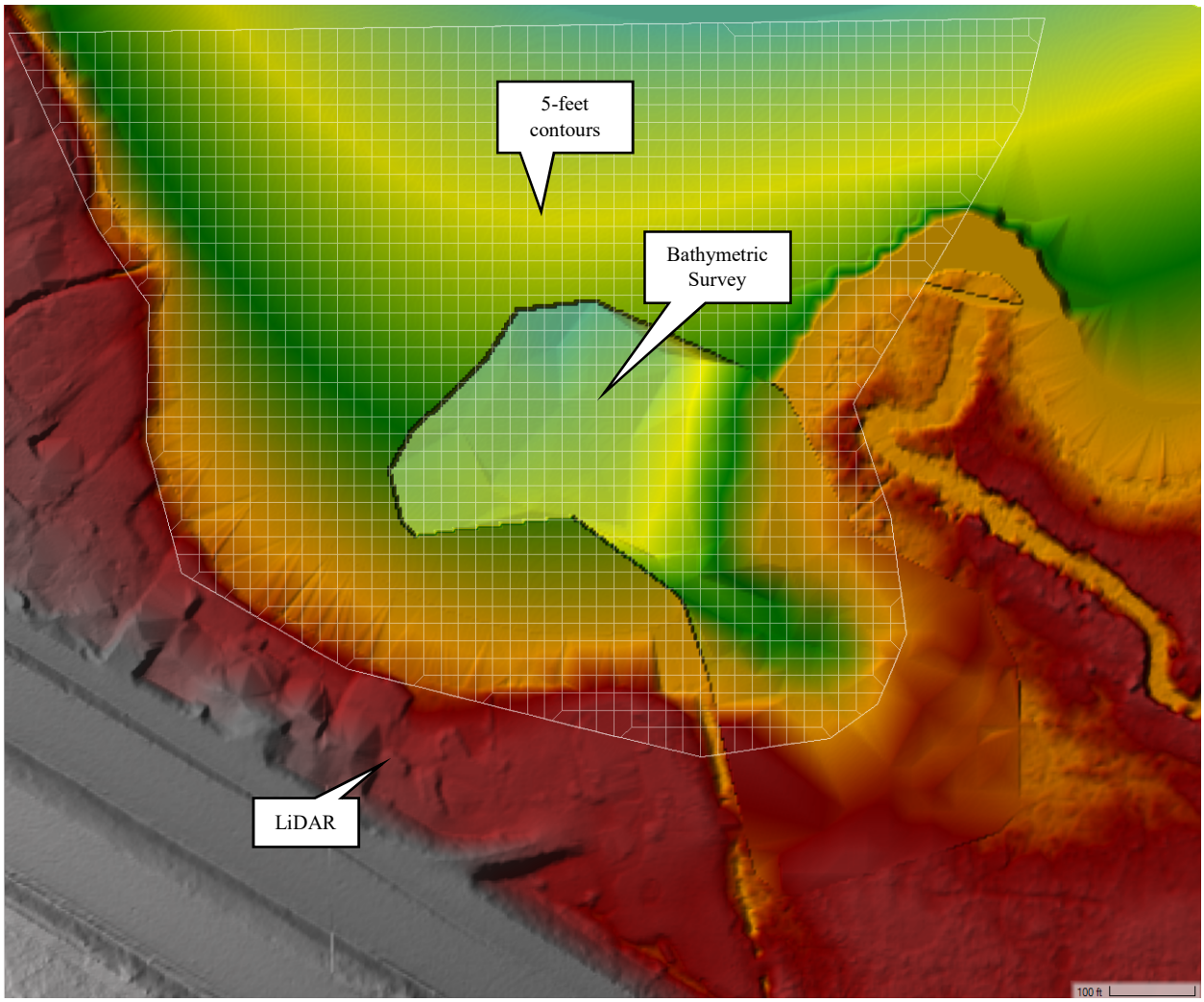

Figure 3. Blended Terrain for Cove Model

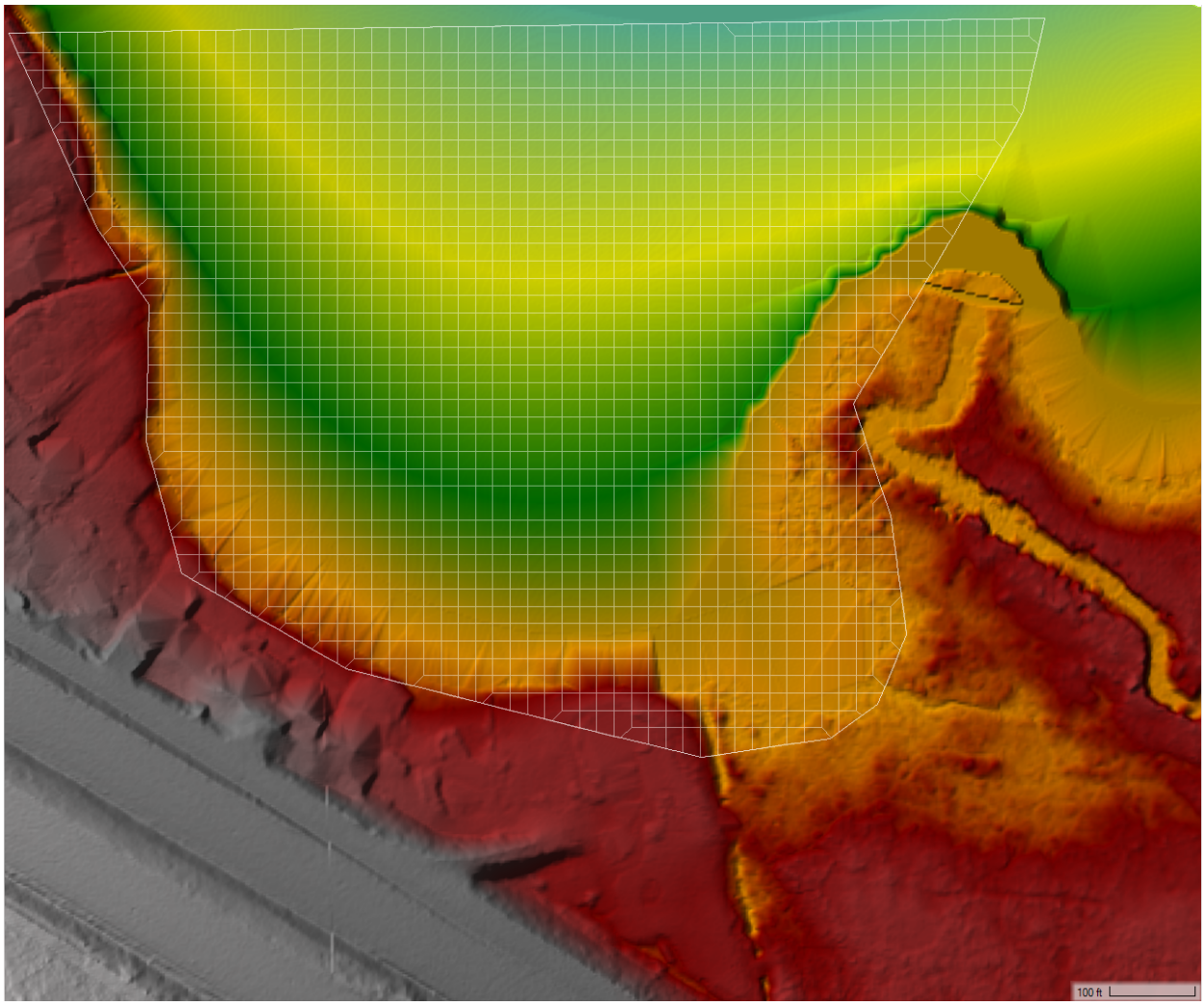

Figure 4. Blended Soundings and LiDAR for Cove Model

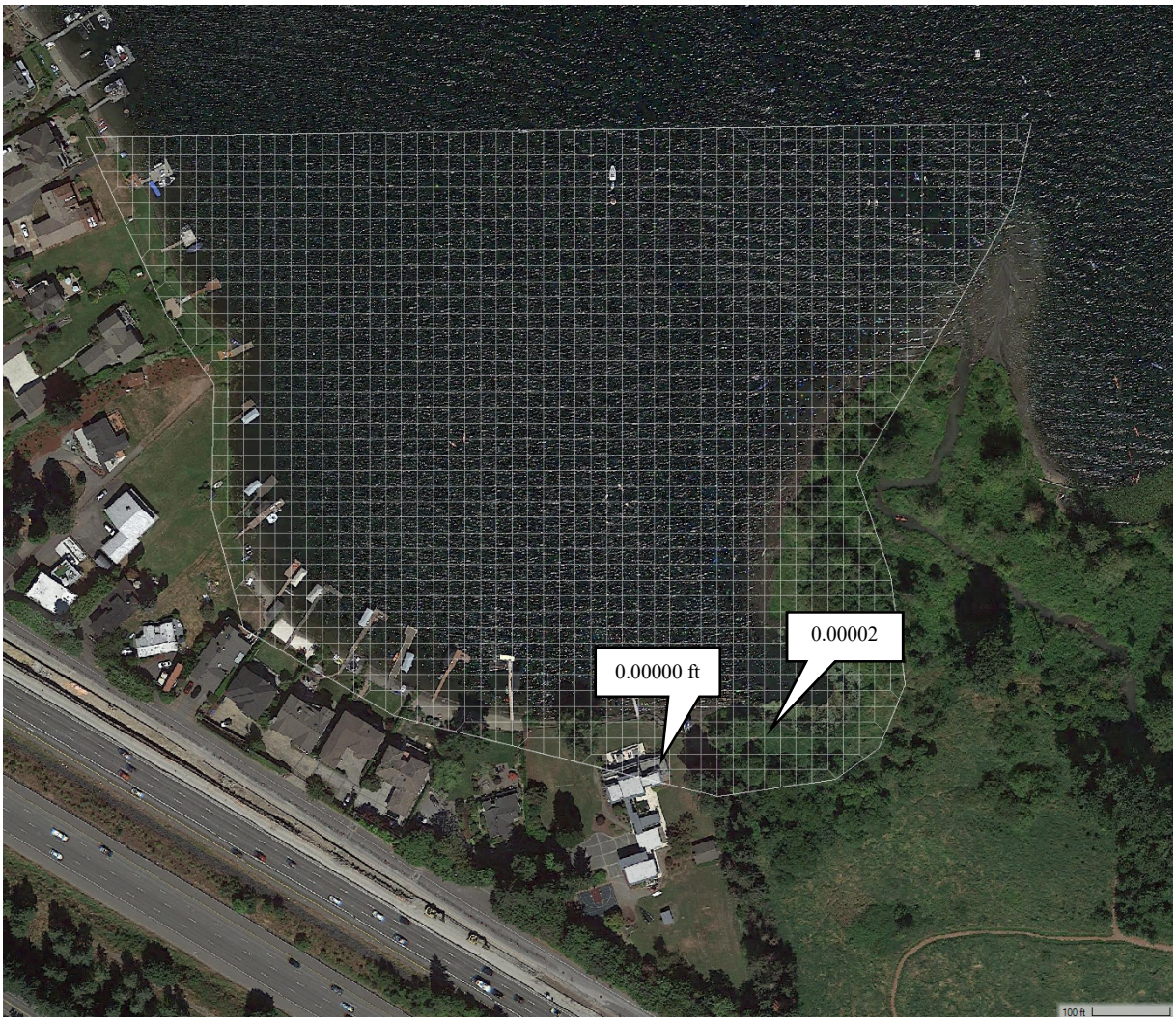

Figure 5. Maximum Increases in Water Surface Elevations

4. CONCLUSIONS

In addressing the two issues raised in the Introduction, the analyses showed:

1. Overall Lake Sammamish WSELs would decrease as the project would decrease the average annual discharge from 0.23 cfs to 0.22 cfs under both "Proposed" and "Detention" conditions.
2. The analysis shows that under "Proposed" Conditions, the maximum increase in Lake Sammamish WSELs is 0.003 feet. This "worst case" estimate assumes high stormwater discharges from the Hyla Crossing Project during extreme low outflows from Lake Sammamish.
3. The maximum pumped discharge of water to the cove to the west of the mouth of Tibbetts Creek would result in no increase (to 5 decimal places) at the dock closest to the discharge location.
4. Both of these WSEL maximum increases are well within the normal "no rise" criterion of 0.00 feet (to two decimal places).