TECHNICAL MEMORANDUM

THE WATERSHED COMPANY

Date:	November 20, 2019
To:	Melissa Place, Senior Planner, City of Lake Stevens
From:	Greg Johnston, CFP – Senior Fisheries Biologist
	Ryan Kahlo, PWS – Senior Wetlands Biologist
Project Number:	170232
Project Name:	On-Call Review, Lake Stevens Costco Site

Subject: Lake Stevens Costco Peer Review of Critical Area & Culvert Design Documentation

1 Introduction

This technical memorandum provides peer review of critical area and culvert design documentation associated with the proposed Costco development in Lake Stevens. This documentation was reviewed for consistency with best available science and for consistency with the Lake Stevens Municipal Code (LSMC) Chapter 14.88 as it relates to the implementation of best available science.[1] A site visit was conducted by the report authors to verify the existing conditions.

Preparation of this technical memorandum included review of the following key environmental support documents submitted by the applicant:

- *Costco Wholesale Lake Stevens – Impacts and Mitigation Report CW #17-0230, SWC Job #18-05* (Sewall Wetland Consulting, Inc. 9/17/2019) (referred to in this technical memorandum as "Mitigation Report").
- *Critical Area Mitigation Project Proposed Lake Stevens Costco Wholesale Lake Stevens, Washington* (Sewell Wetland Consulting, Inc. 10/16/2019) (referred to in this technical memorandum as "Mitigation Plan").
- *Revised Mitigation Bank Use Plan Costco Lake Stevens and City of Lake Stevens 24th Street Extension Project* (Sewall Wetland Consulting, Inc. 10/17/2019) (referred to in this technical memorandum as "Bank Use Plan").

[1] As directed by the City of Lake Stevens, we reviewed an older version of LSMC Chapter 14.88 to which the project is vested; Chapter 14.88 has since been amended.

- *Recommended Culvert Sizing Analysis Mosher Creek and Tributary – 2514 and 2520 Lake Stevens Road* (Cedarock Consultants, Inc. 8/14/2019).

- *Recommended Culvert Sizing Analysis Lake Stevens Road at SR-9* (Cedarock Consultants, Inc. 3/26/2019).

2 Technical Analysis

Wetland Mitigation Approach

Compensatory wetland mitigation is proposed using a combination of on-site wetland creation, replacement/removal of downstream fish passage barriers, and purchase of wetland mitigation bank credits for permanent wetland impacts totaling 1.84 acres. The project proposes 0.82 acre of on-site wetland creation and 0.15 acre of on-site wetland buffer creation; the replacement of four culverts for fish-passage improvement and the complete removal of three additional fish-impassible culverts; and the purchase of 1.664 wetland mitigation bank credits from the Snohomish Basin Mitigation Bank (SBMB). The project proposes innovative development design, in accordance with LSMC 14.88.298, to allow for a reduction of the standard 95-foot buffer to a 25-foot buffer for the proposed on-site wetland creation area and remaining portions of the partially filled Wetland D.

On-site Wetland Mitigation Peer Review Comments

1. The project proposes maximizing on-site wetland creation to, at a minimum, maintain an area equivalent to the existing size of Wetland D, a large Category II depressional wetland that also functions as the headwaters for a tributary to Mosher Creek. Per the Mitigation Plan, a total of 0.741 acre of Wetland D would be filled, and 0.822 acre would be created, resulting in a net expansion of Wetland D. LSMC 14.88.840(f) requires a 3:1 wetland creation ratio for impacts to Category II wetlands. The Mitigation Report notes that "a 3:1 ratio would compensate for 14,136sf (0.32ac) of Category II wetland" and that the remainder of impacts to Wetland D (0.418 acre), as well as all remaining impacts, including filling all or portions of Wetlands A, B, C, F, J, and Z, would be mitigated using the SBMB.

   The area calculation for 3:1 wetland creation ratio is incorrect. Creating 0.822 acre of wetland at a 3:1 ratio would compensate for 0.274 acre of Category II wetland loss, not 0.32 acre. As a potential remedy, the additional 0.046 acre could be incorporated into the proposed transfer of wetland mitigation credits at SBMB.

2. The Mitigation Plan proposes replacing/removing several downstream culverts, including the outlet for Wetland D. A new, larger culvert has the potential to affect the inundation levels in Wetland D. The applicant should provide an analysis outlining how the proposed culvert design, including elevation, invert, and bedding materials, maintains the existing hydrologic conditions in Wetland D and does not result in draining any portions of the inundated areas.

3. The wetland fill summary in the Mitigation Plan (Sheet 2 of 12) is inconsistent with the "Legend" in identifying the total area of proposed wetland fill. The summary notes 80,197 square feet of wetland fill; the legend notes 79,574 square feet. The applicant should ensure that all impact and mitigation areas are consistent across documents.

4. Wetland J is mislabeled as Category II wetland on the Mitigation Plan (Sheet 2 of 12). Wetland J is a Category III wetland, per all other current and previous documentation. The label should be corrected for consistency.

5. The Mitigation Plan includes two areas of emergent plantings only. The plan should incorporate performance standards applicable to emergent plant communities. We recommend a standard of 90 percent areal cover of native emergent vegetation by Year 5.

6. The Mitigation Plan monitoring schedule (Table 1, Sheet 1 of 12) states that monitoring is conducted in Years 1, 2 and 3 for the native plant and noxious weed performance standards. At the end of three years, most mitigation plants are only just starting to put on significant growth and is therefore not enough time to evaluate the ultimate success of a mitigation plan. This should be revised to include Years 4 and 5.

7. The proposed wetland creation risks the spread of noxious weeds, particularly reed canarygrass, for which there is a substantial seed source in the vicinity. We recommend a contingency specific to reed canarygrass control, particularly in the proposed emergent plant communities.

8. We recommend the wetland creation areas be redelineated in Years 3 and 5 to ensure wetland criteria are satisfied. If, by Year 3, wetland criteria have not been satisfied in all or part of the wetland creation area, contingencies can be initiated. If by Year 5,

wetland criteria have not been satisfied all or part of the wetland creation area, additional wetland mitigation bank credits may be required.

Bank Use Plan Peer Review Comments

1. The Bank Use Plan states that "a portion of the impact to Wetland D will be mitigated on site with creation of 42,407 sf of wetland." The area calculation is inconsistent with the wetland creation areas quantified in the Mitigation Plan, which identifies 35,786 square feet of wetland creation. (The 42,407-square-foot number appears to be the source of the miscalculation that the on-site wetland creation area compensates for 0.32 acre of wetland fill. See "On-site Wetland Mitigation Peer Review Comments" item 1, above.) The Bank Use Plan, it seems, is including portions of the proposed 25-foot buffer proposed around Wetland D as wetland creation. Buffer areas around proposed compensatory wetland creation are necessary to protect the wetland functions and should not be included as part of the wetland creation area for determining the appropriate mitigation ratio. These area calculations should be revised, including incorporating the wetland-as-buffer recommendations in "Review of Regulatory Considerations" item #2, below, and be consistent across all submittal materials.

2. Table 2 of the Bank Use Plan notes that 0.290 acre of Wetland A will be permanently filled. The Mitigation Plan notes that 0.292 acre of Wetland A will be filled. This discrepancy should be rectified, and all area calculations revised to be consistent across all submittal materials.

Culvert Peer Review Comments

Culvert Design

The comments below relate to the proposed culvert replacements on Mosher Creek, Mosher Creek tributary (both tributaries of Ebey Slough), and an unnamed tributary beneath SE Lake Stevens Road (a tributary of Centennial Creek and, in turn, the Pilchuck River) as designed in the Mitigation Plan.

All Culverts

1. We recommend the applicant evaluate the inherent detention and attendant flow attenuation that may be present in each of the subject creek basins due to potentially undersized culverts. We further recommend addressing whether there may be a

potential for larger replacement culverts to release streamflow at increased rates, in turn resulting in downstream erosion and/or flooding.

Culverts to Be Removed (#2, #4, and #5)

2. For the cross-section depictions of each, the width and depth dimensions of the low-flow channels are not provided, and these dimensions will be needed in order to accurately construct the channel sections. The top channel width for each is stated as "As needed to match existing not greater than 5'". The "not greater than 5'" part should be struck because the top width would be determined by the specified slopes and the to-be-specified dimensions. Limiting the top width could result in a conflict with these slopes and dimensions.

3. A note in the stream gravel mix specification for culverts #4 and #5 reads: "Stream gravel shall be laid on the native soil to a minimum depth of 6 inches." For culvert #2, the note reads: "Stream gravel shall be laid on the native soil to a depth of 3 to 4 inches." However, dimensions on each of their sections indicate a depth of three inches. These gravel depths should be reviewed by the applicant, re-evaluated, and revised as necessary such that they are appropriate and consistent.

Replaced Culverts #1, #3 & #6

4. A note in the stream gravel mix specification for each reads: "Stream gravel shall be laid on the native soil to a depth of 3 to 4 inches." However, dimensions on the sections indicate a depth of at least one foot. As for the culverts to be removed, these gravel depths should be reviewed, re-evaluated, and revised as necessary by the applicant such that they are appropriate and consistent

Replaced Culverts #1 & #3

5. Care needs to be taken to ensure that wetland water levels extending upstream from each of these culverts is not lowered due to the placement of a permeable gravel substrate to form the stream bed beneath each of these crossings. Sufficient fine clay or silt materials, either existing or placed, should extend immediately upstream of each crossing such that water is not drained out of each wetland below the surface through the porous substrate. See "On-site Wetland Mitigation Peer Review Comments" item 2, above.

SE Lake Stevens Road Culvert

6. A note on the culvert profile states that the gradation of the culvert bed material is to match the existing bed material in the adjoining stream. That the stream gravel mix gradation on Sheet 12/12 of the Mitigation Plan satisfies this match should be verified, including comparisons to the adjoining upstream channel section as well as the adjoining downstream channel section. Furthermore, the stability of the proposed stream gravel mix gradation as shown on Sheet 12/12 should be evaluated by the applicant such that a suitable depth and gradation of gravel will remain within the culvert over time in consideration of anticipated peak flows.

7. The upstream channel gradient is given as approximately three percent, and the gradient proposed within the culvert matches this, also at three percent. However, the downstream gradient appears to be about ten percent, much steeper. Given that the gradient within the culvert matches the upper channel section, but not the much steeper lower channel section, we perceive that there is substantial risk of the gravel within the culvert eventually being swept downstream and out of the culvert to expose the box culvert's concrete bottom. Furthermore, the downstream channel section may downcut over time and a deeper, lower-elevation channel may form below the culvert outfall, creating a plunge which could be impassable to fish and further cause the gravel substrate to be eroded out of the culvert, as described above. A downcut channel section may form first well below the culvert and then work its way upstream via a nickpoint until it reaches the culvert outfall.

   We recommend that the applicant modify the design as needed to preclude this eventuality. A bottomless culvert with deep footings, placed well below any reasonably anticipated channel downcutting within the culvert, should be considered. Substrate gradation and depth, and how far downstream of the culvert outfall to extend the placement these substrate materials, should also be given further consideration. Ensuring that the channel section extending immediately downstream of the new culvert outfall is resistant to downcutting will serve to prevent or limit plunge formation at the outfall (if the culvert has a bottom) or downcutting within the culvert itself (if bottomless) going forward.

8. Section B-B of the Mitigation Plan (Sheet 12 of 12) shows six to nine inches of gravel placed along a new channel section. We recommend that the applicant increase this depth, or substantiate the specified depth. Channel dimensions are not shown and should be provided.

9. In Section A-A of the Mitigation Plan (Sheet 12 of 12), streambed gravel is shown as being placed at a 1:1 slope. Unless it can be substantiated by the applicant that this slope (45 degrees) is below this material's angle of repose and/or that the material will otherwise be able to hold that slope with a reasonable degree of stability, we recommend that this slope be reduced.

Culvert Sizing Analysis

The comments below relate to the two culvert sizing analyses prepared by Cedarock Consultants, Inc. (*Recommended Culvert Sizing Analysis Mosher Creek and Tributary – 2514 and 2520 Lake Stevens Road* [August 14, 2019]) and (*Recommended Culvert Sizing Analysis Lake Stevens Road at SR-9* [March 26, 2019]). The purpose of the analyses was to identify widths for new culverts according to Washington State Department of Fish and Wildlife's *Water Crossing Design Guidelines* (https://wdfw.wa.gov/sites/default/files/publications/01501/draft_wdfw01501.pdf) that will provide unimpeded fish passage, and which will also pass flow, sediment, and debris up to the 100-year event.

Mosher Creek and Tributary – 2514 and 2520 Lake Stevens Road

1. Page 1, 1st Paragraph. Not all three of the replacement culverts are on the unnamed tributary, one of the three is along Mosher Creek. We recommend updating to indicate that Culvert 6 is located along Mosher Creek and not the tributary.

2. Page 1, 1st Paragraph. On Figure 1, the replacement culverts are numbered 1, 3, and 6 and these are the only culverts addressed elsewhere in the memo. As is shown on the mitigation plan sheets, we recommend indicating that culverts 2, 4, and 5 are also present but will be removed.

3. Page 1, 3rd Paragraph. Clarify if the channel was walked from 100 feet upstream of Culvert 1 to 50 feet downstream of Culvert 6. Provide the total length investigated, including the distances between the culverts. Also, see Comment 5, below.

4. Page 1, 3rd Paragraph. It is stated that "All flow passes through several 8-inch culverts without flooding." Our field measurements indicated that all of the culverts were 12 inches in diameter or larger. The culvert diameters should be checked and corrected as necessary. The statement that "All flow passes through several 8-inch culverts" should be retracted.

5. Page 3, 1st Paragraph. It is stated that the channel width "is the average bankfull channel width over the crossing area and 200 feet upstream and downstream." According to previous text (Page 1, 3rd paragraph), "The channel was walked for about 100 feet upstream (north) and 50 feet downstream of the site." Not 200 feet upstream and downstream. The discrepancy should be explained.

6. Page 3, 3rd Paragraph. State why the bankfull width for Crossing #1 is based on a single measurement. Is it because only a short section of defined channel is present due to the wetlands?

7. Overall. Methodologies for measuring bankfull width indicate that highly modified channel sections should be avoided and that this parameter is better measured at representative, naturally-formed channel sections if possible. Given that the channel appears at least somewhat modified along these streams near the subject culvert locations, provide an explanation of how the measured bankfull widths in this setting provides suitable and valid estimates of bankfull width for the purposes of culvert design. The applicant should clarify whether an identifiable floodplain is present and, if not, how bankfull width was determined in the absence.

8. The City should consider requiring the applicant incorporate a climate change escalator into the culvert sizing analysis. In 2016, WDFW published a final project report *Incorporating Climate Change into the Design of Water Crossing Structures* (https://wdfw.wa.gov/publications/01867) describes a study they conducted to explore how climate-related changes to stream channel morphology could be incorporated into the design of water crossing structures such as culverts. Models employed in their analysis were applied to eight ecoregions across the state for two time periods, 2040 and 2080, to project percent change in stream bankfull width.

   Mosher Creek, as part of the Puget Lowland sub-ecoregion, has a mean projected percent change in bankfull width of five to ten percent in both time periods. To anticipate future increases in bankfull width due to climate change, bankfull widths used for stream simulation designs may need be increased accordingly.

SE Lake Stevens Road Culvert Replacement

1. Page 1, 1st Paragraph. We recommend indicating that a roundabout will be placed at the intersection, as opposed to additional turn lanes as stated.

2. Page 2, 4th Paragraph. It is stated that the width of channel is the average bankfull width. However, methodologies indicate that highly modified channel sections should be avoided when measuring bankfull width and that this parameter is better measured at representative or naturally-formed channel sections if possible, rather than a strict average. Given the heavily modified and, therefore, non-representative channel sections prevalent near the culvert location, the applicant should provide an explanation of how the measured bankfull widths in this setting provide a valid estimate of bankfull width for the purposes of culvert design.

3. Page 2, 4th Paragraph. The applicant should clarify whether an identifiable floodplain is present and, if not, how bankfull width was determined in the absence.

4. Page 3, 1st Paragraph. It is stated that two bankfull width measurements were taken with a range of 4.0 to 4.5 feet. If so, then those measurements must have been 4.0 and 4.5 feet and their average would have been 4.25 feet, not 4.5 feet as stated. We recommend correcting the calculation of average bankfull width based on apparent measurements of 4.0 and 4.5 feet.

5. The City should consider requiring a climate change escalator be incorporated into the culvert sizing analysis. In 2016, WDFW published a final project report *Incorporating Climate Change into the Design of Water Crossing Structures* (https://wdfw.wa.gov/publications/01867) that describes a study they conducted to explore how climate-related changes to stream channel morphology could be incorporated into the design of water crossing structures such as culverts (WDFW, 2016). Models employed in their analysis were applied to eight ecoregions across the state for two time periods, 2040 and 2080, to project percent change in stream bankfull width.

   Centennial Creek, as part of the Puget Lowland sub-ecoregion, has a mean projected percent change in bankfull width of 5 to 10 percent in both time periods. To anticipate future increases in bankfull width due to climate change, bankfull widths used for stream simulation designs may need be increased accordingly.

3 Review of Regulatory Considerations

1. The proposed Mitigation Plan creates multiple non-conformances, including the proposed 25-foot buffer on the north and east sides of the Wetland D mitigation area.

LSMC 14.88.830(a) states: "Any wetland created, restored, or enhanced as compensation for approved wetland alterations shall also include the standard buffer required for the category of the created, restored, or enhanced wetland." The proposed location of 24th Street SE as well as the proposed access road connecting with 24th Street SE through Wetland A would not comply with the LSMC, thus creating new non-conformances. The project proposes innovative design to allow for the reduction of the buffer to 25 feet, specifically the removal/replacement of fish passage barriers downstream, in coordination with requests from the Tulalip Tribe. LSMC 14.88.298(b)(1) requires applicants proposed innovative design to "achieve protection equivalent to or better than the treatment of the functions and values of the critical areas that would be obtained by applying the standard prescriptive measures contained in this chapter." LSMC 14.88.298(b)(4), directs applicants incorporating innovative design as a means to deviate from the standard buffer provisions to "consider measures prescribed in the Puget Sound Action Team 2005 Technical Guidance Manual for Low Impact Development." This technical guidance manual describes innovative site design techniques and materials that lessen the impact of a proposed development. Through decreasing the impacts that a proposed development may have on critical areas, including wetlands, smaller buffers can be sufficient to provide equivalent or greater protective functions compared to the standard buffers without the innovative/low-impact design. While the fish passage improvements will provide additional potential wetland functions, specifically rearing and/or overwintering habitat for juvenile salmonids, this measure does not provide equal or greater buffer functions associated with the reduction of the 95-foot buffer to 25 feet. Maintaining a 25-foot buffer around a wetland mitigation site adjacent to a high intensity commercial land use is insufficient per best available science, and the approach does not reduce the intensity/impact of the associated land use.

According to *Wetland Mitigation in Washington State – Part 1, Version 1* (Ecology 2006), referred to in this technical memorandum as "Wetland Mitigation Guidance", wetland mitigation sites require adequate buffers to protect their functions; the Guidance recommends Category II wetlands with moderate habitat functions adjacent to a high-intensity land use to have a 150-foot buffer, and LSMC requires a 95-foot buffer for all Category II wetlands.

According to the Wetland Mitigation Guidance: "In cases where area for an upland buffer is limited or nonexistent, wetland area on the edge of the compensation wetland can be considered a buffer for the rest of the compensatory wetland. However, the acreage of wetland which is acting as a buffer would not count toward compensation requirements for wetland acreage." We recommend that the Mitigation Plan be revised to incorporate wetland-as-buffer to maintain, at a minimum, the standard 95-foot buffer around Wetlands A and D, including all existing and wetland creation areas. Any areas of wetland converted to buffer (i.e., paper fill) should then be appropriately mitigated through the SBMB. Credit for on-site wetland creation should not be given to any areas that are treated as buffer for this purpose. Since paper fill represents an actual loss of buffer that is permitted as an allowance for wetland fill, these impacts may be mitigated through transfer of the appropriate buffer credits at the SBMB.

Additionally, the Mitigation Plan does not accurately depict the new wetland buffer south of the wetland creation area. The 95-foot buffer should apply to the created wetland in addition to the existing wetland. This will effectively increase the buffer area on adjacent private-owned properties to the south (parcels 00457000003403 & 00457000003404). There are no covenants that ensure the expanded buffer areas on these properties will remain protected in perpetuity. Similar to the previous recommendation, we recommend that existing regulatory buffers be maintained, and any wetland creation areas that would otherwise extend buffers onto private property be treated as "paper-fill." Wetland creation credits should not be applied to these areas, and additional mitigation bank credits should be obtained as compensation. Alternatively, the applicant could obtain protective covenants from the adjacent property owners that will protect all post-mitigation buffers on their respective properties in perpetuity.

2. The general approach of mitigating a portion of the wetland impacts, in part as requested by the Tulalip Tribes, and mitigating the remaining impacts at the SBMB complies with LSMC. The proposed basic 3:1 ratio for on-site wetland creation for Wetland D impacts is correct per LSMC Table 14.88-IV. Mitigation bank credits are allowed as compensatory under LSMC 14.88.840(a)(5), and the proposed credit ratios identified in the Bank Use Plan for each wetland impact are correct. However, all of the recommendations enumerated above must be rectified to determine the correct

number of mitigation credits that will be required after incorporating the on-site wetland creation area.