Coho Water Resources
Integrated Water Resource Management

November 11, 2015

Coho Ref.: 2015-04

Sandra Eisert
13315 NE 77th St.
Redmond, Washington 98052

Re: Review of Proposed Stormwater Management for Nouri Short Plat Development

Dear Ms. Eisert:

An application has been submitted to subdivide the Nouri Short Plat at 7502 132nd Avenue NE, Redmond, Washington for development. This letter presents a review of proposed stormwater management practices. This review is prepared by Coho Water Resources, LLC (Coho) as outlined in our October 26, 2015 proposal.

In general, the proposed stormwater management plans for the location are good; however, the supporting analysis for the dry wells is not adequate.

The materials reviewed include materials prepared by the project proponent and provided by you to Coho. The primary document relied upon in this review is Pace (2015a) and the attached Associated Earth Sciences, Inc. report (AESI; 2014).

Much of the project-specific information is preliminary and qualified by the project proponent as requiring further detail and design (e.g., AESI, 2014). Additionally, the design appears to be evolving (e.g., Way, 2015). It is understood that the current status of the project is to determine whether the property should be subdivided, and that further design and possible review may be conducted.

Summary of Proposed Approach

The proposed stormwater management consists of three components:

- Runoff from roof tops to dry wells.
    - Delivery of roof top runoff to dry wells is considered a best management practice, and this review focuses on the dry wells.
- Runoff from other impervious surfaces to the city stormwater drain system.
    - Discharge to the city of Redmond stormwater drain system is assumed to be acceptable because it is the responsibility of the City to maintain the system in proper working order. However, there is anecdotal evidence of the stormwater drain system overflowing at times in the neighborhood (Eisert, 2015).

- Landscaped areas runoff to area drains or grassy swales.
    - Runoff from landscaped areas is expected to be greatly reduced from pre-development conditions because runoff from roofs and impervious surfaces are to be directed to dry wells and the city stormwater drain system, respectively, and is not considered a concern, as long as flow off of the property is not concentrated to a point and is dissipated.

General Comments

The project proponents recently modified the dry-well overflow design to eliminate splash blocks next to the homes and include overland flow to the City's stormwater system in the street (Way, 2015). Reference to splash blocks in Pace (2015a and 2015b) should be updated to reflect this change. There is no explanation of how overland flow from the dry wells will be directed to the street, or which street.

Figures 4 and 5 of Pace (2015a) present different configurations of dry wells. Which configuration is correct? All dry well locations should be located at least 10 feet back from property boundaries, as indicated on Sheet C0.2 of Pace (2015b; per 3.1.1 Downspout Full Infiltration Systems [BMP T5.10A], Chapter 3, Vol III of Ecology 2014b), but incorrectly shown in Sheet C5.0.

Some of the dry wells appear to be located within the drip line of trees and within the 5-foot setback buffer from the tree drip line. Given the community and regulatory sensitivity to the preservation of trees, and the size of the proposed dry wells (i.e., 4-foot diameter), should the dry wells be located outside of the drip line (and therefore root zone) of the trees? It is assumed the dry wells will penetrate the full thickness of Vashon Till on site of approximately 10 feet.

Roofing materials contribute constituents to runoff water (Ecology 2011a, 2011b, 2014a and 2014b). What type of roofing materials are proposed, and has there been an assessment of contaminants that could be released from the roofing materials? Will the water infiltrated to the ground be compliant with the antidegradation of groundwater rule, Washington Administrative Code 173-200?

Evaluation of Infiltration Testing and Groundwater Mounding Analysis

The infiltration test "generally corresponded" to the SWMMWW procedures (AESI 2015, page 6). With which aspects of the procedures did the test not conform?

Please provide the following information to allow independent evaluation of the test:

- Dimensions of the test pit features.
- Test data from the infiltration test pit.
- Plots of flow into the test pit and water levels in the test pit for the duration of the test.

- Data from a data logger that was installed in MW-1 collecting hourly readings for several months (page 6 *of* AESI, 2014).

The following factors cause concern on whether the dry wells will be able to accept roof top runoff:

- The rate of flow during the constant head portion of the infiltration test was 0.3 gallons per minute (gpm; for context, a garden hose usually flows at about 5 gpm). The peak simulation flow was 10 gpm. The validity of extrapolating flows by a factor of approximately 33 from that observed in the field to simulated conditions is tenuous.
- The observation of flow-back into the post-test excavation indicates the presence of perching layers that may cause performance of the dry wells to be less than simulated. This flow-back is significant given the small flow during the constant head test.
- The hydraulic conductivity value was calculated from the test. A safety factor of 2 was applied to account for natural stratification. Additional recommended safety factors are (Table 3.1.1 *in* Ecology 2014b):
    - 2 for a small-scale pilot infiltration test
    - 1.1 for siltation and bio-buildup

  This results in a total combined safety factor of 4.4 (i.e., 2 * 2 * 1.1). Assuming a linear relation between mounding and hydraulic conductivity, mounding will be more than twice as high as simulated using a safety factor of 2.
- The MODRET mounding analysis shows mounding rising above the base of the overlying till, suggesting a change from unconfined conditions to confined conditions (Figure 4 *in* AESI 2014).
- The simulation did not account for mounding interference from multiple dry wells.

Accounting for these variables in the analysis may indicate that the dry wells will overflow.

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It has been a pleasure to provide this review to you. Please let me know if I can be of any further assistance.

Sincerely,

Coho Water Resources, LLC

Chris Pitre, LHG, LG, CWRE
Principal
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CITATIONS

Associated Earth Sciences, Inc., 2014. Report on Infiltration Testing and Ground Water Mounding Analysis Nouri Short Plat. December 23, 2014.

Ecology. 2011a. Control of Toxic Chemicals in Puget Sound Phase 3: Primary Sources of Selected Toxic Chemicals and Quantities Released in the Puget Sound Basin. Washington State Department of Ecology, Olympia, WA. Publication No. 11-03-024. https://fortress.wa.gov/ecy/publications/summarypages/1103024.html

Ecology. 2011b. Control of Toxic Chemicals in Puget Sound: Assessment of Toxic Chemical Loads in the Puget Sound Basin, 2007-2011. Washington State Department of Ecology, Olympia, WA. Publication No. 11-03-055. https://fortress.wa.gov/ecy/publications/summarypages/1103055.html

Ecology, 2014a. Roofing Materials Assessment Investigation of Toxic Chemicals in Roof Runoff from Constructed Panels in 2013 and 2014. Publication No. 14-03-033. Accessed Nov. 9, 2105 at: https://fortress.wa.gov/ecy/publications/documents/1403033.pdf

Ecology 2014b. 2012 Stormwater Management Manual for Western Washington. Amended December 2014 (the 2014 SWMMWW). Accessed November 9, 2015, at https://fortress.wa.gov/ecy/publications/documents/1410055.pdf

Eisert, S., 2015. Personal communication as relayed from a neighbor.

Pace Engineering, 2015a. Preliminary Drainage Report CIVPLAN 2015-01089. Nouri Short Plat. Pace Project 14501. October 17, 2014, revised August 26, 2015.

Pace Engineering, 2015b. Nouri Short Plat Site Improvement Plans: 7502 132nd Ave NE 9/2/2015. CIVPLAN-2015-01089.

Way, Brian, 2015. Nouri Short Plat Tree Preservation and Stormwater Overflow. E-mail to Heather Maiefski. September 2, 2015.