



February 20, 2018

Ms. Taine Wilton
Edmonds School District #15
20420 68th Avenue West
Lynnwood, WA 98036

**RE: FINAL GROUNDWATER MONITORING PLAN FOR STORMWATER
MANAGEMENT, MADRONA SCHOOL REPLACEMENT PROJECT**

Dear Ms. Wilton:

This letter presents the final groundwater monitoring plan for the Madrona School Replacement Project (the Project). This groundwater monitoring plan is based on our discussions with the Edmonds School District (District) and review comments received for the April 19, 2017, Draft Groundwater Monitoring Plan from Ms. Mary Shaleen-Hansen of the Washington State Department of Ecology (Ecology) Water Quality Program.

The District plans to utilize bioretention facilities and underground injection control (UIC) stormwater wells to provide onsite stormwater management and flow control for the Project. Most of the Project stormwater will be managed using UIC wells; these wells will terminate about 50 feet above the regional aquifer that is present in the Vashon Advance Outwash deposits (Qva aquifer). To date, 7 of the 16 planned UIC wells have been installed, but none are in use. The Project stormwater management facilities have been designed in accordance with applicable stormwater codes, both local (City of Edmonds) and state (Ecology). These codes are intended to protect groundwater and surface water quality through appropriate stormwater management techniques. Applicable stormwater codes/guidance for this Project include:

- Stormwater Code Supplement to Edmonds Community Development Code Chapter 18.30 (Edmonds, Washington, 2010);
- Guidance for UIC Wells that Manage Stormwater (Ecology, 2006); and
- Stormwater Management Manual for Western Washington (Ecology, 2005).

The Project is located within the mapped ten-year time of travel zone for the Deer Creek Group A municipal water supply source, operated by Olympic View Water and Sewer District. A requirement of the applicable stormwater code is that the infiltrated stormwater not cause a violation of Ecology's Groundwater Quality Standards. To address this requirement, the Stormwater Management Manual for Western Washington has defined Site Suitability Criteria (SSC) for infiltration facilities to include:

1. SSC-1, Setback Criteria, recommends that stormwater infiltration facilities be set back at least 100 feet from wells and springs used for public drinking water supplies. SSC-1 also states that infiltration facilities located within the ten-year time of travel zone of a drinking water supply must comply with Washington State Department of Health wellhead protection program requirements.
2. SSC-2, Ground Water Protection Areas, recommends verification testing of completed infiltration facilities within wellhead protection zones.
3. To verify that the infiltration facilities do not cause a violation of Ecology's Groundwater Quality Standards, SSC-9, Verification of Performance, typically includes the use of groundwater monitoring wells for groundwater level and groundwater quality monitoring.

The District is developing a Project Operations and Maintenance Manual for the stormwater facilities that will be submitted to Ecology once the baseline testing is completed. The District is also developing a Landscape Management Plan that includes pesticide and herbicide management. These documents, and ongoing Madrona School maintenance staff training, are intended to reduce the potential for contamination of Project stormwater and surface water and to establish protocols to mitigate potential releases.

To demonstrate that the Project on-site stormwater management approach does not endanger the Qva regional aquifer, the District will perform groundwater level and groundwater quality monitoring. The groundwater level monitoring is intended to verify that a separation continues to exist between the top of the Qva regional aquifer and the UIC wells. The groundwater quality monitoring is intended to verify that the Qva aquifer groundwater quality is not degraded by the Project stormwater management approach.

The District's groundwater monitoring approach includes the following elements:

- Continue to monitor groundwater levels in the two existing monitoring wells, OW-1 and OW-2, that were installed on the Project site for the Project hydrogeologic study.

Monitoring is currently in progress and includes the use of water level data logging transducers. Monitoring will continue for a minimum of five years after the UIC wells have been brought online.

- Install and develop two additional monitoring wells on District property, targeting the areas downgradient and upgradient of the Project parking lot UIC wells. (Parking lot stormwater will enter the parking lot UIC wells after being treated by code-approved bioretention and oil/water separation facilities.) The downgradient well, OW-3, was drilled and developed in August 2017. The upgradient well, OW-4, was drilled and developed in October 2017. The locations of these wells are presented in Figure 1. Each of the wells was equipped with approximately 10 feet of polyvinyl chloride (20-slot) screen. Based on input from Ecology, both well screens were installed entirely below the top of the Qva regional aquifer. The approximate screened elevations of the new wells are 270.4 to 260.8 feet (OW-3) and 266.9 to 257.2 feet (OW-4).
- Evaluate the Qva regional aquifer gradient beneath the Project, based on measurements at the four Project monitoring wells (OW-1 through OW-4). The groundwater elevations measured on November 22, 2017, and the interpreted groundwater gradient are presented in Figure 1.
- Monitor groundwater levels in the new monitoring wells (OW-3 and OW-4) using data logging transducers for a minimum of five years after the UIC wells have been brought online.
- Prior to the UIC wells being brought online, perform eight baseline groundwater samplings of the downgradient and upgradient Project monitoring wells OW-3 and OW-4, respectively. The baseline groundwater sampling events will be spread out approximately evenly on about eight-week intervals over the year prior to the UIC wells being brought online. The final baseline sampling will culminate in December 2018. Each baseline sampling event will include measurement of the following:
 - Field parameters, measured to evaluate when well purging is complete and sampling may begin (pH, temperature, specific conductance, dissolved oxygen, and turbidity);
 - Primary and secondary drinking water inorganic chemical characteristics and physical characteristics listed in Tables 5 and 6 of Washington Administrative Code 246-290-310, except for asbestos, which was not required by Ecology;
 - Selected petroleum hydrocarbon-related constituents (diesel-, oil-, and gasoline-range organics, and benzene, toluene, ethylbenzene, and xylenes);

- Polycyclic aromatic hydrocarbons;
 - Pesticides and herbicides;
 - Additional analytes required by Ecology, including coliform, polychlorinated biphenyls (PCBs) and bis(2-ethylhexyl) phthalate; and
 - Additional analyte requested by Olympic View Water & Sewer District (total phosphorus). Additionally, orthophosphate will be included, for comparison to total phosphorus values.
- For the first two years after the UIC wells are operational, perform eight quarterly groundwater samplings of Project monitoring wells OW-3 and OW-4 for the permit-required analytes. This sampling will be started approximately three months after the UIC wells have been brought online. Sampling for the full list of analytes presented above will be performed, with the exceptions of PCBs and bis(2-ethylhexyl) phthalate, which will be sampled quarterly for the first year and annually for the second year. Collection for analytes to be sampled only annually will be targeted for the December/January timeframe.
 - Upon completion of the eight quarterly groundwater sampling events (covering the first and second years after the UIC wells have been brought online), perform a statistical analysis of the baseline and quarterly groundwater sampling results. The purpose of this analysis will be to evaluate if UIC stormwater is impacting the Qva aquifer groundwater quality downgradient of the Project UIC wells.
 - Continue annual groundwater sampling of Project monitoring wells OW-3 and OW-4 for three more years (third to fifth years after the UIC wells have been brought online). Annual sampling will be for the full list of parameters listed above, targeting the December/January timeframe for sample collection.
 - Upon completion of the sampling events described above, perform an additional statistical analysis of the baseline and quarterly/annual sampling to evaluate if UIC stormwater is impacting the Qva aquifer groundwater quality downgradient of the Project UIC wells.

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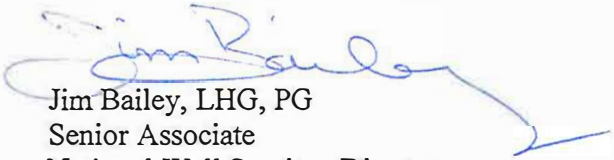
- If a spill or release is known to occur at the Project site, and if the District considers that release to have a reasonable chance of reaching the UIC wells, additional groundwater sampling may be performed.

Sincerely,

SHANNON & WILSON, INC.



Paul L. Van Horne, LHG
Senior Hydrogeologist



Jim Bailey, LHG, PG
Senior Associate
National Well Services Director

PVH:JSB:MWP/pvh

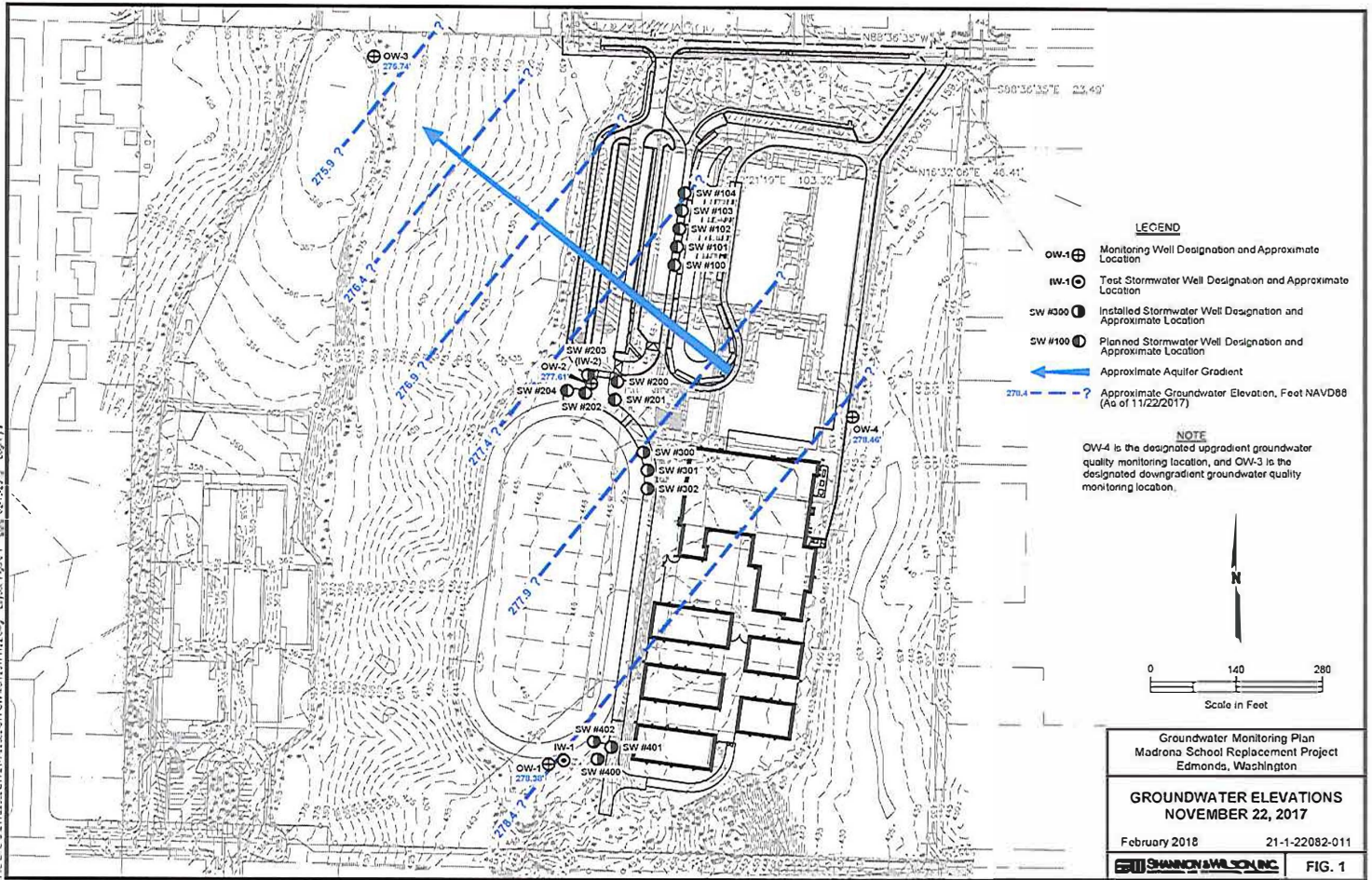
Enc: References
Figure 1 – Groundwater Elevations, November 22, 2017

REFERENCES

Edmonds, Washington, 2010, Exhibit A - Stormwater code supplement to Edmonds Community Development Code Chapter 18.30: Edmonds, Wash., April 20, available: <http://www.edmondswa.gov/development-a-design-stds-text/engineering-codes-design.html>.

Washington State Department of Ecology (Ecology), 2005, Stormwater management manual for western Washington: Olympia, Wash., Washington State Department of Ecology Publication nos. 05-10-029 through 05-10-033, 5 v.

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