



June 8, 2018

Lynne Danielson, General Manager
Olympic View Water and Sewer District
8128 228th Street SW
Edmonds, WA 98026

Subject: Response to Pacific Groundwater Group's letter of findings, dated June 1, 2018, regarding the proposed use of UIC Wells at the Madrona Elementary School in Edmonds, Washington

Dear Lynne,

Robinson Noble has reviewed the recent report prepared by Pacific Groundwater Group (PGG), dated June 1, 2018, which was completed to provide an assessment of the Edmonds School District's (ESD) proposed use of underground injection control (UIC) wells to manage storm-water at the Madrona Elementary School in Edmonds, Washington. A copy of the PGG report is attached with this letter for reference.

Background

The Olympic View Water and Sewer District (OVWSD) has expressed on-going concerns regarding the proposed use of UIC wells at the Madrona Elementary School site. This concern is based on the fact that school site is located within the wellhead protection area (WHPA) of OVWSD's Deer Creek Springs water supply source, and that the proposed UIC wells will bypass a protective 100-foot thick layer of glacial till (Qvt) to inject both treated and untreated storm water directly into the primary sand aquifer (Qva) that feeds the spring. After continued and unresolved debate between the ESD and the OVWSD (and their respective consultants), the two parties tentatively agreed to jointly hire a third-party consultant to review various disputed issues.

Robinson Noble (OVWSD's primary hydrogeologic consultant) suggested several prominent area hydrogeologic consulting firms including PGG, whom the two parties initially agreed to hire jointly. However, there was disagreement on the issues that PGG would be hired to review, and in the end the ESD hired PGG independently to assess what they perceived were the primary unresolved issues. This letter provides Robinson Noble's assessment of PGG's final report to the ESD regarding the use of UIC wells at the Madrona Elementary School site.

General Comment

PGG was hired solely by the ESD to review and assess their concerns (independent of OVWSD). We do not consider this an independent third-party review as initially intended. In reviewing PGG's report, it did not appear that any of OVWSD's major concerns were addressed in the report. The PGG report is intentionally limited to answering six very basic questions. These six questions were answered in a limited sense to show general compliance by the ESD, and it is our opinion that the PGG report does not really consider fully the ultimate protection of the Deer Creek Springs source (the primary concern of the OVWSD).

Comments Regarding Specific Sections of the PGG Report

In the introduction of the report, PGG summarizes their findings regarding the six basic questions that were addressed. Following is our response to these particular findings:

Question 1 and PGG summary response: Whether the use of UIC's in this instance is consistent with water treatment and monitoring process. PGG concludes that, "the use of UIC wells, as proposed, is consistent with best management practices. The Project's monitoring plan adds additional protection and is designed to address concerns of the local drinking water purveyor."

This question is awkwardly phrased and is somewhat ambiguous, but Robinson Noble does not agree with PGG's specific conclusions to this question. We believe the use of the UIC wells is not consistent with best management practices. First of all, the use of the UIC wells is not necessary because other storm management options (albeit more expensive ones) are available (the City of Edmonds has available capacity for additional storm water from the new school). Regardless though, not all BMPs that could reasonably be utilized are utilized in the current plan (i.e. there is only pretreatment on the northern UIC cluster, there is no testing of storm water prior to entry into the UIC wells, the ESD is only planning to monitor one down-gradient well for a limited period of 5 years, a second down-gradient well is not included so that potential changes in gradient could be detected, etc.). In our opinion, ESD is planning to use the minimum BMPs and monitoring required, whether it sufficiently protects the aquifer or not. We think it is safe to say that the monitoring plan is not "designed to address concerns of the local drinking water purveyor," as stated in this part of the report, has not incorporated any significant components requested by the OVWSD, and OVWSD still has major concerns regarding the proposed use of the UICs.

Question 2 and PGG summary response: Whether adequate measures have been proposed by ESD to protect against contamination of the drinking water source of supply now and in the future. PGG concludes that, "the natural, built, and operational features provide a high level of confidence that groundwater will be protected by this system; however, they do not guarantee it."

We do not agree that adequate measures have been proposed by the ESD to protect against contamination of the drinking water source now, and especially not in the future with monitoring limited to only five years. Adequate measures again would include the extended list of BMPs suggested by Robinson Noble and OVWSD (testing prior to injection, on-going monitoring in perpetuity, etc.). PGG states, "the natural, built, and operational features provide a *high level* of confidence that groundwater will be protected by the system; *however, they do not guarantee it*" (emphasis added). We do not agree with the first part of this statement, and furthermore, "high level" is a very subjective description that, in this case, comes across as hyperbole considering the limited amount of monitoring that is being proposed (see comments below for Question 6 and Section 1.1). PGG also states one of the crux-issues in this response, "they do not guarantee it".

Question 3 and PGG summary response: Whether the Project is in compliance with federal, state, and local laws, Clean Water Act law and guidelines including, but not limited to Water Quality and Groundwater Standards, and Best Management Practices, and Underground Injection Control Program Best Management Practices. PGG concludes that, "The Project is consistent with regulations and guidance reviewed."

We do not agree that the project is in compliance with regulatory guidelines. Specifically, the project does not meet the non-endangerment standard for UIC wells (WAC 173-218-080) so it, therefore, does not qualify for rule-authorization. To meet the non-endangerment standard, the project must be in compliance with WAC 173-200 (see 173-218-080(2)), and we do not believe that it is (see anti degradation policy in 173-200-30). The project does not have an overriding consideration of public interest (on the contrary and especially with alternate means available) and it does not adequately fulfill AKART (additional BMPs described above could easily be employed, but the ESD has opted to use only the minimum required, presumably to save costs).

Additionally, WAC 173-218-80(3) references federal regulation 40 CFR 144.12(a) that prohibits movement of fluid into underground sources of drinking water and specifically states that, "no owner can conduct any injection activity that allows fluid containing any contaminate into underground sources of drinking water" (one would think that a WHPA would certainly qualify as a known underground source of drinking water). It further states that, "the applicant for a UIC permit shall have the burden of showing that the requirements of this paragraph are met." To us, this implies water quality testing prior to injection and certainly would not allow simple rule-authorization inside a sensitive WHPA such as Deer Creek Springs.

There is also ambiguity regarding City of Edmonds regulations that do not specifically prohibit UIC wells inside a WHPA (and so do not provide specific guidance) and Snohomish County regulations that do specifically prohibit UIC wells inside a WHPA (see SCC 30.62C.220(2) and SCC 30.62C.330(2)).

Questions 4 through 6: These three questions refer to the travel time and duration of monitoring, water quality analytes to be tested, and location of monitoring wells.

For Question 4, PGG indicates that the five-year monitoring period is sufficient to identify effects of routine operations based on a 600-day travel time between the closest UIC cluster (north UIC cluster) and the one down-gradient monitoring well (OW-3) that will be monitored. We disagree because this only takes into account the initial operation of the system and not problems that may arise during continued operation of the system. This is a major, ongoing issue that has been discussed at length over the course of debate.

For Question 5 regarding water quality analytes, we generally do not have a problem with the analytes selected for water quality testing (however, see comments for Section 2.3.4 below).

For Question 6 regarding monitoring period and locations, PGG again indicates that the five-year monitoring period is sufficient to identify effects of routine operations based on a 600-day travel time from source input (north UIC cluster) and monitoring well OW-3. Again, this limited period is not satisfactory to protect the drinking water source from on-going operation of the UIC wells – monitoring needs to be conducted in perpetuity.

PGG also states that the monitoring locations are appropriate as long as the groundwater flow direction does not change over the project duration. We do not concur with this assessment. In reevaluating the ESD's final monitoring plan (prepared by Shannon and Wilson), we noted that the ESD is only planning to conduct monitoring at two existing monitoring wells; OW-4 which is up-gradient of the school site, and OW-3 which is down-gradient of the site - northwest of the northern (parking lot) UIC cluster. Despite previous recommendations by OVWSD, the ESD is not planning to install or monitor any additional down-gradient wells. This means that the only UIC cluster that will be monitored is the northern (parking lot) cluster. As stated by PGG, if the seasonal gradient shifts, this well may not be in an effective location to detect input from this

cluster. Furthermore, there are no planned monitoring wells located down-gradient of the other UIC clusters, so these will not be monitored at all. To compound this issue, these are also the UIC clusters that will have no pretreatment (see Sections 2.3.1 and 2.3.4 below). The use of a third monitoring well would allow for changes in gradient to be detected. Changes in gradient could allow for contamination to be missed from the planned monitoring (note: we recommended placement and continued monitoring of wells down-gradient of each UIC cluster at the site).

In the body of their report, PGG provides additional discussion to clarify their findings. The following is our response to various PGG findings that we do not agree with:

Section 1.1: This section points out that, "the effects of the injection system on the underlying aquifer will be monitored at one up-gradient (OW-4) and one down-gradient monitoring well (OW-3) for five years after injection begins." As stated previously, Robinson Noble and OWWSO are strongly opposed to a limit of five years because this will only potentially detect impacts from initial operation. The Department of Health has also expressed concern regarding a limited time-frame for monitoring (DOH letter dated April 19, 2018, copy attached).

The fact that ESD is only planning to monitor one down-gradient well is also very alarming and shows that ESD is apparently planning to conduct an as-limited-as-possible monitoring program. Robinson Noble has previously recommended that monitoring wells be placed down-gradient of each UIC cluster and monitored for level and water quality parameters in perpetuity or for at least the life of the Deer Creek Springs treatment plant. As pointed out in the PGG report, monitoring water levels in only two wells will not sufficiently establish potential seasonal shifts in the groundwater flow direction (we concur with this statement).

Of more concern, however, is the fact that only one down-gradient well will be used to monitor water quality. This one well (OW-3), is currently positioned northwest of the parking lot UIC cluster, and as such will potentially only detect water quality irregularities from this one cluster, and possibly not at all if there is a seasonal shift in the flow direction. Input to the other UIC clusters, which do not incorporate any type of pretreatment, will not be monitored. As requested by Department of Health, pesticides and herbicides were added to the list of water quality analytes to be monitored. ESD agreed to add these to the list, but this is a moot point because there will be no monitoring down-gradient of the areas where pesticides and herbicides would most likely be a problem (i.e. down-gradient of the ball field UIC clusters; pesticides and herbicides are not likely to originate from the parking lot area). We feel that this is a fairly obvious discrepancy that the ESD should likely have been aware of. We are also surprised that the PGG report does not express any concern over this issue but in fact indicates that the scope of the monitoring network is satisfactory and that the system, as designed, provides a "high level" of confidence that the groundwater resource will be protected. One down-gradient monitoring well provides very limited protection of the drinking water source and is, in our opinion, inadequate.

Section 2.1: In the second paragraph of this section PGG states that UIC wells are commonly used in Washington as a means of infiltrating storm water, and that Ecology's UIC data base lists 1,245 municipalities with thousands of individual wells. We are not sure what this adds to the current debate, and again (to us) comes across as unnecessary hyperbole. These numbers do not pertain to anything regarding the specific situation of the Madrona School and Deer Creek Springs. This paragraph also states that UICs are allowed in other urban settings that are more vulnerable (i.e. City of Redmond, which is the same example that the ESD and their con-

sultants continue to quote). However, they do not say whether or not the Redmond UICs are allowed within a Group A WHPA (and we would be surprised if they were). As we have argued all along throughout this process, just because something is done elsewhere or has been done in the past doesn't mean it is a good practice and/or is applicable to the current situation – in our opinion, this continues to be an irrelevant argument. A more relevant example for the Madrona School site is Snohomish County, which prohibits the use of UIC wells within Group A WHPAs (SCC 30.62C.220(2) and SCC 30.62C.330(2)). The County codes are clearly aimed at protecting critical drinking water sources.

In the third paragraph of this section, PGG states that the design appears to meet the requirements for rule-authorization and the non-endangerment standard. To us this paragraph is very ambiguous, somewhat misleading, and seems to be taking single elements of the design out of context with regards to meeting the non-endangerment standard. As stated previously, the project does not meet the overriding public interest clause or the AKART requirement in WAC 173-200-30 nor requirements described in 40 CFR 144.12. Therefore, it does not meet the non-endangerment standard in WAC 173-218-80, nor should it qualify for rule-authorization.

At the bottom of the 4th paragraph (at the top of page 5) of this section, the PGG report states that “the vadose zone between the bottom of the wells and the water table is part of the treatment system. Thus, complete performance monitoring can only occur within the aquifer.” This highlights the fact that system performance (or failure) can only be measured after the aquifer is impacted (once a problem has already occurred). This would seem to imply that simple rule-authorization is not appropriate for this system and that testing of the storm water should be conducted prior to injection.

Section 2.1 concludes by stating again that, “the natural, built, and operational features provide a high level of confidence that groundwater will be protected by the system; however, they do not guarantee it.” As stated previously, the term “high level” is subjective and also not appropriate considering all the design limitations (i.e. the lack of pretreatment on all UIC clusters) and the minimal amount of monitoring that is being proposed (only monitoring one down-gradient monitoring well, not monitoring all UIC clusters, limited duration of testing to five years, etc.).

Section 2.2.1: PGG states in this section that they communicated with Ecology and that it is their understanding that Ecology's opinion is that they are likely going to rule-authorize the system based on submittals received from the ESD so far. It is very disconcerting that Ecology may have already made a decision on this matter without considering all input, including concerns voiced by OWWSD.

Section 2.2.2: We strongly disagree with Point 1 in this section in which PGG concludes that the requirement for BMPs has been met. Not all UIC clusters have pretreatment and the monitoring plan is minimal and inadequate.

Section 2.2.4: In the last paragraph of this section PGG recommends that the City of Edmonds revise its CARA designations to include the Deer Creek Springs water source. This implies that PGG believes the spring source may be at risk and that the City of Edmonds current regulations are inadequate to protect this drinking water source.

Section 2.3.1: This section describes how only two monitoring wells (OW-3 and OW-4) will be used for level monitoring. PGG recommends that additional points be used to evaluate possible seasonal fluctuations in the direction of groundwater flow. We concur with this recommendation.

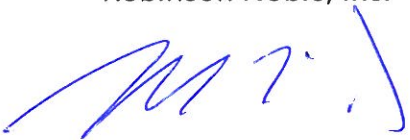
Section 2.3.2: This section states that use of the one down-gradient monitoring well (OW-3) is appropriate. We strongly disagree. Input from all of the UIC clusters needs to be monitored, not just the parking-lot cluster, and the one well may not even effectively detect input from the parking lot (see comments for Section 2.3.1 regarding potential seasonal shifts in the ground-water flow direction).

Section 2.3.3: This section states that if a spill occurs after monitoring has been discontinued (following the initial five-year period), that monitoring should be reestablished. While we agree with this statement should the proposed 5-year monitoring plan go into effect, we disagree with only having a 5-year period of monitoring. Should a spill occur after the end of monitoring, the restarting of monitoring would only occur after catastrophic events. Continuous monitoring should be conducted in perpetuity to measure possible cumulative effects and ongoing operation of the system.

Section 2.3.4: This section states that the list of analytes for monitoring, which includes herbicides and pesticides, is adequate. However, monitoring will only be conducted at one well (OW-3) down-gradient of the parking lot UIC cluster, where these herbicides and pesticides are not likely to be detected. As stated before, monitoring should be conducted down-gradient of all UIC clusters including those in the area of the ball field where herbicides and pesticides are likely to be used.

We hope this assessment of the PGG report is helpful, and if you have any additional questions please feel free to contact me at (425) 488-0599; office, (206) 550-7215; mobile, or by email at mwills@robinson-noble.com. It is our pleasure to be of continued service to the Olympic View Water & Sewer District.

Respectfully submitted,
Robinson Noble, Inc.



Max Wills, LHG
Associate Hydrogeologist



Max Thomas Wills

Attachments

cc Heather Bartlett, Ecology
Mary Sheleen-Hansen, Ecology

Attachments

June 1, 2018

Mr. Edward Peters
Edmonds School District #15
20420 68th Avenue West
Lynnwood, WA 98036

Re: Madrona School Stormwater Management System Assessment

Dear Edward:

PGG has been contracted by the Edmonds School District No. 15 (the District) in Edmonds, WA to perform technical evaluation of selected aspects of the Madrona School stormwater management system (the Project). ESD requested that PGG address the six questions presented below. Each question is followed by a summary of our response as presented in the rest of the document.

1. Whether the use of UIC's in this instance is consistent with current water treatment and monitoring process.

The use of UIC wells, as proposed, is consistent with best management practices. The Project's monitoring plan adds additional protection and is designed to address concerns of the local drinking water purveyor.

2. Whether adequate measures have been proposed by the ESD to protect against contamination of the drinking water source of supply now and in the future.

The natural, built, and operational features provide a high level of confidence that groundwater will be protected by this system; however, they do not guarantee it. Project features are presented in Section 2.1

3. Whether the Project is in compliance with federal, state and local laws, Clean Water Act law and guidelines including, but not limited to Water Quality and Groundwater Standards, and Best Management Practices ("BMP's"), and Underground Injection Control Program Best Management Practices "BMP's".

The Project is consistent with regulations and guidance reviewed. Regulatory compliance is covered in Section 2.2

4. Whether the monitoring plan, as presented, is of sufficient scope and duration to monitor potential impacts of the Project to the water quality of the affected surface and ground water supply?

The five-year monitoring period should be sufficient to identify effects of routine operations given the estimated 600-day travel time between the downgradient monitoring well and the closest infiltration well. See Section 2.3.3 for further discussion of travel time and monitoring duration.

5. Whether the monitoring plan is adequate in providing data that can be used to determine the Project's contribution to future possible contamination at Deer Creek supply source or the District's well field.

The analytes selected for monitoring are appropriate and sufficient to detect potential contamination from the Project. Analytes are further discussed in Section 2.3.4.

6. How and for what period of time and at what locations should the groundwater discharge by the ESD be monitored?

The five-year monitoring period should be sufficient to identify effects of routine operations given the estimated 600-day travel time between the downgradient monitoring well and the closest infiltration well. See Section 2.3.3 for further discussion of travel time and monitoring duration.

The monitoring locations are appropriate as long as the groundwater flow direction does not change over the project duration. See Section 2.3.2 for further discussion on monitoring locations.

1.0 PROJECT DESCRIPTION

The Project is located on a 40-acre parcel owned by the District in Edmonds, WA. The school is in the process of being replaced but the number of students will stay the same – 650. The site is located within the 10-year capture zone of the Deer Creek Group A municipal water supply source, operated by Olympic View Water and Sewer District (OVWSD).

The Project site includes a bluff which drops 80 feet from east to west. The two hydrogeologic units present at land surface near the site are the Vashon Till and the Vashon Advance Outwash (Qva). The Qva is the primary drinking water aquifer in the area and is overlain east of the bluff by the Vashon Till. The Qva reportedly outcrops (is at or near land surface) at the base of the bluff west of the school. Groundwater beneath the site flows generally from East to West towards Puget Sound.

Before remodeling, the site was drained by sheet flow to the west down the bluff (M. Wills, Personal Communication). The new design includes four clusters of four injection wells each, for a total of 16 wells. They penetrate the till and terminate 40 to 50 feet above the water table in the Qva. Wells are completed such that water flows into the top of the sand pack at lower flows. Once flow reaches a threshold, flow is also directed into well casing which is connected to a well screen at the bottom of the sand pack. Gate valves have been added for shutoff of individual wells.

The parking lot is considered a pollution generating surface. Thus, water from the parking lot is treated with an oil/water separator and bioretention pond with underdrain which leads to UIC wells. Wells “that only receive runoff from a roof coated with an inert, non-leachable material and a roof that is not subject to venting of manufacturing, commercial, or other indoor pollutants” are considered to automatically meet the non-endangerment standard” (WAC 173-218-100). The Madrona roofs are coated with such a material (Mahlum 2018) and thus roof runoff is piped straight to the UIC well system.

The wells require registration as Class V (stormwater) Underground Injection Control (UIC) wells (WAC 173-218) with the Department of Ecology. Application for registration may only be submitted once the project is under construction. Ecology has not issued a UIC registration letter for this project yet.

1.1 GROUNDWATER MONITORING SYSTEM

The effects of the injection system on the underlying aquifer will be monitored at one up-gradient (OW-4) and one downgradient monitoring well (OW-3) for five years after injection begins (Shannon & Wilson, 2018).

Groundwater elevations will be monitored using data logging transducers to confirm separation is maintained between the water table and the bottom of the UIC wells.

Groundwater quality samples will be collected both before injection (to establish background) and after injection (to evaluate effects of the project). Background samples include 8 events approximately 8 weeks apart from both monitoring wells, before injection begins. Once the system is in operation, samples will be collected quarterly for 2 years, followed by 3 years of annual sampling.

Analytes to be evaluated as part of the monitoring plan include:

- Field parameters (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
- Selected petroleum hydrocarbon-related constituents (diesel-, oil-, and gasoline range organics and benzene, toluene, ethylbenzene, and xylenes)
- Polycyclic aromatic hydrocarbons
- Pesticides and herbicides
- Other analytes required by Ecology include bis(2-ethylhexyl) phthalate and PCBs

2.0 PROJECT EVALUATION

PGG reviewed general designs for pretreatment, the UIC wells, and the proposed monitoring plan to understand the intention of the stormwater disposal system. The work did not include detailed review or confirmation of as-built conditions, and PGG did not provide opinions reserved for engineering (as opposed to hydrogeologic) or legal professions.

2.1 PROJECT DESIGN

Design standards, including pretreatment, are established in Chapter 173-218 WAC, Underground Injection Control Program, Guidance for UIC Wells that Manage Stormwater (05-10-067) (Ecology, 2006), and the applicable stormwater design manual which in this case is the 2005 Stormwater Management Manual for Western Washington according to City of Edmonds.

The project intends to use Underground Injection Control (UIC) wells to infiltrate treated stormwater. UIC wells are a common way to infiltrate stormwater throughout Washington State. Ecology's UIC database lists 1245 municipalities in Washington with stormwater UIC wells, and each has from one to thousands of individual wells (<https://fortress.wa.gov/ecy/uicsearch/>). UIC stormwater wells are allowed in urban settings that are more vulnerable than the Madrona School setting. Examples include the City of Redmond Washington where very shallow groundwater is used for drinking water.

The Madrona School UIC wells are relatively deep UIC stormwater wells and are designed to infiltrate below the shallowest soil layer that restricts natural downward flow of groundwater recharge. That soil layer also has the potential to remove pollutants from the recharge. Although the shallowest restrictive layer has been excluded by design, the built portions of the system, and the vadose zone between the bottom of the wells and the water table, appear to meet requirements for rule authorization of the UIC wells. Rule authorization means that design standards have been met and Ecology will thus presume groundwater will not be contaminated (ie: it meets the non-endangerment standard¹).

For this project, natural characteristics and designs serving to protect groundwater from contamination include:

- Oil/water separation (Mahlum 2018)
- Pretreatment by biofiltration with a raised underdrain (Mahlum 2018)
- Shut-off valves for each well (Mahlum 2018)
- Vadose zone soils which appear to meet requirements for “medium” and “low” treatment capacity (Ecology 2006)

¹ The non-endangerment standard protects all groundwater and is thus a higher standard than a design basis focused on protecting only groundwater at water supply sources (springs and wells).

With the exception of the shut-off valves, the measures above are identified in Ecology's design guidance document (Ecology 2006). The shut-off valves appear to be an additional measure added by designers in this case. Note that the vadose zone between the bottom of the wells and the water table is part of the water quality treatment system. Thus, complete performance monitoring can only occur within the aquifer.

In addition to natural conditions and engineering measures, the following operational and monitoring measures were offered by ESD in an addendum to the project SEPA environmental checklist (March 2017):

- Coordinate stormwater infiltration efforts in the project area with OVWSD to facilitate OVWSD's compliance with Washington State Department of Health source water protection requirements established under the Watershed Control Program (see protective measures stated in Section 3.1, Deer Creek Water Supply Protection Plan).
- Monitor the performance of the UIC clusters so that appropriate maintenance or UIC well rehabilitation can be scheduled.
- Install and monitor data logging transducers in some of the wells and conduct periodic manual water level measurements.
- Implement a landscape management plan designed to eliminate the use of pesticides, minimize the use of fertilizers, and reduce pollutants throughout all areas of the site that drain into the UIC wells, in accordance with the local stormwater code requirements.
- Implement an operations and maintenance manual for maintenance of the bioretention facilities, and UIC's including soil cleanup and replacement from spill contamination.
- Perform a regular and perpetual maintenance program for all of the site infiltration facilities to reduce siltation and bio-fouling, in accordance with the local stormwater code requirements.
- Perform bioretention facility soil cleanup and replacement if spills occur, in accordance with the local stormwater code requirements.
- Protect groundwater observation wells through the facility construction process and use them to facilitate measurement of facility performance.
- Repair or properly abandon wells damaged during construction in accordance with WAC 173-160

The natural, built, and operational features provide a high level of confidence that groundwater will be protected by this system; however, they do not guarantee it.

2.2 REGULATORY COMPLIANCE

Summary description of the project's compliance with UIC stormwater well design is presented below (UIC Program), followed by review of two land use regulations that pertain to siting of such facilities (Water Supply Protection Plan, and CARA regulations).

2.2.1 Underground Injection Control Program

ESD has applied to Ecology for registration of its UIC wells via submittal of an Underground Injection Control Program Registration Form. Design data have been submitted and Ecology has requested additional information on source control, landscape plan, and operation and maintenance (pers. Comm. Mary Sheleen-Hansen, May 2018). A registration letter has not been issued yet. PGG understands that Ecology's opinion based on submittals so far is that the system will likely be rule-authorized. To the extent of our review of hydrogeologic aspects, PGG concurs that the proposed use and design appear to meet criteria for rule authorization.

2.2.2 DOH Guidance

A DOH Discussion Paper (2015) identifies three criteria that define a "desired state" where the interests of utility managers and stormwater managers can be met. The Project appears to meet all three criteria. The three criteria are discussed below:

1. Vulnerable sources have adequate and appropriate Best Management Practices (BMPs).

The requirement for BMPs has been met by pretreatment including the bi-owale and oil/water separator, the individual shut off valves, and the monitoring plan.

2. Utilities with vulnerable supplies are informed and consulted when stormwater projects using UIC wells are developed in critical wellhead areas.

OVWSD has been informed and is in discussions with ESD.

3. No UIC wells are sited in SCAs without water utility approval

The size of an SCA is not explicitly defined in the context of the Discussion Paper; however, it mentions sanitary setbacks of 100 feet for wells and 200 feet for springs. It also mentions BMPs may be necessary for 3-6-month WHPA zones. Since the Project is within the OVWSD 10-year WHPA, it appears to be outside the intended scope of the DOH Discussion Paper.

2.2.3 The Deer Creek Water Supply Protection Plan

The OVWSD plan (Penhallagon Associates and Robinson and Noble 2001) was developed to protect and enhance water supply from the Deer Creek water supply facility. It outlines well head protection areas and the one-, five-, and 10-year time of (groundwater) travel zones. Water supply protection plans can only be enforced through coordination with municipalities with land use authority (eg: cities).

The plan identifies stormwater flows from the north (not Madrona School) that should be prevented from flowing into the protection area; however, it does not recommend a general prohibition of stormwater infiltration. It recommends "adequate storm drainage

facilities” within the one-year time-of-travel zone and does not address stormwater management in the five- and 10-year time of travel zones (the Madrona school is between the five- and 10-year time-of-travel isochrons). The proposed Madrona school UIC wells appear to be consistent with measures in the OVWSD plan pertaining to siting of stormwater features.

The Protection Plan also recommends several risk reduction measures including involvement of Olympic View Water and Sewer District in land use permitting (which would include stormwater management plans). It requested that the City of Edmonds, Town of Woodway, and Snohomish County maintain a wellhead protection map overlay that would presumably be used in land use planning. PGG did not investigate whether this recommendation was implemented by municipalities with land use authority (City of Edmonds in this case) – we understand that OVWSD was not notified by City of Edmonds regarding proposed use of UICs, but that ESD contacted OVWSD as soon as ESD learned of OVWSD’s concern.

2.2.4 Critical Aquifer Recharge Areas (CARAs)

The City of Edmonds Code states “no areas meeting criteria for CARAs exist in the vicinity of the city of Edmonds. Thus, additional specific provisions for protection of this critical area type are not provided within this title” (Edmonds City Code Ch. 23.60). The proposed Madrona school UIC wells therefore do not violate the applicable CARA regulation.

Additional discussion on the CARA topic is provided below for context and consideration during future revision of the regulation:

The City code does not cite a technical basis for their opinion that no areas meeting criteria for CARA exist in the vicinity; however, maps published in a 1997 USGS report are the likely basis.

PGG’s opinion is that the City code errs in indicating that no areas meeting criteria for CARA exist in the vicinity. The method used by the USGS to assess sensitivity assigns most of the Qva outcrop area in Edmonds as “low sensitivity”, which is not true for the Qva outcrop area near the Deer Creek water source. PGG recommends that the City’s CARA regulation be reviewed, and possibly amended, to consider the OVWSD water source protection plan.

2.3 ADEQUACY OF GROUNDWATER MONITORING PLAN

The Department of Ecology Guidance for UIC Wells that Manage Stormwater (Ecology 2006) does not require monitoring of groundwater for UIC stormwater wells. However, Shannon and Wilson (2018) identified three Site Suitability Criteria from the Stormwater Management manual for Western Washington that refer to the need to evaluate whether the Project has caused a violation of Ecology’s Groundwater Quality Standards. The DOH Discussion Paper (DOH, 2015) also mentions requiring site specific monitoring of

UICs near vulnerable water supply wells. Shannon and Wilson prepared a monitoring plan (Shannon and Wilson 2018) which has subsequently been reviewed by Ecology and amended. Individual aspects of the plan are reviewed below.

2.3.1 Groundwater Level Monitoring

Two locations are proposed for groundwater elevation monitoring: OW-3 and OW-4. The purpose of the proposed groundwater monitoring is to confirm separation between the UICs and water table. The proposed monitoring is sufficient for this purpose.

The location of the down gradient monitoring well is based on the current water table configuration. However, it is not known whether groundwater flow directions change seasonally. A minimum of three monitoring points is required to evaluate groundwater flow directions. Therefore, PGG recommends monitoring groundwater elevations in a third well for one year after groundwater injection begins to evaluate Project and seasonal groundwater flow directions.

2.3.2 Water Quality Locations

The groundwater monitoring system includes two monitoring wells: OW-3 and OW-4. Monitoring well OW-3 is downgradient of the site; OW-4 is the upgradient monitoring well. Given the measured groundwater flow direction in Mahlum 2018, OW-3 is directly downgradient of infiltration wells SW#200 – SW#204, which infiltrate treated water from the parking lot. Water from the parking lot is more likely to contain contaminants than water from other basins and therefore monitoring downgradient from where it is injected is logical. As long as OW-3 is down gradient of infiltration wells SW#200 – SW#204 consistently during operation of the UICs (see Groundwater Level Monitoring section above), the location proposed is appropriate. If there is significant change in the groundwater flow direction, the downgradient monitoring location should be re-evaluated.

2.3.3 Duration of Monitoring

Ecology (Ecology 2017) initially requested the Project collect samples for four quarters and then annually once the drywells are online. This was later expanded to the current monitoring system which includes two years of quarterly sampling followed by three years of annual sampling, for a total of five years (Shannon & Wilson. Feb 20, 2018).

The distance from the downgradient observation well (OW-3) to the nearest upgradient injection points (SW #200 – SW #204) is approximately 500 feet. Shannon and Wilson (2016) report an aquifer gradient of 0.008 and a hydraulic conductivity of 55 feet/day (S&W, 2016). Assuming a porosity of 0.2, the groundwater travel time from the closest infiltration to the observation well is estimated at 600 days, or almost two years. That is likely a sufficient length of time to capture effects of routine operations. The system design and monitoring plan are also likely sufficient to detect effects from parking lot spills that occur during that period. If a spill occurs after the monitoring period expires, PGG recommends reinitiating the monitoring program. The design includes flow through an oil/water separator and filtration by soil media that will retain and retard most pollutants.

The retardation and retainage should reduce or eliminate pollutants from entering the UIC wells and will spread-out water quality effects in the aquifer over time.

2.3.4 Analytes Selected

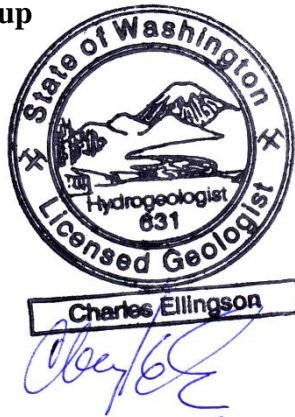
The analyte set was first proposed by Shannon and Wilson in the Draft Groundwater Monitoring Plan dated April 19, 2017. The plan was developed to fulfil requirements of the Stormwater Management Manual for Western Washington (Ecology, 2005). OVWSD reportedly expressed concerns regarding inconsistencies between analytes required for Ecology and DOH regulations. ESD responded by proposing a hybrid analyte list. Further analytes were added after review by the Department of Ecology.

Potential contaminants from the site include oil and gasoline components from the parking lot and fertilizers and herbicides from landscaping activities. The proposed analyte list includes constituents appropriate for monitoring these uses including nitrate, herbicides, and hydrocarbon components, among other constituents. Therefore, the analyte list proposed adequately addresses potential contamination.

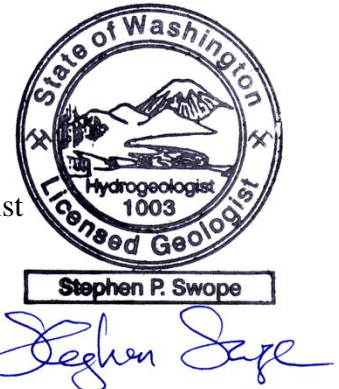
Sincerely,

Pacific Groundwater Group

Charles “Pony” Ellingson
Principal Hydrogeologist



Stephen Swope
Principal Hydrogeologist



References

Mahlum Architects Inc. April 2018. Edmonds School District No. 15, Madrona Stormwater Presentation.

Shannon & Wilson. November 29, 2016. Hydrogeologic Report, New Madrona K-8 Project, 9300 236th Street SW, Edmonds, Washington. Consultant’s report to Edmonds School District #15.

Shannon & Wilson. Feb 20, 2018. Final Groundwater Monitoring Plan for Storm water Management, Madrona School Replacement Project. Consultant’s report to Edmonds School District #15.

United States Geological Survey. 1997. The ground-water system and ground-water quality in western Snohomish County, Washington. Water-Resources Investigations Report 96-4312

Washington State Department of Ecology. December 2006. Guidance for UIC Wells that Manage Stormwater. Publication Number 05-10-067.

Washington State Department of Ecology. April 2005. Stormwater Management Manual for Western Washington. Publication Number 05-10-029

Washington State Department of Ecology. September 14, 2017. Email from Mary Shaleen-Hansen to Taine Wilton Re: Madrona OVWSD meeting presentation.

Washington State Department of Health. November 9, 2015. UIC Stormwater Wells and Vulnerable Drinking Water Supplies. Discussion Paper.



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April 19, 2018

LYNNE DANIELSON
OLYMPIC VIEW WATER & SEWER DISTRICT
8128 228TH STREET SW
EDMONDS, WA 98026

Subject: Olympic View Water System ID# 63600
Snohomish County

Miss Danielson:

Thank you for the opportunity to comment on the Edmonds School District's proposal to inject storm water into the aquifer near Deer Creek and the Deer Creek Springs. The project is located within the 10-year time of travel for ground water to reach the Deer Creek Springs. We understand the concern that the injection wells could directly impact the water quality of the Deer Creek Springs aquifer.

Deer Creek and the springs are the primary sources of supply for Olympic View and the 12,938 people who drink its water. Olympic View is required to develop a Source Water Protection Plan and include it as part of the Water System Plan (WAC 246-290-100). We approved Olympic View's most recent plan in August of 2017. The plan identified storm water as the most likely source of contamination to affect the Deer Creek Source.

We require public water systems to obtain water from the highest quality source feasible (WAC 246-290-130). New sources of supply in an urban environment are difficult to secure, which is why it is important to protect the existing spring aquifer. Based on the report provided, we are concerned about the potential impact on Olympic View's drinking water supply.

We understand that you have raised your concerns to the School Board and asked the Board to address them. We support your efforts and would like to see your source water quality protected. We support your concerns that the Board should consider other feasible alternatives or establish ongoing semiannual monitoring to ensure the protection of the aquifer and the supply of water to the utility that serves the community. Please give me a call at (360) 236-3110 if you have any questions.

Sincerely,

Garin Schrieve, PE
Director, Office of Drinking Water,
Washington State Department of Health

cc: NW Office of Drinking Water
Department of Ecology
Snohomish County Public Health
Edmonds School District