

**To:** Doug Wise / Portland Water Bureau

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**Date:** May 1, 2018

**Re:** Review of *Revised Well Decommissioning Work Plan, East Multnomah County Troutdale Sandstone Aquifer Remedy*, prepared by Geosyntec Consultants and dated April 2, 2018

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GSI Water Solutions, Inc. (GSI) reviewed the *Revised Well Decommissioning Work Plan, East Multnomah County Troutdale Sandstone Aquifer Remedy* (Work Plan) prepared by Geosyntec Consultants and submitted to the Oregon Department of Environmental Quality (DEQ) on April 2, 2018 (Geosyntec, 2018). The Work Plan proposes decommissioning seven groundwater monitoring wells and two vapor extraction wells at the East Multnomah County (EMC) Troutdale Sandstone Aquifer (TSA) site (ECSI Site No. 1479). This memorandum documents our review.

## Work Plan Review

We evaluated whether the Work Plan's decommissioning request meets the criteria for requesting to decommission a well at the EMC TSA site, whether the remaining monitoring wells would be adequate to monitor hydraulic control and restoration progress (assuming that DEQ approves decommissioning of the 9 wells), and whether the proposed decommissioning methods are appropriate.

### Criteria for Requesting to Decommission Wells

Boeing/Cascade may request to decommission a well at the EMC site if they meet certain criteria; the criteria depend on the type of well (i.e., monitoring well or vapor extraction well).

### Monitoring Well Decommissioning

The criteria for decommissioning monitoring wells at the EMC Site are established by DEQ (2008). Decommissioning is a two-step process. First, a well is removed from the monitoring program. Second, confirmation sampling is conducted two years after the well is removed from the monitoring program. These criteria are cited in Geosyntec (2013):

*Wells may be removed from the monitoring program if (1) TCE concentrations have been consistently non-detectable for 2 or more years, (2) the well is located outside the limits of the plume and is no longer needed to monitor hydraulic plume control or restoration progress, or (3) the location of a well duplicate is better suited to evaluate hydraulic control and restoration progress . . . Monitoring well decommissioning may be proposed to DEQ if TCE concentrations remain below the MCL during the confirmation sampling round that will be performed 2 years after a well has been removed from the remedy monitoring schedule.*

All of the monitoring wells proposed for decommissioning have been removed from the monitoring program (see Table 1). Therefore, Boeing/Cascade may propose decommissioning a monitoring well, if Boeing/Cascade collects a confirmation sample from the well two years after removing the well from the monitoring schedule. As shown in Table 1, confirmation samples have not been collected from four of the monitoring wells that the Work Plan proposes to decommission; therefore, these monitoring wells have not met the criteria for Boeing/Cascade to request decommissioning.

**Table 1. Monitoring Wells Proposed for Decommissioning.**

Well ID	Sampling Dates	Date Removed From Monitoring	Date of Confirmation Sampling
BOP-70(ds)	2007 (varies) 2008 – 2009 (~quarterly) 2010 – 2014 (semi-annual)	2014	None
BOP-71(ds)	2007 (varies) 2008 – 2009 (~quarterly) 2010 – 2014 (semi-annual)	2014	None
D-16(dg)	1993 – 1998 (varies) 1999 – 2007 (annually)	2007	None
D-16(ds)	1993 – 1998 (varies) 1999 – 2013 (~annually)	2013	August 4, 2015
D-18(dg)	1995 – 1998 (varies) 1999 – 2007 (annually)	2007	January 6, 2010
D-18(ds)	1995 – 2006 (varies) 2007 – 2013 (~annually)	2013	August 4, 2015
RPW-1(ds)	1993 – 2006 (varies)	2006	None

### Vapor Extraction Wells

A Soil Vapor Extraction (SVE) system has operated since 2015 at the Cascade property to remove VOCs from the unsaturated zone of the TSA. Vapor extraction wells VW-17-42.5 and VW-17-75, which are completed in the unsaturated zone and the Work Plan proposes for decommissioning, were shut down on December 14, 2016 because they were removing “no to low” amounts of VOC mass. A third vapor extraction well in the cluster (VW-17d-95.5) continues to operate along with four new wells (five wells total) (Geosyntec et al., 2017).

DEQ (2008) does not establish decommissioning criteria for wells that are completed in the unsaturated zone. Therefore, there are no criteria for requesting to decommission VW-17-42.5 and VW-17-75.

## Decommissioning Methods

The Oregon Administrative Rules require that a borehole be overdrilled “in areas where groundwater contamination has been identified”<sup>1</sup>, unless the OWRD approves a special standard to decommission the well. On behalf of Boeing/Cascade, Cascade Drilling, LP (the driller) submitted requests for special standards to decommission eight of the nine wells in place (as opposed to overdrilling), as shown in Table 2.

**Table 2. Decommissioning Methods.**

Well ID	Applied for Special Standard to Decommission in Place?	Special Standard Status	Historical TCE Detections <sup>1</sup>
BOP-70(ds)	Yes	Denied <sup>2</sup>	Up to 0.62 ug/L; Detected in 2 of 29 GW samples
BOP-71(ds)	Yes	Approved	22 GW samples; all < 0.5 ug/L
D-16(ds)	Yes	Approved	40 GW samples; all nondetect
D-16(dg)	Yes	Approved	33 GW samples; all nondetect
D-18(dg)	Yes	Approved	22 GW samples; all nondetect
D-18(ds)	Yes	Approved	Up to 0.76 ug/L; Detected in 10 of 35 GW samples
RPW-1(ds)	No	NA	Up to 4.6 ug/L; Detected in 10 of 42 GW samples
VW-17D-42.5	Yes	Approved	Up to 2,800; Detected in 12 of 13 vapor samples
VW-17D-75	Yes	Approved	Up to 8,600, Detected in 12 of 14 vapor samples

### NOTES:

(1) Based on data in Geosyntec (2018). Analytical results that are “J” flagged are considered non-detect. Geosyntec (2018) did not provide units for vapor samples.

(2) Denied because BOP-70(ds) is a nested well constructed under a Special Standards Request

GW = groundwater

ug/L = micrograms per liter

The special standards request forms<sup>2</sup> for three of the wells that OWRD approved to decommission in place, and Table 1 of the Geosyntec (2018) report, do not include a complete record of VOC detections.

- **D-18(ds)**. The November 15, 2017, special standards request stated that volatile organic compounds (VOCs) were “ND” at this well. However, as shown in Table 2, VOCs have been detected at D-18(ds) in the past (29 percent of groundwater samples).
- **VW-17D-42.5**. The January 10, 2018, special standards request stated “VOC’s ND in Vapor.” However, as shown in Table 2, TCE has been detected at VW-17D-42.5 in the past (92 percent of vapor samples).

<sup>1</sup> OAR 690-240-0510(1)

<sup>2</sup> Attachment 2 of the Work Plan

- **VW-17D-75.** The January 10, 2018, special standards request stated “VOC’s ND in Vapor.” However, as shown in Table 2, TCE has been detected at VW-17D-75 in the past (86 percent of vapor samples).

### Adequacy of Remaining Monitoring Wells

The most likely purpose of the wells that the Work Plan proposes to decommission is to detect downgradient VOC migration. Assuming that no VOCs are detected in confirmation samples, the remaining monitoring well network should be adequate for monitoring hydraulic control and restoration progress. Specifically, Upper TSA monitoring wells BOP-22R(ds), BOP-21(ds), BOP-20(ds), and BOP-44(ds), and Lower TSA monitoring wells BOP-20(dg) and BOP-44(dg) are located downgradient of the source area, and, therefore, are appropriately-located for detecting downgradient movement of the VOC plume at the site.

## Conclusions and Recommendations

We make the following conclusions based on our review (recommendations are presented in Table 3):

- Boeing/Cascade has collected the confirmation samples that are required to request decommissioning of wells D-16(ds) and D-18(dg), and OWRD’s Final Order approving decommissioning in place was granted based on an application for Special Standards that included a complete record of VOC detections at the wells.
- Boeing/Cascade has met the applicable criteria to request decommissioning of vapor extraction wells VW-17-42.5 and VW-17-75, and monitoring well D-18(ds). However, OWRD’s Final Orders approving decommissioning in place were granted based on applications for Special Standards that did not include complete information about historical VOC detections in the wells. In the VW-17 wells, VOCs have been detected in over 85% of vapor samples, and have been detected as recently as 2016 (the wells were not sampled in 2017 and 2018). VOCs have historically been detected in monitoring well D-18(ds), albeit at low levels. We do not have sufficient data to evaluate whether these VOC detections are indicative of a VOC source near these wells, or whether a VOC source is no longer present at these wells. Given this uncertainty, our experience is that OWRD generally adopts a conservative approach to decommissioning wells at contaminated sites (i.e., OWRD prefers to decommission by overdrilling). Therefore, the decommissioning method in the Work Plan (decommission in place) may not be appropriate, and OWRD should be provided with a complete record of the historical contamination at these wells as a part of the application for special standards.
- Boeing/Cascade has not met the criteria to request decommissioning of BOP-70(ds), BOP-71(ds), D-16(dg) and RPW-1(ds) because confirmation samples have not been collected from these wells. The most recent groundwater samples from these wells were collected between four and twelve years ago. In that time, TCE concentrations measured by the Portland Water Bureau at monitoring well PWB-1-LTS have been increasing (Figure 1).

Portland Water Bureau sampling also detected TCE in PWB-1-UTS in 2018 for the first time since 2004 (Figure 2). Given the increasing TCE concentrations in PWB-1-LTS and re-emergence of detectable TCE at PWB-1-UTS, confirmation sampling is necessary to confirm that BOP-70(ds), BOP-71(ds), D-16(dg) and RPW-1(ds) still meet the criteria for monitoring well decommissioning that TCE remains below the MCL after the well was removed from the monitoring program.

Table 3 provides our recommendations based on these conclusions. Please note that our recommendations are based solely on VOC concentrations at the wells, and do not consider other factors that may affect whether OWRD approves decommissioning in place (for example, no access for a drill rig).

**Table 3. Decommissioning Recommendations**

Well ID	Collected Confirmation Samples?	Special Standard Approved Based on Complete Record of VOC Detections?	Recommendation
D-16(ds)	Yes	Yes	Decommission Well as Proposed in WP
D-18(dg)	Yes	Yes	Decommission Well as Proposed in WP
D-18(ds)	Yes	No	Decommission by Overdrilling
VW-17-42.5	Not Required	No	Decommission by Overdrilling
VW-17-75	Not Required	No	Decommission by Overdrilling
BOP-70(ds)	No (Last Sampled in 2014)	Special Standard Denied	Collect Confirmation Sample, Request to Decommission by Overdrilling
BOP-71(ds)	No (Last Sampled in 2014)	Yes	Collect Confirmation Sample, Request to Decommission in Place
D-16(dg)	No (Last Sampled in 2007)	Yes	Collect Confirmation Sample, Request to Decommission in Place
RPW-1(ds)	No (Last Sampled in 2006)	Did Not Apply for Special Standard	Collect Confirmation Sample, Request to Decommission by Overdrilling

NOTES:

WP = Work Plan

VOC = Volatile Organic Compounds

## References

DEQ, 2008. Email to S. Prowell, Prowell Environmental. RE: TSA Annual Report-Appendix A Monitoring Recommendations. July 3.

Geosyntec, 2013.

Geosyntec, Landau Associates, and S.S. Papadopoulos & Associates, Inc., 2017. Annual Performance Report, 1 January 2016—31 December 2016, Troutdale Sandstone Aquifer Remedy. March 15.

Geosyntec, 2018. Revised Well Decommissioning Work Plan for the East Multnomah County Troutdale Sandstone Aquifer Remedy. April 2.



Figure 1 - VOC and Groundwater Elevation at PWB-1-LTS

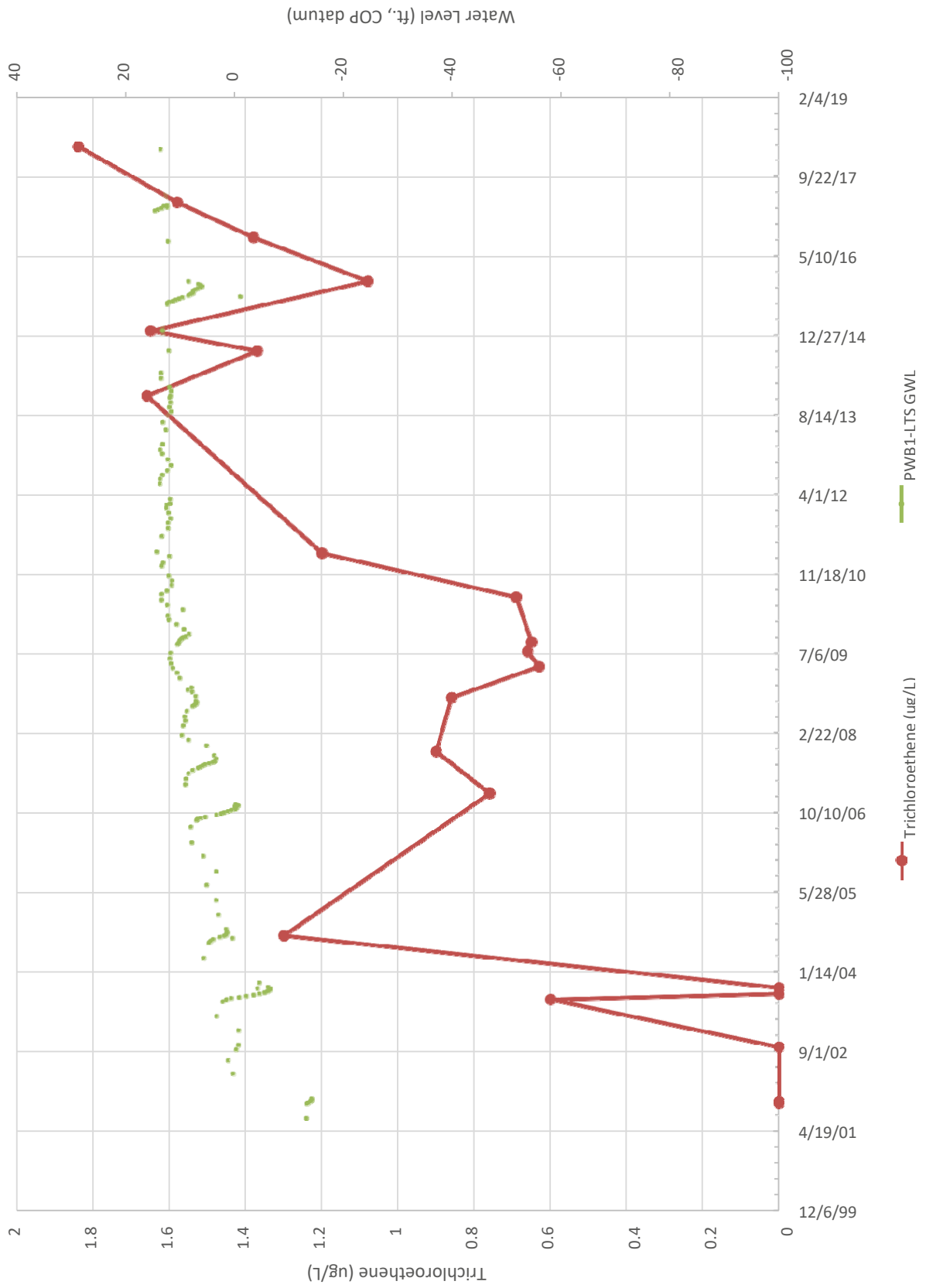


Figure 2 - VOC and Groundwater Elevation at PWB-1-UTS

