GSI Water Solutions, Inc.

TECHNICAL MEMORANDUM

Former Baron-Blakeslee Facility - 2022 Annual Report Review

To: Douglas Wise, Portland Water Bureau

From: Katie Lippard, GSI Water Solutions, Inc.
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Attachments: Figure 1 – Total VOC Concentrations in Groundwater – Fourth Quarter 2022

Date: May 9, 2023

Introduction

This technical memorandum is intended to provide a review of the 2022 *Groundwater Extraction and Treatment System Performance Annual Monitoring and Evaluation Report* (2022 Annual Report) prepared by Jacobs for the Former Baron-Blakeslee Solvent Recycling Inc. (Former Baron-Blakeslee) facility located at 5920 NE 87th Avenue, Portland, Oregon (Jacobs, 2023) (Figure 1). The purpose of this review is to evaluate whether the shutdown of groundwater extraction and treatment system operations for the in situ chemical oxidation (ISCO) pilot study injections are resulting in plume migration, and if increased chlorinated volatile organic compound (VOC) concentrations present a risk to the water rights owned by the Portland Water Bureau in the Unconsolidated Gravel Aquifer/Troutdale Gravel Aquifer (TGA), and Columbia River Sand Aquifer (CRSA) and Troutdale Sandstone Aquifer (TSA).

Summary of the 2022 Annual Report

The following is a summary of pertinent information obtained from GSI Water Solutions, Inc.'s review of the 2022 Annual Report (Jacobs, 2023) and other historical documents available on the Oregon Department of environmental Quality's Environmental Cleanup Site Information (ECSI) database.

Pilot Test Scope

- The groundwater extraction and treatment system was shut down on January 27, 2020. When operational, the groundwater extraction system operated at an average flow rate of 130 to 140 gallons per minute (Jacobs, 2023).
- The ISCO pilot study was initiated on January 27 to 31, 2020, when sodium permanganate was injected into the groundwater in Zone C (105 to 140 feet below grade surface [ft bgs]) in the vicinity of well DW-4 (Jacobs, 2020a) (see Figure 1). Sodium permanganate operates by chemically destroying the VOCs. It is effective for only several months in the aquifer. The pilot test is scheduled to continue into 2023 (Jacobs, 2023).
- As part of the pilot test, potassium/bromide tracer injections were performed in October 2020. Potassium and/or bromide has been identified in all the ISCO monitoring wells (IW-1S, IW-1D, IW-2S, IW-2D, DW-4-4, and DW-4-5) since the fourth quarter (Q4) of 2020 (Jacobs, 2023). The plume stability wells (GW-12, GW-

13C, GW-13D, GW-14D, GW-20-2, GW-21-1, GW-21-2, GW-21-3, GW-23, and GW-25) located near the former extraction wells have not been analyzed for potassium/bromide.

2022 Groundwater Results

- Downgradient monitoring wells consist of GW-21 and GW-22. Samples collected from GW-21 did not contain detectable levels of VOCs at applicable standards. 1,1-Dichloroethane was detected at a concentration of 1.2 micrograms per liter (µg/L) in the CRSA (225 to 235 ft bgs). As shown on Figure 1, the plume limits shown by Jacobs in their report did not include the detection present in this well. GW-22 was not sampled in 2022 due to overgrowth of blackberry bushes (Jacobs, 2023).
- In 2022, the highest VOC concentrations were primarily observed in groundwater Zone C (45 to 120 feet elevation), located in the TGA.
- As part of their data evaluation, Jacobs compares the 2022 groundwater monitoring results to the prior year's sampling event in December 2021 and indicates that VOCs exhibit either the same or decreasing concentrations, with the exception of an increase noted in well GW-18 (Jacobs, 2023). However, this data comparison does not accurately represent increases in VOC concentrations following the system shutdown in January 2020.
- When comparing the Q4 2019 groundwater data (pre-system shutdown) to the Q4 2022 groundwater data (most recent sampling event), the highest increases in total VOC concentrations occurred in wells GW-17, GW-18, GW-20, and GW-25. These wells are located in the vicinity of groundwater extraction wells TW-1, EW-1, and EW-2 (Figure 1).
- Well GW-18 (Zone C) had an increase of more than an order of magnitude for both trichloroethene (TCE) and tetrachloroethene (PCE). TCE increased by 1,291 percent, with concentrations rising from 2.3 µg/L in 2019 to 32 µg/L in 2022, exceeding its maximum contaminant level (MCL) cleanup criteria of 5 µg/L. PCE increased by 983 percent, with concentrations rising from 12 ug/L in 2019 to 130 ug/L in 2022, also exceeding its MCL of 5 µg/L (Figures 34 through 36, Jacobs, 2020b; Figures 22 through 24, Jacobs, 2023). Percent change comparisons of data from Q4 2019 and Q4 2022 in Zone C for wells GW-17, GW-18, GW-20, and GW-25 are shown in Table 1 below.

Table 1. Percent Change of VOCs in Select Zone C Wells: 2019 to 2022

Contaminant	Well ID (Sample Depth in feet)	October 2019 (µg/L)	October 2022 (µg/L)	Percent Change
Total VOCs	GW-17 (65)	5.1	4.2	-18%
	GW-17 (105)	78.6	170.1	116%
	GW-18 (60)	10.0	51.3	413%
	GW-18 (95)	15.4	166.8	983%
	GW-20 (54)	3.9	8.3	113%
	GW-20 (102)	4.0	8.3	108%
	GW-25 (97)	3.5	23	557%
PCE	GW-17 (65)	4.0	3.2	-20%
	GW-17 (105)	66	130	97%
	GW-18 (60)	7.7	39	406%
	GW-18 (95)	12	130	983%
	GW-20 (54)	2.6	7.5	188%
	GW-20 (102)	2.7	6.7	148%
	GW-25 (97)	2.1	18	757%

Contaminant	Well ID (Sample Depth in feet)	October 2019 (µg/L)	October 2022 (µg/L)	Percent Change
TCE	GW-17 (65)	0.9	ND	—
	GW-17 (105)	11	37	236%
	GW-18 (60)	1.4	10	614%
	GW-18 (95)	2.3	32	1,291%
	GW-20 (54)	0.5 J	ND	—
	GW-20 (102)	0.5	1.6	220%
	GW-25 (97)	0.8	5.0	525%

Notes

— = Not calculated

µg/L = micrograms per liter

J = estimated concentration

ND = analyte not detected

PCE = tetrachloroethene

TCE = trichloroethene

VOC = volatile organic compound

Zone C = 45- to 120-foot elevation

- Concentrations either decreased or stayed the same in the remaining wells sampled in 2022. Most notably, decreases were reported in Zone C downgradient wells GW-12-C, GW-13C, and GW-23, located in the TGA, and Zone D (screened below 120 feet elevation) downgradient wells GW-13D and GW-14D, located in the vicinity of the CRSA and TGA transition zone (Jacobs, 2020b and 2023).

Conclusions

Since the system shutdown and ISCO pilot study injections in January 2020, the highest VOC increases have been identified in the central portion of the plume, primarily in Zone C of wells GW-17, GW-18, GW-20, and GW-25. VOC concentrations in GW-18 have increased as much as 1,291 percent since 2019. These wells are located in the vicinity of groundwater treatment system extraction wells, indicating that the treatment system shutdown is likely resulting in plume migration. Concentrations have decreased in downgradient wells GW-12-C, GW-13C, GW-23, and GW-14D; however, detectable concentrations of VOCs are present in downgradient well GW-21 and the status of GW-22 is unknown because it was not sampled. Concentrations of VOCs in the central portion of the plume could ultimately pose a risk to groundwater supplies at the Portland International Center.

Based on the 2022 Annual Report (Jacobs, 2023), the pilot study is on-going and is expected to continue into 2023. The pilot study work plan was not available for review, and it is unknown if additional ISCO injections are planned or if additional tracer study data is to be collected. Sodium permanganate has a relatively fast reaction time (several months); therefore, the chemical oxidation resulting from the January 2020 injections should have already occurred. Turning the system back on, even at a reduced rate, would provide hydraulic control and would reduce the rate of plume migration during the remainder of the pilot study.

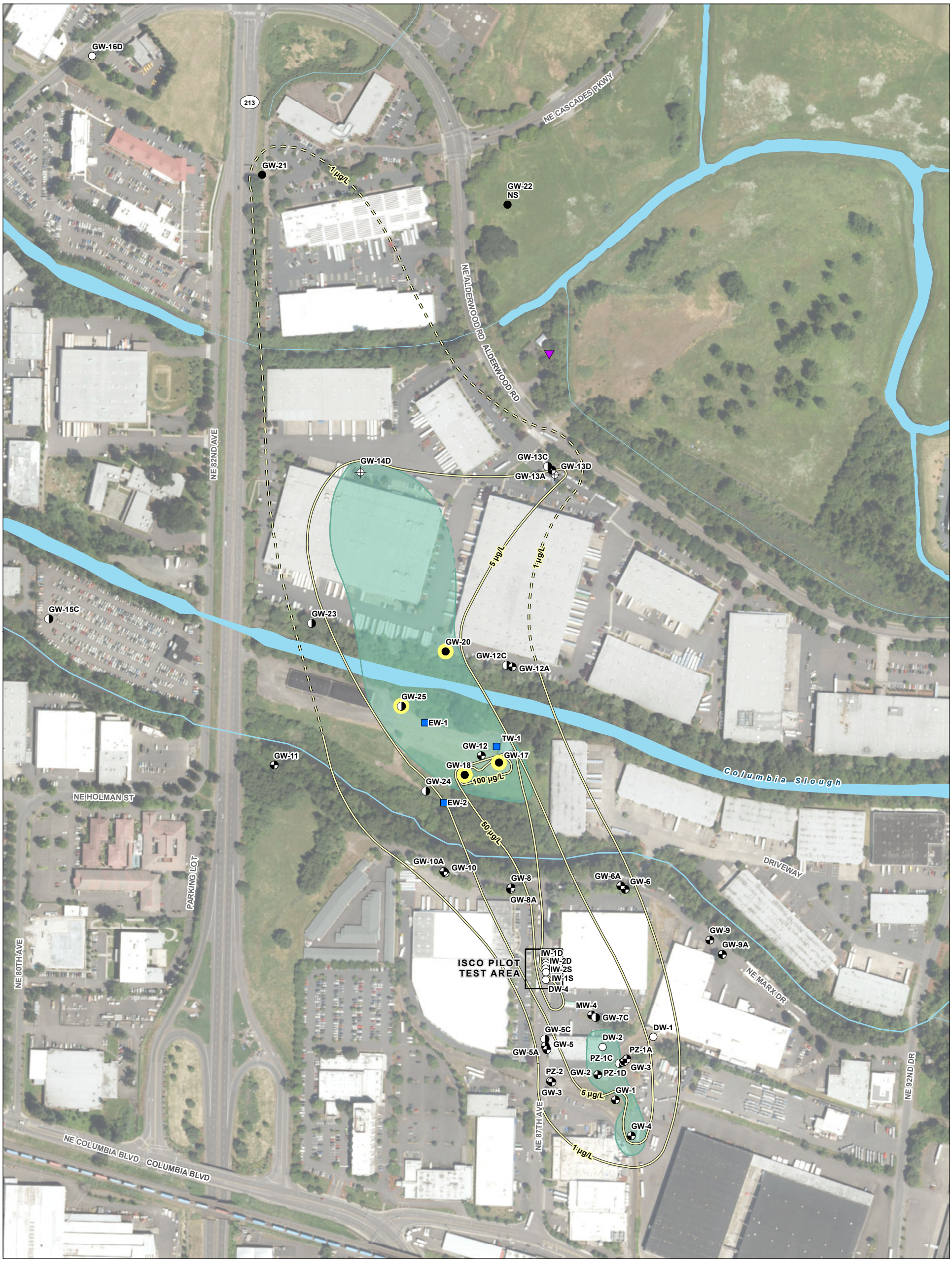
At the Former Baron-Blakeslee site, highly mobile and persistent solvents have been released to shallow aquifers that are used by the Portland International Center and the City of Portland for potable water supplies. The City has existing water supply wells (P21, P22, P26, P28, P29, and P31) and undeveloped municipal groundwater rights (Permit G-8755) in the aquifers that are: (1) impacted by the Former Baron-Blakeslee site (i.e., the TGA) or (2) locally hydraulically connected to the TGA (i.e., the CRSA and TSA). It should also be noted that the Former Baron-Blakeslee site is located within the 30-year time-of-travel for the City's Columbia South Shore Well Field, which represents the area from which the City's existing water supply wells may derive groundwater during the next 30 years. Therefore, increasing concentrations of solvents in the central portion of the plume could ultimately pose a risk to groundwater supplies of the City of Portland and other groundwater users, and compromise the ability of the Portland Water Bureau to develop new sources of groundwater and put its existing water rights for aquifers beneath the Former Baron-Blakeslee site to beneficial use.

References

Jacobs. 2020a. *In Situ Chemical Oxidation Pilot Study Work Plan Addendum*. Prepared for Honeywell International, Inc. Prepared by Jacobs. August 2020.

Jacobs. 2020b. *Groundwater Extraction and Treatment System Performance Annual Monitoring and Evaluation Report, 2019*. Prepared for Honeywell International, Inc. Prepared by Jacobs. February 2020.

Jacobs. 2023. *Groundwater Extraction and Treatment System Performance Annual Monitoring and Evaluation Report, 2022*. Prepared for Honeywell International, Inc. Prepared by Jacobs. February 2022.



LEGEND

- Extraction Well
- A Zone Monitoring Well
- C Zone Monitoring Well
- D Zone Monitoring Well
- CMT Multilevel Well
- Tri-Level Monitoring Well
- Monitoring Well with Significant Increase in Total VOC Concentrations from October 2019 to October 2022
- 2022 Total VOC Isoconcentration (µg/L), dashed where inferred
- MCL Remedial Action Area (5 µg/L concentration of maximum PCE or TCE concentrations from October 2022. Dashed where inferred).
- Groundwater Point of Diversion at Portland International Center
- Watercourse
- Waterbody

NOTES

µg/L: micrograms per liter
MCL: maximum contaminant level
ISCO: In-situ chemical oxidation
PCE: tetrachloroethylene
TCE: trichloroethylene
NS: not sampled

Date: May 9, 2023
Data Sources: BLM, ESRI, ODOT, USGS, Jacobs (Oct 2022), OWRD, COP Imagery (2022)

N

0 165 330 495
Feet

FIGURE 1

Total VOC Concentrations in Groundwater - Fourth Quarter 2022

Former Baron-Blakeslee Facility
Portland, Oregon

GSI Water Solutions, Inc.

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