

December 31, 2019

via email: george.heizman@dec.ny.gov

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**Revised Operations and Monitoring Plan
Former Ferroxcube Site, Saugerties, New York, NYSDEC Site No. 356011**

Dear Mr. Heitzman,

AECOM has prepared this revision of the Operations and Monitoring (O&M) Plan for the former Ferroxcube site (i.e., the Site) at 1033 Kings Highway in Saugerties, New York on behalf of Philips North America, LLC (Philips) in response to our ongoing assessment of the groundwater conditions at the Site. The assessment and remedial activities that have been performed in response to the detection of volatile organic compounds (VOCs) in groundwater at the Site is detailed below. Site contaminants consist primarily of halogenated solvent compounds, such as 1,1,1-trichloroethane (1,1,1-TCA), trichloroethylene (TCE), trichlorotrifluoroethane (Freon-113), tetrachloroethene (PCE) and its breakdown products: 1,2-dichloroethene (1,2-DCE) and 1,1-dichloroethene (1,1-DCE). The current concentrations and distribution of these compounds in groundwater are discussed, as well as the results of groundwater sampling performed at the Site during the previous year for poly- and per-fluoroalkyl substances (PFAS) and 1,4-dioxane (referred to as “emerging contaminants” in this context). This document describes modifications to the sampling locations, analyte lists, and sample collection frequency for future monitoring activities at the Site and is a revision of the Draft Revised O&M Plan submitted to the New York State Department of Environmental Conservation (NYSDEC) in October 2019 and incorporates the Department’s comments thereupon.

BACKGROUND

The Site is located on Kings Highway in the Town of Saugerties, Ulster County, New York. The area surrounding the Site has had a commercial/light industrial presence for decades due to its proximity to the New York State Thruway. Additional commercial and industrial development of the area has been spurred by the installation of a municipal water line along Kings Highway in 2011. Philips discontinued operations at the Site in January 2001, and the property was sold to a perfume and candle-manufacturing firm. The Site was subsequently used for the manufacture of candle products for several years. The former manufacturing buildings 1, 2, 2A, and 2B (see **Figure 1**) on the western side of Kings Highway at the Site are currently largely vacant, although portions are used for the storage of items including movie props and vehicles. A pipe yard for a water and sewer pipe wholesaler is present on the portion of the Site east of Kings Highway.

The Site’s subsurface is underlain by glacial lacustrine clayey silt with varves (i.e., thin layers of fine sand deposited seasonally within the silt) at thicknesses ranging from 0 to 80 feet below the ground surface across the Site. The glacial silt overlies hummocky dolomite bedrock, the irregular upper surface of which is obscured by the relatively flat surface of the silt. Groundwater flow in the overburden varved silt is northward or northeasterly toward the shallow Mudder Kill creek which flows west to east along the northern portion of the Site. Groundwater movement in the underlying bedrock is influenced by solution enhanced fractures and bedding planes and flows east-northeast toward the Esopus Creek approximately 3,600 ft. east of Building 2.

The Site was historically operated by Ferroxcube, and later Philips Components. Both businesses manufactured electronic components at the Site from 1961 until 2000. VOCs were used in production

operations until 1991, resulting in releases to soil and groundwater. In 1982, the Ulster County Department of Health (UC DOH) discovered halogenated hydrocarbons in exceedance of drinking water standards in six nearby residential wells. As a result, groundwater and surface soil investigations were conducted, source areas were evaluated, and impacted soil and groundwater were identified. Properties with potable water supplies that had been impacted by VOCs were supplied with point-of-entry water treatment systems and were later connected to the municipal water supply after its installation along Kings Highway. During this time, Philips purchased a few of the adjacent residential properties that had impacted water supplies, and these residences were either demolished or vacated. The last of the private residences with an impacted water supply was connected to municipal water in October 2014.

Solvent Storage Shed Area: The Site has undergone a series of Remedial Activities in accordance with the terms of a Record of Decision (ROD) initially executed in March 1993 with the New York State Department of Environmental Conservation (NYSDEC), and subsequently revised. The ROD identified the area of a former solvent storage shed that had been attached to Building 2 on the northern portion of the Site (i.e., Solvent Storage Shed Area) as the probable source area for soil and groundwater impacts. The ROD incorporated remedial activities for the Solvent Storage Shed Area including air sparging, soil vapor extraction (SVE), groundwater pumping and treatment, and permanganate injections. Air sparging and SVE were performed from 1994 until 1998, by which time monitoring of off-gas from the SVE system and a concomitant improvement in groundwater quality demonstrated that the mass of VOCs that had been calculated to exist in soils near the Solvent Storage Shed Area had been removed.

The focus of the remedial efforts for the Solvent Storage Shed Area then shifted to improvement of the quality of bedrock groundwater, as three adjacent residences continued to utilize the bedrock aquifer as a potable water supply at that time. Potassium permanganate was injected in small batches from 2000 through 2003 and from 2006 until 2007. A network of groundwater monitoring wells was used to monitor the effectiveness of the remedy for the Solvent Storage Shed Area (**Figure 1**). The network included four bedrock monitoring wells (BW-3, BW-5, RW-4, and K-Well) which have been sampled since 2008 on a quarterly basis, as well as seven additional wells (one bedrock well [BR-00-02] and five overburden wells [OW-10, OW-14, OW-1S, OW-1D, and OW-2]) which have been sampled on an annual basis. A groundwater pump-and-treat system had been operated at the Site since 1988 except during those periods when permanganate was being injected into the subsurface. Bedrock well RW-4 was installed in January 2004 and has since been the primary groundwater extraction point. Hydrogeologic investigations including pump testing, groundwater colorimetric and oxidation reduction potential (ORP) monitoring were completed in 2006 during the performance of permanganate injections and confirmed that a strong interconnection existed between bedrock wells at the central and southwestern portions of the Solvent Storage Shed Area (i.e., RW-4 and BW-5) and wells at the northeastern portion of the Site (specifically, K-Well and to a lesser extent, the Miles Well). On the other hand, bedrock wells BR-00-02 and BW-3, which are located along a subsurface ridge of bedrock east of the northern portion of the Solvent Storage Shed Area, exhibited an insignificant response to these procedures.

Former TCA AST Area: An above ground solvent storage tank (AST) was formerly present at the remote southern portion of the Site, adjacent to Building 1. This former AST was identified as a probable source area for shallow overburden groundwater impacted by 1,1,1-TCA and its breakdown products (1,1-DCE, 1,1-dichloroethane (DCA), chloroethane, and ethane). The network of groundwater monitoring wells used to monitor the effectiveness of the remedy at the Former TCA AST area includes three wells (ITMW-1, ITMW-3, and ITMW-4) which are sampled on a quarterly basis and three additional wells (ITDW-1, ITMW-8 and ITMW-9) which are sampled on an annual basis (refer to **Figure 1**). Overburden monitoring well ITMW-1 was located immediately adjacent to the former TCA AST. A deeper overburden well (ITDW-1) was also installed adjacent to the probable 1,1,1-TCA source area, but has not contained concentrations of VOCs in excess of NYSDEC Standards, Criteria, and Guidance values (SCGs) for groundwater since 2005. The remedy for this area of the Site has included a series of bionutrient substrate injections performed in 2001, 2002, 2004, 2007, 2009, 2011, and 2013 in accordance with the provisions of an Underground Injection Control Program application authorized by the United States Environmental Protection Agency (US EPA) and intended to promote the reductive dechlorination of VOCs by naturally occurring soil bacteria.

CURRENT SITE CONDITIONS

Solvent Storage Shed Area: As a result of the remedial actions completed at the Site, concentrations of VOCs in the overburden wells in the Solvent Storage Shed Area are compliant with SCGs. A summary of the past five years of groundwater sampling results for wells at the Site is included in **Table 1**. **Table 1** also lists the locations and status of monitoring and recovery wells at the Site which are no longer in use. Concentrations of VOCs in two bedrock wells (BR-00-02 and BW-3) along the northern portion of the Solvent Storage Shed Area have been compliant with SCGs for the past five years except for minor exceedances of tetrachloroethene and benzene at BW-3 and benzene at BR-00-02 in 2016. Investigations completed during the remediation of this area have shown that these wells to the north are not as effectively connected hydrogeologically to the Solvent Storage Shed Area as are the wells to the east and southwest (i.e., BW-5 and RW-4) and the wells at the northeastern portion of the Site (specifically the K-Well and to a lesser extent the Miles Well).

Bedrock well RW-4 has been used as the recovery well for the pump-and-treat system since 2004 and removed an appreciable mass of contaminant from the groundwater from 2004 through 2008. Over the past five years, however, the total VOC concentrations detected at this well have remained within a narrow range from 21 to 57 micrograms per liter (µg/L). VOC concentrations continue to exceed SCGs at bedrock well BW-5 despite the reduction in VOC mass achieved by the remediation of the Solvent Storage Shed source area. The last five years of VOC concentration trend data for these wells is presented graphically in **Attachment A**.

The K-Well, which is located furthest to the east and downgradient of the Solvent Storage Shed Area, initially exhibited the highest concentrations of VOCs of any well when sampled during the 1980s. The concentrations of VOCs detected at this well have decreased by nearly two orders of magnitude since the remediation of the Solvent Storage Shed Area. The previous five years of VOC concentration trend data for this well is also presented graphically in **Attachment A**.

As stated previously, no residences currently utilize the bedrock aquifer in the vicinity of the Site as a potable water supply.

In addition to sampling wells in the Solvent Storage Shed Area for VOCs, two wells were sampled for emerging contaminants during the past year. The K-Well did not contain a detectable concentration of 1,4-dioxane, but did contain Perfluorooctanesulfonic acid (PFOS) at a concentration of 60 nanograms per liter (ng/L), and Perfluorooctanoic acid (PFOA) at a concentration of 14 ng/L. Groundwater at BW-5, which is closer to the former Solvent Storage Shed, was not found to contain a detectable concentration of 1,4-dioxane, but did contain PFOS at a concentration of 120 ng/L and PFOA at 24 ng/L.

Former TCA AST Area: The network of groundwater monitoring wells used to monitor the effectiveness of the remedy at the Former TCA AST Area is shown on **Figure 1**, and a summary of the past five years of groundwater sampling results is included in **Table 1**. During the course of the remedy, the total VOC concentrations detected in these wells have been reduced from as high as 81,000 µg/L in 2001 (in ITMW-1) to 74.4 µg/L, which was the highest concentration detected (in ITMW-4) during the June 2019 sampling event. The last five years of VOC concentration trend data for these wells is presented graphically in **Attachment A**, which documents an order of magnitude decrease in VOC concentrations.

Similarly, the original source chemical (1,1,1-TCA) has been degraded so that only the final breakdown products of the reductive dechlorination process (primarily chloroethane, with relatively minor hits of DCA and 1,1-DCE) remain. It is anticipated that within a few years, these analytes will be compliant with SCGs. Concentrations of VOCs in ITDW-1, MW-8 and MW-9 (a deep overburden well, a downgradient well, and a cross-gradient well to the TCA AST source area) have been compliant with groundwater SCGs for several years or more.

In addition to sampling of groundwater for VOCs, two wells in the Former TCA AST Area were sampled for emerging contaminants during the past year. ITMW-1 contained 1,4-dioxane at a concentration of 270 µg/L and PFOS at 1.2 ng/L, but contained no detectable concentration of PFOA. Groundwater at well ITMW-3 contained 62 µg/L of 1,4-dioxane, and 4.2 ng/L of PFOS, but PFOA was not detected.

PROPOSED MODIFICATIONS TO THE OPERATIONS AND MONITORING PLAN

Solvent Storage Shed Area: As the remedial actions completed at the Site have abated the concentrations of VOCs in a majority of the overburden wells in the Solvent Storage Shed Area to compliance with NYSDEC SCGs, AECOM proposes to discontinue monitoring the overburden wells in this area effective December 2019 and permanently abandon them in accordance with NYSDEC CP-43: Groundwater Monitoring Well Decommissioning Policy and the appended Groundwater Monitoring Well Decommissioning Procedures.

Similarly, concentrations of VOCs in two bedrock wells (BR-00-02 and BW-3) along the northern portion of the former Solvent Storage Shed Area have also been largely compliant with groundwater SCGs for the past five years, and AECOM proposes to discontinue monitoring these wells and permanently abandon BR-00-02 in accordance with NYSDEC Groundwater Monitoring Well Decommissioning Policy and Procedures. BW-3 will be maintained for the collection of groundwater elevations. Summaries of the proposed revisions to the Operations and Monitoring Plan are provided in **Tables 1 and 2**.

VOC concentrations remain in excess of groundwater SCGs for several compounds at three wells in the Solvent Storage Shed Area: RW-4, BW-5, and the K-Well. In addition, PFOS and PFOA were detected in BW-5 and the K-Well. RW-4 has been used as the recovery well for the pump-and-treat system since 2004, but over the past five years the total VOCs detected in this well have remained steady. AECOM proposes to discontinue groundwater extraction and treatment from RW-4 upon approval of this O&M Plan, and to sample and analyze groundwater collected from this well for VOCs and PFAS quarterly over the coming year. Groundwater data collected for the site henceforth will be submitted to NYSDEC's EQUIS™ database team for upload into the Department's database.

AECOM also proposes to collect and analyze groundwater from BW-5 and the K-Well for VOCs and PFAS on a quarterly basis over the coming year. A status report containing the sampling data will be submitted on a biannual basis. The last report was submitted following the collection of quarterly samples in June 2019; therefore, the next report will be prepared and submitted following the December 2019 sampling event.

Former TCA AST Area: Concentrations of VOCs detected in monitoring wells at the Former TCA AST source area (ITMW-1, ITMW-3 and ITMW-4) have decreased by greater than three orders of magnitude during the course of the remedial action. AECOM proposes to sample and analyze groundwater collected from these wells for VOCs and 1,4-dioxane on an annual basis over the coming year. In addition, AECOM proposes to collect and analyze groundwater samples on an annual basis for VOCs and 1,4-dioxane from well MW-8, the downgradient well for this area, and well MW-9, the cross-gradient well for this area which were not sampled for 1,4-dioxane previously. As the deep overburden well for this area (ITDW-1) has not contained concentrations of VOCs in excess of SCGs in more than a decade, AECOM proposes to discontinue monitoring this well and permanently abandon it in accordance with the NYSDEC Groundwater Monitoring Well Decommissioning Policy and Procedures.

CLOSING

AECOM looks forward to receiving your approval of this O&M Plan for the Former Ferroxcube site. Please contact Richard Hixon at Rich.Hixon@aecom.com or (518) 951-2288 with any questions or comments regarding this document.

Yours sincerely,

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Revised Operations and Monitoring Plan, Former Ferroxcube Site, Saugerties, New York, NYSDEC Site No. 356011

CC: Mr. Jesse Overgord, Philips

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Figure 1 - Site Plan, Former Ferroxcube Site

Table 1 – Former Ferroxcube Site, Groundwater Monitoring Results, June 2019 with Five Prior Years

Table 2 – Former Ferroxcube Site, Operations and Monitoring Plan, December 2019

Attachment A - Groundwater Quality Trends, VOC Concentrations at Selected Wells

Figures

Tables

Table 1 – Former Ferroxcube Site, Groundwater Monitoring Results, June 2019 with Five Prior Years

Table 2 – Former Ferroxcube Site, Proposed Operations and Monitoring Plan, December 2019

Table 1
Former Ferroxcube Site, Saugerties, NY, NYSDEC Site Code 356011
Groundwater Monitoring Results, June 2019 with Five Prior Years

Well ID	Range of Total VOCs (µg/L) Last 4 quarters	Range of Total VOCs (µg/L) Last 5 years	Well Location, Construction	Emerging Contaminants, 2018 Data	Recommendation for Revised O&M Plan
ITMW-1	49.1 - 189.8	49.1 - 2576	Overburden (OB) well at former TCA AST	1,4-dioxane 270 µg/L; PFOA ND; PFOS 1.2 ng/L; total PFAS 8.12 ng/L	Retain in network; Sample for VOCs and 1,4 dioxane annually.
ITMW-3	21.9 (29.5) - 76.1	21.9 - 351	OB well close to and downgradient (DG) of former TCA AST	1,4-dioxane 62 µg/L; PFOA ND; PFOS 4.2 ng/L; total PFAS 13.5 ng/L	Retain in network; Sample for VOCs and 1,4 dioxane annually.
ITMW-4	51.2 (74.4) - 192	51.2 - 1023	OB well close to and DG of former TCA AST	Not Sampled	Retain in network; Sample for VOCs and 1,4 dioxane annually.
ITMW-5	Not Sampled	Not Sampled	OB well on north side of Building 1	Not Sampled	Well installed in 2003; VOCs never detected; abandon.
ITMW-6	Not Sampled	Not Sampled	OB well on east side of former TCA AST	Not Sampled	VOCs ND for 8 quarters; NYSDEC approved termination of sampling May 2008. Abandon.
ITMW-7	Not Sampled	Not Sampled	OB well on west side of building 1 and DG of former TCA AST	Not Sampled	VOCs ND for 8 quarters; NYSDEC approved termination of sampling May 2008. Abandon.
ITMW-8	ND	ND	OB well DG and distant from former TCA AST	Not Sampled	Retain in network; Sample for VOCs and 1,4 dioxane annually.
ITMW-9	ND - 1.0	ND - 1.0	OB well crossgradient from former TCA AST	Not Sampled	Retain in network; Sample for VOCs and 1,4 dioxane annually.
ITDW-1	ND	ND - 0.4	Deep OB well at former TCA AST	Not Sampled	Delete from O&M plan; abandon.
BW-1	Not Sampled	Not Sampled	Bedrock well (BW) located on west side of Building 2	Not Sampled	Monitoring well for early site investigation; never used to monitor the Remedial Action. Abandon.
BW-2	Not Sampled	Not Sampled	BW located approx. 100 ft. DG of former Solvent Storage Shed (SS)	Not Sampled	Monitoring well for early site investigation; never used to monitor the Remedial Action. Abandon.
BW-3	ND	ND - 9.6	BW located approx. 275 ft. DG of former SS	Not Sampled	Discontinue groundwater sampling, measure groundwater elevation during quarterly events.
BW-5	26.4 - 258.8	26.4 - 857	BW located approx. 125 ft. DG of SS	1,4-dioxane ND; PFOA 24 ng/L; PFOS 120 ng/L; total PFAS 223.8 ng/L	Retain in network; Sample for VOCs and PFAS Quarterly for 1 yr.
RW-3	Not Sampled	Not Sampled	Old overburden recovery well (RW) located approx. 100 ft. north of former SS	Not Sampled	Old overburden recovery well (RW) unused after installation of RW-4 in 2004. Abandon.
RW-4	36 - 46.7	20.6 - 56.9	Bedrock recovery well located approx. 90 ft. DG of SS	Not Sampled	Retain in network; Discontinue P&T; Sample for VOCs and PFAS Quarterly for 1 yr.
BR-00-02	ND	ND - 4.7	BW located approx. 112 ft. DG of SS	Not Sampled	Delete from O&M plan; abandon.
BR-00-03	Not Sampled	Not Sampled	BW located approx. 75 ft. north of former SS	Not Sampled	Damaged in 2004 during installation of new Recovery Well RW-4. Abandon.
OW-1S	ND	ND - 5.6	Shallow OB well located approx. 275 ft DG of SS	Not Sampled	Delete from O&M plan; abandon.
OW-1D	ND	ND	Deep OB well located approx. 275 ft DG of SS	Not Sampled	Delete from O&M plan; abandon.
OW-2	ND	ND	OB well located approx. 250 ft DG of SS	Not Sampled	Delete from O&M plan; abandon.
OW-10	ND	ND - 5.0	Deep OB well located approx. 175 ft DG of SS	Not Sampled	Delete from O&M plan; abandon.
OW-11	Not Sampled	ND	Shallow OB well located approx. 275 ft. DG of SS	Not Sampled	Delete from O&M plan; abandon.
OW-13	Not Sampled	Not Sampled	OB well located approx. 350 ft. DG of SS	Not Sampled	Discontinued as per NYSDEC memorandum of 2008. Abandon.
OW-14	ND	ND - 0.6	Shallow OB well located approx. 175 ft DG of SS on west side of Building 2	Not Sampled	Delete from O&M plan; abandon.
K-Well	25 (32) - 175	25 - 175	BW located approx. 350 ft. DG of SS	1,4-dioxane ND; PFOA 14 ng/L; PFOS 60 ng/L; total PFAS 98.6 ng/L	Retain in network; Sample for VOCs and PFAS Quarterly for 1 yr.
Miles Well	Not Sampled	Not Sampled	BW located approx. 250 ft. DG of SS	Not Sampled	Discontinued as per NYSDEC memorandum of 2008. Abandon.

Note:

49.1 Result from most recent quarterly or annual sampling event

Table 2

Former Ferroxcube Site, Saugerties, NY, NYSDEC Site Code 356011
Operations and Monitoring Plan, December 2019

Well ID	Well Location and Function	Proposed O&M Plan Revision
ITMW-1	Overburden (OB) well at the TCA AST area	Retain in network; Sample for VOCs and 1,4 dioxane Annually for 1 yr.
ITMW-3	OB well close to and downgradient (DG) of the TCA AST area	Retain in network; Sample for VOCs and 1,4 dioxane Annually for 1 yr.
ITMW-4	OB well close to and DG of former TCA AST	Retain in network; Sample for VOCs and 1,4 dioxane Annually for 1 yr.
ITMW-8	OB well DG and distant from former TCA AST	Retain in network; Sample for VOCs and 1,4 dioxane Annually for 1 yr.
ITMW-9	OB well crossgradient from former TCA AST	Retain in network; Sample for VOCs and 1,4 dioxane Annually for 1 yr.
BW-3	Bedrock well (BW) located approx. 275 ft. DG of former Solvent Storage Shed (SS)	Discontinue groundwater sampling, measure groundwater elevation during quarterly events.
BW-5	BW located approx. 125 ft. DG of Solvent Storage Shed area	Retain in network; Sample for VOCs and PFAS Quarterly for 1 yr.
RW-4	Bedrock well located approx. 90 ft. from Solvent Storage Shed location	Retain in network; Discontinue P&T; Sample for VOCs and PFAS Quarterly for 1 yr.
K-Well	BW located approx. 350 ft. DG of Solvent Storage Shed area	Retain in network; Sample for VOCs and PFAS Quarterly for 1 yr.

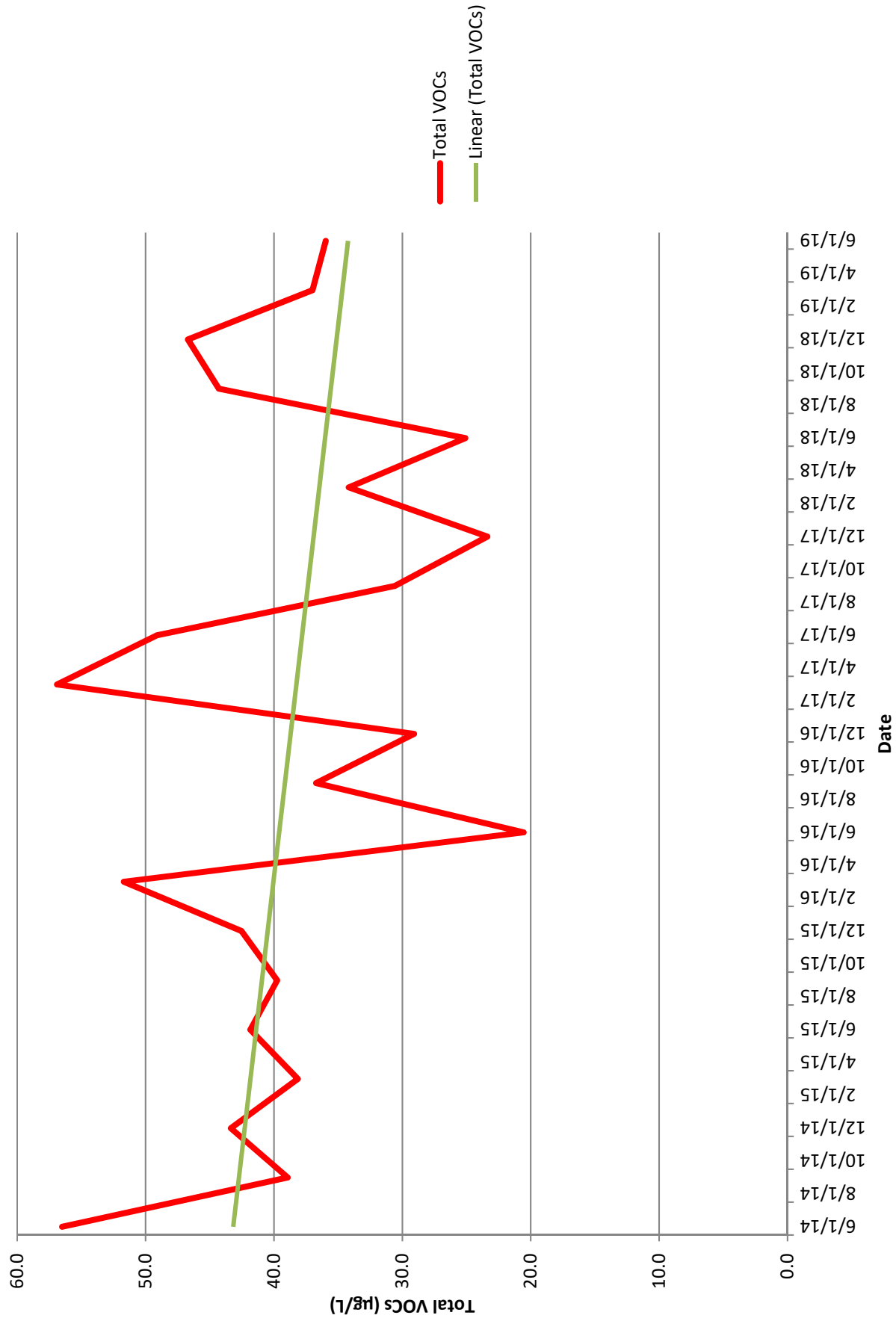
Note:

Wells retained in Monitoring Network for Solvent Storage Shed and TCA AST areas, December 2019

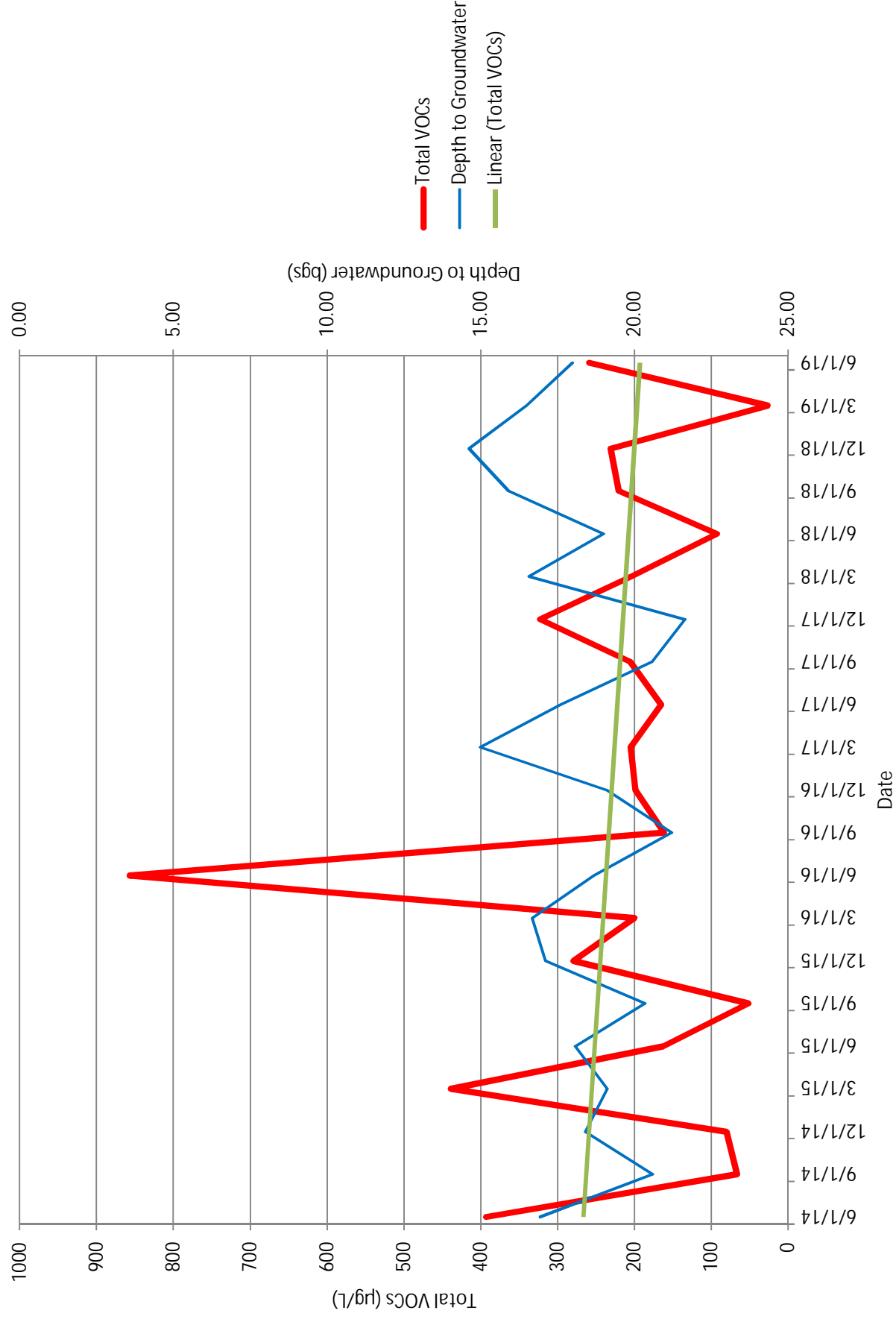
Attachment A

**Groundwater Quality Trends,
VOC Concentrations at Selected Wells**

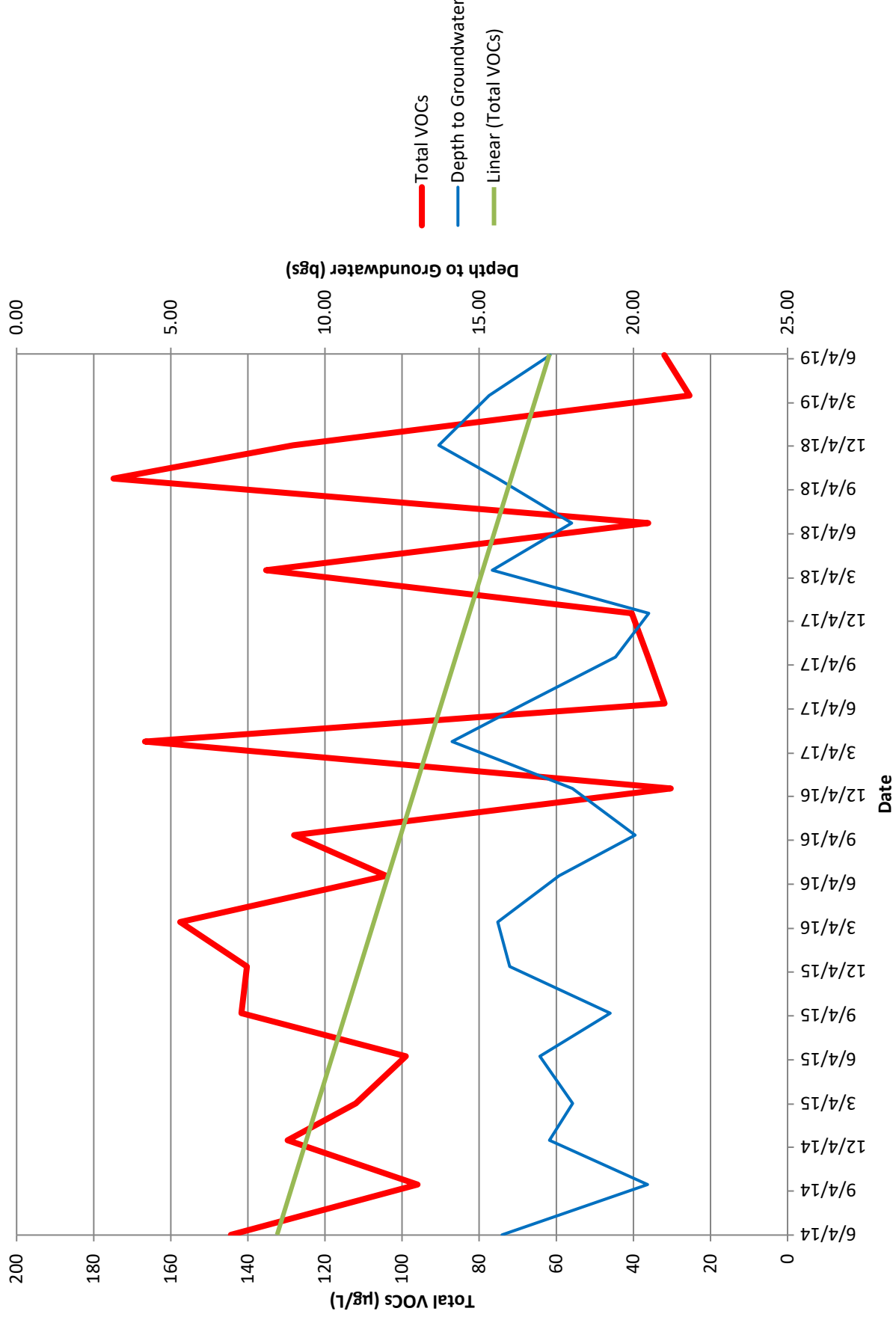
RW-4



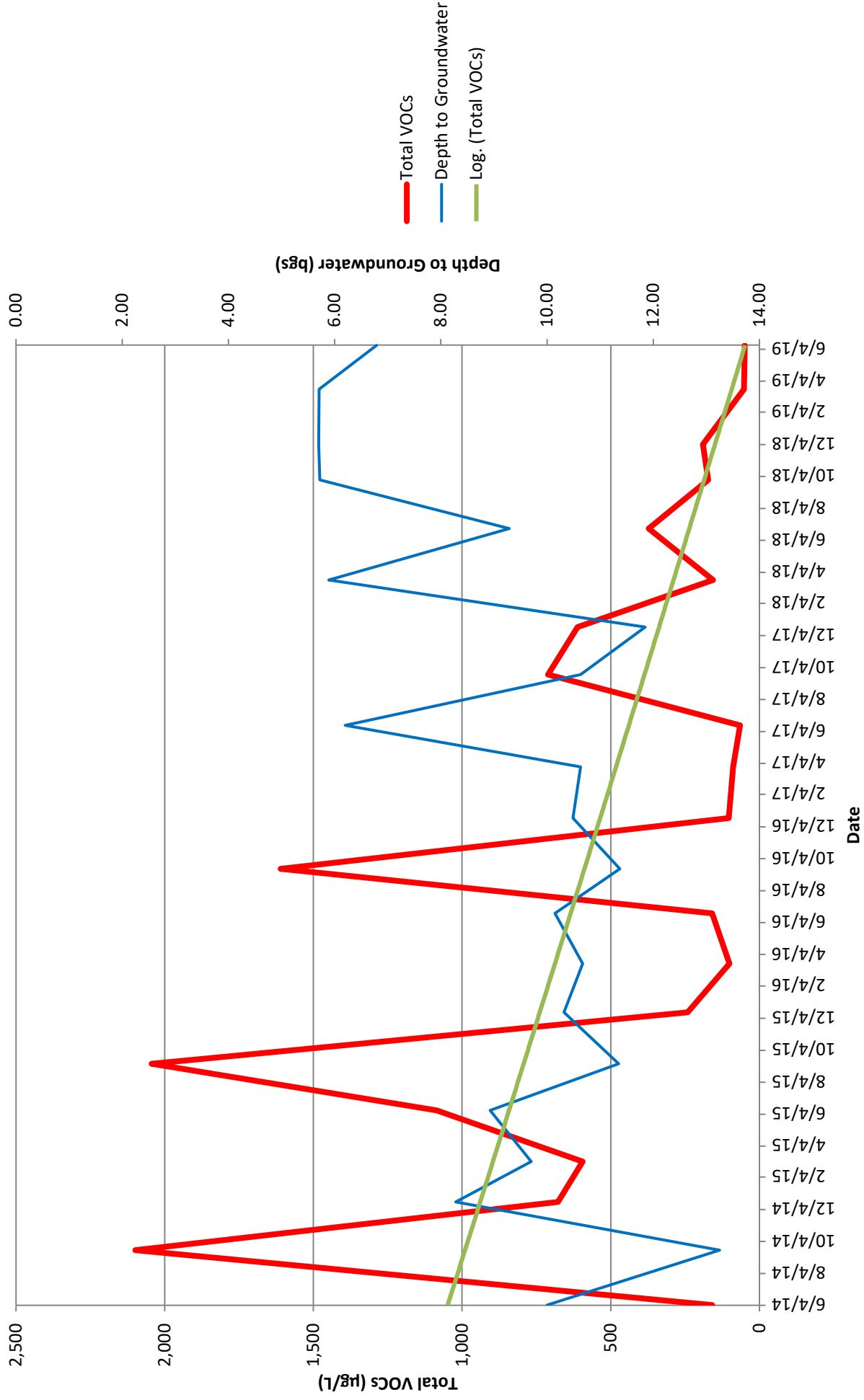
BW-5



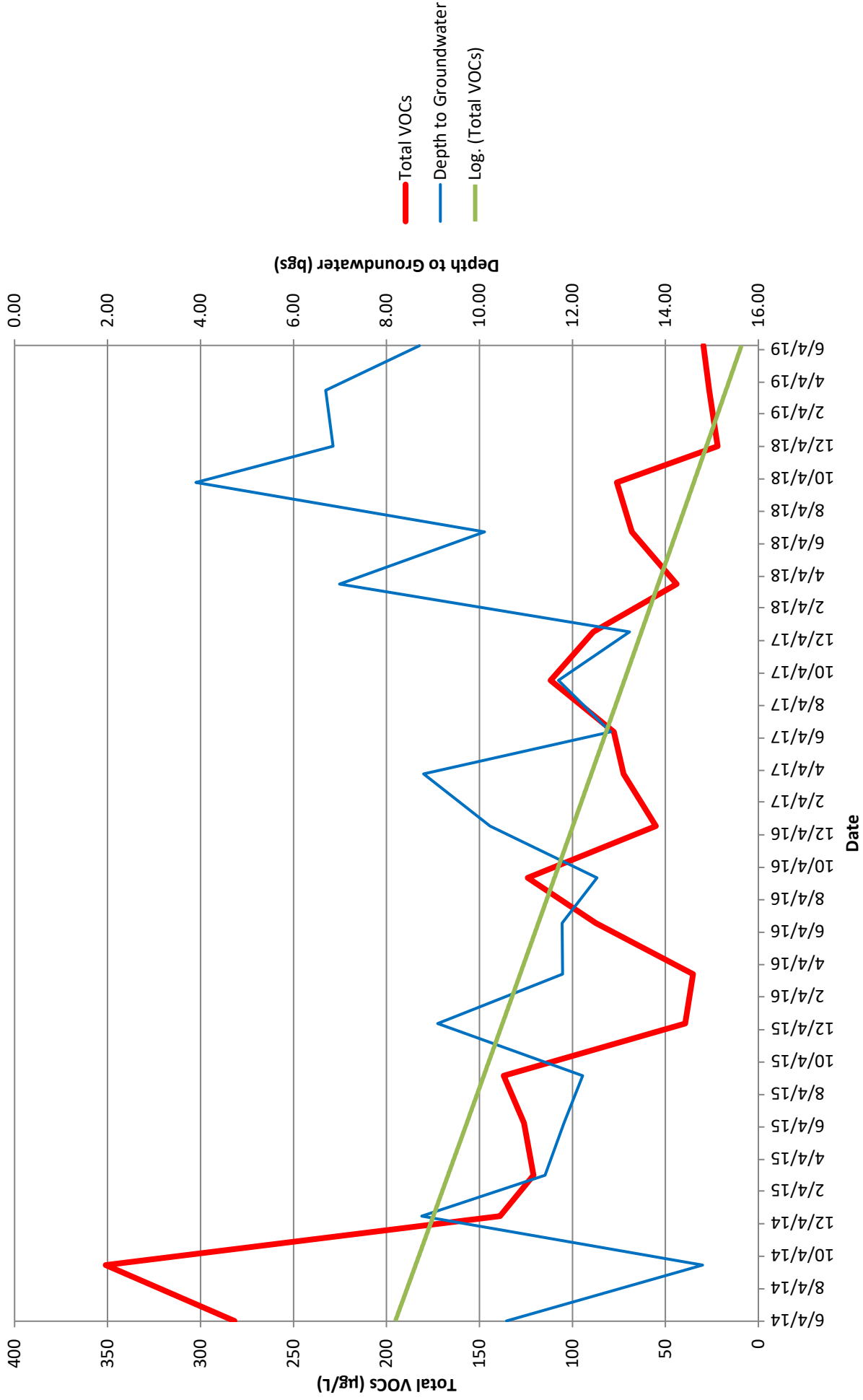
K Well



ITMW-1



ITMW-3



ITMW-4

