VAPOR REPORT

VAPOR INTRUSION ASSESSMENT
INTERIM REMEDIAL ACTIONS
VAPOR INTRUSION PRIORITY WORK PLAN
PRECISION ENGINEERING, INC., SITE

Prepared for
DICK MORGAN
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Project No. 1803.01.02

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The material and data in this report were prepared under the supervision and direction of the undersigned.

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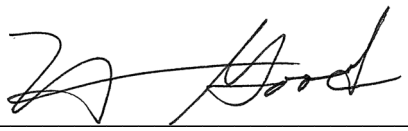

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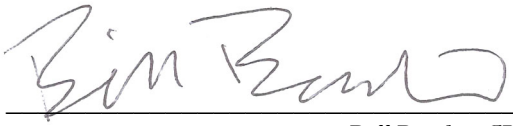

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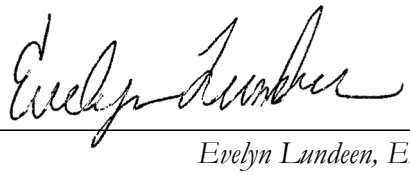

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ACRONYMS AND ABBREVIATIONS

Advance	Advance Environmental, Inc.
CSM	conceptual site model
CUL	cleanup level
DOH	Washington State Department of Health
Ecology	Washington State Department of Ecology
EPA	U.S. Environmental Protection Agency
HEPA	high-efficiency particulate air
HVAC	heating, ventilation, and air conditioning
IRA	interim remedial action
KJC	Kennedy/Jenks Consultants
MFA	Maul Foster & Alongi, Inc.
MTCA	Model Toxics Control Act
PID	photoionization detector
PLP	potentially liable party
Precision	Precision Engineering, Inc.
the Property	1231 S Director Street, Seattle, WA
RAD130	Radiello 130 passive sampler
RA	risk assessment
RI	remedial investigation
the Site	Precision Engineering, Inc., site
TCE	trichloroethene
TO	toxic organics
ug/L	micrograms per liter
ug/m^3	micrograms per cubic meter
VI	vapor intrusion
VIP	vapor intrusion priority
VOC	volatile organic compound

1 INTRODUCTION

Maul Foster & Alongi, Inc. (MFA) has prepared this vapor intrusion (VI) assessment and interim remedial action (IRA) report on behalf of Dick Morgan for the Precision Engineering, Inc. (Precision) site (the Site). The Site includes the property located at 1231 S Director Street in Seattle, Washington (the Property) (see Figure 1-1). The Site is defined by the extent of hazardous substance releases associated with Precision's historical operations. It includes the Property and may include portions of adjoining properties. Additional investigation will be conducted as part of the RI to further delineate the Site boundaries.

Historically, the Property was used for heavy industrial operations. CL Frazier Properties, LLC, owns the Property, where Pacific Industrial Supply, Inc., currently operates an industrial equipment supply store. MFA conducted an initial VI assessment and response actions, two IRAs, and confirmation vapor sampling to address trichloroethene (TCE) in indoor air at the Site, as described in this report. This report also provides a vapor intrusion priority (VIP) work plan for monitoring the long-term effectiveness of the IRAs.

1.1 Regulatory Framework

Site potentially liable parties (PLPs) are negotiating an agreed order with the Washington State Department of Ecology (Ecology). The VI assessments and IRAs were completed as independent actions in coordination with Ecology, but outside an agreed order. Detections of TCE in indoor air samples collected during the initial VI assessment exceeded the short-term action levels included in Ecology's Implementation Memo No. 22 (Ecology, 2019), triggering prompt response actions. IRAs conducted to mitigate VI into the building were completed as independent cleanup actions. The VIP work plan included in this report was prepared to satisfy anticipated agreed order requirements.

1.2 Purpose

The purpose of this report is to present findings from the vapor sampling activities conducted at the Site and to provide documentation of the response and IRAs. Analytical results from the VI assessment will be incorporated into a remedial investigation (RI) work plan for the Site, which is being prepared in coordination with Ecology. An RI and a VIP work plan, which is included in this report, are anticipated to be required deliverables under an agreed order for the Site.

2 BACKGROUND

2.1 Property Description

The Property is located in section 32, township 24 north, range 4 east of the Willamette Meridian on King County tax parcel 000160-0055 (see Figure 1-1). The approximately 3.5-acre Property is zoned for industrial use. One 62,000-square-foot building is currently located on the Property. The east side of the building was constructed in 1968, and the west part was added in 1979. The building is surrounded by an asphalt-paved parking lot (see Figure 2-1). The surrounding area is a mix of industrial and residential properties.

2.2 Property History

Precision operated an industrial manufacturing business at the Property from 1968 to 2005. The operation included manufacturing and repair of large hydraulic cylinders, large rolls used in the manufacturing of paper and sheet metal products, and other equipment. Services included grinding and polishing, honing, hard-chrome plating, milling, welding, and flame- and arc-applied metal coating. The services involved the use of chromic acid and the degreaser TCE (MFA, 2011).

From 1985 to 2003, approximately 10,000 square feet of the west side of the building was leased to Baszile Metals Service, an aluminum distributorship. Former operational areas and tanks inside the building are shown on Figure 2-1. The Property was sold on March 29, 2007, to CL Frazier Properties, LLC (MFA, 2011). The Property is currently occupied by Pacific Industrial Supply, Inc., a wire rope and marine/industrial supply distributor.

West of the Property is a business that repairs and sells refrigerators. East of the Property is a towing and limousine service business (former KASPAC/Chiyoda property) (Kennedy/Jenks Consultants [KJC], 2015). According to former Precision personnel, the property to the east was used as a paint shop in the 1970s, and before that it was a fiberglass-boat-manufacturing operation.

2.3 Previous Environmental Investigations

Extensive site characterization activities have been conducted at the Site since 1986. In 2005 and 2006, MFA conducted an RI and risk assessment (RA), which included the collection and analysis of sub-slab soil gas, indoor air, and ambient air (i.e., outdoor air) samples (MFA, 2008). During that investigation, MFA identified concentrations of TCE in soil, groundwater, and sub-slab soil gas samples above preliminary Model Toxics Control Act (MTCA) Method C cleanup levels (CULs) developed for protection of industrial workers. However, concentrations of TCE in indoor and ambient air samples were below preliminary CULs (MFA, 2008). MFA concluded that based on empirical air sample results, residual contamination beneath the building slab did not appear to pose a significant risk to indoor air quality and that a potential off-Property TCE vapor source may be contributing to TCE in air at the Property.

In an opinion letter dated July 8, 2011, Ecology stated that the nature and extent of impacts at the Site had not been fully characterized (Ecology, 2011). Ecology contracted KJC to conduct an independent RI at the Site. As part of that RI, KJC conducted additional vapor sampling in February 2015, which included collection of one sub-slab soil gas sample, one air sample from inside the building, and one ambient air sample. Below is a summary of findings from the KJC vapor sampling (KJC, 2015):

- TCE was detected at a lower concentration in the KJC sub-slab soil gas sample than in historical sub-slab samples, indicating that concentrations of TCE beneath the slab had declined since the 2006 MFA vapor sampling.
- Benzene, carbon tetrachloride, TCE, and 1,2,4-trimethylbenzene in indoor air exceeded MTCA Method B CULs.
- TCE in sub-slab soil gas exceeded MTCA Method B CULs.
- TCE in indoor air was more than twice the concentration of TCE sub-slab soil gas, indicating a potential source of TCE other than VI.[1]

MFA conducted an initial vapor assessment in February 2020 to further evaluate these conditions and to evaluate potential sources of TCE in indoor air other than VI, including potential indoor and off-Property sources (see Section 4). The results of that investigation are discussed in Section 4.3. MFA conducted a preliminary site visit prior to the initial vapor assessment (MFA, 2019). During that visit, no obvious indications of indoor sources of volatile organic compounds (VOCs) were identified.

In October 2019, Ecology published new, risk-based, short-term exposure action limits for TCE in indoor air for protection of women of childbearing age (Ecology, 2019). The concentration of TCE detected in indoor air from the 2015 KJC vapor investigation exceeded the new short-term action limit for the workplace scenario. Based on that exceedance, Ecology requested that indoor air sampling be conducted as quickly as possible to assess TCE relative to the new action limit. MFA's vapor assessment included an evaluation of TCE relative to the short-term action limit (see Section 4).

Based on the results of the initial vapor assessment (see Section 4.3), additional indoor air sampling, response actions, and IRAs were implemented. Those activities and associated sampling results are presented and discussed in Sections 5 and 6.

3 CONCEPTUAL SITE MODEL

A conceptual site model (CSM) describes potential chemical sources, release mechanisms, environmental transport processes, exposure routes, and receptors. The primary purpose of the CSM is to describe pathways by which human and ecological receptors could be exposed to site-related chemicals. A complete exposure pathway consists of four necessary elements: (1) a source and

[1] See further discussion in Section 4.3.

mechanism of chemical release to the environment, (2) an environmental transport medium for a released chemical, (3) a point of potential contact with the impacted medium (referred to as the exposure point), and (4) an exposure route (e.g., vapor inhalation) at the exposure point. A complete pathway refers to an exposure pathway that is currently complete based on the CSM; however, MTCA also requires protection against potential future exposures if site conditions change. Detailed CSMs are provided in the MFA RI/RA (2008) and KJC RI (2015) reports. The information provided below is excerpted from those reports as it pertains to vapor contamination at the Site, specifically TCE.

3.1 Potential Sources and Release Mechanisms

Based on previous investigations and documented historical uses, leaks and minor spills of degreasers and other solvents associated with a former TCE tank and parts-washing activities in the former chrome-plating, grinding, and cylinder shops associated with Precision operations before the mid-1980s contributed to vapor contamination at the Site (KJC, 2015; MFA, 2008).

No TCE free product has been observed at the Site. As such, TCE releases are attributed to minor leaks and spills associated with the uses described above. Surface releases of TCE may have migrated to the subsurface beneath the building slab via cracks or seams in the concrete building slab or former trenches or drains. TCE contamination has been identified in soil and groundwater on the Property, primarily beneath the building slab, as well as in sub-slab soil gas, indoor air within the building, and ambient air on the Property (KJC, 2015; MFA, 2008).

A schematic CSM diagram showing exposure pathways in all media, obtained from the KJC RI (2015), is provided in Appendix A. The CSM diagram is intended to provide a generalized representation of environmental transport pathways at the Site; an updated CSM will be developed for inclusion in the RI. The diagram illustrates potential VI pathways for VOC-impacted media present beneath the slab to enter the building. Appendix A also includes figures displaying TCE results from previous soil, groundwater, soil gas, and air investigations. These figures provide data used to characterize the sub-slab TCE source area and are excerpted from the VI work plan (MFA, 2019), which provided the scope for the initial vapor assessment discussed in Section 4.

A preliminary site visit was conducted prior to the initial vapor assessment (MFA, 2019). During that visit, no obvious indications of indoor sources of VOCs were identified. Minor cracking and perforations were observed in the building slab. No drains, sumps, or trenches were identified; the former trenches (see Figure 2-2) were confirmed to have been filled in and covered with concrete. Standing water observed in the former evaporator pit (see Figure 2-2) was interpreted to be groundwater seepage and a potential source of vapor in indoor air, which was later confirmed by sampling (see Section 5.2.2). The evaporator pit was decommissioned and perforations in the building slab were sealed as part of the IRAs conducted at the Site (see Section 6). No TCE sources associated with current operations were identified during the preliminary site visit (MFA, 2019) or during any of the field activities described in Sections 4 through 6 of this report. Based on these observations and previous assessment results confirming TCE contamination in sub-slab soil, groundwater, and soil gas (MFA, 2008; KJC, 2015), VI through perforations and cracks in the building slab from sub-slab TCE-containing media and volatilization from TCE-containing standing water in the former evaporator pit were identified as the primary sources of TCE in indoor air.

3.2 Fate and Transport

The primary mechanism likely to influence the fate and transport of volatile chemicals at the Site is volatilization of chemically impacted soil and/or shallow groundwater. Volatile contaminants may partition to the vapor phase, resulting in impacts to sub-slab soil gas. Soil gas may migrate via VI to air within the building and to ambient air. Vapor migration likely occurs along preferential pathways, including perforations (e.g., utility penetrations), cracks, and seams in the concrete building slab; and along utility corridors.

It is expected that once vapors have entered the building, attenuation will occur during the normal workday because of ventilation provided by multiple open bay doors (see Figure 2-1). The building's heating, ventilation, and air conditioning (HVAC) system was assessed as part of the response actions described in Section 5. HVAC system configuration and operation and their potential influence on indoor air quality are discussed in Section 5.2.4.

3.3 Potential Exposure Scenarios

Depending on the extent of impacts at the Site, the following are potentially current or future exposure pathways related to vapor:

- Inhalation of VOCs in indoor air impacted by VI from VOC-impacted soil and/or groundwater beneath the building
- Inhalation of VOCs in ambient air (i.e., outdoor air) impacted by vapors emanating from VOC-impacted soil and/or groundwater

These potential exposure pathways will be evaluated further in the RI.

3.4 Potential Receptors

The following current and future receptors who may potentially be exposed to chemicals in vapor at the Site:

- On-site occupational workers
- General public
- Construction and trench workers

4 INITIAL VAPOR ASSESSMENT

An initial vapor assessment was conducted at the Site from February 1, 2020, to February 13, 2020. The assessment included collection of indoor air, ambient air, sub-slab soil gas, and passive indoor air samples (see Table 4-1). Sampling was conducted in general accordance with the VI work plan;

changes in the VI assessment scope of work were made in coordination with Ecology (MFA, 2019). Initial vapor assessment and follow-up vapor assessment, response actions, and IRA activities are summarized in Table 4-1. Table 4-2 summarizes the vapor samples collected during those activities; Table 4-3 presents vapor analytes and associated screening criteria; analytical results are presented in Tables 4-4 to 4-7.

The indoor air, sub-slab soil gas, and ambient air samples were analyzed for TCE and its breakdown products. Passive indoor air samples were analyzed for TCE. Samples were screened to MTCA Method B indoor air CULs and VI screening levels for sub-slab soil gas, as well as the TCE short-term indoor air action level for workplace exposure provided in Ecology's Implementation Memo No. 22 (Ecology, 2019).

4.1 Field and Analytical Methods

4.1.1 Sub-Slab Soil Gas

On February 1, 2020, four sub-slab soil gas samples were collected, each from one of four locations (A8 to A11) inside the building (see Figure 4-1), using the Cox-Colvin & Associates, Inc. Vapor Pin™ system installed with a roto-hammer. To avoid air breakthrough, depressurized 1-liter Summa canisters were used in sample collection. As a quality assurance measure, to check for potential leaks in the sampling system, the sampling apparatus and vapor pin were contained in a helium shroud during sampling, and the samples were analyzed for helium. Field photographs of the sampling apparatus are provided in Appendix B. Additional sampling protocols are presented in the VI work plan (MFA, 2019). A sub-slab soil gas sample could not be collected from one of the planned sample locations in the northwest corner of Warehouse 1 because groundwater was in direct contact with the building slab.

Sub-slab soil gas samples were analyzed for helium by ASTM International Method D-1946, and for TCE and TCE breakdown products by U.S. Environmental Protection Agency (EPA) Method Toxic Organics (TO)-15. Additional sample information is presented in Table 4-2.

4.1.2 Indoor Air

Eight 24-hour indoor air samplers (i.e., 6-liter Summa canisters with 24-hour flow controllers) were deployed, each in one of eight locations (IA8 to IA15) inside the building, on February 1, 2020, and were collected on February 2, 2020 (see Figure 4-1). Field photographs of the sampling apparatus are provided in Appendix B. The Summa canisters were placed 3 to 5 feet above the floor, in the anticipated breathing zone. Twenty-four-hour indoor air samples were analyzed for TCE and TCE breakdown products by EPA Method TO-15. Additional sample information is presented in Table 4-2.

4.1.3 Ambient Air

Five 24-hour ambient air samplers (i.e., 6-liter Summa canisters with 24-hour flow controllers) were deployed, each in one of five locations (AA1 to AA5) around the perimeter of the Property, upwind

of the building, on February 1, 2020, and were collected on February 2, 2020 (see Figure 4-1). Twenty-four-hour ambient air samples were analyzed for TCE and TCE breakdown products by EPA Method TO-15. Additional sample information is presented in Table 4-2.

As discussed in the VI work plan (MFA, 2019), ambient air samples were collected to evaluate possible off-Property TCE vapor sources. To identify a potential source of TCE detected in the ambient air samples, wind speed and direction data were collected during the sampling event (see Section 4.1.5).

4.1.4 Passive Indoor Air

Three 12-day passive indoor air samplers (Radiello 130 passive samplers [RAD130s]) were deployed, each in one of three locations (RAD1 to RAD3), on February 1, 2020, and were collected on February 13, 2020 (see Figure 4-1). Field photographs of the sampling apparatus are provided in Appendix B. For comparison to the short-term TCE action level, passive samples were collected in areas where female occupational workers of childbearing age were known to work or were likely to spend time during the workday; these samples were collected in the office (RAD1), just inside the shipping and receiving bay door in Warehouse 3 (RAD2), and in Warehouse 1 near the front desk (RAD3). A trip blank sample was also collected and analyzed. Passive samples were analyzed for TCE by modified EPA Method TO-17.

RAD130s were placed 3 to 5 feet above the floor, in the anticipated breathing zone and consistent with 24-hour indoor air sample collection heights. Samplers were deployed in accordance with manufacturer instructions and sampling protocols as provided in the VI work plan (MFA, 2019).

4.1.5 Atmospheric Conditions

A Davis Instruments Vantage Pro2 weather station was placed on the roof of the building on January 31, 2020, to collect atmospheric readings during vapor sampling events (see Appendix C). Temperature, wind direction, wind speed, and barometric pressure readings were collected every 15 minutes. At times, the weather station had connectivity issues or was blown over by strong winds; during these periods, data from the nearest King County weather station supplemented weather station data.

4.2 Analytical Results

Laboratory analytical reports are provided in Appendix D. Analytical data and the laboratory's internal quality assurance and quality control data were reviewed to assess whether they met data quality objectives, consistent with EPA procedures for evaluating laboratory analytical data (EPA, 2014a,b). A memorandum summarizing data validation procedures, data usability, and deviations from specific field and/or laboratory methods is provided in Appendix E. All analytical results were deemed usable, with the assigned qualifiers, for their intended use.

4.2.1 Sub-Slab Soil Gas

Sub-slab soil gas analytical results are summarized in Table 4-4 and shown on Figure 4-2.

TCE was detected above the MTCA Method B screening level of 12 micrograms per cubic meter (ug/m^3) in all sub-slab soil gas samples. The highest TCE concentration, 1,100 ug/m^3, was detected at sample location A9, near the former TCE tank (see Figures 4-2). Other detections of TCE in sub-slab soil gas samples ranged from 29 to 160 ug/m^3.

Cis-1,2-dichlorethene was also detected in samples A9 and A10 at 21 and 40 ug/m^3, respectively. No other TCE breakdown products were detected in the sub-slab soil gas samples.

4.2.2 Indoor Air

Indoor air analytical results from the initial vapor assessment are summarized in Table 4-5 and shown on Figure 4-2.

In all indoor air samples, TCE was detected above the MTCA Method B indoor air CUL of 0.33 ug/m^3 and the TCE short-term action limit of 7.5 ug/m^3. TCE concentrations ranged from 110 to 340 ug/m^3. All indoor air samples from sample location IA11 showed concentrations of 1,2-dichloroethane above the MTCA Method B indoor air CUL of 0.096 ug/m^3. No other TCE breakdown products were detected in the indoor air samples.

4.2.3 Ambient Air

Ambient air analytical results are summarized in Table 4-6 and shown on Figure 4-2.

TCE was not detected in any ambient air samples. 1,2-Dichloroethane was detected in all samples at 0.065 ug/m^3, below the MTCA Method B indoor air CUL of 0.096 ug/m^3.

4.2.4 Passive Indoor Air

Passive indoor air analytical results from the initial vapor assessment are summarized in Table 4-7. Sample locations are shown on Figure 4-1.

All passive samples contained concentrations of TCE above the TCE short-term action limit of 7.5 ug/m^3. TCE detections ranged from 110 to 170 ug/m^3, which is within the range of concentrations observed in the 24-hour initial indoor air samples (see Section 4.2.2).

4.2.5 Atmospheric Conditions

Atmospheric data for all vapor sampling events are provided in Appendix C.

Atmospheric conditions were measured using the on-Property weather station during the 24-hour indoor and ambient air sampling event, as described in Section 4.1.5. Wind was predominantly from the south but varied from the northeast to the south (see the wind rose provided in Appendix C). Observed fluctuations in atmospheric conditions were up to 0.1 inches of mercury in barometric pressure, 12.1 degrees Fahrenheit in temperature, and 10 miles per hour in wind speed (see charts in Appendix C).

During indoor air sampling on May 2 and 3, barometric pressure steadily increased across the 24-hour sampling period. Generally, increases in barometric pressure may result in reduced vapor intrusion. The range of barometric pressure recorded during the sampling (29.38 to 29.81 inches of mercury) was comparable to pressure range recorded over the three-week sampling event from May 15 to June 5 (29.23 to 29.78 inches of mercury). Additionally, the passive samplers deployed over a three-week period captured fluctuations in pressure, and TCE results from passive samples were below action levels.

The on-Property weather station was not functioning properly during the 12-day passive indoor air sampling event. While it did record barometric pressure measurements, it did not record wind speed, wind direction, or temperature data. Supplemental temperature data were obtained from the King County Renton Road weather station. Observed fluctuations in atmospheric conditions were up to 0.8 inches of mercury in barometric pressure and 21.1 degrees Fahrenheit in temperature (see Appendix E).

4.3 Discussion

TCE results for sub-slab soil gas, indoor air, and ambient air samples collected during the initial vapor assessment are shown in Figure 4-2.

TCE and TCE breakdown products were not detected in ambient air samples. These data suggest that no significant sources of TCE vapors were present during the sampling period in upwind locations from the northeast to the south. While these results do not rule out potential off-Property sources, they indicate that an off-Property source was not present during the sampling period and therefore was not contributing to concentrations of TCE and TCE breakdown products detected in indoor air.

No TCE sources associated with current operations were identified during the preliminary site visit (MFA, 2019) or during any of the field activities described in Sections 4 through 6 of this report.

The ambient air results and lack of known, significant VOC sources associated with current operations on the Property, as discussed in the VI work plan (MFA, 2019), and the elevated TCE concentrations detected in sub-slab soil gas samples, suggest that soil and groundwater contamination beneath the building is the primary source of TCE vapor in indoor air.

Wind from the northwest was not measured to be blowing into the Property during the sampling period. Given the steep, approximately 30-foot-high slopes along the north and west boundaries of the Property, it is not likely that the Property typically receives wind from those directions. Therefore, the absence of wind blowing from that direction during the sampling event is not considered a data gap. If an outdoor air TCE source were present in that upwind direction, it would be considered unlikely to impact the Property as the Property is sheltered from receiving wind from that direction.

The highest TCE concentration detected in sub-slab soil gas was in sample location A9, near the former TCE tank (see Figures 4-2). This suggests that the TCE vapor source (i.e., sub-slab TCE-impacted soil and groundwater) is in that area. The extent of TCE in sub-slab soil gas, groundwater, and soil has not been fully delineated. Additional work will be proposed in the RI work plan to better characterize the release for remediation.

The highest indoor air TCE concentrations were observed not in the samples collected closest to sub-slab soil gas location A9, which was located in Warehouse 1, but in sample locations IA9 and IA10, which were located in Warehouse 2 (see Figure 4-2). Indoor air concentrations likely are influenced by indoor air movement and ventilation.

As discussed above, sources of TCE associated with current operations or off-Property activities were not identified during the initial vapor assessment. As noted in Section 3.1, KJC stated in their 2015 RI report that TCE in indoor air was more than twice the concentration of TCE sub-slab soil gas, indicative of a potential source of TCE other than VI. However, KJC formed this conclusion with very limited vapor data: one sub-slab soil gas sample and one indoor air sample. Both samples were collected in the north-central portion of Warehouse 1, approximately 100 feet northeast of the former TCE tank.

During MFA's initial vapor assessment, eight indoor air and four sub-slab soil gas samples were collected from locations throughout Warehouse 1 and 2. TCE was detected in MFA sub-slab soil gas sample A9, located near the former TCE tank, at a concentration of 1,100 ug/m^3. This TCE detection is higher than the concentration of TCE detected in the KJC sub-slab soil gas sample at 95 ug/m^3, and higher than the TCE concentrations detected in all indoor air samples collected during the initial vapor assessment.

Concentrations of TCE in indoor air exceeded sub-slab soil gas concentrations in several areas during MFA's initial vapor assessment, suggesting that sub-slab soil gas may be migrating below the slab before entering the building and/or VI may be occurring at locations with higher sub-slab soil gas concentrations and migrating in indoor air via the HVAC system and other indoor air currents. Vapor migration may have contributed to the elevated concentration of TCE in the KJC indoor air sample. It is also possible that there may have been cross-contamination between sub-slab soil gas and indoor air in KJC's sample. When indoor air and sub-slab soil vapor sample locations are co-located, sampling precautions should be taken to avoid cross-contamination. Ecology recommends installing sub-slab vapor points after indoor air sample collection or, if installed before, to allow sufficient time for indoor vapor concentrations to return to pre-installation levels (Ecology, 2018). KJC installed the co-located sub-slab vapor pin approximately two and a half hours before collection of the indoor air sample and collected their sub-slab soil gas sample approximately 30 minutes before (KJC, 2015). It is unclear if that was sufficient time for concentrations to return to pre-installation levels.

Additionally, TCE vapors volatilizing from chemically-impacted groundwater seeping into the evaporator pit may have contributed to elevated concentrations of TCE in the KJC indoor air sample. However, it is unknown if groundwater seepage was occurring in the pit during the KJC RI vapor assessment.

TCE concentrations detected in the 24-hour indoor air samples exceeded the TCE short-term action limit. As stated in Ecology's Implementation Memo No. 22, exceedances of the TCE short-term indoor air action level require prompt action to quickly reduce concentrations of TCE and protect building occupants. Based on that finding, prompt response actions were developed in coordination with Ecology to reduce TCE concentrations below the short-term indoor air action level, as discussed in Section 5. The 24-hour sampling period was conducted under "worst case" conditions, designed to promote maximum VI (i.e., doors and windows closed, outside working hours). Therefore, one of the

first response action steps was to resample TCE in indoor air during an eight-hour workday to better represent potential worker exposure. The second indoor air sampling event was conducted before the collection of the passive indoor air samples, as discussed below.

Based on the results of that event, air purification was identified as a prompt response action to reduce indoor air TCE concentrations for the protection of human health, as required by Ecology's Implementation Memo No. 22. The passive samplers, which were intended to be deployed for three weeks for comparison to the short-term action limit, which is based on an average three-week exposure duration, were collected before air purification started (12 days from their deployment). The passive air results indicate that TCE concentrations averaged over that 12-day period, which represent conditions during and outside a normal workday, were above the short-term action limit. These results suggest that average indoor air quality was adversely impacted by TCE.

VI is influenced by atmospheric conditions, most notably barometric pressure. Periods of rapidly falling barometric pressure can promote VI and, conversely, VI may be mitigated by rapidly rising barometric pressure. Whereas atmospheric conditions did fluctuate during the sampling events, the range of barometric pressures observed is consistent with typical daily fluctuations. Barometric pressure changes are often as much as 0.7 inches over a day (Electric Power Research Institute, Inc., 2005); 0.1- and 0.8-inch mercury changes in barometric pressure were observed during the 24-hour and three-week sampling periods, respectively. The atmospheric data indicate that while weather conditions did vary during the three-week sampling period, as indicated by periods of rising and falling barometric pressure, no highly variable weather patterns were observed that may have significantly impacted VI assessment results. As such, the three-week samples are considered sufficient to have captured conditions over typical weather variations and were not adversely impacted by extreme weather conditions.

5 RESPONSE ACTIONS

The exceedances of the short-term TCE action limit required urgent response per Ecology's Implementation Memo No. 22 (Ecology, 2019). After receiving analytical results from the initial assessment, MFA worked with the building owner, Ecology, and the Washington State Department of Health (DOH) to implement prompt response actions to reduce indoor air concentrations of TCE to below action levels while IRAs were developed and to better understand worker exposure through additional sampling. The response actions consisted of communication with the building owners and employees working in the building, additional vapor sampling, an HVAC system assessment, and installation of mobile air-purification units.

5.1 Building Owner and Occupant Outreach

After the VI assessment, MFA met with Lee Frazier, the building and Property owner and the owner and president of Pacific Industrial Supply, Inc., to discuss the results of the VI assessment, the installation of air-purifying units, and plans for IRAs. MFA staff also facilitated a meeting with Pacific Industrial Supply staff on February 10, 2020. During that meeting the results of the initial VI

assessment and next steps were explained and staff were provided with a TCE fact sheet from Ecology.

5.2 Additional Assessments

In response to TCE exceedances identified during the vapor assessment, MFA conducted additional screening for preferential pathways and TCE sources and assessed worker exposure and the former evaporator pit.

5.2.1 Site Visit and Screening

On February 11, 2020, MFA conducted a follow-up site visit to evaluate potential TCE sources and potential VI pathways and to identify sample locations for an assessment of TCE in indoor air during an eight-hour workday. The site visit included an interview of the building owner; field observations; and qualitative, real-time measurements of VOCs in indoor air, using a photoionization detector (PID).

Prior to the collection of the second round of indoor air samples, a Honeywell ppbRAE 3000 PID equipped with a 10.6-electron volt lamp was used to qualitatively screen the building for potential areas of increased VI. The PID readings are considered qualitative because the PID is not capable of measuring TCE concentrations alone but measures all VOCs present in air. The PID model and lamp combination was chosen for its ability to read low-level VOC concentrations. If only TCE were present, the PID would be capable of reading concentrations as low as 2 ug/m^3, below the short-term action limit of 7.5 ug/m^3.

Cracks, joints, pipes, and pins in the slab were screened with the PID and compared to ambient air readings in each room of the building. Peak readings were recorded for each general area of the three warehouses, and any sizeable spikes in readings were noted. Activities believed to be potential sources of observed VOC spikes at the time the of the PID screening include the use of gas-powered forklifts, spray painting, and chain degreasing. Locations with the highest observed PID spikes that did not appear to be attributable to work operations were selected as locations for additional indoor air sampling, as discussed in Section 5.2.3.

5.2.2 Evaporator Pit

The former evaporator pit was a 140-cubic-foot concrete pit that was left exposed after Precision ceased operations on the Site. Standing water observed in the pit was attributed to groundwater seepage, which was later confirmed by the presence of a crack in the concrete bottom of the pit observed during its decommissioning (see Section 6.1). A water sample was collected from the pit on February 11, 2020, using a disposable bailer, and was analyzed for total petroleum hydrocarbons (diesel- and residual-oil-range organics), arsenic, chromium, and TCE.

All chemicals for which analyses were conducted were detected in the grab sample from the evaporator pit. Detections included 1.4 micrograms per liter (ug/L) TCE; 3,900 ug/L diesel-range petroleum hydrocarbons; 2,500 ug/L residual-oil-range hydrocarbons; 994,000 ug/L total chromium; and 6.08

ug/L total arsenic. The analytical laboratory indicated that diesel-range hydrocarbons and oil-range hydrocarbons results had chromatographic patterns that most closely resemble a cutting oil, transformer oil, or a fuel metabolite (Erdahl, 2020). These fuel types will be further assessed in the RI. Table 5-1 shows analytical results and screening levels. The analytical lab report is included in Appendix D, and data are assessed in the data validation memorandum included as Appendix E. The results were consistent with chemical concentrations observed in previous shallow groundwater samples collected from monitoring wells on the Property, suggesting that the source of the water was groundwater seepage. Chromium concentrations in the sample qualified the water as hazardous waste for disposal purposes.

No VI screening level is available for TCE in indoor standing water. The TCE concentration was equal to, but did not exceed the VI Method B groundwater screening level. However, standing water in the evaporator pit was directly exposed to indoor air. The groundwater screening level assumes 1,000 times attenuation vapor between groundwater and indoor air. Therefore, the screening level applied, while not directly applicable to standing water in the evaporator pit, indicates the potential for TCE to volatilize to indoor air at unacceptable concentrations. Based on these results, water in the pit was identified as groundwater seepage and a source of TCE in indoor air. An interim action was conducted to remove water from the pit and to prevent future groundwater seepage (see Section 6.2). A location immediately adjacent to the pit was selected as a sample location for the additional round of eight-hour indoor air sampling to further evaluate the pit as a source of TCE in indoor air.

5.2.3 Worker Exposure Assessment

On February 11, 2020, as part of the worker exposure assessment, five indoor air samples were collected using 6-liter Summa canisters with eight-hour flow controllers. Sample canisters were deployed at the start of the workday and were collected after eight hours. During the collection period, the facility operated normally, including providing ventilation by open bay doors. No air purification took place during the sample collection.

Samples were collected in areas where women potentially of childbearing age were observed to be working (IA17 in the second-story sewing shop and IA16 in the office); near the evaporator pit (IA18); in the location where the highest sub-slab soil gas TCE concentration had been detected during the initial vapor assessment (IA19, near A9); and in the central portion of the building, in Warehouse 2 (IA20). Sample locations are shown in Figure 4-1. A sample collection summary is provided in Table 4-2. Analytical results are provided in Table 4-5. The laboratory analytical report and data validation results are provided in Appendices D and E, respectively. Time series plots for atmospheric conditions recorded during the sampling period are provided in Appendix C.

TCE concentrations exceeded MTCA Method B CULs in all five samples, and the short-term TCE action level of 7.5 ug/m^3 in all but one sample (IA16, located in the office). TCE detections ranged from 2.8 to 110 ug/m^3. The TCE exceedances of the short-term action limit demonstrated a need for prompt response actions to reduce indoor air concentrations. Based on these results and in consultation with Ecology, DOH, and the building owner, actions taken to reduce TCE concentrations included an evaluation of the HVAC system and air purification, as discussed in the following sections.

5.2.4 HVAC System

MFA contracted with the Welsh Commissioning Group, Inc., to assess the HVAC system to identify potential improvements that would increase building pressurization and/or ventilation to mitigate VI. A report summarizing the findings of that assessment is included as Appendix F. HVAC assessment findings relevant to the potential for mitigation of TCE in indoor air are described below.

During regular operations, the warehouse rollup doors are typically left open to increase air flow throughout the building and to provide access for forklift and truck traffic. This prevents steady pressurization of some areas of the warehouse would reduce the effectiveness if a new HVAC system were installed. The main administrative office is one of only a few areas in the building with a contained HVAC system. The assessment found that while certain components of the building's HVAC system were outdated, upgrading the system would not be the most efficient way to reduce vapor concentrations inside the building. Based on these findings, no HVAC system adjustments or modifications were recommended as response actions.

5.3 Air Purification

5.3.1 Air Purifier Installation, Operation, and Maintenance

On February 13, 2020, three HEPA-AIRE® PAS2400 air-purifying units with activated charcoal filters were installed at the Site to reduce indoor air TCE concentrations. The units were placed in areas where women potentially of childbearing age typically work for extended periods, including on the first floor of the main office and the second floor of the sewing room, as well as at the south end of the first warehouse to purify air in the space patronized by customers (see Figure 4-1). Each unit contained a prefilter to remove large dust or particulates, VL2002 high-capacity active carbon filter to remove TCE and other VOCs, and a high-efficiency particulate air (HEPA) filter for fine particulates. The internal carbon filter was delivered wrapped in plastic packaging. The packaging was removed and the filters installed on February 17, 2020. Detailed specifications and operating assumptions for the units are provided in Appendix G.

The units in the warehouse and the sewing room were operated on the "low" setting. Facility staff requested that the unit in the main office be operated on the "high" setting because it reportedly ran more quietly on that setting.

A conservative carbon filter change-out schedule of once per week was selected for each air-purifying unit, based on the calculated TCE removal capacity of the carbon filters (see Appendix G). During the weekly carbon filter replacement visits, other maintenance was conducted on the units, including collecting PID readings to qualitatively assess, in real time, the air purifiers' effectiveness in removing VOCs; to perform a visual check to evaluate the potential need to replace the prefilters and HEPA filters; and to ensure that the units were functioning properly.

Before replacement of the carbon filter, PID readings were collected from the inlet and outlet of each unit. For each reading, the PID was allowed to stabilize and the peak reading was recorded. This procedure was repeated after the carbon filter was replaced. PID readings were used as a qualitative

field check that air purifiers were functioning properly and reducing concentrations of VOCs in indoor air. VOC concentrations in indoor air were confirmed by post-air purification indoor air sampling. PID readings, unit maintenance activities, and observations are summarized in Table 5-2.

PID readings, although only a qualitative indicator of air purifier TCE removal, exhibited lower results at the filter outlets than at the inlets, both before and after replacement of the carbon filters (see Table 5-2); however, the difference in concentrations was generally greater in the postfilter replacement readings than in the prefilter replacement readings. These observations suggest that the carbon filters were still removing VOCs from air after approximately one week of continuous operation of the air purifiers, but that the replacement filters were more effective at removing VOCs.

Spent filters were placed in sealed 55-gallon drums awaiting waste characterization for disposal. On May 4, 2020, two composite filter samples were collected for analysis. Each sample consisted of filter fabric and the activated carbon material collected from several filters in different drums. Samples were analyzed for TCE, arsenic, barium, cadmium, chromium, lead, mercury, selenium, and silver, using the toxicity characteristic leaching procedure. Both samples were non-detect for all analytes (see lab report in Appendix H). Filters were disposed of in the on-Property dumpster, the contents of which are subsequently disposed of in a municipal subtitle D landfill.

On April 9, 2020, based on visual observations that the filters were becoming noticeably dirty, the HEPA filters were replaced in all three units and the prefilter was replaced in the unit located in the office (see Table 5-2). Photographs of the units are available in Appendix B.

The air purifiers were run continuously from February 13, 2020, until May 14, 2020, except for during a sampling event conducted from May 2, 2020 through May 3, 2020.

5.3.2 Performance Sampling

To ensure that the air-purifying units were reducing indoor air TCE concentrations to below the short-term action limit, indoor air sampling was conducted while the units were in operation. An eight-hour indoor air sampling event and a three-week passive indoor air sampling event were conducted. Sampling activities are summarized in Tables 4-1 and 4-2. Analytical results are summarized in Tables 4-5 and 4-7. Analytical laboratory reports and data validation results are provided in Appendices D and E, respectively. Time series plots for atmospheric conditions recorded during the sampling period are provided in Appendix C.

Three indoor air samples to be analyzed for TCE were collected on February 20, 2020, using 6-liter Summa canisters with eight-hour flow controllers. Each sample was taken from the vicinity of an air purifier unit to determine the effectiveness of the response action (sample locations IA16, IA17, and IA19; see Figure 5-1). In all three samples, TCE was detected above MTCA Method B indoor air CULs, but below the short-term action limit (see Table 4-5 and Figure 5-1).

Three RAD130s were deployed on February 20, 2020, and were collected for analysis after three weeks (sample locations RAD1, RAD4, and RAD5; see Figure 5-1). The RAD130s were collocated with the Summa canister samples described above. All three passive samples were analyzed for TCE;

concentrations were above MTCA Method B indoor air CULs but below the short-term action limit (see Table 4-5 and Figure 5-1).

The performance sampling results showed TCE reductions with air purification in all locations sampled (see Figure 5-1). Pre-IRA TCE concentrations in indoor air ranged from 110 to 340 ug/m^3, while post-IRA concentrations ranged from non-detect to 2.6 ug/m^3. These results suggest that air purification effectively reduced TCE to below concentrations that pose a short-term health threat, but also suggested that concentrations remained unacceptable for long-term, chronic exposure.

6 INTERIM REMEDIAL ACTIONS

Air purification was identified as a temporary, short-term TCE mitigation measure. IRAs that would provide long-lasting and more reliable TCE mitigation in indoor air were identified. The following two IRAs were selected in consultation with the building owner and Ecology:

- Sealing perforations in the concrete building slab that may be acting as preferential pathways for VI
- Decommissioning the evaporator pit that had been identified as a potential source of TCE vapors in indoor air because of groundwater seepage

Photodocumentation of the IRAs is provided in Appendix B.

6.1 Sealing Concrete Building Slab

Between April 14, 2020, and April 29, 2020 Advance Environmental, Inc. (Advance) made several trips to the Site to seal perforations in the building slab, including cracks, seams, and utility penetrations. Advance worked progressively through the three warehouses to seal all accessible perforations.

The first step in the sealing process was to use a shop vacuum to remove dirt and debris. If that was not successful, a wire brush was used to loosen material before vacuuming it out. After cleaning, sealant was applied to fill up to the existing slab surface. Two kinds of sealant with similar properties were used interchangeably: Sikaflex® 1C SL and Quikrete® concrete sealant.

Some cracks in the slab were wide and penetrated the full thickness of the slab. When product was placed in these cracks, it would sink down into the crack and fail to form a seal. In these cases, dry mix concrete was placed in the crack before applying sealant and/or the sealant was applied multiple times. The sealant was left to cure for 24 hours without foot or vehicle traffic. Photos of the sealant application process are provided in Appendix B.

6.2 Evaporator Pit Decommissioning

Decommissioning of the evaporator pit was conducted to remove TCE-containing water from the pit and stop future seepage of groundwater into the pit. Water present in the pit due to groundwater seepage was identified as a source of TCE in indoor air (see Section 5.2.2). Decommissioning of the evaporator pit involved removal and disposal of standing water and debris, sealing cracks in the walls, backfilling, and capping the pit with concrete. The decommissioning was conducted on April 13, 2020. MFA contracted Advance to lead decommissioning activities. MFA contracted Stericycle to pump water out of the pit for disposal using a vacuum truck. A total of 743 gallons of water was removed for off-site disposal (Appendix H). Based on the previous water sampling results, i.e., high chromium concentrations (see Section 5.2.2), the water was characterized as regulated hazardous waste for disposal purposes. It was assumed that any debris encountered and removed from the pit would be saturated with water with hazardous levels of chromium; therefore, debris was also treated as hazardous waste for disposal.

Solid waste removed from the pit included nine wooden pallets, a small motor, and other small debris such as plastic bottles and a tape measure. The materials were placed on a layer of visqueen sheeting for staging and then broken down and packaged into 1-cubic-yard CleanPak® waste totes for disposal. The totes were stored on site until pickup and transport to a hazardous waste landfill by Cascade Environmental (see Appendix H).

After the contents of the pit had been removed, the pit was sprayed down with potable water to rinse any remaining residue from the pit walls. Rinse water was removed by the vac truck and the pit was monitored for groundwater seepage infiltrating through cracks. Water was observed to infiltrate into the pit from the bottom of the northwest corner. This fluid was once again removed with the vac truck and the pit was rinsed a final time before Advance began to fill the pit.

Approximately 800 pounds of dry-mix concrete was added in the base of the pit and used to seal up cracks. After initial placement, the pit was observed for additional infiltration. Areas where water was still entering the pit were sealed with additional concrete until the seeping stopped. After concrete placement, 5.5 loose cubic yards of gravel was placed in the pit and compacted in 6-inch lifts, using hand tamping to a final volume of 4 cubic yards. The gravel surface was then leveled and 5 inches of mixed concrete was poured to match the existing grade of the building slab. Photodocumentation of the decommissioning is provided in Appendix B.

6.3 Confirmation Vapor Sampling

The following two indoor air monitoring events were conducted after completion of the IRAs to assess their effectiveness at reducing TCE concentrations:

- An initial 24-hour event to assess TCE under "worst-case conditions," without air purification and with no workers present
- Based on favorable results from the initial test, a three-week passive air monitoring period to assess whether favorable conditions were sustained without air purification

Sampling activities are summarized in Tables 4-1 and 4-2. Analytical results are summarized in Tables 4-5 and 4-7. Analytical laboratory reports and data validation results are provided in Appendices D and E, respectively.

Air purification, which had been operating continuously since February 13, 2020, and throughout implementation of the IRAs, was paused to allow the initial round of post-interim-action indoor air monitoring. The monitoring event was conducted over a weekend when workers were not present to avoid the potential for exposure to TCE in the absence of air purification.

Four indoor air samples were collected using 6-liter Summa canisters with 24-hour flow controllers. Sample canisters were deployed on May 2, 2020, after the air purifying units had been shut off and the building closed up for approximately 22 hours. Canisters were collected after 24 hours. Conditions were controlled during the sampling period to create worst-case conditions for TCE buildup in indoor air. Business and commercial operations were shut down and doors and windows were sealed to maximize the potential for VI. Air purification was immediately resumed following sample collection and before workers returned.

Samples were collected from the three air purifier locations (IA16, IA17, and IA19) and adjacent to the former evaporator pit (IA18) (see Figure 5-2). TCE was not detected in any of the samples (see Table 4-5 and Figure 6-1). Based on these results, a determination was made in consultation with Ecology to cease air purification and proceed with passive air sampling to assess whether reduced TCE concentrations would be sustained over a three-week sampling period.

On May 15, 2020, the air purifiers were turned off and removed and three RAD130s were deployed in the air purifier locations (RAD1, RAD4, and RAD5, colocated with the 24-hour sample locations; see Figure 5-2). The RAD130s were collected for analysis after three weeks, on June 5, 2020, and the samples analyzed for TCE. TCE concentrations in all passive samples were below the short-term action limit (see Table 4-7 and Figure 5-2).

Temperature and barometric data were collected from the nearby Renton Road and Salmon Creek weather stations, respectively, during the sampling periods. Time series plots are provided in Appendix C.

The confirmation monitoring results indicate that the IRAs successfully reduced indoor air TCE concentrations. A comparison of pre- and post-interim-action TCE concentrations in indoor air is shown in Figure 5-2. In the locations that were sampled both before and after the IRAs, TCE concentrations without air purification were reduced from a high of 110 ug/m^3 to non-detect in some samples. TCE concentrations in the passive air samples collected with no air purification were similar to those observed with air purification and up to two orders of magnitude below concentrations observed without air purification before the IRAs. However, the post-interim-action passive air sample results indicate that TCE concentrations in indoor air remain above MTCA Method B CULs.

7 VAPOR INTRUSION PRIORITY WORK PLAN

During the initial VI assessment, TCE was detected in indoor air samples above the short-term action levels included in Ecology's Implementation Memo No. 22 (Ecology, 2019), triggering prompt response actions for the protection of human health. The completed IRAs effectively reduced TCE concentrations in indoor air below short-term threat levels; however, the sub-slab source material remains and TCE concentrations in indoor air remain above MTCA Method B CULs. Therefore, additional IRAs will be required. Potential additional IRAs will be considered following completion of data gap sampling to be proposed in the RI work plan. In the meantime, although the completed IRAs have been proven effective, the potential exists for seals in the concrete slab to break down or for new cracks to form that could promote VI from the sub-slab contamination that remains, resulting in unfavorable air quality. Therefore, ongoing performance air monitoring and monitoring of the condition of the concrete slab are recommended until a more permanent remedy has been implemented. Ecology will require a VIP work plan in the agreed order for the Site.

7.1 Scope of Work

The proposed scope of work for VIP monitoring is as follows:

- Quarterly passive air monitoring will be conducted until a more permanent remedy is implemented.
- During each quarterly sampling event, passive air samples will be collected using RAD130s deployed for three weeks from the following three locations: RAD1, RAD4, and RAD5 (see Figure 4-1).
- Site reconnaissance will be conducted at the start of each quarterly air monitoring event to observe and record the condition of the concrete slab and slab seals, and to identify the potential formation of new cracks or perforations in the slab, or other conditions, that could promote VI.

Sampling activities will be conducted in general accordance with the procedures and methods used for the other passive air sampling events described in this report. Samples will be analyzed for TCE by modified EPA Method TO-17. A trip blank will be collected and analyzed for each event.

If TCE concentrations in any of the samples exceed the short-term action limit of 7.5 ug/m^3, Ecology and the building owner will be notified immediately, facility staff will be informed, and air purification activities will be resumed. Air purification, if required, will be conducted in accordance with the procedures developed for the response actions (see Section 5.3) and will continue until a more permanent remedy is implemented.

Data will be shared with Ecology, which will be notified of sampling activities and any TCE action limit exceedances in accordance with finalized agreed order requirements.

7.2 Project Management Plan

The following describes the roles of key personnel on the project.

7.2.1 Key Project Personnel

Jim Maul will be the project director for MFA. Mr. Maul will provide strategic technical project support and will assist with project communications.

Heather Good will be the project manager for MFA. Ms. Good will coordinate with project task leaders and will be the primary point of contact for the PLPs and Ecology. She will be responsible for allocating the resources necessary to ensure that the objectives of the VIP work plan are met. Ms. Good will also provide technical assistance to assigned staff, assist with resolution of technical or logistical challenges that may be encountered during sampling, and write and review reports.

Amanda Bixby will lead field activities and other project tasks and will write and review reports. She will be responsible for ensuring that sampling activities are conducted in accordance with the procedures outlined in this plan.

Seth Baker will assist in developing as-needed communications for Pacific Industrial Supply, Inc., employees.

Bill Beadie will provide as-needed technical support related to human health toxicity concerns, RA, risk communication, and air treatment and testing technologies.

Evelyn Lundeen will assist with field activities and report preparation.

7.3 Schedule

Sampling will begin within 30 days of Ecology's approval of the final VIP work plan and will continue until a more permanent remedy is implemented, unless a TCE short-term action limit exceedance is detected. In that case, sampling will be terminated, and air purification will resume and will continue until a more permanent remedy is implemented. The first two sampling events will be conducted consecutively, and the following events will be conducted on a quarterly basis.

8 CONCLUSIONS AND RECOMMENDATIONS

Based on the analytical results from the confirmation sampling event, the IRAs successfully reduced TCE concentrations below Ecology's short-term action level. Air purification is no longer necessary on the Site, but additional air monitoring may be necessary to ensure the IRAs' continued effectiveness as the RI is completed and more permanent remedies are implemented.

Additional assessment of the sub-slab source material, further evaluation of the nature and extent of contamination, and additional sub-surface data are needed for remedy selection. MFA is preparing an RI work plan, which will provide a basis for additional data collection. Data from the RI will be used to select and implement a permanent remedy to address the sub-slab source material.

LIMITATIONS

The services undertaken in completing this report were performed consistent with generally accepted professional consulting principles and practices. No other warranty, express or implied, is made. These services were performed consistent with our agreement with the Client. This report is solely for the use and information of the Client unless otherwise noted. Any reliance on this report by a third party is at such party's sole risk.

Opinions and recommendations contained in this report apply to conditions existing when services were performed and are intended only for the Client, purposes, locations, time frames, and project parameters indicated. We are not responsible for the impacts of any changes in environmental standards, practices, or regulations subsequent to performance of services. We do not warrant the accuracy of information supplied by others, or the use of segregated portions of this report.

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TABLES

Table 4-1
Event Summary
Precision Engineering, Inc.
Seattle, Washington

Sample Media	Start Date	End Date	Sample Locations	Event Purpose	Sampling Notes
Initial VI Assessment					
SS	02/01/2020	02/01/2020	A8, A9, A10, A11	An initial VI assessment was conducted to evaluate the potential for short-term TCE exposure and potential sources contributing to TCE in indoor air. Work was conducted in general accordance with MFA's December 20, 2019, VI assessment work plan, with subsequent revisions based on Ecology feedback.	--
IA	02/01/2020	02/02/2020	IA8, IA9, IA10, IA11, IA12, IA13, IA14, IA15		24-hour collection period. Sampling was conducted outside normal working hours and without air purification to evaluate "worst-case" conditions.
AA			AA1, AA2, AA3, AA4, AA5		
RAD	02/01/2020	02/13/2020	RAD1, RAD2, RAD3		RAD samplers were collected 12 days after deployment because of the upcoming, scheduled installation of the air purifier units. Sampling was conducted without air purification.
Evaporator Pit Assessment					
W	02/11/2020	02/11/2020	Evap Pit	Standing water in the exposed evaporator pit was sampled to evaluate it as a potential source of TCE in indoor air.	One grab sample was collected from the evaporator pit.
Worker Exposure Assessment					
IA	02/11/2020	02/11/2020	IA16, IA17, IA18, IA19, IA20	Additional indoor air sampling was triggered by TCE concentrations above Ecology's short-term action levels detected in indoor air during the initial VI assessment .	Eight-hour collection period. Sampling was conducted during normal working hours, under normal working conditions, and without air purification.
Air Purification					
--	02/13/2020	05/15/2020	--	Air-purifying units were installed in the building to reduce indoor-air concentrations of TCE, which had been detected above Ecology's short-term action levels during the initial and eight-hour vapor assessments. Air purification ended after the interim action was completed.	Three air-purifying units were installed and were operated continuously, aside from a pause for an indoor air sampling event on May 2 and 3, 2020, in the following locations: the main office, the sewing room, and warehouse 1. The units were assessed and maintained on a weekly schedule.

Table 4-1
Event Summary
Precision Engineering, Inc.
Seattle, Washington

Sample Media	Start Date	End Date	Sample Locations	Event Purpose	Sampling Notes
Air Purification Performance Sampling					
IA	02/20/2020	02/20/2020	IA16, IA17, IA19	Indoor air sampling for TCE was conducted after installation of the air purifiers to evaluate their effectiveness in reducing concentrations of TCE in indoor air.	Eight-hour collection period. Sampling was conducted during normal working hours, under normal working conditions, and with air purification.
RAD	02/20/2020	03/12/2020	RAD1, RAD4, RAD5		Three-week collection period. Sampling was conducted with air purification.
Interim Actions					
--	04/13/2020	04/13/2020	--	Evaporator pit decommissioning.	--
--	04/14/2020	04/29/2020	--	Sealing concrete building slab.	--
Post-Interim Action Confirmation Sampling					
IA	05/02/2020	05/03/2020	IA16, IA17, IA18, IA19	To evaluate whether the interim actions effectively reduced TCE concentrations in indoor air to below Ecology's short-term action limit.	24-hour collection period. Sampling was conducted outside normal working hours and without air purification to evaluate "worst-case" conditions.
RAD	05/15/2020	06/05/2020	RAD1, RAD4, RAD5		Three-week collection period. Sampling was conducted without air purification.

NOTES:

Only sampling and air purification events are summarized. Other events are described in the report text.

Shading (color key below) indicates that the event was conducted under the following conditions:

Prior to air purification

During air purification

After implementation of the interim remedial actions, with no air purification

-- = none.

AA = ambient air.

Ecology = Washington State Department of Ecology.

IA = indoor air.

RAD = passive indoor air sample collected with Radiello 130.

SS = sub-slab soil gas.

TCE = trichloroethene.

VI = vapor intrusion.

W = water.

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Table 4-2
Vapor Sampling and Analysis Summary
Precision Engineering, Inc.
Seattle, Washington

Media Sampled	Location ID	Sample ID	Sample Type	Collection Period	Sample Collection Start			Sample Collection End			Analytical Suite[a]		
					Date	Time	Initial Vacuum ("Hg)	Date	Time	Final Vacuum ("Hg)	He	TCE	TCE Breakdown Products[b]
SS	A8	A8	1-L Summa Canister	5 min	02/01/2020	13:36	-30	02/01/2020	13:42	-5	X	X	X
	A9	A9				12:08	-30		12:14	-5	X	X	X
	A10	A10				11:28	-30		11:35	-5	X	X	X
	A11	A11				13:06	-30		13:12	-5	X	X	X
IA	IA8	IA8-020120	6-L Summa Canister	24 hr	02/01/2020	15:46	-30	02/02/2020	15:46	-6	--	X	X
	IA9	IA9				15:51	-30		15:51	-8	--	X	X
	IA10	IA10				15:48	-29		15:48	-8	--	X	X
	IA11	IA11				15:54	-29		15:47	0	--	X	X
	IA12	IA12				15:56	-29		15:56	-6	--	X	X
	IA13	IA13				15:57	-30		15:57	-7	--	X	X
	IA14	IA14				15:59	-30		15:59	-7	--	X	X
	IA15	IA15				16:05	-30		16:05	-9	--	X	X
	IA16	IA16		8 hr	02/11/2020	8:51	-30	02/11/2020	16:51	-7	--	X	--
		IA16-022020		8 hr	02/20/2020	7:55	-30	02/20/2020	15:55	-6	--	X	--
		IA16-050220		24 hr	05/02/2020	15:07	-29.5	05/03/2020	15:07	-8	--	X	--
	IA17	IA17		8 hr	02/11/2020	8:58	-30	02/11/2020	16:58	-9	--	X	--
		IA17-022020		8 hr	02/20/2020	8:03	-30	02/20/2020	16:03	-9	--	X	--
		IA17-050220		24 hr	05/02/2020	15:11	-29	05/03/2020	15:11	-6	--	X	--
	IA18	IA18		8 hr	02/11/2020	9:07	-30	02/11/2020	17:07	-6	--	X	--
		IA18-050220		24 hr	05/02/2020	15:15	-30	05/03/2020	15:15	-7	--	X	--
	IA19	IA19		8 hr	02/11/2020	9:15	-30	02/11/2020	17:10	-6	--	X	--
		IA19-022020		8 hr	02/20/2020	8:11	-30	02/20/2020	16:11	-6	--	X	--
		IA19-050220		24 hr	05/02/2020	15:19	-30	05/03/2020	15:19	-9	--	X	--
	IA20	IA20		8 hr	02/11/2020	9:30	-30	02/11/2020	17:30	-12	--	X	--
AA	AA1	AA1	6-L Summa Canister	24 hr	02/01/2020	16:30	-30	02/02/2020	16:30	-6	--	X	X
	AA2	AA2				16:41	-30		16:41	-5	--	X	X
	AA3	AA3				16:40	-30		16:40	-12	--	X	X
	AA4	AA4				16:37	-30		16:37	-7	--	X	X
	AA5	AA5				16:32	-30		16:32	-6	--	X	X
Passive IA	RAD1	RAD1	RAD	12 day	02/01/2020	16:55	--	02/13/2020	13:50	--	--	X	--
		RAD1-022020		21 day	02/20/2020	8:30	--	03/12/2020	12:24	--	--	X	--
		RAD1-051520		21 day	05/15/2020	15:13	--	06/05/2020	15:11	--	--	X	--
	RAD2	RAD2		12 day	02/01/2020	16:52	--	02/13/2020	14:12	--	--	X	--
	RAD3	RAD3		12 day	02/01/2020	16:58	--	02/13/2020	14:16	--	--	X	--
	RAD4	RAD4		21 day	02/20/2020	8:35	--	03/12/2020	12:30	--	--	X	--
		RAD4-051520		21 day	05/15/2020	15:20	--	06/05/2020	15:15	--	--	X	--
	RAD5	RAD5		21 day	02/20/2020	8:45	--	03/12/2020	12:21	--	--	X	--
		RAD5-051520		21 day	05/15/2020	15:24	--	06/05/2020	15:18	--	--	X	--

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Table 4-2
Vapor Sampling and Analysis Summary
Precision Engineering, Inc.
Seattle, Washington

NOTES:

Sample shading (color key below) indicates that the sample was collected under the following conditions:

Prior to air purification

During air purification

After implementation of the interim remedial actions, with no air purification

-- = not analyzed.

"Hg = inches of mercury.

AA = ambient air.

DCE = dichloroethene.

EPA = U.S. Environmental Protection Agency.

He = helium.

hr = hour.

IA = indoor air.

ID = identification.

L = liter.

min = minute.

RAD = passive indoor air sample collected with Radiello 130.

SS = sub-slab soil gas.

TCE = trichloroethene.

[a]All analyses performed by EPA Method TO-15.

[b]TCE anaerobic breakdown products include cis-1,2-DCE, trans-1,2-DCE, and vinyl chloride.

Table 4-3
Vapor Analytes and Screening Levels
Precision Engineering, Inc.
Seattle, Washington

Analyte	Indoor Air Cleanup Level, MTCA Method B	TCE Indoor Air Short-Term Action Level, Workplace Scenario	Sub-Slab Soil Gas Screening Level, MTCA Method B
Modified EPA Method TO-15 SIM (ug/m^3)			
TCE	0.33	7.5	11
1,1-Dichloroethene	91	NA	3,000
1,2-Dichloroethane	0.096	NA	3.2
cis-1,2-Dichloroethene	NV	NA	NV
trans-1,2-Dichloroethene	NV	NA	NV
1,1-Dichloroethane	1.6	NA	52
Chloroethane	4,600	NA	150,000
Vinyl chloride	0.28	NA	9.5
Modified EPA Method TO-17 (ug/m^3)			
TCE	0.33	7.5	11
ASTM Method D-1946			
Helium	NV	NA	NV

NOTES:
Cleanup and screening levels obtained from Ecology, CLARC data tables, dated August 2020.
Short-term TCE action level obtained from Ecology, Toxics Cleanup Program Implementation Memo No. 22.
ASTM = ASTM International.
CLARC = Cleanup Levels and Risk Calculation.
Ecology = Washington State Department of Ecology.
EPA = U.S. Environmental Protection Agency.
MTCA = Model Toxics Control Act.
NA = not applicable.
NV = no value.
SIM = selected ion monitoring.
TCE = trichloroethene.
TO = toxic organics.
ug/m^3= micrograms per cubic meter.

Table 4-4
Sub-Slab Soil Gas Analytical Results
Precision Engineering, Inc.
Seattle, Washington

Location:	Sub-Slab Soil Gas Screening Level, MTCA Method B	A8	A9	A10	A11
Sample Name:		A8	A9	A10	A11
Collection Date:		02/01/2020	02/01/2020	02/01/2020	02/01/2020
VOCs (ug/m^3)					
1,1-Dichloroethane	52	3.3 U	6.5 U	18 U	14
1,1-Dichloroethene	3,000	3.3 U	6.3 U	17 U	3.3 U
1,2-Dichloroethane	3.2	0.33 U	0.65 U	1.8 U	0.33 U
Chloroethane	150,000	22 U	42 U	120 U	22 U
cis-1,2-Dichloroethene	NV	3.3 U	21	40	3.3 U
trans-1,2-Dichloroethene	NV	3.3 U	6.3 U	17 U	3.3 U
Trichloroethene	11	160	1100	29	82
Vinyl chloride	9.5	2.1 U	4.1 U	11 U	2.1 U

NOTES:

Result shading indicates an exceedance of the sub-slab soil gas screening level, MTCA Method B; non-detects ("U") were not compared with screening criteria.

Sample shading indicates that the sample was collected prior to air purification.

MTCA = Model Toxics Control Act.

NV = no value.

U = Result not detected at or above method reporting limit.

ug/m^3 = micrograms per cubic meter.

VOC = volatile organic compound.

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Table 4-5
Indoor Air Analytical Results
Precision Engineering, Inc.
Seattle, Washington

Location:	Indoor Air Cleanup Level, MTCA Method B	TCE Indoor Air Short-Term Action Level, Workplace Scenario[a]	IA8	IA9	IA10	IA11	IA12	IA13	IA14	IA15	IA16		
Sample Name:			IA8-020120[b]	IA9[b]	IA10[b]	IA11[b]	IA12[b]	IA13[b]	IA14[b]	IA15[b]	IA16[c]	IA16-022020	IA16050220
Collection Start Date:			02/01/2020	02/01/2020	02/01/2020	02/01/2020	02/01/2020	02/01/2020	02/01/2020	02/01/2020	02/11/2020	02/20/2020	05/02/2020
Collection End Date:			02/02/2020	02/02/2020	02/02/2020	02/02/2020	02/02/2020	02/02/2020	02/02/2020	02/02/2020	02/11/2020	02/20/2020	05/03/2020
VOCs (ug/m^3)													
1,1-Dichloroethane	1.6	NV	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	--	--	--
1,1-Dichloroethene	91	NV	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	--	--	--
1,2-Dichloroethane	0.096	NV	0.093	0.085	0.089	0.097	0.093	0.089	0.085	0.093	--	--	--
Chloroethane	4,600	NV	0.093 U	2.6 U	2.6 U	2.6 U	2.6 U	2.6 U	2.6 U	2.6 U	--	--	--
cis-1,2-Dichloroethene	NV	NV	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	--	--	--
trans-1,2-Dichloroethene	NV	NV	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	--	--	--
TCE	0.33	7.5	270	330	340	170	200	210	110	170	2.8	1.9	0.27 U
Vinyl chloride	0.28	NV	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	--	--	--

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Table 4-5
Indoor Air Analytical Results
Precision Engineering, Inc.
Seattle, Washington

Location:	Indoor Air Cleanup Level, MTCA Method B	TCE Indoor Air Short-Term Action Level, Workplace Scenario[a]	IA17			IA18		IA19			IA20
Sample Name:			IA17[c]	IA17-022020	IA17050220	IA18[c]	IA18050220	IA19[c]	IA19-022020	IA19050220	IA20[c]
Collection Start Date:			02/11/2020	02/20/2020	05/02/2020	02/11/2020	05/02/2020	02/11/2020	02/20/2020	05/02/2020	02/11/2020
Collection End Date:			02/11/2020	02/20/2020	05/03/2020	02/11/2020	05/03/2020	02/11/2020	02/20/2020	05/03/2020	02/11/2020
VOCs (ug/m^3)											
1,1-Dichloroethane	1.6	NV	--	--	--	--	--	--	--	--	--
1,1-Dichloroethene	91	NV	--	--	--	--	--	--	--	--	--
1,2-Dichloroethane	0.096	NV	--	--	--	--	--	--	--	--	--
Chloroethane	4,600	NV	--	--	--	--	--	--	--	--	--
cis-1,2-Dichloroethene	NV	NV	--	--	--	--	--	--	--	--	--
trans-1,2-Dichloroethene	NV	NV	--	--	--	--	--	--	--	--	--
TCE	0.33	7.5	93	4.5	0.27 U	45	0.27 U	110	2.3	0.27 U	73
Vinyl chloride	0.28	NV	--	--	--	--	--	--	--	--	--

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Table 4-5
Indoor Air Analytical Results
Precision Engineering, Inc.
Seattle, Washington

NOTES:

Result shading (color key below) indicates an exceedance of screening criteria; non-detects ("U") were not compared with screening criteria.

Indoor Air Cleanup Level, MTCA Method B

TCE Indoor Air Short-Term Action Level, Workplace Scenario

Sample shading (color key below) indicates that the sample was collected under the following conditions:

Prior to air purification

During air purification

After implementation of the interim remedial actions, with no air purification

-- = not analyzed.

MTCA = Model Toxics Control Act.

NV = no value.

TCE = trichloroethene.

U = Result is non-detect to method reporting limit.

ug/m^3 = micrograms per cubic meter.

VOC = volatile organic compound.

[(a)]TCE Indoor Air Action Level from Washington State Department of Ecology Implementation Memo No. 22.

[(b)]Twenty-four-hour indoor air sample collected with a 6-liter Summa canister outside normal working conditions.

[(c)]Eight-hour indoor air sample collected with a 6-liter Summa canister during normal working conditions.

Table 4-6
Ambient Air Analytical Results
Precision Engineering, Inc.
Seattle, Washington

Location:	Indoor Air Cleanup Level, MTCA Method B	TCE Indoor Air Short-Term Action Level, Workplace Scenario[(a)]	AA1	AA2	AA3	AA4	AA5
Sample Name:			AA1	AA2	AA3	AA4	AA5
Collection Start Date:			02/01/2020	02/01/2020	02/01/2020	02/01/2020	02/01/2020
Collection End Date:			02/02/2020	02/02/2020	02/02/2020	02/02/2020	02/02/2020
VOCs (ug/m^3)							
1,1-Dichloroethane	1.6	NV	0.40 U	0.40 U	0.65 U	0.40 U	0.40 U
1,1-Dichloroethene	91	NV	0.40 U	0.40 U	0.63 U	0.40 U	0.40 U
1,2-Dichloroethane	0.096	NV	0.07	0.07	0.07	0.07	0.07
Chloroethane	4,600	NV	2.60 U	2.60 U	4.20 U	2.60 U	2.60 U
cis-1,2-Dichloroethene	NV	NV	0.40 U	0.40 U	0.63 U	0.40 U	0.40 U
trans-1,2-Dichloroethene	NV	NV	0.40 U	0.40 U	0.63 U	0.40 U	0.40 U
TCE	0.33	7.50	0.16 U	0.16 U	0.27 U	0.16 U	0.16 U
Vinyl chloride	0.28	NV	0.26 U	0.26 U	0.41 U	0.26 U	0.26 U

NOTES:

Ambient air samples collected in 6-liter Summa canisters over a 24-hour period from February 1, 2020 to February 2, 2020 outside normal working conditions.

Sample shading indicates that the sample was collected prior to air purification.

MTCA = Model Toxics Control Act.

NV = no value.

TCE = trichloroethene.

U = Result is non-detect to method reporting limit.

ug/m^3 = micrograms per cubic meter.

VOC = volatile organic compound.

[(a)]TCE Indoor Air Short-Term Action Level from Washington State Department of Ecology Implementation Memo No. 22.

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Table 4-7
Passive Indoor Air Analytical Results
Precision Engineering, Inc.
Seattle, Washington

Location:	Indoor Air Cleanup Level, MTCA Method B	TCE Indoor Air Short-Term Action Level, Workplace Scenario[(a)]	RAD1			RAD2	RAD3	RAD4		RAD5	
Sample Name:			RAD1	RAD1-022020	RAD1-051520	RAD2	RAD3	RAD4	RAD4-051520	RAD5	RAD5-051520
Collection Start Date:			02/01/2020	02/20/2020	05/15/2020	02/01/2020	02/01/2020	02/20/2020	05/15/2020	02/20/2020	05/15/2020
Collection End Date:			02/13/2020	03/12/2020	06/05/2020	02/13/2020	02/13/2020	03/12/2020	06/05/2020	03/12/2020	06/05/2020
VOC (ug/m^3)											
TCE	0.33	7.5	110	1.3	1.4	110	170	2.6	2.6	2.3	1.7

NOTES:

Radiello 130 (R130) passive air samplers were used for all sampling events.

Result shading (color key below) indicates an exceedance of screening criteria.

Indoor Air Cleanup Level, MTCA Method B

TCE Indoor Air Short-Term Action Level, Workplace Scenario

Sample shading (color key below) indicates that the sample was collected under the following conditions:

Prior to air purification

During air purification

After implementation of the interim remedial actions, with no air purification

MTCA = Model Toxics Control Act.

RAD = passive indoor air sample collected with Radiello 130.

TCE = trichloroethene.

ug/m^3 = micrograms per cubic meter.

VOC = volatile organic compound.

[(a)]TCE Indoor Air Short-Term Action Level from Washington State Department of Ecology Implementation Memo No. 22.

Table 5-1
Evaporator Pit Water Analytical Results
Precision Engineering, Inc.
Seattle, Washington

Location:	MTCA Method A, Groundwater	MTCA Method B, Groundwater	Vapor Intrusion, Groundwater Screening Level, MTCA Method B	Evaporation Pit
Sample Name:				EVAPPIT
Collection Date:				02/11/2020
TPH (ug/L)				
Diesel-Range Organics	500	NV	NV	3,900
Residual-Oil-Range Organics	500	NV	NV	2,500
Diesel + Oil[(a)]	500	NV	NV	6,400
Total Metals (ug/L)				
Arsenic	5	0.058	NV	6.1 J
Chromium	50[(b)]	48[(c)]	NV	994,000
VOCs (ug/L)				
Trichloroethene	5	0.54	1.40	1.4

NOTES:

Result shading (color key below) indicates an exceedance of screening criteria.

MTCA Method A, Groundwater

MTCA Method B, Groundwater

Sample shading indicates that the sample was collected prior to air purification.

J = estimated.

MTCA Method A = Model Toxics Control Act Method A.

MTCA Method B = Model Toxics Control Act Method B, lower of carcinogen or noncarcinogen value.

NV = no value.

TPH = total petroleum hydrocarbons.

ug/L = micrograms per liter.

VOC = volatile organic compound.

[(a)]Diesel + Oil is the sum of the diesel-range organics and residual-oil-range organics.

[(b)]Value is for total chromium.

[(c)]Value is for hexavalent chromium, the more toxic species of chromium.

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Table 5-2
Air Purifier PID Readings
Precision Engineering, Inc.
Seattle, Washington

Air Purifier Location	Collection Date	Collection Time	PID Reading		Reading Collected Immediately Before Filter Replacement	Reading Collected Immediately After Filter Placement	Comments
			Air Purifier Inlet (ppb)	Air Purifier Outlet (ppb)			
Warehouse 1	02/17/2020	8:11	446	446	X	--	Air purifier was running, but internal carbon filter was still wrapped in plastic packaging. Packaging was removed and filter was reinstalled. Air purifier was set to low flow.
		14:30	357	146	--	X	
	02/20/2020	8:16	329	200	--	--	Reading collected near time of deployment of eight-hour Summa canister indoor air sample. Prefilter for air-purifying unit was a dark gray color. The change filter indicator light was not on.
		15:41	413	262	--	--	Reading collected near time of collection of eight-hour Summa canister indoor air sample.
	02/24/2020	14:25	200	167	X	--	Filter was changed after readings were collected; no post-replacement reading was recorded.
	03/02/2020	13:57	217	220	X	--	
		14:25	241	96	--	X	
	03/12/2020	12:50	211	170	X	--	
		13:04	197	66	--	X	
	03/19/2020	12:00	283	225	X	--	
		12:18	259	73	--	X	
	03/26/2020	12:36	270	165	X	--	
		13:01	363	140	--	X	
	04/02/2020	11:50	285	232	X	--	
		12:04	309	97	--	X	
	04/09/2020	11:37	254	177	X	--	HEPA and carbon filters were replaced and readings subsequently recorded.
		13:03	220	70	--	X	
	04/16/2020	12:01	722	613	X	--	
		12:16	463	159	--	X	
	04/23/2020	11:33	161	181	X	--	PID was restarted in a clean ambient air environment and the air purifier was retested to ensure that measured results were accurate.
		11:54	204	36	--	X	
	04/29/2020	10:50	86	74	X	--	
		11:07	133	28	--	X	

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Table 5-2
Air Purifier PID Readings
Precision Engineering, Inc.
Seattle, Washington

Air Purifier Location	Collection Date	Collection Time	PID Reading		Reading Collected Immediately Before Filter Replacement	Reading Collected Immediately After Filter Placement	Comments
			Air Purifier Inlet (ppb)	Air Purifier Outlet (ppb)			
Sewing Room	02/17/2020	8:03	378	380	X	--	Air purifier was running, but internal carbon filter was still wrapped in plastic packaging during PID reading. Packaging was removed and filter was reinstalled. Air purifier was set to low flow.
		14:30	446	210	--	X	
	02/20/2020	8:32	832	301	--	--	Reading collected near time of deployment of eight-hour Summa canister indoor air sampler.
		16:00	404	256	--	--	Reading collected near time of collection of eight-hour Summa canister indoor air sample.
	02/24/2020	14:35	9	0	X	--	Filter was changed after readings were collected; no post-replacement reading was recorded.
	03/02/2020	14:02	318	170	X	--	Prefilter had darkened to a gray color.
		14:10	313	87	--	X	
	03/12/2020	12:58	360	342	X	--	Air purifier had been moved to opposite side of room because of leaking roof near unit.
		13:08	315	50	--	X	
	03/19/2020	11:55	272	238	X	--	
		12:15	316	95	--	X	
	03/26/2020	12:50	268	252	X	--	
		13:11	230	67	--	X	
	04/02/2020	11:43	110	55	X	--	
		12:00	138	33	--	X	
	04/09/2020	11:31	332	226	X	--	HEPA and carbon filters were replaced and readings subsequently recorded.
		12:59	162	82	--	X	
	04/16/2020	11:55	272	225	X	--	
		12:12	276	108	--	X	
	04/23/2020	11:27	103	54	X	--	
		11:51	146	7	--	X	
	04/29/2020	10:43	80	40	X	--	
		11:03	206	44	--	X	

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Table 5-2
Air Purifier PID Readings
Precision Engineering, Inc.
Seattle, Washington

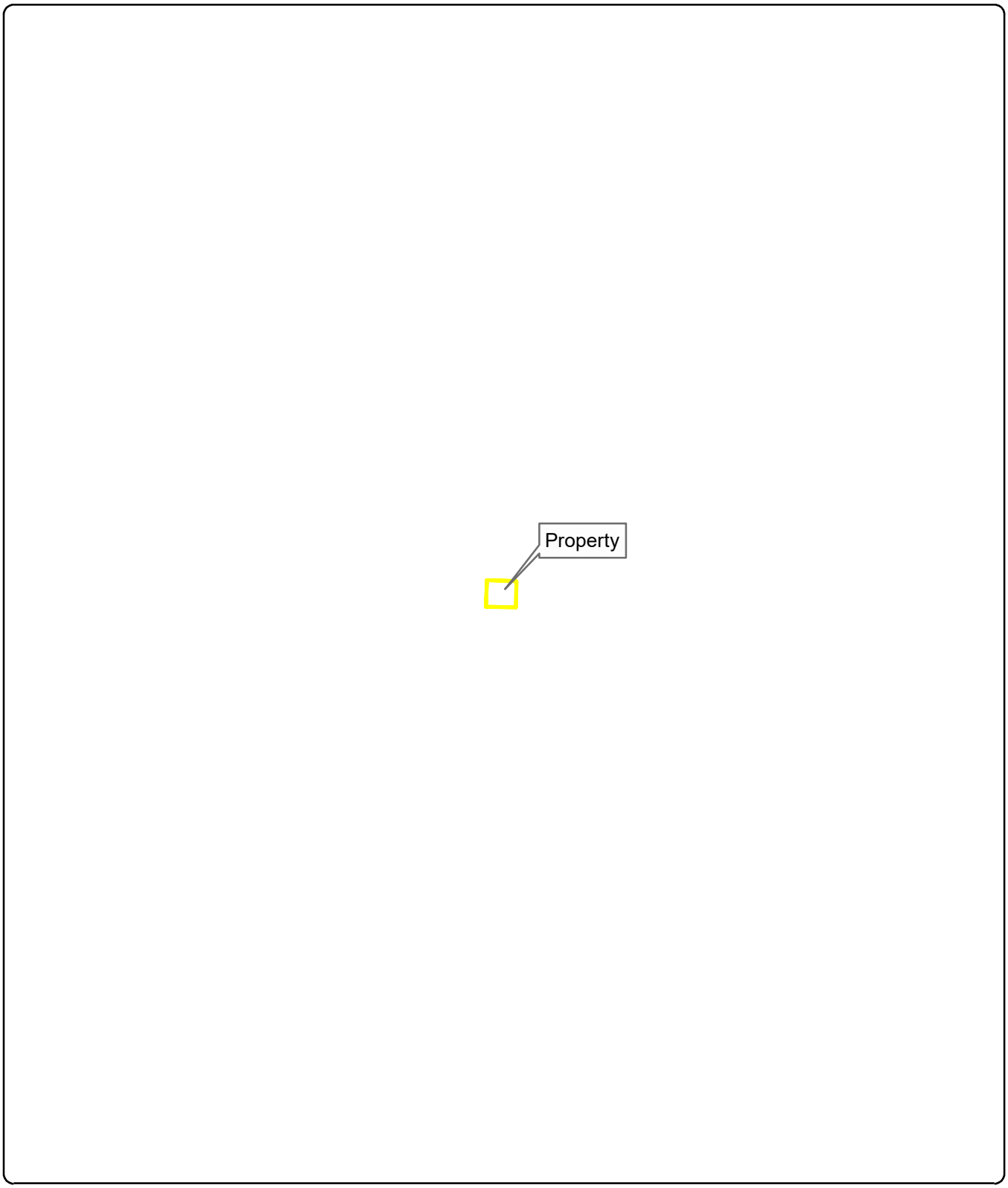
Air Purifier Location	Collection Date	Collection Time	PID Reading		Reading Collected Immediately Before Filter Replacement	Reading Collected Immediately After Filter Placement	Comments
			Air Purifier Inlet (ppb)	Air Purifier Outlet (ppb)			
Office	02/17/2020	7:40	15	10	X	--	Air purifier was running, but carbon filter was still wrapped in plastic packaging for PID reading. Packaging was removed and filter was reinstalled. At employees' request, air purifier is set to high and laid on its back to reduce operation noise. Confirmed that air purifier position did not compromise its operation.
		14:30	265	135	--	X	
	02/20/2020	8:22	822	297	--	--	Reading collected near time of deployment of eight-hour Summa canister indoor air sampler.
		15:53	204	152	--	--	Reading collected near time of collection of eight-hour Summa canister indoor air sample
	02/24/2020	14:20	0	0	X	--	Filter was changed after readings were collected; no post-replacement reading was recorded.
	03/02/2020	14:15	29	39	X	--	
		14:20	30	10	--	X	
	03/12/2020	12:41	63	50	X	--	
		13:03	12	0	--	X	
	03/19/2020	11:49	8	0	X	--	
		12:12	47	1	--	X	
	03/26/2020	12:25	0	0	X	--	Prefilter had darkened to a gray color.
		12:58	30	3	--	X	
	04/02/2020	11:38	0	0	X	--	
		11:57	12	0	--	X	
	04/09/2020	11:25	0	0	X	--	HEPA, prefilter, and carbon filters were replaced and readings subsequently recorded.
		12:56	0	0	--	X	
	04/16/2020	11:51	0	0	X	--	
		12:09	0	0	--	X	
	04/23/2020	11:23	0	0	X	--	
		11:48	0	0	--	X	
	04/29/2020	10:37	0	0	X	--	
		11:01	0	0	--	X	

NOTES:
A Honeywell ppbRAE 3000 PID equipped with a 10.6 electron volt lamp was used to collect ambient air readings during air-purifier operation.
Air-purifying units were HEPA-AIRE® PAS2400 portable air scrubbers equipped with a prefilter, a HEPA filter, and a VL2002 high-capacity carbon filter.
All PID readings are the observed peak value after the instrument had time to stabilize to the new location.
Shading (color key below) indicates that the event was conducted under the following conditions:

Prior to air purification
During air purification
After implementation of the interim remedial actions, with no air purification

-- = no reading collected.
X = reading collected.
HEPA = high-efficiency particulate air.
PID = photoionization detector.
ppb = parts per billion.

FIGURES



Source: US Geological Survey (1990) 7.5-minute topographic quadrangle: Seattle.
Address: 1231 S. Director Street, Seattle, WA
Section 32, Township 24 North, Range 4 East, SE Quarter.
Property boundary obtained from King County assessor.

Legend

Property Boundary (Approximate)

Figure 1-1
Property Location
Precision Engineering, Inc.
Seattle, Washington

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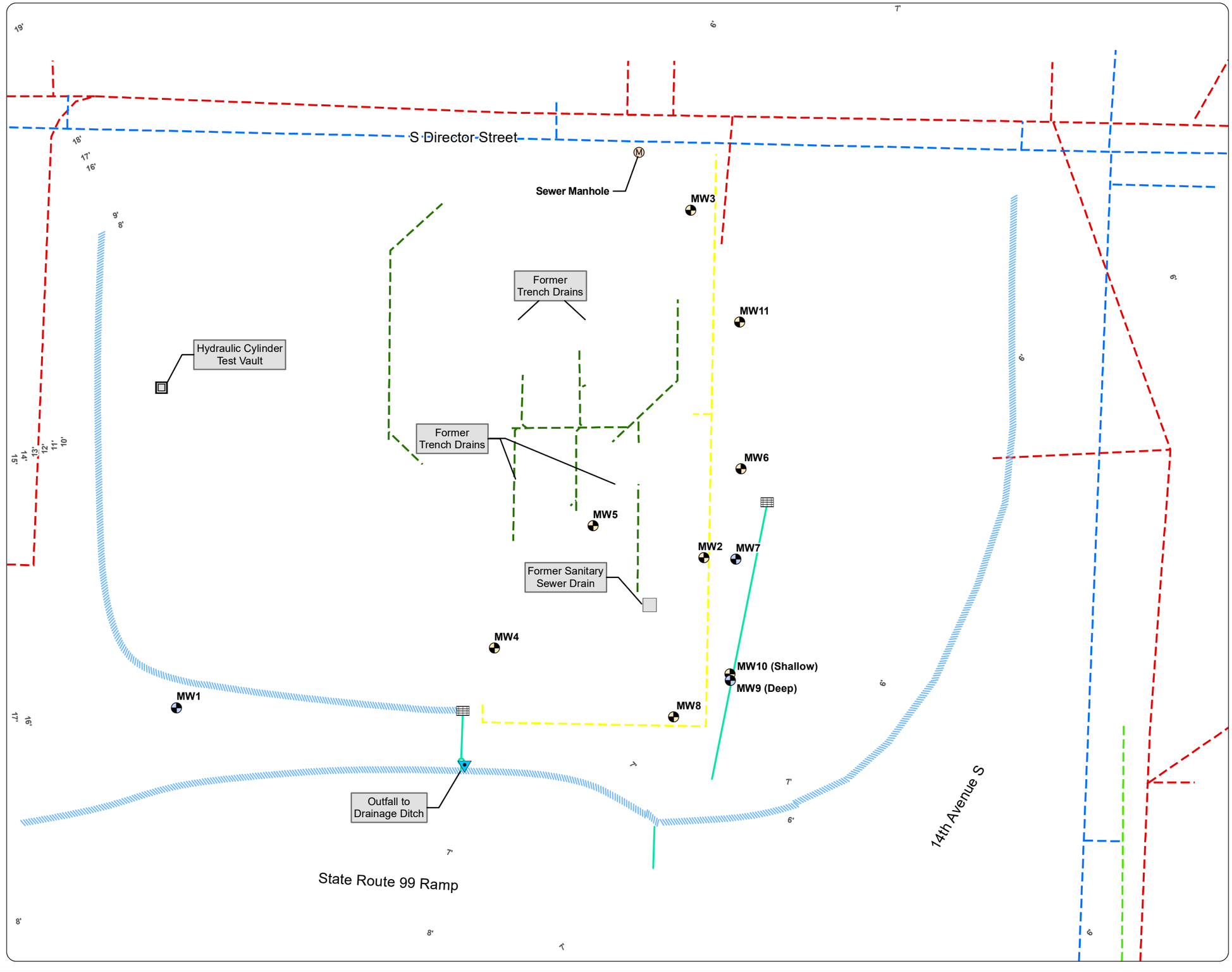
p. 971 544 2139 | www.maulfoster.com

0 1,000 2,000
Feet

Path: X:\1803.01_01\Projects\Fig1_1_Property Location.mxd
Print Date: 9/17/2020
Approved By: hgood
Produced By: sturner
Project:1803.01.01

Figure 2-1
Site Features
Precision Engineering, Inc.
Seattle, Washington



Legend

- Deep Monitoring Well
- Shallow Monitoring Well
- Catch Basin
- Gas
- Sanitary Sewer
- Water
- Overhead Electric
- Former Sanitary Sewer
- Stormwater Piping
- Stormwater Runoff
- Elevation Contours (1ft interval)
- Property Parcel
- King County Parcel

NOTE:
Feature locations are approximate.

0 50 100
Feet

Sources:
Aerial photograph obtained from Mapbox.
Former sanitary sewer and storm drain features obtained from Precision Engineering, Inc. (July, 1986).
Parcel data obtained from King County GIS.
Utility data obtained from MFA site walk on June 5, 2020.
Well locations for MW01-MW08 obtained from survey conducted by Duncanson, Inc.

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Path: X:\1803.01_01\Projects\Fig2_1_Site_Features.mxd
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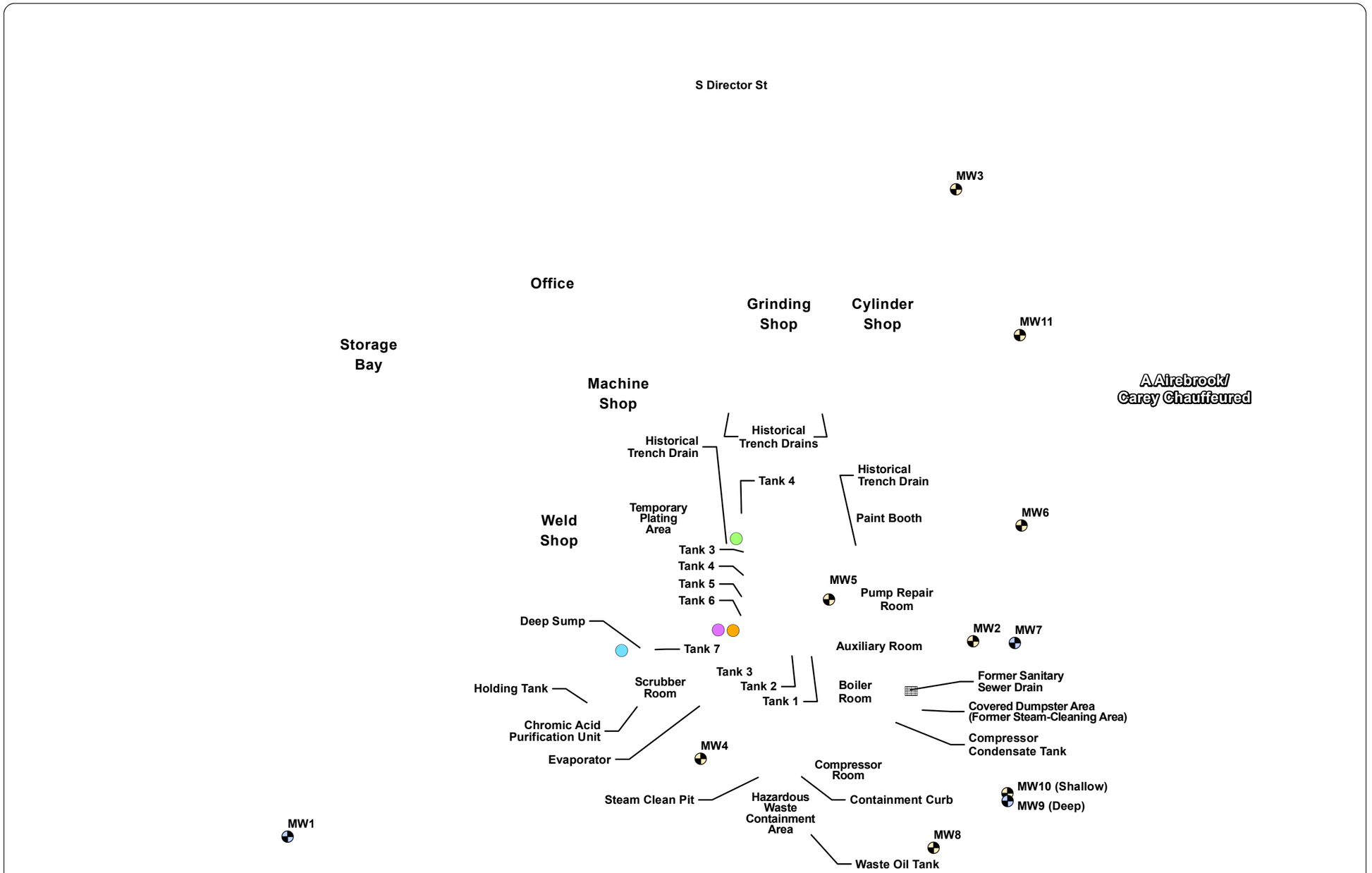
Produced By: abixby
Project: 1803.01

Figure 2-2
Historical Site Features
Precision Engineering, Inc.
Seattle, Washington



Legend

- Deep Monitoring Well
- Shallow Monitoring Well
- Hydrochloric Acid Tank
- Trichloroethene Tank
- Sodium Hydroxide Tank
- Sodium Carbonate Tank
- Other Tanks Containing Chromic Acid
- Chromic Acid Plating Tank
- Other Historical Feature
- Former Sanitary Sewer Piping (from July 1986 drawing by Precision Engineering, Inc.)
- King County Parcels
- Property Parcels

NOTES:
Feature locations are approximate.
Deep monitoring wells are completed in the confined sand and gravel water-bearing zone.
Shallow monitoring wells are completed in the confined alluvial water-bearing zone.

0 25 50
Feet

Source:
Aerial photograph obtained from Mapbox.
Historical features obtained from Final Remedial Investigation and Risk Assessment Report (MFA, 2008).
Parcel data obtained from King County GIS.
Well locations for MW01-MW08 obtained from survey conducted by Duncanson, Inc.

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Path: X:\1803.01_01\Projects\Fig2_2_Historical_Site_Features.mxd
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Produced By: abixby
Project: 1803.01

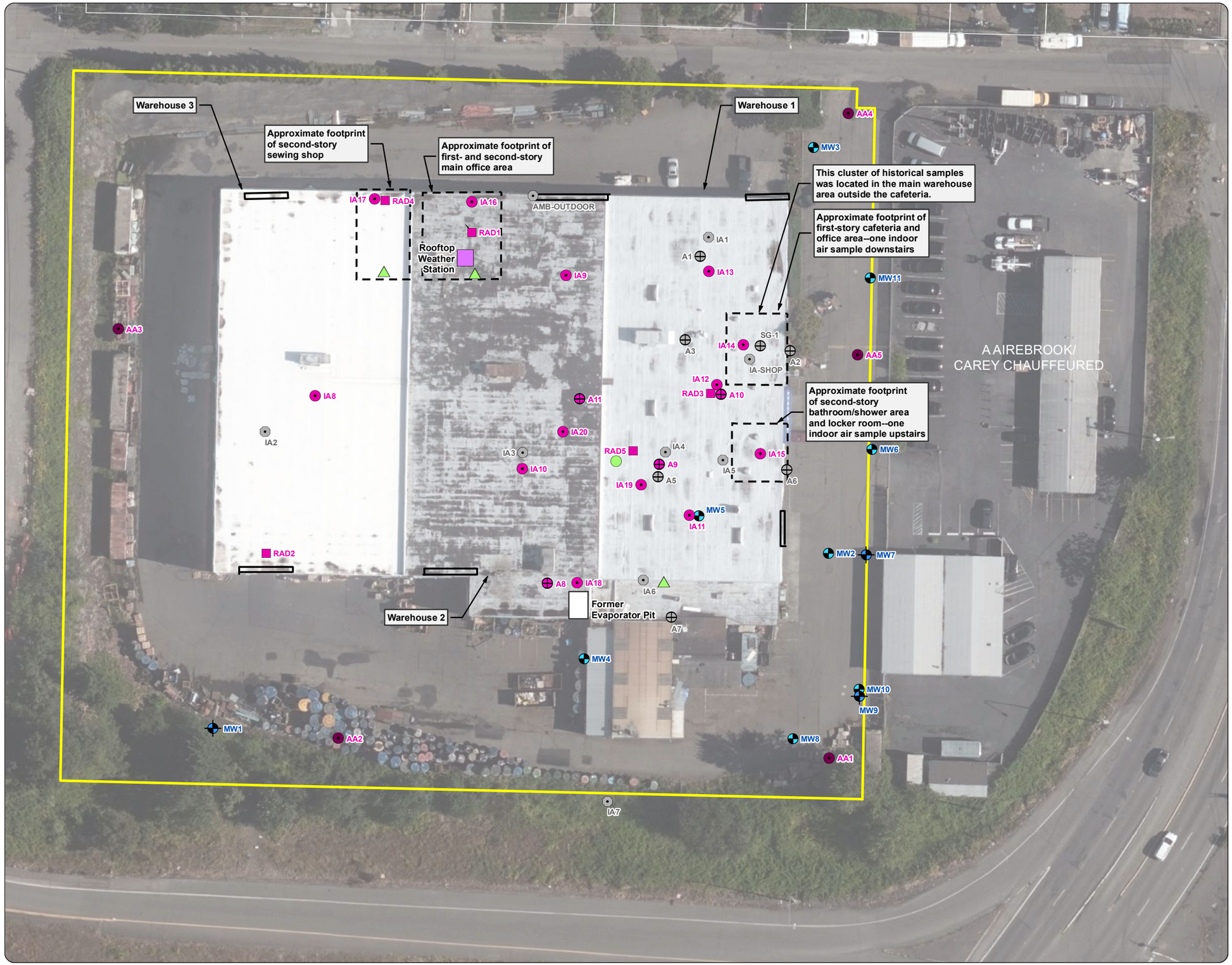

Figure 4-1
Vapor Sample Locations

Precision Engineering, Inc.
Seattle, Washington

Legend

Vapor Sample Locations

- Ambient Air
- Indoor Air
- Passive Sampler
- Sub-slab Soil Gas

Historical Vapor Sample Locations

- Indoor/Ambient Air
- Sub-slab Soil Gas

Property Features

- Air Purifier
- Former Trichloroethene Tank
- Shallow Monitoring Well
- Deep Monitoring Well
- Overhead Door (Approximate)
- Property Parcel
- King County Parcel

NOTES:
Air purifier units were installed on 2/13/2020.
The air purifier located in the sewing shop was originally located near IA17, but was moved on March 12, 2020.
Well locations for MW1 to MW8 were surveyed by Duncanson, Inc. All other feature locations are approximate.

0 25 50
Feet

Source:
Aerial photograph obtained from Mapbox.
Parcel data obtained from King County GIS.

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Path: X:\1803.01_02\Projects\Fig4_1_Vapor_Sample_Locations.mxd
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Project: 1803.01

Figure 4-2
Pre-Air-Purification and -Interim-Action TCE Results
Precision Engineering, Inc.
Seattle, Washington

Location	IA 16
Sample Name	IA 16[d]
Collection Date	2/11/2020
TCE (ug/m3)	2.8

Location	IA 13
Sample Name	IA 13[a]
Collection Date	2/2/2020
TCE (ug/m3)	210

Location	AA 4
Sample Name	AA 4[c]
Collection Date	2/2/2020
TCE (ug/m3)	0.16 U

Location	IA 17
Sample Name	IA 17[d]
Collection Date	2/11/2020
TCE (ug/m3)	93

Location	RAD 1
Sample Name	RAD 1[e]
Collection Date	2/13/2020
TCE (ug/m3)	110

Location	AA 3
Sample Name	AA 3[c]
Collection Date	2/2/2020
TCE (ug/m3)	0.27 U

Location	IA 14
Sample Name	IA 14[a]
Collection Date	2/2/2020
TCE (ug/m3)	110

Location	AA 5
Sample Name	AA 5[c]
Collection Date	2/2/2020
TCE (ug/m3)	0.16 U

Location	A 11
Sample Name	A 11[b]
Collection Date	2/1/2020
TCE (ug/m3)	82

Location	IA 9
Sample Name	IA 9[a]
Collection Date	2/2/2020
TCE (ug/m3)	330

Location	IA 12
Sample Name	IA 12[a]
Collection Date	2/2/2020
TCE (ug/m3)	200

Location	IA 8
Sample Name	IA 8-020120[a]
Collection Date	2/2/2020
TCE (ug/m3)	270

Location	A 10
Sample Name	A 10[b]
Collection Date	2/2/2020
TCE (ug/m3)	29

Location	IA 20
Sample Name	IA 20[d]
Collection Date	2/11/2020
TCE (ug/m3)	73

Location	RAD 3
Sample Name	RAD 3[e]
Collection Date	2/13/2020
TCE (ug/m3)	170

Location	IA 10
Sample Name	IA 10[a]
Collection Date	2/2/2020
TCE (ug/m3)	340

Location	RAD 2
Sample Name	RAD 2[e]
Collection Date	2/13/2020
TCE (ug/m3)	110

Location	IA 15
Sample Name	IA 15[a]
Collection Date	2/2/2020
TCE (ug/m3)	170

Location	A 9
Sample Name	A 9[b]
Collection Date	2/1/2020
TCE (ug/m3)	1100

Location	A 8
Sample Name	A 8[b]
Collection Date	2/1/2020
TCE (ug/m3)	160

Location	IA 18
Sample Name	IA 18[d]
Collection Date	2/11/2020
TCE (ug/m3)	45

Location	IA 11
Sample Name	IA 11[a]
Collection Date	2/1/2020
TCE (ug/m3)	170

Location	IA 19
Sample Name	IA 19[d]
Collection Date	2/11/2020
TCE (ug/m3)	110

Location	AA 2
Sample Name	AA 2[c]
Collection Date	2/1/2020
TCE (ug/m3)	0.16 U

Location	AA 1
Sample Name	AA 1[c]
Collection Date	2/1/2020
TCE (ug/m3)	0.16 U

Approximate footprint of second-story sewing shop

Approximate footprint of first- and second-story main office area

This cluster of historical samples was located in the main warehouse area outside the cafeteria.

Approximate footprint of first-story cafeteria and office area--one indoor air sample downstairs

Approximate footprint of second-story bathroom/shower area and locker room--one indoor air sample upstairs

Rooftop Weather Station

Former Evaporator Pit

Warehouse 1

Warehouse 2

Warehouse 3

A AIREBROOK/
CAREY CHAUFFEURED

IA-SHOP

SG-1

AMB-OUTDOOR

Legend

Vapor Sample Locations
- Ambient Air
- Indoor Air
- Passive Sampler
- Sub-slab Soil Gas

Historical Vapor Sample Locations
- Indoor/Ambient Air
- Sub-slab Soil Gas

Property Features
- Shallow Monitoring Well
- Deep Monitoring Well
- Overhead Door (Approximate)
- Former TCE Tank
- Property Parcel
- King County Parcel

Sample Shading
- Sample collected prior to air purification

TCE Result Shading
- Exceedance of MTCA Method B indoor air CUL (0.33 ug/m3)
- Exceedance of short-term indoor air action level, workplace (7.5 ug/m3)
- Exceedance of MTCA Method B sub-slab soil gas screening level (11 ug/m3)

NOTES:
CUL = cleanup level.
MTCA = Model Toxics Control Act.
TCE = trichloroethene.
U = Result is non-detect to method reporting limit.
ug/m3 = micrograms per cubic meter.
(a) 24-hour indoor air sample collected with a 6-liter Summa canister under "worst case" conditions (i.e., doors and windows closed, outside working hours).
(b) Sub-slab soil gas sample collected with a 1-liter Summa canister.
(c) 24-hour ambient air sample collected with a 6-liter Summa canister.
(d) 8-hour indoor air sample collected with a 6 liter Summa canister.
(e) Radiello 130 passive indoor air sample collected from February 1 to February 13, 2020.

0 25 50
Feet

Source:
Aerial photograph obtained from Mapbox.
Parcel data obtained from King County GIS.

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Path: X:\1803.01_02\Projects\Fig4_2_Initial_Vapor_TCE_Results.mxd
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Produced By: abixby
Project: 1803.01

Figure 5-1
Pre- and Post-Air-Purification Indoor Air TCE Results

Precision Engineering, Inc.
Seattle, Washington

Location	IA 17	
Sample Name	IA 17[a]	IA 17-022020[b]
Collection Date	2/11/2020	2/20/2020
TCE (ug/m3)	93	4.5

Location	RAD 4
Sample Name	RAD4[d]
Collection Date	3/12/2020
TCE (ug/m3)	2.6

Location	IA 16	
Sample Name	IA 16[a]	IA 16-022020[b]
Collection Date	2/11/2020	2/20/2020
TCE (ug/m3)	2.8	1.9

Location	RAD 1	
Sample Name	RAD1[c]	RAD1-022020[b]
Collection Date	2/13/2020	3/12/2020
TCE (ug/m3)	110	1.3

Location	RAD 3
Sample Name	RAD3[c]
Collection Date	2/13/2020
TCE (ug/m3)	170

Location	IA 20
Sample Name	IA20[a]
Collection Date	2/11/2020
TCE (ug/m3)	73

Location	RAD 2
Sample Name	RAD2[c]
Collection Date	2/13/2020
TCE (ug/m3)	110

Location	IA 18
Sample Name	IA 18[a]
Collection Date	2/11/2020
TCE (ug/m3)	45

Location	RAD 5
Sample Name	RAD5[d]
Collection Date	3/12/2020
TCE (ug/m3)	2.3

Location	IA 19	
Sample Name	IA 19[a]	IA 19-022020[b]
Collection Date	2/11/2020	2/20/2020
TCE (ug/m3)	110	2.3

IA17 RAD4 IA16 RAD1 AA4 IA9 IA13 Sewing Room Office Warehouse 3 Warehouse 2 Warehouse 1 AA3 IA14 Cafeteria and Office AA5 AIRE-BROOK/ CAREY CHAUFFEURED IA12 RAD3 A10 IA8 A11 IA20 Locker Room RAD5 IA15 A9 IA10 IA19 IA11 RAD2 IA18 A8 Former Evaporator Pit AA2

Legend

Pre- and Post-Air-Purification Indoor Air Sample Locations

- Indoor Air
- Passive Sampler

Other Sample Locations

- Ambient Air
- Indoor Air
- Sub-slab Soil Gas

Property Features

- Air Purifier
- Former TCE Tank
- Overhead Door (Approximate)
- Property Parcel

Sample Shading

- Sample collected prior to air purification
- Sample collected during air purification

TCE Result Shading

- Exceedance of MTCA Method B indoor air CUL (0.33 ug/m3)
- Exceedance of short-term indoor air action level, workplace (7.5 ug/m3)

NOTES:
All sample locations are approximate.
Indoor air samples were collected under normal working conditions.
CUL = cleanup level.
MTCA = Model Toxics Control Act.
TCE = trichloroethene.
ug/m3 = micrograms per cubic meter.
(a) 8-hour indoor air sample collected with a 6 liter Summa canister.
(b)8-hour indoor air sample collected with a 6 liter Summa canister.
(c) Radiello 130 passive indoor air sample collected from February 1 to February 13, 2020.
(d) Radiello 130 passive indoor air sample collected from February 20 to March 12, 2020.

0 20 40
Feet

Source:
Aerial photograph obtained from Mapbox.
Parcel data obtained from King County GIS.

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Path: X:\1803.011.02\Projects\Fig5-1_Air_Purification_Indoor_TCE_Results.mxd
Print Date: 12/18/2020
Approved By: bgood
Produced By: abixby
Project: 1803.01

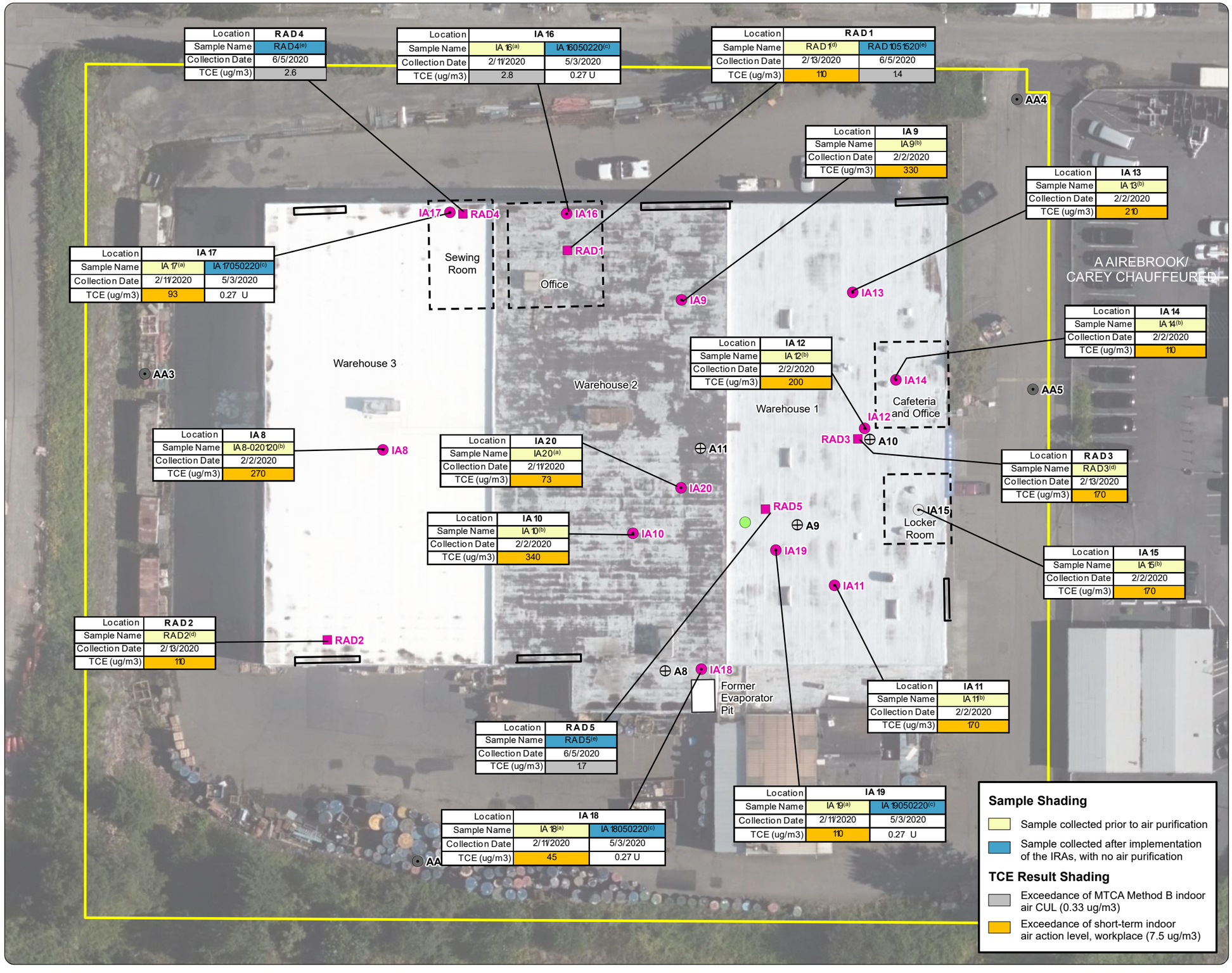

Figure 6-1
Pre- and Post-Interim-Action Indoor Air TCE Results

Precision Engineering, Inc.
Seattle, Washington

Legend

Pre- and Post-Interim-Action Indoor Air Sample Locations

- Indoor Air
- Passive Sampler

Other Sample Locations

- Ambient Air
- Indoor Air
- Sub-slab Soil Gas

Property Features

- Former TCE Tank
- Overhead Door (Approximate)
- Property Parcel

NOTES:
All sample locations are approximate.
Non-detects ("U") were not compared to screening critieria.
CUL = cleanup level.
IRAs = interim remedial actions.
MTCA = Model Toxics Control Act.
TCE = trichloroethene.
U = Result is non-detect to method reporting limit.
ug/m3 = micrograms per cubic meter.
(a) 8-hour indoor air sample collected with a 6-liter Summa canister during normal working conditions.
(b) 24-hour indoor air sample collected with a 6-liter Summa canister outside of normal working conditions.
(c) 24-hour indoor air, post-interim action performance sample collected with a 6-liter Summa canister outside of normal working conditions.
(d) Radiello 130 passive indoor air sampler collected from February 1 to February 13, 2020.
(e) Radiello 130 passive indoor air sampler collected from May 15 to June 5, 2020.

0 20 40
Feet

Source:
Aerial photograph obtained from Mapbox.
Parcel data obtained from King County GIS.

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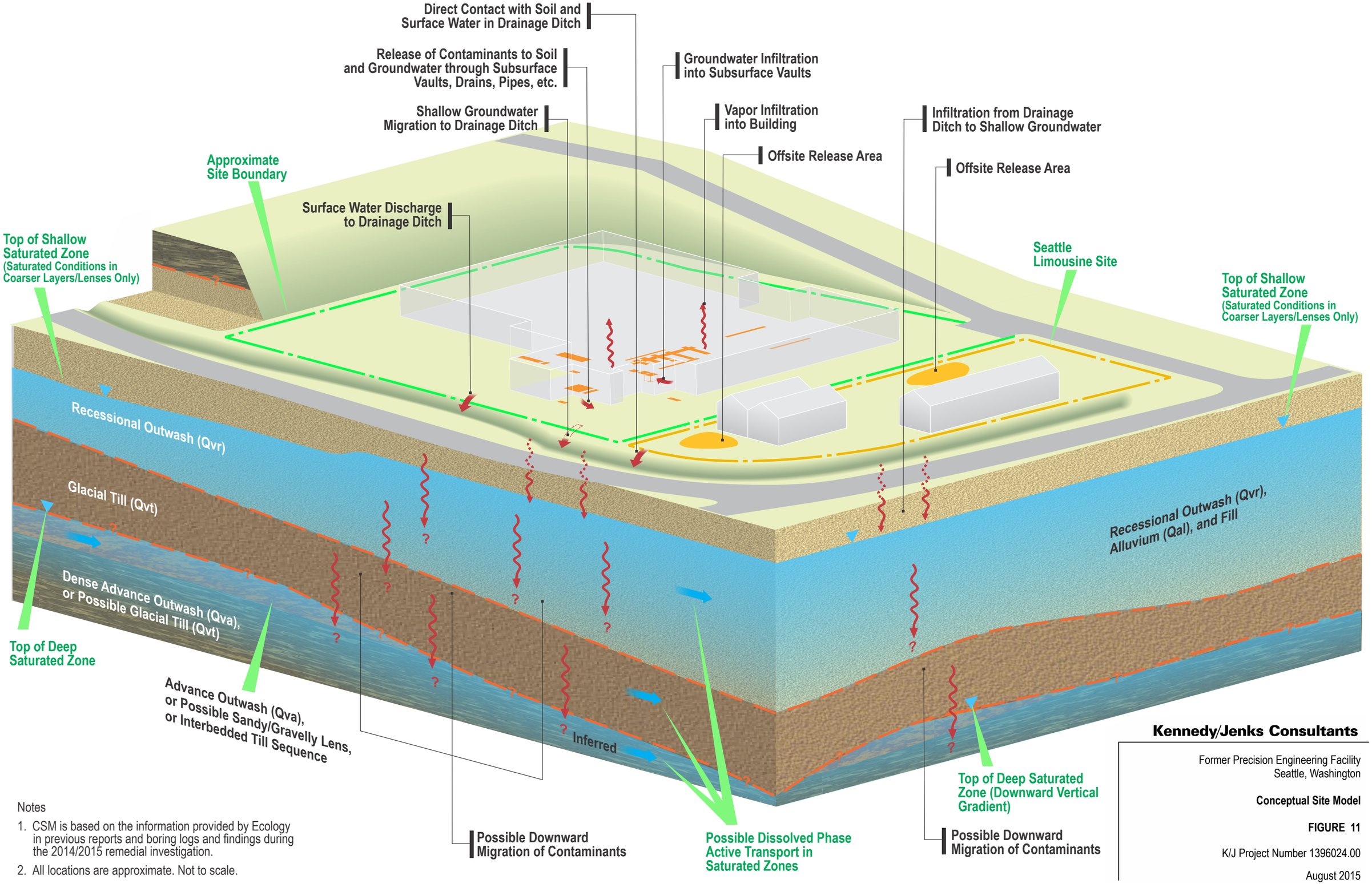
APPENDIX A
CONCEPTUAL SITE MODEL



Notes

1. CSM is based on the information provided by Ecology in previous reports and boring logs and findings during the 2014/2015 remedial investigation.
2. All locations are approximate. Not to scale.

Kennedy/Jenks Consultants

Former Precision Engineering Facility
Seattle, Washington

Conceptual Site Model

FIGURE 11

K/J Project Number 1396024.00

August 2015

Figure 1
TCE and Breakdown Product Detections - Soil Gas and Air

Precision Engineering, Inc.
Seattle, Washington

AMB-OUTDOOR
Ambient air (ug/m^3)
Collection date: 02/07/2015
TCE: **0.96**

IA1
Indoor air (ug/m^3)
Collection date: 06/13/2006
TCE: 0.2

A3
Sub-slab soil gas (ug/m^3)
Collection date: 04/18/2006
cis-1,2-DCE: 470
TCE: **6,100**

SG-1
Sub-slab soil gas (ug/m^3)
Collection date: 02/072015
TCE: **95**

IA2
Indoor air (ug/m^3)
Collection date: 06/13/2006
TCE: 0.083

IA3
Indoor air (ug/m^3)
Collection date: 06/13/2006
TCE: 0.11

IA4
Indoor air (ug/m^3)
Collection date: 06/13/2006
TCE: 0.14

IA-SHOP
Indoor air (ug/m^3)
Collection date: 02/07/2015
TCE: **240**
VC: **0.25**

IA5
Indoor air (ug/m^3)
Collection date: 06/13/2006
TCE: **0.16**

A5
Sub-slab soil gas (ug/m^3)
Collection date: 04/18/2006
cis-1,2-DCE: 1,700
TCE: **37,000**
VC: **420**

IA7
Ambient air (ug/m^3)
Collection date: 06/13/2006
TCE: 0.046

IA6
Indoor air (ug/m^3)
Collection date: 06/13/2006
TCE: 0.15

A1 A2 A3 A4 A5 A6 A7

A Airebrook/
Carey Chauffeured

	Sub-slab Soil Gas VI SL	Air CUL
	ug/m^3	ug/m^3
cis-1,2-DCE	NV	NV
TCE	12	0.37
VC	9.4	0.28

Legend

TCE and Breakdown Product Detections

- CUL or SL Exceedance
- Indoor/Ambient Air
- Sub-slab Soil Gas

Sample Location Type

- Indoor/Ambient Air
- Sub-slab Soil Gas
- King County Parcels
- Property Parcels

Notes:
Only detected concentrations are shown.
Bold values indicate SL or CUL exceedances.
SLs and CULs are provided only for detected compounds.
CUL = cleanup level.
DCE = dichloroethene.
NV = no value.
SL = screening level.
TCE = trichloroethene.
ug/m^3 = micrograms per cubic meter.
VC = vinyl chloride.
VI = vapor intrusion.

0 25 50
Feet

Source: Aerial photograph obtained from Mapbox.
Well locations for MW01-MW08 obtained from survey conducted by Duncanson, Inc.

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Produced By: mjosef
Project: 1803.01

Figure 4
TCE and Breakdown Product Detections - Soil and Groundwater

Precision Engineering, Inc.
Seattle, Washington

GP11
Soil (mg/kg)
Collection depth (ft bgs): 2.0
TCE: 0.0872
Collection depth (ft bgs): 6.5
cis-1,2-DCE: 0.0788
TCE: 0.281

GP14
Soil (mg/kg)
Collection depth (ft bgs): 3.0
TCE: 0.00449

GP18
Soil (mg/kg)
Collection depth (ft bgs): 1.0
TCE: 0.00343

GP10
Soil (mg/kg)
Collection depth (ft bgs): 1.5
1,1-DCE: 0.0237

GP6
Soil (mg/kg)
Collection depth (ft bgs): 1.0
TCE: 0.0405
Collection depth (ft bgs): 14.5
cis-1,2-DCE: 0.149
TCE: 1.16

GP13
Shallow Groundwater (ug/L)
Collection date: 12/14/2005
cis-1,2- DCE: 6.03
trans-1,2-DCE: 1.01
TCE: 0.22
VC: **16.5**

MW3
Shallow groundwater (ug/L)
Collection date: 12/29/2005
cis-1,2-DCE: 0.2

GP16
Soil (mg/kg)
Collection depth (ft bgs): 1.0
TCE: 0.00363

MW5
Shallow Groundwater (ug/L)
Collection date: 12/28/2005
cis-1,2- DCE: 2.42
TCE: **22.1**

GP29
Soil (mg/kg)
Collection depth (ft bgs): 1.0
cis-1,2-DCE: 0.00494
Collection depth (ft bgs): 6.0
cis-1,2-DCE: 0.00996

MW8
Shallow Groundwater (ug/L)
Collection date: 12/28/2005
VC: 0.56
Collection date: 4/18/2006
cis-1,2- DCE: 1.5

SB10, AMB-OUTDOOR, GP12, MW11, SB8, A Airebrook/ Carey Chauffeured, SB7, GP24, GP15, SB15, GP5, GP17, MW-6, GP32, GP19, SB6, SB16, SB14, GP23, GP3, GP2, GP20, GP9, GP7, GP1, MW2, GP4, GP8, GP22, GP21, GP26, GP28, SB5, GP30, GP31, SB17, SB13, GP25, MW4, GP27, MW10, SB4, SB1, SB3, SB18, SB12, SB11

	Groundwater VI SL	Soil CUL
	ug/L	mg/kg
1,1-DCE	130	4,000
cis-1,2-DCE	NV	160
trans-1,2-DCE	NV	1,600
TCE	1.5	12
VC	0.35	0.67

Legend

TCE and Breakdown Product Detections

- CUL or SL Exceedance
- Groundwater
- Soil

Sample Location Type

- Boring
- Shallow Monitoring Well
- King County Parcels
- Property Parcels

Notes:
Only detected concentrations are shown.
All compounds were non-detect in groundwater during the July 2019 event. Historical detections are shown for reference.
TCE and its breakdown products have not been detected in deep monitoring wells or hand auger and surface soil samples (locations not shown).
Bold values indicate SL or CUL exceedances.
SLs and CULs are provided only for detected compounds.
CUL = cleanup level.
DCE = dichloroethene.
ft bgs = feet below ground surface.
mg/kg = milligrams per kilogram.
NV = no value.
SL = screening level.
TCE = trichloroethene.
ug/L = micrograms per liter.
VC = vinyl chloride.
VI = vapor intrusion.

0 25 50
Feet

Source: Aerial photograph obtained from Mapbox.
Well locations for MW01-MW08 obtained from survey conducted by Duncanson, Inc.

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Produced By: mjosef
Project: 1803.01

APPENDIX B

PHOTO ARRAY

PHOTOGRAPHS

Project Name: Precision Engineering Interim Actions
Project Number: 1803.01.02
Location: 1231 S Director Street, Seattle, Washington

Photo No. 1.

Description
Sub-slab soil gas vapor pin installation on January 31, 2020.

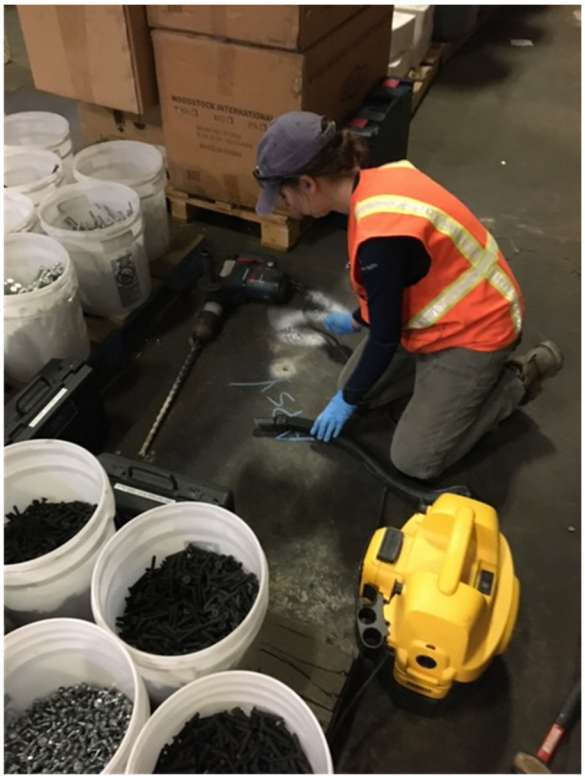

Photo No. 2.

Description
Sub-slab soil gas sampling setup, excluding the helium shroud, on February 1, 2020.

PHOTOGRAPHS

Project Name: Precision Engineering Interim Actions
Project Number: 1803.01.02
Location: 1231 S Director Street, Seattle, Washington

Photo No. 3.

Description
Six-liter Summa canister deployed outside for ambient air sample collection during the initial vapor intrusion assessment on February 1, 2020.

Photo No. 4.

Description
Six-liter Summa canister deployed in Warehouse 1 during the initial vapor intrusion assessment on February 1, 2020.

PHOTOGRAPHS

Project Name: Precision Engineering Interim Actions
Project Number: 1803.01.02
Location: 1231 S Director Street, Seattle, Washington

Photo No. 5.

Description
Six-liter Summa canister deployed in Warehouse 2 during the initial vapor intrusion assessment on February 1, 2020.

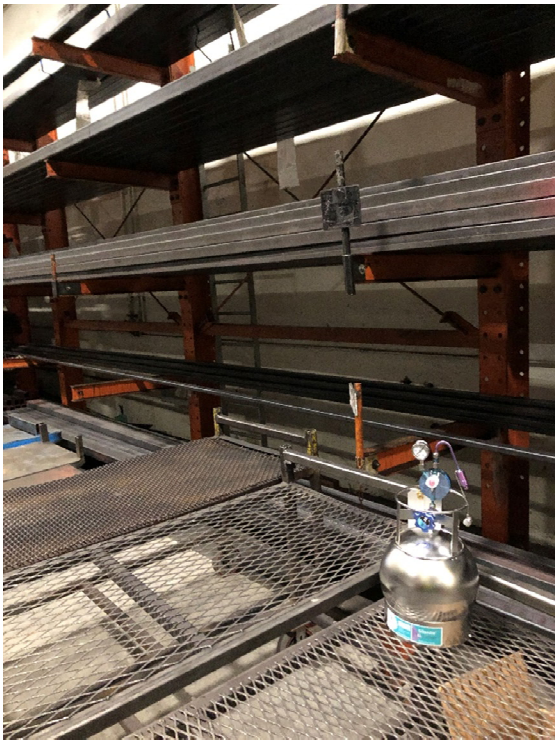

Photo No. 6.

Description
Radiello R130 passive sampler deployed in Warehouse 1 on February 1, 2020.

PHOTOGRAPHS

Project Name: Precision Engineering Interim Actions
Project Number: 1803.01.02
Location: 1231 S Director Street, Seattle, Washington

Photo No. 7.

Description
Davis Instruments Vantage Pro2 weather station on the roof of the building.

Photo No. 8.

Description
HEPA-AIRE® PAS2400 air purification unit in the administrative office.

PHOTOGRAPHS

Project Name: Precision Engineering Interim Actions
Project Number: 1803.01.02
Location: 1231 S Director Street, Seattle, Washington

Photo No. 9.

Description
HEPA-AIRE® PAS2400 air purification unit in the first warehouse.

Photo No. 10.

Description
HEPA-AIRE® PAS2400 air purification unit in the sewing room.

PHOTOGRAPHS

Project Name: Precision Engineering Interim Actions
Project Number: 1803.01.02
Location: 1231 S Director Street, Seattle, Washington

Photo No. 11.

Description
Evaporator pit prior to decommissioning.

Photo No. 12.

Description
Evaporator pit rinsed as a vacuum truck removes liquid waste from the pit.

PHOTOGRAPHS

Project Name: Precision Engineering Interim Actions
Project Number: 1803.01.02
Location: 1231 S Director Street, Seattle, Washington

Photo No. 13.

Description
Groundwater seeping into the evaporator pit after being rinsed out.

Photo No. 14.

Description
Base of the evaporator pit, filled with dry-mix concrete.

PHOTOGRAPHS

Project Name: Precision Engineering Interim Actions
Project Number: 1803.01.02
Location: 1231 S Director Street, Seattle, Washington

Photo No. 15.

Description
Gravel in the base of this evaporator pit being compacted in 6-inch lifts, using hand tools.

Photo No. 16.

Description
Final gravel surface in the evaporator pit, leveled and prepped for concrete.

PHOTOGRAPHS

Project Name: Precision Engineering Interim Actions
Project Number: 1803.01.02
Location: 1231 S Director Street, Seattle, Washington

Photo No. 17.

Description
Concrete being poured and leveled in the evaporator pit to match the existing slab grade.

Photo No. 18.

Description
Decommissioned and filled evaporator pit.

PHOTOGRAPHS

Project Name: Precision Engineering Interim Actions
Project Number: 1803.01.02
Location: 1231 S Director Street, Seattle, Washington

Photo No. 19.

Description
Sikaflex® 1C SL product used to seal cracks in the building slab.

Photo No. 20.

Description
Quikrete® product used to seal cracks in the building slab.

PHOTOGRAPHS

Project Name: Precision Engineering Interim Actions
Project Number: 1803.01.02
Location: 1231 S Director Street, Seattle, Washington

Photo No. 21.

Description
Crack being cleaned with a vacuum prior to the application of sealant.

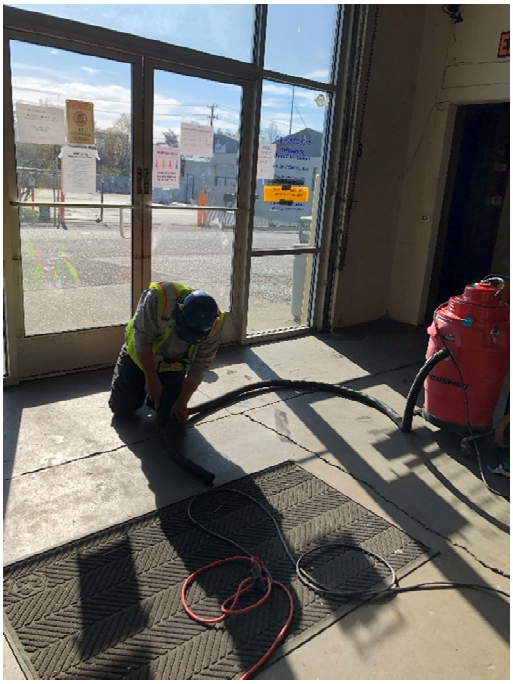

Photo No. 22.

Description
Sealant being applied to a clean crack.

PHOTOGRAPHS

Project Name: Precision Engineering Interim Actions
Project Number: 1803.01.02
Location: 1231 S Director Street, Seattle, Washington

Photo No. 23.

Description
Sealant smoothed into a crack after application.

Photo No. 24.

Description
Sealed cracks in the northern portion of Warehouse 1.

PHOTOGRAPHS

Project Name: Precision Engineering Interim Actions
Project Number: 1803.01.02
Location: 1231 S Director Street, Seattle, Washington

Photo No. 25.

Description
Sealed cracks in the southern portion of Warehouse 1.

Photo No. 26.

Description
Sealed crack in the main entrance of Warehouse 1.

PHOTOGRAPHS

Project Name: Precision Engineering Interim Actions
Project Number: 1803.01.02
Location: 1231 S Director Street, Seattle, Washington

Photo No. 27.

Description
Uneven slab joint that could not be sealed.

Photo No. 28.

Description
Sealed cracks in Warehouse 2.

PHOTOGRAPHS

Project Name: Precision Engineering Interim Actions
Project Number: 1803.01.02
Location: 1231 S Director Street, Seattle, Washington

Photo No. 29.

Description
Sealed hole in Warehouse 2.

Photo No. 30.

Description
Sealed cracks and joints in the wire rigging area of Warehouse 2.

PHOTOGRAPHS

Project Name: Precision Engineering Interim Actions
Project Number: 1803.01.02
Location: 1231 S Director Street, Seattle, Washington

Photo No. 31.

Description
Sealed slab joints near wire rigging "peg holes" in Warehouse 2.

Photo No. 32.

Description
Sealed cracks in the shipping and receiving area of Warehouse 3.

PHOTOGRAPHS

Project Name: Precision Engineering Interim Actions
Project Number: 1803.01.02
Location: 1231 S Director Street, Seattle, Washington

Photo No. 33.

Description
Large patch seal in Warehouse 3.

Photo No. 34.

Description
Sealed cracks in the wire spool storage area of Warehouse 3.

PHOTOGRAPHS

Project Name: Precision Engineering Interim Actions
Project Number: 1803.01.02
Location: 1231 S Director Street, Seattle, Washington

Photo No. 35.

Description
Sealed cracks in the wire spool storage area of Warehouse 3.

Photo No. 36.

Description
Crack prone to groundwater seepage after being sealed.

APPENDIX C

ATMOSPHERIC DATA

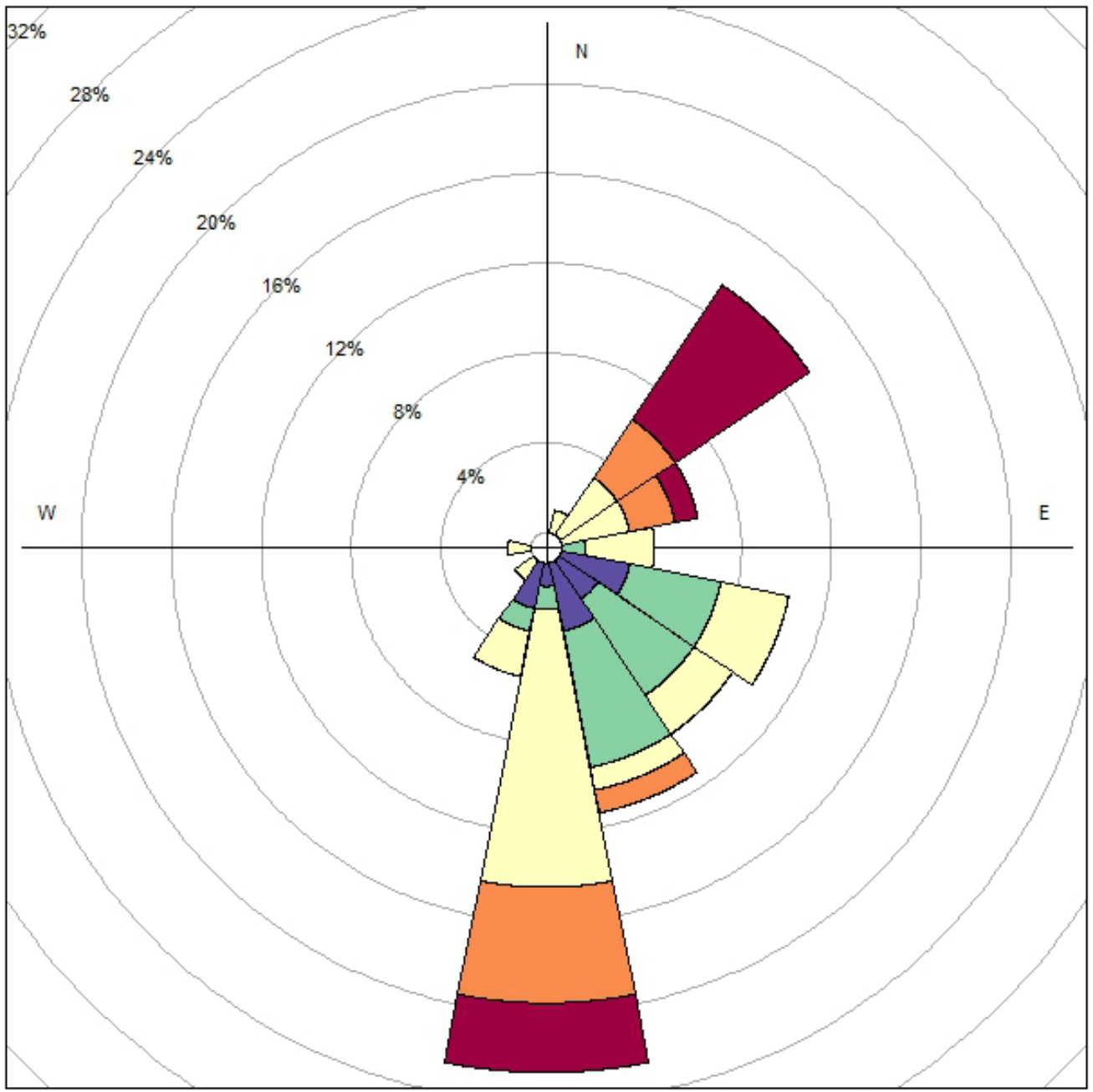

Figure
Wind Rose

Precision Engineering, Inc.
Seattle, Washington

Legend

Wind Speed (m/s)

- 0 to 0.5
- 0.5 to 1.0
- 1.0 to 2.0
- 2.0 to 3.0
- 3.0 to 4.5

Notes:
Data show origin of wind direction.
Wind rose data are from 3:45 PM on 2/1/2020 to 3:45 PM on 2/2/2020. m/s = meters per second.

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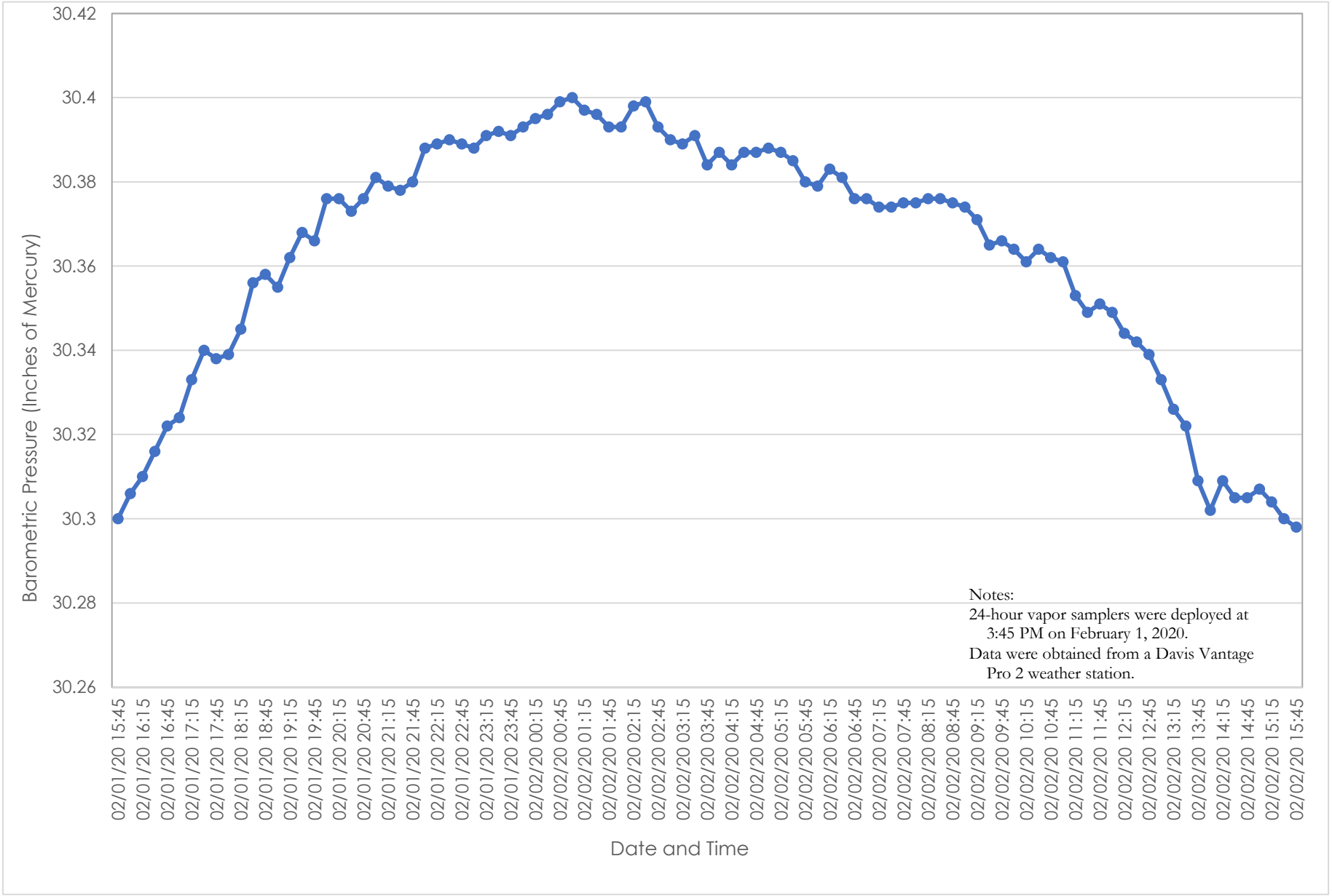
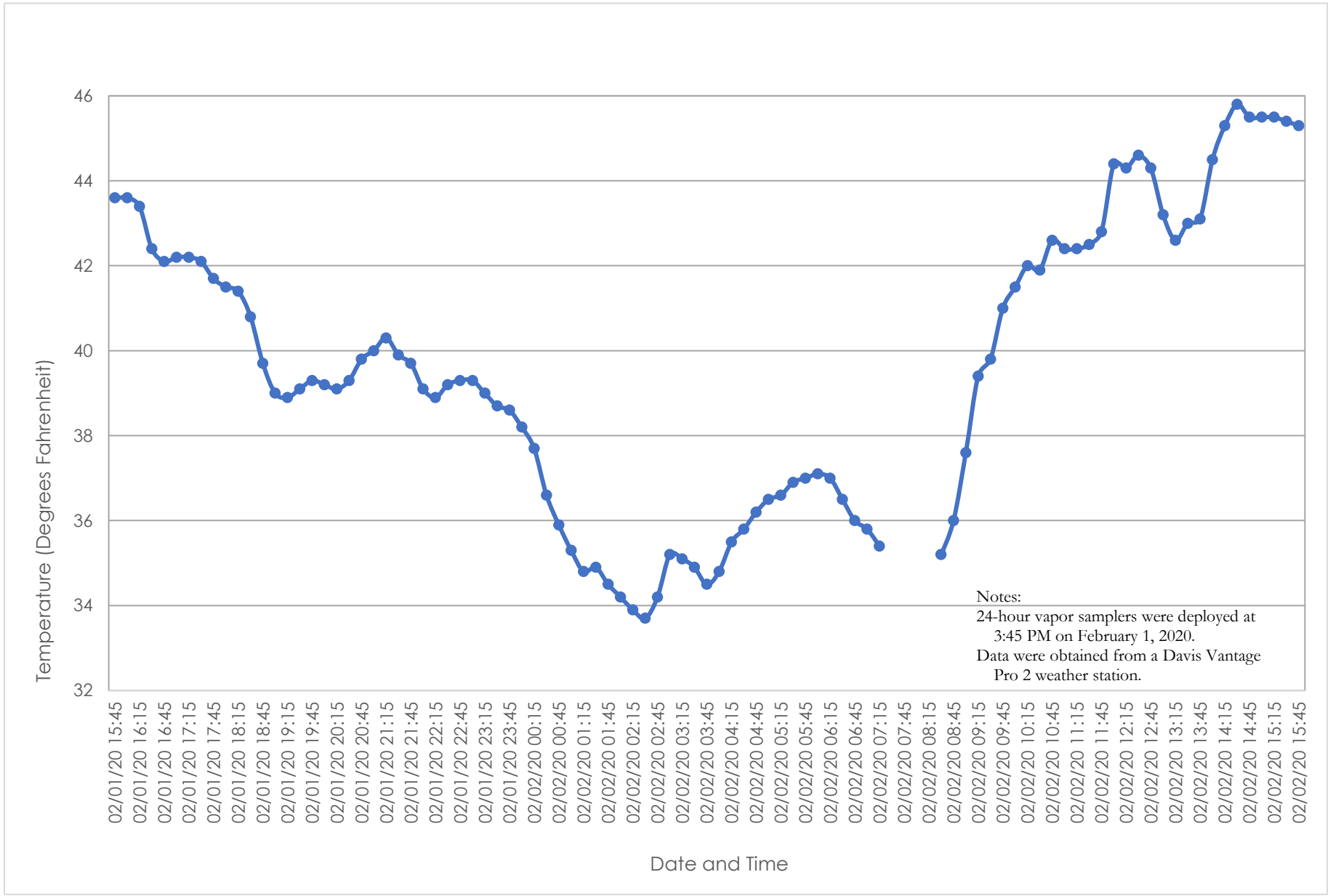
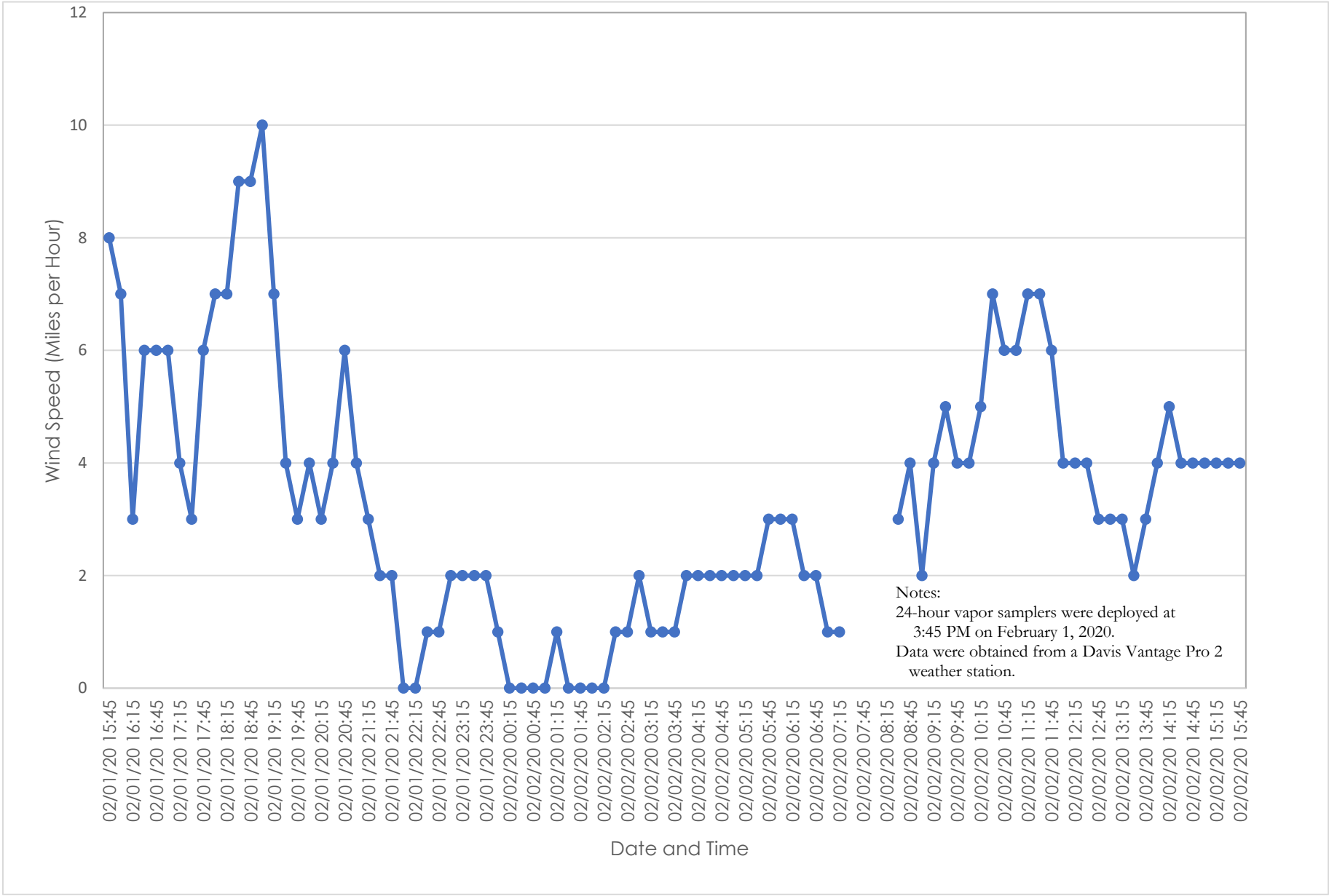
Barometric Pressure during 24-Hour Vapor Sampling
February 1, 2020 to February 2, 2020
Precision Engineering, Inc.
Seattle, Washington



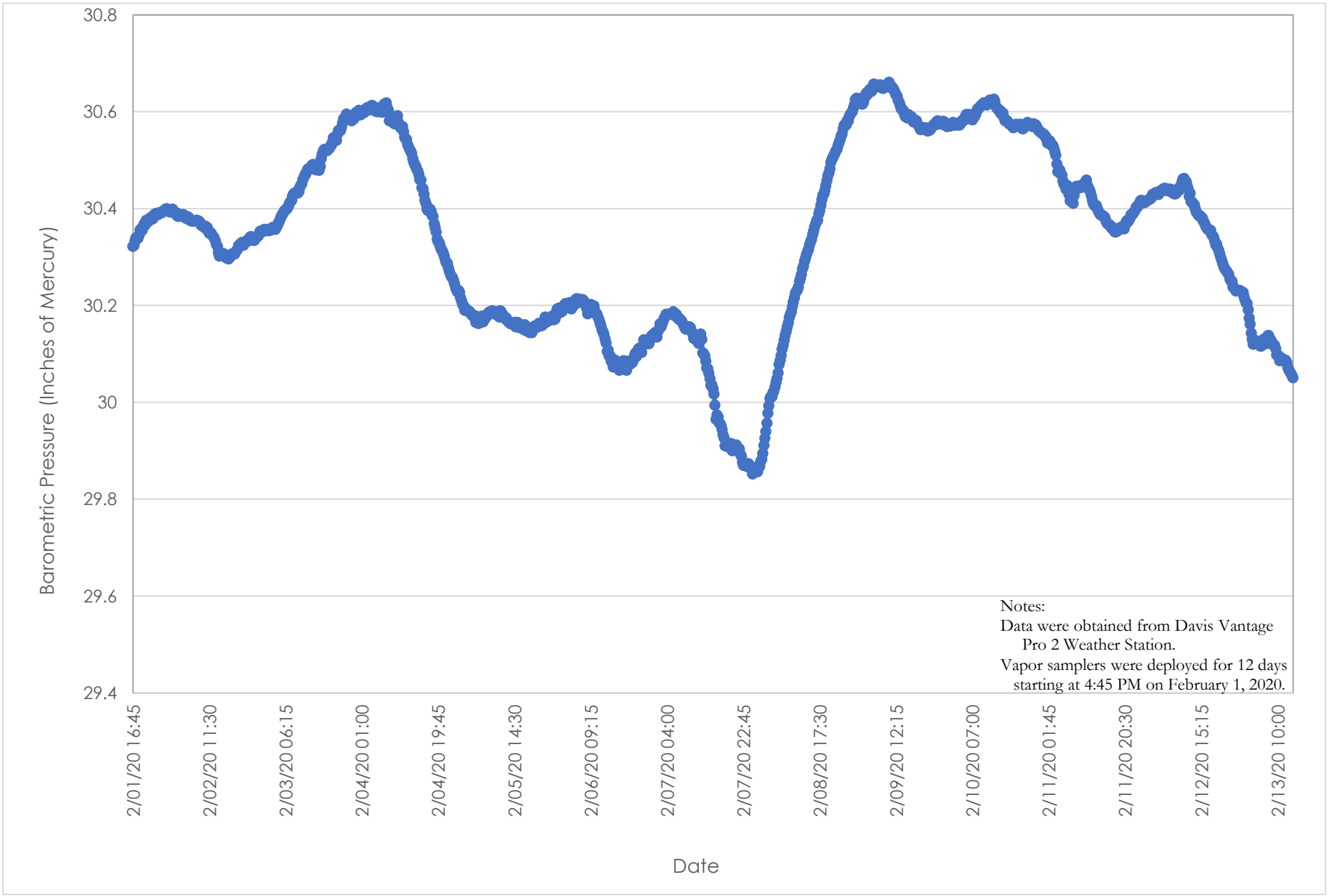
Temperature during 24-Hour Vapor Sampling
February 1, 2020 to February 2, 2020
Precision Engineering, Inc.
Seattle, Washington



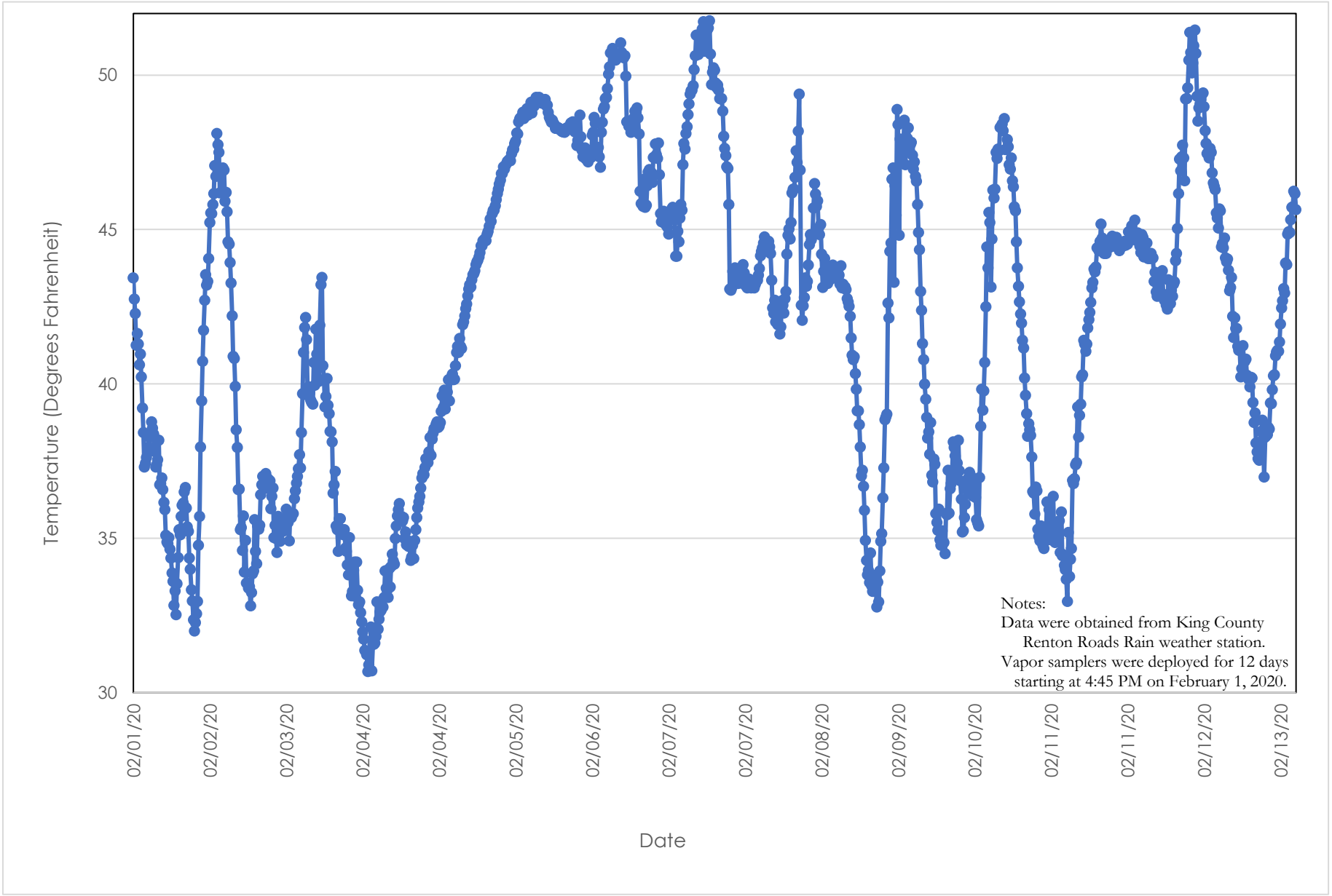
Wind Speed during 24-Hour Vapor Sampling
February 1, 2020 to February 2, 2020
Precision Engineering, Inc.
Seattle, Washington



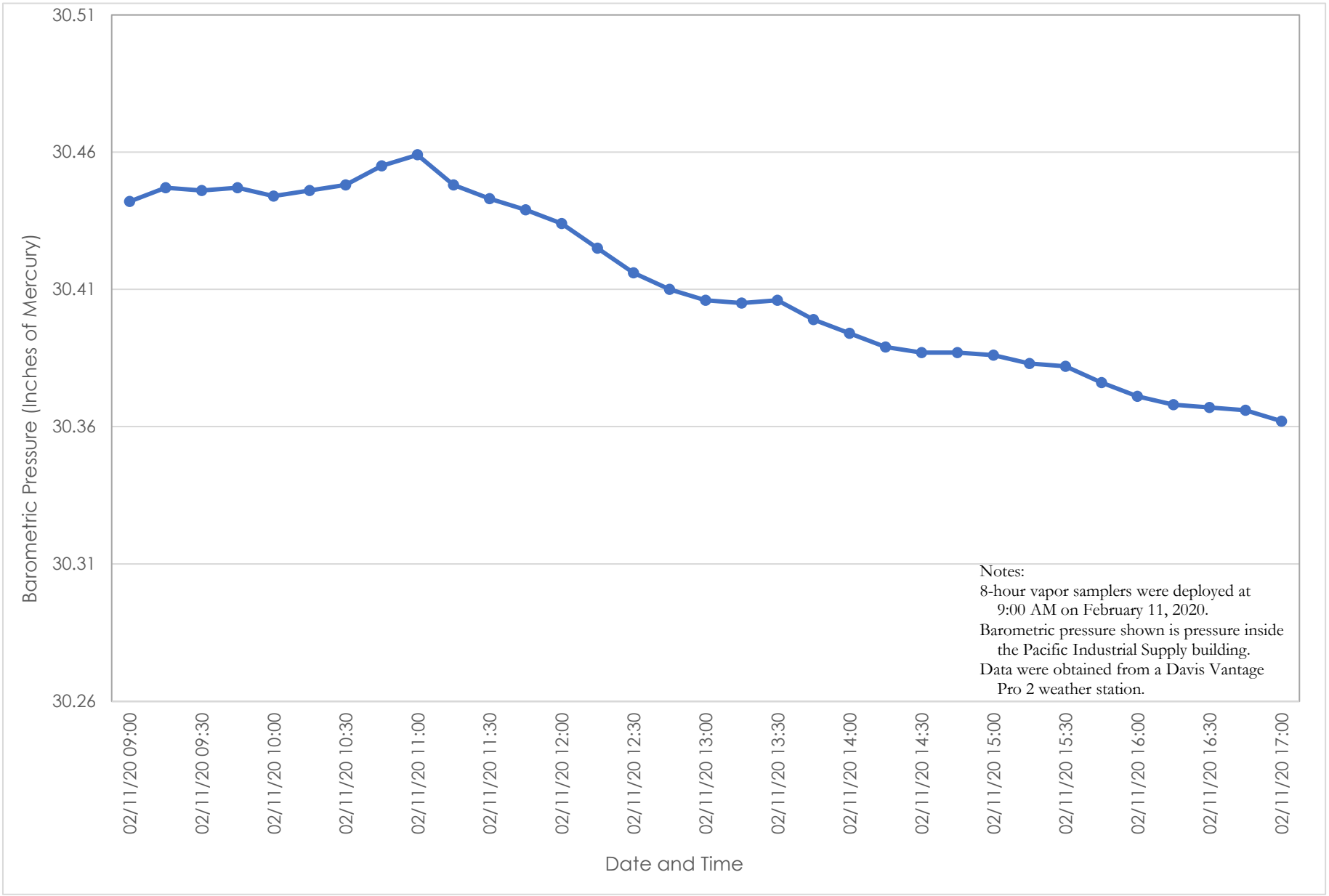
Barometric Pressure during 13-Day Vapor Sampling
February 1, 2020 to February 13, 2020
Precision Engineering, Inc.
Seattle, Washington



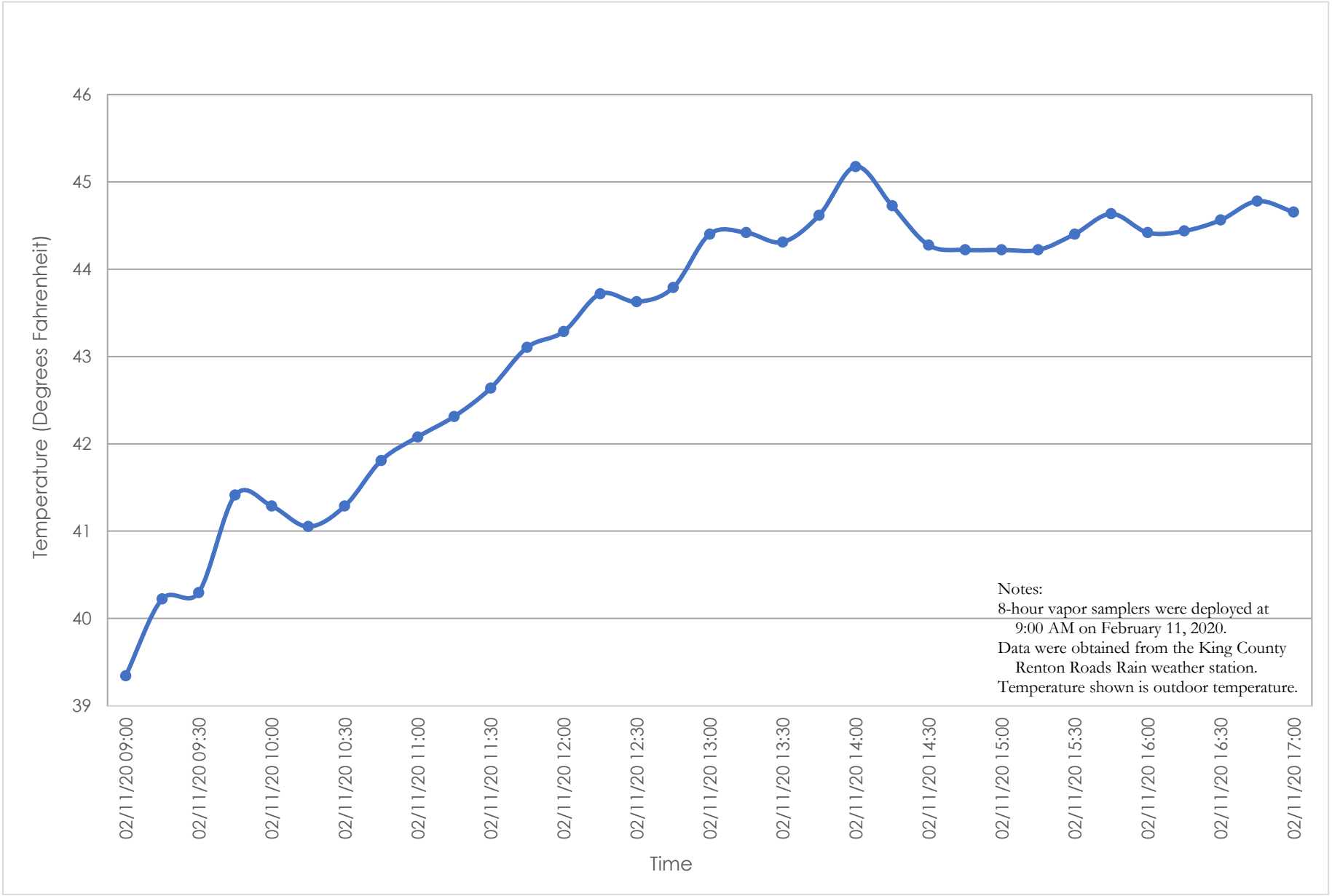
Temperature during 13-Day Vapor Sampling
February 1, 2020 to February 13, 2020
Precision Engineering, Inc.
Seattle, Washington



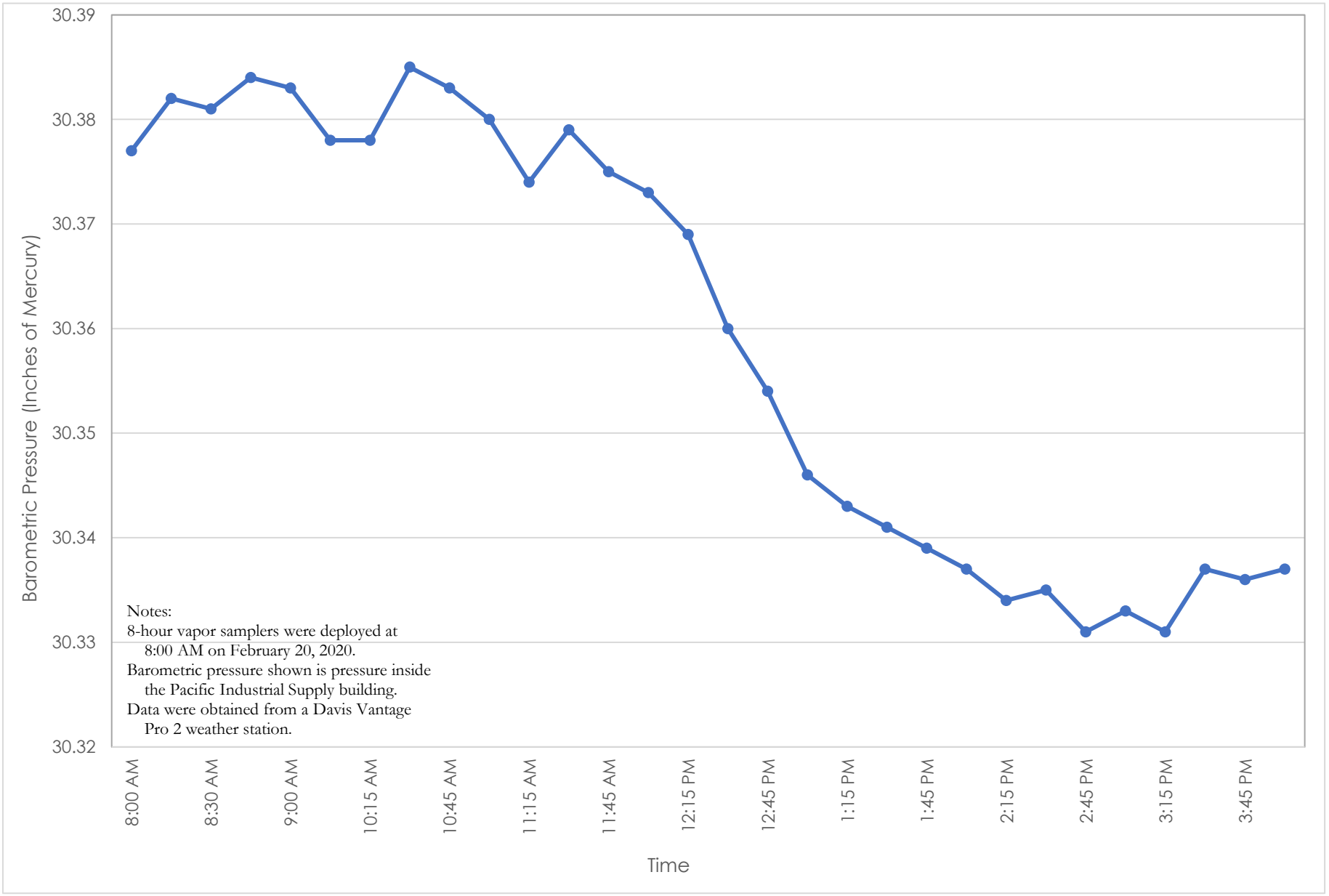
Barometric Pressure during 8-Hour Vapor Sampling
February 11, 2020
Precision Engineering, Inc.
Seattle, Washington



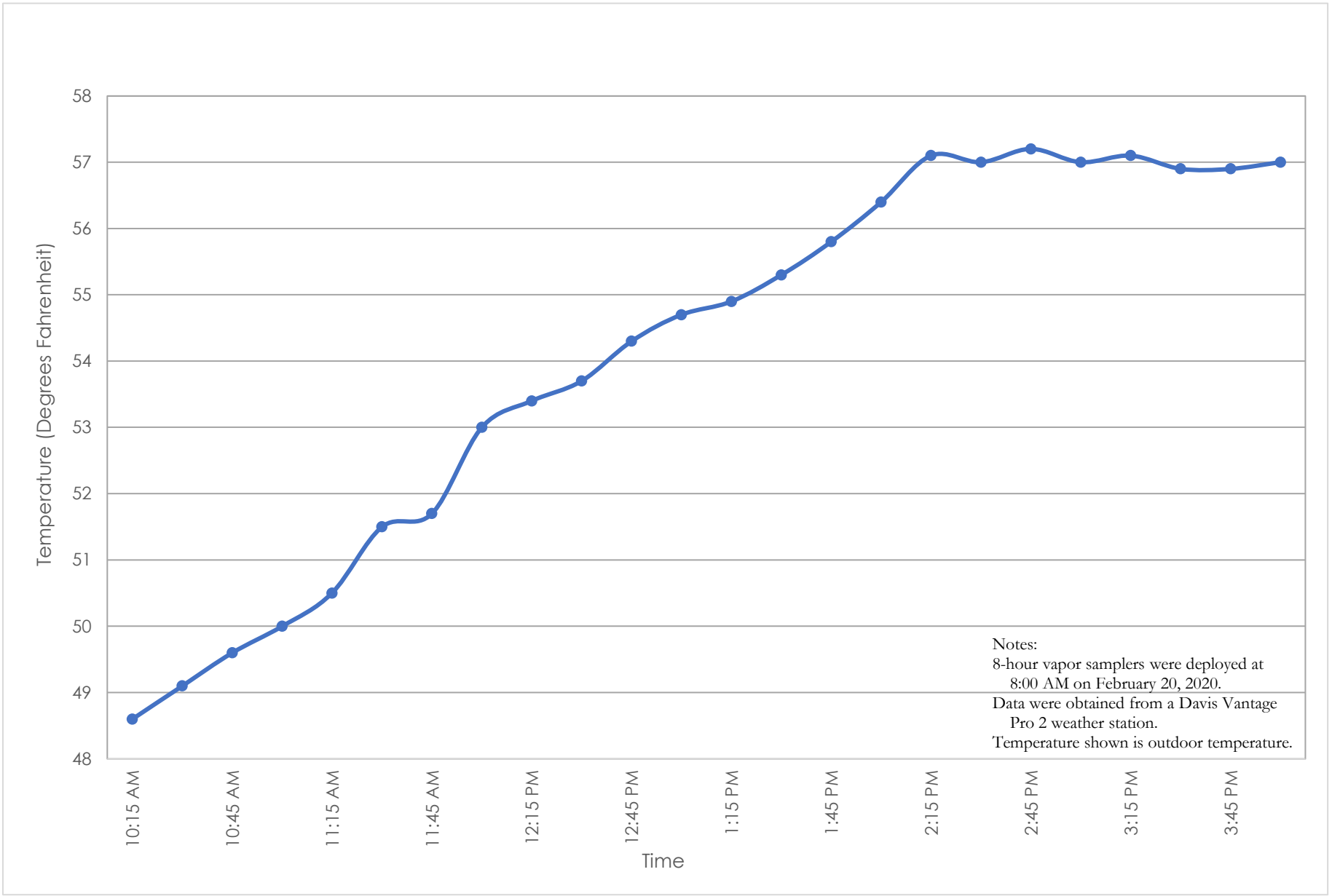
Temperature during 8-Hour Vapor Sampling
February 11, 2020
Precision Engineering, Inc.
Seattle, Washington



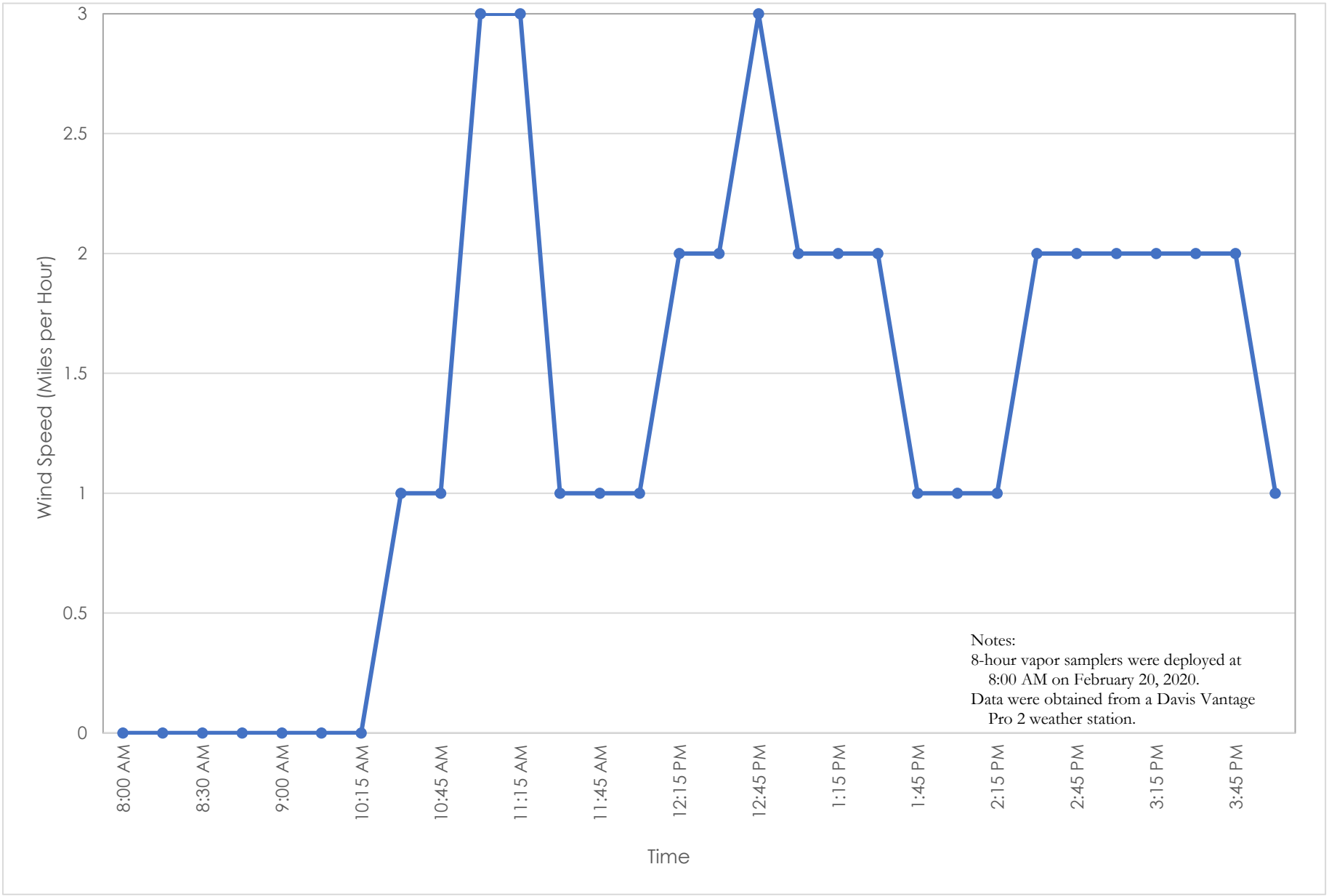
Barometric Pressure during 8-Hour Vapor Sampling
February 20, 2020
Precision Engineering, Inc.
Seattle, Washington



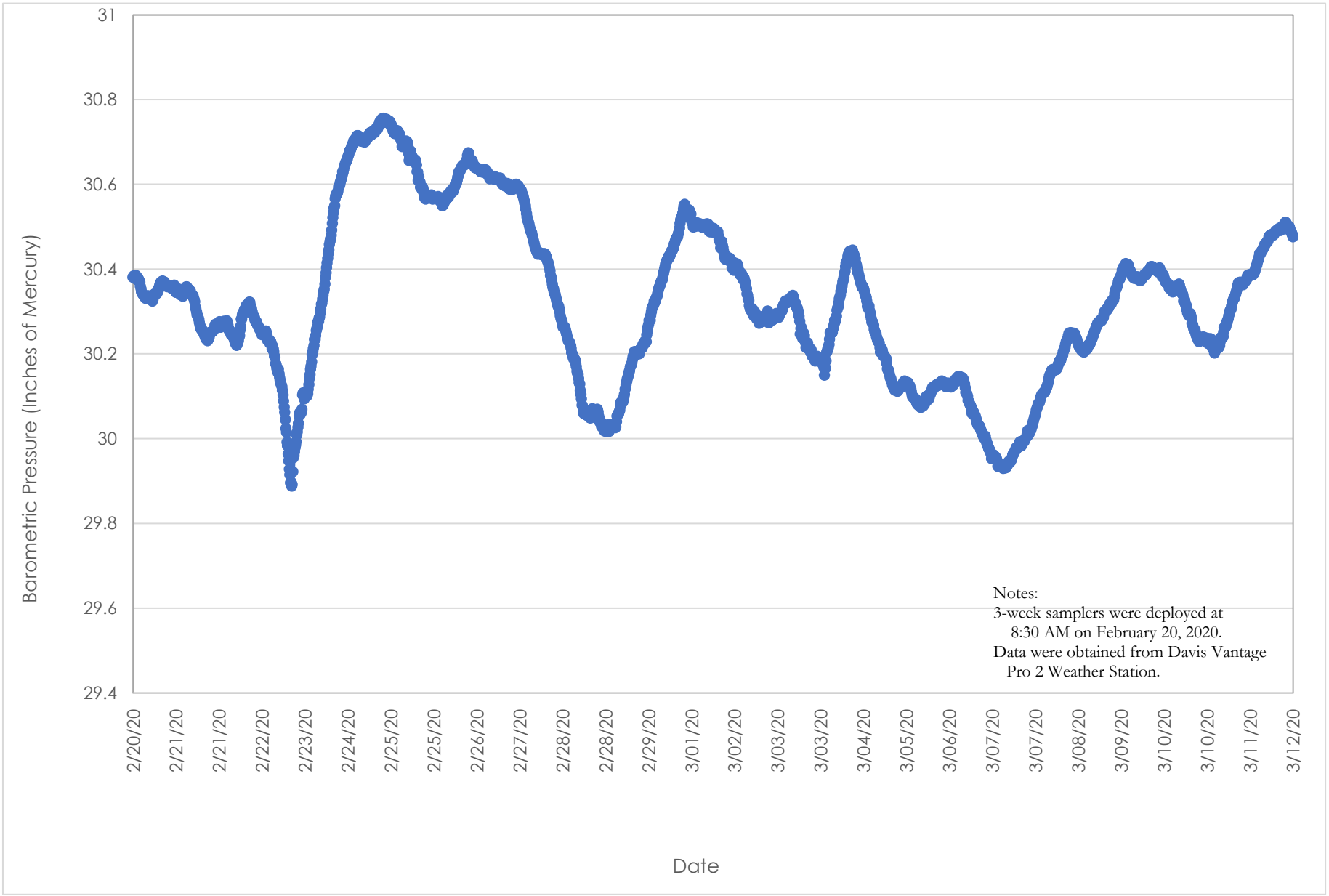
Temperature during 8-Hour Vapor Sampling
February 20, 2020
Precision Engineering, Inc.
Seattle, Washington



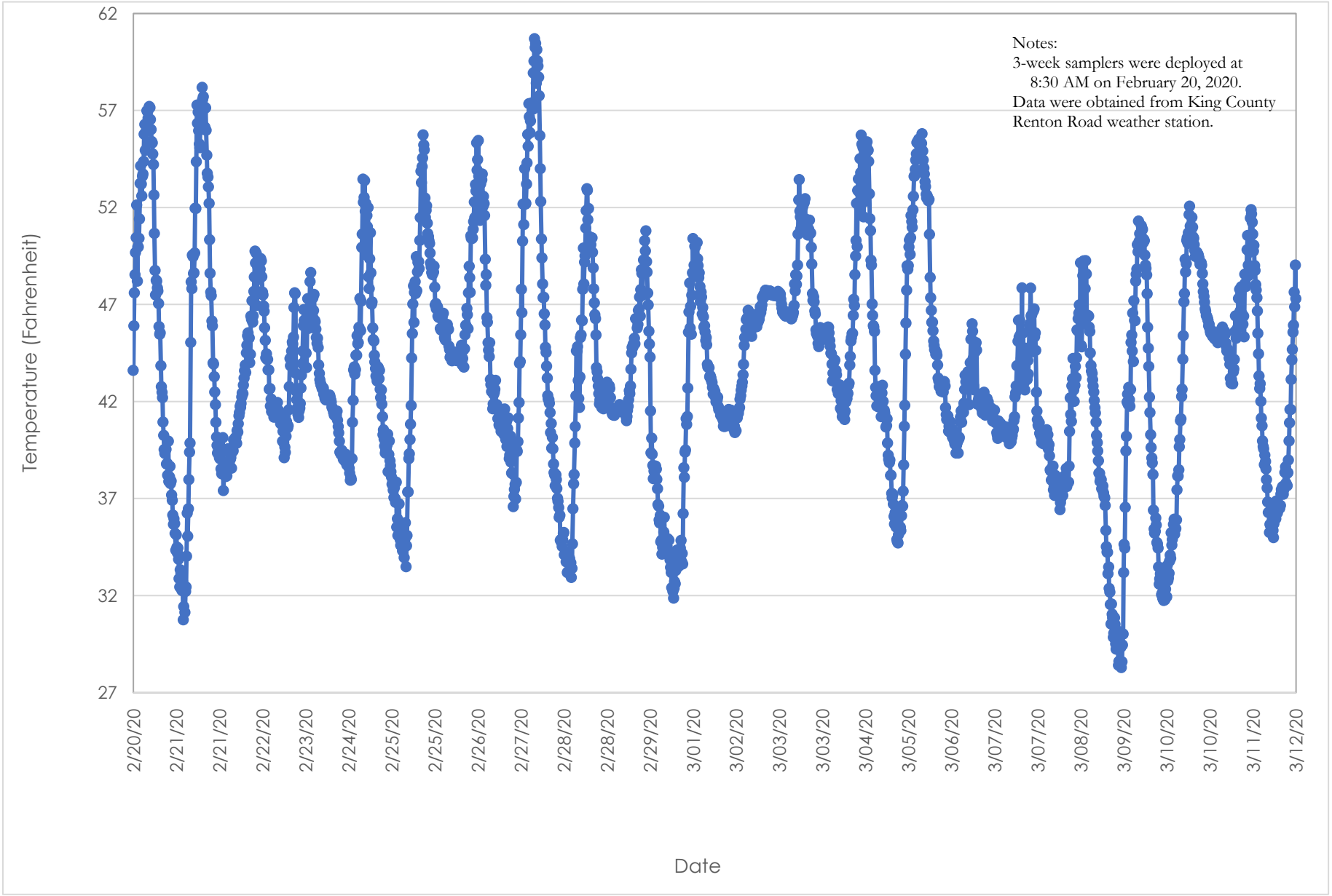
Wind Speed during 8-Hour Vapor Sampling
February 20, 2020
Precision Engineering, Inc.
Seattle, Washington



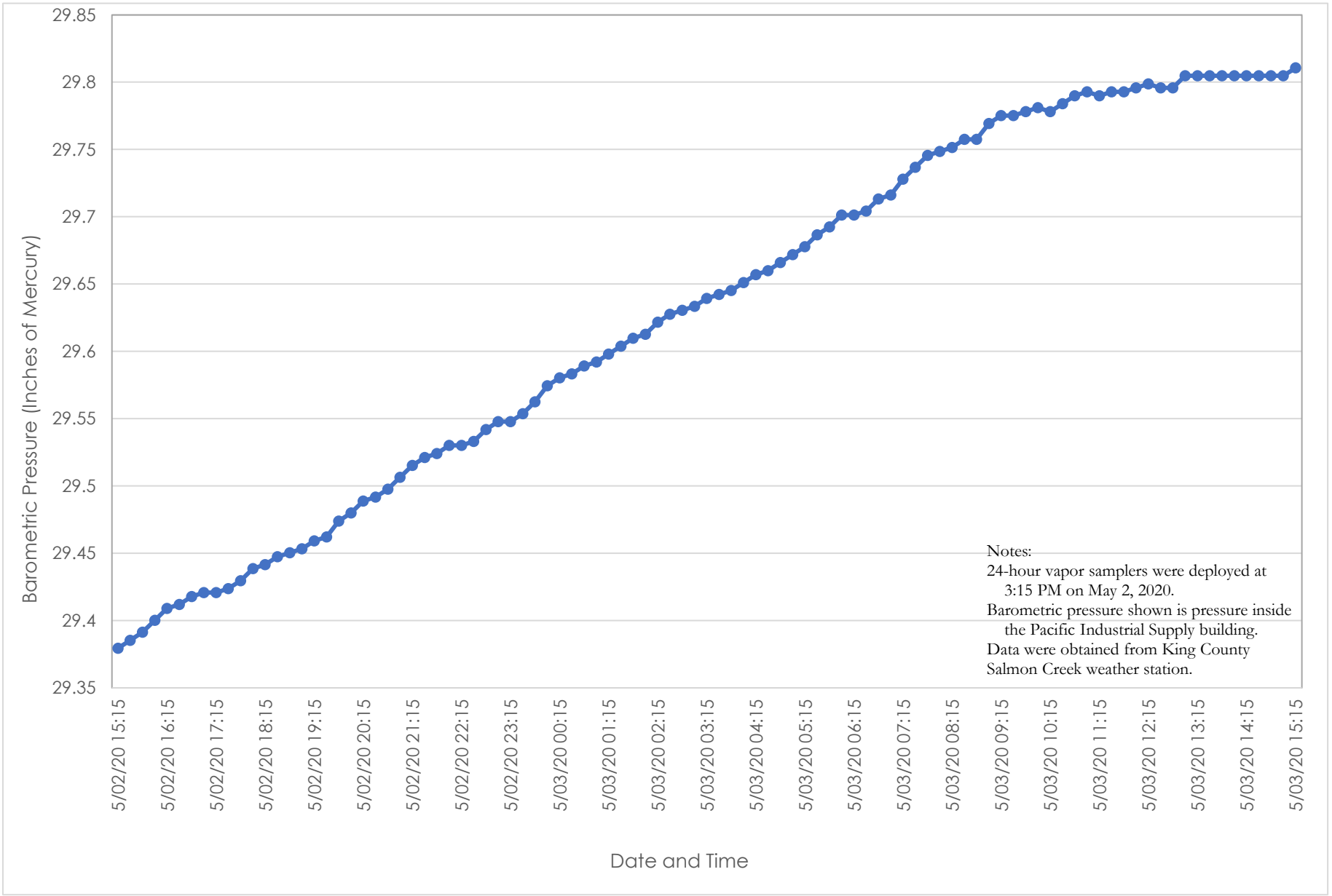
Barometric Pressure during 3-Week Vapor Sampling
February 20, 2020 to March 12, 2020
Precision Engineering, Inc.
Seattle, Washington



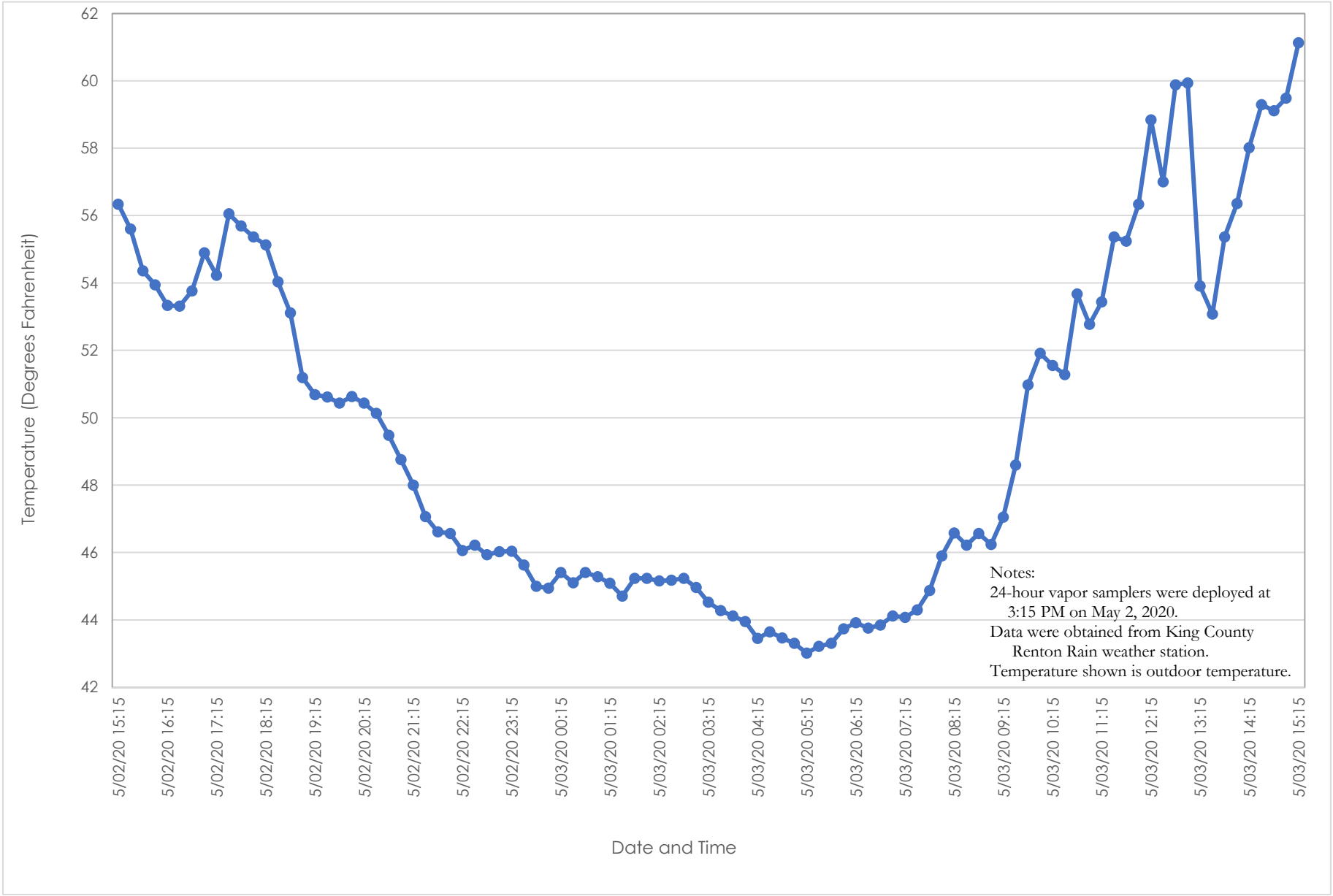
Temperature during 3-Week Vapor Sampling
February 20, 2020 to March 12, 2020
Precision Engineering, Inc.
Seattle, Washington



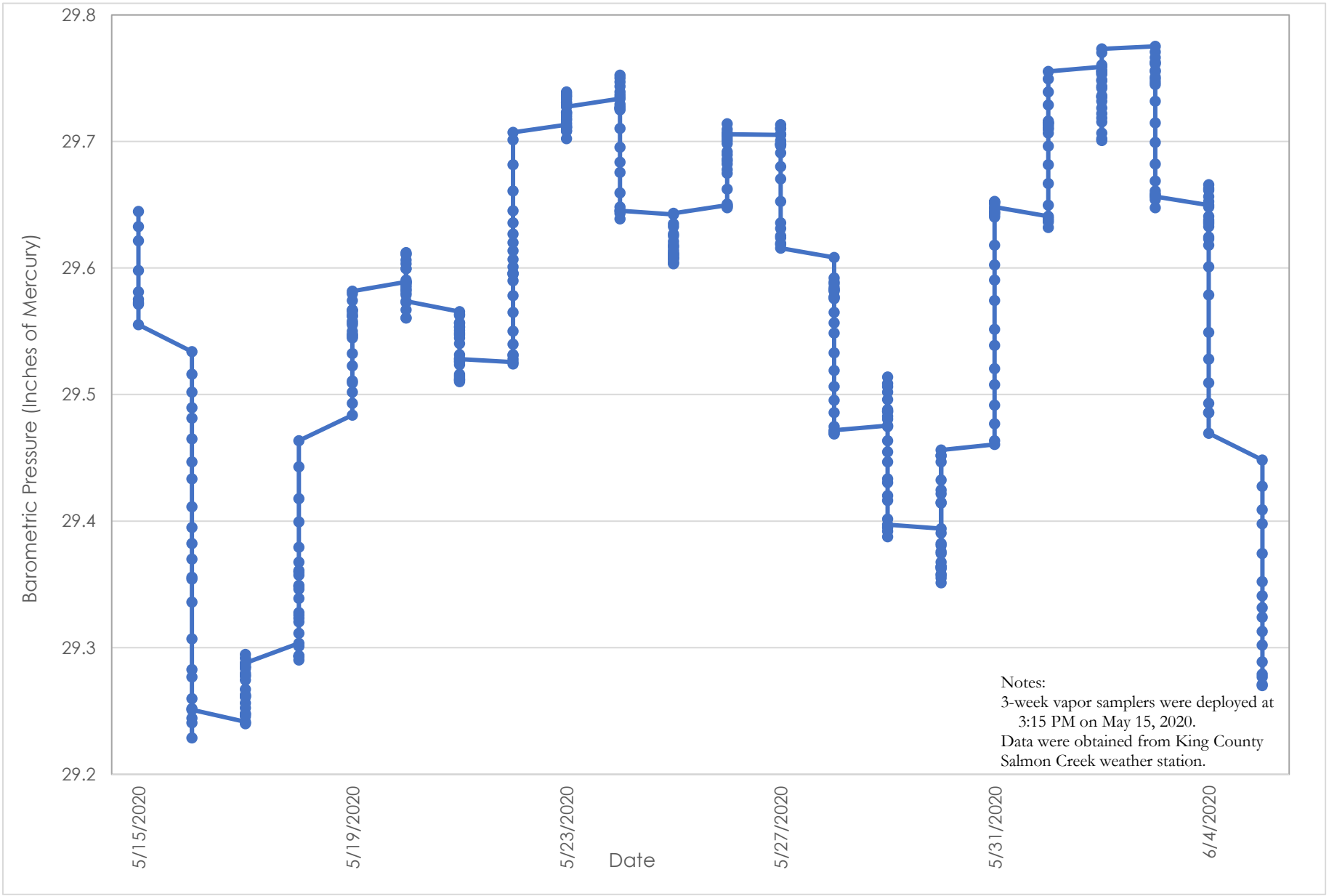
Barometric Pressure during 24-Hour Vapor Sampling
May 2, 2020 to May 3, 2020
Precision Engineering, Inc.
Seattle, Washington



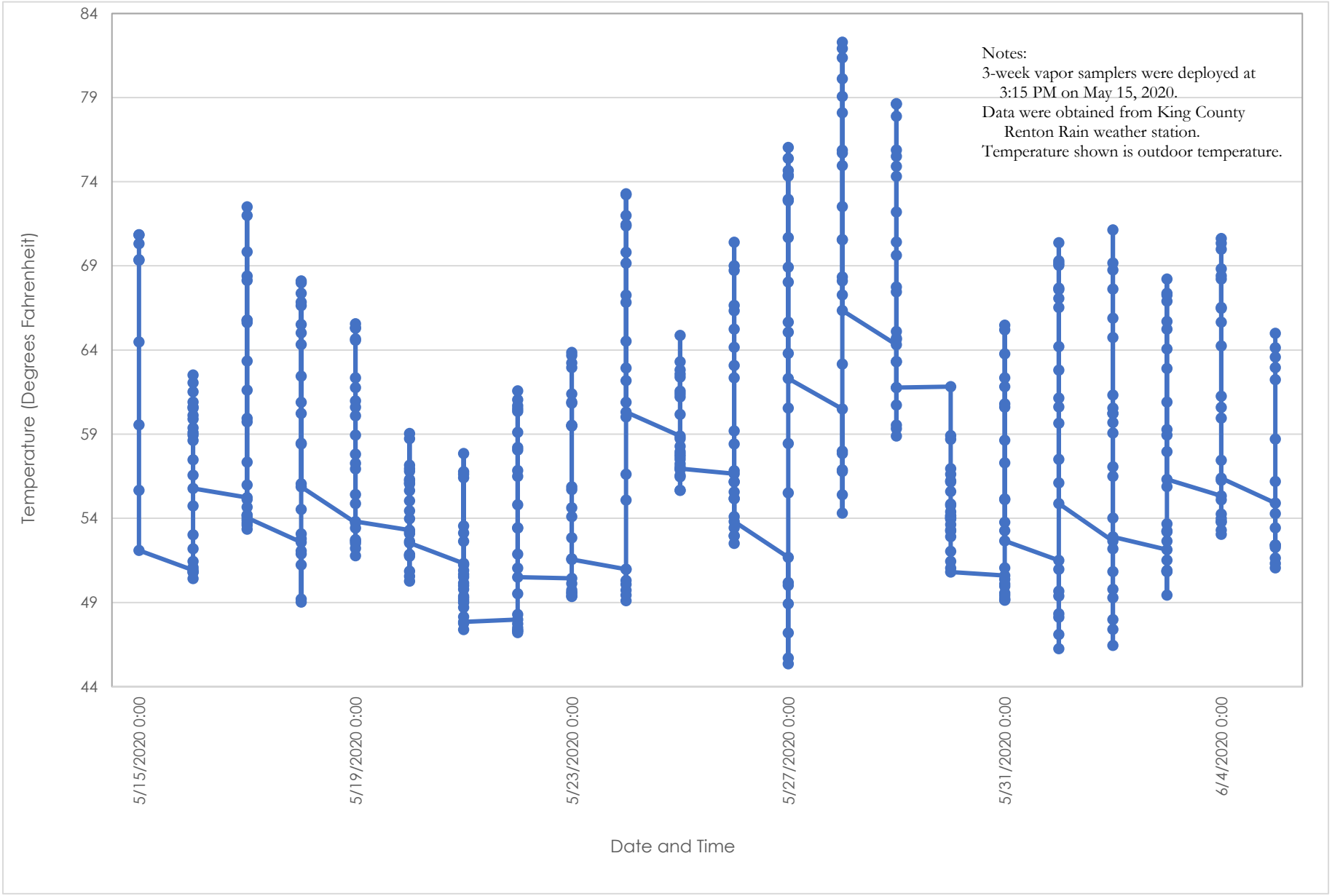
Temperature during 24-Hour Vapor Sampling
May 2, 2020 to May 3, 2020
Precision Engineering, Inc.
Seattle, Washington



Barometric Pressure during 3-Week Vapor Sampling
May 15, 2020 to June 5, 2020
Precision Engineering, Inc.
Seattle, Washington



Temperature during 3-Week Vapor Sampling
May 15, 2020 to June 5, 2020
Precision Engineering, Inc.
Seattle, Washington



APPENDIX D
LABORATORY REPORTS

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

James E. Bruya, Ph.D.
Yelena Aravkina, M.S.
Michael Erdahl, B.S.
Arina Podnozova, B.S.
Eric Young, B.S.

3012 16th Avenue West
Seattle, WA 98119-2029
(206) 285-8282
fbi@isomedia.com
www.friedmanandbruya.com

February 6, 2020

Heather Good, Project Manager
Maul Foster Alongi
2815 2nd Ave, Suite 540
Seattle, WA 98121

Dear Ms Good:

Included is the amended report from the testing of material submitted on February 2, 2020 from the Precision Engineering 1803.01.02, F&BI 002001 project. Per your request, sample IDs were amended.

We appreciate this opportunity to be of service to you and hope you will call if you should have any questions.

Sincerely,

FRIEDMAN & BRUYA, INC.

Michael Erdahl
Project Manager

Enclosures
MFA0206R.DOC

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

James E. Bruya, Ph.D.
Yelena Aravkina, M.S.
Michael Erdahl, B.S.
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3012 16th Avenue West
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fbi@isomedia.com
www.friedmanandbruya.com

February 6, 2020

Heather Good, Project Manager
Maul Foster Alongi
2815 2nd Ave, Suite 540
Seattle, WA 98121

Dear Ms Good:

Included are the results from the testing of material submitted on February 2, 2020 from the Precision Engineering 1803.01.02, F&BI 002001 project. There are 23 pages included in this report.

We appreciate this opportunity to be of service to you and hope you will call if you should have any questions.

Sincerely,

FRIEDMAN & BRUYA, INC.

Michael Erdahl
Project Manager

Enclosures
MFA0206R.DOC

CASE NARRATIVE

This case narrative encompasses samples received on February 2, 2020 by Friedman & Bruya, Inc. from the Maul Foster Alongi Precision Engineering 1803.01.02, F&BI 002001 project. Samples were logged in under the laboratory ID's listed below.

Laboratory ID	Maul Foster Alongi
002001 -01	A10
002001 -02	A9
002001 -03	A8
002001 -04	A11
002001 -05	IA8-020120
002001 -06	IA10
002001 -07	IA9
002001 -08	IA11
002001 -09	IA12
002001 -10	IA13
002001 -11	IA14
002001 -12	IA15
002001 -13	AA1
002001 -14	AA2
002001 -15	AA3
002001 -16	AA4
002001 -17	AA5

The trichloroethene concentration in samples IA8-020120, IA10, IA9, IA11, IA12, IA13, and IA15 exceeded the calibration range of the instrument. The data were flagged accordingly. The overrange samples will be diluted and reanalyzed and the results issued in a separate report.

All other quality control requirements were acceptable.

Analysis For Volatile Compounds By Method TO-15

Client Sample ID:	A10	Client:	Maul Foster Alongi
Date Received:	02/02/20	Project:	Precision Engineering 1803.01.02
Date Collected:	02/01/20	Lab ID:	002001-01 1/44
Date Analyzed:	02/04/20	Data File:	020337.D
Matrix:	Air	Instrument:	GCMS7
Units:	ug/m3	Operator:	bat

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
4-Bromofluorobenzene	89	70	130

Compounds:	Concentration ug/m3	ppbv
Vinyl chloride	<11	<4.4
Chloroethane	<120	<44
1,1-Dichloroethene	<17	<4.4
trans-1,2-Dichloroethene	<17	<4.4
1,1-Dichloroethane	<18	<4.4
cis-1,2-Dichloroethene	40	10
1,2-Dichloroethane (EDC)	<1.8	<0.44
Trichloroethene	29	5.3

Analysis For Volatile Compounds By Method TO-15

Client Sample ID:	A9	Client:	Maul Foster Alongi
Date Received:	02/02/20	Project:	Precision Engineering 1803.01.02
Date Collected:	02/01/20	Lab ID:	002001-02 1/16
Date Analyzed:	02/04/20	Data File:	020336.D
Matrix:	Air	Instrument:	GCMS7
Units:	ug/m3	Operator:	bat

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
4-Bromofluorobenzene	102	70	130

Compounds:	Concentration ug/m3	ppbv
Vinyl chloride	<4.1	<1.6
Chloroethane	<42	<16
1,1-Dichloroethene	<6.3	<1.6
trans-1,2-Dichloroethene	<6.3	<1.6
1,1-Dichloroethane	<6.5	<1.6
cis-1,2-Dichloroethene	21	5.3
1,2-Dichloroethane (EDC)	<0.65	<0.16
Trichloroethene	1,100	210

Analysis For Volatile Compounds By Method TO-15

Client Sample ID:	A8	Client:	Maul Foster Alongi
Date Received:	02/02/20	Project:	Precision Engineering 1803.01.02
Date Collected:	02/01/20	Lab ID:	002001-03 1/8.2
Date Analyzed:	02/04/20	Data File:	020335.D
Matrix:	Air	Instrument:	GCMS7
Units:	ug/m3	Operator:	bat

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
4-Bromofluorobenzene	107	70	130

Compounds:	Concentration ug/m3	ppbv
Vinyl chloride	<2.1	<0.82
Chloroethane	<22	<8.2
1,1-Dichloroethene	<3.3	<0.82
trans-1,2-Dichloroethene	<3.3	<0.82
1,1-Dichloroethane	<3.3	<0.82
cis-1,2-Dichloroethene	<3.3	<0.82
1,2-Dichloroethane (EDC)	<0.33	<0.082
Trichloroethene	160	29

Analysis For Volatile Compounds By Method TO-15

Client Sample ID:	A11	Client:	Maul Foster Alongi
Date Received:	02/02/20	Project:	Precision Engineering 1803.01.02
Date Collected:	02/01/20	Lab ID:	002001-04 1/8.2
Date Analyzed:	02/04/20	Data File:	020333.D
Matrix:	Air	Instrument:	GCMS7
Units:	ug/m3	Operator:	bat

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
4-Bromofluorobenzene	90	70	130

Compounds:	Concentration ug/m3	ppbv
Vinyl chloride	<2.1	<0.82
Chloroethane	<22	<8.2
1,1-Dichloroethene	<3.3	<0.82
trans-1,2-Dichloroethene	<3.3	<0.82
1,1-Dichloroethane	14	3.4
cis-1,2-Dichloroethene	<3.3	<0.82
1,2-Dichloroethane (EDC)	<0.33	<0.082
Trichloroethene	82	15

Analysis For Volatile Compounds By Method TO-15

Client Sample ID:	IA8-020120	Client:	Maul Foster Alongi
Date Received:	02/02/20	Project:	Precision Engineering 1803.01.02
Date Collected:	02/01/20	Lab ID:	002001-05
Date Analyzed:	02/03/20	Data File:	020320.D
Matrix:	Air	Instrument:	GCMS7
Units:	ug/m3	Operator:	bat

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
4-Bromofluorobenzene	94	70	130

Compounds:	Concentration ug/m3	ppbv
Vinyl chloride	<0.26	<0.1
Chloroethane	<2.6	<1
1,1-Dichloroethene	<0.4	<0.1
trans-1,2-Dichloroethene	<0.4	<0.1
1,1-Dichloroethane	<0.4	<0.1
cis-1,2-Dichloroethene	<0.4	<0.1
1,2-Dichloroethane (EDC)	0.093	0.023
Trichloroethene	210 ve	40 ve

Analysis For Volatile Compounds By Method TO-15

Client Sample ID:	IA10	Client:	Maul Foster Alongi
Date Received:	02/02/20	Project:	Precision Engineering 1803.01.02
Date Collected:	02/01/20	Lab ID:	002001-06
Date Analyzed:	02/04/20	Data File:	020321.D
Matrix:	Air	Instrument:	GCMS7
Units:	ug/m3	Operator:	bat

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
4-Bromofluorobenzene	89	70	130

Compounds:	Concentration ug/m3	ppbv
Vinyl chloride	<0.26	<0.1
Chloroethane	<2.6	<1
1,1-Dichloroethene	<0.4	<0.1
trans-1,2-Dichloroethene	<0.4	<0.1
1,1-Dichloroethane	<0.4	<0.1
cis-1,2-Dichloroethene	<0.4	<0.1
1,2-Dichloroethane (EDC)	0.089	0.022
Trichloroethene	260 ve	49 ve

Analysis For Volatile Compounds By Method TO-15

Client Sample ID:	IA9	Client:	Maul Foster Alongi
Date Received:	02/02/20	Project:	Precision Engineering 1803.01.02
Date Collected:	02/01/20	Lab ID:	002001-07
Date Analyzed:	02/04/20	Data File:	020322.D
Matrix:	Air	Instrument:	GCMS7
Units:	ug/m3	Operator:	bat

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
4-Bromofluorobenzene	78	70	130

Compounds:	Concentration ug/m3	ppbv
Vinyl chloride	<0.26	<0.1
Chloroethane	<2.6	<1
1,1-Dichloroethene	<0.4	<0.1
trans-1,2-Dichloroethene	<0.4	<0.1
1,1-Dichloroethane	<0.4	<0.1
cis-1,2-Dichloroethene	<0.4	<0.1
1,2-Dichloroethane (EDC)	0.085	0.021
Trichloroethene	250 ve	47 ve

Analysis For Volatile Compounds By Method TO-15

Client Sample ID:	IA11	Client:	Maul Foster Alongi
Date Received:	02/02/20	Project:	Precision Engineering 1803.01.02
Date Collected:	02/01/20	Lab ID:	002001-08
Date Analyzed:	02/04/20	Data File:	020323.D
Matrix:	Air	Instrument:	GCMS7
Units:	ug/m3	Operator:	bat

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
4-Bromofluorobenzene	95	70	130

Compounds:	Concentration ug/m3	ppbv
Vinyl chloride	<0.26	<0.1
Chloroethane	<2.6	<1
1,1-Dichloroethene	<0.4	<0.1
trans-1,2-Dichloroethene	<0.4	<0.1
1,1-Dichloroethane	<0.4	<0.1
cis-1,2-Dichloroethene	<0.4	<0.1
1,2-Dichloroethane (EDC)	0.097	0.024
Trichloroethene	140 ve	26 ve

Analysis For Volatile Compounds By Method TO-15

Client Sample ID:	IA12	Client:	Maul Foster Alongi
Date Received:	02/02/20	Project:	Precision Engineering 1803.01.02
Date Collected:	02/01/20	Lab ID:	002001-09
Date Analyzed:	02/04/20	Data File:	020324.D
Matrix:	Air	Instrument:	GCMS7
Units:	ug/m3	Operator:	bat

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
4-Bromofluorobenzene	99	70	130

Compounds:	Concentration ug/m3	ppbv
Vinyl chloride	<0.26	<0.1
Chloroethane	<2.6	<1
1,1-Dichloroethene	<0.4	<0.1
trans-1,2-Dichloroethene	<0.4	<0.1
1,1-Dichloroethane	<0.4	<0.1
cis-1,2-Dichloroethene	<0.4	<0.1
1,2-Dichloroethane (EDC)	0.093	0.023
Trichloroethene	160 ve	30 ve

Analysis For Volatile Compounds By Method TO-15

Client Sample ID:	IA13	Client:	Maul Foster Alongi
Date Received:	02/02/20	Project:	Precision Engineering 1803.01.02
Date Collected:	02/01/20	Lab ID:	002001-10
Date Analyzed:	02/04/20	Data File:	020325.D
Matrix:	Air	Instrument:	GCMS7
Units:	ug/m3	Operator:	bat

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
4-Bromofluorobenzene	88	70	130

Compounds:	Concentration ug/m3	ppbv
Vinyl chloride	<0.26	<0.1
Chloroethane	<2.6	<1
1,1-Dichloroethene	<0.4	<0.1
trans-1,2-Dichloroethene	<0.4	<0.1
1,1-Dichloroethane	<0.4	<0.1
cis-1,2-Dichloroethene	<0.4	<0.1
1,2-Dichloroethane (EDC)	0.089	0.022
Trichloroethene	180 ve	34 ve

Analysis For Volatile Compounds By Method TO-15

Client Sample ID:	IA14	Client:	Maul Foster Alongi
Date Received:	02/02/20	Project:	Precision Engineering 1803.01.02
Date Collected:	02/01/20	Lab ID:	002001-11
Date Analyzed:	02/04/20	Data File:	020326.D
Matrix:	Air	Instrument:	GCMS7
Units:	ug/m3	Operator:	bat

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
4-Bromofluorobenzene	91	70	130

Compounds:	Concentration ug/m3	ppbv
Vinyl chloride	<0.26	<0.1
Chloroethane	<2.6	<1
1,1-Dichloroethene	<0.4	<0.1
trans-1,2-Dichloroethene	<0.4	<0.1
1,1-Dichloroethane	<0.4	<0.1
cis-1,2-Dichloroethene	<0.4	<0.1
1,2-Dichloroethane (EDC)	0.085	0.021
Trichloroethene	110	21

Analysis For Volatile Compounds By Method TO-15

Client Sample ID:	IA15	Client:	Maul Foster Alongi
Date Received:	02/02/20	Project:	Precision Engineering 1803.01.02
Date Collected:	02/01/20	Lab ID:	002001-12
Date Analyzed:	02/04/20	Data File:	020327.D
Matrix:	Air	Instrument:	GCMS7
Units:	ug/m3	Operator:	bat

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
4-Bromofluorobenzene	102	70	130

Compounds:	Concentration ug/m3	ppbv
Vinyl chloride	<0.26	<0.1
Chloroethane	<2.6	<1
1,1-Dichloroethene	<0.4	<0.1
trans-1,2-Dichloroethene	<0.4	<0.1
1,1-Dichloroethane	<0.4	<0.1
cis-1,2-Dichloroethene	<0.4	<0.1
1,2-Dichloroethane (EDC)	0.093	0.023
Trichloroethene	150 ve	28 ve

Analysis For Volatile Compounds By Method TO-15

Client Sample ID:	AA1	Client:	Maul Foster Alongi
Date Received:	02/02/20	Project:	Precision Engineering 1803.01.02
Date Collected:	02/01/20	Lab ID:	002001-13
Date Analyzed:	02/04/20	Data File:	020328.D
Matrix:	Air	Instrument:	GCMS7
Units:	ug/m3	Operator:	bat

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
4-Bromofluorobenzene	105	70	130

Compounds:	Concentration ug/m3	ppbv
Vinyl chloride	<0.26	<0.1
Chloroethane	<2.6	<1
1,1-Dichloroethene	<0.4	<0.1
trans-1,2-Dichloroethene	<0.4	<0.1
1,1-Dichloroethane	<0.4	<0.1
cis-1,2-Dichloroethene	<0.4	<0.1
1,2-Dichloroethane (EDC)	0.065	0.016
Trichloroethene	<0.16	<0.03

Analysis For Volatile Compounds By Method TO-15

Client Sample ID:	AA2	Client:	Maul Foster Alongi
Date Received:	02/02/20	Project:	Precision Engineering 1803.01.02
Date Collected:	02/01/20	Lab ID:	002001-14
Date Analyzed:	02/04/20	Data File:	020329.D
Matrix:	Air	Instrument:	GCMS7
Units:	ug/m3	Operator:	bat

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
4-Bromofluorobenzene	99	70	130

Compounds:	Concentration ug/m3	ppbv
Vinyl chloride	<0.26	<0.1
Chloroethane	<2.6	<1
1,1-Dichloroethene	<0.4	<0.1
trans-1,2-Dichloroethene	<0.4	<0.1
1,1-Dichloroethane	<0.4	<0.1
cis-1,2-Dichloroethene	<0.4	<0.1
1,2-Dichloroethane (EDC)	0.065	0.016
Trichloroethene	<0.16	<0.03

Analysis For Volatile Compounds By Method TO-15

Client Sample ID:	AA3	Client:	Maul Foster Alongi
Date Received:	02/02/20	Project:	Precision Engineering 1803.01.02
Date Collected:	02/01/20	Lab ID:	002001-15 1/1.6
Date Analyzed:	02/04/20	Data File:	020330.D
Matrix:	Air	Instrument:	GCMS7
Units:	ug/m3	Operator:	bat

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
4-Bromofluorobenzene	109	70	130

Compounds:	Concentration ug/m3	ppbv
Vinyl chloride	<0.41	<0.16
Chloroethane	<4.2	<1.6
1,1-Dichloroethene	<0.63	<0.16
trans-1,2-Dichloroethene	<0.63	<0.16
1,1-Dichloroethane	<0.65	<0.16
cis-1,2-Dichloroethene	<0.63	<0.16
1,2-Dichloroethane (EDC)	0.065	0.016
Trichloroethene	<0.27	<0.05

Analysis For Volatile Compounds By Method TO-15

Client Sample ID:	AA4	Client:	Maul Foster Alongi
Date Received:	02/02/20	Project:	Precision Engineering 1803.01.02
Date Collected:	02/01/20	Lab ID:	002001-16
Date Analyzed:	02/04/20	Data File:	020331.D
Matrix:	Air	Instrument:	GCMS7
Units:	ug/m3	Operator:	bat

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
4-Bromofluorobenzene	93	70	130

Compounds:	Concentration ug/m3	ppbv
Vinyl chloride	<0.26	<0.1
Chloroethane	<2.6	<1
1,1-Dichloroethene	<0.4	<0.1
trans-1,2-Dichloroethene	<0.4	<0.1
1,1-Dichloroethane	<0.4	<0.1
cis-1,2-Dichloroethene	<0.4	<0.1
1,2-Dichloroethane (EDC)	0.065	0.016
Trichloroethene	<0.16	<0.03

Analysis For Volatile Compounds By Method TO-15

Client Sample ID:	AA5	Client:	Maul Foster Alongi
Date Received:	02/02/20	Project:	Precision Engineering 1803.01.02
Date Collected:	02/01/20	Lab ID:	002001-17
Date Analyzed:	02/04/20	Data File:	020332.D
Matrix:	Air	Instrument:	GCMS7
Units:	ug/m3	Operator:	bat

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
4-Bromofluorobenzene	100	70	130

Compounds:	Concentration ug/m3	ppbv
Vinyl chloride	<0.26	<0.1
Chloroethane	<2.6	<1
1,1-Dichloroethene	<0.4	<0.1
trans-1,2-Dichloroethene	<0.4	<0.1
1,1-Dichloroethane	<0.4	<0.1
cis-1,2-Dichloroethene	<0.4	<0.1
1,2-Dichloroethane (EDC)	0.065	0.016
Trichloroethene	<0.16	<0.03

Analysis For Volatile Compounds By Method TO-15

Client Sample ID:	Method Blank	Client:	Maul Foster Alongi
Date Received:	Not Applicable	Project:	Precision Engineering 1803.01.02
Date Collected:	Not Applicable	Lab ID:	00-0297 mb
Date Analyzed:	02/03/20	Data File:	020319.D
Matrix:	Air	Instrument:	GCMS7
Units:	ug/m3	Operator:	bat

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
4-Bromofluorobenzene	102	70	130

Compounds:	Concentration ug/m3	ppbv
Vinyl chloride	<0.26	<0.1
Chloroethane	<2.6	<1
1,1-Dichloroethene	<0.4	<0.1
trans-1,2-Dichloroethene	<0.4	<0.1
1,1-Dichloroethane	<0.4	<0.1
cis-1,2-Dichloroethene	<0.4	<0.1
1,2-Dichloroethane (EDC)	<0.04	<0.01
Trichloroethene	<0.16	<0.03

Date of Report: 02/06/20
Date Received: 02/02/20
Project: Precision Engineering 1803.01.02, F&BI 002001
Date Extracted: 02/05/20
Date Analyzed: 02/05/20

RESULTS FROM THE ANALYSIS OF AIR SAMPLES FOR HELIUM USING METHOD ASTM D1946

Results Reported as % Helium

Sample ID Laboratory ID	Helium
A10 002001-01	<0.6
A9 002001-02	<0.6
A8 002001-03	<0.6
A11 002001-04	<0.6
Method Blank	<0.6

Date of Report: 02/06/20
Date Received: 02/02/20
Project: Precision Engineering 1803.01.02, F&BI 002001

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF AIR SAMPLES FOR VOLATILES BY METHOD TO-15

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Vinyl chloride	ppbv	5	80	70-130
Chloroethane	ppbv	5	83	70-130
1,1-Dichloroethene	ppbv	5	85	70-130
trans-1,2-Dichloroethene	ppbv	5	82	70-130
1,1-Dichloroethane	ppbv	5	78	70-130
cis-1,2-Dichloroethene	ppbv	5	83	70-130
1,2-Dichloroethane (EDC)	ppbv	5	80	70-130
Trichloroethene	ppbv	5	81	70-130

Date of Report: 02/06/20
Date Received: 02/02/20
Project: Precision Engineering 1803.01.02, F&BI 002001

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF AIR SAMPLES FOR HELIUM USING METHOD ASTM D1946

Laboratory Code: 002001-04 (Duplicate)

Analyte	Sample Result (%)	Duplicate Result (%)	Relative Percent Difference	Acceptance Criteria
Helium	<0.6	<0.6	nm	0-20

Data Qualifiers & Definitions

a - The analyte was detected at a level less than five times the reporting limit. The RPD results may not provide reliable information on the variability of the analysis.

b - The analyte was spiked at a level that was less than five times that present in the sample. Matrix spike recoveries may not be meaningful.

ca - The calibration results for the analyte were outside of acceptance criteria. The value reported is an estimate.

c - The presence of the analyte may be due to carryover from previous sample injections.

cf - The sample was centrifuged prior to analysis.

d - The sample was diluted. Detection limits were raised and surrogate recoveries may not be meaningful.

dv - Insufficient sample volume was available to achieve normal reporting limits.

f - The sample was laboratory filtered prior to analysis.

fb - The analyte was detected in the method blank.

fc - The analyte is a common laboratory and field contaminant.

hr - The sample and duplicate were reextracted and reanalyzed. RPD results were still outside of control limits. Variability is attributed to sample inhomogeneity.

hs - Headspace was present in the container used for analysis.

ht – The analysis was performed outside the method or client-specified holding time requirement.

ip - Recovery fell outside of control limits due to sample matrix effects.

j - The analyte concentration is reported below the lowest calibration standard. The value reported is an estimate.

J - The internal standard associated with the analyte is out of control limits. The reported concentration is an estimate.

jl - The laboratory control sample(s) percent recovery and/or RPD were out of control limits. The reported concentration should be considered an estimate.

js - The surrogate associated with the analyte is out of control limits. The reported concentration should be considered an estimate.

lc - The presence of the analyte is likely due to laboratory contamination.

L - The reported concentration was generated from a library search.

nm - The analyte was not detected in one or more of the duplicate analyses. Therefore, calculation of the RPD is not applicable.

pc - The sample was received with incorrect preservation or in a container not approved by the method. The value reported should be considered an estimate.

ve - The analyte response exceeded the valid instrument calibration range. The value reported is an estimate.

vo - The value reported fell outside the control limits established for this analyte.

x - The sample chromatographic pattern does not resemble the fuel standard used for quantitation.

SAMPLE CHAIN OF CUSTODY

002001

ME 02-02-20

Page # 1 of 3

Report To Heather Good

Company Maul Foster & Alongi

Address 1329 N. State Street, Suite 301

City, State, ZIP Bellingham, WA 98225

Phone (360) 594-6268 Email hgood@maulfoster.com

SAMPLERS (*signature*)

PROJECT NAME: Precision Engineering

PO #: 1803.01.02

REPORTING LEVEL
- Indoor Air
- Deep Soil Gas
- Sub Slab/Soil Gas
- SVE/Grab

INVOICE TO: accounting@maulfoster.com

TURNAROUND TIME
- Standard
- RUSH 3 DAY

Rush charges authorized by:

SAMPLE DISPOSAL
- Dispose after 30 days
- Archive Samples
- Other

ANALYSIS REQUESTED

Sample Name	Lab ID	Canister ID	Flow Contr. ID	Date Sampled	Field Initial Press. (Hg)	Field Initial Time	Field Final Press. (Hg)	Field Final Time	TO-15 Modified SIM Full Scan*	TCE by Mod. TO-17	TO-15 cVOCs	He by ASTM D-1946	Notes
A10	01	2299	12	2/1/20	-30	1128	-5	1135	X	X		X	Subslab
A9	02	2304	18	2/1/20	-30	1208	-5	1214	X	X		X	Subslab
A8	03	3230	111	2/1/20	-30	1336	-5	1312	X	X		X	Subslab
~~A12~~ Per HG 2/6/20 A11	04	2434	17	2/1/20	-30	1306	-5	1312	X	X		X	Subslab
~~IA18-020120~~ Per HG 2/6/20 IA8-020120	05	23229	NA	2/1/20	-30	1546	-6	1546	X	X			Indoor air Sample ID IA8020120 BB
IA10	06	20550	NA	2/1/20	-29	1548	-8	1548	X	X	J 2/2/20		Indoor air
IA9	07	21453	NA	2/1/20	-30	1551	-8	1551	X	X			Indoor air
IA11	08	20549	NA	2/1/20	-29	1554	-0	1547	X	X	J		Indoor air no pressure observed in canister at 1547

Samples received at 17 °C

SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by:	Evelyn Lundeen	MFA	2/2/20	1742
Received by:	Eric Flores	FoB	2/2/20	1742
Relinquished by:				
Received by:				

Friedman & Bruya, Inc.
3012 16th Avenue West
Seattle, WA 98119-2029
Ph. (206) 285-8282
Fax (206) 283-5044

FORMS\COC\COCTO-15.DOC

*Note: TO-15 Modified SIM full scan to include the following:, as specified by email: TCE, 1,1-DCE, 1,2-DCA, cis-1,2-DCE, trans-1,2-DCE, 1,1-DCA, chloroethane, and vinyl chloride.

SAMPLE CHAIN OF CUSTODY

007001

ME 02-02-20

Report To Heather Good

Company Maul Foster & Alongi

Address 1329 N. State Street, Suite 301

City, State, ZIP Bellingham, WA 98225

Phone (360) 594-6268 Email hgood@maulfoster.com

SAMPLERS (*signature*)

PROJECT NAME: Precision Engineering

PO #: 1803.01.02

REPORTING LEVEL
- Indoor Air
- Deep Soil Gas
- Sub Slab/Soil Gas
- SVE/Grab

INVOICE TO: accounting@maulfoster.com

TURNAROUND TIME
- Standard
- RUSH 3 DAY

Rush charges authorized by:

SAMPLE DISPOSAL
- Dispose after 30 days
- Archive Samples
- Other

ANALYSIS REQUESTED

EUB and breakdown products

*TCE by TO15 only - per HG 2/6/20 per HG 2/2/20

Sample Name	Lab ID	Canister ID	Flow Contr. ID	Date Sampled	Field Initial Press. (Hg)	Field Initial Time	Field Final Press. (Hg)	Field Final Time	TO-15 Modified SIM Full Scan*	TCE by Mod. TO-17	TO-15 cVOCs	He by ASTM D-1946	Notes
IA12	09	18564	NA	2/1/20	-29	1556	-6	1556	X	X			Indoor air
IA13	10	20546	NA	2/1/20	-30	1557	-7	1557	X	X			Indoor air
IA14	11	18571	NA	2/1/20	-30	1559	-7	1559	X	X			Indoor air
IA15	12	20545	NA	2/1/20	-30	1605	-9	1605	X	X			Indoor air
AA1	13	18569	NA	2/1/20	-30	1630	-6	1630	X	X			Outdoor air
AA2	14	18580	NA	2/1/20	-30	1641	-5	1641	X	X			Outdoor air
AA3	15	20552	NA	2/1/20	-30	1640	-12	1648	X	X	2/4/20		Outdoor air
AA4	16	18579	NA	2/1/20	-30	1637	-7	1637	X	X			Outdoor air

Friedman & Bruya, Inc.
3012 16th Avenue West
Seattle, WA 98119-2029
Ph. (206) 285-8282
Fax (206) 283-5044

SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by:	Evelyn Lundeen	MFA	2/2/20	1742
Received by:	Eric Downer	FEB	2/2/20	1742
Relinquished by:				
Received by:				

FORMS\COC\COCTO-15.DOC

*Note: TO-15 Modified SIM full scan to include the following:, as specified by email: TCE, 1,1-DCE, 1,2-DCA, cis-1,2-DCE, trans-1,2-DCE, 1,1-DCA, chloroethane, and vinyl chloride.

002001

SAMPLE CHAIN OF CUSTODY

ME 02-02-20

Report To Heather Good

Company Maul Foster & Alongi

Address 1329 N. State Street, Suite 301

City, State, ZIP Bellingham, WA 98225

Phone (360) 594-6268 Email hgood@maulfoster.com

SAMPLERS (*signature*)		TURNAROUND TIME
PROJECT NAME Precision Engineering	PO # 1803.01.02	• Standard • RUSH 3 DAY Rush charges authorized by:
REPORTING LEVEL • Indoor Air • Deep Soil Gas • Sub Slab/Soil Gas • SVE/Grab	INVOICE TO accounting@maulfoster.com	SAMPLE DISPOSAL • Dispose after 30 days • Archive Samples • Other

ANALYSIS REQUESTED

Sample Name	Lab ID	Canister ID	Flow Contr. ID	Date Sampled	Field Initial Press. (Hg)	Field Initial Time	Field Final Press. (Hg)	Field Final Time	TO-15 Modified SIM Full Scan*	TCE by Mod. TO-15	TO-15 cVOCs	He by ASTM D-1946	Notes
AA5	17	20547	NA	2/1/20	-30	1632	-6	1632	X	X	2/2/20		Outdoor air

SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by:	Evelyn Lundeen	MFA	2/2/20	1747
Received by:	Eric Powell	FCR	2/2/20	1747
Relinquished by:				
Received by:				

Friedman & Bruya, Inc.
3012 16th Avenue West
Seattle, WA 98119-2029
Ph. (206) 285-8282
Fax (206) 283-5044

FORMS\COC\COCTO-15.DOC

*Note: TO-15 Modified SIM full scan to include the following:, as specified by email: TCE, 1,1-DCE, 1,2-DCA, cis-1,2-DCE, trans-1,2-DCE, 1,1-DCA, chloroethane, and vinyl chloride.

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

James E. Bruya, Ph.D.
Yelena Aravkina, M.S.
Michael Erdahl, B.S.
Arina Podnozova, B.S.
Eric Young, B.S.

3012 16th Avenue West
Seattle, WA 98119-2029
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fbi@isomedia.com
www.friedmanandbruya.com

February 12, 2020

Heather Good, Project Manager
Maul Foster Alongi
2815 2nd Ave, Suite 540
Seattle, WA 98121

Dear Ms Good:

Included are the additional results from the testing of material submitted on February 2, 2020 from the Precision Engineering 1803.01.02, F&BI 002001 project. There are 11 pages included in this report.

We appreciate this opportunity to be of service to you and hope you will call if you should have any questions.

Sincerely,

FRIEDMAN & BRUYA, INC.

Michael Erdahl
Project Manager

Enclosures
c: jwetmore@maulfoster.com
MFA0212R.DOC

CASE NARRATIVE

This case narrative encompasses samples received on February 2, 2020 by Friedman & Bruya, Inc. from the Maul Foster Alongi Precision Engineering 1803.01.02, F&BI 002001 project. Samples were logged in under the laboratory ID's listed below.

Laboratory ID	Maul Foster Alongi
002001 -01	A10
002001 -02	A9
002001 -03	A8
002001 -04	A11
002001 -05	IA8-020120
002001 -06	IA10
002001 -07	IA9
002001 -08	IA11
002001 -09	IA12
002001 -10	IA13
002001 -11	IA14
002001 -12	IA15
002001 -13	AA1
002001 -14	AA2
002001 -15	AA3
002001 -16	AA4
002001 -17	AA5

All quality control requirements were acceptable.

Analysis For Volatile Compounds By Method TO-15

Client Sample ID:	IA8-020120	Client:	Maul Foster Alongi
Date Received:	02/02/20	Project:	Precision Engineering 1803.01.02
Date Collected:	02/01/20	Lab ID:	002001-05 1/10
Date Analyzed:	02/11/20	Data File:	021030.D
Matrix:	Air	Instrument:	GCMS7
Units:	ug/m3	Operator:	bat

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
4-Bromofluorobenzene	103	70	130

Compounds:	Concentration ug/m3	ppbv
Trichloroethene	270	51

Analysis For Volatile Compounds By Method TO-15

Client Sample ID:	IA10	Client:	Maul Foster Alongi
Date Received:	02/02/20	Project:	Precision Engineering 1803.01.02
Date Collected:	02/01/20	Lab ID:	002001-06 1/10
Date Analyzed:	02/11/20	Data File:	021031.D
Matrix:	Air	Instrument:	GCMS7
Units:	ug/m3	Operator:	bat

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
4-Bromofluorobenzene	101	70	130

Compounds:	Concentration ug/m3	ppbv
Trichloroethene	340	62

Analysis For Volatile Compounds By Method TO-15

Client Sample ID:	IA9	Client:	Maul Foster Alongi
Date Received:	02/02/20	Project:	Precision Engineering 1803.01.02
Date Collected:	02/01/20	Lab ID:	002001-07 1/10
Date Analyzed:	02/11/20	Data File:	021032.D
Matrix:	Air	Instrument:	GCMS7
Units:	ug/m3	Operator:	bat

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
4-Bromofluorobenzene	100	70	130

Compounds:	Concentration ug/m3	ppbv
Trichloroethene	330	61

Analysis For Volatile Compounds By Method TO-15

Client Sample ID:	IA11	Client:	Maul Foster Alongi
Date Received:	02/02/20	Project:	Precision Engineering 1803.01.02
Date Collected:	02/01/20	Lab ID:	002001-08 1/10
Date Analyzed:	02/11/20	Data File:	021033.D
Matrix:	Air	Instrument:	GCMS7
Units:	ug/m3	Operator:	bat

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
4-Bromofluorobenzene	95	70	130

Compounds:	Concentration ug/m3	ppbv
Trichloroethene	170	32

Analysis For Volatile Compounds By Method TO-15

Client Sample ID:	IA12	Client:	Maul Foster Alongi
Date Received:	02/02/20	Project:	Precision Engineering 1803.01.02
Date Collected:	02/01/20	Lab ID:	002001-09 1/10
Date Analyzed:	02/11/20	Data File:	021034.D
Matrix:	Air	Instrument:	GCMS7
Units:	ug/m3	Operator:	bat

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
4-Bromofluorobenzene	93	70	130

Compounds:	Concentration ug/m3	ppbv
Trichloroethene	200	37

Analysis For Volatile Compounds By Method TO-15

Client Sample ID:	IA13	Client:	Maul Foster Alongi
Date Received:	02/02/20	Project:	Precision Engineering 1803.01.02
Date Collected:	02/01/20	Lab ID:	002001-10 1/10
Date Analyzed:	02/11/20	Data File:	021035.D
Matrix:	Air	Instrument:	GCMS7
Units:	ug/m3	Operator:	bat

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
4-Bromofluorobenzene	89	70	130

Compounds:	Concentration ug/m3	ppbv
Trichloroethene	210	39

Analysis For Volatile Compounds By Method TO-15

Client Sample ID:	IA15	Client:	Maul Foster Alongi
Date Received:	02/02/20	Project:	Precision Engineering 1803.01.02
Date Collected:	02/01/20	Lab ID:	002001-12 1/10
Date Analyzed:	02/11/20	Data File:	021036.D
Matrix:	Air	Instrument:	GCMS7
Units:	ug/m3	Operator:	bat

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
4-Bromofluorobenzene	87	70	130

Compounds:	Concentration ug/m3	ppbv
Trichloroethene	170	32

Analysis For Volatile Compounds By Method TO-15

Client Sample ID:	Method Blank	Client:	Maul Foster Alongi
Date Received:	Not Applicable	Project:	Precision Engineering 1803.01.02
Date Collected:	Not Applicable	Lab ID:	00-0332 mb
Date Analyzed:	02/10/20	Data File:	021018.D
Matrix:	Air	Instrument:	GCMS7
Units:	ug/m3	Operator:	bat

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
4-Bromofluorobenzene	96	70	130

Compounds:	Concentration ug/m3	ppbv
Trichloroethene	<0.27	<0.05

Date of Report: 02/12/20
Date Received: 02/02/20
Project: Precision Engineering 1803.01.02, F&BI 002001

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF AIR SAMPLES FOR VOLATILES BY METHOD TO-15

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Trichloroethene	ppbv	5	86	70-130

Data Qualifiers & Definitions

a - The analyte was detected at a level less than five times the reporting limit. The RPD results may not provide reliable information on the variability of the analysis.

b - The analyte was spiked at a level that was less than five times that present in the sample. Matrix spike recoveries may not be meaningful.

ca - The calibration results for the analyte were outside of acceptance criteria. The value reported is an estimate.

c - The presence of the analyte may be due to carryover from previous sample injections.

cf - The sample was centrifuged prior to analysis.

d - The sample was diluted. Detection limits were raised and surrogate recoveries may not be meaningful.

dv - Insufficient sample volume was available to achieve normal reporting limits.

f - The sample was laboratory filtered prior to analysis.

fb - The analyte was detected in the method blank.

fc - The analyte is a common laboratory and field contaminant.

hr - The sample and duplicate were reextracted and reanalyzed. RPD results were still outside of control limits. Variability is attributed to sample inhomogeneity.

hs - Headspace was present in the container used for analysis.

ht – The analysis was performed outside the method or client-specified holding time requirement.

ip - Recovery fell outside of control limits due to sample matrix effects.

j - The analyte concentration is reported below the lowest calibration standard. The value reported is an estimate.

J - The internal standard associated with the analyte is out of control limits. The reported concentration is an estimate.

jl - The laboratory control sample(s) percent recovery and/or RPD were out of control limits. The reported concentration should be considered an estimate.

js - The surrogate associated with the analyte is out of control limits. The reported concentration should be considered an estimate.

lc - The presence of the analyte is likely due to laboratory contamination.

L - The reported concentration was generated from a library search.

nm - The analyte was not detected in one or more of the duplicate analyses. Therefore, calculation of the RPD is not applicable.

pc - The sample was received with incorrect preservation or in a container not approved by the method. The value reported should be considered an estimate.

ve - The analyte response exceeded the valid instrument calibration range. The value reported is an estimate.

vo - The value reported fell outside the control limits established for this analyte.

x - The sample chromatographic pattern does not resemble the fuel standard used for quantitation.

SAMPLE CHAIN OF CUSTODY

002001

ME 02-02-20

Page # 1 of 3

Report To Heather Good

Company Maul Foster & Alongi

Address 1329 N. State Street, Suite 301

City, State, ZIP Bellingham, WA 98225

Phone (360) 594-6268 Email hgood@maulfoster.com

SAMPLERS (*signature*)

PROJECT NAME: Precision Engineering

PO #: 1803.01.02

REPORTING LEVEL
- Indoor Air
- Deep Soil Gas
- Sub Slab/Soil Gas
- SVE/Grab

INVOICE TO: accounting@maulfoster.com

TURNAROUND TIME
- Standard
- RUSH 3 DAY

Rush charges authorized by:

SAMPLE DISPOSAL
- Dispose after 30 days
- Archive Samples
- Other

ANALYSIS REQUESTED

Sample Name	Lab ID	Canister ID	Flow Contr. ID	Date Sampled	Field Initial Press. (Hg)	Field Initial Time	Field Final Press. (Hg)	Field Final Time	TO-15 Modified SIM Full Scan*	TCE by Mod. TO-17	TO-15 cVOCs	He by ASTM D-1946	Notes
A10	01	2299	12	2/1/20	-30	1128	-5	1135	X	X		X	Subslab
A9	02	2304	18	2/1/20	-30	1208	-5	1214	X	X		X	Subslab
A8	03	3230	111	2/1/20	-30	1336	-5	1312	X	X		X	Subslab
~~A12~~ Per HG 2/6/20 A11	04	2434	17	2/1/20	-30	1306	-5	1312	X	X		X	Subslab
~~IA18-020120~~ Per HG 2/6/20 IA8-020120	05	23229	NA	2/1/20	-30	1546	-6	1546	X	X			Indoor air Sample ID IA8020120 BB
IA10	06	20550	NA	2/1/20	-29	1548	-8	1548	X	X	J 2/2/20		Indoor air
IA9	07	21453	NA	2/1/20	-30	1551	-8	1551	X	X			Indoor air
IA11	08	20549	NA	2/1/20	-29	1554	-0	1547	X	X	J		Indoor air no pressure observed in canister at 1547

Samples received at 17 °C

SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by:	Evelyn Lundeen	MFA	2/2/20	1742
Received by:	Eric Flores	FoB	2/2/20	1742
Relinquished by:				
Received by:				

Friedman & Bruya, Inc.
3012 16th Avenue West
Seattle, WA 98119-2029
Ph. (206) 285-8282
Fax (206) 283-5044

FORMS\COC\COCTO-15.DOC

*Note: TO-15 Modified SIM full scan to include the following:, as specified by email: TCE, 1,1-DCE, 1,2-DCA, cis-1,2-DCE, trans-1,2-DCE, 1,1-DCA, chloroethane, and vinyl chloride.

SAMPLE CHAIN OF CUSTODY

007001

ME 02-02-20

Report To Heather Good

Company Maul Foster & Alongi

Address 1329 N. State Street, Suite 301

City, State, ZIP Bellingham, WA 98225

Phone (360) 594-6268 Email hgood@maulfoster.com

SAMPLERS (*signature*)

PROJECT NAME: Precision Engineering

PO #: 1803.01.02

REPORTING LEVEL
- Indoor Air
- Deep Soil Gas
- Sub Slab/Soil Gas
- SVE/Grab

INVOICE TO: accounting@maulfoster.com

TURNAROUND TIME
- Standard
- RUSH 3 DAY

Rush charges authorized by:

SAMPLE DISPOSAL
- Dispose after 30 days
- Archive Samples
- Other

ANALYSIS REQUESTED

EUB and breakdown products

*TCE by TO15 only - per HG 2/6/20 per HG 2/2/20

Sample Name	Lab ID	Canister ID	Flow Contr. ID	Date Sampled	Field Initial Press. (Hg)	Field Initial Time	Field Final Press. (Hg)	Field Final Time	TO-15 Modified SIM Full Scan*	TCE by Mod. TO-17	TO-15 cVOCs	He by ASTM D-1946	Notes
IA12	09	18564	NA	2/1/20	-29	1556	-6	1556	X	X			Indoor air
IA13	10	20546	NA	2/1/20	-30	1557	-7	1557	X	X			Indoor air
IA14	11	18571	NA	2/1/20	-30	1559	-7	1559	X	X			Indoor air
IA15	12	20545	NA	2/1/20	-30	1605	-9	1605	X	X			Indoor air
AA1	13	18569	NA	2/1/20	-30	1630	-6	1630	X	X			Outdoor air
AA2	14	18580	NA	2/1/20	-30	1641	-5	1641	X	X			Outdoor air
AA3	15	20552	NA	2/1/20	-30	1640	-12	1648	X	X	2/4/20		Outdoor air
AA4	16	18579	NA	2/1/20	-30	1637	-7	1637	X	X			Outdoor air

Friedman & Bruya, Inc.
3012 16th Avenue West
Seattle, WA 98119-2029
Ph. (206) 285-8282
Fax (206) 283-5044

SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by:	Evelyn Lundeen	MFA	2/2/20	1742
Received by:	Eric Downer	FEB	2/2/20	1742
Relinquished by:				
Received by:				

FORMS\COC\COCTO-15.DOC

*Note: TO-15 Modified SIM full scan to include the following:, as specified by email: TCE, 1,1-DCE, 1,2-DCA, cis-1,2-DCE, trans-1,2-DCE, 1,1-DCA, chloroethane, and vinyl chloride.

002001

SAMPLE CHAIN OF CUSTODY

ME 02-02-20

Report To Heather Good

Company Maul Foster & Alongi

Address 1329 N. State Street, Suite 301

City, State, ZIP Bellingham, WA 98225

Phone (360) 594-6268 Email hgood@maulfoster.com

SAMPLERS (*signature*)		TURNAROUND TIME
PROJECT NAME Precision Engineering	PO # 1803.01.02	• Standard • RUSH 3 DAY Rush charges authorized by:
REPORTING LEVEL • Indoor Air • Deep Soil Gas • Sub Slab/Soil Gas • SVE/Grab	INVOICE TO accounting@maulfoster.com	SAMPLE DISPOSAL • Dispose after 30 days • Archive Samples • Other

ANALYSIS REQUESTED

Sample Name	Lab ID	Canister ID	Flow Contr. ID	Date Sampled	Field Initial Press. (Hg)	Field Initial Time	Field Final Press. (Hg)	Field Final Time	TO-15 Modified SIM Full Scan*	TCE by Mod. TO-15	TO-15 cVOCs	He by ASTM D-1946	Notes
AA5	17	20547	NA	2/1/20	-30	1632	-6	1632	X	X	2/2/20		Outdoor air

SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by:	Evelyn Lundeen	MFA	2/2/20	1747
Received by:	Eric Powell	FCR	2/2/20	1747
Relinquished by:				
Received by:				

Friedman & Bruya, Inc.
3012 16th Avenue West
Seattle, WA 98119-2029
Ph. (206) 285-8282
Fax (206) 283-5044

FORMS\COC\COCTO-15.DOC

*Note: TO-15 Modified SIM full scan to include the following:, as specified by email: TCE, 1,1-DCE, 1,2-DCA, cis-1,2-DCE, trans-1,2-DCE, 1,1-DCA, chloroethane, and vinyl chloride.

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

James E. Bruya, Ph.D.
Yelena Aravkina, M.S.
Michael Erdahl, B.S.
Arina Podnozova, B.S.
Eric Young, B.S.

3012 16th Avenue West
Seattle, WA 98119-2029
(206) 285-8282
fbi@isomedia.com
www.friedmanandbruya.com

February 12, 2020

Heather Good, Project Manager
Maul Foster Alongi
2815 2nd Ave, Suite 540
Seattle, WA 98121

Dear Ms Good:

Included are the results from the testing of material submitted on February 11, 2020 from the Precision Engineering Vapor Assessment 1803.01.02, F&BI 002154 project. There are 12 pages included in this report.

We appreciate this opportunity to be of service to you and hope you will call if you should have any questions.

Sincerely,

FRIEDMAN & BRUYA, INC.

Michael Erdahl
Project Manager

Enclosures
MFA0212R.DOC

CASE NARRATIVE

This case narrative encompasses samples received on February 11, 2020 by Friedman & Bruya, Inc. from the Maul Foster Alongi Precision Engineering Vapor Assessment 1803.01.02, F&BI 002154 project. Samples were logged in under the laboratory ID's listed below.

Laboratory ID	Maul Foster Alongi
002154 -01	IA16
002154 -02	IA17
002154 -03	IA18
002154 -04	IA19
002154 -05	IA20
002154 -06	EvapPit-W-021120

The NWTPH-Dx and metals requested for sample EvapPit-W-021120 will be sent as an additional report.

All quality control requirements were acceptable.

Analysis For Volatile Compounds By EPA Method 8260D

Client Sample ID:	EvapPit-W-021120	Client:	Maul Foster Alongi
Date Received:	02/11/20	Project:	1803.01.02, F&BI 002154
Date Extracted:	02/12/20	Lab ID:	002154-06 1/10
Date Analyzed:	02/12/20	Data File:	021218.D
Matrix:	Water	Instrument:	GCMS4
Units:	ug/L (ppb)	Operator:	MS

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
1,2-Dichloroethane-d4	99	57	121
Toluene-d8	96	63	127
4-Bromofluorobenzene	96	60	133

Compounds:	Concentration ug/L (ppb)
Trichloroethene	1.4

Analysis For Volatile Compounds By EPA Method 8260D

Client Sample ID:	Method Blank	Client:	Maul Foster Alongi
Date Received:	Not Applicable	Project:	1803.01.02, F&BI 002154
Date Extracted:	02/12/20	Lab ID:	00-334 mb
Date Analyzed:	02/12/20	Data File:	021217.D
Matrix:	Water	Instrument:	GCMS4
Units:	ug/L (ppb)	Operator:	MS

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
1,2-Dichloroethane-d4	100	57	121
Toluene-d8	94	63	127
4-Bromofluorobenzene	92	60	133

Compounds:	Concentration ug/L (ppb)
Trichloroethene	<0.1

Analysis For Volatile Compounds By Method TO-15

Client Sample ID:	IA16	Client:	Maul Foster Alongi
Date Received:	02/11/20	Project:	1803.01.02, F&BI 002154
Date Collected:	02/11/20	Lab ID:	002154-01
Date Analyzed:	02/11/20	Data File:	021111.D
Matrix:	Air	Instrument:	GCMS7
Units:	ug/m3	Operator:	bat

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
4-Bromofluorobenzene	91	70	130

Compounds:	Concentration ug/m3	ppbv
Trichloroethene	2.8	0.52

Analysis For Volatile Compounds By Method TO-15

Client Sample ID:	IA17	Client:	Maul Foster Alongi
Date Received:	02/11/20	Project:	1803.01.02, F&BI 002154
Date Collected:	02/11/20	Lab ID:	002154-02
Date Analyzed:	02/11/20	Data File:	021112.D
Matrix:	Air	Instrument:	GCMS7
Units:	ug/m3	Operator:	bat

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
4-Bromofluorobenzene	82	70	130

Compounds:	Concentration ug/m3	ppbv
Trichloroethene	93	17

Analysis For Volatile Compounds By Method TO-15

Client Sample ID:	IA18	Client:	Maul Foster Alongi
Date Received:	02/11/20	Project:	1803.01.02, F&BI 002154
Date Collected:	02/11/20	Lab ID:	002154-03
Date Analyzed:	02/12/20	Data File:	021113.D
Matrix:	Air	Instrument:	GCMS7
Units:	ug/m3	Operator:	bat

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
4-Bromofluorobenzene	79	70	130

Compounds:	Concentration ug/m3	ppbv
Trichloroethene	45	8.3

Analysis For Volatile Compounds By Method TO-15

Client Sample ID:	IA19	Client:	Maul Foster Alongi
Date Received:	02/11/20	Project:	1803.01.02, F&BI 002154
Date Collected:	02/11/20	Lab ID:	002154-04
Date Analyzed:	02/12/20	Data File:	021114.D
Matrix:	Air	Instrument:	GCMS7
Units:	ug/m3	Operator:	bat

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
4-Bromofluorobenzene	82	70	130

Compounds:	Concentration ug/m3	ppbv
Trichloroethene	110	21

Analysis For Volatile Compounds By Method TO-15

Client Sample ID:	IA20	Client:	Maul Foster Alongi
Date Received:	02/11/20	Project:	1803.01.02, F&BI 002154
Date Collected:	02/11/20	Lab ID:	002154-05 1/1.4
Date Analyzed:	02/12/20	Data File:	021115.D
Matrix:	Air	Instrument:	GCMS7
Units:	ug/m3	Operator:	bat

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
4-Bromofluorobenzene	78	70	130

Compounds:	Concentration ug/m3	ppbv
Trichloroethene	73	14

Analysis For Volatile Compounds By Method TO-15

Client Sample ID:	Method Blank	Client:	Maul Foster Alongi
Date Received:	Not Applicable	Project:	1803.01.02, F&BI 002154
Date Collected:	02/11/20	Lab ID:	00-0337 mb
Date Analyzed:	02/11/20	Data File:	021110.D
Matrix:	Air	Instrument:	GCMS7
Units:	ug/m3	Operator:	bat

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
4-Bromofluorobenzene	102	70	130

Compounds:	Concentration ug/m3	ppbv
Trichloroethene	<0.27	<0.05

Date of Report: 02/12/20
Date Received: 02/11/20
Project: Precision Engineering Vapor Assessment 1803.01.02, F&BI 002154

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF WATER SAMPLES FOR VOLATILES BY EPA METHOD 8260D

Laboratory Code: 002158-01 (Matrix Spike)

Analyte	Reporting Units	Spike Level	Sample Result	Percent Recovery MS	Acceptance Criteria
Trichloroethene	ug/L (ppb)	50	<1	105	66-135

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Percent Recovery LCSD	Acceptance Criteria	RPD (Limit 20)
Trichloroethene	ug/L (ppb)	50	100	103	79-113	3

Date of Report: 02/12/20
Date Received: 02/11/20
Project: Precision Engineering Vapor Assessment 1803.01.02, F&BI 002154

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF AIR SAMPLES FOR VOLATILES BY METHOD TO-15

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Trichloroethene	ppbv	5	84	70-130

Data Qualifiers & Definitions

a - The analyte was detected at a level less than five times the reporting limit. The RPD results may not provide reliable information on the variability of the analysis.

b - The analyte was spiked at a level that was less than five times that present in the sample. Matrix spike recoveries may not be meaningful.

ca - The calibration results for the analyte were outside of acceptance criteria. The value reported is an estimate.

c - The presence of the analyte may be due to carryover from previous sample injections.

cf - The sample was centrifuged prior to analysis.

d - The sample was diluted. Detection limits were raised and surrogate recoveries may not be meaningful.

dv - Insufficient sample volume was available to achieve normal reporting limits.

f - The sample was laboratory filtered prior to analysis.

fb - The analyte was detected in the method blank.

fc - The analyte is a common laboratory and field contaminant.

hr - The sample and duplicate were reextracted and reanalyzed. RPD results were still outside of control limits. Variability is attributed to sample inhomogeneity.

hs - Headspace was present in the container used for analysis.

ht – The analysis was performed outside the method or client-specified holding time requirement.

ip - Recovery fell outside of control limits due to sample matrix effects.

j - The analyte concentration is reported below the lowest calibration standard. The value reported is an estimate.

J - The internal standard associated with the analyte is out of control limits. The reported concentration is an estimate.

jl - The laboratory control sample(s) percent recovery and/or RPD were out of control limits. The reported concentration should be considered an estimate.

js - The surrogate associated with the analyte is out of control limits. The reported concentration should be considered an estimate.

lc - The presence of the analyte is likely due to laboratory contamination.

L - The reported concentration was generated from a library search.

nm - The analyte was not detected in one or more of the duplicate analyses. Therefore, calculation of the RPD is not applicable.

pc - The sample was received with incorrect preservation or in a container not approved by the method. The value reported should be considered an estimate.

ve - The analyte response exceeded the valid instrument calibration range. The value reported is an estimate.

vo - The value reported fell outside the control limits established for this analyte.

x - The sample chromatographic pattern does not resemble the fuel standard used for quantitation.

002154

SAMPLE CHAIN OF CUSTODY

ME 02/11/20

RUSH!

VW1/AI2 - (NP) 2/12/20

Page # 1 of 2

Report To Heather Good

Company Maul Foster Alongi

Address 1329 N State St. #201

City, State, ZIP Bellingham, WA 98225

Phone 360-927-1309 Email hgood@maulfoster.com

SAMPLERS (signature)

PROJECT NAME: Precision Engineering vapor assessment

PO #: 1803.01.02

REPORTING LEVEL: • Indoor Air • Deep Soil Gas • Sub Slab/Soil Gas • SVE/Grab

INVOICE TO: accounting@maulfoster.com

TURNAROUND TIME: • Standard as fast as possible • RUSH next day

Rush charges authorized by:

SAMPLE DISPOSAL: • Dispose after 30 days • Archive Samples • Other

ANALYSIS REQUESTED

Sample Name	Lab ID	Canister ID	Flow Contr. ID	Date Sampled	Field Initial Press. (Hg)	Field Initial Time	Field Final Press. (Hg)	Field Final Time	TO-15 Full Scan	TO-15 BTEXN	TO-15 cVOCs	TO-15 SIM - TCE	Notes
IA16	01	20552	07851	2/11/20	-30	8:51	-7	1651				X	
IA17	02	23234	06605	2/11/20		8:58	-9	1658				X	
IA18	03	23235	05356	2/11/20		9:07	-6	1707				X	
IA19	04	20547	05354	2/11/20		9:15	-6	1710				X	
IA20	05	18568	06606	2/11/20	↓	9:30	-12	1730				X	
													Samples received at 19 °C

SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by:	Evelyn Lindeen	MFA	2/11/20	1800
Received by:	POSLAF TAPIA	FBI	↓	↓
Relinquished by:				
Received by:				

Friedman & Bruya, Inc.
3012 16th Avenue West
Seattle, WA 98119-2029
Ph. (206) 285-8282
Fax (206) 283-5044

002154

SAMPLE CHAIN OF CUSTODY

PUSH! (NP) 2/12/20

Page # X2 of 2

Report To Heather Good
Company Maul Foster Alongi
Address 1329 N State St. #301
City, State, ZIP Bellingham, WA 98225
Phone 360-927-1309 Email hgood@maulfoster.com

SAMPLERS (*signature*) ME 02/11/20
PROJECT NAME: Precision engineering vapor assessment
PO #: 1803.01.02
REMARKS: Project specific RLs? - Yes / No
INVOICE TO: accounting@maulfoster.com

TURNAROUND TIME VW1 AZ2
☐ Standard turnaround
☒ RUSH see notes below
Rush charges authorized by:

SAMPLE DISPOSAL
☐ Archive samples
☐ Other
Default: Dispose after 30 days

Sample ID	Lab ID	Date Sampled	Time Sampled	Sample Type	# of Jars	NWTPH-Dx	NWTPH-Gx	BTEX EPA 8021	NWTPH-HCID	VOCs EPA 8260	PAHs EPA 8270	PCBs EPA 8082	TCE EPA 8260D	total chromium EPA 6020B	arsenic EPA 6020B		Notes
EVAP PIT-W-021120	06A-E	2/11/2020	1015	W	5	X							X	X	X		TCE analysis is needed on the fastest turnaround possible - arsenic, total chromium and NWTPH-Dx results can be on standard turnaround

Samples received at 3 °C

SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by:	Evelyn Lundeen	MFA	2/11/20	1808
Received by:	BISRAT TADESSE	FBI	↓	↓
Relinquished by:				
Received by:				

Friedman & Bruya, Inc.
3012 16th Avenue West
Seattle, WA 98119-2029
Ph. (206) 285-8282

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

James E. Bruya, Ph.D.
Yelena Aravkina, M.S.
Michael Erdahl, B.S.
Arina Podnozova, B.S.
Eric Young, B.S.

3012 16th Avenue West
Seattle, WA 98119-2029
(206) 285-8282
fbi@isomedia.com
www.friedmanandbruya.com

February 19, 2020

Heather Good, Project Manager
Maul Foster Alongi
2815 2nd Ave, Suite 540
Seattle, WA 98121

Dear Ms Good:

Included are the additional results from the testing of material submitted on February 11, 2020 from the Precision Engineering Vapor Assessment 1803.01.02, F&BI 002154 project. There are 8 pages included in this report.

We appreciate this opportunity to be of service to you and hope you will call if you should have any questions.

Sincerely,

FRIEDMAN & BRUYA, INC.

Michael Erdahl
Project Manager

Enclosures
MFA0219R.DOC

CASE NARRATIVE

This case narrative encompasses samples received on February 11, 2020 by Friedman & Bruya, Inc. from the Maul Foster Alongi Precision Engineering Vapor Assessment 1803.01.02, F&BI 002154 project. Samples were logged in under the laboratory ID's listed below.

Laboratory ID	Maul Foster Alongi
002154 -01	IA16
002154 -02	IA17
002154 -03	IA18
002154 -04	IA19
002154 -05	IA20
002154 -06	EvapPit-W-021120

The arsenic concentration in sample EvapPit-W-021120 was reported between the method detection limit and the standard reporting limit. The sample could not be analyzed at a greater concentration due to matrix interferences.

All other quality control requirements were acceptable.

Date of Report: 02/19/20
Date Received: 02/11/20
Project: Precision Engineering Vapor Assessment 1803.01.02, F&BI 002154
Date Extracted: 02/12/20
Date Analyzed: 02/12/20

RESULTS FROM THE ANALYSIS OF WATER SAMPLES FOR TOTAL PETROLEUM HYDROCARBONS AS DIESEL AND MOTOR OIL USING METHOD NWTPH-Dx

Results Reported as ug/L (ppb)

Sample ID Laboratory ID	Diesel Range (C_{10}-C_{25})	Motor Oil Range (C_{25}-C_{36})	Surrogate (% Recovery) (Limit 41-152)
EvapPit-W-021120 002154-06	3,900 x	2,500 x	68
Method Blank 00-365 MB	<50	<250	95

Analysis For Total Metals By EPA Method 6020B

Client ID:	EvapPit-W-021120	Client:	Maul Foster Alongi
Date Received:	02/11/20	Project:	1803.01.02, F&BI 002154
Date Extracted:	02/18/20	Lab ID:	002154-06 x40
Date Analyzed:	02/18/20	Data File:	002154-06 x40.052
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Arsenic	6.08 j

Analysis For Total Metals By EPA Method 6020B

Client ID:	EvapPit-W-021120	Client:	Maul Foster Alongi
Date Received:	02/11/20	Project:	1803.01.02, F&BI 002154
Date Extracted:	02/18/20	Lab ID:	002154-06 x2000
Date Analyzed:	02/18/20	Data File:	002154-06 x2000.049
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Chromium	994,000

Analysis For Total Metals By EPA Method 6020B

Client ID:	Method Blank	Client:	Maul Foster Alongi
Date Received:	NA	Project:	1803.01.02, F&BI 002154
Date Extracted:	02/18/20	Lab ID:	I0-097 mb
Date Analyzed:	02/18/20	Data File:	I0-097 mb.033
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Arsenic	<0.12 j
Chromium	<1

Date of Report: 02/19/20
Date Received: 02/11/20
Project: Precision Engineering Vapor Assessment 1803.01.02, F&BI 002154

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF WATER SAMPLES FOR TOTAL PETROLEUM HYDROCARBONS AS DIESEL EXTENDED USING METHOD NWTPH-Dx

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Percent Recovery LCSD	Acceptance Criteria	RPD (Limit 20)
Diesel Extended	ug/L (ppb)	2,500	100	96	63-142	4

Date of Report: 02/19/20
Date Received: 02/11/20
Project: Precision Engineering Vapor Assessment 1803.01.02, F&BI 002154

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF WATER SAMPLES FOR TOTAL METALS USING EPA METHOD 6020B

Laboratory Code: 002219-01 (Matrix Spike)

Analyte	Reporting Units	Spike Level	Sample Result	Percent Recovery MS	Percent Recovery MSD	Acceptance Criteria	RPD (Limit 20)
Arsenic	ug/L (ppb)	10	1.60	94	93	75-125	1
Chromium	ug/L (ppb)	20	<1	99	98	75-125	1

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Arsenic	ug/L (ppb)	10	96	80-120
Chromium	ug/L (ppb)	20	101	80-120

Data Qualifiers & Definitions

a - The analyte was detected at a level less than five times the reporting limit. The RPD results may not provide reliable information on the variability of the analysis.

b - The analyte was spiked at a level that was less than five times that present in the sample. Matrix spike recoveries may not be meaningful.

ca - The calibration results for the analyte were outside of acceptance criteria. The value reported is an estimate.

c - The presence of the analyte may be due to carryover from previous sample injections.

cf - The sample was centrifuged prior to analysis.

d - The sample was diluted. Detection limits were raised and surrogate recoveries may not be meaningful.

dv - Insufficient sample volume was available to achieve normal reporting limits.

f - The sample was laboratory filtered prior to analysis.

fb - The analyte was detected in the method blank.

fc - The analyte is a common laboratory and field contaminant.

hr - The sample and duplicate were reextracted and reanalyzed. RPD results were still outside of control limits. Variability is attributed to sample inhomogeneity.

hs - Headspace was present in the container used for analysis.

ht – The analysis was performed outside the method or client-specified holding time requirement.

ip - Recovery fell outside of control limits due to sample matrix effects.

j - The analyte concentration is reported below the lowest calibration standard. The value reported is an estimate.

J - The internal standard associated with the analyte is out of control limits. The reported concentration is an estimate.

jl - The laboratory control sample(s) percent recovery and/or RPD were out of control limits. The reported concentration should be considered an estimate.

js - The surrogate associated with the analyte is out of control limits. The reported concentration should be considered an estimate.

lc - The presence of the analyte is likely due to laboratory contamination.

L - The reported concentration was generated from a library search.

nm - The analyte was not detected in one or more of the duplicate analyses. Therefore, calculation of the RPD is not applicable.

pc - The sample was received with incorrect preservation or in a container not approved by the method. The value reported should be considered an estimate.

ve - The analyte response exceeded the valid instrument calibration range. The value reported is an estimate.

vo - The value reported fell outside the control limits established for this analyte.

x - The sample chromatographic pattern does not resemble the fuel standard used for quantitation.

002154

SAMPLE CHAIN OF CUSTODY

ME 02/11/20

RUSH!

VW1/AI2 - (NP) 2/12/20

Page # 1 of 2

Report To Heather Good

Company Maul Foster Alongi

Address 1329 N State St. #201

City, State, ZIP Bellingham, WA 98225

Phone 360-927-1309 Email hgood@maulfoster.com

SAMPLERS (signature)

PROJECT NAME: Precision Engineering vapor assessment

PO #: 1803.01.02

REPORTING LEVEL: • Indoor Air • Deep Soil Gas • Sub Slab/Soil Gas • SVE/Grab

INVOICE TO: accounting@maulfoster.com

TURNAROUND TIME: • Standard as fast as possible • RUSH next day

Rush charges authorized by:

SAMPLE DISPOSAL: • Dispose after 30 days • Archive Samples • Other

ANALYSIS REQUESTED

Sample Name	Lab ID	Canister ID	Flow Contr. ID	Date Sampled	Field Initial Press. (Hg)	Field Initial Time	Field Final Press. (Hg)	Field Final Time	TO-15 Full Scan	TO-15 BTEXN	TO-15 cVOCs	TO-15 SIM - TCE	Notes
IA16	01	20552	07851	2/11/20	-30	8:51	-7	1651				X	
IA17	02	23234	06605	2/11/20		8:58	-9	1658				X	
IA18	03	23235	05356	2/11/20		9:07	-6	1707				X	
IA19	04	20547	05354	2/11/20		9:15	-6	1710				X	
IA20	05	18568	06606	2/11/20	↓	9:30	-12	1730				X	
													Samples received at 19 °C

SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by:	Evelyn Lindeen	MFA	2/11/20	1800
Received by:	POSLAF TAPIA	FBI	↓	↓
Relinquished by:				
Received by:				

Friedman & Bruya, Inc.
3012 16th Avenue West
Seattle, WA 98119-2029
Ph. (206) 285-8282
Fax (206) 283-5044

002154

SAMPLE CHAIN OF CUSTODY

PUSH! (NP) 2/12/20

Page # X2 of 2

Report To Heather Good
Company Maul Foster Alongi
Address 1329 N State St. #301
City, State, ZIP Bellingham, WA 98225
Phone 360-927-1309 Email hgood@maulfoster.com

SAMPLERS (*signature*) ME 02/11/20
PROJECT NAME: Precision engineering vapor assessment
PO #: 1803.01.02
REMARKS: Project specific RLs? - Yes / No
INVOICE TO: accounting@maulfoster.com

TURNAROUND TIME VW1 AZ2
☐ Standard turnaround
☒ RUSH see notes below
Rush charges authorized by:

SAMPLE DISPOSAL
☐ Archive samples
☐ Other
Default: Dispose after 30 days

Sample ID	Lab ID	Date Sampled	Time Sampled	Sample Type	# of Jars	NWTPH-Dx	NWTPH-Gx	BTEX EPA 8021	NWTPH-HCID	VOCs EPA 8260	PAHs EPA 8270	PCBs EPA 8082	TCE EPA 8260D	total chromium EPA 6020B	arsenic EPA 6020B		Notes
EVAP PIT-W-021120	06A-E	2/11/2020	1015	W	5	X							X	X	X		TCE analysis is needed on the fastest turnaround possible - arsenic, total chromium and NWTPH-Dx results can be on standard turnaround

Samples received at 3 °C

SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by:	Evelyn Lundeen	MFA	2/11/20	1808
Received by:	BISRAT TADESSE	FBI	↓	↓
Relinquished by:				
Received by:				

Friedman & Bruya, Inc.
3012 16th Avenue West
Seattle, WA 98119-2029
Ph. (206) 285-8282

eurofins | Air Toxics

2/19/2020
Ms. Heather Good
Maul Foster and Alongi Inc.
1329 North State Street
Suite 301
Bellingham WA 98225

Project Name: Precision Engineering
Project #: 1803.01.02-03
Workorder #: 2002351

Dear Ms. Heather Good

The following report includes the data for the above referenced project for sample(s) received on 2/14/2020 at Air Toxics Ltd.

The data and associated QC analyzed by Passive S.E. RAD130/SKC are compliant with the project requirements or laboratory criteria with the exception of the deviations noted in the attached case narrative.

Thank you for choosing Eurofins Air Toxics Inc. for your air analysis needs. Eurofins Air Toxics Inc. is committed to providing accurate data of the highest quality. Please feel free to contact the Project Manager: Kelly Buettner at 916-985-1000 if you have any questions regarding the data in this report.

Regards,

Kelly Buettner

Project Manager

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WORK ORDER #: 2002351

Work Order Summary

CLIENT:	Ms. Heather Good Maul Foster and Alongi Inc. 1329 North State Street Suite 301 Bellingham, WA 98225	**BILL TO:**	Accounts Payable Maul Foster and Alongi Inc. 400 E. Mill Plain Blvd Suite 400 Vancouver, WA 98660
PHONE:	360-594-6262	**P.O. #**	
FAX:	360-594-6270	**PROJECT #**	1803.01.02-03 Precision Engineering
DATE RECEIVED:	02/14/2020	**CONTACT:**	Kelly Buettner
DATE COMPLETED:	02/19/2020		

FRACTION #	NAME	TEST
01A	RAD1	Passive S.E. RAD130/SKC
02A	RAD2	Passive S.E. RAD130/SKC
03A	RAD3	Passive S.E. RAD130/SKC
04A	Trip Blank	Passive S.E. RAD130/SKC
05A	Lab Blank	Passive S.E. RAD130/SKC
06A	LCS	Passive S.E. RAD130/SKC
06AA	LCSD	Passive S.E. RAD130/SKC

CERTIFIED BY:  DATE: 02/19/20

Technical Director

180 BLUE RAVINE ROAD, SUITE B FOLSOM, CA - 95630
(916) 985-1000 . (800) 985-5955 . FAX (916) 351-8279

LABORATORY NARRATIVE
RAD130 Passive SE by Mod EPA TO-17
Maul Foster and Alongi Inc.
Workorder# 2002351

Four Radiello 130 (Solvent) samples were received on February 14, 2020. The laboratory analyzed the charcoal sorbent bed of the passive sampler following modified method EPA TO-17. The VOCs were chemically extracted using carbon disulfide and an aliquot of the extract was injected into a GC/MS for identification and quantification of volatile organic compounds (VOCs).

The mass of each target compound adsorbed by the sampler was converted to units of concentration using the sample deployment time and the sampling rate for each VOC. If sampling rates were calculated by the lab or the manufacturer, the concentration result has been flagged as an estimated value. Results are not corrected for desorption efficiency.

The reference method used for this procedure is EPA TO-17, which describes the collection of VOCs in ambient air using sorbents and analysis by GC/MS. Because TO-17 describes active sample collection using a pump and thermal desorption as the preparation step, several modifications are required. Modifications to TO-17 are listed in the table below:

Requirement	***TO-17***	***ATL Modifications***
Sample Collection	Pump pulls measured air volume through sorbent tube	VOCs in air adsorbed onto sorbent bed passively through diffusion
Sample Preparation	Thermal extraction	Solvent extraction
Sorbent tube conditioning	Condition newly packed tubes prior to use	Charcoal-based sorbent is a single use media and conditioning is conducted by vendor.
Instrumentation	Thermal desorption introduction system	Liquid injection introduction system
Internal Standard	Gas-phase internal standard introduced on the tube or focusing trap during analysis	Liquid-phase internal standard introduced on the tube at the time of extraction
Media and sample storage	<4 deg C, 30 days	Media shelf life is determined by vendor; sample hold-time is 6 months for the RAD130 and WMS. Sample preservation requirements are storage in a cool, solvent-free refrigerator and optional use of ice during shipping.
Internal Standard Recovery	+/-40% of daily CCV area	-50% to +100% of daily CCV area

Receiving Notes

There were no receiving discrepancies.

Analytical Notes

The uptake rates were corrected based on average field temperatures if provided. In the absence of field temperatures, the uptake rates determined at 25 deg C were used.

To calculate ug/m3 concentrations in the Lab Blank and Trip Blank, a sampling duration of 17120 minutes was applied. The assumed temperature used for the uptake rate is listed on the data page. If the field temperatures were provided, the rate was adjusted in the same manner as the field samples.

Definition of Data Qualifying Flags

Ten qualifiers may have been used on the data analysis sheets and indicate as follows:

B - Compound present in laboratory blank greater than reporting limit (background subtraction not performed).

J - Estimated value.

E - Exceeds instrument calibration range.

S - Saturated peak.

Q - Exceeds quality control limits.

U - Compound analyzed for but not detected above the reporting limit.

UJ- Non-detected compound associated with low bias in the CCV

N - The identification is based on presumptive evidence.

C - Estimated concentration due to calculated sampling rate

CN - See case narrative explanation.

File extensions may have been used on the data analysis sheets and indicates as follows:

a-File was requantified

b-File was quantified by a second column and detector

r1-File was requantified for the purpose of reissue

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Summary of Detected Compounds
VOCS BY PASSIVE SAMPLER - GC/MS

Client Sample ID: RAD1

Lab ID#: 2002351-01A

Compound	Rpt. Limit (ug)	Rpt. Limit (ug/m3)	Amount (ug)	Amount (ug/m3)
Trichloroethene	0.10	0.085	130	110

Client Sample ID: RAD2

Lab ID#: 2002351-02A

Compound	Rpt. Limit (ug)	Rpt. Limit (ug/m3)	Amount (ug)	Amount (ug/m3)
Trichloroethene	0.10	0.085	130	110

Client Sample ID: RAD3

Lab ID#: 2002351-03A

Compound	Rpt. Limit (ug)	Rpt. Limit (ug/m3)	Amount (ug)	Amount (ug/m3)
Trichloroethene	0.10	0.085	200	170

Client Sample ID: Trip Blank

Lab ID#: 2002351-04A

No Detections Were Found.

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Client Sample ID: RAD1

Lab ID#: 2002351-01A

VOCS BY PASSIVE SAMPLER - GC/MS

File Name:	**18021722sim**	**Date of Collection: 2/13/20 1:50:00 PM**	
Dil. Factor:	**1.00**	**Date of Analysis: 2/17/20 04:43 PM**	
		Date of Extraction: 2/17/20	

Compound	Rpt. Limit (ug)	Rpt. Limit (ug/m3)	Amount (ug)	Amount (ug/m3)
Trichloroethene	0.10	0.085	130	110

Temperature = 77.0F , duration time = 17095 minutes.

Container Type: Radiello 130 (Solvent)

Surrogates	%Recovery	Method Limits
Toluene-d8	83	70-130

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Client Sample ID: RAD2

Lab ID#: 2002351-02A

VOCS BY PASSIVE SAMPLER - GC/MS

File Name:	**18021723sim**	**Date of Collection: 2/13/20 2:12:00 PM**
Dil. Factor:	**1.00**	**Date of Analysis: 2/17/20 05:08 PM**
		Date of Extraction: 2/17/20

Compound	Rpt. Limit (ug)	Rpt. Limit (ug/m3)	Amount (ug)	Amount (ug/m3)
Trichloroethene	0.10	0.085	130	110

Temperature = 77.0F , duration time = 17120 minutes.

Container Type: Radiello 130 (Solvent)

Surrogates	%Recovery	Method Limits
Toluene-d8	83	70-130

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Client Sample ID: RAD3

Lab ID#: 2002351-03A

VOCS BY PASSIVE SAMPLER - GC/MS

File Name:	**18021724sim**	**Date of Collection: 2/13/20 2:16:00 PM**	
Dil. Factor:	**1.00**	**Date of Analysis: 2/17/20 05:33 PM**	
		Date of Extraction: 2/17/20	

Compound	Rpt. Limit (ug)	Rpt. Limit (ug/m3)	Amount (ug)	Amount (ug/m3)
Trichloroethene	0.10	0.085	200	170

Temperature = 77.0F , duration time = 17118 minutes.

Container Type: Radiello 130 (Solvent)

Surrogates	%Recovery	Method Limits
Toluene-d8	81	70-130

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Client Sample ID: Trip Blank

Lab ID#: 2002351-04A

VOCS BY PASSIVE SAMPLER - GC/MS

File Name:	**18021725sim**	**Date of Collection: 2/13/20**	
Dil. Factor:	**1.00**	**Date of Analysis: 2/17/20 05:58 PM**	
		Date of Extraction: 2/17/20	

Compound	Rpt. Limit (ug)	Rpt. Limit (ug/m3)	Amount (ug)	Amount (ug/m3)
Trichloroethene	0.10	0.085	Not Detected	Not Detected

Temperature = 77.0F , duration time = 17120 minutes.

Container Type: Radiello 130 (Solvent)

Surrogates	%Recovery	Method Limits
Toluene-d8	84	70-130

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Client Sample ID: Lab Blank

Lab ID#: 2002351-05A

VOCS BY PASSIVE SAMPLER - GC/MS

File Name:	**18021705sim**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 2/17/20 09:32 AM**	
		Date of Extraction: 2/17/20	

Compound	Rpt. Limit (ug)	Rpt. Limit (ug/m3)	Amount (ug)	Amount (ug/m3)
Trichloroethene	0.10	0.085	Not Detected	Not Detected

Temperature = 77.0F , duration time = 17120 minutes.
Container Type: Radiello 130 (Solvent)

Surrogates	%Recovery	Method Limits
Toluene-d8	83	70-130

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Client Sample ID: LCS

Lab ID#: 2002351-06A

VOCS BY PASSIVE SAMPLER - GC/MS

File Name:	**18021703sim**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 2/17/20 08:39 AM**	
		Date of Extraction: 2/17/20	

Compound	%Recovery	Method Limits
Trichloroethene	95	70-130

Container Type: Radiello 130 (Solvent)

Surrogates	%Recovery	Method Limits
Toluene-d8	85	70-130

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Client Sample ID: LCSD

Lab ID#: 2002351-06AA

VOCS BY PASSIVE SAMPLER - GC/MS

File Name:	**18021704sim**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 2/17/20 09:07 AM**	
		Date of Extraction: 2/17/20	

Compound	%Recovery	Method Limits
Trichloroethene	94	70-130

Container Type: Radiello 130 (Solvent)

Surrogates	%Recovery	Method Limits
Toluene-d8	84	70-130

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Passive Sorbent Chain of Custody

Page 1 of 1

WO#: 2002351

Case Seal #: _____

Company: Maul Foster Alongi Project #: 1803.01.02-03 P.O.#

Project Manager: Heather Good Project Name: Precision Engineering

Contact phone/email: hgood@maulfoster.com 360.594.6268 Collected by: Heather Good/Michael Tarbert

Lab ID	Sample Identification	Sampler ID	Date of Deployment (mm/dd/yy)	Time of Deployment (hr:min)	Date of Retrieval (mm/dd/yy)	Time of Retrieval (hr:min)	Sample Matrix (check one): Indoor/Outdoor Air	Soil Gas	Workplace Monitoring	Other( )	Analysis Requested	Sample Comments:
01A	RAD1	X683H	02/01/20	16:55	02/13/20	13:50	X				TO-17	only TCE
02A	RAD2	X684H	02/01/20	16:52	02/13/20	14:12	X				TO-17	
03A	RAD3	X685H	02/01/20	16:58	02/13/20	14:16	X				TO-17	
04A	Trip Blank	X686H	02/01/20		02/13/20		X				TO-17	

Reporting Units (circle): ppbv ug/m3 ppmv mg/m3 ug ng

Turn Around Time: ☐ Normal ☒ Rush 3 Day (Specify)

Relinquished by:	Date	Time	Received by:	Date	Time	Notes to Lab:
Michael Tarbert	2/13/20	3:40pm	Emily Hendrickson	2/13/20	3:40pm	MRL needed 4 = 0.37 ug/m3
Emily Hendrickson	2/13/20	3:55pm	[signature]	2/14/20	0944	

Relinquishing signature on this document indicates that samples are shipped in compliance with all applicable local, State, Federal, and international laws, regulations, and ordinances of any kind. Relinquishing signature also indicates agreement to hold harmless, defend, and indemnify Eurofins Air Toxics against any claim, demand, or action, of any kind, related to the collection, handling, or shipping of samples.

Lab Use Only

Shipper Name: fedex

Air bill #:

Custody Seals Intact? Yes No None

Temperature (°C): NA

Sample Condition Upon Receipt (circle): Good SDR

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

James E. Bruya, Ph.D.
Yelena Aravkina, M.S.
Michael Erdahl, B.S.
Arina Podnozova, B.S.
Eric Young, B.S.

3012 16th Avenue West
Seattle, WA 98119-2029
(206) 285-8282
fbi@isomedia.com
www.friedmanandbruya.com

February 21, 2020

Heather Good, Project Manager
Maul Foster Alongi
2815 2nd Ave, Suite 540
Seattle, WA 98121

Dear Ms Good:

Included are the results from the testing of material submitted on February 20, 2020 from the Precision Engineering Indoor Air Sampling 1803.01.02, F&BI 002298 project. There are 7 pages included in this report.

We appreciate this opportunity to be of service to you and hope you will call if you should have any questions.

Sincerely,

FRIEDMAN & BRUYA, INC.

Michael Erdahl
Project Manager

Enclosures
MFA0221R.DOC

CASE NARRATIVE

This case narrative encompasses samples received on February 20, 2020 by Friedman & Bruya, Inc. from the Maul Foster Alongi Precision Engineering Indoor Air Sampling 1803.01.02, F&BI 002298 project. Samples were logged in under the laboratory ID's listed below.

Laboratory ID	Maul Foster Alongi
002298 -01	IA16-022020
002298 -02	IA17-022020
002298 -03	IA19-022020

All quality control requirements were acceptable.

Analysis For Volatile Compounds By Method TO-15

Client Sample ID:	IA16-022020	Client:	Maul Foster Alongi
Date Received:	02/20/20	Project:	Precision Engineering Indoor Air 1803.01.02
Date Collected:	02/20/20	Lab ID:	002298-01
Date Analyzed:	02/21/20	Data File:	022021.D
Matrix:	Air	Instrument:	GCMS7
Units:	ug/m3	Operator:	bat

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
4-Bromofluorobenzene	83	70	130

Compounds:	Concentration ug/m3	ppbv
Trichloroethene	1.9	0.35

Analysis For Volatile Compounds By Method TO-15

Client Sample ID:	IA17-022020	Client:	Maul Foster Alongi
Date Received:	02/20/20	Project:	Precision Engineering Indoor Air 1803.01.02
Date Collected:	02/20/20	Lab ID:	002298-02
Date Analyzed:	02/21/20	Data File:	022022.D
Matrix:	Air	Instrument:	GCMS7
Units:	ug/m3	Operator:	bat

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
4-Bromofluorobenzene	106	70	130

Compounds:	Concentration ug/m3	ppbv
Trichloroethene	4.5	0.83

Analysis For Volatile Compounds By Method TO-15

Client Sample ID:	IA19-022020	Client:	Maul Foster Alongi
Date Received:	02/20/20	Project:	Precision Engineering Indoor Air 1803.01.02
Date Collected:	02/20/20	Lab ID:	002298-03
Date Analyzed:	02/21/20	Data File:	022023.D
Matrix:	Air	Instrument:	GCMS7
Units:	ug/m3	Operator:	bat

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
4-Bromofluorobenzene	87	70	130

Compounds:	Concentration ug/m3	ppbv
Trichloroethene	2.3	0.42

Analysis For Volatile Compounds By Method TO-15

Client Sample ID:	Method Blank	Client:	Maul Foster Alongi
Date Received:	Not Applicable	Project:	Precision Engineering Indoor Air 1803.01.02
Date Collected:	Not Applicable	Lab ID:	00-0419 mb
Date Analyzed:	02/20/20	Data File:	022014.D
Matrix:	Air	Instrument:	GCMS7
Units:	ug/m3	Operator:	bat

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
4-Bromofluorobenzene	96	70	130

Compounds:	Concentration ug/m3	ppbv
Trichloroethene	<0.27	<0.05

Date of Report: 02/21/20
Date Received: 02/20/20
Project: Precision Engineering Indoor Air Sampling 1803.01.02, F&BI 002298

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF AIR SAMPLES FOR VOLATILES BY METHOD TO-15

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Trichloroethene	ug/m3	73	85	70-130

Data Qualifiers & Definitions

a - The analyte was detected at a level less than five times the reporting limit. The RPD results may not provide reliable information on the variability of the analysis.

b - The analyte was spiked at a level that was less than five times that present in the sample. Matrix spike recoveries may not be meaningful.

ca - The calibration results for the analyte were outside of acceptance criteria. The value reported is an estimate.

c - The presence of the analyte may be due to carryover from previous sample injections.

cf - The sample was centrifuged prior to analysis.

d - The sample was diluted. Detection limits were raised and surrogate recoveries may not be meaningful.

dv - Insufficient sample volume was available to achieve normal reporting limits.

f - The sample was laboratory filtered prior to analysis.

fb - The analyte was detected in the method blank.

fc - The analyte is a common laboratory and field contaminant.

hr - The sample and duplicate were reextracted and reanalyzed. RPD results were still outside of control limits. Variability is attributed to sample inhomogeneity.

hs - Headspace was present in the container used for analysis.

ht – The analysis was performed outside the method or client-specified holding time requirement.

ip - Recovery fell outside of control limits due to sample matrix effects.

j - The analyte concentration is reported below the lowest calibration standard. The value reported is an estimate.

J - The internal standard associated with the analyte is out of control limits. The reported concentration is an estimate.

jl - The laboratory control sample(s) percent recovery and/or RPD were out of control limits. The reported concentration should be considered an estimate.

js - The surrogate associated with the analyte is out of control limits. The reported concentration should be considered an estimate.

lc - The presence of the analyte is likely due to laboratory contamination.

L - The reported concentration was generated from a library search.

nm - The analyte was not detected in one or more of the duplicate analyses. Therefore, calculation of the RPD is not applicable.

pc - The sample was received with incorrect preservation or in a container not approved by the method. The value reported should be considered an estimate.

ve - The analyte response exceeded the valid instrument calibration range. The value reported is an estimate.

vo - The value reported fell outside the control limits established for this analyte.

x - The sample chromatographic pattern does not resemble the fuel standard used for quantitation.

CO2298

SAMPLE CHAIN OF CUSTODY

ME 02/20/20

Page # 1 of 1

Report To Heather Good
Company Maul Foster Alongi
Address 1329 N State St., #301
City, State, ZIP Bellingham, WA 98225
Phone 360-927-1309 Email hgood@maulfoster.com

SAMPLERS (*signature*)	
PROJECT NAME & ADDRESS Precision engineering indoor air sampling	PO # 1803.01.02
NOTES:	INVOICE TO accounting@maulfoster.com

TURNAROUND TIME
☐ Standard
☒ RUSH 1 bus. day (100% MU)
Rush charges authorized by: Heather Good

SAMPLE DISPOSAL
☐ Default: Clean after 3 days
☐ Archive (Fee may apply)

SAMPLE INFORMATION										ANALYSIS REQUESTED						
Sample Name	Lab ID	Canister ID	Flow Cont. ID	Reporting Level: IA=Indoor Air SG=Soil Gas (Circle One)	Date Sampled	Initial Vac. ("Hg)	Field Initial Time	Final Vac. ("Hg)	Field Final Time	TO15 Full Scan	TO15 BTEXN	TO15 cVOCs	APH	Helium	TCE by TO15	Notes
IA16-022020	01	18568	07854	(IA) / SG	02/20/20	-30	755	-6	1555						X	
IA17-022020	02	23235	06607	(IA) / SG	↓	-30	803	-9	1603						X	
IA19-022020	03	23234	07847	(IA) / SG	↓	-30	811	-6	1611						X	
				IA / SG												
				IA / SG												
				IA / SG												
				IA / SG												
				IA / SG												

Friedman & Bruya, Inc.
3012 16th Avenue West
Seattle, WA 98119-2029
Ph. (206) 285-8282
Fax (206) 283-5044

SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by:	Evelyn Lundeen	MFA	2/20	1655
Received by:	Yelena Aravkina	FTB	2/20	16:55
Relinquished by:				
Received by:		Samples received at 20 °C		

FORMS\COC\COCTO-15.DOC

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3/18/2020
Ms. Heather Good
Maul Foster and Alongi Inc.
1329 North State Street
Suite 301
Bellingham WA 98225

Project Name: Precision Engineering
Project #: 1803.01.02
Workorder #: 2003371

Dear Ms. Heather Good

The following report includes the data for the above referenced project for sample(s) received on 3/13/2020 at Air Toxics Ltd.

The data and associated QC analyzed by Passive S.E. RAD130/SKC are compliant with the project requirements or laboratory criteria with the exception of the deviations noted in the attached case narrative.

Thank you for choosing Eurofins Air Toxics Inc. for your air analysis needs. Eurofins Air Toxics Inc. is committed to providing accurate data of the highest quality. Please feel free to contact the Project Manager: Kelly Buettner at 916-985-1000 if you have any questions regarding the data in this report.

Regards,

Kelly Buettner

Project Manager

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WORK ORDER #: 2003371

Work Order Summary

CLIENT:	Ms. Heather Good Maul Foster and Alongi Inc. 1329 North State Street Suite 301 Bellingham, WA 98225	**BILL TO:**	Accounts Payable Maul Foster and Alongi Inc. 400 E. Mill Plain Blvd Suite 400 Vancouver, WA 98660
PHONE:	360-594-6262	**P.O. #**	
FAX:	360-594-6270	**PROJECT #**	1803.01.02 Precision Engineering
DATE RECEIVED:	03/13/2020	**CONTACT:**	Kelly Buettner
DATE COMPLETED:	03/18/2020		

FRACTION #	NAME	TEST
01A	RAD5	Passive S.E. RAD130/SKC
02A	RAD1-022020	Passive S.E. RAD130/SKC
03A	RAD4	Passive S.E. RAD130/SKC
04A	Trip Blank	Passive S.E. RAD130/SKC
05A	Lab Blank	Passive S.E. RAD130/SKC
06A	LCS	Passive S.E. RAD130/SKC
06AA	LCSD	Passive S.E. RAD130/SKC

CERTIFIED BY: Heidi Hayes

Technical Director

DATE: 03/18/20

180 BLUE RAVINE ROAD, SUITE B FOLSOM, CA - 95630
(916) 985-1000 . (800) 985-5955 . FAX (916) 351-8279

LABORATORY NARRATIVE
RAD130 Passive SE by Mod EPA TO-17
Maul Foster and Alongi Inc.
Workorder# 2003371

Four Radiello 130 (Solvent) samples were received on March 13, 2020. The laboratory analyzed the charcoal sorbent bed of the passive sampler following modified method EPA TO-17. The VOCs were chemically extracted using carbon disulfide and an aliquot of the extract was injected into a GC/MS for identification and quantification of volatile organic compounds (VOCs).

The mass of each target compound adsorbed by the sampler was converted to units of concentration using the sample deployment time and the sampling rate for each VOC. If sampling rates were calculated by the lab or the manufacturer, the concentration result has been flagged as an estimated value. Results are not corrected for desorption efficiency.

The reference method used for this procedure is EPA TO-17, which describes the collection of VOCs in ambient air using sorbents and analysis by GC/MS. Because TO-17 describes active sample collection using a pump and thermal desorption as the preparation step, several modifications are required. Modifications to TO-17 are listed in the table below:

Requirement	***TO-17***	***ATL Modifications***
Sample Collection	Pump pulls measured air volume through sorbent tube	VOCs in air adsorbed onto sorbent bed passively through diffusion
Sample Preparation	Thermal extraction	Solvent extraction
Sorbent tube conditioning	Condition newly packed tubes prior to use	Charcoal-based sorbent is a single use media and conditioning is conducted by vendor.
Instrumentation	Thermal desorption introduction system	Liquid injection introduction system
Internal Standard	Gas-phase internal standard introduced on the tube or focusing trap during analysis	Liquid-phase internal standard introduced on the tube at the time of extraction
Media and sample storage	<4 deg C, 30 days	Media shelf life is determined by vendor; sample hold-time is 6 months for the RAD130 and WMS. Sample preservation requirements are storage in a cool, solvent-free refrigerator and optional use of ice during shipping.
Internal Standard Recovery	+/-40% of daily CCV area	-50% to +100% of daily CCV area

Receiving Notes

There were no receiving discrepancies.

Analytical Notes

The uptake rates were corrected based on average field temperatures if provided. In the absence of field temperatures, the uptake rates determined at 25 deg C were used.

To calculate ug/m3 concentrations in the Lab Blank and Trip Blank, a sampling duration of 30475 minutes was applied. The assumed temperature used for the uptake rate is listed on the data page. If the field temperatures were provided, the rate was adjusted in the same manner as the field samples.

Definition of Data Qualifying Flags

Ten qualifiers may have been used on the data analysis sheets and indicate as follows:

B - Compound present in laboratory blank greater than reporting limit (background subtraction not performed).

J - Estimated value.

E - Exceeds instrument calibration range.

S - Saturated peak.

Q - Exceeds quality control limits.

U - Compound analyzed for but not detected above the reporting limit.

UJ- Non-detected compound associated with low bias in the CCV

N - The identification is based on presumptive evidence.

C - Estimated concentration due to calculated sampling rate

CN - See case narrative explanation.

File extensions may have been used on the data analysis sheets and indicates as follows:

a-File was requantified

b-File was quantified by a second column and detector

r1-File was requantified for the purpose of reissue

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Summary of Detected Compounds
VOCS BY PASSIVE SAMPLER - GC/MS

Client Sample ID: RAD5

Lab ID#: 2003371-01A

Compound	Rpt. Limit (ug)	Rpt. Limit (ug/m3)	Amount (ug)	Amount (ug/m3)
Trichloroethene	0.10	0.048	4.9	2.3

Client Sample ID: RAD1-022020

Lab ID#: 2003371-02A

Compound	Rpt. Limit (ug)	Rpt. Limit (ug/m3)	Amount (ug)	Amount (ug/m3)
Trichloroethene	0.10	0.048	2.8	1.3

Client Sample ID: RAD4

Lab ID#: 2003371-03A

Compound	Rpt. Limit (ug)	Rpt. Limit (ug/m3)	Amount (ug)	Amount (ug/m3)
Trichloroethene	0.10	0.048	5.4	2.6

Client Sample ID: Trip Blank

Lab ID#: 2003371-04A

No Detections Were Found.

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Client Sample ID: RAD5

Lab ID#: 2003371-01A

VOCS BY PASSIVE SAMPLER - GC/MS

File Name:	**c031706sim**	**Date of Collection: 3/12/20 12:21:00 PM**	
Dil. Factor:	**1.00**	**Date of Analysis: 3/17/20 11:11 AM**	
		Date of Extraction: 3/17/20	

Compound	Rpt. Limit (ug)	Rpt. Limit (ug/m3)	Amount (ug)	Amount (ug/m3)
Trichloroethene	0.10	0.048	4.9	2.3

Temperature = 77.0F , duration time = 30456 minutes.

Container Type: Radiello 130 (Solvent)

Surrogates	%Recovery	Method Limits
Toluene-d8	81	70-130

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Client Sample ID: RAD1-022020

Lab ID#: 2003371-02A

VOCS BY PASSIVE SAMPLER - GC/MS

File Name:	**c031707sim**	**Date of Collection: 3/12/20 12:24:00 PM**	
Dil. Factor:	**1.00**	**Date of Analysis: 3/17/20 11:36 AM**	
		Date of Extraction: 3/17/20	

Compound	Rpt. Limit (ug)	Rpt. Limit (ug/m3)	Amount (ug)	Amount (ug/m3)
Trichloroethene	0.10	0.048	2.8	1.3

Temperature = 77.0F , duration time = 30474 minutes.

Container Type: Radiello 130 (Solvent)

Surrogates	%Recovery	Method Limits
Toluene-d8	80	70-130

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Client Sample ID: RAD4

Lab ID#: 2003371-03A

VOCS BY PASSIVE SAMPLER - GC/MS

File Name:	**c031708sim**	**Date of Collection: 3/12/20 12:30:00 PM**	
Dil. Factor:	**1.00**	**Date of Analysis: 3/17/20 12:02 PM**	
		Date of Extraction: 3/17/20	

Compound	Rpt. Limit (ug)	Rpt. Limit (ug/m3)	Amount (ug)	Amount (ug/m3)
Trichloroethene	0.10	0.048	5.4	2.6

Temperature = 77.0F , duration time = 30475 minutes.
Container Type: Radiello 130 (Solvent)

Surrogates	%Recovery	Method Limits
Toluene-d8	80	70-130

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Client Sample ID: Trip Blank

Lab ID#: 2003371-04A

VOCS BY PASSIVE SAMPLER - GC/MS

File Name:	**c031709sim**	**Date of Collection: 3/12/20**	
Dil. Factor:	**1.00**	**Date of Analysis: 3/17/20 12:28 PM**	
		Date of Extraction: 3/17/20	

Compound	Rpt. Limit (ug)	Rpt. Limit (ug/m3)	Amount (ug)	Amount (ug/m3)
Trichloroethene	0.10	0.048	Not Detected	Not Detected

Temperature = 77.0F , duration time = 30475 minutes.
Container Type: Radiello 130 (Solvent)

Surrogates	%Recovery	Method Limits
Toluene-d8	82	70-130

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Client Sample ID: Lab Blank

Lab ID#: 2003371-05A

VOCS BY PASSIVE SAMPLER - GC/MS

File Name:	**c031705sim**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 3/17/20 10:27 AM**	
		Date of Extraction: 3/17/20	

Compound	Rpt. Limit (ug)	Rpt. Limit (ug/m3)	Amount (ug)	Amount (ug/m3)
Trichloroethene	0.10	0.048	Not Detected	Not Detected

Temperature = 77.0F , duration time = 30475 minutes.
Container Type: Radiello 130 (Solvent)

Surrogates	%Recovery	Method Limits
Toluene-d8	80	70-130

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Client Sample ID: LCS

Lab ID#: 2003371-06A

VOCS BY PASSIVE SAMPLER - GC/MS

File Name:	**c031703sim**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 3/17/20 09:31 AM**	
		Date of Extraction: 3/17/20	

Compound	%Recovery	Method Limits
Trichloroethene	100	70-130

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
Toluene-d8	82	70-130

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Client Sample ID: LCSD

Lab ID#: 2003371-06AA

VOCS BY PASSIVE SAMPLER - GC/MS

File Name:	**c031704sim**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 3/17/20 09:57 AM**	
		Date of Extraction: 3/17/20	

Compound	%Recovery	Method Limits
Trichloroethene	94	70-130

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
Toluene-d8	80	70-130

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Passive Sorbent Chain of Custody

WO#: 2003371

Case Seal #: _____

Company: Maul Foster & Alongi | Project #: 1803.01.02 | P.O.#

Project Manager: Heather Good | Project Name: Precision Engineering

Contact phone/email: hgood@maulfoster.com 360-594- | Collected by: Evelyn Lundeen

Sample Matrix (check one): Indoor/Outdoor Air | Soil Gas | Workplace Monitoring | Other( )

Reporting Units (circle): ppbv | ug/m3 | ppmv | mg/m3 | ug | ng

Turn Around Time: ☐ Normal ☒ Rush 3-Day (Specify)

Lab ID	Sample Identification	Sampler ID	Date of Deployment (mm/dd/yy)	Time of Deployment (hr:min)	Date of Retrieval (mm/dd/yy)	Time of Retrieval (hr:min)	Indoor/Outdoor Air	Soil Gas	Workplace Monitoring	Other	Analysis Requested	Sample Comments:
01A	RAD5	X951N	2/20/20	845	03/12/20	1221	X				TO-17	only TCE
02A	RAD1-022020	X953N	2/20/20	830	03/12/20	1224	X				TO-17	
03A	RAD4	X952N	02/20/20	835	03/12/20	1230	X				TO-17	
04A	Trip Blank	None *	02/20/20	—	03/12/20	—	X				TO-17	

Relinquished by:	Date	Time	Received by:	Date	Time	Notes to Lab:
Evelyn Lundeen	3/12/20	1815	GAC	3/13/20	0905	* did not have extra label sticker for trip blank
Relinquished by:	Date	Time	Received by:	Date	Time	

Relinquishing signature on this document indicates that samples are shipped in compliance with all applicable local, State, Federal, and international laws, regulations, and ordinances of any kind. Relinquishing signature also indicates agreement to hold harmless, defend, and indemnify Eurofins Air Toxics against any claim, demand, or action, of any kind, related to the collection, handling, or shipping of samples.

Lab Use Only

Shipper Name: FedEx | Air bill #:

Custody Seals Intact? Yes No None

Temperature (°C): NA

Sample Condition Upon Receipt (circle): Good | SDR

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

James E. Bruya, Ph.D.
Yelena Aravkina, M.S.
Michael Erdahl, B.S.
Arina Podnozova, B.S.
Eric Young, B.S.

3012 16th Avenue West
Seattle, WA 98119-2029
(206) 285-8282
fbi@isomedia.com
www.friedmanandbruya.com

May 6, 2020

Heather Good, Project Manager
Maul Foster Alongi
2815 2nd Ave, Suite 540
Seattle, WA 98121

Dear Ms Good:

Included are the results from the testing of material submitted on May 4, 2020 from the Precision Engineering 1803.01.03, F&BI 005024 project. There are 8 pages included in this report.

We appreciate this opportunity to be of service to you and hope you will call if you should have any questions.

Sincerely,

FRIEDMAN & BRUYA, INC.

Michael Erdahl
Project Manager

Enclosures
MFA0506R.DOC

CASE NARRATIVE

This case narrative encompasses samples received on May 4, 2020 by Friedman & Bruya, Inc. from the Maul Foster Alongi Precision Engineering 1803.01.03, F&BI 005024 project. Samples were logged in under the laboratory ID's listed below.

Laboratory ID	Maul Foster Alongi
005024 -01	IA16050220
005024 -02	IA17050220
005024 -03	IA18050220
005024 -04	IA19050220

All quality control requirements were acceptable.

Analysis For Volatile Compounds By Method TO-15

Client Sample ID:	IA16050220	Client:	Maul Foster Alongi
Date Received:	05/04/20	Project:	Precision Engineering 1803.01.03
Date Collected:	05/02/20	Lab ID:	005024-01
Date Analyzed:	05/04/20	Data File:	050416.D
Matrix:	Air	Instrument:	GCMS7
Units:	ug/m3	Operator:	bat

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
4-Bromofluorobenzene	101	70	130

Compounds:	Concentration ug/m3	ppbv
Trichloroethene	<0.27	<0.05

Analysis For Volatile Compounds By Method TO-15

Client Sample ID:	IA17050220	Client:	Maul Foster Alongi
Date Received:	05/04/20	Project:	Precision Engineering 1803.01.03
Date Collected:	05/02/20	Lab ID:	005024-02
Date Analyzed:	05/04/20	Data File:	050413.D
Matrix:	Air	Instrument:	GCMS7
Units:	ug/m3	Operator:	bat

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
4-Bromofluorobenzene	96	70	130

Compounds:	Concentration ug/m3	ppbv
Trichloroethene	<0.27	<0.05

Analysis For Volatile Compounds By Method TO-15

Client Sample ID:	IA18050220	Client:	Maul Foster Alongi
Date Received:	05/04/20	Project:	Precision Engineering 1803.01.03
Date Collected:	05/02/20	Lab ID:	005024-03
Date Analyzed:	05/04/20	Data File:	050414.D
Matrix:	Air	Instrument:	GCMS7
Units:	ug/m3	Operator:	bat

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
4-Bromofluorobenzene	83	70	130

Compounds:	Concentration ug/m3	ppbv
Trichloroethene	<0.27	<0.05

Analysis For Volatile Compounds By Method TO-15

Client Sample ID:	IA19050220	Client:	Maul Foster Alongi
Date Received:	05/04/20	Project:	Precision Engineering 1803.01.03
Date Collected:	05/02/20	Lab ID:	005024-04
Date Analyzed:	05/04/20	Data File:	050415.D
Matrix:	Air	Instrument:	GCMS7
Units:	ug/m3	Operator:	bat

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
4-Bromofluorobenzene	83	70	130

Compounds:	Concentration ug/m3	ppbv
Trichloroethene	<0.27	<0.05

Analysis For Volatile Compounds By Method TO-15

Client Sample ID:	Method Blank	Client:	Maul Foster Alongi
Date Received:	Not Applicable	Project:	Precision Engineering 1803.01.03
Date Collected:	Not Applicable	Lab ID:	00-0991 mb
Date Analyzed:	05/04/20	Data File:	050411.D
Matrix:	Air	Instrument:	GCMS7
Units:	ug/m3	Operator:	bat

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
4-Bromofluorobenzene	108	70	130

Compounds:	Concentration ug/m3	ppbv
Trichloroethene	<0.27	<0.05

Date of Report: 05/06/20
Date Received: 05/04/20
Project: Precision Engineering 1803.01.03, F&BI 005024

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF AIR SAMPLES FOR VOLATILES BY METHOD TO-15

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Trichloroethene	ug/m3	73	80	70-130

Data Qualifiers & Definitions

a - The analyte was detected at a level less than five times the reporting limit. The RPD results may not provide reliable information on the variability of the analysis.

b - The analyte was spiked at a level that was less than five times that present in the sample. Matrix spike recoveries may not be meaningful.

ca - The calibration results for the analyte were outside of acceptance criteria. The value reported is an estimate.

c - The presence of the analyte may be due to carryover from previous sample injections.

cf - The sample was centrifuged prior to analysis.

d - The sample was diluted. Detection limits were raised and surrogate recoveries may not be meaningful.

dv - Insufficient sample volume was available to achieve normal reporting limits.

f - The sample was laboratory filtered prior to analysis.

fb - The analyte was detected in the method blank.

fc - The analyte is a common laboratory and field contaminant.

hr - The sample and duplicate were reextracted and reanalyzed. RPD results were still outside of control limits. Variability is attributed to sample inhomogeneity.

hs - Headspace was present in the container used for analysis.

ht – The analysis was performed outside the method or client-specified holding time requirement.

ip - Recovery fell outside of control limits due to sample matrix effects.

j - The analyte concentration is reported below the lowest calibration standard. The value reported is an estimate.

J - The internal standard associated with the analyte is out of control limits. The reported concentration is an estimate.

jl - The laboratory control sample(s) percent recovery and/or RPD were out of control limits. The reported concentration should be considered an estimate.

js - The surrogate associated with the analyte is out of control limits. The reported concentration should be considered an estimate.

lc - The presence of the analyte is likely due to laboratory contamination.

L - The reported concentration was generated from a library search.

nm - The analyte was not detected in one or more of the duplicate analyses. Therefore, calculation of the RPD is not applicable.

pc - The sample was received with incorrect preservation or in a container not approved by the method. The value reported should be considered an estimate.

ve - The analyte response exceeded the valid instrument calibration range. The value reported is an estimate.

vo - The value reported fell outside the control limits established for this analyte.

x - The sample chromatographic pattern does not resemble the fuel standard used for quantitation.

005024

SAMPLE CHAIN OF CUSTODY ME 05/04/20

Page # 1 of 1

Report To Heather Good

Company Maul Foster + Alongi

Address 1329 North State St., #301

City, State, ZIP Bellingham, WA 98225

Phone 360-929-1309 Email hgood@maulfoster.com

SAMPLERS (*signature*)

PROJECT NAME & ADDRESS: Precision Engineering, 1231 S Director St., Seattle, WA 98108

PO # 1803.01.03

NOTES:

INVOICE TO accounting@maulfoster.com

TURNAROUND TIME
- ☐ Standard
- ☒ RUSH 1 business day

Rush charges authorized by: Heather Good

SAMPLE DISPOSAL
- ☐ Default: Clean after 3 days
- ☐ Archive (Fee may apply)

SAMPLE INFORMATION										ANALYSIS REQUESTED						
Sample Name	Lab ID	Canister ID	Flow Cont. ID	Reporting Level: IA=Indoor Air SG=Soil Gas (Circle One)	Date Sampled	Initial Vac. ("Hg)	Field Initial Time	Final Vac. ("Hg)	Field Final Time	TO15 Full Scan	TO15 BTEXN	TO15 cVOCs	APH	Helium	TCE by TO15	Notes
IA1605022O	01	35338	05351	(IA) / SG	5/2/20	-29.5	1507	-8	1507						X	
IA1705022O	02	20554	07870	(IA) / SG	5/2/20	-29	1511	-6	1511						X	
IA1805022O	03	20544	06603	(IA) / SG	5/2/20	-30	1515	-7	1515						X	
IA1905022O	04	18563	05347	(IA) / SG	5/2/20	-30	1519	-9	1519						X	
				IA / SG												
				IA / SG												
				IA / SG												
				IA / SG												Samples received at 16 °C

SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by:	Evelyn Lundeen	MFA	5/4	903
Received by:	Eric Young	ERS	5/4	903
Relinquished by:				
Received by:				

Friedman & Bruya, Inc.
3012 16th Avenue West
Seattle, WA 98119-2029
Ph. (206) 285-8282
Fax (206) 283-5044

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6/12/2020
Ms. Heather Good
Maul Foster and Alongi Inc.
1329 North State Street
Suite 301
Bellingham WA 98225

Project Name: Precision Engineering
Project #: 1803.01.02
Workorder #: 2006201

Dear Ms. Heather Good

The following report includes the data for the above referenced project for sample(s) received on 6/9/2020 at Air Toxics Ltd.

The data and associated QC analyzed by Passive S.E. RAD130/SKC are compliant with the project requirements or laboratory criteria with the exception of the deviations noted in the attached case narrative.

Thank you for choosing Eurofins Air Toxics Inc. for your air analysis needs. Eurofins Air Toxics Inc. is committed to providing accurate data of the highest quality. Please feel free to contact the Project Manager: Alexandra Winslow at 916-985-1000 if you have any questions regarding the data in this report.

Regards,

Alexandra Winslow

Project Manager

eurofins | Air Toxics

WORK ORDER #: 2006201

Work Order Summary

CLIENT:	Ms. Heather Good Maul Foster and Alongi Inc. 1329 North State Street Suite 301 Bellingham, WA 98225	**BILL TO:**	Accounts Payable Maul Foster and Alongi Inc. 400 E. Mill Plain Blvd Suite 400 Vancouver, WA 98660
PHONE:	360-594-6262	**P.O. #**	
FAX:	360-594-6270	**PROJECT #**	1803.01.02 Precision Engineering
DATE RECEIVED:	06/09/2020	**CONTACT:**	Alexandra Winslow
DATE COMPLETED:	06/12/2020		

FRACTION #	NAME	TEST
01A	RAD1-051520	Passive S.E. RAD130/SKC
02A	RAD4-051520	Passive S.E. RAD130/SKC
03A	RAD5-051520	Passive S.E. RAD130/SKC
04A	Trip Blank	Passive S.E. RAD130/SKC
05A	Lab Blank	Passive S.E. RAD130/SKC
06A	LCS	Passive S.E. RAD130/SKC
06AA	LCSD	Passive S.E. RAD130/SKC

CERTIFIED BY: Heidi Hayes DATE: 06/12/20

Technical Director

Certification numbers: AZ Licensure AZ0775, FL NELAP – E87680, LA NELAP – 02089, NH NELAP - 209219, NJ NELAP - CA016, NY NELAP - 11291, TX NELAP - T104704434-19-14, UT NELAP – CA009332019-11, VA NELAP - 460197, WA NELAP - C935
Name of Accreditation Body: NELAP/ORELAP (Oregon Environmental Laboratory Accreditation Program)
Accreditation number: CA300005-013, Effective date: 10/18/2019, Expiration date: 10/17/2020.
Eurofins Air Toxics, LLC certifies that the test results contained in this report meet all requirements of the NELAC standards

180 BLUE RAVINE ROAD, SUITE B FOLSOM, CA - 95630
(916) 985-1000 . (800) 985-5955 . FAX (916) 351-8279

LABORATORY NARRATIVE
RAD130 Passive SE by Mod EPA TO-17
Maul Foster and Alongi Inc.
Workorder# 2006201

Four Radiello 130 (Solvent) samples were received on June 09, 2020. The laboratory analyzed the charcoal sorbent bed of the passive sampler following modified method EPA TO-17. The VOCs were chemically extracted using carbon disulfide and an aliquot of the extract was injected into a GC/MS for identification and quantification of volatile organic compounds (VOCs).

The mass of each target compound adsorbed by the sampler was converted to units of concentration using the sample deployment time and the sampling rate for each VOC. If sampling rates were calculated by the lab or the manufacturer, the concentration result has been flagged as an estimated value. Results are not corrected for desorption efficiency.

The reference method used for this procedure is EPA TO-17, which describes the collection of VOCs in ambient air using sorbents and analysis by GC/MS. Because TO-17 describes active sample collection using a pump and thermal desorption as the preparation step, several modifications are required. Modifications to TO-17 are listed in the table below:

Requirement	***TO-17***	***ATL Modifications***
Sample Collection	Pump pulls measured air volume through sorbent tube	VOCs in air adsorbed onto sorbent bed passively through diffusion
Sample Preparation	Thermal extraction	Solvent extraction
Sorbent tube conditioning	Condition newly packed tubes prior to use	Charcoal-based sorbent is a single use media and conditioning is conducted by vendor.
Instrumentation	Thermal desorption introduction system	Liquid injection introduction system
Internal Standard	Gas-phase internal standard introduced on the tube or focusing trap during analysis	Liquid-phase internal standard introduced on the tube at the time of extraction
Media and sample storage	<4 deg C, 30 days	Media shelf life is determined by vendor; sample hold-time is 6 months for the RAD130 and WMS. Sample preservation requirements are storage in a cool, solvent-free refrigerator and optional use of ice during shipping.
Internal Standard Recovery	+/-40% of daily CCV area	-50% to +100% of daily CCV area

Receiving Notes

The Chain of Custody (COC) was not relinquished properly. A signature, date and time were not provided by the field sampler.

A revised Chain of Custody (COC) was provided by the client on 06/09/20.

Analytical Notes

The uptake rates were corrected based on average field temperatures if provided. In the absence of field temperatures, the uptake rates determined at 25 deg C were used.

To calculate ug/m3 concentrations in the Lab Blank and Trip Blank, a sampling duration of 30238 minutes was applied. The assumed temperature used for the uptake rate is listed on the data page. If the field temperatures were provided, the rate was adjusted in the same manner as the field samples.

Definition of Data Qualifying Flags

Ten qualifiers may have been used on the data analysis sheets and indicate as follows:

B - Compound present in laboratory blank greater than reporting limit (background subtraction not performed).

J - Estimated value.
E - Exceeds instrument calibration range.
S - Saturated peak.
Q - Exceeds quality control limits.
U - Compound analyzed for but not detected above the reporting limit.
UJ- Non-detected compound associated with low bias in the CCV
N - The identification is based on presumptive evidence.
C - Estimated concentration due to calculated sampling rate
CN - See case narrative explanation.

File extensions may have been used on the data analysis sheets and indicates as follows:

a-File was requantified
b-File was quantified by a second column and detector
r1-File was requantified for the purpose of reissue

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Summary of Detected Compounds
VOCS BY PASSIVE SAMPLER - GC/MS

Client Sample ID: RAD1-051520

Lab ID#: 2006201-01A

Compound	Rpt. Limit (ug)	Rpt. Limit (ug/m3)	Amount (ug)	Amount (ug/m3)
Trichloroethene	0.10	0.048	2.8	1.4

Client Sample ID: RAD4-051520

Lab ID#: 2006201-02A

Compound	Rpt. Limit (ug)	Rpt. Limit (ug/m3)	Amount (ug)	Amount (ug/m3)
Trichloroethene	0.10	0.048	5.5	2.6

Client Sample ID: RAD5-051520

Lab ID#: 2006201-03A

Compound	Rpt. Limit (ug)	Rpt. Limit (ug/m3)	Amount (ug)	Amount (ug/m3)
Trichloroethene	0.10	0.048	3.6	1.7

Client Sample ID: Trip Blank

Lab ID#: 2006201-04A

No Detections Were Found.

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Client Sample ID: RAD1-051520

Lab ID#: 2006201-01A

VOCS BY PASSIVE SAMPLER - GC/MS

File Name:	**c061010sim**	**Date of Collection: 6/5/20 3:11:00 PM**	
Dil. Factor:	**1.00**	**Date of Analysis: 6/10/20 11:01 AM**	
		Date of Extraction: 6/10/20	

Compound	Rpt. Limit (ug)	Rpt. Limit (ug/m3)	Amount (ug)	Amount (ug/m3)
Trichloroethene	0.10	0.048	2.8	1.4

Temperature = 77.0F , duration time = 30238 minutes.
Container Type: Radiello 130 (Solvent)

Surrogates	%Recovery	Method Limits
Toluene-d8	79	70-130

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Client Sample ID: RAD4-051520

Lab ID#: 2006201-02A

VOCS BY PASSIVE SAMPLER - GC/MS

File Name:	**c061011sim**	**Date of Collection: 6/5/20 3:15:00 PM**	
Dil. Factor:	**1.00**	**Date of Analysis: 6/10/20 11:28 AM**	
		Date of Extraction: 6/10/20	

Compound	Rpt. Limit (ug)	Rpt. Limit (ug/m3)	Amount (ug)	Amount (ug/m3)
Trichloroethene	0.10	0.048	5.5	2.6

Temperature = 77.0F , duration time = 30235 minutes.
Container Type: Radiello 130 (Solvent)

Surrogates	%Recovery	Method Limits
Toluene-d8	80	70-130

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Client Sample ID: RAD5-051520

Lab ID#: 2006201-03A

VOCS BY PASSIVE SAMPLER - GC/MS

File Name:	**c061012sim**	**Date of Collection: 6/5/20 3:18:00 PM**	
Dil. Factor:	**1.00**	**Date of Analysis: 6/10/20 11:55 AM**	
		Date of Extraction: 6/10/20	

Compound	Rpt. Limit (ug)	Rpt. Limit (ug/m3)	Amount (ug)	Amount (ug/m3)
Trichloroethene	0.10	0.048	3.6	1.7

Temperature = 77.0F , duration time = 30234 minutes.
Container Type: Radiello 130 (Solvent)

Surrogates	%Recovery	Method Limits
Toluene-d8	77	70-130

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Client Sample ID: Trip Blank

Lab ID#: 2006201-04A

VOCS BY PASSIVE SAMPLER - GC/MS

File Name:	**c061013sim**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 6/10/20 12:22 PM**	
		Date of Extraction: 6/10/20	

Compound	Rpt. Limit (ug)	Rpt. Limit (ug/m3)	Amount (ug)	Amount (ug/m3)
Trichloroethene	0.10	0.048	Not Detected	Not Detected

Temperature = 77.0F , duration time = 30238 minutes.
Container Type: Radiello 130 (Solvent)

Surrogates	%Recovery	Method Limits
Toluene-d8	80	70-130

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Client Sample ID: Lab Blank

Lab ID#: 2006201-05A

VOCS BY PASSIVE SAMPLER - GC/MS

File Name:	**c061005sim**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 6/10/20 08:47 AM**	
		Date of Extraction: 6/10/20	

Compound	Rpt. Limit (ug)	Rpt. Limit (ug/m3)	Amount (ug)	Amount (ug/m3)
Trichloroethene	0.10	0.048	Not Detected	Not Detected

Temperature = 77.0F , duration time = 30238 minutes.
Container Type: Radiello 130 (Solvent)

Surrogates	%Recovery	Method Limits
Toluene-d8	79	70-130

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Client Sample ID: LCS

Lab ID#: 2006201-06A

VOCS BY PASSIVE SAMPLER - GC/MS

File Name:	**c061003sim**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 6/10/20 07:54 AM**	
		Date of Extraction: 6/10/20	

Compound	%Recovery	Method Limits
Trichloroethene	98	70-130

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
Toluene-d8	80	70-130

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Client Sample ID: LCSD

Lab ID#: 2006201-06AA

VOCS BY PASSIVE SAMPLER - GC/MS

File Name:	**c061004sim**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 6/10/20 08:20 AM**	
		Date of Extraction: 6/10/20	

Compound	%Recovery	Method Limits
Trichloroethene	94	70-130

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
Toluene-d8	79	70-130

Revised COC 6/09/20

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Passive Sorbent Chain of Custody

WO#: 2006201

Case Seal #:

Company:	Maul Foster & Alongi	Project #: 1803.01.02	P.O.#
Project Manager:	Heather Good	Project Name:	Precision Engineering
Contact phone/email:	360.594.6268 hgood@maulfoster.com	Collected by:	Evelyn Lundeen

Sample Matrix (check one): Indoor/Outdoor Air | Soil Gas | Workplace Monitoring | Other

Reporting Units (circle): ppbv ug/m3 ppmv mg/m3 ug ng

Turn Around Time: ☐ Normal ☒ Rush 3-day TAT (Specify)

Lab ID	Sample Identification	Sampler ID	Date of Deployment (mm/dd/yy)	Time of Deployment (hr:min)	Date of Retrieval (mm/dd/yy)	Time of Retrieval (hr:min)	Indoor/Outdoor Air	Soil Gas	Workplace Monitoring	Other	Analysis Requested	Sample Comments:
01A	RAD1-051520	Y714B	05/15/20	15:13	06/05/20	15:11	X				TO-17 TCE ONLY	
02A	RAD4-051520	X907U	05/15/20	15:20	06/05/20	15:15	X				TO-17 TCE ONLY	
03A	RAD5-051520	Y712B	05/15/20	15:24	06/05/20	15:18	X				TO-17 TCE ONLY	
04A	Trip Blank	Y713B	N/A	N/A	N/A	N/A					TO-17 TCE ONLY	

Relinquished by: Evelyn Lundeen	Date 06/08/20	Time 13:40	Received by: FedEx	Date	Time	Notes to Lab: MRL needed </= 0.37 ug/m3
Relinquished by:	Date	Time	Received by:	Date	Time	

Relinquishing signature on this document indicates that samples are shipped in compliance with all applicable local, State, Federal, and international laws, regulations, and ordinances of any kind. Relinquishing signature also indicates agreement to hold harmless, defend, and indemnify Eurofins Air Toxics against any claim, demand, or action, of any kind, related to the collection, handling, or shipping of samples.

Lab Use Only

Shipper Name:	Custody Seals Intact?	Yes	No	None	Sample Condition Upon Receipt: (circle)	Good SDR
Air bill #:	Temperature (°C)					

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Passive Sorbent Chain of Custody

WO#: 200620|

Case Seal #: _____

Company: MaulFoster & Alongi Project #: 1803.01.02 P.O.#

Project Manager: Heather Good hgood@maulfoster.com Project Name: Precision Engineering

Contact phone/email: 360.594.6268 Collected by: Evelyn Lundeen

Lab ID	Sample Identification	Sampler ID	Date of Deployment (mm/dd/yy)	Time of Deployment (hr:min)	Date of Retrieval (mm/dd/yy)	Time of Retrieval (hr:min)	Sample Matrix (check one): Indoor/Outdoor Air	Soil Gas	Workplace Monitoring	Other( )	Analysis Requested	Sample Comments:
	RAD1-051520	Y714B	05/15/20	15:13	06/04/20	15:11	X				TO-17	Only TCE
	RAD4-051520	X907U	05/15/20	15:20	06/04/20	15:15	X				TO-17	
	RAD5-051520	Y712B	05/15/20	15:24	06/10/20	15:18	X				TO-17	
	Trip Blank	Y713B	N/A	NA	NA	NA					TO-17	

Reporting Units (circle): ppbv ug/m3 ppmv mg/m3 ug ng

Turn Around Time: ☐ Normal ☒ Rush 3 day (Specify)

Relinquished by:	Date	Time	Received by:	Date	Time	Notes to Lab:
Evelyn Lundeen	6/8/2020	1340		6/8/20	1:40p	MRL needed 4/= 0.37 ug/m3
Relinquished by:	Date	Time	Received by:	Date	Time	
			SEATAC	6/09/20	1038	

Relinquishing signature on this document indicates that samples are shipped in compliance with all applicable local, State, Federal, and international laws, regulations, and ordinances of any kind. Relinquishing signature also indicates agreement to hold harmless, defend, and indemnify Eurofins Air Toxics against any claim, demand, or action, of any kind, related to the collection, handling, or shipping of samples.

Lab Use Only

Shipper Name: FedEx	Custody Seals Intact?	Yes	No	None	Sample Condition Upon Receipt: (circle)	Good	SDR
Air bill #:	Temperature (°C)	NA					

APPENDIX E

DATA VALIDATION MEMORANDUM

DATA QUALITY ASSURANCE/QUALITY CONTROL REVIEW

PROJECT NO. 1803.01.02 | JULY 1, 2020 | PRECISION ENGINEERING, INC.

Maul Foster & Alongi, Inc. (MFA) conducted an independent review of the quality of analytical results for sub-slab, indoor air, outdoor air, and groundwater samples collected at the Precision Engineering, Inc., site located at 1231 S Director Street in Seattle, Washington. The samples were collected from February to June 2020.

Friedman & Bruya, Inc. (FBI) and Eurofins Air Toxics (Eurofins) performed the analyses. FBI report 002001-amended, 002154, 002298, and 005024 and Eurofins report numbers 2002351, 2003371, and 2006201 were reviewed. Additional FBI reports were issued based on follow-up analyses requested by the MFA project manager (reports 002001-additional and 002154-additional). The analyses performed and samples analyzed are listed in the tables below.

Analysis	Reference
DRO and ORO	NWTPH-Dx
Helium	ASTM D1946
Total Metals	USEPA 6020B
VOCs—Summa Canister	USEPA TO-15
VOCs—Radiello 130	USEPA TO-17 Modified
VOCs—Groundwater	USEPA 8260D

NOTES:
ASTM = ASTM International.
DRO = diesel-range organics.
NWTPH = Northwest Total Petroleum Hydrocarbons.
ORO = oil-range organics.
USEPA = U.S. Environmental Protection Agency.
VOCs = volatile organic compounds.

Samples Analyzed				
Report 002001-amended/ 002001-additional		**Report 002154/ 002154-additional**	**Report 002298**	**Report 005024**
A8	IA13	IA16	IA16-022020	IA16050220
A9	IA14	IA17	IA17-022020	IA17050220
A10	IA15	IA18	IA19-022020	IA18050220
A11	AA1	IA19	--	IA19050220
IA8-020120	AA2	IA20	--	--
IA9	AA3	EvapPit-W-021120	--	--
IA10	AA4	--	--	--
IA11	AA5	--	--	--
IA12	--	--	--	--
Report 2002351	**Report 2003371**	**Report 2006201**	--	--
RAD1	RAD5	RAD1-051520	--	--
RAD2	RAD1-022020	RAD4-051520	--	--
RAD3	RAD4	RAD5-051520	--	--
Trip Blank	Trip Blank	Trip Blank	--	--

DATA QUALIFICATIONS

Analytical results were evaluated according to applicable sections of U.S. Environmental Protection Agency (USEPA) procedures (USEPA, 2017) and appropriate laboratory and method-specific guidelines (Eurofins, 2019; FBI, 2019; USEPA, 1986).

Data validation procedures were modified, as appropriate, to accommodate quality-control requirements for methods not specifically addressed by the USEPA procedures (e.g., NWTPH-Dx).

In report 002001-amended, the USEPA Method TO-15 trichloroethene (TCE) results from samples IA8-020120, IA10, IA9, IA11, IA12, IA13, and IA15 were flagged by FBI as exceeding the upper limit of the instrument calibration range. The TCE results were reanalyzed at a ten-fold dilution. Reanalyzed results were reported in the 002001-additional laboratory report; the record of results is shown in the table below.

Report	Sample	Component	Original Result (ug/m^3)	Record of Result (ug/m^3)
002001-amended/ 002001-additional	IA8-020120	Trichloroethene	210	270
	IA10		260	340
	IA9		250	330
	IA11		140	170
	IA12		160	200

Report	Sample	Component	Original Result (ug/m3)	Record of Result (ug/m3)
	IA13		180	210
	IA15		150	170

NOTES:
J = result is estimated.
ug/m3 = micrograms per cubic meter.

In report 002154, FBI indicated that NWTPH-Dx diesel-range hydrocarbon and motor oil-range hydrocarbon results for sample EvapPit-W-021120 had chromatographic patterns that did not resemble the diesel fuel or motor oil fuel standards used for quantitation. FBI indicated that the results most closely resemble a cutting oil, transformer oil, or a fuel metabolite (Erdahl, 2020). The results were reported as diesel-range hydrocarbons and oil-range hydrocarbons; thus, qualification based on chromatographic pattern-matching was not required.

Sub-slab samples submitted for reports 002001-amended and 002001-additional were collected under a helium shroud to detect leaks in the collection system. Helium was not detected in the associated samples.

The data are considered acceptable for their intended use, with the appropriate data qualifiers assigned.

HOLDING TIMES, PRESERVATION, AND SAMPLE STORAGE

Holding Times

Analyses were performed within the recommended holding time criteria.

Preservation and Sample Storage

The samples were preserved and stored appropriately.

BLANKS

Method Blanks

Laboratory method blank analyses were performed at the required frequencies. For purposes of data qualification, the method blanks were associated with all samples prepared in the analytical batch.

According to report 2002351, the method laboratory blank and trip blank were analyzed for 17120 minutes, based on the longest amount of time collected of the submitted samples.

According to report 2003371, the method laboratory blank and trip blank were analyzed for 30475 minutes, based on the longest amount of time collected of the submitted samples.

In report 002154-additional, the USEPA Method 6020B method blank arsenic result was flagged by the laboratory as being estimated and reported below the lowest calibration standard. The validator confirmed with the laboratory that the method blank and associated sample arsenic results were evaluated to the method detection limit. No additional action was required.

All laboratory method blanks were non-detect.

Trip Blanks

Trip blanks are required for 8260D analyses but were not submitted with reports 002001 and 002154. Trip blanks were submitted with reports 2002351, 2003371, and 2006301 for Radiello 130 TO-17-Modified analysis. All trip blank results were non-detect.

Equipment Rinsate Blanks

Equipment rinsate blanks were not required for this sampling event, as all samples were collected using dedicated, single-use equipment.

SURROGATE RECOVERY RESULTS

The samples were spiked with surrogate compounds to evaluate laboratory performance on individual samples. All surrogate recoveries were within acceptance limits.

MATRIX SPIKE/MATRIX SPIKE DUPLICATE RESULTS

Matrix spike/matrix spike duplicate (MS/MSD) results are used to evaluate laboratory precision and accuracy. MS/MSD samples were extracted and analyzed at the required frequency. Where MS/MSD samples were not included, analytical batch precision and accuracy were evaluated with laboratory control sample (LCS) and LCS duplicate (LCSD) results. All MS/MSD results were within acceptance limits for percent recovery and relative percent difference (RPD).

LABORATORY DUPLICATE RESULTS

Duplicate results are used to evaluate laboratory precision. All duplicate samples were extracted and analyzed at the required frequency. Laboratory duplicate results within five times the reporting limit were not evaluated for precision. All laboratory duplicate RPDs were within acceptance limits.

LABORATORY CONTROL SAMPLE/LABORATORY CONTROL SAMPLE DUPLICATE RESULTS

An LCS/LCSD is spiked with target analytes to provide information on laboratory precision and accuracy. The LCS/LCSD samples were extracted and analyzed at the required frequency. All LCS and LCSD results were within acceptance limits for percent recovery and RPD.

FIELD DUPLICATE RESULTS

Field duplicate samples measure both field and laboratory precision. No field duplicates were submitted.

REPORTING LIMITS

FBI used routine reporting limits for non-detect results—except for samples requiring dilutions because of high analyte concentrations and/or matrix interferences. Eurofins used routine reporting limits for non-detect results. Some results were reported to method detection limits and were appropriately flagged by the laboratory.

DATA PACKAGE

The data packages were reviewed for transcription errors, omissions, and anomalies.

Report 002001 was issued as "002001-amended," due to sample name corrections that the MFA project manager requested. The 002001-additional report was issued to report reanalyzed USEPA TO-15 TCE results.

Report 002154 was delivered in two reports, 002154 and 002154-additional, due to the different reporting deadlines requested by the MFA project manager.

According to report 2006201, the chain of custody (COC) was not relinquished properly. The reviewer confirmed that the COC was correctly relinquished by the MFA sampler and correctly recorded for receipt by Eurofins; however, it was incorrectly signed for receipt by the commercial shipper, FedEx, before the shipping container and COC were sealed for shipment by the MFA sampler. Commercial shipments are typically documented on the COC or laboratory receipt forms by recording the shipper company name and waybill number. Custody signatures are not required from commercial shippers. The missing signature, date, and time discussed in the case narrative are not required because they are associated with an incorrect receipt recorded by FedEx. The reviewer also noted that custody seals were not used, and a FedEx waybill number was not noted on the COC. Sample custody protocols were reviewed with the MFA sampler and the laboratory. No additional action was required.

According to report 2006201, a revised COC was provided by MFA on June 9, 2020, and included in the final report as a supplement to the original COC. The reviewer confirmed that the COC was revised to indicate that sample retrieval dates were corrected from June 4, 2020, to June 5, 2020.

No additional issues were found.

REFERENCES

Erdahl, M. 2020. Email (re: chromatograms for lab report 002154) to A. Bixby, Maul Foster & Alongi, Inc., Bellingham, Washington, from Mike Erdahl, Friedman & Bruya, Inc., Seattle, Washington. December 18.

Eurofins. 2019. Laboratory quality assurance manual. Revision 13. Eurofins Air Toxics. Folsom, California. September 9.

FBI. 2019. Quality systems manual. Revision 169. Friedman & Bruya, Inc., Seattle, Washington. October 2.

USEPA. 1986. Test methods for evaluating solid waste, physical/chemical methods. EPA publication SW-846. 3d ed. U.S. Environmental Protection Agency. Final updates I (1993), II (1995), IIA (1994), IIB (1995), III (1997), IIIA (1999), IIIB (2005), IV (2008), V (2015), VI phase I (2017), VI phase II (2018), and VI phase III (2019).

USEPA. 2017. USEPA contract laboratory program, national functional guidelines for Superfund organic methods data review. EPA 540-R-2017-002. U.S. Environmental Protection Agency, Office of Superfund Remediation and Technology Innovation. January.

APPENDIX F

HVAC ASSESSMENT

Commissioning Site Assessment

February 13, 2020

Maul Foster Alongi, Inc. (Pacific Industrial site)

Attendees:

Byron Holmstead	WCG, Commissioning Authority
Heather Good	Maul Foster Alongi, Inc.
Lee Frazier	Pacific Industrial

Time: 10:30 AM
Weather: Cloudy, Windy 44°F

Welsh Commissioning Group Inc. (WCG) was hired under contract with Maul Foster & Alongi Inc. to provide an independent assessment of the HVAC system and specifically the ventilation system at the Pacific Industrial Supply Co. building as follows:

1. Evaluate the existing HVAC system and determine if there are reasonable steps we can take to increase ventilation and pressurization of the building (or occupied spaces).
2. Give us some general guidance on the potential to install carbon treatment in the HVAC system.

The project manager for Maul Foster Alongi is Heather Good, LHG. The assessment was led by Commissioning Project Manager Byron Holmstead and Bryan Welsh served as Managing Principal. Present part of the time was the building owner Lee Frazier to give access and a tour through the building.
The Building Commissioning Association (BCA) has developed a process of commissioning existing buildings. WCG used this existing building commissioning (EBCx) approach for the assessment. The assessment included an observation of the existing HVAC operation.
Building Description:

- Warehouse building built originally around 1968, slab-on-grade, concrete un-insulated walls and wood insulated roof joists and deck with combination asphalt and rubber roof deck at approximately 62,000 square feet. Some attached out buildings for storage not included in assessment.
- Warehouse with three bays each approximately 100’ x 200’ with partial walls within and between each bay and an open corridor connecting all three bays. The warehouses were built at different times going from East to West. However, HVAC system seems consistent with the last addition or remodel.
- There are three separately enclosed areas within the warehouse that are 2-stories. The main offices in the center warehouse of approximately

2,000 square feet. Breakroom and locker room / storage above in the east bay, Shipping and receiving offices in the west bay.

- The east bay is primarily the industrial tools store, warehouse staff break room and locker and storage above. The center and west bays are for storage, fabrication, shipping and receiving.
- The east bay is the only warehouse portion of the warehouse that is currently heated.
- The main office is heated and cooled by a packaged Trane rooftop unit.
- Several bay doors around the building perimeter are commonly left open during normal business operations.
- The outside air temperature at the time of observation was around 44°F, the east bay was in the upper 60s, the center and west bays were in the upper 50s and the main office space was for the most part at setpoint in most spaces of 75°F. There was one office with the thermostat setpoint set at 60°F and the room was close to that temperature with a supply air temperature of 59°F.
- There were two large overhead doors mostly open on the south side of the center and west bays and one open on the north side center bay. The wind blows through the warehouse and plastic strip curtains are installed at the doors to help minimize the wind.

HVAC systems:

- The building was purchased around 2008 with little knowledge of the existing HVAC system shared by the previous owner.
- Heating for the east warehouse bay is provided by an antiquated hydronic hot water system with the smaller of the two gas water boilers in a small outbuilding attached to the south of the warehouse. The heating water system consists of two different sized boilers with primary boiler pumps and a secondary loop pump. The system is set to operate at 160°F supply water. There are several hot water unit heaters that blow air down from the ceiling. The hot water continuously pumped through the coils and the fans cycle with a thermostat. There is an inline ducted unit heater that is not running but looks capable of operation that serves the break room and storage / locker rooms above.
- There are three abandoned natural gas direct fired make up air units on the roof, one in the center of each bay. The discharge of the rooftop make-up air units are a centralized custom built ducted diffuser system. There are relief wall louvers with gravity back draft dampers serving the center and west bays distribute around the buildings about 6 feet above the floor. These louvers are about 18”x18” in dimensions. Four are installed in the west bay and six in the center bay (three at north and threes at south) and none in the east bay. Although there are two roof hood vents in the roof but seem to be sealed from allowing air to vent out. There are also four mushroom roof exhaust fans on the east bay roof that are abandoned. The belts are removed but did not investigate to see if there was still power to these fans.

- The main offices are served by a 10 ton rooftop packaged electric heating and cooling unit. The unit is a Trane model that is obsolete. The unit supplies pre-conditioned air to thermostatic zoned spaces which are then heated by electric terminal heating coils. There are eight thermostats (zones) serving nine spaces. The upstairs conference room temperature is controlled by the upstairs Southeast open office thermostat. The supply air from the rooftop unit is controlled to a discharge air for the zone with the lowest setpoint. The supply air is ducted in the ceiling spaces in a drop ceiling with transfer grilles and ducts at each space to main ceiling return grilles back to the rooftop unit.
- There is a small industrial type rooftop blower that is being used for the main office restroom exhaust. There is a large rooftop mushroom exhaust fan on the east bay roof that is not running and appears to serve the restrooms, lockers and break room.
- There is an industrial blower on the roof of the east bay that has been abandoned with the ductwork disconnected.

Observations

- The make-up air units on the roof have been somewhat abandoned. The power and gas connections are still in place and the owner stated that he has heard the fans operate. However, an experienced mechanical technician would be needed to put these units back into operation. There is no legible name plate data on any of the make-up air units to analyze the capacity and the units have extensive rust that has developed over the years. There is no telling if there is any life left in these units. The unit on the east bay roof has some missing parts in the control panel. It is estimated that these units are 20,000 to 30,000 CFM in range. The controls are antiquated and in disrepair, but it appears that they could be operable with some servicing. (Note: One item noticed was that the shut off valve to the center bay make-up air unit was open and a noticeable gas smell was leaking from the regulator. The valve was shut off during the assessment and the smell went away. It is advisable to check all the gas valves on the abandoned units and make sure the valves are closed.)
- There is currently no heating or cooling in the central and west warehouse bays. Apparently, there is enough heat generated from the east bay that the building stays warm enough to keep from freezing and bursting fire sprinkler pipes. However, with the shipping and receiving doors open all the time the center and west bays space temperature is closer to outside temperatures.
- The main office rooftop unit when assessed, it was discovered that the doors to the filter access and compressors were open and laying on the roof next to the unit. The unit being open assures plenty of outside ventilation air. There is no control on how much outside air is delivered in this situation. However, no noticeable outside operational dampers were observed on the unit, which may indicate why the doors were off the unit to allow outside air to get to the unit and into the space. One of the problems with this condition is that the filters are located such that the outside air is not filtered, and the cooling coils can become clogged with dust and debris from outdoor conditions. It appears that the unit is pulling some return air from the building and the unit is capable of supplying adequate heating to meet the discharge set point. The unit appears to be slightly

oversized for the application. There appears to be a master thermostat for the rooftop unit with a 5-hour after hour override timer on the wall next to it. A time clock for the rooftop unit was not located or observed. The space pressure was measured at the doors between the main offices and the warehouse and outside. The pressure between the warehouse and the offices was slightly negative. This allows for any odors in the warehouses to leak into the offices. The pressure between the offices and outside was slightly positive. This could be from the south wind causing a pressure differential from the south to the north sides of the building. It is difficult to precisely analyze space pressures with doors open and wind blowing.

- The thermostats are all electric stand-alone units specific to each type of equipment.
- The roof insulation is falling from the underside of the roof deck above the main office area.
- The restroom exhaust fan serving the main office area is running at a very low speed. The east bay restroom and locker room exhaust fan does not appear to be functioning.
- This question arises as to why the doors are open so much and is it to introduce more ventilation into the warehouse?
- All of the HVAC equipment appears to be beyond their life expectancy per the ASHRAE (American Society of Heating and Refrigeration Engineers) chart. (Shown Below).
- There were some window AC units on the shipping and receiving offices. These appear to be functional but have no bearing on ventilation to the space it serves other than heat is added to the warehouse space and is inconsequential.

Recommendations

- The main office rooftop unit is old and appears to be older than the standard life expectancy per ASHRAE chart of 15 years. It is recommended that a technician put the doors back on the unit and fix the outside air dampers temporarily while a new unit is budgeted for replacement. A new unit will be much more efficient, and a payback could possibly be just a few years. Also, a new unit with properly operating economizer (outside free cooling) would provide proper ventilation. A correctly-sized unit like a 7.5-ton unit could adequately perform the job. Also, a programable thermostat for the main controller could be used to add the night set back feature to conserve energy.
- It is not recommended that any of the make-up air units on the roof be re-used for heating. The main reason for this is that these units are direct-fired. In other words, the gas furnace products of combustion are directly in the air stream when firing. These products of combustion can be an irritant to people inside the building and could possibly cause reaction to the tools and materials stored inside. Products of combustion also has a high relative humidity. A recommendation is to replace one or more of these units with an indirect fired unit that is high efficiency. The added benefit is that this unit will pressurize the building and the whole building will be more comfortable for most all occupants. With this feature the heating in the east bay may not turn on and not be needed. A new make-up air unit cost is in the neighborhood of $20,000 and the install could be double that. The vents on the roof will need to be refurbished or relief louvers or roof hoods be added. The center and west bays already have relief louvers. On the other hand, the overhead doors at the north and south are often

open and the wind blows right through, so a better possible heating application would be sealed combustion gas radiant heaters strategically placed where workers are located. An option could be to reuse the fan unit and replace the direct furnace section with an indirect furnace or electric strip heater, but full replacement of the unit may be better life cycle cost decision. Another option for a make-up air unit would be to install a make-up air unit on the south side of the center warehouse near the gas meter on the ground and blow the air in from the side wall. Although the air from the roof might be a better location for better chance of cleaner ventilation air from weather breezes.

- Carbon filters in the air handlers are an option but the cost keep these replaced can be 1.5 to 2 times more the price than regular air filters. Or just using an indoor air filter unit to recycle the air will not be as productive of removing odors as a make-up air unit unless the outside air is not tolerable. From my observation it appears that the outside air seems quite adequate to use for ventilation. One added benefit to a filter unit is the savings from not needing to heat or cool the outside ventilation air.
- The restroom exhaust fans for all restrooms should be looked at by a technician for maintenance or refurbishment and put the east bay exhaust back in service to get proper ventilation.
- Re-install the roof insulation in the attic space of the main offices to improve efficiency and prevent any condensation and moisture in the attic.

ASHRAE Equipment Life Expectancy chart

ASHRAE is the industry organization that sets the standards and guidelines for most all HVAC-R equipment. For additional info about ASHRAE the website is www.ashrae.org .

Equipment Item	Median Years
Air conditioners	
Window unit	10
Residential single or Split Package	15
Commercial through-the wall	15
Water-cooled package	15
Heat Pumps	
Residential air-to-air	15
Commercial air-to-air	15
Commercial water-to-air	19
Roof-top air conditioners	
Single-zone	15
Multi-zone	15
Boilers, hot water (steam)	
Steel water-tube	24 (30)
Steel fire-tube	25 (25)
Cast iron	35 (30)
Electric	15
Burners	21
Furnaces	
Gas- or oil-fired	18
Unit heaters	
Gas or electric	13
Hot water or steam	20
Radiant Heaters	
Electric	10
Hot water or steam	25

Equipment Item	Median Years
Air terminals	
Diffusers, grilles, and registers	27
Induction and fan coil units	20
VAV and double-duct boxes	20
Air washers	17
Ductwork	30
Dampers	20
Fans	
Centrifugal	25
Axial	20
Propeller	15
Ventilating roof-mounted	20
Coils	
DX, water, or steam	20
Electric	15
Heat Exchangers	
Shell-and-tube	24
Reciprocating compressors	20
Packaged chillers	
Reciprocating	20
Centrifugal	23
Absorption	23
Cooling towers	
Galvanized metal	20
Wood	20
Ceramic	34

Equipment Item	Median Years
Air-cooled condensers	20
Evaporative condensers	20
Insulation	
Molded	20
Blanket	24
Pumps	
Base-mounted	20
Pipe-mounted	10
Sump and well	10
Condensate	15
Reciprocating engines	20
Steam turbines	30
Electric motors	18
Motor starters	17
Electric transformers	30
Controls	
Pneumatic	20
Electric	16
Electronic	15
Valve actuators	
Hydraulic	15
Pneumatic	20
Self-contained	10

Filter Replacement Calculations
Precision Engineering, Inc.
Seattle, Washington

Parameters	Value	Notes
Air purifier model	HEPA-Aire PAS2400	
Air purifier airflow, max.—high setting (CFM)	2100	(1)
Carbon filter type	VL2002 high-capacity carbon, 2 inch	(1)
Filter carbon weight (grams)	767	(2)
Carbon filter TCE removal capacity (percent by weight)	20	(3)
TCE concentration, indoor air, max. (ug/m^3)	170	(4)
Calculations	**Value**	**Notes**
Filter TCE removal capacity, total weight TCE (micrograms)	1.53E+08	(a)
Filter TCE removal capacity, total air volume (cubic feet)	3.19E+07	(b)
Filter TCE removal capacity, treatment time—high setting (days)	11	(c)

NOTES:

Carbon filter TCE removal capacity, anticipated maximum TCE concentrations in indoor air, and air purifier airflow rates were used to calculate how long filters would be effective at both high and low air purifier airflow settings. A weekly filter changeout schedule was selected based on these calculations and as a conservative measure to allow for the possibility that other volatiles present in indoor air might occupy carbon filter activation sites.

CFM = cubic feet per minute.

max. = maximum.

TCE = trichloroethene.

ug/m^3 = micrograms per cubic meter.

(a) Filter TCE removal capacity, total weight TCE (micrograms) = (carbon filter TCE removal capacity [percent by weight] / 100) x (filter carbon weight [grams]) x (10E+06 micrograms / gram).

(b) Filter TCE removal capacity, total air volume (cubic feet) = (filter TCE removal capacity, total weight TCE [micrograms]) / (TCE concentration, indoor air, max. [ug/m^3]) x (35.315 cubic feet / cubic meter).

(c) Filter TCE removal capacity, treatment time - high setting (days) = (filter TCE removal capacity, total air volume [cubic feet]) / (air purifier airflow, max. - high setting [CFM]) / (60 minutes x 24 hours).

REFERENCES:

(1) Abatement Technologies, Inc. HEPA-Aire portable air scrubber (PAS2400) specification sheet, 2019.

(2) D-Mark, Inc. Abatement filters specification sheet. January 24, 2019.

(3) D-Mark, Inc. Carbon filter pollutant capacity index chart, 2008.

(4) Maximum, pretreatment and pre-interim-action, three-week average TCE concentration measured in indoor air using Radiello passive samplers.

APPENDIX G

AIR PURIFIER DOCUMENTATION

PAS2400

HEPA-AIRE® PORTABLE AIR SCRUBBER

The Most Portable 2,000 CFM System

The Ultimate Combination of Power and Portability

Exceptional performance and a full array of user-friendly features have made the PAS2400 Portable Air Scrubber a popular choice for capturing airborne particles during facility construction and renovation.

FEATURES & BENEFITS

- The upright, two-module design with built-in transport dolly enhances the mobility and maneuverability of the PAS2400 and its ability to operate in tight spaces
- The custom-designed, high-speed motor and blower allow the PAS2400 to produce up to 60% more vacuum power than other 120 VAC systems
- True 99.97%-certified HEPA filter retains its original 99.97%+ efficiency, even after hundreds of hours of operation
- A unique cabinet design and a true high-capacity, IEST-compliant HEPA filter help ensure that the PAS2400 exhausts 99.97%+ efficiency air out of the work area, job after job, month after month
- Hinged, "no tools" prefilter access
- The PAS2400 has been independently tested and certified in accordance with applicable UL and CSA safety requirements

TECHNICAL SPECIFICATIONS

DESCRIPTION	UNIT	PAS2400
Net Weight	lbs. (kg)	170 (77.11)
Dimensions (L x W x H)	in. (cm)	31.5 x 25.25 x 49.75 (80 x 64.135 x 126.37)
Electrical Rating	V, Hz, A	120 VAC, 60 Hz, 15 A
Airflow, max. with clean filters	CFM	2100 on High, 700 on Low
Normal Operating Amps	amps	12 or less
Motor		1.5 HP, auto reset, 60 Hz, single phase
Sound Level @ 5 Feet	dBA	71-83 on high speed
HEPA Filter Efficiency	-	99.97% @ 0.3 microns
Cabinet Material	-	20 gauge stainless steel
Prefilter Access	-	Hinged "no tools" access door
First Stage Prefilter	1 ea.	F1821, 1" deep coarse particulate
Second Stage Prefilter	1 ea.	H1902, 2" deep pleated particulate
Optional Second or Third Stage	1 ea.	VL2002, 2" deep high capacity carbon
HEPA Filter	1 ea.	H2418-99

Specifications and details are subject to change without prior notice.

Note: Airflow ratings estimates are based on factory and independent testing @ 120 VAC with an air straightener and a traverse of readings taken with a computing vane-anemometer. Actual results may vary for various reasons, including motor and blower and HEPA filter tolerances. Factors such as filter loading, reduced voltage to the motor, and inlet and outlet ducting will reduce airflow. Use these ratings as a general guideline only.

THE PAS2400 IS BEST SUITED FOR:

- HEALTH CARE CONSTRUCTION
- CRITICAL ENVIRONMENT PROTECTION
- ABATEMENT & REMEDIATION
- HEALTHCARE FACILITIES

ABATEMENT TECHNOLOGIES®
LEADERS IN CLEAN AIR

CA: 1 800 827 6443
ABATEMENT.CA
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US: 1 800 634 9091
ABATEMENT.COM
IAQINFO@ABATEMENT.COM

Filter Replacement Calculations
Precision Engineering, Inc.
Seattle, Washington

Parameters	Value	Notes
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Filter TCE removal capacity, treatment time—high setting (days)	11	(c)

NOTES:

Carbon filter TCE removal capacity, anticipated maximum TCE concentrations in indoor air, and air purifier airflow rates were used to calculate how long filters would be effective at both high and low air purifier airflow settings. A weekly filter changeout schedule was selected based on these calculations and as a conservative measure to allow for the possibility that other volatiles present in indoor air might occupy carbon filter activation sites.

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(b) Filter TCE removal capacity, total air volume (cubic feet) = (filter TCE removal capacity, total weight TCE [micrograms]) / (TCE concentration, indoor air, max. [ug/m^3]) x (35.315 cubic feet / cubic meter).

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(1) Abatement Technologies, Inc. HEPA-Aire portable air scrubber (PAS2400) specification sheet, 2019.

(2) D-Mark, Inc. Abatement filters specification sheet. January 24, 2019.

(3) D-Mark, Inc. Carbon filter pollutant capacity index chart, 2008.

(4) Maximum, pretreatment and pre-interim-action, three-week average TCE concentration measured in indoor air using Radiello passive samplers.

D-Mark, Inc.

24-Jan-19

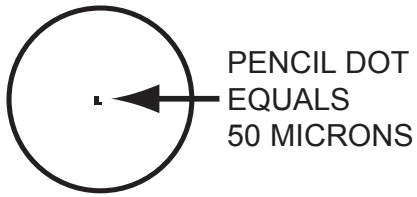
Abatement Part	Size	Description	Carbon Weight in Grams	Carbon Weight in Pounds
VL1002	15-7/8 x 15-3/8 x 2	Carbon Pleat	453	0.99
VL2024	24 x 24 x 2	Carbon Pleat	986	2.1
VL2002	18 x 24 x 2	Carbon Pleat	767	1.7
VL602	15-7/8 x 15-3/8 x 2	Carbon Pleat	151	0.33
VLB1616	15-7/8 x 15-3/8 x 2	Carbon Pleat Carbon & Potassium Permanganate	415	0.91
VLB2418	18 x 24 x 2	Carbon Pleat Carbon & Potassium Permanganate	702	1.5
VLB2424	24 x 24 x 2	Carbon Pleat Carbon & Potassium Permanganate	704	1.9
VLB1818	18 x 17-1/2 x 2	Carbon Pleat Carbon & Potassium Permanganate	534	1.1
H605CPZ	15-7/8 x 15-3/8 x 2	Carbon Pleat Carbon & Potassium Permanganate, Zeolite	420	0.92
HC1802CF	17-1/2 x 17-1/2 x 2	Carbon Pleat	582	1.2
HC618CF	18 x 18 x 2	Carbon Pleat	630	1.3

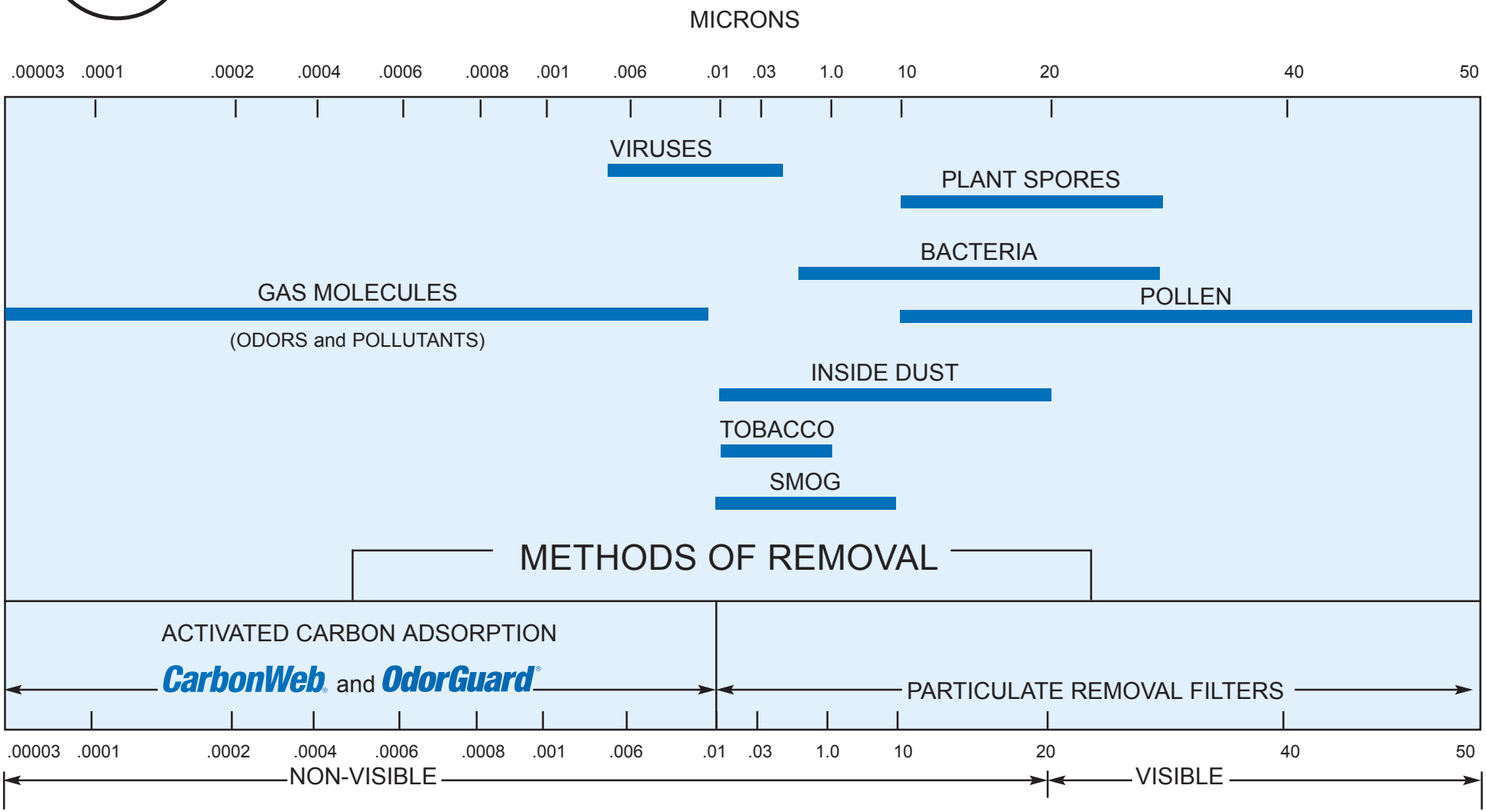
130 N. Groesbeck Hwy.
Mt. Clemens, MI 48043
www.dmarkinc.com

D-MARK®
The Carbon Filter Specialists®
SINCE 1970

TOLL FREE: 800.343.3610
586.949.3610
fax: 586.949.4181
dmark@dmarkinc.com

REMOVAL OF TYPICAL POLLUTANTS





CarbonWeb® and OdorGuard® Odor and Pollutant Capacity Index Chart

SUBSTANCE	INDEX
Acetaldehyde	2
Acetic Acid	4
Acetic Anhydride	4
Acetone	3
Acetylene	1
Acids	**3**
Acrolein	1
Acryaldehyde	3
Acrylic Acid	4
Acrylonitrile	4
Adhesives	**4**
Aged Manuscripts	**4**
Air Wick	**4**
Alcohol	**4**
Alcoholic Beverages	**4**
Amines	2
Ammonia	2
Amyl Acetate	4
Amyl Alcohol	4
Amyl Ether	4
Animal Odors	**3**
Anesthetics	**3**
Aniline	4
Antiseptics	**4**
Asphalt Fumes	**4**
Automobile Exhaust	**3**
Bacteria	**3**
Bathroom Smells	**4**
Benzene	4
Bleaching Solutions	**3**
Body Odors	**4**
Bromine	4
Burned Flesh	**4**
Burned Food	**4**
Burning Fat	**4**
Butadiene	3
Butane	2
Butanone	4
Butyl Acetate	4
Butyl Alcohol	4
Butyl Cellosolve	4
Butyl Choloride	4
Butyl Ether	4
Butylene	2
Butyne	2
Butyraldehyde	3
Butyric Acid	4
Camphor	4
Cancer Odor	**4**
Caprylic Acid	4
Carbolic Acid	4
Carbon Bisulfide	3
Carbon Dioxide	1
Carbon Monoxide	1
Carbon Tetrachloride	4
Cellosolve	4
Cellosolve Acetate	4
Charred Materials	**4**
Cheese	**4**
Chemicals	**3**
Chlorine	3
Chlorobenzene	4
Chlorobutadiene	4
Chloroform	4
Chloro Nitropropane	4
Chloropicrin	4
Cigarette Smoke	**4**
Citrus and other fruits	**4**
Cleaning Compounds	**4**
Coal Smoke	**3**
Combustion Odors	**3**
Cooking Odors	**4**
Corrosive Gases	**3**
Creosote	**4**
Cresol	4
Crotonaldehyde	4
Cyclohexane	4
Cyclohexanol	4
Cyclohexanone	4
Cyclohexene	4
Dead Animals	**4**
Decane	4
Decaying Substances	**4**
Decomposition Odors	**4**
Deodorants	**4**
Detergents	**4**
Dibromethane	4
Dichlorobenzene	4
Dichlorodifluoromethane	3
Dichloroethane	4
Dichloroethylene	4
Dichloroethyl Ether	4
Dichloromonofluormethane	3
Dichloro-Nitroethane	4
Dichloropropane	4
Dichlorotetrafluoroethane	3
Diesel Fumes	**3**
Diethyl Amine	3
Diethyl Ketone	4
Dimethylaniline	4
Dimethylsulfate	4
Dioxane	4
Dipropyl Ketone	4
Disinfectants	**4**
Embalming Odors	**4**
Ethane	1
Ether	3
Ethyl Acetate	**4**
Ethyl Acrylate	4
Ethyl Alcohol	4
Ethyl Amine	3
Ethyl Benzene	4
Ethyl Bromide	3
Ethyl Chloride	3
Ethyl Ether	3
Ethyl Formate	3
Ethyl Mercaptan	4
Ethyl Silicate	4
Ethylene	1
Ethylene Chlorhydrin	4
Ethylene Dichloride	4
Ethylene Oxide	3
Essential Oils	**4**
Eucalyptole	**4**
Exhaust Fumes	**3**
Fabric Finishes	**3**
Fecal Odors	**4**
Fertilizer	**4**
Film Processing Odors	**3**
Fish Odors	**4**
Floral Scents	**4**
Fluorotrichloromethane	3
Food Aromas	**4**
Formaldehyde	2
Formic Acid	3
Freon	3
Fuel Gases	**2**
Fumes	**3**
Gangrene	**4**
Garlic	**4**
Gasoline	**4**
Heptane	4
Heptylene	4
Hexane	3
Hexylene	3
Hexyne	3
Hospital Odors	**4**
Household Smells	**4**
Hydrogen	1
Hydrogen Bromide	2
Hydrogen Chloride	2
Hydrogen Cyanide	3
Hydrogen Fluoride	2
Hydrogen Iodide	3
Hydrogen Selenide	2
Hydrogen Sulfide	3
Incense	**4**
Indole	4
Inorganic Chemicals	3
Incomplete Combustion	**3**
Industrial Wastes	**3**
Iodine	4
Iodoform	4
Irritants	**4**
Isophorone	4
Isoprene	3
Isopropyl Acetate	4
Isopropyl Alcohol	4
Isopropyl Ether	4
Kerosene	**4**
Kitchen Odors	**4**
Lactic Acid	**4**
Lingering Odors	**4**
Liquid Fuels	**4**
Liquor Odors	**4**
Lubricating Oils and Greases	**4**
Lysol	**4**
Masking Agents	**4**
Medicinal Odors	**4**
Melons	**4**
Menthol	4
Mercaptans	**4**
Mesityl Oxide	4
Methane	1
Methyl Acetate	3
Methyl Acrylate	4
Methyl Alcohol	**3**
Methyl Bromide	3
Methyl Butyl Ketone	4
Methyl Cellosolve	4
Methyl Cellosolve Acetate	4
Methyl Chloride	3
Methyl Chloroform	4
Methyl Ether	3
Methyl Ethyl Ketone	4
Methyl Formate	3
Methyl Isobutyl Ketone	4
Methyl Mercaptan	4
Methylal	3
Methylcyclohexane	4
Methylcycohexanol	4
Methylcyclohexanone	4
Methylene Chloride	4
Mildew	**3**
Mixed Odors	**4**
Mold	**3**
Monochlorobenzene	4
Monofluorotrichloromethane	3
Moth Balls	**4**
Naphtha (Coal tar)	**4**
Naphtha (Petroleum)	**4**
Naphthalene	4
Nicotine	**4**
Nitric Acid	3
Nitro Benzene	4
Nitroethane	4
Nitrogen Dioxide	2
Nitroglycerine	4
Nitromethane	4
Nitropropane	4
Nitrotoluene	4
Nonane	4
Noxious Gases	**3**
Octylene	4
Octane	4
Odors	**4**
Odorants	**4**
Onions	**4**
Organic Chemicals	**4**
Ozone	**4**
Packing House Odors	**4**
Paint and Redecorating Odors	**4**
Palmitic Acid	4
Paper Deteriorations	**4**
Paradichlorbenzene	4
Paste and Glue	**4**
Pentane	3
Pentanone	4
Pentylene	3
Pentyne	3
Perchloroethylene	4
Perfumes, Cosmetics	**4**
Perspiration	**4**
Persistent Odors	**4**
Pet Odors	**4**
Phenol	4
Phosgene	4
Pitch	**4**
Plastics	**4**
Poison Gases	**3**
Popcorn and Candy	**4**
Poultry Odors	**4**
Propane	2
Propionaldehyde	3
Propionic Acid	4
Propyl Acetate	4
Propyl Alcohol	4
Propyl Chloride	4
Propyl Ether	4
Propyl Mercaptan	4
Propylene	2
Propyne	2
Putrefying Substances	**3**
Putrescine	4
Pyridine	4
Radiation Products	**2**
Rancid Oils	**4**
Resins	**4**
Reodorants	**4**
Ripening Fruits	**4**
Rubber	**4**
Sauerkraut	**4**
Sewer Odors	**4**
Skatole	4
Slaughtering Odors	**3**
Smog	**4**
Smoke	**4**
Soaps	**4**
Solvents	**3**
Sour Milk	**4**
Spilled Beverages	**4**
Spoiled Food Stuffs	**4**
Stale Odors	**4**
Stoddard Solvent	4
Stuffiness	**4**
Styrene Monomer	4
Sulfur Compounds	3
Sulfur Dioxide	2
Sulfur Trioxide	3
Sulfuric Acid	4
Tar	**4**
Tarnishing Gases	**3**
Tetrachloroethane	4
Tetrachloroethylene	4
Tetrahydrofuran	3
Theatrical Makeup Odors	**4**
Tobacco Smoke	**4**
Toilet Odors	**4**
Toluene	4
Toluidine	4
Trichlorethylene	4
Turpentine	**4**
Urea	4
Uric Acid	4
Valeric Acid	4
Valeric Aldehyde	4
Vapors	**4**
Varnish Fumes	**4**
Vinegar	**4**
Vinyl Chloride	3
Viruses	**3**
Volatile Materials	3
Waste Products	**4**
Waterproofing Compounds	**4**
Wood Alcohol	**3**
Xylene	4

Some of the contaminants listed in the table are specific chemical compounds. Some represent classes of compounds and others are mixtures and of variable composition. Activated carbons capacity for odor varies somewhat with the concentration in the air, with humidity and temperature. The numbers given represent typical or average conditions and might vary in specific instances.

The capacity index has the following meaning-

4. High capacity for all materials in this category. One pound takes up about 20% to 50% of its own weight - average about 1/3 (3301/3%). This category includes most of the odor causing substances.
3. Satisfactory capacity for all items in this category. These constitute good applications but the capacity is not as high as for category 4. Adsorbs about 10% to 25% of its weight - average about 1/6 (16.67%).
2. Includes substances which are not highly absorbed but which might be take up sufficiently to give good service under the particular conditions of operation. These require individual checking.
1. Adsorption capacity is low for these materials. Activated Carbon cannot be satisfactorily used to remove them under ordinary circumstances.

* For the asterisked compounds, impregnated carbon or activated alumina with $KMnO_4$ will greatly increase the adsorption ability.

APPENDIX H

WASTE DISPOSAL MANIFESTS

172290-20 3928843

Please print or type. Form Approved. OMB No. 2050-0039

UNIFORM HAZARDOUS WASTE MANIFEST

1. Generator ID Number	2. Page 1 of	3. Emergency Response Phone	4. Manifest Tracking Number
WAH000057175	1	(877) 577-2669	000310600 DAT

GENERATOR

5. Generator's Name and Mailing Address

PACIFIC INDUSTRIAL SUPPLY DIRE CTOR ST
1231 S DIRECTOR ST
Generator's Phone: Seattle WA 98108 (206)682-2100

Generator's Site Address (if different than mailing address)

PACIFIC INDUSTRIAL SUPPLY DIRE CTOR ST
1231 S DIRECTOR ST
SEATTLE WA 98108

6. Transporter 1 Company Name: Stericycle Specialty Waste Solutions Inc — U.S. EPA ID Number: MNS000110924

7. Transporter 2 Company Name — U.S. EPA ID Number:

8. Designated Facility Name and Site Address — U.S. EPA ID Number

BURLINGTON ENVIRONMENTAL, LLC. KENT FACILITY
20245 77th Avenue South
Facility's Phone: KENT, WA 98032 (253) 872-8030 — WAD991281767

9a. HM	9b. U.S. DOT Description (including Proper Shipping Name, Hazard Class, ID Number, and Packing Group (if any))	10. Containers No.	10. Containers Type	11. Total Quantity	12. Unit Wt./Vol.	13. Waste Codes		
X	1. NA3082 HAZARDOUS WASTE, LIQUID, N.O.S. (CHROMIUM) 9 PGIII	1	TT	743	G	D007		
F 5630	2.							
	3.							
	4.							

14. Special Handling Instructions and Additional Information

(1) 1641479-00 - ERG(171) HAZARDOUS WASTE LIQU

15. **GENERATOR'S/OFFEROR'S CERTIFICATION:** I hereby declare that the contents of this consignment are fully and accurately described above by the proper shipping name, and are classified, packaged, marked and labeled/placarded, and are in all respects in proper condition for transport according to applicable international and national governmental regulations. If export shipment and I am the Primary Exporter, I certify that the contents of this consignment conform to the terms of the attached EPA Acknowledgment of Consent.
I certify that the waste minimization statement identified in 40 CFR 262.27(a) (if I am a large quantity generator) or (b) (if I am a small quantity generator) is true.

Generator's/Offeror's Printed/Typed Name: Kyle Satterthwaite (On Behalf of Gen) — Signature: [signature] — Month: 4 Day: 13 Year: 20

INT'L

16. International Shipments ☐ Import to U.S. ☐ Export from U.S. Port of entry/exit:
Transporter signature (for exports only): Date leaving U.S.:

TRANSPORTER

17. Transporter Acknowledgment of Receipt of Materials

Transporter 1 Printed/Typed Name: MICHAEL BLEVER — Signature: [signature] — Month: 4 Day: 13 Year: 20

Transporter 2 Printed/Typed Name — Signature — Month Day Year

DESIGNATED FACILITY

18. Discrepancy

18a. Discrepancy Indication Space ☐ Quantity ☐ Type ☐ Residue ☐ Partial Rejection ☐ Full Rejection

Manifest Reference Number:

18b. Alternate Facility (or Generator) — U.S. EPA ID Number

Facility's Phone:

18c. Signature of Alternate Facility (or Generator) — Month Day Year

19. Hazardous Waste Report Management Method Codes (i.e., codes for hazardous waste treatment, disposal, and recycling systems)

1.	2.	3.	4.
H135			

20. Designated Facility Owner or Operator: Certification of receipt of hazardous materials covered by the manifest except as noted in Item 18a

Printed/Typed Name: Chance Gerberson — Signature: [signature] — Month: 4 Day: 14 Year: 20

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

James E. Bruya, Ph.D.
Yelena Aravkina, M.S.
Michael Erdahl, B.S.
Arina Podnozova, B.S.
Eric Young, B.S.

3012 16th Avenue West
Seattle, WA 98119-2029
(206) 285-8282
fbi@isomedia.com
www.friedmanandbruya.com

May 12, 2020

Heather Good, Project Manager
Maul Foster Alongi
2815 2nd Ave, Suite 540
Seattle, WA 98121

Dear Ms Good:

Included are the results from the testing of material submitted on May 4, 2020 from the Precision Engineering 1803.01.02, F&BI 005023 project. There are 10 pages included in this report. Any samples that may remain are currently scheduled for disposal in 30 days, or as directed by the Chain of Custody document. If you would like us to return your samples or arrange for long term storage at our offices, please contact us as soon as possible.

We appreciate this opportunity to be of service to you and hope you will call if you should have any questions.

Sincerely,

FRIEDMAN & BRUYA, INC.

Michael Erdahl
Project Manager

Enclosures
MFA0512R.DOC

CASE NARRATIVE

This case narrative encompasses samples received on May 4, 2020 by Friedman & Bruya, Inc. from the Maul Foster Alongi Precision Engineering 1803.01.02, F&BI 005023 project. Samples were logged in under the laboratory ID's listed below.

Laboratory ID	Maul Foster Alongi
005023 -01	Filter-1
005023 -02	Filter-2

All quality control requirements were acceptable.

Analysis For Volatile Compounds By EPA Method 8260D

Client Sample ID:	Filter-1	Client:	Maul Foster Alongi
Date Received:	05/04/20	Project:	Precision Engineering 1803.01.02
Date Extracted:	05/07/20	Lab ID:	005023-01 1/200
Date Analyzed:	05/09/20	Data File:	050895.D
Matrix:	TCLP Extract	Instrument:	GCMS4
Units:	ug/L (ppb)	Operator:	MS

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
1,2-Dichloroethane-d4	102	57	121
Toluene-d8	101	63	127
4-Bromofluorobenzene	101	60	133

Compounds:	Concentration ug/L (ppb)
Trichloroethene	<200

Analysis For Volatile Compounds By EPA Method 8260D

Client Sample ID:	Filter-2	Client:	Maul Foster Alongi
Date Received:	05/04/20	Project:	Precision Engineering 1803.01.02
Date Extracted:	05/07/20	Lab ID:	005023-02 1/200
Date Analyzed:	05/09/20	Data File:	050896.D
Matrix:	TCLP Extract	Instrument:	GCMS4
Units:	ug/L (ppb)	Operator:	MS

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
1,2-Dichloroethane-d4	101	57	121
Toluene-d8	102	63	127
4-Bromofluorobenzene	100	60	133

Compounds:	Concentration ug/L (ppb)
Trichloroethene	<200

Analysis For Volatile Compounds By EPA Method 8260D

Client Sample ID:	Method Blank	Client:	Maul Foster Alongi
Date Received:	Not Applicable	Project:	Precision Engineering 1803.01.02
Date Extracted:	05/08/20	Lab ID:	00-1000 mb 1/200
Date Analyzed:	05/09/20	Data File:	050887.D
Matrix:	TCLP Extract	Instrument:	GCMS4
Units:	ug/L (ppb)	Operator:	MS

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
1,2-Dichloroethane-d4	100	57	121
Toluene-d8	100	63	127
4-Bromofluorobenzene	100	60	133

Compounds:	Concentration ug/L (ppb)
Trichloroethene	<200

Analysis for TCLP Metals By EPA Method 6020B and 1311

Client ID:	Filter-1	Client:	Maul Foster Alongi
Date Received:	05/04/20	Project:	Precision Engineering 1803.01.02
Date Extracted:	05/06/20	Lab ID:	005023-01
Date Analyzed:	05/07/20	Data File:	005023-01.041
Matrix:	Soil/Solid	Instrument:	ICPMS2
Units:	mg/L (ppm)	Operator:	SP

Analyte:	Concentration mg/L (ppm)	TCLP Limit
Arsenic	<1	5.0
Barium	<1	100
Cadmium	<1	1.0
Chromium	<1	5.0
Lead	<1	5.0
Mercury	<0.1	0.2
Selenium	<1	1.0
Silver	<1	5.0

Analysis for TCLP Metals By EPA Method 6020B and 1311

Client ID:	Filter-2	Client:	Maul Foster Alongi
Date Received:	05/04/20	Project:	Precision Engineering 1803.01.02
Date Extracted:	05/06/20	Lab ID:	005023-02
Date Analyzed:	05/07/20	Data File:	005023-02.042
Matrix:	Soil/Solid	Instrument:	ICPMS2
Units:	mg/L (ppm)	Operator:	SP

Analyte:	Concentration mg/L (ppm)	TCLP Limit
Arsenic	<1	5.0
Barium	<1	100
Cadmium	<1	1.0
Chromium	<1	5.0
Lead	<1	5.0
Mercury	<0.1	0.2
Selenium	<1	1.0
Silver	<1	5.0

Analysis for TCLP Metals By EPA Method 6020B and 1311

Client ID:	Method Blank	Client:	Maul Foster Alongi
Date Received:	Not Applicable	Project:	Precision Engineering 1803.01.02
Date Extracted:	05/06/20	Lab ID:	I0-260 mb
Date Analyzed:	05/07/20	Data File:	I0-260 mb.032
Matrix:	Soil/Solid	Instrument:	ICPMS2
Units:	mg/L (ppm)	Operator:	SP

Analyte:	Concentration mg/L (ppm)	TCLP Limit
Arsenic	<1	5.0
Barium	<1	100
Cadmium	<1	1.0
Chromium	<1	5.0
Lead	<1	5.0
Mercury	<0.1	0.2
Selenium	<1	1.0
Silver	<1	5.0

Date of Report: 05/12/20
Date Received: 05/04/20
Project: Precision Engineering 1803.01.02, F&BI 005023

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF TCLP EXTRACTS FOR VOLATILES BY EPA METHOD 8260D

Laboratory Code: 005071-01 (Matrix Spike)

Analyte	Reporting Units	Spike Level	Sample Result	Percent Recovery MS	Acceptance Criteria
Trichloroethene	ug/L (ppb)	50	<1	69	66-135

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Percent Recovery LCSD	Acceptance Criteria	RPD (Limit 20)
Trichloroethene	ug/L (ppb)	50	104	107	67-133	3

Date of Report: 05/12/20
Date Received: 05/04/20
Project: Precision Engineering 1803.01.02, F&BI 005023

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF SOIL/SOLID SAMPLES FOR TCLP METALS USING EPA METHODS 6020B AND 1311

Laboratory Code: 004357-07 (Matrix Spike)

Analyte	Reporting Units	Spike Level	Sample Result	Percent Recovery MS	Percent Recovery MSD	Acceptance Criteria	RPD (Limit 20)
Arsenic	mg/L (ppm)	1.0	<1	100	100	75-125	0
Barium	mg/L (ppm)	5.0	<1	99	99	75-125	0
Cadmium	mg/L (ppm)	0.5	<1	100	99	75-125	1
Chromium	mg/L (ppm)	2.0	<1	99	94	75-125	5
Lead	mg/L (ppm)	1.0	<1	94	91	75-125	3
Mercury	mg/L (ppm)	1.0	<0.1	95	93	75-125	2
Selenium	mg/L (ppm)	0.5	<1	106	101	75-125	5
Silver	mg/L (ppm)	0.5	<1	99	88	75-125	12

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Arsenic	mg/L (ppm)	1.0	101	80-120
Barium	mg/L (ppm)	5.0	98	80-120
Cadmium	mg/L (ppm)	0.5	100	80-120
Chromium	mg/L (ppm)	2.0	98	80-120
Lead	mg/L (ppm)	1.0	90	80-120
Mercury	mg/L (ppm)	1.0	92	80-120
Selenium	mg/L (ppm)	0.5	110	80-120
Silver	mg/L (ppm)	0.5	95	80-120

Data Qualifiers & Definitions

a - The analyte was detected at a level less than five times the reporting limit. The RPD results may not provide reliable information on the variability of the analysis.

b - The analyte was spiked at a level that was less than five times that present in the sample. Matrix spike recoveries may not be meaningful.

ca - The calibration results for the analyte were outside of acceptance criteria. The value reported is an estimate.

c - The presence of the analyte may be due to carryover from previous sample injections.

cf - The sample was centrifuged prior to analysis.

d - The sample was diluted. Detection limits were raised and surrogate recoveries may not be meaningful.

dv - Insufficient sample volume was available to achieve normal reporting limits.

f - The sample was laboratory filtered prior to analysis.

fb - The analyte was detected in the method blank.

fc - The analyte is a common laboratory and field contaminant.

hr - The sample and duplicate were reextracted and reanalyzed. RPD results were still outside of control limits. Variability is attributed to sample inhomogeneity.

hs - Headspace was present in the container used for analysis.

ht – The analysis was performed outside the method or client-specified holding time requirement.

ip - Recovery fell outside of control limits due to sample matrix effects.

j - The analyte concentration is reported below the lowest calibration standard. The value reported is an estimate.

J - The internal standard associated with the analyte is out of control limits. The reported concentration is an estimate.

jl - The laboratory control sample(s) percent recovery and/or RPD were out of control limits. The reported concentration should be considered an estimate.

js - The surrogate associated with the analyte is out of control limits. The reported concentration should be considered an estimate.

lc - The presence of the analyte is likely due to laboratory contamination.

L - The reported concentration was generated from a library search.

nm - The analyte was not detected in one or more of the duplicate analyses. Therefore, calculation of the RPD is not applicable.

pc - The sample was received with incorrect preservation or in a container not approved by the method. The value reported should be considered an estimate.

ve - The analyte response exceeded the valid instrument calibration range. The value reported is an estimate.

vo - The value reported fell outside the control limits established for this analyte.

x - The sample chromatographic pattern does not resemble the fuel standard used for quantitation.

005023

SAMPLE CHAIN OF CUSTODY

ME 05/04/20

AI

Page # 1 of 1

Report To Heather Good
Company Maul Foster Alongi
Address 1329 N State St., #301
City, State, ZIP Bellingham, WA 98225
Phone 360-927-1300 Email hgood@maulfoster.com

SAMPLERS (*signature*)

PROJECT NAME: Precision engineering
PO #: 1803 01.02

REMARKS
Project specific RLs? - Yes / No

INVOICE TO: accounting@maulfoster.com

TURNAROUND TIME
[X] Standard turnaround
[ ] RUSH
Rush charges authorized by:

SAMPLE DISPOSAL
[ ] Archive samples
[ ] Other
Default: Dispose after 30 days

Sample ID	Lab ID	Date Sampled	Time Sampled	Sample Type	# of Jars	ANALYSES REQUESTED: NWTPH-Dx	NWTPH-Gx	BTEX EPA 8021	NWTPH-HCID	VOCs EPA 8260	PAHs EPA 8270	PCBs EPA 8082	TCLP TCE	TCLP RCRA 8*			Notes
FILTER-1	01	05/03/20	1540	filter media	1								X	X			
FILTER-2	02	05/03/20	1630	filter media	1								X	X			
																	*RCRA 8 includes
																	As, Ba, Cd, Cr, Pb, Hg, Se, and Ag
							√										
												Samples received at 4 °C					

SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by:	Evelyn Lundeen	MFA	5/4	903
Received by:	Eric Gauna	RaB	5/4	903
Relinquished by:				
Received by:				

Friedman & Bruya, Inc.
3012 16th Avenue West
Seattle, WA 98119-2029
Ph. (206) 285-8282

JUN 25 '20 PM 10:42

325049-20

Please print or type.

ERI Provider: SES

Form Approved. OMB No. 2050-0039

UNIFORM HAZARDOUS WASTE MANIFEST	1. Generator ID Number	2. Page 1 of	3. Emergency Response Phone	4. Manifest Tracking Number
	WAH000057175	1	(877) 577-2669	000332245 DAT

GENERATOR

5. Generator's Name and Mailing Address

PACIFIC INDUSTRIAL SUPPLY DIRE CTOR ST
1231 S DIRECTOR ST
Generator's Phone: Seattle WA 98108 (206)682-2100

Generator's Site Address (if different than mailing address)

PACIFIC INDUSTRIAL SUPPLY DIRE CTOR ST
1231 S DIRECTOR ST
SEATTLE WA 98108

6. Transporter 1 Company Name

~~CASCADE DRILLING~~ Stericycle Specialty Waste Solutions, Inc.

U.S. EPA ID Number: MNS 000 110924 ~~GESOC~~

7. Transporter 2 Company Name

~~Stericycle Specialty Waste Solutions Inc~~

U.S. EPA ID Number

8. Designated Facility Name and Site Address

BURLINGTON ENVIRONMENTAL, LLC. TACOMA PLANT
1701 East Alexander Avenue
Facility's Phone: TACOMA, WA 98421 (253) 627-7568

U.S. EPA ID Number: MNS000110924 WAD020257945

9a. HM	9b. U.S. DOT Description (including Proper Shipping Name, Hazard Class, ID Number, and Packing Group (if any))	10. Containers No.	10. Containers Type	11. Total Quantity	12. Unit Wt./Vol.	13. Waste Codes
X	1. NA3077 HAZARDOUS WASTE, SOLID, N.O.S. (CHROMIUM) 9 PGIII	3	CF	1000	P	D007
	2.					
	3.					
	4.					

14. Special Handling Instructions and Additional Information

(1) 1652136-00 - ERG(171) HAZARDOUS WASTE DEBR

08674

15. **GENERATOR'S/OFFEROR'S CERTIFICATION:** I hereby declare that the contents of this consignment are fully and accurately described above by the proper shipping name, and are classified, packaged, marked and labeled/placarded, and are in all respects in proper condition for transport according to applicable international and national governmental regulations. If export shipment and I am the Primary Exporter, I certify that the contents of this consignment conform to the terms of the attached EPA Acknowledgment of Consent.
I certify that the waste minimization statement identified in 40 CFR 262.27(a) (if I am a large quantity generator) or (b) (if I am a small quantity generator) is true.

Generator's/Offeror's Printed/Typed Name: John Simmons — Signature — Month 6 Day 22 Year 2020

INT'L

16. International Shipments ☐ Import to U.S. ☐ Export from U.S. Port of entry/exit:
Transporter signature (for exports only): Date leaving U.S.:

TRANSPORTER

17. Transporter Acknowledgment of Receipt of Materials

Transporter 1 Printed/Typed Name: Doug Flemmons — Signature — Month 6 Day 22 Year 2020

Transporter 2 Printed/Typed Name — Signature — Month Day Year

DESIGNATED FACILITY

18. Discrepancy

18a. Discrepancy Indication Space ☐ Quantity ☐ Type ☐ Residue ☐ Partial Rejection ☐ Full Rejection
ok to note changes to line 1 section 12 per Alex Amort 6/26/20

Manifest Reference Number:

18b. Alternate Facility (or Generator) — U.S. EPA ID Number

Facility's Phone:

18c. Signature of Alternate Facility (or Generator) — Month Day Year

19. Hazardous Waste Report Management Method Codes (i.e., codes for hazardous waste treatment, disposal, and recycling systems)

1.	2.	3.	4.
H141			

20. Designated Facility Owner or Operator: Certification of receipt of hazardous materials covered by the manifest except as noted in Item 18a

Printed/Typed Name: Ashley Ahlgren — Signature — Month 6 Day 25 Year 20

EPA Form 8700-22 (Rev. 12-17) Previous editions are obsolete.

DESIGNATED FACILITY TO EPA's e-MANIFEST SYSTEM