PREPARED BY
EnviroForensics, LLC
P.O. Box 128
Oconomowoc, WI 53066

June 19, 2023

John Feeney
Wisconsin Department of Natural Resources
Plymouth Service Center
1155 Pilgrim Road
Plymouth, WI 53073

Subject: **Investigation Work Plan**
Harborview Cleaners
134 East Grand Avenue
Port Washington, Wisconsin 53074
BRRTS# 02-46-548092

Dear Mr. Feeney:

EnviroForensics, LLC (EnviroForensics) presents this Work Scope to conduct additional site investigation activities at Harborview Cleaners, located at 134 E Grand Avenue, Port Washington, Wisconsin (Site). This Work Scope is in response to your letter request for further site information dated January 6, 2023 and as negotiated with you during our conference call held on March 7, 2023.

I also draw your attention to new information that was not previously submitted regarding repeat sub-slab sampling that was performed at the site building this past December 2, 2022. Prior to the sub-slab sampling, the site soil vapor extraction (SVE) remedial system was shut down on October 24, 2022. The data can be seen in attached **Table 1**, and I have also attached the pertinent laboratory analysis sheets. As can be seen in **Table 1**, the concentrations of chlorinated volatile organic compounds (CVOCs) in sub-slab vapor have decreased dramatically due to adjustments made to the SVE system in January, 2021 to target the more heavily contaminated shallower soil. I apologize as I realize it would have been useful to have had this data prior to our recent meeting, however this was during my transition and I was unaware that it had not yet been submitted.

In general, to respond to the DNR's request for additional investigation, I have prepared a workscope as follows:

- Based on water table elevations, the direction of overall groundwater movement may be to the west. Determine the extent of soil and groundwater impacts to the west and southwest of the site where there are data gaps;
- Resample all wells to gain current data. We propose to sample the wells twice or bi-annually during 2023;
- Re-assess the vapor risk at adjacent properties, namely the pebble house to the west at 126 East Grand Avenue and the adjacent property to the north at 103-109 N. Franklin Street. Two rounds of indoor air/sub-slab vapor samples will be collected from each of these properties;
- Assess sub slab conditions at the site building to determine if additional SVE operation is warranted;
- Sample monitoring well (s) for per and poly-fluorinated alkyl substances (PFAS) as DNR contends they are contaminates likely associated with dry cleaning waste streams; and
- Update site figures with the new data and prepare appropriate geologic cross-sections.

Details of the proposed investigations are presented in the sections below.

FURTHER SITE INVESTIGATION ACTIVITIES

Access Coordination

EnviroForensics will consult with City of Port Washington officials for permission to work in the public alley west of the Site and within the East Grand Avenue roadway. Permit applications for street access and occupancy will be completed and submitted. Traffic control measures will be needed for drilling within the East Grand Avenue roadway.

EnviroForensics will also request access to the private properties at 126 E. Grand Avenue (Pebble house) and 105-107 N. Franklin Street for the purpose of collecting sub-slab and indoor air samples.

Further Soil and Groundwater Delineation

Two (2) additional groundwater monitoring wells will be installed in the alleyway and within East Grand Avenue as shown on attached **Figure 1** to help delineate the extent of groundwater impacts that may have migrated onto City property if the overall direction of groundwater flow is in a more westerly to southwesterly direction than previously thought.

Prior to installing the wells, soil samples will be collected continuously to depth in vinyl acetate sleeves having a length of five-feet using direct-push methods. Soil lithology will be

continuously described in accordance with the Unified Soil Classification System (USCS) and recorded on boring logs.

Decontamination of the sample collection rods will occur between each sample, and the rods will be decontaminated between each borehole. Samples will be collected every two (2) feet along the core and placed into two separate plastic zip-lock bags. One bag will be immediately placed on ice to preserve volatiles prior to possible laboratory analysis and the other bag will be subject to ambient temperatures above 65 degrees Fahrenheit to allow volatiles to collect within the headspace of the bag. The heated bag will be screened for volatiles using a photoionization detector (PID). The tip of the PID will be poked through the side of the plastic bag to allow screening of the headspace. Depending on the results of screening, select samples will be collected in laboratory-supplied containers, labeled, logged on a chain-of-custody form, and submitted to a state-certified laboratory for analysis of volatile organic compounds (VOCs) by USEPA SW-846 Test Method 8260. At each location at least one sample for laboratory analysis will be collected within the upper four (4) feet of soil and one or two additional samples will be collected from the remaining soil column as determined by field instrument readings.

Soil cuttings will be staged in 55-gallon steel drums pending characterization for off-site disposal.

In accordance with safe work practices and as required by state law, EnviroForensics will contact Wisconsin Digger's Hotline subsurface utility protection service at least 72 hours prior to the anticipated onset of subsurface work at the Site. EnviroForensics will also contract with a private underground utility locating service to provide additional confidence regarding the position of potential underground hazards at the drilling locations.

Monitoring Well Installation

Proposed well locations are shown on **Figure 1**. The wells will be labeled MW-6 and MW-7. Direct-push borings will be performed initially at each proposed well location to log soil lithology and screen for volatiles. The borings will then be over-drilled using a 4.25-inch inner diameter hollow-stem auger (HSA) to facilitate well installation.

The wells will consist of 2-inch diameter polyvinyl chloride (PVC) and have screens that are ten-feet long with 0.010-inch factory cut slots. The screens will be positioned to intersect the water table anticipated to be located at a depth of approximately 10-12 feet below ground surface. The filter pack, filter pack seal, and annular space seals will be constructed according to the standards presented in Wisconsin Administrative Code, Chapter NR 141. Expandable locking

caps and locks will be placed on each well. Traffic-rated flush-mount well boxes set in concrete will be installed to protect the wells.

Upon completing the installation of the new monitoring wells, a licensed surveyor will record the elevation and location of each monitoring well by standard surveying methods. A vertical elevation survey will be conducted to establish the elevation of each monitoring well relative to above mean sea level (amsl). The horizontal and vertical grid coordinates of each monitoring well will be recorded to within 0.5 foot and 0.01 foot, respectively. Horizontal coordinates will be referenced to the State Plane Coordinate System.

Well Development

The newly installed monitoring wells will be developed in accordance with the procedures and requirements detailed in WAC Chapter NR 141. The wells will be surged with a surge block and pumped during the development process to remove fines from the sand pack until the water runs clear or 10 well volumes are removed. If the monitoring well(s) can be purged dry, the well(s) will be surged and then slowly purged dry using a disposable bailer(s). Non-dedicated development equipment will be decontaminated between each monitoring well. Development water will be temporarily stored in drums pending appropriate disposal.

Groundwater Monitoring

EnviroForensics proposes to conduct two (2) groundwater monitoring events that include depth to water measurements and sample collection from all monitoring wells. Once the new monitoring wells are installed, the monitoring network will consist of seven (7) water table wells (MW-1 through MW-7) and one (1) piezometer (PZ-1).

Well caps will be removed at least 15 minutes prior to collecting water level measurements to allow groundwater in the monitoring well to equilibrate with the atmospheric pressure. The depth to water in each well will be measured to the nearest 0.01 of a foot using an electronic sounding device and recorded on sampling forms prior to sample collection activities.

EnviroForensics anticipates groundwater purging and sampling using standard low-flow methods. If low-flow methods are not suitable due to limited recharge rates, purging and sampling will be completed using new, disposable bailers. Field parameters including pH, specific conductivity, temperature, oxidation-reduction potential (ORP), and dissolved oxygen (DO) will be measured during purging and recorded on a field sampling form. Wells that purge dry will be allowed to recharge for a minimum of four (4) hours prior to sample collection.

Groundwater samples will be transferred directly into laboratory-provided containers containing hydrochloric acid preservative and placed into a cooler with ice. Samples will be submitted under appropriate chain-of-custody procedures to a state-certified laboratory for analysis of VOCs according to U.S. EPA SW Method 8260. For quality assurance/quality control (QA/QC) purposes, duplicate and equipment blank samples will be collected at a frequency of one (1) sample per ten (10) investigative samples during each monitoring event. Purge water will be temporarily stored in drums or 300-gallon totes.

In addition to VOCs, monitoring well MW-3 will be sampled once for PFAS. The sampling protocol to be used will follow our standard operating procedures for PFAS sampling (attached). If PFAS is detected in MW-3 at concentrations exceeding the proposed regulatory standards, then additional sampling from MW-3 and other site wells may be necessary.

Vapor Intrusion Assessment

There is a current concern that vapor intrusion may be occurring with recent detections of trichloroethene (TCE) at concentrations above the groundwater enforcement standard (ES) at MW-4 which is located between the Pebble House and the Site building. TCE is a daughter product of the natural bio-degradation of tetrachloroethene (PCE). Additional vapor intrusion sampling has been requested to rule out a vapor intrusion risk at the Pebble Building and multi-unit building located at 103-109 N. Franklin Street.

In addition, recent exhaust samples from the operating sub-slab depressurization system (SSDS) located at 103-109 N. Franklin Street property contained historically high concentrations of VOCs. The last sampling event was performed in August of 2020; therefore, additional sampling should be performed to determine existing conditions prior to determining whether it is safe or practical to decommission the SSDS. Since past vapor sampling at these properties have not revealed a vapor risk, it is recommended that one (1) more paired sub-slab/indoor air monitoring event be performed at the Pebble House and also at 105-109 N. Franklin Street property during the winter heating months to better determine future risks. The SSDS at 105-109 N. Franklin Street has been shut down since the last sampling event, so there has been ample time for potential vapors to have accumulated below the basement slab.

The potential for these vapor risks to be pervasive is also tied to the effectiveness of past remedial efforts which will be address in other sections of this work scope below.

Indoor Air Sampling

To better determine vapor risk, we are proposing to use passive vapor sampling methods for indoor/outdoor air. The samplers will be of the absorbent tube type and and supplied by and then analyzed by Beacon Environmental of Forest Hill, Maryland. The type of absorbent will be selected based on site contaminates previously detected and will be placed at a level of 3-5 feet above the floor surfaces coinciding with the average breathing zone for adults and children. The passive samplers will be left in place for between 7-10 days to gain a time-weigted average over that period.

Prior to sampling, an inspection will be conducted to identify and inventory materials that could potentially contribute to indoor air conditions, unrelated to VI issues. Suspect items identified during the inspection will be listed on a pre-sampling inspection form for later reference or potential removal. The results of all pre-sampling inspection activities will be recorded on an Indoor Air Building Survey Form.

One (1) indoor air sample each will be collected from the basement and ground floor, respectively, of the Pebble house building located at 126 E. Grand Avenue.

One (1) indoor air sample each will be collected from basements at the multi-unit building located at 103-109 N. Franklin Street within units 105 and 107. In addition, one sample of indoor air will be collected from each of the first-floor commercial units designated 105 and 107, and one (1) indoor air sample each from the second floor residential units identified as 103 and 109 N. Franklin Street. This will result in a total of six (6) indoor air samples from this building. We will collect one (1) outdoor air sample to assess background conditions.

Samples will be identified by project number, address, and sample type “IA” for indoor air samples or “OA” for outside air samples (e.g., 6348-126-IA-1). Samples will be submitted to Beacon Environmental under chain-of-custody for analysis of select VOCs related to dry cleaning solvent according to EPA Test Method TO-17. The analytical results of the air samples will be compared to Vapor Action Levels (VALs) established by WDNR.

Off-site Sub-Slab Vapor Sampling

Stainless steel Vapor Pin® sub-slab vapor sampling ports have been previously installed to facilitate vapor sample collection. The locations of the existing vapor sampling ports are shown on attached **Figure 2**. Sub-slab vapor samples will be collected immediately following the conclusion of indoor air sampling to avoid the incorporation of possible sub-slab vapors within indoor air during the sub-slab sampling process.

One (1) sub-slab sample will be collected from beneath the basement slab of the Pebble house located at 126 E. Grand Street and one (1) sample each will be collected from below the slab at the multi-unit building located at 103-109 N. Franklin Street at the existing ports labeled 105-SS-1, 105-SS-2, and 107-SSV-1.

To ensure that the sub-slab vapor samples are representative of subsurface conditions, water dam leak testing will be performed at each sample port. The integrity of the sample tubing and fittings will be verified prior to sample collection by conducting a negative pressure test.

All samples will be collected through dedicated polyethylene tubing connected to the sub-slab vapor sampling port. Ambient air will be purged from the tubing prior to initiating sample collection. Vapor beneath the concrete slab will then be drawn into a 1-liter vacuum canister fitted with a laboratory supplied regulator that limits the flow rate to approximately 200 milliliters per minute (mL/min). Samples will be identified by project number, address, and unique ID (e.g., 6348-126-SSV-1). Following the completion of sampling activities, the canisters will be submitted to an environmental laboratory for analysis of select VOCs related to dry cleaning solvent according to U.S. EPA Method TO-15. The analytical results of the sub-slab vapor samples will be compared to Vapor Risk Screening Levels (VRSLs) established by WDNR.

Soil Vapor Extraction Remedial System Assessment

A soil vapor extraction system (SVE) has operated at the site building at 134 E. Grand Avenue since August of 2018. In January of 2021, the system was modified slightly by raising the screened interval to vent shallow impacts having greater concentrations of contaminates. The system was then shut down October 24, 2022 to facilitate collection of sub-slab vapor samples on December 2, 2022. The system is currently not operating.

Sub-slab samples were collected on December 2, 2022 at the locations of V-1R and V-2R shown on attached **Figure 2**. As can be seen on **Figure 2** and in updated **Table 1**, the concentrations of PCE and TCE were below the commercial VRSLs.

The WDNR has indicated that the system should continue to operate on a pulsed basis (on for a period of time and then off for a period of time) to further remedial efforts. Because the latest sub-slab results are below commercial VRSLs, it is unknown whether additional SVE is needed. The SVE system has been shut down since October of 2022 so there has been ample time for vapors to accumulate below the slab.

We will perform two (2) additional rounds of sub-slab sampling to include one (1) during the summer months and one (1) during the winter months from the past locations of V-1R and V-2R to determine if additional SVE operation is needed. As in the past, temporary vapor pins will be installed to collect the vapor data, then removed, and the holes in the floor patched.

This information, along with the results of vapor sampling in adjacent buildings, will provide us with the data needed to make this decision. If after either of the proposed sampling events the commercial VRSL is exceeded, then pulsed operation of the SVE system will be implemented.

Sample Results Notifications

Following the initial proposed investigations, and after each additional groundwater and VI sampling event, EnviroForensics will prepare a sample results notification for the property owners in accordance with WDNR regulations. The letter-format notifications will include a description of the sampling procedures, a figure depicting the sample locations, and a results summary table with comparisons to WDNR screening/action levels.

Investigation-Derived Media Management

Investigation-derived media (IDM) will consist of soil cuttings and groundwater generated during well development and purging prior to sample collection. Soil cuttings will be placed in 55-gallon steel drums. One (1) composite soil sample will be collected for profiling. Groundwater will be staged in 300-gallon plastic totes or 55-gallon drums as appropriate. Samples will be collected directly from the totes for characterization and profiling. Based on the concentrations of contaminants detected in previous soil and monitoring well samples, EnviroForensics anticipates that all IDM will be characterized as non-hazardous. A licensed contractor will be retained to transfer the IDM off-site for proper disposal.

Data Evaluation

The soil and groundwater data will be evaluated and summarized with comparison to regulatory standards as laboratory results are received. Data summary tables and preliminary figures will be generated for purposes of data visualization and discussion with project stakeholders. Further data analysis and interpretation will be incorporated into future work plans, as needed, and into a comprehensive report to be prepared at the conclusion of these further investigations.

SCHEDULE

Access coordination will begin immediately along with contracting and scheduling for private utility clearance, drilling, surveying, and IDM management. The source delineation and monitoring well installation can be completed within 6 weeks of receiving access approval. The investigative activities will be combined as much as possible to minimize the number of mobilizations. The off-site vapor intrusion sampling event will be performed during the winter months as recommended by WDNR. The groundwater monitoring events will be conducted on a semi-annual basis. IDM will be removed from the Site on two (2) occasions: after well installation and development, and after the last groundwater monitoring event.

If you have any questions or require additional information, please do not hesitate to contact me at (262) 490-6472 or wfassbender@enviroforensics.com.

Sincerely,
EnviroForensics, LLC

Wayne Fassbender, PG
Senior Project Manager

Attachments:
Table 1: Vapor Intrusion Assessment Results Summary
Figure 1: Groundwater Analytical Results Map
Figure 2: Sub-slab Vapor Sample Results Summary
Vapor Sampling Laboratory Results Sheets
EnviroForensics Standard Operating Procedures (SOP) for PFAS Samplling

Copy:
Ms. Barbara Bahr, Harborview Cleaners
Mr. Andrew Skwierawski, Halling & Cayo

TABLE 1

VAPOR INTRUSION ASSESSMENT RESULTS SUMMARY

Harborview Cleaners

Port Washington, Wisconsin

Address	Sample Identification	Sample Location	Exposure Criteria	Sample Date	Mitigation	Tetrachloroethene	Trichloroethene	cis-1,2-Dichloroethene	trans-1,2-Dichloroethene	Vinyl Chloride
INDOOR/OUTDOOR AIR										
Residential Vapor Action Level						**42**	**2.1**	**NE**	**42**	**1.7**
Small Commercial Vapor Action Level						**180**	**8.8**	**NE**	**180**	**28**
103-109 N. Franklin St.	6348-OA	Outdoor	Small Commercial	12/2/2015	Pre	**5.22**	<1.07	<19.8	<39.6	<1.28
				1/13/2016	Pre	**4.75**	<1.07	<3.96	<3.96	<0.64
				5/24/2016	Post	**6.92**	<1.07	<3.96	<3.96	<0.64
				11/2/2016	Post	**16.9**	<1.07	<3.96	<3.96	<0.64
				8/8/2017	Post	<3.19	<1.07	<19.8	<39.6	<1.28
				2/27/2018	Post	<3.19	<1.07	<19.8	<39.6	<1.28
				2/15/2019	Post	<3.19	<1.07	<19.8	<39.6	<1.28
				9/26/2019	Post	<3.19	<1.07	<19.8	<39.6	<1.28
				2/18/2020	Post	<3.19	<1.07	<19.8	<39.6	<1.28
				8/25/2020	Post **	<3.19	<1.07	<19.8	<39.6	<1.28
	6348-105-IA-B	Basement	Small Commercial	12/2/2015	Pre	**852**	<1.07	<19.8	<39.6	<1.28
				1/13/2016	Pre	**1,130**	<1.07	<3.96	<3.96	<0.64
				5/24/2016	Post	**4,260**	<1.07	<3.96	<3.96	<0.64
				11/2/2016	Post	**402**	<1.07	<3.96	<3.96	<0.64
				8/8/2017	Post	**303**	<1.07	<19.8	<39.6	<1.28
				2/27/2018	Post	**324**	<1.07	<19.8	<39.6	<1.28
				2/15/2019	Post	**41.8**	<1.07	<19.8	<39.6	<1.28
				9/26/2019	Post	**30.4**	<1.07	<19.8	<39.6	<1.28
				2/18/2020	Post	**36.4**	<1.07	<19.8	<39.6	<1.28
				8/25/2020	Post **	**23.3**	<1.07	<19.8	<39.6	<1.28
	6348-107-IA-B	Basement	Small Commercial	12/2/2015	Pre	**265**	<1.07	<19.8	<39.6	<1.28
				1/13/2016	Pre	**504**	<1.07	<3.96	<3.96	<0.64
				5/24/2016	Post	**1,420**	<1.07	<3.96	<3.96	<0.64
				11/2/2016	Post	**188**	<1.07	<3.96	<3.96	<0.64
				8/8/2017	Post	**165**	<1.07	<19.8	<39.6	<1.28
				2/27/2018	Post	**13.5**	<1.07	<19.8	<39.6	<1.28
				2/15/2019	Post	**9.09**	<1.07	<19.8	<39.6	<1.28
				9/26/2019	Post	**6.85**	<1.07	<19.8	<39.6	<1.28
				2/18/2020	Post	**10.5**	<1.07	<19.8	<39.6	<1.28
				8/25/2020	Post **	**16.5**	<1.07	<19.8	<39.6	<1.28
	6348-105/107-IA-1	1st Floor	Small Commercial	12/2/2015	Pre	**199**	<1.07	<19.8	<39.6	<1.28
	6348-105-IA-1	1st Floor	Small Commercial	1/13/2016	Pre	**296**	<1.07	<3.96	<3.96	<0.64
				5/24/2016	Post	**1,480**	<1.07	<3.96	<3.96	<0.64
				11/2/2016	Post	**277**	<1.07	<3.96	<3.96	<0.64
				8/8/2017	Post	**132**	<1.07	<19.8	<39.6	<1.28
				2/27/2018	Post	**53.0**	<1.07	<19.8	<39.6	<1.28
				2/15/2019	Post	**13.2**	<1.07	<19.8	<39.6	<1.28
				9/26/2019	Post	**13.9**	<1.07	<19.8	<39.6	<1.28
				8/25/2020	Post **	**44.8**	<1.07	<19.8	<39.6	<1.28
	6348-107-IA-1	1st Floor	Small Commercial	1/13/2016	Pre	**178**	<1.07	<3.96	<3.96	<0.64
	6348-103-IA	2nd Floor	Residential	12/2/2015	Pre	**288**	<1.07	<19.8	<39.6	<1.28
				1/13/2016	Pre	**849**	<1.07	<3.96	<3.96	<0.64
				5/24/2016	Post	**100**	<1.07	<3.96	<3.96	<0.64
				11/2/2016	Post	**217**	<1.07	<3.96	<3.96	<0.64
				8/8/2017	Post	**101**	<1.07	<19.8	<39.6	<1.28
				2/27/2018	Post	**56.5**	<1.07	<19.8	<39.6	<1.28
				2/18/2020	Post	**14.0**	<1.07	<19.8	<39.6	<1.28
				8/25/2020	Post **	**7.39**	<1.07	<19.8	<39.6	<1.28
	6348-109-IA	2nd Floor	Residential	12/2/2015	Pre	**88.0**	<1.07	<19.8	<39.6	<1.28
				1/13/2016	Pre	**649**	<1.07	<3.96	<3.96	<0.64
				5/24/2016	Post	**352**	<1.07	<3.96	<3.96	<0.64
				11/2/2016	Post	**60**	<1.07	<3.96	<3.96	<0.64
				8/8/2017	Post	**51.0**	<1.07	<19.8	<39.6	<1.28
				3/14/2019	Post	<3.19	<1.07	<19.8	<39.6	<1.28
				2/18/2020	Post	**5.63**	<1.07	<19.8	<39.6	<1.28
				8/25/2020	Post **	<3.19	<1.07	<19.8	<39.6	<1.28
115 N. Franklin St.	6348-115-IA-B	Basement	Small Commercial	12/2/2015	NA	**7.87**	<1.07	<19.8	<39.6	<1.28
				1/28/2016	NA	**7.66**	<1.07	<3.96	<3.96	<0.64
	6348-115-IA-1	1st Floor	Small Commercial	12/2/2015	NA	**6.44**	<1.07	<19.8	<39.6	<1.28
				1/28/2016	NA	**8.14**	<1.07	<3.96	<3.96	<0.64
126 E. Grand Ave.	6348-126-IA-B	Basement	Small Commercial	12/2/2015	NA	**77.3**	<1.07	<19.8	<39.6	<1.28
				1/28/2016	NA	**32.4**	<1.07	<3.96	<3.96	<0.64
	6348-126-IA-1	1st Floor	Small Commercial	12/2/2015	NA	**36.7**	<1.07	<19.8	<39.6	<1.28
				1/28/2016	NA	**39.4**	<1.07	<3.96	<3.96	<0.64

TABLE 1

VAPOR INTRUSION ASSESSMENT RESULTS SUMMARY

Harborview Cleaners

Port Washington, Wisconsin

Address	Sample Identification	Sample Location	Exposure Criteria	Sample Date	Mitigation	Tetrachloroethene	Trichloroethene	cis-1,2-Dichloroethene	trans-1,2-Dichloroethene	Vinyl Chloride
SUB-SLAB VAPOR										
Residential Vapor Risk Screening Level						**1,400**	**70**	**NE**	**1,400**	**56**
Small Commercial Vapor Risk Screening Level						**5,800**	**290**	**NE**	**5,800**	**930**
134 E. Grand Ave.	V-1	1st Floor	Small Commercial	1/21/2008	Pre	**515,100**	**77.0**	**21.0**	<4.8	<1.66
	V-1R			8/24/2020	Post **	**19,800**	**44.1**	<198	<396	<12.8
				12/2/2022	Post	**678**	<10.7	<198	<396	<12.8
	V-2	1st Floor	Small Commercial	1/21/2008	Pre	**1,193,000,000**	**1,541**	**564**	<54.0	<17.7
	V-2R			8/24/2020	Post **	**32,100**	**708**	<198	<396	<12.8
				12/2/2022	Post	**2,880**	<10.7	<198	<396	<12.8
103-109 N. Franklin St.	6348-107-SSV-1	Basement	Small Commercial	12/3/2015	Pre	**142**	<10.7	<198	<396	<12.8
				1/13/2016	Pre	**326**	<10.7	<39.6	<39.6	<6.4
	6348-EP-2 (SSDS Extraction Point)	Basement	Small Commercial	11/2/2016	Post	**4,480**	**107**	<39.6	<39.6	<6.4
				8/8/2017	Post	**317**	**146**	<198	<396	<12.8
				2/27/2018	Post	**120**	<10.7	<198	<396	<12.8
				2/15/2019	Post	**52.9**	**317**	<198	<396	<12.8
				9/26/2019	Post	**158**	<10.7	<198	<396	<12.8
				2/18/2020	Post	**2,070**	**69.3**	<198	<396	<12.8
	6348-105-SS-1	Basement	Small Commercial	8/25/2020	Post **	**199**	<10.7	<198	<396	<12.8
	6348-105-SS-2	Basement	Small Commercial	8/25/2020	Post **	**98.3**	<10.7	<198	<396	<12.8
	6348-105-SS-3	Basement	Small Commercial	8/25/2020	Post **	**104**	<10.7	<198	<396	<12.8
126 E. Grand Ave.	6348-126-SSV-1	Basement	Small Commercial	12/3/2015	NA	**695**	<10.7	<198	<396	<12.8
				1/28/2016	NA	**332**	<10.7	<39.6	<39.6	<6.4

Notes:

** = Vapor mitigation system shut down three weeks prior to sample collection

Vapor Action and Risk Screeing Levels are calculated according to WDNR Publication RR-800 and subsequent vapor intrusion guidance documents

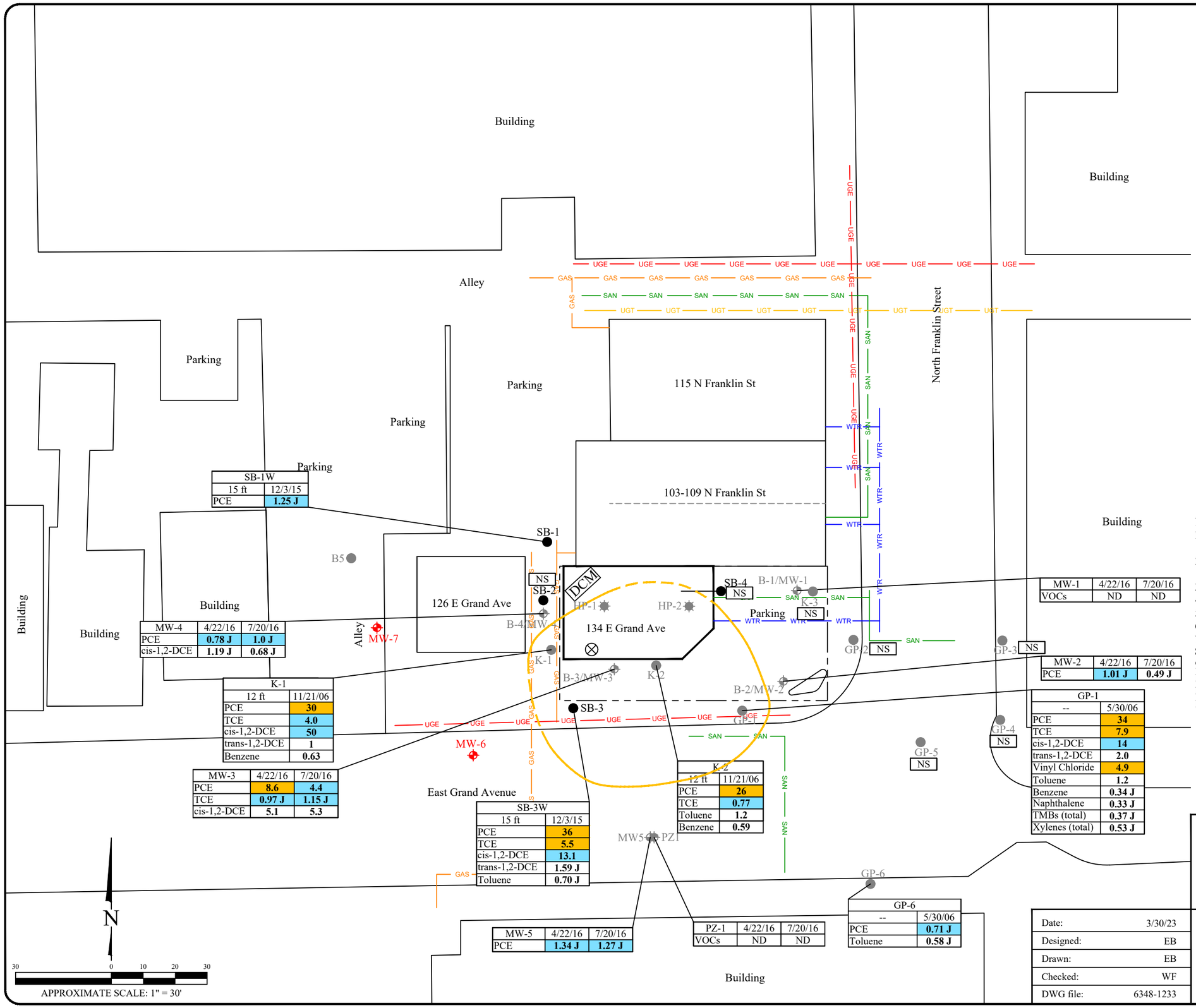
Results reported in micrograms per cubic meter ($\mu g/m^3$)

Samples analyzed according to EPA Method TO-15

NE = Screening/action level not established

Bolded values are above detection limits

Bolded and shaded values exceed the applicable screening or action level



Legend

- Site boundary
- Dividing wall
- GAS — Underground gas utility line
- WTR — Underground water utility line
- SAN — Underground sanitary utility line
- UGT — Fiber optics line
- UGE — Underground electrical utility line
- MW1 — Monitoring well (By Others)
- B5 — Boring (By Others)
- HP-1 — Hand probe (By Others)
- SB-1 — Proposed direct push soil boring
- SB-4 — Directional soil boring
- MW-6 — Proposed monitoring well
- DCM — Dry cleaning machine location
- Historic spent solvent/filter storage

Analyte	Public Health Preventive Action Limit	Public Health Enforcement Standard
PCE	**0.5**	**5**
TCE	**0.5**	**5**
cis-1,2-DCE	**7**	**70**
trans-1,2-DCE	**20**	**100**
Toluene	**200**	**1,000**
Benzene	**0.5**	**5**
n-Butylbenzene	NE	NE
Chlorobenzene	**20**	**100**
sec-Butylbenzene	NE	NE
p-Isopropyltoluene	NE	NE
Naphthalene	**10**	**100**
TMBs (total)	**96**	**480**
Xylenes (total)	**1,000**	**10,000**

Note:
1. Bolded and orange shaded values exceed the Public Health Enforcement Standard
2. Bolded and blue shaded values exceed the Public Health Preventive Action Limit
3. Bolded values are above detection limits
4. J = Analyte concentration less that laboratory detection limits
5. Samples analyzed using EPA SW-846 Method 8260
6. All results reported in units of micrograms per liter (µg/L)
7. PCE = Tetrachloroethene
8. TCE = Trichloroethene
9. TMBs = Trimethylbenzenes
10. VOCs = Volatile Organic Compounds
11. ND = Not detected
12. NS = Not sampled

Extent of PCE impacts in groundwater above Enforcement Standards (Dashed where inferred)

GROUNDWATER ANALYTICAL RESULTS MAP

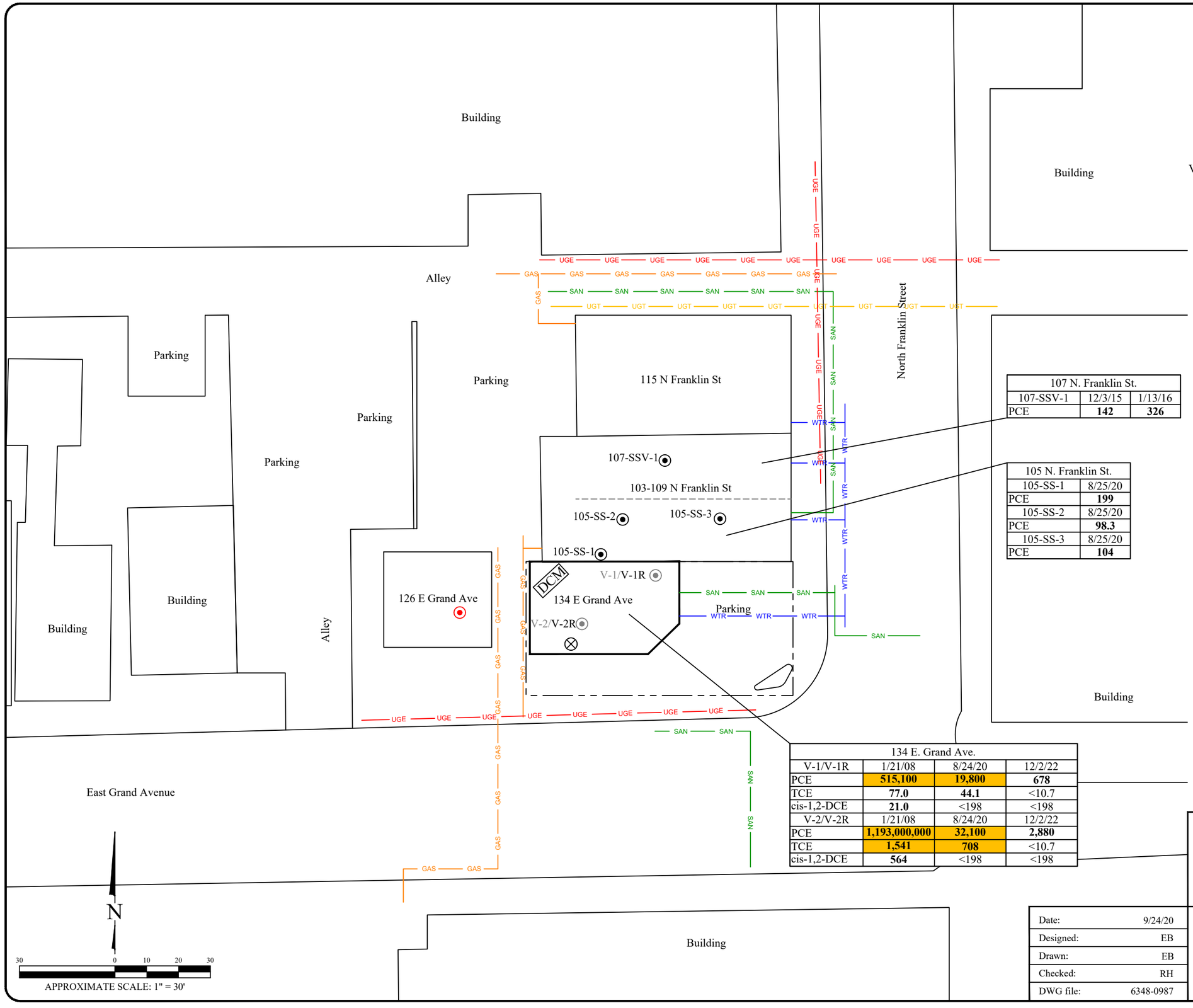
Harborview Cleaners
134 East Grand Avenue
Port Washington, Wisconsin

Date:	3/30/23
Designed:	EB
Drawn:	EB
Checked:	WF
DWG file:	6348-1233

ENVIRO forensics
825 North Capitol Avenue • Indianapolis, IN 46204
EnviroForensics.com

Figure 1

Project 6348



Legend

- Site boundary
- Dividing wall
- Underground gas utility line
- Underground water utility line
- Underground sanitary utility line
- Fiber optics line
- Underground electrical utility line
- V-1 — Vapor sample (By Others)
- V-1R/SS-1/SSV-1 — Sub-slab sample
- Proposed Sub-slab sample
- DCM — Dry cleaning machine location
- Historic spent solvent/filter storage

Sub-slab vapor and Soil gas		
Analyte	Small Commercial Vapor Risk Screening Level	Residential Vapor Risk Screening Level
PCE	**5,800**	**1,400**
TCE	**290**	**70**
cis-1,2-DCE	NE	NE

Note:
1. Bolded and shaded orange values exceed Small Commercial Vapor Risk Screening Levels
2. Bolded and shaded blue values exceed Residential Vapor Risk Screening Levels
3. All results reported in micrograms per cubic meter ($\mu g/m^3$)
4. NE = Not established
5. Vapor Risk Screening Levels calculated according to WDNR Publication RR-800 and subsequent vapor intrusion guidance documents
6. PCE = Tetrachloroethene
7. TCE = Trichloroethene
8. cis-1,2-DCE = cis-1,2-Dichloroethene

107 N. Franklin St.		
107-SSV-1	12/3/15	1/13/16
PCE	**142**	**326**

105 N. Franklin St.	
105-SS-1	8/25/20
PCE	**199**
105-SS-2	8/25/20
PCE	**98.3**
105-SS-3	8/25/20
PCE	**104**

134 E. Grand Ave.			
V-1/V-1R	1/21/08	8/24/20	12/2/22
PCE	**515,100**	**19,800**	**678**
TCE	**77.0**	**44.1**	<10.7
cis-1,2-DCE	**21.0**	<198	<198
V-2/V-2R	1/21/08	8/24/20	12/2/22
PCE	**1,193,000,000**	**32,100**	**2,880**
TCE	**1,541**	**708**	<10.7
cis-1,2-DCE	**564**	<198	<198

N

30 0 10 20 30

APPROXIMATE SCALE: 1" = 30'

SUB-SLAB VAPOR SAMPLE RESULTS SUMMARY

Harborview Cleaners
134 East Grand Avenue
Port Washington, Wisconsin

Date:	9/24/20
Designed:	EB
Drawn:	EB
Checked:	RH
DWG file:	6348-0987

ENVIRO forensics
825 North Capitol Avenue • Indianapolis, IN 46204
EnviroForensics.com

Figure 2

Project 6348

EnvisionAir
1441 Sadlier Circle West Drive
Indianapolis, IN 46239
Ph: 317-351-0885
Fax: 317-351-0882
www.envision-air.com

Mr. Brian Kappen
Enviroforensics
N16 W. 23390 Stone Ridge Dr
Suite G
Waukesha, WI 53188

December 16, 2022

EnvisionAir Project Number: 2022-670
Client Project Name: 6348

Dear Mr. Kappen,

Please find the attached analytical report for the samples received December 5, 2022. All test methods performed were fully compliant with local, state, and federal EPA methods unless otherwise noted. The project was analyzed as requested on the enclosed chain of custody record. Please review the comments section for additional information about your results or Quality Control data.

Feel free to contact me if you have any questions or comments regarding your analytical report or service.

Thank you for your business. EnvisionAir looks forward to working with you on your next project.

Yours Sincerely,

David Norris
Project Manager
EnvisionAir, LLC

EnvisionAir
1441 Sadlier Circle West Drive
Indianapolis, IN 46239
Ph: 317-351-0885
Fax: 317-351-0882
www.envision-air.com

Client Name: ENVIROFORENSICS

Project ID: 6348

Client Project Manager: BRIAN KAPPEN

EnvisionAir Project Number: 2022-670

Sample Summary

Canister Pressure / Vacuum

Laboratory Sample Number:	Sample Description:	Matrix:	START Date Collected:	START Time Collected:	End Date Collected:	End Time Collected:	Date Received:	Time Received	Initial Field (in. Hg)	Final Field (in. Hg)	Lab Received (in. Hg)
22-3381	6348-V-1R	A	12/2/22	13:50			12/5/22	15:45	-30	-5	-5
22-3382	6348-V-2R	A	12/2/22	14:10			12/5/22	15:45	-28	-3	-3

EnvisionAir
1441 Sadlier Circle West Drive
Indianapolis, IN 46239
Ph: 317-351-0885
Fax: 317-351-0882
www.envision-air.com

Client Name: ENVIROFORENSICS

Project ID: 6348

Client Project Manager: BRIAN KAPPEN

EnvisionAir Project Number: 2022-670

Analytical Method: TO-15
Analytical Batch: 120522AIR

Client Sample ID: 6348-V-IR
Sample Collection START Date/Time: 12/2/22 13:50
Sample Collection END Date/Time:
EnvisionAir Sample Number: 22-3381
Sample Received Date/Time: 12/5/22 15:45
Sample Matrix: AIR

Compounds	Sample Results ug/m³	Reporting Limit ug/m³	Flag
cis-1,2-Dichloroethene	< 198	198	
Tetrachloroethene	**678**	31.9	
trans-1,2-Dichloroethene	< 396	396	
Trichloroethene	< 10.7	10.7	
Vinyl Chloride	< 12.8	12.8	
4-bromofluorobenzene (surrogate)	99%		
Analysis Date/Time:	12-5-22/20:37		
Analyst Initials	tjg		

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Client Name: ENVIROFORENSICS

Project ID: 6348

Client Project Manager: BRIAN KAPPEN

EnvisionAir Project Number: 2022-670

Analytical Method: TO-15
Analytical Batch: 120522AIR

Client Sample ID: 6348-V-2R
Sample Collection START Date/Time: 12/2/22 14:10
Sample Collection END Date/Time:
EnvisionAir Sample Number: 22-3382
Sample Received Date/Time: 12/5/22 15:45
Sample Matrix: AIR

Compounds	Sample Results ug/m³	Reporting Limit ug/m³	Flag
cis-1,2-Dichloroethene	< 198	198	
Tetrachloroethene	**2,880**	128	1
trans-1,2-Dichloroethene	< 396	396	
Trichloroethene	< 10.7	10.7	
Vinyl Chloride	< 12.8	12.8	
4-bromofluorobenzene (surrogate)	102%		
Analysis Date/Time:	12-5-22/21:45		
Analyst Initials	tjg		

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Indianapolis, IN 46239
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Fax: 317-351-0882
www.envision-air.com

Analytical Report

TO-15 Quality Control Data

EnvisionAir Batch Number: 120522AIR

Method Blank (MB):	MB Results (ppbv)	Reporting Limit (ppbv)	Flags
cis-1,2-Dichloroethene	< 5	5	
Tetrachloroethene	< 0.47	0.47	
trans-1,2-Dichloroethene	< 10	10	
Trichlorethene	< 0.2	0.2	
Vinyl Chloride	< 0.5	0.5	
4-bromofluorobenzene (surrogate)	97%		
Analysis Date/Time:	12-5-22/13:01		
Analyst Initials	tjg		

LCS/LCSD	LCS Results (ppbv)	LCSD Results (ppbv)	LCS/D Conc(ppbv)	LCS Rec.	LCSD Rec.	RPD	Flag
Vinyl Chloride	9.36	10.4	10	94%	104%	10.5%	
trans-1,2-Dichloroethene	9.49	10.3	10	95%	103%	8.2%	
cis-1,2-Dichloroethene	9.43	10.5	10	94%	105%	10.7%	
Trichloroethene	9.89	10.1	10	99%	101%	2.1%	
Tetrachloroethene	9.61	9.65	10	96%	97%	0.4%	
4-bromofluorobenzene (surrogate)	98%	99%					
Analysis Date/Time:	12-5-22/11:09	12-5-22/11:47					
Analyst Initials	tjg	tjg					

EnvisionAir
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Indianapolis, IN 46239
Ph: 317-351-0885
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www.envision-air.com

Flag Number	Comments
1	Reported value is from a 40x dilution. TJG 12/16/22

EnvisionAir Proj#: 2022.670 Page 1 of 1

CHAIN OF CUSTODY RECORD

EnvisionAir | 1441 Sadlier Circle West Drive | Indianapolis, IN 46239 | Phone: (317) 351-0885 | Fax: (317) 351-0882

Client: EnviroForensics	P.O. Number: 2022-0522
Report Address: bkappen@enviroforensics.com	Project Name or Number: 6348
Report To: B. Kappen	Sampled by: B. Kappen
Phone: 262-745-5054	QA/QC Required: (circle if applicable) Level III Level IV
Invoice Address: accountspayable@enviroforensics.com	Reporting Units needed: (circle) ug/m³ mg/m³ PPBV PPMV
Desired TAT: (Please Circle One) 1 day 2 days 3 days Std (5 bus. days)	Media type: 1LC = 1 Liter Canister; 6LC = 6 Liter Canister; TB = Tedlar Bag; TD = Thermal Desorption Tube

REQUESTED PARAMETERS

TO-15 Full List | TO-15 Short List (Specify in notes)

ENVISIONAIR

Sampling Type:
Soil-Gas: ☐
Sub-Slab: ☒
Indoor-Air: ☐

www.envision-air.com

Canister Pressure / Vacuum

Air Sample ID	Media Type (see code above)	Coll. Date (Grab/Comp Start)	Coll. Time (Grab/Comp Start)	Coll. Date (Comp. End)	Coll. Time (Comp. End)	TO-15 Full List	TO-15 Short List (Specify in notes)			Canister Serial #	Flow Controller Serial #	Initial Field (in. Hg)	Final Field (in. Hg)	Lab Received (in. Hg)	EnvisionAir Sample Number
6348-V-1R	1LC	12/2/22	1350				X			83727	0104	-30	-5	-5	22-3381
6348-V-2R	1LC	12/2/22	1410				X			83679	0085	-28	-3	-3	22-3382

Comments: Short list: PCE, TCE, cis-1,2-DCE, trans-1,2-DCE, Vinyl chloride

Relinquished by:	Date	Time	Received by:	Date	Time
	12/2/22	1700	FedEx	12/2/22	1700
			UPS Worldwide	12/5/22	15:45

STANDARD OPERATING PROCEDURE

Sampling Protocol for Per-and Polyfluoroalkyl Substances (PFAS)

INTRODUCTION

State regulatory agencies are currently developing sampling guidance, soil and groundwater standards, and other procedures aimed at the regulation of per- and polyfluoroalkyl substances (PFAS). Along with the developing regulatory procedures, there exist several sampling guidance resources from various agencies such as the State of Michigan, the U.S. Department of Defense, the U.S. Environmental Protection Agency, the Interstate Technology & Regulatory Council, and a few analytical laboratories such as Pace Analytical and Test America. This Standard Operating Procedure (SOP) was based on the procedures and guidance developed to date by these agencies. Since regulations and standards regarding PFAS are evolving, it is anticipated that this SOP will require periodic modifications.

When sampling for PFAS, this SOP should be used as a supplement to modify existing EnviroForensics SOP's related to standard groundwater and soil sampling procedures.

Although similar to standard sampling methods for other chemical compounds, special precautions are necessary when sampling for PFAS due to the laboratory detection limits that are in the parts per trillion range, and the proliferation of PFAS in common consumer products. This greatly raises the potential for these compounds to be inadvertently introduced to the samples, resulting in false-positive detections.

The sampling precautions and protocol for PFAS are rigorous and there are many potential opportunities for mistakes in the field that can result in cross-contamination, or the inadvertent introduction of PFAS into the sample media. **It is required that any field investigations for PFAS be conducted by a two (2) person team**. One (1) person is assigned the actual sample collection protocol and the other person is assigned to maintaining the integrity of the sample throughout the sampling process.

PRE-SAMPLING CONSIDERATIONS

As mentioned, PFAS have been detected in many everyday products including cosmetics, soaps, sun-screen, insect repellent, and many products having water repellents and/or stain-resistant coatings to include carpeting, car upholstery, some Tyvek suits, water proof leather boots, garments, and rain-wear. Several agencies have prepared a list of acceptable materials that have

been tested free of PFAS; however, there is a long list of items that have not been tested. This SOP provides some acceptable materials that can be safely used before and during sampling for PFAS, along with comments regarding materials that should not be used and various recommendations to improve sample integrity.

A limited number of readily available and recognizable products are presented below instead of listing all options. For example, there are numerous sun-screen and insect repellent products that have been determined to be PFAS-free (and the list will likely grow over time); however, only a few readily available and recognizable products are listed or recommended here to reduce the number of product decisions that project staff may need to make. If any other product is proposed for use, but is not identified in this SOP as PFAS-free, then that product or substance will need to be analyzed or otherwise determined to be PFAS-free before it can be used.

Personal Hygiene and Care Products

Many personal care products may contain PFAS. These products include soaps, shampoos, cosmetics, deodorants, and dental products including floss. By following this SOP it is not likely that these types of products will come into direct contact with a sample. However, it is **highly recommended that the use of personal care products be curtailed the day of sampling** until more information is available for personal care products that do not contain PFAS.

Personal Protective Equipment

Many common types of protective equipment including clothes, jackets, boots, gloves, Tyvek products, sunscreen, and insect repellents contain PFAS. For common clothing, jackets, boots, and gloves, the PFAS occurs in water repellent and stain repellent treatments that have been applied to the clothing and outer wear. The use of fabric softeners during laundering may also impart PFAS to clothing. Rain suits made of breathable, yet water repellent, materials typically have PFAS in them. Items made of rubber or PVC do not contain PFAS.

Items that may be worn and are known to be free of PFAS include:

- Powderless nitrile gloves;
- Clothing made of natural and synthetic fibers (preferably cotton) and that have been **washed at least six (6) times and without using fabric softeners or dryer sheets**;
- Polyvinyl chloride (PVC) or wax-coated fabrics, including rain gear;
- Any boots or over-boots made of polyurethane or PVC;
- Neoprene;
- Un-coated Tyvek® coveralls;

- Sunscreen: Banana Boat Sport Performance Sunscreen Lotion Broad Spectrum SPF 30; or Coppertone Sunscreen Lotion Ultra Guard Broad Spectrum SPF 50; and
- Insect repellent: Off Deep Woods.

Items that **may not** be worn due to the potential for containing PFAS:

- Coated Tyvek® materials as they do contain PFAS;
- Leather or other steel-toed work boots unless polyurethane or PVC over-boots are used;
- Clothing treated with stain or water repellents;
- Clothing and outerwear that has been dry cleaned; and
- Any rain gear having Gore-Tex™ or other water-proof, or water-repellent fabrics or coatings.

Field Sampling Equipment

Carefully select sampling equipment that directly contacts the sample to ensure it is free from PFAS. Submersible pumps, down-hole instruments, and tubing used for groundwater sampling could have external or internal parts that are not PFAS-free. Check with the manufacturer to evaluate whether there are PFAS-containing components in the equipment. If unsure collect an equipment blank and have it analyzed for PFAS.

Some materials that are known to be PFAS-free include:

- Metals (metal components used for groundwater sampling are typically either stainless steel or brass);
- Nylon;
- PVC (bailers and pump parts);
- High-density polyethylene (HDPE);
- Polypropylene and polyurethane (bailer rope and tubing);
- Silicone (tubing); and
- Acetate (drill core sleeves).

Materials that may contain PFAS and **are not** to be used include:

- Low-density polyethylene (LDPE) tubing. LDPE does not inherently contain PFAS, but may have acquired it through materials used in the manufacturing process. LDPE Zip-loc® sample bags can be used if they do not contact the sample media directly;
- Aluminum foil;

- Teflon-lined tubing or equipment having Teflon components;
- Any product or equipment having any "fluoro" prefix;
- "Rite in the Rain" or other all-weather field books; and
- Sharpie markers, post-it notes, or other adhesive paper products.

In addition, **do not** transport field equipment in direct contact with vehicle carpet or seats. These materials typically contain PFAS in stain and water repellent applications. If equipment must be set on seats or carpet, then transport it in a closed container.

Sample Collection Recommendations:

1. If the depth to water is shallow, use disposable PVC bailers with polypropylene or polyurethane rope.
2. Collect an equipment blank from or through any sampling equipment before its use in the field, unless all equipment materials are inherently PFAS-free, or the manufacturer can guarantee that all components are PFAS-free.
3. Determine if the measuring tape on the water level meter contains PFAS, see #2 above.
4. If using a peristaltic pump to collect shallow water table samples, use only new, unused, tubing that is inherently PFAS-free at each sample location (HDPE, nylon, polyurethane, silicone).
5. If using any other submersible pump in deeper water table conditions, see #2 above.
6. If using any other down-hole data collection probe, see #2 above.
7. For longer-term monitoring of confirmed PFAS in groundwater, consider using dedicated and PFAS-free equipment such as dedicated pumps. Passive Diffusion Bags may be used if equipped with HDPE hydrasleeves and the de-ionized water is PFAS-free.
8. If setting temporary wells, collecting soil samples, or using any other drilling method, ensure that the core sleeves are either acetate, PVC, or HDPE (see #2 above).
9. Use only stainless steel tools or wooden disposable tongue depressors to collect soil sub-samples from drill cores.
10. Use only aluminum or Masonite clipboards with loose paper (non-water resistant) to record field notes.
11. Use only ball-point pens to record field data, prepare sample labels, etc.

Decontamination

It is extremely important that any **water** used for decontamination of equipment or hand washing before, between, and after sampling be free of PFAS. Commercially available distilled water sources should be analyzed for PFAS before its use in the field and should come in an HDPE container. If using municipal water, check with the municipality to determine if the source is

PFAS-free. If that cannot be readily determined, then sample the water for PFAS before its use.

All rental equipment and in-house equipment previously used at other sites needs to be decontaminated before its use. Use only Alconox®, Liquinox®, or Citranox® to decontaminate equipment or wash hands, and use only PVC or HDPE brushes for scrubbing equipment.

Decontaminate equipment before collecting samples, between samples, and at the end of the day. Triple-rinse equipment after cleaning, and change nitrile gloves after decontaminating equipment between sample locations.

FIELD SAMPLING PROCEDURES

Sample Handling

Sample handling procedures are implemented to ensure that sample integrity is maintained throughout the sample collection process. Therefore, the procedures for collecting PFAS samples are not unlike typical sample handling procedures already employed by EnviroForensics personnel. However, due to the pervasiveness of PFAS in the environment, low laboratory detection limits, and possibility of cross-sample contamination, the sample handling procedures for PFAS are more rigorous. EnviroForensics uses a clean hands/dirty hands approach during sample handling activities. One person handles all of the sampling equipment and the other person handles only the sample containers. Specific sample handling procedures with respect to PFAS include:

1. Label sample containers and zip-lock bags in the office before visiting the Site, or in a staging area, and keep the containers in a PFAS-free cooler for use on site. Wash hands and don new powderless nitrile gloves before sample collection.
2. The person designated "dirty hands" handles the sampling equipment only. The person designated "clean hands" holds the sample container and seals the container lid after collecting the sample.
3. **Do not** touch anything other than decontaminated field sampling equipment or sample containers after donning clean nitrile gloves. If you do by accident, change gloves before proceeding further.
4. **Do not** touch the sample or let the outside of the sampling equipment (tubing, bailer, etc.) touch the sample container during sample collection.
5. **Do not** set the sample container on the ground or other surfaces while collecting the sample. That is why there are two people involved.

6. Hands must be washed and new powderless nitrile gloves donned after any decontamination procedure, or (if using all disposable materials) before collecting another groundwater or soil sample;
7. Double bag individual soil or groundwater samples in zip-loc bags and immediately place samples on ice in the cooler.

Additional Considerations

1. Wash hands and change gloves frequently during a long decontamination procedure.
2. Set up a staging area away from the sample collection area for logging field notes, labeling samples containers before sampling, and for taking breaks.
3. **Do not bring any fast food to the site or go off site for lunch.** Fast food wrappers typically contain PFAS. Instead, prepare a lunch and bring it in a plain paper bag to consume in the staging area.
4. Wash hands thoroughly and don clean nitrile gloves following lunch and other breaks.

Laboratory

Many states are currently developing PFAS regulatory standards and laboratory certification programs. There are many compounds of concern contained in the overall PFAS family of chemicals. If State standards have not yet been developed, check with the State regulatory agency to determine the particular compounds to analyze for. Some analytical laboratories have been certified by various agencies such as: State regulatory agencies; Department of Defense; Department of Energy; National Environmental Laboratory Accreditation Program; and International Organization for Standardization. That does not mean that they are set up to analyze for all PFAS chemicals of concern to a particular State agency. Check with the laboratory after determining the State requirements.

Do not use glass sampling containers, as glass tends to adsorb PFAS. Instead, use HDPE or polypropylene containers. Container caps should be of the same material with no Teflon™ seal. Confirm that coolers used to store and ship laboratory samples are PFAS-free. A qualified laboratory will provide the appropriate media for these protocols.

For groundwater samples, do not filter or use a chemical preservative. For samples of municipal drinking water (also possibly used for equipment decontamination) the analytical methods call for preservation with Trizma® to buffer and remove chlorine. Check with the laboratory regarding how many sample containers are needed per sample and appropriate preservatives. Place samples separately in double zip-loc® bags and place immediately on ice. Maintain temperature of the samples below 50° F (10° C). Use regular ice. **Do not use "blue ice" or**

chemical ice packs.

Seal Chain-of-Custody forms and other forms in a zip-loc® bag and tape to the inside lid of the cooler. Tape the cooler closed with a custody seal and ship to the analytical laboratory. Hold time is 14 days to the laboratory with extraction within 28 days.

The current U.S. Environmental Protection Agency (USEPA) developed, and validated analytical methods for PFAS are USEPA Method 533, and USEPA Method 537.1. USEPA Method 533 is focused on the detection of short-chained PFAS (4-12 carbon chain lengths), while Method 537.1 is more focused on detecting longer chain PFAS. Using both methods, up to 29 PFAS chemicals can be detected. These methods were developed for drinking water, but would also apply to groundwater. Soil samples are currently being analyzed for PFAS using a modified Method 537M. New sampling methods are evolving, so these methods may change in the future. Check with State agencies and the analytical laboratories to determine if the above stated methods are still valid or if other methods have been developed and approved by the USEPA and State.

ADDITIONAL FIELD QUALITY CONTROL (BLANKS)

Several different blanks will need to be collected during and possibly before field sampling operations. As previously mentioned, equipment blanks should be collected and analyzed before site work if any materials to be used in field sampling cannot be determined to be PFAS-free. There are additional blanks that will need to be collected during the actual sample collection process to ensure that quality control has been maintained and samples have not been contaminated by outside sources.

Equipment Blanks

Equipment blanks are collected to determine the adequacy of the decontamination process. Equipment blanks are not needed if using dedicated or disposable sampling equipment that has been determined to be PFAS-free.

- Collect an equipment blank by passing PFAS-free water through/over field sampling equipment before use; and
- Collect an additional equipment blank for every five (5) samples collected.

Have the analytical laboratory hold the equipment blanks for possible analysis. Some of the equipment blanks may be analyzed if one or more samples contain PFAS detections.

Field Reagent Blanks

Field reagent blanks (FRBs) are collected to determine if PFAS have entered the samples through the ambient environment, the sampling process in general, and the analytical laboratory sample handling processes. The analytical laboratory will supply a vial of PFAS-free water and an empty sample container for collecting the FRB. The analytical laboratory should be consulted regarding the number of FRBs that should be collected per sampling event.

The FRB will be opened during the collection of one (1) site sample and handled in the same way as that of the site sample. The laboratory provided PFAS-free water will be poured into the provided clean sample vial to mimic field sample collection procedures. As with equipment blanks, reserve the FRBs for possible laboratory analysis if PFAS is detected in any given sample.

Field Duplicates

Collect duplicate samples to measure both field and laboratory precision. The State regulatory agency should be contacted to determine the number of duplicate samples to collect. The State may require more duplicate samples than would be typical for other types of contaminants. For example, the Wisconsin Department of Natural Resources typically requires that one (1) duplicate sample be collected for every 10 groundwater samples that are collected. However, this is guidance (refer to *Groundwater Sampling Desk Reference*, PUBL-DG-037, September 1996) and they may require more when sampling for PFAS.

Trip Blanks

Typically, trip blanks are utilized to determine cross-contamination during shipment of samples and the possible introduction of contaminants in the laboratory environment due to volatile organic compounds. However, the analytical laboratory should be consulted regarding the need for a trip blank during PFAS sampling.

If requested by the laboratory, the laboratory will prepare the trip blanks using PFAS-free water and will ship them with the cooler. If required, include one (1) trip blank in each sample cooler. Do not remove the trip blank from the cooler during sampling, or transport to and from the site. The laboratory will decide whether to run the trip blank if one (1) or more site samples contain PFAS.

REFERENCES

California State Water Quality Control Board, Division of Water Quality, 2019, *Per- and Polyfluoroalkyl Substances (PFAS) Sampling Guidelines*, 9 pp.

Interstate Technology Regulatory Council, 2018, *Site Characterization Considerations, Sampling Precautions, and Laboratory Analytical Methods for Per- and Polyfluoroalkyl Substances (PFAS)*, 9 pp.

Michigan Department of Environmental Quality, 2018, *General PFAS Sampling Guidance*, 24 pp.

Pace Analytical Webpage, *PFAS Field Sampling Guide*: https://www.pacelabs.com/assets/2020-01-14-pfas-field-sampling-guide.pdf.

United States Department of Defense Webpage, *Bottle Selection and Other Sampling Considerations When Sampling for Per- and Poly-Fluoroalkyl Substances (PFAS)*: https://www.denix.osd.mil/edqw/home/what-s-new/unassigned/edqw-pfas-sampling-factsheet-rev-1-2-july-2017/.

United States Environmental Protection Agency Webpage, *EPA Drinking Water Laboratory Method 537 Q&A*: https://www.epa.gov/pfas/epa-drinking-water-laboratory-method-537-qa.