ENVIRO forensics

Sent check to close
11/21/16
J.F.

November 8, 2016

Mr. John Feeney
Wisconsin Department of Natural Resources
1155 Pilgrim Road
Plymouth, WI 53073

Re: Remedial Action Options Report
Harborview Cleaners
134 East Grand Avenue
Port Washington, Wisconsin
BRRTS# 02-46-548092

Dear Mr. Feeney:

Environmental Forensic Investigations, Inc. (EnviroForensics) is pleased to submit this Remedial Action Options Report (Report) for the Harborview Cleaners site located at 134 East Grand Avenue in Port Washington, Wisconsin. One hardcopy of the Report is enclosed. The Report has been prepared in accordance with the requirements of Wisconsin Administrative Code (WAC) Chapter NR 722. On behalf of the responsible party, EnviroForensics is requesting a Technical Assistance review of the Report and written response to the recommendations contained in the Report. Payment for the review fee is enclosed.

Sincerely,
Environmental Forensic Investigations, Inc.

Rob Hoverman, LPG
Senior Project Manager

Brian Kappen, PG
Project Manager

enclosures

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Environmental Forensic Investigations, Inc.
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Waukesha, WI 53188
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REMEDIAL ACTION OPTIONS REPORT

HARBORVIEW CLEANERS
134 EAST GRAND AVENUE
PORT WASHINGTON, WI 53074
WDNR BRRTS# 02-46-548092

November 8, 2016

Prepared For:

Harborview Cleaners
134 East Grand Avenue
Port Washington, WI 53074

Prepared By:

Environmental Forensic Investigations, Inc.
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Project Manager

Rob Hoverman, LPG
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EXECUTIVE SUMMARY

Environmental Forensic Investigations, Inc. (EnviroForensics) has prepared this Remedial Action Options Report (Report) for the Harborview Cleaners (Harborview) facility located at 134 East Grand Avenue in Port Washington, Wisconsin (Site). The operator of the Site and the responsible party is Harborview. The Site is improved with a single-story commercial building approximately 1,300 square feet in size that was constructed in the 1930s or 1940s. Reportedly the building was occupied by a gas station until approximately 1970 when it was converted to a dry cleaning operation.

Several contaminants present in the soil and soil vapor beneath the Site exceed Wisconsin Department of Natural Resources (WDNR) health-based standards and screening levels. The site investigation data indicate that the source of contamination is from un-documented, and likely incidental releases of tetrachloroethene (PCE) which occurred over time in the vicinity of the dry cleaning machine. The PCE migrated vertically through soil beneath the Site building, causing subsurface soil and soil gas impacts. PCE and associated compounds are also detected in groundwater in the vicinity of the Site at relatively minor concentrations.

Likely remedial actions for soil were identified and evaluated on technical and economic feasibility. The Site setting and location of the source area beneath the Site building limits the number of possible actions. Two remedial option scenarios were developed and further evaluated. The recommended option would rely on a combination of risk management strategies and soil vapor extraction (SVE) to bring the Site to regulatory closure. The primary remediation objectives would be to reduce the contaminant concentrations in soil and reduce the potential for vapor intrusion at the Site building and the adjoining building to the north.

An SVE pilot test is needed to determine vacuum requirements, potential mass removal rates, and an achievable radius of influence (ROI). Provided the pilot test data demonstrates the feasibility of SVE, a pilot test report will be submitted to WDNR with a recommendation to proceed with full-scale system design.

1.0 BACKGROUND

Environmental Forensic Investigations, Inc. (EnviroForensics) has prepared this Remedial Action Options Report (Report) for the Harborview Cleaners (Harborview) facility located at 134 East Grand Avenue in Port Washington, Wisconsin (Site). The operator of the Site and the responsible party is Harborview. This Report follows guidelines for selecting remedial actions set forth in the Wisconsin Administrative Code (WAC) Chapter NR 722 and other associated Chapter NR 700 series rules. This Report is being submitted subsequent to the Supplemental Site Investigation Report dated March 1, 2016.

The Site is located in the northwest ¼ of the southeast ¼ of Section 28, Township 11 North, Range 22 East, in the City of Port Washington, Ozaukee County, Wisconsin. The topography at the Site is flat. Lake Michigan (Port Washington Harbor) is located approximately 200 feet south of the Site. The location of the Site is depicted in **Figure 1.**

The Site is improved with a single-story commercial building approximately 1,300 square feet in size that was constructed in the 1930s or 1940s. Reportedly the building was occupied by a gas station until approximately 1970 when it was converted to a dry cleaning operation. The building is concrete slab on grade with the remainder of the property being a paved asphalt driveway and parking area. The Site is bound by East Grand Street to the south, a commercial building to the west, a mixed use commercial and residential building to the north, and North Franklin Street to the east. The Site layout is presented as **Figure 2**.

1.1 Site Hydrogeology

Fill material is encountered from below the pavement to approximately five (5) feet below ground surface (bgs), followed by silty clay from 10 to 24 feet bgs with a sand lens at approximately 10 feet bgs. The water table is encountered at depths ranging from 8 to 12 feet bgs. Groundwater elevations appear to be randomly distributed across the monitored area. Specific wells may be influenced by laterally discontinuous zones of higher permeability and/or recharge rates may vary widely across the Site to cause this indiscernible water table. The distribution of contaminants detected in groundwater indicates that shallow groundwater at the Site flows towards the south. Slug test hydraulic conductivity results reported in the 2009 Site Investigation Report were 2.77E-4 centimeters per second (cm/s) at MW-3 and 3.74E-4 cm/s at MW-5.

1.2 Nature and Extent of Contamination

The nature and extent of contamination associated with release(s) at the Site was detailed in the Supplemental Site Investigation Report. A summary is provided herein for reference. The investigative sample locations are depicted on **Figure 2**.

Soil sample analytical results are illustrated on **Figure 3**. The soil source area appears to be located near the dry cleaning machine. The horizontal extent of PCE impacts in soil is bounded to the west by boring B-5, and to the south and east of the Site property by MW-5 and B-2, respectively. The vertical extent of PCE impacts in soil beneath the Site building is limited to within 12 feet of the ground surface. The vertical impacts at the city-owned property west and south of the Site extend to 10-12 feet bgs. The extent of chlorinated volatile organic compound (CVOC) impacts to groundwater (i.e., the CVOC plume) above enforcement standards is defined to the west by MW-4, to the south by MW-5, to the east by MW-1, and to the north by grab sample SB-1W. However, all groundwater VOC concentrations were below ESs during the most recent monitoring event conducted during July 2016.

The results of vapor intrusion (VI) assessments conducted at 126 East Grand Avenue and 115 North Franklin Street indicate that PCE is present in sub-slab vapor and indoor air; however, all concentrations are below WDNR screening/action levels. The results of a VI assessment at the adjoining residential/ commercial space (103 through 109 North Franklin Street) indicated that the VI pathway was complete, and vapor mitigation activities were implemented. Soil gas sample results indicated that additional vapor intrusion assessments at other off-site properties are not warranted.

2.0 IDENTIFICATION OF REMEDIAL ACTION OPTIONS

This section presents the remedial action options identified for control, removal, and/or treatment of impacted media at the Site. Active remediation of groundwater is not needed due to the low concentrations of contaminants detected in groundwater samples, and the limited extent of groundwater impacts. Furthermore, the investigation data indicate that the off-Site vapor impacts are associated with contamination in soil, and not off-gassing from groundwater. Therefore, the evaluation of remedial action options is focused on soil and soil gas impacts. Groundwater conditions are expected to improve after the soil source area has been addressed.

The initial identification and screening of remedial action options is based on information generated during site investigation activities, including the nature and extent of contamination and the hydrogeological conditions at the Site and surrounding areas. Initial screening for remedial technologies under general remedial response actions was completed as discussed below.

The following general responses were considered:

1. No Action,
2. Risk Management,
3. Removal Action, and
4. Treatment Action.

2.1 Screening of Remedial Action Options

An initial screening of remedial actions options was completed as summarized in **Table 1**. The technologies were screened against the conceptual site model to identify whether they would be: 1) protective of human health and the environment; and 2) are appropriate for the Site, considering applicability for Site conditions, reasonably anticipated future land uses, and other factors which would pre-emptively preclude the alternative from further evaluation, as well as relevance to site-specific exposure pathways. Institutional controls such as land use restrictions are not evaluated separately in this report because it is assumed that the Site will be added to the GIS Registry at closure due to residual contamination. Institutional controls are inherent for all sites included in the GIS Registry.

Alternatives which passed both of the initial screening criteria were carried forward for further evaluation. The following remedial technologies for soil were removed from further evaluation:

- No Action – Natural Attenuation
- Engineering Controls – Structural Vapor Barrier
- In-Situ Remediation – Thermal Treatment
- In-Situ Remediation – Injection: In-Situ Chemical Reduction
- In-Situ Remediation – Injection: Ozone Sparging
- In-Situ Remediation – Soil Mixing: Solidification and Stabilization
- In-Situ Remediation – Phytoremediation

2.2 Likely Remedial Action Options

Under the response action scenarios, the following remedial technologies were considered likely for the Site and selected for further evaluation:

- Engineering Controls – Soil Cover
- Removal - Excavation
- In-Situ Remediation – Soil Vapor Extraction
- In-Situ Remediation – Soil Mixing: Chemical Oxidation

3.0 EVALUATION OF REMEDIAL ACTION OPTIONS

The potentially feasible remedial technologies were evaluated according to specific actions associated with each technology. The evaluation was documented and quantified using a ranking matrix (**Table 2**) to identify the most suitable technology or combination of technologies for remediation at the Site.

Each remedial action was evaluated on the following criteria:

- Technical Feasibility
  - Short-Term Effectiveness,
  - Long-Term Effectiveness,
  - Implementability, and
  - Restoration Time Frame, and

- Economic Feasibility
  - Capital Costs,
  - Initial Cost,
  - Annual Operation and Maintenance, and
  - Future Liability.

Additionally, the need for continuing obligations after completion of a remedial action, such as maintenance of an engineering control, was considered.

Given the Site setting, hydrogeology, distribution of impacts, and anticipated future use of the Site, each remedial action was evaluated against the above criteria and relative points were assigned. The scores were summed across all categories for each remedial action. Those remedial actions with greater than 20 accumulated points were selected for further evaluation to develop comprehensive options for addressing soil contamination and exposure pathways.

The detailed evaluation of remedial actions considered for soil is presented in the attached **Table 2**. The table below summarizes the proposed ranking system:

RANKING SYSTEM		
Relative Weight	All Criteria but Cost	Cost
High	5	0
Moderate to high	4	1
Moderate	3	2
Low to moderate	2	3
Low	1	4
Very low to none	0	5
Total available points	30	
Remedial options selected	≥ 20 points	
Remedial options rejected	< 20 points, high cost, difficult to implement	

The evaluation criteria are discussed in more detail below.

3.1 Technical Feasibility

The feasibility of a technology to remediate impacted areas at any specific site is evaluated with regard to the following specific considerations:

- Proven technology: when a technology is fully developed and historical success case histories are available;
- Emerging technology: when a technology is not fully developed and may not be reliable;
- Inappropriate technology: when Site conditions are not technically suitable for the application of the technology; and
- Potential additional liability: whether the treatment technology may add additional liability.

3.1.1 Effectiveness

The key aspect of evaluation is the effectiveness of each remedial action in protecting human health and the environment. Each potential remedial action is evaluated as to its effectiveness in providing protection and the reductions in toxicity, mobility, or volume of contamination that it would achieve. Both short- and long-term components of effectiveness are evaluated; short-term referring to the construction and implementation period until case closure, and long-term referring to the period after remediation is complete. Reduction of toxicity, mobility, or volume

refers to changes in one or more characteristics of the contaminated media by the use of treatment that decreases the inherent threats. Any remedial action option under consideration should minimize adverse impacts to Site workers, visitors, the surrounding population, and the environment. Community impact is also important and the technology is considered a disadvantage if the application of the technology could be perceived as negatively impacting the local community or environment.

3.1.2 Implementability

Implementability, as a measure of both the technical and administrative feasibility of constructing, operating, and maintaining a remedial action option, is used to evaluate combinations of remedial actions with respect to conditions at a specific site. The determination that an option is not readily implementable would usually preclude it from further consideration unless steps can be taken to change the conditions responsible for the determination.

Technical feasibility refers to the ability to construct, reliably operate, and meet technology-specific regulations for remedial actions until remediation is complete; it also includes operation, maintenance, replacement, and monitoring of technical components of an action, if required, into the future after the remedial action is complete. The evaluation also considers the ability to obtain approvals and permitting from other offices and agencies, the availability of treatment, storage, and disposal services and capacity, and the requirements for, and availability of, specific equipment and technical specialists.

3.1.3 Restoration Time Frame

The estimated time for completion of a remedial action and restoration of the environment is based on the information available from vendor(s) with experience in remediating similar sites, and EnviroForensics' past experience using technologies in similar settings. Contaminant degradation rates, both naturally and under treatment conditions, are assumed based on experience to estimate the duration of remedial actions. If necessary, the time frame for continuing obligations is also considered.

3.2 Economic Feasibility

The cost to implement various options is not an exact cost, but represents a combination of typical contractor costs and consultant efforts coupled with the estimated time to achieve remedial endpoints. This is inherent because uncertainties associated with the definition of

options often remain, and it may not be possible or practical to collect all of the data needed to refine costs better than a reliability level of +50% to -30%.

The focus is on comparative estimates of costs between options so that if costs go up or down during the remedial process, that they remain relative. The following cost factors are considered during the evaluation of options:

- Initial costs: those costs incurred for design and testing of the remedial action,
- Capital costs: the cost to construct, install, or otherwise implement the remedial action,
- Operation and maintenance (O&M) costs: the costs to operate and maintain the remedial system or technology. The evaluation includes those O&M costs that would be incurred for as long as necessary, even after the initial remedial action is complete, and
- Future liability: includes potential additional remedial action costs and costs for property re-development are considered during evaluation to the extent they can be estimated.

3.3 Continuing Obligations

The involvement of continuing obligations in the closure strategy is considered in the evaluation process. Post-closure obligations may include activities such as annual cover inspections and operation, maintenance, and inspections of vapor mitigation systems. These activities may be required for an indefinite period of time following case closure. A remedial action is considered more advantageous if the resulting need for continuing obligations is limited or eliminated.

3.4 Remedial Action Options Selected

Selected remedial actions are identified in the remedial action options evaluation matrix (**Table 2**). The following remedial technologies were carried forward in the evaluation process:

- Engineering control (cover), and
- Soil vapor extraction (SVE).

Remedial options using these selected actions have been developed. The first (Option 1) is a risk management approach which would rely on engineering controls to prevent exposure to Site contamination. No remediation would be completed as part of this option. The second option (Option 2) would rely on a combination of risk management strategies and remediation to bring the Site to regulatory closure. Both options are discussed in further detail below.

3.4.1 *Option 1 – Risk Management*

Option 1 would manage exposure risk with engineering controls. Engineering controls would physically limit contact with contamination and would be achieved through maintenance of the existing asphalt and building floor to prevent direct contact with the underlying soil and the installation of a vapor mitigation system at the Site.

This option would require long-term continuing obligations consisting of annual cover inspections and repair as needed, as wells as VI monitoring and long-term operation and maintenance of the vapor mitigation system installed in the 103 through 109 North Franklin Street building. There is considerable uncertainty in the costs, timeframe, and regulatory acceptance of the risk management approach. It is not expected that the contaminants would naturally attenuate in 50 years and the monitoring obligations may continue indefinitely.

3.4.2 *Option 2 – Soil Vapor Extraction and Risk Management*

Option 2 would rely on a combination of risk management strategies and remediation to bring the Site to regulatory closure. Remedial actions would consist of SVE within the soil source area, which is beneath the Site building. The primary remediation objectives would be to reduce the contaminant concentrations in soil and reduce the potential for vapor intrusion at the Site building and 103 through 109 North Franklin Street building.

Implementing SVE eliminates the need for a vapor mitigation system in the Site building, and may also eliminate the VI risk at the neighboring building, thereby decreasing the timeframe for operation and maintenance on the existing vapor mitigation system. Due to the predominantly fine-grained soil comprising the vadose zone, an SVE pilot test will be needed to demonstrate the feasibility of this technology. It is anticipated that one (1) or more vapor extraction wells will need to be installed within the footprint of the building in order for applied vacuum to reach the source area.

Inclusion on the WDNR GIS Registry may still be necessary after remediation to prohibit exposure to residual impacts. The ongoing VI monitoring costs would be much less with Option 2 than with Option 1 due to a shorter monitoring period. The long-term liability would be reduced significantly with Option 2, with post-remediation costs projected over a 2-year period instead of 50-years. Option 2 is expected to provide more certainty (smaller range) regarding timeframe, and regulatory acceptance than would Option 1.

4.0 RECOMMENDED CLOSURE STRATEGY

4.1 Rationale

Option 2 is the recommended closure strategy. In summary, Option 2 is preferred over Option 1 for the following reasons:

- Immediately addresses the vapor intrusion exposure pathway;
- Decreased duration of post-remediation monitoring and decreased time frame for case closure; and
- Less risk and potential added liability.

For Option 2, it is expected that some residual impacts will remain at closure, which will require listing on the GIS registry. Likewise, in order to obtain case closure in the shortest time frame, off-Site properties may also need to be notified of residual impacts.

4.2 System Design

An SVE pilot test will be performed to determine vacuum requirements, potential mass removal rates, and an achievable radius of influence (ROI). Provided the pilot test data demonstrates the feasibility of SVE, a pilot test report will be submitted to WDNR with a recommendation to proceed with full-scale system design. Detailed design documents will be prepared in accordance with NR 724 upon approval of the recommended remedial strategy. Should the pilot test demonstrate that SVE will not be an effective, in-situ treatment or source removal will be re-evaluated.

4.3 Preliminary Schedule

SVE pilot test design can be initiated within 30 days of RAOR approval. EnviroForensics anticipates that remedial actions will be fully implemented in 2017. Remediation and closure activities will include:

- Preparation of remedial design documents;
- Planning, coordination, permitting;
- SVE system installation;
- SVE operation and maintenance for 24 months;

- Sub-slab vapor and indoor air monitoring;
- Remediation Completion Report;
- Case closure request; and
- Well Abandonment and Site restoration.

The estimated duration of the recommended remedial actions for soil is approximately two (2) years, followed by confirmation soil sampling to document contaminant reductions in source area soil. Some post-remediation groundwater monitoring will also be required. The duration of post-remediation groundwater monitoring will depend on remediation effectiveness and regulatory demands but is anticipated to be one (1) year.

4.4 Performance Monitoring

The performance of the remedial action would be measured via a monitoring program that includes:

- The collection of SVE air effluent samples to quantify the mass of contamination removed. Samples would be collected according to the schedule described in WAC Chapter NR 419.07; and
- Soil and sub-slab vapor sampling in the treatment area to confirm the effectiveness of SVE prior to ceasing system operation.

4.5 Sustainability

Power to operate the SVE system will come from the Site building. There are no plans to utilize renewable energy to operate the blower, and the power requirements (i.e., 3-phase and high voltage) would likely preclude the use of renewable energy systems. Provided the SVE exhaust contains VOC concentrations less than the applicable emissions standards, the exhaust will be sent directly to the atmosphere. Alternatively, the exhaust will be sent through carbon treatment so that VOC concentrations are below the emissions thresholds listed in WAC Chapters NR 406 and 407. EnviroForensics does not anticipate generating particulate matter or greenhouse gases during remediation.

The recommended remedial action includes in-situ treatments only, which minimizes waste. No material will be sent off-Site with the exception of a small volume of soil generated during

extraction well installation. The following sustainable practices will be considered during remedial design, implementation, and long-term monitoring:

- Using local contractors to the extent possible;
- Combining mobilizations with work at other sites to minimize vehicle use; and
- Intermittent system operation to improve efficiency.

TABLES

TABLE 1
REMEDIAL ACTION OPTIONS SCREENING - SOIL
Harborview Cleaners
Port Washington, Wisconsin

General Response	Remedial Approach	Description	Protective of Human Health and the Environment?	Appropriate Response?	Further Evaluation Warranted?
No Action	Natural Attenuation	Monitor to confirm natural degradation of contaminants is occurring and screen for potential changes in exposure potential.	No	No	No
Engineering Controls	Structural Vapor Barrier	Construction of vapor barrier to mitigate vapor intrusion concerns in structures.	Yes	No	No
	Soil Cover	Installation and/or maintenance of a cover to prevent potential direct contact with subsurface impacts.	Yes, in conjunction with other options	Yes	Yes, in conjunction with other options
Removal	Excavation	Removal of contaminated soil using excavation equipment.	Yes	Yes	Yes
In-Situ Remediation	Soil Vapor Extraction	Volatilization of contaminant mass in unsaturated zone and removal via vacuum extraction.	Yes	Yes	Yes
	Thermal Treatment	Removal of contaminants in aqueous, liquid, and sorbed phases by heating and volatilization, with subsequent vacuum extraction.	Yes	No	No
	Injection: In-Situ Chemical Reduction	Injection of chemically reductive additives such as zero-valent iron to promote degradation of contaminants via reductive processes. Requires displacement of pore-air content with injection product in vadose zone.	Yes	No	No
	Injection: Ozone Sparging	Combines air sparging with in-situ chemical oxidation. Ozone is added to air sparging injection stream to facilitate oxidative destruction of contaminants.	Yes	No	No
	Soil Mixing: In-Situ Chemical Oxidation	Involves the addition of oxidation reagents to a contaminated material (e.g. soil or sludge) to facilitate oxidative destruction of contaminants.	Yes	Yes	Yes
	Soil Mixing: Solidification and Stabilization	Stabilization involves the addition of reagents to a contaminated material (e.g. soil or sludge) to produce more chemically stable constituents. Solidification involves the addition of reagents to a contaminated material to impart physical/dimensional stability to contain contaminants in a solid product and reduce access by external agents (e.g. air, rainfall).	Yes	No	No
	Phytoremediation	Use of plants to remove, contain, degrade, and/or eliminate contaminants.	Yes	No	No

Highlighted boxes indicate that this technology will move forward in the screening process

TABLE 2
REMEDIAL ACTION OPTIONS EVALUATION MATRIX
Harborview Cleaners
Port Washington, Wisconsin

General Response	Remedial Technology	Remedial Action	Description	Technical Feasibility: Short-Term Effectiveness	Relative Ranking	Technical Feasibility: Long-Term Effectiveness	Relative Ranking	Technical Feasibility: Implementability	Relative Ranking	Technical Feasibility: Restoration Time Frame	Relative Ranking	Economic Feasibility: Initial and Capital Costs	Relative Ranking	Economic Feasibility: Annual O&M and Future Liability	Relative Ranking	Cumulative Points	Comments
								SOIL									
Risk Management	Engineering Control	Cover	Maintain existing building and pavement in good condition to prevent exposure to soil.	Minimizes exposure to subsurface soil and limits construction worker contact. Also limits water infiltration.	4	Reduces future exposure to human health risks. Inherent continuing obligation.	3	Readily implementable. Utilizes existing building/ pavement - no construction needed.	5	> 50 years	0	Minimal. No construction.	5	Annual inspections of cover condition and repair/ replacement as necessary. Long term monitoring of indoor air quality and OM&M on off-site SSD system.	3	20	Selected
Removal	Excavation	Excavation and Disposal	Use of construction equipment, such as backhoes and bulldozers, to remove impacted soils. Transport soil for proper disposal.	Immediate mass removal; however, the majority of impacted soil is inaccessible under the site building. Only partial remediation is possible.	2	Contaminated soil under the site building would remain under building indefinitely, requiring continuing obligations.	2	Building is occupied and there are no plans for demolition. The majority of contaminant mass would remain in place under building.	2	<6 months including all logistics.	5	High landfill disposal costs	2	Contamination would remain in place under building - engineering controls with continuing obligations required after remediation.	3	16	Not selected
In-Situ Treatment	Physical	Soil Vapor Extraction (SVE)	Volatilizes contaminants from soil particles by pulling air through extraction wells.	Mass removal rate is highest within the first few months after system startup. Limited adverse effects during construction.	4	High degree of contaminant reduction in shallow soil - if implemented within the footprint of the site building. May eliminate vapor intrusion risk to the site and off-site buildings.	3	Fine-grained soil may not be conducive to SVE; however coarser-grained intervals are present in the vadose zone. Pilot testing would be needed to demonstrate implementability.	3	2-4 years	4	Moderate design and construction cost	3	Intermittent exhaust sampling, filter replacement, and general maintenance on system. Moderate energy cost to operate. Minimizes continuing obligations.	3	20	Selected
	Chemical	Chemical Oxidation	Addition of oxidants, such as hydrogen peroxide or potassium permanganate, with iron oxide as catalyst to oxidize/destroy organic contaminants with soil mixing.	Expected to be highly effective within a few months. Rapid contaminant destruction upon contact with oxidant. Mixing distributes oxidant thoroughly in soil.	4	High degree of contaminant reduction in accessible areas by mixing to maximize contact with oxidant. Inaccessible source area under building will not be treated.	2	Suitable for depth and type of contaminants. Readily implementable; however, only in accessible areas outside building. May render site unusable until soil stabilized.	2	1 year	4	Moderate chemical and equipment costs. SSD system at site building required for closure.	3	No equipment to maintain. Confirmation soil sampling required.	3	18	Not selected

Relative Ranking (all criteria but cost): 0 = Very low to none; 1 = Low; 2 = Low to moderate; 3 = Moderate; 4 = Moderate to high; 5 = High
Relative Ranking for Cost: 0 = High; 1 = Moderate to high; 2 = Moderate; 3 = Low to moderate; 4 = Low; 5 = Very low to none

Scale 1:24,000

1 1/2 0 1 Mile

1000 0 1000 2000 3000 4000 5000 6000 7000 Feet

N

Source: US Geological Survey, Port Washington East, Wisconsin, 7.5 Minute Series, 2013
Source: US Geological Survey, Port Washington West, Wisconsin, 7.5 Minute Series, 2013
Source: US Geological Survey, Cedarburg, Wisconsin, 7.5 Minute Series, 2013
Source: US Geological Survey, Cedarburg OE E, Wisconsin, 7.5 Minute Series, 2013

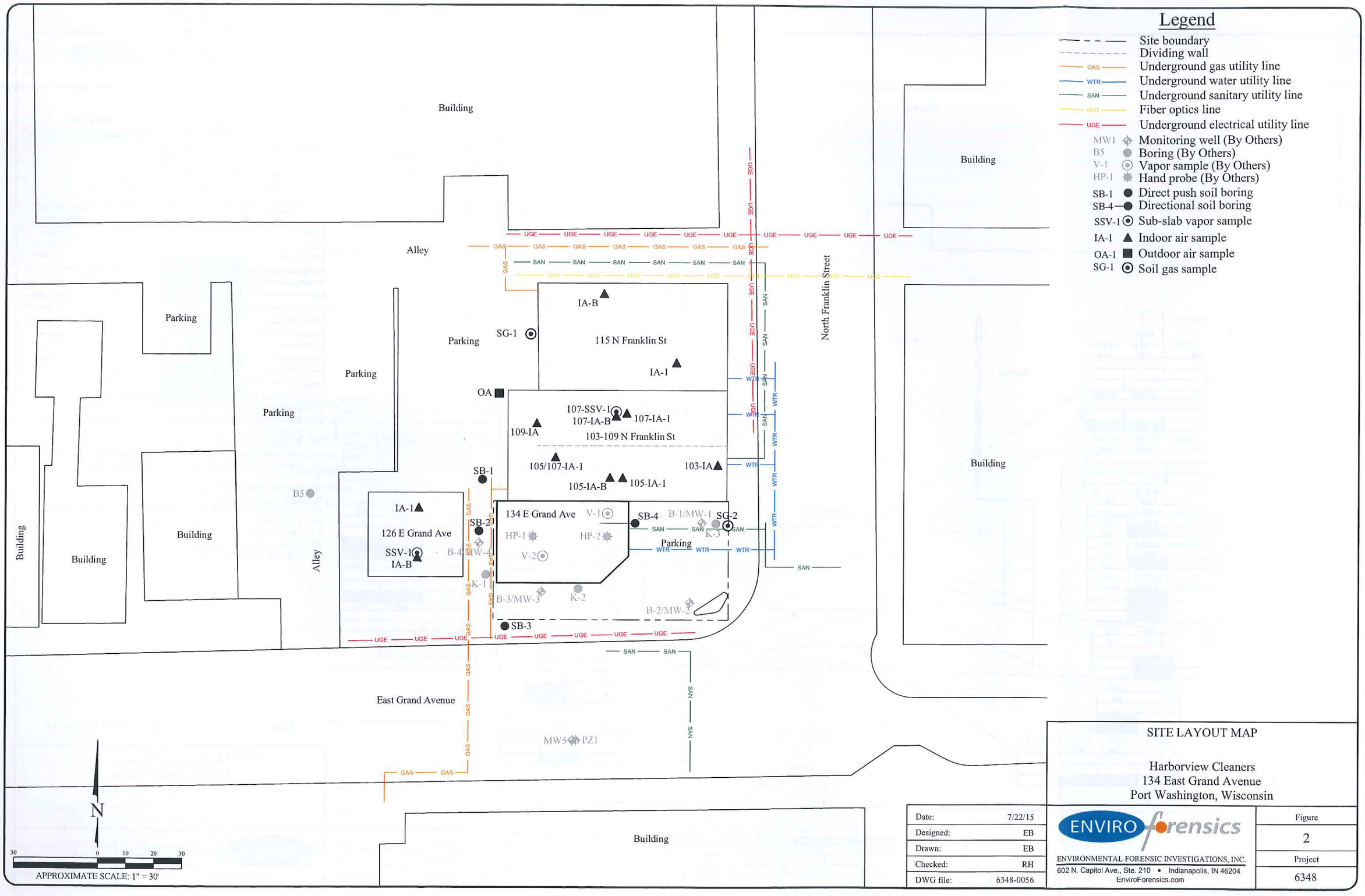
No.	Date	Revision	Approved

ENVIRO forensics
ENVIRONMENTAL FORENSIC INVESTIGATIONS, INC.
602 N. Capitol Ave, Suite 210 • Indianapolis, IN 46204
EnviroForensics.com

Date:	7/22/15
Designed:	EB
Drawn:	EB
Checked:	RH
DWG file:	6348-0057

SITE LOCATION MAP
Harborview Cleaners
134 East Grand Avenue
Port Washington, Wisconsin

Figure
1
Project
6348



SITE LAYOUT MAP

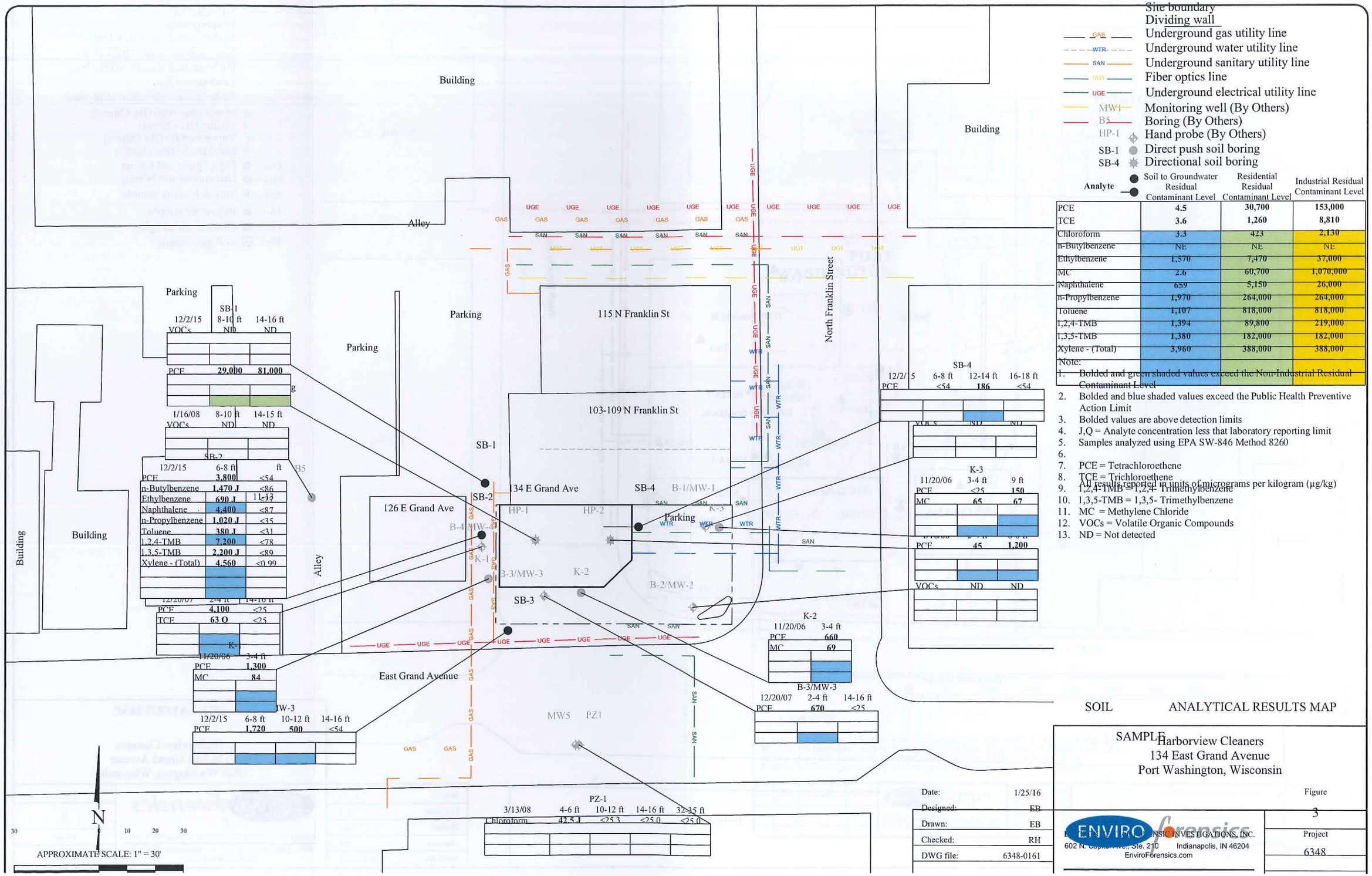
Harborview Cleaners
134 East Grand Avenue
Port Washington, Wisconsin

Date:	7/22/15
Designed:	EB
Drawn:	EB
Checked:	RH
DWG file:	6348-0056

ENVIRO forensics
ENVIRONMENTAL FORENSIC INVESTIGATIONS, INC.
602 N. Capitol Ave., Ste. 210 • Indianapolis, IN 46204
EnviroForensics.com

Figure
2

Project
6348



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 — Direct push soil boring
- SB-4 — Directional soil boring

Analyte	Soil to Groundwater Residual Contaminant Level	Residential Residual Contaminant Level	Industrial Residual Contaminant Level
PCE	**4.5**	**30,700**	**153,000**
TCE	**3.6**	**1,260**	**8,810**
Chloroform	3.3	423	2,130
n-Butylbenzene	NE	NE	NE
Ethylbenzene	1,570	7,470	37,000
MC	2.6	60,700	1,070,000
Naphthalene	659	5,150	26,000
n-Propylbenzene	1,970	264,000	264,000
Toluene	1,107	818,000	818,000
1,2,4-TMB	1,394	89,800	219,000
1,3,5-TMB	1,380	182,000	182,000
Xylene - (Total)	3,960	388,000	388,000

Note:

1. Bolded and green shaded values exceed the Non-Industrial Residual Contaminant Level
2. Bolded and blue shaded values exceed the Public Health Preventive Action Limit
3. Bolded values are above detection limits
4. J,Q = Analyte concentration less that laboratory reporting limit
5. Samples analyzed using EPA SW-846 Method 8260
6.
7. PCE = Tetrachloroethene
8. TCE = Trichloroethene
9. 1,2,4-TMB = 1,2,4- Trimethylbenzene
10. 1,3,5-TMB = 1,3,5- Trimethylbenzene
11. MC = Methylene Chloride
12. VOCs = Volatile Organic Compounds
13. ND = Not detected

All results reported in units of micrograms per kilogram (µg/kg)

SOIL ANALYTICAL RESULTS MAP

SAMPLE

Harborview Cleaners
134 East Grand Avenue
Port Washington, Wisconsin

Date:	1/25/16
Designed:	EB
Drawn:	EB
Checked:	RH
DWG file:	6348-0161

Figure 3

Project 6348

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