June 14, 2022

Mr. Shanna Laube-Anderson
State of Wisconsin
Department of Natural Resources
Southeast Region Headquarters
2300 N. Dr. Martin Luther King, Jr. Drive
Milwaukee, Wisconsin 53212-3128

Subject: **Response to Wisconsin DNR Comments from April 23, 2021**
Greentree Cleaners
5111 Douglass Avenue, Racine, Wisconsin
Wisconsin DNR Facility Identification # 252138700
Wisconsin DNR BRRTS Activity # 02-52-579863

Dear Ms. Laube-Anderson:

Greentree Station LLC retained Apex to conduct additional site investigation at the location of the former dry cleaner tenant space at 5111 Douglas Avenue, Unit D. This tenant space is located within Greentree Station LLC's Greentree Centre, a retail strip mall located at 5055 & 5111-5141 Douglas Avenue in Racine, Racine County, Wisconsin.

Apex prepared the Additional Site Characterization Work Plan (June 28, 2021) which included a response to the WDNRs April 23, 2021, comments, along with scope of work and methodology for the additional assessment.

The scope of work was updated to address comments from WDNR received via email to Steve Newlin on October 1, 2021. The response to comments provided below has been updated to include results from additional assessment conducted in 2022. The responses below refer to the attached tables and figures that have been updated for inclusion in the Closure Request.

Refer to the Additional Site Investigation Report (June 14, 2022), submitted under separate cover, for details on methodology.

Vapor Pathway

1. ***To support the consultant's conclusion that the vapor mitigation system remediated the vapor concern from beneath the building, and continued use or extension of a vapor mitigation system should not be required under Wis. Admin. Code § NR 726.15(2)(h), two rounds of vapor samples, one collected during the heating season and one collected during the cooling season, need to be collected from all previous vapor sample locations, except that only one sampling location is needed in the chemical storage area. Additional vapor sampling points may be required based on the results from these samples.***

Response:

Two rounds of sub-slab vapor sampling; one during the cooling season and one during the heating season have already been conducted at sample location SV-12.

On January 13, 2022, Apex collected additional sub-slab vapor sample from the following locations during the heating season:

SV-2, SV-3, SV-4, SV-5, SV-6, SV-7, SV-8, SV-9, SV-10 and SV-11.

The January 2022 sampling event and results are discussed in the *Additional Site Investigation Report dated June 14, 2022***.** Results from the January 2022 sampling event are included with historical soil vapor data in the attached **Table A.4.1**.

2. ***Evaluate the utilities below the building to establish if they are providing a vapor conduit to other portions of the building. Floor drains in the restroom(s) or kitchens, in the drycleaner space and in adjoining businesses were not discussed as potential discharge areas or pathways for vapor movement to other indoor air spaces. The vapor contamination found in SV-11 indicates a possible impact from a preferential pathway such as a utility line. Provide a diagram of all the utilities within the building, as a whole, to include all the adjacent businesses. Particular attention should be paid to the water main and sanitary sewer. Include the estimated areas of soil, groundwater and vapor contamination to support the utility pathway evaluation. Propose additional vapor sampling points required to investigate these pathways, based on this evaluation.***

Response:

Apex and our subcontractor performed ground penetrating radar (GPR) surveys within the tenant spaces adjacent to the dry cleaner. Based on the survey, Apex prepared the attached **Figure B.4.a** with the interpreted utility lines beneath the building floor slab. The lines identified are believed to be sewer and water lines that run generally north and south from one tenant space to the next. It should be noted that SV-7 was already sampled immediately adjacent to the lines running south of the dry-cleaner. However, to further assess the potential vapor migration along these utilities, Apex installed and sampled two new vapor points (SV-13 and SV-14) as shown on **Figure B.4.a.** In addition, a sample was collected from the floor drain in the bathroom of the dry cleaner.

The January 2022 sampling event and results are discussed in the *Additional Site Investigation Report dated June 14, 2022***.** Soil vapor sampling results from the January 2022 sampling event are included with historical soil vapor data in the attached

Table A.4.1. Results from sample collected from the floor drain are provided in **Table A.4.2** Per WDNR *Guidance for Documenting the Investigation of Human-made Preferential Pathways Including Utility Corridors*, the attenuation factor would be 1.0, since the sample was collected from a sump that was temporarily sealed for sampling, therefore the floor drain sample were compared to the VAL (attenuation = 1).

Trends in soil gas concentrations are summarized as follows:

- SV-3 and SV-4 exceeded residential and small commercial VRSLs in 2017 (pre-SVE).
- SV-2, SV-5, SV-6 SV-7, SV-8 and SV-11 exceeded residential VRSLs only in 2017 (pre-SVE).
- There were no exceedances of any of VRSLs during the 2019 or 2022 (post-SVE) sampling events.

Based on the observed trends and results from post-SVE sampling conducted in 2019 and 2022, including sampling conducted along potential preferential pathways for vapor migration, soil gas has been delineated and meets VRSLs without vapor mitigation.

The concentration of PCE in the sample collected from the floor drain sump exceeded the residential VAL, but met the small commercial and large commercial/industrial VAL, indicating that the floor drain has slightly elevated levels of PCE than indoor air, but does not appear to be significant conduit for preferential migration.

3. *Provide information on building foundations. Determine if the foundations (footwall, knee-wall, or other sub-surface support structures) are impeding or otherwise influencing the migration of the vapors.*

Response:

No as-built drawings are available to determine if foundations exist between each tenant space. Apex observed above the drop ceiling and found concrete cinder block walls between each tenant space, suggesting that the walls between the tenant spaces are structural walls that would require sub-surface footers that may impede migration of vapors.

4. *Based on vapor sampling results:*

a. evaluate whether any additional vapor sampling is required to determine the potential for vapor impacts beneath the building to the north of the strip mall (identified as "K Mart building").

Response:

Sampling conducted between June 2017 and January 2022, and discussed in the response to Comment 1, provide delineation of the extent of potential sub-slab vapor associated with the dry-cleaning operations. Results from SV-11 and SV-14 demonstrate that vapors have not migrated as far as the K Mart building.

b. Evaluate whether indoor air samples should be collected in any building space within the shopping center as part of the vapor intrusion investigation. Identify the use of all building spaces within the shopping center for this evaluation.

Response:

Based on sub-slab sampling results from 2017 at SV-3 and SV-4, which exceeded small commercial building VAL pre-SVE, Apex conducted indoor air sampling in the former dry cleaner and adjacent north tenant space on January 13, 2022. A second sampling event for indoor air was conducted on May 5, 2022.

The January and May 2022 sampling events and results are discussed in the *Additional Site Investigation Report dated June 14, 2022***.** Results from the January and May 2022 sampling events are provided in the attached **Table A.4.3** and compared with indoor air VALs for residential, small commercial, and large commercial/industrial buildings. None of the indoor air samples exceeded the VALs for residential, small commercial and large commercial/industrial.

These results are consistent with the post-SVE sub-slab results from 2019 and 2022 sampling events with no exceedances of sub-slab VALs for residential, small commercial, and large commercial buildings, and results from the sample collected from the floor drain at the dry cleaner, indicating that this is not a significant source for vapor intrusion.

Figure B.4.A shows the use of the nearby tenant spaces.

5. The need for continued use of a vapor mitigation system should be evaluated after completion of the vapor investigation. If vapor mitigation is required, the system should be evaluated to ascertain the effectiveness and area of influence through a commissioning process that may require more than one seasonal assessment depending on the initial results.

Response:

The mitigation system was installed and put into operation in September 2018 and operated for 3 months before being shut down on December 20, 2018, prior to sampling on January 4, 2019. The system remained shut down and another round of sampling was conducted on June 27, 2019.

On November 15, 2021, the exhaust port of the SVE was capped to ensure that subsequent sampling for sub-slab and indoor air were not influenced by passive venting. The results from the two most recent sub-slab vapor sampling events, 2019 and 2022 (**Table A.4.1**), with no exceedance of any VALs, and the results from indoor air sampling at the former dry cleaner and the adjacent north tenant space (**Table A.4.3**), with no indoor air exceedances of any VALs, confirm that mitigation is no longer required.

6. If vapor mitigation is needed to address sub-slab vapor concentrations and prevent vapor intrusion at this site, source control actions are required to be taken under Wis. Admin. Code § NR 726.05 (8).

Response:

Vapor mitigation is no longer needed and source control actions to satisfy Wis. Admin. Code § NR 726.05 (8) are not required.

7. Based on the vapor investigation results, determine whether a continuing obligation is needed to limit property use to commercial (non-residential) uses, as described in Wis. Admin. Code § NR 726.15(2)(k).

Response:

The Site meets residential sub-slab VRSLs and indoor air VALs.

The concentration of PCE in the sample collected from the floor drain sump exceeded the residential VAL, but met the small commercial and large commercial/industrial VAL, indicating that the floor drain has slightly higher levels of PCE than indoor air, but does not appear to be significant conduit for preferential migration.

The revised closure request will include a continuing obligation to limit property use to non-residential uses.

8. Based on the identified soil and groundwater contamination at the site, add a continuing obligation for a future vapor risk, in accordance with Wis. Admin. Code § NR 726.15(L).

Response:

In accordance with Wis. Admin. Code § NR 726.15(L), since residual soil and groundwater contamination from volatile compounds is present on the Site, a continuing obligation will be required to eliminate or control vapor intrusion into a future building.

Soil

9. *The sources for soil, groundwater and vapor contamination have not been fully described. Identify all possible routes/sources of discharge to include floor drains, utilities, outdoor storage, and indoor storage. Once all possible sources are identified, determine if sampling is adequate to confirm sources of contamination and define the degree and extent of the contamination. For example, soil samples have not been collected in the area identified as "chemical storage". Explain how additional soil samples are not needed in the dry cleaner plant area or other potential source areas. The hand auger samples collected after system shut down were located several feet from the dry cleaner machine, and previous samples in the initial soil borings around the dry cleaner plant identified soil contamination at 3-5 feet. Vapor sample results cannot be used to determine*

the extent of soil contamination, or assume a lack of soil contamination, especially in potential source areas.

Response:

The source of the chlorinated solvent impacts is believed to originate from the dry-cleaning machine and handling of the solvent inside the building. Some solvent storage was observed inside the tenant space as illustrated on **Figure 1**. No storage of solvent outside the building is known or observed by Apex during our work to date.

Apex has identified utilities running beneath the floor slab and sub-slab soil vapor samples have been collected at SV-7, SV-14, SV-13 and SV-12 to investigate whether those utilities have served as a preferential pathway for the migration of the solvent. The findings indicate that utilities have not provided a preferential pathway for the migration of solvent.

Figures B.2.a (Soil Contamination) and **B.2.b** (Residual Soil Contamination) from our Closure Request have been revised to include a continuous area of soil contamination between the dry cleaner and the larger area depicted to the east. This area includes the chemical storage area. In addition, **Figure B.3.a** has been updated to include a delineation of soil exceedances, and depicts the area over which utilities are located.

10. ***There are not sufficient soil samples to accurately estimate the extent of soil contamination laterally or vertically beneath the building. Limited access within the building has been provided as a reason for not collecting additional soil samples. If this is the case, a structural impediment continuing obligation should be included in the closure packet, with accompanying required documentation.***

Response:

A structural impediment continuing obligation will be included in the Closure Request, along with any required documentation.

11. ***In the absence of sufficient soil samples to accurately delineate the soil contamination, Figures B.2.a. and B.2.b. should depict a continuous area of soil contamination between the dry cleaner plant area and the larger soil contamination area depicted to the east. Cross sections (Figures B.3.a) should similarly depict a broader and deeper area of estimated soil contamination.***

Response:

Figures B.2.a (Soil Contamination) and **B.2.b** (Residual Soil Contamination) from our Closure Request have been revised to include a continuous area of soil contamination between the dry cleaner and the larger area depicted to the east. This area also includes the chemical storage area.

In addition, **Figure B.3.a** (Geological Cross-Sections) has been updated to depict a broader and deeper area of estimated soil contamination.

12. ***Cross sections should include all utilities, soil results and depth of collection, any potential impediments such as footings and/or foundation walls and water table. Current cross sections do not include any of these items from within the building.***

Response:

The geological cross-section (**Figure B.3.a**) has been revised to include interpreted utility locations and soil sample depth of collection. Sample locations have been color coded to indicate whether the sample met the soil to groundwater RCL.

Groundwater

13. ***All groundwater data should be evaluated to determine if the closure criteria in Wis. Admin. Code § NR 726.05 (6) for groundwater exceeding the enforcement standard at case closure have been met. Particular attention should be given to explaining the results in MW-2, where vinyl chloride levels have increased since the initial sampling event.***

14. ***Based on the data from MW-2, the estimated Enforcement Standard iso-contour line in Figure B.3.b should be extended to the northern property line. Additionally, as no monitoring well has been placed inside the building due to access limitations, while potential source areas exist beneath the building, the estimated Enforcement Standard iso-contour line in Figure B.3.b should extend to the west of MW-1 beneath the building at least to the dry cleaning machine area.***

Responses to comments 13 and 14 have been prepared by a Wisconsin registered hydrogeologist and are provided in **Attachment 1**.

If you have any questions or comments about the proposed work for the Site, please do not hesitate to contact the undersigned at (513) 771-3617, extension 1801.

Sincerely,
Apex Companies, LLC.

Jane Allan, PhD
Senior Project Manager

Attachments

Tables

A.4.1 Summary of Soil Gas Data for Volatile Organic Compounds (VOCs)
EPA Method TO-15
Greentree Centre
5111 Douglas Avenue, Racine, Wisconsin

Analytes	Sub-Slab Vapor VRSL				SV-1		SV-2			SV-3			
	RESIDENTIAL	SMALL COMMERCIAL	LARGE COMMERCIAL	Sub-slab Sample Location									
				Collection Time	8:44-9:14 AM	10:38-11:17 AM	9:36-10:15 AM	11:11-11:48 AM	12:31-1:12 PM	12:52-1:25 PM	11:00-11:39 AM	10:46-11:22 AM	12:31-1:12 PM
	AF = 0.03	AF = 0.03	AF = 0.01	Date	6/13/2017	6/27/2019	6/13/2017	1/4/2019	1/13/2022	6/13/2017	1/4/2019	6/27/2019	1/13/2022
Benzene	120	520	1,600		1.3	0.6	1.4	<0.23	NR	1.2	0.28	0.62	NR
Chloroform	41.0	180	530		1.7	2.2	39.0	27.3	NR	29.8	13.6	16.2	NR
Chloromethane	3,100	13,000	39,000		1.9	<0.23	11.8	<0.24	NR	<0.19	<0.24	<0.24	NR
Dichlorodifluoromethane	3,500	15,000	44,000		849	139	3.2	6.4	NR	3.7	10.9	3.3	NR
1,1-Dichloroethane	590	2,600	7,700		<0.26	<0.34	<0.23	<0.34	NR	<0.27	<0.34	<0.35	NR
1,2-Dichloroethane	36	160	470		<0.34	<0.22	<0.31	<0.23	NR	<0.36	<0.23	<0.23	NR
1,1-Dichloroethene	7,000	29,000	88,000		<0.40	<0.41	<0.353	<0.42	NR	<0.42	<0.42	<0.42	NR
cis-1,2-Dichloroethene	NE	NE	NE		<0.41	<0.33	2.2	13.4	<0.27	5.4	<0.33	<0.34	<0.28
trans-1,2-Dichloroethene	NE	NE	NE		<0.65	<0.42	<0.57	<0.43	<0.24	<0.67	<0.43	<0.44	<0.24
Ethylbenzene	370.0	1,600	4,900		2.3	1	1.5	2.0	NR	2.0	1.4	1.1	NR
Methylene Chloride	21,000	88,000	260,000		14.7	19.6	4.8	2.9	NR	3.8	3.9	17.9	NR
Methyl tertiary-butyl ether	3,700	16,000	47,000		<0.51	<0.99	<0.45	<1.0	NR	<0.53	<1.0	<1.0	NR
Naphthalene	28.0	120	360		19.0	2.9	25.3	11.7	NR	26.0	18.0	2.3	NR
Tetrachloroethene	1,400.0	5,800	18,000		116	30.8	*4,570*	490	8.3	***7,720***	128	61	178
Toluene	170,000	730,000	2,200,000		13.0	3.9	2.8	7.9	NR	4.1	3.7	3.1	NR
1,1,1-Trichloroethane	170,000	730,000	2,200,000		<0.41	<0.46	<0.37	<0.47	NR	<0.43	<0.47	<0.48	NR
Trichloroethene	70.0	290	880		2.7	1.1	28.6	44.9	<0.28	48.0	2.0	2.1	5.6
Trichlorofluoromethane	NE	NE	NE		3.3	2.9	1.9	<0.56	NR	1.9	1.1	1.5	NR
1,2,4-Trimethylbenzene	2,100	8,700	26,000		36.6	15.3	10.6	6.7	NR	16.5	6.6	10.3	NR
1,3,5-Trimethylbenzene	2,100	8,700	26,000		22.4	8.5	4.4	3.6	NR	7.9	2.4	4.7	NR
Vinyl chloride	56	930	2,800		<0.33	<0.19	<0.29	<0.19	<0.12	<0.34	<0.19	<0.20	<0.12
m,p-Xylene	3,500	15,000	44,000		6.3	3.6	2.8	9.1	NR	3.3	6.6	4.1	NR
o-Xylene	3300	15,000	44,000		3.4	3.8	1.5	3.4	NR	2.2	2.7	3	NR

Notes:

Concentrations expressed in micrograms per cubic meter ($\mu g/m^3$)

Analytes above residential VRSL are shown in *italics*

Analytes above small commercial VRSL concentrations are shown in **bold**

NR = Not reported

AF = Attenuation Factor

NE = Remedial Objective not established.

< = Not Detected: Concentration less than the indicated laboratory detection limit.

All samples collected into 6L Summa canisters; Vapor pins purged and sampled at < 0.2 lpm.

Each vapor pin location was leak tested using the water dam method and shut in test.

VRSL = Vapor Risk Screening level

A.4.1 Summary of Soil Gas Data for Volatile Organic Compounds (VOCs)
EPA Method TO-15
Greentree Centre
5111 Douglas Avenue, Racine, Wisconsin

Analytes	Sub-Slab Vapor VRSL				SV-4			SV-5		SV-6		SV-7		SV-8	
	RESIDENTIAL	SMALL COMMERCIAL	LARGE COMMERCIAL	Sub-slab Sample Location											
				Collection Time	1:23-1:58 PM	9:34-10:11 AM	3:08-3:48 PM	1:24-1:58 PM	3:09-3:49 PM	12:24-12:57 PM	11:34-12:00 PM	12:15-12:52 PM	3:06-3:43 PM	2:38-3:11 PM	12:31-1:04 PM
	AF = 0.03	AF = 0.03	AF = 0.01	Date	8/16/2017	6/27/2019	1/13/2022	8/16/2017	1/13/2022	8/16/2017	1/13/2022	8/16/2017	1/13/2022	8/16/2017	1/13/2022
Benzene	120	520	1,600		<2.1	0.5	NR	<2.0	NR	<2.1	NR	<2.0	NR	<2.2	NR
Chloroform	41.0	180	530		***630***	0.58	NR	*53*	NR	*92.2*	NR	39.8	NR	*124*	NR
Chloromethane	3,100	13,000	39,000		<1.7	0.26	NR	<1.6	NR	<1.7	NR	<1.6	NR	<1.8	NR
Dichlorodifluoromethane	3,500	15,000	44,000		<6.7	2.9	NR	115	NR	<6.7	NR	<6.4	NR	<7.0	NR
1,1-Dichloroethane	590	2,600	7,700		<3.4	<0.34	NR	<3.3	NR	<3.4	NR	<3.3	NR	<3.6	NR
1,2-Dichloroethane	36	160	470		<3.0	<0.23	NR	<2.9	NR	<3.0	NR	<2.9	NR	<3.2	NR
1,1-Dichloroethene	7,000	29,000	88,000		<3.8	<0,42	NR	<3.7	NR	<3.8	NR	<3.7	NR	<4.0	NR
cis-1,2-Dichloroethene	NE	NE	NE		32	<0.33	0.49	6	3.7	<3.5	3.4	28.2	2.6	3.9	<0.31
trans-1,2-Dichloroethene	NE	NE	NE		<3.1	<0.43	<0.24	<3.0	<0.24	<3.1	<0.26	<3.0	<0.25	<3.3	<0.27
Ethylbenzene	370.0	1,600	4,900		<2.8	0.9	NR	<2.7	NR	<2.8	NR	<2.7	NR	<2.9	NR
Methylene Chloride	21,000	88,000	260,000		<24.5	105	NR	71.7	NR	<24.5	NR	<23.6	NR	<25.5	NR
Methyl tertiary-butyl ether	3,700	16,000	47,000		<5.0	<1.0	NR	<4.9	NR	<5.0	NR	<4.9	NR	<5.3	NR
Naphthalene	28.0	120	360		<9.4	<2.0	NR	<9.0	NR	<9.4	NR	<9.0	NR	<9.8	NR
Tetrachloroethene	1,400.0	5,800	18,000		***26,100***	4.3	126	*3,700*	82	*2,340*	120	*2,590*	49	*2,230*	6
Toluene	170,000	730,000	2,200,000		69.6	4.7	NR	117	NR	63	NR	101	NR	81.5	NR
1,1,1-Trichloroethane	170,000	730,000	2,200,000		<5.5	<0.47	NR	<5.3	NR	<5.5	NR	<5.3	NR	<5.7	NR
Trichloroethene	70.0	290	880		***491.0***	<0.339	4.5	58.5	4.4	18.1	8.4	76.5	1.5	47.6	<0.32
Trichlorofluoromethane	NE	NE	NE		<6.7	1.4	NR	<6.5	NR	<6.7	NR	<6.5	NR	<7.0	NR
1,2,4-Trimethylbenzene	2,100	8,700	26,000		14.2	1.2	NR	14.9	NR	11.4	NR	15.8	NR	<2.9	NR
1,3,5-Trimethylbenzene	2,100	8,700	26,000		<3.8	<0.61	NR	<3.6	NR	<3.8	NR	<3.6	NR	<3.5	NR
Vinyl chloride	56	930	2,800		<2.0	<0.41	<0.12	<2.0	<0.12	<2.0	<0.13	<2.0	<0.13	<2.1	<0.14
m,p-Xylene	3,500	15,000	44,000		<5.6	2.9	NR	<5.4	NR	<5.6	NR	<5.4	NR	<5.9	NR
o-Xylene	3300	15,000	44,000		<2.8	0.9	NR	<2.7	NR	<2.8	NR	<2.0	NR	<3.0	NR

Notes:

Concentrations expressed in micrograms per cubic meter ($\mu g/m^3$)

Analytes above residential VRSL are shown in *italics*

Analytes above small commercial VRSL concentrations are shown in **bold**

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AF = Attenuation Factor

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All samples collected into 6L Summa canisters; Vapor pins purged and sampled at < 0.2 lpm.

Each vapor pin location was leak tested using the water dam method and shut in test.

VRSL = Vapor Risk Screening level

A.4.1 Summary of Soil Gas Data for Volatile Organic Compounds (VOCs)
EPA Method TO-15
Greentree Centre
5111 Douglas Avenue, Racine, Wisconsin

Analytes	Sub-Slab Vapor VRSL				SV-9		SV-10		SV-11		SV-12		SV-13	SV-14
	RESIDENTIAL	SMALL COMMERCIAL	LARGE COMMERCIAL	Sub-slab Sample Location										
				Collection Time	10:56-11:27 PM	3:07-3:52 PM	11:21-11:51 PM	11:24-12:00 PM	11:53-12:23 PM	3:05-3:42 PM	11:19-11:44 AM	10:54-11:31 AM	11:24-12:00 PM	3:05-3:42 PM
	AF = 0.03	AF = 0.03	AF = 0.01	Date	9/13/2017	1/13/2022	9/13/2017	1/13/2022	9/13/2017	1/13/2022	1/4/2019	6/27/2019	1/13/2022	1/13/2022
Benzene	120	520	1,600		2.8	NR	4.3	NR	4.7	NR	0.7	0.72	NR	NR
Chloroform	41.0	180	530		2	NR	5.6	NR	36.5	NR	6.0	11.5	NR	NR
Chloromethane	3,100	13,000	39,000		<0.23	NR	<0.23	NR	<0.23	NR	<0.24	<0.24	NR	NR
Dichlorodifluoromethane	3,500	15,000	44,000		49	NR	2.8	NR	32.6	NR	7.4	2.8	NR	NR
1,1-Dichloroethane	590	2,600	7,700		<0.36	NR	<0.37	NR	<0.37	NR	<0.35	<0.34	NR	NR
1,2-Dichloroethane	36	160	470		<0.33	NR	<0.35	NR	<0.35	NR	<0.23	<0.23	NR	NR
1,1-Dichloroethene	7,000	29,000	88,000		<0.40	NR	<0.41	NR	<0.41	NR	<0.42	<0.42	NR	NR
cis-1,2-Dichloroethene	NE	NE	NE		<0.57	<0.26	<0.60	4.2	<0.60	6.8	<0.34	<0.33	<0.28	6.6
trans-1,2-Dichloroethene	NE	NE	NE		<0.50	<0.23	<0.52	<0.26	<0.52	<0.25	<0.68	<0.43	<0.25	<0.25
Ethylbenzene	370.0	1,600	4,900		4.0	NR	**3.3**	NR	5.1	NR	2.3	1.3	NR	NR
Methylene Chloride	21,000	88,000	260,000		6.7	NR	<2.7	NR	<2.7	NR	1.8	22.1	NR	NR
Methyl tertiary-butyl ether	3,700	16,000	47,000		<1.1	NR	<1.2	NR	<1.2	NR	<1.0	<1.0	NR	NR
Naphthalene	28.0	120	360		<1.0	NR	<1.0	NR	<1.0	NR	12.7	4.8	NR	NR
Tetrachloroethene	1,400.0	5,800	18,000		100.0	3	127.0	83.6	4,530	342.0	119	83.8	19.7	165
Toluene	170,000	730,000	2,200,000		19.5	NR	12.9	NR	12.5	NR	7.4	4.6	NR	NR
1,1,1-Trichloroethane	170,000	730,000	2,200,000		<0.57	NR	<0.60	NR	<0.60	NR	<0.48	<0.47	NR	NR
Trichloroethene	70.0	290	880		1.8	<0.26	1.5	4.7	68.8	16.7	2.0	2.5	<0.29	10.3
Trichlorofluoromethane	NE	NE	NE		1.8	NR	1.5	NR	2.6	NR	<0.57	1.5	NR	NR
1,2,4-Trimethylbenzene	2,100	8,700	26,000		5.2	NR	7.8	NR	5.3	NR	7.1	31.7	NR	NR
1,3,5-Trimethylbenzene	2,100	8,700	26,000		1.6	NR	3.3	NR	1.7	NR	1.9	16.0	NR	NR
Vinyl chloride	56	930	2,800		<0.21	<0.12	<0.22	<0.13	<0.22	<0.13	<0.20	<0.19	<0.13	<0.13
m,p-Xylene	3,500	15,000	44,000		7.1	NR	7.4	NR	10.4	NR	9.4	5.4	NR	NR
o-Xylene	3300	15,000	44,000		3.3	NR	3.5	NR	4.1	NR	3.8	8.8	NR	NR

Notes:

Concentrations expressed in micrograms per cubic meter ($\mu g/m^3$)

Analytes above residential VRSL are shown in *italics*

Analytes above small commercial VRSL concentrations are shown in **bold**

NR = Not reported

AF = Attenuation Factor

NE = Remedial Objective not established.

< = Not Detected: Concentration less than the indicated laboratory detection limit.

All samples collected into 6L Summa canisters; Vapor pins purged and sampled at < 0.2 lpm.

Each vapor pin location was leak tested using the water dam method and shut in test.

VRSL = Vapor Risk Screening level

A.4.2 Summary Indoor Air and Floor Drain Sump Data for Volatile Organic Compounds (VOCs)
Method TO-15
Greentree Centre
5111 Douglas Avenue, Racine, Wisconsin

Analytes	Indoor Air Vapor Action Level (VAL)			Sample Name	IA-1 (Indoor)	IA-2 (Indoor)	BD-1 (Bathroom Sewer Cleanout)
	Residential	Small Commercial	Large Commercial/Industrial	Date Collected	1/13/2022		
cis-1,2-Dichloroethene	NE	NE	NE		<0.31	<0.3	<0.3
trans-1,2-Dichloroethene	42	180	5800		<0.27	<0.26	<0.26
Tetrachloroethene	42	180	5800		10.3	11.9	**70.5**
Trichloroethene	2.1	8.8	8.8		<0.31	<0.3	<0.3
Vinyl chloride	1.7	28	28		<0.14	<0.13	<0.13

Notes:

concentrations in micrograms per cubic meter (ug/m3).

Samples collected into 6 L. Summa Canisters with < 0.2 lpm regulators.

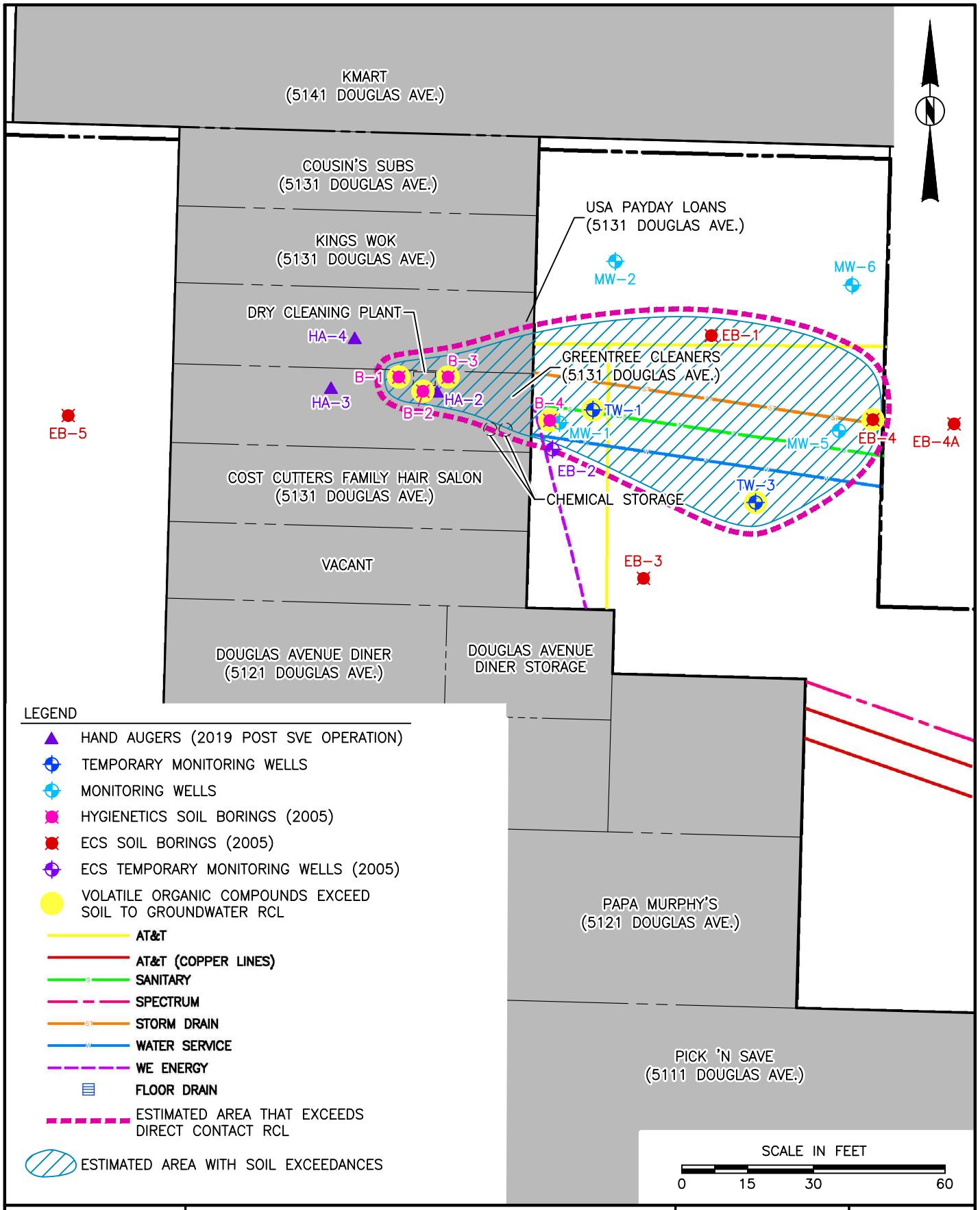
< = Not Detected: Concentration less than the indicated laboratory detection limit.

Analytes above Indoor Vapor Action Level concentrations are shown in **bold**.

NE = Remedial Objective not established.

Figures

APEX



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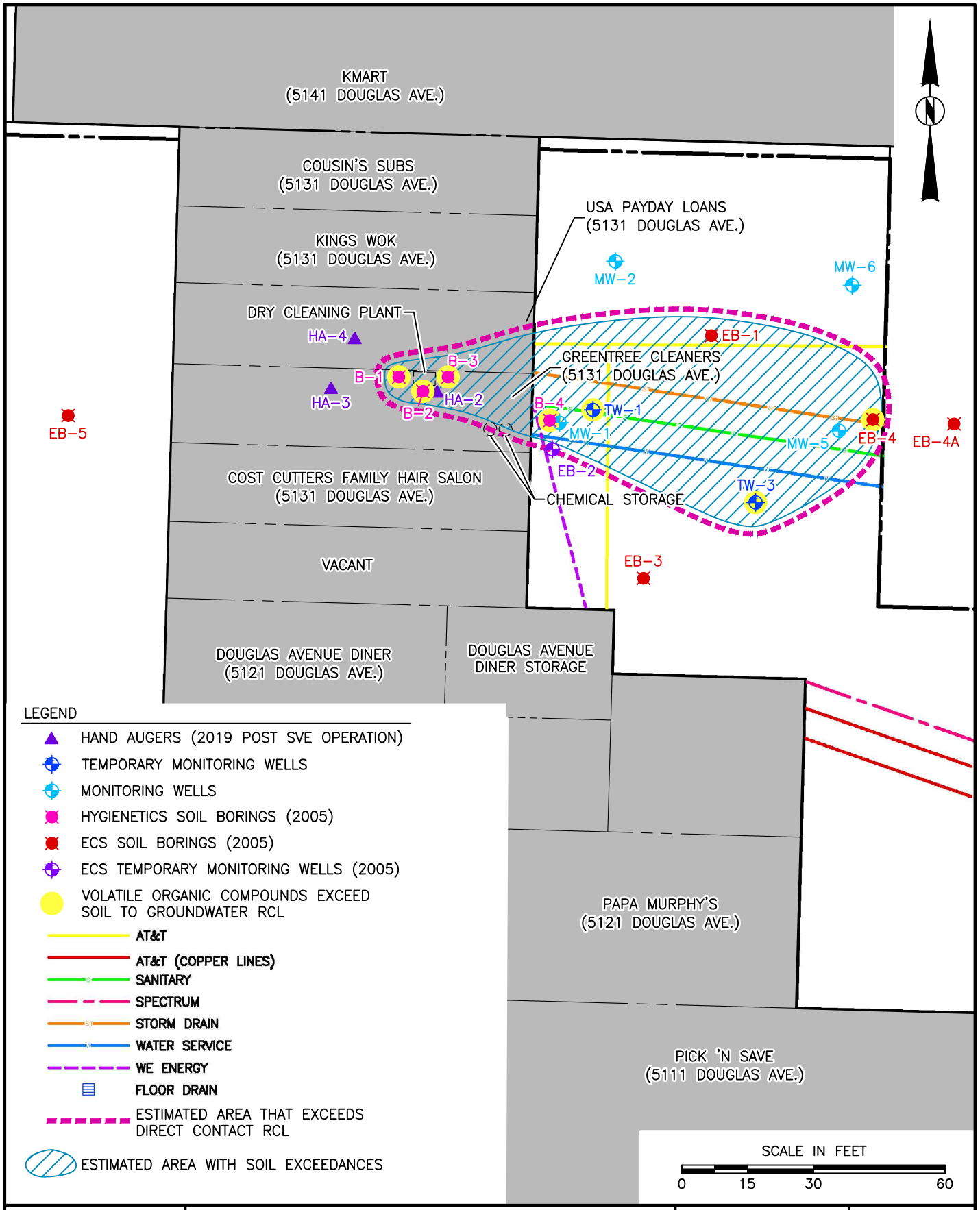
DRAWN BY	OS
DATE	4-28-22
SCALE	AS SHOWN
CAD NO.	PEC0.2017.100e4
PRJ NO.	PEC0_2017-100

SOIL CONTAMINATION

GREENTREE CENTRE
5111 DOUGLAS AVENUE, UNIT D
RACINE, WISCONSIN

APEX

FIGURE
B.2.a



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DRAWN BY	OS
DATE	4-28-22
SCALE	AS SHOWN
CAD NO.	PECO.2017.100e4
PRJ NO.	PECO_2017-100

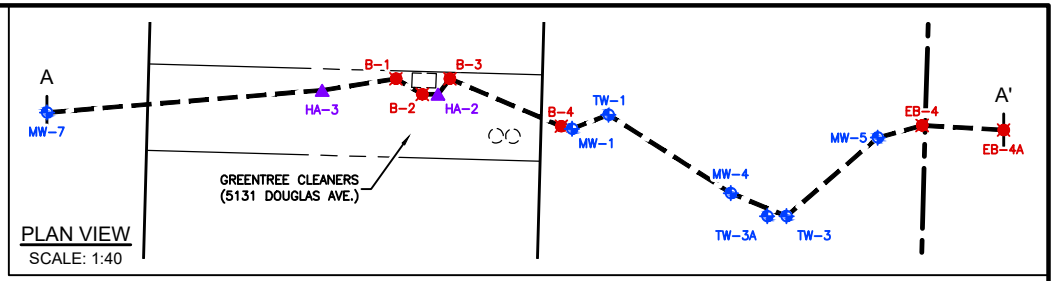
RESIDUAL SOIL CONTAMINATION

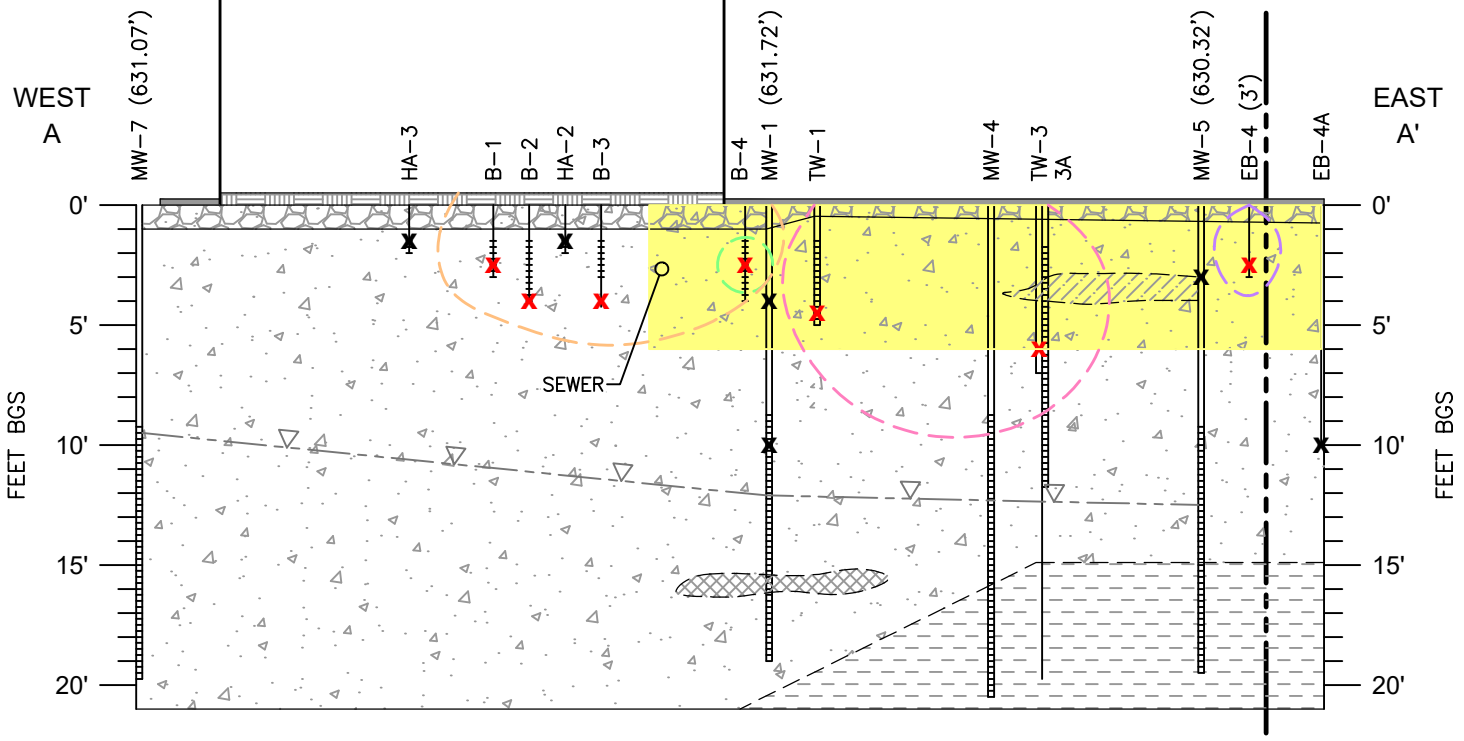
GREENTREE CENTRE
5111 DOUGLAS AVENUE, UNIT D
RACINE, WISCONSIN

APEX

FIGURE
B.2.b

CROSS SECTION VIEW (A-A')





LEGEND

- GROUNDWATER ELEVATION MEASURED ON SEPTEMBER 15, 2017
- BENZENE EXCEEDANCE
- METHYLENE CLORIDE EXCEEDANCE
- NAPHTHALENE EXCEEDANCE
- TETRACHLOETHYLENE EXCEEDANCE
- AREA OF UTILITIES BETWEEN BUILDING AND PROPERTY WITH ESTIMATED DEPTHS LESS THAN 7'
- X EXCEEDANCE OF SOIL TO GROUNDWATER RCL
- X NO EXCEEDANCE OF SOIL TO GROUNDWATER RCL
- PROPERTY LINE
- ASPHALT
- CLAYEY SILT
- CONCRETE
- CRUSHED STONE
- GRAVELLY SAND
- SILTY CLAY
- SILTY SAND

SCALE IN FEET
0 4 8 16

CHK BY	JB
DWN BY	EM
DATE	05-04-22
SCALE	AS SHOWN
CAD NO.	2017-100.05[3]
PRJ NO.	PECO_2017-100

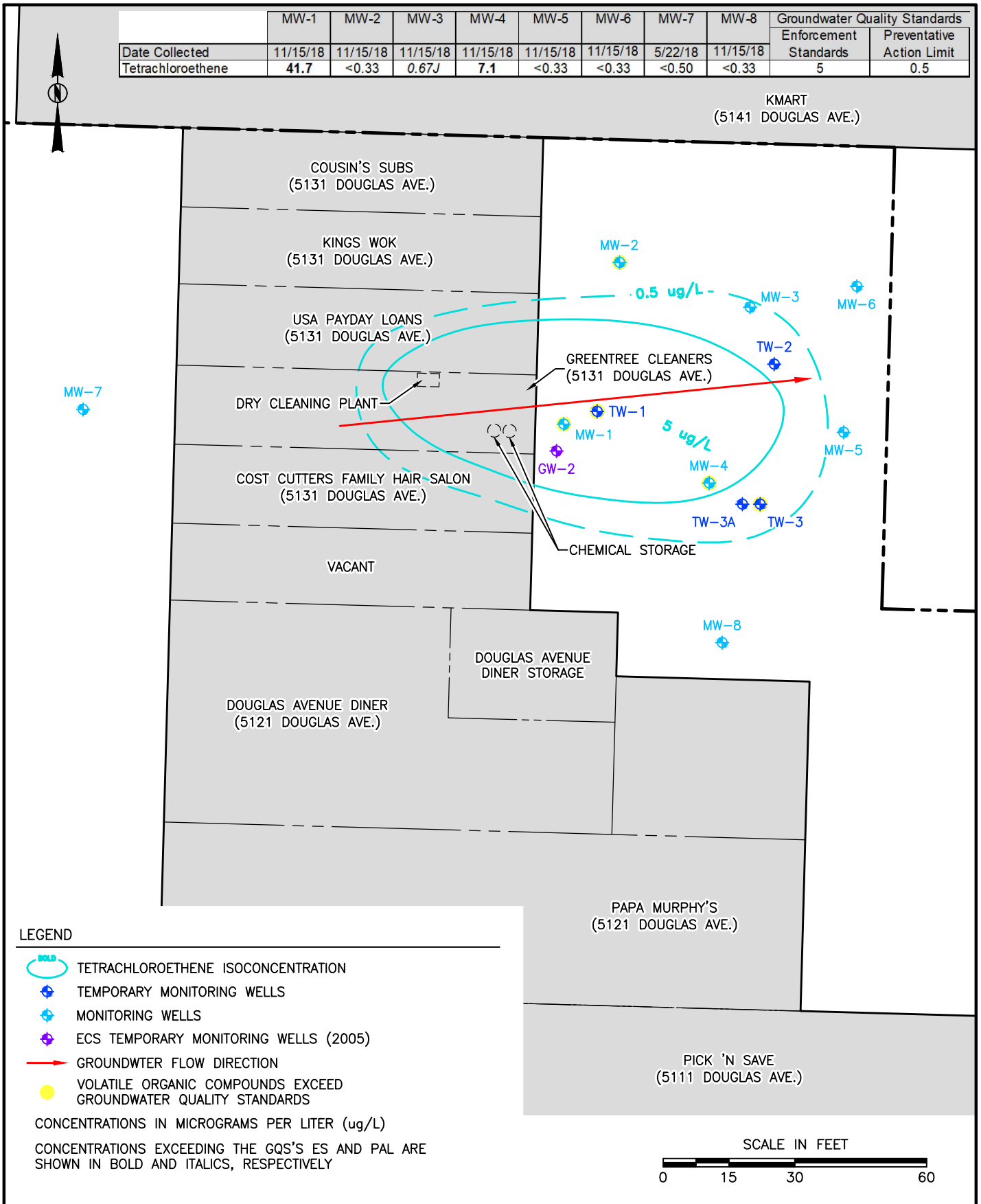
GEOLOGICAL CROSS SECTION A-A'
RESIDUAL SOIL EXCEEDING RCL

GREENTREE CENTRE
5111 DOUGLAS AVENUE, UNIT D
RACINE, WISCONSIN

APEX

FIGURE
B3a1

	MW-1	MW-2	MW-3	MW-4	MW-5	MW-6	MW-7	MW-8	Groundwater Quality Standards	
									Enforcement Standards	Preventative Action Limit
Date Collected	11/15/18	11/15/18	11/15/18	11/15/18	11/15/18	11/15/18	5/22/18	11/15/18		
Tetrachloroethene	**41.7**	<0.33	*0.67J*	**7.1**	<0.33	<0.33	<0.50	<0.33	5	0.5



LEGEND

- TETRACHLOROETHENE ISOCONCENTRATION
- TEMPORARY MONITORING WELLS
- MONITORING WELLS
- ECS TEMPORARY MONITORING WELLS (2005)
- GROUNDWTER FLOW DIRECTION
- VOLATILE ORGANIC COMPOUNDS EXCEED GROUNDWATER QUALITY STANDARDS

CONCENTRATIONS IN MICROGRAMS PER LITER (ug/L)

CONCENTRATIONS EXCEEDING THE GQS'S ES AND PAL ARE SHOWN IN BOLD AND ITALICS, RESPECTIVELY

SCALE IN FEET

0 15 30 60

CHECK BY	JA
DRAWN BY	EM
DATE	04-19-22
SCALE	AS SHOWN
CAD NO.	2017-100.05[2]
PRJ NO.	PECO_2017-100

GROUNDWATER ISOCONCENTRATION TETRACHLOROETHENE

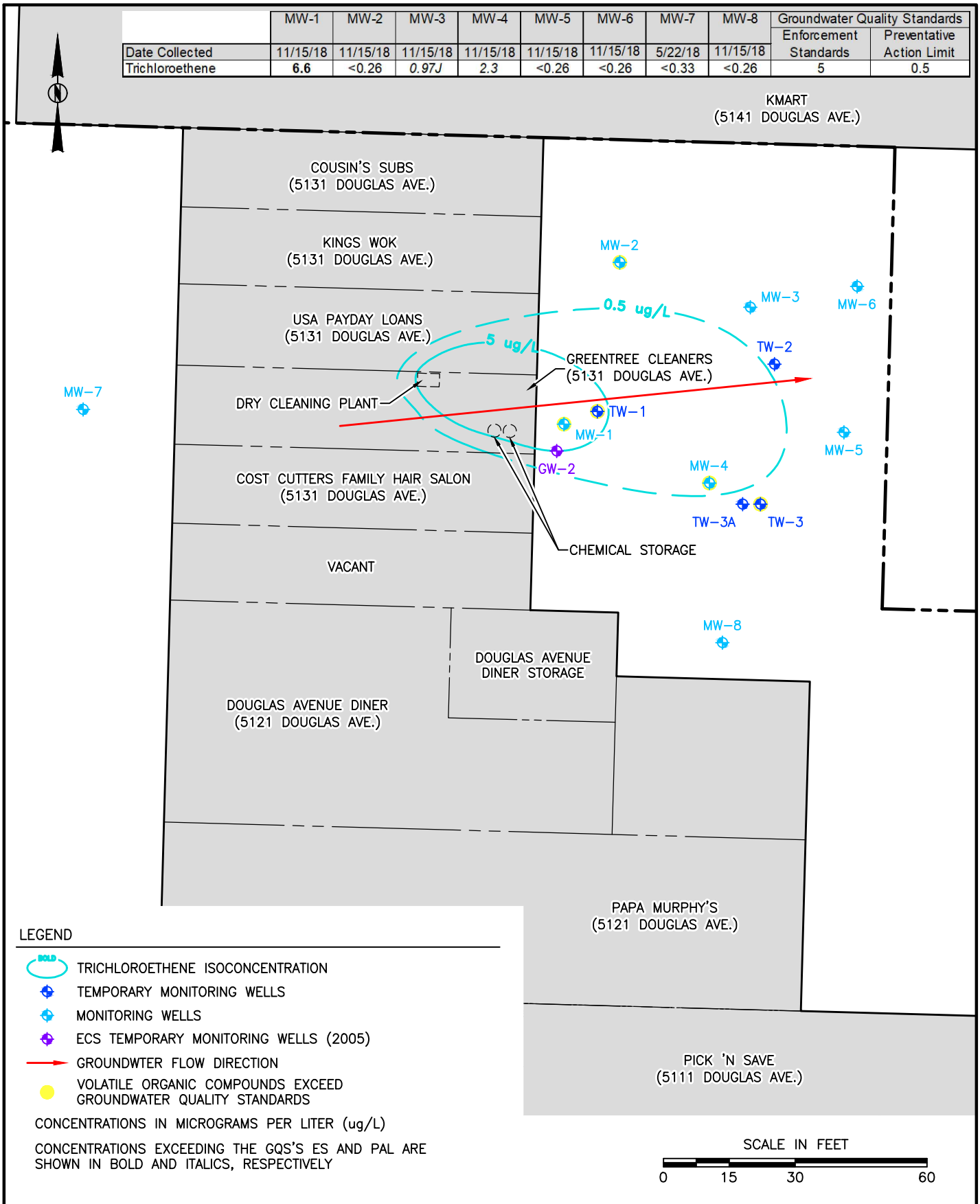
GREENTREE CENTRE
5111 DOUGLAS AVENUE
RACINE, WISCONSIN

APEX

FIGURE

B3b1

	MW-1	MW-2	MW-3	MW-4	MW-5	MW-6	MW-7	MW-8	Groundwater Quality Standards	
									Enforcement Standards	Preventative Action Limit
Date Collected	11/15/18	11/15/18	11/15/18	11/15/18	11/15/18	11/15/18	5/22/18	11/15/18		
Trichloroethene	**6.6**	<0.26	*0.97J*	*2.3*	<0.26	<0.26	<0.33	<0.26	5	0.5



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DRAWN BY	EM
DATE	04-19-22
SCALE	AS SHOWN
CAD NO.	2017-100.05[2]
PRJ NO.	PECO_2017-100

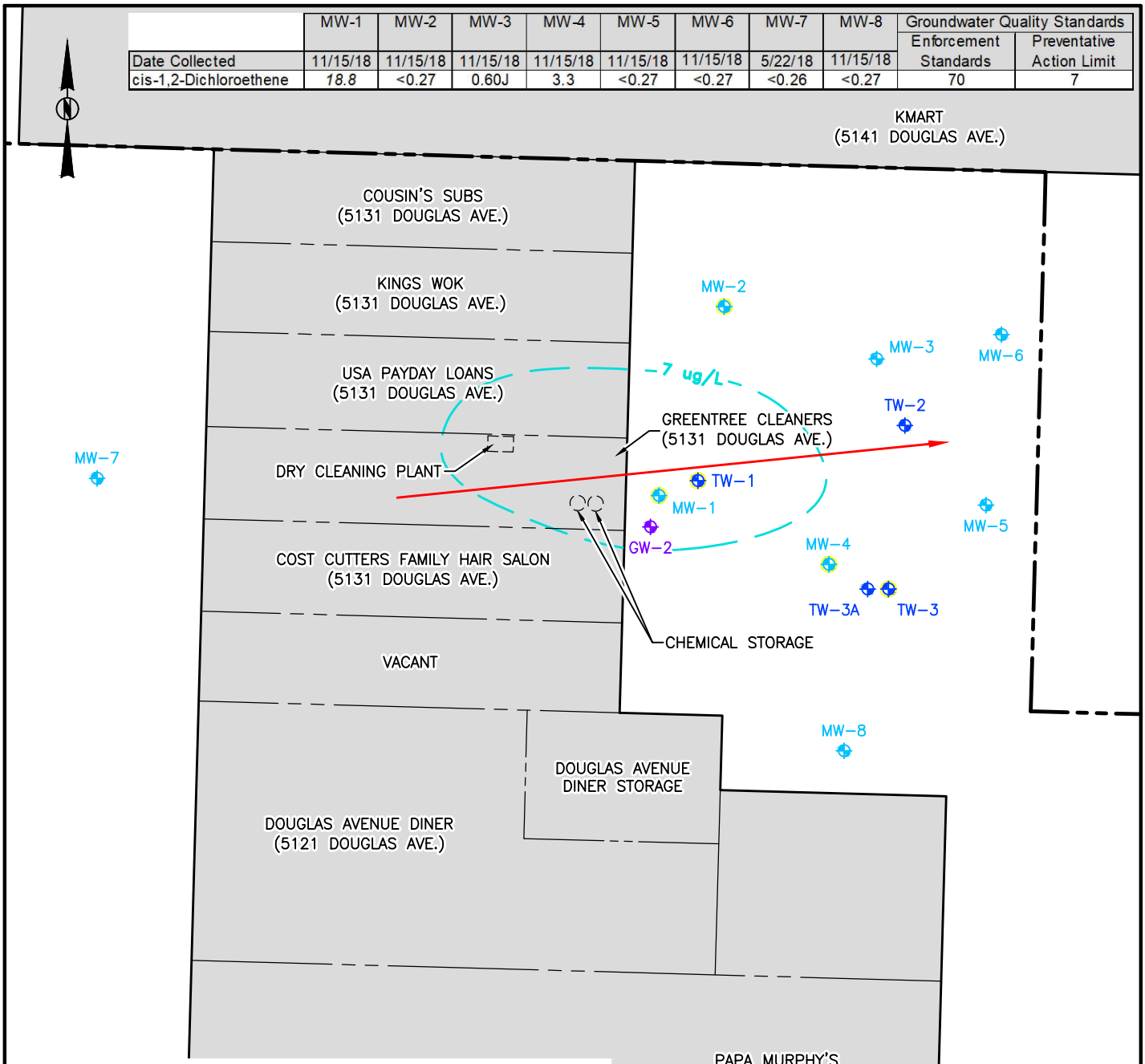
GROUNDWATER ISOCONCENTRATION TRICHLOROETHENE

GREENTREE CENTRE
5111 DOUGLAS AVENUE
RACINE, WISCONSIN

APEX

FIGURE
B3b2

	MW-1	MW-2	MW-3	MW-4	MW-5	MW-6	MW-7	MW-8	Groundwater Quality Standards	
									Enforcement Standards	Preventative Action Limit
Date Collected	11/15/18	11/15/18	11/15/18	11/15/18	11/15/18	11/15/18	5/22/18	11/15/18		
cis-1,2-Dichloroethene	*18.8*	<0.27	0.60J	3.3	<0.27	<0.27	<0.26	<0.27	70	7



LEGEND

- CIS-1,2 DICHLORETHENE ISOCONCENTRATION
- TEMPORARY MONITORING WELLS
- MONITORING WELLS
- ECS TEMPORARY MONITORING WELLS (2005)
- GROUNDWTER FLOW DIRECTION
- VOLATILE ORGANIC COMPOUNDS EXCEED GROUNDWATER QUALITY STANDARDS

CONCENTRATIONS IN MICROGRAMS PER LITER (ug/L)

CONCENTRATIONS EXCEEDING THE GQS'S ES AND PAL ARE SHOWN IN BOLD AND ITALICS, RESPECTIVELY

SCALE IN FEET

0 15 30 60

CHECK BY	JA
DRAWN BY	EM
DATE	04-19-22
SCALE	AS SHOWN
CAD NO.	2017-100.05[2]
PRJ NO.	PECO_2017-100

GROUNDWATER ISOCONCENTRATION CIS-1,2 DICHLORETHENE

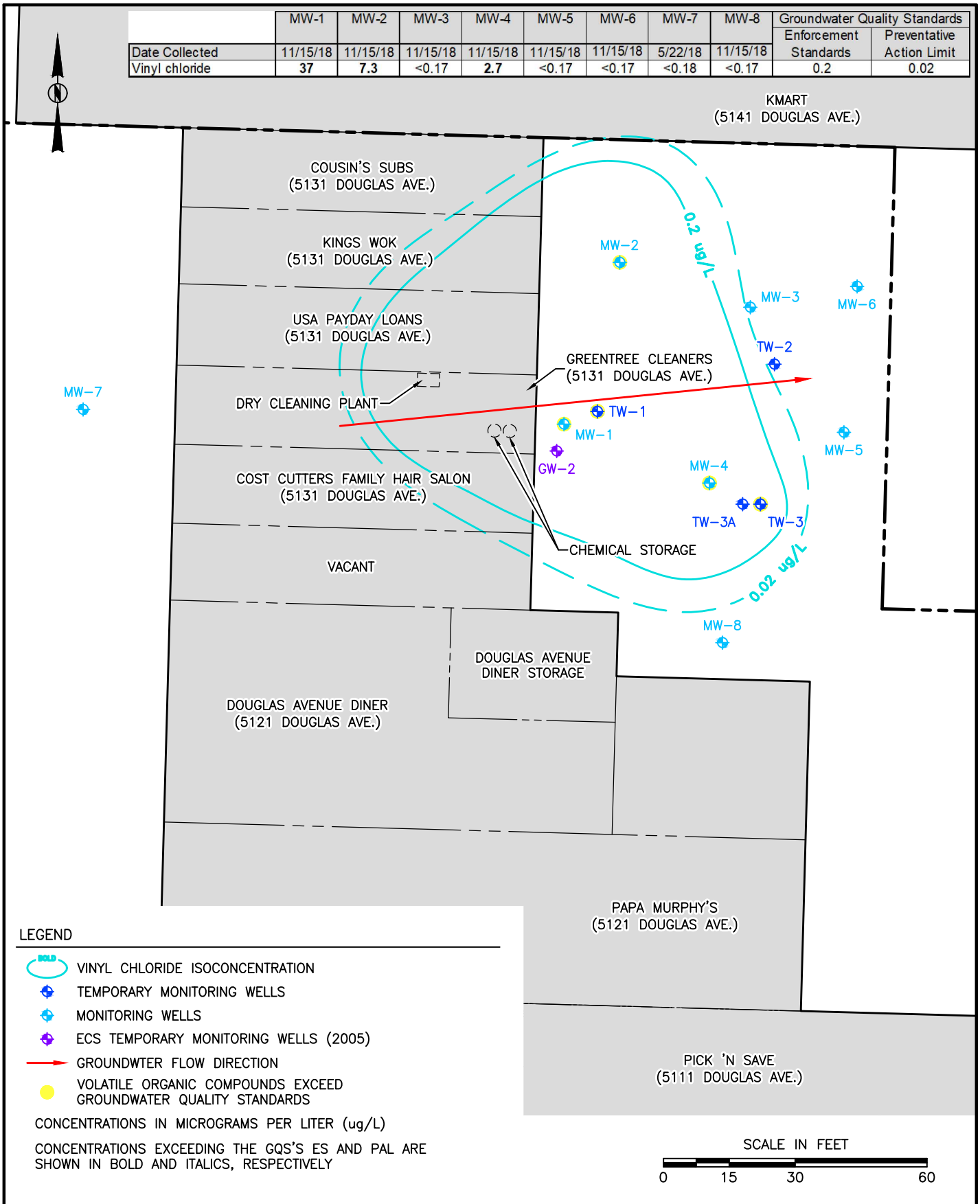
GREENTREE CENTRE
5111 DOUGLAS AVENUE
RACINE, WISCONSIN

APEX

FIGURE

B3b3

	MW-1	MW-2	MW-3	MW-4	MW-5	MW-6	MW-7	MW-8	Groundwater Quality Standards	
									Enforcement Standards	Preventative Action Limit
Date Collected	11/15/18	11/15/18	11/15/18	11/15/18	11/15/18	11/15/18	5/22/18	11/15/18		
Vinyl chloride	**37**	**7.3**	<0.17	**2.7**	<0.17	<0.17	<0.18	<0.17	0.2	0.02



LEGEND

- VINYL CHLORIDE ISOCONCENTRATION
- TEMPORARY MONITORING WELLS
- MONITORING WELLS
- ECS TEMPORARY MONITORING WELLS (2005)
- GROUNDWTER FLOW DIRECTION
- VOLATILE ORGANIC COMPOUNDS EXCEED GROUNDWATER QUALITY STANDARDS

CONCENTRATIONS IN MICROGRAMS PER LITER (ug/L)

CONCENTRATIONS EXCEEDING THE GQS'S ES AND PAL ARE SHOWN IN BOLD AND ITALICS, RESPECTIVELY

SCALE IN FEET

0 15 30 60

CHECK BY	JA
DRAWN BY	EM
DATE	04-19-22
SCALE	AS SHOWN
CAD NO.	2017-100.05[2]
PRJ NO.	PECO_2017-100

GROUNDWATER ISOCONCENTRATION VINYL CHLORIDE

GREENTREE CENTRE
5111 DOUGLAS AVENUE
RACINE, WISCONSIN

APEX

FIGURE

B3b4

Attachment 1

Resolution Partners, LLC, letter dated June 13, 2022
Groundwater Issues, WDNR Case Closure Letter of 23 April 2021, Greentree Cleaners

ReSolution Partners, LLC

13 June 2022

Ms. Jane Allan
Apex Companies, LLC
4701 Creek Road, Suite 100
Blue Ash, Ohio 45242

Subject: Groundwater Issues, WDNR Case Closure Letter of 23 April 2021
Greentree Cleaners. DNR BRRTS Activity No. 02-52-579863,
FID No: 2521138700

Dear Ms. Allan:

This letter provides responses to the groundwater issues (items 13 and 14) in the WDNR's case closure letter. The information provided in the Greentree Cleaners Case Closure Form 4400-202 dated May 2020 was used in the preparation of the following responses.

Item 13. All groundwater data should be evaluated to determine if the closure criteria in Wis. Admin. Code § NR 726.05 (6) for groundwater exceeding the enforcement standard at case closure have been met. Particular attention should be given to explaining the results in MW-2, where vinyl chloride levels have increased since the initial sampling event.

Groundwater data through November 2018 (Table A.1) are shown as micromolar concentrations (uM) of tetrachloroethene (PCE), trichloroethene (TCE, cis-1,2-dichloroethene (cDCE) and chloroethene (CE, a.k.a. vinyl chloride) on Figure 1. Each compound as a fraction of the total molar concentrations is also shown. Concentrations of the four chlorinated volatile organic compounds (CVOCs) reported as less than laboratory detection limits are plotted at one-half of the limit. The Enforcement Standard (ES) and the Preventative Action Limit (PAL) for CE are 0.0032 and 0.00032 uM, respectively.

The total CVOC concentrations at MW-1 increased by a factor of about 5 during 2018. Concentrations of PCE, TCE, cDCE and CE increased, with CE making up 40 to 60 percent of the CVOC concentrations. As a fraction of the total CVOCs, CE increased while the parent compounds (including cDCE) decreased. This indicates that reductive dechlorination was occurring without "stalling" at cDCE.

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As groundwater flows downgradient from MW-1 toward MW-4, the total concentration of CVOCs decreases by about a factor of 10 and PCE, TCE and cDCE make up decreasing fractions of the total CVOC content, while the fraction of CE increases from 10 to 30 percent of the total. This is the result of continued degradation of the CVOCs. While the CE concentrations is still above its ES, the concentration is more than 10 times lower than observed at MW-1.

At the most downgradient location, MW-5, the concentrations for all four CVOCs during 2018 are below laboratory detection limits and below ESs. This indicates the plume is stable given estimated groundwater flow rates on the order of 70 ft/yr ($V = (K/n)i$; with median K = 3.5E-5 cm/s, i = 0.022 and n assumed at 0.3).

Monitoring wells MW-1, -4 and -5 approximate a groundwater flow path with travel distances of 0, 35 and 70 feet, respectively. The concentration trends along this flow path for November 2018 are shown on Figure 2. Note that all concentrations at MW-5 were below the laboratory detection limits. The data fit a linear first order rate model:

$$C_x = C_0 e^{-kx} \quad \text{or} \quad \ln C_x = \ln C_0 - kx$$

where C_x = concentration at distance x
C_0 = concentration at distance 0
e = base e
ln = natural log
k = rate constant of decline as 1/ft

The calculated concentration decay rates for PCE, TCE, cDCE and CE are 0.073, 0.051, 0.074 and 0.084 per foot, respectively. The decay model supports the trends over time conclusion that the plume is stable and CVOCs are degrading with distance from MW-1 to nondetectable levels by the property line.

Well MW-2 is reported to contain only CE in 2018 (Figure 1), with a slight downward trend suggested at the end of 2018. It is not clear how the CE reached MW-2 from the potential dry cleaner sources given the eastward groundwater flow direction. If one assumes dispersion transverse to the flow direction was the transport mechanism, the dispersion rate is approximately equal to the advective transport rate. Even at the low groundwater flow rates at the site, such a high dispersion rate is unlikely. There are no subsurface utilities leading from the dry cleaning facility in the direction of MW-2 that could provide a preferential

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pathway for CVOC migration. The means by which CE reaches MW-2 remains uncertain.

Regardless of the transport mechanism, if the CE is assumed to have originated with the cleaners, the data still suggests complete degradation of the precursor CVOCs by the time the CVOCs have reached MW-2. This would be a greater rate of degradation than is observed in the direction of groundwater flow. Alternatively, CE has the lowest partition coefficient to organic carbon (k_{oc}) and may simply have reached MW-2 quicker that the other CVOCs.

Assuming CVOCs migrated northward to MW-2, there would still be advective transport to the east, towards MW-3. Only cDCE has been detected at this well at an estimated 0.60 µg/L in 2018, again suggesting that the CVOCs are degrading before reaching the eastern property line and the plume is stable. This is consistent with the observations made along the MW-1 to MW-5 flow path.

Item 14. Based on the data from MW-2, the estimated Enforcement Standard iso-contour line in Figure B.3.b should be extended to the northern property line. Additionally, as no monitoring well has been placed inside the building due to access limitations, while potential source areas exist beneath the building, the estimated Enforcement Standard iso-contour line in Figure B.3.b should extend to the west of MW-1 beneath the building at least to the dry cleaning machine area.

The comment regarding MW-2 is assumed to apply to the CE Enforcement Standard since no other CVOCs have been reported at MW-2. The degradation rate per foot for CE from Figure 2 is approximately a factor of ten for every 30 feet of travel while CE is still being produced from the degradation of precursor CVOCs. Without the addition of CE from precursor degradation, the rate of CE loss would be higher. Assuming that there is significant transverse migration of CE from the source area to MW-2, the 30 feet to the north property line would result in more than a 10-fold reduction in CE concentrations since there are no precursor compound to produce more CE. Conservatively assuming a 10-fold decrease would bring the concentration of CE to ~0.7 µg/L. Given the decreasing CE trend at MW-2 and the underestimation of degradation rate considering no CE production, it appears unlikely that the 0.2 µg/L Enforcement Standard would reach the north property line. Placing the PAL line at the north property boundary is adequately conservative.

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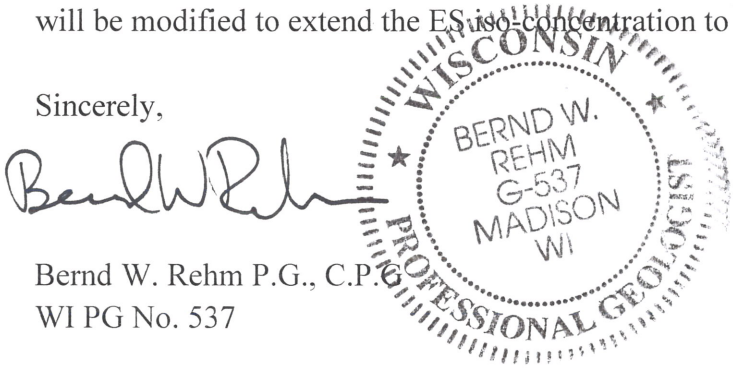
PCE and TCE concentrations above the WDNR Residual Contaminant Levels (RCLs) for the Soil to Groundwater exposure pathway were reported below the dry cleaning facility in 2005. Post-SVE operation samples collected in 2019 did not detect these compounds, but laboratory detection limits were well above the RCLs. Current CVOC concentrations below the facility are presumably lower as a result of removals by the SVE system, advective transport and degradation. However, given the lack of analytical data, the ES iso-contour line could conservatively be extended beneath the dry cleaning machine.

In conclusion, the 2018 data indicate that there is degradation of the CVOCs in the groundwater through the destruction of CE and the plume is at a minimum stable; not reaching the east or north property lines. Figure B3b4 will be modified to extend the PAL iso-concentration line to the north property line and Figures B3b1 through B3b4 will be modified to extend the ES iso-concentration to the dry cleaning machine.

Sincerely,



Bernd W. Rehm P.G., C.P.G.
WI PG No. 537

Attachments: Figure 1. CVOC time trends and compound-specific fraction of total CVOCs.
Figure 2. CVOC distance trends.

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Figure 1. CVOC time trends and compound-specific fraction of total CVOCs.

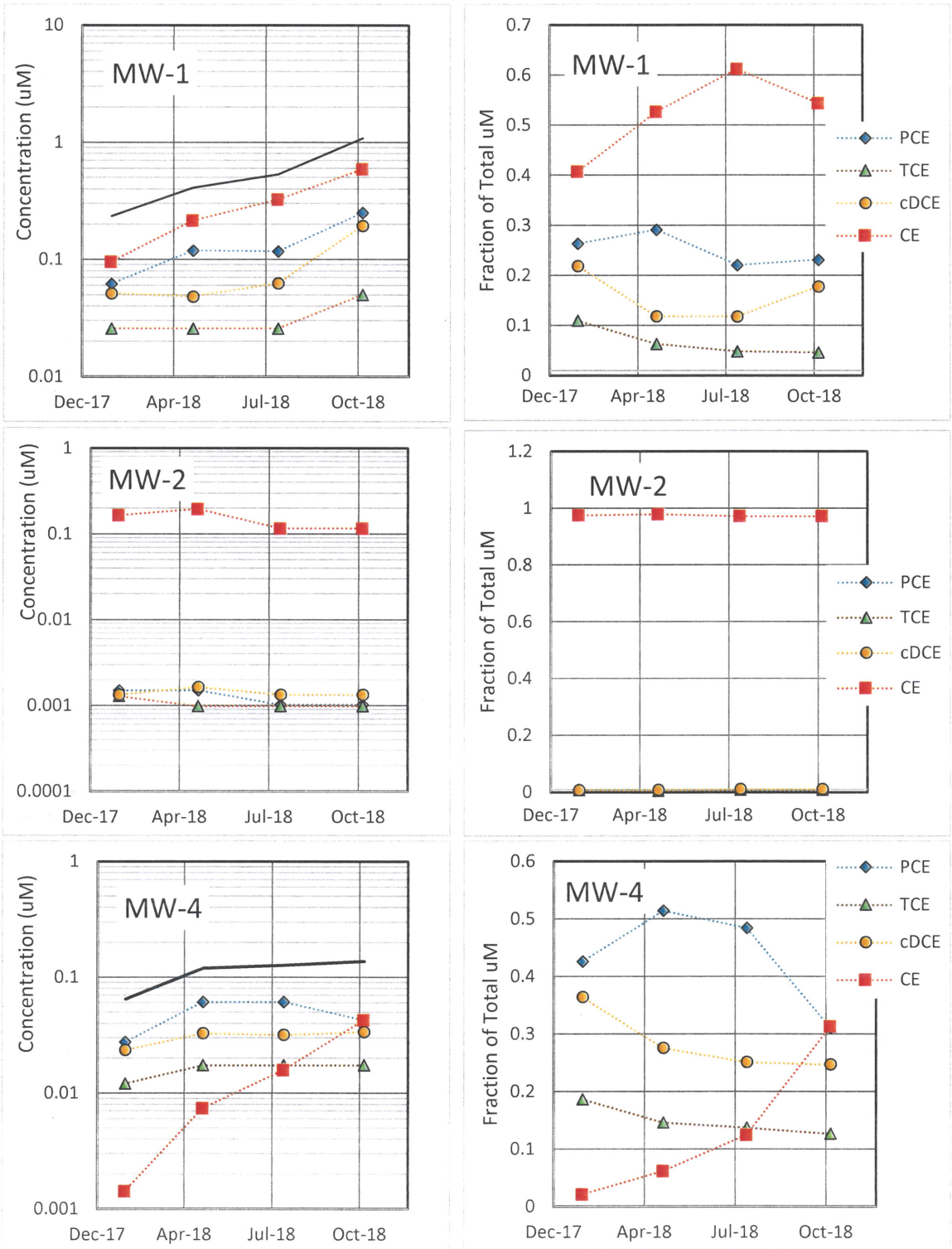

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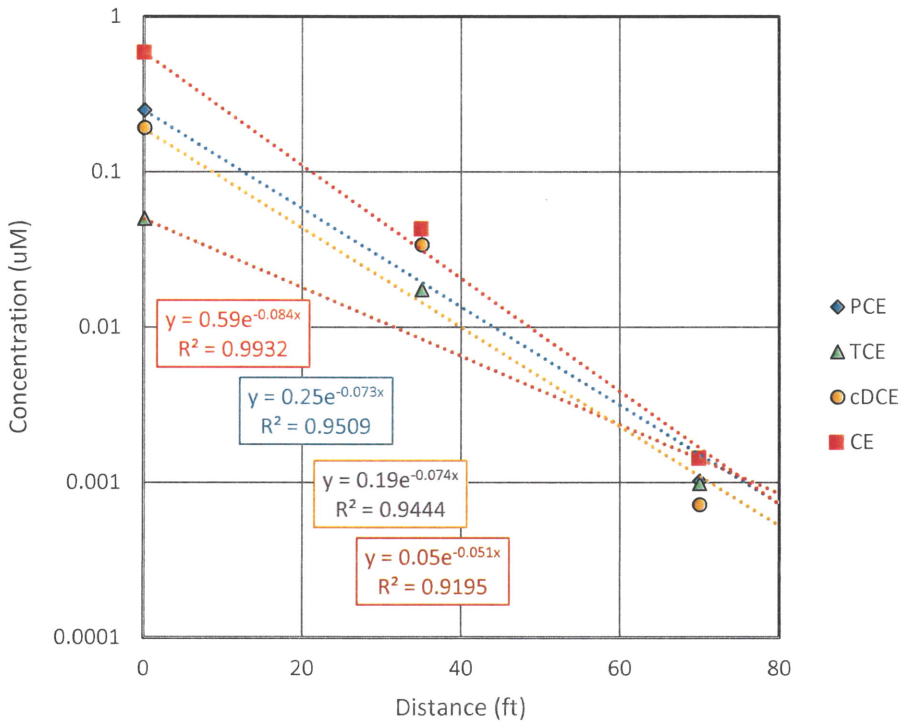
Figure 2. CVOC distance trends. Note that the y-intercept set at the observed MW-1 concentrations.



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