

July 10, 2023

Ms. Jennifer Dorman
Remediation and Redevelopment Program
Wisconsin Department of Natural Resources
1027 West St. Paul Ave.
Milwaukee. WI 53233

Project # 40443A

Subject: Fifth Round of Commissioning for Community Within the Corridor – West Block –

Buildings 6, 7, 8A, and 8B

3212 W. Center St., 2727 N. 32nd St., and 2758 N. 33rd St., Milwaukee, WI 53210

BRRTS #: 02-41-587376, FID #: 341333190

Dear Ms. Dorman:

On behalf of the Community Within the Corridor Limited Partnership, K. Singh & Associates, Inc. (KSingh) is pleased to submit the results of the fifth round of Commissioning of the Vapor Mitigation System for Buildings 6, 7, 8A, and 8B for the Community Within the Corridor – West Block project. Commissioning was performed in accordance with the Commissioning Plan that was approved by WDNR on May 30th, 2023, with the exception that Commissioning was not performed in conjunction with Buildings 4 and 5.

Sub-slab Depressurization System Vacuum Measurements

The sub-slab depressurization system installed for Buildings 6, 7, 8A and 8B was tested on June 5-7, 2023. The locations of the relevant buildings in relation to the project area are shown in Figure 1. A handheld hammer drill was used to install vapor pins beneath the slab of the structure. A digital manometer was utilized to take measurements of vacuum below the slab after the vapor points passed a water dam test. Seventeen locations were chosen to take measurements to get an accurate model of sub-slab depressurization beneath the structure.

In accordance with a vapor mitigation system commissioning plan submitted by KSingh on April 17, 2023, a reading of -0.004 inches water was utilized to determine whether the system was adequately operating. Recorded measurements ranged from 0 to -0.209 inches of water, all except 3 were above the minimum measurement. The three locations where no vacuum was observed were SVP-2, SVP-10A, and SVP-11 which are located in the Hallway of Building 8A within a few feet of outer walls, in the Mail Room of Building 8A, and in the package vestibule of Building 8A within 10 feet of outer walls.

The locations and results of June 2023 sub-slab depressurization measurements are depicted in Figure 1 and summarized in Table 1. The greatest vacuum measurements are observed in the vicinity of the highest exceedances of vapor risk screening levels (VRSLs).

To address the issue of the lack of sub-slab depressurization in the Mail Room of Building 8A, an additional vapor extraction point was installed in the elevator lobby of Building 8A and connected to an Obar HA 89 Fan on the roof of Building 8A. This fan became operational on June 29, 2023, and resulted in vacuum in the adjoining areas which is demonstrated in Table 1. The additional fan induced a differential pressure of -0.019 inches of water in the Mail Room of building 8A indicating that adequate

depressurization had been achieved. The package vestibule point SVP-11 and the hallway point SVP-2 were not affected by the additional vapor extraction point, but the lack of depressurization is believed to be related to their location in relation to outer walls and no impact on indoor air quality was observed.

The vapor pins were removed post-measurement and the holes patched with concrete to avoid potential tampering by residents. Photographs of the vapor pins installation, measurement, and abandonment are included in Attachment A.

Discrete Indoor Air Sampling with Portable GC

A total of 45 individual discrete samples of indoor air were collected using a glass syringe from individual units and common areas and analyzed using a Portable Gas Chromatograph (GC). All the samples reported a reading of under 2.1 ug/m³. The highest concentration of TCE (1.8 ug/m³) was recorded in the Stairwell of Building 6 while 36 of the 45 samples had a reading of less than 1 ug/m³. The Elevator lobby in Building 8A had a false positive reading of 5.3 ug/m³ which resulted in taking multiple reading at several time points leading to values well below the VAL of 2.1 ug/m³. The results of the Discrete air samples are provided in Table 2.

Based on the false positive Discrete Air Sample collected at the 1st Floor Elevator Lobby of Building 8A, a passive sampler, IA-8A-EL, was added to the Commissioning Passive Air Sampling Program as an added measure. The Passive Air Sample IA-8A-EL demonstrated that TCE in the 1st Floor Elevator Lobby of Building 8A was in compliance with indoor air standards. The QA/QC protocol provided by Hartman Environmental Geosciences and the result of the calibration are included in Attachment D.

Passive Indoor Air Sampling

Following documentation of sub-slab depressurization, passive air sampling was performed in accordance with the approved Commissioning Plan. A total of 16 passive air samplers were set up and sampled over a 1-week period from June 6, 2023, until June 16, 2023. On special instructions from the WDNR, an additional passive sampler was added to Unit 109 (IA-8A-01B). Please note the exception that a sampler couldn't be set up in Unit 107 due to non-compliance with the existing tenant. The passive samplers were placed in compliance with the directions from WDNR:

- i. Samplers were placed at a minimum of 6 inches from the walls.
- ii. Samplers were placed in areas of adequate air flow.
- iii. Samplers were placed near the breathing zone, three to five feet above the ground, ensuring that they were not disturbed.
- iv. The locations of the passive air samplers are included in Figure 2A through Figure 2H. The photographs of the location of selective samples are included in Attachment A.

On June 17, 2023, the passive air samplers were submitted to Eurofins Air Toxics, LLC Folsom, CA for analysis for chlorinated solvents including Trichloroethylene (TCE), Tetrachloroethylene (PCE), cis-1,2-Dichloroethylene (cis-DCE), and trans-1,2-Dichloroethylene (trans-DCE). The results are included in Attachment C and summarized in Table 3.

The maximum concentration of TCE detected in indoor air was 0.26 ug/m³. The maximum concentration of PCE detected was 0.53 ug/m³. Based on these results, no air samples were in exceedance of the Residential Indoor Air Vapor Action Levels (VALs) based on the February 2022 Quick Look-Up Table from WDNR.



Exhaust Sampling

Seven fans were installed on the roof of buildings 6, 7, 8A, and 8B as part of the vapor mitigation system. As part of the exhaust sampling, air samples were collected in glass syringes to be analyzed using the portable GC on June 21, 2023.

PCE and TCE concentrations in all exhaust samples are less than the Residential Indoor Air VAL except for EP2 which is in the center of Building 8A. Based on the concentrations of PCE and TCE in the exhaust, some mass reduction is taking place in the sub-slab. The concentrations and trend of PCE and TCE concentrations in the exhaust samples are shown in Figure 3 in Attachment B and demonstrate a declining trend. The amount of TCE exhausted from the exhaust fans can be seen in Table 4. The total TCE exhaust was about 2 lbs/yr.

The results of the June 2023 exhaust fan air quality sampling are summarized in Table 3 and 4 (Attachment B) and the locations of sampled fans are included in Figure 1. Based on the Recommendations by the WDNR, the details of GC Sampling and QA/QC Calibration are attached in Attachment D.

Remedial Actions Taken

On June 6, 2023, at around 5 PM exceedances of the VAL of 2.1 ug/m³ for TCE were observed in the Elevator Lobby with a reading of 5.4 ug/m³, but in subsequent readings, it was observed to be under the VAL. In order to ensure that the value remains under the VAL, a new Obar HA 89 Exhaust Fan was installed on the roof of Building 8A next to the Elevator shaft (Figure 4). This fan became operational on June 29, 2023, and resulted in vacuum in the adjoining areas which is demonstrated in Table 1.

Conclusions and Recommendations

The following conclusions were reached based on the sampling.

- Based on the results of sub-slab vacuum measurements, the vapor mitigation system installed on the subject site, and modified with an additional vapor extraction point, adequately creates vacuum beneath the building slab for buildings 6, 7, 8A, and 8B except in locations close to outer walls.
- Discrete air samples suggest that all the units and the common areas are in compliance with the VALs of 2.1 ug/m³.
- Passive indoor air results demonstrate that TCE met their VALs of 2.1 ug/m³ at all sample locations.
- Fan emissions sampling indicates that PCE and TCE are still present in the sub-slab and that mass reduction is taking place with a declining trend in exhaust concentrations noted.
- Based on the results from the five rounds of commissioning, the sub slab depressurization system is operating as intended.
- No exceedances of VALs have been shown to be present in the last three rounds of commissioning performed from December 2022 to June 2023 covering seasonal variations.



Please contact us if you have any questions or seek clarification regarding this information.

Sincerely,

K. SINGH & ASSOCIATES, INC.

Sameer Neve, Ph.D. ENV SP Staff Environmental Engineer

Robert T. Reineke, PE Senior Engineer

Robert I Reineke

Pratap N. Singh, Ph.D., PE Principal Engineer

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cc: Shane LaFave / Roers Companies Que El-Amin / Scott Crawford, Inc.

Attachments:

Figure 1 Sub-slab Depressurization Locations

Figure 2A - Figure 2H Indoor Air Sampling Locations

Figure 3 Exhaust Fan Trends
Figure 4 Additional Extraction Point
Table 1 Vacuum Measurement Results
Table 2 Summary of Portable GC Results
Table 3 Passive Air Sampling Results for

Table 4 Commissioning Exhaust Fan Sampling Results Attachment A Photographs of Commissioning in June 2023

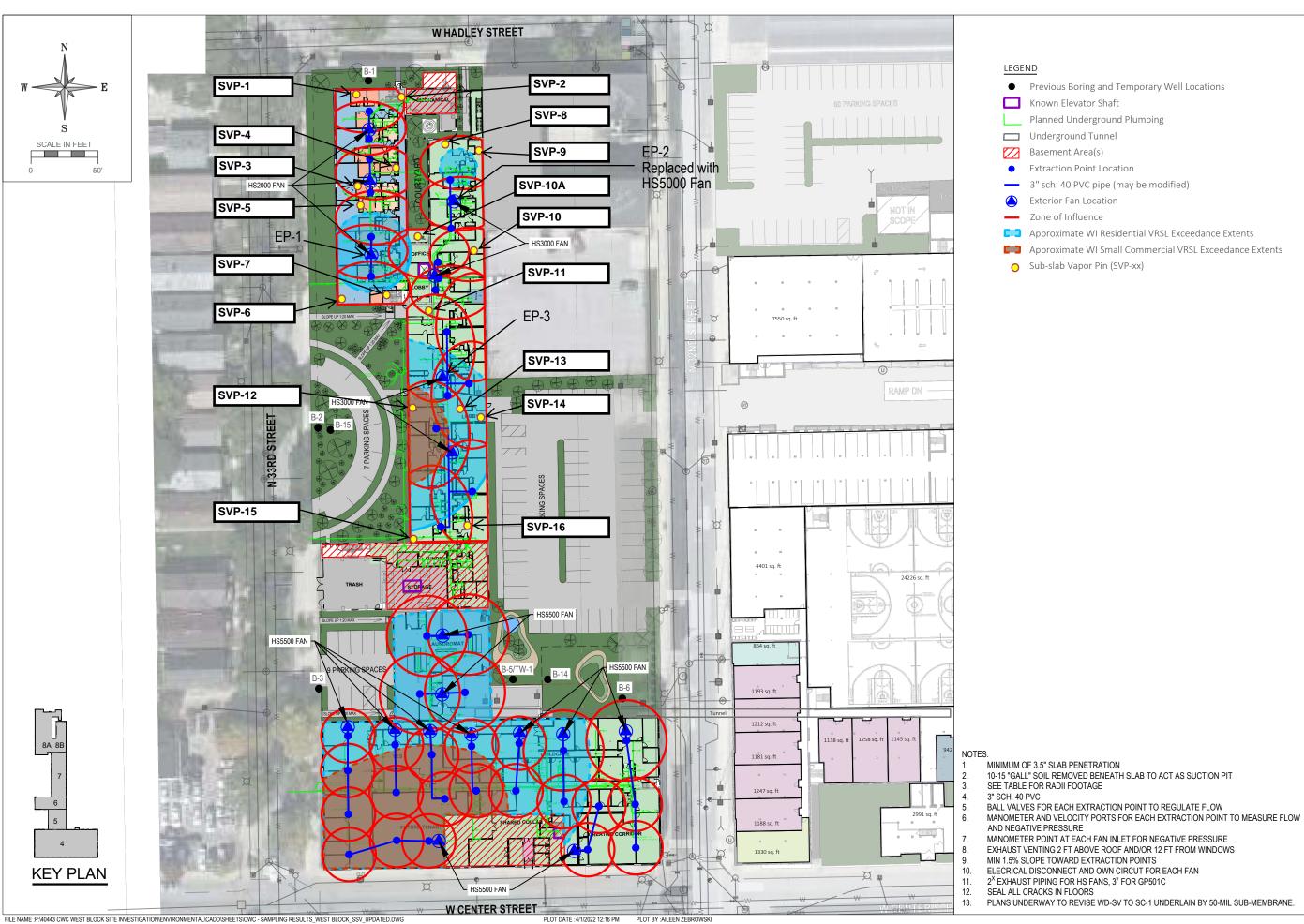
Attachment B Exhaust Fan Trends

Attachment C Passive Air Sampling Test Results
Attachment D QA-QC Protocol for Portable GC



FIGURES





Previous Boring and Temporary Well Locations

Planned Underground Plumbing

Extraction Point Location

3" sch. 40 PVC pipe (may be modified)

Approximate WI Residential VRSL Exceedance Extents

Approximate WI Small Commercial VRSL Exceedance Extents

3636 North 124th Street Wauwatosa, WI 53222 262-821-1171

CONSULTANT

STIGATION REPORT ENTER ST., 2758 N. 33RD ST. ITY WITHIN THE CORRIDOR - WEST BLOCK

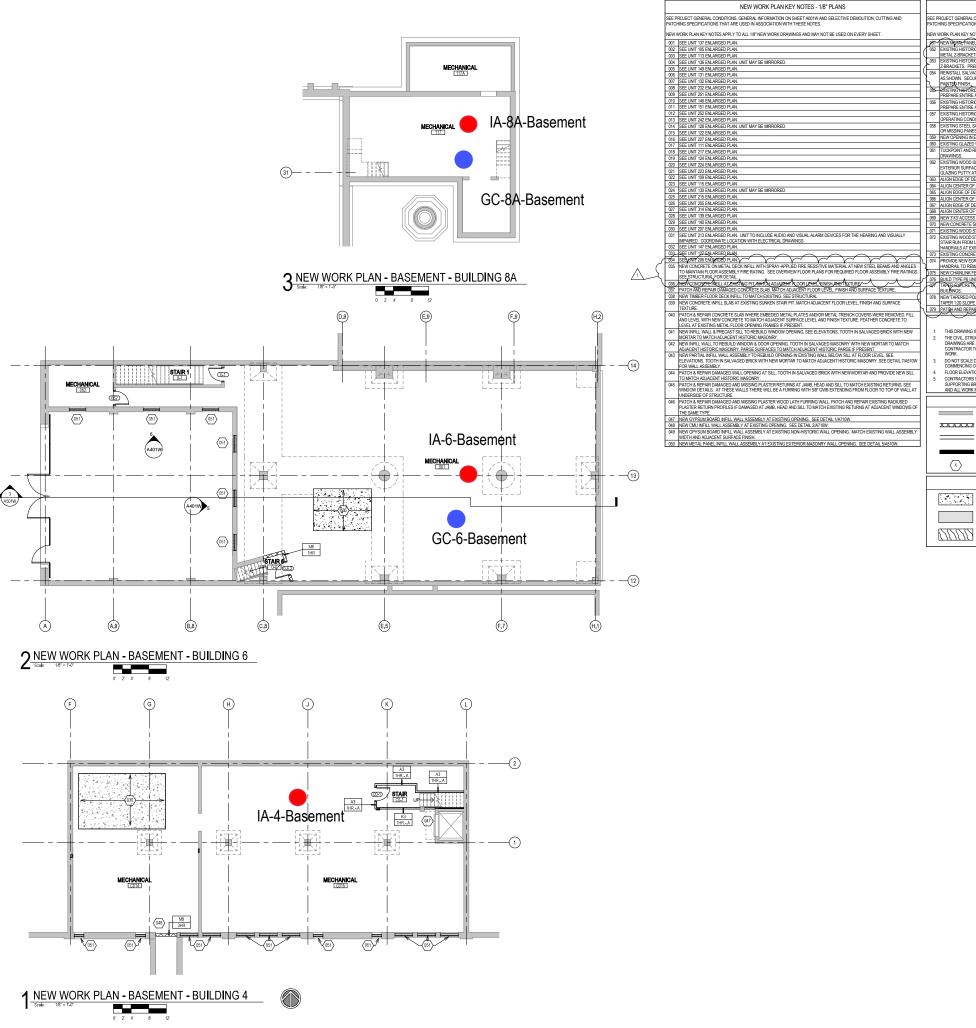
COMMUNITY WITHIN THE CORRIDOR LIMITED PARTNERSHIP SITE INVESTIGATION F 3212 W. CENTER ST., 2 COMMUNITY WITHIN T MILWAUKEE, WI 53210 PROJECT NUMBER: 40

CLIENT:

SHEET TITLE Sub-slab Depressurization Measurement Locations

06/02/2022

FIGURE 1





COMMONITY WILTIN THE CONNIDON - WEST BLO Z758 N 38D STREET MLWAUKEE, WI 5270

T 414.220.9640 751 N Jefferson St. Suite 200 Milwaukee, WI 53202

REVISIONS: 1 10/09/20 ADDENDUM #1

SCALE
PROJECT
NUMBER
SET
TYPE

KEY PLAN

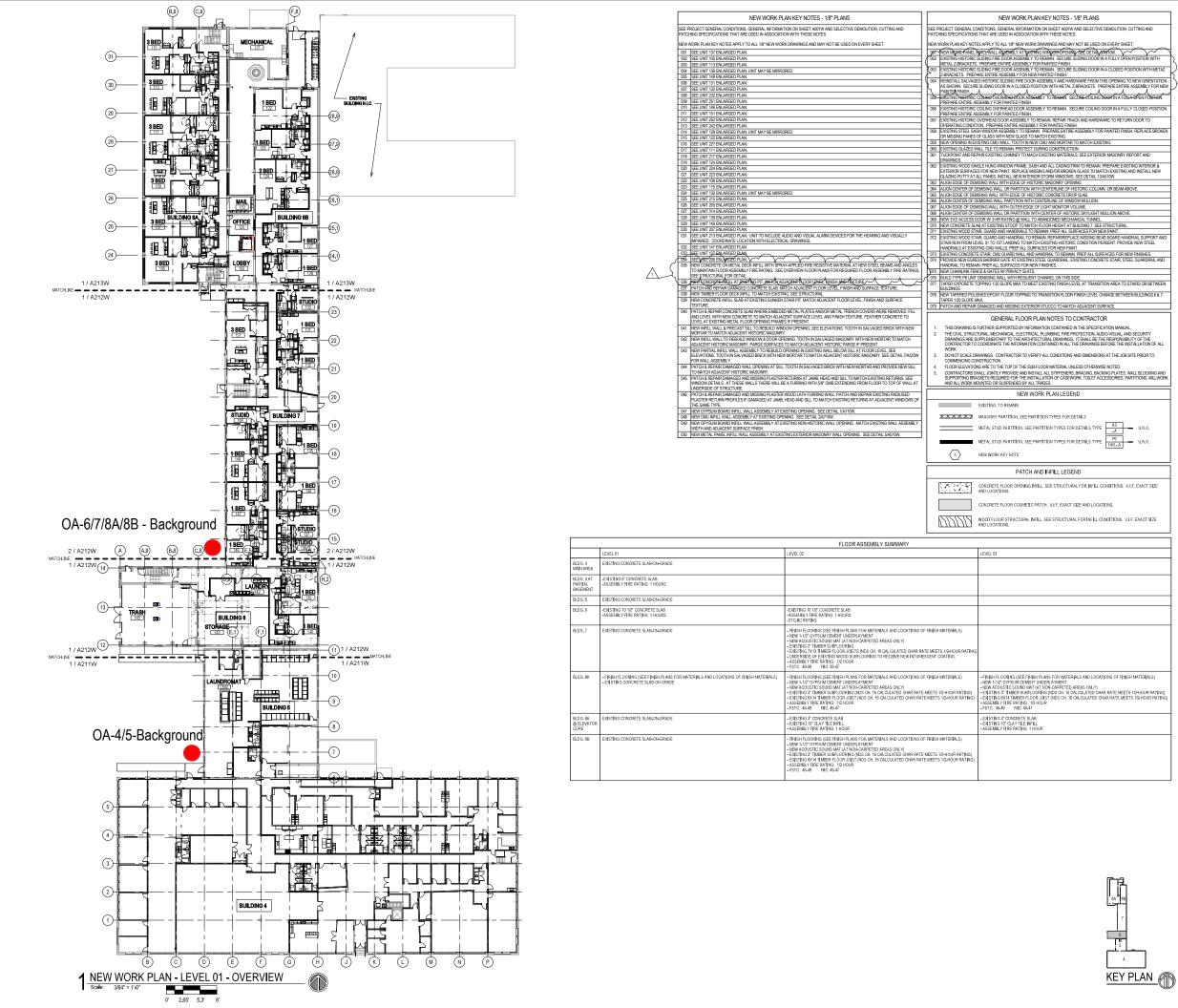
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MMEER 200102

CONSTRUCTION DOCUMENTS

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MARGER A201W



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751 N Jefferson St. Suite 200 Milwaukee, WI 53202

> 2758 N. 33RD STREET MILWAUKEE, WI 53210

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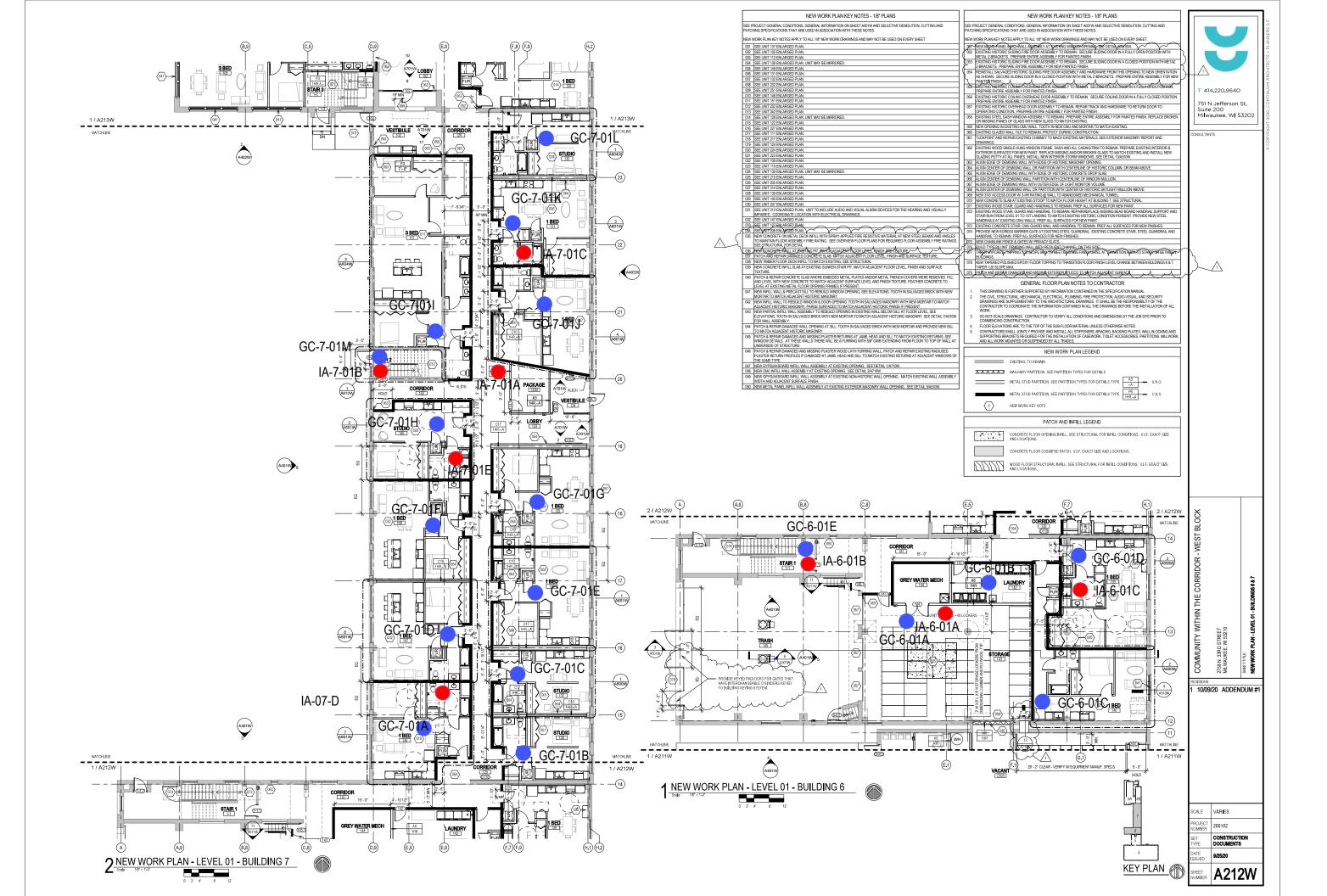
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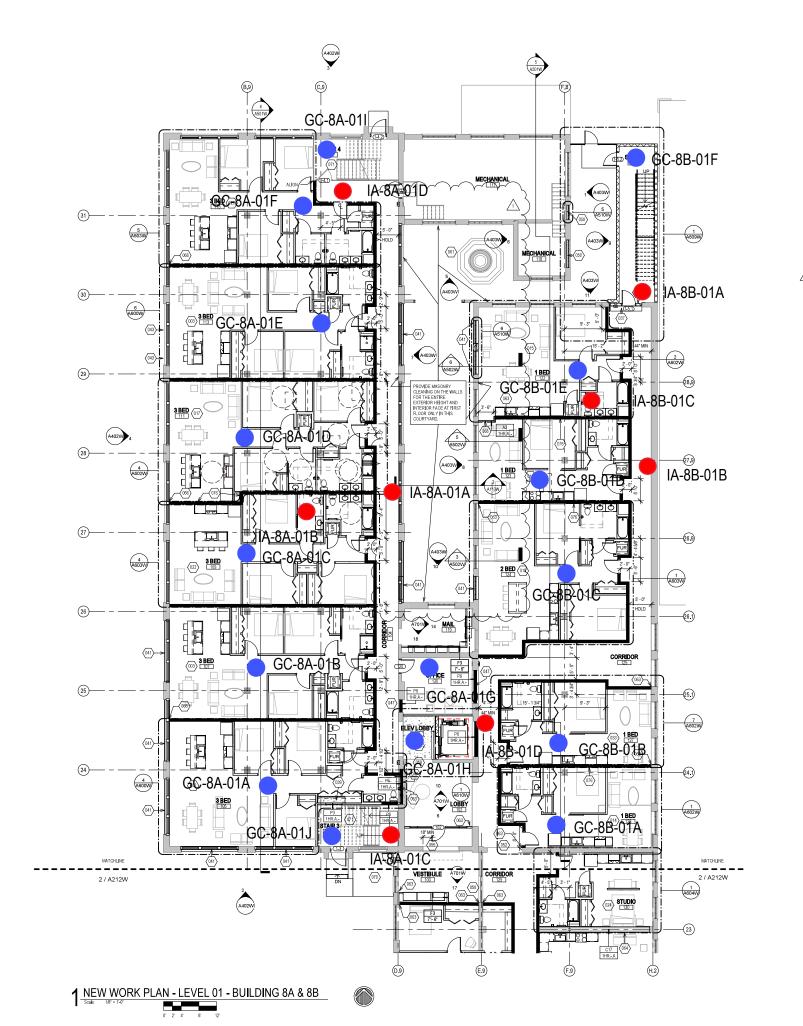
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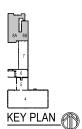


COMMUNITY WITHIN THE CORRIDOR - WEST BLOX
2258 N. 3360 STREET
MLWALKEE, WI 53210
SSETTINE

T 414.220.9640 751 N Jefferson St.

Suite 200 Milwaukee, WI 53202

REVISIONS: 1 10/09/20 ADDENDUM #1

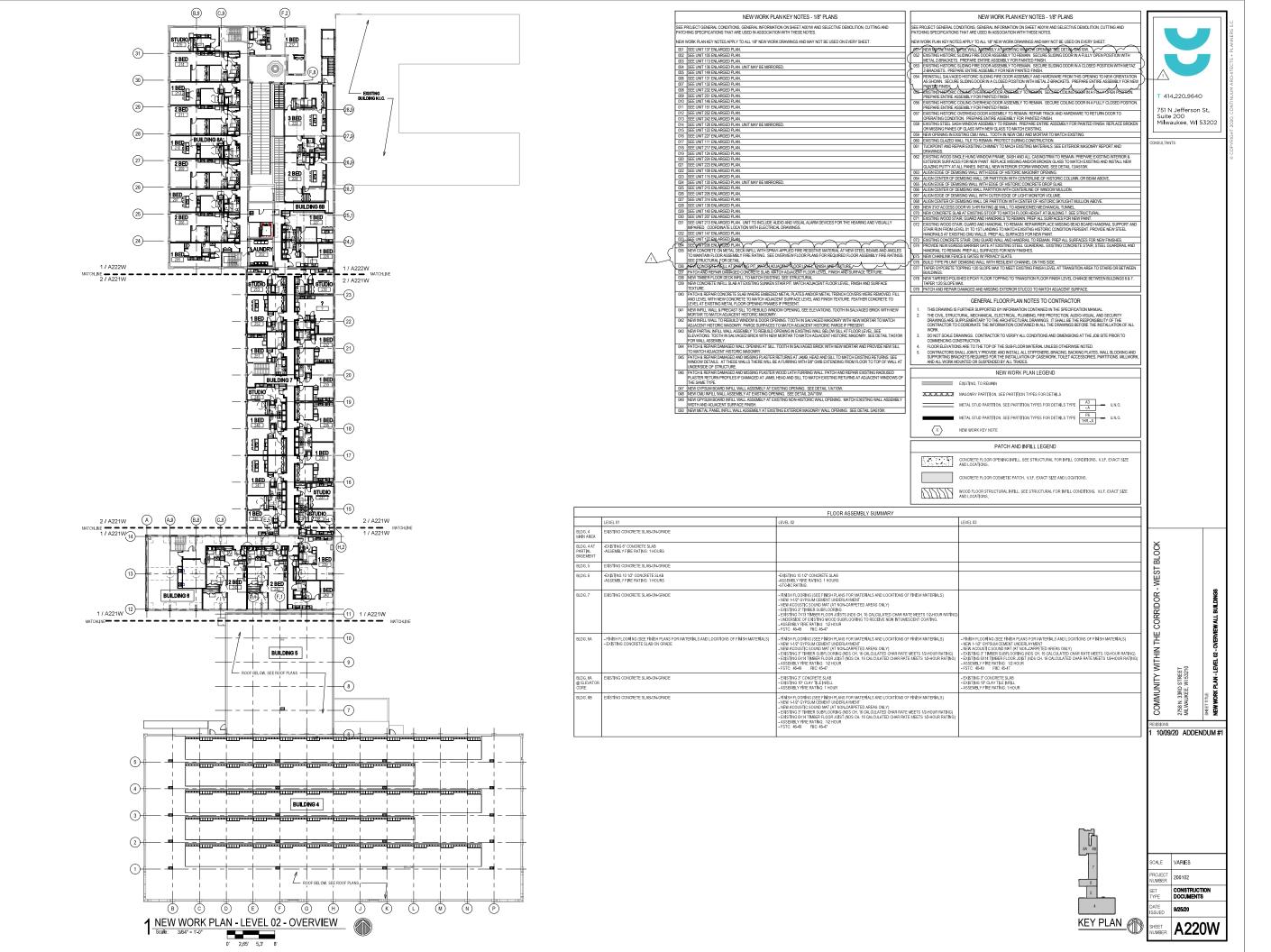


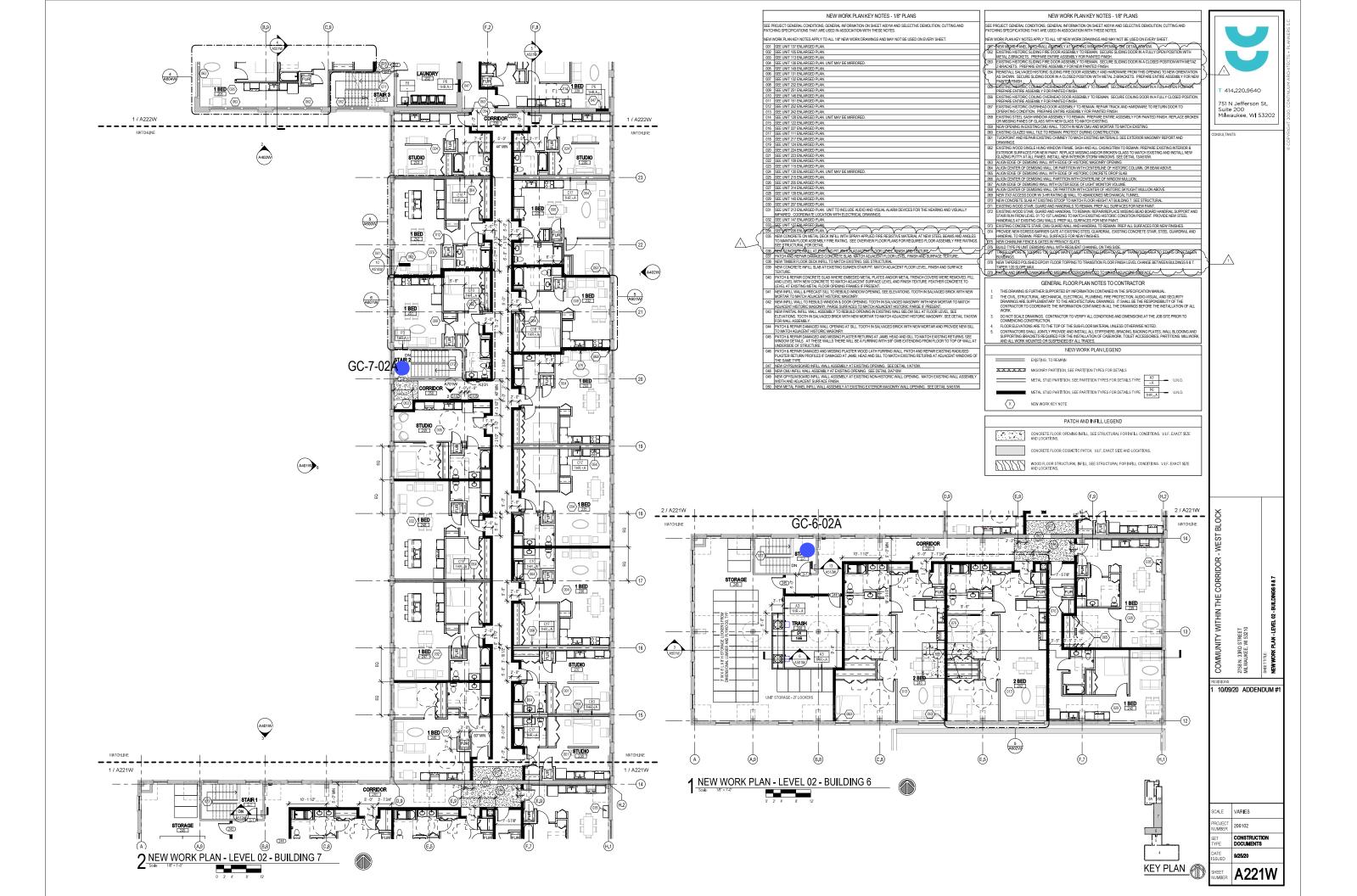
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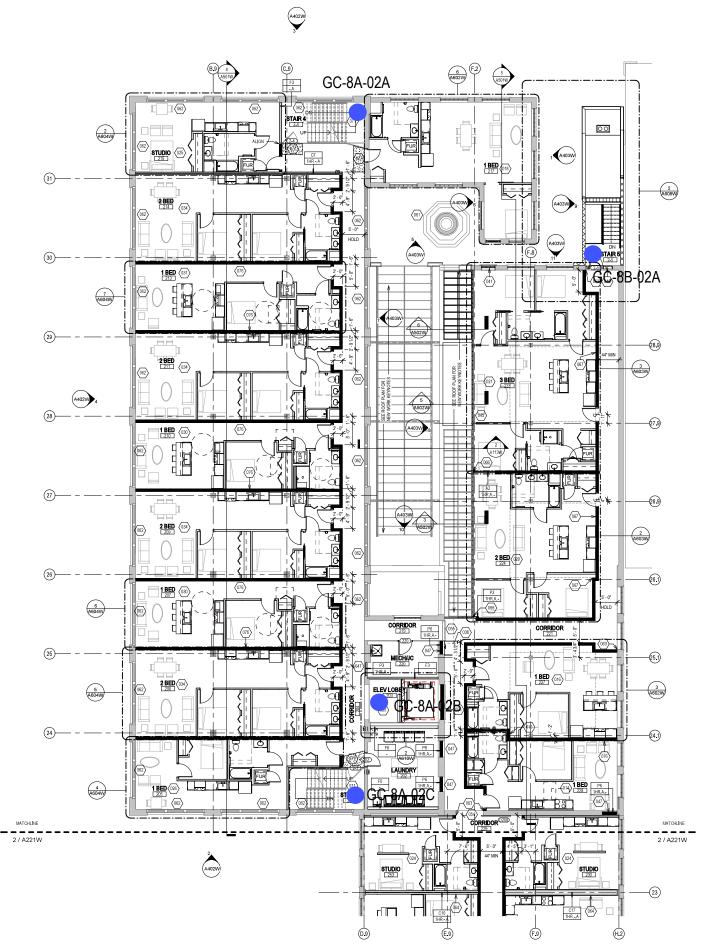
PROJECT 200102
NUMBER 200102
SET CONSTRUCTION TYPE DOCUMENTS

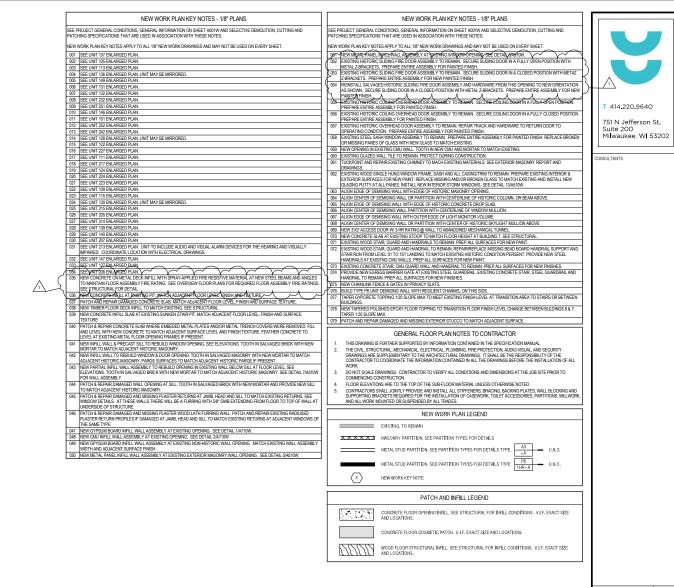
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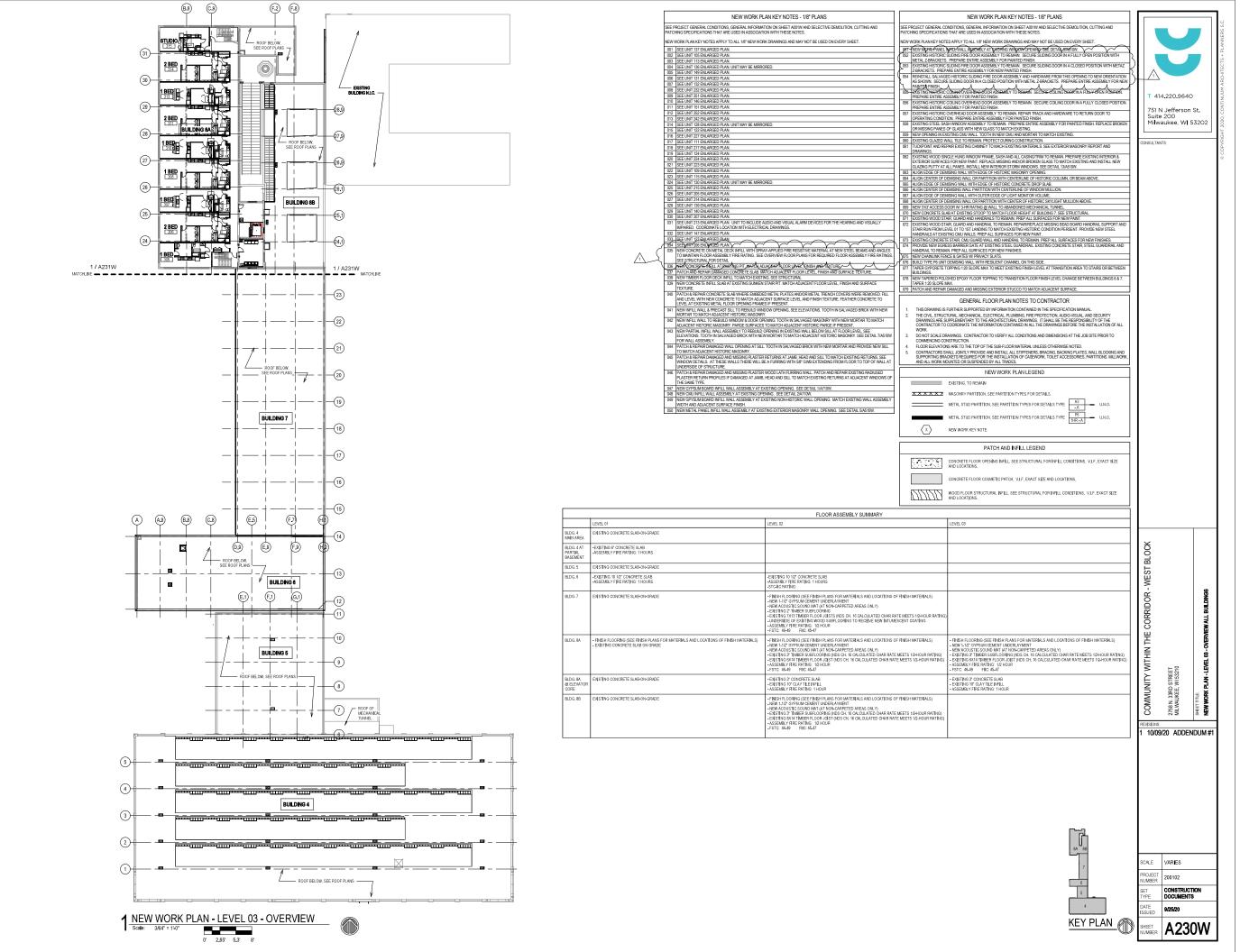
COMMUNITY WITHIN THE CORRIDOR - WEST BLOCK
2758 N 33RD STREET
MILWALKEL, WI 53210

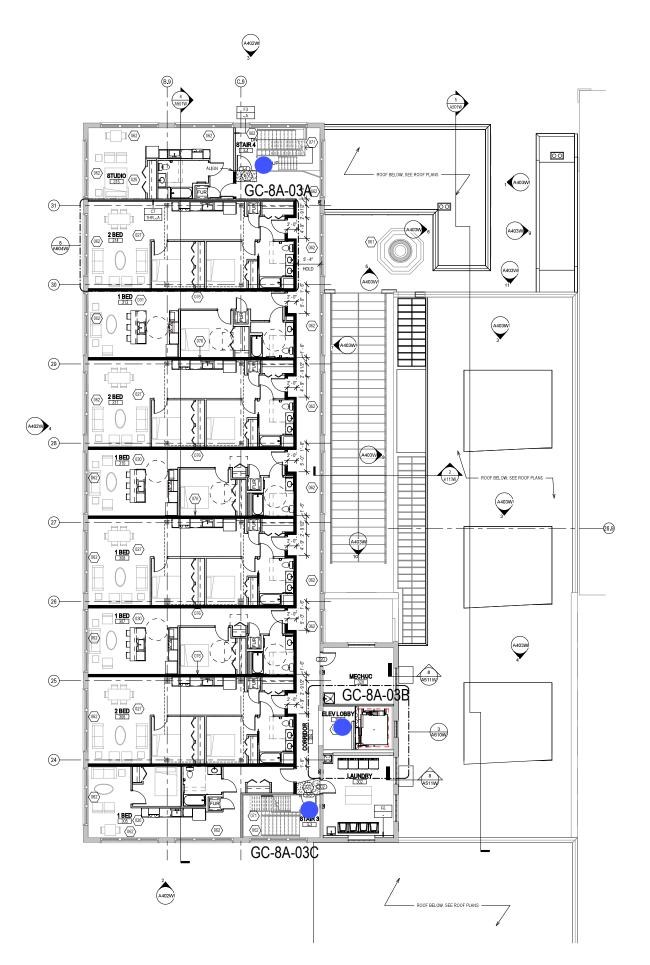
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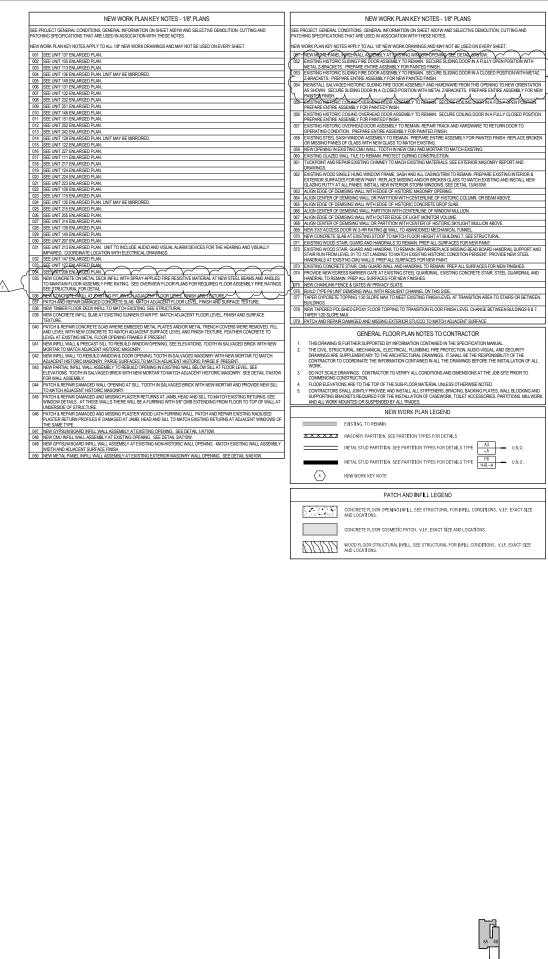
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NEW WORK PLAN - LEVEL 02 - BUILDING 8A & 8B







NEW WORK PLAN - LEVEL 03 - BUILDING 8A

KEY PLAN

200102 CONSTRUCTION DOCUMENTS 9/25/20

ALE VARIES

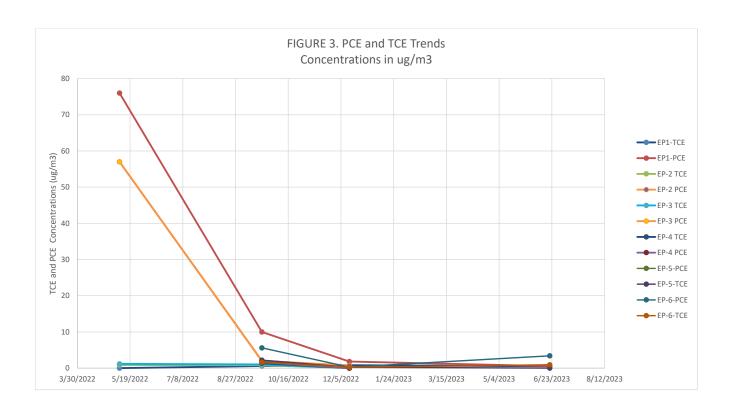
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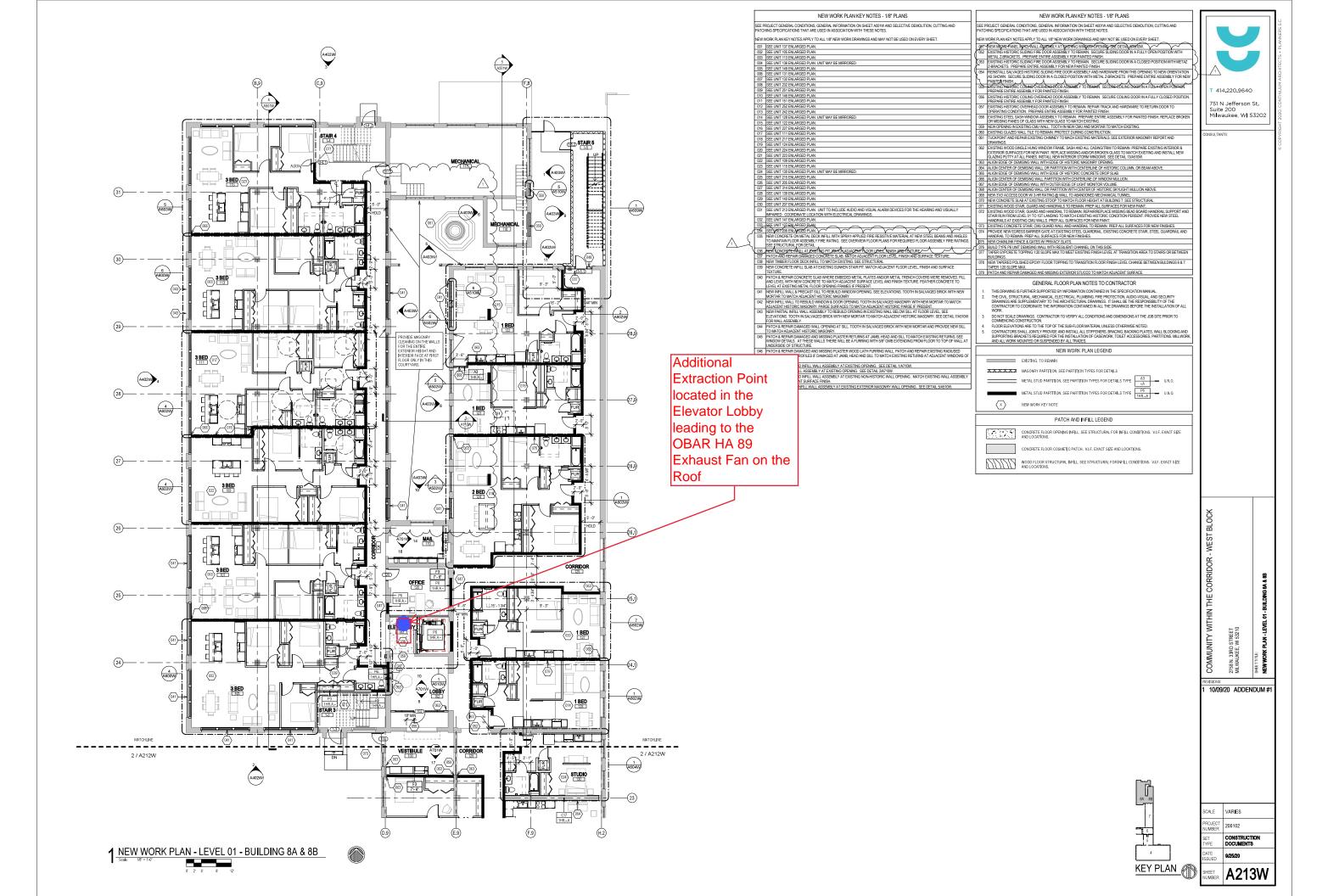
10/09/20 ADDENDUM #1

COMMUNITY

414.220.9640 751 N Jefferson St. Suite 200 Milwaukee, WI 53202

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TABLES



Table 1.

C	NC-West B	lock Commissioning Buildings 6, 7, 8	A, and 8B
		Differential Pressure Measurements	
Date:		Measurerer:	Samuel Ramirez
Point	Date	Differential Pressure (inches H2O)	Notes:
SVP-1	6/5/2023	-0.067	
SVP-2	6/5/2023	0	Near Outer Wall
SVP-3	6/7/2023	-0.12	
SVP-4	6/7/2023	-0.115	
SVP-5	6/7/2023	-0.205	
SVP-6	6/7/2023		
SVP-7	6/6/2023	-0.046	
SVP-8	6/6/2023	-0.015	
SVP-9	6/5/2023	-0.012	
SVP-10	6/5/2023	-0.033	
SVP-10A	6/5/2023	0	Near Outer Wall
SVP-11	6/5/2023	0	Near Outer Wall
SVP-12	6/6/2023	-0.097	
SVP-13	6/6/2023	-0.033	
SVP-14	6/5/2023	-0.057	
SVP-15	6/6/2023	-0.033	
SVP-16	6/5/2023	-0.053	
SVP-2	6/29/2023	0	Near Outer Wall
SVP-10A	6/29/2023	-0.019	Near Outer Wall
SVP-11	6/29/2023	0	Near Outer Wall

Table 2.

CWC West Block Commissioning - Buildings 6, 7, 8A, and 8B

GC Testing Results of Discrete Indoor Air Samples

Collector / Analyzer: Sameer Neve, Ph.D., ENV SP

ID	Unit	File No.	Date	Time	PCE (ug/m^3)	TCE (ug/m^3) Notes:	
GC-6-Basement	Basement	193	6/5/2023		ND	1.40	
GC-6-01A	Storage	190	6/5/2023			0.00	
GC-6-01B	Stair	191	6/5/2023			1.80	
GC-6-01C	140	235	6/6/2023			1.10	
GC-6-01D	139	234	6/6/2023			0.60	
GC-6-01E	Stair	192	6/5/2023			1.50	
GC-7-01A	146	231	6/6/2023			0.50	
GC-7-01B	138	224	6/6/2023			0.50	
GC-7-01C	137	223	6/6/2023			0.40	
GC-7-01D	147	227	6/6/2023	12:08		1.40	
GC-7-01E	136	222	6/6/2023	10:45		0.50	
GC-7-01F	148	228	6/6/2023	12:17		1.00	
GC-7-01G	135	221	6/6/2023	10:37		0.40	
GC-7-01H	149	232	6/6/2023	13:48		0.45	
GC-7-01I	151	233	6/6/2023	13:58		1.00	
GC-7-01J	132	220	6/6/2023	10:29		0.40	
GC-7-01K	131	219	6/6/2023			0.30	
GC-7-01L	130	218	6/6/2023	10:13		0.40	
GC-7-01M	Stair	194	6/5/2023	16:37	ND	1.10	
GC-7-01M	Stair	198	6/5/2023	16:37	ND	0.00	
GC-8A-Basement	Basement	212	6/6/2023	9:12	ND	0.70	
GC-8A-01A	105	197	6/5/2023	17:01	ND	0.90	
GC-8A-01B	107	261	6/7/2023	14:54	ND	1.00	
GC-8A-01C	115	262	6/7/2023	15:36	ND	0.90	
GC-8A-01D	111	229	6/6/2023	13:54	ND	0.70	
GC-8A-01E	113	213	6/6/2023	9:33	1.5	0.80	
GC-8A-01G	120	236	6/6/2023	16:06	ND	0.90	
GC-8A-01H	Elevator Lobby		6/6/2023	12:25	ND	0.46	
GC-8A-01I	Stair	207	6/6/2023	8:08	ND	0.52	
GC-8A-01J	Stair	208	6/6/2023			0.60	
GC-8B-01A	128	217	6/6/2023	10:05	ND	0.70	
GC-8B-01B	127	214	6/6/2023			0.40	
GC-8B-01C	124	215	6/6/2023			0.70	
GC-8B-01D	123	216	6/6/2023			0.50	
GC-8B-01E	122	237	6/6/2023			0.60	
GC-8B-01F	Stair	211	6/6/2023			0.80	
GC-6-02A	Stair	209	6/6/2023			0.40	
GC-7-02A	Stair	210	6/6/2023			0.80	
GC-8A-02A	Stair	204	6/5/2023			0.40	
GC-8A-02B	Elevator Lobby	199	6/5/2023			0.00	
GC-8A-02C	Stair	200	6/5/2023			0.00	
GC-8B-02A	Stair	195	6/5/2023			0.90	
GC-8A-03A	Stair	203	6/5/2023			0.70	
GC-8A-03B	Elevator Lobby	201	6/5/2023			0.00	
GC-8A-03C	Stair	202	6/5/2023	17:46	ND	0.00	

ID	Unit	Date	Time	PCE (ug/m ³)	TCE (ug/m ³)
GC-8A-01H	Elevator Lobby*	6/5/2023	16:53	ND	5.3
GC-8A-01H	Elevator Lobby*	6/6/2023	7:44	ND	0.0
GC-8A-01H	Elevator Lobby*	6/6/2023	12:25	ND	0.46

^{*}Additional passive sampler installed.

		Residential Indoor																
Sample ID	Units			IA-6-01A	IA-6-01A	IA-6-01A	IA-6-01A	IA-6-01B	IA-6-01B	IA-6-01B	IA-6-01B	IA-6-01C	IA-6-01C	IA-6-01C	IA-6-01C	IA-6-02A	IA-6-02A	IA-6-02A
Date			6/8/2022	9/12/2022						12/7/2022								12/7/2022
Trichloroethene	ug/m^3	2.1	<0.14	2.7	<0.14	<0.14	<0.12	<0.14	0.59	<0.14	<0.12	0.10	0.37	<0.14	<0.10	<0.14	0.53	<0.14
Tetrachloroethene	ug/m^3	42	<0.17	<0.17	<0.16	<0.17	<0.14	<0.17	<0.17	<0.17	0.20	0.44	<0.16	<0.17	0.18	0.23	<0.17	<0.17
cis-1,2-Dichloroethene	ug/m^3		<0.16	<0.16	<0.16	<0.16	<0.14	<0.16	<0.16	<0.16	<0.14	<0.16	<0.16	<0.16	<0.11	<0.16	<0.16	<0.16
trans-1,2-Dichloroethene	ug/m^3	42	0.31	0.95	<0.32	0.34	<0.28	2.4	13	<0.33	0.95	0.78	<0.32	<0.34	0.49	1.9	1.2	< 0.33

^{*}Based on WDNR Quick Look-Up Table dated February 2022



Sample ID	Units	Residential Indoor Air VAL*	IA-6-02B	IA-6-02B	IA-6-02B	IA-6-02C	IA-6-02C	IA-6-02C	IΔ-6-Rasement	IA-6-Basement	IΔ-6-Rasement	IA-6-Basement	ΙΔ_7_01Δ	IA-7-01A	IA-7-01A
Date				9/12/2022	12/7/2022		9/12/2022	12/7/2022	6/8/2022	9/12/2022	12/7/2022		6/8/2022		12/7/2022
Trichloroethene	ug/m^3	2.1	<0.14	0.47	<0.14	0.14	0.48	<0.14	<0.14	1.2	0.17	Missing	<0.14	2.1	<0.14
Tetrachloroethene	ug/m^3	42	0.14	<0.17	<0.17	0.25	0.18	<0.17	<0.17	<0.17	<0.17	Missing	0.11	<0.17	<0.17
cis-1,2-Dichloroethene	ug/m^3		<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	Missing	<0.16	<0.16	<0.16
trans-1,2-Dichloroethene	ug/m^3	42	2.2	10	< 0.33	1.4	0.36	< 0.33	0.62	1.8	0.33	Missing	1.4	2.0	< 0.33

^{*}Based on WDNR Quick Look-Up Table dated February 2022



	_		1														
		Residential Indoor															
Sample ID	Units	Air VAL*	IA-7-01A	IA-7-01A	IA-7-01B	IA-7-01B	IA-7-01B	IA-7-01B	IA-7-01C	IA-7-01C	IA-7-01C	IA-7-01C	IA-7-01D	IA-7-01D	IA-7-01D	IA-7-01D	IA-7-01E
Date			2/15/2023	6/14/2023	6/8/2022	9/12/2022	12/7/2022	6/14/2023	6/8/2022	9/12/2022	12/7/2022	6/16/2023	6/8/2022	9/12/2022	12/7/2022	6/16/2023	6/16/2023
Trichloroethene	ug/m^3	2.1	<0.14	<0.12	<0.14	Missing	<0.14	<0.12	<0.14	<0.14	0.17	<0.10	<0.14	0.24	<0.14	<0.10	<0.10
Tetrachloroethene	ug/m^3	42	<0.17	0.42	0.10	Missing	<0.17	0.53	0.27	<0.16	<0.17	0.18	0.40	<0.17	<0.17	0.15	0.21
cis-1,2-Dichloroethene	ug/m^3		<0.16	<0.14	<0.16	Missing	<0.16	<0.14	<0.16	<0.16	<0.16	<0.11	<0.16	<0.16	<0.16	<0.11	<0.11
trans-1,2-Dichloroethene	ug/m^3	42	0.99	0.82	1.1	Missing	<0.33	0.38	1.1	< 0.32	< 0.33	0.42	0.74	< 0.33	< 0.33	0.34	0.32

^{*}Based on WDNR Quick Look-Up Table dated February 2022



		Residential Indoor															
Sample ID	Units	Air VAL*	IA-7-02A	IA-7-02A	IA-7-02A	IA-7-02B	IA-7-02B	IA-7-02B	IA-7-02C	IA-7-02C	IA-7-02C	IA-8A-01A	IA-8A-01A	IA-8A-01A	IA-8A-01A	IA-8A-01B	IA-8A-01B
Date			6/8/2022	9/12/2022	12/7/2022	6/8/2022	9/12/2022	12/7/2022	6/8/2022	9/12/2022	12/7/2022	6/8/2022	9/12/2022	12/7/2022	6/14/2023	6/8/2022	9/12/2022
Trichloroethene	ug/m^3	2.1	<0.14	0.64	<0.14	<0.14	0.76	<0.14	<0.14	<0.14	<0.14	<0.14	1.8	<0.14	<0.12	<0.14	1.2
Tetrachloroethene	ug/m^3	42	0.13	<0.17	<0.17	0.12	<0.17	<0.17	1.1	<0.17	<0.17	3.4	<0.17	<0.17	0.48	42	<0.17
cis-1,2-Dichloroethene	ug/m^3		<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	<0.14	<0.16	<0.16
trans-1,2-Dichloroethene	ug/m^3	42	1.7	1.0	0.33	1.7	1.1	0.38	1.1	< 0.33	< 0.33	6.2	2.8	0.70	1.4	4.3	2.7

^{*}Based on WDNR Quick Look-Up Table dated February 2022



						•			0 /	•							
														IA-8A-EL			
														(1st Floor			1
		Residential Indoor												Elevator			1
Sample ID	Units	Air VAL*	IA-8A-01B	IA-8A-01B	IA-8A-01B	IA-8A-01C	IA-8A-01C	IA-8A-01C	IA-8A-01C	IA-8A-01D	IA-8A-01D	IA-8A-01D	IA-8A-01D	Lobby)	IA-8A-02A	IA-8A-02A	IA-8A-02A
Date			12/7/2022	2/15/2023	6/14/2023	6/8/2022	9/12/2022	12/7/2022	6/14/2023	6/8/2022	9/12/2022	12/7/2022	6/14/2023	6/14/2023	6/8/2022	9/12/2022	12/7/2022
Trichloroethene	ug/m^3	2.1	<0.14	0.21	<0.12	<0.14	<0.14	<0.14	Missing	<0.14	1.2	<0.14	Missing	<0.14	<0.14	0.65	<0.14
Tetrachloroethene	ug/m^3	42	<0.17	0.33	0.36	0.42	<0.17	<0.17	Missing	2.5	<0.17	<0.17	Missing	0.41	0.44	<0.17	0.18
cis-1,2-Dichloroethene	ug/m^3		<0.16	<0.16	<0.14	<0.16	<0.16	<0.16	Missing	<0.16	<0.16	<0.16	Missing	<0.16	<0.16	<0.16	<0.16
trans-1,2-Dichloroethene	ug/m^3	42	<0.33	0.51	0.51	3.7	0.6	< 0.33	Missing	8.1	2.8	0.51	Missing	0.81	1.9	1.6	<0.33

^{*}Based on WDNR Quick Look-Up Table dated February 2022



		Residential Indoor															1
Sample ID	Units	Air VAL*	IA-8A-02B	IA-8A-02B	IA-8A-02B	IA-8A-02C	IA-8A-02C	IA-8A-02C	IA-8A-02D	IA-8A-02D	IA-8A-02D	IA-8A-03A	IA-8A-03A	IA-8A-03A	IA-8A-03B	IA-8A-03B	IA-8A-03B
Date			6/8/2022	9/12/2022	12/7/2022	6/8/2022	9/12/2022	12/7/2022	6/8/2022	9/12/2022	12/7/2022	6/8/2022	9/12/2022	12/7/2022	6/8/2022	9/12/2022	12/7/2022
Trichloroethene	ug/m^3	2.1	<0.14	2	<0.14	<0.14	0.17	<0.14	<0.14	0.21	<0.14	<0.14	0.4	<0.14	<0.14	0.9	<0.14
Tetrachloroethene	ug/m^3	42	1.8	<0.17	0.19	4.4	<0.17	<0.17	0.28	<0.17	<0.17	0.66	<0.17	<0.17	0.85	<0.17	<0.17
cis-1,2-Dichloroethene	ug/m^3		<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16
trans-1,2-Dichloroethene	ug/m^3	42	6.2	1.9	<0.33	1.7	0.5	<0.33	2.6	3.7	<0.33	6.6	2.6	0.52	4.4	2.4	0.42

^{*}Based on WDNR Quick Look-Up Table dated February 2022



		Residential Indoor														
Sample ID	Units	Air VAL*	IA-8A-03C	IA-8A-03C	IA-8A-03C	IA-8A-03D	IA-8A-03D	IA-8A-03D	IA-8A-03E	IA-8A-03E	IA-8A-03E	IA-8A-03F	IA-8A-03F	IA-8A-03F	IA-8A-BASEMENT	IA-8A-BASEMENT
Date			6/8/2022	9/12/2022	12/7/2022	6/8/2022	9/12/2022	12/7/2022	6/8/2022	9/12/2022	12/7/2022	6/8/2022	9/12/2022	12/7/2022	6/8/2022	9/12/2022
Trichloroethene	ug/m^3	2.1	<0.14	<0.14	<0.14	<0.14	0.46	<0.14	<0.14	0.18	<0.14	<0.14	0.41	<0.14	<0.14	0.36
Tetrachloroethene	ug/m^3	42	2.1	<0.17	<0.17	0.53	<0.17	<0.17	0.31	<0.17	<0.17	0.48	<0.17	<0.17	2.9	0.3
cis-1,2-Dichloroethene	ug/m^3		<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16
trans-1,2-Dichloroethene	ug/m^3	42	4.4	0.66	<0.33	6.0	3.2	0.60	5.0	4.3	<0.33	23	2.9	0.58	9.9	6.2

^{*}Based on WDNR Quick Look-Up Table dated February 2022



Sample ID	Units	Residential Indoor Air VAL*	IA QA DASEMENIT	IA-8A-BASEMENT	IA QD 01A	IA QD 01A	IA QD 01A	IA QD 01A	IA QD 01D	IA QD 010	IA QD 010	IA 8D 01C				
'	Ullis	All VAL														
Date			12/7/2022	6/14/2023	6/8/2022	9/12/2022	12/7/2022	6/14/2023	6/8/2022	9/12/2022	12/7/2022	2/15/2023	6/16/2023	6/8/2022	9/12/2022	12/7/2022
Trichloroethene	ug/m^3	2.1	0.34	0.20	<0.14	0.21	<0.14	<0.12	<0.14	2.1	<0.14	0.24	<0.10	<0.14	<0.14	<0.14
Tetrachloroethene	ug/m^3	42	0.38	0.50	0.25	<0.17	<0.17	<0.14	0.30	<0.17	<0.17	<0.17	0.24	0.31	<0.17	<0.17
cis-1,2-Dichloroethene	ug/m^3		<0.16	<0.14	<0.16	<0.16	<0.16	<0.14	<0.16	<0.16	<0.16	<0.16	<0.11	<0.16	<0.16	<0.16
trans-1,2-Dichloroethene	ug/m^3	42	<0.33	0.43	2.0	<0.34	<0.33	<0.28	2.1	2.2	0.53	0.65	0.57	0.40	< 0.33	<0.33

^{*}Based on WDNR Quick Look-Up Table dated February 2022



		Residential Indoor															
Sample ID	Units	Air VAL*	IA-8B-01C	IA-8B-01D	IA-8B-01D	IA-8B-01D	IA-8B-01D	IA-8B-02A	IA-8B-02A	IA-8B-02A	IA-8B-02B	IA-8B-02B	IA-8B-02B	IA-8B-02C	IA-8B-02C	IA-8B-02C	IA-8B-02D
Date			6/14/2023	6/8/2022	9/12/2022	12/7/2022	6/14/2023	6/8/2022	9/12/2022	12/7/2022	6/8/2022	9/12/2022	12/7/2022	6/8/2022	9/12/2022	12/7/2022	6/8/2022
Trichloroethene	ug/m^3	2.1	<0.13	<0.14	1.9	<0.14	<0.12	<0.14	0.67	<0.14	<0.14	0.28	<0.14	0.25	Missing	<0.14	<0.14
Tetrachloroethene	ug/m^3	42	0.13	0.41	<0.17	<0.17	0.38	0.26	<0.17	0.29	0.28	<0.17	<0.17	1.1	Missing	7.0	0.32
cis-1,2-Dichloroethene	ug/m^3		<0.14	<0.16	<0.16	<0.16	<0.14	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	Missing	<0.16	<0.16
trans-1,2-Dichloroethene	ug/m^3	42	<0.30	2.4	1.9	0.46	0.68	2.8	1.2	<0.33	2.4	<0.33	<0.33	1.5	Missing	<0.33	3.0

^{*}Based on WDNR Quick Look-Up Table dated February 2022



TABLE 3

Passive Air Sampling Results for Commissioning

Community Within the Corridor - West Block - Building 6, 7, 8A, and 8B

		Residential Indoor							
Sample ID	Units		IA-8B-02D	IA-8B-02D	OA-6/7/8A/8B Background	OA-6/7/8A/8B Background	OA-6/7/8A/8B Background	OA-6/7/8A/8B Background	OA Background
Date			9/12/2022	12/7/2022	6/8/2022	9/12/2022	12/7/2022	2/15/2023	6/14/2023
Trichloroethene	ug/m^3	2.1	0.7	<0.14	<0.14	0.27	<0.14	<0.14	Missing
Tetrachloroethene	ug/m^3	42	<0.17	<0.17	<0.17	<0.17	<0.16	<0.17	Missing
cis-1,2-Dichloroethene	ug/m^3		<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	Missing
trans-1,2-Dichloroethene	ug/m^3	42	1.2	<0.33	<0.33	<0.33	<0.32	<0.33	Missing

^{*}Based on WDNR Quick Look-Up Table dated February 2022



Table 4											
GC TCE Measurements of Blower Effluent and Estimated Removal Rates											
Date: June 22, 2023											
				TCE	TCE						
Exhaust	Pipe	Exhaust	Flow	Concentr	Removal	TCE Removal					
Fan No.	Diameter	Velocity	Rate	ation	Rate	Rate					
	inches	fpm	cfm	ug/m3	lbs/day	lbs/yr					
EP - 1	4	1476	129	19.8	0.00023	0.083682194					
EP - 2	2	2579	56	16.3	8.2E-05	0.030092652					
EP - 3	4	1417	124	14.9	0.00017	0.060455752					
EP - 4	4	1516	132	15.9	0.00019	0.069020458					
EP - 5	4	1535	134	405	0.00488	1.780102106					
EP - 6	4	1319	115	28.8	0.0003	0.108772421					
EP - 7	4	1437	125	7	7.9E-05	0.028802907					
			·		Total	2.16092849					

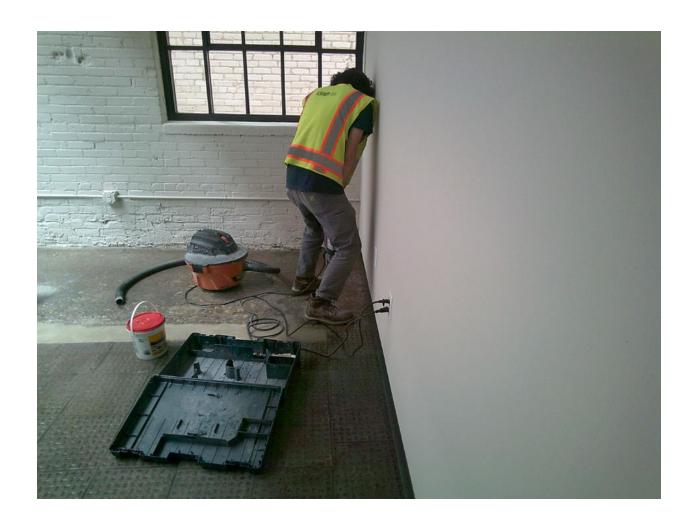
ATTACHMENTS



ATTACHMENT A

Photographs of Commissioning in June 2023





Picture 1. Vapor Pin Installation



Picture 2. Vacuum Measurement at Mail Room



Picture 3. Passive Sampler installed near Elevator



Picture 4. Passive Sampler installed in the hallway

ATTACHMENT B

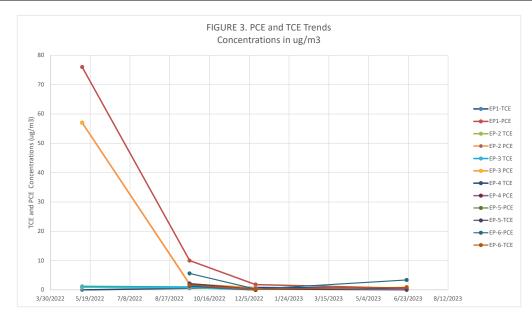
Exhaust Fan TCE Results and Trends



TABLE 3 - EXHAUST FAN SAMPLING RESULTS COMMUNITY WITHIN THE CORRIDOR - WEST BLOCK MILWAUKEE, WI PROJECT NUMBER: 40443

CHEMICAL (ug/m³)			EP-1				EP-2			E	:P-3			EP-4	
	5/9/2022	9/21/2022	12/13/2022	6/21/2023	5/9/2022	9/21/2022	12/13/2022	6/21/2023	5/9/2022	9/21/2022	12/13/2022	6/21/2023	9/21/2022	12/13/2022	6/21/2023
Tetrachloroethene (PCE)	76	10	1.83	0.55	57	2.04	0.75	14.65	57	1.9	<0.278	29.2	1.63	<0.278	0.48
Trichloroethene (TCE)	< 0.237	0.59	0.8	0.52	0.86	0.8	< 0.237	4.14	1.18	1.02	< 0.237	< 0.237	1.34	< 0.237	0.28

CHEMICAL (ug/m ³)		EP-5			El	P-6		EP-7						
	9/21/2022	12/13/2022	6/21/2023	9/21/2022	9/21/2022	12/13/2022	6/21/2023		9/21/2022			12/13/2022		6/21/2023
Tetrachloroethene (PCE)	1.83	0.278	<0.278		5.6	0.278	3.4					0.54		1.2
Trichloroethene (TCE)	2.2	0.237	< 0.237		1.61	0.237	0.91				<	0.237		0.84





ATTACHMENT C

Passive Air Sampling Results for Commissioning





6/29/2023 Mr. Robert Reineke K Singh & Associates 3636 N 124th St

Wauwatosa WI 53222

Project Name: CWC-West Block

Project #: 40443A Workorder #: 2306390

Dear Mr. Robert Reineke

The following report includes the data for the above referenced project for sample(s) received on 6/19/2023 at Eurofins Air Toxics LLC.

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

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

Regards,

Jade White

Project Manager



WORK ORDER #: 2306390

Work Order Summary

CLIENT: Mr. Robert Reineke BILL TO: Mr. Robert Reineke

K Singh & Associates 3636 N 124th St Wauwatosa, WI 53222

3636 N 124th St Wauwatosa, WI 53222

K Singh & Associates

PHONE: P.O.#

FAX: PROJECT # 40443A CWC-West Block

DATE RECEIVED: 06/19/2023 CONTACT: Jade White

DATE COMPLETED: 06/29/2023

FRACTION #	<u>NAME</u>	<u>TEST</u>
01A	IA-6-01A	Passive S.E. RAD130/SKC
02A	IA-6-01B	Passive S.E. RAD130/SKC
03A	IA-6-01C	Passive S.E. RAD130/SKC
04A	IA-7-01A	Passive S.E. RAD130/SKC
05A	IA-7-01B	Passive S.E. RAD130/SKC
06A	IA-7-01C	Passive S.E. RAD130/SKC
07A	IA-7-01D	Passive S.E. RAD130/SKC
08A	IA-7-01E	Passive S.E. RAD130/SKC
09A	IA-8A-01A	Passive S.E. RAD130/SKC
10A	IA-8A-01B	Passive S.E. RAD130/SKC
11A	IA-8A-EL	Passive S.E. RAD130/SKC
12A	IA-8A-Basement	Passive S.E. RAD130/SKC
13A	IA-8B-01A	Passive S.E. RAD130/SKC
14A	IA-8B-01B	Passive S.E. RAD130/SKC
15A	IA-8B-01C	Passive S.E. RAD130/SKC
16A	IA-8B-01D	Passive S.E. RAD130/SKC
17A	Lab Blank	Passive S.E. RAD130/SKC
17B	Lab Blank	Passive S.E. RAD130/SKC
18A	CCV	Passive S.E. RAD130/SKC
18B	CCV	Passive S.E. RAD130/SKC
19A	LCS	Passive S.E. RAD130/SKC
19AA	LCSD	Passive S.E. RAD130/SKC
19B	LCS	Passive S.E. RAD130/SKC

Continued on next page



WORK ORDER #: 2306390

Work Order Summary

CLIENT: Mr. Robert Reineke BILL TO: Mr. Robert Reineke

K Singh & Associates
3636 N 124th St
Wauwatosa, WI 53222

K Singh & Associates
3636 N 124th St
Wauwatosa, WI 53222

PHONE: P.O.#

FAX: PROJECT # 40443A CWC-West Block

DATE RECEIVED: 06/19/2023 **CONTACT:** Jade White **DATE COMPLETED:** 06/29/2023

FRACTION # NAME TEST

19BB LCSD Passive S.E. RAD130/SKC

	1	eide flages	
CERTIFIED BY:		00	DATE: 06/29/23

Technical Director

Certification numbers: AZ Licensure AZ0775, FL NELAP – E87680, LA NELAP – 02089, NH NELAP – 209222, NJ NELAP - CA016, NY NELAP - 11291, TX NELAP – T104704434-22-18, UT NELAP – CA009332022-14, VA NELAP - 12240, WA ELAP - C935 Name of Accreditation Body: NELAP/ORELAP (Oregon Environmental Laboratory Accreditation Program) CA300005-017 Eurofins Environment Testing Northern California, LLC certifies that the test results contained in this report meet all requirements of the 2016 TNI Standard.

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LABORATORY NARRATIVE RAD130 Passive SE by Mod EPA TO-17 K Singh & Associates Workorder# 2306390

Fifteen Radiello 130 (Solvent) samples were received on June 19, 2023 and one Radiello 130 (Solvent) sample was received on June 22, 2023. The laboratory analyzed the charcoal sorbent bed of the passive sampler following modified method EPA TO-17. The VOCs were chemically extracted using carbon disulfide and an aliquot of the extract was injected into a GC/MS for identification and quantification of volatile organic compounds (VOCs).

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

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

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

Receiving Notes

Sample IA-7-01C was not received at Eurofin Air Toxics, LLC on 6/19/2023 despite notation on the Chain of Custody (COC). The sample was subsequently received on 6/22/2023 and was added to the analytical request.

Analytical Notes

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

If validated uptake rates were not available, rates were estimated using the chemical's diffusion coefficient in air and the geometric constant of the sampler. Chemicals that are poorly retained by the sorbent over the sampling duration may exhibit a low bias. All concentrations calculated using estimated rates are qualified with a "C" flag.

To calculate ug/m3 concentrations in the Lab Blanks, a sampling duration of 14528 minutes was applied. The assumed temperature used for the uptake rate is listed on the data page. If the field temperatures were provided, the rate was adjusted in the same manner as the field samples.

Definition of Data Qualifying Flags

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

- B Compound present in laboratory blank greater than reporting limit (background subtraction not performed).
 - J Estimated value.
 - E Exceeds instrument calibration range.
 - S Saturated peak.
 - Q Exceeds quality control limits.
 - U Compound analyzed for but not detected above the reporting limit.
 - UJ- Non-detected compound associated with low bias in the CCV
 - N The identification is based on presumptive evidence.
 - C Estimated concentration due to calculated sampling rate
 - CN See case narrative explanation.

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

- a-File was requantified
- b-File was quantified by a second column and detector
- r1-File was requantified for the purpose of reissue



Client Sample ID: IA-6-01A

Lab ID#: 2306390-01A
No Detections Were Found.

Client Sample ID: IA-6-01B

Lab ID#: 2306390-02A

Compound	Rpt. Limit (ug)	Rpt. Limit (ug/m3)	Amount (ug)	Amount (ug/m3)
Tetrachloroethene	0.10	0.14	0.20	0.28
trans-1,2-Dichloroethene	0.20	0.28	0.95 C	1.3 C

Client Sample ID: IA-6-01C

Lab ID#: 2306390-03A

Compound	Rpt. Limit (ug)	Rpt. Limit (ug/m3)	Amount (ug)	Amount (ug/m3)
Tetrachloroethene	0.10	0.12	0.18	0.22
trans-1,2-Dichloroethene	0.20	0.23	0.49 C	0.58 C

Client Sample ID: IA-7-01A

Lab ID#: 2306390-04A

Compound	Rpt. Limit (ug)	Rpt. Limit (ug/m3)	Amount (ug)	Amount (ug/m3)	
Tetrachloroethene	0.10	0.14	0.42	0.61	_
trans-1,2-Dichloroethene	0.20	0.28	0.82 C	1.2 C	

Client Sample ID: IA-7-01B

Lab ID#: 2306390-05A

Compound	Rpt. Limit (ug)	Rpt. Limit (ug/m3)	Amount (ug)	Amount (ug/m3)
Tetrachloroethene	0.10	0.14	0.53	0.76
trans-1,2-Dichloroethene	0.20	0.28	0.38 C	0.54 C

Client Sample ID: IA-7-01C

Lab ID#: 2306390-06A

	Rpt. Limit	Rpt. Limit	Amount	Amount
Compound	(ug)	(ug/m3)	(ug)	(ug/m3)



Client Sample ID: IA-7-01C

Lab ID#: 2306390-06A

Compound	Rpt. Limit (ug)	Rpt. Limit (ug/m3)	Amount (ug)	Amount (ug/m3)	
Tetrachloroethene	0.10	0.12	0.18	0.21	
trans-1,2-Dichloroethene	0.20	0.23	0.42 C	0.48 C	

Client Sample ID: IA-7-01D

Lab ID#: 2306390-07A

Compound	Rpt. Limit (ug)	(ug/m3)	Amount (ug)	Amount (ug/m3)
Tetrachloroethene	0.10	0.12	0.15	0.17
trans-1,2-Dichloroethene	0.20	0.23	0.34 C	0.40 C

Client Sample ID: IA-7-01E

Lab ID#: 2306390-08A

	Rpt. Limit	Rpt. Limit	Amount	Amount
Compound	(ug)	(ug/m3)	(ug)	(ug/m3)
Tetrachloroethene	0.10	0.12	0.21	0.25
trans-1,2-Dichloroethene	0.20	0.23	0.32 C	0.37 C

Client Sample ID: IA-8A-01A

Lab ID#: 2306390-09A

Compound	Kpt. Limit (ug)	(ug/m3)	Amount (ug)	(ug/m3)
Tetrachloroethene	0.10	0.14	0.48	0.70
trans-1,2-Dichloroethene	0.20	0.28	1.4 C	2.0 C

Client Sample ID: IA-8A-01B

Lab ID#: 2306390-10A

Compound	Rpt. Limit (ug)	Rpt. Limit (ug/m3)	Amount (ug)	Amount (ug/m3)
Tetrachloroethene	0.10	0.14	0.36	0.51
trans-1,2-Dichloroethene	0.20	0.28	0.51 C	0.72 C



Client Sample ID: IA-8A-EL

Lab ID#: 2306390-11A

	Rpt. Limit	Rpt. Limit	Amount	Amount
Compound	(ug)	(ug/m3)	(ug)	(ug/m3)
Tetrachloroethene	0.10	0.17	0.41	0.69
trans-1,2-Dichloroethene	0.20	0.33	0.81 C	1.3 C

Client Sample ID: IA-8A-Basement

Lab ID#: 2306390-12A

Compound	Rpt. Limit (ug)	Rpt. Limit (ug/m3)	Amount (ug)	Amount (ug/m3)	
Trichloroethene	0.10	0.13	0.20	0.26	_
Tetrachloroethene	0.10	0.15	0.50	0.74	
trans-1,2-Dichloroethene	0.20	0.29	0.43 C	0.63 C	

Client Sample ID: IA-8B-01A

Lab ID#: 2306390-13A
No Detections Were Found.

Client Sample ID: IA-8B-01B

Lab ID#: 2306390-14A

Compound	Rpt. Limit (ug)	Rpt. Limit (ug/m3)	Amount (ug)	Amount (ug/m3)
Tetrachloroethene	0.10	0.12	0.24	0.28
trans-1,2-Dichloroethene	0.20	0.23	0.57 C	0.66 C

Client Sample ID: IA-8B-01C

Lab ID#: 2306390-15A

	Rpt. Limit	Rpt. Limit	Amount	Amount
Compound	(ug)	(ug/m3)	(ug)	(ug/m3)
Tetrachloroethene	0.10	0.15	0.13	0.20

Client Sample ID: IA-8B-01D

Lab ID#: 2306390-16A

	Rpt. Limit	Rpt. Limit	Amount	Amount
Compound	(ug)	(ug/m3)	(ug)	(ug/m3)



Client Sample ID: IA-8B-01D

Lab ID#: 2306390-16A

Compound	Rpt. Limit (ug)	Rpt. Limit (ug/m3)	Amount (ug)	Amount (ug/m3)
Compound	(ug)	(ug/iiiə)	(ug)	(ug/ilis)
Tetrachloroethene	0.10	0.14	0.38	0.54
trans-1,2-Dichloroethene	0.20	0.28	0.68 C	0.96 C



Client Sample ID: IA-6-01A Lab ID#: 2306390-01A

VOCS BY PASSIVE SAMPLER - GC/MS

File Name:	18062124sim	Date of Collection: 6/14/23 1:20:00 PM
Dil. Factor:	1.00	Date of Analysis: 6/21/23 04:25 PM
		Date of Extraction: 6/21/23

	Rpt. Limit	Rpt. Limit	Amount	Amount
Compound	(ug)	(ug/m3)	(ug)	(ug/m3)
Trichloroethene	0.10	0.12	Not Detected	Not Detected
Tetrachloroethene	0.10	0.14	Not Detected	Not Detected
cis-1,2-Dichloroethene	0.10	0.14	Not Detected C	Not Detected C
trans-1,2-Dichloroethene	0.20	0.28	Not Detected C	Not Detected C

C = Estimated concentration due to calculated sampling rate.

 $Temperature = 77.0F \ , \ duration \ time = 11770 \ minutes.$

Surrogates	%Recovery	Method Limits	
Toluene-d8	88	70-130	



Client Sample ID: IA-6-01B Lab ID#: 2306390-02A

VOCS BY PASSIVE SAMPLER - GC/MS

File Name:	18062125sim	Date of Collection: 6/14/23 1:25:00 PM
Dil. Factor:	1.00	Date of Analysis: 6/21/23 04:51 PM
		Date of Extraction: 6/21/23

	Rpt. Limit	Rpt. Limit	Amount	Amount
Compound	(ug)	(ug/m3)	(ug)	(ug/m3)
Trichloroethene	0.10	0.12	Not Detected	Not Detected
Tetrachloroethene	0.10	0.14	0.20	0.28
cis-1,2-Dichloroethene	0.10	0.14	Not Detected C	Not Detected C
trans-1,2-Dichloroethene	0.20	0.28	0.95 C	1.3 C

C = Estimated concentration due to calculated sampling rate.

 $Temperature = 77.0F \ , \ duration \ time = 11770 \ minutes.$

		Method
Surrogates	%Recovery	Limits
Toluene-d8	89	70-130



Client Sample ID: IA-6-01C Lab ID#: 2306390-03A

VOCS BY PASSIVE SAMPLER - GC/MS

File Name:	18062126sim	Date of Collection: 6/16/23 11:51:00 AM
Dil. Factor:	1.00	Date of Analysis: 6/21/23 05:18 PM
		Date of Extraction: 6/21/23

	Rpt. Limit	Rpt. Limit	Amount	Amount
Compound	(ug)	(ug/m3)	(ug)	(ug/m3)
Trichloroethene	0.10	0.10	Not Detected	Not Detected
Tetrachloroethene	0.10	0.12	0.18	0.22
cis-1,2-Dichloroethene	0.10	0.11	Not Detected C	Not Detected C
trans-1,2-Dichloroethene	0.20	0.23	0.49 C	0.58 C

C = Estimated concentration due to calculated sampling rate.

 $Temperature = 77.0F \ , \ duration \ time = 14252 \ minutes.$

Surrogatos	%Recovery	Method Limits
Surrogates	76Recovery	Lillits
Toluene-d8	91	70-130



Client Sample ID: IA-7-01A Lab ID#: 2306390-04A

VOCS BY PASSIVE SAMPLER - GC/MS

File Name:	18062127sim	Date of Collection: 6/14/23 2:10:00 PM
Dil. Factor:	1.00	Date of Analysis: 6/21/23 05:45 PM
		Date of Extraction: 6/21/23

	Rpt. Limit	Rpt. Limit	Amount	Amount
Compound	(ug)	(ug/m3)	(ug)	(ug/m3)
Trichloroethene	0.10	0.12	Not Detected	Not Detected
Tetrachloroethene	0.10	0.14	0.42	0.61
cis-1,2-Dichloroethene	0.10	0.14	Not Detected C	Not Detected C
trans-1,2-Dichloroethene	0.20	0.28	0.82 C	1.2 C

C = Estimated concentration due to calculated sampling rate.

 $Temperature = 77.0F \ , \ duration \ time = 11765 \ minutes.$

		Method
Surrogates	%Recovery	Limits
Toluene-d8	90	70-130



Client Sample ID: IA-7-01B Lab ID#: 2306390-05A

VOCS BY PASSIVE SAMPLER - GC/MS

File Name:	18062128sim	Date of Collection: 6/14/23 2:05:00 PM
Dil. Factor:	1.00	Date of Analysis: 6/21/23 06:11 PM
		Date of Extraction: 6/21/23

	Rpt. Limit	Rpt. Limit	Amount	Amount
Compound	(ug)	(ug/m3)	(ug)	(ug/m3)
Trichloroethene	0.10	0.12	Not Detected	Not Detected
Tetrachloroethene	0.10	0.14	0.53	0.76
cis-1,2-Dichloroethene	0.10	0.14	Not Detected C	Not Detected C
trans-1,2-Dichloroethene	0.20	0.28	0.38 C	0.54 C

C = Estimated concentration due to calculated sampling rate.

 $Temperature = 77.0F \ , \ duration \ time = 11750 \ minutes.$

Surrogates	%Recovery	Method Limits
Toluene-d8	90	70-130



Client Sample ID: IA-7-01C Lab ID#: 2306390-06A

VOCS BY PASSIVE SAMPLER - GC/MS

File Name:	18062216sim	Date of Collection: 6/16/23 12:00:00 PM
Dil. Factor:	1.00	Date of Analysis: 6/22/23 01:39 PM
		Date of Extraction: 6/22/23

	Rpt. Limit	Rpt. Limit	Amount	Amount
Compound	(ug)	(ug/m3)	(ug)	(ug/m3)
Trichloroethene	0.10	0.10	Not Detected	Not Detected
Tetrachloroethene	0.10	0.12	0.18	0.21
cis-1,2-Dichloroethene	0.10	0.11	Not Detected C	Not Detected C
trans-1,2-Dichloroethene	0.20	0.23	0.42 C	0.48 C

C = Estimated concentration due to calculated sampling rate.

 $Temperature = 77.0F \ , \ duration \ time = 14510 \ minutes.$

Surremeter	9/ Pagevery	Method
Surrogates	%Recovery	Limits
Toluene-d8	89	70-130



Client Sample ID: IA-7-01D Lab ID#: 2306390-07A

VOCS BY PASSIVE SAMPLER - GC/MS

File Name:	18062129sim	Date of Collection: 6/16/23 11:52:00 AM
Dil. Factor:	1.00	Date of Analysis: 6/21/23 06:38 PM
		Date of Extraction: 6/21/23

	Rpt. Limit	Rpt. Limit	Amount	Amount
Compound	(ug)	(ug/m3)	(ug)	(ug/m3)
Trichloroethene	0.10	0.10	Not Detected	Not Detected
Tetrachloroethene	0.10	0.12	0.15	0.17
cis-1,2-Dichloroethene	0.10	0.11	Not Detected C	Not Detected C
trans-1,2-Dichloroethene	0.20	0.23	0.34 C	0.40 C

C = Estimated concentration due to calculated sampling rate.

 $Temperature = 77.0F \ , \ duration \ time = 14290 \ minutes.$

		Method
Surrogates	%Recovery	Limits
Toluene-d8	89	70-130



Client Sample ID: IA-7-01E Lab ID#: 2306390-08A

VOCS BY PASSIVE SAMPLER - GC/MS

File Name:	18062130sim	Date of Collection: 6/16/23 11:57:00 AM
Dil. Factor:	1.00	Date of Analysis: 6/21/23 07:05 PM
		Date of Extraction: 6/21/23

	Rpt. Limit	Rpt. Limit	Amount	Amount
Compound	(ug)	(ug/m3)	(ug)	(ug/m3)
Trichloroethene	0.10	0.10	Not Detected	Not Detected
Tetrachloroethene	0.10	0.12	0.21	0.25
cis-1,2-Dichloroethene	0.10	0.11	Not Detected C	Not Detected C
trans-1,2-Dichloroethene	0.20	0.23	0.32 C	0.37 C

C = Estimated concentration due to calculated sampling rate.

 $Temperature = 77.0F \ , \ duration \ time = 14286 \ minutes.$

Surremeter	9/ Pagevery	Method
Surrogates	%Recovery	Limits
Toluene-d8	89	70-130



Client Sample ID: IA-8A-01A Lab ID#: 2306390-09A

VOCS BY PASSIVE SAMPLER - GC/MS

File Name:	18062131sim	Date of Collection: 6/14/23 2:30:00 PM
Dil. Factor:	1.00	Date of Analysis: 6/21/23 07:32 PM
		Date of Extraction: 6/21/23

	Rpt. Limit	Rpt. Limit	Amount	Amount
Compound	(ug)	(ug/m3)	(ug)	(ug/m3)
Trichloroethene	0.10	0.12	Not Detected	Not Detected
Tetrachloroethene	0.10	0.14	0.48	0.70
cis-1,2-Dichloroethene	0.10	0.14	Not Detected C	Not Detected C
trans-1,2-Dichloroethene	0.20	0.28	1.4 C	2.0 C

C = Estimated concentration due to calculated sampling rate.

 $Temperature = 77.0F \ , \ duration \ time = 11805 \ minutes.$

Surrogates	%Recovery	Method Limits
Toluene-d8	90	70-130



Client Sample ID: IA-8A-01B Lab ID#: 2306390-10A

VOCS BY PASSIVE SAMPLER - GC/MS

File Name:	18062132sim	Date of Collection: 6/14/23 2:20:00 PM
Dil. Factor:	1.00	Date of Analysis: 6/21/23 07:58 PM
		Date of Extraction: 6/21/23

	Rpt. Limit	Rpt. Limit	Amount	Amount
Compound	(ug)	(ug/m3)	(ug)	(ug/m3)
Trichloroethene	0.10	0.12	Not Detected	Not Detected
Tetrachloroethene	0.10	0.14	0.36	0.51
cis-1,2-Dichloroethene	0.10	0.14	Not Detected C	Not Detected C
trans-1,2-Dichloroethene	0.20	0.28	0.51 C	0.72 C

C = Estimated concentration due to calculated sampling rate.

 $Temperature = 77.0F \ , \ duration \ time = 11825 \ minutes.$

		Method
Surrogates	%Recovery	Limits
Toluene-d8	89	70-130



Client Sample ID: IA-8A-EL Lab ID#: 2306390-11A

VOCS BY PASSIVE SAMPLER - GC/MS

File Name:	18062133sim	Date of Collection: 6/14/23 2:40:00 PM
Dil. Factor:	1.00	Date of Analysis: 6/21/23 08:25 PM
		Date of Extraction: 6/21/23

	Rpt. Limit	Rpt. Limit	Amount	Amount
Compound	(ug)	(ug/m3)	(ug)	(ug/m3)
Trichloroethene	0.10	0.14	Not Detected	Not Detected
Tetrachloroethene	0.10	0.17	0.41	0.69
cis-1,2-Dichloroethene	0.10	0.16	Not Detected C	Not Detected C
trans-1,2-Dichloroethene	0.20	0.33	0.81 C	1.3 C

C = Estimated concentration due to calculated sampling rate.

Temperature = 77.0F, duration time = 10110 minutes.

		Method
Surrogates	%Recovery	Limits
Toluene-d8	89	70-130



Client Sample ID: IA-8A-Basement Lab ID#: 2306390-12A

VOCS BY PASSIVE SAMPLER - GC/MS

File Name:	18062134sim	Date of Collection: 6/14/23 2:35:00 PM
Dil. Factor:	1.00	Date of Analysis: 6/21/23 08:52 PM
		Date of Extraction: 6/21/23

	Rpt. Limit	Rpt. Limit	Amount	Amount
Compound	(ug)	(ug/m3)	(ug)	(ug/m3)
Trichloroethene	0.10	0.13	0.20	0.26
Tetrachloroethene	0.10	0.15	0.50	0.74
cis-1,2-Dichloroethene	0.10	0.14	Not Detected C	Not Detected C
trans-1,2-Dichloroethene	0.20	0.29	0.43 C	0.63 C

C = Estimated concentration due to calculated sampling rate.

 $Temperature = 77.0F \ , \ duration \ time = 11325 \ minutes.$

		Method
Surrogates	%Recovery	Limits
Toluene-d8	92	70-130



Client Sample ID: IA-8B-01A Lab ID#: 2306390-13A

VOCS BY PASSIVE SAMPLER - GC/MS

File Name:	18062135sim	Date of Collection: 6/14/23 2:25:00 PM
Dil. Factor:	1.00	Date of Analysis: 6/21/23 09:19 PM
		Date of Extraction: 6/21/23

	Rpt. Limit	Rpt. Limit	Amount	Amount
Compound	(ug)	(ug/m3)	(ug)	(ug/m3)
Trichloroethene	0.10	0.12	Not Detected	Not Detected
Tetrachloroethene	0.10	0.14	Not Detected	Not Detected
cis-1,2-Dichloroethene	0.10	0.14	Not Detected C	Not Detected C
trans-1,2-Dichloroethene	0.20	0.28	Not Detected C	Not Detected C

C = Estimated concentration due to calculated sampling rate.

 $Temperature = 77.0F \ , \ duration \ time = 11805 \ minutes.$

Surremeter	9/ Pagevery	Method
Surrogates	%Recovery	Limits
Toluene-d8	89	70-130



Client Sample ID: IA-8B-01B Lab ID#: 2306390-14A

VOCS BY PASSIVE SAMPLER - GC/MS

File Name:	18062136sim	Date of Collection: 6/16/23 11:43:00 AM
Dil. Factor:	1.00	Date of Analysis: 6/21/23 09:45 PM
		Date of Extraction: 6/21/23

	Rpt. Limit	Rpt. Limit	Amount	Amount
Compound	(ug)	(ug/m3)	(ug)	(ug/m3)
Trichloroethene	0.10	0.10	Not Detected	Not Detected
Tetrachloroethene	0.10	0.12	0.24	0.28
cis-1,2-Dichloroethene	0.10	0.11	Not Detected C	Not Detected C
trans-1,2-Dichloroethene	0.20	0.23	0.57 C	0.66 C

C = Estimated concentration due to calculated sampling rate.

Temperature = 77.0F, duration time = 14528 minutes.

Surrogates	%Recovery	Method Limits
Toluene-d8	92	70-130



Client Sample ID: IA-8B-01C Lab ID#: 2306390-15A

VOCS BY PASSIVE SAMPLER - GC/MS

File Name:	18062137sim	Date of Collection: 6/14/23 11:38:00 AM
Dil. Factor:	1.00	Date of Analysis: 6/21/23 10:12 PM
		Date of Extraction: 6/21/23

Rpt. Limit Rpt. Limit Amount **Amount** Compound (ug/m3) (ug/m3) (ug) (ug) 0.10 0.13 Not Detected Not Detected Trichloroethene 0.10 0.20 Tetrachloroethene 0.15 0.13 0.10 0.14 Not Detected C Not Detected C cis-1,2-Dichloroethene trans-1,2-Dichloroethene 0.20 0.30 Not Detected C Not Detected C

C = Estimated concentration due to calculated sampling rate.

Temperature = 77.0F, duration time = 11258 minutes.

		Method
Surrogates	%Recovery	Limits
Toluene-d8	90	70-130



Client Sample ID: IA-8B-01D Lab ID#: 2306390-16A

VOCS BY PASSIVE SAMPLER - GC/MS

File Name:	18062138sim	Date of Collection: 6/14/23 2:15:00 PM
Dil. Factor:	1.00	Date of Analysis: 6/21/23 10:39 PM
		Date of Extraction: 6/21/23

	Rpt. Limit	Rpt. Limit	Amount	Amount
Compound	(ug)	(ug/m3)	(ug)	(ug/m3)
Trichloroethene	0.10	0.12	Not Detected	Not Detected
Tetrachloroethene	0.10	0.14	0.38	0.54
cis-1,2-Dichloroethene	0.10	0.14	Not Detected C	Not Detected C
trans-1,2-Dichloroethene	0.20	0.28	0.68 C	0.96 C

C = Estimated concentration due to calculated sampling rate.

 $Temperature = 77.0F \ , \ duration \ time = 11805 \ minutes.$

Surrogates	%Recovery	Method Limits
Toluene-d8	90	70-130



Client Sample ID: Lab Blank Lab ID#: 2306390-17A

VOCS BY PASSIVE SAMPLER - GC/MS

File Name:	18062120sim	Date of Collection: NA
Dil. Factor:	1.00	Date of Analysis: 6/21/23 02:36 PM
		Date of Extraction: 6/21/23

	Rpt. Limit	Rpt. Limit	Amount	Amount
Compound	(ug)	(ug/m3)	(ug)	(ug/m3)
Trichloroethene	0.10	0.10	Not Detected	Not Detected
Tetrachloroethene	0.10	0.12	Not Detected	Not Detected
cis-1,2-Dichloroethene	0.10	0.11	Not Detected C	Not Detected C
trans-1,2-Dichloroethene	0.20	0.23	Not Detected C	Not Detected C

C = Estimated concentration due to calculated sampling rate.

Temperature = 77.0F, duration time = 14528 minutes.

		Method
Surrogates	%Recovery	Limits
Toluene-d8	88	70-130



Client Sample ID: Lab Blank Lab ID#: 2306390-17B

VOCS BY PASSIVE SAMPLER - GC/MS

File Name:	18062205sim	Date of Collection: NA
Dil. Factor:	1.00	Date of Analysis: 6/22/23 08:10 AM
		Date of Extraction: 6/22/23

	Rpt. Limit	Rpt. Limit	Amount	Amount
Compound	(ug)	(ug/m3)	(ug)	(ug/m3)
Trichloroethene	0.10	0.10	Not Detected	Not Detected
Tetrachloroethene	0.10	0.12	Not Detected	Not Detected
cis-1,2-Dichloroethene	0.10	0.11	Not Detected C	Not Detected C
trans-1,2-Dichloroethene	0.20	0.23	Not Detected C	Not Detected C

C = Estimated concentration due to calculated sampling rate.

Temperature = 77.0F, duration time = 14528 minutes.

		Method	
Surrogates	%Recovery	Limits	
Toluene-d8	88	70-130	



Client Sample ID: CCV Lab ID#: 2306390-18A

VOCS BY PASSIVE SAMPLER - GC/MS

File Name:	18062117sim	Date of Collection: NA
Dil. Factor:	1 00	Date of Analysis: 6/21/23 01:11

Date of Extraction: NA

Compound	%Recovery	
Trichloroethene	100	
Tetrachloroethene	98	
cis-1,2-Dichloroethene	100	
trans-1,2-Dichloroethene	101	

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
Toluene-d8	100	70-130



Client Sample ID: CCV Lab ID#: 2306390-18B

VOCS BY PASSIVE SAMPLER - GC/MS

File Name:	18062202sim	Date of Collection: NA	
Dil. Factor:	1.00	Date of Analysis: 6/22/23 06:43 AM	
		Date of Extraction: NA	

Compound	%Recovery	
Trichloroethene	102	
Tetrachloroethene	98	
cis-1,2-Dichloroethene	105	
trans-1,2-Dichloroethene	108	
Container Type: NA - Not Applicable		
		Method
Surrogates	%Recovery	Limits

Surrogates	%Recovery	Limits
Toluene-d8	102	70-130



Client Sample ID: LCS Lab ID#: 2306390-19A

VOCS BY PASSIVE SAMPLER - GC/MS

File Name: 18062118sim Date of Collection: NA

Dil. Factor: 1.00 Date of Analysis: 6/21/23 01:39 PM

Date of Extraction: 6/21/23

		Method
Compound	%Recovery	Limits
Trichloroethene	84	70-130
Tetrachloroethene	84	70-130
cis-1,2-Dichloroethene	82	70-130
trans-1,2-Dichloroethene	83	70-130
Container Type: NA - Not Applicable		
		Method
Surrogates	%Recovery	Limits
Toluene-d8	89	70-130



Client Sample ID: LCSD Lab ID#: 2306390-19AA

VOCS BY PASSIVE SAMPLER - GC/MS

File Name:	18062119sim	Date of Collection: NA
File Name:	18062119sim	Date of Collection: NA

Dil. Factor: 1.00 Date of Analysis: 6/21/23 02:06 PM

Date of Extraction: 6/21/23

		Method	
Compound	%Recovery	Limits	
Trichloroethene	84	70-130	
Tetrachloroethene	83	70-130	
cis-1,2-Dichloroethene	82	70-130	
trans-1,2-Dichloroethene	83	70-130	
Container Type: NA - Not Applicable			
		Method	
Surrogates	%Recovery	Limits	
Toluene-d8	88	70-130	



Client Sample ID: LCS Lab ID#: 2306390-19B

VOCS BY PASSIVE SAMPLER - GC/MS

Date of Collection: NA

Dil. Factor: 1.00 Date of Analysis: 6/22/23 07:13 AM

Date of Extraction: 6/22/23

		Method
Compound	%Recovery	Limits
Trichloroethene	86	70-130
Tetrachloroethene	83	70-130
cis-1,2-Dichloroethene	91	70-130
trans-1,2-Dichloroethene	94	70-130
Container Type: NA - Not Applicable		
		Method
Surrogates	%Recovery	Limits
Toluene-d8	88	70-130



Client Sample ID: LCSD Lab ID#: 2306390-19BB

VOCS BY PASSIVE SAMPLER - GC/MS

File Name:	18062204sim	Date of Collection: NA
Dil Feeten	4.00	D

Dil. Factor: 1.00 Date of Analysis: 6/22/23 07:40 AM

Date of Extraction: 6/22/23

		Method
Compound	%Recovery	Limits
Trichloroethene	86	70-130
Tetrachloroethene	84	70-130
cis-1,2-Dichloroethene	87	70-130
trans-1,2-Dichloroethene	90	70-130
Container Type: NA - Not Applicable		
		Method
Surrogates	%Recovery	Limits
Toluene-d8	88	70-130

ATTACHMENT D

QA-QC Protocol for Portable GC





STANDARD OPERATING PROCEDURES (SOPs)

1

Continuous Monitoring of VOCs by Modified Method TO-14

1.0 **Scope and Applications**

This SOP has been prepared by Hartman Environmental Geoscience (HEG) to help insure consistent analytical protocol. The scope of topics discussed in this SOP includes the following:

- Method Summary
- Personnel Qualifications
- Instrumentation and Equipment
- Reagents & Standards
- Detection and Reporting Limits
- Interferences
- Precision, Bias and Working Range (Method Performance)
- Sample Collection and Holding Times
- Procedures, Calibration, QAQC and sample Analysis
- QA/QC Requirements
- Data and Records Management and Reporting
- Troubleshooting Problems and Preventative Maintenance
- Safety

2.0 Method Summary

The automated continuous monitoring system measures a select group of volatile organic compounds (VOCs) in an air matrix (indoor air, outdoor air or soil gas). The primary VOCs are chlorinated compounds (TCE, CCl4, CHCl3 and PCE), but it can also analyze for hydrocarbons such as benzene and ethylbenzene. The system can be configure to sample from as many as 16 locations. The system can be controlled remotely and data downloaded via the internet in real time.

3.0 Personnel Qualifications

This method is to be performed by a trained analyst in gas chromatographic methods. A bachelor's degree in science or equivalent training is the minimum requirement for performance of this method. An analyst performing this method without on-site supervision must have a minimum of 3 months of GC experience with this method or equivalent.



4.0 <u>Instrumentation and Equipment</u>

4.1 Gas Chromatograph and Peripherals:

The system consists of the following elements:

- Gas chromatograph (SRI 8610) with an electron capture detector (ECD) and optional Photoionization detector (PID);
- Sixteen-port stream selection valve (Valco Instruments);
- Sample injection valve with 2 cc sample loop
- Computerized data acquisition system (Peaksimple by SRI Instruments)
- Remote connection via Wireless connection (ethernet cable, cell or wifi).

Small diameter tubing from each sample location is connected to a stream selector valve. A low-flow vacuum pump draws the indoor air sample through the tubing and through the sample loop from the selected sample location. When purging is complete (approximately 30 seconds), the sample injection valve rotates and injects the sample into the GC for analysis. Analysis time is approximately nine (9) minutes. When the analysis is complete, the stream selector advances to the next position (next sample location) and the process repeats. This sequence continues uninterrupted until stopped.

The above-mentioned equipment requires 115 VAC as a power source to operate. This power can be applied by external power sources available at the site, or by an internal, gasoline operated generator located on the site itself.

The data acquisition software (Peaksimple) acquires the chromatographic data and also controls the stream-selector valve, sample injection, GC analysis and stores the data to a summary file on a laptop. Remote access to the laptop and the data is enabled by a wireless connection.

- 4.2 Small diameter tubing, either stainless steel or nylon.
- 4.3 Low flow vacuum pump.
- 4.4 Computer running Windows 10.

5.0 Reagents and Standards

- 5.1 High purity Nitrogen compressed gas
- 5.2. Primary (stock) standards:



Vapor standards purchased from certified supplier at 1000 ppbv. Certificates and preparations of all secondary standards are recorded on a log sheet.

5.3 Secondary (working) Standards:

Made by diluting primary standard with ultra-pure air or nitrogen. Typical concentration range from 1 ppbv to 100 ppbv. It is preferable to prepare these standards in summa canisters as they are stable for longer time period. Tedlar bags may be used in lieu of summa canisters if prepared fresh daily.

5.3.1 Using a gas-tight syringe introduce the following amounts of 1 ppmv primary stock vapor standard into 1000 cc of air:.

Target Concentration (ppbv)	Volume of Stock (cc)		
1	1		
10	10		
50	50		
100	100		

Standards may be prepared at other concentrations if a different analytical range is possible and desired. (See section 6.2 for more information)

6.0 <u>Detection Limits and Reporting Limits</u>

6.1 Method Detection Limit

The method detection limit (MDL) is the minimum concentration of a substance that can be measured and reported with 99 percent confidence that the analyte concentration is greater than zero. MDLs for each target analyte is established prior to a project. The laboratory shall maintain proof of the MDL demonstrations (i.e., before project samples are analyzed) and upon request in the format specified.

MDLs will be demonstrated using the following instructions:

- (1) Estimate the MDL using one of the following methods:
 - a) The concentration value that corresponds to an instrument signal/noise ratio in the range of 2.5 to 5, or
 - b) The concentration equivalent of 3 times the standard deviation of at least seven replicate measurement of the target analyte or
 - c) The region of the standard curve where there is a significant change in sensitivity (i.e., a break in the slope of the standard curve).
- (2) Prepare and analyze seven samples containing the analyte of interest at a concentration five to ten times the estimated MDL.
- (3) Determine the variance (S2) for each analyte as follows:



$$S2 = \frac{1}{n-1} \left[\sum_{i=1}^{n} (x_i - \overline{x})^2 \right]$$

where xi = is the measurement of the variable x and \overline{x} = the average value of x

$$\overline{X} = \frac{1}{n} \sum_{i=1}^{n} x_i$$

(4) Determine the standard deviation (s) for each analyte as follows:

$$s = (S2)1/2$$

(5) Determine the MDL for each analyte as follows:

MDL = 3.14(s)

(note: 3.14 is the one-sided t-statistic at the 99 percent confidence level appropriate for determining the MDL using 7 samples)

(6) If the spike level used in step 2 is more than 10 times the calculated MDL, repeat the process using a smaller spiking level. If the calculated MDL is more than the spike level concentration, repeat the process using a higher spiking level. If the calculated MDL is less than 10% of the spikes level concentration, repeat the process using a lower spiking level.

Where multiple instruments are used, the MDL used for reporting purposes shall represent the least sensitive instrument.

6.2 Reporting Limits

The reporting limits (RLs) will be dependent upon the sample matrix, indoor air or soil vapor, and the calibration range. The ECD detector has a lower sensitivity than the PID and therefore can be used to achieve lower RLs than the PID. At mid-range concentrations, the results from the PID and ECD can be compared as verifications. At higher concentrations, the ECD will be over-range and will not provide accurate results.

The normal reporting limits are nominally 0.1 ppbv - 20 ppbv of each compound. These limits should be compared annually to the MDL's to make certain that they are appropriate. Depending upon client data quality objectives (DQO's), the reporting limits may change. The reporting limits, however, are still dependent upon the calibration curve. However, the lowest point in the calibration curve cannot be greater than 5 times the reporting limit. Some projects may require that the lowest point on the calibration curve be set at the RLs and these will be project specific.





When samples are diluted, the reporting limits are raised proportionately. All multipliers must also be applied to the reporting limits as well. Dilutions are recorded on the daily extraction/run logs and are entered into the Peaksimple software for the particular analysis.

7.0 <u>Interferences</u>

When analyzing for volatile organics, samples can contain high concentrations of target and non-target analytes. These analytes may interfere with the ECD and PID detectors. The analyst should attempt to analyze these samples at the lowest dilution factor to obtain the lowest achievable reporting limits but at the same time meeting QAQC requirements. In addition, the sample loops may be prone to carry over . The sample loop should be flushed well after a high concentration sample is analyzed (>50 times the RL). In addition, a blank should be analyzed after any high level sample (>50 times the RL) to ensure that carry over is eliminated.

8.0 Precision, Bias and Working Range

The working range of the instrument is between the method detection limit for the analyte and the concentration of the high standard used for system calibration. In the event that sample results are greater than the amount used for the high standard, then sample dilution is necessary. Results reported that are between the MDL and RL should be flagged with the "J" flag as a quantitative estimate.

The required precision of this method is 30%. Precision is determined prior to each sampling program by performing replicate analysis of a mid-range standard.

The required bias of this method is +/- 30% which can be determined by analyzing a mid-point standard, mid-point second source standard, or a performance test sample.

9.0 Sample Collection and Holding Times

In automated mode, samples are not collected in containers. The sample is pulled through the tubing and flushed through the sample loop by a low-flow vacuum pump. If confirmation samples are to be collected for off-site analysis, the chemist is to refer to the project confirmation sheet to determine the details of the sampling. Samples should be collected in passivated canisters designed to prevent the loss of volatile compounds. Holding times for the various sample vessels should be observed, typically no more than 30 days for summa canisters.

10.0 Procedures, Calibration, QAQC Analysis and Sample Analysis

10.1 System Set-Up

A flat surface approximately 3 feet by 3 feet is necessary to set-up the gas chromatograph and supporting equipment. The nitrogen cylinder should be secured in an upright or horizontal position ot in a mobile tank rack. Connect the nitrogen to the instrument using clean copper tubing.



10.2 System Start-Up – Instrument

Open the valve on the nitrogen carrier gas and insure that no leaks are detected. Let the nitrogen run for approximately 5 minutes to flush all air out of the columns and detector bodies. Load the Peaksimple program into the compute. Turn on the GC and check to make sure the carrier flow is within acceptable range.

The recommended GC conditions are:

Initial temp: 60 to 90 C Program rate: Isothermal Injection temp: 125 C ECD Detector temp: 250 C PID Detector temp: 120 C

Turn on the PID lamp and allow the PID and ECD to stabilize. Determine when stable by monitoring the baseline detector voltages on the Peaksimple software. PID voltage should be less than 20 mV and stable. ECD voltage should be less than 500 mV and stable. This may take up to 1 hour. The system is now ready for operation.

10.3 <u>System Calibration</u>

Prior to performing analyses, the GC must be calibrated to ensure system accuracy. To calibrate the GC, standards that were prepared in section 5.3 are injected into the GC and analyzed. A minimum of 3 concentration levels are to be used to generate the calibration curve for each analyte. The end result is a calibration curve for each analyte on each detector. The linearity of the calibration curve is to be evaluated per section 11.1

10.4 Daily Continuing Calibration Verification (CCV)

Once an acceptable calibration curve is generated for all analytes to be reported, this curve can be used to analyze client samples as long as it is still valid. To determine if a curve is still valid, a mid-point standard is analyzed at a regular interval and the percent difference (drift) of each analyte is calculated using the following equation:

$$\% D = C_E - C_C / C_E * 100$$

Where: $C_{E = Expected}$ Analyte Concentration of CCV $C_{C = Determined}$ Analyte Concentration of CCV

See section 11.2 for CCV criteria and corrective actions.



10.5 Blanks

Once the calibration is verified as valid, a method blank is to be analyzed. This is performed by injecting clean air into the sample loop and analyzing per the method. The blank must meet criteria set in section 11.3.

10.6 Samples

Once an acceptable blank is analyzed, sample analysis can proceed. All samples are to be analyzed under the same analytical conditions as the standards and blanks. Samples are to be evaluated according to criteria set forth in section 11.4.

11.0 Quality Assurance and Quality Control

Quality Assurance (QA) and Quality Control (QC) are a set of procedures and conditions implemented to assure data produced are of known and proven quality. The procedures are also designed to maximize the precision and accuracy of the analytical process. QA/QC is a continuous process requiring verification by inspection and, if necessary, appropriate corrective action. Listed below are key items used to insure proper QA/QC.

11.1 <u>Initial Calibration (ICAL)</u>

The computer will construct the calibration "curve" according to one of several methods. Among these are (a) straight line, (b) straight line through origin, (c) point to point, (d) quadratic. For the PID detector, the recommended curve is either method (a) or (b). For the ECD, method (c) is used due to the small linear range of the ECD detector.

Area counts from each calibration standard are inputted into an Excel spreadsheet template (svfixed.xls) which is in the laboratory. The spreadsheet computes the response factor (RF) for each standard, the average response factor for all the standards, the standard deviation (SD) of the response factors, and the % RSD as:

$$%RSD = SD/ave RF*100$$

If the %RSD is less than or equal to 30%, the values are inputted into the Peaksimple software and used for quantitation. If the %RSD is greater than 30%, a new ICAL is performed.

All calibrations are to be reviewed and approved by the laboratory director or QAO before use on client samples.

Hardcopy outputs of the chromatograms are to be saved and kept with the instrument throughout the lifetime of the ICAL. The hardcopy output should list the method used to





generate the ICAL curve. The ICAL is considered valid until the continuing calibration fails or a major change in the instrument operating condition occurs.

11.2 <u>Continuing Calibration (CCAL)</u>

The calibration of the instrument is checked prior to running samples weekly. The continuing calibration (CCAL) or continuing calibration verification (CCV) checks the validity of the ICAL. Normally a standard corresponding to the midpoint of the calibration curve is chosen. Response of the compounds of interest must be within 35% of the calibrated amount for the curve to be valid.

Corrective Action: Reprepare and/or reanalyze the CCV standard. If failure is confirmed, perform a new ICAL.

11.3 Blanks

Method blanks are performed at least daily, and typically every sequence, by drawing clean air through the sampling equipment and analyzing. These blanks verify all components of the sampling and analytical system are free of contamination. Additional blanks are recommended immediately after any high concentration samples. The results of all blank analyses are recorded in the data tables. If a contaminant is found, the source of contamination must be investigated and measures taken to correct, minimize or eliminate the blank if above the reporting limit.

11.4 Sample Duplicates and Replicates

A sample replicate is a sample that is collected as soon as possible after the original sample was collected from that same location. A sample duplicate is a repeat analysis of the same sample. Sample replicates can be performed with the system by repeating the analysis of the same sample location. Sample duplicates can not be performed with the system. Replicate results are evaluated against the original sample results by calculating the Relative Percent Difference (RPD). The RPD can be calculated using the following general equation:

$$RPD = \frac{C_S - C_D}{(C_S + C_D)/2} \times 100$$

Where.. C_S = Concentration of analyte in sample C_D = Concentration of analyte in replicate or duplicate

This RPD criterion is 30% or less.

Corrective Action: Recollect and reanalyze one more replicate.



12.0 Data and Records Management and Reports

Document control is the process by which the documentation associated with samples and sample data are tracked and monitored.

12.1 Reporting

The Data Package

For the continuous monitoring system, the data package will consist of the following in the order listed or as near as possible to that order:

- a) Daily summary files.
- b) An Excel file with data for all the sampling locations..

Final Report

The following information should be included in the lab report:

- Locations of the samples;
- Summary of the results;
- Description of the system as configured;
- Any deviations from the QA/QC requirements listed in this SOP.

After the final laboratory report is issued, the report will remain unchanged. Any amendments to the report will be made as separate reports and will include a statement of amendment or supplement to the original report. The Laboratory will notify the client promptly in writing of any defective measuring or validity problems with data.

The necessary steps to ensure the confidentiality of its report, by providing data only to the client by phone, e-mail or mail.

The Laboratory shall certify that the test results meet all the requirements of this SOP or shall provide a reasonable explanation as to why they do not.



13.0 Troubleshooting and Maintenance

If there are problems with instrumentation refer to the appropriate manual for troubleshooting options.

13.1 Preventive Maintenance

Preventive Maintenance (PM) is that set of procedures taken in an effort to assure that sample throughput is continued and that data quality is not degraded by system malfunctions. Although failure to perform preventive maintenance does not of itself produce poor quality data, the lack of such procedures may lead to earlier degradation of data and slower processing of samples.

This section treats PM in two sections: preparation and instrument PM.

13.1.1 Preparation PM

The primary area where preventable errors can enter throughout the preparation steps is the introduction of contamination. Preventive maintenance in the preparation steps primarily consists of baking and/or nitrogen flushing of the glass syringes before use.

If samples are suspected to be hot, the sample is to be diluted before it is to be analyzed to prevent contamination of the GC system

13.1.2 Instrument PM

There are five pieces of instrumentation involved in the analysis of volatile organics by GC/ECD/PID. They are the following:

- (1) The Gas Chromatograph and detectors
- (2) Sample Loop
- (3) The computer system

The Laboratory follows the manufacturer's recommendations on the Gas Chromatograph. Gas Chromatograph PM consists primarily of maintaining a full stock of consumable parts. Swagelok nuts, ferrules, septa, etc. allow the operator to repair, change worn parts quickly and to continue operation without loss of time. Tubing should be periodically inspected for cracks and possible leaks. Monitoring of the gas levels and rate of pressure loss may help discover problems.

The Computer system PM consists of keeping dust and dirt out of the components and backing up the data and methods as often as possible.



13.2 <u>Troubleshooting</u>

There are many problems that may occur during analyses. The following are the most frequent along with the suggested investigative steps:

13.2.1 Low sensitivity

Possible causes: Leaks or dirty PID lamp

Leaks can occur at the septa and at the analytical column connections. These are to be inspected and the septa and/or ferrules replaced if necessary. Remove and clean PID lamp. Replace and retest.

13.2.3 Poor peak shapes and tailing

Possible causes: Poor column installation or poor carrier flow

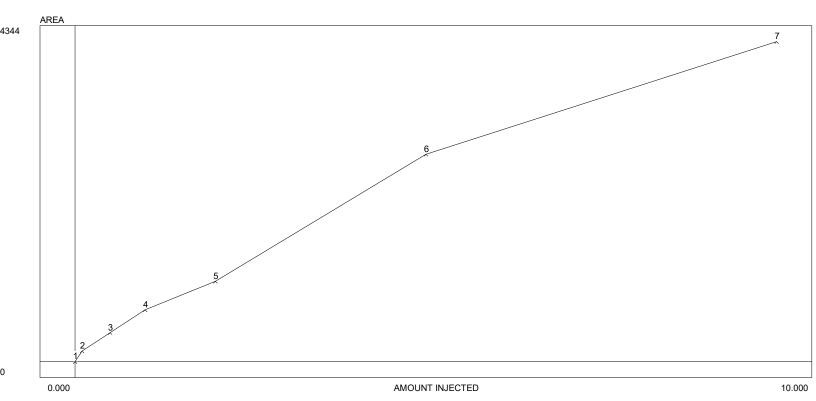
Reinstall column, check and adjust carrier flow and retest

13.2.4 Noise in one or both detector

Noise in the PID detector could suggest a leak or a loose wire to the PID detector. A leak detector can be used to find the source so that it can be corrected. If the noise is in both detectors, the ECD and the PID, the leak will be outside the gas chromatograph.

14.0 References

EPA TO-14ACompendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air Second Edition



Avg slope of curve: 656.05
Y-axis intercept: 0.00
Linearity: 0.46
Number of levels: 7
SD/rel SD of CF's: 428.3/67.3
Y=<multi-line>
r2: 1.0000
Last calibrated: Tue May 16.14

Last calibrated: Tue May 16 14:01:44 2023

Lvl. Area/ht. Amount		CF	Current	Previous #1Previous #2		
1	0.000	0.000	0.000	0.000	N/A	N/A
2	142.000	0.100	1420.000	142.000	N/A	N/A
3	393.000	0.500	786.000	393.000	N/A	N/A
4	704.000	1.000	704.000	704.000	N/A	N/A
5	1090.000	2.000	545.000	1090.000	N/A	N/A
6	2815.000	5.000	563.000	2815.000	N/A	N/A
7	4344.000	10.000	434.400	4344.000	N/A	N/A