Westwood

1 Systems Drive
Appleton, WI 54914

main (920) 735-6900

August 3, 2021

Karen Campoli
Hydrogeologist
Wisconsin Department of Natural Resources
2984 Shawano Avenue
Green Bay, Wisconsin 54313

Re: Site Status Update for Allyn Property, BRRTS ID #02-31-564071 – Westwood Project No. R3000291.00

Dear Ms. Campoli:

Westwood Infrastructure Inc (Westwood) is providing this site status update for the Allyn Property (BRRTS ID #02-31-564071) located at 111 Steele Street in Algoma, Wisconsin (Site). Westwood completed additional vapor sampling at the Site to continue to assess vapor conditions based on an agreed upon scope of work between the Wisconsin Department of Natural Resources (WDNR), client, and Westwood.

Background:

Mr. John Emery, Manager of the Allyn Property, directed Westwood to proceed with the WDNR requested vapor sampling at the site to obtain vapor samples in the bathrooms within the apartment complex at the Site, and the p-trap in one of the apartment bathrooms (reference Figure 1 – Location Map, attached). Samples were placed on June 1 and collected on 2, 2021. Previous vapor results were discussed in the *Site Status Update* letter dated March 3, 2021.

Work Conducted and Procedures:

On June 1, 2021 Westwood mobilized to the Site to place the vapor sampling equipment. While Westwood was onsite, Westwood observed the previously sealed floor cracks within the dry-cleaning room and office area. Westwood noted that the cracks appeared to be sealed and there was no evidence of leaks or new settling of the concrete were visible. Westwood also observed the pressure gauge on the vapor mitigation system. The pressure was observed to be at 0.1" water column (WC). During the communication testing event, the system was shut off during sub slab sampling and the gauge was observed at 0.0" WC. Westwood collected a total of four 24-hour indoor air samples, and one sanitary sample as described below. Westwood believed at that point the system did not have higher vacuum due to the short circuiting as a result of the cracks in the concrete.

One sanitary sample was obtained from the p-trap in the lower-level apartment (P-TRAP). Westwood attempted to insert tubing through the p-trap drain, however tubing would not bend past the p-trap. Therefore, Mr. Emery removed the p-trap from the sink and tubing was inserted directly into the drain pipe. Westwood then sealed the pipe with modeling putty and verified the seal by using a smoke pen. The tubing was connected to a 15-minute flow regulator and purged prior to sample collection. Once the tubing was purged, air flow to the vapor canister was engaged (reference Photo Log, attached).

One 24-hour indoor air canister was placed in the former dry-cleaners room (DC-1) on a folding table at a height of approximately 30-inches from ground surface. The door to the drycleaners room was closed during sample collection (reference Photo Log, attached).

Three 24-hour indoor air canisters were placed within the bathrooms of the apartment building (AB-1, AB-2, and AB-3). Each apartment contained one 24-hour indoor air sample. The vapor canister in the lower apartment was placed on the bathroom counter (AB-1) at a height of approximately 36-inches from ground surface. The 24-hour indoor air canisters in the upstairs apartments were placed on the back of the toilets (AB-2 and AB-3) at a height of approximately 36-inches. The tenants were asked to keep the bathroom doors closed while not in use and to limit the use any aerosols to outside of the bathroom (reference Photo Log, attached).

Prior to engaging the regulator, Westwood recorded the initial vacuum readings and sample collection time in order to compare against the vacuum readings at the end of the sample collection. Vapor canisters were stopped at pressures between four and two inches of mercury (Hg). The final time and pressures were recorded.

The vapor samples were delivered to Synergy Environmental Lab, Inc (Synergy) under standard chain of custody practices and analyzed for TO-15 volatile organic compounds (VOCs) (reference Table 1 – Vapor Analytical Table; and Laboratory Analytical Report, attached).

Results & Discussion:

In the June 2021 vapor test, there was an unintended deviation from the chlorinated volatile organic compound (CVOC) short list analytical sampling proposed, and the entire TO-15 spectrum was analyzed and reported. The following presents the results and discusses the potential reasoning for the limited exceedances outside of the CVOC results.

<u>June 2021 Vapor Results:</u>

The volatile organic compound VOC results were compared against the Wisconsin Residential Vapor Risk Screening Levels (WI VRSL) November 2017 update. The VOCs that were detected exceeding the WI VRSLs include acrolein, benzene, ethylbenzene, and naphthalene. Laboratory analytical results can be found in Table 1 – Vapor Analytical Results, attached.

Acrolein was detected in vapor samples AB-1 (1.74 micrograms per cubic meter (ug/m^3)), AB-2 (6.3 ug/m^3), AB-3 (ug/m^3), and DC-1 (2.04 ug/m^3) exceeding the WI VRSLs Industrial Vapor Action Limits (VALs).

Benzene was detected at DC-1 (9 ug/m^3) exceeding the WI VRSL Residential VALs.

Ethylbenzene was detected at DC-1 (13.7 ug/m^3) exceeding the WI VRSL Residential VALs.

Naphthalene was detected at AB-1 (0.89J ug/m^3), AB-2 (0.89J ug/m^3), and DC-1 (1.94 ug/m^3) exceeding the WI VRSL Residential VALs. However, naphthalene was J-flagged, and the results were not above the limit of quantification and should not be considered exceedances.

Discussion:

Acrolein was detected in all of the 24-hour samples (DC-1, AB-1, AB-2, and AB-3) collected at the Site exceeding the WI VRSL Industrial VALs. According to the Environmental Protection Agency, acrolein can be found in air from the burning of organic matter including tobacco, or from the burning of fuels such as gasoline or oil. Additionally, small amounts of acrolein may be found in some foods, such as fried foods, cooking oils, and roasted coffee (reference Acrolein EPA Hazard Summary, attached). Westwood contacted Synergy regarding the acrolein detected in the recent vapor samples and Mr. Ricker, the lab manager, informed Westwood that the acrolein detected was likely a due to a reaction when extracting the vapors for analysis. Based on a conversation with Mr. Mike Ricker, President of Synergy Environmental Laboratory, he believes that the acrolein is a result of a reaction of the other VOCs in the canister and the canister's lining (specifically acetone). He has seen this anomaly in approximately 30% of the TO-15 samples conducted and

does not believe that the acrolein numbers are truly representative of the actual vapor conditions in these samples. Acrolein is also not reported by many laboratories, citing the same reasons as Mr. Ricker. Additionally, a publication from AECOM titled "Problematic Compounds in Vapor Intrusion Investigations", written by Bart Eklund, states that "If 1,3-butadiene or acrolein are detected in soil gas samples, they generally should be assumed to be false positives." Westwood has also had numerous issues trying to pinpoint the nature of acrolein in vapor samples and believes that the compound should not be considered as an exceedance.

Benzene was detected at DC-1 exceeding the WI VRSL Residential VALs. According to the Wisconsin Department of Health Services (WDHS) and EPA, benzene is found in crude oil and is a major part of gasoline. However, benzene is also used to make plastics, resins, synthetic fibers, rubber lubricants, dyes, detergents, drugs, and pesticides. In homes, benzene is found in glues, adhesives, cleaning products, paint strippers, tobacco smoke, and gasoline (reference Benzene WDHS and EPA Hazard Summary, attached).

Ethylbenzene was detected at DC-1 exceeding the WI VRSL Residential VALs. According to the EPA, ethylbenzene is used as a solvent, as a constituent of asphalt. Ethylbenzene can also be found in household cleaning products, paints, gasoline, pesticides, solvents, glues, and tobacco smoke (reference Ethylbenzene EPA Hazard Summary, attached).

Naphthalene was detected at AB-1, AB-2, and DC-1 exceeding the WI VRSL Residential VALs. According to the EPA, naphthalene can be found through the use of mothballs, coal-tar production, wood preserving, tanning, ink/dye production, and tobacco smoke (reference Naphthalene EPA Hazard Summary, attached).

Most of the exceedances occurred at DC-1 located in the dry-cleaning room. Mr. Emery stores various chemicals in the dry-cleaning room and has knowledge of moth ball use within some of the clothes and personal belongings of the property owner. Based on the conversation with Mr. Emery, the chemicals, cleaners, and adhesives stored in the dry-cleaning room likely caused the benzene, ethylbenzene, and naphthalene exceedances detected at DC-1. It should also be noted that the dry-cleaning room is not a residential setting and is used for approximately 8-hours on one day per week.

Within the bathroom sampling, household chemicals were removed from the tenants bathrooms during the sampling event; however, the removed cleaning chemicals were placed in the hallways just outside of the bathrooms which doesn't necessarily completely isolate the variables of cleaning compounds.

Conclusion & Recommendation:

The vapor mitigation system was reading a 0.1" WC at the time of the vapor sampling and was confirmed at 0.0" WC during the communication testing event in January when the system was shut off. This result shows the vapor mitigation system is pulling vacuum; however, it does appear to be low compared to like systems. Although there is sub-slab communication throughout the building based on the previous communication testing event, Westwood believes the gauge readings are lower than normal and should likely be in the 0.5" – 1.75" WC area. Westwood recommends that the system installer be contacted to inspect the blower to verify optimal operation of the system.

Westwood believes the detected acrolein is a result of the chemical reaction during vapor analysis as Mr. Ricker mentioned above and does not recommend further testing for acrolein.

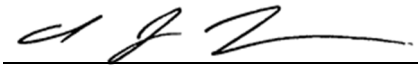
Westwood believes the benzene, ethylbenzene, and naphthalene (J-flagged) detected at DC-1 are due to the chemicals, adhesives, and cleaners which are stored within the dry-cleaning room. There is no recommendation for additional vapor investigation for TO-15 compounds outside of the chlorinated compounds.

Naphthalene detected at the Site was J-flagged, indicating the concentrations detected are below the laboratory limit of detection and the limit of quantification. Additionally, the naphthalene detected at the Site is likely due to the former use of mothballs at the Site.

The latest round of vapor sampling provided Westwood with pertinent data for the site. Based on the data, there does not appear to be a vapor intrusion concern related to the chlorinated solvents at the site.

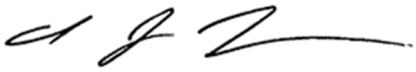
Certification:

"I, Christopher J. Rogers, hereby certify that I am a hydrogeologist as that term is defined in s. NR 712.03(1), Wis. Adm. Code, am registered in accordance with the requirements of ch. GHSS 2, Wis. Adm. Code, or licensed in accordance with the requirements of ch. GHSS 3, Wis. Adm. Code, and that, to the best of my knowledge, all of the information contained in this document is correct and the document was prepared in compliance with all applicable requirements in chs. NR 700 to 726, Wis. Adm. Code."

	Hydrogeologist/Project Manager	8/3/2021
Signature	Title	Date

Sincerely,

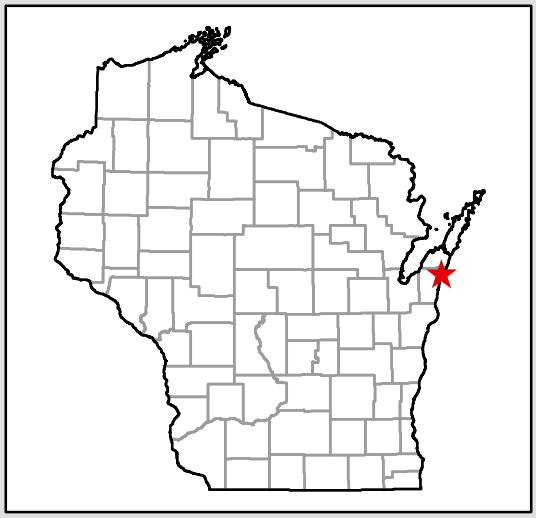
WESTWOOD INFRASTRUCTURE, INC.



Christopher J. Rogers, P.G.
Project Manager / Hydrogeologist

Attachments:
Figure 1 – Site Location Map
Figure 2 – Detailed Site Map
Table 1 – Vapor Analytical Table
Photo Log
Acrolein EPA Hazard Summary
Benzene WDHS and EPA Hazard Summary
Ethylbenzene EPA Hazard Summary
Naphthalene EPA Hazard Summary
Laboratory Analytical Results and Chain of Custody

cc: John Emery – via email



WDNR BRRTS #: 0231564071

Site Name: Allyn Property

Dec. Lat/Long: 44.60895, -87.43591

PLSS: NW 1/4 of SW 1/4 of S26, T25N, R25E

Westwood
1 Systems Drive
Appleton, WI 54914
(920) 735-6900
www.westwoodps.com

N
W E
S

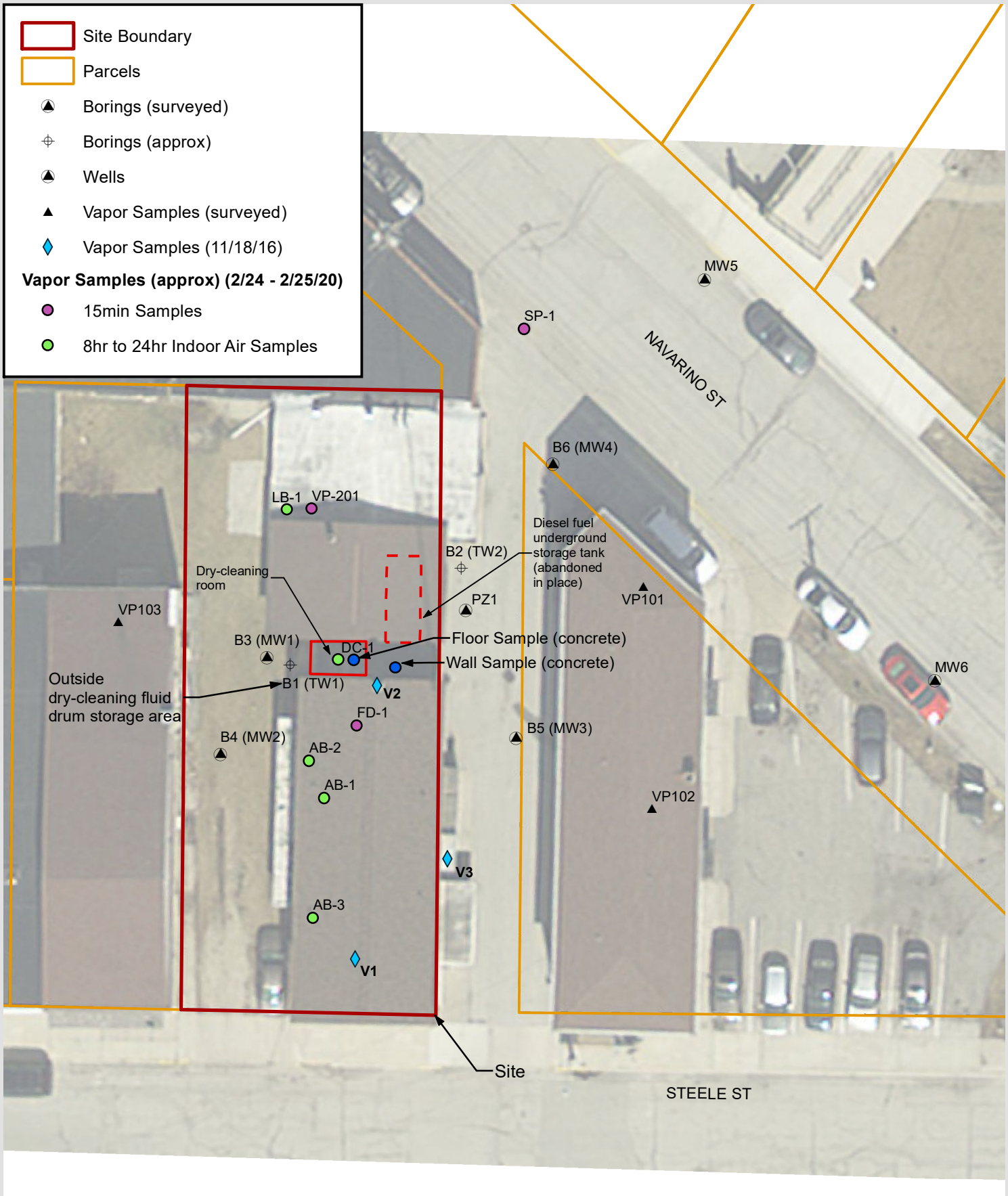
ALLYN PROPERTY INVESTIGATION

LOCATION MAP

111 STEELE STREET
CITY OF ALGOMA, KEWAUNEE COUNTY, WISCONSIN

Project Manager:	SCALE: As shown
Project Engineer:	
Drawn By: JMD	PROJECT NO. **R3000291.00**
Checked By:	
Date: 2/17/2021	FIGURE NO. **1**

F:\ENVIRO\N2162C15 (Allyn investigation)\Mob 1\GIS\LocationMap_210215.mxd
Printed: JMDeshaney 2/17/2021 9:55:51 AM



Westwood

1 Systems Drive
Appleton, WI 54914
(920) 735-6900
www.westwoodps.com

N W E S

ALLYN PROPERTY INVESTIGATION

DETAILED SITE MAP

111 STEELE STREET
CITY OF ALGOMA, KEWAUNEE COUNTY, WISCONSIN

Project Manager:	SCALE: 1 " = 25 '
Project Engineer:	
Drawn By: JMD	PROJECT NO. **R3000291.00**
Checked By:	
Date: 2/18/2021	FIGURE NO. **2**

F:\ENVIRO\N2162C15 (Allyn investigation)\Mob 1\GIS\DetailedSiteMap_210215.mxd
Printed: JMDeshaney 2/18/2021 10:29:50 AM

Allyn Property

BRRTS #02-31-564071

Table 1 - Vapor Analytical Results

Indoor Air Vapor Action Levels (VALs) (µg/m³)

Parameter	CAS	Wisconsin Indoor Air VALs			AB-1	AB-2	AB-3	DC-1
		Residential	Commercial	Industrial	*6/2/2021*	*6/2/2021*	*6/2/2021*	*6/2/2021*
1,1,1-Trichloroethane	71-55-6	5200	22000	22000	0.87	0.76 J	< 0.249	9.2
1,1,2,2-Tetrachloroethane	79-34-5	0.48	2.1	2.1	< 0.325	< 0.325	< 0.325	< 0.325
1,1,2-Trichloroethane	79-00-5	0.21	0.88	0.88	< 0.258	< 0.258	< 0.258	< 0.258
1,1-Dichloroethane	75-34-3	18	77	77	< 0.187	< 0.187	< 0.187	< 0.187
1,1-Dichloroethene	75-35-4	210	880	880	< 0.21	< 0.21	< 0.21	< 0.21
1,2,4-Trichlorobenzene	120-82-1	2.1	8.8	8.8	< 0.657	< 0.657	< 0.657	< 0.657
1,2,4-Trimethylbenzene	95-63-6	63	260	260	2.4	1.57	< 0.283	16.7
1,2-Dichlorobenzene	95-50-1	210	880	880	< 0.235	< 0.235	< 0.235	< 0.235
1,2-Dichloroethane	107-06-2	1.1	4.7	4.7	< 0.24	< 0.24	< 0.24	< 0.24
1,2-Dichloropropane	78-87-5	4.2	18	18	< 0.28	< 0.28	< 0.28	< 0.28
1,2-Dichlorotetrafluoroethane	76-14-2	--	--	--	< 0.446	< 0.446	< 0.446	< 0.446
1,3,5-Trimethylbenzene	108-67-8	63	260	260	0.59 J	0.39 J	< 0.232	4
1,3-Butadiene	106-99-0	0.94	4.1	4.1	< 0.143	< 0.143	< 0.143	< 0.143
1,3-Dichlorobenzene	541-73-1	--	--	--	< 0.302	< 0.302	< 0.302	< 0.302
1,4-Dichlorobenzene	106-46-7	2.6	11	11	< 0.302	0.36 J	< 0.302	< 0.302
1,4-Dioxane	123-91-1	5.6	25	25	< 0.157	< 0.157	< 0.157	< 0.157
2-Hexanone	591-78-6	31	130	130	< 0.222	< 0.222	< 0.222	< 0.222
4-Ethyltoluene	622-96-8	--	--	--	0.59 J	0.34 J	< 0.214	4.5
Acetone	67-64-1	32000	140000	140000	10.7	19.7	14.4	8.6
Acrolein	107-02-8	0.021	0.088	0.088	**1.74**	**6.3**	**0.94**	**2.04**
Benzene	71-43-2	3.6	16	16	1.4	1.44	0.32 J	**9**
Benzyl Chloride	100-44-7	0.57	2.5	2.5	< 0.209	< 0.209	< 0.209	< 0.209
Bromodichloromethane	75-27-4	0.76	3.3	3.3	< 0.374	< 0.374	< 0.374	< 0.374
Bromoform	75-25-2	26	110	110	< 0.414	< 0.414	< 0.414	< 0.414
Bromomethane	74-83-9	5.2	22	22	< 0.2	< 0.2	< 0.2	< 0.2
Carbon Disulfide	75-15-0	730	3100	3100	0.34 J	0.4 J	0.249 J	0.156 J
Carbon Tetrachloride	56-23-5	4.7	20	20	0.5 J	0.57 J	0.5 J	0.5 J
Chlorobenzene	108-90-7	52	220	220	< 0.251	< 0.251	< 0.251	< 0.251
Chloroethane	75-00-3	10000	44000	44000	< 0.159	< 0.159	< 0.159	< 0.159
Chloroform	67-66-3	1.2	5.3	5.3	0.49 J	0.34 J	0.34 J	0.83 J
Chloromethane	74-87-3	94	390	390	3.7	3.5	2.66	2.89
cis-1,2-Dichloroethene	156-59-2	--	--	--	< 0.197	< 0.197	< 0.197	< 0.197
cis-1,3-Dichloropropene	10061-01-5	--	--	--	< 0.234	< 0.234	< 0.234	< 0.234
Cyclohexane	110-82-7	6300	26000	26000	0.52 J	0.48 J	< 0.212	5.9
Dibromochloromethane	124-48-1	--	--	--	< 0.376	< 0.376	< 0.376	< 0.376
Dichlorodifluoromethane	75-71-8	100	440	440	2.03	2.22	2.18	2.37
EDB (1,2-Dibromoethane)	106-93-4	0.047	0.2	0.2	< 0.342	< 0.342	< 0.342	< 0.342
Ethanol	64-17-5	--	--	--	253	118	28	211
Ethyl Acetate	141-78-6	73	310	310	< 0.176	< 0.176	< 0.176	< 0.176
Ethylbenzene	100-41-4	11	49	49	1.78	1.3	0.65	**13.7**
Heptane	142-82-5	420	1800	1800	1.06	1.64	< 0.265	11.6
Hexachlorobutadiene	87-68-3	1.3	5.6	5.6	< 0.489	< 0.489	< 0.489	< 0.489
Hexane	110-54-3	730	3100	3100	7.7	8	4.5	39
Isopropyl Alcohol	67-63-0	210	880	880	9.5	10.2	12.2	20.6
m&p-Xylene	179601-23-1	--	--	--	6.4	4.1	1.65	53
Methyl ethyl ketone (MEK)	78-93-3	5200	22000	22000	2.92	3.6	1.09	4.6
Methyl isobutyl ketone (MIBK)	108-10-1	3100	13000	13000	0.65	0.57	0.49 J	0.53 J
Methyl Methacrylate	80-62-6	730	3100	3100	< 0.217	< 0.217	< 0.217	< 0.217
Methyl tert-butyl ether (MTBE)	1634-04-4	110	470	470	< 0.16	< 0.16	< 0.16	< 0.16
Methylene chloride	75-09-2	630	2600	2600	< 0.159	< 0.159	< 0.159	< 0.159
Naphthalene	91-20-3	0.83	3.6	3.6	**0.89 J**	**0.89 J**	< 0.675	**1.94 J**
o-Xylene	95-47-6	100	440	440	2.38	1.65	0.65 J	17.9
Propene	115-07-1	3100	13000	13000	< 0.079	< 0.079	< 0.079	< 0.079
Styrene	100-42-5	1000	4400	4400	0.298 J	0.55 J	< 0.181	0.255 J
Tetrachloroethene	127-18-4	42	180	180	0.61 J	0.48 J	< 0.278	1.43
Tetrahydrofuran	109-99-9	2100	8800	8800	< 0.131	< 0.131	< 0.131	< 0.131
Toluene	108-88-3	5200	22000	22000	25.2	18.7	1.66	241
trans-1,2-Dichloroethene	156-60-5	42	180	180	< 0.231	< 0.231	< 0.231	< 0.231
trans-1,3-Dichloropropene	10061-02-6	--	--	--	< 0.198	< 0.198	< 0.198	< 0.198
Trichloroethene (TCE)	79-01-6	2.1	8.8	8.8	< 0.237	< 0.237	< 0.237	< 0.237
Trichlorofluoromethane	75-69-4	--	--	--	2.08	1.8	1.35	1.85
Trichlorotrifluoroethane	76-13-1	5200	22000	22000	< 0.402	0.61 J	0.61 J	0.61 J
Vinyl acetate	108-05-4	210	880	880	< 0.203	< 0.203	< 0.203	< 0.203
Vinyl Chloride	75-01-4	1.7	28	28	< 0.148	< 0.148	< 0.148	< 0.148

BOLD entries indicate concentration detected above the WDNR Vapor Action Level (VAL).

All concentrations in micrograms per cubic meter of air (µg/m³).

J = Analyte detected between the limit of detection and limit of quantitation.

Residential VAL exceedance

Commercial VAL exceedance

Industrial VAL exceedance

VAL values based on EPA VISL data generated on 4/27/2021 using methodology on the WI DNR Vapor Quick Look-Up Table (11/2017).

Allyn Property

BRRTS #02-31-564071

Table 1 - Vapor Analytical Results

Sub-Slab Vapor Risk Screening Levels (VRSLs) (µg/m³)

Parameter	CAS	Wisconsin Sub-Slab VRSLs			P-TRAP
		Residential	Commercial	Industrial	*6/2/2021*
1,1,1-Trichloroethane	71-55-6	170000	730000	2200000	1.47
1,1,2,2-Tetrachloroethane	79-34-5	16	70	210	< 0.325
1,1,2-Trichloroethane	79-00-5	7	29	88	< 0.258
1,1-Dichloroethane	75-34-3	600	2600	7700	< 0.187
1,1-Dichloroethene	75-35-4	7000	29000	88000	< 0.21
1,2,4-Trichlorobenzene	120-82-1	70	290	880	< 0.657
1,2,4-Trimethylbenzene	95-63-6	2100	8700	26000	1.91
1,2-Dichlorobenzene	95-50-1	7000	29000	88000	< 0.235
1,2-Dichloroethane	107-06-2	37	160	470	< 0.24
1,2-Dichloropropane	78-87-5	140	600	1800	< 0.28
1,2-Dichlorotetrafluoroethane	76-14-2	--	--	--	< 0.446
1,3,5-Trimethylbenzene	108-67-8	2100	8700	26000	0.69 J
1,3-Butadiene	106-99-0	31	140	410	< 0.143
1,3-Dichlorobenzene	541-73-1	--	--	--	< 0.302
1,4-Dichlorobenzene	106-46-7	87	370	1100	< 0.302
1,4-Dioxane	123-91-1	190	830	2500	< 0.157
2-Hexanone	591-78-6	1000	4300	13000	< 0.222
4-Ethyltoluene	622-96-8	--	--	--	0.59 J
Acetone	67-64-1	1100000	4700000	14000000	14.3
Acrolein	107-02-8	0.7	2.9	8.8	< 0.094
Benzene	71-43-2	120	530	1600	1.53
Benzyl Chloride	100-44-7	19	83	250	< 0.209
Bromodichloromethane	75-27-4	25	110	330	5.3
Bromoform	75-25-2	870	3700	11000	0.52 J
Bromomethane	74-83-9	170	730	2200	< 0.2
Carbon Disulfide	75-15-0	24000	100000	310000	11.9
Carbon Tetrachloride	56-23-5	160	670	2000	0.38 J
Chlorobenzene	108-90-7	1700	7300	22000	< 0.251
Chloroethane	75-00-3	330000	1500000	4400000	1.29
Chloroform	67-66-3	40	180	530	13.4
Chloromethane	74-87-3	3100	13000	39000	4.7
cis-1,2-Dichloroethene	156-59-2	--	--	--	< 0.197
cis-1,3-Dichloropropene	10061-01-5	--	--	--	< 0.234
Cyclohexane	110-82-7	210000	870000	2600000	1
Dibromochloromethane	124-48-1	--	--	--	3.7
Dichlorodifluoromethane	75-71-8	3300	15000	44000	1.83
EDB (1,2-Dibromoethane)	106-93-4	1.6	6.7	20	< 0.342
Ethanol	64-17-5	--	--	--	64
Ethyl Acetate	141-78-6	2400	10000	31000	196
Ethylbenzene	100-41-4	370	1600	4900	2.12
Heptane	142-82-5	14000	60000	180000	16.6
Hexachlorobutadiene	87-68-3	43	190	560	< 0.489
Hexane	110-54-3	24000	100000	310000	9
Isopropyl Alcohol	67-63-0	7000	29000	88000	3.12
m&p-Xylene	179601-23-1	--	--	--	7.7
Methyl ethyl ketone (MEK)	78-93-3	170000	730000	2200000	5.6
Methyl isobutyl ketone (MIBK)	108-10-1	100000	430000	1300000	< 0.168
Methyl Methacrylate	80-62-6	24000	100000	310000	< 0.217
Methyl tert-butyl ether (MTBE)	1634-04-4	3700	16000	47000	< 0.16
Methylene chloride	75-09-2	21000	87000	260000	18.7
Naphthalene	91-20-3	28	120	360	0.84 J
o-Xylene	95-47-6	3300	15000	44000	2.69
Propene	115-07-1	100000	430000	1300000	< 0.079
Styrene	100-42-5	33000	150000	440000	0.6
Tetrachloroethene	127-18-4	1400	6000	18000	3.3
Tetrahydrofuran	109-99-9	70000	290000	880000	10.8
Toluene	108-88-3	170000	730000	2200000	36
trans-1,2-Dichloroethene	156-60-5	1400	6000	18000	< 0.231
trans-1,3-Dichloropropene	10061-02-6	--	--	--	< 0.198
Trichloroethene (TCE)	79-01-6	70	290	880	< 0.237
Trichlorofluoromethane	75-69-4	--	--	--	3.3
Trichlorotrifluoroethane	76-13-1	170000	730000	2200000	0.54 J
Vinyl acetate	108-05-4	7000	29000	88000	< 0.203
Vinyl Chloride	75-01-4	57	930	2800	< 0.148

BOLD entries indicate concentration detected above the WDNR Vapor Risk Screening Level (VRSL).

All concentrations in micrograms per cubic meter of air (µg/m³).

J = Analyte detected between the limit of detection and limit of quantitation.

VRSL values based on EPA VISL data generated on 4/27/2021 using methodology on the WI DNR Vapor Quick Look-Up Table (11/2017).

Residential VRSL exceedance

Commercial VRSL exceedance

Industrial VRSL exceedance

Photo Log

Site Location: Allyn's Property BRRTS #02-31-564071	
Photo # 1 **Date:** 6/1/2021 **Description:** Active vapor mitigation system U-tube reading indicating 0.1 WC.	
Site Location: Allyn's Property BRRTS #02-31-564071	
Photo # 2 **Date:** 6/1/2021 **Description:** Sealed cracks within the dry-cleaning room.	

Photo Log

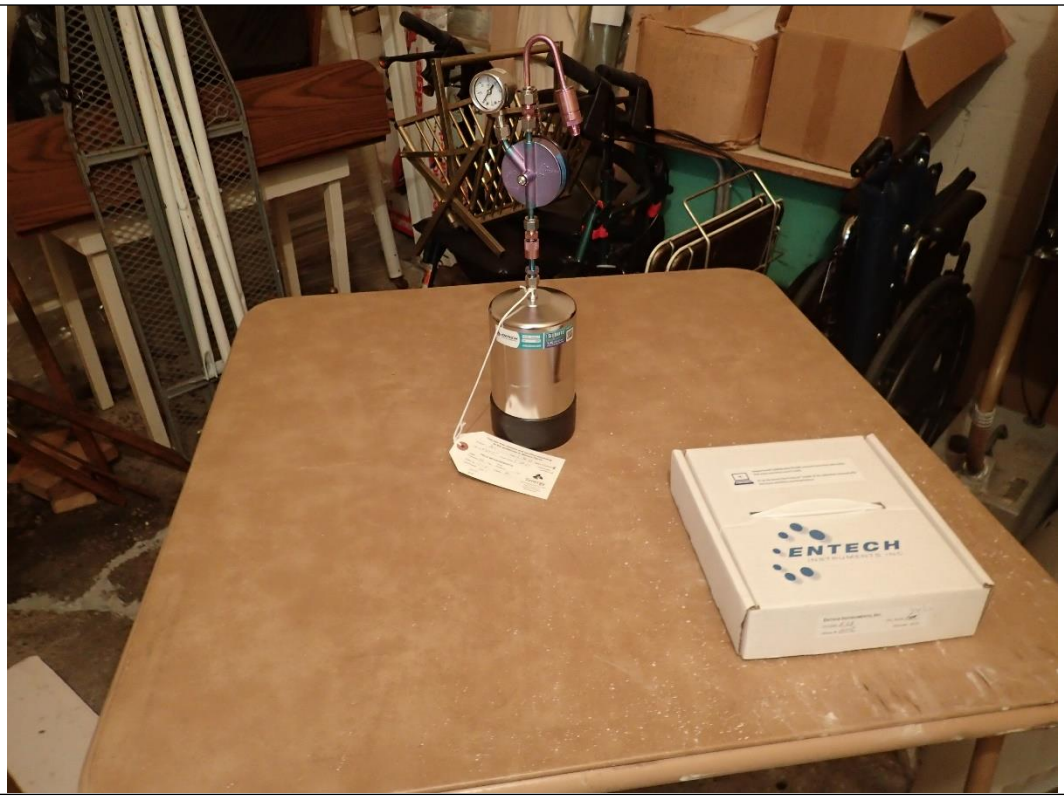
Site Location: Allyn's Property BRRTS #02-31-564071	
Photo # 3 **Date:** 6/1/2021 **Description:** Sealed cracks within the dry-cleaning room.	
Site Location: Allyn's Property BRRTS #02-31-564071	
Photo # 4 **Date:** 6/1/2021 **Description:** 24-hour indoor air vapor sample DC-1 in drycleaner room.	

Photo Log

Site Location: Allyn's Property BRRTS #02-31-564071	
Photo # 5 **Date:** 6/1/2021 **Description:** 24-hour indoor air vapor sample AB-2 in upper back apartment.	
Site Location: Allyn's Property BRRTS #02-31-564071	
Photo # 6 **Date:** 6/1/2021 **Description:** Household cosmetics withing the upper back apartment (AB-2). Household cleaning chemicals were removed from the shelves and placed outside the bathroom.	

Photo Log

Site Location: Allyn's Property BRRTS #02-31-564071	
Photo # 7 **Date:** 6/1/2021 **Description:** 24-hour indoor air vapor sample AB-3 in upper front apartment.	
Site Location: Allyn's Property BRRTS #02-31-564071	
Photo # 8 **Date:** 6/1/2021 **Description:** 24-hour indoor air vapor sample AB-1 in lower level apartment.	

Photo Log

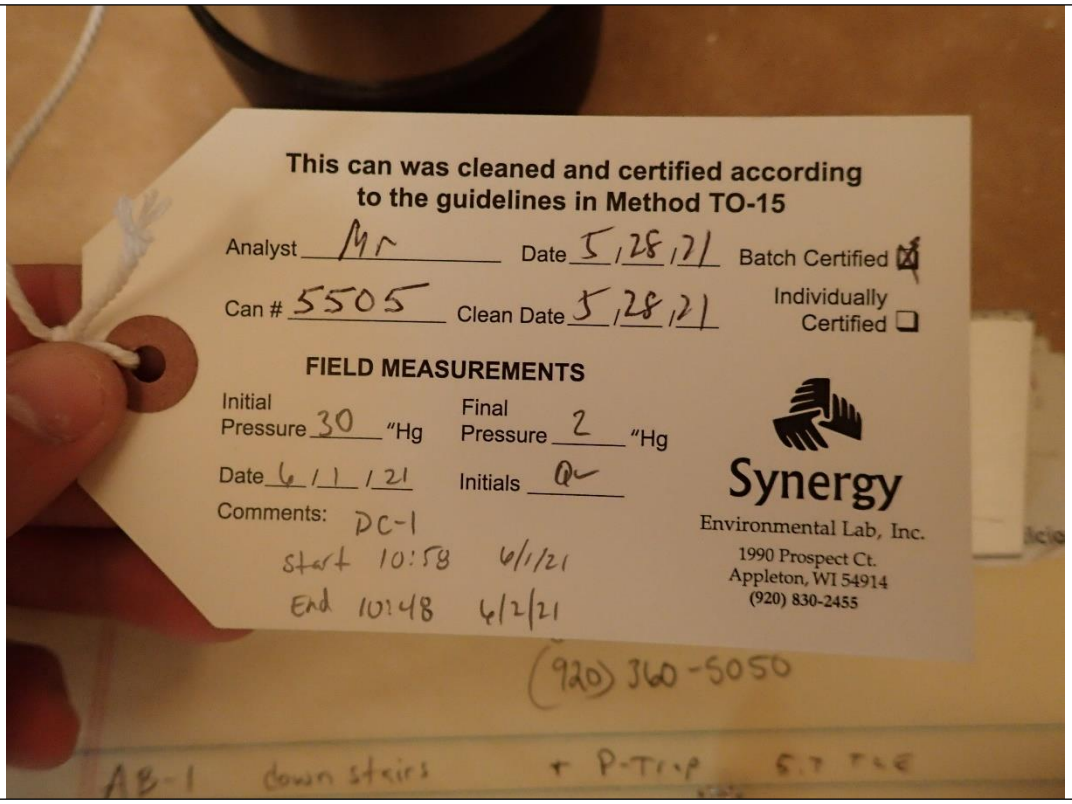
Site Location: Allyn's Property BRRTS #02-31-564071	
Photo # 9 **Date:** 6/1/2021 **Description:** 15-minute vapor sample P-TRAP from the lower level apartment p-trap. Tubing was inserted into the p-trap and sealed with puddy.	
Site Location: Allyn's Property BRRTS #02-31-564071	
Photo # 10 **Date:** 6/2/2021 **Description:** Vapor sample DC-1 sampling tag.	

Photo Log

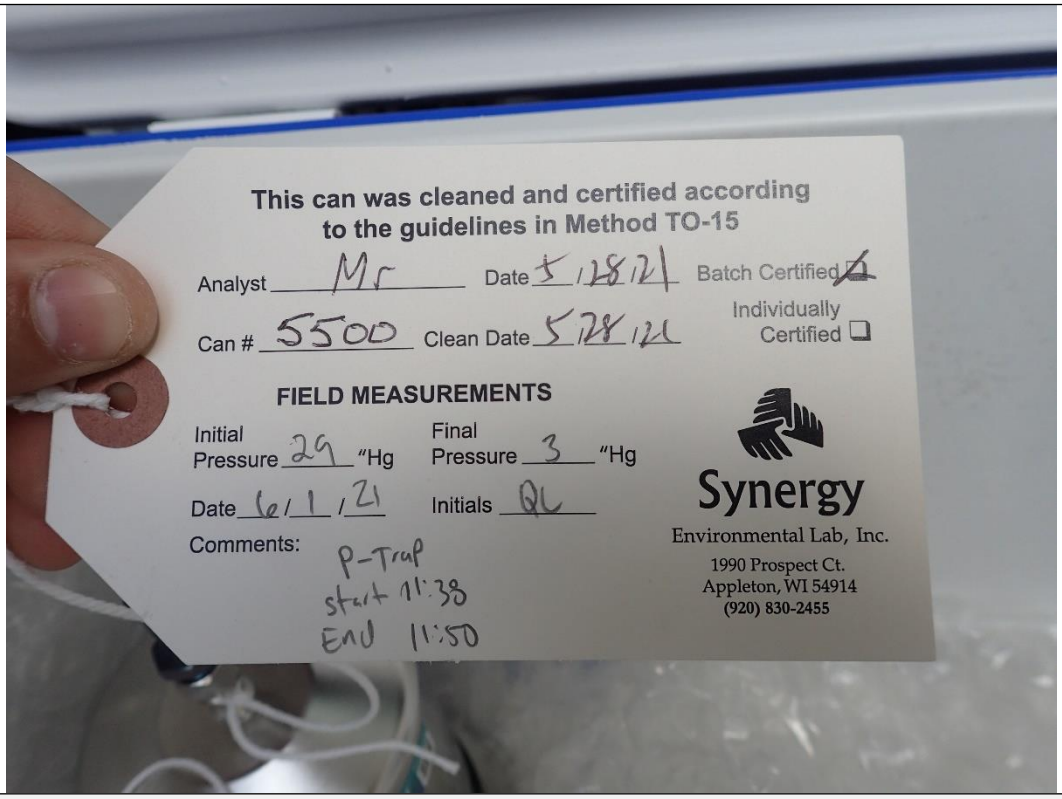
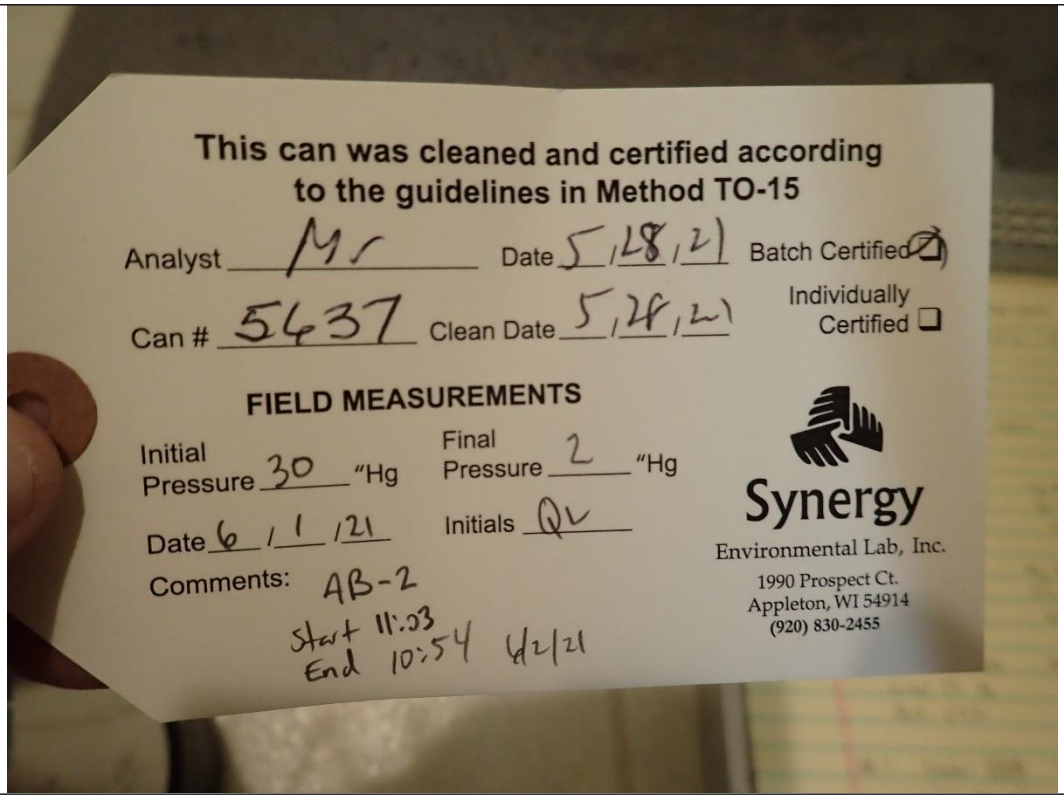
Site Location: Allyn's Property BRRTS #02-31-564071	
Photo # 11 **Date:** 6/2/2021 **Description:** Vapor sample P-TRAP sampling tag.	
Site Location: Allyn's Property BRRTS #02-31-564071	
Photo # 12 **Date:** 6/2/2021 **Description:** Vapor sample AB-2 sampling tag.	

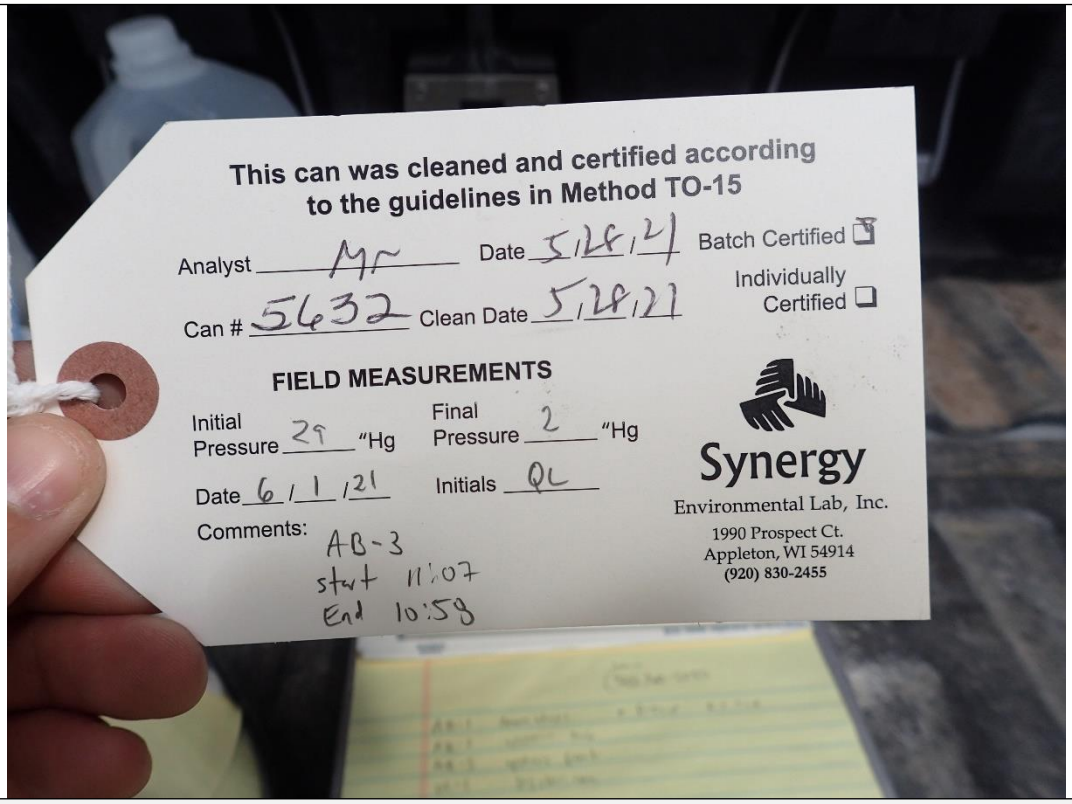
Photo Log

Site Location:
Allyn's Property BRRTS #02-31-564071

Photo #
13

Date:
6/2/2021

Description:
Vapor sample AB-3 sampling tag.

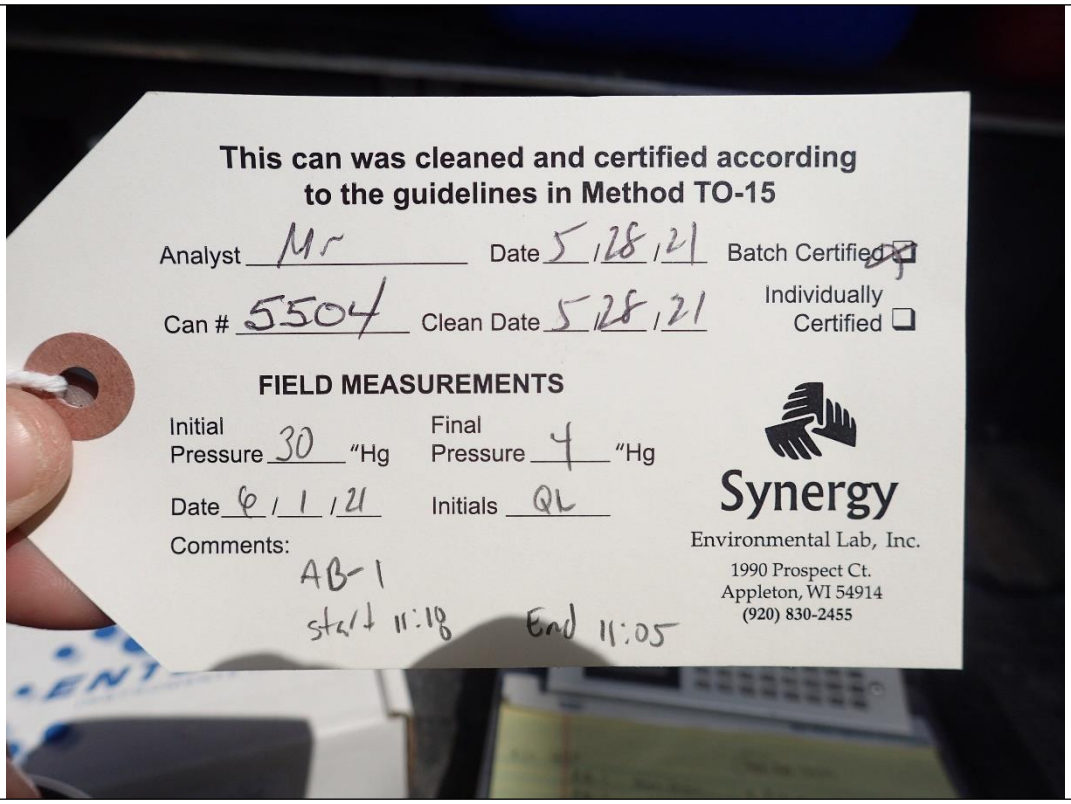


Site Location:
Allyn's Property BRRTS #02-31-564071

Photo #
14

Date:
6/2/2021

Description:
Vapor sample AB-1 sampling tag.



Acrolein

107-02-8

Hazard Summary

Acrolein is primarily used as an intermediate in the synthesis of acrylic acid and as a biocide. It may be formed from the breakdown of certain pollutants in outdoor air or from the burning of organic matter including tobacco, or fuels such as gasoline or oil. It is toxic to humans following inhalation, oral or dermal exposures. Acute (short-term) inhalation exposure may result in upper respiratory tract irritation and congestion. No information is available on its reproductive, developmental, or carcinogenic effects in humans, and the existing animal cancer data are considered inadequate to make a determination that acrolein is carcinogenic to humans.

Please Note: The main sources of information for this fact sheet are EPA's Integrated Risk Information System (IRIS) (2), which contains information on the chronic toxicity of inhaled acrolein and the RfC, and the Agency for Toxic Substances and Disease Registry's (ATSDR's) Toxicological Profile for Acrolein (1) which is the source of information on the acute toxicity and the MRL.

Uses

- The largest use for acrolein is as an intermediate in the synthesis of acrylic acid and as a biocide. (1)

Sources and Potential Exposure

- Acrolein may be formed from the breakdown of certain pollutants found in outdoor air, from the burning of organic matter including tobacco, or from the burning of fuels such as gasoline or oil. (1)
- Airborne exposure to acrolein may occur by breathing contaminated air, by smoking tobacco or by being in the proximity of someone who is smoking, by being near vehicle exhaust, or by being near oil- or coal-fired power plants. (1)
- Occupational exposure to acrolein could occur in industries that use acrolein to make other chemicals. (1)
- Average concentrations of acrolein measured in the ambient air in the U.S. ranged from non-detect to 2.05 micrograms per cubic meter in 2006-2009. The range of concentrations for individual 24-hour measurements may be appreciably higher. (6)
- Small amounts of acrolein may be found in some foods, such as fried foods, cooking oils, and roasted coffee. (1)
- Acrolein has not been detected in drinking water, and is not commonly found in surface water. (1)

Assessing Personal Exposure

- There are currently no simple tests available to determine personal exposure to acrolein. Acrolein or breakdown products of acrolein may be measured in blood or urine. (1)

Health Hazard Information

Acute Effects:

- Volunteers acutely exposed to increasing levels of acrolein for 10 to 60 minutes reported very slight eye irritation and "annoyance"/discomfort at 0.09 parts per million ([ppm], 0.2 milligrams per cubic meter), and nose/throat irritation and a decrease in respiratory rate at approximately 0.3 ppm (0.7 milligrams per cubic

meter).(1)

- The Agency for Toxic Substances and Disease Registry (ATSDR) has established an acute minimal reference level (MRL) of 0.003 ppm (0.007 milligrams per cubic meter) based on respiratory effects in humans. The ATSDR acute MRL is a daily human exposure concentration at or below which adverse health effects are not likely to occur given continuous (all day, every day) exposures of 1-14 days. MRLs are used by ATSDR health assessors and others as screening levels to identify and prioritize contaminants and potential health effects for further attention. MRLs are not intended to define clean up or action levels for ATSDR or other Agencies. (1)

Chronic Effects (Noncancer):

- The major effects from chronic (long-term) inhalation exposure to acrolein in humans and animals consist of general respiratory congestion and eye, nose, and throat irritation. (1,5)
- Acrolein is a strong dermal irritant with the eye being the most sensitive target for exposure. (1)
- Animal studies have reported that the respiratory system is the major target organ for acrolein toxicity. (1,2,5)
- The Reference Concentration (RfC) for acrolein is 0.00002 milligrams per cubic meter (mg/m^3) based on squamous metaplasia and neutrophilic infiltration of nasal epithelium in rats. The RfC is an estimate (with uncertainty spanning perhaps an order of magnitude) of a continuous inhalation exposure to the human population (including sensitive subgroups) that is likely to be without appreciable risk of deleterious noncancer effects during a lifetime. It is not a direct estimator of risk but rather a reference point to gauge the potential effects. At exposures increasingly greater than the RfC, the potential for adverse health effects increases. Lifetime exposure above the RfC does not imply that an adverse health effect would necessarily occur. (2)
- The Reference Dose (RfD) for acrolein is 0.0005 mg/kg-day based on decreased survival following oral exposures in an animal study. The RfD is defined similarly to the RfC except that the exposure is oral rather then by inhalation. (2)

Reproductive/Developmental Effects:

- No information is available on the reproductive effects of acrolein in humans. (1)
- In available reproductive animal studies, rats exposed to 0.55 to 4 ppm (1.3 - 9.2 milligrams per cubic meter) of acrolein by inhalation, showed no effects on the number of pregnancies, the number and weights of the fetuses, or the overall reproductive fitness of the animals. (1)
- No studies were located regarding developmental effects in humans or animals after inhalation exposure to acrolein. (1)

Cancer Risk:

- The potential carcinogenicity of acrolein cannot be determined because existing data are inadequate for an assessment of human carcinogenic potential for either the oral or inhalation routes of exposure. (2)

Physical Properties

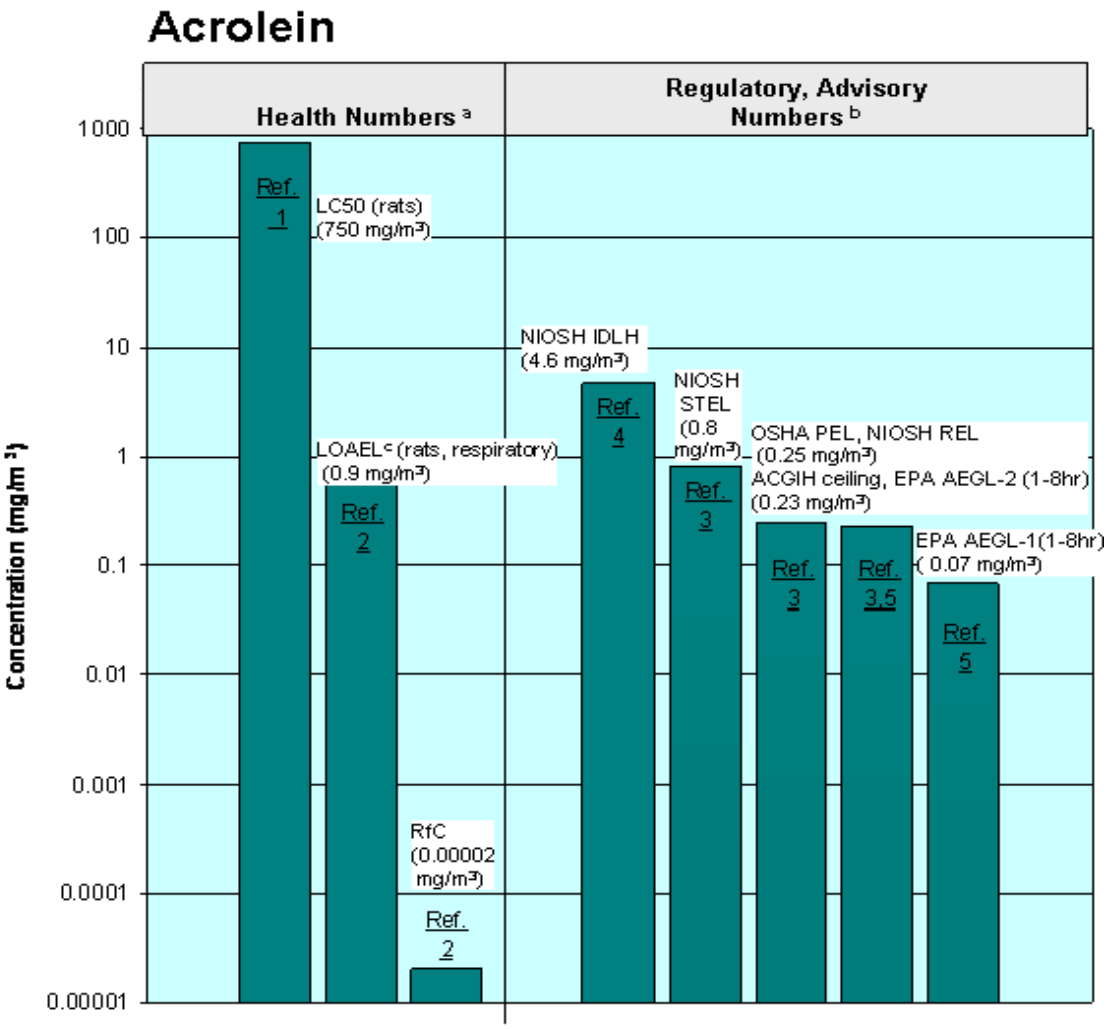
- Acrolein is a clear or yellow liquid with a burned, sweet, pungent odor that most people may begin to smell at air concentrations around 0.25 ppm (0.6 milligrams per cubic meter).(1)
- The chemical formula for acrolein is C_3H_4O and the molecular weight is 56.06 g/mol. (1)
- The vapor pressure for acrolein is 274 mm Hg at 25 °C, and its log octanol/water partition coefficient (log K_{ow}) is -0.01. (1)

Conversion Factors:

To convert concentrations in air (at 25°C) from ppm (parts per million) to mg/m^3 (milligrams per cubic

meter): mg/m^3 = (ppm) × (molecular weight of the compound)/(24.45).
For acrolein: 1 ppm = 2.29 mg/m^3.

Health Data from Inhalation Exposure



[a] Health numbers are toxicological numbers from animal testing or risk assessment values developed by EPA and/or ATSDR.

[b] Regulatory numbers are values that have been incorporated in Government regulations, while advisory numbers are nonregulatory values provided by the Government or other groups as advice. OSHA numbers are regulatory, whereas NIOSH, ACGIH, and AIHA numbers are advisory.

[c] This LOAEL is from the critical study used as the basis for the RfC.

EPA AEGL--EPA's acute exposure guideline levels. AEGL-1 is the maximum airborne concentration above which it is predicted that the general population, including susceptible individuals, could experience notable discomfort, irritation, or certain asymptomatic, non-sensory effects. AEGL-2 is the airborne concentration above which it is predicted that the general population, including susceptible individuals, could experience irreversible or serious, long-lasting adverse health effects or an impaired ability to escape exposure.

ACGIH ceiling--American Conference of Governmental and Industrial Hygienists' threshold limit value ceiling; the concentration of a substance that should not be exceeded during any part of the working exposure.

LC_{50} (Lethal Concentration $_{50}$)--A calculated concentration of a chemical in air to which exposure for a specific length of time is expected to cause death in 50% of a defined experimental animal population.

LOAEL--Lowest-observed-adverse-effect level.

RfC-- The RfC is an estimate (with uncertainty spanning perhaps an order of magnitude) of a continuous inhalation exposure to the human population (including sensitive subgroups) that is likely to be without appreciable risk of deleterious noncancer effects during a lifetime.

NIOSH IDLH --National Institute of Occupational Safety and Health's immediately dangerous to life or health limit; NIOSH recommended exposure limit to ensure that a worker can escape from an exposure condition that is likely to cause death or immediate or delayed permanent adverse health effects or prevent escape from the environment.

NIOSH REL --NIOSH's recommended exposure limit; NIOSH recommended exposure limit for an 8- or 10-h time-weighted average exposure and/or ceiling.

NIOSH STEL --NIOSH's short term exposure limit; NIOSH recommended exposure limit for a 15-minute period.

OSHA PEL --Occupational Safety and Health Administration's permissible exposure limit expressed as a time-weighted average; the concentration of a substance to which most workers can be exposed without adverse effect averaged over a normal 8-h workday or a 40-h workweek.

This factsheet was updated in September 2009 with newer health and regulatory values.

Summary created in April 1992, updated in September 2009.

References

1. Agency for Toxic Substances and Disease Registry (ATSDR). Toxicological Profile for Acrolein. Public Health Service, U.S. Department of Health and Human Services, Atlanta, GA. 2007.
2. U.S. Environmental Protection Agency. Integrated Risk Information System (IRIS) on Acrolein. National Center for Environmental Assessment, Office of Research and Development, Washington, D.C. 2003.
3. American Conference of Governmental Industrial Hygienists (ACGIH). Guide to Occupational Exposure Values. Cincinnati, OH. 2009.
4. National Institute for Occupational Safety and Health (NIOSH). Pocket Guide to Chemical Hazards. U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control and Prevention. Cincinnati, OH. 2005.
5. National Advisory Committee for Acute Exposure Guideline Levels for Hazardous Substances (NAC/AEG> Committee). 2006. Acrolein. Interim Acute Exposure Guideline Levels. For NAS/COT Subcommittee for AEGLs.
6. U.S. Environmental Protection Agency. Air Quality System (AQS) at https://www.epa.gov/aqs/.

WISCONSIN DEPARTMENT of HEALTH SERVICES

Benzene

Also known as: Benzol, Mineral Naphtha, Phenyl Hydride, Annulene
Chemical reference number (CAS): 71-43-2

Benzene is a widely used industrial chemical. Benzene is found in crude oil and is a major part of gasoline. It's used to make plastics, resins, synthetic fibers, rubber lubricants, dyes, detergents, drugs and pesticides. Benzene is produced naturally by volcanoes and forest fires.

In homes, benzene may be found in glues, adhesives, cleaning products, paint strippers, tobacco smoke and gasoline. Most benzene in the environment comes from our use of petroleum products.

Benzene quickly evaporates from water or soil. If benzene leaks from buried storage tanks or landfills, it can contaminate nearby drinking water wells. Benzene can move long distances in groundwater.

The most common way people are exposed to benzene is when they fill their car with gasoline. People are also exposed to benzene when they use household products that contain benzene.

Benzene evaporates quickly from contaminated water. People can be exposed to benzene if they use contaminated water to bathe, shower, wash dishes or do laundry.

What can I do to reduce my exposure?

When dispensing gasoline, avoid breathing the vapors.

Store gasoline in air-tight containers.

Do not dispense or handle gasoline in your home or garage.

Take containers and gasoline operated machinery outside, away from the house, when filling to allow for ventilation.

Benzene vapors are present in exhaust from many industries and automobiles. People who live near highways or industries can be exposed to benzene. People whose drinking water wells are located within half a mile of a leaking underground storage tank, may be exposed by drinking contaminated water.

Benzene can pass through the skin. Benzene exposure through skin contact with gasoline or other solvents is possible. People can also absorb benzene as they bathe or shower in contaminated water.

No standards exist for regulating the amount of benzene allowed in the air of homes. However, the Wisconsin Department of Natural Resources (DNR) has set a residential indoor air action level for benzene at 0.95 parts per billion by volume (ppbv). The action level is considered to be protective of public health. Breathing benzene for a lifetime at 0.95 ppbv is very unlikely to be harmful to people. If benzene concentrations in air are above the action level, we recommend taking an action to halt exposure.

You can smell benzene when the level reaches 5,000 ppbv. If you can smell the chemical, the level is too high to be safe.

The state and federal drinking water standards for benzene are both set at 5 parts per billion (ppb). We suggest you stop drinking water that contains more than 5 ppb of benzene. If the level of benzene in your water is higher than 100 ppb, you may also need to avoid washing, bathing or using the water for other purposes.

Drowsiness, headaches, and dizziness have been reported when people breathed air with benzene levels of more than 10 ppm (10,000 ppbv) for a short time.

- Long-term exposure to benzene can increase the risk of developing leukemia.
- Exposure to benzene can cause anemia and weaken the immune system.
- Animal studies show that inhaling benzene vapors can damage reproductive organs and cause infertility. Exposure to benzene in workplaces has caused menstrual variations.

Everyone's Reaction is Different

A person's reaction to chemicals depends on several things, including individual health, heredity, previous exposure to chemicals including medicines, and personal habits such as smoking or drinking. It's also important to consider the length of exposure to the chemical, the amount of chemical exposure, and whether the chemical was inhaled, touched, or eaten.

Benzene breaks down in the body to several other compounds. Those compounds can be found in the blood or urine of people who have been exposed to high levels of benzene within the past two days. Tests will prove an exposure to benzene occurred but will not predict the kind of illness that could result. We do not know what level of benzene break-down products are common in most people, since most people are regularly exposed to some amount of benzene.

People who think they have been exposed to benzene over a long period of time should contact their doctor. Physicians can use blood chemistry, liver function and kidney function tests.

Seek medical advice if you have any symptoms that you think may be related to chemical exposure.

Last Revised: November 20, 2018

Questions? Can't find what you're looking for? Contact us!

Benzene

71-43-2

Hazard Summary

Benzene is found in the air from emissions from burning coal and oil, gasoline service stations, and motor vehicle exhaust. Acute (short-term) inhalation exposure of humans to benzene may cause drowsiness, dizziness, headaches, as well as eye, skin, and respiratory tract irritation, and, at high levels, unconsciousness. Chronic (long-term) inhalation exposure has caused various disorders in the blood, including reduced numbers of red blood cells and aplastic anemia, in occupational settings. Reproductive effects have been reported for women exposed by inhalation to high levels, and adverse effects on the developing fetus have been observed in animal tests. Increased incidence of leukemia (cancer of the tissues that form white blood cells) have been observed in humans occupationally exposed to benzene. EPA has classified benzene as known human carcinogen for all routes of exposure.

Please Note: The main sources of information for this fact sheet are the Agency for Toxic Substances and Disease Registry's (ATSDR's) Toxicological Profile for Benzene (1) and EPA's Integrated Risk Information System (IRIS) (4), which contains information on the health effects of benzene including the unit cancer risk for inhalation exposure.

Uses

- Benzene is used as a constituent in motor fuels; as a solvent for fats, waxes, resins, oils, inks, paints, plastics, and rubber; in the extraction of oils from seeds and nuts; and in photogravure printing. It is also used as a chemical intermediate. Benzene is also used in the manufacture of detergents, explosives, pharmaceuticals, and dyestuffs. (1,2,6)

Sources and Potential Exposure

- Individuals employed in industries that manufacture or use benzene may be exposed to the highest levels of benzene. (1)
- Benzene is found in emissions from burning coal and oil, motor vehicle exhaust, and evaporation from gasoline service stations and in industrial solvents. These sources contribute to elevated levels of benzene in the ambient air, which may subsequently be breathed by the public. (1)
- Tobacco smoke contains benzene and accounts for nearly half the national exposure to benzene. (1)
- Individuals may also be exposed to benzene by consuming contaminated water. (1)

Assessing Personal Exposure

- Measurement of benzene in an individual's breath or blood or the measurement of breakdown products in the urine (phenol) can estimate personal exposure. However, the tests must be done shortly after exposure and are not helpful for measuring low levels of benzene. (1)

Health Hazard Information

Acute Effects:

- Coexposure to benzene with ethanol (e.g., alcoholic beverages) can increase benzene toxicity in humans. (1)

- Neurological symptoms of inhalation exposure to benzene include drowsiness, dizziness, headaches, and unconsciousness in humans. Ingestion of large amounts of benzene may result in vomiting, dizziness, and convulsions in humans. (1)
- Exposure to liquid and vapor may irritate the skin, eyes, and upper respiratory tract in humans. Redness and blisters may result from dermal exposure to benzene. (1,2)
- Animal studies show neurologic, immunologic, and hematologic effects from inhalation and oral exposure to benzene. (1)
- Tests involving acute exposure of rats, mice, rabbits, and guinea pigs have demonstrated benzene to have low acute toxicity from inhalation, moderate acute toxicity from ingestion, and low or moderate acute toxicity from dermal exposure. (3)
- The reference concentration for benzene is 0.03 mg/m3 based on hematological effects in humans. The RfC is an estimate (with uncertainty spanning perhaps an order of magnitude) of a continuous inhalation exposure to the human population (including sensitive groups) that is likely to be without appreciable risk deleterious noncancer effects over a lifetime. (4)

Chronic Effects (Noncancer):

- Chronic inhalation of certain levels of benzene causes disorders in the blood in humans. Benzene specifically affects bone marrow (the tissues that produce blood cells). Aplastic anemia (a risk factor for acute nonlymphocytic leukemia), excessive bleeding, and damage to the immune system (by changes in blood levels of antibodies and loss of white blood cells) may develop. (1)
- In animals, chronic inhalation and oral exposure to benzene produces the same effects as seen in humans. (1)
- Benzene causes both structural and numerical chromosomal aberrations in humans. (1)
- EPA has established an oral Reference Dose (RfD) for benzene of 0.004 milligrams per kilogram per day (mg/kg/d) based on hematological effects in humans. The RfD is an estimate (with uncertainty spanning perhaps an order of magnitude) of a daily oral exposure to the human population (including sensitive subgroups) that is likely to be without appreciable risk of deleterious noncancer effects during a lifetime. It is not a direct estimator of risk, but rather a reference point to gauge the potential for effects. At exposures increasingly greater than the RfD, the potential for adverse health effects increases. Lifetime exposure above the RfD does not imply that an adverse health effect would necessarily occur. (4)
- EPA has established a Reference Concentration (RfC) of 0.03 milligrams per cubic meter (0.03 mg/m3) for benzene based on hematological effects in humans. The RfC is an inhalation exposure concentration at or below which adverse health effects are not likely to occur. It is not a direct estimator of risk, but rather a reference point to gauge the potential for effects. At lifetime exposures increasingly greater than the reference exposure level, the potential for adverse health effects increases. (4)

Reproductive/Developmental Effects:

- There is some evidence from human epidemiological studies of reproductive and developmental toxicity of benzene, however the data do not provide conclusive evidence of a link between exposure and effect. (4) Animal studies have provided limited evidence that exposure to benzene may affect reproductive organs, however these effects were only observed at exposure levels over the maximum tolerated dose. (4)
- Adverse effects on the fetus, including low birth weight, delayed bone formation, and bone marrow damage, have been observed where pregnant animals were exposed to benzene by inhalation.(4)

Cancer Risk:

- Increased incidence of leukemia (cancer of the tissues that form white blood cells) has been observed in humans occupationally exposed to benzene. (1,4)
- EPA has classified benzene as a Group A, known human carcinogen. (4)
- EPA uses mathematical models, based on human and animal studies,to estimate the probability of a person developing cancer from breathing air containing a specified concentration of a chemical. EPA calculated a range of 2.2×10^{-6} to 7.8×10^{-6} as the increase in the lifetime risk of an individual who is continuously exposed to 1 µg/m3 of benzene in the air over their lifetime.

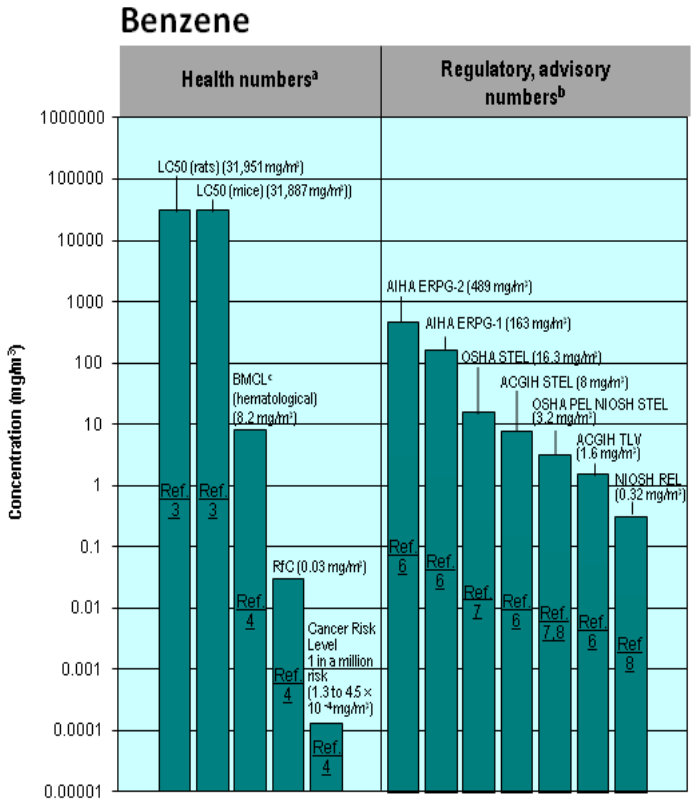
- EPA estimates that, if an individual were to continuously breathe the air containing benzene at an average of 0.13 to 0.45 µg/m^3 ($1.3x10^{-4}$ to $4.5x^{-4}$ mg/m^3) over his or her entire lifetime, that person would theoretically have no more than a one-in-a-million increased chance of developing cancer as a direct result of continuously breathing air containing this chemical. Similarly, EPA estimates that continuously breathing air containing 1.3 to 4.5 µg/m^3 ($1.3x10^{-3}$ to $4.5x10^{-3}$ mg/m^3) would result in not greater than a one-in-a-hundred thousand increased chance of developing cancer, and air containing 13 to 45 µg/m^3 (1.3×10^{-2} to 4.5×10^{-2} mg/m^3) would result in not greater than a one-in-ten thousand increased chance of developing cancer. For a detailed discussion of confidence in the potency estimates, please see IRIS.(4)
- EPA has calculated an oral cancer slope factor ranging from 1.5×10^{-2} to 5.5×10^{-2} $(mg/kg/d)^{-1}$ that is an extrapolation from inhalation dose-response data. (4)

Physical Properties

- The chemical formula for benzene is C_6H_6, and it has a molecular weight of 78.11 g/mol. 4) Benzene occurs as a volatile, colorless, highly flammable liquid that dissolves easily in water. (1,7)
- Benzene has a sweet odor with an ASTDR reported odor threshold of 1.5 ppm (5 mg/m^3).
- The vapor pressure for benzene is 95.2 mm Hg at 25 °C, and it has a log octanol/water partition coefficient (log Kow) of 2.13. (1)

Conversion Factors (only for the gaseous form):
To convert concentrations in air (at 25°C) from ppm to mg/m^3: mg/m^3 = (ppm) × (molecular weight of the compound)/(24.45). For benzene: 1 ppm = 3.19 mg/m^3. To convert concentrations in air from µg/m^3 to mg/m^3: mg/m^3 = (µg/m^3) × (1 mg/1,000 µg).

Health Data from Inhalation Exposure



ACGIH STEL--American Conference of Governmental and Industrial Hygienists' short-term exposure limit.
ACGIH TLV--American Conference of Governmental and Industrial Hygienists' threshold limit value expressed as a time-weighted average; the concentration of a substance to which most workers can be exposed without adverse effects.
AIHA ERPG--American Industrial Hygiene Association's emergency response planning guidelines. ERPG 1 is the maximum airborne concentration below which it is believed nearly all individuals could be exposed up to one hour without experiencing other than mild transient adverse health effects or perceiving a clearly defined objectionable odor; ERPG 2 is the maximum airborne concentration below which it is believed nearly all individuals could be exposed up to one hour without experiencing or developing irreversible or other serious health effects that could impair their abilities to take protective action. The American Industrial Hygiene Association's detection and recognition odor thresholds for benzene are 61 ppm and 97 ppm, respectively.
LC_{50} (Lethal Concentration$_{50}$)--A calculated concentration of a chemical in air to which exposure for a specific length of time is expected to cause death in 50% of a defined experimental animal population.
NIOSH REL--National Institute of Occupational Safety and Health's recommended exposure limit; NIOSH-recommended exposure limit for an 8- or 10-h time-weighted-average exposure and/or ceiling.
NIOSH STEL--NIOSH's short term exposure limit; NIOSH recommended exposure limit for a 15-minute period.
OSHA PEL--Occupational Safety and Health Administration's permissible exposure limit expressed as a time-weighted average; the concentration of a substance to which most workers can be exposed without adverse effect averaged over a normal 8-h workday or a 40-h workweek.
OSHA STEL--Occupational Safety and Health Administration's short-term exposure limit.
The health and regulatory values cited in this graph were obtained in April 2009.
[a]Health numbers are toxicological numbers from animal testing or risk assessment values developed by EPA.
[b]Regulatory numbers are values that have been incorporated in Government regulations, while advisory numbers

are nonregulatory values provided by the Government or other groups as advice. OSHA numbers are regulatory, whereas NIOSH, ACGIH, and AIHA numbers are advisory.

[c] The BMCL (statistical lower confidence limit on the concentration at the benchmark concentration, which is the concentration producing a specified change in a response rate that is considered a critical effect) was used as the point of departure for the RfC derivation. The BMCL for benzene is for hematological effects (reduction in absolute lymphocyte count) in humans (4).

Summary created in April 1992, updated in January 2000 and January 2012.

References

1. Agency for Toxic Substances and Disease Registry (ATSDR). Toxicological Profile for Benzene. U.S. Public Health Service, U.S. Department of Health and Human Services, Atlanta, GA. 2007.
2. M. Sittig. Handbook of Toxic and Hazardous Chemicals and Carcinogens. 2nd ed. Noyes Publications, Park Ridge, NJ. 1985.
3. U.S. Department of Health and Human Services. Registry of Toxic Effects of Chemical Substances (RTECS, online database). National Toxicology Information Program, National Library of Medicine, Bethesda, MD. 1993.
4. U.S. Environmental Protection Agency. Integrated Risk Information System (IRIS) on Benzene. National Center for Environmental Assessment, Office of Research and Development, Washington, DC. 2009.
5. California Environmental Protection Agency(CalEPA). Air Toxics Hot Spots Program Risk Assessment Guidelines: Part III. Technical Support Document for the Determination of Noncancer Chronic Reference Exposure Levels. SRP Draft. Office of Environmental Health Hazard Assessment, Berkeley, CA. 1999.
6. The Merck Index.An Encyclopedia of Chemicals, Drugs, and Biologicals. 11th ed. Ed. S. Budavari. Merck and Co. Inc., Rahway, NJ. 1989.
7. American Conference of Governmental Industrial Hygienists (ACGIH). 1999 TLVs and BEIs. Threshold Limit Values for Chemical Substances and Physical Agents. Biological Exposure Indices. Cincinnati, OH. 1999.
8. 8. Occupational Safety and Health Administration (OSHA). Occupational Safety and Health Standards, Toxic and Hazardous Substances. Code of Federal Regulations. 29 CFR 1910.1000. 1998.
9. National Institute for Occupational Safety and Health (NIOSH). Pocket Guide to Chemical Hazards. U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control and Prevention. Cincinnati, OH. 1997.

Ethylbenzene

100-41-4

Hazard Summary

Ethylbenzene is mainly used in the manufacture of styrene. Acute (short-term) exposure to ethylbenzene in humans results in respiratory effects, such as throat irritation and chest constriction, irritation of the eyes, and neurological effects such as dizziness. Chronic (long-term) exposure to ethylbenzene by inhalation in humans has shown conflicting results regarding its effects on the blood. Animal studies have reported effects on the blood, liver, and kidneys from chronic inhalation exposure to ethylbenzene. Limited information is available on the carcinogenic effects of ethylbenzene in humans. In a study by the National Toxicology Program (NTP), exposure to ethylbenzene by inhalation resulted in an increased incidence of kidney and testicular tumors in rats, and lung and liver tumors in mice. EPA has classified ethylbenzene as a Group D, not classifiable as to human carcinogenicity.

Please Note: The main sources of information for this fact sheet are EPA's Integrated Risk Information System (IRIS) (5), which contains information on inhalation and oral chronic toxicity of ethylbenzene and the RfC, and oral chronic toxicity and the RfD, and the Agency for Toxic Substances and Disease Registry's (ATSDR's) Toxicological Profile for Ethylbenzene. (1)

Uses

- Ethylbenzene is used primarily in the production of styrene. It is also used as a solvent, as a constituent of asphalt and naphtha, and in fuels. (1)

Sources and Potential Exposure

- In one study, ethylbenzene was detected in urban air at a median concentration of 0.62 parts per billion (ppb). The median level in suburban air was about 0.62 ppb, while the mean level measured in air in rural locations was about 0.13 ppb. (1)
- Ethylbenzene has been detected in indoor air at mean concentrations of approximately 1 ppb. The indoor levels tend to be higher than the ambient levels, due to the use of household products such as cleaning products or paints. (1)
- Occupational exposure to ethylbenzene occurs in factories that use ethylbenzene to produce other chemicals; for gas and oil workers; and for varnish workers, spray painters, and persons involved in gluing operations. (1)
- Exposure to ethylbenzene occurs from the use of consumer products, gasoline, pesticides, solvents, carpet glues, varnishes, paints, and tobacco smoke. (1)

Assessing Personal Exposure

- Laboratory tests can determine ethylbenzene exposure by measuring the breakdown products in the urine. (1)

Health Hazard Information

Acute Effects:

- Respiratory effects, such as throat irritation and chest constriction, irritation of the eyes, and neurological effects such as dizziness, have been noted from acute inhalation exposure to ethylbenzene in humans. (1-3)
- Animal studies have reported central nervous system (CNS) toxicity; pulmonary effects; and effects on the liver, kidney, and eyes (irritation) from acute inhalation exposure to ethylbenzene. (1)
- Tests involving acute exposure of rats have shown ethylbenzene to have moderate toxicity from inhalation and oral exposure. (1,4)

Chronic Effects (Noncancer):

- Chronic exposure to ethylbenzene by inhalation in humans has shown conflicting results regarding its effects on the blood. In one study of workers occupationally exposed to ethylbenzene, effects on the blood were noted, while in another study, no adverse effects on the blood were seen. (1)
- In a 20-year study of humans occupationally exposed to ethylbenzene, no liver toxicity was noted. (1)
- Animal studies have reported effects on the blood, liver, and kidneys from chronic inhalation exposure to ethylbenzene. (1,3)
- The Reference Concentration (RfC) for ethylbenzene is 1 milligram per cubic meter (mg/m^3) based on developmental toxicity in rats and rabbits. The RfC is an estimate (with uncertainty spanning perhaps an order of magnitude) of a continuous inhalation exposure to the human population (including sensitive subgroups), that is likely to be without appreciable risk of deleterious noncancer effects during a lifetime. It is not a direct estimator of risk but rather a reference point to gauge the potential effects. At exposures increasingly greater than the RfC, the potential for adverse health effects increases. Lifetime exposure above the RfC does not imply that an adverse health effect would necessarily occur. (5)
- EPA has low confidence in the study on which the RfC was based because higher exposure levels may have provided more information on the potential for maternal toxicity and developmental effects; low confidence in the database because, although other studies have examined a variety of other endpoints (e.g., liver and lung), by histopathology in rats and mice, there are no chronic studies and no multigeneration developmental studies; and, consequently, low confidence in the RfC. (5)
- The Reference Dose (RfD) for ethylbenzene is 0.1 milligrams per kilogram body weight per day (mg/kg/d) based on liver and kidney toxicity in rats. (5)
- EPA has low confidence in the study on which the RfD was based because rats of only one sex were tested and the experiment was not of chronic duration; low confidence in the supporting database because other oral toxicity data were not found; and, consequently, low confidence in the RfD. (5)

Reproductive/Developmental Effects:

- No information is available on the developmental or reproductive effects of ethylbenzene in humans. (1)
- Animal studies have reported developmental effects, such as fetal resorptions, retardation of skeletal development, and an increased incidence of extra ribs in animals exposed to ethylbenzene via inhalation. (1,3,5)

Cancer Risk:

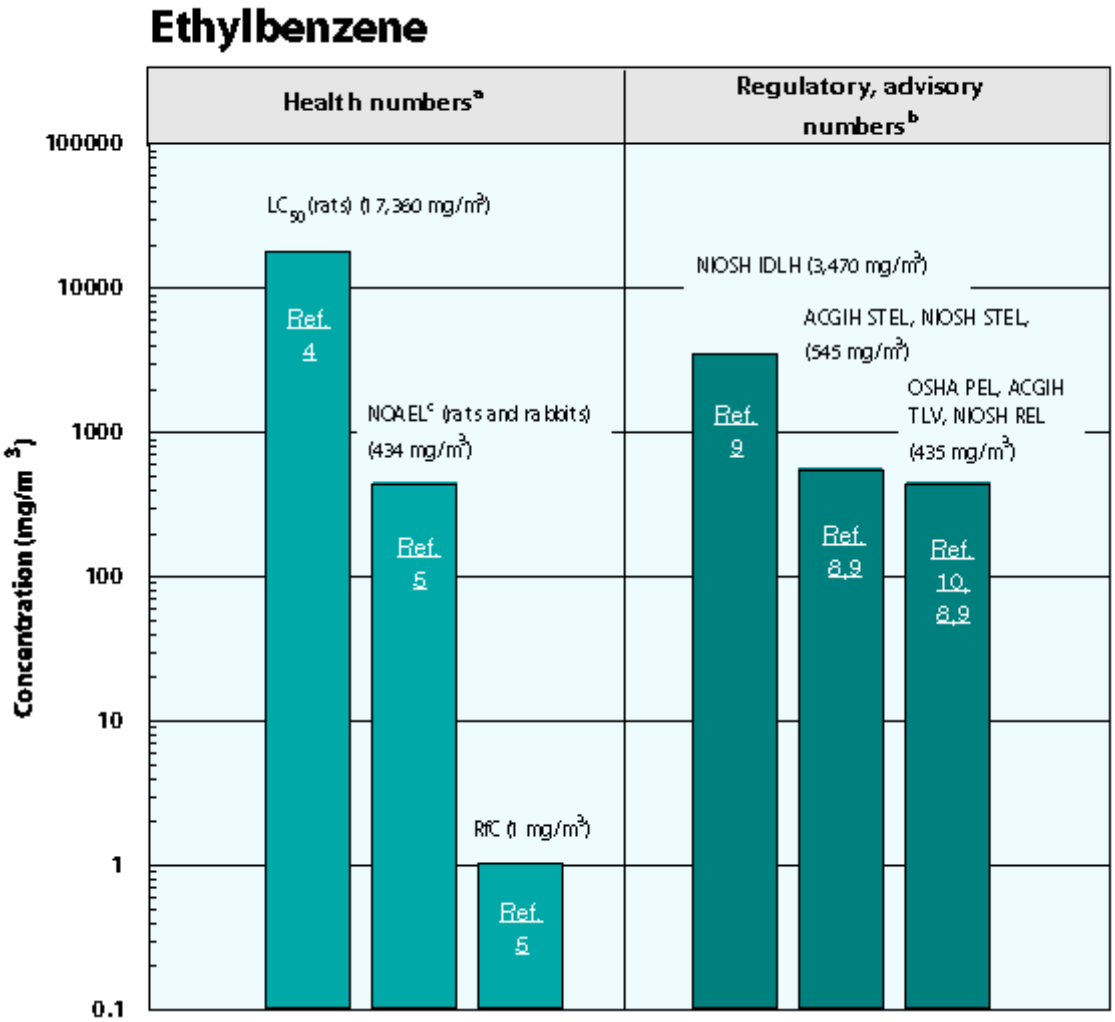
- The only available human cancer study monitored the conditions of workers exposed to ethylbenzene for 10 years, with no tumors reported. However, no firm conclusions can be made from this study because exposure information was not provided, and 10 years is insufficient for detecting long latency tumors in humans. (1)
- In a study by the NTP, exposure to ethylbenzene by inhalation resulted in a clearly increased incidence of kidney and testicular tumors in male rats, and a suggestive increase in kidney tumors in female rats, lung tumors in male mice, and liver tumors in female mice. (6)
- EPA has classified ethylbenzene as a Group D, not classifiable as to human carcinogenicity. (5)

Physical Properties

- Ethylbenzene is a colorless liquid that smells like gasoline. (1)
- The odor threshold for ethylbenzene is 2.3 parts per million (ppm). (7)
- The chemical formula for ethylbenzene is C_8H_{10}, and the molecular weight is 106.16 g/mol. (1)
- The vapor pressure for ethylbenzene is 9.53 mm Hg at 25 °C, and its octanol/water partition coefficient (log K_{ow}) is 3.13. (1)

Conversion Factors:
To convert concentrations in air (at 25 °C) from ppm to mg/m^3: mg/m^3 = (ppm) × (molecular weight of the compound)/(24.45). For ethylbenzene: 1 ppm = 4.34 mg/m^3.

Health Data from Inhalation Exposure



ACGIH STEL --American Conference of Governmental and Industrial Hygienist's threshold limit value short-term exposure limit; a 15-minute TWA exposure which should not be exceeded at any time during a workday.
ACGIH TLV -- ACGIH's threshold limit value expressed as a time-weighted average; the concentration of a substance to which most workers can be exposed without adverse effects.
LC_{50} (Lethal Concentration $_{50}$)--A calculated concentration of a chemical in air to which exposure for a specific length of time is expected to cause death in 50% of a defined experimental animal population.
NIOSH IDLH --National Institute of Occupational Safety and Health immediately dangerous to life and health; NIOSH concentration representing the maximum level of a pollutant from which an individual could escape within 30 minutes without escape-impairing symptoms or irreversible health effects.
NIOSH REL --NIOSH's recommended exposure limit; NIOSH-recommended exposure limit for an 8- or 10-h time-

weighted-average exposure and/or ceiling.
NIOSH STEL--NIOSH's recommended short-term exposure limit; a 15-minute TWA exposure which should not be exceeded at any time during a workday.
NOAEL--No-observed-adverse-effect level.
OSHA PEL--Occupational Safety and Health Administration's permissible exposure limit expressed as a time-weighted average; the concentration of a substance to which most workers can be exposed without adverse effect averaged over a normal 8-h workday or a 40-h workweek.
The health and regulatory values cited in this factsheet were obtained in December 1999.
[a] Health numbers are toxicological numbers from animal testing or risk assessment values developed by EPA.
[b] Regulatory numbers are values that have been incorporated in Government regulations, while advisory numbers are nonregulatory values provided by the Government or other groups as advice. OSHA numbers are regulatory, whereas NIOSH and ACGIH numbers are advisory.
[c] NOAEL is from the critical study used as the basis for the EPA RfC.

Summary created in April 1992, updated January 2000

References

1. Agency for Toxic Substances and Disease Registry (ATSDR). Toxicological Profile for Ethylbenzene (Update). Public Health Service, U.S. Department of Health and Human Services, Atlanta, GA. 1999.
2. E.J. Calabrese and E.M. Kenyon. Air Toxics and Risk Assessment. Lewis Publishers, Chelsea, MI. 1991.
3. U.S. Department of Health and Human Services. Hazardous Substances Data Bank (HSDB, online database). National Toxicology Information Program, National Library of Medicine, Bethesda, MD. 1993.
4. U.S. Department of Health and Human Services. Registry of Toxic Effects of Chemical Substances (RTECS, online database). National Toxicology Information Program, National Library of Medicine, Bethesda, MD. 1993.
5. U.S. Environmental Protection Agency. Integrated Risk Information System (IRIS) on Ethylbenzene. National Center for Environmental Assessment, Office of Research and Development, Washington, DC. 1999.
6. National Toxicology Program. Toxicology and Carcinogenesis Studies of Ethylbenzene (CAS No. 100-41-4) in F344/N Rats and B6C3F1 Mice (Inhalation Studies). TR No. 466. U.S. Department of Health and Human Services, Public Health Service, National Institutes of Health, Bethesda, MD. 1999.
7. J.E. Amoore and E. Hautala. Odor as an aid to chemical safety: Odor thresholds compared with threshold limit values and volatilities for 214 industrial chemicals in air and water dilution. Journal of Applied Toxicology, 3(6):272-290. 1983.
8. American Conference of Governmental Industrial Hygienists (ACGIH). 1999 TLVs and BEIs. Threshold Limit Values for Chemical Substances and Physical Agents. Biological Exposure Indices. Cincinnati, OH. 1999.
9. National Institute for Occupational Safety and Health (NIOSH). Pocket Guide to Chemical Hazards. U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control and Prevention. Cincinnati, OH. 1997.
10. Occupational Safety and Health Administration (OSHA). Occupational Safety and Health Standards, Toxic and Hazardous Substances. Code of Federal Regulations. 29 CFR 1910.1000. 1998.

Naphthalene

91-20-3

Hazard Summary

Naphthalene is used in the production of phthalic anhydride; it is also used in mothballs. Acute (short-term) exposure of humans to naphthalene by inhalation, ingestion, and dermal contact is associated with hemolytic anemia, damage to the liver, and neurological damage. Cataracts have also been reported in workers acutely exposed to naphthalene by inhalation and ingestion. Chronic (long-term) exposure of workers and rodents to naphthalene has been reported to cause cataracts and damage to the retina. Hemolytic anemia has been reported in infants born to mothers who "sniffed" and ingested naphthalene (as mothballs) during pregnancy. Available data are inadequate to establish a causal relationship between exposure to naphthalene and cancer in humans. EPA has classified naphthalene as a Group C, possible human carcinogen.

Please Note: The main sources of information for this fact sheet are the EPA's Toxicological Review of Naphthalene (7) and the Agency for Toxic Substances and Disease Registry's (ATSDR's) Toxicological Profile for Naphthalene. (1)

Uses

- The primary use for naphthalene is in the production of phthalic anhydride. However, o-xylene is replacing naphthalene as the preferred raw material for phthalic anhydride production. (1)
- Other uses of naphthalene include carbamate insecticides, surface active agents and resins, as a dye intermediate, as a synthetic tanning agent, as a moth repellent, and in miscellaneous organic chemicals. (1,2)

Sources and Potential Exposure

- Individuals may be exposed to naphthalene through the use of mothballs. (1)
- Workers may be occupationally exposed to naphthalene during its manufacture and use, especially in coal-tar production, wood preserving, tanning, or ink and dye production. (1)
- Naphthalene is released to the air from the burning of coal and oil and from the use of mothballs. Coal tar production, wood preserving, and other industries release small amounts. (1)
- Typical air concentrations of naphthalene in cities are about 0.18 parts per billion (ppb). (1)
- Naphthalene has also been detected in tobacco smoke. (1)

Assessing Personal Exposure

- Naphthalene or its breakdown products can be measured in fat, urine, and feces. These tests cannot be used to find out how much exposure occurred and require special equipment not routinely available in a doctor's office. (1)

Health Hazard Information

Acute Effects:

- Acute exposure of humans to naphthalene by inhalation, ingestion, and dermal contact is associated with hemolytic anemia, damage to the liver, and, in infants, neurological damage. Symptoms of acute exposure include headache, nausea, vomiting, diarrhea, malaise, confusion, anemia, jaundice, convulsions, and coma. (1,2,6,7)
- Cataracts have been reported in humans acutely exposed to naphthalene by inhalation and ingestion. Cataracts have also been reported in animals following acute oral exposure. (6,7,9)
- Tests involving acute exposure of rats, mice, rabbits, and guinea pigs have demonstrated naphthalene to have moderate to high acute toxicity from ingestion and low to moderate acute toxicity from dermal exposure. (3)

Chronic Effects (Noncancer):

- Chronic exposure of workers to naphthalene has been reported to cause cataracts and retinal hemorrhage. (2,4,5,6,7)
- Chronic inflammation of the lung, chronic nasal inflammation, hyperplasia of the respiratory epithelium in the nose, and metaplasia of the olfactory epithelium were reported in mice chronically exposed to naphthalene via inhalation. (1,6,7)
- Rats, rabbits, and mice chronically exposed to naphthalene via ingestion have developed cataracts and degeneration of the retina. (2,5,6,7)
- Diarrhea, lethargy, hunched posture, rough coats, decreased body weight, and lesions in the kidneys and thymus were observed in rats and mice chronically exposed via gavage (experimentally placing the chemical in the stomach). (2,6,7)
- EPA has calculated a Reference Concentration (RfC) of 0.003 milligrams per cubic meter (mg/m^3) for naphthalene based on nasal effects in mice. The RfC is an estimate (with uncertainty spanning perhaps an order of magnitude) of a continuous inhalation exposure to the human population (including sensitive subgroups) that is likely to be without appreciable risk of deleterious noncancer effects during a lifetime. It is not a direct estimator of risk but rather a reference point to gauge the potential effects. At exposures increasingly greater than the RfC, the potential for adverse health effects increases. Lifetime exposure above the RfC does not imply that an adverse health effect would necessarily occur. (6,7)
- EPA has medium confidence in the RfC based on: 1) medium confidence in the principal study because adequate numbers of animals were used, severity of nasal effects increased at higher exposure concentrations, high mortality, and hematological evaluation not conducted beyond 14 days; and 2) low to medium confidence in the database because there are no chronic or subchronic inhalation studies in other animal species and there are no reproductive or developmental inhalation studies. (6,7)
- The Reference Dose (RfD) for naphthalene is 0.02 milligrams per kilogram body weight per day (mg/kg/d) based on decreased body weight in male rats. (6,7)
- EPA has low confidence in the RfD based on: 1) high confidence in the principal study because adequate numbers of animals were included and experimental protocols were adequately designed, conducted, and reported; and 2) low confidence in the database because of the lack of adequate chronic oral data, dose-response data for hemolytic anemia, and two-generation reproductive toxicological studies. (6,7)

Reproductive/Developmental Effects:

- Hemolytic anemia has been reported in infants born to mothers who "sniffed" and ingested naphthalene (as mothballs) during pregnancy. The mothers themselves were anemic, but to a lesser extent than the infants. (5,6,7)
- Signs of maternal toxicity (e.g., decreased body weight and lethargy) but no fetal effects were reported in rats and rabbits exposed to naphthalene via gavage. (6,7)
- Maternal toxicity (increased mortality and reduced weight gain) and fetotoxicity (reduced number of live pups per litter) were observed in mice exposed via gavage. (2,6,7)

Cancer Risk:

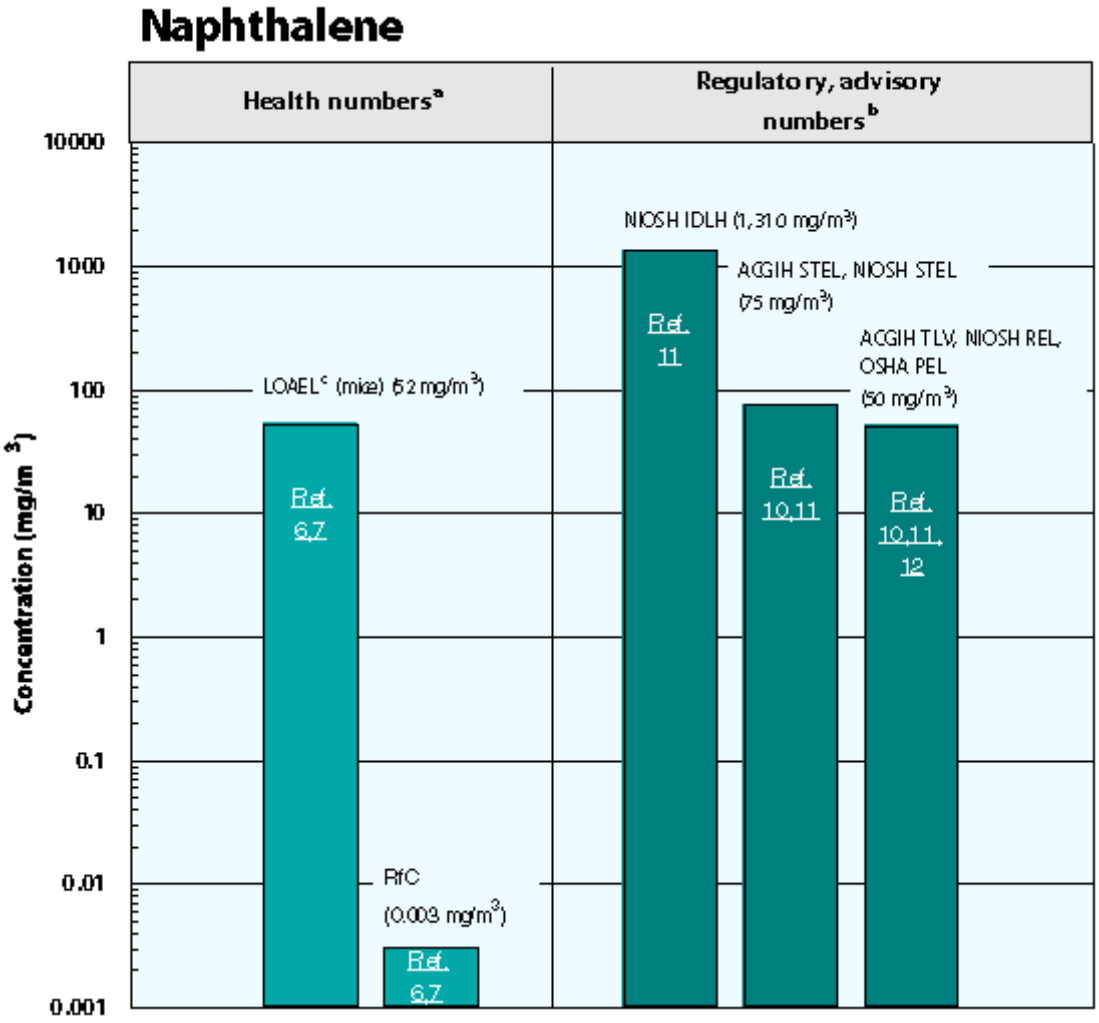
- Workers occupationally exposed to vapors of naphthalene and coal tar developed laryngeal carcinomas or neoplasms of the pylorus and cecum. However, this study is inadequate because there were no controls, exposure levels were not determined, and subjects were exposed to complex mixtures containing other demonstrated carcinogens. (2,5,6,7)
- Di-, tri-, and tetramethyl naphthalene contaminants of coal tar were found to be carcinogenic when applied to the skin of mice, but naphthalene alone was not. (2,5)
- An increased number of alveolar/bronchiolar adenomas and carcinomas were reported in female mice exposed by inhalation. (1,6,7)
- No carcinogenic responses were reported in rats exposed to naphthalene in their diet and by injection. (2,5,6)
- EPA has classified naphthalene as a Group C, possible human carcinogen. (6,7)

Physical Properties

- The chemical formula for naphthalene is $C_{10}H_8$, and its molecular weight is 128.19 g/mol. (1) Naphthalene
- occurs as a white solid or powderthat is insoluble in water. (1,8)
- Naphthalene has a strong, mothball odor, with an odor threshold of 0.44 mg/m^3 (0.084 parts per million, ppm). (1,9)
- The vapor pressure for naphthalene is 0.087 mm Hg at 25 °C, and its log octanol/water partition coefficient (log K_{ow}) is 3.29. (1)

Conversion Factors:
To convert concentrations in air (at 25 °C) from ppm to mg/m^3: mg/m^3 = (ppm) × (molecular weight of the compound)/(24.45). For naphthalene: 1 ppm = 5.24 mg/m^3.

Health Data from Inhalation Exposure



ACGIH TLV--American Conference of Governmental and Industrial Hygienists' threshold limit value expressed as a time-weighted average; the concentration of a substance to which most workers can be exposed without adverse effects.

ACGIH STEL--American Conference of Governmental and Industrial Hygienists' threshold limit value short-term exposure limit; a 15-minute TWA exposure which should not be exceeded at any time during a workday.

LOAEL--Lowest observed adverse effect level.

NIOSH REL--National Institute of Occupational Safety and Health's recommended exposure limit; NIOSH-recommended exposure limit for an 8- or 10-h time-weighted-average exposure and/or ceiling.

NIOSH IDLH -- NIOSH's immediately dangerous to life or health concentration; NIOSH recommended exposure limit to ensure that a worker can escape from an exposure condition that is likely to cause death or immediate or delayed permanent adverse health effects or prevent escape from the environment.

NIOSH STEL--NIOSH's recommended short-term exposure limit; a 15-minute TWA exposure which should not be exceeded at any time during a workday.

OSHA PEL--Occupational Safety and Health Administration's permissible exposure limit expressed as a time-weighted average; the concentration of a substance to which most workers can be exposed without adverse effect averaged over a normal 8-h workday or a 40-h workweek.

The health and regulatory values cited in this factsheet were obtained in December 1999.

[a] Health numbers are toxicological numbers from animal testing or risk assessment values developed by EPA.

[b] Regulatory numbers are values that have been incorporated in Government regulations, while advisory numbers are nonregulatory values provided by the Government or other groups as advice. OSHA numbers are regulatory, whereas NIOSH and ACGIH numbers are advisory.

[c] This LOAEL is from the critical study used as the basis for the EPA RfC.

References

Summary created in April 1992, updated in January 2000

1. Agency for Toxic Substances and Disease Registry (ATSDR). Toxicological Profile for Naphthalene (Update). Public Health Service, U.S. Department of Health and Human Services, Atlanta, GA. 1995.
2. U.S. Environmental Protection Agency. Health and Environmental Effects Profile for Naphthalene. EPA/600/x-86/241. Environmental Criteria and Assessment Office, Office of Health and Environmental Assessment, Office of Research and Development, Cincinnati, OH. 1986.
3. U.S. Department of Health and Human Services. Registry of Toxic Effects of Chemical Substances (RTECS, online database). National Toxicology Information Program, National Library of Medicine, Bethesda, MD. 1993.
4. U.S. Department of Health and Human Services. Hazardous Substances Data Bank (HSDB, online database). National Toxicology Information Program, National Library of Medicine, Bethesda, MD. 1993.
5. U.S. Environmental Protection Agency. Health Effects Assessment for Naphthalene. EPA/540/1-86/014. Environmental Criteria and Assessment Office, Office of Health and Environmental Assessment, Office of Research and Development, Cincinnati, OH. 1986.
6. U.S. Environmental Protection Agency. Integrated Risk Information System (IRIS) on Naphthalene. National Center for Environmental Assessment, Office of Research and Development, Washington, DC. 1999.
7. U.S. Environmental Protection Agency. Toxicological Review of Naphthalene (CAS No. 91-20-3) in Support of Summary Information on the Integrated Risk Information System (IRIS). National Center for Environmental Assessment, Cincinnati, OH. 1998.
8. The Merck Index. An Encyclopedia of Chemicals, Drugs, and Biologicals. 11th ed. Ed. S. Budavari. Merck and Co. Inc., Rahway, NJ. 1989.
9. J.E. Amoore and E. Hautala. Odor as an aid to chemical safety: Odor thresholds compared with threshold limit values and volatilities for 214 industrial chemicals in air and water dilution. Journal of Applied Toxicology, 3(6):272-290. 1983.
10. American Conference of Governmental Industrial Hygienists (ACGIH). 1999 TLVs and BEIs. Threshold Limit Values for Chemical Substances and Physical Agents. Biological Exposure Indices. Cincinnati, OH. 1999.
11. National Institute for Occupational Safety and Health (NIOSH). Pocket Guide to Chemical Hazards. U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control and Prevention. Cincinnati, OH. 1997.
12. Occupational Safety and Health Administration (OSHA). Occupational Safety and Health Standards, Toxic and Hazardous Substances. Code of Federal Regulations 29 CFR 1910.1000. 1998.

Synergy Environmental Lab, INC

1990 Prospect Ct., Appleton, WI 54914 *P 920-830-2455 * F 920-733-0631

CHRIS ROGERS
WESTWOOD PROFESSIONAL SERVICES
12701 WHITEWATER DRIVE
MINNETONKA, MN 55343

Report Date *11-Jun-21*

Project Name ALLYNS
Project # R3000291.00

Invoice # E39489

Lab Code 5039489A
Sample ID DC-1
Sample Matrix Air
Sample Date 6/2/2021

	Result	Unit	LOD	LOQ	Dil	Method	Ext Date	Run Date	Analyst	Code
Organic										
Air Samples										
Acetone	8.6	ug/m3	0.299	0.95	1	TO-15		6/3/2021	CJR	1
Acrolein	2.04	ug/m3	0.094	0.299	1	TO-15		6/3/2021	CJR	1
Benzene	9.0	ug/m3	0.136	0.433	1	TO-15		6/3/2021	CJR	1
Benzyl Chloride	< 0.209	ug/m3	0.209	0.665	1	TO-15		6/3/2021	CJR	1
Bromodichloromethane	< 0.374	ug/m3	0.374	1.19	1	TO-15		6/3/2021	CJR	1
Bromoform	< 0.414	ug/m3	0.414	1.32	1	TO-15		6/3/2021	CJR	1
Bromomethane	< 0.2	ug/m3	0.2	0.637	1	TO-15		6/3/2021	CJR	1
1,3-Butadiene	< 0.143	ug/m3	0.143	0.454	1	TO-15		6/3/2021	CJR	1
Carbon Disulfide	0.156 "J"	ug/m3	0.138	0.44	1	TO-15		6/3/2021	CJR	1
Carbon Tetrachloride	0.50 "J"	ug/m3	0.307	0.978	1	TO-15		6/3/2021	CJR	1
Chlorobenzene	< 0.251	ug/m3	0.251	0.798	1	TO-15		6/3/2021	CJR	1
Chloroethane	< 0.159	ug/m3	0.159	0.507	1	TO-15		6/3/2021	CJR	1
Chloroform	0.83 "J"	ug/m3	0.3	0.953	1	TO-15		6/3/2021	CJR	1
Chloromethane	2.89	ug/m3	0.831	2.64	1	TO-15		6/3/2021	CJR	1
Cyclohexane	5.9	ug/m3	0.212	0.674	1	TO-15		6/3/2021	CJR	1
Dibromochloromethane	< 0.376	ug/m3	0.376	1.2	1	TO-15		6/3/2021	CJR	1
1,4-Dichlorobenzene	< 0.302	ug/m3	0.302	0.96	1	TO-15		6/3/2021	CJR	1
1,3-Dichlorobenzene	< 0.302	ug/m3	0.302	0.96	1	TO-15		6/3/2021	CJR	1
1,2-Dichlorobenzene	< 0.235	ug/m3	0.235	0.749	1	TO-15		6/3/2021	CJR	1
Dichlorodifluoromethane	2.37	ug/m3	0.263	0.836	1	TO-15		6/3/2021	CJR	1
1,2-Dichloroethane	< 0.24	ug/m3	0.24	0.763	1	TO-15		6/3/2021	CJR	1
1,1-Dichloroethane	< 0.187	ug/m3	0.187	0.596	1	TO-15		6/3/2021	CJR	1
1,1-Dichloroethene	< 0.21	ug/m3	0.21	0.668	1	TO-15		6/3/2021	CJR	1
cis-1,2-Dichloroethene	< 0.197	ug/m3	0.197	0.626	1	TO-15		6/3/2021	CJR	1
trans-1,2-Dichloroethene	< 0.231	ug/m3	0.231	0.734	1	TO-15		6/3/2021	CJR	1

Project Name ALLYNS **Invoice #** E39489
Project # R3000291.00

Lab Code 5039489A
Sample ID DC-1
Sample Matrix Air
Sample Date 6/2/2021

	Result	Unit	LOD	LOQ	Dil	Method	Ext Date	Run Date	Analyst	Code
1,2-Dichloropropane	< 0.28	ug/m3	0.28	0.89	1	TO-15		6/3/2021	CJR	1
trans-1,3-Dichloropropene	< 0.198	ug/m3	0.198	0.63	1	TO-15		6/3/2021	CJR	1
cis-1,3-Dichloropropene	< 0.234	ug/m3	0.234	0.745	1	TO-15		6/3/2021	CJR	1
1,2-Dichlorotetrafluoroethane	< 0.446	ug/m3	0.446	1.42	1	TO-15		6/3/2021	CJR	1
1,4-Dioxane	< 0.157	ug/m3	0.157	0.5	1	TO-15		6/3/2021	CJR	1
EDB (1,2-Dibromoethane)	< 0.342	ug/m3	0.342	1.09	1	TO-15		6/3/2021	CJR	1
Ethanol	211	ug/m3	1.52	4.82	10	TO-15		6/4/2021	CJR	1
Ethyl Acetate	< 0.176	ug/m3	0.176	0.559	1	TO-15		6/3/2021	CJR	1
Ethylbenzene	13.7	ug/m3	0.203	0.645	1	TO-15		6/3/2021	CJR	1
4-Ethyltoluene	4.5	ug/m3	0.214	0.681	1	TO-15		6/3/2021	CJR	1
Heptane	11.6	ug/m3	0.265	0.845	1	TO-15		6/3/2021	CJR	1
Hexachlorobutadiene	< 0.489	ug/m3	0.489	1.56	1	TO-15		6/3/2021	CJR	1
Hexane	39	ug/m3	0.235	0.748	1	TO-15		6/3/2021	CJR	1
2-Hexanone	< 0.222	ug/m3	0.222	0.707	1	TO-15		6/3/2021	CJR	1
Isopropyl Alcohol	20.6	ug/m3	0.109	0.347	1	TO-15		6/3/2021	CJR	1
Methyl ethyl ketone (MEK)	4.6	ug/m3	0.178	0.567	1	TO-15		6/3/2021	CJR	1
Methyl isobutyl ketone (MIBK)	0.53 "J"	ug/m3	0.168	0.536	1	TO-15		6/3/2021	CJR	1
Methyl Methacrylate	< 0.217	ug/m3	0.217	0.69	1	TO-15		6/3/2021	CJR	1
Methylene chloride	< 15	ug/m3	0.159	0.506	1	TO-15		6/3/2021	CJR	1
Methyl tert-butyl ether (MTBE)	< 0.16	ug/m3	0.16	0.509	1	TO-15		6/3/2021	CJR	1
Naphthalene	1.94 "J"	ug/m3	0.675	2.15	1	TO-15		6/3/2021	CJR	1
Propene	< 0.079	ug/m3	0.079	0.251	1	TO-15		6/3/2021	CJR	1
Styrene	0.255 "J"	ug/m3	0.181	0.577	1	TO-15		6/3/2021	CJR	1
1,1,2,2-Tetrachloroethane	< 0.325	ug/m3	0.325	1.03	1	TO-15		6/3/2021	CJR	1
Tetrachloroethene	1.43	ug/m3	0.278	0.884	1	TO-15		6/3/2021	CJR	1
Tetrahydrofuran	< 0.131	ug/m3	0.131	0.417	1	TO-15		6/3/2021	CJR	1
Toluene	241	ug/m3	1.84	5.85	10	TO-15		6/4/2021	CJR	1
1,2,4-Trichlorobenzene	< 0.657	ug/m3	0.657	2.09	1	TO-15		6/3/2021	CJR	1
1,1,1-Trichloroethane	9.2	ug/m3	0.249	0.793	1	TO-15		6/3/2021	CJR	1
1,1,2-Trichloroethane	< 0.258	ug/m3	0.258	0.822	1	TO-15		6/3/2021	CJR	1
Trichloroethene (TCE)	< 0.237	ug/m3	0.237	0.754	1	TO-15		6/3/2021	CJR	1
Trichlorofluoromethane	1.85	ug/m3	0.337	1.07	1	TO-15		6/3/2021	CJR	1
Trichlorotrifluoroethane	0.61 "J"	ug/m3	0.402	1.28	1	TO-15		6/3/2021	CJR	1
1,2,4-Trimethylbenzene	16.7	ug/m3	0.283	0.899	1	TO-15		6/3/2021	CJR	1
1,3,5-Trimethylbenzene	4.0	ug/m3	0.232	0.739	1	TO-15		6/3/2021	CJR	1
Vinyl acetate	< 0.203	ug/m3	0.203	0.645	1	TO-15		6/3/2021	CJR	1
Vinyl Chloride	< 0.148	ug/m3	0.148	0.472	1	TO-15		6/3/2021	CJR	1
m&p-Xylene	53	ug/m3	0.377	1.2	1	TO-15		6/3/2021	CJR	1
o-Xylene	17.9	ug/m3	0.218	0.695	1	TO-15		6/3/2021	CJR	1

Project Name ALLYNS **Invoice #** E39489
Project # R3000291.00

Lab Code 5039489B
Sample ID AB-1
Sample Matrix Air
Sample Date 6/2/2021

	Result	Unit	LOD	LOQ	Dil	Method	Ext Date	Run Date	Analyst	Code
Organic										
Air Samples										
Acetone	10.7	ug/m3	0.299	0.95	1	TO-15		6/3/2021	CJR	1
Acrolein	1.74	ug/m3	0.094	0.299	1	TO-15		6/3/2021	CJR	1
Benzene	1.4	ug/m3	0.136	0.433	1	TO-15		6/3/2021	CJR	1
Benzyl Chloride	< 0.209	ug/m3	0.209	0.665	1	TO-15		6/3/2021	CJR	1
Bromodichloromethane	< 0.374	ug/m3	0.374	1.19	1	TO-15		6/3/2021	CJR	1
Bromoform	< 0.414	ug/m3	0.414	1.32	1	TO-15		6/3/2021	CJR	1
Bromomethane	< 0.2	ug/m3	0.2	0.637	1	TO-15		6/3/2021	CJR	1
1,3-Butadiene	< 0.143	ug/m3	0.143	0.454	1	TO-15		6/3/2021	CJR	1
Carbon Disulfide	0.34 "J"	ug/m3	0.138	0.44	1	TO-15		6/3/2021	CJR	1
Carbon Tetrachloride	0.50 "J"	ug/m3	0.307	0.978	1	TO-15		6/3/2021	CJR	1
Chlorobenzene	< 0.251	ug/m3	0.251	0.798	1	TO-15		6/3/2021	CJR	1
Chloroethane	< 0.159	ug/m3	0.159	0.507	1	TO-15		6/3/2021	CJR	1
Chloroform	0.49 "J"	ug/m3	0.3	0.953	1	TO-15		6/3/2021	CJR	1
Chloromethane	3.7	ug/m3	0.831	2.64	1	TO-15		6/3/2021	CJR	1
Cyclohexane	0.52 "J"	ug/m3	0.212	0.674	1	TO-15		6/3/2021	CJR	1
Dibromochloromethane	< 0.376	ug/m3	0.376	1.2	1	TO-15		6/3/2021	CJR	1
1,4-Dichlorobenzene	< 0.302	ug/m3	0.302	0.96	1	TO-15		6/3/2021	CJR	1
1,3-Dichlorobenzene	< 0.302	ug/m3	0.302	0.96	1	TO-15		6/3/2021	CJR	1
1,2-Dichlorobenzene	< 0.235	ug/m3	0.235	0.749	1	TO-15		6/3/2021	CJR	1
Dichlorodifluoromethane	2.03	ug/m3	0.263	0.836	1	TO-15		6/3/2021	CJR	1
1,2-Dichloroethane	< 0.24	ug/m3	0.24	0.763	1	TO-15		6/3/2021	CJR	1
1,1-Dichloroethane	< 0.187	ug/m3	0.187	0.596	1	TO-15		6/3/2021	CJR	1
1,1-Dichloroethene	< 0.21	ug/m3	0.21	0.668	1	TO-15		6/3/2021	CJR	1
cis-1,2-Dichloroethene	< 0.197	ug/m3	0.197	0.626	1	TO-15		6/3/2021	CJR	1
trans-1,2-Dichloroethene	< 0.231	ug/m3	0.231	0.734	1	TO-15		6/3/2021	CJR	1
1,2-Dichloropropane	< 0.28	ug/m3	0.28	0.89	1	TO-15		6/3/2021	CJR	1
trans-1,3-Dichloropropene	< 0.198	ug/m3	0.198	0.63	1	TO-15		6/3/2021	CJR	1
cis-1,3-Dichloropropene	< 0.234	ug/m3	0.234	0.745	1	TO-15		6/3/2021	CJR	1
1,2-Dichlorotetrafluoroethane	< 0.446	ug/m3	0.446	1.42	1	TO-15		6/3/2021	CJR	1
1,4-Dioxane	< 0.157	ug/m3	0.157	0.5	1	TO-15		6/3/2021	CJR	1
EDB (1,2-Dibromoethane)	< 0.342	ug/m3	0.342	1.09	1	TO-15		6/3/2021	CJR	1
Ethanol	253	ug/m3	0.152	0.482	1	TO-15		6/3/2021	CJR	10
Ethyl Acetate	< 0.176	ug/m3	0.176	0.559	1	TO-15		6/3/2021	CJR	1
Ethylbenzene	1.78	ug/m3	0.203	0.645	1	TO-15		6/3/2021	CJR	1
4-Ethyltoluene	0.59 "J"	ug/m3	0.214	0.681	1	TO-15		6/3/2021	CJR	1
Heptane	1.06	ug/m3	0.265	0.845	1	TO-15		6/3/2021	CJR	1
Hexachlorobutadiene	< 0.489	ug/m3	0.489	1.56	1	TO-15		6/3/2021	CJR	1
Hexane	7.7	ug/m3	0.235	0.748	1	TO-15		6/3/2021	CJR	1
2-Hexanone	< 0.222	ug/m3	0.222	0.707	1	TO-15		6/3/2021	CJR	1
Isopropyl Alcohol	9.5	ug/m3	0.109	0.347	1	TO-15		6/3/2021	CJR	1
Methyl ethyl ketone (MEK)	2.92	ug/m3	0.178	0.567	1	TO-15		6/3/2021	CJR	1
Methyl isobutyl ketone (MIBK)	0.65	ug/m3	0.168	0.536	1	TO-15		6/3/2021	CJR	1
Methyl Methacrylate	< 0.217	ug/m3	0.217	0.69	1	TO-15		6/3/2021	CJR	1
Methylene chloride	< 15	ug/m3	0.159	0.506	1	TO-15		6/3/2021	CJR	1

Project Name ALLYNS **Invoice #** E39489
Project # R3000291.00

Lab Code 5039489B
Sample ID AB-1
Sample Matrix Air
Sample Date 6/2/2021

	Result	Unit	LOD	LOQ	Dil	Method	Ext Date	Run Date	Analyst	Code
Methyl tert-butyl ether (MTBE)	< 0.16	ug/m3	0.16	0.509	1	TO-15		6/3/2021	CJR	1
Naphthalene	0.89 "J"	ug/m3	0.675	2.15	1	TO-15		6/3/2021	CJR	1
Propene	< 0.079	ug/m3	0.079	0.251	1	TO-15		6/3/2021	CJR	1
Styrene	0.298 "J"	ug/m3	0.181	0.577	1	TO-15		6/3/2021	CJR	1
1,1,2,2-Tetrachloroethane	< 0.325	ug/m3	0.325	1.03	1	TO-15		6/3/2021	CJR	1
Tetrachloroethene	0.61 "J"	ug/m3	0.278	0.884	1	TO-15		6/3/2021	CJR	1
Tetrahydrofuran	< 0.131	ug/m3	0.131	0.417	1	TO-15		6/3/2021	CJR	1
Toluene	25.2	ug/m3	0.184	0.585	1	TO-15		6/3/2021	CJR	1
1,2,4-Trichlorobenzene	< 0.657	ug/m3	0.657	2.09	1	TO-15		6/3/2021	CJR	1
1,1,1-Trichloroethane	0.87	ug/m3	0.249	0.793	1	TO-15		6/3/2021	CJR	1
1,1,2-Trichloroethane	< 0.258	ug/m3	0.258	0.822	1	TO-15		6/3/2021	CJR	1
Trichloroethene (TCE)	< 0.237	ug/m3	0.237	0.754	1	TO-15		6/3/2021	CJR	1
Trichlorofluoromethane	2.08	ug/m3	0.337	1.07	1	TO-15		6/3/2021	CJR	1
Trichlorotrifluoroethane	< 0.402	ug/m3	0.402	1.28	1	TO-15		6/3/2021	CJR	1
1,2,4-Trimethylbenzene	2.4	ug/m3	0.283	0.899	1	TO-15		6/3/2021	CJR	1
1,3,5-Trimethylbenzene	0.59 "J"	ug/m3	0.232	0.739	1	TO-15		6/3/2021	CJR	1
Vinyl acetate	< 0.203	ug/m3	0.203	0.645	1	TO-15		6/3/2021	CJR	1
Vinyl Chloride	< 0.148	ug/m3	0.148	0.472	1	TO-15		6/3/2021	CJR	1
m&p-Xylene	6.4	ug/m3	0.377	1.2	1	TO-15		6/3/2021	CJR	1
o-Xylene	2.38	ug/m3	0.218	0.695	1	TO-15		6/3/2021	CJR	1

Project Name ALLYNS **Invoice #** E39489
Project # R3000291.00

Lab Code 5039489C
Sample ID AB-2
Sample Matrix Air
Sample Date 6/2/2021

	Result	Unit	LOD	LOQ	Dil	Method	Ext Date	Run Date	Analyst	Code
Organic										
Air Samples										
Acetone	19.7	ug/m3	0.299	0.95	1	TO-15		6/3/2021	CJR	1
Acrolein	6.3	ug/m3	0.094	0.299	1	TO-15		6/3/2021	CJR	1
Benzene	1.44	ug/m3	0.136	0.433	1	TO-15		6/3/2021	CJR	1
Benzyl Chloride	< 0.209	ug/m3	0.209	0.665	1	TO-15		6/3/2021	CJR	1
Bromodichloromethane	< 0.374	ug/m3	0.374	1.19	1	TO-15		6/3/2021	CJR	1
Bromoform	< 0.414	ug/m3	0.414	1.32	1	TO-15		6/3/2021	CJR	1
Bromomethane	< 0.2	ug/m3	0.2	0.637	1	TO-15		6/3/2021	CJR	1
1,3-Butadiene	< 0.143	ug/m3	0.143	0.454	1	TO-15		6/3/2021	CJR	1
Carbon Disulfide	0.40 "J"	ug/m3	0.138	0.44	1	TO-15		6/3/2021	CJR	1
Carbon Tetrachloride	0.57 "J"	ug/m3	0.307	0.978	1	TO-15		6/3/2021	CJR	1
Chlorobenzene	< 0.251	ug/m3	0.251	0.798	1	TO-15		6/3/2021	CJR	1
Chloroethane	< 0.159	ug/m3	0.159	0.507	1	TO-15		6/3/2021	CJR	1
Chloroform	0.34 "J"	ug/m3	0.3	0.953	1	TO-15		6/3/2021	CJR	1
Chloromethane	3.5	ug/m3	0.831	2.64	1	TO-15		6/3/2021	CJR	1
Cyclohexane	0.48 "J"	ug/m3	0.212	0.674	1	TO-15		6/3/2021	CJR	1
Dibromochloromethane	< 0.376	ug/m3	0.376	1.2	1	TO-15		6/3/2021	CJR	1
1,4-Dichlorobenzene	0.36 "J"	ug/m3	0.302	0.96	1	TO-15		6/3/2021	CJR	1
1,3-Dichlorobenzene	< 0.302	ug/m3	0.302	0.96	1	TO-15		6/3/2021	CJR	1
1,2-Dichlorobenzene	< 0.235	ug/m3	0.235	0.749	1	TO-15		6/3/2021	CJR	1
Dichlorodifluoromethane	2.22	ug/m3	0.263	0.836	1	TO-15		6/3/2021	CJR	1
1,2-Dichloroethane	< 0.24	ug/m3	0.24	0.763	1	TO-15		6/3/2021	CJR	1
1,1-Dichloroethane	< 0.187	ug/m3	0.187	0.596	1	TO-15		6/3/2021	CJR	1
1,1-Dichloroethene	< 0.21	ug/m3	0.21	0.668	1	TO-15		6/3/2021	CJR	1
cis-1,2-Dichloroethene	< 0.197	ug/m3	0.197	0.626	1	TO-15		6/3/2021	CJR	1
trans-1,2-Dichloroethene	< 0.231	ug/m3	0.231	0.734	1	TO-15		6/3/2021	CJR	1
1,2-Dichloropropane	< 0.28	ug/m3	0.28	0.89	1	TO-15		6/3/2021	CJR	1
trans-1,3-Dichloropropene	< 0.198	ug/m3	0.198	0.63	1	TO-15		6/3/2021	CJR	1
cis-1,3-Dichloropropene	< 0.234	ug/m3	0.234	0.745	1	TO-15		6/3/2021	CJR	1
1,2-Dichlorotetrafluoroethane	< 0.446	ug/m3	0.446	1.42	1	TO-15		6/3/2021	CJR	1
1,4-Dioxane	< 0.157	ug/m3	0.157	0.5	1	TO-15		6/3/2021	CJR	1
EDB (1,2-Dibromoethane)	< 0.342	ug/m3	0.342	1.09	1	TO-15		6/3/2021	CJR	1
Ethanol	118	ug/m3	0.152	0.482	1	TO-15		6/3/2021	CJR	10
Ethyl Acetate	< 0.176	ug/m3	0.176	0.559	1	TO-15		6/3/2021	CJR	1
Ethylbenzene	1.3	ug/m3	0.203	0.645	1	TO-15		6/3/2021	CJR	1
4-Ethyltoluene	0.34 "J"	ug/m3	0.214	0.681	1	TO-15		6/3/2021	CJR	1
Heptane	1.64	ug/m3	0.265	0.845	1	TO-15		6/3/2021	CJR	1
Hexachlorobutadiene	< 0.489	ug/m3	0.489	1.56	1	TO-15		6/3/2021	CJR	1
Hexane	8.0	ug/m3	0.235	0.748	1	TO-15		6/3/2021	CJR	1
2-Hexanone	< 0.222	ug/m3	0.222	0.707	1	TO-15		6/3/2021	CJR	1
Isopropyl Alcohol	10.2	ug/m3	0.109	0.347	1	TO-15		6/3/2021	CJR	1
Methyl ethyl ketone (MEK)	3.6	ug/m3	0.178	0.567	1	TO-15		6/3/2021	CJR	1
Methyl isobutyl ketone (MIBK)	0.57	ug/m3	0.168	0.536	1	TO-15		6/3/2021	CJR	1
Methyl Methacrylate	< 0.217	ug/m3	0.217	0.69	1	TO-15		6/3/2021	CJR	1
Methylene chloride	< 15	ug/m3	0.159	0.506	1	TO-15		6/3/2021	CJR	1

Project Name ALLYNS **Invoice #** E39489
Project # R3000291.00

Lab Code 5039489C
Sample ID AB-2
Sample Matrix Air
Sample Date 6/2/2021

	Result	Unit	LOD	LOQ	Dil	Method	Ext Date	Run Date	Analyst	Code
Methyl tert-butyl ether (MTBE)	< 0.16	ug/m3	0.16	0.509	1	TO-15		6/3/2021	CJR	1
Naphthalene	0.89 "J"	ug/m3	0.675	2.15	1	TO-15		6/3/2021	CJR	1
Propene	< 0.079	ug/m3	0.079	0.251	1	TO-15		6/3/2021	CJR	1
Styrene	0.55 "J"	ug/m3	0.181	0.577	1	TO-15		6/3/2021	CJR	1
1,1,2,2-Tetrachloroethane	< 0.325	ug/m3	0.325	1.03	1	TO-15		6/3/2021	CJR	1
Tetrachloroethene	0.48 "J"	ug/m3	0.278	0.884	1	TO-15		6/3/2021	CJR	1
Tetrahydrofuran	< 0.131	ug/m3	0.131	0.417	1	TO-15		6/3/2021	CJR	1
Toluene	18.7	ug/m3	0.184	0.585	1	TO-15		6/3/2021	CJR	1
1,2,4-Trichlorobenzene	< 0.657	ug/m3	0.657	2.09	1	TO-15		6/3/2021	CJR	1
1,1,1-Trichloroethane	0.76 "J"	ug/m3	0.249	0.793	1	TO-15		6/3/2021	CJR	1
1,1,2-Trichloroethane	< 0.258	ug/m3	0.258	0.822	1	TO-15		6/3/2021	CJR	1
Trichloroethene (TCE)	< 0.237	ug/m3	0.237	0.754	1	TO-15		6/3/2021	CJR	1
Trichlorofluoromethane	1.8	ug/m3	0.337	1.07	1	TO-15		6/3/2021	CJR	1
Trichlorotrifluoroethane	0.61 "J"	ug/m3	0.402	1.28	1	TO-15		6/3/2021	CJR	1
1,2,4-Trimethylbenzene	1.57	ug/m3	0.283	0.899	1	TO-15		6/3/2021	CJR	1
1,3,5-Trimethylbenzene	0.39 "J"	ug/m3	0.232	0.739	1	TO-15		6/3/2021	CJR	1
Vinyl acetate	< 0.203	ug/m3	0.203	0.645	1	TO-15		6/3/2021	CJR	1
Vinyl Chloride	< 0.148	ug/m3	0.148	0.472	1	TO-15		6/3/2021	CJR	1
m&p-Xylene	4.1	ug/m3	0.377	1.2	1	TO-15		6/3/2021	CJR	1
o-Xylene	1.65	ug/m3	0.218	0.695	1	TO-15		6/3/2021	CJR	1

Project Name ALLYNS **Invoice #** E39489
Project # R3000291.00

Lab Code 5039489D
Sample ID AB-3
Sample Matrix Air
Sample Date 6/2/2021

	Result	Unit	LOD	LOQ	Dil	Method	Ext Date	Run Date	Analyst	Code
Organic										
Air Samples										
Acetone	14.4	ug/m3	0.299	0.95	1	TO-15		6/3/2021	CJR	1
Acrolein	0.94	ug/m3	0.094	0.299	1	TO-15		6/3/2021	CJR	1
Benzene	0.32 "J"	ug/m3	0.136	0.433	1	TO-15		6/3/2021	CJR	1
Benzyl Chloride	< 0.209	ug/m3	0.209	0.665	1	TO-15		6/3/2021	CJR	1
Bromodichloromethane	< 0.374	ug/m3	0.374	1.19	1	TO-15		6/3/2021	CJR	1
Bromoform	< 0.414	ug/m3	0.414	1.32	1	TO-15		6/3/2021	CJR	1
Bromomethane	< 0.2	ug/m3	0.2	0.637	1	TO-15		6/3/2021	CJR	1
1,3-Butadiene	< 0.143	ug/m3	0.143	0.454	1	TO-15		6/3/2021	CJR	1
Carbon Disulfide	0.249 "J"	ug/m3	0.138	0.44	1	TO-15		6/3/2021	CJR	1
Carbon Tetrachloride	0.50 "J"	ug/m3	0.307	0.978	1	TO-15		6/3/2021	CJR	1
Chlorobenzene	< 0.251	ug/m3	0.251	0.798	1	TO-15		6/3/2021	CJR	1
Chloroethane	< 0.159	ug/m3	0.159	0.507	1	TO-15		6/3/2021	CJR	1
Chloroform	0.34 "J"	ug/m3	0.3	0.953	1	TO-15		6/3/2021	CJR	1
Chloromethane	2.66	ug/m3	0.831	2.64	1	TO-15		6/3/2021	CJR	1
Cyclohexane	< 0.212	ug/m3	0.212	0.674	1	TO-15		6/3/2021	CJR	1
Dibromochloromethane	< 0.376	ug/m3	0.376	1.2	1	TO-15		6/3/2021	CJR	1
1,4-Dichlorobenzene	< 0.302	ug/m3	0.302	0.96	1	TO-15		6/3/2021	CJR	1
1,3-Dichlorobenzene	< 0.302	ug/m3	0.302	0.96	1	TO-15		6/3/2021	CJR	1
1,2-Dichlorobenzene	< 0.235	ug/m3	0.235	0.749	1	TO-15		6/3/2021	CJR	1
Dichlorodifluoromethane	2.18	ug/m3	0.263	0.836	1	TO-15		6/3/2021	CJR	1
1,2-Dichloroethane	< 0.24	ug/m3	0.24	0.763	1	TO-15		6/3/2021	CJR	1
1,1-Dichloroethane	< 0.187	ug/m3	0.187	0.596	1	TO-15		6/3/2021	CJR	1
1,1-Dichloroethene	< 0.21	ug/m3	0.21	0.668	1	TO-15		6/3/2021	CJR	1
cis-1,2-Dichloroethene	< 0.197	ug/m3	0.197	0.626	1	TO-15		6/3/2021	CJR	1
trans-1,2-Dichloroethene	< 0.231	ug/m3	0.231	0.734	1	TO-15		6/3/2021	CJR	1
1,2-Dichloropropane	< 0.28	ug/m3	0.28	0.89	1	TO-15		6/3/2021	CJR	1
trans-1,3-Dichloropropene	< 0.198	ug/m3	0.198	0.63	1	TO-15		6/3/2021	CJR	1
cis-1,3-Dichloropropene	< 0.234	ug/m3	0.234	0.745	1	TO-15		6/3/2021	CJR	1
1,2-Dichlorotetrafluoroethane	< 0.446	ug/m3	0.446	1.42	1	TO-15		6/3/2021	CJR	1
1,4-Dioxane	< 0.157	ug/m3	0.157	0.5	1	TO-15		6/3/2021	CJR	1
EDB (1,2-Dibromoethane)	< 0.342	ug/m3	0.342	1.09	1	TO-15		6/3/2021	CJR	1
Ethanol	28	ug/m3	0.152	0.482	1	TO-15		6/3/2021	CJR	1
Ethyl Acetate	< 0.176	ug/m3	0.176	0.559	1	TO-15		6/3/2021	CJR	1
Ethylbenzene	0.65	ug/m3	0.203	0.645	1	TO-15		6/3/2021	CJR	1
4-Ethyltoluene	< 0.214	ug/m3	0.214	0.681	1	TO-15		6/3/2021	CJR	1
Heptane	< 0.265	ug/m3	0.265	0.845	1	TO-15		6/3/2021	CJR	1
Hexachlorobutadiene	< 0.489	ug/m3	0.489	1.56	1	TO-15		6/3/2021	CJR	1
Hexane	4.5	ug/m3	0.235	0.748	1	TO-15		6/3/2021	CJR	1
2-Hexanone	< 0.222	ug/m3	0.222	0.707	1	TO-15		6/3/2021	CJR	1
Isopropyl Alcohol	12.2	ug/m3	0.109	0.347	1	TO-15		6/3/2021	CJR	1
Methyl ethyl ketone (MEK)	1.09	ug/m3	0.178	0.567	1	TO-15		6/3/2021	CJR	1
Methyl isobutyl ketone (MIBK)	0.49 "J"	ug/m3	0.168	0.536	1	TO-15		6/3/2021	CJR	1
Methyl Methacrylate	< 0.217	ug/m3	0.217	0.69	1	TO-15		6/3/2021	CJR	1
Methylene chloride	< 15	ug/m3	0.159	0.506	1	TO-15		6/3/2021	CJR	1

Project Name ALLYNS **Invoice #** E39489
Project # R3000291.00

Lab Code 5039489D
Sample ID AB-3
Sample Matrix Air
Sample Date 6/2/2021

	Result	Unit	LOD	LOQ	Dil	Method	Ext Date	Run Date	Analyst	Code
Methyl tert-butyl ether (MTBE)	< 0.16	ug/m3	0.16	0.509	1	TO-15		6/3/2021	CJR	1
Naphthalene	< 0.675	ug/m3	0.675	2.15	1	TO-15		6/3/2021	CJR	1
Propene	< 0.079	ug/m3	0.079	0.251	1	TO-15		6/3/2021	CJR	1
Styrene	< 0.181	ug/m3	0.181	0.577	1	TO-15		6/3/2021	CJR	1
1,1,2,2-Tetrachloroethane	< 0.325	ug/m3	0.325	1.03	1	TO-15		6/3/2021	CJR	1
Tetrachloroethene	< 0.278	ug/m3	0.278	0.884	1	TO-15		6/3/2021	CJR	1
Tetrahydrofuran	< 0.131	ug/m3	0.131	0.417	1	TO-15		6/3/2021	CJR	1
Toluene	1.66	ug/m3	0.184	0.585	1	TO-15		6/3/2021	CJR	1
1,2,4-Trichlorobenzene	< 0.657	ug/m3	0.657	2.09	1	TO-15		6/3/2021	CJR	1
1,1,1-Trichloroethane	< 0.249	ug/m3	0.249	0.793	1	TO-15		6/3/2021	CJR	1
1,1,2-Trichloroethane	< 0.258	ug/m3	0.258	0.822	1	TO-15		6/3/2021	CJR	1
Trichloroethene (TCE)	< 0.237	ug/m3	0.237	0.754	1	TO-15		6/3/2021	CJR	1
Trichlorofluoromethane	1.35	ug/m3	0.337	1.07	1	TO-15		6/3/2021	CJR	1
Trichlorotrifluoroethane	0.61 "J"	ug/m3	0.402	1.28	1	TO-15		6/3/2021	CJR	1
1,2,4-Trimethylbenzene	< 0.283	ug/m3	0.283	0.899	1	TO-15		6/3/2021	CJR	1
1,3,5-Trimethylbenzene	< 0.232	ug/m3	0.232	0.739	1	TO-15		6/3/2021	CJR	1
Vinyl acetate	< 0.203	ug/m3	0.203	0.645	1	TO-15		6/3/2021	CJR	1
Vinyl Chloride	< 0.148	ug/m3	0.148	0.472	1	TO-15		6/3/2021	CJR	1
m&p-Xylene	1.65	ug/m3	0.377	1.2	1	TO-15		6/3/2021	CJR	1
o-Xylene	0.65 "J"	ug/m3	0.218	0.695	1	TO-15		6/3/2021	CJR	1

Project Name ALLYNS **Invoice #** E39489
Project # R3000291.00

Lab Code 5039489E
Sample ID P-TRAP
Sample Matrix Air
Sample Date 6/2/2021

	Result	Unit	LOD	LOQ	Dil	Method	Ext Date	Run Date	Analyst	Code
Organic										
Air Samples										
Acetone	14.3	ug/m3	0.299	0.95	1	TO-15		6/3/2021	CJR	1
Acrolein	< 0.094	ug/m3	0.094	0.299	1	TO-15		6/3/2021	CJR	1
Benzene	1.53	ug/m3	0.136	0.433	1	TO-15		6/3/2021	CJR	1
Benzyl Chloride	< 0.209	ug/m3	0.209	0.665	1	TO-15		6/3/2021	CJR	1
Bromodichloromethane	5.3	ug/m3	0.374	1.19	1	TO-15		6/3/2021	CJR	1
Bromoform	0.52 "J"	ug/m3	0.414	1.32	1	TO-15		6/3/2021	CJR	1
Bromomethane	< 0.2	ug/m3	0.2	0.637	1	TO-15		6/3/2021	CJR	1
1,3-Butadiene	< 0.143	ug/m3	0.143	0.454	1	TO-15		6/3/2021	CJR	1
Carbon Disulfide	11.9	ug/m3	0.138	0.44	1	TO-15		6/3/2021	CJR	1
Carbon Tetrachloride	0.38 "J"	ug/m3	0.307	0.978	1	TO-15		6/3/2021	CJR	1
Chlorobenzene	< 0.251	ug/m3	0.251	0.798	1	TO-15		6/3/2021	CJR	1
Chloroethane	1.29	ug/m3	0.159	0.507	1	TO-15		6/3/2021	CJR	1
Chloroform	13.4	ug/m3	0.3	0.953	1	TO-15		6/3/2021	CJR	1
Chloromethane	4.7	ug/m3	0.831	2.64	1	TO-15		6/3/2021	CJR	1
Cyclohexane	1.0	ug/m3	0.212	0.674	1	TO-15		6/3/2021	CJR	1
Dibromochloromethane	3.7	ug/m3	0.376	1.2	1	TO-15		6/3/2021	CJR	1
1,4-Dichlorobenzene	< 0.302	ug/m3	0.302	0.96	1	TO-15		6/3/2021	CJR	1
1,3-Dichlorobenzene	< 0.302	ug/m3	0.302	0.96	1	TO-15		6/3/2021	CJR	1
1,2-Dichlorobenzene	< 0.235	ug/m3	0.235	0.749	1	TO-15		6/3/2021	CJR	1
Dichlorodifluoromethane	1.83	ug/m3	0.263	0.836	1	TO-15		6/3/2021	CJR	1
1,2-Dichloroethane	< 0.24	ug/m3	0.24	0.763	1	TO-15		6/3/2021	CJR	1
1,1-Dichloroethane	< 0.187	ug/m3	0.187	0.596	1	TO-15		6/3/2021	CJR	1
1,1-Dichloroethene	< 0.21	ug/m3	0.21	0.668	1	TO-15		6/3/2021	CJR	1
cis-1,2-Dichloroethene	< 0.197	ug/m3	0.197	0.626	1	TO-15		6/3/2021	CJR	1
trans-1,2-Dichloroethene	< 0.231	ug/m3	0.231	0.734	1	TO-15		6/3/2021	CJR	1
1,2-Dichloropropane	< 0.28	ug/m3	0.28	0.89	1	TO-15		6/3/2021	CJR	1
trans-1,3-Dichloropropene	< 0.198	ug/m3	0.198	0.63	1	TO-15		6/3/2021	CJR	1
cis-1,3-Dichloropropene	< 0.234	ug/m3	0.234	0.745	1	TO-15		6/3/2021	CJR	1
1,2-Dichlorotetrafluoroethane	< 0.446	ug/m3	0.446	1.42	1	TO-15		6/3/2021	CJR	1
1,4-Dioxane	< 0.157	ug/m3	0.157	0.5	1	TO-15		6/3/2021	CJR	1
EDB (1,2-Dibromoethane)	< 0.342	ug/m3	0.342	1.09	1	TO-15		6/3/2021	CJR	1
Ethanol	64	ug/m3	0.152	0.482	1	TO-15		6/3/2021	CJR	1
Ethyl Acetate	196	ug/m3	1.76	5.59	10	TO-15		6/4/2021	CJR	1
Ethylbenzene	2.12	ug/m3	0.203	0.645	1	TO-15		6/3/2021	CJR	1
4-Ethyltoluene	0.59 "J"	ug/m3	0.214	0.681	1	TO-15		6/3/2021	CJR	1
Heptane	16.6	ug/m3	0.265	0.845	1	TO-15		6/3/2021	CJR	1
Hexachlorobutadiene	< 0.489	ug/m3	0.489	1.56	1	TO-15		6/3/2021	CJR	1
Hexane	9.0	ug/m3	0.235	0.748	1	TO-15		6/3/2021	CJR	1
2-Hexanone	< 0.222	ug/m3	0.222	0.707	1	TO-15		6/3/2021	CJR	1
Isopropyl Alcohol	3.12	ug/m3	0.109	0.347	1	TO-15		6/3/2021	CJR	1
Methyl ethyl ketone (MEK)	5.6	ug/m3	0.178	0.567	1	TO-15		6/3/2021	CJR	1
Methyl isobutyl ketone (MIBK)	< 0.168	ug/m3	0.168	0.536	1	TO-15		6/3/2021	CJR	1
Methyl Methacrylate	< 0.217	ug/m3	0.217	0.69	1	TO-15		6/3/2021	CJR	1
Methylene chloride	18.7	ug/m3	0.159	0.506	1	TO-15		6/3/2021	CJR	1

Project Name ALLYNS **Invoice #** E39489
Project # R3000291.00

Lab Code 5039489E
Sample ID P-TRAP
Sample Matrix Air
Sample Date 6/2/2021

	Result	Unit	LOD	LOQ	Dil	Method	Ext Date	Run Date	Analyst	Code
Methyl tert-butyl ether (MTBE)	< 0.16	ug/m3	0.16	0.509	1	TO-15		6/3/2021	CJR	1
Naphthalene	0.84 "J"	ug/m3	0.675	2.15	1	TO-15		6/3/2021	CJR	1
Propene	< 0.079	ug/m3	0.079	0.251	1	TO-15		6/3/2021	CJR	1
Styrene	0.60	ug/m3	0.181	0.577	1	TO-15		6/3/2021	CJR	1
1,1,2,2-Tetrachloroethane	< 0.325	ug/m3	0.325	1.03	1	TO-15		6/3/2021	CJR	1
Tetrachloroethene	3.3	ug/m3	0.278	0.884	1	TO-15		6/3/2021	CJR	1
Tetrahydrofuran	10.8	ug/m3	0.131	0.417	1	TO-15		6/3/2021	CJR	1
Toluene	36	ug/m3	0.184	0.585	1	TO-15		6/3/2021	CJR	1
1,2,4-Trichlorobenzene	< 0.657	ug/m3	0.657	2.09	1	TO-15		6/3/2021	CJR	1
1,1,1-Trichloroethane	1.47	ug/m3	0.249	0.793	1	TO-15		6/3/2021	CJR	1
1,1,2-Trichloroethane	< 0.258	ug/m3	0.258	0.822	1	TO-15		6/3/2021	CJR	1
Trichloroethene (TCE)	< 0.237	ug/m3	0.237	0.754	1	TO-15		6/3/2021	CJR	1
Trichlorofluoromethane	3.3	ug/m3	0.337	1.07	1	TO-15		6/3/2021	CJR	1
Trichlorotrifluoroethane	0.54 "J"	ug/m3	0.402	1.28	1	TO-15		6/3/2021	CJR	1
1,2,4-Trimethylbenzene	1.91	ug/m3	0.283	0.899	1	TO-15		6/3/2021	CJR	1
1,3,5-Trimethylbenzene	0.69 "J"	ug/m3	0.232	0.739	1	TO-15		6/3/2021	CJR	1
Vinyl acetate	< 0.203	ug/m3	0.203	0.645	1	TO-15		6/3/2021	CJR	1
Vinyl Chloride	< 0.148	ug/m3	0.148	0.472	1	TO-15		6/3/2021	CJR	1
m&p-Xylene	7.7	ug/m3	0.377	1.2	1	TO-15		6/3/2021	CJR	1
o-Xylene	2.69	ug/m3	0.218	0.695	1	TO-15		6/3/2021	CJR	1

"J" Flag: Analyte detected between LOD and LOQ LOD Limit of Detection LOQ Limit of Quantitation

Code	*Comment*
1	Laboratory QC within limits.
10	Linear range of calibration curve exceeded.

All solid sample results reported on a dry weight basis unless otherwise indicated. All LOD's and LOQ's are adjusted for dilutions but not dry weight. Subcontracted results are denoted by SUB in the analyst field.

Authorized Signature

CHAIN OF CUSTODY RECORD

Synergy Environmental Lab, Inc.

www.synergy-lab.net
1990 Prospect Ct. • Appleton, WI 54914
920-830-2455 • mrsynergy@wi.twcbc.com

Chain # No 37992

Page 1 of 1

Sample Handling Request

____ Rush Analysis Date Required: _____
(Rushes accepted only with prior authorization)
X Normal Turn Around

Lab I.D. #

QUOTE # :

Project #: R3000291.00

Sampler: (signature)

Project (Name / Location): Allyns Algoma WI

Reports To: Chris Rogers	Invoice To: Chris Rogers
Company Westwood	Company Westwood
Address 1 N Systems Dr	Address 1 N. Systems Dr
City State Zip Appleton WI 54914	City State Zip Appleton WI 54914
Phone 920 735-6900	Phone 920 735-6900
Email Chris.Rogers@westwoodps.com	Email APC westwoodps.com

Lab I.D.	Sample I.D.	Collection Date	Collection Time	Filtered Y/N	No. of Containers	Sample Type (Matrix)*	Preservation
5036489A	DC-1	6/2/21	10:48	N	1	A	None
B	AB-1	6/2/21	11:05	N	1	A	None
C	AB-2	6/2/21	10:54	N	1	A	None
D	AB-3	6/2/21	10:58	N	1	A	None
E	P-Trap	6/1/21	11:50	N	1	A	None

Analysis Requested / **Other Analysis**

Lab I.D.	DRO (Mod DRO Sep 95)	GRO (Mod GRO Sep 95)	LEAD	NITRATE/NITRITE	OIL & GREASE	PAH (EPA 8270)	PCB	PVOC (EPA 8021)	PVOC + NAPHTHALENE	SULFATE	TOTAL SUSPENDED SOLIDS	VOC DW (EPA 524.2)	VOC (EPA 8260)	VOC AIR (TO - 15)	8-RCRA METALS	PID/ FID
A														X		
B														X		
C														X		
D														X		
E														X		

Comments/Special Instructions (*Specify groundwater "GW", Drinking Water "DW", Waste Water "WW", Soil "S", Air "A", Oil, Sludge, etc.)

Sample Integrity - To be completed by receiving lab.

Method of Shipment: client

Temp. of Temp. Blank: _____ °C On Ice: ✓

Cooler seal intact upon receipt: ✓ Yes ____ No

Relinquished By: (sign)	Time	Date	Received By: (sign)	Time	Date
	12:28	6/2/21			

Received in Laboratory By: Time: 12:28 Date: 6-2-21