Department of Energy
Carlsbad Field Office
P. O. Box 3090
Carlsbad, New Mexico 88221
January 23, 2002

Mr. Paul Ritzma
New Mexico Environment Department
Office of Chief Counsel
1190 St. Francis Drive
Santa Fe, NM 87505

SUBJECT: CBFO's Response to Technical Issues in Compliance Order HWB 01-08 (CO)

Dear Mr. Ritzma:

On January 7, 2002 the New Mexico Environment Department (NMED) issued a Compliance Order to the Carlsbad Field Office (CBFO) and Westinghouse TRU Solutions, LLC describing three audit findings identified by CBFO during the October recertification audit at the Los Alamos National Laboratory (LANL). NMED contends these findings are related to conditions that are not in compliance with the Waste Isolation Pilot Plant (WIPP) Hazardous Waste Facility Permit (HWFP). While NMED acknowledges that these concerns were identified by the CBFO, they state that the concerns have resulted in the disposal of TRU mixed waste that was not characterized in accordance with the HWFP Waste Analysis Plan (WAP). At the time the Compliance Order was issued, the audit findings at issue were continuing to be addressed at WIPP consistent with processes required by the WIPP HWFP.

The findings at issue are: (1) an error in calculation of the method detection limits (MDLs) for headspace gas analysis; (2) use of analytical data that exceeded the accuracy criteria when performing the MDL calculations; and (3) use of equipment that did not identify methanol when using automated identification software with the headspace gas analysis equipment. Specifically, the MDL values were recalculated by LANL in response to the audit findings of the October audit. The results demonstrate that the error does not change the hazardous waste determinations as shown on Attachment A, columns labeled "New UCL_{90}" and "PRQL". The condition has not resulted in under-reporting headspace gas concentrations. Please, also see the emissions data graphed in Attachment B, which shows that the LANL waste has not resulted in a risk to human health and the environment from volatile organic compound (VOC) emissions. The use of accuracy criteria, as stated in the compliance order, is not consistent with the process for calculating MDLs as defined by both the HWFP and the Environmental Protection Agency's (EPA) SW-846 analytical methods. CBFO does not agree that the accuracy criteria are appropriate restrictions when calculating MDLs. CBFO agrees that the automated identification software did not identify methanol. However, rather than relying solely on the use of automated identification software, the standard laboratory practice for the positive identification of target analytes is performed using calibration standards and analyst expertise. This is consistent with NMED observations from a previous audit. The arguments that substantiate the CBFO position for each of these items is presented and is accompanied by tables which show the recalculation of the MDLs and graphs of emission data that show there has been no increase in emissions from the WIPP site.

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Based on the discussions attached and the recalculation of the MDLs, the CBFO believes that the headspace gas analysis data are in compliance with the WAP.

DISCUSSION

Technical issues addressed include items 26-A, 26-B, 26-C, 28, 36, and 37 in the compliance order, which questions specific analytical practices used at the LANL for the determination of Headspace Gas (HGas) concentrations in TRU waste.

Item 26-A.

The NMED compliance order states that the current LANL MDLs, and those dated 3/8/01, were calculated using an incorrect Student's-t factor. The factor of 3.14, which is for seven samples, was used. However, only four samples were analyzed in the MDL studies, therefore, 4.54 should have been used as the Student's-t factor. This assertion by the NMED is correct. LANL inadvertently used the wrong Student's-t factor. The CBFO has verified that the procedure used for this calculation is compliant with the WAP.

The CBFO believes that this error has had no effect on the quality of the data collected from the analyses of headspace gas samples for containers of TRU waste disposed at the WIPP. The CBFO rationale for this belief is as follows:

> The WIPP WAP requires that the individual MDLs determined for each of the analytes be below the MDL value in Table B3-2 of the WAP. LANL recalculated the MDLs using the correct Student's-t factor. The recalculated MDL values are shown in Attachment A in the four columns labeled "MDL". In each case, the recalculated MDL is less than the WAP established values which are in Table B3-2. Therefore, the CBFO believes that the MDLs in each study are compliant with the WAP.
>
> The MDL value affects the calculation of the UCL_{90} value for instances when an analyte is not detected in the headspace gas sample (the sample value is below the MDL). In such cases, standard laboratory practice is to assign the MDL as the value and use one-half that value in calculating the UCL_{90}. The only time the recalculated MDLs are significant is when a sample value that was believed to be greater than the MDL (J-flagged) is now less than the recalculated MDL. In this case the value is flagged as a "non-detect" and the recalculated MDL value is assigned.

With regard to the waste disposed at WIPP, there were only 26 containers (24 standard waste boxes and two drums) for which a sample value was reassigned as a "non-detect" based on the revised MDL calculation. The revised UCL_{90} values for waste stream LA-TA-55-19, based on the revised MDLs, are shown in Attachment A in the column entitled "New UCL_{90}". These revised UCL_{90} values do not result in a change to the hazardous waste determination for waste stream LA-TA-55-19. This can be seen by comparing the columns in Attachment A entitled "Old UCL_{90}" and "New UCL_{90}".

Item 26-B.

The NMED compliance order states that some percent recoveries for individual data points used to calculate the MDLs, dated 3/8/01, were above the upper accuracy limit of 130 percent. The NMED assertion is correct that some of the values were above 130 percent. However, there are

no accuracy limits specified in either the WIPP HWFP WAP or EPA methods SW-846 for MDL studies. MDL studies are required to determine the capability of the instrument being used and standard practice is to make this determination based upon actual values. Restricting the calculation to samples with some specified recovery will artificially lower the MDL by decreasing the standard deviation. Therefore, standard laboratory practice is to use all of the sample results in the MDL calculation.

Item 26-C.

The NMED compliance order states that during the audit the target analyte methanol, contained in a standard, was searched against two available libraries (Appendix VIII and MBS75K). Neither library identified the compound as methanol. The NMED assertion that the libraries failed to identify methanol is correct, however, this does not affect the final identification of the compound as methanol. LANL does not rely solely on the HGas libraries to do target identification because this approach has limited accuracy and effectiveness. The analytical method requires trained operators who can correctly identify the target analytes by comparing to the spectra and retention times of known standards. In the WIPP WAP (Table B3-10) operators are specifically required to have one year independent spectral interpretation expertise. On a previous audit NMED observers raised the issue that a qualified staff chemist must review the spectral analyses and not rely solely on the software comparison. This was documented and addressed in Rocky Flats Environmental Technology Site Certification Audit, A-00-08, Observation #2. Audits have shown that LANL operators satisfy the training, experience, and educational requirements of the WAP. As a result of Audit A-02-04 (10/11/01) CBFO is requiring LANL to clarify its procedure to reflect the actual laboratory practices.

Specifically, the positive identification of compounds is accomplished through the use of calibration standards which contain known quantities of the target analytes. A set of reference retention times and mass spectra are obtained from the analyses of these calibration standards. The operator uses this information to interpret the retention times and mass spectra from analysis of a sample to determine the compound. Therefore, if a compound in the sample provides the same response as methanol in the calibration standard the operator knows methanol is present in the sample. This analytical approach is described in EPA's SW-846 methods. Therefore, the use of computerized mass spectral search library systems is not the sole basis for positive identification of target analytes.

Likewise, the computerized mass spectral search systems are not used as the sole basis for identification of non-target analytes. Qualitative analysis of tentatively identified compounds (TICs) detected with an ion abundance greater than ten percent of the nearest internal standard is performed using a search of the NIST library as a tool to aid in identifying TICs. The search algorithm compares the relative abundance of ions of the TIC to reference spectra in the data base. As noted in the introduction of the EPA/NIH Mass Spectral Database, "... the relative intensities of the peaks are sensitive to instrumental conditions and can only be taken as a rough guide." This means an analyst, trained in mass spectral interpretation as specified in the WAP, must review these initial assignments, exercise judgment, and report appropriately. Completion of this process leads to the tentative identification and hence the reporting as TICS. CBFO believes that LANL is in compliance with the TIC evaluation and reporting requirements specified in the WAP.

Item 28.

The NMED compliance order states that waste stream LA-TA-55-19 poses a significant risk to human health and the environment. Based on a comparison of the columns entitled "New UCL_{90}" and "PRQL" in Attachment A, CBFO believes the VOC concentrations in the subject drums were not under-reported and no additional hazardous constituents have been identified. Therefore, the VOCs in the waste stream do not lead to an exceedence of established HWFP VOC limits.

In addition, Attachment B provides the VOC emissions data from the WIPP facility collected since the emplacement of the subject drums. There has been no increase of emissions noted.

Item 36.

The NMED compliance order states that miscalculation of the MDLs has resulted in under-reporting of the concentrations of VOCs. As demonstrated in the response to Item 26-A, the CBFO believes the miscalculation of the MDLs did not result in an under-reporting of concentrations. MDLs provide a convenient method to include an undetected target analyte in the calculation of the UCL_{90} value. When used in this manner, MDLs constitute administrative values instead of actual concentrations.

Item 37.

The NMED compliance order states that misidentification of known compounds has resulted in potential misidentification of TICs. As stated above in the response to Item 26-C, the identification of both target and non-target compounds is accomplished by the combination of using calibration standards, computerized searches, and trained operator interpretation. CBFO believes that LANL is in compliance with the TIC evaluation and reporting requirements specified in the WAP.

Sincerely,

Ines Triay

Dr. Ines R. Triay
Manager

Enclosure(s)

cc w/enclosure(s):
Steve Zappe, NMED
James Bearzi, NMED

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Kerry Watson, CBFO	*ED
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ATTACHMENT A

Attachment A

ANALYTE	# of Samples	MDL 4/18/00	MDL 6/19/00	MDL 1/4/01	MDL 3/8/01	Old UCL_{90}	New UCL_{90}[a]	PRQL[a]	EPA HWN[b]
Methanol	165	38.75	16.50	24.61	33.96	27.64	23.51	100	F003(AK)
Ethyl Ether	165	4.14	1.87	5.96	2.79	2.07	1.42	10	F003(AK)
1,1-Dichloroethylene	165	3.53	3.96	5.01	2.74	2.09	2.03	10	
1,1,2-Trichloro1,2,2-trifluoroethane	165	3.63	2.59	3.32	3.18	9.27	8.65	10	F002(AK)
Acetone	165	38.04	23.28	32.92	48.48	82.41	83.09	100	F003(AK)
Methylene Chloride	165	3.82	2.84	3.65	1.70	7.81	7.51	10	F002(AK)
1,1-Dichloroethane	165	3.64	2.56	4.09	3.69	18.02	32.99	10	
cis-1,2-Dichloroethene	165	3.59	2.97	3.49	4.64	1.80	1.95	10	
Methyl ethyl ketone	165	37.80	26.61	46.24	54.05	19.21	21.48	100	F005(AK)
Chloroform	165	3.42	2.67	3.96	3.65	2.00	2.11	10	
1,1,1-Trichloroethane	165	3.52	2.63	3.76	3.84	88.98	97.05	10	F002
Cyclohexane	165	3.27	2.71	4.27	4.47	1.64	1.89	NR	
Carbon Tetrachloride	165	3.66	2.89	2.83	3.58	1.87	1.64	10	F001(AK)
Benzene	165	3.33	2.82	2.97	2.40	2.25	2.06	10	F005(AK)
1,2-Dichloroethane	165	3.33	3.46	2.82	3.22	1.67	1.64	10	
Trichloroethene	165	3.35	1.90	4.76	3.40	7.23	7.09	10	F002(AK)
Butanol	165	46.43	12.69	20.85	36.19	23.22	13.83	100	F003(AK)
Methyl isobutyl ketone	165	34.40	23.18	31.59	35.76	17.25	15.52	100	F005(AK)
Toluene	165	2.78	2.41	3.94	4.37	7.04	7.24	10	F005(AK)
Tetrachloroethene	165	3.29	2.08	3.55	4.53	2.13	1.76	10	F002(AK)
Chlorobenzene	165	3.13	2.79	2.77	5.82	1.57	2.17	10	F002(AK)
Ethylbenzene	165	2.98	2.49	2.56	5.78	1.51	2.09	10	F003(AK)
m-Xylene	165	6.81	5.22	7.15	8.98	5.83	6.70	10	F003(AK)
p-Xylene	165	6.81	5.22	7.15	8.98	5.83	6.70	10	F003(AK)
o-Xylene	165	3.02	2.75	3.89	5.43	1.51	2.11	10	F003(AK)
Bromoform	165	3.49	3.28	4.50	4.22	1.75	1.94	10	
1,1,2,2-Tetrachloroethane	165	3.09	2.35	3.37	6.14	1.54	2.20	10	
1,3,5-Trimethylbenzene	165	3.16	3.27	2.85	3.92	1.58	1.78	NR	
1,2,4-Trimethylbenzene	165	3.25	2.94	3.67	3.88	1.63	1.75	NR	
Hydrogen	165	0.02	0.02	0.00	0.00	0.06	0.06	NR	
Methane	165	0.02	0.02	0.02	0.02	0.02	0.02	NR	

Did the data verify the acceptable knowledge? Yes No

If not, describe the basis for assigning the EPA Hazardous Waste Numbers:

NOTES:

a The concentration for every analyte is in ppmv except for that of Hydrogen and Methane which is in vol%. ND = Not Detected, NR = Not Reported

b No entry indicates no associated EPA HWN assigned to the waste stream. Only F001, F002, F003, and F005 are applicable to headspace gase analysis data. If UCL(90) is below the PRQL, the EPA HWN is assigned from AK only [e.g. entry would read F003(AK)].

MDL Study 4/18/00

4/18/2000																		
Compound Name	Actual Conc. (ppmv)	ppmv	ppmv	ppmv	ppmv	ppmv	ppmv	ppmv	N	avg % Rec.	max % Rec	min % Rec.	Standard Deviation	% RSD	MDL ppmv	Moles analyte	MW	MDL (ng)
Benzene	9.49	8.85	8.33	11.00	11.14	9.48	9.32	9.23	7.00	101.38	117.39	87.78	1.06	11.01	3.33	2.64E-11	78	2.06
Bromoform	9.49	7.98	7.77	10.33	10.63	9.04	8.64	8.45	7.00	94.60	112.01	81.88	1.11	12.38	3.49	2.77E-11	253	7.01
Carbon Tetrachloride	9.49	8.49	8.14	10.97	11.17	9.34	9.17	9.06	7.00	99.86	117.70	85.77	1.17	12.29	3.66	2.90E-11	154	4.47
Chloroform	9.49	8.80	8.33	10.92	11.28	9.47	9.41	9.10	7.00	101.32	118.86	87.78	1.09	11.33	3.42	2.72E-11	119.5	3.24
Chlorobenzene	9.49	8.56	8.09	10.50	10.86	9.28	9.15	9.06	7.00	98.60	114.44	85.25	1.00	10.64	3.13	2.48E-11	113	2.80
Cyclohexane	9.49	8.54	8.22	10.59	10.93	9.24	9.04	8.69	7.00	98.22	115.17	86.62	1.04	11.17	3.27	2.60E-11	84	2.18
1,1-Dichloroethane	9.49	8.39	8.48	11.17	11.17	9.65	9.35	9.02	7.00	101.20	117.70	88.41	1.16	12.06	3.64	2.89E-11	99	2.86
1,2-Dichloroethane	9.49	8.43	8.00	10.44	10.89	9.02	8.99	8.70	7.00	97.05	114.75	84.30	1.06	11.52	3.33	2.64E-11	99	2.62
1,1-Dichloroethylene	9.49	8.39	8.30	11.06	10.88	9.42	9.77	8.80	7.00	100.29	116.54	87.46	1.12	11.81	3.53	2.80E-11	97	2.72
cis-1,2-Dichloroethene	9.49	8.46	8.59	11.11	11.28	9.20	9.61	9.08	7.00	101.35	118.86	89.15	1.14	11.89	3.59	2.85E-11	97	2.77
Ethylbenzene	9.49	7.90	7.64	9.77	10.25	8.79	8.61	8.40	7.00	92.37	108.01	80.51	0.95	10.81	2.98	2.36E-11	106	2.50
Ethyl Ether	9.49	8.72	8.55	11.61	11.70	9.67	9.95	8.91	7.00	104.03	123.29	90.09	1.32	13.34	4.14	3.28E-11	74	2.43
Methylene chloride	9.49	8.61	8.24	11.36	11.00	9.59	9.17	8.69	7.00	100.35	119.70	86.83	1.22	12.76	3.82	3.03E-11	85	2.57
1,1,2,2-Tetrachloroethane	9.49	8.46	8.19	10.31	10.94	9.32	9.04	9.03	7.00	98.28	115.28	86.30	0.98	10.53	3.09	2.45E-11	168	4.11
Tetrachloroethene	9.49	8.48	8.17	10.50	11.09	9.44	9.31	9.02	7.00	99.37	116.86	86.09	1.05	11.10	3.29	2.61E-11	166	4.33
Toluene	9.49	8.56	8.16	10.20	10.62	8.90	9.08	8.89	7.00	96.96	111.91	85.99	0.89	9.63	2.78	2.21E-11	92	2.03
1,1,1-Trichloroethane	9.49	8.63	8.08	10.80	11.03	9.04	9.13	8.79	7.00	98.60	116.23	85.14	1.12	11.96	3.52	2.79E-11	133	3.71
Trichloroethene	9.49	8.57	8.30	10.86	11.06	9.59	9.38	9.03	7.00	100.54	116.54	87.46	1.07	11.17	3.35	2.66E-11	131	3.48
1,1,2-Trichloro-1,2,2-Trifluoroethane	9.49	8.84	8.56	11.41	11.26	9.47	9.75	8.95	7.00	102.72	120.23	90.20	1.15	11.84	3.63	2.88E-11	187	5.38
1,3,5-Trimethylbenzene	9.49	8.10	7.77	10.18	10.47	9.22	8.63	8.95	7.00	95.32	110.33	81.88	1.00	11.10	3.16	2.50E-11	120	3.00
1,2,4-Trimethylbenzene	9.49	8.06	7.89	10.07	10.65	9.36	8.66	8.56	7.00	95.21	112.22	83.14	1.03	11.44	3.25	2.58E-11	120	3.09
m and p Xylene	18.98	15.89	15.65	20.22	20.85	17.74	17.38	15.61	7.00	92.83	109.85	82.24	2.17	12.30	6.81	5.40E-11	106	5.73
o-Xylene	9.49	7.71	7.63	9.69	10.11	8.71	8.11	8.28	7.00	90.68	106.53	80.40	0.96	11.18	3.02	2.40E-11	106	2.54
Acetone	94.9	96.41	90.31	121.80	121.26	104.99	103.60	98.57	7.00	110.93	128.35	95.16	12.10	11.50	38.04	3.02E-10	58	17.50
Butanol	94.9	99.46	100.00	132.46	137.05	109.29	115.20	110.55	7.00	121.03	144.42	104.81	14.78	12.86	46.43	3.68E-10	74	27.26
Methyl ethyl Ketone	94.9	96.08	91.56	120.86	122.45	102.68	102.73	98.57	7.00	110.63	129.03	96.48	12.03	11.46	37.80	3.00E-10	72	21.59
Methanol	94.9	93.96	87.12	118.22	120.45	101.08	100.41	97.27	7.00	108.16	126.92	91.80	12.33	12.01	38.75	3.07E-10	32	9.84
Methyl isobutyl ketone	94.9	101.39	97.06	121.13	126.38	106.34	103.77	102.91	7.00	114.25	133.17	102.28	10.95	10.10	34.40	2.73E-10	100	27.29
		File ID:																
		Sample ID:																
	True Value											Average	Maximum	Minimum	STD	% RSD	MDL	
	Actual Conc. (ppmv)	vol%	vol%	vol%	vol%	vol%	vol%	vol%	vol%	vol%	N	avg % Rec.	max % Rec	min % Rec.	Standard Deviation	% RSD	vol %	
Hydrogen	0.075		0.08	0.08	0.08	0.07	0.07	0.08	0.08		7	102.86	106.67	93.33	0.00	6.33	0.02	
Methane	0.075		0.09	0.08	0.08	0.08	0.09	0.08	0.08		7	110.48	120.00	106.67	0.00	5.89	0.02	

MDL Study 6/19/00

Compound Name	Actual Conc. (ppmv)	ppmv	ppmv	ppmv	ppmv	N	avg % Rec.	max % Rec	min % Rec.	Standard Deviation	% RSD	MDL ppmv	Moles analyte	MW	MDL (ng)
Benzene	9.49	10.61	11.49	11.72	10.48	4	116.70	123.50	110.43	0.62	5.61	2.82	2.24E-11	78	1.75
Bromoform	9.49	9.92	10.82	11.60	10.33	4	112.41	122.23	104.53	0.72	6.77	3.28	2.60E-11	253	6.58
Carbon Tetrachloride	9.49	10.71	11.72	11.95	10.78	4	118.97	125.92	112.86	0.64	5.64	2.89	2.29E-11	154	3.53
Chloroform	9.49	10.47	11.35	11.65	10.54	4	115.94	122.76	110.33	0.59	5.34	2.67	2.12E-11	119.5	2.53
Chlorobenzene	9.49	10.44	11.30	11.89	10.90	4	117.31	125.29	110.01	0.62	5.53	2.79	2.22E-11	113	2.50
Cyclohexane	9.49	9.20	9.85	10.18	8.87	4	100.37	107.27	93.47	0.60	6.27	2.71	2.15E-11	84	1.81
1,1-Dichloroethane	9.49	10.06	10.77	11.22	10.08	4	110.99	118.23	106.01	0.56	5.36	2.56	2.03E-11	99	2.01
1,2-Dichloroethane	9.49	10.28	11.50	11.88	10.54	4	116.44	125.18	108.32	0.76	6.90	3.46	2.75E-11	99	2.72
1,1-Dichloroethylene	9.49	9.87	11.33	11.41	9.85	4	111.85	120.23	103.79	0.87	8.22	3.96	3.14E-11	97	3.05
cis-1,2-Dichloroethene	9.49	10.29	11.08	11.55	10.18	4	113.54	121.71	107.27	0.65	6.07	2.97	2.36E-11	97	2.28
Ethylbenzene	9.49	10.27	10.97	11.53	10.55	4	114.12	121.50	108.22	0.55	5.06	2.49	1.97E-11	106	2.09
Ethyl Ether	9.49	9.24	9.93	9.61	8.99	4	99.50	104.64	94.73	0.41	4.37	1.87	1.49E-11	74	1.10
Methylene chloride	9.49	10.08	11.03	11.34	10.17	4	112.28	119.49	106.22	0.63	5.88	2.84	2.25E-11	85	1.92
1,1,2,2-Tetrachloroethane	9.49	10.74	11.60	11.97	11.33	4	120.23	126.13	113.17	0.52	4.54	2.35	1.87E-11	168	3.13
Tetrachloroethene	9.49	10.08	10.94	10.99	10.29	4	111.43	115.81	106.22	0.46	4.34	2.08	1.65E-11	166	2.74
Toluene	9.49	10.35	11.18	11.40	10.42	4	114.20	120.13	109.06	0.53	4.90	2.41	1.91E-11	92	1.76
1,1,1-Trichloroethane	9.49	10.55	11.43	11.69	10.60	4	116.62	123.18	111.17	0.58	5.23	2.63	2.08E-11	133	2.77
Trichloroethene	9.49	10.35	10.92	11.07	10.22	4	112.12	116.65	107.69	0.42	3.93	1.90	1.50E-11	131	1.97
1,1,2-Trichloro-1,2,2-Trifluoroethane	9.49	10.67	11.80	11.69	10.87	4	118.62	124.34	112.43	0.57	5.07	2.59	2.06E-11	187	3.84
1,3,5-Trimethylbenzene	9.49	9.12	10.47	10.77	9.99	4	106.30	113.49	96.10	0.72	7.14	3.27	2.60E-11	120	3.11
1,2,4-Trimethylbenzene	9.49	9.63	10.71	11.16	10.32	4	110.17	117.60	101.48	0.65	6.20	2.94	2.33E-11	120	2.80
m and p Xylene	18.98	20.50	22.21	23.28	21.77	4	115.60	122.66	108.01	1.15	5.24	5.22	4.14E-11	106	4.39
o-Xylene	9.49	9.96	10.59	11.40	10.37	4	111.49	120.13	104.95	0.61	5.73	2.75	2.18E-11	106	2.31
Acetone	94.9	98.71	105.90	108.75	98.64	4	108.54	114.59	103.94	5.13	4.98	23.28	1.85E-10	58	10.71
Butanol	94.9	124.49	127.52	129.58	123.49	4	133.06	136.54	130.13	2.79	2.21	12.69	1.01E-10	74	7.45
Methyl ethyl Ketone	94.9	110.33	118.83	123.71	113.74	4	122.92	130.36	116.26	5.86	5.02	26.61	2.11E-10	72	15.20
Methanol	94.9	94.94	98.49	101.37	93.25	4	102.23	106.82	98.26	3.63	3.75	16.50	1.31E-10	32	4.19
Methyl isobutyl ketone	94.9	113.16	121.87	125.07	118.31	4	126.03	131.79	119.24	5.11	4.27	23.18	1.84E-10	100	18.39

		File ID:													
		Sample ID:													
	True Value								Average	Maximum	Minimum	STD	% RSD	MDL	
	Actual Conc. (ppmv)	vol%	vol%	vol%	vol%	vol%	vol%	N	avg % Rec.	max % Rec	min % Rec.	Standard Deviation	% RSD	vol %	
Hydrogen	0.075	0.09	0.08	0.08	0.08			4	110.00	120.00	106.67	0.00	6.06	0.02	
Methane	0.075	0.09	0.08	0.09	0.09			4	116.67	120.00	106.67	0.01	5.71	0.02	

MDL Study 1/4/01

Compound Name	Actual Conc. (ppmv)	ppmv	ppmv	ppmv	ppmv	N	avg % Rec.	max % Rec	min % Rec.	Standard Deviation	% RSD	MDL ppmv	Moles analyte	MW	MDL (ng)
Benzene	9.49	9.77	8.84	8.81	10.1	4	98.84	106.43	92.83	0.65	6.98	2.97	2.36E-11	78	1.84
Bromoform	9.49	9.63	8.76	7.83	10.07	4	95.60	106.11	82.51	0.99	10.93	4.50	3.57E-11	253	9.03
Carbon Tetrachloride	9.49	10.11	9.34	9.28	10.57	4	103.53	111.38	97.79	0.62	6.35	2.83	2.25E-11	154	3.46
Chloroform	9.49	10.37	9.02	8.96	10.61	4	102.63	111.80	94.42	0.87	8.95	3.96	3.14E-11	119.5	3.75
Chlorobenzene	9.49	9.81	8.86	8.45	9.48	4	96.42	103.37	89.04	0.61	6.67	2.77	2.20E-11	113	2.49
Cyclohexane	9.49	9.96	8.54	8.21	10.01	4	96.73	105.48	86.51	0.94	10.23	4.27	3.38E-11	84	2.84
1,1-Dichloroethane	9.49	10.72	9.33	8.81	10.42	4	103.48	112.96	92.83	0.90	9.17	4.09	3.24E-11	99	3.21
1,2-Dichloroethane	9.49	9.82	9.15	9.29	10.52	4	102.16	110.85	96.42	0.62	6.41	2.82	2.24E-11	99	2.21
1,1-Dichloroethylene	9.49	11.17	9.1	8.96	10.63	4	105.01	117.70	94.42	1.10	11.07	5.01	3.97E-11	97	3.85
cis-1,2-Dichloroethene	9.49	10.16	8.74	9.06	10.26	4	100.68	108.11	92.10	0.77	8.04	3.49	2.77E-11	97	2.69
Ethylbenzene	9.49	9.52	8.87	8.2	9.2	4	94.28	100.32	86.41	0.56	6.31	2.56	2.03E-11	106	2.16
Ethyl Ether	9.49	11.01	9.01	8.18	10.52	4	102.00	116.02	86.20	1.31	13.57	5.96	4.73E-11	74	3.50
Methylene chloride	9.49	10.24	8.8	8.58	9.85	4	98.71	107.90	90.41	0.80	8.58	3.65	2.89E-11	85	2.46
1,1,2,2-Tetrachloroethane	9.49	10.08	9.24	8.44	9.89	4	99.18	106.22	88.94	0.74	7.88	3.37	2.67E-11	168	4.49
Tetrachloroethene	9.49	9.86	9.07	8.23	9.87	4	97.55	104.00	86.72	0.78	8.43	3.55	2.81E-11	166	4.67
Toluene	9.49	10.44	9.49	8.32	9.5	4	99.45	110.01	87.67	0.87	9.20	3.94	3.13E-11	92	2.88
1,1,1-Trichloroethane	9.49	10.2	9.31	9.05	10.85	4	103.82	114.33	95.36	0.83	8.40	3.76	2.98E-11	133	3.96
Trichloroethene	9.49	10.34	8.46	8.53	10.28	4	99.08	108.96	89.15	1.05	11.15	4.76	3.78E-11	131	4.95
1,1,2-Trichloro-1,2,2-Trifluoroethane	9.49	10.8	9.78	9.28	10.69	4	106.82	113.80	97.79	0.73	7.22	3.32	2.64E-11	187	4.93
1,3,5-Trimethylbenzene	9.49	8.35	7.12	7.33	8.25	4	81.80	87.99	75.03	0.63	8.09	2.85	2.26E-11	120	2.71
1,2,4-Trimethylbenzene	9.49	8.9	7.4	7.05	7.96	4	82.48	93.78	74.29	0.81	10.31	3.67	2.91E-11	120	3.49
m and p Xylene	18.98	18.96	17.63	15.64	18.98	4	93.80	100.00	82.40	1.57	8.84	7.15	5.67E-11	106	6.01
o-Xylene	9.49	9.38	8.57	7.5	9.23	4	91.36	98.84	79.03	0.86	9.87	3.89	3.08E-11	106	3.27
Acetone	94.9	108.46	98.47	93.04	106.85	4	107.17	114.29	98.04	7.25	7.13	32.92	2.61E-10	58	15.14
Butanol	94.9	138.16	129.87	130.25	137.85	4	141.24	145.58	136.85	4.59	3.43	20.85	1.65E-10	74	12.24
Methyl ethyl Ketone	94.9	106.92	89.07	92.65	109.52	4	104.89	115.41	93.86	10.18	10.23	46.24	3.67E-10	72	26.41
Methanol	94.9	110.09	101.11	106.73	113.89	4	113.76	120.01	106.54	5.42	5.02	24.61	1.95E-10	32	6.25
Methyl isobutyl ketone	94.9	107.51	95.73	90.97	97.53	4	103.20	113.29	95.86	6.96	7.10	31.59	2.51E-10	100	25.06

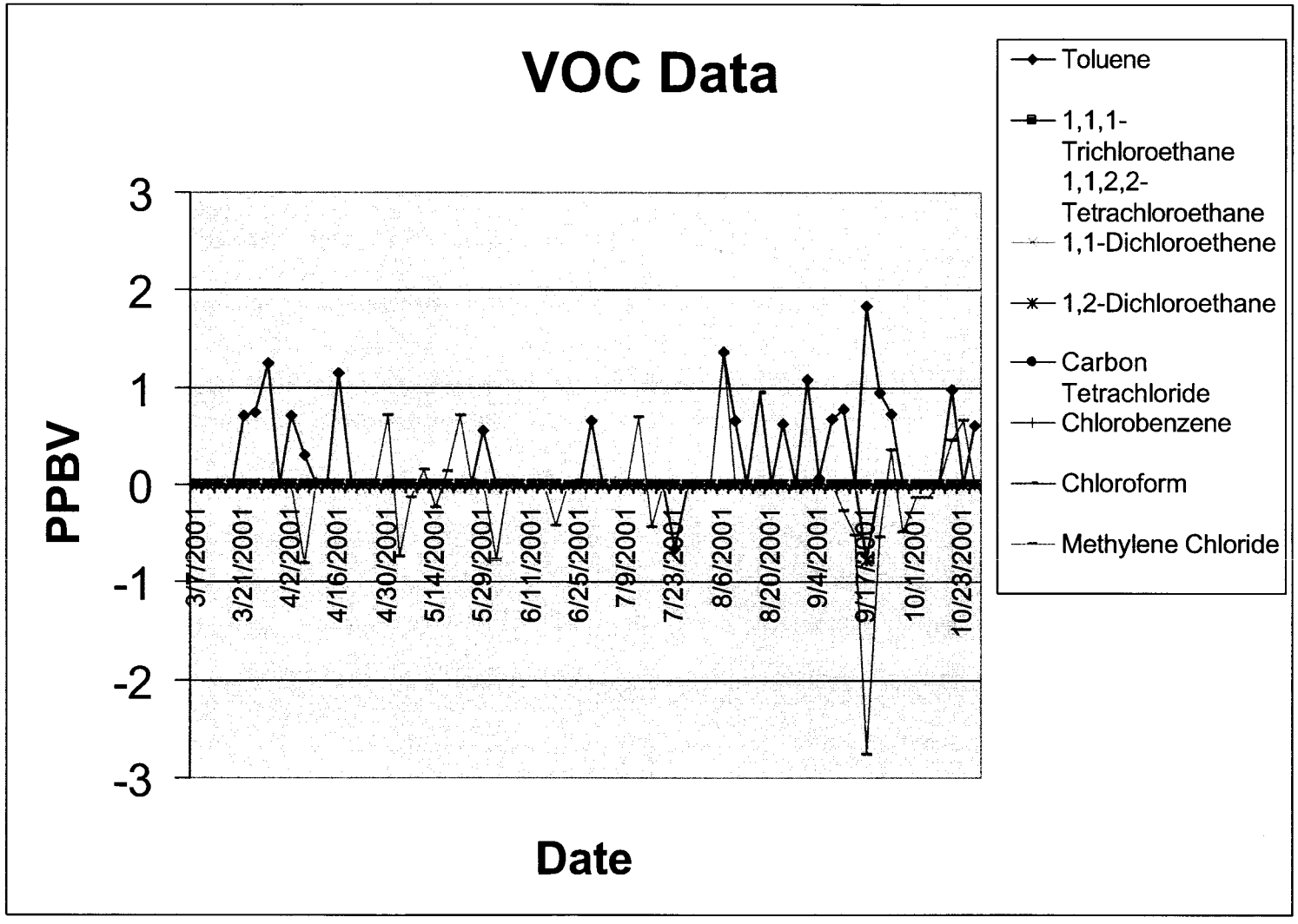
		File ID:													
		Sample ID:													
	True Value								Average	Maximum	Minimum	STD	% RSD	MDL	
	Actual Conc. (ppmv)	vol%	vol%	vol%	vol%	vol%	vol%	N	avg % Rec.	max % Rec	min % Rec.	Standard Deviation	% RSD	vol %	
Hydrogen	0.075	0.08	0.08	0.08	0.08			4	106.67	106.67	106.67	0.00	0.00	0.00	
Methane	0.075	0.09	0.08	0.09	0.09			4	116.67	120.00	106.67	0.01	5.71	0.02	

MDL Study 3/8/01

Compound Name	Actual Conc. (ppmv)	ppmv	ppmv	ppmv	ppmv	N	avg % Rec.	max % Rec	min % Rec.	Standard Deviation	% RSD	MDL ppmv	Moles analyte	MW	MDL (ng)
Benzene	9.49	9.22	9.93	9.26	8.64	4	97.60	104.64	91.04	0.53	5.70	2.40	1.90E-11	78	1.48
Bromoform	9.49	10.39	11.84	11.04	9.66	4	113.09	124.76	101.79	0.93	8.66	4.22	3.35E-11	253	8.46
Carbon Tetrachloride	9.49	8.69	10.19	9.00	8.39	4	95.55	107.38	88.41	0.79	8.70	3.58	2.84E-11	154	4.37
Chloroform	9.49	9.23	10.79	10.07	9.05	4	103.11	113.70	95.36	0.80	8.22	3.65	2.90E-11	119.5	3.46
Chlorobenzene	9.49	10.36	12.82	11.76	10.06	4	118.55	135.09	106.01	1.28	11.40	5.82	4.62E-11	113	5.22
Cyclohexane	9.49	7.52	9.58	8.67	7.57	4	87.83	100.95	79.24	0.99	11.82	4.47	3.55E-11	84	2.98
1,1-Dichloroethane	9.49	7.98	9.72	9.37	8.40	4	93.44	102.42	84.09	0.81	9.17	3.69	2.93E-11	99	2.90
1,2-Dichloroethane	9.49	8.30	9.70	8.39	8.18	4	91.07	102.21	86.20	0.71	8.22	3.22	2.56E-11	99	2.53
1,1-Dichloroethylene	9.49	9.31	9.81	9.84	8.55	4	98.81	103.69	90.09	0.60	6.43	2.74	2.17E-11	97	2.11
cis-1,2-Dichloroethene	9.49	9.19	10.80	9.55	8.34	4	99.79	113.80	87.88	1.02	10.79	4.64	3.68E-11	97	3.57
Ethylbenzene	9.49	9.48	12.31	10.88	9.82	4	111.93	129.72	99.89	1.27	11.99	5.78	4.59E-11	106	4.86
Ethyl Ether	9.49	8.19	9.41	8.47	8.04	4	89.86	99.16	84.72	0.61	7.21	2.79	2.21E-11	74	1.64
Methylene chloride	9.49	9.40	10.12	9.36	9.36	4	100.74	106.64	98.63	0.37	3.91	1.70	1.35E-11	85	1.14
1,1,2,2-Tetrachloroethane	9.49	10.65	12.78	11.18	9.53	4	116.28	134.67	100.42	1.35	12.25	6.14	4.87E-11	168	8.18
Tetrachloroethene	9.49	10.32	12.65	11.31	10.85	4	118.89	133.30	108.75	1.00	8.84	4.53	3.59E-11	166	5.96
Toluene	9.49	10.35	12.08	11.38	9.97	4	115.33	127.29	105.06	0.96	8.80	4.37	3.47E-11	92	3.19
1,1,1-Trichloroethane	9.49	9.44	11.04	9.64	9.13	4	103.40	116.33	96.21	0.84	8.61	3.84	3.04E-11	133	4.05
Trichloroethene	9.49	9.10	10.77	10.26	9.50	4	104.40	113.49	95.89	0.75	7.57	3.40	2.70E-11	131	3.54
1,1,2-Trichloro-1,2,2-Trifluoroethane	9.49	8.89	10.43	9.20	9.07	4	99.03	109.91	93.68	0.70	7.45	3.18	2.52E-11	187	4.71
1,3,5-Trimethylbenzene	9.49	9.41	11.04	10.90	9.55	4	107.74	116.33	99.16	0.86	8.45	3.92	3.11E-11	120	3.73
1,2,4-Trimethylbenzene	9.49	10.00	10.37	11.16	9.10	4	107.03	117.60	95.89	0.86	8.42	3.88	3.08E-11	120	3.70
m and p Xylene	18.98	19.50	23.39	22.68	19.81	4	112.46	123.23	102.74	1.98	9.26	8.98	7.12E-11	106	7.55
o-Xylene	9.49	9.88	12.36	11.14	9.85	4	113.88	130.24	103.79	1.20	11.07	5.43	4.31E-11	106	4.57
Acetone	94.9	87.07	107.52	87.40	84.50	4	96.55	113.30	89.04	10.68	11.65	48.48	3.85E-10	58	22.30
Butanol	94.9	102.47	114.82	101.45	95.93	4	109.24	120.99	101.09	7.97	7.69	36.19	2.87E-10	74	21.24
Methyl ethyl Ketone	94.9	95.47	112.31	101.59	83.81	4	103.58	118.35	88.31	11.90	12.11	54.05	4.29E-10	72	30.87
Methanol	94.9	80.84	94.83	86.20	77.76	4	89.47	99.93	81.94	7.48	8.81	33.96	2.69E-10	32	8.62
Methyl isobutyl ketone	94.9	124.97	114.73	131.81	116.69	4	128.61	138.89	120.90	7.88	6.45	35.76	2.84E-10	100	28.37

		File ID:													
		Sample ID:													
	True Value								Average	Maximum	Minimum	STD	% RSD	MDL	
	Actual Conc. (ppmv)	vol%	vol%	vol%	vol%	vol%	vol%	N	avg % Rec.	max % Rec	min % Rec.	Standard Deviation	% RSD	vol %	
Hydrogen	0.075	0.08	0.08	0.08	0.08			4	106.67	106.67	106.67	0.00	0.00	0.00	
Methane	0.075	0.09	0.09	0.08	0.09			4	116.67	120.00	106.67	0.01	5.71	0.02	

ATTACHMENT B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-2
-3
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4/2/2001
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5/29/2001
6/11/2001
6/25/2001
7/9/2001
7/23/2001
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9/4/2001
9/17/2001
10/1/2001
10/23/2001
Date
Toluene
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1,1-Dichloroethene
1,2-Dichloroethane
Carbon Tetrachloride
Chlorobenzene
Chloroform
Methylene Chloride