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CCP-TP-178

Revision 0

CCP
SUMMA® Canister Cleaning

EFFECTIVE DATE: 05/02/2007

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PRINTED NAME

APPROVED FOR USE

RECORD OF REVISION

Revision Number	Date Approved	Description of Revision
0	05/02/2007	Initial Issue.

1. PURPOSE

This Central Characterization Project (CCP) procedure describes the method used to clean SUMMA® or equivalent canisters at the Environmental Chemistry Laboratory (ECL). These canisters are used in support of headspace gas sampling by CCP. All SUMMA® canisters used for collecting gas samples must be processed and certified as clean and free of volatile organic compound (VOC) contaminants before use.

Personnel performing this procedure will be trained and qualified in accordance with CCP-QP-002, *CCP Training and Qualification Plan,* prior to performing this procedure.

2. SCOPE

SUMMA® or equivalent canisters are cleaned in a batch process using gas purging and heating cycles. Prior to cleaning, all canisters in the cleaning batch are leak tested. The canisters are evacuated and heated for a minimum of 2 hours. Repetitive cycles of pressurization/depressurization using Ultra High Purity (UHP) nitrogen purge gas complete the cleaning process. Canisters are evacuated to 0.10 mm Hg or less for storage prior to shipment. A cleaning blank is collected and analyzed for each batch to ensure that the canisters are cleaned to specified levels. This canister cleaning procedure meets the requirements of the Waste Isolation Pilot Plant (WIPP) Waste Analysis Plan (WAP).

3. DEFINITIONS

SUMMA® Canister. A stainless steel pressure vessel with SUMMA® passivated interior surfaces for the collection and storage of gas samples. The SUMMA® passivation process involves the formation of chromium-nickel oxide on the interior surface of the canister. This type of canister enhances sample storage stability for many organic compounds.

Field Canisters. Those canisters used to collect headspace samples at TRU Waste Generator/Storage Sites. Field canisters may be 100 mL or 250 mL capacity and are equipped with vacuum/pressure gauges.

Laboratory Canisters. Those canisters used for sample and standard dilutions at Environmental Chemistry Laboratory (ECL). Lab canisters range from 100 mL to 6000 mL capacity and may be equipped with pressure gauges.

Ultra High Purity (UHP) Nitrogen. Nitrogen having less than 0.2 ppm total hydrocarbon content.

4. PROCEDURES

4.1 Safety Precautions

4.1.1 Compressed Gas Hazards

4.1.1.1 Handle all compressed gases in accordance with JSA-56-03-INEEL, "Compressed Gas Cylinder Handling."

4.1.2 Thermal Hazards

4.1.2.1 The cleaning ovens operate at elevated temperatures (110º C). To avoid burns, do not touch the inner oven walls, doors or contents until the systems reach room temperature.

4.2 Materials and Apparatus

4.2.1 Canister Cleaning System

ECL uses up to five canister cleaning systems, designated A, B, C, etc. These cleaning systems can accommodate between 18 and 60 250-mL or 100 mL canisters. Operating procedures for all systems are essentially identical.

A canister cleaning system is shown schematically in Figure 1, and consists of the parts described below. Unless otherwise specified, all measurement devices in the system are used for indication only, and calibration is not required.

4.2.2 Dry vacuum pump, Varian Model TriScroll 600 or equivalent, capable of evacuating SUMMA® canisters to an absolute pressure of <0.05 torr.

4.2.3 Canister manifold, consisting of stainless steel tubing with connections for simultaneous cleaning of several canisters.

4.2.4 Shut-off valves, stainless steel and bellows type (Nupro "H" series or equivalent).

4.2.5 Vacuum gauge, Scientific Instruments Specialist P/N VPG-1A or equivalent.

4.2.6 High pressure regulator, Alphgas series 2500 or equivalent.

4.2.7 Stainless steel flow control valve, Nupro "H" series or equivalent.

4.2.8 Humidifier, pressurizable water reservoir containing HPLC (organic free) grade deionized water or other system capable of providing moisture to the purge gas supply (i.e. pre-humidified purge gas).

4.2.9 Isothermal oven, Thermolyne Model OV47510 or equivalent. Temperature must be controlled to ± 5 °C. The temperature controller/monitor must have a current calibration sticker from the Standards and Calibration Laboratory.

4.2.10 Pirani Micro-controller and gauge tube, HPS Series 315 or equivalent. The Pirani gauge may be calibrated by user.

4.3 Ancillary Equipment

4.3.1 SUMMA®, or equivalent, Canisters: 100 mL (cylindrical), 250 mL (spherical), 500 mL (spherical), 1000 mL (spherical), 2800 mL (spherical) and 6000 mL (spherical). Field canister pressure gauges must be calibrated annually by the INL Standards and Calibration Laboratory (S&CL).

4.3.2 Wrenches, open-end, various sizes.

4.3.3 Tech-Tuff® foam-lined shipping cases, or equivalent.

4.4 Reagents, Standard Solutions, and Quality Control Samples

4.4.1 Purge Gas: Compressed nitrogen, ultra high purity.

4.5 Canister Release

4.5.1 Release field SUMMA® canisters containing samples for disposal after notification is received from the TRU client site Project Manager that the samples no longer need to be retained.

4.5.2 Vent all released canisters containing sample above ambient pressure by holding the canisters up to the laboratory exhaust drop vent or fume hood and opening the canister valve.

4.5.3 For field sample canisters, record the sample disposal date on the ECL Internal Sample Tracking Form and on the original COC.

4.6 Canister Leak Testing for Field Canisters and Laboratory Canisters Equipped with Pressure Gauges

NOTE: *Laboratory canisters without gauges are leak tested during the canister cleaning cycle.*

4.6.1 Attach canisters to an available manifold and pressurize to 24 psig using clean inert gas.

NOTE: *Canisters that have been pressurized to 24 psig by the Standards and Calibration Laboratory do not need to be evacuated and repressurized.*

4.6.2 Ensure that the canister gauge readings are as close to 24 psig as possible since it is the reference value for leak rate determination.

4.6.3 Close the canister valves.

4.6.4 Remove canisters from the manifold and place them on the lab bench to allow viewing of the canister gauges.

4.6.5 Record the canister IDs, start date, time and temperature for the pressurized leak test in the SUMMA® Canister Leak Testing Logbook (see example in Exhibit 1).

NOTE: *All field canisters have unique identification numbers of the format "XXyyy", where XX identifies the site owning the canister and yyy is a sequential number. These identification numbers are on barcodes attached to the canisters or are embossed on a tag made from metallic label tape that is attached to a metal snap ring placed around the neck of the canister. Laboratory canisters have a tag identifying them as "LAB", and may be identified using canister ID numbers or canister serial numbers.*

4.6.6 After a minimum of 24 hours, record the end date, time and ambient temperature in the Leak Testing logbook.

4.6.7 Check each canister gauge for acceptable reading (i.e. 24 psig ±2 psig).

4.6.7.1 IF canister gauge reading is acceptable, THEN record "Y" in the "Passed?" column in the Leak Testing logbook.

4.6.7.2 IF canister gauge reading is NOT acceptable, THEN record "N" in the "Passed?" column of the Leak Testing logbook.

4.6.8 IF a canister fails the leak test, THEN retest it once per Steps 4.6.1 or 4.6.7 to eliminate human error as the source of the problem.

4.6.8.1 IF a canister fails the second leak, THEN segregate it for maintenance per Section 4.11.

4.6.8.2 IF a canister passes the second leak test, THEN proceed with canister cleaning per Step 4.7.

4.7 Canister Cleaning

4.7.1 Complete the cleaning oven maintenance logbook.

4.7.2 Replace VCR gaskets on the manifold ports as necessary.

4.7.3 Remove the canister gauge calibration tags and segregate them by cleaning batch.

4.7.4 Attach canisters that passed the leak check or laboratory canisters without gauges to the ports in the cleaning oven.

NOTE: *Laboratory canisters and field canisters may be cleaned together.*

4.7.5 Record all canister IDs to be cleaned in the batch in the SUMMA® Canister Cleaning Logbook (see example in Exhibit 2).

4.7.6 Assign a Cleaning Batch Number (serially per cleaning oven, e.g., 001B, 002B) using the next available number for that oven.

4.7.7 Open all canister valves and pump down the manifold and canisters to <0.10 mm Hg (1×10^{-1} on the Pirani gauge). If the system does not pump down, trouble shoot appropriately and do not continue to the next step until the problem is solved.

CAUTION

Temperatures greater than 125 °C can cause damage to the canister pressure gauges, and must not be exceeded.

4.7.8 Turn on the cleaning oven and allow it to heat to 110 °C.

4.7.9 Record the date, time, initial oven temperature (°C) and manifold pressure (torr) in the cleaning logbook under "Cleaning System."

4.7.10 Process the canisters at 110 °C and <0.10 mm Hg for a minimum of 2 hrs. At the end of a successful cleaning cycle, record the date, time, oven temperature and manifold pressure.

NOTE: *The completion of a successful cleaning cycle documents a successful leak test for all laboratory canisters without gauges in a cleaning batch.*

4.7.11 Turn the oven off and allow the oven temperature to cool to ambient before proceeding.

4.8 Canister Purge Cycle

4.8.1 Close the manifold isolation valve (isolate the canister manifold from the Pirani gauge and the vacuum pump).

4.8.2 Verify that the purge gas cylinder valve is open and its regulator is set to 30 psig.

4.8.3 Align the purge gas piping valves to provide flow through the humidifier into the manifold and canisters.

4.8.4 Pressurize the canisters to 20-25 psig.

4.8.5 Close the purge gas supply valve and open the manifold vent to allow the pressurized canisters to vent to ambient pressure.

4.8.6 Repeat steps 4.8.1 through 4.8.5 two more times for a total of three purge cycles.

4.8.6.1 On the third and final cycle, after pressurizing to 20 to 25 psi (Step 4.8.5), close the canister valve on the canister selected to serve as the cleaning blank.

4.8.7 Record the identity of the cleaning blank canister in the logbook under "Cleaning Blank Certification Data."

4.8.8 Open the manifold vent to allow the remaining canisters to come to ambient pressure.

4.8.9 Close the purge gas supply valves, close the vent, and isolate the humidifier.

4.8.10 Open the vacuum pump isolation valve and evacuate the manifold and the remaining canisters.

4.8.11 Allow canisters to evacuate to less than 0.10 mm Hg.

4.8.12 Close all canister valves.

4.8.13 Record the date, time, evacuation (manifold) pressure (torr), ambient temperature (°C) and ambient pressure (torr) in the cleaning logbook under "Sample Tag Information."

NOTE: *Manifold pressure readings less than 0.05 torr may be recorded as "<5.0 E-2".*

4.8.14 Isolate the vacuum pump and vent the manifold piping to ambient pressure.

4.8.15 Remove the evacuated/cleaned canisters from the manifold.

4.8.16 Place all canisters from the batch except for the cleaning blank in the storage cabinet(s) or shipping cases.

4.8.17 Submit the cleaning blank canister for VOC analysis.

4.9 Cleaning Blank Analysis

NOTE: *The steps in this section are performed by qualified GC and GC/MS analysts.*

4.9.1 Analyze the cleaning blank for VOCs by Methods CCP-TP-173, *CCP Analysis of Gas Samples for VOCs by GC/FID* and CCP-TP-175, *CCP Analysis of Gas Samples for VOCs by GC/MS*.

4.9.2 Review the GC and GC/MS cleaning blank data and ensure that the Quality Control Requirements defined in Section 4.13 are met.

4.9.3 Sign/initial and date the raw data to signify that this review has taken place.

4.9.4 After reviewing the data, give copies of the raw data for the cleaning blank to the person responsible for canister cleaning.

NOTE: *Independent technical review is not required for cleaning blank data.*

4.10 Canister Certification and Release

4.10.1 After receiving the cleaning blank data from the GC and GC/MS analysts, verify that the quality control requirements defined in Section 4.13 are met and file the cleaning blank data.

4.10.1.1 IF the cleaning blank data do not meet the specification criteria defined in Section 4.13,
THEN re-clean the entire batch of canisters (repeat steps 4.7 through 4.9).

4.10.1.2 IF the cleaning blank data meet Section 4.13 specifications, THEN complete the "Cleaning Certification Data" portion of the cleaning logbook.

4.10.1.2.1 Enter the dates of GC and GC/MS analysis, the instrument file IDs, and check "Y" in the "OK" column.

4.10.1.2.2 Sign (or initial) and date the certification statement at the bottom of the page.

4.10.2 Reattach canister gauge calibration tags to their respective canisters.

4.10.3 Verify that all field canister pressure gauges have current calibration and will not expire within the next 30 days.

4.10.3.1 Segregate canisters with gauge calibrations within 30 days (minimum) of expiration for return to the S&CL.

4.10.4 Inspect all canister identification tags or barcodes to ensure that they are securely attached to the canisters and are legible.

4.10.4.1 IF these labels are damaged,
THEN replace them.

4.10.5 Transfer any lab canisters in the batch to the storage cabinet.

4.10.6 Generate a sample canister tag for each field canister cleaned in the batch.

4.10.6.1 Use a database application (e.g., Access) to initiate the tags.

4.10.6.2 Enter the canister ID and the "Certifying Laboratory" information, which includes canister pressure, ambient temperature, ambient pressure, date, time, operator signature/initials, and cleaning batch number.

4.10.6.3 IF sample canister tags are initiated using the Access database,
THEN print the tags and place the hard-copy tags with the canisters.

4.10.7 Transfer the field canisters to the storage areas.

4.11 Shipping Canisters to the Field

4.11.1 Use 250 mL canisters preferentially for headspace gas sampling.

4.11.2 Ship canisters to the field using Tech-Tuff® foam-lined shipping cases (rigid shipping containers equipped with 2 layers of foam spacers) or equivalent.

NOTE: *Canisters are normally shipped to the field in 22-canister batches.*

4.11.2.1 Verify that canister gauge calibration tags are on the correct canister and that there are more than 30 days to the expiration date.

4.11.2.2 Place the canisters in the foam spacers in the shipping case.

4.11.2.3 Place the associated sample canister tags with the canisters.

4.12 Canister Maintenance

4.12.1 Record all canisters needing maintenance in the SUMMA® Canister Maintenance Logbook (see example in Exhibit 3).

4.12.2 Record the reported problem in the maintenance logbook.

4.12.3 Leak test (Step 4.6) all suspect canisters returned from the field.

4.12.4 Examine the canister for irreparable physical damage (e.g., broken welds).

4.12.4.1 IF irreparable physical damage is found, THEN discard the canister.

4.12.5 Check the canister for loose fittings, and replace fittings, valves or pressure gauges as necessary.

NOTE: *Appropriate spare parts are maintained at ECL.*

4.12.6 Record the actual repairs made in the maintenance logbook.

4.12.7 Leak test the repaired canister per Step 4.6 to verify that the repair is successful.

4.12.8 Return the canister to the staging area for canister cleaning.

4.13 Quality Control Requirements

4.13.1 One canister per cleaning batch must be pressurized and analyzed for VOCs to ensure that canister cleanliness requirements are met prior to release of the batch.

4.13.2 During analysis of the cleaning blank, required method daily QC must be in control for the GC and GC/MS (see CCP-TP-173 AND CCP-TP-175).

4.13.3 VOC target compounds are listed in Table 1. In order for the cleaning batch to be certified as "clean," the cleaning blank cannot contain any of these compounds in amounts greater than three times the CCP-required method detection limits (MDLs) given in Table 1.

4.13.3.1 Methanol concentrations are provided as ppmv on the raw data. Specification limits in ppmv that are equivalent to three times the nanogram-MDL are provided in Table 1. An example of a GC External Standard Report (i.e., raw data) is provided in Exhibit 4.

4.13.3.2 GC/MS analyte (all others) amounts appear on the raw data as total nanograms per amount of sample analyzed (see example in Exhibit 5). Table 1 provides ng acceptance limits for these compounds. Compounds less than the MDL appear as N.D. or are marked with an "X" on the quant reports.

4.13.4 IF any VOC target analyte is detected above the specification limit in the cleaning blank,
THEN repeat the entire cleaning process (excluding the leak check) for all canisters in the cleaning batch until the cleaning blank meets the cleanliness criteria.

5. RECORDS

Records generated during the performance of this procedure are maintained as QA records in accordance with CCP-QP-008, *CCP Records Management*. The records are the following:

QA/Nonpermanent

- SUMMA® Canister Cleaning Logbooks
- SUMMA® Canister Cleaning System Maintenance Logbooks
- SUMMA® Canister Leak Testing Logbook
- SUMMA® Canister Maintenance Logbook

The following records generated during the performance of this procedure will be compiled into the Data Report in accordance with CCP-TP-188, *CCP Data Recording, Review and Reporting.*

QA/Nonpermanent

- CCP-TP-173, *CCP Analysis of Gas Samples for VOCs by GC/FID* Cleaning Blank Raw Data
- CCP-TP-175, *CCP Analysis of Gas Samples for VOCs by GC/MS* Cleaning Blank Raw Data
- Gas Sample Canister Tags

6. REFERENCES

6.1 CCP-TP-173, *CCP Analysis of Gas Samples for VOCs by GC/FID*

6.2 CCP-TP-175, *CCP Analysis of Gas Samples for VOCs by GC/MS*

6.3 CCP-QP-008, *CCP Records Management*

6.4 CCP-QP-011, *CCP Notebooks and Logbooks*

6.5 LRD-14303, "Handling and Use of Compressed Gases."

6.6 LWP-14620, "Chemical Hygiene Plan."

6.7 Waste Isolation Pilot Plant (WIPP) Hazardous Waste Facility Permit, Part B, Waste Analysis Plan (WAP), New Mexico Environmental Department, EPA No. NM4890139088.

Exhibit 1. SUMMA® Canister Leak Testing Logbook (Example)

Page: UL1-01- _____

Environmental Chemistry Laboratory
SUMMA Canister Leak Testing Log

Canister ID	Initials	Start			End			Passed? (Y/N)
		Date	Time	Ambient Temp (°C)	Date	Time	Ambient Temp (°C)	
EI								
EI								
EI								
EI								
EI								
EI								
EI								
EI								
EI								
EI								
EI								
EI								
EI								
EI								
EI								
EI								
EI								
EI								
EI								
EI								
EI								
EI								
EI								
EI								

Comments:

_____

_____

_____

_____

Exhibit 2. SUMMA® Canister Cleaning Logbook (Example)

Page: UC6-01-_____

Environmental Chemistry Laboratory
SUMMA Canister Cleaning Log

Batch #: **Process Operator Initials:**

Canister Identification/Classification				Canister Identification/Classification				Canister Identification/Classification			
	ID	Lab/ Field	Volume (mL)		ID	Lab/ Field	Volume (mL)		ID	Lab/ Field	Volume (mL)
1	EI			21	EI			41	EI		
2	EI			22	EI			42	EI		
3	EI			23	EI			43	EI		
4	EI			24	EI			44	EI		
5	EI			25	EI			45	EI		
6	EI			26	EI			46	EI		
7	EI			27	EI			47	EI		
8	EI			28	EI			48	EI		
9	EI			29	EI			49	EI		
10	EI			30	EI			50	EI		
11	EI			31	EI			51	EI		
12	EI			32	EI			52	EI		
13	EI			33	EI			53	EI		
14	EI			34	EI			54	EI		
15	EI			35	EI			55	EI		
16	EI			36	EI			56	EI		
17	EI			37	EI			57	EI		
18	EI			38	EI			58	EI		
19	EI			39	EI			59	EI		
20	EI			40	EI			60	EI		

Cleaning System

	Date	Time	Oven Temperature (°C)	Manifold Pressure (Torr)
Start				
End				

Cleaning Certification Data

Canister ID:

Analysis Type	Analysis Date	File ID	OK? (Y/N)
GC			
GC/MS			

Sample Tag Information

Date	Time	Ambient Conditions		Manifold Final Pressure (Torr)
		Temp (°C)	Pressure (Torr)	

Comments:

Certification Statement:
The above listed canisters have been cleaned as required by ACLP-4.40.

Released by: _____ Date: _____

Exhibit 3. SUMMA® Canister Maintenance Logbook (Example)

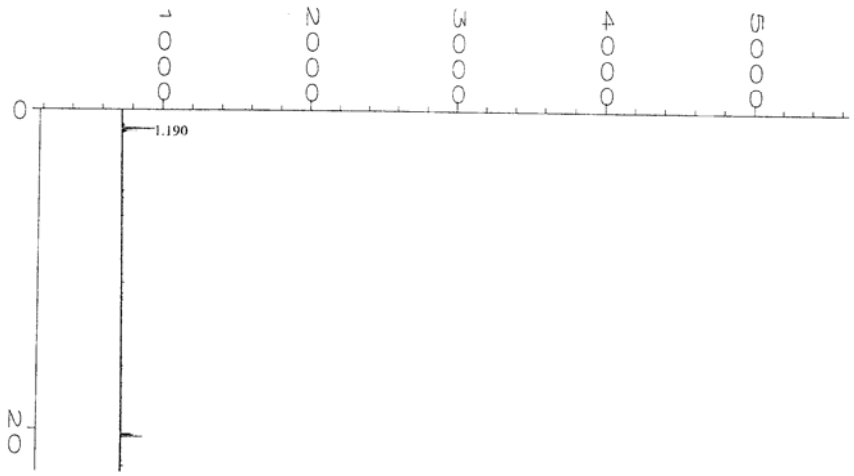
MSC-01-_____

Environmental Chemistry Laboratory SUMMA Canister Maintenance Log		
Canister ID: EI	Date:	Initials:
Reported Problem:		
Actual Maintenance Performed:		

Canister #: EI	Date:	Initials:
Reported Problem:		
Actual Maintenance Performed:		

Canister #:EI	Date:	Initials:
Reported Problem:		
Actual Maintenance Performed:		

Exhibit 4: GC External Standard Report (Example)



External Standard Report

Data File Name	: C:\HPCHEM\1\DATA\1F000350.D		
Operator	: JESSICA ST CLAIR	Page Number	: 1
Instrument	: GC-1	Vial Number	: 1
Sample Name	: CLEAN BLK #561B	Injection Number	:
Run Time Bar Code:		Sequence Line	:
Acquired on	: 26 Jun 01 10:25 AM	Instrument Method	: WIPPT.MTH
Report Created on:	26 Jun 01 10:49 AM	Analysis Method	: 1701-21.MTH
Last Recalib on	: 11 JUL 00 07:08 AM	Sample Amount	: 0
Multiplier	: 1	ISTD Amount	:

Sig. 1 in C:\HPCHEM\1\DATA\1F000350.D

Ret Time	Area	Type	Width	Ref#	PPM	Name
2.855 * not found *				1		Methanol

Not all calibrated peaks were found

Report MDL w/ flag

JAS
6/26/01

Exhibit 5. GC/MS Quantitation Report (Example)

Quantitation Report

Data File : C:\INSTR_F\ECL99028\U02FF.D Vial: 0
Acq On : 2 Jun 1999 14:32 Operator:
Sample : CLEANING BLK 1X 100ML Inst : HP 5970 F
Misc : BATCH #416 Multiplr: 1.00
MS Integration Params: RTEINT.P
Quant Time: Jun 2 15:03 1999 Quant Results File: WPFD041.RES

Quant Method : C:\INSTR_F\WPFD041.M (RTE Integrator)
Title : GC/MS-F Wipp Initial Calibration #41 Method 430.1
Last Update : Mon May 10 16:40:32 1999
Response via : Initial Calibration
DataAcq Meth : METHOD.M

Internal Standards	R.T.	QIon	Response	Conc Units	Dev(Min)
1) Fluorobenzene	12.95	96	347863	270.00 ng	0.07
18) Chlorobenzene-d5	19.58	117	227922	260.00 ng	- 0.07
System Monitoring Compounds					
Target Compounds					Qvalue
2) Ethyl Ether	0.00	59		N.D.	
3) Methylene Chloride	0.00	84		N.D.	
4) 1,1,2-Trichlorotrifluoroet	0.00	101		N.D.	
5) 1,1 Dichloroethene	0.00	96		N.D.	
6) 1,1-Dichloroethane	0.00	63		N.D.	
7) 1,2-Dichloroethene (cis)	0.00	96		N.D.	
8) Chloroform	0.00	83		N.D.	
9) 1,2-Dichloroethane	0.00	62		N.D.	
10) 1,1,1-Trichloroethane	0.00	97		N.D.	
11) Carbon Tetrachloride	0.00	117		N.D.	
12) Trichloroethene	0.00	130		N.D.	
13) Cyclohexane	0.00	56		N.D.	
14) Benzene	0.00	78		N.D.	
15) Acetone	0.00	43		N.D.	
16) 2-Butanone	0.00	72		N.D.	
17) 1-Butanol	0.00	56		N.D.	
19) Bromoform	0.00	173		N.D.	
20) Tetrachloroethene	0.00	164		N.D.	
21) 1,1,2,2-Tetrachloroethane	0.00	83		N.D.	
22) Toluene	0.00	92		N.D.	
23) Chlorobenzene	0.00	112		N.D.	
24) Ethylbenzene	0.00	106		N.D.	
25) Xylene (meta & para)	0.00	106		N.D.	
26) Xylene (ortho)	0.00	106		N.D.	
27) 1,3,5-Trimethylbenzene	0.00	105		N.D.	
28) 1,2,4-Trimethylbenzene	0.00	105		N.D.	
29) 4-Methyl-2-Pentanone	0.00	43		N.D.	

6/2/99

(#) = qualifier out of range (m) = manual integration
U02FF.D WPFD041.M Wed Jun 02 15:03:27 1999 Page 1

Figure 1. Schematic of Canister Cleaning System

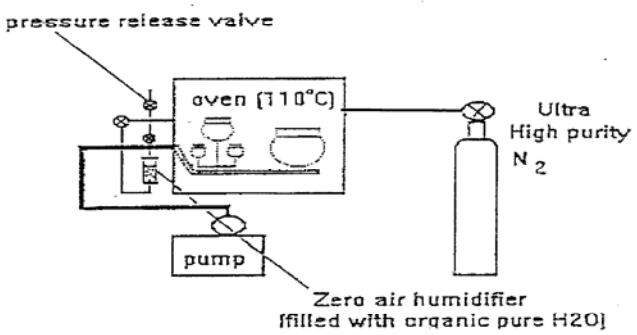


Table 1. VOC Target Analytes and Cleaning Blank Specification Limits

VOC Target Analyte	Method	Molecular Weight	*WIPP Required MDL (ng)	*Cleaning Blank Specification Limit
Acetone	GCMS	58.08	150	450 ng
Benzene	GCMS	78.12	10	30 ng
Bromoform	GCMS	252.75	10	30 ng
Butanol	GCMS	74.12	150	450 ng
Carbon disulfide**	GCMS	76.14	10	30 ng
Carbon tetrachloride	GCMS	153.82	10	30 ng
Chlorobenzene	GCMS	112.56	10	30 ng
Chloroform	GCMS	119.38	10	30 ng
Chloromethane**	GCMS	50.49	10	30 ng
Cyclohexane	GCMS	84.16	10	30 ng
1,1-Dichloroethane	GCMS	98.94	10	30 ng
1,2-Dichloroethane	GCMS	98.94	10	30 ng
1,2-Dichloroethylene	GCMS	96.94	10	30 ng
1,2-Dichloroethylene (cis)	GCMS	96.94	10	30 ng
1,2-Dichloroethylene (trans)	GCMS	96.94	10	30 ng
1,2-Dichloropropane**	GCMS	112.99	10	30 ng
Ethyl benzene	GCMS	106.17	10	30 ng
Ethyl ether	GCMS	74.12	10	30 ng
Methanol	GC or GCMS	32.04	150	34.4 ppmv or 450 ng
Methyl ethyl ketone	GCMS	72.11	150	450 ng
Methyl isobutyl ketone	GCMS	100.16	150	450 ng
Methylene chloride	GCMS	84.93	10	30 ng
1,1,2-Tetrachloroethane	GCMS	167.85	10	30 ng
Tetrachloroethylene	GCMS	165.83	10	30 ng
Toluene	GCMS	92.15	10	30 ng
1,1,1-Trichloroethane	GCMS	133.41	10	30 ng
Trichloroethylene	GCMS	131.39	10	30 ng
Trichlorofluoromethane**	GCMS	137.37	10	30 ng
1,1,2-Trichloro-1,2,2-trifluoroethane	GCMS	187.38	10	30 ng
1,3,5-Trimethylbenzene	GCMS	120.20	10	30 ng
1,2,4-Trimethylbenzene	GCMS	120.20	10	30 ng
p/m-Xylene	GCMS	106.17	10	30 ng
o-Xylene	GCMS	106.17	10	30 ng

* Values based on delivering 10 mL to the analytical system.

** Site-specific analytes: Analysis may not be required for all TRU Waste Generator/Storage Sites.