ESS Laboratory
Division of Thielsch Engineering
Cranston, RI

SOP NO. 20_8260B
VOLATILE ORGANIC COMPOUNDS BY GAS CHROMATOGRAPHY/MASS SPECTROMETRY (GC/MS): CAPILLARY COLUMN TECHNIQUE
(EPA Method 624/SW-846 METHOD 8260B)

APROVED BY:

Operation s Manager — Date 3/20/9

QA Manager — Date 3/20/09

Laboratory Director — Date 3/20/09

MASTER

Volatile Organic Compounds - by GC/MS Capillary Column Technique

1.0 SCOPE AND APPLICATION

1.1 This method describes the technique utilized by ESS Laboratory in the qualitative and quantitative analysis of volatile samples based on SW-846 Method 8260B. Following are compounds that may be determined by this method.

Appropriate Technique Analyte	Cas #[b]	Purge-and-Trap	Direct Injection
Acetone	67-64-1	Pp	a
Acrolein (Propenal)	107-02-8	Pp	a
Acrylonitrile	107-13-1	Pp	a
Allyl chloride	107-05-1	a	a
tert- Amyl methyl ether	994-05-8	a	a
Benzene	71-43-2	a	a
Bromobenzene	108-86-1	a	a
Bromochloromethane	74-97-5	a	a
Bromodichloromethane	75-27-4	a	a
4-Bromofluorobenzene	460-00-4	a	a
Bromoform	75-25-2	a	a
Bromomethane	74-83-9	a	a
2-Butanone (MEK)	78-93-3	Pp	a
n-Butylbenzene	104-51-8	a	a
sec-Butylbenzene	135-98-8	a	a
tert-Butylbenzene	98-06-6	a	a
Carbon disulfide	75-15-0	Pp	a
Carbon tetrachloride	56-23-5	a	a
Chlorobenzene	108-90-7	a	a
1-Chlorobutane	109-69-3	a	a
Chlorodibromomethane	124-48-1	a	a
Chloroethane	75-00-3	a	a
2-Chloroethyl vinyl ether	110-75-8	a	a
Chloroform	67-66-3	a	a
Chloromethane	74-87-3	a	a

Chloroprene	126-99-8	a	a

Appropriate Technique Analyte	Cas #[b]	Purge-and-Trap	Direct Injection
2-Chlorotoluene	95-49-8	a	a
4-Chlorotoluene	106-43-4	a	a
Cyclohexane	110-82-7	a	a
1,2-Dibromo-3-chloropropane	96-12-8	Pp	a
1,2-Dibromoethane	106-93-4	a	a
Dibromomethane	74-95-3	a	a
1,2-Dichlorobenzene	95-50-1	a	a
1,3-Dichlorobenzene	541-73-1	a	a
1,4-Dichlorobenzene	106-46-7	a	a
Cis-1,4-Dichloro-2-butene	1476-11-5	a	a
trans-1,4-Dichloro-2-butene	110-57-6	Pp	a
Dichlorodifluoromethane	75-71-8	a	a
1,1-Dichloroethane	75-34-3	a	a
1,2-Dichloroethane	107-06-2	a	a
1,1-Dichloroethene	75-35-4	a	a
cis-1,2-Dichloroethene	156-59-2	a	a
trans-1,2-Dichloroethene	156-60-5	a	a
1,2-Dichloropropane	78-87-5	a	a
1,3-Dichloropropane	142-28-9	a	a
2,2-Dichloropropane	594-20-7	a	a
1,1-Dichloropropene	563-58-6	a	a
cis-1,3-Dichloropropene	10061-01-5	a	a
trans-1,3-Dichloropropene	10061-02-6	a	a
1,4-Difluorobenzene	540-36-3	a	a
Diethyl Ether	60-29-7	a	a
1,4-Dioxane	123-91-1	Pp	a
Ethylbenzene	100-41-4	a	A
Ethyl methacrylate	97-63-2	a	a
Ethyl tertiary-butyl ether	637-92-3	a	a
Hexachlorobutadiene	87-68-3	a	a
Hexachloroethane	67-72-1	i	a
2-Hexanone	591-78-6	Pp	a

Appropriate Technique Analyte	Cas #[b]	Purge-and-Trap	Direct Injection
Iodomethane	74-88-4	a	a
Isopropylbenzene	98-82-8	a	a
Di-isopropyl ether	108-20-3	a	a
p-Isopropyltoluene	99-87-6	a	a
Methyl acetate	79-20-9	a	a
Methyl acrylate	96-33-3	a	a
Methylacrylonitrile	126-98-7	pp	a
Methyl Cyclohexane	108-87-2	a	a
Methylene chloride	75-09-2	a	a
Methyl methacrylate	80-62-6	a	a
4-Methyl-2-pentanone (MIBK)	108-10-1	pp	a
Naphthalene	91-20-3	a	a
2-Nitropropane	79-46-9	a	a
Pentachloroethane	76-01-7	i	a
n-Propylbenzene	103-65-1	a	a
Styrene	100-42-5	a	a
1,1,1,2-Tetrachloroethane	630-20-6	a	a
1,1,2,2-Tetrachloroethane	79-34-5	a	a
Tetrachloroethene	127-18-4	a	a
Toluene	108-88-3	a	a
1,2,3-Trichlorobenzene	87-61-6	a	a
1,2,4-Trichlorobenzene	120-82-1	a	a
1,3,5-Trichlorobenzene	108-70-3	a	a
1,1,1-Trichloroethane	71-55-6	a	a
1,1,2-Trichloroethane	79-00-5	a	a
Trichloroethene	79-01-6	a	a
Trichlorofluoromethane	75-69-4	a	a
1,2,3-Trichloropropane	96-18-4	a	a
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	a	a
1,2,4-Trimethylbenzene	95-63-6	a	a
1,3,5-Trimethylbenzene	108-67-8	a	a
Vinyl acetate	108-05-4	a	a
Vinyl chloride	75-01-4	a	a
o-Xylene	95-47-6	a	a
m-Xylene	108-38-3	a	a

p-Xylene	106-42-3	a	a

a	Adequate response by this technique.
b	Chemical Abstract Services Registry Number.
i	Inappropriate technique for this method
pp	Poor purging efficiency results in high MDLs.

1.2 This method is used to determine volatile organic compounds in a variety of waste matrices. This method is applicable to nearly all types of samples, including ground water, aqueous sludge, caustic liquors, acid liquors, waste solvents, oily wastes, tars, fibrous wastes, emulsions, filter cakes, soils and sediments.

1.3 This method can be used to quantify most volatile organic compounds that have boiling points below 200°C and that are insoluble or slightly soluble in water. Volatile water-soluble compounds can be included in this analytical technique, however, for the more soluble compounds quantitation limits are approximately ten times higher because of poor purging efficiency.

1.4 The quantitation limit of this method for an individual compound is approximately 1µg/L for all aqueous matrices. The Quantitation limit for soil/sediment samples is listed in SOP 20_5035.

2.0 METHOD SUMMARY

2.1 This SOP provides gas chromatographic/mass spectrometric (GC/MS) conditions for the detection of volatile organic compounds.

2.2 This SOP describes a closed system purge and trap procedure for aqueous samples according to method 5030B.

2.2.1 Purged sample components are trapped in a tube containing suitable sorbent materials.

2.2.2 When purging is complete, the sorbent tube is heated and back-flushed with helium to desorb trapped sample components. The analytes are desorbed directly to a wide bore capillary column for analysis.

2.2.3 Wide-bore capillary columns require a jet separator, whereas narrow bore capillary columns can be directly interfaced to the ion source.

2.3 A temperature program is used in the gas chromatograph to separate the organic compounds. Detection is achieved using a mass spectrometer (MS).

2.4 Tentative identifications are obtained by analyzing standards under the same conditions used for samples and comparing resultant GC retention times. Absolute identifications are obtained by comparing the mass spectra of individual compounds to the reference spectra for that compound.

2.5 Concentrations of the identified components are measured by relating the response produced for that compound to the response produced by a compound that is used as an internal standard.

3.0 HEALTH AND SAFETY

3.1 Each employee has been trained and has acknowledged being trained in the safe use and handling of chemicals being used in the laboratory. This training has been performed according to the ESS Training SOP 80_0016 and by the Chemical Hygiene Plan SOP 90_0001 in conjunction with the Safety orientation

3.2 All sample and material handling should be done in a hood while using proper protective equipment to minimize exposure to liquid or vapor. Minimum personnel protective equipment includes the use of laboratory safety glasses, a lab coat or apron, and protective gloves.

3.3 The MSDSs for the concentrated chemicals used in the laboratory are kept on file in a central location that is available for all employees to review.

4.0 SAMPLE PRESERVATION, CONTAINERS, HANDLING AND STORAGE

4.1 Sample preservation for soil samples is discussed in SOP 20_5035. Aqueous samples are preserved with 1:1 HCl at a ratio of 100 µL to 40 ml.

4.2 Samples for analysis using this SOP must be stored in tightly sealed vials with Teflon-lined silicone septum seals in which the original sample was collected. All samples are stored in a refrigerator at 4 ± 2°C within the laboratory. The soil samples are stored in a separate refrigerator from the aqueous samples in the VOC laboratory. Samples for volatile analysis must be analyzed within 14 days of sample collection

4.3 Samples known to contain high concentrations of VOCs are stored in a separate refrigerator located in the sample storage room. This is to prevent cross contamination.

4.4 Trip blanks for aqueous samples are prepared with organic free water. The water comes from a carbon filtration system located in the VOA lab and is periodically checked for low level VOCs.

4.5 A trip blank should accompany each batch of 20 or less VOC samples. This trip blank must accompany the associated samples at all times.

4.6 Refrigerator blanks are prepared like trip blanks and stored in the refrigerator with samples. These blanks are analyzed weekly to check for possible cross contamination from samples. To prevent cross contamination from sample to sample, all sample containers must be airtight. If the blank is greater than the MRL, then notify operations manager immediately.

5.0 INTERFERENCES AND POTENTIAL PROBLEMS

5.1 Major sources of contamination are volatile materials in the laboratory and impurities in the inert purging gas and in the sorbent trap. The use of non-polytetrafluoroethylene (PTFE) thread sealant, plastic tubing, or flow controllers with rubber components should be avoided since such materials out-gas organic compounds which will be concentrated in the trap during the purge operation.

5.2 Analyses of reagent blanks provide information about the presence of contaminants. When potential interfering peaks are noted in blanks, the analyst should change the purge gas source. Subtracting blank values from sample results is not permitted.

5.3 Interfering contamination may occur when a sample containing low concentrations of volatile organic compounds is analyzed immediately after a sample containing high concentrations of volatile organic compounds. After analysis of a sample containing high concentrations of volatile organic compounds, one or more instrument blanks must be analyzed to check for cross contamination.

5.3.1 This interference may be prevented by rinsing the purging apparatus and sample syringes with portions of organic-free reagent water between samples.

5.3.2 In extreme situations, the whole purge and trap device may require dismantling and cleaning.

5.4 Special precautions must be taken to avoid contamination when analyzing for methylene chloride. The analytical and sample storage area must be isolated from all atmospheric sources of methylene chloride. Otherwise, random background levels will result. Since methylene chloride will permeate through PTFE tubing, all gas chromatography carrier gas lines and purge gas plumbing must be constructed from stainless steel or copper tubing. Laboratory clothing worn by the analyst should be clean since clothing previously exposed to methylene chloride fumes during liquid/liquid extraction procedures can contribute to sample contamination.

5.5 Samples can be contaminated by diffusion of volatile organics (particularly methylene chloride and fluorocarbons) through the septum seal into the sample during shipment and storage. A trip blank prepared from organic-free reagent water and carried through the sampling and handling protocol can serve as a check on such contamination.

5.6 This procedure can be used to quantitate most volatile organic compounds that have boiling points below 200°C and that are insoluble or slightly soluble in water. Volatile water-soluble compounds can be included in this analytical technique. However, for the more soluble compounds, quantitation limits are approximately ten times higher because of poor purging efficiency. Such compounds include low-molecular-weight-halogenated hydrocarbons, aromatics, ketones, nitriles, acetates, acrylates, ethers and sulfides.

6.0 EQUIPMENT/APPARATUS

6.1 **Microsyringes**: 10 µL, 25 µL, 50 µL, 100 µL, 250 µL, 500 µL, and 1,000 µL. These syringes should be equipped with a 20 gauge (0.006" ID) needle.

6.2 **Disposable micropipettes**: 10, 50, 100 and 200 µL volumes. Purchased from Drummond.

6.3 **Syringe**: 5 ml and 25 ml glass, gas-tight, with Luerlock tip.

6.4 **Balance**: Top-loading balance capable of weighing 0.1 g.

6.5 **Micro-reaction vessels**: 1.0 ml and 5.0 ml purchased from Supelco. Catalogue No. 3-3293 with Mininert Caps. Clean reaction vessels by placing in oven at 105°C overnight.

6.6 **Volumetric flasks**: of various sizes with ground glass stoppers –Class A.

6.7 **Vials**: 40 ml, with pierceable Teflon screw cap top.

6.8 **Spatulas**: Stainless steel.

6.9 **Disposable pipettes**: Pasteur.

6.10 **Culture tubes**: 10 x 150 mm. Kimball No. 45060-19150. Culture tubes are only used once, then discarded.

6.11 **Syringe Valve**: Two-way with Luerlok ends.

6.12 **Chamber heaters**: Tekmar sample heater, capable of maintaining the purging chamber to within 1°C over the temperature range of ambient to 100°C.

6.13 **Purge and trap devices**: (A) Tekmar 3100 Purge and Trap Concentrator. (B) Archon Purge and Trap Auto-Sampler System (Varian)

6.13.1 The Archon Purge and Trap Auto-sampler is designed to Automate the tedious sample handling procedures associated with purge and trap analyses for volatile organic compounds (VOCs) under current EPA methods. The Archon can be used for drinking water, wastewater, soil and solid analyses.

6.13.2 **Function Keys**:

A) Method: Methods are entered using a keypad with LCD screen. All information can be edited using keypad. ***NOTE: Settings are variable and may change depending on analysis requirements***.

Method parameters consist of:

	MS1/MS3/MS4
Sample Type (water/soil)	water
First Vial(1-51)	variable

Last Vial(1-51)	variable
Sample Volume(0-25ml)	10
Dilution Factor	variable
Rinse Volume(0-25ml)	12
# Rinses(0-20)	01
Standard 1(yes/no)	variable
Standard 2(yes/no)	variable
S. Preheat Stir(yes/no)	no
Stir(yes/no)	no
W. Stir Time(0-9.9min)	0.0
W. Settle Time(0-99sec)	0.0
Syringe Flush(0-20)	01
Preheat(yes/no)	no
Preheat Temp(amb-140C)	--
Preheat Time(0-99.9min)	--
Purge Time(0-999.9min)	--
Desorb Time(0-99.9min)	1.0
Operation Mode(Local/Remote)	Remote
Cycle Timer(0-99.9min)	0.0
Aux Timer(0-999min)	0.0
Link to Method	variable

B) **Auto**: Starts purge sequence. Initiates single blank runs. Single blank runs can be programmed after specific sample vials within a particular method. These method blanks allow the cleaning of not only the Archon, but also the purge and trap and GC. The blank water is withdrawn from the blank water reservoir, which is pressurized by helium gas at 20-25 psi. Before changing the blank reservoir, the "Blank Water Reservoir and Standard Helium" switch must turned off. This switch is located on the right rear panel inside the Archon. After refilling the reservoir, this switch must be turned on.

C) **Manual**: allows for manual injection of samples.

D) **Flush**: allows flushing of Archon components using water from Blank Water Reservoir

E) **System**: provides access to all settings, maintenance, calibration, and options of the Archon.

F) **Pause/Stop**: allows analyst to pause or abort sequence.

6.13.3 The sample is purged in a 25ml fitted purge tube. The purge gas passes through the water column as finely divided bubbles, each with a diameter of less than 3 mm at the origin. The purge gas is introduced no more than 5 mm from the base of the water column.

6.13.4 The trap is at least 25 cm long and has an inside diameter of at least 0.105". This trap is commercially available from Supelco (Vocarb 3000, Catalogue

No. 2-4920).

6.13.5 The desorber is capable of rapidly heating the trap to 225°C and performing the bake out step at 260°C.

6.13.6 The chamber heater is capable of maintaining the purge device at 40°C ±1°C.

6.14 **Gas chromatograph**: HP5890 Series II or HP-6890. A complete analytical system with a temperature programmable gas chromatograph suitable for on-column injection and all required accessories including syringes, analytical columns and gases.

6.15 **Column**: (A). 75 M x 0.53 mm ID or (B). 30M x 0.25 mm ID, DB624 commercially available from J&W Scientific (or equivalent).

6.16 **Mass spectrometer**: HP5971MSD or HP5972MSD - Capable of scanning from 35 to 260 AMU every 1 second or less, utilizing 70 volts electron energy in the electron impact ionization mode and producing a mass spectrum which meets all the criteria listed in section 11.1 when 50 ng of 4-Bromofluorobenzene (BFB) is injected through the gas chromatograph inlet.

6.17 **Data system**:

6.17.1 **Computers:** The Volatiles laboratory has three GC/MS systems analyzing method 5030B/8260B. VOA MS1 has an AST computer with a Windows 95 operating system. VOA MS3 and MS4 have DELL computers with Windows NT operating system. All computer systems are networked to a Windows 2000 server, which is the destination of all files. A differential back-up is performed nightly and a full back is performed each weekend using Veritas Backup Exec to tapes. As the systems acquires and stores data onto the server, the server becomes full. The data is downloaded and archived onto CDs.

6.17.2 **Software:** HP Enviroquant MSChemstation - The software is interfaced to the mass spectrometer detector and allows the continuous acquisition and storage on machine-readable media of all mass spectra obtained throughout the duration of the chromatographic program. The computer software allows searching of any GC/MS data file for ions of a specified mass and plotting such ion abundance versus time or scan number. This type of plot is defined as an Extracted Ion Current Profile (EICP). The software is also capable of integrating the abundance in any EICP between specified time or scan number limits. The most current version of the EPA/NIST Mass Spectral Library is also available. Current versions VOA MS1:G1032C version C.01.00, VOA MS3:G1701BA Version B.01.00, and VOA MS4: G1701AA version A.03.00.

MASTER

7.0 REAGENTS AND STANDARDS

7.1 Reagents:

7.1.1 **Methanol**: Purge and Trap grade, purchased from Fisher, Catalog No.A453-500.

7.1.2 **Reagent Water**: Water in which interference is not observed at ½ the method reporting limit (MRL) of the parameters of interest. DI water obtained from the VOA laboratory fits the criterion.

7.2 Standards:

7.2.1 **Primary Standards**: obtained from a commercial source. They are stored in the freezer at -10°C to -20°C. After opening; they are stored in a vial with a mininert valve. All Certificates of Analysis (COAs) are marked with the appropriate Primary Standard ID and placed in a logbook. Primary standards are not to be used after the manufacturer's expiration date. Once a standard has been opened, it may not be used after 6 months. A copy of the COAs, which details the compounds found in the mixes, are in Attachment A.

Manufacturer	Standard	Catalog Number	Conc. (µg/ml)
Restek	Ketones	30006	5000
Restek	Acrolein	30499	10000
Restek	Oxygenates	30465	2000/10,000 (TBA)
Restek	Custom	558360	2000
Restek	Gases	30042-510	2000
Restek	Cal Mix#1	30633	2000
Restek	2-CEVE	30265	2000
Restek	Vinyl Acetate	30216	2000
Supelco	1,4-Dioxane	44-2251	10,000*
Ultra	Surrogate	STM-530-1	2500
Accustandard	1,3,5-Trichlorobenzene	As-E0176	5000

*The primary standard for 1,4-Dioxane is made up from neat by diluting 10 µL of neat 1,4-Dioxane into a 1.0 ml volumetric flask

7.2.2 **Working Calibration Standard (25 µg/ml)**: Prepared standards are stored in micro reaction vessels or vials capped with mininert valve. Standards are checked frequently for signs of degradation or evaporation. Working calibration standards are used for preparing calibration curves and daily continuing calibrations.

7.2.2.1 Into 5ml volumetric flask add the following: 125 µL of Ketone std., 62.5 µL each of gas, Custom std., Cal Mix#1, Vinyl acetate, and oxygenate standards, 312.5 µL of 2-CEVE std, 12.5µL of Acrolein std, 25µL of 1,3,5-Trichlorobenzene, 237.5 µL 1,4-Dioxane and 50 µL of surrogate standard. Volumize to 5ml with MeOH. Final concentration equals 125 µg/ml for the Ketones and 2-CEVE, 500 µg/ml of 1,4-Dioxane, and 25 µg/ml for all other analytes including surrogates.

7.2.3 **Secondary Source/BS/Matrix spike standards**: obtained from a commercial source. They are stored in the freezer at -10°C to -20°C. After opening; they are stored in a vial with a mininert valve. All Certificates of Analysis must be kept on file.

Manufacturer	Standard	Catalog Number	Conc. (µg/ml)
Accustandard	TCL Ketone Mix	CLP-022K-25x	5000
Ultra	Acrolein	RCC-150	10,000*
Accustandard	Method 502.2 VOC	M-502-10x	2000
Ultra	VOC Mix	DWm-592-1	2000
Ultra	Custom Std	CUS-10604	2000
Accustandard	2-CEVE	M-601C-10x	2000
Supelco	Vinyl acetate	4-0327	5000
Ultra	1,4-Dioxane	RCC-180	10,000*
Accustandard	tert-Butyl Alcohol	S-410	2000

*The primary standard for 1,4-Dioxane and Acrolein is made from neat product by diluting 10 µL into a 1.0 ml volumetric flask.

u

7.2.3.1 **Initial Calibration Verification- ICV/BS/BSD/Matrix spike standard (25 µg/ml):** Used to check the primary standard. Into 5ml volumetric flask containing approximately 3 ml of MeOH add 62.5 µl each of Custom std., VOC mix , 502.2 mix, 2-CEVE std., and 25 µL of Vinyl acetate. Add 12.5 µL of Acrolein, 250 µL of 1,4-Dioxane, 100 µL TCL Ketone Mix, and 312.5 µL tert-Butyl Alcohol. Volumize to 5ml with MeOH. Individual components will have a final concentration of 25 µg/ml with the exception of 1,4-Dioxane at 500µg/ml. A copy of the COAs, which details the compounds in the mixes, is attached.

7.2.4 **Surrogate Standards**: The surrogate solution is made up of Dibromofluoromethane, Toluene-d_8, 4- Bromofluorobenzene, and 1,2-Dichloroethane-d_4. The mixed stock surrogate solution is purchased from Ultra at 2500 µg/ml (cat no. STM-530-1). The stock solution is logged into the primary standard logbook upon receipt. Several surrogate standard solutions are prepared from the stock at different concentrations in methanol.

7.2.4.1 **Surrogate mix**: For soil/sediment samples, the preparation of this solution is discussed in SOP# 20_5035.

7.2.4.2 **Surrogate/Internal standard QC mix MS1, MS3, and MS4**: To a 5 ml volumetric flask containing approximately 3 ml of methanol add 500 µL of stock surrogate and stock internal standard. Volumize with methanol to give a final concentration of 250 µg/ml. Transfer to reservoir #1 on the Archon. Addition of 1uL of this standard by the Archon to 10.0 ml of sample is equivalent to 25 ppb.

7.2.5 **Internal Standards**: The internal standard compounds are Fluorobenzene, Chlorobenzene-d_5, and 1,4-Dichlorobenzene-d_4. The mixed internal standard solution is purchased from Ultra at 2,500 µg/ml (cat no. STM-520-1). See SOP 20_5035 for internal standard solution for soil calibration.

7.2.5.1 **Internal Standard for calibration:** Prepare by addition of 50 uL of Internal Standard solution into a final volume of 5 ml MeOH, final concentration is 25 ug/ml.

7.2.6 **Continuing Calibration Verification Standard (CCV):** MS1, MS3, and MS4: Addition of 50 uL of the working calibration standard (See 7.2.2.1) to 50.0 ml of organic free water is equivalent to 25 ppb. This solution is prepared fresh daily.

7.2.7 **Blank Spike/Blank spike duplicates (BS/BSD)**: Prepared by adding 40 uL of Blank spike solution (7.2.3.1) to 100 ml DI water in a 100 ml volumetric flask for a final concentration of 10 ug/L. Blank spike concentrations are to be at the midpoint (median standard level) of the calibration curve.

7.2.8 **4-Bromofluorobenzene (BFB) Standard**: A stock solution in methanol is purchased from Supelco at a concentration of 2,000 µg/ml (cat. no. 4-8083).

7.2.8.1 Add 62.5µL of the stock solution to a 5.0-ml volumetric flask and dilute with methanol to produce a 25-µg/ml solution. A 5 ug/L standard is purged to check the instrument tune.

7.2.9 **Matrix Spiking Standard**: prepared as in section 7.2.3.1

7.2.9.1 **Working Matrix Spike Solution**: Prepare aqueous matrix spikes by adding 40 uL of matrix spike solution to 100 ml sample in a 100 ml volumetric flask for a final concentration of 10 ug/L.

8.0 PROCEDURE

8.1 Initial calibration for purge-and-trap procedures:

8.1.1 ESS Laboratory's policy is that the audit trail on the Chemstation/Enviroquant software is always on. This ensures that any changes made to the instrument operating method be documented through the audit trail.

8.1.2 GC/MS operating conditions: The following parameters are setup through Hewlett Packard MS EnviroQuant. A copy of an EnviroQuant method is in Attachment B.

MASTER

Electron energy:	70 volts		
Mass range:	35 amu - 260 amu		
Scan time:	1.5 sec/scan		
Initial column temp..:	40°C		
Initial column hold time:	4.0 min.		
Column temp. program:	Rate	Final Temp	Final Time

Level 1	8°C/Min	150°C	2 min
Level 2	35°C/Min	220°C	0-4.25 min
Injector temperature:	200°C		
Transfer line temperature:	280°C		
Carrier gas (Helium):	15 cm^3/ml		

8.1.3 Assemble a purge-and-trap device that meets the specification in Section 6.1.3. New traps are conditioned one hour at 270°C in the bake mode. Prior to daily use bake trap for 8 minutes at 260°C

8.1.4 Just prior to any analysis of samples or standards, the run logbook should be completely filled out (See Attachment C). Each instrument has its own run logbook. Any unusual observations are included in the comment section of the logbook. The information that must be recorded is:

8.1.4.1 **Batch Date**: Date analytical sequence set-up

8.1.4.2 **Vial #**: Position the standard/sample vial is placed in the auto-sampler

8.1.4.3 **File #**: File ID assigned to standard/sample in sequence

8.1.4.4 **Lab ID**: The ID of the sample or standard. Sample IDs are assigned at log-in by ELEMENT (ex: 0508001) and Batch QC samples contain the batch ID (ex BG50801-blk1, BG50801-bs1, BG50801-bsd1, …)

8.1.4.5 **Method**: Record the method used. The method includes instrument operating parameters and initial calibration for quantitation.

8.1.4.6 **Comments/Dilution/Standard ID**: Record comments and unusual observations. If a sample is run at a dilution, then record the dilution information in the comments section. (Ex. 25x dilution on aqueous sample: 0.2/5 ml) Record standard/spike ID for Tune, CCV, blank spike/blank spike duplicates, and matrix spike/matrix spike duplicates.

8.1.4.7 **Analyst**: Analyst must record their initials.

8.1.5 A tune check must be performed before the initial calibration curve. This is accomplished by purging a 5 ug/L standard of the 4-Bromofluorobenzene standard (See section 7.2.7) onto the GC/MS column. Analysis is not to begin until the 4-BFB spectra meets the criteria in Section 11.1. Evaluation of the ion abundance is performed by using one of the following scan scenarios:

- Use one scan at the peak apex,
- Use the one scan either directly preceding or following the apex,
- Use the mean of the apex and the scans preceding and following the scan, or
- Use the average across the entire peak.

8.1.5.1 The analysis of all calibration standards must be accomplished within 12 hours of this tune check.

8.1.6 Prepare the standards for generating the calibration curve using the Working Standards (see section 7.2.2) and Internal Standard solution (see Section 7.2.4.1) as follows:

8.1.6.1 **Soil Method:** The calibration curve for soil/sediment samples is discussed in SOP 20_5035.

8.1.6.2 **Water Method for MS1, MS3, and MS4:** seven standards (0.4, 1.0, 5.0, 10, 25, 50, and 100 ppb) are run. The 5 ppb is prepared in a 50ml volumetric by adding 10µL of 25 ug/ml working calibration standard (7.2.2) to 50 ml of DI water. 50 ul of internal standard mix (7.2.5.1) is then added for a final concentration of 25 ppb. The flask is inverted three times and the solution is transferred to a 40 ml VOA vial leaving no headspace. The 0.4, 1.0, 10, 25, 50, and 100ppb standards are prepared by adding 0.8, 2.0, 20, 50, 100, and 200µL of working standard as described above, the amount of internal standard added remains constant for all the standards. These are then placed in the Archon for purge and trap analysis.

8.1.7 Carry out the purge-and-trap analysis procedure as described in Section 8.3.

8.1.8 EnviroQuant will tabulate the area response of the characteristic ions (see Table 2) against concentration for each compound and internal standard. It will also calculate response factors (RF) for each compound relative to its internal standards according to the calculations in Section 9.1.

NOTE: HP EnviroQuant software calculates and reports response factors for the analyst. It is each analyst's responsibility to become familiar with the software by reading the available manuals. **After generating the initial calibration curve in Enviroquant, the analyst must visually check that each calibration standard was entered into the new calibration method. This is accomplished by checking that the area response for one compound from each calibration standard's printout corresponds to the area account listed in the calibration method in Enviroquant.** All of the analytes along with their retention times, retention windows, and the ions used for qualitative analysis are listed in Attachment B.

8.1.9 The average RF is calculated and recorded in the EnviroQuant Method for each compound. A system performance check is made before this calibration curve is used. Five compounds (the System Performance Check Compounds or SPCCs) are checked for a minimum average response factor. These compounds are Chloromethane, 1,1-Dichloroethane, Bromoform, 1,1,2,2-Tetrachloroethane and Chlorobenzene. The minimum acceptable RFs are 0.1 for Chloromethane, 1,1-Dichloroethane, and Bromoform, and 0.3 for Chlorobenzene and 1,1,2,2-Tetrachloroethane. These compounds are used to check compound instability and to check for degradation of the system, such as active sites in transfer lines or trap failure. ***NOTE: The minimum response factor for all other compound should not be less than 0.01. ESS Laboratory has found that the following poor performing compounds do not meet this criterion: Acetone, 2-Butanone (MEK), and 1,4-Dioxane.***

8.1.10 Using the RFs from the initial calibration, EnviroQuant software calculates the percent relative standard deviation (%RSD) for all compounds using the equation in Section 9.2. The %RSD should be less than 15% for each compound, except for the following continuing calibration compounds (CCCs) 1,1-Dichloroethene, Chloroform, 1,2-Dichloropropane, Toluene, Ethylbenzene and Vinyl Chloride, where the %RSD must be less than 30%.

8.1.10.1 Linearity - If the %RSD of any compound is 15% or less, then the relative response factor is assumed to be constant over the calibration range, and the average relative response factor may be used for quantitation.

8.1.10.2 When the RSD exceeds 15%, the plotting and/or visual inspection of the calibration data can be a useful diagnostic tool. The inspection may indicate analytical problems, including errors in standard preparation, the presence of active sites in the chromatographic system, analytes that exhibit poor chromatographic behavior, etc.

8.1.10.3 If a %RSD > 30 percent is measured for any method analyte (50% for poor purgers), then corrective action to eliminate a system leak and/or column reactive sites is required before re-attempting calibration. Poor purging compounds are listed in Table 2.

8.1.10.4 If the RSD of **any** compound exceeds 15% (never to exceed 30% except for poor purgers), then one of the following options must be applied to the GC/MS initial calibration in this situation or a new initial calibration must be performed.

8.1.10.4.1 Adjust the instrument and/or perform instrument maintenance until the RSD of the calibration meets the 15% QC limit. This option would apply in those instances where a linear instrument response is expected.

8.1.10.4.2 Narrow the calibration range until the response is linear. If the low standard is below the estimated quantitation limit (i.e., for the poor purgers in a commercially available prepared standard mix), then this standard may be dropped. Recalculate the RSD without this standard to see if the RSD meets the QC limit. It would be recommended that a new standard be prepared at a concentration between the existing fourth and fifth calibration standards, analyzed, and a new RSD calculated with all five points.

8.1.10.4.3 Use a linear calibration. This would be achieved by performing a linear regression of the instrument response versus the concentration of the standards, **do not** force the curve through zero. In order to be used for quantitative purposes, the Correlation of Determination (COD/R^2) must be greater than or equal to 0.99. This can easily be accomplished within the EnviroQuant software (see attachment B).

8.1.10.4.4 Use a non-linear calibration model. This option should be used only after exhausting the other three options, or in situations where the analyst knows that the instrument response does not follow a linear model over a sufficiently wide working range. (COD > 0.99) ***When non-linear calibration is employed a minimum of six calibration points must be used for second order and seven calibration points for third order.***

8.1.11 Immediately after the initial calibration has been generated then the initial calibration has to be verified using a second source standard. The percent recovery for the independent calibration verification standard is 80-120% for all CCC compounds and 70-130% for all other compounds ***When samples are to be to be run for the Army Corp of Engineer (Shell), all compounds must have ≤20% difference with no allowance. When samples are to be to be run for the Navy, DoD or AFCEE, all compounds must have ≤25% difference with no allowance***.

8.1.12 The RRT's are established from the 25 ppb mid-point standard in the initial calibration

8.2 Daily GC/MS analysis: Just prior to all samples and standard analysis, the run logs are filled out according to 8.1.4.

8.2.1 Prior to the analysis of samples, purge a 5 ug/L standard of 4-BFB (10 uL of standard is added into 50ml DI water, Section 7.2.8). The resultant mass spectra for BFB must meet all of the criteria in Section 11.1 before sample analysis begins. This criteria must be met each 12-hour shift.

8.2.2 The initial calibration curve must be verified each 12-hour shift. This is accomplished by analyzing a calibration standard (7.2.7) at 25 µg/L (MS1, MS3, and MS4). Determine if the SPCCs meet criteria from section 8.1.9. Determine if the CCCs listed in section 8.1.10 have % Deviation less than 20% with all other analytes having a % Deviation less than 30%, poor purging compounds (Ketones, 2-CEVE) must be less than 50%. Compounds not analyzed for in the batch of samples do not need to meet the criteria. Continuing calibrations used for 8021 analysis must have <20% RSD. ***When samples are to be to be run for the USACE/Navy/DoD/AFCEE, all compounds and surrogates should have <20% Drift/Deviation, see section 11.4 for expanded criteria***. For compounds analyzed for 624 continuing calibration criteria are met or exceeded by 8260 criteria.

8.2.3 The internal standard responses and retention times in the continuing calibration standard should be evaluated immediately after data acquisition. If the area for any of the internal standards changes by a factor of two (-50% to +100%) or the retention time changes by ± 0.5 minutes from the **mid-point standard of the initial calibration**, the mass spectrometer should be checked for defects. The relative retention time of each compound in each calibration run must agree to within 0.06 Relative Retention Time (RRT) Units. The RRT's in the continuing calibration standard is compared to the RRT's from the 25 ppb standard in the ICAL.Analysis is not to continue until problem has been resolved.

8.2.4 Method blank analysis should be performed at the following frequency:

8.2.4.1 For the analysis of volatile compounds, a method blank analysis must be performed once for each 12-hour shift and must be analyzed before any samples.

8.2.4.2 A method blank for volatile analysis should contain less than or equal to the Method Reporting limit of methylene chloride. For all other TCL compounds, the method blank should contain less than ½ MRL of any single TCL analyte. See section 11.5 for instructions on corrective action when criteria are exceeded.

8.2.5 Blank Spike/Blank spike duplicate analysis must be performed once for each 12-hour shift, after the tune and CCV, and must be analyzed before any samples. BS/BSD concentrations are to be at the midpoint (median standard level) of the calibration curve. See section 10.0 for BS/BSD acceptance criteria.

8.2.5.1 See 7.2.7 for BS/BSD preparation.

8.3 GC/MS analysis: All samples and standards are analyzed under the same conditions in the associated initial calibration. Run logs are filled according to section 8.1.4.

8.3.1 Aqueous samples

8.3.1.1 All samples and working standard solutions should be allowed to warm to ambient temperature before analysis.

8.3.1.2 Set up the GC/MS system as outlined in Section 8.1.1.

8.3.1.3 BFB tuning criteria and daily GC/MS calibration criteria must be met (Section 11.1) before analyzing samples.

8.3.1.4 Sample or standard vials are placed in the Archon. The Archon will transfer 10 ml of sample/standard to a 25ml fitted purge tube (MS1, MS3, and MS4). The process of taking an aliquot destroys the validity of remaining volume of an aqueous sample for future analysis.

8.3.1.5 The Archon is programmed to add 1µL of Surrogate/Internal Standard (Section 7.2.4.2) to the sample. The Surrogate/Internal Standard QC Mix is to be added to each blank, sample and spiked sample.

8.3.1.6 Purge the sample for 11.0 ± 0.1 min at ambient temperature, and then dry purge for 2 minutes.

8.3.1.7 At the conclusion of the purge time, the purge-and-trap will sound a ready signal from the GC and begin to desorb the trap while initiating the chromatographic temperature program and the CHEMSTATION data acquisition.

8.3.1.8 Before reusing any chamber, it must be rinsed with three-5 ml aliquots of reagent water.

8.3.1.9 After the sample has been desorbed for 2 minutes, the LSC 2000 will recondition the trap by heating to 260°C while back flushing with Helium. This step will take 10 minutes.

8.3.1.10 When necessary to composite samples for analysis, the following procedure is used:

8.3.1.10.1 Add 5 ml of each sample (up to 5 samples are allowed) to a 25 ml glass syringe. Special precautions must be made to maintain zero headspace in the syringe. Larger volumes of a smaller number of samples may be used, if equal volumes of each sample are composited.

8.3.1.10.2 The samples must be cooled to 4°C or less during this step to minimize volatilization losses. Sample vials may be placed in a tray of ice during the processing.

8.3.1.10.3 Mix each vial well and draw out a 5-ml aliquot with the 25-ml syringe.

8.3.1.10.4 Once all the aliquots have been combined in the syringe, invert the syringe several times to mix the aliquots. Introduce the composited sample into the instrument, using the method of choice.

8.3.1.10.5 If less than five samples are used for compositing, a proportionately smaller syringe may be used, unless a 25-ml sample is to be purged.

8.3.1.11 If a sample or a dilution of the sample has a concentration of analytes that exceeds the initial calibration range, the sample must be reanalyzed at a higher dilution. The ARCHON can be set to dilute up to 100x. Dilutions can also be performed directly in 5-ml syringe by adding an aliquot of sample to reagent water using a micropipette. The follow procedure is used to dilute aqueous samples. All steps must be performed without delay, until the diluted sample is in a gas-tight syringe.

8.3.1.11.1 Dilutions may be made in volumetric flasks (10-100 ml). Select the volumetric flask that will allow for the necessary dilution. Intermediate dilution steps may be necessary for extremely large dilutions.

8.3.1.11.2 Calculate the approximate volume of organic-free reagent water to be added to the volumetric flask, and add slightly less than this quantity of organic-free reagent water to the flask.

8.3.1.11.3 Inject the appropriate volume of the original sample from the syringe into the flask. Aliquots of less than 1 ml are not recommended. Dilute the sample to the mark with organic-free reagent water. Cap the flask, invert, and shake three times. Repeat above procedure for additional dilutions.

8.3.1.11.4 DELETED

8.3.1.11.5 Dilutions are documented in the analytical run logbook.

8.3.1.12 When a sample is analyzed that has any target compound at a level exceeding twice the initial calibration range, this analysis should be followed by a blank reagent water analysis in the purge chamber to demonstrate that system is clean. If the blank analysis is not free of interferences, the system should be decontaminated. Sample analysis may not resume until a blank can be analyzed that is free of interferences.

NOTE: Since the analytical system is automated the analyst may not be aware that a high concentration sample has been analyzed. If analysis of subsequent samples occurs, then the presence of the high concentration analyte makes re-analysis of that sample necessary to determine if carryover has occurred.

8.3.1.13 For matrix spike analysis, in a 100 ml volumetric flask add 40 µL of the matrix spike solution (Section 7.2.3.1) to the 100 ml of sample. Invert three times and pour into 2 VOA vials.

8.3.1.14 All dilutions should keep the response of the major constituents in the upper half of the linear range of the curve.

8.3.2 Dilutions for soil/sediment samples are discussed in SOP 20_5035.

8.3.2.1 The procedure for running soil/sediment samples is discussed in SOP 20_5035.

8.4 Data interpretation

8.4.1 Qualitative identification

8.4.1.1 An analyte (e.g. those listed in Table 2) is identified by comparison of the sample mass spectrum with the mass spectrum of a standard of the compound obtained on the user's GC/MS. These standard reference spectra are obtained through analysis of the calibration standards. To compare the sample and reference spectra, go into the EnviroQuant software (QEDIT). The characteristic ions from the reference mass spectrum are defined to be the three ions of greatest relative intensity - any ions over 30% if less than three such ions are present. The analytes are listed in Attachment B for each analyte.

8.4.1.2 The requirements for qualitative verification by comparison of mass spectra are:

8.4.1.2.1 The intensities of the characteristic ions of a compound maximize in the same scan or within one scan of each other. Selection of a peak by a data system target compound search routine, where the search is based on the presence of a target chromatographic peak containing ions specific for the target compound at a compound-specific retention time, will be accepted as meeting this criterion.

8.4.1.2.2 The RRT of the sample component is compared to the RRT from the 25 ppb standard in the ICAL and must be within ±0.06 RRT units of the RRT of the standard component.

8.4.1.2.3 The relative intensities of the characteristic ions agree within 30% of the relative intensities of these ions in the reference spectrum. (Example: For an ion with an abundance of 50% in the reference spectrum, the corresponding abundance in a sample spectrum can range between 20% and 80%).

8.4.1.2.4 Structural isomers that produce very similar mass spectra should be identified as individual isomers if they have sufficiently different GC retention times. Sufficient GC resolution is achieved if the height of the valley between the two isomer peaks is less than 25% of the sum of the two peak heights. Otherwise, structural isomers are identified as isomeric pairs. ESS Laboratory currently reports m- and p-xylenes together due to inability of resolving the isomers.

8.4.1.2.5 Identification is hampered when sample components are not resolved chromatographically and produce mass spectra containing ions contributed by more than one analyte. When gas chromatographic peaks obviously represent more than one sample component (i.e., a broadened peak with shoulder(s) or a valley between two or more maxima), appropriate selection of analyte spectra and background spectra are important. Examination of extracted ion current profiles of appropriate ions can aid in the selection of spectra, and in qualitative identification of compounds. When analytes co-elute (i.e., only one chromatographic peak is apparent), the identification criteria can be met, but each analyte spectrum will contain extraneous ions contributed by the co-eluting compound.

8.4.1.2.6 For samples containing components not associated with the calibration standards, a library search may be made for the purpose of tentative identification. The necessity to perform this type of identification will be determined by the type of analyses being conducted. When serving the role of QA (or referee) laboratory, tentatively identified compounds (TICs) shall always be reported. Guidelines for making tentative identification are listed in section 11.9.3.

8.4.2 Quantitative Analysis

8.4.2.1 Compounds, which have been identified, are quantified by the internal standard method, utilizing the integrated abundance of the primary ion. The internal standard used shall be those listed in Section 8.1.7. The EnviroQuant method is setup to calculate the concentration of the analytes of interest in ng/ml using the initial calibration results stored in the method (Attachment B). This raw data number does not account for deviations in sample volume, sample weight, dilution factors, and % moisture. To include these other factors, see section 9.0.

9.0 CALCULATIONS

9.1 Response Factor (RF)
RF=(As x Cis)/(Ais x Cs)

Where:
A_S = Peak area (or height) of the analyte or surrogate.
A_{is} = Peak area (or height) of the internal standard.
C_S = Concentration of the analyte or surrogate, in µg/L.
C_{is} = Concentration of the internal standard, in µg/L.

9.2 Percent Relative Standard Deviation (%RSD)
% RSD = (SD/ $RF_{Average}$) x 100%

Where:
RSD = Relative standard deviation.
RF = Mean of 5 initial RFs for a compound.
SD = Standard deviation of average RFs for a compound.

9.3 Percent Difference
%Difference = $((RF_{Average} - RFc)/ RF\ Average) \times 100\%$

Where:
$RF_{Average}$ = Average response factor from initial calibration
RF_{c} = Response factor from current verification check standard.

9.4 Percent Drift
%Drift = $((C1-C0)/ C1) \times 100\%$

Where:
C_1 = compound standard concentration
C_0 = measured concentration using selected quantitation method

9.5 Concentration of Target Analytes in Water and Water-Miscible Waste Concentration

$\mu g/L = (Ax)(Cs)(D) / (Ais)(RF_{Average})(Vs)$

Where:
A_x = Area (or height) of the peak for the analyte in the sample.
A_{is} = Area (or height) of the peak for the internal standard.
C_s = Mass (amount) of the internal standard in the concentrated sample extract (ng). This is not just the mass injected into the instrument, but the total mass of internal standard in the concentrated extract.
D = Dilution factor, if the sample or extract was diluted prior to analysis. If no dilution was made, D = 1. The dilution factor is always unitless.
$RF_{Average}$ = Mean response factor from the initial calibration.
V_s = Volume of the aqueous sample extracted or purged (ml). If units of liters are used for this term, multiply the results by 1000.

Using the units specified here for these terms will result in a concentration in units of ng/ml, which is equivalent to µg/L.

9.6 Concentration of Target Analytes in Sediment/Soil, Sludge, and Waste – see SOP 20_5035.

10.0 QUALITY ASSURANCE/QUALITY CONTROL

Accuracy and Precision

Laboratory personnel must demonstrate initial proficiency for each sample preparation method/matrix that he or she performs. New employees must successfully demonstrate initial proficiency prior to independently performing analysis on real samples. This is accomplished by generating data of acceptable accuracy and precision for target analytes in a clean matrix. Initial proficiency results will become part of each employee's training file.

QC Sample Preparation:
Spiking Solution: Four QC samples must be prepared from a spiking solution with the analytes of interest. The spiking solution must be made using standards **prepared independently from those used for calibration**. The samples must be prepared at a concentration that would result in data falling within the middle of the calibration curve. In most cases the blank spike or matrix spike solution is used. Prep: The samples are prepared in a clean matrix. In most cases this initial demonstration will simply be a matter of preparing four blank spikes with a batch of samples.

Sample Analysis:
The four QC samples must be analyzed within the criteria of the method being evaluated. The QC samples must be handled in exactly the same manner as actual samples.

Accuracy Calculation:
Accuracy is defined as the closeness of agreement between an observed value and an accepted reference value. Each of the four spiked samples will be calculated for percent recovery. The average of the percent recovery values is the accuracy result.

Precision Calculation:
Precision is defined as the agreement of a set of replicate measurements without assumption of knowledge of the true value. Precision is estimated by the relative standard deviation (RSD) of the four QC samples.

$$\%RSD = (s / \bar{x})\ 100\ \%$$

Where:
s = Standard Deviation of a finite number of values. On a scientific calculator use the **σxn-1** key.

$\bar{x}$ = The average of the four QC sample % recoveries.

Reporting Accuracy and Precision
Accuracy and Precision data should be presented with the following minimum info:

Matrix:
Analysis Method:
Accuracy:
Prep Method:
Date Analyzed:
Precision:

Parameter	*% Rec. QC 1*	*% Rec. QC 2*	*% Rec. QC 3*	*% Rec. QC 4*	*Average Recovery*	*Standard Deviation*	*%RSD*

Interpretation of Results: Percent recovery is to be within 80-120% for all analytes with a RPD of ≤20%. For the full 8260B list a maximum of 5 sporadic marginal failures are allowed with the expanded criteria of 60-140%.

10.1 A preparation batch is defined as a group of up to 20 field samples of similar matrix that have been prepared at the same time or time sequence with the same lots of reagents for the same analysis. In addition to the samples, each prep batch will contain at a minimum, a method blank, a blank spike, blank spike duplicate, a matrix spike, and a matrix spike duplicate. An analytical/instrument batch is defined as samples that are analyzed together within the same time period or in continuous sequential time periods. The analytical batch includes QC requirements as defined by the analytical (determinative) method. For example, each injection sequence would begin with a tune and CCV (or tune, calibration and ICV), followed by a method blank, BS/BSD, MS/MSD, etc. and remaining field samples. Prep batches may be continuously strung together in these run sequences, as long as the analytical batch QC requirements meet the acceptance criteria established within the appropriate SOP. If all field and QC samples could not be completed within the 12-hour clock, then another tune, CCV, and MB would be required. Each analytical sequence must be documented using the run log in Figure 1.

10.2 Perform BFB tune every 12 hours. Tuning acceptance criteria are presented in Section 11.1. The computer software will evaluate the tune information. The analyst should be aware of the process used.

10.3 Run a 7-point initial calibration curve, using the primary source standards each time major instrument maintenance occurs, or if the CCV does not meet acceptance criteria. Acceptance criteria are presented in Section 11.2.

10.4 Run initial calibration verification (ICV) standard using secondary standards (7.2.3) following the initial calibration curve. Acceptance criteria are listed in Section 11.3.

10.5 Run a mid-point Continuing Calibration Verification (CCV) at 25 µg/L using the primary source standards on a daily basis before sample analysis. Also run a CCV every 12 hours during an analytical sequence. Acceptance criteria are listed in Section 11.4.

10.6 A method blank must be prepared with each batch of samples not to exceed 12 hours. The method blank should be prepared from organic-free water. The method blanks are to be related to each 12-hour sequence of samples injected. Acceptance criteria for these blanks are listed in Section 8.2.4 and corrective action is listed in Section 11.5. Instrument blanks may be injected at any time in the sequence to verify absence of contamination.

10.7 A Blank spike/Blank spike duplicate (BS/BSD) must be prepared and analyzed with each batch of samples. The BS/BSDs are prepared using a source different than that used to prepare the initial calibration standards and contain all method target analytes (see 7.2.3.1 and 7.2.7). Acceptance criterion is 70-130% and ≤25% RPD. ***For the Army Corp of Engineer (Shell), all compounds in the BS/BSD must be between 80-120%Rec with allowance for sporadic marginal exceedances. Sporadic marginal exceedances have the expanded criterion of 60-140%. See***

Table 3 for DoD and AFCEE blank spike acceptance criteria. Sporadic Marginal Exceedance number is as follows:

Number of Analytes in BS	Allowable number of Marginal Exceedances
>90	5
71-90	4
51-70	3
31-50	2
11-30	1
<11	0

Exceedances should be within marginal exceedance limits (Table 3) or expanded criterion listed above.

<u>NOTE</u>: The CCV and BS are considered equivalent for aqueous samples. Only one will need to be analyzed but it must be prepared from a source different than that used to perform initial calibration. In the case of solids, the BS is extracted similar to the samples. Use CCV acceptance criteria as presented in Section 8.2.2.

10.7.1 Control charts will be maintained for the BS/BSD for a representative subset of target analytes and surrogate spikes. Biannually, control limits will be determined for all target analytes and surrogates for comparison to default limits.

10.8 On an ongoing basis the laboratory analyzes matrix spikes and matrix spike duplicates from each batch of 20 samples.

10.8.1 The matrix spike is prepared as described in Section 7.2.8.

10.8.2 Matrix spike control limits are 70-130%. %RPD between spike and spike duplicate should be ≤30% (≤ 20% for AFCEE). ***For DoD and AFCEE matrix spike acceptance criteria use the blank spike acceptance criteria in Table 3.*** For samples outside control limits, see Section 11.6 for corrective action.

10.9 Surrogates recoveries limits are 70-130%. ***For DoD and AFCEE surrogate acceptance criteria use the blank spike acceptance criteria in Table 3.*** For samples outside control limits, see Section 11.7 for corrective action.

10.10 The relative retention times (RRTs) need to be checked for each identified compound in samples, and compared to standard RRT. Acceptance criteria are presented in Section 11.8.

10.11 Ion abundance for target compounds and any tentatively identified compounds need to meet specific requirements. Acceptance criteria for ion abundance are presented in Section 11.9.

10.12 Internal standard area counts for standards and samples must meet specifications as described in Section 11.10.

10.13 Data shall be checked to ascertain if it conforms to accepted practices. All sample analytical results used for final data reporting must be between the low standard and the high standard. Results, which fall below the low standard or above the high standard, are to be reported as estimated values. Corrective actions are described in Section 11.11.

10.14 MDLs are determined in reagent water or organic-free sand/soil and verified annually. (Project-specific requirements may require that the MDL study be performed in the site-specific matrix.).

11.0 DATA VALIDATION

The items shall be verified and documented on the VOA Department Analysis Map (Attachment D.)

11.1 Ensure that the BFB tune was run at the beginning of each 12-hour sequence for each batch of samples analyzed. The acceptance criteria are listed below:

BFB Key Ions and Ion Abundance Criteria:

Ion	Abundance
50	15.0-40.0% of mass 95
75	30.0-60.0% of mass 95
95	base peak, 100% relative abundance
96	5.0-9.0% of mass 95
173	< 2.0% if mass 174
174	> 50.0% of mass 95
175	5.0-9.0% of mass 174
176	> 95.0%, but less than 101% of mass 174
177	5.0-9.0% of mass 176

11.1.1 If BFB acceptance criteria are not met, perform any or all of the following corrective actions:

Re-inject BFB.
Retune with PFTBA, then re-inject BFB.
Clean MS source, retune with PFTBA, and re-inject BFB.

11.1.2 If the tuning criteria still cannot be met after performing the above, have the mass spectrometer serviced by manufacturer representative.

11.2 After a seven-point initial calibration curve is analyzed, ensure that the following criteria were met.

11.2.1 For the RFs, the %RSD must be less than 30% for all method target analytes, except for the poor purgers where the %RSD must be less than 50%.

11.2.1.1 If the %RSD of any method target analyte is 15% or less, then the relative response factor is assumed to be constant over the calibration range, and the average relative response factor may be used for quantitation.

11.2.1.2 If the %RSD of any method target analyte is greater than 15%, calibration curves must be constructed using first or higher order regression fits of the six calibration points. ***NOTE: A minimum of 5 points are used for average and linear regression calibration, six point for second order, and seven points for third order calibrations.*** The corresponding Coefficients of Determination (R^2) must be 0.99 or greater.

11.2.1.3 If these acceptance criteria are not met, then the following corrective actions should be performed: (1) adjust the instrument and/or perform instrument maintenance; or (2) narrow the calibration range using seven standards at different concentrations. The low end of the calibration curves must be carefully watched.

11.2.2 System Performance Check Compounds (SPCCs) and continuing calibration compounds (CCCs) must be evaluated and passed for initial calibration. Refer to Section 8.1.9 and 8.1.10.

11.3 If an initial calibration was performed, verify that initial calibration verification (ICV) was also performed. The percent difference for the CCC analytes must be within 20% (30% for all other target analytes). ***When samples are to be to be run for the Army Corp of Engineer (Shell), all compounds must have ≤20% drift with no allowance. Samples that are to be analyzed for Navy/DoD/AFCEE must have ≤25% drift for all compounds, no allowances.*** If not, reanalyze the ICV or prepare a new calibration curve as necessary.

11.4 Ensure the continuing calibration verification (CCV) standard is analyzed at the required frequency (every 12 hours or initially before daily analysis). In addition, the following acceptance criteria must be met.

11.4.1 System Performance Check Compounds (SPCCs): A system performance check must be made during every 12-hour shift. This is the same check that is applied during the initial calibration. If the minimum response factors are not met, the system must be evaluated, and corrective action must be taken before sample analysis begins. The minimum RF for volatile SPCCs is listed in Section 8.1.8.

11.4.2 Calibration Check Compounds (CCCs): After the system performance check is met, CCCs listed in Section 8.1.9 are used to check the validity of the initial calibration with a limit of <20% drift or difference. Acceptance criteria is ≤ 30% drift for all other method target analytes (50% for the poor purgers). *When samples are to be to be run for the Army Corp of Engineers, all compounds must have <20% drift).*

If these criteria are exceeded, corrective action is necessary. If corrective action fails to produce consecutive (immediate) calibration verification within acceptance criteria, then the analyst may perform maintenance to try to troubleshoot the instrument. After maintenance, the analyst must analyze two consecutive CCV at two concentration (one at or below mid-range) to demonstrate that corrective action was successful. If not, then a new six-point calibration must be generated. These criteria must be met before sample analysis begins and re-analysis of samples up to the last acceptable CCV standard must occur with the following exceptions:

- When the acceptance criteria is exceeded high, high bias, then all samples that are non-detects may be reported.
- When the acceptance criteria for the CCV are exceeded low, low bias, sample results that exceed a maximum regulatory limit may be reported.

11.4.3 When performing analysis for MA MCP, Navy, USACE (Shell), DoD, or AFCEE any analyte outside of criteria in the CCV must be noted in the project narrative

11.5 Assess the method blanks. The analyst shall confirm that this blank was analyzed at the required frequency and the criteria in Section 8.3.4 are met. Analytical batches with Method blanks outside acceptance criteria will be re-prepped and re-analyzed with the following exceptions:

11.5.1 Samples that are that are at least twenty times higher than the method blank may be reported.

11.5.2 When the method blank is less than 5% of the regulatory limit associated with the analyte the method blank would be acceptable.

11.5.3 If the analyte is found in the method blank above ½ the MRL but is not in any of the associated samples, no corrective action is needed.

11.5.4 Any results that are reported with method blank contamination must be B-flagged.

11.6 Assess that matrix spike/matrix spike duplicates were analyzed at required frequency. Acceptance criteria are that all % Recovery and/or RPD results meet project-established goals. If no project goals are specified, then results must be within the control limits listed in Section 10. If results are not within criteria, perform the following corrective actions as appropriate.

11.6.1 If both BS/BSD and MS/MSD recoveries are unacceptable, then the entire batch of field and QC samples must be reanalyzed.

11.6.2 If the MS/MSD is unacceptable, but the BS is acceptable, then a potential matrix effect has been identified. Reasonable attempts must be made to address matrix interference. The client must be notified in the case narrative of the matrix problem.

11.7 Check the surrogate calculations for correctness for all samples, blanks, BS, MS, and MSD. The following acceptance criteria apply to surrogate recoveries.

11.7.1 The surrogate recoveries for all QC samples must be within control limits of 70-130%. If the BS/BSD and/or method blank recoveries are outside limits, re-analysis must be performed for verification. If still outside limits, then corrective action is necessary. ***When samples are to be to be run for the Army Corp of Engineers, surrogate limits must be within 20% for method blank and BS/BSD and 30% for project samples. See Table 3 for surrogate acceptance limits for DoD/Navy/AFCEE projects.***

11.7.2 If sample surrogate recoveries exceed these limits, the sample must be re-analyzed. If the results are still outside the limits, then matrix affect has been verified and results are discussed in case narrative. ***NOTE: If an obvious matrix effect is seen on the chromatogram (Unresolved complex mixture, UCM), then re-analysis is not necessary. MA-MCP and CT-RCP projects must have a copy of the chromatogram included with the report.***

11.8 The relative retention times must be checked for all identified compounds in both standards and samples. The internal standard absolute retention times must also be checked for all analyses. Acceptance criteria are as follows:

11.8.1 The relative retention times of each compound in each calibration run should agree within 0.06 relative retention time (RRT) units. Late-eluting compounds usually have much better agreement.

11.8.2 Internal standard retention time:

11.8.2.1 If the retention time for any CCV internal standard changes by more than 30 seconds from the **mid-point standard of the initial calibration**, the chromatographic system must be inspected for malfunctions and corrections must be made, as required.

11.8.3 If the retention time for any sample internal standard changes by more than 30 seconds from the daily calibration, the chromatographic system must be inspected for malfunctions and corrections must be made, as required.

11.9 The analyst must verify that ion abundance meets specific criterion for the various analyses. The following acceptance criteria shall be checked for all appropriate samples.

11.9.1 All ions present in the standard mass spectrum at a relative intensity greater than 10% (most abundant ion in the spectrum equals 100%) must be present in the sample spectrum.

11.9.2 The relative intensities of ions specified in Section 11.10.1 must agree within plus or minus 30% between the standard and sample spectra. (Example: For an ion with an abundance of 50% in the standard spectrum, the corresponding sample abundance must be between 20 and 80 percent.)

11.9.2.1 Molecular ions present in the reference spectrum should be present in the sample spectrum.

11.9.2.2 Ions present in the sample spectrum but not in the reference spectrum should be reviewed for possible background contamination or presence of co-eluting compounds.

11.9.2.3 Ions present in the reference spectrum, but not in the sample spectrum should be reviewed for possible subtraction from the sample spectrum because of background contamination or co-eluting peaks. Data system library reduction programs can sometimes create these discrepancies.

11.9.3 For samples containing components not associated with the calibration standards, a library search may be made for the purpose of tentative identification. The necessity to perform this type of identification will be determined by the purpose of the analyses being conducted. When serving the role as QA (or referee) laboratory, tentatively identified compounds (TICs) are always reported. Computer-generated library search routines should not use normalization routines that would misrepresent the library or unknown spectra when compared to each other. For example, the RCRA permit or waste de-listing requirements may require the reporting of non-target analytes. Only after visual comparison of sample spectra with the nearest library searches will the mass spectral interpretation specialist assign a tentative identification. Guidelines for making tentative identification are as follows:

11.9.3.1 Relative intensities of major ions in the reference spectrum (ions > 10% of the most abundant ion) should be present in the sample spectrum.

11.9.3.2 The relative intensities of the major ions should agree within ±30%. (Example: For an ion with an abundance of 50% in the standard spectrum, the corresponding sample ion abundance must be between 20 and 80%.)

11.9.3.3 Molecular ions present in the reference spectrum should be present in the sample spectrum. Ions present in the sample spectrum but not in the reference spectrum should be reviewed for possible background contamination or presence of co-eluting compounds.

11.9.3.4 Ions present in the reference spectrum, but not in the sample spectrum should be reviewed for possible subtraction from the sample spectrum because of background contamination or co-eluting peaks. Data system library reduction programs can sometimes create these discrepancies.

11.10 The analyst will check the internal standard area counts for all calibration standards, QC samples, and samples for quantitation. If the area for any of the CCV internal standards changes by a factor of two (-50% to +100%) from the mid-point standard of the initial calibration, the mass spectrometer must be inspected for malfunctions and corrections must be made, as appropriate. All sample internal standards must be -50 to 200% if their associated CCV. If the internal standard area counts fail this criterion, the following corrective actions should be considered:

11.10.1Check to ensure there was no error in internal standards preparation or addition. Also, check instrument performance.

11.10.2If the CCV failed criterion, re-analyze once. If this second consecutive CCV still does not meet criterion, then a new initial calibration must be performed.

11.10.3If the internal standards for samples are outside criterion, then re-analyze once. If re-analysis produces results within criteria, then report these results. If the re-analysis is still outside criterion, discuss matrix issue in project narrative. ***NOTE: If an obvious matrix effect is displayed on the chromatogram (Unresolved complex mixture, UCM), then re-analysis is not necessary. MA-MCP and CT-RCP projects must have a copy of the chromatogram included with the report.***

11.11 The analyst must verify all reported results are derived from analytical results that are below the highest standard of the initial calibration curve and above the low standard. Values reported below the low standard are to be reported as estimated values (J values). For samples that exceed the calibration curve, dilute and analyze an appropriate sample aliquot.

11.12 All manual integration must be printed, when made, for verification.

11.13 Besides the items listed in Sections 11.1 through 11.12, the analyst should also verify the additional items as noted in Attachment D. A second level of review must be performed by a second analyst, results are recorded on Attachment D.

12.0 REFERENCES

12.1 SW-846 Method 8260B, Test Methods for the Analysis of Solid Waste, Third Edition, Update III.

12.2 HP GC EnviroQuant User's Guide, HPG1045A.

12.3 HP Environmental Data Analysis User's Guide HPG0032C.

12.4 HP 6890 GC Operations Manual.

12.5 HP 5890 Series II Operations Manual.

12.6 HP 5971A MS Operations Manual.

12.7 HP 5973 MS Operations Manual.

13.0 ATTACHMENTS

13.1 Attachment A – Primary Standard Certificates of Analysis

13.2 Attachment B – Enviroquant method

13.3 Attachment C – Run logbook

13.4 Attachment D – Analysis Map

14.0 POLLUTION PREVENTION AND WASTE MANAGEMENT

14.1 ESS Laboratory's policies on pollution prevention and waste management are covered in SOP 90_0002, Hazardous Waste Contingency and Emergency Response Plan. All employees are trained in the requirements of the SOP.

15.0 METHOD PERFORMANCE

15.1 Precision and Accuracy data must be generated by all employees before performing this analysis on client samples. The data is generated by analyzing a method blank and four blank spike samples. Acceptance criteria are 80-120% Recovery and %RSD of ≤ 20%. Five (5) sporadic marginal exceedances are allowed.

15.2 The precision and accuracy data in Table 1 were obtained using the SOP. Values are in ug/L.

16.0 TABLES, DIAGRAMS, FLOWCHARTS, AND VALIDATION DATA

Table 1. Typical Precision and Accuracy data generated 1/3/2005

Analyte	Spk	Avg	%Rec	%RSD	Analyte	Spk	Avg	%Rec	%RSD
Dichlorodifluoromethane	25	24.51	98	1.3	2-Hexanone	25	118.53	95	1.7
Chloromethane	25	23.82	95	1.1	trans-1,3-Dichloropropene	25	26.19	105	1.8
Vinyl Chloride	25	23.94	96	0.7	1,1,2-Trichloroethane	25	24.73	99	1.7
Bromomethane	25	25.37	101	1.9	1,3-Dichloropropane	25	25.19	101	0.9
Chloroethane	25	25.00	100	1.6	Tetrachloroethene	25	25.15	101	1.2
Trichlorofluoromethane	25	25.05	100	0.2	Dibromochloromethane	25	27.05	108	1.3
Diethyl ether	25	24.63	99	1.7	1,2-Dibromoethane	25	25.26	101	1.4
Acetone	25	113.63	91	1.1	1-Chlorohexane	25	24.39	98	1.0
Carbon Disulfide	25	24.35	97	1.0	Chlorobenzene	25	24.75	99	1.3
1,1-Dichloroethene	25	24.37	97	0.5	1,1,1,2-Tetrachloroethane	25	25.23	101	1.1
Methylene Chloride	25	24.55	98	1.7	Ethylbenzene	25	24.67	99	1.0
Methyl tert-Butyl Ether	25	47.42	95	1.3	Xylene P,M	25	49.08	98	1.5
trans-1,2-Dichloroethene	25	24.42	98	2.4	Xylene O	25	24.56	98	1.8
1,1-Dichloroethane	25	24.31	97	1.8	Styrene	25	25.42	102	1.2
Vinyl Acetate	25	24.78	99	1.8	Bromoform	25	26.13	105	1.1
Di-isopropyl ether	25	24.71	99	1.8	Isopropylbenzene	25	24.86	99	0.8
Ethyl tertiary-butyl ether	25	24.92	100	1.6	1,2,3-Trichloropropane	25	24.13	97	1.2
2-Butanone	25	123.99	99	2.2	Bromobenzene	25	24.95	100	1.7
cis-1,2 Dichloroethene	25	24.54	98	1.6	1,1,2,2-Tetrachloroethane	25	24.79	99	1.9
2,2-Dichloropropane	25	24.47	98	2.1	n-Propylbenzene	25	24.56	98	1.9
Bromochloromethane	25	24.14	97	1.1	2-Chlorotoluene	25	24.31	97	3.9
Tetrahydrofuran	25	23.44	94	2.1	4-Chlorotoluene	25	24.20	97	1.1
Chloroform	25	24.53	98	1.4	1,3,5-Trimethylbenzene	25	24.53	98	1.6
1,1,1-Trichloroethane	25	24.92	100	1.1	tert-Butylbenzene	25	24.52	98	1.2
1,1-Dichloropropene	25	24.41	98	0.9	1,2,4-Trimethylbenzene	25	24.55	98	0.9
Carbon Tetrachloride	25	24.99	100	1.4	sec-Butylbenzene	25	24.67	99	1.3
Benzene	25	24.23	97	1.2	1,3 Dichlorobenzene	25	24.27	97	1.4
1,2-Dichloroethane	25	25.00	100	1.6	4-Isopropyltoluene	25	24.42	98	1.4
Tertiary-amyl methyl ether	25	24.64	99	1.8	1,4 Dichlorobenzene	25	24.46	98	1.4
Trichloroethene	25	24.46	98	1.3	n-Butylbenzene	25	24.65	99	1.0
1,2-Dichloropropane	25	24.25	97	1.8	1,2 Dichlorobenzene	25	24.23	97	1.1
Dibromomethane	25	24.61	98	2.1	1,2-Dibromo-3-Chloropropane	25	25.46	102	1.8
1,4-Dioxane	25	489.19	98	11.1	1,2,4-Trichlorobenzene	25	24.36	97	1.9
Bromodichloromethane	25	25.14	101	1.9	Hexachlorobutadiene	25	26.30	105	1.9
4-Methyl-2-Pentanone	25	121.18	97	1.7	Naphthalene	25	23.59	94	1.3
cis-1,3-Dichloropropene	25	25.30	101	1.7	1,2,3-Trichlorobenzene	25	23.71	95	2.3
Toluene	25	24.70	99	1.1					

17.0 DEFINITIONS

17.1 **Accuracy**: The closeness of agreement between an observed value and an accepted reference value. When applied to a set of observed values, accuracy will be a combination of a random component and of a common systematic error (or bias) component.

17.2 **Batch**: A group of samples which behave similarly with respect to the sampling or the testing procedures being employed and which are processed as a unit. For QC purposes, if the number of samples in a group is greater than 20, then each group of 20 samples or less will all be handled as a separate batch.

17.3 **Bias**: The deviation due to matrix effects of the measured value (x_s - x_u) from a known spiked amount, where x_s is the spiked sample and x_u is the un-spiked sample. Bias can be assessed by comparing a measured value to an accepted reference value in a sample of known concentration or by determining the recovery of a known amount of contaminant spiked into a sample (matrix spike).

17.4 **Control Sample**: A QC sample introduced into a process to monitor the performance of the system.

17.5 **Equipment Blank**: A sample of analyte-free media which has been used to rinse the sampling equipment. It is collected after completion of decontamination and prior to sampling. This blank is useful in documenting adequate decontamination of sampling equipment.

17.6 **Method Reporting Limit**: The lowest concentration that can be reliably achieved within specified limits of precision and accuracy during routine laboratory operating conditions. The MRL is generally 5 to 10 times the MDL. ESS Laboratory sets the MRL to the lowest non-zero standard in the calibration curve or higher.

17.7 **Field Duplicates**: Independent samples which are collected as close as possible to the same point in space and time. They are two separate samples taken from the same source, stored in separate containers, and analyzed independently. These duplicates are useful in documenting the precision of the sampling process.

17.8 **Blank Spike (BS)**: A known matrix spiked with compound(s) representative of the target analytes. This is used to document laboratory performance.

17.9 **Matrix**: The component or substrate (e.g., surface water, drinking water) which contains the analyte of interest.

17.10 **Matrix Duplicate**: An intralaboratory split sample which is used to document the precision of a method in a given sample matrix.

17.11 **Matrix Spike**: An aliquot of sample spiked with a known concentration of target analyte(s). The spiking occurs prior to sample preparation and analysis. A matrix spike is used to document the bias of a method in a given sample matrix.

17.12 **Matrix Spike Duplicates**: Intralaboratory split samples spiked with identical concentrations of target analyte(s). The spiking occurs prior to sample preparation and analysis. They are used to document the precision and bias of a method in a given sample matrix.

17.13 **Method Blank**: An analyte-free matrix to which all reagents are added in the same volumes or proportions as used in sample processing. The method blank should be carried through the complete sample preparation and analytical procedure. The method blank is used to document contamination resulting from the analytical process.

17.14 **Method Detection Limit (MDL)**: The minimum concentration of a substance that can be measured and reported with 99% confidence that the analyte concentration is greater than zero and is determined from analysis of a sample in a given matrix type containing the analyte. See SOP 110_0013 for further explanation.

17.15 **Organic-Free Reagent Water**: For volatiles, all references to water in the method refer to water in which an interferant is not observed at the method detection limit of the compounds of interest. A water purification system is usedto generate organic-free deionized water.

17.16 **Records**: Include all logbooks, papers, machine readable materials, or other documentary materials, regardless of physical form or characteristics.

17.17 **Surrogate**: An organic compound which is similar to the target analyte(s) in chemical composition and behavior in the analytical process, but which is not normally found in environmental samples.

17.18 **Trip Blank**: A sample of analyte-free media taken from the laboratory to the sampling site and returned to the laboratory unopened. A trip blank is used to document contamination attributable to shipping and field handling procedures. This type of blank is useful in documenting contamination of volatile organics samples.

18.0 PERSONNEL QUALIFICATIONS

18.1 Analysts who perform this analysis must have a working knowledge or quantitative and qualitative analysis, instrumental methods of analysis, chemical laboratory methods, and equipment.

18.2 All analysts, before performing any analysis, participate in the ESS Laboratory training program (SOP80_0016). The training process consists of reading the Standard Operating Procedure, gaining instruction on the procedure from an experienced analyst, and performing the initial demonstration of capability.

19.0 TROUBLESHOOTING

19.1 If BFB criteria are not met, the analysis must be repeated. Analysis can not begin until BFB meets acceptance criteria. Repeated failures indicate that the MS acquisition parameters must be adjusted. These parameters should be adjusted in manual tune, saved and the tune repeated.

19.2 If manual or auto-tune does not produce BFB spectra within acceptance criteria, the MS source may need cleaning. Cleaning instructions are found in the MS detector manual.

19.3 Method blanks must not contain any target compound greater than ½ the MRL with the exception of methylene chloride (see section 11.5 for expanded criteria). If the method blank does not meet criteria, then system must be cleaned before processing samples. This includes washing the purge vessel and baking the trap.

19.4 See laboratory supervisor or operations manager for all other maintenance problems.

19.5 Record all maintenance in the instrument's maintenance logbook.

20.0 Data Management And Records

20.1 **Data Management** - ESS Laboratory's utilizes the Promium Element LIMS system as part of its Data Management system. Client sample information is entered into ELEMENT LIMS and analyses are assigned to each sample. The LIMS allows EPA hold times, minimum batch QC requirements, and QC criteria to be assigned to each analysis. Standards can be entered and assigned to QC samples through the LIMS. Once analysis has been performed, data is imported using DataTool avoiding manual errors. In conjunction with Crystal Reports, the ELEMENT system allows for a wide variety of reporting formats.

20.2 **Records** – The specific retention periods required in the NELAC Standards, EPA-CFR and state and local statutes are followed or exceeded. At a minimum, data records are retained for five years from last use (10 years for drinking water). If there is a question about whether a record should be retained or disposed because no specific requirement could be found, the record is retained until such time as a retention period is specified. Records are stored in specified-labeled locations and are easily retrievable. All raw data associated with testing is also retained including; computer printouts, chromatograms, review forms, and logbooks.

TABLE 2 -Internal Standards with their associated compounds

FLUOROBENZENE (IS)	CHLOROBENZENE-d5 (IS)	1,4-DICHLOROBENZENE-d4 (IS)
Dichlorodifluoromethane	Toluene - d_8	Isopropylbenzene
Chloromethane	Toluene	trans-1,4-Dichloro-2-Butene
Vinyl Chloride	2-Hexanone (P)	1,2,3-Trichloropropane
Bromomethane	Ethyl methacrylate	Bromobenzene
Chloroethane (P)	1,3-Dichloropropane	1,1,2,2-Tetrachloroethane
Trichlorofluoromethane	Tetrachloroethene	n-Propylbenzene
Diethyl Ether	Dibromochloromethane	2-Chlorotoluene
Acrolein (P)	1,2-Dibromoethane	4-Chlorotoluene
1,1,2-Trichloro-1,2,2-trifluoroethane	1-Chlorohexane	1,3,5-Trimethylbenzene
Acetone (P)	Chlorobenzene	tert-Butylbenzene
Iodomethane (P)	1,1,1,2-Tetrachloroethane	Pentachloroethane
Carbon Disulfide (P)	Ethylbenzene	1,2,4-Trimethylbenzene
1,1-Dichloroethene	Xylene, M,O	sec-Butylbenzene
Allyl Chloride	Xylene P	1,3-Dichlorobenzene
Methyl acetate	Styrene	4-Isopropyltoluene
Methylene Chloride	Bromoform	1,4-Dichlorobenzene
Methyl tert-butyl ether	cis 1,4-Dicchloro-2-butene	n-Butylbenzene
Acrylonitrile (P)	4-Bromofluorobenzene*	1,2-Dichlorobenzene
trans-1,2-Dichloroethene		Hexachloroethane
1,1-Dichloroethane		1,2-Dibromo-3-chloropropane (P)
Vinyl Acetate		1,2,4-Trichlorobenzene
Chloroprene		Hexachlorobutadiene
Di-isopropyl ether		Naphtalene
Ethyl tertiary butyl ether		1,2,3-Trichlorobenzene
2-Butanone (P)		
cis-1,2-Dichloroethene		
2,2-Dichloropropane		
Methyl acrylate		
Bromochloromethane		
Methacrylonitrile		
Tetrahydrofuran		
Chloroform		
Dibromofluoromethane*		
1,1,1-Trichloroethane		
Cyclohexane		
1-Chlorobutane		
1,1-Dichloropropene		
Carbon Tetrachloride		
1,2-Dichloroethane-D4*		
Benzene		
1,2-Dichloroethane		
Tertiary-amyl methyl ether		
Trichlorethene		
Methylcyclohexane		
1,2-Dichloropropane		
Dibromomethane		
1,4-Dioxane (P)		
Bromodichloromethane		
2-Nitropropane		
2-Chloroethyl vinyl ether (P)		
4-Methyl-2-pentanone (P)		
cis-1,3-Dichloropropene		
Toluene		
trans-1,3-Dichloropropene		
1,1,2-Trichloroethane		

IS = Internal Standard; * = Surrogate; (P) = Poor purger

Table 3 DoD Quality Systems Manual and AFCEE QAAP Blank Spike QC Limits

	DoD				AFCEE			
Analyte	LCL	UCL	LMEL	UMEL	LCL	UCL	LMEL	UMEL
1,1,1,2-Tetrachloroethane	80	130	75	135	81	129	75	135
1,1,1-Trichloroethane	65	130	55	145	67	132	55	145
1,1,2,2-Tetrachloroethane	65	130	55	140	63	128	55	140
1,1,2-Trichloroethane	75	125	65	135	75	125	65	135
1,1-Dichloroethane	70	135	60	145	69	133	60	145
1,1-Dichloroethene	70	130	55	140	68	130	55	140
1,1-Dichloropropene	75	130	65	140	73	132	65	140
1,2,3-Trichlorobenzene	55	140	45	155	67	137	45	155
1,2,3-Trichloropropane	75	125	65	130	73	124	65	130
1,2,4-Trichlorobenzene	65	135	55	145	66	134	55	145
1,2,4-Trimethylbenzene	75	130	65	140	74	132	65	140
1,2-Dibromo-3-Chloropropane	50	130	35	145	50	132	35	145
1,2-Dibromoethane	80	120	75	125	80	121	75	125
1,2-Dichlorobenzene	70	120	60	130	71	122	60	130
1,2-Dichloroethane	70	130	60	140	69	132	60	140
1,2-Dichloropropane	75	125	65	135	75	125	65	135
1,3,5-Trimethylbenzene	75	130	65	140	74	131	65	140
1,3 Dichlorobenzene	75	125	65	130	75	124	65	130
1,3-Dichloropropane	75	125	65	135	73	126	65	135
1,4 Dichlorobenzene	75	125	65	130	74	123	65	130
2,2-Dichloropropane	75	135	60	150	69	137	60	150
2-Butanone	30	150	10	170	49	136	49	136
2-Chlorotoluene	75	125	65	135	73	126	65	135
2-Hexanone	55	130	45	140	-	-	-	-
4-Chlorotoluene	75	130	65	135	74	128	65	135
4-Methyl-2-Pentanone	60	135	45	145	58	134	45	145
Acetone	40	140	20	160	40	135	20	160
Benzene	80	120	75	130	81	122	75	130
Bromobenzene	75	125	70	130	76	124	70	130
Bromochloromethane	65	130	55	140	65	129	55	140
Bromodichloromethane	75	120	70	130	76	121	70	130
Bromoform	70	130	60	140	69	128	60	140
Bromomethane	30	145	10	165	30	141	10	165
Carbon Disulfide	35	160	15	185	-	-	-	-
Carbon Tetrachloride	65	140	55	150	66	138	55	150
Chlorobenzene	80	120	75	130	81	122	75	130
Dibromochloromethane	60	135	45	145	66	133	45	145
Chloroethane	60	135	50	145	58	133	50	145
Chloroform	65	135	50	150	69	128	50	150

Chloromethane	40	125	25	140	56	131	25	140
cis-1,2 Dichloroethene	70	125	60	135	72	126	60	135
cis-1,3-Dichloropropene	70	130	60	140	69	131	60	140
Dibromomethane	75	125	65	135	76	125	65	135
Dichlorodifluoromethane	30	155	10	175	30	153	10	175
Ethylbenzene	75	125	65	135	73	127	65	135
Hexachlorobutadiene	50	140	35	160	67	131	35	160
Isopropylbenzene	75	125	65	135	75	127	65	135
m,p-Xylene	75	130	65	135	76	128	65	135
Methylene Chloride	55	140	40	155	63	137	40	155
Methyl tert-Butyl ether	65	125	55	135	65	123	55	135
Naphthalene	55	140	40	150	54	138	40	150
n-Butylbenzene	70	135	55	150	69	137	55	150
n-Propylbenzene	70	130	65	140	72	129	65	140
o-Xylene	80	120	75	130	80	121	75	130
p-Isopropyltoluene	75	130	65	140	73	130	65	140
sec-Butylbenzene	70	125	65	135	72	127	65	135
Styrene	65	135	55	145	65	134	55	145
tert-Butylbenzene	70	130	60	140	70	129	60	140
Tetrachloroethene	45	150	25	165	66	128	60	135
Toluene	75	120	70	130	77	122	70	130
trans-1,2-Dichloroethene	60	140	45	150	63	137	45	150
trans-1,3-Dichloropropene	55	140	40	155	59	135	40	155
Trichloroethene	70	125	60	135	70	127	60	135
Trichlorofluoromethane	60	145	45	160	57	129	45	160
Vinyl Chloride	50	145	35	165	50	134	35	165
Surrogates:								
Dibromofluoromethane	85	115	-	-	85	115	-	-
Toluene-d8	85	120	-	-	81	120	-	-
4-Bromofluorobenzene	75	120	-	-	76	119	-	-
1,2-Dichloroehane-d4	70	120	-	-	72	119	-	-

LCL = Lower Control Limit
UCL = Upper Control Limit
LMEL = Lower Marginal Exceedance Limit
UMEL = Upper Marginal Exceedance Limit

Table 4

Summary of Method Quality Objectives for Method 8260B Volatile Organic Compounds

QC Element	**Frequency**	**Target Analyte/Surrogate**	**Corrective action**
Tune	Every twelve hours	Criteria in Table 1	Suspend analysis until criteria met.
Initial Calibration	Instrument set up. Each time the ICV or CCV can not meet criteria.	$RSD \leq 15\%$, $R \geq 0.995$, $R^2 \geq 0.99$ Do not force through origin	Recalibrate as required.
ICV	Immediately following initial calibration.	%Rec = 70-130% ***USACE: 80-120%*** ***DoD/AFCEE: 75/125%***	Re-analyze once, if still fails criteria re-calibrate instrument.
CCV	At the beginning of each analytical sequence. No more than 20 samples or 12 hours between CCVs.	CCCs must be < 20%, all other analytes < 30% drift or difference. ***USACE/DoD/AFCEE: 80-120% all compounds.***	Re-analyze once, if still fails criteria re-calibrate instrument.
Blank spike/ Blank spike duplicate	At the beginning of each analytical sequence. Prepared using source different than that used to prepare initial calibration standards and contain all target analytes.	All target analytes < 30% drift or difference and ≤ 25%RPD, except for 1,4-dioxane (screen), where lab CLs are used. ***USACE: 80-120% for all compounds, allows for 5 sporadic marginal failures.*** ***See Table 3 for DoD/AFCEE criteria***	Re-analyze once with associated samples. If still outside criteria, report exceedance in project narrative. The lab is to identify those difficult analyte that routinely are outside the 70-130% criterion, disclose in P/N.
Method Blank	One per analytical batch of 20 or fewer samples. Use second source standard	Analytes < ½ MRL	See Section 11.0. Report nonconformance in case narrative.
MS/MSD	1 per 20 samples.	% Rec = 70-130%, except for 1,4-dioxane (screen), where lab CLs are used; ≤ 30% RPD . ***See Table 3 for DoD/AFCEE criteria***	Check BS, if BS is within criteria then report non-conformance in project narrative. If BS fails, then re-analyze.
Surrogates	Added to all samples and standards.	%Rec = 70-130% ***USACE: 80-120% for BS and method blanks. See Table 3 for DoD/AFCEE criteria***	If one or more is outside criteria, then re-analyze sample unless an obvious interference is present (UCM).
Internal Standards	Added to all samples and standards.	50-200% of area counts in the associated continuing calibration standard.	If one or more is outside criteria, then re-analyze sample unless an obvious interference is present (UCM).

5B14013 5B14017
5B14014
5B14015
5B14016

RESTEK

CERTIFICATE OF ANALYSIS

FOR LABORATORY USE ONLY - READ MSDS PRIOR TO USE

110 Benner Circle
Bellefonte, PA 16823-8812
Tel: (800) 356-1688
Fax: (814) 353-1309

Catalog No.: 30006 **Lot No.:** A034309

Description: VOA Calibration Mix #1

Expiration Date[1]: February 2008 **Storage:** Freezer

Elution Order	Compound	CAS#	Percent Purity[2]	Concentration[3]	Percent Uncertainty[4]
1	Acetone	67-64-1	99%	5000 ug/mL	+/- 0.1
2	2-Butanone (MEK)	78-93-3	99%	5000 ug/mL	+/- 0.1
3	4-Methyl-2-pentanone (MIBK)	108-10-1	99%	5000 ug/mL	+/- 0.1
4	2-Hexanone	591-78-6	99%	5000 ug/mL	+/- 0.1

Solvent: P&T Methanol/Water (90:10) 67-56-1/7732-18-5 99%

Column:
105m x .32mm x 3.0um
Rtx-502.2 (cat.#10910)

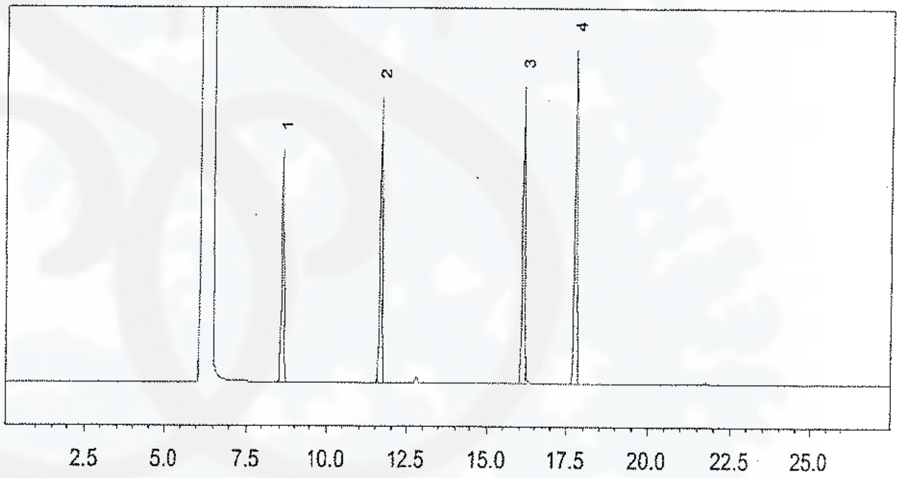
Carrier Gas:
hydrogen @ 40 cc/min.

Temp. Program:
40°C (hold 2 min.) to 240°C
@ 8°C/min.

Inj. Temp:
200°C

Det. Temp:
250°C

Det. Type:
FID



Manufactured By: MEW

John Lidgett

John Lidgett - QA Analyst

---

1 Expiration date of the unopened ampul stored at recommended temperature.
2 Purity was determined by one or more of the following techniques: GC/FID, HPLC, GC/ECD, GC/MS. Value rounded to the nearest LOWER whole percentage. In addtion to detectors listed above, chemical identity and purity are confirmed using 1 or more of the following: MS, DSC, solid probe MS, GC/FPD, GC/NPD, GC/TC, FTIR, melting point, reftactive index, and Karl Fisher. See data pack or contact Restek for further details.
3 Based upon gravimetric preperation with balance calibration verified using NISTtraceable weights (7 mass levels).
4 Percent Uncertainty based upon balance AND ASTM Class A volumetric glassware accuracy.

ISO 9001 REGISTERED
Manufactured Under Restek's ISO
9001 Registered Quality System
Certificate #FM80397

MAS

CERTIFICATE OF ANALYSIS

FOR LABORATORY USE ONLY - READ MSDS PRIOR TO USE

110 Benner Circle
Bellefonte, PA 16823-8812
Tel: (800) 356-1688
Fax: (814) 353-1309

Catalog No.: 30042
Lot No.: A034239
Description: 502.2 Calibration Mix #1
Expiration Date[1]: July 2011
Storage: Freezer

Elution Order	Compound	CAS#	Percent Purity[2]	Concentration[3]	Percent Uncertainty[4]
1	Dichlorodifluoromethane (CFC-12)	75-71-8	99%	2003 ug/mL	+/- 1.3
2	Chloromethane (methyl chloride)	74-87-3	99%	1997 ug/mL	+/- 1.3
3	Vinyl chloride	75-01-4	99%	2002 ug/mL	+/- 2.1
4	Bromomethane (methyl bromide)	74-83-9	99%	1995 ug/mL	+/- 1.3
5	Chloroethane (ethyl chloride)	75-00-3	99%	1996 ug/mL	+/- 1.3
6	Trichlorofluoromethane (CFC-11)	75-69-4	99%	2000 ug/mL	+/- 0.3
	Solvent: P&T Methanol	67-56-1	99%		

Column:
105m x .32mm x 1.8um
Rtx-502.2 (cat.#10921)

Carrier Gas:
helium @ 2.2 ml/min.

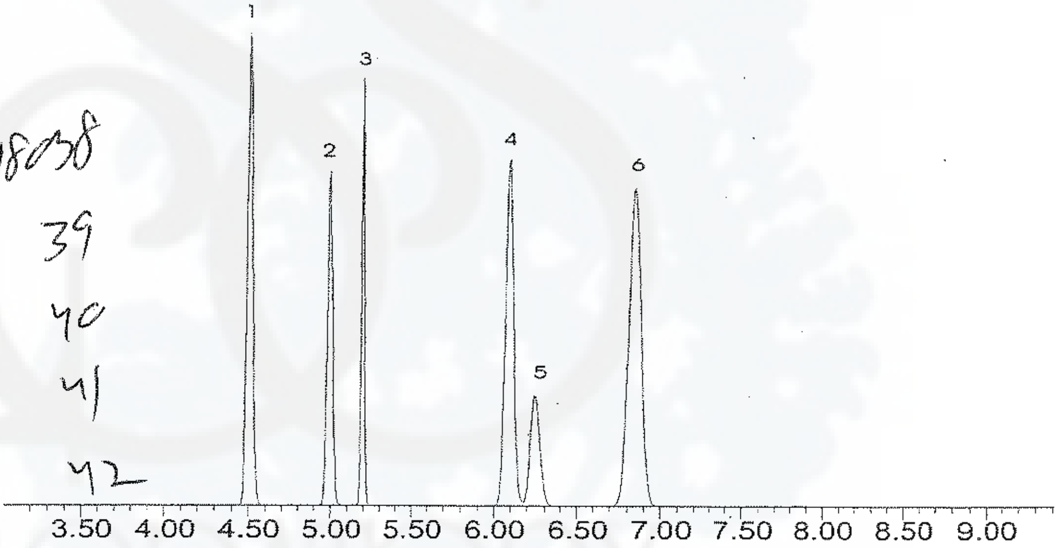
Temp. Program:
50°C (hold 9.5 min.) to 50°C @ 8°C/min.

Inj. Temp:
200°C

Det. Temp:
250°C

Det. Type:
MSD

5018038
39
40
41
42



Manufactured By: MEW

John Lidgett

John Lidgett - QA Analyst

---

[1] Expiration date of the unopened ampul stored at recommended temperature.

[2] Purity was determined by one or more of the following techniques: GC/FID, HPLC, GC/ECD, GC/MS. Value rounded to the nearest LOWER whole percentage. In addtion to detectors listed above, chemical identity and purity are confirmed using 1 or more of the following: MS, DSC, solid probe MS, GC/FPD, GC/NPD, GC/TC, FTIR, melting point, reftactive index, and Karl Fisher. See data pack or contact Restek for further details.

[3] Based upon gravimetric preperation with balance calibration verified using NISTtraceable weights (7 mass levels).

[4] Percent Uncertainty based upon balance AND ASTM Class A volumetric glassware accuracy.

ISO 9001 REGISTERED
Manufactured Under Restek's ISO 9001 Registered Quality System
Certificate #FM80397

CERTIFICATE OF COMPOSITION

FOR LABORATORY USE ONLY - READ MSDS PRIOR TO USE

110 Benner Circle
Bellefonte, PA 16823-8812
Tel: (800) 356-1688
Fax: (814) 353-1309

Catalog No.: 558360 **Lot No.:** A036277

Description: Custom VOA Additions Standard

Expiration Date[1]: October 2006 **Storage:** Freezer

Elution Order	Compound	CAS#	Percent Purity[2]	Concentration[3]	Percent Uncertainty[4]
1	Methyl acetate	79-20-9	99%	2000 ug/mL	+/- 0.1
2	1-Chlorobutane (Butyl chloride)	109-69-3	99%	2000 ug/mL	+/- 0.1
3	Cyclohexane	110-82-7	99%	2000 ug/mL	+/- 0.1
4	Methylcyclohexane	108-87-2	99%	2000 ug/mL	+/- 0.1
5	1-Chlorohexane	544-10-5	99%	2000 ug/mL	+/- 0.1
6	Hexachloroethane	67-72-1	99%	2000 ug/mL	+/- 0.1
	Solvent: P&T Methanol	67-56-1	99%		

Column:
105m x .32mm x 1.8um
Rtx-502.2 (cat.#10921)

Carrier Gas:
helium @ 2.2 ml/min.

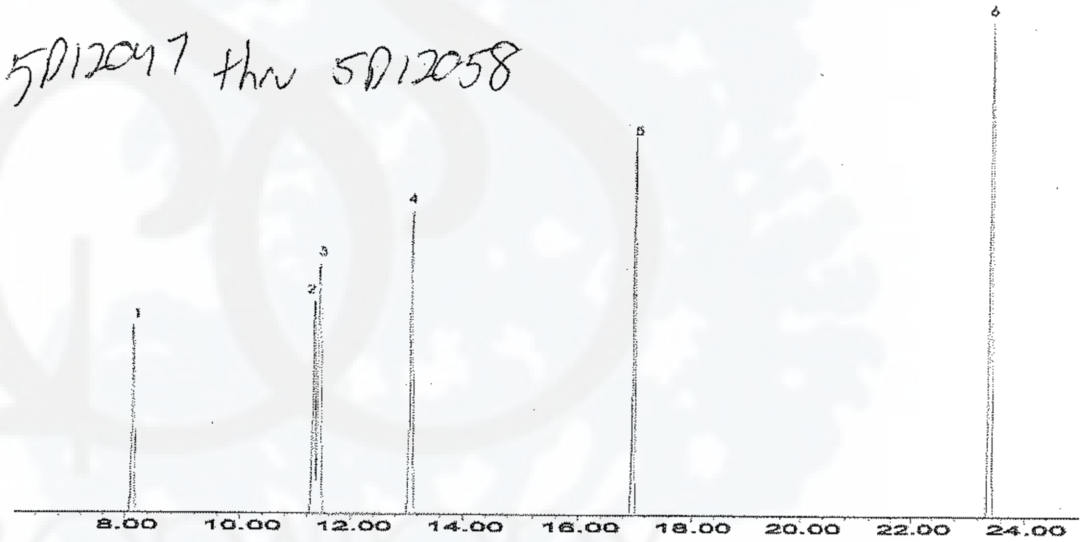
Temp. Program:
40°C (hold 2 min.) to 240°C
@ 8°C/min. (hold 10 min.)

Inj. Temp:
2 [illegible] °C

Det. Temp:
250°C

Det. Type:
MSD

5D12047 thru 5D12058



Manufactured By: JP

John Lidgett
John Lidgett - QA Analyst

---

[1] Expiration date of the unopened ampul stored at recommended temperature.
[2] Purity was determined by one or more of the following techniques: GC/FID, HPLC, GC/ECD, GC/MS. Value rounded to the nearest LOWER whole percentage. In addtion to detectors listed above, chemical identity and purity are confirmed using 1 or more of the following: MS, DSC, solid probe MS, GC/FPD, GC/NPD, GC/TC, FTIR, melting point, reftactive index, and Karl Fisher. See data pack or contact Restek for further details.
[3] Based upon gravimetric preperation with balance calibration verified using NISTtraceable weights (7 mass levels).
[4] Percent Uncertainty based upon balance AND ASTM Class A volumetric glassware accuracy.

ISO 9001 REGISTERED
Manufactured Under Restek's ISO 9001 Registered Quality System Certificate #FM80397

RESTEK

CERTIFICATE OF ANALYSIS

FOR LABORATORY USE ONLY - READ MSDS PRIOR TO USE

110 Benner Circle
Bellefonte, PA 16823-8812
Tel: (800) 356-1688
Fax: (814) 353-1309

Catalog No.: 30475A
Lot No.: A036598
Description: 8260B Calibration Mix #1
Expiration Date[1]: April 2008
Storage: Freezer

SE2068
69
7075

Elution Order	Compound	CAS#	Percent Purity[2]	Concentration[3]	Percent Uncertainty[4]
1	Diethyl ether (ethyl ether)	60-29-7	99%	2000 ug/mL	+/- 0.3
2	1,1,2-Trichlorotrifluoroethane (CFC-113)	76-13-1	99%	2000 ug/mL	+/- 0.3
3	1,1-Dichloroethylene	75-35-4	99%	2000 ug/mL	+/- 0.3
4	Acetonitrile	75-05-8	99%	2000 ug/mL	+/- 0.3
5	Iodomethane (methyl iodide)	74-88-4	99%	2000 ug/mL	+/- 0.3
6	Allyl chloride (3-chloropropene)	107-05-1	99%	2000 ug/mL	+/- 0.3
7	Methylene chloride (dichloromethane)	75-09-2	99%	2000 ug/mL	+/- 0.3
8	Carbon disulfide	75-15-0	99%	2000 ug/mL	+/- 0.3
9	Acrylonitrile	107-13-1	99%	2000 ug/mL	+/- 0.3
10	trans-1,2-Dichloroethylene	156-60-5	99%	2000 ug/mL	+/- 0.3
11	1,1-Dichloroethane	75-34-3	98%	2000 ug/mL	+/- 0.3
12	Chloroprene (2-chloro-1,3-butadiene)	126-99-8	99%	1961 ug/mL	+/- 1.6
13	Propionitrile	107-12-0	99%	2000 ug/mL	+/- 0.3
14	2,2-Dichloropropane	594-20-7	99%	2000 ug/mL	+/- 0.3
15	cis-1,2-Dichloroethylene	156-59-2	98%	2000 ug/mL	+/- 0.3
16	Methacrylonitrile	126-98-7	99%	2000 ug/mL	+/- 0.3
17	Methyl acrylate	96-33-3	99%	2000 ug/mL	+/- 0.3
18	Isobutanol (2-Methyl-1-propanol)	78-83-1	99%	2000 ug/mL	+/- 0.3
19	Chloroform	67-66-3	99%	2000 ug/mL	+/- 0.3
20	Bromochloromethane	74-97-5	99%	2000 ug/mL	+/- 0.3
21	Tetrahydrofuran	109-99-9	99%	2000 ug/mL	+/- 0.3
22	1,1,1-Trichloroethane	71-55-6	99%	2000 ug/mL	+/- 0.3
23	1,1-Dichloropropene	563-58-6	99%	2000 ug/mL	+/- 0.3
24	Carbon tetrachloride	56-23-5	99%	2000 ug/mL	+/- 0.3
25	1,2-Dichloroethane	107-06-2	99%	2000 ug/mL	+/- 0.3
26	Benzene	71-43-2	99%	2000 ug/mL	+/- 0.3
27	2-Chloroethanol (ethylene chlorhydrin)	107-07-3	99%	2000 ug/mL	+/- 0.3
28	Trichloroethylene	79-01-6	99%	2000 ug/mL	+/- 0.3
29	1,2-Dichloropropane	78-87-5	98%	2000 ug/mL	+/- 0.3
30	Methyl methacrylate	80-62-6	99%	2000 ug/mL	+/- 0.3
31	Bromodichloromethane	75-27-4	99%	2000 ug/mL	+/- 0.3
32	1,4-Dioxane	123-91-1	99%	2000 ug/mL	+/- 0.3
33	2-Nitropropane	79-46-9	98%	2000 ug/mL	+/- 0.3
34	Dibromomethane	74-95-3	99%	2000 ug/mL	+/- 0.3
35	cis-1,3-Dichloropropylene	10061-01-5	99%	2000 ug/mL	+/- 0.3
36	Toluene	108-88-3	99%	2000 ug/mL	+/- 0.3
37	Ethyl methacrylate	97-63-2	99%	2000 ug/mL	+/- 0.3
38	trans-1,3-Dichloropropylene	10061-02-6	99%	2000 ug/mL	+/- 0.3
39	1,1,2-Trichloroethane	79-00-5	99%	2000 ug/mL	+/- 0.3
40	1,3-Dichloropropane	142-28-9	99%	2000 ug/mL	+/- 0.3
41	Tetrachloroethylene	127-18-4	99%	2000 ug/mL	+/- 0.3
42	Dibromochloromethane	124-48-1	99%	2000 ug/mL	+/- 0.3
43	1,2-Dibromoethane (EDB)	106-93-4	99%	2000 ug/mL	+/- 0.3
44	Chlorobenzene	108-90-7	99%	2000 ug/mL	+/- 0.3
45	1,1,1,2-Tetrachloroethane	630-20-6	99%	2000 ug/mL	+/- 0.3
46	Ethylbenzene	100-41-4	99%	2000 ug/mL	+/- 0.3
47	m-Xylene	108-38-3	99%	2000 ug/mL	+/- 0.3
48	p-Xylene	106-42-3	99%	2000 ug/mL	+/- 0.3
49	o-Xylene	95-47-6	99%	2000 ug/mL	+/- 0.3
50	Styrene	100-42-5	99%	2000 ug/mL	+/- 0.3
51	Isopropylbenzene (cumene)	98-82-8	99%	2000 ug/mL	+/- 0.3
52	Bromoform	75-25-2	99%	2000 ug/mL	+/- 0.3
53	cis-1,4-Dichloro-2-butene	1476-11-5	97%	2000 ug/mL	+/- 0.3
54	1,1,2,2-Tetrachloroethane	79-34-5	99%	2000 ug/mL	+/- 0.3
55	1,2,3-Trichloropropane	96-18-4	99%	2000 ug/mL	+/- 0.3
56	trans-1,4-dichloro-2-butene	110-57-6	98%	2000 ug/mL	+/- 0.3
57	n-Propylbenzene	103-65-1	99%	2000 ug/mL	+/- 0.3
58	Bromobenzene	108-86-1	99%	2000 ug/mL	+/- 0.3

RESTEK

CERTIFICATE OF ANALYSIS

FOR LABORATORY USE ONLY - READ MSDS PRIOR TO USE

110 Benner Circle
Bellefonte, PA 16823-8812
Tel: (800) 356-1688
Fax: (814) 353-1309

Catalog No.: 30216 **Lot No.:** A035108

Description: Vinyl Acetate Standard

Expiration Date[1]**:** December 2009 **Storage:** Freezer

Elution Order	Compound	CAS#	Percent Purity[2]	Concentration[3]	Percent Uncertainty[4]
1	Vinyl acetate	108-05-4	99%	2000 ug/mL	+/- 0.1
	Solvent: P&T Methanol	67-56-1	99%		

Column:
105m x .53mm x 3.0um
Rtx-502.2 (cat.#10910)

Carrier Gas:
hydrogen @ 40 cm/sec.

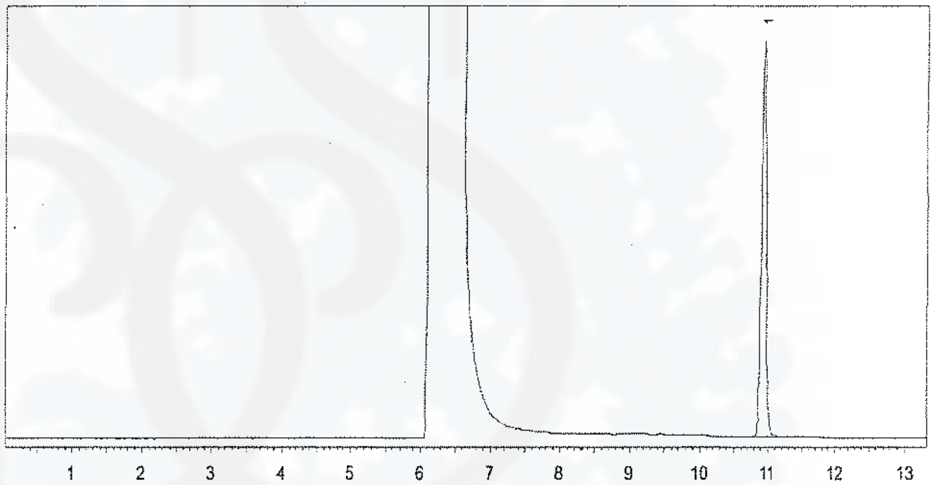
Temp. Program:
40°C (hold 2 min.) to 130°C
@ 8°C/min.

Inj. Temp:
200°C

Det. Temp:
250°C

Det. Type:
FID

5E0071
72
73
74



Manufactured By: MEW

John Lidgett
John Lidgett - QA Analyst

---

1 Expiration date of the unopened ampul stored at recommended temperature.
2 Purity was determined by one or more of the following techniques: GC/FID, HPLC, GC/ECD, GC/MS. Value rounded to the nearest LOWER whole percentage. In addtion to detectors listed above, chemical identity and purity are confirmed using 1 or more of the following: MS, DSC, solid probe MS, GC/FPD, GC/NPD, GC/TC, FTIR, melting point, reftactive index, and Karl Fisher. See data pack or contact Restek for further details.
3 Based upon gravimetric preperation with balance calibration verified using NISTtraceable weights (7 mass levels).
4 Percent Uncertainty based upon balance AND ASTM Class A volumetric glassware accuracy.

ISO 9001 REGISTERED
Manufactured Under Restek's ISO 9001 Registered Quality System Certificate #FM80397

Tech Tip:

Vinyl acetate is a volatile organic ester included in the target lists of several US EPA and other methods. Under acidic conditions, esters react with alcohols to form new esters (transesterification). Methanol-based mixes containing halogenated compounds are slightly acidic, so it is important to minimize exposure of vinyl acetate to mixes of halogenated compounds in methanol. For this reason, we offer vinyl acetate in individual solution, and suggest that it be introduced into the working level calibration solution immediately before use. This will minimize problems and ensure more consistent results.

RESTEK

CERTIFICATE OF ANALYSIS

FOR LABORATORY USE ONLY - READ MSDS PRIOR TO USE

110 Benner Circle
Bellefonte, PA 16823-8812
Tel: (800) 356-1688
Fax: (814) 353-1309

Catalog No.: 30475B **Lot No.:** A031415

Description: 8260B Calibration Mix #2

Expiration Date[1]: January 2008 **Storage:** Freezer

Elution Order	Compound	CAS#	Percent Purity[2]	Concentration (weight/volume)[3]	Percent Uncertainty[4]
1	2-Chloroethyl vinyl ether	110-75-8	99%	2000 ug/mL	+/- 0.04
	Solvent: P&T Methanol	67-56-1	99%		

Column:
105m x .53mm x 3.0um
Rtx-502.2 (cat.#10910)

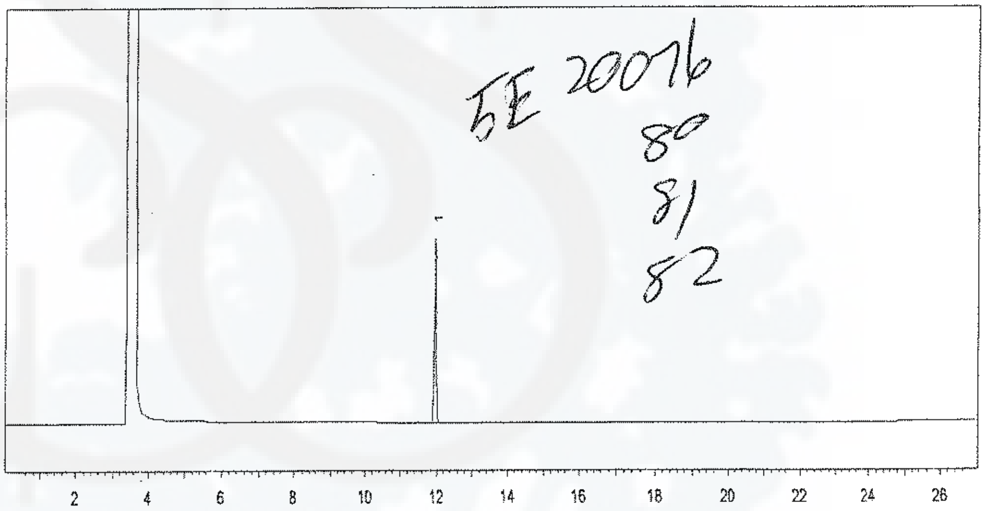
Carrier Gas:
hydrogen @ 40 cm/sec

Temp. Program:
40°C (hold 2 min.) to 240°C
@ 8°C/min.

Inj. Temp:
200°C

et. Temp:
250°C

Det. Type:
FID



5E 20076
80
81
82

Manufactured By: JAM

John Lidgett
John Lidgett - QA Analyst

---

1 Expiration date of the unopened ampul stored at recommended temperature.
2 Purity was determined by one or more of the following techniques: GC/FID, HPLC, GC/ECD, GC/MS. Value rounded to the nearest LOWER whole percentage. In addtion to detectors listed above, chemical identity and purity are confirmed using 1 or more of the following: MS, DSC, solid probe MS, GC/FPD, GC/NPD, GC/TC, FTIR, melting point, reftactive index, and Karl Fisher. See data pack or contact Restek for further details.
3 Based upon gravimetric preperation with balance calibration verified using NISTtraceable weights (7 mass levels).
4 Percent Uncertainty based upon balance AND ASTM Class A volumetric glassware accuracy.

ISO 9001 REGISTERED
Manufactured Under Restek's ISO 9001 Registered Quality System

WASTE

RESTEK

CERTIFICATE OF ANALYSIS

FOR LABORATORY USE ONLY - READ MSDS PRIOR TO USE

110 Benner Circle
Bellefonte, PA 16823-8812
Tel: (800) 356-1688
Fax: (814) 353-1309

Catalog No.: 30465 **Lot No.:** A031618

Description: California Oxygenates Mixture #1

Expiration Date[1]: April 2007 **Storage:** Freezer

lution Order	Compound	CAS#	Percent Purity[2]	Concentration (weight/volume)[3]	Percent Uncertainty[4]
1	tert-Butanol (TBA)	75-65-0	99%	10000 ug/mL	+/- 0.1
2	Methyl-tert-butyl ether (MTBE)	1634-04-4	99%	2000 ug/mL	+/- 0.1
3	Diisopropyl ether (DIPE)	108-20-3	99%	2000 ug/mL	+/- 0.1
4	Ethyl-tert-butyl ether (ETBE)	637-92-3	99%	2000 ug/mL	+/- 0.1
5	tert-Amyl methyl ether (TAME)	994-05-8	99%	2000 ug/mL	+/- 0.1

Solvent: P&T Methanol 67-56-1 99%

Column:
105m x .32mm x 1.8um
Rtx-502.2 (cat.#10921)

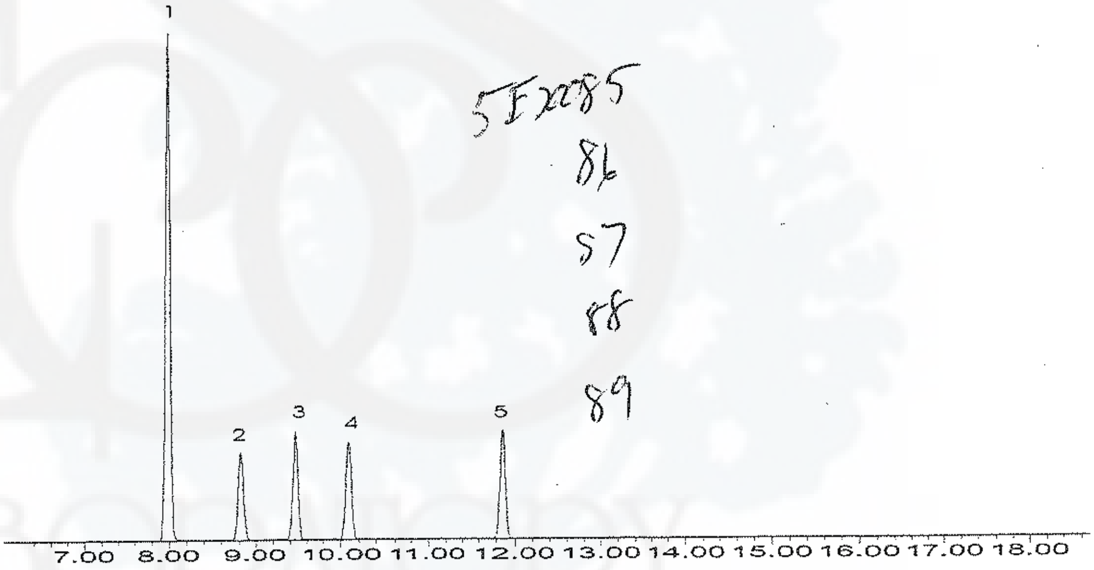
Carrier Gas:
helium @ 2.2 ml/min.

Temp. Program:
40°C (hold 2 min.) to 175°C
@ 8°C/min.

Temp:
200°C

Det. Temp:
250°C

Det. Type:
MSD



5E2285
86
87
88
89

Manufactured By: MEW

John Lidgett
John Lidgett - QA Analyst

ISO 9001 REGISTERED
Manufactured Under Restek's ISO 9001 Registered Quality System

---

1 Expiration date of the unopened ampul stored at recommended temperature.
2 Purity was determined by one or more of the following techniques: GC/FID, HPLC, GC/ECD, GC/MS. Value rounded to the nearest LOWER whole percentage. In addtion to detectors listed above, chemical identity and purity are confirmed using 1 or more of the following: MS, DSC, solid probe MS, GC/FPD, GC/NPD, GC/TC, FTIR, melting point, reftactive index, and Karl Fisher. See data pack or contact Restek for further details.
3 Based upon gravimetric preperation with balance calibration verified using NISTtraceable weights (7 mass levels).
4 Percent Uncertainty based upon balance AND ASTM Class A volumetric glassware accuracy.

RESTEK

CERTIFICATE OF ANALYSIS

FOR LABORATORY USE ONLY - READ MSDS PRIOR TO USE

110 Benner Circle
Bellefonte, PA 16823-8812
Tel: (800) 356-1688
Fax: (814) 353-1309

Catalog No.: 30499
Lot No.: A037729
Description: Acrolein Standard
Expiration Date[1]: October 2005
Storage: Freezer

Elution Order	Compound	CAS#	Percent Purity[2]	Concentration[3]	Percent Uncertainty[4]
1	Acrolein	107-02-8	99%	10000 ug/mL	+/- 0.1
	Solvent: P&T Methanol	67-56-1	99%		

Column:
105m x .53mm x 3.0um
Rtx-502.2 (cat.#10910)

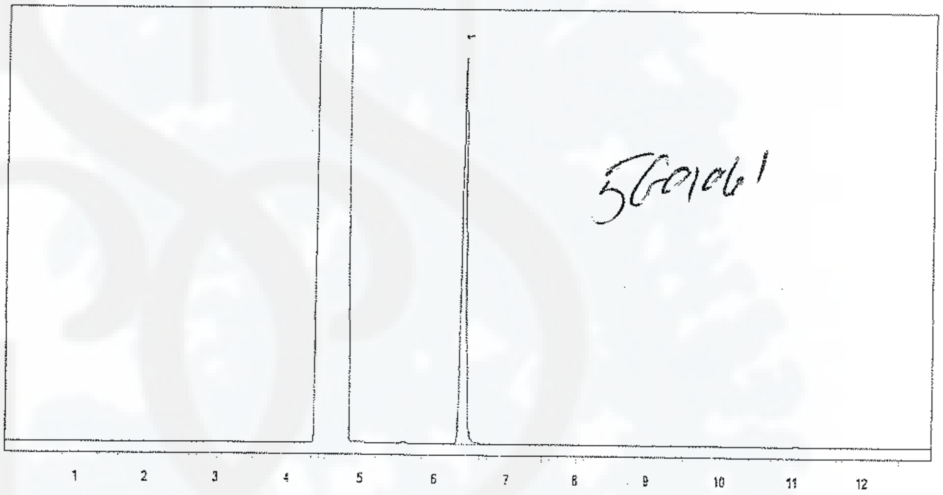
Carrier Gas:
hydrogen @ 40 cm/sec

Temp. Program:
40°C (hold 2 min.) to 200°C
@ 8°C/min.

Inj. Temp:
200°C

Det. Temp:
250°C

Det. Type:
FID



5601061

Manufactured By: n/a

John Lidgett
John Lidgett - QA Analyst

---

1 Expiration date of the unopened ampul stored at recommended temperature.
2 Purity was determined by one or more of the following techniques: GC/FID, HPLC, GC/ECD, GC/MS. Value rounded to the nearest LOWER whole percentage. In addtion to detectors listed above, chemical identity and purity are confirmed using 1 or more of the following: MS, DSC, solid probe MS, GC/FPD, GC/NPD, GC/TC, FTIR, melting point, reftactive index, and Karl Fisher. See data pack or contact Restek for further details.
3 Based upon gravimetric preperation with balance calibration verified using NISTtraceable weights (7 mass levels).
4 Percent Uncertainty based upon balance AND ASTM Class A volumetric glassware accuracy.

ISO 9001 REGISTERED
Manufactured Under Restek's ISO
9001 Registered Quality System
Certificate #FM80397

ULTRA SCIENTIFIC
Analytical Solutions

Certificate of Analysis

Internal Standard Mixture

Product STM-520
Lot Number: CA-2291

Expiration Date: Jan-2008
Page: 1 of 1

This Certified Reference Material (CRM) was manufactured and verified in accordance with ULTRA's ISO 9001:2000 registered quality system, and the analyte concentrations were verified by our ISO 17025 accredited laboratory. The true value and uncertainty value at the 95% confidence level for each analyte, determined gravimetrically, is listed below.

Analyte	CAS#	Analyte Lot	True Value
chlorobenzene-d5	003114-55-4	PR-12098	2509 ± 13 μg/mL
1,4-dichlorobenzene-d4	003855-82-1	16304CA	2503 ± 13 μg/mL
fluorobenzene	000462-06-6	CS10731MG	2507 ± 13 μg/mL

Matrix: methanol (methyl alcohol)

5H01052
53
54
55
56
57
58
59

Balances used in the manufacture of this standard are calibrated with weights traceable to NIST in compliance with ANSI/NCSL Z-540-1 and ISO 9001.

Quality System
Quality Endorsed Company
ISO 9001
SAI Global
Registered

ACCREDITED
ISO 17025
Cert. No. 0851- 01

250 Smith Street, North Kingstown, RI 02852 USA
401-294-9400 Fax: 401-295-2330
www.ultrasci.com

Edward Fitzgerald
Dr. Edward Fitzgerald,
Senior Scientist

ULTRA SCIENTIFIC
Analytical Solutions

Certificate of Analysis

Method 8260 Surrogate Standard Mixture

Product	STM-530	**Expiration Date:**	Jul-2008
Lot Number:	CB-1395	**Page:**	1 of 1

This Certified Reference Material (CRM) was manufactured and verified in accordance with ULTRA's ISO 9001:2000 registered quality system, and the analyte concentrations were verified by our ISO 17025 accredited laboratory. The true value and uncertainty value at the 95% confidence level for each analyte, determined gravimetrically, is listed below.

Analyte	CAS#	Analyte Lot	True Value
4-bromofluorobenzene	000460-00-4	11203KS	2503 ± 13 μg/mL
dibromofluoromethane	001868-53-7	90004843	2506 ± 13 μg/mL
1,2-dichloroethane-d4	017060-07-0	PSO2F-623	2508 ± 13 μg/mL
toluene-d8	002037-26-5	PSOAG-433	2506 ± 13 μg/mL

Matrix: methanol (methyl alcohol)

5H01061
62
63
64
65
66
67
68

Balances used in the manufacture of this standard are calibrated with weights traceable to NIST in compliance with ANSI/NCSL Z-540-1 and ISO 9001.

Quality Endorsed Company
ISO 9001
SAI Global
Registered

ACCREDITED
ISO 17025
Cert. No. 0851- 01

250 Smith Street, North Kingstown, RI 02852 USA
401-294-9400 Fax: 401-295-2330
www.ultrasci.com

Edward Fitzgerald
Dr. Edward Fitzgerald,
Senior Scientist

ULTRA SCIENTIFIC
Analytical Solutions

Certificate of Analysis

Custom Standard

Product Number:	CUS-6492	**Expiration Date:**	Apr-2007
Lot Number:	CB-0748	**Page:**	1 of 1

This Certified Reference Material (CRM) was manufactured and verified in accordance with ULTRA's ISO 9001:2000 registered quality system. The true value and uncertainty value at the 95% confidence level for each analyte, determined gravimetrically, is listed below.

Analyte	CAS#	Analyte Lot	True Value
diisopropyl ether	000108-20-3	02151KQ	2005 ± 10 µg/mL
ethyl tert-butyl ether	000637-92-3	MN-17917	2006 ± 10 µg/mL
TAME	000994-05-8	JN-12512EN	2005 ± 10 µg/mL
1-chlorohexane	000544-10-5	232-8B	2008 ± 10 µg/mL
cyclohexane	000110-82-7	380707	2005 ± 10 µg/mL
methyl acetate	000079-20-9	I-136A	2004 ± 10 µg/mL
methylcyclohexane	000108-87-2	DR-00844CR	2005 ± 10 µg/mL
1,1,2-trichlorotrifluoroethane	000076-13-1	KN-09246KN	2005 ± 10 µg/mL

Matrix: methanol (methyl alcohol)

5D05060
61
62
63
64
65
66 67

Balances used in the manufacture of this standard are calibrated with weights traceable to NIST in compliance with ANSI/NCSL Z-540-1 and ISO 9001.

Quality System
Quality Endorsed Company
ISO 9001
SAI Global
Registered

A2LA ACCREDITED
ISO 17025
Cert. No. 0851-01

250 Smith Street, North Kingstown, RI 02852 USA
401-294-9400 Fax: 401-295-2330
www.ultrasci.com

Edward Fitzgerald
Dr. Edward Fitzgerald,
Senior Scientist

ULTRA SCIENTIFIC
Analytical Solutions

Certificate of Analysis

VOC Mixture

Product Number: DWM-592
Lot Number: W-0239

Expiration Date: May-2007
Page: 1 of 2

This Certified Reference Material (CRM) was manufactured and verified in accordance with ULTRA's ISO 9001:2000 registered quality system, and the analyte concentrations were verified by our ISO 17025 accredited laboratory. The true value and uncertainty value at the 95% confidence level for each analyte, determined gravimetrically, is listed below.

5E0090
91
92
93

Analyte	CAS#	Analyte Lot	True Value
acetone	000067-64-1	43034	2008 ± 10 µg/mL
acrylonitrile	000107-13-1	HI11505EI	2009 ± 10 µg/mL
allyl chloride	000107-05-1	MC070777	2009 ± 10 µg/mL
2-butanone	000078-93-3	CA-02161PO	2010 ± 10 µg/mL
carbon disulfide	000075-15-0	AI12076LU	2008 ± 10 µg/mL
chloroacetonitrile	000107-14-2	CF01026AF	2005 ± 10 µg/mL
1-chlorobutane	000109-69-3	07247HF	2007 ± 10 µg/mL
trans-1,4-dichloro-2-butene	000110-57-6	JN01422DG	2008 ± 10 µg/mL
1,1-dichloro-2-propanone	000513-88-2	LY02111DL	2007 ± 10 µg/mL
diethyl ether	000060-29-7	MA01256EA	2008 ± 10 µg/mL
ethyl methacrylate	000097-63-2	AO09819AS	2008 ± 10 µg/mL
hexachloroethane	000067-72-1	DN06203HF	2005 ± 10 µg/mL
2-hexanone	000591-78-6	AI11228KS	2009 ± 10 µg/mL
methacrylonitrile	000126-98-7	LT00427ET	2009 ± 10 µg/mL
methyl acrylate	000096-33-3	HF01125BF	2008 ± 10 µg/mL
methyl iodide	000074-88-4	KA20329DA	2008 ± 10 µg/mL
methyl methacrylate	000080-62-6	HN03906DN	2007 ± 10 µg/mL
4-methyl-2-pentanone	000108-10-1	05756LQ	2007 ± 10 µg/mL
tert-butylmethyl ether	001634-04-4	36032	2009 ± 10 µg/mL
nitrobenzene	000098-95-3	HK2925LK	2008 ± 10 µg/mL
2-nitropropane	000079-46-9	BZ01727PY	2004 ± 10 µg/mL

Balances used in the manufacture of this standard are calibrated with weights traceable to NIST in compliance with ANSI/NCSL Z-540-1 and ISO 9001.

Quality System
Quality Endorsed Company
ISO 9001
SAI Global
Registered

ACCREDITED
ISO 17025
Cert. No. 0851- 01

250 Smith Street, North Kingstown, RI 02852 USA
401-294-9400 Fax: 401-295-2330
www.ultrasci.com

Edward Fitzgerald
Dr. Edward Fitzgerald,
Senior Scientist

ULTRA SCIENTIFIC
Analytical Solutions

Certificate of Analysis

VOC Mixture

Product Number:	DWM-592	**Expiration Date:**	May-2007
Lot Number:	W-0239	**Page:**	2 of 2

Analyte	CAS#	Analyte Lot	True Value
pentachloroethane	000076-01-7	232-36B	2007 ± 10 µg/mL
propionitrile	000107-12-0	BI18125KS	2008 ± 10 µg/mL
tetrahydrofuran	000109-99-9	EN02837AN	2008 ± 10 µg/mL

Matrix: methanol (methyl alcohol)

Balances used in the manufacture of this standard are calibrated with weights traceable to NIST in compliance with ANSI/NCSL Z-540-1 and ISO 9001.

Quality System
Quality Endorsed Company
ISO 9001
SAI Global
Registered

A2LA ACCREDITED
ISO 17025
Cert. No. 0851- 01

250 Smith Street, North Kingstown, RI 02852 USA
401-294-9400 Fax: 401-295-2330
www.ultrasci.com

Dr. Edward Fitzgerald,
Senior Scientist

ULTRA SCIENTIFIC
Analytical Solutions

Certificate of Analysis

VOC Mixture

Product Number: DWM-588
Lot Number: CB-0526

Expiration Date: Apr-2008
Page: 1 of 3

This Certified Reference Material (CRM) was manufactured and verified in accordance with ULTRA's ISO 9001:2000 registered quality system, and the analyte concentrations were verified by our ISO 17025 accredited laboratory. The true value and uncertainty value at the 95% confidence level for each analyte, determined gravimetrically, is listed below.

Analyte		CAS#	Analyte Lot	True Value
bromochloromethane		000074-97-5	JS-16015HS	2006 ± 10 µg/mL
bromodichloromethane	5E20094	000075-27-4	DU-14522LS	2006 ± 10 µg/mL
bromoform	95	000075-25-2	DU-06126KS	2004 ± 10 µg/mL
carbon tetrachloride	96	000056-23-5	01704MF	2006 ± 10 µg/mL
chloroform		000067-66-3	BS-03041BS	2005 ± 10 µg/mL
dibromochloromethane	97	000124-48-1	DO-12622CI	2006 ± 10 µg/mL
dibromomethane		000074-95-3	EM-01514TJ	2005 ± 10 µg/mL
methylene chloride		000075-09-2	43041	2006 ± 10 µg/mL
trichlorofluoromethane		000075-69-4	DR-16417BR	2007 ± 10 µg/mL
1,2-dibromoethane		000106-93-4	TB-101777	2006 ± 10 µg/mL
1,1-dichloroethane		000075-34-3	64552/1	2005 ± 10 µg/mL
1,2-dichloroethane		000107-06-2	KN-09446KN	2006 ± 10 µg/mL
1,1-dichloroethene		000075-35-4	CA-02207CA	2005 ± 10 µg/mL
cis-1,2-dichloroethene		000156-59-2	13707BO	2006 ± 10 µg/mL
trans-1,2-dichloroethene		000156-60-5	DO-07817JR	2006 ± 10 µg/mL
1,1,1,2-tetrachloroethane		000630-20-6	CO-12312LI	2005 ± 10 µg/mL
1,1,2,2-tetrachloroethane		000079-34-5	10917TB	2006 ± 10 µg/mL
tetrachloroethene		000127-18-4	PS-00344BR	2006 ± 10 µg/mL
1,1,1-trichloroethane		000071-55-6	LU-13149TR	2006 ± 10 µg/mL
1,1,2-trichloroethane		000079-00-5	JB-0701HH	2006 ± 10 µg/mL
trichloroethene		000079-01-6	KN-08846KN	2005 ± 10 µg/mL

Balances used in the manufacture of this standard are calibrated with weights traceable to NIST in compliance with ANSI/NCSL Z-540-1 and ISO 9001.

Quality System
Quality Endorsed Company
ISO 9001
SAI Global
Registered

ACCREDITED
ISO 17025
Cert. No. 0851- 01

Edward Fitzgerald
Dr. Edward Fitzgerald,
Senior Scientist

ULTRA SCIENTIFIC
Analytical Solutions

Certificate of Analysis

VOC Mixture

Product Number: DWM-588
Lot Number: CB-0526

Expiration Date: Apr-2008
Page: 2 of 3

Analyte	CAS#	Analyte Lot	True Value
1,2-dibromo-3-chloropropane	000096-12-8	OGF-01	2006 ± 10 µg/mL
1,2-dichloropropane	000078-87-5	DC-120777	2005 ± 10 µg/mL
1,3-dichloropropane	000142-28-9	PR-17916MR	2006 ± 10 µg/mL
2,2-dichloropropane	000594-20-7	CI-05304BI	2006 ± 10 µg/mL
1,1-dichloropropene	000563-58-6	34768-21	2006 ± 10 µg/mL
cis-1,3-dichloropropene	010061-01-5	35072-03	2007 ± 10 µg/mL
trans-1,3-dichloropropene	010061-02-6	34257-41	2005 ± 10 µg/mL
hexachlorobutadiene	000087-68-3	PB-082017	2006 ± 10 µg/mL
1,2,3-trichloropropane	000096-18-4	EY-01328EY	2006 ± 10 µg/mL
naphthalene	000091-20-3	N960012	2006 ± 10 µg/mL
benzene	000071-43-2	31072	2005 ± 10 µg/mL
n-butylbenzene	000104-51-8	AA-28519CO	2006 ± 10 µg/mL
sec-butylbenzene	000135-98-8	MR-11305DN	2006 ± 10 µg/mL
tert-butylbenzene	000098-06-6	MQ-04010MQ	2005 ± 10 µg/mL
ethylbenzene	000100-41-4	033067	2006 ± 10 µg/mL
isopropylbenzene	000098-82-8	EN-00621TG	2006 ± 10 µg/mL
4-isopropyltoluene	000099-87-6	PP-05104CP	2006 ± 10 µg/mL
n-propylbenzene	000103-65-1	LO-14503MR	2005 ± 10 µg/mL
styrene	000100-42-5	MQ-11228MQ	2005 ± 10 µg/mL
toluene	000108-88-3	34117	2006 ± 10 µg/mL
1,2,4-trimethylbenzene	000095-63-6	BO-13528BI	2006 ± 10 µg/mL
1,3,5-trimethylbenzene	000108-67-8	KM-02011HM	2005 ± 10 µg/mL
o-xylene	000095-47-6	DO-06834CO	2006 ± 10 µg/mL
m-xylene	000108-38-3	DI-00459CI	2005 ± 10 µg/mL

Balances used in the manufacture of this standard are calibrated with weights traceable to NIST in compliance with ANSI/NCSL Z-540-1 and ISO 9001.

Quality System
Quality
Endorsed
Company
ISO 9001
SAI Global
Registered

ACCREDITED
ISO 17025
Cert. No. 0851- 01

Edward Fitzgerald
Dr. Edward Fitzgerald,
Senior Scientist

ULTRA SCIENTIFIC
Analytical Solutions

Certificate of Analysis

VOC Mixture

Product Number: DWM-588
Lot Number: CB-0526

Expiration Date: Apr-2008
Page: 3 of 3

Analyte	CAS#	Analyte Lot	True Value
p-xylene	000106-42-3	03747LN	2005 ± 10 µg/mL
1,4-dichlorobenzene	000106-46-7	06205KA	2004 ± 10 µg/mL
bromobenzene	000108-86-1	CG-02513MF	2006 ± 10 µg/mL
chlorobenzene	000108-90-7	63148HZ	2006 ± 10 µg/mL
2-chlorotoluene	000095-49-8	KS-06506BN	2006 ± 10 µg/mL
4-chlorotoluene	000106-43-4	CR-14512LQ	2005 ± 10 µg/mL
1,2-dichlorobenzene	000095-50-1	08946KY	2005 ± 10 µg/mL
1,3-dichlorobenzene	000541-73-1	JN-05902LZ	2006 ± 10 µg/mL
1,2,3-trichlorobenzene	000087-61-6	LI-12912PF	2005 ± 10 µg/mL
1,2,4-trichlorobenzene	000120-82-1	00334TQ	2006 ± 10 µg/mL
bromomethane	000074-83-9	06623AQ	2008 ± 10 µg/mL
chloroethane	000075-00-3	00223KG	2008 ± 10 µg/mL
chloromethane	000074-87-3	07-44048	2008 ± 10 µg/mL
dichlorodifluoromethane	000075-71-8	N960053	2008 ± 10 µg/mL
vinyl chloride	000075-01-4	UN-1086	2009 ± 10 µg/mL

Matrix: methanol (methyl alcohol)

Balances used in the manufacture of this standard are calibrated with weights traceable to NIST in compliance with ANSI/NCSL Z-540-1 and ISO 9001.

Quality System
Quality Endorsed Company
ISO 9001
SAI Global
Registered

ACCREDITED
ISO 17025
Cert. No. 0851- 01

Edward Fitzgerald
Dr. Edward Fitzgerald,
Senior Scientist

AccuStandard Inc.
125 Market Street
New Haven, CT 06513
USA

Ph: 203-786-5290
Fax: 203-786-5287
E-mail: usa@accustandard.com
www.accustandard.com

ISO 9001

CERTIFICATE OF ANALYSIS

CATALOG NO. M-601C-10X
DESCRIPTION: 2-Chloroethylvinyl ether
LOT: B4100153
SOLVENT: MeOH

EXPIRATION: Oct 20, 2007

The uncertainty in the preparation of this standard is <5% if the concentration is less than or equal to 200μg/mL. For concentrations greater than 200μg/mL the uncertainty is <2%.

Component	CAS #	Purity % (GC/MS)	Gravimetric Concentration[1] (μg/mL)	Analyte Concentration[2] (μg/mL)
2-Chloroethylvinyl ether	110-75-8	99.7	2000	1994

5E20098
99
100
101

Please note: AccuStandard follows the U.S. conventions in reporting numerical values, on both certificates and labels.

A comma (,) is used to separate units of one-thousand or greater.
A period (.) is used as a decimal place marker.

1. All weights are traceable through National Institute of Standards & Technology, Test No. 822/254480
2. Analyte Concentration = Purity x Gravimetric Concentration
3. A product with a suffix (-1A, -2B, etc.) on its lot# has had its expiration date extended and is <u>identical</u> to the same lot# without the suffix.

Certified by: R. Cooper

This product was manufactured to meet the quality system requirements of ISO 9001

AccuStandard Inc.
125 Market Street
New Haven, CT 06513
USA

Ph: 203-786-5290
Fax: 203-786-5287
E-mail: usa@accustandard.com
www.accustandard.com

CERTIFICATE OF ANALYSIS

CATALOG NO. APP-9-007-10X

DESCRIPTION: Acrolein

LOT: B5060041

SOLVENT: MeOH

EXPIRATION: Oct 5, 2005

The uncertainty in the preparation of this standard is <5% if the concentration is less than or equal to 200μg/mL. For concentrations greater than 200μg/mL the uncertainty is <2%.

Component	CAS #	Purity % MFG	Gravimetric Concentration[1] (μg/mL)	Analyte Concentration[2] (μg/mL)
Acrolein	107-02-8	90.0	1112*	1001

560638
39

* Weight compensated to 100% purity

Please note: AccuStandard follows the U.S. conventions in reporting numerical values, on both certificates and labels.

A comma (,) is used to separate units of one-thousand or greater.
A period (.) is used as a decimal place marker.

1. All weights are traceable through National Institute of Standards & Technology, Test No. 822/254480
2. Analyte Concentration = Purity x Gravimetric Concentration
3. A product with a suffix (-1A, -2B, etc.) on its lot# has had its expiration date extended and is <u>identical</u> to the same lot# without the suffix.

Certified by: R. Cooper

This product was manufactured to meet the quality system requirements of ISO 9001

AccuStandard Inc.
125 Market Street
New Haven, CT 06513
USA

Ph: 203-786-5290
Fax: 203-786-5287
E-mail: usa@accustandard.com
www.accustandard.com

ISO 9001

CERTIFICATE OF ANALYSIS

CATALOG NO. APP-9-211-20X

DESCRIPTION: Vinyl acetate

LOT: B5020138-1A

SOLVENT: MeOH

EXPIRATION: Nov 20, 2005

The uncertainty in the preparation of this standard is <5% if the concentration is less than or equal to 200μg/mL. For concentrations greater than 200μg/mL the uncertainty is <2%.

Component	CAS #	Purity % (GC/FID)	Gravimetric Concentration[1] (μg/mL)	Analyte Concentration[2] (μg/mL)
Vinyl acetate	108-05-4	99.9	2001	1999

56-06040
41

1. All weights are traceable through National Institute of Standards & Technology, Test No. 822/254480
2. Analyte Concentration = Purity x Gravimetric Concentration
3. A product with a suffix (-1A, -2B, etc.) on its lot# has had its expiration date extended and is <u>identical</u> to the same lot# without the suffix.

Please note: AccuStandard follows the U.S. conventions in reporting numerical values, on both certificates and labels.

A comma (,) is used to separate units of one-thousand or greater.
A period (.) is used as a decimal place marker.

Certified by: R. Cooper

This product was manufactured to meet the quality system requirements of ISO 9001

ULTRA SCIENTIFIC
Analytical Solutions

Certificate of Analysis

1,4-Dioxane

Product Number:	RCC-180	**Expiration Date:**	Jan-2008
Lot Number:	NT02237	**Page:**	1 of 1

This reference material has been analyzed by high resolution gas chromatography or high performance liquid chromatography, and found to meet the specifications stated below. The uncertainty of the purity measurement is ± 0.5%.

Compound	CAS #	Purity
1,4-dioxane	000123-91-1	99%

Storage: May be stored at room temperature

5G11079

Quality System
Quality Endorsed Company
ISO 9001
SAI Global
Registered

A2LA ACCREDITED
ISO 17025
Cert. No. 0851- 01

Edward Fitzgerald
Dr. Edward Fitzgerald,
Senior Scientist

Certificate of Analysis

CRIPTION: 1,4-Dioxane

MFG. DATE: Nov 2004

CATALOG NO.: 442251 (1)
LOT NO.: LB25729

EXP. DATE: Nov 2007

CAS NUMBER: 123-91-1

MOLECULAR FORMULA: $C_4H_8O_2$
MOLECULAR WEIGHT: 88.1

PHYSICAL PROPERTIES	ASSAY	
FTIR	Matches: SEA 207	Lib. No.: 1563
GC - Mass Spec	Matches: NIST	Lib. No.: 62899
Purity (2)	99.9%	
Refractive index	1.4213 @ 20.0 deg C	

5C04061

(1) This product is packaged from R472225 Lot number LB11219.
(2) Determined by GC-FID unless otherwise noted.

Elwood Doughty
Quality Control Supervisor

SUPELCO
595 North Harrison Road
Bellefonte, PA 16823-0048 USA
Phone (814) 359-3441

```
                     TOPLEVEL PARAMETERS
                     -------------------

Method Information For: C:\HPCHEM\1\METHODS\AQ080505.M

Method Sections To Run:

  ( ) Save Copy of Method With Data
  ( ) Pre-Run Cmd/Macro  =
  (X) Data Acquisition
  (X) Data Analysis
  ( ) Post-Run Cmd/Macro =

Method Comments:
  Method 8260


                     END OF TOPLEVEL PARAMETERS
                     --------------------------



                     INSTRUMENT CONTROL PARAMETERS
                     -----------------------------


Sample Inlet:        GC
Injection Source:    Manual
Injection Location:  Rear
Mass Spectrometer:   Enabled

                HP5890 Temperature Parameters

Zone Temperatures:   State      Setpoint
     Inlet A:         Off         50 C
     Inlet B:          On        200 C
     Detector A:      Off         50 C
     Detector B:       On        280 C
     Auxiliary:       Off         50 C

Oven Parameters:
     Oven Equib Time:           0.20 minutes
     Oven Max:                   260 C
     Oven State:                  On
     Cryo State:                 Off
     Cryo Blast:                 Off
     Ambient:                     25 C

Oven Program:
     Initial Temperature:         40 C
     Initial Time:              4.00 minutes

              Rate            Final             Final
     Level   (C/minute)    Temperature (C)   Time (minutes)
      1          8.0           150               2.00
      2(A)      35.0           220               4.25
      3(B)       0.0             0               0.00
     Next Run Time:           26.00 minutes


                HP5890 Inlet Pressure Programs

GC Pressure Units:  psi
```

MS-3

```
Inlet A:
     Constant Flow:                  Off
     Constant Flow Pressure:         0.0 psi
     Constant Flow Temperature:       50 C
     Initial Pressure:               0.0 psi
     Initial Time:                650.00 minutes

                  Rate             Final            Final
     Level    (psi/minute)   Pressure (psi)   Time (minutes)
      1           0.00             0.0             0.00
      2(A)        0.00             0.0             0.00
      3(B)        0.00             0.0             0.00
     Total Program Time:      650.00 minutes

     Column Length:             30.00 m
     Column Diameter:           0.530 mm
     Gas:                          He
     Vacuum Compensation:         Off

Inlet B:
     Constant Flow:                 On
     Constant Flow Pressure:     19.4 psi
     Constant Flow Temperature:    40 C
     Initial Pressure:            0.0 psi
     Initial Time:             650.00 minutes

                  Rate             Final            Final
     Level    (psi/minute)   Pressure (psi)   Time (minutes)
      1           0.00             0.0             0.00
      2(A)        0.00             0.0             0.00
      3(B)        0.00             0.0             0.00
     Total Program Time:      650.00 minutes

     Column Length:             60.00 m
     Column Diameter:           0.250 mm
     Gas:                          He
     Vacuum Compensation:         Off


                      HP5890 Inlet Split Flow Control

Channel C:
     Carrier gas supply for channel C is not linked to a split vent.

Channel D:
     Carrier gas supply for channel D is not linked to a split vent.

Channel E:
     Carrier gas supply for channel E is not linked to a split vent.

Channel F:
     Carrier gas supply for channel F is not linked to a split vent.


                     HP5890 Packed Column Flow Control

Inlet A not used to control packed column flow.

Inlet B not used to control packed column flow.


                     HP5890 Auxiliary Pressure Programs

Channel C:
     Comment:
```

```
     Pressure Program:
          Initial Pressure:            0.0 psi
          Initial Time:             650.00 minutes

                        Rate         Final          Final
          Level    (psi/minute)  Pressure (psi)  Time (minutes)
           1            0.00          0.0            0.00
           2(A)         0.00          0.0            0.00
           3(B)         0.00          0.0            0.00
          Total Program Time:       650.00 minutes

     Make-up Gas Compensation:  None

Channel D:
     Comment:

     Pressure Program:
          Initial Pressure:            0.0 psi
          Initial Time:             650.00 minutes

                        Rate         Final          Final
          Level    (psi/minute)  Pressure (psi)  Time (minutes)
           1            0.00          0.0            0.00
           2(A)         0.00          0.0            0.00
           3(B)         0.00          0.0            0.00
          Total Program Time:       650.00 minutes

     Make-up Gas Compensation:  None

Channel E:
     Comment:

     Pressure Program:
          Initial Pressure:            0.0 psi
          Initial Time:             650.00 minutes

                        Rate         Final          Final
          Level    (psi/minute)  Pressure (psi)  Time (minutes)
           1            0.00          0.0            0.00
           2(A)         0.00          0.0            0.00
           3(B)         0.00          0.0            0.00
          Total Program Time:       650.00 minutes

     Make-up Gas Compensation:  None

Channel F:
     Comment:

     Pressure Program:
          Initial Pressure:            0.0 psi
          Initial Time:             650.00 minutes

                        Rate         Final          Final
          Level    (psi/minute)  Pressure (psi)  Time (minutes)
           1            0.00          0.0            0.00
           2(A)         0.00          0.0            0.00
           3(B)         0.00          0.0            0.00
          Total Program Time:       650.00 minutes

     Make-up Gas Compensation:  None


                         HP5890 Purge Valve Settings

Inlet Purge    Init Value    On Time    Off Time    Splitless Injection
     A            Off          0.00       0.00              No
     B            On           0.00       0.00              No
```

```
                        HP5890 Valve and Relay Information

Initial Setpoints:
     5890 Valves:
          Valve 1: Off     Valve 2: Off     Valve 3: Off     Valve 4:  On
     19405 Valves:
          Valve 5: Off     Valve 6: Off     Valve 7: Off     Valve 8: Off
     19405 Relays:
          Relay 1: Off     Relay 2: Off     Relay 3: Off     Relay 4: Off


                           HP5890 Detector Information

Detector  Type   State
   A       ---    Off
   B       ---    Off


                            HP5890 Signal Information

Not saving signal data.

Signal    Source            Peak Width   Data Rate   Start Data   Stop Data
  1       Testplot            0.053        5.000        0.00        1.00
  2       Testplot            0.053        5.000        0.00        1.00

                                 MS ACQUISITION PARAMETERS


General Information
------- -----------

Tune File                  : BFB.U
Acquistion Mode            : Scan


MS Information
-- -----------

Solvent Delay              : 3.70 min

EM Absolute                : True
Resulting EM Voltage       : 1941.2

[Scan Parameters]

Low Mass                   : 35
High Mass                  : 260
Threshold                  : 800
Sample #                   : 4       A/D Samples    16
Plot 2 low mass            : 50
Plot 2 high mass           : 550


                              END OF MS ACQUISITION PARAMETERS


                            END OF INSTRUMENT CONTROL PARAMETERS
                            ------------------------------------
```

DATA ANALYSIS PARAMETERS

```
Method Name: C:\HPCHEM\1\METHODS\AQ080505.M


Percent Report Settings
-----------------------

Sort By: Signal

Output Destination
    Screen:  No
    Printer: Yes
    File:    No

Integration Events: Meth Default

Generate Report During Run Method:  No

Signal Correlation Window: 0.020


Qualitative Report Settings
---------------------------

Peak Location of Unknown: Apex

Library to Search      Minimum Quality
c:\database\nbs75k.l     0

Integration Events: Meth Default

Report Type: Summary

Output Destination
    Screen:  No
    Printer: Yes
    File:    No

Generate Report During Run Method:  No


Quantitative Report Settings
----------------------------

Report Type: Summary

Output Destination
    Screen:  No
    Printer: No
    File:    No

Generate Report During Run Method:  Yes


ELEMENT ID: 0508010
Calibration Last Updated: Tue Aug 30 15:15:34 2005


Reference Window: 10.00 Percent
Non-Reference Window: 5.00 Percent
```

```
Correlation Window: 0.02 minutes
Default Multiplier: 1.00
Default Sample Concentration: 0.00

Compound Information
--------------------

-----------------------------------------------------------------------------
 1)  Fluorobenzene                                     (ISTD)

Ret. Time  12.61 min., Extract & Integrate from  12.11 to  13.11 min.

Signal         Rel Resp.   Pct. Unc.(abs)    Integration
Tgt   96.00                                  *** METH DEFAULT ***
Q1    70.00     16.80       30.0             *** METH DEFAULT ***

Lvl ID   Conc (ug/l)  Response
25          25.000      1793239
10          25.000      1801571
5           25.000      1838338
1           25.000      1704091
50          25.000      1818145
100         25.000      1899842
0.5         25.000      1716216

Qualifier Peak Analysis ON    ISTD conc:       25.000 ug/l
Curve Fit: Avg. RF
-----------------------------------------------------------------------------

 2)  Dichlorodifluoromethane                           ( )

Ret. Time   4.15 min., Extract & Integrate from   3.65 to   4.65 min.

Signal         Rel Resp.   Pct. Unc.(abs)    Integration
Tgt   85.00                                  *** METH DEFAULT ***
Q1    87.00     33.20       30.0             *** METH DEFAULT ***

Lvl ID   Conc (ug/l)  Response
25          25.000       416355
10          10.000       172274
5            5.000        90302
1            1.000        18792
50          50.000       836422
100        100.000      1823963
0.5      not used for this compound

Qualifier Peak Analysis ON
Curve Fit: Avg. RF
-----------------------------------------------------------------------------

 3)  Chloromethane                                     ( )

Ret. Time   4.46 min., Extract & Integrate from   3.96 to   4.96 min.

Signal         Rel Resp.   Pct. Unc.(abs)    Integration
Tgt   50.00                                  *** METH DEFAULT ***
Q1    52.00     33.10       30.0             *** METH DEFAULT ***

Lvl ID   Conc (ug/l)  Response
25          25.000       597482
10          10.000       266628
5            5.000       137597
1            1.000        30884
50          50.000      1203850
100        100.000      2480172
0.5      not used for this compound

Qualifier Peak Analysis ON
Curve Fit: Avg. RF
```

```
-------------------------------------------------------------------------------

 4)  Vinyl Chloride                                   ( )

Ret. Time   4.79 min., Extract & Integrate from   4.29 to   5.29 min.

Signal        Rel Resp.   Pct. Unc.(abs)     Integration
Tgt   62.00                                  *** METH DEFAULT ***
Q1    64.00      38.10       30.0            *** METH DEFAULT ***

Lvl ID   Conc (ug/l)  Response
25         25.000       437518
10         10.000       192044
5           5.000       101731
1           1.000        19224
50         50.000       882458
100       100.000      1837800
0.5      not used for this compound

Qualifier Peak Analysis ON
Curve Fit: Avg. RF
-------------------------------------------------------------------------------

 5)  Bromomethane                                     ( )

Ret. Time   5.47 min., Extract & Integrate from   4.97 to   5.97 min.

Signal        Rel Resp.   Pct. Unc.(abs)     Integration
Tgt   94.00                                  *** METH DEFAULT ***
Q1    96.00      95.80       30.0            *** METH DEFAULT ***

Lvl ID   Conc (ug/l)  Response
25         25.000       301032
10         10.000       135055
5           5.000        77283
1           1.000        18213
50         50.000       649844
100       100.000      1436601
0.5      not used for this compound

Qualifier Peak Analysis ON
Curve Fit: Linear
-------------------------------------------------------------------------------

 6)  Chloroethane                                     ( )

Ret. Time   5.72 min., Extract & Integrate from   5.22 to   6.22 min.

Signal        Rel Resp.   Pct. Unc.(abs)     Integration
Tgt   64.00                                  *** METH DEFAULT ***
Q1    66.00      32.00       30.0            *** METH DEFAULT ***
Q2    49.00      32.40       30.0            *** METH DEFAULT ***

Lvl ID   Conc (ug/l)  Response
25         25.000       256692
10         10.000       112808
5           5.000        57979
1           1.000        16574
50         50.000       495501
100       100.000      1066476
0.5      not used for this compound

Qualifier Peak Analysis ON
Curve Fit: Linear
-------------------------------------------------------------------------------

 7)  Trichlorofluoromethane                           ( )

Ret. Time   6.68 min., Extract & Integrate from   6.18 to   7.18 min.
```

```
Signal        Rel Resp.   Pct. Unc.(abs)    Integration
Tgt  101.00                                 *** METH DEFAULT ***
Q1   103.00     67.50        30.0           *** METH DEFAULT ***

Lvl ID   Conc (ug/l)  Response
25          25.000       399557
10          10.000       165001
5            5.000        81556
1            1.000        19818
50          50.000       799662
100        100.000      1678945
0.5      not used for this compound

Qualifier Peak Analysis ON
Curve Fit: Avg. RF
----------------------------------------------------------------------------

 8)  Diethyl ether                                ( )

Ret. Time   7.09 min., Extract & Integrate from   6.59 to   7.59 min.

Signal        Rel Resp.   Pct. Unc.(abs)    Integration
Tgt   59.00                                 *** METH DEFAULT ***
Q1    45.00    102.20        30.0           *** METH DEFAULT ***
Q2    74.00     63.70        30.0           *** METH DEFAULT ***

Lvl ID   Conc (ug/l)  Response
25          25.000       220431
10          10.000       102527
5            5.000        52949
1            1.000        18591
50          50.000       468962
100        100.000      1051883
0.5      not used for this compound

Qualifier Peak Analysis ON
Curve Fit: Linear
----------------------------------------------------------------------------

 9)  Acrolein                                     ( )

Ret. Time   6.68 min., Extract & Integrate from   6.18 to   7.18 min.

Signal        Rel Resp.   Pct. Unc.(abs)    Integration
Tgt   56.00                                 *** METH DEFAULT ***
Q1    55.00     71.60        30.0           *** METH DEFAULT ***

Lvl ID   Conc (ug/l)  Response
25          25.000        42726
10          10.000        18902
5            5.000           -1
1            1.000           -1
50          50.000        72056
100        100.000       165907
0.5      not used for this compound

Qualifier Peak Analysis ON
Curve Fit: Avg. RF
----------------------------------------------------------------------------

10)  Acetone                                      ( )

Ret. Time   6.88 min., Extract & Integrate from   6.38 to   7.38 min.

Signal        Rel Resp.   Pct. Unc.(abs)    Integration
Tgt   58.00                                 *** METH DEFAULT ***
Q1    43.00    388.40        30.0           *** METH DEFAULT ***
```

```
Lvl ID   Conc (ug/l)  Response
25         125.000        99057
10          50.000        47222
5           25.000        30787
1            5.000           -1
50         250.000       176366
100        500.000       382429
0.5      not used for this compound

Qualifier Peak Analysis ON
Curve Fit: Linear
----------------------------------------------------------------------------

11)  Iodomethane                                  ( )

Ret. Time   7.60 min., Extract & Integrate from   7.10 to   8.10 min.

Signal        Rel Resp.   Pct. Unc.(abs)    Integration
Tgt  142.00                                 *** METH DEFAULT ***
Q1   126.90     54.90        30.0           *** METH DEFAULT ***
Q2   141.00     15.60        30.0           *** METH DEFAULT ***

Lvl ID   Conc (ug/l)  Response
25          25.000       500804
10          10.000       206208
5            5.000       106626
1            1.000        31182
50          50.000      1120745
100        100.000      2489139
0.5      not used for this compound

Qualifier Peak Analysis ON
Curve Fit: Linear
----------------------------------------------------------------------------

12)  1,1,2-Trichloro-1,2,2-trifluoroethane        ( )

Ret. Time   7.88 min., Extract & Integrate from   7.38 to   8.38 min.

Signal        Rel Resp.   Pct. Unc.(abs)    Integration
Tgt  101.00                                 *** METH DEFAULT ***
Q1   151.00     59.40        30.0           *** METH DEFAULT ***

Lvl ID   Conc (ug/l)  Response
25          25.000       331875
10          10.000       145444
5            5.000        87959
1            1.000        16874
50          50.000       695665
100        100.000      1381718
0.5      not used for this compound

Qualifier Peak Analysis ON
Curve Fit: Avg. RF
----------------------------------------------------------------------------

13)  Methyl Acetate                               ( )

Ret. Time   7.90 min., Extract & Integrate from   7.40 to   8.40 min.

Signal        Rel Resp.   Pct. Unc.(abs)    Integration
Tgt   43.00                                 *** METH DEFAULT ***
Q1    74.00     14.90        30.0           *** METH DEFAULT ***

Lvl ID   Conc (ug/l)  Response
25          25.000       226125
10          10.000       108222
5            5.000        60912
1            1.000           -1
```

```
50           50.000        467109
100         100.000        960526
0.5      not used for this compound

Qualifier Peak Analysis ON
Curve Fit: Avg. RF
---------------------------------------------------------------------------

14)  Allyl Chloride                                 ( )

Ret. Time   7.94 min., Extract & Integrate from   7.44 to   8.44 min.

Signal         Rel Resp.   Pct. Unc.(abs)    Integration
Tgt   41.00                                  *** METH DEFAULT ***
Q1    76.00      25.20        30.0           *** METH DEFAULT ***

Lvl ID   Conc (ug/l)  Response
25           25.000        671399
10           10.000        288531
5             5.000        162257
1             1.000         36376
50           50.000       1561946
100         100.000       3343008
0.5      not used for this compound

Qualifier Peak Analysis ON
Curve Fit: Avg. RF
---------------------------------------------------------------------------

15)  Carbon Disulfide                               ( )

Ret. Time   8.12 min., Extract & Integrate from   7.62 to   8.62 min.

Signal         Rel Resp.   Pct. Unc.(abs)    Integration
Tgt   76.00                                  *** METH DEFAULT ***
Q1    78.00       9.40        30.0           *** METH DEFAULT ***

Lvl ID   Conc (ug/l)  Response
25           25.000       1537785
10           10.000        650059
5             5.000        331521
1             1.000         70014
50           50.000       3411160
100         100.000       7456603
0.5      not used for this compound

Qualifier Peak Analysis ON
Curve Fit: Avg. RF
---------------------------------------------------------------------------

16)  1,1-Dichloroethene                             ( )

Ret. Time   7.55 min., Extract & Integrate from   7.05 to   8.05 min.

Signal         Rel Resp.   Pct. Unc.(abs)    Integration
Tgt   96.00                                  *** METH DEFAULT ***
Q1    61.00     114.60        30.0           *** METH DEFAULT ***
Q2    63.00      37.30        30.0           *** METH DEFAULT ***

Lvl ID   Conc (ug/l)  Response
25           25.000        300278
10           10.000        128316
5             5.000         62540
1             1.000         20157
50           50.000        621349
100         100.000       1302793
0.5      not used for this compound

Qualifier Peak Analysis ON
```

```
Curve Fit: Linear
----------------------------------------------------------------------------------

17)  Methylene Chloride                            ( )

Ret. Time   7.79 min., Extract & Integrate from   7.29 to   8.29 min.

Signal         Rel Resp.   Pct. Unc.(abs)    Integration
Tgt   84.00                                  *** METH DEFAULT ***
Q1    86.00     64.60        30.0            *** METH DEFAULT ***
Q2    49.00    147.10        30.0            *** METH DEFAULT ***

Lvl ID   Conc (ug/l)  Response
25          25.000       359532
10          10.000       154815
5            5.000        83431
1            1.000        23476
50          50.000       726794
100        100.000      1554380
0.5      not used for this compound

Qualifier Peak Analysis ON
Curve Fit: Linear
----------------------------------------------------------------------------------

18)  Methyl tert-Butyl Ether                       ( )

Ret. Time   9.06 min., Extract & Integrate from   8.56 to   9.56 min.

Signal         Rel Resp.   Pct. Unc.(abs)    Integration
Tgt   73.00                                  *** METH DEFAULT ***
Q1    57.00     25.90        30.0            *** METH DEFAULT ***
Q2    41.00     29.90        30.0            *** METH DEFAULT ***

Lvl ID   Conc (ug/l)  Response
25          25.000       800869
10          10.000       335324
5            5.000       149753
1            1.000        31545
50          50.000      1817014
100        100.000      4152248
0.5      not used for this compound

Qualifier Peak Analysis ON
Curve Fit: Avg. RF
----------------------------------------------------------------------------------

19)  Acrylonitrile                                 ( )

Ret. Time   7.66 min., Extract & Integrate from   7.16 to   8.16 min.

Signal         Rel Resp.   Pct. Unc.(abs)    Integration
Tgt   53.00                                  *** METH DEFAULT ***
Q1    52.00     82.60        30.0            *** METH DEFAULT ***
Q2    51.00     38.40        30.0            *** METH DEFAULT ***

Lvl ID   Conc (ug/l)  Response
25          25.000        92809
10          10.000        44811
5            5.000        23381
1            1.000           -1
50          50.000       190253
100        100.000       405352
0.5      not used for this compound

Qualifier Peak Analysis ON
Curve Fit: Avg. RF
----------------------------------------------------------------------------------
```

```
20)  trans-1,2-Dichloroethene                        ( )

Ret. Time   8.86 min., Extract & Integrate from   8.36 to   9.36 min.

Signal        Rel Resp.   Pct. Unc.(abs)    Integration
Tgt    96.00                                *** METH DEFAULT ***
Q1     61.00    113.30       30.0           *** METH DEFAULT ***
Q2     98.00     66.50       30.0           *** METH DEFAULT ***

Lvl ID   Conc (ug/l)  Response
25          25.000       473996
10          10.000       200838
5            5.000        97241
1            1.000        18775
50          50.000      1052229
100        100.000      2340829
0.5      not used for this compound

Qualifier Peak Analysis ON
Curve Fit: Avg. RF
-------------------------------------------------------------------------------

21)  1,1-Dichloroethane                              ( )

Ret. Time   9.25 min., Extract & Integrate from   8.75 to   9.75 min.

Signal        Rel Resp.   Pct. Unc.(abs)    Integration
Tgt    63.00                                *** METH DEFAULT ***
Q1     65.00     32.60       30.0           *** METH DEFAULT ***
Q2     83.00     14.40       30.0           *** METH DEFAULT ***

Lvl ID   Conc (ug/l)  Response
25          25.000      1084415
10          10.000       469088
5            5.000       228337
1            1.000        50777
50          50.000      2235019
100        100.000      4726697
0.5      not used for this compound

Qualifier Peak Analysis ON
Curve Fit: Avg. RF
-------------------------------------------------------------------------------

22)  Vinyl Acetate                                   ( )

Ret. Time   9.49 min., Extract & Integrate from   8.99 to   9.99 min.

Signal        Rel Resp.   Pct. Unc.(abs)    Integration
Tgt    43.00                                *** METH DEFAULT ***
Q1     86.00      7.10       30.0           *** METH DEFAULT ***

Lvl ID   Conc (ug/l)  Response
25          25.000       969560
10          10.000       398756
5            5.000       192408
1            1.000        39563
50          50.000      2294813
100        100.000      5426019
0.5      not used for this compound

Qualifier Peak Analysis ON
Curve Fit: Avg. RF
-------------------------------------------------------------------------------

23)  Chloroprene                                     ( )

Ret. Time   9.83 min., Extract & Integrate from   9.33 to  10.33 min.
```

```
Signal       Rel Resp.   Pct. Unc.(abs)    Integration
Tgt   53.00                                *** METH DEFAULT ***
Q1    88.00    66.80       30.0            *** METH DEFAULT ***

Lvl ID   Conc (ug/l)  Response
25          25.000      730206
10          10.000      278040
5            5.000      133241
1            1.000       27007
50          50.000     1598316
100        100.000     3503002
0.5      not used for this compound

Qualifier Peak Analysis ON
Curve Fit: Avg. RF
----------------------------------------------------------------------------

24)  2-Butanone                               ( )

Ret. Time   9.95 min., Extract & Integrate from   9.45 to  10.45 min.

Signal       Rel Resp.   Pct. Unc.(abs)    Integration
Tgt   72.00                                *** METH DEFAULT ***
Q1    43.00   695.40       30.0            *** METH DEFAULT ***

Lvl ID   Conc (ug/l)  Response
25         125.000      143841
10          50.000       62943
5           25.000       33898
1            5.000          -1
50         250.000      307714
100        500.000      668126
0.5      not used for this compound

Qualifier Peak Analysis ON
Curve Fit: Avg. RF
----------------------------------------------------------------------------

25)  Di-isopropyl ether                       ( )

Ret. Time   9.98 min., Extract & Integrate from   9.48 to  10.48 min.

Signal       Rel Resp.   Pct. Unc.(abs)    Integration
Tgt   45.00                                *** METH DEFAULT ***
Q1    43.00    48.10       30.0            *** METH DEFAULT ***
Q2    87.00    16.50       30.0            *** METH DEFAULT ***

Lvl ID   Conc (ug/l)  Response
25          25.000     2337668
10          10.000      942710
5            5.000      426010
1            1.000       76440
50          50.000     4992657
100        100.000    10505860
0.5      not used for this compound

Qualifier Peak Analysis ON
Curve Fit: Avg. RF
----------------------------------------------------------------------------

26)  Methacrylonitrile                        ( )

Ret. Time  10.10 min., Extract & Integrate from   9.60 to  10.60 min.

Signal       Rel Resp.   Pct. Unc.(abs)    Integration
Tgt   41.00                                *** METH DEFAULT ***
Q1    67.00    42.30       30.0            *** METH DEFAULT ***

Lvl ID   Conc (ug/l)  Response
```

```
25          25.000       281255
10          10.000       123283
5            5.000        56666
1            1.000         8378
50          50.000       615653
100        100.000      1310989
0.5      not used for this compound

Qualifier Peak Analysis ON
Curve Fit: Avg. RF
-------------------------------------------------------------------------------

27)  cis-1,2 Dichloroethene                       ( )

Ret. Time  10.16 min., Extract & Integrate from   9.66 to  10.66 min.

Signal        Rel Resp.   Pct. Unc.(abs)    Integration
Tgt   96.00                                 *** METH DEFAULT ***
Q1    61.00     95.50       30.0            *** METH DEFAULT ***
Q2    98.00     66.90       30.0            *** METH DEFAULT ***

Lvl ID   Conc (ug/l)  Response
25          25.000       558271
10          10.000       219798
5            5.000       109332
1            1.000        21754
50          50.000      1147128
100        100.000      2455295
0.5      not used for this compound

Qualifier Peak Analysis ON
Curve Fit: Avg. RF
-------------------------------------------------------------------------------

28)  Methyl Acrylate                              ( )

Ret. Time  10.59 min., Extract & Integrate from  10.09 to  11.09 min.

Signal        Rel Resp.   Pct. Unc.(abs)    Integration
Tgt   55.00                                 *** METH DEFAULT ***
Q1    85.00     18.50       30.0            *** METH DEFAULT ***

Lvl ID   Conc (ug/l)  Response
25          25.000       374149
10          10.000       160341
5            5.000        81772
1            1.000        17877
50          50.000       777455
100        100.000      1646033
0.5      not used for this compound

Qualifier Peak Analysis ON
Curve Fit: Avg. RF
-------------------------------------------------------------------------------

29)  Ethyl tertiary-butyl ether                   ( )

Ret. Time  10.60 min., Extract & Integrate from  10.10 to  11.10 min.

Signal        Rel Resp.   Pct. Unc.(abs)    Integration
Tgt   59.00                                 *** METH DEFAULT ***
Q1    87.00     41.30       30.0            *** METH DEFAULT ***
Q2    57.00     32.40       30.0            *** METH DEFAULT ***

Lvl ID   Conc (ug/l)  Response
25          25.000      1452475
10          10.000       584977
5            5.000       267663
1            1.000        46902
```

```
50          50.000      3036504
100        100.000      6314530
0.5      not used for this compound

Qualifier Peak Analysis ON
Curve Fit: Avg. RF
-------------------------------------------------------------------------------

30)  2,2-Dichloropropane                             ( )

Ret. Time  10.60 min., Extract & Integrate from  10.10 to  11.10 min.

Signal         Rel Resp.   Pct. Unc.(abs)    Integration
Tgt   77.00                                  *** METH DEFAULT ***
Q1    97.00     28.60         30.0           *** METH DEFAULT ***
Q2    41.00    112.10         30.0           *** METH DEFAULT ***

Lvl ID   Conc (ug/l)  Response
25          25.000       710782
10          10.000       293585
5            5.000       146387
1            1.000        30152
50          50.000      1349364
100        100.000      2709502
0.5      not used for this compound

Qualifier Peak Analysis ON
Curve Fit: Avg. RF
-------------------------------------------------------------------------------

31)  Bromochloromethane                              ( )

Ret. Time  10.39 min., Extract & Integrate from   9.89 to  10.89 min.

Signal         Rel Resp.   Pct. Unc.(abs)    Integration
Tgt  128.00                                  *** METH DEFAULT ***
Q1    49.00    140.90         30.0           *** METH DEFAULT ***
Q2   130.00    130.70         30.0           *** METH DEFAULT ***

Lvl ID   Conc (ug/l)  Response
25          25.000       249703
10          10.000       106943
5            5.000        49929
1            1.000        11192
50          50.000       535335
100        100.000      1137973
0.5      not used for this compound

Qualifier Peak Analysis ON
Curve Fit: Avg. RF
-------------------------------------------------------------------------------

32)  Tetrahydrofuran                                 ( )

Ret. Time  11.00 min., Extract & Integrate from  10.50 to  11.50 min.

Signal         Rel Resp.   Pct. Unc.(abs)    Integration
Tgt   42.00                                  *** METH DEFAULT ***
Q1    72.00     28.80         30.0           *** METH DEFAULT ***

Lvl ID   Conc (ug/l)  Response
25          25.000        88497
10          10.000        39414
5            5.000        22651
1            1.000           -1
50          50.000       174067
100        100.000       441670
0.5      not used for this compound
```

```
Qualifier Peak Analysis ON
Curve Fit: Avg. RF
----------------------------------------------------------------------------

33)  Chloroform                                   ( )

Ret. Time  10.48 min., Extract & Integrate from   9.98 to  10.98 min.

Signal        Rel Resp.   Pct. Unc.(abs)    Integration
Tgt   83.00                                 *** METH DEFAULT ***
Q1    85.00     67.60        30.0           *** METH DEFAULT ***
Q2    47.00     26.00        30.0           *** METH DEFAULT ***

Lvl ID   Conc (ug/l)  Response
25          25.000       995164
10          10.000       420641
5            5.000       198177
1            1.000        46237
50          50.000      1982965
100        100.000      4108998
0.5      not used for this compound

Qualifier Peak Analysis ON
Curve Fit: Avg. RF
----------------------------------------------------------------------------

34)  Dibromofluoromethane(SURR)                   ( )

Ret. Time  10.66 min., Extract & Integrate from  10.16 to  11.16 min.

Signal        Rel Resp.   Pct. Unc.(abs)    Integration
Tgt  111.00                                 *** METH DEFAULT ***
Q1   113.00     98.00        30.0           *** METH DEFAULT ***
Q2   192.00      9.60        30.0           *** METH DEFAULT ***

Lvl ID   Conc (ug/l)  Response
25          25.000       561295
10          10.000       234152
5            5.000       115870
1            1.000        25783
50          50.000      1136923
100        100.000      2389781
0.5          0.500        13072

Qualifier Peak Analysis ON
Curve Fit: Avg. RF
----------------------------------------------------------------------------

35)  1-Chlorobutane                               ( )

Ret. Time  11.63 min., Extract & Integrate from  11.13 to  12.13 min.

Signal        Rel Resp.   Pct. Unc.(abs)    Integration
Tgt   56.00                                 *** METH DEFAULT ***
Q1    41.00     71.30        30.0           *** METH DEFAULT ***
Q2    43.00     34.30        30.0           *** METH DEFAULT ***

Lvl ID   Conc (ug/l)  Response
25          25.000      1098968
10          10.000       440748
5            5.000       202368
1            1.000        39169
50          50.000      2282885
100        100.000      4790439
0.5      not used for this compound

Qualifier Peak Analysis ON
Curve Fit: Avg. RF
----------------------------------------------------------------------------
```

```
36)  1,1,1-Trichloroethane                      ( )

Ret. Time  11.64 min., Extract & Integrate from  11.14 to  12.14 min.

Signal         Rel Resp.   Pct. Unc.(abs)    Integration
Tgt   97.00                                  *** METH DEFAULT ***
Q1    99.00      66.20        30.0           *** METH DEFAULT ***
Q2    61.00      34.90        30.0           *** METH DEFAULT ***

Lvl ID   Conc (ug/l)  Response
25          25.000       721155
10          10.000       293809
5            5.000       147853
1            1.000        30957
50          50.000      1440140
100        100.000      2962268
0.5      not used for this compound

Qualifier Peak Analysis ON
Curve Fit: Avg. RF
----------------------------------------------------------------------------

37)  1,1-Dichloropropene                        ( )

Ret. Time  11.94 min., Extract & Integrate from  11.44 to  12.44 min.

Signal         Rel Resp.   Pct. Unc.(abs)    Integration
Tgt   75.00                                  *** METH DEFAULT ***
Q1   110.00      50.40        30.0           *** METH DEFAULT ***
Q2    77.00      31.70        30.0           *** METH DEFAULT ***

Lvl ID   Conc (ug/l)  Response
25          25.000       632648
10          10.000       249432
5            5.000       115808
1            1.000        23846
50          50.000      1371122
100        100.000      2910338
0.5      not used for this compound

Qualifier Peak Analysis ON
Curve Fit: Avg. RF
----------------------------------------------------------------------------

38)  Cyclohexane                                ( )

Ret. Time  12.07 min., Extract & Integrate from  11.57 to  12.57 min.

Signal         Rel Resp.   Pct. Unc.(abs)    Integration
Tgt   56.00                                  *** METH DEFAULT ***
Q1    84.00      79.60        30.0           *** METH DEFAULT ***
Q2    41.00      70.50        30.0           *** METH DEFAULT ***

Lvl ID   Conc (ug/l)  Response
25          25.000       907077
10          10.000       355664
5            5.000       169423
1            1.000        35456
50          50.000      1863476
100        100.000      3891957
0.5      not used for this compound

Qualifier Peak Analysis ON
Curve Fit: Avg. RF
----------------------------------------------------------------------------

39)  Carbon Tetrachloride                       ( )
```

```
Ret. Time  12.21 min., Extract & Integrate from  12.01 to  12.41 min.

Signal         Rel Resp.   Pct. Unc.(abs)    Integration
Tgt  117.00                                  *** METH DEFAULT ***
Q1   119.00      95.40        30.0           *** METH DEFAULT ***
Q2   121.00      32.30        30.0           *** METH DEFAULT ***

Lvl ID   Conc (ug/l)  Response
25          25.000       535324
10          10.000       216339
5            5.000       101142
1            1.000        21638
50          50.000      1109861
100        100.000      2361524
0.5      not used for this compound

Qualifier Peak Analysis ON
Curve Fit: Avg. RF
------------------------------------------------------------------------------

40)  Benzene                                   ( )

Ret. Time  12.28 min., Extract & Integrate from  11.78 to  12.78 min.

Signal         Rel Resp.   Pct. Unc.(abs)    Integration
Tgt   78.00                                  *** METH DEFAULT ***

Lvl ID   Conc (ug/l)  Response
25          25.000      1904939
10          10.000       784884
5            5.000       378428
1            1.000        70104
50          50.000      3854560
100        100.000      8180736
0.5      not used for this compound

Qualifier Peak Analysis ON
Curve Fit: Avg. RF
------------------------------------------------------------------------------

41)  1,2-Dichloroethane-d4(SURR)               ( )

Ret. Time  11.38 min., Extract & Integrate from  10.88 to  11.88 min.

Signal         Rel Resp.   Pct. Unc.(abs)    Integration
Tgt   65.00                                  *** METH DEFAULT ***
Q1   102.00      38.00        30.0           *** METH DEFAULT ***

Lvl ID   Conc (ug/l)  Response
25          25.000       589788
10          10.000       252323
5            5.000       131353
1            1.000        31041
50          50.000      1195026
100        100.000      2489303
0.5          0.500        14936

Qualifier Peak Analysis ON
Curve Fit: Avg. RF
------------------------------------------------------------------------------

42)  1,2-Dichloroethane                        ( )

Ret. Time  11.49 min., Extract & Integrate from  11.29 to  11.69 min.

Signal         Rel Resp.   Pct. Unc.(abs)    Integration
Tgt   62.00                                  *** METH DEFAULT ***
Q1    98.00      15.80        30.0           *** METH DEFAULT ***
Q2    49.00      46.90        30.0           *** METH DEFAULT ***
```

```
Lvl ID   Conc (ug/l)  Response
25           25.000      728730
10           10.000      312418
5             5.000      158587
1             1.000       36484
50           50.000     1471334
100         100.000     3064482
0.5      not used for this compound

Qualifier Peak Analysis ON
Curve Fit: Avg. RF
-----------------------------------------------------------------------------

43)  Tertiary-amyl methyl ether                    ( )

Ret. Time  12.55 min., Extract & Integrate from  12.05 to  13.05 min.

Signal         Rel Resp.   Pct. Unc.(abs)    Integration
Tgt   73.00                                  *** METH DEFAULT ***
Q1    43.00      42.10       30.0            *** METH DEFAULT ***
Q2    55.00      23.60       30.0            *** METH DEFAULT ***
Q3    87.00      26.10       30.0            *** METH DEFAULT ***

Lvl ID   Conc (ug/l)  Response
25           25.000      909250
10           10.000      381598
5             5.000      178280
1             1.000       28156
50           50.000     1984661
100         100.000     4429119
0.5      not used for this compound

Qualifier Peak Analysis ON
Curve Fit: Avg. RF
-----------------------------------------------------------------------------

44)  Trichloroethene                               ( )

Ret. Time  13.29 min., Extract & Integrate from  12.79 to  13.79 min.

Signal         Rel Resp.   Pct. Unc.(abs)    Integration
Tgt   95.00                                  *** METH DEFAULT ***
Q1    97.00      66.10       30.0            *** METH DEFAULT ***
Q2   130.00     130.10       30.0            *** METH DEFAULT ***
Q3   132.00     124.60       30.0            *** METH DEFAULT ***

Lvl ID   Conc (ug/l)  Response
25           25.000      525298
10           10.000      209767
5             5.000      101671
1             1.000       20367
50           50.000     1098688
100         100.000     2293127
0.5      not used for this compound

Qualifier Peak Analysis ON
Curve Fit: Avg. RF
-----------------------------------------------------------------------------

45)  1,2-Dichloropropane                           ( )

Ret. Time  13.22 min., Extract & Integrate from  12.72 to  13.72 min.

Signal         Rel Resp.   Pct. Unc.(abs)    Integration
Tgt   63.00                                  *** METH DEFAULT ***
Q1   112.00       6.00       30.0            *** METH DEFAULT ***
Q2    61.00      14.20       30.0            *** METH DEFAULT ***
```

```
Lvl ID   Conc (ug/l)  Response
25          25.000       612692
10          10.000       260437
5            5.000       122156
1            1.000        28518
50          50.000      1253960
100        100.000      2644077
0.5      not used for this compound

Qualifier Peak Analysis ON
Curve Fit: Avg. RF
-------------------------------------------------------------------------------

46)  Dibromomethane                              ( )

Ret. Time  13.16 min., Extract & Integrate from  12.66 to  13.66 min.

Signal        Rel Resp.   Pct. Unc.(abs)     Integration
Tgt   93.00                                  *** METH DEFAULT ***
Q1    95.00      85.70        30.0           *** METH DEFAULT ***
Q2   174.00      84.70        30.0           *** METH DEFAULT ***

Lvl ID   Conc (ug/l)  Response
25          25.000       299812
10          10.000       121141
5            5.000        62564
1            1.000        14370
50          50.000       632274
100        100.000      1349994
0.5      not used for this compound

Qualifier Peak Analysis ON
Curve Fit: Avg. RF
-------------------------------------------------------------------------------

47)  2-Nitropropane                              ( )

Ret. Time  13.31 min., Extract & Integrate from  12.81 to  13.81 min.

Signal        Rel Resp.   Pct. Unc.(abs)     Integration
Tgt   43.00                                  *** METH DEFAULT ***
Q1    41.00      89.50        30.0           *** METH DEFAULT ***

Lvl ID   Conc (ug/l)  Response
25          25.000       115216
10          10.000        46205
5            5.000        26023
1            1.000         4671
50          50.000       238414
100        100.000       420606
0.5      not used for this compound

Qualifier Peak Analysis ON
Curve Fit: Avg. RF
-------------------------------------------------------------------------------

48)  Bromodichloromethane                        ( )

Ret. Time  13.35 min., Extract & Integrate from  12.85 to  13.85 min.

Signal        Rel Resp.   Pct. Unc.(abs)     Integration
Tgt   83.00                                  *** METH DEFAULT ***
Q1    85.00      62.60        30.0           *** METH DEFAULT ***
Q2   127.00      12.70        30.0           *** METH DEFAULT ***

Lvl ID   Conc (ug/l)  Response
25          25.000       699569
10          10.000       281122
5            5.000       129756
```

```
1          1.000      30183
50        50.000    1384589
100      100.000    2844463
0.5      not used for this compound

Qualifier Peak Analysis ON
Curve Fit: Avg. RF
------------------------------------------------------------------------------

49)  1,4-Dioxane                                    ( )

Ret. Time  13.56 min., Extract & Integrate from  13.06 to  14.06 min.

Signal        Rel Resp.   Pct. Unc.(abs)    Integration
Tgt   88.00                                  *** METH DEFAULT ***
Q1    58.00     56.10         30.0           *** METH DEFAULT ***
Q2    43.00     70.10         30.0           *** METH DEFAULT ***

Lvl ID   Conc (ug/l)  Response
25         500.000      33325
10         200.000      22779
5          100.000      11540
1           20.000       6822
50        1000.000      74642
100       1500.000     187314
0.5      not used for this compound

Qualifier Peak Analysis ON
Curve Fit: Avg. RF
------------------------------------------------------------------------------

50)  Methyl Methacrylate                            ( )

Ret. Time  13.62 min., Extract & Integrate from  13.12 to  14.12 min.

Signal        Rel Resp.   Pct. Unc.(abs)    Integration
Tgt   41.00                                  *** METH DEFAULT ***
Q1    69.00     57.10         30.0           *** METH DEFAULT ***
Q2   100.00     31.30         30.0           *** METH DEFAULT ***

Lvl ID   Conc (ug/l)  Response
25          25.000     426428
10          10.000     161949
5            5.000      74582
1            1.000         -1
50          50.000     976712
100        100.000    2135220
0.5      not used for this compound

Qualifier Peak Analysis ON
Curve Fit: Avg. RF
------------------------------------------------------------------------------

51)  2-Chloroethyl vinyl ether                      ( )

Ret. Time  14.04 min., Extract & Integrate from  13.54 to  14.54 min.

Signal        Rel Resp.   Pct. Unc.(abs)    Integration
Tgt   63.00                                  *** METH DEFAULT ***
Q1    65.00     30.70         30.0           *** METH DEFAULT ***
Q2   106.00     34.60         30.0           *** METH DEFAULT ***

Lvl ID   Conc (ug/l)  Response
25         125.000    1201319
10          50.000     472654
5           25.000     194776
1            5.000         -1
50         250.000    2677002
100        500.000    6006774
```

```
0.5      not used for this compound

Qualifier Peak Analysis ON
Curve Fit: Avg. RF
-----------------------------------------------------------------------------

52)  Methyl Cyclohexane                               ( )

Ret. Time  14.10 min., Extract & Integrate from  13.60 to  14.60 min.

Signal        Rel Resp.   Pct. Unc.(abs)    Integration
Tgt   83.00                                 *** METH DEFAULT ***
Q1    55.00     85.60         30.0          *** METH DEFAULT ***
Q2    98.00     52.50         30.0          *** METH DEFAULT ***

Lvl ID   Conc (ug/l)  Response
25          25.000       573799
10          10.000       226672
5            5.000       119751
1            1.000        19461
50          50.000      1188169
100        100.000      2513523
0.5      not used for this compound

Qualifier Peak Analysis ON
Curve Fit: Avg. RF
-----------------------------------------------------------------------------

53)  4-Methyl-2-Pentanone                             ( )

Ret. Time  14.59 min., Extract & Integrate from  14.39 to  14.79 min.

Signal        Rel Resp.   Pct. Unc.(abs)    Integration
Tgt   58.00                                 *** METH DEFAULT ***
Q1    43.00    312.30         30.0          *** METH DEFAULT ***
Q2    85.00     38.90         30.0          *** METH DEFAULT ***
Q3   100.00     43.10         30.0          *** METH DEFAULT ***

Lvl ID   Conc (ug/l)  Response
25         125.000       628870
10          50.000       261111
5           25.000       114609
1            5.000        29151
50         250.000      1393379
100        500.000      3030687
0.5      not used for this compound

Qualifier Peak Analysis ON
Curve Fit: Avg. RF
-----------------------------------------------------------------------------

54)  cis-1,3-Dichloropropene                          ( )

Ret. Time  14.39 min., Extract & Integrate from  13.89 to  14.89 min.

Signal        Rel Resp.   Pct. Unc.(abs)    Integration
Tgt   75.00                                 *** METH DEFAULT ***
Q1    77.00     31.40         30.0          *** METH DEFAULT ***
Q2    39.00     53.80         30.0          *** METH DEFAULT ***

Lvl ID   Conc (ug/l)  Response
25          25.000       677818
10          10.000       257094
5            5.000       120916
1            1.000        23281
50          50.000      1483726
100        100.000      3268559
0.5          0.500        11596
```

```
Qualifier Peak Analysis ON
Curve Fit: Avg. RF
-------------------------------------------------------------------------------

55)  trans-1,3-Dichloropropene                        ( )

Ret. Time  15.08 min., Extract & Integrate from  14.58 to  15.58 min.

Signal          Rel Resp.   Pct. Unc.(abs)     Integration
Tgt   75.00                                    *** METH DEFAULT ***
Q1    77.00      31.90        30.0             *** METH DEFAULT ***
Q2    39.00      61.90        30.0             *** METH DEFAULT ***

Lvl ID   Conc (ug/l)  Response
25          25.000       553563
10          10.000       216459
5            5.000        91643
1            1.000        22578
50          50.000      1252755
100        100.000      2813004
0.5          0.500         7469

Qualifier Peak Analysis ON
Curve Fit: Linear
-------------------------------------------------------------------------------

56)  1,1,2-Trichloroethane                            ( )

Ret. Time  15.33 min., Extract & Integrate from  14.83 to  15.83 min.

Signal          Rel Resp.   Pct. Unc.(abs)     Integration
Tgt   83.00                                    *** METH DEFAULT ***
Q1    97.00     126.30        30.0             *** METH DEFAULT ***
Q2    85.00      62.40        30.0             *** METH DEFAULT ***

Lvl ID   Conc (ug/l)  Response
25          25.000       325064
10          10.000       139694
5            5.000        69384
1            1.000        13659
50          50.000       682634
100        100.000      1473009
0.5      not used for this compound

Qualifier Peak Analysis ON
Curve Fit: Avg. RF
-------------------------------------------------------------------------------

57)  Toluene                                          ( )

Ret. Time  15.66 min., Extract & Integrate from  15.16 to  16.16 min.

Signal          Rel Resp.   Pct. Unc.(abs)     Integration
Tgt   92.00                                    *** METH DEFAULT ***
Q1    91.00     160.60        30.0             *** METH DEFAULT ***
Q2    65.00      14.20        30.0             *** METH DEFAULT ***

Lvl ID   Conc (ug/l)  Response
25          25.000      1086020
10          10.000       439079
5            5.000       197248
1            1.000        35619
50          50.000      2260646
100        100.000      4739947
0.5      not used for this compound

Qualifier Peak Analysis ON
Curve Fit: Avg. RF
-------------------------------------------------------------------------------
```

```
58)  Chlorobenzene-d5                          (ISTD)

Ret. Time  17.92 min., Extract & Integrate from  17.42 to  18.42 min.

Signal          Rel Resp.   Pct. Unc.(abs)     Integration
Tgt  117.00                                    *** METH DEFAULT ***
Q1   119.00       31.70        30.0            *** METH DEFAULT ***

Lvl ID   Conc (ug/l)  Response
25          25.000      1149114
10          25.000      1152088
5           25.000      1198151
1           25.000      1051571
50          25.000      1180885
100         25.000      1210800
0.5         25.000      1056414

Qualifier Peak Analysis ON    ISTD conc:       25.000 ug/l
Curve Fit: Avg. RF
-------------------------------------------------------------------------------

59)  Toluene-d8 (SURR)                         ( )

Ret. Time  15.54 min., Extract & Integrate from  15.04 to  16.04 min.

Signal          Rel Resp.   Pct. Unc.(abs)     Integration
Tgt   98.00                                    *** METH DEFAULT ***
Q1   100.00       72.40        30.0            *** METH DEFAULT ***

Lvl ID   Conc (ug/l)  Response
25          25.000      1457463
10          10.000       566890
5            5.000       248627
1            1.000        44328
50          50.000      3183076
100        100.000      6956506
0.5          0.500        20355

Qualifier Peak Analysis ON
Curve Fit: Avg. RF
-------------------------------------------------------------------------------

60)  Ethyl Methacrylate                        ( )

Ret. Time  15.79 min., Extract & Integrate from  15.29 to  16.29 min.

Signal          Rel Resp.   Pct. Unc.(abs)     Integration
Tgt   69.00                                    *** METH DEFAULT ***
Q1    41.00       91.80        30.0            *** METH DEFAULT ***
Q2    99.00       27.60        30.0            *** METH DEFAULT ***

Lvl ID   Conc (ug/l)  Response
25          25.000       317915
10          10.000       120387
5            5.000        54326
1            1.000           -1
50          50.000       729766
100        100.000      1581816
0.5      not used for this compound

Qualifier Peak Analysis ON
Curve Fit: Avg. RF
-------------------------------------------------------------------------------

61)  2-Hexanone                                ( )

Ret. Time  15.99 min., Extract & Integrate from  15.49 to  16.49 min.
```

```
Signal        Rel Resp.   Pct. Unc.(abs)    Integration
Tgt   43.00                                 *** METH DEFAULT ***
Q1    58.00     44.90        30.0           *** METH DEFAULT ***
Q2    57.00     12.90        30.0           *** METH DEFAULT ***
Q3   100.00      9.80        30.0           *** METH DEFAULT ***

Lvl ID   Conc (ug/l)  Response
25         125.000     1400232
10          50.000      572507
5           25.000      264854
1            5.000       52715
50         250.000     2993528
100        500.000     6284389
0.5      not used for this compound

Qualifier Peak Analysis ON
Curve Fit: Avg. RF
----------------------------------------------------------------------------

62)  1,3-Dichloropropane                           ( )

Ret. Time  15.73 min., Extract & Integrate from  15.53 to  15.93 min.

Signal        Rel Resp.   Pct. Unc.(abs)    Integration
Tgt   76.00                                 *** METH DEFAULT ***
Q1    78.00     33.90        30.0           *** METH DEFAULT ***

Lvl ID   Conc (ug/l)  Response
25          25.000      636645
10          10.000      276904
5            5.000      139114
1            1.000       25367
50          50.000     1328764
100        100.000     2671607
0.5      not used for this compound

Qualifier Peak Analysis ON
Curve Fit: Avg. RF
----------------------------------------------------------------------------

63)  Tetrachloroethene                             ( )

Ret. Time  16.85 min., Extract & Integrate from  16.35 to  17.35 min.

Signal        Rel Resp.   Pct. Unc.(abs)    Integration
Tgt  164.00                                 *** METH DEFAULT ***
Q1   129.00    119.50        30.0           *** METH DEFAULT ***
Q2   131.00    111.80        30.0           *** METH DEFAULT ***
Q3   166.00    126.10        30.0           *** METH DEFAULT ***

Lvl ID   Conc (ug/l)  Response
25          25.000      377976
10          10.000      148543
5            5.000       73358
1            1.000       16445
50          50.000      804360
100        100.000     1781312
0.5      not used for this compound

Qualifier Peak Analysis ON
Curve Fit: Avg. RF
----------------------------------------------------------------------------

64)  Dibromochloromethane                          ( )

Ret. Time  16.16 min., Extract & Integrate from  15.66 to  16.66 min.

Signal        Rel Resp.   Pct. Unc.(abs)    Integration
Tgt  129.00                                 *** METH DEFAULT ***
```

```
Q1   127.00      75.20        30.0           *** METH DEFAULT ***
Q2   131.00      24.50        30.0           *** METH DEFAULT ***

Lvl ID   Conc (ug/l)  Response
25          25.000      392387
10          10.000      153553
5            5.000       74019
1            1.000       13781
50          50.000      863711
100        100.000     1921566
0.5          0.500        6279

Qualifier Peak Analysis ON
Curve Fit: Avg. RF
---------------------------------------------------------------------------

65)  1,2-Dibromoethane                              ( )

Ret. Time  16.57 min., Extract & Integrate from  16.07 to  17.07 min.

Signal         Rel Resp.   Pct. Unc.(abs)     Integration
Tgt  107.00                                   *** METH DEFAULT ***
Q1   109.00      95.30        30.0           *** METH DEFAULT ***
Q2   188.00       1.90        30.0           *** METH DEFAULT ***

Lvl ID   Conc (ug/l)  Response
25          25.000      353284
10          10.000      146149
5            5.000       70101
1            1.000       12382
50          50.000      796363
100        100.000     1791032
0.5      not used for this compound

Qualifier Peak Analysis ON
Curve Fit: Avg. RF
---------------------------------------------------------------------------

66)  1-Chlorohexane                                 ( )

Ret. Time  17.86 min., Extract & Integrate from  17.36 to  18.36 min.

Signal         Rel Resp.   Pct. Unc.(abs)     Integration
Tgt   91.00                                   *** METH DEFAULT ***
Q1    93.00      33.30        30.0           *** METH DEFAULT ***
Q2    55.00      55.90        30.0           *** METH DEFAULT ***

Lvl ID   Conc (ug/l)  Response
25          25.000      495953
10          10.000      171862
5            5.000       76808
1            1.000       15541
50          50.000     1082560
100        100.000          -1
0.5      not used for this compound

Qualifier Peak Analysis ON
Curve Fit: Avg. RF
---------------------------------------------------------------------------

67)  Chlorobenzene                                  ( )

Ret. Time  17.98 min., Extract & Integrate from  17.48 to  18.48 min.

Signal         Rel Resp.   Pct. Unc.(abs)     Integration
Tgt  112.00                                   *** METH DEFAULT ***
Q1    77.00      37.00        30.0           *** METH DEFAULT ***
Q2   114.00      32.80        30.0           *** METH DEFAULT ***
```

```
Lvl ID   Conc (ug/l)  Response
25         25.000      1174907
10         10.000       465819
5           5.000       228308
1           1.000        50309
50         50.000      2445956
100       100.000      5301175
0.5      not used for this compound

Qualifier Peak Analysis ON
Curve Fit: Avg. RF
-------------------------------------------------------------------------------

68)  1,1,1,2-Tetrachloroethane                        ( )

Ret. Time  17.85 min., Extract & Integrate from  17.35 to  18.35 min.

Signal         Rel Resp.   Pct. Unc.(abs)     Integration
Tgt  131.00                                   *** METH DEFAULT ***
Q1   133.00      93.40        30.0            *** METH DEFAULT ***
Q2   119.00      63.20        30.0            *** METH DEFAULT ***

Lvl ID   Conc (ug/l)  Response
25         25.000       391021
10         10.000       158174
5           5.000        79069
1           1.000        16868
50         50.000       846551
100       100.000      1888814
0.5      not used for this compound

Qualifier Peak Analysis ON
Curve Fit: Avg. RF
-------------------------------------------------------------------------------

69)  Ethylbenzene                                     ( )

Ret. Time  18.32 min., Extract & Integrate from  17.82 to  18.82 min.

Signal         Rel Resp.   Pct. Unc.(abs)     Integration
Tgt   91.00                                   *** METH DEFAULT ***
Q1   106.00      35.90        30.0            *** METH DEFAULT ***

Lvl ID   Conc (ug/l)  Response
25         25.000      1893065
10         10.000       726723
5           5.000       311946
1           1.000        52033
50         50.000      4103410
100       100.000      8979616
0.5      not used for this compound

Qualifier Peak Analysis ON
Curve Fit: Linear
-------------------------------------------------------------------------------

70)  Xylene P,M                                       ( )

Ret. Time  18.66 min., Extract & Integrate from  18.16 to  19.16 min.

Signal         Rel Resp.   Pct. Unc.(abs)     Integration
Tgt  106.00                                   *** METH DEFAULT ***
Q1    91.00     170.30        30.0            *** METH DEFAULT ***

Lvl ID   Conc (ug/l)  Response
25         50.000      1422204
10         20.000       550441
5          10.000       240023
1           2.000        35277
```

```
50          100.000      3044004
100         200.000      6571882
0.5       not used for this compound

Qualifier Peak Analysis ON
Curve Fit: Linear
----------------------------------------------------------------------------

71)  Xylene O                                        ( )

Ret. Time  19.42 min., Extract & Integrate from  18.92 to  19.92 min.

Signal        Rel Resp.   Pct. Unc.(abs)    Integration
Tgt  106.00                                 *** METH DEFAULT ***
Q1    91.00    180.90       30.0            *** METH DEFAULT ***

Lvl ID   Conc (ug/l)  Response
25          25.000       693942
10          10.000       278413
5            5.000       122731
1            1.000        17454
50          50.000      1469054
100        100.000      3137818
0.5       not used for this compound

Qualifier Peak Analysis ON
Curve Fit: Linear
----------------------------------------------------------------------------

72)  Styrene                                         ( )

Ret. Time  19.29 min., Extract & Integrate from  18.79 to  19.79 min.

Signal        Rel Resp.   Pct. Unc.(abs)    Integration
Tgt  104.00                                 *** METH DEFAULT ***
Q1    78.00     30.20       30.0            *** METH DEFAULT ***

Lvl ID   Conc (ug/l)  Response
25          25.000      1099006
10          10.000       397107
5            5.000       160783
1            1.000        24153
50          50.000      2427566
100        100.000      5388566
0.5       not used for this compound

Qualifier Peak Analysis ON
Curve Fit: Linear
----------------------------------------------------------------------------

73)  Bromoform                                       ( )

Ret. Time  18.86 min., Extract & Integrate from  18.36 to  19.36 min.

Signal        Rel Resp.   Pct. Unc.(abs)    Integration
Tgt  173.00                                 *** METH DEFAULT ***
Q1   175.00     46.90       30.0            *** METH DEFAULT ***
Q2   254.00      4.00       30.0            *** METH DEFAULT ***

Lvl ID   Conc (ug/l)  Response
25          25.000       247606
10          10.000        94230
5            5.000        44415
1            1.000         9375
50          50.000       557107
100        100.000      1276653
0.5       not used for this compound

Qualifier Peak Analysis ON
```

```
Curve Fit: Avg. RF
-------------------------------------------------------------------------------

74)  cis-1,4-Dichloro-2-butene                  ( )

Ret. Time  19.11 min., Extract & Integrate from  18.61 to  19.61 min.

Signal         Rel Resp.   Pct. Unc.(abs)     Integration
Tgt   75.00                                   *** METH DEFAULT ***
Q1    53.00      79.90         30.0           *** METH DEFAULT ***
Q2    88.00      85.10         30.0           *** METH DEFAULT ***

Lvl ID   Conc (ug/l)  Response
25          25.000         70035
10          10.000         31849
5            5.000         14487
1            1.000          3206
50          50.000        177757
100        100.000            -1
0.5      not used for this compound

Qualifier Peak Analysis ON
Curve Fit: Avg. RF
-------------------------------------------------------------------------------

75)  Bromofluorobenzene (SURR)                  ( )

Ret. Time  20.20 min., Extract & Integrate from  19.70 to  20.70 min.

Signal         Rel Resp.   Pct. Unc.(abs)     Integration
Tgt   95.00                                   *** METH DEFAULT ***
Q1   174.00      68.90         30.0           *** METH DEFAULT ***
Q2   176.00      63.40         30.0           *** METH DEFAULT ***

Lvl ID   Conc (ug/l)  Response
25          25.000        618813
10          10.000        249771
5            5.000        113774
1            1.000         20232
50          50.000       1303299
100        100.000       2673692
0.5          0.500          8751

Qualifier Peak Analysis ON
Curve Fit: Avg. RF
-------------------------------------------------------------------------------

76)  1,4 Dichlorobenzene-D4                     (ISTD)

Ret. Time  22.11 min., Extract & Integrate from  21.61 to  22.61 min.

Signal         Rel Resp.   Pct. Unc.(abs)     Integration
Tgt  152.00                                   *** METH DEFAULT ***
Q1   115.00      76.60         30.0           *** METH DEFAULT ***
Q2   150.00     156.60         30.0           *** METH DEFAULT ***

Lvl ID   Conc (ug/l)  Response
25          25.000        588311
10          25.000        569637
5           25.000        572894
1           25.000        527165
50          25.000        605755
100         25.000        644006
0.5         25.000        505141

Qualifier Peak Analysis ON    ISTD conc:       25.000 ug/l
Curve Fit: Avg. RF
-------------------------------------------------------------------------------
```

```
77)  Trans-1,4-Dichloro-2-Butene                      ( )

Ret. Time  19.75 min., Extract & Integrate from  19.25 to  20.25 min.

Signal         Rel Resp.   Pct. Unc.(abs)     Integration
Tgt   53.00                                   *** METH DEFAULT ***
Q1    88.00      52.00        30.0            *** METH DEFAULT ***
Q2    75.00     147.90        30.0            *** METH DEFAULT ***

Lvl ID   Conc (ug/l)  Response
25          25.000       121372
10          10.000        51739
5            5.000        25474
1            1.000         3142
50          50.000       227308
100        100.000       503763
0.5      not used for this compound

Qualifier Peak Analysis ON
Curve Fit: Avg. RF
----------------------------------------------------------------------------

78)  1,2,3-Trichloropropane                           ( )

Ret. Time  19.69 min., Extract & Integrate from  19.19 to  20.19 min.

Signal         Rel Resp.   Pct. Unc.(abs)     Integration
Tgt   75.00                                   *** METH DEFAULT ***
Q1    77.00      32.10        30.0            *** METH DEFAULT ***
Q2   110.00      46.70        30.0            *** METH DEFAULT ***

Lvl ID   Conc (ug/l)  Response
25          25.000       322230
10          10.000       130377
5            5.000        61639
1            1.000        16957
50          50.000       636122
100        100.000      1399251
0.5      not used for this compound

Qualifier Peak Analysis ON
Curve Fit: Linear
----------------------------------------------------------------------------

79)  Isopropylbenzene                                 ( )

Ret. Time  20.14 min., Extract & Integrate from  19.64 to  20.64 min.

Signal         Rel Resp.   Pct. Unc.(abs)     Integration
Tgt  105.00                                   *** METH DEFAULT ***
Q1   120.00      27.20        30.0            *** METH DEFAULT ***

Lvl ID   Conc (ug/l)  Response
25          25.000      1594156
10          10.000       590306
5            5.000       243620
1            1.000        33892
50          50.000      3528560
100        100.000      7744816
0.5      not used for this compound

Qualifier Peak Analysis ON
Curve Fit: Linear
----------------------------------------------------------------------------

80)  Bromobenzene                                     ( )

Ret. Time  20.55 min., Extract & Integrate from  20.05 to  21.05 min.
```

```
Signal        Rel Resp.   Pct. Unc.(abs)    Integration
Tgt  156.00                                 *** METH DEFAULT ***
Q1    77.00     104.60       30.0           *** METH DEFAULT ***
Q2   158.00      98.30       30.0           *** METH DEFAULT ***

Lvl ID   Conc (ug/l)  Response
25          25.000      487021
10          10.000      186519
5            5.000       81412
1            1.000       15101
50          50.000     1085416
100        100.000     2405392
0.5      not used for this compound

Qualifier Peak Analysis ON
Curve Fit: Avg. RF
-----------------------------------------------------------------------------

81)  1,1,2,2-Tetrachloroethane                        ( )

Ret. Time  19.41 min., Extract & Integrate from  18.91 to  19.91 min.

Signal        Rel Resp.   Pct. Unc.(abs)    Integration
Tgt   83.00                                 *** METH DEFAULT ***
Q1   131.00      12.30       30.0           *** METH DEFAULT ***
Q2    85.00      63.10       30.0           *** METH DEFAULT ***

Lvl ID   Conc (ug/l)  Response
25          25.000      417593
10          10.000      181461
5            5.000       88743
1            1.000       21859
50          50.000      895802
100        100.000     1844826
0.5          0.500       11426

Qualifier Peak Analysis ON
Curve Fit: Linear
-----------------------------------------------------------------------------

82)  n-Propylbenzene                                  ( )

Ret. Time  20.87 min., Extract & Integrate from  20.37 to  21.37 min.

Signal        Rel Resp.   Pct. Unc.(abs)    Integration
Tgt   91.00                                 *** METH DEFAULT ***
Q1   120.00      25.90       30.0           *** METH DEFAULT ***

Lvl ID   Conc (ug/l)  Response
25          25.000     2113209
10          10.000      787297
5            5.000      337422
1            1.000       49059
50          50.000     4566162
100        100.000     9961710
0.5      not used for this compound

Qualifier Peak Analysis ON
Curve Fit: Linear
-----------------------------------------------------------------------------

83)  2-Chlorotoluene                                  ( )

Ret. Time  21.00 min., Extract & Integrate from  20.50 to  21.50 min.

Signal        Rel Resp.   Pct. Unc.(abs)    Integration
Tgt   91.00                                 *** METH DEFAULT ***
Q1   126.00      41.80       30.0           *** METH DEFAULT ***
```

```
Lvl ID   Conc (ug/l)  Response
25          25.000      1353830
10          10.000       539378
5            5.000       239869
1            1.000        40555
50          50.000      2800815
100        100.000      5954898
0.5      not used for this compound

Qualifier Peak Analysis ON
Curve Fit: Avg. RF
-------------------------------------------------------------------------------

84)  4-Chlorotoluene                               ( )

Ret. Time  21.12 min., Extract & Integrate from  20.62 to  21.62 min.

Signal        Rel Resp.   Pct. Unc.(abs)    Integration
Tgt   91.00                                 *** METH DEFAULT ***
Q1   126.00     42.70       30.0            *** METH DEFAULT ***

Lvl ID   Conc (ug/l)  Response
25          25.000      1420409
10          10.000       558637
5            5.000       249781
1            1.000        39577
50          50.000      2921318
100        100.000      6131601
0.5      not used for this compound

Qualifier Peak Analysis ON
Curve Fit: Avg. RF
-------------------------------------------------------------------------------

85)  1,3,5-Trimethylbenzene                        ( )

Ret. Time  21.31 min., Extract & Integrate from  20.81 to  21.81 min.

Signal        Rel Resp.   Pct. Unc.(abs)    Integration
Tgt  105.00                                 *** METH DEFAULT ***
Q1   120.00     58.70       30.0            *** METH DEFAULT ***

Lvl ID   Conc (ug/l)  Response
25          25.000      1362287
10          10.000       526400
5            5.000       222983
1            1.000        28916
50          50.000      2882721
100        100.000      6254356
0.5      not used for this compound

Qualifier Peak Analysis ON
Curve Fit: Linear
-------------------------------------------------------------------------------

86)  Pentachloroethane                             ( )

Ret. Time  21.39 min., Extract & Integrate from  20.89 to  21.89 min.

Signal        Rel Resp.   Pct. Unc.(abs)    Integration
Tgt  119.00                                 *** METH DEFAULT ***
Q1   117.00    105.30       30.0            *** METH DEFAULT ***
Q2   167.00     84.50       30.0            *** METH DEFAULT ***

Lvl ID   Conc (ug/l)  Response
25          25.000       288430
10          10.000       119191
5            5.000        56051
1            1.000        11799
```

```
50           50.000       616309
100         100.000      1338507
0.5       not used for this compound

Qualifier Peak Analysis ON
Curve Fit: Avg. RF
-----------------------------------------------------------------------------

87)  tert-Butylbenzene                        ( )

Ret. Time  21.68 min., Extract & Integrate from  21.18 to  22.18 min.

Signal        Rel Resp.   Pct. Unc.(abs)    Integration
Tgt  119.00                                 *** METH DEFAULT ***
Q1    91.00     52.00       30.0            *** METH DEFAULT ***
Q2   134.00     23.50       30.0            *** METH DEFAULT ***

Lvl ID   Conc (ug/l)  Response
25           25.000      1093230
10           10.000       422799
5             5.000       175015
1             1.000        23912
50           50.000      2385444
100         100.000      5211855
0.5       not used for this compound

Qualifier Peak Analysis ON
Curve Fit: Linear
-----------------------------------------------------------------------------

88)  1,2,4-Trimethylbenzene                   ( )

Ret. Time  21.83 min., Extract & Integrate from  21.33 to  22.33 min.

Signal        Rel Resp.   Pct. Unc.(abs)    Integration
Tgt  105.00                                 *** METH DEFAULT ***
Q1   120.00     50.30       30.0            *** METH DEFAULT ***

Lvl ID   Conc (ug/l)  Response
25           25.000      1427065
10           10.000       544152
5             5.000       238792
1             1.000        32487
50           50.000      3002805
100         100.000      6409908
0.5       not used for this compound

Qualifier Peak Analysis ON
Curve Fit: Linear
-----------------------------------------------------------------------------

89)  sec-Butylbenzene                         ( )

Ret. Time  21.98 min., Extract & Integrate from  21.48 to  22.48 min.

Signal        Rel Resp.   Pct. Unc.(abs)    Integration
Tgt  105.00                                 *** METH DEFAULT ***
Q1   134.00     20.40       30.0            *** METH DEFAULT ***

Lvl ID   Conc (ug/l)  Response
25           25.000      1552406
10           10.000       623645
5             5.000       266416
1             1.000        39345
50           50.000      3273552
100         100.000      7095447
0.5       not used for this compound

Qualifier Peak Analysis ON
```

```
Curve Fit: Avg. RF
------------------------------------------------------------------------------

90)  1,3 Dichlorobenzene                            ( )

Ret. Time  22.07 min., Extract & Integrate from  21.57 to  22.57 min.

Signal         Rel Resp.   Pct. Unc.(abs)     Integration
Tgt  146.00                                   *** METH DEFAULT ***
Q1   111.00      42.50        30.0            *** METH DEFAULT ***
Q2   148.00      64.50        30.0            *** METH DEFAULT ***

Lvl ID   Conc (ug/l)  Response
25          25.000       868503
10          10.000       352801
5            5.000       158563
1            1.000        34723
50          50.000      1824661
100        100.000      3967013
0.5      not used for this compound

Qualifier Peak Analysis ON
Curve Fit: Avg. RF
------------------------------------------------------------------------------

91)  4-Isopropyltoluene                             ( )

Ret. Time  22.22 min., Extract & Integrate from  21.72 to  22.72 min.

Signal         Rel Resp.   Pct. Unc.(abs)     Integration
Tgt  119.00                                   *** METH DEFAULT ***
Q1   134.00      22.60        30.0            *** METH DEFAULT ***
Q2    91.00      18.70        30.0            *** METH DEFAULT ***

Lvl ID   Conc (ug/l)  Response
25          25.000      1378866
10          10.000       529417
5            5.000       238557
1            1.000        38649
50          50.000      2886552
100        100.000      6026376
0.5      not used for this compound

Qualifier Peak Analysis ON
Curve Fit: Avg. RF
------------------------------------------------------------------------------

92)  1,4 Dichlorobenzene                            ( )

Ret. Time  22.16 min., Extract & Integrate from  21.66 to  22.66 min.

Signal         Rel Resp.   Pct. Unc.(abs)     Integration
Tgt  146.00                                   *** METH DEFAULT ***
Q1   111.00      41.20        30.0            *** METH DEFAULT ***
Q2   148.00      63.70        30.0            *** METH DEFAULT ***

Lvl ID   Conc (ug/l)  Response
25          25.000       899117
10          10.000       367083
5            5.000       178481
1            1.000        39315
50          50.000      1815588
100        100.000      4043026
0.5      not used for this compound

Qualifier Peak Analysis ON
Curve Fit: Avg. RF
------------------------------------------------------------------------------
```

```
93)  n-Butylbenzene                              ( )

Ret. Time  22.77 min., Extract & Integrate from  22.27 to  23.27 min.

Signal         Rel Resp.   Pct. Unc.(abs)     Integration
Tgt   91.00                                   *** METH DEFAULT ***
Q1    92.00     59.50        30.0             *** METH DEFAULT ***
Q2   134.00     27.60        30.0             *** METH DEFAULT ***

Lvl ID   Conc (ug/l)  Response
25          25.000      1220286
10          10.000       481734
5            5.000       216979
1            1.000        36480
50          50.000      2534892
100        100.000      5411888
0.5      not used for this compound

Qualifier Peak Analysis ON
Curve Fit: Avg. RF
-----------------------------------------------------------------------------

94)  1,2 Dichlorobenzene                         ( )

Ret. Time  22.64 min., Extract & Integrate from  22.14 to  23.14 min.

Signal         Rel Resp.   Pct. Unc.(abs)     Integration
Tgt  146.00                                   *** METH DEFAULT ***
Q1   111.00     42.90        30.0             *** METH DEFAULT ***
Q2   148.00     63.90        30.0             *** METH DEFAULT ***

Lvl ID   Conc (ug/l)  Response
25          25.000       764113
10          10.000       305758
5            5.000       139625
1            1.000        28586
50          50.000      1623859
100        100.000      3622555
0.5      not used for this compound

Qualifier Peak Analysis ON
Curve Fit: Avg. RF
-----------------------------------------------------------------------------

95)  1,2-Dibromo-3-Chloropropane                 ( )

Ret. Time  23.26 min., Extract & Integrate from  22.76 to  23.76 min.

Signal         Rel Resp.   Pct. Unc.(abs)     Integration
Tgt   75.00                                   *** METH DEFAULT ***
Q1   155.00    129.90        30.0             *** METH DEFAULT ***
Q2   157.00    166.10        30.0             *** METH DEFAULT ***

Lvl ID   Conc (ug/l)  Response
25          25.000        59974
10          10.000        26954
5            5.000        14735
1            1.000           -1
50          50.000       122449
100        100.000       268077
0.5      not used for this compound

Qualifier Peak Analysis ON
Curve Fit: Avg. RF
-----------------------------------------------------------------------------

96)  Hexachloroethane                            ( )

Ret. Time  23.35 min., Extract & Integrate from  22.85 to  23.85 min.
```

```
Signal        Rel Resp.   Pct. Unc.(abs)    Integration
Tgt  117.00                                 *** METH DEFAULT ***
Q1   119.00     98.30        30.0           *** METH DEFAULT ***
Q2   201.00     35.70        30.0           *** METH DEFAULT ***

Lvl ID   Conc (ug/l)  Response
25          25.000       241403
10          10.000        98031
5            5.000        44965
1            1.000         8703
50          50.000       541780
100        100.000      1239041
0.5      not used for this compound

Qualifier Peak Analysis ON
Curve Fit: Avg. RF
---------------------------------------------------------------------------

97)  1,2,4-Trichlorobenzene                         ( )

Ret. Time  25.18 min., Extract & Integrate from  24.68 to  25.68 min.

Signal        Rel Resp.   Pct. Unc.(abs)    Integration
Tgt  180.00                                 *** METH DEFAULT ***
Q1   182.00     88.60        30.0           *** METH DEFAULT ***
Q2   145.00     39.70        30.0           *** METH DEFAULT ***

Lvl ID   Conc (ug/l)  Response
25          25.000       450909
10          10.000       185804
5            5.000        83302
1            1.000        17048
50          50.000       995540
100        100.000      2279041
0.5      not used for this compound

Qualifier Peak Analysis ON
Curve Fit: Avg. RF
---------------------------------------------------------------------------

98)  Hexachlorobutadiene                            ( )

Ret. Time  25.65 min., Extract & Integrate from  25.15 to  26.15 min.

Signal        Rel Resp.   Pct. Unc.(abs)    Integration
Tgt  225.00                                 *** METH DEFAULT ***
Q1   223.00     59.00        30.0           *** METH DEFAULT ***
Q2   227.00     59.90        30.0           *** METH DEFAULT ***

Lvl ID   Conc (ug/l)  Response
25          25.000       174024
10          10.000        78851
5            5.000        39992
1            1.000        10151
50          50.000       366529
100        100.000       831959
0.5          0.500         3888

Qualifier Peak Analysis ON
Curve Fit: Linear
---------------------------------------------------------------------------

99)  Naphthalene                                    ( )

Ret. Time  25.57 min., Extract & Integrate from  25.07 to  26.07 min.

Signal        Rel Resp.   Pct. Unc.(abs)    Integration
Tgt  128.00                                 *** METH DEFAULT ***
```

```
Lvl ID   Conc (ug/l)  Response
25          25.000      706440
10          10.000      293145
5            5.000      128247
1            1.000       27241
50          50.000     1634760
100        100.000     3893262
0.5      not used for this compound

Qualifier Peak Analysis ON
Curve Fit: Avg. RF
------------------------------------------------------------------------------

100)  1,2,3-Trichlorobenzene                       ( )

Ret. Time  25.88 min., Extract & Integrate from  25.38 to  26.38 min.

Signal        Rel Resp.   Pct. Unc.(abs)    Integration
Tgt  180.00                                 *** METH DEFAULT ***
Q1   182.00     90.30        30.0           *** METH DEFAULT ***
Q2   145.00     41.40        30.0           *** METH DEFAULT ***

Lvl ID   Conc (ug/l)  Response
25          25.000      369683
10          10.000      161568
5            5.000       77129
1            1.000       16679
50          50.000      828650
100        100.000     1900077
0.5      not used for this compound

Qualifier Peak Analysis ON
Curve Fit: Avg. RF
------------------------------------------------------------------------------



                   END OF DATA ANALYSIS PARAMETERS
                   -------------------------------

                          Wed Aug 31 16:40:37 2005
```

Attachment C

ESS LABORATORY MS-3 RUN LOG

BATCH DATE	VIAL #	FILE #	LAB ID	METHOD	COMMENTS / DILUTION /STANDARD ID	ANALYST
		M3				
		M3				
		M3				
		M3				
		M3				
		M3				
		M3				
		M3				
		M3				
		M3				
		M3				
		M3				
		M3				
		M3				
		M3				
		M3				
		M3				

Run Sequence Confirmation ____________________

Surrogate: ____________________

On-column IS: ____________________

Control Number 20.0020-0604A

All Standards must be noted with a primary or secondary ID

Page______

Page ________ of ________

VOA Analysis Map

Analysis ______________________________ ESS Work Order/Samples ______________________________

ESS Sample ID	Instr	Directory[1]	File #	Dil	Batch	Sequence	Cal #	RPT	Samp wt/ Vol/ Comments

Comments[2]: ______________________________

VOC Spike ID: ____________ Spike Amt: ____________ Final Volume: ____________

Analyst__________ Date:____

Reviewed by:__________(second review includes a check and approval of manual integrations)

[1] Q:/VOA/"Instr"/
[2] All QC SOP compliant unless otherwise noted.