BT^2 inc.

Environmental Engineering and Science

November 2, 2004

RECEIVED
NOV - 3 2004
DNR
SOUTH CENTRAL REGION

Mr. Hank Kuehling
Wisconsin Department of Natural Resources
3911 Fish Hatchery Road
Fitchburg, WI 53711

SUBJECT: Revisions to: Site Quality Assurance &Quality Control Plan
Site Health and Safety Plan
Refuse Hideaway Landfill
7562 Hwy. 14, Middleton, WI
WDNR License #01953
U.S. EPA Site #WID 980610604
BT^2 Project #2785

Dear Mr. Kuehling:

As required in Section II Specified Tasks of the Specifications/Work Scope, revised March 2004, for the above referenced site, BT^2 is submitting revisions to the Site Quality Assurance & Quality Control Plan along with a new Site Health & Safety Plan.

Please insert the revisions included with this cover letter to the current Site Quality Assurance & Quality Control Plan. We have prepared a new Site Health & Safety Plan. Please contact us at (608) 224-2830 if you have any questions.

Sincerely,
BT^2, Inc.

Steven B. Smith

Steven B. Smith
Environmental Specialist

Leslie Busse

Leslie A. Busse, P.E.
Project Manager

Enclosure: Revisions to the Site Quality Assurance & Quality Control Plan
Site Health & Safety Plan

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Environmental Engineering and Science

REVISIONS
QUALITY ASSURANCE AND SAMPLING PLAN

Refuse Hideaway Landfill
WDNR License No. 01953
U.S. EPA Site ID# WID 980610604
U.S. Highway 14, Middleton, WI

Prepared By:
BT^2, Inc.
2830 Dairy Drive
Madison, WI 53718
BT^2, Inc. Project #2785

Prepared for:
Wisconsin Department of Natural Resources
3911 Fish Hatchery Road
Fitchburg, WI 53711

October 2004

The Quality Assurance and Sampling Plan for the Refuse Hideaway Landfill was originally prepared by Environmental Sampling Corporation, P.O. Box 12, Muskego, WI 53150 on September 2002. As part of our signed Proposal for Groundwater Monitoring at the Refuse Hideaway, dated April 14, 2004, we agree to follow the sites Quality Assurance and Sampling Plan except where noted below.

Add the following changes to the Quality Assurance and Sampling Plan dated September 2002:

Section 7.0 QA/QC Sampling Procedure
Replace the 3rd bullet in Section 7.0 on page 5 with:
BT^2 will collect one duplicate sample for every 10 samples collected for volatile organic compounds (VOC) analysis.

2002 Monitoring System Summary
Add:
Laboratory Contact: Warren Topel – *TestAmerica, Inc.*, Watertown, WI – Phone # (800) 833-7036
On the 2002 Monitoring System Summary, page 2.

Please contact us at (608) 224-2830 if you have any questions.

Sincerely,
BT^2, Inc.

Steve B. Smith

Steven B. Smith
Environmental Specialist

Leslie Busse

Leslie A. Busse, P.E.
Project Manager

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BT ^{2}, Inc. Health and Safety Plan For BT ^{2}, Inc. Staff

Plan Prepared By: ______ Date: 10/[illegible]/04

Project Manager Approval: Leslie A. Busse Date: 10/29/04

H&S Manager Approval: ______ Date: 10/29/04

This plan is for BT^2, Inc. staff to use on the Refuse Hideaway Landfill Groundwater Monitoring Project #2785, while performing the activities described in this plan. A copy of this plan may be provided to non-BT^2 staff for informational purposes only. It should not be relied upon by non-BT^2 personnel for their own health and safety needs and procedures.

GENERAL INFORMATION

Site Name & Address:	Refuse Hideaway Landfill 7562 Hwy. 14 Middleton, WI 53562 BRRTS # 02-13-000849 (formerly 05-13-113298)
Site Use:	Closed Landfill
BT^2 Project Number:	#2785
Project Description:	Groundwater monitoring, private well monitoring at wells around perimeter of landfill
Site Activities:	Water sampling
Scheduled Dates of Activities:	November 2004
BT^2 On-site Personnel:	Steven Smith - BT^2 Site Safety Officer Terry March
Utilities Locating Service &	NA
Utilities Phone Numbers:	NA

EMERGENCY INFORMATION

Ambulance Response Time:	Under 18 minutes
Nearest Hospital:	University Hospital, 600 Highland Avenue, Madison, WI (Est. Travel Time: 18 minutes) **See attached map**
Directions from Site to Hospital:	Turn **RIGHT** from Site on to US 14 – Go 3.1 miles east Continue on UNIVERSITY AVENUE – Go 4.9 miles Turn **LEFT** on UNIVERSITY BAY DRIVE – Go 0.2 miles Bear **RIGHT** on HIGHLAND AVENUE – Go 0.6 miles Arrive at University Hospital, on the **RIGHT**

Emergency/First Aid Equipment in BT^2 vehicle at the following locations:

First Aid Kit:	Behind seat in truck	Fire Extinguisher:	In bed of truck
Eye Wash:	In bed of truck	MSDS: →	In Vehicle MSDS binder. Additional MSDS attached to this plan (as necessary).

In the event that you observe an unsafe condition, you are to move yourself to a safe location, inform the person responsible for the condition, and ask them to correct the condition. If the person does not correct the condition, you are to contact the project manager or the company safety officer and inform them of the problem.

In the event of an emergency, site personnel will egress along pre-determined routes and assemble in pre-determined areas established during the daily safety meeting. Each day these routes and areas will be discussed for the particular portion of the site where work is to be conducted.

Communication:
No on-site telephone communication is available. A mobile phone will be available in the BT^2 field vehicle for emergency communication. On-site emergency communication procedures will include calling 911 and/or the appropriate emergency response agency listed below.

Mobile phones:
Steven Smith- BT^2: (608) 225-2972

IMPORTANT TELEPHONE NUMBERS

Emergency: Ambulance, Fire, Police	**911**
Middleton Police (non-emergency)	(608) 827-1000
Hospital (University Hospital)	(608) 263-6400
BT^2, Inc. Health & Safety Coordinator (Eric Oelkers)	(608) 223-0404 (Home) 224-2830 (Office)
Client Contact (WDNR Project Manager Hank Kuehling)	(608) 275-3286
Poison Control Center (Madison, WI)	(608) 262-3702 or 1-800-815-8555
OSHA Office (Madison, WI)	(608) 264-5388
Diggers Hotline	1-800-242-8511

SITE / WASTE CHARACTERISTICS:

Expected Waste / Substance Type(s): Liquid X Solid ___ Sludge ___ Gas ___

Characteristics: Ignitable ____ Corrosive ____ Reactive ____
Toxic X Unknown ____ Other (explain below) ____

Highest Known Concentrations and Media

Contaminant	Landfill Gas (ppm)	Groundwater (µg/l)	Leachate (µg/l)
Benzene	2.0	24	56
1,2-Dichloroethylene	ND	620	5
Tetrachloroethylene	26.0	530	ND
Toluene	26.0	3	280
Trichloroethylene	23.3	180	5
Vinyl Chloride	61.0	~~52~~ 200	45

Pathways for Dispersion of Hazardous Materials:	Direct contact

PROJECT HISTORY:

Known soil or groundwater contamination:

Closed Superfund Landfill. Accepted municipal, commercial, and industrial wastes until 1988. The methane gas and leachate collection systems were installed in 1989.

Background and description of any previous investigations or releases:

Soils and on-site and off-site groundwater including private wells are contaminated with various VOCs including TCE, PCE, and vinyl chloride.

POTENTIAL HEALTH AND SAFETY HAZARDS:

Anticipated physical hazards (Those that potentially apply are checked):

X Heat
X Cold
___ Noise
___ Excavation
___ Cave-ins
___ Handling/transferring of petroleum products
X Falls/trips/slipping
___ Vehicle traffic on-site
___ Heavy equipment
___ Physical Trauma/injury from moving machinery
___ Electrical hazards
___ Confined space entry
X Explosion
___ Fire
___ Other (specify)

AIR MONITORING REQUIREMENTS:

Work Area Safety - Air Monitoring

Perform air monitoring in the work area whenever beginning work at a different part of the site, when a new activity is begun, and periodically during all intrusive activities. Calibrate monitoring equipment at the beginning and end of each work day, and during use when obtaining erratic or questionable readings. Allow monitoring wells to vent to the atmosphere and check for expolsive atmosphere at well head before introducing sampling or measurement equipment into the well. **Stop work if the presence of methane causes readings of 10% of the lower explosive limit (LEL), or higher, and call the BT2 Safety Manager. Increase monitoring frequency if readings of 1% of the LEL or higher are observed.** Stop work if instrument is not functioning. Record time and results of monitoring in field notebook and/or on field forms.

If dusty conditions are present consider wearing a respirator with a particulate filter, if necessary.

Air Monitoring Instruments to be used include the following:

[ ] Flame ionization detector
[X] Photo ionization detector with a lamp rating of 10.2 eV or greater.
[X] Other (specify)
Industrial Scientific TSX-410 4-Gas Meter for methane LEL monitoring.
MSA Orion 4-Gas Meter

PERSONAL PROTECTIVE EQUIPMENT (PPE):

See attached table

ACTION LEVELS AND REQUIRED PPE

See attached table (volatiles); for dusty conditions (most likely to be encountered during drilling activities) half face air purifying respirator with dust filter.

POTENTIAL CHEMICAL HAZARD SUMMARY

Chemical	TWA (ppm)	STEL (ppm)	IDLH (ppm)	LEL/UEL (%)	Flash Point	Odor Warning	Carcinogen	Skin/Eye Irritant
Benzene	0.1 NIOSH 1 OSHA	1 NIOSH 5 OSHA	500	1.2/7.8	12°F	100% recognition @ 300 ppm	Yes	Yes
Ethylbenzene	100	125	800	0.8/6.7	55°F	--	No	Yes
Naphthalene	10	15	250	0.9/5.9	174°F	Threshold recognition @ <1 ppb to >10 ppb	No	Yes
Toluene	100 NIOSH 200 OSHA	150	500	1.1/7.1	40°F	100% recognition @ 40 ppm	No	Yes
Xylene	100	150	900	0.9/6.7	81-90°F	100% recognition @ 0.4 to 20 ppm	No	Yes
Tetrachloroethylene	100	300	150	NA/NA	NA	Threshold recognition @ 1 to 10 ppm	Yes	Yes
Trichloroethylene	100	300	1000	8.0/10.5	NA	Threshold recognition @ 10 ppm	Yes	Yes
1,2-Dichloroethylene	200	- -	1000	5.6/12.8	36-39°F	Threshold recognition @ 100 to 1000 ppm	No	Yes
Vinyl Chloride	1	5	NA	3.6/33.0	NA	Threshold recognition @ 1000 ppm to 1%	Yes	Yes

NOTES:

1) Data for specific compounds obtained from NIOSH Pocket Guide to Chemical Hazards (February 2004), unless otherwise noted.
2) Odor warning data obtained from Handbook of Environmental Data on Organic Chemicals (1983), edited by Karel Verschueren, published by Van Nostrand Reinhold, page 45-50.
3) TWA = Time-weighted average..........IDLH = Immediately hazardous to life or health
STEL = Short-term exposure level.......LEL/UEL = Lower/upper exposure level

ACTION LEVELS AND REQUIRED PPE

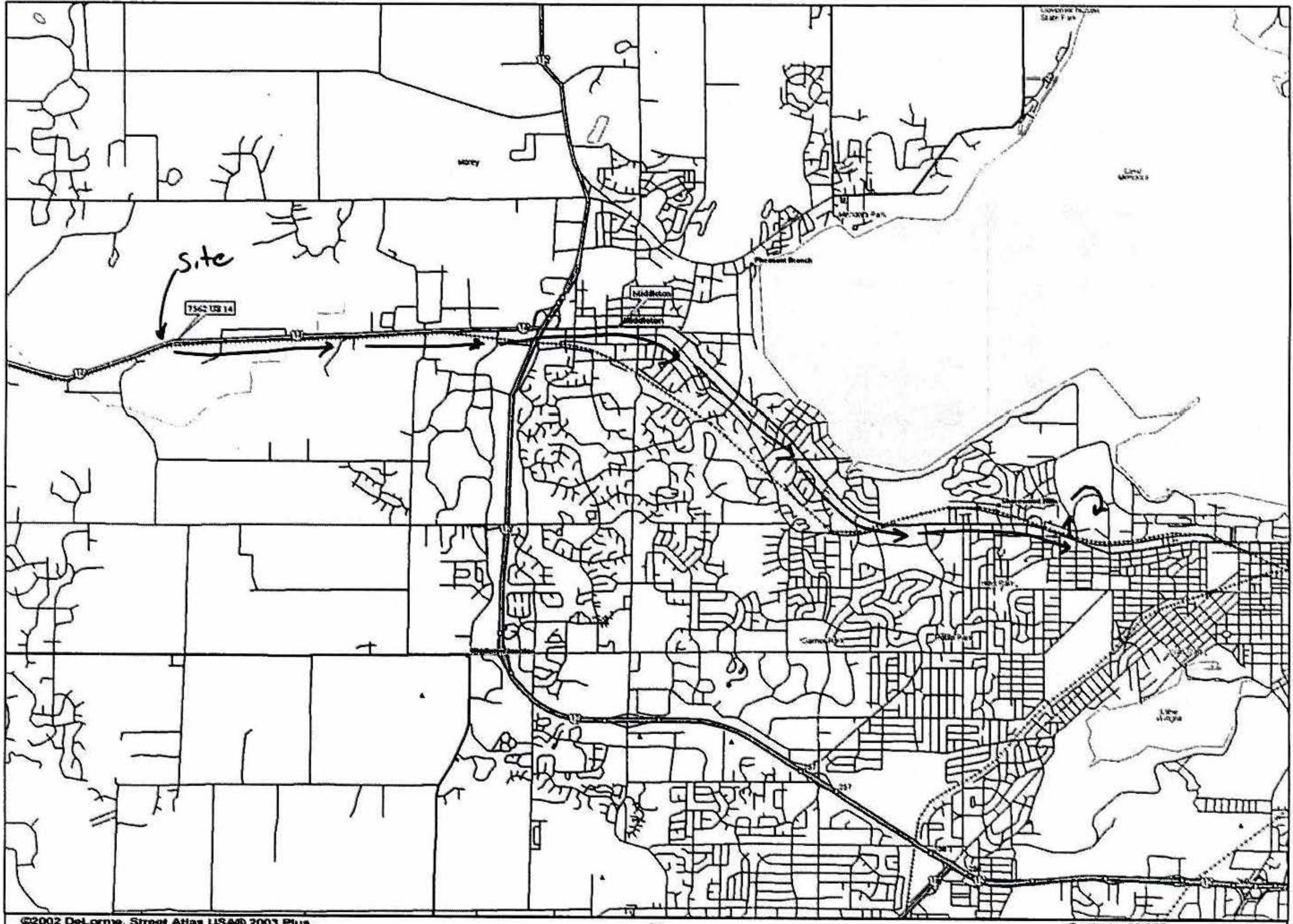
PID Reading in Breathing Zone and LEL	Level of Protection	Required PPE
Background	D	Safety glasses/goggles Steel toe/shank boots Hardhat, when overhead hazards are present Chemical resistant gloves (not latex) Hearing protection, when loud equipment is operating Chemical resistent apron or coveralls when splash hazard exits
Up to 10 units above background, or whenever visible dust is present in the breathing zone.	C	Full or Half-face air purifying respirator (organic vapor with dust filters) Tyvek or other chemical resistent coveralls Wetting should be used for dust suppression All PPE required for level D
Sustained 10 units or more above background.	B	Full-face air purifying respirator (organic vapor with dust filters) Tyvek or other chemical resistent coveralls All PPE required for level D
LEL greater than 10%	Closely monitor levels and inform all personnel of situation.	
LEL greater than 20%.	STOP WORK AND MOVE TO A SAFE AREA.	

ENTRY LEVEL

Initial entry level is **Level D.** Upgrade as needed based on the action levels listed in the above table.

DELORME

Street Atlas USA® 2003 Plus



Scale 1 : 66,667

1" = 1.05 mi

Scale 1 : 23,467

1" = 1960 ft

MANDATORY DAILY SITE SAFETY MEETINGS:

Date: ______________________________ **Project #**______________________

Site:______________________

Location:______________________

Personnel Present: ______________________

____

____

Weather Conditions:______________________

____

____

____

Issues Discussed:______________________

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Incidents:______________________

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Prepared by:______________________
(Signature)

Quality Assurance and Sampling Plan
Site Safety Plan

Refuse Hideaway Landfill
WDNR License No. 01953
Dane County, Wisconsin

Prepared for:
Wisconsin Department of Natural Resources
3911 Fish Hatchery Road
Fitchburg, Wisconsin 53711

Prepared By:
Environmental Sampling Corporation
P.O. Box 12
Muskego, Wisconsin 53150

September 2002

Refuse Hideaway Landfill
WDNR License Number 01953
Dane County, Wisconsin

TABLE OF CONTENTS

Environmental Sampling Corporation
Quality Assurance and Sampling Plan

Refuse Hideaway Landfill
WDNR License Number 01953

Prepared for: Wisconsin Department of Natural Resources,
Fitchburg, Wisconsin

Prepared by: Environmental Sampling Corporation
Muskego, Wisconsin

September 2002

Refuse Hideaway Landfill
WDNR License Number 01953

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Section **Page**

Attachments

1. Refuse Hideaway Landfill Sampling Schedule and Maps
2. ESC Field Information Forms
3. CT Laboratories Standard Operating Procedures for Volatile Organic Compounds by EPA Methods 524.2 and 8260

Environmental Sampling Corporation
Sampling Plan

Refuse Hideaway Landfill
WDNR License Number 01953

1.0 Overview

The Refuse Hideaway Landfill is located in the SW ¼ of the NW ¼ of Section 8, T7N, R8E, Town of Middleton, Dane County, Wisconsin.

The facility's monitoring program currently contains thirty-four (34) groundwater quality monitoring wells, twenty-three (23) groundwater elevation monitoring wells, fourteen (14) private drinking water supply wells, and three (3) surface water staff gauges. The facility also contains one (1) leachate monitoring point, one (1) gas condensate dripleg, one (1) gas blower, thirteen (13) gas extraction wells, and eleven (11) gas probes. The monitoring frequency and parameter lists for each monitoring point are included in Attachment 1. Monitoring of the groundwater monitoring wells, private drinking water supply wells, and staff gauges are described in this sampling plan. Monitoring procedures for the leachate, landfill gas, and gas condensate monitoring locations are included in the Landfill Gas and Leachate Operation and Maintenance Quality Assurance Plan for the Refuse Hideaway Landfill, prepared by SCS Field Services, Inc. and dated July 25, 1997.

A map showing the groundwater monitoring point locations is also included in Attachment 1.

2.0 Sampling Plan Summary

The Sampling Plan for the Refuse Hideaway Landfill outlines the approach to be followed to collect representative groundwater samples from the monitoring well network at the facility, and to comply with regulatory requirements established in NR 507.16, Wis. Adm. Code. Procedures for collecting, preserving, and handling samples from each of the monitoring points are discussed in the following sections

The sampling plan indicates the following procedures and techniques:

- Field Measurements
- Purging Procedures
- Sampling Procedures
- Sample Shipment
- QA/QC Sampling Procedures
- Chain-of-Custody

3.0 Field Measurements

3.1 Groundwater Elevations

Static water levels are measured at site monitoring wells prior to conducting purging or sampling activities. Groundwater elevations are determined from the field water level measurements. All water levels should be measured during each event to avoid variations in groundwater levels that could preclude making an accurate determination of groundwater flow rate and direction. The water level indicator should be a portable electronic device or equivalent, which signals by audio or light signal when the probe contacts the water. ESC typically uses a Solinst electronic water tape. The water level measurement is recorded to the nearest 0.01 foot. The water level measurement, top-of-casing elevation, total depth, and groundwater elevation are recorded on the ESC Field Information Form (Attachment 2). The water level indicator is decontaminated between wells using deionized water.

Water levels are not typically measured at private water supply wells.

3.2 Surface Water Elevations

Staff gauge readings are recorded from the dedicated staff gauges located at each sample location. Readings are recorded to the 0.01-foot and surface water elevations are determined based on survey data. The staff gauge reading, base of gauge elevation, and surface water elevation are recorded on the ESC Field Information Form.

3.3 Field Parameters

Temperature, specific conductance, and pH are measured at monitoring wells following purging, prior to sampling activities. Temperature is measured using an electronic device accurate to ± 1 ° C. Specific conductance is measured using a meter with automatic temperature correction and a range of approximately 0 to 50,000 µmhos. pH is measured using an electronic device accurate to 0.05 standard pH units (SU). Meters are decontaminated using deionized water between wells. Instruments are properly calibrated and checked with standards according to the manufacturer's specifications on a daily basis. Any instrument malfunctions are noted. Improperly operating instruments are repaired or replaced and re-calibrated prior to continuing sampling operations.

Turbidity and color are visually described and unusual odors are noted. Information is recorded on the ESC Field Information Form.

4.0 Purging Procedures

4.1 Monitoring Well Purging Procedures

Upon arrival at the well location, the condition of the well is observed and documented on the ESC Field Information Form. Information to be noted includes the following:

- Condition of the well's identification sign, tag, or label
- Appearance of the well
- Condition of the lock and key
- Well integrity, including: condition of the well, protective casing, and surface seal
- Any physical problems, including: obstructions or kinks in the casing, and water in the annulus
- Weather conditions (i.e., wind speed and direction, temperature, overview, and documentation of any physical activities upwind of the sampling location)
- Evidence of any surface contamination

The static water level is measured as described previously, prior to the start of purging activities. The monitoring well purging system to be used consists of dedicated bladder pumps or dedicated bailers. The monitoring well is purged to dryness or until the equivalent of four standing-water volumes (calculated from the depth to water and well depth) is removed from the well prior to sampling. This procedure insures that samples are drawn from the aquifer, not from stagnant water left in the well between sampling events. Several of the deeper monitoring wells contain dedicated packers that help to reduce the purge volume. The water level field form (Attachment 2) identifies the type of equipment contained in each well. Contaminated purge water is containerized and disposed of in the leachate collection tank located on the landfill site.

If a monitoring well does not recharge sufficiently to allow sampling within a reasonable time period (48 hours), the well is considered "dry" for the sampling event. All results of the purging operation are documented on the ESC Field Information Form.

Wells are sampled immediately upon completion of purging activities. If additional time is necessary for wells to recharge to provide a sufficient volume of water required for analysis, this is documented on the ESC Field Information Form.

4.2 Private Water Supply Well Purging Procedures

Upon arrival at the private well location, the condition of the well is observed and documented on the ESC Field Information Form. Information to be noted includes the following:

- Condition of the private well (i.e. cracked casing or cover)
- Condition of sample location
- Weather conditions (i.e., wind speed and direction, temperature, overview, and documentation of any physical activities upwind of the sampling location)
- Evidence of any surface contamination

The private water supply well is purged from the faucet or spigot closest to the well. The private well is purged for approximately 20 minutes. This procedure insures that the sample is drawn from the aquifer, not from stagnant water left in the household plumbing. All results of the purging operation are documented on the ESC Field Information Form. Wells are sampled immediately upon completion of purging activities.

5.0 Sample Collection

5.1 Monitoring Well Sample Collection

The monitoring well sampling system at the site consists of dedicated bladder pumps or dedicated bailers. Groundwater samples are collected starting with upgradient wells and continuing progressively downgradient. Data from the previous round of groundwater level measurements are used to evaluate the direction of groundwater flow.

Groundwater monitoring wells at the site are analyzed for volatile organic compounds (VOCs). Two groundwater monitoring wells are analyzed for VOCs by EPA Method 524.2 (typically used for drinking water samples); all other groundwater wells are analyzed for VOCs by EPA Method 8260. The laboratory's Standard Operating Procedures for analysis of VOCs by Methods 524.2 and 8260 are included in Attachment 3. VOC samples are collected at the lowest flow possible (<100 ml / min.) in order to provide high-quality, representative, and consistent data. Samples are placed in new pre-preserved vials provided by the laboratory. VOC samples are not field filtered.

A separate container is filled for the temperature, pH, specific conductance, and other field parameters. These field parameters are measured as described previously. All results are documented on the ESC Field Information Form.

5.2 Private Drinking Water Supply Well Sample Collection

The private wells are analyzed for VOCs by EPA Method 524.2. VOC samples are collected at the lowest flow possible (<100 ml/min.) in order to provide high-quality, representative, and consistent data. Samples are placed in new pre-preserved containers provided by the laboratory. VOC samples are not field filtered.

A separate container is filled for the temperature, pH, specific conductance, and other field parameters. These field parameters are measured as described previously. All results are documented on the ESC Field Information Form.

6.0 Sample Shipment

Groundwater and private well samples are placed on ice in coolers immediately after sample collection and maintained at a temperature of 4 °C. ESC Field Information Forms and signed laboratory Chain-of-Custody Forms are also placed in this cooler. Sample coolers are delivered to the laboratory as soon as possible (within 24 hours).

7.0 QA/QC Sampling Procedures

The following QA/QC samples are collected as part of the monitoring program:

- One temperature blank is included with each cooler;
- One field blank is collected at every round;
- One duplicate sample is collected for every twenty samples collected;
- One laboratory trip blank is included with each cooler for volatile organic compounds (VOCs).

Temperature blanks are provided by the laboratory and included with each cooler. Temperature blanks insure that samples are maintained at or below 4 °C upon arrival to the laboratory.

Field blank samples are prepared in the field at a routine sample collection point during a monitoring event by filling the pre-preserved sample containers with deionized water. The field blank is analyzed for contamination that may occur due to site ambient air conditions, sample containers, coolers, cleaning procedures, or preservatives.

A field duplicate is an extra set of samples collected at a random monitoring point and labeled as "DUP". This is an additional sample collected from the same source, stored in separate containers, and analyzed independently. The samples shall be collected in proper alternating order for the sample point and field duplicate for each parameter. Field duplicates are used to document the precision of the sampling and analytical process.

Laboratory VOC trip blanks are sent from the laboratory with the original bottle shipment and shall remain with the samples during sample collection and sample shipment. Trip blanks are analyzed for contamination that may occur due to sample shipment, sample preservatives, or exposure to contaminants after collection.

8.0 Chain-of-Custody Procedures

At the time each sample is collected, a laboratory Chain-of-Custody Form is completed and placed in the cooler. With the transfer of sample possession to a subsequent custodian, the person taking custody of the cooler signs the Chain-of-Custody Form. Upon receipt of the samples at the laboratory, the condition of the samples, date, time, cooler number, temperature, and seal number are recorded by the receiver. The Chain-of-Custody records are included in the analytical report prepared by the laboratory, and are consolidated as an integral part of that report.

As part of the Chain-Of-Custody procedure, each sample container is labeled with the sample ID number, bottle type and size, preservative, and filtering requirements.

Attachment 1

Refuse Hideaway Landfill Sampling Schedule and Maps

REFUSE HIDEAWAY LANDFILL
DANE COUNTY, WI
2002 MONITORING SYSTEM SUMMARY - 05/02

GROUNDWATER

TASK	MONITORING POINTS	PARAMETERS	FREQUENCY
I.	P-1D, P-1S, P-3S, P-4S, P-8BR, P-8D, P-8S, P-9D, P-9S, P-18S, P-21D, P-23D, P-23S, P-25BR, P-25D, P-25S, P-28S, P-30S, P-33D, P-33S, P-36D, P-36S, P-38S, P-39S, P-40S, P-41S, P-42S, PW-Sather*	groundwater elevation (ft MSL)	May 2002 (then every third year - next event in 2005)
II.	P-16S, P-16D, P-17S, P-20SR, P-21S, P-21D, P-21BR, P-22D, P-22S, P-24D, P-24E, P-25S, P-25D, P-25BR, P-26S, P-26D, P-27D, P-27S, P-29S, P-30D, P-30I**, P-31D, P-31IA, P-31IB, P-31S, P-32S, P-32D, P-34S, P-34D, P-35S, P-35D, P-40D, P-40I, P-41D**, DUP-01, FB-01	groundwater elevation (ft. MSL), field pH, field conductivity, field temperature, VOCs (8260) (** Use VOCs by 524.2 for PW-30I and PW41D.)	May 2002 (then every third year - next event in 2005)
III.	P-1D, P-1S, P-3S, P-4S, P-8BR, P-8D, P-8S, P-9D, P-9S, P-18S, P-21D, P-23D, P-23S, P-25BR, P-25D, P-25S, P-28S, P-30S, P-32D, P-32S, P-33D, P-33S, P-35S, P-35D, P-36D, P-36S, P-38S, P-39S, P-40S, P-41S, P-42S, PW-Sather*	groundwater elevation (ft MSL)	May (2003, 2004, 2006, 2007, etc.)
IV.	P-16S, P-16D, P-17S, P-20SR, P-21S, P-21D, P-21BR, P-22D, P-22S, P-24D, P-24E, P-25S, P-25D, P-25BR, P-26S, P-26D, P-27D, P-27S, P-29S, P-30D, P-30I**, P-31D, P-31IA, P-31IB, P-31S, P-34S, P-34D, P-40D, P-40I, P-41D**, DUP-01, FB-01	groundwater elevation (ft. MSL), field pH, field conductivity, field temperature, VOCs (8260) (** Use VOCs by 524.2 for PW-30I and PW41D.)	May (2003, 2004, 2006, 2007, etc.)
V.	P-1D, P-1S, P-3S, P-4S, P-8BR, P-8D, P-8S, P-9D, P-9S, P-16D, P-16S, P-18S, P-21BR, P-21D, P-23D, P-23S, P-24D, P-25BR, P-25D, P-25S, P-26D, P-26S, P-28S, P-29S, P-30S, P-32D, P-32S, P-33D, P-33S, P-34S, P-34D, P-35S, P-35D, P-36D, P-36S, P-38S, P-39S, P-40S, P-41S, P-42S, PW-Sather*	groundwater elevation (ft MSL)	November
VI.	P-17S, P-20SR, P-21S, P-21D, P-22D, P-22S, P-25S, P-25D, P-25BR, P-27D, P-27S, P-30D, P-30I**, P-31D, P-31IA, P-31IB, P-31S, P-40D, P-40I, P-41D**, DUP-01, FB-01	groundwater elevation (ft. MSL), field pH, field conductivity, field temperature, VOCs (8260) (**Use VOCs by 524.2 for PW-30I and PW41D.)	November

* = PW-Sather is currently inaccessable for water level measurements due to the condition of the well cap.

REFUSE HIDEAWAY LANDFILL
DANE COUNTY, WI
2002 MONITORING SYSTEM SUMMARY - 05/02

PRIVATE WELLS

TASK	MONITORING POINTS	PARAMETERS	FREQUENCY
I.	PW-Sather, PW-Plummer, PW-Bula, PW-Wheat/Krueger, PW-Tantrow/Thompson, PW-Summers, PW-Noles, PW-Stoppleworth	field pH, field conductivity, field temperature, VOCs (524.2)	May
II.	PW-Sather, PW-Palo/Bowler, PW-Sommers, PW-Foster/Thesen, PW-Durand, PW-Wagner, PW-Rounds, PW-Noles, PW-Stoppleworth	field pH, field conductivity, field temperature, VOCs (524.2)	November

SURFACE WATER

TASK	MONITORING POINTS	PARAMETERS	FREQUENCY
I.	S-1, S-2, S-3	surface water elevation (ft. MSL)	May & November

Contacts:

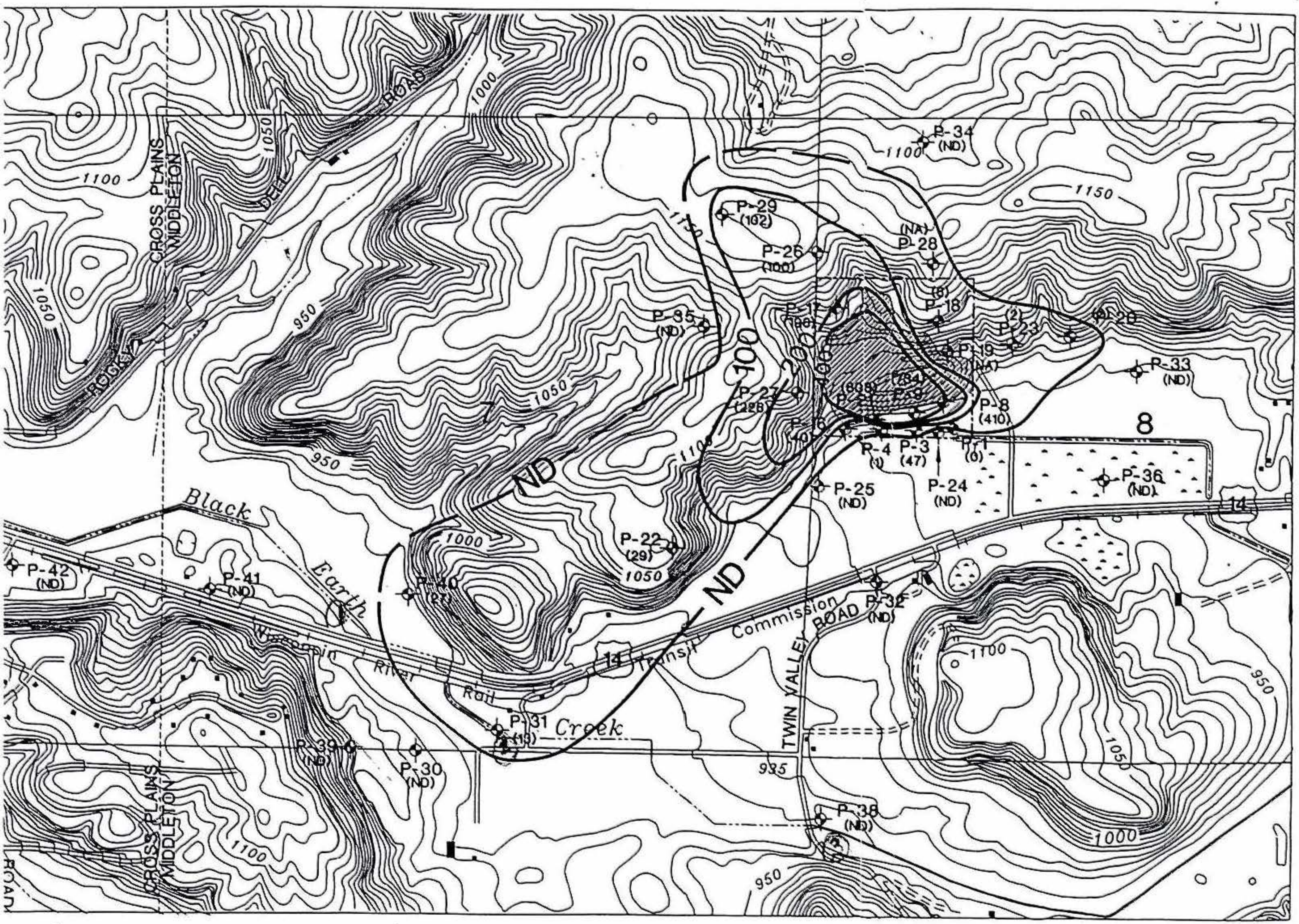
Pat Letterer - CT Laboratory: (800) 228-3012
Hank Kuehling - WDNR: (608) 275-3286

Directions to site:

I94 west to the beltline (HWY 12-18). Exit at Hwy 14 (LaCrosse, Spring Green), turn left. Turn right into driveway before billboard (ShoeBox). 7562 Hwy 14

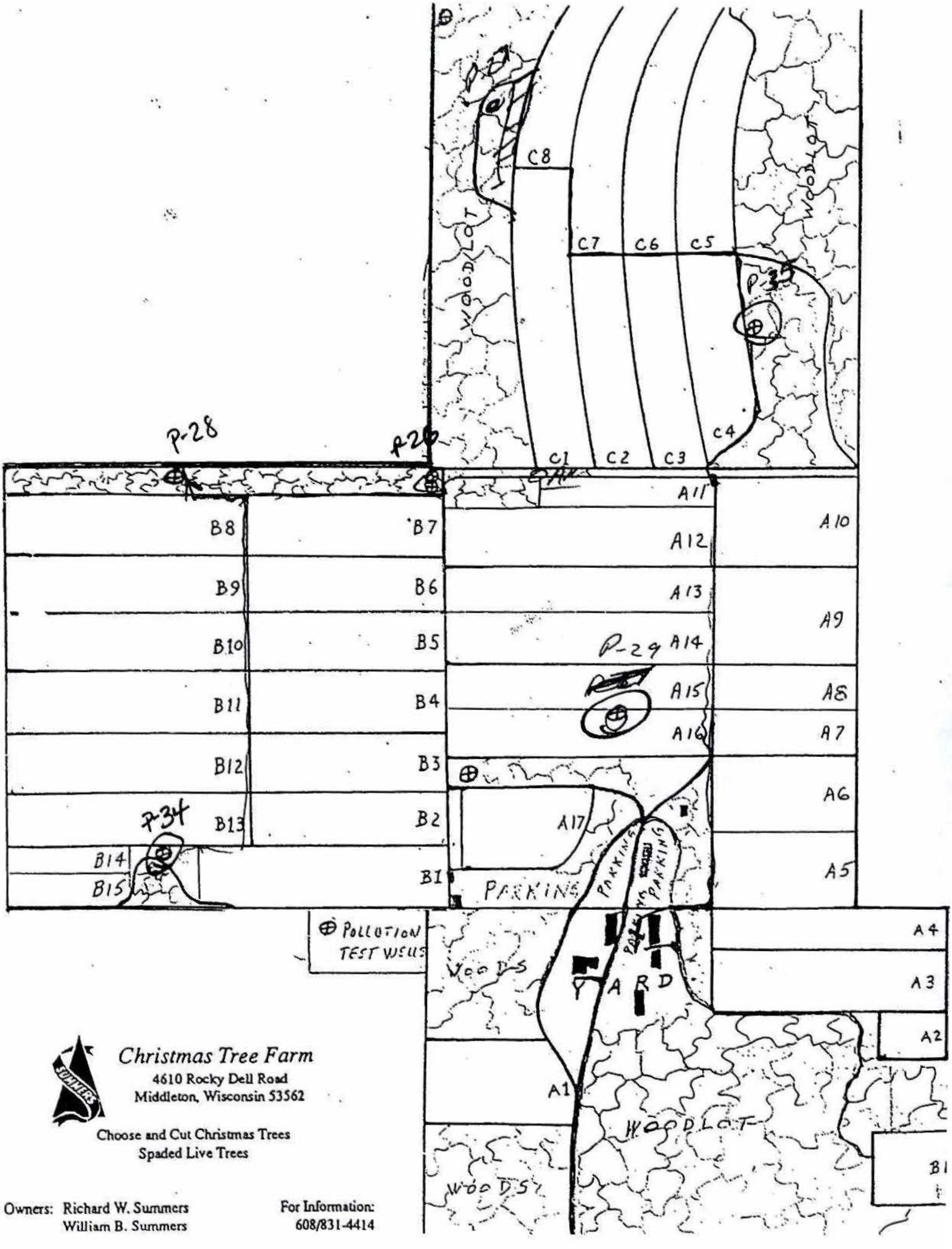
Reporting:

Groundwater and private well monitoring results including elevations (cover letter and analytical) to WDNR in January and July. (ESC)



Refuse Hideaway Landfill - License # 01953

Xs - ①



Christmas Tree Farm

4610 Rocky Dell Road
Middleton, Wisconsin 53562

Choose and Cut Christmas Trees
Spaded Live Trees

Owners: Richard W. Summers
William B. Summers

For Information:
608/831-4414

Attachment 2

ESC Field Information Forms

ENVIRONMENTAL SAMPLING CORP. GROUNDWATER MONITORING FIELD FORM
MONTH____________, 2002

Purging Phase****************************										***Sampling Phase******************************										
Well I.D.	Date 2002	Time (24 hrs.)	Top of Well Elevation (msl-ft.)	Depth to H_2O (ft.)	Ground Water Elevation (msl-ft.)	Total Depth (ft.)	Height of Water Col. (ft.)	Req. Gals. to Purge (4 vols.)	Amount Purged (gal.)	Date 2002	Time (24 hrs.)	pH (STD)	Spec. Cond. at (25°C)	Temp (°C)	Color Before Filter	Color After Filter	Odor	Turb Before Filter	Turb After Filter	Number of Filters Used
P-17S			1081.75			158.8														
P-20SR			961.78			64.4														
P-21S			936.43			19.6														
P-22D			1088.94			217.3														
P-22S			1088.20			185.2														
P-27D			1095.56			204.3														
P-27S			1095.23			188.8														
P-29S			1163.10			253.1														
P-30D			932.97			287.4														
P-30I			930.94			140.7														
P-31D			915.71			255.9														
P-31IA			916.77			93.2														
P-31IB			916.49			132.7														

*Casing I.D. (inches) <=> Gallons per Foot to Get 1 Well Volume.
1.5" Well <=> 0.092 gal. 2" Well <=> 0.163 gal. 3" Well <=> 0.377 4" <=> 0.653 gal.

Weather: Wind Speed____________ Direction____________ Temp.____________
Date: Overview:

Other Remarks: ________________________________

Date Equipment Used:
pH Meter:____________ pH7.0 =________ pH 4.0 =________ Slope=________
Spec. Cond. Meter:____________ Standard =______ Reading=________
Temp.:____________ Standard=______ Reading=________

Site Name: Refuse Hideaway Landfill
Site Address: Middleton, WI
ESC Personnel:____________
ESC FF#1

ENVIRONMENTAL SAMPLING CORPORATION
414-427-5033

Client:____________
Project:____________ Page: 1 of 7
Prepared by:____________ Date:________
Checked by:____________ Date:________

ENVIRONMENTAL SAMPLING CORP. GROUNDWATER MONITORING FIELD FORM

MONTH______________, 2002

*********Purging Phase*********										*********Sampling Phase*********										
Well I.D.	Date 2002	Time (24 hrs.)	Top of Well Elevation (msl-ft.)	Depth to H_2O (ft.)	Ground Water Elevation (msl-ft.)	Total Depth (ft.)	Height of Water Col. (ft.)	Req. Gals. to Purge (4 vols.)	Amount Purged (gal.)	Date 2002	Time (24 hrs.)	pH (STD)	Spec. Cond. at (25°C)	Temp (°C)	Color Before Filter	Color After Filter	Odor	Turb Before Filter	Turb After Filter	Number of Filters Used
P-31S			916.59			25.4														
P-34D			1090.98			273.4														
P-34S			1091.10			183.7														
P-35D			1087.70			250.8														
P-35S			1087.90			183.6														
P-40D			922.98			253.5														
P-40I			922.28			102.8														
P-41D			924.82			103.0														
P-1D			926.67																	
P-1S			924.39																	
P-3S			932.79																	
P-4S			929.89																	
P-8BR			929.53																	

*Casing I.D. (inches) <=> Gallons per Foot to Get 1 Well Volume.
1.5" Well <=> 0.092 gal. 2" Well <=> 0.163 gal. 3" Well <=> 0.377 4" <=> 0.653 gal.

Other Remarks: ____________________

Weather: Wind Speed__________ Direction__________ Temp.__________
Date: Overview:

Date Equipment Used:__________
pH Meter:__________ pH7.0 = ______ pH 4.0 = ______ Slope=______
Spec. Cond. Meter:__________ Standard = ______ Reading=______
Temp.:__________ Standard= ______ Reading=______

Site Name: Refuse Hideaway Landfill__________
Site Address: ____ Middleton, WI __________
ESC Personnel:__________
ESC FF#1

ENVIRONMENTAL SAMPLING CORPORATION
414-427-5033

Client: W DNR__________
Project:__________ Page: _2__ of __7__
Prepared by:__________ Date: ______
Checked by:__________ Date: ______

ENVIRONMENTAL SAMPLING CORP. GROUNDWATER MONITORING FIELD FORM

MONTH____________, 2002

******Purging Phase******										******Sampling Phase******										
Well I.D.	Date 2002	Time (24 hrs.)	Top of Well Elevation (msl-ft.)	Depth to H_2O (ft.)	Ground Water Elevation (msl-ft.)	Total Depth (ft.)	Height of Water Col. (ft.)	Req. Gals. to Purge (4 vols.)	Amount Purged (gal.)	Date 2002	Time (24 hrs.)	pH (STD)	Spec. Cond. at (25°C)	Temp (°C)	Color Before Filter	Color After Filter	Odor	Turb Before Filter	Turb After Filter	Number of Filters Used
P-8D			930.98																	
P-8S			932.50																	
P-9D			930.43																	
P-9S			932.09																	
P-16D			936.30																	
P-16S			935.96																	
P-18S			1020.57																	
P-21BR			935.19																	
P-21D			935.81																	
P-23D			961.53																	
P-23S			961.71																	
P-24D			927.25																	
P-24E			927.39																	

*Casing I.D. (inches) <=> Gallons per Foot to Get 1 Well Volume.
1.5" Well <=> 0.092 gal. 2" Well <=> 0.163 gal. 3" Well <=> 0.377 4" <=> 0.653 gal.

Weather: Wind Speed____________ Direction____________ Temp.____________
Date: Overview:

Other Remarks: ____________

Date Equipment Used: ____________
pH Meter:____________ pH7.0 =____________ pH 4.0 =____________ Slope=____________
Spec. Cond. Meter:____________ Standard =______ Reading=____________
Temp.:____________ Standard=______ Reading=____________

Site Name: Refuse Hideaway Landfill
Site Address: Middleton, WI
ESC Personnel:____________
ESC FF#1

ENVIRONMENTAL SAMPLING CORPORATION
414-427-5033

Client:____________
Project:____________ Page: 3 of 7
Prepared by:____________ Date:____________
Checked by:____________ Date:____________

ENVIRONMENTAL SAMPLING CORP. GROUNDWATER MONITORING FIELD FORM

MONTH______________, 2002

Purging Phase******************************

Well I.D.	Date 2002	Time (24 hrs.)	Top of Well Elevation (msl-ft.)	Depth to H_2O (ft.)	Ground Water Elevation (msl-ft.)	Total Depth (ft.)	Height of Water Col. (ft.)	Req. Gals. to Purge (4 vols.)	Amount Purged (gal.)
P-25BR			943.27						
P-25D			943.86						
P-25S			943.14						
P-26D			1149.63						
P-26S			1150.95						
P-28S			1124.33						
P-28D									
P-30S			932.61						
P-32D			942.66						
P-32S			943.73						
P-33D			928.50						
P-33S			928.55						
P-36D			924.34						

Sampling Phase******************************

Date 2002	Time (24 hrs.)	pH (STD)	Spec. Cond. at (25°C)	Temp (°C)	Color Before Filter	Color After Filter	Odor	Turb Before Filter	Turb After Filter	Number of Filters Used

*Casing I.D. (inches) <=> Gallons per Foot to Get 1 Well Volume.
1.5" Well <=> 0.092 gal. 2" Well <=> 0.163 gal. 3" Well <=> 0.377 4" <=> 0.653 gal.

Other Remarks: ____________________

Weather: Wind Speed__________ Direction__________ Temp.__________
Date: Overview:

Date Equipment Used:__________
pH Meter:__________ pH7.0 =__________ pH 4.0 =__________ Slope=__________
Spec. Cond. Meter:__________ Standard =__________ Reading=__________
Temp.:__________ Standard=__________ Reading=__________

Site Name: Refuse Hideaway Landfill__________
Site Address: ______ Middleton, WI __________
ESC Personnel:__________
ESC FF#1

ENVIRONMENTAL SAMPLING CORPORATION
414-427-5033

Client: W DNR__________
Project:__________ Page: __4__ of __7__
Prepared by:__________ Date:__________
Checked by:__________ Date:__________

ENVIRONMENTAL SAMPLING CORP. GROUNDWATER MONITORING FIELD FORM

MONTH______________, 2002

Purging Phase***********************************

Well I.D.	Date 2002	Time (24 hrs.)	Top of Well Elevation (msl-ft.)	Depth to H_2O (ft.)	Ground Water Elevation (msl-ft.)	Total Depth (ft.)	Height of Water Col. (ft.)	Req. Gals. to Purge (4 vols.)	Amount Purged (gal.)
P-36S			924.49						
P-38S			923.21						
P-39S			946.08						
P-40S			922.01						
P-41S			925.58						
P-42S			917.62						
S-1			913.61						
S-2			910.86						
S-3			909.04						
LEACHATE COLLECTION TANK									

Sampling Phase******************************

Date 2002	Time (24 hrs.)	pH (STD)	Spec. Cond. at (25°C)	Temp (°C)	Color Before Filter	Color After Filter	Odor	Turb Before Filter	Turb After Filter	Number of Filters Used

*Casing I.D. (inches) <=> Gallons per Foot to Get 1 Well Volume.
1.5" Well <=> 0.092 gal. 2" Well <=> 0.163 gal. 3" Well <=> 0.377 4" <=> 0.653 gal.

Other Remarks: ____________________

Weather: Wind Speed__________ Direction__________ Temp.__________
Date: Overview:

Date Equipment Used:__________
pH Meter:__________ pH7.0 =__________ pH 4.0 =__________ Slope=__________
Spec. Cond. Meter:__________ Standard =______ Reading=__________
Temp.:__________ Standard=______ Reading=__________

Site Name: Refuse Hideaway Landfill__________
Site Address: ____ Middleton, WI __________
ESC Personnel:__________
ESC FF#1

ENVIRONMENTAL
SAMPLING
CORPORATION
414-427-5033

Client: W DNR__________
Project:__________ Page: __5__ of __7__
Prepared by: __________ Date: __________
Checked by:__________ Date: __________

ENVIRONMENTAL SAMPLING CORP. GROUNDWATER MONITORING FIELD FORM

MONTH____________, 2002

Purging Phase******************************

Well I.D.	Date 2002	Time (24 hrs.)	Top of Well Elevation (msl-ft.)	Depth to H_2O (ft.)	Ground Water Elevation (msl-ft.)	Total Depth (ft.)	Height of Water Col. (ft.)	Req. Gals. to Purge (4 vols.)	Amount Purged (gal.)
PW- Sather									
PW-Plummer									
PW-Bula									
PW-Wheat / Krueger									
PW- Tantro / Thompson									
PW – Summers									
PW-Noles									
PW- Stopplesworth									

Sampling Phase******************************

Well I.D.	Date 2002	Time (24 hrs.)	pH (STD)	Spec. Cond. at (25°C)	Temp (°C)	Color Before Filter	Color After Filter	Odor	Turb Before Filter	Turb After Filter	Number of Filters Used
PW- Sather											
PW-Plummer											
PW-Bula											
PW-Wheat / Krueger											
PW- Tantro / Thompson											
PW – Summers											
PW-Noles											
PW- Stopplesworth											

*Casing I.D. (inches) <=> Gallons per Foot to Get 1 Well Volume.
1.5" Well <=> 0.092 gal. 2" Well <=> 0.163 gal. 3" Well <=> 0.377 4" <=> 0.653 gal.

Weather: Wind Speed________ Direction________ Temp.________
Date: Overview:

Other Remarks: ________________________

Date Equipment Used:________
pH Meter:________ pH7.0 =______ pH 4.0 =______ Slope=______
Spec. Cond. Meter:________ Standard =______ Reading=______
Temp.:________ Standard=______ Reading=______

Site Name: Refuse Hideaway Landfill________
Site Address: ____ Middleton, WI ________
ESC Personnel:________
ESC FF#1

**ENVIRONMENTAL
SAMPLING
CORPORATION
414-427-5033**

Client: W DNR________
Project:________ Page: _6_ of _7_
Prepared by:________ Date: ______
Checked by:________ Date: ______

ENVIRONMENTAL SAMPLING CORP. GROUNDWATER MONITORING FIELD FORM
MONTH__________, 2002

******Purging Phase******											******Sampling Phase******										
Well I.D.	Date 2002	Time (24 hrs.)	Top of Well Elevation (msl-ft.)	Depth to H_2O (ft.)	Ground Water Elevation (msl-ft.)	Total Depth (ft.)	Height of Water Col. (ft.)	Req. Gals. to Purge (4 vols.)	Amount Purged (gal.)	Date 2002	Time (24 hrs.)	pH (STD)	Spec. Cond. at (25°C)	Temp (°C)	Color Before Filter	Color After Filter	Odor	Turb Before Filter	Turb After Filter	Number of Filters Used
PW- Sather																				
PW- Palo / Bowler																				
PW- Sommers																				
PW- Foster / Theesen																				
PW- Durand																				
PW- Wagner																				
PW- Rounds																				
PW-Noles																				
PW- Stopplewortn																				

*Casing I.D. (inches) <=> Gallons per Foot to Get 1 Well Volume.
1.5" Well <=> 0.092 gal. 2" Well <=> 0.163 gal. 3" Well <=> 0.377 4" <=> 0.653 gal.

Other Remarks: ____________________

Weather: Wind Speed__________ Direction__________ Temp.__________
Date: Overview:

Date Equipment Used:____________________
pH Meter:__________ pH7.0 =__________ pH 4.0 =__________ Slope=__________
Spec. Cond. Meter:__________ Standard =______ Reading=__________
Temp.:__________ Standard=______ Reading=__________

Site Name: Refuse Hideaway Landfill__________
Site Address: ____ Middleton, WI __________
ESC Personnel:____________________
ESC FF#1

ENVIRONMENTAL SAMPLING CORPORATION
414-427-5033

Client: W DNR__________
Project:____________________ Page: __7__ of __7__
Prepared by: ____________________ Date: __________
Checked by:____________________ Date: __________

WDNR - REFUSE HIDEAWAY LANDFILL
WATER LEVELS

MONTH__________2002

Well I.D.	Total Depth (ft)	TOC Elevation (msl)	Depth to Water (ft)	Groundwater Elevation (ft/msl)	Equipment in well
P-1D		926.67		926.67	
P-1S		924.39		924.39	
P-3S		932.79		932.79	
P-4S		929.89		929.89	
P-8BR		929.52		929.52	
P-8D		930.98		930.98	
P-8S		932.50		932.50	
P-9D		930.43		930.43	
P-9S		932.09		932.09	
P-16D	42.90	936.30		936.30	None
P-16S	17.20	935.96		935.96	None
P-17S	158.80	1081.75		1081.75	Bladder
P-18S		1020.57		1020.57	
P-20SR	64.40	961.78		961.78	Bailer
P-21BR	148.30	935.19		935.19	None
P-21D	41.60	935.81		935.81	None
P-21S	19.60	936.43		936.43	Bailer
P-22D	217.30	1088.94		1088.94	Bladder/packer
P-22S	185.20	1088.20		1088.20	Bladder
P-23D		961.53		961.53	
P-23S		961.71		961.71	
P-24D	25.20	927.25		927.25	None
P-24E	52.50	927.39		927.39	None
P-25BR	140.30	943.27		943.27	None
P-25D	96.30	943.86		943.86	None
P-25S	29.40	943.14		943.14	None
P-26D	237.60	1149.63		1149.63	None
P-26S	262.10	1150.95		1150.95	None
P-27D	204.30	1095.56		1095.56	Bladder/packer
P-27S	188.80	1095.23		1095.23	Bladder
P-28S		1124.33		1124.33	

Checked by: ______________

Date: ____________________

WDNR - REFUSE HIDEAWAY LANDFILL
WATER LEVELS

MONTH__________2002

Well I.D.	Total Depth (ft)	TOC Elevation (msl)	Depth to Water (ft)	Groundwater Elevation (ft/msl)	Equipment in well
P-29S	253.10	1163.10		1163.10	Bladder
P-30D	287.36	932.97		932.97	Bladder/packer
P-30I	140.70	930.94		930.94	Bladder/packer
P-30S		932.61		932.61	
P-31D	255.90	915.72	*	N/A	Bladder/packer
P-31IA	93.20	916.77	*	N/A	Bladder/packer
P-31IB	132.70	916.49	*	N/A	Bladder/packer
P-31S	25.40	916.59		916.59	Bladder
P-32D	176.20	942.66		942.66	None
P-32S	39.50	943.73		943.73	None
P-33D		928.50		928.50	
P-33S		928.55		928.55	
P-34D	273.40	1090.98		1090.98	Bladder/packer
P-34S	183.70	1091.10		1091.10	Bladder
P-35D	250.80	1087.70		1087.70	Bladder
P-35S	183.60	1087.90		1087.90	Bladder/packer
P-36D		924.34		924.34	
P-36S		924.49		924.49	
P-38S		923.21		923.21	
P-39S		946.08		946.08	
P-40D	253.50	922.98		922.98	Bladder/packer
P-40I	102.80	922.28		922.28	Bladder/packer
P-40S		922.01		922.01	
P-41D	103.00	924.82		924.82	Bladder/packer
P-41S		925.58		925.58	
P-42S		917.62		917.62	
S-1		913.61		913.61	
S-2		910.86		910.86	
S-3		909.04		909.04	

* - Probe could not be inserted due to pump.

Checked by: ______________
Date: ____________________

Attachment 3

CT Laboratories
Standard Operating Procedures for Volatile Organic Compounds
EPA Methods 524.2 and 8260

Analysis of Volatile
Organic Compounds by GC/MS
For Safe Drinking Water

Approved by: *Laboratory Director*

Reviewed by: *Quality Assurance*

1.0 SCOPE/APPLICATION

This method is used to determine volatile organic compounds in drinking water. See Table 1 for analyte list.

The volatile compounds are introduced into gas chromatograph by the purge and trap method. Inert gas is bubbled through the sample to purge the volatile organics onto an adsorbent trap. The analytes on the trap are then desorbed onto a gas chromatograph with mass spectrometer as the detection mechanism.

The purge and trap/GC-MS system is calibrated with known analyte concentrations and internal standards. Both quantitative and qualitative analyses are applicable.

Table 1. Analyte List

Analyte	**Analyte**
Benzene	1,3-Dichloropropane
Bromobenzene	2,2-Dichloropropane
Bromochloromethane	1,1-Dichloropropene
Bromodichloromethane	cis-1,3-Dichloropropene
Bromoform	trans-1,3-Dichloropropene
Bromomethane	Ethylbenzene
n-Butylbenzene	Hexachlorobutadiene
sec-Butylbenzene	Isopropylbenzene
tert-Butylbenzene	p-Isopropyltoluene
Carbon tetrachloride	Methylene chloride
Chlorobenzene	Methyl tert butyl ether
Chloroethane	n-Propylbenzene
Chloroform	Styrene
Chloromethane	1,1,1,2-Tetrachloroethane
2-Chlorotoluene	1,1,2,2-Tetrachloroethane
4-Chlorotoluene	Tetrachloroethene
Chlorodibromomethane	Toluene
1,2-Dibromo-3-chloropropane	1,2,3-Trichlorobenzene
1,2-Dibromoethane	1,2,4-Trichlorobenzene
Dibromomethane	1,1,1-Trichloroethane
	1,1,2-Trichloroethane

1,3-Dichlorobenzene	Trichloroethene
1,4-Dichlorobenzene	Trichlorofluoromethane
Dichlorodifluoromethane	1,2,3-Trichloropropane
1,1-Dichloroethane	1,2,4-Trimethylbenzene
1,2-Dichloroethane	1,3,5-Trimethylbenzene
1,1-Dichloroethene	Vinyl chloride
cis-1,2-Dichloroethene	o-Xylene
trans-1,2-Dichloroethene	m & p-Xylene
1,2-Dichloropropane	

2.0 REFERENCES

2.1 EPA SW-846 Method 524.2

3.0 DEFINITIONS

BFB: 4-bromofluorobenzene
EICP: extracted ion current profile
GC-MS: gas chromatograph-mass spectrometer system
LFB: laboratory fortified blank
LRB: laboratory reagent blank
MDL: method detection limit
RF: response factor
RRT: relative retention time

4.0 SAFETY

4.1 Gloves and protective clothing should be worn to protect against unnecessary exposure to hazardous chemicals and contaminants in samples. All activities performed while following this procedure should utilize appropriate laboratory safety systems.

5.0 METHOD

5.1 APPARATUS & MATERIALS

5.1.1 Sample Containers - 40 mL screw cap vials with a Teflon faced silicone septum preserved with HCl. ("VOA vials")

5.1.2 Purge and Trap System - The purge and trap system consists of three separate pieces of equipment: purging device, trap, and desorber. The current systems are Dynatrap PTA30WS and Tekmar 2000.

5.1.2.1 The glass purging tubes are of 5 mL or 25 mL in size. The all-glass purging device should be designed to accept 25 mL samples with a water column at least 5 cm deep. A smaller (5 mL) purging device is recommended if the GC/MS system has adequate sensitivity to obtain the method detection limits required; however, the 25mL sparge tube has demonstrated acceptable performance.

5.2.2.2 The trap currently used is Supelco Type K. By method, the trap must be at least 25 cm long and have an inside diameter of at least 0.105 inches. Starting from the inlet, the trap should contain 1.0 cm of methyl silicone coated packing and the following amounts of adsorbents: 33% of 2,6-diphenylene oxide polymer, 33% of silica gel, and 33% of coconut charcoal.

5.1.3 Gas Chromatography/Mass Spectrometer/Data System (GC/MS)

5.1.3.1 Column Supelco, 30 Meter x 0.53 mm ID, 1.1 um film thickness

5.1.3.2 Hewlett Packard Series II Gas Chromatograph

5.1.3.3 Hewlett Packard 5972 Mass Spectrometer

5.1.3.4 Hewlett Packard Chem Station Data Management System (version G1701AA v. A.03.00.

5.1.4 Syringes

5.1.4.1 Micro syringes - 10, 25, 50, and 100 μL

5.2 REAGENTS

5.2.1 Purge and trap grade methanol

5.2.2 Reagent grade water, organic free, 18 megaohm quality

5.2.3 Standards and Internal Standards: (see to Table 1)

5.2.4 Tuning standard: 4- bromofluorobenzene (BFB) working solution: 50 ug/mL.

5.3 PROCEDURE

5.3.1 Sample Storage

5.3.1.1 Store sample at ≤ 4°C until analysis. The sample storage area must be free of organic solvent vapors and direct or intense light. Samples are stored in a location separate from analytical standards.

5.3.2.2 Analyze all sample within 14 days of collection. Samples not analyzed within this period must be discarded and recollected. (7 day hold-time if not preserved)

5.3.2 Settings and Requirements For The GC/MS Volatile System

5.3.2.1 The following tables set forth instrument settings for the daily use of the DynaTrap Purge and Trap System:

PARAMETER SETTINGS FOR TEKMAR 2000	
Standby	30° C
Preheat	40° C (soil) NI for water
Purge	11.00 minutes
Dry Purge	0.0 minutes
Desorb Preheat	245° C
Desorb	2.00 minutes at 250° C
Bake	11.00 minutes at 275 ° C
Auto Drain	Off
Valve	130 ° C
Line	130 ° C
Mount	40 ° C
Gas	Helium
Flow	40 mL / minute

5.3.2.2 The temperature program for the DB-624 column for the analysis of samples is below:

Start temp °C	End temp °C	Rate °C/minute	Time minutes
32	32	0.0	3.00
32	75	5.0	0.00
75	155	5.0	0.00
155	185	8.0	0.00

5.3.2.3 The injector is a split/splitless injector operated in split mode with a 1:10 split. The injector temperature is 200 °C

5.3.2.4 The MS detector parameters are subject to change to achieve optimum chromatography. See instrument maintenance logbook for recent change as with documentation residing in the appropriate instruments' tuning logbook.

5.3.3 Preparation Of Calibration Standards

5.3.3.1 Calibration Standards - Calibration standards at a minimum of five concentration levels should be prepared from the secondary dilution of stock standards. Prepare these solutions in water. One of the concentration levels should be at a concentration near, but above, the detection limit and at or below the reporting limit. The remaining concentration levels should correspond to the expected range of concentrations found in real samples but should contain each analyte for detection by this method.

5.3.3.2 Internal Standards - The internal standards used are chlorobenzene-d_5, 1,4-difluorobenzene, and fluorobenzene. Other compounds may be used as internal standards as long as they have retention times similar to the compounds being detected by GC/MS.

5.3.3.3 Surrogate Standards - The surrogate standards used are 1,2-Dichlorobenzene-d_4 and 4-Bromofluorobenzene. Other compounds may be used as surrogates, depending upon the analysis requirements. A stock surrogate solution in methanol should be prepared.

5.3.3.4 4-Bromofluorobenzene (BFB) Standard - A standard solution containing 50 ug/mL of BFB in methanol should be prepared. This solution is used for the daily "tune check."

5.3.3.5 Prepare fresh stock standards for gases weekly or sooner if comparison with check standards indicates a problem. Reactive compounds such as 2-chloroethylvinyl ether and styrene may need to be prepared more frequently. All other standards must be replaced after one month, or sooner if comparison with check standards indicates a problem. Both gas and liquid standards must be monitored closely by comparison to the initial calibration curve and by comparison to QC check standards. It may be necessary to replace the standards more frequently if either check exceeds a 20% difference. The initial calibration is prepared from an EM Science stock standard, and the continuing calibration standard is prepared from an Ultra Scientific stock standard.

5.3.3.6 Preparation of standards is documented in the Volatile standards log book. Each standard solution is documented with the standard name, concentration, preparation date, expiration date as well as a standard number that is unique to that standard.

5.3.4 Calibration and Standardization

5.3.4.1 The GC/MS system tune must be verified at the beginning of every 12 hours. The tuning compound is BFB. The tuning acceptance criteria are listed below:

Mass (m/z)	Abundance criteria
50	15 to 40% of mass 95.
75	30 to 80% of mass 95.
95	Base Peak, 100% Relative Abundance
96	5 to 9% of mass 95.
173	<2% of mass 174.
174	>50% of mass 95.
175	5 to 9% of mass 174.
176	>95% but <101% of mass 174.
177	5 to 9% of mass 176.

5.3.4.2 The system calibration is based on at least 5 levels of standards utilizing the internal standard method of quantitation. The curve is generated using the relative response factor (RF). The data system tabulates the area response of the characteristic ions against concentration for each compound and each internal standard. Calculate response factors (RF) for each compound relative to one of the internal standards. The internal standard selected for the calculation for the RF for a compound should be the internal standard that has a retention time closest to the compound being measured. The RF is calculated by the data system as follows:

$$RF = \frac{A_S \times C_{IS}}{A_{IS} \times C_S}$$

where:

A_s = Area of the characteristic ion for the compound being measured in the calibration standard.
A_{IS}= Area of the characteristic ion for the specific internal standard.
C_{IS}= Concentration of the specific internal standard.
C_s = Concentration of the compound being measured in the calibration standard.

5.3.4.3 If the RSD of the RFs is less than 20%, then the RF is assumed to be constant over the calibration range, and the average response factor may be used for quantitation. If the RSD of any analyte or surrogate mean RF exceeds 20%, either analyze additional aliquots of appropriate calibration solutions to obtain an acceptable RSD of RFs over the entire concentration range, or take action to improve GC/MS performance. Surrogate compounds are present at the same concentration on every sample, calibration standard, and all types of blanks.

5.3.4.4 As an alternative to calculating mean response factors and applying the RSD test, use the GC/MS data system software to generate a linear or second order regression calibration curve. If this is used, a correlation coefficient of at least 0.995 must be acheived.

5.3.5 Daily GC/MS Calibration

5.3.5.1 Continuing Calibration Check - Verify the MS tune and initial calibration at the beginning of each 12 hour work shift during which analyses are performed, using the following procedure.

Introduce into the GC (either by purging a laboratory reagent blank or making a syringe injection on the trap) 25g of BFB and acquire a mass spectrum that includes data for m/z 35-260. If the spectrum does not meet all criteria, the MS must be retuned and adjusted to meet all criteria before proceeding with the continuing calibration check.

5.3.5.2 The calibration curve for each analyte must be validated against the calibration check standard once every 12 hours of analysis time. The calibration check standard should be at a concentration near the midpoint of the calibration curve (i.e. 2.0 ppb) and is prepared from a second source from the initial calibration standard. This standard is referred to as the Laboratory Fortified Blank (LFB). If the percent difference for each compound is less than 30%, the initial calibration is assumed to be valid.

5.3.5.3 Determine that the absolute areas of the quantitation ions of the internal standard and surrogates have not decreased by more than 30% from the areas measured in the most recent continuing calibration check, or by more than 50% from the areas measured during the initial calibration. If these areas have decreased by more than these amounts, adjustments must be made to restore system sensitivity.

5.3.6 Sample Introduction and Purging

5.3.6.1 BFB tuning criteria and daily GC/MS calibration criteria must be met before analyzing samples.

5.3.6.2. After the continuing calibration sample is verified, the system must be proven to be free of contamination by running a laboratory reagent blank (LRB).

5.3.6.3 Analysis of samples may begin by allowing the sample to come to ambient temperature prior to analysis. The pH of the sample is taken and documented. The surrogate and internal standards are added automatically by the Dynatech autosampler as the sample is transferred from the 40 mL sample vial to the sparge tube.

5.3.6.4 If the initial analysis of 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. Secondary ion quantitation is allowed only when there are sample interferences with the primary ion. When a sample is analyzed that has saturated ions from a compound, this analysis must be followed by a blank water analysis. If the blank analysis is not free of interferences, the system must be decontaminated. Sample analysis may not resume until a blank can be analyzed that is free of interferences.

5.3.7 Qualitative Analysis

The qualitative identification of compounds determined by this method is based on retention time, and on comparison of the sample mass spectrum, after background correction, with characteristic ions in a reference mass spectrum. The reference mass spectrum must be generated by the laboratory using the conditions of this method. The mass spectral library is updated with each new calibration.

The characteristic ions from the reference mass spectrum are defined to be the three ions of greatest relative intensity, or any ions over 30% relative intensity if less than three such ions occur in the reference spectrum. Compounds should be identified as present when the criteria below are met.

5.3.7.1 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.

5.3.7.2 The RRT of the sample component is within +/- 0.06 RRT units of the RRT of the standard component.

5.3.7.3 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%.)

5.3.7.4 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 two isomer peaks is less than 25% of the sum of the two peak heights. Otherwise, structural isomers are identified as isomeric pairs.

5.3.7.5 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 is 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 coelute (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 coeluting compound.

5.3.8 Quantitative Analysis

5.3.8.1 The area of the internal standards for each sample, blank, or QC sample should be no less than half of the average area of the internal standards established during initial calibration, and no greater than twice that area.

5.3.8.2 When a compound has been identified, the quantitation of that compound will be based on the integrated abundance from the EICP of the primary characteristic ion. Quantitation is performed by the data system using the internal standard technique. The internal standard used shall be the one nearest the retention time of that of a given analyte. Quantitation is performed using the initial (i.e. 5pt) calibration, and not the continuing calibration check.

5.3.8.3 The data package includes sequence log, verification of tuning and system performance, verification of calibration, and for each sample, the chromatogram, quantitation and library spectra for all positive targets. All are to be initialed and dated by the analyst. Each data file header should contain the sample lab number and client name.

5.4 QUALITY CONTROL

5.4.1 Before processing any samples, the analyst should demonstrate, through the analysis of a calibration blank, that the analytical system, glassware, and reagents free of interferences.

5.4.2 The analyst should demonstrate initial precision and accuracy through the analysis of at least 4 spiked standards. Four 5-mL aliquots of the well mixed reference sample are analyzed according to the method. Calculate the average recovery (x) in µg/L, and the standard deviation of the recovery (s) in µg/L, for each analyte using the four results. All compounds must have standard deviation less than 20%.

5.4.3 Required Instrument QC

5.4.3.1 The GC/MS system must be tuned to meet the BFB specifications.

5.4.3.2 There must be an initial calibration of the GC/MS system.

5.4.3.3 The GC/MS system must meet the continuing calibration criteria in each 12 hours.

5.4.4 Surrogates: Acceptable surrogate recoveries for water samples are +/- 20% from the amount spiked.

5.4.5 All calibration standards, continuing calibration standards, blanks and samples must have a pH<2. If any sample does not comply, the client must be notified immediately.

5.4.6 Laboratory Fortified Blank (LFB) is required to be analyzed once for every 12 hours of analysis (see 5.3.5.2).

5.4.7 Field Reagent Blanks are laboratory prepared blanks that accompany samples durring transportation and field activities. They are provided at the request of clients or field personnel taking the samples.

6.0 CALCULATIONS

The concentration of a parameter is calculated by the software used with the GC/MS system using the following equation:

Water

$$\text{Concentration } (\mu g/L) = \frac{A_X \text{ x } I_{IS}}{A_{IS} \text{ x } RF}$$

where:

A_X = Area of characteristic ion for compound being measured in the sample.
I_{IS} = Amount of internal standard injected (ng).
A_{IS}= Area of characteristic ion for the internal standard.
RF = Response factor for compound being measured.

Analysis of Volatile Organic Compounds by GC/MS

Method Reference Number(s)
EPA SW-846 8260

Approved by: ____________________
Laboratory Director

Reviewed by: ____________________
Quality Assurance

1.0 SCOPE/APPLICATION

This method is used to determine volatile organic compounds in a variety of matrices. See Table 1 for analyte list.

The volatile compounds are introduced into gas chromatograph by the purge and trap method. Inert gas is bubbled through the sample to purge the volatile organics onto an adsorbent trap. The analytes on the trap are then desorbed onto a gas chromatograph with mass spectrometer as the detection mechanism.

The purge and trap/GC-MS system is calibrated with known analyte concentrations and internal standards. Both quantitative and qualitative analyses are applicable.

Table 1. Analyte List

Analyte	Analyte
Acetone	1,2-Dichloropropane
Benzene	1,3-Dichloropropane
Bromobenzene	2,2-Dichloropropane
Bromochloromethane	1,1-Dichloropropene
Bromodichloromethane	cis-1,3-Dichlropropene
Bromoform	trans-1,3-Dichloropropene
Bromomethane	Diisopropyl ether
2-Butanone	Ethylbenzene
n-Butylbenzene	Hexachlorobutadiene
sec-Butylbenzene	2-Hexanone
tert-Butylbenzene	Isopropylbenzene
Carbon disulfide	p-Isopropyltoluene
Carbon tetrachloride	Methylene chloride
Chlorobenzene	4-Methyl-2-pentanone (MIBK)
Chloroethane	Methyl tert butyl ether
2-Chloroethylvinyl ether	Naphthalene
Chloroform	n-Propylbenzene
Chloromethane	Styrene
2-Chlorotoluene	1,1,1,2-Tetrachloroethane
4-Chlorotoluene	1,1,2,2-Tetrachloroethane
Dibromochloromethane	Tetrachloroethene

1,2-Dibromomethane	Toluene
Dibromomethane	1,2,3-Trichlorobenzene
1,2-Dichlorobenzene	1,2,4-Trichlorobenzene
1,3-Dichlorobenzene	1,1,1-Trichloroethane
1,4-Dichlorobenzene	1,1,2-Trichloroethane
Dichlorodifluoromethane	Trichloroethene
1,1-Dichloroethane	Trichlorofluoromethane
1,2-Dichloroethane	1,2,3-Trichloropropane
1,1-Dichloroethene	1,2,4-Trimethylbenzene
cis-1,2-Dichloroethene	1,3,5-Trimethylbenzene
trans-1,2-Dichloroethene	Vinyl chloride
	Vinyl acetate
	o-Xylene
	m/p-Xylene

2.0 REFERENCES

2.1 EPA SW-846 Method 8260
2.2 EPA 600/4-79-020 Method 624

3.0 DEFINITIONS

BFB: 4-bromofluorobenzene
EICP: extracted ion current profile
GC-MS: gas chromatograph-mass spectrometer system
ICC: initial calibration check
CCC: calibration check compounds
SPCC: system performance check compounds
MDL: method detection limit
P, Ps range: QC acceptance criteria for spike & LCS recovery
RF: response factor
RRT: relative retention time

4.0 SAFETY

4.1 Gloves and protective clothing should be worn to protect against unnecessary exposure to hazardous chemicals and contaminants in samples. All activities performed while following this procedure should utilize appropriate laboratory safety systems.

5.0 METHOD

5.1 APPARATUS & MATERIALS

5.1.1 Sample Containers - 40 mL screw cap vials with a Teflon faced silicone septum. ("VOA vials")

5.1.2 Purge and Trap System - The purge and trap system consists of three separate pieces of equipment: purging device, trap, and desorber. The current systems are

Dynatrap PTA30WS and Tekmar 2000.

5.1.2.1 The glass purging tubes are of 5mL or 25mL size. The all-glass purging device should be designed to accept 25 mL samples with a water column at least 5 cm deep. A smaller (5 mL) purging device is recommended if the GC/MS system has adequate sensitivity to obtain the method detection limits required; however, both the 25mL sparge tube and purge from the 40 mL VOA vial (soils) have demonstrated acceptable performance.

5.2.2.2 The trap currently used is Supelco Type K. By method, the trap must be at least 25 cm long and have an inside diameter of at least 0.105 inches. Starting from the inlet, the trap should contain 1.0 cm of methyl silicone coated packing and the following amounts of adsorbents: 33% of 2,6-diphenylene oxide polymer, 33% of silica gel, and 33% of coconut charcoal.

5.1.3 Gas Chromatography/Mass Spectrometer/Data System (GC/MS)

5.1.3.1 Column Supelco, 30 Meter x 0.53 mm ID, 1.1 um film thickness

5.1.3.2 Hewlett Packard Series II Gas Chromatograph

5.1.3.3 Hewlett Packard 5972 Mass Spectrometer

5.1.3.4 Hewlett Packard Chem Station Data Management System (version G1701AA v. A.03.02.

5.1.4 Syringes

5.1.4.1 Two 5 mL or 25 mL glass hypodermic syringes with Luer-Lok tip (depending on sample volume used).

5.1.4.2 Micro syringes - 10, 25, 50, and 100 µL

5.1.5 Balances - analytical and top loading.

5.2 REAGENTS

5.2.1 Purge and trap grade methanol

5.2.2 Reagent grade water, organic free, 18 megaohm quality

5.2.3 Standards and Internal Standards: (see to Table 1)

5.2.4 Tuning standard: 4- bromofluorobenzene (BFB) working solution: 100 ug/mL.

5.3 PROCEDURE

5.3.1 Sample Storage

5.3.1.1 Store sample at ≤ 4°C until analysis. The sample storage area must be free of organic solvent vapors and direct or intense light. Samples are stored in a location separate from analytical standards.

5.3.2.2 Analyze all sample within 14 days of collection. Samples not analyzed within this period must be discarded and recollected. (7 day hold-time if not preserved)

5.3.2 Trip Blank - Trip Blanks must be handled along with each sample set, and are composed of reagent grade water.

5.3.3 Settings and Requirements For The GC/MS Volatile System

5.3.3.1 The following tables set forth instrument settings for the daily use of the DynaTrap Purge and Trap System:

PARAMETER SETTINGS FOR TEKMAR 2000	
Standby	30° C
Preheat	40° C (soil) NI for water
Purge	11.00 minutes
Dry Purge	4.0 minutes
Desorb Preheat	245° C
Desorb	2.00 minutes at 250° C
Bake	11.00 minutes at 260 ° C
Auto Drain	Off
Valve	135 ° C
Line	135 ° C
Mount	35 ° C
Gas	Helium
Flow	35 mL/minute

5.3.3.2 The temperature program for the DB-624 column for the analysis of samples is below:

Start temp °C	End temp °C	Rate °C/minute	Time minutes
32	32	0.0	3.00
32	75	5.0	0.00
75	155	5.0	0.00
155	185	8.0	0.00

5.3.3.3 The injector is a split/splitless injector operated in split mode with a 1:20 split. The injector temperature is 200 °C

5.3.3.4 The MS detector parameters are subject to change to achieve optimum chromatography. See instrument maintenance logbook for recent change as with documentation residing in the appropriate instruments' tuning logbook.

5.3.4 Preparation Of Calibration Standards

5.3.4.1 Calibration Standards - Calibration standards at a minimum of five concentration levels should be prepared from the secondary dilution of stock standards (EM Science). Prepare these solutions in water. One of the concentration levels should be at a concentration near, but above, the detection limit and at or below the reporting limit. The remaining concentration levels should correspond to the expected range of concentrations found in real samples but should contain each analyte for detection by this method.

5.3.4.2 Internal Standards - The internal standards used are chlorobenzene-d_5, 1,4-difluorobenzene, 1,2-dichloroethane-d_4 and fluorobenzene. Other compounds may be used as internal standards as long as they have retention times similar to the compounds being detected by GC/MS.

5.3.4.3 Surrogate Standards - The surrogate standards used are toluene-d_8, 4-bromofluorobenzene, and dibromofluoromethane. Other compounds may be used as surrogates, depending upon the analysis requirements. A stock surrogate solution in methanol should be prepared.

5.3.4.4 4-Bromofluorobenzene (BFB) Standard - A standard solution containing 50 ug/mL of BFB in methanol should be prepared. This solution is used for the daily "tune check."

5.3.4.5 Prepare fresh stock standards for gases weekly or sooner if comparison with check standards indicates a problem. Reactive compounds such as 2-chloroethylvinyl ether and styrene may need to be prepared more frequently. All other standards must be replaced after six months, or sooner if comparison with check standards indicates a problem. Both gas and liquid standards must be monitored closely by comparison to the initial calibration curve and by comparison to QC check standards. It may be necessary to replace the standards more frequently if either check exceeds a 20% difference.

5.3.4.6 Secondary dilution standards - secondary dilution standards containing the compounds of interest, should be prepared in methanol and must be stored with minimal headspace and should be checked frequently for degradation. They should be stored for one week only.

5.3.4.7 Preparation of standards is documented in the Volatile standards logbook. Each standard solution is documented with the standard name, concentration, preparation date, expiration date and a unique number given to that standard for future traceability.

5.3.5 Calibration and Standardization

5.3.5.1 The GC/MS system tune must be verified at the beginning of every 12 hours. The tuning compound is BFB. The tuning acceptance criteria are listed below:

Mass (m/z)	Abundance criteria
50	15 to 40% of mass 95.
75	30 to 60% of mass 95.
95	Base Peak, 100% Relative Abundance
96	5 to 9% of mass 95.
173	<2% of mass 174.
174	>50% of mass 95.
175	5 to 9% of mass 174.
176	>95% but <101% of mass 174.
177	5 to 9% of mass 176.

5.3.5.2 Demonstration and documentation of acceptable initial calibration is required before any samples are analyzed. Refer to EPA SW-846 Update III, Method 8000B, Section 7, for a detailed discussion of calibration procedures.

5.3.5.3 The system calibration is based on at least 5 levels of standards utilizing the internal standard method of quantitation.

The curve is generated using the relative response factor (RF). The data system tabulates the area response of the characteristic ions against concentration for each compound and each internal standard. Calculate response factors (RF) for each compound relative to one of the internal standards. The internal standard selected for the calculation for the RF for a compound should be the internal standard that has a retention time closest to the compound being measured. The RF is calculated by the data system as follows:

$$RF = \frac{A_S \times C_{IS}}{A_{IS} \times C_S}$$

where:

A_s = Area of the characteristic ion for the compound being measured in the calibration standard.
A_{IS}= Area of the characteristic ion for the specific internal standard.
C_{IS}= Concentration of the specific internal standard.
C_s = Concentration of the compound being measured in the calibration standard.

5.3.5.4 A system performance check should be made before the calibration curve is used. Five compounds (the System Performance Check Compounds, or SPCCs) are used for system performance check.

These compounds are used to check compound instability and check for degradation caused by contaminated lines or active sites in the system. Examples of these occurences are:

SPCC	Minimum RF	Comment
Chloromethane	>0.10	This compound is the most likely compound to be lost it the purge flow is too fast.
Bromoform	>0.10	This compound is one of the compounds most likely to be purged very poorly if the purge flow is too slow. Cold spots and/or active sites in the transfer lines may adversely affect response. Response of the quantitation ion (m/z 173) is directly affected by the tuning of BFB at ions m/z 174/176. Increasing the m/z 174/176 ratio relative to m/z 95 may improve bromoform response.
Chlorobenzene	>0.30	
1,1,2,2 Tetrachloroethane	>0.30	The response factors of these compounds are degraded by contaminated transfer lines in purge and trap systems and/or active sites in trapping materials. (comment for both cpd's)
1,1 Dichloroethane	>0.10	

5.3.5.5 The RSD for the RFs for each individual calibration check compound (CCC) must be less than 20 percent. For the calibration to be valid, this criterion must be met for each CCC compound even if it is not a target compound for the project of concern or samples being analyzed. The CCCs include:

1,1-Dichloroethene
Chloroform
1,2-Dichloropropane
Toluene
Ethylbenzene
Vinyl chloride

If the RSD of any CCC is greater than 20%, then corrective action must be taken and the system re-calibrated.

5.3.5.6 If the RSD of the RFs is less than 15%, then the RF is assumed to be constant over the calibration range, and the average response factor may be used for quantitation. If the RSD of any analyte or surrogate mean RF exceeds 15%, either analyze additional aliquots of appropriate calibration solutions to obtain an acceptable RSD of RFs over the entire concentration range, or take action to improve GC/MS performance. Surrogate compounds are present at the same concentration on every sample, calibration standard, LCS, MS, MSD and all types of blanks.

5.3.6 Daily GC/MS Calibration

5.3.6.1 Continuing Calibration Check - Verify the MS tune and initial calibration at the beginning of each 12 hour work shift during which analyses are performed, using the following procedure.

Introduce into the GC (either by purging a laboratory reagent blank or making a syringe injection on the trap) 50 ng or less of BFB and acquire a mass spectrum that includes data for m/z 35-260. If the spectrum does not meet all criteria, the MS must be retuned and adjusted to meet all criteria before proceeding with the continuing calibration check.

5.3.6.2 The calibration curve for each analyte must be validated against the calibration check standard once every 12 hours of analysis time. The calibration check standard (Ultra Scientific) should be at concentrations near the midpoint of the calibration curves (i.e. 20 ppb).

5.3.6.3 System Performance Check Compounds (SPCCs) - A system performance check must be made each 12 hours. If the SPCC criteria are met, a comparison of response factors is made for all compounds. 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. Some possible problems are standard mixture degration, injection port inlet contamination, contamination at the front end of the analytical column and active sites in the column or chromatographic system.

5.3.6.4 Calibration Check Compounds (CCCs) - After the system performance check is met, CCCs are used to check the validity of the initial calibration. If the percent difference for any compound is greater than 20, the laboratory should consider this a warning limit. If the percent difference for each CCC is less than 20%, the initial calibration is assumed to be valid. If the criterion is not met (> 20% difference), for any one CCC, corrective action must be taken. Problems similar to those listed under SPCCs could affect this criterion. If no source of the problem can be determined after corrective action has been taken, a new five-point calibration must be generated. This criterion must be met before quantitative sample analysis begins. If the CCCs are not required analytes by the permit, then all required analytes must meet the 20% difference criterion.

5.3.6.5 The internal standard responses and retention times in the check calibration standard must be evaluated immediately after or during data acquisition. If the retention time for any internal standard changes by more than 30 seconds from the last check calibration (12 hours), the chromatographic system must be inspected for malfunctions and corrections must be made, as required. If the EICP area for any of the internal standards changes by a factor of two (-50% to +100%) from the last daily calibration standard check, the mass spectrometer must be inspected for malfunctions and corrections must be made, reanalysis of samples analyzed while the system was malfunctioning are necessary.

5.3.7 Sample Introduction and Purging

5.3.7.1 BFB tuning criteria and daily GC/MS calibration criteria must be met before analyzing samples.

5.3.7.2. After the continuing calibration sample is verified, the system must be proven to be free of contamination by analyzing a water blank.

5.3.7.3 Analysis of samples may begin by allowing the sample to comes to ambient temperature prior to analysis. Document the sample pH.

The surrogate and internal standards are added automatically by the Dynatech autosampler as the sample is transferred from the 40 mL sample vial to the sparge tube.

Purge the sample for 11 minutes at ambient temperature with a helium flow of 35 mL/min.

During the 11 minute purge time, the purgeable volatile organics are absorbed on a Supelco carboseive K trap.

The trapped materials are then rapidly heated while back-flushing the trap with helium at 35 mL/min. for 4 minutes and introduced in the GC/MS.

The trap is then baked and back flushed for 2 minutes at 250°C after the valve to the GC is closed.

The GC is temperature programmed at: 32°C for 3 minutes and ramped to 200°C at 5°C/min. The column flow is set at 1 mL/min. of helium.

The transfer line to the MS is maintained at 280°C and the ion trap is maintained at 240°C while under constant vacuum. The GC injector is set at 200°C .

5.3.7.4 If the initial analysis of a sample or a dilution of the sample has a concentration of an analyte that exceeds the initial calibration range, the sample must be reanalyzed at a higher dilution. Secondary ion quantitation is allowed only when there are sample interferences with the primary ion. When a sample is analyzed that has saturated ions from a compound, this analysis must be followed by a blank water analysis. If the blank analysis is not free of interferences, the system must be decontaminated. Sample analysis may not resume until a blank can be analyzed that is free of interferences.

5.3.7.5 Low level soil samples may be analyzed by direct purge by weighing 2-5 grams of sample in the VOA vial and introducing 10 mL of water with the internal standard/surrogate spike. Soils may also be prepared in methanolic dilution when high levels of contamination are suspected. Soils should be heated to 40°C before the purge. When purging low level soil samples all standards and blanks must be purged under the same conditions as the samples.

5.3.7.6 Proceeding the analyses of water samples the pH should be taken to verify proper field preservation as well as to avoid possible sample contamination by measuring the pH prior to sample analyses.

5.3.8 Qualitative Analysis

The qualitative identification of compounds determined by this method is based on retention time, and on comparison of the sample mass spectrum, after background correction, with characteristic ions in a reference mass spectrum. The reference mass spectrum must be generated by the laboratory using the conditions of this method. The mass spectral library is updated with each new calibration.

The characteristic ions from the reference mass spectrum are defined to be the three ions of greatest relative intensity, or any ions over 30% relative intensity if less than three such ions occur in the reference spectrum. Compounds should be identified as present when the criteria below are met.

5.3.8.1 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.

5.3.8.2 The RRT of the sample component is within +/- 0.06 RRT units of the RRT of the standard component.

5.3.8.3 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%.)

5.3.8.4 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 two isomer peaks is less than 25% of the sum of the two peak heights. Otherwise, structural isomers are identified as isomeric pairs.

5.3.8.5 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 is 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 coelute (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 coeluting compound.

5.3.9 Quantitative Analysis

5.3.9.1 The area of the internal standards for each sample, blank, or QCS should be no less than half of the average area of the internal standards established during initial calibration, and no greater than twice that area.

5.3.9.2 When a compound has been identified, the quantitation of that compound will be based on the integrated abundance from the EICP of the primary characteristic ion. Quantitation is performed by the data system using the internal standard technique. The internal standard used shall be the one nearest the retention time of that of a given analyte. Quantitation is performed using the initial (i.e. 5pt) calibration, and not the continuing calibration check.

5.3.9.3 The data package includes sequence log, verification of tuning and system performance, verification of calibration, and for each sample, the chromatogram, quantitation and library spectra for all positive targets. All are to be initialed and dated by the analyst. Each data file header should contain the sample lab number and client name.

5.4 QUALITY CONTROL

5.4.1 Before processing any samples, the analyst should demonstrate, through the analysis of a calibration blank, that the analytical system, glassware, and reagents free of interferences.

5.4.2 The analyst should demonstrate initial precision and accuracy through the analysis of 4 spiked standards. Four 5-mL aliquots of the well mixed reference sample are analyzed according to the method. Calculate the average recovery (x) in µg/L, and the standard deviation of the recovery (s) in µg/L, for each analyte using the four results.

Table 2 provides single laboratory recovery and precision data obtained for the method analytes from water. Similar results from dosed water should be expected for EPA SW-846 Method 8260. Compare s and x for each analyte to the single laboratory recovery and precision data. Results are comparable if the calculated standard deviation of the recovery does not exceed 2.6 times the single laboratory RSD or 20%, whichever is greater, and the mean recovery lies within the interval x ± 3s or x ± 30%, whichever is greater.

NOTE: The large number of analytes in Table 3 present a substantial probability that one or more will fail at least one of the acceptance criteria when all analytes of a given method are determined.

When one or more of the analytes tested are not comparable to the data in Table 3, the analyst must proceed locate and correct the source of the problem and repeat the test for all analytes or repeat the test only for those analytes that are not comparable. Repeated failure, however, will confirm a general problem with the measurement system. If this occurs, locate and correct the source of the problem and repeat the test for all compounds of interest.

Table 2. Recovery Criteria For EPA SW-846 Method 8260

Analyte	Concμ g/L.	No. of Samples	Recovery %	Stand. Deviation of Recovery	Percent RSD
Benzene	0.1	7	99	6.2	6.3
Bromobenzene	0.5	7	97	7.4	7.6
Bromochloromethane	0.5	7	97	5.8	6.0
Bromodichloromethane	0.1	7	100	4.6	4.6
Bromoform	0.5	7	101	5.4	5.3
Bromomethane	0.5	7	99	7.1	7.2
n-Butylbenzene	0.5	7	94	6.0	6.4
Sec-Butylbenzene	0.5	7	110	7.1	6.5
Tert-Butylbenzene	0.5	7	110	2.5	2.3
Carbon tetrachloride	0.1	7	108	6.8	6.3
Chlorobenzene	0.1	7	91	5.8	6.4
Chloroethane	0.1	7	100	5.8	5.8
Chloroform	0.1	7	105	3.2	3.0
Chloromethane	0.5	7	101	4.7	4.7
2-Chlorotoluene	0.5	7	99	4.6	4.6
4-Chlorotoluene	0.5	7	96	7.0	7.3
1,2-Dibro-3-chloropropane	0.5	7	92	10.0	10.9
Dibromochloromethane	0.1	7	99	5.6	5.7
1,2-Dibromoethane	0.5	7	97	5.6	5.8
Dibromomethane	0.5	7	93	5.6	6.0
1,2-Dichlorobenzene	0.1	7	97	3.5	3.6
1,3-Dichlorobenzene	0.1	7	101	6.0	5.9
1,4-Dichlorobenzene	0.1	7	106	6.5	6.1
Dichlorodifluiromethane	0.1	7	99	8.8	8.9
1,1-Dichloroethene	0.5	7	98	6.2	6.3
1,2-Dichloroethene	0.1	7	100	6.3	6.3
1,1-Dichloroethene	0.1	7	95	9.0	9.5
Cis-1,2-Dichloroethene	0.1	7	100	3.7	3.7
Trans-1,2-Dichloroethene	0.5	7	98	7.2	7.3
1,2-Dichloropropane	0.5	7	96	6.0	6.3
1,3-Dichloropropane	0.5	7	99	5.8	5.9
2,2-Dichloropropane	0.5	7	99	4.9	4.9
1,1-Dichloropropene	0.5	7	102	7.4	7.3
Ethylbenzene	0.5	7	99	5.2	5.3
Hexochlorobutadiene	0.5	7	100	6.7	6.7
Isopropylbenzene	0.5	7	102	6.4	6.3
p-Isopropyltoluene	0.5	7	113	13.0	11.5
Methylene chloride	0.5	7	97	13.0	13.4
Naphthalene	0.5	7	98	7.2	7.3
n-Propylbenzene	0.5	7	99	6.6	6.7

5.4.3 Required Instrument QC

5.4.3.1 The GC/MS system must be tuned to meet the BFB specifications.

5.4.3.2 There must be an initial calibration of the GC/MS system.

5.4.3.3 The GC/MS system must meet the SPCC criteria and the CCC criteria in each 12 hours.

5.4.4 Surrogates

Acceptable surrogate recoveries for water and soil samples are in-house derived limits, which are updated semiannually. If in-house derived values are not available, default control limits are 70 – 130 %R.

5.4.5 For each analytical batch, a matrix spike sample and a duplicate or a matrix spike duplicate should be analyzed. The spike concentration should reflect one to five times the background. Duplicate and spikes should be analyzed at a frequency of no less than one in every twenty samples. The spiking compounds consists of the entire list of analytes currently being reported.

5.4.6 The following table outlines quality control requirements and corresponding corrective actions:

Volatile Organic Compounds by GC/MS
Quality Control Requirements

Quality Control Item	Frequency	Acceptance Criteria	Corrective Action
Tune Check (BFB)	Every 12 hours.	Ensure correct mass assignment. BFB % Relative abundance criteria as specified in method.	Retune. Do not proceed with analysis until tune meets criteria.
Initial Calibration	Each time the instrument is set up and when CCCs and SPCCs in the continuing calibration do not meet criteria. 1. Established initially at five concentration levels - low standard at or below project required reporting limit (PRRL). 2. Heated purge for low-level soils.	1. Average RRF for SPCCs chloromethane, 1,1-dichloroethane, and bromoform ≥0.10 and for SPCCs chlorobenzene and 1,1,2,2-tetrachloroethane ≥ 0.30. 2. % RSD for RRFs for each CCC ≤30%. 3. % RSD for RRFs for all compounds ≤15%.	1. Correct system and recalibrate. Criteria must be met before sample analysis may begin. 2. % RSD ≥15% for any compound requires generation of a regression calibration.
Continuing Calibration	Every 12 hours. Must be at or near the mid-point calibration range for all target compounds, CCCs, SPCCs and surrogates. Typically use 50 ppb. Heated purges for low-level soils.	1. RRF for SPCCs chloromethane, 1, 1-dichloroethane, and bromoform ≥0.10 and for SPCCs chlorobenzene and 1,1,2,2-tetrachloroethane ≥0.30. 2. %D for RRFs of each CCC ≤20%, for non-CCCs - <20% - 2 can be out but <40%.	Correct system, if necessary, and recalibrate. Criteria must be met before sample analysis may begin.
Internal Standards	Added to all blanks, standards, and samples. Use 8 mL working standard solution per 40 mL.	1. Peak area within -50% to +100% of area in associated continuing calibration standard. 2. Retention time (RT) within 30 sec of RT for associated continuing calibration standard.	1. Inspect instrument for malfunctions; correct identified malfunctions, then reanalyze samples. 2. If no instrument malfunction identified proceed as follows: * Reanalyze sample. * If reanalysis is out, report both sets of data If in, report only second set.

Volatile Organic Compounds by GC/MS
Quality Control Requirements
(Continued)

Quality Control Item	Frequency	Acceptance Criteria	Corrective Action
Method Blank ("Daily Reagent Water Blank")	1. After each continuing calibration standard (before sample analysis). 2. After the initial calibration if samples are to be analyzed immediately following the calibration.	1. Common laboratory contaminants <5x RL. All other target compounds ≤RL. 2. Must meet internal standard criteria. 3. Must meet surrogate criteria.	Reanalyze to determine if instrument contamination was the cause. If the method blank is still non-compliant, reprep an analysis blank and samples.
Laboratory Control Sample (LCS)	One per matrix/per 20 samples/matrix. Must undergo all sample preparative procedures. Must be from a second source and contain target compounds at concentrations at or near the mid-point of the calibration range.	% Recoveries (and RPDs, if applicable) within in-house generated limits. Default 70-130%.	If still out, reprep, reanalyze associated samples and new LCS. Exception: If LCS recovery is high and no associated positives no further action needed.
Matrix Spike/Matrix Spike Duplicate	One per matrix/per set of 20 samples/matrix/concentration level. Must undergo all sample preparative procedures. Must be spiked with target compounds at concentrations at or near the mid-point of the calibration range.	% Recoveries and RPDs within in-house generated limits. Default 70-130 / 20%.	If LCS is acceptable, then report there was a probable matrix interference.

Volatile Organic Compounds by GC/MS
Quality Control Requirements
(Continued)

Quality Control Item	Frequency	Acceptance Criteria	Corrective Action
Qualitative/Quantitative Issues	1. If instrument level of any compound in a sample exceeds the instrument level of that compound in the highest level standard, the sample must be diluted to approximately mid-level of the calibration range and reanalyzed. 2. If the concentration of the target analyte (that exceeded the calibration range) is present in the sample following the high level sample is greater than the RL but ≤5x RL, then that sample must be reanalyzed to determine if carryover occurred.	1. The instrument level of all compounds must be within the calibration range for all samples. 2. The sample analyzed immediatley after a high-level sample must display concentrations of the high level target compounds less than the RL or greater than 5x RL.	1. Dilute the sample to bring the level of the highest concentration of target compounds within the calibration range. 2. A sample displaying concentrations of target compounds between the RL and 5x the RL that was analyzed immediately after a high-level sample must be reanalyzed. If the results do not agree within the RL, report only the second analysis.
Surrogate	1. Calibrated as target compounds. 2. Added to all blanks, samples, and QC samples, as a part of the internal standard-surrogate spiking mixture.	All % Recoveries within in-house generated limits. Default 70-130%.	If recovery is not within limits: 1. Check to be sure that there are no errors in calculations, surrogate solutions, and internal standards. Also, check instrument performance. 2. If no problem is found, re-prep and re-analyze the sample. 3. If the reanalysis is within limits, report only the reanalysis. 4. If the reanalysis is within limits, but out of hold, report both sets of data 5. If the reanalysis is still out of limits, report both sets of data. 6. No reanalysis is required if the MS and/or MSD are outside limits.

6.0 CALCULATIONS

The concentration of a parameter is calculated by the software used with the GC/MS system using the following equation:

Water

$$\text{Concentration } (\mu g/L) = \frac{A_X \times I_{IS}}{A_{IS} \times RF}$$

where:

A_X = Area of characteristic ion for compound being measured in the sample.
I_{IS} = Amount of internal standard injected (ng).
A_{IS}= Area of characteristic ion for the internal standard.
RF = Response factor for compound being measured.

Soils

Low-level soils may be calculated by the following equation:

$$\text{Concentration } (mg/Kg) = \frac{\text{measured } (\mu g/L) \times \text{ volume purged } (5 \text{ mL})}{\text{g of soil purged } \times \text{ } 1000 \text{ mL/L}}$$

High-level soils may be calculated by the following equation:

$$\text{Concentration } (mg/Kg) = \frac{\text{measured } (\mu g/L) \times \text{ total vol. of extract } \times \text{ vol. purged } (5 \text{ mL})}{\text{g of soil extracted } \times \text{ vol. of extract purged } (\mu L) \times 1000 \text{ mL/L}}$$

September 27, 2002

SITE SAFETY PLAN

JOB LOCATION:	**Refuse Hideaway Landfill** **7182 Hwy 14** **Middleton, WI 53562**
PROJECT DESCRIPTION:	**Groundwater Monitoring**

ON SITE ORGANIZATION AND COORDINATION:

Project Team Leader:	Frank Perugini - Environmental Sampling Corporation (ESC)
Primary Health & Safety Officer:	Frank Perugini - ESC
Client Representative:	Hank Kuehling - Wisconsin Department of Natural Resources

CHEMICAL HAZARD EVALUATION:

Sample bottles provided by the laboratory are pre-preserved with hydrochloric acid. ESC personnel shall use caution when handling sample bottles and avoid contact with the preservative. Material safety data sheets (MSDS) are provided by the laboratory with each sample bottle shipment. MSDS sheets for hydrochloric acid are included in Attachment 1.

Groundwater may contain volatile organic compounds (VOCs) at concentrations at or above WDNR Public Health Groundwater Quality Standards. ESC personnel shall use care to minimize contact with groundwater during purging and sampling.

PHYSICAL HAZARD EVALUATION:

The following hazards could be potentially encountered while performing the operation and maintenance functions of the project:

Hazard	Possible Results
Fire	Burns, death
Mechanical	Serious injury, death
Blood borne Pathogens	Chronic infection
Dermal Absorption of Liquid Contaminants	Chronic infection

Portable gasoline powered air compressors will be used for purging and sampling of groundwater monitoring wells. Exhaust shall be directed down wind and away from operator and sample location. Care shall be taken by the operator to keep limbs, loose clothing, and field equipment away from moving compressor parts (i.e., fan belt and fan blade). The operator shall avoid contact with compressor parts that radiate heat during compressor operation (i.e., muffler, air discharge port and quick connections).

All terrain vehicles are operated in accordance with the operation and safety procedures outlined in the manufacturers owner's manuals.

STANDARD PROCEDURES

The following are standard procedures that ESC will follow while on site:

- **No smoking:** Smoking will not be allowed at anytime on site unless designated smoking areas are available.

- **Personal Protective Equipment:** ESC personnel will wear Level D protection at all times including hard hat (when overhead hazards exist), safety vest, leather work boots, work clothes and latex gloves. Additional personal protective equipment will be available in the ESC company vehicles.

- **Common Sense:** ESC employees will use common sense precautions while performing duties on site. Employees understand when performing a one-person job assignment that they are acting as their own supervisor.

FIELD HYGIENE:

Avoiding or minimizing contact with groundwater and/or sample bottle preservative greatly simplifies decontamination and reduces the potential of injury. Do not handle, or touch groundwater or preservative without latex gloves, if possible. Wear work gloves when handling equipment or tools. Skin abrasions, cuts, and scratches enhance potential for infectious agents or chemicals to penetrate the body. Skin injuries should be adequately covered. Washing with antibacterial soaps and/or disinfectants minimizes infection. Hands should be thoroughly cleaned prior to eating, drinking, or other hand-to-mouth activities. Care should also be taken not to swipe debris from the eyes with soiled fingers during any work activity involving groundwater or preservative.

DECONTAMINATION PROCEDURES:

Spillage of sample bottle preservative on skin should be thoroughly washed with soap and water. Spillage of preservative onto personal clothing should be washed after use. Decontamination (decon) is the process of removing contaminants that have accumulated on personnel and equipment. Proper decon protects workers & others from hazardous substances that may contaminate clothing, tools, vehicles, etc. used on a landfill site.

EMERGENCY MEDICAL CARE:

Permanent first aid equipment will not necessarily be found on site; first aid kits are kept in the ESC company vehicles. A list of emergency phone numbers is shown below in Table 1.

Table 1

Agency/Facility	Telephone Number
Ambulance/Police/Fire	**911**
University of Wisconsin Hospital 600 Highland Avenue Madison, WI 53792	(608) 262-2398 Note: See Attachment 2 for specific directions
ESC – Muskego, WI	(414) 427-5033
Frank Perugini (ESC) – Mobile phone	(414) 333-9453
Client representative: Hank Kuehling	(608) 275-3286

EMERGENCY PROCEDURES:
Stop work activities when injury or accident occurs. As needed notify appropriate emergency agency. Administer first aid if possible. Contact the ESC Project Team Leader and Health & Safety Officer as soon as is possible.

APPROVAL SIGNATURE

All site personnel have read the above plan and are familiar with its provisions.

	Name	**Date**	**SS#**
Project Team Leader and Health & Safety Officer:		9/27/02	394-58-7459
Other Site Personnel:	Tracy Lemmermann	09/27/02	39384-9261
	Freimark	09/27/02	387-96-7253

Attachment 1

Material Safety Data Sheet

Hydrochloric Acid

MSDS Number: H3880 Effective Date: 05/10/01

MSDS MATERIAL SAFETY DATA SHEET

From: Mallinckrodt Baker, Inc.
222 Red School Lane
Phillipsburg, NJ 08865

Emergency Telephone Number: 908-859-2151

CHEMTREC: 800-424-9300 (USA)
703-527-3887
(Outside USA & CANADA)
CANUTEC: 613-996-6666

NOTE: Use CHEMTREC and CANUTEC phone numbers only in the event of a chemical emergency.

All non-emergency questions should be directed to Customer Service (1-800-582-2537) for assistance.

MALLINCKRODT J. T. BAKER

HYDROCHLORIC ACID, 33 - 40%

1. Product Identification

Synonyms: Muriatic acid; hydrogen chloride, aqueous
CAS No: 7647-01-0
Molecular Weight: 36.46
Chemical Formula: HCl

Product Codes: J.T. Baker:
5367, 5537, 5575, 5800, 5814, 5839, 6900, 7831, 9529, 9530, 9534, 9535, 9536, 9537, 9538, 9539, 9540, 9544, 9548
Mallinckrodt:
2062, 2612, 2624, 2626, 5587, H611, H613, H987, H992, H999, V078, V628

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Hydrogen Chloride	7647-01-0	33 - 40%	Yes
Water	7732-18-5	60 - 67%	No

3. Hazards Identification

Emergency Overview

POISON! DANGER! CORROSIVE.
LIQUID AND MIST CAUSE SEVERE BURNS TO ALL BODY TISSUE. MAY BE FATAL IF SWALLOWED OR INHALED. INHALATION MAY CAUSE LUNG DAMAGE.

J.T. Baker SAF-T-DATA(tm) Ratings (Provided here for your convenience)

Health Rating: 3 - Severe (Poison)
Flammability Rating: 0 - None
Reactivity Rating: 2 - Moderate
Contact Rating: 3 - Severe (Corrosive)
Lab Protective Equip: GOGGLES & SHIELD; LAB COAT & APRON; VENT HOOD; PROPER GLOVES
Storage Color Code: White (Corrosive)

Potential Health Effects

Inhalation:
Corrosive! Inhalation of vapors can cause coughing, choking, inflammation of the nose, throat, and upper respiratory tract, and in severe cases, pulmonary edema, circulatory failure, and death.

Ingestion:
Corrosive! Swallowing hydrochloric acid can cause immediate pain and burns of the mouth, throat, esophagus and gastrointestinal tract. May cause nausea, vomiting, and diarrhea. Swallowing may be fatal.

Skin Contact:
Corrosive! Can cause redness, pain, and severe skin burns. Concentrated solutions cause deep ulcers and discolor skin.

Eye Contact:
Corrosive! Vapors are irritating and may cause damage to the eyes. Contact may cause severe burns and permanent eye damage.

Chronic Exposure:
Long-term exposure to concentrated vapors may cause erosion of teeth. Long term exposures seldom occur due to the corrosive properties of the acid.

Aggravation of Pre-existing Conditions:
Persons with pre-existing skin disorders or eye disease may be more susceptible to the effects of this substance.

4. First Aid Measures

Inhalation:
Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately.

Ingestion:
DO NOT INDUCE VOMITING! Give large quantities of water or milk if available. Never give anything by mouth to an unconscious person. Get medical attention immediately.

Skin Contact:
In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention immediately.

Eye Contact:
Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

5. Fire Fighting Measures

Fire:
Extreme heat or contact with metals can release flammable hydrogen gas.

Explosion:
Not considered to be an explosion hazard.

Fire Extinguishing Media:
If involved in a fire, use water spray. Neutralize with soda ash or slaked lime.

Special Information:
In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode. Structural firefighter's protective clothing is ineffective for fires involving hydrochloric acid. Stay away from ends of tanks. Cool tanks with water spray until well after fire is out.

6. Accidental Release Measures

Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8. Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Contain and recover liquid when possible. Neutralize with alkaline material (soda ash, lime), then absorb with an inert material (e. g., vermiculite, dry sand, earth), and place in a chemical waste container. Do not use combustible materials, such as saw dust. Do not flush to sewer! US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.
J. T. Baker NEUTRASORB(R) or TEAM(R) 'Low Na+' acid neutralizers are recommended for spills of this product.

7. Handling and Storage

Store in a cool, dry, ventilated storage area with acid resistant floors and good drainage. Protect from physical damage. Keep out of direct sunlight and away from heat, water, and incompatible materials. Do not wash out container and use it for other purposes. When diluting, the acid should always be added slowly to water and in small amounts. Never use hot water and never add water to the acid. Water added to acid can cause uncontrolled boiling and splashing. When opening metal containers, use non-sparking tools because of the possibility of hydrogen gas being present. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product.

8. Exposure Controls/Personal Protection

Airborne Exposure Limits:

-OSHA Permissible Exposure Limit (PEL):
5 ppm Ceiling
-ACGIH Threshold Limit Value (TLV):
5 ppm Ceiling

Ventilation System:
A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, "Industrial Ventilation, A Manual of Recommended Practices", most recent edition, for details.

Personal Respirators (NIOSH Approved):
If the exposure limit is exceeded, a full facepiece respirator with an acid gas cartridge may be worn up to 50 times the exposure limit or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. For emergencies or instances where the exposure levels are not known, use a full-facepiece positive-pressure, air-supplied respirator. WARNING: Air purifying respirators do not protect workers in oxygen-deficient atmospheres.

Skin Protection:
Rubber or neoprene gloves and additional protection including impervious boots, apron, or coveralls, as needed in areas of unusual exposure to prevent skin contact.

Eye Protection:
Use chemical safety goggles and/or a full face shield where splashing is possible. Maintain eye wash fountain and quick-drench facilities in work area.

9. Physical and Chemical Properties

Appearance:
Colorless, fuming liquid.

Odor:
Pungent odor of hydrogen chloride.

Solubility:
Infinite in water with slight evolution of heat.

Density:
1.18

pH:
For HCL solutions:
0.1 (1.0 N), 1.1 (0.1 N),
2.02 (0.01 N)

% Volatiles by volume @ 21C (70F):
100

Boiling Point:
53C (127F) Azeotrope (20.2%) boils at 109C (228F)

Melting Point:
-74C (-101F)

Vapor Density (Air=1):
No information found.

Vapor Pressure (mm Hg):
190 @ 25C (77F)

Evaporation Rate (BuAc=1):
No information found.

10. Stability and Reactivity

Stability:
Stable under ordinary conditions of use and storage. Containers may burst when heated.

Hazardous Decomposition Products:
When heated to decomposition, emits toxic hydrogen chloride fumes and will react with water or steam to produce heat and toxic and corrosive fumes. Thermal oxidative decomposition produces toxic chlorine fumes and explosive hydrogen gas.

Hazardous Polymerization:
Will not occur.

Incompatibilities:
A strong mineral acid, concentrated hydrochloric acid is incompatible with many substances and highly reactive with strong bases, metals, metal oxides, hydroxides, amines, carbonates and other alkaline materials. Incompatible with materials such as cyanides, sulfides, sulfites, and formaldehyde.

Conditions to Avoid:
Heat, direct sunlight.

11. Toxicological Information

Inhalation rat LC50: 3124 ppm/1H; oral rabbit LD50: 900 mg/kg (Hydrochloric acid concentrated); investigated as a tumorigen, mutagen, reproductive effector.

--------\Cancer Lists\--

	---NTP Carcinogen---		
Ingredient	Known	Anticipated	IARC Category
Hydrogen Chloride (7647-01-0)	No	No	3
Water (7732-18-5)	No	No	None

12. Ecological Information

Environmental Fate:
When released into the soil, this material is not expected to biodegrade. When released into the soil, this material may leach into groundwater.

Environmental Toxicity:
This material is expected to be toxic to aquatic life.

13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be handled as hazardous waste and sent to a RCRA approved waste facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations.

Dispose of container and unused contents in accordance with federal, state and local requirements.

14. Transport Information

Domestic (Land, D.O.T.)

Proper Shipping Name: HYDROCHLORIC ACID
Hazard Class: 8
UN/NA: UN1789 Packing Group: II
Information reported for product/size: 475LB

International (Water, I.M.O.)

Proper Shipping Name: HYDROCHLORIC ACID
Hazard Class: 8
UN/NA: UN1789 Packing Group: II
Information reported for product/size: 475LB

15. Regulatory Information

--------\Chemical Inventory Status - Part 1\--------

Ingredient	TSCA	EC	Japan	Australia
Hydrogen Chloride (7647-01-0)	Yes	Yes	Yes	Yes
Water (7732-18-5)	Yes	Yes	Yes	Yes

--------\Chemical Inventory Status - Part 2\--------

		--Canada--		
Ingredient	Korea	DSL	NDSL	Phil.
Hydrogen Chloride (7647-01-0)	Yes	Yes	No	Yes
Water (7732-18-5)	Yes	Yes	No	Yes

-------\Federal, State & International Regulations - Part 1\--------

	-SARA 302-		------SARA 313------	
Ingredient	RQ	TPQ	List	Chemical Catg.
Hydrogen Chloride (7647-01-0)	5000	500*	Yes	No
Water (7732-18-5)	No	No	No	No

--------\Federal, State & International Regulations - Part 2\--------

Ingredient	CERCLA	-RCRA- 261.33	-TSCA- 8(d)
Hydrogen Chloride (7647-01-0)	5000	No	No
Water (7732-18-5)	No	No	No

Chemical Weapons Convention: No TSCA 12(b): No CDTA: Yes
SARA 311/312: Acute: Yes Chronic: Yes Fire: No Pressure: No
Reactivity: No (Mixture / Liquid)

Australian Hazchem Code: 2R
Poison Schedule: No information found.

WHMIS: This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

16. Other Information

NFPA Ratings:
Health: 3 Flammability: 0 Reactivity: 0

Label Hazard Warning:
POISON! DANGER! CORROSIVE.
LIQUID AND MIST CAUSE SEVERE BURNS TO ALL BODY TISSUE. MAY BE FATAL IF SWALLOWED OR INHALED. INHALATION MAY CAUSE LUNG DAMAGE.

Label Precautions:
Do not get in eyes, on skin, or on clothing.
Do not breathe vapor or mist.
Use only with adequate ventilation.
Wash thoroughly after handling.
Store in a tightly closed container.
Remove and wash contaminated clothing promptly.

Label First Aid:
In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In all cases get medical attention immediately.

Product Use:
Laboratory Reagent.
Labeling according to EC Directives
Symbol: C
R-phrases:
R34 . . . . Causes burns
R37 . . . . Irritating to respiratory system
S-phrases:
S(1/2) . . . . . Keep locked up and out of the reach of children
S26 . . . . In case of contact with eyes, rinse immediately with plenty of water and seek medical advice
S45 . . . . In case of accident or if you feel unwell seek medical advice immediately (show the label where possible)

Revision Information:
MSDS Section(s) changed since last revision of document include: 16.

Disclaimer:
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Prepared by: Environmental Health & Safety
Phone Number: (314) 654-1600 (U.S.A.)

Attachment 2

Map Directions to Hospital

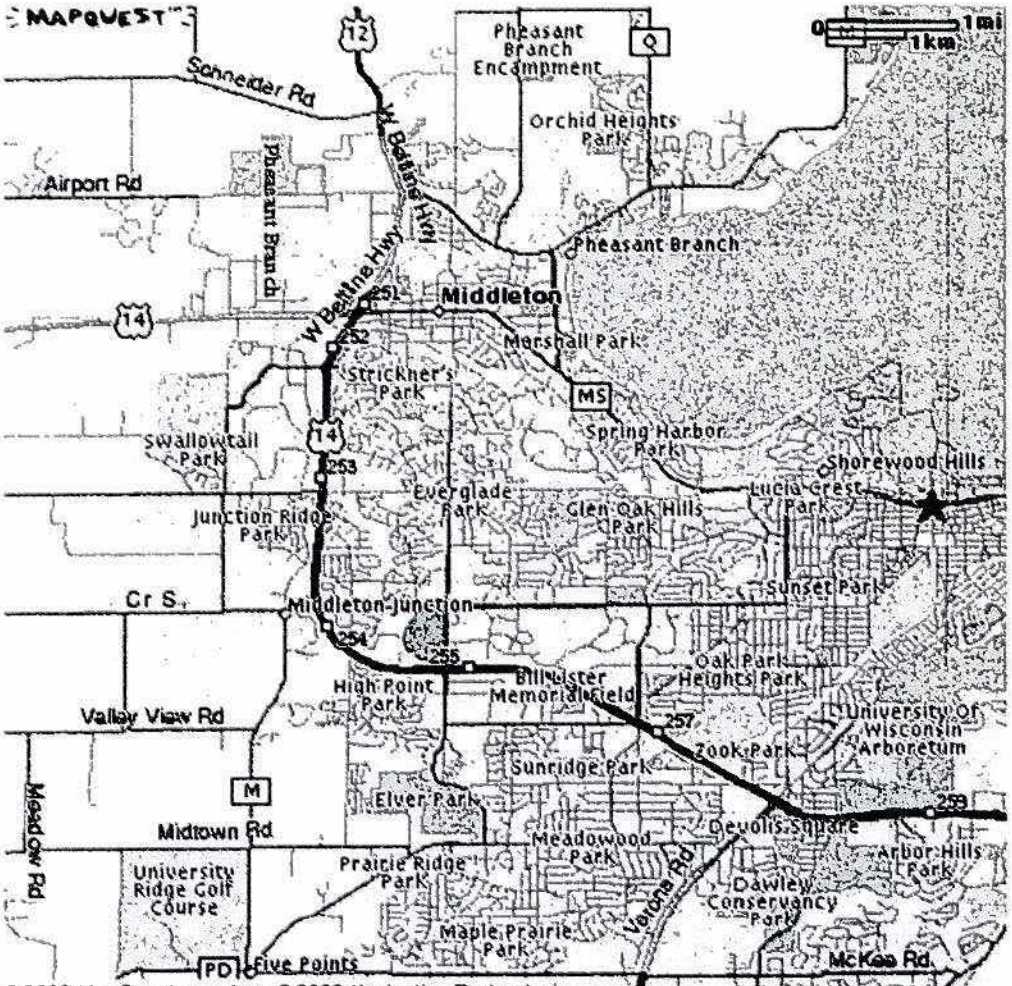
Directions to University Hospital from Refuse Hideaway Landfill

DIRECTIONS	**DISTANCE**
1: Start out going East on US-14 towards WILLOW LN by turning left.	1.61 miles
2: US-14 becomes US-14/UNIVERSITY AVE.	1.12 miles
3: US-14/UNIVERSITY AVE becomes UNIVERSITY AVE.	0.21 miles
4: UNIVERSITY AVE becomes UNIVERSITY AVE/CR-MS E.	2.17 miles
5: UNIVERSITY AVE/CR-MS E becomes UNIVERSITY AVE.	2.59 miles
6: Turn SLIGHT LEFT onto CAMPUS DR.	0.16 miles
Total Estimated Time:	**Total Distance:**
27 minutes	**7.86 miles**

See maps on following page.

Address: **University of Wisconsin Hospital**
600 Highland Avenue
Madison, WI 53792-0001

☆ **Indicates University of Wisconsin Hospital**
600 Highland Avenue
Madison, WI 53792-0001



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