PSC 91

Rocky Mountain
Analytical Laboratory

ANALYTICAL RESULTS

FOR

SIGNETICS

ENSECO-RMAL NO. 014454

APRIL 30, 1991

Enseco

Reviewed by:

Joel E. Holtz

Sue Dalla

Enseco Incorporated
4955 Yarrow Street
Arvada, Colorado 80002
303/421-6611 Fax: 303/431-7171

Enseco
A Corning Company

Halogenated Volatile Organics

Method 8010

Client Name: Signetics
Client ID: Well #2/ Groundwater
Lab ID: 014454-0001-SA
Matrix: AQUEOUS Sampled: 09 APR 91 Received: 11 APR 91
Authorized: 11 APR 91 Prepared: NA Analyzed: 22 APR 91

Parameter	Result	Units	Reporting Limit
Chloromethane	ND	ug/L	5.0
Bromomethane	ND	ug/L	5.0
Vinyl chloride	ND	ug/L	1.0
Chloroethane	ND	ug/L	5.0
Methylene chloride	ND	ug/L	5.0
1,1-Dichloroethene	ND	ug/L	0.50
1,1-Dichloroethane	ND	ug/L	0.50
trans-1,2-Dichloroethene	ND	ug/L	0.50
Chloroform	ND	ug/L	0.50
1,1,2 Trichloro-1,2,2-trifluoroethane	ND	ug/L	1.0
1,2-Dichloroethane	ND	ug/L	1.0
1,1,1-Trichloroethane	ND	ug/L	0.50
Carbon tetrachloride	ND	ug/L	0.50
Bromodichloromethane	ND	ug/L	1.0
1,2-Dichloropropane	ND	ug/L	1.0
trans-1,3-Dichloropropene	ND	ug/L	1.0
Trichloroethene	ND	ug/L	0.50
Dibromochloromethane	ND	ug/L	1.0
cis-1,3-Dichloropropene	ND	ug/L	2.0
1,1,2-Trichloroethane	ND	ug/L	1.0
EDB (1,2-Dibromoethane)	ND	ug/L	2.0
Bromoform	ND	ug/L	5.0
1,1,2,2-Tetrachloroethane	ND	ug/L	1.0
Tetrachloroethene	4.7	ug/L	0.50
Chlorobenzene	ND	ug/L	2.0

Surrogate	Recovery	
Bromochloromethane	81	%

ND = Not detected
NA = Not applicable

Reported By: Tina Pieper Approved By: Mike Hoffman

Enseco
A Corning Company

Halogenated Volatile Organics

Method 8010

Client Name: Signetics
Client ID: Well #1/ Groundwater
Lab ID: 014454-0002-SA
Matrix: AQUEOUS Sampled: 09 APR 91 Received: 11 APR 91
Authorized: 11 APR 91 Prepared: NA Analyzed: 22 APR 91

Parameter	Result	Units	Reporting Limit
Chloromethane	ND	ug/L	5.0
Bromomethane	ND	ug/L	5.0
Vinyl chloride	ND	ug/L	1.0
Chloroethane	ND	ug/L	5.0
Methylene chloride	ND	ug/L	5.0
1,1-Dichloroethene	ND	ug/L	0.50
1,1-Dichloroethane	ND	ug/L	0.50
trans-1,2-Dichloroethene	ND	ug/L	0.50
Chloroform	ND	ug/L	0.50
1,1,2 Trichloro-1,2,2-trifluoroethane	ND	ug/L	1.0
1,2-Dichloroethane	ND	ug/L	1.0
1,1,1-Trichloroethane	ND	ug/L	0.50
Carbon tetrachloride	ND	ug/L	0.50
Bromodichloromethane	ND	ug/L	1.0
1,2-Dichloropropane	ND	ug/L	1.0
trans-1,3-Dichloropropene	ND	ug/L	1.0
Trichloroethene	ND	ug/L	0.50
Dibromochloromethane	ND	ug/L	1.0
cis-1,3-Dichloropropene	ND	ug/L	2.0
1,1,2-Trichloroethane	ND	ug/L	1.0
EDB (1,2-Dibromoethane)	ND	ug/L	2.0
Bromoform	ND	ug/L	5.0
1,1,2,2-Tetrachloroethane	ND	ug/L	1.0
Tetrachloroethene	11	ug/L	0.50
Chlorobenzene	ND	ug/L	2.0

Surrogate	Recovery	
Bromochloromethane	75	%

ND = Not detected
NA = Not applicable

Reported By: Tina Pieper Approved By: Mike Hoffman

Enseco
A Corning Company

Halogenated Volatile Organics

Method 8010

Client Name: Signetics
Client ID: Well #4/ Groundwater
Lab ID: 014454-0003-SA
Matrix: AQUEOUS Sampled: 10 APR 91 Received: 11 APR 91
Authorized: 11 APR 91 Prepared: NA Analyzed: 22 APR 91

Parameter	Result	Units	Reporting Limit
Chloromethane	ND	ug/L	5.0
Bromomethane	ND	ug/L	5.0
Vinyl chloride	ND	ug/L	1.0
Chloroethane	ND	ug/L	5.0
Methylene chloride	ND	ug/L	5.0
1,1-Dichloroethene	ND	ug/L	0.50
1,1-Dichloroethane	ND	ug/L	0.50
trans-1,2-Dichloroethene	ND	ug/L	0.50
Chloroform	ND	ug/L	0.50
1,1,2 Trichloro-1,2,2-trifluoroethane	ND	ug/L	1.0
1,2-Dichloroethane	ND	ug/L	1.0
1,1,1-Trichloroethane	ND	ug/L	0.50
Carbon tetrachloride	ND	ug/L	0.50
Bromodichloromethane	ND	ug/L	1.0
1,2-Dichloropropane	ND	ug/L	1.0
trans-1,3-Dichloropropene	ND	ug/L	1.0
Trichloroethene	ND	ug/L	0.50
Dibromochloromethane	ND	ug/L	1.0
cis-1,3-Dichloropropene	ND	ug/L	2.0
1,1,2-Trichloroethane	ND	ug/L	1.0
EDB (1,2-Dibromoethane)	ND	ug/L	2.0
Bromoform	ND	ug/L	5.0
1,1,2,2-Tetrachloroethane	ND	ug/L	1.0
Tetrachloroethene	5.7	ug/L	0.50
Chlorobenzene	ND	ug/L	2.0

Surrogate	Recovery	
Bromochloromethane	72	%

ND = Not detected
NA = Not applicable

Reported By: Tina Pieper Approved By: Mike Hoffman

Enseco
A Corning Company

Halogenated Volatile Organics

Method 8010

lient Name: Signetics
lient ID: Well #3/ Groundwater
ab ID: 014454-0004-SA
atrix: AQUEOUS Sampled: 10 APR 91 Received: 11 APR 91
uthorized: 11 APR 91 Prepared: NA Analyzed: 23 APR 91

arameter	Result	Units	Reporting Limit
hloromethane	ND	ug/L	5.0
romomethane	ND	ug/L	5.0
inyl chloride	ND	ug/L	1.0
hloroethane	ND	ug/L	5.0
ethylene chloride	ND	ug/L	5.0
,1-Dichloroethene	ND	ug/L	0.50
,1-Dichloroethane	ND	ug/L	0.50
rans-1,2-Dichloroethene	ND	ug/L	0.50
hloroform	ND	ug/L	0.50
,1,2 Trichloro-1,2,2-trifluoroethane	ND	ug/L	1.0
,2-Dichloroethane	ND	ug/L	1.0
,1,1-Trichloroethane	ND	ug/L	0.50
arbon tetrachloride	ND	ug/L	0.50
romodichloromethane	ND	ug/L	1.0
,2-Dichloropropane	ND	ug/L	1.0
rans-1,3-Dichloropropene	ND	ug/L	1.0
richloroethene	ND	ug/L	0.50
ibromochloromethane	ND	ug/L	1.0
is-1,3-Dichloropropene	ND	ug/L	2.0
,1,2-Trichloroethane	ND	ug/L	1.0
DB (1,2-Dibromoethane)	ND	ug/L	2.0
romoform	ND	ug/L	5.0
,1,2,2-Tetrachloroethane	ND	ug/L	1.0
etrachloroethene	ND	ug/L	0.50
hlorobenzene	ND	ug/L	2.0
urrogate	Recovery		
romochloromethane	73	%	

D = Not detected
A = Not applicable

eported By: Tina Pieper Approved By: Mike Hoffman

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Halogenated Volatile Organics

Method 8010

Client Name: Signetics
Client ID: Trip blank
Lab ID: 014454-0005-TB
Matrix: AQUEOUS Sampled: 10 APR 91 Received: 11 APR 91
Authorized: 11 APR 91 Prepared: NA Analyzed: 23 APR 91

Parameter	Result	Units	Reporting Limit
Chloromethane	ND	ug/L	5.0
Bromomethane	ND	ug/L	5.0
Vinyl chloride	ND	ug/L	1.0
Chloroethane	ND	ug/L	5.0
Methylene chloride	ND	ug/L	5.0
1,1-Dichloroethene	ND	ug/L	0.50
1,1-Dichloroethane	ND	ug/L	0.50
trans-1,2-Dichloroethene	ND	ug/L	0.50
Chloroform	ND	ug/L	0.50
1,1,2 Trichloro-1,2,2-trifluoroethane	ND	ug/L	1.0
1,2-Dichloroethane	ND	ug/L	1.0
1,1,1-Trichloroethane	ND	ug/L	0.50
Carbon tetrachloride	ND	ug/L	0.50
Bromodichloromethane	ND	ug/L	1.0
1,2-Dichloropropane	ND	ug/L	1.0
trans-1,3-Dichloropropene	ND	ug/L	1.0
Trichloroethene	ND	ug/L	0.50
Dibromochloromethane	ND	ug/L	1.0
cis-1,3-Dichloropropene	ND	ug/L	2.0
1,1,2-Trichloroethane	ND	ug/L	1.0
EDB (1,2-Dibromoethane)	ND	ug/L	2.0
Bromoform	ND	ug/L	5.0
1,1,2,2-Tetrachloroethane	ND	ug/L	1.0
Tetrachloroethene	ND	ug/L	0.50
Chlorobenzene	ND	ug/L	2.0

Surrogate	Recovery	
Bromochloromethane	73	%

ND = Not detected
NA = Not applicable

Reported By: Tina Pieper Approved By: Mike Hoffman

Enseco
A Corning Company

General Inorganics

Client Name: Signetics
Client ID: Well #2/ Groundwater
Lab ID: 014454-0001-SA
Matrix: AQUEOUS Sampled: 09 APR 91 Received: 11 APR 91
Authorized: 11 APR 91 Prepared: See Below Analyzed: See Below

Parameter	Result	Units	Reporting Limit	Analytical Method	Prepared Date	Analyzed Date
Total Kjeldahl Nitrogen as N	ND	mg/L	0.50	351.2	NA	24 APR 91
Total Organic Carbon	0.79	mg/L	0.50	9060	NA	25 APR 91

ND = Not detected
NA = Not applicable

Reported By: Blake Besser Approved By: Toni Stovall

Enseco
A Corning Company

General Inorganics

Client Name: Signetics
Client ID: Well #1/ Groundwater
Lab ID: 014454-0002-SA
Matrix: AQUEOUS Sampled: 09 APR 91 Received: 11 APR 91
Authorized: 11 APR 91 Prepared: See Below Analyzed: See Below

Parameter	Result	Units	Reporting Limit	Analytical Method	Prepared Date	Analyzed Date
Total Kjeldahl Nitrogen as N	ND	mg/L	0.50	351.2	NA	24 APR 91
Total Organic Carbon	0.53	mg/L	0.50	9060	NA	25 APR 91

ND = Not detected
NA = Not applicable

Reported By: Blake Besser Approved By: Toni Stovall

Enseco
A Corning Company

General Inorganics

Client Name: Signetics
Client ID: Well #4/ Groundwater
Lab ID: 014454-0003-SA
Matrix: AQUEOUS Sampled: 10 APR 91 Received: 11 APR 91
Authorized: 11 APR 91 Prepared: See Below Analyzed: See Below

Parameter	Result	Units	Reporting Limit	Analytical Method	Prepared Date	Analyzed Date
Total Kjeldahl Nitrogen as N	ND	mg/L	0.50	351.2	NA	24 APR 91
Total Organic Carbon	0.77	mg/L	0.50	9060	NA	25 APR 91

ND = Not detected
NA = Not applicable

Reported By: Blake Besser Approved By: Toni Stovall

Enseco
A Corning Company

General Inorganics

Client Name: Signetics
Client ID: Well #3/ Groundwater
Lab ID: 014454-0004-SA
Matrix: AQUEOUS Sampled: 10 APR 91 Received: 11 APR 91
Authorized: 11 APR 91 Prepared: See Below Analyzed: See Below

Parameter	Result	Units	Reporting Limit	Analytical Method	Prepared Date	Analyzed Date
Total Kjeldahl Nitrogen as N	ND	mg/L	0.50	351.2	NA	24 APR 91
Total Organic Carbon	ND	mg/L	0.50	9060	NA	25 APR 91

ND = Not detected
NA = Not applicable

Reported By: Blake Besser Approved By: Toni Stovall

Quality Control Results

The Enseco laboratories operate under a vigorous QA/QC program designed to ensure the generation of scientifically valid, legally defensible data by monitoring every aspect of laboratory operations. Routine QA/QC procedures include the use of approved methodologies, independent verification of analytical standards, use of duplicate Laboratory Control Samples to assess the precision and accuracy of the methodology on a routine basis, and a rigorous system of data review.

In addition, the Enseco laboratories maintain a comprehensive set of certifications from both state and federal governmental agencies which require frequent analyses of blind audit samples. Enseco - Rocky Mountain Analytical Laboratory is certified by the EPA under the EPA/CLP program for both Organic and Inorganic analyses, under the USATHAMA (U.S. Army) program, by the Army Corps of Engineers, and the states of Colorado, New Jersey, New York, Utah, and Florida, among others.

The standard laboratory QC package is designed to:

1) establish a strong, cost-effective QC program that ensures the generation of scientifically valid, legally defensible data

2) assess the laboratory's performance of the analytical method using control limits generated with a well-defined matrix

3) establish clear-cut guidelines for acceptability of analytical data so that QC decisions can be made immediately at the bench, and

4) provide a standard set of reportables which assures the client of the quality of his data.

The Enseco QC program is based upon monitoring the precision and accuracy of an analytical method by analyzing a set of Duplicate Control Samples (DCS) at frequent, well-defined intervals. Each DCS is a well-characterized matrix which is spiked with target compounds at 5-100 times the reporting limit, depending upon the methodology being monitored. The purpose of the DCS is not to duplicate the sample matrix, but rather to provide an interference-free, homogeneous matrix from which to gather data to establish control limits. These limits are used to determine whether data generated by the laboratory on any given day is in control.

Control limits for accuracy (percent recovery) are based on the average, historical percent recovery +/- 3 standard deviation units. Control limits for precision (relative percent difference) range from 0 (identical duplicate DCS results) to the average, historical relative percent difference + 3 standard deviation units. These control limits are fairly narrow based on the consistency of the matrix being monitored and are updated on a quarterly basis.

For each batch of samples analyzed, an additional control measure is taken in the form of a Single Control Sample (SCS). The SCS consists of a control matrix that is spiked with either representative target compounds or surrogate compounds appropriate to the method being used. An SCS is prepared for each sample lot for which the DCS pair are not analyzed.

Accuracy for DCS and SCS is measured by Percent Recovery.

$$\% \text{ Recovery} = \frac{\text{Measured Concentration}}{\text{Actual Concentration}} \times 100$$

Precision for DCS is measured by Relative Percent Difference (RPD).

$$\text{RPD} = \frac{\left| \text{Measured Concentration DCS1} - \text{Measured Concentration DCS2} \right|}{(\text{Measured Concentration DCS1} + \text{Measured Concentration DCS2})/2} \times 100$$

All samples analyzed concurrently by the same test are assigned the same QC lot number. Projects which contain numerous samples, analyzed over several days, may have multiple QC lot numbers associated with each test. The QC information which follows includes a listing of the QC lot numbers associated with each of the samples reported, DCS and SCS (where applicable) recoveries from the QC lots associated with the samples, and control limits for these lots. The QC data is reported by test code, in the order that the tests are reported in the analytical results section of this report.

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QC LOT ASSIGNMENT REPORT
Volatile Organics by GC

Laboratory Sample Number	QC Matrix	QC Category	QC Lot Number (DCS)	QC Run Number (SCS/BLANK)
014454-0001-SA	AQUEOUS	601-A	17 APR 91-F	22 APR 91-F
014454-0002-SA	AQUEOUS	601-A	17 APR 91-F	22 APR 91-F
014454-0003-SA	AQUEOUS	601-A	17 APR 91-F	22 APR 91-F
014454-0004-SA	AQUEOUS	601-A	17 APR 91-F	22 APR 91-F
014454-0005-TB	AQUEOUS	601-A	17 APR 91-F	22 APR 91-F

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DUPLICATE CONTROL SAMPLE REPORT
Volatile Organics by GC

Analyte	Concentration Spiked	Measured DCS1	Measured DCS2	AVG	Accuracy Average(%) DCS	Limits	Precisio (RPD) DCS	Limi
Category: 601-A								
Matrix: AQUEOUS								
QC Lot: 17 APR 91-F								
Concentration Units: ug/L								
1,1-Dichloroethane	5.0	4.61	4.53	4.57	91	80-130	1.8	2
Chloroform	5.0	5.14	5.01	5.08	102	80-120	2.6	2
Bromodichloromethane	10	8.02	7.60	7.81	78	80-120	5.4	2
Trichloroethene	5.0	5.48	5.07	5.28	106	70-120	7.8	2
Chlorobenzene	5.0	4.50	4.54	4.52	90	80-120	0.9	2

Calculations are performed before rounding to avoid round-off errors in calculated results.

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SINGLE CONTROL SAMPLE REPORT
Volatile Organics by GC

Analyte	Concentration Spiked	Concentration Measured	Accuracy(%) SCS	Accuracy(%) Limits
Category: 601-A				
Matrix: AQUEOUS				
QC Lot: 17 APR 91-F QC Run: 22 APR 91-F				
Concentration Units: ug/L				
Bromochloromethane	5.00	3.55	71	20-160

Calculations are performed before rounding to avoid round-off errors in calculated results.

METHOD BLANK REPORT
Volatile Organics by GC

Analyte	Result	Units	Reporting Limit
Test: 601-A Matrix: AQUEOUS QC Lot: 17 APR 91-F QC Run: 22 APR 91-F			
Chloromethane	ND	ug/L	5.0
Bromomethane	ND	ug/L	5.0
Vinyl chloride	ND	ug/L	1.0
Chloroethane	ND	ug/L	5.0
Methylene chloride	ND	ug/L	5.0
1,1-Dichloroethene	ND	ug/L	0.50
1,1-Dichloroethane	ND	ug/L	0.50
trans-1,2-Dichloroethene	ND	ug/L	0.50
Chloroform	ND	ug/L	0.50
1,1,2 Trichloro-1,2,2-trifluoroethane	ND	ug/L	1.0
1,2-Dichloroethane	ND	ug/L	1.0
1,1,1-Trichloroethane	ND	ug/L	0.50
Carbon tetrachloride	ND	ug/L	0.50
Bromodichloromethane	ND	ug/L	1.0
1,2-Dichloropropane	ND	ug/L	1.0
trans-1,3-Dichloropropene	ND	ug/L	1.0
Trichloroethene	ND	ug/L	0.50
Dibromochloromethane	ND	ug/L	1.0
cis-1,3-Dichloropropene	ND	ug/L	2.0
1,1,2-Trichloroethane	ND	ug/L	1.0
EDB (1,2-Dibromoethane)	ND	ug/L	2.0
Bromoform	ND	ug/L	5.0
1,1,2,2-Tetrachloroethane	ND	ug/L	1.0
Tetrachloroethene	ND	ug/L	0.50
Chlorobenzene	ND	ug/L	2.0
Test: 601-A Matrix: AQUEOUS QC Lot: 17 APR 91-F QC Run: 22 APR 91-F			
Chloromethane	ND	ug/L	5.0
Bromomethane	ND	ug/L	5.0
Vinyl chloride	ND	ug/L	1.0
Chloroethane	ND	ug/L	5.0
Methylene chloride	ND	ug/L	5.0
1,1-Dichloroethene	ND	ug/L	0.50
1,1-Dichloroethane	ND	ug/L	0.50
trans-1,2-Dichloroethene	ND	ug/L	0.50
Chloroform	ND	ug/L	0.50

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METHOD BLANK REPORT
Volatile Organics by GC (cont.)

Test: 601-A
Matrix: AQUEOUS
QC Lot: 17 APR 91-F QC Run: 22 APR 91-F

Analyte	Result	Units	Reporting Limit
1,1,2 Trichloro-1,2,2-trifluoroethane	ND	ug/L	1.0
1,2-Dichloroethane	ND	ug/L	1.0
1,1,1-Trichloroethane	ND	ug/L	0.50
Carbon tetrachloride	ND	ug/L	0.50
Bromodichloromethane	ND	ug/L	1.0
1,2-Dichloropropane	ND	ug/L	1.0
trans-1,3-Dichloropropene	ND	ug/L	1.0
Trichloroethene	ND	ug/L	0.50
Dibromochloromethane	ND	ug/L	1.0
cis-1,3-Dichloropropene	ND	ug/L	2.0
1,1,2-Trichloroethane	ND	ug/L	1.0
EDB (1,2-Dibromoethane)	ND	ug/L	2.0
Bromoform	ND	ug/L	5.0
1,1,2,2-Tetrachloroethane	ND	ug/L	1.0
Tetrachloroethene	ND	ug/L	0.50
Chlorobenzene	ND	ug/L	2.0

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QC LOT ASSIGNMENT REPORT
Wet Chemistry Analysis and Preparation

Laboratory Sample Number	QC Matrix	QC Category	QC Lot Number (DCS)	QC Run Number (SCS/BLANK)
014454-0001-SA	AQUEOUS	TOC-A	25 APR 91-A	-
014454-0001-SA	AQUEOUS	TKN-A	24 APR 91-A	24 APR 91-A
014454-0002-SA	AQUEOUS	TOC-A	25 APR 91-A	-
014454-0002-SA	AQUEOUS	TKN-A	24 APR 91-A	24 APR 91-A
014454-0003-SA	AQUEOUS	TOC-A	25 APR 91-A	-
014454-0003-SA	AQUEOUS	TKN-A	24 APR 91-A	24 APR 91-A
014454-0004-SA	AQUEOUS	TOC-A	25 APR 91-A	-
014454-0004-SA	AQUEOUS	TKN-A	24 APR 91-A	24 APR 91-A

Enseco
A Corning Company

DUPLICATE CONTROL SAMPLE REPORT
Wet Chemistry Analysis and Preparation

Analyte	Concentration Spiked	Measured DCS1	Measured DCS2	Measured AVG	Accuracy Average(%) DCS	Accuracy Limits	Precision (RPD) DCS	Precision Limit
Category: TOC-A Matrix: AQUEOUS QC Lot: 25 APR 91-A Concentration Units: mg/L								
Total Organic Carbon	25.0	26.0	26.8	26.4	105	91-109	3.0	20
Category: TKN-A Matrix: AQUEOUS QC Lot: 24 APR 91-A Concentration Units: mg/L								
Total Kjeldahl Nitrogen as N	2.9	3.03	2.93	2.98	103	78-122	3.4	20

Calculations are performed before rounding to avoid round-off errors in calculated results.

METHOD BLANK REPORT
Wet Chemistry Analysis and Preparation

Analyte	Result	Units	Reporting Limit
Test: TKN-TEC-A			
Matrix: AQUEOUS			
QC Lot: 24 APR 91-A QC Run: 24 APR 91-A			
Total Kjeldahl Nitrogen as N	ND	mg/L	0.50