

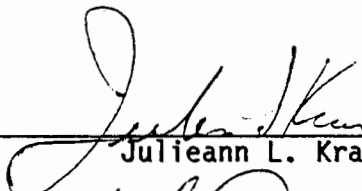
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ANALYTICAL RESULTS
FOR
U.S. GEOLOGICAL SURVEY
ENSECO-RMAL NO. 022785

JUNE 19, 1992

Reviewed by:



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KAFB1228



I. OVERVIEW

On May 15, 1992, Enseco-Rocky Mountain Analytical Laboratory received one aqueous sample from U.S. Geological Survey.

This report presents the analytical results as well as supporting information to aid in the evaluation and interpretation of the data and is arranged in the following order:

- I. Overview
- II. Sample Description Information/Analytical Test Requests
- III. Analytical Results
- IV. Quality Control Report

Standard analytical protocols were followed in the analysis of the samples and no problems were encountered or anomalies observed. All laboratory QC samples analyzed in conjunction with the samples in this project were within established control limits.

II. SAMPLE DESCRIPTION INFORMATION/ANALYTICAL TEST REQUESTS

Sample Description Information

The Sample Description Information lists all of the samples received in this project together with the internal laboratory identification number assigned for each sample. Each project received at Enseco - RMAL is assigned a unique six digit number. Samples within the project are numbered sequentially. The laboratory identification number is a combination of the six digit project code and the sample sequence number.

Also given in the Sample Description Information is the Sample Type (matrix), Date of Sampling (if known) and Date of Receipt at the laboratory.

Analytical Test Requests

The Analytical Test Requests lists the analyses that were performed on each sample. The Custom Test column indicates where tests have been modified to conform to the specific requirements of this project.

ANALYTICAL TEST REQUESTS
for
U.S. Geological Survey

| Lab ID: 022785 | Group Code | Analysis Description | Custom Test? |
|--------------------------|-----------------------|---|-------------------------|
| 0001 | A | Nitrate Plus Nitrite Total Organic Carbon (TOC) Total Organic Halogen (TOX) | N N N |

SAMPLE DESCRIPTION INFORMATION
for
U.S. Geological Survey

| Lab ID | Client ID | Matrix | Sampled Date Time | Received Date |
|----------------|--------------|---------|----------------------|------------------|
| 022785-0001-SA | KAFB090115-2 | AQUEOUS | 14 MAY 92 13:12 | 15 MAY 92 |

III. ANALYTICAL RESULTS

The analytical results for this project are presented in the following data tables. Each data table includes sample identification information, and when available and appropriate, dates sampled, received, authorized, prepared and analyzed. The authorization data is the date when the project was defined by the client such that laboratory work could begin. The date prepared is typically the date an extraction or digestion was initiated. For volatile organic compounds in water, the date prepared is the date the screening of the sample was performed.

Data sheets contain a listing of the parameters measured in each test, the analytical results and the Enseco reporting limit. Reporting limits are adjusted to reflect dilution of the sample, when appropriate. Solid and waste samples are reported on an "as received" basis, i.e. no correction is made for moisture content.

Enseco-RMAL is no longer routinely blank-correcting analytical data. Uncorrected analytical results are reported, along with associated blank results, for all organic and metals analyses. Analytical results and blank results are reported for conventional inorganic parameters as specified in the method. This policy is described in detail in the Enseco Incorporated Quality Assurance Program Plan for Environmental Chemical Monitoring, Revision 3.3, May, 1989.

In addition, surrogate recovery data is presented for all GC/MS analyses. The surrogate recovery is an indication of the affect of the sample matrix on the performance of the method. The results from the Standard Enseco QA/QC Program, which generates data which are independent of matrix effects, is given in Section IV.

The analytical data reported are subject to the following limitations of the analytical methodology:

Metals

All nominal reporting limits for metals have been established from instrument detection limit (IDL) evaluations and represent the level above which reliable data can be routinely obtained. Low level standards are analyzed seven times on three non-consecutive days on each instrument. The standard deviations of the three runs are summed to yield the IDL. Nominal reporting limits are generally 2-5 times the IDL (consistent with the American Chemical Society definition for the Limit of Quantification). The ability to achieve these quoted reporting limits is verified each quarter. Reporting limits above the nominal levels are often submitted due to matrix interferences or elevated analyte levels.

Reporting limits for metals analyzed by Inductively Coupled Plasma (ICP) are typically raised only for dilution due to an analyte exceeding the instrument linear range. Background and interelement interferences are corrected automatically and do not require dilution.

Metals analyzed by Graphite Furnace Atomic Absorption (GFAA) are subject to matrix interferences. Consequently, Enseco protocol is to analyze a spiked aliquot with every sample. The severity of the interference, based upon analyte level and spike recovery, is assessed against specific criteria and the need for an elevated reporting limit or dilution is determined.

The analysis of mercury by Cold Vapor Atomic Absorption (CVAA) is generally free from matrix interferences. As with ICP, reporting limits are raised only for dilution due to a sample concentration exceeding the linear range of the instrument.

Reporting limits for metals analyzed by inductively coupled plasma - mass spectrometry (ICPMS) may be raised for dilution due to an analyte exceeding the linear range of the instrument or matrix interference. An internal standard is analyzed with each sample to measure the degree of matrix interference - a dilution is performed when appropriate. Isobaric and

molecular interferences are corrected at the instrument and do not require dilution.

General Inorganics

Enseco
A Corning Company

Client Name: U.S. Geological Survey
Client ID: KAFB090115-2
Lab ID: 022785-0001-SA
Matrix: AQUEOUS
Authorized: 15 MAY 92

Sampled: 14 MAY 92
Prepared: See Below

Received: 15 MAY 92
Analyzed: See Below

| Parameter | Result | Units | Reporting Limit | Analytical Method | Prepared Date | Analyzed Date |
|-----------------------------|--------|-------|-----------------|-------------------|---------------|---------------|
| Nitrate plus Nitrite | 3.3 | mg/L | 0.10 | 353.2 | NA | 25 MAY 92 |
| Total Organic Carbon | 0.62 | mg/L | 0.50 | 9060 | NA | 11 JUN 92 |
| Total Organic Halogen as Cl | 35.0 | ug/L | 30.0 | 9020 | NA | 08 JUN 92 |

ND = Not detected
NA = Not applicable

Reported By: Pam Rosas

Approved By: Dave Roberts

IV. QUALITY CONTROL REPORT

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 surrogate compounds appropriate to the method being used. In cases where no surrogate is available, (e.g., metals or conventional analyses) a single DCS serves as the control sample. An SCS is prepared for each sample lot for which the DCS pair are not analyzed. The recovery of the SCS is charted in exactly the same manner as described for the DCS, and provides a daily check on the performance of the method.

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).

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

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.

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) |
|-----------------------------|-----------|-------------|------------------------|------------------------------|
| 022785-0001-SA | AQUEOUS | NO3-A | 25 MAY 92-7D | - |
| 022785-0001-SA | AQUEOUS | TOC-A | 11 JUN 92-2D | - |
| 022785-0001-SA | AQUEOUS | TOX-A | 08 JUN 92-1A | - |

DUPLICATE CONTROL SAMPLE REPORT
Wet Chemistry Analysis and Preparation

| Analyte | Concentration Spiked | Concentration Measured | | AVG | Accuracy Average(%) | | Precision |
|---------|----------------------|------------------------|------|-----|---------------------|--------|------------------|
| | | DCS1 | DCS2 | | DCS | Limits | (RPD) DCS Limits |

Category: NO3-A
Matrix: AQUEOUS
QC Lot: 25 MAY 92-7D
Concentration Units: mg/L

| | | | | | | | | |
|--------------|-----|------|------|------|-----|--------|-----|----|
| Nitrate as N | 2.0 | 2.06 | 2.02 | 2.04 | 102 | 91-109 | 2.0 | 10 |
|--------------|-----|------|------|------|-----|--------|-----|----|

Category: TOC-A
Matrix: AQUEOUS
QC Lot: 11 JUN 92-2D
Concentration Units: mg/L

| | | | | | | | | |
|----------------------|----|------|------|------|-----|--------|-----|----|
| Total Organic Carbon | 25 | 27.8 | 26.3 | 27.0 | 108 | 91-109 | 5.5 | 20 |
|----------------------|----|------|------|------|-----|--------|-----|----|

Category: TOX-A
Matrix: AQUEOUS
QC Lot: 08 JUN 92-1A
Concentration Units: ug Cl/L

| | | | | | | | | |
|-----------------------------|-----|------|------|------|----|--------|-----|----|
| Total Organic Halogen as Cl | 100 | 84.8 | 81.1 | 83.0 | 83 | 80-120 | 4.5 | 20 |
|-----------------------------|-----|------|------|------|----|--------|-----|----|

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

Appendix

