# Laboratory Data Consultants, Inc.
# Data Validation Report

**Project/Site Name:** NASA JPL

**Collection Date:** August 25, 2003

**LDC Report Date:** October 17, 2003

**Matrix:** Water

**Parameters:** Wet Chemistry

**Validation Level:** EPA Level III

**Laboratory:** Applied P & Ch Laboratory

**Sample Delivery Group (SDG):** 03-4842

**Sample Identification**

MW-5
MW-8
MW-10
MW-5MS
MW-5MSD

## Introduction

This data review covers 5 water samples listed on the cover sheet including dilutions and reanalysis as applicable. The analyses were per EPA Method 314.0 for Perchlorate and EPA SW 846 Method 7196 for Hexavalent Chromium.

The review follows a modified outline of the USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review (February 1994) as there are no current guidelines for the methods stated above.

A table summarizing all data qualification is provided at the end of this report. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

Blank results are summarized in Section III.

Field duplicates are summarized in Section IX.

Raw data were not reviewed for this SDG. The review was based on QC data.

The following are definitions of the data qualifiers:

U Indicates the compound or analyte was analyzed for but not detected at or above the stated limit.

J Indicates an estimated value.

R Quality control indicates the data is not usable.

N Presumptive evidence of presence of the constituent.

UJ Indicates the compound or analyte was analyzed for but not detected. The sample detection limit is an estimated value.

A Indicates the finding is based upon technical validation criteria.

P Indicates the finding is related to a protocol/contractual deviation.

None Indicates the data was not significantly impacted by the finding, therefore qualification was not required.

## I. Technical Holding Times

All technical holding time requirements were met.

The chain-of-custodies were reviewed for documentation of cooler temperatures. All cooler temperatures met validation criteria.

## II. Calibration

### a. Initial Calibration

All criteria for the initial calibration were met.

### b. Calibration Verification

Calibration verification frequency and analysis criteria were met for each method when applicable with the following exceptions:

| Date | Lab. Reference/ID | Analyte | %R (Limits) | Associated Samples | Flag | A or P |
|---|---|---|---|---|---|---|
| 8/28/03 | CCV2 | Perchlorate | 115 (90-110) | MW-5<br>MW-8<br>MW-10 | J (all detects) | P |
| 8/28/03 | CCV1 | Perchlorate | 115 (90-110) | MB | J (all detects) | P |

## III. Blanks

Method blanks were reviewed for each matrix as applicable. No contaminant concentrations were found in the method blanks.

## IV. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) analyses were reviewed for each matrix as applicable. Percent recoveries (%R) and relative percent differences (RPD) were within QC limits.

## V. Duplicates

Duplicate (DUP) sample analyses were reviewed for each matrix as applicable.

## VI. Laboratory Control Samples

Laboratory control samples were reviewed for each matrix as applicable. Percent recoveries (%R) and relative percent differences (RPD) were within QC limits.

## VII. Sample Result Verification

Raw data were not reviewed for this SDG.

## VIII. Overall Assessment of Data

Data flags are summarized at the end of this report.

## IX. Field Duplicates

No field duplicates were identified in this SDG.

## X. Field Blanks

No field blanks were identified in this SDG.

Applied P & Ch Laboratory

# Wet Analysis Results for Method 7196

| | | | | | |
|---|---|---|---|---|---|
| Client Name: | GEOFON, Inc. | Project No: | 04-4428.10 | Anal. Method | 7196 |
| Project ID: | JPL | Service ID: | 34842 | Collected by: | J. Robinson |

**Component Name: Chromium (VI)**
**CAS No: 1333-82-0**

| Lab ID | Sample ID | Matrix | Coll. Date | Rcv Date | Anal. Date | Batch | Unit | RL | Result | Q |
|---|---|---|---|---|---|---|---|---|---|---|
| 03-4842-1 | MW-5 | Water | 08/25/03 | 08/25/03 | 08/25/03 | 03W4238 | mg/L | 0.01 | <0.01 | U |
| 03-4842-2 | MW-8 | Water | 08/25/03 | 08/25/03 | 08/25/03 | 03W4238 | mg/L | 0.01 | <0.01 | U |
| 03-4842-3 | MW-10 | Water | 08/25/03 | 08/25/03 | 08/25/03 | 03W4238 | mg/L | 0.01 | <0.01 | U |
| 03W4238-MB-01 | 03W4238-MB-01 | Water | 08/25/03 | 08/25/03 | 08/25/03 | 03W4238 | mg/L | 0.01 | <0.01 | U |

Not Detected is shown as PQL, with dilution and moisture corrected if applicable.

Note: Q - Qualifier.
Qualifier: U - Not Detected or less than MDL
B - Less than RL (PQL, EQL or CRDL), but greater than MDL.

10/18/03

**NASA JPL**
**Wet Chemistry - Data Qualification Summary - SDG 03-4842**

| SDG | Sample | Analyte | Flag | A or P | Reason |
|---|---|---|---|---|---|
| 03-4842 | MW-5<br>MW-8<br>MW-10 | Perchlorate | J (all detects) | P | Calibration verification (%R) |

**NASA JPL**
**Wet Chemistry - Laboratory Blank Data Qualification Summary - SDG 03-4842**

No Sample Data Qualified in this SDG

Applied P & Ch Laboratory

# Wet Analysis Results for Method 314.0

| | | | | | |
|---|---|---|---|---|---|
| Client Name: | GEOFON, Inc. | Project No: | 04-4428.10 | Anal. Method | 314.0 |
| Project ID: | JPL | Service ID: | 34842 | Collected by: | J. Robinson |

**Component Name: Perchlorate**
**CAS No:**

| Lab ID | Sample ID | Matrix | Coll. Date | Rcv Date | Anal. Date | Batch | Unit | RL | Result | Q |
|---|---|---|---|---|---|---|---|---|---|---|
| 03-4842-1 | MW-5 | Water | 08/25/03 | 08/25/03 | 08/28/03 | 03W4284 | µg/L | 4 | <4 | U |
| 03-4842-2 | MW-8 | Water | 08/25/03 | 08/25/03 | 08/28/03 | 03W4284 | µg/L | 4 | 9.7 | J |
| 03-4842-3 | MW-10 | Water | 08/25/03 | 08/25/03 | 08/28/03 | 03W4284 | µg/L | 4 | 43.6 | J |
| 03W4284-MB-01 | 03W4284-MB-01 | Water | 08/28/03 | 08/28/03 | 08/28/03 | 03W4284 | µg/L | 4 | <4 | U |

Not Detected is shown as PQL, with dilution and moisture corrected if applicable.

Note: Q - Qualifier.
Qualifier: U - Not Detected or less than MDL
B - Less than RL (PQL, EQL or CRDL), but greater than MDL.

10/18/03

LDC #: 10962D6 **VALIDATION COMPLETENESS WORKSHEET** Date: 10/14/03
SDG #: 03-4842 Level III Page: 1 of 1
Laboratory: Applied P & Ch Laboratory Reviewer: MB
2nd Reviewer:

**METHOD:** Hexavalent chromium (EPA SW 846 Method 7196) Perchlorate (EPA Method 314.0)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

| | Validation Area | | Comments |
|---|---|---|---|
| I. | Technical holding times | A | Sampling dates: 8/25/03 |
| IIa. | Initial calibration | A | |
| IIb. | Calibration verification | SW | |
| III. | Blanks | A | |
| IVa. | Matrix Spike/(Matrix Spike) Duplicates | A | MS/MSD |
| IVb. | Laboratory control samples | A | LCS/LCSD |
| V. | Sample result verification | N | |
| VI. | Overall assessment of data | A | |
| VII. | Field duplicates | N | |
| VIII | Field blanks | N | |

Note: A = Acceptable
N = Not provided/applicable
SW = See worksheet
ND = No compounds detected
R = Rinsate
FB = Field blank
D = Duplicate
TB = Trip blank
EB = Equipment blank

Validated Samples:

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1 | MW-5 | 11 | | 21 | | 31 | |
| 2 | MW-8 | 12 | | 22 | | 32 | |
| 3 | MW-10 | 13 | | 23 | | 33 | |
| 4 | MW-5MS | 14 | | 24 | | 34 | |
| 5 | MW-5MSD | 15 | | 25 | | 35 | |
| 6 | MB | 16 | | 26 | | 36 | |
| 7 | | 17 | | 27 | | 37 | |
| 8 | | 18 | | 28 | | 38 | |
| 9 | | 19 | | 29 | | 39 | |
| 10 | | 20 | | 30 | | 40 | |

Notes:

LDC #: 109206
SDG #: 03-4842

# VALIDATION FINDINGS WORKSHEET
## Sample Specific Analysis Reference

Page: 1 of 1
Reviewer: MH
2nd reviewer:

All circled methods are applicable to each sample.

| Sample ID | Parameter |
|---|---|
| 1-3 | pH TDS Cl F $NO_3$ $NO_2$ $SO_4$ $PO_4$ ALK $CN^-$ $NH_3$ TKN TOC (CR$^{6+}$) (ce04) |
| 4.5 | pH TDS Cl F $NO_3$ $NO_2$ $SO_4$ $PO_4$ ALK $CN^-$ $NH_3$ TKN TOC (CR$^{6+}$) |
| | pH TDS Cl F $NO_3$ $NO_2$ $SO_4$ $PO_4$ ALK $CN^-$ $NH_3$ TKN TOC CR$^{6+}$ |
| | pH TDS Cl F $NO_3$ $NO_2$ $SO_4$ $PO_4$ ALK $CN^-$ $NH_3$ TKN TOC CR$^{6+}$ |
| | pH TDS Cl F $NO_3$ $NO_2$ $SO_4$ $PO_4$ ALK $CN^-$ $NH_3$ TKN TOC CR$^{6+}$ |
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| | pH TDS Cl F $NO_3$ $NO_2$ $SO_4$ $PO_4$ ALK $CN^-$ $NH_3$ TKN TOC CR$^{6+}$ |

Comments:

LDC #: 10962D6
SDG #: 03-4842

# VALIDATION FINDINGS WORKSHEET
## Calibration

Page: 1 of 1
Reviewer: MH
2nd Reviewer: [illegible]

METHOD: Inorganics, EPA Method See cover

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Were all instruments calibrated daily, each set-up time, and were the proper number of standards used?
Y N N/A Were all initial and continuing calibration verification percent recoveries (%R) within the control limits of 90-110% ?
Y N N/A Are all correlation coefficients ≥0.995 ?

LEVEL IV/D ONLY:

Y N N/A Were recalculated results acceptable? See Level IV Initial and Continuing Calibration Recaluculation Worksheet for recalulations.
Y N N/A Was a balance check conducted prior to the TDS analysis.?
Y N N/A Was the titrant normality checked?

| # | Date | Calibration ID | Analyte | %R | Associated Samples | Qualifications |
|---|---|---|---|---|---|---|
| 1 | 8/28/03 | CCV 2 | CeO4 | 115 | MB ~~AK~~ 1-3 | J dtr/p |
| | | | | | | |
| | | | | | | |
| 2 | 8/28/03 | CCV 1 | CeO4 | 115 | MB + LCS/LCSD | ↓ |
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Comments:

CAL6

# Laboratory Data Consultants, Inc.
# Data Validation Report

**Project/Site Name:** NASA JPL

**Collection Date:** August 26, 2003

**LDC Report Date:** October 17, 2003

**Matrix:** Water

**Parameters:** Wet Chemistry

**Validation Level:** EPA Level III

**Laboratory:** Applied P & Ch Laboratory

**Sample Delivery Group (SDG):** 03-4854

**Sample Identification**

MW-7
MW-13
MW-16
MW-16MS
MW-16MSD

## Introduction

This data review covers 5 water samples listed on the cover sheet including dilutions and reanalysis as applicable. The analyses were per EPA Method 314.0 for Perchlorate and EPA SW 846 Method 7196 for Hexavalent Chromium.

The review follows a modified outline of the USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review (February 1994) as there are no current guidelines for the methods stated above.

A table summarizing all data qualification is provided at the end of this report. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

Blank results are summarized in Section III.

Field duplicates are summarized in Section IX.

Raw data were not reviewed for this SDG. The review was based on QC data.

The following are definitions of the data qualifiers:

U Indicates the compound or analyte was analyzed for but not detected at or above the stated limit.

J Indicates an estimated value.

R Quality control indicates the data is not usable.

N Presumptive evidence of presence of the constituent.

UJ Indicates the compound or analyte was analyzed for but not detected. The sample detection limit is an estimated value.

A Indicates the finding is based upon technical validation criteria.

P Indicates the finding is related to a protocol/contractual deviation.

None Indicates the data was not significantly impacted by the finding, therefore qualification was not required.

## I. Technical Holding Times

All technical holding time requirements were met.

The chain-of-custodies were reviewed for documentation of cooler temperatures. All cooler temperatures met validation criteria.

## II. Calibration

### a. Initial Calibration

All criteria for the initial calibration were met.

### b. Calibration Verification

Calibration verification frequency and analysis criteria were met for each method when applicable with the following exceptions:

| Date | Lab. Reference/ID | Analyte | %R (Limits) | Associated Samples | Flag | A or P |
|---|---|---|---|---|---|---|
| 8/28/03 | CCV1 | Perchlorate | 115 (90-110) | MW-16<br>MB | J (all detects) | P |
| 8/28/03 | CCV2 | Perchlorate | 115 (90-110) | MW-7<br>MW-13<br>MW-16MS<br>MW-16MSD | J (all detects) | P |

## III. Blanks

Method blanks were reviewed for each matrix as applicable. No contaminant concentrations were found in the method blanks.

## IV. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) analyses were reviewed for each matrix as applicable. Percent recoveries (%R) and relative percent differences (RPD) were within QC limits.

## V. Duplicates

Duplicate (DUP) sample analyses were reviewed for each matrix as applicable.

## VI. Laboratory Control Samples

Laboratory control samples were reviewed for each matrix as applicable. Percent recoveries (%R) and relative percent differences (RPD) were within QC limits.

## VII. Sample Result Verification

Raw data were not reviewed for this SDG.

## VIII. Overall Assessment of Data

Data flags are summarized at the end of this report.

## IX. Field Duplicates

No field duplicates were identified in this SDG.

## X. Field Blanks

No field blanks were identified in this SDG.

## NASA JPL
## Wet Chemistry - Data Qualification Summary - SDG 03-4854

| SDG | Sample | Analyte | Flag | A or P | Reason |
|---|---|---|---|---|---|
| 03-4854 | MW-16<br>MW-7<br>MW-13 | Perchlorate | J (all detects) | P | Calibration verification (%R) |

## NASA JPL
## Wet Chemistry - Laboratory Blank Data Qualification Summary - SDG 03-4854

No Sample Data Qualified in this SDG

Applied P & Ch Laboratory

# Wet Analysis Results for Method 7196

Client Name: GEOFON, Inc. Project No: 04-4428.10 Anal. Method 7196
Project ID: Service ID: 34854 Collected by:

**Component Name: Chromium (VI)**
**CAS No: 1333-82-0**

| Lab ID | Sample ID | Matrix | Coll. Date | Rcv Date | Anal. Date | Batch | Unit | RL | Result | Q |
|---|---|---|---|---|---|---|---|---|---|---|
| 03-4854-1 | MW-7 | Water | 08/26/03 | 08/26/03 | 08/26/03 | 03W4245 | mg/L | 0.01 | <0.01 | U |
| 03-4854-2 | MW-13 | Water | 08/26/03 | 08/26/03 | 08/26/03 | 03W4245 | mg/L | 0.01 | <0.01 | U |
| 03-4854-3 | MW-16 | Water | 08/26/03 | 08/26/03 | 08/26/03 | 03W4245 | mg/L | 0.01 | <0.01 | U |
| 03W4245-MB-01 | 03W4245-MB-01 | Water | 08/26/03 | 08/26/03 | 08/26/03 | 03W4245 | mg/L | 0.01 | <0.01 | U |

Not Detected is shown as PQL, with dilution and moisture corrected if applicable.

Note: Q - Qualifier.
Qualifier: U - Not Detected or less than MDL
B - Less than RL (PQL, EQL or CRDL), but greater than MDL.

10/18/03

Applied P & Ch Laboratory

# Wet Analysis Results for Method 314.0

Client Name: GEOFON, Inc. Project No: 04-4428.10 Anal. Method 314.0
Project ID: Service ID: 34854 Collected by:

**Component Name: Perchlorate**
**CAS No:**

| Lab ID | Sample ID | Matrix | Coll. Date | Rcv Date | Anal. Date | Batch | Unit | RL | Result | Q |
|---|---|---|---|---|---|---|---|---|---|---|
| 03-4854-1 | MW-7 | Water | 08/26/03 | 08/26/03 | 08/28/03 | 03W4284 | µg/L | 200 | 1920 | J |
| 03-4854-2 | MW-13 | Water | 08/26/03 | 08/26/03 | 08/28/03 | 03W4284 | µg/L | 16 | 159 | ↓ |
| 03-4854-3 | MW-16 | Water | 08/26/03 | 08/26/03 | 08/28/03 | 03W4284 | µg/L | 100 | 1520 | ↓ |
| 03W4284-MB-01 | 03W4284-MB-01 | Water | 08/28/03 | 08/28/03 | 08/28/03 | 03W4284 | µg/L | 4 | <4 | U |

Not Detected is shown as PQL, with dilution and moisture corrected if applicable.

Note: Q - Qualifier.
Qualifier: U - Not Detected or less than MDL
B - Less than RL (PQL, EQL or CRDL), but greater than MDL.

10/18/03

LDC #: 10962E6 **VALIDATION COMPLETENESS WORKSHEET** Date: 10/14/03
SDG #: 03-4854 Level III Page: 1 of 1
Laboratory: Applied P & Ch Laboratory Reviewer: MG
2nd Reviewer: A

**METHOD:** Hexavalent chromium (EPA SW 846 Method 7196) Perchlorate (EPA Method 314.0)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

| | Validation Area | | Comments |
|---|---|---|---|
| I. | Technical holding times | A | Sampling dates: 8/26/03 |
| IIa. | Initial calibration | A | |
| IIb. | Calibration verification | SW | |
| III. | Blanks | A | |
| IVa. | Matrix Spike/(Matrix Spike) Duplicates | A | MS/MSD |
| IVb. | Laboratory control samples | A | LCS/LCSD |
| V. | Sample result verification | N | |
| VI. | Overall assessment of data | A | |
| VII. | Field duplicates | N | |
| VIII | Field blanks | N | |

Note: A = Acceptable
N = Not provided/applicable
SW = See worksheet
ND = No compounds detected
R = Rinsate
FB = Field blank
D = Duplicate
TB = Trip blank
EB = Equipment blank

Validated Samples: All

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1 | MW-7 | 11 | | 21 | | 31 | |
| 2 | MW-13 | 12 | | 22 | | 32 | |
| 3 | MW-16 | 13 | | 23 | | 33 | |
| 4 | MW-16MS | 14 | | 24 | | 34 | |
| 5 | MW-16MSD | 15 | | 25 | | 35 | |
| 6 | MB | 16 | | 26 | | 36 | |
| 7 | | 17 | | 27 | | 37 | |
| 8 | | 18 | | 28 | | 38 | |
| 9 | | 19 | | 29 | | 39 | |
| 10 | | 20 | | 30 | | 40 | |

Notes: _____

LDC #: 10962T6
SDG #: 03-4854

# VALIDATION FINDINGS WORKSHEET
## Sample Specific Analysis Reference


Reviewer: MH
2nd reviewer:

All circled methods are applicable to each sample.

| Sample ID | Parameter |
|---|---|
| 1-3 | pH TDS Cl F $NO_3$ $NO_2$ $SO_4$ $PO_4$ ALK $CN^-$ $NH_3$ TKN TOC (CR$^{6+}$) (clo4) |
| 4,5 | pH TDS Cl F $NO_3$ $NO_2$ $SO_4$ $PO_4$ ALK $CN^-$ $NH_3$ TKN TOC (CR$^{6+}$) (clo4) |
| | pH TDS Cl F $NO_3$ $NO_2$ $SO_4$ $PO_4$ ALK $CN^-$ $NH_3$ TKN TOC CR$^{6+}$ |
| | pH TDS Cl F $NO_3$ $NO_2$ $SO_4$ $PO_4$ ALK $CN^-$ $NH_3$ TKN TOC CR$^{6+}$ |
| | pH TDS Cl F $NO_3$ $NO_2$ $SO_4$ $PO_4$ ALK $CN^-$ $NH_3$ TKN TOC CR$^{6+}$ |
| | pH TDS Cl F $NO_3$ $NO_2$ $SO_4$ $PO_4$ ALK $CN^-$ $NH_3$ TKN TOC CR$^{6+}$ |
| | pH TDS Cl F $NO_3$ $NO_2$ $SO_4$ $PO_4$ ALK $CN^-$ $NH_3$ TKN TOC CR$^{6+}$ |
| | pH TDS Cl F $NO_3$ $NO_2$ $SO_4$ $PO_4$ ALK $CN^-$ $NH_3$ TKN TOC CR$^{6+}$ |
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| | pH TDS Cl F $NO_3$ $NO_2$ $SO_4$ $PO_4$ ALK $CN^-$ $NH_3$ TKN TOC CR$^{6+}$ |
| | pH TDS Cl F $NO_3$ $NO_2$ $SO_4$ $PO_4$ ALK $CN^-$ $NH_3$ TKN TOC CR$^{6+}$ |
| | pH TDS Cl F $NO_3$ $NO_2$ $SO_4$ $PO_4$ ALK $CN^-$ $NH_3$ TKN TOC CR$^{6+}$ |

Comments:

LDC #: 1.962 E6
SDG #: 03-4854

# VALIDATION FINDINGS WORKSHEET
## Calibration

Page: 1 of 1
Reviewer: MY
2nd Reviewer: [illegible]

METHOD: Inorganics, EPA Method See cover

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Were all instruments calibrated daily, each set-up time, and were the proper number of standards used?
Y N N/A Were all initial and continuing calibration verification percent recoveries (%R) within the control limits of 90-110% ?
Y N N/A Are all correlation coefficients ≥0.995 ?

LEVEL IV/D ONLY:

Y N N/A Were recalculated results acceptable? See Level IV Initial and Continuing Calibration Recaluculation Worksheet for recalulations.
Y N N/A Was a balance check conducted prior to the TDS analysis.?
Y N N/A Was the titrant normality checked?

| # | Date | Calibration ID | Analyte | %R | Associated Samples | Qualifications |
|---|---|---|---|---|---|---|
| 1 | 8/28/03 | CCV1 | $ClO_4$ | 115 | MB, ~~LCS/LCSD~~, 3 | J Jete/P |
| 2 | 8/28/03 | CCV2 | $ClO_4$ | 115 | 1, 2, 4, 5 | ↓ |

Comments:

CAL6

# Laboratory Data Consultants, Inc.
# Data Validation Report

**Project/Site Name:** NASA JPL

**Collection Date:** August 27, 2003

**LDC Report Date:** October 20, 2003

**Matrix:** Water

**Parameters:** Wet Chemistry

**Validation Level:** EPA Level III

**Laboratory:** Applied P & Ch Laboratory

**Sample Delivery Group (SDG):** 03-4878

**Sample Identification**

DUPE-6-3-Q03
MW-6
MW-15
DUPE-6-3-Q03MS
DUPE-6-3-Q03MSD

## Introduction

This data review covers 5 water samples listed on the cover sheet including dilutions and reanalysis as applicable. The analyses were per EPA Method 314.0 for Perchlorate and EPA SW 846 Method 7196 for Hexavalent Chromium.

The review follows a modified outline of the USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review (February 1994) as there are no current guidelines for the methods stated above.

A table summarizing all data qualification is provided at the end of this report. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

Blank results are summarized in Section III.

Field duplicates are summarized in Section IX.

Raw data were not reviewed for this SDG. The review was based on QC data.

The following are definitions of the data qualifiers:

U Indicates the compound or analyte was analyzed for but not detected at or above the stated limit.

J Indicates an estimated value.

R Quality control indicates the data is not usable.

N Presumptive evidence of presence of the constituent.

UJ Indicates the compound or analyte was analyzed for but not detected. The sample detection limit is an estimated value.

A Indicates the finding is based upon technical validation criteria.

P Indicates the finding is related to a protocol/contractual deviation.

None Indicates the data was not significantly impacted by the finding, therefore qualification was not required.

## I. Technical Holding Times

All technical holding time requirements were met.

The chain-of-custodies were reviewed for documentation of cooler temperatures. All cooler temperatures met validation criteria.

## II. Calibration

### a. Initial Calibration

All criteria for the initial calibration were met.

### b. Calibration Verification

Calibration verification frequency and analysis criteria were met for each method when applicable with the following exceptions:

| Date | Lab. Reference/ID | Analyte | %R (Limits) | Associated Samples | Flag | A or P |
|---|---|---|---|---|---|---|
| 8/28/03 | CCV1 | Perchlorate | 115 (90-110) | MW-6<br>MB | J (all detects) | P |

## III. Blanks

Method blanks were reviewed for each matrix as applicable. No contaminant concentrations were found in the method blanks.

## IV. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) analyses were reviewed for each matrix as applicable. Percent recoveries (%R) and relative percent differences (RPD) were within QC limits.

## V. Duplicates

Duplicate (DUP) sample analyses were reviewed for each matrix as applicable.

## VI. Laboratory Control Samples

Laboratory control samples were reviewed for each matrix as applicable. Percent recoveries (%R) and relative percent differences (RPD) were within QC limits.

## VII. Sample Result Verification

Raw data were not reviewed for this SDG.

## VIII. Overall Assessment of Data

Data flags are summarized at the end of this report.

## IX. Field Duplicates

Samples DUPE-6-3-Q03 and MW-15 were identified as field duplicates. No contaminant concentrations were detected in any of the samples.

## X. Field Blanks

No field blanks were identified in this SDG.

**NASA JPL**
**Wet Chemistry - Data Qualification Summary - SDG 03-4878**

| SDG | Sample | Analyte | Flag | A or P | Reason |
|---|---|---|---|---|---|
| 03-4878 | MW-6 | Perchlorate | J (all detects) | P | Calibration verification (%R) |

**NASA JPL**
**Wet Chemistry - Laboratory Blank Data Qualification Summary - SDG 03-4878**

No Sample Data Qualified in this SDG

Applied P & Ch Laboratory

# Wet Analysis Results for Method 314.0

| | | | | | |
|---|---|---|---|---|---|
| Client Name: | GEOFON, Inc. | Project No: | 04-4428.10 | Anal. Method | 314.0 |
| Project ID: | JPL | Service ID: | 34878 | Collected by: | |

**Component Name: Perchlorate**
**CAS No:**

| Lab ID | Sample ID | Matrix | Coll. Date | Rcv Date | Anal. Date | Batch | Unit | RL | Result | Q |
|---|---|---|---|---|---|---|---|---|---|---|
| 03-4878-2 | MW-6 | Water | 08/27/03 | 08/27/03 | 08/28/03 | 03W4284 | µg/L | 4 | 2.9 | B J |
| 03W4284-MB-01 | 03W4284-MB-01 | Water | 08/28/03 | 08/28/03 | 08/28/03 | 03W4284 | µg/L | 4 | <4 | U |

Not Detected is shown as PQL, with dilution and moisture corrected if applicable.

Note: Q - Qualifier.
Qualifier: U - Not Detected or less than MDL
B - Less than RL (PQL, EQL or CRDL), but greater than MDL.

10/18/03

Applied P & Ch Laboratory

# Wet Analysis Results for Method 7196

| | | | | | |
|---|---|---|---|---|---|
| Client Name: | GEOFON, Inc. | Project No: | 04-4428.10 | Anal. Method | 7196 |
| Project ID: | JPL | Service ID: | 34878 | Collected by: | |

**Component Name: Chromium (VI)**
**CAS No: 1333-82-0**

| Lab ID | Sample ID | Matrix | Coll. Date | Rcv Date | Anal. Date | Batch | Unit | RL | Result | Q |
|---|---|---|---|---|---|---|---|---|---|---|
| 03-4878-1 | DUPE-6-3-Q03 | Water | 08/27/03 | 08/27/03 | 08/27/03 | 03W4264 | mg/L | 0.01 | <0.01 | U |
| 03-4878-2 | MW-6 | Water | 08/27/03 | 08/27/03 | 08/27/03 | 03W4264 | mg/L | 0.01 | <0.01 | U |
| 03-4878-3 | MW-15 | Water | 08/27/03 | 08/27/03 | 08/27/03 | 03W4264 | mg/L | 0.01 | <0.01 | U |
| 03W4264-MB-01 | 03W4264-MB-01 | Water | 08/27/03 | 08/27/03 | 08/27/03 | 03W4264 | mg/L | 0.01 | <0.01 | U |

Not Detected is shown as PQL, with dilution and moisture corrected if applicable.

Note: Q - Qualifier.
Qualifier: U - Not Detected or less than MDL
B - Less than RL (PQL, EQL or CRDL), but greater than MDL.

10/18/05

LDC #: 10962F6 **VALIDATION COMPLETENESS WORKSHEET** Date: 10/14/03
SDG #: 03-4878 Level III Page: 1 of 1
Laboratory: Applied P & Ch Laboratory Reviewer: MD
2nd Reviewer: A

**METHOD:** Hexavalent chromium (EPA SW 846 Method 7196) Perchlorate (EPA Method 314.0)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

| | Validation Area | | Comments |
|---|---|---|---|
| I. | Technical holding times | A | Sampling dates: 8/29/03 |
| IIa. | Initial calibration | CA | |
| IIb. | Calibration verification | SW | |
| III. | Blanks | A | |
| IVa. | Matrix Spike/(Matrix Spike) Duplicates | A | MS/MSD |
| IVb. | Laboratory control samples | A | LCS/LCSD |
| V. | Sample result verification | N | |
| VI. | Overall assessment of data | A | |
| VII. | Field duplicates | ND | (1, 3) |
| VIII. | Field blanks | N | |

Note: A = Acceptable
N = Not provided/applicable
SW = See worksheet
ND = No compounds detected
R = Rinsate
FB = Field blank
D = Duplicate
TB = Trip blank
EB = Equipment blank

Validated Samples:
All

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1 ✓ | DUPE-6-3-Q03 | 11 | | 21 | | 31 | |
| 2 | MW-6 | 12 | | 22 | | 32 | |
| 3 ✓ | MW-15 | 13 | | 23 | | 33 | |
| 4 | DUPE-6-3-Q03MS | 14 | | 24 | | 34 | |
| 5 | DUPE-6-3-Q03MSD | 15 | | 25 | | 35 | |
| 6 | MB | 16 | | 26 | | 36 | |
| 7 | | 17 | | 27 | | 37 | |
| 8 | | 18 | | 28 | | 38 | |
| 9 | | 19 | | 29 | | 39 | |
| 10 | | 20 | | 30 | | 40 | |

Notes: _____

LDC #: 10962F6
SDG #: 03-4878

# VALIDATION FINDINGS WORKSHEET
## Sample Specific Analysis Reference

Page: 1 of 1
Reviewer: MH
2nd reviewer: [illegible]

All circled methods are applicable to each sample.

| Sample ID | Parameter |
|---|---|
| 2 | pH TDS Cl F $NO_3$ $NO_2$ $SO_4$ $PO_4$ ALK $CN^-$ $NH_3$ TKN TOC **$CR^{6+}$** **$ClO_4$** ____ ____ ____ |
| 1, 3 | pH TDS Cl F $NO_3$ $NO_2$ $SO_4$ $PO_4$ ALK $CN^-$ $NH_3$ TKN TOC **$CR^{6+}$** ____ ____ ____ ____ |
| 2 4, 5 | pH TDS Cl F $NO_3$ $NO_2$ $SO_4$ $PO_4$ ALK $CN^-$ $NH_3$ TKN TOC **$CR^{6+}$** ____ ____ ____ ____ |
| | pH TDS Cl F $NO_3$ $NO_2$ $SO_4$ $PO_4$ ALK $CN^-$ $NH_3$ TKN TOC $CR^{6+}$ ____ ____ ____ ____ |
| | pH TDS Cl F $NO_3$ $NO_2$ $SO_4$ $PO_4$ ALK $CN^-$ $NH_3$ TKN TOC $CR^{6+}$ ____ ____ ____ ____ |
| | pH TDS Cl F $NO_3$ $NO_2$ $SO_4$ $PO_4$ ALK $CN^-$ $NH_3$ TKN TOC $CR^{6+}$ ____ ____ ____ ____ |
| | pH TDS Cl F $NO_3$ $NO_2$ $SO_4$ $PO_4$ ALK $CN^-$ $NH_3$ TKN TOC $CR^{6+}$ ____ ____ ____ ____ |
| | pH TDS Cl F $NO_3$ $NO_2$ $SO_4$ $PO_4$ ALK $CN^-$ $NH_3$ TKN TOC $CR^{6+}$ ____ ____ ____ ____ |
| | pH TDS Cl F $NO_3$ $NO_2$ $SO_4$ $PO_4$ ALK $CN^-$ $NH_3$ TKN TOC $CR^{6+}$ ____ ____ ____ ____ |
| | pH TDS Cl F $NO_3$ $NO_2$ $SO_4$ $PO_4$ ALK $CN^-$ $NH_3$ TKN TOC $CR^{6+}$ ____ ____ ____ ____ |
| | pH TDS Cl F $NO_3$ $NO_2$ $SO_4$ $PO_4$ ALK $CN^-$ $NH_3$ TKN TOC $CR^{6+}$ ____ ____ ____ ____ |
| | pH TDS Cl F $NO_3$ $NO_2$ $SO_4$ $PO_4$ ALK $CN^-$ $NH_3$ TKN TOC $CR^{6+}$ ____ ____ ____ ____ |
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| | pH TDS Cl F $NO_3$ $NO_2$ $SO_4$ $PO_4$ ALK $CN^-$ $NH_3$ TKN TOC $CR^{6+}$ ____ ____ ____ ____ |
| | pH TDS Cl F $NO_3$ $NO_2$ $SO_4$ $PO_4$ ALK $CN^-$ $NH_3$ TKN TOC $CR^{6+}$ ____ ____ ____ ____ |
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| | pH TDS Cl F $NO_3$ $NO_2$ $SO_4$ $PO_4$ ALK $CN^-$ $NH_3$ TKN TOC $CR^{6+}$ ____ ____ ____ ____ |
| | pH TDS Cl F $NO_3$ $NO_2$ $SO_4$ $PO_4$ ALK $CN^-$ $NH_3$ TKN TOC $CR^{6+}$ |

Comments: ______________________________

LDC #: 10962 F6
SDG #: 03-4878

# VALIDATION FINDINGS WORKSHEET
## Calibration

Page: 1 of 1
Reviewer: MW
2nd Reviewer: [illegible]

METHOD: Inorganics, EPA Method See cover

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Were all instruments calibrated daily, each set-up time, and were the proper number of standards used?
Y N N/A Were all initial and continuing calibration verification percent recoveries (%R) within the control limits of 90-110% ?
Y N N/A Are all correlation coefficients ≥0.995 ?

LEVEL IV/D ONLY:

Y N N/A Were recalculated results acceptable? See Level IV Initial and Continuing Calibration Recaluculation Worksheet for recalulations.
Y N N/A Was a balance check conducted prior to the TDS analysis.?
Y N N/A Was the titrant normality checked?

| # | Date | Calibration ID | Analyte | %R | Associated Samples | Qualifications |
|---|---|---|---|---|---|---|
| 1 | 9/28/03 | CCV1 | $ClO_4$ | 115 | MB, ~~LCS/LCSD~~, 2 | J det /P |
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Comments:

CAL.6

**LABORATORY DATA CONSULTANTS, INC.**
7750 El Camino Real, Suite 2L Carlsbad, CA 92009 Phone: 760/634-0437 Fax: 760/634-0439

Geofon, Inc.
22632 Golden Springs Drive, Suite 270
Diamond Bar, CA 91765
ATTN: Mr. Leo Williamson

October 31, 2003

SUBJECT: NASA JPL, DO #01, Data Validation

Dear Mr. Williamson,

Enclosed are the final validation reports for the fraction listed below. These SDGs were received on October 20, 2003. Attachment 1 is a summary of the samples that were reviewed for each analysis.

**LDC Project # 11017:**

| SDG # | Fraction |
|---|---|
| 03-4697, 03-4948 | Chromium |

The data validation was performed under EPA Level III and Level IV guidelines. The analyses were validated using the following documents, as applicable to each method:

- USEPA, Contract Laboratory Program National Functional Guidelines for Inorganic Data Review, February 1994

Please feel free to contact us if you have any questions.

Sincerely,

ERauto

Erlinda T. Rauto
Operations Manager/Senior Chemist

Attachment 1

# LDC #11017 (Geofon-Diamond Bar / JPL, DO#0001)

| LDC | SDG# | DATE REC'D | DATE DUE | Cr (200.8) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Matrix: Water/Soil | | | | W | S | W | S | W | S | W | S | W | S | W | S | W | S | W | S | W | S | W | S | W | S | W | S | W | S | W | S | W | S | W | S |
| A | 03-4697/064876 | 10-20-03 | 11-10-03 | 7 | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| A | 03-4967/064876 | 10-20-03 | 11-10-03 | 1 | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| B | 03-4948/064877 | 10-20-03 | 11-10-03 | 12 | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| B | 03-4948/064877 | 10-20-03 | 11-10-03 | 1 | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Total | TH | | | 21 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

Shaded cells indicate Level IV validation (all other cells are Level III validation).

**NASA JPL**
**Data Validation Reports**
**LDC# 11017**

Chromium

# Laboratory Data Consultants, Inc.
# Data Validation Report

**Project/Site Name:** NASA JPL

**Collection Date:** August 11, 2003

**LDC Report Date:** October 30, 2003

**Matrix:** Water

**Parameters:** Chromium

**Validation Level:** EPA Level III & IV

**Laboratory:** Applied P & Ch Laboratory/Advanced Technology Laboratories

**Sample Delivery Group (SDG):** 03-4697/064876

**Sample Identification**

DUPE-5-3-Q03**
EB-7-8-11-03
MW-12-1
MW-12-2
MW-12-3
MW-22-1
MW-22-2
MW-22-3

**Indicates sample underwent EPA Level IV review

## Introduction

This data review covers 8 water samples listed on the cover sheet including dilutions and reanalysis as applicable. The analyses were per EPA Method 200.8 for Chromium.

This review follows a modified outline of the USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review (February 1994) as there are no current guidelines for the method stated above.

A table summarizing all data qualification flags is provided at the end of this report. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from specified protocols or is of technical advisory nature.

Blanks are summarized in Section III.

Field duplicates are summarized in Section XIII.

Samples indicated by a double asterisk on the front cover underwent a EPA Level IV review. A EPA Level III review was performed on all of the other samples. Raw data were not evaluated for the samples reviewed by Level III criteria since this review is based on QC data.

The following are definitions of the data qualifiers:

U Indicates the compound or analyte was analyzed for but not detected at or above the stated limit.

J Indicates an estimated value.

R Quality control indicates the data is not usable.

N Presumptive evidence of presence of the constituent.

UJ Indicates the compound or analyte was analyzed for but not detected. The sample detection limit is an estimated value.

A Indicates the finding is based upon technical validation criteria.

P Indicates the finding is related to a protocol/contractual deviation.

None Indicates the data was not significantly impacted by the finding, therefore qualification was not required.

## I. Technical Holding Times

All technical holding time requirements were met.

The chain-of-custodies were reviewed for documentation of cooler temperatures. All cooler temperatures met validation criteria.

## II. Calibration

An initial calibration was performed.

The frequency and analysis criteria of the initial calibration verification (ICV) and continuing calibration verification (CCV) were met.

## III. Blanks

Method blanks were reviewed for each matrix as applicable.

Data qualification by the initial, continuing and preparation blanks (ICB/CCB/PBs) was based on the maximum contaminant concentration in the ICB/CCB/PBs in the analysis of each analyte. No contaminant concentrations were found in the initial, continuing and preparation blanks with the following exceptions:

| Method Blank ID | Analyte | Maximum Concentration | Associated Samples |
|---|---|---|---|
| ICB/CCB | Chromium | 0.132 ug/L | All samples in SDG 03-4697/064876 |

Sample concentrations were compared to the maximum contaminant concentrations detected in the ICB/CCB/PBs. The sample concentrations were either not detected or were significantly greater ( >5X blank contaminants) than the concentrations found in the associated method blanks.

## IV. ICP Interference Check Sample (ICS) Analysis

ICP interference check was not required by the method.

## V. Matrix Spike Analysis

Matrix spike (MS) and matrix spike duplicate (MSD) samples were reviewed for each matrix as applicable. Percent recoveries (%R) and relative percent differences (RPD) were within QC limits with the following exceptions:

| Spike ID (Associated Samples) | Analyte | MS (%R) (Limits) | MSD (%R) (Limits) | RPD (Limits) | Flag | A or P |
|---|---|---|---|---|---|---|
| MW-16MS/MSD (All samples in SDG 03-4697/064876) | Chromium | - | 79.1 (80-120) | - | J (all detects) UJ (all non-detects) | A |

## VI. Duplicate Sample Analysis

Duplicate (DUP) sample analyses were reviewed for each matrix as applicable. Results were within QC limits.

## VII. Laboratory Control Samples (LCS)

Laboratory control samples were reviewed for each matrix as applicable. Percent recoveries (%R) were within QC limits.

## VIII. Internal Standards (ICP-MS)

All internal standard percent recoveries (%R) were within QC limits.

## IX. Furnace Atomic Absorption QC

Graphite furnace atomic absorption was not utilized in this SDG.

## X. ICP Serial Dilution

ICP serial dilution was not required by the method.

## XI. Sample Result Verification

All sample result verifications met validation criteria for samples on which a EPA Level IV review was performed. Raw data were not evaluated for the samples reviewed by Level III criteria.

## XII. Overall Assessment of Data

Data flags have been summarized at the end of this report.

## XIII. Field Duplicates

Samples DUPE-5-3-Q03** and MW-22-2 were identified as field duplicates. No chromium was detected in any of the samples with the following exceptions:

| Analyte | Concentration (ug/L) | | RPD |
|---|---|---|---|
| | DUPE-5-3-Q03** | MW-22-2 | |
| Chromium | 2.5 | 2.7 | 8 |

## XIV. Field Blanks

Sample EB-7-8-11-03 was identified as an equipment blank. No chromium contaminants were found in this blank.

## NASA JPL
## Chromium - Data Qualification Summary - SDG 03-4697/064876

| SDG | Sample | Analyte | Flag | A or P | Reason |
|---|---|---|---|---|---|
| 03-4697/064876 | DUPE-5-3-Q03**<br>EB-7-8-11-03<br>MW-12-1<br>MW-12-2<br>MW-12-3<br>MW-22-1<br>MW-22-2<br>MW-22-3 | Chromium | J (all detects)<br>UJ (all non-detects) | A | Matrix spike/Matrix spike duplicates (%R) |

## NASA JPL
## Chromium - Laboratory Blank Data Qualification Summary - SDG 03-4697/064876

No Sample Data Qualified in this SDG

# Advanced Technology Laboratories

**Date:** *26-Sep-03*

| | | | |
|---|---|---|---|
| **CLIENT:** | Applied P & Ch Laboratories | **Client Sample ID:** | EB-7-8-11-03 |
| **Lab Order:** | 064876 | | |
| **Project:** | JPL, 4697 | **Collection Date:** | 8/11/2003 9:10:00 AM |
| **Lab ID:** | 064876-008A | **Matrix:** | WATER |

| Analyte | Result | Qual | MDL | PQL | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **ICP-MS METALS** | | | **EPA 200.8** | | | | Analyst: **NS** |
| RunID: ICP4_030923B | QC Bach: R31161 | | | PrepDate: | | | |
| Chromium | ND | UJ | 0.11 | 1.0 | µg/L | 1 | 9/23/2003 1:06:36 PM |

10/30/03

**Qualifiers:**

- ND - Not Detected at the Reporting Limit
- J - Analyte detected below quantitation limits
- B - Analyte detected in the associated Method Blank
- * - Value exceeds Maximum Contaminant Level
- S - Spike Recovery outside accepted recovery limits
- R - RPD outside accepted recovery limits
- E - Value above quantitation range
- H-Samples exceed holding time



Results are wet unless otherwise specified



*Advanced Technology Laboratories* 3275 Walnut Avenue Signal Hill, CA 90755 Tel: 562 989-4045 Fax: 562 989-4040

# Advanced Technology Laboratories

**Date:** *26-Sep-03*

| | | | |
|---|---|---|---|
| **CLIENT:** | Applied P & Ch Laboratories | **Client Sample ID:** | Dupe-5-3-Q03 |
| **Lab Order:** | 064876 | | |
| **Project:** | JPL, 4697 | **Collection Date:** | 8/11/2003 8:44:00 AM |
| **Lab ID:** | 064876-007A | **Matrix:** | WATER |

| Analyte | Result | Qual | MDL | PQL | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **ICP-MS METALS** | | **EPA 200.8** | | | | | Analyst: **NS** |
| RunID: ICP4_030923B QC Bach: R31161 | | | PrepDate: | | | | |
| Chromium | 2.5 | J | 0.11 | 1.0 | µg/L | 1 | 9/23/2003 1:04:05 PM |

10/30/03

**Qualifiers:**

ND - Not Detected at the Reporting Limit
J - Analyte detected below quantitation limits
B - Analyte detected in the associated Method Blank
* - Value exceeds Maximum Contaminant Level
S - Spike Recovery outside accepted recovery limits
R - RPD outside accepted recovery limits
E - Value above quantitation range
H-Samples exceed holding time

Results are wet unless otherwise specified



*Advanced Technology Laboratories* 3275 Walnut Avenue Signal Hill, CA 90755 Tel: 562 989-4045 Fax: 562 989-4040

# Advanced Technology Laboratories

**Date:** *26-Sep-03*

| | | | |
|---|---|---|---|
| **CLIENT:** | Applied P & Ch Laboratories | **Client Sample ID:** | MW-12-1 |
| **Lab Order:** | 064876 | | |
| **Project:** | JPL, 4697 | **Collection Date:** | 8/11/2003 11:44:00 AM |
| **Lab ID:** | 064876-003A | **Matrix:** | WATER |

| Analyte | Result | Qual | MDL | PQL | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **ICP-MS METALS** | | | **EPA 200.8** | | | | Analyst: **NS** |
| RunID: ICP4_030923B QC Bach: R31161 | | | PrepDate: | | | | |
| Chromium | 8.0 | J | 0.11 | 1.0 | µg/L | 1 | 9/23/2003 12:54:02 P |

10/30/03

**Qualifiers:**

- ND - Not Detected at the Reporting Limit
- J - Analyte detected below quantitation limits
- B - Analyte detected in the associated Method Blank
- * - Value exceeds Maximum Contaminant Level
- S - Spike Recovery outside accepted recovery limits
- R - RPD outside accepted recovery limits
- E - Value above quantitation range
- H-Samples exceed holding time

Results are wet unless otherwise specified



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# Advanced Technology Laboratories

**Date:** *26-Sep-03*

| | | | |
|---|---|---|---|
| **CLIENT:** | Applied P & Ch Laboratories | **Client Sample ID:** | MW-12-2 |
| **Lab Order:** | 064876 | | |
| **Project:** | JPL, 4697 | **Collection Date:** | 8/11/2003 11:24:00 AM |
| **Lab ID:** | 064876-002A | **Matrix:** | WATER |

| Analyte | Result | Qual | MDL | PQL | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **ICP-MS METALS** | | | **EPA 200.8** | | | | Analyst: **NS** |
| RunID: ICP4_030923B QC Bach: R31161 | | | PrepDate: | | | | |
| Chromium | 3.8 | J | 0.11 | 1.0 | µg/L | 1 | 9/23/2003 12:51:32 P |

10/30/03

**Qualifiers:**

- ND - Not Detected at the Reporting Limit
- J - Analyte detected below quantitation limits
- B - Analyte detected in the associated Method Blank
- * - Value exceeds Maximum Contaminant Level
- S - Spike Recovery outside accepted recovery limits
- R - RPD outside accepted recovery limits
- E - Value above quantitation range
- H-Samples exceed holding time

Results are wet unless otherwise specified



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A

# Advanced Technology Laboratories

**Date:** *26-Sep-03*

| | | | |
|---|---|---|---|
| **CLIENT:** | Applied P & Ch Laboratories | **Client Sample ID:** | MW-12-3 |
| **Lab Order:** | 064876 | | |
| **Project:** | JPL, 4697 | **Collection Date:** | 8/11/2003 11:04:00 AM |
| **Lab ID:** | 064876-001A | **Matrix:** | WATER |

| Analyte | Result | Qual | MDL | PQL | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **ICP-MS METALS** | | | **EPA 200.8** | | | | Analyst: **NS** |
| RunID: ICP4_030923B | QC Bach: R31161 | | PrepDate: | | | | |
| Chromium | 2.4 | J | 0.11 | 1.0 | µg/L | 1 | 9/23/2003 12:49:03 P |

10/30/03

**Qualifiers:**

- ND - Not Detected at the Reporting Limit
- J - Analyte detected below quantitation limits
- B - Analyte detected in the associated Method Blank
- * - Value exceeds Maximum Contaminant Level
- S - Spike Recovery outside accepted recovery limits
- R - RPD outside accepted recovery limits
- E - Value above quantitation range
- H-Samples exceed holding time

Results are wet unless otherwise specified



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# Advanced Technology Laboratories

**Date:** *26-Sep-03*

| | | | |
|---|---|---|---|
| **CLIENT:** | Applied P & Ch Laboratories | **Client Sample ID:** | MW-22-1 |
| **Lab Order:** | 064876 | | |
| **Project:** | JPL, 4697 | **Collection Date:** | 8/11/2003 9:14:00 AM |
| **Lab ID:** | 064876-006A | **Matrix:** | WATER |

| Analyte | Result | Qual | MDL | PQL | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **ICP-MS METALS** | | | **EPA 200.8** | | | | Analyst: **NS** |
| RunID: ICP4_030923B QC Bach: R31161 | | | PrepDate: | | | | |
| Chromium | 4.2 | J | 0.11 | 1.0 | µg/L | 1 | 9/23/2003 1:01:33 PM |

10/30/03

**Qualifiers:**

- ND - Not Detected at the Reporting Limit
- J - Analyte detected below quantitation limits
- B - Analyte detected in the associated Method Blank
- * - Value exceeds Maximum Contaminant Level
- S - Spike Recovery outside accepted recovery limits
- R - RPD outside accepted recovery limits
- E - Value above quantitation range
- H-Samples exceed holding time



Results are wet unless otherwise specified



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# Advanced Technology Laboratories

**Date:** *26-Sep-03*

| | | | |
|---|---|---|---|
| **CLIENT:** | Applied P & Ch Laboratories | **Client Sample ID:** | MW-22-2 |
| **Lab Order:** | 064876 | | |
| **Project:** | JPL, 4697 | **Collection Date:** | 8/11/2003 8:13:00 AM |
| **Lab ID:** | 064876-005A | **Matrix:** | WATER |

| Analyte | Result | Qual | MDL | PQL | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **ICP-MS METALS** | | | **EPA 200.8** | | | | Analyst: **NS** |
| RunID: ICP4_030923B QC Bach: R31161 | | | PrepDate: | | | | |
| Chromium | 2.7 | J | 0.11 | 1.0 | µg/L | 1 | 9/23/2003 12:59:02 P |

10/30/07

**Qualifiers:**

- ND - Not Detected at the Reporting Limit
- J - Analyte detected below quantitation limits
- B - Analyte detected in the associated Method Blank
- * - Value exceeds Maximum Contaminant Level
- S - Spike Recovery outside accepted recovery limits
- R - RPD outside accepted recovery limits
- E - Value above quantitation range
- H-Samples exceed holding time

Results are wet unless otherwise specified



*Advanced Technology Laboratories* 3275 Walnut Avenue Signal Hill, CA 90755 Tel: 562 989-4045 Fax: 562 989-4040

# Advanced Technology Laboratories

**Date:** *26-Sep-03*

| | | | |
|---|---|---|---|
| **CLIENT:** | Applied P & Ch Laboratories | **Client Sample ID:** | MW-22-3 |
| **Lab Order:** | 064876 | | |
| **Project:** | JPL, 4697 | **Collection Date:** | 8/11/2003 7:41:00 AM |
| **Lab ID:** | 064876-004A | **Matrix:** | WATER |

| Analyte | Result | Qual | MDL | PQL | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **ICP-MS METALS** | | **EPA 200.8** | | | | | Analyst: **NS** |
| RunID: ICP4_030923B | QC Bach: R31161 | | | PrepDate: | | | |
| Chromium | 2.9 | J | 0.11 | 1.0 | µg/L | 1 | 9/23/2003 12:56:32 P |

10/30/03

**Qualifiers:**

- ND - Not Detected at the Reporting Limit
- J - Analyte detected below quantitation limits
- B - Analyte detected in the associated Method Blank
- * - Value exceeds Maximum Contaminant Level
- S - Spike Recovery outside accepted recovery limits
- R - RPD outside accepted recovery limits
- E - Value above quantitation range
- H-Samples exceed holding time

Results are wet unless otherwise specified



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LDC #: 11017A4

# VALIDATION COMPLETENESS WORKSHEET

Level III/IV

Date: 10-28-03

SDG #: 03-4697/064876

Page: 1 of 1

Laboratory: Applied P & Ch Laboratory/Advanced Technology Laboratories

Reviewer: MG

2nd Reviewer:

**METHOD:** Chromium (EPA Method 200.8)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

| | Validation Area | | Comments |
|---|---|---|---|
| I. | Technical holding times | A | Sampling dates: 8-11-03 |
| II. | Calibration | A | |
| III. | Blanks | SW | |
| IV. | ICP Interference Check Sample (ICS) Analysis | N | Not required |
| V. | Matrix Spike Analysis | SW | MS/MSD (SDG: 03-4948/064877) |
| VI. | Duplicate Sample Analysis | A | DUP ( ↓ ) |
| VII. | Laboratory Control Samples (LCS) | A | LCS |
| VIII. | Internal Standard (ICP-MS) | A | |
| IX. | Furnace Atomic Absorption QC | N | Not utilized |
| X. | ICP Serial Dilution | N | Not required |
| XI. | Sample Result Verification | A | Not reviewed for Level III validation. |
| XII. | Overall Assessment of Data | A | |
| XIII. | Field Duplicates | SW | D=1+7 |
| XIV. | Field Blanks | ND | EB=2 |

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank

Validated Samples: ** Indicates sample underwent Level IV validation.

all water

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1 | DUPE-5-3-Q03** | 11 | | 21 | | 31 | |
| 2 | EB-7-8-11-03 | 12 | | 22 | | 32 | |
| 3 | MW-12-1 | 13 | | 23 | | 33 | |
| 4 | MW-12-2 | 14 | | 24 | | 34 | |
| 5 | MW-12-3 | 15 | | 25 | | 35 | |
| 6 | MW-22-1 | 16 | | 26 | | 36 | |
| 7 | MW-22-2 | 17 | | 27 | | 37 | |
| 8 | MW-22-3 | 18 | | 28 | | 38 | |
| 9 | PBW | 19 | | 29 | | 39 | |
| 10 | | 20 | | 30 | | 40 | |

Notes:

LDC #: 11017A4
SDG #: 03-4697/064876

**VALIDATION FINDINGS CHECKLIST**


Reviewer: MG
2nd Reviewer: MG

**Method:** Metals (EPA SW 826 Method 6010/7000/6020)

| Validation Area | Yes | No | NA | Findings/Comments |
|---|---|---|---|---|
| I. Technical holding times | | | | |
| All technical holding times were met. | ✓ | | | |
| Cooler temperature criteria was met. | ✓ | | | |
| II. Calibration | | | | |
| Were all instruments calibrated daily, each set-up time? | ✓ | | | |
| Were the proper number of standards used? | ✓ | | | |
| Were all initial and continuing calibration verification %Rs within the 90-110% (80-120% for mercury and 85-115% for cyanide) QC limits? | ✓ | | | |
| Were all initial calibration correlation coefficients $\geq$ 0.995? | ✓ | | | |
| Was a midrange cyanide standard distilled? | | | ✓ | |
| III. Blanks | | | | |
| Was a method blank associated with every sample in this SDG? | ✓ | | | |
| Was there contamination in the method blanks? If yes, please see the Blanks validation completeness worksheet. | ✓ | | | |
| IV. ICP Interference Check Sample | | | | |
| Were ICP interference check samples performed daily? | | ✓ | | |
| Were the AB solution percent recoveries (%R) with the 80-120% QC limits? | | | ✓ | |
| IV. Matrix spike/Matrix spike duplicates | | | | |
| Were a matrix spike (MS) and duplicate (DUP) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD or MS/DUP. Soil / Water. | ✓ | | | |
| Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the 75-125 QC limits? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken. | | ✓ | | |
| Were the MS/MSD or duplicate relative percent differences (RPD) $\leq$ 20% for waters and $\leq$ 35% for soil samples? A control limit of +/- RL(+/-2X RL for soil) was used for samples that were $\leq$ 5X the RL, including when only one of the duplicate sample values were $\leq$ 5X the RL. | ✓ | | | |
| V. Laboratory control samples | | | | |
| Was an LCS anaylzed for this SDG? | ✓ | | | |
| Was an LCS analyzed per extraction batch? | ✓ | | | |
| Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the 80-120% QC limits for water samples and laboratory established QC limits for soils? | ✓ | | | |
| VI. Furnace Atomic Absorption QC | | | | |
| If MSA was performed, was the correlation coefficients $\geq$ 0.995? | | | ✓ | |
| Do all applicable analysies have duplicate injections? | | | ✓ | |

LDC #: 1101744
SDG #: 03-4697/064876

**VALIDATION FINDINGS CHECKLIST**


Reviewer: MG
2nd Reviewer: M

| Validation Area | Yes | No | NA | Findings/Comments |
|---|---|---|---|---|
| For sample concentrations > RL, are applicable duplicate injection RSD values < 20%? | | | ✓ | |
| Were analytical spike recoveries within the 85-115% QC limits? | | | ✓ | |
| VII. ICP Serial Dilution | | | | |
| Was an ICP serial dilution analyzed if analyte concentrations were > 50X the IDL? | | ✓ | | |
| Were all percent differences (%Ds) ≤ 10%? | | | ✓ | |
| Was there evidence of negative interference? If yes, professional judgement will be used to qualify the data. | | | ✓ | |
| VIII. Internal Standards (EPA SW 846 Method 6020) | | | | |
| Were all the percent recoveries (%R) within the ~~80-120%~~ 60-125 of the intensity of the internal standard in the associated initial calibration? | ✓ | | | |
| If the %Rs were outside the criteria, was a reanalysis performed? | | | ✓ | |
| IX. Regional Quality Assurance and Quality Control | | | | |
| Were performance evaluation (PE) samples performed? | | ✓ | | |
| Were the performance evaluation (PE) samples within the acceptance limits? | | | ✓ | |
| X. Sample Result Verification | | | | |
| Were RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation? | ✓ | | | |
| XI. Overall assessment of data | | | | |
| Overall assessment of data was found to be acceptable. | ✓ | | | |
| XII. Field duplicates | | | | |
| Field duplicate pairs were identified in this SDG. | ✓ | | | |
| Target analytes were detected in the field duplicates. | ✓ | | | |
| XIII. Field blanks | | | | |
| Field blanks were identified in this SDG. | ✓ | | | |
| Target analytes were detected in the field blanks. | | ✓ | | |

LDC #: 11017A4
SDG #: 03-4697/064876

**VALIDATION FINDINGS WORKSHEET**
**PB/ICB/CCB QUALIFIED SAMPLES**

Page: 1 of 1
Reviewer: MG
2nd Reviewer: [illegible]

**METHOD:** Trace Metals (EPA SW 846 Method 6010/7000) Soil preparation factor applied: NA
Sample Concentration units, unless otherwise noted: µg/L Associated Samples: all

| Analyte | Maximum PB[a] (mg/Kg) | Maximum PB[a] (ug/L) | Maximum ICB/CCB[a] (ug/L) | Blank Action Limit | Sample Identification | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | — | No | findings | — | | | | | | | |
| Al | | | | | | | | | | | | | | | Al |
| Sb | | | | | | | | | | | | | | | Sb |
| As | | | | | | | | | | | | | | | As |
| Ba | | | | | | | | | | | | | | | Ba |
| Be | | | | | | | | | | | | | | | Be |
| Cd | | | | | | | | | | | | | | | Cd |
| Ca | | | | | | | | | | | | | | | Ca |
| Cr | | | 0.132 | 0.66 | | | | | | | | | | | Cr |
| Co | | | | | | | | | | | | | | | Co |
| Cu | | | | | | | | | | | | | | | Cu |
| Fe | | | | | | | | | | | | | | | Fe |
| Pb | | | | | | | | | | | | | | | Pb |
| Mg | | | | | | | | | | | | | | | Mg |
| Mn | | | | | | | | | | | | | | | Mn |
| Hg | | | | | | | | | | | | | | | Hg |
| Ni | | | | | | | | | | | | | | | Ni |
| K | | | | | | | | | | | | | | | K |
| Se | | | | | | | | | | | | | | | Se |
| Ag | | | | | | | | | | | | | | | Ag |
| Na | | | | | | | | | | | | | | | Na |
| Tl | | | | | | | | | | | | | | | Tl |
| V | | | | | | | | | | | | | | | V |
| Zn | | | | | | | | | | | | | | | Zn |
| B | | | | | | | | | | | | | | | B |
| Mo | | | | | | | | | | | | | | | Mo |
| Sr | | | | | | | | | | | | | | | Sr |

Samples with analyte concentrations within five times the associated ICB, CCB or PB concentration are listed above with the identifications from the Validation Completeness Worksheet. These sample results were qualified as not detected, "U".
Note : a - The listed analyte concentration is the highest ICB, CCB, or PB detected in the analysis of each element.

LDC #: 11017A4
SDG #: 03-4697/064876

# VALIDATION FINDINGS WORKSHEET
## Matrix Spike/Matrix Spike Duplicates


Reviewer: MG
2nd Reviewer: My

**METHOD:** Trace metals (EPA SW 846 Method 6010/7000)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

(Y) N N/A Was a matrix spike analyzed for each matrix in this SDG?

Y (N) N/A Were matrix spike percent recoveries (%R) within the control limits of 75-125? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.

(Y) N N/A Were all duplicate sample relative percent differences (RPD) ≤ 20% for water samples and ≤35% for soil samples?

**LEVEL IV ONLY:**

(Y) N N/A Were recalculated results acceptable? See Level IV Recalculation Worksheet for recalculations.

| # | MS/MSD ID | Matrix | Analyte | MS %Recovery | MSD %Recovery | RPD (Limits) | Associated Samples | Qualifications |
|---|---|---|---|---|---|---|---|---|
| 1 | MW-16 MS/MSD | water | Cr | | 79.1 (80-120) | | all | J/UJ/A |
| | | | | | | | | |
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Comments:

LDC #: 11017A4
SDG #: 03-4697/064876

# VALIDATION FINDINGS WORKSHEET
## Field Duplicates


Reviewer: MG
2nd reviewer: [illegible]

**METHOD:** Trace Metals (EPA SW 846 Method 6010/7000)

(Y) N N/A Were field duplicate pairs identified in this SDG?
(Y) N N/A Were target analytes detected in the field duplicate pairs?

| Analyte | Concentration ( µg/L ) | | RPD (Limits) | Difference (Limits) | Qualifications |
|---|---|---|---|---|---|
| | 1 | 7 | | | |
| Aluminum | | | | | |
| Antimony | | | | | |
| Arsenic | | | | | |
| Barium | | | | | |
| Beryllium | | | | | |
| Cadmium | | | | | |
| Calcium | | | | | |
| Chromium | 2.5 | 2.7 | 8 | | |
| Cobalt | | | | | |
| Copper | | | | | |
| Iron | | | | | |
| Lead | | | | | |
| Magnesium | | | | | |
| Manganese | | | | | |
| Mercury | | | | | |
| Nickel | | | | | |
| Potassium | | | | | |
| Selenium | | | | | |
| Silver | | | | | |
| Sodium | | | | | |
| Thallium | | | | | |
| Vanadium | | | | | |
| Zinc | | | | | |
| Cyanide | | | | | |
| Boron | | | | | |
| Molybdenum | | | | | |
| Strontium | | | | | |
| Silicon | | | | | |

Notes:

LDC #: 11017A4
SDG #: 03-4697/064876

# VALIDATION FINDINGS WORKSHEET
## Initial and Continuing Calibration Calculation Verification


Reviewer: MG
2nd Reviewer: MY

**METHOD:** Trace Metals (EPA SW 846 Method 6010/7000)

An initial and continuing calibration verification percent recovery (%R) was recalculated for each type of analysis using the following formula:

%R = Found x 100 / True

Where, Found = concentration (in ug/L) of each analyte measured in the analysis of the ICV or CCV solution
True = concentration (in ug/L) of each analyte in the ICV or CCV source

| Standard ID | Type of Analysis | Element | Found (ug/L) | True (ug/L) | Recalculated %R | Reported %R | Acceptable (Y/N) |
|---|---|---|---|---|---|---|---|
| ICV | ICP (Initial calibration) ICP-MS | Cr | 9.995 | 10.0 | 100 | 100 | Y |
| | GFAA (Initial calibration) | | | | | | |
| | CVAA (Initial calibration) | | | | | | |
| | ICP (Continuing calibration) ICP-MS | (level | IV sample | was run after | ICV, so | no CCV) | |
| | GFAA (Continuing calibration) | | | | | | |
| | CVAA (Continuing calibration) | | | | | | |
| | Cyanide (Initial calibration) | | | | | | |
| | Cyanide (Continuing calibation) | | | | | | |

Comments: Refer to Calibration Verification findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 11017A4
SDG #: 03-4697/064876

# VALIDATION FINDINGS WORKSHEET
## Level IV Recalculation Worksheet

Page: 1 of 1
Reviewer: MG
2nd Reviewer: [illegible]

**METHOD:** Trace Metals (EPA SW 846 Method 6010/7000)

Percent recoveries (%R) for an ICP interference check sample, a laboratory control sample and a matrix spike sample were recaluculated using the following formula:

$$\%R = \frac{Found}{True} \times 100$$

Where, Found = Concentration of each analyte measured in the analysis of the sample. For the matrix spike calculation, Found = SSR (spiked sample result) - SR (sample result).
True = Concentration of each analyte in the source.

A sample and duplicate relative percent difference (RPD) was recalculated using the following formula:

$$RPD = \frac{|S-D|}{(S+D)/2} \times 100$$

Where, S = Original sample concentration
D = Duplicate sample concentration

An ICP serial dilution percent difference (%D) was recalculated using the following formula:

$$\%D = \frac{|I-SDR|}{I} \times 100$$

Where, I = Initial Sample Result (mg/L)
SDR = Serial Dilution Result (mg/L) (Instrument Reading x 5)

| Sample ID | Type of Analysis | Element | Found / S / I (units) | True / D / SDR (units) | Recalculated %R / RPD / %D | Reported %R / RPD / %D | Acceptable (Y/N) |
|---|---|---|---|---|---|---|---|
| — | ICP Interference check | — | — | — | — | — | — |
| LCS | Laboratory control sample | Cr | 10.01 (µg/L) | 10 (µg/L) | 100 | 100 | Y |
| MW-16 MS | Matrix spike | Cr | (SSR-SR) 8.056 (µg/L) | 10 (µg/L) | 80.6 | 80.6 | ↓ |
| MW-16 MS/MSD | Duplicate | Cr | 2.674 (µg/L) | 2.635 (µg/L) | 1.47 | 1.47 | ↓ |
| — | ICP serial dilution | — | — | — | — | — | — |

Comments: Refer to appropriate worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 11017A4
SDG #: 03-4697/064876

# VALIDATION FINDINGS WORKSHEET
## Sample Calculation Verification

Page: 1 of 1
Reviewer: MG
2nd reviewer: [illegible]

**METHOD:** Trace Metals (EPA SW 846 Method 6010/7000)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

(Y) N N/A Have results been reported and calculated correctly?
(Y) N N/A Are results within the calibrated range of the instruments and within the linear range of the ICP?
(Y) N N/A Are all detection limits below the CRDL?

Detected analyte results for 1, Cr were recalculated and verified using the following equation:

Concentration = $\frac{(RD)(FV)(Dil)}{(In.\ Vol.)(\%S)}$

RD = Raw data concentration
FV = Final volume (ml)
In. Vol. = Initial volume (ml) or weight (G)
Dil = Dilution factor
%S = Decimal percent solids

Recalculation:

$$\frac{(2.453\ \mu g/L)(0.010\ L)(1)}{0.010\ L} = 2.453\ \mu g/L$$

| Sample ID | Analyte | Reported Concentration (µg/L) | Calculated Concentration (µg/L) | Acceptable (Y/N) |
|---|---|---|---|---|
| 1 | Cr | 2.5 | 2.5 | Y |
| | | | | |
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RECALC.4S2

# Laboratory Data Consultants, Inc.
# Data Validation Report

**Project/Site Name:** NASA JPL

**Collection Date:** August 25 through August 25, 2003

**LDC Report Date:** October 29, 2003

**Matrix:** Water

**Parameters:** Chromium

**Validation Level:** EPA Level III & IV

**Laboratory:** Applied P & Ch Laboratory/Advanced Technology Laboratories

**Sample Delivery Group (SDG):** 03-4948/064877

**Sample Identification**

DUPE-6-3-Q03**
MW-5
MW-6
MW-7
MW-8
MW-10
MW-13
MW-15
MW-16
MW-16DUP
MW-16MS
MW-16MSD
MW-8DUP

**Indicates sample underwent EPA Level IV review

## Introduction

This data review covers 13 water samples listed on the cover sheet including dilutions and reanalysis as applicable. The analyses were per EPA Method 200.8 for Chromium.

This review follows a modified outline of the USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review (February 1994) as there are no current guidelines for the method stated above.

A table summarizing all data qualification flags is provided at the end of this report. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from specified protocols or is of technical advisory nature.

Blanks are summarized in Section III.

Field duplicates are summarized in Section XIII.

Samples indicated by a double asterisk on the front cover underwent a EPA Level IV review. A EPA Level III review was performed on all of the other samples. Raw data were not evaluated for the samples reviewed by Level III criteria since this review is based on QC data.

The following are definitions of the data qualifiers:

U Indicates the compound or analyte was analyzed for but not detected at or above the stated limit.

J Indicates an estimated value.

R Quality control indicates the data is not usable.

N Presumptive evidence of presence of the constituent.

UJ Indicates the compound or analyte was analyzed for but not detected. The sample detection limit is an estimated value.

A Indicates the finding is based upon technical validation criteria.

P Indicates the finding is related to a protocol/contractual deviation.

None Indicates the data was not significantly impacted by the finding, therefore qualification was not required.

## I. Technical Holding Times

All technical holding time requirements were met.

The chain-of-custodies were reviewed for documentation of cooler temperatures. All cooler temperatures met validation criteria.

## II. Calibration

An initial calibration was performed.

The frequency and analysis criteria of the initial calibration verification (ICV) and continuing calibration verification (CCV) were met.

## III. Blanks

Method blanks were reviewed for each matrix as applicable.

Data qualification by the initial, continuing and preparation blanks (ICB/CCB/PBs) was based on the maximum contaminant concentration in the ICB/CCB/PBs in the analysis of each analyte. No contaminant concentrations were found in the initial, continuing and preparation blanks with the following exceptions:

| Method Blank ID | Analyte | Maximum Concentration | Associated Samples |
|---|---|---|---|
| ICB/CCB | Chromium | 0.132 ug/L | All samples in SDG 03-4948/064877 |

Sample concentrations were compared to the maximum contaminant concentrations detected in the ICB/CCB/PBs. The sample concentrations were either not detected or were significantly greater ( >5X blank contaminants) than the concentrations found in the associated method blanks.

## IV. ICP Interference Check Sample (ICS) Analysis

ICP interference check was not required by the method.

## V. Matrix Spike Analysis

Matrix spike (MS) and matrix spike duplicate (MSD) samples were reviewed for each matrix as applicable. Percent recoveries (%R) and relative percent differences (RPD) were within QC limits with the following exceptions:

| Spike ID (Associated Samples) | Analyte | MS (%R) (Limits) | MSD (%R) (Limits) | RPD (Limits) | Flag | A or P |
|---|---|---|---|---|---|---|
| MW-16MS/MSD (All samples in SDG 03-4948/064877) | Chromium | - | 79.1 (80-120) | - | J (all detects) UJ (all non-detects) | A |

## VI. Duplicate Sample Analysis

Duplicate (DUP) sample analyses were reviewed for each matrix as applicable. Results were within QC limits.

## VII. Laboratory Control Samples (LCS)

Laboratory control samples were reviewed for each matrix as applicable. Percent recoveries (%R) were within QC limits.

## VIII. Internal Standards (ICP-MS)

All internal standard percent recoveries (%R) were within QC limits.

## IX. Furnace Atomic Absorption QC

Graphite furnace atomic absorption was not utilized in this SDG.

## X. ICP Serial Dilution

ICP serial dilution was not required by the method.

## XI. Sample Result Verification

All sample result verifications met validation criteria for samples on which a EPA Level IV review was performed. Raw data were not evaluated for the samples reviewed by Level III criteria.

## XII. Overall Assessment of Data

Data flags have been summarized at the end of this report.

## XIII. Field Duplicates

Samples DUPE-6-3-Q03** and MW-15 were identified as field duplicates. No chromium was detected in any of the samples with the following exceptions:

| Analyte | Concentration (ug/L) | | RPD |
|---|---|---|---|
| | DUPE-6-3-Q03** | MW-15 | |
| Chromium | 3.6 | 3.9 | 8 |

## XIV. Field Blanks

No field blanks were identified in this SDG.

## NASA JPL
## Chromium - Data Qualification Summary - SDG 03-4948/064877

| SDG | Sample | Analyte | Flag | A or P | Reason |
|---|---|---|---|---|---|
| 03-4948/064877 | DUPE-6-3-Q03**<br>MW-5<br>MW-6<br>MW-7<br>MW-8<br>MW-10<br>MW-13<br>MW-15<br>MW-16 | Chromium | J (all detects)<br>UJ (all non-detects) | A | Matrix spike/Matrix spike duplicates (%R) |

## NASA JPL
## Chromium - Laboratory Blank Data Qualification Summary - SDG 03-4948/064877

No Sample Data Qualified in this SDG

# Advanced Technology Laboratories

**Date:** *26-Sep-03*

**CLIENT:** Applied P & Ch Laboratories
**Lab Order:** 064877
**Project:** JPL, #4948
**Lab ID:** 064877-008A

**Client Sample ID:** Dupe-6-3-Q03
**Collection Date:** 8/27/2003 7:29:00 AM
**Matrix:** WATER

| Analyte | Result | Qual | MDL | PQL | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **ICP-MS METALS** | | | **EPA 200.8** | | | | Analyst: **NS** |
| RunID: ICP4_030923B QC Bach: R31161 | | | PrepDate: | | | | |
| Chromium | 3.6 | J | 0.11 | 1.0 | µg/L | 1 | 9/23/2003 1:36:55 PM |

10/30/03

**Qualifiers:**

ND - Not Detected at the Reporting Limit
J - Analyte detected below quantitation limits
B - Analyte detected in the associated Method Blank
* - Value exceeds Maximum Contaminant Level
S - Spike Recovery outside accepted recovery limits
R - RPD outside accepted recovery limits
E - Value above quantitation range
H-Samples exceed holding time



Results are wet unless otherwise specified



*Advanced Technology Laboratories* 3275 Walnut Avenue Signal Hill, CA 90755 Tel: 562 989-4045 Fax: 562 989-4040

# Advanced Technology Laboratories

**Date:** *26-Sep-03*

**CLIENT:** Applied P & Ch Laboratories
**Lab Order:** 064877
**Project:** JPL, #4948
**Lab ID:** 064877-003A

**Client Sample ID:** MW-5
**Collection Date:** 8/25/2003 11:17:00 AM
**Matrix:** WATER

| Analyte | Result | Qual | MDL | PQL | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **ICP-MS METALS** | | | **EPA 200.8** | | | | Analyst: **NS** |
| RunID: ICP4_030923B | QC Bach: R31161 | | | PrepDate: | | | |
| Chromium | 3.1 | J | 0.11 | 1.0 | µg/L | 1 | 9/23/2003 1:21:58 PM |

10/30/03

**Qualifiers:**

ND - Not Detected at the Reporting Limit
J - Analyte detected below quantitation limits
B - Analyte detected in the associated Method Blank
* - Value exceeds Maximum Contaminant Level
S - Spike Recovery outside accepted recovery limits
R - RPD outside accepted recovery limits
E - Value above quantitation range
H-Samples exceed holding time



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# Advanced Technology Laboratories

**Date:** *26-Sep-03*

**CLIENT:** Applied P & Ch Laboratories
**Lab Order:** 064877
**Project:** JPL, #4948
**Lab ID:** 064877-009A

**Client Sample ID:** MW-6
**Collection Date:** 8/27/2003 9:06:00 AM
**Matrix:** WATER

| Analyte | Result | Qual | MDL | PQL | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **ICP-MS METALS** | | | **EPA 200.8** | | | | Analyst: **NS** |
| RunID: ICP4_030923B | QC Bach: R31161 | | | PrepDate: | | | |
| Chromium | 6.6 | J | 0.11 | 1.0 | µg/L | 1 | 9/23/2003 1:44:33 PM |

9/30/2003

**Qualifiers:**

ND - Not Detected at the Reporting Limit
J - Analyte detected below quantitation limits
B - Analyte detected in the associated Method Blank
* - Value exceeds Maximum Contaminant Level
S - Spike Recovery outside accepted recovery limits
R - RPD outside accepted recovery limits
E - Value above quantitation range
H-Samples exceed holding time



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# Advanced Technology Laboratories

**Date:** *26-Sep-03*

| | | | |
|---|---|---|---|
| **CLIENT:** | Applied P & Ch Laboratories | **Client Sample ID:** | MW-7 |
| **Lab Order:** | 064877 | | |
| **Project:** | JPL, #4948 | **Collection Date:** | 8/26/2003 11:47:00 AM |
| **Lab ID:** | 064877-006A | **Matrix:** | WATER |

| Analyte | Result | Qual | MDL | PQL | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **ICP-MS METALS** | | | **EPA 200.8** | | | | Analyst: **NS** |
| RunID: ICP4_030923B | QC Bach: R31161 | | | PrepDate: | | | |
| Chromium | 4.6 | J | 0.11 | 1.0 | µg/L | 1 | 9/23/2003 1:31:58 PM |

10/30/07

**Qualifiers:**

- ND - Not Detected at the Reporting Limit
- J - Analyte detected below quantitation limits
- B - Analyte detected in the associated Method Blank
- * - Value exceeds Maximum Contaminant Level
- S - Spike Recovery outside accepted recovery limits
- R - RPD outside accepted recovery limits
- E - Value above quantitation range
- H-Samples exceed holding time



Results are wet unless otherwise specified



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# Advanced Technology Laboratories

**Date:** *26-Sep-03*

| | | | |
|---|---|---|---|
| **CLIENT:** | Applied P & Ch Laboratories | **Client Sample ID:** | MW-8 |
| **Lab Order:** | 064877 | | |
| **Project:** | JPL, #4948 | **Collection Date:** | 8/25/2003 9:34:00 AM |
| **Lab ID:** | 064877-002A | **Matrix:** | WATER |

| Analyte | Result | Qual | MDL | PQL | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **ICP-MS METALS** | | | **EPA 200.8** | | | | Analyst: **NS** |
| RunID: ICP4_030923B | QC Bach: R31161 | | | PrepDate: | | | |
| Chromium | 3.6 | J | 0.11 | 1.0 | µg/L | 1 | 9/23/2003 1:16:50 PM |

10/30/03

**Qualifiers:**

- ND - Not Detected at the Reporting Limit
- J - Analyte detected below quantitation limits
- B - Analyte detected in the associated Method Blank
- * - Value exceeds Maximum Contaminant Level
- S - Spike Recovery outside accepted recovery limits
- R - RPD outside accepted recovery limits
- E - Value above quantitation range
- H-Samples exceed holding time



Results are wet unless otherwise specified



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B

# Advanced Technology Laboratories

**Date:** *26-Sep-03*

**CLIENT:** Applied P & Ch Laboratories
**Lab Order:** 064877
**Project:** JPL, #4948
**Lab ID:** 064877-001A

**Client Sample ID:** MW-10
**Collection Date:** 8/25/2003 7:46:00 AM
**Matrix:** WATER

| Analyte | Result | Qual | MDL | PQL | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **ICP-MS METALS** | | | **EPA 200.8** | | | | Analyst: **NS** |
| RunID: ICP4_030923B QC Bach: R31161 | | | PrepDate: | | | | |
| Chromium | 11 | J | 0.11 | 1.0 | µg/L | 1 | 9/23/2003 1:14:18 PM |

10/30/03

**Qualifiers:**

ND - Not Detected at the Reporting Limit
J - Analyte detected below quantitation limits
B - Analyte detected in the associated Method Blank
* - Value exceeds Maximum Contaminant Level
S - Spike Recovery outside accepted recovery limits
R - RPD outside accepted recovery limits
E - Value above quantitation range
H-Samples exceed holding time



Results are wet unless otherwise specified



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# Advanced Technology Laboratories

**Date:** *26-Sep-03*

**CLIENT:** Applied P & Ch Laboratories
**Lab Order:** 064877
**Project:** JPL, #4948
**Lab ID:** 064877-004A

**Client Sample ID:** MW-13
**Collection Date:** 8/26/2003 7:40:00 AM
**Matrix:** WATER

| Analyte | Result | Qual | MDL | PQL | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **ICP-MS METALS** | | | **EPA 200.8** | | | | Analyst: **NS** |
| RunID: ICP4_030923B | QC Bach: R31161 | | | PrepDate: | | | |
| Chromium | 8.5 | J | 0.11 | 1.0 | µg/L | 1 | 9/23/2003 1:24:32 PM |

10/30/03

**Qualifiers:**

ND - Not Detected at the Reporting Limit
J - Analyte detected below quantitation limits
B - Analyte detected in the associated Method Blank
* - Value exceeds Maximum Contaminant Level
S - Spike Recovery outside accepted recovery limits
R - RPD outside accepted recovery limits
E - Value above quantitation range
H-Samples exceed holding time



Results are wet unless otherwise specified

0011

Advanced Technology Laboratories
3275 Walnut Avenue Signal Hill, CA 90755 Tel: 562 989-4045 Fax: 562 989-4040

# Advanced Technology Laboratories

**Date:** *26-Sep-03*

**CLIENT:** Applied P & Ch Laboratories
**Lab Order:** 064877
**Project:** JPL, #4948
**Lab ID:** 064877-007A

**Client Sample ID:** MW-15
**Collection Date:** 8/27/2003 7:23:00 AM
**Matrix:** WATER

| Analyte | Result | Qual | MDL | PQL | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **ICP-MS METALS** | | | **EPA 200.8** | | | | Analyst: **NS** |
| RunID: ICP4_030923B | QC Bach: R31161 | | PrepDate: | | | | |
| Chromium | 3.9 | J | 0.11 | 1.0 | µg/L | 1 | 9/23/2003 1:34:26 PM |

10/30/03

**Qualifiers:**

ND - Not Detected at the Reporting Limit
J - Analyte detected below quantitation limits
B - Analyte detected in the associated Method Blank
* - Value exceeds Maximum Contaminant Level
S - Spike Recovery outside accepted recovery limits
R - RPD outside accepted recovery limits
E - Value above quantitation range
H-Samples exceed holding time



Results are wet unless otherwise specified

0014

*Advanced Technology Laboratories* 3275 Walnut Avenue Signal Hill, CA 90755 Tel: 562 989-4045 Fax: 562 989-4040

# Advanced Technology Laboratories

**Date:** *26-Sep-03*

**CLIENT:** Applied P & Ch Laboratories
**Lab Order:** 064877
**Project:** JPL, #4948
**Lab ID:** 064877-005A

**Client Sample ID:** MW-16
**Collection Date:** 8/26/2003 9:21:00 AM
**Matrix:** WATER

| Analyte | Result | Qual | MDL | PQL | Units | DF | Date Analyzed |
|---|---|---|---|---|---|---|---|
| **ICP-MS METALS** | | | **EPA 200.8** | | | | Analyst: **NS** |
| RunID: ICP4_030923B | QC Bach: R31161 | | | PrepDate: | | | |
| Chromium | 2.7 | J | 0.11 | 1.0 | µg/L | 1 | 9/23/2003 1:27:03 PM |

10/20/03

**Qualifiers:**

ND - Not Detected at the Reporting Limit
J - Analyte detected below quantitation limits
B - Analyte detected in the associated Method Blank
* - Value exceeds Maximum Contaminant Level
S - Spike Recovery outside accepted recovery limits
R - RPD outside accepted recovery limits
E - Value above quantitation range
H-Samples exceed holding time



Results are wet unless otherwise specified



*Advanced Technology Laboratories* 3275 Walnut Avenue Signal Hill, CA 90755 Tel: 562 989-4045 Fax: 562 989-4040

LDC #: 11017B4
SDG #: 03-4948/064877
Laboratory: Applied P & Ch Laboratory/Advanced Technology Laboratories

# VALIDATION COMPLETENESS WORKSHEET
Level III/IV

Date: 10-28-03
Page: 1 of 1
Reviewer: MG
2nd Reviewer: [illegible]

**METHOD:** Chromium (EPA Method 200.8)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

| | Validation Area | | Comments |
|---|---|---|---|
| I. | Technical holding times | A | Sampling dates: 8-25-03 through 8-27-03 |
| II. | Calibration | A | |
| III. | Blanks | SW | |
| IV. | ICP Interference Check Sample (ICS) Analysis | N | Not required |
| V. | Matrix Spike Analysis | SW | |
| VI. | Duplicate Sample Analysis | A | |
| VII. | Laboratory Control Samples (LCS) | A | LCS |
| VIII. | Internal Standard (ICP-MS) | A | |
| IX. | Furnace Atomic Absorption QC | N | Not utilized |
| X. | ICP Serial Dilution | N | Not required |
| XI. | Sample Result Verification | A | Not reviewed for Level III validation. |
| XII. | Overall Assessment of Data | A | |
| XIII. | Field Duplicates | SW | D= 1 + 8 |
| XIV. | Field Blanks | N | |

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank

Validated Samples: ** Indicates sample underwent Level IV validation.

all water

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1 | DUPE-6-3-Q03** | 11 | MW-16MS | 21 | MW-16 | 31 | |
| 2 | MW-5 | 12 | MW-16MSD | 22 | ↓ | 32 | |
| 3 | MW-6 | 13 | MW-8DUP | 23 | | 33 | |
| 4 | MW-7 | 14 | PBW | 24 | | 34 | |
| 5 | MW-8 | 15 | | 25 | | 35 | |
| 6 | MW-10 | 16 | | 26 | | 36 | |
| 7 | MW-13 | 17 | | 27 | | 37 | |
| 8 | MW-15 | 18 | | 28 | | 38 | |
| 9 | MW-16 | 19 | | 29 | | 39 | |
| 10 | MW-16DUP | 20 | | 30 | | 40 | |

MW-16

Notes: _____

LDC #: 11017B4
SDG #: 03-4948/064077

**VALIDATION FINDINGS CHECKLIST**


Reviewer: MG
2nd Reviewer: MM

**Method:** Metals (EPA SW 826 Method 6010/7000/6020)

| Validation Area | Yes | No | NA | Findings/Comments |
|---|---|---|---|---|
| I. Technical holding times | | | | |
| All technical holding times were met. | ✓ | | | |
| Cooler temperature criteria was met. | ✓ | | | |
| II. Calibration | | | | |
| Were all instruments calibrated daily, each set-up time? | ✓ | | | |
| Were the proper number of standards used? | ✓ | | | |
| Were all initial and continuing calibration verification %Rs within the 90-110% (80-120% for mercury and 85-115% for cyanide) QC limits? | ✓ | | | |
| Were all initial calibration correlation coefficients $\geq$ 0.995? | ✓ | | | |
| Was a midrange cyanide standard distilled? | | | ✓ | |
| III. Blanks | | | | |
| Was a method blank associated with every sample in this SDG? | ✓ | | | |
| Was there contamination in the method blanks? If yes, please see the Blanks validation completeness worksheet. | ✓ | | | |
| IV. ICP Interference Check Sample | | | | |
| Were ICP interference check samples performed daily? | | ✓ | | |
| Were the AB solution percent recoveries (%R) with the 80-120% QC limits? | | | ✓ | |
| IV. Matrix spike/Matrix spike duplicates | | | | |
| Were a matrix spike (MS) and duplicate (DUP) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD or MS/DUP. Soil / Water. | ✓ | | | |
| Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the 75-125 QC limits? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken. | | ✓ | | |
| Were the MS/MSD or duplicate relative percent differences (RPD) $\leq$ 20% for waters and $\leq$ 35% for soil samples? A control limit of +/- RL(+/-2X RL for soil) was used for samples that were $\leq$ 5X the RL, including when only one of the duplicate sample values were $\leq$ 5X the RL. | ✓ | | | |
| V. Laboratory control samples | | | | |
| Was an LCS anaylzed for this SDG? | ✓ | | | |
| Was an LCS analyzed per extraction batch? | ✓ | | | |
| Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the 80-120% QC limits for water samples and laboratory established QC limits for soils? | ✓ | | | |
| VI. Furnace Atomic Absorption QC | | | | |
| If MSA was performed, was the correlation coefficients $\geq$ 0.995? | | | ✓ | |
| Do all applicable analysies have duplicate injections? | | | ✓ | |

LDC #: 11017B4
SDG #: 03-4948/064877

**VALIDATION FINDINGS CHECKLIST**


Reviewer: MG
2nd Reviewer: MG

| Validation Area | Yes | No | NA | Findings/Comments |
|---|---|---|---|---|
| For sample concentrations > RL, are applicable duplicate injection RSD values < 20%? | | | ✓ | |
| Were analytical spike recoveries within the 85-115% QC limits? | | | ✓ | |
| VII. ICP Serial Dilution | | | | |
| Was an ICP serial dilution analyzed if analyte concentrations were > 50X the IDL? | | ✓ | | |
| Were all percent differences (%Ds) ≤ 10%? | | | ✓ | |
| Was there evidence of negative interference? If yes, professional judgement will be used to qualify the data. | | | ✓ | |
| VIII. Internal Standards (EPA SW 846 Method 6020) | | | | |
| Were all the percent recoveries (%R) within the 30-120% of the intensity of the internal standard in the associated initial calibration? | ✓ | | | |
| If the %Rs were outside the criteria, was a reanalysis performed? | | | ✓ | |
| IX. Regional Quality Assurance and Quality Control | | | | |
| Were performance evaluation (PE) samples performed? | | ✓ | | |
| Were the performance evaluation (PE) samples within the acceptance limits? | | | ✓ | |
| X. Sample Result Verification | | | | |
| Were RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation? | ✓ | | | |
| XI. Overall assessment of data | | | | |
| Overall assessment of data was found to be acceptable. | ✓ | | | |
| XII. Field duplicates | | | | |
| Field duplicate pairs were identified in this SDG. | ✓ | | | |
| Target analytes were detected in the field duplicates. | ✓ | | | |
| XIII. Field blanks | | | | |
| Field blanks were identified in this SDG. | | ✓ | | |
| Target analytes were detected in the field blanks. | | | ✓ | |

LDC #: 1101784
SDG #: 03-4948/064877

**VALIDATION FINDINGS WORKSHEET**
**PB/ICB/CCB QUALIFIED SAMPLES**

Page: 1 of 1
Reviewer: MG
2nd Reviewer: [illegible]

**METHOD:** Trace Metals (EPA SW 846 Method 6010/7000) Soil preparation factor applied: NA
Sample Concentration units, unless otherwise noted: ug/L Associated Samples: all

| Analyte | Maximum PB* (mg/Kg) | Maximum PB* (ug/L) | Maximum ICB/CCB* (ug/L) | Blank Action Limit | Sample Identification | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | — | No | findings | — | | | | | | | |
| Al | | | | | | | | | | | | | | | Al |
| Sb | | | | | | | | | | | | | | | Sb |
| As | | | | | | | | | | | | | | | As |
| Ba | | | | | | | | | | | | | | | Ba |
| Be | | | | | | | | | | | | | | | Be |
| Cd | | | | | | | | | | | | | | | Cd |
| Ca | | | | | | | | | | | | | | | Ca |
| Cr | | | 0.132 | 0.66 | | | | | | | | | | | Cr |
| Cc | | | | | | | | | | | | | | | Co |
| Cu | | | | | | | | | | | | | | | Cu |
| Fe | | | | | | | | | | | | | | | Fe |
| Pb | | | | | | | | | | | | | | | Pb |
| Mg | | | | | | | | | | | | | | | Mg |
| Mn | | | | | | | | | | | | | | | Mn |
| Hg | | | | | | | | | | | | | | | Hg |
| Nl | | | | | | | | | | | | | | | Nl |
| K | | | | | | | | | | | | | | | K |
| Se | | | | | | | | | | | | | | | Se |
| Ag | | | | | | | | | | | | | | | Ag |
| Na | | | | | | | | | | | | | | | Na |
| Tl | | | | | | | | | | | | | | | Tl |
| V | | | | | | | | | | | | | | | V |
| Zn | | | | | | | | | | | | | | | Zn |
| B | | | | | | | | | | | | | | | B |
| Mo | | | | | | | | | | | | | | | Mo |
| Sr | | | | | | | | | | | | | | | Sr |

Samples with analyte concentrations within five times the associated ICB, CCB or PB concentration are listed above with the dentifications from the Validation Completeness Worksheet. These sample results were qualified as not detected, "U".
Note : a - The listed analyte concentration is the highest ICB, CCB, or PB detected in the analysis of each element.

LDC #: 1101784
SDG #: 03-4948/064877

# VALIDATION FINDINGS WORKSHEET
## Matrix Spike/Matrix Spike Duplicates


Reviewer: MG
2nd Reviewer: MG

**METHOD:** Trace metals (EPA SW 846 Method 6010/7000)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

(Y) N N/A Was a matrix spike analyzed for each matrix in this SDG?

Y (N) N/A Were matrix spike percent recoveries (%R) within the control limits of 75-125? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.

(Y) N N/A Were all duplicate sample relative percent differences (RPD) ≤ 20% for water samples and ≤35% for soil samples?

**LEVEL IV ONLY:**

(Y) N N/A Were recalculated results acceptable? See Level IV Recalculation Worksheet for recalculations.

| # | MS/MSD ID | Matrix | Analyte | MS %Recovery | MSD %Recovery | RPD (Limits) | Associated Samples | Qualifications |
|---|---|---|---|---|---|---|---|---|
| 1 | 11/12 | water | Cr | | 79.1 (80-120) | | all | J/UJ/A |

Comments:

LDC #: 110178H
SDG #: 03-4948/064877

# VALIDATION FINDINGS WORKSHEET
## Field Duplicates


Reviewer: MG
2nd reviewer: MG

**METHOD:** Trace Metals (EPA SW 846 Method 6010/7000)

(Y) N N/A Were field duplicate pairs identified in this SDG?
(Y) N N/A Were target analytes detected in the field duplicate pairs?

| Analyte | Concentration (ug/L) | | RPD (Limits) | Difference (Limits) | Qualifications |
|---|---|---|---|---|---|
| | 1 | 8 | | | |
| Aluminum | | | | | |
| Antimony | | | | | |
| Arsenic | | | | | |
| Barium | | | | | |
| Beryllium | | | | | |
| Cadmium | | | | | |
| Calcium | | | | | |
| Chromium | 3.6 | 3.9 | 8 | | |
| Cobalt | | | | | |
| Copper | | | | | |
| Iron | | | | | |
| Lead | | | | | |
| Magnesium | | | | | |
| Manganese | | | | | |
| Mercury | | | | | |
| Nickel | | | | | |
| Potassium | | | | | |
| Selenium | | | | | |
| Silver | | | | | |
| Sodium | | | | | |
| Thallium | | | | | |
| Vanadium | | | | | |
| Zinc | | | | | |
| Cyanide | | | | | |
| Boron | | | | | |
| Molybdenum | | | | | |
| Strontium | | | | | |
| Silicon | | | | | |

Notes:

LDC #: 1101784
SDG #: 03-4948/064877

# VALIDATION FINDINGS WORKSHEET
## Initial and Continuing Calibration Calculation Verification


Reviewer: MG
2nd Reviewer: MG

**METHOD:** Trace Metals (EPA SW 846 Method 6010/7000)

An initial and continuing calibration verification percent recovery (%R) was recalculated for each type of analysis using the following formula:

%R = Found / True x 100 Where, Found = concentration (in ug/L) of each analyte measured in the analysis of the ICV or CCV solution
True = concentration (in ug/L) of each analyte in the ICV or CCV source

| Standard ID | Type of Analysis | Element | Found (ug/L) | True (ug/L) | Recalculated %R | Reported %R | Acceptable (Y/N) |
|---|---|---|---|---|---|---|---|
| ICV | ICP (Initial calibration) ICP-MS | Cr | 9.995 | 10.0 | 100 | 100 | Y |
| | GFAA (Initial calibration) | | | | | | |
| | CVAA (Initial calibration) | | | | | | |
| CCV1 | ICP (Continuing calibration) ICP-MS | Cr | 9.932 | 10.0 | 99 | 99 | Y |
| | GFAA (Continuing calibration) | | | | | | |
| | CVAA (Continuing calibration) | | | | | | |
| | Cyanide (Initial calibration) | | | | | | |
| | Cyanide (Continuing calibation) | | | | | | |

Comments: Refer to Calibration Verification findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 11017B4
SDG #: 03-4948/064877

# VALIDATION FINDINGS WORKSHEET
## Level IV Recalculation Worksheet


Reviewer: MG
2nd Reviewer: [illegible]

**METHOD:** Trace Metals (EPA SW 846 Method 6010/7000)

Percent recoveries (%R) for an ICP interference check sample, a laboratory control sample and a matrix spike sample were recaluculated using the following formula:

$\%R = \frac{Found}{True} \times 100$

Where, Found = Concentration of each analyte measured in the analysis of the sample. For the matrix spike calculation, Found = SSR (spiked sample result) - SR (sample result).
True = Concentration of each analyte in the source.

A sample and duplicate relative percent difference (RPD) was recalculated using the following formula:

$RPD = \frac{|S-D|}{(S+D)/2} \times 100$

Where, S = Original sample concentration
D = Duplicate sample concentration

An ICP serial dilution percent difference (%D) was recalculated using the following formula:

$\%D = \frac{|I-SDR|}{I} \times 100$

Where, I = Initial Sample Result (mg/L)
SDR = Serial Dilution Result (mg/L) (Instrument Reading x 5)

| Sample ID | Type of Analysis | Element | Found / S / I (units) | True / D / SDR (units) | Recalculated %R / RPD / %D | Reported %R / RPD / %D | Acceptable (Y/N) |
|---|---|---|---|---|---|---|---|
| — | ICP interference check | — | — | — | — | — | — |
| LCS | Laboratory control sample | Cr | 10.01 (µg/L) | 10 (µg/L) | 100 | 100 | Y |
| 11 | Matrix spike | Cr | (SSR-SR) 8.056 (µg/L) | 10 (µg/L) | 80.6 | 80.6 | ↓ |
| 11/12 | Duplicate | Cr | 2.674 (µg/L) | 2.635 (µg/L) | 1.47 | 1.47 | ↓ |
| — | ICP serial dilution | — | — | — | — | — | — |

Comments: Refer to appropriate worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 1101784
SDG #: 03-4948/064877

# VALIDATION FINDINGS WORKSHEET
## Sample Calculation Verification

Page: 1 of 1
Reviewer: MG
2nd reviewer: MG

**METHOD:** Trace Metals (EPA SW 846 Method 6010/7000)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

(Y) N N/A Have results been reported and calculated correctly?
(Y) N N/A Are results within the calibrated range of the instruments and within the linear range of the ICP?
(Y) N N/A Are all detection limits below the CRDL?

Detected analyte results for #1, Cr were recalculated and verified using the following equation:

Concentration = $\frac{(RD)(FV)(Dil)}{(In.\ Vol.)(\%S)}$

RD = Raw data concentration
FV = Final volume (ml)
In. Vol. = Initial volume (ml) or weight (G)
Dil = Dilution factor
%S = Decimal percent solids

Recalculation:

$$\frac{(3.630\ \mu g/L)(10)(0.010\ L)(1)}{0.010\ L} = 3.630\ \mu g/L$$

| Sample ID | Analyte | Reported Concentration (µg/L) | Calculated Concentration (µg/L) | Acceptable (Y/N) |
|---|---|---|---|---|
| 1 | Cr | 3.6 | 3.6 | Y |
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