

LABORATORY DATA CONSULTANTS, INC.

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ERM

April 10, 2008

2525 Natomas Park Drive, Suite 350 Sacramento, CA 95833 ATTN: Ms. Maria Barajas-Albalawi

SUBJECT: BRC Tronox Parcel H. Data Validation

Dear Ms. Barajas-Albalawi

Enclosed are the final validation reports for the fractions listed below. These SDGs were received on March 31, 2008. Attachment 1 is a summary of the samples that were reviewed for each analysis.

LDC Project # 18529:

SDG#

Fraction

F8A260145.

Radium-226 & Radium-228, Isotopic Uranium & Isotopic Thorium

F8A290183

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, October 2004
- EPA SW 846, Third Edition, Test Methods for Evaluating Solid Waste, update 1, July 1992; update IIA, August 1993; update II. September 1994; update IIB, January 1995; update III, December 1996; update IIIA, April 1998; IIIB, November 2004; Update IV, February 2007

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

Sincerely,

Erlinda T. Rauto

Operations Manager/Senior Chemist

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| | 3,158 Page | 80/20 | *SDG* | Water/Soil | F8A260145 | F8A260145 | F8A290183 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | T/LR |
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Laboratory Data Consultants, Inc. Data Validation Report

Project/Site Name:

BRC Tronox Parcel H

Collection Date:

January 25, 2008

LDC Report Date:

April 7, 2008

Matrix:

Soil/Water

Parameters:

Radium-226 & Radium-228

Validation Level:

EPA Level III & IV

Laboratory:

TestAmerica, Inc.

Sample Delivery Group (SDG): F8A260145

Sample Identification

TSB-HJ-01-10'**

TSB-HJ-09-0'

TSB-HJ-09-10'**

TSB-HJ-03-0'**

TSB-HJ-03-0'FD**

TSB-HJ-03-10'**

TSB-HR-03-0'**

TSB-HR-03-10'**

TSB-HJ-02-0'

TSB-HJ-02-10'**

TSB-HR-02-0'

TSB-HR-02-10'

TSB-HJ-11-0'**

TSB-HJ-11-10'

TSB-HJ-11-10'FD

TSB-HR-01-0'

TSB-HR-01-10'

TSB-HJ-01-0'

RINSATE-1

TSB-HJ-02-10'DUP

^{**}Indicates sample underwent EPA Level IV review

Introduction

This data review covers 19 soil samples and one water sample listed on the cover sheet. The analyses were per EPA Method 903.1/Method RICH-RC5005 for Radium-226 and EPA Method 904.0/Method RICH-RC5005 for Radium-228.

The review follows a modified outline of the USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review (October 2004) as there are no current guidelines for the method stated above.

A qualification summary table is provided at the end of this report if data has been qualified. 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 VIII.

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:

- J+ Data are qualified as estimated, with a high bias likely to occur. False positives or false negatives are unlikely to have been reported.
- J- Data are qualified as estimated, with a low bias likely to occur. False positives or false negatives are unlikely to have been reported.
- J Data are qualified as estimated; it is not possible to assess the direction of the potential bias. False positives or false negatives are unlikely to have been reported.
- U Indicates the compound or analyte was analyzed for but not detected at or above the stated limit.
- R Data are qualified as rejected. There is a significant potential for the reporting of false negatives or false positives.
- 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.

Detector efficiency was determined for each detector and each radionuclide.

Self absorption factors were determined for each sample when applicable.

b. Continuing Calibration

Calibration verification and background determination were performed at the required frequencies. Results were within laboratory control limits.

III. Blanks

Method blanks were reviewed for each matrix as applicable. Blank results contained less than the minimum detectable activity (MDA).

Sample "RINSATE-1" was identified as a rinsate. No radium-226 or radium-228 was found in this blank.

IV. Accuracy and Precision Data

a. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) analyses were not required by the method.

Duplicate (DUP) sample analyses were reviewed for each matrix as applicable. Results were within QC limits with the following exceptions:

| DUP ID (Associated Samples) | Isotope | DER (Limits) | Difference (Limits) | Flag | A or P |
|--|------------|--------------|---------------------|---|--------|
| TSB-HJ-02-10'DUP (TSB-HJ-01-10'** TSB-HJ-09-0' TSB-HJ-09-10'** TSB-HJ-03-0'** TSB-HJ-03-10'** TSB-HR-03-10'** TSB-HR-03-10'** TSB-HR-03-10'** TSB-HJ-02-0' TSB-HJ-02-10'** | Radium-228 | 2.60 (≤2.58) | • | J (all detects) UJ (all non-detects) | А |

b. Laboratory Control Samples

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

c. Chemical Recovery

All chemical recoveries were within validation criteria.

V. Minimum Detectable Activity

All minimum detectable activities met required detection limits.

VI. Sample Result Verification

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

VII. Overall Assessment of Data

Data flags are summarized at the end of this report if data has been qualified.

VIII. Field Duplicates

Samples TSB-HJ-03-0'** and TSB-HJ-03-0'FD** and samples TSB-HJ-11-10' and TSB-HJ-11-10'FD were identified as field duplicates. No radium-226 or radium-228 was detected in any of the samples with the following exceptions:

| | Activ | ity (pCi/g) | | | | |
|------------|----------------|------------------|-----------------|------------------------|------|--------|
| Isotope | TSB-HJ-03-0'** | TSB-HJ-03-0'FD** | RPD (Limits) | Difference (Limits) | Flag | A or P |
| Radium-226 | 1.12 | 1.05 | • | 0.07 (≤1.00) | • | - |

| | Activ | ity (pCi/g) | | | | |
|------------|----------------|------------------|-----------------|------------------------|------|--------|
| Isotope | TSB-HJ-03-0'** | TSB-HJ-03-0'FD** | RPD (Limits) | Difference (Limits) | Flag | A or P |
| Radium-228 | 1.55 | 1.57 | - | 0.02 (≤2.00) | • | - |

| | Activ | ity (pCi/g) | | | | |
|------------|---------------|-----------------|-----------------|------------------------|------|--------|
| Isotope | TSB-HJ-11-10' | TSB-HJ-11-10'FD | RPD (Limits) | Difference (Limits) | Flag | A or P |
| Radium-226 | 2.32 | 1.55 | - | 0.77 (≤1.00) | - | - |
| Radium-228 | 1.59 | 1.59 | - | 0.00 (≤2.00) | - | • |

BRC Tronox Parcel H Radium-226 & Radium-228 - Data Qualification Summary - SDG F8A260145

| SDG | Sample | Isotope | Flag | A or P | Reason |
|-----------|--|------------|---|--------|-----------------------------|
| F8A260145 | TSB-HJ-01-10'** TSB-HJ-09-0' TSB-HJ-09-10'** TSB-HJ-03-0'** TSB-HJ-03-0'FD** TSB-HR-03-0'** TSB-HR-03-10'** TSB-HR-03-10'** TSB-HJ-02-0' TSB-HJ-02-10'** | Radium-228 | J (all detects) UJ (all non-detects) | A | Duplicate analysis (DER) |

BRC Tronox Parcel H Radium-226 & Radium-228 - Laboratory Blank Data Qualification Summary - SDG F8A260145

No Sample Data Qualified in this SDG

BRC Tronox Parcel H Radium-226 & Radium-228 - Field Blank Data Qualification Summary - SDG F8A260145

No Sample Data Qualified in this SDG

| LDC #: 18529A29 | VALIDATION COMPLETENESS WORKSHEET | Date: <u>4-4-0</u> 8 |
|--------------------------|-----------------------------------|----------------------------|
| SDG #: <u>F8A260145</u> | _ Level III/IV | Page: <u> </u> of <u> </u> |
| Laboratory: Test America | | Reviewer: MG |
| | | 2nd Reviewer: |

METHOD: Radium 226 (EPA Method 903.1/Method RICH-RC5005) Radium 228 (EPA Method 904.0/Method RICH-RC5005)

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 | Α | Sampling dates: 1- 25 - 08 |
| lla. | Initial calibration | A | |
| IIb. | Calibration verification | Α | |
| III. | Blanks | À | |
| IVa. | Matrix Spike/(Matrix Spike) Duplicates | SW | DUP |
| IVb. | Laboratory control samples | Α | LCS |
| IVc. | Chemical recovery | A | |
| V. | Sample result verification | A | Not reviewed for Level III validation. |
| VI. | Minimum dectectable activity (MDA) | Α | |
| VII. | Overall assessment of data | Α | |
| VIII. | Field duplicates | SW | D=4+5 D=14+15 |
| XIV | Field blanks | ND | R = 19 |

Note:

A = Acceptable

ND = No compounds detected

D = Duplicate

N = Not provided/applicable SW = See worksheet R = Rinsate FB = Field blank TB = Trip blank
EB = Equipment blank

Validated Samples: ** Indicates sample underwent Level IV validation

| 1 | TSB-HJ-01-10'** | 5 | 11 1 | TSB-HR-02-0' | 5 | 21 | PBSI | 31 | |
|------|-------------------------|---|-----------------|------------------|---|-----------------|------|----|---|
| 2 1 | TSB-HJ-09-0' | | 12 2 | TSB-HR-02-10' | 1 | ₂₂ 2 | PBS2 | 32 | |
| 3 | TSB-HJ-09-10'** | | 13 J | TSB-HJ-11-0'** | | 23 3 | PBW | 33 | · |
| 4 1 | TSB-HJ-03-0' ★-★ | | 14 ² | TSB-HJ-11-10' | | 24 | | 34 | |
| 5 1 | TSB-HJ-03-0'FD ★★ | | ₁₅ ک | TSB-HJ-11-10'FD | | 25 | | 35 | |
| 6 1 | TSB-HJ-03-10' ★★ | | 16 ² | TSB-HR-01-0' | | 26 | | 36 | |
| 7 1 | TSB-H 7 -03-0'** | | ₁₇ þ | TSB-HR-01-10' | | 27 | | 37 | |
| 8 1 | TSB-HR-03-10'** | | 18 2 | TSB-HJ-01-0' | | 28 | | 38 | |
| 9 l | TSB-HJ-02-0' | | ₁₉ 3 | RINSATE-1 | 2 | 29 | | 39 | |
| 10 (| TSB-HJ-02-10'** | • | ا 20 | TSB-HJ-02-10'DUP | 5 | 30 | | 40 | |

| 10 TSB-HJ-02-10'** | 20 TSB-HJ-02-10'DUP | 5 30 | 40 |
|--------------------|---------------------|------|----|
| Notes: | | | |
| - | | | |
| | | | |

VALIDATION FINDINGS CHECKLIST

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

Method: Radiochemistry (EPA Method See cover)

| Validation Area | Yes | No | NA | Findings/Comments |
|---|----------|----|---------------|-------------------|
| I. Technical holding times | 1 | | | |
| All technical holding times were met. | / | | , | |
| II. Calibration | | | | |
| Were all instruments and detectors calibration as required? | V | | | |
| Were NIST traceable standards used for all calibrations? | ./ | | | |
| Was the check source identified by activity and radionuclide? | V | | | |
| Were check sources including background counts analyzed at the requiried frequency and within laboratory control limits? | 1 | | | |
| III. Blanks | | | | |
| Were blank analyses performed as required? | / | | | |
| Were any activities detected in the blanks greater than the minimum detectable activity (MDA)? If yes, please see the Blanks validation completeness worksheet. | | / | | |
| IV. Matrix splikes and Duplicates | | | | |
| Were a matrix spike (MS) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD or MS/DUP Solly water. | | / | | |
| Were the MS percent recoveries (%R) within the QC limits? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken. | | | | |
| Was a duplicate sample anaylzed at the required frequency of 5% in this SDG? | V. | | | |
| Were all duplicate sample duplicate error rations (DER) <u>≤1.427</u> . ∂.58 | | / | | |
| V. Laboratory control samples | | | | |
| Was an LCS analyzed per analytical batch? | <u>/</u> | | | |
| Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the 75-125% | / | | | |
| /I Sample Chemical/Carrier Recovery | | | | |
| Was a tracer/carrier added to each sample? | / | | | |
| Nere tracer/carrier recoveries within the QC limits? | <u> </u> | | | |
| /ii. Regional Quality Assurance and Quality Control | | | . | |
| Nere performance evaluation (PE) samples performed? | | / | | |
| Were the performance evaluation (PE) samples within the acceptance limits? | | | $\overline{}$ | |
| /III. Sample Result Verification | | | | |
| Were activities adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation? | V | | | |
| Were the Minimum Detectable Activities (MDA) < RL? | / | | | |

LDC #: 18529A 29 SDG #: F8A260145

VALIDATION FINDINGS CHECKLIST

Page: 2 of 3 Reviewer: MG 2nd Reviewer: V

| Validation Area | Yes | No | NA | Findings/Comments |
|--|-----|----|----|-------------------|
| IX Overall assessment of data | | | | |
| Overall assessment of data was found to be acceptable. | / | | | |
| X. Field duplicates | | | | |
| Field duplicate pairs were identified in this SDG. | / | | | ı |
| Target analytes were detected in the field duplicates. | / | | | |
| XI. Field blanks | | | | |
| Field blanks were identified in this SDG. | / | | | |
| Target analytes were detected in the field blanks. | | / | | |

FBA 260145 LDC #: (8539439 SDG #:

VALIDATION FINDINGS WORKSHEET **Duplicate Analysis**

Page: 6 of Reviewer:_ 2nd Reviewer:_

> see cover METHOD: Radiochemistry (Method:_

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

Was a duplicate sample analyzed the required frequency of 5% in this SDG? Y (N) N/A

Act = sample activity Were all duplicate sample duplicate error ratio (DER) \leq 1.42? DER= $\frac{|\text{Act}_1-\text{Act}_2|}{2|\delta_1^2+\delta_2^2|}$

 $\delta = 1$ sigma error

LEVEL IV ONLY:

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

| # ~ | Duplicate ID | Matrix | Isotope | RER DER (Limits) | Associated Samples | Qualifications | |
|-----|--------------|--------|---------|---------------------|--------------------|----------------|--|
| | 0 | | 866-90 | 4.60 (= 4.58) | <u></u> | 5/US/A | |
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Comments:

DUP.35.DOC

Version 1.0 (3/2/2000)

LDC #: 18539A39 VALIDATION FINDINGS WORKSHEET

Page:____of____

| SDG #:F8A760145 | Field Duplic | <u>cates</u> | Reviewer: MG-2nd reviewer: |
|---|--|---------------------------------------|---|
| METHOD: Radiochemistry (Method: Sec | e cover | J | |
| Were field duplicate pairs in N/A Were target isotopes detection. | dentified in this SDG? ted in the field duplicate | e pairs? | не притерителя для заменяе поделе на выполняе на выполняе на притерителя на под станова на под на выполняе на в В притерителя на притерителя на выполняе на выполняе на притерителя на под на притерителя на под на выполняе н |
| | Activity (| pci/g) | by difference |
| Isotopes | 4 | 5 | RPD |
| Ra-226 | 1.12 | 1.05 | 0.07 Pci/g (= 1.00 Pci/g) |
| Ra- 228 | 1.55 | 1.57 | 0.02 \ (\(2.00 \) |
| | | | |
| | | | |
| | Activity (| pci/q) | by difference |
| Isotopes | 14 | 15 | RPD |
| Ra-226 | 2.32 | 1.55 | 0.77 PCi/g (= 1.00 PCi/g) |
| Ra-228 | 1.59 | 1.59 | 0.00 \$ (\(2.00 \) |
| | | | |
| | | | |
| | | | |
| | Activity (|) | |
| Isotopes | | | RPD |
| | | | |
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| | | | |
| | 7 | | |
| | Activity (| | |
| Isotopes | | | RPD |
| | | · | |
| | | | |

SDG #: FOA 260 145 LDC #: 18539 A39

VALIDATION FINDINGS WORKSHEET **Level IV Recalculation Worksheet**

Page:

į.'.

METHOD: Radiochemistry (Method:_

see cover

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

%R = Found x 100

Found = activity of each analyte measured in the analysis of the sample. True = activity of each analyte in the source.

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

x 100 RPD = IS-D;

| o = Original sample activity | D = Duplicate sample activity |
|------------------------------|-------------------------------|
| wnere, | |
| 001 × 10-61 - 01 | (S+D)/2 |

| | | | | | Recalculated | Reported | |
|-----------|---------------------------|------------|---|---------------------------|--------------|-----------|------------------|
| Sample ID | Type of Analysis | Analyte | Found/S (units) | True/D (units) | %R or RPD | %R or RPD | Acceptable (Y/N) |
| | Laboratory control sample | | | | | | |
| 527 | | Ra-236 | 1.53 (PC/g) | . 53 (Pci/g) 1.37 (Pci/g) | <u> </u> | 0 | >- |
| | Matrix spike sample | | | | | | |
|) | | 1 |) | | |) | 1 |
| | Duplicate RPD | Ra-228 | | 0.00 | RERZ | RERZ | |
| 30 | | | 1.75 (pC/4) 7.0.14 (pC/4) 2.0.14 (pC/4) | + 0.14 (PC:/4) | 7.6 | 3.6 | >- |
| | Chemical recovery | Ba-133 | , | 1 | | | |
| | | for Ra-228 | (Courser r | Courier recovery by | Gamma Spec) | 92 | |

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 #: | 18529A29 |
|--------|-----------|
| | F8A260145 |

VALIDATION FINDINGS WORKSHEET Sample Calculation Verification

| Page: | of |
|-------------|-----|
| Reviewer: | MG |
| nd reviewer | 1~/ |

METHOD: Radiochemistry (Method: See cover

| N N/A Hav | tions below for all questions answered "N". Not a e results been reported and calculated correctly results within the calibrated range of the instrum | ?. |
|--|---|---|
| Analyte results for _ and verified using th | # \ Ra - 226 re following equation: | reported with a positive detect were recalculated |
| Activity = | Recalculation: | |
| (cpm - bckgrd cpm) (2.22)(E)(Vol)(CF) | (270/50) - (37/60) | $-\frac{1.5917}{1.0003} = 1.366$ PCi/g |
| E = Efficiency | (2.22) (2.5731) (1.01g) (1.00) | 1.0000 |

E = Efficiency Vol = Volume

CF = %R, Self-absorbance, abundance, ect.

| | | 1 | | <u> </u> | 1 |
|---------|-----------|---------------------------------------|---|---------------------------------------|--|
| # | Sample ID | Analyte | Reported Concentration (^{PC} /q) | Calculated Concentration | Acceptable (Y/N) |
| 1 | 1 | Ra-226 | 1.37 | 1.37 | Y |
| | | Ra - 228 | . 1.42 | 1.42 | J. |
| | · | r 40 | | 1 | |
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| Note: | | | | | | |
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Laboratory Data Consultants, Inc. Data Validation Report

Project/Site Name:

BRC Tronox Parcel H

Collection Date:

January 28, 2008

LDC Report Date:

April 7, 2008

Matrix:

Soil/Water

Parameters:

Radium-226 & Radium-228

Validation Level:

EPA Level III & IV

Laboratory:

TestAmerica, Inc.

Sample Delivery Group (SDG): F8A290183

Sample Identification

TSB-HJ-10-0'

TSB-HJ-10-10'

TSB-HR-06-0'

TSB-HR-06-0'FD

TSB-HR-06-10'

TSB-HJ-08-0'

TSB-HJ-08-10'

TSB-HR-05-0'

TSB-HR-05-10'

RINSATE-2

TSB-HR-05-10'DUP

Introduction

This data review covers 10 soil samples and one water sample listed on the cover sheet. The analyses were per EPA Method 903.1/Method RICH-RC5005 for Radium-226 and EPA Method 904.0/Method RICH-RC5005 for Radium-228.

The review follows a modified outline of the USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review (October 2004) as there are no current guidelines for the method stated above.

A qualification summary table is provided at the end of this report if data has been qualified. 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 VIII.

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

The following are definitions of the data qualifiers:

- J+ Data are qualified as estimated, with a high bias likely to occur. False positives or false negatives are unlikely to have been reported.
- J- Data are qualified as estimated, with a low bias likely to occur. False positives or false negatives are unlikely to have been reported.
- J Data are qualified as estimated; it is not possible to assess the direction of the potential bias. False positives or false negatives are unlikely to have been reported.
- U Indicates the compound or analyte was analyzed for but not detected at or above the stated limit.
- R Data are qualified as rejected. There is a significant potential for the reporting of false negatives or false positives.
- 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.

Detector efficiency was determined for each detector and each radionuclide.

Self absorption factors were determined for each sample when applicable.

b. Continuing Calibration

Calibration verification and background determination were performed at the required frequencies. Results were within laboratory control limits.

III. Blanks

Method blanks were reviewed for each matrix as applicable. Blank results contained less than the minimum detectable activity (MDA).

Sample "RINSATE-2" was identified as a rinsate. No radium-226 or radium-228 was found in this blank.

IV. Accuracy and Precision Data

a. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) analyses were not required by the method.

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

b. Laboratory Control Samples

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

c. Chemical Recovery

All chemical recoveries were within validation criteria.

V. Minimum Detectable Activity

All minimum detectable activities met required detection limits.

VI. Sample Result Verification

Raw data were not reviewed for this SDG.

VII. Overall Assessment of Data

Data flags are summarized at the end of this report if data has been qualified.

VIII. Field Duplicates

Samples TSB-HR-06-0' and TSB-HR-06-0'FD were identified as field duplicates. No radium-226 or radium-228 was detected in any of the samples with the following exceptions:

| | Activ | ity (pCi/g) | | | | |
|------------|--------------|----------------|-----------------|------------------------|------|--------|
| Isotope | TSB-HR-06-0' | TSB-HR-06-0'FD | RPD (Limits) | Difference (Limits) | Flag | A or P |
| Radium-226 | 0.711 | 0.698 | _ | 0.013 (≤1.00) | - | - |
| Radium-228 | 1.63 | 1.17 | - | 0.46 (≤2.00) | - | - |

| SDG# | : 18529B29 t: F8A290183 atory: Test America | VA _ | LIDATIO - | | PLET Leve | | SS WOR | KSHEET | | Date: <u>4-4-0</u> Page: <u>1 of 1</u> Reviewer: <u>MG</u> 2nd Reviewer: |
|--------|---|---------|-------------------|------------------------------------|--------------|---------|---------------------------------------|---------------------------------------|------|--|
| The sa | · | | | | | · | | • | | 4.0/Method RICH-RC5005) dings are noted in attached |
| | Validation | Area | · · | | | | | Comm | ents | |
| I. | Technical holding times | | | A | Samo | ling da | ates: | - 98-08 | | |
| Ila. | Initial calibration | | | A | | 5 00 | | | | |
| IIb. | Calibration verification | | | A | | | | | | |
| III. | Blanks | | | Α | | | | , , , , , | | |
| IVa. | Matrix Spike/(Matrix Spike) | Ouplica | ites | Α | Di | ٦6 | | | | |
| IVb. | Laboratory control samples | | | A | L | cs | | | | |
| IVc. | Chemical recovery | | | A | | | | | | |
| V. | Sample result verification | | | N | | | | | | |
| VI. | Minimum dectectable activity | (MDA | 4) | A | | | | | | |
| VII. | Overall assessment of data | | | Α | | | | | | |
| VIII. | Field duplicates | | | SW | | = 3 | • | | | |
| _xıv_ | Field blanks | | | ND | <u> </u> R | = 1 | <u> </u> | | | |
| | A = Acceptable N = Not provided/applicable SW = See worksheet ad Samples: | | R = Rir | lo compound isate ield blank | is detec | eted | | plicate rip blank quipment blan | k | |
| | T#\$-HJ-10-0' S | 11 | 5β Τββ-HR-05-1 | וחיטוום | 5 | 21 | · · · · · · · · · · · · · · · · · · · | | 31 | |
| | TB\$-HJ-10-10' | 12 \ | PBS | | | 22 | | · | 32 | |
| | TB\$-HR-06-0' | 13 2 | | | | 23 | | | 33 | |
| | TB\$-HR-06-0'FD | 14 | | | | 24 | | | 34 | |
| | TB\$-HR-06-10' | 15 | | | | 25 | · · · · · · · · · · · · · · · · · · · | | 35 | |
| | TB\$-HJ-08-0' | 16 | | | | 26 | | | 36 | |
| | TB\$-HJ-08-10' | 17 | | | | 27 | | | 37 | |
| 8 - | TB\$-HR-05-0' | 18 | | | | 28 | | | 38 | |
| 9 | TB\$-HR-05-10' | 19 | | | | 29 | | | 39 | |
| ا 🗘 | RINSATE-2 ₩ | 20 | | | | 30 | | | 40 | |

Notes: ID: TSB-H_

LDC #: <u>18529 B</u>29 SDG #: <u>F8A 29</u>0183

VALIDATION FINDINGS WORKSHEET <u>Field Duplicates</u>

Page: of I
Reviewer: MG

2nd reviewer:

| | Activity (| ecila . | |
|--|------------|---------|---------------------|
| Isotopes | 3 | | by difference |
| Ra - 226 | 0.711 | 4 | 0.013 PCi/4 (± 1.00 |
| Ra - 228 | 1.63 | 0.698 | 0.46 1 (= 2.00 |
| 114 900 | 1.03 | 1.17 | 0.46 \$ (2.50 |
| And the state of t | | | · |
| | | | |
| | Activity (| \ | |
| Isotopes | Activity (| | |
| Notiopos | | | RPD |
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| | Activity (|) | = |
| Isotopes | | | RPD |
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| | Activity (|) | |
| Isotopes | | | RPD |
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Laboratory Data Consultants, Inc. Data Validation Report

Project/Site Name:

BRC Tronox Parcel H

Collection Date:

January 25, 2008

LDC Report Date:

April 4, 2008

Matrix:

Soil/Water

Parameters:

Isotopic Uranium & Isotopic Thorium

Validation Level:

EPA Level III & IV

Laboratory:

TestAmerica, Inc.

Sample Delivery Group (SDG): F8A260145

Sample Identification

TSB-HJ-01-10'**

TSB-HJ-01-0'DUP

RINSATE-1DUP

TSB-HJ-09-0'

TSB-HJ-09-10'**

TSB-HJ-03-0'**

TSB-HJ-03-0'FD**

TSB-HJ-03-10'**

TSB-HR-03-0'**

TSB-HR-03-10'**

TSB-HJ-02-0'

TSB-HJ-02-10'**

TSB-HR-02-0'

TSB-HR-02-10'

TSB-HJ-11-0'**

TSB-HJ-11-10'

TSB-HJ-11-10'FD

TSB-HR-01-0'

TSB-HR-01-10'

TSB-HJ-01-0'

RINSATE-1

TSB-HJ-02-10'DUP

^{**}Indicates sample underwent EPA Level IV review

Introduction

This data review covers 20 soil samples and 2 water samples listed on the cover sheet. The analyses were per Method RICH-RC5067 for Isotopic Uranium and Method RICH-RC5087 for Isotopic Thorium.

The review follows a modified outline of the USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review (October 2004) as there are no current guidelines for the method stated above.

A qualification summary table is provided at the end of this report if data has been qualified. 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 VIII.

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:

- J+ Data are qualified as estimated, with a high bias likely to occur. False positives or false negatives are unlikely to have been reported.
- J- Data are qualified as estimated, with a low bias likely to occur. False positives or false negatives are unlikely to have been reported.
- J Data are qualified as estimated; it is not possible to assess the direction of the potential bias. False positives or false negatives are unlikely to have been reported.
- U Indicates the compound or analyte was analyzed for but not detected at or above the stated limit.
- R Data are qualified as rejected. There is a significant potential for the reporting of false negatives or false positives.
- 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.

Detector efficiency was determined for each radionuclide of interest.

b. Continuing Calibration

Calibration verification and background determination were performed at the required frequencies. Results were within control limits.

III. Blanks

Method blanks were reviewed for each matrix as applicable. Blank results contained less than the minimum detectable activity (MDA).

Sample "RINSATE-1" was identified as a rinsate. No isotopic uranium or isotopic thorium was found in this blank.

IV. Accuracy and Precision Data

a. Matrix Spike/(Matrix Spike) Duplicate

Matrix spike (MS) and matrix spike duplicate (MSD) analyses were not required by the method.

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

b. Laboratory Control Samples

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

c. Tracer Recovery

All tracer recoveries were within validation criteria.

V. Minimum Detectable Activity (MDA)

All minimum detectable activities met required detection limits.

VI. Sample Result Verification

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

VII. Overall Assessment of Data

Data flags are summarized at the end of this report if data has been qualified.

VIII. Field Duplicates

Samples TSB-HJ-03-0'** and TSB-HJ-03-0'FD** and samples TSB-HJ-11-10' and TSB-HJ-11-10'FD were identified as field duplicates. No isotopic uranium or isotopic thorium was detected in any of the samples with the following exceptions:

| | Activity | | | | | |
|-----------------|----------------|------------------|-----------------|------------------------|------|--------|
| Isotope | TSB-HJ-03-0'** | TSB-HJ-03-0'FD** | RPD (Limits) | Difference (Limits) | Flag | A or P |
| Uranium-233/234 | 1.17 | 0.990 | - | 0.18 (≤1.00) | | - |
| Uranium-235/236 | 0.0299 | 0.0624 | - | 0.03 (≤1.00) | - | - |
| Uranium-238 | 0.976 | 1.06 | - | 0.08 (≤1.00) | - | - |
| Thorium-228 | 1.58 | 2.15 | 31 (≤50) | - | - | - |
| Thorium-230 | 0.959 | 1.37 | 35 (≤50) | - | - | - |
| Thorium-232 | 1.74 | 2.13 | 20 (≤50) | - | • | - |

| | Activity | | | | | |
|-----------------|---------------|-----------------|-----------------|------------------------|-----------------|--------|
| Isotope | TSB-HJ-11-10' | TSB-HJ-11-10'FD | RPD (Limits) | Difference (Limits) | Flag | A or P |
| Uranium-233/234 | 2.68 | 1.36 | - | 1.32 (≤1.00) | J (all detects) | А |
| Uranium-235/236 | 0.110 | 0.0167U | - | 0.09 (≤1.00) | - | - |
| Uranium-238 | 1.79 | 1.30 | - | 0.49 (≤1.00) | - | - |

| | Activity | | | | | |
|-------------|---------------|-----------------|-----------------|------------------------|-----------------|--------|
| Isotope | TSB-HJ-11-10' | TSB-HJ-11-10'FD | RPD (Limits) | Difference (Limits) | Flag | A or P |
| Thorium-228 | 2.09 | 1.87 | 11 (≤50) | - | - | - |
| Thorium-230 | 3.02 | 1.49 | 68 (≤50) | - | J (all detects) | А |
| Thorium-232 | 1.62 | 1.99 | 20 (≤50) | - | - | - |

BRC Tronox Parcel H Isotopic Uranium & Isotopic Thorium - Data Qualification Summary - SDG F8A260145

| SDG | Sample | Isotope | Flag | A or P | Reason |
|-----------|----------------------------------|-----------------|-----------------|--------|----------------------------------|
| F8A260145 | TSB-HJ-11-10' TSB-HJ-11-10'FD | Uranium-233/234 | J (all detects) | А | Field duplicates (Difference) |
| F8A260145 | TSB-HJ-11-10' TSB-HJ-11-10'FD | Thorium-230 | J (all detects) | А | Field duplicates (RPD) |

BRC Tronox Parcel H Isotopic Uranium & Isotopic Thorium - Laboratory Blank Data Qualification Summary -SDG F8A260145

No Sample Data Qualified in this SDG

BRC Tronox Parcel H Isotopic Uranium & Isotopic Thorium - Field Blank Data Qualification Summary - SDG F8A260145

No Sample Data Qualified in this SDG

| LDC #: | 18529A59 | _ VALIDATION COMPLETENESS WORKSHEET | Date: <u>4-4-0</u> 9 |
|------------|-----------------|-------------------------------------|------------------------------|
| SDG #: | F8A260145 | Level III/IV | Page: 1 of 1 Reviewer: MG |
| Laboratory | y: Test America | | Reviewer: MG |
| • | | | 2nd Reviewer: |

ma

METHOD: Isotopic Uranium (EPA Method 908/Method RICH-RC5067), Isotopic Thorium (Method RICH-RC-5087)

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: 1-25-08 |
| IIa. | Initial calibration | Α | |
| IIb. | Calibration verification | A | |
| 111. | Blanks | A | |
| IVa. | Matrix Spike/(Matrix Spike) Duplicates | A | DUP |
| IVa. | Laboratory control samples | l A | LCS |
| V. | Tracer Recovery | A | |
| VI. | Minimum Detectable Activity (MDA) | A | |
| VII. | Sample result verification | A | Not reviewed for Level III validation. |
| VIII. | Overall assessment of data | Α | 1 |
| IX. | Field duplicates | SW | D= 4+5 , D= 14+15 |
| x | Field blanks | ND | R = 19 |

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

| | 1 | TSB-HJ-01-10'** S | 11 | TSB-HR-02-0' S | 21 | TSB-HJ-01-0'DUP S | 31 |
|---|----|------------------------------|-----------------|--------------------|------|-------------------|----|
| | 2 | TSB-HJ-09-0' | 12 | TSB-HR-02-10' | 22 2 | RINSATE-1DUP ₩ | 32 |
| | 3 | TSB-HJ-09-10'** | 13 | TSB-HJ-11-0'** | 23 | PBS | 33 |
| | 4 | TSB-HJ-03-0' ⊁ ⊀ | 14 | TSB-HJ-11-10' | 24 P | PB W | 34 |
| | 5 | TSB-HJ-03-0'FD *★ | 15 | TSB-HJ-11-10'FD | 25 | | 35 |
| | 6 | TSB-HJ-03-10' ★ ★ | 16 | TSB-HR-01-0' | 26 | | 36 |
| 8 | 7 | R TSB-H 7 -03-0'** | 17 | TSB-HR-01-10' | 27 | | 37 |
| | 8 | TSB-HR-03-10'** | 18 | TSB-HJ-01-0' | 28 | | 38 |
| | 9 | TSB-HJ-02-0' | ₁₉ ລ | RINSATE-1 ₩ | 29 | | 39 |
| | 10 | TSB-HJ-02-10'** | 20 | TSB-HJ-02-10'DUP S | 30 | | 40 |

| Notes: | | | |
|--------|--|--|--|
| | | | |
| | | | |

ms

BRC Tronox Parcel H
Radium-226 & Radium-228 - Data Qualification Summary - SDG F8A290183

No Sample Data Qualified in this SDG

BRC Tronox Parcel H
Radium-226 & Radium-228 - Laboratory Blank Data Qualification Summary - SDG
F8A290183

No Sample Data Qualified in this SDG

BRC Tronox Parcel H Radium-226 & Radium-228 - Field Blank Data Qualification Summary - SDG F8A290183

No Sample Data Qualified in this SDG

LDC #: 18529A59 SDG #: F8A 260145

VALIDATION FINDINGS CHECKLIST

Page: 1 of 2
Reviewer: MC
2nd Reviewer: V

Method: Radiochemistry (EPA Method See cover

| Validation Area | Yes | No | NA | Findings/Comments |
|---|-----------|----|----|-------------------|
| I. Technical holding times | • | | | |
| All technical holding times were met. | / | | | |
| II. Calibration | | | | |
| Were all instruments and detectors calibration as required? | / | | | |
| Were NIST traceable standards used for all calibrations? | . / | | | |
| Was the check source identified by activity and radionuclide? | / | | | |
| Were check sources including background counts analyzed at the requiried frequency and within laboratory control limits? | / | | | |
| III. Blanks | | | | |
| Were blank analyses performed as required? | / | | | |
| Were any activities detected in the blanks greater than the minimum detectable activity (MDA)? If yes, please see the Blanks validation completeness worksheet. | | / | | |
| IV. Matrix spikes and Duplicates | | | | |
| Were a matrix spike (MS) 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 percent recoveries (%R) within the QC limits? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken. | ı | | / | |
| Was a duplicate sample anaylzed at the required frequency of 5% in this SDG? | / | | | |
| Were all duplicate sample duplicate error rations (DER) <u>≤1.42?</u> . 2.58 | | | | |
| V. Laboratory control samples | | | | |
| Was an LCS analyzed per analytical batch? | <u> </u> | | | |
| Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the 75-125% | | | | |
| VI. Sample Chemical/Carrier Recovery | | | | |
| Was a tracer/carrier added to each sample? | 4 | | | |
| Were tracer/carrier recoveries within the QC limits? | $\sqrt{}$ | | | |
| /II. Regional Quality Assurance and Quality Control | | | | |
| Were performance evaluation (PE) samples performed? | | / | | |
| Were the performance evaluation (PE) samples within the acceptance limits? | | | | |
| /III. Sample Result Verification | | | | |
| Were activities adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation? | / | | | |
| Vere the Minimum Detectable Activities (MDA) < RL? | / | | | |

LDC #: 18509A59 SDG #: F8A260145

VALIDATION FINDINGS CHECKLIST

Page: $\frac{\partial}{\partial x}$ of $\frac{\partial}{\partial x}$ Reviewer: $\frac{\partial}{\partial x}$ 2nd Reviewer: $\frac{\partial}{\partial x}$

| Validation Area | Yes | No | NA | Findings/Comments |
|--|-----|----|----|-------------------|
| IX. Overall assessment of data | | | | |
| Overall assessment of data was found to be acceptable. | / | | | |
| X Field duplicates | | | | |
| Field duplicate pairs were identified in this SDG. | / | | | ŀ |
| Target analytes were detected in the field duplicates. | / | | | |
| XI: Field blanks | | | | |
| Field blanks were identified in this SDG. | / | | | |
| Target analytes were detected in the field blanks. | | / | | |

LDC #: 18529 A59 SDG #: F&A 260145

VALIDATION FINDINGS WORKSHEET Field Duplicates

| Page:_ | of(|
|---------------|---------------------|
| Reviewer: | MG |
| 2nd reviewer: | $\overline{\gamma}$ |

METHOD: Radiochemistry (Method: See cover)

 \bigcirc N N/A

Were field duplicate pairs identified in this SDG?

YN N/A Were target isotopes detected in the field duplicate pairs?

| | Activity (P | ci/q , | by difference | | | |
|-----------|--------------|--------|---------------|---------------|--|--|
| Isotopes | 4 | 5 | RPD | | | |
| U-233/234 | 1.17 | 0.990 | 0.18 Pci/4 | (41.00 PCi/4) | | |
| U-235/236 | 0.0299 | 0.0624 | 0.03 | (") | | |
| U-238 | 0.976 | 1.06 | 0.08 | (,) | | |
| · | | | | | | |
| | | | | | | |

| | Activity (| ci/q) | |
|----------|------------|--------|----------|
| Isotopes | 4 | 5 | RPD |
| Th-228 | 1.58 | 2.15 | 31 (450) |
| Tu-230 | 0.959 | 1.37 | 35 () |
| Th-232 | 1-74 | 2-13 | 20 (,) |
| , | | | |
| | | | |

| | Activity (| pci/q) | by difference |
|-----------|------------|----------|----------------------------------|
| Isotopes | 14 | 15 | Qual parent only |
| U-233/234 | 2.68 | 1.36 | 1.32 PCi/ (= 1.00 PCi/y) Jobet/A |
| U-235/236 | 0.110 | 0.0167 U | 0.09 () |
| U-738 | 1.79 | 1.30 | 0.49 () |
| | | | |
| | | | |

| | Activity (| pci/g, | |
|----------|------------|--------|----------------------|
| Isotopes | 14 | 15 | Qual parent only RPD |
| Th-228 | 2.09 | 1.87 | 11 (= 50) |
| Th-230 | 3.02 | 1.49 | 68 () Jdet/A |
| Th-232 | 1.62 | 1.99 | 20 (↓) |
| | | | |
| | | | |

FRAZEDIUS LDC #: 18539A59 SDG #:

VALIDATION FINDINGS WORKSHEET **Level IV Recalculation Worksheet**

oţ Page: Reviewer: 2nd Reviewer:

4.5

See METHOD: Radiochemistry (Method:_

00160

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

%R = Found x 100

Where,

Found = activity of each analyte $\underline{\text{measured}}$ in the analysis of the sample. True = activity of each analyte in the source,

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

× 100 $RPD = \frac{|S-D|}{(S+D)/2}$

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

| | | | | | | | any-aud |
|-----------|---------------------------|---------|-----------------|--------------------------|--------------|-----------|--|
| | | | | | Recalculated | Reported | and distributions during the state of the st |
| Sample ID | Type of Analysis | Analyte | Found/S (units) | True/D (units) | %R or RPD | %R or RPD | Acceptable (V/N) |
| | Laboratory control sample | | | | | | |
| 577 | | Th-230 | (p.24) BE. 6 | (pci/2) 2.17 (pci/2) | (05) | 501 | A-VENTAS INVESTIGAS SEPTEMBER |
| | Matrix spike sample | | | • | | | હેવાં તો ક્રિક્સ ના |
|) | | | l | | | l | |
| | Duplicate RPD | | | | RERD | RERA | e and discount for |
| 16 | | 0-238 | (PCi/) | 0.09 (pcid) 1.07 (pcid) | 0.1 | 1.0 | Control Action Control Control |
| | Chemical recovery | | | | | | a potential de la companya de la com |
| | | Th- 234 | 90.53 (dpm) | 90.53 (dpm) 105.66 (dpm) | 38 | 38 | andgolaniy karago istopy is |
| | | | | | | = | > |

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 #: | 18529 A59 |
|--------|--------------|
| | F8 A 260 145 |

VALIDATION FINDINGS WORKSHEET Sample Calculation Verification

| Page: | of |
|--------------|----|
| Reviewer: | MG |
| nd reviewer. | 7 |

| METHOD: Radiochemistry | (Method: | see | cover | , |
|------------------------|----------|-----|-------|---|
| | | | | |

| SALES OF THE PROPERTY OF THE P | TABLES & TANDON AND DESCRIPTION WHITE FOR PROPERTY OF THE PARTY OF THE | CONTRACTOR OF THE PROPERTY OF | Operate interview of the Company of | NACONAL CANADA MANAGAMAN AND AND AND AND AND AND AND AND AND A | ntermonatoris emilia | with the second control of the second control of the second | consequent income entire la copperation entre college e socia | to recommendation of the contract participation of the contract of the contrac | Marketine commence de la commence del la commence de la commence d |
|--|--|---|---|--|----------------------|---|---|--|--|
| Please see q | usalifications | holow for all | duestions | answered " | N" Not | applicable | questions a | are identified | as "N/A". |
| riease see y | uaiiiicalions | Delow ioi all | questions | anomorea i | | abbusasis, | , 4 | | |

Y N N/A Have results been reported and calculated correctly?

Y N N/A Are results within the calibrated range of the instruments?

Analyte results for $\frac{\# \ \cup - 234/233}{}$ reported with a positive detect were recalculated and verified using the following equation:

Activity =

Recalculation:

(cpm - bckgrd cpm) (2.22)(E)(Vol)(CF) $\frac{(279/200.05) - (2/1000.1833)}{(2.22)(0.38124)(1.02)(0.953)} = 1.693 \text{ pci/s}$

E = Efficiency Vol = Volume

CF = %R, Self-absorbance, abundance, ect.

| # | Sample ID | Analyte | Reported Concentration (PC / /q) | Calculated Concentration (^{p C :} /g) | Acceptable (Y/N) |
|---|-----------|--------------|------------------------------------|--|---------------------|
| 1 | | . U- 233/234 | 1.69 | 1.69 | Y |
| | | U-235/236 | . 0.0850 | 0.0851 | |
| | | U-238 | 1.61 | 1.61. | |
| | | Tn-228 | 1.82 | 1.82 | |
| | | Th- 230 | 1.65 | 1.65 | |
| | | Th-232 | 2.41 | 2,41 | J |
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| Note: | | | |
|-------|---|------|------|
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Laboratory Data Consultants, Inc. Data Validation Report

Project/Site Name:

BRC Tronox Parcel H

Collection Date:

January 28, 2008

LDC Report Date:

April 4, 2008

Matrix:

Soil/Water

Parameters:

Isotopic Uranium & Isotopic Thorium

Validation Level:

EPA Level III

Laboratory:

TestAmerica, Inc.

Sample Delivery Group (SDG): F8A290183

Sample Identification

TSB-HJ-10-0'

TSB-HJ-10-10'

TSB-HR-06-0'

TSB-HR-06-0'FD

TSB-HR-06-10'

TSB-HJ-08-0'

TSB-HJ-08-10'

TSB-HR-05-0'

TSB-HR-05-10'

RINSATE-2

TSB-HR-05-10'DUP

RINSATE-2DUP

Introduction

This data review covers 10 soil samples and 2 water samples listed on the cover sheet. The analyses were per Method RICH-RC5067 for Isotopic Uranium and Method RICH-RC5087 for Isotopic Thorium.

The review follows a modified outline of the USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review (October 2004) as there are no current guidelines for the method stated above.

A qualification summary table is provided at the end of this report if data has been qualified. 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 VIII.

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

The following are definitions of the data qualifiers:

- J+ Data are qualified as estimated, with a high bias likely to occur. False positives or false negatives are unlikely to have been reported.
- J- Data are qualified as estimated, with a low bias likely to occur. False positives or false negatives are unlikely to have been reported.
- J Data are qualified as estimated; it is not possible to assess the direction of the potential bias. False positives or false negatives are unlikely to have been reported.
- U Indicates the compound or analyte was analyzed for but not detected at or above the stated limit.
- R Data are qualified as rejected. There is a significant potential for the reporting of false negatives or false positives.
- 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.

Detector efficiency was determined for each radionuclide of interest.

b. Continuing Calibration

Calibration verification and background determination were performed at the required frequencies. Results were within control limits.

III. Blanks

Method blanks were reviewed for each matrix as applicable. Blank results contained less than the minimum detectable activity (MDA) with the following exceptions:

| Method Blank ID | Isotope | Activity (pCi/g) | Associated Samples |
|-----------------|-----------------|------------------|-------------------------|
| PBS | Uranium-233/234 | 0.0422 | All soil samples in SDG |
| | Uranium-238 | 0.0289 | F8A290183 |

No sample data were qualified based on the contaminants found in the method blanks with the following exceptions:

| Sample | Isotope | Reported Activity | Modified Final Activity |
|--------------|-------------|----------------------|----------------------------|
| TSB-HJ-08-0' | Uranium-238 | 0.971 pCi/g | 1.00U pCi/g |

Sample "RINSATE-2" was identified as a rinsate. No isotopic uranium or isotopic thorium was found in this blank.

IV. Accuracy and Precision Data

a. Matrix Spike/(Matrix Spike) Duplicate

Matrix spike (MS) and matrix spike duplicate (MSD) analyses were not required by the method.

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

b. Laboratory Control Samples

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

c. Tracer Recovery

All tracer recoveries were within validation criteria.

V. Minimum Detectable Activity (MDA)

All minimum detectable activities met required detection limits.

VI. Sample Result Verification

Raw data were not reviewed for this SDG.

VII. Overall Assessment of Data

Data flags are summarized at the end of this report if data has been qualified.

VIII. Field Duplicates

Samples TSB-HR-06-0' and TSB-HR-06-0'FD were identified as field duplicates. No isotopic uranium or isotopic thorium was detected in any of the samples with the following exceptions:

| | Activit | y (pCi/g) | | | | |
|-----------------|--------------|----------------|-----------------|------------------------|------|--------|
| Isotope | TSB-HR-06-0' | TSB-HR-06-0'FD | RPD (Limits) | Difference (Limits) | Flag | A or P |
| Uranium-233/234 | 1.35 | 1.29 | _ | 0.06 (≤1.00) | • | - |
| Uranium-235/236 | 0.0291 | 0.0112U | - | 0.02 (≤1.00) | - | - |
| Uranium-238 | 1.23 | 1.15 | - | 0.08 (≤1.00) | - | - |

| | Activity | (pCi/g) | | | | |
|-------------|--------------|----------------|-----------------|------------------------|------|--------|
| Isotope | TSB-HR-06-0' | TSB-HR-06-0'FD | RPD (Limits) | Difference (Limits) | Flag | A or P |
| Thorium-228 | 1.94 | 1.57 | 21 (≤50) | - | • | - |
| Thorium-230 | 1.07 | 0.992 | 8 (≤50) | • | - | - |
| Thorium-232 | 1.87 | 1.71 | 9 (≤50) | - | - | - |

BRC Tronox Parcel H Isotopic Uranium & Isotopic Thorium - Data Qualification Summary - SDG F8A290183

No Sample Data Qualified in this SDG

BRC Tronox Parcel H Isotopic Uranium & Isotopic Thorium - Laboratory Blank Data Qualification Summary -SDG F8A290183

| SDG | Sample | Isotope | Modified Final Activity | A or P |
|-----------|--------------|-------------|----------------------------|--------|
| F8A290183 | TSB-HJ-08-0' | Uranium-238 | 1.00U pCi/g | Α |

BRC Tronox Parcel H Isotopic Uranium & Isotopic Thorium - Field Blank Data Qualification Summary - SDG F8A290183

No Sample Data Qualified in this SDG

| SDG# | 18529B59 F8A290183 story: Test America | | _ VA | LIDATIOI - - | | PLE1 Leve | | ESS ' | WORKSHEE | Т | Date: 4-4-0 Page: 1 of 1 Reviewer: M & 2nd Reviewer: |
|--------|---|---------|-----------------------------|----------------------------|---------------------------------|--------------|------------|----------|--|-------|---|
| Γhe sa | OD: Isotopic Uraniun Imples listed below vion findings workshe | vere | EPA N e revie | | | | | | | | od RICH-RC-5087) dings are noted in attached |
| | Validat | ion | Area | | | | | | Com | ments | |
| I. | Technical holding times | | | | Ą | Sam | pling d | ates: | 1-98-08 | | |
| IIa. | Initial calibration | | | | Α | ļ | | | | | |
| IIb. | Calibration verification | | | | A | | | | | | |
| 111. | Blanks | | | | SW | | | | | | |
| IVa. | Matrix Spike/(Matrix Sp | ike) | Duplica | ites | Α | D | UP | | | | |
| IVa. | Laboratory control sam | ples | | | A | L | <u>.cs</u> | | | | |
| V. | Tracer Recovery | | | | A | | | | | | |
| VI. | Minimum Detectable A | ctivit | y (MDA | ·) | Α | | | 4.48 | | | |
| VII. | Sample result verification | on | | | N | | | | | | |
| VIII. | Overall assessment of | data | | | A | | , | | | | |
| IX. | Field duplicates | | | 1 | SW | D | = 3 | + 4 | 4 | | |
| x | Field blanks | | | | ND | <u> R</u> | = 10 | <u> </u> | | | |
| Note: | A = Acceptable N = Not provided/applic SW = See worksheet | cable | e | R = Rin | o compound sate eld blank | ds dete | ected | | D = Duplicate TB = Trip blank EB = Equipment b | lank | |
| | d Samples: 9M & SB | | | | | | 1 | | | | |
| 1 | ^^ T B\$ -HJ-10-0' | S | 11 | 5 명 T修\$-HR-05-1 | 0'DUP | S | 21 | | AMINUS OF THE STATE OF THE STAT | 31 | |
| | TB\$-HJ-10-10' | 1 | 122 | RINSATE-2D | UP | \sim | 22 | | · · · · · · · · · · · · · · · · · · · | 32 | |
| 3 | TB\$-HR-06-0' | \perp | 13 1 | PBS | ······ | | 23 | | | 33 | |
| 4 | TB\$-HR-06-0'FD | \perp | 14 7 | PBW | | | 24 | | | 34 | |
| 5 | TB\$-HR-06-10' | \perp | 15 | | | | 25 | | | 35 | |
| 6 | TB\$-HJ-08-0' | \perp | 16 | | | | 26 | | | 36 | |
| 7 | TB\$-HJ-08-10' | \perp | 17 | | | | 27 | | | 37 | |
| 8 | TBS-HR-05-0' | \perp | 18 | | | | 28 | | | 38 | |
| 9 | TBS-HR-05-10' | l | 19 | | | | 29 | | | 39 | |

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| Notes: | ID: | TSB- | <u>H</u> | |
|--------|-----|------|----------|--|
| | | | | |
| | | | | |

W 20

RINSATE-2

F8A 390183 LDC #: (8539 B59 SDG #:

VALIDATION FINDINGS WORKSHEET

Page: Reviewer: 2nd Reviewer:

Blanks

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| METHOD: Radiochemistry (Method: See Cover | liochemistry | (Method: 3 | ee cover | ı | - | | - | משוגפ ים אר | ک ک | | | |
|---|--------------------------|-----------------------------|---|--------------------------|----------------------------|---------------------------|------------------------------|-----------------------|---------------|--|------------|----------|
| (K) N/A (N) N/A | Were blank Were any a | canalyses perctivities dete | Were blank analyses performed as required? If no, please see qualifications below. Were any activities detected in the blanks greater than the minimum detectable act | quired? If lanks gree | no, please ster than th | see qualific e minimum | ations belov detectable a | v. ıctivity (MD/ | \)? If yes, p | Were blank analyses performed as required? If no, please see qualifications below. Were any activities detected in the blanks greater than the minimum detectable activity (MDA)? If yes, please see qualifications below. | lification | s below. |
| DC i | | | Associated Samples: | amples: | all soi | 1,05 | | | • | - | | |
| Isotope | Ø Blank ID | Blank | | | | | Sample Id | Sample Identification | | | | |
| | PBS | Level | 9 | | | | | | | | | report |
| U-333/334 0.0422 | 0.0422 | | | | | | | | | | | 00 1 |
| 0-238 | 6860.0 | | 0.971 | | | | | | | | | 1.00 |
| | | | | | | | | | | | | |
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| | | | | | | | | | | | | |
| Units: | | | Associated Samples: | amples: | | | | | | | | |

| Blank ID Blank Action Level Sample Identification Level Leve | Jnits: | | - | Associated Samples: | |
|--|--------|----------|-------|---------------------|--|
| Pevel | edo | Blank ID | Blank | | |
| | | | Level | | |
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| | | | | | |

CIRCLED RESULTS WERE NOT QUALIFIED. ALL RESULTS NOT CIRCLED WERE QUALIFIED BY THE FOLLOWING STATEMENT: If there is activity in the blank above the MDA, sample results within 10x the blank activity will be qualified as not detected "U".

LDC #: 18529 B59 SDG #: F3A290183

VALIDATION FINDINGS WORKSHEET Field Duplicates

Page: ____of ___ Reviewer: ____ M_ G___ 2nd reviewer: ____

| | zild reviewer. |
|---|----------------|
| METHOD: Radiochemistry (Method: <u>See Cover</u>) | |
| YN N/A Were field duplicate pairs identified in this SDG? | |

Were target isotopes detected in the field duplicate pairs?

| | Activity (| pci/q, | by difference |
|-----------|------------|----------|-------------------------|
| Isotopes | 3 | 4 | RPD |
| U-233/234 | 1.35 | 1.29 | 0.06 Pci/4 (£1.00Pci/4) |
| U-235/236 | 0.0291 | 0.0112 U | 0.02 1 () |
| U-238 | 1.23 | 1.15 | 0.08 |
| | | | |
| | | | |

| | Activity (| pci/q, | |
|-------------------|------------|--------|----------|
| Isotopes | 3 | 4 | RPD |
| T 4-228 | 1.94 | 1.57 | 21 (=50) |
| T 4-228 Th-230 | 1.07 | 0.992 | 8 () |
| T4-232 | 1.87 | 1.71 | 9 (🗸) |
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| | Activity () | |
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| Isotopes | | RPD |
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