

COVER LETTER

Tuesday, February 10, 2009

Rick Beauheim  
Sandia National Lab  
4100 National Parks Hwy.  
MS1395  
Carlsbad, NM 88220

TEL: (505) 234-0065  
FAX (505) 234-0061

RE: WIPP/H-15R

Order No.: 0901317

Dear Rick Beauheim:

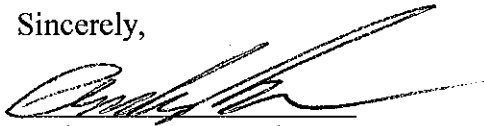
Hall Environmental Analysis Laboratory, Inc. received 1 sample(s) on 1/23/2009 for the analyses presented in the following report.

These were analyzed according to EPA procedures or equivalent. Below is a list of our accreditations. To access our accredited tests please go to [www.hallenvironmental.com](http://www.hallenvironmental.com) or the state specific web sites.

Reporting limits are determined by EPA methodology. No determination of compounds below these (denoted by the ND or < sign) has been made.

Please don't hesitate to contact HEAL for any additional information or clarifications.

Sincerely,



Andy Freeman, Business Manager  
Nancy McDuffie, Laboratory Manager

NM Lab # NM9425  
AZ license # AZ0682  
ORELAP Lab # NM100001  
Texas Lab# T104704424-08-TX



# Hall Environmental Analysis Laboratory, Inc.

Date: 16-Feb-09

**CLIENT:** Sandia National Lab  
**Lab Order:** 0901317  
**Project:** WIPP/H-15R  
**Lab ID:** 0901317-01

**Client Sample ID:** H-15R( C ) - 012209  
**Collection Date:** 1/22/2009 11:00:00 AM  
**Date Received:** 1/23/2009  
**Matrix:** AQUEOUS

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
<b>EPA METHOD 300.0: ANIONS</b>						Analyst: RAGS
Fluoride	5.9	1.0		mg/L	10	1/23/2009 1:41:31 PM
Chloride	110000	400		mg/L	4000	2/14/2009 6:58:03 AM
Bromide	61	4.0		mg/L	40	2/14/2009 6:23:15 AM
Nitrate (As N)+Nitrite (As N)	ND	200		mg/L	1000	1/28/2009 8:02:47 PM
Phosphorus, Orthophosphate (As P)	ND	25	H	mg/L	50	1/26/2009 1:30:25 PM
Sulfate	6400	100		mg/L	200	2/14/2009 6:40:39 AM
<b>EPA METHOD 6010B: DISSOLVED METALS</b>						Analyst: TES
Calcium	1800	100		mg/L	100	2/12/2009 2:08:58 PM
Magnesium	2100	100		mg/L	100	2/12/2009 2:06:58 PM
Potassium	1200	100		mg/L	100	2/12/2009 2:06:58 PM
Sodium	86000	1000		mg/L	1000	2/12/2009 2:13:06 PM
Strontium	36	1.2		mg/L	200	1/28/2009 6:27:56 PM
<b>SM 2320B: ALKALINITY</b>						Analyst: KMS
Alkalinity, Total (As CaCO3)	63	20		mg/L CaCO3	1	2/4/2009
Carbonate	ND	2.0		mg/L CaCO3	1	2/4/2009
Bicarbonate	63	20		mg/L CaCO3	1	2/4/2009
<b>EPA 120.1: SPECIFIC CONDUCTANCE</b>						Analyst: KMS
Specific Conductance	300000	0.50		µmhos/cm	50	1/27/2009
<b>SM4500-H+B: PH</b>						Analyst: KMS
pH	7.53	0.1		pH units	1	1/23/2009
<b>SM 2540 C: TOTAL DISSOLVED SOLIDS</b>						Analyst: KMS
Total Dissolved Solids	200000	2000		mg/L	1	1/26/2009

**Qualifiers:**

- \* Value exceeds Maximum Contaminant Level
- E Estimated value
- J Analyte detected below quantitation limits
- ND Not Detected at the Reporting Limit
- S Spike recovery outside accepted recovery limits

- B Analyte detected in the associated Method Blank
- H Holding times for preparation or analysis exceeded
- MCL Maximum Contaminant Level
- RL Reporting Limit

CATION/ANION BALANCE SHEET FOR WATER ANALYSES

<b>HEAL LAB NUMBER</b>	H-15R ( C ) - 012209 0901317-1								
<b>CATIONS</b>	mg/L meq/L	mg/L meq/L	mg/L meq/L	mg/L meq/L	mg/L meq/L	mg/L meq/L	mg/L meq/L	mg/L meq/L	mg/L meq/L
Sodium	66000 2870.81								
Potassium	1200 30.69								
Calcium	1800 89.82								
Magnesium	2100 172.84								
<b>Total Cations</b>	3164.16								
<b>ANIONS</b>	mg/L meq/L	mg/L meq/L	mg/L meq/L	mg/L meq/L	mg/L meq/L	mg/L meq/L	mg/L meq/L	mg/L meq/L	mg/L meq/L
Sulfate	6400 133.25								
Chloride	110000 3102.96								
Bicarbonate (CaCO3)	63 1.26								
Carbonate (CaCO3)	ND *								
Phosphate (P)	ND *								
Nitrite (N)	ND *								
Nitrate (N)	ND *								
Fluoride	5.9 0.31								
Bromide	61 0.76								
<b>Total Anions</b>	3238.54								
Elect. Cond. (µMhos/cm)	300000								
<b>CATION/ANION RATIO</b>		0.98							
% Difference		1							
<b>TOTAL DISSOLVED SOLIDS RATIOS</b>									
TDS (measured)	200000								
TDS (calculated)	187605								
Ratio meas TDS:calc TDS		1.1							
Ratio Meas. TDS:EC		0.67							
Ratio Calc. TDS:EC		0.63							
Ratio of anion sum:EC		1.1							
Ratio of cation sum:EC		1.1							

\* Analyte not detected (below method detection limit).

\*\* Values below 0.55 can be obtained in waters containing appreciable concentrations of free acid or alkalinity, or not within pH 6 to 9. Values much higher than 0.7 are possible in highly saline waters.

**GENERALLY ACCEPTED RANGES**

Cation/Anion balance: 0-3 meq/L- 0.2 meq/L, 3-10 meq/L- 2%, >10 meq/L - 5%

Ratio measured TDS:calculated TDS – 1.0-1.2. Ratio Calculated TDS:EC – 0.55-0.7. Ratio Measured TDS:EC–0.55-0.7. Ratio of anion sum:EC – 0.9-1.1.

Ratio of cation sum:EC – 0.9-1.1

2

## QA/QC SUMMARY REPORT

**Client:** Sandia National Lab  
**Project:** WIPP/H-15R

**Work Order:** 0901317

Analyte	Result	Units	PQL	%Rec	LowLimit	HighLimit	%RPD	RPDLimit	Qual
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**Method:** EPA Method 300.0: Anions

**Sample ID:** MB **Batch ID:** R32162 **Analysis Date:** 1/23/2009 9:20:22 AM

Fluoride	ND	mg/L	0.10
Chloride	ND	mg/L	0.10
Bromide	ND	mg/L	0.10
Nitrate (As N)+Nitrite (As N)	ND	mg/L	0.20
Phosphorus, Orthophosphate (As P)	ND	mg/L	0.50
Sulfate	ND	mg/L	0.50

**Sample ID:** MB **Batch ID:** R32170 **Analysis Date:** 1/26/2009 9:26:40 AM

Fluoride	ND	mg/L	0.10
Chloride	ND	mg/L	0.10
Bromide	ND	mg/L	0.10
Nitrate (As N)+Nitrite (As N)	ND	mg/L	0.20
Phosphorus, Orthophosphate (As P)	ND	mg/L	0.50
Sulfate	ND	mg/L	0.50

**Sample ID:** MB **Batch ID:** R32180 **Analysis Date:** 1/27/2009 10:00:38 AM

Fluoride	ND	mg/L	0.10
Chloride	ND	mg/L	0.10
Bromide	ND	mg/L	0.10
Nitrate (As N)+Nitrite (As N)	ND	mg/L	0.20
Phosphorus, Orthophosphate (As P)	ND	mg/L	0.50
Sulfate	ND	mg/L	0.50

**Sample ID:** MB **Batch ID:** R32206 **Analysis Date:** 1/28/2009 8:26:20 AM

Fluoride	ND	mg/L	0.10
Chloride	ND	mg/L	0.10
Bromide	ND	mg/L	0.10
Nitrate (As N)+Nitrite (As N)	ND	mg/L	0.20
Phosphorus, Orthophosphate (As P)	ND	mg/L	0.50
Sulfate	ND	mg/L	0.50

**Sample ID:** MB-2 **Batch ID:** R32206 **Analysis Date:** 1/29/2009 3:35:25 AM

Fluoride	ND	mg/L	0.10
Chloride	ND	mg/L	0.10
Bromide	ND	mg/L	0.10
Nitrate (As N)+Nitrite (As N)	ND	mg/L	0.20
Phosphorus, Orthophosphate (As P)	ND	mg/L	0.50
Sulfate	ND	mg/L	0.50

**Sample ID:** LCS **Batch ID:** R32162 **Analysis Date:** 1/23/2009 9:37:46 AM

Fluoride	0.5090	mg/L	0.10	102	90	110
Chloride	4.818	mg/L	0.10	96.4	90	110
Bromide	2.529	mg/L	0.10	101	90	110
Nitrate (As N)+Nitrite (As N)	3.423	mg/L	0.20	97.8	90	110
Phosphorus, Orthophosphate (As P)	4.953	mg/L	0.50	99.1	90	110
Sulfate	9.935	mg/L	0.50	99.3	90	110

**Sample ID:** LCS **Batch ID:** R32170 **Analysis Date:** 1/26/2009 9:44:04 AM

Fluoride	0.4851	mg/L	0.10	97.0	90	110
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**Qualifiers:**

- |  |  |
|--|--|
| E Estimated value                            | H Holding times for preparation or analysis exceeded |
| J Analyte detected below quantitation limits | ND Not Detected at the Reporting Limit               |
| R RPD outside accepted recovery limits       | S Spike recovery outside accepted recovery limits    |

## QA/QC SUMMARY REPORT

Client: Sandia National Lab  
 Project: WIPP/H-15R

Work Order: 0901317

Analyte	Result	Units	PQL	%Rec	LowLimit	HighLimit	%RPD	RPDLimit	Qual
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## Method: EPA Method 300.0: Anions

Sample ID: LCS	LCS	Batch ID: R32170	Analysis Date: 1/26/2009 9:44:04 AM						
Chloride	4.642	mg/L	0.10	92.8	90	110			
Bromide	2.459	mg/L	0.10	98.3	90	110			
Nitrate (As N)+Nitrite (As N)	3.251	mg/L	0.20	92.9	90	110			
Phosphorus, Orthophosphate (As P)	4.699	mg/L	0.50	94.0	90	110			
Sulfate	9.696	mg/L	0.50	97.0	90	110			

Sample ID: LCS	LCS	Batch ID: R32180	Analysis Date: 1/27/2009 10:18:02 AM						
Fluoride	0.5198	mg/L	0.10	104	90	110			
Chloride	4.841	mg/L	0.10	98.8	90	110			
Bromide	2.578	mg/L	0.10	103	90	110			
Nitrate (As N)+Nitrite (As N)	3.410	mg/L	0.20	97.4	90	110			
Phosphorus, Orthophosphate (As P)	5.082	mg/L	0.50	102	90	110			
Sulfate	10.20	mg/L	0.50	102	90	110			

Sample ID: LCS	LCS	Batch ID: R32206	Analysis Date: 1/28/2009 8:43:44 AM						
Fluoride	0.5298	mg/L	0.10	106	90	110			
Chloride	4.769	mg/L	0.10	95.4	90	110			
Bromide	2.435	mg/L	0.10	97.4	90	110			
Nitrate (As N)+Nitrite (As N)	3.411	mg/L	0.20	97.4	90	110			
Phosphorus, Orthophosphate (As P)	5.094	mg/L	0.50	102	90	110			
Sulfate	10.13	mg/L	0.50	101	90	110			

Sample ID: LCS-2	LCS	Batch ID: R32206	Analysis Date: 1/29/2009 3:52:50 AM						
Fluoride	0.5294	mg/L	0.10	106	90	110			
Chloride	4.819	mg/L	0.10	96.4	90	110			
Bromide	2.476	mg/L	0.10	99.0	90	110			
Nitrate (As N)+Nitrite (As N)	3.443	mg/L	0.20	98.4	90	110			
Phosphorus, Orthophosphate (As P)	5.073	mg/L	0.50	101	90	110			
Sulfate	10.12	mg/L	0.50	101	90	110			

## Method: SM 2320B: Alkalinity

Sample ID: MB	MBLK	Batch ID: R32296	Analysis Date: 2/4/2009						
Alkalinity, Total (As CaCO3)	ND	mg/L CaC	20						
Carbonate	ND	mg/L CaC	2.0						
Bicarbonate	ND	mg/L CaC	20						
Sample ID: LCS	LCS	Batch ID: R32296	Analysis Date: 2/4/2009						
Alkalinity, Total (As CaCO3)	85.00	mg/L CaC	20	104	60	120			

## Method: EPA 120.1: Specific Conductance

Sample ID: 0901332-06CDUP	DUP	Batch ID: R32184	Analysis Date: 1/27/2009						
Specific Conductance	1194	µmhos/cm	0.010	0	20				
Sample ID: 0901332-07CDUP	DUP	Batch ID: R32184	Analysis Date: 1/27/2009						
Specific Conductance	1380	µmhos/cm	0.010	1.51	20				

## Qualifiers:

E	Estimated value	H	Holding times for preparation or analysis exceeded
J	Analyte detected below quantitation limits	ND	Not Detected at the Reporting Limit
R	RPD outside accepted recovery limits	S	Spike recovery outside accepted recovery limits

QA/QC SUMMARY REPORT

Client: Sandia National Lab  
 Project: WIPP/H-15R

Work Order: 0901317

Analyte	Result	Units	PQL	%Rec	LowLimit	HighLimit	%RPD	RPDLimit	Qual
<b>Method: EPA Method 6010B: Dissolved Metals</b>									
Sample ID: MB		MBLK							
Calcium	ND	mg/L	1.0						
Magnesium	ND	mg/L	1.0						
Potassium	ND	mg/L	1.0						
Sodium	ND	mg/L	1.0						
Sample ID: MB		MBLK							
Strontium	ND	mg/L	0.0060						
Sample ID: MB		MBLK							
Calcium	ND	mg/L	1.0						
Sodium	ND	mg/L	1.0						
Strontium	ND	mg/L	0.0060						
Sample ID: LCS		LCS							
Calcium	46.41	mg/L	1.0	91.9	80	120			
Magnesium	45.61	mg/L	1.0	90.3	80	120			
Potassium	47.97	mg/L	1.0	87.2	80	120			
Sodium	43.45	mg/L	1.0	86.0	80	120			
Sample ID: LCS		LCS							
Strontium	0.1055	mg/L	0.0060	106	80	120			
Sample ID: LCS		LCS							
Calcium	49.02	mg/L	1.0	97.1	80	120			
Sodium	51.16	mg/L	1.0	101	80	120			
Strontium	0.1012	mg/L	0.0060	101	80	120			

<b>Method: SM4500-H+B: pH</b>									
Sample ID: 0901290-03CDUP		DUP							
pH	8.560	pH units	0.1						

<b>Method: SM 2540 C: Total Dissolved Solids</b>									
Sample ID: LCS-18161		LCS							
Total Dissolved Solids	1029	mg/L	20	103	80	120			

Qualifiers:

- E Estimated value
- J Analyte detected below quantitation limits
- R RPD outside accepted recovery limits
- H Holding times for preparation or analysis exceeded
- ND Not Detected at the Reporting Limit
- S Spike recovery outside accepted recovery limits

# Hall Environmental Analysis Laboratory, Inc.

## Sample Receipt Checklist

Client Name SANDIA CARLSBAD

Date Received:

1/23/2009

Work Order Number 0901317


Received by: TLS

Checklist completed by:



1/23/09  
Date

Sample ID labels checked by:

Initials 

Matrix:

Carrier name FedEx

- Shipping container/cooler in good condition? Yes  No  Not Present
- Custody seals intact on shipping container/cooler? Yes  No  Not Present  Not Shipped
- Custody seals intact on sample bottles? Yes  No  N/A
- Chain of custody present? Yes  No
- Chain of custody signed when relinquished and received? Yes  No
- Chain of custody agrees with sample labels? Yes  No
- Samples in proper container/bottle? Yes  No
- Sample containers intact? Yes  No
- Sufficient sample volume for indicated test? Yes  No
- All samples received within holding time? Yes  No
- Water - VOA vials have zero headspace? No VOA vials submitted  Yes  No
- Water - Preservation labels on bottle and cap match? Yes  No  N/A
- Water - pH acceptable upon receipt? Yes  No  N/A
- Container/Temp Blank temperature? 2° <6° C Acceptable  
If given sufficient time to cool.

COMMENTS:

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Client contacted \_\_\_\_\_ Date contacted: \_\_\_\_\_ Person contacted \_\_\_\_\_

Contacted by: \_\_\_\_\_ Regarding: \_\_\_\_\_

Comments: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Corrective Action \_\_\_\_\_

\_\_\_\_\_

# CHAIN-OF-CUSTODY RECORD

Accreditation Applied:

NELAC  USACE

Other: \_\_\_\_\_

Client: Sandia National Labs

Project Name: WIPP/H-15R

Address: 4100 National Parks Hwy  
Carlsbad NM 88220

Project #: 98806/1.4.2.3

Project Manager: Rick Braukam

Phone #: with 1-22-09 234  
575-234-0107

Sampler: M. Hillesheim H.R. Ke msh  
1-22-09

Fax #: 575-234-0061

Sample Temperature: 2

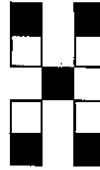
Date	Time	Matrix	Sample I.D. No.	Number/Volume <small>with 1-22-09</small>	Preservative			HEAL No.
					<small>None</small> HgCl <sub>2</sub>	HNO <sub>3</sub>	H <sub>2</sub> SO <sub>4</sub>	
1-22-09	11:00	H <sub>2</sub> O	H-15R(C)-012209	500 mL	X			0901317
1-22-09	11:00	H <sub>2</sub> O	H-15R(C)-012209	125 mL			X	-1
1-22-09	11:00	H <sub>2</sub> O	H-15R(C)-012209	125 mL		X		-1
<small>with 1-22-09</small> 1-22-09	11:00	H <sub>2</sub> O	H-15R(C)-012209	125 mL		X		-1
-	-	-	end sample list	-				-

Date: 1/22/09 Time: 14:36 Relinquished By: (Signature) \_\_\_\_\_

Received By: (Signature) \_\_\_\_\_ BSI

Date: \_\_\_\_\_ Time: \_\_\_\_\_ Relinquished By: (Signature) \_\_\_\_\_

Received By: (Signature) \_\_\_\_\_



**HALL ENVIRONMENTAL ANALYSIS LABORATORY**  
4901 Hawkins NE, Suite D  
Albuquerque, New Mexico 87109  
Tel. 505.345.3975 Fax 505.345.4107  
www.hallenvironmental.com


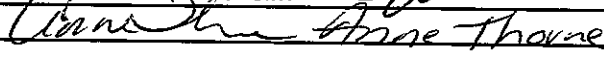
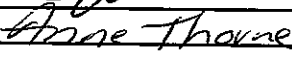
## ANALYSIS REQUEST

BTEX + MTBE + TMB's (B021)	BTEX + MTBE + TPH (Gasoline Only)	TPH Method 8015B (Gas/Diesel)	TPH (Method 41B.1)	EDB (Method 504.1)	EDC (Method B021)	8310 (PNA or PAH)	RCHA 8 Metals	Anions (F, Cl, NO <sub>2</sub> , NO <sub>3</sub> , PO <sub>4</sub> , SO <sub>4</sub> )	8081 Pesticides / PCB's (B082)	8260B (VOA)	8270 (Semi-VOA)	<u>PH, TDS, alk., spec. cond.</u>	<u>NO<sub>2</sub> + NO<sub>3</sub></u>	<u>Cations / Metals</u>	<u>Strength</u>	Air Bubbles or Headspace (Y or N)
								X				X				
													X			
														X		
															X	

Remarks:   
 (1) Samples may contain high salt levels  
 (2) Samples 3+4 are filtered  
 (3) 48-hr hold time for phosphates



Appendix A

<b>ACTIVITY/ PROJECT SPECIFIC PROCEDURE</b>  Sandia National Laboratories	<h1 style="margin: 0;">Chain of Custody</h1>	<b>Form Number:</b> SP 13-1-1  Page <u>1</u> of <u>1</u> Attach more forms as needed				
<b>1. Initial Sample Custodian</b> <u>Michael B. Hillesheim</u> Organization: <u>6712</u> Date: <u>01/22/09</u> <small>Printed Name</small>						
<b>2. Sample Collection or Creation Information</b> Scientific Notebook ID: <u>WSWT#12</u> Test Plan ID: <u>TP03-01</u> Field Log ID: <u>N/A</u> Sample Location: <u>WIPP / H-15R</u> <small>i.e. borehole/core no./lab bldg. no./etc...</small>		Sample Team Members/Organization. <u>Michael Hillesheim - SNL</u> <u>Wes DeYonge - ReSpec msh (1-22-09)</u> <small>enter n/a if none</small>				
<b>3. Sample Identification</b>	Date Collected	Container Type	Volume	Preservative	Analysis Request	Sample Description
Sample/Sub-Sample #						
H-15R(C)_012209	01/22/09	PE Bottle	500 mL	n/a	Anions, TDS, pH, cond., alk.	H-6bR Culebra water unpreserved <span style="float:right">0901317-</span>
H-15R(C)_012209	01/22/09	PE Bottle	125 mL	H2SO4	NO2+NO3	H-6bR Culebra water npreserved w/ sulfuric acid
H-15R(C)_012209	01/22/09	PE Bottle	125 mL	HNO3	Cations/Metals	H-6bR Culebra water preserved w/ nitric acid
H-15R(C)_012209	01/22/09	PE Bottle	125 mL	HNO3	Strontium	H-6bR Culebra water preserved w/ nitric acid
—End Sample List—						
<small>enter n/a if none</small>						
<b>4. Sample Requirements</b>						
Handling: Keep sealed until use						
Storage & Preservation: Keep chilled/refrigerated						
Shipping: Hand Carry/Fed Ex						
Archive: N/A						
Disposition: Discard samples upon completion of testing						
Expiration Date: 06/22/09						
<b>5. Custody Transfer</b>		Printed Name	Signature	Organization/Company	Date-Time	Sample Condition
a. Relinquished by:		Michael B. Hillesheim		SNL/6712	01/22/09 14:30	Containers intact & sealed
a. Received by:				HEAL	1/23/09 0851	intact / 12/21/09
b. Relinquished by:						
b. Received by:						
c. Relinquished by:						
c. Received by:						
Upon sample receipt, note condition. This form (copy for your records) shall follow samples through its life, until final disposition, then send original to WIPP Records Center. For samples that are potentially hazardous & require packaging and shipping, contact Center 6800 ES&H Coordinator or see SNL ES&H Manual, Chpt. 12.						