

**RECEIVED**

By OCD; Dr. Oberding at 7:06 am, Sep 16, 2015

# Limited Groundwater Investigation Proposal

**West Lovington Strawn Unit #8  
NMOCD Reference No. 1RP-2457  
Unit Letter "L", Section 34, Township 15 South, Range 35 East  
Lea County, New Mexico**

**APPROVED**

By OCD; Dr. Oberding at 7:06 am, Sep 16, 2015

August 3, 2015

Terracon Project No. AR157026



**Prepared for:**

Energen Resources Corp.  
Midland, Texas

**Prepared by:**

Terracon Consultants, Inc.  
Lubbock, Texas

terracon.com

**Terracon**

Environmental



Facilities



Geotechnical



Materials

**RECEIVED**

By OCD; Dr. Oberding at 6:49 am, Sep 16, 2015

August 3, 2015

**Terracon**

Energen Resources Corp.  
3510 North "A" Street  
Building A & B  
Midland, Texas 79705

Attn: Mr. Marcus Kujawski  
P: (432) 818 1758  
Marcus.Kujawski@energen.com

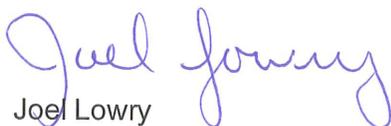
Re: Limited Groundwater Investigation Proposal  
Unit L, Section 34, Township 15 South, Range 35 East  
Lea County, New Mexico  
Terracon Project No. AR157026

Dear Mr. Kujawski:

Terracon Consultants, Inc. (Terracon) is pleased to submit this *Limited Groundwater Investigation Proposal* for the site known as West Lovington Strawn Unit #8 (WLSU #8). The report includes a site description, scope of services, background information along with proposed activities.

Terracon appreciates this opportunity to provide environmental consulting services to Energen Resources Corp. (Energen). Should you have any questions or require additional information, please do not hesitate to contact our office.

Sincerely,  
**Terracon Consultants, Inc.**



Joel Lowry  
Project Geologist



Erin Loyd, P.G.  
Environmental Department Manager

Terracon Consultants, Inc. 5827 50th St. Lubbock, Texas 79424  
P (806) 300 0140 F (806) 797 0947 [terracon.com/lubbock](http://terracon.com/lubbock)

Environmental

Facilities

Geotechnical

Materials

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**LIMITED GROUNDWATER INVESTIGATION PROPOSAL  
WEST LOVINGTON STRAWN UNIT #8  
UNIT L, SECTION 34, TOWNSHIP 15 SOUTH, RANGE 35 EAST  
LEA COUNTY, NEW MEXICO**

**Terracon Project No. AR157026  
August 3, 2015**

## **1.0 SITE DESCRIPTION & INTRODUCTION**

The West Lovington Strawn Unit #8 (WLSU #8) site is located in Unit Letter “L”, Section 34, Township 15 South, Range 35 East in Lea County, New Mexico. The geographic coordinates of the site are 32.971362° North latitude and 103.401210° West longitude. The site is located on property owned by Mr. Dan Field. Please refer to Figure 1 in Appendix A for the site location.

The WLSU #8 site consists of an approximate two acre well pad improved above-ground storage tanks (ASTs), with the WLSU #8-R injection well, an unregistered water well approximately 120 feet (ft.) to the east of the injection well and five groundwater monitoring wells (MW-1 through MW-5) that were installed in 2012. Review of analytical data for groundwater samples collected December 13, 2012, indicates chloride concentrations exceeded the New Mexico Water Quality Control Commission (NMWQCC) Human Health Standard of 250 milligrams per liter (mg/L) in a groundwater sample collected from groundwater monitoring well MW-4.

## **2.0 SCOPE OF SERVICES**

Terracon's *Limited Groundwater Investigation Proposal* has been prepared in accordance with Terracon's *Proposal for Environmental Consulting Services*, dated April 8, 2015 (Terracon Proposal No. PAR150064).

The objective is to provide assessment and remedial activities in support of achieving NMOCD and landowner-approved closure at Energen's WLSU #8 groundwater remediation site.

### **2.1 Standard of Care**

Terracon's services will be performed in a manner consistent with generally accepted practices of the profession undertaken in similar studies in the same geographical area during the same time. Terracon makes no warranties, either express or implied, regarding the findings, conclusions, or recommendations. Please note that Terracon does not warrant the work of laboratories, regulatory agencies, or other third parties supplying information used in the preparation of this proposal.

## **2.2 Additional Scope Limitations**

Findings, conclusions, and recommendations resulting from these services will be based upon information derived from the on-site activities and other services performed under this scope of work; such information may be subject to change over time. Certain indicators of the presence of hazardous substances, petroleum products, or other constituents may be latent, inaccessible, unobservable, nondetectable, or not present during the time of the proposed services. We cannot represent that the site contains no hazardous substances, toxic materials, petroleum products, or other latent conditions beyond those identified during completion of the proposed activities. Subsurface conditions may vary from those encountered at specific borings or wells or during other surveys, tests, assessments, investigations, or exploratory services. The data, interpretations, findings, and our recommendations will be based solely upon data obtained at the time and within the scope of these services.

## **2.3 Reliance**

This report has been prepared for the exclusive use of Energen, and any authorization for use or reliance by any other party (except a governmental entity having jurisdiction over the site) is prohibited without the express written authorization of Energen and Terracon. Any unauthorized distribution or reuse is at Energen's sole risk. Notwithstanding the foregoing, reliance by authorized parties will be subject to the terms, conditions, and limitations stated in the proposal and Terracon's Agreement for Services. The limitation of liability defined in the terms and conditions is the aggregate limit of Terracon's liability to Energen and all relying parties unless otherwise agreed in writing.

## **3.0 BACKGROUND SUMMARY**

The WLSU #8 producing well was drilled in 1994 by an operator that is no longer affiliated with the site. In 2001, Energen became the unit operator of the West Lovington Strawn Unit, including the WLSU #8. In 2009, the well was recompleted before being converted into a water injection well in 2010. Review of historical documents suggests the unregistered water well on the eastern portion of the well pad may have been installed to supply fresh water during drilling operations for the WLSU #8. Available records with the New Mexico Office of the State Engineer's (NMOSE) do not provide conclusive well completion or owner details.

On March 18, 2009, Energen collected groundwater samples (Battery "A" Water Well, WLSU #11 Windmill, WLSU #20 Water Well and WLSU #8 Water Well) from existing water wells in the vicinity of the WLSU #8 as required by the NMOCD to convert the WLSU #8 producing well into an injection well. Collected groundwater samples were submitted to Martin Water Labs of Midland, Texas, for analysis of pH, bicarbonate, calcium, magnesium, sodium and/or potassium, sulfate, chloride, iron, barium, total solids, hydrogen sulfide and resistivity.

Laboratory analytical results indicated the detected chloride concentrations were less than the applicable NMWQCC Human Health Standard of 250 milligrams per liter (mg/L) in each of the submitted groundwater samples with the exception of the groundwater sample collected from the WLSU #8 water well (298 mg/L). Historical laboratory analytical results are provided in Appendix C.

On October 26, 2009, Energen filed a Release Notification and Corrective Action (Form C-141) with the NMOCD, indicating that elevated chloride concentrations were detected in the unregistered water well on the eastern portion of the WLSU #8 well pad. A copy of the Release Notification and Corrective Action (Form C-141) is provided as Appendix D.

On September 11, 2012, Energen proposed to install five groundwater monitoring wells around the affected, unregistered water well in an effort to further characterize chloride impacts to groundwater. The proposal was subsequently approved by the NMOCD.

On December 13, 2012, Energen installed five groundwater monitoring wells (MW-1 through MW-5) in the vicinity of the unregistered water well in an effort to further characterize impacts to groundwater. Monitoring well locations are depicted in Figure 2 of Appendix A.

### **3.1 Historical Groundwater Sampling Results**

On December 13, 2012, groundwater samples were collected from groundwater monitoring wells MW-1 through MW-5 and submitted to Hall Environmental Analysis Laboratory, Inc. of Albuquerque, New Mexico, for analysis of chloride in accordance with EPA Method 300.0, volatile organic compounds (VOCs) in accordance with EPA SW-846 Method 8260B and polycyclic aromatic hydrocarbons (PAHs) in accordance with EPA SW-846 Method 8310.

#### **Chloride Analysis**

Chloride was detected at concentrations above applicable laboratory reporting limits (RLs) in the groundwater samples collected from monitoring wells MW-1 through MW-5. Chloride concentrations detected in the groundwater samples collected from the on-site monitoring were less than the applicable NMWQCC Human Health Standard of 250 mg/L in each of the submitted groundwater samples with the exception of the groundwater sample collected from MW-4. The groundwater sample collected from monitor well MW-4 exhibited a chloride concentration of 390 mg/L. Please refer to Table 1 in Appendix B for a complete summary of analytical results for chloride in groundwater.

## VOCs Analysis

VOCs were not detected at concentrations above their applicable laboratory RLs in the groundwater samples collected from monitoring wells MW-1 through MW-5. Please refer to Table 1 in Appendix B for a complete summary of analytical results for VOCs in groundwater.

## PAHs Analysis

Select PAHs; including phenanthrene, flouranthene and pyrene, were detected at concentrations above their applicable laboratory RLs in the groundwater samples collected from monitoring wells MW-1 through MW-5. The maximum detected concentrations of phenanthrene (0.94 mg/L), flouranthene (0.56 mg/L), and pyrene (0.33 mg/L) were detected in the groundwater sample collected from monitoring well MW-2. The PAH constituents detected in the analyzed groundwater samples are not defined in the NMWQCC Human Health Standards. Please refer to Table 1 in Appendix B for a complete summary of analytical results for PAHs in groundwater.

## 4.0 PROPOSED ACTIVITIES

On March 20, 2015, Energen representatives met with the NMOCD to discuss a path forward for the WLSU #8 groundwater remediation site. During the meeting, it was determined that plugging the unregistered water well on the east side of the well pad and installing a new groundwater monitoring well adjacent to its former location was appropriate.

### 4.1 Unregistered Well Plugging

Upon receiving NMOCD and NMOSE approval, the unregistered water well on the eastern portion of the well pad will be plugged by a well driller licensed in the State of New Mexico. A copy of the *Well Plugging Plan of Operations* is provided as Appendix E.

### 4.2 Monitoring Well Installation

Upon plugging the unregistered water well, one two-inch groundwater monitoring well (MW-6) will be installed adjacent to the unregistered water well's former location. The monitoring well will be installed and developed in accordance with an approved *Application for Permit to Drill a Well with No Consumptive Use of Water* (Form WR-07) and applicable NMOSE regulations, by a well driller licensed in the State of New Mexico. Please refer to Figure 2 in Appendix A for the proposed monitoring well location. A copy of the Form WR-07 is provided as Appendix F.

### **4.3 Initial Groundwater Sampling**

Upon installing and developing the groundwater monitoring well, each of the groundwater monitoring wells (MW-1 through MW-6) will be gauged and sampled using EPA Standard Methods. Groundwater monitoring wells will be purged of a minimum of three well volumes, until the formation fails to recharge, or consistent values (i.e., less than 10% variance between consecutive readings) are obtained for pH, temperature and conductivity. Subsequent to sufficient recharge, one groundwater sample will be collected from each of the groundwater monitoring wells utilizing a new, disposable, polypropylene bailer or low-flow sampling equipment.

Groundwater samples will be placed in laboratory-supplied containers appropriate to the analyses requested and placed on ice in a cooler. Sample coolers and completed chain-of-custody forms will be delivered to Trace Analysis Inc., of Lubbock, Texas for analysis of chloride utilizing EPA Method 300.0, VOCs utilizing with EPA SW-846 Method 8260, PAHs utilizing EPA SW-846 Method 8270 and Total Dissolved Solids (TDS) utilizing SM 2540 C. The groundwater sample collected from monitoring well MW-6 will also be analyzed for RCRA 8 Metals along with copper, iron and manganese utilizing EPA SW-846 6020/7470 and fluoride, nitrate, and sulfate utilizing EPA Method 300.0.

### **4.4 Groundwater Sampling Plan**

Upon receiving laboratory analytical data from initial groundwater samples, each of the on-site groundwater monitoring wells will be gauged and sampled on a quarterly basis using EPA Standard Methods. Groundwater samples will be analyzed for BTEX utilizing EPA SW-846 Method 8021 and chloride utilizing EPA Method 300.0.

### **4.5 Reporting**

The results of initial and quarterly groundwater monitoring activities will be submitted to the NMOCD in an *Annual Groundwater Monitoring Report* to be issued on an initial frequency approved by the NMOCD coordinator. The *Annual Groundwater Monitoring Report* will include a summary of laboratory analytical results from initial and quarterly groundwater sampling events, gauging data, groundwater concentrations maps, groundwater gradient maps, laboratory analytical reports along with proposed activities for the 2016 reporting period.

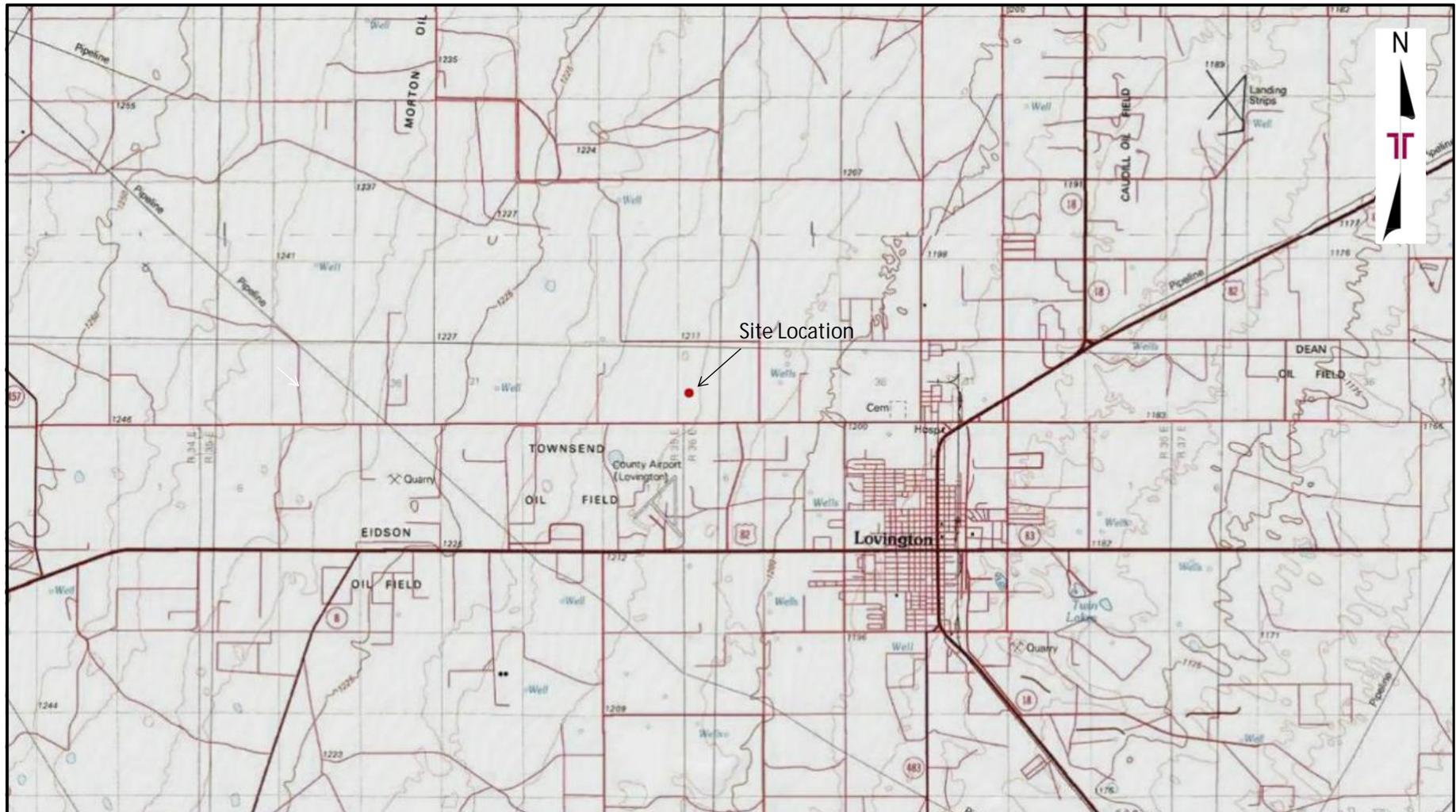
## **5.0 MANAGEMENT OF INVESTIGATION DERIVED WASTES**

Drill cuttings and development water derived during the installation of MW-6 and purge water from groundwater sampling activities will be containerized in 55-gallon drums, pending the results of laboratory analysis. Drums will be labeled to identify the apparent contents and the initial accumulation date. Upon receipt of laboratory analytical results, the contents of the drums will be properly disposed of at an NMOCD-approved disposal facility, if necessary.

## **APPENDIX A – FIGURES**

Figure 1 – Topographic Map

Figure 2 – Site Diagram



Project No.	AR157026
Scale:	1" ~ 7,000'
Source:	Google Earth
Date:	2014

**Terracon**  
 Consulting Engineers & Scientists  
 5827 50<sup>th</sup> St. Suite 1 Lubbock, Texas 79424  
 PH. (806) 300-0104 FAX. (806) 797 0947

Figure 1– Topographic Map  
 West Lovington Strawn Unit #8  
 32.971362° N, -103.401210 ° W  
 Lea County, New Mexico



Project No.	AR157026
Scale:	1" ~ 110'
Source:	Google Earth
Date:	2014

**Terracon**  
 Consulting Engineers & Scientists  
 5827 50<sup>th</sup> St. Suite 1 Lubbock, Texas 79424  
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Figure 2 – Site Diagram  
 West Lovington Strawn Unit #8  
 32.971362° N, -103.401210° W  
 Lea County, New Mexico

## **APPENDIX B – TABLES**

Table 1 – Historical Groundwater Chemistry – Chloride, VOCs  
and PAHs

<b>TABLE 1</b> <b>HISTORICAL GROUNDWATER CHEMISTRY - Chloride<sup>1</sup>, VOCs<sup>2</sup> and PAHs<sup>3</sup></b> West Lovington Strawn Unit #8 U/L L, Section 34, Township 15 South, Range 35 East Lovington, New Mexico Terracon Project No. AR157026				
Sample I.D.	Sample Date	Chlorides <sup>1</sup> (mg/L)	VOCs <sup>2</sup> (mg/L)	PAHs <sup>3</sup> (mg/L)
MW-1	12/13/12	27	ND	Phenanthrene - 0.62
MW-2	12/13/12	130	ND	Phenanthrene - 0.94 Fluoranthene - 0.56 Pyrene - 0.33
MW-3	12/13/12	28	ND	Phenanthrene - 0.85
MW-4	12/13/12	<b>390</b>	ND	Phenanthrene - 0.84
MW-5	12/13/12	23	ND	Phenanthrene - 0.6
<b>New Mexico Water Quality Control Commission Human Health Standards<sup>4</sup></b>		<b>250</b>		<b>Phenanthrene - NE Flouranthene - NE Pyrene - NE</b>

1. Chloride = Anions analyzed by EPA Method 300.0

2. VOCs = Volatile organic compounds analyzed by EPA Method 8260B

3. PAHs = Polycyclic aromatic hydrocarbons analyzed by EPA Method 8310C

4. Defined in Subsections A and B of Section 20.6.2.3103 of the New Mexico Administrative Code

5. Only those constituents detected above the laboratory reporting limits (RLs) are reported.

ND=Not detected at the Reporting Limit

NE = Not Established

**Bold denotes concentrations that exceed NMWQCC Human Health Standards**

## **APPENDIX C**

### Historical Laboratory Analytical Reports





Hall Environmental Analysis Laboratory  
4901 Hawkins NE  
Albuquerque, NM 87109  
TEL: 505-345-3975 FAX: 505-345-4107  
Website: [www.hallenvironmental.com](http://www.hallenvironmental.com)

December 27, 2012

Dr. K. Havenor  
Energen Resources Corp  
3300 North "A" Street Bldg 4 Suite 100  
Midland, Texas 79705  
TEL: (432) 668-3337  
FAX

RE: #8-R Sec 34 T15S-R35E 1980 FSL & 660 FWL

OrderNo.: 1212686

Dear Dr. K. Havenor:

Hall Environmental Analysis Laboratory received 6 sample(s) on 12/15/2012 for the analyses presented in the following report.

These were analyzed according to EPA procedures or equivalent. To access our accredited tests please go to [www.hallenvironmental.com](http://www.hallenvironmental.com) or the state specific web sites. See the sample checklist and/or the Chain of Custody for information regarding the sample receipt temperature and preservation. Data qualifiers or a narrative will be provided if the sample analysis or analytical quality control parameters require a flag. All samples are reported as received unless otherwise indicated. Lab measurement of analytes considered field parameters that require analysis within 15 minutes of sampling such as pH and residual chlorine are qualified as being analyzed outside of the recommended holding time.

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

Sincerely,

A handwritten signature in black ink, appearing to read "Andy Freeman", is written in a cursive style.

Andy Freeman  
Laboratory Manager  
4901 Hawkins NE  
Albuquerque, NM 87109

# Hall Environmental Analysis Laboratory, Inc.

Analytical Report

Lab Order 1212686

Date Reported: 12/27/2012

CLIENT: Energen Resources Corp

Client Sample ID: MW-1

Project: #8-R Sec 34 T15S-R35E 1980 FSL & 66

Collection Date: 12/13/2012 11:00:00 AM

Lab ID: 1212686-001

Matrix: AQUEOUS

Received Date: 12/15/2012 12:00:00 PM

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
<b>EPA METHOD 8310: PAHS</b>						Analyst: SCC
Naphthalene	ND	2.0		µg/L	1	12/21/2012 3:52:57 AM
1-Methylnaphthalene	ND	2.0		µg/L	1	12/21/2012 3:52:57 AM
2-Methylnaphthalene	ND	2.0		µg/L	1	12/21/2012 3:52:57 AM
Acenaphthylene	ND	2.5		µg/L	1	12/21/2012 3:52:57 AM
Acenaphthene	ND	5.0		µg/L	1	12/21/2012 3:52:57 AM
Fluorene	ND	0.80		µg/L	1	12/21/2012 3:52:57 AM
Phenanthrene	0.62	0.60		µg/L	1	12/21/2012 3:52:57 AM
Anthracene	ND	0.60		µg/L	1	12/21/2012 3:52:57 AM
Fluoranthene	ND	0.30		µg/L	1	12/21/2012 3:52:57 AM
Pyrene	ND	0.30		µg/L	1	12/21/2012 3:52:57 AM
Benz(a)anthracene	ND	0.070		µg/L	1	12/21/2012 3:52:57 AM
Chrysene	ND	0.20		µg/L	1	12/21/2012 3:52:57 AM
Benzo(b)fluoranthene	ND	0.10		µg/L	1	12/21/2012 3:52:57 AM
Benzo(k)fluoranthene	ND	0.070		µg/L	1	12/21/2012 3:52:57 AM
Benzo(a)pyrene	ND	0.070		µg/L	1	12/21/2012 3:52:57 AM
Dibenz(a,h)anthracene	ND	0.12		µg/L	1	12/21/2012 3:52:57 AM
Benzo(g,h,i)perylene	ND	0.080		µg/L	1	12/21/2012 3:52:57 AM
Indeno(1,2,3-cd)pyrene	ND	0.080		µg/L	1	12/21/2012 3:52:57 AM
Surr: Benzo(e)pyrene	55.3	46.4-106		%REC	1	12/21/2012 3:52:57 AM
<b>EPA METHOD 300.0: ANIONS</b>						Analyst: JRR
Chloride	27	10		mg/L	20	12/17/2012 2:32:08 PM
<b>EPA METHOD 8260B: VOLATILES</b>						Analyst: RAA
Benzene	ND	1.0		µg/L	1	12/19/2012 7:49:15 PM
Toluene	ND	1.0		µg/L	1	12/19/2012 7:49:15 PM
Ethylbenzene	ND	1.0		µg/L	1	12/19/2012 7:49:15 PM
Methyl tert-butyl ether (MTBE)	ND	1.0		µg/L	1	12/19/2012 7:49:15 PM
1,2,4-Trimethylbenzene	ND	1.0		µg/L	1	12/19/2012 7:49:15 PM
1,3,5-Trimethylbenzene	ND	1.0		µg/L	1	12/19/2012 7:49:15 PM
1,2-Dichloroethane (EDC)	ND	1.0		µg/L	1	12/19/2012 7:49:15 PM
1,2-Dibromoethane (EDB)	ND	1.0		µg/L	1	12/19/2012 7:49:15 PM
Naphthalene	ND	2.0		µg/L	1	12/19/2012 7:49:15 PM
1-Methylnaphthalene	ND	4.0		µg/L	1	12/19/2012 7:49:15 PM
2-Methylnaphthalene	ND	4.0		µg/L	1	12/19/2012 7:49:15 PM
Acetone	ND	10		µg/L	1	12/19/2012 7:49:15 PM
Bromobenzene	ND	1.0		µg/L	1	12/19/2012 7:49:15 PM
Bromodichloromethane	ND	1.0		µg/L	1	12/19/2012 7:49:15 PM
Bromoform	ND	1.0		µg/L	1	12/19/2012 7:49:15 PM
Bromomethane	ND	3.0		µg/L	1	12/19/2012 7:49:15 PM
2-Butanone	ND	10		µg/L	1	12/19/2012 7:49:15 PM
Carbon disulfide	ND	10		µg/L	1	12/19/2012 7:49:15 PM
Carbon Tetrachloride	ND	1.0		µg/L	1	12/19/2012 7:49:15 PM

**Qualifiers:**

- \* Value exceeds Maximum Contaminant Level.
- E Value above quantitation range
- J Analyte detected below quantitation limits
- P Sample pH greater than 2
- RL Reporting Detection Limit

- B Analyte detected in the associated Method Blank
- H Holding times for preparation or analysis exceeded
- ND Not Detected at the Reporting Limit
- R RPD outside accepted recovery limits
- S Spike Recovery outside accepted recovery limits

# Hall Environmental Analysis Laboratory, Inc.

Analytical Report

Lab Order 1212686

Date Reported: 12/27/2012

CLIENT: Energen Resources Corp

Client Sample ID: MW-1

Project: #8-R Sec 34 T15S-R35E 1980 FSL & 66

Collection Date: 12/13/2012 11:00:00 AM

Lab ID: 1212686-001

Matrix: AQUEOUS

Received Date: 12/15/2012 12:00:00 PM

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
<b>EPA METHOD 8260B: VOLATILES</b>						Analyst: RAA
Chlorobenzene	ND	1.0		µg/L	1	12/19/2012 7:49:15 PM
Chloroethane	ND	2.0		µg/L	1	12/19/2012 7:49:15 PM
Chloroform	ND	1.0		µg/L	1	12/19/2012 7:49:15 PM
Chloromethane	ND	3.0		µg/L	1	12/19/2012 7:49:15 PM
2-Chlorotoluene	ND	1.0		µg/L	1	12/19/2012 7:49:15 PM
4-Chlorotoluene	ND	1.0		µg/L	1	12/19/2012 7:49:15 PM
cis-1,2-DCE	ND	1.0		µg/L	1	12/19/2012 7:49:15 PM
cis-1,3-Dichloropropene	ND	1.0		µg/L	1	12/19/2012 7:49:15 PM
1,2-Dibromo-3-chloropropane	ND	2.0		µg/L	1	12/19/2012 7:49:15 PM
Dibromochloromethane	ND	1.0		µg/L	1	12/19/2012 7:49:15 PM
Dibromomethane	ND	1.0		µg/L	1	12/19/2012 7:49:15 PM
1,2-Dichlorobenzene	ND	1.0		µg/L	1	12/19/2012 7:49:15 PM
1,3-Dichlorobenzene	ND	1.0		µg/L	1	12/19/2012 7:49:15 PM
1,4-Dichlorobenzene	ND	1.0		µg/L	1	12/19/2012 7:49:15 PM
Dichlorodifluoromethane	ND	1.0		µg/L	1	12/19/2012 7:49:15 PM
1,1-Dichloroethane	ND	1.0		µg/L	1	12/19/2012 7:49:15 PM
1,1-Dichloroethene	ND	1.0		µg/L	1	12/19/2012 7:49:15 PM
1,2-Dichloropropane	ND	1.0		µg/L	1	12/19/2012 7:49:15 PM
1,3-Dichloropropane	ND	1.0		µg/L	1	12/19/2012 7:49:15 PM
2,2-Dichloropropane	ND	2.0		µg/L	1	12/19/2012 7:49:15 PM
1,1-Dichloropropene	ND	1.0		µg/L	1	12/19/2012 7:49:15 PM
Hexachlorobutadiene	ND	1.0		µg/L	1	12/19/2012 7:49:15 PM
2-Hexanone	ND	10		µg/L	1	12/19/2012 7:49:15 PM
Isopropylbenzene	ND	1.0		µg/L	1	12/19/2012 7:49:15 PM
4-Isopropyltoluene	ND	1.0		µg/L	1	12/19/2012 7:49:15 PM
4-Methyl-2-pentanone	ND	10		µg/L	1	12/19/2012 7:49:15 PM
Methylene Chloride	ND	3.0		µg/L	1	12/19/2012 7:49:15 PM
n-Butylbenzene	ND	3.0		µg/L	1	12/19/2012 7:49:15 PM
n-Propylbenzene	ND	1.0		µg/L	1	12/19/2012 7:49:15 PM
sec-Butylbenzene	ND	1.0		µg/L	1	12/19/2012 7:49:15 PM
Styrene	ND	1.0		µg/L	1	12/19/2012 7:49:15 PM
tert-Butylbenzene	ND	1.0		µg/L	1	12/19/2012 7:49:15 PM
1,1,1,2-Tetrachloroethane	ND	1.0		µg/L	1	12/19/2012 7:49:15 PM
1,1,2,2-Tetrachloroethane	ND	2.0		µg/L	1	12/19/2012 7:49:15 PM
Tetrachloroethene (PCE)	ND	1.0		µg/L	1	12/19/2012 7:49:15 PM
trans-1,2-DCE	ND	1.0		µg/L	1	12/19/2012 7:49:15 PM
trans-1,3-Dichloropropene	ND	1.0		µg/L	1	12/19/2012 7:49:15 PM
1,2,3-Trichlorobenzene	ND	1.0		µg/L	1	12/19/2012 7:49:15 PM
1,2,4-Trichlorobenzene	ND	1.0		µg/L	1	12/19/2012 7:49:15 PM
1,1,1-Trichloroethane	ND	1.0		µg/L	1	12/19/2012 7:49:15 PM
1,1,2-Trichloroethane	ND	1.0		µg/L	1	12/19/2012 7:49:15 PM
Trichloroethene (TCE)	ND	1.0		µg/L	1	12/19/2012 7:49:15 PM

**Qualifiers:**

- \* Value exceeds Maximum Contaminant Level.
- E Value above quantitation range
- J Analyte detected below quantitation limits
- P Sample pH greater than 2
- RL Reporting Detection Limit

- B Analyte detected in the associated Method Blank
- H Holding times for preparation or analysis exceeded
- ND Not Detected at the Reporting Limit
- R RPD outside accepted recovery limits
- S Spike Recovery outside accepted recovery limits

# Hall Environmental Analysis Laboratory, Inc.

Analytical Report

Lab Order 1212686

Date Reported: 12/27/2012

**CLIENT:** Energen Resources Corp

**Client Sample ID:** MW-1

**Project:** #8-R Sec 34 T15S-R35E 1980 FSL & 66

**Collection Date:** 12/13/2012 11:00:00 AM

**Lab ID:** 1212686-001

**Matrix:** AQUEOUS

**Received Date:** 12/15/2012 12:00:00 PM

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
<b>EPA METHOD 8260B: VOLATILES</b>						Analyst: RAA
Trichlorofluoromethane	ND	1.0		µg/L	1	12/19/2012 7:49:15 PM
1,2,3-Trichloropropane	ND	2.0		µg/L	1	12/19/2012 7:49:15 PM
Vinyl chloride	ND	1.0		µg/L	1	12/19/2012 7:49:15 PM
Xylenes, Total	ND	1.5		µg/L	1	12/19/2012 7:49:15 PM
Surr: 1,2-Dichloroethane-d4	94.2	70-130		%REC	1	12/19/2012 7:49:15 PM
Surr: 4-Bromofluorobenzene	105	70-130		%REC	1	12/19/2012 7:49:15 PM
Surr: Dibromofluoromethane	89.9	70-130		%REC	1	12/19/2012 7:49:15 PM
Surr: Toluene-d8	99.0	70-130		%REC	1	12/19/2012 7:49:15 PM

**Qualifiers:**

- \* Value exceeds Maximum Contaminant Level.
- E Value above quantitation range
- J Analyte detected below quantitation limits
- P Sample pH greater than 2
- RL Reporting Detection Limit

- B Analyte detected in the associated Method Blank
- H Holding times for preparation or analysis exceeded
- ND Not Detected at the Reporting Limit
- R RPD outside accepted recovery limits
- S Spike Recovery outside accepted recovery limits

# Hall Environmental Analysis Laboratory, Inc.

Analytical Report

Lab Order 1212686

Date Reported: 12/27/2012

CLIENT: Energen Resources Corp

Client Sample ID: MW-3

Project: #8-R Sec 34 T15S-R35E 1980 FSL & 66

Collection Date: 12/13/2012 11:55:00 AM

Lab ID: 1212686-002

Matrix: AQUEOUS

Received Date: 12/15/2012 12:00:00 PM

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
<b>EPA METHOD 8310: PAHS</b>						Analyst: SCC
Naphthalene	ND	2.0		µg/L	1	12/21/2012 4:22:14 AM
1-Methylnaphthalene	ND	2.0		µg/L	1	12/21/2012 4:22:14 AM
2-Methylnaphthalene	ND	2.0		µg/L	1	12/21/2012 4:22:14 AM
Acenaphthylene	ND	2.5		µg/L	1	12/21/2012 4:22:14 AM
Acenaphthene	ND	5.0		µg/L	1	12/21/2012 4:22:14 AM
Fluorene	ND	0.80		µg/L	1	12/21/2012 4:22:14 AM
Phenanthrene	0.85	0.60		µg/L	1	12/21/2012 4:22:14 AM
Anthracene	ND	0.60		µg/L	1	12/21/2012 4:22:14 AM
Fluoranthene	ND	0.30		µg/L	1	12/21/2012 4:22:14 AM
Pyrene	ND	0.30		µg/L	1	12/21/2012 4:22:14 AM
Benz(a)anthracene	ND	0.070		µg/L	1	12/21/2012 4:22:14 AM
Chrysene	ND	0.20		µg/L	1	12/21/2012 4:22:14 AM
Benzo(b)fluoranthene	ND	0.10		µg/L	1	12/21/2012 4:22:14 AM
Benzo(k)fluoranthene	ND	0.070		µg/L	1	12/21/2012 4:22:14 AM
Benzo(a)pyrene	ND	0.070		µg/L	1	12/21/2012 4:22:14 AM
Dibenz(a,h)anthracene	ND	0.12		µg/L	1	12/21/2012 4:22:14 AM
Benzo(g,h,i)perylene	ND	0.080		µg/L	1	12/21/2012 4:22:14 AM
Indeno(1,2,3-cd)pyrene	ND	0.080		µg/L	1	12/21/2012 4:22:14 AM
Surr: Benzo(e)pyrene	68.8	46.4-106		%REC	1	12/21/2012 4:22:14 AM
<b>EPA METHOD 300.0: ANIONS</b>						Analyst: JRR
Chloride	28	10		mg/L	20	12/17/2012 3:21:47 PM
<b>EPA METHOD 8260B: VOLATILES</b>						Analyst: RAA
Benzene	ND	1.0		µg/L	1	12/19/2012 8:17:25 PM
Toluene	ND	1.0		µg/L	1	12/19/2012 8:17:25 PM
Ethylbenzene	ND	1.0		µg/L	1	12/19/2012 8:17:25 PM
Methyl tert-butyl ether (MTBE)	ND	1.0		µg/L	1	12/19/2012 8:17:25 PM
1,2,4-Trimethylbenzene	ND	1.0		µg/L	1	12/19/2012 8:17:25 PM
1,3,5-Trimethylbenzene	ND	1.0		µg/L	1	12/19/2012 8:17:25 PM
1,2-Dichloroethane (EDC)	ND	1.0		µg/L	1	12/19/2012 8:17:25 PM
1,2-Dibromoethane (EDB)	ND	1.0		µg/L	1	12/19/2012 8:17:25 PM
Naphthalene	ND	2.0		µg/L	1	12/19/2012 8:17:25 PM
1-Methylnaphthalene	ND	4.0		µg/L	1	12/19/2012 8:17:25 PM
2-Methylnaphthalene	ND	4.0		µg/L	1	12/19/2012 8:17:25 PM
Acetone	ND	10		µg/L	1	12/19/2012 8:17:25 PM
Bromobenzene	ND	1.0		µg/L	1	12/19/2012 8:17:25 PM
Bromodichloromethane	ND	1.0		µg/L	1	12/19/2012 8:17:25 PM
Bromoform	ND	1.0		µg/L	1	12/19/2012 8:17:25 PM
Bromomethane	ND	3.0		µg/L	1	12/19/2012 8:17:25 PM
2-Butanone	ND	10		µg/L	1	12/19/2012 8:17:25 PM
Carbon disulfide	ND	10		µg/L	1	12/19/2012 8:17:25 PM
Carbon Tetrachloride	ND	1.0		µg/L	1	12/19/2012 8:17:25 PM

**Qualifiers:**

- \* Value exceeds Maximum Contaminant Level.
- E Value above quantitation range
- J Analyte detected below quantitation limits
- P Sample pH greater than 2
- RL Reporting Detection Limit

- B Analyte detected in the associated Method Blank
- H Holding times for preparation or analysis exceeded
- ND Not Detected at the Reporting Limit
- R RPD outside accepted recovery limits
- S Spike Recovery outside accepted recovery limits

# Hall Environmental Analysis Laboratory, Inc.

Analytical Report

Lab Order 1212686

Date Reported: 12/27/2012

CLIENT: Energen Resources Corp

Client Sample ID: MW-3

Project: #8-R Sec 34 T15S-R35E 1980 FSL & 66

Collection Date: 12/13/2012 11:55:00 AM

Lab ID: 1212686-002

Matrix: AQUEOUS

Received Date: 12/15/2012 12:00:00 PM

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
<b>EPA METHOD 8260B: VOLATILES</b>						Analyst: RAA
Chlorobenzene	ND	1.0		µg/L	1	12/19/2012 8:17:25 PM
Chloroethane	ND	2.0		µg/L	1	12/19/2012 8:17:25 PM
Chloroform	ND	1.0		µg/L	1	12/19/2012 8:17:25 PM
Chloromethane	ND	3.0		µg/L	1	12/19/2012 8:17:25 PM
2-Chlorotoluene	ND	1.0		µg/L	1	12/19/2012 8:17:25 PM
4-Chlorotoluene	ND	1.0		µg/L	1	12/19/2012 8:17:25 PM
cis-1,2-DCE	ND	1.0		µg/L	1	12/19/2012 8:17:25 PM
cis-1,3-Dichloropropene	ND	1.0		µg/L	1	12/19/2012 8:17:25 PM
1,2-Dibromo-3-chloropropane	ND	2.0		µg/L	1	12/19/2012 8:17:25 PM
Dibromochloromethane	ND	1.0		µg/L	1	12/19/2012 8:17:25 PM
Dibromomethane	ND	1.0		µg/L	1	12/19/2012 8:17:25 PM
1,2-Dichlorobenzene	ND	1.0		µg/L	1	12/19/2012 8:17:25 PM
1,3-Dichlorobenzene	ND	1.0		µg/L	1	12/19/2012 8:17:25 PM
1,4-Dichlorobenzene	ND	1.0		µg/L	1	12/19/2012 8:17:25 PM
Dichlorodifluoromethane	ND	1.0		µg/L	1	12/19/2012 8:17:25 PM
1,1-Dichloroethane	ND	1.0		µg/L	1	12/19/2012 8:17:25 PM
1,1-Dichloroethene	ND	1.0		µg/L	1	12/19/2012 8:17:25 PM
1,2-Dichloropropane	ND	1.0		µg/L	1	12/19/2012 8:17:25 PM
1,3-Dichloropropane	ND	1.0		µg/L	1	12/19/2012 8:17:25 PM
2,2-Dichloropropane	ND	2.0		µg/L	1	12/19/2012 8:17:25 PM
1,1-Dichloropropene	ND	1.0		µg/L	1	12/19/2012 8:17:25 PM
Hexachlorobutadiene	ND	1.0		µg/L	1	12/19/2012 8:17:25 PM
2-Hexanone	ND	10		µg/L	1	12/19/2012 8:17:25 PM
Isopropylbenzene	ND	1.0		µg/L	1	12/19/2012 8:17:25 PM
4-Isopropyltoluene	ND	1.0		µg/L	1	12/19/2012 8:17:25 PM
4-Methyl-2-pentanone	ND	10		µg/L	1	12/19/2012 8:17:25 PM
Methylene Chloride	ND	3.0		µg/L	1	12/19/2012 8:17:25 PM
n-Butylbenzene	ND	3.0		µg/L	1	12/19/2012 8:17:25 PM
n-Propylbenzene	ND	1.0		µg/L	1	12/19/2012 8:17:25 PM
sec-Butylbenzene	ND	1.0		µg/L	1	12/19/2012 8:17:25 PM
Styrene	ND	1.0		µg/L	1	12/19/2012 8:17:25 PM
tert-Butylbenzene	ND	1.0		µg/L	1	12/19/2012 8:17:25 PM
1,1,1,2-Tetrachloroethane	ND	1.0		µg/L	1	12/19/2012 8:17:25 PM
1,1,2,2-Tetrachloroethane	ND	2.0		µg/L	1	12/19/2012 8:17:25 PM
Tetrachloroethene (PCE)	ND	1.0		µg/L	1	12/19/2012 8:17:25 PM
trans-1,2-DCE	ND	1.0		µg/L	1	12/19/2012 8:17:25 PM
trans-1,3-Dichloropropene	ND	1.0		µg/L	1	12/19/2012 8:17:25 PM
1,2,3-Trichlorobenzene	ND	1.0		µg/L	1	12/19/2012 8:17:25 PM
1,2,4-Trichlorobenzene	ND	1.0		µg/L	1	12/19/2012 8:17:25 PM
1,1,1-Trichloroethane	ND	1.0		µg/L	1	12/19/2012 8:17:25 PM
1,1,2-Trichloroethane	ND	1.0		µg/L	1	12/19/2012 8:17:25 PM
Trichloroethene (TCE)	ND	1.0		µg/L	1	12/19/2012 8:17:25 PM

**Qualifiers:**

- \* Value exceeds Maximum Contaminant Level.
- E Value above quantitation range
- J Analyte detected below quantitation limits
- P Sample pH greater than 2
- RL Reporting Detection Limit

- B Analyte detected in the associated Method Blank
- H Holding times for preparation or analysis exceeded
- ND Not Detected at the Reporting Limit
- R RPD outside accepted recovery limits
- S Spike Recovery outside accepted recovery limits

Hall Environmental Analysis Laboratory, Inc.

CLIENT: Energen Resources Corp

Client Sample ID: MW-3

Project: #8-R Sec 34 T15S-R35E 1980 FSL & 66

Collection Date: 12/13/2012 11:55:00 AM

Lab ID: 1212686-002

Matrix: AQUEOUS

Received Date: 12/15/2012 12:00:00 PM

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
<b>EPA METHOD 8260B: VOLATILES</b>						Analyst: RAA
Trichlorofluoromethane	ND	1.0		µg/L	1	12/19/2012 8:17:25 PM
1,2,3-Trichloropropane	ND	2.0		µg/L	1	12/19/2012 8:17:25 PM
Vinyl chloride	ND	1.0		µg/L	1	12/19/2012 8:17:25 PM
Xylenes, Total	ND	1.5		µg/L	1	12/19/2012 8:17:25 PM
Surr: 1,2-Dichloroethane-d4	95.1	70-130		%REC	1	12/19/2012 8:17:25 PM
Surr: 4-Bromofluorobenzene	104	70-130		%REC	1	12/19/2012 8:17:25 PM
Surr: Dibromofluoromethane	91.9	70-130		%REC	1	12/19/2012 8:17:25 PM
Surr: Toluene-d8	99.6	70-130		%REC	1	12/19/2012 8:17:25 PM

**Qualifiers:**

- \* Value exceeds Maximum Contaminant Level.
- E Value above quantitation range
- J Analyte detected below quantitation limits
- P Sample pH greater than 2
- RL Reporting Detection Limit

- B Analyte detected in the associated Method Blank
- H Holding times for preparation or analysis exceeded
- ND Not Detected at the Reporting Limit
- R RPD outside accepted recovery limits
- S Spike Recovery outside accepted recovery limits

# Hall Environmental Analysis Laboratory, Inc.

Analytical Report

Lab Order 1212686

Date Reported: 12/27/2012

CLIENT: Energen Resources Corp

Client Sample ID: MW-2

Project: #8-R Sec 34 T15S-R35E 1980 FSL & 66

Collection Date: 12/13/2012 12:50:00 PM

Lab ID: 1212686-003

Matrix: AQUEOUS

Received Date: 12/15/2012 12:00:00 PM

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
<b>EPA METHOD 8310: PAHS</b>						Analyst: SCC
Naphthalene	ND	2.0		µg/L	1	12/21/2012 4:51:37 AM
1-Methylnaphthalene	ND	2.0		µg/L	1	12/21/2012 4:51:37 AM
2-Methylnaphthalene	ND	2.0		µg/L	1	12/21/2012 4:51:37 AM
Acenaphthylene	ND	2.5		µg/L	1	12/21/2012 4:51:37 AM
Acenaphthene	ND	5.0		µg/L	1	12/21/2012 4:51:37 AM
Fluorene	ND	0.80		µg/L	1	12/21/2012 4:51:37 AM
Phenanthrene	0.94	0.60		µg/L	1	12/21/2012 4:51:37 AM
Anthracene	ND	0.60		µg/L	1	12/21/2012 4:51:37 AM
Fluoranthene	0.56	0.30		µg/L	1	12/21/2012 4:51:37 AM
Pyrene	0.33	0.30		µg/L	1	12/21/2012 4:51:37 AM
Benz(a)anthracene	ND	0.070		µg/L	1	12/21/2012 4:51:37 AM
Chrysene	ND	0.20		µg/L	1	12/21/2012 4:51:37 AM
Benzo(b)fluoranthene	ND	0.10		µg/L	1	12/21/2012 4:51:37 AM
Benzo(k)fluoranthene	ND	0.070		µg/L	1	12/21/2012 4:51:37 AM
Benzo(a)pyrene	ND	0.070		µg/L	1	12/21/2012 4:51:37 AM
Dibenz(a,h)anthracene	ND	0.12		µg/L	1	12/21/2012 4:51:37 AM
Benzo(g,h,i)perylene	ND	0.080		µg/L	1	12/21/2012 4:51:37 AM
Indeno(1,2,3-cd)pyrene	ND	0.080		µg/L	1	12/21/2012 4:51:37 AM
Surr: Benzo(e)pyrene	73.8	46.4-106		%REC	1	12/21/2012 4:51:37 AM
<b>EPA METHOD 300.0: ANIONS</b>						Analyst: JRR
Chloride	130	10		mg/L	20	12/17/2012 3:46:35 PM
<b>EPA METHOD 8260B: VOLATILES</b>						Analyst: RAA
Benzene	ND	1.0		µg/L	1	12/19/2012 8:45:21 PM
Toluene	ND	1.0		µg/L	1	12/19/2012 8:45:21 PM
Ethylbenzene	ND	1.0		µg/L	1	12/19/2012 8:45:21 PM
Methyl tert-butyl ether (MTBE)	ND	1.0		µg/L	1	12/19/2012 8:45:21 PM
1,2,4-Trimethylbenzene	ND	1.0		µg/L	1	12/19/2012 8:45:21 PM
1,3,5-Trimethylbenzene	ND	1.0		µg/L	1	12/19/2012 8:45:21 PM
1,2-Dichloroethane (EDC)	ND	1.0		µg/L	1	12/19/2012 8:45:21 PM
1,2-Dibromoethane (EDB)	ND	1.0		µg/L	1	12/19/2012 8:45:21 PM
Naphthalene	ND	2.0		µg/L	1	12/19/2012 8:45:21 PM
1-Methylnaphthalene	ND	4.0		µg/L	1	12/19/2012 8:45:21 PM
2-Methylnaphthalene	ND	4.0		µg/L	1	12/19/2012 8:45:21 PM
Acetone	ND	10		µg/L	1	12/19/2012 8:45:21 PM
Bromobenzene	ND	1.0		µg/L	1	12/19/2012 8:45:21 PM
Bromodichloromethane	ND	1.0		µg/L	1	12/19/2012 8:45:21 PM
Bromoform	ND	1.0		µg/L	1	12/19/2012 8:45:21 PM
Bromomethane	ND	3.0		µg/L	1	12/19/2012 8:45:21 PM
2-Butanone	ND	10		µg/L	1	12/19/2012 8:45:21 PM
Carbon disulfide	ND	10		µg/L	1	12/19/2012 8:45:21 PM
Carbon Tetrachloride	ND	1.0		µg/L	1	12/19/2012 8:45:21 PM

**Qualifiers:**

- \* Value exceeds Maximum Contaminant Level.
- E Value above quantitation range
- J Analyte detected below quantitation limits
- P Sample pH greater than 2
- RL Reporting Detection Limit

- B Analyte detected in the associated Method Blank
- H Holding times for preparation or analysis exceeded
- ND Not Detected at the Reporting Limit
- R RPD outside accepted recovery limits
- S Spike Recovery outside accepted recovery limits

# Hall Environmental Analysis Laboratory, Inc.

Analytical Report

Lab Order 1212686

Date Reported: 12/27/2012

CLIENT: Energen Resources Corp

Client Sample ID: MW-2

Project: #8-R Sec 34 T15S-R35E 1980 FSL & 66

Collection Date: 12/13/2012 12:50:00 PM

Lab ID: 1212686-003

Matrix: AQUEOUS

Received Date: 12/15/2012 12:00:00 PM

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
<b>EPA METHOD 8260B: VOLATILES</b>						Analyst: RAA
Chlorobenzene	ND	1.0		µg/L	1	12/19/2012 8:45:21 PM
Chloroethane	ND	2.0		µg/L	1	12/19/2012 8:45:21 PM
Chloroform	ND	1.0		µg/L	1	12/19/2012 8:45:21 PM
Chloromethane	ND	3.0		µg/L	1	12/19/2012 8:45:21 PM
2-Chlorotoluene	ND	1.0		µg/L	1	12/19/2012 8:45:21 PM
4-Chlorotoluene	ND	1.0		µg/L	1	12/19/2012 8:45:21 PM
cis-1,2-DCE	ND	1.0		µg/L	1	12/19/2012 8:45:21 PM
cis-1,3-Dichloropropene	ND	1.0		µg/L	1	12/19/2012 8:45:21 PM
1,2-Dibromo-3-chloropropane	ND	2.0		µg/L	1	12/19/2012 8:45:21 PM
Dibromochloromethane	ND	1.0		µg/L	1	12/19/2012 8:45:21 PM
Dibromomethane	ND	1.0		µg/L	1	12/19/2012 8:45:21 PM
1,2-Dichlorobenzene	ND	1.0		µg/L	1	12/19/2012 8:45:21 PM
1,3-Dichlorobenzene	ND	1.0		µg/L	1	12/19/2012 8:45:21 PM
1,4-Dichlorobenzene	ND	1.0		µg/L	1	12/19/2012 8:45:21 PM
Dichlorodifluoromethane	ND	1.0		µg/L	1	12/19/2012 8:45:21 PM
1,1-Dichloroethane	ND	1.0		µg/L	1	12/19/2012 8:45:21 PM
1,1-Dichloroethene	ND	1.0		µg/L	1	12/19/2012 8:45:21 PM
1,2-Dichloropropane	ND	1.0		µg/L	1	12/19/2012 8:45:21 PM
1,3-Dichloropropane	ND	1.0		µg/L	1	12/19/2012 8:45:21 PM
2,2-Dichloropropane	ND	2.0		µg/L	1	12/19/2012 8:45:21 PM
1,1-Dichloropropene	ND	1.0		µg/L	1	12/19/2012 8:45:21 PM
Hexachlorobutadiene	ND	1.0		µg/L	1	12/19/2012 8:45:21 PM
2-Hexanone	ND	10		µg/L	1	12/19/2012 8:45:21 PM
Isopropylbenzene	ND	1.0		µg/L	1	12/19/2012 8:45:21 PM
4-Isopropyltoluene	ND	1.0		µg/L	1	12/19/2012 8:45:21 PM
4-Methyl-2-pentanone	ND	10		µg/L	1	12/19/2012 8:45:21 PM
Methylene Chloride	ND	3.0		µg/L	1	12/19/2012 8:45:21 PM
n-Butylbenzene	ND	3.0		µg/L	1	12/19/2012 8:45:21 PM
n-Propylbenzene	ND	1.0		µg/L	1	12/19/2012 8:45:21 PM
sec-Butylbenzene	ND	1.0		µg/L	1	12/19/2012 8:45:21 PM
Styrene	ND	1.0		µg/L	1	12/19/2012 8:45:21 PM
tert-Butylbenzene	ND	1.0		µg/L	1	12/19/2012 8:45:21 PM
1,1,1,2-Tetrachloroethane	ND	1.0		µg/L	1	12/19/2012 8:45:21 PM
1,1,2,2-Tetrachloroethane	ND	2.0		µg/L	1	12/19/2012 8:45:21 PM
Tetrachloroethene (PCE)	ND	1.0		µg/L	1	12/19/2012 8:45:21 PM
trans-1,2-DCE	ND	1.0		µg/L	1	12/19/2012 8:45:21 PM
trans-1,3-Dichloropropene	ND	1.0		µg/L	1	12/19/2012 8:45:21 PM
1,2,3-Trichlorobenzene	ND	1.0		µg/L	1	12/19/2012 8:45:21 PM
1,2,4-Trichlorobenzene	ND	1.0		µg/L	1	12/19/2012 8:45:21 PM
1,1,1-Trichloroethane	ND	1.0		µg/L	1	12/19/2012 8:45:21 PM
1,1,2-Trichloroethane	ND	1.0		µg/L	1	12/19/2012 8:45:21 PM
Trichloroethene (TCE)	ND	1.0		µg/L	1	12/19/2012 8:45:21 PM

**Qualifiers:**

- \* Value exceeds Maximum Contaminant Level.
- E Value above quantitation range
- J Analyte detected below quantitation limits
- P Sample pH greater than 2
- RL Reporting Detection Limit

- B Analyte detected in the associated Method Blank
- H Holding times for preparation or analysis exceeded
- ND Not Detected at the Reporting Limit
- R RPD outside accepted recovery limits
- S Spike Recovery outside accepted recovery limits

# Hall Environmental Analysis Laboratory, Inc.

Analytical Report

Lab Order 1212686

Date Reported: 12/27/2012

**CLIENT:** Energen Resources Corp

**Client Sample ID:** MW-2

**Project:** #8-R Sec 34 T15S-R35E 1980 FSL & 66

**Collection Date:** 12/13/2012 12:50:00 PM

**Lab ID:** 1212686-003

**Matrix:** AQUEOUS

**Received Date:** 12/15/2012 12:00:00 PM

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
<b>EPA METHOD 8260B: VOLATILES</b>						Analyst: RAA
Trichlorofluoromethane	ND	1.0		µg/L	1	12/19/2012 8:45:21 PM
1,2,3-Trichloropropane	ND	2.0		µg/L	1	12/19/2012 8:45:21 PM
Vinyl chloride	ND	1.0		µg/L	1	12/19/2012 8:45:21 PM
Xylenes, Total	ND	1.5		µg/L	1	12/19/2012 8:45:21 PM
Surr: 1,2-Dichloroethane-d4	96.6	70-130		%REC	1	12/19/2012 8:45:21 PM
Surr: 4-Bromofluorobenzene	106	70-130		%REC	1	12/19/2012 8:45:21 PM
Surr: Dibromofluoromethane	90.7	70-130		%REC	1	12/19/2012 8:45:21 PM
Surr: Toluene-d8	99.5	70-130		%REC	1	12/19/2012 8:45:21 PM

**Qualifiers:**

- \* Value exceeds Maximum Contaminant Level.
- E Value above quantitation range
- J Analyte detected below quantitation limits
- P Sample pH greater than 2
- RL Reporting Detection Limit

- B Analyte detected in the associated Method Blank
- H Holding times for preparation or analysis exceeded
- ND Not Detected at the Reporting Limit
- R RPD outside accepted recovery limits
- S Spike Recovery outside accepted recovery limits

# Hall Environmental Analysis Laboratory, Inc.

Analytical Report

Lab Order 1212686

Date Reported: 12/27/2012

CLIENT: Energen Resources Corp

Client Sample ID: MW-4

Project: #8-R Sec 34 T15S-R35E 1980 FSL & 66

Collection Date: 12/13/2012 1:40:00 PM

Lab ID: 1212686-004

Matrix: AQUEOUS

Received Date: 12/15/2012 12:00:00 PM

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
<b>EPA METHOD 8310: PAHS</b>						Analyst: SCC
Naphthalene	ND	2.0		µg/L	1	12/21/2012 5:20:55 AM
1-Methylnaphthalene	ND	2.0		µg/L	1	12/21/2012 5:20:55 AM
2-Methylnaphthalene	ND	2.0		µg/L	1	12/21/2012 5:20:55 AM
Acenaphthylene	ND	2.5		µg/L	1	12/21/2012 5:20:55 AM
Acenaphthene	ND	5.0		µg/L	1	12/21/2012 5:20:55 AM
Fluorene	ND	0.80		µg/L	1	12/21/2012 5:20:55 AM
Phenanthrene	0.84	0.60		µg/L	1	12/21/2012 5:20:55 AM
Anthracene	ND	0.60		µg/L	1	12/21/2012 5:20:55 AM
Fluoranthene	ND	0.30		µg/L	1	12/21/2012 5:20:55 AM
Pyrene	ND	0.30		µg/L	1	12/21/2012 5:20:55 AM
Benz(a)anthracene	ND	0.070		µg/L	1	12/21/2012 5:20:55 AM
Chrysene	ND	0.20		µg/L	1	12/21/2012 5:20:55 AM
Benzo(b)fluoranthene	ND	0.10		µg/L	1	12/21/2012 5:20:55 AM
Benzo(k)fluoranthene	ND	0.070		µg/L	1	12/21/2012 5:20:55 AM
Benzo(a)pyrene	ND	0.070		µg/L	1	12/21/2012 5:20:55 AM
Dibenz(a,h)anthracene	ND	0.12		µg/L	1	12/21/2012 5:20:55 AM
Benzo(g,h,i)perylene	ND	0.080		µg/L	1	12/21/2012 5:20:55 AM
Indeno(1,2,3-cd)pyrene	ND	0.080		µg/L	1	12/21/2012 5:20:55 AM
Surr: Benzo(e)pyrene	73.6	46.4-106		%REC	1	12/21/2012 5:20:55 AM
<b>EPA METHOD 300.0: ANIONS</b>						Analyst: JRR
Chloride	390	10	*	mg/L	20	12/17/2012 4:11:24 PM
<b>EPA METHOD 8260B: VOLATILES</b>						Analyst: RAA
Benzene	ND	1.0		µg/L	1	12/19/2012 9:13:18 PM
Toluene	ND	1.0		µg/L	1	12/19/2012 9:13:18 PM
Ethylbenzene	ND	1.0		µg/L	1	12/19/2012 9:13:18 PM
Methyl tert-butyl ether (MTBE)	ND	1.0		µg/L	1	12/19/2012 9:13:18 PM
1,2,4-Trimethylbenzene	ND	1.0		µg/L	1	12/19/2012 9:13:18 PM
1,3,5-Trimethylbenzene	ND	1.0		µg/L	1	12/19/2012 9:13:18 PM
1,2-Dichloroethane (EDC)	ND	1.0		µg/L	1	12/19/2012 9:13:18 PM
1,2-Dibromoethane (EDB)	ND	1.0		µg/L	1	12/19/2012 9:13:18 PM
Naphthalene	ND	2.0		µg/L	1	12/19/2012 9:13:18 PM
1-Methylnaphthalene	ND	4.0		µg/L	1	12/19/2012 9:13:18 PM
2-Methylnaphthalene	ND	4.0		µg/L	1	12/19/2012 9:13:18 PM
Acetone	ND	10		µg/L	1	12/19/2012 9:13:18 PM
Bromobenzene	ND	1.0		µg/L	1	12/19/2012 9:13:18 PM
Bromodichloromethane	ND	1.0		µg/L	1	12/19/2012 9:13:18 PM
Bromoform	ND	1.0		µg/L	1	12/19/2012 9:13:18 PM
Bromomethane	ND	3.0		µg/L	1	12/19/2012 9:13:18 PM
2-Butanone	ND	10		µg/L	1	12/19/2012 9:13:18 PM
Carbon disulfide	ND	10		µg/L	1	12/19/2012 9:13:18 PM
Carbon Tetrachloride	ND	1.0		µg/L	1	12/19/2012 9:13:18 PM

**Qualifiers:**

- \* Value exceeds Maximum Contaminant Level.
- E Value above quantitation range
- J Analyte detected below quantitation limits
- P Sample pH greater than 2
- RL Reporting Detection Limit

- B Analyte detected in the associated Method Blank
- H Holding times for preparation or analysis exceeded
- ND Not Detected at the Reporting Limit
- R RPD outside accepted recovery limits
- S Spike Recovery outside accepted recovery limits

# Hall Environmental Analysis Laboratory, Inc.

Analytical Report

Lab Order 1212686

Date Reported: 12/27/2012

**CLIENT:** Energen Resources Corp

**Client Sample ID:** MW-4

**Project:** #8-R Sec 34 T15S-R35E 1980 FSL & 66

**Collection Date:** 12/13/2012 1:40:00 PM

**Lab ID:** 1212686-004

**Matrix:** AQUEOUS

**Received Date:** 12/15/2012 12:00:00 PM

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
<b>EPA METHOD 8260B: VOLATILES</b>						Analyst: RAA
Chlorobenzene	ND	1.0		µg/L	1	12/19/2012 9:13:18 PM
Chloroethane	ND	2.0		µg/L	1	12/19/2012 9:13:18 PM
Chloroform	ND	1.0		µg/L	1	12/19/2012 9:13:18 PM
Chloromethane	ND	3.0		µg/L	1	12/19/2012 9:13:18 PM
2-Chlorotoluene	ND	1.0		µg/L	1	12/19/2012 9:13:18 PM
4-Chlorotoluene	ND	1.0		µg/L	1	12/19/2012 9:13:18 PM
cis-1,2-DCE	ND	1.0		µg/L	1	12/19/2012 9:13:18 PM
cis-1,3-Dichloropropene	ND	1.0		µg/L	1	12/19/2012 9:13:18 PM
1,2-Dibromo-3-chloropropane	ND	2.0		µg/L	1	12/19/2012 9:13:18 PM
Dibromochloromethane	ND	1.0		µg/L	1	12/19/2012 9:13:18 PM
Dibromomethane	ND	1.0		µg/L	1	12/19/2012 9:13:18 PM
1,2-Dichlorobenzene	ND	1.0		µg/L	1	12/19/2012 9:13:18 PM
1,3-Dichlorobenzene	ND	1.0		µg/L	1	12/19/2012 9:13:18 PM
1,4-Dichlorobenzene	ND	1.0		µg/L	1	12/19/2012 9:13:18 PM
Dichlorodifluoromethane	ND	1.0		µg/L	1	12/19/2012 9:13:18 PM
1,1-Dichloroethane	ND	1.0		µg/L	1	12/19/2012 9:13:18 PM
1,1-Dichloroethene	ND	1.0		µg/L	1	12/19/2012 9:13:18 PM
1,2-Dichloropropane	ND	1.0		µg/L	1	12/19/2012 9:13:18 PM
1,3-Dichloropropane	ND	1.0		µg/L	1	12/19/2012 9:13:18 PM
2,2-Dichloropropane	ND	2.0		µg/L	1	12/19/2012 9:13:18 PM
1,1-Dichloropropene	ND	1.0		µg/L	1	12/19/2012 9:13:18 PM
Hexachlorobutadiene	ND	1.0		µg/L	1	12/19/2012 9:13:18 PM
2-Hexanone	ND	10		µg/L	1	12/19/2012 9:13:18 PM
Isopropylbenzene	ND	1.0		µg/L	1	12/19/2012 9:13:18 PM
4-Isopropyltoluene	ND	1.0		µg/L	1	12/19/2012 9:13:18 PM
4-Methyl-2-pentanone	ND	10		µg/L	1	12/19/2012 9:13:18 PM
Methylene Chloride	ND	3.0		µg/L	1	12/19/2012 9:13:18 PM
n-Butylbenzene	ND	3.0		µg/L	1	12/19/2012 9:13:18 PM
n-Propylbenzene	ND	1.0		µg/L	1	12/19/2012 9:13:18 PM
sec-Butylbenzene	ND	1.0		µg/L	1	12/19/2012 9:13:18 PM
Styrene	ND	1.0		µg/L	1	12/19/2012 9:13:18 PM
tert-Butylbenzene	ND	1.0		µg/L	1	12/19/2012 9:13:18 PM
1,1,1,2-Tetrachloroethane	ND	1.0		µg/L	1	12/19/2012 9:13:18 PM
1,1,2,2-Tetrachloroethane	ND	2.0		µg/L	1	12/19/2012 9:13:18 PM
Tetrachloroethene (PCE)	ND	1.0		µg/L	1	12/19/2012 9:13:18 PM
trans-1,2-DCE	ND	1.0		µg/L	1	12/19/2012 9:13:18 PM
trans-1,3-Dichloropropene	ND	1.0		µg/L	1	12/19/2012 9:13:18 PM
1,2,3-Trichlorobenzene	ND	1.0		µg/L	1	12/19/2012 9:13:18 PM
1,2,4-Trichlorobenzene	ND	1.0		µg/L	1	12/19/2012 9:13:18 PM
1,1,1-Trichloroethane	ND	1.0		µg/L	1	12/19/2012 9:13:18 PM
1,1,2-Trichloroethane	ND	1.0		µg/L	1	12/19/2012 9:13:18 PM
Trichloroethene (TCE)	ND	1.0		µg/L	1	12/19/2012 9:13:18 PM

**Qualifiers:**

- \* Value exceeds Maximum Contaminant Level.
- E Value above quantitation range
- J Analyte detected below quantitation limits
- P Sample pH greater than 2
- RL Reporting Detection Limit

- B Analyte detected in the associated Method Blank
- H Holding times for preparation or analysis exceeded
- ND Not Detected at the Reporting Limit
- R RPD outside accepted recovery limits
- S Spike Recovery outside accepted recovery limits

# Hall Environmental Analysis Laboratory, Inc.

Analytical Report

Lab Order 1212686

Date Reported: 12/27/2012

**CLIENT:** Energen Resources Corp

**Client Sample ID:** MW-4

**Project:** #8-R Sec 34 T15S-R35E 1980 FSL & 66

**Collection Date:** 12/13/2012 1:40:00 PM

**Lab ID:** 1212686-004

**Matrix:** AQUEOUS

**Received Date:** 12/15/2012 12:00:00 PM

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
<b>EPA METHOD 8260B: VOLATILES</b>						Analyst: RAA
Trichlorofluoromethane	ND	1.0		µg/L	1	12/19/2012 9:13:18 PM
1,2,3-Trichloropropane	ND	2.0		µg/L	1	12/19/2012 9:13:18 PM
Vinyl chloride	ND	1.0		µg/L	1	12/19/2012 9:13:18 PM
Xylenes, Total	ND	1.5		µg/L	1	12/19/2012 9:13:18 PM
Surr: 1,2-Dichloroethane-d4	95.3	70-130		%REC	1	12/19/2012 9:13:18 PM
Surr: 4-Bromofluorobenzene	104	70-130		%REC	1	12/19/2012 9:13:18 PM
Surr: Dibromofluoromethane	89.8	70-130		%REC	1	12/19/2012 9:13:18 PM
Surr: Toluene-d8	98.4	70-130		%REC	1	12/19/2012 9:13:18 PM

**Qualifiers:**

- \* Value exceeds Maximum Contaminant Level.
- E Value above quantitation range
- J Analyte detected below quantitation limits
- P Sample pH greater than 2
- RL Reporting Detection Limit

- B Analyte detected in the associated Method Blank
- H Holding times for preparation or analysis exceeded
- ND Not Detected at the Reporting Limit
- R RPD outside accepted recovery limits
- S Spike Recovery outside accepted recovery limits

# Hall Environmental Analysis Laboratory, Inc.

Analytical Report

Lab Order 1212686

Date Reported: 12/27/2012

CLIENT: Energen Resources Corp

Client Sample ID: MW-5

Project: #8-R Sec 34 T15S-R35E 1980 FSL & 66

Collection Date: 12/13/2012 2:30:00 PM

Lab ID: 1212686-005

Matrix: AQUEOUS

Received Date: 12/15/2012 12:00:00 PM

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
<b>EPA METHOD 8310: PAHS</b>						Analyst: SCC
Naphthalene	ND	2.0		µg/L	1	12/21/2012 5:50:10 AM
1-Methylnaphthalene	ND	2.0		µg/L	1	12/21/2012 5:50:10 AM
2-Methylnaphthalene	ND	2.0		µg/L	1	12/21/2012 5:50:10 AM
Acenaphthylene	ND	2.5		µg/L	1	12/21/2012 5:50:10 AM
Acenaphthene	ND	5.0		µg/L	1	12/21/2012 5:50:10 AM
Fluorene	ND	0.80		µg/L	1	12/21/2012 5:50:10 AM
Phenanthrene	0.60	0.60		µg/L	1	12/21/2012 5:50:10 AM
Anthracene	ND	0.60		µg/L	1	12/21/2012 5:50:10 AM
Fluoranthene	ND	0.30		µg/L	1	12/21/2012 5:50:10 AM
Pyrene	ND	0.30		µg/L	1	12/21/2012 5:50:10 AM
Benz(a)anthracene	ND	0.070		µg/L	1	12/21/2012 5:50:10 AM
Chrysene	ND	0.20		µg/L	1	12/21/2012 5:50:10 AM
Benzo(b)fluoranthene	ND	0.10		µg/L	1	12/21/2012 5:50:10 AM
Benzo(k)fluoranthene	ND	0.070		µg/L	1	12/21/2012 5:50:10 AM
Benzo(a)pyrene	ND	0.070		µg/L	1	12/21/2012 5:50:10 AM
Dibenz(a,h)anthracene	ND	0.12		µg/L	1	12/21/2012 5:50:10 AM
Benzo(g,h,i)perylene	ND	0.080		µg/L	1	12/21/2012 5:50:10 AM
Indeno(1,2,3-cd)pyrene	ND	0.080		µg/L	1	12/21/2012 5:50:10 AM
Surr: Benzo(e)pyrene	59.7	46.4-106		%REC	1	12/21/2012 5:50:10 AM
<b>EPA METHOD 300.0: ANIONS</b>						Analyst: JRR
Chloride	23	10		mg/L	20	12/17/2012 4:36:14 PM
<b>EPA METHOD 8260B: VOLATILES</b>						Analyst: RAA
Benzene	ND	1.0		µg/L	1	12/20/2012 4:37:21 PM
Toluene	ND	1.0		µg/L	1	12/20/2012 4:37:21 PM
Ethylbenzene	ND	1.0		µg/L	1	12/20/2012 4:37:21 PM
Methyl tert-butyl ether (MTBE)	ND	1.0		µg/L	1	12/20/2012 4:37:21 PM
1,2,4-Trimethylbenzene	ND	1.0		µg/L	1	12/20/2012 4:37:21 PM
1,3,5-Trimethylbenzene	ND	1.0		µg/L	1	12/20/2012 4:37:21 PM
1,2-Dichloroethane (EDC)	ND	1.0		µg/L	1	12/20/2012 4:37:21 PM
1,2-Dibromoethane (EDB)	ND	1.0		µg/L	1	12/20/2012 4:37:21 PM
Naphthalene	ND	2.0		µg/L	1	12/20/2012 4:37:21 PM
1-Methylnaphthalene	ND	4.0		µg/L	1	12/20/2012 4:37:21 PM
2-Methylnaphthalene	ND	4.0		µg/L	1	12/20/2012 4:37:21 PM
Acetone	ND	10		µg/L	1	12/20/2012 4:37:21 PM
Bromobenzene	ND	1.0		µg/L	1	12/20/2012 4:37:21 PM
Bromodichloromethane	ND	1.0		µg/L	1	12/20/2012 4:37:21 PM
Bromoform	ND	1.0		µg/L	1	12/20/2012 4:37:21 PM
Bromomethane	ND	3.0		µg/L	1	12/20/2012 4:37:21 PM
2-Butanone	ND	10		µg/L	1	12/20/2012 4:37:21 PM
Carbon disulfide	ND	10		µg/L	1	12/20/2012 4:37:21 PM
Carbon Tetrachloride	ND	1.0		µg/L	1	12/20/2012 4:37:21 PM

**Qualifiers:**

- \* Value exceeds Maximum Contaminant Level.
- E Value above quantitation range
- J Analyte detected below quantitation limits
- P Sample pH greater than 2
- RL Reporting Detection Limit

- B Analyte detected in the associated Method Blank
- H Holding times for preparation or analysis exceeded
- ND Not Detected at the Reporting Limit
- R RPD outside accepted recovery limits
- S Spike Recovery outside accepted recovery limits

# Hall Environmental Analysis Laboratory, Inc.

Analytical Report

Lab Order 1212686

Date Reported: 12/27/2012

CLIENT: Energen Resources Corp

Client Sample ID: MW-5

Project: #8-R Sec 34 T15S-R35E 1980 FSL & 66

Collection Date: 12/13/2012 2:30:00 PM

Lab ID: 1212686-005

Matrix: AQUEOUS

Received Date: 12/15/2012 12:00:00 PM

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
<b>EPA METHOD 8260B: VOLATILES</b>						Analyst: RAA
Chlorobenzene	ND	1.0		µg/L	1	12/20/2012 4:37:21 PM
Chloroethane	ND	2.0		µg/L	1	12/20/2012 4:37:21 PM
Chloroform	ND	1.0		µg/L	1	12/20/2012 4:37:21 PM
Chloromethane	ND	3.0		µg/L	1	12/20/2012 4:37:21 PM
2-Chlorotoluene	ND	1.0		µg/L	1	12/20/2012 4:37:21 PM
4-Chlorotoluene	ND	1.0		µg/L	1	12/20/2012 4:37:21 PM
cis-1,2-DCE	ND	1.0		µg/L	1	12/20/2012 4:37:21 PM
cis-1,3-Dichloropropene	ND	1.0		µg/L	1	12/20/2012 4:37:21 PM
1,2-Dibromo-3-chloropropane	ND	2.0		µg/L	1	12/20/2012 4:37:21 PM
Dibromochloromethane	ND	1.0		µg/L	1	12/20/2012 4:37:21 PM
Dibromomethane	ND	1.0		µg/L	1	12/20/2012 4:37:21 PM
1,2-Dichlorobenzene	ND	1.0		µg/L	1	12/20/2012 4:37:21 PM
1,3-Dichlorobenzene	ND	1.0		µg/L	1	12/20/2012 4:37:21 PM
1,4-Dichlorobenzene	ND	1.0		µg/L	1	12/20/2012 4:37:21 PM
Dichlorodifluoromethane	ND	1.0		µg/L	1	12/20/2012 4:37:21 PM
1,1-Dichloroethane	ND	1.0		µg/L	1	12/20/2012 4:37:21 PM
1,1-Dichloroethene	ND	1.0		µg/L	1	12/20/2012 4:37:21 PM
1,2-Dichloropropane	ND	1.0		µg/L	1	12/20/2012 4:37:21 PM
1,3-Dichloropropane	ND	1.0		µg/L	1	12/20/2012 4:37:21 PM
2,2-Dichloropropane	ND	2.0		µg/L	1	12/20/2012 4:37:21 PM
1,1-Dichloropropene	ND	1.0		µg/L	1	12/20/2012 4:37:21 PM
Hexachlorobutadiene	ND	1.0		µg/L	1	12/20/2012 4:37:21 PM
2-Hexanone	ND	10		µg/L	1	12/20/2012 4:37:21 PM
Isopropylbenzene	ND	1.0		µg/L	1	12/20/2012 4:37:21 PM
4-Isopropyltoluene	ND	1.0		µg/L	1	12/20/2012 4:37:21 PM
4-Methyl-2-pentanone	ND	10		µg/L	1	12/20/2012 4:37:21 PM
Methylene Chloride	ND	3.0		µg/L	1	12/20/2012 4:37:21 PM
n-Butylbenzene	ND	3.0		µg/L	1	12/20/2012 4:37:21 PM
n-Propylbenzene	ND	1.0		µg/L	1	12/20/2012 4:37:21 PM
sec-Butylbenzene	ND	1.0		µg/L	1	12/20/2012 4:37:21 PM
Styrene	ND	1.0		µg/L	1	12/20/2012 4:37:21 PM
tert-Butylbenzene	ND	1.0		µg/L	1	12/20/2012 4:37:21 PM
1,1,1,2-Tetrachloroethane	ND	1.0		µg/L	1	12/20/2012 4:37:21 PM
1,1,2,2-Tetrachloroethane	ND	2.0		µg/L	1	12/20/2012 4:37:21 PM
Tetrachloroethene (PCE)	ND	1.0		µg/L	1	12/20/2012 4:37:21 PM
trans-1,2-DCE	ND	1.0		µg/L	1	12/20/2012 4:37:21 PM
trans-1,3-Dichloropropene	ND	1.0		µg/L	1	12/20/2012 4:37:21 PM
1,2,3-Trichlorobenzene	ND	1.0		µg/L	1	12/20/2012 4:37:21 PM
1,2,4-Trichlorobenzene	ND	1.0		µg/L	1	12/20/2012 4:37:21 PM
1,1,1-Trichloroethane	ND	1.0		µg/L	1	12/20/2012 4:37:21 PM
1,1,2-Trichloroethane	ND	1.0		µg/L	1	12/20/2012 4:37:21 PM
Trichloroethene (TCE)	ND	1.0		µg/L	1	12/20/2012 4:37:21 PM

**Qualifiers:**

- \* Value exceeds Maximum Contaminant Level.
- E Value above quantitation range
- J Analyte detected below quantitation limits
- P Sample pH greater than 2
- RL Reporting Detection Limit

- B Analyte detected in the associated Method Blank
- H Holding times for preparation or analysis exceeded
- ND Not Detected at the Reporting Limit
- R RPD outside accepted recovery limits
- S Spike Recovery outside accepted recovery limits

# Hall Environmental Analysis Laboratory, Inc.

Analytical Report

Lab Order 1212686

Date Reported: 12/27/2012

**CLIENT:** Energen Resources Corp

**Client Sample ID:** MW-5

**Project:** #8-R Sec 34 T15S-R35E 1980 FSL & 66

**Collection Date:** 12/13/2012 2:30:00 PM

**Lab ID:** 1212686-005

**Matrix:** AQUEOUS

**Received Date:** 12/15/2012 12:00:00 PM

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
<b>EPA METHOD 8260B: VOLATILES</b>						Analyst: RAA
Trichlorofluoromethane	ND	1.0		µg/L	1	12/20/2012 4:37:21 PM
1,2,3-Trichloropropane	ND	2.0		µg/L	1	12/20/2012 4:37:21 PM
Vinyl chloride	ND	1.0		µg/L	1	12/20/2012 4:37:21 PM
Xylenes, Total	ND	1.5		µg/L	1	12/20/2012 4:37:21 PM
Surr: 1,2-Dichloroethane-d4	93.7	70-130		%REC	1	12/20/2012 4:37:21 PM
Surr: 4-Bromofluorobenzene	101	70-130		%REC	1	12/20/2012 4:37:21 PM
Surr: Dibromofluoromethane	89.2	70-130		%REC	1	12/20/2012 4:37:21 PM
Surr: Toluene-d8	101	70-130		%REC	1	12/20/2012 4:37:21 PM

**Qualifiers:**

- \* Value exceeds Maximum Contaminant Level.
- E Value above quantitation range
- J Analyte detected below quantitation limits
- P Sample pH greater than 2
- RL Reporting Detection Limit

- B Analyte detected in the associated Method Blank
- H Holding times for preparation or analysis exceeded
- ND Not Detected at the Reporting Limit
- R RPD outside accepted recovery limits
- S Spike Recovery outside accepted recovery limits

# Hall Environmental Analysis Laboratory, Inc.

Analytical Report

Lab Order 1212686

Date Reported: 12/27/2012

CLIENT: Energen Resources Corp

Client Sample ID: Trip Blank

Project: #8-R Sec 34 T15S-R35E 1980 FSL & 66

Collection Date:

Lab ID: 1212686-006

Matrix: AQUEOUS

Received Date: 12/15/2012 12:00:00 PM

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
<b>EPA METHOD 8260B: VOLATILES</b>						Analyst: RAA
Benzene	ND	1.0		µg/L	1	12/20/2012 6:02:13 PM
Toluene	ND	1.0		µg/L	1	12/20/2012 6:02:13 PM
Ethylbenzene	ND	1.0		µg/L	1	12/20/2012 6:02:13 PM
Methyl tert-butyl ether (MTBE)	ND	1.0		µg/L	1	12/20/2012 6:02:13 PM
1,2,4-Trimethylbenzene	ND	1.0		µg/L	1	12/20/2012 6:02:13 PM
1,3,5-Trimethylbenzene	ND	1.0		µg/L	1	12/20/2012 6:02:13 PM
1,2-Dichloroethane (EDC)	ND	1.0		µg/L	1	12/20/2012 6:02:13 PM
1,2-Dibromoethane (EDB)	ND	1.0		µg/L	1	12/20/2012 6:02:13 PM
Naphthalene	ND	2.0		µg/L	1	12/20/2012 6:02:13 PM
1-Methylnaphthalene	ND	4.0		µg/L	1	12/20/2012 6:02:13 PM
2-Methylnaphthalene	ND	4.0		µg/L	1	12/20/2012 6:02:13 PM
Acetone	ND	10		µg/L	1	12/20/2012 6:02:13 PM
Bromobenzene	ND	1.0		µg/L	1	12/20/2012 6:02:13 PM
Bromodichloromethane	ND	1.0		µg/L	1	12/20/2012 6:02:13 PM
Bromoform	ND	1.0		µg/L	1	12/20/2012 6:02:13 PM
Bromomethane	ND	3.0		µg/L	1	12/20/2012 6:02:13 PM
2-Butanone	ND	10		µg/L	1	12/20/2012 6:02:13 PM
Carbon disulfide	ND	10		µg/L	1	12/20/2012 6:02:13 PM
Carbon Tetrachloride	ND	1.0		µg/L	1	12/20/2012 6:02:13 PM
Chlorobenzene	ND	1.0		µg/L	1	12/20/2012 6:02:13 PM
Chloroethane	ND	2.0		µg/L	1	12/20/2012 6:02:13 PM
Chloroform	ND	1.0		µg/L	1	12/20/2012 6:02:13 PM
Chloromethane	ND	3.0		µg/L	1	12/20/2012 6:02:13 PM
2-Chlorotoluene	ND	1.0		µg/L	1	12/20/2012 6:02:13 PM
4-Chlorotoluene	ND	1.0		µg/L	1	12/20/2012 6:02:13 PM
cis-1,2-DCE	ND	1.0		µg/L	1	12/20/2012 6:02:13 PM
cis-1,3-Dichloropropene	ND	1.0		µg/L	1	12/20/2012 6:02:13 PM
1,2-Dibromo-3-chloropropane	ND	2.0		µg/L	1	12/20/2012 6:02:13 PM
Dibromochloromethane	ND	1.0		µg/L	1	12/20/2012 6:02:13 PM
Dibromomethane	ND	1.0		µg/L	1	12/20/2012 6:02:13 PM
1,2-Dichlorobenzene	ND	1.0		µg/L	1	12/20/2012 6:02:13 PM
1,3-Dichlorobenzene	ND	1.0		µg/L	1	12/20/2012 6:02:13 PM
1,4-Dichlorobenzene	ND	1.0		µg/L	1	12/20/2012 6:02:13 PM
Dichlorodifluoromethane	ND	1.0		µg/L	1	12/20/2012 6:02:13 PM
1,1-Dichloroethane	ND	1.0		µg/L	1	12/20/2012 6:02:13 PM
1,1-Dichloroethene	ND	1.0		µg/L	1	12/20/2012 6:02:13 PM
1,2-Dichloropropane	ND	1.0		µg/L	1	12/20/2012 6:02:13 PM
1,3-Dichloropropane	ND	1.0		µg/L	1	12/20/2012 6:02:13 PM
2,2-Dichloropropane	ND	2.0		µg/L	1	12/20/2012 6:02:13 PM
1,1-Dichloropropene	ND	1.0		µg/L	1	12/20/2012 6:02:13 PM
Hexachlorobutadiene	ND	1.0		µg/L	1	12/20/2012 6:02:13 PM
2-Hexanone	ND	10		µg/L	1	12/20/2012 6:02:13 PM

**Qualifiers:**

- \* Value exceeds Maximum Contaminant Level.
- E Value above quantitation range
- J Analyte detected below quantitation limits
- P Sample pH greater than 2
- RL Reporting Detection Limit

- B Analyte detected in the associated Method Blank
- H Holding times for preparation or analysis exceeded
- ND Not Detected at the Reporting Limit
- R RPD outside accepted recovery limits
- S Spike Recovery outside accepted recovery limits

# Hall Environmental Analysis Laboratory, Inc.

Analytical Report

Lab Order 1212686

Date Reported: 12/27/2012

CLIENT: Energen Resources Corp

Client Sample ID: Trip Blank

Project: #8-R Sec 34 T15S-R35E 1980 FSL & 66

Collection Date:

Lab ID: 1212686-006

Matrix: AQUEOUS

Received Date: 12/15/2012 12:00:00 PM

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
<b>EPA METHOD 8260B: VOLATILES</b>						Analyst: RAA
Isopropylbenzene	ND	1.0		µg/L	1	12/20/2012 6:02:13 PM
4-Isopropyltoluene	ND	1.0		µg/L	1	12/20/2012 6:02:13 PM
4-Methyl-2-pentanone	ND	10		µg/L	1	12/20/2012 6:02:13 PM
Methylene Chloride	ND	3.0		µg/L	1	12/20/2012 6:02:13 PM
n-Butylbenzene	ND	3.0		µg/L	1	12/20/2012 6:02:13 PM
n-Propylbenzene	ND	1.0		µg/L	1	12/20/2012 6:02:13 PM
sec-Butylbenzene	ND	1.0		µg/L	1	12/20/2012 6:02:13 PM
Styrene	ND	1.0		µg/L	1	12/20/2012 6:02:13 PM
tert-Butylbenzene	ND	1.0		µg/L	1	12/20/2012 6:02:13 PM
1,1,1,2-Tetrachloroethane	ND	1.0		µg/L	1	12/20/2012 6:02:13 PM
1,1,2,2-Tetrachloroethane	ND	2.0		µg/L	1	12/20/2012 6:02:13 PM
Tetrachloroethene (PCE)	ND	1.0		µg/L	1	12/20/2012 6:02:13 PM
trans-1,2-DCE	ND	1.0		µg/L	1	12/20/2012 6:02:13 PM
trans-1,3-Dichloropropene	ND	1.0		µg/L	1	12/20/2012 6:02:13 PM
1,2,3-Trichlorobenzene	ND	1.0		µg/L	1	12/20/2012 6:02:13 PM
1,2,4-Trichlorobenzene	ND	1.0		µg/L	1	12/20/2012 6:02:13 PM
1,1,1-Trichloroethane	ND	1.0		µg/L	1	12/20/2012 6:02:13 PM
1,1,2-Trichloroethane	ND	1.0		µg/L	1	12/20/2012 6:02:13 PM
Trichloroethene (TCE)	ND	1.0		µg/L	1	12/20/2012 6:02:13 PM
Trichlorofluoromethane	ND	1.0		µg/L	1	12/20/2012 6:02:13 PM
1,2,3-Trichloropropane	ND	2.0		µg/L	1	12/20/2012 6:02:13 PM
Vinyl chloride	ND	1.0		µg/L	1	12/20/2012 6:02:13 PM
Xylenes, Total	ND	1.5		µg/L	1	12/20/2012 6:02:13 PM
Surr: 1,2-Dichloroethane-d4	92.9	70-130		%REC	1	12/20/2012 6:02:13 PM
Surr: 4-Bromofluorobenzene	104	70-130		%REC	1	12/20/2012 6:02:13 PM
Surr: Dibromofluoromethane	87.8	70-130		%REC	1	12/20/2012 6:02:13 PM
Surr: Toluene-d8	99.4	70-130		%REC	1	12/20/2012 6:02:13 PM

**Qualifiers:**

- \* Value exceeds Maximum Contaminant Level.
- E Value above quantitation range
- J Analyte detected below quantitation limits
- P Sample pH greater than 2
- RL Reporting Detection Limit

- B Analyte detected in the associated Method Blank
- H Holding times for preparation or analysis exceeded
- ND Not Detected at the Reporting Limit
- R RPD outside accepted recovery limits
- S Spike Recovery outside accepted recovery limits

# QC SUMMARY REPORT

## Hall Environmental Analysis Laboratory, Inc.

WO#: 1212686

27-Dec-12

**Client:** Energen Resources Corp  
**Project:** #8-R Sec 34 T15S-R35E 1980 FSL & 660 FWL

Sample ID <b>MB</b>	SampType: <b>MBLK</b>		TestCode: <b>EPA Method 300.0: Anions</b>							
Client ID: <b>PBW</b>	Batch ID: <b>R7557</b>		RunNo: <b>7557</b>							
Prep Date:	Analysis Date: <b>12/17/2012</b>		SeqNo: <b>219340</b>		Units: <b>mg/L</b>					
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Chloride	ND	0.50								

Sample ID <b>LCS</b>	SampType: <b>LCS</b>		TestCode: <b>EPA Method 300.0: Anions</b>							
Client ID: <b>LCSW</b>	Batch ID: <b>R7557</b>		RunNo: <b>7557</b>							
Prep Date:	Analysis Date: <b>12/17/2012</b>		SeqNo: <b>219341</b>		Units: <b>mg/L</b>					
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Chloride	4.7	0.50	5.000	0	94.8	90	110			

Sample ID <b>MB</b>	SampType: <b>MBLK</b>		TestCode: <b>EPA Method 300.0: Anions</b>							
Client ID: <b>PBW</b>	Batch ID: <b>R7557</b>		RunNo: <b>7557</b>							
Prep Date:	Analysis Date: <b>12/17/2012</b>		SeqNo: <b>219392</b>		Units: <b>mg/L</b>					
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Chloride	ND	0.50								

Sample ID <b>LCS</b>	SampType: <b>LCS</b>		TestCode: <b>EPA Method 300.0: Anions</b>							
Client ID: <b>LCSW</b>	Batch ID: <b>R7557</b>		RunNo: <b>7557</b>							
Prep Date:	Analysis Date: <b>12/17/2012</b>		SeqNo: <b>219393</b>		Units: <b>mg/L</b>					
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Chloride	4.7	0.50	5.000	0	94.7	90	110			

**Qualifiers:**

- \* Value exceeds Maximum Contaminant Level.
- E Value above quantitation range
- J Analyte detected below quantitation limits
- P Sample pH greater than 2
- B Analyte detected in the associated Method Blank
- H Holding times for preparation or analysis exceeded
- ND Not Detected at the Reporting Limit
- R RPD outside accepted recovery limits

# QC SUMMARY REPORT

## Hall Environmental Analysis Laboratory, Inc.

WO#: 1212686

27-Dec-12

**Client:** Energen Resources Corp  
**Project:** #8-R Sec 34 T15S-R35E 1980 FSL & 660 FWL

Sample ID	5ml-rb	SampType:	MBLK	TestCode:	EPA Method 8260B: VOLATILES					
Client ID:	PBW	Batch ID:	R7612	RunNo:	7612					
Prep Date:		Analysis Date:	12/19/2012	SeqNo:	220999					
				Units:	µg/L					
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Benzene	ND	1.0								
Toluene	ND	1.0								
Ethylbenzene	ND	1.0								
Methyl tert-butyl ether (MTBE)	ND	1.0								
1,2,4-Trimethylbenzene	ND	1.0								
1,3,5-Trimethylbenzene	ND	1.0								
1,2-Dichloroethane (EDC)	ND	1.0								
1,2-Dibromoethane (EDB)	ND	1.0								
Naphthalene	ND	2.0								
1-Methylnaphthalene	ND	4.0								
2-Methylnaphthalene	ND	4.0								
Acetone	ND	10								
Bromobenzene	ND	1.0								
Bromodichloromethane	ND	1.0								
Bromoform	ND	1.0								
Bromomethane	ND	3.0								
2-Butanone	ND	10								
Carbon disulfide	ND	10								
Carbon Tetrachloride	ND	1.0								
Chlorobenzene	ND	1.0								
Chloroethane	ND	2.0								
Chloroform	ND	1.0								
Chloromethane	ND	3.0								
2-Chlorotoluene	ND	1.0								
4-Chlorotoluene	ND	1.0								
cis-1,2-DCE	ND	1.0								
cis-1,3-Dichloropropene	ND	1.0								
1,2-Dibromo-3-chloropropane	ND	2.0								
Dibromochloromethane	ND	1.0								
Dibromomethane	ND	1.0								
1,2-Dichlorobenzene	ND	1.0								
1,3-Dichlorobenzene	ND	1.0								
1,4-Dichlorobenzene	ND	1.0								
Dichlorodifluoromethane	ND	1.0								
1,1-Dichloroethane	ND	1.0								
1,1-Dichloroethene	ND	1.0								
1,2-Dichloropropane	ND	1.0								
1,3-Dichloropropane	ND	1.0								
2,2-Dichloropropane	ND	2.0								
1,1-Dichloropropene	ND	1.0								
Hexachlorobutadiene	ND	1.0								

**Qualifiers:**

- \* Value exceeds Maximum Contaminant Level.
- E Value above quantitation range
- J Analyte detected below quantitation limits
- P Sample pH greater than 2
- B Analyte detected in the associated Method Blank
- H Holding times for preparation or analysis exceeded
- ND Not Detected at the Reporting Limit
- R RPD outside accepted recovery limits

# QC SUMMARY REPORT

## Hall Environmental Analysis Laboratory, Inc.

WO#: 1212686

27-Dec-12

**Client:** Energen Resources Corp  
**Project:** #8-R Sec 34 T15S-R35E 1980 FSL & 660 FWL

Sample ID	5ml-rb	SampType:	MBLK	TestCode:	EPA Method 8260B: VOLATILES					
Client ID:	PBW	Batch ID:	R7612	RunNo:	7612					
Prep Date:		Analysis Date:	12/19/2012	SeqNo:	220999	Units:	µg/L			
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
2-Hexanone	ND	10								
Isopropylbenzene	ND	1.0								
4-Isopropyltoluene	ND	1.0								
4-Methyl-2-pentanone	ND	10								
Methylene Chloride	ND	3.0								
n-Butylbenzene	ND	3.0								
n-Propylbenzene	ND	1.0								
sec-Butylbenzene	ND	1.0								
Styrene	ND	1.0								
tert-Butylbenzene	ND	1.0								
1,1,1,2-Tetrachloroethane	ND	1.0								
1,1,2,2-Tetrachloroethane	ND	2.0								
Tetrachloroethene (PCE)	ND	1.0								
trans-1,2-DCE	ND	1.0								
trans-1,3-Dichloropropene	ND	1.0								
1,2,3-Trichlorobenzene	ND	1.0								
1,2,4-Trichlorobenzene	ND	1.0								
1,1,1-Trichloroethane	ND	1.0								
1,1,2-Trichloroethane	ND	1.0								
Trichloroethene (TCE)	ND	1.0								
Trichlorofluoromethane	ND	1.0								
1,2,3-Trichloropropane	ND	2.0								
Vinyl chloride	ND	1.0								
Xylenes, Total	ND	1.5								
Surr: 1,2-Dichloroethane-d4	9.4		10.00		94.4	70	130			
Surr: 4-Bromofluorobenzene	11		10.00		106	70	130			
Surr: Dibromofluoromethane	8.6		10.00		85.7	70	130			
Surr: Toluene-d8	10		10.00		100	70	130			

Sample ID	100ng lcs	SampType:	LCS	TestCode:	EPA Method 8260B: VOLATILES					
Client ID:	LCSW	Batch ID:	R7612	RunNo:	7612					
Prep Date:		Analysis Date:	12/19/2012	SeqNo:	221001	Units:	µg/L			
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Benzene	21	1.0	20.00	0	103	70	130			
Toluene	21	1.0	20.00	0	107	80	120			
Chlorobenzene	21	1.0	20.00	0	104	70	130			
1,1-Dichloroethene	22	1.0	20.00	0	110	73.7	122			
Trichloroethene (TCE)	18	1.0	20.00	0	87.9	70	130			
Surr: 1,2-Dichloroethane-d4	9.8		10.00		97.9	70	130			
Surr: 4-Bromofluorobenzene	10		10.00		103	70	130			

**Qualifiers:**

- \* Value exceeds Maximum Contaminant Level.
- E Value above quantitation range
- J Analyte detected below quantitation limits
- P Sample pH greater than 2
- B Analyte detected in the associated Method Blank
- H Holding times for preparation or analysis exceeded
- ND Not Detected at the Reporting Limit
- R RPD outside accepted recovery limits

# QC SUMMARY REPORT

## Hall Environmental Analysis Laboratory, Inc.

WO#: 1212686

27-Dec-12

**Client:** Energen Resources Corp  
**Project:** #8-R Sec 34 T15S-R35E 1980 FSL & 660 FWL

Sample ID <b>100ng lcs</b>	SampType: <b>LCS</b>		TestCode: <b>EPA Method 8260B: VOLATILES</b>							
Client ID: <b>LCSW</b>	Batch ID: <b>R7612</b>		RunNo: <b>7612</b>							
Prep Date:	Analysis Date: <b>12/19/2012</b>		SeqNo: <b>221001</b>		Units: <b>µg/L</b>					
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Surr: Dibromofluoromethane	8.8		10.00		88.0	70	130			
Surr: Toluene-d8	9.9		10.00		98.5	70	130			

Sample ID <b>5ml-rb</b>	SampType: <b>MBLK</b>		TestCode: <b>EPA Method 8260B: VOLATILES</b>							
Client ID: <b>PBW</b>	Batch ID: <b>R7656</b>		RunNo: <b>7656</b>							
Prep Date:	Analysis Date: <b>12/20/2012</b>		SeqNo: <b>222374</b>		Units: <b>µg/L</b>					
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Benzene	ND	1.0								
Toluene	ND	1.0								
Ethylbenzene	ND	1.0								
Methyl tert-butyl ether (MTBE)	ND	1.0								
1,2,4-Trimethylbenzene	ND	1.0								
1,3,5-Trimethylbenzene	ND	1.0								
1,2-Dichloroethane (EDC)	ND	1.0								
1,2-Dibromoethane (EDB)	ND	1.0								
Naphthalene	ND	2.0								
1-Methylnaphthalene	ND	4.0								
2-Methylnaphthalene	ND	4.0								
Acetone	ND	10								
Bromobenzene	ND	1.0								
Bromodichloromethane	ND	1.0								
Bromoform	ND	1.0								
Bromomethane	ND	3.0								
2-Butanone	ND	10								
Carbon disulfide	ND	10								
Carbon Tetrachloride	ND	1.0								
Chlorobenzene	ND	1.0								
Chloroethane	ND	2.0								
Chloroform	ND	1.0								
Chloromethane	ND	3.0								
2-Chlorotoluene	ND	1.0								
4-Chlorotoluene	ND	1.0								
cis-1,2-DCE	ND	1.0								
cis-1,3-Dichloropropene	ND	1.0								
1,2-Dibromo-3-chloropropane	ND	2.0								
Dibromochloromethane	ND	1.0								
Dibromomethane	ND	1.0								
1,2-Dichlorobenzene	ND	1.0								
1,3-Dichlorobenzene	ND	1.0								
1,4-Dichlorobenzene	ND	1.0								

**Qualifiers:**

- \* Value exceeds Maximum Contaminant Level.
- E Value above quantitation range
- J Analyte detected below quantitation limits
- P Sample pH greater than 2
- B Analyte detected in the associated Method Blank
- H Holding times for preparation or analysis exceeded
- ND Not Detected at the Reporting Limit
- R RPD outside accepted recovery limits

# QC SUMMARY REPORT

## Hall Environmental Analysis Laboratory, Inc.

WO#: 1212686

27-Dec-12

**Client:** Energen Resources Corp  
**Project:** #8-R Sec 34 T15S-R35E 1980 FSL & 660 FWL

Sample ID	5ml-rb	SampType:	MBLK	TestCode:	EPA Method 8260B: VOLATILES					
Client ID:	PBW	Batch ID:	R7656	RunNo:	7656					
Prep Date:		Analysis Date:	12/20/2012	SeqNo:	222374	Units:	µg/L			
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Dichlorodifluoromethane	ND	1.0								
1,1-Dichloroethane	ND	1.0								
1,1-Dichloroethene	ND	1.0								
1,2-Dichloropropane	ND	1.0								
1,3-Dichloropropane	ND	1.0								
2,2-Dichloropropane	ND	2.0								
1,1-Dichloropropene	ND	1.0								
Hexachlorobutadiene	ND	1.0								
2-Hexanone	ND	10								
Isopropylbenzene	ND	1.0								
4-Isopropyltoluene	ND	1.0								
4-Methyl-2-pentanone	ND	10								
Methylene Chloride	ND	3.0								
n-Butylbenzene	ND	3.0								
n-Propylbenzene	ND	1.0								
sec-Butylbenzene	ND	1.0								
Styrene	ND	1.0								
tert-Butylbenzene	ND	1.0								
1,1,1,2-Tetrachloroethane	ND	1.0								
1,1,2,2-Tetrachloroethane	ND	2.0								
Tetrachloroethene (PCE)	ND	1.0								
trans-1,2-DCE	ND	1.0								
trans-1,3-Dichloropropene	ND	1.0								
1,2,3-Trichlorobenzene	ND	1.0								
1,2,4-Trichlorobenzene	ND	1.0								
1,1,1-Trichloroethane	ND	1.0								
1,1,2-Trichloroethane	ND	1.0								
Trichloroethene (TCE)	ND	1.0								
Trichlorofluoromethane	ND	1.0								
1,2,3-Trichloropropane	ND	2.0								
Vinyl chloride	ND	1.0								
Xylenes, Total	ND	1.5								
Surr: 1,2-Dichloroethane-d4	9.3		10.00		93.1	70	130			
Surr: 4-Bromofluorobenzene	10		10.00		101	70	130			
Surr: Dibromofluoromethane	8.4		10.00		84.4	70	130			
Surr: Toluene-d8	10		10.00		100	70	130			

**Qualifiers:**

- \* Value exceeds Maximum Contaminant Level.
- E Value above quantitation range
- J Analyte detected below quantitation limits
- P Sample pH greater than 2
- B Analyte detected in the associated Method Blank
- H Holding times for preparation or analysis exceeded
- ND Not Detected at the Reporting Limit
- R RPD outside accepted recovery limits

# QC SUMMARY REPORT

## Hall Environmental Analysis Laboratory, Inc.

WO#: 1212686

27-Dec-12

**Client:** Energen Resources Corp  
**Project:** #8-R Sec 34 T15S-R35E 1980 FSL & 660 FWL

Sample ID	100ng lcs	SampType:	LCS	TestCode:	EPA Method 8260B: VOLATILES	Client ID:	LCSW	Batch ID:	R7656	RunNo:	7656	Prep Date:	Analysis Date:	12/20/2012	SeqNo:	222377	Units:	µg/L
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual								
Benzene	21	1.0	20.00	0	106	70	130											
Toluene	21	1.0	20.00	0	105	80	120											
Chlorobenzene	20	1.0	20.00	0	101	70	130											
1,1-Dichloroethene	23	1.0	20.00	0	113	73.7	122											
Trichloroethene (TCE)	17	1.0	20.00	0	85.9	70	130											
Surr: 1,2-Dichloroethane-d4	9.7		10.00		96.9	70	130											
Surr: 4-Bromofluorobenzene	9.6		10.00		96.5	70	130											
Surr: Dibromofluoromethane	8.6		10.00		85.8	70	130											
Surr: Toluene-d8	9.6		10.00		96.4	70	130											

Sample ID	1212686-005a ms	SampType:	MS	TestCode:	EPA Method 8260B: VOLATILES	Client ID:	MW-5	Batch ID:	R7656	RunNo:	7656	Prep Date:	Analysis Date:	12/20/2012	SeqNo:	222385	Units:	µg/L
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual								
Benzene	21	1.0	20.00	0	106	66.8	128											
Toluene	22	1.0	20.00	0	111	70	130											
Chlorobenzene	21	1.0	20.00	0	104	70	130											
1,1-Dichloroethene	23	1.0	20.00	0	113	70	130											
Trichloroethene (TCE)	17	1.0	20.00	0	87.2	70	130											
Surr: 1,2-Dichloroethane-d4	9.6		10.00		96.4	70	130											
Surr: 4-Bromofluorobenzene	10		10.00		104	70	130											
Surr: Dibromofluoromethane	9.0		10.00		90.3	70	130											
Surr: Toluene-d8	10		10.00		100	70	130											

Sample ID	1212686-005a msd	SampType:	MSD	TestCode:	EPA Method 8260B: VOLATILES	Client ID:	MW-5	Batch ID:	R7656	RunNo:	7656	Prep Date:	Analysis Date:	12/20/2012	SeqNo:	222386	Units:	µg/L
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual								
Benzene	19	1.0	20.00	0	95.2	66.8	128	11.2	16.7									
Toluene	20	1.0	20.00	0	102	70	130	8.10	18.7									
Chlorobenzene	20	1.0	20.00	0	99.1	70	130	5.18	19.5									
1,1-Dichloroethene	21	1.0	20.00	0	105	70	130	7.45	16.7									
Trichloroethene (TCE)	16	1.0	20.00	0	77.9	70	130	11.3	17.5									
Surr: 1,2-Dichloroethane-d4	9.7		10.00		96.8	70	130	0	0									
Surr: 4-Bromofluorobenzene	10		10.00		102	70	130	0	0									
Surr: Dibromofluoromethane	8.9		10.00		88.9	70	130	0	0									
Surr: Toluene-d8	10		10.00		100	70	130	0	0									

**Qualifiers:**

- \* Value exceeds Maximum Contaminant Level.
- E Value above quantitation range
- J Analyte detected below quantitation limits
- P Sample pH greater than 2
- B Analyte detected in the associated Method Blank
- H Holding times for preparation or analysis exceeded
- ND Not Detected at the Reporting Limit
- R RPD outside accepted recovery limits

# QC SUMMARY REPORT

## Hall Environmental Analysis Laboratory, Inc.

WO#: 1212686

27-Dec-12

**Client:** Energen Resources Corp  
**Project:** #8-R Sec 34 T15S-R35E 1980 FSL & 660 FWL

Sample ID	MB-5362	SampType:	MBLK	TestCode:	EPA Method 8310: PAHs					
Client ID:	PBW	Batch ID:	5362	RunNo:	7647					
Prep Date:	12/20/2012	Analysis Date:	12/20/2012	SeqNo:	222132	Units:	µg/L			
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Naphthalene	ND	2.0								
1-Methylnaphthalene	ND	2.0								
2-Methylnaphthalene	ND	2.0								
Acenaphthylene	ND	2.5								
Acenaphthene	ND	5.0								
Fluorene	ND	0.80								
Phenanthrene	ND	0.60								
Anthracene	ND	0.60								
Fluoranthene	ND	0.30								
Pyrene	ND	0.30								
Benz(a)anthracene	ND	0.070								
Chrysene	ND	0.20								
Benzo(b)fluoranthene	ND	0.10								
Benzo(k)fluoranthene	ND	0.070								
Benzo(a)pyrene	ND	0.070								
Dibenz(a,h)anthracene	ND	0.12								
Benzo(g,h,i)perylene	ND	0.080								
Indeno(1,2,3-cd)pyrene	ND	0.080								
Surr: Benzo(e)pyrene	15		20.00		75.1	46.4	106			

Sample ID	LCS-5362	SampType:	LCS	TestCode:	EPA Method 8310: PAHs					
Client ID:	LCSW	Batch ID:	5362	RunNo:	7647					
Prep Date:	12/20/2012	Analysis Date:	12/20/2012	SeqNo:	222134	Units:	µg/L			
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Naphthalene	51	2.0	80.00	0	63.6	46	82.9			
1-Methylnaphthalene	53	2.0	80.20	0	65.9	47.2	85.8			
2-Methylnaphthalene	52	2.0	80.00	0	65.6	48.4	84.6			
Acenaphthylene	56	2.5	80.20	0	69.3	58.7	78.7			
Acenaphthene	54	5.0	80.00	0	67.8	55.3	85.1			
Fluorene	4.7	0.80	8.020	0	58.6	31.9	82.2			
Phenanthrene	2.7	0.60	4.020	0	67.7	54.5	81.9			
Anthracene	2.6	0.60	4.020	0	64.2	51.9	82.7			
Fluoranthene	5.2	0.30	8.020	0	64.6	57.6	83.7			
Pyrene	5.1	0.30	8.020	0	64.1	53.1	70.4			
Benz(a)anthracene	0.50	0.070	0.8020	0	62.3	48	85.7			
Chrysene	2.3	0.20	4.020	0	56.2	44.3	78.2			
Benzo(b)fluoranthene	0.69	0.10	1.002	0	68.9	60	90.4			
Benzo(k)fluoranthene	0.36	0.070	0.5000	0	72.0	61.4	89			
Benzo(a)pyrene	0.36	0.070	0.5020	0	71.7	63.5	88.6			
Dibenz(a,h)anthracene	0.72	0.12	1.002	0	71.9	57	92.6			

**Qualifiers:**

- \* Value exceeds Maximum Contaminant Level.
- E Value above quantitation range
- J Analyte detected below quantitation limits
- P Sample pH greater than 2
- B Analyte detected in the associated Method Blank
- H Holding times for preparation or analysis exceeded
- ND Not Detected at the Reporting Limit
- R RPD outside accepted recovery limits

# QC SUMMARY REPORT

## Hall Environmental Analysis Laboratory, Inc.

WO#: 1212686

27-Dec-12

**Client:** Energen Resources Corp  
**Project:** #8-R Sec 34 T15S-R35E 1980 FSL & 660 FWL

Sample ID	<b>LCS-5362</b>	SampType:	<b>LCS</b>	TestCode:	<b>EPA Method 8310: PAHs</b>					
Client ID:	<b>LCSW</b>	Batch ID:	<b>5362</b>	RunNo:	<b>7647</b>					
Prep Date:	<b>12/20/2012</b>	Analysis Date:	<b>12/20/2012</b>	SeqNo:	<b>222134</b>	Units:	<b>µg/L</b>			
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Benzo(g,h,i)perylene	0.69	0.080	1.000	0	69.0	55.4	95.9			
Indeno(1,2,3-cd)pyrene	1.4	0.080	2.004	0	69.4	52.7	88.6			
Surr: Benzo(e)pyrene	14		20.00		71.2	46.4	106			

**Qualifiers:**

- |  |  |
|--|--|
| * Value exceeds Maximum Contaminant Level.   | B Analyte detected in the associated Method Blank    |
| E Value above quantitation range             | H Holding times for preparation or analysis exceeded |
| J Analyte detected below quantitation limits | ND Not Detected at the Reporting Limit               |
| P Sample pH greater than 2                   | R RPD outside accepted recovery limits               |

**Sample Log-In Check List**

Client Name: **ENERGEN RESOURCES CORP** Work Order Number: **1212686**  
 Received by/date: AF 12/15/12  
 Logged By: **Anne Thorne** 12/15/2012 12:00:00 PM *Anne Thorne*  
 Completed By: **Anne Thorne** 12/17/2012 *Anne Thorne*  
 Reviewed By: JMS 12/17/12

**Chain of Custody**

- 1. Were seals intact? Yes  No  Not Present
- 2. Is Chain of Custody complete? Yes  No  Not Present
- 3. How was the sample delivered? UPS

**Log In**

- 4. Coolers are present? (see 19. for cooler specific information) Yes  No  NA
- 5. Was an attempt made to cool the samples? Yes  No  NA
- 6. Were all samples received at a temperature of >0° C to 6.0°C Yes  No  NA
- 7. Sample(s) in proper container(s)? Yes  No
- 8. Sufficient sample volume for indicated test(s)? Yes  No
- 9. Are samples (except VOA and ONG) properly preserved? Yes  No
- 10. Was preservative added to bottles? Yes  No  NA
- 11. VOA vials have zero headspace? Yes  No  No VOA Vials
- 12. Were any sample containers received broken? Yes  No
- 13. Does paperwork match bottle labels? (Note discrepancies on chain of custody) Yes  No
- 14. Are matrices correctly identified on Chain of Custody? Yes  No
- 15. Is it clear what analyses were requested? Yes  No
- 16. Were all holding times able to be met? (If no, notify customer for authorization.) Yes  No

# of preserved bottles checked for pH: \_\_\_\_\_  
 (<2 or >12 unless noted)  
 Adjusted? \_\_\_\_\_  
 Checked by: \_\_\_\_\_

**Special Handling (if applicable)**

- 17. Was client notified of all discrepancies with this order? Yes  No  NA

Person Notified: \_\_\_\_\_ Date: \_\_\_\_\_  
 By Whom: \_\_\_\_\_ Via:  eMail  Phone  Fax  In Person  
 Regarding: \_\_\_\_\_  
 Client Instructions: \_\_\_\_\_

18. Additional remarks:

**19. Cooler Information**

Cooler No	Temp °C	Condition	Seal Intact	Seal No	Seal Date	Signed By
1	2.2	Good	Yes			



## **APPENDIX D**

Release Notification and Corrective Action  
(Form C-141)

District I  
1625 N. French Dr., Hobbs, NM 88240  
District II  
1301 W. Grand Avenue, Artesia, NM 88210  
District III  
1000 Rio Brazos Road, Aztec, NM 87410  
District IV  
1220 S. St. Francis Dr., Santa Fe, NM 87505

State of New Mexico  
Energy Minerals and Natural Resources

Oil Conservation Division  
1220 South St. Francis Dr.  
Santa Fe, NM 87505

Form C-141  
Revised October 10, 2003

Submit 2 Copies to appropriate  
District Office in accordance  
with Rule 116 on back  
side of form

**Release Notification and Corrective Action**

**OPERATOR**

Initial Report  Final Report

Name of Company: Energen Resources Corporation	Contact: Andrew Cobb
Address: 3300 North A St. Bldg. 4, Ste. 100 Midland, Tx. 79705	Telephone No. 432-687-1155
Facility Name: West Lovington Strawn Unit	Facility Type: Fresh Water Well @ WLSU #8 well 30-025-32291

Surface Owner: Dan Field	Mineral Owner: N/A	Lease No. N/A
--------------------------	--------------------	---------------

**LOCATION OF RELEASE**

API

Unit Letter	Section	Township	Range	Feet from the	North/South Line	Feet from the	East/West Line	County
L	34	15S	35E	1980	FNL	660	FWL	Lea

Latitude 32° 58' 19.1" Longitude 103° 24' 06.5"

WTR 55'

**NATURE OF RELEASE**

Type of Release: Unknown	Volume of Release	Volume Recovered
Source of Release	Date and Hour of Occurrence	Date and Hour of Discovery
Was Immediate Notice Given? <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Not Required	If YES, To Whom?	
By Whom?	Date and Hour	
Was a Watercourse Reached? <input type="checkbox"/> Yes <input type="checkbox"/> No	If YES, Volume Impacting the Watercourse.	

If a Watercourse was Impacted, Describe Fully.\*

Describe Cause of Problem and Remedial Action Taken.\*  
Sampling of fresh water well near the WLSU #8 well shows elevated chloride levels.

Describe Area Affected and Cleanup Action Taken.\*  
Will begin investigation into cause of the elevated levels and remediate to approved standard.

I hereby certify that the information given above is true and complete to the best of my knowledge and understand that pursuant to NMOCD rules and regulations all operators are required to report and/or file certain release notifications and perform corrective actions for releases which may endanger public health or the environment. The acceptance of a C-141 report by the NMOCD marked as "Final Report" does not relieve the operator of liability should their operations have failed to adequately investigate and remediate contamination that pose a threat to ground water, surface water, human health or the environment. In addition, NMOCD acceptance of a C-141 report does not relieve the operator of responsibility for compliance with any other federal, state, or local laws and/or regulations.

Signature: Andrew Cobb	<b>OIL CONSERVATION DIVISION</b> <i>J. Johnson</i>	
Printed Name: Andrew Cobb	Approved by District Supervisor <b>ENVIRONMENTAL ENGINEER</b>	
Title: Sr. Safety & Environmental Specialist	Approval Date: 3-19-10	Expiration Date: 5-19-10
E-mail Address: andy.cobb@energen.com	Conditions of Approval:	Attached <input type="checkbox"/>
Date: 10-26-09 Phone: 432-686-3599		IRP# 10-3-2457

\* Attach Additional Sheets If Necessary

**APPENDIX E**  
Well Plugging Plans of Operations



# WELL PLUGGING PLAN OF OPERATIONS



NOTE: A Well Plugging Plan of Operations shall be filed with and accepted by the Office of the State Engineer prior to plugging.

**I. FILING FEE:** There is no filing fee for this form.

**II. GENERAL / WELL OWNERSHIP:**

Existing Office of the State Engineer POD Number (Well Number) for well to be plugged: N/A L-10, 465  
Name of well owner: Energen Resources – Andy Cobb  
Mailing address: 3510 North "A" Street, Building A&B  
City: Midland State: Texas Zip code: 79705  
Phone number: 432 686 3599 E-mail: Andy.Cobb@Energen.com

**III. WELL DRILLER INFORMATION:**

Well Driller contracted to provide plugging services: Edward Bryan – Straub Corporation  
New Mexico Well Driller License No.: WD-1711 Expiration Date: February 2016

**IV. WELL INFORMATION:**

Note: A copy of the existing Well Record for the well to be plugged should be attached to this plan.

- 1) GPS Well Location: Latitude: 32 deg, 59 min, 19 sec  
Longitude: -103 deg, 24 min, 04 sec, NAD 83
- 2) Reason(s) for plugging well: Potential chloride contamination from surface release of brine water.
- 3) Was well used for any type of monitoring program? No If yes, please use section VII of this form to detail what hydrogeologic parameters were monitored. If the well was used to monitor contaminated or poor quality water, authorization from the New Mexico Environment Department may be required prior to plugging.
- 4) Does the well tap brackish, saline, or otherwise poor quality water? Yes If yes, provide additional detail, including analytical results and/or laboratory report(s): Potential chloride contamination
- 5) Static water level: ~55' feet below land surface / feet above land surface (circle one)
- 6) Depth of the well: ~150' feet

- 7) Inside diameter of innermost casing: 7 inches.
- 8) Casing material: Steel
- 9) The well was constructed with:  
 \_\_\_\_\_ an open-hole production interval, state the open interval: unknown  
 \_\_\_\_\_ a well screen or perforated pipe, state the screened interval(s): unknown
- 10) What annular interval surrounding the artesian casing of this well is cement-grouted? N/A
- 11) Was the well built with surface casing? N/A If yes, is the annulus surrounding the surface casing grouted or otherwise sealed? \_\_\_\_\_ If yes, please describe: \_\_\_\_\_
- 12) Has all pumping equipment and associated piping been removed from the well? No If not, describe remaining equipment and intentions to remove prior to plugging in Section VII of this form.

**V. DESCRIPTION OF PLANNED WELL PLUGGING:**

Note: If this plan proposes to plug an artesian well in a way other than with cement grout, placed bottom to top with a tremie pipe, a detailed diagram of the well showing proposed final plugged configuration shall be attached, as well as any additional technical information, such as geophysical logs, that are necessary to adequately describe the proposal.

- 1) Describe the method by which cement grout shall be placed in the well, or describe requested plugging methodology proposed for the well: Tremie 5% bentonite/cement grout under pressure from the bottom of the well to the surface.
- 2) Will well head be cut-off below land surface after plugging? Yes

**VI. PLUGGING AND SEALING MATERIALS:**

Note: The plugging of a well that taps poor quality water may require the use of a specialty cement or specialty sealant

- 1) For plugging intervals that employ cement grout, complete and attach Table A.
- 2) For plugging intervals that will employ approved non-cement based sealant(s), complete and attach Table B.
- 3) Theoretical volume of grout required to plug the well to land surface: 40 Cu/Ft
- 4) Type of Cement proposed: Portland A/B Type I/II
- 5) Proposed cement grout mix: 6.5 gallons of water per 94 pound sack of Portland cement.
- 6) Will the grout be: \_\_\_\_\_ batch-mixed and delivered to the site  
X \_\_\_\_\_ mixed on site

7) Grout additives requested, and percent by dry weight relative to cement: 5% Sodium Bentonite Gel

8) Additional notes and calculations: (D<sup>2</sup> \* 0.005454) \* 150

**VII. ADDITIONAL INFORMATION:** List additional information below, or on separate sheet(s):  
Pumping equipment remains in the wells. An attempt to remove all of the equipment will be made prior to attempting to plug the well.

**VIII. SIGNATURE:**  
I, Raymond L Straub Jr., P.G., say that I have carefully read the foregoing Well Plugging Plan of Operations and any attachments, which are a part hereof; that I am familiar with the rules and regulations of the State Engineer pertaining to the plugging of wells and will comply with them, and that each and all of the statements in the Well Plugging Plan of Operations and attachments are true to the best of my knowledge and belief.

[Signature]  
Signature of Applicant

6/10/2015  
Date

**IX. ACTION OF THE STATE ENGINEER:**

This Well Plugging Plan of Operations is:

- Approved subject to the attached conditions.
- Not approved for the reasons provided on the attached letter.

Witness my hand and official seal this 22<sup>nd</sup> day of June, 2015

Tom Blaine P.E., State Engineer

By: [Signature] C. GOETT  
For ANDY MORLEY  
DISTRICT II MANAGER

## **APPENDIX F**

Application for Permit to Drill a Well with No Consumptive  
Use of Water (Form WR-07)

## NEW MEXICO OFFICE OF THE STATE ENGINEER

APPLICATION FOR PERMIT TO DRILL A WELL  
WITH NO CONSUMPTIVE USE OF WATER

(check applicable box):

For fees, see State Engineer website: <http://www.ose.state.nm.us/>

2-35993

- Purpose:
- Pollution Control And / Or Recovery       Geo-Thermal
- Exploratory       Construction Site De-Watering       Other (Describe):
- Monitoring       Mineral De-Watering

A separate permit will be required to apply water to beneficial use.

 Temporary Request - Requested Start Date: 06-24-2015

Requested End Date:

Plugging Plan of Operations Submitted?  Yes  No

## 1. APPLICANT(S)

Name: Energen Resources	Name: Straub Corporation
Contact or Agent: Andy Cobb      check here if Agent <input type="checkbox"/>	Contact or Agent: Raymond L Straub Jr., P.G.      check here if Agent <input checked="" type="checkbox"/>
Mailing Address: 3510 North "A" Street, Building A&B	Mailing Address: P.O. Box 192
City: Midland	City: Stanton
State: Texas      Zip Code: 79705	State: Texas      Zip Code: 79782
Phone: <input type="checkbox"/> Home <input type="checkbox"/> Cell Phone (Work): 432 686 3599	Phone: 432 756 3489 <input type="checkbox"/> Home <input type="checkbox"/> Cell Phone (Work): 432 756 3489
E-mail (optional): Andy.Cobb@energen.com	E-mail (optional): Raymond@Straubcorporation.com

FOR OSE INTERNAL USE

Application for Permit, Form wr-07, Rev 4/12/12

File Number: L-13216	Trn Number: 570502
Trans Description (optional):	
Sub-Basin:	
PCW/LOG Due Date: 6-30-16	

2. WELL(S) Describe the well(s) applicable to this application.

**Location Required: Coordinate location must be reported in NM State Plane (NAD 83), UTM (NAD 83), or Latitude/Longitude (Lat/Long - WGS84).  
District II (Roswell) and District VII (Cimarron) customers, provide a PLSS location in addition to above.**

- NM State Plane (NAD83) (Feet)       UTM (NAD83) (Meters)       Lat/Long (WGS84) (to the nearest 1/10<sup>th</sup> of second)  
 NM West Zone                               Zone 12N  
 NM East Zone                                   Zone 13N  
 NM Central Zone

Well Number (if known):	X or Easting or Longitude:	Y or Northing or Latitude:	Provide if known: -Public Land Survey System (PLSS) (Quarters or Halves, Section, Township, Range) OR - Hydrographic Survey Map & Tract; OR - Lot, Block & Subdivision; OR - Land Grant Name
MW-6	-103.401242 103 24 4.47	32.972139 32 58 19.69	Unit L, Section 34, Township 15 South, Range 35 East
MW-7	-103.400697 103 24 2.50	32.971840 32 58 18.62	Unit L, Section 34, Township 15 South, Range 35 East
MW-8	-103.400802 103 24 2.88	32.971379 32 58 16.96	Unit L, Section 34, Township 15 South, Range 35 East
MW-9	-103.401210 103 24 4.35	32.971362 32 58 16.90	Unit L, Section 34, Township 15 South, Range 35 East
MW-10	-103.400692 103 24 2.49	32.971290 32 58 16.64	Unit L, Section 34, Township 15 South, Range 35 East

**NOTE: If more well locations need to be described, complete form WR-08 (Attachment 1 – POD Descriptions)**  
 Additional well descriptions are attached:  Yes  No      If yes, how many \_\_\_\_\_

Other description relating well to common landmarks, streets, or other:

Well is on land owned by: Dan Field

**Well Information: NOTE: If more than one (1) well needs to be described, provide attachment. Attached?**  Yes  No  
 If yes, how many 5

Approximate depth of well (feet): 75

Outside diameter of well casing (inches): 2.375

Driller Name: Edward Bryan – Straub Corporation

Driller License Number: WD-1711

3. ADDITIONAL STATEMENTS OR EXPLANATIONS

Monitoring wells to delineate a potential chloride release.

FOR OSE INTERNAL USE

Application for Permit, Form wr-07

File Number:

L-13218

Trn Number:

570502

**4. SPECIFIC REQUIREMENTS:** The applicant must include the following, as applicable to each well type. Please check the appropriate boxes, to indicate the information has been included and/or attached to this application:

<p><b>Exploratory:</b>  <input type="checkbox"/> Include a description of any proposed pump test, if applicable.</p>	<p><b>Pollution Control and/or Recovery:</b>  <input type="checkbox"/> Include a plan for pollution control/recovery, that includes the following:  <input type="checkbox"/> A description of the need for the pollution control or recovery operation.  <input type="checkbox"/> The estimated maximum period of time for completion of the operation.  <input type="checkbox"/> The annual diversion amount.  <input type="checkbox"/> The annual consumptive use amount.  <input type="checkbox"/> The maximum amount of water to be diverted and injected for the duration of the operation.  <input type="checkbox"/> The method and place of discharge.</p>	<p><b>Construction De-Watering:</b>  <input type="checkbox"/> Include a description of the proposed dewatering operation,  <input type="checkbox"/> The estimated duration of the operation,  <input type="checkbox"/> The maximum amount of water to be diverted,  <input type="checkbox"/> A description of the need for the dewatering operation, and,  <input type="checkbox"/> A description of how the diverted water will be disposed of.</p>	<p><b>Mine De-Watering:</b>  <input type="checkbox"/> Include a plan for pollution control/recovery, that includes the following:  <input type="checkbox"/> A description of the need for mine dewatering.  <input type="checkbox"/> The estimated maximum period of time for completion of the operation.  <input type="checkbox"/> The source(s) of the water to be diverted.  <input type="checkbox"/> The geohydrologic characteristics of the aquifer(s).  <input type="checkbox"/> The maximum amount of water to be diverted per annum.  <input type="checkbox"/> The maximum amount of water to be diverted for the duration of the operation.  <input type="checkbox"/> The quality of the water.  <input type="checkbox"/> The method of measurement of water diverted.</p>
<p><b>Monitoring:</b>  <input type="checkbox"/> Include the reason for the monitoring well, and,  <input type="checkbox"/> The duration of the planned monitoring.</p>	<p><input type="checkbox"/> The method of measurement of water produced and discharged.  <input type="checkbox"/> The source of water to be injected.  <input type="checkbox"/> The method of measurement of water injected.  <input type="checkbox"/> The characteristics of the aquifer.  <input type="checkbox"/> The method of determining the resulting annual consumptive use of water and depletion from any related stream system.  <input type="checkbox"/> Proof of any permit required from the New Mexico Environment Department.  <input type="checkbox"/> An access agreement if the applicant is not the owner of the land on which the pollution plume control or recovery well is to be located.</p>	<p><b>Geo-Thermal:</b>  <input type="checkbox"/> Include a description of the geothermal heat exchange project,  <input type="checkbox"/> The amount of water to be diverted and re-injected for the project,  <input type="checkbox"/> The time frame for constructing the geothermal heat exchange project, and,  <input type="checkbox"/> The duration of the project.  <input type="checkbox"/> Preliminary surveys, design data, and additional information shall be included to provide all essential facts relating to the request.</p>	<p><input type="checkbox"/> The recharge of water to the aquifer.  <input type="checkbox"/> Description of the estimated area of hydrologic effect of the project.  <input type="checkbox"/> The method and place of discharge.  <input type="checkbox"/> An estimation of the effects on surface water rights and underground water rights from the mine dewatering project.  <input type="checkbox"/> A description of the methods employed to estimate effects on surface water rights and underground water rights.  <input type="checkbox"/> Information on existing wells, rivers, springs, and wetlands within the area of hydrologic effect.</p>

**ACKNOWLEDGEMENT**

I, We (name of applicant(s)), Raymond L Straub Jr., P.G.  
 Print Name(s)

affirm that the foregoing statements are true to the best of (my, our) knowledge and belief.

[Signature] 6/10/2015  
 Applicant Signature Applicant Signature

**ACTION OF THE STATE ENGINEER**

This application is:

approved  partially approved  denied

provided it is not exercised to the detriment of any others having existing rights, and is not contrary to the conservation of water in New Mexico nor detrimental to the public welfare and further subject to the attached conditions of approval.

Witness my hand and seal this 22nd day of June 20 15, for the State Engineer,

[Signature] Tom Blaine, P.E., State Engineer

By: [Signature]  
 Signature Print

Title: Juan Hernandez, Engr Specialist Supervisor  
 Print

FOR OSE INTERNAL USE

Application for Permit, Form wr-07

File Number: L-13218 Trn Number: 570502

**NEW MEXICO STATE ENGINEER OFFICE  
PERMIT TO EXPLORE**

**SPECIFIC CONDITIONS OF APPROVAL**

- 1B Depth of the well shall not exceed the thickness of the Ogallala formation.
- 4 No water shall be appropriated and beneficially used under this permit.
- 6 The well shall be plugged upon completion of the permitted use, and a plugging report shall be filed with the State Engineer within 10 days.
- 7 The Permittee shall utilize the highest and best technology available to ensure conservation of water to the maximum extent practical.
- B The well shall be drilled by a driller licensed in the State of New Mexico in accordance with Section 72-12-12 New Mexico Statutes Annotated.
- C Driller's well record must be filed with the State Engineer within 20 days after the well is drilled or driven. Well record forms will be provided by the State Engineer upon request.
- C2 No water shall be diverted from this well except for testing purposes which shall not exceed ten (10) cumulative days, and well shall be plugged or capped on or before , unless a permit to use water from this well is acquired from the Office of the State Engineer.
- P The well shall be constructed, maintained, and operated to prevent inter-aquifer exchange of water and to prevent loss of hydraulic head between geologic zones.