

***Rule* Engineering, LLC**Solutions to Regulations for Industry

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March 20, 2013

Mr. Alex Fischer  
Colorado Oil and Gas Conversation Commission  
1120 Lincoln Street, Suite 801  
Denver, Colorado 80203

**Re: NSF NORM Characterization COGCC Facility ID #426582**

Dear Mr. Fischer:

Rule Engineering, LLC has completed the Naturally Occurring Radioactive Material (NORM) Sampling requested by Colorado Oil and Gas Conversation Commission (COGCC). This report summarizes and documents the waste sampling activities and analytical results; is being submitted by Rule on behalf of Encana Oil & Gas (USA), Inc. (Encana).

The North Solidification Facility (NSF), COGCC Facility ID #426582 was sampled to identify NORM concentrations of waste streams processed at the facility. Analytical summary table is located at the end of the report. Analytical Data and Chain of Custody (COC) are located in Appendix A

**Sampling Activities**

The NORM profile sample was collected on March 6, 2013 from NSF solids holding bin. The sample collected represents a composite of all waste streams that are processed at the facility.

One multi-point (5 points) composite sample was collected from the solids holding bin. The sample was collected from one (1) foot to two (2) feet below the stockpile surface. The following sample ID was assigned: NSF-SO-1-2-030613. Summary of analytical results can be found in Table 1.

***Sampling and Analytical Protocols***

The sample was taken from within hopper by removing overburden material, and sampling with nitrile gloves. The sample was composited by mixing the waste in a stainless steel bowl to comprise one analytical sample. Following sample collection each container was labeled with a waterproof marker and data was recorded in the sample documentation form, and chain of custody form. Samples were placed on ice in a cooler and shipped for laboratory analysis.

Mr. Alex Fischer  
NSF NORM Characterization  
March 20, 2013  
Page 2 of 2

The soil sample was analyzed by ESC (Environmental Science Corporation) for the following parameters by the indicated analytical methods:

- Naturally Occurring Radio Active Material (NORM) Gross Alpha, Gross Beta, Gross Gamma Scan (Methods 900 and 901.1 respectively)

The sample was received in good condition, at appropriate temperatures, and analyzed within appropriate holding times.

### **Analytical Review**

Analytical results indicate the E&P waste streams processed at the NSF facility has low levels of naturally occurring radionuclides from the uranium and thorium chains. Analytical data indicates no evidence of enhanced/man-made radionuclides in the material.

If you have any questions please contact me at 970-244-8500.

Sincerely,  
**Rule Engineering, LLC**

Scotty Mann  
Hydrogeologist/Project Manager

cc: Brett Middleton - Encana  
Russell Knight - Rule

**Summary Table**

Table 1				
Sample ID: NSF-SO-1-2-030613				
Lab Sample ID: L623534				
Method	Parameter	Units	Value	Qual
NORM				
900	Gross Alpha	pCi/gram	<4.0	
900	Gross Beta	pCi/gram	<4.0	
901.1	Actinium-228	pCi/gram	0.4	
901.1	Bismuth-211	pCi/gram	0.5	
901.1	Bismuth-214	pCi/gram	0.5	
901.1	Lead-212	pCi/gram	0.3	
901.1	Lead-214	pCi/gram	0.3	
901.1	Potassium-40	pCi/gram	6.2	
901.1	Protactinium-234M	pCi/gram	<6.9	
901.1	Radium-226	pCi/gram	0.4	
901.1	Radium-228	pCi/gram	0.4	

# **Appendix A**

Encana Oil & Gas (USA)  
143 Diamond Avenue  
Parachute, CO 81635  
\*ENCANACO\*  
ENCANACO-RULEENG

Billing Information:

Chris Hines  
143 Diamond Avenue  
Parachute, CO 81635  
970-285-2653  
(970) 244-8500 Office  
(970) 623-0995 Cell

Report to:

Chris Hines

Email to:

christopher.hines@encana.com

Analysis/Container/Preservative

G190

Chain of Custody  
Page 1 of 1



12065 Lebanon Road  
Mt. Juliet, TN 37122

Phone: (800) 767-5859

Phone: (615) 758-5858

Fax: (615) 758-5859

Project Description: NSF-Solids Out

City/State Collected

CO

Phone: 970-623-0995  
FAX:

Client Project #: NSF

ESC Key: ENCANACO-RULEENG

Collected by: SRM

Site/Facility ID#: NSF

P.O.#:

Collected by (signature):

**Rush?** (Lab MUST Be Notified)

Same Day . . . . . 200%

Next Day . . . . . 100%

Two Day . . . . . 50%

Three Day . . . . . 25%

Date Results Needed:

Email? ☐ No ☒ Yes

FAX? ☐ No ☐ Yes

No.

of

Cntrs

Immediately Packed on Ice N Y

Sample ID

Comp/Grab

Matrix\*

Depth

Date

Time

NSF-SO-1-2-030613

Comp

SS

1-2"

03/06/13

1035

2

X

\*Matrix: SS - Soil/Solid GW - Groundwater WW - WasteWater DW - Drinking Water OT - Other

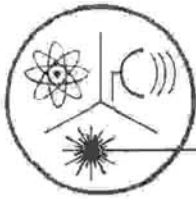
pH Temp

Remarks:

5435 5509 4754

Flow Other

Relinquished by: (Signature) <i>[Signature]</i>	Date: 3-6-13	Time: 1530	Received by: (Signature) <i>[Signature]</i>	Samples returned via: <input type="checkbox"/> UPS <input type="checkbox"/> FedEx <input type="checkbox"/> Courier	Condition: (lab use only) <i>[Signature]</i>
Relinquished by: (Signature)	Date:	Time:	Received by: (Signature)	Temp: 3.4°C	Bottles Received: 246
Relinquished by: (Signature)	Date:	Time:	Received for lab by: (Signature) <i>[Signature]</i>	Date: 3-7-13	Time: 930
				CoC Seals Intact: <input type="checkbox"/> Y <input type="checkbox"/> N <input type="checkbox"/> NA	pH Checked: NCF:



## **Radiation Safety Engineering, Inc.**

3245 N. WASHINGTON ST. • CHANDLER, ARIZONA 85225-1121  
Website: [www.radsafe.com](http://www.radsafe.com)

(480) 897-9459  
FAX (480) 892-5446

March 11, 2013

Janice Cozby  
Environmental Science Corp.  
12065 Lebanon Road  
Mt. Juliet, TN 37122

Dear Ms. Cozby:

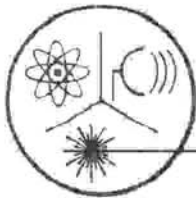
The analysis of your solid samples indicates that it has low levels of naturally occurring radionuclides from the uranium and thorium chains. There is no evidence of man-made radionuclides in the sample. The gross alpha and beta activities and the results of the gamma spectroscopy analysis is attached.

The material is not hazardous under NRC or other state rules, and should be acceptable in ordinary landfills. The levels are comparable to those found in the alluvial fill in the Phoenix area.

Please contact me at (480) 897-9459 if you have any questions or need further information.

Sincerely,

Robert L. Metzger, Ph.D.  
President.



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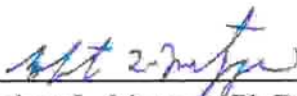
### Gamma Emitters in Solid (pCi/gram)

Environmental Science Corp.  
12065 Lebanon Road  
Mt. Juliet, TN 37122

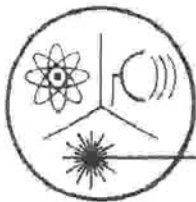
Collection Date: March 6, 2013  
Sample Received: March 8, 2013  
Analysis Completed: March 11, 2013

Sample ID.: L623534-01

Nuclide	Activity Method 901.1 (pCi/gram)
Potassium-40	$6.2 \pm 0.4$
Bismuth-211	$0.5 \pm 0.2$
Lead-212	$0.3 \pm 0.1$
Bismuth-214	$0.5 \pm 0.1$
Lead-214	$0.3 \pm 0.1$
Radium-226	$0.4 \pm 0.1$
Radium-228	$0.4 \pm 0.1$
Actinium-228	$0.4 \pm 0.1$
Protactinium-234M	$< 6.9$

  
Robert L. Metzger, Ph.D., C.H.P.





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FAX (480) 892-5446

### Radiochemical Activity in Solid (pCi/gram)

Environmental Science Corp.  
12065 Lebanon Road  
Mt. Juliet, TN 37122

Sampling Date: March 6, 2013  
Sample Received: March 8, 2013  
Analysis Completed: March 11, 2013

Sample ID	Gross Alpha Activity Method 900 (pCi/gram)	Gross Beta Activity Method 900 (pCi/gram)
L623534-01	< 4.0	< 4.0

Date of Analysis	3/8/2013	3/8/2013
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Robert L. Metzger, Ph.D., C.H.P.



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Fax (615) 758-5859

Tax I.D. 62-0814289

Est. 1970

Chris Hines / Matt Kasten  
EnCana Oil & Gas Inc. - CO  
143 Diamond Avenue  
Parachute, CO 81635

## Report Summary

Tuesday March 12, 2013

Report Number: L623534


Samples Received: 03/07/13

Client Project: NSF

Description: NSF-Solids Out

The analytical results in this report are based upon information supplied by you, the client, and are for your exclusive use. If you have any questions regarding this data package, please do not hesitate to call.

Entire Report Reviewed By:

  
Jarred Willis , ESC Representative

### Laboratory Certification Numbers

A2LA - 1461-01, AIHA - 100789, AL - 40660, CA - 01157CA, CT - PH-0197,  
FL - E87487, GA - 923, IN - C-IN-01, KY - 90010, KYUST - 0016,  
NC - ENV375/DW21704/BIO041, ND - R-140, NJ - TN002, NJ NELAP - TN002,  
SC - 84004, TN - 2006, VA - 460132, WV - 233, AZ - 0612,  
MN - 047-999-395, NY - 11742, WI - 998093910, NV - TN000032011-1,  
TX - T104704245-11-3, OK - 9915, PA - 68-02979, IA Lab #364

Accreditation is only applicable to the test methods specified on each scope of accreditation held by ESC Lab Sciences.

Note: The use of the preparatory EPA Method 3511 is not approved or endorsed by the CA ELAP.

This report may not be reproduced, except in full, without written approval from ESC Lab Sciences. Where applicable, sampling conducted by ESC is performed per guidance provided in laboratory standard operating procedures: 060302, 060303, and 060304.



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Est. 1970

# REPORT OF ANALYSIS

March 12, 2013

Chris Hines / Matt Kasten  
EnCana Oil & Gas Inc. - CO  
143 Diamond Avenue  
Parachute, CO 81635

Date Received : March 07, 2013  
Description : NSF-Solids Out  
Sample ID : NSF-SO-1-2-030613  
Collected By : SRM  
Collection Date : 03/06/13 10:35

ESC Sample # : L623534-01

Site ID : NSF

Project # : NSF

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Miscellaneous	ATTACH TO COC				03/08/13	1
Gross Gamma Scan Miscellaneous	ATTACH TO COC			901.1	03/11/13	1

BDL - Below Detection Limit

Det. Limit - Practical Quantitation Limit(PQL)

Note:

The reported analytical results relate only to the sample submitted.

This report shall not be reproduced, except in full, without the written approval from ESC.

Reported: 03/12/13 13:54 Printed: 03/12/13 13:54

L623534-01 (MISC-SUB) - subcontracted to Radiation Safety Engr

L623534-01 (GROSS GAMMA SCAN) - subcontracted to Radiation Safety Engr

Summary of Remarks For Samples Printed  
03/12/13 at 13:54:58

TSR Signing Reports: 358  
R5 - Desired TAT

Log ALL samples for EDD (COGCC EDD). Log all PAHs as PAHSIM. Try not to report benzene as BDL  
above a 250x dilution.

Sample: L623534-01 Account: ENCANACO Received: 03/07/13 09:30 Due Date: 03/21/13 00:00 RPT Date: 03/12/13 13:54  
Subbed to Radsafcaz jlc 3/7/13 PO#S17796. Gamma Scan and GA/GB (MISC-SUB)



**YOUR LAB OF CHOICE**

EnCana Oil & Gas Inc. - CO  
Chris Hines / Matt Kasten  
143 Diamond Avenue

Parachute, CO 81635

Quality Assurance Report  
Level II

L623534

12065 Lebanon Rd.  
Mt. Juliet, TN 37122  
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Est. 1970

March 12, 2013

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Batch number /Run number / Sample number cross reference

WG639899: R2577419: L623534-01

\* \* Calculations are performed prior to rounding of reported values.

\* Performance of this Analyte is outside of established criteria.

For additional information, please see Attachment A 'List of Analytes with QC Qualifiers.'



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Level II

L623534

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Est. 1970

March 12, 2013

The data package includes a summary of the analytic results of the quality control samples required by the SW-846 or CWA methods. The quality control samples include a method blank, a laboratory control sample, and the matrix spike/matrix spike duplicate analysis. If a target parameter is outside the method limits, every sample that is effected is flagged with the appropriate qualifier in Appendix B of the analytic report.

Method Blank - an aliquot of reagent water carried through the entire analytic process. The method blank results indicate if any possible contamination exposure during the sample handling, digestion or extraction process, and analysis. Concentrations of target analytes above the reporting limit in the method blank are qualified with the "B" qualifier.

Laboratory Control Sample - is a sample of known concentration that is carried through the digestion/extraction and analysis process. The percent recovery, expressed as a percentage of the theoretical concentration, has statistical control limits indicating that the analytic process is "in control". If a target analyte is outside the control limits for the laboratory control sample or any other control sample, the parameter is flagged with a "J4" qualifier for all effected samples.

Matrix Spike and Matrix Spike Duplicate - is two aliquots of an environmental sample that is spiked with known concentrations of target analytes. The percent recovery of the target analytes also has statistical control limits. If any recoveries that are outside the method control limits, the sample that was selected for matrix spike/matrix spike duplicate analysis is flagged with either a "J5" or a "J6". The relative percent difference (%RPD) between the matrix spike and the matrix spike duplicate recoveries is all calculated. If the RPD is above the method limit, the effected samples are flagged with a "J3" qualifier.