

FORM

27

Rev 6/99

ENCANA

C1600  
K2000  
C1000

#7603

FOR OGCC USE ONLY

# State of Colorado Oil and Gas Conservation Commission

1120 Lincoln Street, Suite 801, Denver, Colorado 80203 (303)894-2100 Fax:(303)894-2109

## SITE INVESTIGATION AND REMEDIATION WORKPLAN

This form shall be submitted to the Director for approval prior to the initiation of site investigation and remediation activities. Form 27 is intended to be used whenever possible. Additional documentation will be required when large volumes of soil and groundwater have been impacted or involve large facilities with multiple source areas. See Rule 910. Attach as many pages as needed to fully describe the proposed work.

### CAUSE OF CONDITION BEING INVESTIGATED AND REMEDIATED

☐ Spill or Release ☐ Plug & Abandon ☐ Central Facility Closure ☐ Site/Facility Closure ☒ Other (describe): Insitu Remediation Plan

OGCC Employee:

☐ Spill ☐ Complaint  
☐ Inspection ☐ NOAV

Tracking No:

OGCC Operator Number: 100185

Name of Operator: Encana Oil &amp; Gas (USA) Inc.

Address: 2717 County Road 215, Suite 100

City: Parachute State: CO Zip: 81635

Contact Name and Telephone:

Christopher Hines

No: 970 285 2653

Fax: christopher.hines@encana.com

API Number: see attached

County: see attached

Facility Name: see attached

Facility Number: see attached

Well Name: see attached

Well Number: see attached

Location: (QtrQtr, Sec, Twp, Rng, Meridian): see attached

Latitude: see attached Longitude: see attached

### TECHNICAL CONDITIONS

Type of Waste Causing Impact (crude oil, condensate, produced water, etc): see attached

**Site Conditions:** Is location within a sensitive area (according to Rule 901e)? ☐ Y ☐ N If yes, attach evaluation.

Adjacent land use (cultivated, irrigated, dry land farming, industrial, residential, etc.): see attached

Soil type, if not previously identified on Form 2A or Federal Surface Use Plan: see attached

Potential receptors (water wells within 1/4 mi, surface waters, etc.): see attached

**Description of Impact** (if previously provided, refer to that form or document):

Impacted Media (check):

- ☐ Soils  
☐ Vegetation  
☐ Groundwater  
☐ Surface Water

Extent of Impact:

Any identified impacts will be detailed in the  
required Form 19.

How Determined:

Any identified impacts will be detailed in the  
required Form 19.

### REMEDIALATION WORKPLAN

**Describe initial action taken** (if previously provided, refer to that form or document):

See attached.

**Describe how source is to be removed:**

See attached.

**Describe how remediation of existing impacts is to be accomplished, including removal and disposal at an injection well or licensed facility, land treatment on site, removal of impacted groundwater, insitu bioremediation, burning of oily vegetation, etc.:**

See attached.

Submit Page 2 with Page 1

ENCANA

C16 00  
K20 00  
C10 00

FORM  
27  
Rev 6/99

State of Colorado  
Oil and Gas Conservation Commission  
1120 Lincoln Street, Suite 801, Denver, Colorado 80203  
(303)894-2100 Fax: (303)894-2109



Page 2  
REMEDATION WORKPLAN (Cont.)

Tracking Number: \_\_\_\_\_  
Name of Operator: ENCANA  
OGCC Operator No: \_\_\_\_\_  
Received Date: \_\_\_\_\_  
Well Name & No: \_\_\_\_\_  
Facility Name & No: \_\_\_\_\_

OGCC Employee: \_\_\_\_\_

If groundwater has been impacted, describe proposed monitoring plan (# of wells or sample points, sampling schedule, analytical methods, etc.):

See attached.

Describe reclamation plan. Discuss existing and new grade recontouring; method and testing of compaction alleviation; and reseeding program, including location of new seed, seed mix and noxious weed prevention. Attach diagram or drawing. Use additional sheet for description if required.

See attached.

Attach samples and analytical results taken to verify remediation of impacts. Show locations of samples on an onsite schematic or drawing.

Is further site investigation required? ☒ Y ☐ N If yes, describe:

See attached.

Final disposition of E&P waste (landtreated and disposed onsite, name of licensed disposal facility, recycling, reuse, etc.):

See attached.

### IMPLEMENTATION SCHEDULE

Date Site Investigation Began: <u>see attached</u>	Date Site Investigation Completed: <u>see attached</u>	Date Remediation Plan Submitted: <u>09-25-12</u>
Remediation Start Date: <u>see attached</u>	Anticipated Completion Date: <u>see attached</u>	Actual Completion Date: <u>see attached</u>

I hereby certify that the statements made in this form are, to the best of my knowledge, true, correct, and complete.

Print Name: Christopher Hines

Signed: [Signature]

Title: Natural Resources Specialist | Environmental Field Coordinator

Date: 09-25-2012

OGCC Approved: [Signature]

Title: FOR Chris Canfield

Date: 01/17/2013

EPS NW Region

# NARRATIVE ATTACHMENT

## FORM 27 (SITE INVESTIGATION AND REMEDIATION WORKPLAN)

---

### In Situ Remediation Plan

Date of Last Revision – September 25, 2012

---

This Form 27 (Site Investigation and Remediation Workplan) was prepared as supplement to an existing remediation plan, and/or to initiate a new in situ remediation project in Encana Oil & Gas (USA) Inc. (Encana's) Parachute area of operation. This submittal may supplement and/or initiate several remediation projects, and includes a spreadsheet listing current and/or proposed locations with Form 27 required site-specific information. If the spreadsheet identifies an existing remediation project number (Rem#), please consider this form a supplement to that project. If no Rem# is identified, please generate a new Rem# for the identified location. Also included are the laboratory results summary table(s), and topographic location map(s) specific to the locations and impacted material covered by this form.

Project-specific information, including lab reports and monitoring data will be provided in supplemental Form 4 (Sundry Notices) following construction of the in situ remediation systems. Upon successful completion of the project, a Form 4 (Notification of Completion) will be submitted with documentation demonstrating remediation success.

### REMEDICATION WORKPLAN

#### **Describe initial action taken (if previously provided, refer to that form or document):**

In accordance with COGCC Rule 907, all material impacted or potentially impacted by E&P waste is sampled for the purpose of comparing constituent levels to the allowable limits identified by the COGCC in Table 910-1. If the impacted material covered by this form is drill cuttings, this document is likely the initial disclosure of those impacts. If the impacted material is spoil from a spill response or pit closure, those impacts would have been disclosed in a previously submitted Form 27 and/or Form 19 and the applicable COGCC document tracking number (Doc#) and/or Rem# will be listed in the attached project spreadsheet.

#### **Describe how source is to be removed:**

This remediation plan has been prepared to describe an in situ remediation approach, where impacted material will be remediated in place without removal. In situ remediation will be utilized with material that exceeds the allowable concentration for the organic constituents of concern, TPH (total petroleum hydrocarbon), and BTEX (benzene, toluene, ethylbenzene, and xylenes).

#### **Describe how remediation of existing impacts is to be accomplished, including removal and disposal at an injection well or licensed facility, land treatment on site, removal of impacted groundwater, insitu bioremediation, burning of oily vegetation, etc.:**

In order to determine the preferred remediation option for identified soil impacts, Encana evaluates a number of criteria to assure protection of Public Health and the Environment, while proceeding in the most cost-effective manner.

Encana considers in situ remediation to be the preferred method of remediation any time the volume of impacted material is greater than 500 cubic yards, is unsafe to remove through conventional excavation, or is in a remote location where offsite disposal and regular monitoring of remediation efforts may be financially impractical.

Encana typically installs passive or active soil vapor extraction (SVE) systems for in situ remediation projects. However, each location will be evaluated for appropriate remediation technologies based on site conditions, impact characterization, material disposition, and remedial time constraints. The selected technology will be identified to the COGCC in a Form 4 (Sundry Notice) following construction of the remediation system. System operation and maintenance will be conducted on the schedule identified in the site-specific supplemental Form 4.

All remediation activities are verified with sample collection and laboratory analysis, conducted in accordance with COGCC Rule 910, and when necessary under an approved monitoring plan and analytical suite.



# NARRATIVE ATTACHMENT

## FORM 27 (SITE INVESTIGATION AND REMEDIATION WORKPLAN)

### In Situ Remediation Plan

Date of Last Revision – September 25, 2012

---

**If groundwater has been impacted, describe proposed monitoring plan (# of wells or sample points, sampling schedule, analytical methods, etc.):**

In the event that groundwater is encountered during the installation of an in situ remediation system or during the characterization of soil impacts, an evaluation of potential groundwater impacts would be made, and a revised remediation plan would be submitted through a Form 4 (Sundry Notice).

**Describe reclamation plan. Discuss existing and new grade recontouring; method and testing of compaction alleviation; and reseeding program, including location of new seed, seed mix and noxious weed prevention. Attach diagram or drawing. Use additional sheet for description if required.**

The impacted material and in situ remediation system will occur within the original disturbance boundary for the identified location. The in situ remediation system may be installed on active working surface, or within final reclamation contours. The location of the system will be clearly marked and protected on location with fencing, barriers, and/or signage appropriate to site conditions and operational status. Location specifics surrounding the in situ remediation system, including reclamation status will be detailed in the post construction Form 4 submittal. To assure successful revegetation efforts, Encana buries all treated material below the agronomic zone, beneath a minimum of three feet (3') of clean native fill and topsoil.

Interim and final reclamation activities will be carried out in accordance with COGCC 1000 Series requirements, and will be documented accordingly.

**Attach samples and analytical results taken to verify remediation of impacts. Show locations of samples on an onsite schematic or drawing. Is further site investigation required? If yes, describe:**

Analytical data collected in support of this remediation project will be provided to the COGCC in a Form 4 (Sundry Notice or Notification of Completion). A site diagram illustrating the installed remediation system and monitoring points will also be provided.

Air monitoring is typically utilized for in situ remediation systems to monitor remediation progress. Those results will be provided to the COGCC in a Form 4 (Sundry Notice). When air monitoring results provide evidence that remediation has been successful, soil boring(s) will be used to confirm remediation success. Those results will be provided to the COGCC in a Form 4 (Sundry Notice, and if applicable Notification of Completion).

**Final disposition of E&P waste (landtreated and disposed onsite, name of licensed disposal facility, recycling, reuse, etc.):**

Final onsite disposition of E&P waste would be detailed in a Form 4 (Sundry Notice or Notification of Completion).

#### **List of Attachments**

- Remediation Project Spreadsheet
- Topographic Location Map(s)
- Laboratory Results Summary Table(s)



# Form 27 (Site Investigation Remediation Workplan) Multi-Location Form Submittal - Site Specific Information

09/25/2012

Encana Location	Related COGCC Document and/or Remediation Numbers	CAUSE OF CONDITION BEING INVESTIGATED AND REMEDIATED (p1)								
		API Number:	County:	Facility Name:	Facility Number:	Well Name:	Well Number:	Location: (QtrQtr, Sec, Twp, Rng, Meridian):	Latitude:	Longitude:
C10OU	Please generate Remediation #	NA - multiple wells	Garfield	Keinath Federal [Location Name]	9-12H2 (C10OU) [Location No]	NA - C10OU Well Pad	334093 (Location ID)	NENW, Sec 10, T8S, R96W, 6th PM	39.36853	-108.09871
C16OU	Please generate Remediation #	NA - multiple wells	Mesa	Keinath Federal [Location Name]	17-11H (C16OU) [Location No]	NA - C16OU Well Pad	334416 (Location ID)	NENW, Sec 16, T8S, R96W, 6th PM	39.355313	-108.114492
K20OU	Please generate Remediation #	NA - multiple wells	Mesa	Orchard Unit [Location Name]	18-9HM [Location No]	NA - K20OU Well Pad	334379 (Location ID)	NESW, Sec 20, T8S, R96W, 6th PM	39.332083	-108.135192

# Form 27 (Site Investigation Remediation Workplan) Multi-Location Form Submittal - Site Specific Information

09/25/2012

Encana Location	TECHNICAL CONDITIONS (p1)				
	Type of Waste Causing Impact:	Sensitive Area:	Adjacent land use:	Soil Type:	Potential Receptors: (water wells, surface waters)
C100U	Drill cuttings.	No - Based on distance to surface water (>900'), and depth to groundwater (>100').	rangeland	Potts loam, 3 to 6 percent slopes	According to the COGCC GIS OnLine mapping service there is 2 intermittent streams and no wells within ¼ mile of the well pad.
C160U	Drill cuttings.	No - Based on distance to surface water (>1300') and depth to groundwater (>100').	rangeland	Barx loam, 3 to 12 percent slopes	According to the COGCC GIS OnLine mapping service there are no surface water receptors and no wells within ¼ mile of the well pad.
K200U	Drill cuttings.	No - Based on distance to surface water (>1400') and depth to groundwater (>100').	rangeland	Barx-Clapper complex, 3 to 12 percent slopes	According to the COGCC GIS OnLine mapping service there is one intermittent stream and one well within ¼ mile of the well pad.



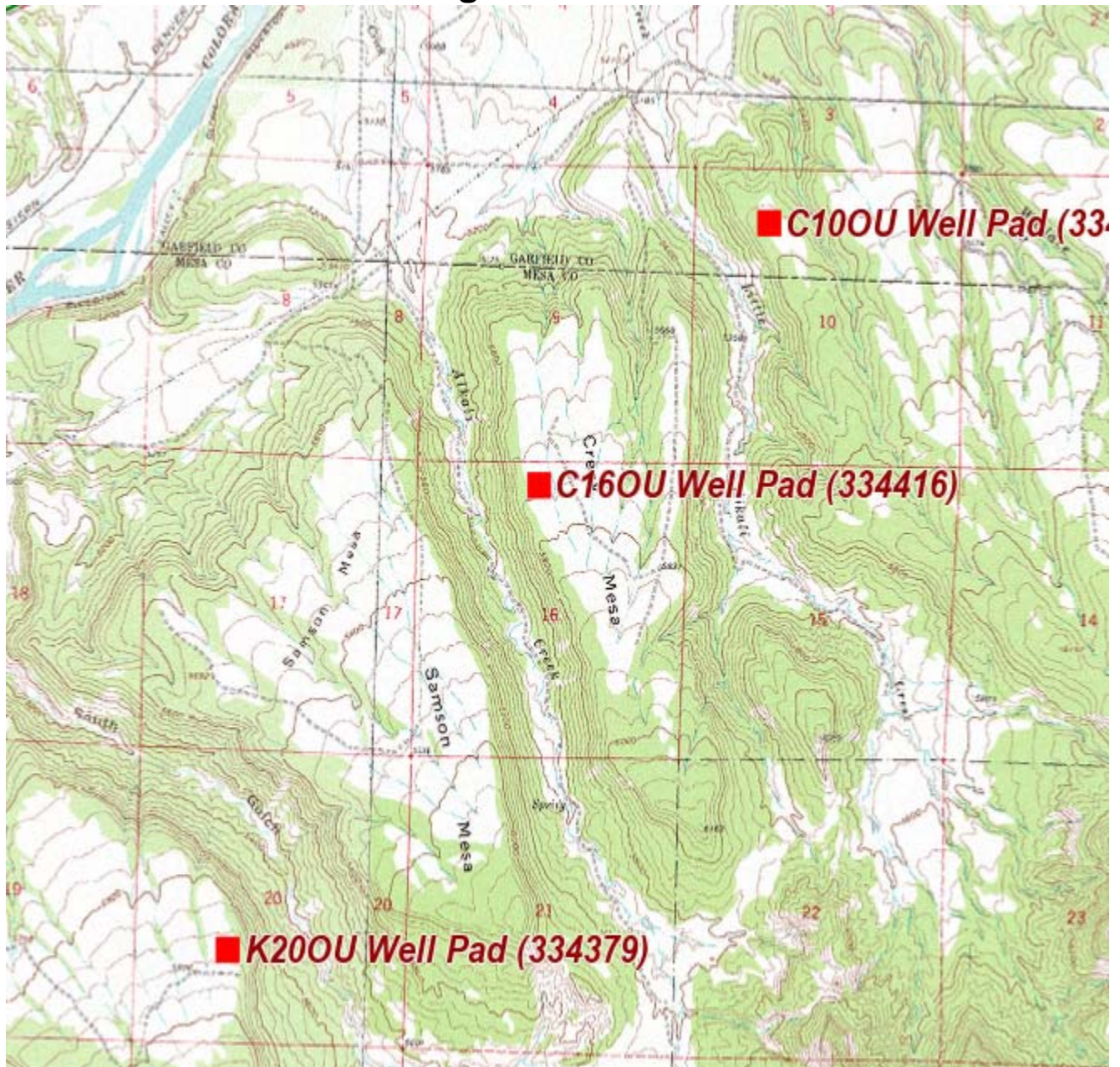
## Form 27 (Site Investigation Remediation Workplan) Multi-Location Form Submittal - Site Specific Information

09/25/2012

Encana Location	IMPLEMENTATION SCHEDULE (p2)					
	Date Site Investigation Began:	Date Site Investigation Completed:	Date Remediation Plan Submitted:	Remediation Start Date:	Anticipated Completion Date:	Actual Completion Date:
C100U	03/19/2010	06/29/2012	See page 2 of Form 27	Summer, 2012	TBD	TBD
C160U	02/15/2011	06/29/2012	See page 2 of Form 27	Summer, 2012	TBD	TBD
K200U	09/16/2009	06/27/2012	See page 2 of Form 27	Summer, 2012	TBD	TBD



## Orchard Cuttings Remediation Locations





Allowable Concentration -->				Organic Compounds in Soil (mg/kg [ppm])																		Inorganics in Soil			Metals in Soil (mg/kg [ppm])															
Location	Sample Date:	Sample Matrix	Matrix Notes	TPH (total volatile and extractable petroleum hydrocarbons)	TPH-GRO (C6-C10) Low Fraction	TPH-DRO (C10-C36) High Fraction	Benzene	Toluene	Ethylbenzene	Xylenes - total	Acenaphthene	Anthracene	Benzo(A)anthracene	Benzo(B)fluoranthene	Benzo(K)fluoranthene	Benzo(A)pyrene	Chrysene	Dibenzo(A,H)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-C,D)pyrene	Naphthalene	Pyrene	EC (<4 mmhos/cm or 2x background)	SAR (calculation)	pH	Arsenic	Barium - EPA Total Barium	Cadmium	Chromium (III)	Chromium (VI)	Copper	Lead (inorganic)	Mercury	Nickel (soluble salts)	Selenium	Silver	Zinc		
C100U	03/19/10	Background		40.12	0.52	39.6	ND		ND		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.094	1.2	8.19	7.2	290	0.17	13	0.029	13	8.3	0.024	13	0.84	ND	34	
C100U	06/10/10	Background	W																									9.9												
C100U	06/10/10	Background	NW																									13												
C100U	03/19/10	Cuttings		137	12	125	0.0008	0.0018	0.0007	0.0051	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.049	ND	0.065	ND	2.2	2.6	8.81	9	6400	0.19	12	0.07	15	8.3	0.03	12	0.81	ND	35		
C100U	06/10/10	Cuttings	arsenic resample for cuttings																									6												
C100U	09/06/11	Cuttings		3427	27	3400	BDL	BDL	0.074	0.28	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	0.62	BDL	4.4	82	9	3.9	3000	0.59	11	BDL	24	5.5	BDL	8.8	1.6	BDL	48		
C100U	12/12/11	Cuttings	resample for 9/06/11 exceeded	4225	25	4200																																		
C100U	04/18/12	Cuttings	West mid 5'	1526	26	1500																																		
C100U	04/18/12	Cuttings	S center 5'	3706.5	6.5	3700																																		
C100U	04/18/12	Cuttings	S center 10'	408	18	390																																		
C100U	04/18/12	Cuttings	N center 5'	273.3	3.3	270																																		
C100U	04/18/12	Cuttings	N center 10'	2334	34	2300																																		
C100U	04/18/12	Cuttings	NE 10'	656	16	640																																		
C100U	04/18/12	Cuttings	SE 10'	1205.9	5.9	1200																																		
C100U	04/18/12	Cuttings	E	1208.5	8.5	1200																																		
C100U	06/29/12	Cuttings	composite1DRO/SPLP	1600		1600																																		
C100U	06/29/12	Cuttings	composite2DRO/SPLP	2300		2300																																		
C100U	06/29/12	Cuttings	composite3DRO/SPLP	2100		2100																																		

Analytes (BDL = Below Detection Limit; ND = Non Detect)

Allowable Concentration -->				Organic Compounds in Soil (mg/kg [ppm])																		Inorganics in Soil			Metals in Soil (mg/kg [ppm])													
Location	Sample Date:	Sample Matrix	Matrix Notes	500			0.17	85	100	175	1000	1000	0.22	0.22	2.2	0.022	22	0.022	1000	1000	0.22	23	1000		(<12)	(6-9)	0.39	15000	70	120000	23	3100	400	23	1600	390	390	23000
				TPH (total volatile and extractable petroleum hydrocarbons)	TPH-GRO (C6-C10) Low Fraction	TPH-DRO (C10-C36) High Fraction	Benzene	Toluene	Ethylbenzene	Xylenes - total	Acenaphthene	Anthracene	Benzo(A)anthracene	Benzo(B)fluoranthene	Benzo(K)luoranthene	Benzo(A)pyrene	Chrysene	Dibenzo(A,H)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3,C,D)pyrene	Naphthalene	Pyrene	EC (<4 mmhos/cm or 2x background)	SAR (calculation)	pH	Arsenic	Barium - EPA Total Barium	Cadmium	Chromium (III)	Chromium (VI)	Copper	Lead (inorganic)	Mercury	Nickel (soluble salts)	Selenium	Silver	Zinc
C16OU	09/09/10	Background	SW																								15.1											
C16OU	09/09/10	Background	SE																								17.5											
C16OU	09/09/10	Background	S																								18.4											
C16OU	09/20/10	Background	Background of spoil from cuttings pit																								24											
C16OU	02/15/11	Cuttings		817	57	760	0.056	BDL	0.17	0.83	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	4.2	52	9.3	2.7	5500	0.67	11	BDL	22	6.3	0.07	7.9	BDL	BDL	38
C16OU	08/17/11	Cuttings		2703.1	3.1	2700	0.0065	0.031	0.044	0.11	0.089	BDL	BDL	0.015	BDL	BDL	BDL	BDL	BDL	0.079	BDL	0.87	0.18	2.8	16	8.7	2.9	2600	0.98	13	BDL	21	6.6	0.044	10	BDL	BDL	42
C16OU	12/12/11	Cuttings	resample for 8/17/11 exceedance	1410	110	1300	BDL	BDL	0.24	0.61																												
C16OU	01/16/12	Cuttings	N1 [N]	2232	32	2200																																
C16OU	01/16/12	Cuttings	N2 [MidN]	2901.7	1.7	2900																																
C16OU	01/16/12	Cuttings	N3 [MidE]	2501.7	1.7	2500																																
C16OU	01/16/12	Cuttings	N4 [E]	2800.99	0.99	2800																																
C16OU	04/18/12	Cuttings	N 5'	2340	140	2200																																
C16OU	04/18/12	Cuttings	NW 5'	337	37	300																																
C16OU	04/18/12	Cuttings	NE 10'	3499	99	3400																																
C16OU	04/18/12	Cuttings	Smid 10'	180	20	160																																
C16OU	04/18/12	Cuttings	Emid 10'	2610	110	2500																																
C16OU	04/18/12	Cuttings	E 10'	3430	130	3300																																
C16OU	06/29/12	Cuttings	composite 1DRO/SPLP	2300		2300																																
C16OU	06/29/12	Cuttings	composite 2DRO/SPLP	3000		3000																																
C16OU	06/29/12	Cuttings	composite 3DRO/SPLP	2600		2600																																

Allowable Concentration -->				Organic Compounds in Soil (mg/kg [ppm])																		Inorganics in Soil			Metals in Soil (mg/kg [ppm])														
Location	Sample Date:	Sample Matrix	Matrix Notes	500	TPH (total volatile and extractable petroleum hydrocarbons)	TPH-GRO (C6-C10) Low Fraction	TPH-DRO (C10-C36) High Fraction	0.17	85	100	175	1000	1000	0.22	0.22	2.2	0.022	22	0.022	1000	1000	0.22	23	1000		(<12)	(6-9)	0.39	15000	70	120000	23	3100	400	23	1600	390	390	23000
K200U	09/16/09	Background		24.73		4.43	20.3	ND	0.0016	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	EC (<4 mmhos/cm or 2x background)	SAR (calculation)	pH	Arsenic	Barium - EPA Total Barium	Cadmium	Chromium (III)	Chromium (VI)	Copper	Lead (inorganic)	Mercury	Nickel (soluble salts)	Selenium	Silver	Zinc
K200U	10/12/10	Background	SE																									6.1		0.53	16.5	1.7	15.1	10.7	0.025	14.5	0.72	0.12	40.1
K200U	10/12/10	Background	S																									5.5											
K200U	10/12/10	Background	SW																									15											
K200U	09/16/09	Cuttings		1389	149	1240		0.145	4.72	0.025	0.433	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0874	ND	0.171	0.0449	0.713	35.1	9.3	5.3		0.41	13.7	1.2	26.4	13.7	0.03	15.6	0.89	0.32	60.9
K200U	06/25/10	Cuttings	Rerun TPH	1690	ND	1690																																	
K200U	10/12/10	Cuttings		480	BDL	480		BDL	BDL	BDL	BDL	0.026	0.015	BDL	0.0073	BDL	BDL	0.017	BDL	0.014	0.055	BDL	0.23	0.025	1.7	21	8.8	6.3	6700	0.87	16	BDL	20	9	0.033	12	BDL	BDL	56
K200U	09/06/11	Cuttings		1102.2	2.2	1100		0.0032	BDL	0.0095	0.34	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	0.54	BDL	4.3	52	8.7	2.4	3300	0.77	10	BDL	18	7.1	0.053	7	BDL	BDL	41
K200U	01/05/12	Cuttings	Resample for TPH	666.4	6.4	660																																	
K200U	01/19/12	Cuttings	N1 [N]	1006.6	6.6	1000																																	
K200U	01/19/12	Cuttings	N2 [N mid]	638.1	8.1	630																																	
K200U	01/19/12	Cuttings	N3 [S mid]	535.5	5.5	530																																	
K200U	01/19/12	Cuttings	N4 [S]	556.7	6.7	550																																	
K200U	06/27/12	Cuttings	composite 1	1400		1400																																	
K200U	06/27/12	Cuttings	composite 2	1500		1500																																	
K200U	06/27/12	Cuttings	composite 3	1500		1500																																	