

State of Colorado
Oil and Gas Conservation Commission



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

#6321

FOR OGCC USE ONLY

RECEIVED
9/27/2011

OGCC Employee:

Spill Complaint
 Inspection NOAV

Tracking No: **2523712**

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): Lined Earthen Pit/Northwest Location

OGCC Operator Number: 100185	Contact Name and Telephone: Chris Hines - Environmental Field Coordinator
Name of Operator: Encana Oil & Gas (USA) Inc.	No: 970.285.2653
Address: 2717 County Road 215, Suite 100	Fax: 970.285.2705
City: Parachute State: CO Zip: 81635	
API Number: 335573 (Location ID)	County: Garfield
Facility Name: N. Parachute (Location Name)	Facility Number: EF G29 595 (Location No) / PIT Facility ID 425550 (we)
Well Name: NA - Multiple Wells	Well Number: NA-Multiple Wells
Location: (QtrQtr, Sec, Twp, Rng, Meridian): SWNE 29 5S 95W 6th	Latitude: 39.58581 Longitude: -108.07428

TECHNICAL CONDITIONS

Type of Waste Causing Impact (crude oil, condensate, produced water, etc): Production Fluids

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.): Rangeland, well pad

Soil type, if not previously identified on Form 2A or Federal Surface Use Plan: Nihill channery loam, 6 to 25 percent slopes

Potential receptors (water wells within 1/4 mi, surface waters, etc.): East Fork of Parachute Creek is located 200 feet north of the site; depth to seasonal groundwater is estimated to be greater than 40 feet below ground surface.

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

Impacted Media (check):	Extent of Impact:	How Determined:
<input checked="" type="checkbox"/> Soils	See Attached	See Attached
<input type="checkbox"/> Vegetation		
<input type="checkbox"/> Groundwater		
<input type="checkbox"/> Surface Water		

REMEDATION 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

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



Tracking Number: _____
Name of Operator: _____
OGCC Operator No: _____
Received Date: _____
Well Name & No: (West & East P.I/S)
Facility Name & No: P/S 425550/425551

Page 2
REMEDIATION WORKPLAN (Cont.)

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: 6/29/2010 Date Site Investigation Completed: 9/30/2011 Date Remediation Plan Submitted: 9-27-11
Remediation Start Date: 6/29/2010 Anticipated Completion Date: TBD Actual Completion Date: TBD

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

Print Name: Chris Hines Signed: _____
Title: Environmental Field Coordinator Date: 9-27-11

OGCC Approved: Carly Bejar Title: FOR Chris Camfield Date: 10/13/2011
EPS NW Region

COA : Provide periodic reports
to document remediation progress.

NARRATIVE ATTACHMENT

FORM 27 (SITE INVESTIGATION AND REMEDIATION WORKPLAN)

G29 Well Pad Pit Closure – 335573 (Location ID)

Document Date – 09/23/2011

TECHNICAL CONDITIONS

Is location within a sensitive area (according to Rule 901e)?

Based on distance to surface water, this location is found in a sensitive area.

Potential receptors (water wells within ¼ mi, surface waters, etc.):

According to the COGCC GIS OnLine mapping service, the East Fork of Parachute Creek is located approximately 200 feet north of the well pad. There are no water wells located within ¼ mile of the well pad.

REMEDIATION WORKPLAN

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

Encana is submitting the attached Form 27 Remediation Workplan as followup to a Form 19 Spill Release Report (Spill #2523712) submitted to the Colorado Oil and Gas Conservation Commission (COGCC) on June 29, 2010. Encana notified the COGCC of a liner failure from the pit which was identified when soil beneath the liner was sampled. The pit was constructed prior to April 1, 2009, and was comprised of two lined pits connected by a weir. The soil beneath the liner was found to be impacted with total petroleum hydrocarbons (TPH), benzene, benzo(b)flouranthene, and indeno(1,2,3,c,d)pyrenes concentrations that exceeded the concentration levels listed on COGCC Table 910-1. Additionally, the soil beneath the liner exceeded the Table 910-1 concentration levels for electrical conductivity (EC), sodium adsorption ratio (SAR), and pH. Each of the remaining Table 910-1 analytes sampled were within background concentrations or in compliance with COGCC concentration levels. Site location and site maps are provided as Figures 1 and 2. The laboratory analytical results for the soil samples collected from the potholes are summarized in Table 1.

Encana excavated impacted soil from the floor of the east pit at the site. To assess the vertical and lateral extent of hydrocarbon impacted soil, Encana excavated potholes in the floors of the east and west pits in June, August, September, and October 2010. Soil samples were collected from potholes excavated in the floors of the two pits and were submitted to a contract laboratory for analysis of TPH, benzene, benzo(b)flouranthene, and indeno(1,2,3,c,d)pyrenes. Analytical results indicated TPH, benzene, benzo(b)flouranthene, and indeno(1,2,3,c,d)pyrenes concentrations were vertically defined in the east pit to concentrations that were in compliance with the COGCC Table 910-1. However, TPH concentrations in the west pit still exceeded the concentration level in Table 910-1 at depth. Following pothole excavation activities, the pits were backfilled with clean material due to safety concerns and to continue assessing hydrocarbon impacted soil at the site.



NARRATIVE ATTACHMENT

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G29 Well Pad Pit Closure – 335573 (Location ID)

Document Date – 09/23/2011

On August 16 and August 17, 2011, six soil borings (G29-SB01 through G29-SB06) were advanced at the site. A soil boring location map is provided as Figure 3. Soil borings G29-SB03 and G29-SB04 were advanced in the western pit at the site, where Encana was unable to define hydrocarbon impacted soil vertically in October 2010. Soil boring G29-SB02 was advanced in the east pit and soil borings G29-SB01, G29-SB05, and G29-SB06 were advanced upgradient and downgradient of the pits. Each of the soil borings was advanced to a total depth ranging from 40 feet to 41 feet below ground surface (bgs). During drilling photo-ionization (PID) readings were minimal and petroleum hydrocarbon staining was not observed in soil borings G29-SB01, G29-SB05, and G29-SB06; therefore, one soil sample was submitted to a contract laboratory from the terminus at each soil boring location. Due to staining and elevated field screen readings, multiple soil samples were submitted from soil borings G29-SB02, G29-SB03, and G29-SB04. All of the soil samples were submitted for laboratory analysis of benzene, toluene, ethylbenzene, and total xylenes (BTEX) and TPH. The TPH results were reported as gasoline range organics (GRO) and diesel range organics (DRO).

Soil analytical results indicated BTEX and TPH concentrations in samples collected from borings G29-SB01, G29-SB05, and G29-SB06 were in compliance with the concentration levels listed in COGCC Table 910-1.

BTEX concentrations in soil samples G29-SB03 20'-22' and G29-SB04 26'-28' were in compliance with COGCC Table 910-1 concentrations levels. However, petroleum hydrocarbon impacts were encountered in soil borings G29-SB03 and G29-SB04 at a depth ranging from 20 feet to 22 feet bgs and 26 feet to 28 feet bgs, respectively. TPH concentrations exceeded Table 910-1 at concentrations of 1,909.7 milligrams per kilogram (mg/kg) in G29-SB03 20'-22' and 2,566 mg/kg in G29-SB04 26'-28'. Both BTEX and TPH concentrations for soil samples collected at the terminus of borings G29-SB03 (G29-SB03-38'-40') and MW04 (G29-SB04-39'-41') were in compliance with Table 910-1 concentration levels.

BTEX concentrations for soil samples G29-SB02 19'-21' and G29-SB02 39'-41' were in compliance with COGCC Table 910-1 concentration levels. Petroleum hydrocarbon impacts were encountered in boring G29-SB02 at depths ranging from 19 feet to 21 feet bgs and 39 feet to 41 feet bgs. The TPH concentrations for both of the samples collected from soil boring G29-SB02 exceeded Table 910-1 at concentrations of 8,520 mg/kg and 5,300 mg/kg, respectively.

A cross-section diagram visually representing TPH concentrations in the soil subsurface is provided as Figure 4. The analytical results for the soil samples collected from the soil borings are summarized in Table 2.



NARRATIVE ATTACHMENT

FORM 27 (SITE INVESTIGATION AND REMEDIATION WORKPLAN)

G29 Well Pad Pit Closure – 335573 (Location ID)

Document Date – 09/23/2011

Describe how source is to be removed/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.:

Encana proposes installing additional soil borings to the north, east, and west of G29-SB02. Soil vapor extraction (SVE) wells (G29-SVE01 through G29-SVE05) will be installed to evaluate the efficacy of and derive design parameters for a passive SVE system. Before installing the SVE wells, soil samples will be collected from soil borings G29-SVE01 and G29-SVE04 to define the vertical and horizontal extents of hydrocarbon impacted soils near G29-SB02. Figure 5 presents the proposed SVE well locations.

Once the extent of soil impact has been defined, Encana will conduct an SVE system pilot test. Following the pilot test, a passive SVE system will be installed and will involve affixing wind-driven turbines to G29-SVE01 through G29-SVE05 to induce air flow into the soil subsurface. The induced air flow promotes volatilization of hydrocarbons entrained on the soil and provides oxygen to indigenous and augmented microbes, thereby promoting remediation of impacted unsaturated soils. If limited flow and remediation activity result from the passive SVE system, Encana will have completed the pilot test and have the necessary SVE wells in place to evaluate an appropriate active SVE system.

Encana will conduct air monitoring consisting of PID, carbon monoxide, oxygen, hydrogen sulfide, and carbon dioxide readings from each well on a quarterly basis. One air sample from the passive SVE well with the highest PID reading will be collected quarterly. The samples will be analyzed for BTEX, GRO, and DRO. The analytical results will be evaluated for potential air permitting requirements and passive SVE well performance.

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

Groundwater was not encountered during drilling activities. The pits were located approximately 200 feet south of the East Fork of Parachute Creek. Due to the proximity of the East Fork of Parachute Creek to the site, Encana collected surface water samples downgradient of the site when water was available. Surface water samples were collected in April, May, June, and July 2011 for analysis of BTEX, methyl-tert-butyl-ether (MTBE), halides, anions, cations, and general water quality parameters. Analytical results indicate the analytes sampled were in compliance with the Colorado Department of Public Health and Environment (CDPHE) and United States Environmental Protection Agency (EPA) standards. Encana will continue to collect surface water samples downgradient of the site on a quarterly basis when water is available.



NARRATIVE ATTACHMENT

FORM 27 (SITE INVESTIGATION AND REMEDIATION WORKPLAN)

G29 Well Pad Pit Closure – 335573 (Location ID)

Document Date – 09/23/2011

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.

Following pothole excavation activities in October 2010, the pits were backfilled with clean material and recontoured in accordance with the interim reclamation specified in the Application for Permit to Drill for wells at this facility.

The EC, SAR, and pH levels for soil samples collected from the floors of the eastern and western pits exceeded the COGCC Table 910-1 concentration level. However, Frequently Asked Question Number 31 on the COGCC website indicates that the COGCC will only apply the Table 910-1 concentration levels for EC, pH, and SAR to soils that are within three feet of the ground surface. As such, the COGCC requires that materials with elevated EC, pH, or SAR concentrations be buried under a minimum of three feet of Table 910-1 compliant backfill cover. Although EC, pH, and SAR are parameters used to ensure proper reclamation of disturbed areas, limited exceedances of these parameters below the required three feet of cover will not affect reclamation, as the pit bottom was buried below the vegetative root zone.

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:

The remediation workplan for this site will be carried out as described above. All analytical data collected in support of this remediation workplan will be provided to the COGCC in the Notification of Completion. A site diagram showing the location of collected samples will also be provided in the notification of completion.

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

All remaining hydrocarbon impacted soil will be remediated *in situ* via passive SVE wells.



FIGURES



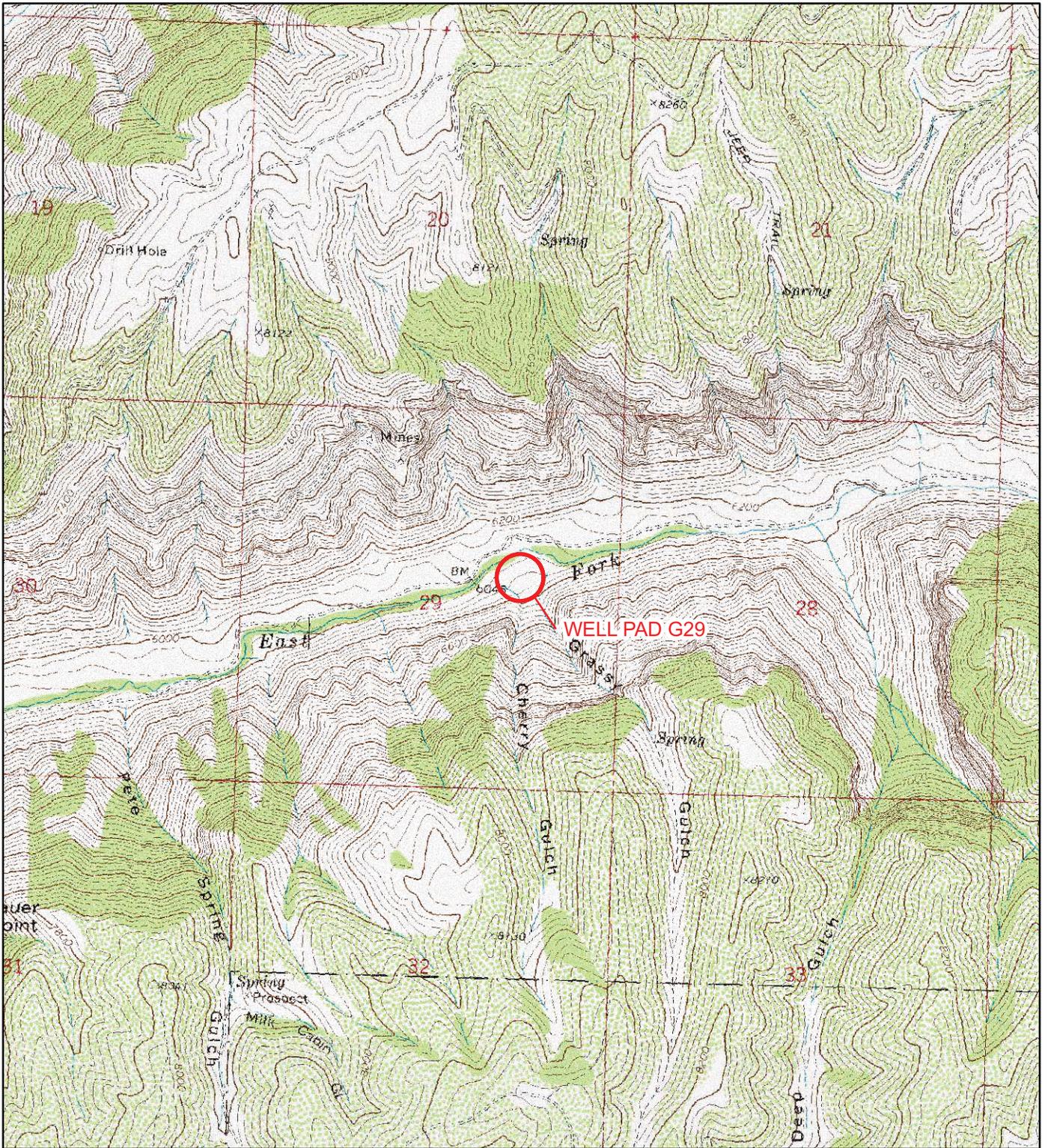


IMAGE COURTESY OF USDA/NRCS, VARIOUS DATES

LEGEND

 SITE LOCATION

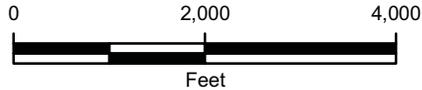
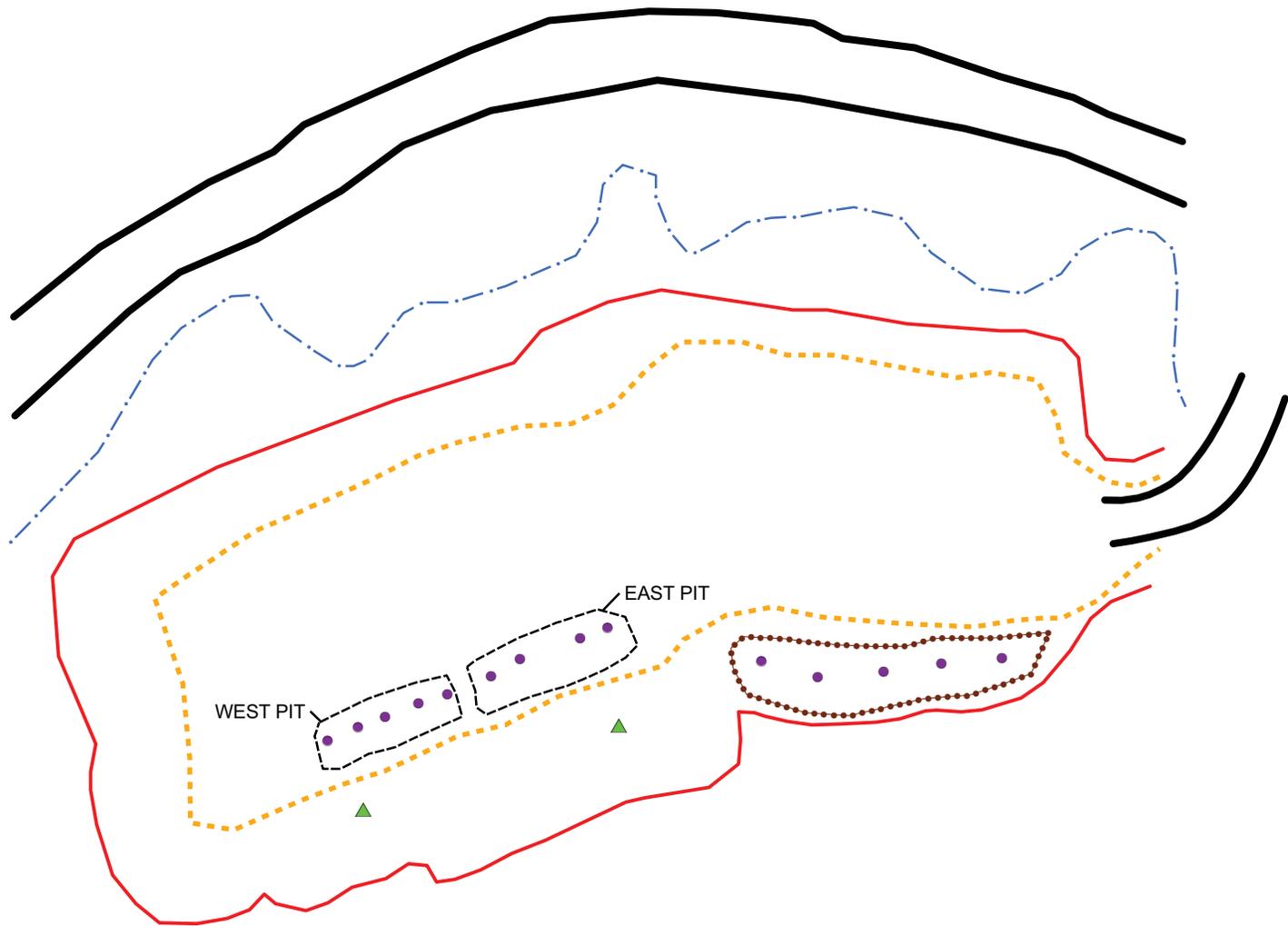


FIGURE 1
SITE LOCATION MAP
WELL PAD G29
SWNE 29 5S 95W
GARFIELD COUNTY, COLORADO
ENCANA OIL AND GAS (USA) INC.





LEGEND

- COMPOSITE SAMPLE POINT
- ▲ BACKGROUND GRAB SAMPLE
- PIT BOUNDARY
- CUTTINGS STOCK PILE
- EDGE OF WORKING SURFACE AND PERIMETER CONTROLS
- EDGE OF DISTURBANCE
- .-.-.- EAST FORK PARACHUTE CREEK
- ACCESS ROAD

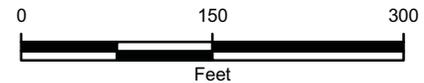


FIGURE 2
SITE MAP
WELL PAD G29
SWNE 29 5S 95W
GARFIELD COUNTY, COLORADO
ENCANA OIL AND GAS (USA) INC.





IMAGE COURTESY OF USDA/NRCS, 2009

LEGEND

- SOIL BORING
- OIL AND GAS WELL

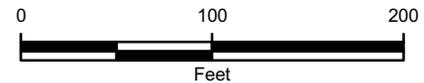
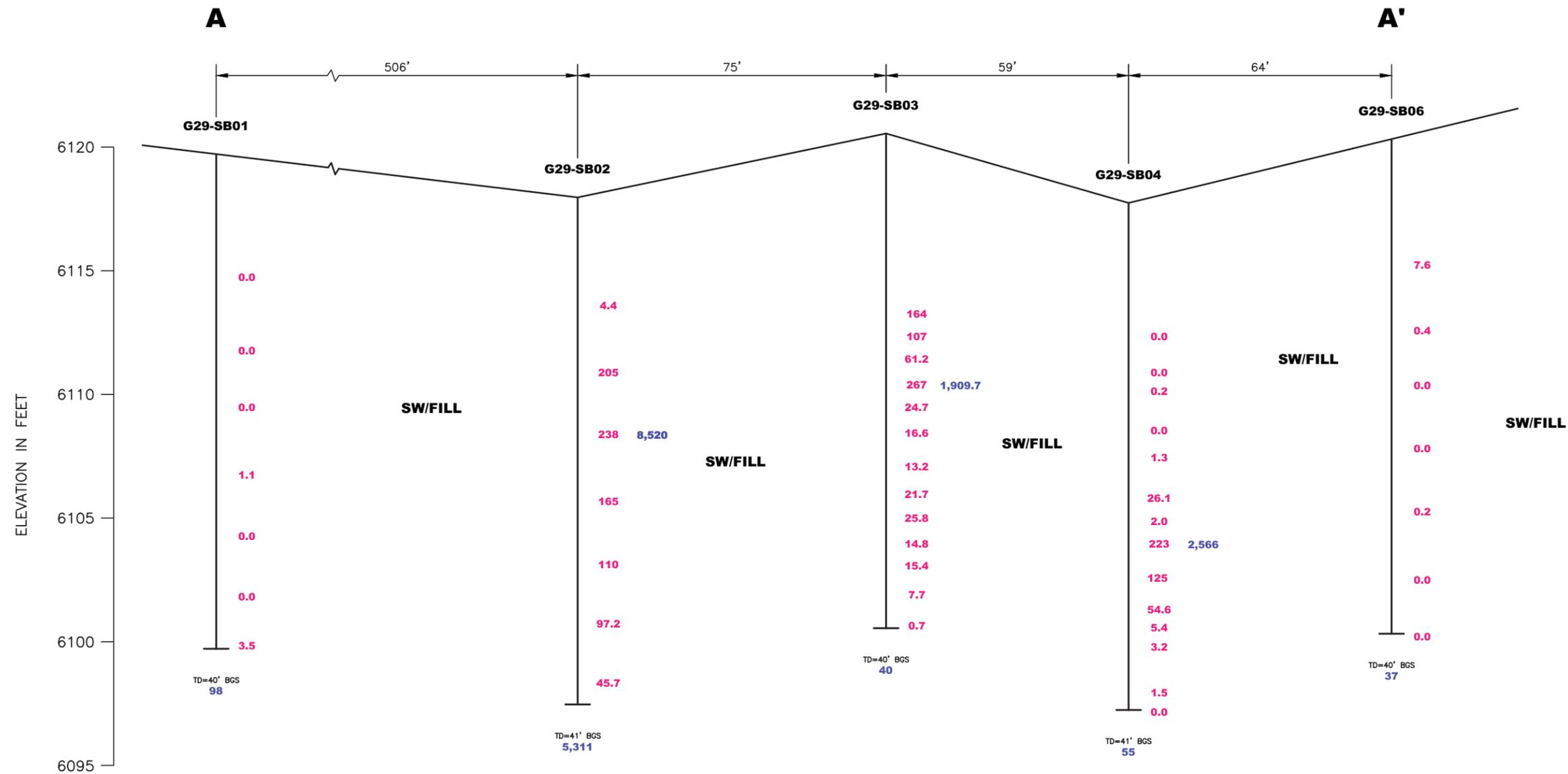


FIGURE 3
SOIL BORING LOCATION MAP
WELL PAD G29
SWNE 29 5S 95W
GARFIELD COUNTY, COLORADO
ENCANA OIL AND GAS (USA) INC.





LEGEND

- SW/FILL** WELL GRADED SANDS, GRAVELLY SANDS, LITTLE TO NO FINES, FILL MATERIAL
- GROUND SURFACE
- | BOREHOLE
- TD TOTAL DEPTH IN FEET BGS
- BGS BELOW GROUND SURFACE

- 0.0** PHOTO-IONIZATION DETECTOR READING (PARTS PER MILLION)
- 98** TOTAL PETROLEUM HYDROCARBONS DIESEL RANGE ORGNICS/GASOLINE RANGE ORGNICS IN MILLIGRAMS PER KILOGRAM (mg/kg)

HORIZONTAL SCALE
1" = 30'
VERTICAL SCALE
1" = 10'

FIGURE 4
CROSS-SECTION A-A'
WELL PAD G29
SWNE 29 5S 95W
GARFIELD COUNTY, COLORADO
ENCANA OIL & GAS (USA) INC.





IMAGE COURTESY OF USDA/NRCS, 2009

LEGEND

- ▲ 2 INCH SOIL VAPOR EXTRACTION WELL
- ▲ 4 INCH SOIL VAPOR EXTRACTION WELL
- SOIL BORING
- OIL AND GAS WELL

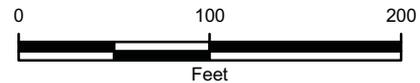


FIGURE 5
PROPOSED SOIL VAPOR EXTRACTION WELL LOCATION MAP
WELL PAD G29
SWNE 29 5S 95W
GARFIELD COUNTY, COLORADO
ENCANA OIL AND GAS (USA) INC.



TABLES



TABLE 2
SOIL ANALYTICAL DATA
WELL PAD G29
GARFIELD COUNTY, COLORADO
ENCANA OIL & GAS (USA) INC.

Soil Sample ID	Date	Depth (ft bgs)	Benzene (mg/kg)	Toluene (mg/kg)	Ethylbenzene (mg/kg)	Total Xylenes (mg/kg)	TPH-GRO (mg/kg)	TPH-DRO (mg/kg)	TPH (mg/kg)
G29 SB01-38'- 40'	8/17/2011	38-40	<0.0050	<0.025	<0.0050	0.04	<0.5	98	98
G29 SB02-19'- 21'	8/16/2011	19-21	<0.050	<0.25	0.23	3.2	120	8,400	8,520
G29 SB02-39'- 41'	8/16/2011	39-41	<0.050	<0.25	<0.050	0.18	11	5,300	5,311
G29 SB03-20'- 22'	8/16/2011	20-22	<0.050	<0.25	<0.050	0.44	9.7	1,900	1,909.7
G29 SB03-38'- 40'	8/16/2011	38-40	<0.0050	<0.025	<0.0050	<0.015	<0.5	40	40
G29 SB04-26'- 28'	8/16/2011	26-28	<0.050	<0.25	<0.050	2	66	2,500	2,566
G29 SB04-39'- 41'	8/16/2011	39-41	<0.0050	<0.025	<0.0050	<0.015	<0.5	55	55
G29 SB05-38'- 40'	8/17/2011	38-40	<0.0050	<0.025	<0.0050	<0.015	<0.5	33	33
G29 SB06-38'- 40'	8/17/2011	38-40	<0.0050	<0.025	<0.0050	<0.015	<0.5	37	37
COGCC Allowable Level			0.17	85	100	175	--	--	500

NOTES:

mg/kg - milligrams per kilogram

ft bgs - feet below ground surface

TPH-GRO - Total petroleum hydrocarbons - gasoline range organics analyzed by EPA Modified Method 8015D

TPH-DRO - Total petroleum hydrocarbons - diesel range organics analyzed by EPA Method 3546

TPH - total petroleum hydrocarbons GRO/DRO

-- No standard

< - indicates result is less than the stated laboratory practical quantitation limit

BOLD - indicates result exceeds the COGCC Allowable Level

COGCC - Colorado Oil and Gas Conservation Commission

Benzene, toluene, ethylbenzene, and total xylenes analyzed by EPA Method 8260B

COGCC Allowable Level taken from 2 CCR 404-1, Table 910-1, effective April 2009



Table 3

Site Identification: ENPR26ST
Sample Location: North Parachute Ranch (East Fork)

Laboratory Analytical Report Summary
Analytical Results

Test Parameter	Units	4/28/2011	6/27/2011	7/21/2011	Regulatory Standards	
					Level	Reference Number
Chloride	mg/l	10.0	7.8	6.1	250	1,5
Fluoride	mg/l	0.16	0.29	0.25	4.0	1
Bromide	mg/l	<1.0	<1.0	<1.0	none	N/A
Nitrate	mg/l	0.78	0.79	0.5	10.0	1,2,3,4
Nitrite	mg/l	<0.10	<0.10	<0.10	1.0	1
Sulfate	mg/l	31.0	40.0	38.0	250	1,5
Ammonia mg/l		<0.10	<0.10	<0.10	none	N/A
pH	su	7.9	8.2	8.4	6.5-8.5	1,3,5
Specific conductance	µmhos/cm	500	530	520	none	N/A
Dissolved Solids	mg/l	300	330	320	500	1,5
Arsenic mg/l		<0.020	<0.020	<0.020	0.01	2
Barium	mg/l	0.073	0.072	0.071	2.0	2,4
Cadmium	mg/l	<0.0050	<0.0050	<0.0050	0.005	2,4
Calcium	mg/l	50.0	52.0	54.0	none	N/A
Chromium	mg/l	<0.010	<0.010	<0.010	0.1	2,3
Copper	mg/l	<0.020	<0.020	<0.020	1	4,5
Iron	mg/l	<0.10	<0.10	<0.10	5.0	3
Lead	mg/l	<0.0050	<0.0050	<0.0050	0.015	4
Magnesium	mg/l	20.0	25.0	26.0	none	N/A
Manganese	mg/l	<0.010	<0.010	<0.010	0.05	5
Selenium mg/l		<0.020	<0.020	<0.020	0.05	2,4
Potassium	mg/l	0.71	1.8	1.8	none	N/A
Silver	mg/l	<0.010	<0.010	<0.010	0.05	2
Sodium	mg/l	30.0	31.0	31.0	none	N/A
Benzene	mg/l	<0.0010	<0.0010	<0.0010	0.005	3
Toluene	mg/l	<0.0050	<0.0050	<0.0050	1	4
Ethylbenzene	mg/l	<0.0010	<0.0010	<0.0010	0.7	4
Total Xylene	mg/l	<0.0030	<0.0030	<0.0030	10	4
Methane	mg/l	<0.010	<0.010	<0.010	none	N/A
Ethane	mg/l	<0.013	<0.013	NT	none	N/A
Ethene	mg/l	<0.013	<0.013	NT	none	N/A
Sulfide	mg/l	<0.050	<0.050	<0.050	none	N/A
Methyl tert-butyl ether (MTBE)	mg/l	<0.0010	<0.0010	<0.0010	none	N/A
Alkalinity	mg/l	220	260	250	none	N/A
Alkalinity, Bicarbonate	mg/l	210	260	240	none	N/A
Alkalinity, Carbonate	mg/l	<20.0	<20.0	<20.0	none	N/A

Notes:

*-units in mS/cm
**-units in ug/L
mg/l = milligrams per liter
µg/l = micrograms per liter
NT = Not tested
µmhos/cm = micromhos per centimeter
NTU = nephelometric turbidity units
pH = parts of hydrogen
su = standard unit
BDL = below detection limit

Standard Reference Numbers:

Standard 1 = Colorado Department of Public Health and Environment Drinking Water Regulations Maximum Contaminant Levels
Standard 2 = Colorado Department of Public Health and Environment Water Quality Control Commission Ground Water Standards - Human Health Standards
Standard 3 = Colorado Department of Public Health and Environment Water Quality Control Commission Ground Water Standards - Agricultural Standards
Standard 4 = U.S. Environmental Protection Agency National Primary Drinking Water Standards
Standard 5 = U.S. Environmental Protection Agency National Secondary Drinking Water Standards

N/A = No applicable standard exists in referenced regulations.