



October 7, 2015

Colorado Oil & Gas Conservation Commission  
Attn: Stan Spencer  
796 Megan Ave, Suite 201  
Rifle, Colorado 81650

Re: Form 27 Site Investigation and Remediation Workplan  
Facility #100879 Husky Hill 6-6

Whiting Oil and Gas Corporation respectfully submits the attached form 27 for remediation plans at the Husky Hill 6-6 facility (#100879).

Should you have any questions, you may reach Jed Smith (Environmental Professional III) at (303) 390-1340, or John Keller (Operations Manager) at (303) 390-4277.

Regards,

Cara Mezydlo  
Engineering Technician III – Central Rockies Asset Group

*Whiting Petroleum Corporation  
and its wholly owned subsidiary  
Whiting Oil and Gas Corporation*

**State of Colorado**  
**Oil and Gas Conservation Commission**

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



FOR OGCC USE ONLY

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REM 9285

## 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): \_\_\_\_\_

OGCC Employee:

☐ Spill   ☐ Complaint  
☐ Inspection   ☐ NOAV

Tracking No:

OGCC Operator Number: 96155

Name of Operator: Whiting Oil &amp; Gas Corporation

Address: 1700 Broadway Ste 2300

City: Denver   State: CO   Zip: 80290

Contact Name and Telephone:

Jed Smith

No: (303)-390-1340

Fax: \_\_\_\_\_

API Number: 05-103-07997

County: Rio Blanco

Facility Name: HUSKY HILL 6-6

Facility Number: 100879

Well Name: Hill

Well Number: 6-6

Location: (QtrQtr, Sec, Twp, Rng, Meridian): SENW Sec 6 T1N R101W 6th PM   Latitude: 40.087020   Longitude: -108.774350

### TECHNICAL CONDITIONS

Type of Waste Causing Impact (crude oil, condensate, produced water, etc): Produced Water, Crude Oil

**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.): open rangeland/oil &amp; gas operations

Soil type, if not previously identified on Form 2A or Federal Surface Use Plan: Crosses boundaries of Uffens loam and Torrfluvents

Potential receptors (water wells within 1/4 mi, surface waters, etc.): No water wells within 1/4 mile, The White River is located approximately 2,400 feet to the west-northwest. The Douglas Creek is located approximately 100 feet to the west.

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

Impacted Media (check):

- ☒ Soils  
☐ Vegetation  
☐ Groundwater  
☐ Surface Water

Extent of Impact:

Refer to attached map

How Determined:

Soil Borings

### REMEDIALTION WORKPLAN

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

See initial Form 19, Spill Tracking Number 400875507

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

See Attachment A

**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 Attachment A



**REMEDIATION WORKPLAN (Cont.)**

Tracking Number: \_\_\_\_\_  
Name of Operator: \_\_\_\_\_  
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.):

Based on the topographical setting of the location, and visual observations from the completed soil borings, groundwater has not been impacted.

**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 Attachment A

**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:

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

See Attachment A

**IMPLEMENTATION SCHEDULE**

Date Site Investigation Began: 6/17/2015 Date Site Investigation Completed: 6/18/2015 Date Remediation Plan Submitted: 10/7/2015  
Remediation Start Date: Oct 2015 Anticipated Completion Date: Nov 2015 Actual Completion Date: \_\_\_\_\_

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

Print Name: Jed Smith

Signed: [Signature]

Title: Env. Professional III

Date: 10/7/15

OGCC Approved: \_\_\_\_\_ Title: EPS Northwest Date: 10/9/15



October 7, 2015

**Whiting Oil & Gas Corporation  
Hill 6-6 - Pit Remediation  
HRL Job #15-164**

**INTRODUCTION**

HRL Compliance Solutions, Inc. (HRL) was contacted by Whiting Oil and Gas Corporation (Whiting) to conduct a site characterization and remediation of a historic pit located at the Hill 6-6 well pad. The site characterization event indicated hydrocarbon impacted soil. Upon discovery of impacted material, a Form 19 Spill/Release Report was submitted to the Colorado Oil and Gas Conservation Commission (COGCC) (Spill/Release #442663, Document #400875507) by Whiting.

**BACKGROUND**

HRL Drilling Services mobilized to the Hill 6-6 location on June 16, 2015 to conduct the site characterization. A CME 55 track mounted drill rig was utilized to advance a series of soil borings within and around the area of the pit to identify the vertical and lateral extent of hydrocarbon impacts associated with the pit. A total of fourteen (14) soil borings were advanced with samples being collected at the 4-6, 9-11, and 14-16 foot intervals. Field screen readings were collected from each sample depth and recorded. A Photoionization Detector (PID) and PetroFlag™ Hydrocarbon detection kit were utilized for field screening activities. Each soil boring was logged and examined to document soil lithology, moisture content, color, and indications of potential environmental impacts. Each boring was mapped with a Trimble GPS unit (see Figure 1).

Samples from BH 04, BH 05, BH 08, BH 09, BH 11, BH 12, and BH 14 were submitted to ALS Environmental in Holland, Michigan for laboratory analysis. Each sample was analyzed for Diesel Range Organics (DRO), Gasoline Range Organics (GRO) and Benzene-Toluene-Ethylbenzene-Xylenes (BTEX) constituents of the COGCC Table 910-1. Each sample was submitted from the 4-6 foot range.

Analytical results and field screen readings indicated the presence of elevated hydrocarbon impacts from soil borings BH 05, BH 06, BH 10, BH 11, and BH 13. Elevated impacts were not observed below 6 feet from any soil boring location. Based on analytical results and field screen readings, there is approximately 200 cubic yards of impacted soil on location. The depths of the impacts are estimated to be between 3 to 7 feet below the ground surface (bgs). Refer to Figure 1 for a diagram of the estimated impacted area. See Table 1 below for analytical and field screen results.

The majority of the soil consisted of sandy clays with some gravels and pebbles. The impacted soil was moist and contained black/grey staining with a strong hydrocarbon odor. The non-impacted soil was brown, dry and loose with no evidence of impacts.

**REMEDIATION**

Remediation options for the impacted soil were discussed during a site visit with Whiting, HRL and COGCC personnel on August 11, 2015. Further remediation plans were discussed subsequently by Whiting and HRL during the planning phase. It was decided that the impacted soil will be excavated and amended (blended and aerated) to below COGCC Table 910-1 allowable standards. A trackhoe or a backhoe will be used for excavation activities. The top three (3) feet of soil will be stockpiled as clean root-zone overburden. During the excavation of impacted soil, field screen observations will be collected

to monitor the status of the excavation. Field screening will be conducted by visual observation, olfactory observation, bag headspace PID readings, and a PetroFLAG<sup>TM</sup> test kit. When field screening observations and data indicate a likelihood of compliance with the Table 910-1 soil cleanup levels, confirmation soil samples will be collected and submitted for analysis. The confirmation samples will be collected from the side walls (north, south, east, and west) and from the bottom of the excavation. If these samples do not indicate that the Table 910-1 cleanup levels have been achieved, further excavation activities will be undertaken.

The excavated and stockpiled soil will be blended and aerated using a soil screening machine. Following this treatment activity, one (1) 5-point composite sample will be collected per 1,000 yards of treated soil stockpile volume. One (1) 5-point composite sample will also be collected per 1,000 yards of clean overburden stockpile volume. The samples will be submitted to a NELAC-certified environmental laboratory for analysis. If the analytical results indicate that the applicable Table 910-1 cleanup levels have been achieved, then backfill activities will be initiated, with the previous grade of the location being maintained.

#### **SAMPLING AND ANALYTICAL PROCEDURES**

The soil samples will be collected and placed into laboratory-provided containers. The samples will be placed in a sample cooler packed with ice and shipped via overnight delivery to ALS Environmental in Kelso, Washington (or a similar NELAC-certified laboratory, if needed) following laboratory chain-of-custody protocol. The soil samples will be analyzed for the COGCC Table 910-1 constituents: DRO, GRO, BTEX, COGCC Table 910-1 Metals, and the COGCC Table 910-1 Semi-Volatile Organic Compounds. The clean overburden stockpile sample(s) will be further analyzed for the COGCC Table 910-1 Inorganics (Sodium Absorption Ratio, Electric Conductivity, and pH).

#### **REPORTING**

Following the receipt of final analytical report, the project may be closed by submitting a COGCC Form 4. A detailed summary report of remediation and sampling activities will be included.

**TABLE 1: SITE CHARACTERIZATION SOIL ANALYTICAL RESULTS**

		Sample Location						
COGCC Table 910-1 Analyte Suite	Table 910-1 Standard	BH 04, 4-6'	BH 05, 4-6'	BH 08, 4-6'	BH 09, 4-6'	BH 11, 4-6'	BH 12, 4-6'	BH 14, 4-6'
Sample Date		6/16/2015	6/16/2015	6/16/2015	6/16/2015	6/16/2015	6/16/2015	6/16/2015
Organics								
TEPH (DRO)	500	21	3,700	100	23	1,000	46	72
TVPH (GRO)	500	ND	310	ND	ND	300	ND	ND
TPH (DRO+GRO)	500	21	4,010	100	23	1,300	46	72
BENZENE	0.17	0.078	ND	ND	ND	ND	ND	ND
TOLUENE	85	ND	ND	ND	ND	ND	ND	ND
ETHYLBENZENE	100	0.470	ND	ND	ND	0.24	ND	ND
XYLENE TOTAL	175	1.2	ND	ND	ND	1.60	ND	ND
ACENAPHTHENE	1,000	NA	NA	NA	NA	NA	NA	NA
ANTHRACENE	1,000	NA	NA	NA	NA	NA	NA	NA
BENZO(A)ANTHRACENE	0.22	NA	NA	NA	NA	NA	NA	NA
BENZO(A)PYRENE	0.022	NA	NA	NA	NA	NA	NA	NA
BENZO(B)FLUORANTHENE	0.22	NA	NA	NA	NA	NA	NA	NA
BENZO(K)FLUORANTHENE	2.2	NA	NA	NA	NA	NA	NA	NA
CHRYSENE	22	NA	NA	NA	NA	NA	NA	NA
DIBENZO(A,H)ANTHRACENE	0.022	NA	NA	NA	NA	NA	NA	NA
FLUORANTHENE	1,000	NA	NA	NA	NA	NA	NA	NA
FLUORENE	1,000	NA	NA	NA	NA	NA	NA	NA
INDENO(1,2,3-CD)PYRENE	0.22	NA	NA	NA	NA	NA	NA	NA
NAPHTHALENE	23	NA	NA	NA	NA	NA	NA	NA
PYRENE	1,000	NA	NA	NA	NA	NA	NA	NA
Metals								
MERCURY	23	NA	NA	NA	NA	NA	NA	NA
ARSENIC	0.39	NA	NA	NA	NA	NA	NA	NA
BARIUM	15,000	NA	NA	NA	NA	NA	NA	NA
CADMIUM	70	NA	NA	NA	NA	NA	NA	NA
CHROMIUM (III)	120,000	NA	NA	NA	NA	NA	NA	NA
CHROMIUM (IV)	23	NA	NA	NA	NA	NA	NA	NA
COPPER	3,100	NA	NA	NA	NA	NA	NA	NA
LEAD	400	NA	NA	NA	NA	NA	NA	NA
NICKEL	1,600	NA	NA	NA	NA	NA	NA	NA
SELENIUM	390	NA	NA	NA	NA	NA	NA	NA
SILVER	390	NA	NA	NA	NA	NA	NA	NA
ZINC	23,000	NA	NA	NA	NA	NA	NA	NA
Inorganics								
Sodium Absorption Ratio (unitless)	<12 <sup>5</sup>	NA	NA	NA	NA	NA	NA	NA
Electric Conductivity (mmhos/cm)	<4mmhos/cm or 2x background	NA	NA	NA	NA	NA	NA	NA
pH (unitless)	6 to 9	NA	NA	NA	NA	NA	NA	NA
Moisture (%)	NA	17.0	22.0	10.0	13.0	18.0	17.0	17.0

all results in mg/kg unless noted

highlight indicates reading above COGCC Table 910-1 standards

NA=not analyzed

ND=non detect

**TABLE 2: SITE CHARACTERIZATION FIELD SCREEN READINGS**

Sample Location	PID (ppm)	PetroFlag (ppm)	Notes
BH 01, 4-6'	0.2	NR	Clay/sand, some pebbles. Moist. Brown. Mod plastic.
BH 01, 9-11'	0.2	NR	Sand/silt. Loose. Dry. Lt brown, red streaks.
BH 01, 14-16'	0.1	NR	Sand. Loose. Brown at 14-15'. Clay. Tight. Moist at 15-16'.
BH 02, 4-6'	8.8	NR	Clay. Moist. Brown. ~1" of black with 'sewage' odor at 6'.
BH 02, 9-11'	0.4	NR	Sandy silt. Slightly moist. Brown, red streaks.
BH 02, 14-16'	0.7	NR	Silt/clay. Soft. Slt moist. Grey sand at 16'.
BH 03, 4-6'	2.1	NR	Clay/silt. Moist. 50% black, 50% brown. 'Sewage' odor. Mod tight.
BH 03, 9-11'	0.4	NR	Clay. Slt moist. Brown/tan.
BH 03, 14-16'	0.5	NR	Sand, some gravels. Dry. Loose. Brown/tan.
BH 04, 4-6'	0.5	NR	Clay (90%), sand. Moist. Mod tight. Brown w/black streaks.
BH 04, 9-11'	3.0	NR	Clay, sand at ~9'. Slt moist. Tight clays with depth. Brown.
BH 04, 14-16'	0.6	NR	Sand, some gravels. Dry. Loose. Brown/tan.
BH 05, 4-6'	81.6	1612	Clay. Brown. Dry from 4-4.5'. Clay. Black. Slt moist. Sticky from 4.5-6'
BH 05, 9-11'	1.4	NR	Clay, silt. Dry. Brown. Loose silt, tight clays.
BH 05, 14-16'	6.5	NR	Sand, some gravels. Dry. Loose. Brown/tan.
BH 06, 4-6'	419	NR	Clay. Black. Moist. Plastic. Sticky.
BH 06, 9-11'	3.0	NR	Sand/silt. Dry. Loose. Brown/tan.
BH 06, 14-16'	10.2	NR	Sand. Dry. Loose. Brown/tan.
BH 07, 4-6'	240	NR	Sand/silt (75%). Dry. Brown at 4-5.5'. Sand/clay (25%). Black. Wet at 5.5-6'.
BH 07, 9-11'	15.3	NR	Sand. Dry. Loose. Brown/tan.
BH 07, 14-16'	4.9	NR	Sand/silt. Mod tight. Brown/ Lt brown.
BH 08, 4-6'	3.6	NR	Clay/sand. Dry. Loose with tighter clays. Brown.
BH 08, 9-11'	2.7	NR	Sand. Dry. Loose. Brown/tan.
BH 08, 14-16'	2.0	NR	Caly/sand. Some pebbles. Brown. Dry sand with moist clays.
BH 08, 19'	NS	NR	Top of groundwater
BH 09, 4-6'	1.9	NR	Clay/sand. Dry. Loose. Brown
BH 09, 9-11'	2.3	NR	Silt/sand. Some pebbles. Dry. Loose. Brown.
BH 09, 14-16'	2.3	NR	Silt/sand. Some pebbles. Dry. Loose. Brown.
BH 10, 4-6'	52.2	NR	Clay. Muddy. Moist. Black with some brown spots. Sticky.
BH 10, 9-11'	NS	NR	No sample collected.
BH 11, 4-6'	27.1	NR	Clay/silt. Brown with black streaks. Moist.
BH 11, 9-11'	5.0	NR	Silt/sand. Dry. Loose. Brown.
BH 11, 14-16'	4.2	NR	Sand. Dry. Loose. Brown.
BH 12, 4-6'	21.2	NR	Clay/silt. Dry. Brown. Tighter clays.
BH 12, 9-11'	7.1	NR	Silt/sand. Dry. Loose. Brown.
BH 12, 14-16'	7.6	NR	Silt/sand. Dry. Loose. Brown.
BH 13, 4-6'	49.1	2206	Clay/silt. Grey, brown. Moist. Black streaks. Plastic.
BH 13, 9-11'	5.7	NR	Silt/sand. Dry. Loose. Brown.
BH 13, 14-16'	4.2	NR	Silt/sand. Slt moist. Loose. Brown, tan.
BH 14, 4-6'	36.7	NR	Silt/clay. Dry. Brown. Tighter clays.
BH 14, 9-11'	14.1	NR	Silt/clay. Loose . Slt moist. Brown. Tighter clays.

highlight indicates elevated reading

NR = no reading collected



**FIGURE 1: SAMPLE LOCATION MAP**

