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February 24, 2014

Mr. Paul Schneider  
Kerr-McGee Oil & Gas Onshore LP  
1099 18<sup>th</sup> Street  
Suite 1800  
Denver, CO 80202

Subject:       **Supplemental Remedial Report**  
                  Helgoth Heirs Unit #1  
                  API # 05-123-10041, Release Tracking # 2232617  
                  Weld County, Colorado

Dear Mr. Schneider:

Please find enclosed a copy of the above-referenced Supplemental Remedial Report for the Helgoth Heirs Unit #1 release site in Weld County, Colorado. The enclosed report describes soil and groundwater investigation activities, analytical sample collection and results, interim remedial actions, and the remedial path forward related to a produced water and condensate release at the site. Please contact me at 970.927.0390 if you require additional information.

Tasman appreciates the opportunity to provide this service.

Sincerely,  
Tasman Geosciences, LLC

A handwritten signature in black ink, appearing to read "Robert M. Cornez", with a stylized flourish at the end.

Robert M. Cornez  
Senior Environmental Manager

Enclosure:    Supplemental Remedial Report

## **SUPPLEMENTAL REMEDIAL REPORT**

Helgoth Heirs Unit #1  
Weld County, Colorado

**Prepared For:**

Kerr-McGee Oil & Gas Onshore LP  
1099 18<sup>th</sup> Street, Suite 1800  
Denver, CO 80202



**Prepared by:**

Tasman Geosciences, LLC  
6899 Pecos Street, Unit C  
Denver, CO 80221



**February 24, 2014**

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## 1.0 Introduction

The purpose of this Supplemental Remedial Report (Report) is to describe the historic and ongoing investigation and remediation activities at the Helgoth Heirs Unit #1 remediation site (Site). A historic release of produced water and condensate from an unknown origin was discovered during a limited Phase II Environmental Assessment (Phase II) conducted as part of a property transfer. The activities described herein were performed to delineate soil and groundwater impacts, remove source material, and remediate the Site to applicable Colorado Oil and Gas Conservation Commission (COGCC) standards.

## 2.0 Facility / Release Background

The Site is located approximately 5.25 miles northeast of the town of Fort Lupton, Colorado in Weld County as shown in Figure 1. The Site is surrounded by agricultural production land and is approximately 0.1 miles east of the intersection of County Road 35 and County Road 18. The Site legal description is the SW  $\frac{1}{4}$  of the SW  $\frac{1}{4}$  of Section 24, Township 2N, Range 66W.

As part of the due diligence activities conducted prior to Kerr-McGee's acquisition of the Site from Whitewing Resources, a limited Phase II was conducted by LT Environmental, Inc. (LTE). Phase II investigation activities included the collection of soil samples, the installation of 17 monitoring wells, and the collection of liquid samples. The results of the Phase II were submitted by LTE under separate cover in the *Subsurface Site Assessment Report* (April 25, 2013). Separate phase (light non-aqueous phase liquid [LNAPL]) and dissolved-phase petroleum hydrocarbon impacts to soil and groundwater were encountered during this assessment. Phase II soil sample analytical results are presented in Table 1; Phase II groundwater and LNAPL sample analytical results are presented in Table 2.

The source and volume of the release investigated in the Phase II is unknown; however, in the Phase II report, LTE estimated that approximately 13,500 cubic yards (yd<sup>3</sup>) of soil was impacted above the applicable COGCC standards. Subsequent to finalization of the of property transfer, the release was reported to the COGCC on a Form 19 submitted on April 4, 2013. The COGCC assigned spill tracking number 2232617 to the incident.

Subsequent to the Phase II, the location was plugged and abandoned (P&A). During P&A activities, additional historic impacts were encountered under the condensate tank and dump lines at the tank battery. The volume of the release is unknown. The Site tanks were cleaned and removed, and further investigation and remediation activities were conducted as described in the subsequent sections of this Report.



### 3.0 Investigation Activities

Concurrent with the P&A activities, Kerr-McGee initiated excavation of visually-impacted soil on July 29, 2013. Approximately 1,180 yd<sup>3</sup> of impacted soils were excavated and transported to the Kerr-McGee land treatment facility in Weld County, CO for treatment and disposal. The approximate limits of the excavation performed in coordination with the P&A are illustrated on Figure 2. Seven soil samples were collected from the sidewalls and base of the excavation and submitted for laboratory analysis. Samples were submitted to Summit Scientific Laboratories in Golden, Colorado for analysis of benzene, toluene, ethylbenzene, total xylenes (collectively referred to as BTEX) and total petroleum hydrocarbons-gasoline range organics (TPH-GRO) using United States Environmental Protection Agency (USEPA) Method 8260B, and TPH-diesel range organics (TPH-DRO) and TPH-oil range organics (TPH-ORO) using USEPA Method 8015.

Based on the analytical results of soil samples collected during the July 2013 excavation (as described in Section 4.0), secondary excavation activities were initiated on December 10, 2013. Approximately 1,580 yd<sup>3</sup> of impacted soils were excavated and transported to the Kerr-McGee land treatment facility in Weld County, CO for treatment and disposal. The approximate limits of the secondary excavation are illustrated on Figure 2. Excavation activities were guided by visual observations, with photoionization detector (PID) confirmation. Twenty-one soil samples were collected from the sidewalls and base of the excavation and submitted for laboratory analysis. Soil samples were field-screened for volatile organic compounds (VOC) using a PID and standard headspace sampling techniques. Samples were submitted to eAnalytics Laboratory in Loveland, CO for analysis of BTEX and TPH-GRO using USEPA Method 8260B and TPH-DRO and TPH-ORO using USEPA Method 8015.

On December 20, 2013, three horizontal remediation wells were installed prior to backfilling the secondary excavation, as illustrated on Figure 2. The horizontal wells were trenched to approximately 20 feet bgs across the length of the secondary excavation and backfilled. Subsequent to excavation soil confirmation sampling activities and horizontal well installation, the excavation was backfilled with clean imported soil and regraded to match the pre-existing conditions.

Phase II monitoring wells SB-01 to SB-06, SB-09, SB-12, and SB-14 to SB-16 were destroyed during P&A and Site grading activities. Subsequent to backfilling the secondary excavation, nine additional remediation/monitoring wells (SB-18 through SB-26) were installed for groundwater monitoring, LNAPL recovery, and future remediation use. Boring logs for the seventeen Phase II monitoring wells are presented in Appendix A. The installation and construction of wells SB-18 through SB-26 were based on the Phase II well geology; as such, these well borings were not logged.

First quarter 2014 (1Q14) groundwater monitoring was conducted on January 13, 2014. Groundwater samples were collected from monitoring wells SB-07, SB-10, SB-13, SB-18 to SB-21, and SB-24. Groundwater samples were submitted to Origins Laboratory in Denver, CO for analysis of BTEX using USEPA Method 8260B. Groundwater monitoring well gauging data is presented in Table 4. A groundwater potentiometric surface map for January 2014 is illustrated on Figure 3.



## 4.0 Investigation Results

Laboratory results for the July 2013 soil samples indicated exceedances of the COGCC TPH-GRO and TPH-DRO standards to the north of the main excavation area. July 2013 soil analytical results are presented in Table 3; the laboratory soil analytical reports are included in Appendix B. Soil sample concentrations from July 2013 are illustrated on Figure 4.

Laboratory results for the December 2013 confirmation soil samples indicate that BTEX and TPH are below the applicable COGCC standards at the extent of the excavation, with the exception of two samples collected from the base of the excavation. Samples B02@19' and B04@19' exhibited TPH concentrations (3,391 mg/kg and 677 mg/kg, respectively) and benzene concentrations in B02@19' (0.257 mg/kg) exceeding the applicable COGCC Table 910-1 standards. These data indicate that residual petroleum hydrocarbon impacts not removed by excavation activities are encountered at depths of approximately 19 feet bgs and extend to the groundwater table, which was encountered during site drilling activities between 17 and 26 feet bgs. Confirmation soil analytical results are presented in Table 3; the laboratory soil analytical reports are included in Appendix B. Soil sample concentrations from December 2013 are illustrated on Figure 5.

LNAPL was detected in two monitoring wells, SB-22 and SB-23 during the 1Q14 groundwater monitoring event. In addition, wells SB-08, SB-11, SB-17, SB-25, and SB-26 were dry and as such groundwater samples could not be collected. Analytical results from the remaining wells were below the applicable Colorado Groundwater Quality Standards (CGWQS). 1Q14 groundwater analytical results are presented in Table 4; the laboratory groundwater analytical reports are included in Appendix C. Groundwater sample concentrations from the 1Q14 event are illustrated on Figure 6.

## 5.0 Remediation Activities

Based on the post-excavation soil, groundwater, and LNAPL data collected, a remedial approach was developed consisting of the following elements: 1) LNAPL removal; 2) mobile air sparge / soil vapor extraction (AS/SVE) events, and; 3) chemical oxidation (chemox), if needed. This strategy is described in detail below.

Kerr-McGee installed a solar-powered LNAPL recovery system in monitoring well SB-23 and initiated LNAPL recovery on February 14, 2014. As of February 22, 2014, approximately 4.6 gallons of LNAPL have been recovered from this location. LNAPL recovery will be conducted for a minimum of six months or until LNAPL thickness at the site has been reduced to a sheen.

Subsequent to the LNAPL recovery phase, mobile AS/SVE events will be conducted three times per week for a period of three months to address residual petroleum hydrocarbon impacts to soil and groundwater. These AS/SVE events will utilize the existing well network installed as described above. Should petroleum hydrocarbon concentrations continue to persist above applicable regulatory standards, chemox injections will be conducted at the site. Chemox injections will be performed using Klorur persulfate along with an activation agent. The focus of chemical injections at the site will be

refined based on the most current data set collected from groundwater and soil sampling. Chemox injections will be performed under an approved underground injection control (UIC) permit.

Kerr-McGee will conduct monitored natural attenuation (MNA) with quarterly groundwater sampling activities at Site well locations until four consecutive quarters of groundwater monitoring indicate that groundwater concentrations are below the applicable CGWQS. In addition, confirmation soil samples will be collected in the source areas where soil impacts were left in place below 19 feet bgs. These samples will be collected using a mobile GeoProbe or equivalent drill rig.

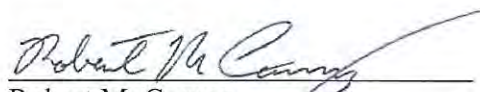
## 6.0 Conclusions and Recommendations

Soil and groundwater impacted with dissolved-phase petroleum hydrocarbons, as well as LNAPL, persist at the Site. These impacts will be addressed through a robust remedial approach consisting of active LNAPL recovery, AS/SVE, and chemox (if needed). Quarterly groundwater monitoring and post-remedial soil confirmation sampling will be conducted to verify the remedial goals have been met. Subsequent to four quarters of groundwater data below applicable CGWQS standards and post-remedial soil samples below applicable COGCC standards, a No Further Action (NFA) status designation will be requested and the Site monitoring wells will be abandoned per applicable regulations.

## 7.0 Upcoming Activities

Active LNAPL recovery was initiated on February 14, 2014, and will continue for a minimum of six months or until LNAPL thickness is reduced to a sheen. The next quarterly groundwater monitoring event is scheduled for March 2014.

This report was prepared by TASMAN GEOSCIENCES, LLC.

  
Robert M. Cornez  
Senior Environmental Manager

Date February 24, 2014

## Tables



**TABLE 1**  
**HELGOTH HEIRS UNIT #1**  
**HISTORIC SOIL ANALYTICAL DATA**  
**KERR-McGEE OIL AND GAS ONSHORE LP**

Sample ID	Date Sampled	Depth (Feet bgs)	Benzene (mg/kg)	Toluene (mg/kg)	Ethylbenzene (mg/kg)	Total Xylenes (mg/kg)	TVPH - GRO (mg/kg)	TEPH - DRO + ORO (mg/kg)
SB01 @ 20'	03/13/2013	20	<0.005	0.0073	<0.005	0.0079	<0.50	<50
SB02 @ 9'	03/13/2013	9	0.10	0.031	8.2	69	<b>2,300</b>	<b>2,200</b>
SB02 @ 17'	03/13/2013	17	<b>0.90</b>	2.8	9.8	130	<b>2,800</b>	<b>1,700</b>
SB03 @ 19'	03/13/2013	19	<b>1.9</b>	39	14	170	<b>4,600</b>	<b>2,100</b>
SB04 @ 21'	03/13/2013	21	<b>0.50</b>	16	11	14	<b>3,200</b>	<b>3,300</b>
SB05 @ 21'	03/13/2013	21	0.008	0.13	0.12	1.5	<b>390</b>	<b>650</b>
SB06 @ 21'	03/13/2013	21	<0.005	0.01	0.012	0.26	7.6	69
SB07 @ 23'	03/15/2013	23	<0.005	<0.005	<0.005	<0.005	<0.50	<50
SB08 @ 21'	03/15/2013	21	<0.005	<0.005	<0.005	<0.005	<0.50	<50
SB09 @ 21'	03/15/2013	21	<0.005	<0.005	0.11	0.40	230	170
SB09 @ 25'	03/15/2013	25	<b>0.38</b>	22	14	<b>200</b>	<b>1,600</b>	<b>3,000</b>
SB10 @ 23'	03/15/2013	23	<0.005	<0.005	<0.005	<0.005	<0.50	<50
SB11 @ 20'	03/15/2013	20	<0.005	<0.005	<0.005	<0.005	<0.50	<50
SB12 @ 16.5'	04/03/2013	16.5	<0.005	<0.005	<0.005	<0.005	<0.50	<50
SB13 @ 23'	04/03/2013	23	<0.005	<0.005	0.031	0.11	26	170
SB14 @ 14'	04/03/2013	14	<0.005	<0.005	<0.005	0.032	8.6	<50
SB15 @ 23'	04/03/2013	23	<0.005	<0.005	<0.005	6.3	<b>280</b>	<b>910</b>
SB16 @ 24.5'	04/03/2013	24.5	<0.005	<0.005	<0.005	<0.005	<0.50	<50
SB17 @ 21'	04/04/2013	21	<0.005	<0.005	<0.005	<0.005	<0.50	<50
COGCC standards for Soil (mg/kg)			<b>0.17</b>	<b>85</b>	<b>100</b>	<b>175</b>	<b>500</b>	

Notes:

Data source: *Subsurface Site Assessment Report* - LT Environmental, Inc., 04/25/2013

TVPH - GRO: Total volatile petroleum hydrocarbons - Gasoline Range Organics

TEPH - DRO: Total extractable petroleum hydrocarbons - Diesel Range Organics

TEPH - ORO: Total extractable petroleum hydrocarbons - Oil Range Organics

mg/kg = Milligrams per kilogram.

bgs - Below ground surface.

**Bold** values indicate an exceedance of the COGCC soil standards for the Site.

**TABLE 2**  
**HELGOTH HEIRS UNIT #1**  
**HISTORIC GROUNDWATER ANALYTICAL DATA**  
**KERR-McGEE OIL AND GAS ONSHORE LP**

Sample ID	Date Sampled	Benzene (ug/L)	Toluene (ug/L)	Ethylbenzene (ug/L)	Total Xylenes (ug/L)	Depth to Water/(Product) (feet bgs)	LNAPL Thickness (feet)
SB01 GW	03/13/2013	Dry					
SB02 FP*	03/13/2013	LNAPL				22 (NR)	NR
SB03 FP*	03/13/2013	LNAPL				22.76 (20.46)	2.30
SB04 FP*	03/13/2013	LNAPL				24.92 (22.24)	2.68
SB05 GW	03/13/2013	2.2	<1.0	<b>750</b>	<b>5,100</b>	18.16	
SB06 GW	03/14/2013	<b>9.4</b>	32	45	1,200	NM	
SB07 GW	03/15/2013	<b>7.3</b>	<1.0	<1.0	14	NM	
SB08 GW	03/15/2013	Dry					
SB09 FP*	03/15/2013	LNAPL				26.96 (23.00)	3.96
SB10 GW	03/15/2013	<1.0	<1.0	<1.0	<1.0	23.93	
SB11 GW	03/15/2013	Dry					
SB12 GW	04/03/2013	Dry					
SB13 GW	04/03/2013	<1.0	<1.0	4.6	15	21.47	
SB14 GW	04/03/2013	Dry					
SB15 GW	04/04/2013	<b>7.2</b>	1.3	22	700	22.84	
SB16 GW	04/08/2013	<1.0	<1.0	<1.0	<1.0	22.45	
SB17 GW	04/08/2013	Dry					
CGWQS (ug/L)		<b>5</b>	<b>560</b>	<b>700</b>	<b>1,400</b>		

Notes:

Data source: *Subsurface Site Assessment Report* - LT Environmental, Inc., 04/25/2013

CGWQS = Colorado Groundwater Quality Standards

**Bold** values indicate an exceedance of the CGWQS groundwater standards for the Site.

ug/L = Micrograms per liter. feet bgs - Feet below ground surface

LNAPL - Light non-aqueous phase liquid

Dry - No measureable amount of liquid was detected in well.

NM- Not measured

\* LNAPL sample collected and analyzed by LT Environmental, Inc.

NR - Not reported

**TABLE 3**  
**HELGOth HEIRS UNIT #1**  
**SOIL ANALYTICAL DATA - JULY AND DECEMBER 2013**  
**KERR-McGEE OIL AND GAS ONSHORE LP**

Sample ID	Date Sampled	Depth (Feet bgs)	Benzene (mg/kg)	Toluene (mg/kg)	Ethylbenzene (mg/kg)	Total Xylenes (mg/kg)	TVPH - GRO (mg/kg)	TEPH - DRO + ORO (mg/kg)
B01@4'	07/29/2013	14	<0.002	<0.005	<0.005	<0.005	9.6	170
S01@10'	07/29/2013	10	<0.002	<0.005	<0.005	<0.005	<0.50	<50
N01@10'	07/29/2013	10	<0.002	<0.005	<0.005	<0.005	11	140
E01@10'	07/29/2013	10	<0.002	<0.005	0.014	<0.005	220	260
W01@10'	07/29/2013	10	<0.002	<0.005	<0.005	<0.005	0.56	<50
B02@12'	07/29/2013	12	<0.002	<0.005	<0.005	<0.005	<0.50	<50
TP1@4'	07/29/2013	4	1.2	0.27	6.4	78	1400	1200
E01@10'	12/11/2013	10	<0.01	<0.01	0.87	17.1	69.4	<50
N01@10'	12/11/2013	10	<0.01	<0.01	<0.01	<0.01	<50	<50
S01@10'	12/11/2013	10	<0.01	<0.01	<0.01	<0.01	<50	<50
TPS@9'	12/11/2013	9	<0.01	<0.01	<0.01	<0.01	<50	<50
TPN@9'	12/11/2013	9	<0.01	<0.01	<0.01	<0.01	<50	<50
S02@17'	12/13/2013	17	<0.01	<0.01	0.036	0.077	<50	<50
W02@17'	12/13/2013	17	0.164	<0.01	0.205	1.32	<50	<50
B01@19'	12/13/2013	19	0.016	<0.01	0.043	0.414	<50	<50
B02@19'	12/13/2013	19	<b>0.257</b>	0.09	28.2	350	<b>2848</b>	<b>543</b>
N02@17'	12/16/2013	17	<0.01	<0.01	<0.01	<0.01	<50	<50
B03@19'	12/16/2013	19	0.021	<0.01	0.994	16.3	115	121
B04@19'	12/16/2013	19	<0.01	0.013	3.32	29.6	<b>471</b>	<b>206</b>
W03@17'	12/16/2013	17	<0.01	<0.01	<0.01	<0.01	<50	<50
W04@17'	12/16/2013	17	<0.01	<0.01	<0.01	0.062	<50	<50
W05@17'	12/17/2013	17	<0.01	<0.01	<0.01	<0.01	<50	<50
E01@17'	12/19/2013	17	<0.01	<0.01	<0.01	0.021	<50	<50
E02@17'	12/19/2013	17	<0.01	0.016	0.266	3.6	68.7	<50
E03@17'	12/19/2013	17	<0.01	<0.01	<0.01	0.028	<50	<50
E04@17'	12/20/2013	17	0.012	<0.01	0.062	0.564	<50	<50
E05@17'	12/20/2013	17	<0.01	<0.01	<0.01	<0.01	<50	<50
N03@17'	12/20/2013	17	<0.01	<0.01	<0.01	<0.01	<50	<50
COGCC standards for Soil (mg/kg)			0.17	85	100	175	500	

Notes:

TVPH - GRO: Total volatile petroleum hydrocarbons - Gasoline Range Organics

TEPH - DRO: Total extractable petroleum hydrocarbons - Diesel Range Organics

TEPH - ORO: Total extractable petroleum hydrocarbons - Oil Range Organics

mg/kg = Milligrams per kilogram

bgs - Below ground surface

**Bold** values indicate an exceedance of the COGCC soil standards for the Site.



**TABLE 4**  
**HELGOTH HEIRS UNIT #1**  
**GROUNDWATER GAUGING AND ANALYTICAL DATA - JANUARY 2014**  
**KERR-McGEE OIL AND GAS ONSHORE LP**

Sample ID	Date Sampled	Benzene (ug/L)	Toluene (ug/L)	Ethylbenzene (ug/L)	Total Xylenes (ug/L)	Depth to Water (ft bgs)	Depth to Product (ft bgs)	Product Thickness (ft)
SB07	01/13/2014	0.0153	<0.004	<0.004	0.0542	25.88	-	-
SB08	01/13/2014	NS	NS	NS	NS	DRY	-	-
SB10	01/13/2014	<0.004	<0.004	<0.004	<0.004	26.14	-	-
SB11	01/13/2014	NS	NS	NS	NS	DRY	-	-
SB13	01/13/2014	0.0287	<0.004	<0.004	<0.004	23.39	-	-
SB17	01/13/2014	NS	NS	NS	NS	DRY	-	-
SB18	01/13/2014	0.0082	<0.004	0.0417	0.0353	17.75	-	-
SB19	01/13/2014	2.4	0.483	0.344	6.42	17.81	-	-
SB20	01/13/2014	0.489	0.25	0.102	0.886	18.39	-	-
SB21	01/13/2014	1.6	4.37	0.342	6.17	22.22	-	-
SB22	01/13/2014	LNAPL				28.68	28.38	0.3
SB23	01/13/2014	LNAPL				23.3	22.4	0.9
SB24	01/13/2014	<0.004	<0.004	0.0065	0.0399	20.86	-	-
SB25	01/13/2014	NS	NS	NS	NS	DRY	-	-
SB26	01/13/2014	NS	NS	NS	NS	DRY	-	-
CGWQS (ug/L)		5	560	700	1,400			

Notes:

CGWQS = Colorado Groundwater Quality Standards

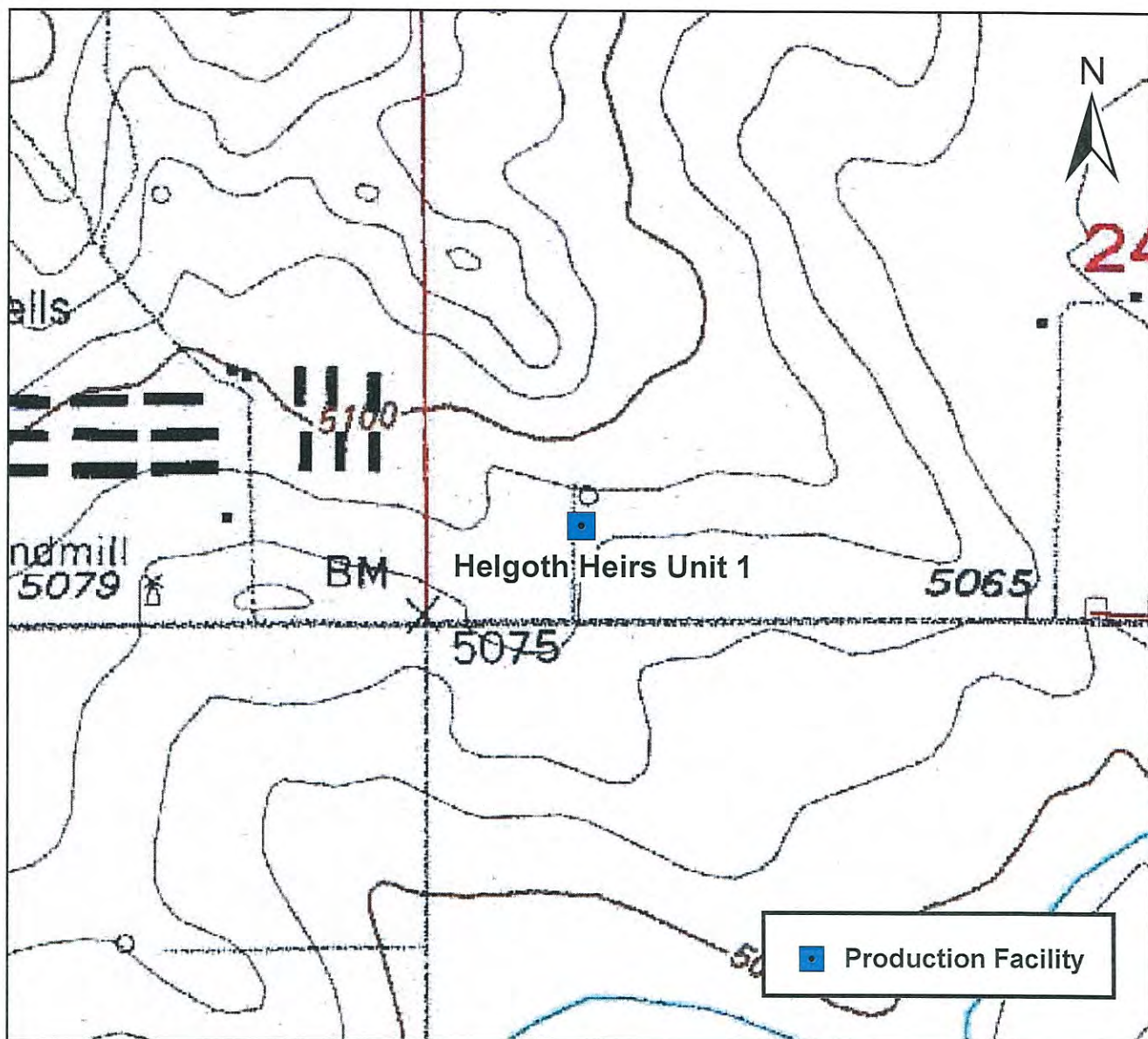
**Bold** values indicate an exceedance of the CGWQS groundwater standards for the Site.

ug/L = Micrograms per liter.

Wells SB01-SB06, SB09, SB12, and SB14-SB16 installed by LT Environmental, Inc. were destroyed as of field observation 12/2013

ft bgs = feet below ground surface

## Figures



0 375 750 1,500  
Feet



## Figure 1

Site Location Map  
Helgoth Heirs Unit 1  
SWSW S24 T2N R66W  
Weld County, Colorado

Drawn By: DEB  
Date: 06/21/2013

  
Tasman Geosciences





Agriculture

Agriculture

Separator

Oil Tank

Water Sump

Abandoned Sales Line

**Notes:**

1. Tank battery decommissioned and production well plugged and abandoned in July 2013. Site infrastructure shown for site orientation and release illustration purposes. No equipment remains on Site.

PROJECT NO:

DRAWN BY: DBA

DATE: 02/20/14

Kerr McGee Oil and Gas Onshore, LP  
Helgoth Heirs #1  
SWSW S24 T2N R66W  
Weld County, CO



6899 Pecos St., Unit C  
Denver, CO 80221

**LEGEND**

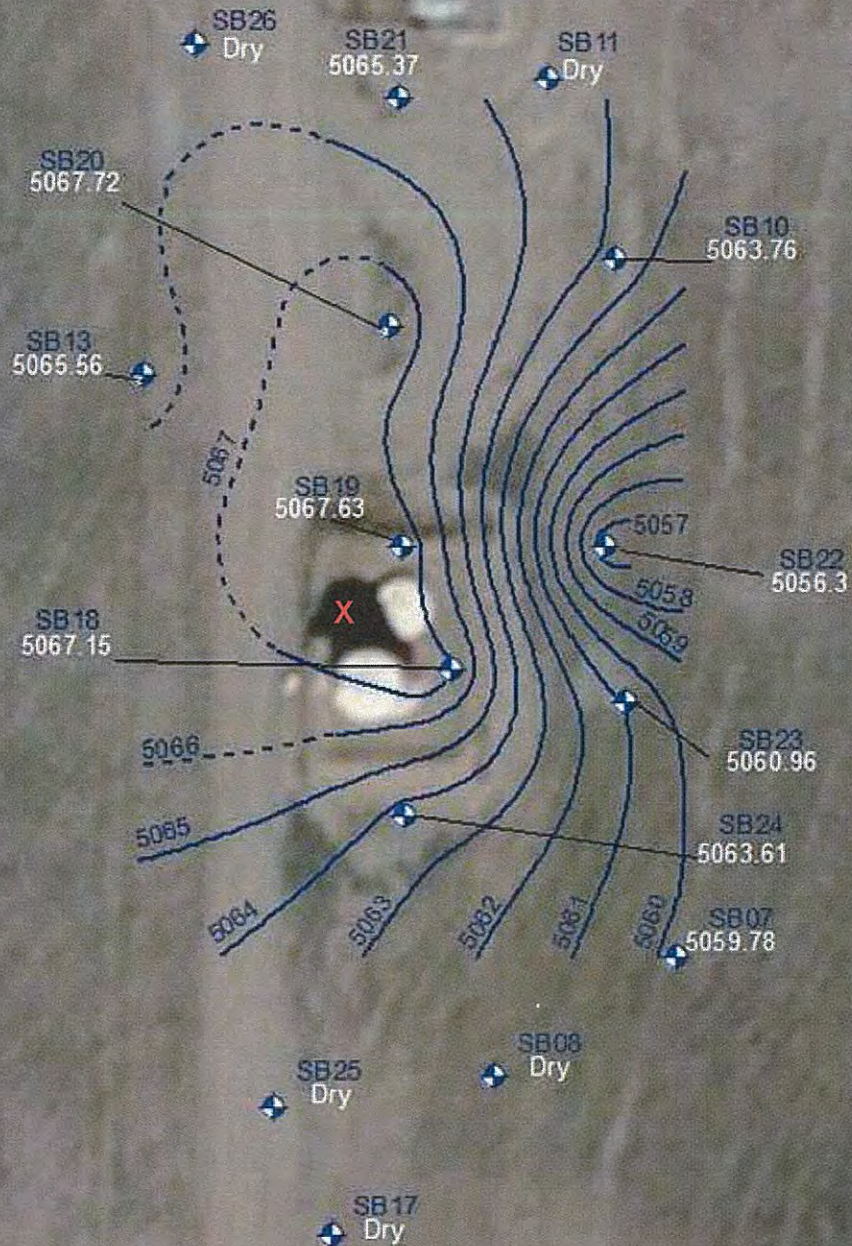
- Remedial Treatment Well Location
- Monitoring Well Location
- Excavation Extent
- Earthen Berm
- Soil Sample Location
- Approximate area of release
- Horizontal well location

**Figure 2**

Site Map and Well Locations

Approximate Scale:  
1"=40'





### Notes:

1. Wells noted as 'Dry' not used in preparing groundwater contours.
2. Tank battery decommissioned and abandoned in July 2013. Site orientation and release illustration purposes. No equipment remains on Site.

PROJECT NO:

DRAWN BY: DBA

DATE: 2/19/2014



6899 Pecos St., Unit C  
Denver, CO 80221

Kerr-Mcgee Oil and  
Gas Onshore, LP  
Helgoth Heirs #1  
SWSW S24 T2N  
R66W  
Weld County, CO

### LEGEND:



Groundwater Monitoring Location



Groundwater elevation contour  
(dashed where inferred)

5060.96 Groundwater Elevation (feet AMSL)



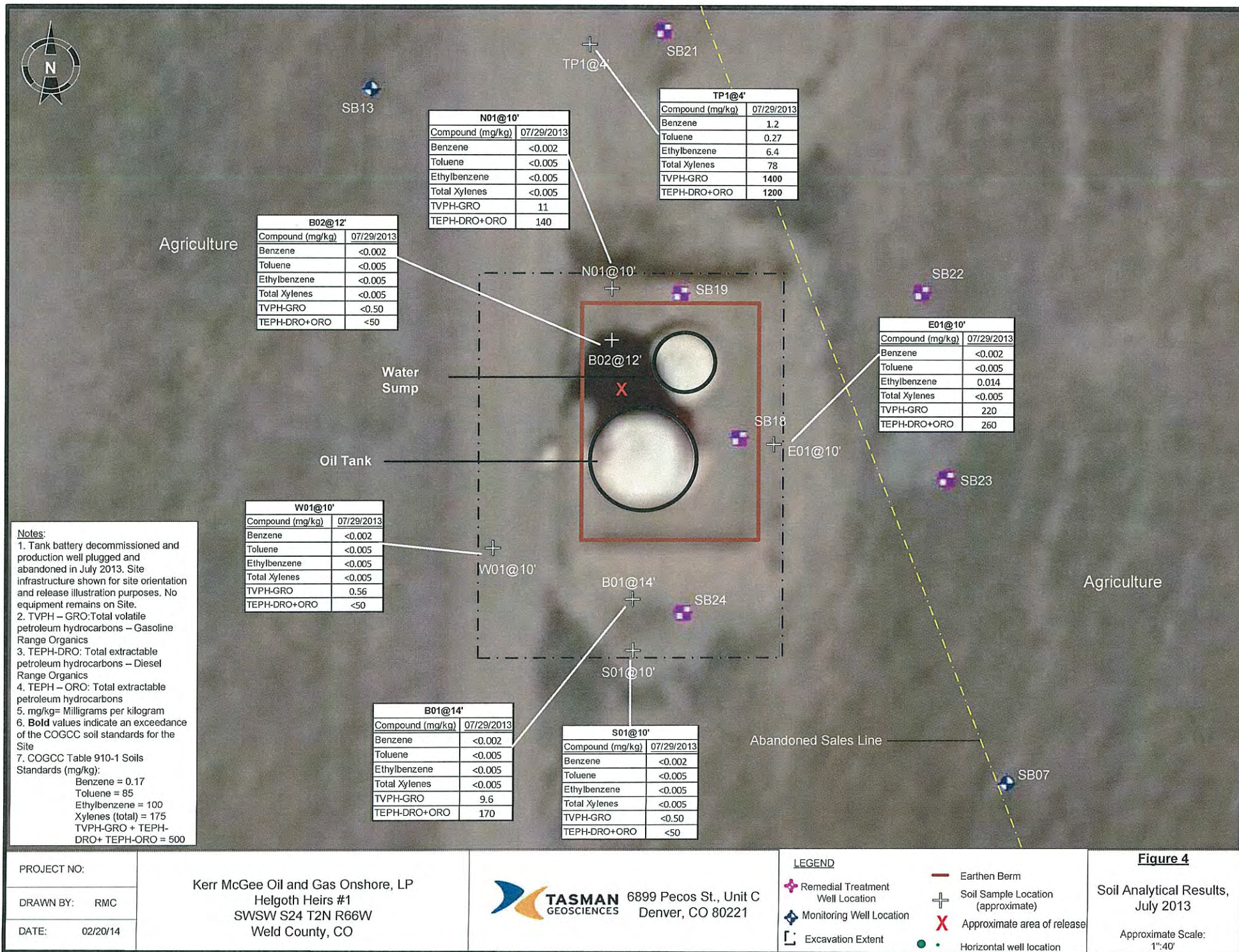
Approximate Release Location

**Figure 3**

Groundwater Elevations and  
Potentiometric Surface  
(January 13, 2014)

Scale: 1" = 42'





PROJECT NO:

DRAWN BY: RMC

DATE: 02/20/14

Kerr McGee Oil and Gas Onshore, LP  
Helgoth Heirs #1  
SWSW S24 T2N R66W  
Weld County, CO



6899 Pecos St., Unit C  
Denver, CO 80221

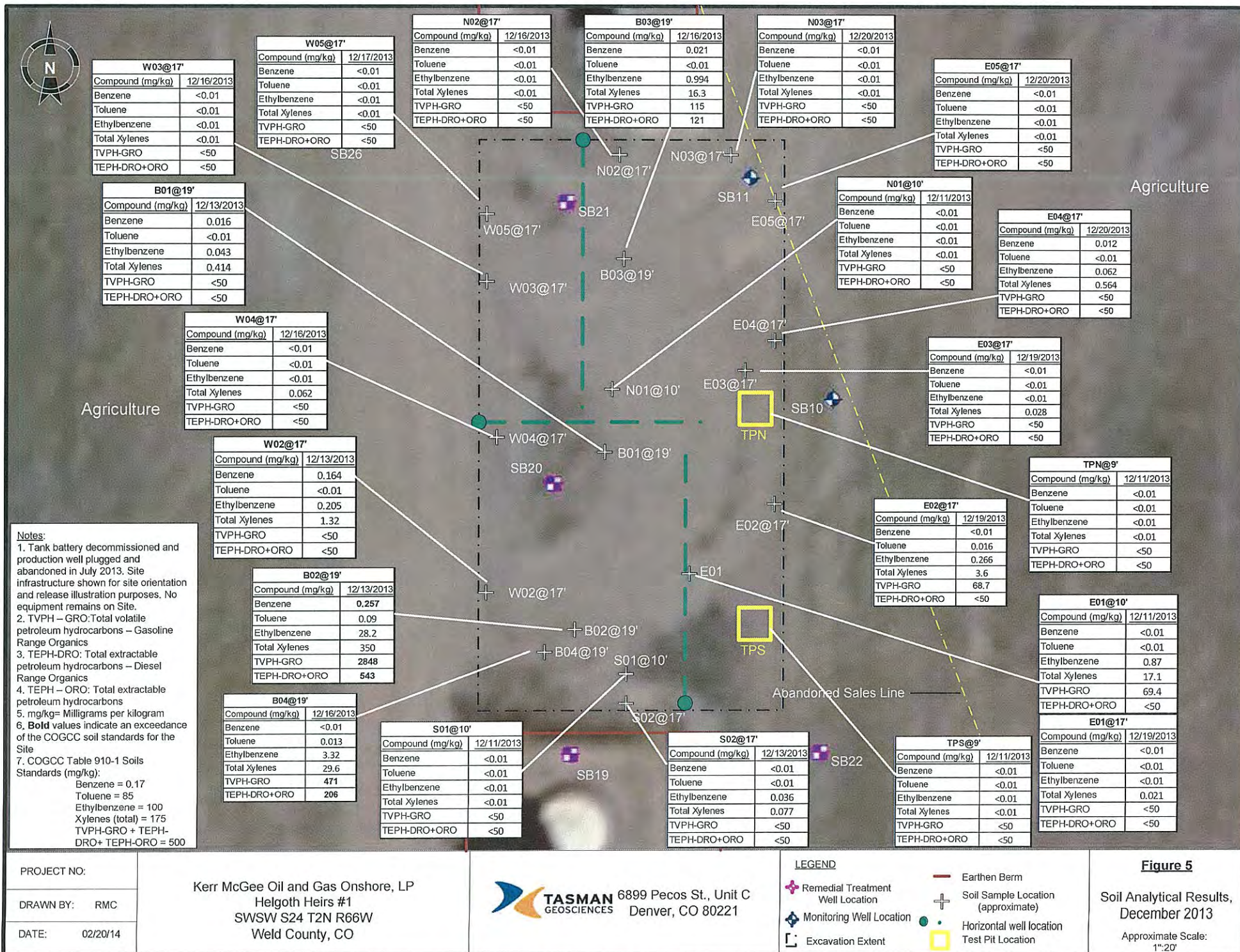
#### LEGEND

- Remedial Treatment Well Location
- Monitoring Well Location
- Excavation Extent
- Earthen Berm
- Soil Sample Location (approximate)
- Approximate area of release
- Horizontal well location

**Figure 4**  
Soil Analytical Results,  
July 2013

Approximate Scale:  
1"=40'









Agriculture

Agriculture

**Notes:**

1. Tank battery decommissioned and production well plugged and abandoned in July 2013. Site infrastructure shown for site orientation and release illustration purposes. No equipment remains on Site.
2. CGWQS – Colorado Groundwater Quality Standards
3. ug/L = Micrograms per liter
4. NS = Not sampled – well was dry at time of sampling
5. LNAPL = Well contains non-aqueous phase liquid – sample not collected – LNAPL thickness indicated
6. **Bold** values indicate an exceedance of the CGWQS for the Site
7. CGWQS (ug/L):  
Benzene = 5  
Toluene = 560  
Ethylbenzene = 700  
Xylenes (total) = 1,400

SB21	
Compound (ug/L)	01/13/2014
Benzene	1.6
Toluene	4.37
Ethylbenzene	0.342
Total Xylenes	6.17

SB13	
Compound (ug/L)	01/13/2014
Benzene	0.0287
Toluene	<0.004
Ethylbenzene	<0.004
Total Xylenes	<0.004

SB19	
Compound (ug/L)	01/13/2014
Benzene	2.4
Toluene	0.483
Ethylbenzene	0.344
Total Xylenes	6.42

SB24	
Compound (ug/L)	01/13/2014
Benzene	<0.004
Toluene	<0.004
Ethylbenzene	0.0065
Total Xylenes	0.0399

SB10	
Compound (ug/L)	01/13/2014
Benzene	<0.004
Toluene	<0.004
Ethylbenzene	<0.004
Total Xylenes	<0.004

SB20	
Compound (ug/L)	01/13/2014
Benzene	0.489
Toluene	0.25
Ethylbenzene	0.102
Total Xylenes	0.886

SB18	
Compound (ug/L)	01/13/2014
Benzene	0.0082
Toluene	<0.004
Ethylbenzene	0.0417
Total Xylenes	0.0353

SB07	
Compound (ug/L)	01/13/2014
Benzene	0.0153
Toluene	<0.004
Ethylbenzene	<0.004
Total Xylenes	0.0542

Separator

Water Sump

Oil Tank

Abandoned Sales Line

PROJECT NO:

DRAWN BY: RMC

DATE: 02/20/14

Kerr McGee Oil and Gas Onshore, LP  
Helgoth Heirs #1  
SWSW S24 T2N R66W  
Weld County, CO



6899 Pecos St., Unit C  
Denver, CO 80221

**LEGEND**

- Remedial Treatment Well Location
- Monitoring Well Location
- Excavation Extent
- (0.30') LNAPL Thickness
- Earthen Berm
- Soil Sample Location (approximate)
- Approximate area of release
- Horizontal well location

**Figure 6**

Groundwater Analytical  
Results, January 2014

Approximate Scale:  
1"=40'