

3R-446

**Q4 2011 Ground Water
Monitoring Report**

**Date
1/31/12**

OIL CONS. DIV DIST. 3

MAR 08 2012

QUARTERLY GROUNDWATER MONITORING REPORT
(December 2011 Event)


Property:

K-51 Pipeline Release
Sections 34 and 35, T26N, R6W
Rio Arriba County, New Mexico
SWG Project No. 0410003
January 31, 2012

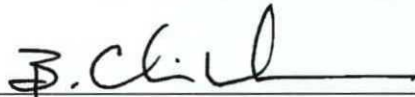
Prepared for:
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PREPARED BY:

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(December, 2011)
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QUARTERLY GROUNDWATER MONITORING REPORT
(December 2011 Event)

K-51 Pipeline Release
Sections 34 and 35, T26N, R6W
Rio Arriba County, New Mexico

SWG Project No. 0410003

1.0 INTRODUCTION

1.1 Site Description & Background

The K-51 pipeline release site is located at the boundary of Sections 34 and 35, Township 26 North, Range 6 West, in Rio Arriba County, New Mexico, referred to hereinafter as the "Site" or "subject Site". The Site consists of silty/sandy canyon bottomland with native grasses, and is crossed by a natural gas pipeline operated by Enterprise Field Services, LLC (Enterprise).

On April 13, 2010, approximately 10 barrels of natural gas condensate were released from the Enterprise natural gas gathering pipeline at the Site, due to internal corrosion. Subsequent to the completion of excavation and off-site disposal of petroleum hydrocarbon affected soils, confirmation soil samples were collected from the excavation by Souder, Miller and Associates (SMA). In addition, one (1) groundwater sample was collected from the groundwater which recharged into the excavation. The excavation was then backfilled with unaffected soils.

In June 2010, eight (8) soil borings (BH-1 through BH-8) were advanced on-site by LT Environmental (LTE). Subsequent to advancement, four (4) of the soil borings were converted to groundwater monitoring wells (MW-1 through MW-4). Based on the results of soil and groundwater sampling activities, constituent of concern (COC) concentrations were identified in soil above the New Mexico Energy, Minerals and Natural Resources Department (EMNRD), Oil Conservation Division (OCD) *Remediation Action Levels* (RALs) and in groundwater above the New Mexico Water Quality Control Commission (WQCC) *Groundwater Quality Standards* (GQSS).

During April 2011, nine (9) soil borings (SB-9, SB-10, MW-11 through MW-14, SB-15, MW-16, and MW-17) were advanced in and around the former K-51 release area to further evaluate the extent of dissolved phase COCs in groundwater. Additionally, fifteen (15) injection points were installed to allow In-Situ Chemical Oxidation (ISCO) of the COCs. ISCO activities were performed during May 2011. During the initial portion of the treatment, the formation was prepared for contaminant oxidation by inoculating the treatment area with an alkaline oxidative de-ionizing solution. This served as a wetting agent, de-ionizing clay platelets and optimizing aqueous reagent contact with contaminants. An aqueous solution containing sodium percarbonate and sodium persulfate was injected through the fifteen (15) injection points. The pre-oxidation alkaline de-ionizing solution also served as a persulfate catalyst (producing sulfate

radicals).

The second portion of the treatment was conducted within twenty four (24) hours after injecting the de-ionizing/catalyst solution. During these activities, the treatment area was inoculated using VeruSolve-HP™ aqueous reagent as a Surfactant-Enhanced In-Situ Chemical Oxidation (S-ISCO™) Coelution Technology™. VeruSOLVE-HP™ is a stabilized surfactant-cosolvent/oxidant combination effective for surgical destruction of source term contaminants. Because the rate of partitioning of contaminants into the aqueous phase determines the overall rate of reaction, as the concentration of stabilized surfactant-cosolvent fraction is increased, the partitioning and subsequent rate of chemical oxidation is increased. VeruTEK's stabilized surfactant-cosolvent/oxidant blend achieves Winsor Type I solubilization, where the contaminant is solubilized as a single-phase micro-emulsion and dissolution of constituents occur without mobilization. This allows for the destruction of the contaminants that are currently in a non-aqueous phase (i.e. the source term). The resulting redox reaction will occur over a very long period of time. Reaction kinetics are controlled, sustaining a highly oxidative environment for weeks. Extended persistence greatly increases the contaminant-oxidant contact occurrence, thereby producing very favorable results.

The Site is subject to regulatory oversight by the New Mexico EMNRD OCD. To address activities related to condensate releases, the New Mexico OCD utilizes the *Guidelines for Remediation of Leaks, Spills and Releases* as guidance, in addition to the OCD rules, specifically NMAC 19.15.30 Remediation. These guidance documents establish investigation and abatement action requirements for sites subject to reporting and/or corrective action.

The Site location is depicted on Figure 1 of Appendix A which was reproduced from a portion of the United States Geological Survey (USGS) 7.5-minute series topographic map.

1.2 Scope of Work

The objective of the groundwater monitoring event was to further evaluate the concentrations of chemicals of concern (COCs) in groundwater at the Site.

A Site Vicinity Map is included as Figure 2, and a Site Map, which indicates the approximate locations of the monitoring wells in relation to pertinent structures and general Site boundaries, is included as Figure 3 of Appendix A.

1.3 Standard of Care & Limitations

The findings and recommendations contained in this report represent SWG's professional opinions based upon information derived from on-Site activities and other services performed under this scope of work and were arrived at in accordance with currently acceptable professional standards. The findings were based upon analytical results provided by an independent laboratory. Evaluations of the geologic/hydrogeologic conditions at the Site for the purpose of this investigation are made from a limited number of available data points (i.e. soil borings and ground water samples) and site wide subsurface conditions may vary from these data points. SWG makes no warranties, express or implied, as to the services performed hereunder. Additionally, SWG does not warrant the work of third parties supplying information used

in the report (e.g. laboratories, regulatory agencies, or other third parties).

This report is based upon a specific scope of work requested by Enterprise. The agreement between SWG and Enterprise outlines the scope of work, and only those tasks specifically authorized by that agreement or outlined in this report were performed. This report has been prepared for the intended use of Enterprise, and any authorization for use or reliance by any other party (except a governmental entity having jurisdiction over the Site) is prohibited without the express written authorization of Enterprise and SWG.

2.0 SAMPLING PROGRAM

A quarterly groundwater sampling event was conducted on December 13th, 2011 by Jordon Dubuisson, a SWG environmental professional.

SWG's groundwater sampling program consisted of the following:

- Collection of one groundwater sample from each monitoring well utilizing low-flow sampling techniques.

Prior to sample collection, SWG gauged the depth to fluids in each monitoring well using an interface probe capable of detecting light non-aqueous phase liquids (LNAPL). LNAPL was not observed in any of the Site monitoring wells.

Prior to sample collection, each monitoring well was micro-purged utilizing low-flow sampling techniques. Low-flow refers to the velocity with which groundwater enters the pump intake and that is imparted to the formation pore water in the immediate vicinity of the well screen. It does not necessarily refer to the flow rate of water discharged at the surface which can be affected by flow regulators or restrictions. Water level drawdown provides the best indication of the stress imparted by a given flow-rate for a given hydrological situation. The objective is to pump in a manner that minimizes stress (drawdown) to the system, to the extent practical, taking into account established Site sampling objectives. Flow rates on the order of 0.1 to 0.5 L/min will be maintained during sampling activities, using dedicated sampling equipment.

The utilization of low-flow minimal drawdown techniques enables the isolation of the screened interval groundwater from the overlying stagnant casing water. The pump intake is placed within the screened interval such that the groundwater recovered is drawn in directly from the formation with little mixing of casing water or disturbance to the sampling zone.

The groundwater samples were collected from each monitoring well once produced groundwater was consistent in color, clarity, pH, DO, ORP, temperature and conductivity.

Groundwater samples were collected in laboratory prepared containers, sealed with custody tape and placed on ice in a cooler secured with a custody seal. The sample coolers and completed chain-of-custody forms were relinquished to Hall Environmental Analysis Laboratory (HEAL) in Albuquerque, New Mexico.

3.0 LABORATORY ANALYTICAL PROGRAM

The groundwater samples collected from the monitoring wells during the groundwater sampling event were analyzed for total petroleum hydrocarbons (TPH) gasoline range organics (GRO) and diesel range organics (DRO) utilizing EPA method SW-846#8015M, and benzene, toluene, ethylbenzene and xylenes (BTEX) utilizing EPA method SW-846 #8021B.

A summary of the analysis, sample type, number of samples and EPA-approved methods are presented on the following table:

Analysis	Sample Type	No. of Samples	Method
<i>TPH GRO/DRO</i>	Groundwater	10	SW-846# 8015M
<i>BTEX</i>	Groundwater	10	SW-846# 8021B

Laboratory results are summarized in Table 1 included in Appendix B. The executed chain-of-custody form and laboratory data sheets are provided in Appendix C.

4.0 GROUNDWATER FLOW DIRECTION

The monitoring wells have been surveyed to determine top-of-casing (TOC) elevations. Prior to sample collection, SWG gauged the depth to fluids in each monitoring well. The groundwater flow direction at the Site is generally towards the west-northwest. The observed gradient during this monitoring event was approximately 0.008 ft/ft across the Site.

Groundwater measurements collected during the most recent gauging event in December 2011 are presented with TOC elevations in Table 2, Appendix B. A groundwater gradient map depicting the most recent gauging data is included as Figure 4 (Appendix A).

5.0 DATA EVALUATION

The Site is subject to regulatory oversight by the New Mexico EMNRD OCD. To address activities related to crude oil/condensate related releases, the New Mexico EMNRD OCD utilizes the *Guidelines for Remediation of Leaks, Spills and Releases* as guidance, in addition to the EMNRD/OCD rules, specifically NMAC 19.15.30 Remediation. These guidance documents establish investigation and abatement action requirements for sites subject to reporting and/or corrective action.

5.1 Groundwater Samples

SWG compared BTEX concentrations or practical quantitation limits (PQLs) associated with the groundwater samples collected from monitoring wells during the December

2011 sampling event to the New Mexico WQCC *Groundwater Quality Standards*. The results of the groundwater sample analyses are summarized in Table 1 of Appendix B. A Groundwater Quality Exceedance Zone map is provided as Figure 5 of Appendix A.

Benzene, Toluene, Ethylbenzene, and Xylenes

The groundwater samples collected from monitoring wells MW-2, MW-3, MW-11, MW-12, MW-13, MW-16 and MW-17 during the December 2011 sampling event did not exhibit benzene, toluene, ethylbenzene or xylenes concentrations above the laboratory PQLs, which were below the respective WQCC *Groundwater Quality Standards*.

The groundwater samples collected from monitoring wells MW-1, MW-4 and MW-14 during the December 2011 sampling event exhibited benzene concentrations ranging from 84 µg/L to 260 µg/L, which exceed the WQCC *Groundwater Quality Standard* of 10 µg/L.

The groundwater sample collected from monitoring well MW-1 exhibited a xylene concentration of 650 µg/L, which exceeds the WQCC *Groundwater Quality Standard* of 620 µg/L.

6.0 FINDINGS

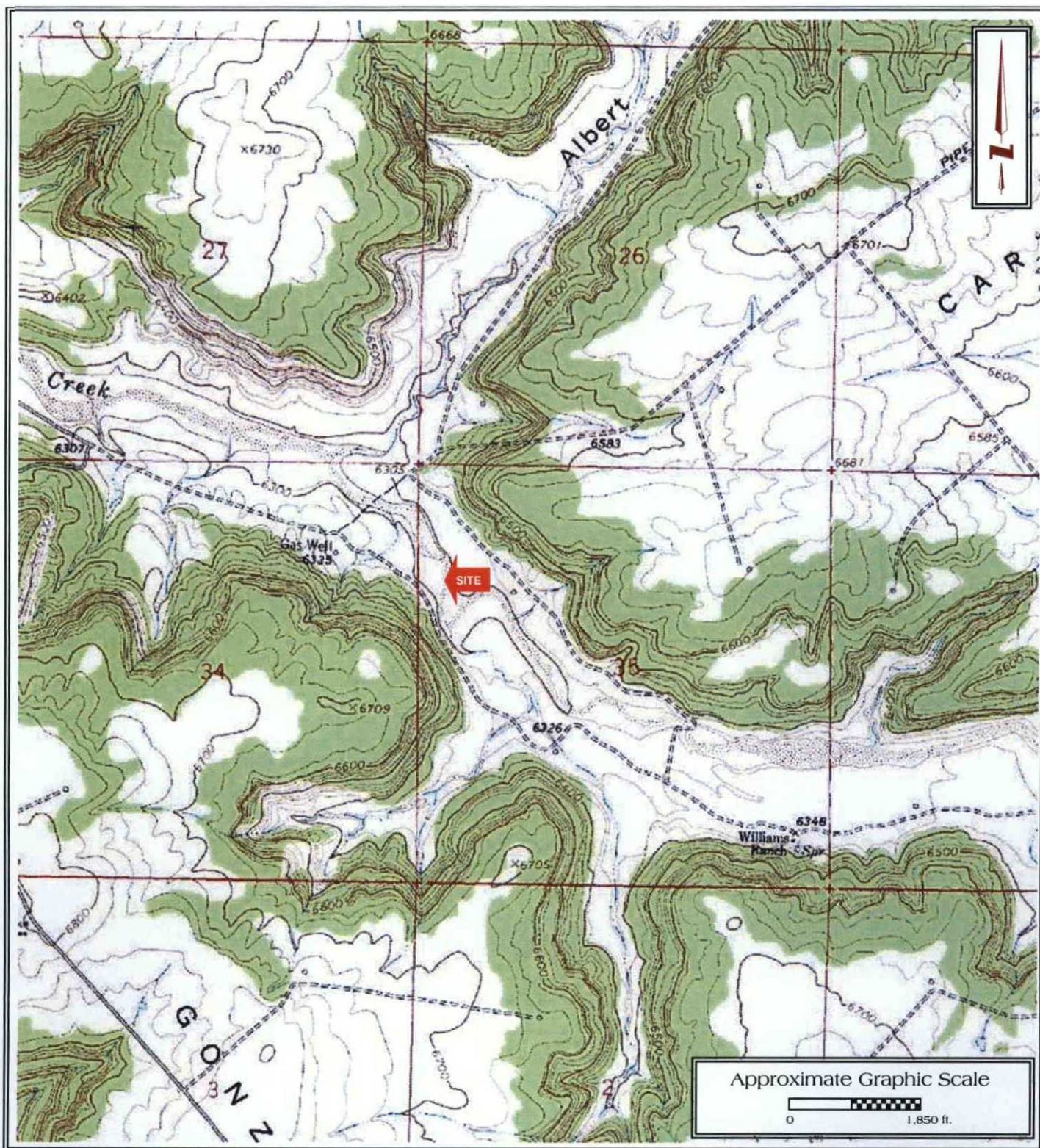
During December 2011, SWG conducted a quarterly groundwater monitoring event at the K-51 Pipeline release site. The Site is located at the boundary of Sections 34 and 35, Township 26 North, Range 6 West, in Rio Arriba County, New Mexico. The Site consists of silty/sandy canyon bottomland with native grasses, and is crossed by a natural gas pipeline operated by Enterprise.

- During the completion of the sampling event, one (1) groundwater sample was collected from each monitoring well utilizing low-flow sampling techniques.
- The groundwater samples collected from monitoring wells MW-2, MW-3, MW-11, MW-12, MW-13, MW-16 and MW-17 during the December 2011 sampling event did not exhibit benzene, toluene, ethylbenzene or xylenes concentrations above the laboratory PQLs, which were below the respective WQCC *Groundwater Quality Standards*.
- The groundwater samples collected from monitoring wells MW-1, MW-4 and MW-14 during the December 2011 sampling event exhibited benzene concentrations ranging from 84 µg/L to 260 µg/L, which exceed the WQCC *Groundwater Quality Standard* of 10 µg/L.
- The groundwater sample collected from monitoring well MW-1 exhibited a xylene concentration of 650 µg/L, which exceeds the WQCC *Groundwater Quality Standard* of 620 µg/L.
- Overall, BTEX concentrations in groundwater across the site continue to decline.

7.0 RECOMMENDATIONS

Based on the results of groundwater monitoring activities, SWG has the following recommendations:

- Report the groundwater monitoring results to the OCD;
- Perform Supplemental Site Investigation activities to further evaluate the extent of COCs in groundwater; and,
- Pursuant to the completion of supplemental site investigation activities, continue the evaluation and execution of corrective actions to reduce the concentrations of COCs in soil to below the OCD *Remediation Action Levels* and groundwater to below the New Mexico WQCC *Groundwater Quality Standards*.



K-51 Pipeline Release

N36° 26' 47.77"; W107° 26' 46.04"

Off County Road 537

Rio Arriba, New Mexico

SWG Project No. 0410003

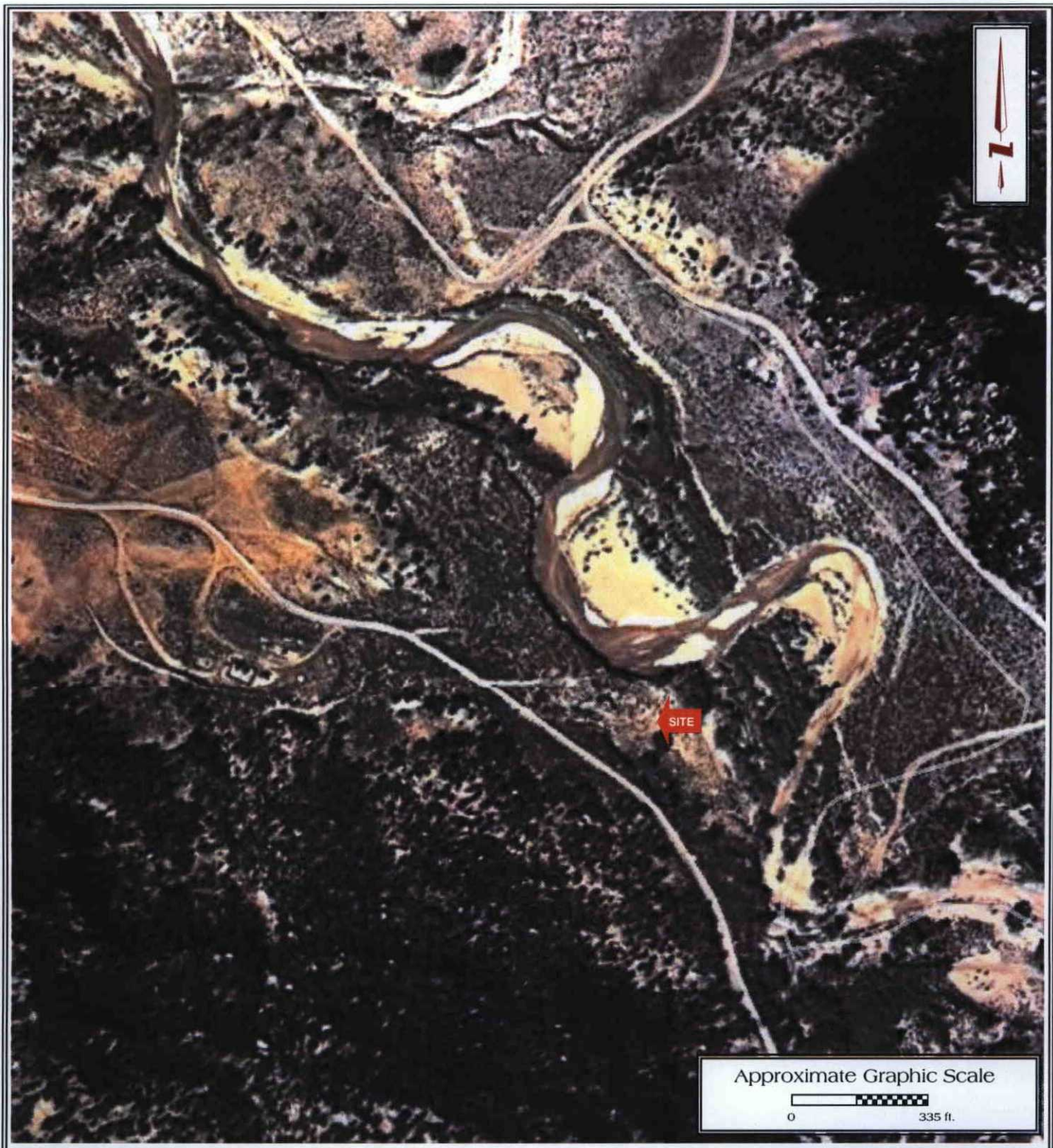
Southwest
GEOSCIENCE

FIGURE 1

Topographic Map

Gonzales Mesa, NM Quadrangle

Contour Interval - 10 Feet



K-51 Pipeline Release

N36° 26' 47.77"; W107° 26' 46.04"

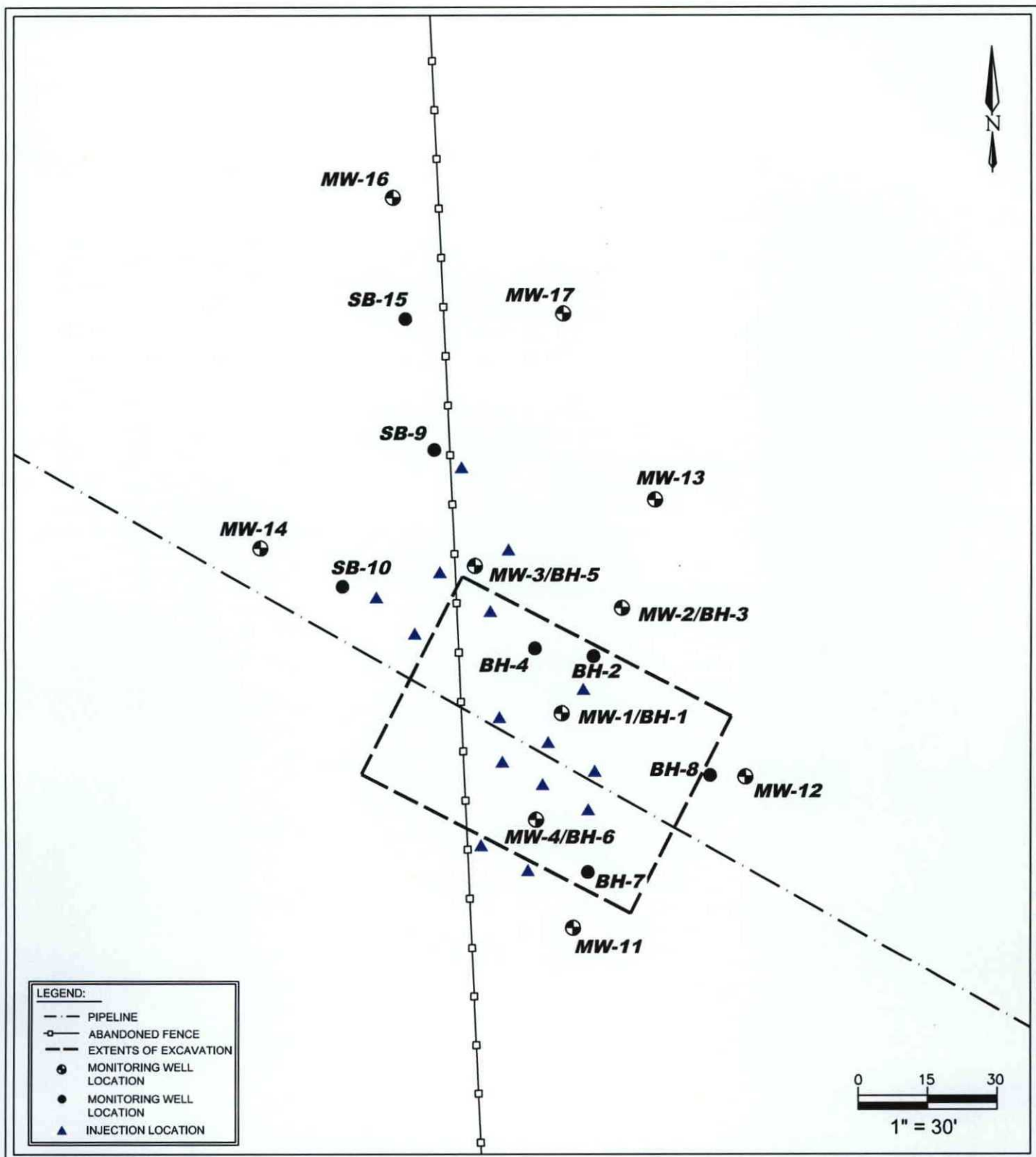
Off County Road 537

Rio Arriba, New Mexico

SWG Project No. 0410003

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FIGURE 2
Site Vicinity Map
2005 Aerial Photograph

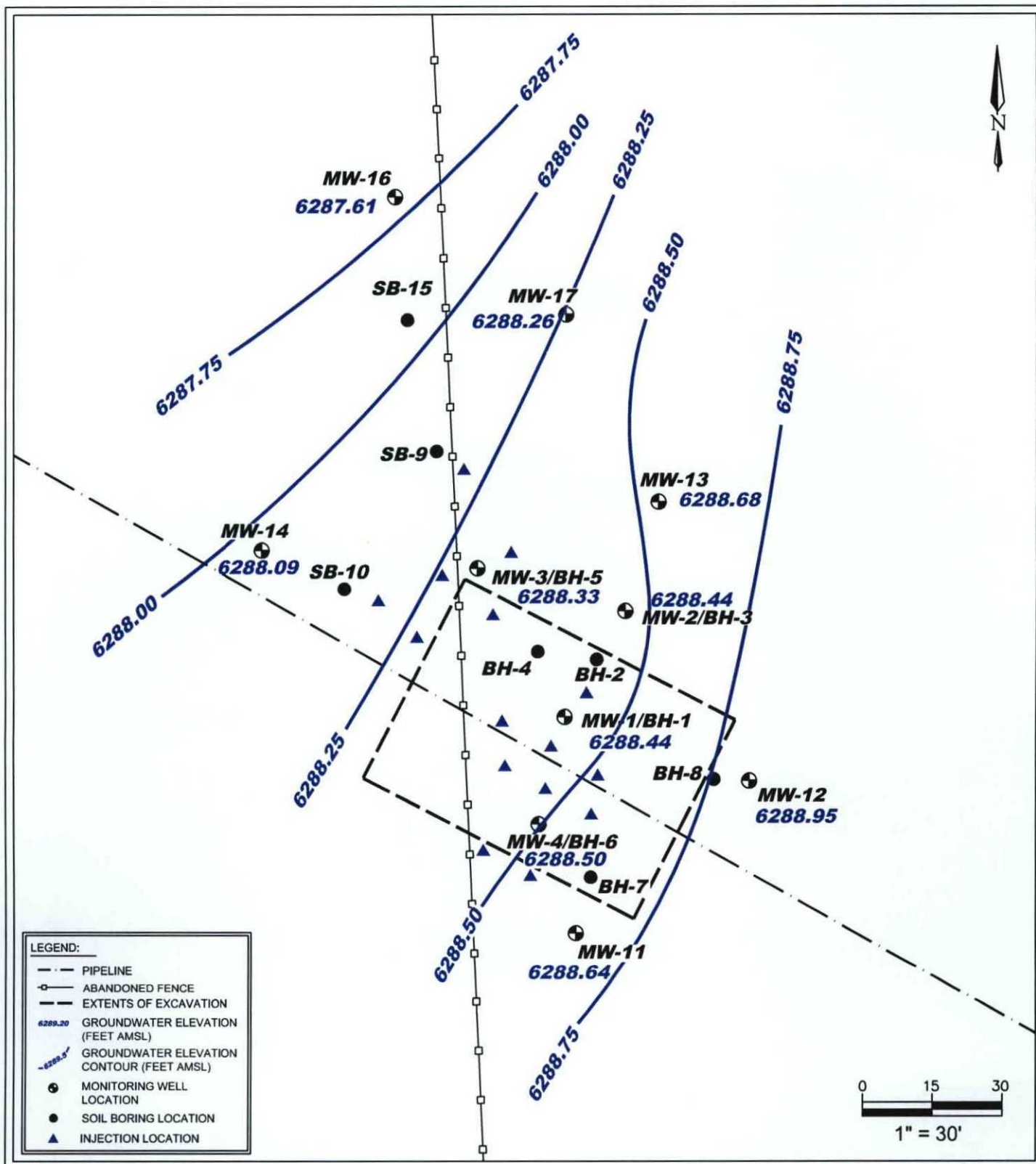


K-51 Pipeline Release
 N35° 26' 47.77"; W107° 26' 46.04"
 Off County Road 537
 Rio Arriba County, New Mexico

SWG Project No. 0410003

Southwest
 GEOSCIENCE

FIGURE 3
SITE MAP

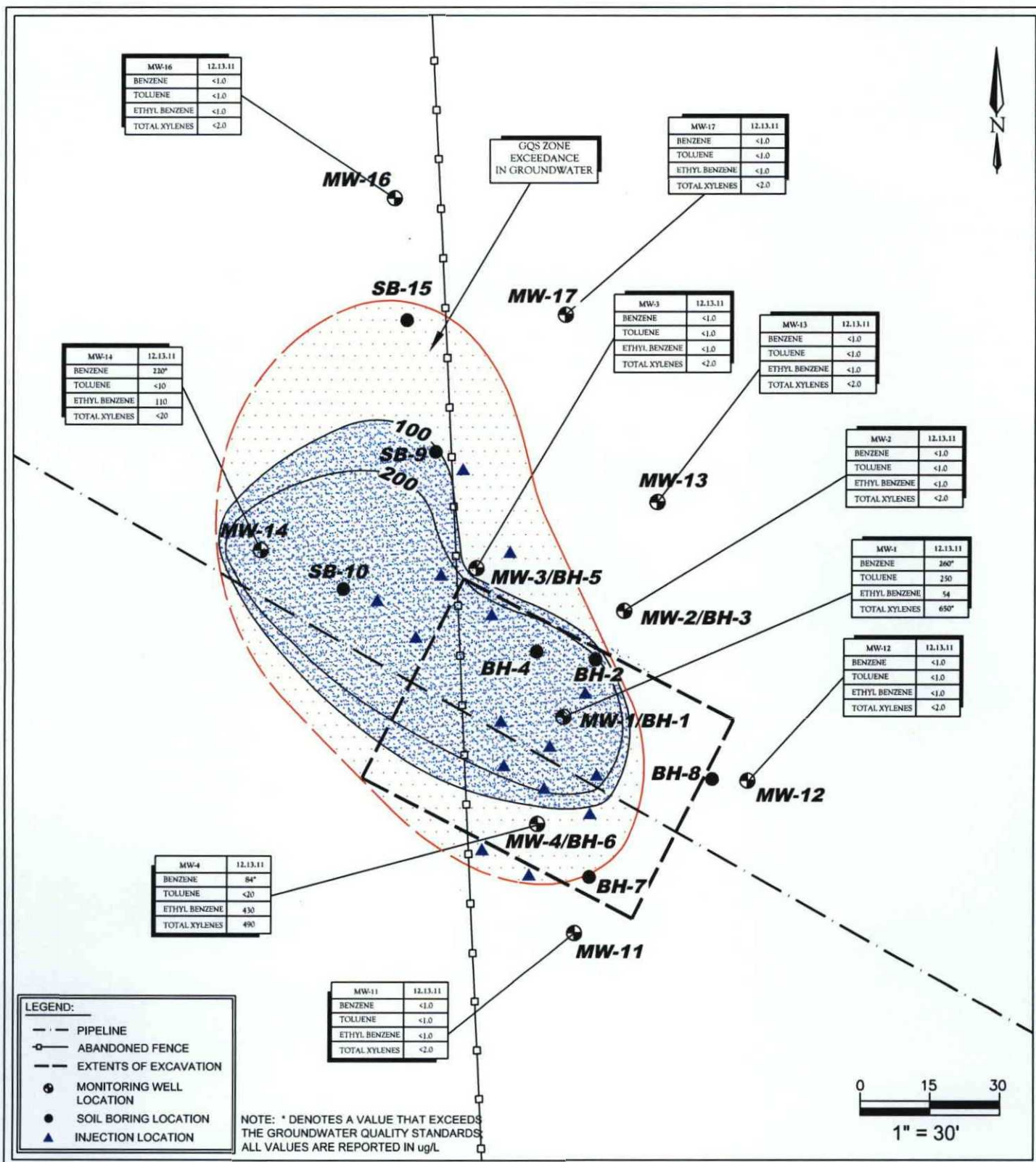


K-51 Pipeline Release
 N35° 26' 47.77"; W107° 26' 46.04"
 Off County Road 537
 Rio Arriba County, New Mexico

SWG Project No. 0410003

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FIGURE 4
 GROUNDWATER
 GRADIENT MAP
 DECEMBER 2011



K-51 Pipeline Release
N35° 26' 47.77"; W107° 26' 46.04"
Off County Road 537
Rio Arriba County, New Mexico

SWG Project No. 0410003

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FIGURE 5
GROUNDWATER QUALITY
STANDARD (GQS)
EXCEEDANCE ZONE IN
GROUNDWATER
MAP

DECEMBER 13, 2011

TABLE 1
K-51 PIPELINE RELEASE
GROUNDWATER ANALYTICAL SUMMARY

Sample I.D.	Date	Benzene (µg/L)	Toluene (µg/L)	Ethylbenzene (µg/L)	Xylenes (µg/L)	TPH GRO (mg/L)	TPH DRO (mg/L)
New Mexico Water Quality Control Commission Groundwater Quality Standards		10	750	750	620	NE	NE
SMA Data from Open Excavation							
Excavation	4.21.10	7,000	13,000	540	5,200	NA	NA
SWG Groundwater Samples							
MW-1	6.21.10	8,400	1,300	560	4,200	NA	NA
	9.24.10	2,300	28	200	520	8.4	<1.0
	4.21.11	430	<20	120	60	2.1	<1.0
	6.21.11	820	370	33	140	5.1	130
	9.22.11	690	1,200	120	1,200	8.9	30
MW-2	12.13.11	260	250	54	650	3.4	<1.0
	6.21.10	200	53	14	96	NA	NA
	9.24.10	2.3	<1.0	<1.0	<2.0	<0.050	<1.0
	4.21.11	3.3	<1.0	<1.0	<2.0	0.065	<1.0
	6.21.11	2.2	<1.0	<1.0	<2.0	<0.050	<1.0
MW-3	9.22.11	<1.0	<1.0	<1.0	<2.0	<0.050	<1.0
	12.13.11	<1.0	<1.0	<1.0	<2.0	<0.050	<1.0
	6.21.10	640	57	72	1,000	NA	NA
	9.24.10	150	<1.0	16	28	0.48	<1.0
	4.21.11	52	<1.0	17	10	0.25	<1.0
MW-4	6.21.11	62	14	13	160	0.67	<1.0
	9.22.11	3	<1.0	8.7	<2.0	0.066	<1.0
	12.13.11	<1.0	<1.0	<1.0	<2.0	<0.050	<1.0
	6.21.10	3,600	10,000	600	6,600	NA	NA
	9.24.10	870	870	260	1,600	12	1
MW-11	4.21.11	670	<20	520	790	6.3	<1.0
	6.21.11	17	22	36	77	0.64	1.1
	9.22.11	62	140	220	820	3.8	1.2
	12.13.11	84	<20	430	490	2.6	<1.0
	4.21.11	<1.0	<1.0	<1.0	<2.0	<0.050	<1.0
MW-12	6.21.11	<1.0	<1.0	<1.0	<2.0	<0.050	<1.0
	9.22.11	<1.0	<1.0	<1.0	<2.0	<0.050	<1.0
	12.13.11	<1.0	<1.0	<1.0	<2.0	<0.050	<1.0
	4.21.11	1.9	<1.0	<1.0	<2.0	<0.050	<1.0
	6.21.11	4.6	<1.0	<1.0	<2.0	0.063	<1.0
MW-13	9.22.11	<1.0	<1.0	<1.0	<2.0	<0.050	<1.0
	12.13.11	<1.0	<1.0	<1.0	<2.0	<0.050	<1.0
	4.21.11	<1.0	<1.0	<1.0	<2.0	<0.050	<1.0
	6.21.11	<1.0	<1.0	<1.0	<2.0	<0.050	<1.0
	9.22.11	<1.0	<1.0	<1.0	<2.0	<0.050	<1.0
MW-14	12.13.11	<1.0	<1.0	<1.0	<2.0	<0.050	<1.0
	4.21.11	2,800	<100	280	720	8.7	<1.0
	6.21.11	470	<10	37	210	1.9	<1.0
	9.22.11	540	<10	100	36	1.7	<1.0
	12.13.11	220	<10	110	<20	1.0	<1.0
MW-16	4.21.11	4.4	<2.0	<2.0	<4.0	<0.10	<1.0
	6.21.11	<1.0	<1.0	<1.0	<2.0	<0.050	<1.0
	9.22.11	<1.0	<1.0	<1.0	<2.0	0.065	<1.0
	12.13.11	<1.0	<1.0	<1.0	<2.0	0.12	<1.0
	4.21.11	<2.0	<2.0	<2.0	<4.0	<0.10	<1.0
MW-17	6.21.11	<2.0	<2.0	<2.0	<4.0	<0.10	<1.0
	9.22.11	<1.0	<1.0	<1.0	<2.0	<0.050	<1.0
	12.13.11	<1.0	<1.0	<1.0	<2.0	<0.050	<1.0
	4.21.11	<2.0	<2.0	<2.0	<4.0	<0.10	<1.0
	6.21.11	<2.0	<2.0	<2.0	<4.0	<0.10	<1.0

Note: Concentrations in bold and yellow exceed the applicable OCD Remediation Action Level

NA = Not Analyzed

NE = Not Established

TABLE 2
K-51 Pipeline Release
GROUNDWATER ELEVATIONS

Well I.D.	Date	Depth to Product (feet BTOC)	Depth to Water (feet BTOC)	Product Thickness	TOC Elevations (feet AMSL)	Groundwater Elevation* (feet AMSL)
MW-1	4.21.11	ND	11.80	ND	6300.89	6289.09
MW-1	6.21.11	ND	12.16	ND	6300.89	6288.73
MW-1	9.22.11	ND	12.92	ND	6300.89	6287.97
MW-1	12.13.11	ND	12.45	ND	6300.89	6288.44
MW-2	4.21.11	ND	10.55	ND	6299.82	6289.27
MW-2	6.21.11	ND	11.87	ND	6299.82	6287.95
MW-2	9.22.11	ND	11.86	ND	6299.82	6287.96
MW-2	12.13.11	ND	11.38	ND	6299.82	6288.44
MW-3	4.21.11	ND	11.30	ND	6300.22	6288.92
MW-3	6.21.11	ND	11.64	ND	6300.22	6288.58
MW-3	9.22.11	ND	12.45	ND	6300.22	6287.77
MW-3	12.13.11	ND	11.89	ND	6300.22	6288.33
MW-4	4.21.11	ND	11.90	ND	6300.91	6289.01
MW-4	6.21.11	ND	12.18	ND	6300.91	6288.73
MW-4	9.22.11	ND	12.90	ND	6300.91	6288.01
MW-4	12.13.11	ND	12.41	ND	6300.91	6288.50
MW-11	4.21.11	ND	11.98	ND	6301.19	6289.21
MW-11	6.21.11	ND	12.40	ND	6301.19	6288.79
MW-11	9.22.11	ND	13.07	ND	6301.19	6288.12
MW-11	12.13.11	ND	12.55	ND	6301.19	6288.64
MW-12	4.21.11	ND	8.96	ND	6299.08	6290.12
MW-12	6.21.11	ND	9.42	ND	6299.08	6289.66
MW-12	9.22.11	ND	10.82	ND	6299.08	6288.26
MW-12	12.13.11	ND	10.13	ND	6299.08	6288.95
MW-13	4.21.11	ND	9.07	ND	6298.27	6289.20
MW-13	6.21.11	ND	9.51	ND	6298.27	6288.76
MW-13	9.22.11	ND	10.15	ND	6298.27	6288.12
MW-13	12.13.11	ND	9.59	ND	6298.27	6288.68
MW-14	4.21.11	ND	12.54	ND	6301.20	6288.66
MW-14	6.21.11	ND	12.88	ND	6301.20	6288.32
MW-14	9.22.11	ND	13.53	ND	6301.20	6287.67
MW-14	12.13.11	ND	13.11	ND	6301.20	6288.09
MW-16	4.21.11	ND	12.06	ND	6299.89	6287.83
MW-16	6.21.11	ND	12.26	ND	6299.89	6287.63
MW-16	9.22.11	ND	12.57	ND	6299.89	6287.32
MW-16	12.13.11	ND	12.28	ND	6299.89	6287.61
MW-17	4.21.11	ND	9.90	ND	6298.57	6288.67
MW-17	6.21.11	ND	9.56	ND	6298.57	6289.01
MW-17	9.22.11	ND	10.83	ND	6298.57	6287.74
MW-17	12.13.11	ND	10.31	ND	6298.57	6288.26

BTOC - below top of casing

AMSL - above mean sea level

TOC - top of casing

* - corrected for presence of phase-separated hydrocarbon using a site-specific density correction factor of 0.63

ND - Not Detected



COVER LETTER

Wednesday, December 21, 2011

Kyle Summers
Southwest Geoscience
606 S. Rio Grande Unit A
Aztec, NM 87410
TEL: (903) 821-5603
FAX

RE: K 51

Order No.: 1112700


Dear Kyle Summers:

Hall Environmental Analysis Laboratory, Inc. received 10 sample(s) on 12/15/2011 for the analyses presented in the following report.

These were analyzed according to EPA procedures or equivalent. Below is a list of our accreditations. To access our accredited tests please go to www.hallenvironmental.com or the state specific web sites. See the sample checklist and/or the Chain of Custody for information regarding the sample receipt temperature and preservation. Data qualifiers or a narrative will be provided if the sample analysis or analytical quality control parameters require a flag. All samples are reported as received unless otherwise indicated.

Please do not hesitate to contact HEAL for any additional information or clarifications.

Sincerely,



Andy Freeman, Laboratory Manager

NM Lab # NM9425 NM0901
AZ license # AZ0682

Hall Environmental Analysis Laboratory, Inc.

Date: 21-Dec-11

Analytical Report

CLIENT: Southwest Geoscience
Lab Order: 1112700
Project: K 51
Lab ID: 1112700-01

Client Sample ID: MW-14
Collection Date: 12/13/2011 10:25:00 AM
Date Received: 12/15/2011
Matrix: AQUEOUS

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
EPA METHOD 8015B: DIESEL RANGE						Analyst: JB
Diesel Range Organics (DRO)	ND	1.0		mg/L	1	12/18/2011 12:13:18 AM
Surr: DNOP	117	81.1-147		%REC	1	12/18/2011 12:13:18 AM
EPA METHOD 8015B: GASOLINE RANGE						Analyst: RAA
Gasoline Range Organics (GRO)	1.0	0.50		mg/L	10	12/20/2011 11:22:45 PM
Surr: BFB	104	69.3-120		%REC	10	12/20/2011 11:22:45 PM
EPA METHOD 8021B: VOLATILES						Analyst: RAA
Benzene	220	10		µg/L	10	12/20/2011 11:22:45 PM
Toluene	ND	10		µg/L	10	12/20/2011 11:22:45 PM
Ethylbenzene	110	10		µg/L	10	12/20/2011 11:22:45 PM
Xylenes, Total	ND	20		µg/L	10	12/20/2011 11:22:45 PM
Surr: 4-Bromofluorobenzene	109	76.5-115		%REC	10	12/20/2011 11:22:45 PM

Qualifiers:

* Value exceeds Maximum Contaminant Level
E Estimated value
J Analyte detected below quantitation limits
NC Non-Chlorinated
PQL Practical Quantitation Limit

B Analyte detected in the associated Method Blank
H Holding times for preparation or analysis exceeded
MCL Maximum Contaminant Level
ND Not Detected at the Reporting Limit
S Spike recovery outside accepted recovery limits

Hall Environmental Analysis Laboratory, Inc.**Date: 21-Dec-11**
Analytical Report**CLIENT:** Southwest Geoscience
Lab Order: 1112700
Project: K 51
Lab ID: 1112700-02**Client Sample ID:** MW-16
Collection Date: 12/13/2011 10:55:00 AM
Date Received: 12/15/2011
Matrix: AQUEOUS

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
EPA METHOD 8015B: DIESEL RANGE						Analyst: JB
Diesel Range Organics (DRO)	ND	1.0		mg/L	1	12/18/2011 12:47:14 AM
Surr: DNOP	119	81.1-147		%REC	1	12/18/2011 12:47:14 AM
EPA METHOD 8015B: GASOLINE RANGE						Analyst: RAA
Gasoline Range Organics (GRO)	0.12	0.050		mg/L	1	12/20/2011 11:51:36 PM
Surr: BFB	119	69.3-120		%REC	1	12/20/2011 11:51:36 PM
EPA METHOD 8021B: VOLATILES						Analyst: RAA
Benzene	ND	1.0		µg/L	1	12/20/2011 11:51:36 PM
Toluene	ND	1.0		µg/L	1	12/20/2011 11:51:36 PM
Ethylbenzene	ND	1.0		µg/L	1	12/20/2011 11:51:36 PM
Xylenes, Total	ND	2.0		µg/L	1	12/20/2011 11:51:36 PM
Surr: 4-Bromofluorobenzene	112	76.5-115		%REC	1	12/20/2011 11:51:36 PM

Qualifiers:

* Value exceeds Maximum Contaminant Level
E Estimated value
J Analyte detected below quantitation limits
NC Non-Chlorinated
PQL Practical Quantitation Limit

B Analyte detected in the associated Method Blank
H Holding times for preparation or analysis exceeded
MCL Maximum Contaminant Level
ND Not Detected at the Reporting Limit
S Spike recovery outside accepted recovery limits

Hall Environmental Analysis Laboratory, Inc.

Date: 21-Dec-11

Analytical Report

CLIENT: Southwest Geoscience

Client Sample ID: MW-17

Lab Order: 1112700

Collection Date: 12/13/2011 11:25:00 AM

Project: K 51

Date Received: 12/15/2011

Lab ID: 1112700-03

Matrix: AQUEOUS

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
EPA METHOD 8015B: DIESEL RANGE						Analyst: JB
Diesel Range Organics (DRO)	ND	1.0		mg/L	1	12/18/2011 1:20:32 AM
Surr: DNOP	118	81.1-147		%REC	1	12/18/2011 1:20:32 AM
EPA METHOD 8015B: GASOLINE RANGE						Analyst: RAA
Gasoline Range Organics (GRO)	ND	0.050		mg/L	1	12/21/2011 12:20:25 AM
Surr: BFB	95.7	69.3-120		%REC	1	12/21/2011 12:20:25 AM
EPA METHOD 8021B: VOLATILES						Analyst: RAA
Benzene	ND	1.0		µg/L	1	12/21/2011 12:20:25 AM
Toluene	ND	1.0		µg/L	1	12/21/2011 12:20:25 AM
Ethylbenzene	ND	1.0		µg/L	1	12/21/2011 12:20:25 AM
Xylenes, Total	ND	2.0		µg/L	1	12/21/2011 12:20:25 AM
Surr: 4-Bromofluorobenzene	104	76.5-115		%REC	1	12/21/2011 12:20:25 AM

Qualifiers:

* Value exceeds Maximum Contaminant Level
E Estimated value
J Analyte detected below quantitation limits
NC Non-Chlorinated
PQL Practical Quantitation Limit

B Analyte detected in the associated Method Blank
H Holding times for preparation or analysis exceeded
MCL Maximum Contaminant Level
ND Not Detected at the Reporting Limit
S Spike recovery outside accepted recovery limits

Hall Environmental Analysis Laboratory, Inc.

Date: 21-Dec-11

Analytical Report

CLIENT: Southwest Geoscience

Client Sample ID: MW-13

Lab Order: 1112700

Collection Date: 12/13/2011 11:55:00 AM

Project: K 51

Date Received: 12/15/2011

Lab ID: 1112700-04

Matrix: AQUEOUS

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
EPA METHOD 8015B: DIESEL RANGE						Analyst: JB
Diesel Range Organics (DRO)	ND	1.0		mg/L	1	12/18/2011 1:54:22 AM
Surr: DNOP	118	81.1-147		%REC	1	12/18/2011 1:54:22 AM
EPA METHOD 8015B: GASOLINE RANGE						Analyst: RAA
Gasoline Range Organics (GRO)	ND	0.050		mg/L	1	12/21/2011 12:49:11 AM
Surr: BFB	95.6	69.3-120		%REC	1	12/21/2011 12:49:11 AM
EPA METHOD 8021B: VOLATILES						Analyst: RAA
Benzene	ND	1.0		µg/L	1	12/21/2011 12:49:11 AM
Toluene	ND	1.0		µg/L	1	12/21/2011 12:49:11 AM
Ethylbenzene	ND	1.0		µg/L	1	12/21/2011 12:49:11 AM
Xylenes, Total	ND	2.0		µg/L	1	12/21/2011 12:49:11 AM
Surr: 4-Bromofluorobenzene	104	76.5-115		%REC	1	12/21/2011 12:49:11 AM

Qualifiers:

* Value exceeds Maximum Contaminant Level
E Estimated value
J Analyte detected below quantitation limits
NC Non-Chlorinated
PQL Practical Quantitation Limit

B Analyte detected in the associated Method Blank
H Holding times for preparation or analysis exceeded
MCL Maximum Contaminant Level
ND Not Detected at the Reporting Limit
S Spike recovery outside accepted recovery limits

Hall Environmental Analysis Laboratory, Inc.

Date: 21-Dec-11

Analytical Report

CLIENT: Southwest Geoscience

Client Sample ID: MW-2

Lab Order: 1112700

Collection Date: 12/13/2011 12:25:00 PM

Project: K 51

Date Received: 12/15/2011

Lab ID: 1112700-05

Matrix: AQUEOUS

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
EPA METHOD 8015B: DIESEL RANGE						Analyst: JB
Diesel Range Organics (DRO)	ND	1.0		mg/L	1	12/18/2011 2:28:15 AM
Surr: DNOP	117	81.1-147		%REC	1	12/18/2011 2:28:15 AM
EPA METHOD 8015B: GASOLINE RANGE						Analyst: RAA
Gasoline Range Organics (GRO)	ND	0.050		mg/L	1	12/21/2011 1:17:56 AM
Surr: BFB	95.3	69.3-120		%REC	1	12/21/2011 1:17:56 AM
EPA METHOD 8021B: VOLATILES						Analyst: RAA
Benzene	ND	1.0		µg/L	1	12/21/2011 1:17:56 AM
Toluene	ND	1.0		µg/L	1	12/21/2011 1:17:56 AM
Ethylbenzene	ND	1.0		µg/L	1	12/21/2011 1:17:56 AM
Xylenes, Total	ND	2.0		µg/L	1	12/21/2011 1:17:56 AM
Surr: 4-Bromofluorobenzene	103	76.5-115		%REC	1	12/21/2011 1:17:56 AM

Qualifiers:

* Value exceeds Maximum Contaminant Level
E Estimated value
J Analyte detected below quantitation limits
NC Non-Chlorinated
PQL Practical Quantitation Limit

B Analyte detected in the associated Method Blank
H Holding times for preparation or analysis exceeded
MCL Maximum Contaminant Level
ND Not Detected at the Reporting Limit
S Spike recovery outside accepted recovery limits

Hall Environmental Analysis Laboratory, Inc.

Date: 21-Dec-11

Analytical Report

CLIENT: Southwest Geoscience

Client Sample ID: MW-3

Lab Order: 1112700

Collection Date: 12/13/2011 12:55:00 PM

Project: K 51

Date Received: 12/15/2011

Lab ID: 1112700-06

Matrix: AQUEOUS

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
EPA METHOD 8015B: DIESEL RANGE						Analyst: JB
Diesel Range Organics (DRO)	ND	1.0		mg/L	1	12/18/2011 3:01:50 AM
Surr: DNOP	117	81.1-147		%REC	1	12/18/2011 3:01:50 AM
EPA METHOD 8015B: GASOLINE RANGE						Analyst: RAA
Gasoline Range Organics (GRO)	ND	0.050		mg/L	1	12/21/2011 1:46:42 AM
Surr: BFB	96.3	69.3-120		%REC	1	12/21/2011 1:46:42 AM
EPA METHOD 8021B: VOLATILES						Analyst: RAA
Benzene	ND	1.0		µg/L	1	12/21/2011 1:46:42 AM
Toluene	ND	1.0		µg/L	1	12/21/2011 1:46:42 AM
Ethylbenzene	ND	1.0		µg/L	1	12/21/2011 1:46:42 AM
Xylenes, Total	ND	2.0		µg/L	1	12/21/2011 1:46:42 AM
Surr: 4-Bromofluorobenzene	104	76.5-115		%REC	1	12/21/2011 1:46:42 AM

Qualifiers:

* Value exceeds Maximum Contaminant Level
E Estimated value
J Analyte detected below quantitation limits
NC Non-Chlorinated
PQL Practical Quantitation Limit

B Analyte detected in the associated Method Blank
H Holding times for preparation or analysis exceeded
MCL Maximum Contaminant Level
ND Not Detected at the Reporting Limit
S Spike recovery outside accepted recovery limits

Hall Environmental Analysis Laboratory, Inc.

Date: 21-Dec-11

Analytical Report

CLIENT: Southwest Geoscience

Client Sample ID: MW-1

Lab Order: 1112700

Collection Date: 12/13/2011 1:25:00 PM

Project: K 51

Date Received: 12/15/2011

Lab ID: 1112700-07

Matrix: AQUEOUS

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
EPA METHOD 8015B: DIESEL RANGE						Analyst: JB
Diesel Range Organics (DRO)	ND	1.0		mg/L	1	12/18/2011 4:08:52 AM
Surr: DNOP	127	81.1-147		%REC	1	12/18/2011 4:08:52 AM
EPA METHOD 8015B: GASOLINE RANGE						Analyst: RAA
Gasoline Range Organics (GRO)	3.4	1.0		mg/L	20	12/21/2011 2:15:25 AM
Surr: BFB	98.0	69.3-120		%REC	20	12/21/2011 2:15:25 AM
EPA METHOD 8021B: VOLATILES						Analyst: RAA
Benzene	260	20		µg/L	20	12/21/2011 2:15:25 AM
Toluene	250	20		µg/L	20	12/21/2011 2:15:25 AM
Ethylbenzene	54	20		µg/L	20	12/21/2011 2:15:25 AM
Xylenes, Total	650	40		µg/L	20	12/21/2011 2:15:25 AM
Surr: 4-Bromofluorobenzene	107	76.5-115		%REC	20	12/21/2011 2:15:25 AM

Qualifiers:

* Value exceeds Maximum Contaminant Level
E Estimated value
J Analyte detected below quantitation limits
NC Non-Chlorinated
PQL Practical Quantitation Limit

B Analyte detected in the associated Method Blank
H Holding times for preparation or analysis exceeded
MCL Maximum Contaminant Level
ND Not Detected at the Reporting Limit
S Spike recovery outside accepted recovery limits

Hall Environmental Analysis Laboratory, Inc.Date: 21-Dec-11
Analytical ReportCLIENT: Southwest Geoscience
Lab Order: 1112700
Project: K 51
Lab ID: 1112700-08Client Sample ID: MW-12
Collection Date: 12/13/2011 1:55:00 PM
Date Received: 12/15/2011
Matrix: AQUEOUS

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
EPA METHOD 8015B: DIESEL RANGE						Analyst: JB
Diesel Range Organics (DRO)	ND	1.0		mg/L	1	12/18/2011 4:42:28 AM
Surr: DNOP	121	81.1-147		%REC	1	12/18/2011 4:42:28 AM
EPA METHOD 8015B: GASOLINE RANGE						Analyst: RAA
Gasoline Range Organics (GRO)	ND	0.050		mg/L	1	12/21/2011 3:12:53 AM
Surr: BFB	95.7	69.3-120		%REC	1	12/21/2011 3:12:53 AM
EPA METHOD 8021B: VOLATILES						Analyst: RAA
Benzene	ND	1.0		µg/L	1	12/21/2011 3:12:53 AM
Toluene	ND	1.0		µg/L	1	12/21/2011 3:12:53 AM
Ethylbenzene	ND	1.0		µg/L	1	12/21/2011 3:12:53 AM
Xylenes, Total	ND	2.0		µg/L	1	12/21/2011 3:12:53 AM
Surr: 4-Bromofluorobenzene	105	76.5-115		%REC	1	12/21/2011 3:12:53 AM

Qualifiers:* Value exceeds Maximum Contaminant Level
E Estimated value
J Analyte detected below quantitation limits
NC Non-Chlorinated
PQL Practical Quantitation LimitB Analyte detected in the associated Method Blank
H Holding times for preparation or analysis exceeded
MCL Maximum Contaminant Level
ND Not Detected at the Reporting Limit
S Spike recovery outside accepted recovery limits

Hall Environmental Analysis Laboratory, Inc.

Date: 21-Dec-11

Analytical Report

CLIENT: Southwest Geoscience

Client Sample ID: MW-11

Lab Order: 1112700

Collection Date: 12/13/2011 2:25:00 PM

Project: K 51

Date Received: 12/15/2011

Lab ID: 1112700-09

Matrix: AQUEOUS

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
EPA METHOD 8015B: DIESEL RANGE						Analyst: JB
Diesel Range Organics (DRO)	ND	1.0		mg/L	1	12/18/2011 5:16:05 AM
Surr: DNOP	119	81.1-147		%REC	1	12/18/2011 5:16:05 AM
EPA METHOD 8015B: GASOLINE RANGE						Analyst: RAA
Gasoline Range Organics (GRO)	ND	0.050		mg/L	1	12/21/2011 3:41:44 AM
Surr: BFB	95.9	69.3-120		%REC	1	12/21/2011 3:41:44 AM
EPA METHOD 8021B: VOLATILES						Analyst: RAA
Benzene	ND	1.0		µg/L	1	12/21/2011 3:41:44 AM
Toluene	ND	1.0		µg/L	1	12/21/2011 3:41:44 AM
Ethylbenzene	ND	1.0		µg/L	1	12/21/2011 3:41:44 AM
Xylenes, Total	ND	2.0		µg/L	1	12/21/2011 3:41:44 AM
Surr: 4-Bromofluorobenzene	106	76.5-115		%REC	1	12/21/2011 3:41:44 AM

Qualifiers:

* Value exceeds Maximum Contaminant Level
E Estimated value
J Analyte detected below quantitation limits
NC Non-Chlorinated
PQL Practical Quantitation Limit

B Analyte detected in the associated Method Blank
H Holding times for preparation or analysis exceeded
MCL Maximum Contaminant Level
ND Not Detected at the Reporting Limit
S Spike recovery outside accepted recovery limits

Hall Environmental Analysis Laboratory, Inc.

Date: 21-Dec-11

Analytical Report

CLIENT: Southwest Geoscience
Lab Order: 1112700
Project: K 51
Lab ID: 1112700-10

Client Sample ID: MW-4
Collection Date: 12/13/2011 2:55:00 PM
Date Received: 12/15/2011
Matrix: AQUEOUS

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
EPA METHOD 8015B: DIESEL RANGE						Analyst: JB
Diesel Range Organics (DRO)	ND	1.0		mg/L	1	12/18/2011 5:49:41 AM
Surr: DNOP	124	81.1-147		%REC	1	12/18/2011 5:49:41 AM
EPA METHOD 8015B: GASOLINE RANGE						Analyst: RAA
Gasoline Range Organics (GRO)	2.6	1.0		mg/L	20	12/21/2011 4:10:33 AM
Surr: BFB	104	69.3-120		%REC	20	12/21/2011 4:10:33 AM
EPA METHOD 8021B: VOLATILES						Analyst: RAA
Benzene	84	20		µg/L	20	12/21/2011 4:10:33 AM
Toluene	ND	20		µg/L	20	12/21/2011 4:10:33 AM
Ethylbenzene	430	20		µg/L	20	12/21/2011 4:10:33 AM
Xylenes, Total	490	40		µg/L	20	12/21/2011 4:10:33 AM
Surr: 4-Bromofluorobenzene	107	76.5-115		%REC	20	12/21/2011 4:10:33 AM

Qualifiers:

* Value exceeds Maximum Contaminant Level
E Estimated value
J Analyte detected below quantitation limits
NC Non-Chlorinated
PQL Practical Quantitation Limit

B Analyte detected in the associated Method Blank
H Holding times for preparation or analysis exceeded
MCL Maximum Contaminant Level
ND Not Detected at the Reporting Limit
S Spike recovery outside accepted recovery limits

QA/QC SUMMARY REPORT

Client: Southwest Geoscience

Project: K 51

Work Order: 1112700

Analyte	Result	Units	PQL	SPK Va	SPK ref	%Rec	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Method: EPA Method 8015B: Diesel Range											
Sample ID: MB-29796		MBLK									
Diesel Range Organics (DRO)	ND	mg/L	1.0								
Sample ID: LCS-29796		LCS									
Diesel Range Organics (DRO)	4.989	mg/L	1.0	5	0	99.8	74	157			
Sample ID: LCSD-29796		LCSD									
Diesel Range Organics (DRO)	4.915	mg/L	1.0	5	0	98.3	74	157	1.49	23	
Method: EPA Method 8015B: Gasoline Range											
Sample ID: 1112700-01A MSD		MSD									
Gasoline Range Organics (GRO)	5.620	mg/L	0.50	5	1.042	91.6	66.1	127	3.15	15.5	
Sample ID: 5ML -RB		MBLK									
Gasoline Range Organics (GRO)	ND	mg/L	0.050								
Sample ID: 2.5UG GRO LCS		LCS									
Gasoline Range Organics (GRO)	0.5262	mg/L	0.050	0.5	0	105	92.1	117			
Sample ID: 1112700-01A MS		MS									
Gasoline Range Organics (GRO)	5.800	mg/L	0.50	5	1.042	95.2	66.1	127			
Method: EPA Method 8021B: Volatiles											
Sample ID: 5ML -RB		MBLK									
Benzene	ND	µg/L	1.0								
Toluene	ND	µg/L	1.0								
Ethylbenzene	ND	µg/L	1.0								
Xylenes, Total	ND	µg/L	2.0								
Sample ID: 100NG BTEX LCS		LCS									
Benzene	20.04	µg/L	1.0	20	0.1774	99.3	80	120			
Toluene	20.57	µg/L	1.0	20	0.1232	102	80	120			
Ethylbenzene	20.78	µg/L	1.0	20	0.1526	103	80	120			
Xylenes, Total	60.99	µg/L	2.0	60	0	102	78.6	121			

Qualifiers:

E Estimated value
 J Analyte detected below quantitation limits
 ND Not Detected at the Reporting Limit

H Holding times for preparation or analysis exceeded
 NC Non-Chlorinated
 R RPD outside accepted recovery limits

Hall Environmental Analysis Laboratory, Inc.

Sample Receipt Checklist

Client Name SOUTHWEST GEOSCIENCE

Date Received:

12/15/2011

Work Order Number 1112700

Received by: MMG

Checklist completed by:

Signature

Date

Sample ID labels checked by:

Initials

Matrix:

Carrier name Courier

Shipping container/cooler in good condition?

Yes ☒

No ☐

Not Present ☐

Custody seals intact on shipping container/cooler?

Yes ☒

No ☐

Not Present ☐

Not Shipped ☐

Custody seals intact on sample bottles?

Yes ☐

No ☐

N/A ☒

Chain of custody present?

Yes ☒

No ☐

Chain of custody signed when relinquished and received?

Yes ☒

No ☐

Chain of custody agrees with sample labels?

Yes ☒

No ☐

Samples in proper container/bottle?

Yes ☒

No ☐

Sample containers intact?

Yes ☒

No ☐

Sufficient sample volume for indicated test?

Yes ☒

No ☐

All samples received within holding time?

Yes ☒

No ☐

Water - VOA vials have zero headspace?

No VOA vials submitted ☐

Yes ☒

No ☐

Water - Preservation labels on bottle and cap match?

Yes ☐

No ☐

N/A ☒

Water - pH acceptable upon receipt?

Yes ☐

No ☐

N/A ☒

Container/Temp Blank temperature?

1.0°

<6° C Acceptable

If given sufficient time to cool.

Number of preserved
bottles checked for
pH:

<2 >12 unless noted
below.

COMMENTS:

Client contacted

Date contacted:

Person contacted

Contacted by:

Regarding:

Comments:

Corrective Action