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REPORTS

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FINAL SUBSURFACE INVESTIGATION REPORT FORMER EARTHEN PIT HOBBS, NEW MEXICO KEY ENERGY SERVICES, INC.

MARCH 7, 2000

FINAL SUBSURFACE INVESTIGATION REPORT FORMER EARTHEN PIT HOBBS, NEW MEXICO

Prepared for

Porter & Hedges, L.L.P. 700 Louisiana Houston, Texas 77002

Project Number: 18347

Mark P. Guarisco Principal Engineer

March 7, 2000

Brown and Caldwell 1415 Louisiana, Suite 2500 Houston, Texas 77002 - (713) 759-0999

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"This report was prepared in accordance with the standards of the environmental consulting industry at the time it was prepared. It should not be relied upon by parties other than those for whom it was prepared, and then only to the extent of the scope of work which was authorized. This report does not guarantee that no additional environmental contamination beyond that described in this report exists at this site."

1.0 INTRODUCTION

This report describes a subsurface investigation performed at the Key Energy Services (KEY) facility located in Lea County, at 1300 North West County Road, Hobbs, New Mexico. A site location map and site plan map are attached as Figures 1 and 2, respectively. The subject of the investigation is a former earthen pit operated by a previous owner of the property, Two States Tank Rental Company (Two States), from the early 1970's until approximately 1990. Two States was in the frac tank rental business. The earthen pit, located on the east side of the facility, as shown in Figure 2, was used to contain oil field wastes generated during frac tank washout operations. There are two concrete washout pits located at the north end of the earthen pit. These washout pits are temporarily out of service.

The objective of this project was to determine if there is impact to subsurface soil in the area of the former earthen pit. Brown and Caldwell subcontracted Safety and Environmental Solutions, Inc. to drill soil borings in the area of the former earthen pit on January 24-25, 2000. Brown and Caldwell submitted soil samples from the borings to SPL laboratory in Houston, Texas. The laboratory results were used to determine the degree of impact present in subsurface soils near the earthen pit and to determine remediation requirements.

KEY authorized the completion of three soil borings within the perimeter of the former earthen pit to assess subsurface soil impact. One downgradient groundwater well was authorized if any one of the soil borings indicated that soil was impacted to the depth of groundwater beneath the earthen pit. Based on the discovery of impacted soil within the earthen pit, Brown and Caldwell did not install the groundwater monitoring well. Based on field observations, two additional soil borings were drilled within the earthen pit as authorized by the on-site KEY representative.

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2.0 **BORING INSTALLATION**

Five soil borings were installed within the perimeter of the former earthen pit as shown on Figure 2. The boring locations were slightly adjusted from the original locations identified in the work plan, based on field observations that more accurately located the former pit. Soil boring SB-1 was terminated at a depth of four feet below grade when highly contaminated soils were recovered from the soil boring. At this time, the focus of the field investigation was modified to assess conditions within the earthen pit and verify its original depth. The on-site KEY representative authorized two additional soil borings within the earthen pit to further assess conditions in the pit. Subsequent borings were terminated when native soils were encountered. The soil borings were terminated at these depths to prevent further vertical migration of contaminants in the soil. The installation date and final depth for the soil borings are provided in Table 1.

The borings were drilled using hollow stem auger drilling techniques as specified in the work plan. Boring logs are in Appendix A. Each soil boring was continuously sampled at approximately 2-foot intervals. Recovered soil samples were classified according to the Unified Soil Classification System (USCS). Field screening (headspace analyses and visual inspection) was conducted on the recovered soil samples to assist in selecting soil samples for laboratory analyses. Soil samples selected for laboratory analysis were chosen based on:

- The sample interval immediately below the bottom of the former pit (generally the bottom of the soil boring since borings were advanced only to the bottom of the pit)
- The sample interval where field screening results indicate the highest potential for impact

Soil samples were collected from these borings using split spoon samplers. Soil samples from each boring were screened for the presence of organic vapors using a photoionization detector (PID). A portion of each recovered sample was visually inspected and placed in a resealable plastic bag for headspace analysis. Organic vapors were allowed to develop for at least ten minutes. During this time period, each bag was massaged and shaken to break up soil clods. One end of the bag was then opened and the probe of the PID inserted into the bag. The plastic bag was then resealed around the probe and the PID reading recorded in the field log. Organic vapor readings were 2 P:\Wp\KEYENRGY\18347\005r.doc

recorded on the soil boring logs. The remainder of each soil sample was placed in a resealable plastic bag and stored on ice for possible laboratory analysis.

At the conclusion of soil sampling activities, each boring was backfilled from the bottom of the boring to grade, in accordance with New Mexico Oil Conservation Division (NMOCD) guidelines. Soil cuttings generated during the sampling activities were placed in two 55-gallon drums and stored on-site.

3.0 ANALYTICAL RESULTS

Table 2 summarizes the analytical results of the samples submitted for lab analysis from the five soil borings. The complete laboratory reports are included in Appendix B. The analyses chosen for these samples were based on remediation criteria established by the NMOCD. The analytical test method used for each analyte is also shown in Table 2.

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4.0 NEW MEXICO OCD SITE RANKING CRITERIA

The NMOCD requires that site owners rank the risk posed by hydrocarbon impacted soil within impoundments using criteria established for the following three site characteristics: Depth to Groundwater, Wellhead Protection Area, and Distance to Surface Water Body. The resulting ranking is used to establish the level of remediation required, if any, for the site. The criteria used to establish the ranking are contained in the NMOCD guidance document titled <u>Unlined</u> <u>Surface Impoundment Closure Guidelines</u>, February 1993.

The first site characteristic to evaluate is depth to groundwater, defined as the vertical distance from the lowermost contaminants to the seasonal high water elevation of the groundwater. Brown and Caldwell estimates that the depth to groundwater is less than 50 feet, based on the presence of impacted soil at a depth of 11 feet and a typical groundwater elevation of 50 - 55 feet below ground surface for the Hobbs area. Therefore, a site ranking score of 20 is assigned for the Depth to Groundwater criteria.

Depth to Groundwater:	Ranking Score:
< 50 feet	20
50 - 99 feet	10
> 100 feet	0

To determine the site ranking for the Wellhead Protection Area criteria, Brown and Caldwell contracted with Banks Information Services, Inc. to obtain a water well search of the area within a one mile radius of the site (Appendix C). The results of the water well search indicated that there were no recorded water wells within 200 feet of the site. Based on this information, a ranking of 0 is assigned for the Wellhead Protection Area criteria.

Wellhead Protection Area:	Ranking Score:
< 1000 feet from a water source, or;	
< 200 feet from a private domestic water source:	
Yes	20
No	0

Based on the USGS topographic map for this site, Brown and Caldwell did not observe any major downgradient surface water bodies within 1000 feet of the site. Therefore, the ranking for the Distance to Surface Water Body category is 0.

Distance to Surface Water Body:	Ranking Score:
< 200 horizontal feet	20
200 – 1,000 feet	10
> 1,000 feet	0

The total ranking score obtained by summing the values for the above three criteria is 20. Table 3 indicates the NMOCD cleanup requirements for three ranges of ranking scores. As shown in Table 3, the cleanup requirements for a ranking score of 20 yields soil action levels of 10 parts per million (ppm) for benzene, 50 ppm for BTEX, and 100 ppm for TPH.

5.0 CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

The investigation at the site determined that impacted soils and sludges are present in the earthen pit with concentrations of TPH and BTEX that exceed the NMOCD cleanup criteria. Highly contaminated soils, as defined by NMOCD guidance, were reported in borings SB-1, SB-1A, SB-2 and SB-4. The NMOCD defines highly contaminated soils as soil having liquid hydrocarbons or gross hydrocarbon staining. The NMOCD requires that these types of soils be removed or remediated to the maximum practical extent.

Based on field measurements of the pit dimensions and analytical data regarding depth of impacted soil, Brown and Caldwell estimates a volume of 5,900 in-place cubic yards (cy) of soil (300' x 50' x 11') is above the cleanup criteria established by the NMOCD. To excavate the earthen pit area now located beneath the concrete pits, it will be necessary to excavate and remove 70 cubic yards of concrete (from the concrete pits). Additional impacted soil may be present outside and below the pit boundaries evaluated during this investigation

5.2 Recommendations

The NMOCD should be notified of the investigation results and any subsequent activities conducted at the site related to the earthen pit. A workplan should be prepared outlining a remediation strategy for impacted soils at the site. This workplan must be approved by the NMOCD.

Brown and Caldwell recommends excavation and off-site disposal of the impacted soils and sludges identified within the pit boundaries. Alternative low-cost remediation methods such as landfarming would require a longer remediation period, treatability testing and possibly construction of a lined treatment area. Also, landfarming would not be allowed for soils containing

free liquid hydrocarbons. Soils exhibiting free liquid hydrocarbons would require on-site blending with other excavated soils prior to landfarming.

Once the most highly contaminated soil/sludges are excavated and disposed off-site, KEY will have to determine the extent of residual impact to underlying and adjacent soils and remediate soils impacted above cleanup limits. Remediation alternatives for the residual soil could then be evaluated to determine if on-site treatment or in-place closure using risk assessment methods would be more cost-effective than excavation and off-site disposal.

If additional soil impacts do not appear extensive, the residual soil could be excavated at the same time as the pit material. Field test methods could be used to determine when concentrations in residual soil are below cleanup criteria. Samples for laboratory analysis would then be collected to confirm the field results.

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FINAL SUBSURFACE INVESTIGATION REPORT FORMER EARTHEN PIT HOBBS, NEW MEXICO

March 7, 2000

QUALITY CONTROL REVIEWER

Daniel K. Gibson, P.G. Project Manager

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FIGURES

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TABLES

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Table 1

Soil Boring Depths

Soil Boring	Date	Depth (feet bgs)
SB-1	1/24/00	4
SB-1A	1/25/00	11
SB-2	1/24/00	7.5
SB-3	1/24/00	11
SB-4	1/25/00	11.8

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Table 2

1

Analytical Results Soil Borings

Sample ID	SB-1	SB-1	SB-1A	SB-1A	SB-2	SB-2	SB-3	SB-3	SB-4
Depth (feet BGS)	0-2	2-4	6-8	10-11	4-6	6.5-7.5	4-6	9-11	11.8-12.5
Benzene	< 0.005	0.850	5	2.3	2.2	1.1	0.190	0.510	4.1
(mg/kg)									
Ethylbenzene	0.0074	1.2	34	9.1	4.4	5	0.098	0.070	19
(mg/kg)									1
Toluene	< 0.005	8.7	28	20	72	6.1	4.8	6.1	23
(mg/kg)	;								
Xylenes	0.012	14.4	67	41	59.3	7.8	3.99	4.2	39
(mg/kg)									
Total BTEX	0.0194	25.15	134	72.4	157.7	17	9.078	10.88	85.1
(mg/kg)									
TPH-DRO	940	35,000	24,000	13,000	34,000	11,000	11,000	13,000	18,000
(mg/kg)									
TPH-GRO	< 0.5	350	850	930	2,600	180	210	240	880
(mg/kg)									
Total TPH	940	35,350	24,850	13,930	36,600	11,180	11,210	13,240	18,880
(mg/kg)									

Benzene, toluene, ethylbenzene, and xylenes (BTEX) were analyzed using Method 8021. Total petroleum hydrocarbons (TPH) was analyzed using Method 8015 (diesel and gasoline ranges).

Table 3

Soil Cleanup Goals*

Contaminant	Cleanup Levels (mg/kg)	Cleanup Levels (mg/kg)	Cleanup Levels (mg/kg)
	Ranking Score >19	Ranking Score 10-19	Ranking Score 0-9
Benzene	10	10	10
BTEX, Total	50	50	50
ТРН	100	1,000	5,000

*As outlined in the NMOCD guidance document, <u>Unlined Surface Impoundment Closure</u> <u>Guidelines</u>, February 1993.

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APPENDIX A

Boring Logs

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SB-1

Proje	et Na	ame:	K	ey Energy		_		Pro	ject Nurr	iber: <u>1</u>	8347.0	01 Sheet of
Proje	ct Lo	ocatio	n: 1	300 North West County Ro	ad, Hobbs, New M	lexic	:0	L	.ogged B	y: Chris	Angel	Approved: Dan Gibson
Drilli	ng C	Contra	ctor:	Safety and Environmenta	Solutions, Inc.				Date Start	ed: 1/24	1/00	Date Finished: 1/24/00
Drilli	ng E	quipn	nent:		Driller: Dee Wha	tley			Depth: (fe	et) 4.0		Water: (feet)
Drilli	ng N	lethoo	d:]	Hollow Stem Auger	Borehole Diameter:	8''		1	OC Elev	ation:		Ground Elevation:
Samp	ling	Meth	od:	Split Spoon					of Well C	asing:	N/A	
Com	nent	S: i	Sout	n of concrete pits ~ 20					Slot Size: Developm	N/A nent Metho	Filter	Material: N/A A
Depth (feet)	Depth to Water	USC Soil Type	Lithology	Description		Readings	Sampled Interval	Recovery (feet)	Sample ID			Soil Boring Remarks
		ML		CLAYEY SILT, reddish-brown, t with calcium carbonate, calcium and seams.	rittle, partly cemented a carbonate nodules	30.1	X	1.2				Sample SB-1-0-2 collected 0-2 fbg.
2		CL		CLAY, very dark gray to black, p product, brittle, very soft, tank b	lastic, saturated with oottoms.	547	X	2				Sample SB-1-2-4 collected 2-4 fbg.
	1											
		l i										

SB-1A

Projec	t Na	me:	K	ey Energy				Pro	Project Number: Sheet				
rojec	t Lo	catio	n: 1	300 North West County Ro	ad, Hobbs, New M	lexic	:0	I	.ogged B	y: Chris A	Angel	Approved: Dan Gibson	
Drillin	g Co		ctor:	Safety and Environmenta	Solutions, Inc.	tlov		1	Date Start	ing 11.0	00	Date Finished: 1/25/00 Depth to Static Water: (feat)	
	<u>у Гл</u> а М	ethor	1. I	Hollow Stem Auger	Borehole Diameter	<u>s''</u>				vation:		Ground Elevation:	
	ina i	Meth	od:	Split Spoon	Dorenoie Diameter.				Diameter	and Type	N/A	Ground Elevation.	
Comm	ients		Sout	h of concrete pits ~ 15'					Slot Size: Developn	N/A nent Method	Filter Ma	aterial: N/A	
Depth (feet)	Depth to Water	USC Soil Type	Lithology	Description		Readings	Sampled Interval	Recovery (feet)	Sample ID			Soil Boring Remarks	
		ML CL		CLAYEY SILT, reddish-brown, t with calcium carbonate, calcium and seams. CLAY, very dark gray to black, p product, strong odor, brittle, ver fine metal shavings. Dark brownish-gray with black stu sized sand and some layers of m Wood chips SANDY SILT, dark gray to black	rittle, partly cemented a carbonate nodules lastic, saturated with y soft, tank bottoms, reaks, some medium netal. , strong odor, moist.	826 861 791 720		4			Sift	ample SB-1A-4-6 collected 4-6 g. ample SB-1A-6-8 collected 6-8 g.	

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Project Name: <u>Ney Energy</u>								Project Number: Sheet of					
roject Lo	ocatio	n: 1	300 North West County Ro	ad, Hobbs, New M	lexic	:0	L	ogged B	y: Chri	s Angel	Approved:	Dan Gibson	
rilling C	ontra	ctor:	Safety and Environmenta	Solutions, Inc.				ate Start	ed: 1/2	4/00	Date Finishe	ed: 1/24/00	
rilling E	quipr	nent:		Driller: Dee What	atley			otal Born epth: (fe	ng et) 7.5	·	Water: (feet)	
rilling N	1etho	d:]	Hollow Stem Auger	Borehole Diameter:	8"		Т	OC Elev	ation:		Ground Elev	vation:	
ampling	Meth	iod:	Split Spoon				0 E	biameter f Well C	and Type asing:	N/A			
omment	s:	Sout	h of SB-1 ~75'				S C	lot Size: Developm	N/A nent Meth	Filter od: N/A	Material: N/A		
Depth (feet) Depth to Water	USC Soil Type	Lithology	Description		Readings	Sampled Interval	Recovery (feet)	Sample ID	2000 - 200 - 200		Soil Boring Remarks		
-	SM		SILTY SAND with GRAVEL, Li seams, calcium carbonate seams	ght brown, some clay	504	M	2		T T				
2	CL		CLAY, very dark gray to black, p tank bottoms, increase moisture and wires in soil, wood chips ar	lastic, odor, moist, with depth, metals ad roots, brittle.	715	$\left \right\rangle$	2						
4			Minor coarse sand, very strong od and silt seams decrease moistur	or, less wood, sand e.	957	$\left[\right]$	2				Sample SB-2-4-	6 collected 4-6 ft	
	SP		SAND with GRAVEL, brown, cc grained, poorly sorted, poorly g carbonate gravel, dry. LIMESTONE, tan, medium cryst crystals not connected.	arse to medium raded, calcium als, slight odor,							Sample SB-2-6- fbg.	7.5 collected 6-7.	

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SB-3

Projec	ct Lo	catio	n: 1	300 North West County R	oad, Hobbs, New Me	xic	0	Logged B	y: Chris Ange	Approved: Dan Gibson
Drilli	ng C	ontra	ctor:	Safety and Environmenta	I Solutions, Inc.	ev		Date Star Total Bor Depth: (fe	ted: $1/24/00$	Date Finished: 1/24/00 Depth to Static Water: (feet)
Drilli	ng N	<u>quipi</u> fetho	4.	Hollow Stem Auger	Borehole Diameter: 8				etion:	Ground Elevation:
Samo	ling	Meth		Split Spoon	Doronoic Dianetti. 0			Diameter of Well C	and Type	
Com	nent	s:	Sou	th of SB-2 ~120'				Slot Size: Developn	N/A Filte nent Method: N	er Material: N/A /A
Depth (feet)	Depth to Water	USC Soil Type	Lithology	Description	۰ ۱	Readings	Sampled Interval Recovery (feet)	Sample ID		Soil Boring Remarks
2-				SANDY SILT, light brown, britt fill, metal pieces.	e, some gravel, dry, s	9.0	2.	5		Sample SB-3-4-6 collected 4-6 f
4- 4- - - 6-		SM		SILTY SAND with GRAVEL fr. greenish-brown, ~ 2" clay sean odor.	agments, 1 at 3', slightly moist, 1	0.0 197	2			Sample SB-3-9-11 collected 9-1 fbg.
8-1				SANDY SILT, brown, slightly n	Ioist. brittle, loose.	167				
10 - -				odor.			X [°]			

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SB-4

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		ontio	n. 1	300 North West County Po	ad Hobbs New N	lovid		Ţ	ogged P		Angol	Approved: Dan Cibson
rilli	ng C	ontra	ctor:	Safety and Environmenta	Solutions, Inc.	ICAN			Date Star	ted: 1/2	5/00	Date Finished: 1/25/00
rilli	ng E	quipn	nent:		Driller: Dee What	atley		T D	otal Bor Depth: (fe	ing et) 13.	0	Depth to Static Water: (feet)
rilli	ng M	etho	1:	Hollow Stem Auger	Borehole Diameter:	8''		T	OC Elev	vation:		Ground Elevation:
amp	ling	Meth	od:	Split Spoon				0	of Well C	asing:	N/A	
Join	nenu	3.						S L	Slot Size: Developn	N/A hent Meth	od: N/	r Material: N/A A
Depth (feet)	Depth to Water	USC Soil Type	Lithology	Description		Readings	Sampled Interval	Recovery (feet)	Sample ID			Soil Boring Remarks
		SM		SILTY SAND, light brown, calcin	um carbonate seams,	9.1	\mathbf{X}	1.5				
2		ML		CLAYEY SILT, black, slightly p sized particles, very moist, stror	astic, soft, some sand ag odor.	407	$\left \right\rangle$	2.5		- - - - - - - - - - - - - - - - - - -		
4		CL		CLAY, very dark gray to black, p tank bottoms, increase moisture and wires in soil, wood chips ar	lastic, odor, moist, with depth, metals ad roots, brittle.	587						
				Saturated.	10							Sample SB-4-11.8-12.5 collect to 12.5' fbg.
		SW		SAND, greenish-tan changing to well sorted, brittle, dry, odor.	an at 12, very fine,							

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APPENDIX B

Laboratory Analytical Results

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APPENDIX B

Laboratory Analytical Results

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Case Narrative for: Brown & Caldwell

Certificate of Analysis Number: 00010628

Report To:	Project Name:	Key Energy #18347.0	01
Brown & Caldwell	Site:	Key Energy	
Dan Gibson	Site Address:		
1415 Louisiana		Hobbs	NM
Suite 2500	PO Number:		
Houston			
ТХ	State:	New Mexico	
77002-	State Cert. No.:	N/A	
ph: (713) 759-0999 fax: (713) 308-3886	Date Reported:	02/07/2000	

Your sample ID "SB-1A-10-11" (SPL ID: 00010628-08) was randomly selected for the use in SPL's quality control program for the Diesel Rang Organics analysis by SW846 method 8015. The Matrix Spike (MS) and Matrix Spike Duplicate (MSD) recoveries were outside of the advisabl quality control limits (Batch ID: 2884), due to matrix interference. A Laboratory Control Sample (LCS) was analyzed as a quality control check the analytical batch and all recoveries were within acceptable limits.

Any other data flags or quality control exceptions associated with this report will be footnoted in the analytical result page(s) or the quality cont summary page(s).

Please do not hesitate to contact us if you have any questions or comments pertaining to this data report. Please reference the above Certific Analysis Number.

SPL, Inc. is pleased to be of service to you. We anticipate working with you in fulfilling all your current and future analytical needs.

This report shall not be reproduced except in full, without the written approval of the laboratory. The reported results are only representative of samples submitted for testing.

 f_{1} etti ini, Bernadette

Customer Service Manager

02/08/2000



Brown & Caldwell

		Cer	rtificate of A	Analysis Number:			
L			000	10628			
<u>teport To:</u>	Brown & Caldwell Dan Gibson 1415 Louisiana			<u>Project Name:</u> <u>Site:</u> <u>Site Address:</u>	Key Energy #18347.00 Key Energy	91	
	Suite 2500 Houston TX 77002-			PO Number:	Hobbs	NM	
Fax To:	ph: (713) 759-0999 Brown & Caldwell	fax: (713) 308	-3886	<u>State:</u> State Cert. No.:	N/A		
	Dan Gibson	fax: (713) 308	3-3886	Date Reported:	2/7/00		
Cli	ient Sample ID	Lab Sample ID	Matrix	Date Collected	Date Received	COC ID	HOLD

B-1-0-2	00010628-01	Soil	1/24/00 10:26:00 AM	1/27/00 10:00:00 AM	084673
,B-1-2-4	00010628-02	Soil	1/24/00 10:37:00 AM	1/27/00 10:00:00 AM	084673
SB-2-4-6	00010628-03	Soil	1/24/00 1:33:00 PM	1/27/00 10:00:00 AM	084673
B-2-6.5-7.5	00010628-04	Soil	1/24/00 1:39:00 PM	1/27/00 10:00:00 AM	084673
B-3-4-6	00010628-05	Soil	1/24/00 9:52:00 PM	1/27/00 10:00:00 AM	084673
SB-3-9-11	00010628-06	Soil	1/24/00 10:02:00 PM	1/27/00 10:00:00 AM	084673
B-1A-6-8	00010628-07	Soil	1/25/00 9:42:00 AM	1/27/00 10:00:00 AM	084673
B-1A-10-11	00010628-08	Soil	1/25/00 9:49:00 AM	1/27/00 10:00:00 AM	084673
B-4-11.8-12.5	00010628-09	Soil	1/25/00 12:06:00 PM	1/27/00 10:00:00 AM	084673
DW	00010628-10	Soil	1/25/00	1/27/00 10:00:00 AM	084673
rip Blank 1/19/00	00010628-11	Water	1/25/00	1/27/00 10:00:00 AM	084672

lette G. Fm' Finl, Bernadette

Customer Service Manager

2/8/00

Date

Joel Grice Laboratory Director

Ted Yen Quality Assurance Officer

> 00010628 Page 1 2/8/00 3:47:13 PM



Client Sample ID SB-	ient Sample ID SB-1-0-2					1/24/00 10:26:00	SPL Sample II): 0001	0628-01
				Site	Key	y Energy			
Analyses/Method		Result		Rep.Limit		Dil. Factor QUAL	Date Analyzed	Analyst	Seq. #
DIESEL RANGE ORG	ANICS				MCL	SW8015B	Units: m	g/Kg	
Diesel Range Organics		940		120		25	02/03/00 7:26	RR	182308
Surr: Pentacosane		1200	%	55-155		25 *	02/03/00 7:26	RR	182308
Run ID/Seq #: HP	V_000203A-	182308							
Prep Method	Prep Date			Prep Initials					
SW3550A	01/28/2000	13:21		EE					
GASOLINE RANGE O	RGANICS				MCL	SW8015B	Units: m	g/Kg	
Gasoline Range Organic	cs	ND		0.5		5	02/04/00 19:00	CJ	181773
Surr: 1,4-Difluorobenz	zene	100	%	63-122		5	02/04/00 19:00	CJ	181773
Surr: 4-Bromofluorob	enzene	88.9	%	39-150		5	02/04/00 19:00	CJ	181773
PURGEABLE AROMA	TICS				MCL	SW8021B	Units: uç	g/Kg	
Benzene	· · · · · · · · · · · · · · · · · · ·	ND		5		5	02/04/00 19:00	CJ	181738
Ethylbenzene		ND		5		5	02/04/00 19:00	CJ	181738
Toluene		7.4		5		5	02/04/00 19:00	CJ	181738
Xylenes, Total		12		5		5	02/04/00 19:00	CJ	181738
Surr: 1,4-Difluorobenz	zene	105	%	59-127		5	02/04/00 19:00	CJ	181738
Surr: 4-Bromofluorob	enzene	103	%	48-156		5	02/04/00 19:00	CJ	181738

Qualifiers:

- ND/U Not Detected at the Reporting Limit
- B Analyte detected in the associated Method Blank
- * Surrogate Recovery Outside Advisable QC Limits

J - Estimated Value between MDL and PQL

>MCL - Result Over Maximum Contamination Limit(MCL) D - Surrogate Recovery Unreportable due to Dilution

> 00010628 Page 2 2/8/00 3:47:15 PM



Client Sample ID SB-	1-2-4			Coll	ected:	1/24/00 10:37:00	SPL Sample II	D: 0001	0628-02
				Site	Key	y Energy			
Analyses/Method		Result		Rep.Limit		Dil. Factor QUAL	Date Analyzed	Analyst	Seq. #
DIESEL RANGE ORG	ANICS				MCL	SW8015B	Units: m	g/Kg	
Diesel Range Organics		35000		5000		250	02/03/00 19:54	RR	182299
Surr: Pentacosane		29900	%	55-155		250 *	02/03/00 19:54	RR	182299
Run ID/Seq #: HP	_V_000203A-	182299							
Prep Method	Prep Date			Prep Initials					
SW3550A	01/28/2000	13:21		EE					
GASOLINE RANGE O	RGANICS				MCL	SW8015B	Units: m	g/Kg	
Gasoline Range Organi	CS	350		5		50	02/03/00 17:10	CJ	180753
Surr: 1,4-Difluoroben:	zene	100	%	63-122		50	02/03/00 17:10	CJ	180753
Surr: 4-Bromofluorob	enzene	1160	%	39-150		50 *	02/03/00 17:10	Cl	180753
PURGEABLE AROMA	TICS				MCL	SW8021B	Units: ug	J/Kg	
Benzene		850		100		100	02/06/00 16:20	CJ	181762
Ethylbenzene	······	8700		100		100	02/06/00 16:20	CJ	181762
Toluene		1200		100		100	02/06/00 16:20	CJ	181762
Xylenes,Total		14400		100		100	02/06/00 16:20	CJ	181762
Surr: 1,4-Difluoroben:	zene	109	%	59-127		100	02/06/00 16:20	CJ	181762
Surr: 4-Bromofluorob	enzene	260	%	48-156		100 *	02/06/00 16:20	CJ	181762

Qualifiers:

ND/U - Not Detected at the Reporting Limit

B - Analyte detected in the associated Method Blank

* - Surrogate Recovery Outside Advisable QC Limits

J - Estimated Value between MDL and PQL

>MCL - Result Over Maximum Contamination Limit(MCL) D - Surrogate Recovery Unreportable due to Dilution

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Client Sample ID SB-	2-4-6			Coll	ected:	1/24/00 1:33:00	SPL Sample I	D: 0001	0628-03
				Site	: Ke	y Energy			
Analyses/Method		Result		Rep.Limit		Dil. Factor QUAL	Date Analyzed	Analyst	Seq. #
DIESEL RANGE ORG	ANICS		;		MCL	SW8015B	Units: m	g/Kg	
Diesel Range Organics		34000		3100		125	02/03/00 20:32	RR	182300
Surr: Pentacosane		29500	%	55-155		125 *	02/03/00 20:32	RR	182300
Run ID/Seq #: HP	V_000203A-	182300							
Prep Method	Prep Date			Prep Initials					
SW3550A	01/28/2000	13:21		EE					
GASOLINE RANGE O	RGANICS				MCL	SW8015B	Units: m	g/Kg	
Gasoline Range Organi	cs	2600	~	50		500	02/03/00 17:42	CJ	180754
Surr: 1,4-Difluoroben	zene	100	%	63-122		500	02/03/00 17:42	CJ	180754
Surr: 4-Bromofluorob	enzene	770	%	39-150		500 *	02/03/00 17:42	CJ	180754
PURGEABLE AROMA	TICS				MCL	SW8021B	Units: ug	g/Kg	
Benzene		22000		500		500	02/02/00 19:26	CJ	179730
Ethylbenzene		72000		500		500	02/02/00 19:26	CJ	179730
Toluene		4400		500		500	02/02/00 19:26	CJ	179730
Xylenes, Total		59300		500		500	02/02/00 19:26	CJ	179730
Surr: 1,4-Difluoroben	zene	116	%	59-127		500	02/02/00 19:26	Cl	179730
Surr: 4-Bromofluorob	enzene	275	%	48-156		500 *	02/02/00 19:26	CJ	179730

Qualifiers:

ND/U - Not Detected at the Reporting Limit

B - Analyte detected in the associated Method Blank

* - Surrogate Recovery Outside Advisable QC Limits

J - Estimated Value between MDL and PQL

>MCL - Result Over Maximum Contamination Limit(MCL) D - Surrogate Recovery Unreportable due to Dilution

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Client Sample ID SB-	ient Sample ID SB-2-6.5-7.5			Col	lected:	1/24/00 1:39:	00	SPL Sample II	D: 0001	0628-04
				Site	: Key	y Energy				
Analyses/Method		Result		Rep.Limit		Dil. Factor Q	UAL	Date Analyzed	Analyst	Seq. #
DIESEL RANGE ORG	ANICS				MCL	SW801	5B	Units: m	g/Kg	
Diesel Range Organics		11000		1200		125		02/03/00 21:11	RR	182301
Surr: Pentacosane		15800	%	55-155		125 *		02/03/00 21:11	RR	182301
Run ID/Seq #: HP	_V_000203A-1	82301								
Prep Method	Prep Date			Prep Initials						
SW3550A	01/28/2000 1	3:21		EE]					
GASOLINE RANGE O	RGANICS				MCL	SW801	5B	Units: m	g/Kg	
Gasoline Range Organi	cs	180		2.5		25		02/03/00 2:19	CJ	179976
Surr: 1,4-Difluoroben	zene	100	%	63-122		25		02/03/00 2:19	Cl	179976
Surr: 4-Bromofluorob	enzene	982	%	39-150		25 *		02/03/00 2:19	CJ	179976
PURGEABLE AROMA	TICS		-		MCL	SW802	21B	Units: ug	g/Kg	
Benzene		1100		50		50		02/03/00 18:14	CJ	180617
Ethylbenzene		6100		50		50		02/03/00 18:14	CJ	180617
Toluene		2000		50		50		02/03/00 18:14	CJ	180617
Xylenes, Total		7800		50		50		02/03/00 18:14	CJ	180617
Surr: 1,4-Difluoroben	zene	121	%	59-127		50		02/03/00 18:14	CJ	180617
Surr: 4-Bromofluorob	enzene	246	%	48-156		50 *		02/03/00 18:14	CJ	180617

Qualifiers:

ND/U - Not Detected at the Reporting Limit

B - Analyte detected in the associated Method Blank

* - Surrogate Recovery Outside Advisable QC Limits

J - Estimated Value between MDL and PQL

>MCL - Result Over Maximum Contamination Limit(MCL) D - Surrogate Recovery Unreportable due to Dilution

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Client Sample ID SB-	3-4-6			Coll	ected:	1/24/00 9:52:	:00	SPL Sample II): 0001	0628-05
				Site	Ke	y Energy				
Analyses/Method		Result		Rep.Limit		Dil. Factor Q	UAL	Date Analyzed	Analyst	Seq. #
DIESEL RANGE ORG	ANICS				MCL	SW802	15B	Units: m	g/Kg	
Diesel Range Organics		11000		1200		125		02/03/00 21:49	RR	182302
Surr: Pentacosane		15200	%	55-155		125 *		02/03/00 21:49	RR	182302
Run ID/Seq #: HP	_V_000203A-1	82302								
Prep Method	Prep Date			Prep Initials						
SW3550A	01/28/2000 1	3:21		EE						
GASOLINE RANGE O	RGANICS				MCL	SW80 ²	15B	Units: m	g/Kg	
Gasoline Range Organ	ics	210		5		50		02/03/00 2:51	CJ	179977
Surr: 1,4-Difluorober	zene	100	%	63-122		50		02/03/00 2:51	CJ	179977
Surr: 4-Bromofluorob	enzene	893	%	39-150		50 *		02/03/00 2:51	CJ	179977
PURGEABLE AROMA	TICS				MCL	SW802	21B	Units: ug	g/Kg	
Benzene		190		50		50		02/03/00 2:51	CJ	179569
Ethylbenzene		4800		50		50		02/03/00 2:51	CJ	179569
Toluene	· · · · · · · · · · · · · · · · · · ·	98		50		50		02/03/00 2:51	CJ	179569
Xylenes, Total		3990		50		50		02/03/00 2:51	CJ	179569
Surr: 1,4-Difluorober	zene	93.0	%	59-127		50		02/03/00 2:51	CJ	179569
Surr: 4-Bromofluorot	enzene	300	%	48-156		50 *		02/03/00 2:51	CJ	179569

Qualifiers:

ND/U - Not Detected at the Reporting Limit

B - Analyte detected in the associated Method Blank

* - Surrogate Recovery Outside Advisable QC Limits

J - Estimated Value between MDL and PQL

>MCL - Result Over Maximum Contamination Limit(MCL) D - Surrogate Recovery Unreportable due to Dilution

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Client Sample ID SB-3	-9-11			Coll	ected:	1/24/00 10:02:00	SPL Sample I	D: 000	10628-06
				Site	: Key	y Energy			
Analyses/Method		Result		Rep.Limit		Dil. Factor QUAL	Date Analyzed	Analyst	Seq. #
DIESEL RANGE ORGA	NICS				MCL	SW8015B	Units: m	g/Kg	
Diesel Range Organics		13000		1200		125	02/03/00 22:27	RR	182303
Surr: Pentacosane		24500	%	55-155		125 *	02/03/00 22:27	RR	182303
Run ID/Seq #: HP_	V_000203A-18	32303							
Prep Method	Prep Date			Prep Initials					
SW3550A	01/28/2000 13	1:21		EE					
GASOLINE RANGE OF	GANICS				MCL	SW8015B	Units: m	g/Kg	
Gasoline Range Organic	S	240		5		50	02/03/00 3:23	CJ	179978
Surr: 1,4-Difluorobenz	ene	100	%	63-122		50	02/03/00 3:23	CJ	179978
Surr: 4-Bromofluorobe	nzene	879	%	39-150		50 *	02/03/00 3:23	CJ	179978
PURGEABLE AROMAT	ICS				MCL	SW8021B	Units: ug	g/Kg	
Benzene		510		50		50	02/03/00 3:23	CJ	179572
Ethylbenzene		6100		50		50	02/03/00 3:23	CJ	179572
Toluene		70		50		50	02/03/00 3:23	CJ	179572
Xylenes, Total		4200		50		50	02/03/00 3:23	CJ	179572
Surr: 1,4-Difluorobenz	ene	108	%	59-127		50	02/03/00 3:23	CJ	179572
Surr: 4-Bromofluorobe	nzene	310	%	48-156		50 *	02/03/00 3:23	CJ	179572

Qualifiers:

ND/U - Not Detected at the Reporting Limit

B - Analyte detected in the associated Method Blank

* - Surrogate Recovery Outside Advisable QC Limits

J - Estimated Value between MDL and PQL

>MCL - Result Over Maximum Contamination Limit(MCL) D - Surrogate Recovery Unreportable due to Dilution

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Client Sample ID SE	ent Sample ID SB-1A-6-8			Colle	ected:	1/25/00 9:42:0	00	SPL Sample II	D: 0001	0628-07
				Site:	Ke	y Energy				
Analyses/Method		Result		Rep.Limit		Dil. Factor Q	UAL	Date Analyzed	Analyst	Seq. #
DIESEL RANGE OR	GANICS				MCL	SW801	5B	Units: m	g/Kg	
Diesel Range Organic	S	24000		2500		125		02/05/00 18:40	RR	182309
Surr: Pentacosane		27900	%	55-155		125 *		02/05/00 18:40	RR	182309
Run ID/Seq #: H	P_V_000203A	-182309								
Prep Method	Prep Date			Prep Initials						
SW3550A	01/28/2000	13:21		EE						
GASOLINE RANGE	ORGANICS			······································	MCL	SW801	5B	Units: m	g/Kg	
Gasoline Range Orga	nics	850		50		500	_	02/03/00 3:55	CJ	179979
Surr: 1,4-Difluorobe	enzene	100	%	63-122		500		02/03/00 3:55	CJ	179979
Surr: 4-Bromofluoro	benzene	331	%	39-150		500 *		02/03/00 3:55	CJ	179979
PURGEABLE AROM	ATICS				MCL	SW802	1B	Units: uç	J/Kg	
Benzene		5000		500		500		02/03/00 3:55	CJ	180576
Ethylbenzene		28000		500		500		02/03/00 3:55	CJ	180576
Toluene		34000		500		500		02/03/00 3:55	CJ	180576
Xylenes, Total		67000		500		500		02/03/00 3:55	CJ	180576
Surr: 1,4-Difluorobe	enzene	93.7	%	59-127		500		02/03/00 3:55	CJ	180576
Surr: 4-Bromofluoro	benzene	190	%	48-156		500 *		02/03/00 3:55	CJ	180576

Qualifiers:

ND/U - Not Detected at the Reporting Limit

B - Analyte detected in the associated Method Blank

* - Surrogate Recovery Outside Advisable QC Limits

J - Estimated Value between MDL and PQL

>MCL - Result Over Maximum Contamination Limit(MCL) D - Surrogate Recovery Unreportable due to Dilution

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Client Sample ID SB-	1A-10-11	_	Coll	ected:	1/25/00 9:49:00	SPL Sample II): 000	10628-08
			Site	: Key	/ Energy			
Analyses/Method	Result		Rep.Limit		Dil. Factor QUAL	Date Analyzed	Analyst	Seq. #
DIESEL RANGE ORG	ANICS			MCL	SW8015B	Units: m	g/Kg	
Diesel Range Organics	13000		1200		125	02/05/00 19:19	RR	182310
Surr: Pentacosane	9930	%	55-155		125 *	02/05/00 19:19	RR	182310
Run ID/Seq #: HP	V_000203A-182310				· · · · · · · · · · · · · · · · · · ·			
Prep Method	Prep Date		Prep Initials					
SW3550A	01/28/2000 13:21		EE					
GASOLINE RANGE O	RGANICS			MCL	SW8015B	Units: m	g/Kg	
Gasoline Range Organi	cs 930		25		250	02/03/00 4:28	CJ	179980
Surr: 1,4-Difluoroben:	zene 100	%	63-122		250	02/03/00 4:28	CJ	179980
Surr: 4-Bromofluorob	enzene 667	%	39-150		250 *	02/03/00 4:28	CJ	179980
PURGEABLE AROMA	TICS			MCL	SW8021B	Units: ug	g/Kg	
Benzene	2300		250		250	02/03/00 4:28	CJ	179739
Ethylbenzene	20000		250		250	02/03/00 4:28	CJ	179739
Toluene	9100		250		250	02/03/00 4:28	CJ	179739
Xylenes, Total	41000	_	250		250	02/03/00 4:28	CJ	179739
Surr: 1,4-Difluoroben	zene 99.1	%	59-127		250	02/03/00 4:28	CJ	179739
Surr: 4-Bromofluorob	enzene 260	%	48-156		250 *	02/03/00 4:28	CJ	179739

Qualifiers:

ND/U - Not Detected at the Reporting Limit

B - Analyte detected in the associated Method Blank

* - Surrogate Recovery Outside Advisable QC Limits

J - Estimated Value between MDL and PQL

>MCL - Result Over Maximum Contamination Limit(MCL) D - Surrogate Recovery Unreportable due to Dilution

> 00010628 Page 9 2/8/00 3:47:18 PM



Client Sample ID SB	ient Sample ID SB-4-11.8-12.5				ected:	1/25/00 12:06:00	SPL Sample II): 0001	0628-09
				Site	: Key	/ Energy			
Analyses/Method		Result		Rep.Limit		Dil. Factor QUAL	Date Analyzed	Analyst	Seq. #
DIESEL RANGE ORG	SANICS				MCL	SW8015B	Units: m	g/Kg	
Diesel Range Organics	S	18000		1900		125	02/05/00 19:19	RR	182304
Surr: Pentacosane	·····,	19200	%	55-155		125 *	02/05/00 19:19	RR	182304
Run ID/Seq #: HI	P_V_000203A-	182304				· · · · · · · · · · · · · · · · · · ·			
Prep Method	Prep Date			Prep Initials					
SW3550A	01/28/2000	13:21		EE					
GASOLINE RANGE	ORGANICS				MCL	SW8015B	Units: m	g/Kg	
Gasoline Range Organ	nics	880		25		250	02/03/00 5:00	CJ	179981
Surr: 1,4-Difluorobe	nzene	100	%	63-122		250	02/03/00 5:00	CJ	179981
Surr: 4-Bromofluoro	benzene	584	%	39-150		250 *	02/03/00 5:00	CJ	179981
PURGEABLE AROM	ATICS				MCL	SW8021B	Units: ug	/Kg	
Benzene		4100		250		250	02/03/00 5:00	CJ	180577
Ethylbenzene		23000		250		250	02/03/00 5:00	CJ	180577
Toluene		19000		250	• • • • • • • • • • • • • • • • • • • •	250	02/03/00 5:00	CJ	180577
Xylenes, Total		39000		250		250	02/03/00 5:00	CJ	180577
Surr: 1,4-Difluorobe	nzene	113	%	59-127		250	02/03/00 5:00	CJ	180577
Surr: 4-Bromofluoro	benzene	248	%	48-156		250 *	02/03/00 5:00	CJ	180577

Qualifiers:

ND/U - Not Detected at the Reporting Limit

B - Analyte detected in the associated Method Blank

* - Surrogate Recovery Outside Advisable QC Limits

J - Estimated Value between MDL and PQL

>MCL - Result Over Maximum Contamination Limit(MCL) D - Surrogate Recovery Unreportable due to Dilution

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Client Sample ID Trip Blank 1/1	9/00	Colle	ected:	1/25/00		SPL Sample II	b: 0001	0628-11
		Site:	Key	/ Energy				
Analyses/Method	Result	Rep.Limit		Dil. Factor	QUAL	Date Analyzed	Analyst	Seq. #
			1101		0040	18 14		

PURGEABLE AROMATICS				MCL	SW8021B	Units: ug	g/L	
Benzene	ND		1		1	01/31/00 17:11	WR	176085
Ethylbenzene	ND		1		1	01/31/00 17:11	WR	176085
Toluene	ND		1		1	01/31/00 17:11	WR	176085
Xylenes,Total	ND		1		1	01/31/00 17:11	WR	176085
Surr: 1,4-Difluorobenzene	106	%	72-137		1	01/31/00 17:11	WR	176085
Surr: 4-Bromofluorobenzene	109	%	48-156		1	01/31/00 17:11	WR	176085

Qualifiers:

ND/U - Not Detected at the Reporting Limit

B - Analyte detected in the associated Method Blank

* - Surrogate Recovery Outside Advisable QC Limits

J - Estimated Value between MDL and PQL

>MCL - Result Over Maximum Contamination Limit(MCL) D - Surrogate Recovery Unreportable due to Dilution

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Quality Control Report

Brown & Caldwell

Key Energy #18347.001

Analysis: lethod:	Diesel Range SW8015B	Organics						Work Lab I	(Order: Batch ID:	000 288	10628 4		
		Method Blank			Sa	mples in	Analyti	cal Bat	ch:				
- RunID:	HP_V_000203A-	182306 Units:	mg/Kg		la	h Samnli	e iD		Client S:	amnie	חו		
nalysis Date:	02/03/2000 6:0	9 Analyst:	RR		00	010628-0)1B		SB-1-0-2				
reparation Date:	01/28/2000 13:	21 Prep By:	EE M	lethod SW3550	A 00	010628-0)2B		SB-1-2-4				
-					00	010628-0)3B		SB-2-4-6				
	Analy	te	Result	Rep Limit	00	010628-0	94B		SB-2-6.5	-7.5			
Diese	Range Organics		ND	10	00	010628-0)5B		SB-3-4-6				
Sur	r: Pentacosane		98.3	55-155	00	010628-0)6B		SB-3-9-1	1			
					00	010628-0	07B		SB-1A-6-	-8			
					00	010628-0	18B		SB-1A-10	0-11			
					00	010020-0	98		5B-4-11.	0-12.5			
	<u></u>		La	boratory Contro	ol Sample (LCS)							
	F	RuniD:	-1P V 000	203A-182307	I Inits:	ma/Ka							
		Analysis Date: (02/03/20	00 6:48	Analyst:	RR							
	i	Preparation Date: (01/28/20	00 13:21	Prep By:	EE Me	thod SV	/3550A					
		Analyte)	Spike	Result	Perce	ent L	ower	Upper				
				Adde	d	Recov	very l	_imit	Limit				
i	Die	esel Range Organics		83.	33 7	3	88	70	122				
		<u>Matrix S</u>	<u>ipike (M</u>	S) / Matrix Spil	e Duplicat	e (MSD)							
•		Sample Spiked:	000106	328-08									
1		RunID:	HP_V_C	00203A-182305	Units:	mg/Kg							
		Analysis Date:	02/05/2	2000 19:57	Analyst:	RR							
		Preparation Date:	01/28/2	2000 13:21	Prep By:	EE N	lethod S	W3550	A				
An	alyte	Sample	MS	MS Result	MS %	MSD	MSD F	Result	MSD %	RPD	RPD	Low	High
,		Result	Spike Added		Recovery	Spike Added			Recovery		Limit	Limit	Limit
iesel Range Orga	anics	13000	83.3	12000	-1180*	83.3		15000	2370*	595*	50	11	15

Qualifiers:

ND/U - Not Detected at the Reporting Limit

* - Recovery Outside Advisable QC Limits

B - Analyte detected in the associated Method Blank

J - Estimated value between MDL and PQL

D - Recovery Unreportable due to Dilution

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Qualifiers:

ND/U - Not Detected at the Reporting Limit

* - Recovery Outside Advisable QC Limits D - Recovery Unreportable due to Dilution

B - Analyte detected in the associated Method Blank

J - Estimated value between MDL and PQL

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Quality Control Report

Brown & Caldwell

Key	Energy	#1834	7.001
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lethod:		Purgeable SW8021B	Aromatics	3					Work Lab E	:Order: Batch ID:	0001 R85	10628 91		
			Meth	od Blank			Sar	mples in	Analytical Bat	ch:			·	
luniD:		HP_R_00020	02B-179731	Units:	ug/Kg		lat	Sample	מו א	Client Sa	mnie i	n		
nalvsis Da	te [.]	02/02/2000	19.52	Analyst:	C.I		000	10628-0	3A	SB-2-4-6		<u> </u>		
narysis bu	.0.	02,02,2000	10.02	rindiyot.	00		000	10628-0	5A	SB-3-4-6				
							000	010628-0	6A	SB-3-9-1	1			
					,		000	10628-0	7A	SB-1A-6-	8			
		A	nalyte		Result	Rep Limit	000	010628-0	8A	SB-1A-10)-11			
	Benzen	10			ND ND	1.0	000	010628-0	9A	SB-4-11.	8-12.5			
	Toluene	nzene				1.0		00020 0		00 1 11.	0 12.0			
	Xylenes	s,⊺otal			ND	1.0								
	Surr:	1,4-Difluorob	enzene		94.5	59-127								
•	Surr	4-Bromonuor	robenzene		103.3	48-156								
					Lat	oratory Contr	ol Sample (i			. <u></u> .				
			RuntD:		HP R 000	202B-179771	Unite: 1	w/Ka						
			Analvei	e Date:	02/02/20/	0 21.16	Analvet: (ug/ing ≏i						
•			Analysi	s Date.	02/02/200	021.10	Analysi.							
									r 1					
				Analyt	е	Spike	Result	Perce	nt Lower	Upper				
				Analyt	e	Spike Adde	e Result d	Perce Recov	nt Lower ery Limit	Upper Limit				
			Benzene	Analyt	e	Spike Adde	e Result d 50 47	Perce Recov	nt Lower ery Limit 94 60	Upper Limit 116				
			Benzene Ethylbenz	Analyt	e	Spike Adde	e Result d 50 47 50 45	Perce Recov	nt Lower ery Limit 94 60 91 68	Upper Limit 116 127				
			Benzene Ethylbenz Toluene	Analyt ene	e	Spike Adde	e Result d 50 47 50 45 50 46	Perce Recov	nt Lower ery Limit 94 60 91 68 92 64	Upper Limit 116 127 122				
			Benzene Ethylbenz Toluene Xylenes,T	Analyt ene otal	e 	Spike Adde	Result 50 47 50 45 50 46 50 136	Perce Recov	nt Lower ery Limit 94 60 91 68 92 64 91 68	Upper Limit 116 127 122 129				
			Benzene Ethylbenz Toluene Xylenes,T	Analyt eene otal	e 	Spike Adde	e Result 50 47 50 45 50 46 50 46 50 136	Perce Recov	nt Lower ery Limit 94 60 91 68 92 64 91 68	Upper Limit 116 127 122 129				
			Benzene Ethylbenz Toluene Xylenes,T	Analyt ene otal Matrix	e Spike (Mi	Spike Adde	e Result 50 47 50 45 50 46 50 136 ce Duplicate	Perce Recov	nt Lower ery Limit 94 60 91 68 92 64 91 68	Upper Limit 116 127 122 129				
			Benzene Ethylbenz Toluene Xylenes,T	Analyt eene otal <u>Matrix</u>	e Spike (Mi	Spike Adde	e Result d 50 47 50 45 50 46 50 136 ce Duplicate	(MSD)	nt Lower ery Limit 94 60 91 68 92 64 91 68	Upper Limit 116 127 122 129				
			Benzene Ethylbenz Toluene Xylenes,T Samp Runl	Analyt ene otal <u>Matrix</u> ole Spiked:	е Spike (М 000106 HP R 0	Spike Adde 5) / Matrix Spil 23-09 202028-179564	Result 50 47 50 45 50 46 50 136 Se Duplicate	(MSD)	nt Lower ery Limit 94 60 91 68 92 64 91 68	Upper Limit 116 127 122 129				
			Benzene Ethylbenz Toluene Xylenes,T Samp RunII Analy	Analyt ene otal <u>Matrix</u> ole Spiked: D: sis Date:	e Spike (M 000106 HP_R_0 02/02/2	Spike Adde 3) / Matrix Spil 23-09 202028-179564 000 23:37	Result d 50 47 50 45 50 46 50 136 ce Duplicate Units: Analyst:	e (MSD)	nt Lower ery Limit 94 60 91 68 92 64 91 68	Upper Limit 116 127 122 129				
			Benzene Ethylbenz Toluene Xylenes,T Samp RunIC Analy	Analyt eene otal <u>Matrix</u> ole Spiked: D: rsis Date:	e Spike (M 000106 HP_R_0 02/02/2	Spike Adde 5) / Matrix Spil 23-09 002028-179564 000 23:37	e Result 50 47 50 45 50 46 50 136 ce Duplicate Units: Analyst:	e (MSD) ug/Kg	nt Lower ery Limit 94 60 91 68 92 64 91 68	Upper Limit 116 127 122 129				
			Benzene Ethylbenz Toluene Xylenes,T Samp RunIC Analy	Analyt eene otal <u>Matrix</u> ole Spiked: D: rsis Date:	e Spike (M 000106 HP_R_0 02/02/2	Spike Adde 5) / Matrix Spil 23-09 002028-179564 000 23:37	e Result 50 47 50 45 50 46 50 136 ce Duplicate Units: Analyst:	e (MSD) ug/Kg CJ	nt Lower ery Limit 94 60 91 68 92 64 91 68	Upper Limit 116 127 122 129				
	And		Benzene Ethylbenz Toluene Xylenes,T Samp RunIC Analy	Analyt eene Total Matrix ole Spiked: D: rsis Date:	e Spike (Mi 000106 HP_R_0 02/02/2	Spike Adde 5) / Matrix Spil 23-09 00202B-179564 000 23:37	Result 50 47 50 45 50 46 50 136 ce Duplicate Units: Analyst:	(MSD) ug/Kg CJ	nt Lower ery Limit 94 60 91 68 92 64 91 68	Upper Limit 116 127 122 129	RPO	RPD		His
	Ana	alyte	Benzene Ethylbenz Toluene Xylenes,T Samp RunIC Analy	Analyt eene otal <u>Matrix</u> ole Spiked: D: rsis Date: Sample Result	е Spike (М 000106 HP_R_0 02/02/2 MS Spike	Spike Adde 23-09 20202B-179564 000 23:37 MS Result	Result Result 50 47 50 45 50 46 50 136 ce Duplicate Units: Analyst: MS % Recovery	MSD Spike	nt Lower ery Limit 94 60 91 68 92 64 91 68	Upper Limit 116 127 122 129 MSD % Recovery	RPD	RPD Limit	Low Limit	Hig
	Ana	alyte	Benzene Ethylbenz Toluene Xylenes,T Samp RunIC Analy	Analyt eene otal <u>Matrix</u> ole Spiked: D: rsis Date: Sample Result	e Spike (M 000106 HP_R_0 02/02/2 MS Spike Added	Spike Adde 23-09 20202B-179564 000 23:37 MS Result	Result Result SO 47 SO 45 SO 46 SO 136 Recovery MS % Recovery	Perce Recov (MSD) ug/Kg CJ Spike Added	nt Lower ery Limit 94 60 91 68 92 64 91 68 91 68	Upper Limit 116 127 122 129 MSD % Recovery	RPD	RPD Limit	Low Limit	Hig
enzene	Ana	alyte	Benzene Ethylbenz Toluene Xylenes,T Samp RunIC Analy	Analyt eene otal <u>Matrix</u> ole Spiked: D: rsis Date: Sample Result	e Spike (M: 000106 HP_R_0 02/02/2 MS Spike Added) 20	Spike Adde Adde 1 5) / Matrix Spil 23-09 202028-179564 000 23:37 MS Result	Result 50 47 50 45 50 46 50 136 ce Duplicate Units: Analyst: MS % Recovery	Perce Recov (MSD) (MSD) ug/Kg CJ Spike Added	nt Lower ery Limit 94 60 91 68 92 64 91 68 91 68 MSD Result	Upper Limit 116 127 122 129 129 MSD % Recovery 76.0	RPD	RPD Limit	Low Limit	Higi Lim
enzene	Ana	alyte	Benzene Ethylbenz Toluene Xylenes,T Samp RunIC Analy	Analyt eene otal <u>Matrix</u> ole Spiked: D: rsis Date: Sample Result NIC	e Spike (M: 000106 HP_R_0 02/02/2 MS Spike Added 0 200 0 200 0 200	Spike Adde Adde 5) / Matrix Spil 23-09 002028-179564 000 23:37 MS Result	Result 50 47 50 45 50 46 50 136 Ce Duplicate Units: Analyst: MS % Recovery 79.1 79.1	Perce Recov (MSD) (MSD) ug/Kg CJ MSD Spike Added 20	nt Lower ery Limit 94 60 91 68 92 64 91 68 91 68 MSD Result 15	Upper Limit 116 127 122 129 129 MSD % Recovery 76.0 66 5	RPD 3.96	RPD Limit 34	Low Limit	Higi Lim
enzenê thylbenzer	Ana	alyte	Benzene Ethylbenz Toluene Xylenes,T Samp RunIC Analy	Analyt eene otal Matrix ole Spiked: D: sis Date: Sample Result NE	e Spike (M: 000106 HP_R_0 02/02/2 MS Spike Added 0 20 0 20 0 20 0 20	Spike Adde Adde 5) / Matrix Spil 23-09 002028-179564 000 23:37 MS Result	Result 50 47 50 45 50 46 50 136 Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2"Colspan="2"Colspan="2"Colspan="2"Colspan="2"Colspan="2"Colspan="2"Colspan="2">Colspan="2"Colspan="	Perce Recov	nt Lower ery Limit 94 60 91 68 92 64 91 68 91 68 MSD Result 15 14	Upper Limit 116 127 122 129 129 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8	RPD 3.96 4.56 3.60	RPD Limit 34 35 28	Low Limit 35 31	Higi Lim

Qualifiers:

ND/U - Not Detected at the Reporting Limit

* - Recovery Outside Advisable QC Limits

B - Analyte detected in the associated Method Blank

J - Estimated value between MDL and PQL

D - Recovery Unreportable due to Dilution

1 1

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Quality Control Report

Brown & Caldwell

Key Energy #18347.001

Analysis: Nethod:	Gasoline Range O SW8015B	ganics					Work Lab B	Order: Batch ID:	0001 R86	10628 03		
	Mei	hod Blank	·····		Sar	nples in	Analytical Bat	ch:				
RunID:	HP_R_000202D-17997	5 Units:	mg/Kg		I ak	Sample	. In	Client S:	omole I	п		
inalysis Date:	02/03/2000 1:47	Analyst:	CJ		000	10628-04	1 <u>D</u> 1A	SB-2-6.5	-7.5	<u> </u>		
		7 maryon	00		000	10628-0	5A	SB-3-4-6				
					000	10628-06	5A	SB-3-9-1	1			
					000	10628-0	7A	SB-1A-6	-8			
	Analyte		Result Rep Lim	nit	000	10628-08	3A	SB-1A-10	0-11			
Ga	asoline Range Organics		ND 0.1	0	000	10628-09	9A	SB-4-11.	8-12.5			
	Surr: 4-Bromofluorobenzene		80.1 39-15	0								
			Laboratory	Contro	I Sample (L	<u>_CS)</u>						
_	Runit	D:	HP_R_000202D-17	9972	Units: n	ng/Kg						
	Analy	sis Date:	02/02/2000 23:02	2	Analyst: 0	CJ						
l												
2												
		Analyte	9	Spike	Result	Percer	nt Lower	Upper				
			•	Addec		Recove		Linit				
	Gasolin	e Range Organ			1 0.7	·	70 44	122				
	······	Matrix S	Spike (MS) / Mat	rix Spik	e Duplicate	(MSD)		· · · · · · · · · · · · · · · · · · ·				
			-									
	San	nple Spiked:	00010623-09									
	San Rur	nple Spiked:	00010623-09 HP_R_000202D-1	179973	Units:	mg/Kg						
	San Rur Ana	nple Spiked: ID: Ilysis Date:	00010623-09 HP_R_000202D-1 02/03/2000 0:4/	179973 4	Units: Analyst:	mg/Kg CJ						
	San Rur Ana	nple Spiked: ID: Iysis Date:	00010623-09 HP_R_000202D- 02/03/2000 0:4/	179973 4	Units: Analyst:	mg/Kg CJ						
	San Rur Ana Analyte	nple Spiked: ID: Iysis Date: Sample	00010623-09 HP_R_000202D- 02/03/2000 0:4/	179973 4 Result	Units: Analyst: MS %	mg/Kg CJ MSD	MSD Result	MSD %	RPD	RPD	Low	High
	San Rur Ana Analyte	nple Spiked: ID: Iysis Date: Sample Result	00010623-09 HP_R_000202D- 02/03/2000 0:4 MS MS F Spike	179973 4 tesuit	Units: Analyst: MS % Recovery	mg/Kg CJ MSD Spike	MSD Result	MSD % Recovery	RPD	RPD Limit	Low Limit	High Limit
	San Rur Ana Analyte	nple Spiked: ID: Iysis Date: Sample Result	00010623-09 HP_R_000202D- 02/03/2000 0:4 MS MS R Spike Added	179973 4 tesult	Units: Analyst: MS % Recovery	mg/Kg CJ MSD Spike Added	MSD Result	MSD % Recovery	RPD	RPD Limit	Low Limit	High Limit

Qualifiers:

ND/U - Not Detected at the Reporting Limit

* - Recovery Outside Advisable QC Limits

B - Analyte detected in the associated Method Blank

J - Estimated value between MDL and PQL

D - Recovery Unreportable due to Dilution

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	FL							B880 II HOUS	NTERCH STON, TE (713) 660	ANGE DI EXAS 77(0-0901	RIVE 054	
· · · · · · · · · · · · · · · · · · ·			¢	Quality Cont	rol Repoi	t			(110)000			
				Brown & C Key Energy #	aldwell							
Analysis: lethod:	Purgeable Aromatic SW8021B	:5					Work Lab E	Order: Batch ID:	0001 R86	10628 37		
· · · · ·	Meth	nod Blank			Sar	nples in	Analytical Bat	ch:				
RunID: nalysis Date:	HP_R_000203A-180611 02/03/2000 12:40	Units: Analyst:	ug/L CJ		<u>Lab</u> 000	9 Sample 10628-0	<u>• ID</u> 4A	<u>Client Sa</u> SB-2-6.5	ample -7.5	ID		
Ben Ethy Tolu Xyle	Analyte zene Ibenzene iene nes,Total		Result ND ND ND ND 96.2	Rep Limit 1.0 1.0 1.0 72-137 49.45								
S S	urr: 1,4-Difluorobenzene urr: 4-Bromofluorobenzene		99.2	40-100								
S	urr: 1,4-Difluorobenzene urr: 4-Bromofluorobenzene RunID	·····	99.2 <u>Lab</u> IP_R_000	<u>48-136</u> oratory Contro 203A-180612	II Sample (L Units: L	<u>.CS)</u> ıg/L						
S	urr: 1,4-Difluorobenzene urr: 4-Bromofluorobenzene RunID Analys	: H is Date: C Analyte	99.2 <u>Lab</u> IP_R_000 02/03/200	oratory Contro 203A-180612 10 13:45 Spike Addec	I Sample (L Units: L Analyst: C Result	-CS) Ig/L CJ Perce Recov	nt Lower erv Limit	Upper Limit				
S	urr: 1,4-Difluorobenzene urr: 4-Bromofluorobenzene RunID Analys Benzene	: H sis Date: C Analyte	99.2 Lab	<u>oratory Contro</u> 203A-180612 10 13:45 Spike Addec	Di Sample (L Units: L Analyst: C Result 50 47	-CS) Ig/L CJ Perce Recov	nt Lower ery Limit 95 61	Upper Limit 119				
S	urr: 1,4-Difluorobenzene urr: 4-Bromofluorobenzene RunID Analys Benzene Ethylben	: H is Date: C Analyte zene	99.2 Lab IP_R_000 02/03/200	40-136 oratory Contro 203A-180612 0 13:45 0 13:45 Spike Addec	I Sample (L Units: L Analyst: C Result 50 47 50 47	.CS) Ig/L CJ Perce Recov	nt Lower ery Limit 95 61 95 70	Upper Limit 119 118				
S	urr: 1,4-Difluorobenzene urr: 4-Bromofluorobenzene RunID Analys Benzene Ethylben Toluene Xylenes,	: H is Date: C Analyte zene	99.2 <u>Lab</u> IP_R_000 02/03/200	40-136 oratory Contro 203A-180612 10 13:45 Spike Addec 5 5 5 5 5 5 5 5 5 5 5 5 5	I Sample (L Units: L Analyst: C	Ig/L CJ Perce Recov	nt Lower ery Limit 95 61 95 70 95 65 95 72	Upper Limit 119 118 125 117				
S	urr: 1,4-Difluorobenzene urr: 4-Bromofluorobenzene RunID Analys Benzene Ethylben Toluene Xylenes,	: H is Date: C Analyte zene Total	99.2 Lab	40-136 oratory Contro 203A-180612 10 13:45 Spike Addec 5 5 5 15	I Sample (L Units: L Analyst: C	ICS) Ig/L CJ Perce Recov	nt Lower Ery Limit 95 61 95 70 95 65 95 72	Upper Limit 119 118 125 117				
S	urr: 1,4-Difluorobenzene urr: 4-Bromofluorobenzene RunID Analys Benzene Ethylben Toluene Xylenes,	: H is Date: C Analyte zene Total <u>Matrix S</u>	99.2 Lab IP_R_000 02/03/200	Spike 0 13:45 Spike Addec 13:45	I Sample (L Units: L Analyst: C Analyst: C Barbon Result C 47 50 47 50 47 50 47 50 48 50 143 e Duplicate	CS) Ig/L J Perce Recove (MSD)	nt Lower Ery Limit 95 61 95 70 95 65 95 72	Upper Limit 119 118 125 117				
S	urr: 1,4-Difluorobenzene urr: 4-Bromofluorobenzene RunID Analys Benzene Ethylben Toluene Xylenes, Sam RunI Anal	: H is Date: C Analyte zene Total <u>Matrix S</u> ple Spiked: D: ysis Date:	99.2 Lab P_R_000 02/03/200 02/03/200 92/03/200 0002004 HP_R_00 02/03/20	46-136 oratory Contro 203A-180612 10 13:45 Spike Addec 5 5) / Matrix Spik 46-01 10203A-180619 000 22:00	Units: L Analyst: C Analyst: C Result C C C C C C C C C C C C C C C C C C C	CS) Ig/L Perce Recovi (MSD) ug/Kg CJ	nt Lower ery Limit 95 61 95 70 95 65 95 72	Upper Limit 119 118 125 117				
	urr: 1,4-Difluorobenzene urr: 4-Bromofluorobenzene RunID Analys Benzene Ethylben Toluene Xylenes, Sam Runi Analyte	: H is Date: C Analyte zene Total <u>Matrix S</u> ple Spiked: D: ysis Date: Sample Result	99.2 Lab HP_R_000 02/03/200 02/03/200 92/03/200 HP_R_00 02/03/20 MS Spike MS Spike	Address oratory Contro 203A-180612 10 13:45 Spike Addec 46-01 20203A-180619 000 000 MS Result	I Sample (L Units: L Analyst: C Result 50 47 50 50 50 50 50 50 50 50 50 50 50 50 50 5	CS) Ig/L J Perce Recove (MSD) Ug/Kg CJ Spike Added	nt Lower Ery Limit 95 61 95 70 95 65 95 72	Upper Limit 119 118 125 117 117 MSD % Recovery	RPD	RPD Limit	Low Limit	Hig
	urr: 1,4-Difluorobenzene urr: 4-Bromofluorobenzene RunID Analys Benzene Ethylben Toluene Xylenes, Sam Runl Analyte	:	99.2 Lab IP_R_000 02/03/200 Spike (MS 0002004 HP_R_00 02/03/20 MS Spike Added	40-130 oratory Contro 203A-180612 10 13:45 Spike Addec 46-01 00203A-180619 000 22:00 MS Result	I Sample (L Units: L Analyst: C Result Result Result 50 47 50 7 50 7 50 7 50 7 50 7 50 7 50 7 50	LCS) Ig/L J Perce Recove (MSD) ug/Kg CJ MSD Spike Added	nt Lower Ery Limit 95 61 95 70 95 65 95 72 95 72	Upper Limit 119 118 125 117 117 MSD % Recovery	RPD	RPD Limit	Low Limit	Hig
enzene thylbenzene	urr: 1,4-Difluorobenzene urr: 4-Bromofluorobenzene RunID Analys Benzene Ethylben Toluene Xylenes, Sam RunI Analyte	:	99.2 Lab HP_R_000 02/03/200 Spike (MS 0002004 HP_R_00 02/03/20 MS Spike Added 20 20	40-130 oratory Contro 203A-180612 (0 13:45 Spike Addec \$\$ Addec \$\$ \$\$ \$\$ \$\$ \$\$ \$\$ \$\$ \$\$ \$\$ \$\$ \$\$ \$\$ \$\$	I Sample (L Units: L Analyst: C Result 50 47 50 47 50 47 50 47 50 48 50 143 e Duplicate Units: Analyst: MS % Recovery 78.5 70.1	LCS) Ig/L J Perce Recov (MSD) ug/Kg CJ MSD Spike Added 20 20 20	nt Lower Ery Limit 95 61 95 70 95 65 95 72 95 72 MSD Result	Upper Limit 119 118 125 117 MSD % Recovery 70.6 66.5	RPD 10.6 5.29	RPD Limit 34	Low Limit 35 31	Hig Lin 1
s s s s s s s s s s s s s s s s s s s	urr: 1,4-Difluorobenzene urr: 4-Bromofluorobenzene RunID Analys Benzene Ethylben Toluene Xylenes; Sam Runi Anal	:	99.2 Lab HP_R_000 02/03/200 2/03/200 5 5 5 5 5 5 5 5 6 6 7 7 7 7 7 7 7 7 7 7 7 7 7	46-136 oratory Contro 203A-180612 10 13:45 Spike Addec 46-01 2003A-180619 000 MS Result 16 14	I Sample (L Units: L Analyst: C 1 Result 50 47 50 47 50 47 50 47 50 143 e Duplicate Units: Analyst: MS % Recovery 78.5 70.1 76.2	LCS) Ig/L J Perce Recove Cove Recove Recove Cove Reco	nt Lower Ery Limit 95 61 95 70 95 65 95 72 95 72 MSD Result 14 14	Upper Limit 119 118 125 117 117 MSD % Recovery 70.6 66.5 70.4	RPD 10.6 5.29 7.87	RPD Limit 34 35 28	Low Limit 35 31 31	Hig Lin 1 1

Qualifiers:

ND/U - Not Detected at the Reporting Limit

* - Recovery Outside Advisable QC Limits

B - Analyte detected in the associated Method Blank

J - Estimated value between MDL and PQL

D - Recovery Unreportable due to Dilution



HOUSTON LABORATORY 8880 INTERCHANGE DRIVE HOUSTON, TEXAS 77054 (713) 860-0901

Quality Control Report

Brown & Caldwell

Key Energy	#18347.001
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ethod:	Gasoline Ra SW8015B	ange Orgar	nics					Work Lab I	Order: Batch ID:	000 [.] R86	10628 42		
		Method	<u>i Blank</u>			Sar	nples in	Analytical Bat	ch:				
RunID:	HP_R_000203	B-180750	Units:	mg/Kg		Lat	Sample) ID	Client Sa	ample	D		
halysis Date:	02/03/2000 ·	12:40	Analyst:	CJ		000	10628-0	2A	SB-1-2-4				
l						000	10628-0	3A	SB-2-4-6				
	An	alyte		Result Re	ep Limit								
Ga	soline Range Organ	nics		ND	0.10								
	Surr: 1,4-Difluorobe Surr: 4-Bromofluoro	nzene benzene		99.7 80.1	63-122 39-150								
		<u></u>		Labo	ratory Contro	ol Sample (L	<u>.CS)</u>	<u> </u>					
_		RuniD:	F	IP_R_00020	3B-180751	Units: r	ng/Kg						
		Analysis	Date: 0	2/03/2000	14:18	Analyst: (CT						
	_												
	ſ		Analyte		Spike Addeo	Result	Perce Recov	nt Lower ery Limit	Upper Limit				
		Gasoline Ra	Analyte ange Organi	CS	Spike Addeo	d Result	Perce Recov	nt Lower ery Limit 72 44	Upper Limit 122				
	C	Gasoline Ra	Analyte ange Organi	CS	Spike Addeo	Result 1 0.72	Perce Recov	nt Lower ery Limit 72 44	Upper Limit 122				
	C	Gasoline Ra	Analyte ange Organi <u>Matrix S</u>	cs Spike (MS)	Spike Addeo / Matrix Spik	d Result 1 0.72	Perce Recov	nt Lower ery Limit 72 44	Upper Limit 122				
	Ī	Gasoline Ra	Analyte ange Organi <u>Matrix S</u> Spiked:	cs Spike (MS) 00020046	/ Matrix Spike	Result 1 0.72	Perce Recov	nt Lower ery Limit 72 44	Upper Limit 122				
		Gasoline Ra Sample RunID:	Analyte ange Organi <u>Matrix S</u> spiked:	cs Spike (MS) 00020046 HP_R_000	Spike Added / Matrix Spik 3-01 203B-180760	d Result 1 0.72	MSD)	nt Lower ery Limit 72 44	Upper Limit 122				
		Gasoline Ra Sample RunID: Analysi	Analyte ange Organi <u>Matrix S</u> e Spiked: s Date:	cs D pike (MS) 00020046 HP_R_000 02/03/200	Spike Addec / Matrix Spik 3-01 203B-180760 00 23:04	d Result 1 0.72 Ce Duplicate Units: Analyst:	MSD) mg/Kg	nt Lower ery Limit 72 44	Upper Limit 122				
	Ē	Gasoline Ra Sample RunID: Analysi	Analyte ange Organi <u>Matrix S</u> e Spiked: s Date:	cs pike (MS) 00020046 HP_R_000 02/03/200	Spike Addec / Matrix Spik 3-01 203B-180760 00 23:04	e Duplicate Units: Analyst:	MSD) mg/Kg CJ	nt Lower ery Limit 72 44	Upper Limit 122				
	Analyte	Gasoline Ra Sample RunID: Analysi	Analyte ange Organi <u>Matrix S</u> e Spiked: s Date: Sample Result	cs Spike (MS) 00020046 HP_R_000 02/03/200 MS Spike Added	Spike Added / Matrix Spik 3-01 203B-180760 00 23:04 MS Result	Analyst: MS % Resourt	MSD Spike Added	nt Lower ery Limit 72 44 MSD Result	Upper Limit 122 4 MSD % Recovery	RPD	RPD Limit	Low Limit	High Limit

Qualifiers:

ND/U - Not Detected at the Reporting Limit

* - Recovery Outside Advisable QC Limits

B - Analyte detected in the associated Method Blank

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J - Estimated value between MDL and PQL

D - Recovery Unreportable due to Dilution

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Quality Control Report

9 Coldwall •

nalysis: lethod:	Purgeabl SW8021E	e Aromatics B						Work Lab I	Order: Batch ID:	0001 R86	10628 45		
		Metho	d Blank			Sar	nples in	Analytical Bat					
uniD:	HP_R_000	204A-180780	Units:	ug/Kg		Lat	Sample		Client Sa	mole i	D		
nalysis Date:	: 02/04/200	0 10:58	Analyst:	CJ		000	10628-0	1A	SB-1-0-2		_		
Í		Analyte		Result f	Rep Limit								
	Benzene			ND	1.0								
k	Ethylbenzene				1.0								
2	Xylenes, Total			ND	1.0								
l E	Surr: 1,4-Difluore Surr: 4-Bromoflu	obenzene lorobenzene		96.3 105.1	59-127 48-156								
				Lab	oratory Contro	l Sample (L	<u>_CS)</u>						
		RunID:	ł	IP R 000;	204A-180777	Units: u	ia/Ka						
		Analysis	Date: 0	2/04/200	0 7:42	Analyst: 0	CJ						
		· · · · · · · · · · · · · · · · · · ·				,							
l f													
			Analyte		Spike	Result	Perce	nt Lower	Upper				
					Added		Recov	ery Limit	Limit				
		Benzene	· · · · · · · · · · · · · · · · · · ·		5	50 51		101 60	116				
		Ethylbenze	ene			50 49)	97 68	127				
1		Toluene			<u>ب</u>	50 49	•	98 64	122				
		Xylenes,To	otal		15	50 147		98 68	129				
		<u></u>					(110)						
			<u>Matrix S</u>	ipike (MS	5) / Matrix Spik	e Duplicate	<u>(MSD)</u>						
•		Sampl	e Spiked:	0002004	47-01								
		RunID	:	HP_R_00	00204A-180778	Units:	ug/Kg						
		Analys	sis Date:	02/04/20	000 8:48	Analyst:	CJ						
L													
	Analyte		Sample Result	MS Spike	MS Result	MS % Recovery	MSD Spike Added	MSD Result	MSD % Recovery	RPD	Limit	Low Limit	Lim
enzene			ND	20	16	78.1	20	15	73.9	5.52	34	35	13
hylbenzene			ND	20	15	76.0	20	15	72.7	4.51	35	31	13
oluono			ND	20	15	76.9	20	15	74.1	3.69	28	31	13
oluelle													

Qualifiers:

100

ND/U - Not Detected at the Reporting Limit

* - Recovery Outside Advisable QC Limits

B - Analyte detected in the associated Method Blank

11 . 11

J - Estimated value between MDL and PQL

D - Recovery Unreportable due to Dilution



Quality Control Report

Brown & Caldwell

Key Energy #18347.001

	34400130								Lab	Batch ID:	R86	46		
- <u></u>		Metho	d Blank				Sar	nples in	Analytical Ba	itch:		<u> </u>		
unID:	HP R 00020	4B-180788	Units:	ma/Ka			1 -1		. 10	011-011-0				
holyeis Date:		10.58	Analyst	CI			<u>Lat</u>	10628-0		SB_1_0_2	ample	<u>ID</u>		
larysis Date.	02/04/2000	10.50	Analysi.	03			000	10020-0		00-1-0-2				
	Ar	nalyte		Result F	Rep Limit									
G	asoline Range Orga	anics		ND	0.10									
	Surr: 1,4-Difluorobe	enzene		99.3	63-122									
1 -	Surr: 4-Bromofluor	obenzene		80.9	39-150									
<u>├</u>	<u> </u>		<u> </u>	Lab	oratory Con	ntrol S	ample (l	<u>.CS)</u>						
		RunID:		HP_R_000	204B-180784	Un	its: r	ng/Kg						
i		Analysis	Date:	02/04/200	0 8:15	An	alyst: (CJ						
i i		· · · · · · · · · · · · · · · · · · ·												
ı	ſ		Analida				Booult	Baraa	at Lower	Upper				
1			Anaiyu	e	Ad	ded	Result	Recov	erv Limit	Limit				
•		Gasoline R	ange Organ			1	0.71		71 44	122				
1	ł	Casoline 1	ange Organ		l	•	0.71	· I		122				
								<u> </u>						
			Matrix S	Spike (MS	<u>6) / Matrix S</u>	pike D	uplicate	(MSD)						
		Sample	e Spiked:	0002004	47-01									
		RunID:		HP_R_00	00204B-18078	16 L	Inits:	mg/Kg						
1		Analysi	s Date:	02/04/20	000 9:52	A	nalyst:	CJ						
ý.		,					-							
J	Analyte		Sample	MS	MS Resul	t I	MS %	MSD	MSD Result	MSD %	RPD	RPD	Low	Hig
			Result	Spike		R	ecovery	Spike		Recovery		Limit	Limit	Lim
Å				Added				Added						
asoline Range	e Organics		ND	0.9	0	.64	70.9	0.9	0.1	78.1	9.66	50	26	1.
					<i>- ·</i>									
i														
j –														

Qualifiers:

ND/U - Not Detected at the Reporting Limit

* - Recovery Outside Advisable QC Limits

B - Analyte detected in the associated Method Blank

J - Estimated value between MDL and PQL

D - Recovery Unreportable due to Dilution

00010628 Page 19 2/8/00 3:47:24 PM



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HOUSTON LABORATORY 8880 INTERCHANGE DRIVE HOUSTON, TEXAS 77054 (713) 660-0901

Quality Control Report

Brown & Caldwell

					Key Energ	gy #1	8347.001							
Analysis: lethod:	Purgeable SW8021B	Aromatic	S						Wo Lab	rkOrder: Batch ID:	000 ⁻ R86	10628 86		
		Meth	od Blank				Sar	nples in	Analytical B	atch:				
RuniD:	HP_R_0002	05A-181747	Units:	ug/Kg			Lab	Sample	<u> ID</u>	Client Sa	mple	D		
nalysis Dat	e: 02/05/2000	0 2:30	Analyst:	CJ			000	10628-0	2A	SB-1-2-4				
	A	nalvte		Result	Rep Limit									
ł. P	Benzene			ND	1.0									
	Ethylbenzene			ND	1.0									
ł	Vienes Total				1.0									
	Surr: 1,4-Difluorol	benzene		95.0	59-127									
	Surr: 4-Bromofluo	robenzene		100.1	48-156									
				Lat	ooratory Co	ntrol	Sample (L	.CS)		·····				
		RunID:	:	HP_R_000)205A-181745	ι	Jnits: u	ıg/Kg						
		Analys	is Date:	02/05/20	00 1:11	A	Analyst: C	CJ						
			Analyte	}	S	oike	Result	Perce	nt Lower	Upper				
			•		A	dded		Recov	ery Limit	Limit				
		Benzene				5	0 46	1	91 6	0 116				
		Ethylben	zene			5	0 45	;	90 6	3 127				
		Toluene	·····			5	0 46	5	91 6	4 122				
		Xylenes,	Fotal			15	0 137		91 6	3 129				
,														
			Matrix S	Spike (M	S) / Matrix S	Spike	e Duplicate	(MSD)						
1		Sam	ple Spiked:	000200	47-13									
		Runi	D:	HP_R_0	00205A-1822	83	Units:	ug/Kg						
		Anal	ysis Date:	02/07/2	2000 12:16		Analyst:	CJ						
	Analyte		Sample	MS	MS Resu	lt	MS %	MSD	MSD Result	MSD %	RPD	RPD	Low	High
ĺ			Result	Spike Added			Recovery	Spike Added		Recovery		Limit	Limit	Lim
Benzene			ND	20		17	83.0	20	1	6 80.2	3.43	34	35	13
	e		ND	20		16	81.8	20	1	6 78.3	4.38	35	31	13
thylbenzen	A REAL PROPERTY AND A REAL		NO	20		17	82.6	20	1	5 77.4	6.52	28	31	13
thylbenzen Foluene			ND											
Ethylbenzen Foluene Kylenes,Tota	al			60		49	81.7	60	4	7 78.3	4.17	38	19	14

Qualifiers:

ND/U - Not Detected at the Reporting Limit

* - Recovery Outside Advisable QC Limits

B - Analyte detected in the associated Method Blank

J - Estimated value between MDL and PQL

D - Recovery Unreportable due to Dilution

00010628 Page 20 2/8/00 3:47:24 PM Chain of Custody And Sample Receipt Checklist Chain of Custody And Sample Receipt Checklist

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450 Hugher Drive 450 Hugher Drive Trav	Other []	48hr 🖸 Standard 🖄	24hr 🗋 72hr 🗋	1	Requested TAT		Client/Consultant Remarks:	TDW	SB-4-11.8-12.5	SB-11-10-11	53-17-6-8	513-3-9-1	58-3-4-6	58-2-6,5-7.5	5B-2-4-6	Sz-1-2-4	53-1-0-2	SAMPLE ID	Invoice To: Den Giberson	Project Location: 15663 / 1)?	Project Number: 1. 5 7. 2	Project Name: Koy Engra	Client Contact: Dan G. C.	Address Phone: 14 15 Lears rung	Circuit Name: Grown L()	For rol	
Houston, T verse City, M	5. Relinquished	3. Kelinquished	1. Relindetinghed	Yan	Special Reporti		1	1/25/00	1/25/00	1 2500	11200	1/2/00	1/24/00	1124/00	1/24/00	1/24/00	1/4/00	DATE	Ĵ.	11	00	ц Ц		HIGN HAR	العت	A	
X 77054 (71 11 49684 (61)	l by:	l by/	by Sampler.	D So puero	ng Requirement				1206	0949	8942 /	2202	12/52	1339	1333	1037	626	TIME						213 213		alysis Re	
3) 660-090 5) 947-577				Level 3	¹⁵ Fax Res		1							\sum	\sum			omp grab						1.25.5	5	quest &	Sb
7 1				Я П	DI SIIN	-	aboratory ren	S 4	5	S C	56	5	SG	SG	5	5	5	W SL P=	=wa =slu plas	ter Idge tic	S= 0: A=	=soi =oti =am	l her: ber	glass	natrix bot	Chain o	L, Inc
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500 Amt		Ē	E.	× D	Is D *			None .	None	None	None	Vorie	Vene	Hore	lane.	Use	Ane	1 = 3 =	HCI H2S	1 504	2 = O=	=HN =oti	VO3 her:		pres.	y Recor	
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8) 237-477	000			BHF	view (initial):		ND A													******						of	84670

Asso Interchange Drive, 4ss Hughes Drive, Try	Other	48hr 🗋 Sundard 🖾	24hr 🔲 72hr 🔲	ну <u>сонально</u> }=	Requested TAT		Client/Consultant Remarks:			is		~	J.	Client Name: Brocen 4. AddrewPhone: 1415 Lee 4252 Client Contact: Dan 6. Client Contact: Dan 6. Project Name: Key Ener Project Number: 16347.00 Project Location: 16347.00 Project Location: 1605.1
Houston, TX 77054 (713) 66 erro City, 141 49684 (516) 94	5. Relinquished by:	3. Rephquished by:	1. Relinquished by Sampler	/ Standard 9C D	Special Reporting Requirements							10/0	1/2c/an	Analysis Reques
30-0901 D	date	defec 1	Jz//	Level 3 QC	Fax Results X Raw D		Laboratory remarks:					 	WV 40	W=water S=soil SL=sludge O=other: P=plastic A=amber glass of Chain of Custo G=glass V=vial 1=1 liter 4=4oz 40=vial site 8=8oz 16=16oz
500 Ambassador (time	time	600 105 6	Ŕ	ata 🔲 Special Detecti								2	1=HCl 2=HNO3 Proceed 3=H2SO4 O=other: Proceed Number of Containers
Caffery Parkway, Scott, LA 705	6. Received by Laboratory	4. Received by:	2. Received by:		on Limits (specify):	Tem	Intac							SPL. Workender Nec OOOLOG 28 Requested Analy
583 (318) 237- 4 775	July 1/27		•	AN G	PM review (initial):	ip: Cl								084672 page Z of Z



Sample Receipt Checklist

Workorder:	00010628		Received by:		Stelly, D'Anna
Date and Time Received:	1/27/00 10:00:00 AM		Carrier name:		FedEx
Temperature:	4				
Shipping container/cooler in	good condition?	Yes 🔽	No 🗌	Not Present	
Custody seals intact on ship	pping container/cooler?	Yes 🔽	No	Not Present	
Custody seals intact on sam	ple bottles?	Yes	No	Not Present	
Chain of custody present?		Yes 🔽	No 🗋		
Chain of custody signed whe	en relinquished and received?	Yes 🔽	No		
Chain of custody agrees with	n sample labels?	Yes 🔽	No 🗌		
Samples in proper container	/bottle?	Yes 🗸	No 🗌		
Sample containers intact?		Yes 🖌	No 🗔		
Sufficient sample volume for	r indicated test?	Yes 🗸	No 🗌		
All samples received within	holding time?	Yes 🔽	No 🗌		
Container/Temp Blank temp	erature in compliance?	Yes 🔽	No		
Water - VOA vials have zero	headspace?	Yes	No 🗌	Not Present	
Water - pH acceptable upon	receipt?	Yes	No 🔽		

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APPENDIX C

Water Well Search

P:\Wp\KEYENRGY\18347\005r.doc

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Use or disclosure of data contained on this sheet is subject to the restriction specified at the beginning of this document.



Water Well Report[™]

February 15, 2000

CLIENT

Brown & Caldwell

1415 Louisiana, Suite 2500

Houston, TX 77002

SITE

Key-Hobbs

1300 Northwest County Road

Hobbs, New Mexico

021500-014

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Water Well Report[™]

DETAILS

·		
State ID	324257103105101	MAP ID
Banks ID	3502501398	1
Owner Of Well	PITTMAN, WAYNE	
Type Of Well	Irrigation	
Depth Drilled	100 '	
Completion Date	N/A	
Longitude	-103.18083333	
Latitude	32.7158333333	
···· ··· ··· · · · · · · · · · · · · ·		
State ID	324301103101001	MAPID
Banks ID	3502501400	2
Owner Of Well	AMERADA PET. CO.	
Type Of Well	Unused	
Depth Drilled	N/A '	
Completion Date	N/A	
Longitude	-103.16944444	
Latitude	32.716944444	
State ID	324308103104301	MAPID
Banks ID	3502501408	3
Owner Of Well	N/A	
Type Of Well	N/A	,
Depth Drilled	N/A '	
Completion Date	N/A	
Longitude	-103.17861111	
Latitude	32,71888888889	

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Barna Information

Latitude

Sources are.

Water Well Report[™]

DETAILS

State ID	324309103104701	MAP ID
Banks ID	3502501412	4
Owner Of Well	N/A	
Type Of Well	Unused	
Depth Drilled	N/A '	
Completion Date	N/A	
Longitude	-103.17972222	
Latitude	32.7191666667	
State ID	324315103103201	MAPID
Banks ID	3502501416	5
Owner Of Well	RYLANT, W.L.	
Type Of Well	Domestic	
Depth Drilled	N/A '	
Completion Date	N/A	
Longitude	-103.17555556	
Latitude	32.7208333333	
State ID	324302103105801	MAP ID
Banks ID	3502501401	6
Owner Of Well	MCCOMBS, LAVERN	[
Type Of Well	Unused	
Depth Drilled	N/A '	
Completion Date	N/A	
Lonaitude	-103.18277778	

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32.7172222222



K.

Banks

TM Water Well Report

DETAILS

324256103110201	MAP ID
3502501396	7
N/A	
N/A	
N/A '	
N/A	
-103.18388889	
32.715555556	
324313103105201	MAP ID
3502501414	8
SAYRE, J.W.	
Domestic	
111'	-
N/A	
-103.18111111	
32.7202777778	
324254103110701	
3502501395	9
N/A	
Unused	
N/A '	
N/A	
-103.18527778	
32.715	
	324256103110201 3502501396 N/A -103.1838889 32.715555556 324313103105201 3502501414 SAYRE, J.W. Domestic 111' N/A -103.1811111 32.7202777778 324254103110701 3502501395 N/A Unused N/A' N/A -103.18527778 32.715

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Water Well Report

DETAILS

State ID	324248103094901	MAP ID
Banks ID	3502501384	10
Owner Of Well	TIDEWATER OIL CO.	
Type Of Well	Irrigation	
Depth Drilled	N/A '	
Completion Date	N/A	
Longitude	-103.16361111	
Latitude	32.713333333	
State ID	324245103111801	MAP ID
Banks ID	3502501382	11
Owner Of Well	OHIO OIL CO.	
Type Of Well	Unused	
Depth Drilled	55 '	
Completion Date	N/A	
Longitude	-103.18833333	
Latitude	32.7125	
State ID	324322103105501	MAPID
Banks ID	3502501430	12
Owner Of Well	N/A	
Type Of Well	N/A	
Depth Drilled	70 '	
Completion Date	N/A	
Longitude	-103.18194444	
Latitude	32 722777778	

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Water Well Report[™]

DETAILS

State ID	324321103095801	MAP ID
Banks ID	3502501426	13
Owner Of Well	N/A	
Type Of Well	Unused	
Depth Drilled	N/A '	· · ·
Completion Date	N/A	
Longitude	-103.16611111	
Latitude	32.7225	
· · · · · · · · · · · · · · · · · · ·		
State ID	324218103094801	MAP ID
Banks ID	3502501360	14
Owner Of Well	AMERADA PET. CO.	
Type Of Well	Unused	
Depth Drilled	76 '	
Completion Date	N/A	
Longitude	-103.16333333	
Latitude	32.705	
State ID	324221103111501	MAP ID
Banks ID	3502501364	15
Owner Of Well	JONES, V.R.	
Type Of Well	Domestic	
Depth Drilled	60 '	
Completion Date	N/A	
Longitude	-103.1875	
Latitude	32,7058333333	

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Water Well Report[™]

DETAILS

State ID	324303103112301	MAP ID
Banks ID	3502501402	16
Owner Of Well	AMERADA	
Type Of Well	Domestic	
Depth Drilled	120 '	
Completion Date	N/A	
Longitude	-103.18972222	
Latitude	32.7175	
State ID	324333103101101	MAPID
Banks ID	3502501442	17
Owner Of Well	NOLEN, KEN, AND NOLEN CONSTRUCTIO	I
Type Of Well	Domestic	
Depth Drilled	102 '	
Completion Date	4/26/93	
Longitude	-103.16972222]
Latitude	32.7258333333	

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Water Well Report

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SUMMARY

Water Well Report[™] Research Mapping Protocol

Banks Information Solutions, Inc. Water Well Report™ is prepared from existing state water well databases and additional file data/records research conducted at the State Engineers Office located in Roswell, New Mexico. In New Mexico, water wells are located within a grid system using section, township, and range. The locations of these wells on the enclosed map were plotted using a GIS program, ArcView 3.2, with the aid of the section, township, and range of the wells provided by the drillers logs.

Banks Information Solutions, Inc. has performed a thorough and diligent search of all groundwater well information provided and recorded with the New Mexico State Engineers Office. All mapped locations are based on information obtained from the NMSEO. Although Banks performs quality assurance and quality control on all research projects, we recognize that any inaccuracies of the records and mapped well locations could possibly be traced to the appropriate regulatory authority or the actual driller. It may be possible that some water well schedules and logs have never been submitted to the regulatory authority by the water driller and, thus, may explain the possible unaccountability of privately drilled wells. It is uncertain if the above listing provides 100% of the existing wells within the area of review. Therefore, Banks Information Solutions, Inc. cannot fully guarantee the accuracy of the data or well location(s) of those maps and records maintained by the New Mexico State Engineer regulatory authorities.

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