1R - 426-281

WORKPLANS

Date:
5-3-11

Rice Environmental Consulting & Safety
P.O. Box 5630 Hobbs, NM 88241
Phone 575.393.4411 Fax 575.393.0293

CERTIFIED MAIL
RETURN RECIEPT NO. 7008 1140 0001 3070 5689

May 3rd, 2011

Mr. Edward Hansen
New Mexico Energy, Minerals, & Natural Resources
Oil Conservation Division, Environmental Bureau
1220 S. St. Francis Drive
Santa Fe, New Mexico 87505

RE: **INVESTIGATION & CHARACTERIZATION PLAN**
Rice Operating Company – BD SWD System
BD G-23 EOL (1R426-281): UL/G sec. 23 T22S R37E
(formerly BD B-23 EOL)

Mr. Hansen:

RICE Operating Company (ROC) has retained Rice Environmental Consulting and Safety (RECS) to address potential environmental concerns at the above-referenced site in the BD Salt Water Disposal (SWD) system. The site was previously referred to as the BD B-23 EOL. However, the site name has changed to the BD G-23 EOL to match its geographical location. All future correspondence will reference BD G-23 EOL.

ROC is the service provider (agent) for the BD SWD System and has no ownership of any portion of the pipeline, well, or facility. The system is owned by a consortium of oil producers, System Parties, who provide all operating capital on a percentage/usage basis. Environmental projects of this nature require System Party AFE approval prior to work commencing at the site. In general, project funding is not forthcoming until NMOCD approves the work plan. Therefore, your timely review of this submission is greatly appreciated.

For all such environmental projects, ROC will choose the path forward that:

- Protects public health,
- Provides the greatest net environmental benefit,
- Complies with NMOCD Rules, and
- Is supported by good science.

Each site shall generally have three submissions:

1. This Investigation and Characterization Plan (ICP) is proposed for gathering data and site characterization and assessment.

2. Upon evaluating the data and results from the ICP, a recommended remedy will be submitted in a Corrective Action Plan (CAP) if warranted.

3. Finally, after implementing the remedy, a Termination Request with final documentation will be submitted.

Background and Previous Work

The site is located approximately 4 miles south-east of Eunice, New Mexico at UL/G sec. 23 T22S R37E as shown on the Site Location Map (Figure 1). NM OSE records indicate that groundwater will likely be encountered at a depth of approximately 59 +/- feet.

In 2010 ROC initiated work on the former BD G-23 EOL junction box. The former junction box contained a boot. The site was delineated using a backhoe to form a 25 ft x 10 ft x 12 ft deep excavation and soil samples were screened at regular intervals for both hydrocarbons and chlorides. From the excavation, the four-wall composite, the bottom composite and the backfill were taken to a commercial laboratory for analysis. Laboratory tests of the four-wall composite showed a chloride reading of 3,320 mg/kg and negligible gasoline range organics (GRO) and a diesel range organics (DRO). The bottom composite showed a chloride laboratory reading of 9,520 mg/kg and negligible GRO and DRO readings. The soil was blended on site and a sample taken to a commercial laboratory for analysis. Laboratory analysis of the blended backfill showed a chloride reading of 4,560 mg/kg and negligible GRO and DRO readings. The blended backfill was returned to the excavation to 5 ft below ground surface (bgs). At 5-4 ft bgs, a 1 foot clay layer was installed and a clay compaction test was performed on March 1st, 2010. The remaining backfill was hauled to a NMOCD approved facility for disposal. The remaining excavation was backfilled with clean, imported soil to ground surface.

The area was contoured to the surrounding landscape, seeded, and an identification plate was placed on the surface of the site to mark its location for future environmental considerations. NMOCD was notified of potential groundwater impact on August 4th, 2010 and a junction box disclosure report (Appendix A) was submitted to NMOCD with all the 2010 junction box closures and disclosures.

ROC proposes additional investigative work at the site to determine if there is potential for groundwater degradation from residual chlorides and hydrocarbons at the site.

Proposed Work Elements

1. Conduct vertical and lateral delineation of residual soil hydrocarbons and chlorides from samples taken using a drill rig, hand auger, and/or backhoe (see Appendix B for Quality Procedures).
    a. Vertical sampling will be conducted until the following criteria are met in the field.
        i. Three samples in which the chloride concentration decreases and the third sample has a chloride concentration of $\leq$ 250 ppm; and,

ii. Three samples in which PID readings decrease and the third sample has a PID reading of ≤ 100 ppm; or,
iii. The sampling reaches the capillary fringe.

b. Lateral sampling will be conducted until the following criteria are met in the field.
i. A decrease is observed in chloride concentrations between lateral bores at similar depths; and,
ii. A chloride concentration of ≤ 250 ppm is observed in a lateral surface sample; or,
iii. Safety concerns impede further lateral delineation.

2. If warranted, install a monitor well to provide direct measurement of the potential groundwater impact at the site. (All monitor wells will be installed by EPA, NMOCD, and industry standards.)
3. Evaluate the risk of groundwater impact based on the information obtained.

If the evaluation of the site shows no threat to groundwater from residual chlorides, then only a vadose zone remedy will be undertaken. However, if groundwater shows impact from residual chlorides, a CAP will be developed to address these concerns.

ROC appreciates the opportunity to work with you on this project. Please call Hack Conder at (575) 393-9174 or me if you have any questions or wish to discuss the site.

Sincerely,

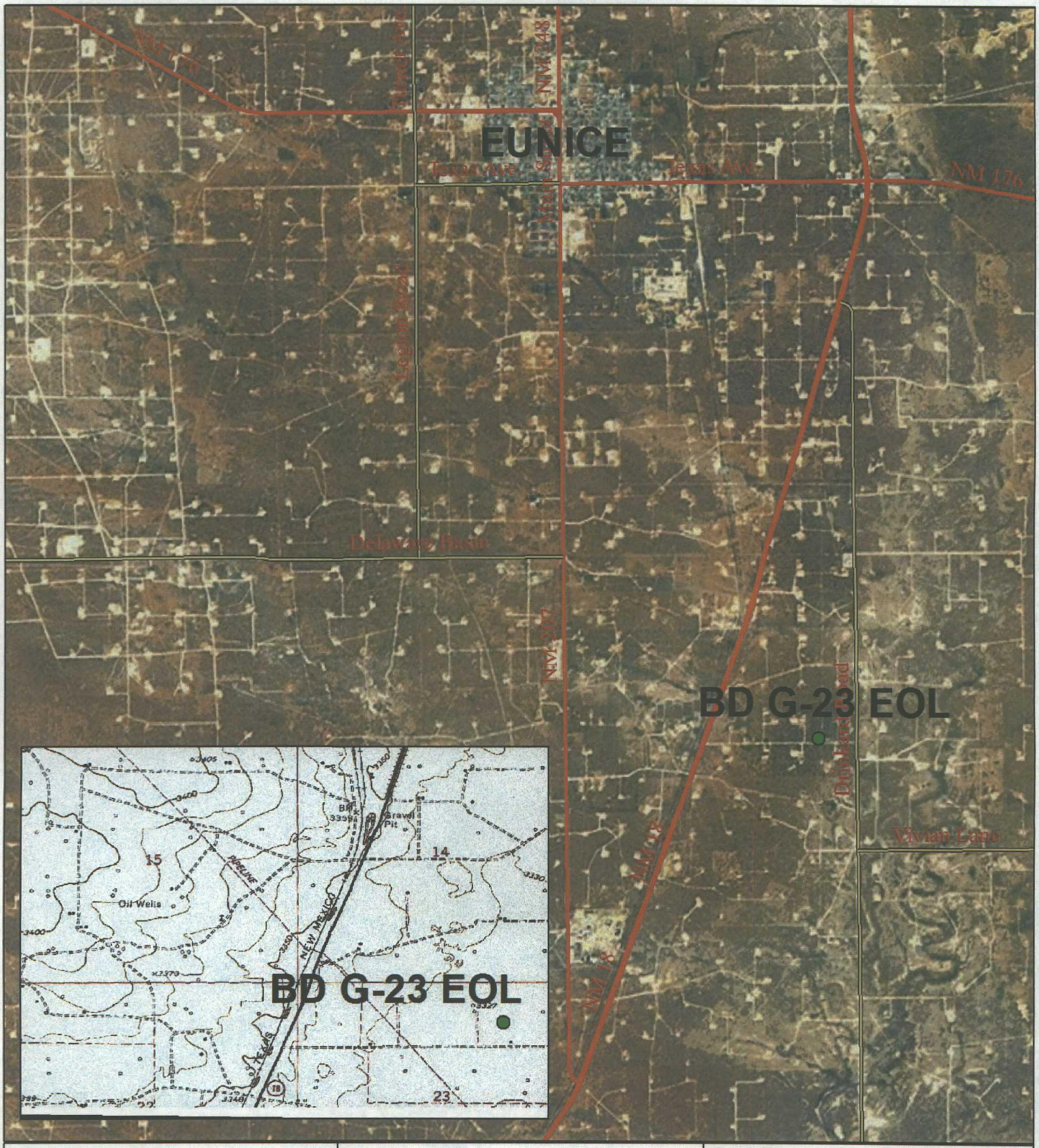
Lara Weinheimer
Project Scientist
RECS
(575) 441-0431

Attachments:
Figures – Site location map
Appendix A – Junction Box Disclosure Report
Appendix B – Quality Procedures

Figures

RICE Environmental Consulting and Safety (RECS)
P.O. Box 5630 Hobbs, NM 88241
Phone 575.393.4411 Fax 575.393.0293

Site Map



RICE ENVIRONMENTAL CONSULTING & SAFETY, LLC — RECS

BD G-23 EOL

LEGALS: UL/G sec. 23
T22S R37E

NMOCD Case # : 1R426-281

N
W E
S

0 2,000 4,000 8,000
Feet

Drawing date: 5.2.11
Drafted by: L. Weinheimer

Appendix A

Junction Box Disclosure Report

RICE Environmental Consulting and Safety (RECS)
P.O. Box 5630 Hobbs, NM 88241
Phone 575.393.4411 Fax 575.393.0293

RICE OPERATING COMPANY
JUNCTION BOX DISCLOSURE* REPORT

BOX LOCATION

SWD SYSTEM	JUNCTION	UNIT	SECTION	TOWNSHIP	RANGE	COUNTY	BOX DIMENSIONS - FEET		
							Length	Width	Depth
Blinebry-Drinkard (BD)	B-23 EOL	B	23	22S	37E	Lea	8'	6'	4'
							eliminated		

LAND TYPE: BLM ___ STATE ___ FEE LANDOWNER Waico Ranch, LLC OTHER ___

Depth to Groundwater 59 feet NMOCD SITE ASSESSMENT RANKING SCORE: 40*

Date Started 2/1/2010 Date Completed 3/1/2010 OCD Witness no

Soil Excavated 111.1 cubic yards Excavation Length 25 Width 10 Depth 12 feet

Soil Disposed 108 cubic yards Offsite Facility Sundance Location Eunice, NM

FINAL ANALYTICAL RESULTS: **Sample Date** 2/8/2010 **Sample Depth** 12'

Procure 5-point composite sample of bottom and 4-point composite sample of sidewalls. TPH and Chloride laboratory test results completed by using an approved lab and testing procedures *pursuant to NMOCD guidelines.*

Sample Location	PID (field) ppm	GRO mg/kg	DRO mg/kg	Chlorides mg/kg
4-WALL COMP.	0.0	<10.0	<10.0	3,320
BOTTOM COMP.	0.1	<10.0	<10.0	9,520
BACKFILL COMP.	0.0	<10.0	<10.0	4,560

CHLORIDE FIELD TESTS

LOCATION	DEPTH	mg/kg
4-wall comp.	n/a	2,356
bottom comp.	12'	5886
backfill comp.	n/a	4,294
vertical delineation trench at 5 ft south of the junction (source)	2'	2,332
	4'	1,783
	6'	4,457
	8'	2,775
	10'	5,216
	12'	9,297

General Description of Remedial Action: This junction and line were eliminated during the pipeline replacement/upgrade program. After the former box was removed, an investigation was conducted using a backhoe to collect soil samples at regular intervals producing a 25x10x12-ft deep excavation. Chloride field tests were performed on each sample which did not relent with depth. Organic vapors were measured using a PID, which yielded relatively low concentrations. The excavated soil was blended on site and representative composite samples were collected from the blended backfill, the bottom of the excavation, and the excavation walls. The representative samples were sent to a commercial laboratory for analysis of chloride and TPH. The blended backfill was returned to the excavation to 5 ft below ground surface (bgs). At 5-4 ft. BGS, a 1-ft. thick clay layer was installed and compaction test performed on 3/1/2010. The remaining blended backfill was hauled to a NMOCD approved facility and the remaining excavation was backfilled with clean imported soil to ground surface and contoured to the surrounding area. An identification plate was placed on the surface of the former junction box site to mark the presence of clay below. On 3/25/2010, site was seeded with a blend of native vegetation and is expected to return to a productive capacity at a normal rate. NMOCD was notified of potential groundwater impact on 8/04/2010.

* inactive windmill, housing 614 ft. east

ADDITIONAL EVALUATION IS HIGH PRIORITY

enclosures: photos, lab reports, PID (field) screenings, cross-section, compaction test, hydraulic conductivity, proctor, chloride curve

I HEREBY CERTIFY THAT THE INFORMATION ABOVE IS TRUE AND COMPLETE TO THE BEST OF MY KNOWLEDGE AND BELIEF.

SITE SUPERVISOR Robert Eagans SIGNATURE Robert Eagans COMPANY RICE OPERATING COMPANY

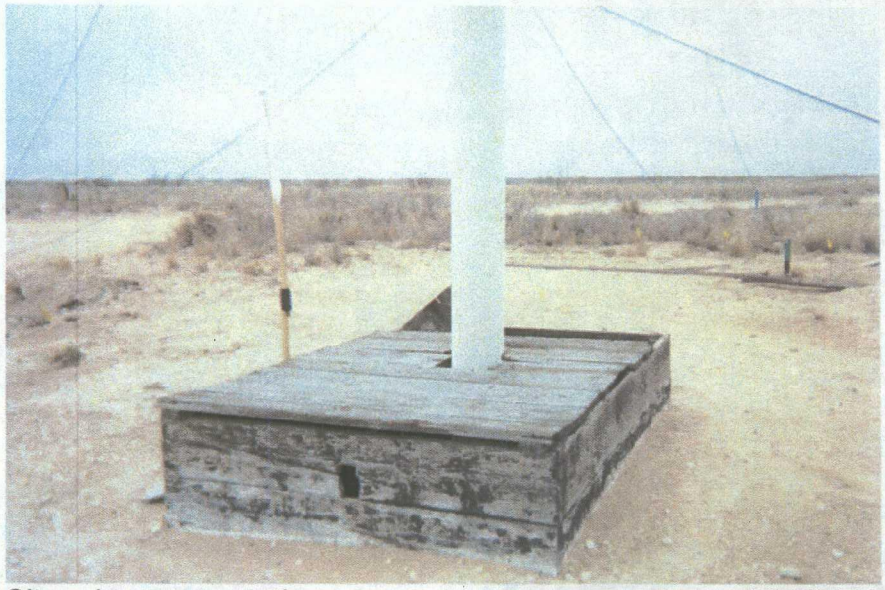
REPORT ASSEMBLED BY Larry Bruce Baker Jr. INITIAL LBB

PROJECT LEADER Larry Bruce Baker Jr. SIGNATURE Larry Bruce Baker Jr. DATE 1-29-11

*This site is a "DISCLOSURE." It will be placed on a prioritized list of similar sites for further consideration.

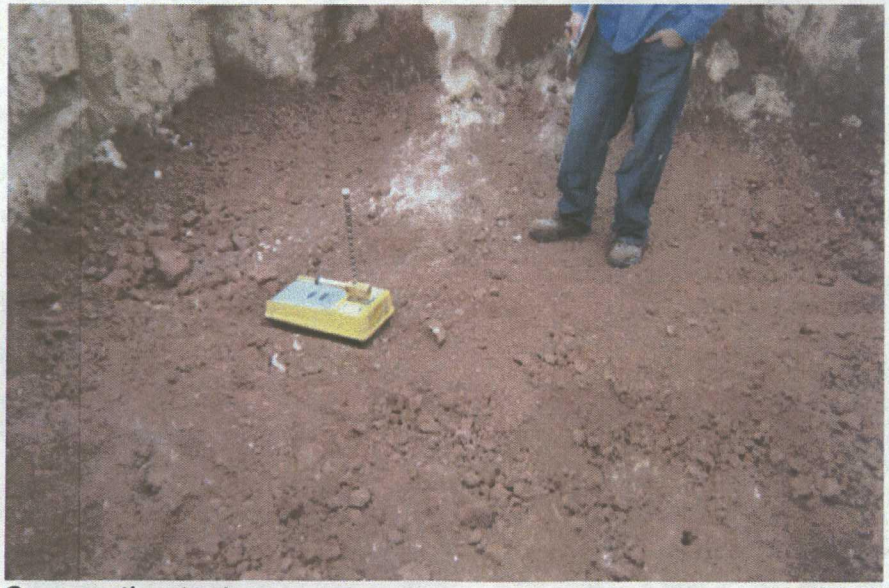
BD B-23 EOL

Unit B, Section 23, T22S, R37E



Site prior to excavation 1/27/2010

Samples being taken 2/1/2010



Compaction test 3/1/2010

Seeding Site 3/25/2010

CARDINAL LABORATORIES

PHONE (575) 393-2326 • 101 E. MARLAND • HOBBS, NM 88240

ANALYTICAL RESULTS FOR
RICE OPERATING COMPANY
ATTN: BRUCE BAKER
122 W. TAYLOR
HOBBS, NM 88240

Receiving Date: 02/08/10
Reporting Date: 02/11/10
Project Number: NOT GIVEN
Project Name: BD JCT. B-23 EOL
Project Location: NOT GIVEN

Sampling Date: 02/08/10
Sample Type: SOIL
Sample Condition: COOL & INTACT
Sample Received By: JH
Analyzed By: AB/HM

LAB NUMBER	SAMPLE ID	GRO (C_6-C_{10}) (mg/kg)	DRO (>C_{10}-C_{28}) (mg/kg)	Cl* (mg/kg)
ANALYSIS DATE		02/11/10	02/11/10	02/09/10
H19230-1	5 PT BOTTOM COMP @ 12'	<10.0	<10.0	9,520
H19230-2	4-WALL COMP.	<10.0	<10.0	3,320
H19230-3	BLENDED BACKFILL	<10.0	<10.0	4,560
Quality Control		526	510	510
True Value QC		500	500	500
% Recovery		105	102	102
Relative Percent Difference		1.0	3.3	2.0

METHODS: TPH GRO & DRO: EPA SW-846 8015 M; Cl^-: Std. Methods 4500-Cl^-B
*Analyses performed on 1:4 w:v aqueous extracts.
Reported on wet weight.

COPY

Chemist

02/11/10
Date

H19230 TCL RICE

CARDINAL LABORATORIES

CHAIN-OF-CUSTODY AND ANALYSIS REQUEST

101 East Marland, Hobbs, NM 88240 2111 Beechwood, Abilene, TX 79603
(505) 393-2326 FAX (505) 393-2476 (325) 673-7001 FAX (325)673-7020

Company Name: Rice Operating Company	BILL TO
Project Manager: Bruce Baker	P.O. #:
Address: 122 W. Taylor	Company:
City: Hobbs State: NM Zip: 88240	Attn:
Phone #: 575-393-9174 Fax #: 575-397-1471	Address:
Project #: Project Owner:	City:
Project Name: BD Jct. B-23 EOL	State: Zip:
Project Location:	Phone #:
Sampler Name: Robert Egans	Fax #:

FOR LAB USE ONLY				MATRIX						PRESERV.			SAMPLING		ANALYSIS REQUEST											
Lab I.D.	Sample I.D.	(G)RAB OR (C)OMP.	# CONTAINERS	GROUNDWATER	WASTEWATER	SOIL	OIL	SLUDGE	OTHER:	ACID/BASE	ICE / COOL	OTHER:	DATE	TIME			CL	TPH 8015M								
H19230-1	SpT Bottom Comp @ 12'	C	1			✓					✓		2-8-10	9:35am			✓	✓								
-2	4-Wall Comp	C	1			✓					✓		2-8-10	10:10am			✓	✓								
-3	Blended backfill	C	1			✓					✓		2-8-10	10:30am			✓	✓								

COPY

PLEASE NOTE: Liability and Damages. Cardinal's liability and client's exclusive remedy for any claim arising whether based in contract or tort, shall be limited to the amount paid by the client for the analyses. All claims including those for negligence and any other cause whatsoever shall be deemed waived unless made in writing and received by Cardinal within 30 days after completion of the applicable service. In no event shall Cardinal be liable for incidental or consequential damages, including without limitation, business interruptions, loss of use, or loss of profits incurred by client, its subsidiaries, affiliates or successors arising out of or related to the performance of services hereunder by Cardinal, regardless of whether such claim is based upon any of the above stated reasons or otherwise.

Relinquished By: Robert Egans	Date: 2-9-10 Time: 4:35	Received By:	Phone Result: ☐ Yes ☐ No Add'l Phone #:
Relinquished By:	Date: 2/8/10 Time: 4:35	Received By: Jodi Henson	Fax Result: ☐ Yes ☐ No Add'l Fax #:
Delivered By: (Circle One) Sampler - UPS - Bus - Other:	Sample Condition Cool: ☐ Yes ☐ No Intact: ☐ Yes ☐ No	CHECKED BY: (Initials) AH	REMARKS: E-Mail Results To: JPurvis@Ricesw0.com BBaker " " " " REgans " " " "

† Cardinal cannot accept verbal changes. Please fax written changes to 505-393-2476

#26

RICE OPERATING COMPANY

122 West Tayor Hobbs, NM 88240
PHONE: (575) 393-9174 FAX: (575) 397-1471
PID METER CALIBRATION & FIELD REPORT FORM

Check Model Number:

	Model: PGM 7300	Serial No: 590-000183			Model: PGM 7600	Serial No: 110-023920
✓	Model: PGM 7300	Serial No: 590-000508			Model: PGM 7600	Serial No: 110-013744
	Model: PGM 7300	Serial No: 590-000504			Model: PGM 7600	Serial No: 110-013676

GAS COMPOSITION: ISOBUTYLENE 100PPM / AIR: BALANCE

LOT NO : 925621	EXPIRATION DATE: 9-27-2012
FILL DATE: 9-28-09	METER READING ACCURACY: 100ppm

ACCURACY : +/- 2%

SYSTEM	JUNCTION	UNIT	SECTION	TOWN SHIP	RANGE
BD	B-23 EOL	B	23	22	37

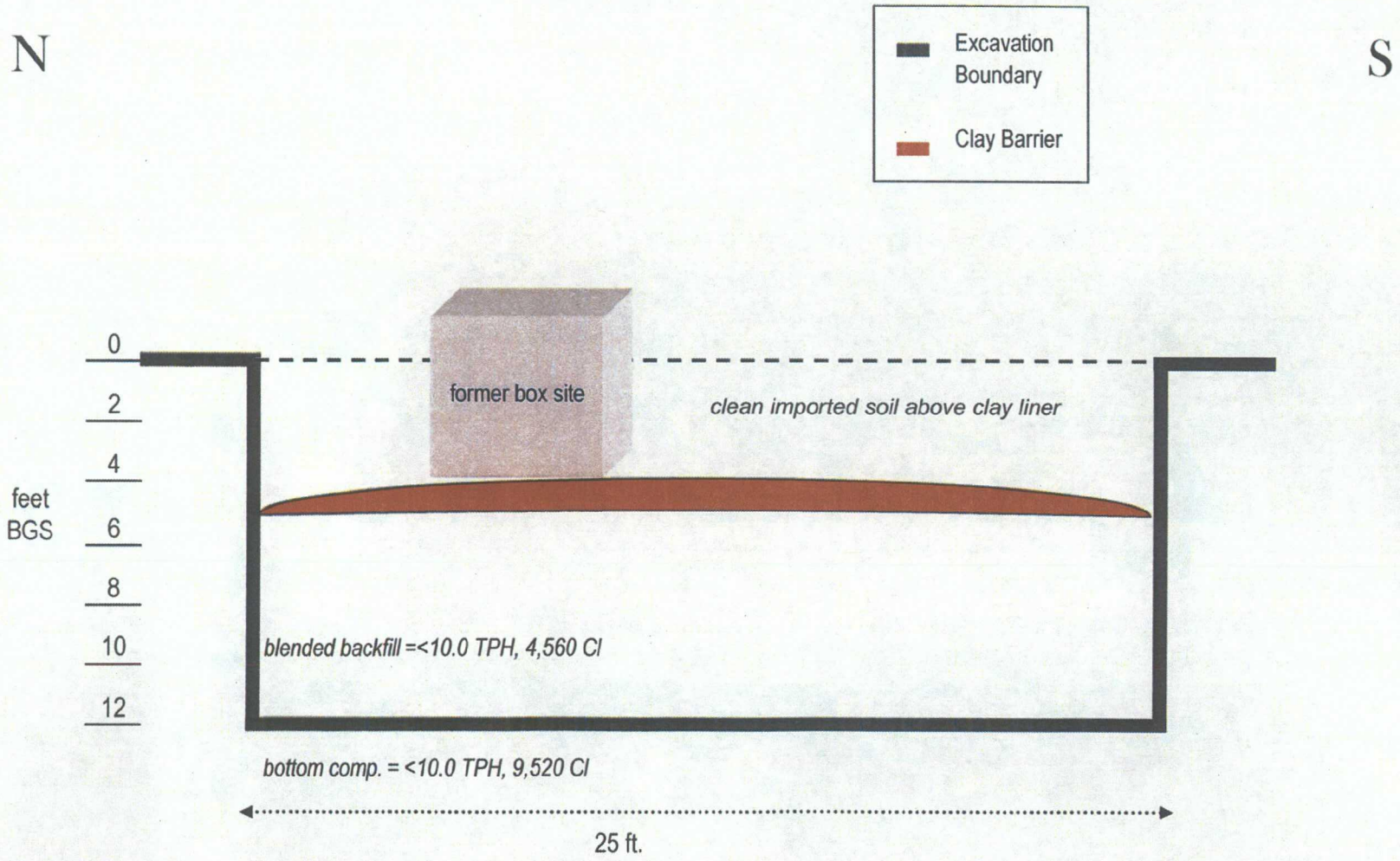
SAMPLE ID	PID	SAMPLE ID	PID
Bottom 5pt Comp	0.1		
Blended Backfill	0		
4-Wall Composite	0		
		COPY	

I verify that I have calibrated the above instrument in accordance to the manufacture operation manual.

SIGNATUE: Robert Byers DATE: 2-8-2010

BD B-23 EOL
Unit 'B', Sec. 23, T22S, R37E

Excavation Cross-Section



LABORATORY TEST REPORT

PETTIGREW & ASSOCIATES, P.A.
1110 N. GRIMES
HOBBS, NM 88240
(575) 393-9827

AASHTO R18
DEBRA P. HICKS, P.E./L.S.I.
WILLIAM M. HICKS. III, P.E./P.S.

To: Rice Operating Company
122 W. Taylor
Hobbs, NM 88240

Material: Wallach Red Clay

Test Method: ASTM: D 2922

Project: BD B-23 EOL 22/37
Project No. 2010.1061

Date of Test: March 1, 2010

Depth: See Below

Depth of Probe: 12"

Test No.	Location	*Dry Density % Max	% Moisture	Depth
SG 1	Pit - 5' W. & 10' S. of NE Corner	91.6	15.2	FSG

Control Density: 102.3
ASTM: D 698

Optimum Moisture: 20.3%

Required Compaction: 90-95%

Densometer ID: 815

Lab No.: 10 2230

Copies To: Rice Operating

PETTIGREW & ASSOCIATES

BY: Erica M Hart

BY: _____ P.E.

ETTL Engineers & Consultants Inc.

GEOTECHNICAL * MATERIALS * ENVIRONMENTAL * DRILLING * LANDFILLS

HYDRAULIC CONDUCTIVITY DETERMINATION
FLEXIBLE WALL PERMEAMETER - CONSTANT VOLUME
(Mercury Permometer Test)

Project : Pettigrew & Associates, P.A., Hobbs, NM - Project #2010.1028 Report No: 1-1201-000003
Date: 2/5/2010 Panel Number : P 3 ; ASTM D 6084
Project No. : C 4635-101 Permometer Data

Boring No.:		ap =	0.031416	cm2	Set Mercury to Bottom Bar of	Equilibrium	1.8	cm3
Sample:	9540	aa =	0.767120	cm2		Pipet Rp	6.7	cm3
Depth (ft):		M1 =	0.030160	C =	0.000434704	Annulus Ra	1.6	cm3
Other Location:	Wallach Plant Eunice	M2 =	1.040853	T =	0.203780628			

Material Description : Red Clay (Your Sample No 10 1422-1424) Compacted D 698 at 95% of your M/D curve (wet side)

SAMPLE DATA

					Before Test		After Test	
Wet Wt. sample + ring or tare :			561.37	g				
Tare or ring Wt. :			0.0	g				
Wet Wt. of Sample :			561.37	g	Tare No.:	T 6	Tare No.:	T 3
Diameter :	2.77	in	7.05	cm2	Wet Wt.+tare:	731.80	Wet Wt.+tare:	800.51
Length :	2.79	in	7.08	cm	Dry Wt.+tare:	641.75	Dry Wt.+tare:	690.35
Area:	6.04	in^2	38.99	cm2	Tare Wt:	218.78	Tare Wt:	220.69
Volume :	16.84	in^3	275.92	cm3	Dry Wt.:	422.97	Dry Wt.:	469.66
Unit Wt.(wet):	126.95	pcf	2.03	g/cm^3	Water Wt.:	80.15	Water Wt.:	110.18
Unit Wt.(dry):	104.65	pcf	1.68	g/cm^3	% moist.:	21.3	% moist.:	23.5

Specific Gravity: 2.77 Max Dry Density(pcf) = 104.6948 OMC = 21.3136683
% of max = 100.0 +/- OMC = 0.00
Calculated % saturation: 99.58 Void ratio (e) = 0.65 Porosity (n)= 0.39

TEST READINGS

Z1(Mercury Height Difference @ t1): 5.1 cm Hydraulic Gradient = 9.10

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZn (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft/day)	Reset = *
2/5/2010	4740	6	0.656997	25	0.889	1.17E-08	3.32E-05	
2/5/2010	5940	5.9	0.756997	25	0.889	1.09E-08	3.09E-05	
2/5/2010	6900	5.8	0.856997	25	0.889	1.08E-08	3.05E-05	
2/5/2010	7800	5.7	0.956997	25	0.889	1.08E-08	3.05E-05	

SUMMARY

ka = 1.10E-08 cm/sec Acceptance criteria = 25 %

ki			Vm	
k1 =	1.17E-08	cm/sec	6.3	%
k2 =	1.09E-08	cm/sec	1.2	%
k3 =	1.08E-08	cm/sec	2.5	%
k4 =	1.08E-08	cm/sec	2.5	%

$$Vm = \frac{|ka - ki|}{ka} \times 100$$

Hydraulic conductivity	k =	1.10E-08	cm/sec	3.13E-05	ft/day
Void Ratio	e =	0.66			
Porosity	n =	0.39			
Bulk Density	γ =	2.03	g/cm3	127.0	pcf
Water Content	W =	0.36	cm3/cm3	(at 20 deg C)	
Intrinsic Permeability	kint =	1.13E-13	cm2	(at 20 deg C)	

Liquid Limit	LL	
Plastic Limit	PL	
Plasticity Index	PI	
- 200 Sieve		%
+ No 40 Sieve		%
+ No 4 Sieve		%

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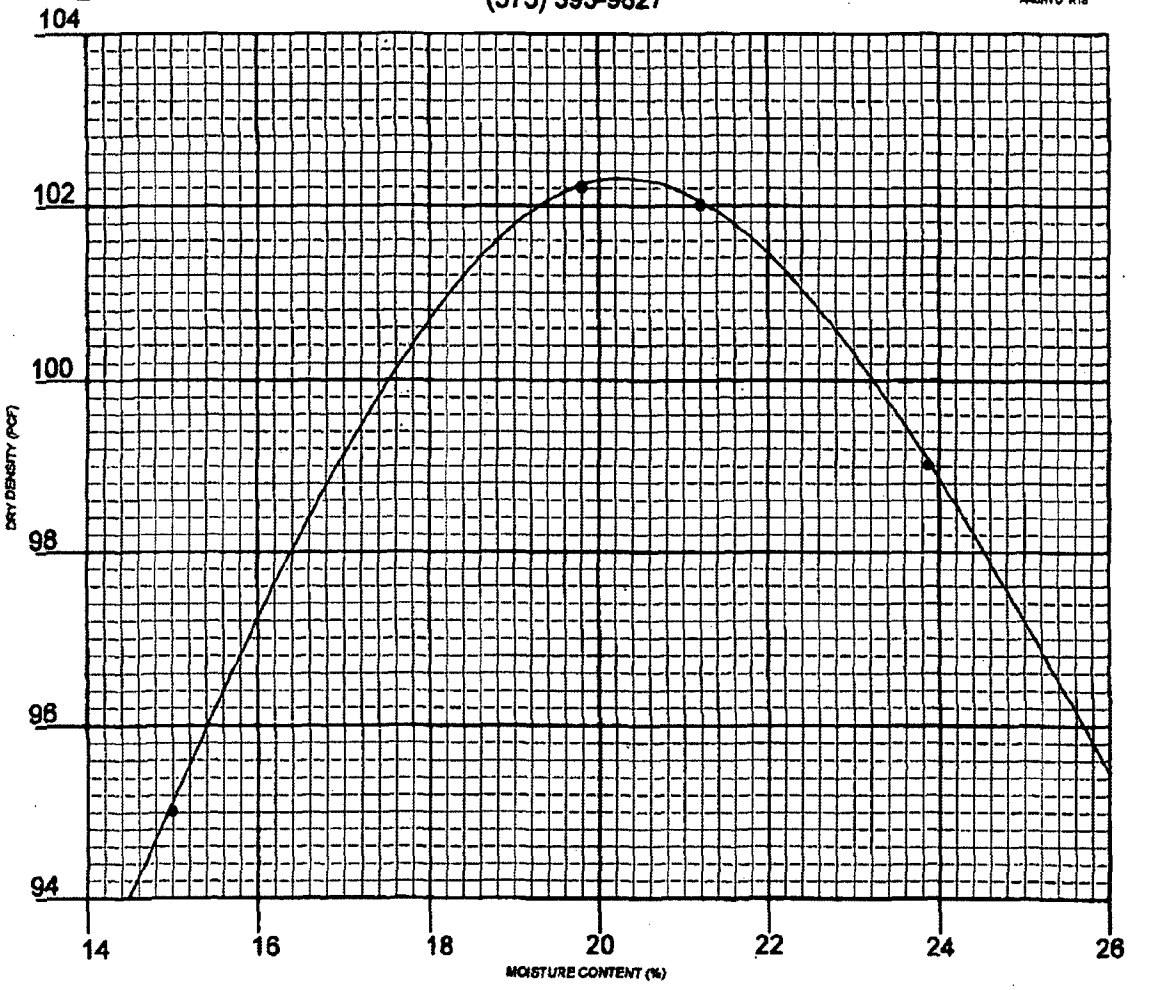
707 West Cotton Street
Longview, Texas 75604-6505
903-758-0915 Phone
903-758-8245 Fax

*Corrected Copy 2/17/10

PETTIGREW & ASSOCIATES, P.A.
1110 N. GRIMES ST.
HOBBS, NM 88240
(575) 393-9827

AASHTO R18



General Information

CLIENT: Rice Operating PROJECT: Project No. 2010.1026

SAMPLE LOCATION: Eunice Wallach Plant

SOIL DESCRIPTION: Wallach Red Clay

SOIL CLASSIFICATION: ____ TEST METHOD: ASTM: D 698

ATTERBERG: LL ____ PI ____ Sampled & Delivered 2/8/10

DATE: 2/12/10 LAB NO. 10 1422-1424

DRY WEIGHT LB/CU. FT. 102.3 MOISTURE CONTENT % 20.3

SIEVE ANALYSIS - % PASSING									

PETTIGREW & ASSOCIATES

BY: Erica M Hart

COPIES: Rice Operating

BY: _____ P.E

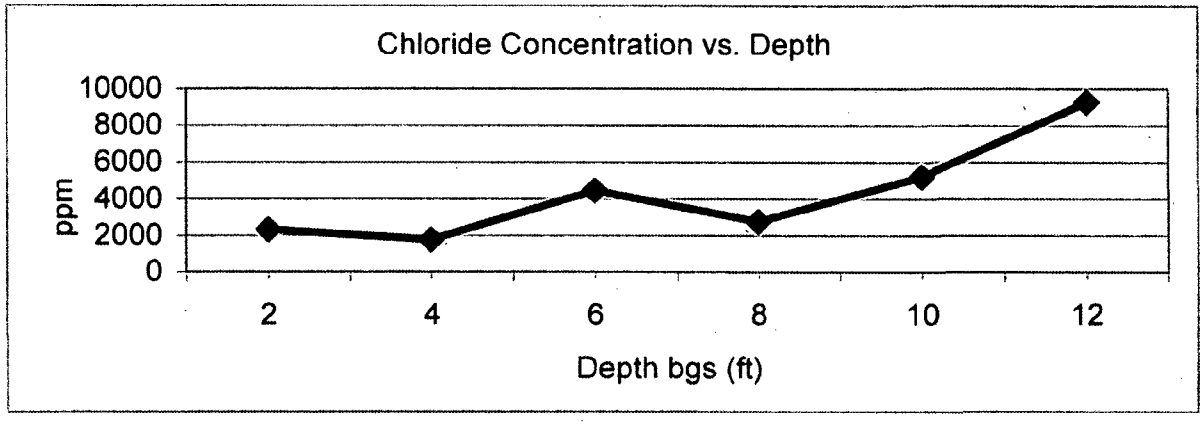
BD Jct. B-23 EOL

Unit 'B', Sec. 23, T22S, R37E

Backhoe samples at 5 ft. south of junction (source)

Depth bgs (ft)	[Cl⁻] ppm
2	2332
4	1783
6	4457
8	2775
10	5216
12	9297

Groundwater = 59 ft



Appendix B
Quality Procedures

RICE Environmental Consulting and Safety (RECS)
P.O. Box 5630 Hobbs, NM 88241
Phone 575.393.4411 Fax 575.393.0293

Rice Environmental Consulting and Safety

Quality Procedures

Table of Contents

Rice Environmental Consulting and Safety

Quality Procedure
Soil Samples for Transportation to a Laboratory

1.0 Purpose

This procedure outlines the methods to be employed when obtaining soil samples to be taken to a laboratory for analysis.

2.0 Scope

This procedure is to be used when collecting soil samples intended for ultimate transfer to a testing laboratory.

3.0 Preliminary

3.1 Obtain sterile sampling containers from the testing laboratory designated to conduct analyses of the soil.

3.2 If collecting TPH, BTEX, RCRA 8 metals, cation /anions or O&G, the sample jar may be a clear 4 oz. container with Teflon lid. If collecting PAH's, use an amber 4 oz. container.

4.0 Chain of Custody

4.1 Prepare a Sample Plan. The plan will list the number, location and designation of each planned sample and the individual tests to be performed on the sample. The sampler will check the list against the available inventory of appropriate sample collection bottles to insure against shortage.

4.2 Transfer the data to the Laboratory Chain of Custody Form. Complete all sections of the form except those that relate to the time of delivery of the samples to the laboratory.

4.3 Pre-label the sample collection jars. Include all requested information except time of collection. (Use a fine point Sharpie to insure that the ink remains on the label.) Affix the labels to the jars.

5.0 Sampling Procedure

5.1 Do not touch the soil with your bare hands. Use new nitrile gloves to help minimize any contamination.

5.2 Go to the sampling point with the sample container. If not analyzing for ions or metals, use a trowel to obtain the soil.

5.3 Pack the soil tightly into the container leaving the top slightly domed. Screw the lid down tightly. Enter the time of collection onto the sample collection jar label.

5.4 Place the sample directly on ice for transport to the laboratory if required.

5.5 Complete the Chain of Custody form to include the collection times for each sample. Deliver all samples to the laboratory.

6.0 Documentation

6.1 The testing laboratory shall provide the following minimum information:

a. Project and sample name.
b. Signed copy of the original Chain of Custody Form including the time the sample was received by the lab.
c. Results of the requested analyses
d. Test Methods employed
e. Quality Control methods and results

Rice Environmental Consulting and Safety

QUALITY PROCEDURE
Chloride Titration Using
0.282 Normal Silver Nitrate Solution

1.0 Purpose

This procedure is to be used to determine the concentration of chloride in soil.

2.0 Scope

This procedure is to be used as the standard field measurement for soil chloride concentrations.

3.0 Sample Collection and Preparation

3.1 Collect at least 80 grams of soil from the sample collection point. Take care to insure that the sample is representative of the general background to include visible concentrations of hydrocarbons and soil types. If necessary, prepare a composite sample for soils obtained at several points in the sample area. Take care to insure that no loose vegetation, rocks or liquids are included in the sample(s).

3.2 The soil sample(s) shall be immediately inserted into a one-quart or larger polyethylene freezer bag. Care should be taken to insure that no cross-contamination occurs between the soil sample and the collection tools or sample processing equipment.

3.3 The sealed sample bag should be massaged to break up any clods.

4.0 Sample Preparation

4.1 Tare a clean glass vial having a minimum 40 ml capacity. Add at least 10 grams of the soil sample and record the weight.

4.2 Add at least 20 grams of reverse osmosis water to the soil sample and shake well.

4.3 Allow the sample to set for a period of 5 minutes or until the separation of soil and water.

5.0 Titration Procedure

5.1 Using a graduated pipette, remove 10 ml extract and dispense into a clean plastic cup.

5.2 Add 2-3 drops potassium chromate (K_2CrO_4) to mixture if necessary.

5.3 Using a 1 ml pipette, carefully add .282 normal silver nitrate (one drop at a time) to the sample while constantly agitating it. Stop adding silver nitrate when the solution begins to change from yellow to red. Be consistent with endpoint recognition.

5.4 Record the ml of silver nitrate used.

6.0 Calculation

To obtain the chloride concentration, insert measured data into the following formula:

$$\frac{.282 \times 35{,}450 \times \text{ml } AgNO_3}{\text{ml water extract}} \times \frac{\text{grams of water in mixture}}{\text{grams of soil in mixture}}$$

Using Step 5.0, determine the chloride concentration of the RO water used to mix with the soil sample. Record this concentration and subtract it from the formula results to find the net chloride in the soil sample.

Record all results on the delineation form.

Rice Environmental Consulting and Safety

Quality Procedure
Development of Cased Water-Monitoring Wells

1.0 Purpose

This procedure outlines the methods to be employed to develop cased monitoring wells.

2.0 Scope

This procedure shall be used for developed, cased water monitoring wells. It is not to be used for standing water samples such as ponds or streams.

3.0 Sample Collection and Preparation

3.1 Prior to development, the static water level and height of the water column within the well casing will be measured with the use of an electric D.C. probe.

3.2 All measurements will be recorded within a field log notebook.

3.3 All equipment used to measure the static water level will be decontaminated after each use by means of Liquinox, a phosphate free laboratory detergent, and water to reduce the possibility of cross-contamination. The volume of water in each well casing will be calculated.

4.0 Purging

4.1 Wells will be purged by using a 2" decontaminated submersible pump or dedicated one liter Teflon bailer. Wells should be purged until the pH and conductivity are stabilized and the turbidity has been reduced to the greatest extent possible.

4.2 If a submersible is used the pump will be decontaminated prior to use by scrubbing the outside surface of tubing and wiring with a Liquinox water mixture, pumping a Liquinox-water mixture through the pump, and a final flush with fresh water.

5.0 Water Disposal

5.1 All purge and decontamination water will be temporarily stored within a portable tank to be later disposed of in an appropriate manner.

6.0 Records

6.1 Rice Environmental Consulting and Safety will record the amount of water removed from the well during development procedures. The purge volume will be reported to the appropriate regulatory authority when filing the closure report.

Rice Environmental Consulting and Safety

Quality Procedure
Sampling of Cased Water-Monitoring Well

1.0 Purpose

This procedure outlines the methods to be employed in obtaining water samples from cased monitoring wells.

2.0 Scope

This procedure shall be used for developed, cased water monitoring wells. It is not to be used for standing water samples such as ponds or streams.

3.0 Preliminary

3.1 Obtain sterile sampling containers from the testing laboratory designated to conduct analyses of the water.

3.2 The following table shall be used to select the appropriate sampling container, preservative method and holding times for the various elements and compounds to be analyzed.

Compound to be Analyzed	Sample Container Size	Sample Container Description	Cap Requirements	Preservative	Maximum Hold Time
BTEX	40 ml	VOA Container	Teflon Lined	HCL	14 days
TPH (8015 Extended)	40 ounces	(2) 40ml VOA vials	Teflon Lined	HCL and Ice	14 days
PAH	1 liter	amber glass	Teflon Lined	Ice	7 days
Cation/Anion	1 liter	HD polyethylene	Any Plastic	None	48 Hrs
Metals	1 liter	HD polyethylene	Any Plastic	Ice/HNO_3	28 Days
TDS	300 ml	clear glass or 250 ml HD polyethylene	Any Plastic	Ice	7 Days
Cl-	500 ml	HD polyethylene	Any Plastic	None	28 Days

4.0 Chain of Custody

4.1 Prepare a Sample Plan. The plan will list the well identification and the individual tests to be performed at that location. The sampler will check the list against the available inventory of appropriate sample collection bottles to insure against shortage.

4.2 Transfer the data to the Laboratory Chain of Custody Form. Complete all sections of the form except those that relate to the time of delivery of the samples to the laboratory.

4.3 Pre-label the sample collection jars. Include all requested information except time of collection. (Use a fine point Sharpie to insure that the ink remains on the label). Affix the labels to the jars.

5.0 Bailing Procedure

5.1 Identify the well from the sites schematics. Place pre-labeled jar(s) next to the well. Remove the plastic cap from the well bore by first lifting the metal lever and then unscrewing the entire assembly.

5.2 Using a dedicated one liter Teflon bailer or submersible pump, purge a minimum of three well volumes. Place the water in storage container for transport to a ROC disposal facility.

5.3 If using a bailer, take care to insure that the bailing device and string does not become cross-contaminated. A clean pair of nitrile gloves should be used when handling either the retrieval string or bailer. The retrieval string should not be allowed to come into contact with the ground.

6.0 Sampling Procedure

6.1 Once the well has been bailed in accordance with 5.2 of this procedure, a sample may be decanted into the appropriate sample collection jar directly from the bailer or submersible pump.

6.2 Note the time of collection on the sample jar with a fine Sharpie.

6.3 Place the sample directly on ice for transport to the laboratory. The preceding table shows the maximum hold times between collection and testing for the various analyses.

6.4 Complete the Chain of Custody form to include the collection times for each sample. Deliver all samples to the laboratory.

7.0 Documentation

7.1 The testing laboratory shall provide the following minimum information:

A. Project and sample name.
B. Signed copy of the original Chain of Custody Form including the time the sample was received by the lab.
C. Results of the requested analyses
D. Test Methods employed
E. Quality Control methods and results

Calculation for Determining the Minimum Bailing Volume for Monitor Wells
Formula V= ($\pi r^2 h$)
2" well [V/231=gal] X 3 = Purge Volume

V=Volume
π=pi
r=inside radius of the well bore
h=maximum height of well bore in water table

Example:

π	r^2	h(in)	V(cu.in)	V(gal)	X 3 Volumes	Actual
3.1416	1	180	565.488	2.448	7.34 gal	>10 gal

Rice Environmental Consulting and Safety

Quality Procedure
Composite Sampling of Excavation Sidewalls and Bottoms For TPH and Chloride Analysis

1.0 Purpose

This procedure outlines the methods to be employed when obtaining final composite soil samples for TPH and Chloride analysis.

2.0 Scope

This procedure is to be used in conjunction with ***Quality Procedure – 02: Soil Samples for Transportation to a Laboratory*** and will be inserted at subparagraph 5.2 of Section 5.0: Sampling Procedure.

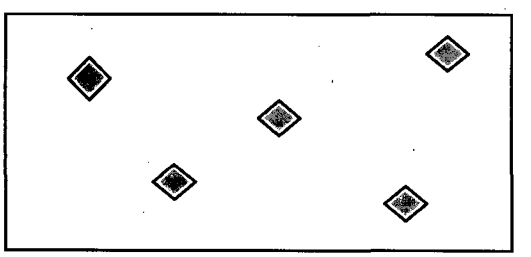
3.0 Sampling Procedure

Follow ***Quality Procedure – 02: Soil Samples for Transportation to a Laboratory*** for all Sections and subparagraphs until subparagraph 5.2 of Section 5.0: Sampling Procedure. Instead of 5.2 instructions, perform the composite sample collection procedure as follows:

3.1 Go to the excavation with a new plastic baggie. If not analyzing for ions or metals, use a trowel to obtain the soil. If the excavation is deeper than 6' BGS, do not enter the pit, but use a backhoe to assist in procurement of the sample. (If a backhoe is used, the backhoe will obtain an amount of soil from each composite point; bring the purchase to the surface staging area where a sample-portion of soil will be extracted from the backhoe purchase. The remainder of the backhoe purchase will be staged on the surface with other staged soils.)

3.2 Sidewall samples

3.2.1 On each sidewall, procure a 5oz sample from each of five distinct points on the sidewall with distinct points resembling the "W" pattern:



3.2.2 Thoroughly blend these five samples in a labeled baggie.
3.2.3 Repeat steps 3.2.1 through 3.2.4 for each remaining sidewall.
3.2.4 From each labeled baggie, procure a 5 oz portion and pour into a baggie labeled "Sidewall Composite". Blend this soil mixture completely.
3.2.5 Obtain proper laboratory sample container for "Sidewall Composite" and continue with subparagraph 5.3 of QP – 01.

3.3 Bottom Sample
3.3.1 From bottom of excavation, procure a 5oz sample from each of five distinct points with distinct points resembling the "W" pattern as illustrated above.
3.3.2 Thoroughly blend these five samples in a clean baggie.
3.3.3 Obtain proper laboratory sample container for "Bottom Composite" and continue with subparagraph 5.3 of QP – 01.

Rice Environmental Consulting and Safety

QUALITY PROCEDURE
Sampling and Testing Protocol for VOC in Soil

1.0 Purpose

This procedure is to be used to determine the concentrations of Volatile Organic Compounds in soils.

2.0 Scope

This procedure is to be used as the standard field measurement for soil VOC concentrations. It is not to be used as a substitute for full spectrographic speciation of organic compounds.

3.0 Procedure

3.1 Sample Collection and Preparation

3.1.1 Collect at least 500 g. of soil from the sample collection point. Take care to insure that the sample is representative of the general background to include visible concentrations of hydrocarbons and soil types. If necessary, prepare a composite sample of soils obtained at several points in the sample area. Take care to insure that no loose vegetation, rocks or liquids are included in the sample(s).

3.1.2 The soil sample(s) shall be immediately inserted into a one-quart or larger polyethylene freezer bag and sealed. When sealed, the bag should contain a nearly equal space between the soil sample and trapped air. Record the sample name and the time that the sample was collected on the Field Analytical Report Form.

3.1.3 The sealed samples shall be allowed to set for a minimum of five minutes at a temperature of between 10-15 Celsius, (59-77 ^{0}F). The sample temperatures may be adjusted by cooling the sample in ice, or by heating the sample within a generally controlled environment such as the inside of a vehicle. The samples should not be placed directly on heated surfaces or placed in direct heat sources such as lamps or heater vents.

3.1.4 The sealed sample bag should be massaged to break up any clods, and to provide the soil sample with as much exposed surface area as practically possible.

3.2 Sampling Procedure

3.2.1 The instrument to be used in conducting VOC concentration testing shall be a RAE Systems Photoionization device. (Device will be identified on VOC Field Test Report Form.) Prior to use, the instrument shall be zeroed-out in accordance with the appropriate maintenance and calibration procedure outlined in the instrument operation manual. The PID device will be calibrated each day it's used.

3.2.2 Carefully open one end of the collection bag and insert the probe tip into the bag taking care that the probe tip not touch the soil sample or the sidewalls of the bag.

3.2.3 Set the instrument to retain the highest result reading value. Record the reading onto the Field Test Report Form.

3.2.4 **If the instrument provides a reading exceeding 100 ppm, proceed to QP-7. If the reading is 100 ppm or less, NMOCD BTEX guideline has been met and no further testing for BTEX is necessary. File the Field Test Report Form in the project file.**

4.0 Clean-up

After testing, the soil samples shall be returned to the sampling location, and the bags collected for off-site disposal. **IN NO CASE SHALL THE SAME BAG BE USED TWICE. EACH SAMPLE CONTAINER MUST BE DISCARDED AFTER EACH USE.**

Rice Environmental Consulting and Safety

Quality Procedure
Composite Sampling of Excavation Sidewalls and Bottoms For BTEX

1.0 Purpose

This procedure outlines the methods to be employed when obtaining final composite soil samples for BTEX analysis.

2.0 Scope

This procedure is to be used when collecting soil samples intended for ultimate transfer to a testing laboratory for BTEX analysis. This procedure is to be used only when the PID field-test results for OVM exceeds 100 ppm.

3.0 Preliminary

3.1 Obtain sterile, clear, 2 oz. glass containers with Teflon lid from a laboratory supply company or the testing laboratory designated to conduct analyses of the soil.

4.0 Chain of Custody

4.1 Prepare a Sample Plan. The plan will list the number, location and designation of each planned sample and the individual tests to be performed on the sample. The sampler will check the list against the available inventory of appropriate sample collection bottles to insure against shortage.

4.2 Transfer the data to the Laboratory Chain of Custody Form. Complete all sections of the form except those that relate to the time of delivery of the samples to the laboratory.

4.3 Pre-label the sample collection jars. Include all requested information except time of collection. (Use a fine point Sharpie to insure that the ink remains on the label.) Affix the labels to the jars.

5.0 Sampling Procedure

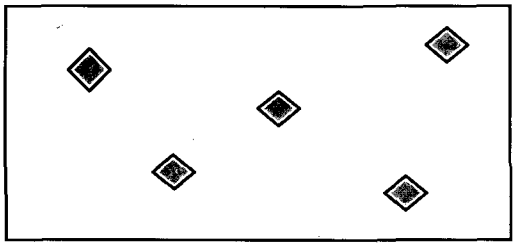
5.1. Do not touch the soil with your bare hands. Use new nitrile gloves to help minimize any cross-contamination.

5.2. If safe and within OSHA regulations, go to the sampling point with the sample container. If not analyzing for ions or metals, use a trowel to

obtain the soil. If the excavation is deeper than 6' BGS, do not enter the pit, but use a backhoe to assist in procurement of the sample. (If a backhoe is used, the backhoe will obtain an amount of soil from each composite point; bring the purchase to the surface staging area where a sample-portion of soil will be extracted from the backhoe purchase. The remainder of the backhoe purchase will be staged on the surface with other staged soils.)

5.3. Sidewall Samples

5.3.1. On each sidewall, procure a 2oz sample from each of five distinct points on the sidewall with distinct points resembling the "W" pattern:



5.4. Pack the soil tightly into the container leaving the top slightly domed. Screw the lid down tightly. Enter the time of collection onto the sample collection jar label. Repeat for each sampling point.

5.5. Place the samples directly on ice for transport to the laboratory if required.

5.6. Complete the Chain of Custody form to include the collection times for each sample. Deliver all samples to the laboratory.

6.0 Documentation

6.1 The testing laboratory shall provide the following minimum information:

a. Project and sample name.
b. Signed copy of the original Chain of Custody Form including the time the sample was received by the lab.
c. Results of the requested analyses
d. Test Methods employed
e. Quality Control methods and results

Rice Environmental Consulting and Safety

Procedure for Plugging & Abandonment of Cased Water Monitoring Wells

1.0 Purpose

This procedure outlines the methods to be employed to plug and abandon cased monitoring wells.

2.0 Scope

This procedure shall be used for developed, cased water monitoring wells located in the State of New Mexico

3.0 Preliminary

3.1 No well may be drilled, modified or plugged without NMOCD approval. Additional approvals may be required if the well is situated in a sensitive area, within municipal jurisdictions or on federal or tribal lands.

4.0 Plugging

4.1 Each bore will be filled with a 1% - 3% bentonite/concrete slurry to three feet bgs. The remaining three feet will be capped with concrete only.

4.2 All wellheads will be removed to below ground surface.

5.0 Records

5.1 The company plugging the well shall prepare a report on their company letter head listing the site name and describing general well construction including total depth of the well, the diameter of casing, material used to plug the well (e.g. bentonite/cement slurry), and date of the plugging operation.

5.2 It is recommended but not required that photographs of the final surface restoration be taken and included within the records.

5.3 Copies of the plugging report shall be submitted to all appropriate agencies and retained by the well operator for a minimum period of ten years.