

1R - 433

# REPORTS

DATE:

2005



**Whole Earth Environmental, Inc.**

2103 Arbor Cove  
Katy, Tx. 77494  
281.394.2050  
whearth@msn.com

IR 0433

February 7, 2005

NMOCD  
1220 South St. Francis Dr.  
Sante Fe, NM 87505

Attn: Wayne Price

Dear Wayne:

Enclosed, please find a copy of the revisions to the Patsy Battery remediation protocol we discussed last week. I hope that these additions will help clarify how relatively minor the contamination is at the site. You may note that there has been no hydrocarbon impact to the groundwater at this location and only a slight increase in the chloride readings well down-gradient of the actual production operation. This is a classic "dig and dilute" candidate for remediation.

Please call if you've any questions or comments.

Warmest regards,

Mike Griffin  
President  
Whole Earth Environmental, Inc.



# Executive Summary

## **Patsy Battery**

### **Location**

The site is located approximately five miles southwest of Monument, New Mexico on BLM. The topography is unremarkable. The primary land use of the surrounding property is grazing of cattle however extensive oil and gas operations are present within the area. The area is semi-arid with a net precipitation / pan evaporation amount of -73" per year. The legal description of the site is the NW ¼ of S-18, T-20S, R-37E.

### **Site History**

At this writing, we've little history of the location, however, from the surface features it appears that the site was used as a bulk storage and processing point for crude oil and natural gas. Three potential areas of interest were identified by the presence of surface staining – basically asphaltic in composition.

### **Previous Site Investigations**

Two separate investigations have been conducted at the site to determine the vertical and lateral extent of contamination. The first study was prepared by Larson Associates and reported on May 15, 2002. In this study, a series of five boreholes were advanced and soil samples collected for laboratory analysis. . The first borehole (described in the schematic Exhibit 2 as Asphalt Soil Area showed no significant chloride or BTEX involvement but significant TPH concentrations at a depth of 15' bgs.

Borehole 2 (located within the "Pit Area" in Exhibit 2) revealed significant TPH concentrations at a depth of 5' bgs quickly tapering off to essentially background concentrations within a few feet. No significant BTEX or chloride concentrations were found within the vertical profile.

Boreholes 3-5 were situated within a production battery area located north of the lease road. Borehole 3 shows a hydrocarbon plume extending to a depth of 15' bgs, no significant BTEX but a 532 ppm chloride reading at a depth of 25' bgs.

Borehole 4 showed no contaminant of concern concentration exceeding NMOCD standards.

Borehole 5 showed significant TPH concentrations >3,000 ppm at depths between 25-30' bgs but no significant BTEX or chloride impact. A summary of these results is included within this report as Exhibit 3.

A second site investigation was commissioned by Devon Energy to Environmental Technology Group, Inc. and reported on December, 2002. In this study, ETGI advanced a series of seven monitor wells, the

locations of which are described in Exhibit 4 of this report. None of the monitor wells registered BTEX concentrations in excess of NMOCD standards however all showed groundwater chloride readings exceeding 250 ppm. All monitor wells had chloride concentrations exceeding 700 ppm including MW-5 situated well up gradient of the battery. The only anomaly was within monitor well 6 located south of what was described within the Larson & Associates report as the pit area. Here, the chloride concentrations spiked to 1,100 ppm. A copy of the groundwater chemistry results is included within this report as Exhibit 5.

### **Remediation Plan**

The enclosed protocol provides for excavating the contaminant plume to all practical extent and remediating the hydrocarbon portion of the plume by means of simple aeration and dilution. Any salt impacted soils will be remediated to a maximum chloride concentration of 250 ppm by simple dilution using the surrounding topsoils available on location.

### **Conclusions and Recommendation**

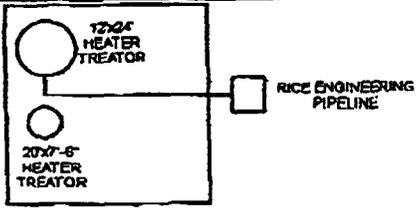
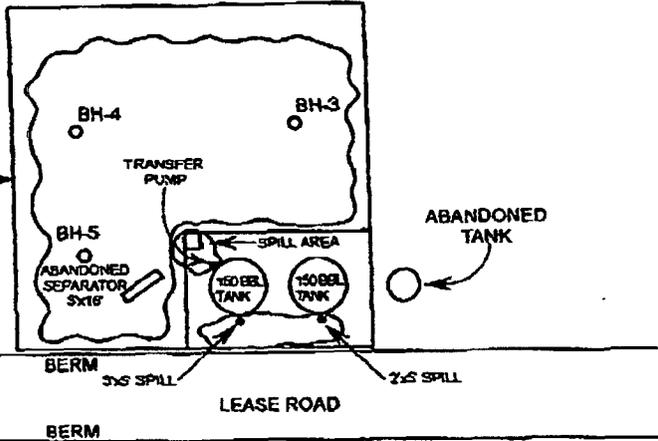
The enclosed protocol describes our approach to remove the bulk of the hydrocarbon plume by excavation and treating on the surface to acceptable concentrations prior to backfilling. The excavated materials may be treated on the surface by a combination of simple aeration and dilution using native topsoils and bio-augmentation. A series of five existing monitor wells will be used to check the continuing ground water quality. The wells will be sampled on an annual basis for the presence and concentration of BTEX and chlorides for a minimum period of five years.



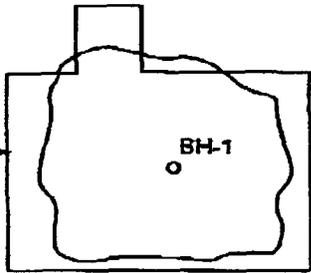
## **Patsy Battery Exhibit Index**

1. U.S.G.S. 7.5' Map of site
2. Larson Associates Borehole Locations
3. Larson Associates Borehole Analytical Results
4. ETGI Monitor Well Location Schematic
5. ETGI Monitor Well Chemistry Summary
6. Histogram of TPH Results @ 5' BGS
7. Histogram of TPH Results @ 15' BGS
8. Histogram of TPH Results @ 25' BGS
9. Detail of Battery Area View to Northeast
10. Detail of Main Pit Area View to North
11. Detail of Main Pit Area View to Southeast
12. Detail of Main Pit Area View to South-southwest
13. Main Pit Area View to South
14. Main Pit Area Detail of Asphaltine Surface Staining
15. Main Pit Area View to East
16. Area B View to Southeast
17. Area B View to South
18. Area B Surface Stain Detail
19. Area B Surface Stain Detail
20. Area B View to West
21. Area C View to South
22. Area C Surface Stain Detail
23. Detail of Flowline East of Areas B & C

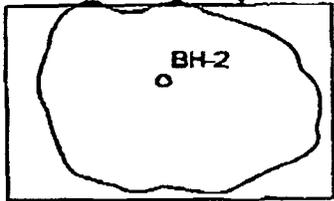
ASPHALT  
SOIL AREA  
(TILLED)



ASPHALT  
SOIL AREA  
(TILLED)



PIT AREA



**LEGEND**

BH-1 ○ TENATIVE SAMPLE LOCATION

○ COMPOSITE GROUP

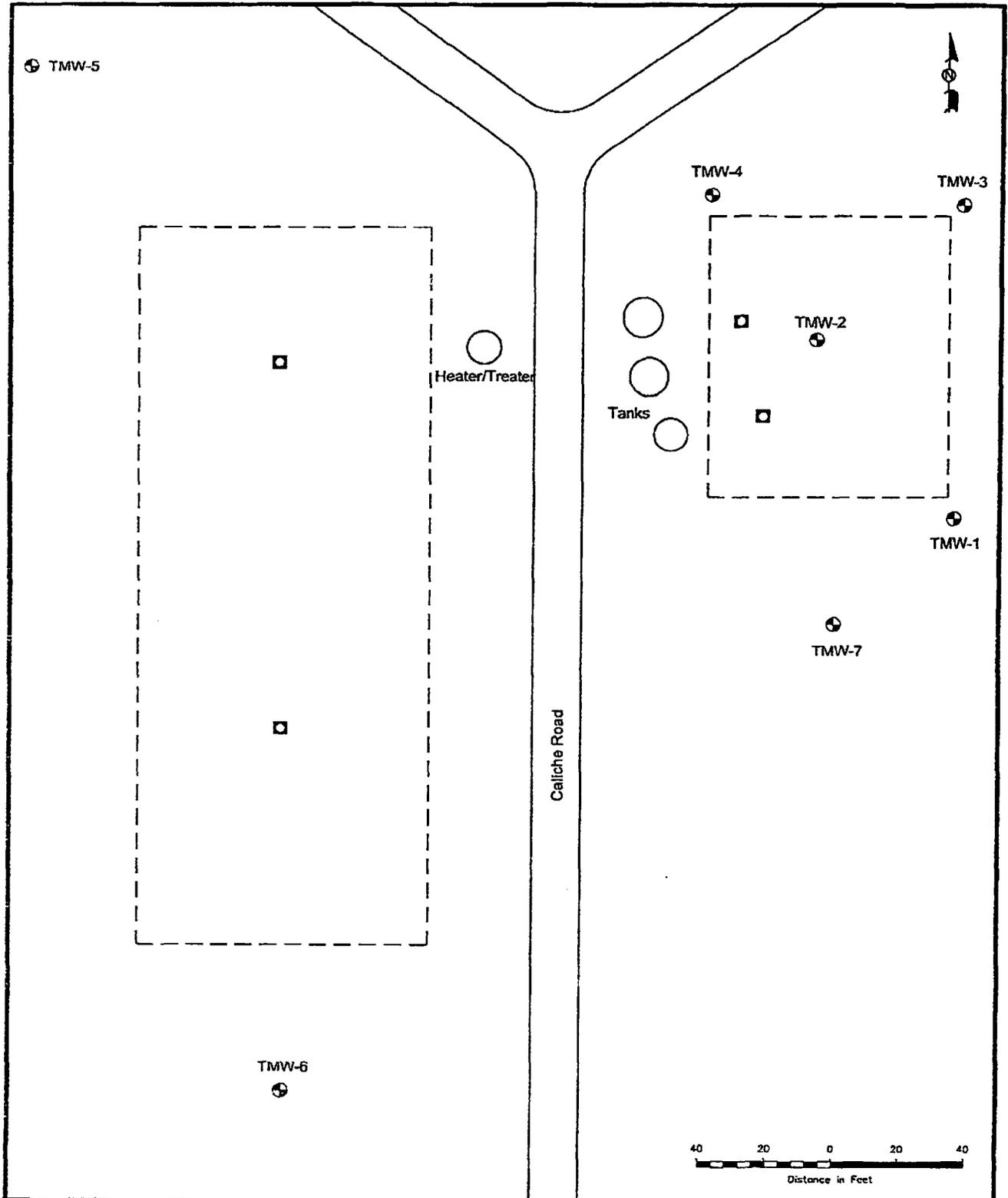


SCALE: 1"=50' APPROXIMATELY

FIGURE #2	
LEA COUNTY, NEW MEXICO	
JOHN H. HENDRIX CORPORATION	
SITE LOCATION	
DATE: 5/25/02	Larson & Associates, Inc. Environmental Consultants
NO. 2-0104	

**Larson & Associates**  
**Summary of BTEX, TPH and Chloride Analysis**  
**Patsy Battery**

Borehole Number	Sample Date	Sample Depth	PID (ppm)	Benzene $\mu\text{g}/\text{kg}$	Total BTEX $\text{mg}/\text{kg}$	DRO C12-C35 $\text{mg}/\text{kg}$	GRO C6-C12 $\text{mg}/\text{kg}$	TPH C6-C35 $\text{mg}/\text{kg}$	Chloride $\text{mg}/\text{kg}$
BH-1	04/18/02	1	49.9						
BH-1	04/18/02	5	194.5	170	2.2	219.0	288.0	507.0	29.5
BH-1	04/18/02	10	132.9						
BH-1	04/18/02	15	125.2	ND	1.0	2,930.0	1,780.0	4,710.0	20.8
BH-1	04/18/02	20	117.1						
BH-1	04/18/02	25	104.3						
BH-1	04/18/02	30	29.3	117	1.5	4,770.0	3,120.0	7,890.0	142.0
BH-2	04/19/02	1	26.7						
BH-2	04/19/02	5	182.4	ND	2.3	607.0	465.0	1,072.0	11.8
BH-2	04/19/02	10	52.6						
BH-2	04/19/02	15	17.9						
BH-2	04/19/02	20	10.4						
BH-2	04/19/02	25	6.8	ND	ND	ND	ND	ND	ND
BH-3	04/19/02	1	3.1						
BH-3	04/19/02	5	126.9	109	2.2	506.0	572.0	1,078.0	14.8
BH-3	04/19/02	10	126.9						
BH-3	04/19/02	15	172.9	124	1.7	1,360.0	1,000.0	2,360.0	<10
BH-3	04/19/02	20	51.3						
BH-3	04/19/02	25	2.4	ND	ND	ND	ND	ND	532.0
BH-4	04/22/04	1	2.6						
BH-4	04/22/04	5	2.3	ND	ND	ND	ND	ND	14.8
BH-4	04/22/04	10	2.5						
BH-4	04/22/04	15	2.9						
BH-4	04/22/04	20	1.8						
BH-4	04/22/04	25	1.6	ND	ND	ND	ND	ND	17.7
BH-5	04/22/04	1	62.9						
BH-5	04/22/04	5	55.3	ND	0.005	49.8	36.7	86.5	35.4
BH-5	04/22/04	10	243.7						
BH-5	04/22/04	15	317.3						
BH-5	04/22/04	20	315.6						
BH-5	04/22/04	25	462.2	0.5	9.2	1,100.0	1,930.0	3,030.0	17.7
BH-5	04/22/04	30	358.7	0.2	7.9	1,350.0	1,670.0	3,020.0	70.9



Legend:

	Temporary Monitor Well Location
	Previous Non-CFGI Soil Boring Location
	Pit Area

Site Map  
 Devon Energy  
 Patsy #1  
 Lea County, NM

**Environmental Technology Group, Inc.**



Prep By: JDU	Checked By: KD
May 13, 2002	Scale: 1" = 40'
ETGI Project #: DEV2101R	32° 34' 40" N 103° 17' 13" W

