3R - 296

GENERAL CORRESPONDENCE

YEAR(S):
1994 - 1993

TIERRA
ENVIRONMENTAL CORPORATION

CORPORATE OFFICE
P. O. Drawer 15250
Farmington, NM 87401
(505) 325-0924

August 31, 1994

Mr. William C. Olson
Environmental Bureau
New Mexico Oil Conservation Division
P. O. Box 2088
Santa Fe, New Mexico 87504

RE: JOHN A. BRIMHALL #1 WELL SITE, NASSAU RESOURCES, INC., SAN JUAN COUNTY, NEW MEXICO

Dear Mr. Olson:

This is a request for closure of the John A. Brimhall #1 pit site. Attached are the August 21, 1994, laboratory analytical results on water from the three (3) monitor wells at the location.

This is the third analyses for polynuclear aromatic hydrocarbons (PAH) and BTEX. The results continue to indicate levels of PAH and BTEX below the limits allowed by the OCD.

Sincerely,

TIERRA ENVIRONMENTAL CORPORATION

Dan Hoover

L. Daniel Hoover, Ph.D
Director of Research

LDH/lp

Enclosures

cc: Denny Foust, NMOCD, Aztec, New Mexico
Murphy Brasuel, Nassau Resources
Phillip C. Nobis, Tierra Environmental Corp.

CARDINAL LABORATORIES

PHONE (915) 673-7001 • 2111 BEECHWOOD • ABILENE, TX 79603
PHONE (505) 393-2326 • 101 E. MARLAND • HOBBS, NM 88240
PHONE (505) 326-4669 • 118 S. COMMERCIAL AVE. • FARMINGTON, NM 87401

ANALYTICAL RESULTS FOR
TIERRA ENVIRONMENTAL
907 WEST APACHE
FARMINGTON, NM 87401

Receiving Date: 08/21/94
Reporting Date: 08/22/94
Project Number: SJ1088
Project Name: NASSAU RESOURCES
Project Location: FRUITLAND, NM - MONITOR WELLS
Lab Number: SJ1088-1

Analysis Date: 08/21/94
Sampling Date: 08/19/94
Sample Type: LIQUID
Sample Condition: COOL & INTACT
Sample Received By: SL
Analyzed By: SL

	POLYNUCLEAR AROMATIC HYDROCARBON - 8270 (ppm)	Detection Limit	Sample Result EAST	Method Blank	QC	%IA	True Value QC
1	Naphthalene	0.004	<0.004	<0.004	50.3	101	50.0
2	Acenaphthylene	0.004	<0.004	<0.004	50.5	101	50.0
3	Acenaphthene	0.004	<0.004	<0.004	50.0	100	50.0
4	Fluorene	0.004	<0.004	<0.004	50.4	101	50.0
5	Phenanthrene	0.004	<0.004	<0.004	51.2	102	50.0
6	Anthracene	0.004	<0.004	<0.004	50.9	102	50.0
7	Fluoranthene	0.004	<0.004	<0.004	52.8	106	50.0
8	Pyrene	0.004	<0.004	<0.004	45.4	91	50.0
9	Benzo(a)anthracene	0.004	<0.004	<0.004	49.9	100	50.0
10	Chrysene	0.004	<0.004	<0.004	49.4	99	50.0
11	Benzo(b)fluoranthene	0.004	<0.004	<0.004	48.7	97	50.0
12	Benzo(k)fluoranthene	0.004	<0.004	<0.004	47.8	96	50.0
13	Benzo(a)pyrene	0.004	<0.004	<0.004	49.4	99	50.0
14	Indeno(1,2,3-cd)pyrene	0.004	<0.004	<0.004	50.4	101	50.0
15	Dibenzo(a,h,)anthracene	0.004	<0.004	<0.004	51.7	103	50.0
16	benzo(g,h,i)perylene	0.004	<0.004	<0.004	50.4	101	50.0

		% Recovery	Relative Percent Difference
17	2-Fluorophenol	53	1
18	Phenol-d5	37	0
19	Nitrobenzene-d5	44	2
20	2,4,6-Tribromophenol	MI	4
21	Terphenyl-d14	MI	3

METHODS: EPA SW 846-8270
MI - Matrix Interference

Jane Haung, Chemist

8-22-94
Date

CARDINAL LABORATORIES

PHONE (915) 673-7001 • 2111 BEECHWOOD • ABILENE, TX 79603
PHONE (505) 393-2326 • 101 E. MARLAND • HOBBS, NM 88240
PHONE (505) 326-4669 • 118 S. COMMERCIAL AVE. • FARMINGTON, NM 87401

ANALYTICAL RESULTS FOR
TIERRA ENVIRONMENTAL
907 WEST APACHE
FARMINGTON, NM 87401

Receiving Date: 08/21/94
Reporting Date: 08/22/94
Project Number: SJ1088
Project Name: NASSAU RESOURCES
Project Location: FRUITLAND, NM - MONITOR WELLS
Lab Number: SJ1088-2

Analysis Date: 08/21/94
Sampling Date: 08/19/94
Sample Type: LIQUID
Sample Condition: COOL & INTACT
Sample Received By: SL
Analyzed By: SL

POLYNUCLEAR AROMATIC HYDROCARBON - 8270 (ppm)		Detection Limit	**Sample Result SOUTH EAST**	Method Blank	QC	%IA	True Value QC
1	Naphthalene	0.004	**<0.004**	<0.004	50.3	101	50.0
2	Acenaphthylene	0.004	**<0.004**	<0.004	50.5	101	50.0
3	Acenaphthene	0.004	**<0.004**	<0.004	50.0	100	50.0
4	Fluorene	0.004	**<0.004**	<0.004	50.4	101	50.0
5	Phenanthrene	0.004	**<0.004**	<0.004	51.2	102	50.0
6	Anthracene	0.004	**<0.004**	<0.004	50.9	102	50.0
7	Fluoranthene	0.004	**<0.004**	<0.004	52.8	106	50.0
8	Pyrene	0.004	**<0.004**	<0.004	45.4	91	50.0
9	Benzo(a)anthracene	0.004	**<0.004**	<0.004	49.9	100	50.0
10	Chrysene	0.004	**<0.004**	<0.004	49.4	99	50.0
11	Benzo(b)fluoranthene	0.004	**<0.004**	<0.004	48.7	97	50.0
12	Benzo(k)fluoranthene	0.004	**<0.004**	<0.004	47.8	96	50.0
13	Benzo(a)pyrene	0.004	**<0.004**	<0.004	49.4	99	50.0
14	Indeno(1,2,3-cd)pyrene	0.004	**<0.004**	<0.004	50.4	101	50.0
15	Dibenzo(a,h,)anthracene	0.004	**<0.004**	<0.004	51.7	103	50.0
16	benzo(g,h,i)perylene	0.004	**<0.004**	<0.004	50.4	101	50.0

		% Recovery	Relative Percent Difference
17	2-Fluorophenol	70	1
18	Phenol-d5	60	0
19	Nitrobenzene-d5	76	2
20	2,4,6-Tribromophenol	75	4
21	Terphenyl-d14	MI	3

METHODS: EPA SW 846-8270
MI - Matrix Interference

Jane Haung, Chemist

8-22-94
Date

CARDINAL LABORATORIES

PHONE (915) 673-7001 • 2111 BEECHWOOD • ABILENE, TX 79603
PHONE (505) 393-2326 • 101 E. MARLAND • HOBBS, NM 88240
PHONE (505) 326-4669 • 118 S. COMMERCIAL AVE. • FARMINGTON, NM 87401

ANALYTICAL RESULTS FOR
TIERRA ENVIRONMENTAL
907 WEST APACHE
FARMINGTON, NM 87401

Receiving Date: 08/21/94
Reporting Date: 08/22/94
Project Number: SJ1088
Project Name: NASSAU RESOURCES
Project Location: FRUITLAND, NM - MONITOR WELLS
Lab Number: SJ1088-3

Analysis Date: 08/21/94
Sampling Date: 08/19/94
Sample Type: LIQUID
Sample Condition: COOL & INTACT
Sample Received By: SL
Analyzed By: SL

POLYNUCLEAR AROMATIC HYDROCARBON - 8270 (ppm)		Detection Limit	Sample Result SOUTH WEST	Method Blank	QC	%IA	True Value QC
1	Naphthalene	0.004	<0.004	<0.004	50.3	101	50.0
2	Acenaphthylene	0.004	<0.004	<0.004	50.5	101	50.0
3	Acenaphthene	0.004	<0.004	<0.004	50.0	100	50.0
4	Fluorene	0.004	<0.004	<0.004	50.4	101	50.0
5	Phenanthrene	0.004	<0.004	<0.004	51.2	102	50.0
6	Anthracene	0.004	<0.004	<0.004	50.9	102	50.0
7	Fluoranthene	0.004	<0.004	<0.004	52.8	106	50.0
8	Pyrene	0.004	<0.004	<0.004	45.4	91	50.0
9	Benzo(a)anthracene	0.004	<0.004	<0.004	49.9	100	50.0
10	Chrysene	0.004	<0.004	<0.004	49.4	99	50.0
11	Benzo(b)fluoranthene	0.004	<0.004	<0.004	48.7	97	50.0
12	Benzo(k)fluoranthene	0.004	<0.004	<0.004	47.8	96	50.0
13	Benzo(a)pyrene	0.004	<0.004	<0.004	49.4	99	50.0
14	Indeno(1,2,3-cd)pyrene	0.004	<0.004	<0.004	50.4	101	50.0
15	Dibenzo(a,h,)anthracene	0.004	<0.004	<0.004	51.7	103	50.0
16	benzo(g,h,i)perylene	0.004	<0.004	<0.004	50.4	101	50.0

		% Recovery	Relative Percent Difference
17	2-Fluorophenol	47	1
18	Phenol-d5	35	0
19	Nitrobenzene-d5	45	2
20	2,4,6-Tribromophenol	81	4
21	Terphenyl-d14	MI	3

METHODS: EPA SW 846-8270
MI - Matrix Interference

Jane Haung, Chemist

8-22-94
Date

CARDINAL LABORATORIES

PHONE (915) 673-7001 • 2111 BEECHWOOD • ABILENE, TX 79603
PHONE (505) 393-2326 • 101 E. MARLAND • HOBBS, NM 88240
PHONE (505) 326-4669 • 118 S. COMMERCIAL AVE. • FARMINGTON, NM 87401

FINAL ANALYSIS REPORT

Company: Nassau Resources
Address: P.O. Box 809
City, State: Farmington, NM 87499

Date: 8/23/94
Lab #: SJ1088

Project Name: Monitor Wells
Location: Fruitland
Sampled by: DH Date: 8/19/94 Time: various
Analyzed by: SW Date: 8/22/94 Time: 8:22
Sample Type: Water Sample Condition: intact Units: mg/l

Samp #	Field Code	BENZENE	TOLUENE	ETHYL BENZENE	PARA-XYLENE	META-XYLENE	ORTHO-XYLENE	MTBE
1	East	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
2	Southeast	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
3	Southwest	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	QC Recovery	0.860	0.831	0.800	0.814	0.765	0.715	0.721
	QC Spike	0.840	0.820	0.830	0.840	0.830	0.720	0.680
	Accuracy	102.4%	101.3%	96.4%	96.9%	92.2%	99.3%	106.0%
	Air Blank	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001

Methods - GAS CHROMOTOGRAPHY
- EPA SW-846; 8020

Sharon Williams

Sharon Williams

8/23/94
Date

STATE OF NEW MEXICO

ENERGY, MINERALS AND NATURAL RESOURCES DEPARTMENT

OIL CONSERVATION DIVISION

BRUCE KING
GOVERNOR

ANITA LOCKWOOD
CABINET SECRETARY

May 17, 1994

POST OFFICE BOX 2088
STATE LAND OFFICE BUILDING
SANTA FE, NEW MEXICO 87504
(505) 827-5800

CERTIFIED MAIL
RETURN RECEIPT NO. P-111-334-106

Mr. Murphy Brasuel
Field Superintendent
Nassau Resources, Inc.
2855 Southside River Road
P.O. Box 809
Farmington, New Mexico 87499

RE: JOHN A. BRIMHALL #1 WELL SITE
NASSAU RESOURCES, INC.
SAN JUAN COUNTY, NEW MEXICO

Dear Mr. Brasuel:

The New Mexico Oil Conservation Division (OCD) has completed a review of Nassau Resources May 9, 1994 "JOHN A. BRIMHALL #1 WELL SITE, NASSAU RESOURCES, INC., SAN JUAN COUNTY NEW MEXICO" and Nassau Resources March 23, 1994 "JOHN A. BRIMHALL #1 WELL SITE PIT CLOSURE, SECOND QUARTER WATER SAMPLING AND REQUEST FOR SITE CLOSURE". These documents contain the results of the 2nd quarterly sampling conducted at the Nassau Resources John A. Brimhall #1 well site during March of 1994 and requests final site closure based upon the analytical sampling results.

Although the 2nd quarterly monitor well sampling showed no detectable ground water contaminants, the previous quarterly sampling showed ground water contaminants in the "East" monitor well in excess of New Mexico Water Quality Control Commission (WQCC) ground water standards. Therefore, the OCD defers consideration of Nassau Resources request for final site closure until the OCD reviews the results of the next quarterly monitor well sampling event.

If you have any questions, please contact me at (505) 827-5885.

Sincerely,

William C. Olson
Hydrogeologist
Environmental Bureau

xc: OCD Aztec Office
Phil Nobis, Tierra Environmental Company, Inc.

TIERRA
ENVIRONMENTAL CORPORATION

CORPORATE OFFICE
12205 E. Skelley Drive
Tulsa, OK 74128
918-437-6200

OPERATIONS OFFICE
909 W. Apache
Farmington, NM 87401
505-325-0924

May 9, 1994

Mr. William C. Olson
Environmental Bureau
New Mexico Oil Conservation Division
P. O. Box 2088
Santa Fe, New Mexico 87504

RE: JOHN A. BRIMHALL #1 WELL SITE, NASSAU RESOURCES, INC., SAN JUAN COUNTY, NEW MEXICO

Dear Mr. Olson:

Enclosed is the information requested in your May 3, 1994 letter to Mr. Murphy Brasuel of Nassau Resources.

1. Q. The ground water quality sampling data provided do not include a laboratory analysis of the concentrations of polynuclear aromatic hydrocarbons (PAH) in the ground water. This sampling analysis was a condition of OCD's November 22, 1993 approval of the ground water monitoring system. Please provide the OCD with this information.

   A. The analysis for PAH were conducted. However, a copy of the results must have been inadvertently omitted. The results are enclosed.

2. Q. Please provide a water table elevation map for the site which shows the locations of the monitor wells and the direction of the water table gradient as required under OCD's November 22, 1993 approval of the ground water monitoring system.

   A. Enclosed is the elevation map and the site map indicating the monitor well locations.

3. Q. The January 10, 1994 quarterly report contains the ground water sampling results of the "East Well", "Southeast Well" and "Southwest Well". However, the March; 23, 1994 quarterly report contains the ground water sampling results of the "North Well", "Southeast Well" and "Southwest Well".

3. Please clarify the discrepancies in the identification of the monitor wells between the January 10, 1994 and March 23, 1994 quarterly reports.

   A. The "North Well" indicated in the March 23, 1994 report should have been designated the "East Well".

I hope this additional information is satisfactory. Bill, thanks for your direction and professionalism.

Sincerely,

TIERRA ENVIRONMENTAL CORPORATION

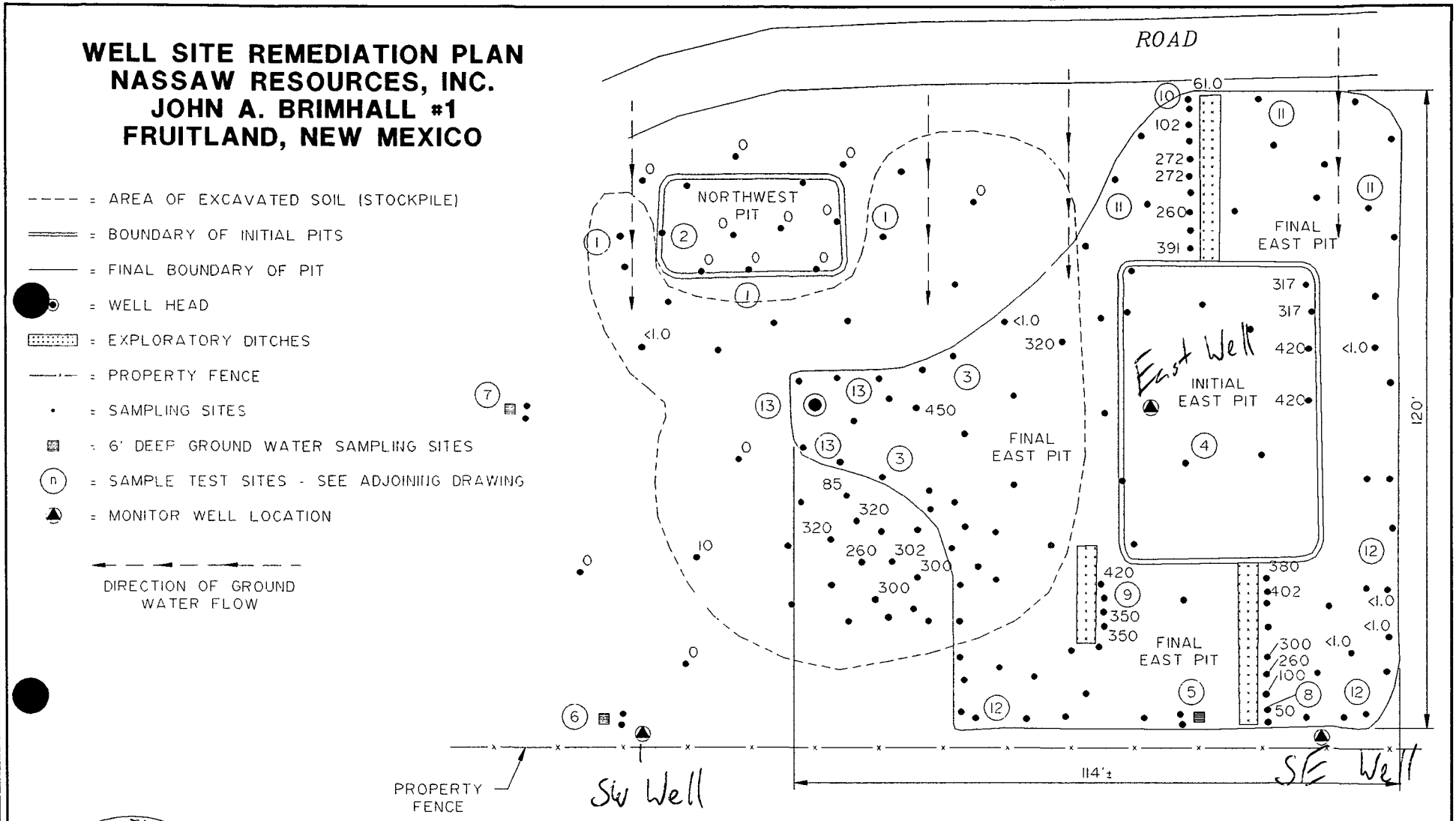
L. Daniel Hoover, Ph.D
Director of Research

LDH/lp

Enclosures

xc: File
Murphy Brasuel, Nassau Resources

WELL SITE REMEDIATION PLAN
NASSAW RESOURCES, INC.
JOHN A. BRIMHALL #1
FRUITLAND, NEW MEXICO

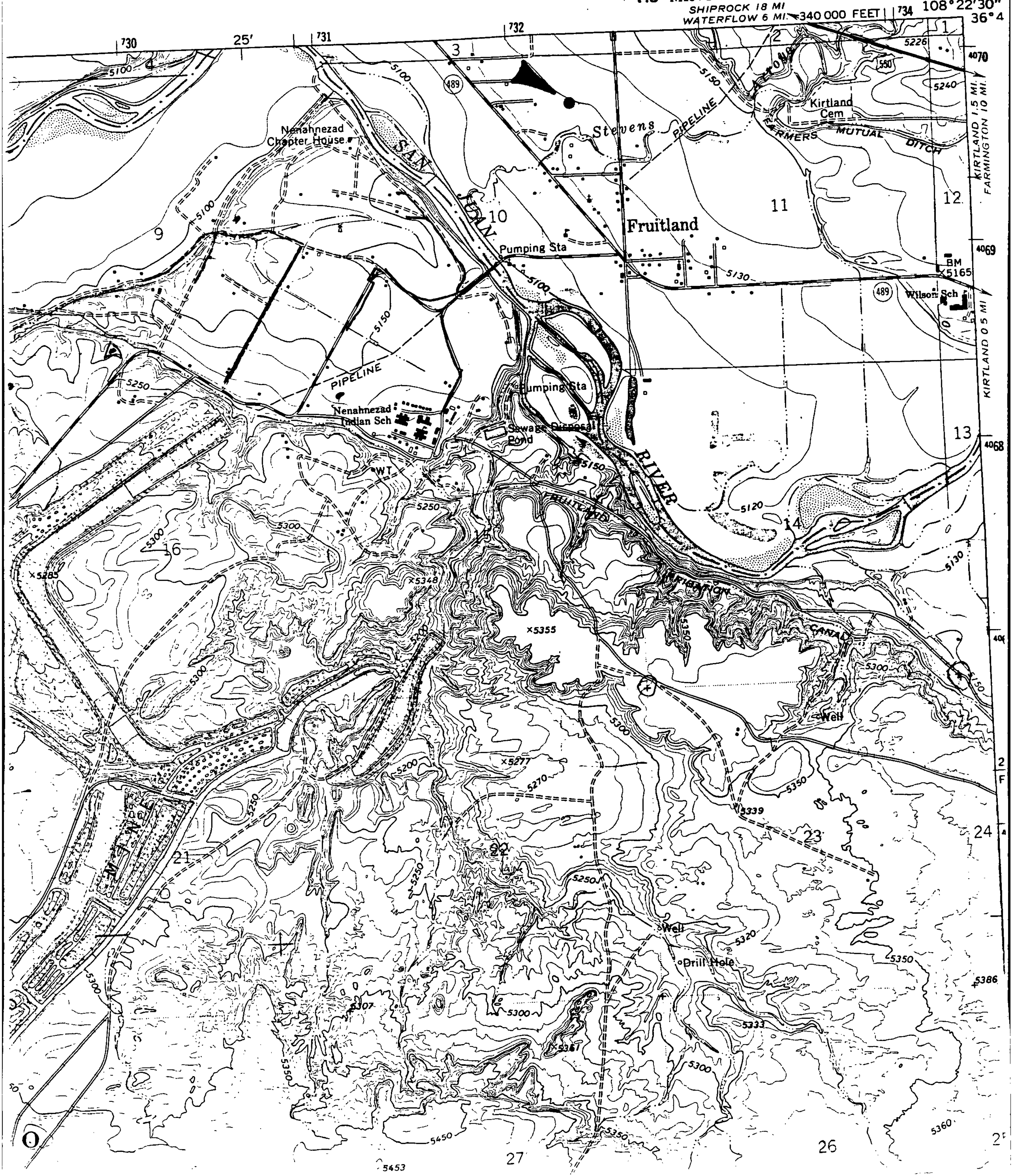


BY

TIERRA

Environmental Company, Inc.
909 West Apache
Farmington, New Mexico 87401 FILE: 3537 DATE: 05-09-94

FRUITLAND QUADRANGLE
NEW MEXICO–SAN JUAN CO.
7.5 MINUTE SERIES (TOPOGRAPHIC)



CARDINAL LABORATORIES

PHONE (915) 673-7001 • 2111 BEECHWOOD • ABILENE, TEXAS 79603

PHONE (505) 393-2326 • 101 E. MARLAND • HOBBS, NEW MEXICO 88240

FINAL ANALYSIS REPORT

Company: Tierra Environmental
Address: 909 W. Apache
City, State: Farmington, NM

Date: 03/31/94
Lab # SJ1017-2

Project Name: 93057
Project Location: Fruitland
Sampled by: DH
Date: 03/21/94
Type of Sample: Liquid Sample Condition: GIST

Sample ID: Nassau-Fruitland SE

POLYNUCLEAR AROMATIC HYDROCARBONS

PARAMETER	RESULT	UNITS
Acenapthene	<0.002	mg/L
Acenaphthylene	<0.002	mg/L
Anthracene	<0.002	mg/L
Benzo(a)anthracene	<0.002	mg/L
Benzo(a)pyrene	<0.002	mg/L
Benzo(b)flouranthene	<0.002	mg/L
Benzo(k)flouranthene	<0.002	mg/L
Benzo(ghi)perylene	<0.002	mg/L
Chrysene	<0.002	mg/L
Dibenz(a,h)anthracene	<0.002	mg/L
Flouranthene	<0.002	mg/L
Fluorene	<0.002	mg/L
Indeno(1,2,3-cd)pyrene	<0.002	mg/L
Naphthalene	<0.002	mg/L
Phenanthrene	<0.002	mg/L
Pyrene	<0.002	mg/L

METHODS- EPA SW846-8270

Michael R. Fowler

Date 3-31-94

STATE OF NEW MEXICO

ENERGY, MINERALS AND NATURAL RESOURCES DEPARTMENT

OIL CONSERVATION DIVISION

BRUCE KING
GOVERNOR

ANITA LOCKWOOD
CABINET SECRETARY

May 3, 1994

POST OFFICE BOX 2088
STATE LAND OFFICE BUILDING
SANTA FE, NEW MEXICO 87504
(505) 827-5800

CERTIFIED MAIL
RETURN RECEIPT NO. P-111-334-096

Mr. Murphy Brasuel
Field Superintendent
Nassau Resources, Inc.
2855 Southside River Road
P.O. Box 809
Farmington, New Mexico 87499

RE: JOHN A. BRIMHALL #1 WELL SITE
NASSAU RESOURCES, INC.
SAN JUAN COUNTY, NEW MEXICO

Dear Mr. Brasuel:

The New Mexico Oil Conservation Division (OCD) is in the process of reviewing Nassau Resources March 23, 1994 "JOHN A. BRIMHALL #1 WELL SITE PIT CLOSURE, SECOND QUARTER WATER SAMPLING AND REQUEST FOR SITE CLOSURE". This document contains the results of the 2nd quarterly sampling conducted at the Nassau Resources John A. Brimhall #1 well site during March of 1994 and a request for final closure of the site based upon the analytical sampling results.

The OCD has the following comments, questions and requests for information regarding the above referenced document:

1. The ground water quality sampling data provided do not include a laboratory analysis of the concentrations of polynuclear aromatic hydrocarbons (PAH) in the ground water. This sampling analysis was a condition of OCD's November 22, 1993 approval of the ground water monitoring system. Please provide the OCD with this information.

2. Please provide a water table elevation map for the site which shows the locations of the monitor wells and the direction of the water table gradient as required under OCD's November 22, 1993 approval of the ground water monitoring system.

3. The January 10, 1994 quarterly report contains the ground water sampling results of the "East Well", "Southeast Well" and "Southwest Well". However, the March 23, 1994 quarterly report contains the ground water sampling results of the "North Well", "Southeast Well" and "Southwest Well". Please clarify the discrepancies in the identification of the monitor wells between the January 10, 1994 and March 23, 1994 quarterly reports.

Receipt of the above information will allow the OCD to complete a review of your request. If you have any questions, please contact me at (505) 827-5885.

Sincerely,

William C. Olson
Hydrogeologist
Environmental Bureau

xc: OCD Aztec Office
Phil Nobis, Tierra Environmental Company, Inc.

TIERRA
ENVIRONMENTAL CORPORATION

CORPORATE OFFICE
12205 E. Skelley Drive
Tulsa, OK 74128
918-437-6200

OPERATIONS OFFICE
909 W. Apache
Farmington, NM 87401
505-325-0924

March 23, 1994

Mr. William C. Olsen, Hydrogeologist
New Mexico Oil Conservation Division
P.O. Box 2088
Santa Fe, New Mexico 87504

RE: JOHN A. BRIMHALL #1 WELL SITE PIT CLOSURE, SECOND QUARTER WATER SAMPLING AND REQUEST FOR SITE CLOSURE

Tierra Project Number: 93057

Dear Mr. Olsen:

Pursuant to your letter of November 23, 1993, concerning the above captioned project, the second set of water samples from the three (3) monitoring wells were taken by Dr. Dan Hoover and analyzed by Cardinal Laboratories of Farmington, New Mexico on March 21, 1994. The results of the analysis are enclosed for your review. As you will see, the analysis indicates that the groundwater meets the regulatory requirements.

Therefore on behalf of our client Nassau Resources, we would request that the site be considered for final closure.

If you have any questions or require more information, please call me at (505) 325-0924.

Sincerely,

TIERRA ENVIRONMENTAL COMPANY, INC.

Phillip C. Nobis
Vice President Operations

xc: Denny Foust, Aztec OCD
Murphy Brasuel, Nassau Resources
File - 93057

CARDINAL LABORATORIES

PHONE (915) 673-7001 • 2111 BEECHWOOD • ABILENE, TEXAS 79603
PHONE (505) 393-2326 • 101 E. MARLAND • HOBBS, NEW MEXICO 88240

FINAL ANALYSIS REPORT

Company: Tierra Environmental Corp. Date: 3/22/94
Address: 909 W. Apache Lab#: SJ1017
City, State: Farmington, NM 87401

Project Name: Nassau - Fruitland Monitor Wells
Project Location: Fruitland,NM
Sampled by: DH Date: 3/21/94 Time: 0900
Analyzed by: SW Date: 3/21/94 Time: 1316
Type of Samples: Water Sample Condition: GIST Units: mg/l

Samp #	Field Code	BENZENE	TOLUENE	ETHYL BENZENE	PARA-XYLENE	META-XYLENE	ORTHO-XYLENE	MTBE
1	North	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
2	Southeast	<0.001	0.009	<0.001	<0.001	<0.001	<0.001	<0.001
3	Southwest	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	QC Recovery	0.789	0.783	0.768	0.765	0.861	0.788	0.794
	QC Spike	0.868	0.863	0.847	0.839	0.849	0.861	0.739
	Accuracy	90.9%	90.7%	90.7%	91.2%	101.4%	91.5%	107.4%
	Air Blank	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001

Methods - AUTOMATED HEADSPACE GC
- EPA SW-846; EPA METHODS 8020

Michael R. Fowler

Date 3-22-94

TIERRA
ENVIRONMENTAL CORPORATION

CORPORATE OFFICE
12205 E. Skelley Drive
Tulsa, OK 74128
918-437-6200

OPERATIONS OFFICE
909 W. Apache
Farmington, NM 87401
505-325-0924

January 10, 1994

Mr. William C. Olson
Oil Conservation Division of New Mexico
Environmental Bureau
P.O. Box 2088
State Land Office Building
Santa Fe, NM 87504

Dear Mr. Olson:

This is an initial report in response to your letter of November 22, 1993, to Mr. Murphy Brasuel of Nassau Resources, Inc. Your letter outlined the monitor well procedure for the John A. Brimhall #1 pit closure.

The three monitor wells described and schematized for you in my letter and proposal of November 16, 1993 were constructed on December 9, 1993. Mr. Denny Foust, OCD Geologist and Inspector was notified, via telephone, of the planned construction activities on December 7, 1993.

The initial samples of water for testing were obtained from the wells on December 13, 1993. Results of these initial tests are detailed on the attached independent laboratory report. The wells will be sampled and tested again in March, 1994. Results of these tests will be reported to you promptly.

Thanks,

TIERRA ENVIRONMENTAL CORPORATION

Dan Hoover, Ph.D
Director of Research

cc: Denny Foust
Murphy Brasuel
Phil Nobis

Inter-Mountain Laboratories, Inc

2506 W Main Street
Farmington, New Mexico 87401

Tierra Environmental Services

Case Narrative

On December 13, 1993, three water samples were submitted to Inter-Mountain Laboratories - Farmington for analysis. The samples were received intact and were designated "Nassau". Analyses for Benzene-Toluene-Ethylbenzene-Xylenes (BTEX) and Polyaromatic Hydrocarbons (PAH) were performed on the samples as per Dan Hoover's request. PAH analyses are being done at our Bozeman, MT facility and will be sent under separate cover.

BTEX analysis was performed by EPA Method 5030, Purge and Trap, and EPA Method 602.2, *Purgeable Aromatics*, using an *OI Analytical 4560 Purge and Trap and a Hewlett-Packard 5890* Gas Chromatograph, equipped with a photoionization detector. BTEX target analytes were detected in one of the samples at levels above the stated detection limits, as indicated on the report sheets.

It is the policy of this laboratory to employ, whenever possible, preparatory and analytical methods which have been approved by regulatory agencies. The methods used in the analyses of the samples reported herein are found in Test Methods for Evaluation of Solid Waste, SW-846, USEPA, 1986 and Methods for Chemical Analysis of Water and Wastes, EPA-600/4-79-020, USEPA, 1983.

Quality control reports appear at the end of the analytical package and may be identified by title. If there are any questions regarding the information presented in this package, please feel free to call at your convenience.

Sincerely,

Dr. Denise A. Bohemier,
Organic Lab Supervisor

TES4336

Inter-Mountain Laboratories, Inc

2506 W Main Street
Farmington New Mexico 87401

PURGEABLE AROMATICS

Tierra Environmental

Project ID:	Nassau	Report Date:	12/27/93
Sample ID:	Nassau - East Well	Date Sampled:	12/13/93
Lab ID:	4336	Date Received:	12/13/93
Sample Matrix:	Water	Date Analyzed:	12/17/93
Preservative:	Cool		
Condition:	Intact		

Target Analyte	Concentration (ug/L)	Detection Limit (ug/L)
Benzene	ND	0.20
Toluene	ND	0.20
Ethylbenzene	0.83	0.20
m,p-Xylenes	15.5	0.40
o-Xylene	0.68	0.20

ppb

ND - Analyte not detected at the stated detection limit.

Quality Control:

Surrogate	Percent Recovery	Acceptance Limits
Toluene-d8	129	88 -110%
Bromofluorobenzene	95	86 -115%

Reference: Method 602.2, Purgeable Aromatics; Federal Register, Vol. 49, No. 209, Oct. 1984.

Comments: High toluene-d8 recovery is due to matrix interference at the d8 retention time.

Analyst

Review

Inter·Mountain Laboratories, Inc

2506 W Main Street
Farmington, New Mexico 87401

PURGEABLE AROMATICS

Tierra Environmental

Project ID:	Nassau	Report Date:	12/27/93
Sample ID:	Nassau - Southwest well	Date Sampled:	12/13/93
Lab ID:	4337	Date Received:	12/13/93
Sample Matrix:	Water	Date Analyzed:	12/17/93
Preservative:	Cool		
Condition:	Intact		

Target Analyte	Concentration (ug/L)	Detection Limit (ug/L)
Benzene	ND	0.20
Toluene	ND	0.20
Ethylbenzene	ND	0.20
m,p-Xylenes	ND	0.40
o-Xylene	ND	0.20

ND - Analyte not detected at the stated detection limit.

Quality Control:

Surrogate	Percent Recovery	Acceptance Limits
Toluene-d8	94	88 -110%
Bromofluorobenzene	93	86 -115%

Reference: Method 602.2, Purgeable Aromatics; Federal Register, Vol. 49, No. 209, Oct. 1984.

Comments:

Analyst

Review

Inter·Mountain Laboratories, Inc

2506 W Main Street
Farmington, New Mexico 87401

PURGEABLE AROMATICS

Tierra Environmental

Project ID:	Nassau	Report Date:	12/27/93
Sample ID:	Nassau - Southeast well	Date Sampled:	12/13/93
Lab ID:	4338	Date Received:	12/13/93
Sample Matrix:	Water	Date Analyzed:	12/17/93
Preservative:	Cool		
Condition:	Intact		

Target Analyte	Concentration (ug/L)	Detection Limit (ug/L)
Benzene	ND	0.20
Toluene	ND	0.20
Ethylbenzene	ND	0.20
m,p-Xylenes	ND	0.40
o-Xylene	ND	0.20

ND - Analyte not detected at the stated detection limit.

Quality Control:

Surrogate	Percent Recovery	Acceptance Limits
Toluene-d8	90	88 -110%
Bromofluorobenzene	88	86 -115%

Reference: Method 602.2, Purgeable Aromatics; Federal Register, Vol. 49, No. 209, Oct. 1984.

Comments:

Analyst

Review

Inter·Mountain Laboratories, Inc

2506 W Main Street
Farmington New Mexico 87401

PURGEABLE AROMATICS

Quality Control Report

Method Blank Analysis

Sample Matrix: Water
Lab ID: MB34320

Report Date: 12/17/93
Date Analyzed: 12/17/93

Target Analyte	Concentration (ug/L)	Detection Limit (ug/L)
Benzene	ND	0.20
Toluene	ND	0.20
Ethylbenzene	ND	0.20
m,p-Xylenes	ND	0.40
o-Xylene	ND	0.20

ND - Analyte not detected at the stated detection limit.

Quality Control:

Surrogate	Percent Recovery	Acceptance Limits
Toluene-d8	96	88 -110%
Bromofluorobenzene	94	86 -115%

Reference: Method 602.2, Purgeable Aromatics; Federal Register, Vol. 49, No. 209, Oct. 1984.

Comments:

Analyst

Review

Inter·Mountain Laboratories, Inc

2506 W. Main Street
Farmington, New Mexico 87401

Purgeable Aromatics

Duplicate Analysis

Lab ID:	4336Dup	Report Date:	12/27/93
Sample Matrix:	Water	Date Sampled:	12/13/93
Preservative:	Cool	Date Received:	12/13/93
Condition:	Intact	Date Analyzed:	12/17/93

Target Analyte	Original Conc. (ug/L)	Duplicate Conc. (ug/L)	Acceptance Range (ug/L)
Benzene	ND	ND	NA
Toluene	ND	ND	NA
Ethylbenzene	0.83	0.75	0 - 3
m,p-Xylenes	15.5	15.4	NE
o-Xylene	0.68	0.61	NE

ND - Analyte not detected at the stated detection limit.
NA - Not applicable or not calculated.
NE - Duplicate acceptance range not established by the EPA.

	Surrogate	Percent Recovery	Acceptance Limits
Quality Control:	Toluene-d8	121	88 - 110%
	Bromofluorobenzene	98	86 - 115%

Reference: Method 602.2, Purgeable Aromatics; Federal Register, Vol. 49, No. 209, Oct. 1984.

Comments: High toluene-d8 recovery is due to matrix interference at the d8 retention time.

Analyst

Review

Inter·Mountain Laboratories, Inc.

2506 W Main Street
Farmington, New Mexico 87401

Purgeable Aromatics

Matrix Spike Analysis

Lab ID:	4337Spk	Report Date:	12/27/93
Sample Matrix:	Water	Date Sampled:	12/13/93
Preservative:	Cool	Date Received:	12/13/93
Condition:	Intact	Date Analyzed:	12/17/93

Target Analyte	Spike Added (ug/L)	Original Conc. (ug/L)	Spiked Sample Conc. (ug/L)	% Recovery	Acceptance Limits (%)
Benzene	10	ND	9.16	92%	39 -150
Toluene	10	ND	9.59	96%	46 - 148
Ethylbenzene	10	ND	9.75	98%	32 - 160
m,p-Xylenes	20	ND	19.6	98%	NE
o-Xylene	10	ND	9.80	98%	NE

ND - Analyte not detected at the stated detection limit.
NA - Not applicable or not calculated.
NE - Spike acceptance range not established by the EPA.

Quality Control:

Surrogate	Percent Recovery	Acceptance Limits
Toluene-d8	94	88 - 110%
Bromofluorobenzene	95	86 - 115%

Reference: Method 602.2, Purgeable Aromatics; Federal Register, Vol. 49, No. 209, Oct. 1984.

Comments:

Analyst

Review

. Inter-Mountain Laboratories, Inc.
1160 Research Drive
Bozeman, Montana 59715

EPA METHOD 8100
POLYNUCLEAR AROMATIC HYDROCARBONS

Client:	TIERRA ENVIRONMENTAL		
Sample ID:	Nassau East	Date Reported:	DRAFT 12/30/93
Laboratory ID:	A542	Date Sampled:	12/13/93
Sample Matrix:	Water	Date Analyzed:	12/28/93

QUALITY CONTROL:

Surrogate Recoveries	%
2-Fluorobiphenyl	67
Terphenyl-d14	74

Reference:

Method 8100, Polynuclear Aromatic Hydrocarbon (PAH). Determination of Organic Analytes by Gas Chromatographic Methods, Test Methods for Evaluating Solid Wastes, SW846, USEPA, Third Edition, November 1986.

Analyst

Reviewed

Inter-Mountain Laboratories, Inc.

1160 Research Drive
Bozeman, Montana 59715

DRAFT

EPA METHOD 8100
POLYNUCLEAR AROMATIC HYDROCARBONS

Client:	**TIERRA ENVIRONMENTAL**		
Sample ID:	Nassau Southeast	Date Reported:	12/30/93
Laboratory ID:	A544	Date Sampled:	12/13/93
Sample Matrix:	Water	Date Analyzed:	12/28/93

QUALITY CONTROL:

Surrogate Recoveries	%
2-Fluorobiphenyl	53
Terphenyl-d14	68

Reference:

Method 8100, Polynuclear Aromatic Hydrocarbon (PAH). Determination of Organic Analytes by Gas Chromatographic Methods, Test Methods for Evaluating Solid Wastes, SW846, USEPA, Third Edition, November 1986.

Analyst

Reviewed

Inter·Mountain Laboratories, I

1160 Research Drive
Bozeman, Montana 59715

EPA METHOD 8100
POLYNUCLEAR AROMATIC HYDROCARBONS DRAFT

Client:	**TIERRA ENVIRONMENTAL**		
Sample ID:	Nassau Southwest	Date Reported:	12/30/93
Laboratory ID:	A543	Date Sampled:	12/13/93
Sample Matrix:	Water	Date Analyzed:	12/28/93

QUALITY CONTROL:

Surrogate Recoveries	%
2-Fluorobiphenyl	60
Terphenyl-d14	71

Reference:

Method 8100, Polynuclear Aromatic Hydrocarbon (PAH). Determination of Organic Analytes by Gas Chromatographic Methods, Test Methods for Evaluating Solid Wastes, SW846, USEPA, Third Edition, November 1986.

Analyst

Reviewed

Inter·Mountain Laboratories, Inc.
1160 Research Drive
Bozeman, Montana 59715

EPA METHOD 8100
POLYNUCLEAR AROMATIC HYDROCARBONS

DRAFT

Client:	TIERRA ENVIRONMENTAL			
Sample ID:	Nassau Southwest Well		Date Reported:	12/30/93
Project ID:	Nassau		Date Sampled:	12/13/93
Laboratory ID:	A543	4337	Date Received:	12/14/93
Sample Matrix:	Water		Date Extracted:	12/15/93
Preservation:	Cool		Date Analyzed:	12/28/93
Condition:	Intact			

Parameter	Analytical Result	Detection Limit	Units
3-Methylcholanthrene	ND	2	ug/L
7H-Dibenzo(c,g)carbazole	ND	2	ug/L
Acenaphthene	ND	2	ug/L
Acenaphthylene	ND	2	ug/L
Anthracene	ND	2	ug/L
Benzo(a)anthracene	ND	2	ug/L
Benzo(a)pyrene	ND	2	ug/L
Benzo(b)fluoranthene	ND	2	ug/L
Benzo(g,h,i)perylene	ND	2	ug/L
Benzo(j)fluoranthene	ND	2	ug/L
Benzo(k)fluoranthene	ND	2	ug/L
Chrysene	ND	2	ug/L
Dibenz(a,h)acridine	ND	2	ug/L
Dibenz(a,j)acridine	ND	2	ug/L
Dibenzo(a,e)pyrene	ND	2	ug/L
Dibenzo(a,h)anthracene	ND	2	ug/L
Dibenzo(a,h)pyrene	ND	2	ug/L
Dibenzo(a,i)pyrene	ND	2	ug/L
Fluoranthene	ND	2	ug/L
Fluorene	ND	2	ug/L
Indeno(1,2,3-c,d)pyrene	ND	2	ug/L
Naphthalene	ND	2	ug/L
Phenanthrene	ND	2	ug/L
Pyrene	ND	2	ug/L

ND - Compound not detected at stated Detection Limit.
B - Compound detected in Method Blank.

Inter-Mountain Laboratories, Inc.
1160 Research Drive
Bozeman, Montana 59715

EPA METHOD 8100
POLYNUCLEAR AROMATIC HYDROCARBONS

DRAFT

Client:	TIERRA ENVIRONMENTAL			
Sample ID:	Nassau Southeast Well		Date Reported:	12/30/93
Project ID:	Nassau		Date Sampled:	12/13/93
Laboratory ID:	A544	4338	Date Received:	12/14/93
Sample Matrix:	Water		Date Extracted:	12/15/93
Preservation:	Cool		Date Analyzed:	12/28/93
Condition:	Intact			

Parameter	Analytical Result	Detection Limit	Units
3-Methylcholanthrene	ND	2	ug/L
7H-Dibenzo(c,g)carbazole	ND	2	ug/L
Acenaphthene	ND	2	ug/L
Acenaphthylene	ND	2	ug/L
Anthracene	ND	2	ug/L
Benzo(a)anthracene	ND	2	ug/L
Benzo(a)pyrene	ND	2	ug/L
Benzo(b)fluoranthene	ND	2	ug/L
Benzo(g,h,i)perylene	ND	2	ug/L
Benzo(j)fluoranthene	ND	2	ug/L
Benzo(k)fluoranthene	ND	2	ug/L
Chrysene	ND	2	ug/L
Dibenz(a,h)acridine	ND	2	ug/L
Dibenz(a,j)acridine	ND	2	ug/L
Dibenzo(a,e)pyrene	ND	2	ug/L
Dibenzo(a,h)anthracene	ND	2	ug/L
Dibenzo(a,h)pyrene	ND	2	ug/L
Dibenzo(a,i)pyrene	ND	2	ug/L
Fluoranthene	ND	2	ug/L
Fluorene	ND	2	ug/L
Indeno(1,2,3-c,d)pyrene	ND	2	ug/L
Naphthalene	ND	2	ug/L
Phenanthrene	ND	2	ug/L
Pyrene	ND	2	ug/L

ND - Compound not detected at stated Detection Limit.
B - Compound detected in Method Blank.

Inter-Mountain Laboratories, Inc.

1160 Research Drive
Bozeman, Montana 59715

DRAFT

EPA METHOD 8100
POLYNUCLEAR AROMATIC HYDROCARBONS

Client:	TIERRA ENVIRONMENTAL			
Sample ID:	Nassau East Well		Date Reported:	12/30/93
Project ID:	Nassau		Date Sampled:	12/13/93
Laboratory ID:	A542	4336	Date Received:	12/14/93
Sample Matrix:	Water		Date Extracted:	12/15/93
Preservation:	Cool		Date Analyzed:	12/28/93
Condition:	Intact			

Parameter	Analytical Result	Detection Limit	Units
3-Methylcholanthrene	ND	2	ug/L
7H-Dibenzo(c,g)carbazole	ND	2	ug/L
Acenaphthene	ND	2	ug/L
Acenaphthylene	4	2	ug/L
Anthracene	ND	2	ug/L
Benzo(a)anthracene	ND	2	ug/L
Benzo(a)pyrene	ND	2	ug/L
Benzo(b)fluoranthene	ND	2	ug/L
Benzo(g,h,i)perylene	ND	2	ug/L
Benzo(j)fluoranthene	ND	2	ug/L
Benzo(k)fluoranthene	ND	2	ug/L
Chrysene	ND	2	ug/L
Dibenz(a,h)acridine	ND	2	ug/L
Dibenz(a,j)acridine	ND	2	ug/L
Dibenzo(a,e)pyrene	ND	2	ug/L
Dibenzo(a,h)anthracene	ND	2	ug/L
Dibenzo(a,h)pyrene	ND	2	ug/L
Dibenzo(a,i)pyrene	ND	2	ug/L
Fluoranthene	ND	2	ug/L
Fluorene	5	2	ug/L
Indeno(1,2,3-c,d)pyrene	ND	2	ug/L
Naphthalene	34	2	ug/L
Phenanthrene	3	2	ug/L
Pyrene	ND	2	ug/L

ND - Compound not detected at stated Detection Limit.
B - Compound detected in Method Blank.

range and the maximum allowable concentration in ground water for the contaminants specified unless the existing condition exceeds the standard or unless otherwise provided in Subsection 3-109.D. or Section 3-110. Regardless of whether there is one contaminant or more than one contaminant present in ground water, when an existing pH or concentration of any water contaminant exceeds the standard specified in Subsection A, B, or C, the existing pH or concentration shall be the allowable limit, provided that the discharge at such concentrations will not result in concentrations at any place of withdrawal for present or reasonably foreseeable future use in excess of the standards of this section.

These standards shall apply to the dissolved portion of the contaminants specified with a definition of dissolved being that given in the publication "Methods for Chemical Analysis of Water and Waste of the U.S. Environmental Protection Agency," with the exception that standards for mercury and the organic compounds shall apply to the total unfiltered concentrations of the contaminants.

A. Human Health Standards-Ground water shall meet the standards of Section A and B unless otherwise provided. If more than one water contaminant affecting human health is present, the toxic pollutant criteria of Section 1-101.UU. for the combination of contaminants, or the Human Health Standard of Section 3-103.A. for each contaminant shall apply, whichever is more stringent.

Arsenic (As)	0.1 mg/l
Barium (Ba)	1.0 mg/l
Cadmium (Cd)	0.01 mg/l
Chromium (Cr)	0.05 mg/l
Cyanide (CN)	0.2 mg/l
Fluoride (F)	1.6 mg/l
Lead (Pb)	0.05 mg/l
Total Mercury (Hg)	0.002 mg/l
Nitrate (NO_3 as N)	10.0 mg/l
Selenium (Se)	0.05 mg/l
Silver (Ag)	0.05 mg/l
Uranium (U)	5.0 mg/l
Radioactivity: Combined Radium-226 & Radium-228	30.0 pCi/l
Benzene	0.01 mg/l
Polychlorinated biphenyls (PCB's)	0.001 mg/l
Toluene	0.75 mg/l
Carbon Tetrachloride	0.01 mg/l
1,2-dichloroethane (EDC)	0.01 mg/l
1,1-dichloroethylene (1,1-DCE)	0.005 mg/l
1,1,2,2-tetrachloroethylene (PCE)	0.02 mg/l
1,1,2-trichloroethylene (TCE)	0.1 mg/l

ethylbenzene	0.75 mg/l
total xylenes	0.62 mg/l
methylene chloride	0.1 mg/l
chloroform	0.1 mg/l
1,1-dichloroethane	0.025 mg/l
ethylene dibromide (EDB)	0.0001mg/l
1,1,1-trichloroethane	0.06 mg/l
1,1,2-trichloroethane	0.01 mg/l
1,1,2,2-tetrachloroethane	0.01 mg/l
vinyl chloride	0.0001mg/l
PAHs: total naphthalene plus monomethylnaphthalenes	0.03 mg/l
benzo-a-pyrene	0.0007mg/l

TIERRA
ENVIRONMENTAL CORPORATION

CORPORATE OFFICE
6846 S. Canton, Suite 100
Tulsa, OK 74136
918-496-3200

REGIONAL OFFICE
909 W. Apache
Farmington, NM 87401
505-325-0924

November 16, 1993

Mr. William C. Olson
Oil Conservation Division of New Mexico
P. O. Box 2088
State Land Office Building
Santa Fe, New Mexico 87504

Dear Mr. Olson:

This communication is in response to your letter of November 10, 1993, to Mr. Murphy Brasuel of Nassau Resources, Inc., requesting more information on the John A. Brimhall #1 Well site pit closure. The questions you asked and their answers are provided as follows:

Question #1 - The report states that contaminated ground water seeping into the excavation was removed and hauled to a disposal. However, the report did not indicate to what disposal facility the wastes were taken. Please provide this information.

Answer #1 - Sunco Disposal (Crouch Mesa), 708 S. Tucker Ave., Farmington, new Mexico 87499, (505) 327-0416

Question #2 - "QUAD 5" was listed as a bioremediation treatment product used in the excavation. Please provide OCD with information on the make-up of this product.

Answer #2 - The Material Safety Data Sheet for QUAD-5 is enclosed with this letter. Also enclosed is a copy of the January 27, 1993 letter from Dan Hoover to Phil Nobis that describes the chemistry and fate of the active chemicals in QUAD-5.

Question #3 - Does soil Sample #3 represent the initial sample for that area prior to excavation and soil sample #13 represents the final samples of the same area? Please clarify what these samples represent.

Answer #3 - Sample #3 was a composite of the initial pile of excavated soil from the East Pit as indicated in the table. This soil was already excavated before Tierra personnel were called to inspect the problem. Sample #13 represented soil around the well head after the pile of excavated soil from the East Pit had been expanded to the well head - removing all contaminated soils, leaving clean soil near the well head. NOTE: The soil sample #3 represents soil piled around and over the well head when Tierra Personnel initially arrived at the location.

Question #4 - The site location map shows numerous sample points that do not have any corresponding sample results. Please provide OCD with any sample results from these points.

Answer #4 - During excavation, the OVM vapor analyzer was used continually as a guide to define the contamination boundaries as indicated in the report. These OVM readings were not all recorded if they continued to remain above 100 ppm TPH. However, many were recorded in the field notes. The ones that were recorded are shown on attached figure enclosed with this letter. It has previously been determined by Tierra that OVM TPH readings are usually much lower than the laboratory IR TPH results (EPA). If the OVM readings were over 100 ppm, it was assumed that the IR TPH readings would be substantially above the OCD acceptable limits for TPH of 100 ppm.

Question #5 - Because the report documented contamination of ground water at the site, the OCD requires that monitor wells be installed to conclusively determine any migration of contamination from the source area. Please submit a work plan for the installation and construction of ground water monitoring system. The work plan should include a sampling plan for monitoring ground water quality.

Answer #5 - Please see enclosed ground water monitoring plans.

Bill, I appreciate the clarity of your questions and hope the answers are satisfactory. I will promptly respond if you require additional information.

Sincerely,

TIERRA ENVIRONMENTAL CORPORATION

L. Daniel Hoover

L. Daniel Hoover, Ph. D.
Director of Research

PROPOSAL

GROUNDWATER MONITORING WELLS: Construction and Sampling
"Nassau Resources, Inc., John A. Brimhall #1 Well Site Pit Closure"

Three 10 foot deep groundwater monitoring wells will be installed. The depth of the groundwater varies seasonally from 3-6 feet deep and flows south-southwest toward the San Juan River, approximately 1/2 mile southwest of the well head. Well #1 will be located in an area approximating the center of the original contaminated soil. Wells #2 & 3 will monitor the groundwater downstream from the original contaminated soil - south and southwest.

The approximate locations of the wells in reference to the well head of John A. Brimhall #1 are:

Well #1 - 70 feet east
Well #2 - 60 feet south and then 100 feet east
Well #3 - 60 feet south and then 40 feet west

Well Construction (see attached schematic).

The monitoring wells will be constructed of 4 inch O.D., flush-threaded, Schedule 40 PVC riser pipe and 10 foot long screens (0.10 in. slots.). The wells will be installed through hollow-stem augers and positioned with the well screens straddle the water table. A sand pack (10/20 size sand) will be placed in the annular space around and 2 feet above the screen. A 1-2 foot thick bentonite pellet will be placed on top of the sand pack. The seal will be hydrated with commercially available distilled water.

After the seal hydrates, a cement/bentonite grout mixture will be placed in the annular space above the seal to within 1-2 feet of the ground surface. The remaining space around the pipe will be filled with concrete or neat cement. A flush-mount water box cover will be set in the concrete around each monitoring well. A locking expansion well cap will be installed on each well. Upon completion, the wells will be developed by bailing.

Elevations of the top riser pipe and ground surface will be measured at each well. The elevations will be referenced to a clearly identified, on-site (relative) benchmark. The wells will be surveyed with an autolevel.

All drilling equipment will be steam cleaned before use. The hollow stem augers and other drilling equipment will be steam cleaned between soil borings. Split spoons and other ancillary soil and water sampling equipment will be cleaned before samples are collected with a non-phosphate detergent wash, followed by or distilled water rinse.

Cuttings from all borings will be stored on-site in clean 55 gallon plastic drums provided by the drilling contractor.

GROUNDWATER MONITORING

The wells will be developed by mechanical surging and/or bailing until the Ph and specific conductivity of the water are within 3% of the previous value, and minimal turbidity is achieved.

Each well will remain undisturbed for 24 hours, purged and, the initial samples collected.

All development and purge water will be containerized and stored on site. The stored cuttings and water will be disposed as indicated by an evaluation of the laboratory results.

Static water levels will be measured and the wells purged with a clean, high density polyethylene bailer before each sampling. The water level measurements will be made using a fiberglass tape, graduated in intervals of 0.01 feet, with an acoustic water level indicator attached to the end of the tape.

The volume of water purged will equal 3X the standing volume. If a well is bailed dry before this volume is removed, the well will be considered purged. Each initial volume will be inspected visually for suspended material.

After purging and recovery of static water levels, the well will be sampled with dedicated high density polyethylene bailers and transferred into laboratory-supplied sample containers. All samples will be housed in iced, insulated coolers and transported to an independent laboratory.

The wells will be sampled initially and every three months for one (1) year after construction, and analyzed for BTEX and TPH compounds by EPA methods 8020 and 8015, respectively.

Bill R.

TIERRA
ENVIRONMENTAL CORPORATION

CORPORATE OFFICE
6846 S. Canton, Suite 100
Tulsa, OK 74136
918-496-3200

REGIONAL OFFICE
909 W. Apache
Farmington, NM 87401
505-325-0924

January 27, 1993

Tierra Environmental Company, Inc.
909 W. Apache
Farmington, New Mexico 87401

Attention: Phillip Nobis

Dear Phillip:

This is a brief of our recent discussion on the fate of potassium permanganate (constituent in QUAD-5) after it is mixed into soil. The primary questions are:

(1) Does KmnO4 remain a hazardous oxidizer once applied to soil?
(2) What are the expected effects of potassium and manganese on soils and plants?

QUAD-5 is utilized at rates suggested by type and concentration of hydrocarbon contaminates in soil and results of the soil analyses. A general average treatment might be one gallon of QUAD-5 per 25 cubic yards of contaminated soil. This amount of soil covers 1,350 sq.ft. to a depth of 6 in. - the spread for remediating soils applied to the land farm. The amount of elemental manganese and potassium in this application is 58 gm. and 41 gm. respectively. This equates to 4.2 lbs. of manganese and 3.0 lbs. of potassium per acre. The moment KMnO4 is added to soils (under ambient environmental conditions of the countryside) it begins to oxidize many of the organics and some inorganics present. The permanganate ion MnOu4 may be reduced to a manganous (Mn++) product in acidic conditions or to relatively insoluble manganese dioxide (MnO2) in neutral or alkaline conditions (Pauling, General Chemistry, 1970, Dover).

Both manganese and potassium are constituents of fertilizer preparations. For growing crops in organic soils with manganese unavailable or deficient, the recommended application rate may be 5-7 lbs./acre. Potassium is added at rates of several hundred lbs. per/acre to soils deficient or requiring the element to optimize crop yield. (Ankerman & Large, Soil & Plant Analysis, A&L Agri. Labs.)

Manganese, long recognized as an essential plant nutrient, has been included in fertilizer formulations since the 1930's (Science in Farming, The Yearbook of Agriculture 1943-1947, U.S. Department of Agriculture). The element functions with enzyme systems involving carbohydrate, nitrogen and other metabolic pathways.

Manganese becomes more available (soluble) to plants as the pH decreases. The element may even become toxic to plants @ pH of 4.0. However, low pH soils are often deficit in manganese because of loss due to leaching. Conversely, soils with excess lime, high organic content or high pH often have sufficient, but unavailable levels of manganese.

Potassium, a major plant nutrient, is the most active of the principal bases that occur in plants - potassium, magnesium, calcium. The element is usually present in larger amounts in soils with higher pH values. Potassium is usually added to soil in the form of KCI, expressed as K2O.

In summary, $KMnO_4$ immediately reacts with the organic and some inorganic constituents of soil liberating oxygen and organic/ inorganic salts and oxides, e.g.:, manganese dioxide - depending on the soil and conditions.

The potassium may form salts or adsorb as a cation in exchangable positions on clay minerals and organic fractions of the soil. Both manganese and potassium are vital plant nutrients and are generally non-toxic to plants @ relatively high concentrations in the high pH soils (>7.5) found in most Western states.

Phil, I hope this brief is sufficient for the information you need in your operations. Please call me anytime and I will be happy to provide any additional information at my disposal.

Sincerely,

L. Daniel Hoover, Ph.D.
Director of Research

MATERIAL SAFETY DATA SHEET

This MSDS complies with 29 CFR 1910.1200

Section I - Product Identification

Product Name: QUAD-5
Issue date 10-01-92

Manufacturers: Tierra Environmental Corporation
909 West Apache
Farmington, New Mexico 87401

24 hour phone number
(505) 325-0924

HMIS Rating: H-2, F-0, R-1, S-none

DOT Hazard Class: Oxidizer
UN# 1490

Section II - Hazardous Ingredients

Ingredient	CAS No.	% by weight
Potassium Permanganate	7722647	< 5 %

Section III - Physical Data

Boiling Point (F)..... = water
Vapor density..... unk
Specific gravity..... 0.99
Ph..... 7

Vapor Pressure.....unk
Solubility (water) > 99%
% volatile..... > 99

Section IV - Fire and Explosion Hazard

Flash point..... N/A
Flammable limits.. N/A

Extinguishing Media.... N/A

Special fire fighting procedures.....N/A

Unusual fire and explosion hazards.....N/A

Section V - Health Hazard Data

Threshold limit value..... >2000ppm
Effects if overexposure.....none
Emergency and first aid procedures: For contact with eyes, flush with water for 15 minutes and consult with a doctor if irritation persists. If swallowed, give large amount of milk or water and consult doctor immediately.

Section VI - Reactivity Data

Stability.....stable

Conditions to avoid..... contact with organic or readily oxidizable materials

Incompatibility..... see conditions to avoid

Hazardous polymerization..... will not occur

Step to be taken in the event of spill or leak.....Flush area with water

Waste disposal method.....Consult local authorities

Section VII - Special Protoection Information

Respiratory protection.....None

Ventilation.....Avoid confined space

Protective gloves.....yes

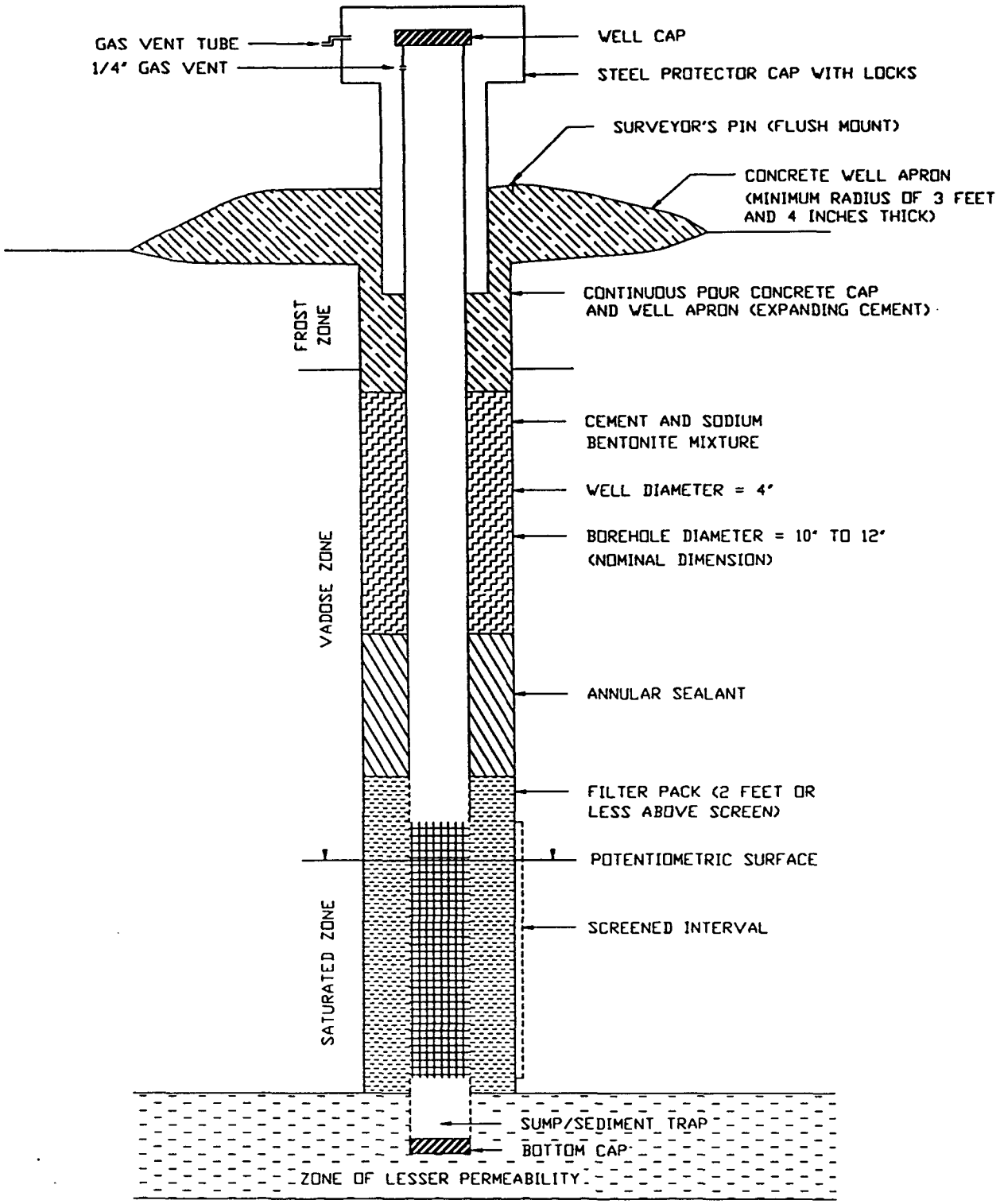
Eye protection.....gogglesor face shield

Other.....none

Section VIII - Special Precautions

Precautions to be taken handling and storage.....none

This information herein provided is believed to be accurate but is not warranteed to be whether originating with the company or not.



GENERAL MONITORING WELL - CROSS-SECTION

References

The following documents may provide further useful guidance:

1. "Manual of Ground-Water Sampling Procedures: Scalf, M.R., et al., 1981. National Water Well Association, Worthington, Ohio.

2. "Procedures for the Collection and Preservation of Ground Water and Surface Water Samples and for the Installation of Monitoring Wells-, U.S. Dept. of Energy, January, 1981, GJ/TMC-08, UC-70A.

3. "Practical Guide for Ground-Water Sampling", Barcelona, M.J., et al., E2A/600/2-85/104 September, 1986.

4. "RCRA Ground Water Monitoring Technical Enforcement Guidance Document", USE2A, OSWER-9950.1, September, 1986.

5. "Procedures Manual for Ground Water Monitoring at Solid Waste Disposal Facilities", EPA SW-611, 1980.

   "Test Methods for Evaluating Solid Waste", EPA SW-846, 1986.

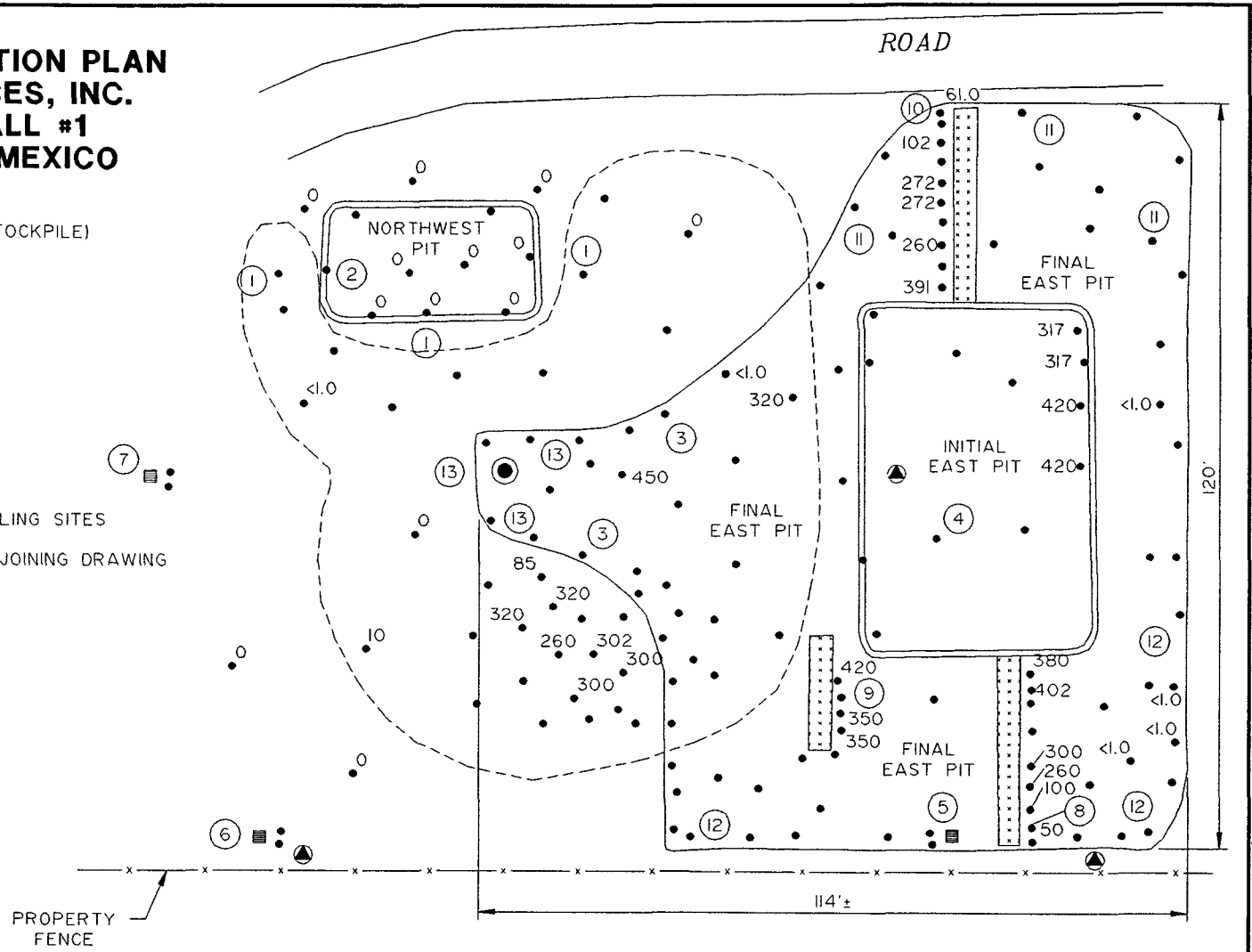
   "Interim Guidelines and Specifications for Preparing Quality Assurance Project Plans", EPA QAMS-005/80, 1980.

6. "Ground Water and Wells", Driscoll, Fletcher D., published by Aohnson Division, Second edition, 1986.

7. "Guidance for Construction of Monitoring Wells", Colorado Department of Health, Water Quality Control Division, Ground Water Unit, 1987.

WELL SITE REMEDIATION PLAN
NASSAW RESOURCES, INC.
JOHN A. BRIMHALL #1
FRUITLAND, NEW MEXICO

- ----- = AREA OF EXCAVATED SOIL (STOCKPILE)
- ═══ = BOUNDARY OF INITIAL PITS
- ——— = FINAL BOUNDARY OF PIT
- ◉ = WELL HEAD
- ▭ = EXPLORATORY DITCHES
- —·— = PROPERTY FENCE
- • = SAMPLING SITES
- ▤ = 6' DEEP GROUND WATER SAMPLING SITES
- (n) = SAMPLE TEST SITES - SEE ADJOINING DRAWING
- ▲ = MONITOR WELL LOCATION



NOT TO SCALE

BY

TIERRA

Environmental Company, Inc.
909 West Apache
Farmington, New Mexico 87401 FILE: 3537 DATE: 10/13/93

STATE OF NEW MEXICO

ENERGY, MINERALS AND NATURAL RESOURCES DEPARTMENT

OIL CONSERVATION DIVISION

BRUCE KING
GOVERNOR

ANITA LOCKWOOD
CABINET SECRETARY

November 10, 1993

POST OFFICE BOX 2088
STATE LAND OFFICE BUILDING
SANTA FE, NEW MEXICO 87504
(505) 827-5800

CERTIFIED MAIL
RETURN RECEIPT NO. P-667-242-406

Mr. Murphy Brasuel
Field Superintendent
Nassau Resources, Inc.
2855 Southside River Road
P.O. Box 809
Farmington, New Mexico 87499

RE: JOHN A. BRIMHALL #1 WELL SITE PIT CLOSURE
NASSAU RESOURCES, INC.
SAN JUAN COUNTY, NEW MEXICO

Dear Mr. Brimhall:

The New Mexico Oil Conservation Division (OCD) is in the process of reviewing Nassau Resources October 1993 "ELIMINATION OF HYDROCARBON EXPOSED SOIL" which was submitted to OCD on October 25, 1993 by Nassau Resources consultant Tierra Environmental Company, Inc. This report documents the results of soil and water remedial actions related to Nassau Resources John A. Brimhall #1 well site.

While the work performed appears to have adequately remediated the source area, the OCD has the following questions, comments and requests for information related to the above referenced report:

1. The report states that contaminated ground water seeping into the excavation was removed and hauled to a disposal. However, the report did not indicate to what disposal facility the wastes were taken. Please provide this information.

2. "Quad-5" was listed as a bioremediation treatment product used in the excavation. Please provide OCD with information on the make-up of this product.

3. Does soil sample #3 represent the initial sample for that area prior to excavation and soil sample #13 represent the final samples of the same area? Please clarify what these samples represent.

4. The site location map shows numerous sample points that do not have any corresponding sample results. Please provide OCD with any sample results from these points.

5. Because the report documented contamination of ground water at the site, the OCD requires that monitor wells be installed to conclusively determine any migration of contamination from the source area. Please submit a work plan for the installation and construction of ground water monitoring system. The work plan should include a sampling plan for monitoring ground water quality.

Receipt of the above information will allow the OCD to complete a review of the above referenced remediation report. If you have any questions, please contact me at (505) 827-5885.

Sincerely,

William C. Olson
Hydrogeologist
Environmental Bureau

xc: OCD Aztec Office
Phil Nobis, Tierra Environmental Company, Inc.