# GW – 001

# MONITORING REPORT

# Facility-Wide GW Monitoring Plan (Revised May 2008)

Western Refining

BLOOMFIELD REFINERY

WNR LISTED NYSE

RECEIVED
2010 MAR 22 PM 1 23

Hope Monzeglio
New Mexico Environmental Department
Hazardous Waste Bureau
2905 Rodeo Park Drive East
Bldg 1
Santa Fe, NM 87505

Certified Mail: # 7008 1300 0001 3402 7060

March 18, 2010

**RE: Western Refining Southwest, Inc. - Bloomfield Refinery**
**EPA ID# NMD089416416**
**GW - 001**

Dear Ms. Monzeglio,.

Bloomfield Refinery personnel will begin collecting semi-annual groundwater samples the week of April 5, 2010.

Refinery personnel will follow guidelines from the *Facility-Wide Groundwater Monitoring Plan December 2007 (Revised May 2008).*

MW #1, MW #6, MW #8, MW #12, MW #13, MW #20, MW #30, MW #33, MW #35, MW #37, and MW #38 will be sampled for the target VOC's (target list – EPA Method 8260), TPH-GRO/DRO (EPA Method 8015B). Samples will also be collected from CW 0+60, CW 25+95,and analyzed for VOC's (target list - EPA Method 8260), TPH-DRO(EPA Method 8015B). Each observation well will be sampled and analyzed for VOC's (target list - EPA Method 8260), TPH-DRO/GRO (EPA Method 8015B). East Outfall #2 and East Outfall #3 will be sampled and analyzed for VOC's (target list – EPA Method 8260), dissolved metals and total metals (target list – EPA Method 6010/7470)), carbon dioxide/alkalinity (SM 2320B), and anions (EPA Method 300.0). In addition, samples will be collected from Seep # 1, #6, #7, #8, and #9, if sufficient water is present and analyzed for VOC's (target list – EPA Method 8260), SVOCs (EPA Method 8270), TDS, carbon dioxide/alkalinity (SM 2320B), and anions (EPA Method 300.0).

All wells within the facility will be monitored for groundwater elevation.

If any representatives from NMED would like to participate, please contact me so that safety orientation training can be scheduled for incoming personnel.

If you need additional information, please contact me at (505) 632-4161.

Sincerely,

Cindy Hurtado

Cindy Hurtado
Environmental Coordinator
Western Refining Southwest, Inc. - Bloomfield Refinery

Cc: Randy Schmaltz – Environmental Manager – Bloomfield Refinery
Carl Chavez – Oil Conservation Division – Santa Fe

Western Refining

WNR LISTED NYSE

BLOOMFIELD REFINERY

RECEIVED

2009 MAR 19 AM 11 53

Hope Monzeglio
New Mexico Environmental Department
Hazardous Waste Bureau
2905 Rodeo Park Drive East
Bldg 1
Santa Fe, NM 87505

Certified Mail: # 7007 0220 0004 0187 0633

March 17, 2009

**RE: Western Refining Southwest, Inc. - Bloomfield Refinery**
**EPA ID# NMD089416416**
**GW - 001**

Dear Ms. Monzeglio,

Bloomfield Refinery personnel will begin collecting semi-annual groundwater samples the week of April 6, 2009.

Refinery personnel will follow guidelines from the *Facility-Wide Groundwater Monitoring Plan (Revised May 2008).*

MW #1, MW #6, MW #8, MW #12, MW #13, MW #20, MW #30, MW #33, MW #35, MW #37, and MW #38 will be sampled for the target VOC's (target list – EPA Method 8260), TPH-GRO/DRO (EPA Method 8015B). Samples will also be collected from CW 0+60, CW 25+95,and analyzed for VOC's (target list - EPA Method 8260), TPH-DRO(EPA Method 8015B). Each observation well will be sampled and analyzed for VOC's (target list - EPA Method 8260), TPH-DRO/GRO (EPA Method 8015B). East Outfall #2 and East Outfall #3 will be sampled and analyzed for VOC's (target list – EPA Method 8260), dissolved metals and total metals (target list – EPA Method 6010/7470)), carbon dioxide/alkalinity (SM 2320B), and anions (EPA Method 300.0). In addition, samples will be collected from Seep # 1, #6, #7, #8, and #9, if sufficient water is present and analyzed for VOC's (target list – EPA Method 8260), SVOCs (EPA Method 8270), TDS, carbon dioxide/alkalinity (SM 2320B), and anions (EPA Method 300.0).

All wells within the facility will be monitored for groundwater elevation.

If any representatives from NMED would like to participate, please contact me so that safety orientation training can be scheduled for incoming personnel.

If you need additional information, please contact me at (505) 632-4161.

Sincerely,

Cindy Hurtado

Cindy Hurtado
Environmental Coordinator
Western Refining Southwest, Inc. - Bloomfield Refinery

Cc: Randy Schmaltz – Environmental Manager – Bloomfield Refinery
Brad Jones – Oil Conservation Division – Santa Fe
Carl Chavez – Oil Conservation Division – Santa Fe

## Chavez, Carl J, EMNRD

**From:** Monzeglio, Hope, NMENV
**Sent:** Wednesday, November 05, 2008 8:40 AM
**To:** Chavez, Carl J, EMNRD
**Cc:** Cobrain, Dave, NMENV; Price, Wayne, EMNRD
**Subject:** GRCB Evaluation of Interim Measures
**Attachments:** 08-001 GRCB 11_08 NMED Response to GRCB Oct 08 lttr.doc

Carl

I will be sending this letter out at the end of the week. Let me know if OCD has any questions.

Hope

Hope Monzeglio
Environmental Specialist
New Mexico Environment Department
Hazardous Waste Bureau
2905 Rodeo Park Drive East, BLDG 1
Santa Fe NM 87505
Phone: (505) 476-6045; Main No.: (505)-476-6000
Fax: (505)-476-6060
hope.monzeglio@state.nm.us

**Websites:**
**New Mexico Environment Department**
**Hazardous Waste Bureau**

# NEW MEXICO
# ENVIRONMENT DEPARTMENT

## *Hazardous Waste Bureau*

**2905 Rodeo Park Drive East, Building 1**
**Santa Fe, New Mexico 87505-6303**
**Phone (505) 476-6000 Fax (505) 476-6030**
***www.nmenv.state.nm.us***

BILL RICHARDSON
Governor

DIANE DENISH
Lieutenant Governor

RON CURRY
Secretary

JON GOLDSTEIN
Deputy Secretary


**CERTIFIED MAIL - RETURN RECEIPT REQUESTED**

November 7, 2008

Mr. Randy Schmaltz
Environmental Supervisor
Western Refining Southwest, Inc., Bloomfield Refinery
P.O. Box 159
Bloomfield, New Mexico 87413

**RE:** DRAFT
**MONITORING REQUIREMENTS**
**EVALUATION OF INTERIM MEASURES**
**WESTERN REFINING SOUTHWEST, INC., BLOOMFIELD REFINERY**
**EPA ID # NMD089416416**
**HWB-GRCB-08-001**

Dear Mr. Schmaltz:

The New Mexico Environment Department (NMED) has received and reviewed Western Refining Southwest, Inc.'s, (Western) letter entitled *Monitoring Requirements Evaluation of Interim Measures* dated October 3, 2008. This letter was in response to NMED's September 2, 2008 letter that provided monitoring requirements to the evaluation of interim measures.

NMED's September 2, 2008 letter requires Western to submit a plan that proposes the hydraulic characterization of the aquifer on the down-gradient side of the barrier wall on or before November 17, 2008. Western has requested an extension for the submittal of this plan until after the six-month observation period for measurement of fluid levels from all of the observation wells, MW-45, and MW-47, in order to gather additional information.

NMED hereby approves Western's request. Western must submit the plan that proposes the hydraulic characterization of the aquifer to NMED and the Oil Conservation Division (OCD) on or before June 20, 2009. Western must schedule a meeting with NMED and the OCD at the end

of the six-month observation period to review the results of the data collection and discuss any preliminary recommendations.

If you have questions regarding this letter, please contact Hope Monzeglio of my staff at 505-476-6045.

Sincerely,

John E. Kieling
Program Manager
Permits Management Program
Hazardous Waste Bureau

cc: D. Cobrain, NMED HWB
H. Monzeglio, NMED HWB
W. Price, OCD
C. Chavez, OCD
B. Powell, OCD Aztec Office
L. King, EPA Region 6
A. Hains, Western Refining, El Paso
File: HWB-GRCB-08-001 and Reading

## Chavez, Carl J, EMNRD

**From:** Monzeglio, Hope, NMENV

**Sent:** Friday, November 07, 2008 12:44 PM

**To:** Schmaltz, Randy

**Cc:** Cobrain, Dave, NMENV; Kieling, John, NMENV; Price, Wayne, EMNRD; Chavez, Carl J, EMNRD; Powell, Brandon, EMNRD; king.laurie@epa.gov; Hains, Allen

**Subject:** Evaluation of Interim Measures

**Attachments:** GRCB-08-001 11_08 NMED Resp to GRCB Oc8 8 lttr.pdf

This will go out in the mail today.

Hope

Hope Monzeglio
Environmental Specialist
New Mexico Environment Department
Hazardous Waste Bureau
2905 Rodeo Park Drive East, BLDG 1
Santa Fe NM 87505
Phone: (505) 476-6045; Main No.: (505)-476-6000
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**Websites:**
**New Mexico Environment Department**
**Hazardous Waste Bureau**

NEW MEXICO
ENVIRONMENT DEPARTMENT

*Hazardous Waste Bureau*

2905 Rodeo Park Drive East, Building 1
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BILL RICHARDSON
Governor

DIANE DENISH
Lieutenant Governor

RON CURRY
Secretary

JON GOLDSTEIN
Deputy Secretary

CERTIFIED MAIL - RETURN RECEIPT REQUESTED

November 7, 2008

Mr. Randy Schmaltz
Environmental Supervisor
Western Refining Southwest, Inc., Bloomfield Refinery
P.O. Box 159
Bloomfield, New Mexico 87413

**RE: MONITORING REQUIREMENTS**
**EVALUATION OF INTERIM MEASURES**
**WESTERN REFINING SOUTHWEST, INC., BLOOMFIELD REFINERY**
**EPA ID # NMD089416416**
**HWB-GRCB-08-001**

Dear Mr. Schmaltz:

The New Mexico Environment Department (NMED) has received and reviewed Western Refining Southwest, Inc.'s, (Western) letter entitled *Monitoring Requirements Evaluation of Interim Measures* dated October 3, 2008. This letter was in response to NMED's September 2, 2008 letter that provided monitoring requirements to the evaluation of interim measures.

NMED's September 2, 2008 letter requires Western to submit a plan that proposes the hydraulic characterization of the aquifer on the down-gradient side of the barrier wall on or before November 17, 2008. Western has requested an extension for the submittal of this plan until after the six-month observation period for measurement of fluid levels from all of the observation wells, MW-45, and MW-47, in order to gather additional information.

NMED hereby approves Western's request. Western must submit the plan that proposes the hydraulic characterization of the aquifer to NMED and the Oil Conservation Division (OCD) on or before June 20, 2009. Western must schedule a meeting with NMED and the OCD at the end of the six-month observation period to review the results of the data collection and discuss any

preliminary recommendations.

If you have questions regarding this letter, please contact Hope Monzeglio of my staff at 505-476-6045.

Sincerely,

John E. Kieling
Program Manager
Permits Management Program
Hazardous Waste Bureau

cc: D. Cobrain, NMED HWB
H. Monzeglio, NMED HWB
W. Price, OCD
C. Chavez, OCD
B. Powell, OCD Aztec Office
L. King, EPA Region 6
A. Hains, Western Refining, El Paso
File: HWB-GRCB-08-001 and Reading

Certified Mail 7006 0810 003 7020 7179

October 3, 2008

Mr. John E. Kieling, Program Manager
Permits Management Program
State of New Mexico Environmental Department
Hazardous Waste Bureau
2905 Rodeo Park Drive East, Building 1
Santa Fe, New Mexico 87505-6303

Re: Monitoring Requirements
Evaluation of Interim Measures
Western Refining Southwest, Inc., Bloomfield Refinery
EPA ID# NMD089416416
HWB-GRCB-08-001

Dear Mr. Kieling:

Pursuant to your letter of September 25 2008, Western Refining Southwest, Inc., Bloomfield Refinery ("Western") has begun the collection of fluid level data from all observation wells, MW-45, and MW-47 on a biweekly basis. This activity will be conducted for the next six months and the resulting data submitted to NMED and OCD on or before April 20, 2009 as directed.

In addition, you requested that Western provide a plan that "proposes the hydraulic characterization of the aquifer on the down-gradient (river) side of the barrier wall." In keeping with the desire to determine the best solution to recover product on the river side of the slurry wall, Western would like to complete the aforementioned six-month observation period prior to proposing the requested plan. Western will review the fluid level data as it is collected and use the information to develop preliminary recommendations for inclusion in a subsequent plan.

I suggest that we schedule a meeting near the end of the six-month observation period. The purpose of the meeting will be to review the results of the data collection effort and to discuss our preliminary recommendations. I believe this short delay will allow us not only to incorporate the new fluid level data, but to work toward development of a final plan that can be approved and implemented without further delay. Thanks in advance for your consideration and please contact me with any questions.

Sincerely,

James R. Schmaltz
Environmental Manager
Western Refining Southwest, Inc., Bloomfield Refinery

cc: H. Monzeglio – NMED HWB
D. Cobrain – NMED HWB
C. Chavez – OCD
W. Price – OCD
B. Powell - OCD Aztec Office
L. King – EPA Region 6
A. Hains – Western Refining, El Paso
S. Crouch – RPS JDC

CERTIFIED MAIL # 7006 0810 0003 7020 6936

July 15, 2008

Mr. John E. Kieling, Program Manager
Permits Management Program
State of New Mexico Environmental Department
Hazardous Waste Bureau
2905 Rodeo Park Drive East, Building 1
Santa Fe, New Mexico 87505-6303

Re: Evaluation of Interim Measures
Western Refining Southwest, Inc., Bloomfield Refinery
EPA ID# NMD089416416
HWB-GRCB-08-001

Dear Mr. Kieling:

Pursuant to Comment No. 2 in your letter of March 25, 2008, Western Refining Southwest, Inc., Bloomfield Refinery ("Western") has completed the three month evaluation of fluid levels in the observation and collection wells and in MW-45 and MW-47, all of which are located along the slurry wall. Depth to water and product was measured twice a week at regular intervals starting on April 1st and continuing through June 30, 2008. The data is enclosed in table form as requested.

A review of the data indicates that separate phase hydrocarbon (SPH) is present in the area of OW 1+50, MW-47, and OW 3+85. SPH was also measured in CW 8+45 and OW 11+15. These occurrences of SPH are consistent with past observations. I have included graphs of the measured thickness of SPH for wells OW 1+50, MW-47, OW 3+85, and OW 11+15. A graph was not produced for CW 8+45 as the measured thickness is very low and did not exceed 0.02 feet. As shown on the enclosed tables and graphs, the thickness did not exceed one foot in any of the wells during the evaluation period. The measured thickness in the wells did slowly increase during the evaluation period.

To further assess the potential for recovery and actual volumes of PSH in the formation near the wells, Western bailed OW 1+50, OW 3+85, OW 11+15, and MW 47. Twenty bailer volumes were removed from each well per day with a disposable hand bailer on eight days. This included four consecutive days of bailing, three days without bailing, followed by four more consecutive days of bailing. As the bailer was removed, the contents were poured into a 1,000 ml graduated cylinder and the amount of SPH and water was recorded. The total recovery volumes for each day at each well are complied in an enclosed table. The depth to SPH and water was measured each day before bailing and immediately after removing the 20 bailers of fluid. The fluid level

measurements are also provided in the enclosed table. Graphs showing the recovery volumes for each day and the fluid levels prior to bailing are also enclosed.

A review of the recovery data indicates that relatively small volumes of SPH were recovered. A maximum recovery of 0.36 gallons on a single day was observed at OW 3+85 and this recovery rate reduced to only approximately 0.2 gallons per day. Recovery rates at OW 1+50 and MW #47 appear to have stabilized at less than 0.1 gallons of SPH per day and less than one hundredth of a gallon of SPH was recovered at OW 11+15 by the eighth day.

An evaluation of the depth to SPH and water during the bailing test indicates a reduction in measured SPH thickness in the wells. Plots were not prepared for the fluid level measurements recorded on each day immediately at the conclusion of the bailing test because there is only a very small difference in fluid levels for SPH and water at the conclusion of the tests. This appears to indicate that most of the SPH was removed from the well bore and immediately adjacent formation and that SPH recharge rates are relatively low compared to removal rates with the bailer.

In summary there were the minor accumulations (i.e., less than one foot) of SPH under static conditions, which were observed during the three month evaluation period. The subsequent bailing tests produced very low recovery rates of SPH. Based on these results, Western recommends that recovery with passive techniques (e.g., absorbent socks) be conducted at OW 1+50, OW 3+85, OW 11+15, and MW-47. If you have additional questions or would like to discuss the evaluation further, please contact me at (505) 632-4171.

Sincerely,

James R. Schmaltz
Environmental Manager
Western Refining Southwest, Inc., Bloomfield Refinery

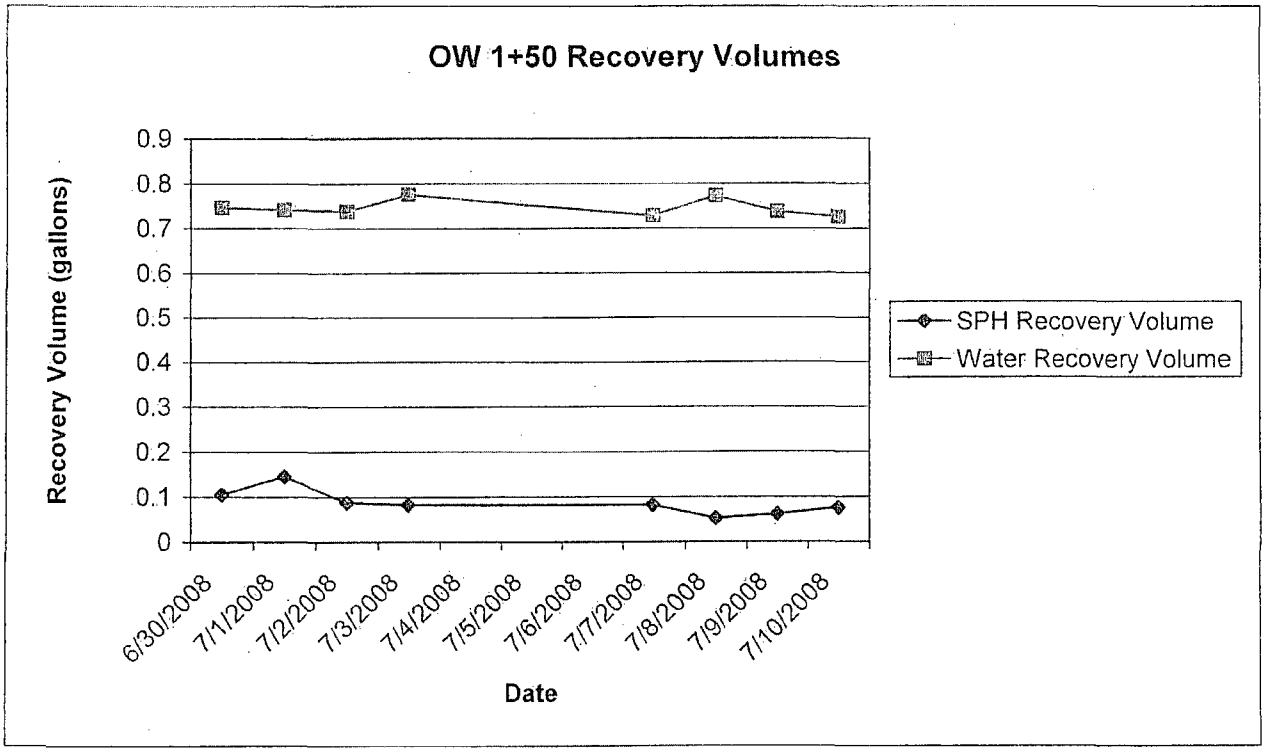
Enclosures

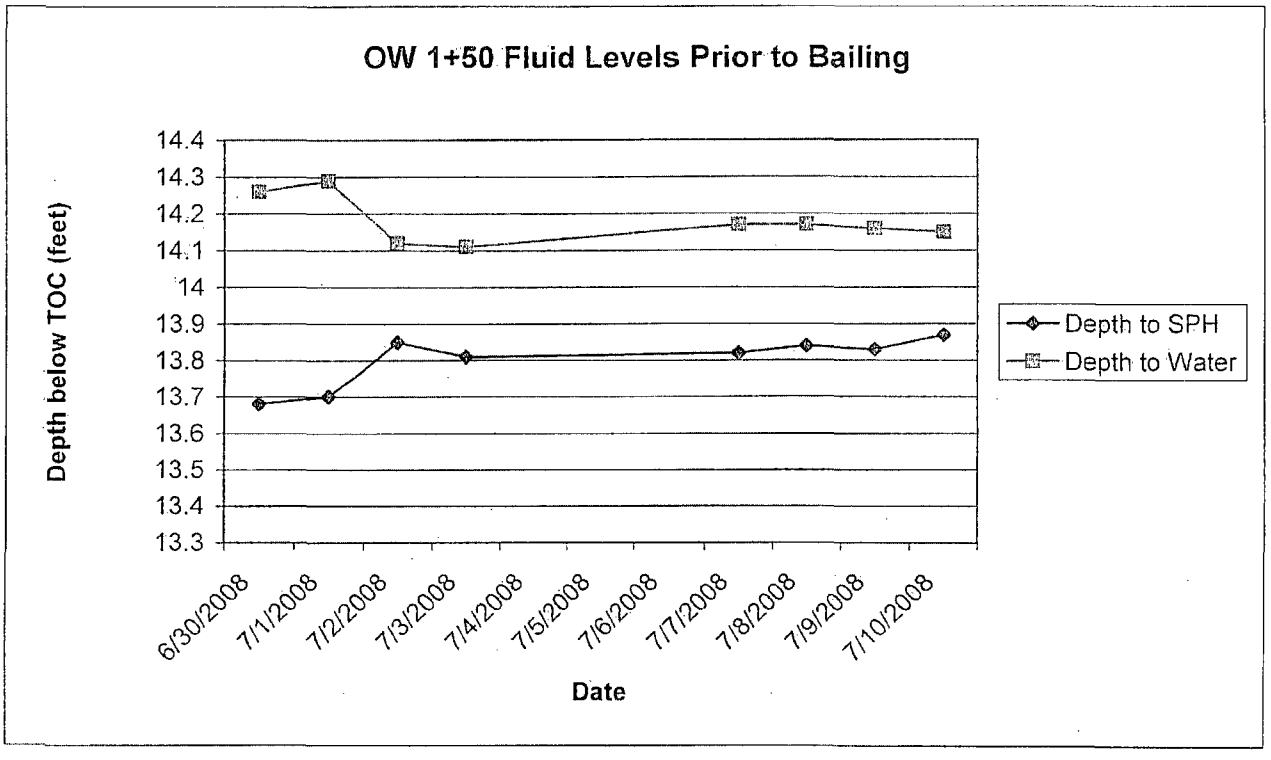
cc: H. Monzeglio – NMED HWB
D. Cobrain – NMED HWB
C. Frischkorn – NMED HWB
C. Chavez – OCD
W. Price – OCD
B. Powell - OCD Aztec Office
L. King – EPA Region 6
A. Hains – Western Refining, El Paso

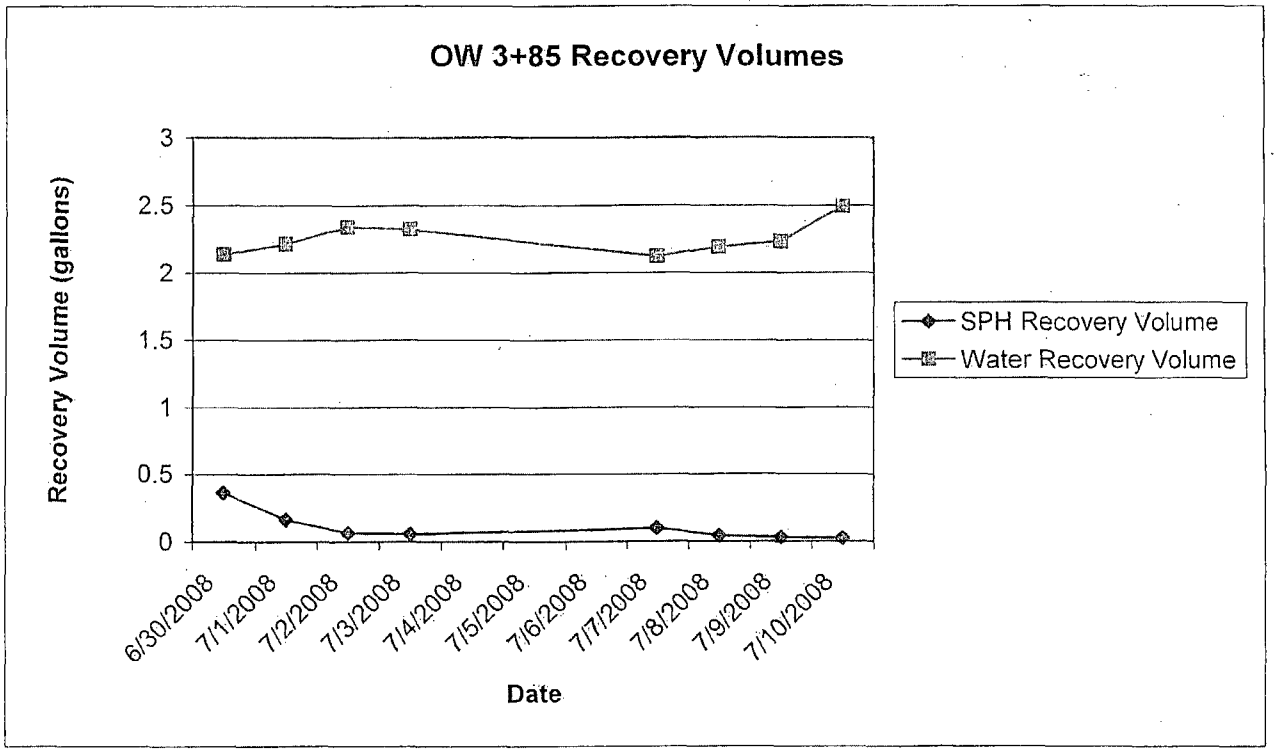
Western Refining Southwest, Inc., Bloomfield Refinery
Interim Measures Evaluation

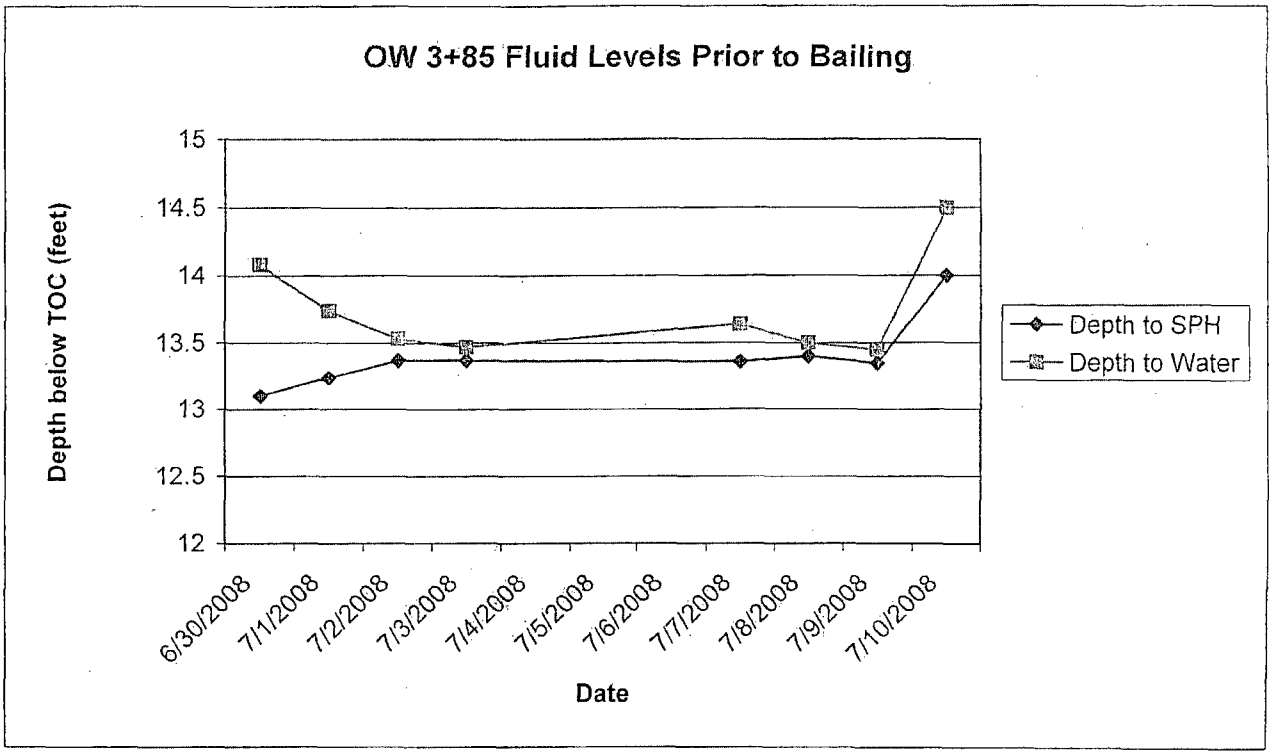
| Date | SPH (gals) | Water (gals) | Total (gals) | Before Bailing | | After Bailing | |
|---|---|---|---|---|---|---|---|
| | | | | Depth to Product (ft) | Depth to Water (ft) | Depth to Product (ft) | Depth to Water (ft) |
| MW #47 Bailing Test Results | | | | | | | |
| 6/30/2008 | 0.25608 | 0.3168 | 0.57288 | 12.68 | 12.42 | 13.96 | 13.98 |
| 7/1/2008 | 0.1716 | 0.39864 | 0.57024 | 12.85 | 13.24 | 14.02 | 14.03 |
| 7/2/2008 | 0.12408 | 0.33528 | 0.45936 | 13.66 | 14.19 | 14.02 | 14.04 |
| 7/3/2008 | 0.078408 | 0.385968 | 0.464376 | 12.59 | 13.14 | 13.98 | 13.99 |
| 7/7/2008 | 0.10824 | 0.28512 | 0.39336 | 12.88 | 13.17 | 14.04 | 14.06 |
| 7/8/2008 | 0.08184 | 0.34584 | 0.42768 | 12.93 | 13.15 | 14.03 | 14.05 |
| 7/9/2008 | 0.07524 | 0.36168 | 0.43692 | 12.88 | 13.06 | 13.95 | 13.98 |
| 7/10/2008 | 0.07524 | 0.40128 | 0.47652 | 12.94 | 13.1 | 14.03 | 14.05 |
| OW 1+50 Bailing Test Results | | | | | | | |
| 6/30/2008 | 0.104544 | 0.746856 | 0.8514 | 13.68 | 14.26 | 13.83 | 13.84 |
| 7/1/2008 | 0.1452 | 0.74184 | 0.88704 | 13.7 | 14.29 | 13.85 | 13.86 |
| 7/2/2008 | 0.08712 | 0.7392 | 0.82632 | 13.85 | 14.12 | 13.9 | 13.91 |
| 7/3/2008 | 0.082632 | 0.77616 | 0.858792 | 13.81 | 14.11 | 13.95 | 13.96 |
| 7/7/2008 | 0.08184 | 0.72864 | 0.81048 | 13.82 | 14.17 | 13.98 | 14 |
| 7/8/2008 | 0.052536 | 0.77352 | 0.826056 | 13.84 | 14.17 | 13.92 | 13.92 |
| 7/9/2008 | 0.06204 | 0.73788 | 0.79992 | 13.83 | 14.16 | 13.96 | 13.97 |
| 7/10/2008 | 0.076032 | 0.726 | 0.802032 | 13.87 | 14.15 | 13.98 | 13.99 |
| OW 3+85 Bailing Test Results | | | | | | | |
| 6/30/2008 | 0.363 | 2.14104 | 2.50404 | 13.1 | 14.08 | 13.7 | 13.82 |
| 7/1/2008 | 0.165 | 2.21496 | 2.37996 | 13.24 | 13.74 | 14 | 14.05 |
| 7/2/2008 | 0.066 | 2.34168 | 2.40768 | 13.37 | 13.53 | 14.09 | 14.14 |
| 7/3/2008 | 0.05676 | 2.32584 | 2.3826 | 13.37 | 13.47 | 14.01 | 14.05 |
| 7/7/2008 | 0.10032 | 2.1252 | 2.22552 | 13.36 | 13.64 | 14.02 | 14.04 |
| 7/8/2008 | 0.04356 | 2.19384 | 2.2374 | 13.4 | 13.5 | 14.33 | 14.35 |
| 7/9/2008 | 0.032208 | 2.2308 | 2.263008 | 13.35 | 13.45 | 14.18 | 14.19 |
| 7/10/2008 | 0.024288 | 2.49216 | 2.516448 | 14 | 14.5 | 14.24 | 14.25 |
| OW 11+15 Bailing Test Results | | | | | | | |
| 6/30/2008 | 0.03696 | 4.94208 | 4.97904 | 12.3 | 12.9 | NPP | 14.45 |
| 7/1/2008 | 0 | 4.28472 | 4.28472 | NPP | 12.34 | NPP | 15.06 |
| 7/2/2008 | 0.00528 | 4.24248 | 4.24776 | 12.57 | 12.62 | NPP | 14.95 |
| 7/3/2008 | 0.00132 | 4.17912 | 4.18044 | 12.35 | 12.36 | NPP | 15.15 |
| 7/7/2008 | 0.01584 | 4.16328 | 4.17912 | 12.37 | 12.47 | NPP | 15.22 |
| 7/8/2008 | 0.007656 | 4.23984 | 4.247496 | 12.34 | 12.36 | NPP | 15.47 |
| 7/9/2008 | 0.001848 | 4.08144 | 4.083288 | 12.42 | 12.44 | NPP | 15.3 |
| 7/10/2008 | 0.002112 | 4.21608 | 4.218192 | 12.41 | 12.42 | NPP | 15.4 |

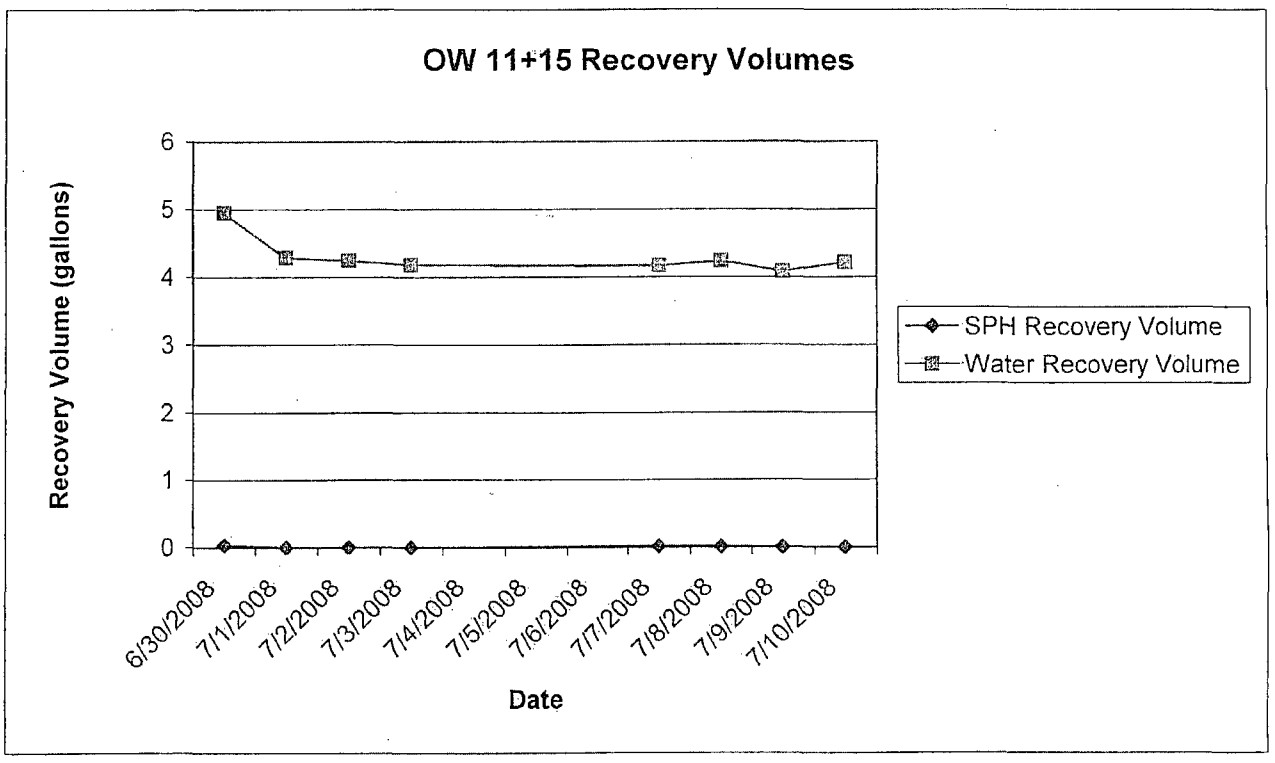
NPP - no product present

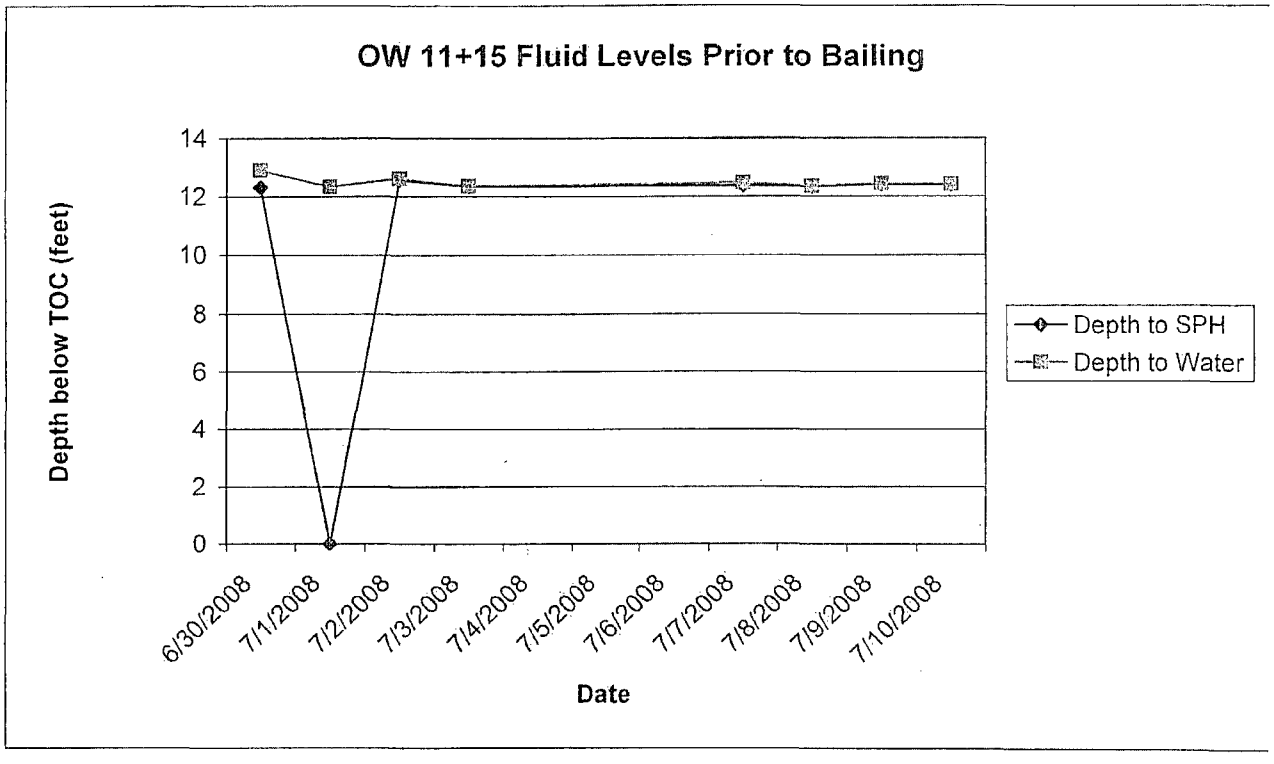

OW 1+50 Recovery Volumes
Recovery Volume (gallons)
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
6/30/2008
7/1/2008
7/2/2008
7/3/2008
7/4/2008
7/5/2008
7/6/2008
7/7/2008
7/8/2008
7/9/2008
7/10/2008
Date
SPH Recovery Volume
Water Recovery Volume


OW 1+50 Fluid Levels Prior to Bailing
Depth below TOC (feet)
14.4
14.3
14.2
14.1
14
13.9
13.8
13.7
13.6
13.5
13.4
13.3
6/30/2008
7/1/2008
7/2/2008
7/3/2008
7/4/2008
7/5/2008
7/6/2008
7/7/2008
7/8/2008
7/9/2008
7/10/2008
Date
Depth to SPH
Depth to Water

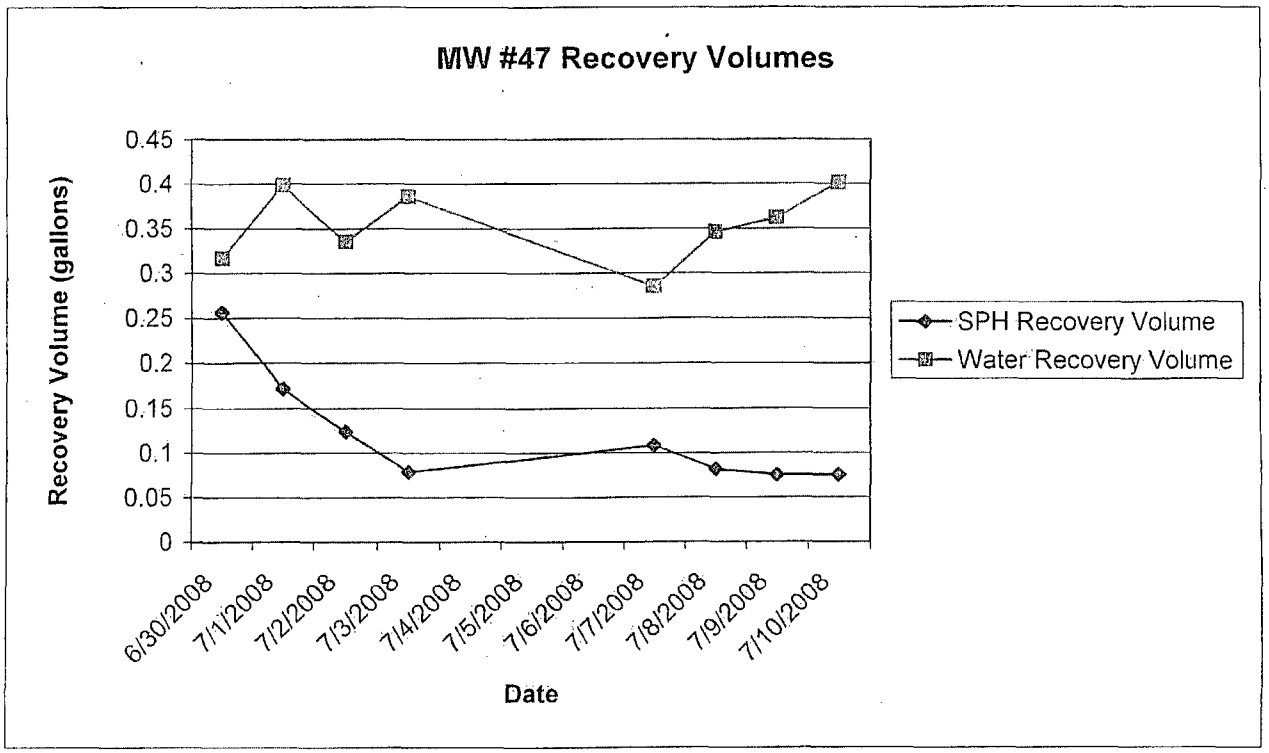

OW 3+85 Recovery Volumes
Recovery Volume (gallons)
3
2.5
2
1.5
1
0.5
0
6/30/2008
7/1/2008
7/2/2008
7/3/2008
7/4/2008
7/5/2008
7/6/2008
7/7/2008
7/8/2008
7/9/2008
7/10/2008
Date
SPH Recovery Volume
Water Recovery Volume

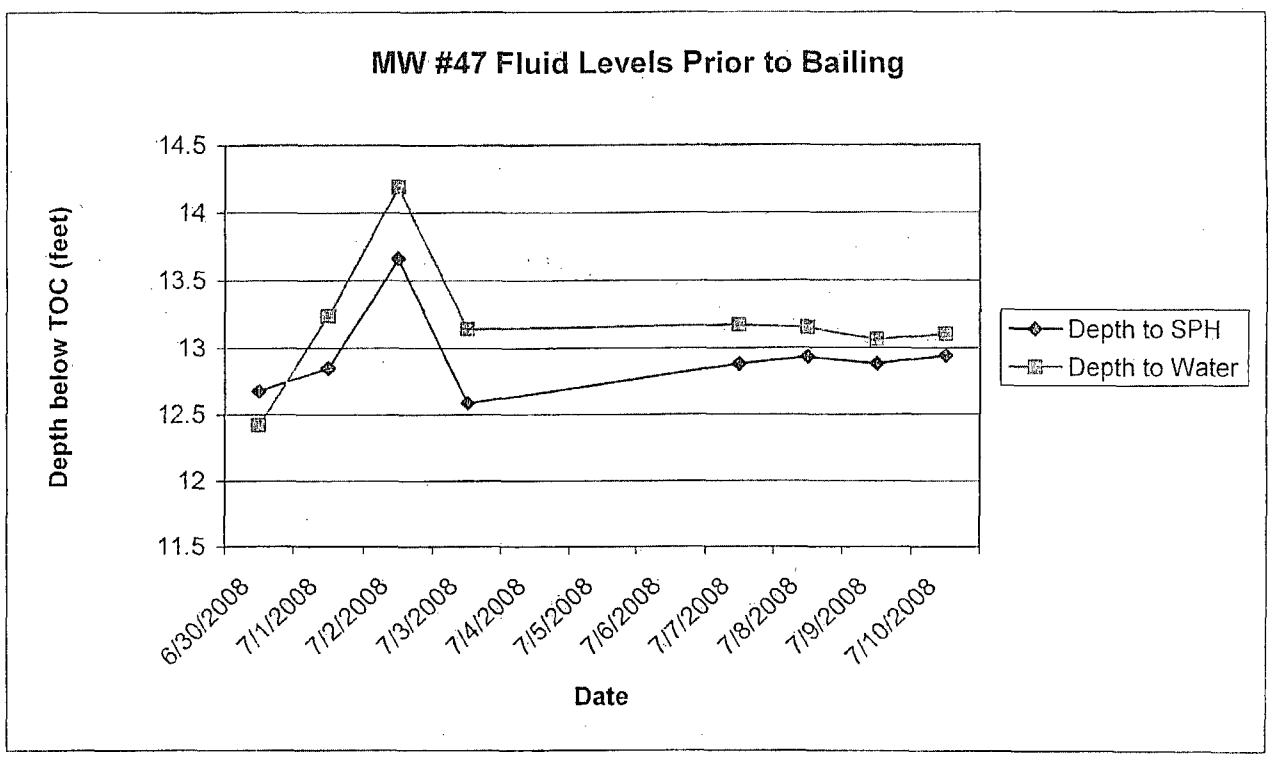

OW 3+85 Fluid Levels Prior to Bailing
Depth below TOC (feet)
15
14.5
14
13.5
13
12.5
12
6/30/2008
7/1/2008
7/2/2008
7/3/2008
7/4/2008
7/5/2008
7/6/2008
7/7/2008
7/8/2008
7/9/2008
7/10/2008
Date
Depth to SPH
Depth to Water


OW 11+15 Recovery Volumes
Recovery Volume (gallons)
0
1
2
3
4
5
6
6/30/2008
7/1/2008
7/2/2008
7/3/2008
7/4/2008
7/5/2008
7/6/2008
7/7/2008
7/8/2008
7/9/2008
7/10/2008
Date
SPH Recovery Volume
Water Recovery Volume


OW 11+15 Fluid Levels Prior to Bailing
Depth below TOC (feet)
0
2
4
6
8
10
12
14
6/30/2008
7/1/2008
7/2/2008
7/3/2008
7/4/2008
7/5/2008
7/6/2008
7/7/2008
7/8/2008
7/9/2008
7/10/2008
Date
Depth to SPH
Depth to Water

Western Refining Southwest, Inc., Bloomfield Refinery
Interim Measures Evaluation



## Chavez, Carl J, EMNRD

**From:** Monzeglio, Hope, NMENV
**Sent:** Wednesday, March 05, 2008 2:09 PM
**To:** Chavez, Carl J, EMNRD
**Cc:** Cobrain, Dave, NMENV; Frischkorn, Cheryl, NMENV; Price, Wayne, EMNRD
**Subject:** RE: Bloomfield

Carl

I will look over your comments, make changes, and provide you with the revised documents for your review again. I will let you know if I have any questions.

Thanks
Hope

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**From:** Chavez, Carl J, EMNRD
**Sent:** Wednesday, March 05, 2008 1:56 PM
**To:** Monzeglio, Hope, NMENV; Price, Wayne, EMNRD
**Cc:** Frischkorn, Cheryl, NMENV; Cobrain, Dave, NMENV
**Subject:** RE: Bloomfield

Hope:

Wayne and I spoke to Randy Schmaltz this morning about the SPH and use of socks (if SPH is present) at OW 1+50 (avg. 8 in. SPH) , OW 3+85 (avg. 12 in. SPH), MW-47 (?), OW 5+50 (0.6 in. SPH), and OW 16+60 (?). Randy said although the 2 in. Dia. wells are screened shallow into the water table, there is a water/SPH interface below the SPH in the wells; consequently, the concern that the SPH layer is thicker than the measured thickness in the wells does not appear to be an issue. He concedes that a 6 in. layer of SPH over a 200 x 200 square ft. area could mean over one-hundred thousand gallons of SPH is floating on the water table, but wants to try the socks (8in. x 2in) in each well with monitoring to see how much SPH they recover per well and can remove with a manual passive SPH recovery process. A 2 in. x 8 in. sock is not expected to recover much SPH. He is aware that the passive method, depending on the frequency that the socks will be squeezed, may require significant manual labor to remove the SPH, but they want to give it a try. He said in the course of monitoring and removing SPH they find it is not feasible to use socks, they will consider installing an active SPH recovery system similar to Navajo where they may install an automated free-product recovery system with sump well design or reactivate vacuum trucks again to recover the SPH. OCD notices in NMED's draft "Interim Measures Letter" that it would like to give the passive SPH system a chance. Randy would like to try the socks. Consequently, the OCD is in agreement, but if monitoring and SPH removal indicates that the passive sock system is ineffective, we need to make sure we include language that will require an active SPH removal system. OCD is a little concerned because the OWs and MW-47 are on the river-side of the barrier wall and not within the contained barrier wall area.

Two letters, one for each report is fine with OCD. OCD comments on NMED draft letters are provided below.

Facility-Wide Groundwater Monitoring Plan:

First sentence: You may want to add "and Oil Conservation Division (OCD)" have reviewed the FWGWMP.

First paragraph: You may want to add "dated January 2008" after the "Evaluation of Interim Measures."

SPH OWs and MW-47 (Comment 2 of your "Evaluation of Interim Measures" draft) could be incorporated into the FWGWMP, since it is part of the groundwater monitoring. We recommend weekly monitoring, SPH thickness, SPH recovery volume per well (discrete and cumulative) be recorded with a conference call to update the agencies on the success of recovery or SPH thickness reduction, and the refinery's determination of whether to

continue passive SPH recovery versus active SPH recovery and the frequency of monitoring thereafter. In addition, the last sentence of Comment 2 should be revised as the goal is to monitor, remove SPH with the socks, and show that the passive SPH recovery method or process is reducing the thickness and overall volume of the SPH over time. OCD likes the SPH thickness greater than 1 foot notification to the agencies because it will alert the agencies to the actual volume of SPH still floating on the water table on the river side of the barrier wall and allow the agencies to mandate active SPH recovery.

Facility-Wide Groundwater Monitoring Plan:

Looks good with similar "Comment 2" changes above (see FWGWMP).

Please let me know what you think or if you have questions. Thank you.

Carl J. Chavez, CHMM
New Mexico Energy, Minerals & Natural Resources Dept.
Oil Conservation Division, Environmental Bureau
1220 South St. Francis Dr., Santa Fe, New Mexico 87505
Office: (505) 476-3491
Fax: (505) 476-3462
E-mail: CarlJ.Chavez@state.nm.us
Website: http://www.emnrd.state.nm.us/ocd/index.htm
(Pollution Prevention Guidance is under "Publications")

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**From:** Monzeglio, Hope, NMENV
**Sent:** Friday, February 29, 2008 2:47 PM
**To:** Price, Wayne, EMNRD; Chavez, Carl J, EMNRD
**Cc:** Frischkorn, Cheryl, NMENV; Cobrain, Dave, NMENV
**Subject:** Bloomfield

Carl and Wayne

I have attached drafts of NMED's Approval with Direction to the Evaluation Interim Measures report and the Facility Wide Groundwater Monitoring Plan. Hopefully by review of these, it will clarify the differences and overlapping issues between the two reports. After your phone call with Randy and review of the letters, let me know if OCD concurs and if not, please provide me with your recommendations.

Thanks
Hope

Hope Monzeglio
Environmental Specialist
New Mexico Environment Department
Hazardous Waste Bureau
2905 Rodeo Park Drive East, BLDG 1
Santa Fe NM 87505
Phone: (505) 476-6045; Main No.: (505)-476-6000
Fax: (505)-476-6060
hope.monzeglio@state.nm.us

**Websites:**
**New Mexico Environment Department**
**Hazardous Waste Bureau**

## Chavez, Carl J, EMNRD

**From:** Chavez, Carl J, EMNRD
**Sent:** Wednesday, March 19, 2008 7:41 AM
**To:** Price, Wayne, EMNRD
**Subject:** FW: GRCB

Wayne:

Do you have any comments on NMED's draft interim measures and facility wide GW monitor plan to pass along this a.m.? Thnx.

Carl J. Chavez, CHMM
New Mexico Energy, Minerals & Natural Resources Dept.
Oil Conservation Division, Environmental Bureau
1220 South St. Francis Dr., Santa Fe, New Mexico 87505
Office: (505) 476-3491
Fax: (505) 476-3462
E-mail: CarlJ.Chavez@state.nm.us
Website: http://www.emnrd.state.nm.us/ocd/index.htm
(Pollution Prevention Guidance is under "Publications")

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**From:** Monzeglio, Hope, NMENV
**Sent:** Wednesday, March 19, 2008 7:03 AM
**To:** Chavez, Carl J, EMNRD
**Subject:** RE: GRCB

Thanks

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**From:** Chavez, Carl J, EMNRD
**Sent:** Tuesday, March 18, 2008 4:58 PM
**To:** Monzeglio, Hope, NMENV
**Subject:** RE: GRCB

Hope:

I'll reply first thing tomorrow morning. Looks good, but may have at least one comments on Interim measures. Thnx.

Carl J. Chavez, CHMM
New Mexico Energy, Minerals & Natural Resources Dept.
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1220 South St. Francis Dr., Santa Fe, New Mexico 87505
Office: (505) 476-3491
Fax: (505) 476-3462
E-mail: CarlJ.Chavez@state.nm.us
Website: http://www.emnrd.state.nm.us/ocd/index.htm
(Pollution Prevention Guidance is under "Publications")

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**From:** Monzeglio, Hope, NMENV
**Sent:** Monday, March 17, 2008 11:19 AM
**To:** Chavez, Carl J, EMNRD; Price, Wayne, EMNRD
**Cc:** Cobrain, Dave, NMENV; Frischkorn, Cheryl, NMENV

**Subject:** GRCB

Carl

Attached are the Drafts to the Approval with Directions to the Evaluation of Interim Measures and Facility Wide Groundwater Monitoring Plan. I have incorporated your comments from your 3/5/08 email. The only other change is to the Evaluation of Interim Measures, Comment 2. Let me know if any additional changes.

Thanks
Hope

Hope Monzeglio
Environmental Specialist
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Hazardous Waste Bureau
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Fax: (505)-476-6060
hope.monzeglio@state.nm.us

**Websites:**
**New Mexico Environment Department**
**Hazardous Waste Bureau**

Western Refining

BLOOMFIELD REFINERY

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CERTIFIED MAIL # 7006 0810 0003 7020 6806

June 6, 2008

Ms. Hope Monzeglio
State of New Mexico Environmental Department
Hazardous Waste Bureau
2905 Rodeo Park Drive East, Building 1
Santa Fe, New Mexico 87505-6303

Re: FACILITY-WIDE GROUNDWATER MONITORING PLAN
REVISED MAY 2008 - REPLACEMENT PAGES
BLOOMFIELD REFINERY

Dear Ms. Monzeglio:

Please find enclosed the replacement pages for Bloomfield Refinery's "Facility-Wide Groundwater Monitoring Plan" as requested in your March 25, 2008 Approval With Directions letter.

I have enclosed two (2) hard copies and one (1) disk.

If you have additional questions or would like to discuss the sampling further, please contact me at (505) 632-4171.

Sincerely,

James R. Schmaltz
Environmental Manager

Cc: Carl Chavez - OCD
Laurie King – EPA Region 6
A. Hains – Western Refining, El Paso

**Western Refining**

Bloomfield Refinery • #50 Road 4990 • Bloomfield, NM 87413

# Facility-Wide Groundwater Monitoring Plan

(Revised May 2008)

December 2007



Report Prepared By:

**Malcolm Pirnie, Inc.**

4646 E Van Buren
Suite 400
Phoenix, AZ 85008
602.241.1770

5127-004

# Contents

## Tables

## Figures



## Appendices

# 4. Investigation Methods

## 4.1. Monitoring and Sampling Methods

### 4.1.1. Groundwater Levels

Groundwater levels and SPH thickness measurements will be collected on a quarterly basis for the first four quarters to monitor groundwater elevation fluctuations over time. The frequency for collection of groundwater elevation data may be adjusted based on review of data collected during the initial four quarters. Measurement data and the date and time of each measurement will be recorded on a site monitoring data sheet. The depth to groundwater and SPH thickness levels will be measured to the nearest 0.01 ft. The depth to groundwater and SPH thickness will be recorded relative to the surveyed well casing rim or other surveyed datum. A corrected water table elevation will be provided in wells containing SPH by adding 0.8 times the measured SPH thickness to the calculated water table elevation. Water level and SPH thickness measurements will be collected using an oil/water interface probe. Prior to groundwater sampling activities, groundwater levels and SPH thickness measurements will be collected in all wells while the recovery wells are in operation, and again after the pumps have been removed and water levels have stabilized (NMED, 2008).

### 4.1.2. Groundwater Sampling

All monitoring wells scheduled for sampling during a groundwater sampling event will be sampled within 15 working days of the start of the monitoring and sampling event.

### 4.1.3. Well Purging

Each monitoring well will be purged by removing groundwater prior to sampling in order to ensure that formation water is being sampled. Total purge volume will be determined by monitoring groundwater pH, specific conductance, dissolved oxygen (DO) concentrations, oxidation-reduction potential (ORP), and temperature after every two gallons or each well volume, whichever is less, has been purged from the well. Field parameters will be measured using an Ultrameter 6P hand-held instrument or equivalent. Purging will continue, as needed, until the field parameter readings stabilize to within ten percent between readings for three consecutive measurements. Once the readings are within 10%, purging will stop and the well is ready for sample collection. The volume of groundwater purged, the instruments used, and the readings obtained at each interval will be recorded on the field-monitoring log. Well purging and sampling will be performed using disposable bailers and/or appropriate sampling pumps.

### 4.1.4. Groundwater Sample Collection

Groundwater samples will be obtained from each well within 24 hours of the completion of well purging. Sample collection methods will be documented in the field monitoring reports. The samples will be transferred to the appropriate, clean, laboratory-prepared containers provided by the analytical laboratory. Sample handling and chain-of-custody procedures are described in Section 4.3. Decontamination procedures for reusable water sampling equipment are described in Section 4.1.6.

All purged groundwater and decontamination water will be disposed in the refinery wastewater treatment system upstream of the API Separator. The procedures for disposable materials are described in Section 4.1.8.

Groundwater samples intended for metals analysis will be submitted to the laboratory as total metals samples. Groundwater samples obtained for dissolved metals analysis will be filtered using disposable filters with a 0.45 micrometers mesh size.

### 4.1.5. Sample Handling

At a minimum, the following procedures will be used when collecting samples:

- Neoprene, nitrile, or other protective gloves will be worn when collecting samples. New disposable gloves will be used to collect each sample.
- All samples collected for chemical analysis will be transferred into clean sample containers supplied by the analytical laboratory. The sample container will be clearly marked. Sample container volumes and preservation methods will be in accordance with the most recent standard EPA and industry accepted practices for use by accredited analytical laboratories. Sufficient sample volume will be obtained for the laboratory to complete the method-specific QC analyses on a laboratory-batch basis.
- Sample labels and documentation will be completed for each sample. Immediately after the samples are collected, they will be stored in a cooler with ice or other appropriate storage method until they are delivered to the analytical laboratory. Standard chain-of-custody procedures, as described in Section 4.3 of this Plan, will be followed for all samples collected. All samples will be submitted to the laboratory to allow the laboratory to conduct the analyses within the method holding times. At a minimum, all samples will be submitted to the laboratory within 48 hours after their collection.

The following shipping procedures will be performed during each sampling event:

- Individual sample containers will be packed to prevent breakage and transported in a sealed cooler with ice or other suitable coolant or other EPA or industry-wide accepted method. The drainage hole at the bottom of the cooler will be sealed and secured in case of sample container leakage. Temperature blanks will be included with each shipping container.

- Each cooler or other container will be delivered directly to the analytical laboratory.
- Glass bottles will be separated in the shipping container by cushioning material to prevent breakage.
- Plastic containers will be protected from possible puncture during shipping using cushioning material.
- The chain-of-custody form and sample request form will be shipped inside the sealed storage container to be delivered to the laboratory.
- Chain-of-custody seals will be used to seal the sample-shipping container in conformance with EPA protocol.
- Signed and dated chain-of-custody seals will be applied to each cooler prior to transport of samples from the site.

### 4.1.6. Decontamination Procedures

The objective of the decontamination procedures is to minimize the potential for cross-contamination. The majority of field equipment used for groundwater sampling will be disposable and, therefore, not require decontamination. In order to prevent cross-contamination, field equipment that comes into contact with water or soil will be decontaminated between each sampling location. The decontamination procedure will consist of washing the equipment with a non-phosphate detergent solution (examples include Fantastik™, Liqui-Nox®), followed by two rinses of distilled water and air dried. Decontamination water and rinsate will be contained and disposed of the same way as purge water, as described in Section 4.1.8. Decontamination procedures and the cleaning agents used will be documented in the daily field log.

### 4.1.7. Field Equipment Calibration Procedures

Field equipment requiring calibration will be calibrated to known standards, in accordance with the manufacturers' recommended schedules and procedures. Calibration checks will be conducted daily and the instruments will be recalibrated if necessary. Calibration measurements will be recorded in the daily field logs.

If field equipment becomes inoperable, its use will be discontinued until the necessary repairs are made. A properly calibrated replacement instrument will be used in the interim. Instrumentation used during sampling events will be recorded in the daily field logs.

### 4.1.8. Collection and Management of Investigation Derived Waste

Investigation derived waste (IDW) generated during each groundwater sampling event may include purge water, decontamination water, excess sample material, and disposable sampling equipment. All water generated during sampling and decontamination activities will be temporarily stored in labeled 55-gallon drums until disposed in the refinery

wastewater treatment system upstream of the API separator. All other solid waste generated during sampling activities (including sampling gloves, tubing, etc) will be disposed of with the Refinery's general municipal waste.

## 4.2. Analytical Methods

Groundwater and surface water samples collected during the monitoring events will be analyzed for one or more of the following constituents:

- volatile organic compounds (VOCs) by EPA Method 8260B and EPA Method 8021B;
- semi-volatile organic compounds (SVOCs) by EPA Method 8270C;
- metals analysis (total and dissolved) by EPA Method 6010, except mercury which will be analyzed by EPA Method 7470.
- total petroleum hydrocarbons (TPH) – gasoline range organics (GRO) by EPA Method 8015B;
- TPH – diesel range organics (DRO) by EPA Method 8015B;
- total dissolved solids (TDS) by EPA Method 160.1 or field measurement;
- specific conductance by EPA Method 120.1 or field measurement;
- carbon dioxide by EPA Method 310.1;
- alkalinity by EPA Method 310.1; and
- anions by EPA Method 300.0.

### 4.2.1. Target Analytes

Table 2 provides a summary of target analytes for each analytical method.

## 4.3. Documentation of Field Activities

### 4.3.1. General

Daily field activities, including observations and field procedures, will be recorded using indelible ink on field sampling forms. The original field forms will be maintained at Bloomfield Refinery. Per the Order, completed forms will be maintained in a bound and sequentially numbered field file for reference during field activities. The daily record of field activities will include the following information:

- Well ID
- Date
- Start and finish sampling time
- Field team members, including visitors

- ☒ Weather conditions
- ☒ Daily activities and times conducted
- ☐ Observations
- ☒ Record of samples collected with sample designations
- ☐ Photo log (if needed)
- ☒ Field monitoring data, including health and safety monitoring (if needed)
- ☒ Equipment used and calibration records, if appropriate
- ☒ List of additional data sheets and maps completed
- ☐ An inventory of the waste generated and the method of storage or disposal
- ☒ Signature of personnel completing the field record

### 4.3.2. Sample Custody

All samples collected for analysis will be recorded in the field report or data sheets. Chain-of-custody forms will be completed at the end of each sampling day, prior to the transfer of samples off site, and will accompany the samples during shipment to the laboratory. A signed and dated custody seal will be affixed to the lid of the shipping container. Upon receipt of the samples at the laboratory, the custody seals will be broken, the chain-of-custody form will be signed as received by the laboratory, and the conditions of the samples will be recorded on the form. The original chain-of-custody form will remain with the laboratory. Bloomfield Refinery will maintain copies of all chain-of-custody forms generated as part of sampling activities. Copies of the chain-of-custody records will be included with all draft and final laboratory reports submitted to NMED and OCD.

## 4.4. Quality Assurance Procedures

Contract analytical laboratories will maintain internal quality assurance programs in accordance with EPA and industry accepted practices and procedures. At a minimum, the laboratories will use a combination of standards, blanks, surrogates, duplicates, matrix spike/matrix spike duplicates (MS/MSD), blank spike/blank spike duplicates (BS/BSD), and laboratory control samples to demonstrate analytical QA/QC. The laboratories will establish control limits for individual chemicals or groups of chemicals based on the long-term performance of the test methods. In addition, the laboratories will establish internal QA/QC that meets EPA's laboratory certification requirements. The specific procedures to be completed are identified in the following sections.

### 4.4.1. Equipment Calibration Procedures and Frequency

The laboratory's equipment calibration procedures, calibration frequency, and calibration standards will be in accordance with the EPA test methodology requirements and documented in the laboratory's quality assurance and SOP manuals. All instruments and

equipment used by the laboratory will be operated, calibrated, and maintained according to manufacturers' guidelines and recommendations. Operation, calibration, and maintenance will be performed by personnel who have been properly trained in these procedures. A routine schedule and record of instrument calibration and maintenance will be kept on file at the laboratory.

### 4.4.2. Field QA/QC Samples

Field duplicates, field blanks, equipment rinsate blanks, and trip blanks will be obtained for quality assurance during sampling activities. The samples will be handled as described in Section 4.1.5.

Field duplicate water samples will be obtained at a frequency of ten percent of the total number of samples submitted for analysis. At a minimum, one duplicate sample per sampling event will be obtained.

Field blanks will be obtained at a minimum frequency of one per day. Field blanks will be generated by filling sample containers in the field with deionized water and submitting the samples, along with the groundwater samples, to the analytical laboratory for the appropriate analyses.

Equipment rinsate blanks will be obtained for chemical analysis at the rate of one per sampling day when using disposable sampling equipment. For sampling equipment that is used at more than one location (e.g., sampling pumps), an equipment rinsate blank will be collected at a frequency of 10 percent, or a minimum of one per sampling day. Rinsate samples will be generated by rinsing deionized water through unused or decontaminated sampling equipment. The rinsate sample then will be placed in the appropriate sample container and submitted with the groundwater samples to the analytical laboratory for the appropriate analyses.

Trip blanks will accompany laboratory sample bottles and shipping and storage containers intended for VOC analyses. Trip blanks will consist of a sample of analyte-free deionized water prepared by the laboratory and placed in an appropriate sample container. The trip blank will be prepared by the analytical laboratory prior to the sampling event and will be kept with the shipping containers and placed with other water samples obtained from the site each day. Trip blanks will be analyzed at a frequency of one for each shipping container of samples.

### 4.4.3. Laboratory QA/QC Samples

Analytical procedures will be evaluated by analyzing reagent or method blanks, surrogates, matrix spike/matrix spike duplicates (MS/MSDs), blank spike/blank spike duplicates (BS/BSDs) and/or laboratory duplicates, as appropriate for each method. The laboratory QA/QC samples and frequency of analysis to be completed will be

documented in the cited EPA or other test methodologies. At a minimum, the laboratory will analyze laboratory blanks, MS/MSDs, BS/BSDs and laboratory duplicates at a frequency of one in twenty for all batch runs requiring EPA test methods and a frequency of one in ten for non-EPA test methods. Laboratory batch QA/QC samples will be project specific.

### 4.4.4. Laboratory Deliverables

The analytical data package will be prepared in accordance with EPA-established Level II analytical support protocol. As stated in the Order, the following will be included in the analytical laboratory reports:

- Transmittal letter, including information about the receipt of samples, the testing methodology performed, any deviations from the required procedures, any problems encountered in the analysis of the samples, any data quality exceptions, and any corrective actions taken by the laboratory relative to the quality of the data contained in the report;
- Sample analytical results, including sampling date; date of sample extraction or preparation; date of sample analysis; dilution factors and test method identification; water sample results in consistent units (milligrams per liter or micrograms per liter (µg/L)); and detection limits for undetected analytes. Results will be reported for all field samples, including field duplicates and blanks, submitted for analysis;
- Method blank results, including reporting limits for undetected analytes;
- Surrogate recovery results and corresponding control limits for samples and method blanks (organic analyses only);
- MS/MSD and/or BS/BSD spike concentrations, percent recoveries, relative percent differences (RPDs), and corresponding control limits;
- Laboratory duplicate results for inorganic analyses, including relative percent differences and corresponding control limits;
- Sample chain-of-custody documentation;
- Holding times and conditions;
- Conformance with required analytical protocol(s);
- Instrument calibration;
- Blanks;
- Detection/quantitation limits;
- Recoveries of surrogates and/or matrix spikes (MS/MSDs);
- Variability for duplicate analyses;
- Completeness;

- Data report formats;

Data deliverables provided by the laboratory that include analysis of organic compounds will also include the following:

- A cover letter referencing the procedure used and discussing any analytical problems, deviations, and modifications, including signature from authority representative certifying to the quality and authenticity of data as reported;
- A report of sample collection, extraction, and analysis dates, including sample holding conditions,
- Tabulated results for samples in units as specified, including data qualification in conformance with EPA protocol, and definition of data descriptor codes;
- Reconstructed ion chromatograms for gas chromatograph/mass spectrometry (GC/MS) analyses for each sample and standard calibration;
- Selected ion chromatograms and mass spectra of detected target analytes (GCMS) for each sample and calibration with associated library/reference spectra;
- Gas Chromatograph/electron capture device (GC/ECD and/or gas chromatograph/flame ionization detector (GC/FID) chromatograms for each sample and standard calibration;
- Raw data quantification reports for each sample and calibrations, including areas and retention times for analytes, surrogates, and internal standards;
- A calibration data summary reporting calibration range used and a measure of linearity [include decafluorotriphenylphosphine (DFTPP) and p-bromofluorobenzene (BFB) spectra and compliance with tuning criteria for GC/MS],
- Final extract volumes (and dilutions required), sample size, wet-to-dry weight ratios, and instrument practical detection/quantitation limit for each analyte,
- Analyte concentrations with reporting units identified, including data qualification in conformance with the contract laboratory program Statement of Work (SOW) (include definition of data descriptor codes),
- Quantification of analytes in all blank analyses, as well as identification of method blank associated with each sample,
- Recovery assessments and a replicate sample summary, including all surrogate spike recovery data with spike levels/concentrations for each sample and all MS/MSD results (recoveries and spike amounts), and
- Report of tentatively identified compounds with comparison of mass spectra to library/reference spectra.

Data deliverables provided by the laboratory that include analysis of inorganic compounds will include the following:

- A cover letter referencing the procedure used and discussing any analytical problems, deviations, and modifications; including signature from authority representative certifying to the quality and authenticity of data as reported,
- Report of sample collection, digestion, and analysis dates, with sample holding conditions,
- Tabulated results for samples in units as specified, including data qualification in conformance with the contract laboratory program (CLP) statement of work (including definition of data descriptor codes),
- Results of all method QA/QC checks, including inductively coupled plasma (ICP) Interference Check Sample and ICP serial dilution results,
- Tabulation of instrument and method practical detection/quantitation limits,
- Raw data quantification report for each sample,
- A calibration data summary reporting calibration range used and a measure of linearity, where appropriate,
- Final digestate volumes (and dilutions required), sample size, and wet-to-dry weight ratios,
- Quantification of analytes in all blank analyses, as well as identification of method blank associated with each sample, and
- Recovery assessments and a replicate sample summary, including post-digestate spike analysis; all MS data (including spike concentrations) for each sample, if accomplished; all MS results (recoveries and spike amounts); and laboratory control sample analytical results).

Bloomfield Refinery will present summary tables of these data in the formats described in Section X of the NMED July 2007 Order. The raw analytical data, including calibration curves, instrument calibration data, data calculation work sheets, and other laboratory support data for groundwater monitoring samples, will be compiled and kept on file locally at Bloomfield Refinery for reference. The data will be available to NMED upon request.

### 4.4.5. Review of Field and Laboratory QA/QC Data

The sample data, field, and laboratory QA/QC results will be evaluated for acceptability with respect to the data quality objectives (DQOs). Each group of samples will be compared with the DQOs and evaluated using data validation guidelines contained in EPA guidance documents: *Guidance Document for the Assessment of RCRA Environmental Data Quality, National Functional Guidelines for Organic Data Review, and Laboratory Data Validation Functional Guidelines for Evaluating Inorganics Analyses*, and the most recent version of SW-846, and industry-accepted QA/QC methods and procedures.

The laboratory will notify the Bloomfield Refinery Project Manager of data quality exceptions within one business day of identifying the data quality exception in order to allow for sample re-analysis, if possible. The Bloomfield Refinery Project Manager will contact NMED within one business day of receipt of laboratory notification of data quality exceptions in order to discuss the implementations and determine whether the data will still be considered acceptable, or if sample re-analysis or resampling is necessary. Following NMED notification, Bloomfield Refinery will submit written documentation summarizing discussions with NMED regarding the data quality exceptions identified. The memorandum will be submitted to NMED by fax or electronic mail within two business days of the conclusion of the data quality discussion.

### 4.4.6. Blanks, Field Duplicates, Reporting Limits and Holding Times

#### 4.4.6.1. Blanks

The analytical results of field blanks and field rinsate blanks will be reviewed to evaluate the adequacy of the equipment decontamination procedures and the possibility of cross-contamination caused by decontamination of sampling equipment. The analytical results of trip blanks will be reviewed to evaluate the possibility for contamination resulting from the laboratory-prepared sample containers or the sample transport containers. The analytical results of laboratory blanks will be reviewed to evaluate the possibility of contamination caused by the analytical procedures. If contaminants are detected in field or laboratory blanks, the sample data will be qualified, as appropriate.

#### 4.4.6.2. Field Duplicates

Field duplicates will consist of two samples either split from the same sample device or collected sequentially. Field duplicate samples will be collected at a minimum frequency of ten percent of the total number of samples submitted for analysis. Relative percent differences for field duplicates will be calculated. The analytical DQO for precision will be used for water duplicates.

#### 4.4.6.3. Method Reporting Limits

Method reporting limits for sample analyses will be established at the lowest level practicable for the method and analyte concentrations and will not exceed groundwater or surface water cleanup standards and screening levels. Detection limits that exceed established standards or screening levels and are reported as "not detected" will be considered data quality exceptions and an explanation for the exceedance and its acceptability for use will be provided.

#### 4.4.6.4. Holding Times

The sampling, extraction, and analysis dates will be reviewed to confirm that extraction and analyses were completed within the recommended holding times, as specified by EPA protocol. Appropriate data qualifiers will be noted if holding times were exceeded.

### 4.4.7. Representativeness and Comparability

#### 4.4.7.1. Representativeness

Representativeness is a qualitative parameter related to the degree to which the sample data represent the relevant specific characteristics of the media sampled. Procedures will be implemented to assure representative samples are collected and analyzed, such as repeated measurements of the same parameter at the same location over several distinct sampling events. Any procedures or variations that may affect the collection or analysis of representative samples will be noted and the data will be qualified.

#### 4.4.7.2. Comparability

Comparability is a qualitative parameter related to whether similar sample data can be compared. To assure comparability, analytical results will be reported in appropriate units for comparison with other data (past studies, comparable sites, screening levels, and cleanup standards), and standard collection and analytical procedures will be implemented. Any procedure or variation that may affect comparability will be noted and the data will be qualified.

### 4.4.8. Laboratory Reporting, Documentation, Data Reduction, and Corrective Action

Upon receipt of each laboratory data package, data will be evaluated against the criteria outlined in the previous sections. Any deviation from the established criteria will be noted and the data will be qualified. A full review and discussion of analytical data QA/QC and all data qualifiers will be submitted as appendices or attachments to the groundwater monitoring reports. Data validation procedures for all samples will include checking the following, when appropriate:

- Holding times
- Detection limits
- Field equipment rinsate blanks
- Field blanks
- Field Duplicates
- Trip blanks
- Reagent blanks
- Laboratory duplicates
- Laboratory blanks
- Laboratory matrix spikes
- Laboratory matrix spike duplicates
- Laboratory blank spikes

- Laboratory blank spike duplicates
- Surrogate recoveries

If significant quality assurance problems are encountered, appropriate corrective action will be implemented. All corrective action will be reported and the corrected data will be qualified.

# 5. Monitoring and Sampling Program

The primary objective of groundwater monitoring is to provide data which will be used to assess groundwater quality at and near the Facility. Groundwater elevation data will also be collected to evaluate groundwater flow conditions. The groundwater monitoring program for the Facility will consist of sample collection and analysis from a series of monitoring wells, recovery wells, piezometers, outfalls, and river locations. The monitoring network is divided into four investigation areas (Refinery Complex; North Boundary Barrier Wall; Bluff Outfalls and Seeps; and River Terrace). The sampling frequency, analyses and target analytes will vary for each investigation area. The combined data from these investigation areas will be used to establish background groundwater quality, assess groundwater quality beneath and immediately downgradient of the Facility, and evaluate local groundwater flow conditions.

Samples will not be collected from monitoring wells that have measurable SPH. For wells that are purged dry, samples will be collected if recharge volume is sufficient for sample collection within 24 hours. Wells not sampled due to insufficient recharge will be documented in the field log. A summary of the Facility-Wide Monitoring Plan is provided in Table 3.

The following sections outline the monitoring program for each investigation area.

## 5.1. Refinery Complex

### 5.1.1. Sampling Locations

The following wells will be sampled within the Refinery Complex (NMED, 2007):

*Background Wells*

MW-3, MW-5, and MW-6

*Cross-gradient Wells*

MW-1, MW-13, MW-26, MW-27, MW-32, and MW-33

*Refinery Area Wells*

RW-1, MW-4, MW-8, RW-9, RW-15, RW-18, MW-20, MW-21, RW-23, RW-28, MW-29, MW-30, MW-31, MW-40, RW-42, RW-43, and MW-44.

*Downgradient Wells*

MW-11, MW-34, MW-35, MW-37, MW-38, and MW-12

The location of the Refinery Complex monitor wells are shown in Figure 9. Information regarding the construction details of the monitor wells, including total well depth, screen interval, and top-of-casing elevation, is provided in Table 1.

Groundwater level and SPH measurements will be collected from the seven sump wells (SW-1 through SW-7) following every major precipitation event. Any sump well where SPH is present will be evacuated to prevent releases along the river bluff. Sump well monitoring activities will be included in the annual groundwater monitoring reports (NMED, 2008).

### 5.1.2. Sampling Frequency and Analyses

On an annual basis, groundwater samples will be collected from each well and analyzed for the following chemical constituents (NMED, 2007):

- VOCs;
- TPH-DRO;
- TPH-GRO;
- dissolved metals;
- carbon dioxide;
- alkalinity (total, bicarbonate, and carbonate);
- anions

Groundwater samples collected during the initial annual sampling event will be analyzed for SVOCs (full method list) and total recoverable metals (target list) to assess baseline groundwater quality conditions. The results of the SVOC and total metals analysis will be included in the 2008 Annual Groundwater Report and will be used to assess whether additional metals, SVOC or PAH analyses will be necessary during future monitoring events. Analyses and target analytes are listed in Table 2.

On a semi-annual basis, only wells MW-1, MW-6, MW-8, MW-12, MW-13, MW-20, MW-30, MW-33, MW-35, MW-37, and MW-38 will be sampled for the target VOCs (target list), TPH-DRO, and TPH-GRO (NMED, 2007).

## 5.2. North Boundary Barrier

### 5.2.1. Sampling Locations

The following wells will be sampled within the North Boundary Barrier area:

*Collection Wells*

CW 0+60 and CW 25+95.

*Observation Wells*

OW 0+60, OW 1+50, OW 3+85, OW 5+50, OW 6+70. OW 8+10, OW 11+15, OW 14+10, OW 16+60, OW 19+50, OW 22+00, OW 23+10, OW 23+90, and OW 25+70.

Collection wells CW 0+60 and CW 25+95 will monitor groundwater quality at each end of the barrier wall. The remaining collection wells along the refinery side of the North Boundary Barrier will be monitored for groundwater elevation and the presence of SPH, but will not be sampled. Samples had been collected from each collection well between May 2005 and April 2006 (see Appendix B). Sample collection from the observation wells eliminates the need for sampling at MW-45, MW-46, and MW-47. These wells will continue to be monitored for groundwater elevation data and the presence of SPH. Figure 10 shows the monitoring well network for the North Boundary Barrier. Information regarding the construction details of the monitor wells, including total well depth, screen interval, and top-of-casing elevation, is provided in Table 1.

### 5.2.2. Sampling Frequency and Analyses

On a semi-annual basis, groundwater samples collected from collection wells CW 0+60 and CW 25+95, and from each observation well will be analyzed for the following chemical constituents, unless otherwise noted:

- VOCs (target list);
- TPH – DRO;
- TPH – GRO (Observation wells only, (NMED, 2007))

Analyses and target analytes are listed in Table 2.

## 5.3. Bluff Outfalls and Seeps

### 5.3.1. Monitoring and Sampling Locations

Groundwater and surface water samples will be collected from the following locations along the Bluff, if water is present:

*Outfalls*

East Outfall #2, East Outfall #3, and Tank #33 (which receives water from East Outfall #1 via Tank #38).

*Seeps*

Seep 1 through Seep 9.

Figure 11 and Figure 2 show the locations of the outfalls and seeps, respectively.

Seep North of MW-45, Seep North of MW-46, and Seep North of MW-47 are general locations identified during the initial discovery of hydrocarbon releases to the river bluff. Since remedial activities began, nine specific locations have been identified as Seep 1 through Seep 9. Seep 3 and Seep 4 are secondary catchments to Seep 1. Seep 2 and Seep 5 have had historic flows, but groundwater discharge at these locations has ceased since the installation of the north boundary barrier. Currently, Seep 2, 3, 4 and Seep 5 have no current discharges of groundwater. All seep location will be visually inspected weekly to monitor active groundwater discharge along the bluff (NMED, 2008). Groundwater will be removed from any seep where analytical results exceed any of the standards set by the Water Quality Control Commission (WQCC), the EPA Maximum Contaminant Level (MCL), or the EPA Region 6 Human Health Medium Specific Screening Levels (Tap Water) in the absence of a WQCC standard or MCL (NMED, 2008)

### 5.3.2. Sampling Frequency and Analyses

On a semi-annual basis, samples will be collected from East Outfall #2 and East Outfall #3, and analyzed for the following chemical constituents:

- VOCs (target list);
- dissolved metals;
- total recoverable metals (target list);
- carbon dioxide;
- alkalinity (total, bicarbonate, and carbonate);
- anions.

In addition, samples will be collected from Seep 1, 6, 7, 8, and 9, if sufficient water is present, on a semi-annual basis and analyzed for the following chemistry constituents:

- VOCs (target list);
- SVOCs;
- total dissolved solids;
- carbon dioxide;
- alkalinity (total, bicarbonate, and carbonate);
- anions.

If active discharges are present at Seep 2, 3, 4, or 5, a sample will be collected during the semi-annual sampling event and analyzed for the above parameters (NMED, 2008).

On a quarterly basis, samples will be collected from Tank #33 and analyzed for the following chemical constituents:

- VOCs (target list)

Analyses and target analytes are listed in Table 2.

## 5.4. River Terrace

### 5.4.1. Sampling Locations

Groundwater and surface water samples will be collected from the following locations in the vicinity of the River Terrace:

*Monitoring Wells*

MW-49 and DW-1

*Piezometers*

TP-1, TP-2, TP-3, TP-5, TP-6, TP-7, TP-8, TP-9, TP-10, TP-11, TP-12, and TP-13. Figure 12 shows the groundwater sampling locations at the River Terrace.

*San Juan River*

Upstream (approximately 1,000 feet upstream of the River Terrace), River Bank north of MW-45, River Bank north of MW-46, and Downstream (approximately 300 feet downstream of the River Terrace). Figure 13 shows the sample locations for the San Juan River. Information regarding the construction details of the monitor wells, including total well depth, screen interval, and top-of-casing elevation, is provided in Table 1.

### 5.4.2. Sampling Frequency and Analyses

The sampling program detailed below has been developed to be compliant with the Final July 2007 NMED Order and is consistent with the Bioventing Monitoring Plan (Revised) River Terrace Voluntary Corrective Measures dated October 28, 2005. If modifications to the Bioventing Monitoring Plan are approved by NMED that result in a change to the groundwater sampling frequency or analysis, then those approved changes will supersede the following specified activities.

On a quarterly basis, the samples collected from the River Terrace monitoring wells and piezometers will be analyzed for the following chemical constituents:

- VOCs (target list)
- TPH-GRO
- TPH-DRO
- total recoverable metals (target list).

On an annual basis, the samples collected from the River Terrace monitoring wells and piezometers will be analyzed for the following chemical constituents:

- total recoverable metals (target list).

On a semi-annual basis, samples will be collected from the San Juan River and analyzed for the following chemical constituents:

- VOCs (target list)
- TPH-GRO
- TPH-DRO
- total recoverable metals (target list)
- dissolved metals
- TDS
- specific conductance
- alkalinity (total, carbonate and bicarbonate)
- anions (target list).

Analyses and target analytes for the River Terrace and San Juan River samples are listed in Table 2. The analytes and sample frequency for the River Terrace monitoring wells is in compliance with Table 1 of NMED's letter dated April 18, 2007. Samples collected from the San Juan River locations in 2006 and 2007 have not contained any SVOCs; therefore, SVOCs have been removed from the list of target analytes in the River Terrace area.

## 5.5. Monitoring Program Revisions

Upon review of the analytical results from the initial annual monitoring event under this Plan, historic facility-wide monitoring data, available soil boring data, and Nacimiento Formation elevation data, Western Refining will assess the monitoring program presented in this Plan. Revisions to the Plan, as necessary, will then be presented for agency review and approval. These revisions may include, but not be limited to, a reduction or change in monitoring locations, monitoring frequency, and/or target analytes.

# 7. References

NMED, 2007. New Mexico Environmental Department (NMED) Hazardous Waste Bureau, *Notice of Disapproval Facility-Wide Groundwater Monitoring Plan dated October 22, 2007.*

NMED, 2008. New Mexico Environmental Department (NMED) Hazardous Waste Bureau, Approval with Direction Facility-Wide Groundwater Monitoring Plan dated March 25, 2008.


## Legend

- Seep
- Injection Well
- Site Well
- Discharge Location
- Site

Note:
Site map revised May 2008
(NMED, 2008)

0 500 1,000 1,500 2,000
Feet

MALCOLM PIRNIE
4646 E. Van Buren St.,
Suite 400
Phoenix, AZ 85008

Site Plan

Bloomfield Refinery
Facility-Wide Groundwater
Monitoring Plan

December 2007 | **Figure 2**

M:\5127004\GIS\Projects_MXD\Figure 2 Site Plan.mxd

**Table 3**
**Facility-Wide Monitoring Program**
**Bloomfield Refinery - Western Refining Company**

| Well ID | Sampling Frequency | VOCs (EPA Method 8260) | VOCs - Target List (EPA Method 8260) [1] | SVOCs (EPA Method 8270) | TPH - Diesel Range Organics (DRO) (EPA Method 8015B) | TPH - Gasoline Range Organics (GRO) (EPA Method 8015B) | Dissolved Metals (EPA Method 6010/7470) | Total Recoverable Metals - Target List (EPA Method 6010/7470) | Total Dissolved Solids (TDS) (EPA Method 160.1 or Field Measurement) | Specific Conductance (EPA Method 120.1 or Field Measurement) | Carbon Dioxide (EPA Method 310.1) | Alkalinity (EPA Method 310.1) | Anions (EPA Method 300.0) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ***Sump Wells*** [2] | | | | | | | | | | | | | |
| SW-1 | Major Precipitation Event | *(No Sampling; Collection of Groundwater and SPH Levels Only)* | | | | | | | | | | | |
| SW-2 | Major Precipitation Event | *(No Sampling; Collection of Groundwater and SPH Levels Only)* | | | | | | | | | | | |
| SW-3 | Major Precipitation Event | *(No Sampling; Collection of Groundwater and SPH Levels Only)* | | | | | | | | | | | |
| SW-4 | Major Precipitation Event | *(No Sampling; Collection of Groundwater and SPH Levels Only)* | | | | | | | | | | | |
| SW-5 | Major Precipitation Event | *(No Sampling; Collection of Groundwater and SPH Levels Only)* | | | | | | | | | | | |
| SW-6 | Major Precipitation Event | *(No Sampling; Collection of Groundwater and SPH Levels Only)* | | | | | | | | | | | |
| SW-7 | Major Precipitation Event | *(No Sampling; Collection of Groundwater and SPH Levels Only)* | | | | | | | | | | | |
| **SAN JUAN RIVER BLUFF** | | | | | | | | | | | | | |
| ***Outfalls*** | | | | | | | | | | | | | |
| Tank #33 (Outfall #1) | Quarterly | | X | | | | | | | | | | |
| Out Fall #2 | Semi-Annually | | X | | | | X | X | X | X | X | X | X |
| Out Fall #3 | Semi-Annually | | X | | | | X | X | X | X | X | X | X |
| ***Seeps*** | | | | | | | | | | | | | |
| Seep 1 | Semi-Annually | | X | X | | | | | X | X | X | X | X |
| Seep 2 [3] | Semi-Annually | | X | X | | | | | X | X | X | X | X |
| Seep 3 [3] | Semi-Annually | | X | X | | | | | X | X | X | X | X |
| Seep 4 [3] | Semi-Annually | | X | X | | | | | X | X | X | X | X |
| Seep 5 [3] | Semi-Annually | | X | X | | | | | X | X | X | X | X |
| Seep 6 | Semi-Annually | | X | X | | | | | X | X | X | X | X |
| Seep 7 | Semi-Annually | | X | X | | | | | X | X | X | X | X |
| Seep 8 | Semi-Annually | | X | X | | | | | X | X | X | X | X |
| Seep 9 | Semi-Annually | | X | X | | | | | X | X | X | X | X |
| **SAN JUAN RIVER TERRACE** | | | | | | | | | | | | | |
| ***Monitoring Wells*** | | | | | | | | | | | | | |
| MW-49 | Quarterly | | X | | X | X | | X | | | | | |
| | Annually | | | | | | | X | | | | | |
| DW-1 | Quarterly | | X | | X | X | | X | | | | | |
| | Annually | | | | | | | X | | | | | |
| ***Piezometers*** | | | | | | | | | | | | | |
| TP-1 | Quarterly | | X | | X | X | | X | | | | | |
| | Annually | | | | | | | X | | | | | |
| TP-2 | Quarterly | | X | | X | X | | X | | | | | |
| | Annually | | | | | | | X | | | | | |
| TP-3 | Quarterly | | X | | X | X | | X | | | | | |
| | Annually | | | | | | | X | | | | | |
| TP-5 | Quarterly | | X | | X | X | | X | | | | | |
| | Annually | | | | | | | X | | | | | |
| TP-6 | Quarterly | | X | | X | X | | X | | | | | |
| | Annually | | | | | | | X | | | | | |
| TP-7 | Quarterly | | X | | X | X | | X | | | | | |
| | Annually | | | | | | | X | | | | | |
| TP-8 | Quarterly | | X | | X | X | | X | | | | | |
| | Annually | | | | | | | X | | | | | |
| TP-9 | Quarterly | | X | | X | X | | X | | | | | |
| | Annually | | | | | | | X | | | | | |
| TP-10 | Quarterly | | X | | X | X | | X | | | | | |
| | Annually | | | | | | | X | | | | | |
| TP-11 | Quarterly | | X | | X | X | | X | | | | | |
| | Annually | | | | | | | X | | | | | |
| TP-12 | Quarterly | | X | | X | X | | X | | | | | |
| | Annually | | | | | | | X | | | | | |
| TP-13 | Quarterly | | X | | X | X | | X | | | | | |
| | Annually | | | | | | | X | | | | | |
| ***San Juan River*** | | | | | | | | | | | | | |
| Upstream | Semi-Annually | | X | | X | X | X | X | X | X | | X | X |
| North of MW#46 | Semi-Annually | | X | | X | X | X | X | X | X | | X | X |
| North of MW#45 | Semi-Annually | | X | | X | X | X | X | X | X | | X | X |
| Downstream | Semi-Annually | | X | | X | X | X | X | X | X | | X | X |

**Notes:**

1. VOC target list analytes for River Terrace sample are analyized by EPA Method 8021B, as stated in Table 1 of NMED's letter dated April 18, 2007.
2. Groundwater and SPH levels are monitored in each sump well following each major precipitation event (NMED, 2008).
3. A sample will be collected at this location during a semi-annual sampling event if an active groundwater discharge is present (NMED, 2008).

**Table 3**
**Facility-Wide Monitoring Program**
**Bloomfield Refinery - Western Refining Company**

| Well ID | Sampling Frequency | VOCs (EPA Method 8260) | VOCs - Target List (EPA Method 8260) [1] | SVOCs (EPA Method 8270) | TPH - Diesel Range Organics (DRO) (EPA Method 8015B) | TPH - Gasoline Range Organics (GRO) (EPA Method 8015B) | Dissolved Metals (EPA Method 6010/7470) | Total Recoverable Metals - Target List (EPA Method 6010/7470) | Total Dissolved Solids (TDS) (EPA Method 160.1 or Field Measurement) | Specific Conductance (EPA Method 120.1 or Field Measurement) | Carbon Dioxide (EPA Method 310.1) | Alkalinity (EPA Method 310.1) | Anions (EPA Method 300.0) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **REFINERY COMPLEX** | | | | | | | | | | | | | |
| ***Background Wells*** | | | | | | | | | | | | | |
| MW-3 | Semi-Annually | Not Sampled | | | | | | | | | | | |
| | Annually | X | | X | X | X | X | X | X | X | X | X | X |
| MW-5 | Semi-Annually | Not Sampled | | | | | | | | | | | |
| | Annually | X | | X | X | X | X | X | X | X | X | X | X |
| MW-6 | Semi-Annually | | X | | X | X | | | | | | | |
| | Annually | X | | X | X | X | X | X | X | X | X | X | X |
| ***Refinery Wells*** | | | | | | | | | | | | | |
| RW-1 | Semi-Annually | Not Sampled | | | | | | | | | | | |
| | Annually | X | | X | X | X | X | X | X | X | X | X | X |
| MW-4 | Semi-Annually | Not Sampled | | | | | | | | | | | |
| | Annually | X | | X | X | X | X | X | X | X | X | X | X |
| MW-8 | Semi-Annually | | X | | X | X | | | | | | | |
| | Annually | X | | X | X | X | X | X | X | X | X | X | X |
| RW-9 | Semi-Annually | Not Sampled | | | | | | | | | | | |
| | Annually | X | | X | X | X | X | X | X | X | X | X | X |
| RW-15 | Semi-Annually | Not Sampled | | | | | | | | | | | |
| | Annually | X | | X | X | X | X | X | X | X | X | X | X |
| RW-18 | Semi-Annually | Not Sampled | | | | | | | | | | | |
| | Annually | X | | X | X | X | X | X | X | X | X | X | X |
| MW-20 | Semi-Annually | | X | | X | X | | | | | | | |
| | Annually | X | | X | X | X | X | X | X | X | X | X | X |
| MW-21 | Semi-Annually | Not Sampled | | | | | | | | | | | |
| | Annually | X | | X | X | X | X | X | X | X | X | X | X |
| RW-23 | Semi-Annually | Not Sampled | | | | | | | | | | | |
| | Annually | X | | X | X | X | X | X | X | X | X | X | X |
| RW-28 | Semi-Annually | Not Sampled | | | | | | | | | | | |
| | Annually | X | | X | X | X | X | X | X | X | X | X | X |
| MW-29 | Semi-Annually | Not Sampled | | | | | | | | | | | |
| | Annually | X | | X | X | X | X | X | X | X | X | X | X |
| MW-30 | Semi-Annually | | X | | X | X | | | | | | | |
| | Annually | X | | X | X | X | X | X | X | X | X | X | X |
| MW-31 | Semi-Annually | Not Sampled | | | | | | | | | | | |
| | Annually | X | | X | X | X | X | X | X | X | X | X | X |
| MW-40 | Semi-Annually | Not Sampled | | | | | | | | | | | |
| | Annually | X | | X | X | X | X | X | X | X | X | X | X |
| RW-42 | Semi-Annually | Not Sampled | | | | | | | | | | | |
| | Annually | X | | X | X | X | X | X | X | X | X | X | X |
| RW-43 | Semi-Annually | Not Sampled | | | | | | | | | | | |
| | Annually | X | | X | X | X | X | X | X | X | X | X | X |
| MW-44 | Semi-Annually | Not Sampled | | | | | | | | | | | |
| | Annually | X | | X | X | X | X | X | X | X | X | X | X |
| ***Cross-Gradient Wells*** | | | | | | | | | | | | | |
| MW-1 | Semi-Annually | | X | | X | X | | | | | | | |
| | Annually | X | | X | X | X | X | X | X | X | X | X | X |
| MW-13 | Semi-Annually | | X | | X | X | | | | | | | |
| | Annually | X | | X | X | X | X | X | X | X | X | X | X |
| MW-26 | Semi-Annually | Not Sampled | | | | | | | | | | | |
| | Annually | X | | X | X | X | X | X | X | X | X | X | X |
| MW-27 | Semi-Annually | Not Sampled | | | | | | | | | | | |
| | Annually | X | | X | X | X | X | X | X | X | X | X | X |
| MW-31 | Semi-Annually | Not Sampled | | | | | | | | | | | |
| | Annually | X | | X | X | X | X | X | X | X | X | X | X |
| MW-32 | Semi-Annually | Not Sampled | | | | | | | | | | | |
| | Annually | X | | X | X | X | X | X | X | X | X | X | X |
| MW-33 | Semi-Annually | | X | | X | X | | | | | | | |
| | Annually | X | | X | X | X | X | X | X | X | X | X | X |
| ***Downgradient Wells*** | | | | | | | | | | | | | |
| MW-11 | Semi-Annually | Not Sampled | | | | | | | | | | | |
| | Annually | X | | X | X | X | X | X | X | X | X | X | X |
| MW-12 | Semi-Annually | | X | | X | X | | | | | | | |
| | Annually | X | | X | X | X | X | X | X | X | X | X | X |
| MW-34 | Semi-Annually | Not Sampled | | | | | | | | | | | |
| | Annually | X | | X | X | X | X | X | X | X | X | X | X |
| MW-35 | Semi-Annually | | X | | X | X | | | | | | | |
| | Annually | X | | X | X | X | X | X | X | X | X | X | X |
| MW-37 | Semi-Annually | | X | | X | X | | | | | | | |
| | Annually | X | | X | X | X | X | X | X | X | X | X | X |
| MW-38 | Semi-Annually | | X | | X | X | | | | | | | |
| | Annually | X | | X | X | X | X | X | X | X | X | X | X |
| **NORTH BARRIER WALL** | | | | | | | | | | | | | |
| ***Collection Wells*** | | | | | | | | | | | | | |
| CW 0+60 | Semi-Annually | | X | | X | | | | | | | | |
| CW 25+95 | Semi-Annually | | X | | X | | | | | | | | |
| ***Observation Wells*** | | | | | | | | | | | | | |
| OW 0+60 | Semi-Annually | | X | | X | X | | | | | | | |
| OW 1+50 | Semi-Annually | | X | | X | X | | | | | | | |
| OW 3+85 | Semi-Annually | | X | | X | X | | | | | | | |
| OW 5+50 | Semi-Annually | | X | | X | X | | | | | | | |
| OW 6+70 | Semi-Annually | | X | | X | X | | | | | | | |
| OW 8+10 | Semi-Annually | | X | | X | X | | | | | | | |
| OW 11+15 | Semi-Annually | | X | | X | X | | | | | | | |
| OW 14+10 | Semi-Annually | | X | | X | X | | | | | | | |
| OW 16+60 | Semi-Annually | | X | | X | X | | | | | | | |
| OW 19+50 | Semi-Annually | | X | | X | X | | | | | | | |
| OW 22+00 | Semi-Annually | | X | | X | X | | | | | | | |
| OW 23+10 | Semi-Annually | | X | | X | X | | | | | | | |
| OW 23+90 | Semi-Annually | | X | | X | X | | | | | | | |
| OW 25+70 | Semi-Annually | | X | | X | X | | | | | | | |