



Consulting Engineers  
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April 10, 2015  
PBW Project No. 1358

VIA EMAIL

Ms. Maureen Hatfield  
**MC-127**  
VCP-CA Section, Remediation Division  
Texas Commission on Environmental Quality  
P.O. Box 13087  
Austin, Texas 78711-3087

Re: DNAPL Recovery Pilot Test – 24-Month Report (February 2013 – January 2015)  
Union Pacific Railroad Houston Wood Preserving Works Facility  
4910 Liberty Road Facility, Houston, Texas  
Post-Closure Care Permit No. HW-50343; Industrial SWR No. 31547

Dear Ms. Hatfield:

Pastor, Behling & Wheeler, LLC (PBW), on behalf of Union Pacific Railroad Company, is providing this summary report for the 24-month dense non-aqueous phase liquid (DNAPL) recovery pilot test conducted at the Houston Wood Preserving Works Facility (the Site). As detailed in the PBW letter dated February 5, 2013, PBW proposed to conduct a 24-month DNAPL recovery pilot test at the Site consisting of monthly manual DNAPL recovery. This letter discusses the DNAPL recovery pilot test activities and results for the 24 month study that was conducted from February 2013 through January 2015.

The following monitoring wells were selected to be included in the DNAPL recovery test based on the amount of DNAPL historically observed in the wells:

Well Name	Zone	Min. DNAPL Thickness (ft.)	Max DNAPL Thickness (ft.)
MW-57A	A-TZ	4.11	4.25
MW-78A*	A-TZ	1.38	6.23
MW-12B	B-TZ	0.41	5.70
MW-32B	B-CZ	5.77	6.13
MW-33BR	B-CZ	0.30	0.30
MW-41B	B-TZ	5.06	24.14
MW-57B	B-CZ	0.44	0.50
MW-70B	B-CZ	1.44	1.53
MW-75B	B-CZ	1.84	1.90
MW-23C	C-TZ	1.13	2.30
MW-34C	C-TZ	7.24	7.60
MW-44C	C-TZ	0.75	7.10
MW-45C	C-TZ	0.39	1.50
MW-46C	C-TZ	0.10	1.25

Notes:

Average depth to water values, minimum and maximum DNAPL thicknesses based on data collected between January 2011 and December 2012, \*except MW-78A which was installed in 2014 and added to the pilot test in November 2014.

Figure 1 shows the location of the wells used in the pilot study. Monitoring well MW-23C and MW-78A were added to the study in November 2014.

The pilot test procedures consisted of measuring the depth to groundwater surface, the depth to the groundwater/DNAPL interface, and the total depth of the well relative to the top of well casing prior to DNAPL recovery. Using a peristaltic pump, DNAPL was pumped from the bottom of the well until groundwater returned in the pump discharge. The volume of recovered DNAPL was estimated from each well based on the volume pumped, and the well was gauged to measure the total depth of the well and depth to residual DNAPL following pumping. Recovered DNAPL was temporarily stored at the Containment Storage Area. The most recent waste manifests for the recovered DNAPL and groundwater are provided in Attachment A.

A summary of the DNAPL recovery measurements for the 24-month period from February 2013 through January 2015 is provided on Table 1. A graph of DNAPL thicknesses prior to each monthly recovery efforts over time is presented on Figure 2. Observations from the recovery testing over the testing period, with emphasis on the last six months of the pilot test, are provided below:

- A-TZ Wells: Initially, MW-57A was the only well completed in the A-TZ Unit that contained DNAPL. For MW-57A, DNAPL thickness decreased from 4.78 feet in February 2013 to less than 1 foot thick from October 2013 through January 2015. DNAPL thicknesses have steadily decreased over the last six months from 0.86 feet to 0.39 feet. Following installation of MW-78A in May 2014 in the Englewood Intermodal Yard and detection of DNAPL in the well, MW-78A was incorporated into the pilot test starting in early November 2014. DNAPL thickness in MW-78A started out at 6.23 feet (early November 2014), and has steadily decreased to 4.06 feet (January 2015).
- B-TZ/B-CZ Wells: At the beginning of the pilot test, monitoring wells with the thickest DNAPL measurements included MW-12B and MW-41B on the west side of the Site (Figure 1). DNAPL thicknesses increased following the February 2013 recovery event in MW-12B (May 2013) and in MW-41B (June 2013). However, DNAPL thickness in well MW-12B gradually decreased from 8.18 feet in May 2013 to less than 1 foot thick in January 2014. Over the last six months, the DNAPL thickness in MW-12B has been stable at around 0.6 to 0.8 feet thick with a slight increase to about 1.09 feet in December 2014, and decreased back to 0.84 feet in January 2015. DNAPL thickness in MW-41B decreased from the August 2013 event (measured at 10.26 feet) to about 5.5 feet thick in December 2013, but increased in April 2014 to 7.6 feet. Over the past six months, DNAPL thickness in MW-41B has slightly decreased from 6.68 feet to 5.65 feet thick from October 2014 to January 2015 (Figure 2).

Monitoring well MW-32B had a DNAPL thickness of 6.23 feet at the beginning of the pilot test. During the first 12 months, DNAPL thicknesses in the well generally decreased to less than two-feet thick by September 2013, and has appears to be decreasing over the last six months to a recent low of one foot thick in January 2015.

Of the all of the wells tested as part of the pilot test, well MW-33BR did not have any measureable DNAPL. No additional DNAPL measurements were collected from this well after October 2014.

DNAPL thickness in well MW-57B decreased from 1.28 feet thick in July 2013 to less than measureable (DNAPL noted on end of probe) thickness in January 2014 through early October 2014. No additional DNAPL measurements were collected from this well after October 2014.

Wells MW-70B and MW-75B had measureable DNAPL at 1.61 feet and 3.1 feet, respectively, at the beginning of the pilot test. During the first 12 months, DNAPL thicknesses in these wells generally decreased to less than one-foot thick, then increased to just over one foot thick in these two wells in early October 2014. Since then, DNAPL thickness in MW-70B and MW-75B have decreased to less than one-foot thick.

- C-TZ Wells: Similar to the other wells tested, DNAPL thicknesses in the C-TZ wells MW-44C, MW-45C, and MW-46C significantly decreased over the first two months of testing, with some sporadic increases from May through August 2013 (Figure 2). From December 2013 through early October 2014, C-TZ wells MW-44C, MW-45C, and MW-46C showed increasing DNAPL thicknesses with the largest increase at MW-44C increasing about 1.57 feet. However, DNAPL thickness in these three C-TZ wells appears to be stable over the past six months. Well MW-34C was gauged in October 2013, and no DNAPL was measured in the well. Since a street lane closure permit through the City of Houston is required for this well for the testing and no DNAPL was measured during the October 2013 event, this well was removed from the list of wells tested and was plugged and abandoned. In May 2014, replacement well MW-34CR was installed and is now gauged as part of the pilot test program. No DNAPL has been detected in the well.

Monitoring well MW-23C was added to the pilot test program in early November 2014. The initial DNAPL thickness in the well in November 2014 was 2.09 feet. Since then, the DNAPL thickness has steadily decreased to 1.76 feet in the well.

- An estimated 154 gallons of creosote DNAPL have been recovered during the 24-month period, with monthly DNAPL recovery volumes slightly decreasing over the past six months to around 5 gallons per month (Figure 2). Approximately 50% of the DNAPL recovered is from wells MW-12B and MW-41B.
- Using the last six months of DNAPL thickness data, a Mann-Kendall trend analysis was conducted to statistically evaluate DNAPL thickness trends in the wells tested. A summary table of the trend analysis is provided on Table 2. Trends were not evaluated for MW-33BR, MW57B, or MW-34C because no measureable DNAPL had been detected in the last six months. The Mann-Kendall trend analysis indicated that 10 of the 11 wells had stable, probably decreasing, or decreasing trends in the DNAPL thickness measured in the wells each month. Only well MW-46C had no trend.

The results from the DNAPL recovery pilot test indicate the following:

- Once per month DNAPL recovery activities are resulting in an overall stable DNAPL thickness trend in the wells tested.
- The current monthly recovery frequency appears to be effective with total DNAPL volume recovered becoming stable in the wells over time. More frequent DNAPL recovery would not likely be effective at the Site.

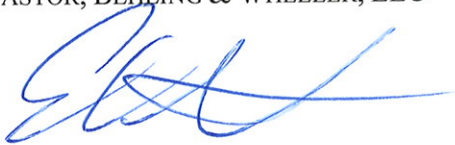
Even though the pilot test has concluded, UPRR plans to continue the monthly DNAPL recovery efforts, and will submit the next status report following the June 2015 recovery event.

Ms. Maureen Hatfield, TCEQ  
DNAPL Recovery Pilot Test – 24-Month Report  
UPRR HWPW, Houston, Texas  
April 10, 2015  
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If you have any questions or need additional information, please feel free to call me at (512) 671-3434 or Mr. Geoffrey Reeder of UPRR at (281) 350-7197.

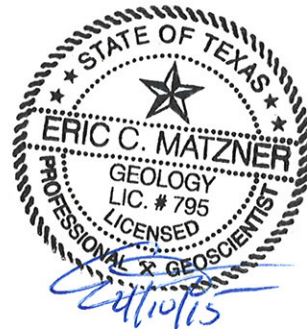
Sincerely,

PASTOR, BEHLING & WHEELER, LLC



Eric C. Matzner, P.G.  
Associate Hydrogeologist

cc: Waste Program Manager, TCEQ Region 12, Houston  
Mr. Geoffrey Reeder, P.G., UPRR – Spring, TX



## **TABLES**

TABLE 1

SUMMARY OF DNAPL RECOVERY MEASUREMENTS  
UPRR HOUSTON, TX - WOOD PRESERVING WORKS

DNAPL Recovery Date	MW-12B				MW-23C				MW-32B				MW-33BR				MW-34C/MW-34CR (July 2014)			
	DTW (ft BTOC)	DTD (ft BTOC)	DNAPL Thickness (ft)	DNAPL Pumped (gal)	DTW (ft BTOC)	DTD (ft BTOC)	DNAPL Thickness (ft)	DNAPL Pumped (gal)	DTW (ft BTOC)	DTD (ft BTOC)	DNAPL Thickness (ft)	DNAPL Pumped (gal)	DTW (ft BTOC)	DTD (ft BTOC)	DNAPL Thickness (ft)	DNAPL Pumped (gal)	DTW (ft BTOC)	DTD (ft BTOC)	DNAPL Thickness (ft)	DNAPL Pumped (gal)
2/14/2013	9.06	39.87	5.93	2.5	NM	NM	NM	---	6.01	30.06	6.23	2	3.72	ND	0	---	NM	NM	NM	---
4/3/2013	9.41	39.95	5.85	1	NM	NM	NM	---	4.86	33.61	2.68	1	4.02	PoP	0	---	NM	NM	NM	---
4/22/2013	8.61	31.64	14.16	0.5*	NM	NM	NM	---	5.62	36.08	0.21	0.25	3.63	ND	0	---	NM	NM	NM	---
5/30/2013	8.47	37.62	8.18	1.5*	NM	NM	NM	---	5.86	32.21	4.08	2	3.59	ND	0	---	NM	NM	NM	---
6/29/2013	9.62	38.22	7.58	1.5	NM	NM	NM	---	6.79	33.59	2.7	1.5	6.07	ND	0	---	NM	NM	NM	---
7/22/2013	11.16	39.04	6.76	1	NM	NM	NM	---	7.14	33.91	2.38	1.5	9.68	ND	0	---	NM	NM	NM	---
8/26/2013	11.31	39.61	6.19	1	NM	NM	NM	---	7.48	33.83	2.46	1	9.86	ND	0	---	NM	NM	NM	---
9/27/2013	11.17	40.63	5.17	1	NM	NM	NM	---	7.23	34.39	1.9	1	9.57	ND	0	---	NM	NM	NM	---
10/31/2013	11.09	43.71	2.09	1	NM	NM	NM	---	7.16	34.96	1.33	0.53	9.32	ND	0	---	21.63	NM	NM	---
11/27/2013	11.17	44.06	1.74	1	NM	NM	NM	---	7.29	35.03	1.26	0.53	9.16	ND	0	---	NM	NM	NM	---
12/31/2013	11.02	44.62	1.18	1	NM	NM	NM	---	7.16	35.16	1.13	0.5	8.97	ND	0	---	NM	NM	NM	---
1/30/2014	11.34	45.12	0.68	1	NM	NM	NM	---	6.72	34.82	1.47	0.53	7.41	ND	0	---	NM	NM	NM	---
3/3/2014	11.17	44.32	1.48	1	NM	NM	NM	---	6.53	34.52	1.77	0.53	7.16	ND	0	---	NM	NM	NM	---
3/31/2014	11.03	44.53	1.27	1	NM	NM	NM	---	6.29	34.21	2.08	0.53	7.04	ND	0	---	NM	NM	NM	---
4/30/2014	10.92	44.26	1.54	1	NM	NM	NM	---	6.42	34.67	1.62	0.53	6.88	ND	0	---	NM	NM	NM	---
5/27/2014	10.81	44.34	1.46	1	NM	NM	NM	---	6.36	34.72	1.57	0.53	6.72	ND	0	---	NM	NM	NM	---
6/26/2014	10.72	44.61	1.19	1	NM	NM	NM	---	6.21	34.61	1.68	0.53	6.52	ND	0	---	NM	NM	NM	---
7/31/2014	10.13	44.96	0.84	1	NM	NM	NM	---	6.06	34.33	1.96	0.25	6.29	ND	0	---	19.06	NM	NM	---
8/27/2014	10.26	45.12	0.68	1	NM	NM	NM	---	6.18	34.98	1.31	0.25	6.47	ND	0	---	18.96	NM	NM	---
10/3/2014	10.17	44.91	0.89	1	NM	NM	NM	---	6.06	34.72	1.57	0.25	6.32	ND	0	---	18.81	NM	NM	---
11/3/2014	10.29	44.97	0.83	1	22.51	70.71	2.09	0.25	6.18	34.91	1.38	0.25	NM	NM	NM	---	19.06	NM	NM	---
11/24/2014	10.27	44.99	0.81	1	22.56	70.92	1.88	0.5	6.21	35.16	1.13	0.5	NM	NM	NM	---	19.11	NM	NM	---
12/22/2014	10.23	44.71	1.09	1	22.47	70.81	1.99	0.5	6.14	35.02	1.27	0.75	NM	NM	NM	---	19.06	NM	NM	---
1/29/2015	10.16	44.96	0.84	1	22.26	71.04	1.76	0.5	5.71	35.29	1	0.75	NM	NM	NM	---	18.79	NM	NM	---
<b>Total DNAPL Pumped (gal)</b>	<b>26</b>				<b>1.75</b>				<b>17.99</b>				<b>0</b>				<b>0</b>			

Notes:  
 \* - indicates DNAPL and groundwater mixture  
 --- - No DNAPL pumped  
 DTW - Depth to water (feet Below Top of Casing (BTOC))  
 DTD - Depth to DNAPL (feet BTOC)

ND - Not detected  
 NM - Not measured  
 PoP - Product on probe, not measureable

TABLE 1

SUMMARY OF DNAPL RECOVERY MEASUREMENTS  
UPRR HOUSTON, TX - WOOD PRESERVING WORKS

DNAPL Recovery Date	MW-41B				MW-44C				MW-45C				MW-46C				MW-57A							
	DTW (ft BTOC)	DTD (ft BTOC)	DNAPL Thickness (ft)	DNAPL Pumped (gal)	DTW (ft BTOC)	DTD (ft BTOC)	DNAPL Thickness (ft)	DNAPL Pumped (gal)	DTW (ft BTOC)	DTD (ft BTOC)	DNAPL Thickness (ft)	DNAPL Pumped (gal)	DTW (ft BTOC)	DTD (ft BTOC)	DNAPL Thickness (ft)	DNAPL Pumped (gal)	DTW (ft BTOC)	DTD (ft BTOC)	DNAPL Thickness (ft)	DNAPL Pumped (gal)				
2/14/2013	8.91	41.1	3.71	3	18.96	62.95	7.85	1	21.26	69.9	0.7	0.25	21.07	71.3	1.6	0.25	10.56	22.12	4.78	0.5				
4/3/2013	9.37	41.6	3.21	1.5	19.34	70.47	0.33	0.25*	21.39	70.39	0.21	0.25*	20.61	72.36	0.54	0.25*	10.32	24.79	2.11	0.5				
4/22/2013	8.62	41.6	3.21	0.5*	18.62	70.64	0.16	0.25*	21.03	70.47	0.13	0.25*	20.61	72.61	0.29	0.25*	10.71	25.85	1.05	0.5				
5/30/2013	8.73	34.16	10.65	2	18.43	70.01	0.79	0.25*	21.16	70.25	0.35	0.25*	20.59	71.61	1.29	0.25*	10.63	24.16	2.74	0.5				
6/29/2013	9.72	37.12	7.69	2	19.34	70.32	0.48	0.25	21.93	70.32	0.28	0.25*	21.09	72.34	0.56	0.25*	12.16	23.82	3.08	2				
7/22/2013	10.31	39.29	5.52	1.5	20.36	70.26	0.54	0.25	22.72	70.39	0.21	0.25*	21.96	72.16	0.74	0.25*	13.21	23.05	3.85	2				
8/26/2013	10.09	34.55	10.26	2.5	20.62	70.39	0.41	0.25	22.86	70.31	0.29	0.25	22.23	72.32	0.58	0.25	12.91	25.32	1.58	1				
9/27/2013	9.63	37.29	7.52	2	20.39	70.61	0.19	0.25	22.66	70.17	0.43	0.25	22.09	72.09	0.81	0.25	12.72	25.71	1.19	0.75				
10/31/2013	9.52	38.16	6.65	2	20.17	70.75	0.05	0.07	22.59	70.42	0.18	0.13	22.41	72.34	0.56	0.2	12.72	25.92	0.98	1				
11/27/2013	9.57	38.39	6.42	2	20.09	70.78	0.02	---	22.52	70.49	0.11	---	22.31	72.47	0.43	0.07	12.61	25.98	0.92	1				
12/31/2013	9.42	39.36	5.45	2	20.01	70.8	PoP	---	22.39	70.46	0.14	---	22.03	72.53	0.37	0.07	12.46	26.09	0.81	1				
1/30/2014	9.06	39.17	5.64	2	19.67	70.42	0.38	0.25	22.13	70.35	0.25	---	21.81	72.55	0.35	0.07	11.79	26.15	0.75	0.25				
3/3/2014	8.62	38.06	6.75	2	19.29	70.17	0.63	0.25	21.86	70.09	0.51	---	21.57	72.05	0.85	0.25	11.02	26.25	0.65	0.25				
3/31/2014	8.52	37.74	7.07	2	19.17	70.02	0.78	0.25	21.71	69.63	0.97	0.25	21.43	72.12	0.78	0.13	10.83	26.41	0.49	0.25				
4/30/2014	8.36	37.21	7.6	2	19.02	69.81	0.99	0.25	21.59	69.74	0.86	0.25	21.27	71.81	1.09	0.25	10.71	26.31	0.59	0.25				
5/27/2014	8.26	37.29	7.52	2	18.92	69.71	1.09	---	21.52	69.67	0.93	0.25	21.34	71.71	1.19	0.25	10.74	26.16	0.74	0.25				
6/26/2014	8.02	37.47	7.34	2	18.81	69.52	1.28	0.25	21.59	69.77	0.83	0.25	21.17	71.6	1.3	0.25	10.61	26.29	0.61	0.25				
7/31/2014	8.21	37.92	6.89	2	18.66	69.37	1.43	0.25	21.21	69.96	0.64	0.25	20.39	71.43	1.47	0.25	10.35	26.18	0.72	0.25				
8/27/2014	8.07	38.29	6.52	1.5	18.53	69.47	1.33	0.25	21.13	70.12	0.48	0.25	20.22	71.61	1.29	0.25	10.22	26.26	0.64	0.25				
10/3/2014	8.02	38.13	6.68	2	18.41	69.23	1.57	0.25	20.13	70.41	0.19	0.25	20.14	71.39	1.51	0.25	10.09	26.04	0.86	0.25				
11/3/2014	8.22	38.29	6.52	2	18.52	69.37	1.43	0.25	20.29	70.36	0.24	0.25	20.27	71.47	1.43	0.25	10.17	26.16	0.74	0.25				
11/24/2014	8.27	38.47	6.34	2	18.57	69.49	1.31	0.5	20.34	70.48	0.12	0.25	20.38	71.53	1.37	0.5	10.13	26.29	0.61	0.25				
12/22/2014	8.16	38.39	6.42	2	18.51	69.31	1.49	0.5	20.31	70.41	0.19	0.25	20.37	71.42	1.48	0.5	10.06	26.34	0.56	0.25				
1/29/2015	8.02	39.16	5.65	1.5	18.39	69.39	1.41	0.5	20.17	70.51	0.09	0.25	20.13	71.48	1.42	0.5	9.73	26.51	0.39	0.25				
<b>Total DNAPL Pumped (gal)</b>					<b>46</b>				<b>6.57</b>				<b>4.88</b>				<b>6.04</b>				<b>14</b>			

Notes:  
 \* - indicates DNAPL and groundwater mixture  
 --- - No DNAPL pumped  
 DTW - Depth to water (feet Below Top of Casing (BTOC))  
 DTD - Depth to DNAPL (feet BTOC)  
 ND - Not detected  
 NM - Not measured  
 PoP - Product on probe, not measurable

TABLE 1

SUMMARY OF DNAPL RECOVERY MEASUREMENTS  
UPRR HOUSTON, TX - WOOD PRESERVING WORKS

DNAPL Recovery Date	MW-57B				MW-70B				MW-75B				MW-78A				Approx DNAPL Recovered (gal)
	DTW (ft BTOC)	DTD (ft BTOC)	DNAPL Thickness (ft)	DNAPL Pumped (gal)	DTW (ft BTOC)	DTD (ft BTOC)	DNAPL Thickness (ft)	DNAPL Pumped (gal)	DTW (ft BTOC)	DTD (ft BTOC)	DNAPL Thickness (ft)	DNAPL Pumped (gal)	DTW (ft BTOC)	DTD (ft BTOC)	DNAPL Thickness (ft)	DNAPL Pumped (gal)	
2/14/2013	28.56	41.41	1.54	0.25	6.57	34.09	1.61	0.25	10.01	34.1	3.1	0.25	NM	NM	NM	---	10.25
4/3/2013	28.09	42.36	0.59	0.25*	6.79	35.26	0.44	0.25	13.71	36.47	0.73	0.25	NM	NM	NM	---	5.5
4/22/2013	27.06	42.17	0.78	0.25	6.06	35.12	0.58	0.25	9.72	36.72	0.48	0.25	NM	NM	NM	---	3.25
5/30/2013	27.13	41.63	1.32	0.25	6.19	34.67	1.03	0.25	9.61	35.09	2.11	0.75	NM	NM	NM	---	8
6/29/2013	18.26	42.07	0.88	0.25	8.01	34.92	0.78	0.25*	10.61	35.61	1.59	0.75	NM	NM	NM	---	9
7/22/2013	16.34	41.67	1.28	0.75	8.22	34.07	1.63	0.25*	9.74	35.71	1.49	0.75	NM	NM	NM	---	8.5
8/26/2013	18.01	42.31	0.64	0.25	8.17	35.09	0.61	0.25	10.76	35.93	1.27	0.75	NM	NM	NM	---	7.5
9/27/2013	17.74	42.51	0.39	0.25	8.32	35.34	0.36	0.25	10.52	36.39	0.81	0.5	NM	NM	NM	---	6.5
10/31/2013	17.61	42.61	0.29	0.07	8.26	35.39	0.31	0.07	10.31	36.47	0.73	1	NM	NM	NM	---	6.07
11/27/2013	17.54	42.67	0.23	0.07	8.12	35.42	0.28	0.07	10.39	36.51	0.69	1	NM	NM	NM	---	5.74
12/31/2013	17.36	42.74	0.16	0.07	7.89	35.51	0.19	0.07	10.13	36.72	0.48	1	NM	NM	NM	---	5.71
1/30/2014	17.04	NM	PoP	---	7.84	35.06	0.64	0.07	12.62	36.49	0.71	0.75	NM	NM	NM	---	4.92
3/3/2014	16.51	NM	PoP	---	7.09	35.05	0.65	0.13	12.12	36.35	0.85	0.75	NM	NM	NM	---	5.16
3/31/2014	16.41	NM	PoP	---	6.87	35.17	0.53	0.07	12.01	36.27	0.53	0.75	NM	NM	NM	---	5.23
4/30/2014	16.29	NM	PoP	---	6.72	35.01	0.69	0.07	11.84	36.02	1.18	0.75	NM	NM	NM	---	5.35
5/27/2014	16.13	NM	PoP	---	6.64	34.86	0.84	0.07	11.71	35.79	1.41	0.75	NM	NM	NM	---	5.1
6/26/2014	16.02	NM	PoP	---	6.52	34.97	0.73	0.25	11.58	35.91	1.29	0.5	NM	NM	NM	---	5.28
7/31/2014	15.84	NM	PoP	---	6.26	34.76	0.94	0.25	11.32	35.82	1.38	0.5	NM	NM	NM	---	5
8/27/2014	15.71	NM	PoP	---	6.84	34.86	0.84	0.25	11.19	36.09	1.11	0.5	NM	NM	NM	---	4.5
10/3/2014	15.61	NM	PoP	---	6.71	34.61	1.09	0.25	11.09	36.01	1.19	0.5	NM	NM	NM	---	5
11/3/2014	NM	NM	NM	---	6.79	34.79	0.91	0.25	11.16	36.19	1.01	0.75	9.31	19.12	6.23	2.00	7.50
11/24/2014	NM	NM	NM	---	6.77	34.93	0.77	0.25	11.21	36.27	0.93	0.5	9.39	19.62	5.73	2.00	8.25
12/22/2014	NM	NM	NM	---	6.69	34.86	0.84	0.25	11.26	36.19	1.01	0.5	9.34	19.86	5.49	2.00	8.50
1/29/2015	NM	NM	NM	---	6.48	34.92	0.78	0.25	11.06	36.34	0.86	0.5	9.14	21.29	4.06	2.00	8.00
<b>Total DNAPL Pumped (gal)</b>	<b>2.71</b>				<b>4.62</b>				<b>15.25</b>				<b>8</b>				<b>153.81</b>

Notes:

\* - indicates DNAPL and groundwater mixture

--- - No DNAPL pumped

DTW - Depth to water (feet Below Top of Casing (BTOC))

DTD - Depth to DNAPL (feet BTOC)

ND - Not detected

NM - Not measured

PoP - Product on probe, not measureable



TABLE 2

SUMMARY OF DNAPL THICKNESS TREND ANALYSIS - LAST SIX MONTHS OF PILOT TEST  
UPRR HOUSTON, TX - WOOD PRESERVING WORKS

DNAPL THICKNESS MANN-KENDALL TEST ANALYSIS

DNAPL IN-WELL THICKNESS (FT) - PILOT TEST - LAST SIX MONTHS (AUG 2014 - JAN 2015)												
Recovery	WELL ID:	MW-57A	MW-78A	MW-12B	MW-32B	MW41B	MW-70B	MW-75B	MW23C	MW44C	MW-45C	MW-46C
Event	Date											
19	8/27/2014	0.64	---	6.52	1.31	6.52	0.84	1.11	---	1.33	0.48	1.29
20	10/3/2014	0.86	---	6.68	1.57	6.68	1.09	1.19	---	1.57	0.19	1.51
21	11/3/2014	0.74	0.74	6.52	1.38	6.52	0.91	1.01	2.09	1.43	0.24	1.43
22	11/24/2014	0.61	0.61	6.34	1.13	6.34	0.77	0.93	1.88	1.31	0.12	1.37
23	12/22/2014	0.56	0.56	6.42	1.27	6.42	0.84	1.01	1.99	1.49	0.19	1.48
24	1/29/2015	0.39	0.39	5.65	1	5.65	0.78	0.86	1.76	1.41	0.09	1.42
Coefficient of Variation:		0.25	0.25	0.06	0.16	0.06	0.14	0.12	0.07	0.07	0.64	0.06
Mann-Kendall Statistic (S):		-11	-6	-10	-9	-10	-6	-10	-4	-1	-10	1
Confidence in Trend:		97.2%	95.8%	95.2%	93.2%	95.2%	81.5%	95.2%	83.3%	50.0%	95.2%	50.0%
Estimated Trend:		Decreasing	Decreasing	Decreasing	Prob. Decreasing	Decreasing	Stable	Decreasing	Stable	Stable	Decreasing	No Trend

Notes:

Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0). > 90% = Probably Increasing or Decreasing;

>95% = Increasing or Decreasing.

--- = not measured

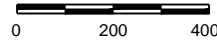
## **FIGURES**

**EXPLANATION**

- UPRR Property Boundary
- Road, Parking Lot, Sidewalk
- Fence
- Railroad
- ⊕ Monitoring Well Location
- ⊕ Monitoring Well Location with DNAPL
- ⊕ Plugged and Abandoned Monitoring Well Location (May 2014)
- (0.84)** In Well DNAPL Thickness (Ft)



Approx. Scale in Feet

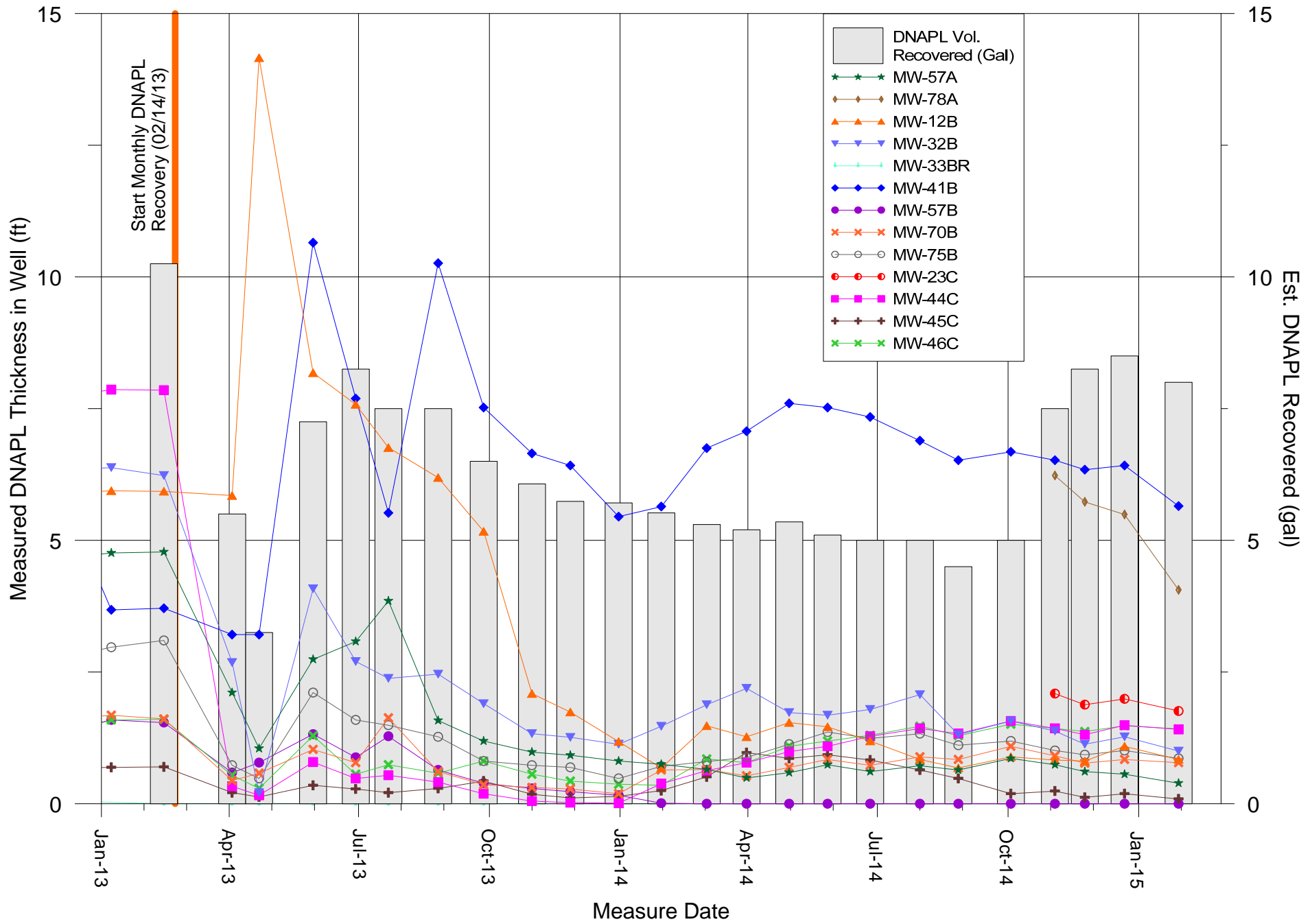


Source:  
Base map from ERM-Southwest, Inc APAR Addendum,  
Fig 3-1, dated June 2004.



<b>UNION PACIFIC RAILROAD CO.</b>		
<b>HOUSTON WOOD PRESERVING WORKS</b>		
Figure 1 <b>IN-WELL DNAPL THICKNESS          JANUARY 2015</b>		
PROJECT: 1358	BY: ZGK	REVISIONS
DATE: APRIL, 2015	CHECKED: ECM	
<b>PASTOR, BEHLING &amp; WHEELER, LLC</b> CONSULTING ENGINEERS AND SCIENTISTS		

**Figure 2**  
**DNAPL Recovery Pilot Test February 2013 - January 2015**  
**UPRR Houston Wood Preserving Works**



**ATTACHMENT A**  
**WASTE MANIFESTS**

<b>UNIFORM HAZARDOUS WASTE MANIFEST</b>		1. Generator ID Number <b>TXD000820266</b>	2. Page 1 of <b>1</b>	3. Emergency Response Phone <b>866-780-3116</b>	4. Manifest Tracking Number <b>002498172 GBF</b>			
5. Generator's Name and Mailing Address <b>UNION PACIFIC RAILROAD c/o USA, P.O. Box 87687 Houston, TX 77287</b>				Generator's Site Address (if different than mailing address) <b>4910 Liberty Road Houston, TX 77287</b>				
6. Transporter 1 Company Name <b>USA WASTE TRANSPORTATION SERVICES</b>		U.S. EPA ID Number <b>TXR000032045</b>						
7. Transporter 2 Company Name		U.S. EPA ID Number						
8. Designated Facility Name and Site Address <b>CLEAN HARBORS DEER PARK, LLC 2027 INDEPENDENCE PARKWAY SOUTH LA PORTE, TX 77571</b>				U.S. EPA ID Number <b>TXD055141378</b>				
Facility's Phone: <b>281-930-2300</b>								
9a. HM	9b. U.S. DOT Description (including Proper Shipping Name, Hazard Class, ID Number, and Packing Group (if any))	10. Containers No. Type		11. Total Quantity	12. Unit WT/Vol.	13. Waste Codes		
X 1.	<b>UN3082, ENVIRONMENTALLY HAZARDOUS SUBSTANCES, LIQUID, N.O.S., 9, PGIII, RQ (CREOSOTE)</b>	<b>001</b>	<b>DM</b>	<b>300</b>	<b>P</b>	<b>0918</b>	<b>219H</b>	<b>F034</b>
X 2.	<b>NA3082, HAZARDOUS WASTE, LIQUID, N.O.S. (F034 WATER), 9, PGIII</b>	<b>002</b>	<b>DM</b>	<b>625</b>	<b>P</b>	<b>0914</b>	<b>101H</b>	<b>F034</b>
3.								
4.								
14. Special Handling Instructions and Additional Information <b>1)CH829200 2)CH229097</b> <b>WO # 1402795600</b> <b>3x55</b> <b>job # 2469-TA-H156</b>								
15. GENERATOR'S/OFFEROR'S CERTIFICATION: I hereby declare that the contents of this consignment are fully and accurately described above by the proper shipping name, and are classified, packaged, marked and labeled/placarded, and are in all respects in proper condition for transport according to applicable international and national governmental regulations. If export shipment and I am the Primary Exporter, I certify that the contents of this consignment conform to the terms of the attached EPA Acknowledgment of Consent. I certify that the waste minimization statement identified in 40 CFR 262.27(a) (if I am a large quantity generator) or (b) (if I am a small quantity generator) is true.								
Generator's/Offoror's Printed/Typed Name <b>Geoffrey Reeder</b>				Signature <i>Geoffrey Reeder</i>		Month Day Year <b>11 6 14</b>		
16. International Shipments <input type="checkbox"/> Import to U.S. <input type="checkbox"/> Export from U.S. Port of entry/exit: _____ Date leaving U.S.: _____								
17. Transporter Acknowledgment of Receipt of Materials								
Transporter 1 Printed/Typed Name <b>L. "De. More" Hatch</b>				Signature <i>L. De. More Hatch</i>		Month Day Year <b>11 6 14</b>		
Transporter 2 Printed/Typed Name <b>Shiela Alexander</b>				Signature <i>SMA</i>		Month Day Year <b>11 06 14</b>		
18. Discrepancy								
18a. Discrepancy Indication Space <input type="checkbox"/> Quantity <input type="checkbox"/> Type <input type="checkbox"/> Residue <input type="checkbox"/> Partial Rejection <input type="checkbox"/> Full Rejection								
Manifest Reference Number: _____								
18b. Alternate Facility (or Generator)				U.S. EPA ID Number				
Facility's Phone: _____								
18c. Signature of Alternate Facility (or Generator)						Month Day Year		
19. Hazardous Waste Report Management Method Codes (I.e., codes for hazardous waste treatment, disposal, and recycling systems)								
1.	2.	3.	4.					
<b>X</b>								
20. Designated Facility Owner or Operator: Certification of receipt of hazardous materials covered by the manifest except as noted in Item 18a								
Printed/Typed Name <b>Mary [Signature]</b>				Signature <i>Mary [Signature]</i>		Month Day Year <b>11 18 14</b>		

<b>UNIFORM HAZARDOUS WASTE MANIFEST</b>		1. Generator ID Number <b>TXD000820268</b>	2. Page 1 of <b>1</b>	3. Emergency Response Phone <b>866-780-3116</b>	4. Manifest Tracking Number <b>013260518 JJK</b>			
5. Generator's Name and Mailing Address <b>UNION PACIFIC RAILROAD c/o USA, P.O. Box 87687 Houston, TX 77287</b>				Generator's Site Address (if different than mailing address) <b>4910 Liberty Road Houston, TX 77287</b>				
Generator's Phone: <b>281-350-7197</b>								
6. Transporter 1 Company Name <b>USA WASTE TRANSPORTATION SERVICES</b>				U.S. EPA ID Number <b>TXR000032045</b>				
7. Transporter 2 Company Name <b>Clean Harbors</b>				U.S. EPA ID Number <b>MAD039322350</b>				
8. Designated Facility Name and Site Address <b>CLEAN HARBORS DEER PARK, LLC 2027 INDEPENDENCE PARKWAY SOUTH LA PORTE, TX 77571</b>				U.S. EPA ID Number <b>TXD055141378</b>				
Facility's Phone: <b>281-830-2300</b>								
9a. HM	9b. U.S. DOT Description (including Proper Shipping Name, Hazard Class, ID Number, and Packing Group (if any))	10. Containers		11. Total Quantity	12. Unit Wt./Vol.	13. Waste Codes		
		No.	Type					
X 1.	UN3082, ENVIRONMENTALLY HAZARDOUS SUBSTANCES, LIQUID, N.O.S., 9, PGIII, RQ (CREOSOTE)	001	DM	80	P	0918	218H	F034
X 2.	NA3082, HAZARDOUS WASTE, LIQUID, N.O.S. (F034 WATER), 9, PGIII	001	DM	80	P	0914	101H	F034
3.								
4.								
14. Special Handling Instructions and Additional Information <b>1)CH629200 2)CH229097</b>  <b>Work order # 1500411209 USA Job # 2469-TD-H156</b>								
15. GENERATOR'S/OFFEROR'S CERTIFICATION: I hereby declare that the contents of this consignment are fully and accurately described above by the proper shipping name, and are classified, packaged, marked and labeled/placarded, and are in all respects in proper condition for transport according to applicable international and national governmental regulations. If export shipment and I am the Primary Exporter, I certify that the contents of this consignment conform to the terms of the attached EPA Acknowledgment of Consent. I certify that the waste minimization statement identified in 40 CFR 262.27(a) (if I am a large quantity generator) or (b) (if I am a small quantity generator) is true.								
Generator's/Offeror's Printed/Typed Name <b>GEOFFREY REEDER</b>				Signature <i>Geoffrey Reeder</i>		Month Day Year <b>12 19 15</b>		
16. International Shipments <input type="checkbox"/> Import to U.S. <input type="checkbox"/> Export from U.S. Port of entry/exit: _____ Date leaving U.S.: _____								
17. Transporter Acknowledgment of Receipt of Materials								
Transporter 1 Printed/Typed Name <b>L. "DR. MONE" Hatch</b>				Signature <i>L. De Mone Hatch</i>		Month Day Year <b>12 19 15</b>		
Transporter 2 Printed/Typed Name <b>Chersea Gray</b>				Signature <i>Chersea Gray</i>		Month Day Year <b>12 10 15</b>		
18. Discrepancy								
18a. Discrepancy Indication Space <input type="checkbox"/> Quantity <input type="checkbox"/> Type <input type="checkbox"/> Residue <input type="checkbox"/> Partial Rejection <input type="checkbox"/> Full Rejection								
Manifest Reference Number: _____								
18b. Alternate Facility (or Generator)						U.S. EPA ID Number		
Facility's Phone: _____								
18c. Signature of Alternate Facility (or Generator)						Month Day Year		
19. Hazardous Waste Report Management Method Codes (i.e., codes for hazardous waste treatment, disposal, and recycling systems)								
1. <b>11040</b>		2. <b>11040</b>		3.		4.		
20. Designated Facility Owner or Operator: Certification of receipt of hazardous materials covered by the manifest, except as noted in Item 18a								
Printed/Typed Name <b>Kim Brannen</b>				Signature <i>Kim Brannen</i>		Month Day Year <b>10 21 15</b>		