



November 5, 2019

Project No. 19119232

Ms. Maureen Hatfield

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

**RE: DNAPL RECOVERY ACTIVITIES QUARTERLY REPORT – 3RD QUARTER 2019
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:

Golder Associates Inc. (Golder), on behalf of Union Pacific Railroad Company (UPRR), is pleased to provide this 3RD Quarter 2019 summary report for the dense non-aqueous phase liquid (DNAPL) recovery activities conducted at the UPRR Houston Wood Preserving Works Facility (the Site). As detailed in the Response Action Plan (RAP) dated November 24, 2014, a 24-month DNAPL recovery pilot test was conducted at the Site that consisted of manual DNAPL recovery on a monthly basis of selected wells. Following the 24-month testing period, the DNAPL recovery activities have continued monthly following the same procedures detailed in the RAP, except with the increased frequency of bi-monthly (twice a month) DNAPL recovery activities that were initiated in June 2019. The following monitoring wells are included as part of the DNAPL recovery activities:

Well Name	Zone
MW-57A	A-TZ
MW-78A	A-TZ
MW-12B	B-TZ
MW-32B	B-CZ
MW-41B	B-TZ
MW-57B	B-CZ
MW-70B	B-CZ
MW-75B	B-CZ
MW-23C	C-TZ
MW-34CR	C-TZ
MW-44C	C-TZ
MW-45C	C-TZ
MW-46C	C-TZ

Figure 1 shows the location of the DNAPL recovery wells.

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

A summary of the DNAPL recovery measurements from February 2013 through October 2019 is provided in Table 1. A graph of DNAPL thicknesses prior to each monthly recovery efforts over time from January 2018 through October 2019 is presented on Figure 2, with a graph of the same information dating back to the beginning of the DNAPL recovery from February 2013 through early October 2019 presented on Figure 3. Observations from the recent recovery activities are provided below for each of the groundwater bearing units (GWBUs):

- **A-TZ Wells:** Two monitoring wells in the A-TZ have had measurable DNAPL detected: MW-57A and MW-78A. No measurable DNAPL has been detected in MW-57A since August 2015 (approximately 49 months). However, a trace of DNAPL was noted at MW-57A in January 2019 through May 2019, but not enough DNAPL has accumulated in the well to be measured.

DNAPL thickness in MW-78A decreased to a low of 0.88 feet in February 2019 but has increased since June 2019 to approximately 2.77 feet in early October 2019.

- **B-TZ/B-CZ Wells:** Wells MW-12B, MW-32B, MW-41B, MW-57B, MW-70B and MW-75B completed in either the B-TZ or B-CZ were evaluated for DNAPL recovery during this period. At the beginning of the recovery activities, monitoring wells with the thickest DNAPL measurements included MW-12B and MW-41B on the west side of the Site (Figure 1). DNAPL thicknesses in well MW-12B gradually decreased from 8.18 feet in May 2013 to 0.11 feet thick in August 2015. From August 2015 to February 2019, the DNAPL thickness in MW-12B had been stable with fluctuations between 0.19 feet (August 2018) to 0.39 feet (February 2019). However, from February 2019 through the beginning of October 2019, DNAPL thickness in MW-12B has increased approximately 2.64 feet to 3.03 feet thick (October 2, 2019). Based on field observations, the viscosity of the DNAPL in MW-12B appears to have increased over the past few months. The DNAPL in MW-12B was too thick for the pump used for recovery in early October 2019, and no DNAPL was recovered. Golder is evaluating other methods to recover DNAPL for the subsequent recovery events.

DNAPL thickness in monitoring well MW-41B was initially as thick as 10.26 feet in August 2013 and decreased during the initial months of DNAPL recovery. DNAPL thickness in MW-41B had been relatively stable at about 4 feet thick between August 2017 and April 2019 fluctuating only about 0.26 feet in the monthly measurements (3.92 feet to 4.18 feet) (Figure 2). However, since February 2019, DNAPL thicknesses in MW-41B has increased approximately 2 feet to 6.05 feet thick in early October 2019.

Monitoring well MW-32B had a DNAPL thickness of 6.23 feet at the beginning of the recovery activities in February 2013. During the first 12 months, DNAPL thicknesses in the well generally decreased to less

than two-feet thick by September 2013. DNAPL thicknesses in this well were below 0.30 feet from July 2017 to May 2019 (measured at 0.19 feet). However, beginning in May 2019 through early October 2019, DNAPL thicknesses in MW-32B have increased approximately 1.2 feet to 1.38 feet thick.

DNAPL thickness in well MW-57B decreased from 1.28 feet thick in July 2013 to less than measurable (trace DNAPL noted) thickness in January 2014 through early October 2014. Since June 2016, no measurable DNAPL has been detected in MW-57B. A trace amount of DNAPL was noted in MW-57B in January 2019 through May 2019, but no DNAPL has been detected since May 2019.

Well MW-70B had measurable DNAPL at 1.61 feet at the beginning of the recovery activities (February 2013). During the first 12 months of recovery activities, DNAPL thicknesses generally decreased to less than one-foot thick, then increased to just over one foot thick in early October 2014. Between April 2018 and May 2019, DNAPL thickness in MW-70B fluctuated between 0.49 feet (April 2018) and 0.29 feet (February 2019). Since May 2019, DNAPL thicknesses in MW-70B have increased approximately 1.46 feet to 1.94 feet thick.

Well MW-75B had measurable DNAPL at 3.1 feet in February 2013. DNAPL thicknesses in MW-75B generally decreased to less than one-foot thick and have been generally less than 0.5 feet thick since January 2018. However, beginning in June 2019, no measurable DNAPL has been detected in MW-75B. Only a trace was noted each event except on August 15, 2019 where no DNAPL was observed.

- C-TZ Wells: Wells MW-23C, MW-44C, MW-45C, and MW-46C completed in the C-TZ were evaluated for DNAPL recovery. Monitoring well MW-23C had an initial DNAPL thickness in November 2014 at 2.09 feet. The DNAPL thickness has steadily decreased to less than one foot in the well. Between January 2018 and the beginning of April 2019, DNAPL thickness in MW-23C fluctuated between 0.34 feet (February 2018) and 0.5 (November 2018). Since late April 2019, DNAPL thicknesses in MW-23C increased 1.23 feet to 1.71 feet thick in the beginning of October 2019.

Wells MW-34CR, MW-44C, MW-45C, and MW-46C are in close proximity to each other on the northeast side of the Site. Well MW-34C was gauged in October 2013, and no DNAPL was measured in the well (the well historically had DNAPL sporadically present). In May 2014, replacement well MW-34CR was installed and is now gauged as part of the recovery program. However, no DNAPL was ever detected in this well. The well was observed to be damaged in April 2019. During the first half of 2019, DNAPL thickness in MW-44C ranged from 0.38 feet in February 2019 to 0.64 feet in April 2019, with no measurable DNAPL since June 2019 events (trace DNAPL noted in mid-June 2019 and no DNAPL noted from the end of June to early October 2019). DNAPL has not been detected in MW-45C since August 2015. DNAPL thickness in well MW-46C fluctuated between 0.41 feet in February 2019 to 0.58 feet in April 2019. Similar to well MW-44C, no measurable DNAPL has been observed in MW-46C since June 2019 (trace DNAPL noted in mid-June 2019 and no DNAPL noted from the end of June to early October 2019).

- DNAPL Recovery: From February 2013 to June 2019, an estimated 673 gallons of creosote DNAPL have been recovered from the wells. Monthly DNAPL recovery volumes increased after the January 2015 event due to a change in pumping techniques. Over the past six months, recovery has ranged from approximately 8.00 to 13.00 gallons per month (Table 1).

DNAPL thicknesses in the wells are still near or below their respective historical maximum thicknesses (Figure 3). Golder will continue to monitor the DNAPL thicknesses twice per month as discussed in the response to the TCEQ 4th Technical Notice of Deficiency (TNOD) letter (April 11, 2019). In addition, UPRR proposed a DNAPL Site Assessment to evaluate the overall DNAPL characterization and recovery activities at the Site in the response to the TNOD.

If you have any questions or need additional information, please feel free to call me at (512) 671-3434 or Mr. Kevin Peterburs of UPRR at (414) 267-4164.

Sincerely,

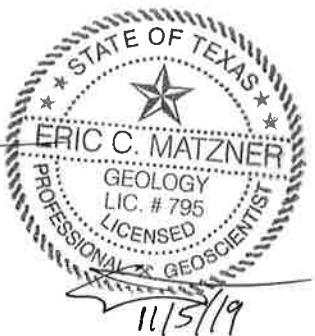
Golder Associates Inc.



Michelle Hermiston, P.G.
Project Hydrogeologist



Eric Matzner, P.G.
Principal Hydrogeologist



CC: Waste Program Manager, TCEQ Region 12, Houston
Mr. Kevin Peterburs, UPRR – Milwaukee, WI

Attachments: Table 1 - Summary of DNAPL Recovery Measurements
Figure 1 – In-Well DNAPL Thickness – October 2019
Figure 2 - DNAPL Recovery Activities January 2018 – October 2019
Figure 3 - DNAPL Recovery Activities February 2013 – October 2019
Attachment A – Recovered DNAPL Waste Manifest

TABLES

TABLE 1

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

DNAPL Recovery Date	MW-12B				MW-23C				MW-32B			
	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	0	6.01	30.06	6.23	2
4/3/2013	9.41	39.95	5.85	1	NM	NM	NM	0	4.86	33.61	2.68	1
4/22/2013	8.61	31.64	14.16	0.5*	NM	NM	NM	0	5.62	36.08	0.21	0.25
5/30/2013	8.47	37.62	8.18	1.5*	NM	NM	NM	0	5.86	32.21	4.08	2
6/29/2013	9.62	38.22	7.58	1.5	NM	NM	NM	0	6.79	33.59	2.7	1.5
7/22/2013	11.16	39.04	6.76	1	NM	NM	NM	0	7.14	33.91	2.38	1.5
8/26/2013	11.31	39.61	6.19	1	NM	NM	NM	0	7.48	33.83	2.46	1
9/27/2013	11.17	40.63	5.17	1	NM	NM	NM	0	7.23	34.39	1.9	1
10/31/2013	11.09	43.71	2.09	1	NM	NM	NM	0	7.16	34.96	1.33	0.53
11/27/2013	11.17	44.06	1.74	1	NM	NM	NM	0	7.29	35.03	1.26	0.53
12/31/2013	11.02	44.62	1.18	1	NM	NM	NM	0	7.16	35.16	1.13	0.5
1/30/2014	11.34	45.12	0.68	1	NM	NM	NM	0	6.72	34.82	1.47	0.53
3/3/2014	11.17	44.32	1.48	1	NM	NM	NM	0	6.53	34.52	1.77	0.53
3/31/2014	11.03	44.53	1.27	1	NM	NM	NM	0	6.29	34.21	2.08	0.53
4/30/2014	10.92	44.26	1.54	1	NM	NM	NM	0	6.42	34.67	1.62	0.53
5/27/2014	10.81	44.34	1.46	1	NM	NM	NM	0	6.36	34.72	1.57	0.53
6/26/2014	10.72	44.61	1.19	1	NM	NM	NM	0	6.21	34.61	1.68	0.53
7/31/2014	10.13	44.96	0.84	1	NM	NM	NM	0	6.06	34.33	1.96	0.25
8/27/2014	10.26	45.12	0.68	1	NM	NM	NM	0	6.18	34.98	1.31	0.25
10/3/2014	10.17	44.91	0.89	1	NM	NM	NM	0	6.06	34.72	1.57	0.25
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
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
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
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
2/26/2015	10.12	44.96	0.84	1.5	22.06	71.09	1.71	0.5	6.02	35.29	1	1
3/26/2015	9.96	45.21	0.59	1.5	22.17	71.12	1.68	0.25	5.46	35.36	0.93	1
4/27/2015	9.89	45.37	0.43	1.5	22.23	71.06	1.74	0.5	5.21	35.29	1	1
5/26/2015	9.72	45.61	0.19	2	22.17	71.14	1.66	0.5	5.07	35.46	0.83	1
7/6/2015	7.12	45.96	0.24	2	19.01	71.39	1.41	0.5	4.06	35.66	0.63	1
8/3/2015	7.26	46.09	0.11	2	19.16	71.46	1.34	0.75	4.29	35.71	0.58	1
8/27/2015	8.09	46.01	0.19	1	20.34	71.51	1.29	0.75	5.05	35.77	0.52	1
10/5/2015	7.12	45.86	0.34	1	19.02	71.57	1.23	0.5	4.31	35.96	0.33	1
11/5/2015	6.86	45.81	0.39	1	18.59	71.59	1.21	0.5	4.02	35.91	0.38	1
12/3/2015	6.46	45.79	0.41	1	18.33	71.67	1.13	0.5	3.92	35.96	0.33	1
12/28/2015	6.23	45.62	0.58	1.25	23.21	71.61	1.19	0.75	3.73	35.91	0.38	1
2/3/2016	6.04	45.55	0.65	1.5	17.96	71.64	1.16	0.5	3.61	35.87	0.42	1
3/3/2016	5.96	45.61	0.59	1.5	17.92	71.71	1.09	0.5	3.51	35.91	0.38	1
3/31/2016	6.06	45.72	0.48	1.5	17.86	71.79	1.01	0.5	3.56	35.92	0.37	1
5/3/2016	6.13	45.66	0.54	1	NM	NM	NM	0	3.67	35.87	0.53	0.5
6/2/2016	6.21	45.61	0.59	1	22.9	71.51	1.29	0.5	3.74	35.92	0.48	0.5
7/8/2016	6.29	45.72	0.48	1	23.09	71.52	1.28	0.25	3.91	35.96	0.44	0.5
8/3/2016	6.34	45.77	0.43	1	23.16	71.66	1.14	0.25	4.03	35.49	0.91	0.5
8/30/2016	6.47	45.69	0.51	1	23.31	71.61	1.19	0.5	4.22	36.09	0.31	0.5
9/30/2016	6.59	45.81	0.39	1	23.39	71.81	0.99	0.5	4.33	35.91	0.49	0.5
11/3/2016	6.64	45.92	0.28	1	23.41	71.98	0.82	0.5	4.47	35.99	0.41	0.5
11/30/2016	6.86	45.86	0.34	0.5	23.59	71.91	0.89	0.75	4.62	35.91	0.49	0.5
1/4/2017	7.02	45.81	0.39	0.5	23.74	71.82	0.98	0.75	4.83	36.02	0.38	0.25
2/7/2017	6.97	45.69	0.51	0.5	23.67	71.74	1.06	0.75	4.81	35.91	0.49	0.25
3/2/2017	6.91	45.64	0.56	0.5	23.54	76.82	0.98	0.75	4.66	35.97	0.43	0.25
4/3/2017	6.82	45.71	0.49	0.5	23.46	76.96	0.84	0.75	4.57	36.01	0.39	0.25
4/27/2017	6.74	45.64	0.56	0.5	23.21	77.04	0.76	0.5	4.51	36.06	0.34	0.25
5/29/2017	6.89	45.77	0.43	0.5	23.49	77.21	0.59	0.25	4.74	36.03	0.37	0.25
7/5/2017	7.01	45.71	0.49	0.5	23.61	77.27	0.53	0.25	4.86	36.13	0.27	0.25
8/1/2017	7.14	45.63	0.57	0.75	23.79	77.17	0.63	0.25	4.99	36.24	0.16	0.25
9/5/2017	7.03	45.6	0.6	1	23.67	77.29	0.51	0.25	4.78	36.24	0.16	0.25
10/4/2017	7.07	45.69	0.51	1	23.61	77.36	0.44	0.25	4.89	36.29	0.11	0.25
11/2/2017	7.11	45.76	0.44	1	23.74	77.42	0.38	0.25	4.96	36.26	0.14	0.25
11/29/2017	7.16	45.71	0.49	1	23.81	77.4	0.40	0.25	5.06	36.31	0.09	0.25
1/2/2018	6.96	45.82	0.38	1	23.67	77.43	0.37	0.25	4.93	36.27	0.13	0.25
2/7/2018	7.13	45.87	0.33	1	23.86	77.46	0.34	0.25	5.16	36.21	0.19	0.25
3/1/2018	7.36	45.96	0.24	1	23.96	77.41	0.39	0.25	5.38	36.13	0.27	0.25

TABLE 1

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

DNAPL Recovery Date	MW-12B				MW-23C				MW-32B			
	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)
4/2/2018	7.29	45.94	0.26	1	23.9	77.32	0.48	0.5	5.31	36.18	0.22	0.25
5/1/2018	8.17	45.91	0.29	1	24.47	77.39	0.41	0.5	6.12	36.23	0.17	0.5
6/1/2018	8.49	45.86	0.34	1	24.81	77.31	0.49	0.5	6.41	36.19	0.21	0.5
6/29/2018	8.62	45.81	0.39	1	24.99	77.37	0.43	0.5	6.59	36.11	0.29	0.75
8/3/2018	8.79	45.96	0.24	1	25.12	77.39	0.41	0.5	6.74	36.19	0.21	0.75
8/31/2018	8.32	46.01	0.19	0.75	24.81	77.43	0.37	0.5	6.47	36.23	0.17	0.75
9/28/2018	8.27	45.93	0.27	0.5	24.69	77.39	0.41	0.5	6.41	36.19	0.21	0.75
11/2/2018	8.16	45.91	0.29	0.5	24.57	77.36	0.44	0.5	6.33	36.21	0.19	0.5
11/29/2018	8.01	45.9	0.30	0.5	24.36	77.3	0.50	0.5	6.21	36.27	0.13	0.25
1/2/2019	7.96	45.87	0.33	0.5	24.29	77.31	0.49	0.5	6.09	36.29	0.11	0.25
2/2/2019	7.82	45.89	0.31	0.5	24.21	77.44	0.36	0.5	5.97	36.24	0.16	0.5
2/28/2019	7.69	45.81	0.39	0.5	24.16	77.36	0.44	0.5	5.86	36.21	0.19	0.25
4/2/2019	7.61	45.8	0.4	0.5	24.08	77.32	0.48	0.5	5.79	36.24	0.16	0.25
4/25/2019	7.49	45.76	0.44	1	24.01	77.16	0.64	0.5	5.86	36.29	0.11	0.25
5/29/2019	7.51	45.71	0.49	1	24.11	77.11	0.69	0.5	5.91	36.21	0.19	0.25
6/12/2019	6.81	45.52	0.68	1.5	24.39	76.71	1.09	1	5.46	35.91	0.49	0.5
6/30/2019	6.67	45.06	1.14	2	24.32	76.67	1.13	0.75	5.39	35.42	0.98	1
7/16/2019	6.62	45.11	1.09	2	24.26	76.61	1.19	1	5.32	35.36	1.04	1
8/2/2019	6.69	45.01	1.19	1.5	24.31	76.49	1.31	1.5	5.41	35.26	1.14	1.5
8/15/2019	6.79	44.76	1.44	2	24.22	76.36	1.44	1.5	5.61	35.19	1.21	1.5
8/28/2019	6.88	44.71	1.49	2	24.29	76.41	1.39	1.5	5.72	35.22	1.18	1.5
9/17/2019	6.93	43.96	2.24	3	24.36	76.29	1.51	1.5	5.81	35.17	1.23	1.5
10/2/2019	6.86	43.17	3.03	0	24.32	76.09	1.71	1.5	5.77	35.02	1.38	1.5
Total DNAPL Pumped (gal)	90.25				36				56.49			

Notes:

* - indicates DNAPL and groundwater mixture

ND - Not detected

--- - No DNAPL pumped

NM - Not measured

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

PoP - Product on probe, not measureable

DTD - Depth to DNAPL (feet BTOC)

TR- Trace amount of DNAPL Extracted

MW-12B- TD measured at 46.2 instead of 45.8, August 28, 2015.

MW-23C- added 5 feet to TOC due to capping after 2/3/2016

TABLE 1

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

DNAPL Recovery Date	MW-33BR				MW-34C/MW-34CR (July 2014)				MW-41B			
	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	3.72	ND	0	0	NM	NM	NM	0	8.91	41.1	3.71	3
4/3/2013	4.02	PoP	0	0	NM	NM	NM	0	9.37	41.6	3.21	1.5
4/22/2013	3.63	ND	0	0	NM	NM	NM	0	8.62	41.6	3.21	0.5*
5/30/2013	3.59	ND	0	0	NM	NM	NM	0	8.73	34.16	10.65	2
6/29/2013	6.07	ND	0	0	NM	NM	NM	0	9.72	37.12	7.69	2
7/22/2013	9.68	ND	0	0	NM	NM	NM	0	10.31	39.29	5.52	1.5
8/26/2013	9.86	ND	0	0	NM	NM	NM	0	10.09	34.55	10.26	2.5
9/27/2013	9.57	ND	0	0	NM	NM	NM	0	9.63	37.29	7.52	2
10/31/2013	9.32	ND	0	0	21.63	NM	NM	0	9.52	38.16	6.65	2
11/27/2013	9.16	ND	0	0	NM	NM	NM	0	9.57	38.39	6.42	2
12/31/2013	8.97	ND	0	0	NM	NM	NM	0	9.42	39.36	5.45	2
1/30/2014	7.41	ND	0	0	NM	NM	NM	0	9.06	39.17	5.64	2
3/3/2014	7.16	ND	0	0	NM	NM	NM	0	8.62	38.06	6.75	2
3/31/2014	7.04	ND	0	0	NM	NM	NM	0	8.52	37.74	7.07	2
4/30/2014	6.88	ND	0	0	NM	NM	NM	0	8.36	37.21	7.6	2
5/27/2014	6.72	ND	0	0	NM	NM	NM	0	8.26	37.29	7.52	2
6/26/2014	6.52	ND	0	0	NM	NM	NM	0	8.02	37.47	7.34	2
7/31/2014	6.29	ND	0	0	19.06	ND	0	0	8.21	37.92	6.89	2
8/27/2014	6.47	ND	0	0	18.96	ND	0	0	8.07	38.29	6.52	1.5
10/3/2014	6.32	ND	0	0	18.81	ND	0	0	8.02	38.13	6.68	2
11/3/2014	NM	NM	NM	0	19.06	ND	0	0	8.22	38.29	6.52	2
11/24/2014	NM	NM	NM	0	19.11	ND	0	0	8.27	38.47	6.34	2
12/22/2014	NM	NM	NM	0	19.06	ND	0	0	8.16	38.39	6.42	2
1/29/2015	NM	NM	NM	0	18.79	ND	0	0	8.02	39.16	5.65	1.5
2/26/2015	NM	NM	NM	0	18.71	ND	0	0	7.92	39.06	5.75	2.5
3/26/2015	NM	NM	NM	0	18.67	ND	0	0	7.83	38.74	6.07	2.5
4/27/2015	NM	NM	NM	0	18.79	ND	0	0	8.02	38.61	6.2	3
5/26/2015	NM	NM	NM	0	18.63	ND	0	0	7.91	38.72	6.09	3
7/6/2015	NM	NM	NM	0	17.29	ND	0	0	6.03	38.96	5.85	2.5
8/3/2015	NM	NM	NM	0	17.21	ND	0	0	6.09	39.01	5.8	2.5
8/27/2015	NM	NM	NM	0	18.46	ND	0	0	7.39	39.14	5.67	2
10/5/2015	NM	NM	NM	0	17.29	ND	0	0	6.32	39.34	5.47	2
11/5/2015	NM	NM	NM	0	16.78	ND	0	0	6.01	39.51	5.3	2
12/3/2015	NM	NM	NM	0	16.44	ND	0	0	5.76	39.56	5.25	2
12/28/2015	NM	NM	NM	0	16.16	ND	0	0	5.62	39.63	5.18	2.25
2/3/2016	NM	NM	NM	0	15.98	ND	0	0	5.32	39.72	5.09	3
3/3/2016	NM	NM	NM	0	15.98	ND	0	0	5.17	39.81	5	3
3/31/2016	NM	NM	NM	0	15.98	ND	0	0	5.26	39.77	5.04	3
5/3/2016	NM	NM	NM	0	15.79	ND	0	0	5.52	39.96	4.85	3
6/2/2016	NM	NM	NM	0	15.97	ND	0	0	5.67	40.07	4.74	3
7/8/2016	NM	NM	NM	0	16.06	ND	0	0	5.72	40.01	4.8	3
8/3/2016	NM	NM	NM	0	16.17	ND	0	0	5.79	40.09	4.72	3
8/30/2016	NM	NM	NM	0	16.31	ND	0	0	5.91	40.26	4.55	3
9/30/2016	NM	NM	NM	0	16.42	ND	0	0	6.06	40.13	4.68	3
11/3/2016	NM	NM	NM	0	16.51	ND	0	0	6.11	40.29	4.52	3
11/30/2016	NM	NM	NM	0	16.72	ND	0	0	6.26	40.42	4.39	3
1/4/2017	NM	NM	NM	0	16.94	ND	0	0	6.39	40.56	4.25	3
2/7/2017	NM	NM	NM	0	16.91	ND	0	0	6.44	40.51	4.3	3
3/2/2017	NM	NM	NM	0	16.78	ND	0	0	6.29	40.76	4.05	3
4/3/2017	NM	NM	NM	0	16.71	ND	0	0	6.21	40.67	4.14	2.5
4/27/2017	NM	NM	NM	0	16.61	ND	0	0	6.19	40.87	3.94	3
5/29/2017	NM	NM	NM	0	16.84	ND	0	0	6.14	40.29	4.52	3
7/5/2017	NM	NM	NM	0	17.01	ND	0	0	6.34	40.57	4.24	2.5
8/1/2017	NM	NM	NM	0	17.17	ND	0	0	6.42	40.79	4.02	3
9/5/2017	NM	NM	NM	0	17.11	ND	0	0	6.36	40.68	4.13	3
10/4/2017	NM	NM	NM	0	17.06	ND	0	0	6.29	40.69	4.12	2.5
11/2/2017	NM	NM	NM	0	17.17	ND	0	0	6.41	40.73	4.08	3
11/29/2017	NM	NM	NM	0	17.29	ND	0	0	6.52	40.82	3.99	2.5
1/2/2018	NM	NM	NM	0	17.52	ND	0	0	6.72	40.72	4.09	2.5
2/7/2018	NM	NM	NM	0	18.11	ND	0	0	6.97	40.79	4.02	2.5
3/1/2018	NM	NM	NM	0	18.38	ND	0	0	7.16	40.63	4.18	2

TABLE 1

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

DNAPL Recovery Date	MW-33BR				MW-34C/MW-34CR (July 2014)				MW-41B			
	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)
4/2/2018	NM	NM	NM	0	18.29	ND	0	0	7.13	40.71	4.1	2
5/1/2018	NM	NM	NM	0	18.33	ND	0	0	8.26	40.76	4.05	2
6/1/2018	NM	NM	NM	0	18.62	ND	0	0	8.71	40.81	4	2.25
6/29/2018	NM	NM	NM	0	18.91	ND	0	0	9.02	40.71	4.1	2.5
8/3/2018	NM	NM	NM	0	19.06	ND	0	0	9.13	40.76	4.05	2.5
8/31/2018	NM	NM	NM	0	18.77	ND	0	0	8.89	40.86	3.95	2
9/28/2018	NM	NM	NM	0	18.64	ND	0	0	8.77	40.76	4.05	2
11/2/2018	NM	NM	NM	0	18.57	ND	0	0	8.61	40.71	4.1	2
11/29/2018	NM	NM	NM	0	18.39	ND	0	0	8.41	40.81	4	2
1/2/2019	NM	NM	NM	0	18.26	ND	0	0	8.22	40.83	3.98	2
2/2/2019	NM	NM	NM	0	18.19	ND	0	0	8.16	40.89	3.92	2
2/28/2019	NM	NM	NM	0	18.02	ND	0	0	8.03	40.76	4.05	3
4/2/2019	NM	NM	NM	0	17.96	ND	0	0	7.93	40.69	4.12	3
4/25/2019	NM	NM	NM	0	Well Damaged			0	7.76	40.28	4.53	3
5/29/2019	NM	NM	NM	0	Well Damaged			0	7.71	40.07	4.74	3
6/12/2019	NM	NM	NM	0	Well Damaged			0	7.52	39.63	5.18	3
6/30/2019	NM	NM	NM	0	Well Damaged			0	7.46	39.52	5.29	3
7/16/2019	NM	NM	NM	0	Well Damaged			0	7.39	39.46	5.35	3
8/2/2019	NM	NM	NM	0	Well Damaged			0	7.46	39.42	5.39	0
8/15/2019	NM	NM	NM	0	Well Damaged			0	7.51	39.31	5.5	3
8/28/2019	NM	NM	NM	0	Well Damaged			0	7.57	39.21	5.6	3
9/17/2019	NM	NM	NM	0	Well Damaged			0	7.66	39.02	5.79	3
10/2/2019	NM	NM	NM	0	Well Damaged			0	7.61	38.76	6.05	3
Total DNAPL Pumped (gal)	0				0				202.5			

Notes:

* - indicates DNAPL and groundwater mixture

ND - Not detected

--- - No DNAPL pumped

NM - Not measured

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

PoP - Product on probe, not measureable

DTD - Depth to DNAPL (feet BTOC)

TR- Trace amount of DNAPL Extracted

MW-44C not measured 3/1/18 - 5/1/18; couldn't locate well due to construction.

TABLE 1

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

DNAPL Recovery Date	MW-44C				MW-45C				MW-46C			
	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	18.96	62.95	7.85	1	21.26	69.9	0.7	0.25	21.07	71.3	1.6	0.25
4/3/2013	19.34	70.47	0.33	0.25*	21.39	70.39	0.21	0.25*	20.61	72.36	0.54	0.25*
4/22/2013	18.62	70.64	0.16	0.25*	21.03	70.47	0.13	0.25*	20.61	72.61	0.29	0.25*
5/30/2013	18.43	70.01	0.79	0.25*	21.16	70.25	0.35	0.25*	20.59	71.61	1.29	0.25*
6/29/2013	19.34	70.32	0.48	0.25	21.93	70.32	0.28	0.25*	21.09	72.34	0.56	0.25*
7/22/2013	20.36	70.26	0.54	0.25	22.72	70.39	0.21	0.25*	21.96	72.16	0.74	0.25*
8/26/2013	20.62	70.39	0.41	0.25	22.86	70.31	0.29	0.25	22.23	72.32	0.58	0.25
9/27/2013	20.39	70.61	0.19	0.25	22.66	70.17	0.43	0.25	22.09	72.09	0.81	0.25
10/31/2013	20.17	70.75	0.05	0.07	22.59	70.42	0.18	0.13	22.41	72.34	0.56	0.2
11/27/2013	20.09	70.78	0.02	0.00	22.52	70.49	0.11	0	22.31	72.47	0.43	0.07
12/31/2013	20.01	70.8	PoP	0.00	22.39	70.46	0.14	0	22.03	72.53	0.37	0.07
1/30/2014	19.67	70.42	0.38	0.25	22.13	70.35	0.25	0	21.81	72.55	0.35	0.07
3/3/2014	19.29	70.17	0.63	0.25	21.86	70.09	0.51	0	21.57	72.05	0.85	0.25
3/31/2014	19.17	70.02	0.78	0.25	21.71	69.63	0.97	0.25	21.43	72.12	0.78	0.13
4/30/2014	19.02	69.81	0.99	0.25	21.59	69.74	0.86	0.25	21.27	71.81	1.09	0.25
5/27/2014	18.92	69.71	1.09	0.00	21.52	69.67	0.93	0.25	21.34	71.71	1.19	0.25
6/26/2014	18.81	69.52	1.28	0.25	21.59	69.77	0.83	0.25	21.17	71.6	1.3	0.25
7/31/2014	18.66	69.37	1.43	0.25	21.21	69.96	0.64	0.25	20.39	71.43	1.47	0.25
8/27/2014	18.53	69.47	1.33	0.25	21.13	70.12	0.48	0.25	20.22	71.61	1.29	0.25
10/3/2014	18.41	69.23	1.57	0.25	20.13	70.41	0.19	0.25	20.14	71.39	1.51	0.25
11/3/2014	18.52	69.37	1.43	0.25	20.29	70.36	0.24	0.25	20.27	71.47	1.43	0.25
11/24/2014	18.57	69.49	1.31	0.5	20.34	70.48	0.12	0.25	20.38	71.53	1.37	0.5
12/22/2014	18.51	69.31	1.49	0.5	20.31	70.41	0.19	0.25	20.37	71.42	1.48	0.5
1/29/2015	18.39	69.39	1.41	0.5	20.17	70.51	0.09	0.25	20.13	71.48	1.42	0.5
2/26/2015	18.42	69.51	1.29	0.5	20.11	70.59	0.01	0	20.09	71.38	1.52	0.5
3/26/2015	18.39	69.42	1.38	0.25	19.26	70.52	0.08	0	20.17	71.02	1.88	0.25
4/27/2015	18.29	69.52	1.28	0.5	20.17	70.48	0.12	0.25	20.22	71.56	1.34	1
5/26/2015	18.17	69.57	1.23	0.75	20.12	70.41	0.19	0.25	20.12	71.61	1.29	1
7/6/2015	16.29	69.86	0.94	0.5	18.07	70.49	0.11	0.25	18.17	71.93	0.97	0.75
8/3/2015	16.18	69.82	0.98	0.5	18.16	70.56	0.04	TR*	18.24	71.98	0.92	0.75
8/27/2015	17.46	69.74	1.06	0.25	19.03	70.54	0.06	TR*	19.39	72.03	0.87	0.5
10/5/2015	16.83	69.86	0.94	0.25	18.39	ND	0	0	18.72	72.34	0.56	0.5
11/5/2015	16.62	69.79	1.01	0.25	17.96	ND	0	0	18.51	72.26	0.64	0.5
12/3/2015	16.46	69.73	1.07	0.25	17.72	ND	0	0	18.62	72.36	0.54	0.5
12/28/2015	16.32	69.77	1.03	0.25	17.62	ND	0	0	18.42	72.31	0.59	0.5
2/3/2016	16.17	69.74	1.06	0.25	17.42	ND	0	0	18.29	72.46	0.44	0.25
3/3/2016	16.12	69.79	1.01	0.25	17.39	ND	0	0	18.23	72.49	0.41	0.25
3/31/2016	16.06	69.71	1.09	0.25	17.33	ND	0	0	18.24	72.54	0.36	0.25
5/3/2016	16.27	69.59	1.21	0.25	17.47	ND	0	0	18.39	72.39	0.51	0.25
6/2/2016	16.38	69.63	1.17	0.25	17.52	ND	0	0	18.43	72.43	0.47	0.25
7/8/2016	16.47	69.71	1.09	0.25	17.62	ND	0	0	18.54	72.49	0.41	0.25
8/3/2016	16.59	69.7	1.1	0.25	17.69	ND	0	0	18.51	72.53	0.37	0.25
8/30/2016	16.67	69.58	1.22	0.25	17.76	ND	0	0	18.72	72.57	0.33	0.25
9/30/2016	16.79	69.49	1.31	0.5	17.86	ND	0	0	18.83	72.46	0.44	0.25
11/3/2016	16.86	69.71	1.09	0.5	17.92	ND	0	0	18.89	72.41	0.49	0.25
11/30/2016	17.03	69.94	0.86	0.75	18.09	ND	0	0	19.12	72.32	0.58	0.25
1/4/2017	17.22	70.11	0.69	0.75	18.22	ND	0	0	19.27	72.46	0.44	0.25
2/7/2017	17.29	70.01	0.79	0.5	18.17	ND	0	0	19.19	72.39	0.51	0.25
3/2/2017	17.17	70.16	0.64	0.5	17.96	ND	0	0	19.03	72.31	0.59	0.25
4/3/2017	17.06	70.21	0.59	0	17.89	ND	0	0	18.97	72.39	0.51	0.25
4/27/2017	17.01	70.29	0.51	0	17.67	ND	0	0	18.84	72.31	0.59	0.5
5/29/2017	17.23	70.24	0.56	0.25	17.84	ND	0	0	18.94	72.47	0.43	0.25
7/5/2017	17.33	70.34	0.46	0.25	17.96	ND	0	0	19.12	72.34	0.56	0.5
8/1/2017	17.39	70.39	0.41	0.25	18.09	ND	0	0	19.23	72.27	0.63	0.5
9/5/2017	17.36	70.43	0.37	0.25	18.16	ND	0	0	19.29	72.34	0.56	0.5
10/4/2017	17.31	70.41	0.39	0.25	18.21	ND	0	0	19.36	72.3	0.6	0.5
11/2/2017	17.42	70.4	0.4	0.25	18.32	ND	0	0	19.42	72.36	0.54	0.5
11/29/2017	17.49	70.36	0.44	0.25	18.43	ND	0	0	19.57	72.34	0.56	0.5
1/2/2018	17.67	70.31	0.49	0.5	18.73	ND	0	0	19.81	72.39	0.51	0.5
2/7/2018	17.77	70.34	0.46	0.5	18.62	ND	0	0	19.96	72.46	0.44	0.5
3/1/2018	NM	NM	NM	0	18.79	ND	0	0	20.02	72.32	0.58	0.5

TABLE 1

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

DNAPL Recovery Date	MW-44C				MW-45C				MW-46C			
	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)
4/2/2018	NM	NM	NM	0	18.72	ND	0	0	19.81	72.39	0.51	0.5
5/1/2018	NM	NM	NM	0	19.31	ND	0	0	20.62	72.46	0.44	1
6/1/2018	18.31	70.17	0.63	0.75	19.47	ND	0	0	20.87	72.51	0.39	1
6/29/2018	18.79	70.39	0.41	0.75	19.67	ND	0	0	20.97	72.57	0.33	1
8/3/2018	18.97	70.36	0.44	0.75	19.77	ND	0	0	21.11	72.59	0.31	1
8/31/2018	18.87	70.39	0.41	0.5	19.41	ND	0	0	20.96	72.48	0.42	0.5
9/28/2018	18.82	70.41	0.39	0.75	19.32	ND	0	0	20.91	72.43	0.47	0.5
11/2/2018	18.67	70.44	0.36	0.75	19.26	ND	0	0	20.77	72.39	0.51	0.75
11/29/2018	18.47	70.46	0.34	0.25	19.16	ND	0	0	20.52	72.34	0.56	0.5
1/2/2019	18.42	70.41	0.39	0.5	19.02	ND	0	0	20.49	72.46	0.44	0.5
2/2/2019	18.29	70.41	0.39	0.5	18.93	ND	0	0	20.43	72.49	0.41	0.5
2/28/2019	18.16	70.42	0.38	0.5	18.77	ND	0	0	20.34	72.37	0.53	0.5
4/2/2019	18.09	70.39	0.41	0.5	18.71	ND	0	0	20.18	72.32	0.58	0.5
4/25/2019	18.02	70.16	0.64	0.5	18.63	ND	0	0	20.14	72.36	0.54	0.5
5/29/2019	18.61	70.23	0.57	0.5	18.47	ND	0	0	20.06	72.39	0.51	0.5
6/12/2019	18.29	ND	Trace	0	18.81	ND	0	0	18.02	ND	Trace	0
6/30/2019	18.16	ND	0	0	18.71	ND	0	0	18.09	ND	0	0
7/16/2019	18.09	ND	0	0	18.66	ND	0	0	18.12	ND	0	0
8/2/2019	18.17	ND	0	0	18.72	ND	0	0	18.17	ND	0	0
8/15/2019	18.22	ND	0	0	18.79	ND	0	0	18.09	ND	0	0
8/28/2019	18.29	ND	0	0	18.86	ND	0	0	18.17	ND	0	0
9/17/2019	18.39	ND	0	0	18.97	ND	0	0	18.23	ND	0	0
10/2/2019	18.32	ND	0	0	18.89	ND	0	0	18.17	ND	0	0
Total DNAPL Pumped (gal)	26.57				5.63				31.54			

Notes:

* - indicates DNAPL and groundwater mixture

ND - Not detected

--- - No DNAPL pumped

NM - Not measured

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

PoP - Product on probe, not measureable

DTD - Depth to DNAPL (feet BTOC)

TR- Trace amount of DNAPL Extracted

TABLE 1

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

DNAPL Recovery Date	MW-57A				MW-57B				MW-70B			
	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	10.56	22.12	4.78	0.5	28.56	41.41	1.54	0.25	6.57	34.09	1.61	0.25
4/3/2013	10.32	24.79	2.11	0.5	28.09	42.36	0.59	0.25*	6.79	35.26	0.44	0.25
4/22/2013	10.71	25.85	1.05	0.5	27.06	42.17	0.78	0.25	6.06	35.12	0.58	0.25
5/30/2013	10.63	24.16	2.74	0.5	27.13	41.63	1.32	0.25	6.19	34.67	1.03	0.25
6/29/2013	12.16	23.82	3.08	2	18.26	42.07	0.88	0.25	8.01	34.92	0.78	0.25*
7/22/2013	13.21	23.05	3.85	2	16.34	41.67	1.28	0.75	8.22	34.07	1.63	0.25*
8/26/2013	12.91	25.32	1.58	1	18.01	42.31	0.64	0.25	8.17	35.09	0.61	0.25
9/27/2013	12.72	25.71	1.19	0.75	17.74	42.51	0.39	0.25	8.32	35.34	0.36	0.25
10/31/2013	12.72	25.92	0.98	1	17.61	42.61	0.29	0.07	8.26	35.39	0.31	0.07
11/27/2013	12.61	25.98	0.92	1	17.54	42.67	0.23	0.07	8.12	35.42	0.28	0.07
12/31/2013	12.46	26.09	0.81	1	17.36	42.74	0.16	0.07	7.89	35.51	0.19	0.07
1/30/2014	11.79	26.15	0.75	0.25	17.04	ND	Trace	0	7.84	35.06	0.64	0.07
3/3/2014	11.02	26.25	0.65	0.25	16.51	ND	Trace	0	7.09	35.05	0.65	0.13
3/31/2014	10.83	26.41	0.49	0.25	16.41	ND	Trace	0	6.87	35.17	0.53	0.07
4/30/2014	10.71	26.31	0.59	0.25	16.29	ND	Trace	0	6.72	35.01	0.69	0.07
5/27/2014	10.74	26.16	0.74	0.25	16.13	ND	Trace	0	6.64	34.86	0.84	0.07
6/26/2014	10.61	26.29	0.61	0.25	16.02	ND	Trace	0	6.52	34.97	0.73	0.25
7/31/2014	10.35	26.18	0.72	0.25	15.84	ND	Trace	0	6.26	34.76	0.94	0.25
8/27/2014	10.22	26.26	0.64	0.25	15.71	ND	Trace	0	6.84	34.86	0.84	0.25
10/3/2014	10.09	26.04	0.86	0.25	15.61	ND	Trace	0	6.71	34.61	1.09	0.25
11/3/2014	10.17	26.16	0.74	0.25	NM	NM	NM	0	6.79	34.79	0.91	0.25
11/24/2014	10.13	26.29	0.61	0.25	NM	NM	NM	0	6.77	34.93	0.77	0.25
12/22/2014	10.06	26.34	0.56	0.25	NM	NM	NM	0	6.69	34.86	0.84	0.25
1/29/2015	9.73	26.51	0.39	0.25	NM	NM	NM	0	6.48	34.92	0.78	0.25
2/26/2015	9.87	26.42	0.48	0.25	NM	NM	NM	0	6.39	34.81	0.89	0.5
3/26/2015	9.81	26.32	0.58	0.25	NM	NM	NM	0	6.27	34.91	0.79	0.25
4/27/2015	9.82	26.47	0.43	0.5	NM	NM	NM	0	6.19	34.99	0.71	0.25
5/26/2015	9.71	26.56	0.34	0.5	NM	NM	NM	0	6.07	35.11	0.59	0.5
7/6/2015	7.41	26.82	0.08	TR*	NM	NM	NM	0	5.03	35.32	0.38	0.25
8/3/2015	7.29	26.86	0.04	TR*	12.32	ND	PoP	0	5.12	35.37	0.33	TR*
8/27/2015	8.11	ND	0	TR*	13.04	ND	0	0	6.31	35.41	0.29	TR*
10/5/2015	7.72	ND	0	0	12.62	ND	0	0	5.72	35.47	0.23	0.25
11/5/2015	7.39	ND	0	0	12.27	ND	0	0	5.41	35.42	0.28	0.25
12/3/2015	7.13	ND	0	0	12.02	ND	0	0	5.13	35.63	0.07	0.25
12/28/2015	NM	NM	NM	0	NM	NM	NM	0	5.02	35.26	0.44	0.25
2/3/2016	NM	NM	NM	0	NM	NM	NM	0	4.86	35.21	0.49	0.25
3/3/2016	NM	NM	NM	0	NM	NM	NM	0	4.92	35.17	0.53	0.25
3/31/2016	NM	NM	NM	0	NM	NM	NM	0	4.91	35.24	0.46	0.25
5/3/2016	NM	NM	NM	0	NM	NM	NM	0	5.13	35.29	0.36	0.25
6/2/2016	7.26	ND	0	0	12.32	ND	0	0	5.26	35.36	0.29	0.25
7/8/2016	7.39	ND	0	0	12.44	ND	0	0	5.34	35.31	0.34	0.25
8/3/2016	7.46	ND	0	0	12.52	ND	0	0	5.42	35.39	0.26	0.25
8/30/2016	7.58	ND	0	0	12.67	ND	0	0	5.61	35.21	0.44	0.25
9/30/2016	7.69	ND	0	0	12.81	ND	0	0	5.74	35.03	0.62	0.25
11/3/2016	7.77	ND	0	0	12.92	ND	0	0	5.79	35.11	0.54	0.25
11/30/2016	7.92	ND	0	0	13.16	ND	0	0	6.03	35.23	0.42	0.25
1/4/2017	8.07	ND	0	0	13.24	ND	0	0	6.17	35.09	0.56	0.5
2/7/2017	8.18	ND	0	0	13.29	ND	0	0	6.26	35.01	0.64	0.5
3/2/2017	8.02	ND	0	0	13.17	ND	0	0	6.16	35.09	0.56	0.5
4/3/2017	8.06	ND	0	0	13.04	ND	0	0	6.09	35.13	0.52	0.5
4/27/2017	8.01	ND	0	0	13.14	ND	0	0	6.12	35.2	0.45	0.5
5/29/2017	8.34	ND	0	0	13.41	ND	0	0	6.29	35.06	0.59	0.5
7/5/2017	8.41	ND	0	0	13.57	ND	0	0	6.39	35.14	0.51	0.25
8/1/2017	8.52	ND	0	0	13.69	ND	0	0	6.47	35.21	0.44	0.25
9/5/2017	8.46	ND	0	0	13.79	ND	0	0	6.56	35.34	0.31	0.25
10/4/2017	8.41	ND	0	0	13.71	ND	0	0	6.63	35.39	0.26	0.25
11/2/2017	8.52	ND	0	0	13.91	ND	0	0	6.74	35.31	0.34	0.25
11/29/2017	8.67	ND	0	0	14.02	ND	0	0	6.79	35.29	0.36	0.25
1/2/2018	8.91	ND	0	0	13.06	ND	0	0	6.34	35.34	0.31	0.25
2/7/2018	8.98	ND	0	0	12.42	ND	0	0	6.42	35.31	0.34	0.25
3/1/2018	9.22	ND	0	0	12.58	ND	0	0	6.67	35.21	0.44	0.5

TABLE 1

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

DNAPL Recovery Date	MW-57A				MW-57B				MW-70B			
	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)
4/2/2018	9.16	ND	0	0	12.46	ND	0	0	6.61	35.16	0.49	0.5
5/1/2018	9.34	ND	0	0	13.04	ND	0	0	7.22	35.23	0.42	1.25
6/1/2018	9.67	ND	0	0	13.29	ND	0	0	7.42	35.29	0.36	1
6/29/2018	9.87	ND	0	0	13.47	ND	0	0	7.58	35.21	0.44	1
8/3/2018	10.02	ND	0	0	13.61	ND	0	0	7.69	35.29	0.36	0.75
8/31/2018	9.91	ND	0	0	13.47	ND	0	0	7.42	35.36	0.29	0.5
9/28/2018	9.86	ND	0	0	13.36	ND	0	0	7.33	35.28	0.37	0.5
11/2/2018	9.77	ND	0	0	13.21	ND	0	0	7.22	35.24	0.41	0.75
11/29/2018	9.56	ND	0	0	13.01	ND	0	0	7.06	35.21	0.44	0.5
1/2/2019	9.52	ND	Trace	0	13.03	ND	Trace	0	6.96	35.31	0.34	0.5
2/2/2019	9.41	ND	Trace	0	12.91	ND	Trace	0	6.87	35.36	0.29	0.5
2/28/2019	9.32	ND	Trace	0	12.83	ND	Trace	0	6.74	35.29	0.36	0.5
4/2/2019	9.27	ND	Trace	0	12.76	ND	Trace	0	6.67	35.27	0.38	0.5
4/25/2019	9.16	ND	Trace	0	12.71	ND	Trace	0	6.74	35.21	0.44	0.5
5/29/2019	9.06	ND	Trace	0	12.70	ND	Trace	0	6.71	35.17	0.48	0.5
6/12/2019	9.39	ND	0	0	12.93	ND	0	0	6.43	34.84	0.81	1
6/30/2019	9.21	ND	0	0	12.86	ND	0	0	6.48	34.61	1.04	1
7/16/2019	9.17	ND	0	0	12.79	ND	0	0	6.43	34.49	1.16	1.5
8/2/2019	9.22	ND	0	0	12.84	ND	0	0	6.48	34.31	1.34	1.5
8/15/2019	9.29	ND	0	0	12.92	ND	0	0	6.51	34.07	1.58	2
8/28/2019	9.33	ND	0	0	12.96	ND	0	0	6.57	34.09	1.56	2
9/17/2019	9.46	ND	0	0	12.86	ND	0	0	6.51	34.01	1.64	2
10/2/2019	9.74	ND	0	0	12.83	ND	0	0	6.46	33.71	1.94	2.5
Total DNAPL Pumped (gal)	15.5				2.71				38.87			

Notes:

* - indicates DNAPL and groundwater mixture

ND - Not detected

--- - No DNAPL pumped

NM - Not measured

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

PoP - Product on probe, not measureable

DTD - Depth to DNAPL (feet BTOC)

TR- Trace amount of DNAPL Extracted

TABLE 1

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

DNAPL Recovery Date	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)	
2/14/2013	10.01	34.1	3.1	0.25	NM	NM	NM	0	9.75
4/3/2013	13.71	36.47	0.73	0.25	NM	NM	NM	0	5.00
4/22/2013	9.72	36.72	0.48	0.25	NM	NM	NM	0	2.75
5/30/2013	9.61	35.09	2.11	0.75	NM	NM	NM	0	7.50
6/29/2013	10.61	35.61	1.59	0.75	NM	NM	NM	0	7.00
7/22/2013	9.74	35.71	1.49	0.75	NM	NM	NM	0	6.50
8/26/2013	10.76	35.93	1.27	0.75	NM	NM	NM	0	6.50
9/27/2013	10.52	36.39	0.81	0.5	NM	NM	NM	0	5.75
10/31/2013	10.31	36.47	0.73	1	NM	NM	NM	0	5.07
11/27/2013	10.39	36.51	0.69	1	NM	NM	NM	0	4.74
12/31/2013	10.13	36.72	0.48	1	NM	NM	NM	0	4.71
1/30/2014	12.62	36.49	0.71	0.75	NM	NM	NM	0	4.67
3/3/2014	12.12	36.35	0.85	0.75	NM	NM	NM	0	4.91
3/31/2014	12.01	36.27	0.93	0.75	NM	NM	NM	0	4.98
4/30/2014	11.84	36.02	1.18	0.75	NM	NM	NM	0	5.10
5/27/2014	11.71	35.79	1.41	0.75	NM	NM	NM	0	4.85
6/26/2014	11.58	35.91	1.29	0.5	NM	NM	NM	0	5.03
7/31/2014	11.32	35.82	1.38	0.5	NM	NM	NM	0	4.75
8/27/2014	11.19	36.09	1.11	0.5	NM	NM	NM	0	4.25
10/3/2014	11.09	36.01	1.19	0.5	NM	NM	NM	0	4.75
11/3/2014	11.16	36.19	1.01	0.75	9.31	19.12	6.23	2.00	7.25
11/24/2014	11.21	36.27	0.93	0.5	9.39	19.62	5.73	2.00	8.00
12/22/2014	11.26	36.19	1.01	0.5	9.34	19.86	5.49	2.00	8.25
1/29/2015	11.06	36.34	0.86	0.5	9.14	21.29	4.06	2.00	7.75
2/26/2015	11.09	36.34	0.86	0.5	9.17	19.97	5.38	2.5	10.00
3/26/2015	10.93	36.42	0.78	0.5	9.12	20.31	5.04	0.75	7.25
4/27/2015	10.78	36.52	0.68	0.5	9.17	20.46	4.89	2	10.50
5/26/2015	10.61	36.72	0.48	0.75	9.09	20.59	4.76	2.5	12.25
7/6/2015	8.52	36.91	0.29	0.75	7.01	21.16	4.19	2	10.50
8/3/2015	8.66	36.96	0.24	0.75	7.12	21.39	3.96	2.5	10.75
8/27/2015	9.31	36.91	0.29	0.75	7.96	21.51	3.84	2	8.25
10/5/2015	8.62	37.02	0.18	0.5	7.23	21.67	3.68	2	8.00
11/5/2015	8.34	36.93	0.27	0.5	7.02	21.56	3.79	2	8.00
12/3/2015	8.12	36.81	0.39	0.5	6.83	21.67	3.68	2	8.00
12/28/2015	8.01	36.72	0.48	0.5	6.71	21.52	3.83	2.25	9.00
2/3/2016	7.82	36.19	1.01	0.25	6.52	21.67	3.68	2	9.00
3/3/2016	7.74	36.27	0.93	0.5	6.46	21.72	3.63	2	9.25
3/31/2016	7.67	36.39	0.81	0.5	6.49	21.86	3.49	2	9.25
5/3/2016	7.79	36.47	0.68	0.5	6.57	21.94	3.41	2	7.75
6/2/2016	7.71	36.42	0.73	0.5	6.65	21.91	3.44	2	8.25
7/8/2016	7.8	36.53	0.62	0.5	6.71	21.97	3.38	2	8.00
8/3/2016	7.89	36.59	0.56	0.5	6.82	22.04	3.31	2	8.00
8/30/2016	7.96	36.64	0.51	0.5	6.94	22.21	3.14	2	8.25
9/30/2016	7.91	36.51	0.64	0.5	7.04	22.39	2.96	2	8.50
11/3/2016	7.86	36.36	0.79	0.5	7.11	22.49	2.86	2	8.50
11/30/2016	7.97	36.47	0.68	0.75	7.29	22.67	2.68	2	8.75
1/4/2017	8.04	36.36	0.79	0.75	7.42	22.74	2.61	2	8.75
2/7/2017	8.12	36.21	0.94	0.75	7.48	22.93	2.42	2.5	9.00
3/2/2017	8.01	36.26	0.89	0.75	7.36	23.26	2.09	2	8.50
4/3/2017	7.93	36.43	0.72	0.75	7.29	23.34	2.01	2	7.50
4/27/2017	7.86	36.52	0.63	0.75	7.36	23.42	1.93	2	8.00
5/29/2017	7.94	36.41	0.74	0.75	7.51	23.51	1.84	2	7.75
7/5/2017	8.04	36.36	0.79	0.75	7.79	23.59	1.76	2	7.25
8/1/2017	8.16	36.31	0.84	0.75	7.89	23.51	1.84	2	8.00
9/5/2017	8.22	36.47	0.68	0.75	7.81	23.48	1.87	2	8.25
10/4/2017	8.29	36.56	0.59	0.75	7.89	23.51	1.84	2	7.75
11/2/2017	8.37	36.51	0.64	1	7.97	23.59	1.76	2	8.50
11/29/2017	8.33	36.59	0.56	1	8.02	23.67	1.68	2	8.00
1/2/2018	8.07	36.72	0.43	1	8.17	23.82	1.53	2	8.25
2/7/2018	8.17	36.91	0.24	1	8.29	23.97	1.38	2	8.25
3/1/2018	8.31	36.94	0.21	1	8.47	23.91	1.44	2	7.50

TABLE 1

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

DNAPL Recovery Date	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)	
4/2/2018	8.26	36.89	0.26	0.75	8.39	23.97	1.38	2.25	7.75
5/1/2018	8.92	36.96	0.19	0.75	9.02	24.06	1.29	2	9.00
6/1/2018	9.34	36.91	0.24	0.75	9.21	24.13	1.22	2	9.75
6/29/2018	9.67	36.82	0.33	0.75	9.39	24.21	1.14	2.25	10.50
8/3/2018	9.84	36.87	0.28	0.75	9.47	24.31	1.04	2	10.00
8/31/2018	9.71	36.91	0.24	0.75	9.32	24.47	0.88	2	8.25
9/28/2018	9.62	36.84	0.31	0.75	9.22	24.39	0.96	2	8.25
11/2/2018	9.57	36.88	0.27	0.75	9.09	24.27	1.08	2	8.50
11/29/2018	9.41	36.92	0.23	1	8.96	24.22	1.13	2	7.50
1/2/2019	9.28	36.96	0.19	1	8.78	24.39	0.96	2	7.75
2/2/2019	9.22	36.91	0.24	1	8.71	24.47	0.88	2	8.00
2/28/2019	9.16	36.93	0.22	1	8.67	24.42	0.93	2	8.75
4/2/2019	9.06	36.91	0.24	1	8.58	24.43	0.92	2	8.75
4/25/2019	9.02	36.72	0.43	1	8.49	24.31	1.04	2	9.25
5/29/2019	9.07	36.67	0.48	1	8.42	24.26	1.09	2	9.25
6/12/2019	8.92	ND	Trace	0	8.67	23.96	1.39	2	9.00
6/30/2019	8.66	ND	Trace	0	9.36	23.77	1.58	2	9.75
7/16/2019	8.62	ND	Trace	0	9.29	23.62	1.73	2	10.50
8/2/2019	8.67	ND	Trace	0	9.34	23.57	1.78	2	8.00
8/15/2019	8.69	ND	ND	0	9.42	23.06	2.29	2	12.00
8/28/2019	8.72	ND	Trace	0	9.51	23.01	2.34	2	12.00
9/17/2019	8.61	ND	Trace	0	9.39	22.76	2.59	2	13.00
10/2/2019	8.53	ND	Trace	0	9.27	22.58	2.77	2	10.50
Total DNAPL Pumped (gal)	52.75				129.5				673.06

Notes:

* - indicates DNAPL and groundwater mixture

ND - Not detected

--- - No DNAPL pumped

NM - Not measured

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

PoP - Product on probe, not measureable

DTD - Depth to DNAPL (feet BTOC)

TR- Trace amount of DNAPL Extracted

FIGURES

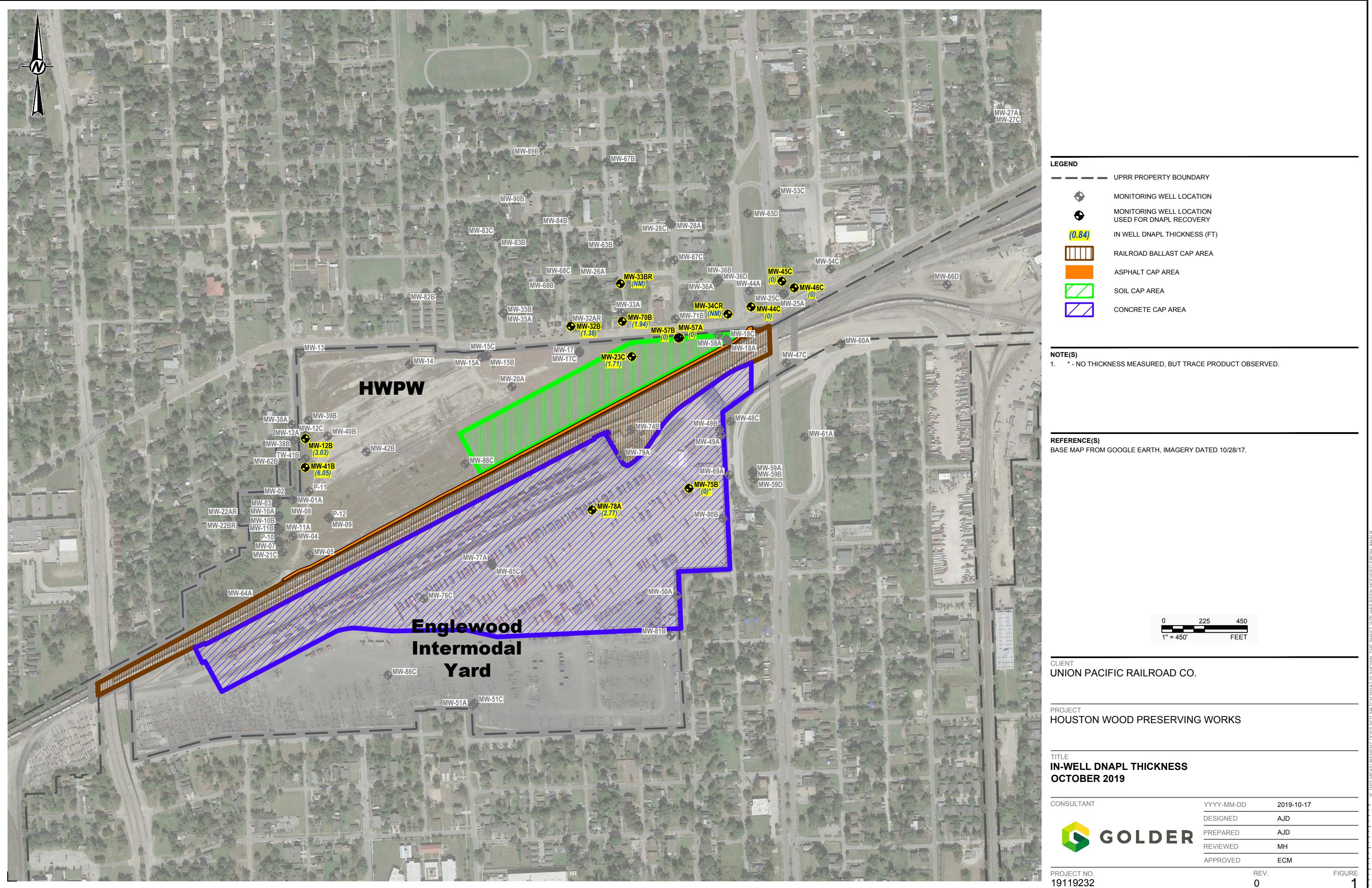


Figure 2
DNAPL Recovery Activities January 2018 - October 2019
UPRR Houston Wood Preserving Works

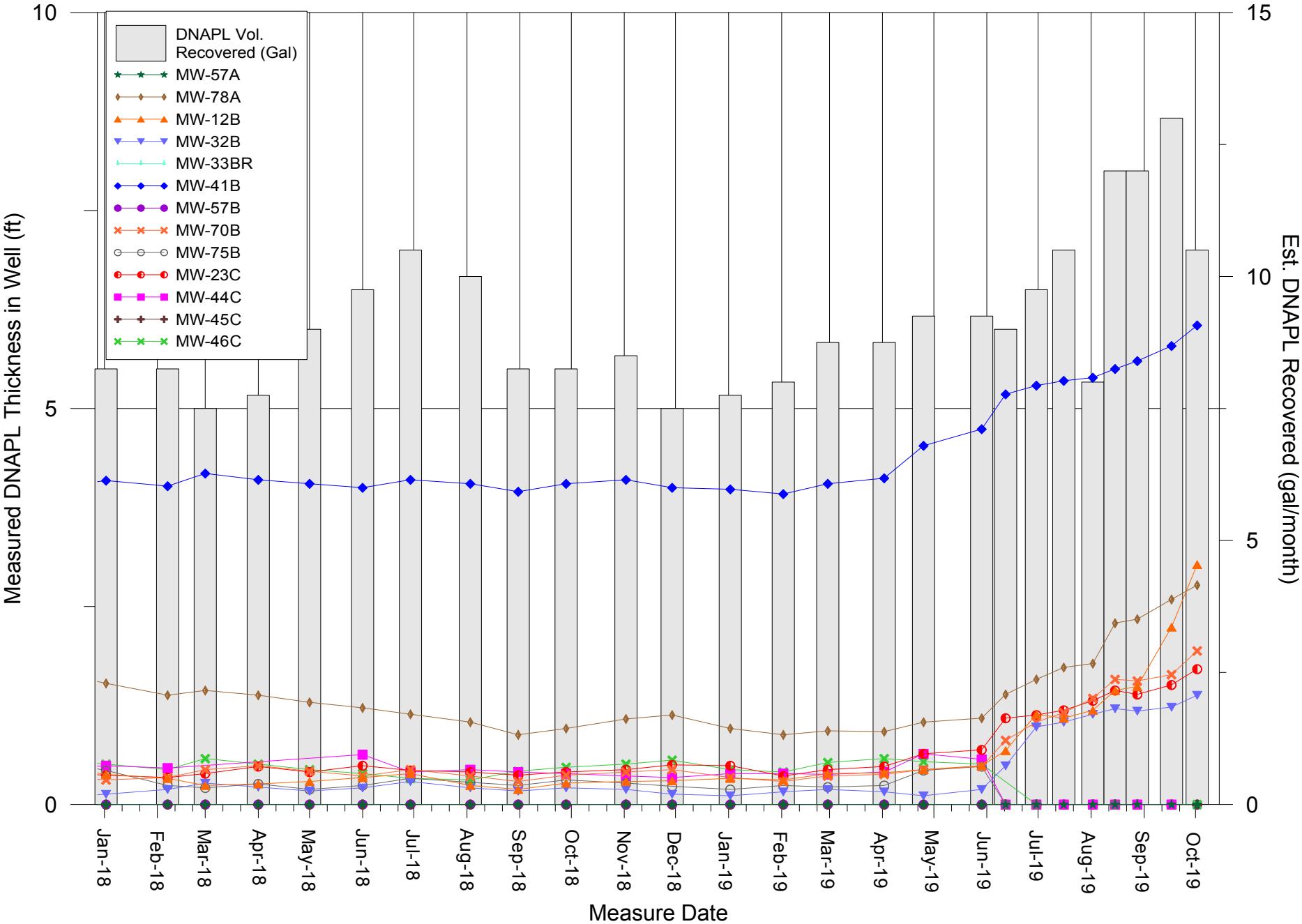
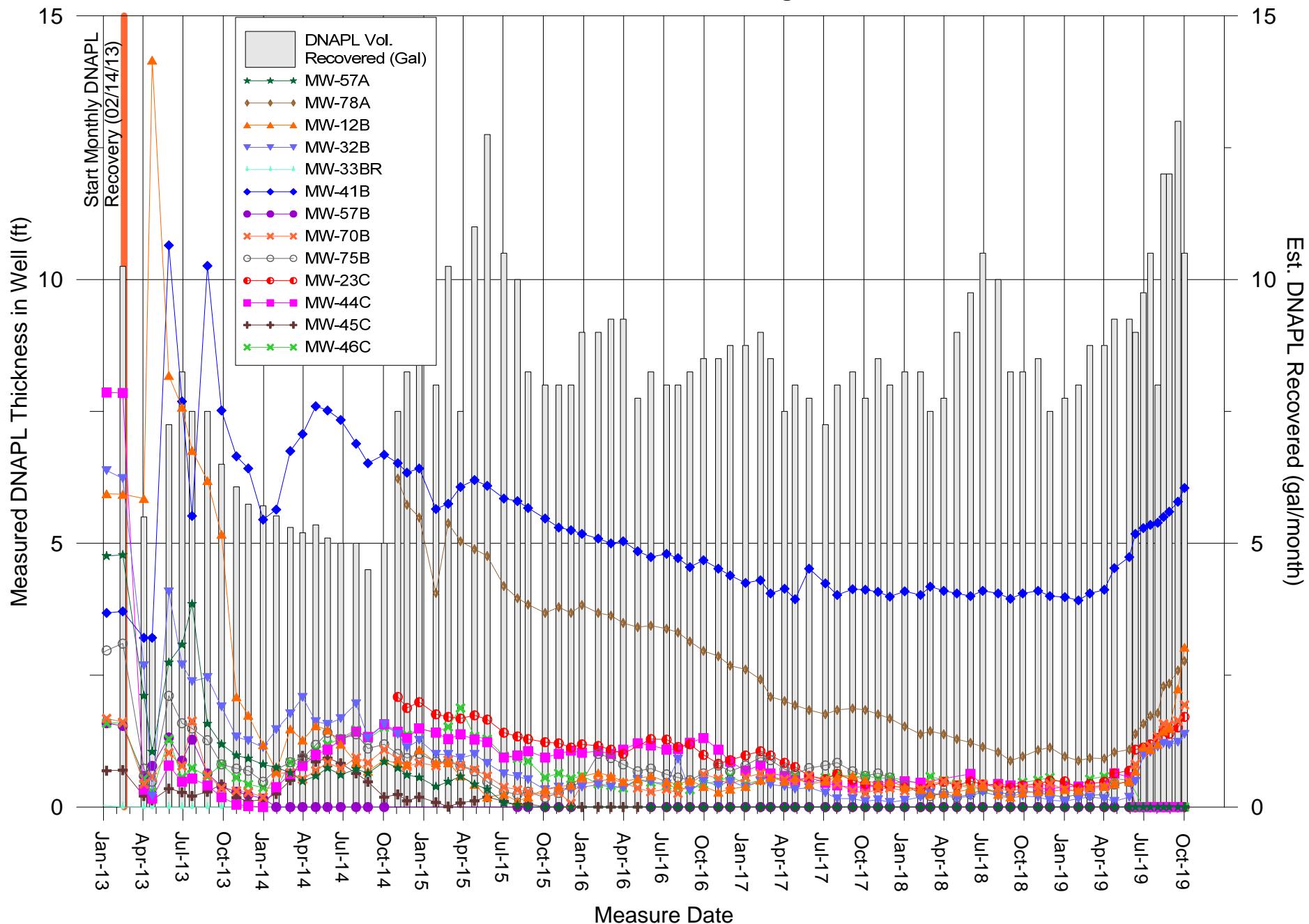


Figure 3
DNAPL Recovery Activities February 2013 - October 2019
UPRR Houston Wood Preserving Works



ATTACHMENT 1

Recovered DNAPL Waste Manifest

Please print or type.

UNIFORM HAZARDOUS WASTE MANIFEST		1. Generator ID Number TXD000820266 / 31547	2. Page 1 of 3. Emergency Response Phone 877-577-2669	4. Manifest Tracking Number 012436486 FLE	
5. Generator's Name and Mailing Address Union Pacific Railroad Environmental Management 101 NE 2nd Ave., ATTN: Tract Rhode Island Portland, OR 97232 Generator's Phone: 414-267-4184					
6. Transporter 1 Company Name Hole Ph#: State ID#:					
7. Transporter 2 Company Name U.S. EPA ID Number					
8. Designated Facility Name and Site Address 2027 Independence Pkwy South U.S. EPA ID Number LaPorte, TX 77571 State ID#: 50089 TXD055141378					
Facility's Phone: 281-931-2300					
GENERATOR	9a. HM 9b. U.S. DOT Description (including Proper Shipping Name, Hazard Class, ID Number, and Packing Group (if any)) RQ, NA3082, Hazardous waste, liquid, n.o.s. (creosote), 9, PG III, ERG 171		10. Containers No. 601 Type DM	11. Total Quantity 55 12. Unit Wt./Vol. G 13. Waste Codes 0918219H F034	
	RQ, NA3082, Hazardous waste, liquid, n.o.s. (purge water contains creosote), 9, PG III, ERG 171		002 DM	110 G 0914101H F034	
	3.				
	4.				
14. Special Handling Instructions and Additional Information: 01: Recovered creosote VR # 21809 (PF:CH1269245) 55G 02: Purge water WR # 21035 (PF:CH1269232) 55G					
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/Officer's Printed/Typed Name Kevin Peterburs		Signature X Kevin Peterburs Month 19 Day 25 Year 19			
TRANSPORTER INT'L	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 John Signature John Month 19 Day 25 Year 19				
	Transporter 2 Printed/Typed Name _____ Signature _____ Month _____ Day _____ Year _____				
DESIGNATED FACILITY	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) Facility's Phone: _____ U.S. EPA ID Number: _____				
	18c. Signature of Alternate Facility (or Generator) Month 19 Day 25 Year 19				
	19. Hazardous Waste Report Management Method Codes (i.e., codes for hazardous waste treatment, disposal, and recycling systems) 01: H040 02: H040 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 _____ Signature _____ Month _____ Day _____ Year _____				