GOLDER

March 12, 2019 Project No. 19119232

Ms. Maureen Hatfield
Texas Commission on Environmental Quality
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 – 4TH QUARTER 2018
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 4th Quarter 2018 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, and will continue monthly following the same procedures detailed in the RAP. 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 manifests for the recovered DNAPL and groundwater are provided in Attachment A.

A summary of the DNAPL recovery measurements for the DNAPL activities from February 2013 through December 2018 (measured January 2, 2019) is provided in Table 1. A graph of DNAPL thicknesses prior to each monthly recovery efforts over time is presented on Figure 2. Observations from the recovery activities are provided below:

- A-TZ Wells: Initially, MW-57A was the only well completed in the A-TZ Unit that contained DNAPL. DNAPL thickness decreased from 4.78 feet in February 2013 to less than 1 foot thick from October 2013 through January 2015 in MW-57A. DNAPL thickness decreased in MW-57A in January 2015 from 0.39 feet to not detected in August 2015. No measurable DNAPL has been detected in MW-57A since August 2015 (approximately 40 months). DNAPL was noted on the end of probe at MW-57A in January 2019. Following installation of MW-78A in May 2014 in the Englewood Industrial Yard and detection of DNAPL in the well, MW-78A was incorporated in the recovery program starting in early November 2014. DNAPL thickness in MW-78A was measured at 4.06 feet (late January 2015), increased to 5.38 feet (late February 2015), and has steadily decreased to 0.96 feet (January 2019).

- B-TZ/B-CZ Wells: 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 increased following the February 2013 recovery event in MW-12B (May 2013) and in MW-41B (June 2013). However, DNAPL thicknesses in well MW-12B gradually decreased from 8.18 feet in May 2013 to 0.11 feet thick in August 2015, with a slight increase to 0.65 feet from August 2015 to February 2016. Since February 2016, the DNAPL thickness in MW-12B has fluctuated between 0.19 feet (August 2018) to 0.6 feet (September 2017).

  DNAPL thicknesses in MW-41B during the first months of the recovery activities increased to 10.26 feet (August 2013). Measured thicknesses through May 2014 fluctuated, then began a steady decrease over time, with a slight increase from January to May 2015, and from April to May 2017. Since August 2017, DNAPL thickness in MW-41B has been relatively stable over that period fluctuating only about 0.23 feet in the monthly measurements (3.95 feet to 4.18 feet) (Figure 2).

  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. Over the past year, the DNAPL thickness in this well has fluctuated between 0.11 feet (January 2019) and 0.29 feet (June 2018).

  DNAPL thickness in well MW-57B decreased from 1.28 feet thick in July 2013 to less than measurable (DNAPL noted on end of probe) thickness in January 2014 through early October 2014. Since June

2016, no measurable DNAPL has been detected in MW-57B. DNAPL was noted on the end of probe at MW-57B in January 2019.

Wells MW-70B and MW-75B had measurable DNAPL at 1.61 feet and 3.1 feet, respectively, at the beginning of the recovery activities (February 2013). During the first 12 months of recovery activities, DNAPL thicknesses in these wells generally decreased to less than one-foot thick, then increased to just over one foot thick in early October 2014. Over the past six months, DNAPL thickness in MW-70B has remained relatively stable fluctuating between 0.44 feet (June 2018) and 0.29 feet (August 2018) thick. DNAPL thickness in MW-75B has fluctuated over the past six months between 0.19 feet (January 2019) to 0.33 feet (June 2018).

- C-TZ Wells: Similar to the wells measured in the other units, DNAPL thicknesses in the C-TZ wells MW-44C, MW-45C, and MW-46C significantly decreased over the first two months of recovery activities, 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 of about 1.57 feet. Since August 2015, no DNAPL has been detected in MW-45C. MW-44C was unable to be measured during March, April, and May 2018 due to road construction activities that had covered the well. Before this interruption, the DNAPL thickness in MW-44C had remained relatively stable from July 2017 to February 2018, ranging from 0.37 feet (September 2017) to 0.46 feet (February 2018). The DNAPL thickness has ranged from 0.44 (August 2018) to 0.34 (November 2018) over the past six months. DNAPL thickness in well MW-46C has fluctuated between 0.56 feet (November 2018) to 0.31 feet (August 2018) over the past six months. 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 has been detected in this 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. Through October 2016, the DNAPL thickness has steadily decreased to less than one foot in the well, with a slight increase from October 2016 to February 2017. Since February 2017, there has been a steady decrease in DNAPL thickness from 1.06 feet to 0.49 feet (January 2019).

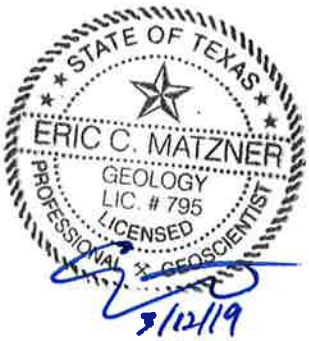
- DNAPL Recovery: From February 2013 to January 2019, an estimated 540 gallons of creosote DNAPL have been recovered from the wells, with monthly DNAPL recovery volumes increased after the January 2015 event (changed pumping techniques). Over the past six months, recovery has ranged from approximately 7.50 to 10.50 gallons per month (Table 1).

With the on-going monthly DNAPL recovery activities, the overall trend in DNAPL thicknesses over the past six months has been either 1) a stable or decreasing trend in the wells with a significant DNAPL thickness (MW-41B and MW-78A) or 2) a relatively stable trend for the wells with less than a foot of measurable DNAPL thickness. Based on the overall observations, the current recovery procedures are achieving the response action objective of removing the readily recoverable DNAPL from the wells as well as reducing the overall thicknesses. Therefore, there are no proposed changes to the recovery activities at this time.

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.



Eric Matzner, P.G.
Associate 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 – January 2019
Figure 2 - DNAPL Recovery Activities February 2013 – January 2019
Attachment A – Recovered DNAPL Waste Manifest

TABLES

TABLE 1

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

	MW-12B				MW-23C				MW-32B				MW-33BR				MW-34C/MW-34CR (July 2014)			
DNAPL Recovery Date	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	0	6.01	30.06	6.23	2	3.72	ND	0	0	NM	NM	NM	0
4/3/2013	9.41	39.95	5.85	1	NM	NM	NM	0	4.86	33.61	2.68	1	4.02	PoP	0	0	NM	NM	NM	0
4/22/2013	8.61	31.64	14.16	0.5*	NM	NM	NM	0	5.62	36.08	0.21	0.25	3.63	ND	0	0	NM	NM	NM	0
5/30/2013	8.47	37.62	8.18	1.5*	NM	NM	NM	0	5.86	32.21	4.08	2	3.59	ND	0	0	NM	NM	NM	0
6/29/2013	9.62	38.22	7.58	1.5	NM	NM	NM	0	6.79	33.59	2.7	1.5	6.07	ND	0	0	NM	NM	NM	0
7/22/2013	11.16	39.04	6.76	1	NM	NM	NM	0	7.14	33.91	2.38	1.5	9.68	ND	0	0	NM	NM	NM	0
8/26/2013	11.31	39.61	6.19	1	NM	NM	NM	0	7.48	33.83	2.46	1	9.86	ND	0	0	NM	NM	NM	0
9/27/2013	11.17	40.63	5.17	1	NM	NM	NM	0	7.23	34.39	1.9	1	9.57	ND	0	0	NM	NM	NM	0
10/31/2013	11.09	43.71	2.09	1	NM	NM	NM	0	7.16	34.96	1.33	0.53	9.32	ND	0	0	21.63	NM	NM	0
11/27/2013	11.17	44.06	1.74	1	NM	NM	NM	0	7.29	35.03	1.26	0.53	9.16	ND	0	0	NM	NM	NM	0
12/31/2013	11.02	44.62	1.18	1	NM	NM	NM	0	7.16	35.16	1.13	0.5	8.97	ND	0	0	NM	NM	NM	0
1/30/2014	11.34	45.12	0.68	1	NM	NM	NM	0	6.72	34.82	1.47	0.53	7.41	ND	0	0	NM	NM	NM	0
3/3/2014	11.17	44.32	1.48	1	NM	NM	NM	0	6.53	34.52	1.77	0.53	7.16	ND	0	0	NM	NM	NM	0
3/31/2014	11.03	44.53	1.27	1	NM	NM	NM	0	6.29	34.21	2.08	0.53	7.04	ND	0	0	NM	NM	NM	0
4/30/2014	10.92	44.26	1.54	1	NM	NM	NM	0	6.42	34.67	1.62	0.53	6.88	ND	0	0	NM	NM	NM	0
5/27/2014	10.81	44.34	1.46	1	NM	NM	NM	0	6.36	34.72	1.57	0.53	6.72	ND	0	0	NM	NM	NM	0
6/26/2014	10.72	44.61	1.19	1	NM	NM	NM	0	6.21	34.61	1.68	0.53	6.52	ND	0	0	NM	NM	NM	0
7/31/2014	10.13	44.96	0.84	1	NM	NM	NM	0	6.06	34.33	1.96	0.25	6.29	ND	0	0	19.06	ND	0	0
8/27/2014	10.26	45.12	0.68	1	NM	NM	NM	0	6.18	34.98	1.31	0.25	6.47	ND	0	0	18.96	ND	0	0
10/3/2014	10.17	44.91	0.89	1	NM	NM	NM	0	6.06	34.72	1.57	0.25	6.32	ND	0	0	18.81	ND	0	0
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	0	19.06	ND	0	0
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	0	19.11	ND	0	0
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	0	19.06	ND	0	0
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	0	18.79	ND	0	0
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	NM	NM	NM	0	18.71	ND	0	0
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	NM	NM	NM	0	18..67	ND	0	0
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	NM	NM	NM	0	18.79	ND	0	0
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	NM	NM	NM	0	18.63	ND	0	0
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	NM	NM	NM	0	17.29	ND	0	0
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	NM	NM	NM	0	17.21	ND	0	0
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	NM	NM	NM	0	18.46	ND	0	0
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	NM	NM	NM	0	17.29	ND	0	0
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	NM	NM	NM	0	16.78	ND	0	0
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	NM	NM	NM	0	16.44	ND	0	0
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	NM	NM	NM	0	16.16	ND	0	0
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	NM	NM	NM	0	15.98	ND	0	0
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	NM	NM	NM	0	15.98	ND	0	0
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	NM	NM	NM	0	15.98	ND	0	0
5/3/2016	6.13	45.66	0.54	1	NM	NM	NM	0	3.67	35.87	0.53	0.5	NM	NM	NM	0	15.79	ND	0	0
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	NM	NM	NM	0	15.97	ND	0	0
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	NM	NM	NM	0	16.06	ND	0	0
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	NM	NM	NM	0	16.17	ND	0	0
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	NM	NM	NM	0	16.31	ND	0	0
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	NM	NM	NM	0	16.42	ND	0	0
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	NM	NM	NM	0	16.51	ND	0	0
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	NM	NM	NM	0	16.72	ND	0	0
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	NM	NM	NM	0	16.94	ND	0	0
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	NM	NM	NM	0	16.91	ND	0	0
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	NM	NM	NM	0	16.78	ND	0	0
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	NM	NM	NM	0	16.71	ND	0	0
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	NM	NM	NM	0	16.61	ND	0	0
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	NM	NM	NM	0	16.84	ND	0	0
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	NM	NM	NM	0	17.01	ND	0	0
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	NM	NM	NM	0	17.17	ND	0	0
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	NM	NM	NM	0	17.11	ND	0	0
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	NM	NM	NM	0	17.06	ND	0	0
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	NM	NM	NM	0	17.17	ND	0	0
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	NM	NM	NM	0	17.29	ND	0	0
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	NM	NM	NM	0	17.52	ND	0	0
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	NM	NM	NM	0	18.11	ND	0	0
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	NM	NM	NM	0	18.38	ND	0	0
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	NM	NM	NM	0	18.29	ND	0	0
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	NM	NM	NM	0	18.33	ND	0	0
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	NM	NM	NM	0	18.62	ND	0	0
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	NM	NM	NM	0	18.91	ND	0	0
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	NM	NM	NM	0	19.06	ND	0	0
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	NM	NM	NM	0	18.77	ND	0	0
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	NM	NM	NM	0	18.64	ND	0	0
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	NM	NM	NM	0	18.57	ND	0	0
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	NM	NM	NM	0	18.39	ND	0	0
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	NM	NM	NM	0	18.26	ND	0	0
Total DNAPL Pumped (gal)				***72.75***				***24***				***44.99***				***0***				***0***

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
TR- Trace amount of DNAPL Exctracted
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

	MW-41B				MW-44C				MW-45C				MW-46C				MW-57A			
DNAPL Recovery Date	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	0.00	22.52	70.49	0.11	0	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	0.00	22.39	70.46	0.14	0	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	0	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	0	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	0.00	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
2/26/2015	7.92	39.06	5.75	2.5	18.42	69.51	1.29	0.5	20.11	70.59	0.01	0	20.09	71.38	1.52	0.5	9.87	26.42	0.48	0.25
3/26/2015	7.83	38.74	6.07	2.5	18.39	69.42	1.38	0.25	19.26	70.52	0.08	0	20.17	71.02	1.88	0.25	9.81	26.32	0.58	0.25
4/27/2015	8.02	38.61	6.20	3	18.29	69.52	1.28	0.5	20.17	70.48	0.12	0.25	20.22	71.56	1.34	1	9.82	26.47	0.43	0.5
5/26/2015	7.91	38.72	6.09	3	18.17	69.57	1.23	0.75	20.12	70.41	0.19	0.25	20.12	71.61	1.29	1	9.71	26.56	0.34	0.5
7/6/2015	6.03	38.96	5.85	2.5	16.29	69.86	0.94	0.5	18.07	70.49	0.11	0.25	18.17	71.93	0.97	0.75	7.41	26.82	0.08	TR*
8/3/2015	6.09	39.01	5.80	2.5	16.18	69.82	0.98	0.5	18.16	70.56	0.04	TR*	18.24	71.98	0.92	0.75	7.29	26.86	0.04	TR*
8/27/2015	7.39	39.14	5.67	2	17.46	69.74	1.06	0.25	19.03	70.54	0.06	TR*	19.39	72.03	0.87	0.5	8.11	26.90	0	TR*
10/5/2015	6.32	39.34	5.47	2	16.83	69.86	0.94	0.25	18.39	70.60	0	0	18.72	72.34	0.56	0.5	7.72	26.90	0	0
11/5/2015	6.01	39.51	5.30	2	16.62	69.79	1.01	0.25	17.96	70.60	0	0	18.51	72.26	0.64	0.5	7.39	26.90	0	0
12/3/2015	5.76	39.56	5.25	2	16.46	69.73	1.07	0.25	17.72	70.60	0	0	18.62	72.36	0.54	0.5	7.13	26.90	0	0
12/28/2015	5.62	39.63	5.18	2.25	16.32	69.77	1.03	0.25	17.62	70.60	0	0	18.42	72.31	0.59	0.5	NM	NM	NM	0
2/3/2016	5.32	39.72	5.09	3	16.17	69.74	1.06	0.25	17.42	70.60	0	0	18.29	72.46	0.44	0.25	NM	NM	NM	0
3/3/2016	5.17	39.81	5.00	3	16.12	69.79	1.01	0.25	17.39	70.60	0	0	18.23	72.49	0.41	0.25	NM	NM	NM	0
3/31/2016	5.26	39.77	5.04	3	16.06	69.71	1.09	0.25	17.33	70.6	0	0	18.24	72.54	0.36	0.25	NM	NM	NM	0
5/3/2016	5.52	39.96	4.85	3	16.27	69.59	1.21	0.25	17.47	70.6	0	0	18.39	72.39	0.51	0.25	NM	NM	NM	0
6/2/2016	5.67	40.07	4.74	3	16.38	69.63	1.17	0.25	17.52	70.6	0	0	18.43	72.43	0.47	0.25	7.26	26.9	0	0
7/8/2016	5.72	40.01	4.8	3	16.47	69.71	1.09	0.25	17.62	70.6	0	0	18.54	72.49	0.41	0.25	7.39	26.9	0	0
8/3/2016	5.79	40.09	4.72	3	16.59	69.7	1.1	0.25	17.69	70.6	0	0	18.51	72.53	0.37	0.25	7.46	26.9	0	0
8/30/2016	5.91	40.26	4.55	3	16.67	69.58	1.22	0.25	17.76	70.6	0	0	18.72	72.57	0.33	0.25	7.58	26.9	0	0
9/30/2016	6.06	40.13	4.68	3	16.79	69.49	1.31	0.5	17.86	70.6	0	0	18.83	72.46	0.44	0.25	7.69	26.9	0	0
11/3/2016	6.11	40.29	4.52	3	16.86	69.71	1.09	0.5	17.92	70.6	0	0	18.89	72.41	0.49	0.25	7.77	26.9	0	0
11/30/2016	6.26	40.42	4.39	3	17.03	69.94	0.86	0.75	18.09	70.6	0	0	19.12	72.32	0.58	0.25	7.92	26.9	0	0
1/4/2017	6.39	40.56	4.25	3	17.22	70.11	0.69	0.75	18.22	70.6	0	0	19.27	72.46	0.44	0.25	8.07	26.9	0	0
2/7/2017	6.44	40.51	4.3	3	17.29	70.01	0.79	0.5	18.17	70.6	0	0	19.19	72.39	0.51	0.25	8.18	26.9	0	0
3/2/2017	6.29	40.76	4.05	3	17.17	70.16	0.64	0.5	17.96	70.6	0	0	19.03	72.31	0.59	0.25	8.02	26.9	0	0
4/3/2017	6.21	40.67	4.14	2.5	17.06	70.21	0.59	0	17.89	70.6	0	0	18.97	72.39	0.51	0.25	8.06	26.9	0	0
4/27/2017	6.19	40.87	3.94	3	17.01	70.29	0.51	0	17.67	70.6	0	0	18.84	72.31	0.59	0.5	8.01	26.9	0	0
5/29/2017	6.14	40.29	4.52	3	17.23	70.24	0.56	0.25	17.84	70.6	0	0	18.94	72.47	0.43	0.25	8.34	26.9	0	0
7/5/2017	6.34	40.57	4.24	2.5	17.33	70.34	0.46	0.25	17.96	70.6	0	0	19.12	72.34	0.56	0.5	8.41	26.9	0	0
8/1/2017	6.42	40.79	4.02	3	17.39	70.39	0.41	0.25	18.09	70.6	0	0	19.23	72.27	0.63	0.5	8.52	26.9	0	0
9/5/2017	6.36	40.68	4.13	3	17.36	70.43	0.37	0.25	18.16	70.6	0	0	19.29	72.34	0.56	0.5	8.46	26.9	0	0
10/4/2017	6.29	40.69	4.12	2.5	17.31	70.41	0.39	0.25	18.21	70.6	0	0	19.36	72.3	0.6	0.5	8.41	26.9	0	0
11/2/2017	6.41	40.73	4.08	3	17.42	70.4	0.4	0.25	18.32	70.6	0	0	19.42	72.36	0.54	0.5	8.52	26.9	0	0
11/29/2017	6.52	40.82	3.99	2.5	17.49	70.36	0.44	0.25	18.43	70.6	0	0	19.57	72.34	0.56	0.5	8.67	26.9	0	0
1/2/2018	6.72	40.72	4.09	2.5	17.67	70.31	0.49	0.5	18.73	70.6	0	0	19.81	72.39	0.51	0.5	8.91	26.9	0	0
2/7/2018	6.97	40.79	4.02	2.5	17.77	70.34	0.46	0.5	18.62	70.6	0	0	19.96	72.46	0.44	0.5	8.98	26.9	0	0
3/1/2018	7.16	40.63	4.18	2	NM	NM	NM	0	18.79	70.6	0	0	20.02	72.32	0.58	0.5	9.22	26.9	0	0
4/2/2018	7.13	40.71	4.10	2	NM	NM	NM	0	18.72	70.6	0	0	19.81	72.39	0.51	0.5	9.16	26.9	0	0
5/1/2018	8.26	40.76	4.05	2	NM	NM	NM	0	19.31	70.6	0	0	20.62	72.46	0.44	1	9.34	26.9	0	0
6/1/2018	8.71	40.81	4.00	2.25	18.31	70.17	0.63	0.75	19.47	70.6	0	0	20.87	72.51	0.39	1	9.67	26.9	0	0
6/29/2018	9.02	40.71	4.10	2.5	18.79	70.39	0.41	0.75	19.67	70.6	0	0	20.97	72.57	0.33	1	9.87	26.9	0	0
8/3/2018	9.13	40.76	4.05	2.5	18.97	70.36	0.44	0.75	19.77	70.6	0	0	21.11	72.59	0.31	1	10.02	26.9	0	0
8/31/2018	8.89	40.86	3.95	2	18.87	70.39	0.41	0.5	19.41	70.6	0	0	20.96	72.48	0.42	0.5	9.91	26.9	0	0
9/28/2018	8.77	40.76	4.05	2	18.82	70.41	0.39	0.75	19.32	70.6	0	0	20.91	72.43	0.47	0.5	9.86	26.9	0	0
11/2/2018	8.61	40.71	4.10	2	18.67	70.44	0.36	0.75	19.26	70.6	0	0	20.77	72.39	0.51	0.75	9.77	26.9	0	0
11/29/2018	8.41	40.81	4.00	2	18.47	70.46	0.34	0.25	19.16	70.6	0	0	20.52	72.34	0.56	0.5	9.56	26.9	0	0
1/2/2019	8.22	40.83	3.98	2	18.42	70.41	0.39	0.5	19.02	70.6	0	0	20.49	72.46	0.44	0.5	9.52	26.9	PoP	0
Total DNAPL Pumped (gal)				***167.5***				***24.07***				***5.63***				***29.04***				***15.5***

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
TR- Trace amount of DNAPL Exctracted

MW-44C not measured 3/1/18 - 5/1/18 due to inability to locate well during construction.

TABLE 1

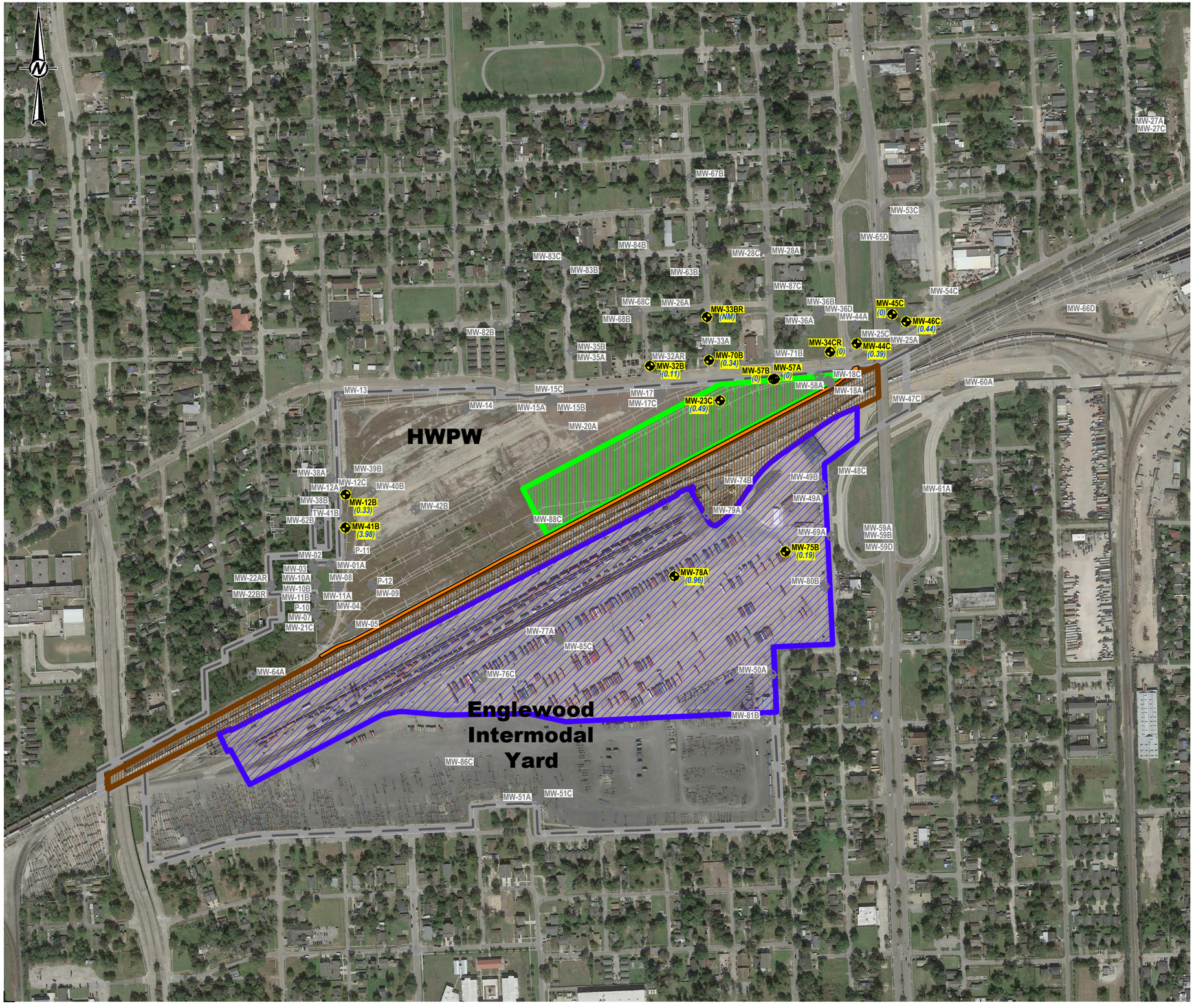
SUMMARY OF DNAPL RECOVERY MEASUREMENTS
UPRR HOUSTON, TX - WOOD PRESERVING WORKS

	MW-57B				MW-70B				MW-75B				MW-78A				
DNAPL Recovery Date	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)	Approx DNAPL Recovered (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	0	9.75
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	0	5.00
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	0	2.75
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	0	7.50
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	0	7.00
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	0	6.50
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	0	6.50
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	0	5.75
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	0	5.07
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	0	4.74
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	0	4.71
1/30/2014	17.04	ND	PoP	0.00	7.84	35.06	0.64	0.07	12.62	36.49	0.71	0.75	NM	NM	NM	0	4.67
3/3/2014	16.51	ND	PoP	0.00	7.09	35.05	0.65	0.13	12.12	36.35	0.85	0.75	NM	NM	NM	0	4.91
3/31/2014	16.41	ND	PoP	0.00	6.87	35.17	0.53	0.07	12.01	36.27	0.93	0.75	NM	NM	NM	0	4.98
4/30/2014	16.29	ND	PoP	0.00	6.72	35.01	0.69	0.07	11.84	36.02	1.18	0.75	NM	NM	NM	0	5.10
5/27/2014	16.13	ND	PoP	0.00	6.64	34.86	0.84	0.07	11.71	35.79	1.41	0.75	NM	NM	NM	0	4.85
6/26/2014	16.02	ND	PoP	0.00	6.52	34.97	0.73	0.25	11.58	35.91	1.29	0.5	NM	NM	NM	0	5.03
7/31/2014	15.84	ND	PoP	0.00	6.26	34.76	0.94	0.25	11.32	35.82	1.38	0.5	NM	NM	NM	0	4.75
8/27/2014	15.71	ND	PoP	0.00	6.84	34.86	0.84	0.25	11.19	36.09	1.11	0.5	NM	NM	NM	0	4.25
10/3/2014	15.61	ND	PoP	0.00	6.71	34.61	1.09	0.25	11.09	36.01	1.19	0.5	NM	NM	NM	0	4.75
11/3/2014	NM	NM	NM	0.00	6.79	34.79	0.91	0.25	11.16	36.19	1.01	0.75	9.31	19.12	6.23	2.00	7.25
11/24/2014	NM	NM	NM	0.00	6.77	34.93	0.77	0.25	11.21	36.27	0.93	0.5	9.39	19.62	5.73	2.00	8.00
12/22/2014	NM	NM	NM	0.00	6.69	34.86	0.84	0.25	11.26	36.19	1.01	0.5	9.34	19.86	5.49	2.00	8.25
1/29/2015	NM	NM	NM	0.00	6.48	34.92	0.78	0.25	11.06	36.34	0.86	0.5	9.14	21.29	4.06	2.00	7.75
2/26/2015	NM	NM	NM	0.00	6.39	34.81	0.89	0.5	11.09	36.34	0.86	0.5	9.17	19.97	5.38	2.5	10.00
3/26/2015	NM	NM	NM	0.00	6.27	34.91	0.79	0.25	10.93	36.42	0.78	0.5	9.12	20.31	5.04	0.75	7.25
4/27/2015	NM	NM	NM	0.00	6.19	34.99	0.71	0.25	10.78	36.52	0.68	0.5	9.17	20.46	4.89	2	10.50
5/26/2015	NM	NM	NM	0.00	6.07	35.11	0.59	0.5	10.61	36.72	0.48	0.75	9.09	20.59	4.76	2.5	12.25
7/6/2015	NM	NM	NM	0.00	5.03	35.32	0.38	0.25	8.52	36.91	0.29	0.75	7.01	21.16	4.19	2	10.50
8/3/2015	12.32	ND	PoP	0.00	5.12	35.37	0.33	TR*	8.66	36.96	0.24	0.75	7.12	21.39	3.96	2.5	10.75
8/27/2015	13.04	ND	0.00	0.00	6.31	35.41	0.29	TR*	9.31	36.91	0.29	0.75	7.96	21.51	3.84	2	8.25
10/5/2015	12.62	ND	0.00	0.00	5.72	35.47	0.23	0.25	8.62	37.02	0.18	0.5	7.23	21.67	3.68	2	8.00
11/5/2015	12.27	ND	0.00	0.00	5.41	35.42	0.28	0.25	8.34	36.93	0.27	0.5	7.02	21.56	3.79	2	8.00
12/3/2015	12.02	ND	0.00	0.00	5.13	35.63	0.07	0.25	8.12	36.81	0.39	0.5	6.83	21.67	3.68	2	8.00
12/28/2015	NM	NM	NM	0.00	5.02	35.26	0.44	0.25	8.01	36.72	0.48	0.5	6.71	21.52	3.83	2.25	9.00
2/3/2016	NM	NM	NM	0.00	4.86	35.21	0.49	0.25	7.82	36.19	1.01	0.25	6.52	21.67	3.68	2	9.00
3/3/2016	NM	NM	NM	0.00	4.92	35.17	0.53	0.25	7.74	36.27	0.93	0.5	6.46	21.72	3.63	2	9.25
3/31/2016	NM	NM	NM	0.00	4.91	35.24	0.46	0.25	7.67	36.39	0.81	0.5	6.49	21.86	3.49	2	9.25
5/3/2016	NM	NM	NM	0.00	5.13	35.29	0.36	0.25	7.79	36.47	0.68	0.5	6.57	21.94	3.41	2	7.75
6/2/2016	12.32	ND	0.00	0.00	5.26	35.36	0.29	0.25	7.71	36.42	0.73	0.5	6.65	21.91	3.44	2	8.25
7/8/2016	12.44	ND	0.00	0.00	5.34	35.31	0.34	0.25	7.8	36.53	0.62	0.5	6.71	21.97	3.38	2	8.00
8/3/2016	12.52	ND	0.00	0.00	5.42	35.39	0.26	0.25	7.89	36.59	0.56	0.5	6.82	22.04	3.31	2	8.00
8/30/2016	12.67	ND	0.00	0.00	5.61	35.21	0.44	0.25	7.96	36.64	0.51	0.5	6.94	22.21	3.14	2	8.25
9/30/2016	12.81	ND	0.00	0.00	5.74	35.03	0.62	0.25	7.91	36.51	0.64	0.5	7.04	22.39	2.96	2	8.50
11/3/2016	12.92	ND	0.00	0.00	5.79	35.11	0.54	0.25	7.86	36.36	0.79	0.5	7.11	22.49	2.86	2	8.50
11/30/2016	13.16	ND	0.00	0.00	6.03	35.23	0.42	0.25	7.97	36.47	0.68	0.75	7.29	22.67	2.68	2	8.75
1/4/2017	13.24	ND	0.00	0.00	6.17	35.09	0.56	0.5	8.04	36.36	0.79	0.75	7.42	22.74	2.61	2	8.75
2/7/2017	13.29	ND	0.00	0.00	6.26	35.01	0.64	0.5	8.12	36.21	0.94	0.75	7.48	22.93	2.42	2.5	9.00
3/2/2017	13.17	ND	0.00	0.00	6.16	35.09	0.56	0.5	8.01	36.26	0.89	0.75	7.36	23.26	2.09	2	8.50
4/3/2017	13.04	ND	0.00	0.00	6.09	35.13	0.52	0.5	7.93	36.43	0.72	0.75	7.29	23.34	2.01	2	7.50
4/27/2017	13.14	ND	0.00	0.00	6.12	35.2	0.45	0.5	7.86	36.52	0.63	0.75	7.36	23.42	1.93	2	8.00
5/29/2017	13.41	ND	0.00	0.00	6.29	35.06	0.59	0.5	7.94	36.41	0.74	0.75	7.51	23.51	1.84	2	7.75
7/5/2017	13.57	ND	0.00	0.00	6.39	35.14	0.51	0.25	8.04	36.36	0.79	0.75	7.79	23.59	1.76	2	7.25
8/1/2017	13.69	ND	0.00	0.00	6.47	35.21	0.44	0.25	8.16	36.31	0.84	0.75	7.89	23.51	1.84	2	8.00
9/5/2017	13.79	ND	0.00	0.00	6.56	35.34	0.31	0.25	8.22	36.47	0.68	0.75	7.81	23.48	1.87	2	8.25
10/4/2017	13.71	ND	0.00	0.00	6.63	35.39	0.26	0.25	8.29	36.56	0.59	0.75	7.89	23.51	1.84	2	7.75
11/2/2017	13.91	ND	0.00	0.00	6.74	35.31	0.34	0.25	8.37	36.51	0.64	1	7.97	23.59	1.76	2	8.50
11/29/2017	14.02	ND	0.00	0.00	6.79	35.29	0.36	0.25	8.33	36.59	0.56	1	8.02	23.67	1.68	2	8.00
1/2/2018	13.06	ND	0.00	0.00	6.34	35.34	0.31	0.25	8.07	36.72	0.43	1	8.17	23.82	1.53	2	8.25
2/7/2018	12.42	ND	0.00	0.00	6.42	35.31	0.34	0.25	8.17	36.91	0.24	1	8.29	23.97	1.38	2	8.25
3/1/2018	12.58	ND	0.00	0.00	6.67	35.21	0.44	0.5	8.31	36.94	0.21	1	8.47	23.91	1.44	2	7.50
4/2/2018	12.46	ND	0.00	0.00	6.61	35.16	0.49	0.5	8.26	36.89	0.26	0.75	8.39	23.97	1.38	2.25	7.75
5/1/2018	13.04	ND	0.00	0.00	7.22	35.23	0.42	1.25	8.92	36.96	0.19	0.75	9.02	24.06	1.29	2	9.00
6/1/2018	13.29	ND	0.00	0.00	7.42	35.29	0.36	1	9.34	36.91	0.24	0.75	9.21	24.13	1.22	2	9.75
6/29/2018	13.47	ND	0.00	0.00	7.58	35.21	0.44	1	9.67	36.82	0.33	0.75	9.39	24.21	1.14	2.25	10.50
8/3/2018	13.61	ND	0.00	0.00	7.69	35.29	0.36	0.75	9.84	36.87	0.28	0.75	9.47	24.31	1.04	2	10.00
8/31/2018	13.47	ND	0.00	0.00	7.42	35.36	0.29	0.5	9.71	36.91	0.24	0.75	9.32	24.47	0.88	2	8.25
9/28/2018	13.36	ND	0.00	0.00	7.33	35.28	0.37	0.5	9.62	36.84	0.31	0.75	9.22	24.39	0.96	2	8.25
11/2/2018	13.21	ND	0.00	0.00	7.22	35.24	0.41	0.75	9.57	36.88	0.27	0.75	9.09	24.27	1.08	2	8.50
11/29/2018	13.01	ND	0.00	0.00	7.06	35.21	0.44	0.5	9.41	36.92	0.23	1	8.96	24.22	1.13	2	7.50
1/2/2019	13.03	ND	PoP	0.00	6.96	35.31	0.34	0.5	9.28	36.96	0.19	1	8.78	24.39	0.96	2	7.75
Total DNAPL Pumped (gal)				***2.71***				***22.87***				***47.75***				***103.5***	***544.31***

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
TR- Trace amount of DNAPL Exctracted

FIGURES



LEGEND

- UPRR PROPERTY BOUNDARY
- FENCE
- RAILROAD
- MONITORING WELL LOCATION
- MONITORING WELL LOCATION USED FOR DNAPL RECOVERY
- (0.84) IN WELL DNAPL THICKNESS (FT)
- RAILROAD BALLAST CAP AREA
- ASPHALT CAP AREA
- SOIL CAP AREA
- CONCRETE CAP AREA

REFERENCE(S)

BASE MAP FROM ERM-SOUTHEAST, INC APAR ADDENDUM, FIG 3-1, DATED JUNE 2004.

0 225 450
1" = 450' FEET

CLIENT
UNION PACIFIC RAILROAD CO.

PROJECT
HOUSTON WOOD PRESERVING WORKS

TITLE
IN-WELL DNAPL THICKNESS JANUARY 2019

CONSULTANT
GOLDER

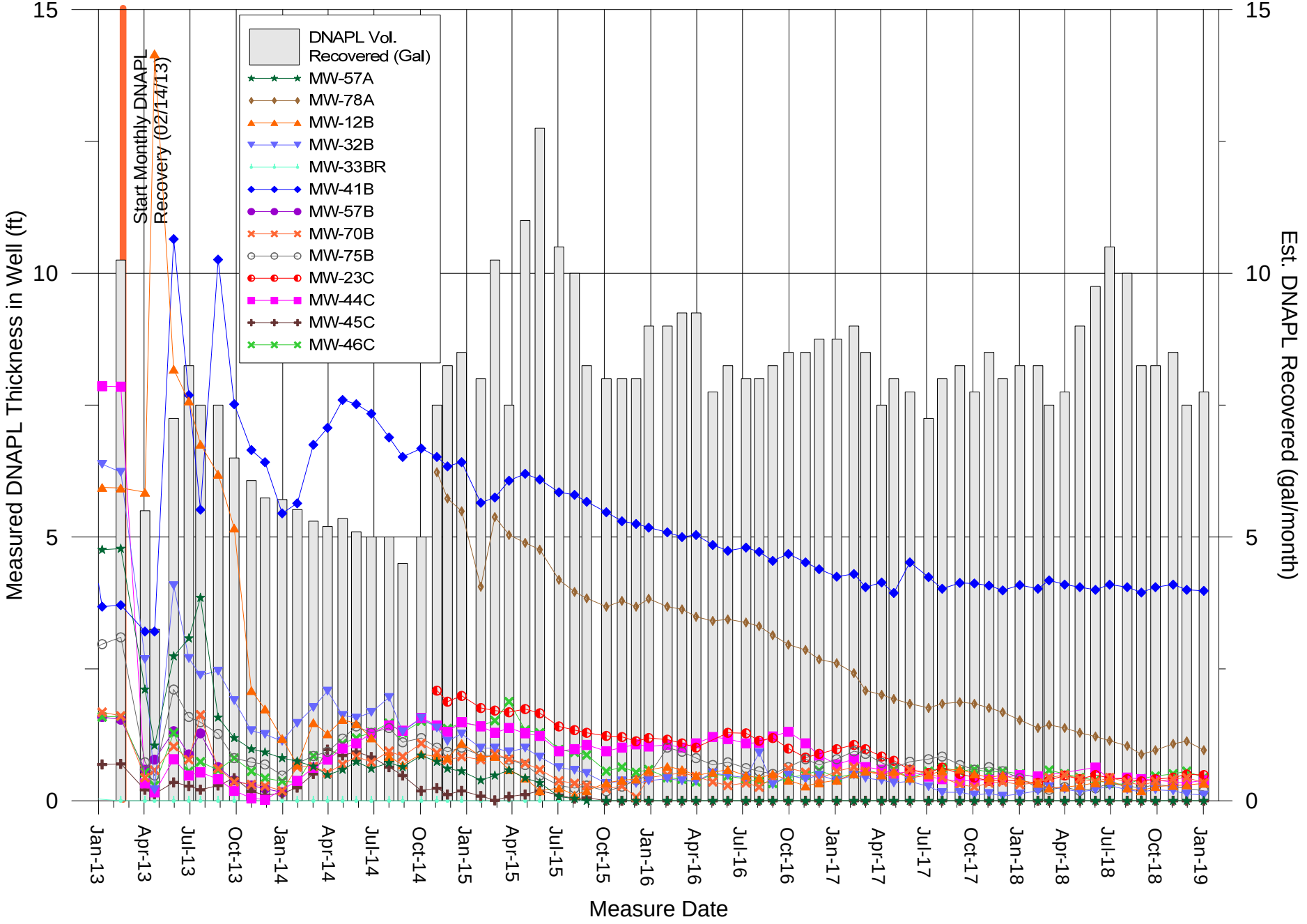
YYYY-MM-DD	2019-02-26
DESIGNED	AJD
PREPARED	AJD
REVIEWED	MH
APPROVED	ECM

PROJECT NO. 30401358 | REV. 0 | FIGURE 1

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

Path: \\exanrkana\data\Projects - Round Rock\1358-UPRR Wood Preserving Works\2018-7 July\ | File Name: FIG 1 - In-Well DNAPL Thickness (January 2019).dwg | Last Edited By: adiamond Date: 2019-02-26 Time:10:39:06 AM | Printed By: adiamond Date: 2019-02-26 Time:10:39:54 AM

Figure 2
DNAPL Recovery Activities February 2013 - January 2019
UPRR Houston Wood Preserving Works



ATTACHMENT 1

Recovered DNAPL Waste Manifest

Projects #: 0-0 1806445694 Order #: 166293

Please print or type: Form Approved. OMB No. 2050-0039

UNIFORM HAZARDOUS WASTE MANIFEST

1. Generator ID Number	2. Page 1 of	3. Emergency Response Phone	4. Manifest Tracking Number
TXD000820266 / 31547	1	877-577-2669	012435724 FLE

GENERATOR

5. Generator's Name and Mailing Address
Union Pacific Railroad
301 NE 2nd Ave, ATTN: Traci Rhode
Portland. OR 97232
Generator's Phone: 414-267-4164 ATTN: Kevin Peterburs

Generator's Site Address (if different than mailing address)
UP Railrod Houston Wood Preserving Works
4910 Liberty Rd
Houston, TX 77026

6. Transporter 1 Company Name
~~None~~ Stericycle Specialty Waste Solutions
Ph#: 713-672-6100
State ID#: 88922/H-1495
U.S. EPA ID Number: MNS000110924

7. Transporter 2 Company Name
Clean Harbors Env. Srv
U.S. EPA ID Number: MAD039322250

8. Designated Facility Name and Site Address
Clean Harbors Deer Park, LP
2027 Independence Pkwy South
LaPorte. TX 77571
State ID#: 50089
U.S. EPA ID Number: TXD055141378

Facility's Phone: 281-930-2300

9a. HM	9b. U.S. DOT Description (including Proper Shipping Name, Hazard Class, ID Number, and Packing Group (if any))	10. Containers No.	10. Containers Type	11. Total Quantity	12. Unit Wt./Vol.	13. Waste Codes
☑	1. RQ, NA3082, Hazardous waste, liquid, n.o.s. (creosote), 9, PG III, ERG 171	001	DM	055	G	0918219H ~~F034~~
	2.					
	3.					
	4.					

14. Special Handling Instructions and Additional Information
01:Recovered creosote WR # 18924 (PF:CH1269245) 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/Offeror's Printed/Typed Name: X Kevin Peterburs
Signature: X
Month 12 Day 13 Year 18

INT'L

16. International Shipments ☐ Import to U.S. ☐ Export from U.S. Port of entry/exit:
Transporter signature (for exports only): Date leaving U.S.:

TRANSPORTER

17. Transporter Acknowledgment of Receipt of Materials

Transporter 1 Printed/Typed Name: JOE Jannillo
Signature:
Month 12 Day 13 Year 18

Transporter 2 Printed/Typed Name: T. Woods
Signature:
Month 12 Day 21 Year 18

DESIGNATED FACILITY

18. Discrepancy

18a. Discrepancy Indication Space ☐ Quantity ☐ Type ☐ Residue ☐ Partial Rejection ☐ 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.
01: H040			

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: Chelsea Gray
Signature:
Month 12 Day 22 Year 18

EPA Form 8700-22 (Rev. 12-17) Previous editions are obsolete. DESIGNATED FACILITY TO EPA's e-MANIFEST SYSTEM

LAND DISPOSAL RESTRICTION NOTIFICATION FORM

For Wastes Subject to the Treatment Standards Found in 40 CFR 268

Order No: 166293

Generator Name: Union Pacific Railroad **Manifest No: 012435724FLE**

WMDS	WW / NWW	EPA Waste Codes / Underlying Hazardous Constituents	LDR Code
CH1269245	[ ] / [X]	F034 /	E

LDR CODES

A. Restricted Waste Meets Treatment Standards (40 CFR 268.7(a) (3))
The restricted waste identified above meets the treatment standards in 40 CFR 268.40 or Alternative LDR treatment standards for contaminated soil 40 CFR 268.49 and can be landfill disposed without further treatment. I have attached all supporting analytical data, where available.
I certify under penalty of law that I personally have examined and am familiar with the waste through analysis and testing or through knowledge of the waste to support this certification that the waste complies with the treatment standards specified in 40 CFR Part 268 Subpart D. I believe that the information I submitted is true, accurate and complete. I am aware that there are significant penalties for submitting a false certification, including the possibility of a fine and imprisonment.

B. Restricted Waste Treated To Treatment Standards (40 CFR 268.7(b) (I) and 268.7 (b) (2))
The treatment residue, or extract of such residue, or the restricted waste identified above has been tested to assure that the treatment residues or extract meet all applicable treatment standards in 40 CFR 268.40 and/or performance standards in 40 CFR 268.45. I have attached all supporting analytical data, where available.
I certify under penalty of law that I personally have examined and am familiar with the waste through analysis and testing or through knowledge of the waste to support this certification that the waste complies with the treatment standards specified in 40 CFR Part 268 Subpart D. I believe that the information I submitted is true, accurate and complete. I am aware that there are significant penalties for submitting a false certification, including the possibility of a fine and imprisonment.

C. Restricted Waste With Technology Based Treatment Standards (40 CFR 268.7(b) (4))
I certify under penalty of law that I personally have examined and am familiar with the treatment technology and operation of the treatment process used to support this certification and that based on my inquiry of those individuals immediately responsible for obtaining this information. I believe that the treatment process has been operated and maintained properly so as to comply with the treatment standards specified in 40 CFR 268.40, without impermissible dilution of the prohibited waste. I am aware that there are significant penalties for submitting a false certification, including the possibility of a fine and imprisonment.

D. Restricted Waste Decharacterized But Requires Treatment For UHC (40 CFR 268.9)
I certify under penalty of law that the waste has been treated in accordance with the requirements of 40 CFR 268.40 to remove the hazardous characteristic. This decharacterized waste contains Underlying Hazardous Constituents (UHC) that require further treatment to meet the universal treatment standards. I am aware that there are significant penalties for submitting a false certification, including the possibility of a fine and imprisonment.

E. Restricted Waste Subject To Treatment (40 CFR 268.7(a) (2))
The restricted waste identified above must be treated to the applicable treatment standards in 40 CFR 268.40, or treated to comply with applicable prohibitions set forth in Part 268.32 or RCRA Section 3004(d). I have attached all supporting analytical data, where available.

F. Hazardous Debris Subject To Treatment (40 CFR 268.45)
This hazardous debris identified above must be treated to the alternative treatment standards in 40 CFR 268.45.

G. Restricted Waste Subject To A Variance or Extension (40 CFR 268.7(a) (4))
This restricted waste identified above is subject to a case by case exemption under 40 CFR 268.5, an exemption under 40 CFR 268.6 or a nationwide capacity variance under Subpart C of 40 CFR 268, and is not prohibited from land disposal. LDR prohibitions become effective on _____(date) for this restricted waste. The corresponding treatment standard(s) are promulgated in 40 CFR 268.40. I have attached all supporting analytical data, where available.

H. Restricted Waste Managed In A "Lab Pack" (40 CFR 268.7(a) (9))
I certify under penalty of law that I personally have examined and am familiar with the waste and that the lab pack contains only waste that have been excluded under appendix IV to 40 CFR Part 268 and that this lab pack will be sent to a combustion facility in compliance with the alternative treatment standards for lab packs at 40 CFR 268.42(c). I am aware that there are significant penalties for submitting a false certification, including the possibility of a fine and imprisonment.

I certify and warrant that the information that appears on this form, and appended documents, is true and correct. I have correctly indicated how my waste is to be managed in accordance with 40 CFR 268. My certification is based on personal examination of the information submitted, or is based on my inquiries of those individuals responsible for obtaining the information.

Authorized Signature X _____ **Title** Manager, Environmental / Site Remediation **Date** 12-7-18

Controlled Document

For Internal Use Only