Tank 17 Stop 02-16-579603

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BARR

Technical Memorandum

To: Alex Smith, Enbridge Energy
From: Ryan Erickson and Noelle Scelina
Subject: Superior Terminal Tank 17 Historical Contamination
BRRTS #: Not identified
Date: January 13, 2017
Project: 49161286

This document summarizes the field screening, analytical sampling, and waste management assistance performed by Barr in response to the discovery of historically contaminated soil within the Tank 17 containment basin (Figure 1) at the Enbridge Superior Terminal in Superior, Wisconsin.

Background

Excavation and pipeline replacement activities were conducted within the Tank 17 containment basin as part of the Superior Terminal Enhancement Project (Project) in 2015. During excavation activities north of Tank 17 (Figure 1), hydrocarbon contamination was encountered in soil adjacent to the tank foundation. Enbridge was notified and the nearby infrastructure was assessed for an active release. No active release was identified; therefore, Enbridge inferred that the contamination was historical. The contractors continued their excavation activities and excavated soil with evidence of hydrocarbon contamination was transported to the Terminal soil management area for characterization and off-site management.

Barr assisted Enbridge with environmental assessment and waste management tasks using methods described in the *Field Activities* section of *Superior Terminal Pipeline Enhancement Project Environmental Oversight Technical Memorandum*. The site specific activities and results are summarized below.

Investigation Activities and Results

Barr was onsite on March 30 and April 1, 2015 to document environmental site conditions and screen the final excavation extents. The excavation location and analytical sample location are shown on Figure 1 and the field screening log is included in Attachment A.

The final excavation was approximately 40 feet long by 27 feet wide by 9.7 feet deep (Photo 1). Soil observed in the excavation extents consisted of clay. Soil field screened from the excavation sidewalls and base, with the exception of the south sidewall, had headspace readings below 10 ppm and no other indication of hydrocarbon contamination such as odor, discoloration, or sheen. Hydrocarbon contaminated soil was identified along the south sidewall below a valve within 3 feet of the tank foundation. The contaminated soil had a strong petroleum odor, bluish gray staining and an elevated headspace reading of 69.7 ppm (Screening sample *S-1*; Photos 2 and 3). The contaminated soil was found from approximately 0 to 7 feet below ground surface (bgs) and along approximately 18 feet of south

sidewall. A small amount of water with a rainbow sheen and hydrocarbon odor was observed seeping out of the south sidewall at approximately 4 feet bgs (Photo 4). The lateral and horizontal extents of the south sidewall contamination were identified by screening samples *S-2* through *S-9*. The presence of the Tank 17 foundation and tank wall prevented additional excavation of contaminated soil.

Barr collected one analytical sidewall sample (*2015 TK 17-S-1*) from the final excavation extents on April 1, 2015 to document residual contamination (Figure 1; Attachment A). The sample was sent to Legend Technical Services for laboratory analysis of petroleum volatile organic compounds (PVOC) and naphthalene. Analytical sampling results are summarized in Table 1 and the laboratory report is included in Attachment B.

2015 TK 17-S-1 analyte concentrations were below Wisconsin Department of Natural Resources (WDNR) industrial direct contact residual contaminant levels (RCL's) and passed the Cumulative Hazard Index criteria. The analyte concentrations did however exceed WDNR Groundwater RCLs for all of the parameters except toluene (Table 1).

TABLE 1: Analytical Soil Sample Results *(all analyte concentrations in mg/kg)*

Sample ID	Sample Date	Sample Depth (feet)	1,2,4-Trimethyl benzene	1,3,5-Trimethyl benzene	Benzene	Ethyl benzene	Toluene	Total Xylenes	Naphthalene
Groundwater RCLs			***<u>1.3821</u>***	***<u>1.3821</u>***	***<u>0.0051</u>***	***<u>1.57</u>***	***<u>1.1072</u>***	***<u>3.96</u>***	***<u>0.6582</u>***
Industrial DC RCLs			*219*	*182*	*7.41*	*37*	*818*	*260*	*26*
2015 TK17-S-1	4/15/2015	2.5	**<u>30</u>**	**<u>12</u>**	**<u>4.2</u>**	**<u>18</u>**	**1.1**	**<u>14</u>**	**<u>16</u>**

BOLD = Analyte detections
<u>Underlined</u> = Analyte detections exceeding WDNR groundwater RCLs.

The excavation was backfilled with clean fill upon completion of the Project work.

Historical Release Information

Barr reviewed the WDNR Bureau of Remediation and Redevelopment Tracking System (BRRTS) database for historical releases in the vicinity of the Tank 17 excavation and no historical release source was identified. Based on the contaminated soil location, beneath a Tank 17 valve, and the limited extent of the contamination, it is likely that contaminated soil is associated with an unreported historical valve release or historical tank maintenance activities.

Waste Management

Contaminated soil was managed off-site as described in the *Waste Management* section of the *Superior Terminal Pipeline Enhancement Project Environmental Oversight Technical Memorandum.*

Receptor Survey

The closest groundwater monitoring wells are wells *MW-6* and *MW-6B* located approximately 1,150 feet to the south. In 2015, analyte concentrations for PVOC and naphthalene in these wells were below method detection limits as described in the *Superior Terminal Pipeline Enhancement Project Environmental Oversight Technical Memorandum.*

The contaminated soil is located below the ground surface and above the water table within the Tank 17 containment basin, therefore no nearby surface water receptors are at risk.

The closest structure is Tank 17, which has no human occupancy. No other vapor receptors were identified within 100 feet of the excavation.

Conclusion

Contaminated soil excavated from the Tank 17 basin was managed at an approved landfill. Contaminated soil that could not be excavated due to the presence of terminal infrastructure had analyte concentrations below the WDNR industrial direct contact RCL's and passed the WDNR Cumulative Hazard Index criteria. Analyte concentrations did exceed WDNR Groundwater criteria; however, groundwater monitoring at the Superior Terminal is conducted on a facility wide basis as part of the hydrogeologic performance standard established in the *WDNR SI/RAP* (2014). The presence of clean backfill, above ground infrastructure and employee-awareness will help prevent direct contact exposure.

No historical release was identified for this site on the WDNR BRRTS website; however, impacted soil is located directly below a Tank 17 valve and hydrocarbon impacts at this site are likely associated with a historical valve release.

Based on the current site conditions, Barr believes that no further remedial actions will be requested by the WDNR for this site at this time and that the WDNR will add the site to the pending Terminal-wide GIS registry.

Attachments

Site Photos	1 through 4
Figure 1	Site Layout
Attachment A	Site Investigation Field Sampling and Screening Log
Attachment B	Legend Technical Services Laboratory Report

Site Photos

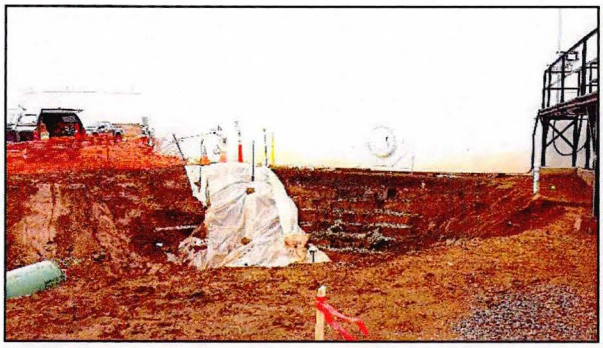


Photo 1

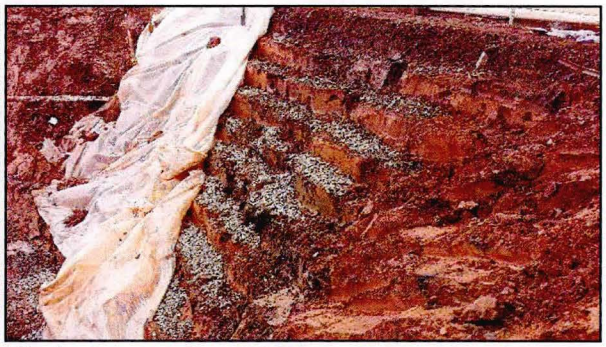


Photo 2

Photo 1: Tank 17 Pipeline Enhancement excavation. Photo taken facing south on April 1, 2015.
Photo 2: South sidewall of the excavation. Photo taken facing east on April 1, 2015.

Photo 3

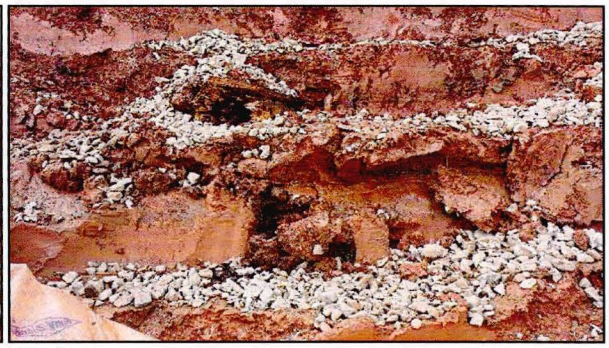
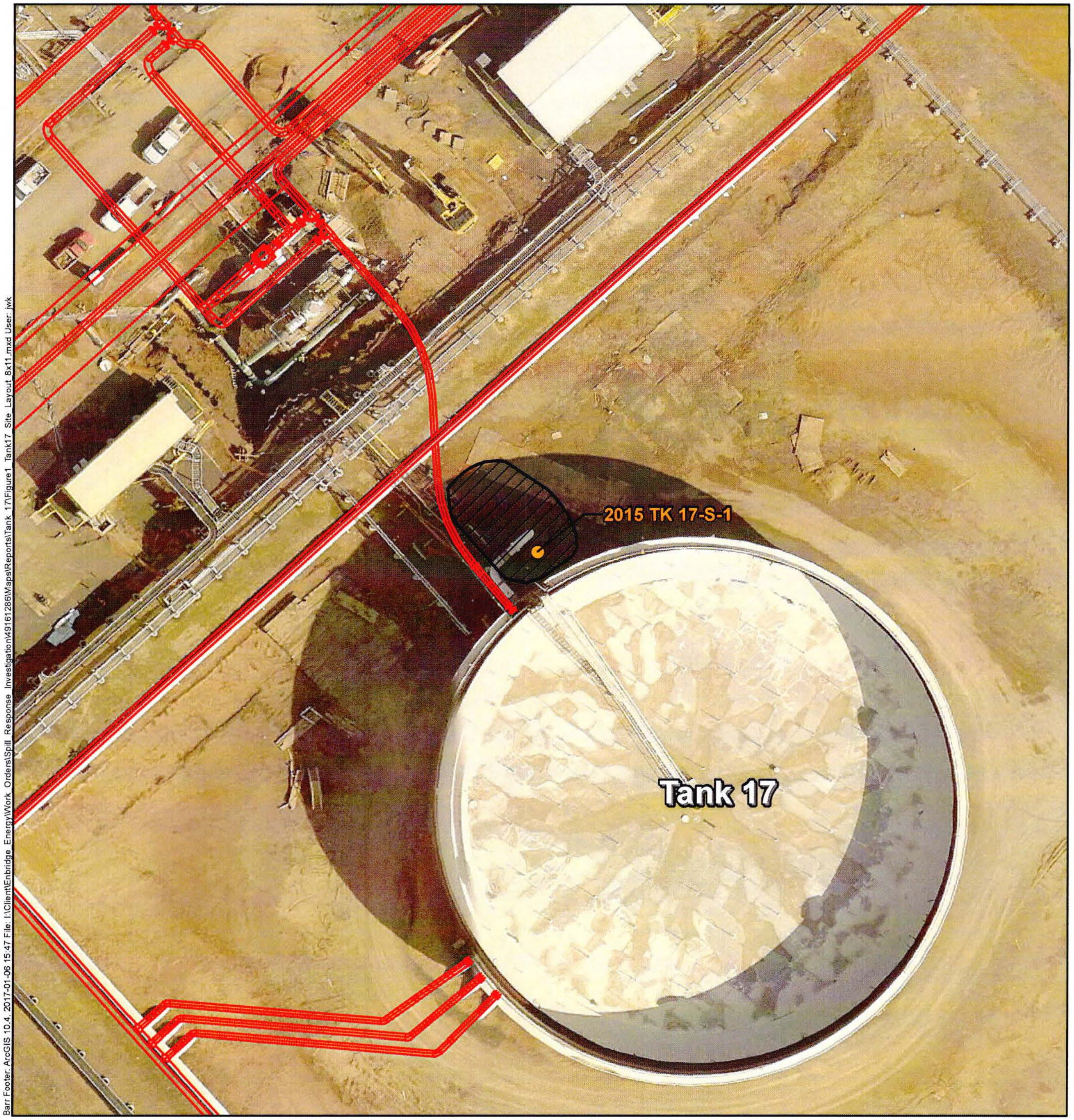
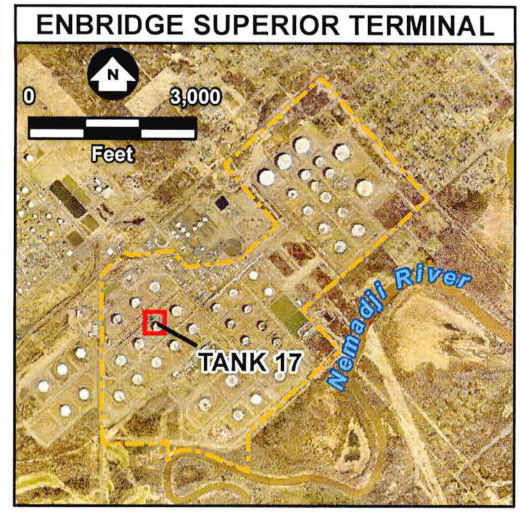


Photo 4

Photo 3: Contaminated soil (gray discoloration) encountered in the south sidewall. The contamination is located below a Tank 17 valve. Photo taken facing south on April 1, 2015.
Photo 4: Hydrocarbon impacted water seeping out of the south sidewall at approximately 4 feet bgs. Photo taken facing south on April 1, 2015.





Analytical Sample Location
Excavation Extents
Pipeline Infrastructure
Terminal Property Boundary

N

0 50 100

Feet
1 Inch = 50 Feet

Douglas County Imagery Circa May, 2016

Figure 1

SITE LAYOUT
TANK 17 ENHANCEMENT
SUPERIOR TERMINAL
Enbridge Energy, L.P.
Superior, Wisconsin

ENBRIDGE

Attachment A

Site Investigation Field Sampling and Screening Log

SITE INVESTIGATION FIELD SAMPLING AND SCREENING LOG

Location: *Milepost or Facility* Tank 17 Enbridge Terminal Superior WI

Equipment used: Photo *-ionization detector with* 11.7 *eV lamp* Background Headspace: 0.0 ppm

Sample Nomenclature *(Location - sample type - #):* _____

Soil Sample Types: **R** = *Removed Sample* ; **S** = *Sidewall Sample* ; **B** = *Bottom Sample* ; **Stockpile** = *Stockpile Sample*

Date: 11-1-15

Sampler: NBS2

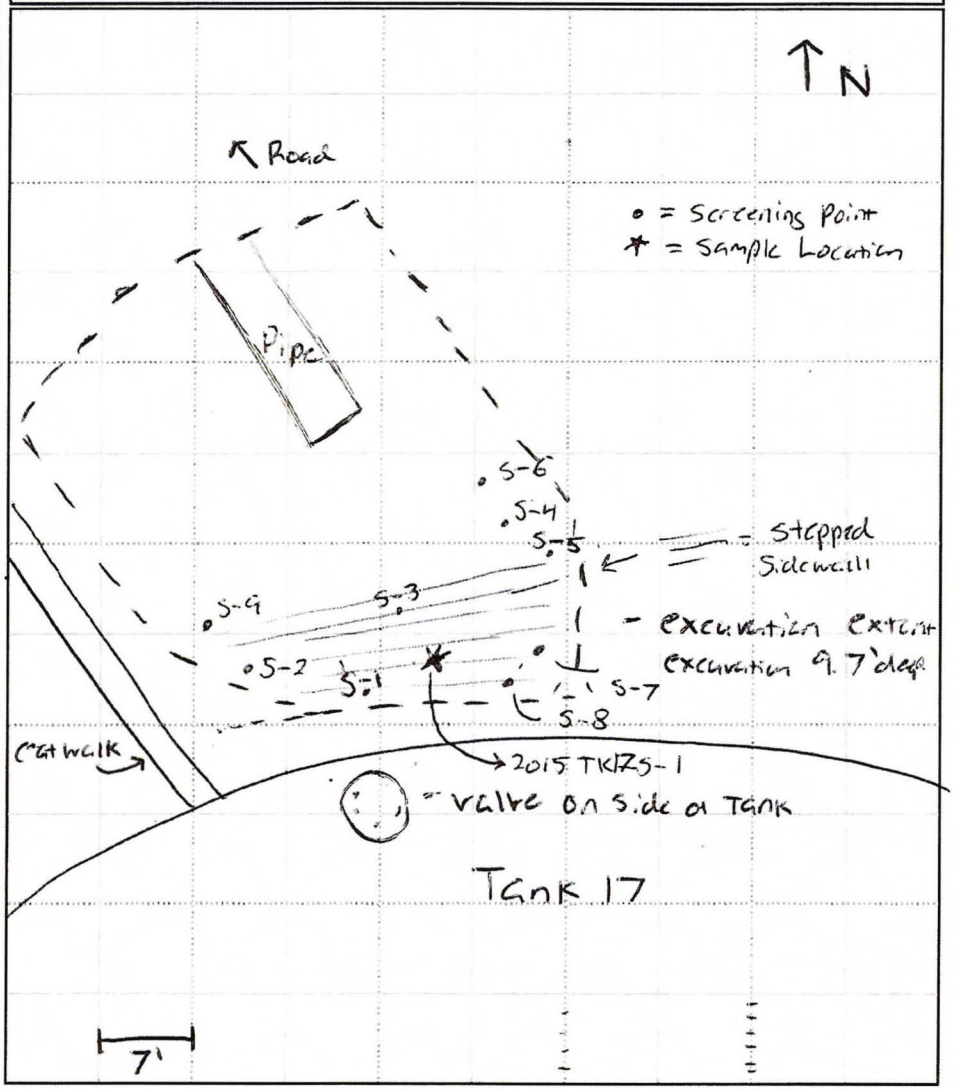
Calibration Time: 0715

BARR

Sample ID	Depth (FT)	Time (military)	Soil Type (USCS)	Color/ Discolor	Odor/ Sheen	Headspace Reading (ppm)
Example: TK99-S-1	4	16:30	CL	Reddish brown	Petroleum/ Rainbow	275
S-1	3	1015	CL	Reddish Brown	*/none	69.7
S-2	2				none/none	0.0
S-3	8				none/none	7.2
S-4	5				none/none	0.9
S-5	2	1025			none/none	1.4
S-6	5				none/none	0.0
S-7	3				none/none	0.1
S-8	2.5				none/none	0.0
S-9	6				none/none	0.1
2015 TK17-S-1	25	1100	CL	Reddish Brown*	Strong odor + sheen	—

Analytical Sample

SITE SKETCH: *north is up; excavation extents & depths, impacted areas, sample locations, borings, wells, structures, utilities, natural features...* ***1 inch/grid =*** 14 ***FEET***



* Slight Petroleum odor

* Bluish gray staining in analytical sample soil.

Attachment B

Legend Technical Services Laboratory Report

LEGEND
Technical Services, Inc.
www.legend-group.com

88 Empire Drive
St Paul, MN 55103
Tel: 651-642-1150
Fax: 651-642-1239

April 14, 2015

Mr. James E. Taraldsen
Barr Engineering Co.
4700 W 77th St
Minneapolis, MN 55435

Work Order Number: 1501145
RE: 49161286

Enclosed are the results of analyses for samples received by the laboratory on 04/02/15. If you have any questions concerning this report, please feel free to contact me.

Results are not blank corrected unless noted within the report. Additionally, all QC results meet requirements unless noted.

All samples will be retained by Legend Technical Services, Inc., unless consumed in the analysis, at ambient conditions for 30 days from the date of this report and then discarded unless other arrangements are made. All samples were received in acceptable condition unless otherwise noted.

WI Accreditation #998022410

Prepared by,
LEGEND TECHNICAL SERVICES, INC

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Client Manager II
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Barr Engineering Co.	Project:	49161286	
4700 W 77th St	Project Number:	49161286.00 001 001	Work Order #: 1501145
Minneapolis, MN 55435	Project Manager:	Mr. James E. Taraldsen	Date Reported: 04/14/15

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
2015 TK17-S-1_2.5-2.5	1501145-01	Soil	04/01/15 11:00	04/02/15 09:05
Trip Blank	1501145-02	Methanol	04/01/15 00:00	04/02/15 09:05

Shipping Container Information

Default Cooler Temperature (°C): 1.2

Received on ice: Yes
Temperature blank was present
Received on ice pack: No
Received on melt water: No
Ambient: No
Acceptable (IH/ISO only): No
Custody seals: Yes

Case Narrative:

The dry weight correction and dilution applies to the sample result, MDL, and RL.

Ethylbenzene; 1,3,5-Trimethylbenzene; and Naphthalene were present in the method blank between the MDL and RL for the BTEX analysis.

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4700 W 77th St	Project Number:	49161286.00 001 001	Work Order #: 1501145
Minneapolis, MN 55435	Project Manager:	Mr. James E. Taraldsen	Date Reported: 04/14/15

WI(95) GRO/8015D
Legend Technical Services, Inc.

Analyte	Result	RL	MDL	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
2015 TK17-S-1_2.5-2.5 (1501145-01) Soil Sampled: 04/01/15 11:00 Received: 04/02/15 9:05										
1,2,4-Trimethylbenzene	**30**	0.34	0.091	mg/kg dry	10	B5D0817	04/08/15	04/09/15	WI(95) GRO	
1,3,5-Trimethylbenzene	**12**	0.34	0.072	mg/kg dry	10	"	"	"	"	
Benzene	**4.3**	0.34	0.011	mg/kg dry	10	"	"	"	"	
Ethylbenzene	**18**	0.34	0.047	mg/kg dry	10	"	"	"	"	
Naphthalene	**16**	6.8	0.30	mg/kg dry	10	"	"	"	"	T-1
Toluene	**1.1**	0.34	0.055	mg/kg dry	10	"	"	"	"	
Xylenes (total)	**14**	1.0	0.19	mg/kg dry	10	"	"	"	"	
Surrogate: 4-Fluorochlorobenzene	*111*			*80-150 %*		"	"	"	"	
Trip Blank (1501145-02) Methanol Sampled: 04/01/15 00:00 Received: 04/02/15 9:05										
1,2,4-Trimethylbenzene	<0.0068	0.025	0.0068	mg/kg wet	1	B5D0817	04/08/15	04/08/15	WI(95) GRO	
1,3,5-Trimethylbenzene	<0.0053	0.025	0.0053	mg/kg wet	1	"	"	"	"	
Benzene	<0.00082	0.025	0.00082	mg/kg wet	1	"	"	"	"	
Ethylbenzene	**0.0090**	0.025	0.0035	mg/kg wet	1	"	"	"	"	B-01, J
Naphthalene	**0.046**	0.50	0.022	mg/kg wet	1	"	"	"	"	B-01, T-1, J
Toluene	**0.0072**	0.025	0.0041	mg/kg wet	1	"	"	"	"	J
Xylenes (total)	<0.014	0.075	0.014	mg/kg wet	1	"	"	"	"	
Surrogate: 4-Fluorochlorobenzene	*94.8*			*80-150 %*		"	"	"	"	

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Minneapolis, MN 55435	Project Manager:	Mr. James E. Taraldsen	Date Reported: 04/14/15

PERCENT SOLIDS
Legend Technical Services, Inc.

Analyte	Result	RL	MDL	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
2015 TK17-S-1_2.5-2.5 (1501145-01) Soil	**Sampled: 04/01/15 11:00**			**Received: 04/02/15 9:05**						
% Solids	**74**			%	1	B5D0906	04/09/15	04/09/15	% calculation	

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WI(95) GRO/8015D - Quality Control
Legend Technical Services, Inc.

Analyte	Result	RL	MDL	Units	Spike Level	Source Result	%REC	%REC Limits	%RPD	%RPD Limit	Notes
Batch B5D0817 - EPA 5035 Soil (Purge and Trap)											
Blank (B5D0817-BLK1)					Prepared & Analyzed: 04/08/15						
1,2,4-Trimethylbenzene	< 0.0068	0.025	0.0068	mg/kg wet							
1,3,5-Trimethylbenzene	0.00672	0.025	0.0053	mg/kg wet							B-02, J
Benzene	< 0.00082	0.025	0.00082	mg/kg wet							
Ethylbenzene	0.00847	0.025	0.0035	mg/kg wet							B-02, J
Naphthalene	0.0373	0.50	0.022	mg/kg wet							B-02, J
Toluene	< 0.0041	0.025	0.0041	mg/kg wet							
Xylenes (total)	< 0.014	0.075	0.014	mg/kg wet							
Surrogate: 4-Fluorochlorobenzene	*23.5*			*ug/L*	*25.0*		*94.1*	*80-150*			
LCS (B5D0817-BS1)					Prepared & Analyzed: 04/08/15						
1,2,4-Trimethylbenzene	98.1			ug/L	100		98.1	80-120			
1,3,5-Trimethylbenzene	103			ug/L	100		103	80-120			
Benzene	90.2			ug/L	100		90.2	80-120			
Ethylbenzene	100			ug/L	100		100	80-120			
Naphthalene	108			ug/L	100		108	80-120			
Toluene	104			ug/L	100		104	80-120			
Xylenes (total)	308			ug/L	300		103	80-120			
Surrogate: 4-Fluorochlorobenzene	*26.0*			*ug/L*	*25.0*		*104*	*80-150*			
LCS Dup (B5D0817-BSD1)					Prepared: 04/08/15 Analyzed: 04/09/15						
1,2,4-Trimethylbenzene	84.0			ug/L	100		84.0	80-120	15.5	20	
1,3,5-Trimethylbenzene	88.2			ug/L	100		88.2	80-120	15.3	20	
Benzene	99.1			ug/L	100		99.1	80-120	9.44	20	
Ethylbenzene	92.2			ug/L	100		92.2	80-120	8.52	20	
Naphthalene	88.7			ug/L	100		88.7	80-120	20.0	20	
Toluene	95.9			ug/L	100		95.9	80-120	8.26	20	
Xylenes (total)	279			ug/L	300		92.9	80-120	9.93	20	
Surrogate: 4-Fluorochlorobenzene	*25.4*			*ug/L*	*25.0*		*101*	*80-150*			
Matrix Spike (B5D0817-MS1)	**Source: 1501133-03**				Prepared: 04/08/15 Analyzed: 04/09/15						
1,2,4-Trimethylbenzene	94.3			ug/L	100	0.199	94.1	80-120			
1,3,5-Trimethylbenzene	99.9			ug/L	100	0.137	99.7	80-120			
Benzene	102			ug/L	100	<	102	80-120			
Ethylbenzene	101			ug/L	100	0.244	101	80-120			
Naphthalene	92.2			ug/L	100	0.413	91.8	80-120			
Toluene	104			ug/L	100	<	104	80-120			
Xylenes (total)	306			ug/L	300	0.233	102	80-120			
Surrogate: 4-Fluorochlorobenzene	*26.0*			*ug/L*	*25.0*		*104*	*80-150*			

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Minneapolis, MN 55435	Project Manager:	Mr. James E. Taraldsen	Date Reported: 04/14/15

PERCENT SOLIDS - Quality Control
Legend Technical Services, Inc.

Analyte	Result	RL	MDL	Units	Spike Level	Source Result	%REC	%REC Limits	%RPD	%RPD Limit	Notes
Batch B5D0906 - General Preparation											
Duplicate (B5D0906-DUP1)		**Source: 1501221-03**			Prepared & Analyzed: 04/09/15						
% Solids	89.0			%		90.0			1.12	20	

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Notes and Definitions

T-1	MDH does not offer certification for this parameter.
J	Parameter was present between the MDL and RL and should be considered an estimated value
B-02	Target analyte was present in the method blank between the MDL and RL.
B-01	Analyte was present in the method blank. Sample result is less than or equal to 10 times the blank concentration.
<	Less than value listed
dry	Sample results reported on a dry weight basis
NA	Not applicable. The %RPD is not calculated from values less than the reporting limit.
MDL	Method Detection Limit
RL	Reporting Limit
RPD	Relative Percent Difference
LCS	Laboratory Control Spike = Blank Spike (BS) = Laboratory Fortified Blank (LFB)
MS	Matrix Spike = Laboratory Fortified Matrix (LFM)

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Chain of Custody

BARR
4700 West 77th Street
Minneapolis, MN 55435-4803
(952) 832-2600

150145

Project Number: 41916286.00 001 021
Project Name: ~~Tank 17~~ Enbridge - Tank 17
Sample Origination State: WI (use two letter postal state abbreviation)
COC Number: № 44720

COC 1 of 1

Project Manager: REE
Project QC Contact: JET
Sampled by: NRS2
Laboratory: Legend

Location	Start Depth	Stop Depth	Depth Unit (in./ft or m.)	Collection Date (mm/dd/yyyy)	Collection Time (hh:mm)	Matrix: Water	Matrix: Soil	Type: Grab	Type: Comp.	Type: QC	Number of Containers/Preservative: Water: PVOC-MTBE + Naphthalene	Number of Containers/Preservative: Soil: PVOC-MTBE + Naphthalene	Total Number Of Containers	
1 2015 TK17-S-1	-	-	2.5	04/01/2015	1100		X	X				12	3	PVOC-MTBE + naphthalene.
2 Temp Blank	-	-	-	-	-					X			1	
3 Trip Blank	-	-	-	-	-					X			1	
4														
5														Standard TAT
6														
7														
8														
9														
10														

Common Parameter/Container - Preservation Key

#1 - Volatile Organics = BTEX, GRO, TPH, 8260 Full List
#2 - Semivolatile Organics = PAHs, PCP, Dioxins, 8270 Full List, Herbicide/Pesticide/PCBs
#3 - General = pH, Chloride, Fluoride, Alkalinity, TSS, TDS, TS, Sulfate
#4 - Nutrients = COD, TOC, Phenols, Ammonia Nitrogen, TKN

Relinquished By:	On Ice?	Date	Time	Received by:	Date	Time
	Y N	4/1/15	1650			
Relinquished By:	On Ice?	Date	Time	Received by:	Date	Time
	Y N				4/2/15	905

Samples Shipped VIA: ☐ Air Freight ☑ Federal Express ☐ Sampler ☐ Other: _____ Air Bill Number: 1120

Distribution: White-Original Accompanies Shipment to Lab; Yellow - Field Copy, Pink - Lab Coordinator

#RLG/STDFORMS/Chain Of Custody Form 2009 #LG Rev. 09/21/09