Table 1-1
Field Activities
North Pole Refinery
Flint Hills Resources Alaska, LLC

Activity	Frequency during 2012 Q4
Ground Water Elevation Check	Quarterly
Data Loggers	Downloaded quarterly, measuring hourly
LNAPL Migration Network Check	Monthly
LNAPL Thickness Network Check	Monthly
Residential Sulfolane Resampling	Throughout quarter
Residential Sulfolane Initial Sampling (call-ins)	Throughout quarter
Sulfolane Network Sampling	Once during Q4
COPC Network Sampling (iron only)	Once during Q4
Quarterly BTEX Network Sampling	Once during Q4
Geochemical Sampling	Once during Q4
Groundwater Treatment System (including GAC filters) and Recovery Well Sampling	Monthly
Wells Installed	One well (MW-335-41) sampled for first time, was installed in Q3; two wells (MW-323-50 and MW-322-150) were re-installed (moved) and initial samples collected
Wells Developed	
Initial Sulfolane Sampling	
Air-sparge system pilot study sampling	Bi-weekly[1]
Bio-traps Collected	3 locations during Q4

Notes:

[1] Frequency varied throughout quarter
LNAPL Light Non-Aqueous Phase Liquid
COPC Contaminants of Potential Concern
BTEX Benzene, Toluene, Ethylbenzene, and Xylenes
GAC Granular Activated Carbon
Q4 Fourth Quarter 2012

Table 3-1
Well Construction Parameters
North Pole Refinery
Flint Hills Resources Alaska, LLC

Well Type	Well	Proximity	Boring Completion Date	Survey Date	Riser Elevation (feet MSL)	Riser Stickup (feet)	Ground Surface Elevation (feet MSL)	Well Depth (feet BGS)	Well Bottom Elevation (feet MSL)	Depth to Top of Permafrost (feet BGS)	Well Diameter (inches)	Well Screen: Depth to Top (feet BGS)	Well Screen: Top Elevation (feet MSL)	Well Screen: Depth to Bottom (feet BGS)	Well Screen: Bottom Elevation (feet MSL)	Well Screen: Length (feet)	Well Screen: Screen Slot Size (inches)	Well Screen: Material	Riser Material	ALASKA STATE PLANE NAD83, ZONE 3: NORTHING	ALASKA STATE PLANE NAD83, ZONE 3: EASTING
Monitoring	MW-101	On-site	3/19/1987	Nov-2012	494.59	3.45	491.1	61.00	430.14	—	2.00	56.00	435.14	61.00	430.14	5.00	0.02	ss	ss?	3927588.78	1428199.67
	MW-101A	On-site	3/28/1987	Nov-2012	495.01	4.00	491.0	23.00	468.01	—	2.00	17.80	473.21	22.80	468.21	5.00	0.02	ss	ss?	3927590.29	1428209.63
	MW-102	On-site	4/4/1987	Nov-2012	496.02	3.46	492.6	71.50	421.06	—	2.50	61.50	431.06	71.50	421.06	10.00	0.01	PVC	PVC?	3927955.12	1429113.91
	MW-104	On-site	4/2/1987	Nov-2012	496.02	2.99	493.0	67.00	426.03	—	2.50	63.00	430.03	67.00	426.03	4.00	0.02	PVC	PVC?	3927958.82	1429747.75
	MW-105	On-site	3/21/1987	Nov-2012	497.66	2.46	495.2	63.00	432.20	—	2.00	58.00	437.20	63.00	432.20	5.00	0.02	ss	ss?	3924919.0	1430402.4
	MW-105A	On-site	3/21/1987	Nov-2012	499.21	3.58	495.6	23.00	472.63	—	2.00	18.00	477.63	23.00	472.63	5.00	0.02	ss	ss?	3924910.02	1430404.24
	MW-106	On-site	9/14/1987	Nov-2012	499.28	1.51	497.8	23.00	474.77	—	2.00	18.50	479.27	23.00	474.77	4.50	0.02	PVC	PVC?	3926112.10	1428065.05
	MW-109	On-site	8/9/1988	Nov-2012	495.22	1.45	493.8	14.00	479.77	—	2.00	9.50	484.27	14.00	479.77	4.50	0.02	PVC	PVC?	3925855.20	1428674.99
	MW-110	On-site	8/10/1988	Nov-2012	496.73	3.26	493.5	18.00	475.47	—	2.00	13.50	479.97	18.00	475.47	4.50	0.02	PVC	PVC?	3925975.36	1428873.06
	MW-113	On-site	9/19/1988	Nov-2012	494.44	3.25	491.2	16.00	475.19	—	2.00	11.50	479.69	16.00	475.19	4.50	0.02	PVC	PVC?	3926957.71	1428777.98
	MW-115	On-site	9/20/1988	Nov-2012	495.84	2.55	493.3	17.00	476.29	—	2.00	12.50	480.79	17.00	476.29	4.50	0.02	ss	ss?	3925758.76	1429540.81
	MW-116	On-site	9/22/1988	Nov-2012	496.17	2.91	493.3	17.00	476.26	—	2.00	12.00	481.26	17.00	476.26	5.00	0.02	ss	ss?	3925670.10	1429332.64
	MW-118	On-site	3/9/1990	Nov-2012	496.90	4.26	492.6	43.00	449.64	—	2.00	38.50	454.14	43.00	449.64	4.50	0.02	ss	PVC	3927467.01	1429638.43
	MW-124	On-site	6/6/1990	Nov-2012	497.39	3.36	494.0	24.50	469.53	—	2.00	20.00	474.03	24.50	469.53	4.50	0.02	PVC	PVC?	3927015.09	1429816.83
	MW-125	On-site	6/6/1990	Nov-2012	496.16	3.02	493.1	24.00	469.14	—	2.00	19.50	473.64	24.00	469.14	4.50	0.02	PVC	PVC	3927032.49	1429569.75
	MW-126	On-site	6/4/1991	Nov-2012	495.53	3.72	491.8	24.50	467.31	—	2.00	20.00	471.81	24.50	467.31	4.50	0.02	PVC	PVC	3927426.37	1429419.17
	MW-127	On-site	6/4/1991	Nov-2012	496.53	3.68	492.9	24.50	468.35	—	2.00	20.00	472.85	24.50	468.35	4.50	0.02	PVC	PVC	3927476.29	1429065.47
	MW-129	On-site	10/21/1996	Nov-2012	496.05	3.12	492.9	41.50	451.43	—	2.00	37.00	455.93	41.50	451.43	4.50	0.02	PVC	PVC	3927205.45	1429720.22
	MW-130	On-site	4/22/1997	Nov-2012	496.88	2.72	494.2	23.00	471.16	—	2.00	19.00	475.16	23.00	471.16	4.00	0.02	PVC	PVC	3926825.66	1429354.64
	MW-131	On-site	8/5/1988	Nov-2012	495.75	2.00	493.8	24.50	469.25	—	2.00	20.00	473.75	24.50	469.25	4.50	0.02	PVC	PVC	3927936.24	1429024.82
	MW-132	On-site	9/1/1999	Nov-2012	499.41	2.69	496.7	22.00	474.72	—	2.00	17.50	479.22	22.00	474.72	4.50	0.02	PVC	PVC	3926600.34	1429997.01
	MW-133	On-site	9/1/1999	Nov-2012	498.34	2.59	495.8	22.00	473.75	—	2.00	17.50	478.25	22.00	473.75	4.50	0.02	PVC	PVC	3926597.42	1430160.18
	MW-134	On-site	9/2/1999	Nov-2012	497.76	2.56	495.2	21.50	473.70	—	2.00	17.00	478.20	21.50	473.70	4.50	0.02	PVC	PVC	3926000.91	1430170.26
	MW-135	On-site	3/8/2001	Nov-2012	496.94	3.38	493.6	19.50	474.06	—	2.00	10.60	482.96	19.50	474.06	8.90	0.02	PVC	PVC	3927024.53	1429730.91
	MW-136	On-site	3/8/2001	Nov-2012	496.93	3.06	493.9	19.10	474.77	—	2.00	10.10	483.77	19.10	474.77	9.00	0.02	PVC	PVC	3927024.41	1429778.02
	MW-137	On-site	3/8/2001	Nov-2012	497.26	3.40	493.9	19.30	474.56	—	2.00	10.40	483.46	19.30	474.56	8.90	0.02	PVC	PVC	3927083.81	1429737.46
	MW-138	On-site	4/12/2001	Nov-2012	496.34	3.14	493.2	18.10	475.10	—	2.00	3.90	489.30	18.10	475.10	14.20	0.02	PVC	PVC	3925738.32	1429686.77
	MW-139	On-site	5/29/2001	Nov-2012	497.25	1.96	495.3	25.00	470.29	—	2.00	5.70	489.59	25.00	470.29	19.30	0.02	PVC	PVC	3927427.97	1428848.56
	MW-140	On-site	5/30/2001	Nov-2012	494.90	2.83	492.1	23.50	468.57	—	2.00	4.20	487.87	23.50	468.57	19.30	0.02	PVC	PVC	3927683.10	1429244.57
	MW-141	On-site	10/5/2001	Nov-2012	492.38	2.17	490.2	22.40	467.81	—	2.00	7.90	482.31	22.40	467.81	14.50	0.02	PVC	PVC	3927598.03	1427540.67
	MW-142	On-site	8/10/2001	Nov-2012	496.17	3.14	493.0	19.40	473.63	—	2.00	5.40	487.63	19.40	473.63	14.00	0.02	PVC	PVC	3927602.87	1428813.48
	MW-143	On-site	8/15/2005	Nov-2012	495.37	3.36	492.0	19.50	472.51	—	2.00	4.70	487.31	19.50	472.51	14.80	0.02	PVC	PVC	3927688.65	1428487.50
	MW-144A	On-site	9/15/2005	Nov-2012	495.35	2.95	492.4	24.70	467.70	—	2.00	5.70	486.70	24.70	467.70	19.00	0.02	PVC	PVC	3927485.68	1429623.04
	MW-144BR	On-site	9/21/2011	Nov-2012	494.98	2.88	492.1	90.52	401.58	—	2.00	85.44	406.66	89.91	402.19	4.47	0.01	PVC	PVC	3927483.2	1429632.1
	MW-145	On-site	8/15/2005	Nov-2012	495.61	2.76	492.9	19.00	473.85	—	2.00	4.70	488.15	19.00	473.85	14.30	0.02	PVC	PVC	3927212.61	1429712.57
	MW-146A	On-site	9/29/2008	Nov-2012	495.09	2.52	492.6	16.00	476.57	—	2.00	6.00	486.57	16.00	476.57	10.00	0.02	PVC	PVC	3927201.05	1427049.42
	MW-146B	On-site	9/29/2008	Nov-2012	494.98	2.39	492.6	28.00	464.59	—	2.00	22.00	470.59	27.00	465.59	5.00	0.02	PVC	PVC	3927193.28	1427048.17
	MW-147A	On-site	10/1/2001	Nov-2012	491.93	2.26	489.7	13.00	476.67	—	2.00	3.00	486.67	13.00	476.67	10.00	0.02	PVC	PVC	3927723.21	1427288.46
	MW-147B	On-site	9/30/2008	Nov-2012	492.59	2.90	489.7	26.00	463.69	—	2.00	20.50	469.19	25.50	464.19	5.00	0.02	PVC	PVC	3927729.22	1427290.37
	MW-148A	Off-site	10/2/2008	Nov-2012	493.33	2.48	490.9	15.00	475.85	—	2.00	5.00	485.85	15.00	475.85	10.00	0.02	PVC	PVC	3928675.03	1428153.49
	MW-148B	Off-site	10/2/2008	Nov-2012	492.78	2.52	490.3	29.00	461.26	—	2.00	22.00	468.26	27.00	463.26	5.00	0.02	PVC	PVC	3928677.21	1428158.65
	MW-148C	Off-site	9/27/2011	Nov-2012	493.29	3.02	490.3	55.74	434.53	—	2.00	50.72	439.55	55.15	435.12	4.43	0.01	PVC	PVC	3928670.73	1428140.18
	MW-148D	Off-site	9/26/2011	Nov-2012	493.02	2.70	490.3	150.96	339.36	151.50	2.00	145.92	344.40	150.36	339.96	4.44	0.01	PVC	PVC	3928673.10	1428146.93
	MW-149A	On-site	10/3/2008	Nov-2012	493.68	2.77	490.9	14.00	476.91	—	2.00	4.00	486.91	14.00	476.91	10.00	0.02	PVC	PVC	3928676.81	1428953.13
	MW-149B	On-site	10/3/2008	Nov-2012	493.38	2.32	491.1	21.00	470.06	19.00	2.00	14.00	477.06	19.00	472.06	5.00	0.02	PVC	PVC	3928677.69	1428959.56
	MW-150A	Off-site	10/2/2009	Nov-2012	487.14	-0.43	487.6	11.58	475.99	—	2.00	6.70	480.87	11.10	476.47	4.40	0.01	PVC	PVC	3930163.44	1426522.55
	MW-150B	Off-site	10/2/2009	Nov-2012	486.95	-0.57	487.5	24.64	462.88	—	2.00	20.60	466.92	24.50	463.02	3.90	0.01	PVC	PVC	3930162.06	1426527.97
	MW-150C	Off-site	5/12/2012	Nov-2012	486.41	-0.56	487.0	60.51	426.46	63.5	2.00	55.43	431.54	60.08	426.89	4.65	0.01	PVC	PVC	3930159.85	1426535.91
	MW-151A	Off-site	10/7/2009	Nov-2012	487.22	-0.32	487.5	15.50	472.04	—	2.00	10.00	477.54	15.00	472.54	5.00	0.01	PVC	PVC	3930152.81	1427042.16
	MW-151B	Off-site	10/2/2009	Nov-2012	487.18	-0.44	487.6	23.60	464.02	—	2.00	18.50	469.12	23.10	464.52	4.60	0.01	PVC	PVC	3930154.30	1427034.87
	MW-151C	Off-site	2/18/2010	Nov-2012	491.11	3.43	487.7	57.70	429.98	65.00	2.00	52.55	435.13	57.15	430.53	4.60	0.01	PVC	PVC	3930151.93	1427038.65
	MW-152A	Off-site	10/7/2009	Nov-2012	488.44	-0.19	488.6	16.00	472.63	—	2.00	10.60	478.03	15.00	473.63	4.40	0.01	PVC	PVC	3930112.63	1427987.59
	MW-152B	Off-site	10/7/2009	Nov-2012	488.02	-0.46	488.5	25.40	463.08	—	2.00	19.90	468.58	24.40	464.08	4.50	0.01	PVC	PVC	3930112.89	1427983.05
	MW-152C	Off-site	9/28/2011	Nov-2012	488.10	-0.60	488.7	65.17	423.53	67.50	2.00	60.13	428.57	64.57	424.13	4.44	0.01	PVC	PVC	3930113.17	1427992.07

Table 3-1
Well Construction Parameters
North Pole Refinery
Flint Hills Resources Alaska, LLC

Well Type	Well	Proximity	Boring Completion Date	Survey Date	Riser Elevation (feet MSL)	Riser Stickup (feet)	Ground Surface Elevation (feet MSL)	Well Depth (feet BGS)	Well Bottom Elevation (feet MSL)	Depth to Top of Permafrost (feet BGS)	Well Diameter (inches)	Well Screen: Depth to Top (feet BGS)	Well Screen: Top Elevation (feet MSL)	Well Screen: Depth to Bottom (feet BGS)	Well Screen: Bottom Elevation (feet MSL)	Well Screen: Length (feet)	Well Screen: Screen Slot Size (inches)	Well Screen: Material	Riser Material	ALASKA STATE PLANE NAD83, ZONE 3 NORTHING	ALASKA STATE PLANE NAD83, ZONE 3 EASTING
Monitoring	MW-153A	Off-site	10/7/2009	Nov-2012	490.20	-0.31	490.5	16.00	474.51	—	2.00	10.60	479.91	14.50	476.01	3.90	0.01	PVC	PVC	3928749.86	1427720.55
	MW-153B	Off-site	4/20/2010	Nov-2012	489.72	-0.56	490.3	56.65	433.63	59.00	2.00	51.60	438.68	56.10	434.18	4.50	0.01	PVC	PVC	3928741.21	1427721.08
	MW-154A	On-site	10/5/2009	Nov-2012	498.04	2.56	495.5	75.50	419.98	—	2.00	71.00	424.48	75.00	420.48	4.00	0.01	PVC	PVC	3927391.51	1428835.89
	MW-154B	On-site	2/20/2010	Nov-2012	497.76	2.70	495.1	95.00	400.06	102.00	2.00	90.15	404.91	94.75	400.31	4.60	0.01	PVC	PVC	3927410.23	1428845.45
	MW-155A	Off-site	11/11/2009	Nov-2012	488.19	-0.40	488.6	15.50	473.09	—	2.00	5.35	483.24	15.08	473.51	9.73	0.01	PVC	PVC	3930320.08	1425509.58
	MW-155B	Off-site	9/11/2010	Nov-2012	488.25	-0.45	488.7	65.80	422.90	67.00	2.00	60.78	427.92	65.20	423.50	4.42	0.02	PVC	PVC	3930314.75	1425510.07
	MW-156A	Off-site	11/11/2009	Nov-2012	485.88	-0.32	486.2	15.50	470.70	—	2.00	5.35	480.85	15.09	471.11	9.74	0.01	PVC	PVC	3931955.04	1425536.52
	MW-156B	Off-site	2/17/2010	Nov-2012	489.36	2.87	486.5	50.40	436.09	51.50	2.00	45.20	441.29	50.00	436.49	4.80	0.01	PVC	PVC	3931949.92	1425537.02
	MW-157A	Off-site	11/13/2009	Nov-2012	484.82	-0.41	485.2	15.50	469.73	—	2.00	5.36	479.87	15.09	470.14	9.73	0.01	PVC	PVC	3932561.84	1426870.93
	MW-157B	Off-site	9/30/2011	Nov-2012	485.08	-0.18	485.3	30.73	454.53	40.00	2.00	25.71	459.55	30.14	455.12	4.43	0.01	PVC	PVC	3932567.15	1426874.11
	MW-158A	Off-site	11/13/2009	Nov-2012	487.90	-0.26	488.2	15.60	472.56	—	2.00	5.50	482.66	15.20	472.96	9.70	0.02	PVC	PVC	3931120.65	1426869.14
	MW-158B	Off-site	9/23/2010	Nov-2012	487.46	-0.49	488.0	60.61	427.34	65.00	2.00	55.62	432.33	60.14	427.81	4.52	0.02	PVC	PVC	3931119.26	1426874.85
	MW-159A	Off-site	11/13/2009	Nov-2012	488.52	-0.37	488.9	15.60	473.29	—	2.00	5.50	483.39	15.20	473.69	9.70	0.02	PVC	PVC	3931101.34	1427690.57
	MW-159B	Off-site	10/12/2011	Nov-2012	488.22	-0.77	489.0	46.20	442.79	—	2.00	41.16	447.83	45.60	443.39	4.44	0.01	PVC	PVC	3931101.12	1427679.28
	MW-159C	Off-site	9/29/2011	Nov-2012	488.70	-0.38	489.1	72.30	416.78	72.50	2.00	67.13	421.95	71.84	417.24	4.71	0.01	PVC	PVC	3931100.83	1427684.86
	MW-160A	Off-site	11/13/2009	Nov-2012	485.46	-0.36	485.8	15.50	470.32	—	2.00	5.35	480.47	15.08	470.74	9.73	0.01	PVC	PVC	3932566.91	1427463.18
	MW-160B	Off-site	2/19/2010	Nov-2012	485.53	-0.24	485.8	90.73	395.04	91.00	2.00	85.58	400.19	90.18	395.59	4.60	0.01	PVC	PVC	3932566.90	1427459.68
	MW-161A	Off-site	12/9/2009	Nov-2012	479.46	-0.34	479.8	15.60	464.20	—	2.00	5.50	474.30	15.20	464.60	9.70	0.02	PVC	PVC	3935554.06	1421680.78
	MW-161B	Off-site	9/10/2010	Nov-2012	479.60	-0.34	479.9	50.44	429.50	54.00	2.00	46.02	433.92	50.44	429.50	4.42	0.02	PVC	PVC	3935553.83	1421678.29
	MW-162A	Off-site	11/25/2009	Nov-2012	483.92	-0.61	484.5	15.60	468.93	—	2.00	5.50	479.03	15.20	469.33	9.70	0.02	PVC	PVC	3934831.10	1425571.90
	MW-162B	Off-site	11/25/2009	Nov-2012	484.11	-0.23	484.3	65.38	418.96	67.50	2.00	60.18	424.16	64.73	419.61	4.55	0.01	PVC	PVC	3934825.07	1425574.08
	MW-163A	Off-site	12/9/2009	Nov-2012	485.02	-0.78	485.8	15.60	470.20	—	2.00	5.50	480.30	15.20	470.60	9.70	0.02	PVC	PVC	3935430.75	1426901.11
	MW-163B	Off-site	9/13/2010	Nov-2012	484.80	-0.93	485.7	39.55	446.18	40.00	2.00	34.53	451.20	38.96	446.77	4.43	0.02	PVC	PVC	3935430.72	1426906.78
	MW-164A	Off-site	12/10/2009	Nov-2012	480.22	-0.18	480.4	15.60	464.80	—	2.00	5.50	474.90	15.20	465.20	9.70	0.02	PVC	PVC	3938026.16	1425651.07
	MW-164B	Off-site	9/9/2010	Nov-2012	479.47	-0.37	479.8	50.67	429.17	—	2.00	45.62	434.22	50.06	429.78	4.44	0.02	PVC	PVC	3938027.01	1425654.08
	MW-164C	Off-site	8/17/2011	Nov-2012	479.45	-0.38	479.8	62.44	417.39	63.00	2.00	57.34	422.49	61.99	417.84	4.65	0.01	PVC	PVC	3938023.06	1425652.19
	MW-165A	Off-site	1/18/2010	Nov-2012	474.79	-0.46	475.3	15.40	459.85	—	2.00	5.19	470.06	14.90	460.35	9.71	0.01	PVC	PVC	3938692.18	1416849.70
	MW-165B	Off-site	9/28/2010	Nov-2012	474.64	-0.62	475.3	50.88	424.38	—	2.00	45.87	429.39	50.35	424.91	4.48	0.02	PVC	PVC	3938690.33	1416854.17
	MW-166A	Off-site	1/8/2010	Nov-2012	474.93	2.66	472.3	15.60	456.67	—	2.00	5.44	466.83	15.15	457.12	9.71	0.01	PVC	PVC	3940972.27	1419512.27
	MW-166B	Off-site	3/15/2010	Nov-2012	475.43	3.16	472.3	32.10	440.17	33.00	2.00	27.15	445.12	31.35	440.92	4.20	0.01	PVC	PVC	3940967.37	1419509.53
	MW-167A	Off-site	1/7/2010	Nov-2012	475.70	-0.46	476.2	15.80	460.36	—	2.00	5.65	470.51	15.35	460.81	9.70	0.01	PVC	PVC	3942809.92	1423092.52
	MW-167B	Off-site	3/23/2010	Nov-2012	475.57	-0.52	476.1	33.27	442.82	33.50	2.00	28.17	447.92	33.15	442.94	4.98	0.01	PVC	PVC	3942813.73	1423092.51
	MW-168A	Off-site	1/8/2010	Nov-2012	478.27	-0.39	478.7	15.50	463.16	—	2.00	5.36	473.30	15.06	463.60	9.70	0.01	PVC	PVC	3941284.64	1425723.88
	MW-168B	Off-site	10/1/2011	Nov-2012	478.34	-0.28	478.6	51.45	427.17	55.00	2.00	46.29	432.33	51.00	427.62	4.71	0.01	PVC	PVC	3941289.40	1425724.13
	MW-169A	Off-site	2/25/2010	Nov-2012	485.90	2.74	483.2	15.15	468.01	—	2.00	5.27	477.89	15.06	468.10	9.79	0.01	PVC	PVC	3931955.69	1423035.08
	MW-169C	Off-site	9/1/2011	Nov-2012	482.56	-0.65	483.2	59.94	423.27	69.00	2.00	54.82	428.39	59.47	423.74	4.65	0.02	PVC	PVC	3931966.50	1423042.84
	MW-170A	Off-site	2/24/2010	Nov-2012	490.66	-0.51	491.2	14.90	476.27	—	2.00	4.60	486.57	14.40	476.77	9.80	0.01	PVC	PVC	3930005.65	1429184.98
	MW-170B	Off-site	3/6/2010	Nov-2012	490.74	-0.27	491.0	74.79	416.22	—	4.00	69.70	421.31	74.06	416.95	4.36	0.01	PVC	PVC	3930000.43	1429187.53
	MW-170C	Off-site	3/4/2010	Nov-2012	490.87	-0.26	491.1	130.90	360.23	135.00	2.00	125.90	365.23	130.20	360.93	4.30	0.01	PVC	PVC	3929995.96	1429188.84
	MW-170D	Off-site	10/13/2010	Nov-2012	490.41	-0.55	491.0	50.62	440.34	—	2.00	45.52	445.44	50.14	440.82	4.62	0.02	PVC	PVC	3929991.96	1429189.27
	MW-171A	Off-site	2/25/2010	Nov-2012	484.77	-0.43	485.2	15.20	470.00	—	2.00	4.96	480.24	14.77	470.43	9.81	0.01	PVC	PVC	3935401.97	1428945.84
	MW-171B	Off-site	3/16/2010	Nov-2012	484.83	-0.40	485.2	40.28	444.95	42.00	2.00	35.26	449.97	39.70	445.53	4.44	0.01	PVC	PVC	3935402.47	1428941.37
	MW-172A	Off-site	3/24/2010	Nov-2012	475.72	-0.20	475.9	15.47	460.45	—	2.00	5.33	470.59	15.04	460.88	9.71	0.01	PVC	PVC	3942632.06	1427431.58
	MW-172B	Off-site	3/27/2010	Nov-2012	475.73	-0.40	476.1	150.37	325.76	150.50	2.00	145.35	330.78	149.78	326.35	4.43	0.01	PVC	PVC	3942631.33	1427425.63
	MW-173A	On-site	3/3/2010	Nov-2012	496.28	3.30	493.0	14.60	478.38	—	2.00	4.54	488.44	14.24	478.74	9.70	0.01	PVC	PVC	3927534.58	1430223.98
	MW-173B	On-site	3/30/2010	Nov-2012	496.40	3.33	493.1	150.82	342.25	—	2.00	145.80	347.27	150.20	342.87	4.40	0.01	PVC	PVC	3927527.38	1430222.41
	MW-174A	On-site	9/16/2010	Nov-2012	494.25	2.91	491.3	50.17	441.17	—	2.00	44.96	446.38	49.68	441.66	4.72	0.02	PVC	PVC	3926454.50	1428665.44
	MW-174B	On-site	9/15/2010	Nov-2012	493.37	2.12	491.3	90.37	400.88	—	2.00	85.16	406.09	89.88	401.37	4.72	0.02	PVC	PVC	3926461.30	1428664.22
	MW-175	On-site	9/30/2010	Nov-2012	497.06	3.12	493.9	90.82	403.12	—	2.00	85.81	408.13	90.30	403.64	4.49	0.02	PVC	PVC	3926774.40	1429593.36
	MW-176A	On-site	10/4/2010	Nov-2012	497.02	3.20	493.8	14.83	478.99	—	2.00	4.67	489.15	14.42	479.40	9.75	0.02	PVC	PVC	3926055.80	1429416.30
	MW-176B	On-site	10/4/2010	Nov-2012	496.93	3.21	493.7	50.61	443.11	—	2.00	45.56	448.16	50.06	443.66	4.50	0.02	PVC	PVC	3926056.30	1429412.03
	MW-176C	On-site	10/1/2010	Nov-2012	496.86	3.15	493.7	90.49	403.22	—	2.00	85.43	408.28	89.93	403.78	4.50	0.02	PVC	PVC	3926056.80	1429407.76
	MW-177	On-site	9/22/2010	Nov-2012	497.92	3.01	494.9	89.71	405.20	—	2.00	84.71	410.20	89.19	405.72	4.48	0.02	PVC	PVC	3925072.46	1430037.88

Table 3-1
Well Construction Parameters
North Pole Refinery
Flint Hills Resources Alaska, LLC

Well Type	Well	Proximity	Boring Completion Date	Survey Date	Riser Elevation (feet MSL)	Riser Stickup (feet)	Ground Surface Elevation (feet MSL)	Well Depth (feet BGS)	Well Bottom Elevation (feet MSL)	Depth to Top of Permafrost (feet BGS)	Well Diameter (inches)	Well Screen: Depth to Top (feet BGS)	Well Screen: Top Elevation (feet MSL)	Well Screen: Depth to Bottom (feet BGS)	Well Screen: Bottom Elevation (feet MSL)	Well Screen: Length (feet)	Well Screen: Screen Slot Size (inches)	Well Screen: Material	Riser Material	ALASKA STATE PLANE NAD83, ZONE 3 NORTHING	ALASKA STATE PLANE NAD83, ZONE 3 EASTING
Monitoring	MW-178A	On-site	9/18/2010	Nov-2012	496.48	2.32	494.2	16.06	478.10	—	2.00	5.90	488.26	15.64	478.52	9.74	0.02	PVC	PVC	3926117.29	1429586.63
	MW-178B	On-site	9/18/2010	Nov-2012	496.10	2.19	493.9	51.17	442.74	—	2.00	46.01	447.90	50.73	443.18	4.72	0.02	PVC	PVC	3926117.08	1429579.97
	MW-178C	On-site	9/17/2010	Nov-2012	497.27	3.03	494.2	90.15	404.09	—	2.00	85.16	409.08	89.93	404.31	4.77	0.02	PVC	PVC	3926117.30	1429573.58
	MW-179A	On-site	9/21/2010	Nov-2012	496.96	3.02	493.9	15.61	478.33	—	2.00	5.56	488.38	15.20	478.74	9.64	0.02	PVC	PVC	3926050.54	1429676.64
	MW-179B	On-site	9/21/2010	Nov-2012	496.75	2.78	494.0	50.82	443.15	—	2.00	45.80	448.17	50.29	443.68	4.49	0.02	PVC	PVC	3926047.16	1429680.75
	MW-179C	On-site	9/20/2010	Nov-2012	497.27	3.48	493.8	90.43	403.36	—	2.00	85.41	408.38	89.90	403.89	4.49	0.02	PVC	PVC	3926045.58	1429674.43
	MW-179D	On-site	8/12/2011	Nov-2012	497.06	3.26	493.8	134.05	359.75	140.50	2.00	128.95	364.85	133.65	360.15	4.70	0.02	PVC	PVC	3926048.88	1429668.63
	MW-180A	On-site	9/27/2010	Nov-2012	497.42	3.09	494.3	15.39	478.94	—	2.00	5.25	489.08	14.97	479.36	9.72	0.02	PVC	PVC	3925874.85	1429928.62
	MW-180B	On-site	9/27/2010	Nov-2012	496.87	2.65	494.2	50.72	443.50	—	2.00	45.71	448.51	50.19	444.03	4.48	0.02	PVC	PVC	3925879.52	1429922.58
	MW-180C	On-site	9/25/2010	Nov-2012	497.05	2.85	494.2	90.42	403.78	—	2.00	85.33	408.87	89.87	404.33	4.54	0.02	PVC	PVC	3925873.80	1429924.19
	MW-181A	Off-site	10/6/2010	Nov-2012	475.90	-0.53	476.4	15.16	461.27	—	2.00	5.05	471.38	14.75	461.68	9.70	0.02	PVC	PVC	3944095.46	1425755.04
	MW-181B	Off-site	10/6/2010	Nov-2012	475.83	-0.53	476.4	50.78	425.58	—	2.00	45.77	430.59	50.30	426.06	4.53	0.02	PVC	PVC	3944099.95	1425752.10
	MW-181C	Off-site	10/3/2011	Nov-2012	475.96	-0.44	476.4	150.45	325.95	—	2.00	145.43	330.97	149.86	326.54	4.43	0.01	PVC	PVC	3944089.21	1425759.17
	MW-182A	Off-site	10/8/2010	Nov-2012	475.65	-0.35	476.0	15.83	460.17	—	2.00	5.70	470.30	15.42	460.58	9.72	0.02	PVC	PVC	3941132.12	1423038.13
	MW-182B	Off-site	8/22/2011	Nov-2012	475.40	-0.46	475.9	44.67	431.19	46.00	2.00	39.57	436.29	44.27	431.59	4.70	0.02	PVC	PVC	3941136.42	1423037.29
	MW-183A	Off-site	10/8/2010	Nov-2012	478.06	-0.56	478.6	15.88	462.74	—	2.00	5.77	472.85	15.47	463.15	9.70	0.02	PVC	PVC	3937529.71	1420159.70
	MW-183B	Off-site	8/29/2011	Nov-2012	478.06	-0.58	478.6	59.74	418.90	59.00	2.00	54.64	424.00	59.34	419.30	4.70	0.02	PVC	PVC	3937532.14	1420157.14
	MW-184	Off-site	10/1/2010	Nov-2012	486.64	-0.65	487.3	45.23	442.06	45.00	2.00	40.12	447.17	44.75	442.54	4.63	0.02	PVC	PVC	3932560.61	1428756.36
	MW-185A	Off-site	10/12/2010	Nov-2012	478.08	-0.54	478.6	15.57	463.05	—	2.00	5.48	473.14	15.10	463.52	9.62	0.02	PVC	PVC	3940802.50	1428251.19
	MW-185B	Off-site	10/12/2010	Nov-2012	478.09	-0.41	478.5	51.41	427.09	—	2.00	46.30	432.20	50.93	427.57	4.63	0.02	PVC	PVC	3940797.61	1428251.05
	MW-185C	Off-site	10/2/2011	Nov-2012	478.48	-0.21	478.7	120.99	357.70	121.00	2.00	115.96	362.73	120.40	358.29	4.44	0.01	PVC	PVC	3940806.68	1428250.19
	MW-186A	On-site	10/19/2010	Nov-2012	495.95	3.29	492.7	15.22	477.44	—	2.00	5.11	487.55	14.79	477.87	9.68	0.02	PVC	PVC	3927025.87	1429092.83
	MW-186B	On-site	10/16/2010	Nov-2012	495.80	3.12	492.7	60.80	431.88	—	2.00	50.69	441.99	60.37	432.31	9.68	0.02	PVC	PVC	3927021.15	1429092.67
	MW-186C	On-site	10/15/2010	Nov-2012	495.72	3.11	492.6	100.79	391.82	—	2.00	90.69	401.92	100.32	392.29	9.63	0.02	PVC	PVC	3927017.05	1429092.45
	MW-186D	On-site	12/4/2011	Nov-2012	495.72	3.03	492.7	134.99	357.70	—	2.00	129.83	362.86	134.62	358.07	4.79	0.01	PVC	PVC	3927010.35	1429093.23
	MW-186E	On-site	4/25/2012	Nov-2012	495.71	2.97	492.7	75.90	416.84	—	2.00	70.76	421.98	75.42	417.32	4.66	0.01	PVC	PVC	3927030.39	1429093.30
	MW-187	Off-site	10/21/2010	Nov-2012	485.52	2.95	482.6	17.38	465.19	—	2.00	7.28	475.29	16.91	465.66	9.63	0.02	PVC	PVC	3934464.24	1420335.62
	MW-188A	Off-site	4/28/2012	Nov-2012	461.84	-0.15	462.0	15.33	446.66	—	2.00	5.20	456.79	14.98	447.01	9.78	0.01	PVC	PVC	3951510.80	1410365.41
	MW-188B	Off-site	11/24/2010	Nov-2012	461.53	-0.37	461.9	40.90	421.00	45.50	2.00	35.40	426.50	40.40	421.50	5.00	0.02	PVC	PVC	3951521.8	1410365.5
	MW-189A	Off-site	8/19/2011	Nov-2012	470.21	-0.65	470.9	16.54	454.32	—	2.00	6.49	464.37	16.16	454.70	9.67	0.01	PVC	PVC	3945399.36	1424696.44
	MW-189B	Off-site	8/19/2011	Nov-2012	470.25	-0.74	471.0	60.52	410.47	—	2.00	55.42	415.57	60.07	410.92	4.65	0.01	PVC	PVC	3945396.24	1424692.19
	MW-190A	Off-site	8/23/2011	Nov-2012	481.67	-0.29	482.0	15.59	466.37	—	2.00	5.49	476.47	15.20	466.76	9.71	0.01	PVC	PVC	3938370.06	1429592.42
	MW-190B	Off-site	8/23/2011	Nov-2012	481.56	-0.30	481.9	60.71	421.15	—	2.00	55.62	426.24	60.28	421.58	4.66	0.01	PVC	PVC	3938370.16	1429596.16
	MW-191A	Off-site	8/24/2011	Nov-2012	475.62	-0.76	476.4	15.28	461.10	—	2.00	5.18	471.20	14.90	461.48	9.72	0.01	PVC	PVC	3937781.57	1417713.87
	MW-191B	Off-site	8/24/2011	Nov-2012	475.51	-0.78	476.3	60.29	416.00	—	2.00	55.22	421.07	59.84	416.45	4.62	0.01	PVC	PVC	3937777.89	1417714.18
	MW-192A	On-site	8/25/2011	Nov-2012	495.90	2.44	493.5	14.64	478.82	—	2.00	4.54	488.92	14.24	479.22	9.70	0.02	PVC	PVC	3924992.22	1428889.36
	MW-192B	On-site	8/26/2011	Nov-2012	495.47	2.22	493.3	55.51	437.74	—	2.00	50.41	442.84	55.11	438.14	4.70	0.02	PVC	PVC	3924992.57	1428887.11
	MW-193A	Off-site	8/30/2011	Nov-2012	487.70	-0.43	488.1	15.68	472.45	—	2.00	5.00	483.13	15.50	472.63	10.50	0.02	PVC	PVC	3930483.21	1424590.71
	MW-193B	Off-site	8/30/2011	Nov-2012	487.40	-0.61	488.0	59.88	428.13	61.00	2.00	54.72	433.29	59.41	428.60	4.69	0.02	PVC	PVC	3930481.25	1424593.75
	MW-194A	Off-site	8/31/2011	Nov-2012	475.68	-0.62	476.3	15.76	460.54	—	2.00	6.00	470.30	15.36	460.94	9.36	0.02	PVC	PVC	3939634.55	1418923.90
	MW-194B	Off-site	8/31/2011	Nov-2012	475.88	-0.42	476.3	39.45	436.85	39.00	2.00	34.38	441.92	38.96	437.34	4.58	0.02	PVC	PVC	3939630.80	1418924.87
	MW-195A	On-site	10/11/2011	Nov-2012	496.10	2.76	493.3	15.35	477.99	—	2.00	5.15	488.19	14.95	478.39	9.80	0.01	PVC	PVC	3926110.91	1428572.63
	MW-195B	On-site	12/5/2011	Nov-2012	496.12	2.66	493.5	149.90	343.56	—	2.00	144.80	348.66	149.50	343.96	4.70	0.01	PVC	PVC	3926110.92	1428566.32
	MW-196	On-site	10/11/2011	Nov-2012	497.37	3.31	494.1	15.20	478.86	—	2.00	5.01	489.05	14.73	479.33	9.72	0.01	PVC	PVC	3925033.44	1429646.49
	MW-197A	On-site	6/6/2012	Nov-2012	495.17	2.35	492.8	66.06	426.76	—	2.00	61.09	431.73	65.74	427.08	4.65	0.01	PVC	PVC	3926959.84	1429490.28
	MW-197B	On-site	10/16/2011	Nov-2012	495.28	2.54	492.7	149.69	343.05	—	2.00	144.61	348.13	149.08	343.66	4.47	0.01	PVC	PVC	3926950.83	1429491.74
	MW-198	On-site	12/10/2011	Nov-2012	493.32	-0.28	493.6	149.81	343.79	—	2.00	144.73	348.87	149.38	344.22	4.65	0.01	PVC	PVC	3925820.02	1429027.70
	MW-199	On-site	12/2/2011	Nov-2012	495.90	2.51	493.4	149.83	343.56	—	2.00	144.65	348.74	149.44	343.95	4.79	0.01	PVC	PVC	3926959.18	1428830.82
	MW-300	On-site	12/6/2011	Nov-2012	496.00	1.94	494.1	150.30	343.76	—	2.00	145.00	349.06	149.70	344.36	4.65	0.01	PVC	PVC	3926139.62	1429895.14
	MW-301-60	On-site	10/26/2011	Nov-2012	492.85	3.36	489.5	60.85	428.64	—	2.00	55.61	433.88	60.26	429.23	4.65	0.01	PVC	PVC	3927435.06	1427867.56
	MW-301-70	On-site	10/9/2011	Nov-2012	492.46	2.86	489.6	70.75	418.85	71.50	2.00	65.70	423.90	70.14	419.46	4.44	0.01	PVC	PVC	3927422.66	1427894.40
	MW-301-CMT-10	On-site	10/26/2011	Nov-2012	492.88	3.44	489.4	10.00	479.44	—	2.00	9.87	479.57	10.13	479.31	0.25	CMT	PVC	PVC	3927444.5	1427850.4
	MW-301-CMT-20	On-site	10/26/2011	Nov-2012	492.88	3.44	489.4	20.00	469.44	—	2.00	19.87	469.57	20.13	469.31	0.25	CMT	PVC	PVC	3927444.5	1427850.4
	MW-301-CMT-30	On-site	10/26/2011	Nov-2012	492.88	3.44	489.4	30.00	459.44	—	2.00	29.87	459.57	30.13	459.31	0.25	CMT	PVC	PVC	3927444.5	1427850.4

Table 3-1
Well Construction Parameters
North Pole Refinery
Flint Hills Resources Alaska, LLC

Well Type	Well	Proximity	Boring Completion Date	Survey Date	Riser Elevation (feet MSL)	Riser Stickup (feet)	Ground Surface Elevation (feet MSL)	Well Depth (feet BGS)	Well Bottom Elevation (feet MSL)	Depth to Top of Permafrost (feet BGS)	Well Diameter (inches)	Well Screen: Depth to Top (feet BGS)	Well Screen: Top Elevation (feet MSL)	Well Screen: Depth to Bottom (feet BGS)	Well Screen: Bottom Elevation (feet MSL)	Well Screen: Length (feet)	Well Screen: Screen Slot Size (inches)	Well Screen: Material	Riser Material	ALASKA STATE PLANE NAD83, ZONE 3 NORTHING	ALASKA STATE PLANE NAD83, ZONE 3 EASTING
Monitoring	MW-301-CMT-40	On-site	10/26/2011	Nov-2012	492.88	3.44	489.4	40.00	449.44	—	2.00	39.87	449.57	40.13	449.31	0.25	CMT	PVC	PVC	3927444.5	1427850.4
	MW-301-CMT-50	On-site	10/26/2011	Nov-2012	492.88	3.44	489.4	50.00	439.44	—	2.00	49.87	439.57	50.13	439.31	0.25	CMT	PVC	PVC	3927444.5	1427850.4
	MW-302-110	On-site	10/17/2011	Nov-2012	493.65	2.96	490.7	110.18	380.51	110.00	2.00	105.11	385.58	109.58	381.11	4.47	0.01	PVC	PVC	3927616.89	1428196.81
	MW-302-70	On-site	11/5/2011	Nov-2012	493.29	3.02	490.3	70.87	419.40	—	2.00	65.75	424.52	70.40	419.87	4.65	0.01	PVC	PVC	3927612.39	1428219.37
	MW-302-80	On-site	11/3/2011	Nov-2012	493.49	3.04	490.5	81.45	409.00	—	2.00	76.33	414.12	80.98	409.47	4.65	0.01	PVC	PVC	3927614.39	1428208.27
	MW-302-95	On-site	10/25/2011	Nov-2012	493.00	2.72	490.3	95.20	395.08	—	2.00	90.15	400.13	94.81	395.47	4.66	0.01	PVC	PVC	3927608.27	1428231.29
	MW-302-CMT-10	On-site	10/25/2011	Nov-2012	494.32	3.58	490.7	10.00	480.74	—	2.00	9.87	480.87	10.13	480.61	0.25	CMT	PVC	PVC	3927605.7	1428194.2
	MW-302-CMT-20	On-site	10/25/2011	Nov-2012	494.32	3.58	490.7	20.00	470.74	—	2.00	19.87	470.87	20.13	470.61	0.25	CMT	PVC	PVC	3927605.7	1428194.2
	MW-302-CMT-30	On-site	10/25/2011	Nov-2012	494.32	3.58	490.7	30.00	460.74	—	2.00	29.87	460.87	30.13	460.61	0.25	CMT	PVC	PVC	3927605.7	1428194.2
	MW-302-CMT-40	On-site	10/25/2011	Nov-2012	494.32	3.58	490.7	40.00	450.74	—	2.00	39.87	450.87	40.13	450.61	0.25	CMT	PVC	PVC	3927605.7	1428194.2
	MW-302-CMT-50	On-site	10/25/2011	Nov-2012	494.32	3.58	490.7	50.00	440.74	—	2.00	49.87	440.87	50.13	440.61	0.25	CMT	PVC	PVC	3927605.7	1428194.2
	MW-303-130	On-site	10/18/2011	Nov-2012	495.15	3.16	492.0	130.70	361.29	130.00	2.00	125.60	366.39	130.23	361.76	4.63	0.01	PVC	PVC	3927682.57	1428479.64
	MW-303-70	On-site	11/1/2011	Nov-2012	495.06	2.87	492.2	70.44	421.75	—	2.00	65.24	426.95	70.04	422.15	4.80	0.01	PVC	PVC	3927668.05	1428484.37
	MW-303-80	On-site	11/2/2011	Nov-2012	495.12	2.92	492.2	80.73	411.47	—	2.00	75.54	416.66	80.33	411.87	4.79	0.01	PVC	PVC	3927660.37	1428485.11
	MW-303-95	On-site	4/17/2012	Nov-2012	495.12	3.12	492.0	95.18	396.82	—	2.00	90.13	401.87	94.78	397.22	4.65	0.01	PVC	PVC	3927651.67	1428487.31
	MW-303-CMT-19	On-site	10/20/2011	Nov-2012	495.85	3.55	492.3	19.00	473.30	—	2.00	18.87	473.43	19.13	473.17	0.25	CMT	PVC	PVC	3927676.0	1428481.8
	MW-303-CMT-29	On-site	10/20/2011	Nov-2012	495.85	3.55	492.3	29.00	463.30	—	2.00	28.87	463.43	29.13	463.17	0.25	CMT	PVC	PVC	3927676.0	1428481.8
	MW-303-CMT-39	On-site	10/20/2011	Nov-2012	495.85	3.55	492.3	39.00	453.30	—	2.00	38.87	453.43	39.13	453.17	0.25	CMT	PVC	PVC	3927676.0	1428481.8
	MW-303-CMT-49	On-site	10/20/2011	Nov-2012	495.85	3.55	492.3	49.00	443.30	—	2.00	48.87	443.43	49.13	443.17	0.25	CMT	PVC	PVC	3927676.0	1428481.8
	MW-303-CMT-59	On-site	10/20/2011	Nov-2012	495.85	3.55	492.3	59.00	433.30	—	2.00	58.87	433.43	59.13	433.17	0.25	CMT	PVC	PVC	3927676.0	1428481.8
	MW-303-CMT-9	On-site	10/20/2011	Nov-2012	495.85	3.55	492.3	9.00	483.30	—	2.00	8.87	483.43	9.13	483.17	0.25	CMT	PVC	PVC	3927676.0	1428481.8
	MW-304-125	On-site	10/14/2011	Nov-2012	497.32	3.61	493.7	125.92	367.79	—	2.00	120.89	372.82	125.32	368.39	4.43	0.01	PVC	PVC	3927730.33	1428833.79
	MW-304-15	On-site	4/18/2012	Nov-2012	496.97	3.27	493.7	18.17	475.53	—	2.00	8.02	485.68	17.83	475.87	9.81	0.01	PVC	PVC	3927723.82	1428828.03
	MW-304-150	On-site	10/14/2011	Nov-2012	497.21	3.00	494.2	150.65	343.56	—	2.00	145.53	348.68	150.18	344.03	4.65	0.01	PVC	PVC	3927769.24	1428870.53
	MW-304-70	On-site	10/20/2011	Nov-2012	496.99	2.75	494.2	70.66	423.58	—	2.00	65.54	428.70	70.20	424.04	4.66	0.01	PVC	PVC	3927751.83	1428854.08
	MW-304-80	On-site	10/31/2011	Nov-2012	496.75	2.72	494.0	81.14	412.89	—	2.00	76.02	418.01	80.67	413.36	4.65	0.01	PVC	PVC	3927740.60	1428843.75
	MW-304-96	On-site	4/18/2012	Nov-2012	496.95	2.86	494.1	95.71	398.38	—	2.00	90.57	403.52	95.22	398.87	4.65	0.01	PVC	PVC	3927746.17	1428848.56
	MW-304-CMT-10	On-site	10/18/2011	Nov-2012	497.63	3.47	494.2	10.00	484.16	—	2.00	9.87	484.29	10.13	484.03	0.25	CMT	PVC	PVC	3927758.3	1428860.6
	MW-304-CMT-20	On-site	10/18/2011	Nov-2012	497.63	3.47	494.2	20.00	474.16	—	2.00	19.87	474.29	20.13	474.03	0.25	CMT	PVC	PVC	3927758.3	1428860.6
	MW-304-CMT-30	On-site	10/18/2011	Nov-2012	497.63	3.47	494.2	30.00	464.16	—	2.00	29.87	464.29	30.13	464.03	0.25	CMT	PVC	PVC	3927758.3	1428860.6
	MW-304-CMT-40	On-site	10/18/2011	Nov-2012	497.63	3.47	494.2	40.00	454.16	—	2.00	39.87	454.29	40.13	454.03	0.25	CMT	PVC	PVC	3927758.3	1428860.6
	MW-304-CMT-50	On-site	10/18/2011	Nov-2012	497.63	3.47	494.2	50.00	444.16	—	2.00	49.87	444.29	50.13	444.03	0.25	CMT	PVC	PVC	3927758.3	1428860.6
	MW-304-CMT-60	On-site	10/18/2011	Nov-2012	497.63	3.47	494.2	60.00	434.16	—	2.00	59.87	434.29	60.13	434.03	0.25	CMT	PVC	PVC	3927758.3	1428860.6
	MW-305-100	On-site	10/8/2011	Nov-2012	495.71	2.74	493.0	99.92	393.05	110.00	2.00	94.88	398.09	99.32	393.65	4.44	0.01	PVC	PVC	3927946.36	1429034.54
	MW-305-70	On-site	10/22/2011	Nov-2012	495.67	2.91	492.8	70.37	422.39	—	2.00	65.00	427.76	69.90	422.86	4.90	0.01	PVC	PVC	3927953.08	1429040.73
	MW-305-80	On-site	10/30/2011	Nov-2012	495.38	2.69	492.7	81.22	411.47	—	2.00	76.10	416.59	80.75	411.94	4.65	0.01	PVC	PVC	3927959.70	1429046.56
	MW-305-CMT-18	On-site	10/24/2011	Nov-2012	496.39	3.25	493.1	17.50	475.64	—	2.00	17.37	475.77	17.63	475.51	0.25	CMT	PVC	PVC	3927940.7	1429049.0
	MW-305-CMT-28	On-site	10/24/2011	Nov-2012	496.39	3.25	493.1	27.50	465.64	—	2.00	27.37	465.77	27.63	465.51	0.25	CMT	PVC	PVC	3927940.7	1429049.0
	MW-305-CMT-38	On-site	10/24/2011	Nov-2012	496.39	3.25	493.1	37.50	455.64	—	2.00	37.37	455.77	37.63	455.51	0.25	CMT	PVC	PVC	3927940.7	1429049.0
	MW-305-CMT-48	On-site	10/24/2011	Nov-2012	496.39	3.25	493.1	47.50	445.64	—	2.00	47.37	445.77	47.63	445.51	0.25	CMT	PVC	PVC	3927940.7	1429049.0
	MW-305-CMT-58	On-site	10/24/2011	Nov-2012	496.39	3.25	493.1	57.50	435.64	—	2.00	57.37	435.77	57.63	435.51	0.25	CMT	PVC	PVC	3927940.7	1429049.0
	MW-305-CMT-8	On-site	10/24/2011	Nov-2012	496.39	3.25	493.1	7.50	485.64	—	2.00	7.37	485.77	7.63	485.51	0.25	CMT	PVC	PVC	3927940.7	1429049.0
	MW-306-100	On-site	10/13/2011	Nov-2012	495.55	2.46	493.1	100.60	392.49	—	2.00	95.40	397.69	100.16	392.93	4.76	0.01	PVC	PVC	3928121.97	1429302.41
	MW-306-15	On-site	4/16/2012	Nov-2012	496.78	3.12	493.7	15.40	478.26	—	2.00	5.20	488.46	15.01	478.65	9.81	0.01	PVC	PVC	3928103.64	1429299.52
	MW-306-150	On-site	10/7/2011	Nov-2012	495.98	2.90	493.1	150.06	343.02	—	2.00	144.86	348.22	149.63	343.45	4.77	0.01	PVC	PVC	3928118.47	1429293.75
	MW-306-70	On-site	11/6/2011	Nov-2012	496.70	3.39	493.3	70.71	422.60	—	2.00	65.51	427.80	70.31	423.00	4.80	0.01	PVC	PVC	3928115.77	1429309.12
	MW-306-80	On-site	11/7/2011	Nov-2012	496.52	3.22	493.3	80.50	412.80	—	2.00	75.31	417.99	80.10	413.20	4.79	0.01	PVC	PVC	3928108.87	1429292.74
	MW-306-CMT-10	On-site	10/27/2011	Nov-2012	496.95	3.46	493.5	10.00	483.49	—	2.00	9.87	483.62	10.13	483.36	0.25	CMT	PVC	PVC	3928108.3	1429306.7
	MW-306-CMT-20	On-site	10/27/2011	Nov-2012	496.95	3.46	493.5	20.00	473.49	—	2.00	19.87	473.62	20.13	473.36	0.25	CMT	PVC	PVC	3928108.3	1429306.7
	MW-306-CMT-30	On-site	10/27/2011	Nov-2012	496.95	3.46	493.5	30.00	463.49	—	2.00	29.87	463.62	30.13	463.36	0.25	CMT	PVC	PVC	3928108.3	1429306.7
	MW-306-CMT-40	On-site	10/27/2011	Nov-2012	496.95	3.46	493.5	40.00	453.49	—	2.00	39.87	453.62	40.13	453.36	0.25	CMT	PVC	PVC	3928108.3	1429306.7
	MW-306-CMT-50	On-site	10/27/2011	Nov-2012	496.95	3.46	493.5	50.00	443.49	—	2.00	49.87	443.62	50.13	443.36	0.25	CMT	PVC	PVC	3928108.3	1429306.7
	MW-306-CMT-60	On-site	10/27/2011	Nov-2012	496.95	3.46	493.5	60.00	433.49	—	2.00	59.87	433.62	60.13	433.36	0.25	CMT	PVC	PVC	3928108.3	1429306.7
	MW-307	On-site	12/3/2011	Nov-2012	495.49	2.57	492.9	149.90	343.02	—	2.00	144.76	348.16	149.56	343.36	4.80	0.01	PVC	PVC	3926951.83	1429734.66

Table 3-1
Well Construction Parameters
North Pole Refinery
Flint Hills Resources Alaska, LLC

Well Type	Well	Proximity	Boring Completion Date	Survey Date	Riser Elevation (feet MSL)	Riser Stickup (feet)	Ground Surface Elevation (feet MSL)	Well Depth (feet BGS)	Well Bottom Elevation (feet MSL)	Depth to Top of Permafrost (feet BGS)	Well Diameter (inches)	Well Screen: Depth to Top (feet BGS)	Well Screen: Top Elevation (feet MSL)	Well Screen: Depth to Bottom (feet BGS)	Well Screen: Bottom Elevation (feet MSL)	Well Screen: Length (feet)	Well Screen: Screen Slot Size (inches)	Well Screen: Material	Riser Material	ALASKA STATE PLANE NAD83, ZONE 3 NORTHING	ALASKA STATE PLANE NAD83, ZONE 3 EASTING
Monitoring	MW-308-15	Off-site	4/13/2012	Nov-2012	476.90	3.94	473.0	14.95	458.01	—	2.00	4.91	468.05	14.36	458.60	9.45	0.01	PVC	PVC	3943105.50	1420578.30
	MW-308-30	Off-site	4/12/2012	Nov-2012	475.35	3.67	471.7	30.42	441.26	41.0	2.00	25.21	446.47	30.02	441.66	4.81	0.01	PVC	PVC	3943026.01	1420453.62
	MW-309-15	On-site	4/19/2012	Nov-2012	495.08	3.09	492.0	15.06	476.93	—	2.00	4.92	487.07	14.72	477.27	9.80	0.01	PVC	PVC	3927042.65	1428539.04
	MW-309-150	On-site	4/19/2012	Nov-2012	494.74	2.69	492.1	149.75	342.30	—	2.00	144.61	347.44	149.27	342.78	4.66	0.01	PVC	PVC	3927043.93	1428525.49
	MW-309-66	On-site	4/23/2012	Nov-2012	495.05	3.12	491.9	65.85	426.08	—	2.00	59.43	432.50	64.10	427.83	4.67	0.01	PVC	PVC	3927043.2	1428532.4
	MW-310-110	On-site	5/29/2012	Nov-2012	494.26	3.19	491.1	110.42	380.65	—	2.00	105.28	385.79	109.94	381.13	4.66	0.01	PVC	PVC	3926802.76	1428044.57
	MW-310-15	On-site	4/26/2012	Nov-2012	494.32	3.20	491.1	14.72	476.40	—	2.00	4.58	486.54	14.38	476.74	9.80	0.01	PVC	PVC	3926810.88	1428028.92
	MW-310-65	On-site	4/20/2012	Nov-2012	494.48	3.23	491.3	65.53	425.72	—	2.00	60.47	430.78	65.13	426.12	4.66	0.01	PVC	PVC	3926805.71	1428036.73
	MW-311-15	Off-site	4/26/2012	Nov-2012	467.00	-0.28	467.3	15.43	451.85	—	2.00	5.24	462.04	15.04	452.24	9.80	0.01	PVC	PVC	3946536.13	1415602.20
	MW-311-46	Off-site	4/28/2012	Nov-2012	467.06	-0.28	467.3	45.74	421.60	48.0	2.00	40.60	426.74	45.26	422.08	4.66	0.01	PVC	PVC	3946534.99	1415612.86
	MW-312-15	Off-site	4/26/2012	Nov-2012	464.12	-0.46	464.6	15.52	449.06	—	2.00	5.34	459.24	15.13	449.45	9.79	0.01	PVC	PVC	3951394.25	1415642.38
	MW-312-50	Off-site	5/2/2012	Nov-2012	464.30	-0.34	464.6	50.36	414.28	50.0	2.00	44.90	419.74	49.56	415.08	4.66	0.01	PVC	PVC	3951399.72	1415642.19
	MW-313-15	Off-site	4/30/2012	Nov-2012	465.79	-0.43	466.2	15.18	451.04	—	2.00	4.99	461.23	14.79	451.43	9.80	0.01	PVC	PVC	3951374.78	1423235.06
	MW-313-150	Off-site	5/8/2012	Nov-2012	465.88	-0.29	466.2	149.94	316.23	—	2.00	144.69	321.48	149.34	316.83	4.65	0.01	PVC	PVC	3951370.40	1423237.65
	MW-314-15	Off-site	4/30/2012	Nov-2012	476.29	-0.29	476.6	15.56	461.02	—	2.00	5.38	471.20	15.16	461.42	9.78	0.01	PVC	PVC	3943869.90	1427115.02
	MW-314-150	Off-site	5/11/2012	Nov-2012	476.12	-0.33	476.5	150.51	325.94	—	2.00	145.31	331.14	150.13	326.32	4.82	0.01	PVC	PVC	3943874.84	1427119.27
	MW-315-15	Off-site	5/1/2012	Nov-2012	458.44	-0.74	459.2	15.83	443.35	—	2.00	5.70	453.48	15.49	443.69	9.79	0.01	PVC	PVC	3949804.15	1403467.06
	MW-315-150	Off-site	5/2/2012	Nov-2012	458.96	-0.41	459.4	150.63	308.74	—	2.00	145.58	313.79	150.23	309.14	4.65	0.01	PVC	PVC	3949809.75	1403467.06
	MW-316-15	Off-site	5/1/2012	Nov-2012	486.34	-0.29	486.6	15.67	470.96	—	2.00	5.46	481.17	15.26	471.37	9.80	0.01	PVC	PVC	3932950.20	1428372.65
	MW-316-56	Off-site	5/16/2012	Nov-2012	486.15	-0.48	486.6	56.00	430.63	57.0	2.00	50.95	435.68	55.59	431.04	4.64	0.01	PVC	PVC	3932950.03	1428377.41
	MW-317-15	Off-site	5/3/2012	Nov-2012	488.86	-0.44	489.3	15.66	473.64	—	2.00	5.46	483.84	15.25	474.05	9.79	0.01	PVC	PVC	3930184.86	1428701.63
	MW-317-71	Off-site	5/21/2012	Nov-2012	488.79	-0.56	489.4	71.23	418.12	—	2.00	66.10	423.25	70.73	418.62	4.63	0.01	PVC	PVC	3930185.90	1428666.62
	MW-318-20	Off-site	5/3/2012	Nov-2012	492.86	2.77	490.1	20.48	469.61	—	2.00	10.29	479.80	20.08	470.01	9.79	0.01	PVC	PVC	3928866.23	1424726.43
	MW-318-135	Off-site	5/10/2012	Nov-2012	493.10	3.21	489.9	135.29	354.60	—	2.00	130.15	359.74	134.80	355.09	4.65	0.01	PVC	PVC	3928883.99	1424703.15
	MW-319-15	Off-site	5/4/2012	Nov-2012	456.10	-0.35	456.5	15.28	441.17	—	2.00	5.08	451.37	14.89	441.56	9.81	0.01	PVC	PVC	3953109.18	1404197.93
	MW-319-45	Off-site	5/7/2012	Nov-2012	455.96	-0.69	456.7	45.52	411.13	45.5	2.00	40.44	416.21	45.10	411.55	4.66	0.01	PVC	PVC	3953109.18	1404192.73
	MW-320-130	Off-site	5/9/2012	Nov-2012	451.01	-0.48	451.5	131.38	320.11	—	2.00	126.32	325.17	130.97	320.52	4.65	0.01	PVC	PVC	3963539.90	1402678.14
	MW-320-20	Off-site	5/4/2012	Nov-2012	450.92	-0.37	451.3	20.15	431.14	—	2.00	9.96	441.33	19.76	431.53	9.80	0.01	PVC	PVC	3963542.54	1402682.33
	MW-321-15	On-site	5/5/2012	Nov-2012	495.59	2.74	492.9	15.77	477.08	—	2.00	5.62	487.23	15.41	477.44	9.79	0.01	PVC	PVC	3926256.76	1428855.78
	MW-321-151	On-site	5/26/2012	Nov-2012	495.13	2.20	492.9	150.54	342.39	—	2.00	145.41	347.52	150.06	342.87	4.65	0.01	PVC	PVC	3926273.73	1428856.06
	MW-321-65	On-site	5/5/112	Nov-2012	495.26	2.44	492.8	66.04	426.78	—	2.00	60.89	431.93	65.55	427.27	4.66	0.01	PVC	PVC	3926265.14	1428856.30
	MW-322-15	Off-site	5/8/2012	Nov-2012	472.01	2.61	469.4	15.73	453.67	—	2.00	5.55	463.85	15.34	454.06	9.79	0.01	PVC	PVC	3940670.73	1410082.02
	MW-322-150	Off-site	10/9/2012	Nov-2012	472.12	2.71	469.4	151.07	318.34	—	2.00	145.94	323.47	150.59	318.82	4.65	0.01	PVC	PVC	3940646.94	1410074.03
	MW-323-15	Off-site	5/7/2012	Nov-2012	485.27	3.01	482.3	15.55	466.71	—	2.00	5.42	476.84	15.21	467.05	9.79	0.01	PVC	PVC	3931840.58	1422094.72
	MW-323-50	Off-site	10/8/2012	Nov-2012	484.78	2.58	482.2	60.80	421.40	64.0	2.00	55.70	426.50	60.35	421.85	4.65	0.01	PVC	PVC	3931823.38	1422078.80
	MW-324-15	Off-site	5/8/2012	Nov-2012	463.41	-0.37	463.8	15.35	448.43	—	2.00	5.17	458.61	14.96	448.82	9.79	0.01	PVC	PVC	3945444.19	1404965.19
	MW-324-151	Off-site	5/23/2012	Nov-2012	462.90	-0.70	463.6	150.92	312.68	—	2.00	145.78	317.82	150.44	313.16	4.66	0.01	PVC	PVC	3945446.0	1404958.6
	MW-325-150	Off-site	5/14/2012	Nov-2012	486.83	-0.62	487.5	150.54	336.91	—	2.00	145.48	341.97	150.13	337.32	4.65	0.01	PVC	PVC	3937085.15	1430633.64
	MW-325-18	Off-site	5/18/2012	Nov-2012	486.11	-0.80	486.9	18.68	468.23	—	2.00	8.53	478.38	18.33	468.58	9.80	0.01	PVC	PVC	3937079.28	1430639.29
	MW-326-150	Off-site	5/15/2012	Nov-2012	500.47	2.97	497.5	150.51	346.99	—	2.00	145.45	352.05	150.10	347.40	4.65	0.01	PVC	PVC	3921145.09	1430276.63
	MW-326-20	Off-site	6/8/2012	Nov-2012	500.55	3.02	497.5	20.75	476.78	—	2.00	10.61	486.92	20.40	477.13	9.79	0.01	PVC	PVC	3921150.73	1430277.63
	MW-327-15	Off-site	5/21/2012	Nov-2012	467.82	-0.25	468.1	15.40	452.67	—	2.00	5.21	462.86	15.01	453.06	9.80	0.01	PVC	PVC	3951301.83	1420336.90
	MW-327-150	Off-site	5/19/2012	Nov-2012	467.61	-0.44	468.1	150.92	317.13	—	2.00	145.79	322.26	150.44	317.61	4.65	0.01	PVC	PVC	3951297.90	1420342.92
	MW-328-15	Off-site	5/21/2012	Nov-2012	472.36	-0.62	473.0	15.77	457.21	—	2.00	5.83	467.15	15.33	457.65	9.50	0.01	PVC	PVC	3945516.60	1422877.24
	MW-328-151	Off-site	5/24/2012	Nov-2012	472.68	-0.51	473.2	150.66	322.53	—	2.00	145.58	327.61	150.25	322.94	4.67	0.01	PVC	PVC	3945525.83	1422876.28
	MW-329-15	Off-site	4/10/2001	Nov-2012	482.91	2.93	480.0	14.82	465.16	—	2.00	5.40	474.58	14.34	465.64	8.94	0.01	PVC	PVC	3937284.38	1421278.22
	MW-329-66	Off-site	5/22/2012	Nov-2012	479.23	-0.47	479.7	65.67	414.03	67.0	2.00	60.53	419.17	65.19	414.51	4.66	0.01	PVC	PVC	3937283.6	1421283.4
	MW-330-150	On-site	6/2/2012	Nov-2012	499.65	2.40	497.3	150.42	346.83	—	2.00	145.36	351.89	150.02	347.23	4.66	0.01	PVC	PVC	3926206.19	1428288.44
	MW-330-20	On-site	6/4/2012	Nov-2012	500.03	2.73	497.3	19.62	477.68	—	2.00	9.46	487.84	19.21	478.09	9.75	0.01	PVC	PVC	3926218.84	1428281.49
	MW-330-65	On-site	6/4/2012	Nov-2012	499.83	2.55	497.3	65.39	431.89	—	2.00	60.26	437.02	64.91	432.37	4.65	0.01	PVC	PVC	3926212.39	1428284.78
	MW-331-150	On-site	6/5/2012	Nov-2012	495.62	2.67	493.0	150.24	342.71	—	2.00	145.10	347.85	149.75	343.20	4.65	0.01	PVC	PVC	3927767.73	1429695.15
	MW-332-15	Off-site	6/8/2012	Nov-2012	481.80	-0.22	482.0	15.67	466.35	—	2.00	5.53	476.49	15.32	466.70	9.79	0.01	PVC	PVC	3937270.16	1428736.01
	MW-332-150	Off-site	6/7/2012	Nov-2012	481.35	-1.09	482.4	150.87	331.57	—	2.00	145.74	336.70	150.39	332.05	4.65	0.01	PVC	PVC	3937270.37	1428731.02
	MW-333-150	Off-site	6/11/2012	Nov-2012	497.62	2.63	495.0	150.47	344.52	—	2.00	145.32	349.67	149.98	345.01	4.66	0.01	PVC	PVC	3922968.19	1430186.58

Table 3-1
Well Construction Parameters
North Pole Refinery
Flint Hills Resources Alaska, LLC

Well Type	Well	Proximity	Boring Completion Date	Survey Date	Riser Elevation (feet MSL)	Riser Stickup (feet)	Ground Surface Elevation (feet MSL)	Well Depth (feet BGS)	Well Bottom Elevation (feet MSL)	Depth to Top of Permafrost (feet BGS)	Well Diameter (inches)	Well Screen: Depth to Top (feet BGS)	Well Screen: Top Elevation (feet MSL)	Well Screen: Depth to Bottom (feet BGS)	Well Screen: Bottom Elevation (feet MSL)	Well Screen: Length (feet)	Well Screen: Screen Slot Size (inches)	Well Screen: Material	Riser Material	ALASKA STATE PLANE NAD83, ZONE 3 NORTHING	ALASKA STATE PLANE NAD83, ZONE 3 EASTING
Monitoring	MW-333-16	Off-site	6/12/2012	Nov-2012	497.67	2.69	495.0	16.22	478.76	—	2.00	6.09	488.89	15.83	479.15	9.74	0.01	PVC	PVC	3922961.12	1430188.05
	MW-334-15	On-site	8/21/2012	Nov-2012	495.87	2.33	493.5	15.53	478.01	—	2.00	5.43	488.11	14.92	478.62	9.49	0.01	PVC	PVC	3927035.89	1429327.86
	MW-334-65	On-site	8/20/2012	Nov-2012	495.82	2.57	493.3	65.41	427.84	—	2.00	60.57	432.68	65.23	428.02	4.66	0.01	PVC	PVC	3927036.11	1429323.29
	MW-335-41	Off-site	8/23/2012	Nov-2012	469.34	-1.16	470.5	41.11	429.39	43.0	2.00	36.01	434.49	40.56	429.94	4.55	0.01	PVC	PVC	3946145.2	1419928.0
Observation	O-1	On-site	9/23/2010	Nov-2012	497.14	2.60	494.5	15.09	479.45	—	2.00	4.94	489.60	14.67	479.87	9.73	0.02	PVC	PVC	3925973.83	1429619.47
	O-10	On-site	9/16/2011	Nov-2012	496.36	2.76	493.6	16.37	477.23	—	4.00	6.38	487.22	16.03	477.57	9.65	0.01	PVC	PVC	3926386.30	1429760.78
	O-11	On-site	9/20/2011	Nov-2012	497.87	2.79	495.1	16.40	478.68	—	2.00	6.41	488.67	15.90	479.18	9.49	0.01	PVC	PVC	3927247.94	1429025.71
	O-12	On-site	9/21/2011	Nov-2012	496.17	3.25	492.9	16.99	475.93	—	2.00	6.79	486.13	16.60	476.32	9.81	0.01	PVC	PVC	3927268.21	1429161.41
	O-13	On-site	9/21/2011	Nov-2012	495.37	2.92	492.5	15.88	476.57	—	2.00	5.68	486.77	15.49	476.96	9.81	0.01	PVC	PVC	3927268.35	1429254.10
	O-14	On-site	10/1/2011	Nov-2012	494.90	-0.36	495.3	15.30	479.96	—	2.00	5.12	490.14	14.91	480.35	9.79	0.01	PVC	PVC	3925995.33	1430224.22
	O-15	On-site	10/6/2011	Nov-2012	498.70	3.15	495.6	15.37	480.18	—	2.00	5.19	490.36	14.97	480.58	9.78	0.01	PVC	PVC	3925553.75	1430177.50
	O-16	On-site	10/7/2011	Nov-2012	493.09	-0.50	493.6	14.60	478.99	—	2.00	4.41	489.18	14.20	479.39	9.79	0.01	PVC	PVC	3925819.74	1429033.87
	O-17	On-site	10/13/2011	Nov-2012	493.26	-0.34	493.6	15.04	478.56	—	2.00	4.87	488.73	14.56	479.04	9.69	0.01	PVC	PVC	3926546.15	1429036.74
	O-18	On-site	10/12/2011	Nov-2012	492.70	-0.39	493.1	15.32	477.77	—	2.00	5.15	487.94	14.85	478.24	9.70	0.01	PVC	PVC	3926309.43	1429007.34
	O-19	On-site	10/15/2011	Nov-2012	496.48	3.19	493.3	15.34	477.95	—	2.00	5.15	488.14	14.87	478.42	9.72	0.01	PVC	PVC	3926814.98	1429229.93
	O-2	On-site	9/23/2010	Nov-2012	497.54	3.80	493.7	15.03	478.71	—	2.00	4.88	488.86	14.61	479.13	9.73	0.02	PVC	PVC	3927114.04	1429130.05
	O-20	On-site	10/13/2011	Nov-2012	497.41	3.12	494.3	15.84	478.45	—	2.00	5.64	488.65	15.44	478.85	9.80	0.01	PVC	PVC	3925863.81	1429729.04
	O-21	On-site	10/14/2011	Nov-2012	493.12	-0.46	493.6	15.69	477.89	—	2.00	5.49	488.09	15.29	478.29	9.80	0.01	PVC	PVC	3925656.97	1429631.77
	O-22	On-site	11/14/2011	Nov-2012	496.76	1.92	494.8	18.59	476.25	—	2.00	8.30	486.54	18.05	476.79	9.75	0.01	PVC	PVC	3926789.25	1430139.00
	O-23	On-site	12/5/2011	Nov-2012	495.83	2.37	493.5	16.32	477.14	—	2.00	6.03	487.43	15.78	477.68	9.75	0.01	PVC	PVC	3927110.81	1429926.50
	O-24	On-site	9/16/2011	Nov-2012	496.87	2.52	494.4	15.24	479.11	—	2.00	4.95	489.40	14.70	479.65	9.75	0.01	PVC	PVC	3927281.16	1429428.42
	O-25	On-site	11/10/2011	Nov-2012	497.75	2.59	495.2	16.41	478.75	—	2.00	6.12	489.04	15.87	479.29	9.75	0.01	PVC	PVC	3927402.44	1429242.45
	O-26	On-site	11/9/2011	Nov-2012	496.82	2.89	493.9	14.96	478.97	—	2.00	4.67	489.26	14.42	479.51	9.75	0.01	PVC	PVC	3927363.19	1429037.48
	O-27	On-site	11/10/2011	Nov-2012	496.86	1.86	495.0	17.37	477.63	—	2.00	7.08	487.92	16.83	478.17	9.75	0.01	PVC	PVC	3927278.05	1428804.68
	O-28	On-site	11/14/2011	Nov-2012	494.65	2.16	492.5	14.84	477.65	—	2.00	4.55	487.94	14.30	478.19	9.75	0.01	PVC	PVC	3925637.58	1428886.20
	O-29	On-site	11/12/2011	Nov-2012	498.61	2.37	496.2	18.16	478.08	—	2.00	7.87	488.37	17.62	478.62	9.75	0.01	PVC	PVC	3926600.52	1430083.48
	O-30	On-site	8/14/2012	Nov-2012	497.97	2.97	495.0	15.82	479.18		2.00	6.71	488.29	15.36	479.64	9.75	0.01	PVC	PVC	3926425.9	1430292.8
	O-3	On-site	9/23/2010	Nov-2012	497.76	3.29	494.5	14.57	479.90	—	2.00	4.43	490.04	14.16	480.31	9.73	0.02	PVC	PVC	3927090.75	1429551.50
	O-4	On-site	9/16/2010	Nov-2012	496.50	2.48	494.0	15.11	478.91	—	2.00	4.98	489.04	14.64	479.38	9.66	0.02	PVC	PVC	3927159.11	1428795.47
	O-5	On-site	9/13/2011	Nov-2012	496.11	2.88	493.2	15.08	478.15	—	2.00	4.97	488.26	14.68	478.55	9.71	0.01	PVC	PVC	3926951.41	1428829.08
	O-6	On-site	9/14/2011	Nov-2012	494.73	2.49	492.2	15.58	476.66	—	2.00	5.47	486.77	15.17	477.07	9.70	0.01	PVC	PVC	3926744.06	1428769.81
	O-7	On-site	9/14/2011	Nov-2012	496.01	2.52	493.5	15.33	478.16	—	2.00	5.22	488.27	14.92	478.57	9.70	0.01	PVC	PVC	3926757.84	1429941.88
	O-8	On-site	9/15/2011	Nov-2012	496.72	2.74	494.0	15.86	478.12	—	2.00	5.75	488.23	15.45	478.53	9.70	0.01	PVC	PVC	3926131.00	1429895.90
	O-9	On-site	9/15/2011	Nov-2012	496.95	3.11	493.8	15.14	478.70	—	2.00	5.03	488.81	14.73	479.11	9.70	0.01	PVC	PVC	3926505.32	1429912.51
	S-21	On-site	5/15/1987	Nov-2012	497.19	2.84	494.4	13.40	480.95	—	2.00	2.92	491.43	12.67	481.68	9.75	0.02	PVC	PVC	3926670.65	1429597.64
	S-22	On-site	5/15/1987	Nov-2012	496.70	1.90	494.8	14.70	480.10	—	2.00	4.50	490.30	14.20	480.60	9.70	0.02	PVC	PVC	3926430.46	1429717.90
	S-32	On-site	11/15/1987	Nov-2012	495.82	2.93	492.9	11.30	481.59	—	4.00	1.30	491.59	11.30	481.59	10.00	0.02	ABS	ABS	3926946.66	1429732.57
	S-39	On-site	12/15/1989	Nov-2012	494.07	1.02	493.1	13.00	480.05	—	?	7.53	485.52	12.53	480.52	5.00	?	?	?	3927009.82	1429395.60
	S-43	On-site	6/15/1991	Nov-2012	496.21	2.06	494.2	13.00	481.15	—	?	3.37	490.78	12.70	481.45	9.33	?	?	?	3926779.68	1429530.33
	S-44	On-site	6/15/1991	Nov-2012	495.02	2.16	492.9	13.00	479.86	—	?	3.16	489.70	12.64	480.22	9.48	?	?	?	3926922.12	1429493.51
	S-50	On-site	7/15/1997	Nov-2012	496.68	2.97	493.7	15.00	478.71	—	4.00	3.88	489.83	13.56	480.15	9.68	0.02	PVC	PVC	3926779.29	1429065.48
	S-51	On-site	6/15/1997	Nov-2012	495.90	2.90	493.0	15.00	478.00	—	2.00	4.75	488.25	14.43	478.57	9.68	0.02	PVC	PVC	3926824.07	1429045.61
	S-54	On-site	7/15/1998	Nov-2012	497.01	3.03	494.0	15.00	478.98	—	2.00	10.00	483.98	15.00	478.98	5.00	0.02	PVC	PVC	3928055.37	1429680.65
	S-9	On-site	8/15/2001	Nov-2012	495.12	2.89	492.2	19.80	472.43	—	2.00	4.88	487.35	18.88	473.35	14.00	0.01	PVC	PVC	3927494.32	1429112.46
Recovery	R-14	On-site	6/10/1986	Nov-2012	493.99	1.43	492.6	6.06	486.50	—	20.00	?	?	?	?	?	NA	culvert		3927108.36	1429010.00
	R-14A	On-site	6/10/1987	Nov-2012	494.09	1.37	492.7	10.73	481.99	—	4.00	4.00	488.72	10.73	481.99	6.73	?	ABS	ABS	3927100.21	1429016.07
	R-18	On-site	6/10/1987	Nov-2012	499.76	3.82	495.9	32.77	463.17	—	10.00	7.65	488.29	32.77	463.17	25.12	?	steel	steel	3926667.15	1429608.07
	R-20R	On-site	2/20/2011	Nov-2012	498.74	3.80	494.9	19.70	475.24	—	6.00	3.80	491.14	19.70	475.24	15.90	0.03	ss	ss	3926382.77	1429577.80
	R-21	On-site	10/15/2011	Nov-2012	495.52	2.76	492.8	24.17	468.59	—	12.00	4.17	488.59	24.17	468.59	20.00	?	steel	steel	3926960.05	1429035.68
	R-22	On-site	10/15/1987	Nov-2012	495.56	2.46	493.1	24.65	468.45	—	12.00	4.65	?	24.65	?	20.00	?	steel	steel	3927061.93	1429008.20
	R-3	On-site	11/15/1987	Nov-2012	494.08	0.54	493.5	6.92	486.62	—	38.00	?	?	?	?	?	NA	culvert		3925550.08	1429397.48
	R-32	On-site	11/15/1987	Nov-2012	494.33	0.58	493.8	10.97	482.78	—	24.00	?	?	?	?	?	NA	culvert		3926473.43	1429438.03
	R-33	On-site	8/15/1988	Nov-2012	495.82	2.62	493.2	24.60	468.60	—	12.00	7.40	485.80	24.60	468.60	17.20	?	steel	steel	3925827.95	1429332.73
	R-34	On-site	8/15/1988	Nov-2012	495.20	1.95	493.3	20.83	472.42	—	12.00	0.50	492.75	20.83	472.42	20.33	?	ss	steel	3926500.01	1429393.41
	R-35R	On-site	2/16/2011	Nov-2012	494.72	1.74	493.0	39.00	453.98	—	8.00	4.00	488.98	39.00	453.98	35.00	0.01	ss	steel	3926840.14	1429455.05
	R-38	On-site	8/15/1988	Nov-2012	498.64	2.72	495.9	9.80	486.12	—	24.00	?	?	?	?	?	NA	culvert		3925496.45	1429474.75
	R-39	On-site	8/15/1988	Nov-2012	495.05	1.55	493.5	25.50	468.00	—	10.00	6.25	487.25	25.50	468.00	19.25	?	steel	steel	3927030.22	1429648.72
	R-4	On-site	11/15/1987	Nov-2012	494.92	0.82	494.1	8.56	485.54	—	50.00	?	?	?	?	?	NA	culvert		3925501.58	1429377.63
	R-40	On-site	6/15/1989	Nov-2012	494.46	1.70	492.8	25.17	467.59	—	10.00	6.00	486.76	25.17	467.59	19.17	?	steel	steel	3927004.81	1429396.89
	R-42	On-site	5/15/2011	Nov-2012	493.31	1.49	491.8	35.00	456.82	—	8.00	15.00	476.82	35.00	456.82	20.00	0.04	ss	steel	3926974.24	1428686.38
	R-5	On-site	6/15/1986	Nov-2012	495.33	1.83	493.5	7.23	486.27	—	38.00	?	?	?	?	?	NA	culvert		3925824.93	1429309.40

Table 3-1
Well Construction Parameters
North Pole Refinery
Flint Hills Resources Alaska, LLC

Well Type	Well	Proximity	Boring Completion Date	Survey Date	Riser Elevation (feet MSL)	Riser Stickup (feet)	Ground Surface Elevation (feet MSL)	Well Depth (feet BGS)	Well Bottom Elevation (feet MSL)	Depth to Top of Permafrost (feet BGS)	Well Diameter (inches)	Well Screen: Depth to Top (feet BGS)	Well Screen: Top Elevation (feet MSL)	Well Screen: Depth to Bottom (feet BGS)	Well Screen: Bottom Elevation (feet MSL)	Well Screen: Length (feet)	Well Screen: Screen Slot Size (inches)	Well Screen: Material	Riser Material	ALASKA STATE PLANE NAD83, ZONE 3: NORTHING	ALASKA STATE PLANE NAD83, ZONE 3: EASTING
PF Boring	PF-1	Off-site	10/21/2010	Permafrost encountered at ground surface to 15 feet; NO WELL																	
	PF-2	Off-site	10/21/2010	Permafrost encountered at ground surface to 15 feet; NO WELL																	
	PF-3	Off-site	4/14/2012	Permafrost encountered at ground surface to 28.5 feet; NO WELL																	
	PF-4	Off-site	4/30/2012	Permafrost encountered at 1.50 to 20.0 feet; NO WELL																	

Notes:

This table came from Version 5 of the Sampling and Analysis Plan submitted with this Report dated March 1, 2013. The table will be revised after proposed site characterization activities are completed in 2013.

BGS	below ground surface
CMT	continuous multi-channel tubing
MSL	mean sea level
ss	stainless steel
PVC	polyvinyl chloride
ABS	acrylonitrile butadiene styrene
NS	not surveyed
NA	not applicable
PF	permafrost

Table 3-2
Groundwater Elevation Monitoring Well Network
North Pole Refinery
Flint Hills Resources Alaska, LLC

Priority Level	**1**		**2**		**3**			**4**	**5**	**6**	**7**
Location	**Water Table**		**Water Table**		**10'-55'**			**55'-90'**	**Vertical gradient**	**90'-160'**	
Duration	**1-2 days**		**1-2 days**		**1-2 days**			**1 day**	**1-2 days**	**1 day**	**Surface Water**
	On-site		**Off-site**		**On-site**	**Off-site**		**On-site**	**On-site**	**On-site**	**On-site**
Monitoring Well	MW-105A	O-2	MW-148A	MW-191A	MW-101	MW-148B	MW-188B	MW-102	MW-179A/B/C/D	MW-173B	North Gravel Pit
	MW-106	O-22	MW-150A	MW-192A	MW-104	MW-148C	MW-189B	MW-144BR	MW-186A/C	MW-179D	South Gravel Pit
	MW-109	O-23	MW-151A	MW-193A	MW-105	MW-150B	MW-190B	MW-154A	MW-301-CMT cluster	MW-186D	
	MW-110	O-24	MW-152A	MW-194A	MW-129	MW-151C	MW-191B	MW-174B	MW-302-CMT cluster	MW-195B	
	MW-113	O-26	MW-153A	MW-195A	MW-146B	MW-152B	MW-193B	MW-175	MW-303-CMT cluster	MW-198	
	MW-125	O-27	MW-155A	MW-311-15	MW-147B	MW-152C	MW-194B	MW-176C	MW-304-CMT cluster	MW-199	
	MW-130	O-28	MW-156A	MW-312-15	MW-174A	MW-153B	MW-311-46	MW-177	MW-305-CMT cluster	MW-300	
	MW-133	O-29	MW-157A	MW-313-15	MW-176B	MW-156B	MW-312-50	MW-178C	MW-306-CMT cluster	MW-302-110	
	MW-135	O-3	MW-158A	MW-315-15	MW-179B	MW-157B	MW-319-45	MW-179C	**Off-site**	MW-303-130	
	MW-140	O-30	MW-159A	MW-318-20	MW-180B	MW-158B		MW-180C	MW-148A/B/C/D	MW-304-125	
	MW-141	O-4	MW-161A	MW-319-15	MW-186B	MW-159B		MW-186E	MW-181A/B/C	MW-304-150	
	MW-144A	O-5	MW-162A	MW-322-15	MW-192B	MW-161B		MW-301-70	MW-185A/B/C	MW-305-100	
	MW-145	O-6	MW-163A	MW-324-15	MW-197A	MW-162B		MW-302-70		MW-306-150	
	MW-146A	O-8	MW-164A	MW-326-20	MW-301-60	MW-163B		MW-302-80		MW-307	
	MW-149A	R-14A	MW-165A	MW-327-15	MW-310-65	MW-164B		MW-302-95		MW-310-110	
	MW-173A	R-21	MW-166A	MW-328-15	MW-321-65	MW-164C		MW-303-70		**Off-site**	
	MW-179A	R-35R	MW-167A	MW-332-15	MW-330-65	MW-165B		MW-303-80		MW-148D	
	MW-186A	R-39	MW-168A	MW-333-16	MW-334-65	MW-166B		MW-303-95		MW-170C	
	MW-192A	R-40	MW-169A		MW-309-66	MW-167B		MW-304-70		MW-172B	
	MW-195A	R-42	MW-170A			MW-168B		MW-304-80		MW-181C	
	MW-309-15	S-32	MW-171A			MW-169B		MW-304-96		MW-185C	
	MW-310-15	S-39	MW-172A			MW-169C		Mw-305-70		MW-315-150	
	MW-321-15	S-43	MW-173A			MW-170D		MW-305-80		MW-318-135	
	MW-334-15	S-44	MW-181A			MW-171B		MW-306-100		MW-322-150	
	O-1	S-50	MW-182A			MW-181B		MW-306-70		MW-324-151	
	O-12	S-54	MW-183A			MW-182B		MW-306-80		MW-326-150	
	O-14		MW-185A			MW-183B		**Off-site**		MW-327-150	
	O-15		MW-187			MW-184		MW-159C		MW-328-151	
	O-17		MW-188A			MW-185B		MW-160B		MW-332-150	
	O-18		MW-189A					MW-170B		MW-333-150	
			MW-190A					MW-317-71			

Notes

This table came from Version 5 of the Sampling and Analysis Plan submitted with this Report dated March 1, 2013. The table will be revised after proposed site characterization activities are completed in 2013.

The groundwater monitoring network is under development and will be updated as wells are installed.
Well prioritization will inform wells selected for sampling during cold weather months which limits available time for sampling.
Wells are on LNAPL Migration (Table 3-3) and Thickness (Table 3-4) list and will also provide groundwater elevation data quarterly.
Vertical gradient clusters (i.e., MW-301-CMT cluster) will provide data from each well within that cluster.

Table 3-3
LNAPL Thickness Monitoring Network
North Pole Refinery
Flint Hills Resources Alaska, LLC

Well	Frequency	Priority	Rationale	Notes
R-14A	monthly	1	Monitor fluctuation in product thickness	-
MW-186A	monthly	1	Monitor fluctuation in product thickness	-
O-10	monthly	1	Monitor fluctuation in product thickness	installed 2011 Q4
O-11	monthly	1	Monitor fluctuation in product thickness	installed 2011 Q3
O-13	monthly	1	Monitor fluctuation in product thickness	installed 2011 Q3
O-19	monthly	1	Monitor fluctuation in product thickness	installed 2011 Q4
O-7	monthly	1	Monitor fluctuation in product thickness	installed 2011 Q3
O-9	monthly	1	Monitor fluctuation in product thickness	installed 2011 Q3
O-21	monthly	1	Monitor fluctuation in product thickness	installed 2011 Q4
O-27	monthly	1	Monitor fluctuation in product thickness	installed 2011 Q4
S-21	monthly	1	Monitor fluctuation in product thickness	-
S-22	monthly	1	Monitor fluctuation in product thickness	-
S-39	monthly	1	Monitor fluctuation in product thickness	-
S-44	monthly	1	Monitor fluctuation in product thickness	-
S-51	monthly	1	Monitor fluctuation in product thickness	-
MW-138	monthly	2	Monitor fluctuation in product thickness	pumping well
O-2	monthly	2	Monitor fluctuation in product thickness	pumping well
R-20R	monthly	2	Monitor fluctuation in product thickness	pumping well
R-21	monthly	2	Monitor fluctuation in product thickness	pumping well
R-32	monthly	2	Monitor fluctuation in product thickness	pumping well
R-33	monthly	2	Monitor fluctuation in product thickness	pumping well
R-35R	monthly	2	Monitor fluctuation in product thickness	pumping well
R-39	monthly	2	Monitor fluctuation in product thickness	pumping well
R-40	monthly	2	Monitor fluctuation in product thickness	pumping well
S-32	monthly	2	Monitor fluctuation in product thickness	-
S-43	monthly	2	Monitor fluctuation in product thickness	-
S-50	monthly	2	Monitor fluctuation in product thickness	pumping well
MW-334-15	monthly	2	Monitor fluctuation in product thickness	installed 2012 Q3
MW-176A	quarterly	3	Monitor fluctuation in product thickness	-
R-18	quarterly	3	Monitor fluctuation in product thickness	-
R-34	quarterly	3	Monitor fluctuation in product thickness	-

Notes:

This table came from Version 5 of the Sampling and Analysis Plan submitted with this Report dated March 1, 2013. The table will be revised after proposed site characterization activities are completed in 2013.

The groundwater monitoring network is under development and will be updated as wells are installed.
S-20 is to-be-decommissioned.
LNAPL appropriate observation wells (O-series) were installed to monitor product boundary and replace.
MW-111, MW-113, MW-115, MW-116, MW-132, MW-134, MW-135, MW-136, and MW-137.

Table 3-4
LNAPL Migration Monitoring Network
North Pole Refinery
Flint Hills Resources Alaska, LLC

Well	Frequency	Priority	Rationale	Notes
MW-139	monthly	1	Monitor NW product boundary	-
MW-145	monthly	1	Monitor NE product boundary	-
O-12	monthly	1	Monitor product boundary	installed 2011 Q3
O-23	monthly	1	Monitor product boundary	installed 2011 Q4
O-24	monthly	1	Monitor product boundary	installed 2011 Q4
O-25	monthly	1	Monitor product boundary	installed 2011 Q4
O-26	monthly	1	Monitor product boundary	installed 2011 Q4
O-3	monthly	1	Monitor product boundary	-
O-4	monthly	1	Monitor product boundary	-
S-9	monthly	1	Monitor product boundary	down gradient of known LNAPL, nearby wells ND for contaminants.
O-1	monthly	2	Monitor product boundary	-
O-14	monthly	2	Monitor product boundary	installed 2011 Q4
O-15	monthly	2	Monitor product boundary	installed 2011 Q4
O-16	monthly	2	Monitor product boundary	installed 2011 Q4
O-17	monthly	2	Monitor product boundary	installed 2011 Q4
O-18	monthly	2	Monitor product boundary	installed 2011 Q4
O-20	monthly	2	Monitor product boundary	installed 2011 Q4
O-22	monthly	2	Monitor product boundary	installed 2011 Q4
O-28	monthly	2	Monitor product boundary	installed 2011 Q4
O-29	monthly	2	Monitor product boundary	installed 2011 Q4
O-5	monthly	2	Monitor product boundary	installed 2011 Q3
O-6	monthly	2	Monitor product boundary	installed 2011 Q3
O-8	monthly	2	Monitor product boundary	installed 2011 Q3
R-42	monthly	2	Monitor product boundary	pumping well
O-30	quarterly	3	Monitor product boundary	installed 2012 Q3
MW-140	quarterly	3	Monitor product boundary	-
MW-142	quarterly	3	Monitor product boundary	-
MW-144A	quarterly	3	Monitor product boundary	-
MW-178A	quarterly	3	Monitor product boundary	-
MW-179A	quarterly	3	Monitor product boundary	-
MW-180A	quarterly	3	Monitor product boundary	-
MW-195A	quarterly	3	Monitor product boundary	installed 2011 Q4
MW-196	quarterly	3	Monitor product boundary	installed 2011 Q4
R-3	quarterly	3	Monitor product boundary	Suitablity as observation well should be assessed; well dry for several quarters
R-38	quarterly	3	Monitor product boundary	Suitablity as observation well should be assessed

Notes:

This table came from Version 5 of the Sampling and Analysis Plan submitted with this Report dated March 1, 2013. The table will be revised after proposed site characterization activities are completed in 2013.

The groundwater monitoring network is under development and will be updated as wells are installed.
LNAPL appropriate observation wells (O-series) were installed to monitor product boundary and replace.
MW-111, MW-113, MW-115, MW-116, MW-132, MW-134, MW-135, MW-136, and MW-137.

Table 3-5
BTEX Monitoring Network
North Pole Refinery
Flint Hills Resources Alaska, LLC

Well	Sampling Frequency	Cold Weather Priority	Category	Notes
R-21	Monthly	2	Recovery System	with GAC sampling
R-35R	Monthly	2	Recovery System	with GAC sampling
R-39	Monthly	2	Recovery System	with GAC sampling
R-40	Monthly	2	Recovery System	with GAC sampling
R-42	Monthly	2	Recovery System	with GAC sampling
O-12	Quarterly	1	Plume delineation	
S-9	Quarterly	1	Plume delineation	
MW-126	Quarterly	2	Plume leading edge	
MW-137	Quarterly	2	Plume	
MW-145	Quarterly	2	Plume leading edge	
MW-134	Quarterly	2	Upgradient	Used to monitor for any potential changes as a result of the leak in sump 5002
MW-334-15	Quarterly	2	Plume boundary	
O-14	Quarterly	2	Upgradient	Used to monitor for any potential changes as a result of the leak in sump 5002
MW-127	Semiannually	1	Plume leading edge	
MW-139	Semiannually	1	Plume	
MW-142	Semiannually	1	Plume leading edge	
MW-106	Semiannually	2	Near gravel pit	
MW-109	Semiannually	2	Plume leading edge	
MW-110	Semiannually	2	Plume	
MW-113	Semiannually	2	Plume leading edge	
MW-115	Semiannually	2	Plume	
MW-116	Semiannually	2	Plume	
MW-124	Semiannually	2	Plume	
MW-125	Semiannually	2	Plume	
MW-132	Semiannually	2	Plume	
MW-133	Semiannually	2	Plume	
MW-135	Semiannually	2	Plume	
MW-136	Semiannually	2	Plume	
MW-140	Semiannually	2	Plume leading edge	
MW-141	Semiannually	2	Near gravel pit	
MW-143	Semiannually	2	Plume leading edge	
MW-144A	Semiannually	2	Plume leading edge	
MW-148A	Semiannually	2	Downgradient property boundary	
MW-148B	Semiannually	2	Downgradient property boundary	
MW-149A	Semiannually	2	Downgradient property boundary	
MW-149B	Semiannually	2	Downgradient property boundary	
MW-153A	Semiannually	2	Downgradient property boundary	
MW-153B	Semiannually	2	Downgradient property boundary	
MW-176A	Semiannually	2	Plume	
MW-179A	Semiannually	2	Plume	
MW-180A	Semiannually	2	Plume	
MW-309-15	Semiannually	2	West edge of plume	
MW-321-15	Semiannually	2	West edge of plume	
O-2	Semiannually	2	Plume	
O-6	Semiannually	2	West edge of plume	
O-16	Semiannually	2	Plume	
O-17	Semiannually	2	Plume	
O-18	Semiannually	2	Plume	
S-44	Semiannually	2	Plume	
S-50	Semiannually	2	Plume	
MW-101A	Annually	2	Downgradient	
MW-105A	Annually	2	Upgradient	
MW-131	Annually	2	Downgradient	
MW-138	Annually	2	Source	
MW-192A	Annually	2	Upgradient	Southwest property boundary
MW-196	Annually	2	Upgradient	Replaces S-19

GAC = Granular activated carbon

Notes:

This table came from Version 5 of the Sampling and Analysis Plan submitted with this Report dated March 1, 2013. The table will be revised after proposed site characterization activities are completed in 2013.

The groundwater monitoring network is under development and will be updated as wells are installed.

Table 3-6a
Sulfolane Monitoring Network - On-Site
North Pole Refinery
Flint Hills Resources Alaska, LLC

Well	Sampling Frequency	Cold Weather Priority	Category	Notes
MW-105A	Annual	4	Upgradient	Dedicated pump present in well
MW-192A	Annual	4	Upgradient	Southwest property boundary
MW-192B	Annual	4	Upgradient	Southwest property boundary
R-21	Monthly	1	Plume	With GAC Sampling
R-35R	Monthly	1	Plume	With GAC Sampling
R-39	Monthly	1	Plume	With GAC Sampling
R-40	Monthly	1	Plume	With GAC Sampling
R-42	Monthly	1	Plume	With GAC Sampling
MW-101	Quarterly	4	Downgradient of remediation	
MW-101A	Quarterly	4	Downgradient of remediation	Dedicated pump present in well
MW-105	Quarterly	4	Upgradient	Dedicated pump present in well
MW-110	Quarterly	1	Plume	Dedicated pump present in well
MW-113	Quarterly	4	Plume	
MW-125	Quarterly	4	Plume Delineation	
MW-127	Quarterly	1	Downgradient of remediation	Dedicated pump present in well
MW-129	Quarterly	4	Plume	Dedicated pump present in well
MW-130	Quarterly	1	Plume	
MW-131	Quarterly	1	Downgradient of remediation	
MW-133	Quarterly	4	Plume Delineation	
MW-134	Quarterly	4	Upgradient	Used to monitor for any potential changes as a result of the leak in sump 5002; Dedicated pump present in well
MW-135	Quarterly	4	Plume	
MW-138	Quarterly	1	Plume	
MW-139	Quarterly	1	Downgradient of remediation	
MW-141	Quarterly	4	Plume (downgradient property boundary)	Dedicated pump present in well
MW-142	Quarterly	1*	Downgradient of remediation	Dedicated pump present in well
MW-143	Quarterly	1	Downgradient of remediation	
MW-144BR	Quarterly	4	Plume Delineation	Dedicated pump present in well
MW-145	Quarterly	4	Plume	Dedicated pump present in well
MW-147B	Quarterly	4	Plume (downgradient property boundary)	
MW-149A	Quarterly	3	Plume (downgradient property boundary)	
MW-149B	Quarterly	3	Plume (downgradient property boundary)	Dedicated pump present in well
MW-154A	Quarterly	4	Plume Delineation	Dedicated pump present in well
MW-154B	Quarterly	4	Plume Delineation	
MW-173A	Quarterly	4	Property boundary (east)	Dedicated pump present in well
MW-173B	Quarterly	4	Property boundary (east)	Dedicated pump present in well
MW-174A	Quarterly	4	Plume Delineation	Dedicated pump present in well
MW-174B	Quarterly	4	Plume Delineation	
MW-175	Quarterly	4	Plume Delineation	
MW-176A	Quarterly	1	Plume Delineation	
MW-176B	Quarterly	1	Plume Delineation	
MW-176C	Quarterly	1	Plume Delineation	Dedicated pump present in well
MW-177	Quarterly	1	Upgradient	Dedicated pump present in well
MW-178A	Quarterly	1	Plume Delineation	
MW-178B	Quarterly	1	Plume Delineation	
MW-178C	Quarterly	1	Plume Delineation	Dedicated pump present in well
MW-179A	Quarterly	4	Plume Delineation	
MW-179B	Quarterly	4	Plume Delineation	
MW-179C	Quarterly	4	Plume Delineation	Dedicated pump present in well
MW-179D	Quarterly	4	Plume Delineation	
MW-180A	Quarterly	4	Plume Delineation	
MW-180B	Quarterly	4	Plume Delineation	
MW-180C	Quarterly	4	Plume Delineation	Dedicated pump present in well
MW-186A	Quarterly	1	Monitor R-42 Effects	
MW-186B	Quarterly	1	Monitor R-42 Effects	
MW-186C	Quarterly	4	Monitor R-42 Effects	
MW-186D	Quarterly	4	Monitor R-42 Effects	
MW-186E	Quarterly	1	Monitor R-42 Effects	
MW-301-60	Quarterly	2	Vertical Profiling Transect	
MW-301-70	Quarterly	2	Vertical Profiling Transect	
MW-301-CMT-10	Quarterly	2	Vertical Profiling Transect	
MW-301-CMT-20	Quarterly	2	Vertical Profiling Transect	
MW-301-CMT-30	Quarterly	2	Vertical Profiling Transect	
MW-301-CMT-40	Quarterly	2	Vertical Profiling Transect	
MW-301-CMT-50	Quarterly	2	Vertical Profiling Transect	
MW-302-110	Quarterly	2	Vertical Profiling Transect	
MW-302-70	Quarterly	2	Vertical Profiling Transect	
MW-302-80	Quarterly	2	Vertical Profiling Transect	
MW-302-95	Quarterly	2	Vertical Profiling Transect	
MW-302-CMT-10	Quarterly	2	Vertical Profiling Transect	
MW-302-CMT-20	Quarterly	2	Vertical Profiling Transect	
MW-302-CMT-30	Quarterly	2	Vertical Profiling Transect	
MW-302-CMT-40	Quarterly	2	Vertical Profiling Transect	

Table 3-6a
Sulfolane Monitoring Network - On-Site
North Pole Refinery
Flint Hills Resources Alaska, LLC

Well	Sampling Frequency	Cold Weather Priority	Category	Notes
MW-302-CMT-50	Quarterly	2	Vertical Profiling Transect	
MW-303-130	Quarterly	2	Vertical Profiling Transect	
MW-303-70	Quarterly	2	Vertical Profiling Transect	
MW-303-80	Quarterly	2	Vertical Profiling Transect	
MW-303-95	Quarterly	2	Vertical Profiling Transect	
MW-303-CMT-19	Quarterly	2	Vertical Profiling Transect	
MW-303-CMT-29	Quarterly	2	Vertical Profiling Transect	
MW-303-CMT-39	Quarterly	2	Vertical Profiling Transect	
MW-303-CMT-49	Quarterly	2	Vertical Profiling Transect	
MW-303-CMT-59	Quarterly	2	Vertical Profiling Transect	
MW-303-CMT-9	Quarterly	2	Vertical Profiling Transect	
MW-304-125	Quarterly	2	Vertical Profiling Transect	
MW-304-15	Quarterly	2	Vertical Profiling Transect	
MW-304-150	Quarterly	2	Vertical Profiling Transect	
MW-304-70	Quarterly	2	Vertical Profiling Transect	
MW-304-80	Quarterly	2	Vertical Profiling Transect	
MW-304-96	Quarterly	2	Vertical Profiling Transect	
MW-304-CMT-10	Quarterly	2	Vertical Profiling Transect	
MW-304-CMT-20	Quarterly	2	Vertical Profiling Transect	
MW-304-CMT-30	Quarterly	2	Vertical Profiling Transect	
MW-304-CMT-40	Quarterly	2	Vertical Profiling Transect	
MW-304-CMT-50	Quarterly	2	Vertical Profiling Transect	
MW-304-CMT-60	Quarterly	2	Vertical Profiling Transect	
MW-305-100	Quarterly	2	Vertical Profiling Transect	
MW-305-70	Quarterly	2	Vertical Profiling Transect	
MW-305-80	Quarterly	2	Vertical Profiling Transect	
MW-305-CMT-18	Quarterly	2	Vertical Profiling Transect	
MW-305-CMT-28	Quarterly	2	Vertical Profiling Transect	
MW-305-CMT-38	Quarterly	2	Vertical Profiling Transect	
MW-305-CMT-48	Quarterly	2	Vertical Profiling Transect	
MW-305-CMT-58	Quarterly	2	Vertical Profiling Transect	
MW-305-CMT-8	Quarterly	2	Vertical Profiling Transect	
MW-306-100	Quarterly	4	Vertical Profiling Transect	
MW-306-15	Quarterly	4	Vertical Profiling Transect	
MW-306-150	Quarterly	4	Vertical Profiling Transect	
MW-306-70	Quarterly	4	Vertical Profiling Transect	
MW-306-80	Quarterly	4	Vertical Profiling Transect	
MW-306-CMT-10	Quarterly	4	Vertical Profiling Transect	
MW-306-CMT-20	Quarterly	4	Vertical Profiling Transect	
MW-306-CMT-30	Quarterly	4	Vertical Profiling Transect	
MW-306-CMT-40	Quarterly	4	Vertical Profiling Transect	
MW-306-CMT-50	Quarterly	4	Vertical Profiling Transect	
MW-306-CMT-60	Quarterly	4	Vertical Profiling Transect	
MW-307	Quarterly	4	Plume	
MW-309-15	Quarterly	3	Plume	
MW-309-150	Quarterly	3	Plume Delineation	
MW-309-66	Quarterly	3	Plume	
MW-310-110	Quarterly	4	Plume Delineation	
MW-310-15	Quarterly	4	Plume	
MW-310-65	Quarterly	4	Plume	
MW-321-15	Quarterly	1	Plume	
MW-321-151	Quarterly	1	Plume Delineation	
MW-321-65	Quarterly	4	Plume Delineation	
MW-330-150	Quarterly	3	Plume Delineation	
MW-330-20	Quarterly	3	Plume	
MW-330-65	Quarterly	3	Plume Delineation	
MW-331-150	Quarterly	4	Plume Delineation	
MW-334-15	Quarterly	2	Plume Delineation	
MW-334-65	Quarterly	2	Plume Delineation	
O-1	Quarterly	1	Plume	
O-12	Quarterly	1	Plume	
O-14	Quarterly	4	Crossgradient	Used to monitor for any potential changes as a result of the leak in sump 5002
O-19	Quarterly	4	Plume	
O-2	Quarterly	4	Plume	
O-24	Quarterly	4	Plume	

Table 3-6a
Sulfolane Monitoring Network - On-Site
North Pole Refinery
Flint Hills Resources Alaska, LLC

Well	Sampling Frequency	Cold Weather Priority	Category	Notes
O-26	Quarterly	1	Plume	
O-3	Quarterly	4	Plume	
O-4	Quarterly	4	Plume	
O-6	Quarterly	4	Plume	
S-39	Quarterly	4	Monitor recovery well R-36	
S-43	Quarterly	4	Plume	
S-51	Quarterly	4	Monitor recovery well R-38	
MW-195A	Quarterly	4	Plume	
MW-195B	Quarterly	4	Plume	
MW-196	Quarterly	4	Plume	
MW-197A	Quarterly	4	Plume	
MW-197B	Quarterly	4	Plume	
MW-198	Quarterly	4	Plume	
MW-199	Quarterly	4	Plume	
MW-300	Quarterly	4	Plume	
MW-104	Semiannual	4	Plume	Dedicated pump present in well
MW-106	Semiannual	4	Plume	
MW-109	Semiannual	4	Plume	
MW-115	Semiannual	4	Plume	
MW-116	Semiannual	4	Plume	
MW-132	Semiannual	4	Plume	Dedicated pump present in well
MW-144A	Semiannual	4	Plume	
S-21	Semiannual	4	Plume	
S-50	Semiannual	4	Plume	

Notes:

This table came from Version 5 of the Sampling and Analysis Plan submitted with this Report dated March 1, 2013. The table will be revised after proposed site characterization activities are completed in 2013.

* = Wells will receive sampling priority early during the first quarter 2013 to potentially allow for a second sample to be collected near the end of the quarter.
The groundwater monitoring network is under development and will be updated as wells are installed.
Sampling Priority - wells are assigned priority for sampling during cold weather.
GAC = Granular activated carbon

Table 3-6b
Sulfolane Monitoring Network - Off-Site
North Pole Refinery
Flint Hills Resources Alaska, LLC

Well	Sampling Frequency	Cold Weather Priority	Category	Notes
MW-148A	Quarterly	1*	Plume (downgradient property boundary)	Dedicated pump present in well
MW-148B	Quarterly	1	Plume (downgradient property boundary)	
MW-148C	Quarterly	2	Plume (downgradient property boundary)	
MW-148D	Quarterly	2	Plume (downgradient property boundary)	
MW-150A	Quarterly	3	Plume Delineation	
MW-150B	Quarterly	4	Plume Delineation	
MW-150C	Quarterly	4	Plume Delineation	
MW-151A	Quarterly	4	Plume Delineation	
MW-151B	Quarterly	4	Plume Delineation	
MW-151C	Quarterly	4	Plume Delineation	
MW-152A	Quarterly	4	Plume Delineation	
MW-152B	Quarterly	4	Plume Delineation	
MW-152C	Quarterly	4	Plume Delineation	
MW-153A	Quarterly	2	Plume Delineation	
MW-153B	Quarterly	1*	Plume Delineation	Dedicated pump present in well
MW-155A	Quarterly	4	Plume Delineation	
MW-155B	Quarterly	4	Plume Delineation	Dedicated pump present in well
MW-156A	Quarterly	4	Plume Delineation	
MW-156B	Quarterly	4	Plume Delineation	
MW-157A	Quarterly	4	Plume Delineation	
MW-157B	Quarterly	4	Plume Delineation	
MW-158A	Quarterly	4	Plume Delineation	
MW-158B	Quarterly	3	Plume Delineation	Dedicated pump present in well
MW-159A	Quarterly	4	Plume Delineation	
MW-159B	Quarterly	4	Plume Delineation	
MW-159C	Quarterly	4	Plume Delineation	
MW-160B	Quarterly	2	Plume Delineation	Dedicated pump present in well
MW-161A	Quarterly	1*	Plume Delineation	
MW-161B	Quarterly	1*	Plume Delineation	Dedicated pump present in well
MW-162A	Quarterly	3*	Plume Delineation	
MW-162B	Quarterly	3*	Plume Delineation	
MW-163A	Quarterly	3*	Plume Delineation	
MW-163B	Quarterly	3*	Plume Delineation	Dedicated pump present in well
MW-164A	Quarterly	1*	Plume Delineation	
MW-164B	Quarterly	1*	Plume Delineation	Dedicated pump present in well
MW-164C	Quarterly	1*	Plume Delineation	
MW-165A	Quarterly	4	Plume Delineation	
MW-165B	Quarterly	4	Plume Delineation	
MW-166A	Quarterly	1*	Plume Delineation	
MW-166B	Quarterly	1*	Plume Delineation	
MW-167A	Quarterly	1*	Plume Delineation	
MW-167B	Quarterly	1*	Plume Delineation	
MW-168A	Quarterly	2	Plume Delineation	
MW-168B	Quarterly	2	Plume Delineation	
MW-169A	Quarterly	4	Plume Delineation	
MW-169C	Quarterly	4	Plume Delineation	
MW-170A	Quarterly	4	Plume Delineation	
MW-170B	Quarterly	4	Plume Delineation	Dedicated pump present in well
MW-170C	Quarterly	4	Plume Delineation	
MW-170D	Quarterly	4	Plume Delineation	Dedicated pump present in well
MW-171A	Quarterly	4	Plume Delineation	
MW-171B	Quarterly	4	Plume Delineation	Dedicated pump present in well
MW-172A	Quarterly	4	Plume Delineation	
MW-172B	Quarterly	4	Plume Delineation	
MW-181A	Quarterly	4	Plume Delineation	
MW-181B	Quarterly	4	Plume Delineation	
MW-181C	Quarterly	4	Plume Delineation	
MW-182A	Quarterly	1*	Plume Delineation	
MW-182B	Quarterly	1*	Plume Delineation	
MW-183A	Quarterly	3*	Plume Delineation	
MW-183B	Quarterly	3*	Plume Delineation	
MW-184	Quarterly	4	Plume Delineation	
MW-185A	Quarterly	2	Plume Delineation	
MW-185B	Quarterly	2	Plume Delineation	
MW-185C	Quarterly	2	Plume Delineation	
MW-187	Quarterly	2*	Plume Delineation	
MW-308-15	Quarterly	1*	Plume Delineation	
MW-308-30	Quarterly	1*	Plume Delineation	
MW-311-15	Quarterly	4	Plume Delineation	
MW-311-46	Quarterly	4	Plume Delineation	
MW-314-15	Quarterly	4	Plume Delineation	
MW-314-150	Quarterly	4	Plume Delineation	
MW-316-15	Quarterly	4	Plume Delineation	
MW-316-56	Quarterly	4	Plume Delineation	
MW-317-15	Quarterly	4	Plume	

Table 3-6b
Sulfolane Monitoring Network - Off-Site
North Pole Refinery
Flint Hills Resources Alaska, LLC

Well	Sampling Frequency	Cold Weather Priority	Category	Notes
MW-317-71	Quarterly	4	Plume	
MW-318-135	Quarterly	4	Plume Delineation	
MW-318-20	Quarterly	4	Plume Delineation	
MW-322-15	Quarterly	4	Plume Delineation	
MW-322-150	Quarterly	4	Plume Delineation	
MW-323-15	Quarterly	4	Plume Delineation	
MW-323-61	Quarterly	4	Plume Delineation	
MW-325-150	Quarterly	4	Plume Delineation	
MW-325-18	Quarterly	4	Plume Delineation	
MW-328-15	Quarterly	4	Plume Delineation	
MW-328-151	Quarterly	4	Plume Delineation	
MW-329-15	Quarterly	3*	Plume	
MW-329-66	Quarterly	3*	Plume	
MW-332-15	Quarterly	1*	Plume Delineation	
MW-332-150	Quarterly	1*	Plume Delineation	
MW-335-41	Quarterly	1*	Plume Delineation	
MW-189A	Quarterly	2	Plume Delineation	
MW-189B	Quarterly	2	Plume Delineation	
MW-190A	Quarterly	4	Plume Delineation	
MW-191A	Quarterly	4	Plume Delineation	
MW-191B	Quarterly	4	Plume Delineation	
MW-193A	Quarterly	4	Plume Delineation	
MW-193B	Quarterly	4	Plume Delineation	
MW-194A	Quarterly	1*	Plume Delineation	
MW-194B	Quarterly	1*	Plume	

Notes:

This table came from Version 5 of the Sampling and Analysis Plan submitted with this Report dated March 1, 2013. The table will be revised after proposed site characterization activities are completed in 2013.

* = Wells will receive sampling priority early during the first quarter 2013 to potentially allow for a second sample to be collected near the end of the quarter.
The groundwater monitoring network is under development and will be updated as wells are installed.
Sampling Priority - wells are assigned priority for sampling during cold weather.
GAC = Granular activated carbon

Table 4-1
Groundwater Well Field Parameter Results
North Pole Refinery
Flint Hills Resources Alaska, LLC

Date	Location	Samples	Analysis	Depth to Water (feet)	Measured Total Well Depth	Temperature (°C)	DO (mg/L)	Conductivity (µS/cm)	pH	ORP (mV)	Water Clarity	Notes
11/14/2012	On site	EB-109	S	--	--	--	--	--	--	--	--	Equipment Blank
12/13/2012	On site	EB-178A	S	--	--	--	--	--	--	--	--	Equipment blank taken after MW-178A
12/14/2012	On site	EB-304-70	S	--	--	--	--	--	--	--	--	Equipment blank taken after MW-304-70
12/14/2012	On site	EB-304-80	S	--	--	--	--	--	--	--	--	Equipment blank taken after MW-304-80
11/12/2012	On site	EB-307	S	--	--	--	--	--	--	--	--	Equipment Blank
11/14/2012	On site	MW-104	S	11.72	--	3.9	0.11	204.9	7.31	141.1	Clear	Parameters stabilized
11/12/2012	On site	MW-105	S,MNA w/ methane	9.98	--	3.0	0.32	239.3	7.23	-73.1	Clear	Parameters stabilized.
11/12/2012	On site	MW-105A	MNA w/ methane	11.62	--	4.0	0.26	286.1	7.07	-70.2	Clear	> 3 well volumes purged
12/11/2012	On site	MW-105A	PFC	12.18	--	2.98	0.13[c]	219.0	7.16	-33.9	Clear	Parameters stabilized
11/15/2012	On site	MW-106	S,B,PAH	13.50	--	5.1	0.06	238.0	7.18	51.6	Clear	Parameters stabilized
11/14/2012	On site	MW-109	S,B,MNA w/ methane	8.90	--	10.4	0.18	340.4	7.30	-105.0	Clear	Parameters stabilized
12/11/2012	On site	MW-109	PFC	9.47	--	6.8	0.29[c]	252.3	7.33	-85.0	clear	Parameters stabilized
10/18/2012	On site	MW-110	S, B, MNA, PFC	11.62	19.86	6.05	2.02	787[a]	5.99	-202.0	Clear	PID Headspace: VOC=0.0ppm
10/18/2012	On site	MW-210	B	--	--	--	--	--	--	--	--	Duplicate of MW-110
11/14/2012	On site	MW-113	S,B,COPC	9.52	--	4.3	0.10	355.3	7.00	-27.5	Clear	> 3 well volumes purged
11/14/2012	On site	MW-213	S	--	--	--	--	--	--	--	--	Duplicate of MW-113
11/14/2012	On site	MW-124	B	12.29	--	5.4	0.09	269.9	7.10	-57.9	Clear	Parameters stabilized
11/14/2012	On site	MW-224	B	--	--	--	--	--	--	--	--	Duplicate of MW-124
11/14/2012	On site	MW-125	S,B,COPC	11.26	--	5.3	0.11	232.9	7.40	-112.1	Clear	Parameters stabilized
11/14/2012	On site	MW-225	B	--	--	--	--	--	--	--	--	Duplicate of MW-125
11/15/2012	On site	MW-126	B	10.82	--	4.3	0.16	245.4	7.41	-53.6	Clear	Parameters stabilized
11/11/2012	On site	MW-127	S, B, MNA w/ methane, COPC	11.94	--	5.7	0.07	280.6	7.11	-28.0	Clear	> 3 well volumes purged
11/11/2012	On site	MW-227	S	--	--	--	--	--	--	--	--	Duplicate of MW-127
11/15/2012	On site	MW-129	S	11.08	--	3.0	0.07	214.3	7.26	19.5	Clear	Parameters stabilized
10/22/2012	On site	MW-130	S	12.63	--	6.3	0.31	336.9	6.70	-94.7	clear	Parameters stabilized.
11/14/2012	On site	MW-131	S,MNA w/ methane	11.39	--	4.1	0.25	280.5	7.26	-7.9	Clear	Parameters stabilized
11/14/2012	On site	MW-231	S,MNA w/ methane	--	--	--	--	--	--	--	--	Duplicate of MW-131
11/15/2012	On site	MW-133	S,B,COPC	12.86	--	4.8	0.17	222.5	7.33	20.0	Clear	Parameters stabilized
11/15/2012	On site	MW-233	COPC	--	--	--	--	--	--	--	--	Duplicate of MW-133
12/13/2012	On site	MW-138	S, COPC	10.26	--	2.70	0.42	355.8	6.22	-57.3	Clear	Parameters stabilized
11/14/2012	On site	MW-139	S,B,COPC	12.55	--	4.6	0.05	318.2	7.10	-75.3	Clear	> 3 well volumes purged
11/14/2012	On site	MW-239	S	--	--	--	--	--	--	--	--	Duplicate of MW-139
11/15/2012	On site	MW-141	S,B,COPC,PAH	8.02	--	8.7	0.10	258.7	7.33	-50.5	Clear	Parameters stabilized
11/11/2012	On site	MW-142	S,B,MNA w/ methane	11.68	--	4.4	0.11	301.9	7.35	-85.2	Clear	> 3 well volumes purged
11/11/2012	On site	MW-242	S	--	--	--	--	--	--	--	--	Duplicate of MW-142
11/15/2012	On site	MW-143	S,B,MNA w/ methane	10.87		3.3	0.34	244.1	7.20	-34.6	Clear	> 3 well volumes purged
11/15/2012	On site	MW-243	S	--	--	--	--	--	--	--	--	Duplicate of MW-143
11/14/2012	On site	MW-144A	S,B	10.61	--	4.0	0.23	259.5	6.52	48.4	Clear	> 3 well volumes purged
11/14/2012	On site	MW-144BR	S	10.22	--	4.5	0.11	197.1	7.27	85.2	Clear	Parameters stabilized
11/15/2012	On site	MW-145	S,B	10.67	--	4.5	0.09	317.1	6.98	10.3	Clear	Parameters stabilized
11/10/2012	On site	MW-149A	S,B,COPC	10.44	--	0.9	4.02	64.0	6.92	77.5	clear	> 3 well volumes purged
11/10/2012	On site	MW-149B	S,B	10.13	--	1.2	0.31	220.0	7.09	27.9	clear	parameters stabilized.
11/15/2012	On site	MW-154A	S,B	13.40	--	4.0	0.16	239.5	7.50	-96.6	Clear	Parameters stabilized
11/15/2012	On site	MW-154B	S,B	13.08	--	4.1	0.24	235.3	7.48	-115.3	Clear	Parameters stabilized
11/15/2012	On site	MW-254B	S	--	--	--	--	--	--	--	--	Duplicate of MW-154B
10/16/2012	On site	MW-174A	S,PFC	9.47	--	5.12	2.04	346[a]	7.26	-247.5	Clear	PID Headspace: VOC=0.0ppm
11/14/2012	On site	MW-175	S,B	11.64	--	4.5	0.09	215.5	7.29	-75.1	Clear	Parameters stabilized
12/12/2012	On site	MW-176A	S, B, MNA w/ methane, COPC	12.88	--	4.0	1.01	676.0	6.95	-78.0	clear	Parameters stabilized
12/12/2012	On site	MW-176B	S, B, MNA w/ methane, COPC	11.24	--	5.0	0.13	217.6	7.21	17.5	clear	Parameters stabilized
12/12/2012	On site	MW-176C	S,B	11.14	--	4.80	0.28	185.4	7.42	43.9	Clear	Parameters stabilized
12/13/2012	On site	MW-178A	S	10.83	--	3.00	0.11	258.4	8.74	-102.2	Clear	Parameters stabilized except for pH which was reading abnormally high
12/13/2012	On site	MW-178B	S,B	10.45	--	3.98	0.09	221.0	7.29	8.3	clear	Parameters stabilized
12/13/2012	On site	MW-278B	S	--	--	--	--	--	--	--	--	Duplicate of MW-178B
12/13/2012	On site	MW-178C	S,B	11.60	--	4.14	0.09	195.0	7.42	-60.0	Clear	Parameters stabilized
11/12/2012	On site	MW-180A	S, B, MNA w/ methane	‡	--	3.9	0.27	287.8	6.99	-44.0	Clear	Parameters stabilized
11/12/2012	On site	MW-180B	S, B, MNA w/ methane	‡	--	3.5	0.26	243.9	7.30	38.2	Clear	Parameters stabilized
11/12/2012	On site	MW-280B	MNA w/ methane	--	--	--	--	--	--	--	--	Duplicate of MW-180B
11/12/2012	On site	MW-180C	S,B	‡	--	3.5	0.20	241.0	7.41	-60.1	Clear	Parameters stabilized
12/13/2012	On site	MW-186A	S	11.88	--	3.00	0.89	61.2	7.34	-109.6	Clear	Parameters stabilized
11/15/2012	On site	MW-186B	S,B	10.81	--	4.1	0.26	67.9	7.44	49.0	Clear	Parameters stabilized
11/15/2012	On site	MW-286B	S	--	--	--	--	--	--	--	--	Duplicate of MW-186B
11/12/2012	On site	MW-186C	S,B	‡	--	5.0	0.25	208.6	7.44	-79.9	Clear	Parameters stabilized
11/12/2012	On site	MW-186D	S	‡	--	4.5	0.18	199.0	7.33	-114.2	Clear	Parameters stabilized
11/15/2012	On site	MW-186E	S	10.73	--	4.1	0.18	233.2	7.42	42.4	Clear	Parameters stabilized
10/15/2012	On site	MW-192A	S,PFC,VOC	9.65	16.96	5.72	3.20	358[a]	6.92	-87.8	Clear	PID Headspace: VOC=0.0ppm
10/15/2012	On site	MW-192B	PFC,VOC	9.22	62.69	4.85	2.28	327[a]	7.12	-157.9	Clear	PID Headspace: VOC=0.0ppm
10/15/2012	On site	MW-195A	S,B,PFC	11.02	18.00	5.56	0.93	455[a]	3.82[b]	248.4	Clear	PID Headspace: VOC=0.0ppm
11/15/2012	On site	MW-195A	S	10.28	--	5.3	0.22	296.4	6.88	75.6	Clear	Parameters stabilized
10/15/2012	On site	MW-195B	S,PFC,VOC	11.05	--	6.21	2.02	307[a]	7.16	-152.8	Clear	PID Headspace: VOC=0.0ppm
12/11/2012	On site	MW-196	S, PFC	10.72	--	2.72	1.36[c]	216.0	7.05	57.3	Clear	Parameters stabilized except for DO ranging between 1.4 mg/L and 1.16 mg/L
12/11/2012	On site	MW-296	S	--	--	--	--	--	--	--	--	Duplicate of MW-196
11/14/2012	On site	MW-197A	S	10.01	--	3.9	0.07	218.8	7.33	19.7	Clear	Parameters stabilized
12/9/2012	On site	MW-301-CMT-10	S, PFC	8.87	--	4.46	1.4[c]	241	6.01	-45.2	Clear	> 3 well volumes purged
12/9/2012	On site	MW-301-CMT-20	S, PFC	8.88	--	5.86	1.6[c]	456	7.45	3.5	Clear	> 3 well volumes purged
12/9/2012	On site	MW-301-CMT-40	S, PFC	8.91	--	5.4	0.13[c]	224.3	7.80	-25.5	Clear	Parameters stabilized
12/9/2012	On site	MW-302-CMT-10	S, PFC	10.26	--	--	--	--	--	--	--	Unable to obtain sample due to low water volume

Table 4-1
Groundwater Well Field Parameter Results
North Pole Refinery
Flint Hills Resources Alaska, LLC

Date	Location	Samples	Analysis	Depth to Water (feet)	Measured Total Well Depth	Temperature (°C)	DO (mg/L)	Conductivity (µS/cm)	pH	ORP (mV)	Water Clarity	Notes
12/9/2012	On site	MW-302-CMT-20	S, PFC	10.23	--	2.5	0.09[c]	436	7.29	-92.7	Clear	Parameters stabilized
12/9/2012	On site	MW-302-CMT-40	S, PFC	10.23	--	1.7	0.26[c]	200.2	7.22	-27.6	Clear	Parameters stabilized
12/9/2012	On site	MW-303-CMT-19	S, PFC	11.91	--	3.0	0.39[c]	484.0	7.27	7.0	Clear	> 3 well volumes purged
12/9/2012	On site	MW-303-CMT-39	S, PFC	11.90	--	2.5	0.15[c]	219.1	7.45	-67.7	Clear	Parameters stabilized
12/9/2012	On site	MW-303-CMT-9	S, PFC	11.90	--	2.04	0.63[c]	454	6.92	-87.9	Clear	Parameters stabilized
12/14/2012	On site	MW-304-70	S	12.87	--	4.00	0.06	174.2	7.33	36.4	Clear	Parameters stabilized
12/14/2012	On site	MW-304-80	S	12.67	--	3.80	0.26	51.5	7.42	56.6	Clear	Parameters stabilized
12/14/2012	On site	MW-304-95	S	12.84	--	4.50	0.09	174.9	7.40	32.5	Clear	Parameters stabilized
12/10/2012	On site	MW-304-CMT-10	S, PFC	--	--	--	--	--	--	--	--	frozen/obstruction at 2.99'
12/10/2012	On site	MW-304-CMT-15	S, PFC	12.97	--	2.84	0.14[c]	722[d]	6.88	-49.3	Clear	Parameters stabilized
12/10/2012	On site	MW-304-CMT-20	S, PFC	13.62	--	1.8	0.30[c]	264.9	7.04	-26.9	Clear	Parameters stabilized
12/10/2012	On site	MW-304-CMT-30	S, PFC	13.72	--	2.0	0.27[c]	221.1	7.40	-15.7	Clear	Parameters stabilized
12/14/2012	On site	MW-304-CMT-30	S	13.47	--	3.10	0.39	202.3	7.16	11.9	Clear	Parameters stabilized
12/14/2012	On site	MW-304-CMT-50	S	13.45	--	3.20	0.12	192.0	7.40	-27.1	Clear	Parameters stabilized
12/14/2012	On site	MW-304-CMT-60	S	13.54	--	3.40	0.18	182.4	7.33	275.0	Clear	Parameters stabilized
11/14/2012	On site	MW-305-70	S	11.35	--	4.0	0.21	241.8	7.40	47.8	Clear	Parameters stabilized
12/10/2012	On site	MW-305-CMT-18	S, PFC	12.49	--	3.13	0.23[c]	513.0	7.05	202.1	Clear	Parameters stabilized
12/10/2012	On site	MW-305-CMT-38	S, PFC	12.45	--	2.55	0.93[c]	158.0	6.05	-58.6	Clear	> 3 well volumes purged
12/10/2012	On site	MW-305-CMT-8	S, PFC	--	--	--	--	--	--	--	--	frozen/obstruction at 2.38'
12/10/2012	On site	MW-306-CMT-10	S, PFC	13.11	13.72	1.5	0.97[c]	262.5	6.80	54.9	Clear	Parameters stabilized
12/10/2012	On site	MW-306-CMT-20	S, PFC	13.11	--	2.88	0.17[c]	522.0	7.16	-15.9	Clear	Parameters stabilized
12/10/2012	On site	MW-306-CMT-40	S, PFC	13.11	--	2.65	0.16[c]	448.0	7.14	256.5	Clear	Parameters stabilized
11/12/2012	On site	MW-307	S	‡	--	4.7	0.13	196.3	7.43	25.9	Clear	Parameters stabilized
11/11/2012	On site	MW-309-15	S	10.30	--	3.6	0.21	274.6	6.91	-50.3	Clear	Parameters stabilized.
11/11/2012	On site	MW-309-150	S	9.88	--	4.8	0.14	210.6	7.39	42.2	Clear	Parameters stabilized.
11/11/2012	On site	MW-309-65	S	10.20	--	4.6	0.27	65.6	7.23	-62.4	Clear	Parameters stabilized.
11/15/2012	On site	MW-310-15	S	9.36	--	5.0	0.21	307.8	6.90	-57.5	Clear	> 3 well volumes purged
12/11/2012	On site	MW-310-15	PFC	9.89	--	2.8	0.26[c]	314.0	6.74	-17.3	Clear	Parameters stabilized
11/15/2012	On site	MW-310-65	S	9.39	--	5.6	0.22	230.2	7.36	-22.3	Clear	Parameters stabilized
10/15/2012	On site	MW-321-15	S,PFC	10.58	18.30	4.25	1.21	381	7.04	-63.4	Brownish	--
12/10/2012	On site	MW-321-15	PFC	10.41	--	2.57	0.23[c]	820[d]	7.03	-89.2	Clear	Parameters stabilized
12/13/2012	On site	MW-321-151	S	9.93	--	3.50	0.59	191.8	7.48	-10.2	Clear	Parameters stabilized
12/10/2012	On site	MW-321-65	PFC	10.14	--	3.39	0.26[c]	400.0	7.36	226.1	Clear	Parameters stabilized
12/13/2012	On site	MW-321-65	S	10.11	--	4.66	0.13	340.0	7.37	-85.4	Clear	Parameters stabilized
11/11/2012	On site	MW-328-151	S	7.64	--	2.0	0.17	169.5	7.49	-67.4	clear	Parameters stabilized.
11/15/2012	On site	MW-330-20	S	14.36	--	5.9	0.17	302.2	6.64	103.0	Clear	Parameters stabilized
12/11/2012	On site	MW-330-20	PFC	14.84	--	4.2	0.6[c]	290.2	6.76	2.0	clear	Parameters stabilized
11/15/2012	On site	MW-330-65	S	14.19	--	7.1	0.19	246.3	6.91	94.0	Clear	Parameters stabilized
11/11/2012	On site	MW-331-150	S	11.17	--	4.2	0.14	203.8	7.23	64.1	Clear	Parameters stabilized.
12/13/2012	On site	MW-334-15	S,B	12.47	--	3.20	R	240.2	7.30	-112.4	Clear	> 3 well volumes purged
12/13/2012	On site	MW-334-65	S,B	11.21	--	4.40	0.14	207.4	7.38	7.9	Clear	Parameters stabilized
12/14/2012	On site	MW-404-80	S	--	--	--	--	--	--	--	--	Duplicate of MW-304-80
12/14/2012	On site	MW-404-CMT-30	S	--	--	--	--	--	--	--	--	Duplicate of MW-304-CMT-30
12/13/2012	On site	O-1	S	11.46	--	3.40	0.27	329.0	7.33	-88.7	Clear	Parameters stabilized
12/11/2012	On site	O-116	B	--	--	--	--	--	--	--	--	Duplicate of O-16
11/15/2012	On site	O-12	S,B	11.37	--	5.1	0.04	237.8	7.25	-66.6	Clear	Parameters stabilized
12/11/2012	On site	O-15	PFC	12.45	--	3.0	0.25[c]	239.1	6.74	55.0	Clear	Parameters stabilized
12/11/2012	On site	O-16	B,PFC	7.36	--	3.7	0.46[c]	334.8	7.03	-54.4	clear	Parameters stabilized
11/14/2012	On site	O-24	S	12.05	--	5.2	0.11	408.5	6.73	-67.0	Clear	Parameters stabilized
11/14/2012	On site	O-26	S	12.11	--	5.1	0.12	379.0	7.36	-110.9	Clear	Parameters stabilized
11/15/2012	On site	O-3	S	12.88	--	5.0	1.58	533	7.00	-46.5	Clear	> 3 well volumes purged
11/9/2012	On site	O-4	S	11.74	--	4.7	0.13	295.0	6.64	-18.3	Clear	> 3 well volumes purged
11/9/2012	On site	O-6	S	9.62	--	5.2	0.16	293.6	6.77	-22.3	Clear	Parameters stabilized.
12/11/2012	On site	O-6	PFC	10.05	--	3.2	0.31[c]	276.3	6.78	3.4	Clear	Parameters stabilized
12/13/2012	On site	S-9	B	10.83	--	5.70	0.22	242.3	7.70	-93.7	Clear	> 3 well volumes purged
10/10/2012	Off site	EB-314-15	S	--	--	--	--	--	--	--	--	Equipment blank taken after MW-314-15
11/3/2012	Off site	EB-329-66	S	--	--	--	--	--	--	--	--	Equipment blank
10/31/2012	Off site	EB-332-150	S	--	--	--	--	--	--	--	--	Equipment blank
10/22/2012	Off site	MW-148A	S, MNA w/ methane, B, COPC, Bio-trap	10.57	--	4.1	0.34	195.7	6.52	0.5	clear	Parameters stabilized.
10/22/2012	Off site	MW-248A	S	--	--	--	--	--	--	--	--	Duplicate of MW-148A
11/11/2012	Off site	MW-148B	S,B,MNA w/ methane	9.35	--	3.0	0.22	269.7	6.60	-30.6	Clear	> 3 well volumes purged
10/31/2012	Off site	MW-148C	S	10.13	--	3.5	0.14	236.4	7.13	-53.6	clear	parameters stabilized.
10/31/2012	Off site	MW-148D	S	10.40	--	4.5	0.16	199.9	7.14	-18.8	clear	parameters stabilized.
10/31/2012	Off site	MW-150A	S	5.89	--	3.9	0.14	249.4	6.96	-49.8	clear	Parameters stabilized
10/31/2012	Off site	MW-150B	S	5.68	--	2.8	0.14	257.2	6.96	-34.2	clear	Parameters stabilized
10/31/2012	Off site	MW-250B	S	--	--	--	--	--	--	--	--	Duplicate of MW-150B
10/31/2012	Off site	MW-150C	S	5.15	--	--	--	--	--	--	--	Obstruction at 59.70' in well. No sample taken.
11/10/2012	Off site	MW-151A	S, G	5.05	--	2.5	0.40	254.7	7.08	-55.7	clear	Parameters stabilized
11/10/2012	Off site	MW-151B	S, G	4.99	--	2.3	0.19	240.3	7.17	-15.7	clear	>3 well volumes purged
11/10/2012	Off site	MW-151C	S	8.80	--	0.4	0.16	204.0	7.29	10.3	clear	Parameters stabilized
11/11/2012	Off site	MW-251C	S	--	--	--	--	--	--	--	--	Duplicate of MW-151C

Table 4-1
Groundwater Well Field Parameter Results
North Pole Refinery
Flint Hills Resources Alaska, LLC

Date	Location	Samples	Analysis	Depth to Water (feet)	Measured Total Well Depth	Temperature (°C)	DO (mg/L)	Conductivity (µS/cm)	pH	ORP (mV)	Water Clarity	Notes
11/9/2012	Off site	MW-152A	S, G	6.34	--	4.4	2.43	255.5	7.17	-37.9	clear	>3 well volumes purged
11/9/2012	Off site	MW-252A	S	--	--	--	--	--	--	--	--	Duplicate of MW-152A
11/9/2012	Off site	MW-152B	S, G	5.93	--	3.1	0.30	234.1	7.09	51.4	clear	Parameters stabilized
11/9/2012	Off site	MW-152C	S	6.01	--	1.2	0.40	200.2	7.35	85.6	clear	Parameters stabilized
11/14/2012	Off site	MW-153A	S, B,COPC	6.71	--	3.8	0.27	270.7	6.95	18.7	Clear	Parameters stabilized
11/14/2012	Off site	MW-253A	COPC	--	--	--	--	--	--	--	--	Duplicate of MW-153A
11/14/2012	Off site	MW-153B	S, B	6.19	--	3.3	0.25	245.3	7.37	-38.8	Clear	Parameters stabilized
11/10/2012	Off site	MW-155A	S	6.93	--	3.7	0.28	268.6	7.13	-79.8	clear	Parameters stabilized
11/10/2012	Off site	MW-155B	S	6.95	--	1.9	0.18	210.9	7.23	29.1	clear	Parameters stabilized
10/31/2012	Off site	MW-156A	S, G	6.85	--	2.9	0.24	77.4	6.92	-113.2	clear	Parameters stabilized
10/31/2012	Off site	MW-256A	G	--	--	--	--	--	--	--	--	Duplicate of MW-156A
10/31/2012	Off site	MW-156B	S, G	10.24	--	-0.2	0.20	225.9	7.24	5.9	clear	Parameters stabilized
10/31/2012	Off site	MW-256B	S	--	--	--	--	--	--	--	--	duplicate of MW-156B
10/31/2012	Off site	MW-157A	S, G	6.84	--	2.5	0.42	71.1	7.14	-56.7	clear	Parameters stabilized
10/31/2012	Off site	MW-157B	S	~8.2	--	0.8	0.32	259.2	7.20	-67.1	clear	>3 well volumes purged
10/31/2012	Off site	MW-257B	S	--	--	--	--	--	--	--	--	Duplicate of MW-157B
11/9/2012	Off site	MW-158A	S, G w/methane	7.15	--	3.1	3.09	436.8	6.50	30.4	clear	>3 well volumes purged
11/9/2012	Off site	MW-158B	S	5.68	--	0.6	2.89	228.4	7.24	7.0	clear	Parameters stabilized
10/31/2012	Off site	MW-159A	S, G	7.95	--	5.1	3.50	345.4	6.21	160.5	clear	Parameters stabilized
10/31/2012	Off site	MW-259A	S	--	--	--	--	--	--	--	--	Duplicate of MW-159A
10/31/2012	Off site	MW-159B	S	7.61	--	1.6	1.53	201.6	7.23	122.9	clear	Parameters stabilized
10/31/2012	Off site	MW-159C	S	8.08	--	0.9	1.62	197.7	7.18	135.3	clear	Parameters stabilized
10/31/2012	Off site	MW-259C	S	--	--	--	--	--	--	--	--	Duplicate of MW-159C
11/11/2012	Off site	MW-160B	S	6.67	--	0.9	0.21	217.0	7.00	-36.2	clear	Parameters stabilized
10/22/2012	Off site	MW-161A	S, G w/methane, Bio-trap	6.58	--	1.4	0.56	324.4	6.75	-81.2	clear	>3 well vol. & parameters stabilized
10/25/2012	Off site	MW-161B	S, G	6.85	--	-0.4	0.26	282.3	7.29	-31.2	clear	Parameters stabilized
10/31/2012	Off site	MW-162A	S, G	8.25	--	2.4	0.37	351.9	7.05	-107.5	clear	Parameters stabilized
10/31/2012	Off site	MW-162B	S, G	8.50	--	-0.2	0.33	212.1	7.09	25.3	clear	Parameters stabilized
10/30/2012	Off site	MW-163A	S, G	9.22	--	2.1	0.30	259.2	6.70	59.6	clear	Parameters stabilized
10/30/2012	Off site	MW-263A	S	--	--	--	--	--	--	--	--	Duplicate of MW-163A
10/30/2012	Off site	MW-163B	S	9.45	--	-0.3	0.24	216.3	7.07	-54.0	clear	Parameters stabilized
10/25/2012	Off site	MW-164A	S, G	7.44	--	2.0	0.40	342.6	7.33	-43.1	clear	>3 well volumes purged
10/25/2012	Off site	MW-164B	S	6.65	--	-0.3	0.33	243.3	7.14	-32.9	clear	Parameters stabilized
10/25/2012	Off site	MW-164C	S	6.61	--	-0.3	0.32	219.1	7.15	-37.6	clear	Parameters stabilized
10/25/2012	Off site	MW-264C	S	--	--	--	--	--	--	--	--	Duplicate of MW-164C
10/26/2012	Off site	MW-165A	S, G	6.62	--	3.8	0.87	222.5	6.16	84.3	turbid	>3 well volumes purged
10/26/2012	Off site	MW-165B	S	6.41	--	2.3	0.14	209.0	6.91	-16.2	clear	Parameters stabilized
10/8/2012	Off site	MW-166A	S, G w/methane	8.54	--	2.3	0.14	326.7	6.64	-27.4	clear	Parameters stabilized
10/23/2012	Off site	MW-166B	S, G	9.00	--	-0.4	0.34	280.9	6.93	-45.3	clear	>3 well volumes purged
10/23/2012	Off site	MW-266B	G	--	--	--	--	--	--	--	--	Duplicate of MW-166B
10/25/2012	Off site	MW-167A	S, G	9.51	--	1.0	0.65	480.8	6.87	3.0	clear	Parameters stabilized
10/25/2012	Off site	MW-167B	S, G	9.36	--	-0.3	0.46	468.3	6.81	39.3	clear	Parameters stabilized
10/26/2012	Off site	MW-168A	S, G	9.17	--	2.5	0.16	256.5	6.55	-37.1	clear	>3 well vol. & parameters stabilized
10/26/2012	Off site	MW-168B	S	9.23	--	0.4	0.26	202.4	6.96	-56.3	clear	Parameters stabilized
10/23/2012	Off site	MW-169A	S, G	9.57	--	1.2	0.35	217.5	7.23	-67.7	clear	>3 well volumes purged
10/23/2012	Off site	MW-269A	G	--	--	--	--	--	--	--	--	Duplicate of MW-169A
10/23/2012	Off site	MW-169C	S, G,COPC	6.16	--	-0.5	0.37	169.6	7.33	-72.1	clear	Parameters stabilized
10/31/2012	Off site	MW-170A	S	8.88	--	7.4	1.33	480.3	6.60	-8.3	clear	Parameters stabilized
11/3/2012	Off site	MW-170B	S	8.68	--	3.4	0.20	191.6	7.25	-35.9	clear	Parameters stabilized
10/31/2012	Off site	MW-170C	S	8.95	--	4.4	1.62	193.6	7.28	-7.1	clear	Parameters stabilized
11/3/2012	Off site	MW-170D	S	8.36	--	4.0	0.24	285.3	7.21	-8.6	clear	Parameters stabilized
10/30/2012	Off site	MW-171A	S, G	9.11	--	3.5	0.49	322.7	6.71	95.1	clear	>3 well volumes purged
10/30/2012	Off site	MW-171B	S, G	9.17	--	0.1	0.33	259.6	6.98	-100.6	clear	Parameters stabilized
10/20/2012	Off site	MW-172A	S	6.89	--	1.4	0.15	236.4	6.99	-77.2	clear	>3 well vol. & parameters stabilized
10/30/2012	Off site	MW-172B	S	6.78	--	3.3	0.13	169.9	7.23	-87.3	clear	Parameters stabilized
10/10/2012	Off site	MW-181A	S	9.19	--	3.3	2.86*	197.0	7.58	94.5	clear	>3 well volumes purged
10/10/2012	Off site	MW-181B	S	9.08	--	2.8	2.42*	176.6	7.80	30.3	clear	Parameters stabilized
10/11/2012	Off site	MW-181C	S	9.01	--	3.3	3.69*	200.1	7.90	-92.0	clear	Parameters stabilized
10/19/2012	Off site	MW-182A	S, G	6.39	--	1.0	0.15	247.5	6.57	-19.1	Clear	Parameters stabilized
10/19/2012	Off site	MW-182B	S	6.33	--	0.2	0.08	238.8	6.99	-32.1	clear	Parameters stabilized
10/30/2012	Off site	MW-183A	S	6.73	--	1.9	2.26	270.6	7.07	-46.6	clear	Parameters stabilized
10/30/2012	Off site	MW-283A	S	--	--	--	--	--	--	--	--	Duplicate of MW-183A
10/31/2012	Off site	MW-183B	S	6.73	--	0.3	1.79	240.9	6.93	157.2	clear	Parameters stabilized
10/22/2012	Off site	MW-184	S	7.93	--	0.2	0.17	169.1	7.02	13.9	clear	>3 well vol. & parameters stabilized
10/19/2012	Off site	MW-185A	S	7.28	--	3.7	0.24	354.5	7.20	-114.1	Clear	Parameters stabilized
10/20/2012	Off site	MW-185B	S	7.31	--	3.2	0.08	201.7	7.00	-89.5	clear	>3 well vol. & parameters stabilized

Table 4-1
Groundwater Well Field Parameter Results
North Pole Refinery
Flint Hills Resources Alaska, LLC

Date	Location	Samples	Analysis	Depth to Water (feet)	Measured Total Well Depth	Temperature (°C)	DO (mg/L)	Conductivity (µS/cm)	pH	ORP (mV)	Water Clarity	Notes
10/20/2012	Off site	MW-185C	S	7.66	--	3.4	0.08	159.4	7.17	-63.6	clear	Parameters stabilized
10/23/2012	Off site	MW-187	S	12.92	--	3.3	0.49	237.4	7.27	23.3	clear	Parameters stabilized
10/10/2012	Off site	MW-189A	S	4.70	--	0.9	3.07*	360.3	7.37	-71.8	clear	Parameters stabilized
10/10/2012	Off site	MW-189B	S	4.74	--	2.1	2.93*	199.9	7.68	-43.5	clear	Parameters stabilized
10/22/2012	Off site	MW-190A	S	8.35	--	3.4	0.17	203.5	6.36	3.1	clear	>3 well vol. & parameters stabilized
10/10/2012	Off site	MW-191A	S	5.45	--	5.8	2.18	224.7	6.89	22.5	clear	>3 well volumes purged
10/10/2012	Off site	MW-191B	S	5.38	--	3.3	0.03	199.4	7.22	-20.4	clear	Parameters stabilized
10/18/2012	Off site	MW-193A	S, G	8.87	--	3.1	1.05	357.5	6.55	8.1	clear	>3 well volumes purged
10/18/2012	Off site	MW-193B	S, G	8.51	--	0.2	0.11	174.2	6.88	13.1	clear	Parameters stabilized
10/10/2012	Off site	MW-194A	S	7.63	--	2.3	0.25	240.5	7.02	-33.0	clear	Parameters stabilized
10/10/2012	Off site	MW-194B	S	7.77	--	0.2	0.05	228.5	7.13	-17.0	clear	Parameters stabilized
10/10/2012	Off site	MW-294B	S	--	--	--	--	--	--	--	--	Duplicate of MW-194B
10/10/2012	Off site	MW-308-15	S	11.66	--	3.7	0.16	295.7	6.59	6.9	clear	Parameters stabilized
10/10/2012	Off site	MW-308-30	--	--	--	--	--	--	--	--	--	Frozen/obstruction in well. No sample taken.
10/10/2012	Off site	MW-311-15	S	3.55	--	4.8	4.20*	213.4	7.47	-17.8	clear	>3 well volumes purged
10/10/2012	Off site	MW-311-46	S	3.65	--	0.5	3.36*	176.1	7.54	7.1	clear	Parameters stabilized
10/10/2012	Off site	MW-314-15	S	8.40	--	1.7	6.94*	275.8	7.15	78.5	clear	>3 well volumes purged
10/11/2012	Off site	MW-314-150	S	8.13	--	2.8	4.00*	216.1	7.85	-100.1	Clear	Parameters stabilized
10/22/2012	Off site	MW-316-15	S	7.88	--	2.5	0.14	231.5	6.65	-43.2	clear	>3 well vol. & parameters stabilized
10/22/2012	Off site	MW-316-56	S	7.67	--	0.5	0.14	177.0	5.47	93.0	clear	>3 well volumes purged
11/10/2012	Off site	MW-317-15	S	6.78	--	3.0	0.61	259.8	6.81	124.9	clear	Parameters stabilized
11/10/2012	Off site	MW-317-71	S	6.74	--	-0.1	0.46	205.7	7.13	-18.4	clear	Parameters stabilized
10/30/2012	Off site	MW-318-135	S	11.33	--	2.6	4.06	197.1	7.33	61.3	clear	Parameters stabilized
10/30/2012	Off site	MW-318-20	S	11.02	--	1.0	4.33	196.7	7.11	-27.0	clear	Parameters stabilized
10/10/2012	Off site	MW-322-15	S	9.02	--	4.5	4.89*	219.6	7.05	104.3	clear	>3 well volumes purged
12/12/2012	Off site	MW-322-150	S	9.20	--	2.9	0.13	275.0	7.41	-35.1	clear	Parameters stabilized
11/12/2012	Off site	MW-323-15	S	7.20	--	0.3	0.23	232.1	6.83	-17.6	clear	Parameters stabilized
11/12/2012	Off site	MW-323-50	S	6.69	--	0.3	0.23	250.5	6.54	7.4	clear	>3 well volumes purged. Sample taken immediately after development of well
10/30/2012	Off site	MW-325-150	S	NA	--	3.9	0.15	163.5	7.43	-98.0	clear	Parameters stabilized
10/30/2012	Off site	MW-325-18	S	NA	--	4.8	1.37	220.3	6.76	6.2	clear	Parameters stabilized
10/10/2012	Off site	MW-328-15	S	7.52	--	3.9	2.67*	585	7.40	-65.3	clear	Parameters stabilized
11/3/2012	Off site	MW-329-15	S	10.44	--	2.7	0.29	304.0	6.70	7.6	clear	>3 well volumes purged
11/3/2012	Off site	MW-329-66	S	6.80	--	0.2	0.26	217.7	6.59	137.5	clear	Parameters stabilized
10/31/2012	Off site	MW-332-15	S	7.68	--	3.0	0.19	256.7	6.55	-37.2	clear	Parameters stabilized
10/30/2012	Off site	MW-332-150	S	NA	--	1.6	0.20	185.9	7.33	-85.6	clear	Parameters stabilized
10/3/2012	Off site	MW-335-41	S	5.19	40.08	-0.3	0.53	280.1	7.08	-97.4	clear	Sample taken immediately after development of well
12/12/2012	Off site	MW-422-150	S	--	--	--	--	--	--	--	--	Duplicate of MW-322-150

Notes:

µS/cm	microsiemens per centimeter
mg/L	milligrams per liter
mV	millivolts
°C	degrees centigrade
S	sulfolane
B	benzene, toluene, ethylbenzene, and xylenes
G	geochemistry for monitored natural attenuation
COPC	contaminants of potential concern
*	High DO readings, likely due to faulty YSI hose connectors sucking air.
MNA	monitored natural attenuation
PFC	perfluorinated compounds-- samples were taken by ARCADIS personnel.
PAH	polycyclic aromatic hydrocarbon
R	reading rejected due to noted DO sensor malfunction and anomolous high reading
[a]	conductivity readings recorded were 1/1000th those listed here; they were most likely recorded in mS/cm, though it was not noted on the sampling log
[b]	pH reading may be unreliable, anomolously low, though no issue noted on sampling log
[c]	one of the YSIs used during PFC sampling was set up to read in % DO, readings may be in % DO
[d]	possible conductivity probe malfunction, conductivity reading unreliable
‡	depth to water not recorded due to malfunctioning water sounder

Table 4-2
Groundwater Elevation and LNAPL Thickness
North Pole Refinery
Flint Hills Resources Alaska, LLC

Well ID	Date Measured	Riser Elevation (MSL ft)	Depth to Water (ft)	Depth to LNAPL (ft)	Corrected Water Table Elevation (MSL ft)	Proximity	Zone	Notes
MW-101	11/1/2012	494.59	10.73	–	483.86	On-site	10-55	Vertical Gradient
MW-101A	11/1/2012	495.01	11.13	–	483.88	On-site	Water Table	Vertical Gradient
MW-102	11/1/2012	496.02	12.29	–	483.73	On-site	55-90	
MW-104	11/1/2012	496.02	12.30	No LNAPL	483.72	On-site	10-55	
MW-105	11/1/2012	497.66	10.68	No LNAPL	486.98	On-site	10-55	
MW-105A	11/1/2012	499.21	12.32	No LNAPL	486.89	On-site	Water Table	
MW-106	11/1/2012	499.28	14.07	No LNAPL	485.21	On-site	Water Table	
MW-110	11/1/2012	496.73	11.42	No LNAPL	485.31	On-site	Water Table	
MW-113	11/1/2012	494.44	10.11	–	484.33	On-site	Water Table	
MW-121	Well Destroyed							
MW-125	11/1/2012	496.16	12.97	No LNAPL	483.19	On-site	Water Table	
MW-129	11/1/2012	496.05	11.73	No LNAPL	484.32	On-site	10-55	
MW-130	11/1/2012	496.88	12.42	No LNAPL	484.46	On-site	Water Table	
MW-131	11/1/2012	495.75	12.02	–	483.73	On-site	Water Table	Vertical Gradient
MW-133	11/1/2012	498.34	13.31	No LNAPL	485.03	On-site	Water Table	
MW-135	11/1/2012	496.94	12.68	12.62	484.31	On-site	Water Table	
MW-140	11/1/2012	494.90	10.94	No LNAPL	483.96	On-site	Water Table	
MW-141	11/1/2012	492.38	8.59	No LNAPL	483.79	On-site	Water Table	
MW-143	11/1/2012	495.37	11.52	–	483.85	On-site	Water Table	Vertical Gradient
MW-144A	11/1/2012	495.35	11.24	No LNAPL	484.11	On-site	Water Table	
MW-144BR	11/1/2012	494.98	10.81	No LNAPL	484.17	On-site	55-90	
MW-145	11/1/2012	495.61	11.32	No LNAPL	484.29	On-site	Water Table	
MW-146A	11/1/2012	495.09	11.04	–	484.05	On-site	Water Table	
MW-146B	11/1/2012	494.98	10.87	–	484.11	On-site	10-55	
MW-147B	11/1/2012	492.59	8.91	No LNAPL	483.68	On-site	10-55	
MW-148A	11/1/2012	493.33	10.43	–	482.90	Off-site	Water Table	Vertical Gradient

Table 4-2
Groundwater Elevation and LNAPL Thickness
North Pole Refinery
Flint Hills Resources Alaska, LLC

Well ID	Date Measured	Riser Elevation (MSL ft)	Depth to Water (ft)	Depth to LNAPL (ft)	Corrected Water Table Elevation (MSL ft)	Proximity	Zone	Notes
MW-148B	11/1/2012	492.78	9.80	–	482.98	Off-site	10-55	Vertical Gradient
MW-148C	11/1/2012	493.29	9.96	–	483.33	Off-site	10-55	Vertical Gradient
MW-148D	11/1/2012	493.02	10.23	–	482.79	Off-site	90-160	Vertical Gradient
MW-149A	11/1/2012	493.68	10.87	–	482.81	On-site	Water Table	
MW-150A	11/1/2012	487.14	5.78	–	481.36	Off-site	Water Table	
MW-150B	11/1/2012	486.95	5.56	–	481.39	Off-site	10-55	
MW-151A	11/1/2012	487.22	5.35	–	481.87	Off-site	Water Table	
MW-151C	11/1/2012	491.11	9.09	–	482.02	Off-site	10-55	
MW-152A	11/1/2012	488.44	6.70	–	481.74	Off-site	Water Table	
MW-152B	11/1/2012	488.02	6.28	–	481.74	Off-site	10-55	
MW-152C	11/1/2012	488.10	6.38	–	481.72	Off-site	10-55	
MW-153A	11/2/2012	490.20	7.19	–	483.01	Off-site	Water Table	
MW-153B	11/2/2012	489.72	6.65	–	483.07	Off-site	10-55	
MW-154A	11/1/2012	498.04	13.96	No LNAPL	484.08	On-site	55-90	
MW-155A	11/1/2012	488.19	7.42	–	480.77	Off-site	Water Table	
MW-156A	11/1/2012	485.88	6.80	–	479.08	Off-site	Water Table	
MW-156B	11/1/2012	489.36	10.19	–	479.17	Off-site	10-55	
MW-157A	11/1/2012	484.82	6.81	–	478.01	Off-site	Water Table	
MW-157B	11/1/2012	485.08	7.10	–	477.98	Off-site	10-55	
MW-158A	11/1/2012	487.90	7.36	–	480.54	Off-site	Water Table	
MW-158B	11/1/2012	487.46	6.98	–	480.48	Off-site	10-55	
MW-159A	11/1/2012	488.52	7.89	–	480.63	Off-site	Water Table	
MW-159B	11/1/2012	488.22	7.53	–	480.69	Off-site	10-55	
MW-159C	11/1/2012	488.70	8.03	–	480.67	Off-site	55-90	
MW-160B	11/1/2012	485.53	6.90	–	478.63	Off-site	55-90	
MW-161A	11/1/2012	479.46	6.47	–	472.99	Off-site	Water Table	
MW-161B	11/1/2012	479.60	6.60	–	473.00	Off-site	10-55	
MW-162A	11/1/2012	483.92	8.21	–	475.71	Off-site	Water Table	
MW-162B	11/1/2012	484.11	8.43	–	475.68	Off-site	10-55	
MW-163A	11/1/2012	485.02	9.19	–	475.83	Off-site	Water Table	

Table 4-2
Groundwater Elevation and LNAPL Thickness
North Pole Refinery
Flint Hills Resources Alaska, LLC

Well ID	Date Measured	Riser Elevation (MSL ft)	Depth to Water (ft)	Depth to LNAPL (ft)	Corrected Water Table Elevation (MSL ft)	Proximity	Zone	Notes
MW-163B	11/1/2012	484.80	9.40	–	475.40	Off-site	10-55	
MW-164A	11/1/2012	480.22	7.40	–	472.82	Off-site	Water Table	
MW-164B	11/1/2012	479.47	6.59	–	472.88	Off-site	10-55	
MW-164C	11/1/2012	479.45	6.55	–	472.90	Off-site	10-55	
MW-165A	11/1/2012	474.79	5.99	–	468.80	Off-site	Water Table	
MW-165B	11/1/2012	474.64	5.73	–	468.91	Off-site	10-55	
MW-166A	11/1/2012	474.93	7.74	–	467.19	Off-site	Water Table	
MW-166B	11/1/2012	475.43	8.26	–	467.17	Off-site	10-55	
MW-167A	11/1/2012	475.70	9.53	–	466.17	Off-site	Water Table	
MW-167B	11/1/2012	475.57	9.38	–	466.19	Off-site	10-55	
MW-168A	11/1/2012	478.27	9.05	–	469.22	Off-site	Water Table	
MW-168B	11/1/2012	478.34	9.10	–	469.24	Off-site	10-55	
MW-169A	11/1/2012	485.90	8.60	–	477.30	Off-site	Water Table	
MW-169C	11/1/2012	482.56	5.32	–	477.24	Off-site	10-55	
MW-170A	11/1/2012	490.66	8.79	–	481.87	Off-site	Water Table	
MW-170B	11/1/2012	490.74	8.78	–	481.96	Off-site	55-90	
MW-170C	11/1/2012	490.87	8.87	–	482.00	Off-site	90-160	
MW-170D	11/1/2012	490.41	8.47	–	481.94	Off-site	10-55	
MW-171A	11/1/2012	484.77	9.09	–	475.68	Off-site	Water Table	
MW-171B	11/1/2012	484.83	9.16	–	475.67	Off-site	10-55	
MW-172A	11/1/2012	475.72	6.77	–	468.95	Off-site	Water Table	
MW-172B	11/1/2012	475.73	6.78	–	468.95	Off-site	90-160	
MW-173A	11/1/2012	496.28	12.14	No LNAPL	484.14	On-site	Water Table	
MW-173B	11/1/2012	496.40	12.15	No LNAPL	484.25	On-site	90-160	
MW-174A	11/1/2012	494.25	9.29	–	484.96	On-site	10-55	
MW-174B	11/1/2012	493.37	8.56	–	484.81	On-site	55-90	
MW-175	11/1/2012	497.06	12.28	No LNAPL	484.78	On-site	55-90	
MW-176B	11/1/2012	496.93	11.47	No LNAPL	485.46	On-site	10-55	
MW-176C	11/1/2012	496.86	11.35	No LNAPL	485.51	On-site	55-90	
MW-177	11/1/2012	497.92	11.20	No LNAPL	486.72	On-site	55-90	
MW-178C	11/1/2012	497.27	11.80	No LNAPL	485.47	On-site	55-90	

Table 4-2
Groundwater Elevation and LNAPL Thickness
North Pole Refinery
Flint Hills Resources Alaska, LLC

Well ID	Date Measured	Riser Elevation (MSL ft)	Depth to Water (ft)	Depth to LNAPL (ft)	Corrected Water Table Elevation (MSL ft)	Proximity	Zone	Notes
MW-179A	11/1/2012	496.96	11.46	No LNAPL	485.50	On-site	Water Table	Vertical Gradient
MW-179B	11/1/2012	496.75	11.21	No LNAPL	485.54	On-site	10-55	Vertical Gradient
MW-179C	11/1/2012	497.27	11.73	No LNAPL	485.54	On-site	55-90	Vertical Gradient
MW-179D	11/1/2012	497.06	11.53	No LNAPL	485.53	On-site	90-160	Vertical Gradient
MW-180B	11/1/2012	496.87	11.14	No LNAPL	485.73	On-site	10-55	
MW-180C	11/1/2012	497.05	11.29	No LNAPL	485.76	On-site	55-90	
MW-181A	11/1/2012	475.90	9.05	–	466.85	Off-site	Water Table	Vertical Gradient
MW-181B	11/1/2012	475.83	8.94	–	466.89	Off-site	10-55	Vertical Gradient
MW-181C	11/1/2012	475.96	8.95	–	467.01	Off-site	90-160	Vertical Gradient
MW-182A	11/1/2012	475.65	6.54	–	469.11	Off-site	Water Table	
MW-182B	11/1/2012	475.40	6.37	–	469.03	Off-site	10-55	
MW-183A	11/1/2012	478.06	6.63	–	471.43	Off-site	Water Table	
MW-183B	11/1/2012	478.06	6.68	–	471.38	Off-site	10-55	
MW-184	11/1/2012	486.64	7.99	–	478.65	Off-site	10-55	
MW-185A	11/1/2012	478.08	7.18	–	470.90	Off-site	Water Table	Vertical Gradient
MW-185B	11/1/2012	478.09	7.22	–	470.87	Off-site	10-55	Vertical Gradient
MW-185C	11/1/2012	478.48	7.56	–	470.92	Off-site	90-160	Vertical Gradient
MW-186A	11/1/2012	495.95	12.17	11.61	484.24	On-site	Water Table	
MW-186B	11/1/2012	495.80	11.46	No LNAPL	484.34	On-site	10-55	
MW-186D	11/1/2012	495.72	11.29	No LNAPL	484.43	On-site	90-160	
MW-186E	11/1/2012	495.71	11.38	No LNAPL	484.33	On-site	55-90	
MW-187	11/1/2012	485.52	12.46	–	473.06	Off-site	Water Table	
MW-188A	11/1/2012	461.84	5.43	–	456.41	Off-site	Water Table	
MW-188B	11/1/2012	461.53	5.13	–	456.40	Off-site	10-55	
MW-189A	11/1/2012	470.21	4.62	–	465.59	Off-site	Water Table	
MW-189B	11/1/2012	470.25	4.64	–	465.61	Off-site	10-55	
MW-190A	11/1/2012	481.67	8.32	–	473.35	Off-site	Water Table	
MW-190B	11/1/2012	481.56	8.11	–	473.45	Off-site	10-55	
MW-191A	11/1/2012	475.62	5.58	–	470.04	Off-site	Water Table	
MW-191B	11/1/2012	475.51	5.45	–	470.06	Off-site	10-55	
MW-192A	11/1/2012	495.90	9.46	No LNAPL	486.44	On-site	Water Table	

Table 4-2
Groundwater Elevation and LNAPL Thickness
North Pole Refinery
Flint Hills Resources Alaska, LLC

Well ID	Date Measured	Riser Elevation (MSL ft)	Depth to Water (ft)	Depth to LNAPL (ft)	Corrected Water Table Elevation (MSL ft)	Proximity	Zone	Notes
MW-192B	11/1/2012	495.47	9.02	No LNAPL	486.45	On-site	10-55	
MW-193A	11/1/2012	487.70	8.25	–	479.45	Off-site	Water Table	
MW-193B	11/1/2012	487.40	7.98	–	479.42	Off-site	10-55	
MW-194A	11/1/2012	475.68	7.38	–	468.30	Off-site	Water Table	
MW-194B	11/1/2012	475.88	7.55	–	468.33	Off-site	10-55	
MW-195A	11/1/2012	496.10	10.90	–	485.20	On-site	Water Table	
MW-195B	11/1/2012	496.12	10.89	–	485.23	On-site	90-160	
MW-197A	11/1/2012	495.17	10.67	No LNAPL	484.50	On-site	10-55	
MW-198	11/1/2012	493.32	7.65	No LNAPL	485.67	On-site	90-160	
MW-199	11/1/2012	495.90	11.41	–	484.49	On-site	90-160	
MW-300	11/1/2012	496.00	10.45	No LNAPL	485.55	On-site	90-160	
MW-301-60	11/1/2012	492.85	8.94	–	483.91	On-site	10-55	Vertical Gradient
MW-301-70	11/1/2012	492.46	8.52	–	483.94	On-site	55-90	Vertical Gradient
MW-301-CMT-10	11/1/2012	492.88	8.99	–	483.89	On-site	Water Table	Vertical Gradient
MW-301-CMT-20	11/1/2012	492.88	8.98	–	483.90	On-site	10-55	Vertical Gradient
MW-301-CMT-30	11/1/2012	492.88	8.98	–	483.90	On-site	10-55	Vertical Gradient
MW-301-CMT-40	11/1/2012	492.88	8.99	–	483.89	On-site	10-55	Vertical Gradient
MW-301-CMT-50	11/1/2012	492.88	9.10	–	483.78	On-site	10-55	Vertical Gradient
MW-302-110	11/1/2012	493.65	9.83	–	483.82	On-site	90-160	
MW-302-70	11/1/2012	493.29	9.41	–	483.88	On-site	55-90	Vertical Gradient
MW-302-80	11/1/2012	493.49	9.67	–	483.82	On-site	55-90	Vertical Gradient
MW-302-95	11/1/2012	493.00	9.12	–	483.88	On-site	55-90	Vertical Gradient
MW-302-CMT-10	11/1/2012	494.32	10.50	–	483.82	On-site	Water Table	Vertical Gradient
MW-302-CMT-20	11/1/2012	494.32	10.47	–	483.85	On-site	10-55	Vertical Gradient
MW-302-CMT-30	11/1/2012	494.32	10.48	–	483.84	On-site	10-55	Vertical Gradient
MW-302-CMT-40	11/1/2012	494.32	10.47	–	483.85	On-site	10-55	Vertical Gradient
MW-302-CMT-50	11/1/2012	494.32	10.48	–	483.84	On-site	10-55	Vertical Gradient
MW-303-130	11/1/2012	495.15	11.24	–	483.91	On-site	90-160	Vertical Gradient
MW-303-70	11/1/2012	495.06	11.26	–	483.80	On-site	55-90	Vertical Gradient
MW-303-80	11/1/2012	495.12	11.27	–	483.85	On-site	55-90	Vertical Gradient
MW-303-95	11/1/2012	495.12	12.24	–	482.88	On-site	55-90	Vertical Gradient

Table 4-2
Groundwater Elevation and LNAPL Thickness
North Pole Refinery
Flint Hills Resources Alaska, LLC

Well ID	Date Measured	Riser Elevation (MSL ft)	Depth to Water (ft)	Depth to LNAPL (ft)	Corrected Water Table Elevation (MSL ft)	Proximity	Zone	Notes
MW-303-CMT-9	11/1/2012	495.85	12.02	–	483.83	On-site	Water Table	Vertical Gradient
MW-303-CMT-19	11/1/2012	495.85	12.02	–	483.83	On-site	10-55	Vertical Gradient
MW-303-CMT-29	11/1/2012	495.85	12.02	–	483.83	On-site	10-55	Vertical Gradient
MW-303-CMT-39	11/1/2012	495.85	12.02	–	483.83	On-site	10-55	Vertical Gradient
MW-303-CMT-49	11/1/2012	495.85	12.02	–	483.83	On-site	10-55	Vertical Gradient
MW-303-CMT-59	11/1/2012	495.85	12.02	–	483.83	On-site	10-55	Vertical Gradient
MW-304-125	11/1/2012	497.32	13.48	–	483.84	On-site	90-160	
MW-304-15	11/1/2012	496.97	13.16	–	483.81	On-site	Water Table	Vertical Gradient
MW-304-150	11/1/2012	497.21	13.35	–	483.86	On-site	90-160	
MW-304-70	11/1/2012	496.99	13.12	–	483.87	On-site	55-90	Vertical Gradient
MW-304-80	11/1/2012	496.75	12.90	–	483.85	On-site	55-90	Vertical Gradient
MW-304-96	11/1/2012	496.95	13.80	–	483.15	On-site	55-90	Vertical Gradient
MW-304-CMT-10	11/1/2012	497.63	obstruction at 2.94'	–	--	On-site	Water Table	Vertical Gradient
MW-304-CMT-20	11/1/2012	497.63	13.86	–	483.77	On-site	10-55	Vertical Gradient
MW-304-CMT-30	11/1/2012	497.63	13.85	–	483.78	On-site	10-55	Vertical Gradient
MW-304-CMT-40	11/1/2012	497.63	13.86	–	483.77	On-site	10-55	Vertical Gradient
MW-304-CMT-50	11/1/2012	497.63	13.85	–	483.78	On-site	10-55	Vertical Gradient
MW-304-CMT-60	11/1/2012	497.63	13.85	–	483.78	On-site	10-55	Vertical Gradient
MW-305-100	11/1/2012	495.71	11.94	–	483.77	On-site	90-160	Vertical Gradient
MW-305-70	11/1/2012	495.67	11.93	–	483.74	On-site	55-90	Vertical Gradient
MW-305-80	11/1/2012	495.38	11.66	–	483.72	On-site	55-90	Vertical Gradient
MW-305-CMT-8	11/1/2012	496.39	obstruction at 11.10'	–	--	On-site	Water Table	Vertical Gradient
MW-305-CMT-18	11/1/2012	496.39	12.66	–	483.73	On-site	10-55	Vertical Gradient
MW-305-CMT-28	11/1/2012	496.39	12.66	–	483.73	On-site	10-55	Vertical Gradient
MW-305-CMT-38	11/1/2012	496.39	12.64	–	483.75	On-site	10-55	Vertical Gradient
MW-305-CMT-48	11/1/2012	496.39	12.66	–	483.73	On-site	10-55	Vertical Gradient
MW-305-CMT-58	11/1/2012	496.39	12.68	–	483.71	On-site	10-55	Vertical Gradient
MW-306-100	11/1/2012	495.55	11.98	–	483.57	On-site	55-90	Vertical Gradient
MW-306-15	11/1/2012	496.78	13.14	–	483.64	On-site	Water Table	Vertical Gradient
MW-306-150	11/1/2012	495.98	12.45	–	483.53	On-site	90-160	Vertical Gradient
MW-306-70	11/1/2012	496.70	13.10	–	483.60	On-site	55-90	Vertical Gradient

Table 4-2
Groundwater Elevation and LNAPL Thickness
North Pole Refinery
Flint Hills Resources Alaska, LLC

Well ID	Date Measured	Riser Elevation (MSL ft)	Depth to Water (ft)	Depth to LNAPL (ft)	Corrected Water Table Elevation (MSL ft)	Proximity	Zone	Notes
MW-306-80	11/1/2012	496.52	12.92	–	483.60	On-site	55-90	Vertical Gradient
MW-306-CMT-10	11/1/2012	496.95	13.35	–	483.60	On-site	Water Table	Vertical Gradient
MW-306-CMT-20	11/1/2012	496.95	13.35	–	483.60	On-site	10-55	Vertical Gradient
MW-306-CMT-30	11/1/2012	496.95	13.35	–	483.60	On-site	10-55	Vertical Gradient
MW-306-CMT-40	11/1/2012	496.95	13.35	–	483.60	On-site	10-55	Vertical Gradient
MW-306-CMT-50	11/1/2012	496.95	13.35	–	483.60	On-site	10-55	Vertical Gradient
MW-306-CMT-60	11/1/2012	496.95	13.35	–	483.60	On-site	10-55	Vertical Gradient
MW-307	11/1/2012	495.49	10.85	No LNAPL	484.64	On-site	90-160	
MW-309-15	11/1/2012	495.08	10.91	–	484.17	On-site	Water Table	
MW-309-66	11/1/2012	495.05	10.75	–	484.30	On-site	10-55	
MW-310-110	11/1/2012	494.26	9.79	–	484.47	On-site	90-160	
MW-310-15	11/1/2012	494.32	10.19	–	484.13	On-site	Water Table	
MW-310-65	11/1/2012	494.48	10.08	–	484.40	On-site	10-55	
MW-311-15	11/1/2012	467.00	5.01	–	461.99	Off-site	Water Table	
MW-311-46	11/1/2012	467.06	5.10	–	461.96	Off-site	10-55	
MW-312-15	11/1/2012	464.12	5.45	–	458.67	Off-site	Water Table	
MW-312-50	11/1/2012	464.30	5.61	–	458.69	Off-site	10-55	
MW-313-15	11/1/2012	465.79	4.32	–	461.47	Off-site	Water Table	
MW-315-15	11/1/2012	458.44	5.67	–	452.77	Off-site	Water Table	
MW-315-150	11/1/2012	458.96	6.14	–	452.82	Off-site	90-160	
MW-317-71	11/1/2012	488.79	7.10	–	481.69	Off-site	55-90	
MW-318-135	11/1/2012	493.10	10.74	–	482.36	Off-site	90-160	
MW-318-20	11/1/2012	492.86	10.44	–	482.42	Off-site	Water Table	
MW-319-15	11/1/2012	456.10	4.97	–	451.13	Off-site	Water Table	
MW-319-45	11/1/2012	455.96	4.79	–	451.17	Off-site	10-55	
MW-321-15	11/1/2012	495.59	10.05	–	485.54	On-site	Water Table	
MW-321-65	11/1/2012	495.26	10.23	–	485.03	On-site	10-55	
MW-322-15	11/1/2012	472.01	8.66	–	463.35	Off-site	Water Table	
MW-322-150	11/1/2012	472.12	8.71	–	463.41	Off-site	90-160	
MW-324-15	11/1/2012	463.41	7.33	–	456.08	Off-site	Water Table	
MW-324-151	11/1/2012	462.90	6.74	–	456.16	Off-site	90-160	

Table 4-2
Groundwater Elevation and LNAPL Thickness
North Pole Refinery
Flint Hills Resources Alaska, LLC

Well ID	Date Measured	Riser Elevation (MSL ft)	Depth to Water (ft)	Depth to LNAPL (ft)	Corrected Water Table Elevation (MSL ft)	Proximity	Zone	Notes
MW-326-20	11/1/2012	500.55	8.41	–	492.14	Off-site	Water Table	
MW-326-150	11/1/2012	500.47	8.23	–	492.24	Off-site	90-160	
MW-327-15	11/1/2012	467.82	7.22	–	460.60	Off-site	Water Table	
MW-327-150	11/1/2012	467.61	6.84	–	460.77	Off-site	90-160	
MW-328-15	11/1/2012	472.36	7.45	–	464.91	Off-site	Water Table	
MW-328-151	11/1/2012	472.68	7.74	–	464.94	Off-site	90-160	
MW-330-65	11/1/2012	499.83	14.79	No LNAPL	485.04	On-site	10-55	
MW-332-15	11/1/2012	481.80	7.67	–	474.13	Off-site	Water Table	
MW-332-150	11/1/2012	481.35	7.24	–	474.11	Off-site	90-160	
MW-333-16	11/1/2012	497.67	8.68	–	488.99	Off-site	Water Table	
MW-333-150	11/1/2012	497.62	8.39	–	489.23	Off-site	90-160	
MW-334-65	11/1/2012	495.82	11.46	No LNAPL	484.36	On-site	10-55	
North Gravel Pit	11/2/2012	492.81	8.58	–	484.23	On-site		Surface Water
O-1	11/1/2012	497.14	11.62	No LNAPL	485.52	On-site	Water Table	
O-12	11/1/2012	496.17	12.01	No LNAPL	484.16	On-site	Water Table	
O-14	11/1/2012	494.90	9.21	No LNAPL	485.69	On-site	Water Table	
O-15	11/1/2012	498.70	12.54	No LNAPL	486.16	On-site	Water Table	
O-17	11/1/2012	493.26	8.38	No LNAPL	484.88	On-site	Water Table	
O-18	11/1/2012	492.70	7.59	No LNAPL	485.11	On-site	Water Table	
O-2	11/1/2012	497.54	12.81	12.52	484.97	On-site	Water Table	
O-22	11/1/2012	496.76	11.98	No LNAPL	484.78	On-site	Water Table	
O-23	11/1/2012	495.83	11.34	No LNAPL	484.49	On-site	Water Table	
O-24	11/1/2012	496.87	12.70	No LNAPL	484.17	On-site	Water Table	
O-26	11/1/2012	496.82	12.75	No LNAPL	484.07	On-site	Water Table	
O-27	11/1/2012	496.86	12.70	12.68	484.18	On-site	Water Table	
O-28	11/1/2012	494.65	8.88	No LNAPL	485.77	On-site	Water Table	
O-29	11/1/2012	498.61	13.60	No LNAPL	485.01	On-site	Water Table	
O-3	11/1/2012	497.76	13.58	No LNAPL	484.18	On-site	Water Table	
O-4	11/1/2012	496.50	12.26	No LNAPL	484.24	On-site	Water Table	
O-5	11/1/2012	496.11	11.85	–	484.26	On-site	Water Table	
O-6	11/1/2012	494.73	10.17	No LNAPL	484.56	On-site	Water Table	

Table 4-2
Groundwater Elevation and LNAPL Thickness
North Pole Refinery
Flint Hills Resources Alaska, LLC

Well ID	Date Measured	Riser Elevation (MSL ft)	Depth to Water (ft)	Depth to LNAPL (ft)	Corrected Water Table Elevation (MSL ft)	Proximity	Zone	Notes
O-8	11/1/2012	496.72	11.26	No LNAPL	485.46	On-site	Water Table	
R-14A	11/1/2012	494.09	10.10	9.82	484.22	On-site	Water Table	
R-21	11/1/2012	495.52	12.47	12.40	483.11	On-site	Water Table	
R-35R	11/1/2012	494.72	19.20	19.19	475.53	On-site	Water Table	
R-39	11/1/2012	495.05	17.39	sheen	477.66	On-site	Water Table	
R-40	11/1/2012	494.46	18.28	18.18	476.26	On-site	Water Table	
R-42	11/1/2012	493.31	10.81	–	482.50	On-site	Water Table	
S-32	11/1/2012	495.82	11.44	No LNAPL	484.38	On-site	Water Table	
S-39	11/1/2012	494.07	11.18	11.10	482.95	On-site	Water Table	
S-43	11/1/2012	496.21	11.70	sheen	484.51	On-site	Water Table	
S-44	11/1/2012	495.02	11.35	10.60	484.25	On-site	Water Table	
S-50	11/1/2012	496.68	12.75	12.04	484.53	On-site	Water Table	
S-54	11/1/2012	497.01	13.40	No LNAPL	483.61	On-site	Water Table	
South Gravel Pit*	11/2/2012	493.51	9.55 (depth of water)	–	491.06	On-site		Surface Water

Notes:

Groundwater elevation in wells where LNAPL was present were corrected by: (riser elevation - depth to water) + (specific gravity*LNAPL Thickness), where specific gravity of LNAPL corresponds to various specific gravity values presented in the SCR - 2011 (Barr 2012).

MSL	Mean sea level
LNAPL	Light Non-Aqueous Phase Liquid
ft	feet
–	A water sounder was used to measure the groundwater elevation; well not checked with interface for presence of LNAPL.
No LNAPL	An interface probe was used, but no LNAPL was measured or observed.
sheen	An interface probe was used. No measurable LNAPL was present, but LNAPL was observed visually.
*	The South Gravel Pit measurement is taken from a 12 foot staff gauge in the pond. The 12 foot mark on the gauge is at at elevation of 498.10 MSL ft.

Table 4-3
LNAPL Thickness Results
North Pole Refinery
Flint Hills Resources Alaska, LLC

			October 2012					November 2012					December 2012				
Well ID	Top of Riser Elevation (MSL ft.)	Frequency	Date Measured	LNAPL Thickness (ft.)	Depth to LNAPL (ft.)	Depth to Water (ft.)	Corrected Water Table Elevation (MSL ft.)	Date Measured	LNAPL Thickness (ft.)	Depth to LNAPL (ft.)	Depth to Water (ft.)	Corrected Water Table Elevation (MSL ft.)	Date Measured	LNAPL Thickness (ft.)	Depth to LNAPL (ft.)	Depth to Water (ft.)	Corrected Water Table Elevation (MSL ft.)
MW-138	496.34	monthly	10/15/2012	0.08	10.46	10.54	485.87	11/29/2012	0.02	10.07	10.09	486.27	12/28/2012	0.07	10.45	10.52	485.88
MW-176A	497.02	monthly	10/15/2012	2.50	11.17	13.67	485.39	11/29/2012	1.27	10.96	12.23	485.82	12/28/2012	1.98	11.23	13.21	485.42
MW-186A	495.95	monthly	10/15/2012	0.53	11.56	12.09	484.29	11/29/2012	0.36	11.16	11.52	484.72	12/27/2012	0.48	11.48	11.96	484.38
MW-334-15[1]*	495.87	monthly	10/15/2012	1.41	11.33	12.74	484.26	11/29/2012	1.07	11.01	12.08	484.65	12/27/2012	1.29	11.32	12.61	484.29
O-10	496.36	monthly	10/15/2012	0.71	10.97	11.68	485.26	11/29/2012	0.89	10.62	11.51	485.58	12/28/2012	0.96	11.04	12.00	485.15
O-11	497.87	monthly	10/15/2012	0.93	13.52	14.45	484.19	11/29/2012	0.44	13.18	13.62	484.62	12/28/2012	0.89	13.45	14.34	484.27
O-13	495.37	monthly	10/15/2012	0.39	11.06	11.45	484.24	11/29/2012	0.20	10.70	10.90	484.64	12/28/2012	0.16	11.03	11.19	484.31
O-19	496.48	monthly	10/15/2012	0.56	11.80	12.36	484.57	11/29/2012	0.21	11.44	11.65	485.00	12/28/2012	0.17	11.80	11.97	484.65
O-2	497.54	monthly	10/15/2012	0.42	12.44	12.86	485.02	11/29/2012	0.47	12.04	12.51	485.41	12/28/2012	0.40	12.43	12.83	485.03
O-21	493.12	monthly	10/16/2012	0.05	7.28	7.33	485.83	11/29/2012	0.01	6.80	6.81	486.32	12/28/2012	0.02	7.14	7.16	485.98
O-27	496.86	monthly	10/15/2012	0.91	12.50	13.41	484.21	11/29/2012	0.23	12.19	12.42	484.63	12/28/2012	0.45	12.52	12.97	484.26
O-7	496.01	monthly	10/15/2012	0.01	11.13	11.14	484.88	11/29/2012	sheen	sheen	10.85	485.16	12/28/2012	0.01	11.19	11.20	484.82
O-9	496.95	monthly	10/15/2012	0.09	11.69	11.78	485.24	11/29/2012	sheen	sheen	11.37	485.58	12/28/2012	0.02	11.74	11.76	485.21
R-14A	494.09	monthly	10/15/2012	0.81	9.70	10.51	484.24	11/29/2012	0.26	9.37	9.63	484.67	12/28/2012	0.58	9.67	10.25	484.31
R-18	499.76	monthly	10/15/2012	0.37	14.82	15.19	484.86	11/29/2012	0.22	14.47	14.69	485.24	12/28/2012	0.42	14.79	15.21	484.88
R-20R	498.74	monthly	10/15/2012	0.07	13.59	13.66	485.14	11/29/2012	0.10	13.13	13.23	485.59	12/28/2012	0.11	13.49	13.60	485.23
R-21	495.52	monthly	10/15/2012	0.10	12.43	12.53	483.07	11/29/2012	0.08	11.87	11.95	483.64	12/28/2012	0.07	12.15	12.22	483.36
R-32	494.33	monthly	10/15/2012	0.03	9.24	9.27	485.08	11/29/2012	0.25	8.88	9.13	485.40	12/28/2012	0.49	9.11	9.60	485.13
R-33	495.82	monthly	10/16/2012	0.12	10.23	10.35	485.57	11/29/2012	0.11	9.74	9.85	486.06	12/28/2012	0.16	10.08	10.24[2]	frozen/bottom
R-34	495.20	monthly	10/15/2012	sheen	sheen	10.21	484.99	11/29/2012	0.01	9.77	9.78	485.43	12/28/2012	0.01	10.14	10.15	485.06
R-35R	494.72	monthly	10/15/2012	sheen	sheen	18.72	476.00	11/29/2012	sheen	sheen	18.09	476.63	12/28/2012	sheen	sheen	19.29	475.43
R-39	495.05	monthly	10/15/2012	0.01	17.25	17.26	477.80	11/29/2012	sheen	sheen	17.22	477.83	12/28/2012	sheen	sheen	17.78	477.27
R-40	494.46	monthly	10/15/2012	0.30	18.19	18.49	476.22	11/29/2012	0.70	18.73	19.43	475.61	12/28/2012	0.11	19.20	19.31	475.24
R-5	495.33	monthly	10/16/2012	0.25	9.47	9.72	485.81	11/29/2012	0.28	8.85	9.13[2]	frozen/bottom	12/28/2012	0.02	8.96	8.98[2]	frozen/bottom
S-21	497.19	monthly	10/15/2012	0.26	12.43	12.69	484.70	11/29/2012	0.32	12.02	12.34	485.10	12/28/2012	0.22	12.37	12.59	484.77
S-22	496.70	monthly	10/15/2012	1.81	11.26	13.07	485.12	11/29/2012	0.55	11.08	11.63	485.52	12/28/2012	1.08	11.33	12.41	485.18
S-32	495.82	monthly	10/15/2012	--	--	11.32	484.50	11/29/2012	--	--	10.97	484.85	12/28/2012	--	--	11.26	484.56
S-39	494.07	monthly	10/15/2012	0.63	10.98	11.61	482.97	11/29/2012	0.04	10.76	10.80	483.30	12/28/2012	0.13	11.00	11.13	483.05
S-43	496.21	monthly	10/15/2012	sheen	sheen	11.64	484.57	11/29/2012	--	--	11.29	484.92	12/28/2012	sheen	sheen	11.62	484.59
S-44	495.02	monthly	10/15/2012	0.13	10.66	10.79	484.33	11/29/2012	0.36	10.25	10.61	484.69	12/28/2012	0.82	10.45	11.27	484.39
S-50	496.68	monthly	10/15/2012	1.49	11.87	13.36	484.57	11/29/2012	0.13	11.66	11.79	485.00	12/28/2012	0.78	11.89	12.67	484.67
S-51	495.90	monthly	10/15/2012	0.98	11.27	12.25	484.46	11/29/2012	0.17	10.95	11.12	484.92	12/28/2012	0.40	11.28	11.68	484.55

Notes:

MSL	Mean Sea Level
LNAPL	Light Non-Aqueous Phase Liquid
ft	feet
--	LNAPL was not detected.
sheen	LNAPL thickness was less than 0.01' and was not detected with an air/product/water interface probe; LNAPL was observed visually.
1	The corrected groundwater elevation for MW-334-15 is an approximation based on a LNAPL specific gravity of 0.8.
*	Erroneous data for MW-334-15 was reported in third quarter 2012 due to a survey error.
2	Water was not detected. The measurement is to ice/bottom.

Table 4-4
LNAPL Migration Monitoring Well Network Results
North Pole Refinery
Flint Hills Resources Alaska, LLC

		October 2012			November 2012			December 2012		
Location	Frequency	Date Measured	LNAPL Present (yes/no)	Notes	Date Measured	LNAPL Present (yes/no)	Notes	Date Measured	LNAPL Present (yes/no)	Notes
MW-139	monthly	10/16/2012	N		11/29/2012	N		12/27/2012	N	
MW-140	monthly	10/16/2012	N		11/29/2012	N		12/27/2012	N	
MW-142	monthly	10/16/2012	N		11/29/2012	N		12/27/2012	N	
MW-144A	monthly	10/16/2012	N		11/29/2012	N		12/28/2012	N	
MW-145	monthly	10/16/2012	N		11/29/2012	N		12/27/2012	N	
MW-178A	monthly	10/16/2012	N		11/29/2012	N		12/28/2012	N	
MW-179A	monthly	10/16/2012	N		11/29/2012	N		12/28/2012	--	data logger frozen in well
MW-180A	monthly	10/16/2012	N		11/29/2012	N		12/28/2012	N	
MW-195A	monthly	10/16/2012	N		11/29/2012	N		12/27/2012	N	
MW-196	monthly	10/16/2012	N		11/29/2012	N		12/27/2012	N	
O-1	monthly	10/16/2012	N		11/29/2012	N		12/28/2012	N	
O-12	monthly	10/16/2012	N		11/29/2012	N		12/28/2012	N	
O-14	monthly	10/16/2012	N		11/29/2012	N		12/28/2012	N	
O-15	monthly	10/16/2012	N		11/29/2012	N		12/27/2012	N	
O-16	monthly	10/16/2012	N		11/29/2012	N		12/28/2012	N	
O-17	monthly	10/16/2012	N		11/29/2012	N		12/27/2012	N	
O-18	monthly	10/24/2012	N		11/29/2012	N		12/27/2012	N	
O-20	monthly	10/16/2012	N		11/29/2012	N		12/28/2012	N	
O-22	monthly	10/16/2012	N		11/29/2012	N		12/27/2012	N	
O-23	monthly	10/16/2012	N		11/29/2012	N		12/28/2012	N	
O-24	monthly	10/16/2012	N		11/29/2012	N		12/27/2012	N	
O-25	monthly	10/16/2012	N		11/29/2012	N		12/27/2012	N	
O-26	monthly	10/16/2012	N		11/29/2012	N		12/27/2012	N	
O-28	monthly	10/16/2012	N		11/29/2012	N		12/27/2012	N	
O-29	monthly	10/16/2012	N		11/29/2012	N		12/27/2012	N	
O-3	monthly	10/16/2012	N		11/29/2012	N		12/27/2012	N	
O-4	monthly	10/16/2012	N		11/29/2012	N		12/27/2012	N	
O-5	monthly	10/16/2012	N		11/29/2012	N		12/27/2012	N	
O-6	monthly	10/16/2012	N		11/29/2012	N		12/27/2012	N	
O-8	monthly	10/16/2012	N		11/29/2012	N		12/28/2012	N	
R-3	monthly	10/16/2012	N		11/29/2012	N		12/28/2012	N	

Table 4-4
LNAPL Migration Monitoring Well Network Results
North Pole Refinery
Flint Hills Resources Alaska, LLC

		October 2012			November 2012			December 2012		
Location	Frequency	Date Measured	LNAPL Present (yes/no)	Notes	Date Measured	LNAPL Present (yes/no)	Notes	Date Measured	LNAPL Present (yes/no)	Notes
R-38	monthly	10/16/2012	N		11/29/2012	N		12/27/2012	N	frozen at 11.03 feet below MP
R-42	monthly	10/16/2012	N		11/29/2012	N		12/28/2012	N	
S-9	monthly	10/16/2012	N		11/29/2012	N		12/27/2012	N	

Notes:

LNAPL Light Non-Aqueous Phase Liquid
MP Measuring Point

Table 4-5
LNAPL Baildown Testing and Analysis Results
North Pole Refinery
Flint Hills Resources - Alaska, LLC

Well ID	Test	Date	Initial LNAPL Thickness (ft)	Test Duration (min)	Final LNAPL Thickness (ft)	LNAPL Transmissivity, T_n (ft^2/day)		LNAPL Hydraulic Conductivity, K_n (ft/day) [based on T_n]
						Bouwer & Rice	Cooper & Jacob / Jacob & Lohman	
MW-176A	1	10/26/2012	2.94	1453	2.18	**1.7**		0.79
MW-176A	2	10/29/2012	2.69	1404	1.86	**1.4**		0.74
MW-186A	1	10/17/2012	0.52	1465	0.38	0.1		0.32
MW-186A	2	10/18/2012	0.38	293	0.28	0		--
O-10	1	10/22/2012	1.25	1248	0.76		**2.4**	3.16
O-10	2	10/24/2012	0.93	1437	0.69		**2.7**	3.89
O-11	1	10/23/2012	0.99	2809	0.21	NA		--
O-13	1	10/23/2012	0.54	2783	0.59		**2.0**	3.37
O-13	2	10/29/2012	0.69	1404	1.86	**1.3**		0.67
O-19	1	10/22/2012	0.57	1379	0.38	NA		--
O-19	2	10/24/2012	0.47	1399	0.42	0		--
O-27	1	10/17/2012	0.99	1494	0.37		**1.1**	2.86
O-27	2	10/29/2012	0.68	1435	0.12		**1.4**	12.00
R-14A	1	10/23/2012	0.78	2900	0.24	0.3		1.08
S-22	1	10/26/2012	1.49	1493	0.36	0.2		0.58
S-39	1	10/26/2012	0.64	1321.0	0.07	NA		--
S-50	1	10/19/2012	1.72	4265	1.73	**2.3**		1.34
S-50	2	10/22/2012	1.73	1447	1.49	**1.8**		1.19
S-51	1	10/18/2012	1.27	1229	1.29	0.7		0.54
S-51	2	10/19/2012	1.29	230	1.05	0.6		0.55

Notes:

Bold Exceeds 0.1 to 0.8 ft^2/day lower criterion range to produce sufficient LNAPL recoverability (ITRC 2009).

0	Transmissivity assumed to be zero ft^2/day due negligible LNAPL thickness prior to test commencement.
ft	feet
LNAPL	Light Non-Aqueous Phase Liquid
min	minute
NA	Not analyzed

Table 4-6
BTEX Analytical Results
North Pole Refinery
Flint Hills Resources Alaska, LLC

BTEX						SW8260B					
						Benzene	Toluene	Ethylbenzene	m,p-Xylene	o-Xylene	Xylenes (total)
Location	Comments	Sample	Dup	Work Order	Collect Date	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
ADEC Groundwater Cleanup Level						5 µg/L	1,000 µg/L	700 µg/L	-	-	10,000 µg/L
Onsite Wells											
Water Table Groundwater Monitoring Zone											
MW-106		MW-106		1128664	11/15/12	<0.240†	<0.620†	<0.620†	<0.620†	<1.24†	<1.86*
MW-109		MW-109		1128665	11/14/12	<0.240	<0.620	<0.620	<0.620	<1.24	<1.86*
MW-110		MW-110		1128588	10/18/12	121	<0.620	0.610J	<0.620	68.0	68.0*
MW-110		MW-210	DUP	1128588	10/18/12	125	<0.620	0.630J	<0.620	72.9	72.9*
MW-113		MW-113		1128665	11/14/12	0.150J	<0.620	3.70	<0.620	<1.24	<1.86*
MW-115	Weather	Not sampled		--	--	--	--	--	--	--	--
MW-116	Weather	Not sampled		--	--	--	--	--	--	--	--
MW-124		MW-124		1128665	11/14/12	<0.240	<0.620	<0.620	<0.620	<1.24	<1.86*
MW-124		MW-224	DUP	1128665	11/14/12	<0.240	<0.620	<0.620	<0.620	<1.24	<1.86*
MW-125		MW-125		1128665	11/14/12	121	<0.620	0.910J	<0.620	<1.24	<1.86*
MW-125		MW-225	DUP	1128665	11/14/12	130	<0.620	0.810J	<0.620	<1.24	<1.86*
MW-126		MW-126		1128665	11/15/12	<0.240	<0.620	<0.620	<0.620	<1.24	<1.86*
MW-127		MW-127		1128665	11/12/12	<0.240	<0.620	<0.620	<0.620	<1.24	<1.86*
MW-132	Weather	Not sampled		--	--	--	--	--	--	--	--
MW-133		MW-133		1128665	11/15/12	<0.240	<0.620	<0.620	<0.620	0.920J	0.920J*
MW-134	Weather	Not sampled		--	--	--	--	--	--	--	--
MW-135	Weather	Not sampled		--	--	--	--	--	--	--	--
MW-136	Weather	Not sampled		--	--	--	--	--	--	--	--
MW-137	Weather	Not sampled		--	--	--	--	--	--	--	--
MW-139		MW-139		1128665	11/14/12	36.4	<0.620	36.9	<0.620	409	409*
MW-140	Weather	Not sampled		--	--	--	--	--	--	--	--
MW-141		MW-141		1128664	11/15/12	<0.240†	<0.620†	<0.620†	<0.620†	<1.24†	<1.86*
MW-142		MW-142		1128665	11/12/12	<0.240	<0.620	<0.620	<0.620	<1.24	<1.86*
MW-143		MW-143		1128665	11/15/12	<0.240	<0.620	<0.620	<0.620	<1.24	<1.86*
MW-144A		MW-144A		1128665	11/14/12	<0.240	<0.620	<0.620	<0.620	<1.24	<1.86*
MW-145		MW-145		1128665	11/15/12	<0.240	<0.620	<0.620	<0.620	<1.24	<1.86*
MW-149A		MW-149A		1128653	11/10/12	<0.240	<0.620	<0.620	<0.620	0.940J	0.940J*
MW-176A		MW-176A		1128696	12/12/12	116	63.8	92.5	167	527	694*
MW-179A	Weather	Not sampled		--	--	--	--	--	--	--	--
MW-180A		MW-180A		1128653	11/12/12	0.210J	2.06	24.1	16.7	60.7	77.4*
MW-334-15		MW-334-15		1128696	12/13/12	<0.240	6340	745	1320	2710	4030*
O-12		O-12		1128665	11/15/12	<0.240	<0.620	<0.620	<0.620	<1.24	<1.86*
O-14	Weather	Not sampled		--	--	--	--	--	--	--	--
O-16		O-116	DUP	1128690	12/11/12	2.34	<0.620	1.10	<0.620	2.02	2.02*
O-16		O-16		1128690	12/11/12	2.14	<0.620	1.14	<0.620	2.25	2.25*
O-17	Weather	Not sampled		--	--	--	--	--	--	--	--
O-18	Weather	Not sampled		--	--	--	--	--	--	--	--
S-44	Weather	Not sampled		--	--	--	--	--	--	--	--
S-9		S-9		1128696	12/13/12	<0.240	<0.620	<0.620	<0.620	<1.24	<1.86*
10-55' Groundwater Monitoring Zone											
MW-149B		MW-149B		1128653	11/10/12	<0.240	<0.620	<0.620	<0.620	<1.24	<1.86*
MW-176B		MW-176B		1128696	12/12/12	<0.240	<0.620	<0.620	<0.620	<1.24	<1.86*
MW-178B		MW-178B		1128696	12/13/12	<0.240	<0.620	<0.620	<0.620	<1.24	<1.86*
MW-179B	Weather	Not sampled		--	--	--	--	--	--	--	--
MW-180B		MW-180B		1128653	11/12/12	<0.240	<0.620	<0.620	<0.620	<1.24	<1.86*
MW-186B		MW-186B		1128665	11/15/12	<0.240	<0.620	<0.620	<0.620	<1.24	<1.86*
MW-334-65		MW-334-65		1128696	12/13/12	0.290J	0.490J	<0.620	<0.620	<1.24	<1.86*
55-90' Groundwater Monitoring Zone											
MW-154A		MW-154A		1128665	11/15/12	<0.240	<0.620	<0.620	<0.620	<1.24	<1.86*
MW-154B		MW-154B		1128665	11/15/12	<0.240	<0.620	<0.620	<0.620	<1.24	<1.86*
MW-175		MW-175		1128665	11/14/12	<0.240	<0.620	<0.620	<0.620	<1.24	<1.86*
MW-176C		MW-176C		1128696	12/12/12	<0.240	0.330J	<0.620	<0.620	<1.24	<1.86*
MW-178C		MW-178C		1128696	12/13/12	<0.240	<0.620	<0.620	<0.620	<1.24	<1.86*
MW-179C	Weather	Not sampled		--	--	--	--	--	--	--	--
MW-180C		MW-180C		1128653	11/12/12	<0.240	<0.620	<0.620	<0.620	<1.24	<1.86*
MW-186C		MW-186C		1128653	11/12/12	<0.240	<0.620	<0.620	<0.620	<1.24	<1.86*

Table 4-6
BTEX Analytical Results
North Pole Refinery
Flint Hills Resources Alaska, LLC

BTEX						SW8260B					
						Benzene	Toluene	Ethylbenzene	m,p-Xylene	o-Xylene	Xylenes (total)
Location	Comments	Sample	Dup	Work Order	Collect Date	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
ADEC Groundwater Cleanup Level						5 µg/L	1,000 µg/L	700 µg/L	-	-	10,000 µg/L
Offsite Wells											
Water Table Groundwater Monitoring Zone											
MW-148A		MW-148A		1128601	10/22/12	<0.240	<0.620	<0.620	<0.620	<1.24	<1.86*
MW-153A		MW-153A		1128665	11/14/12	<0.240	<0.620	<0.620	<0.620	<1.24	<1.86*
10-55' Groundwater Monitoring Zone											
MW-148B		MW-148B		1128653	11/11/12	<0.240	<0.620	<0.620	<0.620	<1.24	<1.86*
MW-153B		MW-153B		1128665	11/14/12	<0.240	<0.620	<0.620	<0.620	<1.24	<1.86*

Notes:

µg/L	micrograms per liter
DUP	Field-duplicate sample
USEPA	United States Environmental Protection Agency
ADEC	Alaska Department of Environmental Conservation
BTEX	benzene, toluene, ethylbenzene and total xylenes
J	Estimated concentration, detected above the detection limit (DL) and below the limit of quantitation (LOQ)
J*	Result is considered estimated (no direction of bias), due to QC failures (flag applied by SWI)
<	Not detected; limit of detection (LOD) listed
†	BTEX analyzed by USEPA Method 624 (equivalent to SW8260B)
*	Total xylenes calculated by SWI
--	not sampled

Comments:

Weather	No sample collected due to cold-weather constraints

Table 4-7
Sulfolane Analytical Results
North Pole Refinery
Flint Hills Resources Alaska, LLC

Analysis Method						Sulfolane-USEPA1625B w/Iso Dil-W
Location	**Comments**	**Sample**	**Dup**	**Work Order**	**Collect Date**	**Sulfolane Result µg/L**
ADEC ACL*						**14 µg/L**
Onsite Wells						
Water table groundwater monitoring zone						
MW-101A	Weather	Not sampled		--	--	--
MW-106		MW-106		1128665	11/15/12	<6.20
MW-109		MW-109		1128665	11/14/12	<6.60
MW-110		MW-110		1128589	10/18/12	608
MW-113		MW-113		1128665	11/14/12	310
MW-113		MW-213	DUP	1128665	11/14/12	306
MW-115	Weather	Not sampled		--	--	--
MW-116	Weather	Not sampled		--	--	--
MW-125		MW-125		1128665	11/14/12	<6.20
MW-127		MW-127		1128653	11/12/12	49.1
MW-127		MW-227	DUP	1128653	11/12/12	55.1
MW-130		MW-130		1128600	10/22/12	854
MW-131		MW-131		1128665	11/14/12	24.8
MW-131		MW-231	DUP	1128665	11/14/12	23.6
MW-132	Weather	Not sampled		--	--	--
MW-133		MW-133		1128665	11/15/12	<6.60
MW-134	Weather	Not sampled		--	--	--
MW-135	Weather	Not sampled		--	--	--
MW-138		MW-138		1128696	12/13/12	1,210
MW-139		MW-139		1128665	11/14/12	202
MW-139		MW-239	DUP	1128665	11/14/12	218
MW-141		MW-141		1128665	11/15/12	<6.20
MW-142		MW-142		1128653	11/12/12	284
MW-142		MW-242	DUP	1128653	11/12/12	284
MW-143		MW-143		1128665	11/15/12	68.0
MW-143		MW-243	DUP	1128665	11/15/12	70.1
MW-144A		MW-144A		1128665	11/14/12	<6.20
MW-145		MW-145		1128665	11/15/12	<6.20
MW-149A		MW-149A		1128653	11/10/12	<6.20
MW-173A	Weather	Not sampled		--	--	--
MW-176A		MW-176A		1128696	12/12/12	2,070
MW-178A		MW-178A		1128696	12/13/12	27.2
MW-179A	Weather	Not sampled		--	--	--
MW-180A		MW-180A		1128653	11/12/12	<6.20
MW-186A		MW-186A		1128696	12/13/12	313
MW-192A		MW-192A		1128575	10/15/12	<6.20
MW-195A		MW-195A		1128665	11/15/12	174
MW-196		MW-196		1128690	12/11/12	<6.26
MW-196		MW-296	DUP	1128690	12/11/12	<6.46
MW-301-CMT-10		MW-301-CMT-10		1128683	12/09/12	<6.66
MW-302-CMT-10	Frozen/dry	Not sampled		--	--	--
MW-303-CMT-9		MW-303-CMT-9		1128683	12/09/12	6.07J
MW-304-15		MW-304-15		1128690	12/10/12	299
MW-304-CMT-10	Frozen/dry	Not sampled		--	--	--
MW-305-CMT-8	Frozen/dry	Not sampled		--	--	--
MW-306-15	Weather	Not sampled		--	--	--
MW-306-CMT-10		MW-306-CMT-10		1128690	12/10/12	<6.40
MW-309-15		MW-309-15		1128658	11/11/12	77.2
MW-310-15		MW-310-15		1128665	11/15/12	235
MW-321-15		MW-321-15		1128575	10/15/12	140
MW-330-20		MW-330-20		1128665	11/15/12	269

Table 4-7
Sulfolane Analytical Results
North Pole Refinery
Flint Hills Resources Alaska, LLC

Analysis Method						Sulfolane-USEPA1625B w/Iso Dil-W
Location	**Comments**	**Sample**	**Dup**	**Work Order**	**Collect Date**	**Sulfolane Result µg/L**
ADEC ACL*						**14 µg/L**
MW-334-15		MW-334-15		1128696	12/13/12	265
O-1		O-1		1128696	12/13/12	6,090
O-12		O-12		1128665	11/15/12	103
O-14	Weather	Not sampled		--	--	--
O-19	Weather	Not sampled		--	--	--
O-2	Weather	Not sampled		--	--	--
O-24		O-24		1128665	11/14/12	5.02J
O-26		O-26		1128665	11/14/12	671
O-3		O-3		1128665	11/15/12	11.1
O-4		O-4		1128653	11/09/12	149
O-6		O-6		1128653	11/09/12	8.18J
S-21	Weather	Not sampled		--	--	--
S-39	Weather	Not sampled		--	--	--
S-43	Weather	Not sampled		--	--	--
S-51	Weather	Not sampled		--	--	--
10-55 feet below water table groundwater monitoring zone						
MW-101	Weather	Not sampled		--	--	--
MW-104		MW-104		1128665	11/14/12	<6.20
MW-105		MW-105		1128653	11/12/12	<6.66
MW-129		MW-129		1128665	11/15/12	<6.20
MW-147B	Weather	Not sampled		--	--	--
MW-149B		MW-149B		1128653	11/10/12	<6.52
MW-174A		MW-174A		1128578	10/16/12	21.9
MW-174A		MW-274A	DUP	1128578	10/16/12	16.5
MW-176B		MW-176B		1128696	12/12/12	<6.60
MW-178B		MW-178B		1128696	12/13/12	302
MW-178B		MW-278B	DUP	1128696	12/13/12	304
MW-179B	Weather	Not sampled		--	--	--
MW-180B		MW-180B		1128653	11/12/12	<6.46
MW-186B		MW-186B		1128665	11/15/12	24.2
MW-186B		MW-286B	DUP	1128665	11/15/12	25.2
MW-197A		MW-197A		1128665	11/14/12	<6.20
MW-301-60	Weather	Not sampled		--	--	--
MW-301-CMT-20		MW-301-CMT-20		1128683	12/09/12	<6.60
MW-301-CMT-30	Weather	Not sampled		--	--	--
MW-301-CMT-40		MW-301-CMT-40		1128683	12/09/12	<6.74
MW-301-CMT-50	Weather	Not sampled		--	--	--
MW-302-CMT-20		MW-302-CMT-20		1128683	12/09/12	59.4
MW-302-CMT-30	Weather	Not sampled		--	--	--
MW-302-CMT-40		MW-302-CMT-40		1128683	12/09/12	18.1
MW-302-CMT-50	Weather	Not sampled		--	--	--
MW-303-CMT-19		MW-303-CMT-19		1128683	12/09/12	61.2
MW-303-CMT-29	Weather	Not sampled		--	--	--
MW-303-CMT-39		MW-303-CMT-39		1128683	12/09/12	35.2
MW-303-CMT-49	Weather	Not sampled		--	--	--
MW-303-CMT-59	Weather	Not sampled		--	--	--
MW-304-CMT-20		MW-304-CMT-20		1128690	12/10/12	5.00J
MW-304-CMT-30		MW-304-CMT-30		1128690	12/14/12	79.5
MW-304-CMT-30		MW-404-CMT-30	DUP	1128699	12/14/12	78.6
MW-304-CMT-40	Weather	Not sampled		--	--	--
MW-304-CMT-50		MW-304-CMT-50		1128699	12/14/12	11.4
MW-304-CMT-60		MW-304-CMT-60		1128699	12/14/12	6.45J
MW-305-CMT-18		MW-305-CMT-18		1128690	12/10/12	10.0J

Table 4-7
Sulfolane Analytical Results
North Pole Refinery
Flint Hills Resources Alaska, LLC

Analysis Method						Sulfolane-USEPA1625B w/Iso Dil-W
Location	**Comments**	**Sample**	**Dup**	**Work Order**	**Collect Date**	**Sulfolane Result µg/L**
ADEC ACL*						**14 µg/L**
MW-305-CMT-28	Weather	Not sampled		--	--	--
MW-305-CMT-38		MW-305-CMT-38		1128690	12/10/12	<6.52
MW-305-CMT-48	Weather	Not sampled		--	--	--
MW-305-CMT-58	Weather	Not sampled		--	--	--
MW-306-CMT-20		MW-306-CMT-20		1128690	12/10/12	<7.04
MW-306-CMT-40		MW-306-CMT-40		1128690	12/10/12	<6.66
MW-306-CMT-50	Weather	Not sampled		--	--	--
MW-306-CMT-60	Weather	Not sampled		--	--	--
MW-309-66		MW-309-65		1128658	11/11/12	16.6
MW-310-65		MW-310-65		1128665	11/15/12	<6.20
MW-321-65		MW-321-65		1128696	12/13/12	<6.32
MW-330-65		MW-330-65		1128665	11/15/12	<6.20
MW-334-65		MW-334-65		1128696	12/13/12	5.63J
55-90 feet below water table groundwater monitoring zone						
MW-144BR		MW-144BR		1128665	11/14/12	<6.60
MW-154A		MW-154A		1128665	11/15/12	18.5
MW-154B		MW-154B		1128665	11/15/12	89.1
MW-154B		MW-254B	DUP	1128665	11/15/12	94.3
MW-174B	Weather	Not sampled		--	--	--
MW-175		MW-175		1128665	11/14/12	<6.20
MW-176C		MW-176C		1128696	12/12/12	<6.20
MW-177	Weather	Not sampled		--	--	--
MW-178C		MW-178C		1128696	12/13/12	<6.32
MW-179C	Weather	Not sampled		--	--	--
MW-180C		MW-180C		1128653	11/12/12	<6.20
MW-186E		MW-186E		1128665	11/15/12	16.7
MW-301-70	Weather	Not sampled		--	--	--
MW-302-70	Weather	Not sampled		--	--	--
MW-302-80	Weather	Not sampled		--	--	--
MW-302-95	Weather	Not sampled		--	--	--
MW-303-70	Weather	Not sampled		--	--	--
MW-303-80	Weather	Not sampled		--	--	--
MW-303-95	Weather	Not sampled		--	--	--
MW-304-70		MW-304-70		1128699	12/14/12	4.79J
MW-304-70		MW-404-70	DUP	1128699	12/14/12	4.65J
MW-304-80		MW-304-80		1128699	12/14/12	4.66J
MW-304-80		MW-404-80	DUP	1128699	12/14/12	4.25J
MW-304-96		MW-304-95		1128699	12/14/12	4.65J
MW-305-70		MW-305-70		1128665	11/14/12	<6.74
MW-305-80	Weather	Not sampled		--	--	--
MW-306-100	Weather	Not sampled		--	--	--
MW-306-70	Weather	Not sampled		--	--	--
MW-306-80	Weather	Not sampled		--	--	--
90-160 feet below water table groundwater monitoring zone						
MW-173B	Weather	Not sampled		--	--	--
MW-179D	Weather	Not sampled		--	--	--
MW-186C		MW-186C		1128653	11/12/12	<6.20
MW-186D		MW-186D		1128653	11/12/12	<6.20
MW-195B		MW-195B		1128575	10/15/12	<6.20
MW-197B	Weather	Not sampled		--	--	--
MW-198	Weather	Not sampled		--	--	--
MW-199	Weather	Not sampled		--	--	--
MW-300	Weather	Not sampled		--	--	--

Table 4-7
Sulfolane Analytical Results
North Pole Refinery
Flint Hills Resources Alaska, LLC

Analysis Method						Sulfolane-USEPA1625B w/Iso Dil-W
Location	**Comments**	**Sample**	**Dup**	**Work Order**	**Collect Date**	**Sulfolane Result µg/L**
ADEC ACL*						**14 µg/L**
MW-302-110	Weather	Not sampled		--	--	--
MW-303-130	Weather	Not sampled		--	--	--
MW-304-125	Weather	Not sampled		--	--	--
MW-304-150	Weather	Not sampled		--	--	--
MW-305-100	Weather	Not sampled		--	--	--
MW-306-150	Weather	Not sampled		--	--	--
MW-307		MW-307		1128653	11/12/12	<6.20
MW-309-150		MW-309-150		1128653	11/11/12	<6.40
MW-310-110	Weather	Not sampled		--	--	--
MW-321-151		MW-321-151		1128696	12/13/12	<7.12
MW-330-150	Weather	Not sampled		--	--	--
MW-331-150		MW-331-150		1128653	11/11/12	<6.46
Offsite Wells						
Water table groundwater monitoring zone						
MW-148A		MW-148A		1128600	10/22/12	96.9
MW-148A		MW-248A	DUP	1128601	10/22/12	96.4
MW-150A		MW-150A		1128633	10/31/12	77.8
MW-151A		MW-151A		1128658	11/10/12	66.0
MW-152A		MW-152A		1128658	11/09/12	95.8
MW-152A		MW-252A	DUP	1128658	11/09/12	91.1
MW-153A		MW-153A		1128667	11/14/12	18.4
MW-155A		MW-155A		1128658	11/10/12	17.5
MW-156A		MW-156A		1128639	10/31/12	62.2
MW-157A		MW-157A		1128639	10/31/12	68.6
MW-158A		MW-158A		1128658	11/09/12	71.1
MW-159A		MW-159A		1128638	10/31/12	<6.20
MW-159A		MW-259A	DUP	1128638	10/31/12	<6.20
MW-161A		MW-161A		1128600	10/22/12	231
MW-162A		MW-162A		1128639	10/31/12	48.1
MW-163A		MW-163A		1128626	10/30/12	39.0
MW-163A		MW-263A	DUP	1128626	10/30/12	40.9
MW-164A		MW-164A		1128618	10/25/12	75.5J*
MW-165A		MW-165A		1128623	10/26/12	<6.20
MW-166A		MW-166A		1128558	10/08/12	22.5
MW-167A		MW-167A		1128618	10/25/12	5.56J*
MW-168A		MW-168A		1128623	10/26/12	9.11J
MW-169A		MW-169A		1128618	10/23/12	5.65J
MW-170A		MW-170A		1128638	10/31/12	<6.20
MW-171A		MW-171A		1128626	10/30/12	<6.52
MW-172A		MW-172A		1128597	10/20/12	<6.32
MW-181A		MW-181A		1128564	10/10/12	<6.20
MW-182A		MW-182A		1128593	10/19/12	21.3
MW-183A		MW-183A		1128636	10/30/12	95.3
MW-183A		MW-283A	DUP	1128636	10/30/12	94.6
MW-185A		MW-185A		1128593	10/19/12	<6.20
MW-187		MW-187		1128618	10/23/12	5.65J
MW-189A		MW-189A		1128564	10/10/12	<6.20
MW-190A		MW-190A		1128597	10/22/12	<6.32
MW-191A		MW-191A		1128564	10/10/12	<6.52
MW-193A		MW-193A		1128593	10/18/12	4.85J
MW-194A		MW-194A		1128564	10/10/12	15.0
MW-308-15		MW-308-15		1128564	10/10/12	7.39J
MW-311-15		MW-311-15		1128564	10/10/12	<6.20

Table 4-7
Sulfolane Analytical Results
North Pole Refinery
Flint Hills Resources Alaska, LLC

Analysis Method						Sulfolane-USEPA1625B w/Iso Dil-W
Location	**Comments**	**Sample**	**Dup**	**Work Order**	**Collect Date**	**Sulfolane Result µg/L**
ADEC ACL*						**14 µg/L**
MW-314-15		MW-314-15		1128564	10/10/12	<6.20
MW-316-15		MW-316-15		1128597	10/22/12	4.06J
MW-317-15		MW-317-15		1128658	11/10/12	8.07J
MW-318-20		MW-318-20		1128636	10/30/12	<6.20
MW-322-15		MW-322-15		1128564	10/10/12	<6.20
MW-323-15	New well	MW-323-15		1128656	11/12/12	<6.20
MW-325-18		MW-325-18		1128633	10/30/12	<6.20
MW-328-15		MW-328-15		1128564	10/10/12	<6.20
MW-329-15		MW-329-15		1128649	11/03/12	92.1
MW-332-15		MW-332-15		1128633	10/31/12	<6.20
10-55 feet below water table groundwater monitoring zone						
MW-148B		MW-148B		1128653	11/11/12	193
MW-148C		MW-148C		1128633	10/31/12	109
MW-150B		MW-150B		1128633	10/31/12	54.0
MW-150B		MW-250B	DUP	1128633	10/31/12	52.8
MW-150C	Frozen	Not sampled		--	--	--
MW-151B		MW-151B		1128658	11/10/12	48.8
MW-151C		MW-151C		1128658	11/10/12	31.1
MW-151C		MW-251C	DUP	1128658	11/10/12	30.7
MW-152B		MW-152B		1128658	11/09/12	89.6
MW-152C		MW-152C		1128658	11/09/12	30.8
MW-153B		MW-153B		1128667	11/14/12	28.0
MW-155B		MW-155B		1128658	11/10/12	<6.60
MW-156B		MW-156B		1128639	10/31/12	34.2
MW-156B		MW-256B	DUP	1128639	10/31/12	35.7
MW-157B		MW-157B		1128639	10/31/12	64.7
MW-157B		MW-257B	DUP	1128639	10/31/12	64.0
MW-158B		MW-158B		1128658	11/09/12	96.0
MW-159B		MW-159B		1128638	10/31/12	77.7
MW-161B		MW-161B		1128618	10/25/12	297
MW-162B		MW-162B		1128639	10/31/12	72.7
MW-163B		MW-163B		1128626	10/30/12	34.9
MW-164B		MW-164B		1128618	10/25/12	122J*
MW-164C		MW-164C		1128618	10/25/12	118J*
MW-164C		MW-264C	DUP	1128618	10/25/12	113
MW-165B		MW-165B		1128623	10/26/12	<6.20J*
MW-166B		MW-166B		1128618	10/23/12	52.8J*
MW-167B		MW-167B		1128618	10/25/12	9.93J*
MW-168B		MW-168B		1128623	10/26/12	13.8
MW-169C		MW-169C		1128618	10/23/12	<6.20J*
MW-170D		MW-170D		1128649	11/03/12	<6.40
MW-171B		MW-171B		1128626	10/30/12	<6.96
MW-181B		MW-181B		1128564	10/10/12	<6.20
MW-182B		MW-182B		1128593	10/19/12	24.7
MW-183B		MW-183B		1128638	10/31/12	141
MW-184		MW-184		1128597	10/22/12	<6.20
MW-185B		MW-185B		1128597	10/20/12	9.48J

Table 4-7
Sulfolane Analytical Results
North Pole Refinery
Flint Hills Resources Alaska, LLC

Analysis Method						Sulfolane-USEPA1625B w/Iso Dil-W
Location	**Comments**	**Sample**	**Dup**	**Work Order**	**Collect Date**	**Sulfolane Result µg/L**
ADEC ACL*						**14 µg/L**
MW-189B		MW-189B		1128564	10/10/12	<6.20
MW-191B		MW-191B		1128564	10/10/12	<6.20
MW-193B		MW-193B		1128593	10/18/12	<6.52
MW-194B		MW-194B		1128564	10/10/12	36.8
MW-194B		MW-294B	DUP	1128564	10/10/12	37.1
MW-308-30	Frozen	Not sampled		--	--	--
MW-311-46		MW-311-46		1128564	10/10/12	<6.20
MW-316-56		MW-316-56		1128597	10/22/12	<6.20
MW-323-50	New well	MW-323-50		1128657	11/12/12	<6.20
MW-329-66		MW-329-66		1128649	11/03/12	106
MW-335-41	New well	MW-335-41		1128539	10/03/12	<6.20
55-90 feet below water table groundwater monitoring zone						
MW-159C		MW-159C		1128638	10/31/12	75.2
MW-159C		MW-259C	DUP	1128638	10/31/12	74.9
MW-160B		MW-160B		1128658	11/11/12	84.3
MW-170B		MW-170B		1128649	11/03/12	<6.20
MW-317-71		MW-317-71		1128658	11/10/12	19.1
90-160 feet below water table groundwater monitoring zone						
MW-148D		MW-148D		1128633	10/31/12	<6.20
MW-170C		MW-170C		1128638	10/31/12	<6.20
MW-172B		MW-172B		1128633	10/30/12	<6.20
MW-181C		MW-181C		1128564	10/11/12	<6.20
MW-185C		MW-185C		1128597	10/20/12	4.22J
MW-314-150		MW-314-150		1128564	10/11/12	<6.20
MW-318-135		MW-318-135		1128636	10/30/12	<6.20
MW-322-150	New well	MW-322-150		1128694	12/12/12	<6.60
MW-322-150		MW-422-150	DUP	1128694	12/12/12	<6.88
MW-325-150		MW-325-150		1128633	10/30/12	<6.20
MW-328-151		MW-328-151		1128658	11/11/12	<6.20
MW-332-150		MW-332-150		1128633	10/30/12	186

Notes:

*For purposes of this Fourth Quarter 2012 Groundwater Monitoring Report (Report), FHRA has used the 14 µg/L alternative cleanup level (ACL) referenced by the ADEC in its July 19, 2012 letter (ADEC 2012). This Report is submitted subject to the positions and reservations expressed by FHRA in its August 20, 2012 letter (FHRA 2012).

USEPA	United States Environmental Protection Agency
FHRA	Flint Hills Resources Alaska, LLC
ADEC	Alaska Department of Environmental Conservation
µg/L	micrograms per liter
DUP	Field-duplicate sample
J	Estimated concentration, detected above the detection limit (DL) and below the limit of quantitation (LOQ)
J*	Result is considered estimated (no direction of bias), due to QC failures (flag applied by SWI)
<	Not detected; limit of detection (LOD) listed

Comments:

New well	Phase 7 well, installed in third or fourth quarter 2012
Frozen	Well was frozen or had obstruction in casing; no sample collected
Weather	No sample collected due to cold-weather constraints
Damage	Well casing possibly damaged, unable to collect sample

Table 4-8
Sulfolane Analytical Results - Vertical Profiling Transect
North Pole Refinery
Flint Hills Resources Alaska, LLC

Analysis Method						Sulfolane-USEPA1625B w/Iso Dil-W
Location	**Comments**	**Sample**	**Dup**	**Work Order**	**Collect Date**	**Sulfolane Result µg/L**
ADEC ACL*						**14 µg/L**
MW-301-CMT-10		MW-301-CMT-10		1128683	12/09/12	<6.66
MW-301-CMT-20		MW-301-CMT-20		1128683	12/09/12	<6.60
MW-301-CMT-30	Weather	Not sampled		--	--	--
MW-301-CMT-40		MW-301-CMT-40		1128683	12/09/12	<6.74
MW-301-CMT-50	Weather	Not sampled		--	--	--
MW-301-70	Weather	Not sampled		--	--	--
MW-302-CMT-10	Frozen/dry	Not sampled		--	--	--
MW-302-CMT-20		MW-302-CMT-20		1128683	12/09/12	59.4
MW-302-CMT-30	Weather	Not sampled		--	--	--
MW-302-CMT-40		MW-302-CMT-40		1128683	12/09/12	18.1
MW-302-CMT-50	Weather	Not sampled		--	--	--
MW-302-70	Weather	Not sampled		--	--	--
MW-302-80	Weather	Not sampled		--	--	--
MW-302-95	Weather	Not sampled		--	--	--
MW-302-110	Weather	Not sampled		--	--	--
MW-303-CMT-9		MW-303-CMT-9		1128683	12/09/12	6.07J
MW-303-CMT-19		MW-303-CMT-19		1128683	12/09/12	61.2
MW-303-CMT-29	Weather	Not sampled		--	--	--
MW-303-CMT-39		MW-303-CMT-39		1128683	12/09/12	35.2
MW-303-CMT-49	Weather	Not sampled		--	--	--
MW-303-CMT-59	Weather	Not sampled		--	--	--
MW-303-70	Weather	Not sampled		--	--	--
MW-303-80	Weather	Not sampled		--	--	--
MW-303-95	Weather	Not sampled		--	--	--
MW-303-130	Weather	Not sampled		--	--	--
MW-304-CMT-10	Frozen/dry	Not sampled		--	--	--
MW-304-15		MW-304-15		1128690	12/10/12	299
MW-304-CMT-20		MW-304-CMT-20		1128690	12/10/12	5.00J
MW-304-CMT-30		MW-304-CMT-30		1128690	12/14/12	79.5
MW-304-CMT-30		MW-404-CMT-30	DUP	1128699	12/14/12	78.6
MW-304-CMT-40	Weather	Not sampled		--	--	--
MW-304-CMT-50		MW-304-CMT-50		1128699	12/14/12	11.4
MW-304-CMT-60		MW-304-CMT-60		1128699	12/14/12	6.45J
MW-304-70		MW-304-70		1128699	12/14/12	4.79J
MW-304-70		MW-404-70	DUP	1128699	12/14/12	4.65J
MW-304-80		MW-304-80		1128699	12/14/12	4.66J
MW-304-80		MW-404-80	DUP	1128699	12/14/12	4.25J
MW-304-96		MW-304-95		1128699	12/14/12	4.65J
MW-304-125	Weather	Not sampled		--	--	--
MW-304-150	Weather	Not sampled		--	--	--
MW-305-CMT-8	Frozen/dry	Not sampled		--	--	--
MW-305-CMT-18		MW-305-CMT-18		1128690	12/10/12	10.0J
MW-305-CMT-28	Weather	Not sampled		--	--	--

Table 4-8
Sulfolane Analytical Results - Vertical Profiling Transect
North Pole Refinery
Flint Hills Resources Alaska, LLC

Analysis Method						Sulfolane-USEPA1625B w/Iso Dil-W
Location	**Comments**	**Sample**	**Dup**	**Work Order**	**Collect Date**	**Sulfolane Result µg/L**
ADEC ACL*						**14 µg/L**
MW-305-CMT-38		MW-305-CMT-38		1128690	12/10/12	<6.52
MW-305-CMT-48	Weather	Not sampled		--	--	--
MW-305-CMT-58	Weather	Not sampled		--	--	--
MW-305-70		MW-305-70		1128665	11/14/12	<6.74
MW-305-80	Weather	Not sampled		--	--	--
MW-305-100	Weather	Not sampled		--	--	--
MW-306-CMT-10		MW-306-CMT-10		1128690	12/10/12	<6.40
MW-306-15	Weather	Not sampled		--	--	--
MW-306-CMT-20		MW-306-CMT-20		1128690	12/10/12	<7.04
MW-306-CMT-40		MW-306-CMT-40		1128690	12/10/12	<6.66
MW-306-CMT-50	Weather	Not sampled		--	--	--
MW-306-CMT-60	Weather	Not sampled		--	--	--
MW-306-70	Weather	Not sampled		--	--	--
MW-306-80	Weather	Not sampled		--	--	--
MW-306-100	Weather	Not sampled		--	--	--
MW-306-150	Weather	Not sampled		--	--	--

Notes:

*For purposes of this Fourth Quarter 2012 Groundwater Monitoring Report (Report), FHRA has used the 14 µg/L alternative cleanup level (ACL) referenced by the ADEC in its July 19, 2012 letter (ADEC 2012). This Report is submitted subject to the positions and reservations expressed by FHRA in its August 20, 2012 letter (FHRA 2012).

USEPA	United States Environmental Protection Agency
FHRA	Flint Hills Resources Alaska, LLC
ADEC	Alaska Department of Environmental Conservation
µg/L	micrograms per liter
DUP	Field-duplicate sample
J	Estimated concentration, detected above the detection limit (DL) and below the limit of quantitation (LOQ)
<	Not detected; limit of detection (LOD) listed

Comments:

Frozen/dry	Well was frozen, had obstruction in casing, or was dry; no sample collected
Weather	No sample collected due to cold-weather constraints
Damage	Well casing possibly damaged, unable to collect sample

Table 4-9
Sulfolane Mass Flux Results
North Pole Refinery
Flint Hills Resources Alaska, LLC

VPT Well Cluster	Approximate Depth (feet BGS / feet BWT)	Mass Flux (g/day)	Approximate Percent of Total Mass Flux
November 2011 Total Mass Flux = 86 g/day			
MW-302	8 (Water table) to 60 / 0 to 52	16.8	20%
MW-303	22 to 35 / 13 to 26	7.39	9%
MW-304	11 (Water table) to 60 / 0 to 49	40.63	47%
MW-305	9 (Water table) to 34 / 0 to 25	9.30	11%
First Quarter 2012 Total Mass Flux = 62 g/day			
MW-302	11 (Water table) to 90 / 0 to 79	22.54	36%
MW-303	22 to 35 / 13 to 26	5.29	9%
MW-304	14 (Water table) to 35 / 0 to 11	18.17	29%
MW-305	13 (Water table) to 34 / 0 to 21	5.48	9%
Second Quarter 2012 Total Mass Flux = 83 g/day			
MW-302	10 (Water table) to 90 / 0 to 80	16.36	20%
MW-303	22 to 35 / 13 to 26	5.34	6%
MW-304	13 (Water table) to 60 / 0 to 47	46.99	57%
MW-305	12 (Water table) to 22 / 0 to 10	4.63	6%
Third Quarter 2012 Total Mass Flux = 73 g/day			
MW-302	9 (Water table) to 90 / 0 to 81	22.11	30%
MW-303	22 to 35 / 13 to 26	3.55	5%
MW-304	12 (Water table) to 60 / 0 to 48	37.21	51%
MW-305	11 (Water table) to 34 / 0 to 23	3.75	5%

Notes:

VPT	Vertical Profiling Transect
BGS	below ground surface
BWT	below water table
g/day	grams per day

Table 4-10
Residential Well Sulfolane Results
Initial Sampling Event
North Pole Refinery
Flint Hills Resources Alaska, LLC

Collection Date	Sulfolane Results µg/L	Sample Type	Laboratory WO #
12/14/2012	<6.40	PS	1128693
11/20/2012	<6.46	PS	1128671
10/16/2012	<6.20	PS	1128577
10/4/2012	<6.20	PS	1128546
10/22/2012	<6.32	PS	1128598
11/6/2012	<6.96	PS	1128644
12/15/2012	<6.20	PS	1128698
10/25/2012	<6.46	PS	1128615
10/25/2012	<6.60	PS	1128614
10/15/2012	<6.20	PS	1128574
11/20/2012	<6.52	PS	1128670
11/20/2012	<6.52	DUP	1128670
11/27/2012	<6.20	PS	1128674

Notes:
The samples tabulated above were collected per FHRA direction.
Wells listed in this table were analyzed using USEPA Method 1625 with isotope dilution.

FHRA	Flint Hills Resources Alaska, LLC
USEPA	United States Environmental Protection Agency
< LOD	Non-detect results are presented as < LOD (Limit of Detection)
µg/L	Micrograms per liter
WO #	Work order number
PS	Project Sample
Dup	Duplicate

Table 4-11
Residential Well Sulfolane Results
Resampling Event
North Pole Refinery
Flint Hills Resources Alaska, LLC

Initial Collection Date	Initial Sulfolane Result µg/L	Resample Collection Date	Resample Sulfolane Results µg/L	Sample Type	Laboratory WO #
11/21/2011	<6.20	11/30/2012	<6.52	PS	1128676
N/A	N/A	11/30/2012	<6.20	DUP	1128676
11/4/2011	<6.46	10/4/2012	<6.20	PS	1128547

Notes: The samples tabulated above were collected per FHRA direction.
Wells listed in this table were analyzed using USEPA Method 1625 with isotope dilution.

FHRA	Flint Hills Resources Alaska, LLC
USEPA	United States Environmental Protection Agency
< LOD	Non-detect results are presented as < LOD (Limit of Detection)
µg/L	micrograms per liter
WO #	Work order number
PS	Project Sample
Dup	Duplicate
N/A	Not applicable

Table 4-12
Geochemical Field Parameter Results
North Pole Refinery
Flint Hills Resources Alaska, LLC

Date	Samples	Dup	Temperature (°C)	Dissolved Oxygen (mg/L)	Conductivity (µS/cm)	pH (std. units)	Mn(II) (mg/L)	Mn(tot) (mg/L)	Mn(IV) (mg/L)	Fe(II) (mg/L)	Fe(tot) (mg/L)	Fe(III) (mg/L)
10/12/2012	AS-MW-6		6.7	14.02	315.9	7.56	--	0.0204	0.01	<0.156	0.296	--
11/12/2012	MW-105		3.0	0.32	239.3	7.23	0.162	0.547	0.385	0.79	0.87	0.08
11/12/2012	MW-105A		4.0	0.26	286.1	7.07	0.329	1.65	1.32	2.47	2.52	0.05
11/14/2012	MW-109		10.4	0.18	340.4	7.30	0.340	1.97	1.63	2.17	2.79	0.62
10/18/2012	MW-110		6.05	2.02	787	5.99	0.410	3.84	3.43	1.45	35.4	34.0
11/12/2012	MW-127		5.7	0.07	280.6	7.11	0.856	4.46	3.60	5.02	5.28	0.26
10/22/2012	MW-130		6.3	0.31	336.9	6.70	--	--	--	--	--	--
11/14/2012	MW-131		4.1	0.25	280.5	7.26	0.321	2.21	1.89	0.06	0.05	<0.03
11/14/2012	MW-231	DUP	--	--	--	--	0.307	2.41	2.10	<0.03	0.04	<0.03
11/12/2012	MW-142		4.4	0.11	301.9	7.35	1.05	9.00	7.95	10.1	10.9	0.8
11/15/2012	MW-143		3.3	0.34	244.1	7.20	0.432	3.39	2.96	0.44	0.64	0.20
10/22/2012	MW-148A		4.1	0.34	195.7	6.52	1.66	2.42	0.76	6.6	7.3	0.7
11/11/2012	MW-148B		3.0	0.22	269.7	6.60	0.560	2.47	1.91	3.32	3.42	0.10
11/10/2012	MW-151A		2.5	0.40	254.7	7.08	0.513	2.02	1.50	0.62	0.78	0.16
11/10/2012	MW-151B		2.3	0.19	240.3	7.17	0.593	1.75	1.16	1.28	1.33	0.05
11/9/2012	MW-152A		4.4	2.43	255.5	7.17	0.365	1.98	1.62	0.98	1.45	0.47
11/9/2012	MW-152B		3.1	0.30	234.1	7.09	0.370	1.96	1.59	0.31	0.67	0.36
10/31/2012	MW-156A		2.9	0.24	77.4	6.92	4.19	6.00	1.81	28.0	36.8	8.8
10/31/2012	MW-256A		--	--	--	--	5.04	6.39	1.35	30.4	35.8	5.4
10/31/2012	MW-156B		-0.2	0.20	225.9	7.24	0.457	0.910	0.453	0.04	0.08	0.04
10/31/2012	MW-157A		2.5	0.42	71.7	7.14	1.57	4.91	3.34	0.50	1.63	1.13
11/9/2012	MW-158A		3.1	3.09	436.8	6.50	0.355	2.23	1.88	5.95	6.25	0.30
10/31/2012	MW-159A		5.1	3.50	345.4	6.21	0.256	0.319	0.063	<0.03	0.09	<0.03
10/22/2012	MW-161A		1.4	0.56	324.4	6.75	0.634	0.960	0.326	9.64	10.3	0.7
10/25/2012	MW-161B		-0.4	0.26	282.3	7.29	0.188	0.715	0.527	0.38	0.41	0.03
10/31/2012	MW-162A		2.4	0.37	351.9	7.05	0.479	3.04	2.56	8.29	9.85	1.56
10/31/2012	MW-162B		-0.2	0.33	212.1	7.09	0.714	0.800	0.086	<0.03	<0.03	<0.03
10/30/2012	MW-163A		2.1	0.30	259.2	6.70	0.222	0.625	0.403	0.07	0.14	0.07
10/25/2012	MW-164A		2.0	0.40	342.6	7.33	0.265	1.67	1.40	5.20	5.85	0.65
10/26/2012	MW-165A		3.8	0.87	222.5	6.16	0.088	0.129	0.041	0.35	0.69	0.34
10/8/2012	MW-166A		2.3	0.14	326.7	6.64	0.372	1.26	0.89	6.20	9.30	3.10
10/23/2012	MW-166B		-0.4	0.34	280.9	6.93	0.307	1.81	1.50	2.84	3.10	0.26
10/23/2012	MW-266B	DUP	--	--	--	--	0.392	2.01	1.62	2.55	3.09	0.54
10/25/2012	MW-167A		1.0	0.65	480.8	6.87	0.206	1.06	0.85	1.5	2.02	0.5
10/25/2012	MW-167B		-0.3	0.46	468.3	6.81	0.145	2.11	1.96	0.54	0.68	0.14
10/26/2012	MW-168A		2.5	0.16	256.5	6.55	0.164	1.06	0.90	9.05	11.95	2.90
10/23/2012	MW-169A		1.2	0.35	217.5	7.23	0.222	0.758	0.536	2.80	2.84	0.04

Table 4-12
Geochemical Field Parameter Results
North Pole Refinery
Flint Hills Resources Alaska, LLC

Date	Samples	Dup	Temperature (°C)	Dissolved Oxygen (mg/L)	Conductivity (µS/cm)	pH (std. units)	Mn(II) (mg/L)	Mn(tot) (mg/L)	Mn(IV) (mg/L)	Fe(II) (mg/L)	Fe(tot) (mg/L)	Fe(III) (mg/L)
10/23/2012	MW-269A	DUP	--	--	--	--	0.250	0.814	0.564	2.56	2.76	0.20
10/23/2012	MW-169C		-0.5	0.37	169.6	7.33	0.230	0.366	0.136	2.80	2.78	<0.03
10/31/2012	MW-170A		7.4	1.33	480.3	6.60	0.402	3.56	3.16	12.1	12.3	0.2
10/30/2012	MW-171A		3.5	0.49	322.7	6.72	0.693	1.15	0.45	<0.03	<0.03	<0.03
10/30/2012	MW-171B		0.1	0.33	259.6	6.98	0.576	0.97	0.394	5.26	5.26	<0.03
12/12/2012	MW-176A		4.0	1.01	676	6.95	2.35	11.1	8.8	6.6	26.4	19.80
12/12/2012	MW-176B		5.0	0.13	217.6	7.21	0.212	0.95	0.74	0.09	0.19	0.10
11/12/2012	MW-180A		3.9	0.27	287.8	6.99	0.373	1.71	1.34	1.46	2.72	1.26
11/12/2012	MW-180B		3.5	0.26	243.9	7.30	0.260	0.656	0.396	<0.03	<0.03	<0.03
11/12/2012	MW-280B	DUP	--	--	--	--	0.263	0.671	0.408	<0.03	<0.03	<0.03
10/19/2012	MW-182A		1.0	0.15	247.5	6.57	1.25	1.60	0.35	3.88	5.48	1.60
10/18/2012	MW-193A		3.1	1.05	357.5	6.55	0.544	2.67	2.13	4.2	4.4	0.1
10/18/2012	MW-193B		0.2	0.11	174.2	6.88	0.242	1.03	0.79	0.42	0.46	0.04

Notes:

DUP	Field-duplicate sample
Fe	iron
Mn	manganese
°C	degrees celsius
µS/cm	microsiemens per centimeter
mg/L	milligrams per liter
std.	standard
tot	total
Fe(II) or Fe(III)	valence state of iron
Mn(II) or Mn(IV)	valence state of manganese

Estimated Detection Limits (EDLs) provided by HACH in "HACH DR/890 Colorimeter Procedures Manual," Hach Company, 1997-2009. China.
EDLs:
Mn, LR is 0.020 mg/L
Fe is 0.03 mg/L

Table 4-13
Geochemical Parameter Analytical Results
North Pole Refinery
Flint Hills Resources Alaska, LLC

Geochemical Analysis Method						EPA 300.0	SM 5310B	SM21 2320B				SM21 2340B	EPA 300.0	RSK-175
Location	Comments	Sample	Dup	Work Order	Collect Date	Sulfate	Total Organic Carbon	Alkalinity	CO_3 Alkalinity	HCO_3 Alkalinity	OH Alkalinity	Hardness as $CaCO_3$	Total Nitrate/Nitrite-N	Methane
						mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Onsite Wells														
Water table groundwater monitoring zone														
AS-MW-6		AS-MW-6		1128567	10/12/2012	62.1	--	--	--	--	--	--	3.86	<0.00520
MW-105A		MW-105A		1128654	11/12/12	39.3	1.93	142	<6.20	142	<6.20	169	0.0900J	0.0352
MW-109		MW-109		1128666	11/14/12	39.8	1.38	136	<6.20	136	<6.20	166	--	<0.00130B*
MW-110		MW-110		1128588	10/18/12	10.5	10.1	110	<6.20	110	<6.20	178	--	2.55
MW-116	Weather	Not sampled		--	--	--	--	--	--	--	--	--	--	--
MW-127		MW-127		1128654	11/12/12	32.9	2.58	152	<6.20	152	<6.20	172	--	0.169
MW-131		MW-131		1128666	11/14/12	37.4	1.86	153	<6.20	153	<6.20	195	--	0.0740
MW-131		MW-231	DUP	1128666	11/14/12	37.5	1.83	159	<6.20	159	<6.20	194	--	0.0660
MW-142		MW-142		3120376	11/12/12	18.1	3.78	187	<6.20	187	<6.20	173	0.0860J	0.447
MW-143		MW-143		1128666	11/15/12	36.3	2.37	147	<6.20	147	<6.20	164	--	0.0890
MW-176A		MW-176A		1128695	12/12/12	2.53	11.3	220	<6.20	220	<6.20	286	--	3.00
MW-180A		MW-180A		1128654	11/12/12	43.2	2.66	143	<6.20	143	<6.20	188	--	<0.00710
10-55 feet below water table groundwater monitoring zone														
MW-105		MW-105		1128654	11/12/12	44.6	1.16	123	<6.20	123	<6.20	147	--	<0.00710
MW-148B		MW-148B		3120376	11/11/12	33.4	3.02	161	<6.20	161	<6.20	189	--	<0.00710
MW-176B		MW-176B		1128695	12/12/12	46.0	1.17	124	<6.20	124	<6.20	152	--	0.00450
MW-180B		MW-180B		1128654	11/12/12	45.4	1.11	117	<6.20	117	<6.20	150	--	<0.00710
MW-180B		MW-280B	DUP	1128654	11/12/12	45.3	1.05	110	<6.20	110	<6.20	148	--	<0.00710
Offsite Wells														
Water table groundwater monitoring zone														
MW-148A		MW-148A		1128600	10/22/12	17.3	15.8	134	<6.20	134	<6.20	144	--	0.0571
MW-151A		MW-151A		1128654	11/10/12	37.1	2.10J*	150	<6.20	150	<6.20	169	--	--
MW-152A		MW-152A		1128654	11/09/12	39.0	2.11	132	<6.20	132	<6.20	172	--	--
MW-156A		MW-156A		1128640	10/31/12	24.7	8.09	252	<6.20	252	<6.20	253	--	--
MW-156A		MW-256A	DUP	1128640	10/31/12	24.8	8.08	252	<6.20	252	<6.20	249	--	--
MW-157A		MW-157A		1128640	10/31/12	35.6	2.66	167	<6.20	167	<6.20	194	--	--
MW-158A		MW-158A		1128654	11/09/12	29.3	15.4	323	<6.20	323	<6.20	323	--	0.450
MW-159A		MW-159A		1128637	10/31/12	38.6	4.37	227	<6.20	227	<6.20	270	--	--
MW-161A		MW-161A		1128602	10/22/12	14.9	3.19	234	<6.20	234	<6.20	239	<0.100B*	0.132
MW-162A		MW-162A		1128640	10/31/12	28.7	7.62	223	<6.20	223	<6.20	215	--	--
MW-163A		MW-163A		1128627	10/30/12	32.9	2.79	165	<6.20	165	<6.20	183	--	--
MW-164A		MW-164A		1128616	10/25/12	22.8	7.11	259	<6.20	259	<6.20	260	--	--
MW-165A		MW-165A		1128624	10/26/12	18.2	4.48	150	<6.20	150	<6.20	179	--	--
MW-166A		MW-166A		1128562	10/08/12	16.4	6.26	197	<6.20	197	<6.20	216	--	0.0118
MW-167A		MW-167A		1128616	10/25/12	27.4	5.95	301	<6.20	301	<6.20	322	--	--
MW-168A		MW-168A		1128624	10/26/12	22.6	3.97	171	<6.20	171	<6.20	165	--	--
MW-169A		MW-169A		1128616	10/23/12	36.4	2.34	142	<6.20	142	<6.20	156	--	--
MW-169A		MW-269A	DUP	1128616	10/23/12	36.5	2.34	142	<6.20	142	<6.20	165	--	--
MW-170A		MW-170A		1128637	10/31/12	20.9	6.23	344	<6.20	344	<6.20	329	--	--
MW-171A		MW-171A		1128627	10/30/12	19.5	10.5	262	<6.20	262	<6.20	264	--	--
MW-182A		MW-182A		1128592	10/19/12	16.2JL*	8.14JL*	197JL*	6.20JL*	197JL*	6.20JL*	225JL*	--	--
MW-193A		MW-193A		1128592	10/18/12	37.5	5.00	275	<6.20	275	<6.20	341	--	--
10-55 feet below water table groundwater monitoring zone														
MW-151B		MW-151B		1128654	11/10/12	37.5	1.71	142	<6.20	142	<6.20	166	--	--
MW-152B		MW-152B		1128654	11/09/12	39.3	1.81	139	<6.20	139	<6.20	174	--	--
MW-156B		MW-156B		1128640	10/31/12	37.1	1.72	139	<6.20	139	<6.20	177	--	--
MW-161B		MW-161B		1128616	10/25/12	25.3	2.20	201	<6.20	201	<6.20	230	--	--
MW-162B		MW-162B		1128640	10/31/12	36.5J*	2.09	152	<6.20	152	<6.20	173	--	--
MW-166B		MW-166B		1128616	10/23/12	19.1	4.71	211	<6.20	211	<6.20	225	--	--
MW-166B		MW-266B	DUP	1128616	10/23/12	19.1	4.56	212	<6.20	212	<6.20	228	--	--

Table 4-13
Geochemical Parameter Analytical Results
North Pole Refinery
Flint Hills Resources Alaska, LLC

Geochemical Analysis Method						EPA 300.0	SM 5310B	SM21 2320B				SM21 2340B	EPA 300.0	RSK-175
Location	Comments	Sample	Dup	Work Order	Collect Date	Sulfate	Total Organic Carbon	Alkalinity	CO_3 Alkalinity	HCO_3 Alkalinity	OH Alkalinity	Hardness as $CaCO_3$	Total Nitrate/Nitrite-N	Methane
						mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
MW-167B		MW-167B		1128616	10/25/12	15.4	5.75	309	<6.20	309	<6.20	320	--	--
MW-169C		MW-169C		1128616	10/23/12	40.0	1.72	127	<6.20	127	<6.20	156	--	--
MW-171B		MW-171B		1128627	10/30/12	37.4	3.39	172	<6.20	172	<6.20	200	--	--
MW-193B		MW-193B		1128592	10/18/12	36.5	2.02	128	<6.20	128	<6.20	152	--	--

Notes:

mg/L	milligrams per liter
DUP	Field-duplicate sample
J	Estimated value detected below the limit of quantification and above the detection limit (flag applied by SGS)
J*	Result is considered estimated (no direction of bias), due to QC failures (flag applied by SWI)
JL*	Result is considered estimated, biased low, due to QC failures (flag applied by SWI)
B*	Result is considered not detected due to laboratory-based contamination identified in the method blank (flag applied by SGS)
<	Not detected; limit of detection (LOD) listed (except for methane, where limit of quantitation [LOQ] is listed)
HCO_3	bicarbonate
CO_3	carbonate
OH	hydroxide
$CaCO_3$	calcium carbonate
N	nitrogen
USEPA	United States Environmental Protection Agency

Comments:

Weather	No sample collected due to cold-weather constraints

Table 4-14
COPC Analytical Results
North Pole Refinery
Flint Hills Resources Alaska, LLC

COPC Analysis Method						USEPA 200.8
Location	Comments	Sample	Dup	Work Order	Collect Date	Iron
						mg/L
ADEC Groundwater Cleanup Level						11 mg/L[a]
Onsite Wells						
Water table groundwater monitoring zone						
MW-110		MW-110		1128588	10/18/12	30.2
MW-113		MW-113		1128665	11/14/12	5.27
MW-125		MW-125		1128665	11/14/12	7.97
MW-127		MW-127		1128653	11/12/12	5.42†
MW-133		MW-133		1128665	11/15/12	0.165J
MW-133		MW-233	DUP	1128665	11/15/12	0.149J
MW-135	Weather	Not sampled		--	--	--
MW-138		MW-138		1128695	12/13/12	32.3
MW-139		MW-139		1128665	11/14/12	15.2
MW-141		MW-141		1128664	11/15/12	1.88
MW-148A		MW-148A		1128600	10/22/12	7.72
MW-149A		MW-149A		1128653	11/10/12	<0.620†
MW-176A		MW-176A		1128695	12/12/12	26.7
10-55 feet below water table groundwater monitoring zone						
MW-176B		MW-176B		1128695	12/12/12	0.160J
Onsite Wells - 55 - 90 feet below water table groundwater monitoring zone						
MW-174B	Weather	Not sampled		--	--	--
Offsite Wells						
Water table groundwater monitoring zone						
MW-153A		MW-153A		1128665	11/14/12	0.121J
MW-153A		MW-253A	DUP	1128665	11/14/12	0.0993J
10-55 feet below water table groundwater monitoring zone						
MW-169C		MW-169C		1128617	10/23/12	2.58†

Notes:

mg/L	milligrams per liter
DUP	Field-duplicate sample
J	Estimated concentration, detected above the detection limit (DL) and below the limit of quantitation (LOQ)
<	Not detected; limit of detection (LOD) listed
†	Iron analyzed by Method SW6020
COPC	Chemical of Potential Concern
ADEC	Alaska Department of Environmental Conservation
USEPA	United States Environmental Protection Agency
a	USEPA Regions 3, 6, and 9. (Updated November 2011). Regional Screening Levels for Chemical Contaminants at Superfund Sites.

Comments:

Weather No sample collected due to cold-weather constraints

Table 5-1
Remediation System Operation - Groundwater Recovery
North Pole Refinery
Flint Hills Resources Alaska, LLC

Date	Monthly Total (gallons)	Monthly Average (gallons / day)	Monthly Average (gallons / minute)
January 2009	5,637,292	181,848	126
February 2009	4,965,414	177,336	123
March 2009	5,673,504	183,016	127
April 2009	5,845,823	194,861	135
May 2009	6,430,915	207,449	144
June 2009	6,229,883	207,663	144
July 2009	6,316,965	203,773	142
August 2009	6,243,319	201,397	140
September 2009	10,634,423	354,481	246
October 2009	5,114,811	164,994	115
November 2009	0	0	0
December 2009	6,153,173	198,489	138
January 2010	8,676,601	279,890	194
February 2010	9,185,582	328,057	228
March 2010	9,424,363	304,012	211
April 2010	9,914,262	330,475	229
May 2010	9,812,735	316,540	220
June 2010	9,282,464	309,415	215
July 2010	9,325,475	300,822	209
August 2010	9,872,250	318,460	221
September 2010	9,122,386	304,080	211
October 2010	7,700,526	248,404	173
November 2010	7,489,601	249,653	173
December 2010	7,279,463	234,821	163
January 2011	8,605,402	277,594	193
February 2011	7,409,928	264,640	184
March 2011	7,144,062	230,454	160
April 2011	8,034,008	267,800	186
May 2011	8,076,367	260,528	181
June 2011	9,735,245	324,508	225
July 2011	11,838,286	381,880	265
August 2011	12,119,042	390,937	271
September 2011	15,458,620	515,287	358
October 2011	15,492,362	499,754	347
November 2011	16,279,722	542,657	377
December 2011	16,711,381	539,077	374
January 2012	15,645,486	504,381	350
February 2012	15,936,577	515,987	358
March 2012	16,390,112	530,180	368
April 2012	16,010,934	514,711	357
May 2012	14,639,653	472,247	328
June 2012	14,109,044	451,769	314
July 2012	16,721,808	540,994	376
August 2012	16,256,379	523,831	364
September 2012	15,402,121	515,527	358
October 2012	16,377,507	527,101	366
November 2012	15,069,768	503,018	349
December 2012	15,740,566	507,135	352

Table 5-2
Groundwater Recovery System
Sulfolane Mass Recovery
North Pole Refinery
Flint Hills Resources Alaska, LLC

Date	Groundwater Recovery (gpm)	Recovered Sulfolane Concentration (µg/L)*	Sulfolane Mass Recovery (lb/day)
1/6/2012	365.8	97.2	0.43
1/18/2012	354.0	104	0.44
2/1/2012	368.7	99	0.44
2/16/2012	373.4	101	0.45
3/5/2012	368.0	93.3	0.41
3/20/2012	373.6	92	0.41
4/5/2012	373.8	96.6	0.43
4/18/2012	343.6	80.5	0.33
5/4/2012	332.7	95.9	0.38
5/16/2012	337.4	102	0.41
6/5/2012	321.2	102	0.39
6/19/2012	284.1	117	0.40
7/17/2012	372.4	102	0.46
8/9/2012	371.5	103	0.46
9/13/2012	368.0	103	0.46
10/16/2012	362.6	90.2	0.39
11/13/2012	330.6	100	0.40
12/12/2012	361.7	94.7	0.41
		4Q 2012 Average	0.40

Notes:

*	As measured at the combined air stripper influent
gpm	gallons per minute
µg/L	micrograms per liter
lb/day	pounds per day

Table 5-3a
Groundwater Recovery System
Sulfolane Mass Recovery R-42

North Pole Refinery
Flint Hills Resources Alaska, LLC

Date	Groundwater Recovery (gpm)	Recovered Sulfolane Concentration (µg/L)*	Sulfolane Mass Recovery (lb/day)
1/17/2012	109	59.1	0.08
2/15/2012	117	69.8	0.10
3/19/2012	121	60.4	0.09
4/18/2012	119	65.6	0.09
5/16/2012	122	70.8	0.10
6/19/2012	119	61.8	0.09
7/17/2012	121	50.2	0.07
8/9/2012	120	57.4	0.08
9/13/2012	120	54.2	0.08
10/16/2012	120	52.6	0.08
11/13/2012	111	52.5	0.07
12/11/2012	120	50.4	0.07
		4Q 2012 Average	0.07

Notes:

*	As measured at the combined air stripper influent
gpm	gallons per minute
µg/L	micrograms per liter
lb/day	pounds per day

Table 5-3b
Groundwater Recovery System
Sulfolane Mass Recovery R-40

North Pole Refinery
Flint Hills Resources Alaska, LLC

Date	Groundwater Recovery (gpm)	Recovered Sulfolane Concentration (µg/L)*	Sulfolane Mass Recovery (lb/day)
1/17/2012	49	68.4	0.04
2/15/2012	50	69.2	0.04
3/19/2012	53	54.9	0.03
4/18/2012	52	48.6	0.03
5/16/2012	53	38.7	0.02
6/19/2012	50	39.4	0.02
7/17/2012	61	49.8	0.04
8/9/2012	60	47.8	0.03
9/13/2012	40	48.3	0.02
10/16/2012	49	50.9	0.03
11/13/2012	43	44.2	0.02
12/11/2012	53	40.7	0.03
		4Q 2012 Average	0.03

Notes:

*	As measured at the combined air stripper influent
gpm	gallons per minute
µg/L	micrograms per liter
lb/day	pounds per day

Table 5-3c
Groundwater Recovery System
Sulfolane Mass Recovery R-39

North Pole Refinery
Flint Hills Resources Alaska, LLC

Date	Groundwater Recovery (gpm)	Recovered Sulfolane Concentration (µg/L)*	Sulfolane Mass Recovery (lb/day)
1/17/2012	84	<6.2	0.00
2/15/2012	88	<6.52	0.00
3/19/2012	87	<6.2	0.00
4/18/2012	79	<6.2	0.00
5/16/2012	59	<6.2	0.00
6/19/2012	83	<6.2	0.00
7/17/2012	91	<6.46	0.00
8/9/2012	91	<6.2	0.00
9/13/2012	92	<6.60	0.00
10/16/2012	90	<6.20	0.00
11/13/2012	83	<6.20	0.00
12/11/2012	90	<6.40	0.00
		4Q 2012 Average	0.00

Notes:

*	As measured at the combined air stripper influent
gpm	gallons per minute
µg/L	micrograms per liter
lb/day	pounds per day

Table 5-3d
Groundwater Recovery System
Sulfolane Mass Recovery R-35R

North Pole Refinery
Flint Hills Resources Alaska, LLC

Date	Groundwater Recovery (gpm)	Recovered Sulfolane Concentration (µg/L)*	Sulfolane Mass Recovery (lb/day)
1/17/2012	83	123	0.12
2/15/2012	87	127	0.13
3/19/2012	91	118	0.13
4/18/2012	89	110	0.12
5/16/2012	92	113	0.12
6/19/2012	87	112	0.12
7/17/2012	91	131	0.14
8/9/2012	92	131	0.14
9/13/2012	92	147	0.16
10/16/2012	89	121	0.13
11/13/2012	83	139	0.14
12/11/2012	89	125	0.13
		4Q 2012 Average	0.13

Notes:

*	As measured at the combined air stripper influent
gpm	gallons per minute
µg/L	micrograms per liter
lb/day	pounds per day

Table 5-3e
Groundwater Recovery System
Sulfolane Mass Recovery R-21

North Pole Refinery
Flint Hills Resources Alaska, LLC

Date	Groundwater Recovery (gpm)	Recovered Sulfolane Concentration (µg/L)*	Sulfolane Mass Recovery (lb/day)
1/17/2012	45	355	0.19
2/15/2012	42	413	0.21
3/19/2012	44	304	0.16
4/18/2012	41	315	0.16
5/16/2012	44	302	0.16
6/19/2012	46	268	0.15
7/17/2012	47	399	0.23
8/9/2012	45	441	0.24
9/13/2012	51	356	0.22
10/16/2012	48	344	0.20
11/13/2012	43	336	0.17
12/11/2012	46	314	0.17
		4Q 2012 Average	0.18

Notes:

*	As measured at the combined air stripper influent
gpm	gallons per minute
µg/L	micrograms per liter
lb/day	pounds per day

Table 5-4
Fourth Quarter 2012 LNAPL Recovery
North Pole Refinery
Flint Hills Resources Alaska, LLC

All units in gallons

2012	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
MW-138	20	96	78	92	0	0	0	0	0	0	0	0	286
MW-176-A	0	0	0	0	0	0	0	0	0	4	0	0	4
MW-186-A	0	0	0	0	0	0	0	0	0	1	0	0	1
MW-334-15	0	0	0	0	0	0	0	0	0	11	0	0	11
O-wells	0.3	1.1	1	0	0	0	6	1	2	3	0	1	15
S-wells	0	0	0	0	0	0	0	0	0	3	0	1	4
R-14A	0	0	0	0	0	0	0	0	0	0.7	0.0	0.0	1
R-18	30	0	34	10	14	0	1	5	4	2	0	1	101
R-20-R	11	12	20	27	18	20	12	10	4	0	5	6	144
R-21	176	134	106	100	43	19	0	15	4	10	15	8	629
R-22	0	0	0	5	0	0	0	0	0	0	0	0	5
R-32	90	0	50	125	124	26	12	12	2	1	0	12	453
R-33	FROZEN	FROZEN	FROZEN	FROZEN	FROZEN	0	0	0	0	0	0	FROZEN	0
R-34	18	0	8	15	5	0	0	0	0	0	0	0	46
R-35-R	35	69	114	114	17	10	0	0	0	0	0	0	358
R-39	4	3	5	5	0.2	0	0	0	0	0	0	0	17
R-40	50	102	102	116	31	35	9	15	0	0	40	13	512
Coalescer	0	3	0	32	4	0	0	0	0	0	0	0	38
TOTAL	433	419	518	641	255	110	41	57	15	35	60	42	2625

Note: This summary includes only product that has been recovered for recycling. Product that has been recovered but has not yet been removed from the storage tank for recycling is not included in the table.

Table 5-5
Annual LNAPL Recovery
North Pole Refinery
Flint Hills Resources Alaska, LLC

Well ID	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012 (through Fourth Quarter)	Well Total (gallons)
R-1	3,243	1,165	340	218	60	35	25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Removed July 2008					**5,086**
R-2	1,538	1,546	175	40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**3,299**
R-3	39	313	0	42	25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**419**
R-4	412	430	110	148	20	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**1,140**
R-5&5A	4,170	3,606	978	1,464	1,115	447	316	209	141	321	175	236	222	25	0	0	0	0	0	0	0	0	0	0	0	0	0	**13,425**
R-6	25	55	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Removed October 2009				**80**
R-7 & 8	14,216	17,108	67	809	1,438	575	1,793	1,693	385	250	0	Removed																**38,334**
R-9	11,011	22,378	744	479	385	510	1,036	565	106	71	23	25	29	12	0	0	0	0	0	0	0	0	0	5	2	0	0	**37,381**
R-10&10A	2,558	5,271	200	352	280	127	0	20	0	0	0	0	0	0	0	0	0	0	0	Removed May 2005								**8,808**
R-11	15,796	14,920	724	241	190	5	0	317	444	117	0	0	0	11	0	0	0	0	0	Removed May 2005								**32,765**
R-12	4,099	0	80	51	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**4,230**
R-13	1,044	3,563	79	177	55	0	27	15	62	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**5,022**
R-14&14A	4,664	773	125	341	344	48	116	182	96	123	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	**6,813**
R-18	0	1,955	5,128	13	0	10	17	0	151	30	0	25	0	0	1	2	0	0	0	0	0	0	0	7	29	5	101	**7,474**
R-19	0	6,106	1,623	106	90	30	138	496	205	9	0	0	0	0	2	0	0	0	0	0	0	0	0	12	14	Removed August 2010		**8,831**
R-20/R-20R	0	5,165	28,603	46	281	2,443	2,193	1,131	296	69	123	112	88	115	33	56	16	0	94	46	100	87	49	50	48	34	144	**41,422**
R-21	0	4,859	46,028	767	422	175	370	5,993	6,621	1,441	2,154	1,118	3,364	737	314	207	112	303	786	1,225	157	6,489	2,799	92	2,403	2,254	629	**91,818**
R-22	0	0	411	136	45	101	775	34	0	64	26	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	5	**1,598**
R-23	0	210	147	0	0	15	7	183	71	33	12	5	0	0	0	0	0	0	0	Removed May 2005								**683**
R-24	0	1,070	109	30	0	30	18	254	156	5	40	0	0	0	0	0	0	0	0	Removed May 2005								**1,712**
R-25	0	435	44	20	30	70	91	227	177	62	40	62	5	0	21	0	0	0	0	Removed May 2005								**1,284**
R-26	0	0	26	73	157	149	79	57	47	13	12	2	0	0	0	0	0	0	0	Removed May 2005								**615**
R-27	0	460	477	120	305	124	68	25	55	26	0	9	54	11	3	0	0	0	0	Removed May 2005								**1,737**
R-28	0	35	14	10	78	0	48	40	0	7	0	0	0	0	0	0	0	0	0	Removed May 2005								**232**
R-29	0	0	6	0	0	0	0	40	21	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	4	0	0	**75**
R-30	0	0	10	0	0	0	0	0	26	21	0	14	5	0	0	0	0	0	0	0	0	0	0	3	3	0	0	**82**
R-31	0	2,255	3,452	269	110	350	316	340	343	20	52	85	110	0	6	0	0	0	0	0	0	0	0	0	0	0	0	**7,708**
R-32	0	7,360	5,498	394	543	1,089	1,242	1,074	1,642	555	118	315	602	141	18	56	0	0	0	0	0	0	0	55	318	25	453	**21,498**
R-33	0	0	162	47	290	685	19	112	50	0	25	22	0	0	0	0	0	0	0	0	0	0	0	12	0	10	0	**1,434**
R-34	0	0	201	1,216	4,922	2,734	4,208	3,177	5,923	3,077	508	193	200	407	190	5	155	110	502	327	913	201	0	11	43	4	46	**29,271**
R-35/R-35R	0	0	22	37	1,042	2,659	740	468	26	0	0	0	0	0	4	5	0	0	13	0	0	0	0	18	234	201	358	**5,827**
R-36	0	0	20	23	0	0	191	261	491	0	26	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**1,016**
R-37	0	0	8	15	65	1,147	297	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**1,532**
R-38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
R-39	0	0	0	0	50	336	40	68	27	0	0	1,261	1,090	6	61	7	4	9	1	4	21	0	58	2	33	46	17	**3,141**
R-40	0	0	0	0	0	141	128	27	0	0	0	0	0	0	28	173	85	85	106	27	211	58	253	46	19	350	512	**2,248**
MW-138													Installed April 2001			0	0	76	352	469	365	367	187	321	216	144	286	**2,783**
MW-176-A																							Installed October 2010		0	0	4	**4**
MW-186-A																							Installed October 2010		0	0	1	**1**
MW-334-15																									Installed August 2012		11	**11**
S-22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
S-27	0	0	0	0	0	0	0	0	0	0	340	0	0	2	1	0	4	0	0	Removed May 2005								**347**
S-28	0	0	0	0	0	0	0	0	0	0	44	0	0	0	1	3	1	0	0	Removed May 2005								**49**
S-33	0	0	0	0	0	4	0	0	0	28	0	0	0	0	3	2	0	0	0	0	0	0	0	0	0	0	0	**37**
S-34	0	0	0	0	0	0	0	0	0	0	38	4	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	**43**
S-40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	53	0	0	0	0	0	0	0	**53**
S-42	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	2	0	0	0	0	0	0	0	0	0	0	**6**
S-43	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
S-44	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	0	0	0	0	0	0	0	0	0	0	0	**4**
S-45	0	0	0	0	0	0	0	0	0	0	0	Removed 1997																**0**
S-46	0	0	0	0	0	0	0	0	0	0	50	21	0	Removed May 1999														**71**
S-47	0	0	0	0	0	0	0	0	0	0	92	9	0	0	1	2	0	0	0	0	0	0	0	0	0	0	0	**104**
S-48	0	0	0	0	0	0	0	0	0	0	225	44	0	0	1	2	0	0	0	0	0	0	0	0	0	0	0	**272**
S-49	0	0	0	0	0	0	0	0	0	0	450	401	181	38	0	1	0	0	0	0	0	0	0	0	0	0	0	**1,071**
S-50	0	0	0	0	0	0	0	0	0	0	0	9	0	0	3	4	4	0	0	0	0	0	0	1	4	0	3	**27**
S-51	0	0	0	0	0	0	0	0	0	0	0	65	0	0	0	1	4	0	0	0	0	0	0	1	0	0	1	**72**
S-52	0	0	0	0	0	0	0	0	0	0	0	70	22	0	3	6	6	0	0	0	0	0	0	0	1	0	0	**108**
O-2																							Installed September 2010			176	0.1	**176**
O-10																								Installed September 2011			12	**12**
O-11																								Installed September 2011			0.6	**1**
O-13																								Installed September 2011			2	**2**
O-19																								Installed October 2011			0.3	**0**
O-27																								Installed November 2011			0.2	**0**
Coalescer																						Installed December 2009			264	355	38	**657**
Annual Total	**62,815**	**101,038**	**95,611**	**7,684**	**12,342**	**14,059**	**14,298**	**17,008**	**17,562**	**6,342**	**4,573**	**4,111**	**5,972**	**1,505**	**703**	**537**	**393**	**583**	**1,854**	**2,150**	**1,767**	**7,201**	**3,345**	**635**	**3,634**	**3,603**	**2,625**	**393,950**

Table 5-6
Remediation System Operation-Treatment System Performance
North Pole Refinery
Flint Hills Resources Alaska, LLC

Method / Analyte	Units	JANUARY 6, 2012										
		Combined Influent	Air Stripper Effluent (A Tower)	Air Stripper Effluent (B Tower)	Air Stripper Effluent (C Tower)	Air Stripper Effluent (D Tower)	Sand Filter Influent	GAC Vessel A-Inlet	GAC Vessel A-Outlet	GAC Vessel B-Outlet	Final Effluent	Percent Removal (%)
EPA 624 - Benzene, Toluene, Ethylbenzene, Xylenes												
Benzene	µg/L	**56.5**	**13.2**	0.850	0.490	1.30	2.92	0.620	< 0.240	--	< 0.240	>99.58
Toluene	µg/L	**8.64**	**1.92**	< 0.620	< 0.620	< 0.620	0.630 J	< 0.620	< 0.620	--	< 0.620	>92.82
Ethylbenzene	µg/L	**17.0**	**2.87**	< 0.620	< 0.620	< 0.620	0.580 J	< 0.620	< 0.620	--	< 0.620	>96.35
P & M -Xylene	µg/L	**54.6**	**9.90**	< 1.24	< 1.24	1.22 J	2.02	< 1.24	< 1.24	--	< 1.24	>97.73
o-Xylene	µg/L	**8.77**	**2.11**	< 0.620	< 0.620	0.370 J	0.580 J	< 0.620	< 0.620	--	< 0.620	>92.93
EP200.8 - Iron												
Total Iron	µg/L	3490	1010	1240	1020	896	2460	397	262	85.3 J	< 156	
Dissolved Iron	µg/L	3350	100 J	101 J	101 J	465	< 156	< 156	< 156	< 156	< 156	
SM 5310B - Total Organic Carbon												
Total Organic Carbon	mg/L	1.96	1.56	1.80	1.82	1.76	1.96	1.62	1.65	1.56	1.52	
SM20 2540D - TSS												
Total Suspended Solids	mg/L	7.40	1.75	2.70	2.00	1.62	16.8	0.707	0.500	< 0.600	0.306 J	
EPA 625M-SIMS - Polyaromatic Hydrocarbons												
Naphthalene	µg/L	**2.49**	**0.355**	< 0.0620	< 0.0620	< 0.0620	--	--	--	--	< 0.0640	>97.43
Acenaphthylene	µg/L	< 0.0314	< 0.0312	< 0.0300	< 0.0300	< 0.0300	--	--	--	--	< 0.0310	ND
Acenaphthene	µg/L	< 0.0314	< 0.0312	< 0.0300	< 0.0300	< 0.0300	--	--	--	--	< 0.0310	ND
Fluorene	µg/L	**0.0776**	**0.0282 J**	< 0.0300	< 0.0300	< 0.0300	--	--	--	--	< 0.0310	>60.05
Phenanthrene	µg/L	**0.0511 J**	< 0.0312	< 0.0300	< 0.0300	< 0.0300	--	--	--	--	< 0.0310	>39.33
Anthracene	µg/L	< 0.0314	< 0.0312	< 0.0300	< 0.0300	< 0.0300	--	--	--	--	< 0.0310	ND
Fluoranthene	µg/L	< 0.0314	< 0.0312	< 0.0300	< 0.0300	< 0.0300	--	--	--	--	< 0.0310	ND
Pyrene	µg/L	< 0.0314	< 0.0312	< 0.0300	< 0.0300	< 0.0300	--	--	--	--	< 0.0310	ND
Benzo(a)Anthracene	µg/L	< 0.0314	< 0.0312	< 0.0300	< 0.0300	< 0.0300	--	--	--	--	< 0.0310	ND
Chrysene	µg/L	< 0.0314	< 0.0312	< 0.0300	< 0.0300	< 0.0300	--	--	--	--	< 0.0310	ND
Benzo[b]Fluoranthene	µg/L	< 0.0314	< 0.0312	< 0.0300	< 0.0300	< 0.0300	--	--	--	--	< 0.0310	ND
Benzo[k]fluoranthene	µg/L	< 0.0314	< 0.0312	< 0.0300	< 0.0300	< 0.0300	--	--	--	--	< 0.0310	ND
Benzo[a]pyrene	µg/L	< 0.0314	< 0.0312	< 0.0300	< 0.0300	< 0.0300	--	--	--	--	< 0.0310	ND
Indeno[1,2,3-c,d] pyrene	µg/L	< 0.0314	< 0.0312	< 0.0300	< 0.0300	< 0.0300	--	--	--	--	< 0.0310	ND
Dibenzo[a,h]anthracene	µg/L	< 0.0314	< 0.0312	< 0.0300	< 0.0300	< 0.0300	--	--	--	--	< 0.0310	ND
Benzo[g,h,i]perylene	µg/L	< 0.0314	< 0.0312	< 0.0300	< 0.0300	< 0.0300	--	--	--	--	< 0.0310	ND
SW8270D - Sulfolane												
Sulfolane	µg/L	**97.2**	**49.2**	24	**28.2**	**28.1**	8.09	7.32	< 6.20	< 6.20	< 6.42	>93.40

Notes:

--	Sample not analyzed for analyte
Bold	Result or LOQ exceeds ADEC interim remediation goal (sulfolane), or wastewater disposal permit limit (benzene and total aromatic hydrocarbons).
J	Concentration is estimated; analyte was detected below the limit of quantitation (LOQ).
<	Analyte not detected above listed limit of detection (LOD)
µg/L	micrograms per liter
mg/L	milligrams per liter
GAC	Granular activated carbon

Table 5-6
Remediation System Operation-Treatment System Performance
North Pole Refinery
Flint Hills Resources Alaska, LLC

Method / Analyte	Units	JANUARY 18, 2012															
		R-21	R-35R	R-39	R-40	R-42	Combined Influent	Air Stripper Effluent (A Tower)	Air Stripper Effluent (B Tower)	Air Stripper Effluent (C Tower)	Air Stripper Effluent (D Tower)	Sand Filter Influent	GAC Vessel A-Inlet	GAC Vessel A-Outlet	GAC Vessel B-Outlet	Final Effluent	Percent Removal (%)
EPA 624 - Benzene, Toluene, Ethylbenzene, Xylenes																	
Benzene	µg/L	**106**	**28.5**	**46.3**	**232**	4.88	**58.6**	**12.1**	0.670	0.820	2.81	3.02	0.660	< 0.240	--	< 0.240	>99.59
Toluene	µg/L	**26.3**	**25.2**	**16.5**	**195**	< 0.620	**11.9**	**3.22**	0.540J	0.470J	0.740J	0.760J	< 0.620	< 0.620	--	< 0.620	>94.79
Ethylbenzene	µg/L	**38.1**	**21.6**	**10.2**	**58.2**	< 0.620	**17.7**	**3.71**	< 0.620	< 0.620	0.710J	0.810J	< 0.620	< 0.620	--	< 0.620	>96.5
P & M -Xylene	µg/L	**193**	**54.2**	**53.8**	**193**	< 1.24	**54.8**	**14.4**	0.670J	0.860J	2.83	2.92	< 1.24	< 1.24	--	< 1.24	>97.74
o-Xylene	µg/L	**41.9**	**11.4**	**16.6**	**76.7**	< 0.620	**10.6**	**3.48**	< 0.620	0.370J	1.00	0.930J	< 0.620	< 0.620	--	< 0.620	>94.15
EP200.8 - Iron																	
Total Iron	µg/L	3910	2360	2210	4160	2920	3820	1070	1160	1090	937	11100	554	305	131J	< 156	
Dissolved Iron	µg/L	3960	2420	2350	4230	2790	3610	145J	100J	88.2J	88.1J	< 156	< 156	< 156	< 156	< 156	
SM 5310B - Total Organic Carbon																	
Total Organic Carbon	mg/L	2.58	2.01	1.52	1.76	2.15	1.94	1.69	1.67	1.64	1.65	1.95	1.65	1.55	1.48	1.47	
SM20 2540D - TSS																	
Total Suspended Solids	mg/L	6.50	1.40	3.20	7.00	4.60	7.00	2.12	1.80	2.00	1.90	8.60	0.800	0.606	0.400J	0.400J	
EPA 625M-SIMS - Polyaromatic Hydrocarbons																	
Naphthalene	µg/L	**12.5**	**3.19**	**1.05**	**4.63**	< 0.0632	**2.69**	**0.156**	< 0.0620	< 0.0620	< 0.0620	--	--	--	--	< 0.0620	>97.7
Acenaphthylene	µg/L	< 0.0300	< 0.0300	< 0.0300	< 0.0300	< 0.0306	< 0.0300	< 0.0312	< 0.0300	< 0.0300	< 0.0300	--	--	--	--	< 0.0300	ND
Acenaphthene	µg/L	< 0.0300	< 0.0300	< 0.0300	< 0.0300	< 0.0306	< 0.0300	< 0.0312	< 0.0300	< 0.0300	< 0.0300	--	--	--	--	< 0.0300	ND
Fluorene	µg/L	**0.286**	**0.0753**	< 0.0300	**0.117**	< 0.0306	**0.0768**	**0.0274J**	< 0.0300	< 0.0300	< 0.0300	--	--	--	--	< 0.0300	>60.94
Phenanthrene	µg/L	**0.103**	**0.0241J**	< 0.0300	**0.119**	< 0.0306	**0.0432J**	< 0.0312	< 0.0300	< 0.0300	< 0.0300	--	--	--	--	< 0.0300	>30.56
Anthracene	µg/L	< 0.0300	< 0.0300	< 0.0300	< 0.0300	< 0.0306	< 0.0300	< 0.0312	< 0.0300	< 0.0300	< 0.0300	--	--	--	--	< 0.0300	ND
Fluoranthene	µg/L	**0.0160J**	< 0.0300	< 0.0300	< 0.0300	< 0.0306	< 0.0300	< 0.0312	< 0.0300	< 0.0300	< 0.0300	--	--	--	--	< 0.0300	ND
Pyrene	µg/L	< 0.0300	< 0.0300	< 0.0300	< 0.0300	< 0.0306	< 0.0300	< 0.0312	< 0.0300	< 0.0300	< 0.0300	--	--	--	--	< 0.0300	ND
Benzo(a)Anthracene	µg/L	< 0.0300	< 0.0300	< 0.0300	< 0.0300	< 0.0306	< 0.0300	< 0.0312	< 0.0300	< 0.0300	< 0.0300	--	--	--	--	< 0.0300	ND
Chrysene	µg/L	< 0.0300	< 0.0300	< 0.0300	< 0.0300	< 0.0306	< 0.0300	< 0.0312	< 0.0300	< 0.0300	< 0.0300	--	--	--	--	< 0.0300	ND
Benzo[b]Fluoranthene	µg/L	< 0.0300	< 0.0300	< 0.0300	< 0.0300	< 0.0306	< 0.0300	< 0.0312	< 0.0300	< 0.0300	< 0.0300	--	--	--	--	< 0.0300	ND
Benzo[k]fluoranthene	µg/L	< 0.0300	< 0.0300	< 0.0300	< 0.0300	< 0.0306	< 0.0300	< 0.0312	< 0.0300	< 0.0300	< 0.0300	--	--	--	--	< 0.0300	ND
Benzo[a]pyrene	µg/L	< 0.0300	< 0.0300	< 0.0300	< 0.0300	< 0.0306	< 0.0300	< 0.0312	< 0.0300	< 0.0300	< 0.0300	--	--	--	--	< 0.0300	ND
Indeno[1,2,3-c,d] pyrene	µg/L	< 0.0300	< 0.0300	< 0.0300	< 0.0300	< 0.0306	< 0.0300	< 0.0312	< 0.0300	< 0.0300	< 0.0300	--	--	--	--	< 0.0300	ND
Dibenzo[a,h]anthracene	µg/L	< 0.0300	< 0.0300	< 0.0300	< 0.0300	< 0.0306	< 0.0300	< 0.0312	< 0.0300	< 0.0300	< 0.0300	--	--	--	--	< 0.0300	ND
Benzo[g,h,i]perylene	µg/L	< 0.0300	< 0.0300	< 0.0300	< 0.0300	< 0.0306	< 0.0300	< 0.0312	< 0.0300	< 0.0300	< 0.0300	--	--	--	--	< 0.0300	ND
SW8270D - Sulfolane																	
Sulfolane	mg/L	**0.355**	**0.123**	< 0.00620	**0.0684**	**0.0591**	**0.104**	**0.056**	**0.0361**	**0.0443**	**0.0496**	0.0143	0.0115	< 0.00620	< 0.00640	< 0.00646	>93.79

Notes:

R-wells were sampled on Jan. 17, 2012 and the treatment system was sampled on Jan. 18, 2012.
J Concentration is estimated; analyte was detected below the limit of quantitation (LOQ).
< Analyte not detected above listed limit of detection (LOD).
-- Analyte not requested for analysis.
Bold Result or LOQ exceeds ADEC interim remediation goal (sulfolane), or wastewater disposal permit limit (benzene and total aromatic hydrocarbons).
µg/L micrograms per liter
mg/L milligrams per liter
GAC Granular activated carbon

Table 5-6
Remediation System Operation-Treatment System Performance
North Pole Refinery
Flint Hills Resources Alaska, LLC

Method / Analyte	Units	FEBRUARY 1, 2012									
		Combined Influent	Air Stripper Effluent (B Tower)	Air Stripper Effluent (C Tower)	Air Stripper Effluent (D Tower)	Sand Filter Influent	GAC Vessel A-Inlet	GAC Vessel A-Outlet	GAC Vessel B-Outlet	Final Effluent	Percent Removal (%)
EPA 624 - Benzene, Toluene, Ethylbenzene, Xylenes											
Benzene	µg/L	**62.9**	1.91	**10.3**	**27.7**	**11.8**	**5.33**	<0.240	<0.240	<0.240	>99.62
Toluene	µg/L	**36.0**	1.57	**6.71**	**16.5**	**7.79**	**2.55**	<0.620	<0.620	<0.620	>98.28
Ethylbenzene	µg/L	**16.3**	0.430J	**2.55**	**6.95**	**2.76**	**0.810J**	<0.620	<0.620	<0.620	>96.2
P & M -Xylene	µg/L	**60.1**	2.23	**11.0**	**30.1**	**13.3**	**3.41**	<1.24	<1.24	<1.24	>97.94
o-Xylene	µg/L	**17.4**	1.14	**4.54**	**10.1**	**5.02**	**1.51**	<0.620	<0.620	<0.620	>96.44
EP200.8 - Iron											
Total Iron	µg/L	3470	1740	1910	1820	5610	1290	451	213J	<156	
Dissolved Iron	µg/L	3420	394	1450	897	243J	<156	<156	<156	<156	
SM 5310B - Total Organic Carbon											
Total Organic Carbon	mg/L	2.51	2.01	1.84	1.80	2.02	1.65	1.58	1.57	1.45	
SM20 2540D - TSS											
Total Suspended Solids	mg/L	9.75	3.50	4.75	3.80	25.7	1.24	0.526	0.426J	<0.600	
EPA 625M-SIMS - Polyaromatic Hydrocarbons											
Naphthalene	µg/L	**2.00**	<0.0646	**0.427**	**0.820**	--	--	--	--	<0.0682	>96.59
Acenaphthylene	µg/L	<0.0312	<0.0312	<0.0300	<0.0300	--	--	--	--	<0.0330	ND
Acenaphthene	µg/L	<0.0312	<0.0312	<0.0300	<0.0300	--	--	--	--	<0.0330	ND
Fluorene	µg/L	**0.0927**	0.0188J	**0.0449J**	**0.0569**	--	--	--	--	<0.0330	>64.4
Phenanthrene	µg/L	**0.0517J**	<0.0312	<0.0300	**0.0226J**	--	--	--	--	<0.0330	>36.17
Anthracene	µg/L	<0.0312	<0.0312	<0.0300	<0.0300	--	--	--	--	<0.0330	ND
Fluoranthene	µg/L	<0.0312	<0.0312	<0.0300	<0.0300	--	--	--	--	<0.0330	ND
Pyrene	µg/L	<0.0312	<0.0312	<0.0300	<0.0300	--	--	--	--	<0.0330	ND
Benzo(a)Anthracene	µg/L	<0.0312	<0.0312	<0.0300	<0.0300	--	--	--	--	<0.0330	ND
Chrysene	µg/L	<0.0312	<0.0312	<0.0300	<0.0300	--	--	--	--	<0.0330	ND
Benzo[b]Fluoranthene	µg/L	<0.0312	<0.0312	<0.0300	<0.0300	--	--	--	--	<0.0330	ND
Benzo[k]fluoranthene	µg/L	<0.0312	<0.0312	<0.0300	<0.0300	--	--	--	--	<0.0330	ND
Benzo[a]pyrene	µg/L	<0.0312	<0.0312	<0.0300	<0.0300	--	--	--	--	<0.0330	ND
Indeno[1,2,3-c,d] pyrene	µg/L	<0.0312	<0.0312	<0.0300	<0.0300	--	--	--	--	<0.0330	ND
Dibenzo[a,h]anthracene	µg/L	<0.0312	<0.0312	<0.0300	<0.0300	--	--	--	--	<0.0330	ND
Benzo[g,h,i]perylene	µg/L	<0.0312	<0.0312	<0.0300	<0.0300	--	--	--	--	<0.0330	ND
SW8270D - Sulfolane											
Sulfolane	mg/L	**0.099**	**0.0348**	**0.0507**	**0.0631**	**0.0267**	0.0177	<0.00704	<0.00688	<0.00652	>93.41

Notes:

	Samples were collected on Feb. 1, 2012
J	Concentration is estimated; analyte was detected below the limit of quantitation (LOQ).
<	Analyte not detected; listed as less than limit of detection (LOD).
--	Analyte not requested for analysis.
Bold	Result or LOQ exceeds ADEC interim remediation goal (sulfolane), or wastewater disposal permit limit (benzene and total aromatic hydrocarbons).
µg/L	micrograms per liter
mg/L	milligrams per liter
GAC	Granular activated carbon

Table 5-6
Remediation System Operation-Treatment System Performance
North Pole Refinery
Flint Hills Resources Alaska, LLC

Method / Analyte	Units	FEBRUARY 15, 2012														
		R-21	R-35R	R-39	R-40	R-42	Combined Influent	Air Stripper Effluent (B Tower)	Air Stripper Effluent (C Tower)	Air Stripper Effluent (D Tower)	Sand Filter Influent	GAC Vessel A-Inlet	GAC Vessel A-Outlet	GAC Vessel B-Outlet	Final Effluent	Percent Removal (%)
EPA 624 - Benzene, Toluene, Ethylbenzene, Xylenes																
Benzene	mg/L	**0.110**	**0.0237**	**0.0371**	**0.216**	**0.00609**	**0.0492**	0.00199	**0.0133**	**0.0268**	**0.0138**	**0.00721**	<0.000240	-	<0.000240	>99.51
Toluene	mg/L	**0.0283**	**0.0231**	**0.0144**	**0.222**	<0.000620	**0.0299**	0.00162	**0.00857**	**0.0158**	**0.00843**	**0.00400**	<0.000620	-	<0.000620	>97.93
Ethylbenzene	mg/L	**0.0369**	**0.0196**	**0.00939**	**0.0530**	<0.000620	**0.0165**	0.000580J	**0.00374**	**0.00733**	**0.00376**	**0.00157**	<0.000620	-	<0.000620	>96.24
P & M -Xylene	mg/L	**0.179**	**0.0495**	**0.0475**	**0.158**	<0.00124	**0.0589**	0.00263	**0.0164**	**0.0307**	**0.0160**	**0.00632**	<0.00124	-	<0.00124	>97.89
o-Xylene	mg/L	**0.0390**	**0.0119**	**0.0143**	**0.0589**	<0.000620	**0.0165**	0.00119	**0.00602**	**0.00963**	**0.00539**	**0.00219**	<0.000620	-	<0.000620	>96.24
EP200.8 - Iron																
Total Iron	mg/L	3.57	2.26	2.14	3.75	2.60	3.51	1.19	1.38	1.49	3.24	0.355	0.197J	0.401	<0.156	
Dissolved Iron	mg/L	3.48	2.25	1.93	3.63	2.62	3.32	0.141J	0.148J	0.720	<0.156	<0.156	<0.156	<0.156	<0.156	
SM 5310B - Total Organic Carbon																
Total Organic Carbon	mg/L	2.45	1.99	1.27	1.58	1.81	2.00	1.71	1.71	1.88	2.00	1.55	1.49	1.49	1.44	
SM20 2540D - TSS																
Total Suspended Solids	mg/L	6.00	4.40	10.2	8.20	6.00	7.00	2.20	1.20	1.60	12.0	0.500	<0.600	<0.588	<0.304	
EPA 625M-SIMS - Polyaromatic Hydrocarbons																
Naphthalene	mg/L	**0.0126**	**0.00200**	**0.000671**	**0.00503**	<0.0000620	**0.00252**	<0.0000652	**0.000109**	**0.00103**	-	-	-	-	<0.0000646	>97.44
Acenaphthylene	mg/L	<0.000632	<0.0000312	<0.0000306	<0.0000320	<0.0000300	<0.0000320	<0.0000316	<0.0000312	<0.0000312	-	-	-	-	<0.0000312	ND
Acenaphthene	mg/L	<0.000632	<0.0000312	<0.0000306	<0.0000320	<0.0000300	<0.0000320	<0.0000316	<0.0000312	<0.0000312	-	-	-	-	<0.0000312	ND
Fluorene	mg/L	<0.000632	**0.0000491J**	<0.0000306	**0.000128**	<0.0000300	**0.0000606**	<0.0000316	<0.0000312	**0.0000386J**	-	-	-	-	<0.0000312	>48.51
Phenanthrene	mg/L	<0.000632	<0.0000312	<0.0000306	**0.000110**	<0.0000300	**0.0000375J**	<0.0000316	<0.0000312	<0.0000312	-	-	-	-	<0.0000312	>16.8
Anthracene	mg/L	<0.000632	<0.0000312	<0.0000306	<0.0000320	<0.0000300	<0.0000320	<0.0000316	<0.0000312	<0.0000312	-	-	-	-	<0.0000312	ND
Fluoranthene	mg/L	<0.000632	<0.0000312	<0.0000306	<0.0000320	<0.0000300	<0.0000320	<0.0000316	<0.0000312	<0.0000312	-	-	-	-	<0.0000312	ND
Pyrene	mg/L	<0.000632	<0.0000312	<0.0000306	<0.0000320	<0.0000300	<0.0000320	<0.0000316	<0.0000312	<0.0000312	-	-	-	-	<0.0000312	ND
Benzo(a)Anthracene	mg/L	<0.000632	<0.0000312	<0.0000306	<0.0000320	<0.0000300	<0.0000320	<0.0000316	<0.0000312	<0.0000312	-	-	-	-	<0.0000312	ND
Chrysene	mg/L	<0.000632	<0.0000312	<0.0000306	<0.0000320	<0.0000300	<0.0000320	<0.0000316	<0.0000312	<0.0000312	-	-	-	-	<0.0000312	ND
Benzo[b]Fluoranthene	mg/L	<0.000632	<0.0000312	<0.0000306	<0.0000320	<0.0000300	<0.0000320	<0.0000316	<0.0000312	<0.0000312	-	-	-	-	<0.0000312	ND
Benzo[k]fluoranthene	mg/L	<0.000632	<0.0000312	<0.0000306	<0.0000320	<0.0000300	<0.0000320	<0.0000316	<0.0000312	<0.0000312	-	-	-	-	<0.0000312	ND
Benzo[a]pyrene	mg/L	<0.000632	<0.0000312	<0.0000306	<0.0000320	<0.0000300	<0.0000320	<0.0000316	<0.0000312	<0.0000312	-	-	-	-	<0.0000312	ND
Indeno[1,2,3-c,d] pyrene	mg/L	<0.000632	<0.0000312	<0.0000306	<0.0000320	<0.0000300	<0.0000320	<0.0000316	<0.0000312	<0.0000312	-	-	-	-	<0.0000312	ND
Dibenzo[a,h]anthracene	mg/L	<0.000632	<0.0000312	<0.0000306	<0.0000320	<0.0000300	<0.0000320	<0.0000316	<0.0000312	<0.0000312	-	-	-	-	<0.0000312	ND
Benzo[g,h,i]perylene	mg/L	<0.000632	<0.0000312	<0.0000306	<0.0000320	<0.0000300	<0.0000320	<0.0000316	<0.0000312	<0.0000312	-	-	-	-	<0.0000312	ND
SW8270D - Sulfolane																
Sulfolane	mg/L	**0.413**	**0.127**	<0.00652	**0.0692**	**0.0698**	**0.101**	**0.0298**	**0.0488**	**0.0621**	0.0211	0.0224	<0.00640	<0.00640	<0.00620	>93.86

Notes:

	recovery wells were sampled on February 15, 2012 and treatment system was sampled on February 16, 2012
	A Tower was offline for maintenance during the sampling event
J	Concentration is estimated; analyte was detected below the limit of quantitation (LOQ).
JH	Result is considered biased high due to low internal standard (sulfolane-d8) recovery
mg/L	milligrams per liter
<	analyte not detected; limit of detection listed
-	analysis not requested/performed
Bold	Result or LOQ exceeds ADEC interim remediation goal (sulfolane), or wastewater disposal permit limit (benzene and total aromatic hydrocarbons).
GAC	Granular activated carbon

Table 5-6
Remediation System Operation-Treatment System Performance
North Pole Refinery
Flint Hills Resources Alaska, LLC

Method / Analyte	Units	MARCH 5, 2012									
		Combined Influent	Air Stripper Effluent (A Tower)	Air Stripper Effluent (B Tower)	Air Stripper Effluent (D Tower)	Sand Filter Influent	GAC Vessel A-Inlet	GAC Vessel A-Outlet	GAC Vessel B-Outlet	Final Effluent	Percent Removal (%)
EPA 624 - Benzene, Toluene, Ethylbenzene, Xylenes											
Benzene	mg/L	**0.0529**	0.00176	0.000620	0.00112	0.000620	0.000650	<0.000240	<0.000240	<0.000240	>99.55
Toluene	mg/L	**0.0422**	0.00190	0.000680J	0.00117	0.000620J	0.000640J	<0.000620	<0.000620	<0.000620	>98.53
Ethylbenzene	mg/L	**0.0162**	0.000550J	<0.000620	<0.000620	<0.000620	<0.000620	<0.000620	<0.000620	<0.000620	>96.17
P & M -Xylene	mg/L	**0.0612**	0.00247	0.000750J	0.00149J	0.000750J	0.000770J	<0.00124	<0.00124	<0.00124	>97.97
o-Xylene	mg/L	**0.0174**	0.00155	0.000360J	0.000770J	0.000440J	0.000430J	<0.000620	<0.000620	<0.000620	>96.44
EP200.8 - Iron											
Total Iron	mg/L	3.49	182	1.10	2.33	9.24	1.46	1.80	0.0888J	<0.156	
Dissolved Iron	mg/L	3.41	2.45	0.230J	2.83	0.586	0.401	0.142J	<0.156	<0.156	
SM 5310B - Total Organic Carbon											
Total Organic Carbon	mg/L	1.92	1.93	1.59	1.90	2.26	1.57	1.64	1.58	1.44	
SM20 2540D - TSS											
Total Suspended Solids	mg/L	7.33	8.60	1.56	2.67	5.20	2.20	5.00	<0.326	<0.666	
EPA 625M-SIMS - Polyaromatic Hydrocarbons											
Naphthalene	mg/L	**0.00259**	0.00192	<0.000105B*	0.000839	-	-	-	-	<0.0000674	>97.4
Acenaphthylene	mg/L	<0.0000320	<0.0000312	<0.0000316	<0.0000326	-	-	-	-	<0.0000326	ND
Acenaphthene	mg/L	<0.0000320	<0.0000312	<0.0000316	0.0000165J	-	-	-	-	<0.0000326	ND
Fluorene	mg/L	**0.0000640**	0.0000611	0.0000163J	0.0000475J	-	-	-	-	<0.0000326	>49.06
Phenanthrene	mg/L	**0.0000418J**	0.0000343J	<0.0000316	0.0000324J	-	-	-	-	<0.0000326	>22.01
Anthracene	mg/L	<0.0000320	<0.0000312	<0.0000316	<0.0000326	-	-	-	-	<0.0000326	ND
Fluoranthene	mg/L	<0.0000320	<0.0000312	<0.0000316	<0.0000326	-	-	-	-	<0.0000326	ND
Pyrene	mg/L	<0.0000320	<0.0000312	<0.0000316	<0.0000326	-	-	-	-	<0.0000326	ND
Benzo(a)Anthracene	mg/L	<0.0000320	<0.0000312	<0.0000316	<0.0000326	-	-	-	-	<0.0000326	ND
Chrysene	mg/L	<0.0000320	<0.0000312	<0.0000316	<0.0000326	-	-	-	-	<0.0000326	ND
Benzo[b]Fluoranthene	mg/L	<0.0000320	<0.0000312	<0.0000316	<0.0000326	-	-	-	-	<0.0000326	ND
Benzo[k]fluoranthene	mg/L	<0.0000320	<0.0000312	<0.0000316	<0.0000326	-	-	-	-	<0.0000326	ND
Benzo[a]pyrene	mg/L	<0.0000320	<0.0000312	<0.0000316	<0.0000326	-	-	-	-	<0.0000326	ND
Indeno[1,2,3-c,d] pyrene	mg/L	<0.0000320	<0.0000312	<0.0000316	<0.0000326	-	-	-	-	<0.0000326	ND
Dibenzo[a,h]anthracene	mg/L	<0.0000320	<0.0000312	<0.0000316	<0.0000326	-	-	-	-	<0.0000326	ND
Benzo[g,h,i]perylene	mg/L	<0.0000320	<0.0000312	<0.0000316	<0.0000326	-	-	-	-	<0.0000326	ND
SW8270D - Sulfolane											
Sulfolane	mg/L	**0.0933**	**0.0933**	**0.0467**	**0.089**	**0.077**	**0.0622**	0.00754J	<0.00646	<0.00666	>92.86

Notes:

J	Estimated concentration; result is less than the limit of quantitation (LOQ)
B	Result considered not detected at the LOQ due to laboratory-based contamination identified in a method blank
*	Quality-control flag applied by Shannon & Wilson, Inc.
mg/L	milligrams per liter
-	analysis not requested/performed
Bold	Result or LOQ exceeds ADEC interim remediation goal (sulfolane), or wastewater disposal permit limit (benzene and total aromatic hydrocarbons).
GAC	Granular activated carbon

Table 5-6
Remediation System Operation-Treatment System Performance
North Pole Refinery
Flint Hills Resources Alaska, LLC

Method / Analyte	Units	MARCH 19, 2012													
		R-21	R-35R	R-39	R-40	R-42	Combined Influent	Air Stripper Effluent (A Tower)	Air Stripper Effluent (C Tower)	Sand Filter Influent	GAC Vessel A-Inlet	GAC Vessel A-Outlet	GAC Vessel B-Outlet	Final Effluent	Percent Removal (%)
EPA 624 - Benzene, Toluene, Ethylbenzene, Xylenes															
Benzene	mg/L	**0.0769**	**0.0219**	**0.0265**	**0.228**	**0.00605**	**0.0459**	0.000500	0.000230J	<0.000240	<0.000240	<0.000240	<0.000240	<0.000240	>99.48
Toluene	mg/L	**0.0257**	**0.0243**	**0.0110**	**0.312**	<0.000620	**0.0353**	0.000540J	<0.000620	<0.000620	<0.000620	<0.000620	<0.000620	<0.000620	>98.24
Ethylbenzene	mg/L	**0.0283**	**0.0153**	**0.00718**	**0.0457**	<0.000620	**0.0130**	<0.000620	<0.000620	<0.000620	<0.000620	<0.000620	<0.000620	<0.000620	>95.23
P & M -Xylene	mg/L	**0.133**	**0.0413**	**0.0322**	**0.170**	<0.00124	**0.0507**	0.000760J	<0.00124	<0.00124	<0.00124	<0.00124	<0.00124	<0.00124	>97.55
o-Xylene	mg/L	**0.0283**	**0.0104**	**0.00821**	**0.0699**	<0.000620	**0.0143**	0.000510J	<0.000620	<0.000620	<0.000620	<0.000620	<0.000620	<0.000620	>95.66
EP200.8 - Iron															
Total Iron	mg/L	5.51	2.41	3.04	4.00	2.81	33.8	2.71	2.57	9.58	1.75	0.159J	0.198J	0.290	
Dissolved Iron	mg/L	3.70	2.42	2.18	3.83	2.76	3.03	1.16	1.41	0.158J	0.373	<0.156	<0.156	<0.156	
SM 5310B - Total Organic Carbon															
Total Organic Carbon	mg/L	2.60	2.03	1.46	1.71	2.10	2.20	1.86	1.88	2.13	1.52	1.58	1.53	1.52	
SM20 2540D - TSS															
Total Suspended Solids	mg/L	8.60	3.60	5.20	5.20	5.20	7.20	5.86	6.30	32.0	3.50	<0.300	0.305J	2.80	
EPA 625M-SIMS - Polyaromatic Hydrocarbons															
Naphthalene	mg/L	**0.0112**	**0.00223**	**0.000666**	**0.00440**	<0.0000666	**0.00188**	0.000433	0.0000567J	-	-	-	-	<0.0000620	>96.7
Acenaphthylene	mg/L	<0.0000320	<0.0000320	<0.0000320	<0.0000326	<0.0000322	<0.0000312	<0.0000316	<0.0000316	-	-	-	-	<0.0000300	ND
Acenaphthene	mg/L	<0.0000320	<0.0000320	<0.0000320	<0.0000326	<0.0000322	<0.0000312	<0.0000316	<0.0000316	-	-	-	-	<0.0000300	ND
Fluorene	mg/L	**0.000229**	**0.0000599**	<0.0000320	**0.000160**	<0.0000322	**0.0000433J**	0.0000325J	0.0000404J	-	-	-	-	<0.0000300	>30.72
Phenanthrene	mg/L	**0.0000807**	**0.0000186J**	<0.0000320	**0.000204**	<0.0000322	**0.0000274J**	0.0000186J	0.0000212J	-	-	-	-	<0.0000300	>-9.49
Anthracene	mg/L	<0.0000320	<0.0000320	<0.0000320	<0.0000326	<0.0000322	<0.0000312	<0.0000316	<0.0000316	-	-	-	-	<0.0000300	ND
Fluoranthene	mg/L	<0.0000320	<0.0000320	<0.0000320	<0.0000326	<0.0000322	<0.0000312	<0.0000316	<0.0000316	-	-	-	-	<0.0000300	ND
Pyrene	mg/L	<0.0000320	<0.0000320	<0.0000320	<0.0000326	<0.0000322	<0.0000312	0.0000158J	<0.0000316	-	-	-	-	<0.0000300	ND
Benzo(a)Anthracene	mg/L	<0.0000320	<0.0000320	<0.0000320	<0.0000326	<0.0000322	<0.0000312	<0.0000316	<0.0000316	-	-	-	-	<0.0000300	ND
Chrysene	mg/L	<0.0000320	<0.0000320	<0.0000320	<0.0000326	<0.0000322	<0.0000312	<0.0000316	<0.0000316	-	-	-	-	<0.0000300	ND
Benzo[b]Fluoranthene	mg/L	<0.0000320	<0.0000320	<0.0000320	<0.0000326	<0.0000322	<0.0000312	<0.0000316	<0.0000316	-	-	-	-	<0.0000300	ND
Benzo[k]fluoranthene	mg/L	<0.0000320	<0.0000320	<0.0000320	<0.0000326	<0.0000322	<0.0000312	<0.0000316	<0.0000316	-	-	-	-	<0.0000300	ND
Benzo[a]pyrene	mg/L	<0.0000320	<0.0000320	<0.0000320	<0.0000326	<0.0000322	<0.0000312	<0.0000316	<0.0000316	-	-	-	-	<0.0000300	ND
Indeno[1,2,3-c,d] pyrene	mg/L	<0.0000320	<0.0000320	<0.0000320	<0.0000326	<0.0000322	<0.0000312	<0.0000316	<0.0000316	-	-	-	-	<0.0000300	ND
Dibenzo[a,h]anthracene	mg/L	<0.0000320	<0.0000320	<0.0000320	<0.0000326	<0.0000322	<0.0000312	<0.0000316	<0.0000316	-	-	-	-	<0.0000300	ND
Benzo[g,h,i]perylene	mg/L	<0.0000320	<0.0000320	<0.0000320	<0.0000326	<0.0000322	<0.0000312	<0.0000316	<0.0000316	-	-	-	-	<0.0000300	ND
SW8270D - Sulfolane															
Sulfolane	mg/L	**0.304**	**0.118**	<0.00620	**0.0549**	**0.0604**	**0.092**	**0.0963**	**0.0938**	**0.0391**	**0.0741**	0.00665J	<0.00640	<0.00652	>92.91

Notes:

recovery wells were sampled on March 19, 2012 and treatment system was sampled on March 20, 2012
B Tower was offline for maintenance during the sampling event
D Tower did not produce water through sampling port, and Frank Young was unavailable to assist with the sampling

J	Concentration is estimated; analyte was detected below the limit of quantitation (LOQ).
mg/L	milligrams per liter
<	analyte not detected; limit of detection listed
-	analysis not requested/performed
Bold	Result or LOQ exceeds ADEC interim remediation goal (sulfolane), or wastewater disposal permit limit (benzene and total aromatic hydrocarbons).
GAC	Granular activated carbon

Table 5-6
Remediation System Operation-Treatment System Performance
North Pole Refinery
Flint Hills Resources Alaska, LLC

Method / Analyte	Units	APRIL 5, 2012										
		Combined Influent	Air Stripper Effluent (A Tower)	Air Stripper Effluent (C Tower)	Air Stripper Effluent (D Tower)	Sand Filter Influent	GAC Vessel A-Inlet	GAC Vessel A-Outlet	GAC Vessel C-Outlet	GAC Vessel B-Outlet	Final Effluent	Percent Removal (%)
EPA 624 - Benzene, Toluene, Ethylbenzene, Xylenes												
Benzene	mg/L	**0.0444**	0.000390J	0.000170J	<0.000240	<0.000240	<0.000240J*	<0.000240	<0.000240	<0.000240	<0.000240	>99.5
Toluene	mg/L	**0.0392**	0.000440J	<0.000620	<0.000620	<0.000620	<0.000620J*	<0.000620	<0.000620	<0.000620	<0.000620	>98.4
Ethylbenzene	mg/L	**0.0152**	<0.000620	<0.000620	<0.000620	<0.000620	<0.000620J*	<0.000620	<0.000620	<0.000620	<0.000620	>95.9
P & M -Xylene	mg/L	**0.0501**	<0.00124	<0.00124	<0.00124	<0.00124	<0.00124J*	<0.00124	<0.00124	<0.00124	<0.00124	>97.5
o-Xylene	mg/L	**0.0158**	0.000440J	<0.000620	<0.000620	<0.000620	<0.000620J*	<0.000620	<0.000620	<0.000620	<0.000620	>96.1
EP200.8 - Iron												
Total Iron	mg/L	3.20	1.79	3.93	0.993	5.72	1.93	4.42	1.26	0.602	0.403	
Dissolved Iron	mg/L	3.06	0.614	1.08	0.266	0.337	0.178J	<0.156	<0.156	<0.156	<0.156	
SM 5310B - Total Organic Carbon												
Total Organic Carbon	mg/L	1.86	1.65	1.71	1.63	1.68	1.75	1.55	1.46	1.53	1.46	
SM21 2540D - TSS												
Total Suspended Solids	mg/L	9.60	1.40	8.71	1.70	13.0	5.15	3.56	6.12	0.300J	1.21	
EPA 625M-SIMS - Polyaromatic Hydrocarbons												
Naphthalene	mg/L	**0.00223**	0.0000538J	0.000345	0.0000421J	-	-	-	-	-	<0.0000646	>97.1
Acenaphthylene	mg/L	<0.0000312	<0.0000312	<0.0000312	<0.0000312	-	-	-	-	-	<0.0000312	ND
Acenaphthene	mg/L	<0.0000312	<0.0000312	<0.0000312	<0.0000312	-	-	-	-	-	<0.0000312	ND
Fluorene	mg/L	**0.0000627**	0.0000511J	0.0000495J	0.0000457J	-	-	-	-	-	<0.0000312	>50.2
Phenanthrene	mg/L	**0.0000346J**	0.0000257J	0.0000235J	0.0000232J	-	-	-	-	-	<0.0000312	>9.83
Anthracene	mg/L	<0.0000312	<0.0000312	<0.0000312	<0.0000312	-	-	-	-	-	<0.0000312	ND
Fluoranthene	mg/L	<0.0000312	<0.0000312	<0.0000312	<0.0000312	-	-	-	-	-	<0.0000312	ND
Pyrene	mg/L	<0.0000312	<0.0000312	<0.0000312	<0.0000312	-	-	-	-	-	<0.0000312	ND
Benzo(a)Anthracene	mg/L	<0.0000312	<0.0000312	<0.0000312	<0.0000312	-	-	-	-	-	<0.0000312	ND
Chrysene	mg/L	<0.0000312	<0.0000312	<0.0000312	<0.0000312	-	-	-	-	-	<0.0000312	ND
Benzo[b]Fluoranthene	mg/L	<0.0000312	<0.0000312	<0.0000312	<0.0000312	-	-	-	-	-	<0.0000312	ND
Benzo[k]fluoranthene	mg/L	<0.0000312	<0.0000312	<0.0000312	<0.0000312	-	-	-	-	-	<0.0000312	ND
Benzo[a]pyrene	mg/L	<0.0000312	<0.0000312	<0.0000312	<0.0000312	-	-	-	-	-	<0.0000312	ND
Indeno[1,2,3-c,d] pyrene	mg/L	<0.0000312	<0.0000312	<0.0000312	<0.0000312	-	-	-	-	-	<0.0000312	ND
Dibenzo[a,h]anthracene	mg/L	<0.0000312	<0.0000312	<0.0000312	<0.0000312	-	-	-	-	-	<0.0000312	ND
Benzo[g,h,i]perylene	mg/L	<0.0000312	<0.0000312	<0.0000312	<0.0000312	-	-	-	-	-	<0.0000312	ND
EPA 1625B w/ Iso Dil-W - Sulfolane												
Sulfolane	mg/L	**0.0966**	**0.0865**	**0.0956**	**0.0983**	**0.0312**	<0.00646	<0.00620	<0.00646	<0.00620	<0.00646	>93.3

Notes:

Samples were collected on April 5, 2012
B Tower was offline during the sampling event

J	Concentration is estimated; analyte was detected below the limit of quantitation (LOQ).
J*	Limit of detection (LOD) flagged as estimated due to presence of headspace in sample vial
<	Analyte not detected; listed as less than limit of detection (LOD).
-	Analyte not requested for analysis.
Bold	Result or LOQ exceeds ADEC interim remediation goal (sulfolane), or wastewater disposal permit limit (benzene and total aromatic hydrocarbons).
GAC	Granular activated carbon
mg/L	milligrams per liter

Table 5-6
Remediation System Operation-Treatment System Performance
North Pole Refinery
Flint Hills Resources Alaska, LLC

		APRIL 18, 2012																	
Method / Analyte	Units	R-21	R-35R	R-39	R-40	R-42	MW-106	MW-141	Combined Influent	Air Stripper Effluent (A Tower)	Air Stripper Effluent (C Tower)	Air Stripper Effluent (D Tower)	Sand Filter Influent	GAC Vessel A-Inlet	GAC Vessel A-Outlet	GAC Vessel C-Outlet	GAC Vessel B-Outlet	Final Effluent	Percent Removal (%)
EPA 624 - Benzene, Toluene, Ethylbenzene, Xylenes																			
Benzene	mg/L	**0.114**	**0.0639**	**0.0226**	**0.225**	**0.00730**	<0.000240	<0.000240	**0.0607**	0.000330J	<0.000240	0.000230J	0.000130J	0.000120J	<0.000240	<0.000240	<0.000240	<0.000240	>99.6
Toluene	mg/L	**0.0809**	**0.0701**	**0.00824**	**0.395**	<0.000620	<0.000620	<0.000620	**0.0564**	0.000430J	<0.000620	0.000790J	<0.000620	<0.000620	<0.000620	<0.000620	<0.000620	<0.000620	>98.9
Ethylbenzene	mg/L	**0.0564**	**0.0519**	**0.00776**	**0.0618**	<0.000620	<0.000620	<0.000620	**0.0265**	<0.000620	<0.000620	<0.000620	<0.000620	<0.000620	<0.000620	<0.000620	<0.000620	<0.000620	>97.7
P & M -Xylene	mg/L	**0.241**	**0.131**	**0.0293**	**0.228**	<0.00124	<0.00124	<0.00124	**0.0926**	0.000650J	<0.00124	<0.00124	<0.00124	<0.00124	<0.00124	<0.00124	<0.00124	<0.00124	>98.7
o-Xylene	mg/L	**0.0680**	**0.0446**	**0.00676**	**0.0931**	<0.000620	<0.000620	<0.000620	**0.0280**	0.000560J	<0.000620	<0.000620	<0.000620	<0.000620	<0.000620	<0.000620	<0.000620	<0.000620	>97.8
EP200.8 - Iron																			
Total Iron	mg/L	4.08	2.46	1.85	3.69	2.73	-	-	3.34	1.25	0.997	1.24	1.64	0.250	<0.156	<0.156	<0.156	0.124J	
Dissolved Iron	mg/L	4.15	2.33	2.10	3.85	2.51	-	-	2.89	0.0806J	0.106J	0.115J	0.0838J	0.166J	<0.156	<0.156	<0.156	<0.156	
SM 5310B - Total Organic Carbon																			
Total Organic Carbon	mg/L	4.12	2.65	1.33	1.67	1.93	-	-	2.21	1.87	1.88	1.93	2.08	1.76	1.54	1.52	1.57	1.48	
SM21 2540D - TSS																			
Total Suspended Solids	mg/L	8.50	6.00	4.20	8.00	6.40	-	-	6.50	13.6	1.60	2.20	13.0	0.400J	<0.300	1.20	<0.600	<0.600	
EPA 625M-SIMS - Polyaromatic Hydrocarbons																			
Naphthalene	mg/L	**0.0196**	**0.0109**	**0.000731**	**0.00719**	<0.0000620	<0.0000666	<0.0000620	**0.00598**	0.0000621J	0.000126	<0.0000640	-	-	-	-	-	<0.0000640	>98.9
Acenaphthylene	mg/L	<0.0000300	<0.0000320	<0.0000300	<0.0000312	<0.0000300	<0.0000322	<0.0000300	<0.0000330	<0.0000310	<0.0000310	<0.0000310	-	-	-	-	-	<0.0000310	ND
Acenaphthene	mg/L	<0.0000300	<0.0000320	<0.0000300	<0.0000312	<0.0000300	<0.0000322	<0.0000300	<0.0000330	<0.0000310	0.0000425J	<0.0000310	-	-	-	-	-	<0.0000310	ND
Fluorene	mg/L	**0.000304**	**0.000349**	<0.0000300	**0.000264**	<0.0000300	<0.0000322	<0.0000300	**0.000179**	0.000143	0.000125	0.0000843	-	-	-	-	-	<0.0000310	>82.7
Phenanthrene	mg/L	**0.000106**	**0.0000766**	<0.0000300	**0.000370**	<0.0000300	<0.0000322	<0.0000300	**0.0000590**	0.0000345J	0.0000342J	0.0000177J	-	-	-	-	-	<0.0000310	>47.5
Anthracene	mg/L	<0.0000300	<0.0000320	<0.0000300	<0.0000312	<0.0000300	<0.0000322	<0.0000300	<0.0000330	<0.0000310	<0.0000310	<0.0000310	-	-	-	-	-	<0.0000310	ND
Fluoranthene	mg/L	<0.0000300	<0.0000320	<0.0000300	<0.0000312	<0.0000300	<0.0000322	<0.0000300	<0.0000330	<0.0000310	<0.0000310	<0.0000310	-	-	-	-	-	<0.0000310	ND
Pyrene	mg/L	<0.0000300	<0.0000320	<0.0000300	<0.0000312	<0.0000300	<0.0000322	<0.0000300	<0.0000330	<0.0000310	<0.0000310	<0.0000310	-	-	-	-	-	<0.0000310	ND
Benzo(a)Anthracene	mg/L	<0.0000300	<0.0000320	<0.0000300	<0.0000312	<0.0000300	<0.0000322	<0.0000300	<0.0000330	<0.0000310	<0.0000310	<0.0000310	-	-	-	-	-	<0.0000310	ND
Chrysene	mg/L	<0.0000300	<0.0000320	<0.0000300	<0.0000312	<0.0000300	<0.0000322	<0.0000300	<0.0000330	<0.0000310	<0.0000310	<0.0000310	-	-	-	-	-	<0.0000310	ND
Benzo[b]Fluoranthene	mg/L	<0.0000300	<0.0000320	<0.0000300	<0.0000312	<0.0000300	<0.0000322	<0.0000300	<0.0000330	<0.0000310	<0.0000310	<0.0000310	-	-	-	-	-	<0.0000310	ND
Benzo[k]fluoranthene	mg/L	<0.0000300	<0.0000320	<0.0000300	<0.0000312	<0.0000300	<0.0000322	<0.0000300	<0.0000330	<0.0000310	<0.0000310	<0.0000310	-	-	-	-	-	<0.0000310	ND
Benzo[a]pyrene	mg/L	<0.0000300	<0.0000320	<0.0000300	<0.0000312	<0.0000300	<0.0000322	<0.0000300	<0.0000330	<0.0000310	<0.0000310	<0.0000310	-	-	-	-	-	<0.0000310	ND
Indeno[1,2,3-c,d] pyrene	mg/L	<0.0000300	<0.0000320	<0.0000300	<0.0000312	<0.0000300	<0.0000322	<0.0000300	<0.0000330	<0.0000310	<0.0000310	<0.0000310	-	-	-	-	-	<0.0000310	ND
Dibenzo[a,h]anthracene	mg/L	<0.0000300	<0.0000320	<0.0000300	<0.0000312	<0.0000300	<0.0000322	<0.0000300	<0.0000330	<0.0000310	<0.0000310	<0.0000310	-	-	-	-	-	<0.0000310	ND
Benzo[g,h,i]perylene	mg/L	<0.0000300	<0.0000320	<0.0000300	<0.0000312	<0.0000300	<0.0000322	<0.0000300	<0.0000330	<0.0000310	<0.0000310	<0.0000310	-	-	-	-	-	<0.0000310	ND
EPA 1625B w/ Iso Dil-W - Sulfolane																			
Sulfolane	mg/L	**0.315**	**0.110**	<0.00620	**0.0480**	**0.0656**	-	-	**0.0805**	**0.0834**	**0.0826**	**0.0837**	0.00928J	**0.0381**	<0.00640	<0.00640	<0.00640	<0.00640	>92.0

Notes:

Groundwater treatment system and recovery-well samples were collected on April 18, 2012
B Tower was offline during the sampling event

J	Concentration is estimated; analyte was detected below the limit of quantitation (LOQ).
<	Analyte not detected above listed limit of detection (LOD).
-	Analyte not requested for analysis.
Bold	Result or LOQ exceeds ADEC interim remediation goal (sulfolane), or wastewater disposal permit limit (benzene and total aromatic hydrocarbons).
GAC	Granular activated carbon
mg/L	milligrams per liter

Table 5-6
Remediation System Operation-Treatment System Performance
North Pole Refinery
Flint Hills Resources Alaska, LLC

Method / Analyte	Units	MAY 4, 2012								
		Combined Influent	Air Stripper Effluent (A Tower)	Air Stripper Effluent (C Tower)	Sand Filter Influent	GAC Vessel A-Inlet	GAC Vessel A-Outlet	GAC Vessel B-Outlet	Final Effluent	Percent Removal (%)
EPA 624 - Benzene, Toluene, Ethylbenzene, Xylenes										
Benzene	mg/L	**0.0579**	0.000170J	<0.000240	<0.000240	<0.000240	<0.000240	<0.000240	<0.000240	>99.6
Toluene	mg/L	**0.0277**	<0.000620	<0.000620	<0.000620	<0.000620	<0.000620	<0.000620	<0.000620	>97.8
Ethylbenzene	mg/L	**0.0280**	<0.000620	<0.000620	<0.000620	<0.000620	<0.000620	<0.000620	<0.000620	>97.8
P & M -Xylene	mg/L	**0.0897**	<0.00124	<0.00124	<0.00124	<0.00124	<0.00124	<0.00124	<0.00124	>98.6
o-Xylene	mg/L	**0.0267**	<0.000620	<0.000620	<0.000620	<0.000620	<0.000620	<0.000620	<0.000620	>97.7
EP200.8 - Iron										
Total Iron	mg/L	3.51	1.02	1.06	1.15	0.277	<0.156	<0.156	<0.156	
Dissolved Iron	mg/L	3.29	0.0911J	0.124J	<0.156	<0.156	<0.156	<0.156	<0.156	
SM 5310B - Total Organic Carbon										
Total Organic Carbon	mg/L	2.02	1.98	1.79	1.78	1.68	1.52	1.47	1.46	
SM21 2540D - TSS										
Total Suspended Solids	mg/L	7.14	2.40	2.10	0.900	0.400J	<0.300	<0.300	<0.310	
EPA 625M-SIMS - Polyaromatic Hydrocarbons										
Naphthalene	mg/L	**0.00326**	<0.0000632	<0.0000640	-	-	-	-	<0.0000666	>98.0
Acenaphthylene	mg/L	<0.0000310	<0.0000306	<0.0000310	-	-	-	-	<0.0000322	ND
Acenaphthene	mg/L	<0.0000310	<0.0000306	<0.0000310	-	-	-	-	<0.0000322	ND
Fluorene	mg/L	**0.0000679**	0.0000160J	0.0000343J	-	-	-	-	<0.0000322	>52.6
Phenanthrene	mg/L	**0.0000243J**	<0.0000306	<0.0000310	-	-	-	-	<0.0000322	ND
Anthracene	mg/L	<0.0000310	<0.0000306	<0.0000310	-	-	-	-	<0.0000322	ND
Fluoranthene	mg/L	<0.0000310	<0.0000306	<0.0000310	-	-	-	-	<0.0000322	ND
Pyrene	mg/L	<0.0000310	<0.0000306	<0.0000310	-	-	-	-	<0.0000322	ND
Benzo(a)Anthracene	mg/L	<0.0000310	<0.0000306	<0.0000310	-	-	-	-	<0.0000322	ND
Chrysene	mg/L	<0.0000310	<0.0000306	<0.0000310	-	-	-	-	<0.0000322	ND
Benzo[b]Fluoranthene	mg/L	<0.0000310	<0.0000306	<0.0000310	-	-	-	-	<0.0000322	ND
Benzo[k]fluoranthene	mg/L	<0.0000310	<0.0000306	<0.0000310	-	-	-	-	<0.0000322	ND
Benzo[a]pyrene	mg/L	<0.0000310	<0.0000306	<0.0000310	-	-	-	-	<0.0000322	ND
Indeno[1,2,3-c,d] pyrene	mg/L	<0.0000310	<0.0000306	<0.0000310	-	-	-	-	<0.0000322	ND
Dibenzo[a,h]anthracene	mg/L	<0.0000310	<0.0000306	<0.0000310	-	-	-	-	<0.0000322	ND
Benzo[g,h,i]perylene	mg/L	<0.0000310	<0.0000306	<0.0000310	-	-	-	-	<0.0000322	ND
EPA 1625B w/ Iso Dil-W - Sulfolane										
Sulfolane	mg/L	**0.0959JL***	**0.0513J***	**0.0566J***	**0.0385**	0.0212J*	<0.00620	<0.00620	<0.00666J*	>93.1

Notes:

Samples were collected on May 4, 2012
B Tower was offline and D Tower sample port was not working during the sampling event

J	Concentration is estimated; analyte was detected below the limit of quantitation (LOQ).
J*	Concentration is considered estimated due to internal standard recovery failures for the sample or the LCS
JL*	Concentration is considered estimated, biased low, due to holding time exceedance
<	Analyte not detected; listed as less than limit of detection (LOD).
-	Analyte not requested for analysis.
Bold	Result or LOQ exceeds ADEC interim remediation goal (sulfolane), or wastewater disposal permit limit (benzene and total aromatic hydrocarbons).
mg/L	milligrams per liter
GAC	Granular activated carbon

Table 5-6
Remediation System Operation-Treatment System Performance
North Pole Refinery
Flint Hills Resources Alaska, LLC

Method / Analyte	Units	MAY 16, 2012														
		R-21	R-35R	R-39	R-40	R-42	Combined Influent	Air Stripper Effluent (A Tower)	Air Stripper Effluent (C Tower)	Air Stripper Effluent (D Tower)	Sand Filter Influent	GAC Vessel A-Inlet	GAC Vessel A-Outlet	GAC Vessel B-Outlet	Final Effluent	Percent Removal (%)
EPA 624 - Benzene, Toluene, Ethylbenzene, Xylenes																
Benzene	mg/L	**0.0904**	**0.0265**	**0.0233**	**0.194**	**0.00779**	**0.0466**	--	<0.000240	<0.000240	<0.000240	<0.000240	<0.000240	<0.000240	<0.000240	>99.5
Toluene	mg/L	**0.101**	**0.0195**	**0.00424**	**0.256**	0.000540J	**0.0286**	--	<0.000620	<0.000620	<0.000620	<0.000620	<0.000620	<0.000620	<0.000620	>97.8
Ethylbenzene	mg/L	**0.0434**	**0.0291**	**0.00744**	**0.0633**	0.000370J	**0.0178**	--	<0.000620	<0.000620	<0.000620	<0.000620	<0.000620	<0.000620	<0.000620	>96.5
P & M -Xylene	mg/L	**0.185**	**0.0700**	**0.0259**	**0.187**	0.000680J	**0.0572**	--	<0.00124	<0.00124	<0.00124	<0.00124	<0.00124	<0.00124	<0.00124	>97.8
o-Xylene	mg/L	**0.0607**	**0.0184**	**0.00643**	**0.0819**	<0.000620	**0.0166**	--	<0.000620	<0.000620	<0.000620	<0.000620	<0.000620	<0.000620	<0.000620	>96.3
EP200.8 - Iron																
Total Iron	mg/L	3.81	2.45	2.25	3.78	2.86	3.40	1.28	1.81	1.50	1.18	0.481	0.192J	<0.156	<0.156	
Dissolved Iron	mg/L	3.82	2.40	2.15	3.84	2.91	3.58	0.247J	0.207J	0.0940J	<0.156	<0.156	<0.156	<0.156	<0.156	
SM 5310B - Total Organic Carbon																
Total Organic Carbon	mg/L	2.74	1.95	1.45	1.78	2.16	1.98	1.89	1.71	1.74	1.68	1.68	1.57	1.50	1.45	
SM21 2540D - TSS																
Total Suspended Solids	mg/L	7.90	5.10	4.85	7.92	6.00	6.93	3.47	3.88	5.19	2.55	0.485	<0.292	0.194J	<0.298	
EPA 625M-SIMS - Polyaromatic Hydrocarbons																
Naphthalene	mg/L	**0.0134**	**0.00382**	**0.000573**	**0.00583**	<0.0000620	**0.00241**	<0.0000652	<0.0000620	<0.0000620	-	-	-	-	<0.0000620	>97.4
Acenaphthylene	mg/L	<0.0000316	<0.0000322	<0.0000300	<0.0000300	<0.0000300	<0.0000306	<0.0000316	<0.0000300	<0.0000300	-	-	-	-	<0.0000300	ND
Acenaphthene	mg/L	**0.0000976**	**0.0000229J**	<0.0000300	<0.0000300	<0.0000300	**0.0000261J**	<0.0000316	<0.0000300	<0.0000300	-	-	-	-	<0.0000300	ND
Fluorene	mg/L	**0.000229**	**0.0000533J**	<0.0000300	**0.000167**	<0.0000300	**0.0000537**	<0.0000316	<0.0000300	<0.0000300	-	-	-	-	<0.0000300	>44.1
Phenanthrene	mg/L	**0.0000824**	<0.0000322	<0.0000300	**0.000180**	<0.0000300	**0.0000245J**	<0.0000316	<0.0000300	<0.0000300	-	-	-	-	<0.0000300	ND
Anthracene	mg/L	<0.0000316	<0.0000322	<0.0000300	<0.0000300	<0.0000300	<0.0000306	<0.0000316	<0.0000300	<0.0000300	-	-	-	-	<0.0000300	ND
Fluoranthene	mg/L	<0.0000316	<0.0000322	<0.0000300	<0.0000300	<0.0000300	<0.0000306	<0.0000316	<0.0000300	<0.0000300	-	-	-	-	<0.0000300	ND
Pyrene	mg/L	<0.0000316	<0.0000322	<0.0000300	<0.0000300	<0.0000300	<0.0000306	<0.0000316	<0.0000300	<0.0000300	-	-	-	-	<0.0000300	ND
Benzo(a)Anthracene	mg/L	<0.0000316	<0.0000322	<0.0000300	<0.0000300	<0.0000300	<0.0000306	<0.0000316	<0.0000300	<0.0000300	-	-	-	-	<0.0000300	ND
Chrysene	mg/L	<0.0000316	<0.0000322	<0.0000300	<0.0000300	<0.0000300	<0.0000306	<0.0000316	<0.0000300	<0.0000300	-	-	-	-	<0.0000300	ND
Benzo[b]Fluoranthene	mg/L	<0.0000316	<0.0000322	<0.0000300	<0.0000300	<0.0000300	<0.0000306	<0.0000316	<0.0000300	<0.0000300	-	-	-	-	<0.0000300	ND
Benzo[k]fluoranthene	mg/L	<0.0000316	<0.0000322	<0.0000300	<0.0000300	<0.0000300	<0.0000306	<0.0000316	<0.0000300	<0.0000300	-	-	-	-	<0.0000300	ND
Benzo[a]pyrene	mg/L	<0.0000316	<0.0000322	<0.0000300	<0.0000300	<0.0000300	<0.0000306	<0.0000316	<0.0000300	<0.0000300	-	-	-	-	<0.0000300	ND
Indeno[1,2,3-c,d] pyrene	mg/L	<0.0000316	<0.0000322	<0.0000300	<0.0000300	<0.0000300	<0.0000306	<0.0000316	<0.0000300	<0.0000300	-	-	-	-	<0.0000300	ND
Dibenzo[a,h]anthracene	mg/L	<0.0000316	<0.0000322	<0.0000300	<0.0000300	<0.0000300	<0.0000306	<0.0000316	<0.0000300	<0.0000300	-	-	-	-	<0.0000300	ND
Benzo[g,h,i]perylene	mg/L	<0.0000316	<0.0000322	<0.0000300	<0.0000300	<0.0000300	<0.0000306	<0.0000316	<0.0000300	<0.0000300	-	-	-	-	<0.0000300	ND
EPA 1625B w/ Iso Dil-W - Sulfolane																
Sulfolane	mg/L	**0.302**	**0.113**	<0.00620	**0.0387**	**0.0708**	**0.102**	0.0196	0.0124	0.0199	0.0175	0.00923J	<0.00620	<0.00620	<0.00620	>93.9

Notes:

Groundwater treatment system and recovery-well samples were collected on May 16, 2012
B Tower was offline during the sampling event

J	Concentration is estimated; analyte was detected below the limit of quantitation (LOQ).
<	Analyte not detected above listed limit of detection (LOD).
-	Analyte not requested for analysis.
--	The laboratory failed to analyze this sample for BTEX
Bold	Result or LOQ exceeds ADEC interim remediation goal (sulfolane), or wastewater disposal permit limit (benzene and total aromatic hydrocarbons).
mg/L	milligrams per liter
GAC	Granular activated carbon

Table 5-6
Remediation System Operation-Treatment System Performance
North Pole Refinery
Flint Hills Resources Alaska, LLC

Method / Analyte	Units	JUNE 5, 2012									
		Combined Influent	Air Stripper Effluent (A Tower)	Air Stripper Effluent (B Tower)	Air Stripper Effluent (C Tower)	Sand Filter Influent	GAC Vessel A-Inlet	GAC Vessel A-Outlet	GAC Vessel B-Outlet	Final Effluent	Percent Removal (%)
EPA 624 - Benzene, Toluene, Ethylbenzene, Xylenes											
Benzene	mg/L	**0.0617**	0.000200J	0.000230J	<0.000240	0.000230J	<0.000240	<0.000240	<0.000240	<0.000240	>99.6
Toluene	mg/L	**0.0328**	<0.000620	<0.000620	<0.000620	<0.000620	<0.000620	<0.000620	<0.000620	<0.000620	>98.1
Ethylbenzene	mg/L	**0.0277**	<0.000620	<0.000620	<0.000620	<0.000620	<0.000620	<0.000620	<0.000620	<0.000620	>97.8
P & M -Xylene	mg/L	**0.0910**	<0.00124	<0.00124	<0.00124	<0.00124	<0.00124	<0.00124	<0.00124	<0.00124	>98.6
o-Xylene	mg/L	**0.0251**	<0.000620	<0.000620	<0.000620	<0.000620	<0.000620	<0.000620	<0.000620	<0.000620	>97.5
EP200.8 - Iron											
Total Iron	mg/L	3.71	0.924	3.11	4.71	2.63	0.663	<0.156	<0.156	<0.156	
Dissolved Iron	mg/L	3.55	<0.156	1.23	0.0790J	<0.156	<0.156	<0.156	<0.156	<0.156	
SM 5310B - Total Organic Carbon											
Total Organic Carbon	mg/L	2.19	1.97	2.07	1.87	1.90	1.83	1.69	1.59	1.61	
SM21 2540D - TSS											
Total Suspended Solids	mg/L	4.33	3.30	4.47	6.89	11.0	1.48	0.381J	<0.576	0.600J	
EPA 625M-SIMS - Polyaromatic Hydrocarbons											
Naphthalene	mg/L	**0.00527**	<0.0000646J*	0.00217	<0.0000640	-	-	-	-	<0.0000660	>98.7
Acenaphthylene	mg/L	<0.0000312	<0.0000312J*	<0.0000300	<0.0000310	-	-	-	-	<0.0000320	ND
Acenaphthene	mg/L	<0.0000312	<0.0000312J*	0.0000298J	<0.0000310	-	-	-	-	<0.0000320	ND
Fluorene	mg/L	**0.000111**	<0.0000312J*	0.0000876	<0.0000310	-	-	-	-	<0.0000320	>71.2
Phenanthrene	mg/L	**0.0000460J**	<0.0000312	0.0000421J	<0.0000310	-	-	-	-	<0.0000320	>30.4
Anthracene	mg/L	<0.0000312	<0.0000312J*	<0.0000300	<0.0000310	-	-	-	-	<0.0000320	ND
Fluoranthene	mg/L	<0.0000312	<0.0000312	<0.0000300	<0.0000310	-	-	-	-	<0.0000320	ND
Pyrene	mg/L	<0.0000312	<0.0000312	<0.0000300	<0.0000310	-	-	-	-	<0.0000320	ND
Benzo(a)Anthracene	mg/L	<0.0000312	<0.0000312	<0.0000300	<0.0000310	-	-	-	-	<0.0000320	ND
Chrysene	mg/L	<0.0000312	<0.0000312	<0.0000300	<0.0000310	-	-	-	-	<0.0000320	ND
Benzo[b]Fluoranthene	mg/L	<0.0000312	<0.0000312	<0.0000300	<0.0000310	-	-	-	-	<0.0000320	ND
Benzo[k]fluoranthene	mg/L	<0.0000312	<0.0000312	<0.0000300	<0.0000310	-	-	-	-	<0.0000320	ND
Benzo[a]pyrene	mg/L	<0.0000312	<0.0000312	<0.0000300	<0.0000310	-	-	-	-	<0.0000320	ND
Indeno[1,2,3-c,d] pyrene	mg/L	<0.0000312	<0.0000312	<0.0000300	<0.0000310	-	-	-	-	<0.0000320	ND
Dibenzo[a,h]anthracene	mg/L	<0.0000312	<0.0000312	<0.0000300	<0.0000310	-	-	-	-	<0.0000320	ND
Benzo[g,h,i]perylene	mg/L	<0.0000312	<0.0000312	<0.0000300	<0.0000310	-	-	-	-	<0.0000320	ND
EPA 1625B w/ Iso Dil-W - Sulfolane											
Sulfolane	mg/L	**0.102**	**0.0307**	**0.0997**	**0.0330**	0.0110	0.0134	<0.00640	<0.00620	<0.00652	>93.6

Notes:

Samples were collected on June 5, 2012
D Tower was offline during the sampling event

J	Concentration is estimated; analyte was detected below the limit of quantitation (LOQ).
J*	Limit of detection qualified due to low surrogate recovery.
<	Analyte not detected; listed as less than limit of detection (LOD).
-	Analyte not requested for analysis.
Bold	Result or LOQ exceeds ADEC interim remediation goal (sulfolane), or wastewater disposal permit limit (benzene and total aromatic hydrocarbons).
mg/L	milligrams per liter
GAC	Granular activated carbon

Table 5-6
Remediation System Operation-Treatment System Performance
North Pole Refinery
Flint Hills Resources Alaska, LLC

Method / Analyte	Units	JUNE 19, 2012														
		R-21	R-35R	R-39	R-40	R-42	Combined Influent	Air Stripper Effluent (A Tower)	Air Stripper Effluent (C Tower)	Air Stripper Effluent (D Tower)	Sand Filter Influent	GAC Vessel A-Inlet	GAC Vessel A-Outlet	GAC Vessel B-Outlet	Final Effluent	Percent Removal (%)
EPA 624 - Benzene, Toluene, Ethylbenzene, Xylenes																
Benzene	mg/L	**0.1**	**0.0675**	**0.0701**	**0.272**	**0.00705**	**0.0701**	0.00027	<0.000240	<0.000240	<0.000240	<0.000240	<0.000240	<0.000240	<0.000240	>99.7
Toluene	mg/L	**0.0344**	**0.0905**	**0.0813**	**0.353**	<0.000620	**0.0553**	0.00032	0.00044	<0.000620	0.04%	<0.000620	<0.000620	<0.000620	<0.000620	>98.9
Ethylbenzene	mg/L	**0.0483**	**0.0805**	**0.023**	**0.0687**	<0.000620	**0.0445**	<0.000620	<0.000620	<0.000620	<0.000620	<0.000620	<0.000620	<0.000620	<0.000620	>98.6
P & M -Xylene	mg/L	**0.18**	**0.214**	**0.0997**	**0.248**	<0.00124	**0.136**	0.00066	<0.00124	<0.00124	<0.00124	<0.00124	<0.00124	<0.00124	<0.00124	>99.1
o-Xylene	mg/L	**0.0457**	**0.0655**	**0.0386**	**0.106**	<0.000620	**0.0363**	0.00048	<0.000620	<0.000620	<0.000620	<0.000620	<0.000620	<0.000620	<0.000620	>98.3
EP200.8 - Iron																
Total Iron	mg/L	3.81	2.60	2.40	3.45	2.35	3.93	0.568	0.743	1.07	1.64	0.578	0.121J	<0.156	0.110J	
Dissolved Iron	mg/L	3.98	2.51	2.38	3.55	2.31	2.24	<0.156	0.323	0.288	0.118J	<0.156	<0.156	<0.156	<0.156	
SM 5310B - Total Organic Carbon																
Total Organic Carbon	mg/L	2.87	2.62	1.49	1.83	1.93	2.38	1.92	1.97	2.09	1.98	1.83	1.64	1.60	1.57	
SM21 2540D - TSS																
Total Suspended Solids	mg/L	10.6	9.41	5.95	8.40	6.18	10.8	8.00	7.43	4.40	9.80	2.23	0.396J	0.385J	0.583	
EPA 625M-SIMS - Polyaromatic Hydrocarbons																
Naphthalene	mg/L	**0.0142**	**0.0107**	**0.00113**	**0.00438**	<0.0000640	**0.00437**	0.000262JL*	<0.0000620	<0.0000620	-	-	-	-	<0.0000646	>98.5
Acenaphthylene	mg/L	<0.0000300	<0.0000300	<0.0000300	<0.0000320	<0.0000310	<0.0000312	<0.0000310J*	<0.0000300	<0.0000300	-	-	-	-	<0.0000312	ND
Acenaphthene	mg/L	**0.000115**	**0.0000533**	<0.0000300	<0.0000320	<0.0000310	<0.0000312	<0.0000310J*	<0.0000300	<0.0000300	-	-	-	-	<0.0000312	ND
Fluorene	mg/L	**0.000296**	**0.000155**	**0.0000223J**	**0.000139**	<0.0000310	**0.0000903**	<0.0000251J*	<0.0000300	0.0000265J	-	-	-	-	<0.0000312	>65.4
Phenanthrene	mg/L	**0.000110**	**0.0000164J**	<0.0000300	**0.000137**	<0.0000310	**0.0000342J**	<0.0000310J*	<0.0000300	<0.0000300	-	-	-	-	<0.0000312	>8.77
Anthracene	mg/L	<0.0000300	<0.0000300	<0.0000300	<0.0000320	<0.0000310	<0.0000312	<0.0000310J*	<0.0000300	<0.0000300	-	-	-	-	<0.0000312	ND
Fluoranthene	mg/L	<0.0000300	<0.0000300	<0.0000300	<0.0000320	<0.0000310	<0.0000312	<0.0000310	<0.0000300	<0.0000300	-	-	-	-	<0.0000312	ND
Pyrene	mg/L	<0.0000300	<0.0000300	<0.0000300	<0.0000320	<0.0000310	<0.0000312	<0.0000310	<0.0000300	<0.0000300	-	-	-	-	<0.0000312	ND
Benzo(a)Anthracene	mg/L	<0.0000300	<0.0000300	<0.0000300	<0.0000320	<0.0000310	<0.0000312	<0.0000310	<0.0000300	<0.0000300	-	-	-	-	<0.0000312	ND
Chrysene	mg/L	<0.0000300	<0.0000300	<0.0000300	<0.0000320	<0.0000310	<0.0000312	<0.0000310	<0.0000300	<0.0000300	-	-	-	-	<0.0000312	ND
Benzo[b]Fluoranthene	mg/L	<0.0000300	<0.0000300	<0.0000300	<0.0000320	<0.0000310	<0.0000312	<0.0000310	<0.0000300	<0.0000300	-	-	-	-	<0.0000312	ND
Benzo[k]fluoranthene	mg/L	<0.0000300	<0.0000300	<0.0000300	<0.0000320	<0.0000310	<0.0000312	<0.0000310	<0.0000300	<0.0000300	-	-	-	-	<0.0000312	ND
Benzo[a]pyrene	mg/L	<0.0000300	<0.0000300	<0.0000300	<0.0000320	<0.0000310	<0.0000312	<0.0000310	<0.0000300	<0.0000300	-	-	-	-	<0.0000312	ND
Indeno[1,2,3-c,d] pyrene	mg/L	<0.0000300	<0.0000300	<0.0000300	<0.0000320	<0.0000310	<0.0000312	<0.0000310	<0.0000300	<0.0000300	-	-	-	-	<0.0000312	ND
Dibenzo[a,h]anthracene	mg/L	<0.0000300	<0.0000300	<0.0000300	<0.0000320	<0.0000310	<0.0000312	<0.0000310	<0.0000300	<0.0000300	-	-	-	-	<0.0000312	ND
Benzo[g,h,i]perylene	mg/L	<0.0000300	<0.0000300	<0.0000300	<0.0000320	<0.0000310	<0.0000312	<0.0000310	<0.0000300	<0.0000300	-	-	-	-	<0.0000312	ND
EPA 1625B w/ Iso Dil-W - Sulfolane																
Sulfolane	mg/L	**0.268**	**0.112**	<0.00620	**0.0394**	**0.0618**	**0.117**	**0.0444**	**0.0448**	**0.0926**	0.0161	0.0154	<0.00640	<0.00640	<0.00640	>94.5

Notes:

Groundwater treatment system and recovery-well samples were collected on June 19, 2012
B Tower was offline during the sampling event

J	Concentration is estimated; analyte was detected below the limit of quantitation (LOQ).
J*	Limit of detection qualified due to low surrogate recovery.
JL*	Concentration is considered estimated, biased low, due to low surrogate recovery
<	Analyte not detected above listed limit of detection (LOD).
-	Analyte not requested for analysis.
Bold	Result or LOQ exceeds ADEC interim remediation goal (sulfolane), or wastewater disposal permit limit (benzene and total aromatic hydrocarbons).
mg/L	milligrams per liter
GAC	Granular activated carbon

Table 5-6
Remediation System Operation-Treatment System Performance
North Pole Refinery
Flint Hills Resources Alaska, LLC

Method / Analyte	Units	JULY 17, 2012														
		R-21	R-35R	R-39	R-40	R-42	Combined Influent	Air Stripper Effluent (A Tower)	Air Stripper Effluent (C Tower)	Air Stripper Effluent (D Tower)	Sand Filter Influent	GAC Vessel A-Inlet	GAC Vessel A-Outlet	GAC Vessel B-Outlet	Final Effluent	Percent Removal (%)
EPA 624 - Benzene, Toluene, Ethylbenzene, Xylenes																
Benzene	mg/L	**0.132**	**0.0543**	**0.0584**	**0.349**	**0.00605**	**0.0853**	0.00856	0.000490	0.000520	0.00190	0.00236	<0.000240	<0.000240	<0.000240	>99.7
Toluene	mg/L	**0.0257**	**0.0382**	**0.0666**	**0.367**	<0.000620	**0.0622**	0.00690	0.000570J	0.000650J	0.00164	0.00195	<0.000620	<0.000620	<0.000620	>99.0
Ethylbenzene	mg/L	**0.0437**	**0.0693**	**0.0212**	**0.0840**	<0.000620	**0.0363**	0.00310	<0.000620	<0.000620	0.000620J	0.000780J	<0.000620	<0.000620	<0.000620	>98.3
P & M -Xylene	mg/L	**0.194**	**0.145**	**0.0862**	**0.286**	<0.00124	**0.112**	0.0136	0.000920J	0.000950J	0.00314	0.00340	<0.00124	<0.00124	<0.00124	>98.9
o-Xylene	mg/L	**0.0316**	**0.0370**	**0.0344**	**0.124**	<0.000620	**0.0340**	0.00769	0.000650J	0.000680J	0.00178	0.00211	<0.000620	<0.000620	<0.000620	>98.2
EP200.8 - Iron																
Total Iron	mg/L	4.59	2.88	2.16	3.70	2.52	3.47	3.07	2.39	1.57	3.76	0.554	<0.156	1.00	<0.156	
Dissolved Iron	mg/L	4.36	3.21	2.79	3.94	2.63	3.29	<0.156	0.119J	<0.156	<0.156	<0.156	<0.156	<0.156	<0.156	
SM21 2540D - TSS																
Total Suspended Solids	mg/L	9.40	2.14	3.04	7.65	5.10	7.40	1.75	10.5	4.80	13.6	2.12J*	0.404J	1.86	0.196J	
EPA 625M-SIMS - Polyaromatic Hydrocarbons																
Naphthalene	mg/L	-	-	-	-	-	**0.00455JL***	0.00183JL*	0.000679JL*	0.00176JL*	-	-	-	-	<0.0000620J*	>98.6
Acenaphthylene	mg/L	-	-	-	-	-	<0.0000300J*	<0.0000300J*	<0.0000300J*	<0.0000306J*	-	-	-	-	<0.0000300J*	ND
Acenaphthene	mg/L	-	-	-	-	-	<0.0000300J*	<0.0000300J*	<0.0000300J*	<0.0000306J*	-	-	-	-	<0.0000300J*	ND
Fluorene	mg/L	-	-	-	-	-	**0.0000801JL***	0.0000363JL*	0.0000224JL*	0.0000711JL*	-	-	-	-	<0.0000300J*	>65.5
Phenanthrene	mg/L	-	-	-	-	-	**0.0000361JL***	0.0000164JL*	<0.0000300J*	0.0000259JL*	-	-	-	-	<0.0000300J*	>16.9
Anthracene	mg/L	-	-	-	-	-	<0.0000300J*	<0.0000300J*	<0.0000300J*	<0.0000306J*	-	-	-	-	<0.0000300J*	ND
Fluoranthene	mg/L	-	-	-	-	-	<0.0000300	<0.0000300	<0.0000300	<0.0000306	-	-	-	-	<0.0000300	ND
Pyrene	mg/L	-	-	-	-	-	<0.0000300	<0.0000300	<0.0000300	<0.0000306	-	-	-	-	<0.0000300	ND
Benzo(a)Anthracene	mg/L	-	-	-	-	-	<0.0000300	<0.0000300	<0.0000300	<0.0000306	-	-	-	-	<0.0000300	ND
Chrysene	mg/L	-	-	-	-	-	<0.0000300	<0.0000300	<0.0000300	<0.0000306	-	-	-	-	<0.0000300	ND
Benzo[b]Fluoranthene	mg/L	-	-	-	-	-	<0.0000300	<0.0000300	<0.0000300	<0.0000306	-	-	-	-	<0.0000300	ND
Benzo[k]fluoranthene	mg/L	-	-	-	-	-	<0.0000300	<0.0000300	<0.0000300	<0.0000306	-	-	-	-	<0.0000300	ND
Benzo[a]pyrene	mg/L	-	-	-	-	-	<0.0000300	<0.0000300	<0.0000300	<0.0000306	-	-	-	-	<0.0000300	ND
Indeno[1,2,3-c,d] pyrene	mg/L	-	-	-	-	-	<0.0000300	<0.0000300	<0.0000300	<0.0000306	-	-	-	-	<0.0000300	ND
Dibenzo[a,h]anthracene	mg/L	-	-	-	-	-	<0.0000300	<0.0000300	<0.0000300	<0.0000306	-	-	-	-	<0.0000300	ND
Benzo[g,h,i]perylene	mg/L	-	-	-	-	-	<0.0000300	<0.0000300	<0.0000300	<0.0000306	-	-	-	-	<0.0000300	ND
EPA 1625B w/ Iso Dil-W - Sulfolane																
Sulfolane	mg/L	**0.399**	**0.131**	<0.00646	**0.0498**	**0.0502**	**0.102**	**0.0654**	**0.0487**	**0.0632**	**0.0276**	**0.0345**	<0.00646	<0.00646	<0.00640	>93.7

Note:

Groundwater treatment system and recovery-well samples were collected on July 17, 2012
B Tower was offline during the sampling event

J	Concentration is estimated; analyte was detected below the limit of quantitation (LOQ).
J*	Limit of detection qualified due to low surrogate recovery.
JL*	Concentration is considered estimated, biased low, due to low surrogate recovery
<	Analyte not detected above listed limit of detection (LOD).
-	Analyte not requested for analysis.
Bold	Result or LOQ exceeds ADEC interim remediation goal (sulfolane), or wastewater disposal permit limit (benzene and total aromatic hydrocarbons).
mg/L	milligrams per liter
GAC	Granular activated carbon

Table 5-6
Remediation System Operation-Treatment System Performance
North Pole Refinery
Flint Hills Resources Alaska, LLC

Method / Analyte	Units	AUGUST 9, 2012														
		R-21	R-35R	R-39	R-40	R-42	Combined Influent	Air Stripper Effluent (B Tower)	Air Stripper Effluent (C Tower)	Air Stripper Effluent (D Tower)	Sand Filter Influent	GAC Vessel A-Inlet	GAC Vessel A-Outlet	GAC Vessel B-Outlet	Final Effluent	Percent Removal (%)
EPA 624 - Benzene, Toluene, Ethylbenzene, Xylenes																
Benzene	mg/L	**0.115**	**0.0405**	**0.0589**	**0.311**	**0.00577**	**0.0694**	0.000370J	0.00163	0.00353	0.00105	0.00192	<0.000240	<0.000240	<0.000240	>99.7
Toluene	mg/L	**0.0227**	**0.0290**	**0.0302**	**0.329**	<0.000620	**0.0458**	0.000890J	0.00120	0.00235	0.000770J	0.00107	<0.000620	<0.000620	<0.000620	>98.6
Ethylbenzene	mg/L	**0.0341**	**0.0564**	**0.0234**	**0.0752**	<0.000620	**0.0311**	0.000350J	0.000680J	0.00137	0.000410J	0.000520J	<0.000620	<0.000620	<0.000620	>98.0
P & M -Xylene	mg/L	**0.164**	**0.103**	**0.0905**	**0.248**	<0.00124	**0.0887**	0.00125J	0.00292	0.00512	0.00171J	0.00225	<0.00124	<0.00124	<0.00124	>98.6
o-Xylene	mg/L	**0.0242**	**0.0223**	**0.0352**	**0.108**	<0.000620	**0.0278**	0.000540J	0.00191	0.00309	0.000840J	0.00130	<0.000620	<0.000620	<0.000620	>97.8
EP200.8 - Iron																
Total Iron	mg/L	4.57	2.61	2.08	3.74	2.65	3.68	3.31	1.49	0.772	10.6	0.408	0.0807J	<0.156	<0.156	
Dissolved Iron	mg/L	4.46	2.52	2.51	3.87	2.56	3.48	1.22	0.309	0.427	3.37	0.0917J	<0.156	<0.156	<0.156	
SM21 2540D - TSS																
Total Suspended Solids	mg/L	8.33	6.19	5.56	8.40	3.60	7.25	2.25	29.0	1.13	6.60	3.25	<0.312	0.214J	<0.300	
EPA 625M-SIMS - Polyaromatic Hydrocarbons																
Naphthalene	mg/L	-	-	-	-	-	**0.00476**	-	-	-	-	-	-	-	<0.0000682	>98.6
Acenaphthylene	mg/L	-	-	-	-	-	<0.0000330	-	-	-	-	-	-	-	<0.0000330	ND
Acenaphthene	mg/L	-	-	-	-	-	<0.0000330	-	-	-	-	-	-	-	<0.0000330	ND
Fluorene	mg/L	-	-	-	-	-	**0.0000863**	-	-	-	-	-	-	-	<0.0000330	>61.8
Phenanthrene	mg/L	-	-	-	-	-	**0.0000292J**	-	-	-	-	-	-	-	<0.0000330	ND
Anthracene	mg/L	-	-	-	-	-	<0.0000330	-	-	-	-	-	-	-	<0.0000330	ND
Fluoranthene	mg/L	-	-	-	-	-	<0.0000330	-	-	-	-	-	-	-	<0.0000330	ND
Pyrene	mg/L	-	-	-	-	-	<0.0000330	-	-	-	-	-	-	-	<0.0000330	ND
Benzo(a)Anthracene	mg/L	-	-	-	-	-	<0.0000330	-	-	-	-	-	-	-	<0.0000330	ND
Chrysene	mg/L	-	-	-	-	-	<0.0000330	-	-	-	-	-	-	-	<0.0000330	ND
Benzo[b]Fluoranthene	mg/L	-	-	-	-	-	<0.0000330	-	-	-	-	-	-	-	<0.0000330	ND
Benzo[k]fluoranthene	mg/L	-	-	-	-	-	<0.0000330	-	-	-	-	-	-	-	<0.0000330	ND
Benzo[a]pyrene	mg/L	-	-	-	-	-	<0.0000330	-	-	-	-	-	-	-	<0.0000330	ND
Indeno[1,2,3-c,d] pyrene	mg/L	-	-	-	-	-	<0.0000330	-	-	-	-	-	-	-	<0.0000330	ND
Dibenzo[a,h]anthracene	mg/L	-	-	-	-	-	<0.0000330	-	-	-	-	-	-	-	<0.0000330	ND
Benzo[g,h,i]perylene	mg/L	-	-	-	-	-	<0.0000330	-	-	-	-	-	-	-	<0.0000330	ND
EPA 1625B w/ Iso Dil-W - Sulfolane																
Sulfolane	mg/L	**0.441**	**0.131**	<0.00620	**0.0478**	**0.0574J***	**0.103**	**0.107**	**0.0309**	**0.0378**	**0.0177**	**0.0196**	<0.00688	<0.00652	<0.00682J*	>98.5

Note:

Groundwater treatment system and recovery-well samples were collected on July 17, 2012
A Tower was offline during the sampling event

J	Concentration is estimated; analyte was detected below the limit of quantitation (LOQ).
J*	Limit of detection qualified due to low surrogate recovery.
JL*	Concentration is considered estimated, biased low, due to low surrogate recovery
<	Analyte not detected above listed limit of detection (LOD).
-	Analyte not requested for analysis.
Bold	Result or LOQ exceeds ADEC interim remediation goal (sulfolane), or wastewater disposal permit limit (benzene and total aromatic hydrocarbons).
mg/L	milligrams per liter
GAC	Granular activated carbon

Table 5-6
Remediation System Operation-Treatment System Performance
North Pole Refinery
Flint Hills Resources Alaska, LLC

Method / Analyte	Units	September 13, 2012														
		R-21	R-35R	R-39	R-40	R-42	Combined Influent	Air Stripper Effluent (A Tower)	Air Stripper Effluent (B Tower)	Air Stripper Effluent (D Tower)	Sand Filter Influent	GAC Vessel A-Inlet	GAC Vessel A-Outlet	GAC Vessel B-Outlet	Final Effluent	Percent Removal (%)
EPA 624 - Benzene, Toluene, Ethylbenzene, Xylenes																
Benzene	mg/L	**0.101**	**0.0241**	**0.0461**	**0.253**	**0.00683**	**0.0523**	0.00148	<0.000240	0.000160J	0.000320J	<0.000240	<0.000240	<0.000240	<0.000240	>99.5
Toluene	mg/L	**0.0159**	**0.00731**	**0.00742**	**0.263**	<0.000620	**0.0253**	0.000880J	<0.000620	0.000400J	<0.000620	<0.000620	<0.000620	<0.000620	<0.000620	>97.5
Ethylbenzene	mg/L	**0.0273**	**0.0265**	**0.0134**	**0.0693**	<0.000620	**0.0193**	0.000570J	<0.000620	<0.000620	<0.000620	<0.000620	<0.000620	<0.000620	<0.000620	>96.8
P & M -Xylene	mg/L	**0.132**	**0.0564**	**0.0649**	**0.236**	<0.00124	**0.0656**	0.00269	<0.00124	<0.00124	<0.00124	<0.00124	<0.00124	<0.00124	<0.00124	>98.1
o-Xylene	mg/L	**0.0218**	**0.0106**	**0.0235**	**0.1**	<0.000620	**0.0186**	0.00163	<0.000620	<0.000620	0.000420J	<0.000620	<0.000620	<0.000620	<0.000620	>96.7
EP200.8 - Iron																
Total Iron	mg/L	3.90	2.16	2.14	3.71	2.41	3.81	2.96	3.60	2.03	3.81	0.270	0.0954J	0.236J	<0.156	
Dissolved Iron	mg/L	3.91	2.22	2.11	3.65	2.56	3.15	0.937	0.985	1.39	0.556	0.0851J	<0.156	<0.156	<0.156	
SM21 2540D - TSS																
Total Suspended Solids	mg/L	8.72	6.63	4.85	11.2	5.15	7.96	14.8	1.52	22.1	9.19	1.15	2.04	0.204J	0.209J	
EPA 625M-SIMS - Polyaromatic Hydrocarbons																
Naphthalene	mg/L	-	-	-	-	-	**0.00305**	-	-	-	-	-	-	-	<0.0000660	>97.8
Acenaphthylene	mg/L	-	-	-	-	-	<0.0000300	-	-	-	-	-	-	-	<0.0000320	ND
Acenaphthene	mg/L	-	-	-	-	-	<0.0000300	-	-	-	-	-	-	-	<0.0000320	ND
Fluorene	mg/L	-	-	-	-	-	**0.0000652**	-	-	-	-	-	-	-	<0.0000320	>50.9
Phenanthrene	mg/L	-	-	-	-	-	**0.0000304J**	-	-	-	-	-	-	-	<0.0000320	ND
Anthracene	mg/L	-	-	-	-	-	<0.0000300	-	-	-	-	-	-	-	<0.0000320	ND
Fluoranthene	mg/L	-	-	-	-	-	<0.0000300	-	-	-	-	-	-	-	<0.0000320	ND
Pyrene	mg/L	-	-	-	-	-	<0.0000300	-	-	-	-	-	-	-	<0.0000320	ND
Benzo(a)Anthracene	mg/L	-	-	-	-	-	<0.0000300	-	-	-	-	-	-	-	<0.0000320	ND
Chrysene	mg/L	-	-	-	-	-	<0.0000300	-	-	-	-	-	-	-	<0.0000320	ND
Benzo[b]Fluoranthene	mg/L	-	-	-	-	-	<0.0000300	-	-	-	-	-	-	-	<0.0000320	ND
Benzo[k]fluoranthene	mg/L	-	-	-	-	-	<0.0000300	-	-	-	-	-	-	-	<0.0000320	ND
Benzo[a]pyrene	mg/L	-	-	-	-	-	<0.0000300	-	-	-	-	-	-	-	<0.0000320	ND
Indeno[1,2,3-c,d] pyrene	mg/L	-	-	-	-	-	<0.0000300	-	-	-	-	-	-	-	<0.0000320	ND
Dibenzo[a,h]anthracene	mg/L	-	-	-	-	-	<0.0000300	-	-	-	-	-	-	-	<0.0000320	ND
Benzo[g,h,i]perylene	mg/L	-	-	-	-	-	<0.0000300	-	-	-	-	-	-	-	<0.0000320	ND
EPA 1625B w/ Iso Dil-W - Sulfolane																
Sulfolane	mg/L	**0.356**	**0.147**	<6.60	**0.0483**	**0.0542**	**0.103**	**0.0486**	**0.0681**	**0.0916**	**0.0445**	**0.0327**	<0.00666	<0.00652	<0.00646	>98.2

Note:

Groundwater treatment system and recovery-well samples were collected on July 17, 2012
C Tower was offline during the sampling event

J	Concentration is estimated; analyte was detected below the limit of quantitation (LOQ).
J*	Limit of detection qualified due to low surrogate recovery.
JL*	Concentration is considered estimated, biased low, due to low surrogate recovery
<	Analyte not detected above listed limit of detection (LOD).
-	Analyte not requested for analysis.
Bold	Result or LOQ exceeds ADEC interim remediation goal (sulfolane), or wastewater disposal permit limit (benzene and total aromatic hydrocarbons).
mg/L	milligrams per liter
GAC	Granular activated carbon

Table 5-6
Remediation System Operation-Treatment System Performance
North Pole Refinery
Flint Hills Resources Alaska, LLC

Method / Analyte	Units	October 16, 2012													
		R-21	R-35R	R-39	R-40	R-42	Combined Influent	Air Stripper Effluent (A Tower)	Air Stripper Effluent (B Tower)	Air Stripper Effluent (C Tower)	Air Stripper Effluent (D Tower)	Sand Filter Influent	GAC Vessel C-Inlet	Final Effluent	Percent Removal (%)
EPA 624 - Benzene, Toluene, Ethylbenzene, Xylenes															
Benzene	mg/L	**0.0851**	**0.0217**	**0.0384**	**0.227**	**0.00699**	**0.0546**	<0.000240	<0.000240	<0.000240	<0.000240	<0.000240	<0.000240	<0.000240	>99.5
Toluene	mg/L	**0.0144**	**0.00364**	**0.00587**	**0.269**	<0.000620	**0.0114**	<0.000620	<0.000620	<0.000620	<0.000620	<0.000620	<0.000620	<0.000620	>94.5
Ethylbenzene	mg/L	**0.0222**	**0.0178**	**0.00753**	**0.0616**	<0.000620	**0.0167**	<0.000620	<0.000620	<0.000620	<0.000620	<0.000620	<0.000620	<0.000620	>96.2
P & M -Xylene	mg/L	**0.119**	**0.0424**	**0.0453**	**0.221**	<0.00124	**0.0619**	<0.00124	<0.00124	<0.00124	<0.00124	<0.00124	<0.00124	<0.00124	>97.9
o-Xylene	mg/L	**0.0193**	**0.00714**	**0.0153**	**0.0867**	<0.000620	**0.0165**	**0.000330J**	<0.000620	<0.000620	<0.000620	<0.000620	<0.000620	<0.000620	>96.2
EP200.8 - Iron															
Total Iron	mg/L	3.92	2.13	2.09	3.75	2.55	3.41	1.67	1.23	1.06	1.61	1.01	0.508	<0.156	>95.4
Dissolved Iron	mg/L	3.47	1.92	1.88	3.16	2.29	3.37	0.0963J	0.153J	0.274	0.414	0.129J	<0.156	<0.156	>95.3
SM21 2540D - TSS															
Total Suspended Solids	mg/L	8.20	4.20	3.00	7.20	5.40	6.20	3.20	3.20	1.40	3.64	3.50	0.400J	0.200J	>96.7
EPA 625M-SIMS - Polyaromatic Hydrocarbons															
Naphthalene	mg/L	-	-	-	-	-	**0.00198**	<0.000100B*	<0.000620	<0.000115B*	<0.000620	-	-	<0.0000632	>96.8
Acenaphthylene	mg/L	-	-	-	-	-	<0.0000306	<0.0000300	<0.0000300	<0.0300	<0.0000300	-	-	<0.0000306	ND
Acenaphthene	mg/L	-	-	-	-	-	<0.0000306	<0.0000300	<0.0000300	<0.0300	<0.0000300	-	-	<0.0000306	ND
Fluorene	mg/L	-	-	-	-	-	**0.0440J**	**0.0281J**	<0.0000300	**0.0305J**	<0.0000300	-	-	<0.0000306	>99.9
Phenanthrene	mg/L	-	-	-	-	-	**0.0189J**	<0.0000300	<0.0000300	<0.0300	<0.0000300	-	-	<0.0000306	>99.8
Anthracene	mg/L	-	-	-	-	-	<0.0000306	<0.0000300	<0.0000300	<0.0300	<0.0000300	-	-	<0.0000306	ND
Fluoranthene	mg/L	-	-	-	-	-	<0.0000306	<0.0000300	<0.0000300	<0.0300	<0.0000300	-	-	<0.0000306	ND
Pyrene	mg/L	-	-	-	-	-	<0.0000306	<0.0000300	<0.0000300	<0.0300	<0.0000300	-	-	<0.0000306	ND
Benzo(a)Anthracene	mg/L	-	-	-	-	-	<0.0000306	<0.0000300	<0.0000300	<0.0300	<0.0000300	-	-	<0.0000306	ND
Chrysene	mg/L	-	-	-	-	-	<0.0000306	<0.0000300	<0.0000300	<0.0300	<0.0000300	-	-	<0.0000306	ND
Benzo[b]Fluoranthene	mg/L	-	-	-	-	-	<0.0000306	<0.0000300	<0.0000300	<0.0300	<0.0000300	-	-	<0.0000306	ND
Benzo[k]fluoranthene	mg/L	-	-	-	-	-	<0.0000306	<0.0000300	<0.0000300	<0.0300	<0.0000300	-	-	<0.0000306	ND
Benzo[a]pyrene	mg/L	-	-	-	-	-	<0.0000306	<0.0000300	<0.0000300	<0.0300	<0.0000300	-	-	<0.0000306	ND
Indeno[1,2,3-c,d] pyrene	mg/L	-	-	-	-	-	<0.0000306	<0.0000300	<0.0000300	<0.0300	<0.0000300	-	-	<0.0000306	ND
Dibenzo[a,h]anthracene	mg/L	-	-	-	-	-	<0.0000306	<0.0000300	<0.0000300	<0.0300	<0.0000300	-	-	<0.0000306	ND
Benzo[g,h,i]perylene	mg/L	-	-	-	-	-	<0.0000306	<0.0000300	<0.0000300	<0.0300	<0.0000300	-	-	<0.0000306	ND
EPA 1625B w/ Iso Dil-W - Sulfolane															
Sulfolane	mg/L	**0.344**	**0.121**	<0.00620	**0.0509**	**0.0526**	**0.0902**	**0.0645**	**0.0387**	**0.0892**	**0.0373**	**0.0323**	**0.0303**	<0.00620	>93.1

Note:

Groundwater treatment system and recovery-well samples were collected on October 16, 2012
GAC vessels C and D were in parallel during the sampling event; A and B were offline for maintenance

J	Concentration is estimated; analyte was detected below the limit of quantitation (LOQ).
B*	Analyte considered not detected; result was attributible to laboratory-based contamination, identified in the method blank.
<	Analyte not detected above listed limit of detection (LOD).
-	Analyte not requested for analysis.
Bold	Result or LOQ exceeds ADEC interim remediation goal (sulfolane), or wastewater disposal permit limit (benzene and total aromatic hydrocarbons).
mg/L	milligrams per liter
GAC	Granular activated carbon

Table 5-6
Remediation System Operation-Treatment System Performance
North Pole Refinery
Flint Hills Resources Alaska, LLC

Method / Analyte	Units	November 13, 2012														
		R-21	R-35R	R-39	R-40	R-42	Combined Influent	Air Stripper Effluent (A Tower)	Air Stripper Effluent (B Tower)	Air Stripper Effluent (C Tower)	Air Stripper Effluent (D Tower)	Sand Filter Influent	GAC Vessel A-Inlet	GAC Vessel A-Outlet	Final Effluent	Percent Removal (%)
EPA 624 - Benzene, Toluene, Ethylbenzene, Xylenes																
Benzene	mg/L	**0.0835**	**0.0352**	**0.0445**	**0.221**	**0.00613**	**0.0574**	**0.000280J**	**0.000190J**	<0.000240	<0.000240	<0.000240	<0.000240	<0.000240	<0.000240	>99.5
Toluene	mg/L	**0.0225**	**0.0245**	**0.0267**	**0.281**	<0.000620	**0.00616**	<0.000620	<0.000620	<0.000620	<0.000620	<0.000620	<0.000620	<0.000620	<0.000620	>89.9
Ethylbenzene	mg/L	**0.0333**	**0.0364**	**0.0109**	**0.0653**	<0.000620	**0.022**	<0.000620	<0.000620	<0.000620	<0.000620	<0.000620	<0.000620	<0.000620	<0.000620	>97.1
P & M -Xylene	mg/L	**0.184**	**0.0805**	**0.0557**	**0.214**	<0.00124	**0.0792**	<0.00124	<0.00124	<0.00124	<0.00124	<0.00124	<0.00124	<0.00124	<0.00124	>98.4
o-Xylene	mg/L	**0.0325**	**0.0155**	**0.0197**	**0.0845**	<0.000620	**0.0192**	<0.000620	<0.000620	<0.000620	<0.000620	<0.000620	<0.000620	<0.000620	<0.000620	>96.7
EP200.8 - Iron																
Total Iron	mg/L	3.92	2.28	2.21	3.42	2.48	3.58	0.912	0.912	1.30	0.850	4.45	0.255	0.0837J	<0.156	>95.6
Dissolved Iron	mg/L	3.79	2.33	2.05	3.50	2.40	3.33	<0.156	0.0976J	0.179J	0.148J	0.120J	<0.156	<0.156	<0.156	>95.3
SM21 2540D - TSS																
Total Suspended Solids	mg/L	10.8	4.51	3.10	7.14	5.00	7.10	1.70	1.47	1.60	0.700	49.0	0.300J	<0.600	<0.302	>95.7
EPA 625M-SIMS - Polyaromatic Hydrocarbons																
Naphthalene	mg/L	-	-	-	-	-	**0.00299**	**0.0000346J**	<0.0000620	<0.0000620	<0.0000660	-	-	-	<0.0000620	>97.9
Acenaphthylene	mg/L	-	-	-	-	-	<0.0000326	<0.0000300	<0.0000300	<0.0000300	<0.0000320	-	-	-	<0.0000300	ND
Acenaphthene	mg/L	-	-	-	-	-	<0.0000326	<0.0000300	<0.0000300	<0.0000300	<0.0000320	-	-	-	<0.0000300	ND
Fluorene	mg/L	-	-	-	-	-	**0.0000644**	<0.0000300	<0.0000300	<0.0000300	<0.0000320	-	-	-	<0.0000300	>53.4
Phenanthrene	mg/L	-	-	-	-	-	**0.0000243J**	<0.0000300	<0.0000300	<0.0000300	<0.0000320	-	-	-	<0.0000300	ND
Anthracene	mg/L	-	-	-	-	-	<0.0000326	<0.0000300	<0.0000300	<0.0000300	<0.0000320	-	-	-	<0.0000300	ND
Fluoranthene	mg/L	-	-	-	-	-	<0.0000326	<0.0000300	<0.0000300	<0.0000300	<0.0000320	-	-	-	<0.0000300	ND
Pyrene	mg/L	-	-	-	-	-	<0.0000326	<0.0000300	<0.0000300	<0.0000300	<0.0000320	-	-	-	<0.0000300	ND
Benzo(a)Anthracene	mg/L	-	-	-	-	-	<0.0000326	<0.0000300	<0.0000300	<0.0000300	<0.0000320	-	-	-	<0.0000300	ND
Chrysene	mg/L	-	-	-	-	-	<0.0000326	<0.0000300	<0.0000300	<0.0000300	<0.0000320	-	-	-	<0.0000300	ND
Benzo[b]Fluoranthene	mg/L	-	-	-	-	-	<0.0000326	<0.0000300	<0.0000300	<0.0000300	<0.0000320	-	-	-	<0.0000300	ND
Benzo[k]fluoranthene	mg/L	-	-	-	-	-	<0.0000326	<0.0000300	<0.0000300	<0.0000300	<0.0000320	-	-	-	<0.0000300	ND
Benzo[a]pyrene	mg/L	-	-	-	-	-	<0.0000326	<0.0000300	<0.0000300	<0.0000300	<0.0000320	-	-	-	<0.0000300	ND
Indeno[1,2,3-c,d] pyrene	mg/L	-	-	-	-	-	<0.0000326	<0.0000300	<0.0000300	<0.0000300	<0.0000320	-	-	-	<0.0000300	ND
Dibenzo[a,h]anthracene	mg/L	-	-	-	-	-	<0.0000326	<0.0000300	<0.0000300	<0.0000300	<0.0000320	-	-	-	<0.0000300	ND
Benzo[g,h,i]perylene	mg/L	-	-	-	-	-	<0.0000326	<0.0000300	<0.0000300	<0.0000300	<0.0000320	-	-	-	<0.0000300	ND
EPA 1625B w/ Iso Dil-W - Sulfolane																
Sulfolane	mg/L	**0.336**	**0.139**	<0.00620	**0.0442**	**0.0525**	**0.1**	**0.0453**	**0.0295**	**0.0417**	**0.0391**	0.00480J	**0.0108**	<0.00620	<0.00620	>93.7

Note:

Groundwater treatment system and recovery-well samples were collected on November 13, 2012
GAC vessels A and B were in series, followed by C and D in parallel during the sampling event

J Concentration is estimated; analyte was detected below the limit of quantitation (LOQ).
< Analyte not detected above listed limit of detection (LOD).
- Analyte not requested for analysis.
Bold Result or LOQ exceeds ADEC interim remediation goal (sulfolane), or wastewater disposal permit limit (benzene and total aromatic hydrocarbons).
mg/L milligrams per liter
GAC Granular activated carbon

Table 5-6
Remediation System Operation-Treatment System Performance
North Pole Refinery
Flint Hills Resources Alaska, LLC

Method / Analyte	Units	December 11-12, 2012														
		R-21	R-35R	R-39	R-40	R-42	Combined Influent	Air Stripper Effluent (A Tower)	Air Stripper Effluent (B Tower)	Air Stripper Effluent (C Tower)	Air Stripper Effluent (D Tower)	Sand Filter Influent	GAC Vessel A-Inlet	GAC Vessel A-Outlet	Final Effluent	Percent Removal (%)
EPA 624 - Benzene, Toluene, Ethylbenzene, Xylenes																
Benzene	mg/L	**0.0638**	**0.0313**	**0.0391**	**0.156**	**0.00455**	**0.0485**	<0.000240	**0.00086**	<0.000240	<0.000240	**0.000350J**	<0.000240	<0.000240	<0.000240	>99.5
Toluene	mg/L	**0.0121**	**0.00592**	**0.0169**	**0.16**	<0.000620	**0.0149**	<0.000620	**0.000560J**	<0.000620	<0.000620	**0.000350J**	<0.000620	<0.000620	<0.000620	>95.8
Ethylbenzene	mg/L	**0.0295**	**0.0224**	**0.00994**	**0.052**	<0.000620	**0.0153**	<0.000620	**0.000340J**	<0.000620	<0.000620	<0.000620	<0.000620	<0.000620	<0.000620	>95.9
P & M -Xylene	mg/L	**0.156**	**0.0484**	**0.0428**	**0.163**	<0.00124	**0.0533**	<0.00124	**0.00133J**	<0.00124	<0.00124	<0.00124	<0.00124	<0.00124	<0.00124	>98.8
o-Xylene	mg/L	**0.0213**	**0.00753**	**0.0137**	**0.0696**	<0.000620	**0.0129**	<0.000620	**0.000760J**	<0.000620	<0.000620	<0.000620	<0.000620	<0.000620	<0.000620	>95.1
EP200.8 - Iron																
Total Iron	mg/L	3.93	2.38	2.45	3.38	2.61	5.33	1.24	2.80	2.76	0.957	3.20	0.312	0.0896J	<0.156	>97.0
Dissolved Iron	mg/L	3.83	2.21	2.13	3.27	2.53	3.29	<0.156	0.166J	0.183J	0.137J	0.108J	<0.156	<0.156	<0.156	>95.2
SM21 2540D - TSS																
Total Suspended Solids	mg/L	8.40J*	5.05J*	4.90J*	8.24J*	5.98J*	9.02	1.57	2.45	7.84	3.92	1.47	0.392J	0.196J	<0.294	>96.7
EPA 625M-SIMS - Polyaromatic Hydrocarbons																
Naphthalene	mg/L	-	-	-	-	-	**0.00304**	<0.0000640	<0.0000640	<0.0000632	<0.0000640	-	-	-	<0.0000632	>97.9
Acenaphthylene	mg/L	-	-	-	-	-	<0.0000306	<0.0000310	<0.0000310	<0.0000306	<0.0000310	-	-	-	<0.0000306	ND
Acenaphthene	mg/L	-	-	-	-	-	**0.0000203J**	<0.0000310	<0.0000310	<0.0000306	<0.0000310	-	-	-	<0.0000306	ND
Fluorene	mg/L	-	-	-	-	-	**0.0000656**	<0.0000310	<0.0000310	<0.0000306	<0.0000310	-	-	-	<0.0000306	>53.3
Phenanthrene	mg/L	-	-	-	-	-	**0.0000282J**	<0.0000310	<0.0000310	<0.0000306	<0.0000310	-	-	-	<0.0000306	ND
Anthracene	mg/L	-	-	-	-	-	<0.0000306	<0.0000310	<0.0000310	<0.0000306	<0.0000310	-	-	-	<0.0000306	ND
Fluoranthene	mg/L	-	-	-	-	-	<0.0000306	<0.0000310	<0.0000310	<0.0000306	<0.0000310	-	-	-	<0.0000306	ND
Pyrene	mg/L	-	-	-	-	-	<0.0000306	<0.0000310	<0.0000310	<0.0000306	<0.0000310	-	-	-	<0.0000306	ND
Benzo(a)Anthracene	mg/L	-	-	-	-	-	<0.0000306	<0.0000310	<0.0000310	<0.0000306	<0.0000310	-	-	-	<0.0000306	ND
Chrysene	mg/L	-	-	-	-	-	<0.0000306	<0.0000310	<0.0000310	<0.0000306	<0.0000310	-	-	-	<0.0000306	ND
Benzo[b]Fluoranthene	mg/L	-	-	-	-	-	<0.0000306	<0.0000310	<0.0000310	<0.0000306	<0.0000310	-	-	-	<0.0000306	ND
Benzo[k]fluoranthene	mg/L	-	-	-	-	-	<0.0000306	<0.0000310	<0.0000310	<0.0000306	<0.0000310	-	-	-	<0.0000306	ND
Benzo[a]pyrene	mg/L	-	-	-	-	-	<0.0000306	<0.0000310	<0.0000310	<0.0000306	<0.0000310	-	-	-	<0.0000306	ND
Indeno[1,2,3-c,d] pyrene	mg/L	-	-	-	-	-	<0.0000306	<0.0000310	<0.0000310	<0.0000306	<0.0000310	-	-	-	<0.0000306	ND
Dibenzo[a,h]anthracene	mg/L	-	-	-	-	-	<0.0000306	<0.0000310	<0.0000310	<0.0000306	<0.0000310	-	-	-	<0.0000306	ND
Benzo[g,h,i]perylene	mg/L	-	-	-	-	-	<0.0000306	<0.0000310	<0.0000310	<0.0000306	<0.0000310	-	-	-	<0.0000306	ND
EPA 1625B w/ Iso Dil-W - Sulfolane																
Sulfolane	mg/L	**0.314**	**0.125**	<0.00640	**0.0407**	**0.0504**	**0.0947**	0.00840J	**0.0247**	**0.015**	**0.0243**	**0.0129**	0.00478J	<0.00646	<0.00650	>93.1

Note:

	Groundwater treatment system samples were collected on December 12, 2012 and recovery-well samples were collected on December 11, 2012
	GAC vessels A and B were in series, followed by C and D in parallel during the sampling event
J	Concentration is estimated; analyte was detected below the limit of quantitation (LOQ).
J*	Result is considered an estimate; flag applied by SWI based on sample-handling or analytical QC issues, see data-review checklist for details
*	Total xylenes calculated by SWI from database
<	Analyte not detected above listed limit of detection (LOD).
-	Analyte not requested for analysis.
Bold	Result or LOQ exceeds ADEC interim remediation goal (sulfolane), or wastewater disposal permit limit (benzene and total aromatic hydrocarbons).
mg/L	milligrams per liter
GAC	Granular activated carbon