

Table 1
Sulfolane Content in Gasoline
North Pole Refinery
Flint Hills Resources Alaska, LLC

Date	Product	Season	Sulfolane ppm
Data prior to 1992 is no longer available			
8/13/92	88 Octane	Summer grade	92
11/16/92	87 Octane	Winter grade	231
4/2/94	88 Octane	Winter grade	161
12/17/94	88 Octane	Winter grade	103
7/1/97	87 Octane	Summer grade	316
7/27/98	90 Octane	Summer grade	123
9/16/98	87 Octane	Summer grade	251
4/21/99	90 Octane	Winter grade	868
5/9/99	87 Octane	Summer grade	302
3/13/01	90 Octane	Winter grade	156
4/2/01	Sub grade	Winter grade	191
7/19/01	87 Octane	Summer grade	256
LIMS implemented 2002, maximum amount in an approved tank for each year:			
2002 Max	90 Octane	Winter grade	162
2002 Max	87 Octane	Summer grade	298
2003 Max	90 Octane	Summer grade	24
2003 Max	87 Octane	Winter grade	46
2004 Max	90 Octane	Summer grade	50
2004 Max	87 Octane	Summer grade	184
8/01/04 gasoline spec. for sulfolane was set at 48 ppm			
4/04/05 gasoline spec. for sulfolane was set at 56 ppm			
2005 Max	87 Octane	Winter Grade	52
2005 Max	90 Octane	Winter Grade	53
2006 Max	87 Octane	Winter Grade	53
2006 Max	90 Octane	Summer Grade	22
2007 Max	87 Octane		<2
2007 Max	90 Octane		<2
2008 Max	87 Octane	Summer Grade	55.5
2008 Max	90 Octane	Winter Grade	20
2009 Max	87 Octane		<2
2009 Max	90 Octane		<2

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Facility Tracking Number	Date	Material	Volume Spilled (gallons)	Location
ND	19770731	Kerosene	100	North Pole Refinery
ND	19770807	Naphtha	150	North Pole Refinery
77-3	19770814	Gasoline	250	North Pole Refinery
77-4	19770902	Naphtha	120	Tank 502 dike
78-2 AL004424	19771001	Naphtha	200	Tank 502 dike
78-1 AL004425	19771226	Crude	150	Heat exchanger
78-3 AL004431	19771228	Naphtha	180	Control room Crude tower Utilities Building
78-4 AL004432	19780110	JP-4	50	JP-4 Filter Loading Rack
78-5 AL004433	19780110	#1 fuel oil	1,000	Load Rack
78-6 AL004434	19780113	JP-4	10	Skid 6
78-9 AL004437	19780115	hago	3	Skid 5
78-11	19780117	JP-4	50	Loading Rack
78-15	19780119	Crude Kerosene	10	Hot Oil Surge Tank
78-15	19780119	Crude	100	Crude charge pump skid
78-14	19780202	JP-4	12,000	Dike, sump & ditch at Tank 504
	19780203	Return oil	150	Adjacent to return oil pumps
	19780207	Return oil	100	Skid 4 return oil pumps
78-17A AL004454	19780213	Lube oil	3	Skid 4 return oil pumps
78-18	19780213	JP-4	3	Salt tower
78-19	19780213	Reduced Crude	100	Skid at heat exchangers
78-20 AL004459	19780307	Crude oil	10	North Pole Metering Station
78-21 AL004458	19780317	waste oil	5	Fire water tank
	19780328	#2 Fuel Oil	20	Truck Loading Rack
78-23 AL004463	19780410	Return oil	200	Skid 4 return oil pumps
78-24	19780413	Kerosene	75	Truck Loading Rack
78-25 AL004467	19780805	JP-4	230	Inside Tank 502 dike
ND	19780907	Crude	5	Truck Loading Rack
ND	19781029	Propylene Glycol	1,150	Crude charge pump Pipe rack Skid #4
ND	19781031	JP-4	40	Tank 501
ND	19781204	JP-4	1,500	Tank
ND	19781221	JP-4	300	Tank
ND	19791214	#1 Fuel Oil	2,000	Within Tank 509 dike
ND	19800212	JP-4	5,600	Tank
ND	19800923	JP-4	60,000	Surplus DOD Tanks (old bolted tanks along Naphtha Avenue)
81-1 AL004485	19801120	JP-4	100	Tank
81-2 AL004488	19801220	Diesel	220	North Pole Refinery

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81-3A AL004493	19810110	JP-4	1,100	Tank
81-4 AL004496	19810507	Jet-A	200	Tank Car Loading Rack
81-5 AL004498	19810604	JP-4	100	Tank Car Loading Rack
81-6 AL004500	19810803	Jet A-1	50	Rail Loading Terminal
81-7	19810831	Jet A-1	200	Jet fuel tank farm
81-8 AL004504	19811101	Jet A-1	2,000	Tank 508 Tank 509
82-1 AL004511	19811103	#1 Heating Diesel	150	Train Loading Rack
82-2 AL004513	19811118	#1 Heating	100	Rail Rack Station 4
82-3	19811204	Jet-A Kero	3,150	T-509
82-5 AL004526	19820105	Jet A	500	Rail Loading Station Rail Rack
82-6 AL004528	19820223	Jet A	125	Rail Loading Terminal Station 1
84-1 AL004536	19820722	Kerosene or Jet B JP-4	1,000	Gathering sump Process unit
84-10	19821104	Jet-B	300	Rail Loading Station Rail Rack
85-1 AL004539	19821111	Jet-A	1,000	Load Rack Rail Loading Terminal
ND	19840407	#4 Fuel Oil hago	4,287	Rail Loading Station
ND	19840905	asphalt	200	Asphalt Unit
ND	19850123	Return oil	20	JP-4 Filter Skid
ND	19850125	Kerosene	100	Chemical addition
85-7 AL004544	19850323	JP-4	17,000	Rail Loading Rack
85-8 AL004545	19850503	Kerosene	600	End of bottom loading rack
ND	19850505	Kerosene	1,000	Asphalt loading rack
86-1 AL004550	19850607	Crude	500	Block valve North/South Pipe Rack
ND	19850913	asphalt	8,000	Truck Loading Area
86-3 AL004556	19851002	Wastewater	100	Flow from lagoon west to gravel pit
	19860102	unleaded gas	8,400	Tank 617 Tank Farm
86-8 AL004564	19860424	Unleaded gasoline	8,400	Tank 617 (near intersection of Williams Ave. and Gasoline Alley)
ND	19860429	hago	2,500	Tank Dike
87-2 AL004589	19861204	Jet-A	900	Jet A filter skid Tank 402 dike
87-5 AL004594	19861212	Oil	200	
87-4 AL004593	19870101	HAGO	20,000	Spread northerly from skids 5 & 6 under the pipe rack
87-6	19870325	Jet-A	15	T-508 Dike
87-7	19870408	Jet-A	15	Old bottoms loading rack
87-8 AL004599	19870408	#2 Diesel	100	Tank 401
87-9 AL004601	19870415	Crude	100	Charge skid
87-10	19870416	Crank case oil	10	Generator Building
87-11 AL004607	19870916	Effluent water	250	Waste water lagoon dike

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Facility Tracking Number	Date	Material	Volume Spilled (gallons)	Location
88-2 AL004612	19871008	Jet-A	5	Sump 922
88-4 AL004616	19871013	hago Propylene Glycol	1	North/South Pipe Rack Salt Dryers
88-5 AL004618	19871111	LAGO	10	Tank 404
88-6	19880115	JP-4 Kero	20	Tank Dike 404
88-7 AL004624	19880426	Jet-A	10	North/South Pipe Rack Tank Farm
	19880627	Mixed products	30	Old Truck Loading Rack
88-8 AL004628	19880709	JP-4 Kero	20	Sump 05-7
88-9 AL004631	19880715	hago	250	crude unit #1
88-11 AL004635	19880722	hago	5	HAGO Filters
AL004643	19880723	Oil	5	Salt Dryers
	19880922	Oily water	200	Tank 508 dike
AL004647	19881123	Oily Water	140	Sump 05-7
89-4 AL004650	19890114	Jet-A	10	Rail Spur
89-5 AL004653	19890121	hago	100	Rail Loading Rack
90-1	19890204	hago	30	Boiler Building HAGO Transfer Line to GVEA
90-2	19890512	#1 Diesel	10	Load Rack
90-3	19891227	#2 Diesel	40	Rail Rack Loading Area Sump 902
90-4	19900115	Jet A	100	Rail Rack
90-6	19900126	hago	30	North/South Pipe Rack
91-1	19900402	Oily Water	120	Lagoon B
91-2	19900417	asphalt Kerosene	15	Pipe rack
91-3	19900705	JP-4	2,400	Tank 501 Dike
91-4	19910129	Gasoline	100	Rail Loading Rack
91-5	19910404	Kerosene	8,000	Tank 302
91-6	19910619	Asphalt AC-5	200	Asphalt Truck rack
92-1	19910626	#2 Fuel Oil	50	Utility Building
ND	19910709	AC-5	100	Asphalt load rack
ND	19911024	hago	25	Effluent Building Rail Spur
ND	19920114	Nalco 5376	5	Tank 191
ND	19920328	JP-4	400	Tank dike area around tanks
92-6	19920404	Naphtha	1,250	East end How Baker Unit
92-7	19920422	AC-5	118	Rail Rack Loading Area
92-8	19920517	Crude	5	crude unit #1
92-9	19920612	Av Fuel	4,000	North Pole Refinery
92-11	19920624	Diesel	50	Rail Rack
92-13	19920714	Hydraulic Oil	20	Rail Rack Spur track

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Facility Tracking Number	Date	Material	Volume Spilled (gallons)	Location
ND	19920805	Return crude	5	crude unit #1 Pipe rack
93-3	19920909	Premium unleaded gasoline	50	Rail Rack
93-4	19921124	Jet A	187	Rail Loading Rack
93-5	19930203	Kerosene	3,600	Rail rack
93-6	19930210	Oily Water	250	Effluent Building Tank 192
93-8	19930401	Oil	1	Generator Building Pipe rack
93-9	19930417	Kerosene	30	Rail Spur
93-10	19930423	hago	500	Truck rack
93-12	19930607	unleaded gas	10	Rail Rack Station 4
93-11	19930608	LAGO	5	Distribution Building
93-14	19930610	unleaded	304	Distribution Gas Loading Rack Station 5
93-15	19930701	JP4	10	Military Skid Piping manifold
93-16	19930721	waste oil	3	Maintenance Building
93-17	19930728	Kerosene	10	Sump 5103
ND	19930729	Hydrocarbon	30	S-908 Salt tower
93-19	19930825	Oil	51	Rail Loading Rack
ND	19930923	Oily Water	20	Salt tower skid
93-21	19931104	Jet A	1,255	Rail Rack
94-01	19931105	Lubrizol	3	Truck Loading Rack
94-02	19931111	Jet a	11,500	Truck Loading Rack
94-03	19931206	asphalt	5	Rail Tracks
94-04	19940102	asphalt hago	0.5	Blower Building Rail Car Steam Header
94-05	19940117	Oily Wastewater	400	Lagoon A
94-06	19940126	#4 Fuel Oil hago	3	Track #4
94-08	19940130	Effluent water	500	C pond
ND	19940205	FSII	1	FSII Pump Box
94-10	19940315	Resid	1	Resid Pump
94-11	19940331	AC 2.5 ARC LAGO	5	Truck rack
ND	19940420	Wastewater	400	North of Lagoon B
94-12	19940428	unleaded gas	3	Road by rail sump
94-13	19940430	Wastewater	1,000	Lagoon B
94-15	19940503	#1 Fuel oil	100	North Pole Refinery
94-16	19940517	Kerosene	20	Sump 04-3
94-17	19940607	AC-5	50	Lane 8 Truck Loading Facility
94-18	19940616	Jet A-1	9	Rail Rack Station 2

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Facility Tracking Number	Date	Material	Volume Spilled (gallons)	Location
94-19	19940810	hago	5	Hago salt tower North/South Pipe Rack
94-20	19940829	AC-5	10	Lane 8 Truck Loading Area
94-21	19940830	Gasoline	1,300	Rail station between tracks 3 & 4
ND	19941003	Resid	1.5	5180 Reject Pump
94-23	19941010	Resid	10	Injection pump 5180 & 397
95-3	19941109	Diesel	870	Rail Loading Rack
ND	19941113	Ethylene Glycol	165	VRU
95-05	19941215	JP-4 Kerosene	10	Pipe rack Tank 401
95-06	19950413	unleaded gas	200	Rail Rack
092095IR.065 95-09	19950424	Diesel	100	Truck rack
95-11	19950614	FSII	15	FSII Injection Skid
ND	19950618	JP-4 unleaded gas	5	Tank 515
ND	19950920	#4 Fuel Oil hago	10	Skid #5
110995IR.092	19951021	wastewater	30	CTX Box Skid
1116951IR.095	19951101	Additive	313	Additive enclosure and wastewater system
ND	19951109	Jet-A	100	Rail Rack Station 4
120195IR.107	19951109	Jet-A	103	Rail Rack Station 4
ND	19951114	HAGO	300	Truck rack paved area only
031796IR.010	19951116	Kerosene	10	CU2 Salt Tower skid
040996IR.016	19951201	Gasoline	100	Lane 1 Truck rack
050196IR.027	19960201	wastewater	10	Blower Building Lagoon A
051096IR.023	19960315	Slop oil	2	Crude #1 charge pump Pipe rack
062596IR.038	19960409	Naphtha	15	JP-4 Salt Tower
ND	19960501	Slop oil	300	Utilidor
ND	19960510	Slop oil Sump Sludge	20	Distribution Rail Loading Sump Sump 158
100796IR.063	19960625	Resid Return oil	5	Return oil pipeline
110196IR.075	19960627	Crude	1,200	Crude Unit 1 Desalter
041497IR.028	19960812	Gasoline	94	Truck rack lane 6
ND	19961007	Mixture of Various Hydrocarbon Products		Sump 902
ND	19961101	aromatics Gasoline	750	Tank 513 Tank Farm
060597IR.050	19970414	Kerosene	10	Crude #1 Slop manifold
	19970425	Gasoline	750	North Pole Refinery
060797IR.46	19970501	Propylene Glycol	7,400	North Pole Refinery
062397IR.056	19970605	Gasoline	1	Infiltration Gallery Air Stripper Effluent Pond
070797IR.057	19970607	Gasoline	500	Rupture in off-site slop oil line during increase in pressure

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Facility Tracking Number	Date	Material	Volume Spilled (gallons)	Location
ND	19970608	Slop oil	100	S-921 Discharge piping
ND	19970623	Wastewater	100	Sump 903 Charge skid crude unit #1
ND	19970707	#1 Diesel	40	Roadway Truck rack fence line
072997IR.063	19970714	Diesel	200	Truck rack, lane 3
ND	19970718	Crude	500	North Pole Refinery
ND	19970722	Oily Water	100	Ground surrounding sump
ND	19970729	Kerosene	100	Lane 3 Truck Loading Rack
082297IR.078	19970822	Oily Water	100	Sump 908
082397IR.079	19970828	Sulfolane	9	Sulfolane Unit
090897IR.080	19970908	Oily Water	200	Tank 192 Utility Building
ND	19971012	Kerosene	400	New naphtha extraction skid
103107IR.098	19971031	Oily Water	200	Oily water line Pipe rack
ND	19971107	Wastewater?	100	North Pole Refinery
ND	19971107	Wastewater?	500	North Pole Refinery
111297IR.100	19971112	Oily Water	50	Effluent Building Sump 905
	19971218	Kerosene	150	Naphtha extractor skid on ground level
020998-IR-6	19980103	Kerosene	10	Auxiliary tank
010698IR.005 980211-	19980106	glycol	150	C-Pond Outlet piping
020998-IR-9	19980108	JP-4	5	Tank Farm
011298IR.004	19980112	Gasoline	0.5	Air Stripper Effluent Pond
980309-IR-28	19980309	glycol	50	JP-4 Filter Skid Tank Farm
0980520-IR-89	19980520	wastewater	50	Drain line Lab
980526-IR-96	19980524	Propylene Glycol	200	Asphalt loading pump Tank Farm
980628-IR-130	19980627	Residual Crude	15	CU1 Pipeline Piperack
980714-IR-150	19980714	glycol	2	Tank Farm
980827-IR-212	19980826	Propylene Glycol	40	Kero Loading filter Piperack Tank Farm
980109-IR-223	19980829	Nalco 5541	150	Crude #1
980921-IR-242	19980830	glycol	4,140	Crude #1 Heating Glycol System Maintenance Building
980901-IR-222	19980901	unleaded gas	3	Check valve Pipe rack Truck rack
ND	19980901	Nalco 5541	150	Secondary containment
ND	19980929	Propylene Glycol	200	Crude Unit #1 Glycol Heater 5005, Secondary containment
981007-IR-262	19981002	Hydrocarbon	5	Gas Skid Sump Tank Farm
981014-IR-269	19981014	Propylene Glycol	40	CU3 Glycol system
981102-IR-280	19981102	Hydrocarbon	10	Crude 1
ND	19981115	Residual Oil	280	Crude Unit #1 Secondary containment
ND	19981129	Kerosene	1,500	Tank Farm - Sump 922

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ND	19990108	Benzene Overhead product	200	Crude Unit #2 BeRT Unit - secondary containment
ND	19990117	Kerosene	300	Truck rack - sump
ND	19990623	Asphalt AC-5	200	Trank Farm - Tank 822 loading skid
93-13	19990721	Oily Water	10	CU1 Resid Stripper
991130-IR-112	19991128	Propylene Glycol	300	Behind Lt. Kero product pumps near the BERT unit by CU2
ND	19991231	Kerosene	488	North Pole Refinery
000127-IR-9	20000126	Gasoline	10	Truck rack VRU knock out drum
ND	20000216	Kerosene	200	Tank Farm - skid form filter vessel
ND	20000301	Naphtha	150	Rail rack - strainer housing
000511-IR-44	20000509	MEA	10	Crude 2
000522-IR-47	20000522	Oily Wastewater	40	Utility Building
ND	20000525	Diesel	500	North Pole Refinery
000604-IR-52	20000604	#2 LAGO	59	Truck rack
000622-IR-59	20000621	Propylene Glycol	40	Crude 2
000623-IR-61	20000623	glycol	92	crude unit #1
000710-IR-70	20000710	Oily Water	20	Boiler Building CU1 I/O Building Utility Building
000718-IR-78	20000718	Kerosene	4	Truck rack
000808-IR-84	20000808	#2 Diesel	40	Drain cup Tank Farm
000814-IR-87	20000813	Desalter water	5	Crude 3 Oily water line
ND	20000821	Propylene Glycol	144	Tank farm
000918-IR-99	20000918	glycol	45	crude unit #2
000920-IR-100	20000920	glycol	50	Crude 2 Hot glycol system
ND	20000920	glycol	800	
000929-IR-105	20000927	Gasoline	250	Tank Farm
001013-IR-115	20001013	Crude	20	Administration building Crude #1 slop manifold
001014-IR-117	20001013	LAGO	50	Administration building Tank 402 - NE Corner
ND	20001204	Groundwater	1,000	Tank Farm - Recovery well line
001208-IR-144	20001208	Oily Water	45	crude unit #2 Crude Unit #3
001219-IR-149	20001219	Kero Rich Solvent	30	Extraction Unit
010113-IR-3	20010113	Ground water	200	Tank Farm
010118-IR-9	20010118	Oily Water	5	Crude Unit #3 Oily water line
010122-IR-10	20010122	Kero	50	Rail Rack
010214-IR-17	20010213	glycol	30	Crude 2 East/West Pipe Rack Glycol trace
010220-IR-23	20010218	Propylene Glycol	240	crude unit #2 Tank Farm
010219-IR-22	20010219	water/brine	35	CU3 oily water line on CU2 side of Fin Fan Alley Extraction Unit

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010313-IR-30	20010313	Kerosene Oily Water	20	Oily water line Tank Farm
010326-IR-39	20010323	glycol	1	Tank Farm
010313-IR-38	20010323	hago	150	Tank Farm
010404-IR-45	20010402	hago	2	Tank Farm
010402-IR-42	20010402	Propylene Glycol	158	Crude 2
010404-IR-46	20010404	Kerosene	5	crude unit #2
010410-IR-52	20010410	Sodium Hydroxide	2	Maintenance Building
010418-IR-69	20010418	K050 wastewater	1	500-bbl tank rented by CEDA from R&K Industrial
010418-IR-68	20010418	K050 wastewater	10	Heat exchanger cleaning skid
010427-IR-91	20010426	Hydrocarbon sulfolane	40	Rail Rack
010501-IR-95	20010430	Kero	20	Rail Rack
010502-IR-96	20010502	hot ARC	1	Asphalt load arm, Station 8 Truck rack
010504-IR-98	20010504	Oily Water	0.5	Crude 1
010508-IR-101	20010507	K050 wastewater	40	Tank Farm
010531-IR-111	20010531	Kero	8	Truck rack
010614-IR-130	20010614	Gasoline	306	Rail Rack
010617-IR-137	20010616	wastewater	300	Benzene Strippers Crude #1 Inlet line Tank 198
ND	20010616	HAGO	1,500	Tank Farm HAGO Drier
010629-IR-148	20010629	Propylene Glycol	10	Tank Farm
010706-IR-156	20010706	wastewater	2	crude unit 3
010716-IR-160	20010713	Propylene Glycol	160	Flare Stack Tank Farm
010726-IR-172	20010725	AC PG 52-28	2	Station 8 Truck rack
010801-IR-176	20010801	wastewater	20	Oily water line near tank 192 Utility Building
010822-IR-191	20010822	hago	5	Sump 904 Tank Farm
010914-IR-213	20010914	Sulfolane	5	Effluent Building Utility Building
010918-IR-221	20010917	glycol/water mixture	725	Crude 2 Underground heat tracing near salt towers across from Fire Hall
010925-IR-230	20010925	Oily Water	20	Tank Farm
010927-IR-233	20010927	Propylene Glycol	200	Glycol trace Tank Farm
011115-IR-390	20011115	ANS crude oil	3	Crude 3
ND	20011208	Propylene Glycol	165	Tank Farm
ND	20011211	Kerosene	5	Asphalt piping sample point
011212-IR-486	20011211	Kerosene	5	Tank Farm
020103-IR-5	20020103	Residual oil & kero	2,000	Crude 1
ND	20020209	Propylene Glycol	147	Crude Unit #2 coupler fitting
ND	20020221	Automatic transmission fluid	6	Track machine

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020430-IR-585	20020429	Naphtha Wash Water	800	Crude 2
020430-IR-591	20020430	IRIS Inspection Water with very low percentage Kerosene	55	Off-site
020509-IR-723	20020509	Oily Water	5	Crude 2
ND	20020510	ARC	300	Crude Unit #1 Charge Skid Sump
020516-IR-784	20020515	glycol	10	Glycol header Tank Farm
020516-IR-777	20020515	Sulfolane	75	Crude 1 Portable transfer pump
ND	20020524	Oily Water	1	Sump Drain
ND	20020602	asphalt	3	Asphalt loading arm
020626-IR-1024	20020626	Propylene Glycol	10	Heat trace for CTX stack exhaust Utility Building
020711-IR-1090	20020711	antistrip	0.25	Truck rack
ND	20020715	Sulfolane	150	Crude Unit #1 Tank 194
020717-IR-1117	20020717	asphalt	20	Truck rack
020719-IR-1128	20020719	asphalt	9	Asphalt loading arm
020819-IR-1278	20020817	wastewater	10	Crude 1
020902-IR-1333	20020831	Kerosene	30	Rail Rack Strainer screen
020908-IR-1365	20020908	Avgas LL100	5	Truck rack
020914-IR-1395	20020912	Hydraulic Oil	4	Distribution Track mover
021024-IR-1599	20021021	Propylene Glycol	140	Crude #2
ND	20021031	Kerosene	225	Truck Rack Lane 2 Load Arm
021102-IR-1648	20021102	Hydraulic fluid (oil)	4	Loading Rack
021102-IR-1649	20021102	Propylene Glycol	20	Crude Unit #3 Glycol heat trace
021121-IR-1727	20021121	glycol	280	CU#1 Glycol line Portable air compressor
021123-IR-1736	20021123	ethelene glycol	7	Distribution
021127-IR-1750	20021126	glycol	15	Crude 1
021213-IR-1809	20021213	Propylene Glycol	86	crude unit #2 Heat trace Tank Farm
030311-IR-303	20030311	Jet A	3	Distribution
030407-IR-406	20030406	Kero	2	Distribution
030514-IR-614	20030513	ARC	15	crude unit #1
030515IR.675	20030516	Oily Water	200	railtrack Sump 5118
030517-IR-698	20030517	AFFF Foam	0.25	Contractor Parking area
030531-IR-835	20030531	antistrip Pave Bond	2	Anti-strip tank Truck Loading Rack
030610-IR-890	20030610	hago	30	GVEA Metering Building
ND	20030711	Jet A	7	
030817-IR-1274	20030817	hago	1	crude unit #2 Hago salt tower Tank Farm

Table 2
Release Summary
North Pole Refinery
Flint Hills Resources Alaska, LLC

Facility Tracking Number	Date	Material	Volume Spilled (gallons)	Location
ND	20030903	Propylene Glycol	50	Propylene Glycol heat tracing
030918-IR-1522	20030918	Mineral Oil	50	Gasket Transformer ET-2101B
031008-IR-1642	20030929	glycol	15	Gravel pad Tank Farm
031008-IR-1642	20030929	Propylene Glycol	15	Tank Farm
030930-IR-1588	20030930	Oil	3	Tank Farm
031020-IR-1707	20031017	AC 5 ARC	3	Lane 7 Truck rack
031017-IR-1692	20031017	Propylene Glycol	45	NPR Tank Farm
031202-IR-1934	20031202	Crude oil	200	NPR Boiler House (107)
040413-IR-391	20040412	Kerosene	25	Rail Rack
040419-IR-410	20040419	Mineral Oil	5	Crude Unit #3
040422-IR-423	20040422	JP-8 Kerosene	3	Military Skid Tank Farm
040512-IR-452	20040512	heating oil #2	2	Warehouse Complex
040528-IR-488	20040528	Kero	1	Warehouse Complex
040606-IR-497	20040605	LAGO Water	5	Tank Farm; Tank 402
ND	20040608	LAGO	4	Lago loading line drain
040608-IR-500	20040608	LAGO	9	Skid 6 Tank Farm
040615-IR-506	20040614	Chromium		Tank Farm
040617-IR-508	20040617	Hydraulic Oil		Rail Loading Rack
040623-IR-518	20040623	Demulsifier; EC2043A	0.5	P-5535
ND	20040623	EC2043A	0.5	
040628-IR-524	20040628	Jet Fuel	250	Rail Rack Station 1
040630-IR-526	20040629	asphalt	40	Asphalt Truck rack Lane 7
ND	20040711	LAGO	154	Rail Rack
040722-IR-569	20040722	asphalt	8	Tank Farm
ND	20040731	Kerosene	1,071	Crude Unit #2
ND	20040927	water/oil	5	FHR terminal SW corner of asphalt scale
ND	20040930	glycol	21	Hot glycol heat trace North of the terminal building
ND	20040930	glycol	21	Glycol line tracer
ND	20041023	Propylene Glycol	178	East West Pipe Rack
Lynx 5432	20041025	glycol	52	CU#3 Chemical Building Glycol tracer
ND	20041028	Oily Wastewater	390	Sump 5002
5468	20041108	glycol	15	CU1 Portable air compressor
5501	20041202	ASA Stadis 450	0.001	ASA injection system Truck Loading Rack
5541	20041227	hydraulic fluid	1	Blend Building CU#3
ND	20050102	Propylene Glycol	5	CU2 Glycol pipe rack north of Extraction Unit
ND	20050125	Liquid Gas Water		Sulfatreat

Table 2
Release Summary
North Pole Refinery
Flint Hills Resources Alaska, LLC

Facility Tracking Number	Date	Material	Volume Spilled (gallons)	Location
ND	20050405	Propylene Glycol	250	CU3
ND	20050405	glycol	250	Crude Unit #3 Hot glycol system
6951	20050429	Kerosene	5	Tank 302 Foam Chamber Piping
6758	20050529	JP-4	1	Tank 511
7030	20050603	Process water / oily water	8	crude unit 3 Oily water piping
ND	20050624	Sulfolane	0.008	Tank 194 solvent tanks Tank 194 transfer line
7241	20050910	Asphalt	75	Truck Loading Rack
ND	20051031	Propylene Glycol	20	Fitting Glycol line Piperack Slop manifold
ND	20060116	Nalco 2043	0.016	2043 Bulk Tank Bulk Tank Dike Check valve
9795	20060126	Ferric Chloride	110	C pond
ND	20060213	Hitec 6560 Fuel Additive	0.004	Truck rack
10886	20060414	Jet A	100	Rail Rack Station 2
ND	20060512	Oily Water	600	Exchanger Wash Skid
ND	20060519	Jet Fuel	2	Flange connection Nap line tie in
ND	20060704	FeCl, Propylene Glycol	162	Ferric Chloride Pump
12331	20060725	Oily water	200	ASIG Pit sump
ND	20060725	glycol	329	crude unit #2; Glycol System
ND	20060917	Kero	3	Fuel terminal
ND	20061216	Jet A	108	Rail Rack
15963	20070426	Jet Fuel	50	Anchorage Railrack
16552	20070606	Pave Bond	0.25	Anchorage Asphalt Yard
17662	20070822	Hydraulic oil	0.13	Maintenance Building
21838 5429	20080422	Fuel oil	1	Maintenance Building parking area
23417	20080709	Oily Water	25	crude unit #2 Hago salt tower Pipe rack
23587	20080723	Rectifier Vapor/Water	0.125	crude unit #2
6344	20080904	OVHD Desalter Water	50	CU2
25059 6381	20080913	LAGO Oily Water	15	Sump 908
25060	20080915	waste thinner	0.125	Bucket Field of Dreams Gravel field north of CU2
27525	20081212	Propylene Glycol	75	Asphalt Dike Heat tracing on gasoline load line to rail rack
27931	20090110	Hydraulic fluid	2	North Tank dike
27932	20090112	oily water	8	Utilities Tank 196 Wastewater piping
81858	20090728	Treated waste water	25	CPS Overflow Sump
31942	20090731	Futurathane 5040 part A	0.008	APC Trailer
33695	20091013	Hydraulic fluid	5	Hydraulic hose Rail Rack Track 3 Track machine
34714	20091128	Recovery Well Water	84	Recovery Well #35 Recovery Well #39 Recovery Well Line
34841	20091203	Recovery Well Water	0.125	Discharge valve Recovery Well #39

Table 5
Well Decommissioning Summary
North Pole Refinery
Flint Hills Resources Alaska, LLC

Well ID	Casing Type	Approximate Depth (ft.)	Well Decommissioning Notes
R-9	Culvert	8	Well decommissioned: Excavated approximately 2 feet below ground surface, cut culvert at that depth, filled well with gravel, poured concrete cap at top of cut casing, backfilled excavation to ground surface.
R-12	4-inch ABS	7.6	Decommissioning postponed due to onset of winter conditions.
R-13	Culvert	9.7	Well decommissioned: Excavated approximately 2 feet below ground surface, cut culvert at that depth, filled well with gravel, poured concrete cap at top of cut casing, backfilled excavation to ground surface.
R-28	Culvert	6.7	Well decommissioned: Excavated approximately 2 feet below ground surface, cut culvert at that depth, filled well with gravel, poured concrete cap at top of cut casing, backfilled excavation to ground surface.
R-29	Culvert	7.3	Well decommissioned: Excavated approximately 2 feet below ground surface, cut culvert at that depth, filled well with gravel, poured concrete cap at top of cut casing, backfilled excavation to ground surface.
R-30	Culvert	7	Well decommissioned: Excavated approximately 2 feet below ground surface, cut culvert at that depth, filled well with gravel, poured concrete cap at top of cut casing, backfilled excavation to ground surface.
R-35	12-inch steel	7	Well decommissioned: Excavated approximately 2 feet below ground surface, cut well at that depth, filled well with gravel, poured concrete cap at top of cut casing, backfilled excavation to ground surface.
S-19	4-inch PVC	11.7	Well decommissioned: Hand-dug around casing to approximately 2 feet below ground surface. Cut casing at that depth and filled remaining casing with bentonite. Hydrated bentonite with potable water, covered the top of casing with a layer of pea gravel, backfilled hole using excavated material.
S-20	2-inch PVC	12.1	Decommissioning postponed due to onset of winter conditions.
S-23	2-inch PVC	13.6	Decommissioning postponed due to onset of winter conditions.
S-37	2-inch PVC	12	Decommissioning postponed due to onset of winter conditions.
S-38	2-inch PVC	13	Decommissioning postponed due to onset of winter conditions.
S-40	2-inch PVC	13	Decommissioning postponed due to onset of winter conditions.
S-41	2-inch PVC	17	Decommissioning postponed due to onset of winter conditions.
S-52	2-inch PVC	15	Decommissioning postponed due to onset of winter conditions.
S-55	2-inch PVC	15	Well decommissioned: Hand-dug around casing to approximately 2.5 feet below ground surface. Cut casing at that depth and filled remaining casing with bentonite. Hydrated bentonite with potable water, covered the top of casing with a layer of pea gravel, backfilled hole using excavated material.
MW-144B	2-inch PVC	45	Well decommissioned: 90-foot well, casing damaged at 45 feet. Removed protective monument. Excavated 2-foot square hole to approximately 2 feet below ground surface, cut PVC casing at that depth. Used tremie pipe to pump grout slurry from 45 feet to top of well. Used bentonite chips to seal top of cut casing, covered with pea gravel, and backfilled hole using excavated material.
MW-169B	2-inch PVC	49	Decommissioning postponed due to onset of winter conditions.

Table 6
Well Repair and Redevelopment Summary
North Pole Refinery
Flint Hills Resources Alaska, LLC

Well ID	Repair needed	Repair Notes
S-32	Add monument	Repair postponed due to onset of winter conditions
S-39	Add monument	Repair postponed due to onset of winter conditions
S-51	Add monument	Repair postponed due to onset of winter conditions
S-54	Add monument	New monument installed
R-32	24-inch culvert well with slots nearly to ground surface. Need to seal slots near surface to reduce potential for surface water to flow into well.	Excavated approximately 2 feet below grade, wrapped well casing with petroleum-resistant fabric, then poured concrete around exposed portion of well to ground surface
S-21	2-inch well frost-jacked above monument.	Cut well casing to below level of protective monument (cut 1.38 feet)
S-22	2-inch well frost-jacked above monument.	Cut well casing to below level of protective monument (cut 1.85 feet)
S-43	4-inch well frost-jacked above monument.	Cut well casing to below level of protective monument (cut 1.31 feet)
MW-102	Needs conversion to new-style monument (remove 12-inch PVC cover).	Excavated approximately 2 feet below ground surface, welded steel casing monument extension to existing base, cut 0.14 feet from PVC well casing
MW-104	Needs conversion to new-style monument (remove 12-inch PVC cover).	Excavated approximately 2 feet below ground surface, welded steel casing monument extension to existing base, cut 0.14 feet from PVC well casing
MW-106	Needs monument repair (cannot be locked, casing jacked).	Repair postponed due to onset of winter conditions
MW-109	Lagoon B berm collapsing on monument; dig out and replace monument.	Repair postponed due to onset of winter conditions
MW-125	Repair monument (well has frost-jacked); redevelop	Redevelopment completed, repair postponed due to onset of winter conditions
MW-101	Redevelop	Redeveloped
MW-101A	Redevelop	Redeveloped
MW-105	Redevelop	Redeveloped
MW-105A	Redevelop	Redeveloped
MW-113	Redevelop	Redeveloped
MW-116	Redevelop	Redeveloped
MW-126	Redevelop	Redeveloped
MW-127	Redevelop	Redeveloped
MW-137	Redevelop	Redeveloped
MW-139	Redevelop	Redeveloped
MW-141	Redevelop	Redeveloped
MW-144A	Redevelop	Redeveloped
MW-148B	Redevelop	Redeveloped
MW-149B	Redevelop	Redeveloped
MW-169C	Replace flush monument with stickup	Repair postponed due to onset of winter conditions
R-21	Cleaning	Cleaned and redeveloped; inserted 8-inch slotted screen within 12-inch casing following discovery of breach in original screen.
R-39	Cleaning	Cleaned and redeveloped
R-40	Cleaning	Cleaned and redeveloped

Table 7
Sampled Private Wells with Depth Information
North Pole Refinery
Flint Hills Resources Alaska, LLC

YEAR BUILT	PAN	Well Log	Well Depth (feet)	Top of Permafrost (feet BGS)	Bottom of Permafrost (feet BGS)
1977	315460	Yes	45		
1998	348571	Yes	60		
1998	348554	Yes	40	1	8
1998	348589	Yes	34		
1985	315290	Yes	122	5	110
1981	333891	Yes	140	3	120
1977	315320	Yes	127	4	117
2000	318043	Yes	40		
1999	317918	Yes	40		
1999	372943	Yes	51		
1988	406333	Yes	353	30	230
1972	328383	Yes	40		
2006	348481	Yes	32		
1984	391565	Yes	120	36	105
1984	391557	Yes	150	40	150
1984	391531	Yes	205	24	205
2006	565822	Yes	40		
2005	565831	Yes	40		
1998	484067	Yes	40		
1999	348520	Yes	55	5	12
1984	375721	Yes	42		
1985	383899	Yes	50		
2001	317217	Yes	40		
2006	565521	Yes	50		
2002	519359	Yes	40		
1998	348546	Yes	33		
1975	296945	Yes	40		
1985	296937	Yes	220	20	210
1984	316679	Yes	80		
1984	316687	Yes	40		
2006	318191	Yes	40		
1984	408697	Yes	193	22	176
2006	565717	Yes	50		
1979	294501	Yes	36		
1998	348716				

Table 7
Sampled Private Wells with Depth Information
North Pole Refinery
Flint Hills Resources Alaska, LLC

YEAR BUILT	PAN	Well Log	Well Depth (feet)	Top of Permafrost (feet BGS)	Bottom of Permafrost (feet BGS)
1984	381039	Yes	42		
1981	333883	Yes	196	12	180
2006	565695	Yes	40		
1983	347531	No	35		
1984	395218	Yes	70	32	70
2005	304034	Yes	54		
1964	535885	Yes	40		
2001	499897	Yes	40		
2001	333778	Yes	236	8	230
1982	333905	Yes	60		
1977	296449	Yes	200		
1980	290670	Yes	40		
1987	297135	Yes	40		
2005	318205	Yes	40		
2006	565512	Yes	50		
1984	391409	Yes	255	19	146
1985	429929	Yes	305	8	228
1985	333794	Yes	40	27	40
1985	333786	Yes	42	23	38
1984	399248	Yes	65		
0	445657	Yes	215	5	205
2006	565849	Yes	40		
2004	429911.1	Yes	40		
2006	565652	Yes	60		
2005	565661	Yes	40		
2003	317926	Yes	40		
1967	406309	Yes	21		
2002	460800	Yes	40		
2003	317713	Yes	40		
1984	375730	Yes	42		
1983	375748	Yes	50		
1999	348538	Yes	55	8	13
1984	302082	Yes	105	20	103
1984	395200	Yes	236	55	230
1984	39				

Table 7
Sampled Private Wells with Depth Information
North Pole Refinery
Flint Hills Resources Alaska, LLC

YEAR BUILT	PAN	Well Log	Well Depth (feet)	Top of Permafrost (feet BGS)	Bottom of Permafrost (feet BGS)
0	290190	Yes	238	6	215
1983	297062	Yes	40		
2006	581593	Yes	40		
2006	581666	Yes	40		
1998	429881.1	Yes	75	8	65
2004	429911.2	Yes	40		
2004	429911.3	Yes	115	10	92
1983	375586	Yes	76.0		
1983	375594	Yes	53.0		
1972	513431	No	26.5		
2000	315206	Yes	98.0	25	90
1982	373834	No	20.0		
1985	296775	No	160.0		
1982	296783	Yes	186.0		
1976	296635	No	49.0		
1980	278912	No	30.0		
1985	296813	Yes	40.0	34	40
1982	296830	Yes	205.0		
1983	348473	No	35.6		
1983	375608	Yes	42.0		
1982	296805	Yes	200.0		
1983	375578	Yes	63.0		
1979	296759	No	63.0		
1979	296767	No	63.0		
1976	296724	No	40.0		
1982	296589	No	220.0		
1993	130427	No	32.0		
1985	296732	Yes	41.0		
1983	348465	Yes	40.0		
1986	427063	No	220.0		
1997	296856	Yes	218.0		
1996	348902	Yes	40.0		
1986	296571	No	48.0		
1979	115525	No	40.0		
1978					

Table 7
Sampled Private Wells with Depth Information
North Pole Refinery
Flint Hills Resources Alaska, LLC

YEAR BUILT	PAN	Well Log	Well Depth (feet)	Top of Permafrost (feet BGS)	Bottom of Permafrost (feet BGS)
1986	383848	Yes	40.0		
1984	295884	No	35.0		
1976	296643	No	45.0		
1979	113921	No	30.0		
2004	348724	Yes	40.0		
1976	296163	Yes	40.0		
1997	401951	No	35.0		
1976	288845	No	30.0		
1972	424391	Yes	51.0	3	20
2004	348651	Yes	40.0		
1983	375641	Yes	42.0		
1983	375632	Yes	42.0		
1984	383856	No	40.0		
1984	375624	Yes	40.0		
1983	347400	No	33.0		
1984	375659	Yes	65.0		
1983	375667	No	42.0		
1983	375675	Yes	40.0		
1984	383864	No	40.0		
1983	375683	Yes	42.0		
1985	383872	No	34.0		
1983	348449	No	40.0		
1984	383759	Yes	51.0		
1976	296716	No	40.0		
2000	348732	Yes	40.0		
1984	346110	No	32.0		
1980	296627	No	57.0		
1982	296601	No	158.0		
1984	296597	No	170.0		

Table 8
Current Groundwater Elevation and LNAPL Monitoring Well Network
North Pole Refinery
Flint Hills Resources Alaska, LLC

Well	Measurement		Frequency	Rationale	Notes
	LNAPL & GW Elev	GW Elev			
MW-101		x	quarterly	Monitor groundwater elevation	
MW-101A		x	annually	Monitor groundwater elevation	
MW-102		x	quarterly	Monitor groundwater elevation	
MW-104		x	semi-annually	Monitor groundwater elevation	
MW-105		x	annually	Monitor groundwater elevation	
MW-105A		x	annually	Monitor groundwater elevation	
MW-106		x	quarterly	Monitor groundwater elevation	
MW-109		x	quarterly	Monitor groundwater elevation	
MW-110		x	quarterly	Monitor groundwater elevation	
MW-111		x	quarterly	Monitor groundwater elevation	
MW-113		x	quarterly	Monitor groundwater elevation	
MW-115		x	semi-annually	Monitor groundwater elevation	
MW-116		x	semi-annually	Monitor groundwater elevation	
MW-124		x	semi-annually	Monitor groundwater elevation	
MW-125		x	semi-annually	Monitor groundwater elevation	
MW-126		x	semi-annually	Monitor groundwater elevation	
MW-127		x	quarterly	Monitor groundwater elevation	
MW-129		x	semi-annually	Monitor groundwater elevation	
MW-130		x	quarterly	Monitor groundwater elevation	
MW-131		x	quarterly	Monitor groundwater elevation	
MW-132			semi-annually	Monitor groundwater elevation	
MW-133		x	semi-annually	Monitor groundwater elevation	
MW-135		x	semi-annually	Monitor groundwater elevation	
MW-136		x	semi-annually	Monitor groundwater elevation	
MW-137		x	semi-annually	Monitor groundwater elevation	
MW-138	x		monthly	Monitor fluctuation in LNAPL thickness	pumping well
MW-139	x		monthly	Monitor NW LNAPL extent	-
MW-140	x		quarterly	Monitor LNAPL extent	-
MW-141		x		Monitor groundwater elevation	
MW-142	x		quarterly	Monitor LNAPL extent	-
MW-143		x	quarterly	Monitor groundwater elevation	
MW-144A	x		quarterly	Monitor LNAPL extent	-
MW-144BR		x		Monitor groundwater elevation	
MW-145	x		monthly	Monitor NE LNAPL extent	-
MW-146A		x	quarterly	Monitor groundwater elevation	
MW-146B		x	quarterly	Monitor groundwater elevation	

Table 8
Current Groundwater Elevation and LNAPL Monitoring Well Network
North Pole Refinery
Flint Hills Resources Alaska, LLC

Well	Measurement		Frequency	Rationale	Notes
	LNAPL & GW Elev	GW Elev			
MW-154B		x	quarterly	Monitor groundwater elevation	
MW-155A		x	quarterly	Monitor groundwater elevation	
MW-155B		x	quarterly	Monitor groundwater elevation	
MW-156A		x	quarterly	Monitor groundwater elevation	
MW-156B		x	quarterly	Monitor groundwater elevation	
MW-157A		x	quarterly	Monitor groundwater elevation	
MW-157B		x	quarterly	Monitor groundwater elevation	
MW-158A		x	quarterly	Monitor groundwater elevation	
MW-158B		x	quarterly	Monitor groundwater elevation	
MW-159A		x	quarterly	Monitor groundwater elevation	
MW-159B		x	quarterly	Monitor groundwater elevation	
MW-159C		x	quarterly	Monitor groundwater elevation	
MW-160A	Well destroyed				
MW-160B		x	quarterly	Monitor groundwater elevation	
MW-161A		x	quarterly	Monitor groundwater elevation	
MW-161B		x	quarterly	Monitor groundwater elevation	
MW-162A		x	quarterly	Monitor groundwater elevation	
MW-162B		x	quarterly	Monitor groundwater elevation	
MW-163A		x	quarterly	Monitor groundwater elevation	
MW-163B		x	quarterly	Monitor groundwater elevation	
MW-164A		x	quarterly	Monitor groundwater elevation	
MW-164B		x	quarterly	Monitor groundwater elevation	
MW-164C		x	quarterly	Monitor groundwater elevation	
MW-165A		x	quarterly	Monitor groundwater elevation	
MW-165B		x	quarterly	Monitor groundwater elevation	
MW-166A		x	quarterly	Monitor groundwater elevation	
MW-166B		x	quarterly	Monitor groundwater elevation	
MW-167A		x	quarterly	Monitor groundwater elevation	
MW-167B		x	quarterly	Monitor groundwater elevation	
MW-168A		x	quarterly	Monitor groundwater elevation	
MW-168B		x	quarterly	Monitor groundwater elevation	
MW-169A		x	quarterly	Monitor groundwater elevation	
MW-169B		x	quarterly	Monitor groundwater elevation	
MW-169C		x	quarterly	Monitor groundwater elevation	
MW-170A		x	quarterly	Monitor groundwater elevation	
MW-170B		x			

Table 8
Current Groundwater Elevation and LNAPL Monitoring Well Network
North Pole Refinery
Flint Hills Resources Alaska, LLC

Well	Measurement		Frequency	Rationale	Notes
	LNAPL & GW Elev	GW Elev			
MW-179C		x	quarterly	Monitor groundwater elevation	
MW-179D		x	quarterly	Monitor groundwater elevation	
MW-180A	x		quarterly	Monitor LNAPL extent	-
MW-180B		x	quarterly	Monitor groundwater elevation	
MW-180C		x	quarterly	Monitor groundwater elevation	
MW-181A		x	quarterly	Monitor groundwater elevation	
MW-181B		x	quarterly	Monitor groundwater elevation	
MW-181C		x	quarterly	Monitor groundwater elevation	
MW-182A		x	quarterly	Monitor groundwater elevation	
MW-182B		x	quarterly	Monitor groundwater elevation	
MW-183A		x	quarterly	Monitor groundwater elevation	
MW-183B		x	quarterly	Monitor groundwater elevation	
MW-184		x	quarterly	Monitor groundwater elevation	
MW-185A		x	quarterly	Monitor groundwater elevation	
MW-185B		x	quarterly	Monitor groundwater elevation	
MW-185C		x	quarterly	Monitor groundwater elevation	
MW-186A	x		monthly	Monitor fluctuation in LNAPL thickness	-
MW-186B		x	quarterly	Monitor groundwater elevation	
MW-186D		x	quarterly	Monitor groundwater elevation	
MW-187		x	quarterly	Monitor groundwater elevation	
MW-188		x	quarterly	Monitor groundwater elevation	
MW-189A		x	quarterly	Monitor groundwater elevation	
MW-189B		x	quarterly	Monitor groundwater elevation	
MW-190A		x	quarterly	Monitor groundwater elevation	
MW-190B		x	quarterly	Monitor groundwater elevation	
MW-191A		x	quarterly	Monitor groundwater elevation	
MW-191B		x	quarterly	Monitor groundwater elevation	
MW-192A		x	quarterly	Monitor groundwater elevation	
MW-192B		x	quarterly	Monitor groundwater elevation	
MW-193A		x	quarterly	Monitor groundwater elevation	
MW-193B		x	quarterly	Monitor groundwater elevation	
MW-194A		x	quarterly	Monitor groundwater elevation	
MW-194B		x	quarterly	Monitor groundwater elevation	
MW-195A	x		quarterly	Monitor LNAPL extent	installed 2011 Q4
MW-195B		x	quarterly	Monitor groundwater elevation	
MW-196	x		quarterly		

Table 8
Current Groundwater Elevation and LNAPL Monitoring Well Network
North Pole Refinery
Flint Hills Resources Alaska, LLC

Well	Measurement		Frequency	Rationale	Notes
	LNAPL & GW Elev	GW Elev			
S-38	Well damaged; decommission				
S-39	x		monthly	Monitor fluctuation in LNAPL thickness	-
S-40	Well damaged; decommission				
S-41	Well damaged; decommission				
S-43	x		monthly	Monitor fluctuation in LNAPL thickness	-
S-44	x		monthly	Monitor fluctuation in LNAPL thickness	-
S-50	x		monthly	Monitor fluctuation in LNAPL thickness	pumping well
S-51	x		monthly	Monitor fluctuation in LNAPL thickness	-
S-52	Well damaged; decommission				
S-54		x		Monitor groundwater elevation	
S-55	Well damaged; decommission				
O-1	x		monthly	Monitor LNAPL extent	-
O-2	x		monthly	Monitor fluctuation in LNAPL thickness	pumping well
O-3	x		monthly	Monitor LNAPL extent	-
O-4	x		monthly	Monitor LNAPL extent	-
O-5	x		monthly	Monitor LNAPL extent	installed 2011 Q3
O-6	x		monthly	Monitor LNAPL extent	installed 2011 Q3
O-7	x		monthly	Monitor fluctuation in LNAPL thickness	installed 2011 Q3
O-8	x		monthly	Monitor LNAPL extent	installed 2011 Q3
O-9	x		monthly	Monitor fluctuation in LNAPL thickness	installed 2011 Q3
O-10	x		monthly	Monitor fluctuation in LNAPL thickness	installed 2011 Q4
O-11	x		monthly	Monitor fluctuation in LNAPL thickness	installed 2011 Q3
O-12	x		monthly	Monitor LNAPL extent	installed 2011 Q3
O-13	x		monthly	Monitor fluctuation in LNAPL thickness	installed 2011 Q3
O-14	x		monthly	Monitor LNAPL extent	installed 2011 Q4
O-15	x		monthly	Monitor LNAPL extent	installed 2011 Q4
O-16	x		monthly	Monitor LNAPL extent	installed 2011 Q4
O-17	x		monthly	Monitor LNAPL extent	installed 2011 Q4
O-18	x		monthly	Monitor LNAPL extent	installed 2011 Q4
O-19	x		monthly	Monitor fluctuation in LNAPL thickness</	

Table 8
Current Groundwater Elevation and LNAPL Monitoring Well Network
North Pole Refinery
Flint Hills Resources Alaska, LLC

Well	Measurement		Frequency	Rationale	Notes
	LNAPL & GW Elev	GW Elev			
R-20R	x		monthly	Monitor fluctuation in LNAPL thickness	pumping well
R-21	x		monthly	Monitor fluctuation in LNAPL thickness	pumping well
R-28	Well damaged; decommission				
R-29	Well damaged; decommission				
R-30	Well damaged; decommission				
R-32	x		monthly	Monitor fluctuation in LNAPL thickness	pumping well
R-33	x		monthly	Monitor fluctuation in LNAPL thickness	pumping well
R-34	x		quarterly	Monitor fluctuation in LNAPL thickness	-
R-35R	x		monthly	Monitor fluctuation in LNAPL thickness	pumping well
R-38	x		quarterly	Monitor LNAPL extent	Suitability as observation well should be assessed
R-39	x		monthly	Monitor fluctuation in LNAPL thickness	pumping well
R-40	x		monthly	Monitor fluctuation in LNAPL thickness	pumping well
R-42	x		monthly	Monitor LNAPL extent	pumping well

Table 9
Monitoring Wells with Pressure Transducers and Data Loggers
North Pole Refinery
Flint Hills Resources Alaska, LLC

Monitoring Well	Well Nest	Well Depth (feet BGS)	WL-16 Installation Date
MW-150A	MW-150	11.6	3/11/11
MW-150B		24.6	12/15/10
MW-151A	MW-151	15.5	12/4/10
MW-151B		26.5	12/4/10
MW-151C		57.7	12/21/10
MW-156A		15.5	12/15/10
MW-158A		16.5	3/11/11
MW-161A		16.5	3/11/11
MW-162A	MW-162	16.5	2/18/11
MW-162B		65.4	2/18/11
MW-170A	MW-170	15	12/21/10
MW-170C		130.2	12/21/10
MW-111		19.5	12/21/10
MW-113		16	12/21/10
MW-186A	MW-186	15.2	12/21/10
MW-186B		60.8	12/21/10
MW-186C		100.8	12/21/10

Table 10
Summary of Analytical Soil Samples from the Laboratory Drain Investigation
North Pole Refinery
Flint Hills Resources Alaska, LLC

Sample Location	Sample Depth (ft BGS)	Sample ID	Sample Date	Parameter	GRO	DRO	RRO	VOCs	SVOCs	RCRA Metals	Total Solids	Sulfolane
				Method	AK101	AK102	AK103	SW8260B	SW8270D	SW6020	SM20 2540G	
SBLAB-1	3-3.2	SBLAB-1-3-3.2	3/29/2011		x	x	x	x	x	x	x	x
	5.2-5.4	SBLAB-1-5.2-5.4	3/29/2011		x	x	x	x	x	x	x	x
SBLAB-2	3-3.2	SBLAB-2-3-3.2	3/29/2011		x	x	x	x	x	x	x	x
	5.8-5.9	SBLAB-2-5.8-5.9	3/29/2011		x	x	x	x	x	x	x	x
SBLAB-3	2.5-2.7	SBLAB-3-2.5-2.7	3/29/2011		x	x	x	x	x	x	x	x
	4.4-4.6	SBLAB-3-4.4-4.6	3/29/2011		x	x	x	x	x	x	x	x
SBLAB-4	1.6-1.8	SBLAB-4-1.6-1.8	3/29/2011		x	x	x	x	x	x	x	x
	1.6-1.8 ^D	DUP-1	3/29/2011		x	x	x	x	x	x	x	x
	3.8-4.0	SBLAB-4-3.8-4.0	3/29/2011		x	x	x	x	x	x	x	x
SBLAB-5	2.5-2.7	SBLAB-5-2.5-2.7	3/29/2011		x	x	x	x	x	x	x	x
	6.9-7.0	SBLAB-5-6.9-7.0	3/29/2011		x	x	x	x	x	x	x	x

ft BGS feet below ground surface

GRO Gasoline Range Organics

DRO Diesel Range Organics

RRO Residual Range Organics

^D Duplicate Sample

Table 11
Summary of Analytical Soil Samples from Site Characterization (2010)
North Pole Refinery
Flint Hills Resources Alaska, LLC

Sample Location	Sample Depth (ft)	Sample ID	Sample Date	Method	SW8270D	AK101	AK102	SW8021B	SW8260B	SW8270D
				Parameter	Sulfolane	GRO	DRO	BTEX	VOCs	SVOCs
MW-180C	90-91.5	<i>MW-180C(90-91.5)</i>	9/25/10		x	x	x	x	x	x
MW-186A	15-16.5	<i>MW-186A (15-16.5)</i>	10/19/10		x	—	—	—	x	x
MW-186C	7.5-9	<i>MW-186C (7.5-9)</i>	10/15/10		x	—	—	—	x	x
MW-186C	7.5-9	<i>MW-186D*</i>	10/15/10		x	—	—	—	x	x
MW-186C	100-101.5	<i>MW-186C (100-101.5)</i>	10/15/10		x	—	—	—	x	x
O-1	2.5-4	<i>0-1 (2.5-4)</i>	10/19/10		x	—	—	—	x	x
O-1	5-6.5	<i>0-1 (5-6.5)</i>	10/19/10		x	—	—	—	x	x
O-1	10-11.5	<i>0-1 (10-11.5)</i>	10/19/10		x	—	—	—	x	x
O-1	12.5-14	<i>0-1 (12.5-14)</i>	10/19/10		x	—	—	—	x	x
O-1	15-16.5	<i>0-1(15-16.5)</i>	9/23/10		x	x	x	x	x	x
O-2	2.5-4	<i>0-2 (2.5-4)</i>	10/20/10		x	—	—	—	x	x
O-2	5-6.5	<i>0-2 (5-6.5)</i>	10/20/10		x	—	—	—	x	x
O-2	5-6.5	<i>0-2 D*</i>	10/20/10		x	—	—	—	x	x
O-2	7.5-9	<i>0-2(7.5-9)</i>	9/23/10		x	x	x	x	x	x
O-2	10-11.5	<i>0-2 (10-11.5)</i>	10/20/10		x	—	—	—	x	x
O-2	10-11.5	<i>0-2 DD*</i>	10/20/10		x	—	—	—	x	x
O-2	12.5-									

Table 12
Summary of Single Well Pumping Test Analyses
North Pole Refinery
Flint Hills Resources Alaska, LLC

Well Name	Well Depth (ft bgs)	Transmissivity ¹ (ft ² /d)	Screen Top (ft BGS)	Screen Bottom (ft BGS)	Screen Length ² (ft)	Hydraulic Conductivity (ft/d)
MW-101	61	645	56	61	5	130
MW-101A	23	627	17.8	22.8	5	130
MW-102	71.5	503	61.5	71.5	10	50
MW-118	43	1365	38.5	43	4.5	300
MW-127	24.5	1096	20	24.5	4.5	240
MW-131	24.5	1360	20	24.5	4.5	300
MW-139 ³	25	2610	5.7	25	14	190
MW-143 ³	19.5	7231	4.7	19.5	10	720
MW-144A ³	24.7	1039	5.7	24.7	14	74
MW-144B	90	1840	84.9	89.5	4.6	400
MW-154A	75.5	42960	71	75	4	10,700
MW-154B	95	1405	90.2	94.8	4.6	310
MW-186B	60.8	1045	50.7	60.4	9.7	110
MW-186C	100.8	4035	90.7	100.3	9.6	420
Geometric Mean of the Hydraulic Conductivities (all tests)						270
Geometric Mean of the Hydraulic Conductivities (excluding MW-154A)						200
Minimum Hydraulic Conductivity						50
Maximum Hydraulic Conductivity						10,700
Standard Deviation of Hydraulic Conductivity (all tests)						2,800
Standard Deviation of Hydraulic Conductivity (excluding MW-154A)						180

Notes:

fbgs = feet below ground surface.

ft²/d = squared feet per day.

ft/d = feet per day.

1 - Estimated from AQTESOLV using the

Table 13
Hydraulic Conductivity Distribution Along the VPT
North Pole Refinery
Flint Hills Resources Alaska, LLC

Monitoring Well	Top of Grid Cell (feet bgs)	Bottom of Grid Cell (feet bgs)	Lithologic Designation ⁽¹⁾	Grid Hydraulic Conductivity (feet per day)
MW-301	9	23.5	C	75
MW-301	23.5	28.5	A	700
MW-301	28.5	32	B	300
MW-301	32	35.5	A	700
MW-301	35.5	43.5	C	75
MW-301	43.5	46	A	700
MW-301	46	55	B	300
MW-301	55	58.5	A	700
MW-301	58.5	72	B	300
MW-302	9	58	A	700
MW-302	58	60	B	300
MW-302	60	112	A	700
MW-101A	9	17.75	A	700
MW-101A	17.75	22.75	SWPT Result	130
MW-101	22.75	56.15	A	700
MW-101	56.15	61.15	SWPT Result	130
MW-143	9	19.47	SWPT Result	720
MW-303	9	18.5	A	700
MW-303	18.5	26.5	C	75
MW-303	26.5	45.5	A	700
MW-303	45.5	51	C	75
MW-303	51	132	A	700
MW-154A	9	15	A	700
MW-154A	15	71	A	700
MW-154A	71	75	SWPT Result	10,700
MW-154B	75	90.15	B	300
MW-154B	90.15	94.75	SWPT Result	310
MW-154B	94.75	102	B	300
MW-154B	102	103.5	D	10
MW-139	9	25	SWPT Result	190
MW-304	9	17	A	700
MW-304	17	23	C	75
MW-304	23	24.5	D	10
MW-304	24.5	34	A	700
MW-304	34	45	C	75
MW-304	45	150.7	A	700
MW-127	9	25	SWPT Result	

Table 13
Hydraulic Conductivity Distribution Along the VPT
North Pole Refinery
Flint Hills Resources Alaska, LLC

Notes:

bgs Below ground surface

(1) Zone Designations

Zone A - Gravel, sandy gravel

Zone B - Gravelly sand

Zone C - Fine-grained sand

Zone D - Silt and silty fine grained sand

(2) All averages reported as geometric mean

(3) Average measured hydraulic conductivity based on field test performed at nine monitoring wells using the :
method.

SWPT Single Well Pumping Test

Table 14
Groundwater Characterization Full COPC List for Sampling
North Pole Refinery
Flint Hills Resources Alaska, LLC

Compound/Suite of Compounds	Analytical Method	Notes
GRO	AK101	
DRO	AK102	
RRO	AK103	
Cyanide	SM20 4500-CN C	1
Sulfolane	USEPA 1625 Isotope Dilution	
Antimony	USEPA SW 6020	
Barium	USEPA SW 6020	
Cadmium	USEPA SW 6020	
Chromium, Total	USEPA SW 6020	
Iron	USEPA SW 6020	
Lead	USEPA SW 6020	
Selenium	USEPA SW 6020	
Propylene glycol (1,2,-Propanediol)	USEPA 8015 Modified	
Isopropanol (propanol)	USEPA 8015 Modified	
1,1-Dichloroethene	USEPA SW-846 8260B	
1,2,4-Trimethylbenzene	USEPA SW-846 8260B	
1,3,5-Trimethylbenzene	USEPA SW-846 8260B	
4-Isopropyltoluene (p-cymene)	USEPA SW-846 8260B	
Benzene	USEPA SW-846 8260B	
Cyclohexane	USEPA SW-846 8260B	
Ethylbenzene	USEPA SW-846 8260B	
Methyl tert-butyl ether	USEPA SW-846 8260B	
Methylene chloride	USEPA SW-846 8260B	
n-Hexane	USEPA SW-846 8260B	
n-Propylbenzene	USEPA SW-846 8260B	
Toluene	USEPA SW-846 8260B	
Xylenes	USEPA SW-846 8260B	
1-Methylnaphthalene	USEPA 8270C PAH SIM	
2-Methylnaphthalene	USEPA 8270C PAH SIM	
Benzo (a) anthracene	USEPA 8270C PAH SIM	
Benzo (a) pyrene	USEPA 8270C PAH SIM	
Benzo (b) fluoranthene	USEPA 8270C PAH SIM	
Benzo (k) fluoranthene	USEPA 8270C PAH SIM	
Dibenzo (a,h) anthracene	USEPA 8270C PAH SIM	
Indeno (1,2,3-cd) pyrene	USEPA 8270C PAH SIM	
Naphthalene	USEPA 8270C PAH SIM	
Dibenzofuran	USEPA 8270D	
Alkanol amines	No Available Method	1
Alkylamines	No Available Method	1
Alkylene amines	No Available Method	1
Dinonylnaphthylsulfonic acid	No Available Method	1
Fluoroalkyl surfactant	No Available Method	1
Iron oxides	No Available Method	1
2-Methoxymethylethoxy propanol	No Available Method	1
Monoethanolamine	No Available Method	1
Montmorillonite, calcined	No Available Method	1

Table 14
Groundwater Characterization Full COPC List for Sampling
North Pole Refinery
Flint Hills Resources Alaska, LLC

Notes:

1: Subject to further evaluation

USEPA = United States Environmental Protection Agency

AK = Alaska

ADEC = Alaska Department of Environmental Conservation

Addendum = Site Characterization Work Plan Addendum

COPC = chemical of potential concern

PAH = Polyaromatic Hydrocarbon

SIM = Selective Ion Monitoring

All analyses confirmed with SGS Laboratories of Anchorage, Alaska.

This list is currently under review by ADEC and may be subject to change independent of the Addendum

Table 15
Monitored Natural Attenuation Evaluation Sampling Locations and Parameters
North Pole Refinery
Flint Hills Resources Alaska, LLC

Wells for Shallow MNA Sampling (within 10 feet of water table)	
Well ID	Rationale
MW-170A, MW-171A	Sidegradient well, baseline for MNA capacity of aquifer
MW-142, MW-143, MW-148A	Upgradient well in plume
MW-151A, MW-152A, MW-158, MW-159	Downgradient about ½ mile in plume
MW-156A, MW-157, MW-160A	Downgradient about ¾ mile in plume
MW-161, MW-162A, MW-163, MW-164	Downgradient about 1.5 miles in plume
MW-165, MW-166A, MW-167A, MW-168	Downgradient, outside of plume
Wells for Deep MNA Sampling (15 to 55 feet from water table)	
Well ID	Rationale
MW-171B	Sidegradient well, baseline for MNA capacity of aquifer
MW-127, MW-131	Within plume, near edge
MW-152B, MW-151B, MW-148B	Upgradient well in plume
MW-156B, MW-162B, MW-166B	In plume, downgradient
MW-167B	Out of plume, downgradient

MNA Parameters	
Field-based Measurements	Laboratory Analyses (Method)
Dissolved oxygen, conductivity, temperature, pH	Sulfolane (EPA Method 8270D)
Total and ferrous iron	Total organic carbon (SM20 5310B)
Total and reduced manganese	Total phosphorus (SM20 4500P-B,E)
Sulfide	Total Kjeldahl nitrogen (SM20 4500-N D)
	Alkalinity (SM20 2320B)
	Total hardness (SM20 2340B)
	Sulfate (EPA Method 300.0)
	Nitrate/nitrite (SM20 4500NO3-F)

Table 16
Suprapermafrost and Subpermafrost Geochemistry Sampling Locations
North Pole Refinery
Flint Hills Resources Alaska, LLC

Location	Screen Bottom Depth (feet bgs)	Permafrost Depth at Time of Well Installation (feet bgs)	Notes
Area 1			
A1-1	>215	Frozen 6 feet to 215 feet	Sulfolane detected in well sample. Permafrost thickness obtained from well-installation log.
MW-162A	15.2	Frozen at 67.5 feet	Sulfolane detected in well samples; well is upgradient from residence.
MW-162B	64.7		Sulfolane detected in well samples; well is upgradient from residence.
Area 2			
A2-1	>100	unknown	Sulfolane detected in well sample. No well log available; resident states well is greater than 100 feet deep.
A2-4	<40	approximately 40	Sulfolane not detected in well sample. No well log available.
A2-5	<40	approximately 40	Sulfolane not detected in well sample. No well log available.
MW-163A	15.2	Frozen at 40 feet	Sulfolane detected in well samples.
MW-163B	39.9		Sulfolane detected in well samples.
MW-171A	14.8	Frozen at 42 feet	Sulfolane not detected in well samples.
MW-171B	39.7		Sulfolane not detected in well samples.
Area 3			
A3-3	>120	3 - 120	Sulfolane detected in well sample. Permafrost thickness obtained from well-installation log.
A3-2	>230	8 - 230	Sulfolane not detected in well sample. Permafrost thickness obtained from well-installation log.
MW-164A	15.2	not encountered	Sulfolane detected in well samples.
MW-164B	50.1		Sulfolane detected in well samples.
Additional Wells to Assess Suprapermafrost Geochemistry			
MW-158A	15.2	frozen at 65 feet	Sulfolane detected in well samples.
MW-158B	60.1		Sulfolane detected in well samples.
MW-167A	15.4	frozen at 33.5 feet	Sulfolane not detected in well samples.
MW-167B	33.2		Sulfolane not detected in well samples.

Table 18
Constituents of Interest in Soil and Groundwater
North Pole Refinery
Flint Hills Resources Alaska, LLC

Constituent of Interest	Constituent Included in Analyte List				Included on Refinery Laboratory Spilled Material "Ingredient" List	Toxicity Values Available from USEPA			
	2000 Characterization Study-Soil ^a	2001 Characterization Study-Soil ^b	2009-2010 Characterization Study-Soil ^c	Historical Groundwater ^d		Oral CSF	IUR	Oral RfD	Inhalation RfC
3,3-Dichlorobenzidine		X	X	X		X	X		
3-Nitroaniline		X	X	X					
4,6-Dinitro-2-methylphenol		X	X	X					
4-Bromophenyl phenyl ether		X	X	X					
4-Chloro-3-methylphenol		X	X	X					
4-Chloroaniline		X	X	X		X		X	
4-Chlorophenyl phenyl ether		X	X	X					
4-Nitroaniline		X	X	X				X	X
4-Nitrophenol		X	X	X					
Acenaphthene		X	X	X				X	
Acenaphthylene		X	X	X					
Anthracene		X	X	X				X	
Benzo (a) anthracene		X	X	X		X	X		
Benzo (a) pyrene		X	X	X		X	X		
Benzo (b) fluoranthene		X	X	X		X	X		
Benzo (g,h,i) perylene		X	X	X					
Benzo (k) fluoranthene		X	X	X		X	X		
Benzidine				X		X	X	X	
Benzoic Acid		X	X	X				X	
Benzyl alcohol		X	X	X				X	
Bis(2-chloroethoxy)methane		X	X	X				X	
Bis(2-chloroethyl)ether		X	X	X		X	X		
Bis(2-chloroisopropyl)ether		X	X	X		X	X	X	
Bis(2-ethylhexyl)phthalate		X	X	X		X	X	X	
Butyl benzyl phthalate		X	X	X		X		X	
Carbaz									

Table 18
Constituents of Interest in Soil and Groundwater
North Pole Refinery
Flint Hills Resources Alaska, LLC

Constituent of Interest	Constituent Included in Analyte List				Included on Refinery Laboratory Spilled Material "Ingredient" List	Toxicity Values Available from USEPA			
	2000 Characterization Study-Soil ^a	2001 Characterization Study-Soil ^b	2009-2010 Characterization Study-Soil ^c	Historical Groundwater ^d		Oral CSF	IUR	Oral RfD	Inhalation RfC
Naphthalene		X	X	X	X		X	X	X
Nitrobenzene		X	X	X			X	X	X
N-Nitrosodimethylamine		X	X	X		X	X	X	X
N-Nitrosodi-n-propylamine		X	X	X		X	X		
N-Nitrosodiphenylamine		X	X	X		X	X		
Pentachlorophenol		X	X	X		X	X	X	
Phenanthrene		X	X	X					
Phenol		X	X	X				X	X
Pyrene		X	X	X				X	
Metals									
Antimony	X	X		X				X	
Arsenic	X	X		X	X	X	X	X	X
Barium		X		X	X			X	X
Cadmium		X		X	X		X	X	X
Chromium Total	X	X		X	X	X	X	X	X
Copper				X	X			X	
Iron				X	X			X	
Lead		X		X	X				
Mercury		X		X	X			X	X
Nickel				X	X		X	X	X
Selenium	X			X	X			X	X
Silver		X		X				X	
Zinc				X	X			X	
Other									
Alkanol amines					X				
Alkylamines					X				
Alkylene amines									

Table 18
Constituents of Interest in Soil and Groundwater
North Pole Refinery
Flint Hills Resources Alaska, LLC

Constituent of Interest	Constituent Included in Analyte List				Included on Refinery Laboratory Spilled Material "Ingredient" List	Toxicity Values Available from USEPA			
	2000 Characterization Study-Soil ^a	2001 Characterization Study-Soil ^b	2009-2010 Characterization Study-Soil ^c	Historical Groundwater ^d		Oral CSF	IUR	Oral RfD	Inhalation RfC
Sulfolane			X	X	X			X	
GRO		X	X	X					
DRO		X	X	X					
RRO		X	X	X					
Heavy aromatic naptha (Naphtha, High Flash Aromatic [HFAN])					X				
Heavy paraffinic distillate (mixture)					X				

Table 18
Constituents of Interest in Soil and Groundwater
North Pole Refinery
Flint Hills Resources Alaska, LLC

Constituent of Interest	Constituent Included in Analyte List				Included on Refinery Laboratory Spilled Material "Ingredient" List	Toxicity Values Available from USEPA			
	2000 Characterization Study-Soil ^a	2001 Characterization Study-Soil ^b	2009-2010 Characterization Study-Soil ^c	Historical Groundwater ^d		Oral CSF	IUR	Oral RfD	Inhalation RfC

Notes:

a - Shannon and Wilson, Inc. 2000. Draft Site Characterization and Corrective Action Plan, Williams Alaska Petroleum, Inc., North Pole Refinery. December 2000.

b - Shannon and Wilson, Inc. 2001. Contaminant Characterization Study, Williams Alaska Petroleum, Inc., North Pole Refinery, North Pole, Alaska. October 2001.

c - Barr Engineering Company. 2011. Site Characterization and First Quarter 2011 Groundwater Monitoring Report. May 2011.

d - Included in SWI groundwater database, dated June 2011

USEPA = United States Environmental Protection Agency Integrated Risk Information System (2011)

CSF = Cancer Slope Factor

IUR= Inhalation Unit Risk

RfD = Reference Dose

RfC = Reference Concentration

VOCs - volatile organic compounds

SVOCs - semi-volatile organic compounds

Note, lead is evaluated based on blood lead level.

Table 19
Constituents of Potential Concern in Soil and Groundwater
North Pole Refinery
Flint Hills Resources Alaska, LLC

Constituents of Interest	Maximum Soil Concentration (mg/kg) [a]	Maximum Observation or MRL Location	ADEC Soil Cleanup Level Based on Migration to Groundwater (mg/kg)	ADEC Soil Cleanup Level Based on Direct Contact (mg/kg)	ADEC Soil Cleanup Level Based on Outdoor Inhalation (mg/kg)	Selected Soil Screening Level [h] (mg/kg)	Soil COPC Selected in the RAWP [b]	Soil COPC in the 2012 HHRA [c]	Maximum Groundwater Concentration (ug/L) [d,k]	Maximum Observation or MRL Location	ADEC Groundwater Screening Level (ug/L)	Source	Groundwater COPC in RAWP [b]	Groundwater COPC in 2012 HHRA [c]
Heavy aromatic naptha (Naphtha, High Flash Aromatic [HFAN])	--						No[m]	No[m]	--		na		No[m]	No[m]
Heavy paraffinic distillate (mixture)	--						No[m]	No[m]	--		na		No[m]	No[m]
Iron Oxides	--		na	na	na	na	Yes[o]	Yes[o]	--		na		Yes[o]	Yes[o]
2-Methoxymethylethoxy propanol	--		na	na	na	na	Yes[o]	Yes[o]	--		na		Yes[o]	Yes[o]
Monoethanolamine	--		na	na	na	na	Yes[o]	Yes[o]	--		na		Yes[o]	Yes[o]
Montmorillonite, calcined	--		na	na	na	na	Non	Non	--		na		No[n]	No[n]
Silica	--		na	na	na	na	Yes[o]	Yes[o]	--		na		Yes[o]	Yes[o]
Cyanide	0.15	SB-101 (0.0 - 2.0)	27	2,000	na	27	Yes[o]	No	5.6	MW-125	20	[e]	Yes[o]	No
Sulfate	--		na	na	na	na	No [j]	No [j]	38600	MW-131	na		No [j]	No [j]
Sulfolane	58.9	O-2	0.073	250	na	0.073	Yes	Yes	10400	O-1	5	[e]	Yes	Yes
GRO	7,730	3/8/2001 at MW135	300	1,400	1,400	140	Yes	Yes	20800	MW-135	220	[e]	Yes	Yes
DRO	18800	SB-160 (6.4-8.4)	250	10,250	12,500	250	Yes	Yes	2150	MW-110	150	[e]	Yes	Yes
RRO	64700	1236-072804-009	11,000	10,000	22,000	1,000	Yes	Yes	278	MW-135	110	[e]	Yes	Yes

