

Table S1 Sample Information and TSEM results

PERD samples (2010 July)			Wet weight	Moisture	Dry weight	Extract volume	TSEM	Vol. for GC anal	Soil weight for oil anal
ESTS code	ALS sample number	Sample Information	(g)	(%)	(g)	(mL)	(mg/mL)	(mL)	(mg)
2010/06/29-1563	L871887-1	Toronto background site, plant	9.8500	ND	9.8500	10.0	1.7	3.00	2955.0
2010/06/29-1564	L871887-2	Orphan Well Asso. (OWA), plants	9.5000	83	1.6150	10.0	3.6	3.00	484.5
2010/06/29-1565	L871887-3	Turner Valley phytoremediation site, plants	6.1000	21	4.8190	10.0	9.7	1.00	481.9
2010/06/29-1566	L871887-4	Sarnia phytoremediation site, plants	9.0400	11	8.0456	10.0	17.8	0.80	643.6
2010/06/29-1567	L871887-5	Hinton phytoremediation site, plants	9.9100	10	8.9190	10.0	5.6	2.00	1783.8
2010/06/29-1568	L871887-6	Swan Hills phytoremediation site, plants	9.9800	9	9.0818	10.0	6.2	2.00	1816.4
2010/06/29-1569	L871887-7	Toronto background site, soil	9.7200	28	6.9984	10.0	0.8	3.00	2099.5
2010/06/29-1570	L871887-8	Kingston background site, soil	9.5000	69	2.9450	10.0	2.0	3.00	883.5
2010/06/29-1571	L871887-9	Orphan Well Asso., SBH 2 backgr. soil 1	9.9500	65	3.4825	10.0	3.6	3.00	1044.8
2010/06/29-1572	L871887-10	Orphan Well Asso., SBH 30 backgr. soil 2	9.9200	74	2.5792	10.0	2.1	3.00	773.8
2010/06/29-1573	L871887-11	Kinder Morgan, background soil	10.47	84	1.6752	10.0	1.2	3.00	502.6
2010/06/29-1579	L892017-5	Jeffrey S-003, background soil	9.95	16	8.3580	10.0	0.5	3.00	2507.4
2010/06/29-1574	Blank	Blank	0.00	/	0.0000	10.0	0.1	3.00	0.0
		Husky Heavy F4 (tar-cont soil)							
2010/06/29-1575	L892017-1	(30 year old distilled crude oil burial site) Nordeg	10.36	5	9.8420	10.0	12.2	0.91	894.6
2010/06/29-1576	L892017-2	(Imperial remediated crude oil-cont soil 1) Big Lake	10.46	18	8.5772	10.0	39.3	0.30	257.3
2010/06/29-1577	L892017-3	(Imperial remediated diesel-cont soil 2) Kinder Morgan, highly cont. soil	9.60	2	9.4080	10.0	55.2	0.20	188.2
2010/06/29-1578	L892017-4	(25 year old oil pipeline spill in a peatland)	10.22	74	2.6572	10.0	178.2	0.10	26.6
2010/06/29-1580	L892017-6	Jeffrey S-011, diesel-cont soil	10.03	15	8.5255	10.0	14.3	1.00	852.6
2010/06/29-1581	L892017-7	Swan Hills-7, oil/diesel cont soil	9.87	22	7.6986	10.0	2.2	3.00	2309.6
2010/06/29-1582	L892017-8	Hinton-I, soil contaminated with diesel invert	10.19	24	7.7444	10.0	4.2	3.00	2323.3
		OWA RBH4-I, highly oil-cont soil							
2010/06/29-1583	L892017-9	(30 year old oil pipeline spill in a peatland) Suncor, diesel-cont biopile woodchips	9.80	66	3.3320	10.0	17.2	1.00	333.2
2010/06/29-1584	L892017-10	(10 year old woodchip diesel biopile site)	10.35	58	4.3470	10.0	3.3	3.00	1304.1
2010/06/29-1585	Blank	WG112025, Lab Blank	0.0000	/	0.0000	10.0	0.0	3.00	0.0

Table S2 TPH analysis results

ESTD code	1563	1564	1565	1566	1567	1568	1569	1570	1571	1572	1573	1574
ALS #	L871887-1	L871887-2	L871887-3	L871887-4	L871887-5	L871887-6	L871887-7	L871887-8	L871887-9	L871887-10	L871887-11	Blank
	T.O.											
	Background	OWA	Turner	Sarnia	Hinton	Swan Hills	T.O.	Kingston	OWA	OWA	Kinder	
Customer sample info.	site plant	Background	Valley	plants	plants	plants	Background	Background	SBH2 soil	SBH30 soil	Morgan	Blank
	sample	plants	plants				soil	soil	background	background	Background	
Total TPH* (mg/g)	1.17	8.43	5.63	9.96	2.83	3.58	0.32	1.60	3.12	2.99	2.82	/
TPH-F3** (mg/g)	0.04	0.44	0.97	1.82	0.57	0.64	0.06	0.39	0.50	0.30	0.27	/
TSH (mg/g)	0.03	0.18	0.84	1.20	0.43	0.48	0.04	0.26	0.26	0.10	0.12	/
TAH (mg/g)	0.01	0.26	0.13	0.62	0.14	0.16	0.02	0.13	0.23	0.19	0.15	/
Total Alkanes (mg/g)	0.02	0.11	0.76	0.85	0.35	0.37	0.02	0.04	0.05	0.05	0.02	/
TSH/TPH-F3 (%)	64.7	40.9	86.4	65.9	75.8	74.8	69.7	67.5	52.7	34.6	44.4	/
TAH/TPH-F3 (%)	35.3	59.1	13.6	34.1	24.2	25.2	30.3	32.5	47.3	65.4	55.6	/
Resolved Peaks/TPH-F3 (%)	81.8	62.4	95.8	68.1	92.6	86.7	56.7	30.4	86.3	78.8	67.3	/
Total TPH - TPH-F3 (mg/g)	1.13	7.99	4.66	8.14	2.26	2.94	0.27	1.20	2.63	2.70	2.55	/
TPH-F3/Total TPH (%)	3.4	5.2	17.3	18.3	20.2	18.0	17.1	24.5	15.9	9.9	9.5	/
Total target BOC (mg/g)	1.01	3.74	4.38	4.84	1.92	0.87	0.22	0.52	1.39	0.59	1.31	/
Total BOC/Total TPH (%)	86.3	44.4	77.8	48.6	67.8	24.3	68.8	32.5	44.6	19.7	46.5	/
Total TPH Distribution (no cleanup, mg/g)												
C10-C16 (CCME F2)	0.05	0.32	0.12	0.18	0.07	0.28	0.00	0.04	0.05	0.08	0.07	/
C16-C34 (CCME F3)	0.47	5.08	4.53	8.13	2.15	2.52	0.15	0.83	1.95	1.81	1.46	/
C34+ (CCME F4)	0.33	2.85	0.93	1.61	0.57	0.67	0.15	0.69	1.08	1.05	1.20	/
TPH-F3 Distribution (F3, mg/g)												
C10-C16 (CCME F2)	0.00	0.02	0.01	0.02	0.01	0.03	0.00	0.01	0.01	0.02	0.03	/
C16-C34 (CCME F3)	0.03	0.27	0.84	1.35	0.46	0.49	0.04	0.26	0.37	0.21	0.17	/
C34+ (CCME F4)	0.01	0.15	0.12	0.45	0.10	0.12	0.01	0.12	0.12	0.06	0.06	/

* TPH were determined for original extracts with no column cleanup.

** TPH-F3 were determined for extracts after column cleanup.

Table S2 TPH analysis results

ESTD code	1575	1576	1577	1578	1579	1580	1581	1582	1583	1584	1585
ALS #	L892017-1	L892017-2	L892017-3	L892017-4	L892017-5	L892017-6	L892017-7	L892017-8	L892017-9	L892017-10	Blank
Customer sample info.	Husky Heavy F4	Nordeg	Big Lake	Kinder Morgan	Jeffrey S-003 (background soil)	Jeffrey S- 011	Swan Hills- 7	Hinton-I	OWA RBH4-I	L892017-10	Blank
Total TPH (mg/g)	4.12	38.5	45.2	501	0.07	16.8	2.31	3.42	35.5	4.78	/
TPH F3 (mg/g)	3.31	32.3	31.2	376	0.07	16.3	2.05	2.98	32.1	2.75	/
TSH (mg/g)	1.84	25.9	21.5	244	0.07	13.6	1.59	2.51	23.0	2.58	/
TAH (mg/g)	1.47	6.43	9.72	132	0.01	2.63	0.46	0.47	9.02	0.16	/
Total Alkanes (mg/g)	0.01	3.61	0.80	2.45	0.00	1.31	0.28	0.03	0.82	0.00	/
TSH/TPH (%)	55.7	80.1	68.9	64.8	91.2	83.8	77.5	84.1	71.9	94.2	/
TAH/TPH (%)	44.3	19.9	31.1	35.2	8.8	16.2	22.5	15.9	28.1	5.8	/
Resolved Peaks/TPH-F3 (%)	4.75	31.6	13.3	11.7	12.4	22.9	25.1	5.0	17.9	8.4	/
Total TPH - TPH-F3 (mg/g)	0.81	6.2	14.0	125	0.00	0.50	0.26	0.44	3.41	2.03	/
TPH-F3/Total TPH (%)	80.4	83.9	69.1	75.1	100	97.0	88.7	87.2	90.4	57.5	/
Total target BOC (mg/g)	0.55	0.17	0.04	3.36	0.00	0.02	0.02	0.38	0.57	0.09	/
Total BOC/Total TPH (%)	16.6	0.44	0.09	0.67	/	0.12	0.86	11.1	1.61	1.88	/
Total TPH Distribution (no cleanup, mg/g)											
C10-C16 (CCME F2)	1.76	1.5	6.3	23.1	0.03	3.09	0.16	0.81	2.31	0.64	/
C16-C34 (CCME F3)	2.00	26.8	28.0	329	0.03	10.77	1.95	1.92	29.1	3.30	/
C34+ (CCME F4)	0.35	10.1	10.6	127	0.00	2.76	0.19	0.57	4.05	0.58	/
TPH-F3 Distribution (F3, mg/g)											
C10-C16 (CCME F2)	1.29	1.12	3.44	18.0	0.04	2.08	0.15	0.55	2.97	0.44	/
C16-C34 (CCME F3)	1.73	22.5	19.7	259	0.04	11.4	1.83	1.84	27.6	1.82	/
C34+ (CCME F4)	0.29	8.68	8.04	91.4	0.00	2.78	0.07	0.57	1.41	0.39	/

* TPH were determined for original extracts with no column cleanup.

** TPH-F3 were determined for extracts after column cleanup.

Table S3 n-Alkane analysis results

ESTD code	2010/06/29- 1563	2010/06/29- 1564	2010/06/29- 1565	2010/06/29- 1566	2010/06/29- 1567
Customer sample info.	T.O. Background site plant sample	OWA Background plants	Turner Valley plants	Sarnia plants	Hinton plants
Compounds	µg/g	µg/g	µg/g	µg/g	µg/g
n-Alkanes					
n-C9	0.00	0.00	0.00	0.00	0.00
n-C10	0.00	0.00	0.00	0.00	0.00
n-C11	0.00	0.00	0.00	0.05	0.00
n-C12	0.00	0.00	0.05	0.14	0.02
n-C13	0.00	0.00	0.15	0.37	0.04
n-C14	0.01	0.10	0.05	0.08	0.02
n-C15	0.04	0.91	0.08	0.04	0.08
n-C16	0.02	0.11	0.06	0.07	0.04
n-C17	0.05	0.40	0.11	0.08	0.05
Pristane	0.02	0.14	0.04	0.04	0.02
n-C18	0.06	0.36	0.15	0.16	0.08
Phytane	0.02	0.12	0.06	0.08	0.03
n-C19	0.05	0.35	0.17	0.15	0.14
n-C20	0.04	0.25	0.15	0.18	0.09
n-C21	0.03	0.54	1.32	0.55	1.70
n-C22	0.04	0.34	1.07	1.12	0.15
n-C23	0.05	2.39	4.30	3.10	3.77
n-C24	0.05	0.78	3.01	5.28	0.41
n-C25	0.11	16.6	16.8	16.0	9.31
n-C26	0.08	1.27	3.29	9.29	0.94
n-C27	0.73	34.7	38.6	41.1	22.1
n-C28	0.15	1.17	10.1	15.1	5.16
n-C29	3.37	21.5	183	196	119
n-C30	0.48	0.67	20.8	23.7	8.82
n-C31	12.6	20.2	377	383	159
n-C32	0.77	0.29	7.19	10.4	2.11
n-C33	1.87	10.5	86.3	131	20.5
n-C34	0.03	0.07	1.01	1.42	0.22
n-C35	0.07	0.50	4.50	6.74	0.86
n-C36	0.00	0.00	0.09	0.08	0.00
n-C37	0.00	0.00	0.12	0.20	0.00
n-C38	0.00	0.00	0.00	0.00	0.00
n-C39	0.00	0.00	0.00	0.00	0.00
n-C40	0.00	0.00	0.00	0.00	0.00
Total alkane (ug/g)	20.7	114.3	760	846	354
Diagnostic indexes					
n-C17/Pristane	3.21	2.97	2.72	2.08	3.12
n-C18/Phytane	2.65	3.07	2.63	1.89	2.88
Pr/Ph	0.69	1.15	0.73	0.47	0.53
Odd alkanes	19.0	108.7	713	779	336
Even alkanes	1.73	5.41	47.0	67.0	18.1
CPI	11.0	20.1	15.2	11.6	18.6

Table S3 n-Alkane analysis results

ESTD code	2010/06/29-1568	2010/06/29-1569	2010/06/29-1570	2010/06/29-1571	2010/06/29-1572	2010/06/29-1573
Customer sample info.	Swan Hills plants	T.O. Background soil	Kingston Background soil	OWA SBH2 soil background	OWA SBH30 soil background	Kinder Morgan Background soil
Compounds	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g
n-Alkanes						
n-C9	0.00	0.00	0.00	0.00	0.00	0.00
n-C10	0.36	0.00	0.00	0.00	0.00	0.00
n-C11	0.79	0.00	0.00	0.00	0.00	0.00
n-C12	0.79	0.00	0.00	0.00	0.02	0.00
n-C13	0.83	0.00	0.00	0.00	0.02	0.00
n-C14	0.41	0.01	0.03	0.02	0.03	0.04
n-C15	0.13	0.02	0.03	0.02	0.04	0.04
n-C16	0.31	0.03	0.06	0.04	0.07	0.10
n-C17	0.20	0.08	0.17	0.13	0.16	0.29
Pristane	0.09	0.03	0.04	0.04	0.06	0.06
n-C18	0.38	0.12	0.21	0.17	0.31	0.35
Phytane	0.22	0.04	0.06	0.05	0.10	0.10
n-C19	0.45	0.11	0.20	0.22	0.57	0.31
n-C20	0.37	0.08	0.22	0.67	0.35	0.30
n-C21	1.70	0.10	1.37	0.85	1.77	0.78
n-C22	0.52	0.10	0.38	0.57	0.69	0.37
n-C23	4.56	0.11	1.50	2.03	2.03	1.36
n-C24	0.87	0.06	0.30	0.97	0.70	0.36
n-C25	13.0	0.17	1.17	6.8	5.89	3.27
n-C26	1.51	0.08	0.40	1.1	0.91	0.37
n-C27	24.4	0.82	1.82	16.5	15.6	3.39
n-C28	4.11	0.19	0.60	1.15	1.00	0.37
n-C29	105	3.31	4.5	10.0	10.8	2.70
n-C30	8.77	0.29	0.60	0.35	0.30	0.19
n-C31	165	8.45	12.06	5.42	3.49	4.29
n-C32	2.60	0.41	0.77	0.19	0.11	0.22
n-C33	26.2	1.70	7.46	1.84	1.14	3.15
n-C34	0.39	0.04	0.25	0.03	0.00	0.00
n-C35	1.39	0.16	1.65	0.10	0.07	0.04
n-C36	0.07	0.00	0.10	0.00	0.00	0.00
n-C37	0.08	0.00	0.14	0.00	0.00	0.00
n-C38	0.04	0.00	0.07	0.00	0.00	0.00
n-C39	0.04	0.00	0.09	0.00	0.00	0.00
n-C40	0.00	0.00	0.00	0.00	0.00	0.00
Total	366	16.5	36.3	49.3	46.3	22.5
Diagnostic indexes						
n-C17/Pristane	2.31	2.81	3.92	3.39	2.54	4.75
n-C18/Phytane	1.74	3.30	3.55	3.48	3.24	3.42
Pr/Ph	0.41	0.73	0.71	0.79	0.67	0.59
Odd alkanes	345	15.0	32.2	44.0	41.65	19.6
Even alkanes	21.5	1.42	4.01	5.21	4.49	2.68
CPI	16.0	10.6	8.03	8.44	9.28	7.31

Table S3 n-Alkane analysis results

ESTD code	2010/06/29-1574	2010/06/29-1575	2010/06/29-1576	2010/06/29-1577	2010/06/29-1578	2010/06/29-1579
Customer sample info.	Blank	Husky Heavy F4	Nordeg	Big Lake	Kinder Morgan	Jeffrey S-003
Compounds	µg/mL	µg/g	µg/g	µg/g	µg/g	µg/g
n-Alkanes						
n-C9	0.00	0.00	0.00	0.00	0.00	0.00
n-C10	0.00	0.00	4.30	0.00	0.00	0.00
n-C11	0.00	0.00	47.3	0.00	0.02	0.00
n-C12	0.00	0.00	174	0.22	0.00	0.01
n-C13	0.00	0.00	304	0.47	0.01	0.02
n-C14	0.00	0.00	420	2.66	2.46	0.03
n-C15	0.00	0.00	397	2.94	0.00	0.04
n-C16	0.01	0.00	343	5.42	0.00	0.07
n-C17	0.02	0.04	307	0.98	0.00	0.16
Pristane	0.01	0.36	160	147	929	0.06
n-C18	0.05	0.12	194	8.96	0.00	0.16
Phytane	0.01	0.35	136	169	1205	0.10
n-C19	0.04	0.13	147	13.5	0.00	0.16
n-C20	0.03	0.12	121	14.6	0.00	0.13
n-C21	0.02	0.12	107	16.0	0.00	0.12
n-C22	0.02	0.16	96.2	17.9	0.00	0.13
n-C23	0.02	0.18	85.6	19.8	0.00	0.11
n-C24	0.01	0.20	86.9	21.5	0.00	0.12
n-C25	0.0	0.28	77.9	25.7	0.0	0.12
n-C26	0.01	0.42	74.0	33.0	95.3	0.08
n-C27	0.0	0.62	58.2	27.1	27.1	0.21
n-C28	0.01	0.48	48.2	25.8	0.00	0.10
n-C29	0.0	0.85	41.1	30.9	0.00	0.11
n-C30	0.00	0.29	31.8	23.7	0.00	0.05
n-C31	0.00	0.95	29.6	33.3	0.00	0.08
n-C32	0.00	0.47	21.4	24.1	0.00	0.04
n-C33	0.00	0.66	20.5	25.6	0.00	0.05
n-C34	0.00	0.46	16.5	22.9	0.00	0.03
n-C35	0.00	0.66	15.5	23.8	0.00	0.03
n-C36	0.00	0.71	12.3	17.0	25.3	0.00
n-C37	0.00	0.68	13.3	15.3	39.8	0.00
n-C38	0.00	0.68	9.54	12.5	45.6	0.00
n-C39	0.00	0.55	7.76	17.9	76.8	0.00
n-C40	0.00	0.00	0.00	0.00	0.0	0.00
Total	0.29	10.5	3606	800	2446	2.31
Diagnostic indexes						
n-C17/Pristane	2.18	0.11	1.92	0.01	0.00	2.95
n-C18/Phytane	3.31	0.34	1.43	0.05	0.00	1.60
Pr/Ph	0.75	1.03	1.18	0.87	0.771	0.56
Odd alkanes	0.12	5.19	1658	253	144	1.21
Even alkenes	0.14	3.74	1652	230	169	0.95
CPI	0.89	1.39	1.00	1.10	0.85	1.27

Table S3 n-Alkane analysis results

ESTD code	2010/06/29-1580	2010/06/29-1581	2010/06/29-1582	2010/06/29-1583	2010/06/29-1584	2010/06/29-1585
Customer sample info.	Jeffrey S-011	Swan Hills-7	Hinton-I	OWA RBH4-I	Wood chips	WG112025 Lab Blank
Compounds	µg/g	µg/g	µg/g	µg/g	µg/g	µg/mL
n-Alkanes						
n-C9	4.51	0.00	0.00	0.00	0.00	0.00
n-C10	28.4	0.00	0.04	0.00	0.00	0.00
n-C11	75.1	0.28	0.06	0.00	0.04	0.00
n-C12	119	2.47	0.12	0.00	0.04	0.00
n-C13	158	8.54	0.26	0.00	0.07	0.00
n-C14	185	15.5	0.73	33.4	0.17	0.00
n-C15	167	18.8	1.16	7.63	0.51	0.01
n-C16	146	17.2	2.01	6.47	0.51	0.02
n-C17	111	21.0	3.30	5.77	0.91	0.05
Pristane	44.0	10.0	5.41	234	0.57	0.02
n-C18	83.3	14.0	2.85	3.21	0.37	0.07
Phytane	42.6	11.9	5.02	180	0.49	0.02
n-C19	58.1	14.0	2.87	5.59	0.25	0.07
n-C20	37.3	11.7	2.62	6.22	0.15	0.05
n-C21	22.8	11.5	2.17	5.64	0.13	0.05
n-C22	13.0	10.9	1.44	5.70	0.14	0.07
n-C23	7.09	10.5	0.96	8.08	0.11	0.06
n-C24	3.45	10.6	0.70	7.44	0.07	0.05
n-C25	1.73	11.7	0.59	5.71	0.09	0.05
n-C26	0.91	11.4	0.34	15.6	0.05	0.04
n-C27	0.50	10.7	0.72	12.2	0.16	0.08
n-C28	0.25	9.71	0.20	3.87	0.00	0.04
n-C29	0.87	8.49	0.26	5.61	0.06	0.04
n-C30	0.15	7.05	0.11	4.49	0.00	0.02
n-C31	2.15	6.71	0.19	5.90	0.00	0.03
n-C32	0.08	5.21	0.00	7.04	0.00	0.00
n-C33	0.52	4.61	0.11	22.3	0.00	0.02
n-C34	0.00	3.69	0.00	33.8	0.00	0.00
n-C35	0.05	2.90	0.00	43.1	0.00	0.00
n-C36	0.00	2.36	0.00	37.8	0.00	0.00
n-C37	0.00	1.72	0.00	49.5	0.00	0.00
n-C38	0.00	1.35	0.00	37.5	0.00	0.00
n-C39	0.00	1.18	0.00	25.4	0.00	0.00
n-C40	0.00	0.00	0.00	0.00	0.00	0.00
Total	1313	278	34.2	819	4.89	0.85
Diagnostic indexes						
n-C17/Pristane	2.52	2.11	0.61	0.02	1.59	3.40
n-C18/Phytane	1.95	1.18	0.57	0.02	0.75	3.11
Pr/Ph	1.03	0.84	1.08	1.30	1.16	0.66
Odd alkanes	610	133	12.7	202	2.34	0.46
Even alkenes	616	123	11.1	203	1.49	0.36
CPI	0.99	1.08	1.14	1.00	1.57	1.29

Table S4 PAHs analysis results

ESTD sample No.		2010/06/29-1563	2010/06/29-1564	2010/06/29-1565	2010/06/29-1566	2010/06/29-1567	2010/06/29-1568
Sample info.		T.O. Background site plant sample (ng/g sample)	OWA Background plants (ng/g sample)	Turner Valley plants (ng/g sample)	Sarnia plants (ng/g sample)	Hinton plants (ng/g sample)	Swan Hills plants (ng/g sample)
Alkylated PAHs	Naphthalene	C0-N 0.0	5.59	10.5	62.4	6.05	57.3
		C1-N 0.0	0.0	21.1	56.5	11.2	58.4
		C2-N 0.00	0.00	0.00	38.0	0.00	34.5
		C3-N 0.00	0.00	0.00	68.1	0.00	21.2
		C4-N 0.00	0.00	0.00	0.0	0.00	0.00
Sum		0.00	5.59	31.6	225	17.2	171
Phenanthrene		C0-P 4.51	14.2	26.1	80.0	4.19	11.6
		C1-P 0.00	0.00	0.00	96.3	0.00	8.94
		C2-P 0.00	0.00	0.00	68.9	0.00	10.1
		C3-P 0.00	0.00	0.00	75.1	0.00	7.47
		C4-P 0.00	0.00	0.00	0.00	0.00	0.00
Sum		4.51	14.2	26.1	320	4.19	38.0
Dibenzothiophene		C0-D 0.00	0.00	0.00	0.00	0.00	0.00
		C1-D 0.00	0.00	0.00	0.00	0.00	0.00
		C2-D 0.00	0.00	0.00	0.00	0.00	0.00
		C3-D 0.00	0.00	0.00	0.00	0.00	0.00
	Sum	0.00	0.00	0.00	0.00	0.00	0.00
Fluorene		C0-F 0.00	0.00	0.00	14.8	0.00	3.78
		C1-F 0.00	0.00	0.00	0.00	0.00	5.79
		C2-F 0.00	0.00	0.00	0.00	0.00	9.75
		C3-F 0.00	0.00	0.00	0.00	0.00	0.00
	Sum	0.00	0.00	0.00	14.8	0.00	19.3
Chrysene		C0-C 2.90	0.00	4.10	123	0.00	2.64
		C1-C 0.00	0.00	0.00	189	0.00	2.93
		C2-C 0.00	0.00	0.00	321	0.00	0.00
		C3-C 0.00	0.00	0.00	683	0.00	0.00
	Sum	2.90	0.00	4.10	1315	0.00	5.58
Total alkylated PAHs		7.41	19.8	61.8	1875	21.4	234
Other Priority PAHs (ng/g sample)							
Biphenyl (Bph)		0.00	0.00	7.05	19.9	3.79	33.8
Acenaphthylene (Acl)		0.00	0.00	0.00	290	0.00	0.00
Acenaphthene (Ace)		0.00	0.00	0.00	6.61	0.00	0.00
Anthracene (An)		0.00	0.00	0.00	122	0.00	0.00
Fluoranthene (Fl)		7.74	18.8	19.6	65.7	2.54	4.18
Pyrene (Py)		4.69	10.0	11.1	115	1.87	2.30
Benz(a)anthracene (BaA)		1.74	3.35	2.04	19.1	0.46	0.54
Benzo(b)fluoranthene (BbF)		1.89	0.00	0.00	30.4	0.00	0.00
Benzo(k)fluoranthene (BkF)		1.14	0.00	0.00	8.3	0.00	0.00
Benzo(e)pyrene (BeP)		1.05	0.00	0.00	249	0.00	0.00
Benzo(a)pyrene (BaP)		1.25	0.00	0.00	98.2	0.00	0.00
Perylene (Pe)		0.69	1.87	0.00	63.1	0.00	0.00
Indeno(1,2,3-cd)pyrene (IP)		0.86	0.00	0.00	81.3	0.00	0.00
Dibenzo(ah)anthracene (DA)		0.00	0.00	0.00	50.5	0.00	0.00
Benzo(ghi)perylene (BgP)		1.39	0.00	0.00	357	0.00	0.00
Total EPA priority PAHs		22.4	34.0	39.7	1576	8.66	40.8
Total aromatic compounds		29.9	53.8	102	3451	30.1	275
Diagnostic Ratios							
2-m-N:1-m-N		/	/	1.72	2.49	2.02	2.39
(3+2-)/(4-9-+1-m-phen)		/!	/	/	1.21	/	1.07
Pyrogenic Index (PI)		3.03	1.72	0.64	0.84	0.40	0.17

Table S4 PAHs analysis results

ESTD sample No.		2010/06/29-1569	2010/06/29-1570	2010/06/29-1571	2010/06/29-1572	2010/06/29-1573	2010/06/29-1574
Sample info.		T.O. Background soil	Kingston Background soil	OWA SBH2 soil background	OWA SBH30 soil background	Kinder Morgan Background soil	Blank
Alkylated PAHs		(ng/g sample)	(ng/g sample)	(ng/g sample)	(ng/g sample)	(ng/g sample)	(ng/mL)
Naphthalene	C0-N	2.61	6.08	1.83	4.20	6.08	0.00
	C1-N	3.63	9.87	3.06	5.45	8.0	0.00
	C2-N	0.00	11.8	0.00	0.00	0.00	0.00
	C3-N	0.00	17.5	0.00	0.00	0.00	0.00
	C4-N	0.00	0.00	0.00	0.00	0.00	0.00
	Sum	6.25	45.3	4.89	9.65	14.1	0.00
Phenanthrene	C0-P	29.9	456	8.83	15.1	14.7	1.33
	C1-P	16.0	153	0.00	14.6	0.00	0.00
	C2-P	19.1	95.4	0.00	7.66	0.00	0.00
	C3-P	5.42	39.6	0.00	0.00	0.00	0.00
	C4-P	0.00	318	0.00	0.00	0.00	0.00
	Sum	70.5	1063	8.83	37.3	14.7	1.33
Dibenzothiophene	C0-D	0.00	12.2	0.00	0.00	0.00	0.00
	C1-D	0.00	0.00	0.00	0.00	0.00	0.00
	C2-D	0.00	0.00	0.00	0.00	0.00	0.00
	C3-D	0.00	0.00	0.00	0.00	0.00	0.00
	Sum	0.00	12.2	0.00	0.00	0.00	0.00
Fluorene	C0-F	1.45	10.7	0.00	0.00	0.00	0.00
	C1-F	0.00	0.00	0.00	0.00	0.00	0.00
	C2-F	0.00	0.00	0.00	0.00	0.00	0.00
	C3-F	0.00	0.00	0.00	0.00	0.00	0.00
	Sum	1.45	10.7	0.00	0.00	0.00	0.00
Chrysene	C0-C	50.0	1494	0.00	11.7	7.79	0.00
	C1-C	16.2	388	0.00	0.00	0.00	0.00
	C2-C	6.49	184	0.00	0.00	0.00	0.00
	C3-C	0.00	83.3	0.00	0.00	0.00	0.00
	Sum	72.6	2150	0.00	11.7	7.79	0.00
Total alkylated PAHS		151	3281	13.7	58.6	36.5	1.33
Other Priority PAHs (ng/g sample)							
Biphenyl (Bph)		0.73	2.12	1.53	2.07	2.66	0.00
Acenaphthylene (Acl)		2.44	8.56	0.00	0.00	0.00	0.00
Acenaphthene (Ace)		1.40	12.5	0.00	0.00	0.00	0.00
Anthracene (An)		7.05	59.7	0.00	0.00	0.00	0.00
Fluoranthene (Fl)		101	3389	17.3	18.1	19.3	2.73
Pyrene (Py)		78.0	2513	22.6	10.6	10.3	1.46
Benz(a)anthracene (BaA)		33.7	648	1.57	3.48	3.23	0.53
Benzo(b)fluoranthene (BbF)		60.6	2408	8.72	0.00	0.00	0.00
Benzo(k)fluoranthene (BkF)		31.2	1111	0.00	0.00	0.00	0.00
Benzo(e)pyrene (BeP)		35.3	1369	2.69	2.40	0.00	0.00
Benzo(a)pyrene (BaP)		46.1	1506	0.94	0.00	0.00	0.00
Perylene (Pe)		9.8	254	105	156	293	0.00
Indeno(1,2,3-cd)pyrene (IP)		36.0	1529	0.00	0.00	0.00	0.00
Dibenzo(ah)anthracene (DA)		11.3	355	0.00	0.00	0.00	0.00
Benzo(ghi)perylene (DgP)		62.3	2197	0.00	0.00	0.00	0.00
Total EPA priority PAHs		517	17361	161	193	329	4.72
Total aromatic compounds		668	20642	174	251	365	6.05
Diagnostic Ratios							
2-m-N:1-m-N		1.43	1.65	1.57	1.79	2.50	/
(3+2-)/(4-9-+1-m-phen)		1.44	1.72	/	0.78	/	/
Pyrogenic Index (PI)		3.43	5.29	11.70	3.28	9.00	3.55

Table S4 PAHs analysis results

ESTD sample No.		2010/06/29-1575	2010/06/29-1576	2010/06/29-1577	2010/06/29-1578	2010/06/29-1579
Sample info.		Husky Heavy F4	Nordeg	Big Lake	Kinder Morgan	Jeffrey S-003
Alkylated PAHs (ng/g sample)		(ng/g sample)	(ng/g sample)	(ng/g sample)	(ng/g sample)	(ng/g sample)
Naphthalene	C0-N	5.16	1302	0.00	0.00	0.89
	C1-N	11.6	14495	119	0.00	0.59
	C2-N	39.4	321867	8951	36230	0.00
	C3-N	102	211598	47698	617940	0.00
	C4-N	138	99251	53531	885841	0.00
	Sum	296	648513	110299	1540010	1.48
Phenanthrene	C0-P	31.2	4723	630	0.00	2.47
	C1-P	106	17995	6277	45144	2.60
	C2-P	255	16518	16499	188506	10.60
	C3-P	407	9196	25251	322097	3.53
	C4-P	580	12646	15378	142671	0.00
	Sum	1379	61078	64036	698418	19.2
Dibenzothiophene	C0-D	18.4	4550	699	0.00	0.00
	C1-D	137	20125	4639	105764	0.00
	C2-D	336	18113	886	267824	0.00
	C3-D	627	7629	768	298060	0.00
	Sum	1119	50418	6993	671648	0.00
Fluorene	C0-F	4.82	4861	310	2341	0.00
	C1-F	23.4	17716	1758	42766	0.00
	C2-F	68.3	23482	4680	133949	0.00
	C3-F	134	14420	7431	175156	0.00
	Sum	230	60479	14179	354212	0.00
Chrysene	C0-C	68.7	196	313	5392	0.00
	C1-C	387	1029	2135	27833	0.00
	C2-C	938	1409	6017	61194	0.00
	C3-C	987	1103	6141	56406	0.00
	Sum	2380	3736	14606	150825	0.00
Total alkylated PAHS		5404	824224	210113	3415113	20.7
Other Priority PAHs (ng/g sample)						
Biphenyl		1.71	369	0.00	0.00	0.00
Acenaphthylene		0.00	819	70.0	0.00	0.00
Acenaphthene		0.00	1161	52.2	0.00	0.00
Anthracene		11.5	355	0.00	0.00	0.00
Fluoranthene		46.5	162	303	3361	5.02
Pyrene		76.0	634	886	13096	3.75
Benz(a)anthracene		42.0	32.3	98.8	1263	0.73
Benzo(b)fluoranthene		96.5	112	136.44	2346	2.09
Benzo(k)fluoranthene		39.4	0.00	0.00	0.00	0.74
Benzo(e)pyrene		87.4	220	313	4498	1.93
Benzo(a)pyrene		101	0.00	0.00	0.00	1.08
Perylene		65.0	0.00	0.00	0.00	0.66
Indeno(1,2,3-cd)pyrene		61.8	0.00	0.00	0.00	1.22
Dibenzo(ah)anthracene		46.9	0.00	0.00	1363	0.00
Benzo(ghi)perylene		125	98.6	275	1806	2.69
Total EPA priority PAHs (ng/g)		801	3965	2134	27733	19.9
Total aromatic compounds (ng/g)		6205	828189	212247	3442847	40.6
Diagnostic Ratios						
2-m-N:1-m-N		1.69	0.30	0.39	/	/
(3-+2-)/(4-/9-+1-m-phen)		0.76	1.05	0.61	0.39	0.85
Pyrogenic Index (PI)		0.15	0.005	0.01	0.01	0.96

Table S4 PAHs analysis results

ESTD sample No.		2010/06/29-1580	2010/06/29-1581	2010/06/29-1582	2010/06/29-1583	2010/06/29-1584	2010/06/29-1585
Sample info.		Jeffrey S-011	Swan Hills-7	Hinton-I	OWA RBH4-I	Wood chips	WG112025 Lab Balnk
Alkylated PAHs (ng/g sample)		(ng/g sample)	(ng/g sample)	(ng/g sample)	(ng/g sample)	(ng/g sample)	(ng/mL)
Naphthalene	C0-N	763	4.09	30.3	1677	5.89	0.98
	C1-N	1592	61.6	158	19485	29.4	0.00
	C2-N	5194	351	334	66365	59.6	0.00
	C3-N	6586	1450	421	77610	59.9	0.00
	C4-N	6201	2168	147	57666	0.00	0.00
	Sum	20336	4035	1090	222803	155	0.98
Phenanthrene	C0-P	111	96.8	76.6	0.00	26.2	0.00
	C1-P	251	743	233	13433	58.8	3.03
	C2-P	474	2249	297	17378	71.0	0.00
	C3-P	623	2393	244	16945	30.3	0.00
	C4-P	411	1292	60.0	12333	0.00	0.00
	Sum	1871	6774	912	60089	186	3.03
Dibenzothiophene	C0-D	0.00	37.3	11.5	395	0.00	0.00
	C1-D	0.00	224	32.9	2690	0.00	0.00
	C2-D	0.00	861	0.00	3977	0.00	0.00
	C3-D	0.00	730	0.00	3958	0.00	0.00
	Sum	0.00	1852	44.4	11021	0.00	0.00
Fluorene	C0-F	292	5.29	5.65	2213	0.00	0.00
	C1-F	1171	172	43.2	6178	0.00	0.00
	C2-F	1123	964	20.3	10711	0.00	0.00
	C3-F	2352	1811	0.0	10625	0.00	0.00
	Sum	4937	2952	69.2	29726	0.00	0.00
Chrysene	C0-C	0.00	68.5	6.54	518	5.60	0.00
	C1-C	0.00	508	61.2	2281	47.5	0.00
	C2-C	0.00	778	80.2	3450	59.8	0.00
	C3-C	0.00	623	109	2738	38.4	0.00
	Sum	0.00	1978	257	8987	151	0.00
Total alkylated PAHS		27144	17591	2373	332626	492	4.01
Other Priority PAHs (ng/g sample)							
Biphenyl		1413	3.99	38.8	373	11.3	0.00
Acenaphthylene		0.00	0.00	0.00	0.00	0.00	0.00
Acenaphthene		0.08	0.00	3.76	252	0.00	0.00
Anthracene		124	0.00	22.4	184	0.00	0.00
Fluoranthene		0.00	21.1	0.00	308	0.00	3.01
Pyrene		477	143	152	1108	50.0	1.46
Benz(a)anthracene		0.00	18.2	5.53	92.7	1.49	0.00
Benzo(b)fluoranthene		2.96	21.9	11.1	247	23.4	0.00
Benzo(k)fluoranthene		1.57	0.00	1.33	0.00	0.00	0.00
Benzo(e)pyrene		2.17	77.9	32.1	455	56.5	0.00
Benzo(a)pyrene		0.95	8.22	5.50	79.0	3.93	0.00
Perylene		1.24	17.6	27.6	0.00	1.99	0.00
Indeno(1,2,3-cd)pyrene		0.00	0.00	10.4	0.00	6.92	0.00
Dibenzo(ah)anthracene		0.00	11.92	3.65	102	8.96	0.00
Benzo(ghi)perylene		3.10	24.4	148	331	51.5	0.00
Total EPA priority PAHs (ng/g)		2026	349	462	3532	216	4.47
Total aromatic compounds (ng/g)		29170	17940	2835	336158	708	8.5
Diagnostic Ratios							
2-m-N:1-m-N		1.87	1.52	/	2.44	2.68	/
(3-+2-)/(4-/9-+1-m-phen)		2.74	0.56	/	1.58	2.09	2.04
Pyrogenic Index (PI)		0.07	0.02	0.19	0.01	0.44	1.11

Table S5 Biomarker analysis results

ESTD sample No.	2010/06/29-1563	2010/06/29-1564	2010/06/29-1565	2010/06/29-1566	2010/06/29-1567	2010/06/29-1568
Sample info.	T.O. Background site plant sample	OWA Background plants	Turner Valley plants	Sarnia plants	Hinton plants	Swan Hills plants
Biomarkers	(ng/g)	(ng/g)	(ng/g)	(ng/g)	(ng/g)	(ng/g)
C21 terpane	0.00	0.00	0.00	16.9	0.00	2.82
C22 terpane	0.00	0.00	0.00	0.00	0.00	0.00
C23 terpane	0.00	0.00	0.00	8.94	0.00	7.02
C24 terpane	0.00	0.00	0.00	40.9	0.00	7.41
C27 Ts	0.00	0.00	0.00	77.5	0.00	7.78
C27 Tm	0.00	0.00	0.00	58.9	0.00	4.63
C29 ab Hopane	0.00	0.00	0.0	166	0.00	17.5
C30 ab Hopane	0.00	0.00	0.0	171	0.00	19.2
C31(S) hopane	0.00	0.00	0.00	66.8	0.00	6.26
C31(R) hopane	0.00	0.00	0.00	48.3	0.00	4.56
C32(S) hopane	0.00	0.00	0.00	56.4	0.00	3.72
C32(R) hopane	0.00	0.00	0.00	41.4	0.00	3.75
C33(S) hopane	0.00	0.00	0.00	77.6	0.00	0.00
C33(R) hopane	0.00	0.00	0.00	38.1	0.00	0.00
C34(S) hopane	0.00	0.00	0.00	91.6	0.00	0.00
C34(R) hopane	0.00	0.00	0.00	44.6	0.00	0.00
C35(S) hopane	0.00	0.00	0.00	113	0.00	0.00
C35(R) hopane	0.00	0.00	0.00	48.2	0.00	0.00
C27aββ steranes	0.00	0.00	0.00	284	0.00	29.5
C28aββ steranes	0.00	0.00	0.00	388	0.00	11.7
C29aββ steranes	0.00	0.00	0.00	769	0.00	29.5
Sum	0.00	0.00	0.00	2608	0.00	155
Diagnostic Ratios						
C ₂₃ /C ₂₄	/	/	/	0.22	/	0.95
C ₂₃ /C ₃₀	/	/	/	0.05	/	0.37
C ₂₄ /C ₃₀	/	/	/	0.24	/	0.39
C ₂₉ /C ₃₀	/	/	/	0.97	/	0.91
C ₃₁ (S)/C ₃₁ (R)	/	/	/	1.38	/	1.37
C ₃₂ (S)/C ₃₂ (R)	/	/	/	1.36	/	0.99
Ts/Tm	/	/	/	1.32	/	1.68
C ₂₇ αββ/ C ₂₉ αββ	/	/	/	0.37	/	1.00
C ₃₀ /(C ₃₁ +C ₃₂ +C ₃₃ +C ₃₄ +C ₃₅)	/	/	/	0.27	/	1.05

Table S5 Biomarker analysis results

ESTD sample No.	2010/06/29- 1569	2010/06/29- 1570	2010/06/29- 1571	2010/06/29- 1572	2010/06/29- 1573	2010/06/29- 1574
Sample info.	T.O. Background soil	Kingston Background soil	OWA SBH2 soil background	OWA SBH30 soil background	Kinder Morgan Background soil	Blank
Biomarkers	(ng/g)	(ng/g)	(ng/g)	(ng/g)	(ng/g)	ng/mL
C21 terpane	0.00	0.00	0.00	7.55	0.00	0.00
C22 terpane	0.00	0.00	0.00	0.00	0.00	0.00
C23 terpane	2.53	31.6	4.30	5.97	9.91	0.00
C24 terpane	3.02	31.58	6.22	17.5	16.3	0.00
C27 Ts	3.04	60.9	0.00	0.00	12.5	0.00
C27 Tm	3.35	69.4	23.6	15.9	24.4	0.00
C29 ab Hopane	17.5	360	41.4	32.5	94.8	0.00
C30 ab Hopane	14.1	368	42.3	26.2	83.6	0.00
C31(S) hopane	0.00	195	12.1	0.00	0.00	0.00
C31(R) hopane	0.00	111	18.4	0.00	0.00	0.00
C32(S) hopane	0.00	176	0.00	0.00	0.00	0.00
C32(R) hopane	0.00	88.7	0.00	0.00	0.00	0.00
C33(S) hopane	0.00	151	0.00	0.00	0.00	0.00
C33(R) hopane	0.00	55.7	0.00	0.00	0.00	0.00
C34(S) hopane	0.00	86.0	0.00	0.00	0.00	0.00
C34(R) hopane	0.00	48.0	0.00	0.00	0.00	0.00
C35(S) hopane	0.00	95.8	0.00	0.00	0.00	0.00
C35(R) hopane	0.00	50.0	0.00	0.00	0.00	0.00
C27aββ steranes	21.9	245	0.00	0.00	54.8	0.00
C28aββ steranes	10.7	217	0.00	0.00	39.2	0.00
C29aββ steranes	20.8	420	0.00	0.00	81.9	0.00
Sum	96.9	2860	148	106	417	0.00
Diagnostic Ratios						
C ₂₃ /C ₂₄	0.84	1.00	0.69	0.34	0.61	/
C ₂₃ /C ₃₀	0.18	0.09	0.10	0.23	0.12	/
C ₂₄ /C ₃₀	0.21	0.09	0.15	0.67	0.19	/
C ₂₉ /C ₃₀	1.25	0.98	0.98	1.24	1.13	/
C ₃₁ (S)/C ₃₁ (R)	/	1.77	0.66	/	/	/
C ₃₂ (S)/C ₃₂ (R)	/	1.99	/	/	/	/
Ts/Tm	0.91	0.88	0.00	0.00	0.51	/
C ₂₇ αββ/ C ₂₉ αββ	1.05	0.58	/	/	0.67	/
C ₃₀ /(C ₃₁ +C ₃₂ +C ₃₃ +C ₃₄ +C ₃₅)	/	0.35	1.39	/	/	/

Table S5 Biomarker analysis results

ESTD sample No.	2010/06/29-1575	2010/06/29-1576	2010/06/29-1577	2010/06/29-1578	2010/06/29-1579	2010/06/29-1580
Sample info.	Husky Heavy F4	Nordeg	Big Lake	Kinder Morgan	Jeffrey S-003	Jeffrey S-011
Biomarkers	(ng/g)	(ng/g)	(ng/g)	(ng/g)	(ng/g)	(ng/g)
C21 terpane	109	460	2215	73442	16.2	4371
C22 terpane	52.3	132	649	22066	5.66	1628
C23 terpane	419	873	6393	175891	42.4	6396
C24 terpane	265	624	3279	103209	33.4	2450
C27 Ts	453	916	6411	100092	57.2	75.9
C27 Tm	1182	335	5429	223796	81.2	81.7
C29 ab Hopane	3228	2201	30675	632884	264	248
C30 ab Hopane	3636	4215	50165	916763	304	245
C31(S) hopane	1690	1334	15452	393249	143	129
C31(R) hopane	1287	794	11316	265092	92.7	97.5
C32(S) hopane	1155	1074	11090	266086	96.0	110.7
C32(R) hopane	858	802	7943	184031	65.6	75.9
C33(S) hopane	951	843	8640	204154	72.1	63.2
C33(R) hopane	658	610	6062	133879	45.8	56.1
C34(S) hopane	720	632	5753	123375	65.0	79.0
C34(R) hopane	491	440	3881	78520	40.4	54.9
C35(S) hopane	916	424	3170	74800	52.8	44.4
C35(R) hopane	571	415	2916	62115	33.6	27.9
C27aββ steranes	1921	7852	41476	827335	220	246
C28aββ steranes	1742	8823	15668	334805	140	148
C29aββ steranes	3088	8102	46474	984749	296	251
Sum	25393	41901	285055	6180333	2168	16880
Diagnostic Ratios						
C ₂₃ /C ₂₄	1.58	1.40	1.95	1.70	1.27	2.61
C ₂₃ /C ₃₀	0.12	0.21	0.13	0.19	0.14	26.11
C ₂₄ /C ₃₀	0.07	0.15	0.07	0.11	0.11	10.00
C ₂₉ /C ₃₀	0.89	0.52	0.61	0.69	0.87	1.01
C ₃₁ (S)/C ₃₁ (R)	1.31	1.68	1.37	1.48	1.54	1.33
C ₃₂ (S)/C ₃₂ (R)	1.35	1.34	1.40	1.45	1.46	1.46
Ts/Tm	0.38	2.74	1.18	0.45	0.70	0.93
C ₂₇ αββ/ C ₂₉ αββ	0.62	0.97	0.89	0.84	0.74	0.98
C ₃₀ /(C ₃₁ +C ₃₂ +C ₃₃ +C ₃₄ +C ₃₅)	0.39	0.57	0.66	0.51	0.43	0.33

Table S5 Biomarker analysis results

ESTD sample No.	2010/06/29- 1581	2010/06/29- 1582	2010/06/29- 1583	2010/06/29- 1584	2010/06/29- 1585
Sample info.	Swan Hills-7	Hinton-I	OWA RBH4-I	Wood chips	WG112025 Lab Balnk
Biomarkers	(ng/g)	(ng/g)	(ng/g)	(ng/g)	(ng/mL)
C21 terpane	393	3587	4389	313	0.00
C22 terpane	105	1386	959	99	0.00
C23 terpane	767	6290	8513	572	0.00
C24 terpane	556	1988	6280	479	0.00
C27 Ts	1035	257	10704	511	0.00
C27 Tm	408	249	7038	1653	0.00
C29 ab Hopane	1819	862	34316	5622	0.00
C30 ab Hopane	2374	1096	73022	8724	0.00
C31(S) hopane	704	521	23383	2408	0.00
C31(R) hopane	590	488	17037	1769	0.00
C32(S) hopane	546	357	19132	1745	0.00
C32(R) hopane	427	247	14535	1228	0.00
C33(S) hopane	448	318	16198	1341	0.00
C33(R) hopane	291	188	12297	950	0.00
C34(S) hopane	319	204	11754	923	0.00
C34(R) hopane	227	141	8188	642	0.00
C35(S) hopane	197	156	7861	721	0.00
C35(R) hopane	177	118	7280	506	0.00
C27aββ steranes	4359	1843	121419	1563	0.00
C28aββ steranes	2560	1440	153822	3215	0.00
C29aββ steranes	4218	2050	129947	4812	0.00
Sum	22520	23787	688075	39796	0.00
Diagnostic Ratios					
C ₂₃ /C ₂₄	1.38	3.16	1.36	1.20	/
C ₂₃ /C ₃₀	0.32	5.74	0.12	0.07	/
C ₂₄ /C ₃₀	0.23	1.81	0.09	0.05	/
C ₂₉ /C ₃₀	0.77	0.79	0.47	0.64	/
C ₃₁ (S)/C ₃₁ (R)	1.19	1.07	1.37	1.36	/
C ₃₂ (S)/C ₃₂ (R)	1.3	1.44	1.32	1.42	/
Ts/Tm	2.54	1.03	1.52	0.31	/
C ₂₇ αββ/ C ₂₉ αββ	1.03	0.90	0.93	0.32	/
C ₃₀ /(C ₃₁ +C ₃₂ +C ₃₃ +C ₃₄ +C ₃₅)	0.60	0.40	0.53	0.71	/

Table S6 Biogenic compounds analysis results

ESTD code	2010/06/29-1563 T.O. Background site plant sample	2010/06/29-1564 OWA Background plants	2010/06/29-1565 Turner Valley plants	2010/06/29-1566 Sarnia plants	2010/06/29-1567 Hinton plants	2010/06/29-1568 Swan Hills plants
Customer sample info.						
Compounds	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g
Fatty acids						
C10 fatty acid	1.35	2.29	2.89	2.96	0.85	0.86
C11 fatty acid	0.00	0.00	0.00	0.00	0.00	0.00
C12 Fatty acid	1.51	4.52	11.5	22.1	7.29	8.43
C13 fatty acid	0.00	2.81	1.68	1.89	0.39	0.51
C14 fatty acid	8.22	14.6	37.6	49.3	15.3	11.5
C15 fatty acid	12.1	15.9	29.8	27.5	5.40	2.41
C16:1 9d FA	37.0	104	45.8	24.7	10.6	2.48
C16 fatty acid	215	359	503	537	177	86.6
C17 fatty acid	3.66	0.00	16.0	23.9	4.20	1.18
C18:2FA 9,12d	0.00	0.00	0.00	0.00	0.00	0.00
C18:1FA 9d	31.6	135	377	339	143	19.7
C18 fatty acid	11.6	109	172	180	59.8	10.5
C19 fatty acid	0.17	0.00	8.87	11.6	1.57	0.14
C20 fatty acid	2.28	61.0	108	105	31.0	3.72
C21 fatty acid	0.00	12.9	30.6	29.8	5.97	0.57
C22 fatty acid	4.09	73.3	222	172	59.9	4.56
C23 fatty acid	0.73	29.9	75.8	61.2	13.13	0.63
C24 fatty acid	1.23	93.0	277	184	73.0	5.36
C25 fatty acid	0.00	14.9	21.4	12.7	4.44	0.00
C26 fatty acid	0.48	60.3	215	232	83.5	3.71
C27 fatty acid	0.00	0.00	12.0	11.3	4.61	0.00
C28 fatty acid	4.14	70.9	143	154	76.5	3.10
C29 fatty acid	0.00	0.00	9.49	15.3	6.53	0.00
C30 fatty acid	0.00	0.00	102	115	64.9	3.97
C31 fatty acid	0.00	0.00	2.23	3.47	2.21	0.00
C32 fatty acid	0.00	0.00	11.5	29.6	19.1	0.00
Sum of fatty acids	335	1163	2436	2345	871	170
Fatty alcohols						
C16 alcohol	0.98	4.44	19.5	3.85	5.91	1.54
C17 alcohol	1.37	0.17	0.14	0.00	0.00	0.14
C18 alcohol	1.22	3.16	1.63	1.50	0.56	0.99
Phytol	103	639	227	637	360	231
C19 alcohol	1.08	2.46	0.36	0.00	0.53	0.07
C20 alcohol	0.67	3.76	1.56	1.12	1.81	0.56
C21 alcohol	0.61	1.53	0.72	3.91	0.22	0.16
C22 alcohol	7.79	28.7	6.66	7.26	4.17	2.63
C23 alcohol	0.48	3.95	1.08	0.85	2.40	0.27
C24 alcohol	14.7	43.1	14.6	16.5	12.3	7.88
C25 alcohol	0.77	9.16	5.45	7.47	2.39	1.73
C26 alcohol	16.4	920	848	932	279	227
C27 alcohol	0.99	16.1	12.9	13.5	6.86	3.68
C28 alcohol	18.8	171	212	217	57.1	40.9
C29 alcohol	1.10	6.92	14.8	12.9	8.51	4.87
C30 alcohol	5.07	41.5	20.8	12.1	7.33	5.62
C31 alcohol	1.04	0.00	11.0	8.72	4.07	2.59
C32 alcohol	2.99	11.0	21.1	14.0	3.60	2.93
Sum of fatty alcohols	179	1906	1419	1889	757	534
Sterols						
S1+S10: 5β-Cholestan-(3α+3β)-ol	0.06	0.00	0.20	0.12	0.00	0.02
S2: Cholesterol	2.03	34.2	6.84	5.53	2.55	1.98
S11: 5α-Cholestan-3β-ol	0.13	3.88	1.07	0.45	0.07	0.07
S9: 5α-Cholestan-3-one	0.00	4.17	2.73	3.09	0.91	0.00
S3: Desmosterol	0.48	12.1	0.00	0.00	0.00	0.00
S12: Campesterol	28.7	66.1	81.0	76.8	43.5	28.0
S4: Stigmasterol	108	74.0	107	135	55.7	36.8
S5: β-Sitosterol	183	414	283	353	160	97.0
S6: Stigmastanol	8.41	45.4	12.5	16.1	5.47	4.96
S7: β-Amyrin	107	9.93	26.3	10.7	17.6	0.00
S8: α-AMyrin	55.8	11.7	8.33	4.21	4.69	0.00
Friedelin	0.00	0.00	0.00	2.31	0.00	0.00
Sum of sterols	493	676	528	607	290	169
Total biogenic compounds	1007	3744	4383	4841	1918	873

Table S6 Biogenic compounds analysis results

ESTD code	2010/06/29-1569	2010/06/29-1570	2010/06/29-1571	2010/06/29-1572	2010/06/29-1573	2010/06/29-1574
	T.O.	Kingston	OWA SBH2	OWA SBH30	Kinder Morgan	
Customer sample info.	Background soil	Background soil	soil background	soil background	Background soil	Blank
Compounds	µg/g	µg/g	µg/g	µg/g	µg/g	µg/mL
Fatty acids						
C10 fatty acid	0.40	1.26	1.05	0.63	1.52	0.09
C11 fatty acid	0.00	0.00	0.00	0.00	0.00	0.00
C12 Fatty acid	0.56	1.21	1.78	0.70	1.7	0.09
C13 fatty acid	0.08	0.36	0.36	0.19	0.47	0.03
C14 fatty acid	1.29	4.06	4.60	1.42	5.04	0.14
C15 fatty acid	0.59	2.60	3.07	0.88	4.28	0.09
C16:1 9d FA	2.88	19.4	8.21	1.84	8.92	0.22
C16 fatty acid	10.1	56.3	43.9	21.6	70.8	2.40
C17 fatty acid	0.45	3.67	4.00	0.65	1.64	0.05
C18:2FA 9,12d	0.00	0.00	0.00	0.00	0.00	0.00
C18:1FA 9d	9.7	38.3	20.1	7.35	25.8	0.23
C18 fatty acid	4.00	45.2	40.3	18.4	72.0	2.57
C19 fatty acid	0.41	2.51	0.58	0.62	1.61	0.01
C20 fatty acid	6.02	11.3	28.8	6.99	32.9	0.16
C21 fatty acid	2.24	5.24	13.4	2.79	9.05	0.02
C22 fatty acid	18.5	28.1	161	29.4	170	0.39
C23 fatty acid	9.55	13.4	70.7	11.3	55.1	0.07
C24 fatty acid	34.6	43.6	286	52.7	278	0.38
C25 fatty acid	4.74	6.01	29.5	4.35	25.4	0.04
C26 fatty acid	22.8	17.8	108	18.2	72.1	0.15
C27 fatty acid	2.97	3.89	6.73	0.00	5.18	0.00
C28 fatty acid	14.4	12.3	37.3	12.5	38.6	0.10
C29 fatty acid	0.00	3.96	2.57	0.00	4.44	0.00
C30 fatty acid	7.19	14.3	18.7	0.00	27.1	0.00
C31 fatty acid	0.00	1.25	9.43	0.00	3.37	0.00
C32 fatty acid	0.00	1.03	2.41	0.00	1.83	0.00
Sum of fatty acids	154	337	902	192.4	917	7.23
Fatty alcohols						
C16 alcohol	0.11	0.38	0.47	0.41	0.62	0.00
C17 alcohol	0.00	0.12	0.28	0.14	0.16	0.00
C18 alcohol	0.30	0.85	0.78	0.69	1.21	0.01
Phytol	1.41	3.13	6.14	5.51	3.55	0.03
C19 alcohol	0.14	0.00	0.12	0.12	0.00	0.06
C20 alcohol	0.36	1.49	3.54	1.94	6.89	0.00
C21 alcohol	0.12	0.61	1.14	1.20	1.57	0.10
C22 alcohol	1.92	14.0	38.9	25.0	23.5	0.00
C23 alcohol	0.18	2.43	3.42	2.74	2.67	0.06
C24 alcohol	5.30	16.7	46.4	29.4	26.7	0.03
C25 alcohol	0.40	2.65	4.88	2.47	2.33	0.01
C26 alcohol	9.10	13.6	72.3	43.6	22	0.21
C27 alcohol	0.69	1.39	3.88	2.77	2.82	0.02
C28 alcohol	5.07	10.8	34.5	65.5	38.7	0.18
C29 alcohol	0.59	1.16	1.81	1.51	1.02	0.00
C30 alcohol	3.23	5.96	13.0	12.5	11.4	0.02
C31 alcohol	0.28	1.00	0.94	0.00	0.57	0.00
C32 alcohol	1.39	3.13	4.57	3.26	6.23	0.00
Sum of fatty alcohols	30.6	79.4	237	199	152	0.72
Sterols						
S1+S10: 5β-Cholestan-(3α+3β)-ol	0.04	0.00	0.27	0.20	0.25	0.00
S2: Cholesterol	1.65	5.54	2.09	1.76	3.48	0.00
S11: 5α-Cholestan-3β-ol	0.16	0.73	0.84	1.26	1.25	0.00
S9: 5α-Cholestan-3-one	0.00	0.00	0.16	0.07	0.00	0.00
S3: Desmosterol	0.00	0.37	0.00	0.00	0.27	0.00
S12: Campesterol	2.22	6.90	15.2	9.01	22.1	0.04
S4: Stigmasterol	5.94	8.25	5.08	4.92	10.9	0.00
S5: β-Sitosterol	16.2	54.6	147	118	165	0.00
S6: Stigmastanol	5.23	12.4	38.3	52.4	25.1	0.00
S7: β-Amyrin	1.80	2.33	3.90	0.91	2.05	0.00
S8: α-Amyrin	0.39	3.15	7.85	0.92	3.10	0.00
Friedelin	1.30	4.54	30.4	11.4	3.67	0.00
Sum of sterols	34.9	98.9	251	201	238	0.04
Total biogenic compounds	219	515	1390	592	1306	7.98

Table S6 Biogenic compounds analysis results

ESTD code	2010/06/29-1575	2010/06/29-1576	2010/06/29-1577	2010/06/29-1578	2010/06/29-1579	2010/06/29-1580
Customer sample info.	Husky Heavy F4	Nordeg	Big Lake	Kinder Morgan	Jeffrey S-003	Jeffrey S-011
Compounds	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g
Fatty acids						
C10 fatty acid	0.57	0.36	1.14	15.2	0.05	0.04
C11 fatty acid	0.00	0.00	0.00	0.00	0.00	0.00
C12 Fatty acid	0.76	0.60	1.63	17.2	0.05	0.03
C13 fatty acid	0.25	0.16	1.08	5.82	0.01	0.00
C14 fatty acid	1.38	0.76	1.23	27.8	0.03	0.04
C15 fatty acid	0.98	0.31	0.94	19.3	0.02	0.00
C16:1 9d FA	1.22	0.77	0.00	17.2	0.09	0.43
C16 fatty acid	15.4	3.62	5.35	624	0.18	0.78
C17 fatty acid	0.74	0.51	0.00	21.1	0.01	0.00
C18:2FA 9,12d	7.95	0.00	0.00	0.00	0.00	0.00
C18:1FA 9d	8.16	1.85	0.00	0.00	0.00	0.36
C18 fatty acid	17.1	2.49	3.43	803	0.16	0.64
C19 fatty acid	0.65	0.00	0.00	11.7	0.00	0.00
C20 fatty acid	10.4	5.28	1.68	89.3	0.06	0.06
C21 fatty acid	4.07	0.00	0.00	30.1	0.00	0.00
C22 fatty acid	60.1	8.17	3.22	283	0.15	0.14
C23 fatty acid	26.9	0.00	0.00	61.9	0.03	0.00
C24 fatty acid	149	7.09	4.55	310	0.23	0.15
C25 fatty acid	20.9	0.00	0.00	39.2	0.00	0.00
C26 fatty acid	77.9	2.17	2.49	102	0.08	0.00
C27 fatty acid	8.60	0.00	0.00	13.0	0.00	0.00
C28 fatty acid	58.6	2.28	1.87	78.0	0.03	0.00
C29 fatty acid	6.20	0.00	0.00	36.9	0.00	0.00
C30 fatty acid	37.0	0.00	0.00	58.5	0.00	0.00
C31 fatty acid	2.72	0.00	0.00	0.00	0.00	0.00
C32 fatty acid	15.1	0.00	0.00	0.00	0.00	0.00
Sum of fatty acids	533	36.4	28.6	2664	1.19	2.68
Fatty alcohols						
C16 alcohol	0.15	0.27	0.15	8.9	0.01	0.09
C17 alcohol	0.03	0.00	0.00	0.00	0.00	0.02
C18 alcohol	0.33	0.82	0.46	26.4	0.03	0.22
Phytol	0.00	14.2	0.00	0.00	0.00	0.00
C19 alcohol	0.00	1.65	0.00	3.87	0.01	0.02
C20 alcohol	0.29	2.70	0.16	10.9	0.02	0.11
C21 alcohol	0.06	0.17	0.00	2.82	0.00	0.01
C22 alcohol	1.39	6.74	0.79	99.3	0.10	0.87
C23 alcohol	0.15	0.37	0.00	8.07	0.01	0.08
C24 alcohol	1.31	5.97	0.67	92.5	0.17	0.79
C25 alcohol	0.00	0.19	0.00	2.17	0.02	0.08
C26 alcohol	2.51	3.97	1.83	31.8	0.24	7.41
C27 alcohol	0.00	0.00	0.00	1.69	0.00	0.13
C28 alcohol	1.51	2.17	0.71	9.86	0.22	1.65
C29 alcohol	0.00	0.31	0.00	0.00	0.00	0.16
C30 alcohol	1.00	2.10	0.00	6.27	0.04	0.23
C31 alcohol	0.00	0.00	0.00	0.00	0.00	0.00
C32 alcohol	0.00	0.87	0.00	0.00	0.03	0.17
Sum of fatty alcohols	8.74	42.5	4.78	304	0.89	12.0
Sterols						
S1+S10: 5β-Cholestan-(3α+3β)-ol	0.00	0.00	0.00	0.00	0.00	0.00
S2: Cholesterol	0.24	0.51	0.00	5.22	0.05	0.21
S11: 5α-Cholestan-3β-ol	0.00	0.85	0.00	0.00	0.02	0.00
S9: 5α-Cholestan-3-one	0.00	0.24	0.00	0.00	0.00	0.00
S3: Desmosterol	0.00	0.00	0.00	0.00	0.00	0.00
S12: Campesterol	0.78	6.51	0.42	49.1	0.19	0.48
S4: Stigmasterol	0.87	2.69	0.00	4.02	0.59	0.00
S5: β-Sitosterol	3.84	69.7	1.66	211	1.17	1.79
S6: Stigmastanol	1.17	7.40	0.83	117	0.22	1.14
S7: β-Amyrin	0.52	0.00	0.00	0.82	0.06	0.01
S8: α-Amyrin	0.22	0.29	0.00	0.00	0.13	0.00
Friedelin	0.00	0.00	0.00	0.00	0.00	0.00
Sum of sterols	7.63	88.1	2.91	388	2.42	3.64
Total biogenic compounds	549	167	36.3	3356	4.51	18.3

Table S6 Biogenic compounds analysis results

ESTD code	2010/06/29-1581	2010/06/29-1582	2010/06/29-1583	2010/06/29-1584	2010/06/29-1585
Customer sample info.	Swan Hills-7	Hinton-I	OWA RBH4-I	Wood chips	Blank
Compounds	µg/g	µg/g	µg/g	µg/g	µg/mL
Fatty acids					
C10 fatty acid	0.06	0.30	1.19	0.38	0.19
C11 fatty acid	0.00	0.00	0.00	0.00	0.00
C12 Fatty acid	0.09	0.61	1.24	0.35	0.22
C13 fatty acid	0.02	0.17	0.32	0.00	0.09
C14 fatty acid	0.12	1.10	2.20	0.79	0.45
C15 fatty acid	0.06	0.00	1.36	0.79	0.34
C16:1 9d FA	0.12	3.24	2.45	5.50	0.42
C16 fatty acid	1.02	13.8	22.5	14.4	13.4
C17 fatty acid	0.04	2.46	0.66	0.00	0.42
C18:2FA 9,12d	0.00	14.3	0.00	0.00	0.00
C18:1FA 9d	0.80	13.8	13.2	17.6	4.45
C18 fatty acid	0.93	12.2	24.1	6.16	17.9
C19 fatty acid	0.09	0.57	0.28	0.00	0.19
C20 fatty acid	0.45	30.4	12.9	4.63	2.48
C21 fatty acid	0.09	3.19	1.65	0.00	0.90
C22 fatty acid	0.68	72.9	36.4	1.89	10.1
C23 fatty acid	0.13	8.48	8.15	0.49	2.57
C24 fatty acid	0.74	92.3	54.4	1.80	12.0
C25 fatty acid	0.00	3.70	3.52	0.15	1.35
C26 fatty acid	0.17	17.2	10.6	0.91	5.52
C27 fatty acid	0.00	1.72	2.24	0.00	0.52
C28 fatty acid	0.15	6.20	7.74	0.15	3.29
C29 fatty acid	0.00	0.00	0.89	0.00	0.81
C30 fatty acid	0.00	3.52	0.00	0.00	2.11
C31 fatty acid	0.00	0.00	0.00	0.00	0.00
C32 fatty acid	0.00	0.00	0.00	0.00	0.37
Sum of fatty acids	5.77	302	207.9	56.0	80.1
Fatty alcohols					
C16 alcohol	0.10	0.11	0.46	0.09	0.00
C17 alcohol	0.02	0.00	0.14	0.81	0.02
C18 alcohol	0.26	0.50	1.02	0.67	0.03
Phytol	0.29	5.41	38.6	0.00	0.05
C19 alcohol	0.04	1.25	0.12	0.00	0.10
C20 alcohol	0.30	0.00	3.66	1.17	0.02
C21 alcohol	0.06	0.62	0.56	0.40	0.33
C22 alcohol	1.41	3.39	16.9	3.00	0.00
C23 alcohol	0.11	1.65	1.69	0.32	0.02
C24 alcohol	1.28	2.75	20.1	1.47	0.18
C25 alcohol	0.06	0.21	1.60	0.49	0.05
C26 alcohol	1.59	1.27	17.9	0.26	1.21
C27 alcohol	0.06	0.18	1.03	0.00	0.10
C28 alcohol	0.49	0.41	11.6	0.17	1.06
C29 alcohol	0.03	0.11	0.63	0.09	0.02
C30 alcohol	0.24	0.16	4.36	0.00	0.21
C31 alcohol	0.00	0.12	0.00	0.00	0.02
C32 alcohol	0.07	0.08	1.62	0.00	0.18
Sum of fatty alcohols	6.41	18.2	122	8.94	3.58
Sterols					
S1+S10: 5β-Cholestan-(3α+3β)-ol	0.00	0.03	0.20	0.00	0.00
S2: Cholesterol	0.14	0.66	1.92	1.87	0.06
S11: 5α-Cholestan-3β-ol	0.05	0.04	1.16	0.05	0.00
S9: 5α-Cholestan-3-one	0.00	0.02	1.25	0.00	0.00
S3: Desmosterol	0.00	0.20	0.00	0.32	0.00
S12: Campesterol	1.51	5.11	28.4	2.06	0.03
S4: Stigmasterol	0.36	1.90	8.85	2.18	0.00
S5: β-Sitosterol	8.04	47.7	165	10.2	0.01
S6: Stigmastanol	1.66	2.15	23.1	3.55	0.00
S7: β-Amyrin	0.13	0.09	1.65	0.27	0.33
S8: α-Amyrin	0.11	0.04	3.42	0.37	0.00
Friedelin	0.00	0.00	4.33	0.00	1.40
Sum of sterols	12.0	58.0	239	20.9	1.85
Total biogenic compounds	24.2	378	569	85.8	85.5

Table S7 Source identification based on the End Member (EM) profiles in Figure 9

End Member	Source and rationale
EM1	Mid-chain alkanes indicative of a lightly weathered crude oil
EM2	Odd over even dominance suggesting terrestrial plant matter
EM3	As above but slight longer chains – may be the same source or indicate different climatic zones
EM4	Heavily weathered crude oil due to resistant pristane and phytane and some long chain alkanes
EM5	Short chain alkane suite indicative of a refined fuel such as diesel