

**Table 1: Particle Size Analytical Results - Soil**

**Alberta Energy Regulator Imperial Kearn Oil Sands, Wood Buffalo, Alberta**

Sample Identification	SL01:0-0.1	SL01:0.1-0.3	SL01:0.3-1.0	SL018:0-0.1	SL018:0.1-0.3	SL018:0.3-1.0
Sample Location	delineation	delineation	delineation	delineation	delineation	delineation
Depth (mbg)	0-0.1	0.1-0.3	0.3-1.0	0-0.1	0.1-0.3	0.3-1.0
Date Sampled	27-Sep-23	27-Sep-23	27-Sep-23	27-Sep-23	27-Sep-23	27-Sep-23
Laboratory Sample Identification	5330808	5330810	5330811	5330818	5330819	5330820
Laboratory Report Number	23E075537	23E075537	23E075537	23E075537	23E075537	23E075537
<b>Grain Size 75 µm Sieve</b>						
Percent Retained on Sieve	76	99	99	29	25	26
Soil Type (fine / coarse)	Coarse	Coarse	Coarse	Fine	Fine	Fine
<b>Soil Texture 2-Point Hydrometer</b>						
Percent Sand	80	96	96	44	38	38
Percent Silt	12	2	2	44	52	48
Percent Clay	8	2	2	12	10	14
Soil Textural Class	Loamy Sand	Sand	Sand	Loam	Silt Loam	Loam

Notes:

Units are Percent (%) unless otherwise noted.

mbg = metres below grade; na = not analyzed; µm = micron.

**Table 2: Petroleum Hydrocarbons Analytical Results - Soil**
**Alberta Energy Regulator**
**Imperial Kearn Oil Sands, Wood Buffalo, Alberta**

Sample Identification	Natural Area	Natural Area	SL01:0-0.1	SL01:0.1-0.3	SL01 :0.3-1.0	SL10:0-0.1	SL10:0.3	SL11:0-0.1	SL11:0.3	SL12:0-0.1	SL12:0.3	SL13: 0-0.1
Sample Location	Surface Soil  Land Use Guidelines	Surface Soil  Land Use Guidelines	delineation	delineation	delineation	delineation	delineation	delineation	delineation	delineation	delineation	delineation
Depth (mbg)			0-0.1	0.1-0.3	0.3-1.0	0-0.1	0.3	0-0.1	0.3	0-0.1	0.3	0-0.1
Date Sampled			27-Sep-23	27-Sep-23	24-Oct-23	7-Apr-23	7-Apr-23	7-Apr-23	7-Apr-23	7-Apr-23	7-Apr-23	22-Apr-23
Laboratory Sample Identification			5330808	5330810	5402880	4903770	4903771	4903772	4903773	4903774	4903775	4937450
Laboratory Report Number			23E075537	23E075537	23E085932	23E012607	23E012607	23E012607	23E012607	23E012607	23E012607	23I017391
Surface Soil/Subsoil			Surface Soil	Surface Soil	Surface Soil	Surface Soil	Surface Soil	Surface Soil	Surface Soil	Surface Soil	Surface Soil	Surface Soil
OVA (ppm)			na	na	na	na	na	na	na	na	na	na
Cheiron (Positive/Negative)			na	na	na	na	na	na	na	na	na	na
<b>BTEX</b>	<b>BTEX</b>	<b>BTEX</b>										
Benzene	0.046	0.078	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Toluene	0.52	0.12	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Ethylbenzene	0.073	0.14	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.01
Xylenes	0.99	1.9	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
<b>PHC (F1-F4)</b>	<b>PHC (F1-F4)</b>	<b>PHC (F1-F4)</b>										
F1 (C6-C10)	ng	ng	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
F1-BTEX <sup>a</sup>	210	210	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
F2 (C11-C16)	150	150	<10	<10	<10	12	19	<10	<10	25	31	60
F3 (C17-C34)	1,300	300	219	53	76	220	355	151	101	386	819	1,660
F4 (C34-C50+)	5,600	2,800	162	54	58	175	248	114	89	265	272	930
Moisture Content (%)	ng	ng	13	6	18	57	53	28	29	71	84	83

Notes:

Units are mg/kg unless otherwise noted.

BTEX = benzene, toluene, ethylbenzene, xylenes; F1-F4 = fraction 1 - fraction 4; mbg = metres below grade; mg/kg = milligrams per kilogram; na = not analyzed; ng = no guideline; OVA = organic vapour analysis; PHC = petroleum hydrocarbons; ppm = parts per million; < = below laboratory method detection limit.

All combustible vapour readings measured using a RKI Eagle portable gas monitor (or equivalent).

<sup>a</sup> = F1(C6-C10) includes the entire C6-C10 fraction including BTEX. The F1-BTEX value is compared to the guideline as BTEX parameters have separate guidelines.

Guideline

<sup>b</sup> Alberta Environment and Protected Areas (AEPA). 2023. *Alberta Tier 1 Soil and Groundwater Remediation Guidelines*. Land Policy Branch, Policy and Planning Division. January 1, 2023.

**Table 2: Petroleum Hydrocarbons Analytical Results - Soil**
**Alberta Energy Regulator**
**Imperial Keral Oil Sands, Wood Buffalo, Alberta**

Sample Identification	Natural Area	Natural Area	SL14: 0-0.1	SL15: 0-0.1	SL016:0-0.1	SL016:0.1-0.3	SL016:0.3-1.0	SL017:0-0.1	SL017:0.1-0.3	SL017:0.3-1.0	SL018:0-0.1	SL018:0.1-0.3
Sample Location	Surface Soil  Land Use Guidelines	Surface Soil  Land Use Guidelines	delineation	delineation	delineation	delineation	delineation	delineation	delineation	delineation	delineation	delineation
Depth (mbg)			0-0.1	0-0.1	0-0.1	0.1-0.3	0.3-1.0	0-0.1	0.1-0.3	0.3-1.0	0-0.1	0.1-0.3
Date Sampled			22-Apr-23	22-Apr-23	27-Sep-23	27-Sep-23	27-Sep-23	27-Sep-23	27-Sep-23	27-Sep-23	27-Sep-23	27-Sep-23
Laboratory Sample Identification			4937454	4937455	5330812	5330813	5330814	5330815	5330816	5330817	5330818	5330819
Laboratory Report Number			23I017391	23I017391	23E075537	23E075537	23E075537	23E075537	23E075537	23E075537	23E075537	23E075537
Surface Soil/Subsoil			Surface Soil	Surface Soil	Surface Soil	Surface Soil	Surface Soil	Surface Soil	Surface Soil	Surface Soil	Surface Soil	Surface Soil
OVA (ppm)			na	na	na	na	na	na	na	na	na	na
Cheiron (Positive/Negative)			na	na	na	na	na	na	na	na	na	na
<b>BTEX</b>	<b>BTEX</b>	<b>BTEX</b>										
Benzene	0.046	0.078	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Toluene	0.52	0.12	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Ethylbenzene	0.073	0.14	<0.01	<0.01	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Xylenes	0.99	1.9	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
<b>PHC (F1-F4)</b>	<b>PHC (F1-F4)</b>	<b>PHC (F1-F4)</b>										
F1 (C6-C10)	ng	ng	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
F1-BTEX <sup>a</sup>	210	210	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
F2 (C11-C16)	150	150	70	40	30	37	57	61	32	46	18	13
F3 (C17-C34)	1,300	300	1,830	1,900	417	1,040	1,520	925	506	863	421	198
F4 (C34-C50+)	5,600	2,800	620	420	195	406	506	312	169	325	720	414
Moisture Content (%)	ng	ng	78	70	78	79	82	83	74	80	28	18

Notes:

Units are mg/kg unless otherwise noted.

BTEX = benzene, toluene, ethylbenzene, xylenes; F1-F4 = fraction 1 - fraction 4; mbg = metres below grade; mg/kg = milligrams per kilogram; na = not analyzed; ng = no guideline; OVA = organic vapour analysis; PHC = petroleum hydrocarbons; ppm = parts per million; < = below laboratory method detection limit.

All combustible vapour readings measured using a RKI Eagle portable gas monitor (or equivalent).

<sup>a</sup> = F1(C6-C10) includes the entire C6-C10 fraction including BTEX. The F1-BTEX value is compared to the guideline as BTEX parameters have separate guidelines.

Guideline

<sup>b</sup> Alberta Environment and Protected Areas (AEPA). 2023. *Alberta Tier 1 Soil and Groundwater Remediation Guidelines*. Land Policy Branch, Policy and Planning Division. January 1, 2023.

**Table 2: Petroleum Hydrocarbons Analytical Results - Soil**
**Alberta Energy Regulator**
**Imperial Kearn Oil Sands, Wood Buffalo, Alberta**

<b>Sample Identification</b>		<b>Natural Area</b>	<b>Natural Area</b>	<b>SL018:0.3-1.0</b>
Sample Location				delineation
Depth (mbg)		<b>Surface Soil</b>	<b>Surface Soil</b>	0.3-1.0
Date Sampled				27-Sep-23
Laboratory Sample Identification				5330820
Laboratory Report Number				23E075537
Surface Soil/Subsoil				Surface Soil
OVA (ppm)		<b>Fine<sup>b</sup></b>	<b>Coarse<sup>b</sup></b>	na
Cheiron (Positive/Negative)				na
<b>BTEX</b>	<b>BTEX</b>	<b>BTEX</b>		
Benzene	0.046	0.078	<0.005	
Toluene	0.52	0.12	<0.05	
Ethylbenzene	0.073	0.14	<0.010	
Xylenes	0.99	1.9	<0.05	
<b>PHC (F1-F4)</b>	<b>PHC (F1-F4)</b>	<b>PHC (F1-F4)</b>		
F1 (C6-C10)	ng	ng	<10	
F1-BTEX <sup>a</sup>	210	210	<10	
F2 (C11-C16)	150	150	24	
F3 (C17-C34)	1,300	300	563	
F4 (C34-C50+)	5,600	2,800	1,260	
Moisture Content (%)	ng	ng	22	

Notes:

Units are mg/kg unless otherwise noted.

BTEX = benzene, toluene, ethylbenzene, xylenes; F1-F4 = fraction 1 - fraction 4; mbg = metres below grade; mg/kg = milligrams per kilogram; na = not analyzed; ng = no guideline; OVA = organic vapour analysis; PHC = petroleum hydrocarbons; ppm = parts per million; < = below laboratory method detection limit.

All combustible vapour readings measured using a RKI Eagle portable gas monitor (or equivalent).

<sup>a</sup> = F1(C6-C10) includes the entire C6-C10 fraction including BTEX. The F1-BTEX value is compared to the guideline as BTEX parameters have separate guidelines.

Guideline

<sup>b</sup> Alberta Environment and Protected Areas (AEPA). 2023. *Alberta Tier 1 Soil and Groundwater Remediation Guidelines*. Land Policy Branch, Policy and Planning Division. January 1, 2023.

**Table 3: Metals Analytical Results - Soil**
**Alberta Energy Regulator**
**Imperial Kearl Oil Sands, Wood Buffalo, Alberta**

Sample Identification	Natural Area Land Use Guidelines <sup>a</sup>	SL01:0-0.1	SL01:0-0.1	SL01:0.1-0.3	SL01:0.3	SL01:0.3-1.0	SL02:0-0.1	SL02:0.3	SL03:0-0.1	SL03:0.3	SL04:0-0.1
Sample Location		delineation	delineation	delineation	delineation	delineation	delineation	delineation	delineation	delineation	delineation
Depth (mbg)		0-0.1	0-0.1	0.1-0.3	0.3	0.3-1.0	0-0.1	0.3	0-0.1	0.3	0-0.1
Date Sampled		15-Mar-23	27-Sep-23	27-Sep-23	15-Mar-23	27-Sep-23	15-Mar-23	15-Mar-23	15-Mar-23	15-Mar-23	15-Mar-23
Laboratory Sample Identification		4859171	5330808	5330810	4859176	5330811	4859177	4859178	4859179	4859180	4859181
Laboratory Report Number		23E006628	23E075537	23E075537	23E006628	23E075537	23E006628	23E006628	23E006628	23E006628	23E006628
Antimony (Sb)	20	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Arsenic (As)	17	1.8	16	<0.5	0.7	<0.5	<0.5	<0.5	1.1	0.9	1
Total Barium (Ba) (strong acid)	750	125	87.5	2.7	72.2	3.3	19.6	5.4	80.8	18.2	69
Beryllium (Be)	5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Boron (B) (saturated paste) (mg/L)	3.3	na	1.1	<0.5	na	<0.5	<0.5	<0.5	<0.5	<0.5	na
Cadmium (Cd)	3.8	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Chromium (Cr) (hexavalent)	0.4	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
Chromium (Cr) (total)	64	2.6	4	1	1.1	0.9	2.6	2.2	6.4	4.3	4.4
Cobalt (Co)	20	1.9	3	<0.5	<0.5	<0.5	0.6	0.5	2.3	1.7	1.9
Copper (Cu)	63	3.5	2.7	0.5	1.3	0.5	1.1	0.8	3	2.7	2.5
Lead (Pb)	70	2.1	1.8	0.5	<0.5	<0.5	0.9	0.7	2.8	2.4	2.2
Mercury (Hg)	12	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Molybdenum (Mo)	4	1	1.7	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Nickel (Ni)	45	4.3	8.1	0.8	1.1	0.8	1.7	1.2	4.4	3.8	4
Selenium (Se)	1	<0.5	<0.5	<0.5	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Silver (Ag)	20	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Thallium (Tl)	1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Tin (Sn)	5	<0.5	0.8	<0.5	<0.5	<0.5	1.1	<0.5	<0.5	<0.5	<0.5
Uranium (U)	33	1	0.6	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Vanadium (V)	130	4.8	8.7	1.4	0.8	1.5	2.6	2.3	9.2	6.7	7
Zinc (Zn)	250	9	10	2	3	2	6	2	11	11	30

Notes:

Units are mg/kg unless otherwise noted.

 CaCl<sub>2</sub> = calcium chloride; mbg = metres below grade; mg/kg = milligrams per kilogram; mg/L = milligrams per litre; na = not analyzed; ng = no guideline; < = below laboratory method detection limit.

Guidelines
<sup>a</sup> Alberta Environment and Protected Areas (AEPA). 2023. *Alberta Tier 1 Soil and Groundwater Remediation Guidelines*. Land Policy Branch, Policy and Planning Division. January 1, 2023.

**Table 3: Metals Analytical Results - Soil**
**Alberta Energy Regulator**
**Imperial Kearn Oil Sands, Wood Buffalo, Alberta**

Sample Identification	Natural Area Land Use Guidelines <sup>a</sup>	SL04:0.3	SL05:0-0.1	SL05:0.3	SL06:0-0.1	SL06:0.3	SL07:0-0.1	SL07:0.3	SL08:0-0.1	SL08:0.3	SL09:0-0.1
Sample Location		delineation									
Depth (mbg)		0.3	0-0.1	0.3	0-0.1	0.3	0-0.1	0.3	0-0.1	0.3	0-0.1
Date Sampled		15-Mar-23									
Laboratory Sample Identification		4859182	4859183	4859184	4859185	4859186	4859187	4859188	4859189	4859190	4859191
Laboratory Report Number		23E006628									
Antimony (Sb)	20	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Arsenic (As)	17	1.4	1.7	1.4	1.2	1.2	0.9	2.1	2.9	3	2.9
Total Barium (Ba) (strong acid)	750	76.4	126	98.4	100	92.3	27.2	52.6	123	84.5	39.8
Beryllium (Be)	5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Boron (B) (saturated paste) (mg/L)	3.3	1.6	1.5	3.4	3.7	3.4	<0.5	<0.5	<0.5	<0.5	<0.5
Cadmium (Cd)	3.8	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Chromium (Cr) (hexavalent)	0.4	<0.30	<0.30	na	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
Chromium (Cr) (total)	64	4.7	6.4	6.4	5.9	6.2	4.3	8.3	8.6	7.5	8.4
Cobalt (Co)	20	2.8	4.2	3.5	2.7	2.8	2.4	4.6	5.3	4.7	5.3
Copper (Cu)	63	2.9	3.5	3.5	3.8	4.5	1.1	2.5	6.1	4.7	2.6
Lead (Pb)	70	2.6	3.9	3.9	3.6	3.1	2.2	4.5	5.1	3.8	6.1
Mercury (Hg)	12	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Molybdenum (Mo)	4	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	0.6
Nickel (Ni)	45	5.5	7.6	6.9	6.2	6.6	3.9	9.1	14.2	11	8.2
Selenium (Se)	1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Silver (Ag)	20	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Thallium (Tl)	1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Tin (Sn)	5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Uranium (U)	33	0.5	<0.5	<0.5	<0.5	<0.5	0.5	<0.5	<0.5	0.6	<0.5
Vanadium (V)	130	8.4	11.8	11.5	10.2	11.6	7.2	15.5	22.3	20.8	26.8
Zinc (Zn)	250	31	33	30	31	35	7	14	46	28	21

Notes:

Units are mg/kg unless otherwise noted.

 CaCl<sub>2</sub> = calcium chloride; mbg = metres below grade; mg/kg = milligrams per kilogram; mg/L = milligrams per litre; na = not analyzed; ng = no guideline; < = below laboratory method detection limit.

Guidelines
<sup>a</sup> Alberta Environment and Protected Areas (AEPA). 2023. *Alberta Tier 1 Soil and Groundwater Remediation Guidelines*. Land Policy Branch, Policy and Planning Division. January 1, 2023.

**Table 3: Metals Analytical Results - Soil**
**Alberta Energy Regulator**
**Imperial Kearn Oil Sands, Wood Buffalo, Alberta**

Sample Identification	Natural Area Land Use Guidelines <sup>a</sup>	SL09:0.3	SL10:0-0.1	SL10:0.3	SL11:0-0.1	SL11:0.3	SL12:0-0.1	SL12:0.3	SL13: 0-0.1	SL14: 0-0.1	SL15: 0-0.1
Sample Location		delineation									
Depth (mbg)		0.3	0-0.1	0.3	0-0.1	0.3	0-0.1	0.3	0-0.1	0-0.1	0-0.1
Date Sampled		15-Mar-23	7-Apr-23	7-Apr-23	7-Apr-23	7-Apr-23	7-Apr-23	7-Apr-23	22-Apr-23	22-Apr-23	22-Apr-23
Laboratory Sample Identification		4859192	4903770	4903771	4903772	4903773	4903774	4903775	4937450	4937454	4937455
Laboratory Report Number		23E006628	23E012607	23E012607	23E012607	23E012607	23E012607	23E012607	23I017391	23I017391	23I017391
Antimony (Sb)	20	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Arsenic (As)	17	3.7	2.2	1.9	1.4	0.5	1.1	1.1	2.5	8.9	3.8
Total Barium (Ba) (strong acid)	750	50.6	108	119	101	28.7	39.3	71.1	116	332	556
Beryllium (Be)	5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Boron (B) (saturated paste) (mg/L)	3.3	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Cadmium (Cd)	3.8	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Chromium (Cr) (hexavalent)	0.4	<0.30	NR	NR	NR	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
Chromium (Cr) (total)	64	13.5	8	7.8	6	2.7	5.5	1.2	6.4	6	1.7
Cobalt (Co)	20	6.7	3.6	3.3	2.5	1.1	1.3	0.6	6.5	12.3	2.5
Copper (Cu)	63	5.1	5.7	6.5	3.7	1.7	2.5	1.7	5.2	4.4	1.7
Lead (Pb)	70	7.3	3.4	3.2	2.7	1.2	2.3	0.9	4.1	5.2	1
Mercury (Hg)	12	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Molybdenum (Mo)	4	0.9	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.5	0.8	0.8
Nickel (Ni)	45	10.4	9.1	9.6	5.2	2.6	3.4	1.9	10.3	11.4	3
Selenium (Se)	1	<0.5	0.8	0.8	0.5	<0.5	<0.5	0.7	<0.5	<0.5	<0.5
Silver (Ag)	20	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Thallium (Tl)	1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Tin (Sn)	5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	1	<0.5	<0.5
Uranium (U)	33	0.6	0.6	0.6	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Vanadium (V)	130	30.1	12.9	12.4	9.6	3.9	7.5	2.1	14.3	15.7	3.4
Zinc (Zn)	250	25	25	26	15	7	9	10	230	46	16

Notes:

Units are mg/kg unless otherwise noted.

 CaCl<sub>2</sub> = calcium chloride; mbg = metres below grade; mg/kg = milligrams per kilogram; mg/L = milligrams per litre; na = not analyzed; ng = no guideline; < = below laboratory method detection limit.

Guidelines
<sup>a</sup> Alberta Environment and Protected Areas (AEPA). 2023. *Alberta Tier 1 Soil and Groundwater Remediation Guidelines*. Land Policy Branch, Policy and Planning Division. January 1, 2023.

**Table 3: Metals Analytical Results - Soil**

**Alberta Energy Regulator**

**Imperial Kearn Oil Sands, Wood Buffalo, Alberta**

Sample Identification	Natural Area  Land Use  Guidelines <sup>a</sup>	SL016:0-0.1	SL016:0.1-0.3	SL016:0.3-1.0	SL017:0-0.1	SL017:0.1-0.3	SL017:0.3-1.0	SL018:0-0.1	SL018:0.1-0.3	SL018:0.3-1.0
Sample Location		delineation	delineation	delineation	delineation	delineation	delineation	delineation	delineation	delineation
Depth (mbg)		0-0.1	0.1-0.3	0.3-1.0	0-0.1	0.1-0.3	0.3-1.0	0-0.1	0.1-0.3	0.3-1.0
Date Sampled		27-Sep-23	27-Sep-23	27-Sep-23	27-Sep-23	27-Sep-23	27-Sep-23	27-Sep-23	27-Sep-23	27-Sep-23
Laboratory Sample Identification		5330812	5330813	5330814	5330815	5330816	5330817	5330818	5330819	5330820
Laboratory Report Number		23E075537	23E075537	23E075537	23E075537	23E075537	23E075537	23E075537	23E075537	23E075537
Antimony (Sb)	20	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Arsenic (As)	17	3.9	3.1	0.7	1.4	0.7	<0.5	0.7	0.8	0.7
Total Barium (Ba) (strong acid)	750	102	128	85.3	94.4	77.6	66.3	16.2	18.8	18.6
Beryllium (Be)	5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Boron (B) (saturated paste) (mg/L)	3.3	0.9	0.8	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Cadmium (Cd)	3.8	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Chromium (Cr) (hexavalent)	0.4	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
Chromium (Cr) (total)	64	2.7	3	1	2	0.7	0.5	6.3	6.7	5.8
Cobalt (Co)	20	4.1	3.7	1	1.4	0.6	<0.5	1.8	2	1.9
Copper (Cu)	63	4.1	3.5	1.5	1.9	1.4	1.4	2.3	3.5	2.3
Lead (Pb)	70	2.2	2.6	0.8	1.7	1.4	<0.5	4.2	4.5	4.3
Mercury (Hg)	12	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Molybdenum (Mo)	4	1.1	0.8	<0.5	0.7	<0.5	<0.5	<0.5	<0.5	<0.5
Nickel (Ni)	45	6.3	5	1.7	3.5	1.3	1.5	4.8	4.4	4.2
Selenium (Se)	1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Silver (Ag)	20	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Thallium (Tl)	1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Tin (Sn)	5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Uranium (U)	33	0.6	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	<0.5
Vanadium (V)	130	10.5	9.5	2.8	5.5	2.2	1.2	13.2	25.8	12.1
Zinc (Zn)	250	54	33	12	21	15	10	8	13	8

Notes:

Units are mg/kg unless otherwise noted.

CaCl<sub>2</sub> = calcium chloride; mbg = metres below grade; mg/kg = milligrams per kilogram; mg/L = milligrams per litre; na = not analyzed; ng = no guideline; < = below laboratory method detection limit.

Guidelines

<sup>a</sup> Alberta Environment and Protected Areas (AEPA). 2023. *Alberta Tier 1 Soil and Groundwater Remediation Guidelines*. Land Policy Branch, Policy and Planning Division. January 1, 2023.

**Table 4: Detailed Salinity Analytical Results - Soil**  
**Alberta Energy Regulator**  
**Imperial Kearn Oil Sands, Wood Buffalo, Alberta**

Sample Identification		AEPA Guideline <sup>a</sup>	SL01:0-0.1	SL01:0.1-0.3	SL01:0.3-1.0	SL02:0-0.1	SL02:0.3	SL03:0-0.1	SL03:0.3	SL04:0.3	SL05:0-0.1	SL05:0.3	SL06:0-0.1	
Sample Location			delineation	delineation	delineation	delineation	delineation	delineation	delineation	delineation	delineation	delineation	delineation	
Depth (mbg)			0-0.1	0.1-0.3	0.3-1.0	0-0.1	0.3	0-0.1	0.3	0.3	0-0.1	0.3	0-0.1	
Date Sampled			27-Sep-23	27-Sep-23	27-Sep-23	15-Mar-23								
Laboratory Sample Identification			5330808	5330810	5330811	4859177	4859178	4859179	4859180	4859182	4859183	4859184	4859185	
Laboratory Report Number			23E075537	23E075537	23E075537	23E006628								
Field EC (dS/m)			na	na	na	na	na	na	na	na	na	na	na	
pH (CaCl <sub>2</sub> )	6-8.5		7.09	7.54	7.55	7.24	7.44	7.22	7.14	5.85	6.65	6.17	5.90	
Electrical Conductivity (EC) (dS/m)	-		4.32	0.83	0.43	0.40	0.42	1.38	1.49	0.82	0.73	0.54	0.45	
Sodium Adsorption Ratio <sup>c</sup> (SAR)	-		0.79	0.51	0.95	<0.34	0.39	2.61	2.82	1.24	0.80	0.59	0.66	
Saturation Percentage (%)	ng		40	27	26	31	33	91	47	99	165	71	140	
<b>Soluble Ions</b>														
Sodium (Na)	ng		36	6	6	3	4	122	71	50	54	15	29	
Calcium (Ca)	ng		213	22	8	18	17	123	69	68	130	39	60	
Magnesium (Mg)	ng		110	8	3	5	4	35	19	36	51	18	28	
Potassium (K)	ng		6	2	<2	<2	<2	4	5	7	12	6	10	
Chloride (Cl)	ng		7	3	2	2	10	15	114	9	13	5	10	
Chloride (Cl) (mg/L) <sup>b</sup>	120		17	11	8	8	30	17	242	9	8	7	7	
Sulphate (SO <sub>4</sub> )	ng		940	93	34	9	6	298	246	232	183	43	46	
Soil Quality Guidelines <sup>d</sup>	Soil Horizon	-	Subsoil	Subsoil	Subsoil	Topsoil								
	Salinity Rating (EC)	-	Fair	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	
	Sodicity Rating (SAR)	-	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	

**Notes:**

Units are mg/kg unless otherwise noted.

CaCl<sub>2</sub> = calcium chloride extraction method; dS/m = deciSiemens per metre; EC = electrical conductivity; mbg = metres below grade; mg/kg = milligrams per kilogram; mg/L = milligrams per litre; na = not analyzed; ng = no guideline; < = below laboratory method detection limit.

**Guidelines**

<sup>a</sup> Alberta Environment and Protected Areas (AEPA). 2023. *Alberta Tier 1 Soil and Groundwater Remediation Guidelines*. Land Policy Branch, Policy and Planning Division. January 1, 2023.

<sup>b</sup> AEPA. 2023. *Alberta Tier 1 Soil and Groundwater Remediation Guidelines - Groundwater Guideline for Chloride*. Land Policy Branch, Policy and Planning Division. January 1, 2023.

<sup>c</sup> Material characterized by SAR of 12 to 20 may be rated as poor if texture is sandy loam or coarser and saturation % is less than 100 (AENV, 2001).

<sup>d</sup> AENV. 2001. *Salt Contamination Assessment & Remediation Guidelines*

	Topsoil	Subsoil
Good	EC <2 dS/m; SAR <4	EC <3 dS/m; SAR <4
Fair	EC 2 to 4 dS/m; SAR 4 to 8	EC 3 to 5 dS/m; SAR 4 to 8
Poor	EC 4 to 8 dS/m; SAR 8 to 12	EC 5 to 10 dS/m; SAR 8 to 12
Unsuitable	EC >8 dS/m; SAR >12	EC >10 dS/m; SAR >12

**Table 4: Detailed Salinity Analytical Results - Soil**  
**Alberta Energy Regulator**  
**Imperial Kearn Oil Sands, Wood Buffalo, Alberta**

Sample Identification		AEPA Guideline <sup>a</sup>	SL06:0.3	SL07:0-0.1	SL07:0.3	SL08:0-0.1	SL08:0.3	SL09:0-0.1	SL09:0.3	SL10:0-0.1	SL10:0.3	SL11:0-0.1	SL11:0.3	
Sample Location			delineation											
Depth (mbg)			0.3	0-0.1	0.3	0-0.1	0.3	0-0.1	0.3	0-0.1	0.3	0-0.1	0.3	
Date Sampled			15-Mar-23	7-Apr-23	7-Apr-23	7-Apr-23	7-Apr-23							
Laboratory Sample Identification			4859186	4859187	4859188	4859189	4859190	4859191	4859192	4903770	4903771	4903772	4903773	
Laboratory Report Number			23E006628	23E012607	23E012607	23E012607	23E012607							
Field EC (dS/m)			na											
pH (CaCl <sub>2</sub> )	6-8.5		6.27	4.69	5.72	6.64	7.42	5.72	5.92	6.89	6.42	6.63	6.84	
Electrical Conductivity (EC) (dS/m)	-		0.60	0.15	0.16	0.46	0.44	0.45	0.40	0.62	0.54	0.99	0.75	
Sodium Adsorption Ratio <sup>c</sup> (SAR)	-		0.58	0.87	0.82	<0.34	<0.34	0.37	0.40	0.49	0.68	0.79	1.36	
Saturation Percentage (%)	ng		88	48	44	82	74	55	60	108	112	70	39	
<b>Soluble Ions</b>														
Sodium (Na)	ng	19	7	7	9	8	7	8	18	25	25	20		
Calcium (Ca)	ng	55	6	6	55	56	33	32	63	55	73	27		
Magnesium (Mg)	ng	25	2	3	16	7	11	10	23	20	19	8		
Potassium (K)	ng	10	<2	<2	4	2	2	<2	8	6	4	3		
Chloride (Cl)	ng	5	2	<2	9	<2	6	4	14	12	30	22		
Chloride (Cl) (mg/L) <sup>b</sup>	120	6	5	<5	11	<5	11	7	13	11	43	56		
Sulphate (SO <sub>4</sub> )	ng	26	6	4	47	36	39	48	160	90	244	91		
Soil Quality Guidelines <sup>d</sup>	Soil Horizon	-	Topsoil	Subsoil	Topsoil	Topsoil								
	Salinity Rating (EC)	-	Good											
	Sodicity Rating (SAR)	-	Good											

**Notes:**

Units are mg/kg unless otherwise noted.

CaCl<sub>2</sub> = calcium chloride extraction method; dS/m = deciSiemens per metre; EC = electrical conductivity; mbg = metres below grade; mg/kg = milligrams per kilogram; mg/L = milligrams per litre; na = not analyzed; ng = no guideline; < = below laboratory method detection limit.

**Guidelines**

<sup>a</sup> Alberta Environment and Protected Areas (AEPA). 2023. *Alberta Tier 1 Soil and Groundwater Remediation Guidelines*. Land Policy Branch, Policy and Planning Division. January 1, 2023.

<sup>b</sup> AEPA. 2023. *Alberta Tier 1 Soil and Groundwater Remediation Guidelines - Groundwater Guideline for Chloride*. Land Policy Branch, Policy and Planning Division. January 1, 2023.

<sup>c</sup> Material characterized by SAR of 12 to 20 may be rated as poor if texture is sandy loam or coarser and saturation % is less than 100 (AENV, 2001).

<sup>d</sup> AENV. 2001. *Salt Contamination Assessment & Remediation Guidelines*

	Topsoil	Subsoil
Good	EC <2 dS/m; SAR <4	EC <3 dS/m; SAR <4
Fair	EC 2 to 4 dS/m; SAR 4 to 8	EC 3 to 5 dS/m; SAR 4 to 8
Poor	EC 4 to 8 dS/m; SAR 8 to 12	EC 5 to 10 dS/m; SAR 8 to 12
Unsuitable	EC >8 dS/m; SAR >12	EC >10 dS/m; SAR >12

**Table 4: Detailed Salinity Analytical Results - Soil**  
**Alberta Energy Regulator**  
**Imperial Kearn Oil Sands, Wood Buffalo, Alberta**

Sample Identification		AEPA Guideline <sup>a</sup>	SL12:0-0.1	SL12:0.3	SL13: 0-0.1	SL14: 0-0.1	SL15: 0-0.1	SL016:0-0.1	SL016:0.1-0.3	SL016:0.3-1.0	SL017:0-0.1	SL017:0.1-0.3	SL017:0.3-1.0	
Sample Location			delineation	delineation	delineation	delineation	delineation							
Depth (mbg)			0-0.1	0.3	0-0.1	0-0.1	0-0.1	0-0.1	0.1-0.3	0.3-1.0	0-0.1	0.1-0.3	0.3-1.0	
Date Sampled			7-Apr-23	7-Apr-23	22-Apr-23	22-Apr-23	22-Apr-23	27-Sep-23	27-Sep-23	27-Sep-23	27-Sep-23	27-Sep-23	27-Sep-23	
Laboratory Sample Identification			4903774	4903775	4937450	4937454	4937455	5330812	5330813	5330814	5330815	5330816	5330817	
Laboratory Report Number			23E012607	23E012607	23I017391	23I017391	23I017391	23E075537	23E075537	23E075537	23E075537	23E075537	23E075537	
Field EC (dS/m)			na	na	na	na	na							
pH (CaCl <sub>2</sub> )	6-8.5		6.84	6.54	7.31	7.09	7.53	6.92	6.90	6.46	7.06	6.01	5.81	
Electrical Conductivity (EC) (dS/m)	-		3.85	0.99	2.01	1.31	1.49	2.11	2.62	1.51	2.03	1.17	1.18	
Sodium Adsorption Ratio <sup>c</sup> (SAR)	-		6.99	4.95	1.95	1.44	0.97	0.76	0.90	1.47	<0.34	<0.34	<0.34	
Saturation Percentage (%)	ng		169	450	428	288	300	424	428	455	549	851	647	
<b>Soluble Ions</b>														
Sodium (Na)	ng		928	635	638	242	177	237	330	369	126	94	116	
Calcium (Ca)	ng		492	158	946	418	567	1,240	1,700	687	1,660	1,340	938	
Magnesium (Mg)	ng		181	72	574	199	165	301	407	214	428	391	272	
Potassium (K)	ng		68	68	133	75	204	85	107	32	159	68	45	
Chloride (Cl)	ng		95	72	43	40	54	55	1,070	177	264	60	304	
Chloride (Cl) (mg/L) <sup>b</sup>	120		56	16	10	14	18	13	249	39	48	7	47	
Sulphate (SO <sub>4</sub> )	ng		3,240	1,650	2,110	876	756	4,320	5,610	2,990	4,560	4,710	3,110	
Soil Quality Guidelines <sup>d</sup>	Soil Horizon	-	Topsoil	Topsoil	Topsoil	Topsoil	Topsoil							
	Salinity Rating (EC)	-	Fair	Good	Fair	Good	Fair	Fair	Good	Fair	Good	Good	Good	
	Sodicity Rating (SAR)	-	Fair	Fair	Good	Good	Good	Good	Good	Good	Good	Good	Good	

**Notes:**

Units are mg/kg unless otherwise noted.

CaCl<sub>2</sub> = calcium chloride extraction method; dS/m = deciSiemens per metre; EC = electrical conductivity; mbg = metres below grade; mg/kg = milligrams per kilogram; mg/L = milligrams per litre; na = not analyzed; ng = no guideline; < = below laboratory method detection limit.

**Guidelines**

<sup>a</sup> Alberta Environment and Protected Areas (AEPA). 2023. *Alberta Tier 1 Soil and Groundwater Remediation Guidelines*. Land Policy Branch, Policy and Planning Division. January 1, 2023.

<sup>b</sup> AEPA. 2023. *Alberta Tier 1 Soil and Groundwater Remediation Guidelines - Groundwater Guideline for Chloride*. Land Policy Branch, Policy and Planning Division. January 1, 2023.

<sup>c</sup> Material characterized by SAR of 12 to 20 may be rated as poor if texture is sandy loam or coarser and saturation % is less than 100 (AENV, 2001).

<sup>d</sup> AENV. 2001. *Salt Contamination Assessment & Remediation Guidelines*

	Topsoil	Subsoil
Good	EC <2 dS/m; SAR <4	EC <3 dS/m; SAR <4
Fair	EC 2 to 4 dS/m; SAR 4 to 8	EC 3 to 5 dS/m; SAR 4 to 8
Poor	EC 4 to 8 dS/m; SAR 8 to 12	EC 5 to 10 dS/m; SAR 8 to 12
Unsuitable	EC >8 dS/m; SAR >12	EC >10 dS/m; SAR >12

**Table 4: Detailed Salinity Analytical Results - Soil**  
**Alberta Energy Regulator**  
**Imperial Kearn Oil Sands, Wood Buffalo, Alberta**

Sample Identification		AEPA Guideline <sup>a</sup>	SL018:0-0.1	SL018:0.1-0.3	SL018:0.3-1.0
Sample Location			delineation	delineation	delineation
Depth (mbg)			0-0.1	0.1-0.3	0.3-1.0
Date Sampled			27-Sep-23	27-Sep-23	27-Sep-23
Laboratory Sample Identification			5330818	5330819	5330820
Laboratory Report Number			23E075537	23E075537	23E075537
Field EC (dS/m)			na	na	na
pH (CaCl <sub>2</sub> )	6-8.5		3.38	4.09	3.71
Electrical Conductivity (EC) (dS/m)	-		0.19	0.29	0.22
Sodium Adsorption Ratio <sup>c</sup> (SAR)	-		<0.34	0.47	0.40
Saturation Percentage (%)	ng		61	47	49
<b>Soluble Ions</b>					
Sodium (Na)	ng		4	5	4
Calcium (Ca)	ng		15	13	10
Magnesium (Mg)	ng		4	4	3
Potassium (K)	ng		2	3	2
Chloride (Cl)	ng		7	4	4
Chloride (Cl) (mg/L) <sup>b</sup>	120		11	9	8
Sulphate (SO <sub>4</sub> )	ng		12	13	15
Soil Quality Guidelines <sup>d</sup>	Soil Horizon	-	Topsoil	Topsoil	Topsoil
	Salinity Rating (EC)	-	Good	Good	Good
	Sodicity Rating (SAR)	-	Good	Good	Good

Notes:

Units are mg/kg unless otherwise noted.

CaCl<sub>2</sub> = calcium chloride extraction method; dS/m = deciSiemens per metre; EC = electrical conductivity; mbg = metres below grade; mg/kg = milligrams per kilogram; mg/L = milligrams per litre; na = not analyzed; ng = no guideline; < = below laboratory method detection limit.

Guidelines

<sup>a</sup> Alberta Environment and Protected Areas (AEPA). 2023. *Alberta Tier 1 Soil and Groundwater Remediation Guidelines*. Land Policy Branch, Policy and Planning Division. January 1, 2023.

<sup>b</sup> AEPA. 2023. *Alberta Tier 1 Soil and Groundwater Remediation Guidelines - Groundwater Guideline for Chloride*. Land Policy Branch, Policy and Planning Division. January 1, 2023.

<sup>c</sup> Material characterized by SAR of 12 to 20 may be rated as poor if texture is sandy loam or coarser and saturation % is less than 100 (AENV, 2001).

<sup>d</sup> AENV. 2001. *Salt Contamination Assessment & Remediation Guidelines*

	Topsoil	Subsoil
Good	EC <2 dS/m; SAR <4	EC <3 dS/m; SAR <4
Fair	EC 2 to 4 dS/m; SAR 4 to 8	EC 3 to 5 dS/m; SAR 4 to 8
Poor	EC 4 to 8 dS/m; SAR 8 to 12	EC 5 to 10 dS/m; SAR 8 to 12
Unsuitable	EC >8 dS/m; SAR >12	EC >10 dS/m; SAR >12

**Table 5: Polycyclic Aromatic Hydrocarbons Analytical Results - Soil**
**Alberta Energy Regulator**
**Imperial Kearn Oil Sands, Wood Buffalo, Alberta**

Sample Identification	Natural Area		SL01:0-0.1	SL01:0.1-0.3	SL01:0.3-1.0	SL10:0-0.1	SL10:0.3	SL11:0-0.1	SL11:0.3	SL12:0-0.1	SL12:0.3	SL13: 0-0.1	SL14: 0-0.1	SL15: 0-0.1	SL016:0-0.1
Sample Location	Land Use Guidelines <sup>a</sup>		delineation	delineation	delineation	delineation	delineation	delineation	delineation	delineation	delineation	delineation	delineation	delineation	delineation
Depth (mbg)			0-0.1	0.1-0.3	0.3-1.0	0-0.1	0.3	0-0.1	0.3	0-0.1	0.3	0-0.1	0-0.1	0-0.1	0-0.1
Date Sampled			27-Sep-23	27-Sep-23	27-Sep-23	7-Apr-23	22-Apr-23	22-Apr-23	27-Sep-23						
Laboratory Sample Identification			5330808	5330810	5330811	4903770	4903771	4903772	4903773	4903774	4903775	4937450	4937454	4937455	5330812
Laboratory Report Number	Fine	Coarse	23E075537	23E075537	23E075537	23E012607	23E012607	23E012607	23E012607	23E012607	23E012607	23I017391	23I017391	23I017391	23E075537
Carcinogenic PAHs (IACR, Fine Grained)	IACR<1.0		0.0259	0.0259	0.0259	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.0259
Carcinogenic PAHs (IACR, Coarse Grained)	IACR<1.0		0.0136	0.0136	0.0136	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.01	0.01	0.0136
Carcinogenic PAHs (as B[a]P TPE)	ng	ng	0.0225	0.0225	0.0225	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.0225
Acenaphthene	0.33	0.38	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Acenaphthylene	ng	ng	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Acridine	ng	ng	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Anthracene	1.3	0.0056	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040
Benz[a]anthracene <sup>d</sup>	6.2	6.2	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.03	<0.02	<0.02	<0.02
Benzo[a]pyrene <sup>b</sup>	0.60	0.60	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Benzo[b+j]fluoranthene <sup>d</sup>	6.2	6.2	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Benzo[g,h,i]perylene <sup>c</sup>	130	250	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Benzo[k]fluoranthene <sup>d</sup>	6.2	6.2	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Chrysene <sup>d</sup>	6.2	6.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Dibenz[a,h]anthracene <sup>c</sup>	4.4	8.5	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Fluoranthene	15.4	0.055	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Fluorene	0.40	0.34	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Indeno[1,2,3-c,d]pyrene <sup>c</sup>	51	98	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
2-Methylnaphthalene	ng	ng	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Naphthalene	0.014	0.017	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Phenanthrene	0.11	0.061	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Pyrene	7.7	0.15	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Perylene	ng	ng	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Quinoline	ng	ng	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05

**Notes:**

Units are mg/kg unless otherwise noted.

B[a]P = Benzo[a]pyrene; IACR = Index of Additive Cancer Risk; mbg = metres below grade; mg/kg = milligrams per kilogram; na = not analyzed; ng = no guideline; TPE =Total Potency Equivalent; < = below laboratory method detection limit.

**Guideline**

<sup>a</sup> Alberta Environment and Protected Areas (AEPA). 2023. *Alberta Tier 1 Soil and Groundwater Remediation Guidelines*. Land Policy Branch, Policy and Planning Division. January 1, 2023.

<sup>b</sup> AEPA. 2023. *Alberta Tier 1 Soil and Groundwater Remediation Guidelines - Overall guideline value for ecological receptors only*. Land Policy Branch, Policy and Planning Division. January 1, 2023.

<sup>c</sup> AEPA. 2023. *Alberta Tier 1 Soil and Groundwater Remediation Guidelines - Protection of Domestic Use Aquifer*. Land Policy Branch, Policy and Planning Division. August 26, 2022.

<sup>d</sup> AEPA. 2023. *Alberta Tier 1 Soil and Groundwater Remediation Guidelines - Agricultural and Natural Area land use overall guideline value for ecological receptors only - Commercial, Industrial and Residential land use guideline value Protection of Domestic Use Aquifer Pathway*. Land Policy Branch, Policy and Planning Division. January 1, 2023.

**Table 5: Polycyclic Aromatic Hydrocarbons Analytical Results - Soil**

**Alberta Energy Regulator**

**Imperial Kearn Oil Sands, Wood Buffalo, Alberta**

Sample Identification	Natural Area		SL016:0.1-0.3	SL016:0.3-1.0	SL017:0-0.1	SL017:0.1-0.3	SL017:0.3-1.0	SL018:0-0.1	SL018:0.1-0.3	SL018:0.3-1.0
Sample Location	Land Use  Guidelines <sup>a</sup>		delineation	delineation	delineation	delineation	delineation	delineation	delineation	delineation
Depth (mbg)			0.1-0.3	0.3-1.0	0-0.1	0.1-0.3	0.3-1.0	0-0.1	0.1-0.3	0.3-1.0
Date Sampled			27-Sep-23	27-Sep-23	27-Sep-23	27-Sep-23	27-Sep-23	27-Sep-23	27-Sep-23	27-Sep-23
Laboratory Sample Identification			5330813	5330814	5330815	5330816	5330817	5330818	5330819	5330820
Laboratory Report Number	Fine	Coarse	23E075537	23E075537	23E075537	23E075537	23E075537	23E075537	23E075537	23E075537
Carcinogenic PAHs (IACR, Fine Grained)	IACR<1.0		0.0259	0.0259	0.0259	0.0259	0.0259	0.0259	0.0259	0.0259
Carcinogenic PAHs (IACR, Coarse Grained)	IACR<1.0		0.0136	0.0136	0.0136	0.0136	0.0136	0.0136	0.0136	0.0136
Carcinogenic PAHs (as B[a]P TPE)	ng	ng	0.0225	0.0225	0.0225	0.0225	0.0225	0.0225	0.0225	0.0225
Acenaphthene	0.33	0.38	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Acenaphthylene	ng	ng	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Acridine	ng	ng	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Anthracene	1.3	0.0056	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040
Benz[a]anthracene <sup>d</sup>	6.2	6.2	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Benzo[a]pyrene <sup>b</sup>	0.60	0.60	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Benzo[b+j]fluoranthene <sup>d</sup>	6.2	6.2	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Benzo[g,h,i]perylene <sup>c</sup>	130	250	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Benzo[k]fluoranthene <sup>d</sup>	6.2	6.2	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Chrysene <sup>d</sup>	6.2	6.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Dibenz[a,h]anthracene <sup>c</sup>	4.4	8.5	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Fluoranthene	15.4	0.055	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Fluorene	0.40	0.34	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Indeno[1,2,3-c,d]pyrene <sup>c</sup>	51	98	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
2-Methylnaphthalene	ng	ng	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Naphthalene	0.014	0.017	0.009	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Phenanthrene	0.11	0.061	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Pyrene	7.7	0.15	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Perylene	ng	ng	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Quinoline	ng	ng	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05

Notes:

Units are mg/kg unless otherwise noted.

B[a]P = Benzo[a]pyrene; IACR = Index of Additive Cancer Risk; mbg = metres below grade; mg/kg = milligrams per kilogram; na = not analyzed; ng = no guideline; TPE =Total Potency Equivalent; < = below laboratory method detection limit.

Guideline

<sup>a</sup> Alberta Environment and Protected Areas (AEPA). 2023. *Alberta Tier 1 Soil and Groundwater Remediation Guidelines*. Land Policy Branch, Policy and Planning Division. January 1, 2023.

<sup>b</sup> AEPA. 2023. *Alberta Tier 1 Soil and Groundwater Remediation Guidelines - Overall guideline value for ecological receptors only*. Land Policy Branch, Policy and Planning Division. January 1, 2023.

<sup>c</sup> AEPA. 2023. *Alberta Tier 1 Soil and Groundwater Remediation Guidelines - Protection of Domestic Use Aquifer*. Land Policy Branch, Policy and Planning Division. August 26, 2022.

<sup>d</sup> AEPA. 2023. *Alberta Tier 1 Soil and Groundwater Remediation Guidelines - Agricultural and Natural Area land use overall guideline value for ecological receptors only - Commercial, Industrial and Residential land use guideline value Protection of Domestic Use Aquifer Pathway*. Land Policy Branch, Policy and Planning Division. January 1, 2023.

Table 6: Petroleum Hydrocarbon Analytical Results - Surface Water  
 Alberta Energy Regulator  
 Imperial Keral Oil Sands, Wood Buffalo, Alberta

Sample Identification	Sample Location	Date Sampled	Laboratory Sampled Identification	Laboratory Report Number	Benzene	Toluene	Ethylbenzene	Xylenes	F1 (C6-C10)	F1-BTEX	F2 (>C10-C16)	F3 (C17-C34)	F4 (C34-C50+)	
<b>AEPA Guideline*</b>														
<b>Protection of Freshwater Aquatic Life (PAL)</b>														
SW01	northeastern investigation area	15-Mar-23	4859262	23E006628	<0.0005	<0.0003	<0.0005	<0.0005	<0.1	<0.10	0.1	na	na	ng
		06-Apr-23	4903754	23E012607	<0.0005	<0.0003	<0.0005	<0.0005	<0.0005	<0.1	<0.10	0.2	1.5	<0.1
		04-May-23	4967076	23E021784	<0.0005	<0.0003	<0.0005	<0.0005	<0.1	<0.10	<0.1	<0.1	<0.1	<0.1
		11-May-23	4986004	23E024382	<0.0005	<0.0003	<0.0005	<0.0005	<0.0005	<0.1	<0.10	<0.1	<0.1	<0.1
		19-May-23	5003672	23E026902	<0.0005	<0.0003	<0.0005	<0.0005	<0.1	<0.10	<0.1	<0.1	<0.1	<0.1
		31-May-23	5036044	23E031691	<0.0005	<0.0003	<0.0005	<0.0005	<0.1	<0.10	<0.1	0.2	<0.1	<0.1
		13-Jun-23	5065780	23E036123	<0.0005	<0.0003	<0.0005	<0.0005	<0.1	<0.10	<0.1	<0.1	<0.1	<0.1
		13-Jun-23	5065901	23E036123	<0.0005	<0.0003	<0.0005	<0.0005	<0.1	<0.10	<0.1	<0.1	<0.1	<0.1
		28-Jun-23	5107162	23E041864	<0.0005	<0.0003	<0.0005	<0.0005	<0.1	<0.10	<0.1	<0.1	<0.1	<0.1
		26-Jul-23	5177242	23E052402	<0.0005	<0.0003	<0.0005	<0.0005	<0.1	<0.10	<0.1	<0.1	<0.1	<0.1
		22-Aug-23	5235352	23E061053	<0.0005	<0.0003	<0.0005	<0.0005	<0.1	<0.10	<0.1	<0.1	<0.1	<0.1
		28-Sep-23	5330830	23E075537	<0.0005	<0.0003	<0.0005	<0.0005	<0.1	<0.10	<0.1	<0.1	<0.1	<0.1
		28-Sep-23	5330914	23E075537	<0.0005	<0.0003	<0.0005	<0.0005	<0.1	<0.10	<0.1	<0.1	<0.1	<0.1
SW02	northeastern investigation area	15-Mar-23	4859263	23E006628	<0.0005	<0.0003	<0.0005	<0.0005	<0.1	<0.10	0.1	na	na	ng
		06-Apr-23	4903758	23E012607	<0.0005	0.0008	<0.0005	<0.0005	0.1	<0.10	<0.1	0.6	<0.1	<0.1
		04-May-23	4967077	23E021784	<0.0005	<0.0003	<0.0005	<0.0005	<0.1	<0.10	<0.1	<0.1	<0.1	<0.1
		04-May-23	4967086	23E021784	<0.0005	<0.0003	<0.0005	<0.0005	<0.1	<0.10	<0.1	<0.1	<0.1	<0.1
		11-May-23	4986587	23E024382	<0.0005	<0.0003	<0.0005	<0.0005	<0.1	<0.10	0.1	0.4	<0.1	<0.1
		19-May-23	5003690	23E026902	<0.0005	<0.0003	<0.0005	<0.0005	<0.1	<0.10	<0.1	<0.1	<0.1	<0.1
		31-May-23	5036408	23E031691	<0.0005	<0.0003	<0.0005	<0.0005	<0.1	<0.10	<0.1	0.2	<0.1	<0.1
		13-Jun-23	5065797	23E036123	<0.0005	<0.0003	<0.0005	<0.0005	<0.1	<0.10	<0.1	<0.1	<0.1	<0.1
		28-Jun-23	5107186	23E041864	<0.0005	<0.0003	<0.0005	<0.0005	<0.1	<0.10	<0.1	<0.1	<0.1	<0.1
		26-Jul-23	5177247	23E052402	<0.0005	<0.0003	<0.0005	<0.0005	<0.1	<0.10	<0.1	<0.1	<0.1	<0.1
		22-Aug-23	5235353	23E061053	<0.0005	<0.0003	<0.0005	<0.0005	<0.1	<0.10	<0.1	<0.1	<0.1	<0.1
		28-Sep-23	5330853	23E075537	<0.0005	<0.0003	<0.0005	<0.0005	<0.1	<0.10	<0.1	<0.1	<0.1	<0.1
SW02-2	30 m southeast of SW02	24-Oct-23	5402743	23E085932	<0.0005	<0.0003	<0.0005	<0.0005	<0.1	<0.10	<0.1	<0.1	<0.1	<0.1
SW03	northeastern investigation area	15-Mar-23	4859264	23E006628	<0.0005	<0.0003	<0.0005	<0.0005	<0.1	<0.10	0.6	na	na	ng
		06-Apr-23	4903759	23E012607	<0.0005	<0.0003	<0.0005	<0.0005	<0.1	<0.10	0.4	2.3	<0.1	<0.1
		21-Apr-23	4937342	23E017391	<0.0005	<0.0003	<0.0005	<0.0005	<0.1	<0.10	0.9	6.1	0.7	<0.1
		27-Apr-23	4948767	23E019331	<0.0005	<0.0003	<0.0005	<0.0005	<0.1	<0.10	0.4	1.4	0.1	<0.1
		27-Apr-23	4948788	23E019331	<0.0005	<0.0003	<0.0005	<0.0005	<0.1	<0.10	0.2	1.2	<0.1	<0.1
		04-May-23	4967083	23E021784	<0.0005	<0.0003	<0.0005	<0.0005	<0.1	<0.10	0.3	0.9	<0.1	<0.1
		11-May-23	4986589	23E024382	<0.0005	<0.0003	<0.0005	<0.0005	<0.1	<0.10	0.6	6.3	4.2	<0.1
		19-May-23	5003697	23E026902	<0.0005	<0.0003	<0.0005	<0.0005	<0.1	<0.10	0.3	1.7	<0.1	<0.1
		31-May-23	5036409	23E031691	<0.0005	<0.0003	<0.0005	<0.0005	<0.1	<0.10	0.3	1.1	<0.1	<0.1
		13-Jun-23	5065800	23E036123	<0.0005	<0.0003	<0.0005	<0.0005	<0.1	<0.10	0.5	1	<0.1	<0.1
		28-Jun-23	5107187	23E041864	<0.0005	<0.0003	<0.0005	<0.0005	<0.1	<0.10	0.2	0.8	<0.1	<0.1
		26-Jul-23	5177248	23E052402	<0.0005	<0.0003	<0.0005	<0.0005	<0.1	<0.10	0.4	1.6	0.2	<0.1
		22-Aug-23	5235354	23E061053	<0.0005	<0.0003	<0.0005	<0.0005	<0.1	<0.10	0.3	1	<0.1	<0.1
		28-Sep-23	5330854	23E075537	<0.0005	<0.0003	<0.0005	<0.0005	<0.1	<0.10	0.8	1.5	<0.1	<0.1
		24-Oct-23	5402747	23E085932	<0.0005	<0.0003	<0.0005	<0.0005	<0.1	<0.10	0.4	1.1	0.1	<0.1
SW04	northeastern investigation area	15-Mar-23	4859265	23E006628	&lt									

Table 6: Petroleum Hydrocarbon Analytical Results - Surface Water  
 Alberta Energy Regulator  
 Imperial Keral Oil Sands, Wood Buffalo, Alberta

Sample Identification	Sample Location	Date Sampled	Laboratory Sampled Identification	Laboratory Report Number	Benzene	Toluene	Ethylbenzene	Xylenes	F1 (C6-C10)	F1-BTEX	F2 (-C10-C16)	F3 (C17-C34)	F4 (C34-C50+)	
<b>AEPA Guideline*</b>														
<b>Protection of Freshwater Aquatic Life (PAL)</b>														
SW07	150 m downstream of SW06	06-Apr-23	4903763	23E012607	<0.0005	<0.0003	<0.0005	<0.0005	<0.1	<0.10	<0.1	0.4	<0.1	ng
		21-Apr-23	4937442	23D17391	<0.0005	<0.0003	<0.0005	<0.0005	<0.0005	<0.1	<0.10	<0.1	<0.1	<0.1
		27-Apr-23	4948255	23E019331	<0.0005	<0.0003	<0.0005	<0.0005	<0.1	<0.10	<0.1	<0.1	<0.1	<0.1
		04-May-23	4967078	23E021784	<0.0005	<0.0003	<0.0005	<0.0005	<0.1	<0.10	<0.1	<0.1	<0.1	<0.1
		11-May-23	4986594	23E024382	<0.0005	<0.0003	<0.0005	<0.0005	<0.1	<0.10	<0.1	<0.1	<0.1	<0.1
		19-May-23	5003701	23E026902	<0.0005	<0.0003	<0.0005	<0.0005	<0.1	<0.10	<0.1	<0.1	<0.1	<0.1
		19-May-23	5003702	23E026902	<0.0005	<0.0003	<0.0005	<0.0005	<0.1	<0.10	<0.1	0.1	<0.1	ng
		31-May-23	5036413	23E031691	<0.0005	<0.0003	<0.0005	<0.0005	<0.1	<0.10	<0.1	0.3	<0.1	ng
		13-Jun-23	5065814	23E036123	<0.0005	<0.0003	<0.0005	<0.0005	<0.1	<0.10	<0.1	<0.1	<0.1	<0.1
		28-Jun-23	5107191	23E041864	<0.0005	<0.0003	<0.0005	<0.0005	<0.1	<0.10	<0.1	<0.1	<0.1	<0.1
		26-Jul-23	5177252	23E052402	<0.0005	<0.0003	<0.0005	<0.0005	<0.1	<0.10	<0.1	<0.1	<0.1	<0.1
		22-Aug-23	5235358	23E061053	<0.0005	<0.0003	<0.0005	<0.0005	<0.1	<0.10	<0.1	<0.1	<0.1	<0.1
		28-Sep-23	5330858	23E075537	<0.0005	<0.0003	<0.0005	<0.0005	<0.1	<0.10	<0.1	<0.1	<0.1	<0.1
		21-Apr-23	4937442	23D17391	<0.0005	<0.0003	<0.0005	<0.0005	<0.1	<0.10	0.2	1.7	<0.1	ng
		27-Apr-23	4948770	23E019331	<0.0005	<0.0003	<0.0005	<0.0005	<0.1	<0.10	0.6	3.0	0.1	ng
		04-May-23	4967085	23E021784	<0.0005	<0.0003	<0.0005	<0.0005	<0.1	<0.10	0.1	0.4	<0.1	ng
		11-May-23	4986595	23E024382	<0.0005	<0.0003	<0.0005	<0.0005	<0.1	<0.10	0.4	2.3	0.3	ng
		19-May-23	5003703	23E026902	<0.0005	<0.0003	<0.0005	<0.0005	<0.1	<0.10	0.1	0.7	<0.1	ng
		31-May-23	5036414	23E031691	<0.0005	0.0014	<0.0005	<0.0005	<0.1	<0.10	0.1	0.5	<0.1	ng
		13-Jun-23	5065816	23E036123	<0.0005	0.002	<0.0005	<0.0005	<0.1	<0.10	0.3	1.2	<0.1	ng
		28-Jun-23	5107192	23E041864	<0.0005	0.0071	<0.0005	<0.0005	<0.1	<0.10	0.5	3.5	0.2	ng
		26-Jul-23	5177253	23E052402	<0.0005	0.0193	<0.0005	<0.0005	<0.1	<0.10	0.4	2.1	<0.1	ng
		28-Jul-23	5177258	23E052402	<0.0005	0.0255	<0.0005	<0.0005	<0.1	<0.10	0.3	2.8	0.4	ng
		22-Aug-23	5235359	23E061053	<0.0005	0.0088	<0.0005	<0.0005	<0.1	<0.10	0.6	4.6	1	ng
		28-Sep-23	5330859	23E075537	<0.0005	0.0157	<0.0005	<0.0005	<0.1	<0.10	0.6	2.4	0.3	ng
		24-Oct-23	5402753	23E085932	<0.0005	0.0173	<0.0005	<0.0005	<0.1	<0.10	0.2	1.7	0.4	ng
SW09	northeastern investigation area	21-Apr-23	4937444	23D17391	<0.0005	<0.0003	<0.0005	<0.0005	<0.1	<0.10	0.5	2.7	0.1	ng
SW10	northeastern investigation area	21-Apr-23	4937445	23D17391	<0.0005	<0.0003	<0.0005	<0.0005	<0.1	<0.10	0.3	1.3	<0.1	ng
SW11	northeastern investigation area	21-Apr-23	4937446	23D17391	<0.0005	<0.0003	<0.0005	<0.0005	<0.1	<0.10	<0.1	0.4	<0.1	ng
		27-Apr-23	4948774	23E019331	<0.0005	<0.0003	<0.0005	<0.0005	<0.1	<0.10	0.4	1.3	<0.1	ng
		04-May-23	4967082	23E021784	<0.0005	<0.0003	<0.0005	<0.0005	<0.1	<0.10	<0.1	<0.1	<0.1	<0.1
		11-May-23	4986596	23E024382	<0.0005	<0.0003	<0.0005	<0.0005	<0.1	<0.10	<0.1	0.2	0.1	ng
		19-May-23	5003704	23E026902	<0.0005	<0.0003	<0.0005	<0.0005	<0.1	<0.10	<0.1	0.3	<0.1	ng
		31-May-23	5036415	23E031691	<0.0005	<0.0003	<0.0005	<0.0005	<0.1	<0.10	<0.1	<0.1	<0.1	ng
		13-Jun-23	5065817	23E036123	<0.0005	<0.0003	<0.0005	<0.0005	<0.1	<0.10	<0.1	<0.1	<0.1	ng
		28-Jun-23	5107193	23E041864	<0.0005	<0.0003	<0.0005	<0.0005	<0.1	<0.10	<0.1	0.2	<0.1	ng
		26-Jul-23	5177254	23E052402	<0.0005	0.0629	<0.0005	<0.0005	<0.1	<0.10	<0.1	1.9	0.5	ng
		22-Aug-23	5235360	23E061053	<0.0005	0.0001	<0.0005	<0.0005	<0.1	<0.10	<0.1	<0.1	<0.1	ng
		28-Sep-23	5330860	23E075537	<0.0005	0.0002	<0.0005	<0.0005	<0.1	<0.10	<0.1	0.3	<0.1	ng
		24-Oct-23	5402756	23E085932	<0.0005	<0.0003	<0.0005	<0.0005	<0.1	<0.10	<0.1	1	0.3	ng
SW12	northeastern investigation area	21-Apr-23	4937447	23D17391	<0.0005	<0.0003	<0.0005	<0.0005	<0.1	<0.10	0.2	2.0	<0.1	ng
SW13	northeastern investigation area	21-Apr-23	4937448											

Table 7: Total Metals Analytical Results - Surface Water  
 Alberta Energy Regulator  
 Imperial Kearl Oil Sands, Wood Buffalo, Alberta

Sample Identification	Sample Location	Date Sampled	Laboratory Sample Identification	Laboratory Report Number	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium <sup>a</sup>	Chromium	Cobalt <sup>b</sup>	Copper	Iron	Lead <sup>b</sup>	Manganese	Molybdenum	Nickel <sup>b</sup>	Selenium	Silver	Thallium	Uranium	Vanadium	Zinc
<b>AEPA Guideline<sup>c</sup></b>																									
				Protection of Freshwater Aquatic Life (PAL)	ng	ng	0.005	ng	ng	1.5	0.00004 to 0.00037	0.0089	0.0008 to 0.0018	0.007	0.001 to 0.007	ng	0.073	0.01165 to 0.23416	0.002	0.00025	0.0008	0.015	ng	0.03	
SW01	northeastern investigation area	15-Mar-23	4859262	23E006628	0.008	<0.0010	<0.0010	<0.05	<0.001	0.25	<0.00016	<0.001	<0.001	<0.0010	0.7	<0.0001	0.243	<0.001	<0.002	<0.0005	0.00007	<0.0005	<0.001	na	<0.010
		6-Apr-23	4903754	23E012607	0.034	<0.0010	<0.0010	0.06	<0.001	0.11	<0.00016	<0.001	<0.001	<0.0010	0.81	<0.0001	0.241	<0.001	<0.002	<0.0005	<0.0005	<0.0005	<0.001	<0.001	<0.010
		04-May-23	4967076	23E021784	<0.004	<0.0010	<0.0010	<0.05	<0.001	0.04	<0.00016	<0.001	<0.001	<0.0010	0.21	<0.0001	0.026	<0.001	<0.002	<0.0005	<0.0005	<0.0005	<0.001	0.002	<0.010
		11-May-23	4986004	23E024382	<0.004	<0.0010	<0.0010	<0.05	<0.001	0.04	<0.00016	<0.002	<0.0002	<0.0013	0.14	<0.0001	0.034	<0.001	<0.002	<0.0005	<0.0005	<0.0005	<0.001	0.001	<0.010
		19-May-23	5003672	23E026902	0.009	<0.0010	<0.0010	<0.05	<0.001	0.03	<0.00016	<0.001	<0.0002	<0.0010	<0.10	<0.0001	0.018	<0.001	<0.002	<0.0005	0.00011	<0.0005	<0.001	<0.001	<0.010
		31-May-23	5036044	23E031691	0.009	<0.0010	<0.0010	<0.05	<0.001	0.04	<0.00016	<0.002	<0.0002	<0.0010	<0.12	<0.0001	0.023	<0.001	<0.003	<0.0005	<0.0005	<0.0005	<0.001	<0.001	0.011
		13-Jun-23	5065780	23E036123	0.023	<0.0010	<0.0010	<0.05	<0.001	0.06	<0.00016	<0.001	<0.0002	<0.0010	0.12	<0.0001	0.024	<0.001	<0.006	<0.0005	<0.0005	<0.0005	<0.001	<0.001	<0.010
		13-Jun-23	5065901	23E036123	0.021	<0.0010	<0.0010	<0.05	<0.001	0.06	<0.00016	<0.002	<0.0002	<0.0010	0.14	<0.0001	0.025	<0.001	<0.005	<0.0005	<0.0005	<0.0005	<0.001	<0.001	<0.010
		28-Jun-23	5107162	23E041864	<0.004	<0.0010	<0.0010	<0.05	<0.001	0.04	<0.00016	<0.001	<0.0002	<0.0010	0.26	<0.0001	0.012	<0.001	<0.002	<0.0032	<0.0005	<0.0005	<0.001	<0.001	<0.010
		26-Jul-23	5177242	23E052402	0.007	<0.0010	<0.0010	<0.05	<0.001	0.04	<0.00016	<0.001	<0.0002	<0.0010	<0.10	<0.0002	0.019	<0.001	<0.002	<0.0016	<0.0005	<0.0005	<0.001	<0.001	<0.010
		22-Aug-23	5236352	23E061053	0.058	<0.0010	<0.0010	<0.05	<0.001	0.05	0.000074	<0.001	<0.0002	<0.0010	0.12	<0.0000	0.011	<0.001	<0.002	<0.0005	<0.0005	<0.0005	<0.001	0.002	<0.010
		28-Sep-23	5330830	23E075537	0.013	<0.0010	<0.0010	<0.05	<0.001	0.05	0.000098	0.002	<0.0002	<0.0010	0.14	<0.0000	0.015	<0.001	<0.002	<0.0005	<0.0005	<0.0005	<0.001	<0.001	<0.010
		28-Sep-23	5330914	23E075537	0.01	<0.0010	<0.0010	<0.05	<0.001	0.05	0.000016	<0.001	<0.0002	<0.0010	0.18	<0.0000	0.015	<0.001	<0.002	<0.0005	<0.0005	<0.0005	<0.001	<0.001	<0.010
SW02	northeastern investigation area	15-Mar-23	4859263	23E006628	0.82	<0.0010	0.010	0.12	<0.001	0.05	0.000105	0.001	0.001	0.0015	6.71	0.0016	0.254	<0.001	<0.002	<0.0005	0.00011	<0.0005	<0.001	na	0.038
		6-Apr-23	4903759	23E012607	0.195	<0.0010	<0.0010	0.07	<0.001	0.09	<0.00016	<0.001	<0.0001	<0.0010	1.02	0.0003	0.253	<0.001	0.003	0.0013	0.0007	<0.0005	<0.001	0.002	0.010
		04-May-23	4967077	23E021784	<0.004	<0.0010	<0.0010	<0.05	<0.001	0.03	<0.00016	<0.001	<0.0001	<0.0010	27	<0.0001	0.003	<0.001	<0.002	<0.0005	<0.0005	<0.0005	<0.001	0.002	<0.010
		04-May-23	4967086	23E021784	<0.004	<0.0010	<0.0010	<0.05	<0.001	0.04	<0.00016	<0.001	<0.0001	<0.0010	19	<0.0001	0.002	<0.001	<0.002	<0.0005	<0.0005	<0.0005	<0.001	0.001	<0.010
		11-May-23	4985857	23E024382	<0.004	<0.0010	<0.0010	<0.05	<0.001	0.04	<0.00016	<0.001	<0.0002	<0.0010	13	<0.0001	0.003	<0.001	<0.002	<0.0005	<0.0005	<0.0005	<0.001	0.002	<0.010
		19-May-23	5003696	23E026902	0.007	<0.0010	0.0045	0.15	<0.001	0.41	<0.00016	<0.001	<0.0002	<0.0010	10	<0.0001	0.023	<0.001	<0.002	<0.0005	<0.0005	<0.0005	<0.001	0.002	<0.010
		31-May-23	5036409	23E031691	0.119	<0.0010	0.0184	0.22	<0.001	0.46	0.000035	0.003	0.00016	0.024	463	0.0013	1.74	0.008	0.005	0.00033	<0.0005	0.0002	na	<0.010	
		6-Apr-23	4903759	23E012607	2.93	<0.0010	0.412	3.06	0.001	0.81	0.000183	0.018	0.0015	0.0099	832	0.0049	2.69	0.015	0.043	<0.005	0.0002	0.0005	0.003	0.072	0.032
		21-Apr-23	4937342	23E017391	2.93	<0.0010	0.491	0.81	<0.001	1.01	0.000172														

Table 7: Total Metals Analytical Results - Surface Water  
 Alberta Energy Regulator  
 Imperial Kearl Oil Sands, Wood Buffalo, Alberta

Sample Identification	Sample Location	Date Sampled	Laboratory Sample Identification	Laboratory Report Number	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium <sup>a</sup>	Chromium	Cobalt <sup>b</sup>	Copper	Iron	Lead <sup>b</sup>	Manganese	Molybdenum	Nickel <sup>b</sup>	Selenium	Silver	Thallium	Uranium	Vanadium	Zinc
AEPA Guideline <sup>c</sup>																									
	Protection of Freshwater Aquatic Life (PAL)																								
					ng	ng	0.005	ng	ng	1.5	0.00004 to 0.00037	0.0089	0.0008 to 0.0018	0.007	0.001 to 0.007	ng	0.073	0.01165 to 0.23416	0.002	0.00025	0.0008	0.015	ng	0.03	
SW07	150 m downstream of SW06	6-Apr-23	4903763	23E012607	0.034	<0.0010	<0.0010	0.06	<0.001	0.04	<0.00016	<0.001	<0.001	<0.0010	0.79	<0.0001	0.305	<0.001	<0.002	0.0016	<0.00005	<0.0005	<0.001	<0.010	
		21-Apr-23	4937442	23E017391	0.043	<0.0010	<0.0010	<0.05	<0.001	0.02	<0.00016	<0.001	<0.001	<0.0010	0.31	<0.0001	0.111	<0.001	<0.002	0.0049	<0.00005	<0.0005	<0.001	<0.010	
		27-Apr-23	4948255	23E019331	0.016	<0.0010	<0.0010	<0.05	<0.001	0.02	<0.00016	<0.001	<0.001	<0.0010	0.14	<0.0001	0.03	<0.001	<0.002	<0.0005	<0.0005	<0.001	<0.010		
		04-May-23	4967078	23E021784	0.041	<0.0010	<0.0010	<0.05	<0.001	0.03	<0.00016	<0.001	<0.001	<0.0010	0.01	<0.0001	0.103	<0.001	<0.001	0.0003	<0.00005	<0.0005	<0.001	<0.010	
		11-May-23	4986594	23E024382	<0.004	<0.0010	<0.0010	<0.05	<0.001	0.04	<0.00016	<0.001	<0.002	<0.0001	0.14	0.0001	0.038	<0.001	<0.003	<0.0005	<0.0005	<0.001	<0.001	0.023	
		19-May-23	5003701	23E026902	<0.004	<0.0010	<0.0010	<0.05	<0.001	0.03	<0.00016	<0.001	<0.002	<0.0001	0.01	<0.0001	0.005	<0.001	<0.001	0.0003	<0.00005	<0.0005	<0.001	<0.010	
		19-May-23	5003702	23E026902	<0.004	<0.0010	<0.0010	<0.05	<0.001	0.04	<0.00016	<0.001	<0.002	<0.0001	0.10	<0.0001	0.025	<0.001	<0.002	<0.0005	<0.0005	<0.001	<0.003	<0.010	
		31-May-23	5036413	23E031691	1.09	<0.0010	<0.0010	0.07	<0.001	0.05	0.000042	0.088	0.002	0.0031	5.21	0.002	0.244	<0.001	<0.007	<0.005	<0.0005	<0.0005	<0.001	0.017	
		13-Jun-23	5065814	23E036123	0.014	<0.0010	0.0011	<0.05	<0.001	0.04	<0.00016	<0.001	<0.002	<0.0001	0.2	<0.0001	0.033	<0.001	<0.002	<0.0005	<0.0005	<0.001	0.004	<0.010	
		28-Jun-23	5107191	23E041864	<0.004	<0.0010	<0.0010	<0.05	<0.001	0.04	<0.00016	0.043	0.004	<0.0010	0.36	<0.001	0.063	<0.001	0.004	<0.0005	0.00033	<0.0005	<0.001	0.003	<0.010
		26-Jul-23	5177252	23E052402	1.29	<0.0010	0.0034	0.28	<0.001	0.89	0.000056	0.003	0.002	0.00019	0.89	0.002	0.25	<0.001	<0.002	<0.0005	<0.0005	<0.001	0.016		
		22-Aug-23	5235359	23E061053	2.47	<0.0010	0.0026	0.17	<0.001	1.03	0.000155	0.006	0.005	0.0042	41.2	0.0043	4.38	0.002	0.013	<0.0005	<0.001	0.007	0.065		
		28-Sep-23	5330860	23E075537	0.14	<0.0010	<0.0010	0.14	<0.001	0.70	0.000058	<0.001	0.006	0.001	0.46	0.0007	0.494	<0.001	<0.002	<0.0005	0.0008	<0.001	0.002	0.011	
		24-Oct-23	5402753	23E085932	1.63	<0.0010	0.0009	0.99	<0.001	0.80	0.000293	0.004	0.0033	0.0089	9.27	0.0055	0.492	0.002	0.011	<0.0005	0.0006	<0.001	0.012	0.057	
		21-Apr-23	4937443	23E017391	0.044	<0.0010	0.0011	<0.05	<0.001	0.04	<0.00016	<0.001	<0.002	<0.0001	0.36	0.0001	0.045	<0.001	<0.002	<0.0005	<0.0005	<0.001	0.002	<0.010	
		27-Apr-23	4948770	23E019331	0.027	<0.0010	<0.0010	<0.05	<0.001	0.32	<0.00016	<0.001	<0.001	<0.0010	1.72	<0.001	0.529	<0.001	<0.002	<0.0005	<0.0005	<0.001	<0.001	<0.010	
		27-Apr-23	4948770	23E019331	0.221	<0.0010	<0.0010	0.12	<0.001	0.46	<0.00016	<0.001	<0.001	<0.0010	10.0	0.000006	0.809	<0.001	<0.003	<0.0005	<0.0005	<0.001	0.013		
		04-May-23	4967085	23E021784	0.018	<0.0010	<0.0010	<0.05	<0.001	0.14	<0.00016	<0.001	<0.001	<0.0010	0.29	<0.0001	0.08	<0.001	<0.002	<0.0005	<0.0005	<0.001	0.010		
		11-May-23	4986595	23E024382	<0.004	<0.0010	<0.0010	<0.05	<0.001	0.49	<0.00016	0.002	0.003	0.000009	0.89	0.0002	0.25	<0.001	<0.002	<0.0005	<0.0005	<0.001	<0.010		
		19-May-23	5003703	23E026902	0.071	<0.0010	<0.0010	<0.05	<0.001	0.2	<0.00016	0.004	0.005	<0.0010	1.17	0.0002	0.298	<0.001	<0.003	<0.0005	<0.0005	<0.001	<0.010		
		31-May-23	5036414	23E031691	0.02	<0.0010	0.0010	<0.05	<0.001	0.15	0.000037	0.002	0.002	0.000016	0.13	0.0012	0.136	<0.001	<0.002	<0.0005	<0.0005	<0.001	0.003		
		13-Jun-23	5065817	23E036123	0.026	<0.0010	0.0010	<0.05	<0.001	0.46	<0.00016	<0.001	<0.001	<0.0010	0.52	0.0001	0.181	<0.001	<0.002	<0.0005	<0.0005	<0.001	0.004	<0.010	
		28-Jun-23	5107192</td																						

Table 8: Dissolved Metals Analytical Results - Surface Water  
 Alberta Energy Regulator  
 Imperial Keral Oil Sands, Wood Buffalo, Alberta

Sample Identification	Sample Location	Date Sampled	Laboratory Sample Identification	Laboratory Report Number	Aluminum <sup>a</sup>	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Chromium	Cobalt	Copper	Iron	Lead	Manganese	Molybdenum	Nickel	Selenium	Silver	Thallium	Uranium	Vanadium	Zinc
<b>AEPA Guideline<sup>c</sup></b>																									
Protection of Freshwater Aquatic Life (PAL)																									
SW01	northeastern investigation area	15-Mar-23	4859262	23E006628	<0.004	<0.0010	<0.001	0.06	<0.001	0.27	<0.00016	<0.001	<0.001	0.4	<0.0002	0.226	<0.001	0.001	<0.0005	<0.0005	<0.001	<0.001	na	<0.1	
		6-Apr-23	4903754	23E012607	0.036	<0.0010	<0.001	0.07	<0.001	0.12	<0.00016	<0.001	<0.001	0.4	<0.0002	0.236	<0.001	0.014	<0.0005	<0.0005	<0.001	<0.001	<0.1		
		04-May-23	4967076	23E021784	<0.004	<0.0010	<0.001	<0.05	<0.001	0.04	<0.00016	<0.001	<0.001	<0.1	<0.0001	0.018	<0.001	<0.0005	<0.0005	<0.001	<0.001	<0.1			
		11-May-23	4986004	23E024382	<0.004	<0.0010	<0.001	<0.05	<0.001	0.04	<0.00016	<0.001	<0.002	0.002	<0.1	<0.0002	<0.005	<0.001	<0.0005	<0.0005	<0.001	<0.001	<0.1		
		19-May-23	5003672	23E026902	0.011	0.0015	<0.001	<0.05	<0.001	0.04	0.00016	<0.001	<0.002	<0.001	<0.1	<0.0002	<0.005	<0.001	<0.0005	<0.0005	<0.001	<0.001	<0.1		
		31-May-23	5030404	23E031691	0.013	<0.0010	<0.001	<0.05	<0.001	0.04	<0.00016	<0.001	<0.002	<0.001	<0.1	<0.0002	0.012	<0.001	<0.0005	<0.0005	<0.001	<0.001	<0.1		
		13-Jun-23	5065780	23E036123	<0.004	<0.0010	<0.001	<0.05	<0.001	0.05	<0.00016	<0.001	<0.002	0.002	<0.1	<0.0002	0.006	<0.001	<0.0005	<0.0005	<0.001	<0.001	<0.1		
		13-Jun-23	5065901	23E036123	<0.004	<0.0010	<0.001	<0.05	<0.001	0.05	<0.00016	<0.001	<0.002	0.002	<0.1	<0.0002	0.006	<0.001	<0.0005	<0.0005	<0.001	<0.001	<0.1		
		28-Jun-23	5107162	23E041864	<0.004	<0.0010	<0.001	<0.05	<0.001	0.04	<0.00016	<0.001	<0.002	<0.001	<0.1	<0.0002	<0.005	<0.001	<0.0005	<0.0005	<0.001	<0.001	<0.1		
		26-Jul-23	5177242	23E052402	<0.004	<0.0010	<0.001	<0.05	<0.001	0.04	<0.00016	<0.001	<0.002	<0.001	<0.1	<0.0002	<0.005	<0.001	<0.0005	<0.0005	<0.001	<0.001	<0.1		
		22-Aug-23	5235352	23E061053	<0.004	<0.0010	<0.001	<0.05	<0.001	0.04	<0.00016	<0.001	<0.002	<0.001	<0.1	<0.0002	<0.009	<0.001	<0.0005	<0.0005	<0.001	<0.001	<0.1		
		28-Sep-23	5330850	23E075537	<0.004	<0.0010	<0.001	<0.05	<0.001	0.05	<0.00016	<0.001	<0.002	<0.001	<0.1	<0.0002	<0.009	<0.001	<0.0005	<0.0005	<0.001	<0.001	<0.1		
		28-Sep-23	5330914	23E075537	<0.004	<0.0010	<0.001	<0.05	<0.001	0.05	<0.00016	<0.001	<0.002	<0.001	<0.1	<0.0002	<0.009	<0.001	<0.0005	<0.0005	<0.001	<0.001	<0.1		
SW02	northeastern investigation area	15-Mar-23	4859263	23E006628	<0.004	<0.0010	<0.001	0.06	<0.001	0.05	<0.00016	<0.001	<0.002	<0.001	0.2	<0.0002	0.173	<0.001	<0.0005	<0.0005	<0.001	<0.001	na	<0.1	
		6-Apr-23	4903758	23E012607	0.113	<0.0010	0.003	0.84	<0.001	0.12	<0.000150	<0.007	<0.001	0.1	<0.0002	0.228	<0.002	0.008	<0.009	<0.0040	<0.003	<0.001	0.004	<0.1	
		04-May-23	4967077	23E021784	<0.004	<0.0010	0.001	<0.05	<0.001	0.04	<0.00016	<0.001	<0.002	0.002	<0.1	<0.0002	0.006	<0.001	<0.0005	<0.0005	<0.001	<0.001	<0.1		
		04-May-23	4967086	23E021784	<0.004	<0.0010	<0.001	<0.05	<0.001	0.04	<0.00016	<0.001	<0.002	0.002	<0.1	<0.0002	0.006	<0.001	<0.0005	<0.0005	<0.001	<0.001	<0.1		
		11-May-23	4986597	23E024382	<0.004	<0.0010	<0.001	<0.05	<0.001	0.03	<0.00016	<0.001	<0.002	0.002	<0.1	<0.0002	0.005	<0.001	<0.0005	<0.0005	<0.001	<0.001	<0.1		
		19-May-23	5003696	23E026902	<0.004	<0.0010	<0.001	<0.05	<0.001	0.03	<0.00016	<0.001	<0.002	0.002	<0.1	<0.0002	0.008	<0.001	<0.0005	<0.0005	<0.001	<0.001	<0.1		
		31-May-23	5036408	23E031691	<0.004	<0.0010	<0.001	<0.05	<0.001	0.04	<0.00016	<0.001	<0.002	0.002	<0.1	<0.0002	0.011	<0.001	<0.0005	<0.0005	<0.001	<0.001	<0.1		
		13-Jun-23	5065797	23E036123	<0.004	<0.0010	<0.001	<0.05	<0.001	0.05	<0.00016	<0.001	<0.002	0.002	<0.1	<0.0002	0.008	<0.001	<0.0005	<0.0005	<0.001	<0.001	<0.1		
		28-Jun-23	5107186	23E041864	<0.004	<0.0010	<0.001	<0.05	<0.001	0.04	<0.00016	<0.001	<0.002	0.002	<0.1	<0.0002	0.013	<0.001	<0.0005	<0.0005	<0.001	<0.001	<0.1		
		26-Jul-23	5177247	23E052402	<0.004	<0.0010	<0.001	<0.05	<0.001	0.04	<0.00016	<0.001	<0.002	0.001	<0.1	<0.0002	0.010	<0.001	<0.0005	<0.0005	<0.001	<0.001	<0.1		
		22-Aug-23	5235353	23E061053	0.029	<0.0010	<0.00																		

Table 8: Dissolved Metals Analytical Results - Surface Water  
 Alberta Energy Regulator  
 Imperial Keral Oil Sands, Wood Buffalo, Alberta

Sample Identification	Sample Location	Date Sampled	Laboratory Sample Identification	Laboratory Report Number	Aluminum <sup>a</sup>	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Chromium	Cobalt	Copper	Iron	Lead	Manganese	Molybdenum	Nickel	Selenium	Silver	Thallium	Uranium	Vanadium	Zinc
<b>AEPA Guideline<sup>b</sup></b>																									
<b>Protection of Freshwater Aquatic Life (PAL)</b>																									
SW07	150 m downstream of SW06	6-Apr-23	4903763	23E012607	0.022	<0.0010	<0.001	0.07	<0.001	0.04	<0.000016	<0.001	<0.001	0.5	<0.0002	0.288	<0.001	<0.0005	<0.0005	<0.0005	<0.001	<0.001	<0.01		
		21-Apr-23	4937442	23017391	0.1	<0.0010	<0.001	<0.05	<0.001	0.02	<0.000016	<0.001	<0.001	0.1	<0.0002	0.091	<0.001	<0.0005	<0.0005	<0.0005	<0.001	<0.001	<0.01		
		27-Apr-23	4948255	23E019331	<0.004	<0.0010	<0.001	<0.05	<0.001	0.01	<0.000016	<0.001	<0.001	<0.1	<0.0002	0.026	<0.001	<0.0005	<0.0005	<0.0005	<0.001	<0.001	<0.01		
		04-May-23	4967078	23E021784	<0.004	<0.0010	<0.001	<0.05	<0.001	0.03	<0.000016	<0.001	<0.001	<0.1	<0.0002	0.011	<0.001	<0.0005	<0.0005	<0.0005	<0.001	<0.001	<0.01		
		11-May-23	4986594	23E024386	<0.004	<0.0010	<0.001	<0.05	<0.001	0.05	0.000018	<0.001	<0.0002	<0.001	<0.1	<0.0002	0.222	<0.001	<0.0005	<0.0005	<0.001	<0.001	<0.01		
		19-May-23	5003701	23E026902	<0.004	<0.0010	<0.001	<0.05	<0.001	0.04	<0.000016	<0.001	<0.0002	<0.001	<0.1	<0.0002	0.017	<0.001	<0.0005	<0.0005	<0.001	<0.001	<0.01		
		19-May-23	5003702	23E026902	<0.004	<0.0010	<0.001	<0.05	<0.001	0.04	<0.000016	<0.001	<0.0002	<0.001	<0.1	<0.0002	0.017	<0.001	<0.0005	<0.0005	<0.001	<0.001	<0.01		
		31-May-23	5036413	23E031691	<0.004	<0.0010	<0.001	<0.05	<0.001	0.04	<0.000016	<0.001	<0.0002	0.002	<0.1	<0.0002	0.019	<0.001	<0.0005	<0.0005	<0.001	<0.001	<0.01		
		13-Jun-23	5065814	23E036123	<0.004	<0.0010	<0.001	<0.05	<0.001	0.04	<0.000016	<0.001	<0.0002	0.002	<0.1	<0.0002	0.019	<0.001	<0.0005	<0.0005	<0.001	<0.001	<0.01		
		28-Jun-23	5107191	23E041864	<0.004	<0.0010	<0.001	<0.05	<0.001	0.03	<0.000016	<0.001	<0.0002	0.001	<0.1	<0.0002	0.001	<0.0007	<0.0005	<0.0005	<0.001	<0.001	<0.01		
		26-Jul-23	5177252	23E052402	<0.004	<0.0010	<0.001	<0.05	<0.001	0.03	<0.000016	<0.001	<0.0002	0.001	<0.1	<0.0002	0.022	<0.001	<0.0013	<0.0005	<0.0005	<0.001	<0.001	<0.01	
		22-Aug-23	5235358	23E061053	<0.004	<0.0010	<0.001	<0.05	<0.001	0.03	<0.000016	<0.001	<0.0002	0.001	<0.1	<0.0002	0.021	<0.001	<0.0005	<0.0005	<0.001	<0.001	<0.01		
		28-Sep-23	5330859	23E075537	<0.004	<0.0010	<0.001	<0.05	<0.001	0.03	<0.000016	<0.001	<0.0002	0.001	<0.1	<0.0002	0.029	<0.001	<0.0012	<0.0005	<0.0005	<0.001	<0.001		
		24-Oct-23	5402753	23E085932	0.054	<0.0010	<0.001	0.24	<0.001	0.4	<0.000016	<0.001	<0.0002	<0.001	<0.1	<0.0002	0.288	<0.001	<0.0005	<0.0005	<0.001	<0.001	0.03		
SW08	northeastern investigation area	21-Apr-23	4937443	23017391	0.053	<0.0010	<0.001	0.06	<0.001	0.33	<0.000016	<0.001	<0.0001	<0.1	<0.0002	0.511	<0.001	0.0013	<0.0005	<0.0005	<0.001	<0.001	<0.01		
		27-Apr-23	4948770	23E019331	0.004	<0.0010	<0.001	0.01	0.08	0.048	<0.000016	0.001	<0.0001	0.7	<0.0002	0.553	<0.003	0.003	<0.0005	<0.0005	<0.001	<0.001	<0.01		
		04-May-23	4967085	23E021784	0.004	<0.0010	<0.001	0.05	<0.001	0.29	<0.000016	<0.001	<0.0001	0.1	<0.0002	0.014	<0.001	0.0009	<0.0005	<0.0005	<0.001	<0.001	<0.01		
		11-May-23	4986595	23E024382	0.021	<0.0010	<0.001	0.05	<0.001	0.49	<0.000016	<0.001	<0.0001	0.1	<0.0002	0.257	<0.001	0.002	<0.0005	<0.0005	<0.001	<0.001	<0.01		
		19-May-23	5003703	23E026902	<0.004	<0.0010	<0.001	0.05	<0.001	0.26	<0.000016	<0.001	<0.0001	0.1	<0.0002	0.17	<0.001	0.0008	<0.0005	<0.0005	<0.001	<0.001	<0.01		
		31-May-23	5036414	23E031691	<0.004	<0.0010	<0.001	0.07	<0.001	0.14	<0.000016	<0.001	<0.0002	<0.001	<0.1	<0.0002	0.106	<0.001	<0.0005	<0.0005	<0.001	<0.001	<0.01		
		13-Jun-23	5065816	23E036123	0.004	<0.0010	<0.001	0.01	0.05	0.04	<0.000016	<0.001	<0.0002	0.001	<0.1	<0.0002	0.155	<0.001	0.0017	<0.0005	<0.0005	<0.001	<0.001	<0.01	
		28-Jun-23 <sup>c</sup>	5107192	23E041864	0.018	<0.0010	<0.001	0.05	<0.001	0.69	<0.000016	<0.001	<0.0002	0.001	<0.1	<0.0002	0.422	<0.001	0.0024	<0.0005	<0.0005	<0.001	<0.001	<0.01	
		26-Jul-23	5177253	23E052402	0.004	<0.0010	<0.001	0.01	0.05	0.069</															

**Table 9: Routine Chemistry Analytical Results - Surface Water**  
 Alberta Energy Regulator  
 Imperial Keral Oil Sands, Wood Buffalo, Alberta

Sample Identification	Sample Location	Date Sampled	Laboratory Sample Identification	Laboratory Report Number	Field Chloride (QuanTab) (mg/L)	pH	Electrical Conductivity (EC) ( $\mu\text{s}/\text{cm}$ )	Total Dissolved Solids (TDS) (Calculated)	Chloride	Fluoride	Sulphate	Calcium (Dissolved)	Sodium (Dissolved)	Iron (Dissolved)	Magnesium (Dissolved)	Potassium (Dissolved)	Nitrate ( $\text{NO}_3^-$ )	Nitrate-N ( $\text{NO}_3-\text{N}$ )	Nitrite ( $\text{NO}_2^-$ )	Nitrite-N ( $\text{NO}_2-\text{N}$ )	Nitrate + Nitrite-N	Bicarbonate	Carbonate	Hydroxide	Ion Balance (%)	Hardness (mg $\text{CaCO}_3$ /L)	T - Alkalinity (as $\text{CaCO}_3$ ) (mg/L) <sup>a</sup>	P - Alkalinity (as $\text{CaCO}_3$ ) (mg/L)	Sodium Adsorption Ratio (SAR)	Ammonia (as N)	Field Temperature (°C)	Phosphorus (total)	Dissolved Oxygen (mg/L)	Field Turbidity (NTU)
<b>AEPA Guideline<sup>c</sup></b>																																		
SW01	northeastern investigation area	Protection of Freshwater Aquatic Life (PAL)					ng	6.5-9.0	ng	ng	120	ng	table A	ng	0.3	ng	ng	3.0	ng	table B	ng	ng	ng	ng	ng	> 20	ng	ng	0.267 to 49.921	ng	ng	ng	ng	
		15-Mar-23	4859262	23E00628	na	7.58	771	440	11	0.36	43	87	40.8	0.4	36.5	0.226	3.5	<0.5	<0.2	<0.05	<0.01	<0.02	444	<5	<5	109	368	364	<5	0.93	na	0.2	na	22.06
		6-Apr-23	4903754	23E012607	na	7.52	884	493	6	0.58	48	76.4	53.7	0.4	36.8	0.236	4.8	<0.5	<0.2	<0.05	<0.01	<0.02	543	<5	<5	92	342	445	<5	1.26	na	0.2	na	8.57
		04-May-23	4967076	23E021784	na	8.07	391	223	2	0.15	18	48.4	14.6	<0.1	18.1	0.018	2.5	<0.5	<0.2	<0.05	<0.01	<0.02	242	<5	<5	105	195	199	<5	0.45	na	16.2	na	9.8
		11-May-23	4986000	23E024382	na	8.02	382	217	2	0.17	14	46.9	13.3	<0.1	18.4	<0.005	2.5	<0.5	<0.2	<0.05	<0.01	<0.02	244	<5	<5	103	193	200	<5	0.42	<0.015	16.8	<0.08	9.31
		19-May-23	5003672	23E026902	na	8.11	400	205	1	0.16	11	43.1	12	<0.1	19.3	<0.005	2.2	<0.5	<0.2	<0.05	<0.01	<0.02	237	<5	<5	104	187	194	<5	0.38	0.093	15.2	<0.08	10.94
		31-May-23	5036044	23E031691	na	8.16	401	210	2	0.21	12	43.4	12.4	<0.1	20.1	0.012	2.0	<0.5	<0.2	<0.05	<0.01	<0.02	241	<5	<5	103	191	198	<5	0.39	<0.015	18.8	<0.08	10.13
		13-Jun-23	5065780	23E036123	na	8.13	382	202	2	0.17	10	39.3	13.1	<0.1	20.8	0.006	1.9	<0.5	<0.2	<0.05	<0.01	<0.02	233	<5	<5	105	184	191	<5	0.42	<0.015	20.2	<0.08	9.68
		13-Jun-23	5065901	23E036123	na	8.19	385	201	1	0.2	10	39.4	13.1	<0.1	20.8	0.006	1.9	<0.5	<0.2	<0.05	<0.01	<0.02	234	<5	<5	105	184	192	<5	0.42	0.016	20.2	<0.08	na
		28-Jun-23	5107162	23E041864	na	8.06	343	187	<1	0.13	6	41.7	9	<0.1	20.2	<0.005	1.2	<0.5	<0.2	<0.05	<0.01	<0.02	222	<5	<5	110	187	182	<5	0.29	0.019	24	<0.08	6.1
		26-Jul-23	5177242	23E052402	na	7.93	335	179	<1	0.17	5	41	8.5	<0.1	18.4	0.005	0.7	<0.5	<0.2	<0.05	<0.01	<0.02	215	<5	<5	109	178	176	<5	0.28	0.053	18.9	<0.08	5.89
		22-Aug-23	5233532	23E061053	na	8.07	352	196	<1	0.17	3	42.6	9.3	<0.1	21.8	<0.005	1.1	0.8	<0.18	<0.05	<0.01	<0.02	239	<5	<5	109	196	196	<5	0.29	0.015	17.4	0.11	9.77
		28-Sep-23	5330830	23E075537	na	8.18	428	223	1	0.21	3	51	9.4	<0.1	25.2	0.009	1.6	<0.5	<0.2	<0.05	<0.01	<0.02	269	<5	<5	112	231	221	<5	0.27	<0.015	12.7	<0.08	9.03
		28-Sep-23	5330914	23E075537	na	8.20	431	225	1	0.19	3	51.9	9.4	<0.1	24.9	0.009	1.7	<0.5	<0.2	<0.05	<0.01	<0.02	271	<5	<5	112	232	222	<5	0.27	0.024 <sup>b</sup>	na	<0.08	na
SW02	northeastern investigation area	15-Mar-23	4859263	23E006262	na	7.42	727	395	3	0.28	16	88.7	25.5	0.2	34.9	0.173	3	8.8	1.99	0.21	0.06	2.05	436	<5	<5	110	365	358	<5	0.58	na	0.2	na	35
		6-Apr-23	4903758	23E012607	na	7.41	890	481	5	0.68	42	76.8	52.9	0.1	35.5	0.228	5.7	<0.5	<0.2	<0.05	<0.01	<0.02	534	<5	<5	94	338	438	<5	1.25	na	0.1	na	6.69
		04-May-23	4967077	23E021784	na	8.08	391	223	2	0.13	19	47.3	14.3	<0.1	17.6	0.010	2.2	<0.5	<0.2	<0.05	<0.01	<0.02	246	<5	<5	100	191	202	<5	0.45	na	16.4	na	10.65
		04-May-23	4967086	23E021784	na	8.11	401	221	2	0.17	18	47.9	14.5	0.1	17.9	0.010	2.3	<0.5	<0.2	<0.05	<0.01	<0.02	240	<5	<5	104	193	197	<5	0.45	na	16.4	na	na
		11-May-23	4986587	23E024382	na	8.05	399	218	2	0.16	17	45.7	13.1	<0.1	17.8	0.005	2.4	<0.5	<0.2	<0.05	<0.01	<0.02	243	<5	<5	99	187	200	<5	0.42	0.019	16.9	<0.08	9.71
		19-May-23	5003690	23E026902	na	8.11	396	207	1	0.2	11	44.5	12	<0.1	19.1	0.008	2.2	<0.5	<0.2</td															

**Table 9: Routine Chemistry Analytical Results - Surface Water**  
 Alberta Energy Regulator  
 Imperial Keral Oil Sands, Wood Buffalo, Alberta

Sample Identification	Sample Location	Date Sampled	Laboratory Sample Identification	Laboratory Report Number	Field Chloride (QuanTab) (mg/L)	pH	Electrical Conductivity (EC) ( $\mu\text{S}/\text{cm}$ )	Total Dissolved Solids (TDS) (Calculated)	Chloride	Fluoride	Sulphate	Calcium (Dissolved)	Sodium (Dissolved)	Iron (Dissolved)	Magnesium (Dissolved)	Potassium (Dissolved)	Nitrate ( $\text{NO}_3^-$ )	Nitrate-N ( $\text{NO}_3-\text{N}$ )	Nitrite ( $\text{NO}_2^-$ )	Nitrite-N ( $\text{NO}_2-\text{N}$ )	Nitrate + Nitrite-N	Bicarbonate	Carbonate	Hydroxide	Ion Balance (%)	Hardness (mg $\text{CaCO}_3/\text{L}$ )	T - Alkalinity (as $\text{CaCO}_3$ ) (mg/L) <sup>a</sup>	P - Alkalinity (as $\text{CaCO}_3$ ) (mg/L)	Sodium Adsorption Ratio (SAR)	Ammonia (as N)	Field Temperature (°C)	Phosphorus (total)	Dissolved Oxygen (mg/L)	Field Turbidity (NTU)	
<b>AEPA Guideline<sup>c</sup></b>																																			
<b>Protection of Freshwater Aquatic Life (PAL)</b>																																			
SW06	within outlet east of SW05 off site	6-Apr-23	4903762	23E012607	na	7.47	585	310	2	0.16	6	67.6	13.1	0.6	28.5	0.285	2.3	<0.5	<0.2	<0.05	<0.01	<0.02	387	<5	<5	98	286	317	<5	0.34	na	0.1	na	6.47	14.2
		6-Apr-23	4903764	23E012607	na	7.52	607	305	2	0.17	7	62.4	13.5	0.5	26.9	0.264	2.2	<0.5	<0.2	<0.05	<0.01	<0.02	389	<5	<5	91	267	319	<5	0.36	na	0.1	na	na	
		21-Apr-23	4937441	23I017391	na	7.84	219	114	<1	0.09	4	28.9	2.8	0.9	0.10	0.22	<0.5	<0.2	<0.05	<0.01	<0.02	136	<5	<5	102	109	112	<5	0.12	na	9.0	na	6.07	9.87	
		27-Apr-23	4948777	23E019331	na	7.72	258	141	<1	0.1	6	36.1	4.8	<0.1	13.4	0.036	1.5	<0.5	<0.2	<0.05	<0.01	<0.02	161	<5	<5	114	145	132	<5	0.17	na	7.0	na	9.05	0.78
		04-May-23	4967079	23E021784	na	8.01	389	220	2	0.16	17	48.6	13.7	<0.1	18.1	<0.005	2.3	<0.5	<0.2	<0.05	<0.01	<0.02	241	<5	<5	105	196	198	<5	0.43	na	15.3	na	6.63	0.99
		11-May-23	4986593	23E024382	na	7.99	387	213	1	0.16	14	47.8	11	<0.1	17.7	0.016	2.3	<0.5	<0.2	<0.05	<0.01	<0.02	242	<5	<5	102	192	198	<5	0.35	0.024	17.0	<0.08	8.95	0.54
		11-May-23	4986603	23E024382	na	8.03	390	209	1	0.14	11	47.9	10.9	<0.1	17.2	0.015	2.2	<0.5	<0.2	<0.05	<0.01	<0.02	242	<5	<5	102	190	199	<5	0.34	<0.015	17.0	<0.08	na	na
		19-May-23	5003703	23E026902	na	8.07	371	208	1	0.19	12	45	11.9	<0.1	19.4	0.011	2.2	<0.5	<0.2	<0.05	<0.01	<0.02	236	<5	<5	106	192	193	<5	0.37	0.055	15.4	0.16	9.26	0.78
		31-May-23	5036412	23E031691	na	8.09	381	209	1	0.2	10	46.4	10.5	<0.1	20	0.023	1.9	<0.5	<0.2	<0.05	<0.01	<0.02	242	<5	<5	106	198	199	<5	0.32	<0.015	18.6	<0.08	8.05	2.86
		13-Jun-23	5065812	23E036123	na	7.94	372	200	<1	0.22	7	44.8	9.5	0.1	20.4	0.021	1.5	<0.5	<0.2	<0.05	<0.01	<0.02	237	<5	<5	108	196	195	<5	0.3	0.033	19.4	<0.08	7.21	1.36
		28-Jun-23	5107190	23E041864	na	7.95	337	177	<1	0.14	5	40.8	7.9	<0.1	18.5	0.012	1	<0.5	<0.2	<0.05	<0.01	<0.02	211	<5	<5	110	178	173	<5	0.26	0.040	21.4	<0.08	7.11	na
		26-Jul-23	5177251	23E052402	na	7.96	351	185	<1	0.18	3	46.2	6.3	0.1	18.2	0.052	0.7	<0.5	<0.2	<0.05	<0.01	<0.02	224	<5	<5	110	190	183	<5	0.20	0.052	18.4	<0.08	5.16	na
		22-Aug-23	5235357	23E061053	na	7.92	369	197	<1	0.17	2	45.2	6.6	<0.1	19.8	0.016	0.9	<0.5	<0.2	<0.05	<0.01	<0.02	250	<5	<5	101	194	205	<5	0.21	0.027	17.6	<0.08	9.7	3.26
		28-Sep-23	5330857	23E075537	na	8.15	424	224	<1	0.15	2	57	6.7	<0.1	24.3	0.015	1.4	<0.5	<0.2	<0.05	<0.01	<0.02	270	<5	<5	116	242	222	<5	0.19	0.022	12.5	<0.08	7.37	1.79
SW07	150 m downstream of SW06	6-Apr-23	4903763	23E012607	na	7.49	617	310	2	0.2	9	63.5	13.3	0.5	27.5	0.288	2.3	<0.5	<0.2	<0.05	<0.01	<0.02	391	<5	<5	92	272	321	<5	0.35	na	0.7	na	6.77	10.18
		21-Apr-23	4937442	23I017391	na	7.76	295	154	1	0.1	6	36.4	4.8	0.1	13.8	0.091	1.9	<0.5	<0.2	<0.05	<0.01	<0.02	184	<5	<5	101	148	151	<5	0.17	na	5.4	na	8.84	355.05
		27-Apr-23	4948255	23E019331	na	7.64	205	107	<1	0.08	4	27.2	4.1	<0.1	9.9	0.026	0.8	<0.5	<0.2	<0.05	<0.01	<0.02	125	<5	<5	111	109	103	<5	0.17	na	8.1	na	9.35	0.45
		04-May-23	4967079	23E021784	na	7.96	393	217	2	0.15	16	48.2	13.3	<0.1	17.8	0.011	2	<0.5	<0.2	<0.05	<0.01	<0.02	240	<5	<5	104	194	197	<5	0.42	na	16.0	na	6.22	0.27
		11-May-23	4986593																																

**Table 9: Routine Chemistry Analytical Results - Surface Water**  
 Alberta Energy Regulator  
 Imperial Keral Oil Sands, Wood Buffalo, Alberta

Sample Identification	Sample Location	Date Sampled	Laboratory Sample Identification	Laboratory Report Number	Field Chloride (QuanTab) (mg/L)	pH	Electrical Conductivity (EC) ( $\mu\text{S}/\text{cm}$ )	Total Dissolved Solids (TDS) (Calculated)	Chloride	Fluoride	Sulphate	Calcium (Dissolved)	Sodium (Dissolved)	Iron (Dissolved)	Magnesium (Dissolved)	Potassium (Dissolved)	Nitrate ( $\text{NO}_3^-$ )	Nitrate-N ( $\text{NO}_3^-/\text{N}$ )	Nitrite ( $\text{NO}_2^-$ )	Nitrite-N ( $\text{NO}_2^-/\text{N}$ )	Nitrate + Nitrite-N	Bicarbonate	Carbonate	Hydroxide	Ion Balance (%)	Hardness (mg $\text{CaCO}_3/\text{L}$ )	T - Alkalinity (as $\text{CaCO}_3$ ) (mg/L) <sup>a</sup>	P - Alkalinity (as $\text{CaCO}_3$ ) (mg/L)	Sodium Adsorption Ratio (SAR)	Ammonia (as N)	Field Temperature (°C)	Phosphorus (total)	Dissolved Oxygen (mg/L)	Field Turbidity (NTU)	
<b>AEPA Guideline<sup>c</sup></b>																																			
<b>Protection of Freshwater Aquatic Life (PAL)</b>																																			
DP4-SW01	northern investigation area	22-Apr-23	4937456	23017391	na	7.83	582	358	3	<0.05	91	63.3	25.5	0.8	32.1	0.659	6	<0.5	<0.02	<0.05	<0.01	<0.02	279	<5	<5	109	290	228	<5	0.65	na	2.6	na	7.37	49.91
		04-May-23	4967075	23E021784	na	7.71	847	534	3	0.26	144	98.6	30	1.0	46.7	2.81	5.3	1.2	0.27	<0.05	<0.01	0.27	418	<5	<5	104	439	342	<5	0.62	na	5.3	na	1.27	7.12
		11-May-23	4986599	23E024382	na	7.75	923	554	3	0.31	124	107	30.1	5.5	48.5	4.06	5.6	<0.5	<0.02	<0.05	<0.01	<0.02	479	<5	<5	106	467	392	<5	0.61	0.389	12.2	0.33	7.51	103.64
		19-May-23	5003706	23E026902	na	7.78	848	542	3	0.26	142	100	30.1	4.4	49.6	2.77	4.9	<0.5	<0.02	<0.05	<0.01	<0.02	431	<5	<5	106	454	353	<5	0.61	0.353	11.9	0.27	3.07	41.66
		31-May-23	5036418	23E031691	na	7.94	849	544	4	0.23	132	102	34	1.0	50.7	0.557	5.1	<0.5	<0.02	<0.05	<0.01	<0.02	439	<5	<5	109	463	360	<5	0.69	<0.015	11.6	<0.08	0.69	127.6
		13-Jun-23	5065902	23E036123	na	7.73	1.110	698	4	0.21	193	117	41.3	2.4	54.2	3.05	5.4	<0.5	<0.02	<0.05	<0.01	<0.02	575	<5	<5	92	515	472	<5	0.79	0.266	17.7	19	3.6	4,290
		28-Jun-23	5107195	23E041864	na	7.79	991	618	4	0.29	156	112	35.6	2.4	50.9	1.92	5.6	9.4	2.12	0.09	0.03	2.15	496	<5	<5	100	489	406	<5	0.7	0.084	13.7	0.16	5.21	na
		28-Jun-23	5107197	23E041864	na	7.87	965	609	4	0.41	156	113	35.6	2.9	50.4	1.95	5.4	<0.5	<0.02	<0.05	<0.01	<0.02	498	<5	<5	101	490	408	<5	0.7	0.085 <sup>b</sup>	na	0.34	na	na
		26-Jul-23	5177256	23E052402	na	7.87	900	556	4	0.30	116	117	38.7	2.7	49.7	1.38	5.8	<0.5	<0.02	<0.05	<0.01	<0.02	458	<5	<5	118	497	376	<5	0.76	0.232	17.4	2.79	4.28	na
		22-Aug-23	5235363	23E061053	na	7.88	910	554	3	0.32	89	101	33.4	1.9	47.8	1.24	5.6	<0.5	<0.02	<0.05	<0.01	<0.02	558	<5	<5	96	449	457	<5	0.69	0.144	14.8	5.16	4.66	175.5
		24-Oct-23	5402834	23E085932	na	7.76	831	545	2	0.27	103	99	25.8	<0.1	43.2	1.53	5	<0.5	<0.02	<0.05	<0.01	<0.02	542	<5	<5	88	425	444	<5	0.54	0.330	3.2	22.40	1.1	na
WB4-SW01	northern investigation area	22-Apr-23	4937457	23017391	na	6.83	62	29.6	<1	<0.05	<1	4.7	<0.6	0.2	1.3	0.125	3.6	9.0	2.03	0.23	0.07	2.1	22	<5	<5	87	17	18	<5	<0.02	na	0.9	na	5.93	66
		27-Apr-23	4948778	23E019331	na	6.90	73	40.1	1	<0.05	<1	8.7	0.6	0.3	2.4	0.101	7.7	<0.5	<0.02	<0.05	<0.01	<0.02	40	<5	<5	127	32	33	<5	0.05	na	10.6	na	8.12	18.17
		04-May-23	4966946	23E021784	na	7.56	70	36.3	<1	<0.05	<1	8.7	1	<0.1	2.1	0.051	4.3	<0.5	<0.02	<0.05	<0.01	<0.02	41	<5	<5	113	30	33	<5	0.08	na	17.8	na	na	na
		11-May-23	4986600	23E024382	na	7.32	70	35	<1	<0.05	<1	8.4	0.6	0.2	2.2	0.04	5.1	<0.5	<0.02	<0.05	<0.01	<0.02	38	<5	<5	123	30	31	<5	0.05	0.174	23.1	1.24	9.01	14.42
		19-May-23	5003707	23E026902	na	7.26	72	34.1	<1	0.09	<1	8.3	<0.6	0.1	2.4	0.017	4.7	<0.5	<0.02	<0.05	<0.01	<0.02	38	<5	<5	117	31	31	<5	<0.02	0.133	19.1	1.05	7.8	2.76
		31-May-23	5036419	23E031691	na	7.29	75	38.1	<1	0.08	<1	8.4	0.6	0.1	2.3	0.015	5.2	<0.5	<0.02	<0.05	<0.01	<0.02	44	<5	<5	106	30	36	<5	0.05	<0.015	24.5	0.75	9.71	19.32
		31-May-23	5036420	23E031691	na	7.01	81	36.5	<1	<0.05	<1	8.5	<0.6	0.1	2.5	0.017	4.8	<0.5	<0.02	<0.05	<0.01	<0.02	42	<5	<5	110	32	34	<5	<0.02	<0.015	24.5	0.59	na	na
		13-Jun-23	5065902																																



**Table 10: Polycyclic Aromatic Hydrocarbon Analytical Results - Surface Water  
Alberta Energy Regulator  
Imperial Kearn Oil Sands, Wood Buffalo, Alberta**

**Table 10: Polycyclic Aromatic Hydrocarbon Analytical Results - Surface Water**

Alberta Energy Regulator

Imperial Keral Oil Sands, Wood Buffalo, Alberta

Sample Identification	Sample Location	Date Sampled	Laboratory Sample Identification	Laboratory Report Number	Acenaphthene	Acenaphthylene	Acridine	Anthracene	Benz[a] anthracene	Benzo[a] pyrene	Benzo[b+] fluoranthene	Benzo[g,h,i] perylene	Benzo[k] fluoranthene	Chrysene	Dibenz[a,h] anthracene	Fluoranthene	Fluorene	Indeno[1,2,3-c,d]pyrene	2-Methyl naphthalene	Naphthalene	Phenanthrene	Pyrene	Perylene	Quinoline		
					0.0058	ng	0.0044	0.000012	0.000018	0.000015	ng	ng	ng	ng	ng	0.00004	0.003	ng	ng	0.001	0.0004	0.000025	ng	0.0034		
			AEPA Guidelines <sup>a</sup>	Protection of Freshwater Aquatic Life (PAL)																						
					6-Apr-23	4903762	23E012607	<0.00001	<0.00001	<0.00005	<0.000010	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.0000100	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.000010	<0.00001	<0.00001	
					6-Apr-23	4903764	23E012607	<0.00001	<0.00001	<0.00005	<0.000010	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.0000100	<0.00001	<0.00001	<0.00001	<0.00001	<0.000010	<0.00001	<0.00001		
					21-Apr-23	4937441	23I017391	<0.00001	<0.00001	<0.00005	<0.000010	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.0000100	<0.00001	<0.00001	<0.00001	<0.00001	<0.000010	<0.00001	<0.00001		
					27-Apr-23	4948777	23E019331	<0.00001	<0.00001	<0.00005	<0.000010	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.0000100	<0.00001	<0.00001	<0.00001	<0.00001	<0.000010	<0.00001	<0.00001		
					4-May-23	4967079	23E021784	<0.00001	<0.00001	<0.00005	<0.000010	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.0000100	<0.00001	<0.00001	<0.00001	<0.00001	<0.000010	<0.00001	<0.00003	<0.0001	
					11-May-23	4986593	23E024382	<0.00001	<0.00001	<0.00005	<0.000010	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.0000100	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	
					11-May-23	4986603	23E024382	<0.00001	<0.00001	<0.00005	<0.000010	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.0000100	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	
					19-May-23	5003700	23E026902	<0.00001	<0.00001	<0.00005	<0.000010	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.0000100	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.000010	<0.00001	<0.00001	
					31-May-23	5036412	23E031691	<0.00001	<0.00001	<0.00005	<0.000010	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.0000100	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.000010	<0.00001	<0.00001	
					13-Jun-23	5065812	23E036123	<0.00001	<0.00001	<0.00005	<0.000010	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.0000100	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.000010	<0.00001	<0.00001
					26-Jul-23	5177251	23E052402	<0.00001	<0.00001	<0.00005	<0.000010	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.0000100	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.000010	<0.00001	<0.00001	
					22-Aug-23	5235357	23E061053	<0.00001	<0.00001	<0.00005	<0.000010	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.0000100	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.000010	<0.00001	<0.00001	
					28-Sep-23	5330857	23E075537	<0.00001	<0.00001	<0.00005	<0.000010	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.0000100	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.000010	<0.00001	<0.00001	
SW06	within outlet east of SW05 off site				26-Jul-23	5177252	23E052402	<0.00001	<0.00005	<0.000010	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.0000100	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.000010	<0.00001	<0.00001	
SW07	northeastern investigation area				21-Apr-23	4937443	23I017391	<0.00001	<0.00005	<0.000010	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.0000100	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.000010	<0.00001	<0.00001	
SW08	northeastern investigation area				27-Apr-23	4948770	23E019331	<0.00001	<0.00001	<0.00005	<0.000010	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.0000100	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.000010	<0.00001	<0.00001	
SW09	northeastern investigation area				21-Apr-23	4937445	23I017391	<0.00001	<0.00001	<0.00005	<0.000010	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.0000100	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.000010	<0.00001	<0.00001	
SW10	northeastern investigation area				21-Apr-23	4937445	23I017391	<0.00001	<0.00001	<0.00005	<0.000010	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.0000100	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.000010	<0.00001	<0.00001	
SW11	northeastern investigation area				21-Apr-23	4937446	23I017391	<0.00001	<0.00005	<0.000010	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.0000100	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.000010	<0.00001	<0.00001	
SW12	northeastern investigation area				21-Apr-23	4937447	23I017391	<0.00001	<0.00005	<0.000010	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.0000100	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.000010	<0.00001	<0.00001	
SW13	northeastern investigation area				21-Apr-23	4937448	23I017391	<0.00001	<0.00005	<0.000010	<0.00001</td															

**Table 10: Polycyclic Aromatic Hydrocarbon Analytical Results - Surface Water**

Alberta Energy Regulator

Imperial Keral Oil Sands, Wood Buffalo, Alberta

Sample Identification	Sample Location	Date Sampled	Laboratory Sample Identification	Laboratory Report Number	Acenaphthene	Acenaphthylene	Acridine	Anthracene	Benz[a] anthracene	Benzo[a] pyrene	Benzo[b+] fluoranthene	Benzo[g,h,i] perylene	Benzo[k] fluoranthene	Chrysene	Dibenz[a,h] anthracene	Fluoranthene	Fluorene	Indeno[1,2,3-c,d]pyrene	2-Methyl naphthalene	Naphthalene	Phenanthrene	Pyrene	Perylene	Quinoline
			AEPA Guidelines <sup>a</sup>	Protection of Freshwater Aquatic Life (PAL)	0.0058	ng	0.0044	0.000012	0.000018	0.000015	ng	ng	ng	ng	ng	0.00004	0.003	ng	ng	0.001	0.0004	0.000025	ng	0.0034
DP4-SW01	northern investigation area	22-Apr-23	4937456	23I017391	<0.00001	<0.00001	<0.00005	<0.000010	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
		4-May-23	4967075	23E021784	<0.00001	<0.00001	<0.00005	<0.000010	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
		11-May-23	4986598	23E024382	<0.00001	<0.00001	<0.00005	<0.000010	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
		19-May-23	5003706	23E026902	<0.00001	<0.00001	<0.00005	<0.000010	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
		31-May-23	5036418	23E031691	<0.00001	<0.00001	<0.00005	<0.000010	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
		13-Jun-23	5065902	23E036123	<0.00001	<0.00001	<0.00005	<0.000010	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
		26-Jul-23	5177256	23E052402	<0.00001	<0.00001	<0.00005	<0.000010	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
		22-Aug-23	5235363	23E061053	<0.00001	<0.00001	<0.00005	<0.000010	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
		24-Oct-23	5402834	23E085932	<0.00001	<0.00001	<0.00005	<0.000010	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
		22-Apr-23	4937457	23I017391	<0.00001	<0.00001	<0.00005	<0.000010	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
		27-Apr-23	4948778	23E019331	<0.00001	<0.00001	<0.00005	<0.000010	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
		4-May-23	4966946	23E021784	<0.00001	<0.00001	<0.00005	<0.000010	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
		11-May-23	4986600	23E024382	<0.00001	<0.00001	<0.00005	<0.000010	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
		19-May-23	5003707	23E026902	<0.00001	<0.00001	<0.00005	<0.000010	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
		31-May-23	5036419	23E031691	<0.00001	<0.00001	<0.00005	<0.000010	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
		31-May-23	5036420	23E031691	<0.00001	<0.00001	<0.00005	<0.000010	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
		13-Jun-23	5065903	23E036123	<0.00001	<0.00001	<0.00005	<0.000010	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
		26-Jul-23	5177257	23E052402	<0.00001	<0.00001	<0.00005	<0.000010	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
		22-Aug-23	5235362	23E061053	<0.00001	<0.00001	<0.00005	<0.000010	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
		27-Sep-23	5330862	23E075537	<0.00001	<0.00001	<0.00005	<0.000010	<0.00001	<0.00001	<0.00001	<0.000												



**Table 12: Naphthenic Acids (FTIR) Analytical Results - Surface Water**  
**Alberta Energy Regulator**  
**Imperial Kearl Oil Sands, Wood Buffalo, Alberta**

Sample Identification	Sample Location	Date Sampled	Laboratory Sample Identification	Laboratory Report Number	Naphthenic Acids
AEPA Guideline <sup>a</sup>			Protection of Freshwater Aquatic Life (PAL)		ng
SW01	northeastern investigation area	15-Mar-23	4859262	23E006628	0.8
		6-Apr-23	4903754	23E012607	1.2
		04-May-23	4967076	23E021784	<0.2
		11-May-23	4986004	23E024382	<0.2
		19-May-23	5003672	23E026902	<0.2
		31-May-23	5036044	23E031691	<0.1
		13-Jun-23	5065780	23E036123	<0.2
		13-Jun-23	5065901	23E036123	<0.2
		28-Jun-23	5107162	23E041864	<0.2
		26-Jul-23	5177242	23E052402	<0.2
		22-Aug-23	5235352	23E061053	<0.2
		28-Sep-23	5330830	23E075537	<0.2
		28-Sep-23	5330914	23E075537	<0.2
		15-Mar-23	4859263	23E006628	0.4
SW02	northeastern investigation area	6-Apr-23	4903758	23E012607	0.4
		04-May-23	4967077	23E021784	<0.2
		04-May-23	4967086	23E021784	<0.2
		11-May-23	4986587	23E024382	<0.2
		19-May-23	5003696	23E026902	<0.2
		31-May-23	5036408	23E031691	<0.1
		13-Jun-23	5065797	23E036123	<0.2
		28-Jun-23	5107186	23E041864	<0.2
		26-Jul-23	5177247	23E052402	<0.2
		22-Aug-23	5235353	23E061053	<0.2
		28-Sep-23	5330853	23E075537	<0.2
SW02-2	30 m southeast of SW02	24-Oct-23	5402645	23E085932	<0.2
SW03	northeastern investigation area	15-Mar-23	4859264	23E006628	5.3
		6-Apr-23	4903759	23E012607	2.3
		21-Apr-23	4937342	23I017391	3.1
		27-Apr-23	4948767	23E019331	1.4
		27-Apr-23	4948768	23E019331	1.6
		04-May-23	4967083	23E021784	1.5
		11-May-23	4986589	23E024382	2.1
		19-May-23	5003697	23E026902	2.6
		31-May-23	5036409	23E031691	1.1
		13-Jun-23	5065800	23E036123	1.8
		28-Jun-23	5107187	23E041864	0.83
		26-Jul-23	5177248	23E052402	1.6
		22-Aug-23	5235354	23E061053	1.3
		28-Sep-23	5330854	23E075537	1.8
		24-Oct-23	5402747	23E085932	2.1
SW04	northeastern investigation area	15-Mar-23	4859265	23E006628	6.2
		6-Apr-23	4903760	23E012607	4.3
		21-Apr-23	4937439	23I017391	3.2
		21-Apr-23	4937449	23I017391	6.0
		27-Apr-23	4948769	23E019331	<0.2
		04-May-23	4967084	23E021784	<0.2
		11-May-23	4986591	23E024382	<0.2
		19-May-23	5003698	23E026902	<0.2
		31-May-23	5036410	23E031691	0.7
		13-Jun-23	5065808	23E036123	2.8
		28-Jun-23	5107190	23E041864	1.39
		26-Jul-23	5177249	23E052402	2.2
		22-Aug-23	5235355	23E061053	2.6
		22-Aug-23	5237422	23E061053	2.7
		28-Sep-23	5330855	23E075537	4.1
SW05	northeastern investigation area	24-Oct-23	5402748	23E085932	5.8
		15-Mar-23	4859266	23E006628	<0.2
		6-Apr-23	4903761	23E012607	<0.2
		21-Apr-23	4937440	23I017391	<0.2
		27-Apr-23	4948776	23E019331	<0.2
		04-May-23	4967080	23E021784	0.3
		11-May-23	4986592	23E024382	<0.2
		19-May-23	5003699	23E026902	<0.2
		31-May-23	5036411	23E031691	<0.1
		13-Jun-23	5065811	23E036123	<0.2
		28-Jun-23	5107190	23E041864	<0.2
		26-Jul-23	5177250	23E052402	<0.2
		22-Aug-23	5235356	23E061053	<0.2
		28-Sep-23	5330856	23E075537	<0.2
		24-Oct-23	5402751	23E085932	<0.2
SW06	within outlet east of SW05 off site	6-Apr-23	4903762	23E012607	<0.2
		6-Apr-23	4903764	23E012607	<0.2
		21-Apr-23	4937441	23I017391	<0.2
		27-Apr-23	4948777	23E019331	<0.2
		04-May-23	4967079	23E021784	<0.2
		11-May-23	4986593	23E024382	<0.2
		11-May-23	4986603	23E024382	<0.2
		19-May-23	5003700	23E026902	<0.2
		31-May-23	5036412	23E031691	<0.1
		13-Jun-23	5065812	23E036123	<0.2
		28-Jun-23	5107190	23E041864	<0.2
		26-Jul-23	5177251	23E052402	<0.2
		22-Aug-23	5235357	23E061053	<0.2
		28-Sep-23	5330857	23E075537	<0.2

**Table 12: Naphthenic Acids (FTIR) Analytical Results - Surface Water**  
**Alberta Energy Regulator**  
**Imperial Kearl Oil Sands, Wood Buffalo, Alberta**

Sample Identification	Sample Location	Date Sampled	Laboratory Sample Identification	Laboratory Report Number	Naphthenic Acids
AEPA Guideline <sup>a</sup>				ng	
SW07	150 m downstream of SW06	6-Apr-23	4903763	23E012607	0.4
		21-Apr-23	4937442	23I017391	<0.2
		27-Apr-23	4948255	23E019331	<0.2
		04-May-23	4967078	23E021784	<0.2
		11-May-23	4986594	23E024382	<0.2
		19-May-23	5003701	23E026902	<0.2
		19-May-23	5003702	23E026902	<0.2
		31-May-23	5036413	23E031691	<0.1
		13-Jun-23	5065814	23E036123	<0.2
		28-Jun-23	5107191	23E041864	<0.2
		26-Jul-23	5177252	23E052402	<0.2
		22-Aug-23	5235358	23E061053	<0.2
		28-Sep-23	5330858	23E075537	<0.2
SW08	northeastern investigation area	21-Apr-23	4937443	23I017391	<0.2
		27-Apr-23	4948770	23E019331	2.4
		04-May-23	4967085	23E021784	0.5
		11-May-23	4986595	23E024382	3.8
		19-May-23	5003703	23E026902	0.3
		31-May-23	5036414	23E031691	<0.1
		13-Jun-23	5065816	23E036123	1.6
		28-Jun-23b	5107192	23E041864	2.4
		26-Jul-23	5177253	23E052402	0.8
		26-Jul-23	5177258	23E052402	0.9
		22-Aug-23	5235359	23E061053	0.7
		28-Sep-23	5330859	23E075537	0.4
		24-Oct-23	5402753	23E085932	1.1
SW09	northeastern investigation area	21-Apr-23	4937444	23I017391	4.7
		27-Apr-23	4948771	23E019331	0.4
SW10	northeastern investigation area	21-Apr-23	4937445	23I017391	2.0
		27-Apr-23	4948775	23E019331	<0.2
SW11	northeastern investigation area	21-Apr-23	4937446	23I017391	0.3
		27-Apr-23	4948774	23E019331	1.8
		04-May-23	4967082	23E021784	<0.2
		11-May-23	4986596	23E024382	<0.2
		19-May-23	5003704	23E026902	<0.2
		31-May-23	5036415	23E031691	<0.1
		13-Jun-23	5065817	23E036123	<0.2
		28-Jun-23	5107193	23E041864	<0.2
		26-Jul-23	5177254	23E052402	<0.2
		22-Aug-23	5235360	23E061053	<0.2
		28-Sep-23	5330860	23E075537	<0.2
		24-Oct-23	5402756	23E085932	<0.2
SW12	northeastern investigation area	21-Apr-23	4937447	23I017391	3.6
		27-Apr-23	4948772	23E019331	1.9
SW13	northeastern investigation area	21-Apr-23	4937448	23I017391	0.4
		27-Apr-23	4948773	23E019331	0.4
		04-May-23	4967081	23E021784	0.4
		11-May-23	4986597	23E024382	0.8
		19-May-23	5003705	23E026902	<0.2
		31-May-23	5036417	23E031691	0.8
		13-Jun-23	5065818	23E036123	<0.2
		28-Jun-23	5107194	23E041864	<0.2
		26-Jul-23	5177255	23E052402	<0.2
		22-Aug-23	5235361	23E061053	<0.2
		28-Sep-23	5330861	23E075537	<0.2
		24-Oct-23	5402829	23E085932	0.3
DP4-SW01	northern investigation area	22-Apr-23	4937456	23I017391	0.3
		04-May-23	4967075	23E021784	0.3
		11-May-23	4986598	23E024382	0.4
		19-May-23	5003706	23E026902	0.3
		31-May-23	5036418	23E031691	<0.1
		13-Jun-23	5065902	23E036123	<0.2
		28-Jun-23	5107195	23E041864	<0.2
		28-Jun-23	5107197	23E041864	<0.2
		26-Jul-23	5177256	23E052402	<0.2
		22-Aug-23	5235363	23E061053	<0.2
		24-Oct-23	5402834	23E085932	<0.2
WB4-SW01	northern investigation area	22-Apr-23	4937457	23I017391	<0.2
		27-Apr-23	4948778	23E019331	<0.2
		04-May-23	4966946	23E021784	<0.2
		11-May-23	4986600	23E024382	<0.2
		19-May-23	5003707	23E026902	<0.2
		31-May-23	5036419	23E031691	<0.1
		31-May-23	5036420	23E031691	<0.1
		13-Jun-23	5065903	23E036123	<0.2
		28-Jun-23	5107196	23E041864	<0.2
		26-Jul-23	5177257	23E052402	<0.2
		22-Aug-23	5235362	23E061053	<0.2
		27-Sep-23	5330862	23E075537	<0.2
		24-Oct-23	5402830	23E085932	<0.2

Notes:

units are in µg/mL unless otherwise indicated

µg/mL = micrograms per millilitre; na = not analyzed; ng = no guideline; < = below detection limit

Guidelines

<sup>a</sup> Alberta Environment and Protected Areas (AEPA). 2018. *Environmental Quality Guidelines for Alberta Surface Waters*. Water Policy Branch, Government of Alberta. Edmonton, Alberta. March 28, 2018



Table 13: Naphthenic Acids (Orbitrap) Analytical Results - Surface Water  
 Alberta Energy Regulator  
 Imperial Kefal Oil Sands, Wood Buffalo, Alberta

Sample Identification	Sample Location	Date Sampled	Laboratory Sample Identification	Laboratory Report Number	Naphthenic Acids (total ug/L) (Z = < DBE 6)	C1H8DBE 6	C1H8DBE 4	C1H8DBE 2	C1H8DBE 0	C2H10DBE 6	C2H10DBE 4	C2H10DBE 2	C2H10DBE 0	C2H14DBE 6	C2H14DBE 4	C2H14DBE 2	C2H14DBE 0	C2H18DBE 6	C2H18DBE 4	C2H18DBE 2	C2H18DBE 0	C2H24DBE 6	C2H24DBE 4	C2H24DBE 2	C2H24DBE 0	C2H28DBE 6	C2H28DBE 4	C2H28DBE 2	C2H28DBE 0	C2H34DBE 6	C2H34DBE 4	C2H34DBE 2	C2H34DBE 0	C2H40DBE 6	C2H40DBE 4	C2H40DBE 2	C2H40DBE 0	C2H46DBE 6	C2H46DBE 4	C2H46DBE 2	C2H46DBE 0	C2H52DBE 6	C2H52DBE 4	C2H52DBE 2	C2H52DBE 0	C2H58DBE 6	C2H58DBE 4	C2H58DBE 2	C2H58DBE 0	C2H64DBE 6	C2H64DBE 4	C2H64DBE 2	C2H64DBE 0	C2H70DBE 6	C2H70DBE 4	C2H70DBE 2	C2H70DBE 0	C2H76DBE 6	C2H76DBE 4	C2H76DBE 2	C2H76DBE 0	C2H82DBE 6	C2H82DBE 4	C2H82DBE 2	C2H82DBE 0	C2H88DBE 6	C2H88DBE 4	C2H88DBE 2	C2H88DBE 0	C2H94DBE 6	C2H94DBE 4	C2H94DBE 2	C2H94DBE 0	C2H100DBE 6	C2H100DBE 4	C2H100DBE 2	C2H100DBE 0	C2H106DBE 6	C2H106DBE 4	C2H106DBE 2	C2H106DBE 0	C2H112DBE 6	C2H112DBE 4	C2H112DBE 2	C2H112DBE 0	C2H118DBE 6	C2H118DBE 4	C2H118DBE 2	C2H118DBE 0	C2H124DBE 6	C2H124DBE 4	C2H124DBE 2	C2H124DBE 0	C2H130DBE 6	C2H130DBE 4	C2H130DBE 2	C2H130DBE 0	C2H136DBE 6	C2H136DBE 4	C2H136DBE 2	C2H136DBE 0	C2H142DBE 6	C2H142DBE 4	C2H142DBE 2	C2H142DBE 0	C2H148DBE 6	C2H148DBE 4	C2H148DBE 2	C2H148DBE 0	C2H154DBE 6	C2H154DBE 4	C2H154DBE 2	C2H154DBE 0	C2H160DBE 6	C2H160DBE 4	C2H160DBE 2	C2H160DBE 0	C2H166DBE 6	C2H166DBE 4	C2H166DBE 2	C2H166DBE 0	C2H172DBE 6	C2H172DBE 4	C2H172DBE 2	C2H172DBE 0	C2H178DBE 6	C2H178DBE 4	C2H178DBE 2	C2H178DBE 0	C2H184DBE 6	C2H184DBE 4	C2H184DBE 2	C2H184DBE 0	C2H190DBE 6	C2H190DBE 4	C2H190DBE 2	C2H190DBE 0	C2H196DBE 6	C2H196DBE 4	C2H196DBE 2	C2H196DBE 0	C2H202DBE 6	C2H202DBE 4	C2H202DBE 2	C2H202DBE 0	C2H208DBE 6	C2H208DBE 4	C2H208DBE 2	C2H208DBE 0	C2H214DBE 6	C2H214DBE 4	C2H214DBE 2	C2H214DBE 0	C2H220DBE 6	C2H220DBE 4	C2H220DBE 2	C2H220DBE 0	C2H226DBE 6	C2H226DBE 4	C2H226DBE 2	C2H226DBE 0	C2H232DBE 6	C2H232DBE 4	C2H232DBE 2	C2H232DBE 0	C2H238DBE 6	C2H238DBE 4	C2H238DBE 2	C2H238DBE 0	C2H244DBE 6	C2H244DBE 4	C2H244DBE 2	C2H244DBE 0	C2H250DBE 6	C2H250DBE 4	C2H250DBE 2	C2H250DBE 0	C2H256DBE 6	C2H256DBE 4	C2H256DBE 2	C2H256DBE 0	C2H262DBE 6	C2H262DBE 4	C2H262DBE 2	C2H262DBE 0	C2H268DBE 6	C2H268DBE 4	C2H268DBE 2	C2H268DBE 0	C2H274DBE 6	C2H274DBE 4	C2H274DBE 2	C2H274DBE 0	C2H280DBE 6	C2H280DBE 4	C2H280DBE 2	C2H280DBE 0	C2H286DBE 6	C2H286DBE 4	C2H286DBE 2	C2H286DBE 0	C2H292DBE 6	C2H292DBE 4	C2H292DBE 2	C2H292DBE 0	C2H298DBE 6	C2H298DBE 4	C2H298DBE 2	C2H298DBE 0	C2H304DBE 6	C2H304DBE 4	C2H304DBE 2	C2H304DBE 0	C2H310DBE 6	C2H310DBE 4	C2H310DBE 2	C2H310DBE 0	C2H316DBE 6	C2H316DBE 4	C2H316DBE 2	C2H316DBE 0	C2H322DBE 6	C2H322DBE 4	C2H322DBE 2	C2H322DBE 0	C2H328DBE 6	C2H328DBE 4	C2H328DBE 2	C2H328DBE 0	C2H334DBE 6	C2H334DBE 4	C2H334DBE 2	C2H334DBE 0	C2H340DBE 6	C2H340DBE 4	C2H340DBE 2	C2H340DBE 0	C2H346DBE 6	C2H346DBE 4	C2H346DBE 2	C2H346DBE 0	C2H352DBE 6	C2H352DBE 4	C2H352DBE 2	C2H352DBE 0	C2H358DBE 6	C2H358DBE 4	C2H358DBE 2	C2H358DBE 0	C2H364DBE 6	C2H364DBE 4	C2H364DBE 2	C2H364DBE 0	C2H370DBE 6	C2H370DBE 4	C2H370DBE 2	C2H370DBE 0	C2H376DBE 6	C2H376DBE 4	C2H376DBE 2	C2H376DBE 0	C2H382DBE 6	C2H382DBE 4	C2H382DBE 2	C2H382DBE 0	C2H388DBE 6	C2H388DBE 4	C2H388DBE 2	C2H388DBE 0	C2H394DBE 6	C2H394DBE 4	C2H394DBE 2	C2H394DBE 0	C2H400DBE 6	C2H400DBE 4	C2H400DBE 2	C2H400DBE 0	C2H406DBE 6	C2H406DBE 4	C2H406DBE 2	C2H406DBE 0	C2H412DBE 6	C2H412DBE 4	C2H412DBE 2	C2H412DBE 0	C2H418DBE 6	C2H418DBE 4	C2H418DBE 2	C2H418DBE 0	C2H424DBE 6	C2H424DBE 4	C2H424DBE 2	C2H424DBE 0	C2H430DBE 6	C2H430DBE 4	C2H430DBE 2	C2H430DBE 0	C2H436DBE 6	C2H436DBE 4	C2H436DBE 2	C2H436DBE 0	C2H442DBE 6	C2H442DBE 4	C2H442DBE 2	C2H442DBE 0	C2H448DBE 6	C2H448DBE 4	C2H448DBE 2	C2H448DBE 0	C2H454DBE 6	C2H454DBE 4	C2H454DBE 2	C2H454DBE 0	C2H460DBE 6	C2H460DBE 4	C2H460DBE 2	C2H460DBE 0	C2H466DBE 6	C2H466DBE 4	C2H466DBE 2	C2H466DBE 0	C2H472DBE 6	C2H472DBE 4	C2H472DBE 2	C2H472DBE 0	C2H478DBE 6	C2H478DBE 4	C2H478DBE 2	C2H478DBE 0	C2H484DBE 6	C2H484DBE 4	C2H484DBE 2	C2H484DBE 0	C2H490DBE 6	C2H490DBE 4	C2H490DBE 2	C2H490DBE 0	C2H496DBE 6	C2H496DBE 4	C2H496DBE 2	C2H496DBE 0	C2H502DBE 6	C2H502DBE 4	C2H502DBE 2	C2H502DBE 0	C2H508DBE 6	C2H508DBE 4	C2H508DBE 2	C2H508DBE 0	C2H514DBE 6	C2H514DBE 4	C2H514DBE 2	C2H514DBE 0	C2H520DBE 6	C2H520DBE 4	C2H520DBE 2	C2H520DBE 0	C2H526DBE 6	C2H526DBE 4	C2H526DBE 2	C2H526DBE 0	C2H532DBE 6	C2H532DBE 4	C2H532DBE 2	C2H532DBE 0	C2H538DBE 6	C2H538DBE 4	C2H538DBE 2	C2H538DBE 0	C2H544DBE 6	C2H544DBE 4	C2H544DBE 2	C2H544DBE 0	C2H550DBE 6	C2H550DBE 4	C2H550DBE 2	C2H550DBE 0	C2H556DBE 6	C2H556DBE 4	C2H556DBE 2	C2H556DBE 0	C2H562DBE 6	C2H562DBE 4	C2H562DBE 2	C2H562DBE 0	C2H568DBE 6	C2H568DBE 4	C2H568DBE 2	C2H568DBE 0	C2H574DBE 6	C2H574DBE 4	C2H574DBE 2	C2H574DBE 0	C2H580DBE 6	C2H580DBE 4	C2H580DBE 2	C2H580DBE 0	C2H586DBE 6	C2H586DBE 4	C2H586DBE 2	C2H586DBE 0	C2H592DBE 6	C2H592DBE 4	C2H592DBE 2	C2H592DBE 0	C2H598DBE 6	C2H598DBE 4	C2H598DBE 2	C2H598DBE 0	C2H604DBE 6	C2H604DBE 4	C2H604DBE 2	C2H604DBE 0	C2H610DBE 6	C2H610DBE 4	C2H610DBE 2	C2H610DBE 0	C2H616DBE 6	C2H616DBE 4	C2H616DBE 2	C2H616DBE 0	C2H622DBE 6	C2H622DBE 4	C2H622DBE 2	C2H622DBE 0	C2H628DBE 6	C2H628DBE 4	C2H628DBE 2	C2H628DBE 0	C2H634DBE 6	C2H634DBE 4	C2H634DBE 2	C2H634DBE 0	C2H640DBE 6	C2H640DBE 4	C2H640DBE 2	C2H640DBE 0	C2H646DBE 6	C2H646DBE 4	C2H646DBE 2	C2H646DBE 0	C2H652DBE 6	C2H652DBE 4	C2H652DBE 2	C2H652DBE 0	C2H658DBE 6	C2H658DBE 4	C2H658DBE 2	C2H658DBE 0	C2H664DBE 6	C2H664DBE 4	C2H664DBE 2	C2H664DBE 0	C2H670DBE 6	C2H670DBE 4	C2H670DBE 2	C2H670DBE 0	C2H676DBE 6	C2H676DBE 4	C2H676DBE 2	C2H676DBE 0	C2H682DBE 6	C2H682DBE 4	C2H682DBE 2	C2H682DBE 0	C2H688DBE 6	C2H688DBE 4	C2H688DBE 2	C2H688DBE 0	C2H694DBE 6	C2H694DBE 4	C2H694DBE 2	C2H694DBE 0	C2H700DBE 6	C2H700DBE 4	C2H700DBE 2	C2H700DBE 0	C2H706DBE 6	C2H706DBE 4	C2H706DBE 2	C2H706DBE 0	C2H712DBE 6	C2H712DBE 4	C2H712DBE 2	C2H712DBE 0	C2H718DBE 6	C2H718DBE 4	C2H718DBE 2	C2H718DBE 0	C2H724DBE 6	C2H724DBE 4	C2H724DBE 2	C2H724DBE 0	C2H730DBE 6	C2H730DBE 4	C2H730DBE 2	C2H730DBE 0	C2H736DBE 6	C2H736DBE 4	C2H736DBE 2	C2H736DBE 0	C2H742DBE 6	C2H742DBE 4	C2H742DBE 2	C2H742DBE 0	C2H748DBE 6	C2H748DBE 4	C2H748DBE 2	C2H748DBE 0	C2H754DBE 6	C2H754DBE 4	C2H754DBE 2	C2H754DBE 0	C2H760DBE 6	C2H760DBE 4	C2H760DBE 2	C2H760DBE 0	C2H766DBE 6	C2H766DBE 4	C2H766DBE 2	C2H766DBE 0	C2H772DBE 6	C2H772DBE 4	C2H772DBE 2	C2H772DBE 0	C2H778DBE 6	C2H778DBE 4	C2H778DBE 2	C2H778DBE 0	C2H784DBE 6	C2H784DBE 4	C2H784DBE 2	C2H784DBE 0	C2H790DBE 6	C2H790DBE 4	C2H790DBE 2	C2H790DBE 0	C2H796DBE 6	C2H796DBE 4	C2H796DBE 2	C2H796DBE 0	C2H802DBE 6	C2H802DBE 4	C2H802DBE 2	C2H802DBE 0	C2H808DBE 6	C2H808

**Table 14: Total Sulphide Analytical Results - Surface Water**  
**Alberta Energy Regulator**  
**Imperial Keral Oil Sands, Wood Buffalo, Alberta**

Sample Identification	Sample Location	Date Sampled	Laboratory Sample Identification	Laboratory Report Number	Sulphide (Total)
AEPA Guideline			Protection of Freshwater Aquatic Life (PAL)		0.0019
SW01	northeastern investigation area	6-Apr-23	4903754	23E012607	8.40
		04-May-23	4967076	23E021784	0.0115
		11-May-23	4986004	23E024382	0.0116
		19-May-23	5003672	23E026902	0.0092
		31-May-23	5036044	23E031691	0.0103
		13-Jun-23	5065780	23E036123	0.0118
		13-Jun-23	5065901	23E036123	0.0105
		28-Jun-23	5107162	23E041864	0.0090
		26-Jul-23	5177242	23E052402	0.0099
		22-Aug-23	5235352	23E061053	0.0050
		28-Sep-23	5330830	23E075537	0.0082
		28-Sep-23	5330914	23E075537	0.0080
SW02	northeastern investigation area	6-Apr-23	4903758	23E012607	16.8
		04-May-23	4967077	23E021784	0.01
		04-May-23	4967086	23E021784	0.0109
		11-May-23	4986587	23E024382	0.0145
		19-May-23	5003696	23E026902	0.0101
		31-May-23	5036408	23E031691	0.0116
		13-Jun-23	5065797	23E036123	0.0174
		28-Jun-23	5107166	23E041864	0.0214
		26-Jul-23	5177247	23E052402	0.0104
		22-Aug-23	5235353	23E061053	0.0091
		28-Sep-23	5330853	23E075537	0.0078
		6-Apr-23	4903759	23E012607	0.02
SW03	northeastern investigation area	21-Apr-23	4937342	23I017391	0.876
		27-Apr-23	4948767	23E019331	0.135
		27-Apr-23	4948768	23E019331	0.234
		04-May-23	4967083	23E021784	0.0741
		11-May-23	4986589	23E024382	0.922
		19-May-23	5003697	23E026902	0.142
		31-May-23	5036409	23E031691	0.0374
		13-Jun-23	5065800	23E036123	0.0509
		28-Jun-23	5107187	23E041864	0.0158
		26-Jul-23	5177248	23E052402	0.675
		22-Aug-23	5235354	23E061053	0.0480
		28-Sep-23	5330854	23E075537	0.0221
SW04	northeastern investigation area	6-Apr-23	4903760	23E012607	2.80
		21-Apr-23	4937439	23I017391	0.238
		21-Apr-23	4937449	23I017391	0.168
		27-Apr-23	4948769	23E019331	0.336
		04-May-23	4967084	23E021784	0.423
		11-May-23	4986591	23E024382	0.0938
		19-May-23	5003698	23E026902	0.270
		31-May-23	5036410	23E031691	0.0286
		13-Jun-23	5065808	23E036123	0.0148
		28-Jun-23	5107188	23E041864	0.0247
		26-Jul-23	5177249	23E052402	0.475
		22-Aug-23	5235355	23E061053	0.0149
SW05	northeastern investigation area	22-Aug-23	5237422	23E061053	0.0126
		28-Sep-23	5330855	23E075537	0.0086
SW06	within outlet east of SW05 off site	6-Apr-23	4903761	23E012607	7.20
		21-Apr-23	4937440	23I017391	0.0025
		27-Apr-23	4948776	23E019331	0.0052
		04-May-23	4967080	23E021784	0.0095
		11-May-23	4986592	23E024382	0.0104
		19-May-23	5003699	23E026902	0.0085
		31-May-23	5036411	23E031691	0.0101
		13-Jun-23	5065811	23E036123	0.0268
		28-Jun-23	5107189	23E041864	0.0086
		26-Jul-23	5177250	23E052402	0.0090
		22-Aug-23	5235356	23E061053	0.0086
		28-Sep-23	5330856	23E075537	0.0067

**Table 14: Total Sulphide Analytical Results - Surface Water**  
**Alberta Energy Regulator**  
**Imperial Keral Oil Sands, Wood Buffalo, Alberta**

Sample Identification	Sample Location	Date Sampled	Laboratory Sample Identification	Laboratory Report Number	Sulphide (Total)
AEPA Guideline	Protection of Freshwater Aquatic Life (PAL)				0.0019
SW07	150 m downstream of SW06	6-Apr-23	4903763	23E012607	2.00
		21-Apr-23	4937442	23I017391	0.0088
		27-Apr-23	4948255	23E019331	0.0051
		04-May-23	4967078	23E021784	0.0124
		11-May-23	4986594	23E024382	0.0098
		19-May-23	5003701	23E026902	0.0090
		19-May-23	5003702	23E026902	0.0102
		31-May-23	5036413	23E031691	0.0118
		13-Jun-23	5065814	23E036123	0.0115
		28-Jun-23	5107191	23E041864	0.0082
		26-Jul-23	5177252	23E052402	0.0086
		22-Aug-23	5235358	23E061053	0.0102
		28-Sep-23	5330868	23E075537	0.0068
SW08	northeastern investigation area	21-Apr-23	4937443	23I017391	0.0738
		27-Apr-23	4948770	23E019331	0.200
		04-May-23	4967085	23E021784	0.341
		11-May-23	4986595	23E024382	2.22
		19-May-23	5003703	23E026902	1.46
		31-May-23	5036414	23E031691	0.0857
		13-Jun-23	5065816	23E036123	0.655
		28-Jun-23	5107192	23E041864	6.68
		26-Jul-23	5177253	23E052402	3.91
		26-Jul-23	5177258	23E052402	6.52
		22-Aug-23	5235359	23E061053	8.59
		28-Sep-23	5330869	23E075537	2.14
SW09	northeastern investigation area	21-Apr-23	4937444	23I017391	0.111
		27-Apr-23	4948771	23E019331	0.203
SW10	northeastern investigation area	21-Apr-23	4937445	23I017391	0.0062
		27-Apr-23	4948775	23E019331	0.0116
SW11	northeastern investigation area	21-Apr-23	4937446	23I017391	0.148
		27-Apr-23	4948774	23E019331	0.0162
		04-May-23	4967082	23E021784	0.173
		11-May-23	4986596	23E024382	0.183
		19-May-23	5003704	23E026902	0.559
		31-May-23	5036415	23E031691	0.187
		13-Jun-23	5065817	23E036123	0.0684
		28-Jun-23	5107193	23E041864	0.0907
		26-Jul-23	5177254	23E052402	13.0
		22-Aug-23	5235360	23E061053	0.711
		28-Sep-23	5330860	23E075537	0.1990
SW12	northeastern investigation area	21-Apr-23	4937447	23I017391	0.0382
		27-Apr-23	4948772	23E019331	0.104
SW13	northeastern investigation area	21-Apr-23	4937448	23I017391	0.0120
		27-Apr-23	4948773	23E019331	0.0123
		04-May-23	4967081	23E021784	0.0528
		11-May-23	4986597	23E024382	0.0468
		19-May-23	5003705	23E026902	0.0643
		31-May-23	5036417	23E031691	0.615
		13-Jun-23	5065818	23E036123	0.322
		28-Jun-23	5107194	23E041864	0.243
		26-Jul-23	5177255	23E052402	0.938
		22-Aug-23	5235361	23E061053	0.0665
		28-Sep-23	5330861	23E075537	0.5440
DP4-SW01	northern investigation area	22-Apr-23	4937456	23I017391	0.0679
		04-May-23	4967075	23E021784	0.0136
		11-May-23	4986598	23E024382	0.0104
		19-May-23	5003706	23E026902	0.0140
		31-May-23	5036418	23E031691	0.0107
		13-Jun-23	5065902	23E036123	<1.88
		28-Jun-23	5107197	23E041864	0.0186
		28-Jun-23	5107197	23E041864	0.0157
		26-Jul-23	5177256	23E052402	0.0432
		22-Aug-23	5235363	23E061053	0.0232
WB4-SW01	northern investigation area	22-Apr-23	4937457	23I017391	0.0454
		27-Apr-23	4948778	23E019331	0.0413
		04-May-23	4966946	23E021784	0.0214
		11-May-23	4986600	23E024382	0.0229
		19-May-23	5003707	23E026902	0.0279
		31-May-23	5036419	23E031691	0.0261
		31-May-23	5036420	23E031691	0.0202
		13-Jun-23	5065903	23E036123	0.0125
		28-Jun-23	5107196	23E041864	0.0153
		26-Jul-23	5177257	23E052402	0.0144

**Notes:**

units are in mg/L unless otherwise indicated  
mg/L = milligrams per litre; na = not analyzed; ng = no guideline; < = below detection limit

**Guidelines**

<sup>a</sup> Alberta Environment and Protected Areas (AEPA). 2018. Environmental Quality Guidelines for Alberta Surface Waters. Water Policy Branch, Government of Alberta. Edmonton, Alberta. March 28, 2018

**Table 15: Dissolved Sulphide Analytical Results - Surface Water**  
**Alberta Energy Regulator**  
**Imperial Keral Oil Sands, Wood Buffalo, Alberta**

Sample Identification	Sample Location	Date Sampled	Laboratory Sample Identification	Laboratory Report Number	Sulphide (Dissolved)
AEPA Guideline	Protection of Freshwater Aquatic Life (PAL)				
					ng
SW01	northeastern investigation area	6-Apr-23	4903754	23E012607	5.6
		04-May-23	4967076	23E021784	0.0081
		11-May-23	4986004	23E024382	0.0036
		19-May-23	5003672	23E026902	0.0036
		31-May-23	5036044	23E031691	0.0041
		13-Jun-23	5065780	23E036123	0.0024
		13-Jun-23	5065901	23E036123	0.0032
		28-Jun-23	5107162	23E041864	0.0037
		26-Jul-23	5177242	23E052402	0.0041
		22-Aug-23	5235352	23E061053	0.0157
		28-Sep-23	5330830	23E075537	0.0025
		28-Sep-23	5330914	23E075537	0.0034
SW02	northeastern investigation area	6-Apr-23	4903758	23E012607	12.0
		04-May-23	4967077	23E021784	0.0073
		04-May-23	4967086	23E021784	0.0094
		11-May-23	4986587	23E024382	0.0061
		19-May-23	5003696	23E026902	0.0036
		31-May-23	5036408	23E031691	0.0058
		13-Jun-23	5065797	23E036123	0.0028
		28-Jun-23	5107166	23E041864	0.0058
		26-Jul-23	5177247	23E052402	0.0053
		22-Aug-23	5235353	23E061053	0.0100
		28-Sep-23	5330853	23E075537	0.0029
SW03	northeastern investigation area	6-Apr-23	4903759	23E012607	<0.02
		21-Apr-23	4937342	23I017391	0.0336
		27-Apr-23	4948767	23E019331	0.0205
		27-Apr-23	4948768	23E019331	0.0208
		04-May-23	4967083	23E021784	0.0139
		11-May-23	4986589	23E024382	0.0398
		19-May-23	5003697	23E026902	0.0178
		31-May-23	5036409	23E031691	0.0205
		13-Jun-23	5065800	23E036123	0.0088
		28-Jun-23	5107187	23E041864	0.0192
		26-Jul-23	5177248	23E052402	0.0052
		22-Aug-23	5235354	23E061053	0.0158
		28-Sep-23	5330854	23E075537	0.0052
SW04	northeastern investigation area	6-Apr-23	4903760	23E012607	2.20
		21-Apr-23	4937439	23I017391	0.0233
		21-Apr-23	4937449	23I017391	0.0070
		27-Apr-23	4948769	23E019331	0.0761
		04-May-23	4967084	23E021784	0.2840
		11-May-23	4986591	23E024382	0.0139
		19-May-23	5003698	23E026902	0.0478
		31-May-23	5036410	23E031691	0.0144
		13-Jun-23	5065808	23E036123	0.0038
		28-Jun-23	5107188	23E041864	0.0097
		26-Jul-23	5177249	23E052402	0.0053
		22-Aug-23	5235355	23E061053	0.0060
		22-Aug-23	5237422	23E061053	0.0076
		28-Sep-23	5330855	23E075537	0.0038
SW05	northeastern investigation area	6-Apr-23	4903761	23E012607	4.60
		21-Apr-23	4937440	23I017391	<0.0015
		27-Apr-23	4948776	23E019331	0.0032
		04-May-23	4967080	23E021784	0.0059
		11-May-23	4986592	23E024382	0.0037
		19-May-23	5003699	23E026902	0.0049
		31-May-23	5036411	23E031691	0.0066
		13-Jun-23	5065811	23E036123	0.0064
		28-Jun-23	5107189	23E041864	0.0031
		26-Jul-23	5177250	23E052402	0.0047
		22-Aug-23	5235356	23E061053	0.0071
		28-Sep-23	5330856	23E075537	0.0022
SW06	within outlet east of SW05 off site	6-Apr-23	4903762	23E012607	1.20
		6-Apr-23	4903764	23E012607	1.10
		21-Apr-23	4937441	23I017391	0.0027
		27-Apr-23	4948777	23E019331	0.0048
		04-May-23	4967079	23E021784	0.0067
		11-May-23	4986593	23E024382	0.0037
		19-May-23	4986603	23E024382	0.0036
		31-May-23	5003700	23E026902	0.0038
		13-Jun-23	5036412	23E031691	0.0036
		28-Jun-23	5065812	23E036123	0.0024
		26-Jul-23	5107190	23E041864	0.0042
		22-Aug-23	5177251	23E052402	0.0040
		28-Sep-23	5235357	23E061053	0.0036
		28-Sep-23	5330857	23E075537	0.0025

**Table 15: Dissolved Sulphide Analytical Results - Surface Water**  
**Alberta Energy Regulator**  
**Imperial Keral Oil Sands, Wood Buffalo, Alberta**

Sample Identification	Sample Location	Date Sampled	Laboratory Sample Identification	Laboratory Report Number	Sulphide (Dissolved)
AEPA Guideline	Protection of Freshwater Aquatic Life (PAL)				
					ng
SW07	150 m downstream of SW06	6-Apr-23	4903763	23E012607	1.40
		21-Apr-23	4937442	23I017391	<0.0015
		27-Apr-23	4948255	23E019331	0.0041
		04-May-23	4967078	23E021784	0.0095
		11-May-23	4986594	23E024382	0.0035
		19-May-23	5003701	23E026902	0.0041
		19-May-23	5003702	23E026902	0.0044
		31-May-23	5036413	23E031691	0.0036
		13-Jun-23	5065814	23E036123	0.0034
		28-Jun-23	5107191	23E041864	0.0033
		26-Jul-23	5177252	23E052402	0.0049
		22-Aug-23	5235358	23E061053	0.0071
		28-Sep-23	5330868	23E075537	0.0028
SW08	northeastern investigation area	21-Apr-23	4937443	23I017391	0.0130
		27-Apr-23	4948770	23E019331	0.0294
		04-May-23	4967085	23E021784	0.0531
		11-May-23	4986595	23E024382	2.76
		19-May-23	5003703	23E026902	1.34
		31-May-23	5036414	23E031691	0.0382
		13-Jun-23	5065816	23E036123	0.3850
		28-Jun-23	5107192	23E041864	1.78
		26-Jul-23	5177253	23E052402	0.0590
		26-Jul-23	5177258	23E052402	0.1200
		22-Aug-23	5235359	23E061053	0.1150
		28-Sep-23	5330869	23E075537	3.08
SW09	northeastern investigation area	21-Apr-23	4937444	23I017391	0.0237
		27-Apr-23	4948771	23E019331	0.0413
SW10	northeastern investigation area	21-Apr-23	4937445	23I017391	0.0020
		27-Apr-23	4948775	23E019331	0.0058
SW11	northeastern investigation area	21-Apr-23	4937446	23I017391	0.0179
		27-Apr-23	4948774	23E019331	0.0087
		04-May-23	4967082	23E021784	0.0462
		11-May-23	4986596	23E024382	0.1090
		19-May-23	5003704	23E026902	0.2780
		31-May-23	5036415	23E031691	0.0200
		13-Jun-23	5065817	23E036123	0.0236
		28-Jun-23	5107193	23E041864	0.0202
		26-Jul-23	5177254	23E052402	5.72
		22-Aug-23	5235360	23E061053	0.2450
		28-Sep-23	5330860	23E075537	0.0524
SW12	northeastern investigation area	21-Apr-23	4937447	23I017391	0.0034
		27-Apr-23	4948772	23E019331	0.0539
SW13	northeastern investigation area	21-Apr-23	4937448	23I017391	0.0036
		27-Apr-23	4948773	23E019331	0.0082
		04-May-23	4967081	23E021784	0.0300
		11-May-23	4986597	23E024382	0.0246
		19-May-23	5003705	23E026902	0.0423
		31-May-23	5036417	23E031691	0.4450
		13-Jun-23	5065818	23E036123	0.1010
		28-Jun-23	5107194	23E041864	0.5780
		26-Jul-23	5177255	23E052402	0.0082
		22-Aug-23	5235361	23E061053	0.2870
		28-Sep-23	5330861	23E075537	0.1710
DP4-SW01	northern investigation area	22-Apr-23	4937456	23I017391	0.0046
		04-May-23	4967075	23E021784	0.0063
		11-May-23	4986598	23E024382	0.0040
		19-May-23	5003706	23E026902	0.0058
		31-May-23	5036418	23E031691	0.0200
		13-Jun-23	5065902	23E036123	0.0177
		28-Jun-23	5107197	23E041864	0.0048
		28-Jun-23	5107197	23E041864	0.0052
		26-Jul-23	5177256	23E052402	0.0058
		22-Aug-23	5235363	23E061053	0.0128
WB4-SW01	northern investigation area	22-Apr-23	4937457	23I017391	0.0060
		27-Apr-23	4948778	23E019331	0.0542
		04-May-23	4966946	23E021784	0.0138
		11-May-23	4986600	23E024382	0.0127
		19-May-23	5003707	23E026902	0.0122
		31-May-23	5036419	23E031691	0.0143
		31-May-23	5036420	23E031691	0.0127
		13-Jun-23	5065903	23E036123	0.0068
		28-Jun-23	5107196	23E041864	0.0097
		26-Jul-23	5177257	23E052402	0.0080
		22-Aug-23	5235362	23E061053	0.0693
		27-Sep-23	5330862	23E075537	0.0123

**Notes:**

units are in mg/L unless otherwise indicated  
mg/L = milligrams per litre; na = not analyzed; ng = no guideline; < = below detection limit

**Guidelines**

<sup>a</sup> Alberta Environment and Protected Areas (AEPA). 2018. Environmental Quality Guidelines for Alberta Surface Waters. Water Policy Branch, Government of Alberta. Edmonton, Alberta. March 28, 2018

**Table 16: Petroleum Hydrocarbon Analytical Results - Groundwater**
**Alberta Energy Regulator**
**Imperial Kearn Oil Sands, Wood Buffalo, Alberta**

Sample Identification Monitoring Well	Sample Location	Date Sampled	Laboratory Sample Identification	Laboratory Report Number	Benzene	Toluene	Ethylbenzene	Xylenes	F1 (C6-C10)	F1-BTEX	F2 (C10-C16)	F3 (C17-C34)	F4 (C34-C50+)
AEPA Guideline <sup>a</sup>	Natural Area			Fine-Grained	0.005	0.024	0.0016	0.02	ng	2.2	1.1	ng	ng
				Coarse-Grained	0.005	0.021	0.0016	0.02	ng	2.2	1.1	ng	ng
KHY22-604	northeastern investigation area	15-Mar-23	4859196	23E006628	<0.0005	<0.0003	<0.0005	<0.0005	<0.1	<0.10	0.7	na	na
		06-Apr-23	4903765	23E012607	<0.0005	<0.0003	<0.0005	<0.0005	<0.1	<0.10	0.8	na	na
		04-May-23	4967542	23E021784	<0.0005	<0.0003	<0.0005	<0.0005	<0.1	<0.10	0.7	na	na
		01-Jun-23	5036421	23E031691	<0.0005	<0.0003	<0.0005	<0.0005	<0.1	<0.10	1.0	6.7	2.3
		28-Jun-23	5106900	23E041837	<0.0005	<0.0003	<0.0005	<0.0005	<0.1	<0.10	0.9	na	na
		27-Jul-23	5177315	23E052430	<0.0005	<0.0003	<0.0005	<0.0005	<0.1	<0.10	1.0	na	na
		23-Aug-23	5235367	23E061053	<0.0005	<0.0003	<0.0005	<0.0005	<0.1	<0.10	1.1	na	na
		27-Sep-23	5330876	23E075537	<0.0005	<0.0003	<0.0005	<0.0005	<0.1	<0.10	1.1	na	na
		27-Sep-23	5330907	23E075537	<0.0005	<0.0003	<0.0005	<0.0005	<0.1	<0.10	1.1	na	na
		24-Oct-23	5402837	23E085932	<0.0005	<0.0003	<0.0005	<0.0005	<0.1	<0.10	0.9	na	na
KHY22-605	northeastern investigation area	06-Apr-23	4903767	23E012607	<0.0005	<0.0003	<0.0005	<0.0005	<0.1	<0.10	0.1	na	na
		04-May-23	4967620	23E021784	<0.0005	<0.0003	<0.0005	<0.0005	<0.1	<0.10	<0.1	na	na
		31-May-23	5036521	23E031691	<0.0005	<0.0003	<0.0005	<0.0005	<0.1	<0.10	<0.1	0.1	<0.1
		28-Jun-23	5106910	23E041837	<0.0005	<0.0003	<0.0005	<0.0005	0.3	0.3	<0.1	na	na
		27-Jul-23	5177324	23E052430	<0.0005	<0.0003	<0.0005	<0.0005	<0.1	<0.10	<0.1	na	na
		27-Jul-23	5177329	23E052430	<0.0005	<0.0003	<0.0005	<0.0005	<0.1	<0.10	<0.1	na	na
		23-Aug-23	5237381	23E061053	<0.0005	<0.0003	<0.0005	<0.0005	<0.1	<0.10	<0.1	na	na
		27-Sep-23	5330908	23E075537	<0.0005	<0.0003	<0.0005	<0.0005	<0.1	<0.10	<0.1	na	na
		24-Oct-23	5402843	23E085932	<0.0005	<0.0003	<0.0005	<0.0005	<0.1	<0.10	<0.1	na	na
		15-Mar-23	4859261	23E006628	<0.0005	<0.0003	<0.0005	<0.0005	<0.1	<0.10	0.7	na	na
KHY22-606	northeastern investigation area	06-Apr-23	4903768	23E012607	<0.0005	<0.0003	<0.0005	<0.0005	<0.1	<0.10	0.8	na	na
KHY22-608	northeastern investigation area	04-May-23	4967621	23E021784	<0.0005	<0.0003	<0.0005	<0.0005	<0.1	<0.10	<b>1.2</b>	na	na
		01-Jun-23	5036518	23E031691	<0.0005	<0.0003	<0.0005	<0.0005	<0.1	<0.10	<b>1.3</b>	8.7	2.8
		27-Jul-23	5177325	23E052430	<0.0005	<0.0003	<0.0005	<0.0005	<0.1	<0.10	1.0	na	na
		22-Aug-23	5237399	23E061053	<0.0005	<0.0003	<0.0005	<0.0005	<0.1	<0.10	0.9	na	na
		27-Sep-23	5330909	23E075537	<0.0005	<0.0003	<0.0005	<0.0005	<0.1	<0.10	<b>1.4</b>	na	na
		24-Oct-23	5402844	23E085932	<0.0005	<0.0003	<0.0005	<0.0005	<0.1	<0.10	<b>2</b>	na	na
		24-Oct-23	5402850	23E085932	<0.0005	<0.0003	<0.0005	<0.0005	<0.1	<0.10	<b>1.6</b>	na	na

**Table 16: Petroleum Hydrocarbon Analytical Results - Groundwater**
**Alberta Energy Regulator**
**Imperial Kearn Oil Sands, Wood Buffalo, Alberta**

Sample Identification Monitoring Well	Sample Location	Date Sampled	Laboratory Sample Identification	Laboratory Report Number	Benzene	Toluene	Ethylbenzene	Xylenes	F1 (C6-C10)	F1-BTEX	F2 (C10-C16)	F3 (C17-C34)	F4 (C34-C50+)
AEPA Guideline <sup>a</sup>	Natural Area		Fine-Grained		0.005	0.024	0.0016	0.02	ng	2.2	1.1	ng	ng
			Coarse-Grained		0.005	0.021	0.0016	0.02	ng	2.2	1.1	ng	ng
KHY22_609	northeastern investigation area	01-Jun-23	5036519	23E031691	<0.0005	<0.0003	<0.0005	<0.0005	<0.1	<0.10	0.1	0.7	0.2
		28-Jun-23	5106911	23E041837	<0.0005	<0.0003	<0.0005	<0.0005	<0.1	<0.10	<0.1	na	na
		27-Jul-23	5177326	23E052430	<0.0005	<0.0003	<0.0005	<0.0005	<0.1	<0.10	<0.1	na	na
		23-Aug-23	5237400	23E061053	<0.0005	<0.0003	<0.0005	<0.0005	<0.1	<0.10	0.1	na	na
		22-Aug-23	5237423	23E061053	<0.0005	<0.0003	<0.0005	<0.0005	<0.1	<0.10	<0.1	na	na
		27-Sep-23	5330910	23E075537	<0.0005	<0.0003	<0.0005	<0.0005	<0.1	<0.10	<0.1	na	na
		24-Oct-23	5402845	23E085932	<0.0005	<0.0003	<0.0005	<0.0005	<0.1	<0.10	<0.1	na	na
KHY22-610	northeastern investigation area	06-Apr-23	4903769	23E012607	<0.0005	<0.0003	<0.0005	<0.0005	<0.1	<0.10	<b>2.0</b>	na	na
KHY23-771	northeastern investigation area	27-Jul-23	5177328	23E052430	<0.0005	<0.0003	<0.0005	<0.0005	<0.1	<0.10	0.7	na	na
		22-Aug-23	5237401	23E061053	<0.0005	<0.0003	<0.0005	<0.0005	<0.1	<0.10	0.4	na	na
		27-Sep-23	5330911	23E075537	<0.0005	<0.0003	<0.0005	<0.0005	<0.1	<0.10	0.6	na	na
		24-Oct-23	5402847	23E085932	<0.0005	<0.0003	<0.0005	<0.0005	<0.1	<0.10	0.5	na	na
		01-Jun-23	5036520	23E031691	<0.0005	<0.0003	<0.0005	<0.0005	<0.1	<0.10	<b>1.6</b>	41.5	35.6
KHY23_772	northeastern investigation area	28-Jun-23	5106912	23E041837	<0.0005	<0.0003	<0.0005	<0.0005	<0.1	<0.10	<b>1.8</b>	na	na
		27-Jul-23	5177327	23E052430	<0.0005	<0.0003	<0.0005	<0.0005	<0.1	<0.10	<b>1.4</b>	na	na
		22-Aug-23	5237402	23E061053	<0.0005	<0.0003	<0.0005	<0.0005	<0.1	<0.10	<b>1.7</b>	na	na
		27-Sep-23	5330912	23E075537	<0.0005	<0.0003	<0.0005	<0.0005	<0.1	<0.10	<b>1.6</b>	na	na
		24-Oct-23	5402848	23E085932	<0.0005	<0.0003	<0.0005	<0.0005	<0.1	<0.10	<b>1.6</b>	na	na

Notes:

units are in mg/L unless otherwise specified

BTEX = benzene, toluene, ethylbenzene, and xylenes; mg/L = milligrams per litre; na = not analyzed; ng = no guideline; &lt; = below detection limit

Guideline
<sup>a</sup> Alberta Environment and Protected Areas (AEPA). 2023. Alberta Tier 1 Soil and Groundwater Remediation Guidelines. Land Policy Branch, Policy and Planning Division. January 1, 2023.

**Table 17: Total Metals Analytical Results - Groundwater**

Alberta Energy Regulator

Imperial Kearn Oil Sands, Wood Buffalo, Alberta

Sample Identification Monitoring Well	Sample Location	Date Sampled	Laboratory Sample Identification	Laboratory Report Number	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Chromium	Cobalt	Copper	Iron	Lead	Manganese	Molybdenum	Nickel	Selenium	Silver	Thallium	Uranium	Vanadium	Zinc
AEPA Guideline <sup>a</sup>	Natural Area		fine / coarse grained soil type		ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng
KHY22-604	northeastern investigation area	15-Mar-23	4859196	23E006628	1.89	0.0012	0.0069	0.35	na	0.78	0.000077	0.005	0.004	0.0033	68.7	0.0033	1.04	0.005	0.006	0.0013	0.00014	<0.0005	0.004	na	<0.010
		06-Apr-23	4903765	23E012607	0.055	<0.0010	0.0034	0.31	na	0.63	0.000019	0.002	0.003	<0.0010	61.6	<0.0001	0.801	0.005	0.006	<0.0005	<0.00005	<0.0005	<0.001	0.001	<0.010
		04-May-23	4967542	23E021784	0.105	<0.0010	0.006	0.3	<0.001	0.55	<0.000016	<0.001	0.004	<0.0010	53.9	<0.0001	0.785	0.005	0.004	<0.0005	<0.00005	<0.0005	<0.001	<0.001	<0.010
		01-Jun-23	5036421	23E031691	1.92	<0.0010	0.0047	0.33	<0.001	1.14	0.000108	0.006	0.0054	0.0079	47.6	0.0036	0.94	0.004	0.011	0.0007	0.00006	<0.0005	0.001	0.008	0.017
		28-Jun-23	5106900	23E041837	0.53	0.0011	0.0056	0.3	<0.001	0.88	0.000036	0.003	0.0032	0.0028	44.6	0.0013	0.964	0.004	0.010	<0.0005	<0.00005	<0.0005	<0.001	0.004	<0.010
		27-Jul-23	5177315	23E052430	0.478	<0.0010	0.0052	0.38	<0.001	1.11	0.000031	0.002	0.0029	0.0024	25.7	0.0011	0.988	0.005	0.006	<0.0005	<0.00005	<0.0005	0.002	0.002	<0.010
		23-Aug-23	5235367	23E061053	1.34	0.0011	0.0053	0.4	<0.001	1.41	0.000098	0.003	0.0036	0.0057	33.7	0.0026	1.33	0.006	0.009	0.0014	<0.00005	<0.0005	0.002	0.002	0.019
		27-Sep-23	5330876	23E075537	0.44	0.0018	0.007	0.38	<0.001	1.37	0.000113	0.002	0.0027	0.0029	29.4	0.0019	1.3	0.004	0.008	<0.0005	0.00089	<0.0005	0.004	0.002	0.019
		27-Sep-23	5330907	23E075537	0.42	0.001	0.0069	0.31	<0.001	1.35	0.000073	0.002	0.0028	0.0028	25.8	0.0015	1.24	0.004	0.007	0.0005	0.00084	<0.0005	0.004	0.001	0.02
		24-Oct-23	5402837	23E085932	0.26	<0.0010	0.0082	0.39	<0.001	1.44	<0.000016	<0.001	0.0025	0.0021	28.7	0.0008	1.4	0.006	0.008	<0.0005	<0.00005	<0.0005	0.004	0.001	<0.010
KHY22-605	northeastern investigation area	06-Apr-23	4903767	23E012607	0.099	<0.0010	<0.0010	0.08	na	0.02	<0.000016	<0.001	<0.001	<0.0010	5.14	0.0001	0.146	<0.001	<0.002	0.0005	0.00005	<0.0005	<0.001	<0.001	<0.010
		04-May-23	4967620	23E021784	0.52	<0.0010	<0.0010	0.09	<0.001	0.03	0.000029	0.003	<0.001	<0.0010	6.21	<0.0001	0.183	<0.001	<0.002	<0.0005	<0.0005	<0.001	0.003	<0.010	
		31-May-23	5036521	23E031691	0.052	<0.0010	<0.0010	0.08	<0.001	0.03	<0.000016	<0.001	<0.0002	<0.0010	5.16	<0.0001	0.15	<0.001	<0.002	<0.0005	<0.0005	<0.001	<0.001	<0.010	
		28-Jun-23	5106910	23E041837	0.323	<0.0010	<0.0010	<0.05	<0.001	0.05	0.000016	0.002	0.0008	0.0149	1.57	0.0007	0.038	<0.001	0.002	<0.0005	<0.00005	<0.0005	<0.001	0.002	0.010
		27-Jul-23	5177324	23E052430	0.191	<0.0010	<0.0010	0.09	<0.001	0.03	<0.000016	0.002	<0.0002	<0.0010	4.55	0.0002	0.127	<0.001	<0.002	<0.0005	<0.0005	<0.001	0.003	<0.010	
		27-Jul-23	5177329	23E052430	0.211	<0.0010	<0.0010	0.08	<0.001	0.03	<0.000016	0.002	<0.0002	<0.0010	4.7	0.0002	0.154	<0.001	<0.002	<0.0005	<0.0005	<0.001	0.002	<0.010	
		23-Aug-23	5237381	23E061053	0.125	<0.0010	<0.0010	0.08	<0.001	0.03	0.000071	<0.001	<0.0002	<0.0010	5.32	0.0006	0.155	<0.001	<0.002	0.0007	<0.0005	<0.001	0.002	0.012	
		27-Sep-23	5330908	23E075537	0.135	<0.0010	<0.0010	0.09	<0.001	0.03	0.000042	0.002	<0.0002	0.0041	5.92	0.0009	0.16	<0.001	<0.002	<0.0005	0.00089	<0.0005	<0.001	<0.001	0.017
		24-Oct-23	5402843	23E085932	0.368	<0.0010	0.0011	0.1	<0.001	0.04	<0.000016	0.001	0.0003	0.0017	6.02	0.0008	0.156	0.001	<0.002	<0.0005	0.00006	<0.0005	<0.001	0.002	0.017
KHY22-606	northeastern investigation area	15-Mar-23	4859261	23E006628	0.249	<0.0010	0.0064	0.14	na	1.45	0.000017	0.001	<0.001	<0.0010	12	0.0005	0.778	0.003	0.004	0.0013	0.00011	<0.0005	0.002	na	<0.010
		06-Apr-23	4903768	23E012607	0.94	<0.0010	0.0085	0.2	na	1.35	0.000048	0.005	0.002	0.003	13.4	0.0014	0.776	0.004	0.007	<0.0005	0.00008	<0.0005	0.002	0.005	<0.010
KHY22-608	northeastern investigation area	04-May-23	4967621	23E021784	0.91	<0.0010	0.006	0.19	<0.001	1.1	0.00003	0.002	0.005	0.0039	57.7	<0.0001	0.424	0.005	0.01	<0.0005	<0.00005	<0.0005	0.001	0.006	<0.010
		01-Jun-23	5036518	23E031691	2.66	<0.0010	0.0068	0.26	<0.001	1.15	0.000091	0.008	0.006	0.0099	45.6	0.005	0.589	0.007	0.013	<0.0005</					

**Table 17: Total Metals Analytical Results - Groundwater**

Alberta Energy Regulator

Imperial Kearn Oil Sands, Wood Buffalo, Alberta

Sample Identification Monitoring Well	Sample Location	Date Sampled	Laboratory Sample Identification	Laboratory Report Number	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Chromium	Cobalt	Copper	Iron	Lead	Manganese	Molybdenum	Nickel	Selenium	Silver	Thallium	Uranium	Vanadium	Zinc
AEPA Guideline <sup>a</sup>	Natural Area			fine / coarse grained soil type	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	
KHY23_772	northeastern investigation area	01-Jun-23	5036520	23E031691	28.1	<0.0010	0.0334	0.54	0.002	1.03	0.000905	0.152	0.0563	0.11	133	0.051	2.38	0.014	0.13	0.0024	0.00111	0.0017	0.007	0.112	0.141
		28-Jun-23	5106912	23E041837	21.0	<0.0010	0.0469	0.62	0.002	1.43	0.000901	0.131	0.0511	0.122	142	0.0549	2.83	0.017	0.140	0.0026	0.00073	0.0018	0.006	0.128	0.153
		27-Jul-23	5177327	23E052430	8.11	<0.0010	0.0187	0.33	<0.001	1.52	0.00026	0.034	0.0144	0.0402	66.4	0.0175	2.32	0.009	0.041	0.0018	0.00033	0.0005	0.002	0.041	0.038
		22-Aug-23	5237402	23E061053	8.90	<0.0010	0.0166	0.29	<0.001	1.52	0.000334	0.033	0.0135	0.0396	69.7	0.0173	2.5	0.01	0.039	<0.0005	0.00043	0.0008	0.002	0.049	0.055
		27-Sep-23	5330912	23E075537	4.61	<0.0010	0.0114	0.28	<0.001	1.41	0.000212	0.017	0.0078	0.0203	55.6	0.0098	2.21	0.008	0.022	<0.0005	0.00112	0.0006	0.002	0.022	0.029
		24-Oct-23	5402848	23E085932	12.3	<0.0010	0.0251	0.44	<0.001	1.87	0.000401	0.038	0.017	0.124	67.9	0.0296	2.59	0.013	0.049	<0.0005	0.00039	0.0008	0.003	0.063	0.056

**Notes:**

units are in mg/L unless otherwise indicated

 CaCO<sub>3</sub> = calcium carbonate; mg/L = milligrams per litre; na = not analyzed; ng = no guideline; < = below detection limit

**Guidelines**
<sup>a</sup> Alberta Environment and Protected Areas (AEPA). 2023. Alberta Tier 1 Soil and Groundwater Remediation Guidelines. Land Policy Branch, Policy and Planning Division. January 1, 2023.

**Table 18: Dissolved Metals Analytical Results - Groundwater**  
 Alberta Energy Regulator  
 Imperial Keral Oil Sands, Wood Buffalo, Alberta

Sample Identification Monitoring Well	Sample Location	Date Sampled	Laboratory Sample Identification	Laboratory Report Number	Aluminum <sup>a,d</sup>	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium <sup>a,d</sup>	Chromium	Cobalt	Copper	Iron	Lead <sup>b,d</sup>	Manganese	Molybdenum	Nickel <sup>b,d</sup>	Selenium	Silver	Thallium	Uranium	Vanadium	Zinc	
AEPA Guideline <sup>c</sup>	Natural Area		fine / coarse grained soil type		0.050	0.0060	0.0050	2.0	ng	1.50	0.00014 to 0.00037	0.05	ng	0.0070	0.30	0.003 to 0.007	0.020	ng	0.0450 to 0.3603	0.0020	0.00010	ng	0.015	ng	0.030	
KHY22-604	northeastern investigation area	15-Mar-23	4859196	23E006628	0.014	<0.0010	0.003	0.33	na	0.63	<0.000016	<0.001	<0.001	<0.001	0.3	<0.0002	0.791	0.005	0.0048	<0.0005	<0.0005	na	<0.001	na	<0.01	
		06-Apr-23	4903765	23E012607	0.025	<0.0010	0.003	0.32	na	0.73	<0.000016	<0.001	<0.001	<0.001	<0.1	<0.0002	0.777	0.005	0.0053	<0.0005	0.00066	na	<0.001	0.001	<0.01	
		04-May-23	4967542	23E021784	<0.004	<0.0010	0.003	0.24	<0.001	0.48	<0.000016	<0.001	0.002	<0.001	<0.1	<0.0001	0.787	0.004	0.0042	<0.0005	<0.0005	<0.001	<0.001	<0.01		
		01-Jun-23	5036421	23E031691	0.007	<0.0010	0.002	0.29	<0.001	1.06	<0.000016	<0.001	0.0033	<0.001	37.7	<0.0002	0.749	0.004	0.0047	<0.0005	<0.0005	<0.0005	<0.001	<0.001	<0.01	
		28-Jun-23	5106900	23E041837	<0.004	<0.0010	0.004	0.25	<0.001	0.99	<0.000016	<0.001	0.0014	0.003	39.6	<0.0002	0.961	0.003	0.0057	<0.0005	<0.0005	<0.001	<0.001	<0.01		
		27-Jul-23	5177315	23E052430	0.008	<0.0010	0.005	0.36	<0.001	1.11	<0.000016	0.002	0.0018	<0.001	28.1	<0.0002	1.19	0.005	0.0066	<0.0005	<0.0005	0.002	0.002	<0.01		
		23-Aug-23	5235367	23E061053	<0.004	<0.0010	0.004	0.34	<0.001	1.38	0.000025	<0.001	0.0017	<0.001	21.8	<0.0002	1.17	0.005	0.0054	<0.0005	<0.0005	0.002	<0.001	<0.01		
		27-Sep-23	5330876	23E075537	0.018	<0.0010	0.006	0.31	<0.001	1.33	<0.000016	<0.001	0.0019	<0.001	25.5	<0.0002	1.29	0.004	0.0056	<0.0005	<0.0005	0.003	<0.001	<0.01		
		27-Sep-23	5330907	23E075537	0.015	<0.0010	0.006	0.29	<0.001	1.35	0.000035	<0.001	0.0018	<0.001	25.7	<0.0002	1.28	0.004	0.0059	<0.0005	<0.0005	0.003	<0.001	<0.01		
		24-Oct-23	5402837	23E085932	0.016	<0.0010	<0.001	0.25	<0.001	1.24	<0.000016	<0.001	0.0017	<0.001	0.3	<0.0002	1.36	0.003	0.0058	<0.0005	<0.0005	0.004	0.002	0.02		
KHY22-605	northeastern investigation area	06-Apr-23	4903767	23E012607	0.020	<0.0010	<0.001	0.08	na	0.02	<0.000016	<0.001	0.001	0.001	0.2	<0.0002	0.139	<0.001	0.0007	<0.0005	na	<0.001	<0.001	<0.01		
		04-May-23	4967620	23E021784	<0.004	<0.0010	<0.001	0.06	<0.001	0.02	<0.000016	<0.001	<0.001	<0.001	1.8	<0.0001	0.148	<0.001	<0.0005	<0.0005	<0.0005	<0.001	<0.001	<0.01		
		31-May-23	5036521	23E031691	<0.004	<0.0010	<0.001	0.07	<0.001	0.03	<0.000016	<0.001	<0.0002	<0.001	4.3	<0.0002	0.13	<0.001	<0.0005	<0.0005	<0.0005	<0.001	<0.001	<0.01		
		28-Jun-23	5106910	23E041837	0.004	<0.0010	<0.001	-0.05	<0.001	0.04	0.000028	0.001	0.0005	0.011	0.3	<0.0002	0.006	<0.001	0.0030	<0.0005	<0.0005	<0.001	<0.001	<0.01		
		27-Jul-23	5177324	23E052430	0.027	<0.0010	<0.001	0.07	<0.001	0.03	<0.000016	<0.001	<0.0002	<0.001	4.2	<0.0002	0.12	<0.001	<0.0005	<0.0005	<0.0005	<0.001	0.002	<0.01		
		27-Jul-23	5177329	23E052430	0.031	<0.0010	<0.001	0.07	<0.001	0.03	<0.000016	<0.001	<0.0002	<0.001	4.8	<0.0002	0.15	<0.001	<0.0005	<0.0005	<0.0005	<0.001	0.001	<0.01		
		23-Aug-23	5237381	23E061053	0.019	<0.0010	<0.001	0.08	<0.001	0.03	<0.000016	<0.001	<0.0002	<0.002	4.3	<0.0002	0.14	<0.001	<0.0005	<0.0005	<0.0005	<0.001	<0.001	0.01		
		27-Sep-23	5330908	23E075537	0.020	<0.0010	<0.001	0.08	<0.001	0.03	0.000018	0.002	<0.0002	<0.001	5.70	<0.0002	0.158	<0.001	<0.0005	<0.0005	<0.0005	<0.001	<0.001	<0.01		
		24-Oct-23	5402843	23E085932	0.052	<0.0010	<0.001	0.1	<0.001	0.04	<0.000016	0.002	<0.0002	<0.001	1.70	<0.0002	0.167	<0.001	<0.0005	<0.0005	<0.0005	<0.001	0.002	0.02		
KHY22-606	northeastern investigation area	15-Mar-23	4859261	23E006628	0.008	<0.0010	0.006	0.15	na	1.46	<0.000016	<0.001	<0.001	<0.001	0.3	<0.0002	0.732	0.003	0.0041	<0.0005	0.00005	na	0.002	na	<0.01	
KHY22-608	northeastern investigation area	06-Apr-23	4903768	23E012607	0.016	<0.0010	0.007	0.19	na	1.42	0.000025	<0.001	<0.001	<0.001	<0.1	<0.0002	0.741	0.002	0.0048	<0.0005	0.00005	na	0.002	0.003	<0.01	
		04-May-23	4967621	23E021784	<0.004	<0.0010	0.003	0.18	<0.001	1.12	<0.000016	<0.001	0.002	<0.001	0.2	<0.0001	0.346	0.005	0.0071	0.00006	<0.0005	0.001	<0.001	<0.01		
		01-Jun-23	5036518	23E031691	0.065	<0.0010	0.004	0.21	<0.001	1.19	<0.000016	<0.001	0.0024	<0.001	38.6	<0.0002	0.402	0.006	0.0037	<0.0005	<0.0005	<0.001	<0.001	<0.01		

**Table 19: Routine Chemistry Analytical Results - Groundwater**

 Alberta Energy Regulator  
 Imperial Keral Oil Sands, Wood Buffalo, Alberta

Sample Identification Monitoring Well	Sample Location	Date Sampled	Laboratory Sample Identification	Laboratory Report Number	Field Chloride (QuanTab) (mg/L)	pH	Electrical Conductivity (EC) ( $\mu\text{S}/\text{cm}$ )	Total Dissolved Solids (TDS) (Calculated)	Chloride	Fluoride	Sulphate	Calcium (Dissolved)	Sodium (Dissolved)	Iron (Dissolved)	Magnesium (Dissolved)	Manganese (Dissolved)	Potassium (NO <sub>3</sub> )	Nitrate-N (NO <sub>3</sub> -N)	Nitrite-N (NO <sub>2</sub> -N)	Nitrite + Nitrate-N (NO <sub>2</sub> -NO <sub>3</sub> )	Bicarbonate	Carbonate	Hydroxide	Ion Balance (%)	Hardness (mg CaCO <sub>3</sub> /L)	T - Alkalinity (as CaCO <sub>3</sub> ) (mg/L)	P - Alkalinity (as CaCO <sub>3</sub> ) (mg/L)	Sodium Adsorption Ratio (SAR)	Field Temperature (°C)	Ammonia (as N)	Dissolved Oxygen (mg/L)	Field Turbidity (NTU)			
<b>AEPA Guideline<sup>a</sup></b>		<b>Natural Area</b>		fine / coarse grained soil type		ng	6.5-8.5	ng	500	120	1.5	table A	ng	200	0.30	ng	0.020	ng	3.0	ng	table B	ng	ng	ng	ng	ng	ng	0.021 to 7.683	ng	ng					
KHY22-604	northeastern investigation area	15-Mar-23	4859196	23E006628	na	7.26	1,580	1,070	14	1.6	432	129	161	0.3	52.6	0.791	5.9	<0.5	<0.02	<0.05	<0.01	<0.02	561	<5	96	539	460	<5	3.02	3.7	na	na	75.74		
		06-Apr-23	4903765	23E012607	na	7.26	1,610	1,050	13	1.0	461	107	143	<0.1	51.3	0.777	5.9	<0.5	<0.02	<0.05	<0.01	<0.02	562	<5	83	478	461	<5	2.84	4.0	na	na	14.11		
		04-May-23	4967542	23E021784	na	7.40	1,460	1,020	11	0.87	400	135	139	<0.1	58.7	0.787	6.7	2.2	0.50	<0.05	<0.01	0.5	534	<5	<5	102	579	438	<5	2.51	5.7	na	na	3.77	14.88
		01-Jun-23	5036421	23E031691	na	7.45	1,680	1,260	16	0.60	701	143	149	37.7	57.7	0.749	5.7	<0.5	<0.02	<0.05	<0.01	<0.02	387	<5	93	595	317	<5	2.66	6.8	2.9	4.12	21.9		
		28-Jun-23	5106900	23E041837	na	7.55	1,550	1,060	16	1.16	493	130	158	39.6	46.3	0.961	6.9	<0.5	<0.02	<0.05	<0.01	<0.02	429	<5	<5	106	515	351	<5	3.03	7.4	29.2	5.62	na	
		27-Jul-23	5177315	23E052430	na	7.60	1,750	1,300	17	1.10	597	205	164	28.1	64.1	1.19	12.2	<0.5	<0.02	<0.05	<0.01	<0.02	491	<5	<5	114	776	402	<5	2.56	10	na	6.1	na	
		23-Aug-23	5235367	23E061053	na	7.70	1,750	1,270	22	1.14	691	143	171	21.8	52.5	1.17	12.7	<0.5	<0.02	<0.05	<0.01	<0.02	371	<5	<5	95	573	304	<5	3.11	11.9	1.31	na	na	
		27-Sep-23	5330876	23E075537	na	7.88	1,560	962	17	0.98	322	143	133	25.5	47.7	1.29	12.6	<0.5	<0.02	<0.05	<0.01	<0.02	582	<5	<5	108	553	477	<5	2.46	13.5	na	4.6	51.9	
		27-Sep-23	5330907	23E075537	na	7.92	1,560	1,010	19	0.87	356	146	137	25.7	48.1	1.28	12.8	<0.5	<0.02	<0.05	<0.01	<0.02	590	<5	<5	105	563	484	<5	2.51	na	na	na		
		24-Oct-23	5402837	23E085932	na	8.18	1,640	1,140	19	1.19	437	152	188	0.3	50.4	1.36	13.4	<0.5	<0.02	<0.05	<0.01	<0.02	568	<5	<5	107	587	465	<5	3.38	11.1	na	4	na	
KHY22-605	northeastern investigation area	06-Apr-23	4903767	23E012607	na	7.76	594	312	<1	0.06	<1	73.2	1.7	0.2	26.7	0.139	1.7	<0.5	<0.02	<0.05	<0.01	<0.02	425	<5	<5	86	293	349	<5	0.04	6.5	na	6.79	20.13	
		04-May-23	4967620	23E021784	na	7.80	563	297	<1	0.1	<1	77.7	1.6	1.8	25.0	0.148	1.0	1.3	0.29	<0.05	<0.01	0.29	388	<5	<5	96	297	318	<5	0.04	9.5	na	3.31	35.91	
		31-May-23	5036521	23E031691	na	7.89	577	304	<1	0.14	<1	81.1	1.9	4.3	26.8	0.13	1.5	<0.5	<0.02	<0.05	<0.01	<0.02	391	<5	<5	102	313	321	<5	0.05	7.5	0.051	5.35	5.28	
		28-Jun-23	5106910	23E041837	na	10.3	852	13,900	3	0.43	9	6.1	8.0	0.1	16.8	<0.005	1.9	0.8	0.18	<0.05	<0.01	0.18	8,100	2,350	4,280	<1	84	660	5,460	0.38	7.8	<0.2	4.7	na	
		27-Jul-23	5177324	23E052430	na	7.82	536	290	<1	0.12	<1	86.3	1.8	4.2	24.2	0.12	1.4	<0.5	<0.02	<0.05	<0.01	<0.02	359	<5	<5	111	315	294	<5	0.04	7.5	na	3.53	na	
		27-Jul-23	5177329	23E052430	na	7.81	554	298	<1	0.13	<1	89.6	1.9	4.8	27.8	0.15	1.7	<0.5	<0.02	<0.05	<0.01	<0.02	360	<5	<5	120	338	295	<5	0.04	na	5.31	na		
		23-Aug-23	5237381	23E061053	na	7.84	537	287	<1	0.13	<1	74.4	1.7	4.3	25.4	0.14	1.7	<0.5	<0.02	<0.05	<0.01	<0.02	373	<5	<5	99	290	306	<5	0.04	8.6	0.18	na	na	
		27-Sep-23	5330908	23E075537	na	8	574	309	<1	0.12	<1	92.9	1.8	5.7	28.9	0.158	1.6	<0.5	<0.02	<0.05	<0.01	<0.02	374	<5	<5	120	351	306	<5	0.04	8.2	na	4.8	31.6	
		24-Oct-23	5402843	23E085932	na	8.1	579	317	<1	0.16	<1	92	2.7	1.7	28.5	0.167	1.8	<0.5	<0.02	<0.05	<0.01	<0.02	391	<5	<5	112	347	320	<5	0.06	7.5	na	2.2	na	
KHY22-606	northeastern investigation area	15-Mar-23	4859261	23E006628	na	7.56	1,680	1,140	21	1.47	410	139	182	0.3	52.8	0.732	14.6	<0.5	<0.02	<0.05	<0.01</td														



Table 20: Alkylated Polycyclic Aromatic Hydrocarbon Analytical Results - Groundwater  
Alberta Energy Regulator  
Imperial Kest Oil Sands, Wood Buffalo, Alberta

Sample Identification Monitoring Well	Sample location	Date Sampled	Laboratory Sample Identification Number	Laboratory Report Number	Fluoranthene	2-Methyl naphthalene	1-Methyl naphthalene	Quinoline	C2-Naphthalene	C3-Naphthalene	C4-Naphthalene	Biphenyl	C1-Biphenyl	C2-Biphenyl	Aacenaphthylene	Aacenaphthene	C1-Acphenyl	Fluorene	C1-Fluorene	C2-Fluorene	C3-Fluorene	Phenanthrene	Anthracene	C1-Pheanthrene	C2-Pheanthrene
					ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	
ADPA Guideline	Natural Area				0.001																				
					ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	
					Coarse-Grained																				
KHY22_004	northeastern investigation area	15-Mar-22	4959115	230306028	<0.0001	<0.0001	<0.0001	<0.0004	<0.0004	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0004	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
		06-Apr-22	4959155	230319027	<0.0001	<0.0001	<0.0001	<0.0004	<0.0004	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0004	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
		07-Apr-22	4959165	230319028	<0.0001	<0.0001	<0.0001	<0.0004	<0.0004	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0004	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
		01-Jun-22	5394211	230319031	<0.0001	<0.0001	<0.0001	<0.0004	<0.0004	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0004	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
		21-Jun-22	5772115	230319040	<0.0001	<0.0001	<0.0001	<0.0004	<0.0004	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0004	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
		23-Aug-22	5325027	230319053	<0.0001	<0.0001	<0.0001	<0.0004	<0.0004	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0004	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
		27-Sep-22	5325027	230319057	<0.0001	<0.0001	<0.0001	<0.0004	<0.0004	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0004	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
		24-Oct-22	5402443	230319062	<0.0001	<0.0001	<0.0001	<0.0004	<0.0004	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0004	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
		15-Nov-22	4959211	230319062	<0.0001	<0.0001	<0.0001	<0.0004	<0.0004	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0004	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
		04-May-23	4959211	230319104	<0.0001	<0.0001	<0.0001	<0.0004	<0.0004	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0004	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
		01-Jun-23	5395125	230319105	<0.0001	<0.0001	<0.0001	<0.0004	<0.0004	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0004	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
		20-Jun-23	5371258	230319127	<0.0001	<0.0001	<0.0001	<0.0004	<0.0004	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0004	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
		21-Jun-23	5772124	230319142	<0.0001	<0.0001	<0.0001	<0.0004	<0.0004	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0004	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
		23-Aug-23	5325027	230319153	<0.0001	<0.0001	<0.0001	<0.0004	<0.0004	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0004	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
		25-Aug-23	5325027	230319157	<0.0001	<0.0001	<0.0001	<0.0004	<0.0004	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0004	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
		27-Aug-23	5325027	230319160	<0.0001	<0.0001	<0.0001	<0.0004	<0.0004	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0004	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
		15-Nov-23	4959211	230319162	<0.0001	<0.0001	<0.0001	<0.0004	<0.0004	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0004	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
		04-May-24	4959211	230319174	<0.0001	<0.0001	<0.0001	<0.0004	<0.0004	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0004	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
		31-May-23	5395125	230319175	<0.0001	<0.0001	<0.0001	<0.0004	<0.0004	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0004	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
		27-Jun-23	5772124	230319180	<0.0001	<0.0001	<0.0001	<0.0004	&lt																

**Table 21: Naphthenic Acids (FTIR) Analytical Results - Groundwater**

Alberta Energy Regulator  
Imperial Kearl Oil Sands, Wood Buffalo, Alberta

Sample Identification	Sample Location	Date Sampled	Laboratory Sample Identification	Laboratory Report Number	Naphthenic Acids
AEPA Guideline <sup>a</sup>	Natural Area			Fine-Grained	
				Coarse-Grained	ng
KHY22-604	northeastern investigation area	15-Mar-23	4859196	23E006628	8.5
		06-Apr-23	4903765	23E012607	7.3
		04-May-23	4967542	23E021784	5.8
		01-Jun-23	5036421	23E031691	10.5
		28-Jun-23	5106900	23E041837	29.2
		27-Jul-23	5177315	23E052430	5.4
		23-Aug-23	5235367	23E061053	9.6
		27-Sep-23	5330876	23E075537	5.2
		27-Sep-23	5330907	23E075537	3.3
		24-Oct-23	5402837	23E085932	7.5
KHY22-605	northeastern investigation area	06-Apr-23	4903767	23E012607	<0.2
		04-May-23	4967620	23E021784	<0.2
		31-May-23	5036521	23E031691	<0.1
		28-Jun-23	5106910	23E041837	<0.2
		27-Jul-23	5177324	23E052430	<0.2
		27-Jul-23	5177329	23E052430	<0.2
		23-Aug-23	5237381	23E061053	<0.2
		27-Sep-23	5330908	23E075537	<0.2
		24-Oct-23	5402843	23E085932	<0.2
KHY22-606	northeastern investigation area	15-Mar-23	4859261	23E006628	7.9
		06-Apr-23	4903768	23E012607	7.5
KHY22-608	northeastern investigation area	04-May-23	4967621	23E021784	8.4
		01-Jun-23	5036518	23E031691	8.3
		27-Jul-23	5177325	23E052430	6.2
		22-Aug-23	5237399	23E061053	3.4
		27-Sep-23	5330909	23E075537	5.2
		24-Oct-23	5402844	23E085932	8.6
		24-Oct-23	5402850	23E085932	7.5
KHY22_609		01-Jun-23	5036519	23E031691	<0.1
	northeastern investigation area	28-Jun-23	5106911	23E041837	<0.2
		27-Jul-23	5177326	23E052430	<0.2
		23-Aug-23	5237400	23E061053	<0.2
		22-Aug-23	5237423	23E061053	<0.2
		27-Sep-23	5330910	23E075537	<0.2
		24-Oct-23	5402845	23E085932	<0.2
KHY22-610		06-Apr-23	4903769	23E012607	10.9
KHY23-771	northeastern investigation area	27-Jul-23	5177328	23E052430	0.7
		22-Aug-23	5237401	23E061053	0.6
		27-Sep-23	5330911	23E075537	1.2
		24-Oct-23	5402847	23E085932	1.2
KHY23_772		01-Jun-23	5036520	23E031691	38.6
	northeastern investigation area	28-Jun-23	5106912	23E041837	34.2
		27-Jul-23	5177327	23E052430	43.5
		22-Aug-23	5237402	23E061053	17.6
		27-Sep-23	5330912	23E075537	5.6
		24-Oct-23	5402848	23E085932	12.0

Notes:

units are in µg/mL unless otherwise indicated

µg/mL = micrograms per millilitre; na = not analyzed; ng = no guideline; < = below detection limit

Guidelines

<sup>a</sup> Alberta Environment and Protected Areas (AEPA). 2023. Alberta Tier 1 Soil and Groundwater Remediation Guidelines. Land Policy Branch, Policy and Planning Division. January 1, 2023.