

Laboratory Analysis of Produced Water from Westhazel Release

TABLE 1

Produced Water Quality Results - General and Inorganic Parameters

Husky Oil Operations Ltd.
13-34-050-22 W3M

Sample Point	Sample Date	MSI Sample Number	Lab #	Lab pH	Lab EC μ S/cm	Ca mg/L	Mg mg/L	Na mg/L	K mg/L	Cl mg/L	SO ₄ mg/L	F mg/L	NO ₂ -N mg/L	NO ₃ -N mg/L	NO ₂ /NO ₃ -N mg/L	T-Alkalinity mg/L	HCO ₃ mg/L	Hardness mg/L	TDS mg/L
Pre-Filter Produced Water																			
18-PRO1	19-Jul-18	25898180719999	181364384	7.15	70600	828	468.0	17100	406	28900	10	<0.6	<0.01	<0.02	<0.02	670	818	3990	48100

TABLE 2

Product Quality Results - Dissolved Hydrocarbons

Husky Oil Operations Ltd.
13-34-050-22 W3M

Sample Point	Sample Date	MSI Sample Number	Lab #	Benzene mg/L	Toluene mg/L	Ethylbenzene mg/L	Xylenes mg/L	F1 C ₆ -C ₁₀ - BTEX mg/L	F2 C ₇ -C ₁₆ mg/L
Pre-Filter Produced Water									
18-PRO1	19-Jul-18	25898180719999	181364384	0.0038	0.0088	0.0096	0.0442	0.2	0.87

TABLE 3

Produced Water Quality Results - Total Metals

Husky Oil Operations Ltd.
13-34-050-22 W3M

Sample Point	Sample Date	MSI Sample Number	Lab #	Al mg/L	Sb mg/L	As mg/L	Ba mg/L	Be mg/L	B mg/L	Cd mg/L	Cr mg/L	Co mg/L	Cu mg/L	Fe mg/L	Pb mg/L	Li mg/L	Mn mg/L	Mo mg/L	Ni mg/L	Se mg/L	Si mg/L	Ag mg/L	Sr mg/L	Tl mg/L	Sn mg/L	Ti mg/L	U mg/L	V mg/L	Zn mg/L		
Pre-Filter Produced Water																															
18-PRO1	19-Jul-18	25898180719999	181364384	<0.10	<0.001	<0.01	40.7	<0.0010	9.1	<0.00080	0.007	0.0017	<0.0050	17	<0.0005	7.83	0.47	0.002	<0.005	0.291	4.5	0.003	72.1	<0.0005	<0.005	0.02	<0.001	<0.05	<0.05		

TABLE 4

Produced Water Quality Results - Dissolved Metals

Husky Oil Operations Ltd.
13-34-050-22 W3M

Sample Point	Sample Date	MSI Sample Number	Lab #	Al mg/L	Sb mg/L	As mg/L	Ba mg/L	Be mg/L	B mg/L	Cd mg/L	Cr mg/L	Co mg/L	Cu mg/L	Fe mg/L	Pb mg/L	Li mg/L	Mn mg/L	Mo mg/L	Ni mg/L	Se mg/L	Si mg/L	Ag mg/L	Sr mg/L	Tl mg/L	Sn mg/L	Ti mg/L	U mg/L	V mg/L	Zn mg/L
Pre-Filter Produced Water																													
18-PRO1	19-Jul-18	25898180719999	181364384	0.03	<0.002	0.002	36.9	<0.002	9.9	<0.00017	<0.005	0.001	<0.0025	1.6	<0.0025	7.83	0.398	0.002	<0.005	0.302	4.29	0.0009	73.9	<0.0005	<0.001	0.02	<0.001	<0.005	<0.05

TABLE 5

Surface Water Quality Results - Polycyclic Aromatic Hydrocarbons

Husky Oil Operations Ltd.
13-34-050-22 W3M

Sample Point	Sample Date	MSI Sample Number	Lab #	Acenaphthene mg/L	Acenaphthylene mg/L	Acridine mg/L	Anthracene mg/L	Benz[a]anthracene mg/L	Benzo[b,j]fluoranthene mg/L	Benzo[k]fluoranthene mg/L	Benzo[g,h,i]perylene mg/L	Benzo[a]pyrene mg/L	Chrysene mg/L	Dibenz[a,h]anthracene mg/L	Fluoranthene mg/L	Fluorene mg/L	Indeno[1,2,3-cd]pyrene mg/L	2-Methylnaphthalene mg/L	Naphthalene mg/L	Phenanthrene mg/L	Pyrene mg/L	Quinoline mg/L
Pre-Filter Produced Water																						
18-PRO1	19-Jul-18	25898180719999	181364384	0.00063	<0.00001	<0.00005	<0.000010	<0.000010	<0.00001	<0.00001	<0.00001	<0.000007	<0.00001	<0.000008	0.00006	0.00109	<0.00001	0.00774	0.0105	0.00131	<0.00001	<0.00004

TABLE 6

Produced Water Quality Results - Amines

Husky Oil Operations Ltd.
13-34-050-22 W3M

Sample Point	Sample Date	MSI Sample Number	Lab #	MEA mg/L	DEA mg/L	DIPA mg/L	MIPA mg/L
Pre-Filter Produced Water							
18-PRO1	19-Jul-18	25898180719999	181364384	<0.05	<0.04	<0.1	<0.1

TABLE 7**Produced Water Quality Results - Glycols**Husky Oil Operations Ltd.
13-34-050-22 W3M

Sample Point	Sample Date	MSI Sample Number	Lab #	Ethylene Glycol mg/L	Diethylene Glycol mg/L	Propylene Glycol mg/L	Triethylene Glycol mg/L	Tetraethylene Glycol mg/L
Pre-Filter Produced Water								
18-PRO1	19-Jul-18	25898180719999	18I364384	<8	<5	<10	<8	<10

TABLE 8**Produced Water Quality Results - Alcohols**Husky Oil Operations Ltd.
13-34-050-22 W3M

Sample Point	Sample Date	MSI Sample Number	Lab #	Methanol mg/L	Ethanol mg/L	Propanol mg/L	Isopropanol mg/L	Butanol mg/L	Pentanol mg/L
Pre-Filter Produced Water									
18-PRO1	19-Jul-18	25898180719999	18I364384	<1	<10	<10	<10	<10	<10