

APPENDIX 2-VI

REGIONAL DEVELOPMENTS

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1 INTRODUCTION

This appendix provides information on developments located within the region of MEG's Christina Lake Regional Project – Phase 3 (the Project). This information is provided to aid reviewers in comparing the scale of the Project to other developments in the region. For the purpose of this appendix, the region has been defined as the boundaries of the air modelling domain used in the assessment, as it is the largest spatial boundary considered in the Environmental Impact Assessment (EIA).

The types of developments presented in this appendix include oil sands developments; gas plants and compressor stations, and other developments including aggregate resources, communities, forestry, pipelines and roadways. Linear disturbances less than 10 m in width (e.g., seismic lines) are not presented in this appendix.

Information on these developments was gathered from permitting applications, EIAs, websites and press releases.

The information on each of the regional developments described includes:

- relevant information on the type of operation or operations;
- the existing and/or approved production (in either barrels of bitumen or barrels of synthetic crude oil);
- disturbance footprint; and
- common project air emissions (e.g., sulphur dioxide [SO₂] and oxides of nitrogen [NO_x]).

2 OIL SANDS DEVELOPMENTS

2.1 ALBIAN SANDS ENERGY INC.

Albian Sands Energy Inc. (Shell Canada Energy, Chevron Canada Resources and Western Oil Sands) is the operator of the following projects:

- Muskeg River Mine; and
- Muskeg River Mine Expansion Project.

These projects are located in the western portion of Lease 13, 30 and 90, about 75 km north of Fort McMurray. The Muskeg River Mine Projects include open pit truck and shovel mining as well as extraction and utilities operations. Bitumen product is shipped via pipeline to an upgrading facility (Scotford) near Fort Saskatchewan, Alberta. The Muskeg River Mine started production in 2002. The Muskeg River Mine Expansion Project was approved in 2007.

Albian Sands production is provided in Table 1, disturbance areas in Table 2 and air emissions in Table 3.

Table 1 Albian Sands Production

Component	Status	Capacity [bpd] ^(a)
Muskeg River Mine	existing/approved	150,000
Muskeg River Mine Expansion	approved	120,000
Total		270,000

^(a) Bitumen production.

Table 2 Albian Sands Disturbance Areas

Component	Status	Disturbance [ha]
Muskeg River Mine	existing/approved	4,385
Muskeg River Mine Expansion	approved	8,135
Total		12,520

Table 3 Albian Sands Air Emissions

Component	Emission Rates ^(a)						
	Stream-day SO ₂ [t/sd]	Calendar-day SO ₂ [t/cd]	NO _x [t/d]	CO [t/d]	PM _{2.5} [t/d]	VOC [t/d]	TRS [t/d]
Muskeg River Mine	0.20	0.20	17.34	16.93	1.07	13.84	0.07
Muskeg River Mine Expansion	0.41	0.41	14.34	10.10	0.54	12.96	0.06
Total	0.61	0.61	31.68	27.03	1.61	26.80	0.13

^(a) Emissions are expressed as tonnes per stream-day (t/sd), tonnes per calendar-day (t/cd) or tonnes per day (t/d).

Note: Some numbers are rounded for presentation purposes. Therefore, it may appear that the totals do not equal the sum of the individual values.

2.2 CANADIAN NATURAL RESOURCES LIMITED

The Canadian Natural Resources Limited (Canadian Natural) oil sands operations include:

- Burnt Lake Project;
- Primrose North, South and Wolf Lake In-Situ Project;
- Horizon Oil Sands Project;
- Primrose East In-Situ Project; and
- Kirby Pilot Project (decommissioned).

The Canadian Natural Burnt Lake Project, and Primrose North, South and Wolf Lake projects are located in the Cold Lake Air Weapons Range. The Primrose East Project, which was approved in early 2007, will be fully integrated with the existing Primrose and Wolf Lake operations. The Canadian Natural Horizon Oil Sands Project is located on Oil Sands Leases 6, 7, 10 and 18, about 15 km north of the community of Fort McKay, on the west side of the Athabasca River. Canadian Natural started construction of the Horizon Project in 2004, with commissioning and initial production scheduled for 2008. Full target production is targeted for 2011. The Kirby Pilot Project is located 88 km northeast of Lac La Biche and has been decommissioned.

Canadian Natural production is provided in Table 4 disturbance areas in Table 5 air emissions in Table 6.

Table 4 Canadian Natural Production

Component	Status	Capacity [bpd] ^(a)
Burnt Lake Project	existing	900
Primrose North, South and Wolf Lake In-Situ Project	existing	90,000
Primrose East In-Situ Project	approved	30,000
Horizon Oil Sands Project	approved	270,000
Kirby Pilot Project (decommissioned)	existing	0
Total		390,900

(a) Bitumen production.

Table 5 Canadian Natural Disturbance Areas

Component	Status	Land Disturbance [ha]
Burnt Lake Project	existing	457
Primrose North, South and Wolf Lake In-Situ Project	existing	1,288
Primrose East In-Situ Project	approved	7,218
Horizon Oil Sands Project	existing	17,317
Kirby Pilot Project (decommissioned)	existing	11
Total		26,291

Note: Some numbers are rounded for presentation purposes. Therefore, it may appear that the totals do not equal the sum of the individual values.

Table 6 Canadian Natural Air Emissions

Component	Emission Rates ^(a)						
	Stream-day SO ₂ [t/sd]	Calendar-day SO ₂ [t/cd]	NO _x [t/d]	CO [t/d]	PM _{2.5} [t/d]	VOC [t/d]	TRS [t/d]
Burnt Lake Project	0.30	0.30	0.27	0.23	0.02	0.01	0.00
Primrose North, South and Wolf Lake Project	5.50	5.59	14.18	4.73	1.04	0.31	0.06
Primrose East In-Situ Oil Sands Project	2.59	2.55	6.17	1.14	0.59	0.07	0.01
Horizon Oil Sands Project	7.63	12.70	48.67	33.44	2.31	157.28	2.31
Kirby Pilot Project (decommissioned)	0	0	0	0	0	0	0
Total	16.01	21.14	69.29	39.55	3.96	157.68	2.38

(a) Emissions are expressed as tonnes per stream-day (t/sd), tonnes per calendar-day (t/cd) or tonnes per day (t/d).

Note: Some numbers are rounded for presentation purposes. Therefore, it may appear that the totals do not equal the sum of the individual values.

2.3 CONNACHER OIL AND GAS LTD.

Connacher Oil and Gas Ltd. began development of the Great Divide Oil Sands Project following approval in June 2006. The Great Divide project is located near Conklin, about 80 km southwest of Fort McMurray. The Great Divide project is expected to produce 10,000 bpd of bitumen by mid 2007. Initial

development is located west of Highway 63, with future plans to develop east of the highway.

Connacher production is provided in Table 7, disturbance area in Table 8 and air emissions in Table 9.

Table 7 Connacher Production

Component	Status	Capacity [bpd]
Great Divide Oil Sands Project	approved	10,000 ^(a)

^(a) Bitumen production.

Table 8 Connacher Disturbance Area

Component	Status	Land Disturbance [ha]
Great Divide Oil Sands Project	approved	26,509 ^(a)

^(a) Represents lease area as exact footprint not determined at this time.

Table 9 Connacher Air Emissions

Component	Emission Rates ^(a)						
	Stream-day SO ₂ [t/sd]	Calendar-day SO ₂ [t/cd]	NO _x [t/d]	CO [t/d]	PM _{2.5} [t/d]	VOC [t/d]	TRS [t/d]
Great Divide Oil Sands Project	0.40	0.40	0.25	0.38	0.03	0.02	0.00

^(a) Emissions are expressed as tonnes per stream-day (t/sd), tonnes per calendar-day (t/cd) or tonnes per day (t/d).

Note: Some numbers are rounded for presentation purposes. Therefore, it may appear that the totals do not equal the sum of the individual values.

2.4 CONOCOPHILLIPS CANADA

The ConocoPhillips Canada (ConocoPhillips) Surmont Commercial Steam Assisted Gravity Drainage (SAGD) Project located about 60 km southeast of Fort McMurray. The Surmont project began construction in 2004, following regulatory approvals in 2003. The project life is anticipated to be 30 years with peak production in 2016

ConocoPhillips production is provided in Table 10, disturbance area in Table 11 and air emissions in Table 12.

Table 10 ConocoPhillips Production

Component	Status	Capacity [bpd]
Surmont Commercial SAGD	existing/approved	100,000 ^(a)

^(a) Bitumen production.

Table 11 ConocoPhillips Disturbance Area

Component	Status	Disturbance [ha]
Surmont Commercial SAGD	existing/approved	1,800

Table 12 ConocoPhillips Air Emissions

Component	Emission Rates ^(a)						
	Stream-day SO ₂ [t/sd]	Calendar-day SO ₂ [t/cd]	NO _x [t/d]	CO [t/d]	PM _{2.5} [t/d]	VOC [t/d]	TRS [t/d]
Surmont Commercial SAGD Project	0.40	0.40	3.10	5.03	0.36	0.33	0.00

^(a) Emissions are expressed as tonnes per stream-day (t/sd), tonnes per calendar-day (t/cd) or tonnes per day (t/d).

2.5 DEVON CANADA CORPORATION

The Devon Canada Corporation (Devon) operates the Jackfish SAGD Project located about 15 km east of Conklin, and is anticipated to have a 20-year operational life. The Jackfish Project was approved by regulators in 2004.

Devon production is provided in Table 13, disturbance areas in Table 14 and air emissions in Table 15.

Table 13 Devon Production

Component	Status	Capacity [bpd] ^(a)
Jackfish SAGD Project	approved	35,000

^(a) Bitumen production.

Table 14 Devon Disturbance Areas

Component	Status	Disturbance [ha]
Jackfish SAGD Project	approved	238

Table 15 Devon Air Emissions

Component	Emission Rates ^(a)						
	Stream-day SO ₂ [t/sd]	Calendar-day SO ₂ [t/cd]	NO _x [t/d]	CO [t/d]	PM _{2.5} [t/d]	VOC [t/d]	TRS [t/d]
Jackfish SAGD Project	2.00	2.00	1.21	1.57	0.18	0.12	0.00

^(a) Emissions are expressed as tonnes per stream-day (t/sd), tonnes per calendar-day (t/cd) or tonnes per day (t/d).

Note: Some numbers are rounded for presentation purposes. Therefore, it may appear that the totals do not equal the sum of the individual values.

2.6 ENCANA CORPORATION

The EnCana Corporation (EnCana) oil sands operations include:

- Foster Creek Pilot;
- Foster Creek Phases 1 and 2; and
- Christina Lake Thermal Project;

The EnCana Foster Creek and Christina Lake thermal projects are SAGD developments located south of Fort McMurray in areas near Conklin, Alberta as well as in the Cold Lake Air Weapons Range.

EnCana production is provided in Table 16, disturbance areas in Table 17 and air emissions in Table 18.

Table 16 EnCana Production

Component	Status	Capacity [bpd] ^(a)
Foster Creek Pilot	existing	3,000
Foster Creek Phase 1 and 2	existing	30,000
Christina Lake Thermal Project	existing	10,000
Total		43,000

^(a) Bitumen production.

Table 17 EnCana Disturbance Areas

Component	Status	Land Disturbance [ha]
Foster Creek Pilot	existing	317
Foster Creek Phase 1 and 2	existing	515
Christina Lake Thermal Project	existing	1,362
Total		2,194

Table 18 EnCana Air Emissions

Component	Emission Rates ^(a)						
	Stream-day SO ₂ [t/sd]	Calendar-day SO ₂ [t/cd]	NO _x [t/d]	CO [t/d]	PM _{2.5} [t/d]	VOC [t/d]	TRS [t/d]
Foster Creek Pilot	0.24	0.24	0.39	0.18	0.02	0.02	0.00
Foster Creek Phases 1 and 2	2.71	2.71	5.55	9.95	0.38	0.63	0.00
Christina Lake Thermal Project	5.70	5.70	2.21	1.95	0.18	0.12	0.00
Total	8.64	8.64	8.16	12.08	0.57	0.77	0.00

^(a) Emissions are expressed as tonnes per stream-day (t/sd), tonnes per calendar-day (t/cd) or tonnes per day (t/d).

Note: Some numbers are rounded for presentation purposes. Therefore, it may appear that the totals do not equal the sum of the individual values.

2.7 HUSKY ENERGY INC.

The Husky Energy Inc. (Husky) oil sands operations include:

- Tucker Thermal Project; and
- Sunrise Thermal Project.

The Tucker Thermal Project is located in the Cold Lake area south of the Imperial Oil Cold Lake Project. The Tucker Thermal Project is expected to start with four wellpads, with up to 12 well pairs per wellpad. Husky expects that up to eight additional wellpads may be required over the 35-year project life.

The Husky Sunrise Thermal Project is on leases located about 5 km south of Kearl Lake, which is about 60 km northeast of Fort McMurray. The Sunrise Project will use SAGD technology to develop the resource, with planned production to start in 2010 to 2012.

Husky production is provided in Table 19, disturbance areas in Table 20 and air emissions in Table 21.

Table 19 Husky Production

Component	Status	Capacity [bpd] ^(a)
Tucker Thermal Project	existing	30,000
Sunrise Thermal Project	approved	200,000
Total		230,000

^(a) Bitumen production.

Table 20 Husky Disturbance Areas

Component	Status	Disturbance [ha]
Tucker Thermal Project	existing	288
Sunrise Thermal Project	approved	534
Total		822

Table 21 Husky Air Emissions

Component	Emission Rates ^(a)						
	Stream-day SO ₂ [t/sd]	Calendar-day SO ₂ [t/cd]	NO _x [t/d]	CO [t/d]	PM _{2.5} [t/d]	VOC [t/d]	TRS [t/d]
Existing and Approved Case							
Tucker Thermal Project	1.20	1.20	1.44	0.42	0.14	0.12	0.00
Sunrise Thermal Project	1.18	1.18	6.61	20.56	0.00	0.19	0.00
Total	2.38	2.38	8.05	20.98	0.14	0.31	0.00

^(a) Emissions are expressed as tonnes per stream-day (t/sd), tonnes per calendar-day (t/cd) or tonnes per day (t/d).

Note: Some numbers are rounded for presentation purposes. Therefore, it may appear that the totals do not equal the sum of the individual values.

2.8 IMPERIAL OIL

Oil sands operations for Imperial Oil include:

- Cold Lake In-Situ Project;
- Nabiye and Mahihkan North Expansion; and
- Kearl Oil Sands Project – Mine Development.

Imperial Oil received approval for its Cold Lake In-Situ Project in 1983. Additional approvals followed for the Muskwa development area, the Mahihkan development area and the Leming Plant and field facilities. All Imperial Oil Cold Lake facilities are currently operational with approximately 2,500 active wells.

Imperial Oil received regulatory approval in 2004 to expand its heavy oil operations near Cold Lake with the development of the Nabiye and Mahihkan North areas of the existing Cold Lake leases. The developments will occur over the next 5 to 10 years and will result in an increase in production of 30,000 bpd from the Cold Lake facility. The Nabiye and Mahihkan North developments will include construction of new wellpads, steam-generating equipment, bitumen processing and water treatment facilities.

The Kearl Oil Sands Project will be centred on Lease 36, north of Kearl Lake. The Kearl Project will include a truck and shovel mining. Initial production from the Kearl Project is planned for 2010.

Imperial Oil production is provided in Table 22, disturbance areas in Table 23 and air emissions in Table 24.

Table 22 Imperial Oil Production

Component	Status	Capacity [bpd] ^(a)
Cold Lake In-Situ Project	existing	126,000
Nabiye and Mahihkan North Expansion	existing/approved	30,000
Kearl Oil Sands Project	approved	200,000
Total		356,000

^(a) Bitumen production.

Table 23 Imperial Oil Disturbance Areas

Component	Status	Land Disturbance [ha]
Cold Lake In-Situ Project	existing	2,986
Nabiye Expansion	approved	417
Mahihkan North Expansion	existing/approved	423
Kearl Oil Sands Project	approved	21,179
Total		25,005

Table 24 Imperial Oil Air Emissions

Component	Emission Rates ^(a)						
	Stream-day SO ₂ [t/sd]	Calendar-day SO ₂ [t/cd]	NO _x [t/d]	CO [t/d]	PM _{2.5} [t/d]	VOC [t/d]	TRS [t/d]
Cold Lake In-Situ Project	14.75	14.75	10.09	8.19	0.89	0.59	0.00
Nabiye and Mahihkan North Expansion	3.81	3.81	2.70	2.70	0.67	0.13	0.00
Kearl Oil Sands Project	0.67	0.67	42.68	28.60	1.97	156.69 ^(b)	0.77 ^(b)
Total	19.23	19.23	55.47	39.49	3.52	157.41	0.77

^(a) Emissions are expressed as tonnes per stream-day (t/sd), tonnes per calendar-day (t/cd) or tonnes per day (t/d).

^(b) VOC and TRS emissions include the maximum daily emissions from tailings ponds. The tailings pond maximum daily VOC emission rate of 137.95 t/d and TRS emission rate of 0.69 t/d are based on the annual average emission rates of 55.27 t/d of VOC and 0.28 t/d of TRS, as well as the annual average percentage of solvent loss emitted from tailings pond of 40.1% (Imperial Oil 2005).

Note: Some numbers are rounded for presentation purposes. Therefore, it may appear that the totals do not equal the sum of the individual values.

2.9 JAPAN CANADA OIL SANDS LIMITED

The Japan Canada Oil Sands Limited (JACOS) Hangingstone In-Situ Pilot Project is located southwest of Fort McMurray.

JACOS production is provided in Table 25, disturbance areas in Table 26 and air emissions in Table 27.

Table 25 JACOS Production

Component	Status	Capacity [bpd] ^(a)
Hangingstone In-Situ Pilot	existing	11,000

^(a) Bitumen production.

Table 26 JACOS Disturbance Areas

Component	Status	Disturbance [ha]
Hangingstone In-Situ Pilot Project	existing	420

Table 27 JACOS Air Emissions

Component	Emission Rates ^(a)						
	Stream-day SO ₂ [t/sd]	Calendar-day SO ₂ [t/cd]	NO _x [t/d]	CO [t/d]	PM _{2.5} [t/d]	VOC [t/d]	TRS [t/d]
Hangingstone In-Situ Pilot Project	1.63	1.63	0.70	0.53	0.04	0.04	0.00

^(a) Emissions are expressed as tonnes per stream-day (t/sd), tonnes per calendar-day (t/cd) or tonnes per day (t/d).

Note: Some numbers are rounded for presentation purposes. Therefore, it may appear that the totals do not equal the sum of the individual values.

2.10 MEG ENERGY CORP.

MEG Energy Corp. (MEG) currently operates a SAGD pilot on its oil sands leases located between Conklin and Janvier, south of Fort McMurray. MEG is currently constructing the commercial phase of their SAGD operations (25,000 bpd) and expect to commission the facility in the first quarter of 2009.

MEG's existing and approved oil sands projects include:

- Christina Lake Regional Project – Pilot;
- Christina Lake Regional Project – Phase 2; and
- Christina Lake Regional Project – Phase 2B.

MEG production is provided in Table 28, disturbance areas in Table 29 and air emissions in Table 30.

Table 28 MEG Oil Sands Production for Planned Developments

Component	Status	Capacity [bpd]
Christina Lake Regional Project – Pilot	existing	3,000 ^(a)
Christina Lake Regional Project – Phase 2	approved	22,000 ^(a)
Christina Lake Regional Project – Phase 2B	approved	35,000 ^(a)
Total		60,000^(a)

^(a) Bitumen production.

Table 29 MEG Disturbance Areas

Component	Status	Disturbance [ha]
Christina Lake Regional Project – Pilot	existing	5
Christina Lake Regional Project – Phase 2	approved	273
Christina Lake Regional Project – Phase 2B	approved	24
Total		302

Table 30 MEG Air Emissions

Component	Emission Rates ^(a)						
	Stream-day SO ₂ [t/sd]	Calendar-day SO ₂ [t/cd]	NO _x [t/d]	CO [t/d]	PM _{2.5} [t/d]	VOC [t/d]	TRS [t/d]
Christina Lake Regional Project – Pilot	0.00	0.00	0.21	0.19	0.02	0.01	0.00
Christina Lake Regional Project – Phase 2	0.01	0.01	2.76	1.72	0.15	0.08	0.01
Christina Lake Regional Project – Phase 2B	1.52	1.52	3.52	2.41	0.21	0.12	0.01
Total^(b)	1.53	1.53	6.49	4.33	0.37	0.22	0.02

^(a) Emissions are expressed as tonnes per stream-day (t/sd), tonnes per calendar-day (t/cd) or tonnes per day (t/d).

Note: Some numbers are rounded for presentation purposes. Therefore, it may appear that the totals do not equal the sum of the individual values.

2.11 OPTI CANADA INC. AND NEXEN CANADA LTD.

The OPTI Canada Inc. and Nexen Canada Ltd. (OPTI/Nexen) Long Lake Pilot and Commercial Project is located 40 km southeast of Fort McMurray and 8 km southeast of Anzac. The projects include an in-situ bitumen recovery operation, on-site upgrading operations including gasification facilities to convert upgrader by-products to syngas, and cogeneration facilities to use the syngas to produce steam and power.

The OPTI/Nexen production is provided in Table 31, disturbance areas in Table 32 and air emissions in Table 33.

Table 31 OPTI/Nexen Production

Component	Status	Capacity [bpd]
Long Lake Pilot Project	approved	73,000 ^(a)
Long Lake Commercial Project	approved	140,000 ^(b)

^(a) Bitumen production.

^(b) Synthetic crude oil.

Table 32 OPTI/Nexen Disturbance Areas

Component	Status	Land Disturbance
Long Lake Pilot and Commercial Project	existing/approved	883

^(a) Represents lease area as exact footprint not determined at this time.

Table 33 OPTI/Nexen Air Emissions

Component	Emission Rates ^(a)						
	Stream-day SO ₂ [t/sd]	Calendar-day SO ₂ [t/cd]	NO _x [t/d]	CO [t/d]	PM _{2.5} [t/d]	VOC [t/d]	TRS [t/d]
Existing and Approved Case							
Long Lake Pilot Project	0.15	0.15	0.50	0.27	0.02	0.03	0.00
Long Lake Commercial Project	13.63	18.42	10.93	8.95	0.73	2.48	0.11
Total^(b)	13.78	18.57	11.43	9.22	0.75	2.51	0.11

^(a) Emissions are expressed as tonnes per stream-day (t/sd), tonnes per calendar-day (t/cd) or tonnes per day (t/d).

Note: Some numbers are rounded for presentation purposes. Therefore, it may appear that the totals do not equal the sum of the individual values.

2.12 PETROBANK ENERGY AND RESOURCES

Petrobank Energy and Resources Ltd. (Petrobank), received approval for the Whitesands Pilot Project in early 2004. The Whitesands Pilot Project is located on 42 sections of oil sands leases near Conklin, Alberta.

The Whitesands Pilot Project will be the first in the region to develop a field scale test of the patented Toe-to-Heel-Air-Injection (THAI) heavy oil recovery technology. The in-situ technology combines a vertical air injection well with a horizontal production well.

Petrobank production is provided in Table 34, disturbance area in Table 35 and air emissions in Table 36.

Table 34 Petrobank Production

Component	Status	Capacity [bpd]
Whitesands Pilot Project	approved	1,886 ^(a)

^(a) Bitumen production.

Table 35 Petrobank Disturbance Area

Component	Status	Disturbance [ha]
Whitesands Pilot Project	approved	78

Table 36 Petrobank Air Emissions

Component	Emission Rates ^(a)						
	Stream-day SO ₂ [t/sd]	Calendar-day SO ₂ [t/cd]	NO _x [t/d]	CO [t/d]	PM _{2.5} [t/d]	VOC [t/d]	TRS [t/d]
Existing and Approved Case							
Whitesands Pilot Project	0.08	0.08	0.26	9.37	0.01	0.09	0.07

^(a) Emissions are expressed as tonnes per stream-day (t/sd), tonnes per calendar-day (t/cd) or tonnes per day (t/d).

2.13 PETRO-CANADA

The Petro-Canada oil sands developments included in the assessment are:

- Dover SAGD and VAPEX Pilots;
- MacKay River In-Situ Project; and
- Meadow Creek In-Situ Project.

The Dover SAGD Pilot and Vapex Pilot are two Petro-Canada projects that are being decommissioned. Petro-Canada has two approved SAGD developments, one of which is currently operational. The MacKay River development is currently ramping up to production of 30,000 bpd. The recently approved Meadow Creek Project has a planned production of up to 80,000 bpd of bitumen.

Petro-Canada production is provided in Table 37, disturbance areas in Table 38 and air emissions in Table 39.

Table 37 Petro-Canada Production

Component	Status	Capacity [bpd]
Dover SAGD and VAPEX Pilots	existing	999 ^{(a)(b)}
Mackay River In-Situ	existing	30,000 ^(a)
Meadow Creek In-Situ	approved	80,000 ^(a)
Total		110,999^(a)

(a) Bitumen production.

(b) Production from pilots is variable, with integration of the facilities into the Mackay River Project as being planned.

Table 38 Petro-Canada Disturbance Areas

Component	Status	Disturbance [ha]
Mackay River In-Situ	existing	152
Meadow Creek In-Situ	approved	1,629
Dover SAGD and VAPEX Pilots	existing	22
Total		1,803

Table 39 Petro-Canada Air Emissions

Component	Emission Rates ^(a)						
	Stream-day SO ₂ [t/sd]	Calendar-day SO ₂ [t/cd]	NO _x [t/d]	CO [t/d]	PM _{2.5} [t/d]	VOC [t/d]	TRS [t/d]
Existing and Approved Case							
Mackay River In-Situ	1.00	1.00	5.01	4.45	0.19	0.44	0.00
Meadow Creek In-Situ	1.51	1.51	7.20	5.61	0.48	0.25	0.00
Dover SAGD and Vapex Pilot ^(b)	0.50	0.50	0.33	0.12	0.02	0.01	0.00
Total	3.01	3.01	12.54	10.18	0.69	0.71	0.00

(a) Emissions are expressed as tonnes per stream-day (t/sd), tonnes per calendar-day (t/cd) or tonnes per day (t/d).

(b) Emissions from the Dover SAGD Pilot project include emissions from the VAPEX Pilot project, which is an amendment to the Dover SAGD Pilot.

Note: Some numbers are rounded for presentation purposes. Therefore, it may appear that the totals do not equal the sum of the individual values.

2.14 PETRO-CANADA OIL SANDS INC. (FORMERLY FORT HILLS ENERGY CORPORATION)

Petro-Canada Oil Sands Inc. (formerly Fort Hills Energy Corporation (Fort Hills)) is a partnership among Petro-Canada, UTS Energy Corporation and Teck Cominco Ltd. The Fort Hills Project, which is located about 90 km north of Fort McMurray in an area north of the Syncrude Aurora North Mine, was approved in October 2002.

The Fort Hills Project includes land development in association with its open pit mining operations and associated infrastructure, truck and shovel open pit mining operation, water withdrawal from the Athabasca River and air emissions associated with facility operations and the mining fleet.

The Fort Hills Project production is provided in Table 40, disturbance areas in Table 41 and air emissions in Table 42.

Table 40 Petro-Canada Oil Sands Inc. (Fort Hills) Production

Component	Status	Capacity [bbl/d]
Fort Hills Oil Sands Project	approved	190,000 ^(a)

^(a) Bitumen production.

Table 41 Petro-Canada Oil Sands Inc. (Fort Hills) Disturbance Areas

Component	Status	Disturbance [ha]
Fort Hills Oil Sands Project	existing	12,584

Table 42 Petro-Canada Oil Sands Inc. (Fort Hills) Air Emissions

Component	Emission Rates ^(a)						
	Stream-day SO ₂ [t/sd]	Calendar-day SO ₂ [t/cd]	NO _x [t/d]	CO [t/d]	PM _{2.5} [t/d]	VOC [t/d]	TRS [t/d]
Fort Hills Oil Sands Project	1.73	1.73	26.74	5.24	0.72	15.14	0.00

^(a) Emissions are expressed as tonnes per stream-day (t/sd), tonnes per calendar-day (t/cd) or tonnes per day (t/d).

2.15 SHELL CANADA LIMITED

The Shell Canada Limited (Shell) developments include the Jackpine Mine – Phase 1 operation, which is located in the eastern portion of Lease 13. Commissioning and start up of the Jackpine Mine – Phase 1 plant is planned for 2010, with a planned production rate of 200,000 bpd.

In July 2006, Shell acquired BlackRock Ventures Inc. and is currently developing the Orion Environmental and Operating Renewal (EOR) Project, an in-situ project located near Hilda Lake. The Orion EOR project will be developed in two phases over a 25-year project life.

Shell production is provided in Table 43, disturbance areas in Table 44 and air emissions in Table 45.

Table 43 Shell Production

Component	Status	Capacity [bpd] ^(a)
Jackpine Mine – Phase 1	approved	200,000
Orion EOR Project	approved	20,000
Total		220,000

^(a) Bitumen production.

Note: Planned production across the Athabasca Oil Sands Project is to achieve 770,000+ bpd.

Table 44 Shell Disturbance Areas

Component	Status	Disturbance [ha]
Jackpine Mine – Phase 1	approved	8,154
Orion EOR Project	approved	77
Total		8,231

Table 45 Shell Air Emissions

Component	Emission Rates ^(a)						
	Stream-day SO ₂ [t/sd]	Calendar-day SO ₂ [t/cd]	NO _x [t/d]	CO [t/d]	PM _{2.5} [t/d]	VOC [t/d]	TRS [t/d]
Existing and Approved Case							
Jackpine Mine – Phase 1	0.33	0.33	18.28	12.22	0.86	17.97	0.09
Orion EOR Project	0.90	0.90	1.26	0.41	0.10	0.09	0.00
Total^(b)	1.23	1.23	19.54	12.63	0.96	18.06	0.09

^(a) Emissions are expressed as tonnes per stream-day (t/sd), tonnes per calendar-day (t/cd) or tonnes per day (t/d).

^(b) Some numbers are rounded for presentation purposes. Therefore, it may appear that the totals do not equal the sum of the individual values.

2.16 SUNCOR ENERGY INC.

The Suncor Energy Inc. (Suncor) oil sands developments include a combination of open pit mining and extraction operations, in-situ operations, upgrading operations and support infrastructure. Suncor oil sands developments include:

- Base Plant Upgrader;
- Millennium Upgrader including (the Millennium Coker Unit [MCU] and Millennium Vacuum Unit [MVU]);
- Voyageur Upgrader;

- Steepbank Mine;
- Millennium Mine (including Lease 86/17);
- South Tailings Pond;
- North Steepbank Mine Extension
- Fee Lot 2;
- Firebag Enhanced Thermal Solvent (ETS); and
- Firebag SAGD Project.

Suncor also co-operates a utilities plant with TransAlta on Lease 86/17. Suncor oil sands operations began in 1967. The Suncor oil sands base operation is located on opposite sides of the Athabasca River. The areas are connected by a bridge across the Athabasca River from the Lease 86/17 west-side operations to the Steepbank and Millennium mining operations on the east side of the Athabasca River. The Suncor Voyageur Project was approved in 2006, with construction starting early 2007

Suncor production is provided in Table 46, disturbance areas in Table 47 and air emissions in Table 48.

Table 46 Suncor Production

Component	Status	Capacity [bpd]
Suncor Lease 86/17 and Base Plant Upgrader, Steepbank and Millennium mines, and South Tailings Pond	existing/approved	360,000 ^(b)
Firebag Operations (including Phases 4 to 6)	existing/approved	140,000 ^(a)
Voyageur Project (North Steepbank Mine Extension and Voyageur Upgrader)	approved	190,000 ^(b)
Total		690,000^{(a)(b)}

^(a) Bitumen production.

^(b) Synthetic crude oil.

Table 47 Suncor Disturbance Areas

Component	Status	Disturbance [ha]
Suncor Lease 86/17 and Base Plant Upgrader, Steepbank and Millennium mines, and South Tailings Pond	existing/approved	18,429
Fee Lot 2	existing/approved	745
Firebag ETS and SAGD	existing/approved	1,322
Voyageur Project - North Steepbank Mine Extension	approved	3,787
Voyageur Project - Voyageur Upgrader	approved	1,004
Total		25,287

Table 48 Suncor Air Emissions

Component	Emission Rates ^(a)						
	Stream-day SO ₂ [t/sd]	Calendar-day SO ₂ [t/cd]	NO _x [t/d]	CO [t/d]	PM _{2.5} [t/d]	VOC [t/d]	TRS [t/d]
Suncor Lease 86/17 and Base Plant Upgrader, Steepbank and Millennium mines, and South Tailings Pond	42.45	62.94	67.82	31.65	6.27	187.51	2.15
Firebag SAGD	5.68	7.18	21.21	14.45	1.66	0.83	0.10
Firebag ETS	0.17	0.17	0.21	0.12	0.01	0.03	0.00
Voyageur Project - North Steepbank Mine Extension	0.10	0.10	16.79	18.01	0.88	7.12	0.03
Voyageur Project - Voyageur Upgrader	6.88	14.34	6.11	5.01	0.44	1.27	0.05
Total^(b)	55.27	84.72	112.14	69.25	9.26	196.76	2.33

^(a) Emissions are expressed as tonnes per stream-day (t/sd), tonnes per calendar-day (t/cd) or tonnes per day (t/d).

Note: Some numbers are rounded for presentation purposes. Therefore, it may appear that the totals do not equal the sum of the individual values.

2.17 SYNCRUDE CANADA LTD.

The Syncrude Canada Ltd. (Syncrude) operations include:

- Mildred Lake Mining and Extraction;
- Aurora North Mine;
- Aurora South Mine; and
- Mildred Lake Upgrader Expansion and Emissions Reduction Program (ERP).

The Syncrude operations include open pit mines, a utilities plant, a bitumen extraction plant and an upgrading facility that processes bitumen and produces light, sweet crude oil for domestic consumption and export. The Syncrude mining operation is now a truck and shovel operation. Production from the Syncrude operation began in 1978.

Syncrude production is provided in Table 49, disturbance areas in Table 50 and air emissions in Table 51.

Table 49 Syncrude Production

Component	Status	Capacity [bpd]
Syncrude Mildred Lake Mining and Extraction	existing/approved	220,000 ^(a)
Aurora North Mine	existing/approved	195,000 ^(a)
Aurora South Mine	approved	195,000 ^(a)
Mildred Lake Upgrader Expansion and ERP	existing/approved	474,000 ^(b)
Total		610,000^{(a)(b)}

(a) Bitumen production.

(b) Synthetic crude oil.

Table 50 Syncrude Disturbance Areas

Component	Status	Disturbance [ha]
Mildred Lake Mining and Extraction	existing/approved	17,636 ^(a)
Aurora North Mine	existing/approved	7,980
Aurora South Mine	approved	8,966
Mildred Lake Upgrader Expansion and ERP	existing/approved	n/a
Total		34,582

(a) Value represents original disturbance footprint without consideration of reclamation.

n/a = Not applicable.

Table 51 Syncrude Air Emissions

Component	Emission Rates ^(a)						
	Stream-day SO ₂ [t/sd]	Calendar-day SO ₂ [t/cd]	NO _x [t/d]	CO [t/d]	PM _{2.5} [t/d]	VOC [t/d]	TRS [t/d]
Mildred Lake Mining Extraction, Upgrader and ERP	67.06	100.06	61.73	81.01	6.59	58.17	1.62
Aurora North Mine	0.04	0.04	15.48	3.74	0.56	7.90	0.06
Aurora South Mine	0.03	0.03	12.28	2.94	0.48	7.77	0.06
Total	67.12	100.12	89.49	87.69	7.63	73.84	1.75

(a) Emissions are expressed as tonnes per stream-day (t/sd), tonnes per calendar-day (t/cd) or tonnes per day (t/d).

Note: Some numbers are rounded for presentation purposes. Therefore, it may appear that the totals do not equal the sum of the individual values.

2.18 TOTAL E&P CANADA LTD

In late 2005, Total Canada E&P Canada Ltd. (Total Canada) acquired Deer Creek Energy Limited. Total Canada now operates the Joslyn Creek SAGD Project located 65 km north of Fort McMurray, near Fort McKay. Joslyn Creek SAGD Phase 1 and Commercial began production in late 2006.

Total Canada production is provided in Table 52, disturbance areas in Table 53 and air emissions in Table 54.

Table 52 Total Canada Production

Component	Status	Capacity [bpd] ^(a)
Joslyn Creek SAGD Project - Phase I and Commercial	existing	12,000

^(a) Bitumen production.

Table 53 Total Canada Disturbance Areas

Component	Status	Disturbance [ha]
Joslyn Creek SAGD Project - Phase I and Commercial (Phase II)	existing	86

Table 54 Total Canada Air Emissions

Component	Emission Rates ^(a)						
	Stream-day SO ₂ [t/sd]	Calendar-day SO ₂ [t/cd]	NO _x [t/d]	CO [t/d]	PM _{2.5} [t/d]	VOC [t/d]	TRS [t/d]
Joslyn Creek SAGD Project – Phase 1 and Commercial	0.74	0.74	0.51	0.48	0.04	0.04	0.00

^(a) Emissions are expressed as tonnes per stream-day (t/sd), tonnes per calendar-day (t/cd) or tonnes per day (t/d).

Note: Some numbers are rounded for presentation purposes. Therefore, it may appear that the totals do not equal the sum of the individual values.

3 GAS PLANTS AND COMPRESSOR STATIONS

Information is provided below on gas plants and compressor stations that were considered in the air quality assessment of the EIA.

3.1 CANADIAN NATURAL RESOURCES LIMITED

Information on Canadian Natural operations in the region is provided in Table 55.

Table 55 Summary of Canadian Natural Air Emissions

Component	Emission Rates ^(a)						
	Stream-day SO ₂ [t/sd]	Calendar-day SO ₂ [t/cd]	NO _x [t/d]	CO [t/d]	PM _{2.5} [t/d]	VOC [t/d]	TRS [t/d]
Chard	0.00	0.00	0.14	0.01	0.00	0.00	0.00
Cowpar	0.50	0.50	0.46	0.04	0.00	0.01	0.00
Kettle River	0.60	0.60	0.03	0.00	0.00	0.00	0.00
Newby	1.08	1.08	0.06	0.00	0.00	0.00	0.00
Wiau Lake	0.00	0.00	0.04	0.00	0.00	0.00	0.00
Kirby West	0.00	0.00	0.04	0.00	0.00	0.00	0.00
Moose Hills	0.00	0.00	0.03	0.02	0.00	0.00	0.00
Elk Point	0.00	0.00	0.06	0.04	0.000	0.00	0.00
Total	2.18	2.18	0.85	0.13	0.01	0.03	0.00

^(a) Emissions are expressed as tonnes per stream-day (t/sd), tonnes per calendar-day (t/cd) or tonnes per day (t/d).

Note: Some numbers are rounded for presentation purposes. Therefore, it may appear that the totals do not equal the sum of the individual values.

3.2 DEVON CANADA CORPORATION

Information on Devon operations in the region is provided in Table 56.

Table 56 Summary of Devon Emissions

Component	Emission Rates ^(a)						
	Stream-day SO ₂ [t/sd]	Calendar-day SO ₂ [t/cd]	NO _x [t/d]	CO [t/d]	PM _{2.5} [t/d]	VOC [t/d]	TRS [t/d]
Hangingstone	0.00	0.00	1.15	0.09	0.00	0.03	0.00
Surmont	0.00	0.00	4.36	0.34	0.01	0.13	0.00
Surmont West	0.00	0.00	1.74	0.14	0.00	0.05	0.00
Pony Creek	0.00	0.00	0.11	0.01	0.00	0.00	0.00
Kirby North	0.00	0.00	0.04	0.14	0.00	0.00	0.00
Kirby South	0.00	0.00	0.74	0.06	0.00	0.02	0.00
Chard	0.00	0.00	0.30	0.02	0.00	0.01	0.00
Leismer East	0.00	0.00	3.01	0.23	0.01	0.09	0.00
Total	0.00	0.00	11.45	1.03	0.03	0.33	0.00

^(a) Emissions are expressed as tonnes per stream-day (t/sd), tonnes per calendar-day (t/cd) or tonnes per day (t/d).

Note: Some numbers are rounded for presentation purposes. Therefore, it may appear that the totals do not equal the sum of the individual values.

3.3 ENCANA CORPORATION

Information on EnCana operations in the region is provided in Table 57.

Table 57 Summary of EnCana Emissions

Component	Emission Rates ^(a)						
	Stream-day SO ₂ [t/sd]	Calendar-day SO ₂ [t/cd]	NO _x [t/d]	CO [t/d]	PM _{2.5} [t/d]	VOC [t/d]	TRS [t/d]
North Caribou	0.00	0.00	0.86	2.31	0.13	0.02	0.00
South Caribou	0.00	0.00	0.66	1.45	0.07	0.02	0.00
Primrose North	0.00	0.00	0.83	0.19	0.02	0.02	0.00
Total	0.00	0.00	2.35	3.95	0.22	0.07	0.00

^(a) Emissions are expressed as tonnes per stream-day (t/sd), tonnes per calendar-day (t/cd) or tonnes per day (t/d).

Note: Some numbers are rounded for presentation purposes. Therefore, it may appear that the totals do not equal the sum of the individual values.

3.4 HUSKY ENERGY INC.

Information on Husky operations in the region is provided in Table 58.

Table 58 Summary of Husky Emissions

Component	Emission Rates ^(a)						
	Stream-day SO ₂ [t/sd]	Calendar-day SO ₂ [t/cd]	NO _x [t/d]	CO [t/d]	PM _{2.5} [t/d]	VOC [t/d]	TRS [t/d]
Agnes Lake	0.00	0.00	0.71	0.05	0.00	0.02	0.00
Thornbury	0.00	0.00	0.44	0.03	0.00	0.01	0.00
Total	0.00	0.00	1.15	0.09	0.00	0.03	0.00

^(a) Emissions are expressed as tonnes per stream-day (t/sd), tonnes per calendar-day (t/cd) or tonnes per day (t/d).

Note: Some numbers are rounded for presentation purposes. Therefore, it may appear that the totals do not equal the sum of the individual values.

3.5 PARAMOUNT

Information on Paramount operations in the region is provided in Table 59.

Table 59 Summary of Paramount Emissions

Component	Emission Rates ^(a)						
	Stream-day SO ₂ [t/sd]	Calendar-day SO ₂ [t/cd]	NO _x [t/d]	CO [t/d]	PM _{2.5} [t/d]	VOC [t/d]	TRS [t/d]
Quigley	0.00	0.00	0.26	0.03	0.00	0.01	0.00
Hangingstone	0.00	0.00	0.20	0.02	0.00	0.01	0.00
Kettle River	0.00	0.00	0.23	0.04	0.00	0.01	0.00
Total	0.00	0.00	0.69	0.08	0.00	0.02	0.00

^(a) Emissions are expressed as tonnes per stream-day (t/sd), tonnes per calendar-day (t/cd) or tonnes per day (t/d).

Note: Some numbers are rounded for presentation purposes. Therefore, it may appear that the totals do not equal the sum of the individual values.

3.6 VIKING ENERGY

Information on Viking Energy operations in the region is provided in Table 60.

Table 60 Summary of Viking Energy Gas Plant Emissions

Component	Emission Rates ^(a)						
	Stream-day SO ₂ [t/sd]	Calendar-day SO ₂ [t/cd]	NO _x [t/d]	CO [t/d]	PM _{2.5} [t/d]	VOC [t/d]	TRS [t/d]
Wappau	0.00	0.00	0.36	0.03	0.00	0.01	0.00

^(a) Emissions are expressed as tonnes per stream-day (t/sd), tonnes per calendar-day (t/cd) or tonnes per day (t/d).

3.7 WILLIAMS LIQUIDS EXTRACTION AND STORAGE

In 2001 Williams built an olefins cryogenic liquids extraction facility near the Suncor Lease 86/17 operations. This project is known as the Hydrocarbon Liquids Conservation Project. This project recovers higher value natural gas liquids and olefins and transports them to processing facilities near Redwater where they are fractionated into products such as butane and propane.

Information on the Williams Liquids Extraction and Storage operations is provided in Table 61.

Table 61 Summary of Williams Energy Liquids Extraction and Storage Emissions

Component	Emission Rates ^(a)						
	Stream-day SO ₂ [t/sd]	Calendar-day SO ₂ [t/cd]	NO _x [t/d]	CO [t/d]	PM _{2.5} [t/d]	VOC [t/d]	TRS [t/d]
Liquids Extraction and Storage Plant	0.00	0.00	0.02	0.02	0.00	0.24	0.00

^(a) Emissions are expressed as tonnes per stream-day (t/sd), tonnes per calendar-day (t/cd) or tonnes per day (t/d).

4 OTHER DEVELOPMENTS

4.1 AGGREGATE RESOURCES

Birch Mountain Resources Ltd.

Birch Mountain Resources Ltd. (Birch Mountain) holds metallic and industrial mineral rights over an extensive portion of the Athabasca Valley. Birch Mountain received regulatory approval for its Muskeg Valley Quarry in June 2005. The quarry is located on the east side of the Athabasca River in an area east of Fort McKay.

The Muskeg Valley Quarry includes a truck and shovel waste rock and overburden operation, shovel and remote crushing operations for the limestone, sorting and washing operations as well as loading and weighing facilities. The project started operations in December 2005 and will operate through three phases until its anticipated closure in 2035.

Birch Mountain production is provided in Table 62 and air emissions listed in Table 63.

Table 62 Birch Mountain Production

Component	Status	Peak Capacity [tonnes per year of limestone]
Muskeg Valley Quarry	existing	6,900,000

Table 63 Birch Mountain Air Emissions

Component	Emission Rates ^(a)						
	Stream-day SO ₂ [t/sd]	Calendar-day SO ₂ [t/cd]	NO _x [t/d]	CO [t/d]	PM _{2.5} [t/d]	VOC [t/d]	TRS [t/d]
Muskeg Valley Quarry	0.02	0.02	0.88	0.30	0.05	0.05	0.00

^(a) Emissions are expressed as tonnes per stream-day (t/sd), tonnes per calendar-day (t/cd) or tonnes per day (t/d).

Note: Some numbers are rounded for presentation purposes. Therefore, it may appear that the totals do not equal the sum of the individual values.

4.2 COMMUNITIES

The location and population of communities in the region are listed in Table 64. Emissions information for the communities is provided in Table 65.

Table 64 Summary of Communities in the Region

Community	Location	Population
Aznac	45 km southeast of Fort McMurray on Secondary Highway 881	711
Conklin	140 km southeast of Fort McMurray at the convergence of the Jackfish River and Christina Lake	338
Fort Chipewyan	225 km north of Fort McMurray	915
Fort Fitzgerald	200 km north of Fort Chipewyan	4
Fort McMurray	450 km north of Edmonton	64,400
Fort McKay	55 km north of Fort McMurray on the west side of the Athabasca River	536
Gregoire Lake Estates	32 km southeast of Fort McMurray adjacent to Gregoire Lake Provincial Park, on the shores of Gregoire (Willow) Lake	285
Janvier	100 km southeast of Fort McMurray	218
Mariana Lake	along Highway 63, 100 km south of Fort McMurray	9

Table 65 Summary of Emissions Information for Municipalities

Component	Emission Rates ^(a)			
	Stream-day SO ₂ [t/sd] ^(b)	Calendar-day SO ₂ [t/cd] ^(b)	NO _x [t/d] ^(b)	VOC [t/d]
Anzac	0.01	0.01	0.02	0.06
Beaver Lake	0.00	0.00	0.01	0.03
Bonnyville	0.03	0.03	0.17	0.34
Cold Lake	0.06	0.06	0.32	0.65
Cold Lake (IR 149)	0.00	0.00	0.01	0.02
Cold Lake (IR 149B)	0.00	0.00	0.00	0.01
Conklin	0.00	0.00	0.01	0.02
Elizabeth Métis Settlement	0.00	0.00	0.02	0.06
Fort Fitzgerald	n/d	n/d	n/d	n/d
Gregoire Lake Estates	n/d	n/d	n/d	n/d
Heart Lake	0.00	0.00	0.00	0.01
Janvier	0.00	0.00	0.00	0.01
Kehiwin (IR 123)	0.01	0.01	0.02	0.06
Marianna Lake	n/d	n/d	n/d	n/d
Lac La Biche	0.02	0.02	0.08	0.16
La Loche	0.01	0.01	0.07	0.26
Peter Pond (IR 193)	0.00	0.00	0.02	0.06
Pierceland	0.00	0.00	0.02	0.05
St. Paul	0.03	0.03	0.16	0.32
Total	0.19	0.19	0.92	2.13

^(a) Emissions are expressed as tonnes per stream-day (t/sd), tonnes per calendar-day (t/cd) or tonnes per day (t/d).

^(b) Community emissions for SO₂ and NO_x were used for regional predictions only. Predictions of exposure levels within communities used background concentrations to represent local sources of SO₂ and NO_x emissions, as discussed in Volume 3, Appendix 3-III.

n/d = No data.

Note: Some numbers are rounded for presentation purposes. Therefore, it may appear that the totals do not equal the sum of the individual values.

4.3 FORESTRY

The majority of timber rights in the region have been granted to Alberta Pacific Forest Industries Inc. (Al-Pac) under a Forest Management Agreement (FMA). Al-Pac harvests coniferous timber under a joint planning agreement with Northland Forest Products Ltd, and is actively harvesting forest resources throughout the region. Forestry development plans are defined and detailed by Al-Pac in annual operating plans

Al-Pac has timber rights over a surface area of 17,958 ha.

Northland Forest Products operates a mill north of Fort McMurray. Air emissions from the mill are presented in Table 66.

Table 66 Northland Forest Products Air Emissions

Component	Emission Rates ^(a)						
	Stream-day SO ₂ [t/sd]	Calendar-day SO ₂ [t/cd]	NO _x [t/d]	CO [t/d]	PM _{2.5} [t/d]	VOC [t/d]	TRS [t/d]
Northland Forest Products	0.02	0.02	0.19	25.00	0.19	2.12	0.00

^(a) Emissions are expressed as tonnes per stream-day (t/sd), tonnes per calendar-day (t/cd) or tonnes per day (t/d).

4.4 PIPELINES

Major pipeline operators in the region, a description of the pipeline product and the total disturbance area are listed in Table 67.

Table 67 Major Pipelines in the Region

Operator	Pipeline Product	Disturbance [ha]
Access Pipeline Inc.	low vapour pressure products	916
Alberta Oil Sands Pipeline Ltd.	crude oil	1,387
AltaGas Ltd.	natural and fuel gas	7,851
AltaGas Utilities Inc.	natural gas	2,053
ATCO Gas and Pipelines Ltd.	natural gas	1,761
Baytex Energy Ltd.	crude oil, natural gas, fuel gas, oil well effluent, and fresh and salt water	1,529
BlackRock Ventures Inc.	crude oil, natural gas, fuel gas, oil well effluent and low vapour pressure products	587
Bonavista Petroleum Ltd.	natural gas, fuel gas, oil well effluent and salt water	1,552
BP Canada Energy Company	natural gas, fuel gas, salt water and oil well effluent	4,810
Canadian Natural Resources Limited	crude oil, natural gas, fuel gas, oil well effluent, fresh and salt water, and low vapour pressure products	34,279
Canetic Resources Inc.	natural gas, oil well effluent and salt water	980
Cold Lake Pipeline Ltd.	crude oil, and high and low vapour pressure products	1,650
ConocoPhillips Canada Resources Corp.	crude oil, natural gas, fuel gas, oil well effluent, and fresh and salt water	2,665
County of Vermillion River Co-op	natural and fuel gas	897
Crescent Point Resources Ltd.	natural gas	501
Daylight Energy Ltd.	natural and fuel gas	669
Devon Canada Corporation	crude oil, natural gas, fuel gas, oil well effluent, and fresh and salt water	9,646
East Peace Gas Co-op Ltd.	natural gas	1,003
Enbridge Pipelines (Athabasca) Inc.	crude oil and low vapour pressure products	2,565
EnCana Corporation	natural gas, fuel gas, oil well effluent, salt water and low vapour pressure products	537
EnCana Oil & Gas Co. Ltd.	natural gas, fuel gas, oil well effluent, salt water and low vapour pressure products	8,286
Galleon Energy Inc.	natural gas, fuel gas, salt water and oil well effluent	1,545
Harvest Operations Corp.	crude oil, natural gas and oil well effluent	2,023
Husky Oil Operations Limited	crude oil, natural gas, fuel gas, oil well effluent, high and low vapour pressure products, and fresh and salt water	15,052
Imperial Oil	crude oil, natural gas, fuel gas, oil well effluent, high and low vapour pressure products, and fresh and salt water	1,813
Invasion Energy Inc.	natural gas and salt water	1,102
Iteration Energy Ltd.	natural gas and salt water	821
Keyera Energy Ltd.	crude oil, natural gas and salt water	1,282
MEG Energy Corp	natural gas, oil well effluent and salt water	802
North East Gas Co-op Ltd.	natural and fuel gas	530
North Peace Gas Co-op Ltd.	natural gas	1,008
Nova Gas Transmission Ltd.	crude oil and natural gas	17,344
Paramount Energy Operating Corp.	natural gas, fuel gas, oil well effluent and salt water	11,686
Penn West Petroleum Ltd.	crude oil, natural gas, oil well effluent and salt water	1,089
Primewest Energy Inc.	natural gas, and fresh and salt water	724
Rainbow Pipeline Company Ltd.	crude oil	792
Set Resources Inc.	natural gas	519
Suncor Energy Inc.	crude oil, natural gas, fuel gas, oil well effluent, high and low vapour pressure products, and fresh and salt water	2,444
Talisman Energy Inc.	crude oil, natural gas, fuel gas, and fresh and salt water	4,516
Terasen Pipelines (Corridor) Inc.	crude oil and low vapour pressure products	1,727
TransCanada Pipeline Ventures Ltd.	natural gas	665
True Energy Inc.	natural gas	600

4.5 ROADWAYS

The primary roadways in the region, their general locations and their disturbance footprint are listed in Table 68.

Table 68 Major Roadways in the Region

Roadway	General Location	Disturbance [ha]
MEG/EnCana Christina access road	runs from Secondary Highway 881 to Christina Lake	32
Secondary Highway 881	runs from Highway 63 south through the region	1,848
Highway 63/963	runs through the region south of Fort McMurray to the Lougheed Bridge near Fort McKay and then to its northern point at Bitumont	1,883
Fort Chipewyan Winter Road	access road to Fort Chipewyan	647
Canterra Road	runs from Highway 63 east turning south of Kearn Lake	194
Petro-Canada Access Road	gravel road from Highway 63 to the Petro-Canada and Dover SAGD developments	199
Canadian Natural Horizon Access Road	gravel road from Highway 63 to the Canadian Natural Horizon Project site	143

4.6 POWER LINES

The primary power lines in the region and their disturbance areas are listed in Table 69.

Table 69 Primary Power Lines in the Region

Power Line	Description	Disturbance [ha]
ATCO Dover-McMillan	240 kv transmission line between the Dover and McMillan power substations	1,314
ATCO McMillan-Charron	240 kv transmission line between the McMillan and Charron substations.	595
Dover-Muskeg River	260 kv transmission line, 53 km long to provide further transmission to the mining areas of northern Alberta and the population centres of the central and southern areas of Alberta	275
Firebag Transmission Line	double-circuit 260-KV transmission line, 2 km long that crosses the Athabasca River from Suncor's Millennium Substation to the new substation east of the Athabasca River	246