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Appendix B

Air Quality

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Appendix B1

Air Quality Modelling Approach

Appendix B1: Air Quality Modelling Approach
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1.0 MODELLING METHODOLOGY

The CALPUFF modelling system, which includes the CALMET meteorological pre-processor and other utilities, was used in this air quality assessment. CALPUFF (Scire et al. 2000; Scire and Escoffier-Czaja 2004) is recommended by the Alberta Energy Regulator and Alberta Environment and Parks (AEP) Air Quality Modelling Guideline (AQMG) for air quality assessments (ESRD 2013).

1.1 The CALPUFF Model

CALPUFF is currently considered the state-of-the-art in regulatory modelling and represents a major improvement over previous versions because the model:

- is applicable over spatial scales from a few metres to hundreds of kilometres, allowing the modelling of both local and regional air impacts;
- incorporates the BPIP-PRIME downwash algorithm found in other advanced models used to predict building downwash in the vicinity of emission sources;
- includes wet and dry removal processes (deposition);
- has algorithms to simulate sulphur dioxide (SO_2) and nitrogen oxide (NO_x) chemistry for secondary particulate formation and for predicting acidification;
- includes dispersion in three dimensions, allowing for more realistic plume movement;
- allows winds to vary in space in response to channelling and blocking by terrain, removing a constraint in older models;
- includes dispersion in calm winds, another major shortcoming of older models; and
- has been widely used for research and has thus undergone extensive peer review.

Additional features of the CALPUFF model are provided in Table B1-1.

Table B1-1: Major Features of the CALPUFF Model

Source Types
• Point sources (constant or variable emissions) • Line sources (constant emissions) • Volume sources (constant or variable emissions) • Area sources (constant or variable emissions).
Non-steady State Emissions and Meteorological Conditions (if CALMET is used)
• Gridded 3D fields of meteorological variables (winds, temperature) • Spatially variable fields of mixing height, friction velocity, convective velocity scale, Monin-Obukhov length, precipitation rate • Vertically and horizontally varying turbulence and dispersion rates • Time-independent source and emissions data.

Dispersion Coefficient (σ_y, σ_z) Options
• Direct measurements of σv and σw • Estimated values of σv and σw based on similarity theory • Micrometeorology dispersion coefficients (rural areas) • Pasquill-Gifford (PG) dispersion coefficients (rural areas) • McElroy-Pooler (MP) dispersion coefficients (urban areas).
Vertical Wind Shear
• Puff splitting • Differential advection and dispersion.
Plume Rise
• Partial penetration • Buoyant and momentum rise • Stack tip effects • Vertical wind shear.
Dry Deposition
• Gases and particulate matter • Three options: – full treatment of space and time variations of deposition with a resistance model – user-specified diurnal cycles for each pollutant – no dry deposition.
Chemical Transformation Options
• Pseudo-first-order chemical mechanism for SO2, SO4, NOx, HNO3, and NO3 (MESOPUFF II method) • Specified hourly time-series of ozone concentrations of transformation rates.
Wet Removal
• Scavenging coefficient approach • Removal rate a function of precipitation intensity and precipitation type.
Graphical User Interface
• Click and point model set-up and data input • Enhanced error checking of model inputs.

1.2 The CALMET Pre-processor

Improvements in modelling introduced by CALPUFF include requirements for significantly more meteorological data than its predecessors, which only required data from a single meteorological station. CALPUFF makes use of three-dimensional meteorological data prepared by an equally sophisticated companion program called CALMET.

CALMET generates three-dimensional fields of winds and other meteorological data by first interpolating between surface stations and upper air soundings. CALMET then adjusts this interpolated wind field to be physically consistent with the channelling and blocking posed by the terrain. It performs this adjustment such that atmospheric stability can enhance or suppress vertical motion. Although CALMET is not a prediction model, it can generate a continuous and realistic historical record of three-dimensional flow even with sparse observations. In addition, from these raw weather observations CALMET can calculate other parameters required in predicting pollution dispersion, such as surface friction velocity, convective velocity scale, Monin-Obukhov length, mixing height and Pasquill-Gifford (PG) stability class.

The CALMET modelling domain used in this study is 120 km long west to east and 120 km long north to south. The UTM coordinates (WGS-84, Zone 12) for the modelling domain range from 460.25 km to 580.25 km easting, and 6,073.5 km to 6,193.5 km northing. This domain was selected to contain not only the Pike 2 Project but also the major sources in the region.

Horizontal grid cells 2.0 km x 2.0 km in size were adopted for the modelling to allow sufficient resolution of major terrain feature influences on wind flow. Along the vertical, 12 layers were assigned to represent the atmospheric boundary layer, following the 2013 AQMG.

The 2002 to 2006 MM5 regional meteorological dataset provided by AEP served as the raw data used in CALMET. Mean wind flow in winter and summer (represented by January and July, respectively) are shown in Figures B1-1 and B1-2.

Tables B1-2 to B1-5 outline the options selected for use in CALMET pre-processing for various meteorological conditions.

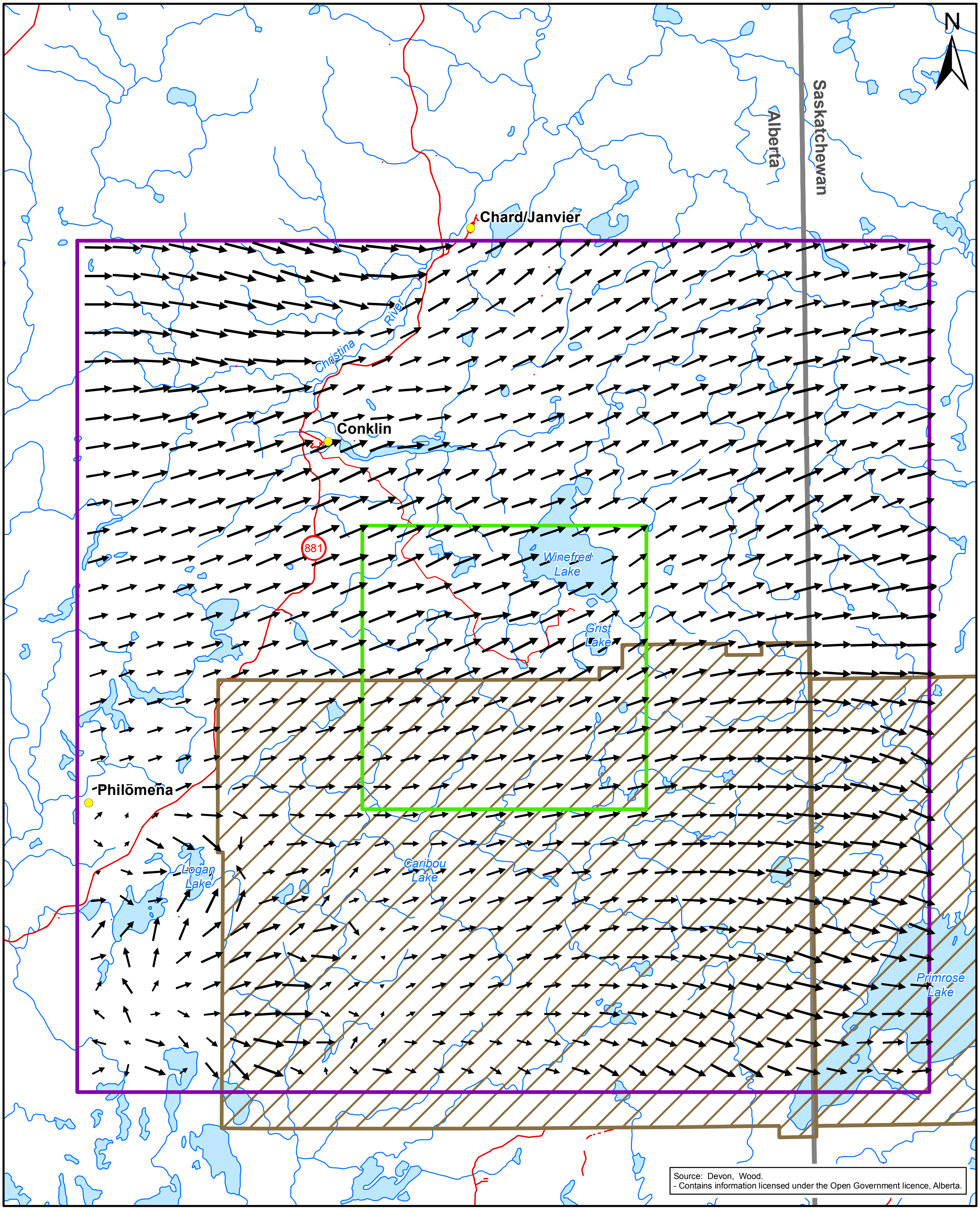
1.2.1 Surface and Upper Air Data

CALMET typically requires surface station and upper air sounding data as input to generate a three-dimensional wind field. For the present study, the 2002 to 2006 MM5 data from ESRD were used as the initial guess wind field in CALMET. No additional surface data were used to adjust meteorological fields.

1.2.2 The Fifth Generation NCAR/Penn State Mesoscale Model (MM5)

MM5 refers to the fifth generation NCAR/Penn State Mesoscale Model (MM5) developed jointly by the National Center for Atmospheric Research (NCAR) and Pennsylvania State University. It is a first-principle weather forecasting model capable of simulating meteorological processes, including the conservation of momentum, energy and mass (of air and moisture) and phase changes of water. The MM5 model is a widely used tool in such applications as tropical cyclone forecasting and climate downscaling.

As noted earlier, the MM5 data used in this project was the 2002 to 2006 database provided by AEP.



Legend

- Air Quality Local Study Area
- Air Quality Regional Study Area
- Cold Lake Air Weapons Range
- Open Water
- Watercourse
- Road
- Community/Urban Area
- Wind Vector

7 3.5 0 7 14
Kilometres
1:750000

Pike 2 Project

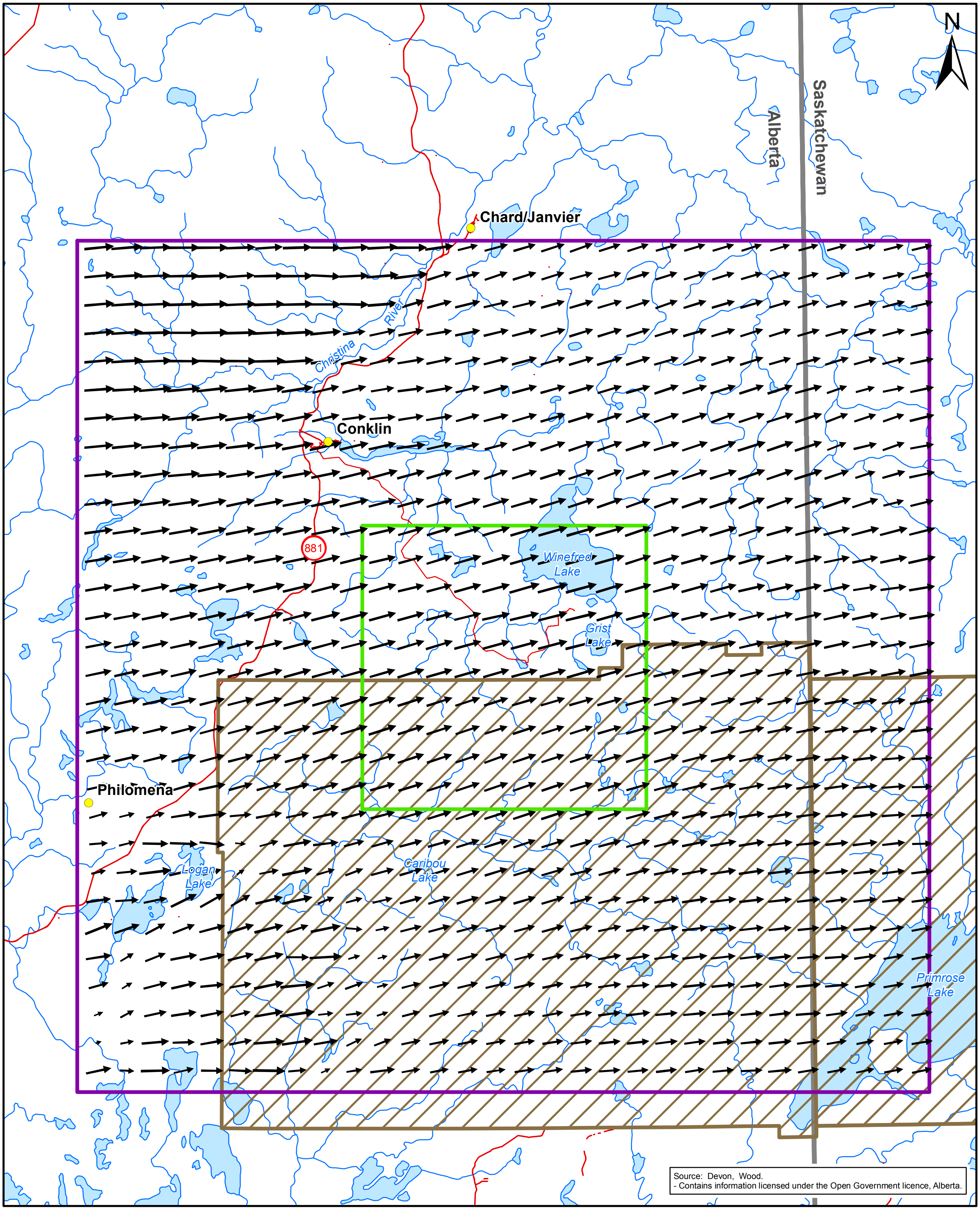
CALMET-Generated Mean Surface Winds for January (2002-2006)

November 12, 2018
FigB1-01 Jan Winds.mxd
devon
PROVIDED BY: Wood.
FINAL MAPPING BY: Wood.

Figure B1-1

Map Path: S:\Gis\Projects\CE\Devon\04808_Pike_2_EIA\ArcGIS\Air\AppB\FigB1-01 Jan Winds.mxd
Analyst - Jackie Hoglund

Previous View | Main Menu | Search



Legend

- Air Quality Local Study Area
- Air Quality Regional Study Area
- Cold Lake Air Weapons Range
- Open Water
- Watercourse
- Road
- Community/Urban Area
- Wind Vector

7 3.5 0 7 14
Kilometres
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Pike 2 Project

CALMET-Generated Mean Surface Winds for July (2002-2006)

November 12, 2018 | FigB1-02 July Winds.mxd

PROVIDED BY: Wood.

FINAL MAPPING BY: Wood.

devon

Figure B1-2

Map Path: S:\Gis\Projects\CE\Devon\04808_Pike_2_EIA\ArcGIS\Air\AppB\FigB1-02 July Winds.mxd   Analyst - Jackie Hoglund

Table B1-2: Meteorological Data Options (Input Group 4)

Parameter	Default	This Study	Description
NOOBS	0	2	No surface, overwater, or upper air observations Use MM4/MM5/3D.DAT for surface, overwater, and upper air data
Number of Surface & Precipitation Meteorological Stations:			
NSSTA	–	0	Number of surface stations.
NPSTA	–	-1	Use of MM5/M3D precipitation data.
Cloud Data Options:			
MCLOUD	0	4	Gridded cloud cover from prognostic relative humidity at all levels (MM5toGrads algorithm); value used is from ESRD (2013).
File Formats:			
IFORMS	2	2	Surface meteorological data file format (2 = formatted).
IFORMP	2	2	Precipitation data file format (2 = formatted).
IFORMC	2	2	Cloud data file format (2 = formatted).

Note:
– = Not available.

Table B1-3: Wind Field Options and Parameters (Input Group 5)

Parameter	Default	This Study	Description
Wind Field Model Options:			
IWFCOD	1	1	Model selection variable – Diagnostic wind module.
IFRADJ	1	1	Compute Froude number adjustment (Yes = 1).
IKINE	0	0	Compute kinematic effects (No = 0).
IOBR	0	0	Use O'Brien procedure for adjustment of the vertical velocity (No = 0).
ISLOPE	1	1	Compute slope flow effects (Yes = 1).
IEXTRP	-4	1	Extrapolate surface wind observations to upper layers? (1 = no extrapolation); value based on ESRD (2013) guideline.
ICALM	0	0	Extrapolate surface winds even if calm (No = 0).
RMIN2	4.0	4.0	Minimum distance (km) from nearest upper air station to surface station for which extrapolation of surface winds at surface station will be allowed.
IPROG	0	14	Use gridded prognostic wind field model output fields as input to the diagnostic wind field model (14=use winds from MM5.DAT file as initial guess field); value based on ESRD (2013) guideline.
Radius of Influence Parameters:			
LVARY	F	F	Use varying radius of influence (F – False).
RMAX1	–	24	Maximum radius of influence over land in the surface layer (km); twice the 12-km resolution of ESRD provided meteorological data set.
RMAX2	–	24	Maximum radius of influence over land aloft (km); twice the 12-km resolution of ESRD provided meteorological data set.
RMAX3	–	24	Maximum radius of influence over water (km); twice the 12-km resolution of ESRD provided meteorological data set.

Parameter	Default	This Study	Description
Other Wind Field Input Parameters:			
RMIN	0.1	0.1	Minimum radius of influence used in the wind field interpolation (km).
TERRAD	–	24	Radius of influence of terrain features (km); value based on approximate dimensions of key terrain features.
R1	–	6.0	Relative weighting of the first guess field and observations in the surface layer (km); one-half the 12-km resolution of the ESRD meteorological data set.
R2	–	6.0	Relative weighting of the first guess field and observations in the layers aloft (km); one-half the 12-km resolution of the ESRD meteorological data set.
RPROG	–	0.0	Relative weighting parameter of the prognostic wind field data (km).
DIVLIM	5.0E-6	5.0E-6	Maximum acceptable divergence in the divergence minimization procedure.
NITER	50	50	Maximum number of iterations in the divergence minimization procedure.
NSMTH (NZ)	2,(mxnz-1)*4	2,(mxnz-1)*4	Number of passes in the smoothing procedure.
NINTR2	99	99	Maximum number of stations used in each layer for the interpolation of data to a grid point (number 12 is bigger than number of stations, then all stations are used).
CRITFN	1.0	1.0	Critical Froude number.
ALPHA	0.1	0.1	Empirical factor controlling the influence of kinematic effects.
FEXTR2(NZ)	nz*0.0	nz*0.0	Multiplicative scaling factor for extrapolation of surface observations to upper layers.
Diagnostic Module Data Input Options:			
IDIOPTI	0	0	Surface temperature (0 = compute internally from hourly surface observation).
ISURFT	-1	-1	Surface meteorological station to use for the surface temperature (-1 = use 2D spatially varying surface temperatures).
IDIOPT2	0	0	Temperature lapse rate used in the computation of terrain-induced circulations (0 = compute internally from twice-daily upper air observations or prognostic fields).
IUPT	-1	-1	Upper air station to use for the domain-scale lapse rate (-1 = use 2D spatially varying lapse rate).
ZUPT	200	200	Depth through which the domain-scale lapse rate is computed (m).
IDIOPT3	0	0	Initial guess field winds (0 = compute internally from observations or prognostic wind fields).
IUPWND	-1	-1	Upper air station to use for the domain-scale winds (-1 = 3D initial guess fields).
IDIOPT4	0	0	Observed surface wind components for wind field module (0 = Read WS, WD from a surface data file).
IDIOPT5	0	0	Observed upper air wind components for wind field module (0 = Read WS, WD from a surface data file).

Notes:
Lake breeze and barrier modules not used in this application.
– = Not available.

Table B1-4: Mixing Height Parameters (Input Group 6)

Parameter	Default	This Study	Description
Empirical Mixing Height Constants:			
CONSTB	1.41	1.41	Neutral, mechanical equation.
CONSTE	0.15	0.15	Convective mixing height equation.
CONSTN	2,400	2,400	Stable mixing height equation.
CONSTW	0.16	0.16	Over-water mixing height equation.
FCORIOL	1.0E-4	1.0E-04	Absolute value of Coriolis parameter (1/s).
Spatial Averaging of Mixing Heights:			
IAVEZI	1	1	Conduct spatial averaging (1 = yes).
MNMDAV	1	1	Maximum search radius in averaging process (1 grid cells).
HAFANG	30	30	Half-angle of upwind looking cone for averaging (degrees).
ILEVZI	1	1	Layer of winds used in upwind averaging (1 layers).
Other Mixing Heights Variables:			
DPTMIN	0.001	0.001	Minimum potential temperature lapse rate in the stable layer above the current convective missing height (°K/m).
DZZI	200	200	Depth of layer above current convective mixing height through which lapse rate is computed (m).
ZIMIN	50	50	Minimum overland mixing height (m).
ZIMAX	3,000	3,000	Maximum overland mixing height (m).
ZIMINW	50	50	Minimum over-water mixing height (m).
ZIMAXW	3,000	3,000	Maximum over-water mixing height (m).

Table B1-5: Temperature Parameters (Input Group 6)

Parameter	Default	This Study	Description
Temperature Parameters:			
ITPROG	0	2	No surface or upper air observations. Use MM5/M3D for surface and upper air data (only if NOOBS = 0,1,2).
IRAD	1	1	Interpolation type (1 = 1/R).
TRADKM	500	24	Radius of influence for temperature interpolation (km); twice the 12-km resolution of ESRD meteorological data set.
NUMTS	5	5	Maximum number of stations to include in temperature interpolation.
IAVET	1	1	Conduct spatial averaging of temperatures (1 = yes).
TGDEFB	-.0098	-.0098	Default temperature gradient below the mixing height over water (°K/m).
TGDEFA	-.0045	-.0045	Default temperature gradient above the mixing height over water (°K/m).
JWAT1	–	55	Beginning land use categories for temperature interpolation over water (disabled).
JWAT2	–	55	Ending land use categories for temperature interpolation over water (disabled).

Precipitation Interpolation Parameters:			
NFLAGP	2	2	Method of interpolation (1 = 1/R^2).
SIGMAP	100.0	100.0	Radius of influence (km).
CUTP	0.01	0.01	Minimum precipitation rate cutoff (mm/h).

Note:
– = Not available.

1.2.3 Land Use

Land use data required by CALMET was taken from the European Space Agency GlobCover 2.3 map for North America (Arino et al. 2012). This is more recent than both the default land cover data options available in the CALPUFF package and the Canada Centre for remote sensing data, all of which were collected during 2000 or earlier. A program was written to read the European Space Agency data and identify the most common corresponding land cover classification at a grid cell. From the grid-averaged land use category, default values of the surface characteristics using the CALPUFF utility MAKEGEO were then generated. These parameters include the following:

- leaf area index;
- roughness length;
- anthropogenic heat flux;
- bowen ratio; and
- albedo.

1.2.4 Terrain

Topographic elevations for the region were obtained from the 1:50,000 Canadian Digital Elevation Data downloaded from the Natural Resources Canada Geogratis website. The resolution of these maps is 0.75 arc seconds. The TERREL program was used to extract and format terrain data for input into CALMET.

2.0 DISPERSION MODELLING APPROACH

2.1 Dispersion Modelling Assessment Assumptions

Key assumptions designed to simplify the modelling procedure while increasing the likelihood of overestimating actual concentrations were made where appropriate. These assumptions include:

- all facility sources were simultaneously operating on a continuous basis at maximum capacity
- all activities, such as road traffic and fugitive emissions, emit at their maximum levels.

2.2 Building Downwash

Building downwash was incorporated using the BPIP-PRIME program. However, downwash was only applied for the Pike 2 Project in absence of building data for the other industrial sources in the study area.

2.3 Chemistry

The MESOPUFF II chemistry module in CALPUFF was used in the prediction of acid deposition and secondary particulate formation. This setting is among those recommended in the ESRD (2013) guideline.

2.4 CALPUFF Version

CALPUFF version 7.2.1 level 150618, the latest release, was used in the modelling.

2.5 Receptors

Receptors where ambient concentration and deposition rates were predicted were selected based on guidance in ESRD (2013). Receptor spacing was based on the following criteria:

- 20 m spacing at the project fence line;
- 50 m spacing between 100 to 500 m from the fence line;
- 250 m spacing between 500 to 2 km;
- 500 m spacing between 2 to 5 km; and
- 1,000 m spacing between beyond 5 km.

After applying this rule, receptors that fell inside area and volume sources were assumed to be inside a facility and were removed as unrepresentative of ambient conditions. In all, there were more than 6,600 discrete receptors, including 193 human health risk receptors and around 88 water quality impact receptors. A map of receptors is presented in Figure B1-3.

2.6 CALPUFF Model Options

The CALPUFF control file defines 17 input groups as identified in Table B1-6.

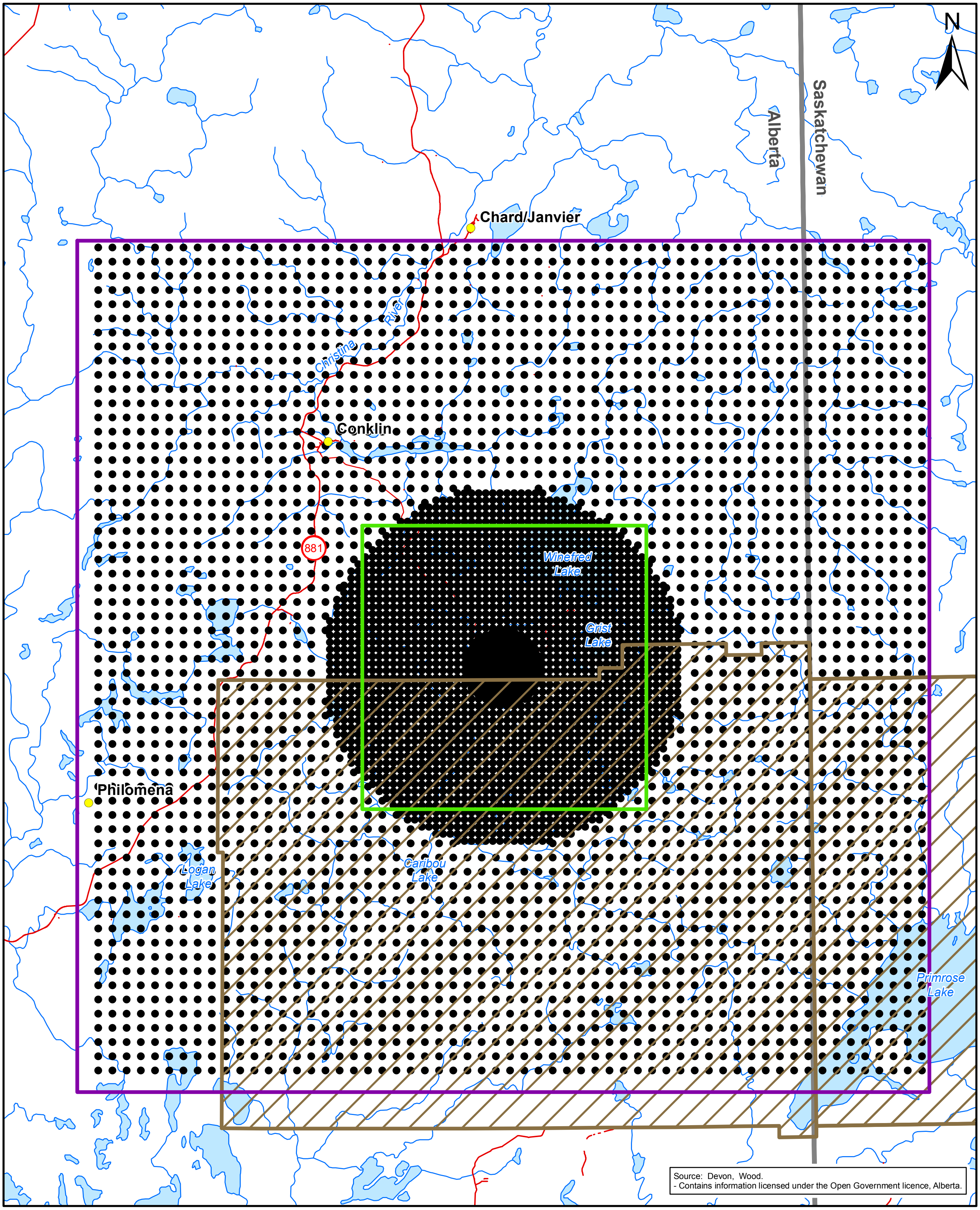
Table B1-6: Input Groups in the CALPUFF Control File

Input Group	Description	Applicable to the Pike 2 Project
0	Input and output file names	Yes
1	General run control parameters	Yes
2	Technical options	Yes
3	Species list	Yes
4	Grid control parameters	Yes
5	Output options	Yes
6	Sub grid scale complex terrain inputs	No
7	Dry deposition parameters for gases	Yes
8	Dry deposition parameters for particles	Yes
9	Miscellaneous dry deposition for parameters	Yes
10	Wet deposition parameters	Yes
11	Chemistry parameters	Yes
12	Diffusion and computational parameters	Yes
13	Point source parameters	Yes
14	Area source parameters	Yes
15	Line source parameters	No
16	Volume source parameters	No
17	Discrete receptor information	Yes

The chemistry option was applied for the prediction of wet and dry acid deposition. This required the inclusion of five species in a single run: SO_2, sulphate (SO_4), NO_x, nitric acid (HNO_3), and nitrate (NO_3). Wet and dry deposition of $PM_{2.5}$ was also modelled. Other species not involved in the chemistry such as carbon monoxide (CO), primary $PM_{2.5}$, volatile organic compounds, heavy metals and other air pollutants were modelled as conservative pollutants.

CALPUFF input parameters were selected according to the default values except where specified by the ESRD (2013) guidelines. Tables B1-7 to B1-16 identify the input parameters, default options and values used for the current Pike 2 Project.

Previous View Main Menu Search



Legend

- Air Quality Local Study Area
- Air Quality Regional Study Area
- Cold Lake Air Weapons Range
- Open Water
- Watercourse
- Road
- Community/Urban Area
- Model Grid Receptor

7 3.5 0 7 14
Kilometres
1:750000

Map Path: S:\Gis\Projects\CE\Devon\04808_Pike_2_EIA\ArcGIS\Air\AppB\FigB1-03 Receptors.mxd Analyst - Jay Boutin

Pike 2 Project

Air Quality Model
Grid Receptors

November 08, 2018	FigB1-03 Receptors.mxd	
devon	PROVIDED BY: Wood.	Figure B1-3
	FINAL MAPPING BY: Wood.	

Table B1-7: General Run Control Parameters (Input Group 1)

Parameter	Default	Project	Description
ABTZ	–	UTC-0700	Base time zone (MST = UTC-0700)
NSPEC	5	6	Number of chemical species
NSE	3	3	Number of chemical species to be emitted
METFM	1	1	Meteorological data format 1= CALMET binary file (CALMET.MET)
AVET	60	60	Averaging time (minutes)
PGTIME	60	60	PG Averaging time (minutes)

Note:
– = Not available.

Table B1-8: Technical Options (Input Group 2)

Parameter	Default	Project	Description
MGAUSS	1	1	Gaussian distribution used in near field
MCTADJ	3	3	Terrain adjustment method (3 = Partial plume path adjustment)
MCTSG	0	0	Subgrid-scale complex terrain (0 = not modelled)
MSLUG	0	0	Near-field puffs not modelled as elongated
MTRANS	1	1	Transitional plume rise modelled
MTIP	1	1	Stack tip downwash used
MRISE	1	1	Briggs plume rise
MBDW	1	2	Method used to simulate building downwash (2 = PRIME method); value based on ESRD (2013)
MSHEAR	0	0	Vertical wind shear not modelled
MSPLIT	0	0	Puff splitting is not allowed
MCHEM	1	1	Transformation rates computed internally using MESUPUFF II scheme
MAQCHEM	0	0	Aqueous phase transformation not modelled
MWET	1	1	Wet removal modelled
MDRY	1	1	Dry deposition modelled
MTILT	0	0	Gravitational settling (plume tilt) not modelled
MDISP	3	2	Dispersion coefficients from internally calculated sigma v, sigma w using micrometeorological variables; value based on ESRD (2013)
MTURBVW	3	3	Use both σv and σw from PROFILE.DAT to compute σy and σz (n/a)
MDISP2	3	3	Back-up method used to compute dispersion when measured turbulence data are missing (used only if MDISP = 1 or 5). This parameter is not used because MDISP = 3 for the project
MTAULY	0	0	Draxler default 617.284 (s) used for Lagrangian timescale for Sigma-y (used only if MDISP = 1,2 or MDISP2 = 1,2)
MTAUADV	0	0	Method used for Advective-Decay timescale for Turbulence (used only if MDISP = 2 or MDISP2 = 2)
MCTURB	1	1	Standard CALPUFF subroutines used to compute turbulence sigma-v & sigma-w using micrometeorological variables (used only if MDISP = 2 or MDISP2 = 2)
MROUGH	0	0	PG σy and σz not adjusted for roughness
MPARTL	1	1	Partial plume penetration of elevated inversion for point sources

Parameter	Default	Project	Description
MPARTLBA	1	1	Partial plume penetration of elevated inversion for buoyant area sources
MTINV	0	0	Strength of temperature inversion not computed from default gradients
MPDF	0	1	PDF used for dispersion under convective conditions; value based on ESRD (2013)
MSGTIBL	0	0	Sub-grid TIBL module not used for shore line
MBCON	0	0	Boundary conditions (concentration) not modelled
MSOURCE	0	0	No Individual source contributions saved
MFOG	0	0	Do not configure for FOG model output
MREG	1	0	Do not test options specified to see if they conform to regulatory values; value based on ESRD (2013)

Table B1-9: Species List-Chemistry Options (Subgroup 3a)

CSPEC	Modelled (0=no, 1=yes)	Emitted (0=no, 1=yes)	Dry Deposition (0=none, 1=computed-gas, 2=computed particle, 3=user-specified)	Output Group Number
SO_2	1	1	1	0
SO_4^{-2}	1	0	2	0
NOx	1	1	1	0
HNO_3	1	0	1	0
NO_3^-	1	0	2	0
PM_{25}	1	1	2	0

Table B1-10: Map Projection Grid Control Parameters (Input Group 4)

Parameter	Default	Project	Description
PMAP	UTM	UTM	Map projection: Universal Transverse Mercator
IUTMZN	–	12	UTM Zone (1 to 60)
UTMHEM	N	N	Northern hemisphere UTM projection
DATUM	WGS-84	WGS-84	NIMA Datum Region – Canada
NX	–	61	Number of X grid cells in meteorological grid
NY	–	61	Number of Y grid cells in meteorological grid
NZ	–	12	Number of vertical layers in meteorological grid
DGRIDKM	–	2.0	Grid spacing (km)
ZFACE	–	0,20,40,80,120,280, 520,880,1320,1820, 2380,3000,4000	Cell face heights in meteorological grid (m)
XORIGKM	–	460.25	Reference X coordinate for SW corner of grid cell (1,1) of meteorological grid (km)

Parameter	Default	Project	Description
YORIGKM	–	6073.5	Reference Y coordinate for SW corner of grid cell (1,1) of meteorological grid (km)
IBCOMP	–	2	Lower left corner of the computational grid
JBCOMP	–	2	Lower left corner of the computational grid
IECOMP	–	60	Upper right corner of the computational grid
JECOMP	–	60	Upper right corner of the computational grid
LSAMP	T	F	Sampling grid is not used

Note:
– = Not available.

Table B1-11: Dry Deposition Parameters for Gases (Input Group 7)

Species	Default	Project	Description
SO_2	0.1509	0.1509	Diffusivity (cm^2/s)
	1000.0	1000.0	Alpha star
	8.0	8.0	Reactivity
	0.0	0.0	Mesophyll resistance (s/cm)
	0.4	0.4	Henry's Law coefficient
NO_x	0.1656	0.1656	Diffusivity (cm^2/s)
	1.0	1.0	Alpha star
	8.0	8.0	Reactivity
	5.0	5.0	Mesophyll resistance (s/cm)
	3.5	3.5	Henry's Law coefficient
HNO_3	0.1628	0.1628	Diffusivity (cm^2/s)
	1.0	1.0	Alpha star
	18.0	18.0	Reactivity
	0.0	0.	Mesophyll resistance (s/cm)
	0.00000008	0.00000008	Henry's Law coefficient

Table B1-12: Size Parameters for Dry Deposition of Particles (Input Group 8)

Species	Default	Project	Description
$SO_4{}^{2}$	0.48	0.48	Geometric mass mean diameter of $SO_4{}^{2}$(µm)
$SO_4{}^{2}$	2.0	2.0	Geometric standard deviation of $SO_4{}^{2}$ (µm)
$NO_3{}^{-}$	0.48	0.48	Geometric mass mean diameter of NO_3 (µm)
$NO_3{}^{-}$	2.0	2.0	Geometric standard deviation of $NO_3{}^{-}$ (µm)
$PM_{2.5}.^{-}$	0.48	0.48	Geometric mass mean diameter of $PM_{2.5}$.(µm)
$PM_{2.5}{}^{-}$	2.0	2.0	Geometric standard deviation of $PM_{2.5}$ (µm)

Table B1-13: Miscellaneous Dry Deposition Parameters (Input Group 9)

Parameters	Default	Project	Description
RCUTR	30	30	Reference cuticle resistance (s/cm)
RGR	10	10	Reference ground resistance (s/cm)
REACTR	8	8	Reference pollutant reactivity
NINT	9	9	Number of particle size intervals for effective particle deposition velocity
IVEG	1	1	Vegetation state in unirrigated areas is active and unstressed

Table B1-14: Wet Deposition Parameters (Input Group 10)

Species	Default	Project	Description
SO_2	0.00003	0.00003	Scavenging coefficient for liquid precipitation (s^{-1})
	0.0	0.0	Scavenging coefficient for frozen precipitation (s^{-1})
SO_4^{-2}	0.0001	0.0001	Scavenging coefficient for liquid precipitation (s^{-1})
	0.00003	0.00003	Scavenging coefficient for frozen precipitation (s^{-1})
NOx	0.0	0.0	Scavenging coefficient for liquid precipitation (s^{-1})
	0.0	0.0	Scavenging coefficient for frozen precipitation (s^{-1})
HNO_3	0.00006	0.00006	Scavenging coefficient for liquid precipitation (s^{-1})
	0.0	0.0	Scavenging coefficient for frozen precipitation (s^{-1})
NO_3^-	0.0001	0.0001	Scavenging coefficient for liquid precipitation (s^{-1})
	0.00003	0.00003	Scavenging coefficient for frozen precipitation (s^{-1})
$PM_{2.5}$.	0.0001	0.0001	Scavenging coefficient for liquid precipitation (s^{-1})
	0.00003	0.00003	Scavenging coefficient for frozen precipitation (s^{-1})

Table B1-15: Chemistry Parameters (Input Group 11)

Parameters	Default	Project	Description
MOZ	1	1	Hourly background O_3 value
BCKO3	12*80	12*80	Background monthly O_3 concentration (ppb)
MNH3	0	0	Monthly background ammonia value
MAVGNH3	1	1	Average ammonia values over vertical extent of puff
BCKNH3	12*10	12*10	Background NH_4 concentration (ppb)
RNITE1	0.2	0.2	Nighttime NO_2 loss rate in percent/hour
RNITE2	2	2	Nighttime NO_X loss rate in percent/hour
RNITE3	2	2	Nighttime HNO_3 loss rate in percent/hour
MH202	1	1	Background H_2O_2 concentrations
BCKH202	12*1	12*1	Background monthly H_2O_2 concentrations (aqueous phase transformations not modelled)

Table B1-16: Miscellaneous Dispersion and Computational Parameters (Input Group 12)

Parameters	Default	Project	Description
SYTDEP	550	550	Horizontal size of a puff in metres beyond which the time dependent dispersion equation of Heffter is used
MHFTSZ	0	0	Heffter formulas not used for sigma z
JSUP	5	5	Stability class used to determine dispersion rates for puffs above boundary layer
CONK1	0.01	0.01	Vertical dispersion constant for stable conditions
CONK2	0.1	0.1	Vertical dispersion constant for neutral/stable conditions
TBD	0.5	0.5	Use ISC transition point for determining the transition point between the Schulman-Scire to Huber-Snyder Building Downwash scheme
IURB2	10	10	Lower range of land use categories for which urban dispersion is assumed
IURB2	19	19	Upper range of land use categories for which urban dispersion is assumed
XMXLEN	1	1	Maximum length of a slug in meteorological grid units
XSAMLEN	1	1	Maximum travel distance of slug or puff in meteorological grid units during one sampling unit
MXNEW	99	99	Maximum number of puffs or slugs released from one source during one time step
MXSAM	99	99	Maximum number of sampling steps during one time step for a puff or slug
NCOUNT	2	2	Number of iterations used when computing the transport wind for a sampling step that includes transitional plume rise
SYMIN	1	1	Minimum sigma y in metres for a new puff or slug
SZMIN	1	1	Minimum sigma z in metres for a new puff or slug
CDIV	0.0, 0.0	0.0, 0.0	Divergence criteria for dw/dz in met cells
NLUTIBL	4	4	Search radius (number of cells) for nearest land and water cells used in the subgrid TIBL module
WSCALM	0.5	0.5	Minimum wind speed allowed for non-calm conditions (m/s)
XMAXZI	3,000	3,000	Maximum mixing height in metres
XMINZI	50	50	Minimum mixing height in metres
WSCAT	1.54	1.54	Wind speed category 1 (m/s)
	3.09	3.09	Wind speed category 2 (m/s)
	5.14	5.14	Wind speed category 3 (m/s)
	8.23	8.23	Wind speed category 4 (m/s)
	10.80	10.80	Wind speed category 5 (m/s)
PTG0	0.020	0.020	Potential temperature gradient for E stability (°K/m)
	0.035	0.035	Potential temperature gradient for F stability (°K/m)
SL2PF	10	10	Slug-to-puff transition criterion factor equal to sigma y/length of slug
NSPLIT	3	3	Number of puffs that result every time a puff is split
IRESPLIT	Hour 17=1	Hour 17=1	Time(s) of day when split puffs are eligible to be split once again
ZISPLIT	100	100	Minimum allowable last hour's mixing height for puff splitting
ROLDMAX	0.25	0.25	Maximum allowable ratio of last hour's mixing height and maximum mixing height experienced by the puff for puff splitting
NSPLITH	5	5	Number of puffs that result every time a puff is horizontally split
SYSPLITH	1	1	Minimum sigma-y of puff before it may be horizontally split

Parameters	Default	Project	Description
SHSPLITH	2	2	Minimum puff elongation rate due to wind shear before it may be horizontally split
CNSPLITH	1.0E-7	1.0E-7	Minimum concentration of each species in puff before it may be horizontally split
EPSSLUG	1.00E-04	1.00E-04	Fractional convergence criterion for numerical SLUG sampling iteration
EPSAREA	1.00E-06	1.00E-06	Fractional convergence criterion for numerical AREA sampling iteration
DRISE	1.0	1.0	Trajectory step length for numerical rise integration

Stability Class	Land Parameter	
	SVMIN	SWMIN
	Minimum Turbulence (σ_v) (m/s)	Minimum Turbulence (σ_w) (m/s)
A	0.5	0.2
B	0.5	0.12
C	0.5	0.08
D	0.5	0.06
E	0.5	0.03
F	0.5	0.016

Stability Class	Parameter	
	PLX0	PPC
	Wind Speed Profile Exponent	Plume Path Coefficient
A	0.07	0.5
B	0.07	0.5
C	0.10	0.5
D	0.15	0.5
E	0.35	0.35
F	0.55	0.35

2.7 Nitrogen Oxide to Nitrogen Dioxide Conversion

The 2013 AQMG recommend a tiered approach in modelling the conversion of NO_x to nitrogen dioxide (NO_2). In this tiered approach, the OLM is suggested if modelling NO_x as a conservative pollutant yields unrealistic results.

As its term implies, the OLM is based on the fact that the amount of NO_2 that can be converted from NO_x is dependent on the available ozone. Ozone provides the oxygen needed for this conversion. The OLM is expressed as follows:

$$\text{If } [O_3] > 0.9 \times [NO_x] \text{ then } [NO_2] = [NO_x]$$
$$\text{otherwise } [NO_2] = [O_3] + 0.1 \times [NO_x]$$

Hourly ambient O_3 concentrations for rural areas provided in Appendix E of the AQMG were used. NO_x results are also provided to represent NO_2 concentrations using the overly-conservative total conversion method.

2.8 Background Levels of Acid-Forming Compounds

The deposition of acid-forming compounds takes place through wet and dry processes that can result in long-term effects on aquatic and terrestrial environments. The wet process involves rain and snowfall, while the dry process involves the removal of the compounds through contact with surfaces such as vegetation. At the same time, the presence of neutralizing compounds can mitigate acidification. The net impact is modelled as potential acid input (PAI).

PAI incorporates the following:

- the effects of nitrogen and sulphur species;
- effects of dry and wet deposition mechanisms; and
- effects of base cations in mitigating acidity.

The calculation of PAI is based on the wet and dry deposition of sulphur species (e.g., SO_2 gas, SO_4^{2-} particle), nitrogen species (e.g., NO_2 gas, NO gas, HNO_3 gas, NO_3^- particle) and base cations (e.g., Ca^{2+} particle, Mg^+ particle and K^+ particle). PAI is expressed in keq/ha/y, where keq refers to the number of equivalent hydrogen ions (1 keq = 1 kmol H^+) deposited on the surface through both natural and anthropogenic processes. PAI is, therefore, highly variable in space, but since surface processes such as runoff and aquatic flow can redistribute the deposited material, quantifying its impact requires determining the sizes of areas receiving critical loads set by CASA and AENV (1999).

Background PAI data were taken from Fenn et al. (2015), which discusses recent data on nitrogen and sulphur compounds as well as base cation deposition in the oil sands region.

3.0 MODELLING NON-POINT SOURCES

While stack emissions are straightforward to model, other sources require some representation or parameterization in order to be modelled. This section describes how mines, stockpiles, material handling, urban areas, and highways were treated in CALPUFF. Fugitive emissions such as windblown dust, heavy equipment exhausts, highway traffic, and emissions from urban areas were treated as area sources. Emissions from existing operating facilities in the AQRSA were obtained from facility operators and previously submitted environmental impact assessments. The coordinates of the corners of the sources were obtained and the sources are represented as polygons. The CALPUFF model requires initial vertical dispersion (σ_z) and release height to model area sources. The detail parameters used for area sources are listed below. Emissions were estimated as described in Volume 3, Appendices B2 and B4.

Modelling parameters were based either on publicly available facility data or were estimated based on assumptions discussed below.

3.1 Project Process and Fugitive Emissions

Project process areas and fugitive emissions from the oil sands facilities were modelled as area sources with effective emission height of 3 m and initial vertical dispersion parameters of 5 m. This release height was deemed typical of the elevations of pipes and valves, and approximates the height of other structures onsite.

3.2 Tanks

Emissions from tanks were assumed to be volume sources. Tank emissions were assumed to be emitted from a height of 10m above the surface. The effective height of tanks was set to be 4.65 m following the ISC3 manual that the initial y dispersion parameter is 1⁄2.15 of its physical height, and the initial z is 1⁄4.3 of its physical diameter (US EPA 1995).

3.3 Highways

Emissions of vehicles travelling along Highways 663 and 881 were modelled as chains of area sources each with an effective emission height of 3.0 m.

3.4 Towns

Emissions from the cities and towns of Wood Buffalo and Heart Lake were modelled. Town limits were approximated as a four-sided polygon for input into CALPUFF. The effective emission height of 3.0 m and initial vertical dispersion parameter of 5 m were used. This release height was deemed typical of the height of urban structures.

4.0 MODEL PERFORMANCE

4.1 Introduction

In order to provide insights into model performance and confidence in the predicted results, the results of the modelling were compared with actual measurements. For this purpose, hourly data on SO_2, NO_2, CO and $PM_{2.5}$ from monitoring stations within the AQRSA were gathered. Observations from August 2015 to August 2018 were downloaded to obtain a monitoring record of comparable length (after accounting for missing data) to the modelling results, which are three years in length.

A direct comparison of hourly receptor values between the monitoring and the model results cannot be done for a number of reasons, but primarily because the periods they cover are separated by several years. But since the modelling assumes that the five-year period covers the variability in meteorological conditions in the AQRSA during any period of comparable length, meaningful comparison can be made between the distributions of values at each station.

To perform the comparison, hourly modelling and monitoring results from the same locations were ranked and plotted in Q-Q plots. In each plot, good agreement means that points (blue) representing the measured and modelling value lie close to the line indicating perfect agreement (green). A plot in which the blue points appear above the green line means that the model may over-predict the measurements at that receptor. Conversely, points below the green line indicates potential under-prediction.

It is important to note that observed concentrations cover periods of unusually high emissions from natural (e.g., forest fires and dust storms) and industrial (e.g., upset releases and abnormally high long distance transport emissions) causes. The shapes of Q-Q plots are highly sensitive to the extreme values resulting from these conditions, but these conditions are not captured by the modelling. For this reason, values above the 99.9th percentile were removed from each set of observations. Given a complete record of 8,760 hours in a year, this means that eight hours per year will be removed, which is assumed to be sufficient to eliminate the effects of upset releases. In practice, this implies the removal of about 44 hours out of the approximately 44,000 valid hourly observations within the five-year monitoring period at each station.

For $PM_{2.5}$, a lower cutoff percentile (99.5th) was used in view of the fact that events causing extreme particulate emissions are also longer in duration. This means that 44 hours will be removed in a complete record of 8,760 hours in a year. But since the observations were not 100% complete over the five-year period, the actual number of hours were fewer.

Since the modelling is not subject to these extreme emission conditions, all the model predictions were used. Only hourly concentrations were compared since any conclusions on model performance for other averaging periods can be drawn from the hourly results.

4.2 Sulphur Dioxide Results

Results of the comparison are shown in Figure B1-4. At the Conklin and Stony Mountain stations, the modelling over-predicts the observed percentiles. These findings generally confirm the expected conservativeness of the model.

The modelling appears to slightly under-predict SO_2 concentrations at Janvier station. This station is at the northern edge of the AQRSA. Concentrations at this location are, therefore, likely to be affected by industrial sources that may not be captured by the modelling (e.g., sources immediately outside the modelling domain).

4.3 Nitrogen Dioxide Results

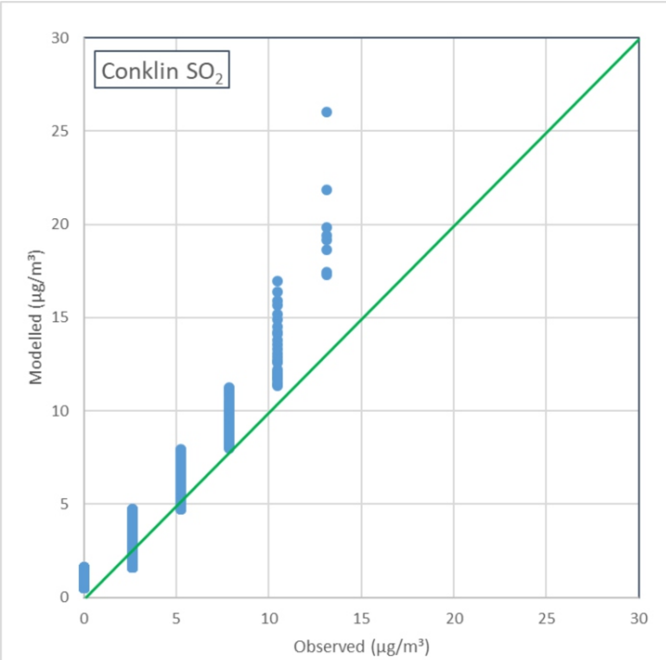
Results of the comparison of modelled and observed hourly NO_2 are shown in Figure B1-5. The model over-predicts at all three stations. the predictions are much closer at lower percentiles for Conklin and Janvier stations, showing there is good agreement between observed and modelled values.

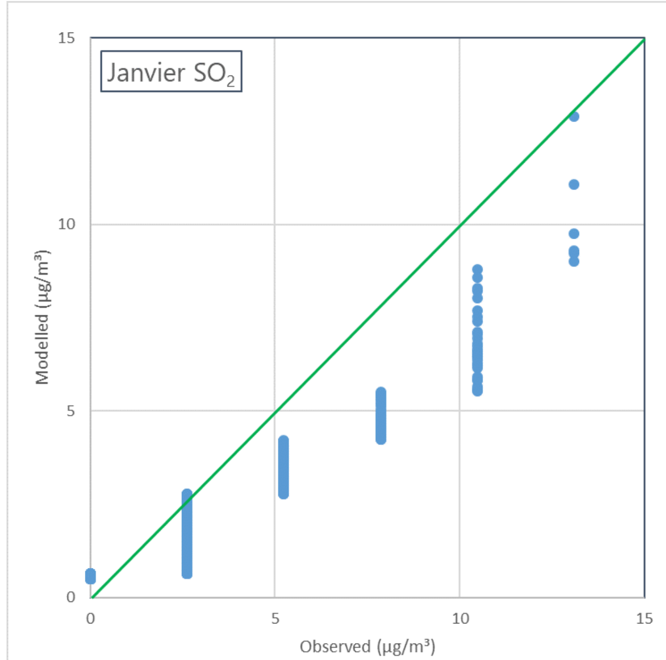
In general, these results show similar trends to those of SO_2. Additional uncertainty in NO_2 predictions is introduced by the need to convert NO_x concentrations to NO_2 using the ozone limiting method.

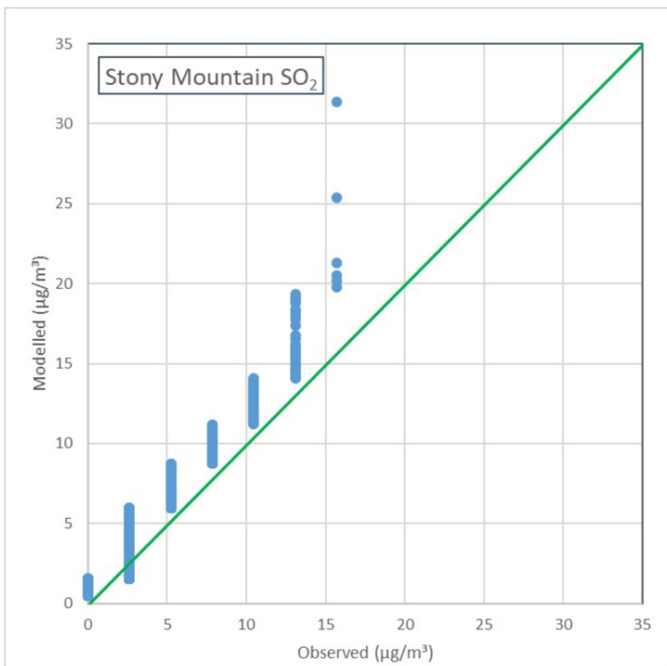
4.4 $PM_{2.5}$ Results

Results of the comparison of modelled and observed hourly $PM_{2.5}$ are shown in Figure B1-6. Unlike the findings for SO_2 and NO_2, results for $PM_{2.5}$ suggest less conservative model performance. The model under-predicts at all three stations.

The lack of conservativeness in model results for $PM_{2.5}$ can be explained by the higher degree of uncertainty in modelling this pollutant. Sources of particulate matter are more diverse and less easily quantified. In addition, its dispersion can be complicated by resuspension and deposition, neither of which can be modelled as accurately as other processes.





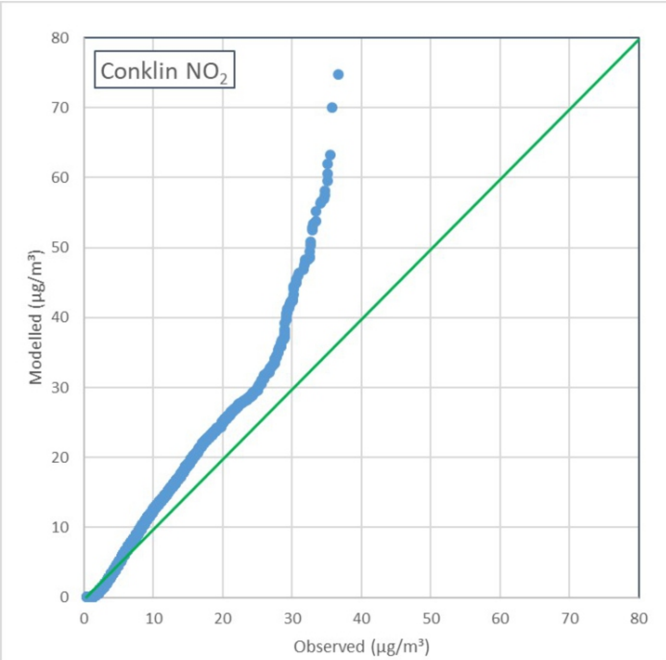


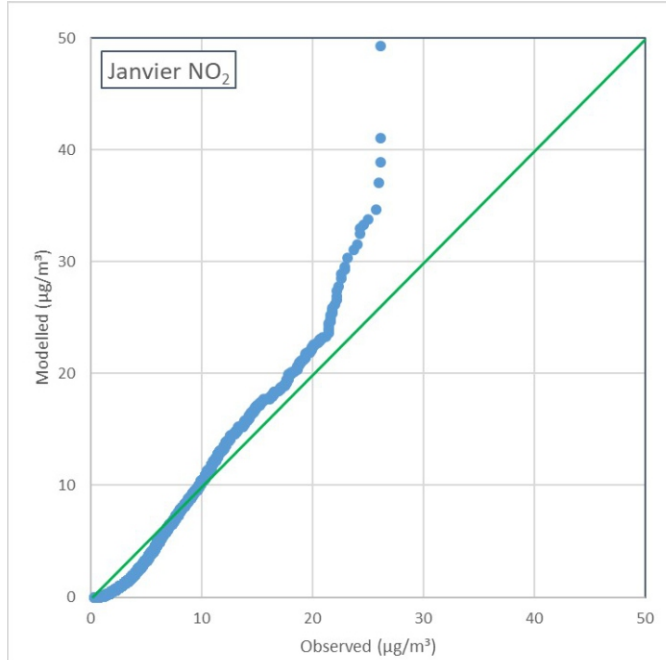
Map Path: S:\Gis\Projects\CE\ Devon\04808 Pike 2 EIA\CrorelDraw\AppB\Fig B1-4 SO2 Concentrations 291018.cdr Analyst: Jackie Hoglund

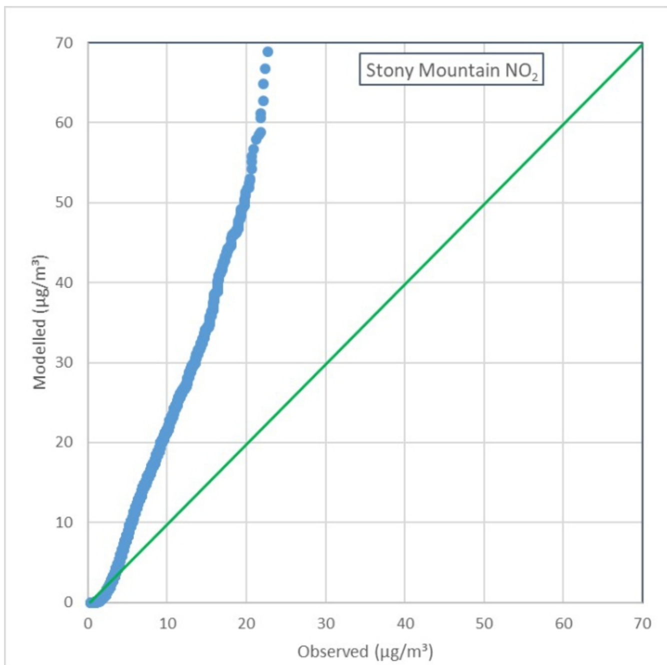
Pike 2 Project

Q-Q Plots of Modelled Versus Observed Hourly SO_2 Concentrations

October 29, 2018	FigB1-4 SO2 Concentrations 291018.cdr		
devon	PROVIDED BY: Wood.	FINAL MAPPING BY: Wood.	**Figure B1-4**







Pike 2 Project

Q-Q Plots of Modelled Versus Observed Hourly NO_2 Concentrations

October 29, 2018 | FigB1-5 NO2 Concentrations 291018.cdr

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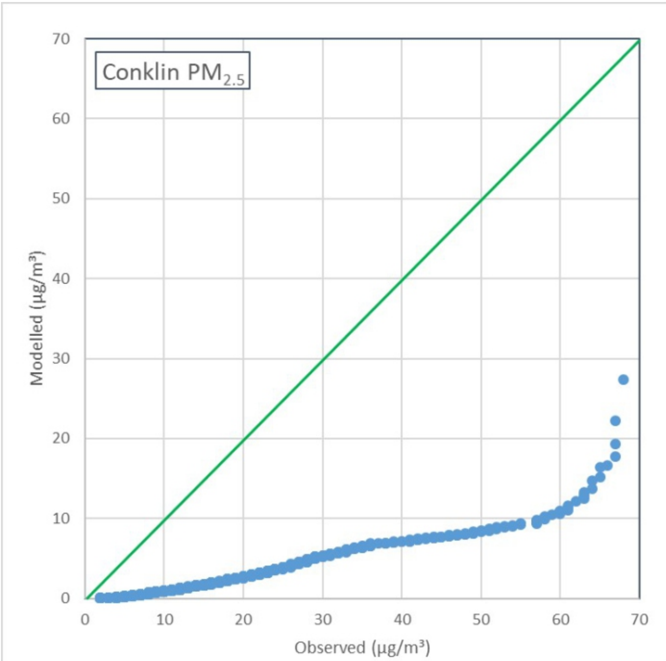
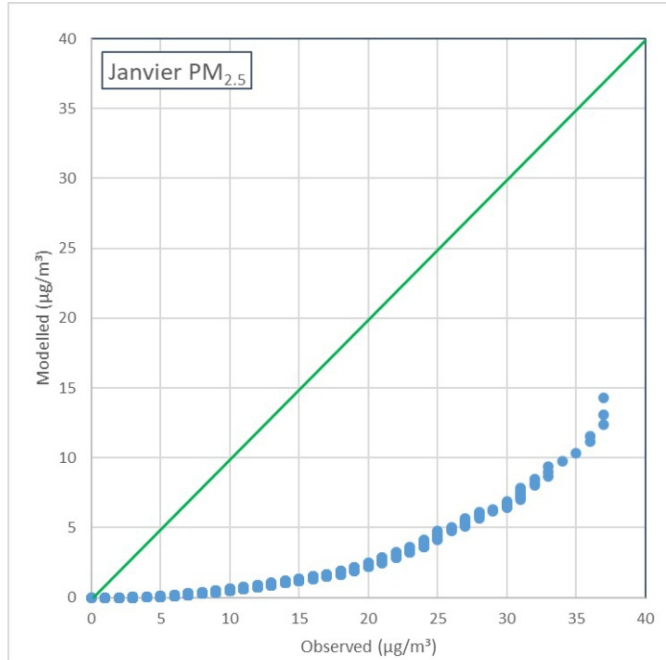
PROVIDED BY: Wood.

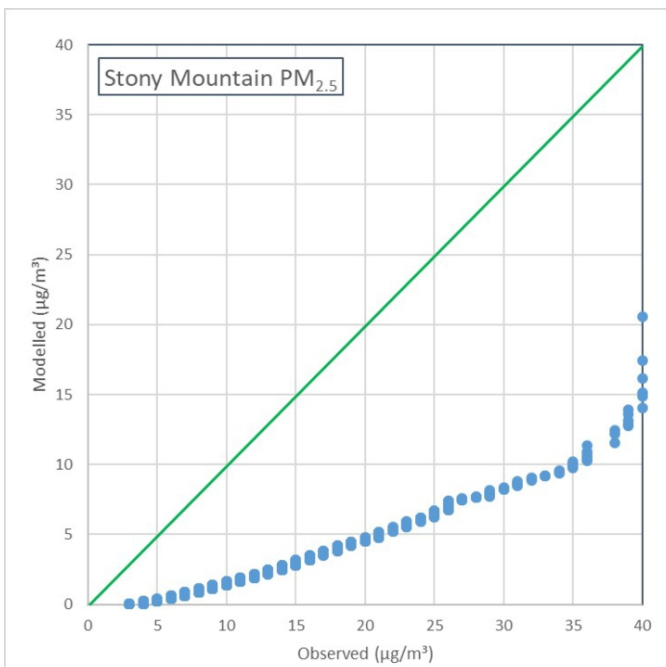
FINAL MAPPING BY: Wood.

Figure B1-5

Map Path: S:\Gis\Projects\CE\ Devon\04808 Pike 2 EIA\CrorelDraw\AppB\Fig B1-5 NO2 Concentrations 291018.cdr Analyst: Jackie Hoglund







Pike 2 Project

Q-Q Plots of Modelled Versus Observed Hourly $PM_{2.5}$ Concentrations

October 29, 2018	FigB1-6 PM25 Concentrations 291018.cdr	
devon	PROVIDED BY: Wood. FINAL MAPPING BY: Wood.	**Figure B1-6**

Map Path: S:\Gis\Projects\CE\ Devon\04808 Pike 2 EIA\CrorelDraw\AppB\Fig B1-6 PM25 Concentrations 291018.cdr Analyst: Jackie Hoglund

5.0 REFERENCES

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Appendix B2

Emission Sources Information – Criteria Air Contaminants

Appendix B2: Emission Sources Information – Criteria Air Contaminants Table of Contents

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Table of Contents (cont'd)

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List of Tables

1.0 INTRODUCTION

This appendix lists the emission source characteristics and emission rate details of the criteria air contaminants, including sulphur dioxide (SO_2), gaseous oxides of nitrogen (NO_x), carbon monoxide (CO), $PM_{2.5}$ and total volatile organic compounds (VOC) within the air quality regional study area (AQRSA). The air quality impacts as a result of emissions of SO_2, NO_x, CO, and $PM_{2.5}$ are assessed and provided in the main report (Volume 2, Section 4.0), while a fraction of the species that comprise the VOC emissions (Volume 3, Appendix B4) are modelled as part of the human health risk assessment.

Devon provided emissions data for the Pike 2 Project, as well as baseline data for the Pike 1 and Jackfish projects. Additional data were taken from the Suncor Meadow Creek EIA (Suncor 2017). Other facility and planned emission information was obtained from direct contact with regional operators or proponents, and from recent environmental impact assessments (Cenovus 2010; Teck and SilverBirch 2011; Devon 2012; VCI 2012; Imperia 2013). Some emission data were obtained from the facility approvals issued by Alberta Environment and Parks.

The facility and planned emissions within the AQRSA that were included in the Baseline, Application and Planned Development (planned) emission cases of this air quality assessment are presented on a company-by-company basis. Background emission sources for the application emission case were considered to be the same as those for the Baseline Case.

Most of the documented emission sources occur from steam-assisted gravity drainage (SAGD) operations, which primarily use processed natural gas fuel (containing negligible hydrogen sulphide [H_2S]) and small quantities of produced gas (containing some H_2S) in steam boilers/generators and heaters. For this type of industrial development, the only significant major SO_2 and NO_x emission sources are the steam boilers/generators and heaters.

This appendix also presents the estimated emissions from a number of communities and highways, as well as a summary of small gas production and processing facilities in the region.

All of the listed facilities and projects are located within the AQRSA and have been selected for inclusion in the air quality assessment.

2.0 INDUSTRIAL FACILITIES

2.1 Athabasca Oil Corp.

Emissions Included in the Baseline and Application Cases

Athabasca Oil Corp. acquired Statoil Canada in 2017. Athabasca now operates the Leismer Demonstration/Commercial project, which is located approximately 101 km south of Fort McMurray. The Leismer Demonstration/Commercial project is a 20,000 bpd facility. The Leismer Expansion was also approved with the total capacity of 40,000 bpd.

Table B2-1 provides a summary of the emissions that were included in the Baseline and Application cases. The capacity of the facility is expected as 20,000 bpd.

Emissions Included in the Baseline, Application and Planned Development Cases

Future Leismer Northwest have been announced, which is located approximately 99 to 116 km south of Fort McMurray.

Table B2-2 provides a summary of the emissions that were included in the Baseline, Application and Planned Development cases.

2.2 Canadian Natural Resources Limited

Emissions Included in the Baseline and Application Cases

Canadian Natural Resources Limited (CNRL) operates the Primrose North, Kirby South and Kirby North thermal in situ oil sands projects.

The Kirby South Phase 1 project, which was approved by the Alberta Energy Regulator (AER) in August 2010, was commenced in September 2013. The expected facility capacity is 45,000 bpd, located approximately 85 km northeast of Lac La Biche, Christina Lake area.

The Kirby North included three parts. One of them was purchased from Enerplus Corporation in October 2010 and approved by AER in May 2011, is a 10,000 bpd in situ SAGD facility located 140 km south of Fort McMurray. Another part of Kirby North Phase 1, shortly after receiving regulatory approval in May 2014, is under construction. The project is targeted to include a central processing facility for bitumen with a peak production rate of 40,000 bpd of bitumen. Kirby North Phase 2 Expansion is approved by AER with the 60,000 bpd production.

The Primrose North project uses cyclic steam stimulation and consists of three sites located 212 to 223 km south-southeast of Fort McMurray. The target production rate for Primrose East is 32,000 bpd; the target rate for Primrose North and South combined is 75,000 bpd.

Table B2-3 is a summary of the emissions that were included in the Baseline and Application cases.

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Table B2-1: Athabasca Oil Sands Existing and Approved Air Emissions Used for the Baseline and Application Cases

Point Sources

Facility	Emission Source	UTM Easting (m)	UTM Northing (m)	Elevation (masl)	Stack Height (m)	Stack Diameter (m)	Exit Velocity (m/s)	Exit Temp (K)	SO_2 (t/d)	NO_X (t/d)	CO (t/d)	$PM_{2.5}$ (t/d)	VOC (t/d)
Leismer Demo/Commercial	Glycol Heater	471809	6185646	654	16	0.76	5.1	616	0	0.008	0.0047	0.0011	0.0008
Leismer Demo/Commercial	HP Flare Continuous	471946	6185545	654	32	3.78	0	1273	0	0.0001	0.0005	0	0
Leismer Demo/Commercial	LP Flare Continuous	471946	6185546	654	32	1.89	0	1273	0	0.0001	0.0005	0	0
Leismer Demo/Commercial	Slop Treater	472007	6185728	654	10	0.32	11	532	0	0.0016	0.0009	0.0002	0.0002
Leismer Demo/Commercial	OTSG 1	471728	6185804	653	27	1.68	16.7	444	0.0596	0.2784	0.2005	0.0251	0.0186
Leismer Demo/Commercial	OTSG 2	471728	6185792	654	27	1.68	16.7	444	0.0596	0.2784	0.2005	0.0251	0.0186
Leismer Demo/Commercial	OTSG 3	471728	6185780	654	27	1.68	16.7	444	0.0596	0.2784	0.2005	0.0251	0.0186
Leismer Demo/Commercial	OTSG 4	471728	6185768	654	27	1.68	16.7	444	0.0596	0.2784	0.2005	0.0251	0.0186
Leismer Demo/Commercial	OTSG 5	471826	6185804	653	27	1.68	16.7	444	0.0596	0.2784	0.2005	0.0251	0.0186
Leismer Demo/Commercial	OTSG 6	471826	6185792	654	27	1.68	16.7	444	0.0596	0.2784	0.2005	0.0251	0.0186
Leismer Demo/Commercial	OTSG 7	471827	6185780	654	27	1.68	16.7	444	0.0596	0.2784	0.2005	0.0251	0.0186
Leismer Demo/Commercial	OTSG 8	471827	6185768	654	27	1.68	16.7	444	0.0596	0.2784	0.2005	0.0251	0.0186
Leismer Demo/Commercial	Sulphur Plant Process Heater	471878	6185758	654	16	0.76	5.1	616	0	0.008	0.0047	0.0011	0.0008
Leismer Expansion	Glycol Heater	472609	6185646	654	16	0.76	5.1	616	0	0.008	0.0047	0.0011	0.0008
Leismer Expansion	HP Flare Continuous	472746	6185545	654	32	3.78	0	1273	0	0.0001	0.0005	0	0
Leismer Expansion	LP Flare Continuous	472746	6185545	654	32	1.89	0	1273	0	0.0001	0.0005	0	0
Leismer Expansion	Slop Treater	472807	6185728	654	10	0.32	11	532	0	0.0016	0.0009	0.0002	0.0002
Athabasca Oil Sands Air Emissions Total Used for the Baseline and Application Cases									**0.477**	**2.255**	**1.622**	**0.205**	**0.152**

Area Sources

Facility	Emission Source	NW UTM E (m)	NW UTM N (m)	NE UTM E (m)	NE UTM N (m)	SE UTM E (m)	SE UTM N (m)	SW UTM E (m)	SW UTM N (m)	Area (m^2)	Elevation (masl)	SO_2 (t/d)	NO_X (t/d)	CO (t/d)	$PM_{2.5}$ (t/d)	VOC (t/d)
Leismer North West	Plant fugitive	467150	6189314	467650	6189314	467650	6188814	467150	6188814	250,000	675	0	0	0	0	0.0846
Leismer South	Plant fugitive	465625	6172058	466125	6172058	466125	6171558	465625	6171558	250,000	683	0	0	0	0	0.0846
Athabasca Oil Sands Air Emission Totals for the Baseline and Application Cases												**0**	**0**	**0**	**0**	**0.169**

Note:
"0" = No emissions. OTSG = Once-through steam generators. HP = High pressure. LP = Low pressure.

Table B2-2: Athabasca Oil Sands Air Emissions Used for the Baseline, Application and Planned Development Cases

Point Sources														
Facility	**Emission Source**	**UTM Easting (m)**	**UTM Northing (m)**	**Elevation (masl)**	**Stack Height (m)**	**Stack Diameter (m)**	**Exit Velocity (m/s)**	**Exit Temp (K)**	**SO_2 (t/d)**	**NO_X (t/d)**	**CO (t/d)**	**$PM_{2.5}$ (t/d)**	**VOC (t/d)**
Leismer Demo/Commercial	Glycol Heater	471809	6185646	654	16	0.76	5.1	616	0	0.008	0.0047	0.0011	0.0008
Leismer Demo/Commercial	HP Flare Continuous	471946	6185545	654	32	3.78	0	1273	0	0.0001	0.0005	0	0
Leismer Demo/Commercial	LP Flare Continuous	471946	6185546	654	32	1.89	0	1273	0	0.0001	0.0005	0	0
Leismer Demo/Commercial	Slop Treater	472007	6185728	654	10	0.32	11	532	0	0.0016	0.0009	0.0002	0.0002
Leismer Demo/Commercial	OTSG 1	471728	6185804	653	27	1.68	16.7	444	0.0596	0.2784	0.2005	0.0251	0.0186
Leismer Demo/Commercial	OTSG 2	471728	6185792	654	27	1.68	16.7	444	0.0596	0.2784	0.2005	0.0251	0.0186
Leismer Demo/Commercial	OTSG 3	471728	6185780	654	27	1.68	16.7	444	0.0596	0.2784	0.2005	0.0251	0.0186
Leismer Demo/Commercial	OTSG 4	471728	6185768	654	27	1.68	16.7	444	0.0596	0.2784	0.2005	0.0251	0.0186
Leismer Demo/Commercial	OTSG 5	471826	6185804	653	27	1.68	16.7	444	0.0596	0.2784	0.2005	0.0251	0.0186
Leismer Demo/Commercial	OTSG 6	471826	6185792	654	27	1.68	16.7	444	0.0596	0.2784	0.2005	0.0251	0.0186
Leismer Demo/Commercial	OTSG 7	471827	6185780	654	27	1.68	16.7	444	0.0596	0.2784	0.2005	0.0251	0.0186
Leismer Demo/Commercial	OTSG 8	471827	6185768	654	27	1.68	16.7	444	0.0596	0.2784	0.2005	0.0251	0.0186
Leismer Demo/Commercial	Sulphur Plant Process Heater	471878	6185758	654	16	0.76	5.1	616	0	0.008	0.0047	0.0011	0.0008
Leismer Expansion	Glycol Heater	472609	6185646	654	16	0.76	5.1	616	0	0.008	0.0047	0.0011	0.0008
Leismer Expansion	HP Flare Continuous	472746	6185545	654	32	3.78	0	1273	0	0.0001	0.0005	0	0
Leismer Expansion	LP Flare Continuous	472746	6185545	654	32	1.89	0	1273	0	0.0001	0.0005	0	0
Leismer Expansion	Slop Treater	472807	6185728	654	10	0.32	11	532	0	0.0016	0.0009	0.0002	0.0002
Leismer North West	Glycol Heater	467333	6189009	675	16	0.76	5.1	616	0	0.008	0.0047	0.0011	0.0008
Leismer North West	HP Flare Continuous	467469	6188908	675	32	3.78	0	1273	0	0.0001	0.0005	0	0
Leismer North West	LP Flare Continuous	467469	6188909	675	32	1.89	0	1273	0	0.0001	0.0005	0	0
Leismer North West	Slop Treater	467530	6189091	676	10	0.32	11	532	0	0.0016	0.0009	0.0002	0.0002
Leismer North West	OTSG 1	467349	6189167	676	27	1.68	16.7	444	0.0596	0.312	0.2005	0.0251	0.0186
Leismer North West	OTSG 2	467349	6189155	676	27	1.68	16.7	444	0.0596	0.312	0.2005	0.0251	0.0186
Leismer North West	OTSG 3	467350	6189143	675	27	1.68	16.7	444	0.0596	0.312	0.2005	0.0251	0.0186
Leismer North West	OTSG 4	467350	6189131	675	27	1.68	16.7	444	0.0596	0.312	0.2005	0.0251	0.0186
Athabasca Oil Sands Air Emissions Total Used for the Baseline, Application and Planned Development Cases									**0.715**	**4.770**	**3.239**	**0.408**	**0.302**

Area Sources																
Facility	**Emission Source**	**NW UTM E (m)**	**NW UTM N (m)**	**NE UTM E (m)**	**NE UTM N (m)**	**SE UTM E (m)**	**SE UTM N (m)**	**SW UTM E (m)**	**SW UTM N (m)**	**Area (m^2)**	**Elevation (masl)**	**SO_2 (t/d)**	**NO_X (t/d)**	**CO (t/d)**	**$PM_{2.5}$ (t/d)**	**VOC (t/d)**
Leismer Demo	Plant Fugitive	471581	6185982	472081	6185982	472081	6185482	471581	6185482	250,000	654	0	0	0	0	0.0423
Leismer Commercial	Plant Fugitive	471581	6185982	472081	6185982	472081	6185482	471581	6185482	250,000	654	0	0	0	0	0.0423
Leismer Expansion	Plant Fugitive	472477	6185867	472977	6185867	472977	6185367	472477	6185367	250,000	654	0	0	0	0	0.0846
Leismer North West	Plant Fugitive	467150	6189314	467650	6189314	467650	6188814	467150	6188814	250,000	675	0	0	0	0	0.0846
Athabasca Oil Sands Air Emissions Total Used for the Baseline, Application and Planned Development Cases												**0**	**0**	**0**	**0**	**0.254**

Note:
"0" = No emissions. OTSG = Once-through steam generators. HP = High pressure. LP = Low pressure.

Table B2-3: CNRL Existing and Approved Air Emissions Used for the Baseline and Application Cases

Point Sources													
Facility	**Emission Source**	**UTM Easting (m)**	**UTM Northing (m)**	**Elevation (masl)**	**Stack Height (m)**	**Stack Diameter (m)**	**Exit Velocity (m/s)**	**Exit Temp (K)**	**SO_2 (t/d)**	**NO_x (t/d)**	**CO (t/d)**	**$PM_{2.5}$ (t/d)**	**VOC (t/d)**
Primrose North	FGD Stack 1	526706	6081204	696	30	2.64	13	330	0.6	0.696	0.216	0.197	0.012
	FGD Stack 2	526715	6081181	696	30	2.64	13	330	0.6	0.696	0.216	0.197	0.012
	Glycol Heater (4 MW)	526764	6081140	696	7.6	0.48	7.8	393	0	0.041	0.1677	0.001	0.001
	OTSG 8 (37 MW)	526754	6081146	696	26.1	1.5	11.8	441	0.154	0.368	0.1677	0.012	0.009
	OTSG 7 (37 MW)	526751	6081155	696	26.1	1.5	11.8	441	0.154	0.368	0.1677	0.012	0.009
	OTSG 6 (37 MW)	526748	6081163	696	26.1	1.5	11.8	441	0.154	0.368	0.1677	0.012	0.009
	OTSG 5 (37 MW)	526745	6081172	696	26.1	1.5	11.8	441	0.154	0.368	0.1677	0.012	0.009
	OTSG 4 (77 MW)	526729	6081178	696	29.4	1.68	19.2	420	0.321	0.3408	0.1677	0.025	0.018
	OTSG 3 (77 MW)	526724	6081190	696	29.4	1.68	19.2	420	0.321	0.3408	0.1677	0.025	0.018
	OTSG 2 (77 MW)	526720	6081202	696	29.4	1.68	19.2	420	0.321	0.3408	0.1677	0.025	0.018
	OTSG 1 (77 MW)	526716	6081213	696	29.4	1.68	19.2	420	0.321	0.3408	0.1677	0.025	0.018
Kirby North	Steam Generator 1	485599	6146544	682	45.5	1.981	17.2	467.15	0	0.406	0.347	0.031	0.023
	Steam Generator 2	485585	6146563	682	45.5	1.981	17.2	467.15	0	0.406	0.347	0.031	0.023
	Steam Generator 3	485515	6146542	682	45.5	1.981	17.2	467.15	0	0.406	0.347	0.031	0.023
	Steam Generator 4	485529	6146522	682	45.5	1.981	17.2	467.15	0	0.406	0.347	0.031	0.023
	Steam Generator 5	485543	6146503	682	45.5	1.981	17.2	467.15	0	0.406	0.347	0.031	0.023
	Glycol Heater	485566	6146588	682	31.394	1.3	7	488.15	0	0.029	0.039	0.004	0.003
	Incinerator	485638	6146420	698	45.5	1.336	6.568	1595.37	1.6	0	0	0	0
	HP Flare (47 m H, 0.6 m D)	485301	6146622	683	44.7	2.82	0.1	1263.03	0	0.001	0.003	0	0.001
	Steam Generator 1	485225	6146592	670	27	1.6	20	423	0.04	0.29	0.257	0.023	0.017
	Steam Generator 2	485236	6146603	670	27	1.6	20	423	0.04	0.29	0.257	0.023	0.017
	Glycol Heater	485270	6146607	683	8	0.9	8	523	0	0.014	0.018	0.002	0.001

Point Sources													
Facility	**Emission Source**	**UTM Easting (m)**	**UTM Northing (m)**	**Elevation (masl)**	**Stack Height (m)**	**Stack Diameter (m)**	**Exit Velocity (m/s)**	**Exit Temp (K)**	**SO_2 (t/d)**	**NO_x (t/d)**	**CO (t/d)**	**$PM_{2.5}$ (t/d)**	**VOC (t/d)**
Kirby South	Steam Generator 1	498263	6132807	723	45.5	1.981	17.2	467.15	0	0.474	0.398	0.036	0.018
	Steam Generator 2	498263	6132791	723	45.5	1.981	17.2	467.15	0	0.474	0.398	0.036	0.018
	Steam Generator 3	498263	6132775	723	45.5	1.981	17.2	467.15	0	0.474	0.398	0.036	0.018
	Steam Generator 4	498312	6132807	723	45.5	1.981	17.2	467.15	0	0.474	0.398	0.036	0.018
	Steam Generator 5	498312	6132791	723	45.5	1.981	17.2	467.15	0	0.474	0.398	0.036	0.018
	Steam Generator 6	498312	6132775	723	45.5	1.981	17.2	467.15	0	0.474	0.398	0.036	0.018
	Glycol Heater	498262	6132828	723	31.394	0.91	13.7	609	0	0.03	0.04	0.004	0.018
	HP Flare (47 m H, 0.6 m D)	498663	6132984	723	45.5	2.39	0.4	1273	0	0.001	0.013	0	0.018
	Steam Generator 1	497450	6133407	723	45.5	1.981	17.2	467.15	0	0.406	0.347	0.031	0.023
	Steam Generator 2	497474	6133407	723	45.5	1.981	17.2	467.15	0	0.406	0.347	0.031	0.023
	Steam Generator 3	497498	6133407	723	45.5	1.981	17.2	467.15	0	0.406	0.347	0.031	0.023
	Steam Generator 4	497450	6133338	723	45.5	1.981	17.2	467.15	0	0.406	0.347	0.031	0.023
	Steam Generator 5	497474	6133338	723	45.5	1.981	17.2	467.15	0	0.406	0.347	0.031	0.023
	Glycol Heater	497506	6133339	723	31.394	1.3	7	488.15	0	0.029	0.039	0.004	0.003
	HP Flare (47 m H, 0.6 m D)	497764	6133168	723	44.7	2.82	0.1	1263.03	0	0.001	0.003	0	0.001
CNRL Air Emission Totals for Baseline and Application Cases									**4.780**	**11.9**	**8.468**	**1.129**	**0.550**

Area Sources															
Facility	**Emission Source**	**NW UTM E (m)**	**NW UTM N (m)**	**NE UTM E (m)**	**NE UTM N (m)**	**SE UTM E (m)**	**SE UTM N (m)**	**SW UTM E (m)**	**SW UTM N (m)**	**Area (m^2)**	**Elevation (masl)**	**SO_2 (t/d)**	**NO_x (t/d)**	**CO (t/d)**	**$PM_{2.5}$ (t/d)**	**VOC (t/d)**
Primrose North	Plant Fugitive	526484	6081427	526984	6081427	526984	6080927	526484	6080927	250,000	696	0	0	0	0	0.1269
Kirby North 1	Plant Fugitive	485031	6146278	485031	6146778	485531	6146778	485531	6146278	250,000	682	0	0	0	0	0.43
Kirby North 2	Plant Fugitive	485031	6146278	485031	6146778	485531	6146778	485531	6146278	250,000	682	0	0	0	0	0.258
Kirby South 1	Plant Fugitive	497701	6132814	497701	6133314	498201	6133314	498201	6132814	250,000	723	0	0	0	0	0.387
Kirby South 2	Plant Fugitive	497701	6132814	497701	6133314	498201	6133314	498201	6132814	250,000	723	0	0	0	0	0.129
CNRL Air Emission Totals for Baseline and Application Cases												**0**	**0**	**0**	**0**	**1.331**

Note:
"0" = No emissions. OTSG = Once-through steam generators. HP = High pressure. LP = Low pressure.

2.3 Cenovus Energy Inc.

Emissions Included in the Baseline and Application Cases

Cenovus Energy operates the Christina Lake and Foster Creek SAGD facilities. Christina Lake is located approximately 150 km south-southeast of Fort McMurray and has been approved to produce 218,800 bpd at full capacity in 2013. Phase G expansion is under construction resumed in the first quarter of 2017, with approved capacity of 50,000 bpd.

Foster Creek is located about 330 km northeast of Edmonton, on the Cold Lake Air Weapons Range. Cenovus Energy received the approval for the Foster Creek Phase J from the AER. The production is expected to be 50,000 bpd. Foster Creek current production is 180,000 bpd with the total capacity of 390,000 bpd.

Narrows Lake Project received regulatory approval in 2012, which is located about 150 km southeast of Fort McMurray. The project is developed based on either SAGD thermal technology or solvent aided process; it is expected to have a production capacity of approximately 130,000 bpd of bitumen, up to three phases, and a project life of up to 40 years.

Table B2-4 is a summary of the emissions that were included in the Baseline and Application cases.

2.4 Devon Canada Corp.

Emissions Included in the Baseline and Application Cases

The Devon Jackfish SAGD Project is located 15 km south of Conklin. The project is comprised of three phases, with the production of 35,000 bpd for each phase. Three phases started the operation in 2007, 2011 and 2014, respectively.

In 2014, Devon received approval for the Pike 1 project. The project is a 50/50 joint venture with BP Canada Energy and will be operated by Devon. The project is located approximately 25 km southeast of Conklin, in Lac La Biche County. SAGD technologies will be used to recover bitumen resources from the McMurray Formation. The project is expected to produce approximately 105,000 bpd of bitumen.

Table B2-5 provides a summary of the emissions that were included in the Baseline and Application cases.

devon

Table B2-4: Cenovus Existing and Approved Air Emissions Used for the Baseline and Application Cases

Point Sources													
Facility	**Emission Source**	**UTM Easting (m)**	**UTM Northing (m)**	**Elevation (masl)**	**Stack Height (m)**	**Stack Diameter (m)**	**Exit Velocity (m/s)**	**Exit Temp (K)**	**SO_2 (t/d)**	**NO_X (t/d)**	**CO (t/d)**	**$PM_{2.5}$ (t/d)**	**VOC (t/d)**
Christina Lake Thermal - Phase 1A/1B	OTSG (B-101)	506880	6159498	573	26.62	1.372	27	463	0.052	0.252	0.788	0.02	0.015
	OTSG (B-102)	506874	6159489	573	13.8	0.914	22	463	0.019	0.059	0.285	0.007	0.005
	OTSG (B-1725)	507036	6159450	573	32.9	1.676	23.3	463	0.067	0.324	1.013	0.026	0.019
	Glycol Heater (H-522)	506939	6159483	573	6.7	0.591	13.9	474	0	0.015	0.074	0.002	0.001
Christina Lake Thermal - Phase 1C	OTSG (B-2100)	507169	6159613	574	32	1.676	24.5	488	0.067	0.324	1.013	0.026	0.019
	OTSG (B-2200)	507162	6159626	574	32	1.676	24.5	488	0.067	0.324	1.013	0.026	0.019
	OTSG (B-2300)	507155	6159639	574	32	1.676	24.5	488	0.067	0.324	1.013	0.026	0.019
	OTSG (B-2400)	507147	6159652	574	32	1.676	24.5	488	0.067	0.324	1.013	0.026	0.019
	Glycol Heater (H-7100)	507380	6159601	571	9.2	0.914	9.6	474	0	0.025	0.122	0.003	0.002
Christina Lake Thermal - Phase 1D	OTSG (B-2500)	507130	6159682	574	32	1.676	24.5	488	0.067	0.324	1.013	0.026	0.019
	OTSG (B-2600)	507123	6159691	574	32	1.676	24.5	488	0.067	0.324	1.013	0.026	0.019
	OTSG (B-2700)	507116	6159709	574	32	1.676	24.5	488	0.067	0.324	1.013	0.026	0.019
	OTSG (B-2800)	507109	6159722	574	32	1.676	24.5	488	0.067	0.324	1.013	0.026	0.019
	Glycol Heater (H-7200)	507387	6159605	571	9.2	0.914	9.6	474	0	0.025	0.122	0.003	0.002
Christina Lake Thermal - Phase 1C/1D	Flash Treater (H-5070A)	507259	6159598	571	3.3	0.311	30.5	512	0	0.007	0.036	0.001	0.001
	Flash Treater (H-5070B)	507249	6159595	574	3.3	0.311	30.5	512	0	0.007	0.036	0.001	0.001
Christina Lake Thermal - Phase 1C/ 1D/1E	OTSG (B-2360)	507062	6159805	574	32	1.83	26.3	442	0.094	0.455	1.423	0.037	0.026
	OTSG (B-2460)	507055	6159818	574	32	1.83	26.3	442	0.094	0.455	1.423	0.037	0.026
Christina Lake Thermal - Phase 1E	OTSG (B-3100)	507092	6159752	574	32	1.676	24.5	488	0.067	0.324	1.013	0.026	0.019
	OTSG (B-3200)	507084	6159766	574	32	1.676	24.5	488	0.067	0.324	1.013	0.026	0.019
	OTSG (B-3300)	507077	6159779	574	32	1.676	24.5	488	0.067	0.324	1.013	0.026	0.019
	OTSG (B-3400)	507070	6159792	574	32	1.676	24.5	488	0.067	0.324	1.013	0.026	0.019
Christina Lake Thermal - Phase 1F	OTSG (B-3160)	507436	6159817	571	32	1.676	24.5	488	0.067	0.324	1.013	0.026	0.019
	OTSG (B-3260)	507429	6159831	571	32	1.676	24.5	488	0.067	0.324	1.013	0.026	0.019
	Cogenerator Unit (GT-2900, B-3360)	507486	6159780	571	32	3.34	22.7	473	0.058	1.007	1.408	0.056	0.027
	Cogenerator Unit (GT-2900, B-3460)	507471	6159808	571	32	3.34	22.7	473	0.058	1.007	1.408	0.056	0.027

Point Sources														
Facility	**Emission Source**	**UTM Easting (m)**	**UTM Northing (m)**	**Elevation (masl)**	**Stack Height (m)**	**Stack Diameter (m)**	**Exit Velocity (m/s)**	**Exit Temp (K)**	**SO_2 (t/d)**	**NO_X (t/d)**	**CO (t/d)**	**$PM_{2.5}$ (t/d)**	**VOC (t/d)**
Christina Lake Thermal - Phase 1G	OTSG (B-3500)	507412	6159861	571	32	1.676	24.5	488	0.067	0.324	1.013	0.026	0.019
	OTSG (B-3550)	507405	6159874	571	32	1.676	24.5	488	0.067	0.324	1.013	0.026	0.019
	OTSG (B-3600)	507397	6159887	571	32	1.676	24.5	488	0.067	0.324	1.013	0.026	0.019
	OTSG (B-3650)	507390	6159901	571	32	1.676	24.5	488	0.067	0.324	1.013	0.026	0.019
	OTSG (B-3700)	507383	6159914	571	32	1.676	24.5	488	0.067	0.324	1.013	0.026	0.019
Christina Lake Thermal - Phase 1E/F/G	Flash Treater (H-5270A)	507568	6159773	571	3.3	0.311	30.5	512	0	0.007	0.036	0.001	0.001
	Flash Treater (H-5270B)	507578	6159778	571	3.3	0.311	30.5	512	0	0.007	0.036	0.001	0.001
	Glycol Heater (H-7300)	507623	6159709	571	9.2	0.914	9.6	474	0	0.025	0.122	0.003	0.002
Christina Lake Thermal - Phase 1G	Glycol Heater (H-7300B)	507614	6159704	571	9.2	0.914	9.6	474	0	0.025	0.122	0.003	0.002
Christina Lake Thermal - Phase 1H	OTSG (B-3750)	507366	6159944	571	32	1.68	24.5	488	0.067	0.324	1.013	0.026	0.019
	OTSG (B-3800)	507359	6159957	571	32	1.68	24.5	488	0.067	0.324	1.013	0.026	0.019
	OTSG (B-3850)	507352	6159970	571	32	1.68	24.5	488	0.067	0.324	1.013	0.026	0.019
	OTSG (B-3900)	507344	6159984	571	32	1.68	24.5	488	0.067	0.324	1.013	0.026	0.019
	OTSG (B-3950)	507337	6159997	571	32	1.68	24.5	488	0.067	0.324	1.013	0.026	0.019
	Glycol Heater (H-7300C)	507606	6159698	571	9.2	0.914	9.6	474	0	0.025	0.122	0.003	0.002
Narrows Lake Thermal Phase 1	Steam Generator(B-2100)	507435	6167162	564	32	1.68	24.5	488	0.024	0.324	1.013	0.026	0.019
	Steam Generator(B-2150)	507415	6167162	564	32	1.68	24.5	488	0.024	0.324	1.013	0.026	0.019
Narrows Lake Thermal Phase 1	Steam Generator(B-2200)	507395	6167162	564	32	1.68	24.5	488	0.024	0.324	1.013	0.026	0.019
	Steam Generator (B-2250)	507375	6167162	564	32	1.68	24.5	488	0.024	0.324	1.013	0.026	0.019
	Steam Generator (B-2300)	507355	6167162	564	32	1.68	24.5	488	0.024	0.324	1.013	0.026	0.019
	Steam Generator (B-2400)	507315	6167162	564	32	1.68	24.5	488	0.024	0.324	1.013	0.026	0.019
	Steam Generator (B-2450)	507295	6167162	564	32	1.68	24.5	488	0.024	0.324	1.013	0.026	0.019
	Steam Generator (B-2500)	507275	6167162	564	32	1.68	24.5	488	0.024	0.324	1.013	0.026	0.019
	Steam Generator (B-2550)	507255	6167162	564	32	1.68	24.5	488	0.024	0.324	1.013	0.026	0.019
	Steam Generator (B-2600)	507235	6167162	564	32	1.68	24.5	488	0.024	0.324	1.013	0.026	0.019
	Steam Generator (B-2700)	507195	6167162	564	32	1.68	24.5	488	0.024	0.324	1.013	0.026	0.019
	Steam Generator (B-2750)	507175	6167162	564	32	1.68	24.5	488	0.024	0.324	1.013	0.026	0.019
	Steam Generator (B-2800)	507155	6167162	564	32	1.68	24.5	488	0.024	0.324	1.013	0.026	0.019
	Steam Generator (B-2850)	507135	6167162	564	32	1.68	24.5	488	0.024	0.324	1.013	0.026	0.019
	Steam Generator (B-2900)	507115	6167162	564	32	1.68	24.5	488	0.024	0.324	1.013	0.026	0.019
	Steam Generator (H-7100)	507565	6166983	565	9.2	0.91	9.6	474	0	0.025	0.122	0.003	0.002

Point Sources														
Facility	**Emission Source**	**UTM Easting (m)**	**UTM Northing (m)**	**Elevation (masl)**	**Stack Height (m)**	**Stack Diameter (m)**	**Exit Velocity (m/s)**	**Exit Temp (K)**	**SO_2 (t/d)**	**NO_X (t/d)**	**CO (t/d)**	**$PM_{2.5}$ (t/d)**	**VOC (t/d)**
	Steam Generator (H-7110)	507565	6166992	565	9.2	0.91	9.6	474	0	0.025	0.122	0.003	0.002
	Slop Oil Treater Reheater (H-5070A)	507495	6167004	565	3.3	0.31	30.5	512	0	0.0072	0.036	0.001	0.001
	Slop Oil Treater Reheater (H-5070B)	507495	6166992	565	3.3	0.31	30.5	512	0	0.0072	0.036	0.001	0.001
	Process Glycol Heater	507847	6167022	565	6.4	0.71	12.2	483	0	0.0408	0.066	0.002	0.001
	SRU Preheater	507885	6167053	565	6.3	0.26	4.6	873	0	0	0.001	0	0
	Sulphur Incinerator	507930	6167058	565	29	0.91	15	811	1.640	0	0	0	0
	Well Pad Turbine	504641	6172293	568	6.1	0.61	20	773	0	0.014	0.005	0	0
	Well Pad Turbine	505441	6172293	570	6.1	0.61	20	773	0	0.014	0.005	0	0
	Well Pad Turbine	504431	6171597	569	6.1	0.61	20	773	0	0.014	0.005	0	0
Narrows Lake Thermal Phase 1	Well Pad Turbine	505881	6171565	572	6.1	0.61	20	773	0	0.014	0.005	0	0
	Well Pad Turbine	506218	6172061	570	6.1	0.61	20	773	0	0.014	0.005	0	0
	Well Pad Turbine	505881	6170766	573	6.1	0.61	20	773	0	0.014	0.005	0	0
	Well Pad Turbine	505081	6170689	571	6.1	0.61	20	773	0	0.014	0.005	0	0
	Well Pad Turbine	504451	6170888	570	6.1	0.61	20	773	0	0.014	0.005	0	0
	Well Pad Turbine	504293	6170802	571	6.1	0.61	20	773	0	0.014	0.005	0	0
	Well Pad Turbine	504387	6169881	564	6.1	0.61	20	773	0	0.014	0.005	0	0
	Well Pad Turbine	505229	6169659	564	6.1	0.61	20	773	0	0.014	0.005	0	0
	Well Pad Turbine	505019	6169325	564	6.1	0.61	20	773	0	0.014	0.005	0	0
	Well Pad Turbine	503546	6168771	565	6.1	0.61	20	773	0	0.014	0.005	0	0
	Well Pad Turbine	501066	6169915	564	6.1	0.61	20	773	0	0.014	0.005	0	0
	Well Pad Turbine	500248	6169866	565	6.1	0.61	20	773	0	0.014	0.005	0	0
	Well Pad Turbine	500352	6169571	565	6.1	0.61	20	773	0	0.014	0.005	0	0
	Well Pad Turbine	498808	6168912	561	6.1	0.61	20	773	0	0.014	0.005	0	0
	Well Pad Turbine	499170	6168360	561	6.1	0.61	20	773	0	0.014	0.005	0	0
	Well Pad Turbine	500173	6167870	562	6.1	0.61	20	773	0	0.014	0.005	0	0
	Well Pad Turbine	499385	6167584	562	6.1	0.61	20	773	0	0.014	0.005	0	0
	Well Pad Turbine	499648	6166781	563	6.1	0.61	20	773	0	0.014	0.005	0	0
	Well Pad Turbine	497109	6166593	561	6.1	0.61	20	773	0	0.014	0.005	0	0
	Well Pad Turbine	497596	6166578	563	6.1	0.61	20	773	0	0.014	0.005	0	0
	Well Pad Turbine	497791	6166676	563	6.1	0.61	20	773	0	0.014	0.005	0	0

Point Sources														
Facility	**Emission Source**	**UTM Easting (m)**	**UTM Northing (m)**	**Elevation (masl)**	**Stack Height (m)**	**Stack Diameter (m)**	**Exit Velocity (m/s)**	**Exit Temp (K)**	**SO_2 (t/d)**	**NO_X (t/d)**	**CO (t/d)**	**$PM_{2.5}$ (t/d)**	**VOC (t/d)**
	Well Pad Turbine	497976	6166751	563	6.1	0.61	20	773	0	0.014	0.005	0	0
	Well Pad Turbine	498146	6166578	563	6.1	0.61	20	773	0	0.014	0.005	0	0
	Well Pad Turbine	499338	6165857	562	6.1	0.61	20	773	0	0.014	0.005	0	0
	Well Pad Turbine	499545	6165671	562	6.1	0.61	20	773	0	0.014	0.005	0	0
	Well Pad Turbine	499509	6164798	561	6.1	0.61	20	773	0	0.014	0.005	0	0
	Well Pad Turbine	499511	6164108	567	6.1	0.61	20	773	0	0.014	0.005	0	0
	Well Pad Turbine	499512	6163567	566	6.1	0.61	20	773	0	0.014	0.005	0	0
	Well Pad Turbine	500224	6163318	566	6.1	0.61	20	773	0	0.014	0.005	0	0
	Well Pad Turbine	500679	6163304	567	6.1	0.61	20	773	0	0.014	0.005	0	0
Narrows Lake Thermal Phase 1	Well Pad Turbine	500337	6165654	562	6.1	0.61	20	773	0	0.014	0.005	0	0
	Well Pad Turbine	500710	6165708	562	6.1	0.61	20	773	0	0.014	0.005	0	0
	Well Pad Turbine	500369	6164257	568	6.1	0.61	20	773	0	0.014	0.005	0	0
	Well Pad Turbine	501272	6163912	564	6.1	0.61	20	773	0	0.014	0.005	0	0
	Well Pad Turbine	501748	6164030	564	6.1	0.61	20	773	0	0.014	0.005	0	0
	Well Pad Turbine	501773	6164426	565	6.1	0.61	20	773	0	0.014	0.005	0	0
	Well Pad Turbine	501884	6164766	560	6.1	0.61	20	773	0	0.014	0.005	0	0
	Well Pad Turbine	500971	6164109	568	6.1	0.61	20	773	0	0.014	0.005	0	0
	Well Pad Turbine	501073	6164311	568	6.1	0.61	20	773	0	0.014	0.005	0	0
	Well Pad Turbine	501257	6164309	565	6.1	0.61	20	773	0	0.014	0.005	0	0
	Well Pad Turbine	503433	6165060	561	6.1	0.61	20	773	0	0.014	0.005	0	0
	Well Pad Turbine	502802	6165118	561	6.1	0.61	20	773	0	0.014	0.005	0	0
	Well Pad Turbine	502571	6164943	561	6.1	0.61	20	773	0	0.014	0.005	0	0
	Well Pad Turbine	502380	6164450	565	6.1	0.61	20	773	0	0.014	0.005	0	0
	Well Pad Turbine	502872	6164570	561	6.1	0.61	20	773	0	0.014	0.005	0	0
	Well Pad Turbine	503097	6164568	561	6.1	0.61	20	773	0	0.014	0.005	0	0
	Well Pad Turbine	503459	6164645	561	6.1	0.61	20	773	0	0.014	0.005	0	0
	Well Pad Turbine	503697	6164603	561	6.1	0.61	20	773	0	0.014	0.005	0	0
	Well Pad Turbine	504560	6166889	562	6.1	0.61	20	773	0	0.014	0.005	0	0
	Well Pad Turbine	506851	6166586	564	6.1	0.61	20	773	0	0.014	0.005	0	0
	Well Pad Turbine	506227	6166331	560	6.1	0.61	20	773	0	0.014	0.005	0	0
	Well Pad Turbine	508046	6166150	559	6.1	0.61	20	773	0	0.014	0.005	0	0
	Well Pad Turbine	506724	6165617	561	6.1	0.61	20	773	0	0.014	0.005	0	0

Point Sources													
Facility	**Emission Source**	**UTM Easting (m)**	**UTM Northing (m)**	**Elevation (masl)**	**Stack Height (m)**	**Stack Diameter (m)**	**Exit Velocity (m/s)**	**Exit Temp (K)**	**SO_2 (t/d)**	**NO_X (t/d)**	**CO (t/d)**	**$PM_{2.5}$ (t/d)**	**VOC (t/d)**
	Well Pad Turbine	506007	6165617	561	6.1	0.61	20	773	0	0.014	0.005	0	0
	Well Pad Turbine	504660	6166089	560	6.1	0.61	20	773	0	0.014	0.005	0	0
	Well Pad Turbine	504453	6165965	560	6.1	0.61	20	773	0	0.014	0.005	0	0
	Well Pad Turbine	504667	6165768	560	6.1	0.61	20	773	0	0.014	0.005	0	0
	Well Pad Turbine	504461	6165169	561	6.1	0.61	20	773	0	0.014	0.005	0	0
	Well Pad Turbine	505197	6164757	561	6.1	0.61	20	773	0	0.014	0.005	0	0
	Well Pad Turbine	505249	6165618	561	6.1	0.61	20	773	0	0.014	0.005	0	0
Narrows Lake Thermal Phase 1	Well Pad Turbine	505456	6165784	561	6.1	0.61	20	773	0	0.014	0.005	0	0
	Well Pad Turbine	506730	6164371	559	6.1	0.61	20	773	0	0.014	0.005	0	0
	Well Pad Turbine	507066	6164423	559	6.1	0.61	20	773	0	0.014	0.005	0	0
	Well Pad Turbine	512845	6164717	559	6.1	0.61	20	773	0	0.014	0.005	0	0
	Well Pad Turbine	512578	6165887	559	6.1	0.61	20	773	0	0.014	0.005	0	0
	Well Pad Turbine	513956	6166238	567	6.1	0.61	20	773	0	0.014	0.005	0	0
	Well Pad Turbine	513165	6166078	558	6.1	0.61	20	773	0	0.014	0.005	0	0
	Well Pad Turbine	513162	6166654	561	6.1	0.61	20	773	0	0.014	0.005	0	0
	Well Pad Turbine	512537	6166831	562	6.1	0.61	20	773	0	0.014	0.005	0	0
	Well Pad Turbine	511094	6166771	563	6.1	0.61	20	773	0	0.014	0.005	0	0
	Well Pad Turbine	512534	6167521	561	6.1	0.61	20	773	0	0.014	0.005	0	0
	Well Pad Turbine	510690	6168448	561	6.1	0.61	20	773	0	0.014	0.005	0	0
	Well Pad Turbine	512325	6168348	561	6.1	0.61	20	773	0	0.014	0.005	0	0
	Well Pad Turbine	510506	6166391	557	6.1	0.61	20	773	0	0.014	0.005	0	0
	Well Pad Turbine	509990	6165940	557	6.1	0.61	20	773	0	0.014	0.005	0	0
	Well Pad Turbine	509664	6168359	560	6.1	0.61	20	773	0	0.014	0.005	0	0
	Well Pad Turbine	509090	6167958	565	6.1	0.61	20	773	0	0.014	0.005	0	0
	Well Pad Turbine	509694	6167622	561	6.1	0.61	20	773	0	0.014	0.005	0	0
	Well Pad Turbine	510940	6167779	562	6.1	0.61	20	773	0	0.014	0.005	0	0
	Well Pad Turbine	510302	6167972	561	6.1	0.61	20	773	0	0.014	0.005	0	0
	Well Pad Turbine	507872	6168352	564	6.1	0.61	20	773	0	0.014	0.005	0	0
	Well Pad Turbine	508398	6167732	565	6.1	0.61	20	773	0	0.014	0.005	0	0
	Well Pad Turbine	507534	6167819	564	6.1	0.61	20	773	0	0.014	0.005	0	0
	Well Pad Turbine	509669	6166658	562	6.1	0.61	20	773	0	0.014	0.005	0	0
	Well Pad Turbine	509763	6166882	562	6.1	0.61	20	773	0	0.014	0.005	0	0

Point Sources														
Facility	**Emission Source**	**UTM Easting (m)**	**UTM Northing (m)**	**Elevation (masl)**	**Stack Height (m)**	**Stack Diameter (m)**	**Exit Velocity (m/s)**	**Exit Temp (K)**	**SO_2 (t/d)**	**NO_X (t/d)**	**CO (t/d)**	**$PM_{2.5}$ (t/d)**	**VOC (t/d)**
	Well Pad Turbine	507219	6167697	564	6.1	0.61	20	773	0	0.014	0.005	0	0
	Well Pad Turbine	508662	6169856	566	6.1	0.61	20	773	0	0.014	0.005	0	0
	Well Pad Turbine	507975	6169416	565	6.1	0.61	20	773	0	0.014	0.005	0	0
	Well Pad Turbine	508748	6169687	566	6.1	0.61	20	773	0	0.014	0.005	0	0
	Well Pad Turbine	510056	6169136	564	6.1	0.61	20	773	0	0.014	0.005	0	0
Narrows Lake Thermal Phase 1	Well Pad Turbine	510237	6168796	564	6.1	0.61	20	773	0	0.014	0.005	0	0
	Well Pad Turbine	510369	6169067	564	6.1	0.61	20	773	0	0.014	0.005	0	0
	Well Pad Turbine	512142	6169008	563	6.1	0.61	20	773	0	0.014	0.005	0	0
	Well Pad Turbine	500953	6169691	564	6.1	0.61	20	773	0	0.014	0.005	0	0
	Well Pad Turbine	511047	6167592	562	6.1	0.61	20	773	0	0.014	0.005	0	0
	Well Pad Turbine	510532	6168466	561	6.1	0.61	20	773	0	0.014	0.005	0	0
	Well Pad Turbine	510630	6168297	561	6.1	0.61	20	773	0	0.014	0.005	0	0
	Well Pad Turbine	510366	6167166	562	6.1	0.61	20	773	0	0.014	0.005	0	0
	Well Pad Turbine	510377	6166943	562	6.1	0.61	20	773	0	0.014	0.005	0	0
	Well Pad Turbine	504086	6170594	571	6.1	0.61	20	773	0	0.014	0.005	0	0
	Well Pad Turbine	503243	6169344	565	6.1	0.61	20	773	0	0.014	0.005	0	0
	Well Pad Turbine	503827	6169931	563	6.1	0.61	20	773	0	0.014	0.005	0	0
	Well Pad Turbine	503038	6168508	566	6.1	0.61	20	773	0	0.014	0.005	0	0
	Well Pad Line Heater	504643	6172326	568	4.6	0.36	4	959	0	0.001	0.002	0	0
	Well Pad Line Heater	505443	6172326	570	4.6	0.36	4	959	0	0.001	0.002	0	0
	Well Pad Line Heater	504433	6171631	569	4.6	0.36	4	959	0	0.001	0.002	0	0
	Well Pad Line Heater	505883	6171598	571	4.6	0.36	4	959	0	0.001	0.002	0	0
	Well Pad Line Heater	506220	6172094	570	4.6	0.36	4	959	0	0.001	0.002	0	0
	Well Pad Line Heater	505883	6170799	573	4.6	0.36	4	959	0	0.001	0.002	0	0
	Well Pad Line Heater	505083	6170723	571	4.6	0.36	4	959	0	0.001	0.002	0	0
	Well Pad Line Heater	504453	6170921	570	4.6	0.36	4	959	0	0.001	0.002	0	0
	Well Pad Line Heater	504295	6170835	571	4.6	0.36	4	959	0	0.001	0.002	0	0
	Well Pad Line Heater	504388	6169915	564	4.6	0.36	4	959	0	0.001	0.002	0	0
	Well Pad Line Heater	505230	6169692	564	4.6	0.36	4	959	0	0.001	0.002	0	0
	Well Pad Line Heater	505020	6169359	564	4.6	0.36	4	959	0	0.001	0.002	0	0
	Well Pad Line Heater	503547	6168805	565	4.6	0.36	4	959	0	0.001	0.002	0	0
	Well Pad Line Heater	501068	6169948	564	4.6	0.36	4	959	0	0.001	0.002	0	0

Point Sources

Facility	Emission Source	UTM Easting (m)	UTM Northing (m)	Elevation (masl)	Stack Height (m)	Stack Diameter (m)	Exit Velocity (m/s)	Exit Temp (K)	SO_2 (t/d)	NO_X (t/d)	CO (t/d)	$PM_{2.5}$ (t/d)	VOC (t/d)
	Well Pad Line Heater	500249	6169899	565	4.6	0.36	4	959	0	0.001	0.002	0	0
	Well Pad Line Heater	500354	6169604	565	4.6	0.36	4	959	0	0.001	0.002	0	0
	Well Pad Line Heater	498810	6168946	561	4.6	0.36	4	959	0	0.001	0.002	0	0
Narrows Lake Thermal Phase 1	Well Pad Line Heater	499171	6168394	561	4.6	0.36	4	959	0	0.001	0.002	0	0
	Well Pad Line Heater	500175	6167903	562	4.6	0.36	4	959	0	0.001	0.002	0	0
	Well Pad Line Heater	499387	6167617	562	4.6	0.36	4	959	0	0.001	0.002	0	0
	Well Pad Line Heater	499650	6166814	563	4.6	0.36	4	959	0	0.001	0.002	0	0
	Well Pad Line Heater	497111	6166626	561	4.6	0.36	4	959	0	0.001	0.002	0	0
	Well Pad Line Heater	497598	6166611	563	4.6	0.36	4	959	0	0.001	0.002	0	0
	Well Pad Line Heater	497793	6166709	563	4.6	0.36	4	959	0	0.001	0.002	0	0
	Well Pad Line Heater	497978	6166784	563	4.6	0.36	4	959	0	0.001	0.002	0	0
	Well Pad Line Heater	498148	6166612	563	4.6	0.36	4	959	0	0.001	0.002	0	0
	Well Pad Line Heater	499339	6165890	562	4.6	0.36	4	959	0	0.001	0.002	0	0
	Well Pad Line Heater	499547	6165705	562	4.6	0.36	4	959	0	0.001	0.002	0	0
	Well Pad Line Heater	499510	6164832	561	4.6	0.36	4	959	0	0.001	0.002	0	0
	Well Pad Line Heater	499513	6164142	567	4.6	0.36	4	959	0	0.001	0.002	0	0
	Well Pad Line Heater	499513	6163600	566	4.6	0.36	4	959	0	0.001	0.002	0	0
	Well Pad Line Heater	500226	6163351	566	4.6	0.36	4	959	0	0.001	0.002	0	0
	Well Pad Line Heater	500680	6163337	567	4.6	0.36	4	959	0	0.001	0.002	0	0
	Well Pad Line Heater	500338	6165688	562	4.6	0.36	4	959	0	0.001	0.002	0	0
	Well Pad Line Heater	500712	6165741	562	4.6	0.36	4	959	0	0.001	0.002	0	0
	Well Pad Line Heater	500370	6164290	568	4.6	0.36	4	959	0	0.001	0.002	0	0
	Well Pad Line Heater	501273	6163946	564	4.6	0.36	4	959	0	0.001	0.002	0	0
	Well Pad Line Heater	501749	6164063	565	4.6	0.36	4	959	0	0.001	0.002	0	0
	Well Pad Line Heater	501775	6164459	565	4.6	0.36	4	959	0	0.001	0.002	0	0
	Well Pad Line Heater	501885	6164799	561	4.6	0.36	4	959	0	0.001	0.002	0	0
	Well Pad Line Heater	500973	6164142	568	4.6	0.36	4	959	0	0.001	0.002	0	0
	Well Pad Line Heater	501075	6164344	568	4.6	0.36	4	959	0	0.001	0.002	0	0
	Well Pad Line Heater	501259	6164342	565	4.6	0.36	4	959	0	0.001	0.002	0	0
	Well Pad Line Heater	503434	6165093	561	4.6	0.36	4	959	0	0.001	0.002	0	0
	Well Pad Line Heater	502804	6165151	561	4.6	0.36	4	959	0	0.001	0.002	0	0
	Well Pad Line Heater	502573	6164976	561	4.6	0.36	4	959	0	0.001	0.002	0	0

Point Sources													
Facility	**Emission Source**	**UTM Easting (m)**	**UTM Northing (m)**	**Elevation (masl)**	**Stack Height (m)**	**Stack Diameter (m)**	**Exit Velocity (m/s)**	**Exit Temp (K)**	**SO_2 (t/d)**	**NO_X (t/d)**	**CO (t/d)**	**$PM_{2.5}$ (t/d)**	**VOC (t/d)**
	Well Pad Line Heater	502382	6164483	565	4.6	0.36	4	959	0	0.001	0.002	0	0
Narrows Lake Thermal Phase 1	Well Pad Line Heater	502874	6164603	561	4.6	0.36	4	959	0	0.001	0.002	0	0
	Well Pad Line Heater	503098	6164601	561	4.6	0.36	4	959	0	0.001	0.002	0	0
	Well Pad Line Heater	503461	6164679	561	4.6	0.36	4	959	0	0.001	0.002	0	0
	Well Pad Line Heater	503699	6164636	561	4.6	0.36	4	959	0	0.001	0.002	0	0
	Well Pad Line Heater	504562	6166922	562	4.6	0.36	4	959	0	0.001	0.002	0	0
	Well Pad Line Heater	506852	6166619	564	4.6	0.36	4	959	0	0.001	0.002	0	0
	Well Pad Line Heater	506228	6166364	560	4.6	0.36	4	959	0	0.001	0.002	0	0
	Well Pad Line Heater	508047	6166183	559	4.6	0.36	4	959	0	0.001	0.002	0	0
	Well Pad Line Heater	506726	6165650	561	4.6	0.36	4	959	0	0.001	0.002	0	0
	Well Pad Line Heater	506009	6165650	561	4.6	0.36	4	959	0	0.001	0.002	0	0
	Well Pad Line Heater	504662	6166123	560	4.6	0.36	4	959	0	0.001	0.002	0	0
	Well Pad Line Heater	504454	6165998	560	4.6	0.36	4	959	0	0.001	0.002	0	0
	Well Pad Line Heater	504669	6165802	560	4.6	0.36	4	959	0	0.001	0.002	0	0
	Well Pad Line Heater	504463	6165203	561	4.6	0.36	4	959	0	0.001	0.002	0	0
	Well Pad Line Heater	505198	6164790	561	4.6	0.36	4	959	0	0.001	0.002	0	0
	Well Pad Line Heater	505250	6165651	560	4.6	0.36	4	959	0	0.001	0.002	0	0
	Well Pad Line Heater	505458	6165818	561	4.6	0.36	4	959	0	0.001	0.002	0	0
	Well Pad Line Heater	506732	6164405	559	4.6	0.36	4	959	0	0.001	0.002	0	0
	Well Pad Line Heater	507068	6164456	559	4.6	0.36	4	959	0	0.001	0.002	0	0
	Well Pad Line Heater	512847	6164750	559	4.6	0.36	4	959	0	0.001	0.002	0	0
	Well Pad Line Heater	512579	6165921	559	4.6	0.36	4	959	0	0.001	0.002	0	0
	Well Pad Line Heater	513957	6166271	567	4.6	0.36	4	959	0	0.001	0.002	0	0
	Well Pad Line Heater	513167	6166111	558	4.6	0.36	4	959	0	0.001	0.002	0	0
	Well Pad Line Heater	513163	6166687	561	4.6	0.36	4	959	0	0.001	0.002	0	0
	Well Pad Line Heater	512538	6166865	562	4.6	0.36	4	959	0	0.001	0.002	0	0
	Well Pad Line Heater	511096	6166804	563	4.6	0.36	4	959	0	0.001	0.002	0	0
	Well Pad Line Heater	512536	6167554	561	4.6	0.36	4	959	0	0.001	0.002	0	0
	Well Pad Line Heater	510692	6168482	561	4.6	0.36	4	959	0	0.001	0.002	0	0
	Well Pad Line Heater	512327	6168381	561	4.6	0.36	4	959	0	0.001	0.002	0	0
	Well Pad Line Heater	510508	6166425	557	4.6	0.36	4	959	0	0.001	0.002	0	0
	Well Pad Line Heater	509992	6165973	557	4.6	0.36	4	959	0	0.001	0.002	0	0

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Point Sources														
Facility	**Emission Source**	**UTM Easting (m)**	**UTM Northing (m)**	**Elevation (masl)**	**Stack Height (m)**	**Stack Diameter (m)**	**Exit Velocity (m/s)**	**Exit Temp (K)**	**SO_2 (t/d)**	**NO_X (t/d)**	**CO (t/d)**	**$PM_{2.5}$ (t/d)**	**VOC (t/d)**
Narrows Lake Thermal Phase 1	Well Pad Line Heater	509666	6168392	560	4.6	0.36	4	959	0	0.001	0.002	0	0
	Well Pad Line Heater	509091	6167991	565	4.6	0.36	4	959	0	0.001	0.002	0	0
	Well Pad Line Heater	509696	6167655	561	4.6	0.36	4	959	0	0.001	0.002	0	0
	Well Pad Line Heater	510942	6167812	562	4.6	0.36	4	959	0	0.001	0.002	0	0
	Well Pad Line Heater	510303	6168006	561	4.6	0.36	4	959	0	0.001	0.002	0	0
	Well Pad Line Heater	507874	6168385	564	4.6	0.36	4	959	0	0.001	0.002	0	0
	Well Pad Line Heater	508399	6167765	565	4.6	0.36	4	959	0	0.001	0.002	0	0
	Well Pad Line Heater	507536	6167852	564	4.6	0.36	4	959	0	0.001	0.002	0	0
	Well Pad Line Heater	509671	6166692	562	4.6	0.36	4	959	0	0.001	0.002	0	0
	Well Pad Line Heater	509765	6166916	562	4.6	0.36	4	959	0	0.001	0.002	0	0
	Well Pad Line Heater	507220	6167730	564	4.6	0.36	4	959	0	0.001	0.002	0	0
	Well Pad Line Heater	508664	6169889	566	4.6	0.36	4	959	0	0.001	0.002	0	0
	Well Pad Line Heater	507977	6169449	565	4.6	0.36	4	959	0	0.001	0.002	0	0
	Well Pad Line Heater	508750	6169720	566	4.6	0.36	4	959	0	0.001	0.002	0	0
	Well Pad Line Heater	510058	6169169	564	4.6	0.36	4	959	0	0.001	0.002	0	0
	Well Pad Line Heater	510239	6168829	564	4.6	0.36	4	959	0	0.001	0.002	0	0
	Well Pad Line Heater	510371	6169101	564	4.6	0.36	4	959	0	0.001	0.002	0	0
	Well Pad Line Heater	512144	6169042	563	4.6	0.36	4	959	0	0.001	0.002	0	0
	Well Pad Line Heater	500954	6169724	564	4.6	0.36	4	959	0	0.001	0.002	0	0
	Well Pad Line Heater	511049	6167626	562	4.6	0.36	4	959	0	0.001	0.002	0	0
	Well Pad Line Heater	510534	6168499	561	4.6	0.36	4	959	0	0.001	0.002	0	0
	Well Pad Line Heater	510632	6168330	561	4.6	0.36	4	959	0	0.001	0.002	0	0
	Well Pad Line Heater	510368	6167199	562	4.6	0.36	4	959	0	0.001	0.002	0	0
	Well Pad Line Heater	510379	6166976	562	4.6	0.36	4	959	0	0.001	0.002	0	0
	Well Pad Line Heater	504087	6170628	571	4.6	0.36	4	959	0	0.001	0.002	0	0
	Well Pad Line Heater	503244	6169377	565	4.6	0.36	4	959	0	0.001	0.002	0	0
	Well Pad Line Heater	503828	6169965	563	4.6	0.36	4	959	0	0.001	0.002	0	0
	Well Pad Line Heater	503040	6168541	566	4.6	0.36	4	959	0	0.001	0.002	0	0
Foster Creek 1A-E	Cogen #1	529663	6102406	666	26	3.4	21	448	0.084	0.92	1.2	0.057	0.026
	Cogen #2	529643	6102368	666	26	3.4	21	448	0.084	0.92	1.2	0.057	0.026
	Cogen Air Handling Heater AH-1201	529650	6102408	666	22	0.51	12	448	0	0.0044	0.021	0.00055	0.00039

Point Sources													
Facility	**Emission Source**	**UTM Easting (m)**	**UTM Northing (m)**	**Elevation (masl)**	**Stack Height (m)**	**Stack Diameter (m)**	**Exit Velocity (m/s)**	**Exit Temp (K)**	**SO_2 (t/d)**	**NO_X (t/d)**	**CO (t/d)**	**$PM_{2.5}$ (t/d)**	**VOC (t/d)**
	Cogen Air Handling Heater AH-1202	529620	6102363	666	21	0.51	12	448	0	0.0044	0.021	0.00055	0.00039
	Steam Generator B-0201	529736	6102529	665	27	1.4	16	447.2	0.07	0.2	0.58	0.015	0.011
Foster Creek 1A-E	Steam Generator B-0202	529729	6102519	665	27	1.4	16	447.2	0.07	0.2	0.58	0.015	0.011
	Steam Generator B-0203	529685	6102562	665	27	1.4	16	447.2	0.07	0.2	0.58	0.015	0.011
	Steam Generator B-0204	529680	6102552	665	27	1.4	16	447.2	0.07	0.2	0.58	0.015	0.011
	Steam Generator B-0205	529713	6102493	666	27	1.4	16	447.2	0.07	0.2	0.58	0.015	0.011
	Glycol Heater H-0501	529716	6102588	665	8.2	0.76	12	533	0	0.024	0.093	0.0024	0.0017
	Fuel Gas Heater H-0502	529797	6102590	665	7.7	0.61	2	533	0	0.0016	0.0078	0.0002	0.00014
	Hot Oil Heater H-0503	529662	6102630	665	8	0.61	4.6	533	0	0.0037	0.018	0.00046	0.00033
	Well Pad Heater (H-2001)	530439	6102875	666	6.6	0.41	3.6	533	0	0.0012	0.006	0.00015	0.00011
	Well Pad Heater (H-2101)	529885	6102492	666	6.6	0.41	3.6	533	0	0.0012	0.006	0.00015	0.00011
	Well Pad Heater (H-2201)	528916	6102768	667	6.6	0.41	3.6	533	0	0.0012	0.006	0.00015	0.00011
	Well Pad Heater (H-2301)	528805	6102756	667	6.6	0.41	3.6	533	0	0.0012	0.006	0.00015	0.00011
	Fuel Gas Heater H-0514	529792	6102594	665	8.2	0.61	2.4	533	0	0.0031	0.015	0.00038	0.00028
	Steam Generator B-0206	529793	6102876	665	27	1.7	21	488.2	0	0.32	1	0.026	0.019
	Steam Generator B-0207	529780	6102884	665	27	1.7	21	488.2	0	0.32	1	0.026	0.019
	Steam Generator B-0208	529768	6102893	665	27	1.7	21	488.2	0	0.32	1	0.026	0.019
	Steam Generator B-0209	529755	6102901	665	27	1.7	21	488.2	0	0.32	1	0.026	0.019
	Glycol Heater H-0501B	529764	6102798	665	8.2	0.91	4.1	579.8	0	0.024	0.093	0.0024	0.0017
	Steam Generator B-0210	529828	6102817	665	30	1.7	21	488.2	0	0.32	1	0.026	0.019
	Steam Generator B-0211	529836	6102830	665	30	1.7	21	488.2	0	0.32	1	0.026	0.019
	Steam Generator B-0212	529845	6102842	665	30	1.7	21	488.2	0	0.32	1	0.026	0.019
	Steam Generator B-0213	529853	6102855	665	30	1.7	21	488.2	0	0.32	1	0.026	0.019
	Steam Generator B-0214	529862	6102868	665	30	1.7	21	488.2	0	0.32	1	0.026	0.019
	Steam Generator B-0215	529870	6102880	665	30	1.7	21	488.2	0	0.32	1	0.026	0.019
	Glycol Heater H- 0501C	529753	6102840	665	8.2	0.91	4.1	579.8	0	0.024	0.093	0.0024	0.0017
	Glycol Heater H-0564-1	529485	6102503	665	6.4	0.2	4.8	479	0	0.0041	0.02	0.00051	0.00037
	Glycol Heater H-0564-2	529485	6102502	665	6.4	0.2	4.8	479	0	0.0041	0.02	0.00051	0.00037
	Disposal Water Heater	529850	6102561	665	8.2	0.51	3.8	505	0	0.0033	0.016	0.00041	0.00029
	Tricanter Glycol Heater	529374	6102932	665	8.6	0.61	3.2	562	0	0.0035	0.017	0.00043	0.00031

Point Sources													
Facility	**Emission Source**	**UTM Easting (m)**	**UTM Northing (m)**	**Elevation (masl)**	**Stack Height (m)**	**Stack Diameter (m)**	**Exit Velocity (m/s)**	**Exit Temp (K)**	**SO_2 (t/d)**	**NO_X (t/d)**	**CO (t/d)**	**$PM_{2.5}$ (t/d)**	**VOC (t/d)**
	Heated Source Water Tank Heater	529378	6102854	665	10	0.51	2	475	0	0.0012	0.006	0.00015	0.00011
Foster Creek 1A-E	Heated Source Water Tank Heater	529383	6102859	665	9	0.51	2	475	0	0.0005	0.0024	0.000061	0.000045
	Slop/Clean Oil Tank T202C Heater	529350	6102907	665	11	0.41	2.1	475	0	0.0013	0.0063	0.00016	0.00012
	Slop/Clean Oil Tank T202C Heater	529333	6102903	665	11	0.41	2.1	475	0	0.0013	0.0063	0.00016	0.00012
	Brine Tank Heater	529359	6102859	665	9.1	0.31	2.2	475	0	0.0016	0.0078	0.0002	0.00014
Foster Creek SRF	Process Glycol Boiler	530273	6102801	666	14	0.81	12	499.2	0	0.017	0.081	0.0021	0.0015
	Process Glycol Boiler	530277	6102801	666	14	0.81	12	499.2	0	0.017	0.081	0.0021	0.0015
	Utility Glycol Boiler	530256	6102864	666	14	0.51	8.2	447.2	0	0.005	0.024	0.00061	0.00045
	Air Preheater A	530240	6102835	666	6.3	0.26	0.81	873.2	0	0.00006	0.0003	0.000008	0.000006
	Air Preheater B	530240	6102839	666	6.3	0.26	0.81	873.2	0	0.00006	0.0003	0.000008	0.000006
	Air Preheater C	530240	6102843	666	6.3	0.26	0.81	873.2	0	0.00006	0.0003	0.000008	0.000006
	SRU Incinerator	530269	6102801	666	29	0.9	7.6	811.2	0.94	0.0036	0.017	0.00044	0.00032
Foster Creek F	Steam Generator	529317	6103310	665	30	1.7	21	490	0.032	0.32	1	0.026	0.019
	Steam Generator	529332	6103310	665	30	1.7	21	490	0.032	0.32	1	0.026	0.019
	Steam Generator	529347	6103310	665	30	1.7	21	490	0.032	0.32	1	0.026	0.019
	Steam Generator	529362	6103310	665	30	1.7	21	490	0.032	0.32	1	0.026	0.019
	Glycol Heater	529196	6103027	667	9.5	0.9	6.1	468	0	0.029	0.12	0.0031	0.0023
	Glycol Heater	529196	6103020	667	9.5	0.9	6.1	468	0	0.029	0.12	0.0031	0.0023
	Glycol Heater Pilot	529360	6102940	665	5.3	0.22	2.4	672	0	0.012	0.057	0.0015	0.0011
	Flash Treater	529324	6103225	665	6.7	0.61	9.7	970.1	0	0.0096	0.041	0.001	0.00076
Foster Creek G	Steam Generator	529397	6103311	665	30	1.7	21	490	0.032	0.32	1	0.026	0.019
	Steam Generator	529412	6103311	665	30	1.7	21	490	0.032	0.32	1	0.026	0.019
	Steam Generator	529427	6103311	665	30	1.7	21	490	0.032	0.32	1	0.026	0.019
	Steam Generator	529442	6103311	665	30	1.7	21	490	0.032	0.32	1	0.026	0.019
	Glycol Heater	529196	6103017	667	9.5	0.9	6.1	468	0	0.029	0.12	0.0031	0.0023
	Flash Treater	529284	6103224	665	6.7	0.61	9.7	970.1	0	0.0096	0.041	0.001	0.00076

Point Sources														
Facility	**Emission Source**	**UTM Easting (m)**	**UTM Northing (m)**	**Elevation (masl)**	**Stack Height (m)**	**Stack Diameter (m)**	**Exit Velocity (m/s)**	**Exit Temp (K)**	**SO_2 (t/d)**	**NO_X (t/d)**	**CO (t/d)**	**$PM_{2.5}$ (t/d)**	**VOC (t/d)**
Foster Creek H	Steam Generator	529477	6103311	665	30	1.7	21	490	0.032	0.32	1	0.026	0.019
	Steam Generator	529492	6103312	665	30	1.7	21	490	0.032	0.32	1	0.026	0.019
	Steam Generator	529507	6103312	665	30	1.7	21	490	0.032	0.32	1	0.026	0.019
	Steam Generator	529522	6103312	665	30	1.7	21	490	0.032	0.32	1	0.026	0.019
	Glycol Heater	529196	6103008	667	9.5	0.9	6.1	468	0	0.029	0.12	0.0031	0.0023
Foster Creek Osprey	Osprey Steam Generator	531670	6098682	671	8	0.76	14	450	0	0.048	0.27	0.007	0.0051
	BFW Tank Heater	531659	6098707	671	8.2	0.25	2	475	0	0.00031	0.0015	0.000038	0.000028
	BFW Tank Heater	531658	6098701	671	8.2	0.25	2	475	0	0.00031	0.0015	0.000038	0.000028
Foster Creek 1A-E	CPF HP Flare (S-505)	530026	6102848	665	30	1.7	0.1	1266	0	0.00022	0.0012	0.000048	0.00046
	CPF LP Flare (S-503)	529282	6102840	665	20	1.7	0.1	1269	0	0.00022	0.0012	0.000048	0.00046
	CPF Pop Tank Vent Flare	530026	6102848	665	29	3.2	0.1	1273	0	0.00075	0.0041	0.00016	0.0015
Foster Creek SRF	SRF Emergency Flare HP	530281	6102892	666	28	1.7	0.1	1267	0	0.00022	0.0012	0.000048	0.00046
	SRF Emergency Flare LP	530281	6102892	666	29	0.99	0.1	1257	0	0.000075	0.00041	0.000016	0.00016
Foster Creek FGH	Phase F/G/H HP Flare	529190	6103529	667	27	9	0.1	1281	0	0.0061	0.033	0.0013	0.012
	Phase F/G/H LP Flare	529184	6103529	667	29	2.6	0.1	1271	0	0.00051	0.0028	0.00011	0.001
Foster Creek J	2nd Stage OTSG	529694	6103317	665	30	1.7	18	483	0.029	0.32	1	0.026	0.019
	3rd Stage OTSG	529709	6103317	665	30	1.7	18	483	0.029	0.32	1	0.026	0.019
	4th Stage OTSG	529724	6103317	665	30	1.7	18	483	0.029	0.32	1	0.026	0.019
	5th Stage OTSG	529739	6103317	665	30	1.7	18	483	0.029	0.32	1	0.026	0.019
	6th Stage OTSG	529754	6103317	665	30	1.7	18	483	0.029	0.32	1	0.026	0.019
	7th Stage OTSG	529769	6103317	665	30	1.7	18	483	0.029	0.32	1	0.026	0.019
	FC3-H-0501E Glycol Heater	529256	6102991	665	9.5	0.9	6.1	468	0	0.025	0.034	0.0031	0.0022
	FC3-H-0501F Glycol Heater	529892	6103321	665	9.5	0.9	6.1	468	0	0.025	0.034	0.0031	0.0022
	FC3-H-0501G Glycol Heater	529901	6103321	665	9.5	0.9	6.1	468	0	0.025	0.034	0.0031	0.0022
	Cogen (Turbine+HRSG)	529880	6103526	665	30	3.3	23	474	0.021	0.97	0.95	0.053	0.024
Cenovus Air Emission Totals for Baseline and Application Cases									**6.087**	**31.265**	**85.187**	**2.31**	**1.623**

Area Sources																
Facility	**Emission Source**	**NW UTM E (m)**	**NW UTM N (m)**	**NE UTM E (m)**	**NE UTM N (m)**	**SE UTM E (m)**	**SE UTM N (m)**	**SW UTM E (m)**	**SW UTM N (m)**	**Area (m^2)**	**Elevation (masl)**	**SO_2 (t/d)**	**NO_x (t/d)**	**CO (t/d)**	**$PM_{2.5}$ (t/d)**	**VOC (t/d)**
Christina Lake - Phase 1A	Plant fugitive	506697	6159225	506697	6159317	506789	6159317	506789	6159225	8,431	572	0	0	0	0	0.001
Christina Lake - Phase 1B	Plant fugitive	506772	6159236	506772	6159520	507056	6159520	507056	6159236	81,024	573	0	0	0	0	0.012
Christina Lake - Phase 1C	Plant fugitive	506961	6159359	506961	6159835	507437	6159835	507437	6159359	226,828	574	0	0	0	0	0.032
Christina Lake - Phase 1D	Plant fugitive	507288	6159608	507288	6159918	507598	6159918	507598	6159608	96,710	571	0	0	0	0	0.014
Christina Lake - Phase 1E/F/G/H	Plant fugitive	507463	6159615	507463	6160087	507935	6160087	507935	6159615	223,383	571	0	0	0	0	0.032
Foster Creek Phase 1A-E	Plant fugitive	529404	6102452	529404	6102952	529904	6102952	529904	6102452	250,000	665	0	0	0	0	0.05
Foster Creek Phase 1A-E Tank Farm	Plant fugitive	529404	6102452	529404	6102952	529904	6102952	529904	6102452	250,000	665	0	0	0	0	0.6
Foster Creek Phase FGH	Plant fugitive	529116	6103499	529616	6103499	529616	6102999	529116	6102999	250,000	665	0	0	0	0	0.07
Foster Creek Phase FGH Tank Farm	Plant fugitive	529116	6103499	529616	6103499	529616	6102999	529116	6102999	250,000	665	0	0	0	0	0.9
Narrows Lake Phase 1-3	Plant fugitive	507155	6167365	507655	6167365	507655	6166865	507155	6166865	250,000	564	0	0	0	0	0.5499
Foster Creek Phase J	Plant fugitive	529482	6103056	529482	6103556	529982	6103556	529982	6103056	250,000	665	0	0	0	0	0.003
Foster Creek Phase J Tank Farm	Plant fugitive	529482	6103056	529482	6103556	529982	6103556	529982	6103056	250,000	665	0	0	0	0	0.25
Cenovus Air Emission Totals for Baseline and Application Cases												**0**	**0**	**0**	**0**	**2.514**

Note:
"0" = No emissions. OTSG = Once-through steam generators. HRSG = Heat recovery steam generator. HP = High pressure. LP = Low pressure.

Table B2-5: Devon Air Emissions Included in the Baseline and Application Cases

Point Sources													
Facility	**Emission Source**	**UTM Easting (m)**	**UTM Northing (m)**	**Elevation (masl)**	**Stack Height (m)**	**Stack Diameter (m)**	**Exit Velocity (m/s)**	**Exit Temp (K)**	**SO_2 (t/d)**	**NO_X (t/d)**	**CO (t/d)**	**$PM_{2.5}$ (t/d)**	**VOC (t/d)**
Jackfish 1	Steam Generator 1	507855	6153524	611	28.9	1.83	15.5	443	0.3333	0.3528	0.2227	0.0202	0.0146
	Steam Generator 2	507846	6153515	611	28.9	1.83	15.5	443	0.3333	0.3528	0.2227	0.0202	0.0146
	Steam Generator 3	507838	6153507	611	28.9	1.83	15.5	443	0.3333	0.3528	0.2227	0.0202	0.0146
	Steam Generator 4	507830	6153498	611	28.9	1.83	15.5	443	0.3333	0.3528	0.2227	0.0202	0.0146
	Steam Generator 5	507821	6153490	611	28.9	1.83	15.5	443	0.3333	0.3528	0.2227	0.0202	0.0146
	Steam Generator 6	507813	6153481	611	28.9	1.83	15.5	443	0.3333	0.3528	0.2227	0.0202	0.0146
	Glycol Trim Heater 1	508036	6153691	611	6.7	0.71	27.7	399	0	0.0192	0.0239	0.0022	0.0016
	Glycol Trim Heater 2	508028	6153684	611	6.7	0.71	27.7	399	0	0.0192	0.0239	0.0022	0.0016
	Flash Treater	508008	6153514	610	6	0.15	23.2	443	0	0.0065	0.0022	0.0002	0.0001
	Flash Treater	508009	6153512	610	6	0.15	23.2	443	0	0.0065	0.0022	0.0002	0.0001
	Continuous Flare	508148	6153476	610	40.3	12.38	0	2777	0	0.0002	0.0001	0	0.0004
Jackfish 2	Steam Generator 1	500046	6153268	652	28.9	1.83	15.5	443	0.3333	0.3528	0.2227	0.0202	0.0146
	Steam Generator 2	500039	6153259	652	28.9	1.83	15.5	443	0.3333	0.3528	0.2227	0.0202	0.0146
	Steam Generator 3	500032	6153249	651	28.9	1.83	15.5	443	0.3333	0.3528	0.2227	0.0202	0.0146
	Steam Generator 4	500026	6153239	651	28.9	1.83	15.5	443	0.3333	0.3528	0.2227	0.0202	0.0146
	Steam Generator 5	500019	6153229	651	28.9	1.83	15.5	443	0.3333	0.3528	0.2227	0.0202	0.0146
	Steam Generator 6	500012	6153219	651	28.9	1.83	15.5	443	0.3333	0.3528	0.2227	0.0202	0.0146
	Glycol Trim Heater 1	500199	6153286	653	6.7	0.71	27.7	399	0	0.0192	0.0239	0.0022	0.0016
	Glycol Trim Heater 2	500200	6153285	653	6.7	0.71	27.7	399	0	0.0192	0.0239	0.0022	0.0016
	Flash Treater	500194	6153465	652	6	0.15	23.2	443	0	0.0065	0.0022	0.0002	0.0001
	Flash Treater	500189	6153457	652	6	0.15	23.2	443	0	0.0065	0.0022	0.0002	0.0001
	Continuous Flare	500343	6153272	652	40.3	12.38	0	2777	0	0.0002	0.0001	0	0.0004
Jackfish 3	Steam Generator 1	503235	6151932	665	28.9	1.83	15.5	443	0.3333	0.3528	0.2227	0.0202	0.0146
	Steam Generator 2	503247	6151932	665	28.9	1.83	15.5	443	0.3333	0.3528	0.2227	0.0202	0.0146
	Steam Generator 3	503259	6151932	639	28.9	1.83	15.5	443	0.3333	0.3528	0.2227	0.0202	0.0146
	Steam Generator 4	503271	6151932	639	28.9	1.83	15.5	443	0.3333	0.3528	0.2227	0.0202	0.0146
	Steam Generator 5	503283	6151932	639	28.9	1.83	15.5	443	0.3333	0.3528	0.2227	0.0202	0.0146
	Steam Generator 6	503295	6151932	639	28.9	1.83	15.5	443	0.3333	0.3528	0.2227	0.0202	0.0146
	Glycol Trim Heater 1	502989	6151940	664	6.7	0.71	27.7	399	0	0.0192	0.0239	0.0022	0.0016
	Glycol Trim Heater 2	502999	6151940	664	6.7	0.71	27.7	399	0	0.0192	0.0239	0.0022	0.0016

Point Sources													
Facility	**Emission Source**	**UTM Easting (m)**	**UTM Northing (m)**	**Elevation (masl)**	**Stack Height (m)**	**Stack Diameter (m)**	**Exit Velocity (m/s)**	**Exit Temp (K)**	**SO_2 (t/d)**	**NO_X (t/d)**	**CO (t/d)**	**$PM_{2.5}$ (t/d)**	**VOC (t/d)**
	Flash Treater	503133	6152050	664	6	0.15	23.2	443	0	0.0065	0.0022	0.0002	0.0001
	Flash Treater	503133	6152048	664	6	0.15	23.2	443	0	0.0065	0.0022	0.0002	0.0001
	Continuous Flare	503062	6152174	664	40.3	12.38	0	2777	0	0.0002	0.0001	0	0.0004
Pike Phase 1A	Steam Generator 1	511027	6144536	655	28.9	1.8	15.5	443	0.18	0.21	1	0.01	0.02
	Steam Generator 2	511035	6144526	655	28.9	1.8	15.5	443	0.18	0.21	1	0.01	0.02
	Steam Generator 3	511043	6144517	655	28.9	1.8	15.5	443	0.18	0.21	1	0.01	0.02
	Steam Generator 4	511050	6144508	655	28.9	1.8	15.5	443	0.18	0.21	1	0.01	0.02
	Steam Generator 5	511058	6144499	637	28.9	1.8	15.5	443	0.18	0.21	1	0.01	0.02
	Steam Generator 6	511066	6144490	637	28.9	1.8	15.5	443	0.18	0.21	1	0.01	0.02
	Steam Generator 7	511073	6144480	637	28.9	1.8	15.5	443	0.18	0.21	1	0.01	0.02
Pike Phase 1B	Flash Treater 1	510989	6144414	638	6	0.2	23.2	443	0	0	0.02	0	0
	Flash Treater 2	510990	6144415	638	6	0.2	23.2	443	0	0	0.02	0	0
	Glycol Heater 1	511072	6144433	637	6.7	0.7	27.7	399	0	0.02	0.1	0	0
	Glycol Heater 2	511064	6144426	637	6.7	0.7	27.7	399	0	0.02	0.1	0	0
	Flare	511223	6144265	637	84	0.8	0	2777	0	0	0	0	0.02
	Steam Generator 8	510896	6144692	656	28.9	1.8	15.5	443	0.18	0.21	1	0.01	0
	Steam Generator 9	510904	6144682	655	28.9	1.8	15.5	443	0.18	0.21	1	0.01	0
	Steam Generator 10	510911	6144674	655	28.9	1.8	15.5	443	0.18	0.21	1	0.01	0
	Steam Generator 11	510919	6144664	655	28.9	1.8	15.5	443	0.18	0.21	1	0.01	0
	Steam Generator 12	510927	6144655	655	28.9	1.8	15.5	443	0.18	0.21	1	0.01	0
	Steam Generator 13	510935	6144646	655	28.9	1.8	15.5	443	0.18	0.21	1	0.01	0
	Steam Generator 14	510942	6144637	655	28.9	1.8	15.5	443	0.18	0.21	1	0.01	0
	Flash Treater 3	510995	6144419	638	6	0.2	23.2	443	0	0	0.02	0	0
	Flash Treater 4	510996	6144420	638	6	0.2	23.2	443	0	0	0.02	0	0
	Glycol Heater 3	510939	6144592	655	6.7	0.7	27.7	399	0	0.02	0.1	0	0
	Glycol Heater 4	510931	6144585	655	6.7	0.7	27.7	399	0	0.02	0.1	0	0
Devon ARL Corp. Air Emission Totals for Planned Development Case									**8.519**	**9.525**	**18.645**	**0.518**	**0.434**

Area Sources																
Facility	**Emission Source**	**NW UTM E (m)**	**NW UTM N (m)**	**NE UTM E (m)**	**NE UTM N (m)**	**SE UTM E (m)**	**SE UTM N (m)**	**SW UTM E (m)**	**SW UTM N (m)**	**Area (m^2)**	**Elevation (masl)**	**SO_2 (t/d)**	**NO_X (t/d)**	**CO (t/d)**	**$PM_{2.5}$ (t/d)**	**VOC (t/d)**
Jackfish 1	Plant Fugitive	507677	6153788	508177	6153788	508177	6153288	507677	6153288	250,000	611	0	0	0	0	0.14805
Jackfish 2	Plant Fugitive	499862	6153549	500362	6153549	500362	6153049	499862	6153049	250,000	652	0	0	0	0	0.14805
Jackfish 3	Plant Fugitive	502922	6152218	503422	6152218	503422	6151718	502922	6151718	250,000	664	0	0	0	0	0.14805
Pike 1A-C	Plant Fugitive	510695	6144845	511195	6144845	511195	6144345	510695	6144345	250,000	655	0	0	0	0	0.44415
Devon ARL Corp. Air Emission Totals for Planned Development Case												0	0	0	0	**0.888**

Notes:
"0" = No emissions.

2.5 Grizzly Oil Sands ULC

Emissions Included in the Baseline and Application Cases

In 2012, Grizzly acquired the Whitesands Project, which is a pilot in situ combustion project, from Petrobank Energy and Resources Ltd. This facility is located approximately 130 km southeast of Fort McMurray and 14 km from the town of Conklin. The expected production of the facility is 10,000 to 15,000 bpd.

Table B2-6 is a summary of the emissions that were included in the Baseline and Application cases.

Emissions Included in the Baseline, Application and Planned Development Cases

In December 2013, Grizzly submitted a regulatory Application for its May River SAGD project, located approximately 130 km southeast of Fort McMurray and 14 km from the town of Conklin. The SAGD development is expected to produce 100,000 bpd of bitumen for Phases 1 and 2.

Table B2-7 provides a summary of the emissions that were included in the Baseline, Application and Planned Development cases.

2.6 Harvest Operations Corp.

Emissions Included in the Baseline and Application Cases

Harvest has received regulatory approval for its BlackGold Oil Sands Project located approximately 130 km south of Fort McMurray. The SAGD development was purchased from Korea National Oil Corporation (KNOC) in 2010 and construction started later that year.

Phase 1 of the project (BlackGold) was approved by Alberta Environment and Water in January 2010 and is expected to produce 10,000 bpd of bitumen, with first oil anticipated in 2013.

Phase 2 of the project (BlackGold Expansion) was also approved by Alberta Environment and Water; it is targeted to increase production to 30,000 bpd over a period of approximately 25 years.

Table B2-8 provides a summary of the emissions that were included in the Baseline and Application cases.

2.7 Husky Energy Inc.

Emissions Included in the Baseline and Application Cases

Husky received AER approval to develop the Caribou Lake Thermal Demonstration Project in June 2008. The project is located approximately 203 km south-southeast of Fort McMurray. The project is expected to produce 10,000 bpd of bitumen.

Table B2- 9 provides a summary of the emissions that were included in the Baseline and Application cases.

2.8 MEG Energy Corp.

Emissions Included in the Baseline and Application Cases

Emissions Included in the Baseline and Application Cases MEG has been operating the SAGD Christina Lake Regional Project. Currently Phase 1 is operational and Phase 2 has received regulatory approval and is under construction. Phase 2 will bring total production to 60 000 bpd. MEG also received the approval for Phase 3 in 2012 to produce an additional 150 000 bpd. The total production will be 210 000 bpd.

Table B2-10 provides a summary of the emissions that were included in the Baseline and Application Cases.

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Table B2-6: Grizzly Oil Sands Inc. Air Emissions Included in the Baseline and Application Case

Point Sources													
Facility	**Emission Source**	**UTM Easting (m)**	**UTM Northing (m)**	**Elevation (masl)**	**Stack Height (m)**	**Stack Diameter (m)**	**Exit Velocity (m/s)**	**Exit Temp (K)**	**SO_2 (t/d)**	**NO_X (t/d)**	**CO (t/d)**	**$PM_{2.5}$ (t/d)**	**VOC (t/d)**
Whitesands Pilot (including 3 wells expansion)	Flare Stack	483874	6168345	607	12.3	0.15	0.5	2738	0.183	0.007	0.0052	0.0017	0.0144
	Steam Generator (2.2 MW)	484000	6168220	608	6.6	0.4	11.1	723	0	0.025	0.021	0.0003	0.0014
	Glycol Boiler (2 MW)	483894	6168325	608	5.5	0.6	1.7	773	0	0.0045	0.0038	0.0003	0.0002
	Glycol Boiler (2 MW)	483894	6168315	608	5.5	0.6	1.7	773	0	0.0045	0.0038	0	0.0002
	Incinerator	483964	6168182	608	20.1	1.6	16.3	1179	2	0	0	0	0
Grizzly Oil Sands Inc. Air Emission Totals used for the Baseline and Application Case									**2.183**	**0.041**	**0.0338**	**0.0023**	**0.0162**

Notes:
"0" = No emissions.

Table B2-7: Grizzly Oil Sands Inc. Air Emissions Included in the Baseline, Application and Planned Development Cases

Point Sources													
Facility	**Emission Source**	**UTM Easting (m)**	**UTM Northing (m)**	**Elevation (masl)**	**Stack Height (m)**	**Stack Diameter (m)**	**Exit Velocity (m/s)**	**Exit Temp (K)**	**SO_2 (t/d)**	**NO_X (t/d)**	**CO (t/d)**	**$PM_{2.5}$ (t/d)**	**VOC (t/d)**
Whitesands Pilot (including 3 wells expansion)	Flare Stack	483874	6168345	607	12.3	0.15	0.5	2738	0.183	0.007	0.0052	0.0017	0.0144
	Steam Generator (2.2 MW)	484000	6168220	608	6.6	0.4	11.1	723	0	0.025	0.021	0.0003	0.0014
	Glycol Boiler (2 MW)	483894	6168325	608	5.5	0.6	1.7	773	0	0.0045	0.0038	0.0003	0.0002
	Glycol Boiler (2 MW)	483894	6168315	608	5.5	0.6	1.7	773	0	0.0045	0.0038	0	0.0002
	Incinerator	483964	6168182	608	20.1	1.6	16.3	1179	2	0	0	0	0
May River Phase 1	Well Pad Incinerator (Well Pad 2)	483463	6170387	587	12.2	2.43	15.3	918	0.025	0	0	0.0017	0.0144
	Well Pad Incinerator (Well Pad 3)	483169	6169940	597	12.2	2.43	23.7	973	0.093	0	0	0.0003	0.0014
	Flue Gas Desulphurization (CPF)	482254	6168317	624	51.8	3.05	13	339	1.828	0.541	0.4545	0.0411	0.0298
May River Phase 2	Well Pad Incinerator	484560	6163859	654	12.2	2.43	15.3	918	0.225	0	0	0	0.0002
	Well Pad Incinerator	484266	6163412	651	12.2	2.43	23.7	973	0.837	0	0	0	0
	Flue Gas Desulphurization (CPF)	483351	6161789	668	90	6	30	339	1.084	0.492	1.519	0.093	0.094
Grizzly Oil Sands Inc. Air Emission Totals used for the Baseline, Application and Planned Development Case									**6.275**	**1.074**	**2.007**	**0.136**	**0.140**

Notes:
"0" = No emissions.

Table B2-8: Harvest Operations CORP. Air Emissions Included in the Baseline and Application Case

Point Sources													
Facility	**Emission Source**	**UTM Easting (m)**	**UTM Northing (m)**	**Elevation (masl)**	**Stack Height (m)**	**Stack Diameter (m)**	**Exit Velocity (m/s)**	**Exit Temp (K)**	**SO_2 (t/d)**	**NO_x (t/d)**	**CO (t/d)**	**$PM_{2.5}$ (t/d)**	**VOC (t/d)**
BlackGold Phase 1	Steam Generator	500933	6159367	607	30	1.5	27	756	0.3	0.3432	0.29	0.04	0.03
	Slop Oil Heater	500973	6159400	607	15	0.4	27	739	0	0.02	0.01	0	0
	Glycol Heater	501108	6159561	607	15	0.4	27	739	0	0.012	0.01	0	0
BlackGold Expansion	Steam Generator	500958	6159367	607	30	1.5	27	756	0.3	0.3432	0.29	0.04	0.03
	Steam Generator	501015	6159367	607	30	1.5	27	756	0.3	0.3432	0.29	0.04	0.03
	Glycol Heater	501139	6159567	607	15	0.4	27	739	0	0.012	0.01	0	0
	Slop Oil Heater	500830	6159314	606	15	0.4	27	739	0	0.15	0	0	0
	HP Flare	500783	6159311	606	36.3	0.4	27	1086	0	0.15	0	0	0
	LP Flare	500783	6159311	606	36.3	0.4	27	1086	0	0.02	0	0	0
Harvest Operations CORP. Air Emission Totals used for the Baseline and Application Case									**0.9**	**1.3936**	**0.9**	**0.12**	**0.09**

Area Sources															
Facility	**Emission Source**	**NW UTM E (m)**	**NW UTM N (m)**	**NE UTM E (m)**	**NE UTM N (m)**	**SE UTM E (m)**	**SE UTM N (m)**	**SW UTM E (m)**	**SW UTM N (m)**	**Area (m^2)**	**Elevation (masl)**	**SO_2 (t/d)**	**NO_x (t/d)**	**CO (t/d)**	**$PM_{2.5}$ (t/d)**	**VOC (t/d)**
BlackGold Phase 2	Plant Fugitive	500580	6159564	501080	6159564	501080	6159064	500580	6159064	250,000	606	0	0	0	0	0.0846
BlackGold Phase 1	Plant Fugitive	500769	6159608	501269	6159608	501269	6159108	500769	6159108	250,000	607	0	0	0	0	0.0423
Harvest Operations CORP. Air Emission Totals used for the Baseline and Application Case												0	0	0	0	0.8883

Notes:
"0" = No emissions. LP = Low pressure. HP = High pressure.

Table B2-9: Husky Energy Inc. Air Emissions Included in the Baseline and Application Case

Point Sources													
Facility	**Emission Source**	**UTM Easting (m)**	**UTM Northing (m)**	**Elevation (masl)**	**Stack Height (m)**	**Stack Diameter (m)**	**Exit Velocity (m/s)**	**Exit Temp (K)**	**SO_2 (t/d)**	**NO_x (t/d)**	**CO (t/d)**	**$PM_{2.5}$ (t/d)**	**VOC (t/d)**
Caribou Lake Thermal Demonstration	Steam Generator 1	525137	6090343	692	30	1.67	25.5	423	0.1953	0.3292	0.3603	0.0239	0.0181
	Steam Generator 2	525151	6090343	692	30	1.67	25.5	423	0.1953	0.3292	0.3603	0.0239	0.0181
	Glycol Heater	525105	6090330	692	12	0.46	20.5	523	0	0.0145	0.03	0.0016	0.0008
	Emergency Generator	525138	6090292	692	6	0.2	100	718	0	0.1538	0.084	0.0003	0.0085
	Flare	524930	6090335	693	30.8	2.38	0.1	1273	0	0.0005	0	0	0
Husky Energy Inc. Air Emission Totals used for the Baseline and Application Case									**0.3906**	**0.8272**	**0.8346**	**0.0497**	**0.0455**

Area Sources																
Facility	**Emission Source**	**NW UTM E (m)**	**NW UTM N (m)**	**NE UTM E (m)**	**NE UTM N (m)**	**SE UTM E (m)**	**SE UTM N (m)**	**SW UTM E (m)**	**SW UTM N (m)**	**Area (m^2)**	**Elevation (masl)**	**SO_2 (t/d)**	**NO_x (t/d)**	**CO (t/d)**	**$PM_{2.5}$ (t/d)**	**VOC (t/d)**
Caribou Lake Thermal Demonstration	Plant Fugitive	524842	6090579	525342	6090579	525342	6090079	524842	6090079	250,000	692	0	0	0	0	0.0423
Husky Energy Inc. Air Emission Totals used for the Baseline and Application Case												0	0	0	0	0.0423

Notes:
"0" = No emissions.

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Table B2-10: MEG Energy Corp. Air Emissions Included in the Baseline and Application Case

Point Sources													
Facility	**Emission Source**	**UTM Easting (m)**	**UTM Northing (m)**	**Elevation (masl)**	**Stack Height (m)**	**Stack Diameter (m)**	**Exit Velocity (m/s)**	**Exit Temp (K)**	**SO_2 (t/d)**	**NO_X (t/d)**	**CO (t/d)**	**$PM_{2.5}$ (t/d)**	**VOC (t/d)**
Christina Lake Phase 1 (Pilot)	OTSG	517796	6168843	578	30	1.38	20.7	445	0.002	0.3336	0.177	0.016	0.012
Christina Lake Phase 1 (Pilot)	Glycol Heater	517828	6168816	578	7.5	0.51	4.5	434	0	0.1176	0.005	0	0
	LP Flare Continuous	517870	6168764	578	13.2	2.4	0.2	1273	0	0.001	0.005	0	0.001
	HP Flare Continuous	517850	6168732	578	31.5	2.88	0.1	1273	0	0.001	0.005	0	0.001
Christina Lake Phase 2	OTSG	517772	6168836	578	30	1.68	19.7	445	0.002	0.2832	0.251	0.023	0.016
	Cogen	517704	6168835	578	24	5.18	21.4	437	0.012	1.9584	1.426	0.119	0.053
	Glycol Heater	517818	6168886	578	5	1.02	5.8	434	0	0.0264	0.028	0.003	0.002
	Slop Treater	517867	6168901	578	9	0.61	5.3	533	0	0.004	0.005	0	0
	Slop Treater	517867	6168900	578	9	0.61	5.3	533	0	0.004	0.005	0	0
	HP Flare Continuous	517874	6169058	578	55.2	5.75	0	1273	0	0.001	0.007	0	0.002
Christina Lake Phase 2B	Steam Generator 1	517373	6169140	579	30	1.96	17	444	0.003	0.3336	0.294	0.027	0.019
	Steam Generator 2	517378	6169122	579	30	1.96	17	444	0.003	0.3336	0.294	0.027	0.019
	Steam Generator 3	517383	6169105	579	30	1.96	17	444	0.003	0.3336	0.294	0.027	0.019
	Cogen	517632	6168815	578	24	5.18	21.4	437	0.012	1.9584	1.426	0.119	0.053
	Glycol Heater	517639	6169235	579	15	1.52	9.5	618	0.001	0.0216	0.07	0.006	0.005
	Amine Preheater	517917	6168990	578	15	0.31	76.3	533	0	0.019	0.025	0.002	0.002
	Flare	517860	6169109	578	55.2	7.19	0	1273	0	0.001	0.007	0	0.002
Christina Lake Phase 3A	Steam Generator 1	525543	6162802	585	30	1.96	17	444	0.003	0.3336	0.294	0.027	0.019
	Steam Generator 2	525543	6162785	585	30	1.96	17	444	0.003	0.3336	0.294	0.027	0.019
	Steam Generator 3	525543	6162767	585	30	1.96	17	444	0.003	0.3336	0.294	0.027	0.019
	Steam Generator 4	525543	6162750	585	30	1.96	17	444	0.003	0.3336	0.294	0.027	0.019
	Steam Generator 5	525543	6162732	585	30	1.96	17	444	0.003	0.3336	0.294	0.027	0.019
	Steam Generator 6	525543	6162714	585	30	1.96	17	444	0.003	0.3336	0.294	0.027	0.019
	Steam Generator 7	525543	6162696	585	30	1.96	17	444	0.003	0.3336	0.294	0.027	0.019
	Steam Generator 8	525542	6162595	585	30	1.96	17	444	0.003	0.3336	0.294	0.027	0.019
	Steam Generator 9	525543	6162578	585	30	1.96	17	444	0.003	0.3336	0.294	0.027	0.019
	Steam Generator 10	525543	6162560	585	30	1.96	17	444	0.003	0.3336	0.294	0.027	0.019
	Steam Generator 11	525543	6162542	585	30	1.96	17	444	0.003	0.3336	0.294	0.027	0.019

Point Sources														
Facility	**Emission Source**	**UTM Easting (m)**	**UTM Northing (m)**	**Elevation (masl)**	**Stack Height (m)**	**Stack Diameter (m)**	**Exit Velocity (m/s)**	**Exit Temp (K)**	**SO_2 (t/d)**	**NO_X (t/d)**	**CO (t/d)**	**$PM_{2.5}$ (t/d)**	**VOC (t/d)**
	Steam Generator 12	525543	6162525	585	30	1.96	17	444	0.003	0.3336	0.294	0.027	0.019
	Steam Generator 13	525542	6162507	585	30	1.96	17	444	0.003	0.3336	0.294	0.027	0.019
	Steam Generator 14	525542	6162489	611	30	1.96	17	444	0.003	0.3336	0.294	0.027	0.019
Christina Lake Phase 3A	Glycol Heater 1	525800	6162663	585	15	1.52	10.2	618	0.001	0.0552	0.075	0.007	0.005
	Glycol Heater 2	525801	6162627	585	15	1.52	10.2	618	0.001	0.0552	0.075	0.007	0.005
	Slop Treater 1A	526028	6162662	586	15	0.61	5.7	533	0	0.004	0.005	0	0
	Slop Treater 1B	526028	6162661	586	15	0.61	5.7	533	0	0.004	0.005	0	0
	Slop Treater 2A	526097	6162662	586	15	0.61	5.7	533	0	0.004	0.005	0	0
	Slop Treater 2B	526097	6162661	586	15	0.61	5.7	533	0	0.004	0.005	0	0
	Amine Preheater 1	525844	6162684	585	15	0.31	29.8	533	0	0.012	0.016	0.001	0.001
	Amine Preheater 2	525843	6162609	585	15	0.31	29.8	533	0	0.012	0.016	0.001	0.001
	Flare 1	526002	6162859	586	55.2	7.19	0	1273	0	0.001	0.008	0	0.002
	Flare 2	526002	6162432	611	55.2	7.19	0	1273	0	0.001	0.008	0	0.002
Christina Lake Phase 3B	Steam Generator 1	506443	6174903	586	30	1.96	17	444	0.003	0.3336	0.294	0.027	0.019
	Steam Generator 2	506443	6174885	586	30	1.96	17	444	0.003	0.3336	0.294	0.027	0.019
	Steam Generator 3	506443	6174867	586	30	1.96	17	444	0.003	0.3336	0.294	0.027	0.019
	Steam Generator 4	506443	6174850	586	30	1.96	17	444	0.003	0.3336	0.294	0.027	0.019
	Steam Generator 5	506443	6174832	586	30	1.96	17	444	0.003	0.3336	0.294	0.027	0.019
	Steam Generator 6	506443	6174814	586	30	1.96	17	444	0.003	0.3336	0.294	0.027	0.019
	Steam Generator 7	506443	6174796	586	30	1.96	17	444	0.003	0.3336	0.294	0.027	0.019
	Steam Generator 8	506442	6174695	586	30	1.96	17	444	0.003	0.3336	0.294	0.027	0.019
	Steam Generator 9	506442	6174678	586	30	1.96	17	444	0.003	0.3336	0.294	0.027	0.019
	Steam Generator 10	506442	6174660	586	30	1.96	17	444	0.003	0.3336	0.294	0.027	0.019
	Steam Generator 11	506443	6174642	586	30	1.96	17	444	0.003	0.3336	0.294	0.027	0.019
	Steam Generator 12	506443	6174625	586	30	1.96	17	444	0.003	0.3336	0.294	0.027	0.019
	Steam Generator 13	506443	6174607	586	30	1.96	17	444	0.003	0.3336	0.294	0.027	0.019
	Steam Generator 14	506442	6174589	586	30	1.96	17	444	0.003	0.3336	0.294	0.027	0.019
	Glycol Heater 1	506700	6174763	585	15	1.52	10.2	618	0.001	0.0552	0.075	0.007	0.005
	Glycol Heater 2	506701	6174727	585	15	1.52	10.2	618	0.001	0.0552	0.075	0.007	0.005

Point Sources

Facility	Emission Source	UTM Easting (m)	UTM Northing (m)	Elevation (masl)	Stack Height (m)	Stack Diameter (m)	Exit Velocity (m/s)	Exit Temp (K)	SO_2 (t/d)	NO_x (t/d)	CO (t/d)	$PM_{2.5}$ (t/d)	VOC (t/d)
	Slop Treater 1A	506928	6174762	584	15	0.61	5.7	533	0	0.004	0.005	0	0
	Slop Treater 1B	506928	6174761	584	15	0.61	5.7	533	0	0.004	0.005	0	0
	Slop Treater 2A	506997	6174762	584	15	0.61	5.7	533	0	0.004	0.005	0	0
	Slop Treater 2B	506997	6174761	584	15	0.61	5.7	533	0	0.004	0.005	0	0
Christina Lake Phase 3B	Amine Preheater 1	506745	6174783	585	15	0.31	29.8	533	0	0.012	0.016	0.001	0.001
	Amine Preheater 2	506745	6174708	585	15	0.31	29.8	533	0	0.012	0.016	0.001	0.001
	Flare 1	506902	6174959	585	55.2	7.19	0	1273	0	0.001	0.008	0	0.002
	Flare 2	506902	6174532	584	55.2	7.19	0	1273	0	0.001	0.008	0	0.002
Christina Lake	SRU Incinerator 1	517929	6168916	578	45.7	0.61	6.9	873	0.999	0.001	0.001	0	0
	SRU Incinerator 2	517950	6168923	578	80	0.41	18.3	873	0.835	0.002	0.002	0	0
	SRU Incinerator 3	517967	6168927	578	80	0.41	18.3	873	0.835	0.002	0.002	0	0
MEG Energy Corp. Air Emission Totals used for the Baseline and Application Case									**2.795**	**15.382**	**12.997**	**1.157**	**0.77**

Area Sources

Facility	Emission Source	NW UTM E (m)	NW UTM N (m)	NE UTM E (m)	NE UTM N (m)	SE UTM E (m)	SE UTM N (m)	SW UTM E (m)	SW UTM N (m)	Area (m^2)	Elevation (masl)	SO_2 (t/d)	NO_x (t/d)	CO (t/d)	$PM_{2.5}$ (t/d)	VOC (t/d)
Christina Lake Phase 1 (Pilot)	Plant Fugitive	517546	6169093	518046	6169093	518046	6168593	517546	6168593	250,000	578	0	0	0	0	0.01269
Christina Lake Phase 2	Plant Fugitive	517522	6169086	518022	6169086	518022	6168586	517522	6168586	250,000	578	0	0	0	0	0.09306
Christina Lake Phase 2B	Plant Fugitive	517123	6169390	517623	6169390	517623	6168890	517123	6168890	250,000	579	0	0	0	0	0.14805
Christina Lake Phase 3A	Plant Fugitive	525293	6163052	525793	6163052	525793	6162552	525293	6162552	250,000	585	0	0	0	0	0.31725
Christina Lake Phase 3B	Plant Fugitive	506193	6175153	506693	6175153	506693	6174653	506193	6174653	250,000	586	0	0	0	0	0.31725
MEG Energy Corp. Air Emission Totals used for the Baseline and Application Case												0	0	0	0	0.8883

Note:
"0" = No emissions. OTSG = Once-through steam generators. HRSG = Heat recovery steam generator. LP = Low pressure. HP = High pressure.

3.0 PROJECT EMISSIONS

Table B2-11 provides a summary of the emissions from the facility included in the Application and Planned Development cases (Volume 2, Sections 4.5 and 4.6). Project emissions were estimated on the basis of published emission factors, as well as regulatory limits where applicable. Specific details are provided in the following sections.

3.1 Sulphur Dioxide

Emissions of SO_2 are based on the sulphur content in the produced gas, and compliance with sulphur removal requirements under ID 2001-03. Specifically, this requires that sulphur removal be incorporated if the sulphur inlet to the facility exceeds 1 t/d.

Project SO_2 emissions are estimated based on the anticipated composition of the mixed fuel gas and the volume combusted, assuming sulphur removal is in service.

3.2 Nitrogen Oxides

Modelled emissions of NO_x from the heaters and boilers have been based on the Base Level Industrial Emissions Requirements (BLIERs) specified in the *Multi-Sector Air Pollutant Regulation*. Vendor selection has not yet been completed; however, it is expected that actual emissions will be below these values, which results in a conservative assessment overall. For example, the Pike Phase 2 steam generators are rated at 84.3 MW_o (303 GJ/h). The *Multi-Sector Air Pollutant Regulation* limit for alternate fuel is based on the thermal efficiency of the boiler, which is 83.3% on a higher heating value basis. The permitted emission rate is then given by 15.8 g/GJ. Applying this emission rate results in an emission rate of 4.8 kg/h, or 0.115 t/d.

3.3 Carbon Monoxide

Modelled emissions of CO for the heaters and boilers are based on the CCME limit of 125 g/GJ_i. Although actual emissions are expected to be much lower, this approach results in a conservative assessment overall. As an example, the Pike Phase 2 steam generators are rated at 84.3 MW_o (303 GJ/h). Applying the CCME limit results in an emission rate then given of 37.9 kg/h, or 0.91 t/d.

3.4 Fine Particulate Matter

Modelled emissions of $PM_{2.5}$ for the all sources except the flare are based on emission factors of 7.6 lb/10^6 scf or 121.6 kg/10^6 m^3 from US EPA AP-42 Chapter 1 Section 4. As an example, the Project OTSG fuel consumption is 201,506 Sm^3/d. Applying the AP-42 emission factor results in an emission rate of 0.024 t/d.

Table B2-11: Project Air Emissions Included in the Application and Planned Development Cases

Point Sources													
Facility	**Emission Source**	**UTM E (m)**	**UTM N (m)**	**Elevation (masl)**	**Stack Height (m)**	**Stack Diameter (m)**	**Exit Velocity (m/s)**	**Exit Temp (K)**	**SO_2 (t/d)**	**NO_X (t/d)**	**CO (t/d)**	**$PM_{2.5}$ (t/d)**	**VOC (t/d)**
Pike Phase 2	OTSG 1	520144	6133296	679	28.3	1.68	458	19.75	0.279	0.115	0.910	0.024	0.02
	OTSG 2	520136	6133287	679	28.3	1.68	458	19.75	0.279	0.115	0.910	0.024	0.02
	OTSG 3	520127	6133279	679	28.3	1.68	458	19.75	0.279	0.115	0.910	0.024	0.02
	OTSG 4	520119	6133270	679	28.3	1.68	458	19.75	0.279	0.115	0.910	0.024	0.02
	OTSG 5	520110	6133262	679	28.3	1.68	458	19.75	0.279	0.115	0.910	0.024	0.02
	OTSG 6	520102	6133253	679	28.3	1.68	458	19.75	0.279	0.115	0.910	0.024	0.02
	COGEN	520130	6133424	679	30.0	3.35	443	17.75	0.121	0.238	1.550	0.040	0.05
	Glycol Heater 1	520325	6133466	678	6.7	0.71	424	10.7	0	0.013	0.099	0.003	0.0020
	Glycol Heater 2 (Spare)	520318	6133459	678	6.7	0.71	424	10.7	0	0.013	0.099	0.003	0.002
	Flash Treater Stack 1	520265	6133343	679	5.56	0.20	443	30.8	0	0.003	0.022	0.001	0.001
	Flash Treater Stack 2	520257	6133334	679	5.56	0.20	443	30.8	0	0.003	0.022	0.001	0.001
	Flare Stack (Normal Purge)	520496	6133217	681	41.15	0.406	2777	0.4150	0	0.000	0.001	0.000	0.000
	Pad 202 Steam Heater	521904	6133205	681	15.24	1.22	595	2.9	0	0.014	0.110	0.003	0.002
	Pad 203 Steam Heater	524838	6133032	677	15.24	1.22	595	2.9	0	0.014	0.110	0.003	0.002
	Pad 205 Steam Heater	520410	6133842	673	15.24	1.22	595	2.9	0	0.014	0.110	0.003	0.002
	Pad 206 Steam Heater	520035	6134676	660	15.24	1.22	595	2.9	0	0.014	0.110	0.003	0.002
	Pad 207 Steam Heater	519961	6135289	659	15.24	1.22	595	2.9	0	0.014	0.110	0.003	0.002
Air Emission Totals for the Project									**1.80**	**1.08**	**8.24**	**0.217**	**0.177**

Area Sources															
Facility	**Emission Source**	**NW UTM E (m)**	**NW UTM N (m)**	**NE UTM E (m)**	**NE UTM N (m)**	**SE UTM E (m)**	**SE UTM N (m)**	**SW UTM E (m)**	**SW UTM N (m)**	**Area (m^2)**	**Elevation (masl)**	**SO_2 (t/d)**	**NO_X (t/d)**	**CO (t/d)**	**$PM_{2.5}$ (t/d)**	**VOC (t/d)**
Pike Phase 2	Plant Fugitive	520341	6133476	520282	6133324	520096	6133240	520109	6133415	31561	681	0	0	0	0	0.216
Pike Phase 2	Well Pads	520341	6133476	520282	6133324	520096	6133240	520109	6133415	31561	681	0	0	0	0	0.140
Air Emission Totals for the Project												**0**	**0**	**0**	**0**	**0.356**

Volume Sources													
Facility	**Emission Source**	**UTM E (m)**	**UTM N (m)**	**Elevation (masl)**	**Diameter (m)**	**Height (m)**	σ_{z0}	σ_{y0}	**SO_2 (t/d)**	**NO_X (t/d)**	**CO (t/d)**	**$PM_{2.5}$ (t/d)**	**VOC (t/d)**
Pike Phase 2	Diesel tank T-1660	510685	6144816	684	9.14x2.50 (LxW)	2.93	1.36	2.59	0	0	0	0	4.86E-06
	Reverse demulsifier tank T-2100	510783	6144817	684	3.658	6.096	2.84	0.85	0	0	0	0	0.013
	Demulsifier tank T-2150	510786	6144813	684	3.658	6.096	2.84	0.85	0	0	0	0	0.013
	Fresh scavenger tank T-2830	510879	6144862	682	4.648	9.754	4.54	1.08	0	0	0	0	0
	Spent scavenger tank T-2840	510886	6144853	682	4.648	9.754	4.54	1.08	0	0	0	0	0
	Methanol Tank T-2850	510781	6144679	682	3.353	3.658	1.70	0.396	0	0	0	0	0
	Recycle tank T-3100	510739	6144698	685	11.278	12.198	5.67	2.62	0	0	0	0	0.012
	Skim tank T-3110	510723	6144737	685	36.881	6.409	2.98	8.58	0	0	0	0	0.07
	Water storage tank T-3190	510771	6144691	685	25.76	14.637	6.81	5.99	0	0	0	0	0.078
	Slop Tank T-3800	510882	6144568	685	11.60	9.76	4.54	2.70	0	0	0	0	0.011
	Shipping Tank T-4100	510826	6144579	686	14.60	12.198	5.67	3.40	0	0	0	0	0.021
	Off-spec Tank A T-4110A	510861	6144546	686	21.07	14.637	6.81	4.90	0	0	0	0	0.052
	Off-spec Tank B T-4110B	510851	6144596	686	21.07	14.637	6.81	4.90	0	0	0	0	0.052
	Diluent Storage Tank T-4130	510882	6144857	686	14.60	12.198	5.67	3.40	0	0	0	0	0.023
Air Emission Totals for the Project									**0**	**0**	**0**	**0**	**0.345**

Note:
"0" = No emissions. OTSG = Once-through steam generators.

4.0 COMMUNITIES AND HIGHWAYS

The emissions from communities and highways located within the AQRSA are included in each of the emission cases. Tables B2-12 and B2-13 present a summary of the emission data.

Table B2-12: Community and Highway Emissions Included in the Baseline and Application Cases

Source	SO_2 (t/d)	NO_X (t/d)	CO (t/d)	$PM_{2.5}$ (t/d)	VOC (t/d)
Community	0.0004	0.0037	0.0082	0.0014	0.0014
Hwy 663	0.0000	0.0025	0.0107	0.0002	0.0006
Hwy 881	0.0022	0.2334	0.9674	0.0145	0.0545
Total	0.003	0.240	0.986	0.016	0.057

Table B2-13: Community and Highway Emissions Included in the Planned Development Case

Source	SO_2 (t/d)	NO_X (t/d)	CO (t/d)	$PM_{2.5}$ (t/d)	VOC (t/d)
Community	0.0009	0.0077	0.0171	0.0029	0.0029
Hwy 663	0.0000	0.0053	0.0223	0.0003	0.0013
Hwy 881	0.0046	0.4888	2.0256	0.0304	0.1140
Total	0.006	0.502	2.065	0.034	0.118

5.0 REFERENCES

Cenovus FCCL Ltd. (Cenovus). 2010. *Application for Approval of the Narrows Lake Project*. Prepared by Golder Associates Ltd. Calgary, AB.

Devon NEC Corporation (Devon). 2012. *Application for Approval of the Devon Pike 1 Project*. Prepared by AMEC Environment & Infrastructure. Calgary, AB.

Imperial Oil Resources Ventures Limited. 2013. *Application for Approval of the Aspen Project.* Submitted to the Alberta Energy Regulator. Prepared by AMEC Environment & Infrastructure, Calgary, AB.

Suncor Energy Inc. (Suncor). 2017. *Meadow Creek West Project Environmental Impact Assessment*.

Teck Resources Ltd. (Teck) and SilverBirch Energy Corp. (SilverBirch). 2011. *Integrated Application for Approval of Frontier Oil Sands Mine Project. Air Quality Section*. Prepared by Stantec, Calgary, AB.

Value Creation Inc. (VCI). 2012. *Application for Approval of Advanced TriStar Project. Air Quality Section*. Prepared by Millennium EMS Solutions Ltd, Calgary, AB.

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Appendix B3

Air Quality and Meteorological Observations in the Regional Study Area

Appendix B3: Air Quality and Meteorological Observations in the Regional Study Area
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1.0 INTRODUCTION

1.1 Objectives

The following section provides a summary of baseline information on air quality for the Devon Pike 2 Project (the Project). This information forms the basis of comparison for the environmental impact assessment (EIA) and cumulative assessment to be completed as part of the Project approval process. The baseline information is derived from representative monitoring programs in the region.

The Project will result in direct emissions to the atmosphere from fossil fuel combustion sources, as well as fugitive emissions (e.g., from a small amount of potential equipment leaks). While combustion exhaust consists primarily of carbon dioxide and water, nitrogen oxide (NO_x), particulate matter with diameters less than 2.5 µm ($PM_{2.5}$), carbon monoxide (CO), and volatile organic compounds (VOC) are also produced. In addition, if the fuel contains sulphur compounds, such as hydrogen sulphide (H_2S), then trace sulphur dioxide (SO_2) emissions can occur. At sufficiently high concentrations, these air emissions can have direct and indirect effects on humans, animals, vegetation, soil, and water.

The information presented in this air quality section reflects the conditions between 2015 to the present, as monitoring data allow.

1.2 Air Quality, Meteorology and Climate Data Sources

The data consisted of hourly observations of meteorology and ambient air quality. This information was quality-checked and has been summarized in this report. The following are the major sources of air quality information used in the preparation of this document:

- The current regional air quality data are based on observations from three continuous monitoring stations inside the air quality regional study area (AQRSA) operated by the Wood Buffalo Environmental Association (WBEA). However, none of these three stations monitor CO and H_2S. Therefore, the data from the nearest stations monitoring for these compounds were also collected. Table B3-1 lists the air quality stations and the data available for each station. For the current study, one year (2017) of hourly data from each station were analyzed. In addition, data from 2015 to 2017 were also collected to obtain three-year averages as required by certain air quality indicators.
- MM5 model output data were used as a first guess wind field for CALMET modelling. MM5 Model output for 2002 to 2006 was obtained from Alberta Environment and Sustainable Resource Development.
- Air quality observations were compared to Alberta's Ambient Air Quality Objectives (AAAQO; AEP 2016) and to Canadian Ambient Air Quality Standards (CAAQS, CCME 2017), which are summarized for selected contaminants in Table B3-2.
- Additional relevant air quality indicators based on triggers and limits specified by the Lower Athabasca Regional Plan (LARP) are in Table B3-3.

Table B3-1: Data Obtained from Wood Buffalo Environmental Association Monitoring Stations

ID	Station Name	Start Year	End Year	CO	H_2S	O_3	$PM_{2.5}$	SO_2	NO_2
AMS7	Athabasca Valley	2015	2017	√		√	√	√	√
AMS17	Wapasu	2015	2017		√	√	√	√	√
AMS18	Stony Mountain	2015	2017			√	√	√	√√
AMS21	Conklin	2016	2017			√	√	√√	√√
AMS22	Janvier	2017	2017			√	√	√√	√√

Notes:
√ - 2017 data >75% complete, √√ - 2017 data <75% complete.

Table B3-2: Alberta and Canadian Ambient Air Quality Objectives

	Period	Alberta Objectives		Alberta Guideline	Canadian Standards			
		($\mu g/m^3$)	(ppb)	($\mu g/m^3$)	Desirable ($\mu g/m^3$)	Acceptable ($\mu g/m^3$)	Tolerable ($\mu g/m^3$)	CAAQS ($\mu g/m^3$)
SO_2	Annual	20	8	–	30	60	–	–
	30-d	30	11	–	–	–	–	–
	24-h	125	48	–	150	300	800	–
	1-h	450	172	–	450	900	–	–
NO_2	Annual	45	24	–	60	100	–	–
	1-h	300	159	–	–	400	1,000	–
$PM_{2.5}$	Annual	–	–	–	–	–	–	10
	24-h	30	–	–	–	–	–	28
	1-h	–	–	80	–	–	–	–
H_2S	1-h	14	10	–	–	–	–	–
	24-h	4	3	–	–	–	–	–
O_3	8-h	–	–	–	–	–	–	130
	1-h	160	82	–	–	–	–	–

Notes:
[1] *Maximum desirable*: long-term goal for air quality, basis for an anti-degradation policy, and supports continuing development of control technology. *Maximum acceptable*: provides adequate protection against adverse effects on soil, water, vegetation, materials, animals, visibility, and personal comfort and well-being. *Maximum tolerable*: concentration of an air contaminant that requires abatement without delay to avoid air quality deterioration to a level that endangers lifestyle or to level that poses a substantial risk to public health.
– = Not applicable.

Table B3-3: Lower Athabasca Regional Plan Air Quality Triggers and Limits for Nitrogen Dioxide and Sulphur Dioxide

Averaging Period	Trigger	NO_2	SO_2
Annual	Limit (AAAQO)	45	20
	Level 3	30	13
	Level 2	15	8
99th percentile of hourly data	Level 4	176	94
	Level 3	118	63
	Level 2	57	31

1.3 Continuous Air Quality Monitoring Results

Monitoring data were analyzed for comparison with applicable air quality guidelines. Results of the analysis include:

- 1-hour and 24-hour maximum concentrations;
- annual average concentrations;
- 99.9th and 90th percentile of 1-hour and 24-hour concentrations;
- 99th percentile of 1-hour SO_2 and NO_2 concentrations for comparison with LARP metrics;
- maximum 8-hour concentration (CO);
- three-year average of the 98th percentile of 24-hour average concentrations ($PM_{2.5}$);
- three-year average of the annual average concentrations ($PM_{2.5}$); and
- three-year average of the 4th-highest daily maximum 8-hour average concentrations (O_3).

Observations of an air quality parameter were used if the hourly data were at least 75% complete during a given year.

To show temporal variation of air quality, graphs of hourly, monthly and seasonal averages from AMS 22 (Janvier), the closest to the Project site, are also presented. For pollutants not measured at this station, CO data from AMS 7 (Fort McMurray Athabasca Valley station) and H_2S data from AMS 17 (Wapasu station) were used. Gaps in the hourly data indicate calibration periods.

1.3.1 Sulphur Dioxide

Table B3-4 summarizes measured SO_2 concentrations at the three WBEA stations in the AQRSA in 2017. No exceedances of the AAAQO and LARP were recorded.

In general, concentrations tend to decrease with distance from the major facilities.

Table B3-4: Sulphur Dioxide Concentrations (µg/m³) at Wood Buffalo Environmental Association Stations in the Air Quality Regional Study Area (2017)

	Stony Mountain	Conklin	Janvier	AAAQO	LARP
AMS ID	**18**	**21**	**22**	**–**	**–**
1-h Maximum	26.2	23.6	36.7	450	–
1-h 99.9th Percentile	13.1	13.1	10.5	–	–
1-h 99th Percentile	5.24	5.24	5.24	–	94
1-h 90th Percentile	2.62	2.62	0.00	–	–
24-h Maximum	7.97	5.69	3.42	–	–
24-h 90th Percentile	1.59	1.37	1.25	–	–
30-d Maximum	8.31	1.13	0.516	30	–
Annual Average	2.86	0.449	0.329	20	20

Note:
– = Not applicable.

Hourly, monthly and seasonal hourly average concentrations at AMS22 (Janvier) are provided on Figure B3-1. Concentrations are higher around midday, possibly reflecting the level of industrial activity in the area. There are lower concentrations in summer and higher concentrations in winter.

1.3.2 Nitrogen Dioxide

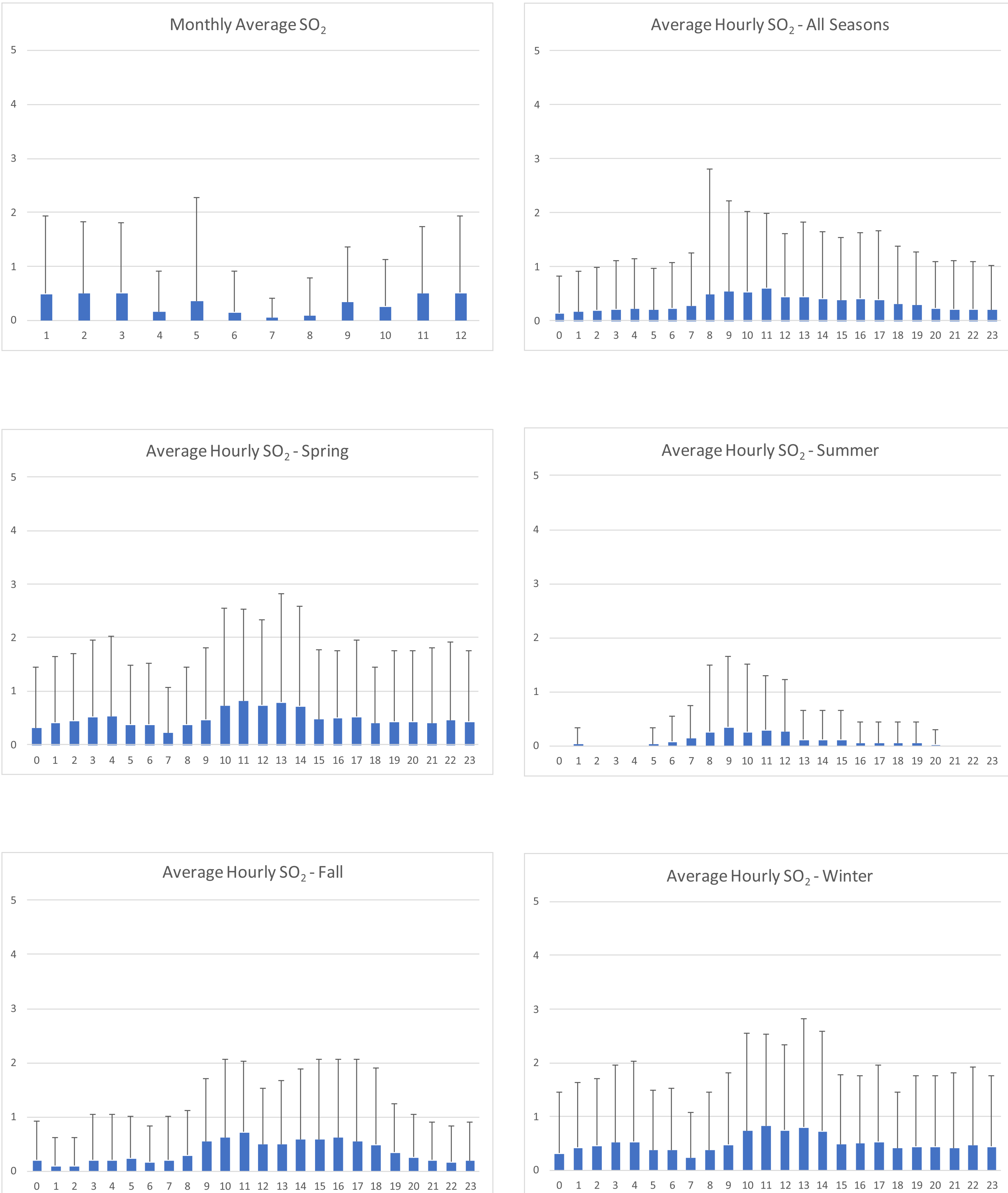
Table B3-5 summarizes the measured nitrogen dioxide (NO_2) concentrations at WBEA stations in the AQRSA in 2017. The NO_2 concentrations in the area are low. No exceedances of the AAAQO or LARP limits were recorded. Concentrations tend to decrease with distance from the key industrial facilities in the area

Table B3-5: Nitrogen Dioxide Concentrations (µg/m³) at Wood Buffalo Environmental Association Stations in the Air Quality Regional Study Area (2017)

	Stony Mountain	Conklin	Janvier	AAAQO	LARP
AMD ID	**18**	**21**	**22**	**–**	**–**
1-h Maximum	32.0	45.3	42.1	300	–
1-h 99.9th Percentile	19.7	35.4	25.7	–	
1-h 99th Percentile	11.2	22.4	14.5	–	176
1-h 90th Percentile	4.70	10.2	6.02	–	–
Annual Average	2.19	4.63	2.46	45	45

Note:
– = Not applicable.

Average NO_2 concentrations are highest in winter and lowest in summer. The diurnal variation of NO_2 concentrations at Janvier Station show minimum around midday, with less hourly variation in summer than in spring or winter (Figure B3-2). This pattern is consistent with results of Boersma et al (2008) at fossil-fuel regions in North America.



Pike 2 Project

2017 Average SO_2 Concentrations ($\mu g/m^3$) at AMS22 (Janvier Station)

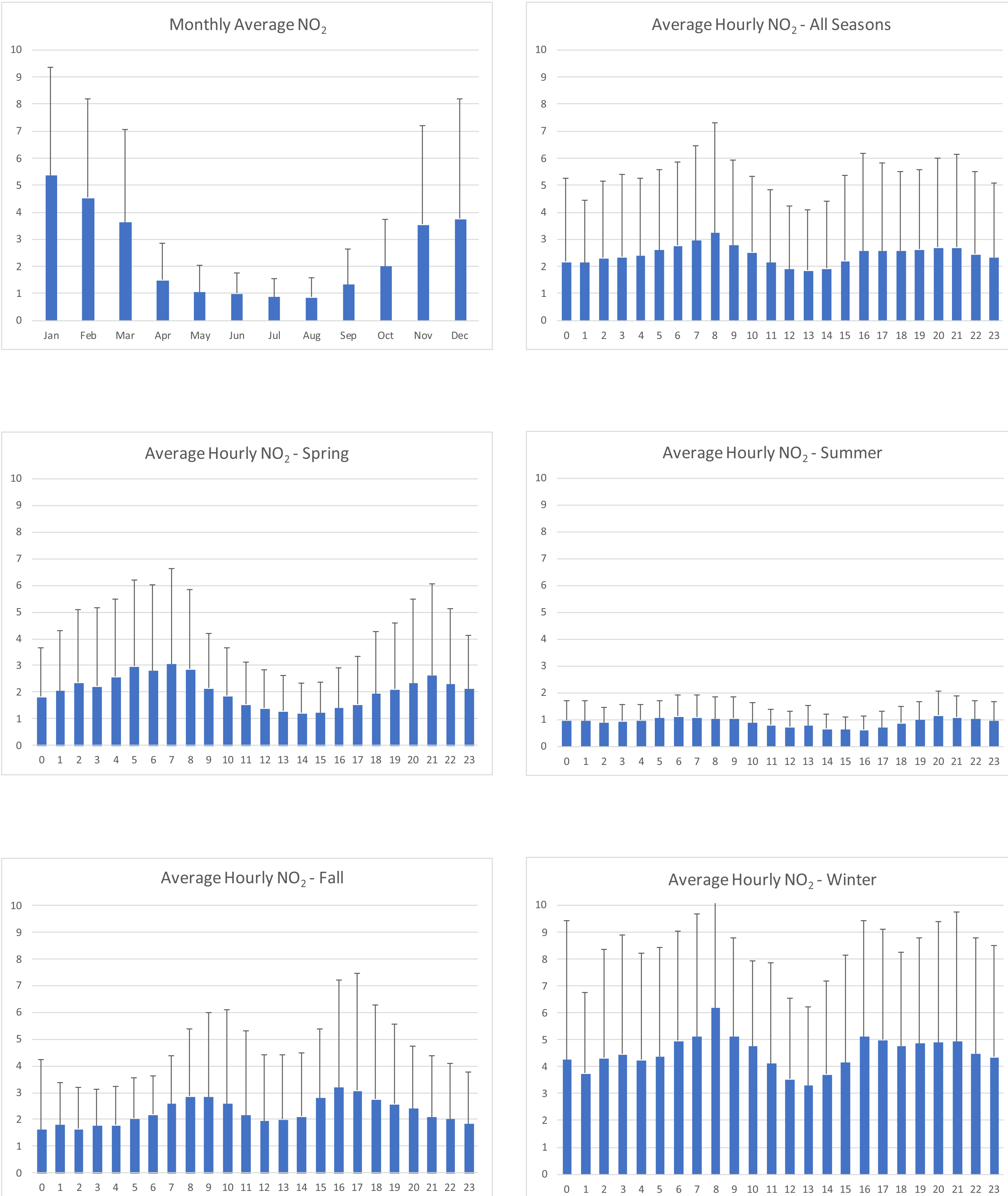
October 29, 2018
FigB3-1 Average So2 Concentrations 291018.cdr

devon

PROVIDED BY: Wood.
FINAL MAPPING BY: Wood.

Figure B3-1

Map Path: S:\Gis\Projects\CE\ Devon\04808 Pike 2 EIA\CorelDraw\AppB\FigB3-1 Average So2 Concentrations 291018.cdr Analyst: Jackie Hoglund



Pike 2 Project

2017 Average NO_2 Concentrations ($\mu g/m^3$) at AMS22 (Janvier Station)

October 29, 2018 | FigB3-2Average NO2 Concentrations 291018.cdr

devon

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FINAL MAPPING BY: Wood.

Figure B3-2

Map Path: S:\Gis\Projects\CE\ Devon\04808 Pike 2 EIA\CorelDraw\AppB\FigB3-2 Average NO2 Concentrations 291018.cdr Analyst: Jackie Hoglund

1.3.3 Carbon Monoxide

Table B3-6 summarizes CO concentrations measured at the Fort McMurray – Athabasca Valley station in 2017. No exceedances for the 1-hour and 8-hour concentrations were recorded.

Table B3-6: Carbon Monoxide Concentrations (µg/m³) at Wood Buffalo Environmental Association Stations in 2017

	Fort McMurray-Athabasca Valley	AAAQO
1-h Maximum	916	15,000
1-h 99.9th Percentile	802	–
1-h 90th Percentile	229	–
8-h Maximum	589	6,000
8-h 90th Percentile	229	–

Note:
– = Not applicable.

Temporal patterns in CO concentrations are presented on Figure B3-3. Both hourly and seasonal variation appear to be small, with the average maximum only about 50% higher than minimum.

1.3.4 Particulate Matter Smaller than 2.5 µm ($PM_{2.5}$)

Table B3-7 summarizes $PM_{2.5}$ concentrations measured at the WBEA stations in the AQRSA in 2017. The AAAQO for the 1-hour concentrations were exceeded at all stations. Highest concentrations were measured at the Stony Mountain station (AMS 18), suggesting the influence of emissions sources related to industrial facilities. Two stations recorded exceedances for the 24-hour concentrations with a range from 41.2 to 41.4 µg/m³.

Table B3-7: $PM_{2.5}$ Concentrations (µg/m³) at Wood Buffalo Environmental Association Stations in the Air Quality Regional Study Area (2017)

	Stony Mountain	Conklin	Janvier	AAAQO	CAAQS
AMS ID	**18**	**21**	**22**	**–**	**–**
1-h Maximum	***125***	***126***	***103***	80	–
1-h 99.9th Percentile	56.0	78.3	56.5	–	–
1-h 90th Percentile	8.00	9.00	9.00	–	–
24-h Maximum	23.8	***41.4***	***41.2***	30	–
24-h 90th Percentile	8.93	7.30	8.82	–	–
24-h 98th Percentile[1]	14.3	20.6	13.6	–	28
Annual[1]	4.50	5.15	4.23	–	10

Notes:
[1] Three-year average.
Bold and italic numbers exceed the objectives or limits.
– = Not available.

Pike 2 Project

2017 Average CO Concentrations ($\mu g/m^3$) at AMS7 (Fort McMurray Athabasca Valley Station)

October 29, 2018 | FigB3-3 Average CO Concentrations 291018.cdr

devon

PROVIDED BY: Wood.

FINAL MAPPING BY: Wood.

Figure B3-3

Map Path: S:\Gis\Projects\CE\ Devon\04808 Pike 2 EIA\CrorelDraw\AppB\FigB3-3 Average CO Concentrations 291018.cdr Analyst: Jackie Hoglund

Three-year averages of the 24-hour 98th percentile and annual averages from 2015 to 2017 were also calculated for comparison with Canadian Ambient Air Quality Standard. Only Stony Mountain station has at least three years of sufficient $PM_{2.5}$.data. No exceedances of the 24-hour and annual standards were recorded at the station.

Average hourly $PM_{2.5}$ concentrations exhibit very little variation in all seasons (Figure B3-4). There is a pronounced peak in summer, likely a result of drier conditions.

1.3.5 Ozone

1.3.5.1 Ozone Formation

Ozone (O_3) is an important natural constituent of the atmosphere, an oxidizing agent, and its concentration is highly variable. Altshuller (1986) indicated ground level concentrations of O_3 can be influenced by:

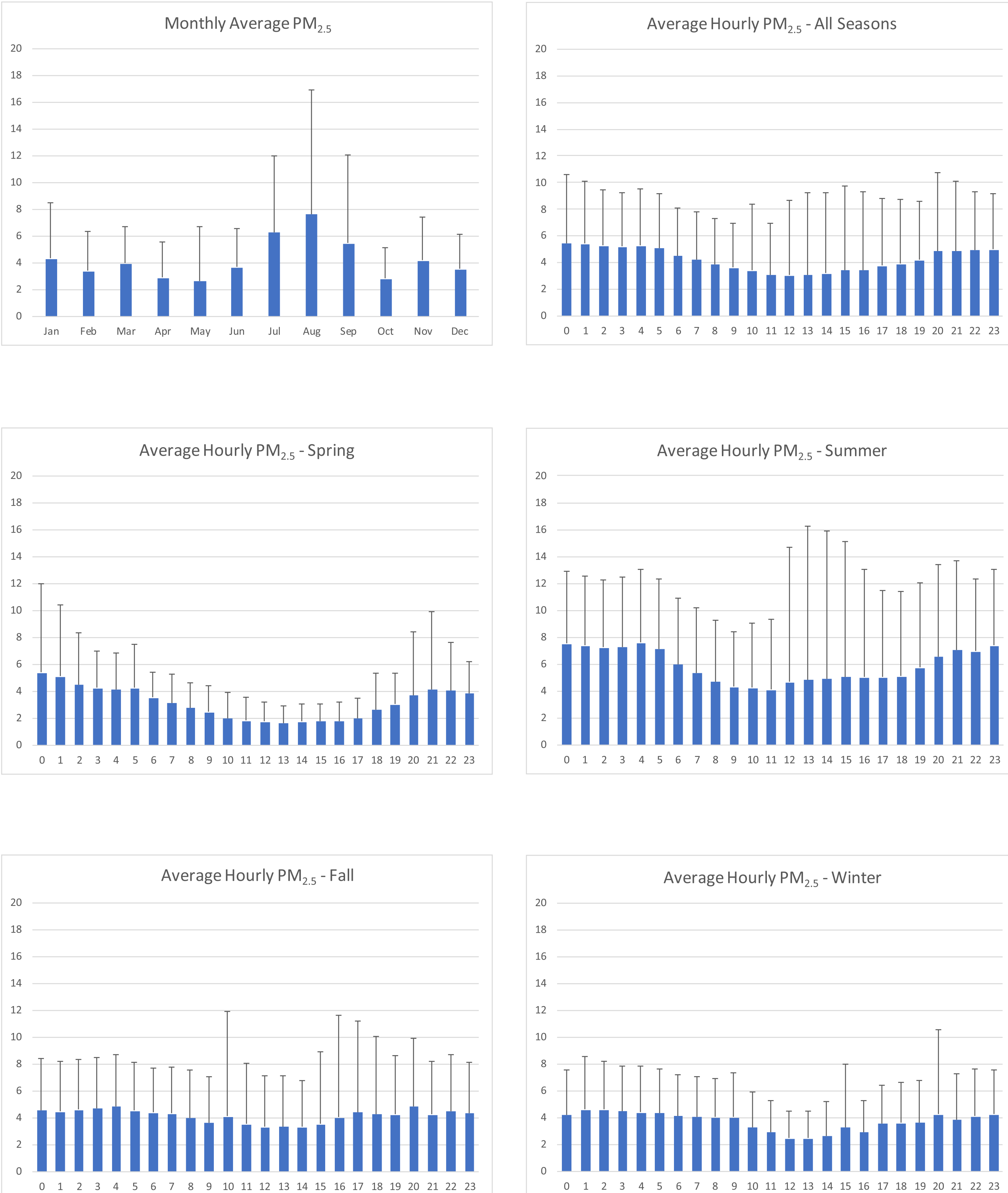
- downward transport of stratospheric O_3;
- photochemical formation within a pristine troposphere;
- photochemical formation within a polluted troposphere especially during passage of warm high pressure systems; and
- O_3 formation within plumes.

Ground level O_3 concentrations are determined by formation, destruction and transport processes. Leforn et al. (1990) reported elevated O_3 values at relatively pristine locations.

1.3.5.2 Precursors

O_3 is not typically directly emitted into the atmosphere from anthropogenic sources. Formation in the stratosphere and in the lower atmosphere is photochemical and occurs through a complex series of precursor compounds. Primary precursors that may be affected by industrial activity are NO_x and VOCs.

As summarized in Sandhu (1999), NO emissions are partially converted to NO_2. O_3 photolysis and reactions with water produce OH^-. Reactions of O_3 and OH^- with NO_x and VOCs produce HNO_3 and HNO_2, peroxyacetyl nitrate and nitrates. NO_2 photolysis and reactions with O_2 produce O_3. The presence of various species of VOCs greatly complicates the scenario and it is beyond the scope of this work to illustrate all of the possible reaction pathways.



Pike 2 Project

2017 Average $PM_{2.5}$ Concentrations ($\mu g/m^3$) at AMS22 (Janvier Station)

October 29, 2018 | FigB3-4 Average PM25 Concentrations 291018.cdr

devon

PROVIDED BY: Wood.

FINAL MAPPING BY: Wood.

Figure B3-4

Map Path: S:\Gis\Projects\CE\ Devon\04808 Pike 2 EIA\CorelDraw\AppB\FigB3-4 Average PM25 Concentrations 291018.cdr   Analyst: Jackie Hoglund

1.3.5.3 Meteorological Considerations

Ground-level O_3 concentrations are influenced by sunlight, temperature, wind speed, mixing, as well as scavenging. Solar radiation plays a key role in initiating the photochemical reactions that might lead to O_3 formation and varies with season and latitude. Daylight in the Wood Buffalo region ranges from about six hours in winter to 18 hours in summer, and the diurnal nature of sunlight is important in understanding the diurnal variation in observed O_3 concentrations for the region. Ground-level O_3 formation is also a function of temperature. Episodes of high temperature have been linked to seasonally high O_3 observations (US EPA 1996). This research indicates that O_3 concentrations may vary widely at a given temperature, but that maximum O_3 concentrations typically increase with temperature. Temperature ranges at which O_3 formation takes place are typically above 25 to 30°C; however, O_3 has been observed to form at lower temperatures in the oil sands area (Deer Creek 2004). Low wind speed increases O_3 formation potential because lower wind speeds lead to reduced ventilation and the build-up of precursor concentrations. High temperatures are typically associated with low wind speeds, greater solar radiation, stagnant circulation and suppressed mixing.

Sandhu (1999) used the term 'chemical air mass' to identify a body of air that becomes stagnant over a source region, such as the oil sands, and subsequently takes on the characteristics of the region with respect to temperature, humidity, stability, and the accumulation of O_3 and precursors. The chemical air mass in which high O_3 values may be observed is likely to be a high pressure area with subsidence, an elevated inversion layer, lack of clouds, low winds and high temperatures.

1.3.5.4 Alberta Observations

O_3 and precursor values are summarized in a large number of publications including Deer Creek (2004), Angle and Sandhu (1986 and 1989), Cheng et al. (1997), Conor Pacific (2000), Fanaki et al. (1979), Leahey and Hansen (1990), Legge and Krupa (1990), Legge et al. (1991), Myrick (1995, 1996a and 1996b), Myrick and Asquin (1992 and 1993), Myrick et al. (1994), Peake and Fong (1990), Peake and Sandhu (1983), Peake et al. (1983, 1985, 1986, 1988a, and 1988b), as well as in EIAs in the oil sands area (Devon 2000; Deer Creek 2004; EnCana 2007).

The observations generally indicate:

- elevated stations have higher ground-level concentrations and show little diurnal variation (Angle and Sandhu 1986; Legge and Krupa 1990);
- urban areas generally show maximum values in May and minimum values in November (Myrick and Asquin 1992, 1993; Myrick 1995, 1996a, 1996b);
- urban areas show much larger diurnal variation in summer than in winter, with the highest values in the afternoon and the lowest values just before sunrise (Angle and Sandhu 1989);
- urban areas are O_3 sinks throughout the year and at least one measurement program indicates the sink can extend tens of kilometres downwind of the city (Angle and Sandhu 1989; Leahey and Hansen 1990);

- rural stations show diurnal variations between elevated and urban areas (Angle and Sandhu 1986; Sandhu 1999);
- trajectory analysis of surface observations in Fort McMurray and Fort McKay shows that oil sands sources can be identified upwind of monitoring locations on most days with the highest O_3 concentrations (Davies and Fellin 1999);
- O_3 formation occurs in oil sands plumes in late morning and afternoon during summer at distances beyond about 20 km from the source while depletion occurs nearer the source (Fanaki et al. 1979; Deer Creek 2004).

Surface maximum 1-hour values are highest in rural areas downwind of industrial facilities and lowest in urban centres and more remote rural areas (Deer Creek 2004). Ninety-ninth percentile values do not follow the same trend, suggesting conditions leading to the highest values do not occur frequently.

1.3.5.5 Ozone Observations

Table B3-8 summarizes O_3 concentrations measured at the WBEA stations in the AQRSA in 2017. No exceedances were recorded for both the AAAQO and CAAQS during the observation period.

Table B3-8: Ozone Concentrations (µg/m³) at Wood Buffalo Environmental Association Stations in the Air Quality Regional Study Area in 2017

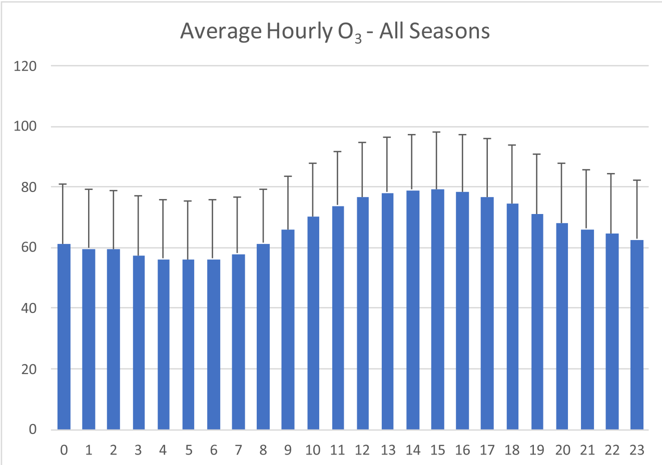
	Stony Mountain	Conklin	Janvier	AAAQO	CAAQS
AMS ID	**18**	**21**	**22**	**–**	**–**
1-h Maximum	151	151	153	160	–
99.9th Percentile of 1-h daily maximum	143	143	146	–	–
8-h maximum	133	120	120	–	–
3-year average of 4th highest maximum 8-h	108	–	–	–	130

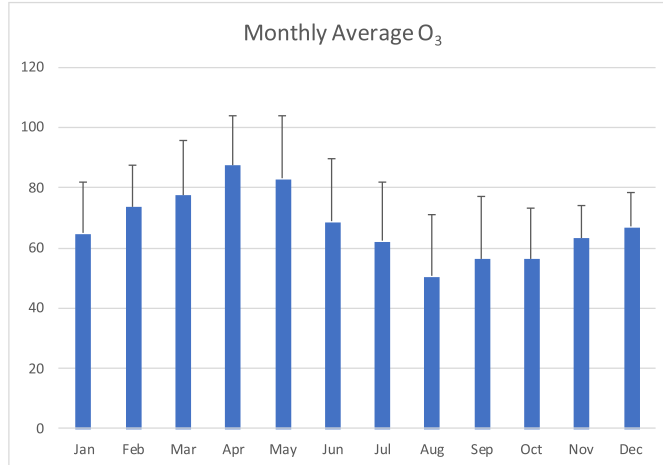
Note:
– = Not applicable.

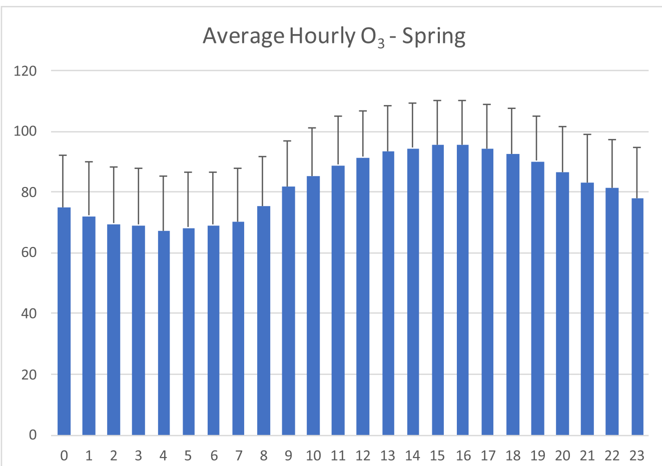
Temporal variations in O_3 are depicted on Figure B3-5. Because O_3 is photochemically active, its concentrations show a peak after midday. Seasonal concentrations are highest in spring and show a clear minimum in August.

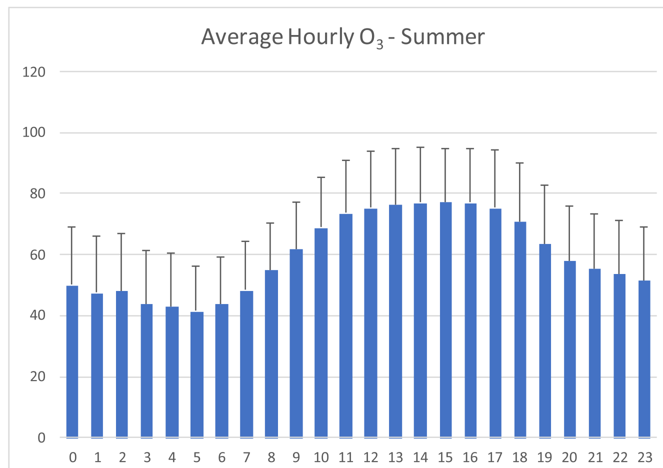
1.3.6 Hydrogen Sulphide

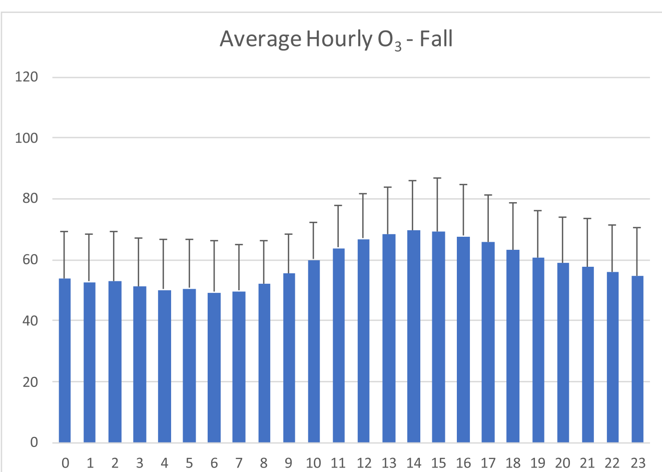
Table B3-9 summarizes H_2S observations in 2017 at the nearest WBEA station with H_2S monitoring data. No exceedances of the AAAQO of the 1-hour and 24-hour concentrations were recorded in this station.

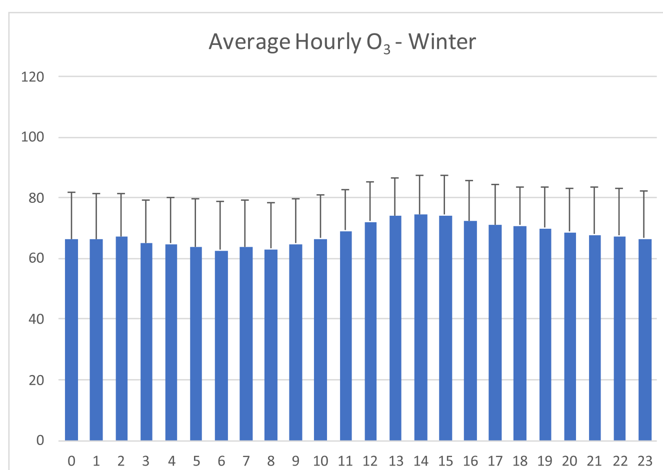












Pike 2 Project

2017 Average Ozone Concentrations ($\mu g/m^3$) at AMS22 (Janvier Station)

October 29, 2018 | FigB3-5 Average O3 Concentrations 291018.cdr

devon

PROVIDED BY: Wood.

FINAL MAPPING BY: Wood.

Figure B3-5

Map Path: S:\Gis\Projects\CE\ Devon\04808 Pike 2 EIA\CorelDraw\AppB\FigB3-5 Average O3 Concentrations 291018.cdr Analyst: Jackie Hoglund

Table B3-9: Hydrogen Sulphide Concentrations (µg/m³) at Wapasu Station in 2017

	Wapasu	AAAQO
AMS ID	**17**	**–**
1-h Maximum	2.79	14
1-h 99.9th Percentile	1.39	–
1-h 90th Percentile	0.00	–
24-h Maximum	0.849	4
24-h 90th Percentile	1.20	–

Note:
– = Not applicable.

Observed ambient concentrations for H_2S are expected to be influenced by fugitive and upset releases from oil and gas operations within the region. As a result, most readings are zero.

Temporal averages of H_2S concentrations at Wapasu are shown on Figure B3-6. Concentrations tend to be higher in the early morning, particularly in the winter.

1.4 Meteorology and Climatology Measurements

The climate was inferred primarily from observations from Janvier Station, which is the closest station to the central processing facility. Additionally, CALMET-extracted data for a 'pseudo-station' at the central processing facility was prepared.

1.4.1 Winds

Winds in the region are defined by the interaction between the large-scale flow and the local terrain. The latter makes wind conditions vary over parts of the domain.

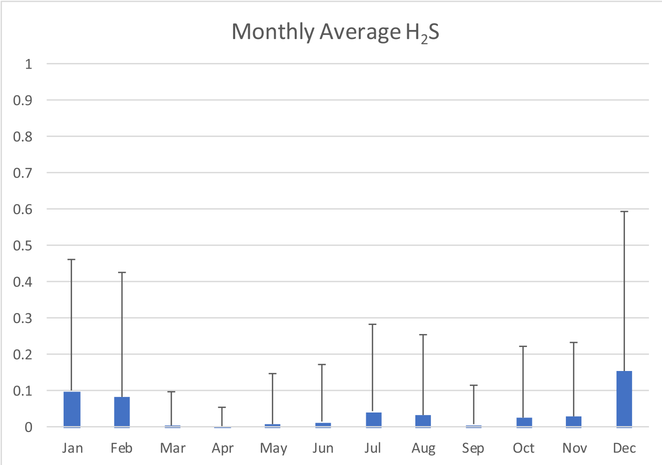
Annual, seasonal and hourly wind roses for 2017 at Janvier station are shown on Figures B3-7 to B3-9. Winds from the south-southwest and south are the most common, particularly during fall and winter. Hourly winds generally reflect the same pattern.

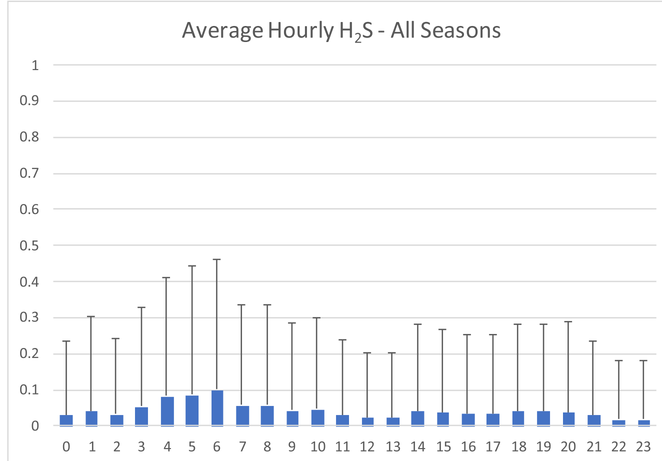
Surface winds generated by CALMET at the centre of the Local Study Area are shown on Figures B3-10 to B3-12. West-southwesterly winds are common, although winds from the west are the most dominant. Local topographic influences and separation in the years represented by the wind roses may account for the differences.

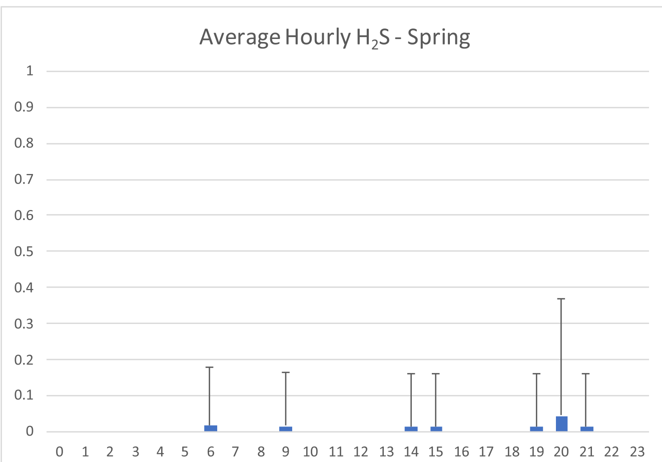
1.4.2 Ambient Temperature

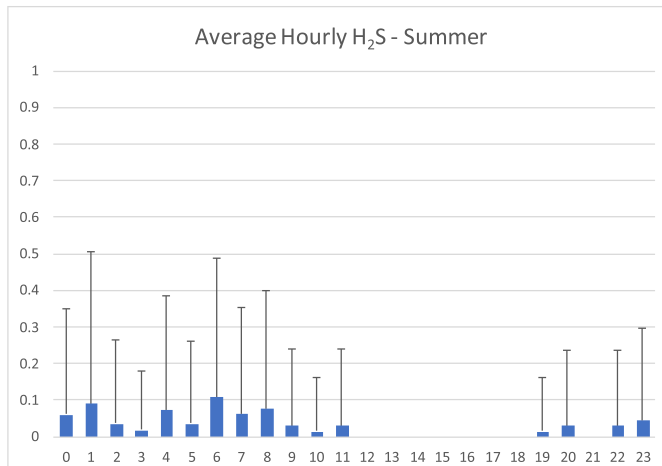
Temperature measurements in the area surrounding the Project are presented in Table B3-10 and Figures B3-13 and B3-14.

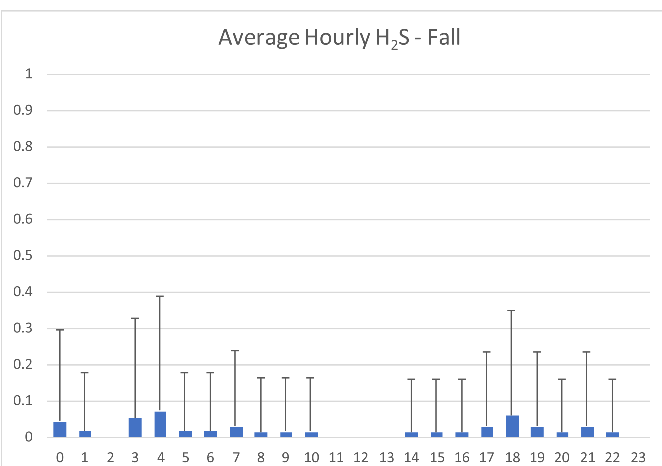
Previous View Main Menu Search

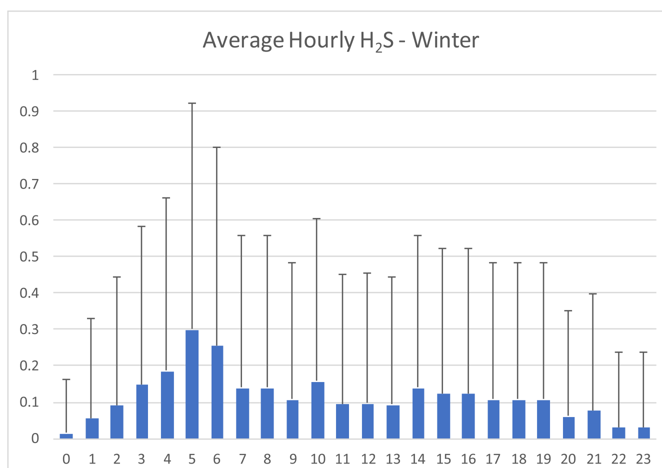












Pike 2 Project

2017 Average H_2S Concentrations ($\mu g/m^3$) at AMS17 (Wapasu Station)

October 29, 2018 | FigB3-6 Average H2S Concentrations 291018.cdr

devon

PROVIDED BY: Wood.

FINAL MAPPING BY: Wood.

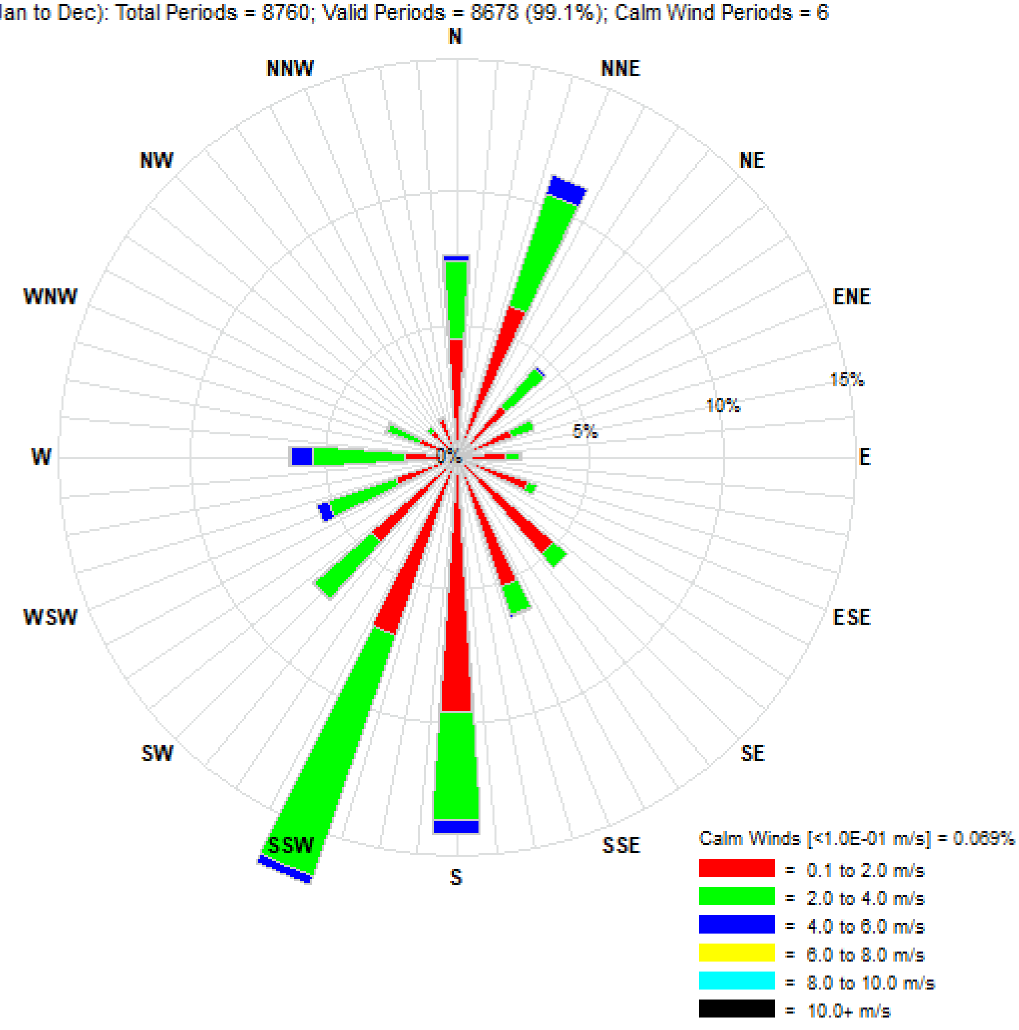
Figure B3-6

Map Path: S:\Gis\Projects\CE\ Devon\04808 Pike 2 EIA\CorelDraw\AppB\FigB3-6 Average H2S Concentrations 291018.cdr Analyst: Jackie Hoglund

Station ID = AMS22

Height = 10.00 m; [Jan 1, 2017 - 1:00:00 AM to Jan 1, 2018 - 12:00:00 AM (UTC-0700)]

Annual(Jan to Dec): Total Periods = 8760; Valid Periods = 8678 (99.1%); Calm Wind Periods = 6



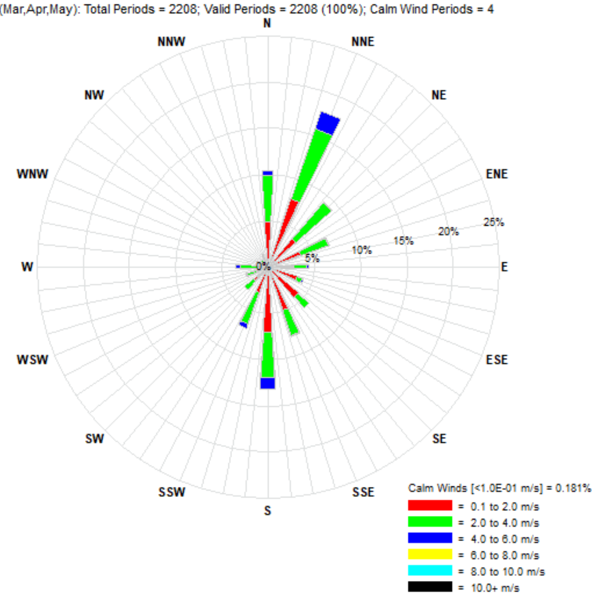
Map Path: S:\Gis\Projects\CE\ Devon\04808 Pike 2 EIA\CrorelDraw\AppB\Fig B3-7 AMS22 2017 Wind Rose 291018.cdr Analyst: Jackie Hoglund

Pike 2 Project

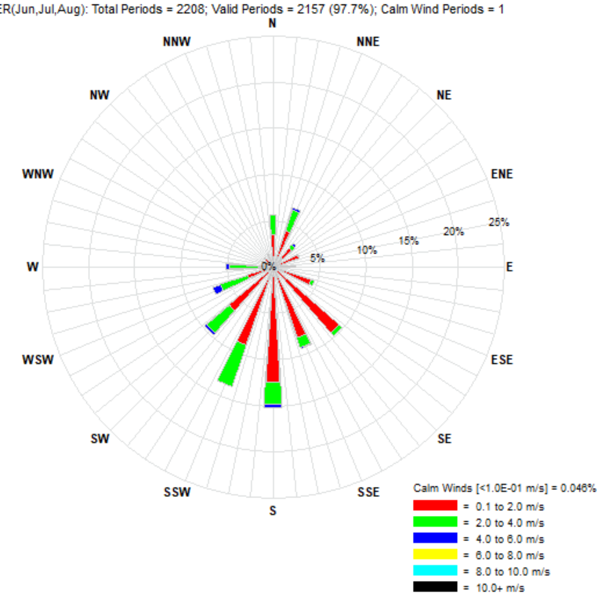
Wind Rose for 2017
at AMS22 (Janvier Station)

October 29, 2018	FigB3-7 AMS22 2017 Wind Rose 291018.cdr	
devon	PROVIDED BY: Wood. FINAL MAPPING BY: Wood.	**Figure B3-7**

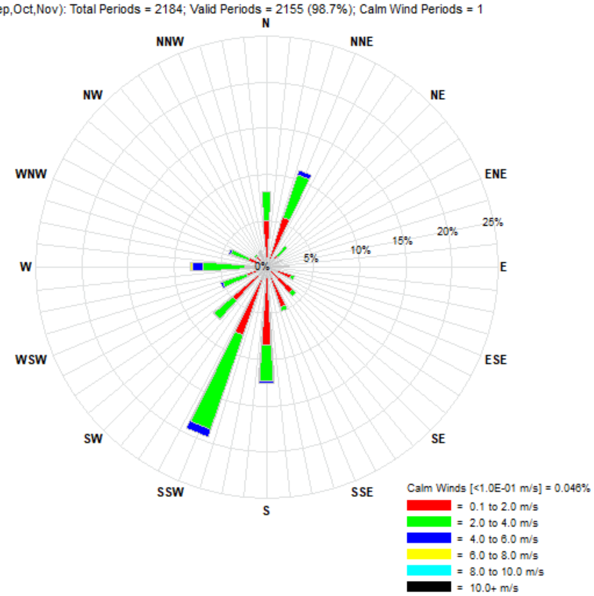
Station ID = AMS22
Height = 10.00 m; [Jan 1, 2017 - 1:00:00 AM to Jan 1, 2018 - 12:00:00 AM (UTC-0700)]
SPRING(Mar,Apr,May): Total Periods = 2208; Valid Periods = 2208 (100%); Calm Wind Periods = 4



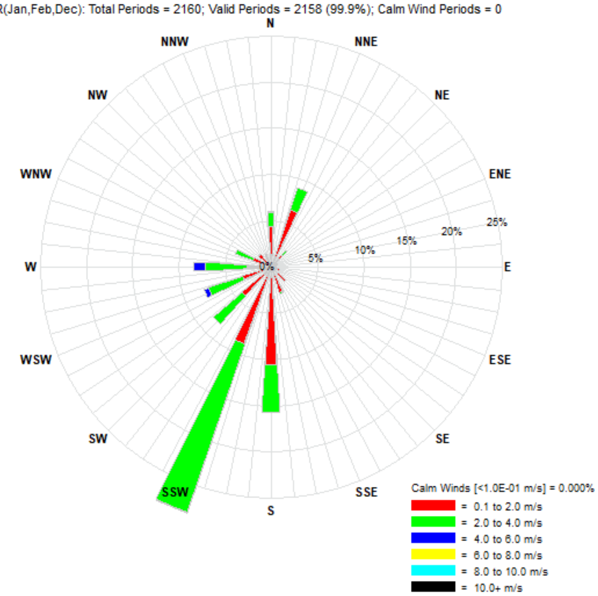
Station ID = AMS22
Height = 10.00 m; [Jan 1, 2017 - 1:00:00 AM to Jan 1, 2018 - 12:00:00 AM (UTC-0700)]
SUMMER(Jun,Jul,Aug): Total Periods = 2208; Valid Periods = 2157 (97.7%); Calm Wind Periods = 1



Station ID = AMS22
Height = 10.00 m; [Jan 1, 2017 - 1:00:00 AM to Jan 1, 2018 - 12:00:00 AM (UTC-0700)]
FALL(Sep,Oct,Nov): Total Periods = 2184; Valid Periods = 2155 (98.7%); Calm Wind Periods = 1



Station ID = AMS22
Height = 10.00 m; [Jan 1, 2017 - 1:00:00 AM to Jan 1, 2018 - 12:00:00 AM (UTC-0700)]
WINTER(Jan,Feb,Dec): Total Periods = 2160; Valid Periods = 2158 (99.9%); Calm Wind Periods = 0



Map Path: S:\Gis\Projects\CE\ Devon\04808 Pike 2 EIA\CorelDraw\AppB\Fig B3-7 AMS22 2017 Wind Rose 291018.cdr Analyst: Jackie Hoglund

Pike 2 Project

Seasonal Wind Rose for 2017 at AMS22 (Janvier Station)

October 29, 2018 | FigB3-8 AMS22 Seasonal Wind Rose 291018.cdr

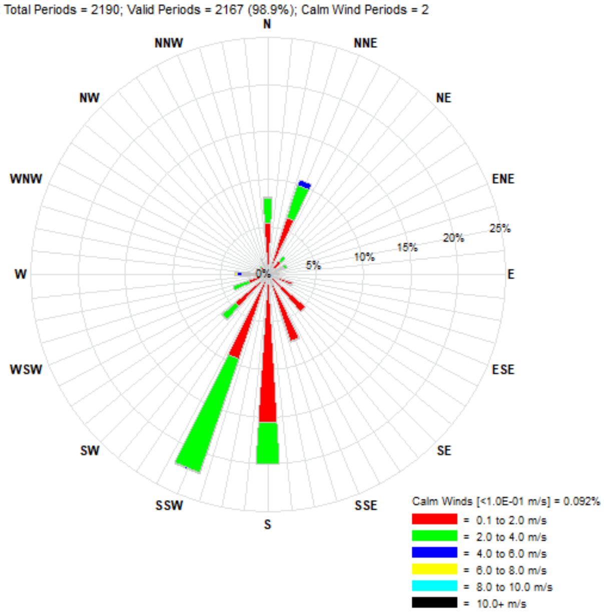
devon

PROVIDED BY: Wood.

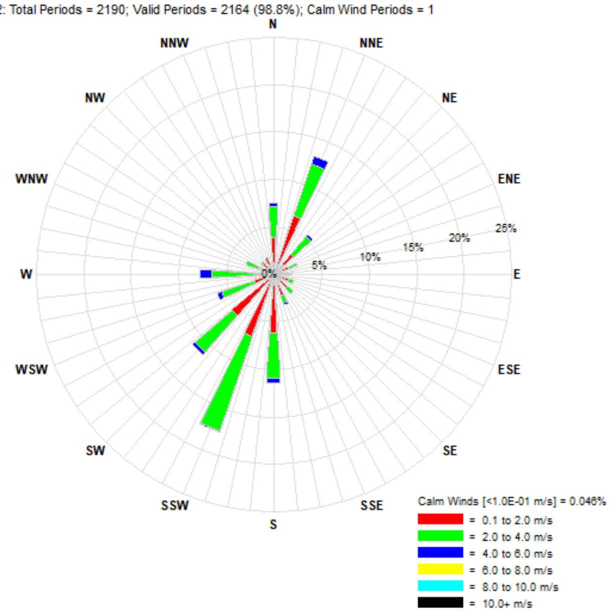
FINAL MAPPING BY: Wood.

Figure B3-8

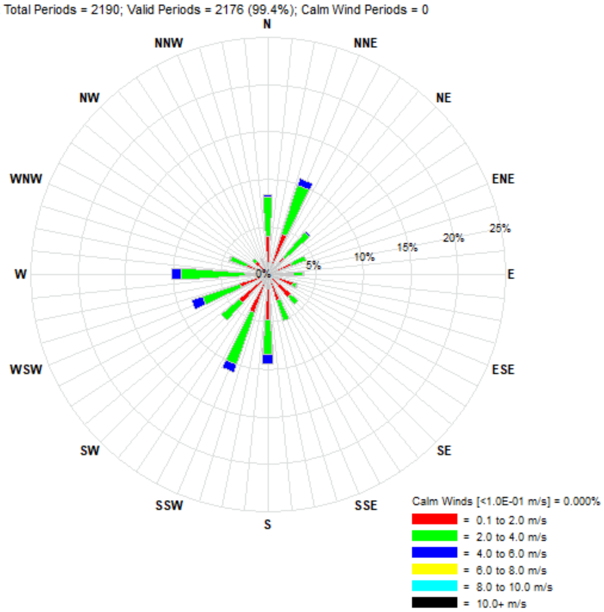
Station ID = AMS22
Height = 10.00 m; [Jan 1, 2017 - 1:00:00 AM to Jan 1, 2018 - 12:00:00 AM (UTC-0700)]
HR01-06: Total Periods = 2190; Valid Periods = 2167 (98.9%); Calm Wind Periods = 2



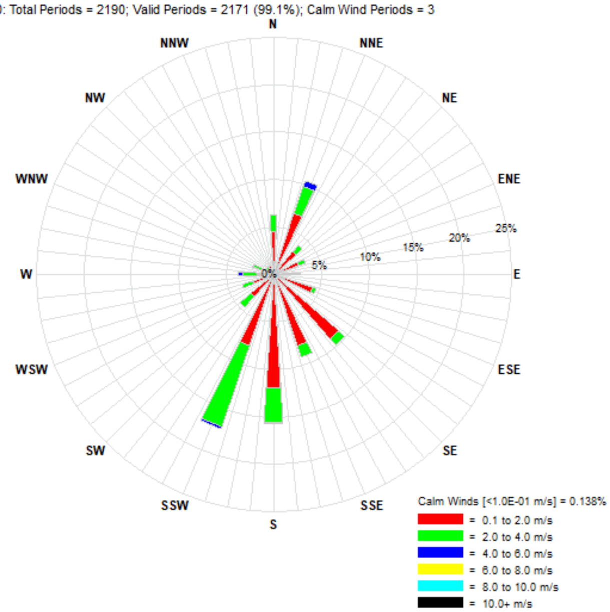
Station ID = AMS22
Height = 10.00 m; [Jan 1, 2017 - 1:00:00 AM to Jan 1, 2018 - 12:00:00 AM (UTC-0700)]
HR07-12: Total Periods = 2190; Valid Periods = 2164 (98.8%); Calm Wind Periods = 1



Station ID = AMS22
Height = 10.00 m; [Jan 1, 2017 - 1:00:00 AM to Jan 1, 2018 - 12:00:00 AM (UTC-0700)]
HR13-18: Total Periods = 2190; Valid Periods = 2176 (99.4%); Calm Wind Periods = 0



Station ID = AMS22
Height = 10.00 m; [Jan 1, 2017 - 1:00:00 AM to Jan 1, 2018 - 12:00:00 AM (UTC-0700)]
HR19-00: Total Periods = 2190; Valid Periods = 2171 (99.1%); Calm Wind Periods = 3



Pike 2 Project

6-Hour Wind Rose for 2017
at AMS22 (Janvier Station)

October 29, 2018 | FigB3-9 AMS22 6-Hour Wind Rose 291018.cdr

devon

PROVIDED BY: Wood.

FINAL MAPPING BY: Wood.

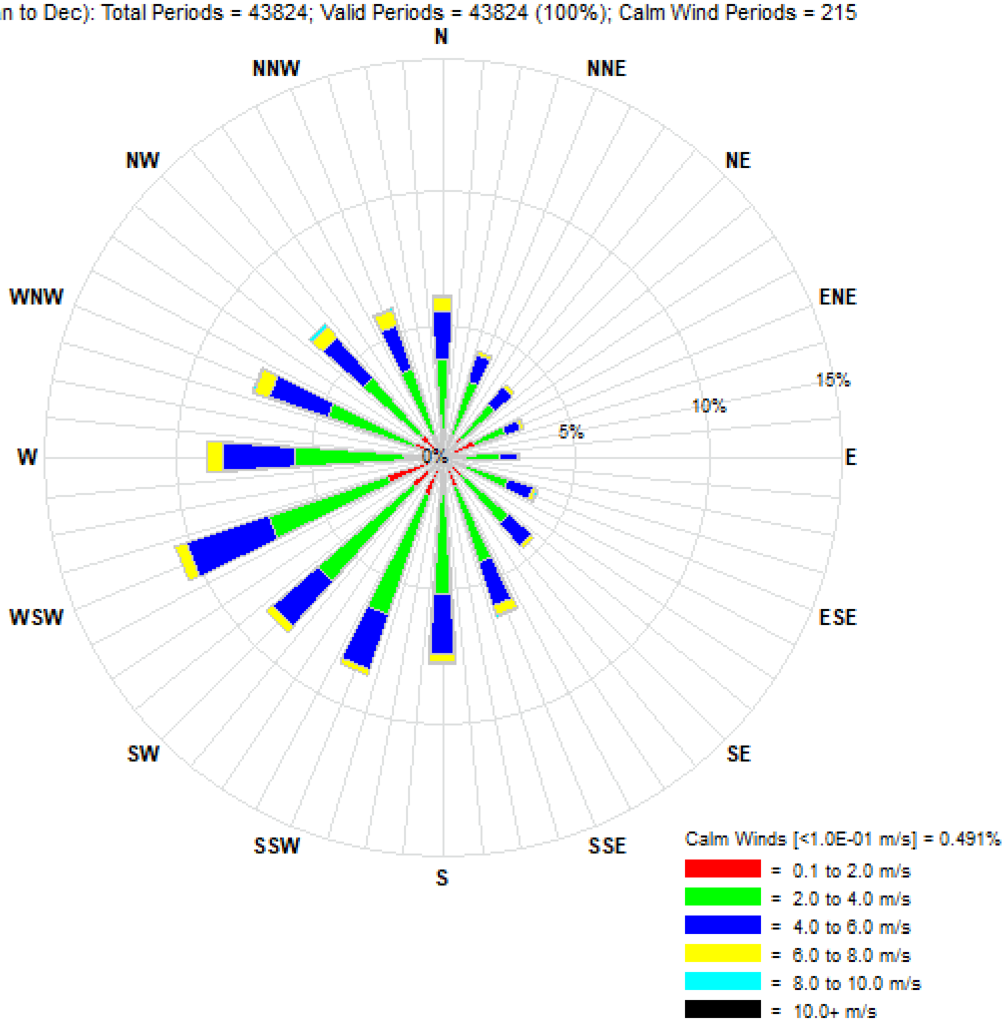
Figure B3-9

Map Path: S:\Gis\Projects\CE\ Devon\04808 Pike 2 EIA\CorelDraw\AppB\Fig B3-9 AMS22 6-Hour Wind Rose 291018.cdr Analyst: Jackie Hoglund

CALMET.DAT: Interpolated to [(I,J)=(30.523, 30.404)])][(X,Y)km=(520.297, 6133.308) in MODEL Projection]

Height = 10.00 m; [Jan 1, 2002 - 1:00:00 AM to Jan 1, 2007 - 12:00:00 AM (UTC-0700)]

Annual(Jan to Dec): Total Periods = 43824; Valid Periods = 43824 (100%); Calm Wind Periods = 215



Pike 2 Project

Wind Rose for 2002-2006
at Project Pseudo-Station

October 29, 2018 | FigB3-10 Pseudo-Station Wind Rose 291018.cdr

devon

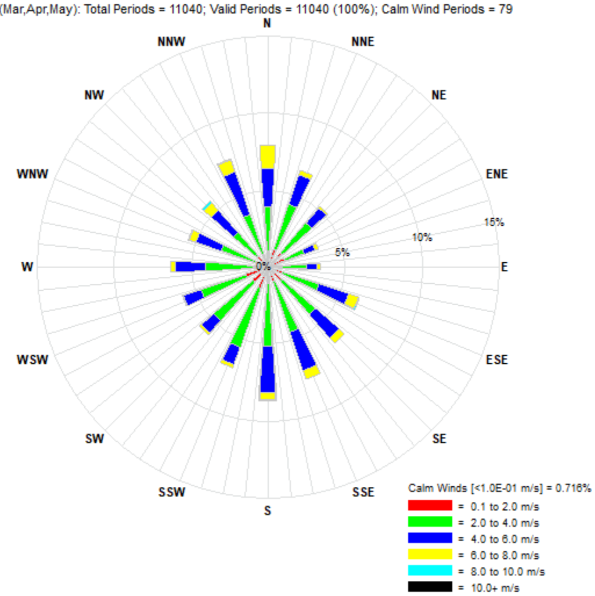
PROVIDED BY: Wood.

FINAL MAPPING BY: Wood.

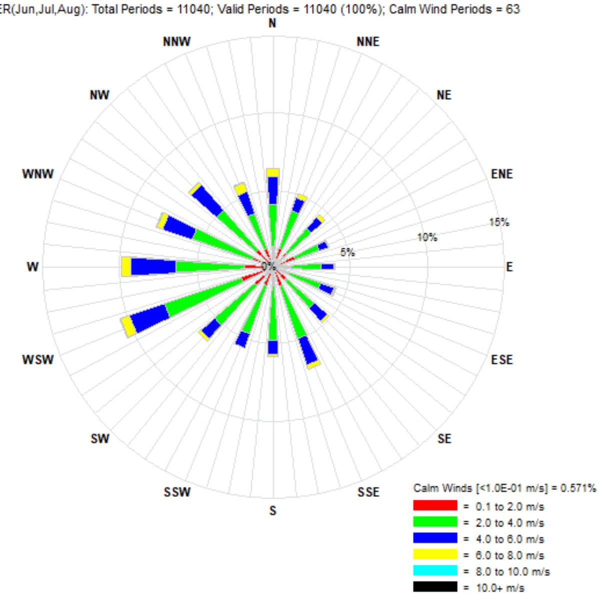
Figure B3-10

Map Path: S:\Gis\Projects\CE\ Devon\04808 Pike 2 EIA\CorelDraw\AppB\Fig B3-10 Pseudo-Station Wind Rose 291018.cdr Analyst: Jackie Hoglund

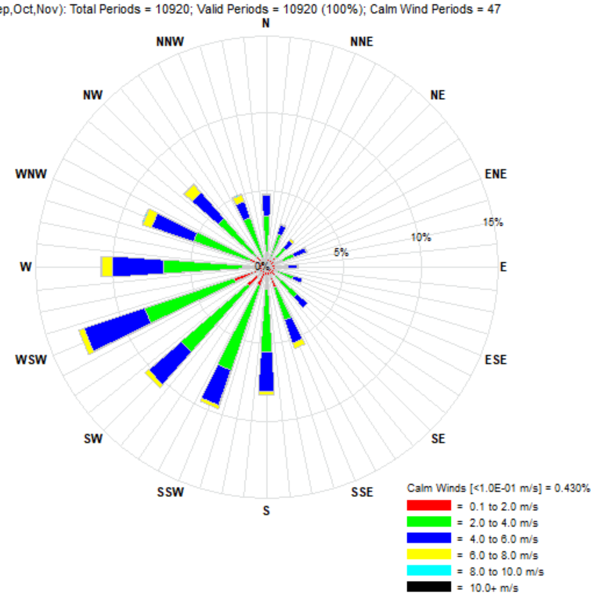
CALMET.DAT: Interpolated to [(I,J)=(30.523, 30.404)]][(X,Y)km=(520.297, 6133.308) in MODEL Projection]
Height = 10.00 m; [Jan 1, 2002 - 1:00:00 AM to Jan 1, 2007 - 12:00:00 AM (UTC-0700)]
SPRING(Mar,Apr,May): Total Periods = 11040; Valid Periods = 11040 (100%); Calm Wind Periods = 79



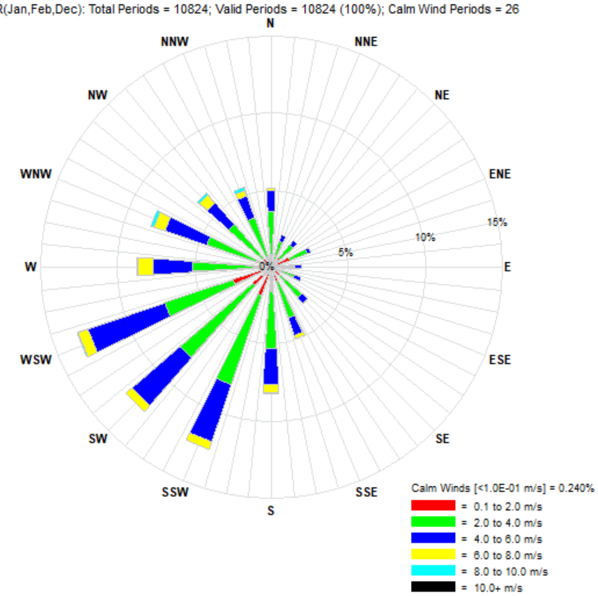
CALMET.DAT: Interpolated to [(I,J)=(30.523, 30.404)]][(X,Y)km=(520.297, 6133.308) in MODEL Projection]
Height = 10.00 m; [Jan 1, 2002 - 1:00:00 AM to Jan 1, 2007 - 12:00:00 AM (UTC-0700)]
SUMMER(Jun,Jul,Aug): Total Periods = 11040; Valid Periods = 11040 (100%); Calm Wind Periods = 63



CALMET.DAT: Interpolated to [(I,J)=(30.523, 30.404)]][(X,Y)km=(520.297, 6133.308) in MODEL Projection]
Height = 10.00 m; [Jan 1, 2002 - 1:00:00 AM to Jan 1, 2007 - 12:00:00 AM (UTC-0700)]
FALL(Sep,Oct,Nov): Total Periods = 10920; Valid Periods = 10920 (100%); Calm Wind Periods = 47



CALMET.DAT: Interpolated to [(I,J)=(30.523, 30.404)]][(X,Y)km=(520.297, 6133.308) in MODEL Projection]
Height = 10.00 m; [Jan 1, 2002 - 1:00:00 AM to Jan 1, 2007 - 12:00:00 AM (UTC-0700)]
WINTER(Jan,Feb,Dec): Total Periods = 10824; Valid Periods = 10824 (100%); Calm Wind Periods = 26



Map Path: S:\Gis\Projects\CE\ Devon\04808 Pike 2 EIA\CorelDraw\AppB\Fig B3-11 Pseudo-Station Seasonal Wind Rose 291018.cdr Analyst: Jackie Hoglund

Pike 2 Project

Seasonal Wind Rose for 2002-2006 at Project Pseudo-Station

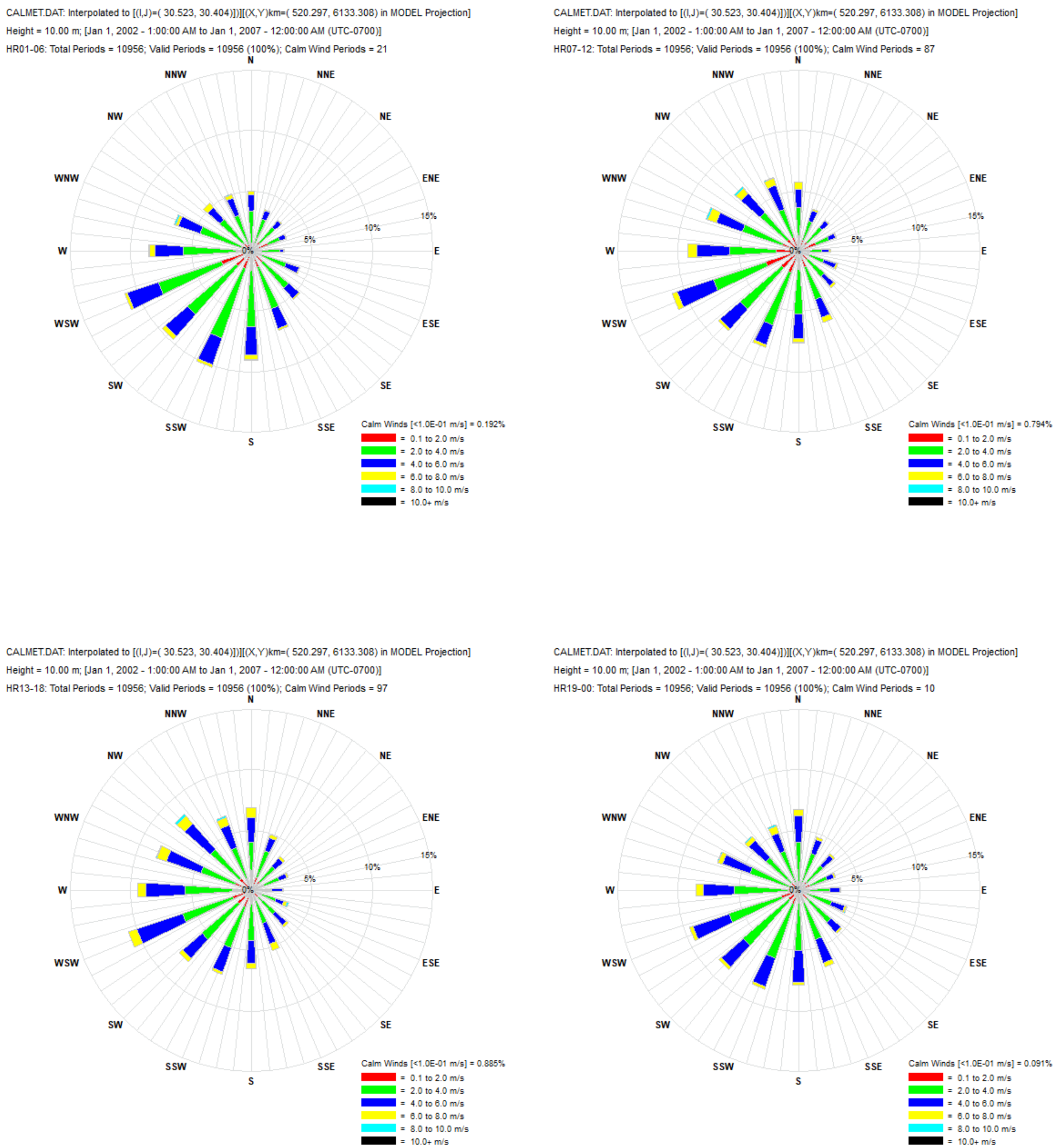
October 29, 2018 | FigB3-11 Pseudo-Station Seasonal Wind Rose 291018.cdr

devon

PROVIDED BY: Wood.

FINAL MAPPING BY: Wood.

Figure B3-11



Pike 2 Project

6-Hour Wind Rose for 2002-2006
at Project Pseudo-Station

October 29, 2018	FigB3-12 Pseudo-Station 6-Hour Wind Rose 291018.cdr

devon

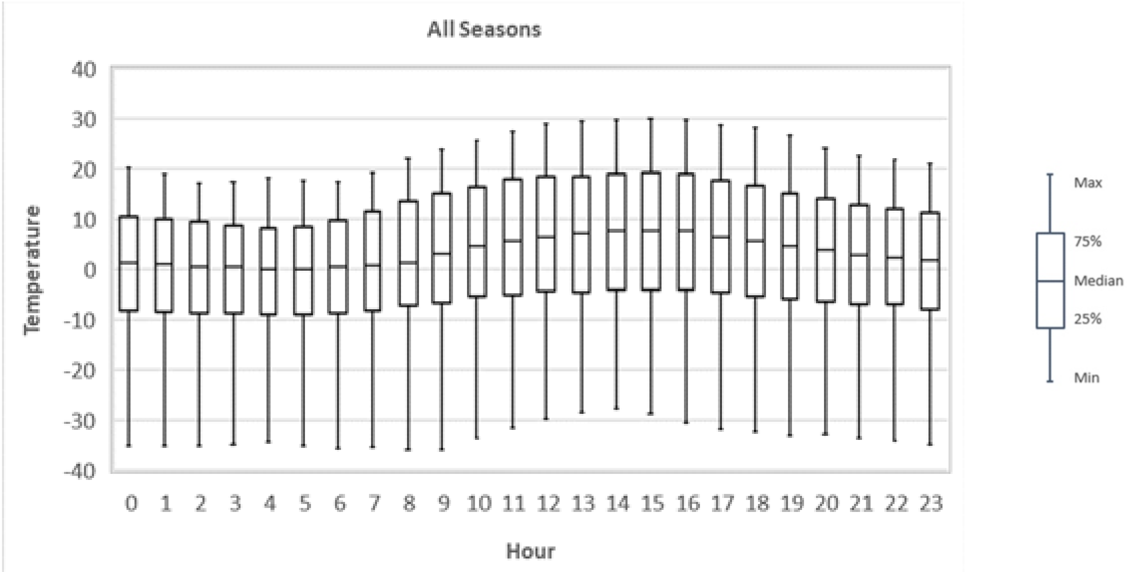
PROVIDED BY: Wood.

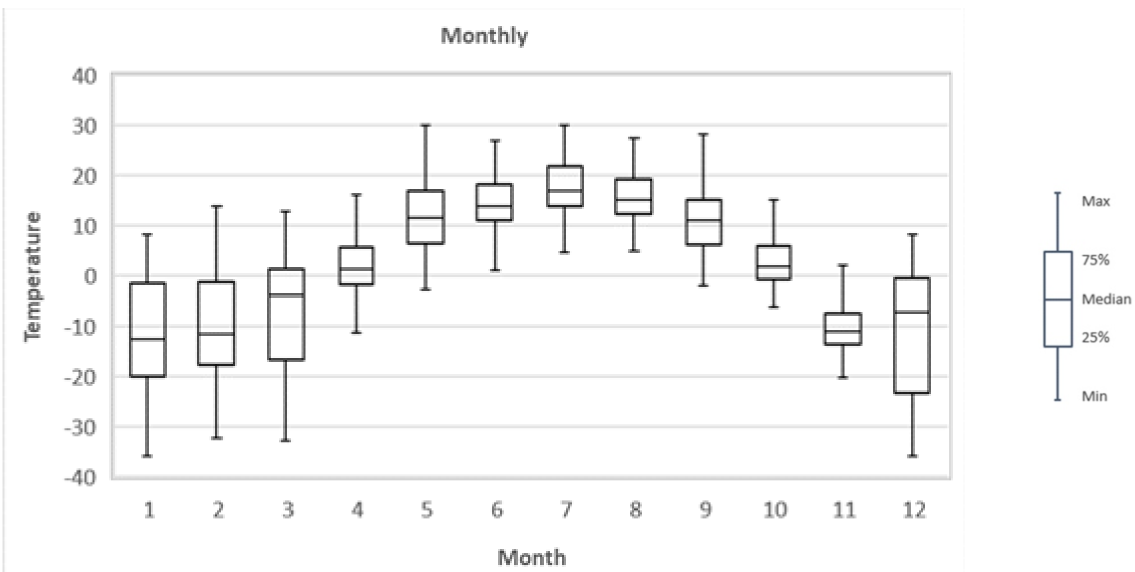
FINAL MAPPING BY: Wood.

Figure B3-12

Map Path: S:\Gis\Projects\CE\ Devon\04808 Pike 2 EIA\CrorelDraw\AppB\Fig B3-12 Pseudo-Station 6-Hour Wind Rose 291018.cdr Analyst: Jackie Hoglund

Previous View Main Menu Search





Map Path: S:\Gis\Projects\CE\ Devon\04808 Pike 2 EIA\CrorelDraw\AppB\Fig B3-13 Janvier Average Temperatures 291018.cdr Analyst: Jackie Hoglund

Pike 2 Project

Diurnal and Monthly Average Temperatures at the Janvier Station

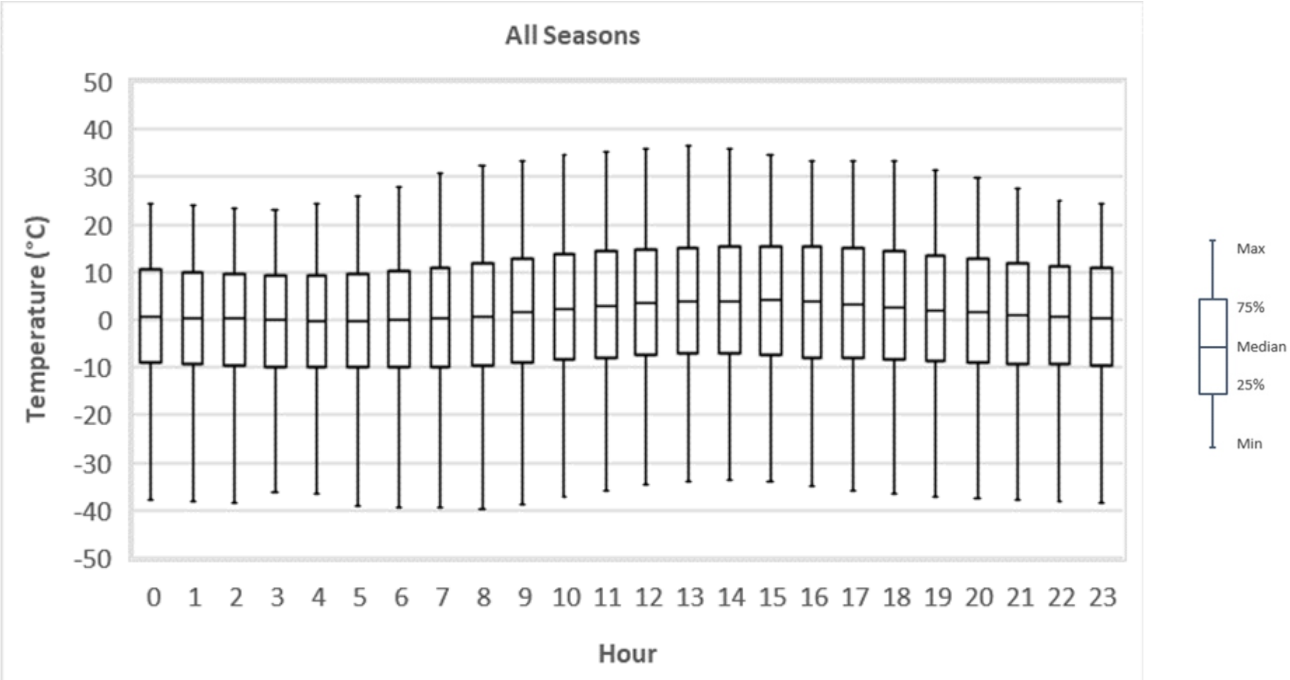
October 29, 2018 | FigB3-13 Janvier Average Temperatures 291018.cdr

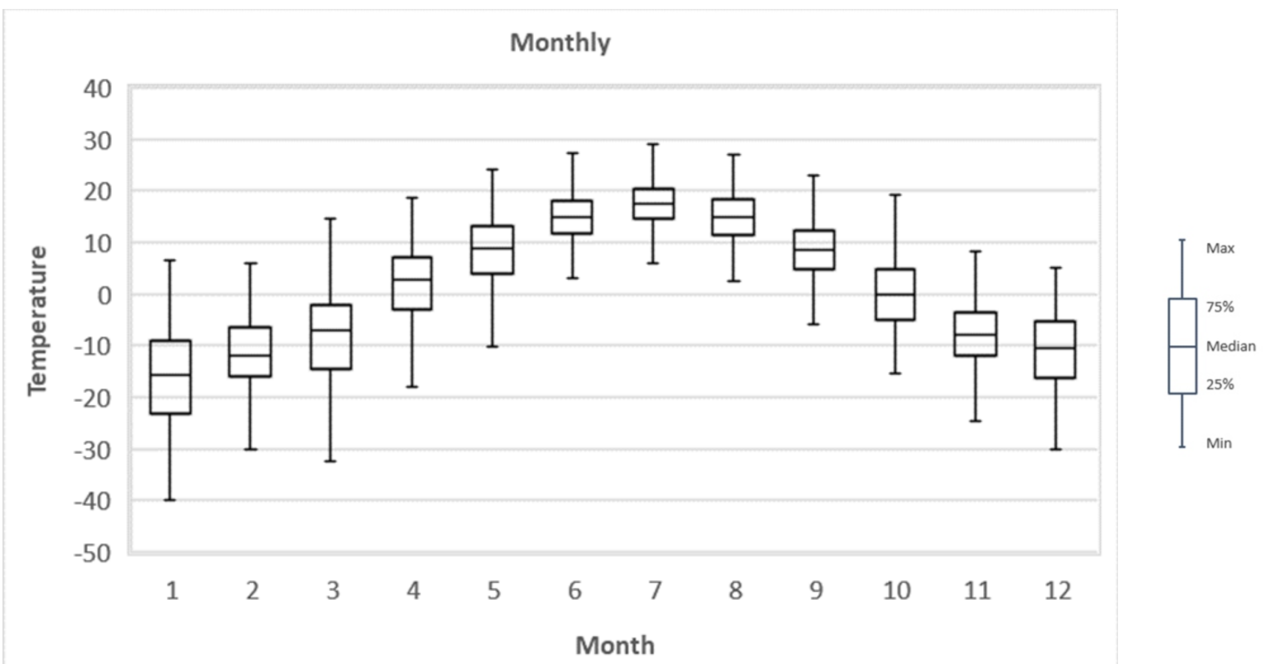
devon

PROVIDED BY: Wood.

FINAL MAPPING BY: Wood.

Figure B3-13





Map Path: S:\Gis\Projects\CE\ Devon\04808 Pike 2 EIA\CrorelDraw\AppB\Fig B3-14 Psudo-Station Average Temperatures 291018.cdr Analyst: Jackie Hoglund

Pike 2 Project

Diurnal and Monthly Average Temperatures at the Project Pseudo-Station

October 29, 2018 | FigB3-14 Pseudo-Station Average Temperatures 291018.cdr

devon

PROVIDED BY: Wood.

FINAL MAPPING BY: Wood.

Figure B3-14

Table B3-10: Ambient Temperatures Measured at Janvier and Project Pseudo-Station

Station	Temperature (°C)			
	Min	Median	Average	Max
Janvier (2017)	-35.9	3.40	2.29	29.9
Project Pseudo-Station (2002-2006)	-39.8	1.47	0.957	36.4

Temperature measurements indicate the following:

- monthly median temperatures range from about -12°C in winter to +17°C in summer;
- the median hourly temperatures recorded at these stations show that the temperatures were the highest from 12:00 to 17:00 as a result of solar heating; and
- the lowest median temperatures occurred just before sunrise from 02:00 to 05:00.

1.4.3 Atmospheric Stability

While Pasquill-Gifford (PG) stability classifications are not directly used in CALPUFF modelling, they are useful to describe the amount of turbulence present in the atmosphere. These classes range from unstable (Classes A, B, C) through neutral (D) to stable (E, F). Unstable conditions are primarily associated with daytime heating conditions that result in enhanced turbulence. Stable conditions occur during nighttime cooling and indicated suppressed turbulence. Neutral conditions occur in cloudy or windy conditions.

Stability class was derived following the approach of US EPA where the final stability class changes are limited to one category per hour. For this reason, the final PG stability classes can include a few hours with stable conditions occurring in daylight hours, and/or unstable conditions in evening hours.

Figure B3-15 presents diurnal trends in PG stability class seasonally for the Project Pseudo-Station. The information indicates:

- neutral conditions (Stability Class D) can occur at any hour of the day and occur about 51% of the time;
- unstable stability classes (A, B, and C) are limited to daytime hours and occur about 20% of the time, while stable classes (E and F) occur through afternoon to early morning nighttime hours (except as indicated above) and occur about 28% of the time; and
- spring and summer have the largest percentage of stability Class A (very unstable) that can occur during up to 1% of daylight hours. Winter and fall have the fewest stability Class A values because this class is associated with strong daytime heating.

Pike 2 Project

Diurnal and Seasonal Stability Class Frequency Distributions at the Project Pseudo-Station

October 29, 2018	FigB3-15 Pseudo-Station Stability Class 291018.cdr
devon	PROVIDED BY: Wood. FINAL MAPPING BY: Wood.

Figure B3-15

1.4.4 Mixing Height

A temperature increase with height is referred to as an inversion. The base of the temperature inversion may be ground-based or elevated. In the case of the latter, the near-surface atmosphere is divided into two horizontal layers. The lower layer tends to be well mixed and is characterized by neutral or unstable conditions. The depth of this lower layer is referred to as the mixing height. The upper layer tends to be characterized by stable conditions. The vertical transfer of mass between these two layers is minimal. Mixing heights are not explicitly used as inputs to the CALPUFF model. However, an examination of them is useful from a climatological perspective.

During the night, the mixing height is determined by the mechanical interaction of the wind with surface features. Maximum mixing layer depths tend to be a few hundred metres. The depth of the mechanical mixing layer can be estimated from the relationship:

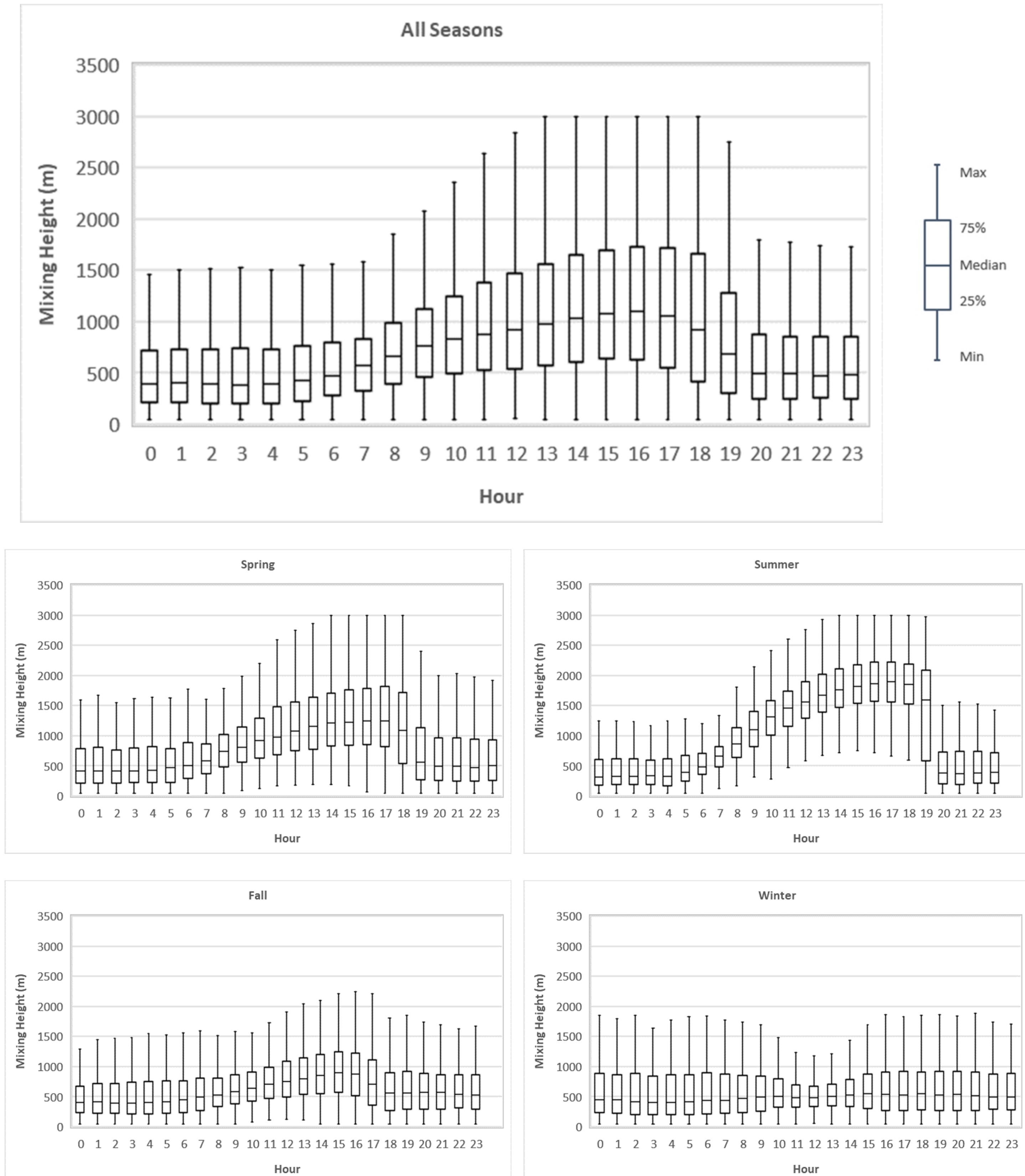
$$Z_m = 263\ U$$

where: U is the wind speed at 10 m (m/s) and is centre-averaged for a 3-h period (Benkley and Schulman 1979). The above relationship assumes a surface roughness length of 100 cm, a logarithmic wind profile, a von Karman constant of 0.4 and a Coriolis parameter of 1.22×10^{-4} s^{-1}. The roughness length is likely nearer to 0.5 to 1 m in the oil sands area, which may slightly decrease Z_m compared to the above value (TrueNorth Energy 2001a, 2001b). In the event that the roughness lengths were only 50 cm, the estimated height of the mechanical mixing layer (Z_m) would be given by Z_m = 202 U_z (where U is the wind speed) instead of Z_m = 263 U_z as described above.

After sunrise, solar heating usually determines the depth of the mixing layer. Typical depths increase from the mechanical mixing height at sunrise to heights of up to a few thousand metres by mid-afternoon. Mean maximum afternoon mixing depths for the study area were obtained from a climatological summary of mixing heights prepared by Portelli (1977). Figure B3-16 shows mixing heights for the five modelled years at the Project Pseudo-Station and shows diurnal variation in mixing heights by season. Median mixing heights range from approximately 410 m during winter nights to approximately 1,900 m during summer afternoons.

1.4.5 Precipitation

Table B3-11 and Figure B3-17 show average monthly rainfall, snowfall and total precipitation at the Fort McMurray Airport from 1981 through 2010. Most of the total rainfall occurs between May to September, while most of the annual snowfall occurs during the period November to March. The greatest total precipitation of about 80 mm/month occurs in July.



Pike 2 Project

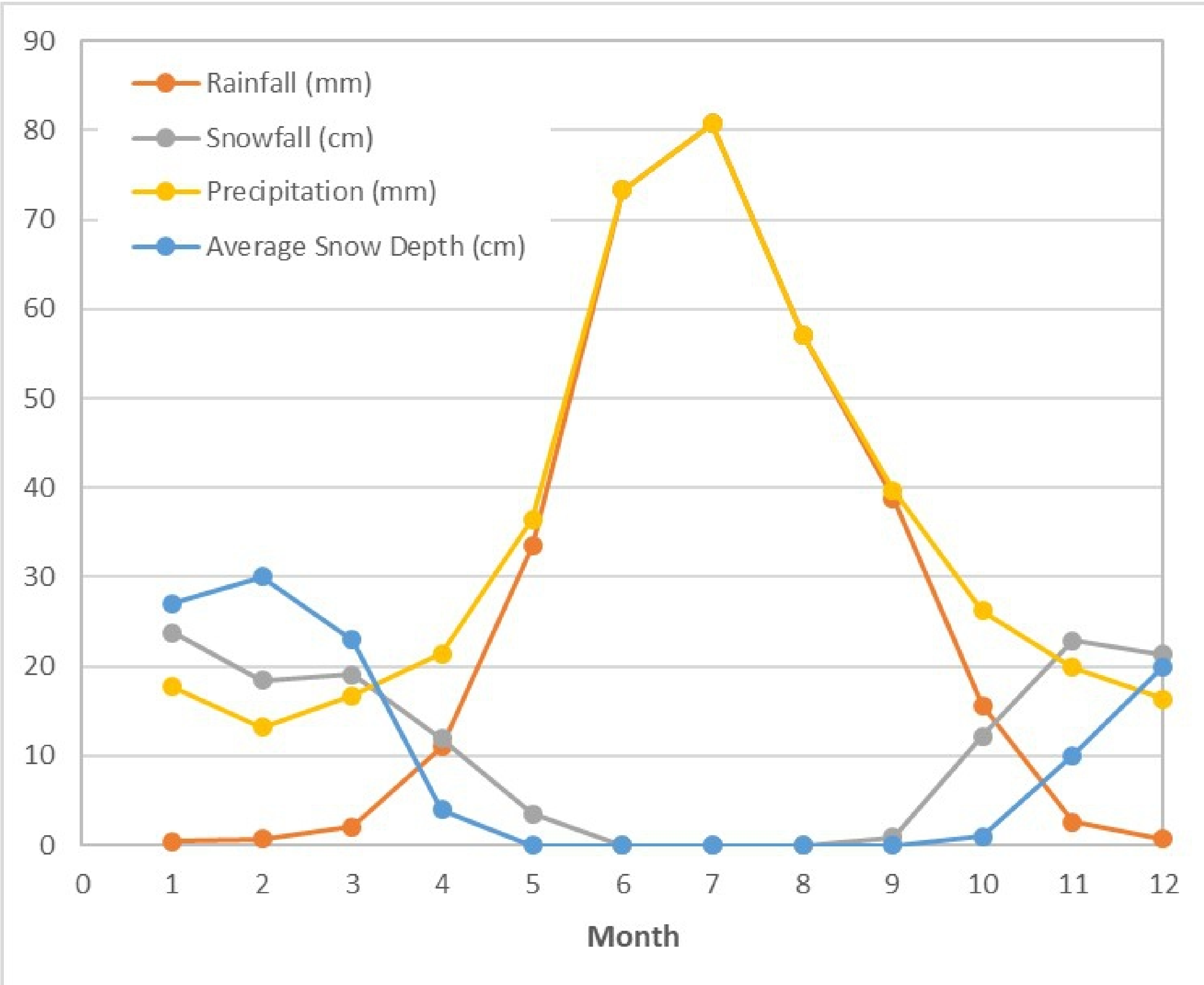
Diurnal Variation in Mixing Height at the Project Pseudo-Station

October 29, 2018
FigB3-16 Pseudo-Station Mixing Height 291018.cdr

devon
PROVIDED BY: Wood.
FINAL MAPPING BY: Wood.

Figure B3-16

Map Path: S:\Gis\Projects\CE\ Devon\04808 Pike 2 EIA\CorelDraw\AppB\Fig B3-16 Psudo-Station Mixing Height 291018.cdr Analyst: Jackie Hoglund



Pike 2 Project

Average Monthly Rainfall, Snowfall and Total Precipitation Values for McMurray from 1981 through to 2010

October 29, 2018	FigB3-17 Fort McMurray Precipitation 291018.cdr		
devon	PROVIDED BY: Wood.		Figure B3-17
	FINAL MAPPING BY: Wood.		

Map Path: S:\Gis\Projects\CE\ Devon\04808 Pike 2 EIA\CrorelDraw\AppB\Fig B3-17 Fort McMurray Precipitation 291018.cdr Analyst: Jackie Hoglund

Table B3-11: Average Precipitation at the Fort McMurray Airport (1981 to 2010)

Month	Rainfall (mm)	Snowfall (cm)	Total Precipitation (mm)	Average Snow Depth (cm)
January	0.4	23.8	17.7	27
February	0.7	18.4	13.2	30
March	2.1	19.1	16.7	23
April	11.0	11.9	21.4	4
May	33.5	3.5	36.5	0
June	73.3	0.0	73.3	0
July	80.7	0.0	80.7	0
August	57.1	0.0	57.1	0
September	38.8	0.9	39.7	0
October	15.6	12.2	26.2	1
November	2.6	22.9	19.9	10
December	0.7	21.3	16.4	20
Total	316.3	133.8	418.6	10

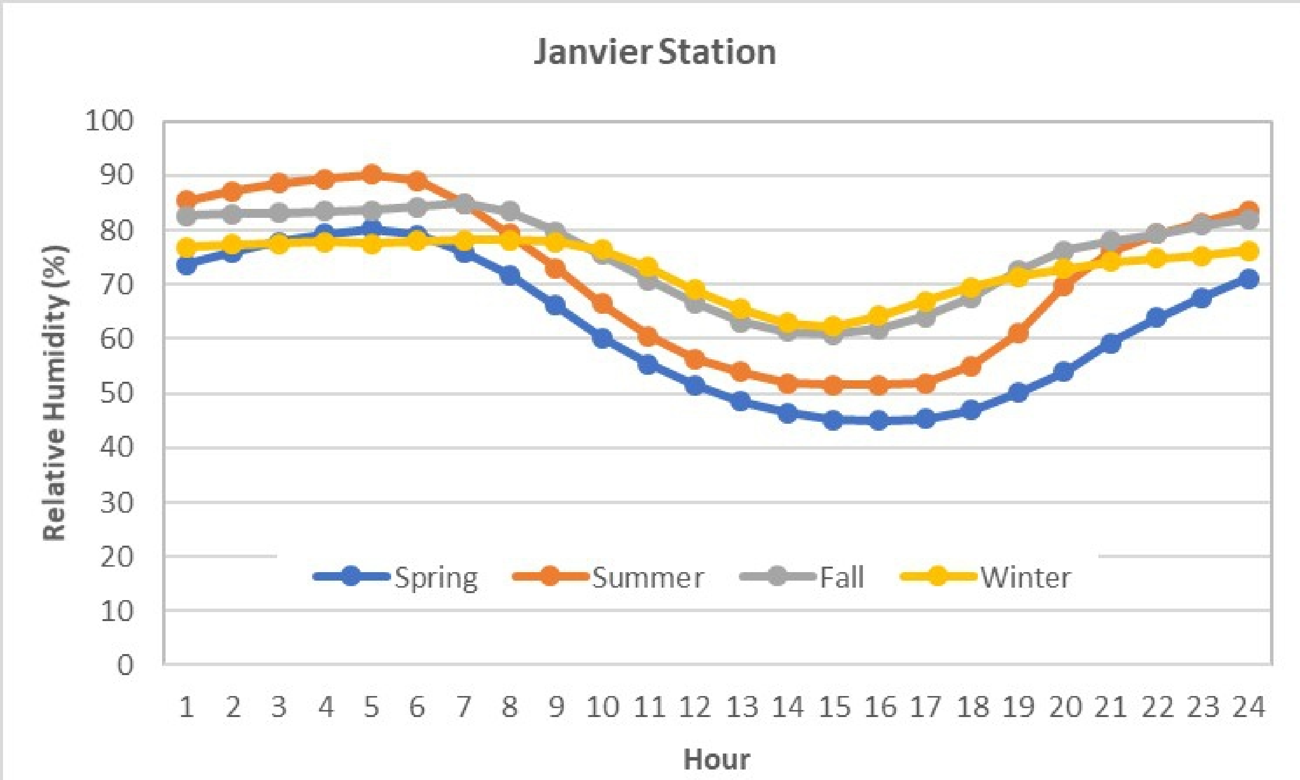
1.4.6 General Climate

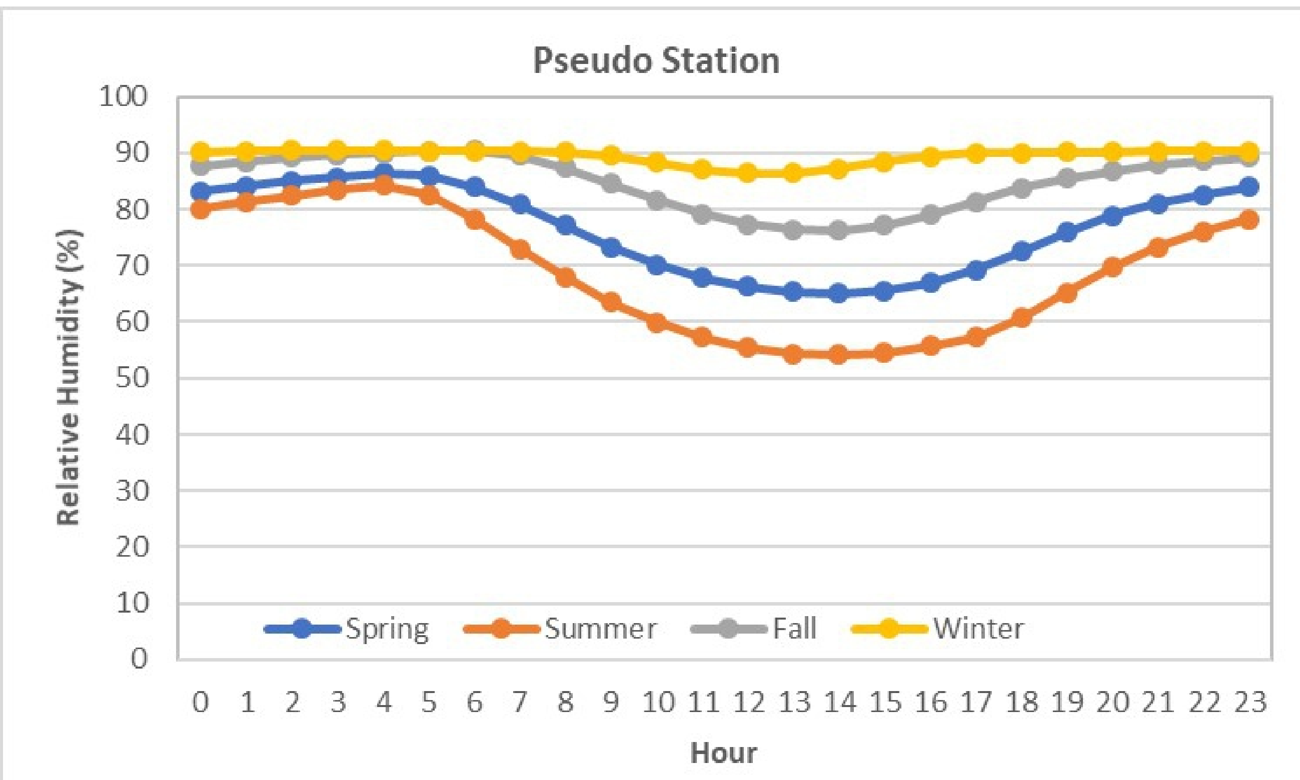
While not directly related to dispersion, common climatological variables such as relative humidity are often of interest. Figure B3-18 shows the diurnal variation in relative humidity for each month at the Project Pseudo-Station. The highest relative humidity values tend to occur in the early morning hours in November and December. The lowest values tend to occur in the afternoon hours in May and June. Overall, the lower daytime values are associated with the warmer temperatures that occur during the day.

1.4.7 Climate Extremes

A review of climate extremes from the 1981 to 2010 Canadian Climate Normals database (Environment Canada 2014) for the Fort McMurray weather station indicates the following extremes:

- temperature extremes range from -50.6°C to 37.0°C;
- extreme daily precipitation events reached 94.5 mm (rainfall) and 29.7 cm (snowfall);
- snow depth reached up to 68 cm; and
- maximum hourly wind speeds of up to 72 km/h, with gusts up to 113 km/h.





Pike 2 Project

Annual Relative Humidity at Pseudo Station & Janvier Station (%)

October 29, 2018	FigB3-18 Relative Humidity 291018.cdr	
devon	PROVIDED BY: Wood. FINAL MAPPING BY: Wood.	**Figure B3-18**

Map Path: S:\Gis\Projects\CE\ Devon\04808 Pike 2 EIA\CorelDraw\AppB\Fig B3-18 Relative Humidity 291018.cdr Analyst: Jackie Hoglund

1.4.7.1 Severe Weather

Data on severe weather events at the Project site were taken from summaries found in Hage (2003), which analyzed data on destructive windstorms in Alberta and Saskatchewan and Khandekar (2002), which looked at precipitation and temperature extremes in Canada focusing on Alberta and the prairies.

Hage classified wind storms into six types, of which the most destructive are tornadoes. Data from multiple sources gathered by the paper showed that tornadoes are very rare at the Project site, with a recorded annual frequency of less than 0.1/y per 10^4 km^2 between 1880 and 1998. By contrast, the region with the highest frequency, located about 100 km about south of Edmonton, suffered more than 0.8 events per 10^4 km^2. Even after a rough estimation of tornadoes in the area that may have occurred unreported, the Project site is still considered an area with a low frequency of destructive events.

The site is within a region where hailstorms, which are associated with strong convective thunderstorms, occur less than 1 d/y. Areas closer to the Rocky Mountains are more prone to these phenomena.

Drought conditions in the Prairies are related to the cold phase of the El Nino-Southern Oscillation phenomenon. These anomalies are, however, much more pronounced over the southern sections of the Prairies.

Hage describes the long-term trend of windstorms in the region as "wavelike," with the five-year average at a maximum between 1910 and 1940 followed by a quiet period up to about 1970. The numbers rose again up to around 1990, after which the frequency appears to decrease towards the end of the record in 2000. Based on this lack of a clear trend, it is difficult to state whether the frequency of these extremes will increase or decrease in the future.

This lack of a clear trend in severe weather was also seen in other parameters. More specifically, no change in the fraction of annual precipitation falling in heavy events was seen at the Project site, even if weak seasonal changes were found.

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Appendix B4

Background Emission Source Information
Volatile Organic Compounds (VOCs),
Polycyclic Aromatic Hydrocarbons (PAHs) and Metals

Appendix B4: Background Emission Source Information VOCS, PAHS and Metals
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1.0 INTRODUCTION

This appendix lists the emission source characteristics and emission rate details of volatile organic compound (VOC), polycyclic aromatic hydrocarbon (PAH) and metal species within the air quality regional study area (AQRSA). The data represent facility and planned project emission information obtained primarily from recent environmental impact assessments (EIAs) (Devon 2010; Devon 2012; Teck and SilverBirch 2011; VCI 2012; Imperial Oil Aspen 2013). The facility and planned Project emissions within the AQRSA that were included in the Baseline and Planned Development (Planned) emission scenarios of this air quality assessment are presented on a company-by-company basis. Background emission sources for the project emission scenario were considered to be the same as those for the Baseline scenario.

Only the individual species emitted from the project were estimated and listed in the tables. Devon provided emissions data for the Project. For other operators, only total VOC and $PM_{2.5}$ emissions were available, although some had emission rates for individual species. The speciation profiles for all kinds of emission sources are adopted from previous EIAs (Devon 2010; 2012; Teck and SilverBirch 2011; VCI 2012). For chemicals whose emissions were not directly available, they were estimated as explained below.

1.1 Point Sources (Boilers, Heaters, Turbines, Engines and Flares)

For the Project, the average emission factors from the California Air Toxic Emission Factors (CATEF) were used. The emission factors from US EPA AP-42 were assumed to be averages and considered as a supplement to CATEF source. Cogeneration emissions were estimated based on 67% from the turbine emission factor and 33% from the heater emission factor, consistent with other assessments in the region (Teck and SilverBirch 2011).

The total VOC and PM were speciated using the values listed in Table B4-1 (Devon 2010).

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Table B4-1: Speciation Profile for Point Sources

Source Type	Boiler/Heater	Turbine	Cogenerator	Engine	Flare	Wood Burner
VOC	**100**	**100**	**100**	**100**	**100**	**100**
Acenaphthene	2.53E-05	0	0	0	0	1.05E-04
Acenaphthylene	2.20E-04	0	0	0	0	0
Acetaldehyde	2.84E-01	6.40E+00	4.36E+00	2.92E+00	1.80E-01	9.64E-02
Acrolein	3.35E-01	8.83E-01	7.00E-01	1.81E+00	5.90E-02	4.65E-01
Aliphatic C_5 -C_8	3.64E+01	2.14E+01	2.64E+01	6.34E+00	3.64E+01	0
Aliphatic C_9 -C_{16}	1.40E+00	1.40E+00	1.40E+00	1.40E+00	1.40E+00	0
Anthracene	2.93E-05	0	0	0	0	0
Aromatic C_{17} -C_{34}	3.27E-05	5.81E-05	4.96E-05	3.27E-05	9.64E-05	3.64E-07
Aromatic C_9 -C_{16}	7.94E-04	6.11E-03	4.34E-03	8.89E-01	7.30E-02	1.55E-03
Benzaldehyde	2.98E-01	0	2.98E-01	0	0	9.91E-05
Benzene	2.04E-01	4.25E+00	2.90E+00	6.32E+00	1.28E-01	4.89E-01
Benzo(a)anthracene	3.56E-05	1.06E-03	7.16E-04	9.74E-04	1.48E-02	7.56E-06
Benzo(a)pyrene	1.78E-05	6.50E-04	4.39E-04	3.81E-04	1.48E-02	3.03E-04
Benzo(b)fluoranthene	2.07E-05	5.28E-04	3.59E-04	7.85E-04	1.48E-02	1.16E-05
Benzo(g,h,i)perylene	2.27E-05	6.40E-04	4.34E-04	6.46E-04	1.48E-02	1.08E-05
Benzo(k)fluoranthene	1.80E-05	5.14E-04	3.49E-04	3.41E-04	1.48E-02	4.19E-06
C_3	0	0	0	0	0	0
C_4	0	0	0	0	0	0
Chrysene	2.53E-05	1.18E-03	7.93E-04	1.03E-03	1.48E-02	4.42E-06
Dibenz(a,h)anthracene	1.67E-05	1.10E-03	7.38E-04	4.14E-05	1.48E-02	1.05E-06
Ethylbenzene	4.09E-02	8.36E-01	5.71E-01	3.84E-02	0	3.61E-03
Fluoranthene	2.16E-04	2.02E-03	1.42E-03	3.29E-03	1.59E-02	1.86E-04
Fluorene	8.35E-05	0	0	0	0	0
Formaldehyde	4.02E+00	4.29E+01	2.99E+01	7.78E+00	2.06E+01	5.12E-01
Hexane	0	1.21E+01	8.07E+00	4.30E-01	0	0
Indeno(1,2,3-cd)pyrene	2.13E-05	1.10E-03	7.39E-04	5.60E-04	1.48E-02	1.01E-05
Naphthalene	2.04E-02	7.76E-02	5.85E-02	2.53E-01	9.09E+00	1.13E-02
Phenanthrene	6.13E-04	1.46E-02	9.96E-03	2.34E-02	1.96E-02	8.15E-04
Propylene	4.27E+00	0	0	0	0	0
Pyrene	1.02E-04	1.29E-03	8.97E-04	5.93E-03	1.56E-02	4.31E-04
Toluene	5.36E-01	3.32E+00	2.39E+00	3.54E+00	1.23E+01	1.07E-01
Xylenes	5.02E-01	1.22E+00	9.80E-01	1.99E-01	3.87E-01	2.91E-03
PM	**100**	**100**	**100**	**0**	**0**	**100**
Aluminum (Al)	5.48E-02	3.03E-02	3.85E-02	0	0	1.01E-02
Arsenic (As)	1.83E-03	0	1.83E-03	0	0	2.82E-02
Barium (Ba)	4.78E-03	0	4.78E-03	0	0	2.18E-01
Cadmium (Cd)	6.04E-04	0	6.04E-04	0	0	5.25E-03
Chromium (Cr)	4.83E-04	9.24E-03	6.32E-03	0	0	2.69E-02
Cobalt (Co)	1.31E-02	4.85E-04	4.70E-03	0	0	8.32E-03
Copper (Cu)	2.28E-02	6.67E-03	1.21E-02	0	0	6.27E-02
Iron (Fe)	1.00E-01	8.64E-02	9.10E-02	0	0	1.27E+00
Lead (Pb)	1.37E-03	1.52E-03	1.47E-03	0	0	6.14E-02
Manganese (Mn)	4.56E-03	2.42E-03	3.14E-03	0	0	2.05E+00

Source Type	Boiler/Heater	Turbine	Cogenerator	Engine	Flare	Wood Burner
Molybdenum (Mo)	6.04E-06	0	0	0	0	2.69E-03
Nickel (Ni)	2.28E-02	2.58E-03	9.32E-03	0	0	4.22E-02
Potassium (K)	4.56E-02	1.82E-02	2.73E-02	0	0	4.99E+01
Selenium (Se)	3.22E-03	1.67E-01	2.64E-01	0	0	3.59E-03
Silicon (Si)	2.64E-01	0	2.64E-01	0	0	0
Strontium (Sr)	4.56E-04	9.09E-04	7.58E-04	0	0	1.28E-02
Vanadium (V)	9.13E-03	2.27E-03	4.56E-03	0	0	1.25E-03
Zinc (Zn)	3.65E-02	8.03E-03	1.75E-02	0	0	5.38E-01
Zirconium (Zr)	5.37E-05	5.91E-04	4.12E-04	0	0	0

Note:
"0" = No emissions.

1.2 Processing Area

For the Project plant fugitive, tank farm and well pads, the emissions of VOC and TRS were estimated based on Devon Pike 1 project (corresponding bitumen production rate of 109,00 bpd) (Devon 2012).

Processing plant emissions from plant combustion sources were estimated based on VOC and TRS emissions from the Devon Jackfish project (corresponding bitumen production rate of 305,000 bpd) (Devon 2010).

***For each plant, the total fugitive VOC emission rate was speciated using the values listed in Table B4-2 (Devon 2010).

Table B4-2: Speciation Profile for In Situ Plants

Compound Group	In Situ Plant
VOC	**100.00%**
1,3-butadiene	0.00%
Aliphatic alcohols	0.53%
Aliphatic aldehydes	2.09%
Aliphatic C17-C34	0.97%
Aliphatic C5-C8	16.40%
Aliphatic C9-C16	67.51%
Aliphatic ketones	7.40%
Aromatic C9-C16	1.74%
Benzene	1.30%
Carboxylic acids	0.00%
Ethylbenzene	0.08%
Hexane	1.07%
Naphthalene	0.00%
Toluene	0.58%
Xylenes	0.34%
TRS	**100.00%**
Carbon disulphide	28.71%
Hydrogen Sulphide	2.36%
Mercaptans	29.63%
Thiophenes	39.31%

1.3 Community and Highway

Baseline community fugitive emissions for the community were calculated using populations in communities out of the total population of Census Division, and then scaled based on the emission data based on Alberta Census Divisions (ChemInfo 2007).

Community emission rates for the Planned Development Case were scaled up based on the projected population of these communities 25 years after the start of project operations. The populations were all assumed to grow at a rate of 3% per year for 25 years over baseline estimates.

Baseline highway fugitive emission rates were derived by estimating the annual average daily traffic volume, the average number of kilometres each vehicle traveled, and the average equivalent diesel fuel consumption rate of each vehicle travelling on the highways, and then scaled based on the emission data based on Alberta Census Divisions (ChemInfo 2007).

For the Planned Development Case, highway emission rates were scaled up from baseline values assuming that traffic on these highways grew at a rate of 4% per year for 25 years while the average fuel consumption rate of each vehicle decreased by 1% per year for 25 years.

The speciation profiles for traffic and heating are listed in Table B4-3 (Teck and SilverBirch 2011).

Table B4-3: Speciation Profile for Traffic, Heating and Aviation

Compound Group	Traffic	Heating
VOC	**100%** [1]	**100%** [2]
1,3-butadiene	0.37%	–
7,12-Dimethylbenz(a)anthracene	–	0.00%
Acetaldehyde	9.65%	0.25%
Acrolein	0.77%	0.33%
Aliphatic alcohols	1.68%	–
Aliphatic aldehydes	10.05%	–
Aliphatic C_{17}-C_{34}	0.26%	–
Aliphatic C_5-C_8	18.24%	47.27%
Aliphatic C_9-C_{16}	3.79%	–
Aliphatic ketones	2.00%	–
Aromatic C_9-C_{16}	6.53%	0.00%
Aromatic C_{17}-C_{34}	0.05%	–
Benzo(a)anthracene	0.00%	–
Benzaldehyde	0.89%	0.30%
Benzene	2.81%	0.20%
Carboxylic acids	–	–
Chrysene	0.00%	–
Dichlorobenzene	–	0.02%
Ethylbenzene	0.91%	0.04%
Fluoranthene	0.01%	0.00%
Formaldehyde	5.73%	4.02%
Hexane	0.42%	32.73%

Compound Group	Traffic	Heating
Naphthalene	0.25%	0.02%
Phenanthrene	0.02%	0.00%
Pyrene	–	0.00%
Styrene	0.19%	–
Toluene	6.54%	0.54%
Xylenes	3.88%	0.26%
PM	**100%** [1]	**100%** [2]
Aluminum (Al)	0.10%	0.05%
Antimony (Sb)	0.01%	0.00%
Arsenic (As)	0.00%	0.00%
Barium (Ba)	0.04%	0.00%
Cadmium (Cd)	0.01%	0.00%
Chromium (Cr)	0.00%	0.00%
Cobalt (Co)	0.00%	0.01%
Copper (Cu)	0.01%	0.02%
Gallium (Ga)	0.00%	0.00%
Indium (In)	0.00%	0.00%
Iron (Fe)	0.28%	0.10%
Lanthanum (La)	0.02%	0.00%
Lead (Pb)	0.03%	0.00%
Magnesium (Mg)	0.04%	0.00%
Manganese (Mn)	0.00%	0.00%
Nickel (Ni)	0.00%	0.02%
Palladium (Pd)	0.00%	0.00%
Potassium (K)	0.01%	0.05%
Silicon (Si)	0.40%	0.26%
Silver (Ag)	0.01%	0.00%
Strontium (Sr)	0.00%	0.00%
Tin (Sn)	0.01%	0.00%
Titanium (Ti)	0.00%	0.00%
Vanadium (V)	0.00%	0.01%
Zinc (Zn)	0.18%	0.04%
Zirconium (Zr)	0.00%	0.00%

Note:
– = Not applicable.

2.0 INDUSTRIAL FACILITIES

2.1 Athabasca Oil Sands Corp.

Table B4-4: Summary of Athabasca Oil Sands Leismer Demo/Commercial VOC, PAH and Metal Air Emissions Used for Baseline and Application Cases

Point Source							
Facility	Units	Leismer Demo/Commercial					
Emission Source		Glycol Heater	HP Flare	LP Flare	Slop Treater	OTSG 1	OTSG 2
UTMmN	m	471809	471946	471946	472007	471728	471728
UTMmE	m	6185646	6185545	6185546	6185728	6185804	6185792
Elevation	masl	654	654	654	654	653	654
Stack Height	m	16	32	32	10	27	27
Stack Diameter	m	0.76	3.78	1.89	0.32	1.68	1.68
Exit Velocity	m/s	5.1	0	0	11	16.7	16.7
Exit Temperature	K	616	1273	1273	532	444	444
1,3-butadiene	t/d	0	0	0	0	0	0
Acenaphthene	t/d	2.022E-10	0	0	5.055E-11	4.701E-09	4.701E-09
Acenaphthylene	t/d	1.76E-09	0	0	4.4E-10	4.092E-08	4.092E-08
Acetaldehyde	t/d	2.269E-06	0	0	5.673E-07	5.276E-05	5.276E-05
Acrolein	t/d	2.676E-06	0	0	6.691E-07	6.223E-05	6.223E-05
Aliphatic aldehydes	t/d	0	0	0	0	0	0
Aliphatic C_{17}-C_{34}	t/d	0	0	0	0	0	0
Aliphatic C_5-C_8	t/d	0.0002912	0	0	0.0000728	0.0067704	0.0067704
Aliphatic C_9-C_{16}	t/d	0.0000112	0	0	0.0000028	0.0002604	0.0002604
Aliphatic ketones	t/d	0	0	0	0	0	0
Anthracene	t/d	2.342E-10	0	0	5.855E-11	5.445E-09	5.445E-09
Aromatic C_{17}-C_{34}	t/d	2.616E-10	0	0	6.54E-11	6.082E-09	6.082E-09
Aromatic C_9-C_{16}	t/d	6.352E-09	0	0	1.588E-09	1.477E-07	1.477E-07
Benzaldehyde	t/d	2.385E-06	0	0	5.964E-07	5.546E-05	5.546E-05
Benzene	t/d	1.629E-06	0	0	4.073E-07	3.788E-05	3.788E-05
Benzo(a)pyrene	t/d	1.425E-10	0	0	3.564E-11	3.314E-09	3.314E-09
Benzo(b)fluoranthene	t/d	1.658E-10	0	0	4.145E-11	3.855E-09	3.855E-09
Benzo(g,h,i)perylene	t/d	1.818E-10	0	0	4.545E-11	4.227E-09	4.227E-09
Benzo(k)fluoranthene	t/d	1.44E-10	0	0	3.6E-11	3.348E-09	3.348E-09
Carboxylic acids	t/d	0	0	0	0	0	0
Chrysene	t/d	2.022E-10	0	0	5.055E-11	4.701E-09	4.701E-09
Dibenz(a,h)anthracene	t/d	1.334E-10	0	0	3.335E-11	3.101E-09	3.101E-09
Ethylbenzene	t/d	3.273E-07	0	0	8.182E-08	7.609E-06	7.609E-06
Fluoranthene	t/d	1.731E-09	0	0	4.327E-10	4.024E-08	4.024E-08
Fluorene	t/d	6.676E-10	0	0	1.669E-10	1.552E-08	1.552E-08
Formaldehyde	t/d	3.215E-05	0	0	8.036E-06	0.0007474	0.0007474
Hexane	t/d	0	0	0	0	0	0
Indeno(1,2,3-cd)pyrene	t/d	1.702E-10	0	0	4.255E-11	3.957E-09	3.957E-09
Naphthalene	t/d	1.629E-07	0	0	4.073E-08	3.788E-06	3.788E-06
Phenanthrene	t/d	4.902E-09	0	0	1.225E-09	1.14E-07	1.14E-07

Point Source							
Facility	**Units**	**Leismer Demo/Commercial**					
Emission Source		**Glycol Heater**	**HP Flare**	**LP Flare**	**Slop Treater**	**OTSG 1**	**OTSG 2**
Propylene	t/d	3.418E-05	0	0	8.545E-06	0.0007947	0.0007947
Pyrene	t/d	8.145E-10	0	0	2.036E-10	1.894E-08	1.894E-08
Toluene	t/d	4.291E-06	0	0	1.073E-06	9.976E-05	9.976E-05
Xylenes	t/d	4.015E-06	0	0	1.004E-06	9.334E-05	9.334E-05
Aluminum (Al)	t/d	6.024E-07	0	0	1.095E-07	1.375E-05	1.375E-05
Arsenic (As)	t/d	2.008E-08	0	0	3.651E-09	4.582E-07	4.582E-07
Barium (Ba)	t/d	5.256E-08	0	0	9.557E-09	1.199E-06	1.199E-06
Cadmium (Cd)	t/d	6.644E-09	0	0	1.208E-09	1.516E-07	1.516E-07
Calcium (Ca)	t/d	2.008E-06	0	0	3.651E-07	4.582E-05	4.582E-05
Chromium (Cr)	t/d	5.315E-09	0	0	9.664E-10	1.213E-07	1.213E-07
Cobalt (Co)	t/d	1.446E-07	0	0	2.628E-08	3.298E-06	3.298E-06
Copper (Cu)	t/d	2.51E-07	0	0	4.564E-08	5.728E-06	5.728E-06
Iron (Fe)	t/d	1.104E-06	0	0	2.008E-07	2.52E-05	2.52E-05
Lead (Pb)	t/d	1.506E-08	0	0	2.738E-09	3.437E-07	3.437E-07
Magnesium (Mg)	t/d	0	0	0	0	0	0
Manganese (Mn)	t/d	5.02E-08	0	0	9.128E-09	1.146E-06	1.146E-06
Nickel (Ni)	t/d	2.51E-07	0	0	4.564E-08	5.728E-06	5.728E-06
Potassium (K)	t/d	5.02E-07	0	0	9.128E-08	1.146E-05	1.146E-05
Silver (Ag)	t/d	0	0	0	0	0	0
Silicon (Si)	t/d	2.909E-06	0	0	5.289E-07	6.637E-05	6.637E-05
Strontium (Sr)	t/d	5.02E-09	0	0	9.128E-10	1.146E-07	1.146E-07
Titanium (Ti)	t/d	5.02E-08	0	0	9.128E-09	1.146E-06	1.146E-06
Vanadium (V)	t/d	1.004E-07	0	0	1.826E-08	2.291E-06	2.291E-06
Zinc (Zn)	t/d	4.016E-07	0	0	7.302E-08	9.164E-06	9.164E-06
Zirconium (Zr)	t/d	5.906E-10	0	0	1.074E-10	1.348E-08	1.348E-08
Molybdenum (Mo)	t/d	6.644E-11	0	0	1.208E-11	1.516E-09	1.516E-09
Selenium (Se)	t/d	3.544E-08	0	0	6.443E-09	8.086E-07	8.086E-07

Point Source (cont'd)								
Facility	**Units**	**Leismer Demo/Commercial**						
Emission Source		**OTSG 3**	**OTSG 4**	**OTSG 5**	**OTSG 6**	**OTSG 7**	**OTSG 8**	**Sulphur Plant Process Heater**
UTMmN	m	471728	471728	471826	471826	471827	471827	471878
UTMmE	m	6185780	6185768	6185804	6185792	6185780	6185768	6185758
Elevation	masl	654	654	653	654	654	654	654
Stack Height	m	27	27	27	27	27	27	16
Stack Diameter	m	1.68	1.68	1.68	1.68	1.68	1.68	0.76
Exit Velocity	m/s	16.7	16.7	16.7	16.7	16.7	16.7	5.1
Exit Temperature	K	444	444	444	444	444	444	616
1,3-butadiene	t/d	0	0	0	0	0	0	0
Acenaphthene	t/d	4.701E-09	4.701E-09	4.701E-09	4.701E-09	4.701E-09	4.701E-09	2.022E-10
Acenaphthylene	t/d	4.092E-08	4.092E-08	4.092E-08	4.092E-08	4.092E-08	4.092E-08	1.76E-09
Acetaldehyde	t/d	5.276E-05	5.276E-05	5.276E-05	5.276E-05	5.276E-05	5.276E-05	2.269E-06
Acrolein	t/d	6.223E-05	6.223E-05	6.223E-05	6.223E-05	6.223E-05	6.223E-05	2.676E-06
Aliphatic aldehydes	t/d	0	0	0	0	0	0	0
Aliphatic C_{17}-C_{34}	t/d	0	0	0	0	0	0	0
Aliphatic C_5-C_8	t/d	0.0067704	0.0067704	0.0067704	0.0067704	0.0067704	0.0067704	0.0002912
Aliphatic C_9-C_{16}	t/d	0.0002604	0.0002604	0.0002604	0.0002604	0.0002604	0.0002604	0.0000112
Aliphatic ketones	t/d	0	0	0	0	0	0	0
Anthracene	t/d	5.445E-09	5.445E-09	5.445E-09	5.445E-09	5.445E-09	5.445E-09	2.342E-10
Aromatic C_{17}-C_{34}	t/d	6.082E-09	6.082E-09	6.082E-09	6.082E-09	6.082E-09	6.082E-09	2.616E-10
Aromatic C_9-C_{16}	t/d	1.477E-07	1.477E-07	1.477E-07	1.477E-07	1.477E-07	1.477E-07	6.352E-09
Benzaldehyde	t/d	5.546E-05	5.546E-05	5.546E-05	5.546E-05	5.546E-05	5.546E-05	2.385E-06
Benzene	t/d	3.788E-05	3.788E-05	3.788E-05	3.788E-05	3.788E-05	3.788E-05	1.629E-06
Benzo(a)pyrene	t/d	3.314E-09	3.314E-09	3.314E-09	3.314E-09	3.314E-09	3.314E-09	1.425E-10
Benzo(b)fluoranthene	t/d	3.855E-09	3.855E-09	3.855E-09	3.855E-09	3.855E-09	3.855E-09	1.658E-10
Benzo(g,h,i)perylene	t/d	4.227E-09	4.227E-09	4.227E-09	4.227E-09	4.227E-09	4.227E-09	1.818E-10
Benzo(k)fluoranthene	t/d	3.348E-09	3.348E-09	3.348E-09	3.348E-09	3.348E-09	3.348E-09	1.44E-10
Carboxylic acids	t/d	0	0	0	0	0	0	0
Chrysene	t/d	4.701E-09	4.701E-09	4.701E-09	4.701E-09	4.701E-09	4.701E-09	2.022E-10
Dibenz(a,h)anthracene	t/d	3.101E-09	3.101E-09	3.101E-09	3.101E-09	3.101E-09	3.101E-09	1.334E-10
Ethylbenzene	t/d	7.609E-06	7.609E-06	7.609E-06	7.609E-06	7.609E-06	7.609E-06	3.273E-07
Fluoranthene	t/d	4.024E-08	4.024E-08	4.024E-08	4.024E-08	4.024E-08	4.024E-08	1.731E-09
Fluorene	t/d	1.552E-08	1.552E-08	1.552E-08	1.552E-08	1.552E-08	1.552E-08	6.676E-10
Formaldehyde	t/d	0.0007474	0.0007474	0.0007474	0.0007474	0.0007474	0.0007474	3.215E-05
Hexane	t/d	0	0	0	0	0	0	0
Indeno(1,2,3-cd)pyrene	t/d	3.957E-09	3.957E-09	3.957E-09	3.957E-09	3.957E-09	3.957E-09	1.702E-10
Naphthalene	t/d	3.788E-06	3.788E-06	3.788E-06	3.788E-06	3.788E-06	3.788E-06	1.629E-07
Phenanthrene	t/d	1.14E-07	1.14E-07	1.14E-07	1.14E-07	1.14E-07	1.14E-07	4.902E-09
Propylene	t/d	0.0007947	0.0007947	0.0007947	0.0007947	0.0007947	0.0007947	3.418E-05
Pyrene	t/d	1.894E-08	1.894E-08	1.894E-08	1.894E-08	1.894E-08	1.894E-08	8.145E-10
Toluene	t/d	9.976E-05	9.976E-05	9.976E-05	9.976E-05	9.976E-05	9.976E-05	4.291E-06
Xylenes	t/d	9.334E-05	9.334E-05	9.334E-05	9.334E-05	9.334E-05	9.334E-05	4.015E-06
Aluminum (Al)	t/d	1.375E-05	1.375E-05	1.375E-05	1.375E-05	1.375E-05	1.375E-05	6.024E-07
Arsenic (As)	t/d	4.582E-07	4.582E-07	4.582E-07	4.582E-07	4.582E-07	4.582E-07	2.008E-08

Point Source (cont'd)								
Facility	**Units**	**Leismer Demo/Commercial**						
Emission Source		**OTSG 3**	**OTSG 4**	**OTSG 5**	**OTSG 6**	**OTSG 7**	**OTSG 8**	**Sulphur Plant Process Heater**
Barium (Ba)	t/d	1.199E-06	1.199E-06	1.199E-06	1.199E-06	1.199E-06	1.199E-06	5.256E-08
Cadmium (Cd)	t/d	1.516E-07	1.516E-07	1.516E-07	1.516E-07	1.516E-07	1.516E-07	6.644E-09
Calcium (Ca)	t/d	4.582E-05	4.582E-05	4.582E-05	4.582E-05	4.582E-05	4.582E-05	2.008E-06
Chromium (Cr)	t/d	1.213E-07	1.213E-07	1.213E-07	1.213E-07	1.213E-07	1.213E-07	5.315E-09
Cobalt (Co)	t/d	3.298E-06	3.298E-06	3.298E-06	3.298E-06	3.298E-06	3.298E-06	1.446E-07
Copper (Cu)	t/d	5.728E-06	5.728E-06	5.728E-06	5.728E-06	5.728E-06	5.728E-06	2.51E-07
Iron (Fe)	t/d	2.52E-05	2.52E-05	2.52E-05	2.52E-05	2.52E-05	2.52E-05	1.104E-06
Lead (Pb)	t/d	3.437E-07	3.437E-07	3.437E-07	3.437E-07	3.437E-07	3.437E-07	1.506E-08
Magnesium (Mg)	t/d	0	0	0	0	0	0	0
Manganese (Mn)	t/d	1.146E-06	1.146E-06	1.146E-06	1.146E-06	1.146E-06	1.146E-06	5.02E-08
Nickel (Ni)	t/d	5.728E-06	5.728E-06	5.728E-06	5.728E-06	5.728E-06	5.728E-06	2.51E-07
Potassium (K)	t/d	1.146E-05	1.146E-05	1.146E-05	1.146E-05	1.146E-05	1.146E-05	5.02E-07
Silver (Ag)	t/d	0	0	0	0	0	0	0
Silicon (Si)	t/d	6.637E-05	6.637E-05	6.637E-05	6.637E-05	6.637E-05	6.637E-05	2.909E-06
Strontium (Sr)	t/d	1.146E-07	1.146E-07	1.146E-07	1.146E-07	1.146E-07	1.146E-07	5.02E-09
Titanium (Ti)	t/d	1.146E-06	1.146E-06	1.146E-06	1.146E-06	1.146E-06	1.146E-06	5.02E-08
Vanadium (V)	t/d	2.291E-06	2.291E-06	2.291E-06	2.291E-06	2.291E-06	2.291E-06	1.004E-07
Zinc (Zn)	t/d	9.164E-06	9.164E-06	9.164E-06	9.164E-06	9.164E-06	9.164E-06	4.016E-07
Zirconium (Zr)	t/d	1.348E-08	1.348E-08	1.348E-08	1.348E-08	1.348E-08	1.348E-08	5.906E-10
Molybdenum (Mo)	t/d	1.516E-09	1.516E-09	1.516E-09	1.516E-09	1.516E-09	1.516E-09	6.644E-11
Selenium (Se)	t/d	8.086E-07	8.086E-07	8.086E-07	8.086E-07	8.086E-07	8.086E-07	3.544E-08

Point Source (cont'd)					
Facility	**Units**	**Leismer Demo/Commercial**			
Emission Source		**Glycol Heater**	**HP Flare**	**LP Flare**	**Slop Treater**
UTMmN	m	472609	472746	472746	472807
UTMmE	m	6185646	6185545	6185545	6185728
Elevation	masl	654	654	654	654
Stack Height	m	16	32	32	10
Stack Diameter	m	0.76	3.78	1.89	0.32
Exit Velocity	m/s	5.1	0	0	11
Exit Temperature	K	616	1273	1273	532
1,3-butadiene	t/d	0	0	0	0
Acenaphthene	t/d	2.022E-10	0	0	5.055E-11
Acenaphthylene	t/d	1.76E-09	0	0	4.4E-10
Acetaldehyde	t/d	2.269E-06	0	0	5.673E-07
Acrolein	t/d	2.676E-06	0	0	6.691E-07
Aliphatic aldehydes	t/d	0	0	0	0
Aliphatic C_{17}-C_{34}	t/d	0	0	0	0
Aliphatic C_5-C_8	t/d	0.0002912	0	0	0.0000728
Aliphatic C_9-C_{16}	t/d	0.0000112	0	0	0.0000028
Aliphatic ketones	t/d	0	0	0	0
Anthracene	t/d	2.342E-10	0	0	5.855E-11
Aromatic C_{17}-C_{34}	t/d	2.616E-10	0	0	6.54E-11
Aromatic C_9-C_{16}	t/d	6.352E-09	0	0	1.588E-09
Benzaldehyde	t/d	2.385E-06	0	0	5.964E-07
Benzene	t/d	1.629E-06	0	0	4.073E-07
Benzo(a)pyrene	t/d	1.425E-10	0	0	3.564E-11
Benzo(b)fluoranthene	t/d	1.658E-10	0	0	4.145E-11
Benzo(g,h,i)perylene	t/d	1.818E-10	0	0	4.545E-11
Benzo(k)fluoranthene	t/d	1.44E-10	0	0	3.6E-11
Carboxylic acids	t/d	0	0	0	0
Chrysene	t/d	2.022E-10	0	0	5.055E-11
Dibenz(a,h)anthracene	t/d	1.334E-10	0	0	3.335E-11
Ethylbenzene	t/d	3.273E-07	0	0	8.182E-08
Fluoranthene	t/d	1.731E-09	0	0	4.327E-10
Fluorene	t/d	6.676E-10	0	0	1.669E-10
Formaldehyde	t/d	3.215E-05	0	0	8.036E-06
Hexane	t/d	0	0	0	0
Indeno(1,2,3-cd)pyrene	t/d	1.702E-10	0	0	4.255E-11
Naphthalene	t/d	1.629E-07	0	0	4.073E-08
Phenanthrene	t/d	4.902E-09	0	0	1.225E-09
Propylene	t/d	3.418E-05	0	0	8.545E-06
Pyrene	t/d	8.145E-10	0	0	2.036E-10
Toluene	t/d	4.291E-06	0	0	1.073E-06
Xylenes	t/d	4.015E-06	0	0	1.004E-06
Aluminum (Al)	t/d	6.024E-07	0	0	1.095E-07
Arsenic (As)	t/d	2.008E-08	0	0	3.651E-09
Barium (Ba)	t/d	5.256E-08	0	0	9.557E-09

Point Source (cont'd)					
Facility	**Units**	**Leismer Demo/Commercial**			
Emission Source		**Glycol Heater**	**HP Flare**	**LP Flare**	**Slop Treater**
Cadmium (Cd)	t/d	6.644E-09	0	0	1.208E-09
Calcium (Ca)	t/d	2.008E-06	0	0	3.651E-07
Chromium (Cr)	t/d	5.315E-09	0	0	9.664E-10
Cobalt (Co)	t/d	1.446E-07	0	0	2.628E-08
Copper (Cu)	t/d	2.51E-07	0	0	4.564E-08
Iron (Fe)	t/d	1.104E-06	0	0	2.008E-07
Lead (Pb)	t/d	1.506E-08	0	0	2.738E-09
Magnesium (Mg)	t/d	0	0	0	0
Manganese (Mn)	t/d	5.02E-08	0	0	9.128E-09
Nickel (Ni)	t/d	2.51E-07	0	0	4.564E-08
Potassium (K)	t/d	5.02E-07	0	0	9.128E-08
Silver (Ag)	t/d	0	0	0	0
Silicon (Si)	t/d	2.909E-06	0	0	5.289E-07
Strontium (Sr)	t/d	5.02E-09	0	0	9.128E-10
Titanium (Ti)	t/d	5.02E-08	0	0	9.128E-09
Vanadium (V)	t/d	1.004E-07	0	0	1.826E-08
Zinc (Zn)	t/d	4.016E-07	0	0	7.302E-08
Zirconium (Zr)	t/d	5.906E-10	0	0	1.074E-10
Molybdenum (Mo)	t/d	6.644E-11	0	0	1.208E-11
Selenium (Se)	t/d	3.544E-08	0	0	6.443E-09

Note: "0" – No emissions.

Area Source			
Facility	**Unit**	**Leismer Demo**	**Leismer Commercial**
Emission Source		**Plant Fugitive**	**Plant Fugitive**
Corner 1 UTM N	m	471581	471581
Corner 1 UTM E	m	6185982	6185982
Corner 2 UTM N	m	472081	472081
Corner 2 UTM E	m	6185982	6185982
Corner 3 UTM N	m	472081	472081
Corner 3 UTM E	m	6185482	6185482
Corner 4 UTM N	m	471581	471581
Corner 4 UTM E	m	6185482	6185482
Area	m^2	250000	250000
Elevation (m)	masl	653.6738	653.6738
1,3-butadiene	t/d	1.48E-07	1.48E-07
Acenaphthene	t/d	0	0
Acenaphthylene	t/d	0	0
Acetaldehyde	t/d	0	0
Acrolein	t/d	0	0
Aliphatic aldehydes	t/d	0.000884	0.000884
Aliphatic C_{17}-C_{34}	t/d	0.00041	0.00041
Aliphatic C_5-C_8	t/d	0.006937	0.006937
Aliphatic C_9-C_{16}	t/d	0.028558	0.028558
Aliphatic ketones	t/d	0.00313	0.00313
Anthracene	t/d	0	0
Aromatic C_{17}-C_{34}	t/d	0	0
Aromatic C_9-C_{16}	t/d	0.000735	0.000735
Aromatic Ketones	t/d	0	0
Benzene	t/d	0.000548	0.000548
Benzo(a)anthracene	t/d	0	0
Benzo(a)pyrene	t/d	0	0
Benzo(b)fluoranthene	t/d	0	0
Benzo(g,h,i)perylene	t/d	0	0
Benzo(k)fluoranthene	t/d	0	0
Carboxylic acids	t/d	1.18E-07	1.18E-07
Dibenz(a,h)anthracene	t/d	0	0
Ethylbenzene	t/d	3.3E-05	3.3E-05
Fluoranthene	t/d	0	0
Formaldehyde	t/d	0	0
Hexane	t/d	0.000453	0.000453
Indeno(1,2,3-cd)pyrene	t/d	0	0
Naphthalene	t/d	4.23E-09	4.23E-09
Pyrene	t/d	0	0
Toluene	t/d	0.000245	0.000245
Xylenes	t/d	0.000144	0.000144
Aluminum (Al)	t/d	0	0
Arsenic (As)	t/d	0	0
Barium (Ba)	t/d	0	0

Area Source			
Facility	**Unit**	**Leismer Demo**	**Leismer Commercial**
Emission Source		**Plant Fugitive**	**Plant Fugitive**
Cadmium (Cd)	t/d	0	0
Calcium (Ca)	t/d	0	0
Chromium (Cr)	t/d	0	0
Cobalt (Co)	t/d	0	0
Copper (Cu)	t/d	0	0
Iron (Fe)	t/d	0	0
Lead (Pb)	t/d	0	0
Magnesium (Mg)	t/d	0	0
Manganese (Mn)	t/d	0	0
Nickel (Ni)	t/d	0	0
Potassium (K)	t/d	0	0
Silver (Ag)	t/d	0	0
Silicon (Si)	t/d	0	0
Strontium (Sr)	t/d	0	0
Titanium (Ti)	t/d	0	0
Vanadium (V)	t/d	0	0
Zinc (Zn)	t/d	0	0
Zirconium (Zr)	t/d	0	0
Molybdenum (Mo)	t/d	0	0
Selenium (Se)	t/d	0	0
Carbon disulphide	t/d	0.000238	0.000238
Hydrogen Sulphide	t/d	1.96E-05	1.96E-05
Mercaptans	t/d	0.000246	0.000246
Thiophenes	t/d	0.000326	0.000326

Note: “0” – No emissions.

Table B4-5: Summary of Athabasca Oil Sands Leismer Northwest VOC, PAH and Metal Air Emissions Used for Baseline, Application and Planned Development Cases

Point Source					
Facility	Units	Leismer Northwest			
Emission Source		Glycol Heater	HP Flare Continuous	LP Flare Continuous	Slop Treater
UTMmN	m	467333	467469	467469	467530
UTMmE	m	6189009	6188908	6188909	6189091
Elevation	masl	675	675	675	676
Stack Height	m	16	32	32	10
Stack Diameter	m	0.76	3.78	1.89	0.32
Exit Velocity	m/s	5.1	0	0	11
Exit Temperature	K	616	1273	1273	532
1,3-butadiene	t/d	0	0	0	0
Acenaphthene	t/d	2.022E-10	0	0	5.055E-11
Acenaphthylene	t/d	1.76E-09	0	0	4.4E-10
Acetaldehyde	t/d	2.269E-06	0	0	5.673E-07
Acrolein	t/d	2.676E-06	0	0	6.691E-07
Aliphatic aldehydes	t/d	0	0	0	0
Aliphatic C_{17}-C_{34}	t/d	0	0	0	0
Aliphatic C_5-C_8	t/d	0.0002912	0	0	0.0000728
Aliphatic C_9-C_{16}	t/d	0.0000112	0	0	0.0000028
Aliphatic ketones	t/d	0	0	0	0
Anthracene	t/d	2.342E-10	0	0	5.855E-11
Aromatic C_{17}-C_{34}	t/d	2.616E-10	0	0	6.54E-11
Aromatic C_9-C_{16}	t/d	6.352E-09	0	0	1.588E-09
Benzaldehyde	t/d	2.385E-06	0	0	5.964E-07
Benzene	t/d	1.629E-06	0	0	4.073E-07
Benzo(a)pyrene	t/d	1.425E-10	0	0	3.564E-11
Benzo(b)fluoranthene	t/d	1.658E-10	0	0	4.145E-11
Benzo(g,h,i)perylene	t/d	1.818E-10	0	0	4.545E-11
Benzo(k)fluoranthene	t/d	1.44E-10	0	0	3.6E-11
Carboxylic acids	t/d	0	0	0	0
Chrysene	t/d	2.022E-10	0	0	5.055E-11
Dibenz(a,h)anthracene	t/d	1.334E-10	0	0	3.335E-11
Ethylbenzene	t/d	3.273E-07	0	0	8.182E-08
Fluoranthene	t/d	1.731E-09	0	0	4.327E-10
Fluorene	t/d	6.676E-10	0	0	1.669E-10
Formaldehyde	t/d	3.215E-05	0	0	8.036E-06
Hexane	t/d	0	0	0	0
Indeno(1,2,3-cd)pyrene	t/d	1.702E-10	0	0	4.255E-11
Naphthalene	t/d	1.629E-07	0	0	4.073E-08
Phenanthrene	t/d	4.902E-09	0	0	1.225E-09
Propylene	t/d	3.418E-05	0	0	8.545E-06
Pyrene	t/d	8.145E-10	0	0	2.036E-10
Toluene	t/d	4.291E-06	0	0	1.073E-06
Xylenes	t/d	4.015E-06	0	0	1.004E-06

Point Source					
Facility	Units	Leismer Northwest			
Emission Source		Glycol Heater	HP Flare Continuous	LP Flare Continuous	Slop Treater
Aluminum (Al)	t/d	6.024E-07	0	0	1.095E-07
Arsenic (As)	t/d	2.008E-08	0	0	3.651E-09
Barium (Ba)	t/d	5.256E-08	0	0	9.557E-09
Cadmium (Cd)	t/d	6.644E-09	0	0	1.208E-09
Calcium (Ca)	t/d	2.008E-06	0	0	3.651E-07
Chromium (Cr)	t/d	5.315E-09	0	0	9.664E-10
Cobalt (Co)	t/d	1.446E-07	0	0	2.628E-08
Copper (Cu)	t/d	2.51E-07	0	0	4.564E-08
Iron (Fe)	t/d	1.104E-06	0	0	2.008E-07
Lead (Pb)	t/d	1.506E-08	0	0	2.738E-09
Magnesium (Mg)	t/d	0	0	0	0
Manganese (Mn)	t/d	5.02E-08	0	0	9.128E-09
Nickel (Ni)	t/d	2.51E-07	0	0	4.564E-08
Potassium (K)	t/d	5.02E-07	0	0	9.128E-08
Silver (Ag)	t/d	0	0	0	0
Silicon (Si)	t/d	2.909E-06	0	0	5.289E-07
Strontium (Sr)	t/d	5.02E-09	0	0	9.128E-10
Titanium (Ti)	t/d	5.02E-08	0	0	9.128E-09
Vanadium (V)	t/d	1.004E-07	0	0	1.826E-08
Zinc (Zn)	t/d	4.016E-07	0	0	7.302E-08
Zirconium (Zr)	t/d	5.906E-10	0	0	1.074E-10
Molybdenum (Mo)	t/d	6.644E-11	0	0	1.208E-11
Selenium (Se)	t/d	3.544E-08	0	0	6.443E-09

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Point Source (cont'd)					
Facility	**Units**	**Leismer Northwest**			
Emission Source		**OTSG 1**	**OTSG 2**	**OTSG 3**	**OTSG 4**
UTMmN	m	467349	467349	467350	467350
UTMmE	m	6189167	6189155	6189143	6189131
Elevation	masl	676	676	675	675
Stack Height	m	27	27	27	27
Stack Diameter	m	1.68	1.68	1.68	1.68
Exit Velocity	m/s	16.7	16.7	16.7	16.7
Exit Temperature	K	444	444	444	444
1,3-butadiene	t/d	0	0	0	0
Acenaphthene	t/d	4.701E-09	4.701E-09	4.701E-09	4.701E-09
Acenaphthylene	t/d	4.092E-08	4.092E-08	4.092E-08	4.092E-08
Acetaldehyde	t/d	5.276E-05	5.276E-05	5.276E-05	5.276E-05
Acrolein	t/d	6.223E-05	6.223E-05	6.223E-05	6.223E-05
Aliphatic aldehydes	t/d	0	0	0	0
Aliphatic C_{17}-C_{34}	t/d	0	0	0	0
Aliphatic C_5-C_8	t/d	0.0067704	0.0067704	0.0067704	0.0067704
Aliphatic C_9-C_{16}	t/d	0.0002604	0.0002604	0.0002604	0.0002604
Aliphatic ketones	t/d	0	0	0	0
Anthracene	t/d	5.445E-09	5.445E-09	5.445E-09	5.445E-09
Aromatic C_{17}-C_{34}	t/d	6.082E-09	6.082E-09	6.082E-09	6.082E-09
Aromatic C_9-C_{16}	t/d	1.477E-07	1.477E-07	1.477E-07	1.477E-07
Benzaldehyde	t/d	5.546E-05	5.546E-05	5.546E-05	5.546E-05
Benzene	t/d	3.788E-05	3.788E-05	3.788E-05	3.788E-05
Benzo(a)pyrene	t/d	3.314E-09	3.314E-09	3.314E-09	3.314E-09
Benzo(b)fluoranthene	t/d	3.855E-09	3.855E-09	3.855E-09	3.855E-09
Benzo(g,h,i)perylene	t/d	4.227E-09	4.227E-09	4.227E-09	4.227E-09
Benzo(k)fluoranthene	t/d	3.348E-09	3.348E-09	3.348E-09	3.348E-09
Carboxylic acids	t/d	0	0	0	0
Chrysene	t/d	4.701E-09	4.701E-09	4.701E-09	4.701E-09
Dibenz(a,h)anthracene	t/d	3.101E-09	3.101E-09	3.101E-09	3.101E-09
Ethylbenzene	t/d	7.609E-06	7.609E-06	7.609E-06	7.609E-06
Fluoranthene	t/d	4.024E-08	4.024E-08	4.024E-08	4.024E-08
Fluorene	t/d	1.552E-08	1.552E-08	1.552E-08	1.552E-08
Formaldehyde	t/d	0.0007474	0.0007474	0.0007474	0.0007474
Hexane	t/d	0	0	0	0
Indeno(1,2,3-cd)pyrene	t/d	3.957E-09	3.957E-09	3.957E-09	3.957E-09
Naphthalene	t/d	3.788E-06	3.788E-06	3.788E-06	3.788E-06
Phenanthrene	t/d	1.14E-07	1.14E-07	1.14E-07	1.14E-07
Propylene	t/d	0.0007947	0.0007947	0.0007947	0.0007947
Pyrene	t/d	1.894E-08	1.894E-08	1.894E-08	1.894E-08
Toluene	t/d	9.976E-05	9.976E-05	9.976E-05	9.976E-05
Xylenes	t/d	9.334E-05	9.334E-05	9.334E-05	9.334E-05
Aluminum (Al)	t/d	1.375E-05	1.375E-05	1.375E-05	1.375E-05
Arsenic (As)	t/d	4.582E-07	4.582E-07	4.582E-07	4.582E-07
Barium (Ba)	t/d	1.199E-06	1.199E-06	1.199E-06	1.199E-06

Point Source (cont'd)					
Facility	**Units**	**Leismer Northwest**			
Emission Source		**OTSG 1**	**OTSG 2**	**OTSG 3**	**OTSG 4**
Cadmium (Cd)	t/d	1.516E-07	1.516E-07	1.516E-07	1.516E-07
Calcium (Ca)	t/d	4.582E-05	4.582E-05	4.582E-05	4.582E-05
Chromium (Cr)	t/d	1.213E-07	1.213E-07	1.213E-07	1.213E-07
Cobalt (Co)	t/d	3.298E-06	3.298E-06	3.298E-06	3.298E-06
Copper (Cu)	t/d	5.728E-06	5.728E-06	5.728E-06	5.728E-06
Iron (Fe)	t/d	2.52E-05	2.52E-05	2.52E-05	2.52E-05
Lead (Pb)	t/d	3.437E-07	3.437E-07	3.437E-07	3.437E-07
Magnesium (Mg)	t/d	0	0	0	0
Manganese (Mn)	t/d	1.146E-06	1.146E-06	1.146E-06	1.146E-06
Nickel (Ni)	t/d	5.728E-06	5.728E-06	5.728E-06	5.728E-06
Potassium (K)	t/d	1.146E-05	1.146E-05	1.146E-05	1.146E-05
Silver (Ag)	t/d	0	0	0	0
Silicon (Si)	t/d	6.637E-05	6.637E-05	6.637E-05	6.637E-05
Strontium (Sr)	t/d	1.146E-07	1.146E-07	1.146E-07	1.146E-07
Titanium (Ti)	t/d	1.146E-06	1.146E-06	1.146E-06	1.146E-06
Vanadium (V)	t/d	2.291E-06	2.291E-06	2.291E-06	2.291E-06
Zinc (Zn)	t/d	9.164E-06	9.164E-06	9.164E-06	9.164E-06
Zirconium (Zr)	t/d	1.348E-08	1.348E-08	1.348E-08	1.348E-08
Molybdenum (Mo)	t/d	1.516E-09	1.516E-09	1.516E-09	1.516E-09
Selenium (Se)	t/d	8.086E-07	8.086E-07	8.086E-07	8.086E-07

Area Source		
Facility	**Unit**	**Leismer Northwest**
Emission Source		**Plant Fugitive**
Corner 1 UTM N	m	467150
Corner 1 UTM E	m	6189314
Corner 2 UTM N	m	467650
Corner 2 UTM E	m	6189314
Corner 3 UTM N	m	467650
Corner 3 UTM E	m	6188814
Corner 4 UTM N	m	467150
Corner 4 UTM E	m	6188814
Area	m^2	250000
Elevation (m)	masl	675
1,3-butadiene	t/d	2.96E-07
Acenaphthene	t/d	0
Acenaphthylene	t/d	0
Acetaldehyde	t/d	0
Acrolein	t/d	0
Aliphatic aldehydes	t/d	0.001767
Aliphatic C_{17}-C_{34}	t/d	0.000821
Aliphatic C_5-C_8	t/d	0.013874
Aliphatic C_9-C_{16}	t/d	0.057116
Aliphatic ketones	t/d	0.00626
Anthracene	t/d	0
Aromatic C_{17}-C_{34}	t/d	0
Aromatic C_9-C_{16}	t/d	0.00147
Benzaldehyde	t/d	0
Benzene	t/d	0.001096
Benzo(a)pyrene	t/d	0
Benzo(b)fluoranthene	t/d	0
Benzo(g,h,i)perylene	t/d	0
Benzo(k)fluoranthene	t/d	0
Carboxylic acids	t/d	2.37E-07
Chrysene	t/d	0
Dibenz(a,h)anthracene	t/d	0
Ethylbenzene	t/d	6.6E-05
Fluoranthene	t/d	0
Fluorene	t/d	0
Formaldehyde	t/d	0
Hexane	t/d	0.000905
Indeno(1,2,3-cd)pyrene	t/d	0
Naphthalene	t/d	8.46E-09
Phenanthrene	t/d	0
Propylene	t/d	0
Pyrene	t/d	0
Toluene	t/d	0.000491
Xylenes	t/d	0.000288
Carbon disulphide	t/d	0.000477
Hydrogen Sulphide	t/d	3.92E-05
Mercaptans	t/d	0.000492
Thiophenes	t/d	0.000653

Note: "0" – No emissions.

2.2 Canadian Natural Resources Ltd. (CNRL)

Table B4-6: Summary of CNRL Primrose VOC, PAH and Metal Air Emissions Used for Baseline and Application Cases

Point Source							
Facility	Units	Primrose North					
Emission Source		FGD Stack 1	FGD Stack 2	Glycol Heater (4 MW)	OTSG 8 (37 MW)	OTSG 7 (37 MW)	OTSG 6 (37 MW)
UTMmN	m	526706	526715	526764	526754	526751	526748
UTMmE	m	6081204	6081181	6081140	6081146	6081155	6081163
Elevation	masl	696	696	696	696	696	696
Stack Height	m	30	30	7.6	26.1	26.1	26.1
Stack Diameter	m	2.64	2.64	0.48	1.5	1.5	1.5
Exit Velocity	m/s	13	13	7.8	11.8	11.8	11.8
Exit Temperature	K	330	330	393	441	441	441
1,3-butadiene	t/d	0	0	0	0	0	0
Acenaphthene	t/d	3.033E-09	3.033E-09	2.527E-10	2.275E-09	2.275E-09	2.275E-09
Acenaphthylene	t/d	2.64E-08	2.64E-08	2.2E-09	1.98E-08	1.98E-08	1.98E-08
Acetaldehyde	t/d	3.404E-05	3.404E-05	2.836E-06	2.553E-05	2.553E-05	2.553E-05
Acrolein	t/d	4.015E-05	4.015E-05	3.345E-06	3.011E-05	3.011E-05	3.011E-05
Aliphatic aldehydes	t/d	0	0	0	0	0	0
Aliphatic C_{17}-C_{34}	t/d	0	0	0	0	0	0
Aliphatic C_5-C_8	t/d	0.004368	0.004368	0.000364	0.003276	0.003276	0.003276
Aliphatic C_9-C_{16}	t/d	0.000168	0.000168	0.000014	0.000126	0.000126	0.000126
Aliphatic ketones	t/d	0	0	0	0	0	0
Anthracene	t/d	3.513E-09	3.513E-09	2.927E-10	2.635E-09	2.635E-09	2.635E-09
Aromatic C_{17}-C_{34}	t/d	3.924E-09	3.924E-09	3.27E-10	2.943E-09	2.943E-09	2.943E-09
Aromatic C_9-C_{16}	t/d	9.528E-08	9.528E-08	7.94E-09	7.146E-08	7.146E-08	7.146E-08
Benzaldehyde	t/d	3.578E-05	3.578E-05	2.982E-06	2.684E-05	2.684E-05	2.684E-05
Benzene	t/d	2.444E-05	2.444E-05	2.036E-06	1.833E-05	1.833E-05	1.833E-05
Benzo(a)pyrene	t/d	2.138E-09	2.138E-09	1.782E-10	1.604E-09	1.604E-09	1.604E-09
Benzo(b)fluoranthene	t/d	2.487E-09	2.487E-09	2.073E-10	1.865E-09	1.865E-09	1.865E-09
Benzo(g,h,i)perylene	t/d	2.727E-09	2.727E-09	2.273E-10	2.045E-09	2.045E-09	2.045E-09
Benzo(k)fluoranthene	t/d	2.16E-09	2.16E-09	1.8E-10	1.62E-09	1.62E-09	1.62E-09
Carboxylic acids	t/d	0	0	0	0	0	0
Chrysene	t/d	3.033E-09	3.033E-09	2.527E-10	2.275E-09	2.275E-09	2.275E-09
Dibenz(a,h)anthracene	t/d	2.001E-09	2.001E-09	1.667E-10	1.501E-09	1.501E-09	1.501E-09
Ethylbenzene	t/d	4.909E-06	4.909E-06	4.091E-07	3.682E-06	3.682E-06	3.682E-06
Fluoranthene	t/d	2.596E-08	2.596E-08	2.164E-09	1.947E-08	1.947E-08	1.947E-08
Fluorene	t/d	1.001E-08	1.001E-08	8.345E-10	7.511E-09	7.511E-09	7.511E-09
Formaldehyde	t/d	0.0004822	0.0004822	4.018E-05	0.0003616	0.0003616	0.0003616
Hexane	t/d	0	0	0	0	0	0
Indeno(1,2,3-cd)pyrene	t/d	2.553E-09	2.553E-09	2.127E-10	1.915E-09	1.915E-09	1.915E-09
Naphthalene	t/d	2.444E-06	2.444E-06	2.036E-07	1.833E-06	1.833E-06	1.833E-06
Phenanthrene	t/d	7.353E-08	7.353E-08	6.127E-09	5.515E-08	5.515E-08	5.515E-08
Propylene	t/d	0.0005127	0.0005127	4.273E-05	0.0003845	0.0003845	0.0003845
Pyrene	t/d	1.222E-08	1.222E-08	1.018E-09	9.164E-09	9.164E-09	9.164E-09

Point Source							
Facility	**Units**	**Primrose North**					
Emission Source		**FGD Stack 1**	**FGD Stack 2**	**Glycol Heater (4 MW)**	**OTSG 8 (37 MW)**	**OTSG 7 (37 MW)**	**OTSG 6 (37 MW)**
Toluene	t/d	6.436E-05	6.436E-05	5.364E-06	4.827E-05	4.827E-05	4.827E-05
Xylenes	t/d	6.022E-05	6.022E-05	5.018E-06	4.516E-05	4.516E-05	4.516E-05
Aluminum (Al)	t/d	0.0001079	0.0001079	5.477E-07	6.572E-06	6.572E-06	6.572E-06
Arsenic (As)	t/d	3.596E-06	3.596E-06	1.826E-08	2.191E-07	2.191E-07	2.191E-07
Barium (Ba)	t/d	9.414E-06	9.414E-06	4.779E-08	5.734E-07	5.734E-07	5.734E-07
Cadmium (Cd)	t/d	1.19E-06	1.19E-06	6.04E-09	7.248E-08	7.248E-08	7.248E-08
Calcium (Ca)	t/d	0.0003596	0.0003596	1.826E-06	2.191E-05	2.191E-05	2.191E-05
Chromium (Cr)	t/d	9.519E-07	9.519E-07	4.832E-09	5.799E-08	5.799E-08	5.799E-08
Cobalt (Co)	t/d	2.589E-05	2.589E-05	1.314E-07	1.577E-06	1.577E-06	1.577E-06
Copper (Cu)	t/d	4.495E-05	4.495E-05	2.282E-07	2.738E-06	2.738E-06	2.738E-06
Iron (Fe)	t/d	0.0001978	0.0001978	1.004E-06	1.205E-05	1.205E-05	1.205E-05
Lead (Pb)	t/d	2.697E-06	2.697E-06	1.369E-08	1.643E-07	1.643E-07	1.643E-07
Magnesium (Mg)	t/d	0	0	0	0	0	0
Manganese (Mn)	t/d	8.991E-06	8.991E-06	4.564E-08	5.477E-07	5.477E-07	5.477E-07
Nickel (Ni)	t/d	4.495E-05	4.495E-05	2.282E-07	2.738E-06	2.738E-06	2.738E-06
Potassium (K)	t/d	8.991E-05	8.991E-05	4.564E-07	5.477E-06	5.477E-06	5.477E-06
Silver (Ag)	t/d	0	0	0	0	0	0
Silicon (Si)	t/d	0.0005209	0.0005209	2.644E-06	3.173E-05	3.173E-05	3.173E-05
Strontium (Sr)	t/d	8.991E-07	8.991E-07	4.564E-09	5.477E-08	5.477E-08	5.477E-08
Titanium (Ti)	t/d	8.991E-06	8.991E-06	4.564E-08	5.477E-07	5.477E-07	5.477E-07
Vanadium (V)	t/d	1.798E-05	1.798E-05	9.128E-08	1.095E-06	1.095E-06	1.095E-06
Zinc (Zn)	t/d	7.192E-05	7.192E-05	3.651E-07	4.381E-06	4.381E-06	4.381E-06
Zirconium (Zr)	t/d	1.058E-07	1.058E-07	5.369E-10	6.443E-09	6.443E-09	6.443E-09
Molybdenum (Mo)	t/d	1.19E-08	1.19E-08	6.04E-11	7.248E-10	7.248E-10	7.248E-10
Selenium (Se)	t/d	6.346E-06	6.346E-06	3.221E-08	3.866E-07	3.866E-07	3.866E-07

Point Source (cont/d)						
Facility	**Units**	**Primrose North**				
Emission Source		**OTSG 5 (37 MW)**	**OTSG 4 (77 MW)**	**OTSG 3 (77 MW)**	**OTSG 2 (77 MW)**	**OTSG 1 (77 MW)**
UTMmN	m	526745	526729	526724	526720	526716
UTMmE	m	6081172	6081178	6081190	6081202	6081213
Elevation	masl	696	696	696	696	696
Stack Height	m	26.1	29.4	29.4	29.4	29.4
Stack Diameter	m	1.5	1.68	1.68	1.68	1.68
Exit Velocity	m/s	11.8	19.2	19.2	19.2	19.2
Exit Temperature	K	441	420	420	420	420
1,3-butadiene	t/d	0	0	0	0	0
Acenaphthene	t/d	2.275E-09	4.549E-09	4.549E-09	4.549E-09	4.549E-09
Acenaphthylene	t/d	1.98E-08	3.96E-08	3.96E-08	3.96E-08	3.96E-08
Acetaldehyde	t/d	2.553E-05	5.105E-05	5.105E-05	5.105E-05	5.105E-05
Acrolein	t/d	3.011E-05	6.022E-05	6.022E-05	6.022E-05	6.022E-05
Aliphatic aldehydes	t/d	0	0	0	0	0
Aliphatic C_{17}-C_{34}	t/d	0	0	0	0	0
Aliphatic C_5-C_8	t/d	0.003276	0.006552	0.006552	0.006552	0.006552
Aliphatic C_9-C_{16}	t/d	0.000126	0.000252	0.000252	0.000252	0.000252
Aliphatic ketones	t/d	0	0	0	0	0
Anthracene	t/d	2.635E-09	5.269E-09	5.269E-09	5.269E-09	5.269E-09
Aromatic C_{17}-C_{34}	t/d	2.943E-09	5.886E-09	5.886E-09	5.886E-09	5.886E-09
Aromatic C_9-C_{16}	t/d	7.146E-08	1.429E-07	1.429E-07	1.429E-07	1.429E-07
Benzaldehyde	t/d	2.684E-05	5.367E-05	5.367E-05	5.367E-05	5.367E-05
Benzene	t/d	1.833E-05	3.665E-05	3.665E-05	3.665E-05	3.665E-05
Benzo(a)pyrene	t/d	1.604E-09	3.207E-09	3.207E-09	3.207E-09	3.207E-09
Benzo(b)fluoranthene	t/d	1.865E-09	3.731E-09	3.731E-09	3.731E-09	3.731E-09
Benzo(g,h,i)perylene	t/d	2.045E-09	4.091E-09	4.091E-09	4.091E-09	4.091E-09
Benzo(k)fluoranthene	t/d	1.62E-09	3.24E-09	3.24E-09	3.24E-09	3.24E-09
Carboxylic acids	t/d	0	0	0	0	0
Chrysene	t/d	2.275E-09	4.549E-09	4.549E-09	4.549E-09	4.549E-09
Dibenz(a,h)anthracene	t/d	1.501E-09	3.001E-09	3.001E-09	3.001E-09	3.001E-09
Ethylbenzene	t/d	3.682E-06	7.364E-06	7.364E-06	7.364E-06	7.364E-06
Fluoranthene	t/d	1.947E-08	3.895E-08	3.895E-08	3.895E-08	3.895E-08
Fluorene	t/d	7.511E-09	1.502E-08	1.502E-08	1.502E-08	1.502E-08
Formaldehyde	t/d	0.0003616	0.0007233	0.0007233	0.0007233	0.0007233
Hexane	t/d	0	0	0	0	0
Indeno(1,2,3-cd)pyrene	t/d	1.915E-09	3.829E-09	3.829E-09	3.829E-09	3.829E-09
Naphthalene	t/d	1.833E-06	3.665E-06	3.665E-06	3.665E-06	3.665E-06
Phenanthrene	t/d	5.515E-08	1.103E-07	1.103E-07	1.103E-07	1.103E-07
Propylene	t/d	0.0003845	0.0007691	0.0007691	0.0007691	0.0007691
Pyrene	t/d	9.164E-09	1.833E-08	1.833E-08	1.833E-08	1.833E-08
Toluene	t/d	4.827E-05	9.655E-05	9.655E-05	9.655E-05	9.655E-05
Xylenes	t/d	4.516E-05	9.033E-05	9.033E-05	9.033E-05	9.033E-05
Aluminum (Al)	t/d	6.572E-06	1.369E-05	1.369E-05	1.369E-05	1.369E-05
Arsenic (As)	t/d	2.191E-07	4.564E-07	4.564E-07	4.564E-07	4.564E-07
Barium (Ba)	t/d	5.734E-07	1.195E-06	1.195E-06	1.195E-06	1.195E-06

Point Source (cont/d)						
Facility	**Units**	**Primrose North**				
Emission Source		**OTSG 5 (37 MW)**	**OTSG 4 (77 MW)**	**OTSG 3 (77 MW)**	**OTSG 2 (77 MW)**	**OTSG 1 (77 MW)**
Cadmium (Cd)	t/d	7.248E-08	1.51E-07	1.51E-07	1.51E-07	1.51E-07
Calcium (Ca)	t/d	2.191E-05	4.564E-05	4.564E-05	4.564E-05	4.564E-05
Chromium (Cr)	t/d	5.799E-08	1.208E-07	1.208E-07	1.208E-07	1.208E-07
Cobalt (Co)	t/d	1.577E-06	3.285E-06	3.285E-06	3.285E-06	3.285E-06
Copper (Cu)	t/d	2.738E-06	5.705E-06	5.705E-06	5.705E-06	5.705E-06
Iron (Fe)	t/d	1.205E-05	2.51E-05	2.51E-05	2.51E-05	2.51E-05
Lead (Pb)	t/d	1.643E-07	3.423E-07	3.423E-07	3.423E-07	3.423E-07
Magnesium (Mg)	t/d	0	0	0	0	0
Manganese (Mn)	t/d	5.477E-07	1.141E-06	1.141E-06	1.141E-06	1.141E-06
Nickel (Ni)	t/d	2.738E-06	5.705E-06	5.705E-06	5.705E-06	5.705E-06
Potassium (K)	t/d	5.477E-06	1.141E-05	1.141E-05	1.141E-05	1.141E-05
Silver (Ag)	t/d	0	0	0	0	0
Silicon (Si)	t/d	3.173E-05	6.611E-05	6.611E-05	6.611E-05	6.611E-05
Strontium (Sr)	t/d	5.477E-08	1.141E-07	1.141E-07	1.141E-07	1.141E-07
Titanium (Ti)	t/d	5.477E-07	1.141E-06	1.141E-06	1.141E-06	1.141E-06
Vanadium (V)	t/d	1.095E-06	2.282E-06	2.282E-06	2.282E-06	2.282E-06
Zinc (Zn)	t/d	4.381E-06	9.128E-06	9.128E-06	9.128E-06	9.128E-06
Zirconium (Zr)	t/d	6.443E-09	1.342E-08	1.342E-08	1.342E-08	1.342E-08
Molybdenum (Mo)	t/d	7.248E-10	1.51E-09	1.51E-09	1.51E-09	1.51E-09
Selenium (Se)	t/d	3.866E-07	8.054E-07	8.054E-07	8.054E-07	8.054E-07

Note: "0" – No emissions.

Area Source		
Facility	Units	Primrose North
Emission Source		Plant Fugitive
Corner 1 UTM N	m	526484
Corner 1 UTM E	m	6081427
Corner 2 UTM N	m	526984
Corner 2 UTM E	m	6081427
Corner 3 UTM N	m	526984
Corner 3 UTM E	m	6080927
Corner 4 UTM N	m	526484
Corner 4 UTM E	m	6080927
Area	m^2	250000
Elevation (m)	masl	696
1,3-butadiene	t/d	4.44E-07
Acenaphthene	t/d	0
Acenaphthylene	t/d	0
Acetaldehyde	t/d	0
Acrolein	t/d	0
Aliphatic aldehydes	t/d	0.00265
Aliphatic C_{17}-C_{34}	t/d	0.00123
Aliphatic C_5-C_8	t/d	0.02081
Aliphatic C_9-C_{16}	t/d	0.08567
Aliphatic ketones	t/d	0.00939
Anthracene	t/d	0
Aromatic C_{17}-C_{34}	t/d	0
Aromatic C_9-C_{16}	t/d	0.0022
Benzaldehyde	t/d	0
Benzene	t/d	0.00164
Benzo(a)pyrene	t/d	0
Benzo(b)fluoranthene	t/d	0
Benzo(g,h,i)perylene	t/d	0
Benzo(k)fluoranthene	t/d	0
Carboxylic acids	t/d	3.6E-07
Chrysene	t/d	0
Dibenz(a,h)anthracene	t/d	0
Ethylbenzene	t/d	9.9E-05
Fluoranthene	t/d	0
Fluorene	t/d	0
Formaldehyde	t/d	0
Hexane	t/d	0.00136
Indeno(1,2,3-cd)pyrene	t/d	0
Naphthalene	t/d	1.3E-08
Phenanthrene	t/d	0
Propylene	t/d	0
Pyrene	t/d	0
Toluene	t/d	0.00074
Xylenes	t/d	0.00043
Carbon disulphide	t/d	0.00071
Hydrogen Sulphide	t/d	5.9E-05
Mercaptans	t/d	0.00074
Thiophenes	t/d	0.00098

Note: “0” = No emissions.

Table B4-7: Summary of CNRL Kirby VOC, PAH and Metal Air Emissions Used for Baseline and Application Cases

Point Source							
Facility	**Units**	**Kirby North**					
Emission Source		**Steam Generator 1**	**Steam Generator 2**	**Steam Generator 3**	**Steam Generator 4**	**Steam Generator 5**	**Glycol Heater**
UTMmN	m	485599	485585	485515	485529	485543	485566
UTMmE	m	6146544	6146563	6146542	6146522	6146503	6146588
Elevation	masl	682	682	682	682	682	682
Stack Height	m	45.5	45.5	45.5	45.5	45.5	31.394
Stack Diameter	m	1.981	1.981	1.981	1.981	1.981	1.3
Exit Velocity	m/s	17.2	17.2	17.2	17.2	17.2	7
Exit Temperature	K	467.15	467.15	467.15	467.15	467.15	488.15
1,3-butadiene	t/d	0	0	0	0	0	0
Acenaphthene	t/d	5.813E-09	5.813E-09	5.813E-09	5.813E-09	5.813E-09	7.582E-10
Acenaphthylene	t/d	5.06E-08	5.06E-08	5.06E-08	5.06E-08	5.06E-08	6.6E-09
Acetaldehyde	t/d	6.524E-05	6.524E-05	6.524E-05	6.524E-05	6.524E-05	8.509E-06
Acrolein	t/d	7.695E-05	7.695E-05	7.695E-05	7.695E-05	7.695E-05	1.004E-05
Aliphatic aldehydes	t/d	0	0	0	0	0	0
Aliphatic C_{17}-C_{34}	t/d	0	0	0	0	0	0
Aliphatic C_5-C_8	t/d	0.008372	0.008372	0.008372	0.008372	0.008372	0.001092
Aliphatic C_9-C_{16}	t/d	0.000322	0.000322	0.000322	0.000322	0.000322	0.000042
Aliphatic ketones	t/d	0	0	0	0	0	0
Anthracene	t/d	6.733E-09	6.733E-09	6.733E-09	6.733E-09	6.733E-09	8.782E-10
Aromatic C_{17}-C_{34}	t/d	7.521E-09	7.521E-09	7.521E-09	7.521E-09	7.521E-09	9.81E-10
Aromatic C_9-C_{16}	t/d	1.826E-07	1.826E-07	1.826E-07	1.826E-07	1.826E-07	2.382E-08
Benzaldehyde	t/d	6.858E-05	6.858E-05	6.858E-05	6.858E-05	6.858E-05	8.945E-06
Benzene	t/d	4.684E-05	4.684E-05	4.684E-05	4.684E-05	4.684E-05	6.109E-06
Benzo(a)pyrene	t/d	4.098E-09	4.098E-09	4.098E-09	4.098E-09	4.098E-09	5.345E-10
Benzo(b)fluoranthene	t/d	4.767E-09	4.767E-09	4.767E-09	4.767E-09	4.767E-09	6.218E-10
Benzo(g,h,i)perylene	t/d	5.227E-09	5.227E-09	5.227E-09	5.227E-09	5.227E-09	6.818E-10
Benzo(k)fluoranthene	t/d	4.14E-09	4.14E-09	4.14E-09	4.14E-09	4.14E-09	5.4E-10
Carboxylic acids	t/d	0	0	0	0	0	0
Chrysene	t/d	5.813E-09	5.813E-09	5.813E-09	5.813E-09	5.813E-09	7.582E-10
Dibenz(a,h)anthracene	t/d	3.835E-09	3.835E-09	3.835E-09	3.835E-09	3.835E-09	5.002E-10
Ethylbenzene	t/d	9.409E-06	9.409E-06	9.409E-06	9.409E-06	9.409E-06	1.227E-06
Fluoranthene	t/d	4.976E-08	4.976E-08	4.976E-08	4.976E-08	4.976E-08	6.491E-09
Fluorene	t/d	1.919E-08	1.919E-08	1.919E-08	1.919E-08	1.919E-08	2.504E-09
Formaldehyde	t/d	0.0009242	0.0009242	0.0009242	0.0009242	0.0009242	0.0001205
Hexane	t/d	0	0	0	0	0	0
Indeno(1,2,3-cd)pyrene	t/d	4.893E-09	4.893E-09	4.893E-09	4.893E-09	4.893E-09	6.382E-10
Naphthalene	t/d	4.684E-06	4.684E-06	4.684E-06	4.684E-06	4.684E-06	6.109E-07
Phenanthrene	t/d	1.409E-07	1.409E-07	1.409E-07	1.409E-07	1.409E-07	1.838E-08
Propylene	t/d	0.0009827	0.0009827	0.0009827	0.0009827	0.0009827	0.0001282
Pyrene	t/d	2.342E-08	2.342E-08	2.342E-08	2.342E-08	2.342E-08	3.055E-09
Toluene	t/d	0.0001234	0.0001234	0.0001234	0.0001234	0.0001234	1.609E-05
Xylenes	t/d	0.0001154	0.0001154	0.0001154	0.0001154	0.0001154	1.505E-05
Aluminum (Al)	t/d	1.698E-05	1.698E-05	1.698E-05	1.698E-05	1.698E-05	2.191E-06
Arsenic (As)	t/d	5.659E-07	5.659E-07	5.659E-07	5.659E-07	5.659E-07	7.302E-08
Barium (Ba)	t/d	1.481E-06	1.481E-06	1.481E-06	1.481E-06	1.481E-06	1.911E-07

Point Source							
Facility	**Units**	**Kirby North**					
Emission Source		**Steam Generator 1**	**Steam Generator 2**	**Steam Generator 3**	**Steam Generator 4**	**Steam Generator 5**	**Glycol Heater**
Cadmium (Cd)	t/d	1.872E-07	1.872E-07	1.872E-07	1.872E-07	1.872E-07	2.416E-08
Calcium (Ca)	t/d	5.659E-05	5.659E-05	5.659E-05	5.659E-05	5.659E-05	7.302E-06
Chromium (Cr)	t/d	1.498E-07	1.498E-07	1.498E-07	1.498E-07	1.498E-07	1.933E-08
Cobalt (Co)	t/d	4.074E-06	4.074E-06	4.074E-06	4.074E-06	4.074E-06	5.256E-07
Copper (Cu)	t/d	7.074E-06	7.074E-06	7.074E-06	7.074E-06	7.074E-06	9.128E-07
Iron (Fe)	t/d	3.112E-05	3.112E-05	3.112E-05	3.112E-05	3.112E-05	4.016E-06
Lead (Pb)	t/d	4.244E-07	4.244E-07	4.244E-07	4.244E-07	4.244E-07	5.477E-08
Magnesium (Mg)	t/d	0	0	0	0	0	0
Manganese (Mn)	t/d	1.415E-06	1.415E-06	1.415E-06	1.415E-06	1.415E-06	1.826E-07
Nickel (Ni)	t/d	7.074E-06	7.074E-06	7.074E-06	7.074E-06	7.074E-06	9.128E-07
Potassium (K)	t/d	1.415E-05	1.415E-05	1.415E-05	1.415E-05	1.415E-05	1.826E-06
Silver (Ag)	t/d	0	0	0	0	0	0
Silicon (Si)	t/d	8.197E-05	8.197E-05	8.197E-05	8.197E-05	8.197E-05	1.058E-05
Strontium (Sr)	t/d	1.415E-07	1.415E-07	1.415E-07	1.415E-07	1.415E-07	1.826E-08
Titanium (Ti)	t/d	1.415E-06	1.415E-06	1.415E-06	1.415E-06	1.415E-06	1.826E-07
Vanadium (V)	t/d	2.83E-06	2.83E-06	2.83E-06	2.83E-06	2.83E-06	3.651E-07
Zinc (Zn)	t/d	1.132E-05	1.132E-05	1.132E-05	1.132E-05	1.132E-05	1.46E-06
Zirconium (Zr)	t/d	1.664E-08	1.664E-08	1.664E-08	1.664E-08	1.664E-08	2.148E-09
Molybdenum (Mo)	t/d	1.872E-09	1.872E-09	1.872E-09	1.872E-09	1.872E-09	2.416E-10
Selenium (Se)	t/d	9.987E-07	9.987E-07	9.987E-07	9.987E-07	9.987E-07	1.289E-07

Point Source (cont'd)							
Facility	**Units**	**Kirby North 2**		**Kirby North 2010**		
Emission Source		**Incinerator**	**HP Flare (47 m H, 0.6 m D)**	**Steam Generator 1**	**Steam Generator 2**	**Glycol Heater**
UTMmN	m	485638	485301	485225	485236	485270
UTMmE	m	6146420	6146622	6146592	6146603	6146607
Elevation	masl	698	683	670	670	683
Stack Height	m	45.5	44.7	27	27	8
Stack Diameter	m	1.336	2.82	1.6	1.6	0.9
Exit Velocity	m/s	6.568	0.1	20	20	8
Exit Temperature	K	1595.37	1263.03	423	423	523
1,3-butadiene	t/d	0	0	0	0	0
Acenaphthene	t/d	0	0	4.296E-09	4.296E-09	2.527E-10
Acenaphthylene	t/d	0	0	3.74E-08	3.74E-08	2.2E-09
Acetaldehyde	t/d	0	1.804E-06	4.822E-05	4.822E-05	2.836E-06
Acrolein	t/d	0	5.902E-07	5.687E-05	5.687E-05	3.345E-06
Aliphatic aldehydes	t/d	0	0	0	0	0
Aliphatic C_{17}-C_{34}	t/d	0	0	0	0	0
Aliphatic C_5-C_8	t/d	0	0.000364	0.006188	0.006188	0.000364
Aliphatic C_9-C_{16}	t/d	0	0.000014	0.000238	0.000238	0.000014
Aliphatic ketones	t/d	0	0	0	0	0
Anthracene	t/d	0	0	4.976E-09	4.976E-09	2.927E-10
Aromatic C_{17}-C_{34}	t/d	0	9.64E-10	5.559E-09	5.559E-09	3.27E-10
Aromatic C_9-C_{16}	t/d	0	7.3E-07	1.35E-07	1.35E-07	7.94E-09
Benzaldehyde	t/d	0	0	5.069E-05	5.069E-05	2.982E-06
Benzene	t/d	0	1.28E-06	3.462E-05	3.462E-05	2.036E-06
Benzo(a)pyrene	t/d	0	1.476E-07	3.029E-09	3.029E-09	1.782E-10
Benzo(b)fluoranthene	t/d	0	1.476E-07	3.524E-09	3.524E-09	2.073E-10
Benzo(g,h,i)perylene	t/d	0	1.476E-07	3.864E-09	3.864E-09	2.273E-10
Benzo(k)fluoranthene	t/d	0	1.476E-07	3.06E-09	3.06E-09	1.8E-10
Carboxylic acids	t/d	0	0	0	0	0
Chrysene	t/d	0	1.483E-07	4.296E-09	4.296E-09	2.527E-10
Dibenz(a,h)anthracene	t/d	0	1.476E-07	2.834E-09	2.834E-09	1.667E-10
Ethylbenzene	t/d	0	0	6.955E-06	6.955E-06	4.091E-07
Fluoranthene	t/d	0	1.587E-07	3.678E-08	3.678E-08	2.164E-09
Fluorene	t/d	0	0	1.419E-08	1.419E-08	8.345E-10
Formaldehyde	t/d	0	0.0002063	0.0006831	0.0006831	4.018E-05
Hexane	t/d	0	0	0	0	0
Indeno(1,2,3-cd)pyrene	t/d	0	1.476E-07	3.616E-09	3.616E-09	2.127E-10
Naphthalene	t/d	0	9.091E-05	3.462E-06	3.462E-06	2.036E-07
Phenanthrene	t/d	0	1.958E-07	1.042E-07	1.042E-07	6.127E-09
Propylene	t/d	0	0	0.0007264	0.0007264	4.273E-05
Pyrene	t/d	0	1.559E-07	1.731E-08	1.731E-08	1.018E-09
Toluene	t/d	0	0.0001231	9.118E-05	9.118E-05	5.364E-06
Xylenes	t/d	0	3.874E-06	8.531E-05	8.531E-05	5.018E-06
Aluminum (Al)	t/d	0	0	1.26E-05	1.26E-05	1.095E-06
Arsenic (As)	t/d	0	0	4.199E-07	4.199E-07	3.651E-08

Point Source (cont'd)						
Facility	**Units**	**Kirby North 2**		**Kirby North 2010**		
Emission Source		**Incinerator**	**HP Flare (47 m H, 0.6 m D)**	**Steam Generator 1**	**Steam Generator 2**	**Glycol Heater**
Barium (Ba)	t/d	0	0	1.099E-06	1.099E-06	9.557E-08
Cadmium (Cd)	t/d	0	0	1.389E-07	1.389E-07	1.208E-08
Calcium (Ca)	t/d	0	0	4.199E-05	4.199E-05	3.651E-06
Chromium (Cr)	t/d	0	0	1.111E-07	1.111E-07	9.664E-09
Cobalt (Co)	t/d	0	0	3.022E-06	3.022E-06	2.628E-07
Copper (Cu)	t/d	0	0	5.248E-06	5.248E-06	4.564E-07
Iron (Fe)	t/d	0	0	2.309E-05	2.309E-05	2.008E-06
Lead (Pb)	t/d	0	0	3.149E-07	3.149E-07	2.738E-08
Magnesium (Mg)	t/d	0	0	0	0	0
Manganese (Mn)	t/d	0	0	1.05E-06	1.05E-06	9.128E-08
Nickel (Ni)	t/d	0	0	5.248E-06	5.248E-06	4.564E-07
Potassium (K)	t/d	0	0	1.05E-05	1.05E-05	9.128E-07
Silver (Ag)	t/d	0	0	0	0	0
Silicon (Si)	t/d	0	0	6.082E-05	6.082E-05	5.289E-06
Strontium (Sr)	t/d	0	0	1.05E-07	1.05E-07	9.128E-09
Titanium (Ti)	t/d	0	0	1.05E-06	1.05E-06	9.128E-08
Vanadium (V)	t/d	0	0	2.099E-06	2.099E-06	1.826E-07
Zinc (Zn)	t/d	0	0	8.397E-06	8.397E-06	7.302E-07
Zirconium (Zr)	t/d	0	0	1.235E-08	1.235E-08	1.074E-09
Molybdenum (Mo)	t/d	0	0	1.389E-09	1.389E-09	1.208E-10
Selenium (Se)	t/d	0	0	7.409E-07	7.409E-07	6.443E-08

Point Source (cont'd)						
Facility	**Units**	**Kirby South In Situ**				
Emission Source		**Steam Generator 1**	**Steam Generator 2**	**Steam Generator 3**	**Steam Generator 4**	**Steam Generator 5**
UTMmN	m	498263	498263	498263	498312	498312
UTMmE	m	6132807	6132791	6132775	6132807	6132791
Elevation	masl	723	723	723	723	723
Stack Height	m	45.5	45.5	45.5	45.5	45.5
Stack Diameter	m	1.981	1.981	1.981	1.981	1.981
Exit Velocity	m/s	17.2	17.2	17.2	17.2	17.2
Exit Temperature	K	467.15	467.15	467.15	467.15	467.15
1,3-butadiene	t/d	0	0	0	0	0
Acenaphthene	t/d	4.549E-09	4.549E-09	4.549E-09	4.549E-09	4.549E-09
Acenaphthylene	t/d	3.96E-08	3.96E-08	3.96E-08	3.96E-08	3.96E-08
Acetaldehyde	t/d	5.105E-05	5.105E-05	5.105E-05	5.105E-05	5.105E-05
Acrolein	t/d	6.022E-05	6.022E-05	6.022E-05	6.022E-05	6.022E-05
Aliphatic aldehydes	t/d	0	0	0	0	0
Aliphatic C_{17}-C_{34}	t/d	0	0	0	0	0
Aliphatic C_5-C_8	t/d	0.006552	0.006552	0.006552	0.006552	0.006552
Aliphatic C_9-C_{16}	t/d	0.000252	0.000252	0.000252	0.000252	0.000252
Aliphatic ketones	t/d	0	0	0	0	0
Anthracene	t/d	5.269E-09	5.269E-09	5.269E-09	5.269E-09	5.269E-09
Aromatic C_{17}-C_{34}	t/d	5.886E-09	5.886E-09	5.886E-09	5.886E-09	5.886E-09
Aromatic C_9-C_{16}	t/d	1.429E-07	1.429E-07	1.429E-07	1.429E-07	1.429E-07
Benzaldehyde	t/d	5.367E-05	5.367E-05	5.367E-05	5.367E-05	5.367E-05
Benzene	t/d	3.665E-05	3.665E-05	3.665E-05	3.665E-05	3.665E-05
Benzo(a)pyrene	t/d	3.207E-09	3.207E-09	3.207E-09	3.207E-09	3.207E-09
Benzo(b)fluoranthene	t/d	3.731E-09	3.731E-09	3.731E-09	3.731E-09	3.731E-09
Benzo(g,h,i)perylene	t/d	4.091E-09	4.091E-09	4.091E-09	4.091E-09	4.091E-09
Benzo(k)fluoranthene	t/d	3.24E-09	3.24E-09	3.24E-09	3.24E-09	3.24E-09
Carboxylic acids	t/d	0	0	0	0	0
Chrysene	t/d	4.549E-09	4.549E-09	4.549E-09	4.549E-09	4.549E-09
Dibenz(a,h)anthracene	t/d	3.001E-09	3.001E-09	3.001E-09	3.001E-09	3.001E-09
Ethylbenzene	t/d	7.364E-06	7.364E-06	7.364E-06	7.364E-06	7.364E-06
Fluoranthene	t/d	3.895E-08	3.895E-08	3.895E-08	3.895E-08	3.895E-08
Fluorene	t/d	1.502E-08	1.502E-08	1.502E-08	1.502E-08	1.502E-08
Formaldehyde	t/d	0.0007233	0.0007233	0.0007233	0.0007233	0.0007233
Hexane	t/d	0	0	0	0	0
Indeno(1,2,3-cd)pyrene	t/d	3.829E-09	3.829E-09	3.829E-09	3.829E-09	3.829E-09
Naphthalene	t/d	3.665E-06	3.665E-06	3.665E-06	3.665E-06	3.665E-06
Phenanthrene	t/d	1.103E-07	1.103E-07	1.103E-07	1.103E-07	1.103E-07
Propylene	t/d	0.0007691	0.0007691	0.0007691	0.0007691	0.0007691
Pyrene	t/d	1.833E-08	1.833E-08	1.833E-08	1.833E-08	1.833E-08
Toluene	t/d	9.655E-05	9.655E-05	9.655E-05	9.655E-05	9.655E-05
Xylenes	t/d	9.033E-05	9.033E-05	9.033E-05	9.033E-05	9.033E-05
Aluminum (Al)	t/d	1.972E-05	1.972E-05	1.972E-05	1.972E-05	1.972E-05
Arsenic (As)	t/d	6.572E-07	6.572E-07	6.572E-07	6.572E-07	6.572E-07
Barium (Ba)	t/d	1.72E-06	1.72E-06	1.72E-06	1.72E-06	1.72E-06
Cadmium (Cd)	t/d	2.174E-07	2.174E-07	2.174E-07	2.174E-07	2.174E-07
Calcium (Ca)	t/d	6.572E-05	6.572E-05	6.572E-05	6.572E-05	6.572E-05
Chromium (Cr)	t/d	1.74E-07	1.74E-07	1.74E-07	1.74E-07	1.74E-07

Point Source (cont'd)						
Facility	**Units**	**Kirby South In Situ**				
Emission Source		**Steam Generator 1**	**Steam Generator 2**	**Steam Generator 3**	**Steam Generator 4**	**Steam Generator 5**
Cobalt (Co)	t/d	4.731E-06	4.731E-06	4.731E-06	4.731E-06	4.731E-06
Copper (Cu)	t/d	8.215E-06	8.215E-06	8.215E-06	8.215E-06	8.215E-06
Iron (Fe)	t/d	3.614E-05	3.614E-05	3.614E-05	3.614E-05	3.614E-05
Lead (Pb)	t/d	4.929E-07	4.929E-07	4.929E-07	4.929E-07	4.929E-07
Magnesium (Mg)	t/d	0	0	0	0	0
Manganese (Mn)	t/d	1.643E-06	1.643E-06	1.643E-06	1.643E-06	1.643E-06
Nickel (Ni)	t/d	8.215E-06	8.215E-06	8.215E-06	8.215E-06	8.215E-06
Potassium (K)	t/d	1.643E-05	1.643E-05	1.643E-05	1.643E-05	1.643E-05
Silver (Ag)	t/d	0	0	0	0	0
Silicon (Si)	t/d	9.519E-05	9.519E-05	9.519E-05	9.519E-05	9.519E-05
Strontium (Sr)	t/d	1.643E-07	1.643E-07	1.643E-07	1.643E-07	1.643E-07
Titanium (Ti)	t/d	1.643E-06	1.643E-06	1.643E-06	1.643E-06	1.643E-06
Vanadium (V)	t/d	3.286E-06	3.286E-06	3.286E-06	3.286E-06	3.286E-06
Zinc (Zn)	t/d	1.314E-05	1.314E-05	1.314E-05	1.314E-05	1.314E-05
Zirconium (Zr)	t/d	1.933E-08	1.933E-08	1.933E-08	1.933E-08	1.933E-08
Molybdenum (Mo)	t/d	2.174E-09	2.174E-09	2.174E-09	2.174E-09	2.174E-09
Selenium (Se)	t/d	1.160E-06	1.160E-06	1.160E-06	1.160E-06	1.160E-06

Point Source (cont'd)						
Facility	**Units**	**Kirby South In Situ**			**Kirby South 2**	
Emission Source		**Steam Generator 6**	**Glycol Heater**	**HP Flare (47 m H, 0.6 m D)**	**Steam Generator 1**	**Steam Generator 2**
UTMmN	m	498312	498262	498663	497450	497474
UTMmE	m	6132775	6132828	6132984	6133407	6133407
Elevation	masl	723	723	723	723	723
Stack Height	m	45.5	31.394	45.5	45.5	45.5
Stack Diameter	m	1.981	0.91	2.39	1.981	1.981
Exit Velocity	m/s	17.2	13.7	0.4	17.2	17.2
Exit Temperature	K	467.15	609	1273	467.15	467.15
1,3-butadiene	t/d	0	0	0	0	0
Acenaphthene	t/d	4.549E-09	4.549E-09	0	5.813E-09	5.813E-09
Acenaphthylene	t/d	3.96E-08	3.96E-08	0	5.06E-08	5.06E-08
Acetaldehyde	t/d	5.105E-05	5.105E-05	3.248E-05	6.524E-05	6.524E-05
Acrolein	t/d	6.022E-05	6.022E-05	1.062E-05	7.695E-05	7.695E-05
Aliphatic aldehydes	t/d	0	0	0	0	0
Aliphatic C_{17}-C_{34}	t/d	0	0	0	0	0
Aliphatic C_5-C_8	t/d	0.006552	0.006552	0.006552	0.008372	0.008372
Aliphatic C_9-C_{16}	t/d	0.000252	0.000252	0.000252	0.000322	0.000322
Aliphatic ketones	t/d	0	0	0	0	0
Anthracene	t/d	5.269E-09	5.269E-09	0	6.733E-09	6.733E-09
Aromatic C_{17}-C_{34}	t/d	5.886E-09	5.886E-09	1.735E-08	7.521E-09	7.521E-09
Aromatic C_9-C_{16}	t/d	1.429E-07	1.429E-07	1.314E-05	1.826E-07	1.826E-07
Benzaldehyde	t/d	5.367E-05	5.367E-05	0	6.858E-05	6.858E-05
Benzene	t/d	3.665E-05	3.665E-05	2.303E-05	4.684E-05	4.684E-05
Benzo(a)pyrene	t/d	3.207E-09	3.207E-09	2.656E-06	4.098E-09	4.098E-09
Benzo(b)fluoranthene	t/d	3.731E-09	3.731E-09	2.656E-06	4.767E-09	4.767E-09
Benzo(g,h,i)perylene	t/d	4.091E-09	4.091E-09	2.656E-06	5.227E-09	5.227E-09
Benzo(k)fluoranthene	t/d	3.24E-09	3.24E-09	2.656E-06	4.14E-09	4.14E-09
Carboxylic acids	t/d	0	0	0	0	0
Chrysene	t/d	4.549E-09	4.549E-09	2.669E-06	5.813E-09	5.813E-09
Dibenz(a,h)anthracene	t/d	3.001E-09	3.001E-09	2.656E-06	3.835E-09	3.835E-09
Ethylbenzene	t/d	7.364E-06	7.364E-06	0	9.409E-06	9.409E-06
Fluoranthene	t/d	3.895E-08	3.895E-08	2.857E-06	4.976E-08	4.976E-08
Fluorene	t/d	1.502E-08	1.502E-08	0	1.919E-08	1.919E-08
Formaldehyde	t/d	0.0007233	0.0007233	0.0037133	0.0009242	0.0009242
Hexane	t/d	0	0	0	0	0
Indeno(1,2,3-cd)pyrene	t/d	3.829E-09	3.829E-09	2.656E-06	4.893E-09	4.893E-09
Naphthalene	t/d	3.665E-06	3.665E-06	0.0016364	4.684E-06	4.684E-06
Phenanthrene	t/d	1.103E-07	1.103E-07	3.524E-06	1.409E-07	1.409E-07
Propylene	t/d	0.0007691	0.0007691	0	0.0009827	0.0009827
Pyrene	t/d	1.833E-08	1.833E-08	2.807E-06	2.342E-08	2.342E-08
Toluene	t/d	9.655E-05	9.655E-05	0.0022154	0.0001234	0.0001234
Xylenes	t/d	9.033E-05	9.033E-05	6.973E-05	0.0001154	0.0001154
Aluminum (Al)	t/d	1.972E-05	2.191E-06	0	1.698E-05	1.698E-05
Arsenic (As)	t/d	6.572E-07	7.302E-08	0	5.659E-07	5.659E-07

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Point Source (cont'd)						
Facility	**Units**	**Kirby South In Situ**			**Kirby South 2**	
Emission Source		**Steam Generator 6**	**Glycol Heater**	**HP Flare (47 m H, 0.6 m D)**	**Steam Generator 1**	**Steam Generator 2**
Barium (Ba)	t/d	1.72E-06	1.911E-07	0	1.481E-06	1.481E-06
Cadmium (Cd)	t/d	2.174E-07	2.416E-08	0	1.872E-07	1.872E-07
Calcium (Ca)	t/d	6.572E-05	7.302E-06	0	5.659E-05	5.659E-05
Chromium (Cr)	t/d	1.74E-07	1.933E-08	0	1.498E-07	1.498E-07
Cobalt (Co)	t/d	4.731E-06	5.256E-07	0	4.074E-06	4.074E-06
Copper (Cu)	t/d	8.215E-06	9.128E-07	0	7.074E-06	7.074E-06
Iron (Fe)	t/d	3.614E-05	4.016E-06	0	3.112E-05	3.112E-05
Lead (Pb)	t/d	4.929E-07	5.477E-08	0	4.244E-07	4.244E-07
Magnesium (Mg)	t/d	0	0	0	0	0
Manganese (Mn)	t/d	1.643E-06	1.826E-07	0	1.415E-06	1.415E-06
Nickel (Ni)	t/d	8.215E-06	9.128E-07	0	7.074E-06	7.074E-06
Potassium (K)	t/d	1.643E-05	1.826E-06	0	1.415E-05	1.415E-05
Silver (Ag)	t/d	0	0	0	0	0
Silicon (Si)	t/d	9.519E-05	1.058E-05	0	8.197E-05	8.197E-05
Strontium (Sr)	t/d	1.643E-07	1.826E-08	0	1.415E-07	1.415E-07
Titanium (Ti)	t/d	1.643E-06	1.826E-07	0	1.415E-06	1.415E-06
Vanadium (V)	t/d	3.286E-06	3.651E-07	0	2.83E-06	2.83E-06
Zinc (Zn)	t/d	1.314E-05	1.46E-06	0	1.132E-05	1.132E-05
Zirconium (Zr)	t/d	1.933E-08	2.148E-09	0	1.664E-08	1.664E-08
Molybdenum (Mo)	t/d	2.174E-09	2.416E-10	0	1.872E-09	1.872E-09
Selenium (Se)	t/d	1.160E-06	1.289E-07	0	9.987E-07	9.987E-07

Point Source (cont'd)						
Facility	**Units**	**Kirby South 2**				
Emission Source		**Steam Generator 3**	**Steam Generator 4**	**Steam Generator 5**	**Glycol Heater**	**HP Flare (47 m H, 0.6 m D)**
UTMmN	m	497498	497450	497474	497506	497764
UTMmE	m	6133407	6133338	6133338	6133339	6133168
Elevation	masl	723	723	723	723	723
Stack Height	m	45.5	45.5	45.5	31.394	44.7
Stack Diameter	m	1.981	1.981	1.981	1.3	2.82
Exit Velocity	m/s	17.2	17.2	17.2	7	0.1
Exit Temperature	K	467.15	467.15	467.15	488.15	1263.03
1,3-butadiene	t/d	0	0	0	0	0
Acenaphthene	t/d	5.813E-09	5.813E-09	5.813E-09	7.582E-10	0
Acenaphthylene	t/d	5.06E-08	5.06E-08	5.06E-08	6.6E-09	0
Acetaldehyde	t/d	6.524E-05	6.524E-05	6.524E-05	8.509E-06	1.804E-06
Acrolein	t/d	7.695E-05	7.695E-05	7.695E-05	1.004E-05	5.902E-07
Aliphatic aldehydes	t/d	0	0	0	0	0
Aliphatic C_{17}-C_{34}	t/d	0	0	0	0	0
Aliphatic C_5-C_8	t/d	0.008372	0.008372	0.008372	0.001092	0.000364
Aliphatic C_9-C_{16}	t/d	0.000322	0.000322	0.000322	0.000042	0.000014
Aliphatic ketones	t/d	0	0	0	0	0
Anthracene	t/d	6.733E-09	6.733E-09	6.733E-09	8.782E-10	0
Aromatic C_{17}-C_{34}	t/d	7.521E-09	7.521E-09	7.521E-09	9.81E-10	9.64E-10
Aromatic C_9-C_{16}	t/d	1.826E-07	1.826E-07	1.826E-07	2.382E-08	7.3E-07
Benzaldehyde	t/d	6.858E-05	6.858E-05	6.858E-05	8.945E-06	0
Benzene	t/d	4.684E-05	4.684E-05	4.684E-05	6.109E-06	1.28E-06
Benzo(a)pyrene	t/d	4.098E-09	4.098E-09	4.098E-09	5.345E-10	1.476E-07
Benzo(b)fluoranthene	t/d	4.767E-09	4.767E-09	4.767E-09	6.218E-10	1.476E-07
Benzo(g,h,i)perylene	t/d	5.227E-09	5.227E-09	5.227E-09	6.818E-10	1.476E-07
Benzo(k)fluoranthene	t/d	4.14E-09	4.14E-09	4.14E-09	5.4E-10	1.476E-07
Carboxylic acids	t/d	0	0	0	0	0
Chrysene	t/d	5.813E-09	5.813E-09	5.813E-09	7.582E-10	1.483E-07
Dibenz(a,h)anthracene	t/d	3.835E-09	3.835E-09	3.835E-09	5.002E-10	1.476E-07
Ethylbenzene	t/d	9.409E-06	9.409E-06	9.409E-06	1.227E-06	0
Fluoranthene	t/d	4.976E-08	4.976E-08	4.976E-08	6.491E-09	1.587E-07
Fluorene	t/d	1.919E-08	1.919E-08	1.919E-08	2.504E-09	0
Formaldehyde	t/d	0.0009242	0.0009242	0.0009242	0.0001205	0.0002063
Hexane	t/d	0	0	0	0	0
Indeno(1,2,3-cd)pyrene	t/d	4.893E-09	4.893E-09	4.893E-09	6.382E-10	1.476E-07
Naphthalene	t/d	4.684E-06	4.684E-06	4.684E-06	6.109E-07	9.091E-05
Phenanthrene	t/d	1.409E-07	1.409E-07	1.409E-07	1.838E-08	1.958E-07
Propylene	t/d	0.0009827	0.0009827	0.0009827	0.0001282	0
Pyrene	t/d	2.342E-08	2.342E-08	2.342E-08	3.055E-09	1.559E-07
Toluene	t/d	0.0001234	0.0001234	0.0001234	1.609E-05	0.0001231
Xylenes	t/d	0.0001154	0.0001154	0.0001154	1.505E-05	3.874E-06
Aluminum (Al)	t/d	1.698E-05	1.698E-05	1.698E-05	2.191E-06	0
Arsenic (As)	t/d	5.659E-07	5.659E-07	5.659E-07	7.302E-08	0
Barium (Ba)	t/d	1.481E-06	1.481E-06	1.481E-06	1.911E-07	0
Cadmium (Cd)	t/d	1.872E-07	1.872E-07	1.872E-07	2.416E-08	0
Calcium (Ca)	t/d	5.659E-05	5.659E-05	5.659E-05	7.302E-06	0
Chromium (Cr)	t/d	1.498E-07	1.498E-07	1.498E-07	1.933E-08	0

Point Source (cont'd)						
Facility	**Units**	**Kirby South 2**				
Emission Source		**Steam Generator 3**	**Steam Generator 4**	**Steam Generator 5**	**Glycol Heater**	**HP Flare (47 m H, 0.6 m D)**
Cobalt (Co)	t/d	4.074E-06	4.074E-06	4.074E-06	5.256E-07	0
Copper (Cu)	t/d	7.074E-06	7.074E-06	7.074E-06	9.128E-07	0
Iron (Fe)	t/d	3.112E-05	3.112E-05	3.112E-05	4.016E-06	0
Lead (Pb)	t/d	4.244E-07	4.244E-07	4.244E-07	5.477E-08	0
Magnesium (Mg)	t/d	0	0	0	0	0
Manganese (Mn)	t/d	1.415E-06	1.415E-06	1.415E-06	1.826E-07	0
Nickel (Ni)	t/d	7.074E-06	7.074E-06	7.074E-06	9.128E-07	0
Potassium (K)	t/d	1.415E-05	1.415E-05	1.415E-05	1.826E-06	0
Silver (Ag)	t/d	0	0	0	0	0
Silicon (Si)	t/d	8.197E-05	8.197E-05	8.197E-05	1.058E-05	0
Strontium (Sr)	t/d	1.415E-07	1.415E-07	1.415E-07	1.826E-08	0
Titanium (Ti)	t/d	1.415E-06	1.415E-06	1.415E-06	1.826E-07	0
Vanadium (V)	t/d	2.83E-06	2.83E-06	2.83E-06	3.651E-07	0
Zinc (Zn)	t/d	1.132E-05	1.132E-05	1.132E-05	1.46E-06	0
Zirconium (Zr)	t/d	1.664E-08	1.664E-08	1.664E-08	2.148E-09	0
Molybdenum (Mo)	t/d	1.872E-09	1.872E-09	1.872E-09	2.416E-10	0
Selenium (Se)	t/d	9.987E-07	9.987E-07	9.987E-07	1.289E-07	0

Note: "0" = No emissions.

Area Source					
Facility	**Units**	**Kirby North 1**	**Kirby North 2**	**Kirby South 2010**	**Kirby South 2**
Emission Source		**Plant Fugitive**	**Plant Fugitive**	**Plant Fugitive**	**Plant Fugitive**
Corner 1 UTM N	m	485031	485031	497701	497701
Corner 1 UTM E	m	6146278	6146278	6132814	6132814
Corner 2 UTM N	m	485031	485031	497701	497701
Corner 2 UTM E	m	6146778	6146778	6133314	6133314
Corner 3 UTM N	m	485531	485531	498201	498201
Corner 3 UTM E	m	6146778	6146778	6133314	6133314
Corner 4 UTM N	m	485531	485531	498201	498201
Corner 4 UTM E	m	6146278	6146278	6132814	6132814
Area	m^2	250000	250000	250000	250000
Elevation (m)	masl	682	682	723	723
1,3-butadiene	t/d	1.51E-06	9.03E-07	1.35E-06	4.52E-07
Acenaphthene	t/d	0	0	0	0
Acenaphthylene	t/d	0	0	0	0
Acetaldehyde	t/d	0	0	0	0
Acrolein	t/d	0	0	0	0
Aliphatic aldehydes	t/d	0.008983	0.00539	0.008084	0.002695
Aliphatic C_{17}-C_{34}	t/d	0.004171	0.002503	0.003754	0.001251
Aliphatic C_5-C_8	t/d	0.07052	0.042312	0.063468	0.021156
Aliphatic C_9-C_{16}	t/d	0.290306	0.174184	0.261275	0.087092
Aliphatic ketones	t/d	0.031816	0.019089	0.028634	0.009545
Anthracene	t/d	0	0	0	0
Aromatic C_{17}-C_{34}	t/d	0	0	0	0
Aromatic C_9-C_{16}	t/d	0.007469	0.004481	0.006722	0.002241
Benzaldehyde	t/d	0	0	0	0
Benzene	t/d	0.005573	0.003344	0.005016	0.001672
Benzo(a)pyrene	t/d	0	0	0	0
Benzo(b)fluoranthene	t/d	0	0	0	0
Benzo(g,h,i)perylene	t/d	0	0	0	0
Benzo(k)fluoranthene	t/d	0	0	0	0
Carboxylic acids	t/d	1.2E-06	7.22E-07	1.08E-06	3.61E-07
Chrysene	t/d	0	0	0	0
Dibenz(a,h)anthracene	t/d	0	0	0	0
Ethylbenzene	t/d	0.000335	0.000201	0.000302	0.000101
Fluoranthene	t/d	0	0	0	0
Fluorene	t/d	0	0	0	0
Formaldehyde	t/d	0	0	0	0
Hexane	t/d	0.004601	0.002761	0.004141	0.00138
Indeno(1,2,3-cd)pyrene	t/d	0	0	0	0
Naphthalene	t/d	4.3E-08	2.58E-08	3.87E-08	1.29E-08
Phenanthrene	t/d	0	0	0	0
Propylene	t/d	0	0	0	0
Pyrene	t/d	0	0	0	0

Area Source					
Facility	**Units**	**Kirby North 1**	**Kirby North 2**	**Kirby South 2010**	**Kirby South 2**
Emission Source		**Plant Fugitive**	**Plant Fugitive**	**Plant Fugitive**	**Plant Fugitive**
Toluene	t/d	0.002494	0.001496	0.002245	0.000748
Xylenes	t/d	0.001462	0.000877	0.001316	0.000439
Carbon disulphide	t/d	0.001723	0.000861	0.001436	0.000574
Hydrogen Sulphide	t/d	0.000142	7.08E-05	0.000118	4.72E-05
Mercaptans	t/d	0.001778	0.000889	0.001482	0.000593
Thiophenes	t/d	0.002359	0.001179	0.001966	0.000786

Note: “0” = No emissions.

2.3 Cenovus Energy Inc.

Table B4-8: Summary of Cenovus Christina Lake SAGD VOC, PAH and Metal Air Emissions Used for Baseline and Application

Point Source								
Facility	Units	Christina Lake						
Emission Source		OTSG (B-101)	OTSG (B-102)	OTSG (B-1725)	Glycol Heater (H-522)	OTSG (B-2100)	OTSG (B-2200)	OTSG (B-2300)
UTMmN	m	506880	506874	507036	506939	507169	507162	507155
UTMmE	m	6159498	6159489	6159450	6159483	6159613	6159626	6159639
Elevation	masl	573	573	573	573	574	574	574
Stack Height	m	26.62	13.8	32.9	6.7	32	32	32
Stack Diameter	m	1.372	0.914	1.676	0.591	1.676	1.676	1.676
Exit Velocity	m/s	27	22	23.3	13.9	24.5	24.5	24.5
Exit Temperature	K	463	463	463	474	488	488	488
1,3-butadiene	t/d	0	0	0	0	0	0	0
Acenaphthene	t/d	3.791E-09	1.264E-09	4.802E-09	2.527E-10	4.802E-09	4.802E-09	4.802E-09
Acenaphthylene	t/d	3.3E-08	1.1E-08	4.18E-08	2.2E-09	4.18E-08	4.18E-08	4.18E-08
Acetaldehyde	t/d	4.255E-05	1.418E-05	5.389E-05	2.836E-06	5.389E-05	5.389E-05	5.389E-05
Acrolein	t/d	5.018E-05	1.673E-05	6.356E-05	3.345E-06	6.356E-05	6.356E-05	6.356E-05
Aliphatic aldehydes	t/d	0	0	0	0	0	0	0
Aliphatic C_{17}-C_{34}	t/d	0	0	0	0	0	0	0
Aliphatic C_5-C_8	t/d	0.00546	0.00182	0.006916	0.000364	0.006916	0.006916	0.006916
Aliphatic C_9-C_{16}	t/d	0.00021	0.00007	0.000266	0.000014	0.000266	0.000266	0.000266
Aliphatic ketones	t/d	0	0	0	0	0	0	0
Anthracene	t/d	4.391E-09	1.464E-09	5.562E-09	2.927E-10	5.562E-09	5.562E-09	5.562E-09
Aromatic C_{17}-C_{34}	t/d	4.905E-09	1.635E-09	6.213E-09	3.27E-10	6.213E-09	6.213E-09	6.213E-09
Aromatic C_9-C_{16}	t/d	1.191E-07	3.97E-08	1.509E-07	7.94E-09	1.509E-07	1.509E-07	1.509E-07
Benzaldehyde	t/d	4.473E-05	1.491E-05	5.665E-05	2.982E-06	5.665E-05	5.665E-05	5.665E-05
Benzene	t/d	3.055E-05	1.018E-05	3.869E-05	2.036E-06	3.869E-05	3.869E-05	3.869E-05
Benzo(a)pyrene	t/d	2.673E-09	8.909E-10	3.385E-09	1.782E-10	3.385E-09	3.385E-09	3.385E-09
Benzo(b)fluoranthene	t/d	3.109E-09	1.036E-09	3.938E-09	2.073E-10	3.938E-09	3.938E-09	3.938E-09
Benzo(g,h,i)perylene	t/d	3.409E-09	1.136E-09	4.318E-09	2.273E-10	4.318E-09	4.318E-09	4.318E-09
Benzo(k)fluoranthene	t/d	2.7E-09	9E-10	3.42E-09	1.8E-10	3.42E-09	3.42E-09	3.42E-09
Carboxylic acids	t/d	0	0	0	0	0	0	0
Chrysene	t/d	3.791E-09	1.264E-09	4.802E-09	2.527E-10	4.802E-09	4.802E-09	4.802E-09
Dibenz(a,h)anthracene	t/d	2.501E-09	8.336E-10	3.168E-09	1.667E-10	3.168E-09	3.168E-09	3.168E-09
Ethylbenzene	t/d	6.136E-06	2.045E-06	7.773E-06	4.091E-07	7.773E-06	7.773E-06	7.773E-06
Fluoranthene	t/d	3.245E-08	1.082E-08	4.111E-08	2.164E-09	4.111E-08	4.111E-08	4.111E-08
Fluorene	t/d	1.252E-08	4.173E-09	1.586E-08	8.345E-10	1.586E-08	1.586E-08	1.586E-08
Formaldehyde	t/d	0.0006027	0.0002009	0.0007635	4.018E-05	0.0007635	0.0007635	0.0007635
Hexane	t/d	0	0	0	0	0	0	0
Indeno(1,2,3-cd)pyrene	t/d	3.191E-09	1.064E-09	4.042E-09	2.127E-10	4.042E-09	4.042E-09	4.042E-09
Naphthalene	t/d	3.055E-06	1.018E-06	3.869E-06	2.036E-07	3.869E-06	3.869E-06	3.869E-06
Phenanthrene	t/d	9.191E-08	3.064E-08	1.164E-07	6.127E-09	1.164E-07	1.164E-07	1.164E-07
Propylene	t/d	0.0006409	0.0002136	0.0008118	4.273E-05	0.0008118	0.0008118	0.0008118
Pyrene	t/d	1.527E-08	5.091E-09	1.935E-08	1.018E-09	1.935E-08	1.935E-08	1.935E-08

Point Source								
Facility	**Units**	**Christina Lake**						
Emission Source		**OTSG (B-101)**	**OTSG (B-102)**	**OTSG (B-1725)**	**Glycol Heater (H-522)**	**OTSG (B-2100)**	**OTSG (B-2200)**	**OTSG (B-2300)**
Toluene	t/d	8.045E-05	2.682E-05	0.0001019	5.364E-06	0.0001019	0.0001019	0.0001019
Xylenes	t/d	7.527E-05	2.509E-05	9.535E-05	5.018E-06	9.535E-05	9.535E-05	9.535E-05
Aluminum (Al)	t/d	1.095E-05	3.834E-06	1.424E-05	1.095E-06	1.424E-05	1.424E-05	1.424E-05
Arsenic (As)	t/d	3.651E-07	1.278E-07	4.746E-07	3.651E-08	4.746E-07	4.746E-07	4.746E-07
Barium (Ba)	t/d	9.557E-07	3.345E-07	1.242E-06	9.557E-08	1.242E-06	1.242E-06	1.242E-06
Cadmium (Cd)	t/d	1.208E-07	4.228E-08	1.57E-07	1.208E-08	1.57E-07	1.57E-07	1.57E-07
Calcium (Ca)	t/d	3.651E-05	1.278E-05	4.746E-05	3.651E-06	4.746E-05	4.746E-05	4.746E-05
Chromium (Cr)	t/d	9.664E-08	3.383E-08	1.256E-07	9.664E-09	1.256E-07	1.256E-07	1.256E-07
Cobalt (Co)	t/d	2.628E-06	9.199E-07	3.417E-06	2.628E-07	3.417E-06	3.417E-06	3.417E-06
Copper (Cu)	t/d	4.564E-06	1.597E-06	5.933E-06	4.564E-07	5.933E-06	5.933E-06	5.933E-06
Iron (Fe)	t/d	2.008E-05	7.028E-06	2.61E-05	2.008E-06	2.61E-05	2.61E-05	2.61E-05
Lead (Pb)	t/d	2.738E-07	9.584E-08	3.56E-07	2.738E-08	3.56E-07	3.56E-07	3.56E-07
Magnesium (Mg)	t/d	0	0	0	0	0	0	0
Manganese (Mn)	t/d	9.128E-07	3.195E-07	1.187E-06	9.128E-08	1.187E-06	1.187E-06	1.187E-06
Nickel (Ni)	t/d	4.564E-06	1.597E-06	5.933E-06	4.564E-07	5.933E-06	5.933E-06	5.933E-06
Potassium (K)	t/d	9.128E-06	3.195E-06	1.187E-05	9.128E-07	1.187E-05	1.187E-05	1.187E-05
Silver (Ag)	t/d	0	0	0	0	0	0	0
Silicon (Si)	t/d	5.289E-05	1.851E-05	6.875E-05	5.289E-06	6.875E-05	6.875E-05	6.875E-05
Strontium (Sr)	t/d	9.128E-08	3.195E-08	1.187E-07	9.128E-09	1.187E-07	1.187E-07	1.187E-07
Titanium (Ti)	t/d	9.128E-07	3.195E-07	1.187E-06	9.128E-08	1.187E-06	1.187E-06	1.187E-06
Vanadium (V)	t/d	1.826E-06	6.389E-07	2.373E-06	1.826E-07	2.373E-06	2.373E-06	2.373E-06
Zinc (Zn)	t/d	7.302E-06	2.556E-06	9.493E-06	7.302E-07	9.493E-06	9.493E-06	9.493E-06
Zirconium (Zr)	t/d	1.074E-08	3.758E-09	1.396E-08	1.074E-09	1.396E-08	1.396E-08	1.396E-08
Molybdenum (Mo)	t/d	1.208E-09	4.228E-10	1.57E-09	1.208E-10	1.57E-09	1.57E-09	1.57E-09
Selenium (Se)	t/d	6.443E-07	2.255E-07	8.376E-07	6.443E-08	8.376E-07	8.376E-07	8.376E-07

Point Source (cont'd)								
Facility	**Units**	**Christina Lake**						
Emission Source		**OTSG (B-2400)**	**Glycol Heater (H-7100)**	**OTSG (B-2500)**	**OTSG (B-2600)**	**OTSG (B-2700)**	**OTSG (B-2800)**	**Glycol Heater (H-7200)**
UTMmN	m	507147	507380	507130	507123	507116	507109	507387
UTMmE	m	6159652	6159601	6159682	6159691	6159709	6159722	6159605
Elevation	masl	574	571	574	574	574	574	571
Stack Height	m	32	9.2	32	32	32	32	9.2
Stack Diameter	m	1.676	0.914	1.676	1.676	1.676	1.676	0.914
Exit Velocity	m/s	24.5	9.6	24.5	24.5	24.5	24.5	9.6
Exit Temperature	K	488	474	488	488	488	488	474
1,3-butadiene	t/d	0	0	0	0	0	0	0
Acenaphthene	t/d	4.802E-09	5.055E-10	4.802E-09	4.802E-09	4.802E-09	4.802E-09	5.055E-10
Acenaphthylene	t/d	4.18E-08	4.4E-09	4.18E-08	4.18E-08	4.18E-08	4.18E-08	4.4E-09
Acetaldehyde	t/d	5.389E-05	5.673E-06	5.389E-05	5.389E-05	5.389E-05	5.389E-05	5.673E-06
Acrolein	t/d	6.356E-05	6.691E-06	6.356E-05	6.356E-05	6.356E-05	6.356E-05	6.691E-06
Aliphatic aldehydes	t/d	0	0	0	0	0	0	0
Aliphatic C_{17}-C_{34}	t/d	0	0	0	0	0	0	0
Aliphatic C_5-C_8	t/d	0.006916	0.000728	0.006916	0.006916	0.006916	0.006916	0.000728
Aliphatic C_9-C_{16}	t/d	0.000266	0.000028	0.000266	0.000266	0.000266	0.000266	0.000028
Aliphatic ketones	t/d	0	0	0	0	0	0	0
Anthracene	t/d	5.562E-09	5.855E-10	5.562E-09	5.562E-09	5.562E-09	5.562E-09	5.855E-10
Aromatic C_{17}-C_{34}	t/d	6.213E-09	6.54E-10	6.213E-09	6.213E-09	6.213E-09	6.213E-09	6.54E-10
Aromatic C_9-C_{16}	t/d	1.509E-07	1.588E-08	1.509E-07	1.509E-07	1.509E-07	1.509E-07	1.588E-08
Benzaldehyde	t/d	5.665E-05	5.964E-06	5.665E-05	5.665E-05	5.665E-05	5.665E-05	5.964E-06
Benzene	t/d	3.869E-05	4.073E-06	3.869E-05	3.869E-05	3.869E-05	3.869E-05	4.073E-06
Benzo(a)pyrene	t/d	3.385E-09	3.564E-10	3.385E-09	3.385E-09	3.385E-09	3.385E-09	3.564E-10
Benzo(b)fluoranthene	t/d	3.938E-09	4.145E-10	3.938E-09	3.938E-09	3.938E-09	3.938E-09	4.145E-10
Benzo(g,h,i)perylene	t/d	4.318E-09	4.545E-10	4.318E-09	4.318E-09	4.318E-09	4.318E-09	4.545E-10
Benzo(k)fluoranthene	t/d	3.42E-09	3.6E-10	3.42E-09	3.42E-09	3.42E-09	3.42E-09	3.6E-10
Carboxylic acids	t/d	0	0	0	0	0	0	0
Chrysene	t/d	4.802E-09	5.055E-10	4.802E-09	4.802E-09	4.802E-09	4.802E-09	5.055E-10
Dibenz(a,h)anthracene	t/d	3.168E-09	3.335E-10	3.168E-09	3.168E-09	3.168E-09	3.168E-09	3.335E-10
Ethylbenzene	t/d	7.773E-06	8.182E-07	7.773E-06	7.773E-06	7.773E-06	7.773E-06	8.182E-07
Fluoranthene	t/d	4.111E-08	4.327E-09	4.111E-08	4.111E-08	4.111E-08	4.111E-08	4.327E-09
Fluorene	t/d	1.586E-08	1.669E-09	1.586E-08	1.586E-08	1.586E-08	1.586E-08	1.669E-09
Formaldehyde	t/d	0.0007635	8.036E-05	0.0007635	0.0007635	0.0007635	0.0007635	8.036E-05
Hexane	t/d	0	0	0	0	0	0	0
Indeno(1,2,3-cd)pyrene	t/d	4.042E-09	4.255E-10	4.042E-09	4.042E-09	4.042E-09	4.042E-09	4.255E-10
Naphthalene	t/d	3.869E-06	4.073E-07	3.869E-06	3.869E-06	3.869E-06	3.869E-06	4.073E-07
Phenanthrene	t/d	1.164E-07	1.225E-08	1.164E-07	1.164E-07	1.164E-07	1.164E-07	1.225E-08
Propylene	t/d	0.0008118	8.545E-05	0.0008118	0.0008118	0.0008118	0.0008118	8.545E-05
Pyrene	t/d	1.935E-08	2.036E-09	1.935E-08	1.935E-08	1.935E-08	1.935E-08	2.036E-09
Toluene	t/d	0.0001019	1.073E-05	0.0001019	0.0001019	0.0001019	0.0001019	1.073E-05
Xylenes	t/d	9.535E-05	1.004E-05	9.535E-05	9.535E-05	9.535E-05	9.535E-05	1.004E-05
Aluminum (Al)	t/d	1.424E-05	1.643E-06	1.424E-05	1.424E-05	1.424E-05	1.424E-05	1.643E-06
Arsenic (As)	t/d	4.746E-07	5.477E-08	4.746E-07	4.746E-07	4.746E-07	4.746E-07	5.477E-08

Point Source (cont'd)								
Facility	**Units**	**Christina Lake**						
Emission Source		**OTSG (B-2400)**	**Glycol Heater (H-7100)**	**OTSG (B-2500)**	**OTSG (B-2600)**	**OTSG (B-2700)**	**OTSG (B-2800)**	**Glycol Heater (H-7200)**
Barium (Ba)	t/d	1.242E-06	1.434E-07	1.242E-06	1.242E-06	1.242E-06	1.242E-06	1.434E-07
Cadmium (Cd)	t/d	1.57E-07	1.812E-08	1.57E-07	1.57E-07	1.57E-07	1.57E-07	1.812E-08
Calcium (Ca)	t/d	4.746E-05	5.477E-06	4.746E-05	4.746E-05	4.746E-05	4.746E-05	5.477E-06
Chromium (Cr)	t/d	1.256E-07	1.45E-08	1.256E-07	1.256E-07	1.256E-07	1.256E-07	1.45E-08
Cobalt (Co)	t/d	3.417E-06	3.942E-07	3.417E-06	3.417E-06	3.417E-06	3.417E-06	3.942E-07
Copper (Cu)	t/d	5.933E-06	6.846E-07	5.933E-06	5.933E-06	5.933E-06	5.933E-06	6.846E-07
Iron (Fe)	t/d	2.61E-05	3.012E-06	2.61E-05	2.61E-05	2.61E-05	2.61E-05	3.012E-06
Lead (Pb)	t/d	3.56E-07	4.107E-08	3.56E-07	3.56E-07	3.56E-07	3.56E-07	4.107E-08
Magnesium (Mg)	t/d	0	0	0	0	0	0	0
Manganese (Mn)	t/d	1.187E-06	1.369E-07	1.187E-06	1.187E-06	1.187E-06	1.187E-06	1.369E-07
Nickel (Ni)	t/d	5.933E-06	6.846E-07	5.933E-06	5.933E-06	5.933E-06	5.933E-06	6.846E-07
Potassium (K)	t/d	1.187E-05	1.369E-06	1.187E-05	1.187E-05	1.187E-05	1.187E-05	1.369E-06
Silver (Ag)	t/d	0	0	0	0	0	0	0
Silicon (Si)	t/d	6.875E-05	7.933E-06	6.875E-05	6.875E-05	6.875E-05	6.875E-05	7.933E-06
Strontium (Sr)	t/d	1.187E-07	1.369E-08	1.187E-07	1.187E-07	1.187E-07	1.187E-07	1.369E-08
Titanium (Ti)	t/d	1.187E-06	1.369E-07	1.187E-06	1.187E-06	1.187E-06	1.187E-06	1.369E-07
Vanadium (V)	t/d	2.373E-06	2.738E-07	2.373E-06	2.373E-06	2.373E-06	2.373E-06	2.738E-07
Zinc (Zn)	t/d	9.493E-06	1.095E-06	9.493E-06	9.493E-06	9.493E-06	9.493E-06	1.095E-06
Zirconium (Zr)	t/d	1.396E-08	1.611E-09	1.396E-08	1.396E-08	1.396E-08	1.396E-08	1.611E-09
Molybdenum (Mo)	t/d	1.57E-09	1.812E-10	1.57E-09	1.57E-09	1.57E-09	1.57E-09	1.812E-10
Selenium (Se)	t/d	8.376E-07	9.664E-08	8.376E-07	8.376E-07	8.376E-07	8.376E-07	9.664E-08

devon

Point Source (cont'd)								
Facility	Units	Christina Lake						
Emission Source		Flash Treater (H-5070A)	Flash Treater (H-5070B)	OTSG (B-2360)	OTSG (B-2460)	OTSG (B-3100)	OTSG (B-3200)	OTSG (B-3300)
UTMmN	m	507259	507249	507062	507055	507092	507084	507077
UTMmE	m	6159598	6159595	6159805	6159818	6159752	6159766	6159779
Elevation	masl	571	574	574	574	574	574	574
Stack Height	m	3.3	3.3	32	32	32	32	32
Stack Diameter	m	0.311	0.311	1.83	1.83	1.676	1.676	1.676
Exit Velocity	m/s	30.5	30.5	26.3	26.3	24.5	24.5	24.5
Exit Temperature	K	512	512	442	442	488	488	488
1,3-butadiene	t/d	0	0	0	0	0	0	0
Acenaphthene	t/d	2.527E-10	2.527E-10	6.571E-09	6.571E-09	4.802E-09	4.802E-09	4.802E-09
Acenaphthylene	t/d	2.2E-09	2.2E-09	5.72E-08	5.72E-08	4.18E-08	4.18E-08	4.18E-08
Acetaldehyde	t/d	2.836E-06	2.836E-06	7.375E-05	7.375E-05	5.389E-05	5.389E-05	5.389E-05
Acrolein	t/d	3.345E-06	3.345E-06	8.698E-05	8.698E-05	6.356E-05	6.356E-05	6.356E-05
Aliphatic aldehydes	t/d	0	0	0	0	0	0	0
Aliphatic C_{17}-C_{34}	t/d	0	0	0	0	0	0	0
Aliphatic C_5-C_8	t/d	0.000364	0.000364	0.009464	0.009464	0.006916	0.006916	0.006916
Aliphatic C_9-C_{16}	t/d	0.000014	0.000014	0.000364	0.000364	0.000266	0.000266	0.000266
Aliphatic ketones	t/d	0	0	0	0	0	0	0
Anthracene	t/d	2.927E-10	2.927E-10	7.611E-09	7.611E-09	5.562E-09	5.562E-09	5.562E-09
Aromatic C_{17}-C_{34}	t/d	3.27E-10	3.27E-10	8.502E-09	8.502E-09	6.213E-09	6.213E-09	6.213E-09
Aromatic C_9-C_{16}	t/d	7.94E-09	7.94E-09	2.064E-07	2.064E-07	1.509E-07	1.509E-07	1.509E-07
Benzaldehyde	t/d	2.982E-06	2.982E-06	7.753E-05	7.753E-05	5.665E-05	5.665E-05	5.665E-05
Benzene	t/d	2.036E-06	2.036E-06	5.295E-05	5.295E-05	3.869E-05	3.869E-05	3.869E-05
Benzo(a)pyrene	t/d	1.782E-10	1.782E-10	4.633E-09	4.633E-09	3.385E-09	3.385E-09	3.385E-09
Benzo(b)fluoranthene	t/d	2.073E-10	2.073E-10	5.389E-09	5.389E-09	3.938E-09	3.938E-09	3.938E-09
Benzo(g,h,i)perylene	t/d	2.273E-10	2.273E-10	5.909E-09	5.909E-09	4.318E-09	4.318E-09	4.318E-09
Benzo(k)fluoranthene	t/d	1.8E-10	1.8E-10	4.68E-09	4.68E-09	3.42E-09	3.42E-09	3.42E-09
Carboxylic acids	t/d	0	0	0	0	0	0	0
Chrysene	t/d	2.527E-10	2.527E-10	6.571E-09	6.571E-09	4.802E-09	4.802E-09	4.802E-09
Dibenz(a,h)anthracene	t/d	1.667E-10	1.667E-10	4.335E-09	4.335E-09	3.168E-09	3.168E-09	3.168E-09
Ethylbenzene	t/d	4.091E-07	4.091E-07	1.064E-05	1.064E-05	7.773E-06	7.773E-06	7.773E-06
Fluoranthene	t/d	2.164E-09	2.164E-09	5.625E-08	5.625E-08	4.111E-08	4.111E-08	4.111E-08
Fluorene	t/d	8.345E-10	8.345E-10	2.17E-08	2.17E-08	1.586E-08	1.586E-08	1.586E-08
Formaldehyde	t/d	4.018E-05	4.018E-05	0.0010447	0.0010447	0.0007635	0.0007635	0.0007635
Hexane	t/d	0	0	0	0	0	0	0
Indeno(1,2,3-cd)pyrene	t/d	2.127E-10	2.127E-10	5.531E-09	5.531E-09	4.042E-09	4.042E-09	4.042E-09
Naphthalene	t/d	2.036E-07	2.036E-07	5.295E-06	5.295E-06	3.869E-06	3.869E-06	3.869E-06
Phenanthrene	t/d	6.127E-09	6.127E-09	1.593E-07	1.593E-07	1.164E-07	1.164E-07	1.164E-07
Propylene	t/d	4.273E-05	4.273E-05	0.0011109	0.0011109	0.0008118	0.0008118	0.0008118
Pyrene	t/d	1.018E-09	1.018E-09	2.647E-08	2.647E-08	1.935E-08	1.935E-08	1.935E-08
Toluene	t/d	5.364E-06	5.364E-06	0.0001395	0.0001395	0.0001019	0.0001019	0.0001019
Xylenes	t/d	5.018E-06	5.018E-06	0.0001305	0.0001305	9.535E-05	9.535E-05	9.535E-05
Aluminum (Al)	t/d	5.477E-07	5.477E-07	2.026E-05	2.026E-05	1.424E-05	1.424E-05	1.424E-05
Arsenic (As)	t/d	1.826E-08	1.826E-08	6.754E-07	6.754E-07	4.746E-07	4.746E-07	4.746E-07

Point Source (cont'd)								
Facility	**Units**	**Christina Lake**						
Emission Source		**Flash Treater (H-5070A)**	**Flash Treater (H-5070B)**	**OTSG (B-2360)**	**OTSG (B-2460)**	**OTSG (B-3100)**	**OTSG (B-3200)**	**OTSG (B-3300)**
Barium (Ba)	t/d	4.779E-08	4.779E-08	1.768E-06	1.768E-06	1.242E-06	1.242E-06	1.242E-06
Cadmium (Cd)	t/d	6.04E-09	6.04E-09	2.235E-07	2.235E-07	1.57E-07	1.57E-07	1.57E-07
Calcium (Ca)	t/d	1.826E-06	1.826E-06	6.754E-05	6.754E-05	4.746E-05	4.746E-05	4.746E-05
Chromium (Cr)	t/d	4.832E-09	4.832E-09	1.788E-07	1.788E-07	1.256E-07	1.256E-07	1.256E-07
Cobalt (Co)	t/d	1.314E-07	1.314E-07	4.862E-06	4.862E-06	3.417E-06	3.417E-06	3.417E-06
Copper (Cu)	t/d	2.282E-07	2.282E-07	8.443E-06	8.443E-06	5.933E-06	5.933E-06	5.933E-06
Iron (Fe)	t/d	1.004E-06	1.004E-06	3.715E-05	3.715E-05	2.61E-05	2.61E-05	2.61E-05
Lead (Pb)	t/d	1.369E-08	1.369E-08	5.066E-07	5.066E-07	3.56E-07	3.56E-07	3.56E-07
Magnesium (Mg)	t/d	0	0	0	0	0	0	0
Manganese (Mn)	t/d	4.564E-08	4.564E-08	1.689E-06	1.689E-06	1.187E-06	1.187E-06	1.187E-06
Nickel (Ni)	t/d	2.282E-07	2.282E-07	8.443E-06	8.443E-06	5.933E-06	5.933E-06	5.933E-06
Potassium (K)	t/d	4.564E-07	4.564E-07	1.689E-05	1.689E-05	1.187E-05	1.187E-05	1.187E-05
Silver (Ag)	t/d	0	0	0	0	0	0	0
Silicon (Si)	t/d	2.644E-06	2.644E-06	9.784E-05	9.784E-05	6.875E-05	6.875E-05	6.875E-05
Strontium (Sr)	t/d	4.564E-09	4.564E-09	1.689E-07	1.689E-07	1.187E-07	1.187E-07	1.187E-07
Titanium (Ti)	t/d	4.564E-08	4.564E-08	1.689E-06	1.689E-06	1.187E-06	1.187E-06	1.187E-06
Vanadium (V)	t/d	9.128E-08	9.128E-08	3.377E-06	3.377E-06	2.373E-06	2.373E-06	2.373E-06
Zinc (Zn)	t/d	3.651E-07	3.651E-07	1.351E-05	1.351E-05	9.493E-06	9.493E-06	9.493E-06
Zirconium (Zr)	t/d	5.369E-10	5.369E-10	1.987E-08	1.987E-08	1.396E-08	1.396E-08	1.396E-08
Molybdenum (Mo)	t/d	6.04E-11	6.04E-11	2.235E-09	2.235E-09	1.57E-09	1.57E-09	1.57E-09
Selenium (Se)	t/d	3.221E-08	3.221E-08	1.192E-06	1.192E-06	8.376E-07	8.376E-07	8.376E-07

Point Source (cont'd)								
Facility	Units	Christina Lake						
Emission Source		OTSG (B-3400)	OTSG (B-3160)	OTSG (B-3260)	Cogenerator Unit (GT-2900, B-3360)	Cogenerator Unit (GT-2900, B-3460)	OTSG (B-3500)	OTSG (B-3550)
UTMmN	m	507070	507436	507429	507486	507471	507412	507405
UTMmE	m	6159792	6159817	6159831	6159780	6159808	6159861	6159874
Elevation	masl	574	571	571	571	571	571	571
Stack Height	m	32	32	32	32	32	32	32
Stack Diameter	m	1.676	1.676	1.676	3.34	3.34	1.676	1.676
Exit Velocity	m/s	24.5	24.5	24.5	22.7	22.7	24.5	24.5
Exit Temperature	K	488	488	488	473	473	488	488
1,3-butadiene	t/d	0	0	0	0	0	0	0
Acenaphthene	t/d	4.802E-09	4.802E-09	4.802E-09	6.824E-09	6.824E-09	4.802E-09	4.802E-09
Acenaphthylene	t/d	4.18E-08	4.18E-08	4.18E-08	5.94E-08	5.94E-08	4.18E-08	4.18E-08
Acetaldehyde	t/d	5.389E-05	5.389E-05	5.389E-05	7.658E-05	7.658E-05	5.389E-05	5.389E-05
Acrolein	t/d	6.356E-05	6.356E-05	6.356E-05	9.033E-05	9.033E-05	6.356E-05	6.356E-05
Aliphatic aldehydes	t/d	0	0	0	0	0	0	0
Aliphatic C_{17}-C_{34}	t/d	0	0	0	0	0	0	0
Aliphatic C_5-C_8	t/d	0.006916	0.006916	0.006916	0.009828	0.009828	0.006916	0.006916
Aliphatic C_9-C_{16}	t/d	0.000266	0.000266	0.000266	0.000378	0.000378	0.000266	0.000266
Aliphatic ketones	t/d	0	0	0	0	0	0	0
Anthracene	t/d	5.562E-09	5.562E-09	5.562E-09	7.904E-09	7.904E-09	5.562E-09	5.562E-09
Aromatic C_{17}-C_{34}	t/d	6.213E-09	6.213E-09	6.213E-09	8.829E-09	8.829E-09	6.213E-09	6.213E-09
Aromatic C_9-C_{16}	t/d	1.509E-07	1.509E-07	1.509E-07	2.144E-07	2.144E-07	1.509E-07	1.509E-07
Benzaldehyde	t/d	5.665E-05	5.665E-05	5.665E-05	8.051E-05	8.051E-05	5.665E-05	5.665E-05
Benzene	t/d	3.869E-05	3.869E-05	3.869E-05	5.498E-05	5.498E-05	3.869E-05	3.869E-05
Benzo(a)pyrene	t/d	3.385E-09	3.385E-09	3.385E-09	4.811E-09	4.811E-09	3.385E-09	3.385E-09
Benzo(b)fluoranthene	t/d	3.938E-09	3.938E-09	3.938E-09	5.596E-09	5.596E-09	3.938E-09	3.938E-09
Benzo(g,h,i)perylene	t/d	4.318E-09	4.318E-09	4.318E-09	6.136E-09	6.136E-09	4.318E-09	4.318E-09
Benzo(k)fluoranthene	t/d	3.42E-09	3.42E-09	3.42E-09	4.86E-09	4.86E-09	3.42E-09	3.42E-09
Carboxylic acids	t/d	0	0	0	0	0	0	0
Chrysene	t/d	4.802E-09	4.802E-09	4.802E-09	6.824E-09	6.824E-09	4.802E-09	4.802E-09
Dibenz(a,h)anthracene	t/d	3.168E-09	3.168E-09	3.168E-09	4.502E-09	4.502E-09	3.168E-09	3.168E-09
Ethylbenzene	t/d	7.773E-06	7.773E-06	7.773E-06	1.105E-05	1.105E-05	7.773E-06	7.773E-06
Fluoranthene	t/d	4.111E-08	4.111E-08	4.111E-08	5.842E-08	5.842E-08	4.111E-08	4.111E-08
Fluorene	t/d	1.586E-08	1.586E-08	1.586E-08	2.253E-08	2.253E-08	1.586E-08	1.586E-08
Formaldehyde	t/d	0.0007635	0.0007635	0.0007635	0.0010849	0.0010849	0.0007635	0.0007635
Hexane	t/d	0	0	0	0	0	0	0
Indeno(1,2,3-cd)pyrene	t/d	4.042E-09	4.042E-09	4.042E-09	5.744E-09	5.744E-09	4.042E-09	4.042E-09
Naphthalene	t/d	3.869E-06	3.869E-06	3.869E-06	5.498E-06	5.498E-06	3.869E-06	3.869E-06
Phenanthrene	t/d	1.164E-07	1.164E-07	1.164E-07	1.654E-07	1.654E-07	1.164E-07	1.164E-07
Propylene	t/d	0.0008118	0.0008118	0.0008118	0.0011536	0.0011536	0.0008118	0.0008118
Pyrene	t/d	1.935E-08	1.935E-08	1.935E-08	2.749E-08	2.749E-08	1.935E-08	1.935E-08
Toluene	t/d	0.0001019	0.0001019	0.0001019	0.0001448	0.0001448	0.0001019	0.0001019
Xylenes	t/d	9.535E-05	9.535E-05	9.535E-05	0.0001355	0.0001355	9.535E-05	9.535E-05
Aluminum (Al)	t/d	1.424E-05	1.424E-05	1.424E-05	3.067E-05	3.067E-05	1.424E-05	1.424E-05
Arsenic (As)	t/d	4.746E-07	4.746E-07	4.746E-07	1.022E-06	1.022E-06	4.746E-07	4.746E-07

Point Source (cont'd)								
Facility	**Units**	**Christina Lake**						
Emission Source		**OTSG (B-3400)**	**OTSG (B-3160)**	**OTSG (B-3260)**	**Cogenerator Unit (GT-2900, B-3360)**	**Cogenerator Unit (GT-2900, B-3460)**	**OTSG (B-3500)**	**OTSG (B-3550)**
Barium (Ba)	t/d	1.242E-06	1.242E-06	1.242E-06	2.676E-06	2.676E-06	1.242E-06	1.242E-06
Cadmium (Cd)	t/d	1.57E-07	1.57E-07	1.57E-07	3.383E-07	3.383E-07	1.57E-07	1.57E-07
Calcium (Ca)	t/d	4.746E-05	4.746E-05	4.746E-05	0.0001022	0.0001022	4.746E-05	4.746E-05
Chromium (Cr)	t/d	1.256E-07	1.256E-07	1.256E-07	2.706E-07	2.706E-07	1.256E-07	1.256E-07
Cobalt (Co)	t/d	3.417E-06	3.417E-06	3.417E-06	7.359E-06	7.359E-06	3.417E-06	3.417E-06
Copper (Cu)	t/d	5.933E-06	5.933E-06	5.933E-06	1.278E-05	1.278E-05	5.933E-06	5.933E-06
Iron (Fe)	t/d	2.61E-05	2.61E-05	2.61E-05	5.623E-05	5.623E-05	2.61E-05	2.61E-05
Lead (Pb)	t/d	3.56E-07	3.56E-07	3.56E-07	7.667E-07	7.667E-07	3.56E-07	3.56E-07
Magnesium (Mg)	t/d	0	0	0	0	0	0	0
Manganese (Mn)	t/d	1.187E-06	1.187E-06	1.187E-06	2.556E-06	2.556E-06	1.187E-06	1.187E-06
Nickel (Ni)	t/d	5.933E-06	5.933E-06	5.933E-06	1.278E-05	1.278E-05	5.933E-06	5.933E-06
Potassium (K)	t/d	1.187E-05	1.187E-05	1.187E-05	2.556E-05	2.556E-05	1.187E-05	1.187E-05
Silver (Ag)	t/d	0	0	0	0	0	0	0
Silicon (Si)	t/d	6.875E-05	6.875E-05	6.875E-05	0.0001481	0.0001481	6.875E-05	6.875E-05
Strontium (Sr)	t/d	1.187E-07	1.187E-07	1.187E-07	2.556E-07	2.556E-07	1.187E-07	1.187E-07
Titanium (Ti)	t/d	1.187E-06	1.187E-06	1.187E-06	2.556E-06	2.556E-06	1.187E-06	1.187E-06
Vanadium (V)	t/d	2.373E-06	2.373E-06	2.373E-06	5.111E-06	5.111E-06	2.373E-06	2.373E-06
Zinc (Zn)	t/d	9.493E-06	9.493E-06	9.493E-06	2.045E-05	2.045E-05	9.493E-06	9.493E-06
Zirconium (Zr)	t/d	1.396E-08	1.396E-08	1.396E-08	3.007E-08	3.007E-08	1.396E-08	1.396E-08
Molybdenum (Mo)	t/d	1.57E-09	1.57E-09	1.57E-09	3.383E-09	3.383E-09	1.57E-09	1.57E-09
Selenium (Se)	t/d	8.376E-07	8.376E-07	8.376E-07	1.804E-06	1.804E-06	8.376E-07	8.376E-07

Point Source (cont'd)								
Facility	**Units**	**Christina Lake**						
Emission Source		**OTSG (B-3600)**	**OTSG (B-3650)**	**OTSG (B-3700)**	**Flash Treater (H-5270A)**	**Flash Treater (H-5270B)**	**Glycol Heater (H-7300)**	**Glycol Heater (H-7300B)**
UTMmN	m	507397	507390	507383	507568	507578	507623	507614
UTMmE	m	6159887	6159901	6159914	6159773	6159778	6159709	6159704
Elevation	masl	571	571	571	571	571	571	571
Stack Height	m	32	32	32	3.3	3.3	9.2	9.2
Stack Diameter	m	1.676	1.676	1.676	0.311	0.311	0.914	0.914
Exit Velocity	m/s	24.5	24.5	24.5	30.5	30.5	9.6	9.6
Exit Temperature	K	488	488	488	512	512	474	474
1,3-butadiene	t/d	0	0	0	0	0	0	0
Acenaphthene	t/d	4.802E-09	4.802E-09	4.802E-09	2.527E-10	2.527E-10	5.055E-10	5.055E-10
Acenaphthylene	t/d	4.18E-08	4.18E-08	4.18E-08	2.2E-09	2.2E-09	4.4E-09	4.4E-09
Acetaldehyde	t/d	5.389E-05	5.389E-05	5.389E-05	2.836E-06	2.836E-06	5.673E-06	5.673E-06
Acrolein	t/d	6.356E-05	6.356E-05	6.356E-05	3.345E-06	3.345E-06	6.691E-06	6.691E-06
Aliphatic aldehydes	t/d	0	0	0	0	0	0	0
Aliphatic C_{17}-C_{34}	t/d	0	0	0	0	0	0	0
Aliphatic C_5-C_8	t/d	0.006916	0.006916	0.006916	0.000364	0.000364	0.000728	0.000728
Aliphatic C_9-C_{16}	t/d	0.000266	0.000266	0.000266	0.000014	0.000014	0.000028	0.000028
Aliphatic ketones	t/d	0	0	0	0	0	0	0
Anthracene	t/d	5.562E-09	5.562E-09	5.562E-09	2.927E-10	2.927E-10	5.855E-10	5.855E-10
Aromatic C_{17}-C_{34}	t/d	6.213E-09	6.213E-09	6.213E-09	3.27E-10	3.27E-10	6.54E-10	6.54E-10
Aromatic C_9-C_{16}	t/d	1.509E-07	1.509E-07	1.509E-07	7.94E-09	7.94E-09	1.588E-08	1.588E-08
Benzaldehyde	t/d	5.665E-05	5.665E-05	5.665E-05	2.982E-06	2.982E-06	5.964E-06	5.964E-06
Benzene	t/d	3.869E-05	3.869E-05	3.869E-05	2.036E-06	2.036E-06	4.073E-06	4.073E-06
Benzo(a)pyrene	t/d	3.385E-09	3.385E-09	3.385E-09	1.782E-10	1.782E-10	3.564E-10	3.564E-10
Benzo(b)fluoranthene	t/d	3.938E-09	3.938E-09	3.938E-09	2.073E-10	2.073E-10	4.145E-10	4.145E-10
Benzo(g,h,i)perylene	t/d	4.318E-09	4.318E-09	4.318E-09	2.273E-10	2.273E-10	4.545E-10	4.545E-10
Benzo(k)fluoranthene	t/d	3.42E-09	3.42E-09	3.42E-09	1.8E-10	1.8E-10	3.6E-10	3.6E-10
Carboxylic acids	t/d	0	0	0	0	0	0	0
Chrysene	t/d	4.802E-09	4.802E-09	4.802E-09	2.527E-10	2.527E-10	5.055E-10	5.055E-10
Dibenz(a,h)anthracene	t/d	3.168E-09	3.168E-09	3.168E-09	1.667E-10	1.667E-10	3.335E-10	3.335E-10
Ethylbenzene	t/d	7.773E-06	7.773E-06	7.773E-06	4.091E-07	4.091E-07	8.182E-07	8.182E-07
Fluoranthene	t/d	4.111E-08	4.111E-08	4.111E-08	2.164E-09	2.164E-09	4.327E-09	4.327E-09
Fluorene	t/d	1.586E-08	1.586E-08	1.586E-08	8.345E-10	8.345E-10	1.669E-09	1.669E-09
Formaldehyde	t/d	0.0007635	0.0007635	0.0007635	4.018E-05	4.018E-05	8.036E-05	8.036E-05
Hexane	t/d	0	0	0	0	0	0	0
Indeno(1,2,3-cd)pyrene	t/d	4.042E-09	4.042E-09	4.042E-09	2.127E-10	2.127E-10	4.255E-10	4.255E-10
Naphthalene	t/d	3.869E-06	3.869E-06	3.869E-06	2.036E-07	2.036E-07	4.073E-07	4.073E-07
Phenanthrene	t/d	1.164E-07	1.164E-07	1.164E-07	6.127E-09	6.127E-09	1.225E-08	1.225E-08
Propylene	t/d	0.0008118	0.0008118	0.0008118	4.273E-05	4.273E-05	8.545E-05	8.545E-05
Pyrene	t/d	1.935E-08	1.935E-08	1.935E-08	1.018E-09	1.018E-09	2.036E-09	2.036E-09
Toluene	t/d	0.0001019	0.0001019	0.0001019	5.364E-06	5.364E-06	1.073E-05	1.073E-05
Xylenes	t/d	9.535E-05	9.535E-05	9.535E-05	5.018E-06	5.018E-06	1.004E-05	1.004E-05
Aluminum (Al)	t/d	1.424E-05	1.424E-05	1.424E-05	5.477E-07	5.477E-07	1.643E-06	1.643E-06
Arsenic (As)	t/d	4.746E-07	4.746E-07	4.746E-07	1.826E-08	1.826E-08	5.477E-08	5.477E-08

Point Source (cont'd)									
Facility	**Units**	**Christina Lake**							
Emission Source		**OTSG (B-3600)**	**OTSG (B-3650)**	**OTSG (B-3700)**	**Flash Treater (H-5270A)**	**Flash Treater (H-5270B)**	**Glycol Heater (H-7300)**	**Glycol Heater (H-7300B)**
Barium (Ba)	t/d	1.242E-06	1.242E-06	1.242E-06	4.779E-08	4.779E-08	1.434E-07	1.434E-07
Cadmium (Cd)	t/d	1.57E-07	1.57E-07	1.57E-07	6.04E-09	6.04E-09	1.812E-08	1.812E-08
Calcium (Ca)	t/d	4.746E-05	4.746E-05	4.746E-05	1.826E-06	1.826E-06	5.477E-06	5.477E-06
Chromium (Cr)	t/d	1.256E-07	1.256E-07	1.256E-07	4.832E-09	4.832E-09	1.45E-08	1.45E-08
Cobalt (Co)	t/d	3.417E-06	3.417E-06	3.417E-06	1.314E-07	1.314E-07	3.942E-07	3.942E-07
Copper (Cu)	t/d	5.933E-06	5.933E-06	5.933E-06	2.282E-07	2.282E-07	6.846E-07	6.846E-07
Iron (Fe)	t/d	2.61E-05	2.61E-05	2.61E-05	1.004E-06	1.004E-06	3.012E-06	3.012E-06
Lead (Pb)	t/d	3.56E-07	3.56E-07	3.56E-07	1.369E-08	1.369E-08	4.107E-08	4.107E-08
Magnesium (Mg)	t/d	0	0	0	0	0	0	0
Manganese (Mn)	t/d	1.187E-06	1.187E-06	1.187E-06	4.564E-08	4.564E-08	1.369E-07	1.369E-07
Nickel (Ni)	t/d	5.933E-06	5.933E-06	5.933E-06	2.282E-07	2.282E-07	6.846E-07	6.846E-07
Potassium (K)	t/d	1.187E-05	1.187E-05	1.187E-05	4.564E-07	4.564E-07	1.369E-06	1.369E-06
Silver (Ag)	t/d	0	0	0	0	0	0	0
Silicon (Si)	t/d	6.875E-05	6.875E-05	6.875E-05	2.644E-06	2.644E-06	7.933E-06	7.933E-06
Strontium (Sr)	t/d	1.187E-07	1.187E-07	1.187E-07	4.564E-09	4.564E-09	1.369E-08	1.369E-08
Titanium (Ti)	t/d	1.187E-06	1.187E-06	1.187E-06	4.564E-08	4.564E-08	1.369E-07	1.369E-07
Vanadium (V)	t/d	2.373E-06	2.373E-06	2.373E-06	9.128E-08	9.128E-08	2.738E-07	2.738E-07
Zinc (Zn)	t/d	9.493E-06	9.493E-06	9.493E-06	3.651E-07	3.651E-07	1.095E-06	1.095E-06
Zirconium (Zr)	t/d	1.396E-08	1.396E-08	1.396E-08	5.369E-10	5.369E-10	1.611E-09	1.611E-09
Molybdenum (Mo)	t/d	1.57E-09	1.57E-09	1.57E-09	6.04E-11	6.04E-11	1.812E-10	1.812E-10
Selenium (Se)	t/d	8.376E-07	8.376E-07	8.376E-07	3.221E-08	3.221E-08	9.664E-08	9.664E-08

Point Source (cont'd)							
Facility	**Units**	**Christina Lake**					
Emission Source		**OTSG (B-3750)**	**OTSG (B-3800)**	**OTSG (B-3850)**	**OTSG (B-3900)**	**OTSG (B-3950)**	**Glycol Heater (H-7300C)**
UTMmN	m	507366	507359	507352	507344	507337	507606
UTMmE	m	6159944	6159957	6159970	6159984	6159997	6159698
Elevation	masl	571	571	571	571	571	571
Stack Height	m	32	32	32	32	32	9.2
Stack Diameter	m	1.68	1.68	1.68	1.68	1.68	0.914
Exit Velocity	m/s	24.5	24.5	24.5	24.5	24.5	9.6
Exit Temperature	K	488	488	488	488	488	474
1,3-butadiene	t/d	0	0	0	0	0	0
Acenaphthene	t/d	4.802E-09	4.802E-09	4.802E-09	4.802E-09	4.802E-09	5.055E-10
Acenaphthylene	t/d	4.18E-08	4.18E-08	4.18E-08	4.18E-08	4.18E-08	4.4E-09
Acetaldehyde	t/d	5.389E-05	5.389E-05	5.389E-05	5.389E-05	5.389E-05	5.673E-06
Acrolein	t/d	6.356E-05	6.356E-05	6.356E-05	6.356E-05	6.356E-05	6.691E-06
Aliphatic aldehydes	t/d	0	0	0	0	0	0
Aliphatic C_{17}-C_{34}	t/d	0	0	0	0	0	0
Aliphatic C_5-C_8	t/d	0.006916	0.006916	0.006916	0.006916	0.006916	0.000728
Aliphatic C_9-C_{16}	t/d	0.000266	0.000266	0.000266	0.000266	0.000266	0.000028
Aliphatic ketones	t/d	0	0	0	0	0	0
Anthracene	t/d	5.562E-09	5.562E-09	5.562E-09	5.562E-09	5.562E-09	5.855E-10
Aromatic C_{17}-C_{34}	t/d	6.213E-09	6.213E-09	6.213E-09	6.213E-09	6.213E-09	6.54E-10
Aromatic C_9-C_{16}	t/d	1.509E-07	1.509E-07	1.509E-07	1.509E-07	1.509E-07	1.588E-08
Benzaldehyde	t/d	5.665E-05	5.665E-05	5.665E-05	5.665E-05	5.665E-05	5.964E-06
Benzene	t/d	3.869E-05	3.869E-05	3.869E-05	3.869E-05	3.869E-05	4.073E-06
Benzo(a)pyrene	t/d	3.385E-09	3.385E-09	3.385E-09	3.385E-09	3.385E-09	3.564E-10
Benzo(b)fluoranthene	t/d	3.938E-09	3.938E-09	3.938E-09	3.938E-09	3.938E-09	4.145E-10
Benzo(g,h,i)perylene	t/d	4.318E-09	4.318E-09	4.318E-09	4.318E-09	4.318E-09	4.545E-10
Benzo(k)fluoranthene	t/d	3.42E-09	3.42E-09	3.42E-09	3.42E-09	3.42E-09	3.6E-10
Carboxylic acids	t/d	0	0	0	0	0	0
Chrysene	t/d	4.802E-09	4.802E-09	4.802E-09	4.802E-09	4.802E-09	5.055E-10
Dibenz(a,h)anthracene	t/d	3.168E-09	3.168E-09	3.168E-09	3.168E-09	3.168E-09	3.335E-10
Ethylbenzene	t/d	7.773E-06	7.773E-06	7.773E-06	7.773E-06	7.773E-06	8.182E-07
Fluoranthene	t/d	4.111E-08	4.111E-08	4.111E-08	4.111E-08	4.111E-08	4.327E-09
Fluorene	t/d	1.586E-08	1.586E-08	1.586E-08	1.586E-08	1.586E-08	1.669E-09
Formaldehyde	t/d	0.0007635	0.0007635	0.0007635	0.0007635	0.0007635	8.036E-05
Hexane	t/d	0	0	0	0	0	0
Indeno(1,2,3-cd)pyrene	t/d	4.042E-09	4.042E-09	4.042E-09	4.042E-09	4.042E-09	4.255E-10
Naphthalene	t/d	3.869E-06	3.869E-06	3.869E-06	3.869E-06	3.869E-06	4.073E-07
Phenanthrene	t/d	1.164E-07	1.164E-07	1.164E-07	1.164E-07	1.164E-07	1.225E-08
Propylene	t/d	0.0008118	0.0008118	0.0008118	0.0008118	0.0008118	8.545E-05
Pyrene	t/d	1.935E-08	1.935E-08	1.935E-08	1.935E-08	1.935E-08	2.036E-09
Toluene	t/d	0.0001019	0.0001019	0.0001019	0.0001019	0.0001019	1.073E-05
Xylenes	t/d	9.535E-05	9.535E-05	9.535E-05	9.535E-05	9.535E-05	1.004E-05
Aluminum (Al)	t/d	1.424E-05	1.424E-05	1.424E-05	1.424E-05	1.424E-05	1.643E-06
Arsenic (As)	t/d	4.746E-07	4.746E-07	4.746E-07	4.746E-07	4.746E-07	5.477E-08

Point Source (cont'd)							
Facility	**Units**	**Christina Lake**					
Emission Source		**OTSG (B-3750)**	**OTSG (B-3800)**	**OTSG (B-3850)**	**OTSG (B-3900)**	**OTSG (B-3950)**	**Glycol Heater (H-7300C)**
Barium (Ba)	t/d	1.242E-06	1.242E-06	1.242E-06	1.242E-06	1.242E-06	1.434E-07
Cadmium (Cd)	t/d	1.57E-07	1.57E-07	1.57E-07	1.57E-07	1.57E-07	1.812E-08
Calcium (Ca)	t/d	4.746E-05	4.746E-05	4.746E-05	4.746E-05	4.746E-05	5.477E-06
Chromium (Cr)	t/d	1.256E-07	1.256E-07	1.256E-07	1.256E-07	1.256E-07	1.45E-08
Cobalt (Co)	t/d	3.417E-06	3.417E-06	3.417E-06	3.417E-06	3.417E-06	3.942E-07
Copper (Cu)	t/d	5.933E-06	5.933E-06	5.933E-06	5.933E-06	5.933E-06	6.846E-07
Iron (Fe)	t/d	2.61E-05	2.61E-05	2.61E-05	2.61E-05	2.61E-05	3.012E-06
Lead (Pb)	t/d	3.56E-07	3.56E-07	3.56E-07	3.56E-07	3.56E-07	4.107E-08
Magnesium (Mg)	t/d	0	0	0	0	0	0
Manganese (Mn)	t/d	1.187E-06	1.187E-06	1.187E-06	1.187E-06	1.187E-06	1.369E-07
Nickel (Ni)	t/d	5.933E-06	5.933E-06	5.933E-06	5.933E-06	5.933E-06	6.846E-07
Potassium (K)	t/d	1.187E-05	1.187E-05	1.187E-05	1.187E-05	1.187E-05	1.369E-06
Silver (Ag)	t/d	0	0	0	0	0	0
Silicon (Si)	t/d	6.875E-05	6.875E-05	6.875E-05	6.875E-05	6.875E-05	7.933E-06
Strontium (Sr)	t/d	1.187E-07	1.187E-07	1.187E-07	1.187E-07	1.187E-07	1.369E-08
Titanium (Ti)	t/d	1.187E-06	1.187E-06	1.187E-06	1.187E-06	1.187E-06	1.369E-07
Vanadium (V)	t/d	2.373E-06	2.373E-06	2.373E-06	2.373E-06	2.373E-06	2.738E-07
Zinc (Zn)	t/d	9.493E-06	9.493E-06	9.493E-06	9.493E-06	9.493E-06	1.095E-06
Zirconium (Zr)	t/d	1.396E-08	1.396E-08	1.396E-08	1.396E-08	1.396E-08	1.611E-09
Molybdenum (Mo)	t/d	1.57E-09	1.57E-09	1.57E-09	1.57E-09	1.57E-09	1.812E-10
Selenium (Se)	t/d	8.376E-07	8.376E-07	8.376E-07	8.376E-07	8.376E-07	9.664E-08

Note: "0" – No emissions.

Area Source						
Facility	**Units**	**Christina Lake - Phase 1A**	**Christina Lake - Phase 1B**	**Christina Lake - Phase 1C**	**Christina Lake - Phase 1D**	**Christina Lake - Phase 1E/F/G/H**
Emission Source		**Plant Fugitive**	**Plant Fugitive**	**Plant Fugitive**	**Plant Fugitive**	**Plant Fugitive**
Corner 1 UTM N	m	506697	506772	506961	507288	507463
Corner 1 UTM E	m	6159225	6159236	6159359	6159608	6159615
Corner 2 UTM N	m	506697	506772	506961	507288	507463
Corner 2 UTM E	m	6159317	6159520	6159835	6159918	6160087
Corner 3 UTM N	m	506789	507056	507437	507598	507935
Corner 3 UTM E	m	6159317	6159520	6159835	6159918	6160087
Corner 4 UTM N	m	506789	507056	507437	507598	507935
Corner 4 UTM E	m	6159225	6159236	6159359	6159608	6159615
Area	m^2	8431	81024	226828	96710	223383
Elevation (m)	masl	572	573	574	571	571
1,3-butadiene	t/d	3.500E-09	4.200E-08	1.120E-07	4.900E-08	1.120E-07
Acenaphthene	t/d	0	0	0	0	0
Acenaphthylene	t/d	0	0	0	0	0
Acetaldehyde	t/d	0	0	0	0	0
Acrolein	t/d	0	0	0	0	0
Aliphatic aldehydes	t/d	2.089E-05	0.0002507	0.0006685	0.0002925	0.0006685
Aliphatic C_{17}-C_{34}	t/d	0.0000097	0.0001164	0.0003104	0.0001358	0.0003104
Aliphatic C_5-C_8	t/d	0.000164	0.001968	0.005248	0.002296	0.005248
Aliphatic C_9-C_{16}	t/d	0.0006751	0.0081016	0.0216042	0.0094518	0.0216042
Aliphatic ketones	t/d	7.399E-05	0.0008879	0.0023677	0.0010359	0.0023677
Anthracene	t/d	0	0	0	0	0
Aromatic C_{17}-C_{34}	t/d	0	0	0	0	0
Aromatic C_9-C_{16}	t/d	1.737E-05	0.0002084	0.0005558	0.0002432	0.0005558
Benzaldehyde	t/d	0	0	0	0	0
Benzene	t/d	1.296E-05	0.0001555	0.0004147	0.0001814	0.0004147
Benzo(a)pyrene	t/d	0	0	0	0	0
Benzo(b)fluoranthene	t/d	0	0	0	0	0
Benzo(g,h,i)perylene	t/d	0	0	0	0	0
Benzo(k)fluoranthene	t/d	0	0	0	0	0
Carboxylic acids	t/d	2.8E-09	3.36E-08	8.96E-08	3.92E-08	8.96E-08
Chrysene	t/d	0	0	0	0	0
Dibenz(a,h)anthracene	t/d	0	0	0	0	0
Ethylbenzene	t/d	7.8E-07	9.36E-06	2.496E-05	1.092E-05	2.496E-05
Fluoranthene	t/d	0	0	0	0	0
Fluorene	t/d	0	0	0	0	0
Formaldehyde	t/d	0	0	0	0	0
Hexane	t/d	0.0000107	0.0001284	0.0003424	0.0001498	0.0003424
Indeno(1,2,3-cd)pyrene	t/d	0	0	0	0	0
Naphthalene	t/d	1E-10	1.2E-09	3.2E-09	1.4E-09	3.2E-09
Phenanthrene	t/d	0	0	0	0	0
Propylene	t/d	0	0	0	0	0
Pyrene	t/d	0	0	0	0	0
Toluene	t/d	0.0000058	0.0000696	0.0001856	0.0000812	0.0001856

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Area Source						
Facility	**Units**	**Christina Lake - Phase 1A**	**Christina Lake - Phase 1B**	**Christina Lake - Phase 1C**	**Christina Lake - Phase 1D**	**Christina Lake - Phase 1E/F/G/H**
Emission Source		**Plant Fugitive**	**Plant Fugitive**	**Plant Fugitive**	**Plant Fugitive**	**Plant Fugitive**
Xylenes	t/d	0.0000034	0.0000408	0.0001088	0.0000476	0.0001088
Carbon disulphide	t/d	0.0002871	0.0031581	0.0083259	0.0037323	0.0083259
Hydrogen Sulphide	t/d	0.0000236	0.0002596	0.0006844	0.0003068	0.0006844
Mercaptans	t/d	0.0002963	0.0032593	0.0085927	0.0038519	0.0085927
Thiophenes	t/d	0.0003931	0.0043241	0.0113999	0.0051103	0.0113999

Note: “0” = No emissions.

Table B4-9: Summary of Cenovus Foster Creek SAGD VOC, PAH and Metal Air Emissions Used for Baseline and Application Cases

Point Source								
Facility	**Units**	**Foster Creek**						
Emission Source		**Cogen #1**	**Cogen #2**	**Cogen Air Handling Heater AH-1201**	**Cogen Air Handling Heater AH-1202**	**Steam Generator B-0201**	**Steam Generator B-0202**	**Steam Generator B-0203**
UTMmN	m	529663	529643	529650	529620	529736	529729	529685
UTMmE	m	6102406	6102368	6102408	6102363	6102529	6102519	6102562
Elevation	masl	666	666	666	666	665	665	665
Stack Height	m	26	26	22	21	27	27	27
Stack Diameter	m	3.4	3.4	0.51	0.51	1.4	1.4	1.4
Exit Velocity	m/s	21	21	12	12	16	16	16
Exit Temperature	K	448	448	448	448	447.2	447.2	447.2
1,3-butadiene	t/d	1.543E-06	1.543E-06	0	0	0	0	0
Acenaphthene	t/d	0	0	9.856E-11	9.856E-11	2.78E-09	2.78E-09	2.78E-09
Acenaphthylene	t/d	0	0	8.58E-10	8.58E-10	2.42E-08	2.42E-08	2.42E-08
Acetaldehyde	t/d	0.0011342	0.0011342	1.106E-06	1.106E-06	0.0000312	0.0000312	0.0000312
Acrolein	t/d	0.0001821	0.0001821	1.305E-06	1.305E-06	0.0000368	0.0000368	0.0000368
Aliphatic aldehydes	t/d	0	0	0	0	0	0	0
Aliphatic C_{17}-C_{34}	t/d	0	0	0	0	0	0	0
Aliphatic C_5-C_8	t/d	0.006864	0.006864	0.000142	0.000142	0.004004	0.004004	0.004004
Aliphatic C_9-C_{16}	t/d	0.000364	0.000364	5.46E-06	5.46E-06	0.000154	0.000154	0.000154
Aliphatic ketones	t/d	0	0	0	0	0	0	0
Anthracene	t/d	0	0	1.142E-10	1.142E-10	3.22E-09	3.22E-09	3.22E-09
Aromatic C_{17}-C_{34}	t/d	1.29E-08	1.29E-08	1.275E-10	1.275E-10	3.597E-09	3.597E-09	3.597E-09
Aromatic C_9-C_{16}	t/d	1.128E-06	1.128E-06	3.097E-09	3.097E-09	8.734E-08	8.734E-08	8.734E-08
Benzaldehyde	t/d	7.753E-05	7.753E-05	1.163E-06	1.163E-06	0.0000328	0.0000328	0.0000328
Benzene	t/d	0.0007539	0.0007539	7.942E-07	7.942E-07	0.0000224	0.0000224	0.0000224
Benzo(a)pyrene	t/d	1.141E-07	1.141E-07	6.949E-11	6.949E-11	1.96E-09	1.96E-09	1.96E-09
Benzo(b)fluoranthene	t/d	9.332E-08	9.332E-08	8.084E-11	8.084E-11	2.28E-09	2.28E-09	2.28E-09
Benzo(g,h,i)perylene	t/d	1.129E-07	1.129E-07	8.864E-11	8.864E-11	2.5E-09	2.5E-09	2.5E-09
Benzo(k)fluoranthene	t/d	9.066E-08	9.066E-08	7.02E-11	7.02E-11	1.98E-09	1.98E-09	1.98E-09
Carboxylic acids	t/d	0	0	0	0	0	0	0
Chrysene	t/d	2.063E-07	2.063E-07	9.856E-11	9.856E-11	2.78E-09	2.78E-09	2.78E-09
Dibenz(a,h)anthracene	t/d	1.918E-07	1.918E-07	6.502E-11	6.502E-11	1.834E-09	1.834E-09	1.834E-09
Ethylbenzene	t/d	0.0001485	0.0001485	1.595E-07	1.595E-07	0.0000045	0.0000045	0.0000045
Fluoranthene	t/d	3.687E-07	3.687E-07	8.438E-10	8.438E-10	2.38E-08	2.38E-08	2.38E-08
Fluorene	t/d	0	0	3.255E-10	3.255E-10	9.18E-09	9.18E-09	9.18E-09
Formaldehyde	t/d	0.0077757	0.0077757	1.567E-05	1.567E-05	0.000442	0.000442	0.000442
Hexane	t/d	0.0020978	0.0020978	0	0	0	0	0
Indeno(1,2,3-cd)pyrene	t/d	1.922E-07	1.922E-07	8.296E-11	8.296E-11	2.34E-09	2.34E-09	2.34E-09
Naphthalene	t/d	1.521E-05	1.521E-05	7.942E-08	7.942E-08	2.24E-06	2.24E-06	2.24E-06
Phenanthrene	t/d	2.588E-06	2.588E-06	2.39E-09	2.39E-09	6.74E-08	6.74E-08	6.74E-08
Propylene	t/d	0	0	1.666E-05	1.666E-05	0.00047	0.00047	0.00047
Pyrene	t/d	2.332E-07	2.332E-07	3.971E-10	3.971E-10	1.12E-08	1.12E-08	1.12E-08

Point Source								
Facility	**Units**	**Foster Creek**						
Emission Source		**Cogen #1**	**Cogen #2**	**Cogen Air Handling Heater AH-1201**	**Cogen Air Handling Heater AH-1202**	**Steam Generator B-0201**	**Steam Generator B-0202**	**Steam Generator B-0203**
Toluene	t/d	0.0006216	0.0006216	2.092E-06	2.092E-06	0.000059	0.000059	0.000059
Xylenes	t/d	0.0002549	0.0002549	1.957E-06	1.957E-06	0.0000552	0.0000552	0.0000552
Aluminum (Al)	t/d	2.192E-05	2.192E-05	3.012E-07	3.012E-07	8.215E-06	8.215E-06	8.215E-06
Arsenic (As)	t/d	1.041E-06	1.041E-06	1.004E-08	1.004E-08	2.738E-07	2.738E-07	2.738E-07
Barium (Ba)	t/d	2.724E-06	2.724E-06	2.628E-08	2.628E-08	7.168E-07	7.168E-07	7.168E-07
Cadmium (Cd)	t/d	3.443E-07	3.443E-07	3.322E-09	3.322E-09	9.06E-08	9.06E-08	9.06E-08
Calcium (Ca)	t/d	5.023E-05	5.023E-05	1.004E-06	1.004E-06	2.738E-05	2.738E-05	2.738E-05
Chromium (Cr)	t/d	3.604E-06	3.604E-06	2.658E-09	2.658E-09	7.248E-08	7.248E-08	7.248E-08
Cobalt (Co)	t/d	2.681E-06	2.681E-06	7.228E-08	7.228E-08	1.971E-06	1.971E-06	1.971E-06
Copper (Cu)	t/d	6.869E-06	6.869E-06	1.255E-07	1.255E-07	3.423E-06	3.423E-06	3.423E-06
Iron (Fe)	t/d	5.189E-05	5.189E-05	5.522E-07	5.522E-07	1.506E-05	1.506E-05	1.506E-05
Lead (Pb)	t/d	8.359E-07	8.359E-07	7.53E-09	7.53E-09	2.054E-07	2.054E-07	2.054E-07
Magnesium (Mg)	t/d	0.0000095	0.0000095	0	0	0	0	0
Manganese (Mn)	t/d	1.788E-06	1.788E-06	2.51E-08	2.51E-08	6.846E-07	6.846E-07	6.846E-07
Nickel (Ni)	t/d	5.314E-06	5.314E-06	1.255E-07	1.255E-07	3.423E-06	3.423E-06	3.423E-06
Potassium (K)	t/d	1.558E-05	1.558E-05	2.51E-07	2.51E-07	6.846E-06	6.846E-06	6.846E-06
Silver (Ag)	t/d	6.564E-06	6.564E-06	0	0	0	0	0
Silicon (Si)	t/d	0.0001507	0.0001507	1.454E-06	1.454E-06	3.966E-05	3.966E-05	3.966E-05
Strontium (Sr)	t/d	4.322E-07	4.322E-07	2.51E-09	2.51E-09	6.846E-08	6.846E-08	6.846E-08
Titanium (Ti)	t/d	2.997E-06	2.997E-06	2.51E-08	2.51E-08	6.846E-07	6.846E-07	6.846E-07
Vanadium (V)	t/d	2.598E-06	2.598E-06	5.02E-08	5.02E-08	1.369E-06	1.369E-06	1.369E-06
Zinc (Zn)	t/d	9.988E-06	9.988E-06	2.008E-07	2.008E-07	5.477E-06	5.477E-06	5.477E-06
Zirconium (Zr)	t/d	2.347E-07	2.347E-07	2.953E-10	2.953E-10	8.054E-09	8.054E-09	8.054E-09
Molybdenum (Mo)	t/d	0	0	3.322E-11	3.322E-11	9.06E-10	9.06E-10	9.06E-10
Selenium (Se)	t/d	0	0	1.772E-08	1.772E-08	4.832E-07	4.832E-07	4.832E-07

Point Source (cont'd)								
Facility	**Units**	**Foster Creek**						
Emission Source		**Steam Generator B-0204**	**Steam Generator B-0205**	**Glycol Heater H-0501**	**Fuel Gas Heater H-0502**	**Hot Oil Heater H-0503**	**Well Pad Heater (H-2001)**	**Well Pad Heater (H-2101)**
UTMmN	m	529680	529713	529716	529797	529662	530439	529885
UTMmE	m	6102552	6102493	6102588	6102590	6102630	6102875	6102492
Elevation	masl	665	666	665	665	665	666	666
Stack Height	m	27	27	8.2	7.7	8	6.6	6.6
Stack Diameter	m	1.4	1.4	0.76	0.61	0.61	0.41	0.41
Exit Velocity	m/s	16	16	12	2	4.6	3.6	3.6
Exit Temperature	K	447.2	447.2	533	533	533	533	533
1,3-butadiene	t/d	0	0	0	0	0	0	0
Acenaphthene	t/d	2.78E-09	2.78E-09	4.296E-10	3.538E-11	8.34E-11	2.78E-11	2.78E-11
Acenaphthylene	t/d	2.42E-08	2.42E-08	3.74E-09	3.08E-10	7.26E-10	2.42E-10	2.42E-10
Acetaldehyde	t/d	0.0000312	0.0000312	4.822E-06	3.971E-07	9.36E-07	3.12E-07	3.12E-07
Acrolein	t/d	0.0000368	0.0000368	5.687E-06	4.684E-07	1.104E-06	3.68E-07	3.68E-07
Aliphatic aldehydes	t/d	0	0	0	0	0	0	0
Aliphatic C_{17}-C_{34}	t/d	0	0	0	0	0	0	0
Aliphatic C_5-C_8	t/d	0.004004	0.004004	0.0006188	5.096E-05	0.0001201	4.004E-05	4.004E-05
Aliphatic C_9-C_{16}	t/d	0.000154	0.000154	0.0000238	1.96E-06	4.62E-06	1.54E-06	1.54E-06
Aliphatic ketones	t/d	0	0	0	0	0	0	0
Anthracene	t/d	3.22E-09	3.22E-09	4.976E-10	4.098E-11	9.66E-11	3.22E-11	3.22E-11
Aromatic C_{17}-C_{34}	t/d	3.597E-09	3.597E-09	5.559E-10	4.578E-11	1.079E-10	3.597E-11	3.597E-11
Aromatic C_9-C_{16}	t/d	8.734E-08	8.734E-08	1.35E-08	1.112E-09	2.62E-09	8.734E-10	8.734E-10
Benzaldehyde	t/d	0.0000328	0.0000328	5.069E-06	4.175E-07	9.84E-07	3.28E-07	3.28E-07
Benzene	t/d	0.0000224	0.0000224	3.462E-06	2.851E-07	6.72E-07	2.24E-07	2.24E-07
Benzo(a)pyrene	t/d	1.96E-09	1.96E-09	3.029E-10	2.495E-11	5.88E-11	1.96E-11	1.96E-11
Benzo(b)fluoranthene	t/d	2.28E-09	2.28E-09	3.524E-10	2.902E-11	6.84E-11	2.28E-11	2.28E-11
Benzo(g,h,i)perylene	t/d	2.5E-09	2.5E-09	3.864E-10	3.182E-11	7.5E-11	2.5E-11	2.5E-11
Benzo(k)fluoranthene	t/d	1.98E-09	1.98E-09	3.06E-10	2.52E-11	5.94E-11	1.98E-11	1.98E-11
Carboxylic acids	t/d	0	0	0	0	0	0	0
Chrysene	t/d	2.78E-09	2.78E-09	4.296E-10	3.538E-11	8.34E-11	2.78E-11	2.78E-11
Dibenz(a,h)anthracene	t/d	1.834E-09	1.834E-09	2.834E-10	2.334E-11	5.502E-11	1.834E-11	1.834E-11
Ethylbenzene	t/d	0.0000045	0.0000045	6.955E-07	5.727E-08	1.35E-07	4.5E-08	4.5E-08
Fluoranthene	t/d	2.38E-08	2.38E-08	3.678E-09	3.029E-10	7.14E-10	2.38E-10	2.38E-10
Fluorene	t/d	9.18E-09	9.18E-09	1.419E-09	1.168E-10	2.754E-10	9.18E-11	9.18E-11
Formaldehyde	t/d	0.000442	0.000442	6.831E-05	5.625E-06	1.326E-05	4.42E-06	4.42E-06
Hexane	t/d	0	0	0	0	0	0	0
Indeno(1,2,3-cd)pyrene	t/d	2.34E-09	2.34E-09	3.616E-10	2.978E-11	7.02E-11	2.34E-11	2.34E-11
Naphthalene	t/d	2.24E-06	2.24E-06	3.462E-07	2.851E-08	6.72E-08	2.24E-08	2.24E-08
Phenanthrene	t/d	6.74E-08	6.74E-08	1.042E-08	8.578E-10	2.022E-09	6.74E-10	6.74E-10
Propylene	t/d	0.00047	0.00047	7.264E-05	5.982E-06	0.0000141	0.0000047	0.0000047
Pyrene	t/d	1.12E-08	1.12E-08	1.731E-09	1.425E-10	3.36E-10	1.12E-10	1.12E-10
Toluene	t/d	0.000059	0.000059	9.118E-06	7.509E-07	1.77E-06	5.9E-07	5.9E-07
Xylenes	t/d	0.0000552	0.0000552	8.531E-06	7.025E-07	1.656E-06	5.52E-07	5.52E-07
Aluminum (Al)	t/d	8.215E-06	8.215E-06	1.314E-06	1.095E-07	2.519E-07	8.215E-08	8.215E-08

Point Source (cont'd)								
Facility	**Units**	**Foster Creek**						
Emission Source		**Steam Generator B-0204**	**Steam Generator B-0205**	**Glycol Heater H-0501**	**Fuel Gas Heater H-0502**	**Hot Oil Heater H-0503**	**Well Pad Heater (H-2001)**	**Well Pad Heater (H-2101)**
Arsenic (As)	t/d	2.738E-07	2.738E-07	4.381E-08	3.651E-09	8.397E-09	2.738E-09	2.738E-09
Barium (Ba)	t/d	7.168E-07	7.168E-07	1.147E-07	9.557E-09	2.198E-08	7.168E-09	7.168E-09
Cadmium (Cd)	t/d	9.06E-08	9.06E-08	1.45E-08	1.208E-09	2.779E-09	9.06E-10	9.06E-10
Calcium (Ca)	t/d	2.738E-05	2.738E-05	4.381E-06	3.651E-07	8.397E-07	2.738E-07	2.738E-07
Chromium (Cr)	t/d	7.248E-08	7.248E-08	1.16E-08	9.664E-10	2.223E-09	7.248E-10	7.248E-10
Cobalt (Co)	t/d	1.971E-06	1.971E-06	3.154E-07	2.628E-08	6.045E-08	1.971E-08	1.971E-08
Copper (Cu)	t/d	3.423E-06	3.423E-06	5.477E-07	4.564E-08	1.05E-07	3.423E-08	3.423E-08
Iron (Fe)	t/d	1.506E-05	1.506E-05	2.41E-06	2.008E-07	4.619E-07	1.506E-07	1.506E-07
Lead (Pb)	t/d	2.054E-07	2.054E-07	3.286E-08	2.738E-09	6.298E-09	2.054E-09	2.054E-09
Magnesium (Mg)	t/d	0	0	0	0	0	0	0
Manganese (Mn)	t/d	6.846E-07	6.846E-07	1.095E-07	9.128E-09	2.099E-08	6.846E-09	6.846E-09
Nickel (Ni)	t/d	3.423E-06	3.423E-06	5.477E-07	4.564E-08	1.05E-07	3.423E-08	3.423E-08
Potassium (K)	t/d	6.846E-06	6.846E-06	1.095E-06	9.128E-08	2.099E-07	6.846E-08	6.846E-08
Silver (Ag)	t/d	0	0	0	0	0	0	0
Silicon (Si)	t/d	3.966E-05	3.966E-05	6.346E-06	5.289E-07	1.216E-06	3.966E-07	3.966E-07
Strontium (Sr)	t/d	6.846E-08	6.846E-08	1.095E-08	9.128E-10	2.099E-09	6.846E-10	6.846E-10
Titanium (Ti)	t/d	6.846E-07	6.846E-07	1.095E-07	9.128E-09	2.099E-08	6.846E-09	6.846E-09
Vanadium (V)	t/d	1.369E-06	1.369E-06	2.191E-07	1.826E-08	4.199E-08	1.369E-08	1.369E-08
Zinc (Zn)	t/d	5.477E-06	5.477E-06	8.762E-07	7.302E-08	1.679E-07	5.477E-08	5.477E-08
Zirconium (Zr)	t/d	8.054E-09	8.054E-09	1.289E-09	1.074E-10	2.47E-10	8.054E-11	8.054E-11
Molybdenum (Mo)	t/d	9.06E-10	9.06E-10	1.45E-10	1.208E-11	2.779E-11	9.06E-12	9.06E-12
Selenium (Se)	t/d	4.832E-07	4.832E-07	7.732E-08	6.443E-09	1.482E-08	4.832E-09	4.832E-09

Point Source (cont'd)								
Facility	**Units**	**Foster Creek**						
Emission Source		**Well Pad Heater (H-2201)**	**Well Pad Heater (H-2301)**	**Fuel Gas Heater H-0514**	**Steam Generator B-0206**	**Steam Generator B-0207**	**Steam Generator B-0208**	**Steam Generator B-0209**
UTMmN	m	528916	528805	529792	529793	529780	529768	529755
UTMmE	m	6102768	6102756	6102594	6102876	6102884	6102893	6102901
Elevation	masl	667	667	665	665	665	665	665
Stack Height	m	6.6	6.6	8.2	27	27	27	27
Stack Diameter	m	0.41	0.41	0.61	1.7	1.7	1.7	1.7
Exit Velocity	m/s	3.6	3.6	2.4	21	21	21	21
Exit Temperature	K	533	533	533	488.2	488.2	488.2	488.2
1,3-butadiene	t/d	0	0	0	0	0	0	0
Acenaphthene	t/d	2.78E-11	2.78E-11	7.076E-11	4.802E-09	4.802E-09	4.802E-09	4.802E-09
Acenaphthylene	t/d	2.42E-10	2.42E-10	6.16E-10	4.18E-08	4.18E-08	4.18E-08	4.18E-08
Acetaldehyde	t/d	3.12E-07	3.12E-07	7.942E-07	5.389E-05	5.389E-05	5.389E-05	5.389E-05
Acrolein	t/d	3.68E-07	3.68E-07	9.367E-07	6.356E-05	6.356E-05	6.356E-05	6.356E-05
Aliphatic aldehydes	t/d	0	0	0	0	0	0	0
Aliphatic C_{17}-C_{34}	t/d	0	0	0	0	0	0	0
Aliphatic C_5-C_8	t/d	4.004E-05	4.004E-05	0.0001019	0.006916	0.006916	0.006916	0.006916
Aliphatic C_9-C_{16}	t/d	1.54E-06	1.54E-06	3.92E-06	0.000266	0.000266	0.000266	0.000266
Aliphatic ketones	t/d	0	0	0	0	0	0	0
Anthracene	t/d	3.22E-11	3.22E-11	8.196E-11	5.562E-09	5.562E-09	5.562E-09	5.562E-09
Aromatic C_{17}-C_{34}	t/d	3.597E-11	3.597E-11	9.156E-11	6.213E-09	6.213E-09	6.213E-09	6.213E-09
Aromatic C_9-C_{16}	t/d	8.734E-10	8.734E-10	2.223E-09	1.509E-07	1.509E-07	1.509E-07	1.509E-07
Benzaldehyde	t/d	3.28E-07	3.28E-07	8.349E-07	5.665E-05	5.665E-05	5.665E-05	5.665E-05
Benzene	t/d	2.24E-07	2.24E-07	5.702E-07	3.869E-05	3.869E-05	3.869E-05	3.869E-05
Benzo(a)pyrene	t/d	1.96E-11	1.96E-11	4.989E-11	3.385E-09	3.385E-09	3.385E-09	3.385E-09
Benzo(b)fluoranthene	t/d	2.28E-11	2.28E-11	5.804E-11	3.938E-09	3.938E-09	3.938E-09	3.938E-09
Benzo(g,h,i)perylene	t/d	2.5E-11	2.5E-11	6.364E-11	4.318E-09	4.318E-09	4.318E-09	4.318E-09
Benzo(k)fluoranthene	t/d	1.98E-11	1.98E-11	5.04E-11	3.42E-09	3.42E-09	3.42E-09	3.42E-09
Carboxylic acids	t/d	0	0	0	0	0	0	0
Chrysene	t/d	2.78E-11	2.78E-11	7.076E-11	4.802E-09	4.802E-09	4.802E-09	4.802E-09
Dibenz(a,h)anthracene	t/d	1.834E-11	1.834E-11	4.668E-11	3.168E-09	3.168E-09	3.168E-09	3.168E-09
Ethylbenzene	t/d	4.5E-08	4.5E-08	1.145E-07	7.773E-06	7.773E-06	7.773E-06	7.773E-06
Fluoranthene	t/d	2.38E-10	2.38E-10	6.058E-10	4.111E-08	4.111E-08	4.111E-08	4.111E-08
Fluorene	t/d	9.18E-11	9.18E-11	2.337E-10	1.586E-08	1.586E-08	1.586E-08	1.586E-08
Formaldehyde	t/d	4.42E-06	4.42E-06	1.125E-05	0.0007635	0.0007635	0.0007635	0.0007635
Hexane	t/d	0	0	0	0	0	0	0
Indeno(1,2,3-cd)pyrene	t/d	2.34E-11	2.34E-11	5.956E-11	4.042E-09	4.042E-09	4.042E-09	4.042E-09
Naphthalene	t/d	2.24E-08	2.24E-08	5.702E-08	3.869E-06	3.869E-06	3.869E-06	3.869E-06
Phenanthrene	t/d	6.74E-10	6.74E-10	1.716E-09	1.164E-07	1.164E-07	1.164E-07	1.164E-07
Propylene	t/d	0.0000047	0.0000047	1.196E-05	0.0008118	0.0008118	0.0008118	0.0008118
Pyrene	t/d	1.12E-10	1.12E-10	2.851E-10	1.935E-08	1.935E-08	1.935E-08	1.935E-08
Toluene	t/d	5.9E-07	5.9E-07	1.502E-06	0.0001019	0.0001019	0.0001019	0.0001019
Xylenes	t/d	5.52E-07	5.52E-07	1.405E-06	9.535E-05	9.535E-05	9.535E-05	9.535E-05
Aluminum (Al)	t/d	8.215E-08	8.215E-08	2.081E-07	1.424E-05	1.424E-05	1.424E-05	1.424E-05

Point Source (cont'd)								
Facility	**Units**	**Foster Creek**						
Emission Source		**Well Pad Heater (H-2201)**	**Well Pad Heater (H-2301)**	**Fuel Gas Heater H-0514**	**Steam Generator B-0206**	**Steam Generator B-0207**	**Steam Generator B-0208**	**Steam Generator B-0209**
Arsenic (As)	t/d	2.738E-09	2.738E-09	6.937E-09	4.746E-07	4.746E-07	4.746E-07	4.746E-07
Barium (Ba)	t/d	7.168E-09	7.168E-09	1.816E-08	1.242E-06	1.242E-06	1.242E-06	1.242E-06
Cadmium (Cd)	t/d	9.06E-10	9.06E-10	2.295E-09	1.57E-07	1.57E-07	1.57E-07	1.57E-07
Calcium (Ca)	t/d	2.738E-07	2.738E-07	6.937E-07	4.746E-05	4.746E-05	4.746E-05	4.746E-05
Chromium (Cr)	t/d	7.248E-10	7.248E-10	1.836E-09	1.256E-07	1.256E-07	1.256E-07	1.256E-07
Cobalt (Co)	t/d	1.971E-08	1.971E-08	4.994E-08	3.417E-06	3.417E-06	3.417E-06	3.417E-06
Copper (Cu)	t/d	3.423E-08	3.423E-08	8.671E-08	5.933E-06	5.933E-06	5.933E-06	5.933E-06
Iron (Fe)	t/d	1.506E-07	1.506E-07	3.815E-07	2.61E-05	2.61E-05	2.61E-05	2.61E-05
Lead (Pb)	t/d	2.054E-09	2.054E-09	5.203E-09	3.56E-07	3.56E-07	3.56E-07	3.56E-07
Magnesium (Mg)	t/d	0	0	0	0	0	0	0
Manganese (Mn)	t/d	6.846E-09	6.846E-09	1.734E-08	1.187E-06	1.187E-06	1.187E-06	1.187E-06
Nickel (Ni)	t/d	3.423E-08	3.423E-08	8.671E-08	5.933E-06	5.933E-06	5.933E-06	5.933E-06
Potassium (K)	t/d	6.846E-08	6.846E-08	1.734E-07	1.187E-05	1.187E-05	1.187E-05	1.187E-05
Silver (Ag)	t/d	0	0	0	0	0	0	0
Silicon (Si)	t/d	3.966E-07	3.966E-07	1.005E-06	6.875E-05	6.875E-05	6.875E-05	6.875E-05
Strontium (Sr)	t/d	6.846E-10	6.846E-10	1.734E-09	1.187E-07	1.187E-07	1.187E-07	1.187E-07
Titanium (Ti)	t/d	6.846E-09	6.846E-09	1.734E-08	1.187E-06	1.187E-06	1.187E-06	1.187E-06
Vanadium (V)	t/d	1.369E-08	1.369E-08	3.468E-08	2.373E-06	2.373E-06	2.373E-06	2.373E-06
Zinc (Zn)	t/d	5.477E-08	5.477E-08	1.387E-07	9.493E-06	9.493E-06	9.493E-06	9.493E-06
Zirconium (Zr)	t/d	8.054E-11	8.054E-11	2.04E-10	1.396E-08	1.396E-08	1.396E-08	1.396E-08
Molybdenum (Mo)	t/d	9.06E-12	9.06E-12	2.295E-11	1.57E-09	1.57E-09	1.57E-09	1.57E-09
Selenium (Se)	t/d	4.832E-09	4.832E-09	1.224E-08	8.376E-07	8.376E-07	8.376E-07	8.376E-07

Point Source (cont'd)								
Facility	**Units**	**Foster Creek**						
Emission Source		**Glycol Heater H-0501B**	**Steam Generator B-0210**	**Steam Generator B-0211**	**Steam Generator B-0212**	**Steam Generator B-0213**	**Steam Generator B-0214**	**Steam Generator B-0215**
UTMmN	m	529764	529828	529836	529845	529853	529862	529870
UTMmE	m	6102798	6102817	6102830	6102842	6102855	6102868	6102880
Elevation	masl	665	665	665	665	665	665	665
Stack Height	m	8.2	30	30	30	30	30	30
Stack Diameter	m	0.91	1.7	1.7	1.7	1.7	1.7	1.7
Exit Velocity	m/s	4.1	21	21	21	21	21	21
Exit Temperature	K	579.8	488.2	488.2	488.2	488.2	488.2	488.2
1,3-butadiene	t/d	0	0	0	0	0	0	0
Acenaphthene	t/d	4.296E-10	4.802E-09	4.802E-09	4.802E-09	4.802E-09	4.802E-09	4.802E-09
Acenaphthylene	t/d	3.74E-09	4.18E-08	4.18E-08	4.18E-08	4.18E-08	4.18E-08	4.18E-08
Acetaldehyde	t/d	4.822E-06	5.389E-05	5.389E-05	5.389E-05	5.389E-05	5.389E-05	5.389E-05
Acrolein	t/d	5.687E-06	6.356E-05	6.356E-05	6.356E-05	6.356E-05	6.356E-05	6.356E-05
Aliphatic aldehydes	t/d	0	0	0	0	0	0	0
Aliphatic C_{17}-C_{34}	t/d	0	0	0	0	0	0	0
Aliphatic C_5-C_8	t/d	0.0006188	0.006916	0.006916	0.006916	0.006916	0.006916	0.006916
Aliphatic C_9-C_{16}	t/d	0.0000238	0.000266	0.000266	0.000266	0.000266	0.000266	0.000266
Aliphatic ketones	t/d	0	0	0	0	0	0	0
Anthracene	t/d	4.976E-10	5.562E-09	5.562E-09	5.562E-09	5.562E-09	5.562E-09	5.562E-09
Aromatic C_{17}-C_{34}	t/d	5.559E-10	6.213E-09	6.213E-09	6.213E-09	6.213E-09	6.213E-09	6.213E-09
Aromatic C_9-C_{16}	t/d	1.35E-08	1.509E-07	1.509E-07	1.509E-07	1.509E-07	1.509E-07	1.509E-07
Benzaldehyde	t/d	5.069E-06	5.665E-05	5.665E-05	5.665E-05	5.665E-05	5.665E-05	5.665E-05
Benzene	t/d	3.462E-06	3.869E-05	3.869E-05	3.869E-05	3.869E-05	3.869E-05	3.869E-05
Benzo(a)pyrene	t/d	3.029E-10	3.385E-09	3.385E-09	3.385E-09	3.385E-09	3.385E-09	3.385E-09
Benzo(b)fluoranthene	t/d	3.524E-10	3.938E-09	3.938E-09	3.938E-09	3.938E-09	3.938E-09	3.938E-09
Benzo(g,h,i)perylene	t/d	3.864E-10	4.318E-09	4.318E-09	4.318E-09	4.318E-09	4.318E-09	4.318E-09
Benzo(k)fluoranthene	t/d	3.06E-10	3.42E-09	3.42E-09	3.42E-09	3.42E-09	3.42E-09	3.42E-09
Carboxylic acids	t/d	0	0	0	0	0	0	0
Chrysene	t/d	4.296E-10	4.802E-09	4.802E-09	4.802E-09	4.802E-09	4.802E-09	4.802E-09
Dibenz(a,h)anthracene	t/d	2.834E-10	3.168E-09	3.168E-09	3.168E-09	3.168E-09	3.168E-09	3.168E-09
Ethylbenzene	t/d	6.955E-07	7.773E-06	7.773E-06	7.773E-06	7.773E-06	7.773E-06	7.773E-06
Fluoranthene	t/d	3.678E-09	4.111E-08	4.111E-08	4.111E-08	4.111E-08	4.111E-08	4.111E-08
Fluorene	t/d	1.419E-09	1.586E-08	1.586E-08	1.586E-08	1.586E-08	1.586E-08	1.586E-08
Formaldehyde	t/d	6.831E-05	0.0007635	0.0007635	0.0007635	0.0007635	0.0007635	0.0007635
Hexane	t/d	0	0	0	0	0	0	0
Indeno(1,2,3-cd)pyrene	t/d	3.616E-10	4.042E-09	4.042E-09	4.042E-09	4.042E-09	4.042E-09	4.042E-09
Naphthalene	t/d	3.462E-07	3.869E-06	3.869E-06	3.869E-06	3.869E-06	3.869E-06	3.869E-06
Phenanthrene	t/d	1.042E-08	1.164E-07	1.164E-07	1.164E-07	1.164E-07	1.164E-07	1.164E-07
Propylene	t/d	7.264E-05	0.0008118	0.0008118	0.0008118	0.0008118	0.0008118	0.0008118
Pyrene	t/d	1.731E-09	1.935E-08	1.935E-08	1.935E-08	1.935E-08	1.935E-08	1.935E-08
Toluene	t/d	9.118E-06	0.0001019	0.0001019	0.0001019	0.0001019	0.0001019	0.0001019
Xylenes	t/d	8.531E-06	9.535E-05	9.535E-05	9.535E-05	9.535E-05	9.535E-05	9.535E-05
Aluminum (Al)	t/d	1.314E-06	1.424E-05	1.424E-05	1.424E-05	1.424E-05	1.424E-05	1.424E-05

Point Source (cont'd)								
Facility	**Units**	**Foster Creek**						
Emission Source		**Glycol Heater H-0501B**	**Steam Generator B-0210**	**Steam Generator B-0211**	**Steam Generator B-0212**	**Steam Generator B-0213**	**Steam Generator B-0214**	**Steam Generator B-0215**
Arsenic (As)	t/d	4.381E-08	4.746E-07	4.746E-07	4.746E-07	4.746E-07	4.746E-07	4.746E-07
Barium (Ba)	t/d	1.147E-07	1.242E-06	1.242E-06	1.242E-06	1.242E-06	1.242E-06	1.242E-06
Cadmium (Cd)	t/d	1.45E-08	1.57E-07	1.57E-07	1.57E-07	1.57E-07	1.57E-07	1.57E-07
Calcium (Ca)	t/d	4.381E-06	4.746E-05	4.746E-05	4.746E-05	4.746E-05	4.746E-05	4.746E-05
Chromium (Cr)	t/d	1.16E-08	1.256E-07	1.256E-07	1.256E-07	1.256E-07	1.256E-07	1.256E-07
Cobalt (Co)	t/d	3.154E-07	3.417E-06	3.417E-06	3.417E-06	3.417E-06	3.417E-06	3.417E-06
Copper (Cu)	t/d	5.477E-07	5.933E-06	5.933E-06	5.933E-06	5.933E-06	5.933E-06	5.933E-06
Iron (Fe)	t/d	2.41E-06	2.61E-05	2.61E-05	2.61E-05	2.61E-05	2.61E-05	2.61E-05
Lead (Pb)	t/d	3.286E-08	3.56E-07	3.56E-07	3.56E-07	3.56E-07	3.56E-07	3.56E-07
Magnesium (Mg)	t/d	0	0	0	0	0	0	0
Manganese (Mn)	t/d	1.095E-07	1.187E-06	1.187E-06	1.187E-06	1.187E-06	1.187E-06	1.187E-06
Nickel (Ni)	t/d	5.477E-07	5.933E-06	5.933E-06	5.933E-06	5.933E-06	5.933E-06	5.933E-06
Potassium (K)	t/d	1.095E-06	1.187E-05	1.187E-05	1.187E-05	1.187E-05	1.187E-05	1.187E-05
Silver (Ag)	t/d	0	0	0	0	0	0	0
Silicon (Si)	t/d	6.346E-06	6.875E-05	6.875E-05	6.875E-05	6.875E-05	6.875E-05	6.875E-05
Strontium (Sr)	t/d	1.095E-08	1.187E-07	1.187E-07	1.187E-07	1.187E-07	1.187E-07	1.187E-07
Titanium (Ti)	t/d	1.095E-07	1.187E-06	1.187E-06	1.187E-06	1.187E-06	1.187E-06	1.187E-06
Vanadium (V)	t/d	2.191E-07	2.373E-06	2.373E-06	2.373E-06	2.373E-06	2.373E-06	2.373E-06
Zinc (Zn)	t/d	8.762E-07	9.493E-06	9.493E-06	9.493E-06	9.493E-06	9.493E-06	9.493E-06
Zirconium (Zr)	t/d	1.289E-09	1.396E-08	1.396E-08	1.396E-08	1.396E-08	1.396E-08	1.396E-08
Molybdenum (Mo)	t/d	1.45E-10	1.57E-09	1.57E-09	1.57E-09	1.57E-09	1.57E-09	1.57E-09
Selenium (Se)	t/d	7.732E-08	8.376E-07	8.376E-07	8.376E-07	8.376E-07	8.376E-07	8.376E-07

Point Source (cont'd)								
Facility	**Units**	**Foster Creek**						
Emission Source		**Glycol Heater H- 0501C**	**Glycol Heater H-0564-1**	**Glycol Heater H-0564-2**	**Disposal Water Heater (H-0519)**	**Tricanter Glycol Heater (H-0900)**	**Heated Source Water Tank Heater (H-0603A)**	**Heated Source Water Tank Heater (H-0603B)**
UTMmN	m	529753	529485	529485	529850	529374	529378	529383
UTMmE	m	6102840	6102503	6102502	6102561	6102932	6102854	6102859
Elevation	masl	665	665	665	665	665	665	665
Stack Height	m	8.2	6.4	6.4	8.2	8.6	10	9
Stack Diameter	m	0.91	0.2	0.2	0.51	0.61	0.51	0.51
Exit Velocity	m/s	4.1	4.8	4.8	3.8	3.2	2	2
Exit Temperature	K	579.8	479	479	505	562	475	475
1,3-butadiene	t/d	0	0	0	0	0	0	0
Acenaphthene	t/d	4.296E-10	9.351E-11	9.351E-11	7.329E-11	7.835E-11	2.78E-11	1.137E-11
Acenaphthylene	t/d	3.74E-09	8.14E-10	8.14E-10	6.38E-10	6.82E-10	2.42E-10	9.9E-11
Acetaldehyde	t/d	4.822E-06	1.049E-06	1.049E-06	8.225E-07	8.793E-07	3.12E-07	1.276E-07
Acrolein	t/d	5.687E-06	1.238E-06	1.238E-06	9.702E-07	1.037E-06	3.68E-07	1.505E-07
Aliphatic aldehydes	t/d	0	0	0	0	0	0	0
Aliphatic C_{17}-C_{34}	t/d	0	0	0	0	0	0	0
Aliphatic C_5-C_8	t/d	0.0006188	0.0001347	0.0001347	0.0001056	0.0001128	4.004E-05	1.638E-05
Aliphatic C_9-C_{16}	t/d	0.0000238	5.18E-06	5.18E-06	4.06E-06	4.34E-06	1.54E-06	6.3E-07
Aliphatic ketones	t/d	0	0	0	0	0	0	0
Anthracene	t/d	4.976E-10	1.083E-10	1.083E-10	8.489E-11	9.075E-11	3.22E-11	1.317E-11
Aromatic C_{17}-C_{34}	t/d	5.559E-10	1.21E-10	1.21E-10	9.483E-11	1.014E-10	3.597E-11	1.472E-11
Aromatic C_9-C_{16}	t/d	1.35E-08	2.938E-09	2.938E-09	2.303E-09	2.461E-09	8.734E-10	3.573E-10
Benzaldehyde	t/d	5.069E-06	1.103E-06	1.103E-06	8.647E-07	9.244E-07	3.28E-07	1.342E-07
Benzene	t/d	3.462E-06	7.535E-07	7.535E-07	5.905E-07	6.313E-07	2.24E-07	9.164E-08
Benzo(a)pyrene	t/d	3.029E-10	6.593E-11	6.593E-11	5.167E-11	5.524E-11	1.96E-11	8.018E-12
Benzo(b)fluoranthene	t/d	3.524E-10	7.669E-11	7.669E-11	6.011E-11	6.425E-11	2.28E-11	9.327E-12
Benzo(g,h,i)perylene	t/d	3.864E-10	8.409E-11	8.409E-11	6.591E-11	7.045E-11	2.5E-11	1.023E-11
Benzo(k)fluoranthene	t/d	3.06E-10	6.66E-11	6.66E-11	5.22E-11	5.58E-11	1.98E-11	8.1E-12
Carboxylic acids	t/d	0	0	0	0	0	0	0
Chrysene	t/d	4.296E-10	9.351E-11	9.351E-11	7.329E-11	7.835E-11	2.78E-11	1.137E-11
Dibenz(a,h)anthracene	t/d	2.834E-10	6.169E-11	6.169E-11	4.835E-11	5.169E-11	1.834E-11	7.503E-12
Ethylbenzene	t/d	6.955E-07	1.514E-07	1.514E-07	1.186E-07	1.268E-07	4.5E-08	1.841E-08
Fluoranthene	t/d	3.678E-09	8.005E-10	8.005E-10	6.275E-10	6.707E-10	2.38E-10	9.736E-11
Fluorene	t/d	1.419E-09	3.088E-10	3.088E-10	2.42E-10	2.587E-10	9.18E-11	3.755E-11
Formaldehyde	t/d	6.831E-05	1.487E-05	1.487E-05	1.165E-05	1.246E-05	4.42E-06	1.808E-06
Hexane	t/d	0	0	0	0	0	0	0
Indeno(1,2,3-cd)pyrene	t/d	3.616E-10	7.871E-11	7.871E-11	6.169E-11	6.595E-11	2.34E-11	9.573E-12
Naphthalene	t/d	3.462E-07	7.535E-08	7.535E-08	5.905E-08	6.313E-08	2.24E-08	9.164E-09
Phenanthrene	t/d	1.042E-08	2.267E-09	2.267E-09	1.777E-09	1.899E-09	6.74E-10	2.757E-10
Propylene	t/d	7.264E-05	1.581E-05	1.581E-05	1.239E-05	1.325E-05	0.0000047	1.923E-06
Pyrene	t/d	1.731E-09	3.767E-10	3.767E-10	2.953E-10	3.156E-10	1.12E-10	4.582E-11
Toluene	t/d	9.118E-06	1.985E-06	1.985E-06	1.555E-06	1.663E-06	5.9E-07	2.414E-07
Xylenes	t/d	8.531E-06	1.857E-06	1.857E-06	1.455E-06	1.556E-06	5.52E-07	2.258E-07

Point Source (cont'd)								
Facility	**Units**	**Foster Creek**						
Emission Source		**Glycol Heater H- 0501C**	**Glycol Heater H-0564-1**	**Glycol Heater H-0564-2**	**Disposal Water Heater (H-0519)**	**Tricanter Glycol Heater (H-0900)**	**Heated Source Water Tank Heater (H-0603A)**	**Heated Source Water Tank Heater (H-0603B)**
Aluminum (Al)	t/d	1.314E-06	2.793E-07	2.793E-07	2.245E-07	2.355E-07	8.215E-08	3.341E-08
Arsenic (As)	t/d	4.381E-08	9.31E-09	9.31E-09	7.485E-09	7.85E-09	2.738E-09	1.114E-09
Barium (Ba)	t/d	1.147E-07	2.437E-08	2.437E-08	1.959E-08	2.055E-08	7.168E-09	2.915E-09
Cadmium (Cd)	t/d	1.45E-08	3.081E-09	3.081E-09	2.477E-09	2.597E-09	9.06E-10	3.685E-10
Calcium (Ca)	t/d	4.381E-06	9.31E-07	9.31E-07	7.485E-07	7.85E-07	2.738E-07	1.114E-07
Chromium (Cr)	t/d	1.16E-08	2.464E-09	2.464E-09	1.981E-09	2.078E-09	7.248E-10	2.948E-10
Cobalt (Co)	t/d	3.154E-07	6.702E-08	6.702E-08	5.388E-08	5.651E-08	1.971E-08	8.016E-09
Copper (Cu)	t/d	5.477E-07	1.164E-07	1.164E-07	9.356E-08	9.812E-08	3.423E-08	1.392E-08
Iron (Fe)	t/d	2.41E-06	5.121E-07	5.121E-07	4.117E-07	4.317E-07	1.506E-07	6.125E-08
Lead (Pb)	t/d	3.286E-08	6.983E-09	6.983E-09	5.613E-09	5.887E-09	2.054E-09	8.352E-10
Magnesium (Mg)	t/d	0	0	0	0	0	0	0
Manganese (Mn)	t/d	1.095E-07	2.328E-08	2.328E-08	1.871E-08	1.962E-08	6.846E-09	2.784E-09
Nickel (Ni)	t/d	5.477E-07	1.164E-07	1.164E-07	9.356E-08	9.812E-08	3.423E-08	1.392E-08
Potassium (K)	t/d	1.095E-06	2.328E-07	2.328E-07	1.871E-07	1.962E-07	6.846E-08	2.784E-08
Silver (Ag)	t/d	0	0	0	0	0	0	0
Silicon (Si)	t/d	6.346E-06	1.349E-06	1.349E-06	1.084E-06	1.137E-06	3.966E-07	1.613E-07
Strontium (Sr)	t/d	1.095E-08	2.328E-09	2.328E-09	1.871E-09	1.962E-09	6.846E-10	2.784E-10
Titanium (Ti)	t/d	1.095E-07	2.328E-08	2.328E-08	1.871E-08	1.962E-08	6.846E-09	2.784E-09
Vanadium (V)	t/d	2.191E-07	4.655E-08	4.655E-08	3.742E-08	3.925E-08	1.369E-08	5.568E-09
Zinc (Zn)	t/d	8.762E-07	1.862E-07	1.862E-07	1.497E-07	1.57E-07	5.477E-08	2.227E-08
Zirconium (Zr)	t/d	1.289E-09	2.738E-10	2.738E-10	2.201E-10	2.309E-10	8.054E-11	3.275E-11
Molybdenum (Mo)	t/d	1.45E-10	3.081E-11	3.081E-11	2.477E-11	2.597E-11	9.06E-12	3.685E-12
Selenium (Se)	t/d	7.732E-08	1.643E-08	1.643E-08	1.321E-08	1.385E-08	4.832E-09	1.965E-09

Point Source (cont'd)								
Facility	**Units**	**Foster Creek**						
Emission Source		**Slop/Clean Oil Tank T202C Heater (H-1204A)**	**Slop/Clean Oil Tank T202C Heater (H-1204B)**	**Brine Tank Heater (H-0605)**	**Process Glycol Boiler (H-5970A)**	**Process Glycol Boiler (H-5970B)**	**Utility Glycol Boiler (H-5770)**	**Air Preheater A (H-5914A)**
UTMmN	m	529350	529333	529359	530273	530277	530256	530240
UTMmE	m	6102907	6102903	6102859	6102801	6102801	6102864	6102835
Elevation	masl	665	665	665	666	666	666	666
Stack Height	m	11	11	9.1	14	14	14	6.3
Stack Diameter	m	0.41	0.41	0.31	0.81	0.81	0.51	0.26
Exit Velocity	m/s	2.1	2.1	2.2	12	12	8.2	0.81
Exit Temperature	K	475	475	475	499.2	499.2	447.2	873.2
1,3-butadiene	t/d	0	0	0	0	0	0	0
Acenaphthene	t/d	3.033E-11	3.033E-11	3.538E-11	3.791E-10	3.791E-10	1.137E-10	1.415E-12
Acenaphthylene	t/d	2.64E-10	2.64E-10	3.08E-10	3.3E-09	3.3E-09	9.9E-10	1.232E-11
Acetaldehyde	t/d	3.404E-07	3.404E-07	3.971E-07	4.255E-06	4.255E-06	1.276E-06	1.588E-08
Acrolein	t/d	4.015E-07	4.015E-07	4.684E-07	5.018E-06	5.018E-06	1.505E-06	1.873E-08
Aliphatic aldehydes	t/d	0	0	0	0	0	0	0
Aliphatic C_{17}-C_{34}	t/d	0	0	0	0	0	0	0
Aliphatic C_5-C_8	t/d	4.368E-05	4.368E-05	5.096E-05	0.000546	0.000546	0.0001638	2.038E-06
Aliphatic C_9-C_{16}	t/d	1.68E-06	1.68E-06	1.96E-06	0.000021	0.000021	0.0000063	7.84E-08
Aliphatic ketones	t/d	0	0	0	0	0	0	0
Anthracene	t/d	3.513E-11	3.513E-11	4.098E-11	4.391E-10	4.391E-10	1.317E-10	1.639E-12
Aromatic C_{17}-C_{34}	t/d	3.924E-11	3.924E-11	4.578E-11	4.905E-10	4.905E-10	1.472E-10	1.831E-12
Aromatic C_9-C_{16}	t/d	9.528E-10	9.528E-10	1.112E-09	1.191E-08	1.191E-08	3.573E-09	4.446E-11
Benzaldehyde	t/d	3.578E-07	3.578E-07	4.175E-07	4.473E-06	4.473E-06	1.342E-06	1.67E-08
Benzene	t/d	2.444E-07	2.444E-07	2.851E-07	3.055E-06	3.055E-06	9.164E-07	1.14E-08
Benzo(a)pyrene	t/d	2.138E-11	2.138E-11	2.495E-11	2.673E-10	2.673E-10	8.018E-11	9.978E-13
Benzo(b)fluoranthene	t/d	2.487E-11	2.487E-11	2.902E-11	3.109E-10	3.109E-10	9.327E-11	1.161E-12
Benzo(g,h,i)perylene	t/d	2.727E-11	2.727E-11	3.182E-11	3.409E-10	3.409E-10	1.023E-10	1.273E-12
Benzo(k)fluoranthene	t/d	2.16E-11	2.16E-11	2.52E-11	2.7E-10	2.7E-10	8.1E-11	1.008E-12
Carboxylic acids	t/d	0	0	0	0	0	0	0
Chrysene	t/d	3.033E-11	3.033E-11	3.538E-11	3.791E-10	3.791E-10	1.137E-10	1.415E-12
Dibenz(a,h)anthracene	t/d	2.001E-11	2.001E-11	2.334E-11	2.501E-10	2.501E-10	7.503E-11	9.337E-13
Ethylbenzene	t/d	4.909E-08	4.909E-08	5.727E-08	6.136E-07	6.136E-07	1.841E-07	2.291E-09
Fluoranthene	t/d	2.596E-10	2.596E-10	3.029E-10	3.245E-09	3.245E-09	9.736E-10	1.212E-11
Fluorene	t/d	1.001E-10	1.001E-10	1.168E-10	1.252E-09	1.252E-09	3.755E-10	4.673E-12
Formaldehyde	t/d	4.822E-06	4.822E-06	5.625E-06	6.027E-05	6.027E-05	1.808E-05	2.25E-07
Hexane	t/d	0	0	0	0	0	0	0
Indeno(1,2,3-cd)pyrene	t/d	2.553E-11	2.553E-11	2.978E-11	3.191E-10	3.191E-10	9.573E-11	1.191E-12
Naphthalene	t/d	2.444E-08	2.444E-08	2.851E-08	3.055E-07	3.055E-07	9.164E-08	1.14E-09
Phenanthrene	t/d	7.353E-10	7.353E-10	8.578E-10	9.191E-09	9.191E-09	2.757E-09	3.431E-11
Propylene	t/d	5.127E-06	5.127E-06	5.982E-06	6.409E-05	6.409E-05	1.923E-05	2.393E-07
Pyrene	t/d	1.222E-10	1.222E-10	1.425E-10	1.527E-09	1.527E-09	4.582E-10	5.702E-12
Toluene	t/d	6.436E-07	6.436E-07	7.509E-07	8.045E-06	8.045E-06	2.414E-06	3.004E-08

Point Source (cont'd)								
Facility		**Foster Creek**						
Emission Source	**Units**	**Slop/Clean Oil Tank T202C Heater (H-1204A)**	**Slop/Clean Oil Tank T202C Heater (H-1204B)**	**Brine Tank Heater (H-0605)**	**Process Glycol Boiler (H-5970A)**	**Process Glycol Boiler (H-5970B)**	**Utility Glycol Boiler (H-5770)**	**Air Preheater A (H-5914A)**
Xylenes	t/d	6.022E-07	6.022E-07	7.025E-07	7.527E-06	7.527E-06	2.258E-06	2.81E-08
Aluminum (Al)	t/d	8.762E-08	8.762E-08	1.095E-07	1.15E-06	1.15E-06	3.341E-07	4.217E-09
Arsenic (As)	t/d	2.921E-09	2.921E-09	3.651E-09	3.834E-08	3.834E-08	1.114E-08	1.406E-10
Barium (Ba)	t/d	7.646E-09	7.646E-09	9.557E-09	1.003E-07	1.003E-07	2.915E-08	3.679E-10
Cadmium (Cd)	t/d	9.664E-10	9.664E-10	1.208E-09	1.268E-08	1.268E-08	3.685E-09	4.651E-11
Calcium (Ca)	t/d	2.921E-07	2.921E-07	3.651E-07	3.834E-06	3.834E-06	1.114E-06	1.406E-08
Chromium (Cr)	t/d	7.732E-10	7.732E-10	9.664E-10	1.015E-08	1.015E-08	2.948E-09	3.721E-11
Cobalt (Co)	t/d	2.103E-08	2.103E-08	2.628E-08	2.76E-07	2.76E-07	8.016E-08	1.012E-09
Copper (Cu)	t/d	3.651E-08	3.651E-08	4.564E-08	4.792E-07	4.792E-07	1.392E-07	1.757E-09
Iron (Fe)	t/d	1.606E-07	1.606E-07	2.008E-07	2.108E-06	2.108E-06	6.125E-07	7.731E-09
Lead (Pb)	t/d	2.191E-09	2.191E-09	2.738E-09	2.875E-08	2.875E-08	8.352E-09	1.054E-10
Magnesium (Mg)	t/d	0	0	0	0	0	0	0
Manganese (Mn)	t/d	7.302E-09	7.302E-09	9.128E-09	9.584E-08	9.584E-08	2.784E-08	3.514E-10
Nickel (Ni)	t/d	3.651E-08	3.651E-08	4.564E-08	4.792E-07	4.792E-07	1.392E-07	1.757E-09
Potassium (K)	t/d	7.302E-08	7.302E-08	9.128E-08	9.584E-07	9.584E-07	2.784E-07	3.514E-09
Silver (Ag)	t/d	0	0	0	0	0	0	0
Silicon (Si)	t/d	4.231E-07	4.231E-07	5.289E-07	5.553E-06	5.553E-06	1.613E-06	2.036E-08
Strontium (Sr)	t/d	7.302E-10	7.302E-10	9.128E-10	9.584E-09	9.584E-09	2.784E-09	3.514E-11
Titanium (Ti)	t/d	7.302E-09	7.302E-09	9.128E-09	9.584E-08	9.584E-08	2.784E-08	3.514E-10
Vanadium (V)	t/d	1.46E-08	1.46E-08	1.826E-08	1.917E-07	1.917E-07	5.568E-08	7.028E-10
Zinc (Zn)	t/d	5.842E-08	5.842E-08	7.302E-08	7.667E-07	7.667E-07	2.227E-07	2.811E-09
Zirconium (Zr)	t/d	8.591E-11	8.591E-11	1.074E-10	1.128E-09	1.128E-09	3.275E-10	4.134E-12
Molybdenum (Mo)	t/d	9.664E-12	9.664E-12	1.208E-11	1.268E-10	1.268E-10	3.685E-11	4.651E-13
Selenium (Se)	t/d	5.154E-09	5.154E-09	6.443E-09	6.765E-08	6.765E-08	1.965E-08	2.481E-10

Point Source (cont'd)								
Facility	**Units**	**Foster Creek**						
Emission Source		**Air Preheater B (H-5914B)**	**Air Preheater C (H-5914C)**	**SRU Incinerator (S-5950)**	**Steam Generator FC3-B-0201**	**Steam Generator FC3-B-0202**	**Steam Generator FC3-B-0203**	**Steam Generator FC3-B-0204**
UTMmN	m	530240	530240	530269	529317	529332	529347	529362
UTMmE	m	6102839	6102843	6102801	6103310	6103310	6103310	6103310
Elevation	masl	666	666	666	665	665	665	665
Stack Height	m	6.3	6.3	29	30	30	30	30
Stack Diameter	m	0.26	0.26	0.9	1.7	1.7	1.7	1.7
Exit Velocity	m/s	0.81	0.81	7.6	21	21	21	21
Exit Temperature	K	873.2	873.2	811.2	490	490	490	490
1,3-butadiene	t/d	0	0	0	0	0	0	0
Acenaphthene	t/d	1.415E-12	1.415E-12	8.087E-11	4.802E-09	4.802E-09	4.802E-09	4.802E-09
Acenaphthylene	t/d	1.232E-11	1.232E-11	7.04E-10	4.18E-08	4.18E-08	4.18E-08	4.18E-08
Acetaldehyde	t/d	1.588E-08	1.588E-08	9.076E-07	5.389E-05	5.389E-05	5.389E-05	5.389E-05
Acrolein	t/d	1.873E-08	1.873E-08	1.071E-06	6.356E-05	6.356E-05	6.356E-05	6.356E-05
Aliphatic aldehydes	t/d	0	0	0	0	0	0	0
Aliphatic C_{17}-C_{34}	t/d	0	0	0	0	0	0	0
Aliphatic C_5-C_8	t/d	2.038E-06	2.038E-06	0.0001165	0.006916	0.006916	0.006916	0.006916
Aliphatic C_9-C_{16}	t/d	7.84E-08	7.84E-08	4.48E-06	0.000266	0.000266	0.000266	0.000266
Aliphatic ketones	t/d	0	0	0	0	0	0	0
Anthracene	t/d	1.639E-12	1.639E-12	9.367E-11	5.562E-09	5.562E-09	5.562E-09	5.562E-09
Aromatic C_{17}-C_{34}	t/d	1.831E-12	1.831E-12	1.046E-10	6.213E-09	6.213E-09	6.213E-09	6.213E-09
Aromatic C_9-C_{16}	t/d	4.446E-11	4.446E-11	2.541E-09	1.509E-07	1.509E-07	1.509E-07	1.509E-07
Benzaldehyde	t/d	1.67E-08	1.67E-08	9.542E-07	5.665E-05	5.665E-05	5.665E-05	5.665E-05
Benzene	t/d	1.14E-08	1.14E-08	6.516E-07	3.869E-05	3.869E-05	3.869E-05	3.869E-05
Benzo(a)pyrene	t/d	9.978E-13	9.978E-13	5.702E-11	3.385E-09	3.385E-09	3.385E-09	3.385E-09
Benzo(b)fluoranthene	t/d	1.161E-12	1.161E-12	6.633E-11	3.938E-09	3.938E-09	3.938E-09	3.938E-09
Benzo(g,h,i)perylene	t/d	1.273E-12	1.273E-12	7.273E-11	4.318E-09	4.318E-09	4.318E-09	4.318E-09
Benzo(k)fluoranthene	t/d	1.008E-12	1.008E-12	5.76E-11	3.42E-09	3.42E-09	3.42E-09	3.42E-09
Carboxylic acids	t/d	0	0	0	0	0	0	0
Chrysene	t/d	1.415E-12	1.415E-12	8.087E-11	4.802E-09	4.802E-09	4.802E-09	4.802E-09
Dibenz(a,h)anthracene	t/d	9.337E-13	9.337E-13	5.335E-11	3.168E-09	3.168E-09	3.168E-09	3.168E-09
Ethylbenzene	t/d	2.291E-09	2.291E-09	1.309E-07	7.773E-06	7.773E-06	7.773E-06	7.773E-06
Fluoranthene	t/d	1.212E-11	1.212E-11	6.924E-10	4.111E-08	4.111E-08	4.111E-08	4.111E-08
Fluorene	t/d	4.673E-12	4.673E-12	2.671E-10	1.586E-08	1.586E-08	1.586E-08	1.586E-08
Formaldehyde	t/d	2.25E-07	2.25E-07	1.286E-05	0.0007635	0.0007635	0.0007635	0.0007635
Hexane	t/d	0	0	0	0	0	0	0
Indeno(1,2,3-cd)pyrene	t/d	1.191E-12	1.191E-12	6.807E-11	4.042E-09	4.042E-09	4.042E-09	4.042E-09
Naphthalene	t/d	1.14E-09	1.14E-09	6.516E-08	3.869E-06	3.869E-06	3.869E-06	3.869E-06
Phenanthrene	t/d	3.431E-11	3.431E-11	1.961E-09	1.164E-07	1.164E-07	1.164E-07	1.164E-07
Propylene	t/d	2.393E-07	2.393E-07	1.367E-05	0.0008118	0.0008118	0.0008118	0.0008118
Pyrene	t/d	5.702E-12	5.702E-12	3.258E-10	1.935E-08	1.935E-08	1.935E-08	1.935E-08
Toluene	t/d	3.004E-08	3.004E-08	1.716E-06	0.0001019	0.0001019	0.0001019	0.0001019
Xylenes	t/d	2.81E-08	2.81E-08	1.606E-06	9.535E-05	9.535E-05	9.535E-05	9.535E-05
Aluminum (Al)	t/d	4.217E-09	4.217E-09	2.41E-07	1.424E-05	1.424E-05	1.424E-05	1.424E-05
Arsenic (As)	t/d	1.406E-10	1.406E-10	8.032E-09	4.746E-07	4.746E-07	4.746E-07	4.746E-07
Barium (Ba)	t/d	3.679E-10	3.679E-10	2.103E-08	1.242E-06	1.242E-06	1.242E-06	1.242E-06

Point Source (cont'd)								
Facility	**Units**	**Foster Creek**						
Emission Source		**Air Preheater B (H-5914B)**	**Air Preheater C (H-5914C)**	**SRU Incinerator (S-5950)**	**Steam Generator FC3-B-0201**	**Steam Generator FC3-B-0202**	**Steam Generator FC3-B-0203**	**Steam Generator FC3-B-0204**
Cadmium (Cd)	t/d	4.651E-11	4.651E-11	2.658E-09	1.57E-07	1.57E-07	1.57E-07	1.57E-07
Calcium (Ca)	t/d	1.406E-08	1.406E-08	8.032E-07	4.746E-05	4.746E-05	4.746E-05	4.746E-05
Chromium (Cr)	t/d	3.721E-11	3.721E-11	2.126E-09	1.256E-07	1.256E-07	1.256E-07	1.256E-07
Cobalt (Co)	t/d	1.012E-09	1.012E-09	5.782E-08	3.417E-06	3.417E-06	3.417E-06	3.417E-06
Copper (Cu)	t/d	1.757E-09	1.757E-09	1.004E-07	5.933E-06	5.933E-06	5.933E-06	5.933E-06
Iron (Fe)	t/d	7.731E-09	7.731E-09	4.418E-07	2.61E-05	2.61E-05	2.61E-05	2.61E-05
Lead (Pb)	t/d	1.054E-10	1.054E-10	6.024E-09	3.56E-07	3.56E-07	3.56E-07	3.56E-07
Magnesium (Mg)	t/d	0	0	0	0	0	0	0
Manganese (Mn)	t/d	3.514E-10	3.514E-10	2.008E-08	1.187E-06	1.187E-06	1.187E-06	1.187E-06
Nickel (Ni)	t/d	1.757E-09	1.757E-09	1.004E-07	5.933E-06	5.933E-06	5.933E-06	5.933E-06
Potassium (K)	t/d	3.514E-09	3.514E-09	2.008E-07	1.187E-05	1.187E-05	1.187E-05	1.187E-05
Silver (Ag)	t/d	0	0	0	0	0	0	0
Silicon (Si)	t/d	2.036E-08	2.036E-08	1.163E-06	6.875E-05	6.875E-05	6.875E-05	6.875E-05
Strontium (Sr)	t/d	3.514E-11	3.514E-11	2.008E-09	1.187E-07	1.187E-07	1.187E-07	1.187E-07
Titanium (Ti)	t/d	3.514E-10	3.514E-10	2.008E-08	1.187E-06	1.187E-06	1.187E-06	1.187E-06
Vanadium (V)	t/d	7.028E-10	7.028E-10	4.016E-08	2.373E-06	2.373E-06	2.373E-06	2.373E-06
Zinc (Zn)	t/d	2.811E-09	2.811E-09	1.606E-07	9.493E-06	9.493E-06	9.493E-06	9.493E-06
Zirconium (Zr)	t/d	4.134E-12	4.134E-12	2.362E-10	1.396E-08	1.396E-08	1.396E-08	1.396E-08
Molybdenum (Mo)	t/d	4.651E-13	4.651E-13	2.658E-11	1.57E-09	1.57E-09	1.57E-09	1.57E-09
Selenium (Se)	t/d	2.481E-10	2.481E-10	1.417E-08	8.376E-07	8.376E-07	8.376E-07	8.376E-07

Point Source (cont'd)								
Facility	**Units**	**Foster Creek**						
Emission Source		**Glycol Heater FC3-H-0501A**	**Glycol Heater FC3-H-0501B**	**Glycol Heater Pilot**	**Flash Treater FC3-V-0304A**	**Steam Generator FC3-B-0205**	**Steam Generator FC3-B-0206**	**Steam Generator FC3-B-0207**
UTMmN	m	529196	529196	529360	529324	529397	529412	529427
UTMmE	m	6103027	6103020	6102940	6103225	6103311	6103311	6103311
Elevation	masl	667	667	665	665	665	665	665
Stack Height	m	9.5	9.5	5.3	6.7	30	30	30
Stack Diameter	m	0.9	0.9	0.22	0.61	1.7	1.7	1.7
Exit Velocity	m/s	6.1	6.1	2.4	9.7	21	21	21
Exit Temperature	K	468	468	672	970.1	490	490	490
1,3-butadiene	t/d	0	0	0	0	0	0	0
Acenaphthene	t/d	5.813E-10	5.813E-10	2.78E-10	1.921E-10	4.802E-09	4.802E-09	4.802E-09
Acenaphthylene	t/d	5.06E-09	5.06E-09	2.42E-09	1.672E-09	4.18E-08	4.18E-08	4.18E-08
Acetaldehyde	t/d	6.524E-06	6.524E-06	3.12E-06	2.156E-06	5.389E-05	5.389E-05	5.389E-05
Acrolein	t/d	7.695E-06	7.695E-06	3.68E-06	2.543E-06	6.356E-05	6.356E-05	6.356E-05
Aliphatic aldehydes	t/d	0	0	0	0	0	0	0
Aliphatic C_{17}-C_{34}	t/d	0	0	0	0	0	0	0
Aliphatic C_5-C_8	t/d	0.0008372	0.0008372	0.0004004	0.0002766	0.006916	0.006916	0.006916
Aliphatic C_9-C_{16}	t/d	0.0000322	0.0000322	0.0000154	1.064E-05	0.000266	0.000266	0.000266
Aliphatic ketones	t/d	0	0	0	0	0	0	0
Anthracene	t/d	6.733E-10	6.733E-10	3.22E-10	2.225E-10	5.562E-09	5.562E-09	5.562E-09
Aromatic C_{17}-C_{34}	t/d	7.521E-10	7.521E-10	3.597E-10	2.485E-10	6.213E-09	6.213E-09	6.213E-09
Aromatic C_9-C_{16}	t/d	1.826E-08	1.826E-08	8.734E-09	6.034E-09	1.509E-07	1.509E-07	1.509E-07
Benzaldehyde	t/d	6.858E-06	6.858E-06	3.28E-06	2.266E-06	5.665E-05	5.665E-05	5.665E-05
Benzene	t/d	4.684E-06	4.684E-06	2.24E-06	1.548E-06	3.869E-05	3.869E-05	3.869E-05
Benzo(a)pyrene	t/d	4.098E-10	4.098E-10	1.96E-10	1.354E-10	3.385E-09	3.385E-09	3.385E-09
Benzo(b)fluoranthene	t/d	4.767E-10	4.767E-10	2.28E-10	1.575E-10	3.938E-09	3.938E-09	3.938E-09
Benzo(g,h,i)perylene	t/d	5.227E-10	5.227E-10	2.5E-10	1.727E-10	4.318E-09	4.318E-09	4.318E-09
Benzo(k)fluoranthene	t/d	4.14E-10	4.14E-10	1.98E-10	1.368E-10	3.42E-09	3.42E-09	3.42E-09
Carboxylic acids	t/d	0	0	0	0	0	0	0
Chrysene	t/d	5.813E-10	5.813E-10	2.78E-10	1.921E-10	4.802E-09	4.802E-09	4.802E-09
Dibenz(a,h)anthracene	t/d	3.835E-10	3.835E-10	1.834E-10	1.267E-10	3.168E-09	3.168E-09	3.168E-09
Ethylbenzene	t/d	9.409E-07	9.409E-07	4.5E-07	3.109E-07	7.773E-06	7.773E-06	7.773E-06
Fluoranthene	t/d	4.976E-09	4.976E-09	2.38E-09	1.644E-09	4.111E-08	4.111E-08	4.111E-08
Fluorene	t/d	1.919E-09	1.919E-09	9.18E-10	6.343E-10	1.586E-08	1.586E-08	1.586E-08
Formaldehyde	t/d	9.242E-05	9.242E-05	0.0000442	3.054E-05	0.0007635	0.0007635	0.0007635
Hexane	t/d	0	0	0	0	0	0	0
Indeno(1,2,3-cd)pyrene	t/d	4.893E-10	4.893E-10	2.34E-10	1.617E-10	4.042E-09	4.042E-09	4.042E-09
Naphthalene	t/d	4.684E-07	4.684E-07	2.24E-07	1.548E-07	3.869E-06	3.869E-06	3.869E-06
Phenanthrene	t/d	1.409E-08	1.409E-08	6.74E-09	4.657E-09	1.164E-07	1.164E-07	1.164E-07
Propylene	t/d	9.827E-05	9.827E-05	0.000047	3.247E-05	0.0008118	0.0008118	0.0008118
Pyrene	t/d	2.342E-09	2.342E-09	1.12E-09	7.738E-10	1.935E-08	1.935E-08	1.935E-08
Toluene	t/d	1.234E-05	1.234E-05	0.0000059	4.076E-06	0.0001019	0.0001019	0.0001019
Xylenes	t/d	1.154E-05	1.154E-05	5.52E-06	3.814E-06	9.535E-05	9.535E-05	9.535E-05
Aluminum (Al)	t/d	1.698E-06	1.698E-06	8.215E-07	5.477E-07	1.424E-05	1.424E-05	1.424E-05

Point Source (cont'd)								
Facility	**Units**	**Foster Creek**						
Emission Source		**Glycol Heater FC3-H-0501A**	**Glycol Heater FC3-H-0501B**	**Glycol Heater Pilot**	**Flash Treater FC3-V-0304A**	**Steam Generator FC3-B-0205**	**Steam Generator FC3-B-0206**	**Steam Generator FC3-B-0207**
Arsenic (As)	t/d	5.659E-08	5.659E-08	2.738E-08	1.826E-08	4.746E-07	4.746E-07	4.746E-07
Barium (Ba)	t/d	1.481E-07	1.481E-07	7.168E-08	4.779E-08	1.242E-06	1.242E-06	1.242E-06
Cadmium (Cd)	t/d	1.872E-08	1.872E-08	9.06E-09	6.04E-09	1.57E-07	1.57E-07	1.57E-07
Calcium (Ca)	t/d	5.659E-06	5.659E-06	2.738E-06	1.826E-06	4.746E-05	4.746E-05	4.746E-05
Chromium (Cr)	t/d	1.498E-08	1.498E-08	7.248E-09	4.832E-09	1.256E-07	1.256E-07	1.256E-07
Cobalt (Co)	t/d	4.074E-07	4.074E-07	1.971E-07	1.314E-07	3.417E-06	3.417E-06	3.417E-06
Copper (Cu)	t/d	7.074E-07	7.074E-07	3.423E-07	2.282E-07	5.933E-06	5.933E-06	5.933E-06
Iron (Fe)	t/d	3.112E-06	3.112E-06	1.506E-06	1.004E-06	2.61E-05	2.61E-05	2.61E-05
Lead (Pb)	t/d	4.244E-08	4.244E-08	2.054E-08	1.369E-08	3.56E-07	3.56E-07	3.56E-07
Magnesium (Mg)	t/d	0	0	0	0	0	0	0
Manganese (Mn)	t/d	1.415E-07	1.415E-07	6.846E-08	4.564E-08	1.187E-06	1.187E-06	1.187E-06
Nickel (Ni)	t/d	7.074E-07	7.074E-07	3.423E-07	2.282E-07	5.933E-06	5.933E-06	5.933E-06
Potassium (K)	t/d	1.415E-06	1.415E-06	6.846E-07	4.564E-07	1.187E-05	1.187E-05	1.187E-05
Silver (Ag)	t/d	0	0	0	0	0	0	0
Silicon (Si)	t/d	8.197E-06	8.197E-06	3.966E-06	2.644E-06	6.875E-05	6.875E-05	6.875E-05
Strontium (Sr)	t/d	1.415E-08	1.415E-08	6.846E-09	4.564E-09	1.187E-07	1.187E-07	1.187E-07
Titanium (Ti)	t/d	1.415E-07	1.415E-07	6.846E-08	4.564E-08	1.187E-06	1.187E-06	1.187E-06
Vanadium (V)	t/d	2.83E-07	2.83E-07	1.369E-07	9.128E-08	2.373E-06	2.373E-06	2.373E-06
Zinc (Zn)	t/d	1.132E-06	1.132E-06	5.477E-07	3.651E-07	9.493E-06	9.493E-06	9.493E-06
Zirconium (Zr)	t/d	1.664E-09	1.664E-09	8.054E-10	5.369E-10	1.396E-08	1.396E-08	1.396E-08
Molybdenum (Mo)	t/d	1.872E-10	1.872E-10	9.06E-11	6.04E-11	1.57E-09	1.57E-09	1.57E-09
Selenium (Se)	t/d	9.987E-08	9.987E-08	4.832E-08	3.221E-08	8.376E-07	8.376E-07	8.376E-07

Point Source (cont'd)								
Facility	**Units**	**Foster Creek**						
Emission Source		**Steam Generator FC3-B-0208**	**Glycol Heater FC3-H-0501C**	**Flash Treater FC3-V-0304B**	**Steam Generator FC3-B-0209**	**Steam Generator FC3-B-0210**	**Steam Generator FC3-B-0211**	**Steam Generator FC3-B-0212**
UTMmN	m	529442	529196	529284	529477	529492	529507	529522
UTMmE	m	6103311	6103017	6103224	6103311	6103312	6103312	6103312
Elevation	masl	665	667	665	665	665	665	665
Stack Height	m	30	9.5	6.7	30	30	30	30
Stack Diameter	m	1.7	0.9	0.61	1.7	1.7	1.7	1.7
Exit Velocity	m/s	21	6.1	9.7	21	21	21	21
Exit Temperature	K	490	468	970.1	490	490	490	490
1,3-butadiene	t/d	0	0	0	0	0	0	0
Acenaphthene	t/d	4.802E-09	5.813E-10	1.921E-10	4.802E-09	4.802E-09	4.802E-09	4.802E-09
Acenaphthylene	t/d	4.18E-08	5.06E-09	1.672E-09	4.18E-08	4.18E-08	4.18E-08	4.18E-08
Acetaldehyde	t/d	5.389E-05	6.524E-06	2.156E-06	5.389E-05	5.389E-05	5.389E-05	5.389E-05
Acrolein	t/d	6.356E-05	7.695E-06	2.543E-06	6.356E-05	6.356E-05	6.356E-05	6.356E-05
Aliphatic aldehydes	t/d	0	0	0	0	0	0	0
Aliphatic C_{17}-C_{34}	t/d	0	0	0	0	0	0	0
Aliphatic C_5-C_8	t/d	0.006916	0.0008372	0.0002766	0.006916	0.006916	0.006916	0.006916
Aliphatic C_9-C_{16}	t/d	0.000266	0.0000322	1.064E-05	0.000266	0.000266	0.000266	0.000266
Aliphatic ketones	t/d	0	0	0	0	0	0	0
Anthracene	t/d	5.562E-09	6.733E-10	2.225E-10	5.562E-09	5.562E-09	5.562E-09	5.562E-09
Aromatic C_{17}-C_{34}	t/d	6.213E-09	7.521E-10	2.485E-10	6.213E-09	6.213E-09	6.213E-09	6.213E-09
Aromatic C_9-C_{16}	t/d	1.509E-07	1.826E-08	6.034E-09	1.509E-07	1.509E-07	1.509E-07	1.509E-07
Benzaldehyde	t/d	5.665E-05	6.858E-06	2.266E-06	5.665E-05	5.665E-05	5.665E-05	5.665E-05
Benzene	t/d	3.869E-05	4.684E-06	1.548E-06	3.869E-05	3.869E-05	3.869E-05	3.869E-05
Benzo(a)pyrene	t/d	3.385E-09	4.098E-10	1.354E-10	3.385E-09	3.385E-09	3.385E-09	3.385E-09
Benzo(b)fluoranthene	t/d	3.938E-09	4.767E-10	1.575E-10	3.938E-09	3.938E-09	3.938E-09	3.938E-09
Benzo(g,h,i)perylene	t/d	4.318E-09	5.227E-10	1.727E-10	4.318E-09	4.318E-09	4.318E-09	4.318E-09
Benzo(k)fluoranthene	t/d	3.42E-09	4.14E-10	1.368E-10	3.42E-09	3.42E-09	3.42E-09	3.42E-09
Carboxylic acids	t/d	0	0	0	0	0	0	0
Chrysene	t/d	4.802E-09	5.813E-10	1.921E-10	4.802E-09	4.802E-09	4.802E-09	4.802E-09
Dibenz(a,h)anthracene	t/d	3.168E-09	3.835E-10	1.267E-10	3.168E-09	3.168E-09	3.168E-09	3.168E-09
Ethylbenzene	t/d	7.773E-06	9.409E-07	3.109E-07	7.773E-06	7.773E-06	7.773E-06	7.773E-06
Fluoranthene	t/d	4.111E-08	4.976E-09	1.644E-09	4.111E-08	4.111E-08	4.111E-08	4.111E-08
Fluorene	t/d	1.586E-08	1.919E-09	6.343E-10	1.586E-08	1.586E-08	1.586E-08	1.586E-08
Formaldehyde	t/d	0.0007635	9.242E-05	3.054E-05	0.0007635	0.0007635	0.0007635	0.0007635
Hexane	t/d	0	0	0	0	0	0	0
Indeno(1,2,3-cd)pyrene	t/d	4.042E-09	4.893E-10	1.617E-10	4.042E-09	4.042E-09	4.042E-09	4.042E-09
Naphthalene	t/d	3.869E-06	4.684E-07	1.548E-07	3.869E-06	3.869E-06	3.869E-06	3.869E-06
Phenanthrene	t/d	1.164E-07	1.409E-08	4.657E-09	1.164E-07	1.164E-07	1.164E-07	1.164E-07
Propylene	t/d	0.0008118	9.827E-05	3.247E-05	0.0008118	0.0008118	0.0008118	0.0008118
Pyrene	t/d	1.935E-08	2.342E-09	7.738E-10	1.935E-08	1.935E-08	1.935E-08	1.935E-08
Toluene	t/d	0.0001019	1.234E-05	4.076E-06	0.0001019	0.0001019	0.0001019	0.0001019
Xylenes	t/d	9.535E-05	1.154E-05	3.814E-06	9.535E-05	9.535E-05	9.535E-05	9.535E-05
Aluminum (Al)	t/d	1.424E-05	1.698E-06	5.477E-07	1.424E-05	1.424E-05	1.424E-05	1.424E-05

Point Source (cont'd)								
Facility	**Units**	**Foster Creek**						
Emission Source		**Steam Generator FC3-B-0208**	**Glycol Heater FC3-H-0501C**	**Flash Treater FC3-V-0304B**	**Steam Generator FC3-B-0209**	**Steam Generator FC3-B-0210**	**Steam Generator FC3-B-0211**	**Steam Generator FC3-B-0212**
Arsenic (As)	t/d	4.746E-07	5.659E-08	1.826E-08	4.746E-07	4.746E-07	4.746E-07	4.746E-07
Barium (Ba)	t/d	1.242E-06	1.481E-07	4.779E-08	1.242E-06	1.242E-06	1.242E-06	1.242E-06
Cadmium (Cd)	t/d	1.57E-07	1.872E-08	6.04E-09	1.57E-07	1.57E-07	1.57E-07	1.57E-07
Calcium (Ca)	t/d	4.746E-05	5.659E-06	1.826E-06	4.746E-05	4.746E-05	4.746E-05	4.746E-05
Chromium (Cr)	t/d	1.256E-07	1.498E-08	4.832E-09	1.256E-07	1.256E-07	1.256E-07	1.256E-07
Cobalt (Co)	t/d	3.417E-06	4.074E-07	1.314E-07	3.417E-06	3.417E-06	3.417E-06	3.417E-06
Copper (Cu)	t/d	5.933E-06	7.074E-07	2.282E-07	5.933E-06	5.933E-06	5.933E-06	5.933E-06
Iron (Fe)	t/d	2.61E-05	3.112E-06	1.004E-06	2.61E-05	2.61E-05	2.61E-05	2.61E-05
Lead (Pb)	t/d	3.56E-07	4.244E-08	1.369E-08	3.56E-07	3.56E-07	3.56E-07	3.56E-07
Magnesium (Mg)	t/d	0	0	0	0	0	0	0
Manganese (Mn)	t/d	1.187E-06	1.415E-07	4.564E-08	1.187E-06	1.187E-06	1.187E-06	1.187E-06
Nickel (Ni)	t/d	5.933E-06	7.074E-07	2.282E-07	5.933E-06	5.933E-06	5.933E-06	5.933E-06
Potassium (K)	t/d	1.187E-05	1.415E-06	4.564E-07	1.187E-05	1.187E-05	1.187E-05	1.187E-05
Silver (Ag)	t/d	0	0	0	0	0	0	0
Silicon (Si)	t/d	6.875E-05	8.197E-06	2.644E-06	6.875E-05	6.875E-05	6.875E-05	6.875E-05
Strontium (Sr)	t/d	1.187E-07	1.415E-08	4.564E-09	1.187E-07	1.187E-07	1.187E-07	1.187E-07
Titanium (Ti)	t/d	1.187E-06	1.415E-07	4.564E-08	1.187E-06	1.187E-06	1.187E-06	1.187E-06
Vanadium (V)	t/d	2.373E-06	2.83E-07	9.128E-08	2.373E-06	2.373E-06	2.373E-06	2.373E-06
Zinc (Zn)	t/d	9.493E-06	1.132E-06	3.651E-07	9.493E-06	9.493E-06	9.493E-06	9.493E-06
Zirconium (Zr)	t/d	1.396E-08	1.664E-09	5.369E-10	1.396E-08	1.396E-08	1.396E-08	1.396E-08
Molybdenum (Mo)	t/d	1.57E-09	1.872E-10	6.04E-11	1.57E-09	1.57E-09	1.57E-09	1.57E-09
Selenium (Se)	t/d	8.376E-07	9.987E-08	3.221E-08	8.376E-07	8.376E-07	8.376E-07	8.376E-07

Point Source (cont'd)							
Facility	**Units**	**Foster Creek**					
Emission Source		**Glycol Heater FC3-H-0501D**	**Osprey Steam Generator (CSSH-0800)**	**BFW Tank Heater (CSS-H-0300A)**	**BFW Tank Heater (CSS-H-0300B)**	**CPF HP Flare (S-505)**	**CPF LP Flare (S-503)**
UTMmN	m	529196	531670	531659	531658	530026	529282
UTMmE	m	6103008	6098682	6098707	6098701	6102848	6102840
Elevation	masl	667	671	671	671	665	665
Stack Height	m	9.5	8	8.2	8.2	30	20
Stack Diameter	m	0.9	0.76	0.25	0.25	1.7	1.7
Exit Velocity	m/s	6.1	14	2	2	0.1	0.1
Exit Temperature	K	468	450	475	475	1266	1269
1,3-butadiene	t/d	0	0	0	0	0	0
Acenaphthene	t/d	5.813E-10	1.289E-09	7.076E-12	7.076E-12	0	0
Acenaphthylene	t/d	5.06E-09	1.122E-08	6.16E-11	6.16E-11	0	0
Acetaldehyde	t/d	6.524E-06	1.447E-05	7.942E-08	7.942E-08	8.299E-07	8.299E-07
Acrolein	t/d	7.695E-06	1.706E-05	9.367E-08	9.367E-08	2.715E-07	2.715E-07
Aliphatic aldehydes	t/d	0	0	0	0	0	0
Aliphatic C_{17}-C_{34}	t/d	0	0	0	0	0	0
Aliphatic C_5-C_8	t/d	0.0008372	0.0018564	1.019E-05	1.019E-05	0.0001674	0.0001674
Aliphatic C_9-C_{16}	t/d	0.0000322	0.0000714	3.92E-07	3.92E-07	6.44E-06	6.44E-06
Aliphatic ketones	t/d	0	0	0	0	0	0
Anthracene	t/d	6.733E-10	1.493E-09	8.196E-12	8.196E-12	0	0
Aromatic C_{17}-C_{34}	t/d	7.521E-10	1.668E-09	9.156E-12	9.156E-12	4.434E-10	4.434E-10
Aromatic C_9-C_{16}	t/d	1.826E-08	4.049E-08	2.223E-10	2.223E-10	3.358E-07	3.358E-07
Benzaldehyde	t/d	6.858E-06	1.521E-05	8.349E-08	8.349E-08	0	0
Benzene	t/d	4.684E-06	1.039E-05	5.702E-08	5.702E-08	5.887E-07	5.887E-07
Benzo(a)pyrene	t/d	4.098E-10	9.087E-10	4.989E-12	4.989E-12	6.787E-08	6.787E-08
Benzo(b)fluoranthene	t/d	4.767E-10	1.057E-09	5.804E-12	5.804E-12	6.787E-08	6.787E-08
Benzo(g,h,i)perylene	t/d	5.227E-10	1.159E-09	6.364E-12	6.364E-12	6.787E-08	6.787E-08
Benzo(k)fluoranthene	t/d	4.14E-10	9.18E-10	5.04E-12	5.04E-12	6.787E-08	6.787E-08
Carboxylic acids	t/d	0	0	0	0	0	0
Chrysene	t/d	5.813E-10	1.289E-09	7.076E-12	7.076E-12	6.82E-08	6.82E-08
Dibenz(a,h)anthracene	t/d	3.835E-10	8.503E-10	4.668E-12	4.668E-12	6.787E-08	6.787E-08
Ethylbenzene	t/d	9.409E-07	2.086E-06	1.145E-08	1.145E-08	0	0
Fluoranthene	t/d	4.976E-09	1.103E-08	6.058E-11	6.058E-11	7.302E-08	7.302E-08
Fluorene	t/d	1.919E-09	4.256E-09	2.337E-11	2.337E-11	0	0
Formaldehyde	t/d	9.242E-05	0.0002049	1.125E-06	1.125E-06	9.49E-05	9.49E-05
Hexane	t/d	0	0	0	0	0	0
Indeno(1,2,3-cd)pyrene	t/d	4.893E-10	1.085E-09	5.956E-12	5.956E-12	6.787E-08	6.787E-08
Naphthalene	t/d	4.684E-07	1.039E-06	5.702E-09	5.702E-09	4.182E-05	4.182E-05
Phenanthrene	t/d	1.409E-08	3.125E-08	1.716E-10	1.716E-10	9.007E-08	9.007E-08
Propylene	t/d	9.827E-05	0.0002179	1.196E-06	1.196E-06	0	0
Pyrene	t/d	2.342E-09	5.193E-09	2.851E-11	2.851E-11	7.173E-08	7.173E-08
Toluene	t/d	1.234E-05	2.735E-05	1.502E-07	1.502E-07	5.662E-05	5.662E-05
Xylenes	t/d	1.154E-05	2.559E-05	1.405E-07	1.405E-07	1.782E-06	1.782E-06
Aluminum (Al)	t/d	1.698E-06	3.834E-06	2.081E-08	2.081E-08	0	0

Point Source (cont'd)							
Facility	**Units**	**Foster Creek**					
Emission Source		**Glycol Heater FC3-H-0501D**	**Osprey Steam Generator (CSSH-0800)**	**BFW Tank Heater (CSS-H-0300A)**	**BFW Tank Heater (CSS-H-0300B)**	**CPF HP Flare (S-505)**	**CPF LP Flare (S-503)**
Arsenic (As)	t/d	5.659E-08	1.278E-07	6.937E-10	6.937E-10	0	0
Barium (Ba)	t/d	1.481E-07	3.345E-07	1.816E-09	1.816E-09	0	0
Cadmium (Cd)	t/d	1.872E-08	4.228E-08	2.295E-10	2.295E-10	0	0
Calcium (Ca)	t/d	5.659E-06	1.278E-05	6.937E-08	6.937E-08	0	0
Chromium (Cr)	t/d	1.498E-08	3.383E-08	1.836E-10	1.836E-10	0	0
Cobalt (Co)	t/d	4.074E-07	9.199E-07	4.994E-09	4.994E-09	0	0
Copper (Cu)	t/d	7.074E-07	1.597E-06	8.671E-09	8.671E-09	0	0
Iron (Fe)	t/d	3.112E-06	7.028E-06	3.815E-08	3.815E-08	0	0
Lead (Pb)	t/d	4.244E-08	9.584E-08	5.203E-10	5.203E-10	0	0
Magnesium (Mg)	t/d	0	0	0	0	0	0
Manganese (Mn)	t/d	1.415E-07	3.195E-07	1.734E-09	1.734E-09	0	0
Nickel (Ni)	t/d	7.074E-07	1.597E-06	8.671E-09	8.671E-09	0	0
Potassium (K)	t/d	1.415E-06	3.195E-06	1.734E-08	1.734E-08	0	0
Silver (Ag)	t/d	0	0	0	0	0	0
Silicon (Si)	t/d	8.197E-06	1.851E-05	1.005E-07	1.005E-07	0	0
Strontium (Sr)	t/d	1.415E-08	3.195E-08	1.734E-10	1.734E-10	0	0
Titanium (Ti)	t/d	1.415E-07	3.195E-07	1.734E-09	1.734E-09	0	0
Vanadium (V)	t/d	2.83E-07	6.389E-07	3.468E-09	3.468E-09	0	0
Zinc (Zn)	t/d	1.132E-06	2.556E-06	1.387E-08	1.387E-08	0	0
Zirconium (Zr)	t/d	1.664E-09	3.758E-09	2.04E-11	2.04E-11	0	0
Molybdenum (Mo)	t/d	1.872E-10	4.228E-10	2.295E-12	2.295E-12	0	0
Selenium (Se)	t/d	9.987E-08	2.255E-07	1.224E-09	1.224E-09	0	0

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Point Source (cont'd)						
Facility	**Units**	**Foster Creek**				
Emission Source		**CPF Pop Tank Vent Flare (S-504)**	**SRF Emergency Flare HP (S-5955)**	**SRF Emergency Flare LP (S-5955)**	**Phase F/G/H HP Flare (FC3-S-0501)**	**Phase F/G/H LP Flare (FC3-S-0503)**
UTMmN	m	530026	530281	530281	529190	529184
UTMmE	m	6102848	6102892	6102892	6103529	6103529
Elevation	masl	665	666	666	667	667
Stack Height	m	29	28	29	27	29
Stack Diameter	m	3.2	1.7	0.99	9	2.6
Exit Velocity	m/s	0.1	0.1	0.1	0.1	0.1
Exit Temperature	K	1273	1267	1257	1281	1271
1,3-butadiene	t/d	0	0	0	0	0
Acenaphthene	t/d	0	0	0	0	0
Acenaphthylene	t/d	0	0	0	0	0
Acetaldehyde	t/d	2.706E-06	8.299E-07	2.887E-07	2.165E-05	1.804E-06
Acrolein	t/d	8.853E-07	2.715E-07	9.443E-08	7.083E-06	5.902E-07
Aliphatic aldehydes	t/d	0	0	0	0	0
Aliphatic C_{17}-C_{34}	t/d	0	0	0	0	0
Aliphatic C_5-C_8	t/d	0.000546	0.0001674	5.824E-05	0.004368	0.000364
Aliphatic C_9-C_{16}	t/d	0.000021	6.44E-06	2.24E-06	0.000168	0.000014
Aliphatic ketones	t/d	0	0	0	0	0
Anthracene	t/d	0	0	0	0	0
Aromatic C_{17}-C_{34}	t/d	1.446E-09	4.434E-10	1.542E-10	1.157E-08	9.64E-10
Aromatic C_9-C_{16}	t/d	1.095E-06	3.358E-07	1.168E-07	8.76E-06	7.3E-07
Benzaldehyde	t/d	0	0	0	0	0
Benzene	t/d	1.92E-06	5.887E-07	2.048E-07	1.536E-05	1.28E-06
Benzo(a)pyrene	t/d	2.213E-07	6.787E-08	2.361E-08	1.771E-06	1.476E-07
Benzo(b)fluoranthene	t/d	2.213E-07	6.787E-08	2.361E-08	1.771E-06	1.476E-07
Benzo(g,h,i)perylene	t/d	2.213E-07	6.787E-08	2.361E-08	1.771E-06	1.476E-07
Benzo(k)fluoranthene	t/d	2.213E-07	6.787E-08	2.361E-08	1.771E-06	1.476E-07
Carboxylic acids	t/d	0	0	0	0	0
Chrysene	t/d	2.224E-07	6.82E-08	2.372E-08	1.779E-06	1.483E-07
Dibenz(a,h)anthracene	t/d	2.213E-07	6.787E-08	2.361E-08	1.771E-06	1.476E-07
Ethylbenzene	t/d	0	0	0	0	0
Fluoranthene	t/d	2.381E-07	7.302E-08	2.54E-08	1.905E-06	1.587E-07
Fluorene	t/d	0	0	0	0	0
Formaldehyde	t/d	0.0003094	9.49E-05	3.301E-05	0.0024755	0.0002063
Hexane	t/d	0	0	0	0	0
Indeno(1,2,3-cd)pyrene	t/d	2.213E-07	6.787E-08	2.361E-08	1.771E-06	1.476E-07
Naphthalene	t/d	0.0001364	4.182E-05	1.455E-05	0.0010909	9.091E-05
Phenanthrene	t/d	2.937E-07	9.007E-08	3.133E-08	2.35E-06	1.958E-07
Propylene	t/d	0	0	0	0	0
Pyrene	t/d	2.339E-07	7.173E-08	2.495E-08	1.871E-06	1.559E-07
Toluene	t/d	0.0001846	5.662E-05	1.969E-05	0.0014769	0.0001231
Xylenes	t/d	5.811E-06	1.782E-06	6.199E-07	4.649E-05	3.874E-06
Aluminum (Al)	t/d	0	0	0	0	0

Point Source (cont'd)						
Facility	**Units**	**Foster Creek**				
Emission Source		**CPF Pop Tank Vent Flare (S-504)**	**SRF Emergency Flare HP (S-5955)**	**SRF Emergency Flare LP (S-5955)**	**Phase F/G/H HP Flare (FC3-S-0501)**	**Phase F/G/H LP Flare (FC3-S-0503)**
Arsenic (As)	t/d	0	0	0	0	0
Barium (Ba)	t/d	0	0	0	0	0
Cadmium (Cd)	t/d	0	0	0	0	0
Calcium (Ca)	t/d	0	0	0	0	0
Chromium (Cr)	t/d	0	0	0	0	0
Cobalt (Co)	t/d	0	0	0	0	0
Copper (Cu)	t/d	0	0	0	0	0
Iron (Fe)	t/d	0	0	0	0	0
Lead (Pb)	t/d	0	0	0	0	0
Magnesium (Mg)	t/d	0	0	0	0	0
Manganese (Mn)	t/d	0	0	0	0	0
Nickel (Ni)	t/d	0	0	0	0	0
Potassium (K)	t/d	0	0	0	0	0
Silver (Ag)	t/d	0	0	0	0	0
Silicon (Si)	t/d	0	0	0	0	0
Strontium (Sr)	t/d	0	0	0	0	0
Titanium (Ti)	t/d	0	0	0	0	0
Vanadium (V)	t/d	0	0	0	0	0
Zinc (Zn)	t/d	0	0	0	0	0
Zirconium (Zr)	t/d	0	0	0	0	0
Molybdenum (Mo)	t/d	0	0	0	0	0
Selenium (Se)	t/d	0	0	0	0	0

Note: "0" – No emissions.

Area Source					
Facility	**Units**	**Foster Creek Phase 1A-E**	**Foster Creek Phase 1A-E Tank Farm**	**Foster Creek Phase FGH**	**Foster Creek Phase FGH Tank Farm**
Emission Source		**Plant Fugitive**	**Tank Farm**	**Plant Fugitive**	**Tank Farm**
Corner 1 UTM N	m	529404	529404	529116	529116
Corner 1 UTM E	m	6102452	6102452	6103499	6103499
Corner 2 UTM N	m	529404	529404	529616	529616
Corner 2 UTM E	m	6102952	6102952	6103499	6103499
Corner 3 UTM N	m	529904	529904	529616	529616
Corner 3 UTM E	m	6102952	6102952	6102999	6102999
Corner 4 UTM N	m	529904	529904	529116	529116
Corner 4 UTM E	m	6102452	6102452	6102999	6102999
Area	m^2	250000	250000	250000	250000
Elevation (m)	masl	665	665	665	665
1,3-butadiene	t/d	1.750E-07	0.0000021	2.45E-07	3.15E-06
Acenaphthene	t/d	0	0	0	0
Acenaphthylene	t/d	0	0	0	0
Acetaldehyde	t/d	0	0	0	0
Acrolein	t/d	0	0	0	0
Aliphatic aldehydes	t/d	0.0010445	0.012534	0.0014623	0.018801
Aliphatic C_{17}-C_{34}	t/d	0.000485	0.00582	0.000679	0.00873
Aliphatic C_5-C_8	t/d	0.0082	0.0984	0.01148	0.1476
Aliphatic C_9-C_{16}	t/d	0.0337565	0.405078	0.0472591	0.607617
Aliphatic ketones	t/d	0.0036995	0.044394	0.0051793	0.066591
Anthracene	t/d	0	0	0	0
Aromatic C_{17}-C_{34}	t/d	0	0	0	0
Aromatic C_9-C_{16}	t/d	0.0008685	0.010422	0.0012159	0.015633
Benzaldehyde	t/d	0	0	0	0
Benzene	t/d	0.000648	0.007776	0.0009072	0.011664
Benzo(a)pyrene	t/d	0	0	0	0
Benzo(b)fluoranthene	t/d	0	0	0	0
Benzo(g,h,i)perylene	t/d	0	0	0	0
Benzo(k)fluoranthene	t/d	0	0	0	0
Carboxylic acids	t/d	1.4E-07	1.68E-06	1.96E-07	2.52E-06
Chrysene	t/d	0	0	0	0
Dibenz(a,h)anthracene	t/d	0	0	0	0
Ethylbenzene	t/d	0.000039	0.000468	0.0000546	0.000702
Fluoranthene	t/d	0	0	0	0
Fluorene	t/d	0	0	0	0
Formaldehyde	t/d	0	0	0	0
Hexane	t/d	0.000535	0.00642	0.000749	0.00963
Indeno(1,2,3-cd)pyrene	t/d	0	0	0	0
Naphthalene	t/d	5E-09	6E-08	7E-09	9E-08
Phenanthrene	t/d	0	0	0	0
Propylene	t/d	0	0	0	0
Pyrene	t/d	0	0	0	0
Toluene	t/d	0.00029	0.00348	0.000406	0.00522

Area Source					
Facility	**Units**	**Foster Creek Phase 1A-E**	**Foster Creek Phase 1A-E Tank Farm**	**Foster Creek Phase FGH**	**Foster Creek Phase FGH Tank Farm**
Emission Source		**Plant Fugitive**	**Tank Farm**	**Plant Fugitive**	**Tank Farm**
Xylenes	t/d	0.00017	0.00204	0.000238	0.00306
Carbon disulphide	t/d	6.316E-05	0.0004594	2.469E-05	0.0004307
Hydrogen Sulphide	t/d	5.192E-06	3.776E-05	2.03E-06	0.0000354
Mercaptans	t/d	6.519E-05	0.0004741	2.548E-05	0.0004445
Thiophenes	t/d	8.648E-05	0.000629	3.381E-05	0.0005897

Note: “0” = No emissions.

Table B4-10: Summary of Cenovus Narrow Lake SAGD VOC, PAH and Metal Air Emissions Used for Baseline and Application Cases

Point Source							
Facility	**Units**	**Narrow Lake**					
Emission Source		**Steam Generator (B-2100)**	**Steam Generator (B-2150)**	**Steam Generator (B-2200)**	**Steam Generator (B-2250)**	**Steam Generator (B-2300)**	**Steam Generator (B-2400)**
UTMmN	m	507435	507415	507395	507375	507355	507315
UTMmE	m	6167162	6167162	6167162	6167162	6167162	6167162
Elevation	masl	564	564	564	564	564	564
Stack Height	m	32	32	32	32	32	32
Stack Diameter	m	1.68	1.68	1.68	1.68	1.68	1.68
Exit Velocity	m/s	24.5	24.5	24.5	24.5	24.5	24.5
Exit Temperature	K	488	488	488	488	488	488
1,3-butadiene	t/d	0	0	0	0	0	0
Acenaphthene	t/d	4.802E-09	4.802E-09	4.802E-09	4.802E-09	4.802E-09	4.802E-09
Acenaphthylene	t/d	4.18E-08	4.18E-08	4.18E-08	4.18E-08	4.18E-08	4.18E-08
Acetaldehyde	t/d	5.389E-05	5.389E-05	5.389E-05	5.389E-05	5.389E-05	5.389E-05
Acrolein	t/d	6.356E-05	6.356E-05	6.356E-05	6.356E-05	6.356E-05	6.356E-05
Aliphatic aldehydes	t/d	0	0	0	0	0	0
Aliphatic C_{17}-C_{34}	t/d	0	0	0	0	0	0
Aliphatic C_5-C_8	t/d	0.006916	0.006916	0.006916	0.006916	0.006916	0.006916
Aliphatic C_9-C_{16}	t/d	0.000266	0.000266	0.000266	0.000266	0.000266	0.000266
Aliphatic ketones	t/d	0	0	0	0	0	0
Anthracene	t/d	5.562E-09	5.562E-09	5.562E-09	5.562E-09	5.562E-09	5.562E-09
Aromatic C_{17}-C_{34}	t/d	6.213E-09	6.213E-09	6.213E-09	6.213E-09	6.213E-09	6.213E-09
Aromatic C_9-C_{16}	t/d	1.509E-07	1.509E-07	1.509E-07	1.509E-07	1.509E-07	1.509E-07
Benzaldehyde	t/d	5.665E-05	5.665E-05	5.665E-05	5.665E-05	5.665E-05	5.665E-05
Benzene	t/d	3.869E-05	3.869E-05	3.869E-05	3.869E-05	3.869E-05	3.869E-05
Benzo(a)pyrene	t/d	3.385E-09	3.385E-09	3.385E-09	3.385E-09	3.385E-09	3.385E-09
Benzo(b)fluoranthene	t/d	3.938E-09	3.938E-09	3.938E-09	3.938E-09	3.938E-09	3.938E-09
Benzo(g,h,i)perylene	t/d	4.318E-09	4.318E-09	4.318E-09	4.318E-09	4.318E-09	4.318E-09
Benzo(k)fluoranthene	t/d	3.42E-09	3.42E-09	3.42E-09	3.42E-09	3.42E-09	3.42E-09
Carboxylic acids	t/d	0	0	0	0	0	0
Chrysene	t/d	4.802E-09	4.802E-09	4.802E-09	4.802E-09	4.802E-09	4.802E-09
Dibenz(a,h)anthracene	t/d	3.168E-09	3.168E-09	3.168E-09	3.168E-09	3.168E-09	3.168E-09
Ethylbenzene	t/d	7.773E-06	7.773E-06	7.773E-06	7.773E-06	7.773E-06	7.773E-06
Fluoranthene	t/d	4.111E-08	4.111E-08	4.111E-08	4.111E-08	4.111E-08	4.111E-08
Fluorene	t/d	1.586E-08	1.586E-08	1.586E-08	1.586E-08	1.586E-08	1.586E-08
Formaldehyde	t/d	0.0007635	0.0007635	0.0007635	0.0007635	0.0007635	0.0007635
Hexane	t/d	0	0	0	0	0	0
Indeno(1,2,3-cd)pyrene	t/d	4.042E-09	4.042E-09	4.042E-09	4.042E-09	4.042E-09	4.042E-09
Naphthalene	t/d	3.869E-06	3.869E-06	3.869E-06	3.869E-06	3.869E-06	3.869E-06
Phenanthrene	t/d	1.164E-07	1.164E-07	1.164E-07	1.164E-07	1.164E-07	1.164E-07
Propylene	t/d	0.0008118	0.0008118	0.0008118	0.0008118	0.0008118	0.0008118
Pyrene	t/d	1.935E-08	1.935E-08	1.935E-08	1.935E-08	1.935E-08	1.935E-08

Point Source							
Facility	**Units**	**Narrow Lake**					
Emission Source		**Steam Generator (B-2100)**	**Steam Generator (B-2150)**	**Steam Generator (B-2200)**	**Steam Generator (B-2250)**	**Steam Generator (B-2300)**	**Steam Generator (B-2400)**
Toluene	t/d	0.0001019	0.0001019	0.0001019	0.0001019	0.0001019	0.0001019
Xylenes	t/d	9.535E-05	9.535E-05	9.535E-05	9.535E-05	9.535E-05	9.535E-05
Aluminum (Al)	t/d	1.424E-05	1.424E-05	1.424E-05	1.424E-05	1.424E-05	1.424E-05
Arsenic (As)	t/d	4.746E-07	4.746E-07	4.746E-07	4.746E-07	4.746E-07	4.746E-07
Barium (Ba)	t/d	1.242E-06	1.242E-06	1.242E-06	1.242E-06	1.242E-06	1.242E-06
Cadmium (Cd)	t/d	1.57E-07	1.57E-07	1.57E-07	1.57E-07	1.57E-07	1.57E-07
Calcium (Ca)	t/d	4.746E-05	4.746E-05	4.746E-05	4.746E-05	4.746E-05	4.746E-05
Chromium (Cr)	t/d	1.256E-07	1.256E-07	1.256E-07	1.256E-07	1.256E-07	1.256E-07
Cobalt (Co)	t/d	3.417E-06	3.417E-06	3.417E-06	3.417E-06	3.417E-06	3.417E-06
Copper (Cu)	t/d	5.933E-06	5.933E-06	5.933E-06	5.933E-06	5.933E-06	5.933E-06
Iron (Fe)	t/d	2.61E-05	2.61E-05	2.61E-05	2.61E-05	2.61E-05	2.61E-05
Lead (Pb)	t/d	3.56E-07	3.56E-07	3.56E-07	3.56E-07	3.56E-07	3.56E-07
Magnesium (Mg)	t/d	0	0	0	0	0	0
Manganese (Mn)	t/d	1.187E-06	1.187E-06	1.187E-06	1.187E-06	1.187E-06	1.187E-06
Nickel (Ni)	t/d	5.933E-06	5.933E-06	5.933E-06	5.933E-06	5.933E-06	5.933E-06
Potassium (K)	t/d	1.187E-05	1.187E-05	1.187E-05	1.187E-05	1.187E-05	1.187E-05
Silver (Ag)	t/d	0	0	0	0	0	0
Silicon (Si)	t/d	6.875E-05	6.875E-05	6.875E-05	6.875E-05	6.875E-05	6.875E-05
Strontium (Sr)	t/d	1.187E-07	1.187E-07	1.187E-07	1.187E-07	1.187E-07	1.187E-07
Titanium (Ti)	t/d	1.187E-06	1.187E-06	1.187E-06	1.187E-06	1.187E-06	1.187E-06
Vanadium (V)	t/d	2.373E-06	2.373E-06	2.373E-06	2.373E-06	2.373E-06	2.373E-06
Zinc (Zn)	t/d	9.493E-06	9.493E-06	9.493E-06	9.493E-06	9.493E-06	9.493E-06
Zirconium (Zr)	t/d	1.396E-08	1.396E-08	1.396E-08	1.396E-08	1.396E-08	1.396E-08
Molybdenum (Mo)	t/d	1.57E-09	1.57E-09	1.57E-09	1.57E-09	1.57E-09	1.57E-09
Selenium (Se)	t/d	8.376E-07	8.376E-07	8.376E-07	8.376E-07	8.376E-07	8.376E-07

Point Source (cont'd)							
Facility	**Units**	**Narrow Lake**					
Emission Source		**Steam Generator (B-2450)**	**Steam Generator (B-2500)**	**Steam Generator (B-2550)**	**Steam Generator (B-2600)**	**Steam Generator (B-2700)**	**Steam Generator (B-2750)**
UTMmN	m	507295	507275	507255	507235	507195	507175
UTMmE	m	6167162	6167162	6167162	6167162	6167162	6167162
Elevation	masl	564	564	564	564	564	564
Stack Height	m	32	32	32	32	32	32
Stack Diameter	m	1.68	1.68	1.68	1.68	1.68	1.68
Exit Velocity	m/s	24.5	24.5	24.5	24.5	24.5	24.5
Exit Temperature	K	488	488	488	488	488	488
1,3-butadiene	t/d	0	0	0	0	0	0
Acenaphthene	t/d	4.802E-09	4.802E-09	4.802E-09	4.802E-09	4.802E-09	4.802E-09
Acenaphthylene	t/d	4.18E-08	4.18E-08	4.18E-08	4.18E-08	4.18E-08	4.18E-08
Acetaldehyde	t/d	5.389E-05	5.389E-05	5.389E-05	5.389E-05	5.389E-05	5.389E-05
Acrolein	t/d	6.356E-05	6.356E-05	6.356E-05	6.356E-05	6.356E-05	6.356E-05
Aliphatic aldehydes	t/d	0	0	0	0	0	0
Aliphatic C_{17}-C_{34}	t/d	0	0	0	0	0	0
Aliphatic C_5-C_8	t/d	0.006916	0.006916	0.006916	0.006916	0.006916	0.006916
Aliphatic C_9-C_{16}	t/d	0.000266	0.000266	0.000266	0.000266	0.000266	0.000266
Aliphatic ketones	t/d	0	0	0	0	0	0
Anthracene	t/d	5.562E-09	5.562E-09	5.562E-09	5.562E-09	5.562E-09	5.562E-09
Aromatic C_{17}-C_{34}	t/d	6.213E-09	6.213E-09	6.213E-09	6.213E-09	6.213E-09	6.213E-09
Aromatic C_9-C_{16}	t/d	1.509E-07	1.509E-07	1.509E-07	1.509E-07	1.509E-07	1.509E-07
Benzaldehyde	t/d	5.665E-05	5.665E-05	5.665E-05	5.665E-05	5.665E-05	5.665E-05
Benzene	t/d	3.869E-05	3.869E-05	3.869E-05	3.869E-05	3.869E-05	3.869E-05
Benzo(a)pyrene	t/d	3.385E-09	3.385E-09	3.385E-09	3.385E-09	3.385E-09	3.385E-09
Benzo(b)fluoranthene	t/d	3.938E-09	3.938E-09	3.938E-09	3.938E-09	3.938E-09	3.938E-09
Benzo(g,h,i)perylene	t/d	4.318E-09	4.318E-09	4.318E-09	4.318E-09	4.318E-09	4.318E-09
Benzo(k)fluoranthene	t/d	3.42E-09	3.42E-09	3.42E-09	3.42E-09	3.42E-09	3.42E-09
Carboxylic acids	t/d	0	0	0	0	0	0
Chrysene	t/d	4.802E-09	4.802E-09	4.802E-09	4.802E-09	4.802E-09	4.802E-09
Dibenz(a,h)anthracene	t/d	3.168E-09	3.168E-09	3.168E-09	3.168E-09	3.168E-09	3.168E-09
Ethylbenzene	t/d	7.773E-06	7.773E-06	7.773E-06	7.773E-06	7.773E-06	7.773E-06
Fluoranthene	t/d	4.111E-08	4.111E-08	4.111E-08	4.111E-08	4.111E-08	4.111E-08
Fluorene	t/d	1.586E-08	1.586E-08	1.586E-08	1.586E-08	1.586E-08	1.586E-08
Formaldehyde	t/d	0.0007635	0.0007635	0.0007635	0.0007635	0.0007635	0.0007635
Hexane	t/d	0	0	0	0	0	0
Indeno(1,2,3-cd)pyrene	t/d	4.042E-09	4.042E-09	4.042E-09	4.042E-09	4.042E-09	4.042E-09
Naphthalene	t/d	3.869E-06	3.869E-06	3.869E-06	3.869E-06	3.869E-06	3.869E-06
Phenanthrene	t/d	1.164E-07	1.164E-07	1.164E-07	1.164E-07	1.164E-07	1.164E-07
Propylene	t/d	0.0008118	0.0008118	0.0008118	0.0008118	0.0008118	0.0008118
Pyrene	t/d	1.935E-08	1.935E-08	1.935E-08	1.935E-08	1.935E-08	1.935E-08
Toluene	t/d	0.0001019	0.0001019	0.0001019	0.0001019	0.0001019	0.0001019
Xylenes	t/d	9.535E-05	9.535E-05	9.535E-05	9.535E-05	9.535E-05	9.535E-05
Aluminum (Al)	t/d	1.424E-05	1.424E-05	1.424E-05	1.424E-05	1.424E-05	1.424E-05

Point Source (cont'd)							
Facility	**Units**	**Narrow Lake**					
Emission Source		**Steam Generator (B-2450)**	**Steam Generator (B-2500)**	**Steam Generator (B-2550)**	**Steam Generator (B-2600)**	**Steam Generator (B-2700)**	**Steam Generator (B-2750)**
Arsenic (As)	t/d	4.746E-07	4.746E-07	4.746E-07	4.746E-07	4.746E-07	4.746E-07
Barium (Ba)	t/d	1.242E-06	1.242E-06	1.242E-06	1.242E-06	1.242E-06	1.242E-06
Cadmium (Cd)	t/d	1.57E-07	1.57E-07	1.57E-07	1.57E-07	1.57E-07	1.57E-07
Calcium (Ca)	t/d	4.746E-05	4.746E-05	4.746E-05	4.746E-05	4.746E-05	4.746E-05
Chromium (Cr)	t/d	1.256E-07	1.256E-07	1.256E-07	1.256E-07	1.256E-07	1.256E-07
Cobalt (Co)	t/d	3.417E-06	3.417E-06	3.417E-06	3.417E-06	3.417E-06	3.417E-06
Copper (Cu)	t/d	5.933E-06	5.933E-06	5.933E-06	5.933E-06	5.933E-06	5.933E-06
Iron (Fe)	t/d	2.61E-05	2.61E-05	2.61E-05	2.61E-05	2.61E-05	2.61E-05
Lead (Pb)	t/d	3.56E-07	3.56E-07	3.56E-07	3.56E-07	3.56E-07	3.56E-07
Magnesium (Mg)	t/d	0	0	0	0	0	0
Manganese (Mn)	t/d	1.187E-06	1.187E-06	1.187E-06	1.187E-06	1.187E-06	1.187E-06
Nickel (Ni)	t/d	5.933E-06	5.933E-06	5.933E-06	5.933E-06	5.933E-06	5.933E-06
Potassium (K)	t/d	1.187E-05	1.187E-05	1.187E-05	1.187E-05	1.187E-05	1.187E-05
Silver (Ag)	t/d	0	0	0	0	0	0
Silicon (Si)	t/d	6.875E-05	6.875E-05	6.875E-05	6.875E-05	6.875E-05	6.875E-05
Strontium (Sr)	t/d	1.187E-07	1.187E-07	1.187E-07	1.187E-07	1.187E-07	1.187E-07
Titanium (Ti)	t/d	1.187E-06	1.187E-06	1.187E-06	1.187E-06	1.187E-06	1.187E-06
Vanadium (V)	t/d	2.373E-06	2.373E-06	2.373E-06	2.373E-06	2.373E-06	2.373E-06
Zinc (Zn)	t/d	9.493E-06	9.493E-06	9.493E-06	9.493E-06	9.493E-06	9.493E-06
Zirconium (Zr)	t/d	1.396E-08	1.396E-08	1.396E-08	1.396E-08	1.396E-08	1.396E-08
Molybdenum (Mo)	t/d	1.57E-09	1.57E-09	1.57E-09	1.57E-09	1.57E-09	1.57E-09
Selenium (Se)	t/d	8.376E-07	8.376E-07	8.376E-07	8.376E-07	8.376E-07	8.376E-07

Point Source (cont'd)							
Facility	**Units**	**Narrow Lake**					
Emission Source		**Steam Generator (B-2800)**	**Steam Generator (B-2850)**	**Steam Generator (B-2900)**	**Steam Generator (H-7100)**	**Steam Generator (H-7110)**	**Slop Oil Treater Reheater (H-5070A)**
UTMmN	m	507155	507135	507115	507565	507565	507495
UTMmE	m	6167162	6167162	6167162	6166983	6166992	6167004
Elevation	masl	564	564	564	565	565	565
Stack Height	m	32	32	32	9.2	9.2	3.3
Stack Diameter	m	1.68	1.68	1.68	0.91	0.91	0.31
Exit Velocity	m/s	24.5	24.5	24.5	9.6	9.6	30.5
Exit Temperature	K	488	488	488	474	474	512
1,3-butadiene	t/d	0	0	0	0	0	0
Acenaphthene	t/d	4.802E-09	4.802E-09	4.802E-09	5.055E-10	5.055E-10	2.527E-10
Acenaphthylene	t/d	4.18E-08	4.18E-08	4.18E-08	4.4E-09	4.4E-09	2.2E-09
Acetaldehyde	t/d	5.389E-05	5.389E-05	5.389E-05	5.673E-06	5.673E-06	2.836E-06
Acrolein	t/d	6.356E-05	6.356E-05	6.356E-05	6.691E-06	6.691E-06	3.345E-06
Aliphatic aldehydes	t/d	0	0	0	0	0	0
Aliphatic C_{17}-C_{34}	t/d	0	0	0	0	0	0
Aliphatic C_5-C_8	t/d	0.006916	0.006916	0.006916	0.000728	0.000728	0.000364
Aliphatic C_9-C_{16}	t/d	0.000266	0.000266	0.000266	0.000028	0.000028	0.000014
Aliphatic ketones	t/d	0	0	0	0	0	0
Anthracene	t/d	5.562E-09	5.562E-09	5.562E-09	5.855E-10	5.855E-10	2.927E-10
Aromatic C_{17}-C_{34}	t/d	6.213E-09	6.213E-09	6.213E-09	6.54E-10	6.54E-10	3.27E-10
Aromatic C_9-C_{16}	t/d	1.509E-07	1.509E-07	1.509E-07	1.588E-08	1.588E-08	7.94E-09
Benzaldehyde	t/d	5.665E-05	5.665E-05	5.665E-05	5.964E-06	5.964E-06	2.982E-06
Benzene	t/d	3.869E-05	3.869E-05	3.869E-05	4.073E-06	4.073E-06	2.036E-06
Benzo(a)pyrene	t/d	3.385E-09	3.385E-09	3.385E-09	3.564E-10	3.564E-10	1.782E-10
Benzo(b)fluoranthene	t/d	3.938E-09	3.938E-09	3.938E-09	4.145E-10	4.145E-10	2.073E-10
Benzo(g,h,i)perylene	t/d	4.318E-09	4.318E-09	4.318E-09	4.545E-10	4.545E-10	2.273E-10
Benzo(k)fluoranthene	t/d	3.42E-09	3.42E-09	3.42E-09	3.6E-10	3.6E-10	1.8E-10
Carboxylic acids	t/d	0	0	0	0	0	0
Chrysene	t/d	4.802E-09	4.802E-09	4.802E-09	5.055E-10	5.055E-10	2.527E-10
Dibenz(a,h)anthracene	t/d	3.168E-09	3.168E-09	3.168E-09	3.335E-10	3.335E-10	1.667E-10
Ethylbenzene	t/d	7.773E-06	7.773E-06	7.773E-06	8.182E-07	8.182E-07	4.091E-07
Fluoranthene	t/d	4.111E-08	4.111E-08	4.111E-08	4.327E-09	4.327E-09	2.164E-09
Fluorene	t/d	1.586E-08	1.586E-08	1.586E-08	1.669E-09	1.669E-09	8.345E-10
Formaldehyde	t/d	0.0007635	0.0007635	0.0007635	8.036E-05	8.036E-05	4.018E-05
Hexane	t/d	0	0	0	0	0	0
Indeno(1,2,3-cd)pyrene	t/d	4.042E-09	4.042E-09	4.042E-09	4.255E-10	4.255E-10	2.127E-10
Naphthalene	t/d	3.869E-06	3.869E-06	3.869E-06	4.073E-07	4.073E-07	2.036E-07
Phenanthrene	t/d	1.164E-07	1.164E-07	1.164E-07	1.225E-08	1.225E-08	6.127E-09
Propylene	t/d	0.0008118	0.0008118	0.0008118	8.545E-05	8.545E-05	4.273E-05
Pyrene	t/d	1.935E-08	1.935E-08	1.935E-08	2.036E-09	2.036E-09	1.018E-09
Toluene	t/d	0.0001019	0.0001019	0.0001019	1.073E-05	1.073E-05	5.364E-06
Xylenes	t/d	9.535E-05	9.535E-05	9.535E-05	1.004E-05	1.004E-05	5.018E-06
Aluminum (Al)	t/d	1.424E-05	1.424E-05	1.424E-05	1.643E-06	1.643E-06	5.477E-07

Point Source (cont'd)							
Facility	**Units**	**Narrow Lake**					
Emission Source		**Steam Generator (B-2800)**	**Steam Generator (B-2850)**	**Steam Generator (B-2900)**	**Steam Generator (H-7100)**	**Steam Generator (H-7110)**	**Slop Oil Treater Reheater (H-5070A)**
Arsenic (As)	t/d	4.746E-07	4.746E-07	4.746E-07	5.477E-08	5.477E-08	1.826E-08
Barium (Ba)	t/d	1.242E-06	1.242E-06	1.242E-06	1.434E-07	1.434E-07	4.779E-08
Cadmium (Cd)	t/d	1.57E-07	1.57E-07	1.57E-07	1.812E-08	1.812E-08	6.04E-09
Calcium (Ca)	t/d	4.746E-05	4.746E-05	4.746E-05	5.477E-06	5.477E-06	1.826E-06
Chromium (Cr)	t/d	1.256E-07	1.256E-07	1.256E-07	1.45E-08	1.45E-08	4.832E-09
Cobalt (Co)	t/d	3.417E-06	3.417E-06	3.417E-06	3.942E-07	3.942E-07	1.314E-07
Copper (Cu)	t/d	5.933E-06	5.933E-06	5.933E-06	6.846E-07	6.846E-07	2.282E-07
Iron (Fe)	t/d	2.61E-05	2.61E-05	2.61E-05	3.012E-06	3.012E-06	1.004E-06
Lead (Pb)	t/d	3.56E-07	3.56E-07	3.56E-07	4.107E-08	4.107E-08	1.369E-08
Magnesium (Mg)	t/d	0	0	0	0	0	0
Manganese (Mn)	t/d	1.187E-06	1.187E-06	1.187E-06	1.369E-07	1.369E-07	4.564E-08
Nickel (Ni)	t/d	5.933E-06	5.933E-06	5.933E-06	6.846E-07	6.846E-07	2.282E-07
Potassium (K)	t/d	1.187E-05	1.187E-05	1.187E-05	1.369E-06	1.369E-06	4.564E-07
Silver (Ag)	t/d	0	0	0	0	0	0
Silicon (Si)	t/d	6.875E-05	6.875E-05	6.875E-05	7.933E-06	7.933E-06	2.644E-06
Strontium (Sr)	t/d	1.187E-07	1.187E-07	1.187E-07	1.369E-08	1.369E-08	4.564E-09
Titanium (Ti)	t/d	1.187E-06	1.187E-06	1.187E-06	1.369E-07	1.369E-07	4.564E-08
Vanadium (V)	t/d	2.373E-06	2.373E-06	2.373E-06	2.738E-07	2.738E-07	9.128E-08
Zinc (Zn)	t/d	9.493E-06	9.493E-06	9.493E-06	1.095E-06	1.095E-06	3.651E-07
Zirconium (Zr)	t/d	1.396E-08	1.396E-08	1.396E-08	1.611E-09	1.611E-09	5.369E-10
Molybdenum (Mo)	t/d	1.57E-09	1.57E-09	1.57E-09	1.812E-10	1.812E-10	6.04E-11
Selenium (Se)	t/d	8.376E-07	8.376E-07	8.376E-07	9.664E-08	9.664E-08	3.221E-08

Point Source (cont'd)							
Facility	**Units**	**Narrow Lake**					
Emission Source		**Slop Oil Treater Reheater (H- 5070B)**	**Process Glycol Heater**	**SRU Preheater**	**Sulphur Incinerator**	**Well Pad Turbine*106**	**Well Pad Line Heater*106**
UTMmN	m	507495	507847	507885	507930	-	-
UTMmE	m	6166992	6167022	6167053	6167058	-	-
Elevation	masl	565	565	565	565	-	-
Stack Height	m	3.3	6.4	6.3	29	6.1	4.6
Stack Diameter	m	0.31	0.71	0.26	0.91	0.61	0.36
Exit Velocity	m/s	30.5	12.2	4.6	15	20	4
Exit Temperature	K	512	483	873	811	773	959
1,3-butadiene	t/d	0	0	0	0	0	0
Acenaphthene	t/d	2.527E-10	2.527E-10	0	0	0	0
Acenaphthylene	t/d	2.2E-09	2.2E-09	0	0	0	0
Acetaldehyde	t/d	2.836E-06	2.836E-06	0	0	0	0
Acrolein	t/d	3.345E-06	3.345E-06	0	0	0	0
Aliphatic aldehydes	t/d	0	0	0	0	0	0
Aliphatic C_{17}-C_{34}	t/d	0	0	0	0	0	0
Aliphatic C_5-C_8	t/d	0.000364	0.000364	0	0	0	0
Aliphatic C_9-C_{16}	t/d	0.000014	0.000014	0	0	0	0
Aliphatic ketones	t/d	0	0	0	0	0	0
Anthracene	t/d	2.927E-10	2.927E-10	0	0	0	0
Aromatic C_{17}-C_{34}	t/d	3.27E-10	3.27E-10	0	0	0	0
Aromatic C_9-C_{16}	t/d	7.94E-09	7.94E-09	0	0	0	0
Benzaldehyde	t/d	2.982E-06	2.982E-06	0	0	0	0
Benzene	t/d	2.036E-06	2.036E-06	0	0	0	0
Benzo(a)pyrene	t/d	1.782E-10	1.782E-10	0	0	0	0
Benzo(b)fluoranthene	t/d	2.073E-10	2.073E-10	0	0	0	0
Benzo(g,h,i)perylene	t/d	2.273E-10	2.273E-10	0	0	0	0
Benzo(k)fluoranthene	t/d	1.8E-10	1.8E-10	0	0	0	0
Carboxylic acids	t/d	0	0	0	0	0	0
Chrysene	t/d	2.527E-10	2.527E-10	0	0	0	0
Dibenz(a,h)anthracene	t/d	1.667E-10	1.667E-10	0	0	0	0
Ethylbenzene	t/d	4.091E-07	4.091E-07	0	0	0	0
Fluoranthene	t/d	2.164E-09	2.164E-09	0	0	0	0
Fluorene	t/d	8.345E-10	8.345E-10	0	0	0	0
Formaldehyde	t/d	4.018E-05	4.018E-05	0	0	0	0
Hexane	t/d	0	0	0	0	0	0
Indeno(1,2,3-cd)pyrene	t/d	2.127E-10	2.127E-10	0	0	0	0
Naphthalene	t/d	2.036E-07	2.036E-07	0	0	0	0
Phenanthrene	t/d	6.127E-09	6.127E-09	0	0	0	0
Propylene	t/d	4.273E-05	4.273E-05	0	0	0	0
Pyrene	t/d	1.018E-09	1.018E-09	0	0	0	0
Toluene	t/d	5.364E-06	5.364E-06	0	0	0	0
Xylenes	t/d	5.018E-06	5.018E-06	0	0	0	0
Aluminum (Al)	t/d	5.477E-07	1.095E-06	0	0	0	0

Point Source (cont'd)							
Facility	**Units**	**Narrow Lake**					
Emission Source		**Slop Oil Treater Reheater (H- 5070B)**	**Process Glycol Heater**	**SRU Preheater**	**Sulphur Incinerator**	**Well Pad Turbine*106**	**Well Pad Line Heater*106**
Arsenic (As)	t/d	1.826E-08	3.651E-08	0	0	0	0
Barium (Ba)	t/d	4.779E-08	9.557E-08	0	0	0	0
Cadmium (Cd)	t/d	6.04E-09	1.208E-08	0	0	0	0
Calcium (Ca)	t/d	1.826E-06	3.651E-06	0	0	0	0
Chromium (Cr)	t/d	4.832E-09	9.664E-09	0	0	0	0
Cobalt (Co)	t/d	1.314E-07	2.628E-07	0	0	0	0
Copper (Cu)	t/d	2.282E-07	4.564E-07	0	0	0	0
Iron (Fe)	t/d	1.004E-06	2.008E-06	0	0	0	0
Lead (Pb)	t/d	1.369E-08	2.738E-08	0	0	0	0
Magnesium (Mg)	t/d	0	0	0	0	0	0
Manganese (Mn)	t/d	4.564E-08	9.128E-08	0	0	0	0
Nickel (Ni)	t/d	2.282E-07	4.564E-07	0	0	0	0
Potassium (K)	t/d	4.564E-07	9.128E-07	0	0	0	0
Silver (Ag)	t/d	0	0	0	0	0	0
Silicon (Si)	t/d	2.644E-06	5.289E-06	0	0	0	0
Strontium (Sr)	t/d	4.564E-09	9.128E-09	0	0	0	0
Titanium (Ti)	t/d	4.564E-08	9.128E-08	0	0	0	0
Vanadium (V)	t/d	9.128E-08	1.826E-07	0	0	0	0
Zinc (Zn)	t/d	3.651E-07	7.302E-07	0	0	0	0
Zirconium (Zr)	t/d	5.369E-10	1.074E-09	0	0	0	0
Molybdenum (Mo)	t/d	6.04E-11	1.208E-10	0	0	0	0
Selenium (Se)	t/d	3.221E-08	6.443E-08	0	0	0	0

Note: "0" – No emissions.

Area Source		
Facility	Units	Narrows Lake Thermal Phases 1-3
Emission Source		Plant Fugitive
Corner 1 UTM N	m	507155
Corner 1 UTM E	m	6167365
Corner 2 UTM N	m	507655
Corner 2 UTM E	m	6167365
Corner 3 UTM N	m	507655
Corner 3 UTM E	m	6166865
Corner 4 UTM N	m	507155
Corner 4 UTM E	m	6166865
Area	m^2	250000
Elevation (m)	masl	564
1,3-butadiene	t/d	1.925E-06
Acenaphthene	t/d	0
Acenaphthylene	t/d	0
Acetaldehyde	t/d	0
Acrolein	t/d	0
Aliphatic aldehydes	t/d	0.0114874
Aliphatic C_{17}-C_{34}	t/d	0.005334
Aliphatic C_5-C_8	t/d	0.0901836
Aliphatic C_9-C_{16}	t/d	0.371254
Aliphatic ketones	t/d	0.0406871
Anthracene	t/d	0
Aromatic C_{17}-C_{34}	t/d	0
Aromatic C_9-C_{16}	t/d	0.0095518
Benzaldehyde	t/d	0
Benzene	t/d	0.0071267
Benzo(a)pyrene	t/d	0
Benzo(b)fluoranthene	t/d	0
Benzo(g,h,i)perylene	t/d	0
Benzo(k)fluoranthene	t/d	0
Carboxylic acids	t/d	1.54E-06
Chrysene	t/d	0
Dibenz(a,h)anthracene	t/d	0
Ethylbenzene	t/d	0.0004289
Fluoranthene	t/d	0
Fluorene	t/d	0
Formaldehyde	t/d	0
Hexane	t/d	0.0058839
Indeno(1,2,3-cd)pyrene	t/d	0
Naphthalene	t/d	5.499E-08
Phenanthrene	t/d	0
Propylene	t/d	0
Pyrene	t/d	0
Toluene	t/d	0.0031894
Xylenes	t/d	0.0018697
Carbon disulphide	t/d	0.0030978
Hydrogen Sulphide	t/d	0.0002546
Mercaptans	t/d	0.0031971
Thiophenes	t/d	0.0042415

Note: “0” = No emissions.

2.4 Devon ARL Corp.

Table B4-11: Summary of Devon ARL Jackfish VOC, PAH and Metal Air Emissions Used for Baseline Case

Point Source								
Facility	Units	Jackfish						
Emission Source		Steam Generator 1	Steam Generator 2	Steam Generator 3	Steam Generator 4	Steam Generator 5	Steam Generator 6	Glycol Trim Heater 1
UTMmN	m	507855	507846	507838	507830	507821	507813	508036
UTMmE	m	6153524	6153515	6153507	6153498	6153490	6153481	6153691
Elevation	masl	611	611	611	611	611	611	611
Stack Height	m	28.9	28.9	28.9	28.9	28.9	28.9	6.7
Stack Diameter	m	1.83	1.83	1.83	1.83	1.83	1.83	0.71
Exit Velocity	m/s	15.5	15.5	15.5	15.5	15.5	15.5	27.7
Exit Temperature	K	443	443	443	443	443	443	399
1,3-butadiene	t/d	0	0	0	0	0	0	0
Acenaphthene	t/d	3.69E-09	3.69E-09	3.69E-09	3.69E-09	3.69E-09	3.69E-09	4.044E-10
Acenaphthylene	t/d	3.212E-08	3.212E-08	3.212E-08	3.212E-08	3.212E-08	3.212E-08	3.52E-09
Acetaldehyde	t/d	4.141E-05	4.141E-05	4.141E-05	4.141E-05	4.141E-05	4.141E-05	4.538E-06
Acrolein	t/d	4.884E-05	4.884E-05	4.884E-05	4.884E-05	4.884E-05	4.884E-05	5.353E-06
Aliphatic aldehydes	t/d	0	0	0	0	0	0	0
Aliphatic C_{17}-C_{34}	t/d	0	0	0	0	0	0	0
Aliphatic C_5-C_8	t/d	0.0053144	0.0053144	0.0053144	0.0053144	0.0053144	0.0053144	0.0005824
Aliphatic C_9-C_{16}	t/d	0.0002044	0.0002044	0.0002044	0.0002044	0.0002044	0.0002044	0.0000224
Aliphatic ketones	t/d	0	0	0	0	0	0	0
Anthracene	t/d	4.274E-09	4.274E-09	4.274E-09	4.274E-09	4.274E-09	4.274E-09	4.684E-10
Aromatic C_{17}-C_{34}	t/d	4.774E-09	4.774E-09	4.774E-09	4.774E-09	4.774E-09	4.774E-09	5.232E-10
Aromatic C_9-C_{16}	t/d	1.159E-07	1.159E-07	1.159E-07	1.159E-07	1.159E-07	1.159E-07	1.27E-08
Benzaldehyde	t/d	4.353E-05	4.353E-05	4.353E-05	4.353E-05	4.353E-05	4.353E-05	4.771E-06
Benzene	t/d	2.973E-05	2.973E-05	2.973E-05	2.973E-05	2.973E-05	2.973E-05	3.258E-06
Benzo(a)pyrene	t/d	2.601E-09	2.601E-09	2.601E-09	2.601E-09	2.601E-09	2.601E-09	2.851E-10
Benzo(b)fluoranthene	t/d	3.026E-09	3.026E-09	3.026E-09	3.026E-09	3.026E-09	3.026E-09	3.316E-10
Benzo(g,h,i)perylene	t/d	3.318E-09	3.318E-09	3.318E-09	3.318E-09	3.318E-09	3.318E-09	3.636E-10
Benzo(k)fluoranthene	t/d	2.628E-09	2.628E-09	2.628E-09	2.628E-09	2.628E-09	2.628E-09	2.88E-10
Carboxylic acids	t/d	0	0	0	0	0	0	0
Chrysene	t/d	3.69E-09	3.69E-09	3.69E-09	3.69E-09	3.69E-09	3.69E-09	4.044E-10
Dibenz(a,h)anthracene	t/d	2.434E-09	2.434E-09	2.434E-09	2.434E-09	2.434E-09	2.434E-09	2.668E-10
Ethylbenzene	t/d	5.973E-06	5.973E-06	5.973E-06	5.973E-06	5.973E-06	5.973E-06	6.545E-07
Fluoranthene	t/d	3.159E-08	3.159E-08	3.159E-08	3.159E-08	3.159E-08	3.159E-08	3.462E-09
Fluorene	t/d	1.218E-08	1.218E-08	1.218E-08	1.218E-08	1.218E-08	1.218E-08	1.335E-09
Formaldehyde	t/d	0.0005867	0.0005867	0.0005867	0.0005867	0.0005867	0.0005867	6.429E-05
Hexane	t/d	0	0	0	0	0	0	0
Indeno(1,2,3-cd)pyrene	t/d	3.106E-09	3.106E-09	3.106E-09	3.106E-09	3.106E-09	3.106E-09	3.404E-10
Naphthalene	t/d	2.973E-06	2.973E-06	2.973E-06	2.973E-06	2.973E-06	2.973E-06	3.258E-07
Phenanthrene	t/d	8.946E-08	8.946E-08	8.946E-08	8.946E-08	8.946E-08	8.946E-08	9.804E-09
Propylene	t/d	0.0006238	0.0006238	0.0006238	0.0006238	0.0006238	0.0006238	6.836E-05

Point Source								
Facility	**Units**	**Jackfish**						
Emission Source		**Steam Generator 1**	**Steam Generator 2**	**Steam Generator 3**	**Steam Generator 4**	**Steam Generator 5**	**Steam Generator 6**	**Glycol Trim Heater 1**
Pyrene	t/d	1.487E-08	1.487E-08	1.487E-08	1.487E-08	1.487E-08	1.487E-08	1.629E-09
Toluene	t/d	7.831E-05	7.831E-05	7.831E-05	7.831E-05	7.831E-05	7.831E-05	8.582E-06
Xylenes	t/d	7.327E-05	7.327E-05	7.327E-05	7.327E-05	7.327E-05	7.327E-05	8.029E-06
Aluminum (Al)	t/d	1.106E-05	1.106E-05	1.106E-05	1.106E-05	1.106E-05	1.106E-05	1.205E-06
Arsenic (As)	t/d	3.688E-07	3.688E-07	3.688E-07	3.688E-07	3.688E-07	3.688E-07	4.016E-08
Barium (Ba)	t/d	9.653E-07	9.653E-07	9.653E-07	9.653E-07	9.653E-07	9.653E-07	1.051E-07
Cadmium (Cd)	t/d	1.22E-07	1.22E-07	1.22E-07	1.22E-07	1.22E-07	1.22E-07	1.329E-08
Calcium (Ca)	t/d	3.688E-05	3.688E-05	3.688E-05	3.688E-05	3.688E-05	3.688E-05	4.016E-06
Chromium (Cr)	t/d	9.761E-08	9.761E-08	9.761E-08	9.761E-08	9.761E-08	9.761E-08	1.063E-08
Cobalt (Co)	t/d	2.654E-06	2.654E-06	2.654E-06	2.654E-06	2.654E-06	2.654E-06	2.891E-07
Copper (Cu)	t/d	4.609E-06	4.609E-06	4.609E-06	4.609E-06	4.609E-06	4.609E-06	5.02E-07
Iron (Fe)	t/d	2.028E-05	2.028E-05	2.028E-05	2.028E-05	2.028E-05	2.028E-05	2.209E-06
Lead (Pb)	t/d	2.766E-07	2.766E-07	2.766E-07	2.766E-07	2.766E-07	2.766E-07	3.012E-08
Magnesium (Mg)	t/d	0	0	0	0	0	0	0
Manganese (Mn)	t/d	9.219E-07	9.219E-07	9.219E-07	9.219E-07	9.219E-07	9.219E-07	1.004E-07
Nickel (Ni)	t/d	4.609E-06	4.609E-06	4.609E-06	4.609E-06	4.609E-06	4.609E-06	5.02E-07
Potassium (K)	t/d	9.219E-06	9.219E-06	9.219E-06	9.219E-06	9.219E-06	9.219E-06	1.004E-06
Silver (Ag)	t/d	0	0	0	0	0	0	0
Silicon (Si)	t/d	5.341E-05	5.341E-05	5.341E-05	5.341E-05	5.341E-05	5.341E-05	5.817E-06
Strontium (Sr)	t/d	9.219E-08	9.219E-08	9.219E-08	9.219E-08	9.219E-08	9.219E-08	1.004E-08
Titanium (Ti)	t/d	9.219E-07	9.219E-07	9.219E-07	9.219E-07	9.219E-07	9.219E-07	1.004E-07
Vanadium (V)	t/d	1.844E-06	1.844E-06	1.844E-06	1.844E-06	1.844E-06	1.844E-06	2.008E-07
Zinc (Zn)	t/d	7.375E-06	7.375E-06	7.375E-06	7.375E-06	7.375E-06	7.375E-06	8.032E-07
Zirconium (Zr)	t/d	1.085E-08	1.085E-08	1.085E-08	1.085E-08	1.085E-08	1.085E-08	1.181E-09
Molybdenum (Mo)	t/d	1.22E-09	1.22E-09	1.22E-09	1.22E-09	1.22E-09	1.22E-09	1.329E-10
Selenium (Se)	t/d	6.507E-07	6.507E-07	6.507E-07	6.507E-07	6.507E-07	6.507E-07	7.087E-08

Point Source (cont'd)								
Facility	**Units**	**Jackfish 1**				**Jackfish 2**		
Emission Source		**Glycol Trim Heater 2**	**Flash Treater**	**Flash Treater**	**Continuous Flare**	**Steam Generator 1**	**Steam Generator 2**	**Steam Generator 3**
UTMmN	m	508028	508008	508009	508148	500046	500039	500032
UTMmE	m	6153684	6153514	6153512	6153476	6153269	6153259	6153249
Elevation	masl	611	610	610	610	652	652	651
Stack Height	m	6.7	6	6	40.3	28.9	28.9	28.9
Stack Diameter	m	0.71	0.15	0.15	12.38	1.83	1.83	1.83
Exit Velocity	m/s	27.7	23.2	23.2	0	15.5	15.5	15.5
Exit Temperature	K	399	443	443	2777	443	443	443
1,3-butadiene	t/d	0	0	0	0	0	0	0
Acenaphthene	t/d	4.044E-10	2.527E-11	2.527E-11	0	3.69E-09	3.69E-09	3.69E-09
Acenaphthylene	t/d	3.52E-09	2.2E-10	2.2E-10	0	3.212E-08	3.212E-08	3.212E-08
Acetaldehyde	t/d	4.538E-06	2.836E-07	2.836E-07	7.217E-07	4.141E-05	4.141E-05	4.141E-05
Acrolein	t/d	5.353E-06	3.345E-07	3.345E-07	2.361E-07	4.884E-05	4.884E-05	4.884E-05
Aliphatic aldehydes	t/d	0	0	0	0	0	0	0
Aliphatic C_{17}-C_{34}	t/d	0	0	0	0	0	0	0
Aliphatic C_5-C_8	t/d	0.0005824	0.0000364	0.0000364	0.0001456	0.0053144	0.0053144	0.0053144
Aliphatic C_9-C_{16}	t/d	0.0000224	0.0000014	0.0000014	0.0000056	0.0002044	0.0002044	0.0002044
Aliphatic ketones	t/d	0	0	0	0	0	0	0
Anthracene	t/d	4.684E-10	2.927E-11	2.927E-11	0	4.274E-09	4.274E-09	4.274E-09
Aromatic C_{17}-C_{34}	t/d	5.232E-10	3.27E-11	3.27E-11	3.856E-10	4.774E-09	4.774E-09	4.774E-09
Aromatic C_9-C_{16}	t/d	1.27E-08	7.94E-10	7.94E-10	2.92E-07	1.159E-07	1.159E-07	1.159E-07
Benzaldehyde	t/d	4.771E-06	2.982E-07	2.982E-07	0	4.353E-05	4.353E-05	4.353E-05
Benzene	t/d	3.258E-06	2.036E-07	2.036E-07	5.119E-07	2.973E-05	2.973E-05	2.973E-05
Benzo(a)pyrene	t/d	2.851E-10	1.782E-11	1.782E-11	5.902E-08	2.601E-09	2.601E-09	2.601E-09
Benzo(b)fluoranthene	t/d	3.316E-10	2.073E-11	2.073E-11	5.902E-08	3.026E-09	3.026E-09	3.026E-09
Benzo(g,h,i)perylene	t/d	3.636E-10	2.273E-11	2.273E-11	5.902E-08	3.318E-09	3.318E-09	3.318E-09
Benzo(k)fluoranthene	t/d	2.88E-10	1.8E-11	1.8E-11	5.902E-08	2.628E-09	2.628E-09	2.628E-09
Carboxylic acids	t/d	0	0	0	0	0	0	0
Chrysene	t/d	4.044E-10	2.527E-11	2.527E-11	5.93E-08	3.69E-09	3.69E-09	3.69E-09
Dibenz(a,h)anthracene	t/d	2.668E-10	1.667E-11	1.667E-11	5.902E-08	2.434E-09	2.434E-09	2.434E-09
Ethylbenzene	t/d	6.545E-07	4.091E-08	4.091E-08	0	5.973E-06	5.973E-06	5.973E-06
Fluoranthene	t/d	3.462E-09	2.164E-10	2.164E-10	6.35E-08	3.159E-08	3.159E-08	3.159E-08
Fluorene	t/d	1.335E-09	8.345E-11	8.345E-11	0	1.218E-08	1.218E-08	1.218E-08
Formaldehyde	t/d	6.429E-05	4.018E-06	4.018E-06	8.252E-05	0.0005867	0.0005867	0.0005867
Hexane	t/d	0	0	0	0	0	0	0
Indeno(1,2,3-cd)pyrene	t/d	3.404E-10	2.127E-11	2.127E-11	5.902E-08	3.106E-09	3.106E-09	3.106E-09
Naphthalene	t/d	3.258E-07	2.036E-08	2.036E-08	3.636E-05	2.973E-06	2.973E-06	2.973E-06
Phenanthrene	t/d	9.804E-09	6.127E-10	6.127E-10	7.832E-08	8.946E-08	8.946E-08	8.946E-08
Propylene	t/d	6.836E-05	4.273E-06	4.273E-06	0	0.0006238	0.0006238	0.0006238
Pyrene	t/d	1.629E-09	1.018E-10	1.018E-10	6.238E-08	1.487E-08	1.487E-08	1.487E-08
Toluene	t/d	8.582E-06	5.364E-07	5.364E-07	4.923E-05	7.831E-05	7.831E-05	7.831E-05
Xylenes	t/d	8.029E-06	5.018E-07	5.018E-07	1.55E-06	7.327E-05	7.327E-05	7.327E-05
Aluminum (Al)	t/d	1.205E-06	1.095E-07	1.095E-07	0	1.106E-05	1.106E-05	1.106E-05

Point Source (cont'd)								
Facility	**Units**	**Jackfish 1**				**Jackfish 2**		
Emission Source		**Glycol Trim Heater 2**	**Flash Treater**	**Flash Treater**	**Continuous Flare**	**Steam Generator 1**	**Steam Generator 2**	**Steam Generator 3**
Arsenic (As)	t/d	4.016E-08	3.651E-09	3.651E-09	0	3.688E-07	3.688E-07	3.688E-07
Barium (Ba)	t/d	1.051E-07	9.557E-09	9.557E-09	0	9.653E-07	9.653E-07	9.653E-07
Cadmium (Cd)	t/d	1.329E-08	1.208E-09	1.208E-09	0	1.22E-07	1.22E-07	1.22E-07
Calcium (Ca)	t/d	4.016E-06	3.651E-07	3.651E-07	0	3.688E-05	3.688E-05	3.688E-05
Chromium (Cr)	t/d	1.063E-08	9.664E-10	9.664E-10	0	9.761E-08	9.761E-08	9.761E-08
Cobalt (Co)	t/d	2.891E-07	2.628E-08	2.628E-08	0	2.654E-06	2.654E-06	2.654E-06
Copper (Cu)	t/d	5.02E-07	4.564E-08	4.564E-08	0	4.609E-06	4.609E-06	4.609E-06
Iron (Fe)	t/d	2.209E-06	2.008E-07	2.008E-07	0	2.028E-05	2.028E-05	2.028E-05
Lead (Pb)	t/d	3.012E-08	2.738E-09	2.738E-09	0	2.766E-07	2.766E-07	2.766E-07
Magnesium (Mg)	t/d	0	0	0	0	0	0	0
Manganese (Mn)	t/d	1.004E-07	9.128E-09	9.128E-09	0	9.219E-07	9.219E-07	9.219E-07
Nickel (Ni)	t/d	5.02E-07	4.564E-08	4.564E-08	0	4.609E-06	4.609E-06	4.609E-06
Potassium (K)	t/d	1.004E-06	9.128E-08	9.128E-08	0	9.219E-06	9.219E-06	9.219E-06
Silver (Ag)	t/d	0	0	0	0	0	0	0
Silicon (Si)	t/d	5.817E-06	5.289E-07	5.289E-07	0	5.341E-05	5.341E-05	5.341E-05
Strontium (Sr)	t/d	1.004E-08	9.128E-10	9.128E-10	0	9.219E-08	9.219E-08	9.219E-08
Titanium (Ti)	t/d	1.004E-07	9.128E-09	9.128E-09	0	9.219E-07	9.219E-07	9.219E-07
Vanadium (V)	t/d	2.008E-07	1.826E-08	1.826E-08	0	1.844E-06	1.844E-06	1.844E-06
Zinc (Zn)	t/d	8.032E-07	7.302E-08	7.302E-08	0	7.375E-06	7.375E-06	7.375E-06
Zirconium (Zr)	t/d	1.181E-09	1.074E-10	1.074E-10	0	1.085E-08	1.085E-08	1.085E-08
Molybdenum (Mo)	t/d	1.329E-10	1.208E-11	1.208E-11	0	1.22E-09	1.22E-09	1.22E-09
Selenium (Se)	t/d	7.087E-08	6.443E-09	6.443E-09	0	6.507E-07	6.507E-07	6.507E-07

Point Source (cont'd)								
Facility	**Units**	**Jackfish 2**						
Emission Source		**Steam Generator 4**	**Steam Generator 5**	**Steam Generator 6**	**Glycol Trim Heater 1**	**Glycol Trim Heater 2**	**Flash Treater 1**	**Flash Treater 2**
UTMmN	m	500026	500019	500012	500194	500189	500199	500200
UTMmE	m	6153239	6153229	6153219	6153465	6153457	6153286	6153285
Elevation	masl	651	651	651	653	653	652	652
Stack Height	m	28.9	28.9	28.9	6.7	6.7	6	6
Stack Diameter	m	1.83	1.83	1.83	0.71	0.71	0.15	0.15
Exit Velocity	m/s	15.5	15.5	15.5	27.7	27.7	23.2	23.2
Exit Temperature	K	443	443	443	399	399	443	443
1,3-butadiene	t/d	0	0	0	0	0	0	0
Acenaphthene	t/d	3.69E-09	3.69E-09	3.69E-09	4.044E-10	4.044E-10	2.527E-11	2.527E-11
Acenaphthylene	t/d	3.212E-08	3.212E-08	3.212E-08	3.52E-09	3.52E-09	2.2E-10	2.2E-10
Acetaldehyde	t/d	4.141E-05	4.141E-05	4.141E-05	4.538E-06	4.538E-06	2.836E-07	2.836E-07
Acrolein	t/d	4.884E-05	4.884E-05	4.884E-05	5.353E-06	5.353E-06	3.345E-07	3.345E-07
Aliphatic aldehydes	t/d	0	0	0	0	0	0	0
Aliphatic C_{17}-C_{34}	t/d	0	0	0	0	0	0	0
Aliphatic C_5-C_8	t/d	0.0053144	0.0053144	0.0053144	0.0005824	0.0005824	0.0000364	0.0000364
Aliphatic C_9-C_{16}	t/d	0.0002044	0.0002044	0.0002044	0.0000224	0.0000224	0.0000014	0.0000014
Aliphatic ketones	t/d	0	0	0	0	0	0	0
Anthracene	t/d	4.274E-09	4.274E-09	4.274E-09	4.684E-10	4.684E-10	2.927E-11	2.927E-11
Aromatic C_{17}-C_{34}	t/d	4.774E-09	4.774E-09	4.774E-09	5.232E-10	5.232E-10	3.27E-11	3.27E-11
Aromatic C_9-C_{16}	t/d	1.159E-07	1.159E-07	1.159E-07	1.27E-08	1.27E-08	7.94E-10	7.94E-10
Benzaldehyde	t/d	4.353E-05	4.353E-05	4.353E-05	4.771E-06	4.771E-06	2.982E-07	2.982E-07
Benzene	t/d	2.973E-05	2.973E-05	2.973E-05	3.258E-06	3.258E-06	2.036E-07	2.036E-07
Benzo(a)pyrene	t/d	2.601E-09	2.601E-09	2.601E-09	2.851E-10	2.851E-10	1.782E-11	1.782E-11
Benzo(b)fluoranthene	t/d	3.026E-09	3.026E-09	3.026E-09	3.316E-10	3.316E-10	2.073E-11	2.073E-11
Benzo(g,h,i)perylene	t/d	3.318E-09	3.318E-09	3.318E-09	3.636E-10	3.636E-10	2.273E-11	2.273E-11
Benzo(k)fluoranthene	t/d	2.628E-09	2.628E-09	2.628E-09	2.88E-10	2.88E-10	1.8E-11	1.8E-11
Carboxylic acids	t/d	0	0	0	0	0	0	0
Chrysene	t/d	3.69E-09	3.69E-09	3.69E-09	4.044E-10	4.044E-10	2.527E-11	2.527E-11
Dibenz(a,h)anthracene	t/d	2.434E-09	2.434E-09	2.434E-09	2.668E-10	2.668E-10	1.667E-11	1.667E-11
Ethylbenzene	t/d	5.973E-06	5.973E-06	5.973E-06	6.545E-07	6.545E-07	4.091E-08	4.091E-08
Fluoranthene	t/d	3.159E-08	3.159E-08	3.159E-08	3.462E-09	3.462E-09	2.164E-10	2.164E-10
Fluorene	t/d	1.218E-08	1.218E-08	1.218E-08	1.335E-09	1.335E-09	8.345E-11	8.345E-11
Formaldehyde	t/d	0.0005867	0.0005867	0.0005867	6.429E-05	6.429E-05	4.018E-06	4.018E-06
Hexane	t/d	0	0	0	0	0	0	0
Indeno(1,2,3-cd)pyrene	t/d	3.106E-09	3.106E-09	3.106E-09	3.404E-10	3.404E-10	2.127E-11	2.127E-11
Naphthalene	t/d	2.973E-06	2.973E-06	2.973E-06	3.258E-07	3.258E-07	2.036E-08	2.036E-08
Phenanthrene	t/d	8.946E-08	8.946E-08	8.946E-08	9.804E-09	9.804E-09	6.127E-10	6.127E-10
Propylene	t/d	0.0006238	0.0006238	0.0006238	6.836E-05	6.836E-05	4.273E-06	4.273E-06
Pyrene	t/d	1.487E-08	1.487E-08	1.487E-08	1.629E-09	1.629E-09	1.018E-10	1.018E-10
Toluene	t/d	7.831E-05	7.831E-05	7.831E-05	8.582E-06	8.582E-06	5.364E-07	5.364E-07
Xylenes	t/d	7.327E-05	7.327E-05	7.327E-05	8.029E-06	8.029E-06	5.018E-07	5.018E-07
Aluminum (Al)	t/d	1.106E-05	1.106E-05	1.106E-05	1.205E-06	1.205E-06	1.095E-07	1.095E-07
Arsenic (As)	t/d	3.688E-07	3.688E-07	3.688E-07	4.016E-08	4.016E-08	3.651E-09	3.651E-09

Point Source (cont'd)								
Facility	**Units**	**Jackfish 2**						
Emission Source		**Steam Generator 4**	**Steam Generator 5**	**Steam Generator 6**	**Glycol Trim Heater 1**	**Glycol Trim Heater 2**	**Flash Treater 1**	**Flash Treater 2**
Barium (Ba)	t/d	9.653E-07	9.653E-07	9.653E-07	1.051E-07	1.051E-07	9.557E-09	9.557E-09
Cadmium (Cd)	t/d	1.22E-07	1.22E-07	1.22E-07	1.329E-08	1.329E-08	1.208E-09	1.208E-09
Calcium (Ca)	t/d	3.688E-05	3.688E-05	3.688E-05	4.016E-06	4.016E-06	3.651E-07	3.651E-07
Chromium (Cr)	t/d	9.761E-08	9.761E-08	9.761E-08	1.063E-08	1.063E-08	9.664E-10	9.664E-10
Cobalt (Co)	t/d	2.654E-06	2.654E-06	2.654E-06	2.891E-07	2.891E-07	2.628E-08	2.628E-08
Copper (Cu)	t/d	4.609E-06	4.609E-06	4.609E-06	5.02E-07	5.02E-07	4.564E-08	4.564E-08
Iron (Fe)	t/d	2.028E-05	2.028E-05	2.028E-05	2.209E-06	2.209E-06	2.008E-07	2.008E-07
Lead (Pb)	t/d	2.766E-07	2.766E-07	2.766E-07	3.012E-08	3.012E-08	2.738E-09	2.738E-09
Magnesium (Mg)	t/d	0	0	0	0	0	0	0
Manganese (Mn)	t/d	9.219E-07	9.219E-07	9.219E-07	1.004E-07	1.004E-07	9.128E-09	9.128E-09
Nickel (Ni)	t/d	4.609E-06	4.609E-06	4.609E-06	5.02E-07	5.02E-07	4.564E-08	4.564E-08
Potassium (K)	t/d	9.219E-06	9.219E-06	9.219E-06	1.004E-06	1.004E-06	9.128E-08	9.128E-08
Silver (Ag)	t/d	0	0	0	0	0	0	0
Silicon (Si)	t/d	5.341E-05	5.341E-05	5.341E-05	5.817E-06	5.817E-06	5.289E-07	5.289E-07
Strontium (Sr)	t/d	9.219E-08	9.219E-08	9.219E-08	1.004E-08	1.004E-08	9.128E-10	9.128E-10
Titanium (Ti)	t/d	9.219E-07	9.219E-07	9.219E-07	1.004E-07	1.004E-07	9.128E-09	9.128E-09
Vanadium (V)	t/d	1.844E-06	1.844E-06	1.844E-06	2.008E-07	2.008E-07	1.826E-08	1.826E-08
Zinc (Zn)	t/d	7.375E-06	7.375E-06	7.375E-06	8.032E-07	8.032E-07	7.302E-08	7.302E-08
Zirconium (Zr)	t/d	1.085E-08	1.085E-08	1.085E-08	1.181E-09	1.181E-09	1.074E-10	1.074E-10
Molybdenum (Mo)	t/d	1.22E-09	1.22E-09	1.22E-09	1.329E-10	1.329E-10	1.208E-11	1.208E-11
Selenium (Se)	t/d	6.507E-07	6.507E-07	6.507E-07	7.087E-08	7.087E-08	6.443E-09	6.443E-09

Point Source (cont'd)								
Facility	**Units**	**Jackfish 2**	**Jackfish 3**					
Emission Source		**Continuous Flare**	**Steam Generator 1**	**Steam Generator 2**	**Steam Generator 3**	**Steam Generator 4**	**Steam Generator 5**
UTMmN	m	500343	503235	503247	503259	503271	503283
UTMmE	m	6153272	6151932	6151932	6151932	6151932	6151932
Elevation	masl	652	665	665	639	639	639
Stack Height	m	40	28.9	28.9	28.9	28.9	28.9
Stack Diameter	m	12.39	1.83	1.83	1.83	1.83	1.83
Exit Velocity	m/s	0	15.5	15.5	15.5	15.5	15.5
Exit Temperature	K	2777	443	443	443	443	443
1,3-butadiene	t/d	0	0	0	0	0	0
Acenaphthene	t/d	0	3.69E-09	3.69E-09	3.69E-09	3.69E-09	3.69E-09
Acenaphthylene	t/d	0	3.212E-08	3.212E-08	3.212E-08	3.212E-08	3.212E-08
Acetaldehyde	t/d	7.217E-07	4.141E-05	4.141E-05	4.141E-05	4.141E-05	4.141E-05
Acrolein	t/d	2.361E-07	4.884E-05	4.884E-05	4.884E-05	4.884E-05	4.884E-05
Aliphatic aldehydes	t/d	0	0	0	0	0	0
Aliphatic C_{17}-C_{34}	t/d	0	0	0	0	0	0
Aliphatic C_5-C_8	t/d	0.0001456	0.0053144	0.0053144	0.0053144	0.0053144	0.0053144
Aliphatic C_9-C_{16}	t/d	0.0000056	0.0002044	0.0002044	0.0002044	0.0002044	0.0002044
Aliphatic ketones	t/d	0	0	0	0	0	0
Anthracene	t/d	0	4.274E-09	4.274E-09	4.274E-09	4.274E-09	4.274E-09
Aromatic C_{17}-C_{34}	t/d	3.856E-10	4.774E-09	4.774E-09	4.774E-09	4.774E-09	4.774E-09
Aromatic C_9-C_{16}	t/d	2.92E-07	1.159E-07	1.159E-07	1.159E-07	1.159E-07	1.159E-07
Benzaldehyde	t/d	0	4.353E-05	4.353E-05	4.353E-05	4.353E-05	4.353E-05
Benzene	t/d	5.119E-07	2.973E-05	2.973E-05	2.973E-05	2.973E-05	2.973E-05
Benzo(a)pyrene	t/d	5.902E-08	2.601E-09	2.601E-09	2.601E-09	2.601E-09	2.601E-09
Benzo(b)fluoranthene	t/d	5.902E-08	3.026E-09	3.026E-09	3.026E-09	3.026E-09	3.026E-09
Benzo(g,h,i)perylene	t/d	5.902E-08	3.318E-09	3.318E-09	3.318E-09	3.318E-09	3.318E-09
Benzo(k)fluoranthene	t/d	5.902E-08	2.628E-09	2.628E-09	2.628E-09	2.628E-09	2.628E-09
Carboxylic acids	t/d	0	0	0	0	0	0
Chrysene	t/d	5.93E-08	3.69E-09	3.69E-09	3.69E-09	3.69E-09	3.69E-09
Dibenz(a,h)anthracene	t/d	5.902E-08	2.434E-09	2.434E-09	2.434E-09	2.434E-09	2.434E-09
Ethylbenzene	t/d	0	5.973E-06	5.973E-06	5.973E-06	5.973E-06	5.973E-06
Fluoranthene	t/d	6.35E-08	3.159E-08	3.159E-08	3.159E-08	3.159E-08	3.159E-08
Fluorene	t/d	0	1.218E-08	1.218E-08	1.218E-08	1.218E-08	1.218E-08
Formaldehyde	t/d	8.252E-05	0.0005867	0.0005867	0.0005867	0.0005867	0.0005867
Hexane	t/d	0	0	0	0	0	0
Indeno(1,2,3-cd)pyrene	t/d	5.902E-08	3.106E-09	3.106E-09	3.106E-09	3.106E-09	3.106E-09
Naphthalene	t/d	3.636E-05	2.973E-06	2.973E-06	2.973E-06	2.973E-06	2.973E-06
Phenanthrene	t/d	7.832E-08	8.946E-08	8.946E-08	8.946E-08	8.946E-08	8.946E-08
Propylene	t/d	0	0.0006238	0.0006238	0.0006238	0.0006238	0.0006238
Pyrene	t/d	6.238E-08	1.487E-08	1.487E-08	1.487E-08	1.487E-08	1.487E-08
Toluene	t/d	4.923E-05	7.831E-05	7.831E-05	7.831E-05	7.831E-05	7.831E-05
Xylenes	t/d	1.55E-06	7.327E-05	7.327E-05	7.327E-05	7.327E-05	7.327E-05
Aluminum (Al)	t/d	0	1.106E-05	1.106E-05	1.106E-05	1.106E-05	1.106E-05
Arsenic (As)	t/d	0	3.688E-07	3.688E-07	3.688E-07	3.688E-07	3.688E-07

Point Source (cont'd)								
Facility	**Units**	**Jackfish 2**	**Jackfish 3**					
Emission Source		**Continuous Flare**	**Steam Generator 1**	**Steam Generator 2**	**Steam Generator 3**	**Steam Generator 4**	**Steam Generator 5**
Barium (Ba)	t/d	0	9.653E-07	9.653E-07	9.653E-07	9.653E-07	9.653E-07
Cadmium (Cd)	t/d	0	1.22E-07	1.22E-07	1.22E-07	1.22E-07	1.22E-07
Calcium (Ca)	t/d	0	3.688E-05	3.688E-05	3.688E-05	3.688E-05	3.688E-05
Chromium (Cr)	t/d	0	9.761E-08	9.761E-08	9.761E-08	9.761E-08	9.761E-08
Cobalt (Co)	t/d	0	2.654E-06	2.654E-06	2.654E-06	2.654E-06	2.654E-06
Copper (Cu)	t/d	0	4.609E-06	4.609E-06	4.609E-06	4.609E-06	4.609E-06
Iron (Fe)	t/d	0	2.028E-05	2.028E-05	2.028E-05	2.028E-05	2.028E-05
Lead (Pb)	t/d	0	2.766E-07	2.766E-07	2.766E-07	2.766E-07	2.766E-07
Magnesium (Mg)	t/d	0	0	0	0	0	0
Manganese (Mn)	t/d	0	9.219E-07	9.219E-07	9.219E-07	9.219E-07	9.219E-07
Nickel (Ni)	t/d	0	4.609E-06	4.609E-06	4.609E-06	4.609E-06	4.609E-06
Potassium (K)	t/d	0	9.219E-06	9.219E-06	9.219E-06	9.219E-06	9.219E-06
Silver (Ag)	t/d	0	0	0	0	0	0
Silicon (Si)	t/d	0	5.341E-05	5.341E-05	5.341E-05	5.341E-05	5.341E-05
Strontium (Sr)	t/d	0	9.219E-08	9.219E-08	9.219E-08	9.219E-08	9.219E-08
Titanium (Ti)	t/d	0	9.219E-07	9.219E-07	9.219E-07	9.219E-07	9.219E-07
Vanadium (V)	t/d	0	1.844E-06	1.844E-06	1.844E-06	1.844E-06	1.844E-06
Zinc (Zn)	t/d	0	7.375E-06	7.375E-06	7.375E-06	7.375E-06	7.375E-06
Zirconium (Zr)	t/d	0	1.085E-08	1.085E-08	1.085E-08	1.085E-08	1.085E-08
Molybdenum (Mo)	t/d	0	1.22E-09	1.22E-09	1.22E-09	1.22E-09	1.22E-09
Selenium (Se)	t/d	0	6.507E-07	6.507E-07	6.507E-07	6.507E-07	6.507E-07

Point Source (cont'd)							
Facility	**Units**	**Jackfish 3**					
Emission Source		**Steam Generator 6**	**Glycol Trim Heater**	**Glycol Trim Heater**	**Flash Treater**	**Flash Treater**	**Continuous Flare**
UTMmN	m	503295	502989	502999	503133	503133	503062
UTMmE	m	6151932	6151940	6151940	6152050	6152048	6152174
Elevation	masl	639	664	664	664	664	664
Stack Height	m	28.9	6.7	6.7	6	6	40
Stack Diameter	m	1.83	0.71	0.71	0.15	0.15	12.39
Exit Velocity	m/s	15.5	27.7	27.7	23.2	23.2	0
Exit Temperature	K	443	399	399	443	443	2777
1,3-butadiene	t/d	0	0	0	0	0	0
Acenaphthene	t/d	3.69E-09	4.044E-10	4.044E-10	2.527E-11	2.527E-11	0
Acenaphthylene	t/d	3.212E-08	3.52E-09	3.52E-09	2.2E-10	2.2E-10	0
Acetaldehyde	t/d	4.141E-05	4.538E-06	4.538E-06	2.836E-07	2.836E-07	7.217E-07
Acrolein	t/d	4.884E-05	5.353E-06	5.353E-06	3.345E-07	3.345E-07	2.361E-07
Aliphatic aldehydes	t/d	0	0	0	0	0	0
Aliphatic C_{17}-C_{34}	t/d	0	0	0	0	0	0
Aliphatic C_5-C_8	t/d	0.0053144	0.0005824	0.0005824	0.0000364	0.0000364	0.0001456
Aliphatic C_9-C_{16}	t/d	0.0002044	0.0000224	0.0000224	0.0000014	0.0000014	0.0000056
Aliphatic ketones	t/d	0	0	0	0	0	0
Anthracene	t/d	4.274E-09	4.684E-10	4.684E-10	2.927E-11	2.927E-11	0
Aromatic C_{17}-C_{34}	t/d	4.774E-09	5.232E-10	5.232E-10	3.27E-11	3.27E-11	3.856E-10
Aromatic C_9-C_{16}	t/d	1.159E-07	1.27E-08	1.27E-08	7.94E-10	7.94E-10	2.92E-07
Benzaldehyde	t/d	4.353E-05	4.771E-06	4.771E-06	2.982E-07	2.982E-07	0
Benzene	t/d	2.973E-05	3.258E-06	3.258E-06	2.036E-07	2.036E-07	5.119E-07
Benzo(a)pyrene	t/d	2.601E-09	2.851E-10	2.851E-10	1.782E-11	1.782E-11	5.902E-08
Benzo(b)fluoranthene	t/d	3.026E-09	3.316E-10	3.316E-10	2.073E-11	2.073E-11	5.902E-08
Benzo(g,h,i)perylene	t/d	3.318E-09	3.636E-10	3.636E-10	2.273E-11	2.273E-11	5.902E-08
Benzo(k)fluoranthene	t/d	2.628E-09	2.88E-10	2.88E-10	1.8E-11	1.8E-11	5.902E-08
Carboxylic acids	t/d	0	0	0	0	0	0
Chrysene	t/d	3.69E-09	4.044E-10	4.044E-10	2.527E-11	2.527E-11	5.93E-08
Dibenz(a,h)anthracene	t/d	2.434E-09	2.668E-10	2.668E-10	1.667E-11	1.667E-11	5.902E-08
Ethylbenzene	t/d	5.973E-06	6.545E-07	6.545E-07	4.091E-08	4.091E-08	0
Fluoranthene	t/d	3.159E-08	3.462E-09	3.462E-09	2.164E-10	2.164E-10	6.35E-08
Fluorene	t/d	1.218E-08	1.335E-09	1.335E-09	8.345E-11	8.345E-11	0
Formaldehyde	t/d	0.0005867	6.429E-05	6.429E-05	4.018E-06	4.018E-06	8.252E-05
Hexane	t/d	0	0	0	0	0	0
Indeno(1,2,3-cd)pyrene	t/d	3.106E-09	3.404E-10	3.404E-10	2.127E-11	2.127E-11	5.902E-08
Naphthalene	t/d	2.973E-06	3.258E-07	3.258E-07	2.036E-08	2.036E-08	3.636E-05
Phenanthrene	t/d	8.946E-08	9.804E-09	9.804E-09	6.127E-10	6.127E-10	7.832E-08
Propylene	t/d	0.0006238	6.836E-05	6.836E-05	4.273E-06	4.273E-06	0
Pyrene	t/d	1.487E-08	1.629E-09	1.629E-09	1.018E-10	1.018E-10	6.238E-08
Toluene	t/d	7.831E-05	8.582E-06	8.582E-06	5.364E-07	5.364E-07	4.923E-05
Xylenes	t/d	7.327E-05	8.029E-06	8.029E-06	5.018E-07	5.018E-07	1.55E-06
Aluminum (Al)	t/d	1.106E-05	1.205E-06	1.205E-06	1.095E-07	1.095E-07	0
Arsenic (As)	t/d	3.688E-07	4.016E-08	4.016E-08	3.651E-09	3.651E-09	0

Point Source (cont'd)							
Facility	**Units**	**Jackfish 3**					
Emission Source		**Steam Generator 6**	**Glycol Trim Heater**	**Glycol Trim Heater**	**Flash Treater**	**Flash Treater**	**Continuous Flare**
Barium (Ba)	t/d	9.653E-07	1.051E-07	1.051E-07	9.557E-09	9.557E-09	0
Cadmium (Cd)	t/d	1.22E-07	1.329E-08	1.329E-08	1.208E-09	1.208E-09	0
Calcium (Ca)	t/d	3.688E-05	4.016E-06	4.016E-06	3.651E-07	3.651E-07	0
Chromium (Cr)	t/d	9.761E-08	1.063E-08	1.063E-08	9.664E-10	9.664E-10	0
Cobalt (Co)	t/d	2.654E-06	2.891E-07	2.891E-07	2.628E-08	2.628E-08	0
Copper (Cu)	t/d	4.609E-06	5.02E-07	5.02E-07	4.564E-08	4.564E-08	0
Iron (Fe)	t/d	2.028E-05	2.209E-06	2.209E-06	2.008E-07	2.008E-07	0
Lead (Pb)	t/d	2.766E-07	3.012E-08	3.012E-08	2.738E-09	2.738E-09	0
Magnesium (Mg)	t/d	0	0	0	0	0	0
Manganese (Mn)	t/d	9.219E-07	1.004E-07	1.004E-07	9.128E-09	9.128E-09	0
Nickel (Ni)	t/d	4.609E-06	5.02E-07	5.02E-07	4.564E-08	4.564E-08	0
Potassium (K)	t/d	9.219E-06	1.004E-06	1.004E-06	9.128E-08	9.128E-08	0
Silver (Ag)	t/d	0	0	0	0	0	0
Silicon (Si)	t/d	5.341E-05	5.817E-06	5.817E-06	5.289E-07	5.289E-07	0
Strontium (Sr)	t/d	9.219E-08	1.004E-08	1.004E-08	9.128E-10	9.128E-10	0
Titanium (Ti)	t/d	9.219E-07	1.004E-07	1.004E-07	9.128E-09	9.128E-09	0
Vanadium (V)	t/d	1.844E-06	2.008E-07	2.008E-07	1.826E-08	1.826E-08	0
Zinc (Zn)	t/d	7.375E-06	8.032E-07	8.032E-07	7.302E-08	7.302E-08	0
Zirconium (Zr)	t/d	1.085E-08	1.181E-09	1.181E-09	1.074E-10	1.074E-10	0
Molybdenum (Mo)	t/d	1.22E-09	1.329E-10	1.329E-10	1.208E-11	1.208E-11	0
Selenium (Se)	t/d	6.507E-07	7.087E-08	7.087E-08	6.443E-09	6.443E-09	0

Note: "0" – No emissions.

Area Source				
Facility	Units	Jackfish 1	Jackfish 2	Jackfish 3
Emission Source		Plant Fugitive	Plant Fugitive	Plant Fugitive
Corner 1 UTM N	m	507677	499862	502922
Corner 1 UTM E	m	6153788	6153549	6152218
Corner 2 UTM N	m	508177	500362	503422
Corner 2 UTM E	m	6153788	6153549	6152218
Corner 3 UTM N	m	508177	500362	503422
Corner 3 UTM E	m	6153288	6153049	6151718
Corner 4 UTM N	m	507677	499862	502922
Corner 4 UTM E	m	6153288	6153049	6151718
Area	m^2	250000	250000	250000
Elevation (m)	masl	611	652	664
1,3-butadiene	t/d	5.182E-07	5.182E-07	5.182E-07
Acenaphthene	t/d	0	0	0
Acenaphthylene	t/d	0	0	0
Acetaldehyde	t/d	0	0	0
Acrolein	t/d	0	0	0
Aliphatic aldehydes	t/d	0.0030928	0.0030928	0.0030928
Aliphatic C_{17}-C_{34}	t/d	0.0014361	0.0014361	0.0014361
Aliphatic C_5-C_8	t/d	0.0242802	0.0242802	0.0242802
Aliphatic C_9-C_{16}	t/d	0.099953	0.099953	0.099953
Aliphatic ketones	t/d	0.0109542	0.0109542	0.0109542
Anthracene	t/d	0	0	0
Aromatic C_{17}-C_{34}	t/d	0	0	0
Aromatic C_9-C_{16}	t/d	0.0025716	0.0025716	0.0025716
Benzaldehyde	t/d	0	0	0
Benzene	t/d	0.0019187	0.0019187	0.0019187
Benzo(a)pyrene	t/d	0	0	0
Benzo(b)fluoranthene	t/d	0	0	0
Benzo(g,h,i)perylene	t/d	0	0	0
Benzo(k)fluoranthene	t/d	0	0	0
Carboxylic acids	t/d	4.145E-07	4.145E-07	4.145E-07
Chrysene	t/d	0	0	0
Dibenz(a,h)anthracene	t/d	0	0	0
Ethylbenzene	t/d	0.0001155	0.0001155	0.0001155
Fluoranthene	t/d	0	0	0
Fluorene	t/d	0	0	0
Formaldehyde	t/d	0	0	0
Hexane	t/d	0.0015841	0.0015841	0.0015841
Indeno(1,2,3-cd)pyrene	t/d	0	0	0
Naphthalene	t/d	1.481E-08	1.481E-08	1.481E-08
Phenanthrene	t/d	0	0	0
Propylene	t/d	0	0	0
Pyrene	t/d	0	0	0
Toluene	t/d	0.0008587	0.0008587	0.0008587
Xylenes	t/d	0.0005034	0.0005034	0.0005034
Carbon disulphide	t/d	0.000834	0.000834	0.000834
Hydrogen Sulphide	t/d	6.856E-05	6.856E-05	6.856E-05
Mercaptans	t/d	0.0008608	0.0008608	0.0008608
Thiophenes	t/d	0.001142	0.001142	0.001142

Note: "0" = No emissions

Table B4-12: Summary of Devon ARL Crop. Pike 1 VOC, PAH and Metal Air Emissions Used for Baseline and Application Cases

Point Source							
Facility	**Units**	**Pike 1**					
Emission Source		**Steam Generator 1**	**Steam Generator 2**	**Steam Generator 3**	**Steam Generator 4**	**Steam Generator 5**	**Steam Generator 6**
UTMmN	m	511027	511035	511043	511050	511058	511066
UTMmE	m	6144536	6144526	6144517	6144508	6144499	6144490
Elevation	masl	655	655	655	655	637	637
Stack Height	m	28.9	28.9	28.9	28.9	28.9	28.9
Stack Diameter	m	1.8	1.8	1.8	1.8	1.8	1.8
Exit Velocity	m/s	15.5	15.5	15.5	15.5	15.5	15.5
Exit Temperature	K	443	443	443	443	443	443
1,3-butadiene	t/d	0	0	0	0	0	0
Acenaphthene	t/d	5.055E-09	5.055E-09	5.055E-09	5.055E-09	5.055E-09	5.055E-09
Acenaphthylene	t/d	4.4E-08	4.4E-08	4.4E-08	4.4E-08	4.4E-08	4.4E-08
Acetaldehyde	t/d	5.673E-05	5.673E-05	5.673E-05	5.673E-05	5.673E-05	5.673E-05
Acrolein	t/d	6.691E-05	6.691E-05	6.691E-05	6.691E-05	6.691E-05	6.691E-05
Aliphatic aldehydes	t/d	0	0	0	0	0	0
Aliphatic C_{17}-C_{34}	t/d	0	0	0	0	0	0
Aliphatic C_5-C_8	t/d	0.00728	0.00728	0.00728	0.00728	0.00728	0.00728
Aliphatic C_9-C_{16}	t/d	0.00028	0.00028	0.00028	0.00028	0.00028	0.00028
Aliphatic ketones	t/d	0	0	0	0	0	0
Anthracene	t/d	5.855E-09	5.855E-09	5.855E-09	5.855E-09	5.855E-09	5.855E-09
Aromatic C_{17}-C_{34}	t/d	6.54E-09	6.54E-09	6.54E-09	6.54E-09	6.54E-09	6.54E-09
Aromatic C_9-C_{16}	t/d	1.588E-07	1.588E-07	1.588E-07	1.588E-07	1.588E-07	1.588E-07
Benzaldehyde	t/d	5.964E-05	5.964E-05	5.964E-05	5.964E-05	5.964E-05	5.964E-05
Benzene	t/d	4.073E-05	4.073E-05	4.073E-05	4.073E-05	4.073E-05	4.073E-05
Benzo(a)pyrene	t/d	3.564E-09	3.564E-09	3.564E-09	3.564E-09	3.564E-09	3.564E-09
Benzo(b)fluoranthene	t/d	4.145E-09	4.145E-09	4.145E-09	4.145E-09	4.145E-09	4.145E-09
Benzo(g,h,i)perylene	t/d	4.545E-09	4.545E-09	4.545E-09	4.545E-09	4.545E-09	4.545E-09
Benzo(k)fluoranthene	t/d	3.6E-09	3.6E-09	3.6E-09	3.6E-09	3.6E-09	3.6E-09
Carboxylic acids	t/d	0	0	0	0	0	0
Chrysene	t/d	5.055E-09	5.055E-09	5.055E-09	5.055E-09	5.055E-09	5.055E-09
Dibenz(a,h)anthracene	t/d	3.335E-09	3.335E-09	3.335E-09	3.335E-09	3.335E-09	3.335E-09
Ethylbenzene	t/d	8.182E-06	8.182E-06	8.182E-06	8.182E-06	8.182E-06	8.182E-06
Fluoranthene	t/d	4.327E-08	4.327E-08	4.327E-08	4.327E-08	4.327E-08	4.327E-08
Fluorene	t/d	1.669E-08	1.669E-08	1.669E-08	1.669E-08	1.669E-08	1.669E-08
Formaldehyde	t/d	0.0008036	0.0008036	0.0008036	0.0008036	0.0008036	0.0008036
Hexane	t/d	0	0	0	0	0	0
Indeno(1,2,3-cd)pyrene	t/d	4.255E-09	4.255E-09	4.255E-09	4.255E-09	4.255E-09	4.255E-09
Naphthalene	t/d	4.073E-06	4.073E-06	4.073E-06	4.073E-06	4.073E-06	4.073E-06
Phenanthrene	t/d	1.225E-07	1.225E-07	1.225E-07	1.225E-07	1.225E-07	1.225E-07
Propylene	t/d	0.0008545	0.0008545	0.0008545	0.0008545	0.0008545	0.0008545
Pyrene	t/d	2.036E-08	2.036E-08	2.036E-08	2.036E-08	2.036E-08	2.036E-08
Toluene	t/d	0.0001073	0.0001073	0.0001073	0.0001073	0.0001073	0.0001073

Point Source							
Facility	**Units**	**Pike 1**					
Emission Source		**Steam Generator 1**	**Steam Generator 2**	**Steam Generator 3**	**Steam Generator 4**	**Steam Generator 5**	**Steam Generator 6**
Xylenes	t/d	0.0001004	0.0001004	0.0001004	0.0001004	0.0001004	0.0001004
Aluminum (Al)	t/d	5.477E-06	5.477E-06	5.477E-06	5.477E-06	5.477E-06	5.477E-06
Arsenic (As)	t/d	1.826E-07	1.826E-07	1.826E-07	1.826E-07	1.826E-07	1.826E-07
Barium (Ba)	t/d	4.779E-07	4.779E-07	4.779E-07	4.779E-07	4.779E-07	4.779E-07
Cadmium (Cd)	t/d	6.04E-08	6.04E-08	6.04E-08	6.04E-08	6.04E-08	6.04E-08
Calcium (Ca)	t/d	1.826E-05	1.826E-05	1.826E-05	1.826E-05	1.826E-05	1.826E-05
Chromium (Cr)	t/d	4.832E-08	4.832E-08	4.832E-08	4.832E-08	4.832E-08	4.832E-08
Cobalt (Co)	t/d	1.314E-06	1.314E-06	1.314E-06	1.314E-06	1.314E-06	1.314E-06
Copper (Cu)	t/d	2.282E-06	2.282E-06	2.282E-06	2.282E-06	2.282E-06	2.282E-06
Iron (Fe)	t/d	1.004E-05	1.004E-05	1.004E-05	1.004E-05	1.004E-05	1.004E-05
Lead (Pb)	t/d	1.369E-07	1.369E-07	1.369E-07	1.369E-07	1.369E-07	1.369E-07
Magnesium (Mg)	t/d	0	0	0	0	0	0
Manganese (Mn)	t/d	4.564E-07	4.564E-07	4.564E-07	4.564E-07	4.564E-07	4.564E-07
Nickel (Ni)	t/d	2.282E-06	2.282E-06	2.282E-06	2.282E-06	2.282E-06	2.282E-06
Potassium (K)	t/d	4.564E-06	4.564E-06	4.564E-06	4.564E-06	4.564E-06	4.564E-06
Silver (Ag)	t/d	0	0	0	0	0	0
Silicon (Si)	t/d	2.644E-05	2.644E-05	2.644E-05	2.644E-05	2.644E-05	2.644E-05
Strontium (Sr)	t/d	4.564E-08	4.564E-08	4.564E-08	4.564E-08	4.564E-08	4.564E-08
Titanium (Ti)	t/d	4.564E-07	4.564E-07	4.564E-07	4.564E-07	4.564E-07	4.564E-07
Vanadium (V)	t/d	9.128E-07	9.128E-07	9.128E-07	9.128E-07	9.128E-07	9.128E-07
Zinc (Zn)	t/d	3.651E-06	3.651E-06	3.651E-06	3.651E-06	3.651E-06	3.651E-06
Zirconium (Zr)	t/d	5.369E-09	5.369E-09	5.369E-09	5.369E-09	5.369E-09	5.369E-09
Molybdenum (Mo)	t/d	6.04E-10	6.04E-10	6.04E-10	6.04E-10	6.04E-10	6.04E-10
Selenium (Se)	t/d	3.221E-07	3.221E-07	3.221E-07	3.221E-07	3.221E-07	3.221E-07

Point Source (cont'd)							
Facility	Units	Pike 1					
Emission Source		Steam Generator 7	Flash Treater 1	Flash Treater 2	Glycol Heater 1	Glycol Heater 2	Flare
UTMmN	m	511073	510989	510990	511072	511064	511223
UTMmE	m	6144480	6144414	6144415	6144433	6144426	6144265
Elevation	masl	637	638	638	637	637	637
Stack Height	m	28.9	6	6	6.7	6.7	84
Stack Diameter	m	1.8	0.2	0.2	0.7	0.7	0.8
Exit Velocity	m/s	15.5	23.2	23.2	27.7	27.7	0
Exit Temperature	K	443	443	443	399	399	2777
1,3-butadiene	t/d	0	0	0	0	0	0
Acenaphthene	t/d	5.055E-09	0	0	0	0	0
Acenaphthylene	t/d	4.4E-08	0	0	0	0	0
Acetaldehyde	t/d	5.673E-05	0	0	0	0	3.608E-05
Acrolein	t/d	6.691E-05	0	0	0	0	1.18E-05
Aliphatic aldehydes	t/d	0	0	0	0	0	0
Aliphatic C_{17}-C_{34}	t/d	0	0	0	0	0	0
Aliphatic C_5-C_8	t/d	0.00728	0	0	0	0	0.00728
Aliphatic C_9-C_{16}	t/d	0.00028	0	0	0	0	0.00028
Aliphatic ketones	t/d	0	0	0	0	0	0
Anthracene	t/d	5.855E-09	0	0	0	0	0
Aromatic C_{17}-C_{34}	t/d	6.54E-09	0	0	0	0	1.928E-08
Aromatic C_9-C_{16}	t/d	1.588E-07	0	0	0	0	0.0000146
Benzaldehyde	t/d	5.964E-05	0	0	0	0	0
Benzene	t/d	4.073E-05	0	0	0	0	2.559E-05
Benzo(a)pyrene	t/d	3.564E-09	0	0	0	0	2.951E-06
Benzo(b)fluoranthene	t/d	4.145E-09	0	0	0	0	2.951E-06
Benzo(g,h,i)perylene	t/d	4.545E-09	0	0	0	0	2.951E-06
Benzo(k)fluoranthene	t/d	3.6E-09	0	0	0	0	2.951E-06
Carboxylic acids	t/d	0	0	0	0	0	0
Chrysene	t/d	5.055E-09	0	0	0	0	2.965E-06
Dibenz(a,h)anthracene	t/d	3.335E-09	0	0	0	0	2.951E-06
Ethylbenzene	t/d	8.182E-06	0	0	0	0	0
Fluoranthene	t/d	4.327E-08	0	0	0	0	3.175E-06
Fluorene	t/d	1.669E-08	0	0	0	0	0
Formaldehyde	t/d	0.0008036	0	0	0	0	0.0041259
Hexane	t/d	0	0	0	0	0	0
Indeno(1,2,3-cd)pyrene	t/d	4.255E-09	0	0	0	0	2.951E-06
Naphthalene	t/d	4.073E-06	0	0	0	0	0.0018182
Phenanthrene	t/d	1.225E-07	0	0	0	0	3.916E-06
Propylene	t/d	0.0008545	0	0	0	0	0
Pyrene	t/d	2.036E-08	0	0	0	0	3.119E-06
Toluene	t/d	0.0001073	0	0	0	0	0.0024615
Xylenes	t/d	0.0001004	0	0	0	0	7.748E-05
Aluminum (Al)	t/d	5.477E-06	0	0	0	0	0
Arsenic (As)	t/d	1.826E-07	0	0	0	0	0

Point Source (cont'd)							
Facility	**Units**	**Pike 1**					
Emission Source		**Steam Generator 7**	**Flash Treater 1**	**Flash Treater 2**	**Glycol Heater 1**	**Glycol Heater 2**	**Flare**
Barium (Ba)	t/d	4.779E-07	0	0	0	0	0
Cadmium (Cd)	t/d	6.04E-08	0	0	0	0	0
Calcium (Ca)	t/d	1.826E-05	0	0	0	0	0
Chromium (Cr)	t/d	4.832E-08	0	0	0	0	0
Cobalt (Co)	t/d	1.314E-06	0	0	0	0	0
Copper (Cu)	t/d	2.282E-06	0	0	0	0	0
Iron (Fe)	t/d	1.004E-05	0	0	0	0	0
Lead (Pb)	t/d	1.369E-07	0	0	0	0	0
Magnesium (Mg)	t/d	0	0	0	0	0	0
Manganese (Mn)	t/d	4.564E-07	0	0	0	0	0
Nickel (Ni)	t/d	2.282E-06	0	0	0	0	0
Potassium (K)	t/d	4.564E-06	0	0	0	0	0
Silver (Ag)	t/d	0	0	0	0	0	0
Silicon (Si)	t/d	2.644E-05	0	0	0	0	0
Strontium (Sr)	t/d	4.564E-08	0	0	0	0	0
Titanium (Ti)	t/d	4.564E-07	0	0	0	0	0
Vanadium (V)	t/d	9.128E-07	0	0	0	0	0
Zinc (Zn)	t/d	3.651E-06	0	0	0	0	0
Zirconium (Zr)	t/d	5.369E-09	0	0	0	0	0
Molybdenum (Mo)	t/d	6.04E-10	0	0	0	0	0
Selenium (Se)	t/d	3.221E-07	0	0	0	0	0

Point Source (cont'd)							
Facility	**Units**	**Pike 1**					
Emission Source		**Steam Generator 8**	**Steam Generator 9**	**Steam Generator 10**	**Steam Generator 11**	**Steam Generator 12**	**Steam Generator 13**
UTMmN	m	510896	510904	510911	510919	510927	510935
UTMmE	m	6144692	6144682	6144674	6144664	6144655	6144646
Elevation	masl	656	655	655	655	655	655
Stack Height	m	28.9	28.9	28.9	28.9	28.9	28.9
Stack Diameter	m	1.8	1.8	1.8	1.8	1.8	1.8
Exit Velocity	m/s	15.5	15.5	15.5	15.5	15.5	15.5
Exit Temperature	K	443	443	443	443	443	443
1,3-butadiene	t/d	0	0	0	0	0	0
Acenaphthene	t/d	0	0	0	0	0	0
Acenaphthylene	t/d	0	0	0	0	0	0
Acetaldehyde	t/d	0	0	0	0	0	0
Acrolein	t/d	0	0	0	0	0	0
Aliphatic aldehydes	t/d	0	0	0	0	0	0
Aliphatic C_{17}-C_{34}	t/d	0	0	0	0	0	0
Aliphatic C_5-C_8	t/d	0	0	0	0	0	0
Aliphatic C_9-C_{16}	t/d	0	0	0	0	0	0
Aliphatic ketones	t/d	0	0	0	0	0	0
Anthracene	t/d	0	0	0	0	0	0
Aromatic C_{17}-C_{34}	t/d	0	0	0	0	0	0
Aromatic C_9-C_{16}	t/d	0	0	0	0	0	0
Benzaldehyde	t/d	0	0	0	0	0	0
Benzene	t/d	0	0	0	0	0	0
Benzo(a)pyrene	t/d	0	0	0	0	0	0
Benzo(b)fluoranthene	t/d	0	0	0	0	0	0
Benzo(g,h,i)perylene	t/d	0	0	0	0	0	0
Benzo(k)fluoranthene	t/d	0	0	0	0	0	0
Carboxylic acids	t/d	0	0	0	0	0	0
Chrysene	t/d	0	0	0	0	0	0
Dibenz(a,h)anthracene	t/d	0	0	0	0	0	0
Ethylbenzene	t/d	0	0	0	0	0	0
Fluoranthene	t/d	0	0	0	0	0	0
Fluorene	t/d	0	0	0	0	0	0
Formaldehyde	t/d	0	0	0	0	0	0
Hexane	t/d	0	0	0	0	0	0
Indeno(1,2,3-cd)pyrene	t/d	0	0	0	0	0	0
Naphthalene	t/d	0	0	0	0	0	0
Phenanthrene	t/d	0	0	0	0	0	0
Propylene	t/d	0	0	0	0	0	0
Pyrene	t/d	0	0	0	0	0	0
Toluene	t/d	0	0	0	0	0	0
Xylenes	t/d	0	0	0	0	0	0
Aluminum (Al)	t/d	5.477E-06	5.477E-06	5.477E-06	5.477E-06	5.477E-06	5.477E-06
Arsenic (As)	t/d	1.826E-07	1.826E-07	1.826E-07	1.826E-07	1.826E-07	1.826E-07

Point Source (cont'd)							
Facility	**Units**	**Pike 1**					
Emission Source		**Steam Generator 8**	**Steam Generator 9**	**Steam Generator 10**	**Steam Generator 11**	**Steam Generator 12**	**Steam Generator 13**
Barium (Ba)	t/d	4.779E-07	4.779E-07	4.779E-07	4.779E-07	4.779E-07	4.779E-07
Cadmium (Cd)	t/d	6.04E-08	6.04E-08	6.04E-08	6.04E-08	6.04E-08	6.04E-08
Calcium (Ca)	t/d	1.826E-05	1.826E-05	1.826E-05	1.826E-05	1.826E-05	1.826E-05
Chromium (Cr)	t/d	4.832E-08	4.832E-08	4.832E-08	4.832E-08	4.832E-08	4.832E-08
Cobalt (Co)	t/d	1.314E-06	1.314E-06	1.314E-06	1.314E-06	1.314E-06	1.314E-06
Copper (Cu)	t/d	2.282E-06	2.282E-06	2.282E-06	2.282E-06	2.282E-06	2.282E-06
Iron (Fe)	t/d	1.004E-05	1.004E-05	1.004E-05	1.004E-05	1.004E-05	1.004E-05
Lead (Pb)	t/d	1.369E-07	1.369E-07	1.369E-07	1.369E-07	1.369E-07	1.369E-07
Magnesium (Mg)	t/d	0	0	0	0	0	0
Manganese (Mn)	t/d	4.564E-07	4.564E-07	4.564E-07	4.564E-07	4.564E-07	4.564E-07
Nickel (Ni)	t/d	2.282E-06	2.282E-06	2.282E-06	2.282E-06	2.282E-06	2.282E-06
Potassium (K)	t/d	4.564E-06	4.564E-06	4.564E-06	4.564E-06	4.564E-06	4.564E-06
Silver (Ag)	t/d	0	0	0	0	0	0
Silicon (Si)	t/d	2.644E-05	2.644E-05	2.644E-05	2.644E-05	2.644E-05	2.644E-05
Strontium (Sr)	t/d	4.564E-08	4.564E-08	4.564E-08	4.564E-08	4.564E-08	4.564E-08
Titanium (Ti)	t/d	4.564E-07	4.564E-07	4.564E-07	4.564E-07	4.564E-07	4.564E-07
Vanadium (V)	t/d	9.128E-07	9.128E-07	9.128E-07	9.128E-07	9.128E-07	9.128E-07
Zinc (Zn)	t/d	3.651E-06	3.651E-06	3.651E-06	3.651E-06	3.651E-06	3.651E-06
Zirconium (Zr)	t/d	5.369E-09	5.369E-09	5.369E-09	5.369E-09	5.369E-09	5.369E-09
Molybdenum (Mo)	t/d	6.04E-10	6.04E-10	6.04E-10	6.04E-10	6.04E-10	6.04E-10
Selenium (Se)	t/d	3.221E-07	3.221E-07	3.221E-07	3.221E-07	3.221E-07	3.221E-07

Point Source (cont'd)						
Facility	**Units**	**Pike 1**				
Emission Source		**Steam Generator 14**	**Flash Treater 3**	**Flash Treater 4**	**Glycol Heater 3**	**Glycol Heater 4**
UTMmN	m	510942	510995	510996	510939	510931
UTMmE	m	6144637	6144419	6144420	6144592	6144585
Elevation	masl	655	638	638	655	655
Stack Height	m	28.9	6	6	6.7	6.7
Stack Diameter	m	1.8	0.2	0.2	0.7	0.7
Exit Velocity	m/s	15.5	23.2	23.2	27.7	27.7
Exit Temperature	K	443	443	443	399	399
1,3-butadiene	t/d	0	0	0	0	0
Acenaphthene	t/d	0	0	0	0	0
Acenaphthylene	t/d	0	0	0	0	0
Acetaldehyde	t/d	0	0	0	0	0
Acrolein	t/d	0	0	0	0	0
Aliphatic aldehydes	t/d	0	0	0	0	0
Aliphatic C_{17}-C_{34}	t/d	0	0	0	0	0
Aliphatic C_5-C_8	t/d	0	0	0	0	0
Aliphatic C_9-C_{16}	t/d	0	0	0	0	0
Aliphatic ketones	t/d	0	0	0	0	0
Anthracene	t/d	0	0	0	0	0
Aromatic C_{17}-C_{34}	t/d	0	0	0	0	0
Aromatic C_9-C_{16}	t/d	0	0	0	0	0
Benzaldehyde	t/d	0	0	0	0	0
Benzene	t/d	0	0	0	0	0
Benzo(a)pyrene	t/d	0	0	0	0	0
Benzo(b)fluoranthene	t/d	0	0	0	0	0
Benzo(g,h,i)perylene	t/d	0	0	0	0	0
Benzo(k)fluoranthene	t/d	0	0	0	0	0
Carboxylic acids	t/d	0	0	0	0	0
Chrysene	t/d	0	0	0	0	0
Dibenz(a,h)anthracene	t/d	0	0	0	0	0
Ethylbenzene	t/d	0	0	0	0	0
Fluoranthene	t/d	0	0	0	0	0
Fluorene	t/d	0	0	0	0	0
Formaldehyde	t/d	0	0	0	0	0
Hexane	t/d	0	0	0	0	0
Indeno(1,2,3-cd)pyrene	t/d	0	0	0	0	0
Naphthalene	t/d	0	0	0	0	0
Phenanthrene	t/d	0	0	0	0	0
Propylene	t/d	0	0	0	0	0
Pyrene	t/d	0	0	0	0	0
Toluene	t/d	0	0	0	0	0
Xylenes	t/d	0	0	0	0	0
Aluminum (Al)	t/d	5.477E-06	0	0	0	0
Arsenic (As)	t/d	1.826E-07	0	0	0	0
Barium (Ba)	t/d	4.779E-07	0	0	0	0

Point Source (cont'd)						
Facility	**Units**	**Pike 1**				
Emission Source		**Steam Generator 14**	**Flash Treater 3**	**Flash Treater 4**	**Glycol Heater 3**	**Glycol Heater 4**
Cadmium (Cd)	t/d	6.04E-08	0	0	0	0
Calcium (Ca)	t/d	1.826E-05	0	0	0	0
Chromium (Cr)	t/d	4.832E-08	0	0	0	0
Cobalt (Co)	t/d	1.314E-06	0	0	0	0
Copper (Cu)	t/d	2.282E-06	0	0	0	0
Iron (Fe)	t/d	1.004E-05	0	0	0	0
Lead (Pb)	t/d	1.369E-07	0	0	0	0
Magnesium (Mg)	t/d	0	0	0	0	0
Manganese (Mn)	t/d	4.564E-07	0	0	0	0
Nickel (Ni)	t/d	2.282E-06	0	0	0	0
Potassium (K)	t/d	4.564E-06	0	0	0	0
Silver (Ag)	t/d	0	0	0	0	0
Silicon (Si)	t/d	2.644E-05	0	0	0	0
Strontium (Sr)	t/d	4.564E-08	0	0	0	0
Titanium (Ti)	t/d	4.564E-07	0	0	0	0
Vanadium (V)	t/d	9.128E-07	0	0	0	0
Zinc (Zn)	t/d	3.651E-06	0	0	0	0
Zirconium (Zr)	t/d	5.369E-09	0	0	0	0
Molybdenum (Mo)	t/d	6.04E-10	0	0	0	0
Selenium (Se)	t/d	3.221E-07	0	0	0	0

Note: "0" = No emissions.

Area Source		
Facility	**Units**	**Pike 1**
Emission Source		**Plant Fugitive**
Corner 1 UTM N	m	510695
Corner 1 UTM E	m	6144845
Corner 2 UTM N	m	511195
Corner 2 UTM E	m	6144845
Corner 3 UTM N	m	511195
Corner 3 UTM E	m	6144345
Corner 4 UTM N	m	510695
Corner 4 UTM E	m	6144345
Area	m^2	250000
Elevation (m)	masl	655
1,3-butadiene	t/d	1.555E-06
Acenaphthene	t/d	0
Acenaphthylene	t/d	0
Acetaldehyde	t/d	0
Acrolein	t/d	0
Aliphatic aldehydes	t/d	0.0092783
Aliphatic C_{17}-C_{34}	t/d	0.0043083
Aliphatic C_5-C_8	t/d	0.0728406
Aliphatic C_9-C_{16}	t/d	0.299859
Aliphatic ketones	t/d	0.0328627
Anthracene	t/d	0
Aromatic C_{17}-C_{34}	t/d	0
Aromatic C_9-C_{16}	t/d	0.0077149
Benzaldehyde	t/d	0
Benzene	t/d	0.0057562
Benzo(a)pyrene	t/d	0
Benzo(b)fluoranthene	t/d	0
Benzo(g,h,i)perylene	t/d	0
Benzo(k)fluoranthene	t/d	0
Carboxylic acids	t/d	1.244E-06
Chrysene	t/d	0
Dibenz(a,h)anthracene	t/d	0
Ethylbenzene	t/d	0.0003464
Fluoranthene	t/d	0
Fluorene	t/d	0
Formaldehyde	t/d	0
Hexane	t/d	0.0047524
Indeno(1,2,3-cd)pyrene	t/d	0
Naphthalene	t/d	4.442E-08
Phenanthrene	t/d	0
Propylene	t/d	0
Pyrene	t/d	0
Toluene	t/d	0.0025761
Xylenes	t/d	0.0015101
Carbon disulphide	t/d	0.0025021
Hydrogen Sulphide	t/d	0.0002057
Mercaptans	t/d	0.0025823
Thiophenes	t/d	0.0034259

Note: "0" = No emissions.

2.5 Grizzly Oil Sands.

Table B4-13: Summary of Grizzly Operations Corp. Whitesands VOC, PAH and Metal Air Emissions Used for Baseline and Application Cases

Point Source						
Facility	**Units**	**Whitesands Pilot**				
Emission Source		**Flare Stack**	**Steam Generator (2.2 MW)**	**Glycol Boiler (2 MW)**	**Glycol Boiler (2 MW)**	**Incinerator**
UTMmN	m	483874	484000	483894	483894	483964
UTMmE	m	6168345	6168220	6168325	6168315	6168182
Elevation	masl	607	608	608	608	608
Stack Height	m	12.3	6.6	5.5	5.5	20.1
Stack Diameter	m	0.15	0.4	0.6	0.6	1.6
Exit Velocity	m/s	0.5	11.1	1.7	1.7	16.3
Exit Temperature	K	2738	723	773	773	1179
1,3-butadiene	t/d	0	0	0	0	0
Acenaphthene	t/d	0	3.538E-10	5.055E-11	5.055E-11	0
Acenaphthylene	t/d	0	3.08E-09	4.4E-10	4.4E-10	0
Acetaldehyde	t/d	2.598E-05	3.971E-06	5.673E-07	5.673E-07	0
Acrolein	t/d	8.499E-06	4.684E-06	6.691E-07	6.691E-07	0
Aliphatic aldehydes	t/d	0	0	0	0	0
Aliphatic C_{17}-C_{34}	t/d	0	0	0	0	0
Aliphatic C_5-C_8	t/d	0.0052416	0.0005096	0.0000728	0.0000728	0
Aliphatic C_9-C_{16}	t/d	0.0002016	0.0000196	0.0000028	0.0000028	0
Aliphatic ketones	t/d	0	0	0	0	0
Anthracene	t/d	0	4.098E-10	5.855E-11	5.855E-11	0
Aromatic C_{17}-C_{34}	t/d	1.388E-08	4.578E-10	6.54E-11	6.54E-11	0
Aromatic C_9-C_{16}	t/d	1.051E-05	1.112E-08	1.588E-09	1.588E-09	0
Benzaldehyde	t/d	0	4.175E-06	5.964E-07	5.964E-07	0
Benzene	t/d	1.843E-05	2.851E-06	4.073E-07	4.073E-07	0
Benzo(a)pyrene	t/d	2.125E-06	2.495E-10	3.564E-11	3.564E-11	0
Benzo(b)fluoranthene	t/d	2.125E-06	2.902E-10	4.145E-11	4.145E-11	0
Benzo(g,h,i)perylene	t/d	2.125E-06	3.182E-10	4.545E-11	4.545E-11	0
Benzo(k)fluoranthene	t/d	2.125E-06	2.52E-10	3.6E-11	3.6E-11	0
Carboxylic acids	t/d	0	0	0	0	0
Chrysene	t/d	2.135E-06	3.538E-10	5.055E-11	5.055E-11	0
Dibenz(a,h)anthracene	t/d	2.125E-06	2.334E-10	3.335E-11	3.335E-11	0
Ethylbenzene	t/d	0	5.727E-07	8.182E-08	8.182E-08	0
Fluoranthene	t/d	2.286E-06	3.029E-09	4.327E-10	4.327E-10	0
Fluorene	t/d	0	1.168E-09	1.669E-10	1.669E-10	0
Formaldehyde	t/d	0.0029706	5.625E-05	8.036E-06	8.036E-06	0
Hexane	t/d	0	0	0	0	0
Indeno(1,2,3-cd)pyrene	t/d	2.125E-06	2.978E-10	4.255E-11	4.255E-11	0
Naphthalene	t/d	0.0013091	2.851E-07	4.073E-08	4.073E-08	0
Phenanthrene	t/d	2.82E-06	8.578E-09	1.225E-09	1.225E-09	0
Propylene	t/d	0	5.982E-05	8.545E-06	8.545E-06	0
Pyrene	t/d	2.246E-06	1.425E-09	2.036E-10	2.036E-10	0

Point Source						
Facility	**Units**	**Whitesands Pilot**				
Emission Source		**Flare Stack**	**Steam Generator (2.2 MW)**	**Glycol Boiler (2 MW)**	**Glycol Boiler (2 MW)**	**Incinerator**
Toluene	t/d	0.0017723	7.509E-06	1.073E-06	1.073E-06	0
Xylenes	t/d	5.579E-05	7.025E-06	1.004E-06	1.004E-06	0
Aluminum (Al)	t/d	0	1.643E-07	1.643E-07	0	0
Arsenic (As)	t/d	0	5.477E-09	5.477E-09	0	0
Barium (Ba)	t/d	0	1.434E-08	1.434E-08	0	0
Cadmium (Cd)	t/d	0	1.812E-09	1.812E-09	0	0
Calcium (Ca)	t/d	0	5.477E-07	5.477E-07	0	0
Chromium (Cr)	t/d	0	1.45E-09	1.45E-09	0	0
Cobalt (Co)	t/d	0	3.942E-08	3.942E-08	0	0
Copper (Cu)	t/d	0	6.846E-08	6.846E-08	0	0
Iron (Fe)	t/d	0	3.012E-07	3.012E-07	0	0
Lead (Pb)	t/d	0	4.107E-09	4.107E-09	0	0
Magnesium (Mg)	t/d	0	0	0	0	0
Manganese (Mn)	t/d	0	1.369E-08	1.369E-08	0	0
Nickel (Ni)	t/d	0	6.846E-08	6.846E-08	0	0
Potassium (K)	t/d	0	1.369E-07	1.369E-07	0	0
Silver (Ag)	t/d	0	0	0	0	0
Silicon (Si)	t/d	0	7.933E-07	7.933E-07	0	0
Strontium (Sr)	t/d	0	1.369E-09	1.369E-09	0	0
Titanium (Ti)	t/d	0	1.369E-08	1.369E-08	0	0
Vanadium (V)	t/d	0	2.738E-08	2.738E-08	0	0
Zinc (Zn)	t/d	0	1.095E-07	1.095E-07	0	0
Zirconium (Zr)	t/d	0	1.611E-10	1.611E-10	0	0
Molybdenum (Mo)	t/d	0	1.812E-11	1.812E-11	0	0
Selenium (Se)	t/d	0	9.664E-09	9.664E-09	0	0

Table B4-14: Summary of Grizzly Operations Corp. May River VOC, PAH and Metal Air Emissions Used for Baseline, Application and Planned Developed Cases

Point Source							
Facility	**Units**	**May River Phase 1**			**May River Phase 2**		
Emission Source		**Well Pad Incinerator (Well Pad 2)**	**Well Pad Incinerator (Well Pad 3)**	**Flue Gas Desulphurization (CPF)**	**Well Pad Incinerator**	**Well Pad Incinerator**	**Flue Gas Desulphurization (CPF)**
UTMmN	m	483463	483169	482254	484560	484266	483351
UTMmE	m	6170387	6169940	6168317	6163859	6163412	6161789
Elevation	masl	587	597	624	654	651	668
Stack Height	m	12.2	12.2	51.8	12.2	12.2	90
Stack Diameter	m	2.43	2.43	3.05	2.43	2.43	6
Exit Velocity	m/s	15.3	23.7	13	15.3	23.7	30
Exit Temperature	K	918	973	339	918	973	339
1,3-butadiene	t/d	0	0	0	0	0	0
Acenaphthene	t/d	0	0	2.654E-09	0	0	2.378E-08
Acenaphthylene	t/d	0	0	2.31E-08	0	0	2.07E-07
Acetaldehyde	t/d	0	0	2.978E-05	0	0	0.0002669
Acrolein	t/d	0	0	3.513E-05	0	0	0.0003148
Aliphatic aldehydes	t/d	0	0	0	0	0	0
Aliphatic C_{17}-C_{34}	t/d	0	0	0	0	0	0
Aliphatic C_5-C_8	t/d	0	0	0.003822	0	0	0.0342524
Aliphatic C_9-C_{16}	t/d	0	0	0.000147	0	0	0.0013174
Aliphatic ketones	t/d	0	0	0	0	0	0
Anthracene	t/d	0	0	3.074E-09	0	0	2.755E-08
Aromatic C_{17}-C_{34}	t/d	0	0	3.434E-09	0	0	3.077E-08
Aromatic C_9-C_{16}	t/d	0	0	8.337E-08	0	0	7.472E-07
Benzaldehyde	t/d	0	0	3.131E-05	0	0	0.0002806
Benzene	t/d	0	0	2.138E-05	0	0	0.0001916
Benzo(a)pyrene	t/d	0	0	1.871E-09	0	0	1.677E-08
Benzo(b)fluoranthene	t/d	0	0	2.176E-09	0	0	1.95E-08
Benzo(g,h,i)perylene	t/d	0	0	2.386E-09	0	0	2.139E-08
Benzo(k)fluoranthene	t/d	0	0	1.89E-09	0	0	1.694E-08
Carboxylic acids	t/d	0	0	0	0	0	0
Chrysene	t/d	0	0	2.654E-09	0	0	2.378E-08
Dibenz(a,h)anthracene	t/d	0	0	1.751E-09	0	0	1.569E-08
Ethylbenzene	t/d	0	0	4.295E-06	0	0	3.85E-05
Fluoranthene	t/d	0	0	2.272E-08	0	0	2.036E-07
Fluorene	t/d	0	0	8.763E-09	0	0	7.853E-08
Formaldehyde	t/d	0	0	0.0004219	0	0	0.0037811
Hexane	t/d	0	0	0	0	0	0
Indeno(1,2,3-cd)pyrene	t/d	0	0	2.234E-09	0	0	2.002E-08
Naphthalene	t/d	0	0	2.138E-06	0	0	1.916E-05
Phenanthrene	t/d	0	0	6.434E-08	0	0	5.766E-07
Propylene	t/d	0	0	0.0004486	0	0	0.0040206
Pyrene	t/d	0	0	1.069E-08	0	0	9.581E-08

Point Source							
Facility	**Units**	**May River Phase 1**			**May River Phase 2**		
Emission Source		**Well Pad Incinerator (Well Pad 2)**	**Well Pad Incinerator (Well Pad 3)**	**Flue Gas Desulphurization (CPF)**	**Well Pad Incinerator**	**Well Pad Incinerator**	**Flue Gas Desulphurization (CPF)**
Toluene	t/d	0	0	5.632E-05	0	0	0.0005047
Xylenes	t/d	0	0	5.269E-05	0	0	0.0004722
Aluminum (Al)	t/d	0	0	6.024E-07	0	0	5.422E-06
Arsenic (As)	t/d	0	0	2.008E-08	0	0	1.807E-07
Barium (Ba)	t/d	0	0	5.256E-08	0	0	4.731E-07
Cadmium (Cd)	t/d	0	0	6.644E-09	0	0	5.98E-08
Calcium (Ca)	t/d	0	0	2.008E-06	0	0	1.807E-05
Chromium (Cr)	t/d	0	0	5.315E-09	0	0	4.784E-08
Cobalt (Co)	t/d	0	0	1.446E-07	0	0	1.301E-06
Copper (Cu)	t/d	0	0	2.51E-07	0	0	2.259E-06
Iron (Fe)	t/d	0	0	1.104E-06	0	0	9.94E-06
Lead (Pb)	t/d	0	0	1.506E-08	0	0	1.355E-07
Magnesium (Mg)	t/d	0	0	0	0	0	0
Manganese (Mn)	t/d	0	0	5.02E-08	0	0	4.518E-07
Nickel (Ni)	t/d	0	0	2.51E-07	0	0	2.259E-06
Potassium (K)	t/d	0	0	5.02E-07	0	0	4.518E-06
Silver (Ag)	t/d	0	0	0	0	0	0
Silicon (Si)	t/d	0	0	2.909E-06	0	0	2.618E-05
Strontium (Sr)	t/d	0	0	5.02E-09	0	0	4.518E-08
Titanium (Ti)	t/d	0	0	5.02E-08	0	0	4.518E-07
Vanadium (V)	t/d	0	0	1.004E-07	0	0	9.036E-07
Zinc (Zn)	t/d	0	0	4.016E-07	0	0	3.614E-06
Zirconium (Zr)	t/d	0	0	5.906E-10	0	0	5.315E-09
Molybdenum (Mo)	t/d	0	0	6.644E-11	0	0	5.98E-10
Selenium (Se)	t/d	0	0	3.544E-08	0	0	3.189E-07

Note: “0” – No emissions.

Area Source		
Facility	Units	May River Phase 2
Emission Source		Plant Fugitive
Corner 1 UTM N	m	483809
Corner 1 UTM E	m	6163270
Corner 2 UTM N	m	484309
Corner 2 UTM E	m	6163270
Corner 3 UTM N	m	484309
Corner 3 UTM E	m	6162770
Corner 4 UTM N	m	483809
Corner 4 UTM E	m	6162770
Area	m^2	250000
Elevation (m)	masl	649
1,3-butadiene	t/d	1.334E-06
Acenaphthene	t/d	0
Acenaphthylene	t/d	0
Acetaldehyde	t/d	0
Acrolein	t/d	0
Aliphatic aldehydes	t/d	0.0079591
Aliphatic C_{17}-C_{34}	t/d	0.0036957
Aliphatic C_5-C_8	t/d	0.062484
Aliphatic C_9-C_{16}	t/d	0.2572245
Aliphatic ketones	t/d	0.0281902
Anthracene	t/d	0
Aromatic C_{17}-C_{34}	t/d	0
Aromatic C_9-C_{16}	t/d	0.006618
Benzaldehyde	t/d	0
Benzene	t/d	0.0049378
Benzo(a)pyrene	t/d	0
Benzo(b)fluoranthene	t/d	0
Benzo(g,h,i)perylene	t/d	0
Benzo(k)fluoranthene	t/d	0
Carboxylic acids	t/d	1.067E-06
Chrysene	t/d	0
Dibenz(a,h)anthracene	t/d	0
Ethylbenzene	t/d	0.0002972
Fluoranthene	t/d	0
Fluorene	t/d	0
Formaldehyde	t/d	0
Hexane	t/d	0.0040767
Indeno(1,2,3-cd)pyrene	t/d	0
Naphthalene	t/d	3.81E-08
Phenanthrene	t/d	0
Propylene	t/d	0
Pyrene	t/d	0
Toluene	t/d	0.0022098
Xylenes	t/d	0.0012954
Carbon disulphide	t/d	0.0020097
Hydrogen Sulphide	t/d	0.0001652
Mercaptans	t/d	0.0020741
Thiophenes	t/d	0.0027517

Note: "0" = No emissions.

2.6 Harvest Operations Corp.

Table B4-15: Summary of Harvest Operations Corp. BlackGold VOC, PAH and Metal Air Emissions Used for Baseline and Application Cases

Point Source										
Facility	**Units**	**BlackGold Phase 1**			**BlackGold Expansion**					
Emission Source		**Steam Generator**	**Slop Oil Heater**	**Glycol Heater**	**Steam Generator**	**Steam Generator**	**Glycol Heater**	**Slop Oil Heater**	**HP Flare**	**LP Flare**
UTMmN	m	500933	500973	501108	500958	501015	501139	500830	500783	500783
UTMmE	m	6159367	6159400	6159561	6159367	6159367	6159567	6159314	6159311	6159311
Elevation	masl	607	607	607	607	607	607	606	606	606
Stack Height	m	30	15	15	30	30	15	15	36.3	36.3
Stack Diameter	m	1.5	0.4	0.4	1.5	1.5	0.4	0.4	0.4	0.4
Exit Velocity	m/s	27	27	27	27	27	27	27	27	27
Exit Temperature	K	756	739	739	756	756	739	739	1086	1086
1,3-butadiene	t/d	0	0	0	0	0	0	0	0	0
Acenaphthene	t/d	7.582E-09	0	0	7.582E-09	7.582E-09	0	0	0	0
Acenaphthylene	t/d	6.6E-08	0	0	6.6E-08	6.6E-08	0	0	0	0
Acetaldehyde	t/d	8.509E-05	0	0	8.509E-05	8.509E-05	0	0	0	0
Acrolein	t/d	0.0001004	0	0	0.0001004	0.0001004	0	0	0	0
Aliphatic aldehydes	t/d	0	0	0	0	0	0	0	0	0
Aliphatic C_{17}-C_{34}	t/d	0	0	0	0	0	0	0	0	0
Aliphatic C_5-C_8	t/d	0.01092	0	0	0.01092	0.01092	0	0	0	0
Aliphatic C_9-C_{16}	t/d	0.00042	0	0	0.00042	0.00042	0	0	0	0
Aliphatic ketones	t/d	0	0	0	0	0	0	0	0	0
Anthracene	t/d	8.782E-09	0	0	8.782E-09	8.782E-09	0	0	0	0
Aromatic C_{17}-C_{34}	t/d	9.81E-09	0	0	9.81E-09	9.81E-09	0	0	0	0
Aromatic C_9-C_{16}	t/d	2.382E-07	0	0	2.382E-07	2.382E-07	0	0	0	0
Benzaldehyde	t/d	8.945E-05	0	0	8.945E-05	8.945E-05	0	0	0	0
Benzene	t/d	6.109E-05	0	0	6.109E-05	6.109E-05	0	0	0	0
Benzo(a)pyrene	t/d	5.345E-09	0	0	5.345E-09	5.345E-09	0	0	0	0
Benzo(b)fluoranthene	t/d	6.218E-09	0	0	6.218E-09	6.218E-09	0	0	0	0
Benzo(g,h,i)perylene	t/d	6.818E-09	0	0	6.818E-09	6.818E-09	0	0	0	0
Benzo(k)fluoranthene	t/d	5.4E-09	0	0	5.4E-09	5.4E-09	0	0	0	0
Carboxylic acids	t/d	0	0	0	0	0	0	0	0	0
Chrysene	t/d	7.582E-09	0	0	7.582E-09	7.582E-09	0	0	0	0
Dibenz(a,h)anthracene	t/d	5.002E-09	0	0	5.002E-09	5.002E-09	0	0	0	0
Ethylbenzene	t/d	1.227E-05	0	0	1.227E-05	1.227E-05	0	0	0	0
Fluoranthene	t/d	6.491E-08	0	0	6.491E-08	6.491E-08	0	0	0	0
Fluorene	t/d	2.504E-08	0	0	2.504E-08	2.504E-08	0	0	0	0
Formaldehyde	t/d	0.0012055	0	0	0.0012055	0.0012055	0	0	0	0
Hexane	t/d	0	0	0	0	0	0	0	0	0
Indeno(1,2,3-cd)pyrene	t/d	6.382E-09	0	0	6.382E-09	6.382E-09	0	0	0	0
Naphthalene	t/d	6.109E-06	0	0	6.109E-06	6.109E-06	0	0	0	0
Phenanthrene	t/d	1.838E-07	0	0	1.838E-07	1.838E-07	0	0	0	0
Propylene	t/d	0.0012818	0	0	0.0012818	0.0012818	0	0	0	0
Pyrene	t/d	3.055E-08	0	0	3.055E-08	3.055E-08	0	0	0	0

Point Source										
Facility	**Units**	**BlackGold Phase 1**			**BlackGold Expansion**					
Emission Source		**Steam Generator**	**Slop Oil Heater**	**Glycol Heater**	**Steam Generator**	**Steam Generator**	**Glycol Heater**	**Slop Oil Heater**	**HP Flare**	**LP Flare**
Toluene	t/d	0.0001609	0	0	0.0001609	0.0001609	0	0	0	0
Xylenes	t/d	0.0001505	0	0	0.0001505	0.0001505	0	0	0	0
Aluminum (Al)	t/d	2.191E-05	0	0	2.191E-05	2.191E-05	0	0	0	0
Arsenic (As)	t/d	7.302E-07	0	0	7.302E-07	7.302E-07	0	0	0	0
Barium (Ba)	t/d	1.911E-06	0	0	1.911E-06	1.911E-06	0	0	0	0
Cadmium (Cd)	t/d	2.416E-07	0	0	2.416E-07	2.416E-07	0	0	0	0
Calcium (Ca)	t/d	7.302E-05	0	0	7.302E-05	7.302E-05	0	0	0	0
Chromium (Cr)	t/d	1.933E-07	0	0	1.933E-07	1.933E-07	0	0	0	0
Cobalt (Co)	t/d	5.256E-06	0	0	5.256E-06	5.256E-06	0	0	0	0
Copper (Cu)	t/d	9.128E-06	0	0	9.128E-06	9.128E-06	0	0	0	0
Iron (Fe)	t/d	4.016E-05	0	0	4.016E-05	4.016E-05	0	0	0	0
Lead (Pb)	t/d	5.477E-07	0	0	5.477E-07	5.477E-07	0	0	0	0
Magnesium (Mg)	t/d	0	0	0	0	0	0	0	0	0
Manganese (Mn)	t/d	1.826E-06	0	0	1.826E-06	1.826E-06	0	0	0	0
Nickel (Ni)	t/d	9.128E-06	0	0	9.128E-06	9.128E-06	0	0	0	0
Potassium (K)	t/d	1.826E-05	0	0	1.826E-05	1.826E-05	0	0	0	0
Silver (Ag)	t/d	0	0	0	0	0	0	0	0	0
Silicon (Si)	t/d	0.0001058	0	0	0.0001058	0.0001058	0	0	0	0
Strontium (Sr)	t/d	1.826E-07	0	0	1.826E-07	1.826E-07	0	0	0	0
Titanium (Ti)	t/d	1.826E-06	0	0	1.826E-06	1.826E-06	0	0	0	0
Vanadium (V)	t/d	3.651E-06	0	0	3.651E-06	3.651E-06	0	0	0	0
Zinc (Zn)	t/d	1.46E-05	0	0	1.46E-05	1.46E-05	0	0	0	0
Zirconium (Zr)	t/d	2.148E-08	0	0	2.148E-08	2.148E-08	0	0	0	0
Molybdenum (Mo)	t/d	2.416E-09	0	0	2.416E-09	2.416E-09	0	0	0	0
Selenium (Se)	t/d	1.289E-06	0	0	1.289E-06	1.289E-06	0	0	0	0

Note: "0" – No emissions.

Area Source			
Facility	Units	BlackGold Phase 2	BlackGold Phase 1
Emission Source		Plant Fugitive	Plant Fugitive
Corner 1 UTM N	m	500580	500769
Corner 1 UTM E	m	6159564	6159608
Corner 2 UTM N	m	501080	501269
Corner 2 UTM E	m	6159564	6159608
Corner 3 UTM N	m	501080	501269
Corner 3 UTM E	m	6159064	6159108
Corner 4 UTM N	m	500580	500769
Corner 4 UTM E	m	6159064	6159108
Area	m^2	250000	250000
Elevation (m)	masl	606	607
1,3-butadiene	t/d	2.961E-07	1.481E-07
Acenaphthene	t/d	0	0
Acenaphthylene	t/d	0	0
Acetaldehyde	t/d	0	0
Acrolein	t/d	0	0
Aliphatic aldehydes	t/d	0.0017673	0.0008836
Aliphatic C_{17}-C_{34}	t/d	0.0008206	0.0004103
Aliphatic C_5-C_8	t/d	0.0138744	0.0069372
Aliphatic C_9-C_{16}	t/d	0.057116	0.028558
Aliphatic ketones	t/d	0.0062596	0.0031298
Anthracene	t/d	0	0
Aromatic C_{17}-C_{34}	t/d	0	0
Aromatic C_9-C_{16}	t/d	0.0014695	0.0007348
Benzaldehyde	t/d	0	0
Benzene	t/d	0.0010964	0.0005482
Benzo(a)pyrene	t/d	0	0
Benzo(b)fluoranthene	t/d	0	0
Benzo(g,h,i)perylene	t/d	0	0
Benzo(k)fluoranthene	t/d	0	0
Carboxylic acids	t/d	2.369E-07	1.184E-07
Chrysene	t/d	0	0
Dibenz(a,h)anthracene	t/d	0	0
Ethylbenzene	t/d	6.599E-05	3.299E-05
Fluoranthene	t/d	0	0
Fluorene	t/d	0	0
Formaldehyde	t/d	0	0
Hexane	t/d	0.0009052	0.0004526
Indeno(1,2,3-cd)pyrene	t/d	0	0
Naphthalene	t/d	8.46E-09	4.23E-09
Phenanthrene	t/d	0	0
Propylene	t/d	0	0
Pyrene	t/d	0	0
Toluene	t/d	0.0004907	0.0002453
Xylenes	t/d	0.0002876	0.0001438
Carbon disulphide	t/d	0.0004766	0.0002383
Hydrogen Sulphide	t/d	3.918E-05	1.959E-05
Mercaptans	t/d	0.0004919	0.0002459
Thiophenes	t/d	0.0006525	0.0003263

Note: “0” = No emissions.

2.7 Husky Energy

Table B4-16: Summary of Husky Caribou VOC, PAH and Metal Air Emissions Used for Baseline and Application Cases

Point Source						
Facility	**Units**	**Caribou Lake Thermal Demonstration**				
Emission Source		**Steam Generator 1**	**Steam Generator 2**	**Glycol Heater**	**Emergency Generator**	**Flare**
UTMmN	m	525137	525151	525105	525138	524930
UTMmE	m	6090343	6090343	6090330	6090292	6090335
Elevation	masl	692	692	692	692	693
Stack Height	m	30	30	12	6	30.8
Stack Diameter	m	1.67	1.67	0.46	0.2	2.38
Exit Velocity	m/s	25.5	25.5	20.5	100	0.1
Exit Temperature	K	423	423	523	718	1273
1,3-butadiene	t/d	0	0	0	0	0
Acenaphthene	t/d	4.574E-09	4.574E-09	2.022E-10	2.148E-09	0
Acenaphthylene	t/d	3.982E-08	3.982E-08	1.76E-09	1.87E-08	0
Acetaldehyde	t/d	5.134E-05	5.134E-05	2.269E-06	2.411E-05	0
Acrolein	t/d	6.055E-05	6.055E-05	2.676E-06	2.844E-05	0
Aliphatic aldehydes	t/d	0	0	0	0	0
Aliphatic C_{17}-C_{34}	t/d	0	0	0	0	0
Aliphatic C_5-C_8	t/d	0.0065884	0.0065884	0.0002912	0.003094	0
Aliphatic C_9-C_{16}	t/d	0.0002534	0.0002534	0.0000112	0.000119	0
Aliphatic ketones	t/d	0	0	0	0	0
Anthracene	t/d	5.298E-09	5.298E-09	2.342E-10	2.488E-09	0
Aromatic C_{17}-C_{34}	t/d	5.919E-09	5.919E-09	2.616E-10	2.78E-09	0
Aromatic C_9-C_{16}	t/d	1.437E-07	1.437E-07	6.352E-09	6.749E-08	0
Benzaldehyde	t/d	5.397E-05	5.397E-05	2.385E-06	2.535E-05	0
Benzene	t/d	3.686E-05	3.686E-05	1.629E-06	1.731E-05	0
Benzo(a)pyrene	t/d	3.225E-09	3.225E-09	1.425E-10	1.515E-09	0
Benzo(b)fluoranthene	t/d	3.752E-09	3.752E-09	1.658E-10	1.762E-09	0
Benzo(g,h,i)perylene	t/d	4.114E-09	4.114E-09	1.818E-10	1.932E-09	0
Benzo(k)fluoranthene	t/d	3.258E-09	3.258E-09	1.44E-10	1.53E-09	0
Carboxylic acids	t/d	0	0	0	0	0
Chrysene	t/d	4.574E-09	4.574E-09	2.022E-10	2.148E-09	0
Dibenz(a,h)anthracene	t/d	3.018E-09	3.018E-09	1.334E-10	1.417E-09	0
Ethylbenzene	t/d	7.405E-06	7.405E-06	3.273E-07	3.477E-06	0
Fluoranthene	t/d	3.916E-08	3.916E-08	1.731E-09	1.839E-08	0
Fluorene	t/d	1.511E-08	1.511E-08	6.676E-10	7.094E-09	0
Formaldehyde	t/d	0.0007273	0.0007273	3.215E-05	0.0003415	0
Hexane	t/d	0	0	0	0	0
Indeno(1,2,3-cd)pyrene	t/d	3.85E-09	3.85E-09	1.702E-10	1.808E-09	0
Naphthalene	t/d	3.686E-06	3.686E-06	1.629E-07	1.731E-06	0
Phenanthrene	t/d	1.109E-07	1.109E-07	4.902E-09	5.208E-08	0
Propylene	t/d	0.0007734	0.0007734	3.418E-05	0.0003632	0
Pyrene	t/d	1.843E-08	1.843E-08	8.145E-10	8.655E-09	0

Point Source						
Facility	Units	Caribou Lake Thermal Demonstration				
Emission Source		Steam Generator 1	Steam Generator 2	Glycol Heater	Emergency Generator	Flare
Toluene	t/d	9.708E-05	9.708E-05	4.291E-06	4.559E-05	0
Xylenes	t/d	9.083E-05	9.083E-05	4.015E-06	4.265E-05	0
Aluminum (Al)	t/d	1.309E-05	1.309E-05	8.762E-07	1.643E-07	0
Arsenic (As)	t/d	4.363E-07	4.363E-07	2.921E-08	5.477E-09	0
Barium (Ba)	t/d	1.142E-06	1.142E-06	7.646E-08	1.434E-08	0
Cadmium (Cd)	t/d	1.444E-07	1.444E-07	9.664E-09	1.812E-09	0
Calcium (Ca)	t/d	4.363E-05	4.363E-05	2.921E-06	5.477E-07	0
Chromium (Cr)	t/d	1.155E-07	1.155E-07	7.732E-09	1.45E-09	0
Cobalt (Co)	t/d	3.141E-06	3.141E-06	2.103E-07	3.942E-08	0
Copper (Cu)	t/d	5.454E-06	5.454E-06	3.651E-07	6.846E-08	0
Iron (Fe)	t/d	2.4E-05	2.4E-05	1.606E-06	3.012E-07	0
Lead (Pb)	t/d	3.272E-07	3.272E-07	2.191E-08	4.107E-09	0
Magnesium (Mg)	t/d	0	0	0	0	0
Manganese (Mn)	t/d	1.091E-06	1.091E-06	7.302E-08	1.369E-08	0
Nickel (Ni)	t/d	5.454E-06	5.454E-06	3.651E-07	6.846E-08	0
Potassium (K)	t/d	1.091E-05	1.091E-05	7.302E-07	1.369E-07	0
Silver (Ag)	t/d	0	0	0	0	0
Silicon (Si)	t/d	6.32E-05	6.32E-05	4.231E-06	7.933E-07	0
Strontium (Sr)	t/d	1.091E-07	1.091E-07	7.302E-09	1.369E-09	0
Titanium (Ti)	t/d	1.091E-06	1.091E-06	7.302E-08	1.369E-08	0
Vanadium (V)	t/d	2.181E-06	2.181E-06	1.46E-07	2.738E-08	0
Zinc (Zn)	t/d	8.726E-06	8.726E-06	5.842E-07	1.095E-07	0
Zirconium (Zr)	t/d	1.283E-08	1.283E-08	8.591E-10	1.611E-10	0
Molybdenum (Mo)	t/d	1.444E-09	1.444E-09	9.664E-11	1.812E-11	0
Selenium (Se)	t/d	7.699E-07	7.699E-07	5.154E-08	9.664E-09	0

Note: "0" – No emissions.

Area Source		
Facility	**Units**	**Caribou Lake**
Emission Source		**Plant Fugitive**
Corner 1 UTM N	m	524842
Corner 1 UTM E	m	6090579
Corner 2 UTM N	m	525342
Corner 2 UTM E	m	6090579
Corner 3 UTM N	m	525342
Corner 3 UTM E	m	6090079
Corner 4 UTM N	m	524842
Corner 4 UTM E	m	6090079
Area	m^2	250000
Elevation (m)	masl	692
1,3-butadiene	t/d	1.481E-07
Acenaphthene	t/d	0
Acenaphthylene	t/d	0
Acetaldehyde	t/d	0
Acrolein	t/d	0
Aliphatic aldehydes	t/d	0.0008836
Aliphatic C_{17}-C_{34}	t/d	0.0004103
Aliphatic C_5-C_8	t/d	0.0069372
Aliphatic C_9-C_{16}	t/d	0.028558
Aliphatic ketones	t/d	0.0031298
Anthracene	t/d	0
Aromatic C_{17}-C_{34}	t/d	0
Aromatic C_9-C_{16}	t/d	0.0007348
Benzaldehyde	t/d	0
Benzene	t/d	0.0005482
Benzo(a)pyrene	t/d	0
Benzo(b)fluoranthene	t/d	0
Benzo(g,h,i)perylene	t/d	0
Benzo(k)fluoranthene	t/d	0
Carboxylic acids	t/d	1.184E-07
Chrysene	t/d	0
Dibenz(a,h)anthracene	t/d	0
Ethylbenzene	t/d	3.299E-05
Fluoranthene	t/d	0
Fluorene	t/d	0
Formaldehyde	t/d	0
Hexane	t/d	0.0004526
Indeno(1,2,3-cd)pyrene	t/d	0
Naphthalene	t/d	4.23E-09
Phenanthrene	t/d	0
Propylene	t/d	0
Pyrene	t/d	0
Toluene	t/d	0.0002453
Xylenes	t/d	0.0001438
Carbon disulphide	t/d	0.0002383
Hydrogen Sulphide	t/d	1.959E-05
Mercaptans	t/d	0.0002459
Thiophenes	t/d	0.0003263

Note: “0” = No emissions.

2.8 MEG Energy Corp.

Table B4-17: Summary of MEG Christina Lake VOC, PAH and Metal Air Emissions Used for Baseline and Application Cases

Point Source					
Facility	Units	Christina Lake Phase 1 (Pilot)			
Emission Source		OTSG	Glycol Heater	LP Flare Continuous	HP Flare Continuous
UTMmN	m	517796	517828	517870	517850
UTMmE	m	6168843	6168816	6168764	6168732
Elevation	masl	578	578	578	578
Stack Height	m	30	7.5	13.2	31.5
Stack Diameter	m	1.38	0.51	2.4	2.88
Exit Velocity	m/s	20.7	4.5	0.2	0.1
Exit Temperature	K	445	434	1273	1273
1,3-butadiene	t/d	0	0	0	0
Acenaphthene	t/d	3.033E-09	0	0	0
Acenaphthylene	t/d	2.64E-08	0	0	0
Acetaldehyde	t/d	3.404E-05	0	1.804E-06	1.804E-06
Acrolein	t/d	4.015E-05	0	5.902E-07	5.902E-07
Aliphatic aldehydes	t/d	0	0	0	0
Aliphatic C_{17}-C_{34}	t/d	0	0	0	0
Aliphatic C_5-C_8	t/d	0.004368	0	0.000364	0.000364
Aliphatic C_9-C_{16}	t/d	0.000168	0	0.000014	0.000014
Aliphatic ketones	t/d	0	0	0	0
Anthracene	t/d	3.513E-09	0	0	0
Aromatic C_{17}-C_{34}	t/d	3.924E-09	0	9.64E-10	9.64E-10
Aromatic C_9-C_{16}	t/d	9.528E-08	0	7.3E-07	7.3E-07
Benzaldehyde	t/d	3.578E-05	0	0	0
Benzene	t/d	2.444E-05	0	1.28E-06	1.28E-06
Benzo(a)pyrene	t/d	2.138E-09	0	1.476E-07	1.476E-07
Benzo(b)fluoranthene	t/d	2.487E-09	0	1.476E-07	1.476E-07
Benzo(g,h,i)perylene	t/d	2.727E-09	0	1.476E-07	1.476E-07
Benzo(k)fluoranthene	t/d	2.16E-09	0	1.476E-07	1.476E-07
Carboxylic acids	t/d	0	0	0	0
Chrysene	t/d	3.033E-09	0	1.483E-07	1.483E-07
Dibenz(a,h)anthracene	t/d	2.001E-09	0	1.476E-07	1.476E-07
Ethylbenzene	t/d	4.909E-06	0	0	0
Fluoranthene	t/d	2.596E-08	0	1.587E-07	1.587E-07
Fluorene	t/d	1.001E-08	0	0	0
Formaldehyde	t/d	0.0004822	0	0.0002063	0.0002063
Hexane	t/d	0	0	0	0
Indeno(1,2,3-cd)pyrene	t/d	2.553E-09	0	1.476E-07	1.476E-07
Naphthalene	t/d	2.444E-06	0	9.091E-05	9.091E-05
Phenanthrene	t/d	7.353E-08	0	1.958E-07	1.958E-07
Propylene	t/d	0.0005127	0	0	0
Pyrene	t/d	1.222E-08	0	1.559E-07	1.559E-07

Point Source					
Facility	**Units**	**Christina Lake Phase 1 (Pilot)**			
Emission Source		**OTSG**	**Glycol Heater**	**LP Flare Continuous**	**HP Flare Continuous**
Toluene	t/d	6.436E-05	0	0.0001231	0.0001231
Xylenes	t/d	6.022E-05	0	3.874E-06	3.874E-06
Aluminum (Al)	t/d	8.762E-06	0	0	0
Arsenic (As)	t/d	2.921E-07	0	0	0
Barium (Ba)	t/d	7.646E-07	0	0	0
Cadmium (Cd)	t/d	9.664E-08	0	0	0
Calcium (Ca)	t/d	2.921E-05	0	0	0
Chromium (Cr)	t/d	7.732E-08	0	0	0
Cobalt (Co)	t/d	2.103E-06	0	0	0
Copper (Cu)	t/d	3.651E-06	0	0	0
Iron (Fe)	t/d	1.606E-05	0	0	0
Lead (Pb)	t/d	2.191E-07	0	0	0
Magnesium (Mg)	t/d	0	0	0	0
Manganese (Mn)	t/d	7.302E-07	0	0	0
Nickel (Ni)	t/d	3.651E-06	0	0	0
Potassium (K)	t/d	7.302E-06	0	0	0
Silver (Ag)	t/d	0	0	0	0
Silicon (Si)	t/d	4.231E-05	0	0	0
Strontium (Sr)	t/d	7.302E-08	0	0	0
Titanium (Ti)	t/d	7.302E-07	0	0	0
Vanadium (V)	t/d	1.46E-06	0	0	0
Zinc (Zn)	t/d	5.842E-06	0	0	0
Zirconium (Zr)	t/d	8.591E-09	0	0	0
Molybdenum (Mo)	t/d	9.664E-10	0	0	0
Selenium (Se)	t/d	5.154E-07	0	0	0

Point Source (cont'd)							
Facility	**Units**	**Christina Lake Phase 2**					
Emission Source		**OTSG**	**Cogen**	**Glycol Heater**	**Slop Treater**	**Slop Treater**	**HP Flare Continuous**
UTMmN	m	517772	517704	517818	517867	517867	517874
UTMmE	m	6168836	6168835	6168886	6168901	6168900	6169058
Elevation	masl	578	578	578	578	578	578
Stack Height	m	30	24	5	9	9	55.2
Stack Diameter	m	1.68	5.18	1.02	0.61	0.61	5.75
Exit Velocity	m/s	19.7	21.4	5.8	5.3	5.3	0
Exit Temperature	K	445	437	434	533	533	1273
1,3-butadiene	t/d	0	3.145E-06	0	0	0	0
Acenaphthene	t/d	4.044E-09	0	5.055E-10	0	0	0
Acenaphthylene	t/d	3.52E-08	0	4.4E-09	0	0	0
Acetaldehyde	t/d	4.538E-05	0.0023121	5.673E-06	0	0	3.608E-06
Acrolein	t/d	5.353E-05	0.0003712	6.691E-06	0	0	1.18E-06
Aliphatic aldehydes	t/d	0	0	0	0	0	0
Aliphatic C_{17}-C_{34}	t/d	0	0	0	0	0	0
Aliphatic C_5-C_8	t/d	0.005824	0.013992	0.000728	0	0	0.000728
Aliphatic C_9-C_{16}	t/d	0.000224	0.000742	0.000028	0	0	0.000028
Aliphatic ketones	t/d	0	0	0	0	0	0
Anthracene	t/d	4.684E-09	0	5.855E-10	0	0	0
Aromatic C_{17}-C_{34}	t/d	5.232E-09	2.631E-08	6.54E-10	0	0	1.928E-09
Aromatic C_9-C_{16}	t/d	1.27E-07	2.299E-06	1.588E-08	0	0	1.46E-06
Benzaldehyde	t/d	4.771E-05	0.000158	5.964E-06	0	0	0
Benzene	t/d	3.258E-05	0.0015368	4.073E-06	0	0	2.559E-06
Benzo(a)pyrene	t/d	2.851E-09	2.326E-07	3.564E-10	0	0	2.951E-07
Benzo(b)fluoranthene	t/d	3.316E-09	1.902E-07	4.145E-10	0	0	2.951E-07
Benzo(g,h,i)perylene	t/d	3.636E-09	2.302E-07	4.545E-10	0	0	2.951E-07
Benzo(k)fluoranthene	t/d	2.88E-09	1.848E-07	3.6E-10	0	0	2.951E-07
Carboxylic acids	t/d	0	0	0	0	0	0
Chrysene	t/d	4.044E-09	4.205E-07	5.055E-10	0	0	2.965E-07
Dibenz(a,h)anthracene	t/d	2.668E-09	3.91E-07	3.335E-10	0	0	2.951E-07
Ethylbenzene	t/d	6.545E-06	0.0003028	8.182E-07	0	0	0
Fluoranthene	t/d	3.462E-08	7.515E-07	4.327E-09	0	0	3.175E-07
Fluorene	t/d	1.335E-08	0	1.669E-09	0	0	0
Formaldehyde	t/d	0.0006429	0.0158504	8.036E-05	0	0	0.0004126
Hexane	t/d	0	0.0042763	0	0	0	0
Indeno(1,2,3-cd)pyrene	t/d	3.404E-09	3.918E-07	4.255E-10	0	0	2.951E-07
Naphthalene	t/d	3.258E-06	3.101E-05	4.073E-07	0	0	0.0001818
Phenanthrene	t/d	9.804E-08	5.276E-06	1.225E-08	0	0	3.916E-07
Propylene	t/d	0.0006836	0	8.545E-05	0	0	0
Pyrene	t/d	1.629E-08	4.753E-07	2.036E-09	0	0	3.119E-07
Toluene	t/d	8.582E-05	0.001267	1.073E-05	0	0	0.0002462
Xylenes	t/d	8.029E-05	0.0005196	1.004E-05	0	0	7.748E-06
Aluminum (Al)	t/d	1.26E-05	4.576E-05	1.643E-06	0	0	0
Arsenic (As)	t/d	4.199E-07	2.172E-06	5.477E-08	0	0	0

Point Source (cont'd)							
Facility	**Units**	**Christina Lake Phase 2**					
Emission Source		**OTSG**	**Cogen**	**Glycol Heater**	**Slop Treater**	**Slop Treater**	**HP Flare Continuous**
Barium (Ba)	t/d	1.099E-06	5.686E-06	1.434E-07	0	0	0
Cadmium (Cd)	t/d	1.389E-07	7.188E-07	1.812E-08	0	0	0
Calcium (Ca)	t/d	4.199E-05	0.0001049	5.477E-06	0	0	0
Chromium (Cr)	t/d	1.111E-07	7.524E-06	1.45E-08	0	0	0
Cobalt (Co)	t/d	3.022E-06	5.597E-06	3.942E-07	0	0	0
Copper (Cu)	t/d	5.248E-06	1.434E-05	6.846E-07	0	0	0
Iron (Fe)	t/d	2.309E-05	0.0001083	3.012E-06	0	0	0
Lead (Pb)	t/d	3.149E-07	1.745E-06	4.107E-08	0	0	0
Magnesium (Mg)	t/d	0	1.983E-05	0	0	0	0
Manganese (Mn)	t/d	1.05E-06	3.734E-06	1.369E-07	0	0	0
Nickel (Ni)	t/d	5.248E-06	1.109E-05	6.846E-07	0	0	0
Potassium (K)	t/d	1.05E-05	3.253E-05	1.369E-06	0	0	0
Silver (Ag)	t/d	0	1.37E-05	0	0	0	0
Silicon (Si)	t/d	6.082E-05	0.0003147	7.933E-06	0	0	0
Strontium (Sr)	t/d	1.05E-07	9.022E-07	1.369E-08	0	0	0
Titanium (Ti)	t/d	1.05E-06	6.258E-06	1.369E-07	0	0	0
Vanadium (V)	t/d	2.099E-06	5.424E-06	2.738E-07	0	0	0
Zinc (Zn)	t/d	8.397E-06	2.085E-05	1.095E-06	0	0	0
Zirconium (Zr)	t/d	1.235E-08	4.901E-07	1.611E-09	0	0	0
Molybdenum (Mo)	t/d	1.389E-09	0	1.812E-10	0	0	0
Selenium (Se)	t/d	7.409E-07	0	9.664E-08	0	0	0

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Point Source (cont'd)								
Facility	**Units**	**Christina Lake Phase 2B**						
Emission Source		**Steam Generator 1**	**Steam Generator 2**	**Steam Generator 3**	**Cogen**	**Glycol Heater**	**Amine Preheater**	**Flare**
UTMmN	m	517373	517378	517383	517632	517639	517917	517860
UTMmE	m	6169140	6169122	6169105	6168815	6169235	6168990	6169109
Elevation	masl	579	579	579	578	579	578	578
Stack Height	m	30	30	30	24	15	15	55.2
Stack Diameter	m	1.96	1.96	1.96	5.18	1.52	0.31	7.19
Exit Velocity	m/s	17	17	17	21.4	9.5	76.3	0
Exit Temperature	K	444	444	444	437	618	533	1273
1,3-butadiene	t/d	0	0	0	3.145E-06	0	0	0
Acenaphthene	t/d	4.802E-09	4.802E-09	4.802E-09	0	1.264E-09	5.055E-10	0
Acenaphthylene	t/d	4.18E-08	4.18E-08	4.18E-08	0	1.1E-08	4.4E-09	0
Acetaldehyde	t/d	5.389E-05	5.389E-05	5.389E-05	0.0023121	1.418E-05	5.673E-06	3.608E-06
Acrolein	t/d	6.356E-05	6.356E-05	6.356E-05	0.0003712	1.673E-05	6.691E-06	1.18E-06
Aliphatic aldehydes	t/d	0	0	0	0	0	0	0
Aliphatic C_{17}-C_{34}	t/d	0	0	0	0	0	0	0
Aliphatic C_5-C_8	t/d	0.006916	0.006916	0.006916	0.013992	0.00182	0.000728	0.000728
Aliphatic C_9-C_{16}	t/d	0.000266	0.000266	0.000266	0.000742	0.00007	0.000028	0.000028
Aliphatic ketones	t/d	0	0	0	0	0	0	0
Anthracene	t/d	5.562E-09	5.562E-09	5.562E-09	0	1.464E-09	5.855E-10	0
Aromatic C_{17}-C_{34}	t/d	6.213E-09	6.213E-09	6.213E-09	2.631E-08	1.635E-09	6.54E-10	1.928E-09
Aromatic C_9-C_{16}	t/d	1.509E-07	1.509E-07	1.509E-07	2.299E-06	3.97E-08	1.588E-08	1.46E-06
Benzaldehyde	t/d	5.665E-05	5.665E-05	5.665E-05	0.000158	1.491E-05	5.964E-06	0
Benzene	t/d	3.869E-05	3.869E-05	3.869E-05	0.0015368	1.018E-05	4.073E-06	2.559E-06
Benzo(a)pyrene	t/d	3.385E-09	3.385E-09	3.385E-09	2.326E-07	8.909E-10	3.564E-10	2.951E-07
Benzo(b)fluoranthene	t/d	3.938E-09	3.938E-09	3.938E-09	1.902E-07	1.036E-09	4.145E-10	2.951E-07
Benzo(g,h,i)perylene	t/d	4.318E-09	4.318E-09	4.318E-09	2.302E-07	1.136E-09	4.545E-10	2.951E-07
Benzo(k)fluoranthene	t/d	3.42E-09	3.42E-09	3.42E-09	1.848E-07	9E-10	3.6E-10	2.951E-07
Carboxylic acids	t/d	0	0	0	0	0	0	0
Chrysene	t/d	4.802E-09	4.802E-09	4.802E-09	4.205E-07	1.264E-09	5.055E-10	2.965E-07
Dibenz(a,h)anthracene	t/d	3.168E-09	3.168E-09	3.168E-09	3.91E-07	8.336E-10	3.335E-10	2.951E-07
Ethylbenzene	t/d	7.773E-06	7.773E-06	7.773E-06	0.0003028	2.045E-06	8.182E-07	0
Fluoranthene	t/d	4.111E-08	4.111E-08	4.111E-08	7.515E-07	1.082E-08	4.327E-09	3.175E-07
Fluorene	t/d	1.586E-08	1.586E-08	1.586E-08	0	4.173E-09	1.669E-09	0
Formaldehyde	t/d	0.0007635	0.0007635	0.0007635	0.0158504	0.0002009	8.036E-05	0.0004126
Hexane	t/d	0	0	0	0.0042763	0	0	0
Indeno(1,2,3-cd)pyrene	t/d	4.042E-09	4.042E-09	4.042E-09	3.918E-07	1.064E-09	4.255E-10	2.951E-07
Naphthalene	t/d	3.869E-06	3.869E-06	3.869E-06	3.101E-05	1.018E-06	4.073E-07	0.0001818
Phenanthrene	t/d	1.164E-07	1.164E-07	1.164E-07	5.276E-06	3.064E-08	1.225E-08	3.916E-07
Propylene	t/d	0.0008118	0.0008118	0.0008118	0	0.0002136	8.545E-05	0
Pyrene	t/d	1.935E-08	1.935E-08	1.935E-08	4.753E-07	5.091E-09	2.036E-09	3.119E-07
Toluene	t/d	0.0001019	0.0001019	0.0001019	0.001267	2.682E-05	1.073E-05	0.0002462
Xylenes	t/d	9.535E-05	9.535E-05	9.535E-05	0.0005196	2.509E-05	1.004E-05	7.748E-06
Aluminum (Al)	t/d	1.479E-05	1.479E-05	1.479E-05	4.576E-05	3.286E-06	1.095E-06	0

Point Source (cont'd)								
Facility	**Units**	**Christina Lake Phase 2B**						
Emission Source		**Steam Generator 1**	**Steam Generator 2**	**Steam Generator 3**	**Cogen**	**Glycol Heater**	**Amine Preheater**	**Flare**
Arsenic (As)	t/d	4.929E-07	4.929E-07	4.929E-07	2.172E-06	1.095E-07	3.651E-08	0
Barium (Ba)	t/d	1.29E-06	1.29E-06	1.29E-06	5.686E-06	2.867E-07	9.557E-08	0
Cadmium (Cd)	t/d	1.631E-07	1.631E-07	1.631E-07	7.188E-07	3.624E-08	1.208E-08	0
Calcium (Ca)	t/d	4.929E-05	4.929E-05	4.929E-05	0.0001049	1.095E-05	3.651E-06	0
Chromium (Cr)	t/d	1.305E-07	1.305E-07	1.305E-07	7.524E-06	2.899E-08	9.664E-09	0
Cobalt (Co)	t/d	3.548E-06	3.548E-06	3.548E-06	5.597E-06	7.885E-07	2.628E-07	0
Copper (Cu)	t/d	6.161E-06	6.161E-06	6.161E-06	1.434E-05	1.369E-06	4.564E-07	0
Iron (Fe)	t/d	2.711E-05	2.711E-05	2.711E-05	0.0001083	6.024E-06	2.008E-06	0
Lead (Pb)	t/d	3.697E-07	3.697E-07	3.697E-07	1.745E-06	8.215E-08	2.738E-08	0
Magnesium (Mg)	t/d	0	0	0	1.983E-05	0	0	0
Manganese (Mn)	t/d	1.232E-06	1.232E-06	1.232E-06	3.734E-06	2.738E-07	9.128E-08	0
Nickel (Ni)	t/d	6.161E-06	6.161E-06	6.161E-06	1.109E-05	1.369E-06	4.564E-07	0
Potassium (K)	t/d	1.232E-05	1.232E-05	1.232E-05	3.253E-05	2.738E-06	9.128E-07	0
Silver (Ag)	t/d	0	0	0	1.37E-05	0	0	0
Silicon (Si)	t/d	7.14E-05	7.14E-05	7.14E-05	0.0003147	1.587E-05	5.289E-06	0
Strontium (Sr)	t/d	1.232E-07	1.232E-07	1.232E-07	9.022E-07	2.738E-08	9.128E-09	0
Titanium (Ti)	t/d	1.232E-06	1.232E-06	1.232E-06	6.258E-06	2.738E-07	9.128E-08	0
Vanadium (V)	t/d	2.464E-06	2.464E-06	2.464E-06	5.424E-06	5.477E-07	1.826E-07	0
Zinc (Zn)	t/d	9.858E-06	9.858E-06	9.858E-06	2.085E-05	2.191E-06	7.302E-07	0
Zirconium (Zr)	t/d	1.45E-08	1.45E-08	1.45E-08	4.901E-07	3.221E-09	1.074E-09	0
Molybdenum (Mo)	t/d	1.631E-09	1.631E-09	1.631E-09	0	3.624E-10	1.208E-10	0
Selenium (Se)	t/d	8.698E-07	8.698E-07	8.698E-07	0	1.933E-07	6.443E-08	0

Point Source (cont'd_							
Facility	**Units**	**Christina Lake Phase 3A**					
Emission Source		**Steam Generator 1**	**Steam Generator 2**	**Steam Generator 3**	**Steam Generator 4**	**Steam Generator 5**	**Steam Generator 6**
UTMmN	m	525543	525543	525543	525543	525543	525543
UTMmE	m	6162802	6162785	6162767	6162750	6162732	6162714
Elevation	masl	585	585	585	585	585	585
Stack Height	m	30	30	30	30	30	30
Stack Diameter	m	1.96	1.96	1.96	1.96	1.96	1.96
Exit Velocity	m/s	17	17	17	17	17	17
Exit Temperature	K	444	444	444	444	444	444
1,3-butadiene	t/d	0	0	0	0	0	0
Acenaphthene	t/d	4.802E-09	4.802E-09	4.802E-09	4.802E-09	4.802E-09	4.802E-09
Acenaphthylene	t/d	4.18E-08	4.18E-08	4.18E-08	4.18E-08	4.18E-08	4.18E-08
Acetaldehyde	t/d	5.389E-05	5.389E-05	5.389E-05	5.389E-05	5.389E-05	5.389E-05
Acrolein	t/d	6.356E-05	6.356E-05	6.356E-05	6.356E-05	6.356E-05	6.356E-05
Aliphatic aldehydes	t/d	0	0	0	0	0	0
Aliphatic C_{17}-C_{34}	t/d	0	0	0	0	0	0
Aliphatic C_5-C_8	t/d	0.006916	0.006916	0.006916	0.006916	0.006916	0.006916
Aliphatic C_9-C_{16}	t/d	0.000266	0.000266	0.000266	0.000266	0.000266	0.000266
Aliphatic ketones	t/d	0	0	0	0	0	0
Anthracene	t/d	5.562E-09	5.562E-09	5.562E-09	5.562E-09	5.562E-09	5.562E-09
Aromatic C_{17}-C_{34}	t/d	6.213E-09	6.213E-09	6.213E-09	6.213E-09	6.213E-09	6.213E-09
Aromatic C_9-C_{16}	t/d	1.509E-07	1.509E-07	1.509E-07	1.509E-07	1.509E-07	1.509E-07
Benzaldehyde	t/d	5.665E-05	5.665E-05	5.665E-05	5.665E-05	5.665E-05	5.665E-05
Benzene	t/d	3.869E-05	3.869E-05	3.869E-05	3.869E-05	3.869E-05	3.869E-05
Benzo(a)pyrene	t/d	3.385E-09	3.385E-09	3.385E-09	3.385E-09	3.385E-09	3.385E-09
Benzo(b)fluoranthene	t/d	3.938E-09	3.938E-09	3.938E-09	3.938E-09	3.938E-09	3.938E-09
Benzo(g,h,i)perylene	t/d	4.318E-09	4.318E-09	4.318E-09	4.318E-09	4.318E-09	4.318E-09
Benzo(k)fluoranthene	t/d	3.42E-09	3.42E-09	3.42E-09	3.42E-09	3.42E-09	3.42E-09
Carboxylic acids	t/d	0	0	0	0	0	0
Chrysene	t/d	4.802E-09	4.802E-09	4.802E-09	4.802E-09	4.802E-09	4.802E-09
Dibenz(a,h)anthracene	t/d	3.168E-09	3.168E-09	3.168E-09	3.168E-09	3.168E-09	3.168E-09
Ethylbenzene	t/d	7.773E-06	7.773E-06	7.773E-06	7.773E-06	7.773E-06	7.773E-06
Fluoranthene	t/d	4.111E-08	4.111E-08	4.111E-08	4.111E-08	4.111E-08	4.111E-08
Fluorene	t/d	1.586E-08	1.586E-08	1.586E-08	1.586E-08	1.586E-08	1.586E-08
Formaldehyde	t/d	0.0007635	0.0007635	0.0007635	0.0007635	0.0007635	0.0007635
Hexane	t/d	0	0	0	0	0	0
Indeno(1,2,3-cd)pyrene	t/d	4.042E-09	4.042E-09	4.042E-09	4.042E-09	4.042E-09	4.042E-09
Naphthalene	t/d	3.869E-06	3.869E-06	3.869E-06	3.869E-06	3.869E-06	3.869E-06
Phenanthrene	t/d	1.164E-07	1.164E-07	1.164E-07	1.164E-07	1.164E-07	1.164E-07
Propylene	t/d	0.0008118	0.0008118	0.0008118	0.0008118	0.0008118	0.0008118
Pyrene	t/d	1.935E-08	1.935E-08	1.935E-08	1.935E-08	1.935E-08	1.935E-08
Toluene	t/d	0.0001019	0.0001019	0.0001019	0.0001019	0.0001019	0.0001019
Xylenes	t/d	9.535E-05	9.535E-05	9.535E-05	9.535E-05	9.535E-05	9.535E-05
Aluminum (Al)	t/d	1.479E-05	1.479E-05	1.479E-05	1.479E-05	1.479E-05	1.479E-05
Arsenic (As)	t/d	4.929E-07	4.929E-07	4.929E-07	4.929E-07	4.929E-07	4.929E-07

Point Source (cont'd_							
Facility	**Units**	**Christina Lake Phase 3A**					
Emission Source		**Steam Generator 1**	**Steam Generator 2**	**Steam Generator 3**	**Steam Generator 4**	**Steam Generator 5**	**Steam Generator 6**
Barium (Ba)	t/d	1.29E-06	1.29E-06	1.29E-06	1.29E-06	1.29E-06	1.29E-06
Cadmium (Cd)	t/d	1.631E-07	1.631E-07	1.631E-07	1.631E-07	1.631E-07	1.631E-07
Calcium (Ca)	t/d	4.929E-05	4.929E-05	4.929E-05	4.929E-05	4.929E-05	4.929E-05
Chromium (Cr)	t/d	1.305E-07	1.305E-07	1.305E-07	1.305E-07	1.305E-07	1.305E-07
Cobalt (Co)	t/d	3.548E-06	3.548E-06	3.548E-06	3.548E-06	3.548E-06	3.548E-06
Copper (Cu)	t/d	6.161E-06	6.161E-06	6.161E-06	6.161E-06	6.161E-06	6.161E-06
Iron (Fe)	t/d	2.711E-05	2.711E-05	2.711E-05	2.711E-05	2.711E-05	2.711E-05
Lead (Pb)	t/d	3.697E-07	3.697E-07	3.697E-07	3.697E-07	3.697E-07	3.697E-07
Magnesium (Mg)	t/d	0	0	0	0	0	0
Manganese (Mn)	t/d	1.232E-06	1.232E-06	1.232E-06	1.232E-06	1.232E-06	1.232E-06
Nickel (Ni)	t/d	6.161E-06	6.161E-06	6.161E-06	6.161E-06	6.161E-06	6.161E-06
Potassium (K)	t/d	1.232E-05	1.232E-05	1.232E-05	1.232E-05	1.232E-05	1.232E-05
Silver (Ag)	t/d	0	0	0	0	0	0
Silicon (Si)	t/d	7.14E-05	7.14E-05	7.14E-05	7.14E-05	7.14E-05	7.14E-05
Strontium (Sr)	t/d	1.232E-07	1.232E-07	1.232E-07	1.232E-07	1.232E-07	1.232E-07
Titanium (Ti)	t/d	1.232E-06	1.232E-06	1.232E-06	1.232E-06	1.232E-06	1.232E-06
Vanadium (V)	t/d	2.464E-06	2.464E-06	2.464E-06	2.464E-06	2.464E-06	2.464E-06
Zinc (Zn)	t/d	9.858E-06	9.858E-06	9.858E-06	9.858E-06	9.858E-06	9.858E-06
Zirconium (Zr)	t/d	1.45E-08	1.45E-08	1.45E-08	1.45E-08	1.45E-08	1.45E-08
Molybdenum (Mo)	t/d	1.631E-09	1.631E-09	1.631E-09	1.631E-09	1.631E-09	1.631E-09
Selenium (Se)	t/d	8.698E-07	8.698E-07	8.698E-07	8.698E-07	8.698E-07	8.698E-07

Point Source (cont'd_							
Facility	**Units**	**Christina Lake Phase 3A**					
Emission Source		**Steam Generator 7**	**Steam Generator 8**	**Steam Generator 9**	**Steam Generator 10**	**Steam Generator 11**	**Steam Generator 12**
UTMmN	m	525543	525542	525543	525543	525543	525543
UTMmE	m	6162696	6162595	6162578	6162560	6162542	6162525
Elevation	masl	585	585	585	585	585	585
Stack Height	m	30	30	30	30	30	30
Stack Diameter	m	1.96	1.96	1.96	1.96	1.96	1.96
Exit Velocity	m/s	17	17	17	17	17	17
Exit Temperature	K	444	444	444	444	444	444
1,3-butadiene	t/d	0	0	0	0	0	0
Acenaphthene	t/d	4.802E-09	4.802E-09	4.802E-09	4.802E-09	4.802E-09	4.802E-09
Acenaphthylene	t/d	4.18E-08	4.18E-08	4.18E-08	4.18E-08	4.18E-08	4.18E-08
Acetaldehyde	t/d	5.389E-05	5.389E-05	5.389E-05	5.389E-05	5.389E-05	5.389E-05
Acrolein	t/d	6.356E-05	6.356E-05	6.356E-05	6.356E-05	6.356E-05	6.356E-05
Aliphatic aldehydes	t/d	0	0	0	0	0	0
Aliphatic C_{17}-C_{34}	t/d	0	0	0	0	0	0
Aliphatic C_5-C_8	t/d	0.006916	0.006916	0.006916	0.006916	0.006916	0.006916
Aliphatic C_9-C_{16}	t/d	0.000266	0.000266	0.000266	0.000266	0.000266	0.000266
Aliphatic ketones	t/d	0	0	0	0	0	0
Anthracene	t/d	5.562E-09	5.562E-09	5.562E-09	5.562E-09	5.562E-09	5.562E-09
Aromatic C_{17}-C_{34}	t/d	6.213E-09	6.213E-09	6.213E-09	6.213E-09	6.213E-09	6.213E-09
Aromatic C_9-C_{16}	t/d	1.509E-07	1.509E-07	1.509E-07	1.509E-07	1.509E-07	1.509E-07
Benzaldehyde	t/d	5.665E-05	5.665E-05	5.665E-05	5.665E-05	5.665E-05	5.665E-05
Benzene	t/d	3.869E-05	3.869E-05	3.869E-05	3.869E-05	3.869E-05	3.869E-05
Benzo(a)pyrene	t/d	3.385E-09	3.385E-09	3.385E-09	3.385E-09	3.385E-09	3.385E-09
Benzo(b)fluoranthene	t/d	3.938E-09	3.938E-09	3.938E-09	3.938E-09	3.938E-09	3.938E-09
Benzo(g,h,i)perylene	t/d	4.318E-09	4.318E-09	4.318E-09	4.318E-09	4.318E-09	4.318E-09
Benzo(k)fluoranthene	t/d	3.42E-09	3.42E-09	3.42E-09	3.42E-09	3.42E-09	3.42E-09
Carboxylic acids	t/d	0	0	0	0	0	0
Chrysene	t/d	4.802E-09	4.802E-09	4.802E-09	4.802E-09	4.802E-09	4.802E-09
Dibenz(a,h)anthracene	t/d	3.168E-09	3.168E-09	3.168E-09	3.168E-09	3.168E-09	3.168E-09
Ethylbenzene	t/d	7.773E-06	7.773E-06	7.773E-06	7.773E-06	7.773E-06	7.773E-06
Fluoranthene	t/d	4.111E-08	4.111E-08	4.111E-08	4.111E-08	4.111E-08	4.111E-08
Fluorene	t/d	1.586E-08	1.586E-08	1.586E-08	1.586E-08	1.586E-08	1.586E-08
Formaldehyde	t/d	0.0007635	0.0007635	0.0007635	0.0007635	0.0007635	0.0007635
Hexane	t/d	0	0	0	0	0	0
Indeno(1,2,3-cd)pyrene	t/d	4.042E-09	4.042E-09	4.042E-09	4.042E-09	4.042E-09	4.042E-09
Naphthalene	t/d	3.869E-06	3.869E-06	3.869E-06	3.869E-06	3.869E-06	3.869E-06
Phenanthrene	t/d	1.164E-07	1.164E-07	1.164E-07	1.164E-07	1.164E-07	1.164E-07
Propylene	t/d	0.0008118	0.0008118	0.0008118	0.0008118	0.0008118	0.0008118
Pyrene	t/d	1.935E-08	1.935E-08	1.935E-08	1.935E-08	1.935E-08	1.935E-08
Toluene	t/d	0.0001019	0.0001019	0.0001019	0.0001019	0.0001019	0.0001019
Xylenes	t/d	9.535E-05	9.535E-05	9.535E-05	9.535E-05	9.535E-05	9.535E-05
Aluminum (Al)	t/d	1.479E-05	1.479E-05	1.479E-05	1.479E-05	1.479E-05	1.479E-05
Arsenic (As)	t/d	4.929E-07	4.929E-07	4.929E-07	4.929E-07	4.929E-07	4.929E-07

Point Source (cont'd_							
Facility	**Units**	**Christina Lake Phase 3A**					
Emission Source		**Steam Generator 7**	**Steam Generator 8**	**Steam Generator 9**	**Steam Generator 10**	**Steam Generator 11**	**Steam Generator 12**
Barium (Ba)	t/d	1.29E-06	1.29E-06	1.29E-06	1.29E-06	1.29E-06	1.29E-06
Cadmium (Cd)	t/d	1.631E-07	1.631E-07	1.631E-07	1.631E-07	1.631E-07	1.631E-07
Calcium (Ca)	t/d	4.929E-05	4.929E-05	4.929E-05	4.929E-05	4.929E-05	4.929E-05
Chromium (Cr)	t/d	1.305E-07	1.305E-07	1.305E-07	1.305E-07	1.305E-07	1.305E-07
Cobalt (Co)	t/d	3.548E-06	3.548E-06	3.548E-06	3.548E-06	3.548E-06	3.548E-06
Copper (Cu)	t/d	6.161E-06	6.161E-06	6.161E-06	6.161E-06	6.161E-06	6.161E-06
Iron (Fe)	t/d	2.711E-05	2.711E-05	2.711E-05	2.711E-05	2.711E-05	2.711E-05
Lead (Pb)	t/d	3.697E-07	3.697E-07	3.697E-07	3.697E-07	3.697E-07	3.697E-07
Magnesium (Mg)	t/d	0	0	0	0	0	0
Manganese (Mn)	t/d	1.232E-06	1.232E-06	1.232E-06	1.232E-06	1.232E-06	1.232E-06
Nickel (Ni)	t/d	6.161E-06	6.161E-06	6.161E-06	6.161E-06	6.161E-06	6.161E-06
Potassium (K)	t/d	1.232E-05	1.232E-05	1.232E-05	1.232E-05	1.232E-05	1.232E-05
Silver (Ag)	t/d	0	0	0	0	0	0
Silicon (Si)	t/d	7.14E-05	7.14E-05	7.14E-05	7.14E-05	7.14E-05	7.14E-05
Strontium (Sr)	t/d	1.232E-07	1.232E-07	1.232E-07	1.232E-07	1.232E-07	1.232E-07
Titanium (Ti)	t/d	1.232E-06	1.232E-06	1.232E-06	1.232E-06	1.232E-06	1.232E-06
Vanadium (V)	t/d	2.464E-06	2.464E-06	2.464E-06	2.464E-06	2.464E-06	2.464E-06
Zinc (Zn)	t/d	9.858E-06	9.858E-06	9.858E-06	9.858E-06	9.858E-06	9.858E-06
Zirconium (Zr)	t/d	1.45E-08	1.45E-08	1.45E-08	1.45E-08	1.45E-08	1.45E-08
Molybdenum (Mo)	t/d	1.631E-09	1.631E-09	1.631E-09	1.631E-09	1.631E-09	1.631E-09
Selenium (Se)	t/d	8.698E-07	8.698E-07	8.698E-07	8.698E-07	8.698E-07	8.698E-07

Point Source (cont'd)							
Facility	**Units**	**Christina Lake Phase 3A**					
Emission Source		**Steam Generator 13**	**Steam Generator 14**	**Glycol Heater 1**	**Glycol Heater 2**	**Slop Treater 1A**	**Slop Treater 1B**
UTMmN	m	525542	525542	525800	525801	526028	526028
UTMmE	m	6162507	6162489	6162663	6162627	6162662	6162661
Elevation	masl	585	611	585	585	586	586
Stack Height	m	30	30	15	15	15	15
Stack Diameter	m	1.96	1.96	1.52	1.52	0.61	0.61
Exit Velocity	m/s	17	17	10.2	10.2	5.7	5.7
Exit Temperature	K	444	444	618	618	533	533
1,3-butadiene	t/d	0	0	0	0	0	0
Acenaphthene	t/d	4.802E-09	4.802E-09	1.264E-09	1.264E-09	0	0
Acenaphthylene	t/d	4.18E-08	4.18E-08	1.1E-08	1.1E-08	0	0
Acetaldehyde	t/d	5.389E-05	5.389E-05	1.418E-05	1.418E-05	0	0
Acrolein	t/d	6.356E-05	6.356E-05	1.673E-05	1.673E-05	0	0
Aliphatic aldehydes	t/d	0	0	0	0	0	0
Aliphatic C_{17}-C_{34}	t/d	0	0	0	0	0	0
Aliphatic C_5-C_8	t/d	0.006916	0.006916	0.00182	0.00182	0	0
Aliphatic C_9-C_{16}	t/d	0.000266	0.000266	0.00007	0.00007	0	0
Aliphatic ketones	t/d	0	0	0	0	0	0
Anthracene	t/d	5.562E-09	5.562E-09	1.464E-09	1.464E-09	0	0
Aromatic C_{17}-C_{34}	t/d	6.213E-09	6.213E-09	1.635E-09	1.635E-09	0	0
Aromatic C_9-C_{16}	t/d	1.509E-07	1.509E-07	3.97E-08	3.97E-08	0	0
Benzaldehyde	t/d	5.665E-05	5.665E-05	1.491E-05	1.491E-05	0	0
Benzene	t/d	3.869E-05	3.869E-05	1.018E-05	1.018E-05	0	0
Benzo(a)pyrene	t/d	3.385E-09	3.385E-09	8.909E-10	8.909E-10	0	0
Benzo(b)fluoranthene	t/d	3.938E-09	3.938E-09	1.036E-09	1.036E-09	0	0
Benzo(g,h,i)perylene	t/d	4.318E-09	4.318E-09	1.136E-09	1.136E-09	0	0
Benzo(k)fluoranthene	t/d	3.42E-09	3.42E-09	9E-10	9E-10	0	0
Carboxylic acids	t/d	0	0	0	0	0	0
Chrysene	t/d	4.802E-09	4.802E-09	1.264E-09	1.264E-09	0	0
Dibenz(a,h)anthracene	t/d	3.168E-09	3.168E-09	8.336E-10	8.336E-10	0	0
Ethylbenzene	t/d	7.773E-06	7.773E-06	2.045E-06	2.045E-06	0	0
Fluoranthene	t/d	4.111E-08	4.111E-08	1.082E-08	1.082E-08	0	0
Fluorene	t/d	1.586E-08	1.586E-08	4.173E-09	4.173E-09	0	0
Formaldehyde	t/d	0.0007635	0.0007635	0.0002009	0.0002009	0	0
Hexane	t/d	0	0	0	0	0	0
Indeno(1,2,3-cd)pyrene	t/d	4.042E-09	4.042E-09	1.064E-09	1.064E-09	0	0
Naphthalene	t/d	3.869E-06	3.869E-06	1.018E-06	1.018E-06	0	0
Phenanthrene	t/d	1.164E-07	1.164E-07	3.064E-08	3.064E-08	0	0
Propylene	t/d	0.0008118	0.0008118	0.0002136	0.0002136	0	0
Pyrene	t/d	1.935E-08	1.935E-08	5.091E-09	5.091E-09	0	0
Toluene	t/d	0.0001019	0.0001019	2.682E-05	2.682E-05	0	0
Xylenes	t/d	9.535E-05	9.535E-05	2.509E-05	2.509E-05	0	0
Aluminum (Al)	t/d	1.479E-05	1.479E-05	3.834E-06	3.834E-06	0	0
Arsenic (As)	t/d	4.929E-07	4.929E-07	1.278E-07	1.278E-07	0	0

Point Source (cont'd)							
Facility	**Units**	**Christina Lake Phase 3A**					
Emission Source		**Steam Generator 13**	**Steam Generator 14**	**Glycol Heater 1**	**Glycol Heater 2**	**Slop Treater 1A**	**Slop Treater 1B**
Barium (Ba)	t/d	1.29E-06	1.29E-06	3.345E-07	3.345E-07	0	0
Cadmium (Cd)	t/d	1.631E-07	1.631E-07	4.228E-08	4.228E-08	0	0
Calcium (Ca)	t/d	4.929E-05	4.929E-05	1.278E-05	1.278E-05	0	0
Chromium (Cr)	t/d	1.305E-07	1.305E-07	3.383E-08	3.383E-08	0	0
Cobalt (Co)	t/d	3.548E-06	3.548E-06	9.199E-07	9.199E-07	0	0
Copper (Cu)	t/d	6.161E-06	6.161E-06	1.597E-06	1.597E-06	0	0
Iron (Fe)	t/d	2.711E-05	2.711E-05	7.028E-06	7.028E-06	0	0
Lead (Pb)	t/d	3.697E-07	3.697E-07	9.584E-08	9.584E-08	0	0
Magnesium (Mg)	t/d	0	0	0	0	0	0
Manganese (Mn)	t/d	1.232E-06	1.232E-06	3.195E-07	3.195E-07	0	0
Nickel (Ni)	t/d	6.161E-06	6.161E-06	1.597E-06	1.597E-06	0	0
Potassium (K)	t/d	1.232E-05	1.232E-05	3.195E-06	3.195E-06	0	0
Silver (Ag)	t/d	0	0	0	0	0	0
Silicon (Si)	t/d	7.14E-05	7.14E-05	1.851E-05	1.851E-05	0	0
Strontium (Sr)	t/d	1.232E-07	1.232E-07	3.195E-08	3.195E-08	0	0
Titanium (Ti)	t/d	1.232E-06	1.232E-06	3.195E-07	3.195E-07	0	0
Vanadium (V)	t/d	2.464E-06	2.464E-06	6.389E-07	6.389E-07	0	0
Zinc (Zn)	t/d	9.858E-06	9.858E-06	2.556E-06	2.556E-06	0	0
Zirconium (Zr)	t/d	1.45E-08	1.45E-08	3.758E-09	3.758E-09	0	0
Molybdenum (Mo)	t/d	1.631E-09	1.631E-09	4.228E-10	4.228E-10	0	0
Selenium (Se)	t/d	8.698E-07	8.698E-07	2.255E-07	2.255E-07	0	0

Point Source (cont'd)							
Facility	Units	Christina Lake Phase 3A					
Emission Source		Slop Treater 2A	Slop Treater 2B	Amine Preheater 1	Amine Preheater 2	Flare 1	Flare 2
UTMmN	m	526097	526097	525844	525843	526002	526002
UTMmE	m	6162662	6162661	6162684	6162609	6162859	6162432
Elevation	masl	586	586	585	585	586	611
Stack Height	m	15	15	15	15	55.2	55.2
Stack Diameter	m	0.61	0.61	0.31	0.31	7.19	7.19
Exit Velocity	m/s	5.7	5.7	29.8	29.8	0	0
Exit Temperature	K	533	533	533	533	1273	1273
1,3-butadiene	t/d	0	0	0	0	0	0
Acenaphthene	t/d	0	0	2.527E-10	2.527E-10	0	0
Acenaphthylene	t/d	0	0	2.2E-09	2.2E-09	0	0
Acetaldehyde	t/d	0	0	2.836E-06	2.836E-06	3.608E-06	3.608E-06
Acrolein	t/d	0	0	3.345E-06	3.345E-06	1.18E-06	1.18E-06
Aliphatic aldehydes	t/d	0	0	0	0	0	0
Aliphatic C_{17}-C_{34}	t/d	0	0	0	0	0	0
Aliphatic C_5-C_8	t/d	0	0	0.000364	0.000364	0.000728	0.000728
Aliphatic C_9-C_{16}	t/d	0	0	0.000014	0.000014	0.000028	0.000028
Aliphatic ketones	t/d	0	0	0	0	0	0
Anthracene	t/d	0	0	2.927E-10	2.927E-10	0	0
Aromatic C_{17}-C_{34}	t/d	0	0	3.27E-10	3.27E-10	1.928E-09	1.928E-09
Aromatic C_9-C_{16}	t/d	0	0	7.94E-09	7.94E-09	1.46E-06	1.46E-06
Benzaldehyde	t/d	0	0	2.982E-06	2.982E-06	0	0
Benzene	t/d	0	0	2.036E-06	2.036E-06	2.559E-06	2.559E-06
Benzo(a)pyrene	t/d	0	0	1.782E-10	1.782E-10	2.951E-07	2.951E-07
Benzo(b)fluoranthene	t/d	0	0	2.073E-10	2.073E-10	2.951E-07	2.951E-07
Benzo(g,h,i)perylene	t/d	0	0	2.273E-10	2.273E-10	2.951E-07	2.951E-07
Benzo(k)fluoranthene	t/d	0	0	1.8E-10	1.8E-10	2.951E-07	2.951E-07
Carboxylic acids	t/d	0	0	0	0	0	0
Chrysene	t/d	0	0	2.527E-10	2.527E-10	2.965E-07	2.965E-07
Dibenz(a,h)anthracene	t/d	0	0	1.667E-10	1.667E-10	2.951E-07	2.951E-07
Ethylbenzene	t/d	0	0	4.091E-07	4.091E-07	0	0
Fluoranthene	t/d	0	0	2.164E-09	2.164E-09	3.175E-07	3.175E-07
Fluorene	t/d	0	0	8.345E-10	8.345E-10	0	0
Formaldehyde	t/d	0	0	4.018E-05	4.018E-05	0.0004126	0.0004126
Hexane	t/d	0	0	0	0	0	0
Indeno(1,2,3-cd)pyrene	t/d	0	0	2.127E-10	2.127E-10	2.951E-07	2.951E-07
Naphthalene	t/d	0	0	2.036E-07	2.036E-07	0.0001818	0.0001818
Phenanthrene	t/d	0	0	6.127E-09	6.127E-09	3.916E-07	3.916E-07
Propylene	t/d	0	0	4.273E-05	4.273E-05	0	0
Pyrene	t/d	0	0	1.018E-09	1.018E-09	3.119E-07	3.119E-07
Toluene	t/d	0	0	5.364E-06	5.364E-06	0.0002462	0.0002462
Xylenes	t/d	0	0	5.018E-06	5.018E-06	7.748E-06	7.748E-06
Aluminum (Al)	t/d	0	0	5.477E-07	5.477E-07	0	0
Arsenic (As)	t/d	0	0	1.826E-08	1.826E-08	0	0

Point Source (cont'd)							
Facility	**Units**	**Christina Lake Phase 3A**					
Emission Source		**Slop Treater 2A**	**Slop Treater 2B**	**Amine Preheater 1**	**Amine Preheater 2**	**Flare 1**	**Flare 2**
Barium (Ba)	t/d	0	0	4.779E-08	4.779E-08	0	0
Cadmium (Cd)	t/d	0	0	6.04E-09	6.04E-09	0	0
Calcium (Ca)	t/d	0	0	1.826E-06	1.826E-06	0	0
Chromium (Cr)	t/d	0	0	4.832E-09	4.832E-09	0	0
Cobalt (Co)	t/d	0	0	1.314E-07	1.314E-07	0	0
Copper (Cu)	t/d	0	0	2.282E-07	2.282E-07	0	0
Iron (Fe)	t/d	0	0	1.004E-06	1.004E-06	0	0
Lead (Pb)	t/d	0	0	1.369E-08	1.369E-08	0	0
Magnesium (Mg)	t/d	0	0	0	0	0	0
Manganese (Mn)	t/d	0	0	4.564E-08	4.564E-08	0	0
Nickel (Ni)	t/d	0	0	2.282E-07	2.282E-07	0	0
Potassium (K)	t/d	0	0	4.564E-07	4.564E-07	0	0
Silver (Ag)	t/d	0	0	0	0	0	0
Silicon (Si)	t/d	0	0	2.644E-06	2.644E-06	0	0
Strontium (Sr)	t/d	0	0	4.564E-09	4.564E-09	0	0
Titanium (Ti)	t/d	0	0	4.564E-08	4.564E-08	0	0
Vanadium (V)	t/d	0	0	9.128E-08	9.128E-08	0	0
Zinc (Zn)	t/d	0	0	3.651E-07	3.651E-07	0	0
Zirconium (Zr)	t/d	0	0	5.369E-10	5.369E-10	0	0
Molybdenum (Mo)	t/d	0	0	6.04E-11	6.04E-11	0	0
Selenium (Se)	t/d	0	0	3.221E-08	3.221E-08	0	0

Point Source (cont'd)								
Facility	**Units**	**Christina Lake Phase 3B**						
Emission Source		**Steam Generator 1**	**Steam Generator 2**	**Steam Generator 3**	**Steam Generator 4**	**Steam Generator 5**	**Steam Generator 6**	**Steam Generator 7**
UTMmN	m	506443	506443	506443	506443	506443	506443	506443
UTMmE	m	6174903	6174885	6174867	6174850	6174832	6174814	6174796
Elevation	masl	586	586	586	586	586	586	586
Stack Height	m	30	30	30	30	30	30	30
Stack Diameter	m	1.96	1.96	1.96	1.96	1.96	1.96	1.96
Exit Velocity	m/s	17	17	17	17	17	17	17
Exit Temperature	K	444	444	444	444	444	444	444
1,3-butadiene	t/d	0	0	0	0	0	0	0
Acenaphthene	t/d	4.802E-09	4.802E-09	4.802E-09	4.802E-09	4.802E-09	4.802E-09	4.802E-09
Acenaphthylene	t/d	4.18E-08	4.18E-08	4.18E-08	4.18E-08	4.18E-08	4.18E-08	4.18E-08
Acetaldehyde	t/d	5.389E-05	5.389E-05	5.389E-05	5.389E-05	5.389E-05	5.389E-05	5.389E-05
Acrolein	t/d	6.356E-05	6.356E-05	6.356E-05	6.356E-05	6.356E-05	6.356E-05	6.356E-05
Aliphatic aldehydes	t/d	0	0	0	0	0	0	0
Aliphatic C_{17}-C_{34}	t/d	0	0	0	0	0	0	0
Aliphatic C_5-C_8	t/d	0.006916	0.006916	0.006916	0.006916	0.006916	0.006916	0.006916
Aliphatic C_9-C_{16}	t/d	0.000266	0.000266	0.000266	0.000266	0.000266	0.000266	0.000266
Aliphatic ketones	t/d	0	0	0	0	0	0	0
Anthracene	t/d	5.562E-09	5.562E-09	5.562E-09	5.562E-09	5.562E-09	5.562E-09	5.562E-09
Aromatic C_{17}-C_{34}	t/d	6.213E-09	6.213E-09	6.213E-09	6.213E-09	6.213E-09	6.213E-09	6.213E-09
Aromatic C_9-C_{16}	t/d	1.509E-07	1.509E-07	1.509E-07	1.509E-07	1.509E-07	1.509E-07	1.509E-07
Benzaldehyde	t/d	5.665E-05	5.665E-05	5.665E-05	5.665E-05	5.665E-05	5.665E-05	5.665E-05
Benzene	t/d	3.869E-05	3.869E-05	3.869E-05	3.869E-05	3.869E-05	3.869E-05	3.869E-05
Benzo(a)pyrene	t/d	3.385E-09	3.385E-09	3.385E-09	3.385E-09	3.385E-09	3.385E-09	3.385E-09
Benzo(b)fluoranthene	t/d	3.938E-09	3.938E-09	3.938E-09	3.938E-09	3.938E-09	3.938E-09	3.938E-09
Benzo(g,h,i)perylene	t/d	4.318E-09	4.318E-09	4.318E-09	4.318E-09	4.318E-09	4.318E-09	4.318E-09
Benzo(k)fluoranthene	t/d	3.42E-09	3.42E-09	3.42E-09	3.42E-09	3.42E-09	3.42E-09	3.42E-09
Carboxylic acids	t/d	0	0	0	0	0	0	0
Chrysene	t/d	4.802E-09	4.802E-09	4.802E-09	4.802E-09	4.802E-09	4.802E-09	4.802E-09
Dibenz(a,h)anthracene	t/d	3.168E-09	3.168E-09	3.168E-09	3.168E-09	3.168E-09	3.168E-09	3.168E-09
Ethylbenzene	t/d	7.773E-06	7.773E-06	7.773E-06	7.773E-06	7.773E-06	7.773E-06	7.773E-06
Fluoranthene	t/d	4.111E-08	4.111E-08	4.111E-08	4.111E-08	4.111E-08	4.111E-08	4.111E-08
Fluorene	t/d	1.586E-08	1.586E-08	1.586E-08	1.586E-08	1.586E-08	1.586E-08	1.586E-08
Formaldehyde	t/d	0.0007635	0.0007635	0.0007635	0.0007635	0.0007635	0.0007635	0.0007635
Hexane	t/d	0	0	0	0	0	0	0
Indeno(1,2,3-cd)pyrene	t/d	4.042E-09	4.042E-09	4.042E-09	4.042E-09	4.042E-09	4.042E-09	4.042E-09
Naphthalene	t/d	3.869E-06	3.869E-06	3.869E-06	3.869E-06	3.869E-06	3.869E-06	3.869E-06
Phenanthrene	t/d	1.164E-07	1.164E-07	1.164E-07	1.164E-07	1.164E-07	1.164E-07	1.164E-07
Propylene	t/d	0.0008118	0.0008118	0.0008118	0.0008118	0.0008118	0.0008118	0.0008118
Pyrene	t/d	1.935E-08	1.935E-08	1.935E-08	1.935E-08	1.935E-08	1.935E-08	1.935E-08
Toluene	t/d	0.0001019	0.0001019	0.0001019	0.0001019	0.0001019	0.0001019	0.0001019
Xylenes	t/d	9.535E-05	9.535E-05	9.535E-05	9.535E-05	9.535E-05	9.535E-05	9.535E-05
Aluminum (Al)	t/d	1.479E-05	1.479E-05	1.479E-05	1.479E-05	1.479E-05	1.479E-05	1.479E-05

Point Source (cont'd)								
Facility	**Units**	**Christina Lake Phase 3B**						
Emission Source		**Steam Generator 1**	**Steam Generator 2**	**Steam Generator 3**	**Steam Generator 4**	**Steam Generator 5**	**Steam Generator 6**	**Steam Generator 7**
Arsenic (As)	t/d	4.929E-07	4.929E-07	4.929E-07	4.929E-07	4.929E-07	4.929E-07	4.929E-07
Barium (Ba)	t/d	1.29E-06	1.29E-06	1.29E-06	1.29E-06	1.29E-06	1.29E-06	1.29E-06
Cadmium (Cd)	t/d	1.631E-07	1.631E-07	1.631E-07	1.631E-07	1.631E-07	1.631E-07	1.631E-07
Calcium (Ca)	t/d	4.929E-05	4.929E-05	4.929E-05	4.929E-05	4.929E-05	4.929E-05	4.929E-05
Chromium (Cr)	t/d	1.305E-07	1.305E-07	1.305E-07	1.305E-07	1.305E-07	1.305E-07	1.305E-07
Cobalt (Co)	t/d	3.548E-06	3.548E-06	3.548E-06	3.548E-06	3.548E-06	3.548E-06	3.548E-06
Copper (Cu)	t/d	6.161E-06	6.161E-06	6.161E-06	6.161E-06	6.161E-06	6.161E-06	6.161E-06
Iron (Fe)	t/d	2.711E-05	2.711E-05	2.711E-05	2.711E-05	2.711E-05	2.711E-05	2.711E-05
Lead (Pb)	t/d	3.697E-07	3.697E-07	3.697E-07	3.697E-07	3.697E-07	3.697E-07	3.697E-07
Magnesium (Mg)	t/d	0	0	0	0	0	0	0
Manganese (Mn)	t/d	1.232E-06	1.232E-06	1.232E-06	1.232E-06	1.232E-06	1.232E-06	1.232E-06
Nickel (Ni)	t/d	6.161E-06	6.161E-06	6.161E-06	6.161E-06	6.161E-06	6.161E-06	6.161E-06
Potassium (K)	t/d	1.232E-05	1.232E-05	1.232E-05	1.232E-05	1.232E-05	1.232E-05	1.232E-05
Silver (Ag)	t/d	0	0	0	0	0	0	0
Silicon (Si)	t/d	7.14E-05	7.14E-05	7.14E-05	7.14E-05	7.14E-05	7.14E-05	7.14E-05
Strontium (Sr)	t/d	1.232E-07	1.232E-07	1.232E-07	1.232E-07	1.232E-07	1.232E-07	1.232E-07
Titanium (Ti)	t/d	1.232E-06	1.232E-06	1.232E-06	1.232E-06	1.232E-06	1.232E-06	1.232E-06
Vanadium (V)	t/d	2.464E-06	2.464E-06	2.464E-06	2.464E-06	2.464E-06	2.464E-06	2.464E-06
Zinc (Zn)	t/d	9.858E-06	9.858E-06	9.858E-06	9.858E-06	9.858E-06	9.858E-06	9.858E-06
Zirconium (Zr)	t/d	1.45E-08	1.45E-08	1.45E-08	1.45E-08	1.45E-08	1.45E-08	1.45E-08
Molybdenum (Mo)	t/d	1.631E-09	1.631E-09	1.631E-09	1.631E-09	1.631E-09	1.631E-09	1.631E-09
Selenium (Se)	t/d	8.698E-07	8.698E-07	8.698E-07	8.698E-07	8.698E-07	8.698E-07	8.698E-07

Point Source (cont'd)								
Facility	**Units**	**Christina Lake Phase 3B**						
Emission Source		**Steam Generator 8**	**Steam Generator 9**	**Steam Generator 10**	**Steam Generator 11**	**Steam Generator 12**	**Steam Generator 13**	**Steam Generator 14**
UTMmN	m	506442	506442	506442	506443	506443	506443	506442
UTMmE	m	6174695	6174678	6174660	6174642	6174625	6174607	6174589
Elevation	masl	586	586	586	586	586	586	586
Stack Height	m	30	30	30	30	30	30	30
Stack Diameter	m	1.96	1.96	1.96	1.96	1.96	1.96	1.96
Exit Velocity	m/s	17	17	17	17	17	17	17
Exit Temperature	K	444	444	444	444	444	444	444
1,3-butadiene	t/d	0	0	0	0	0	0	0
Acenaphthene	t/d	4.802E-09	4.802E-09	4.802E-09	4.802E-09	4.802E-09	4.802E-09	4.802E-09
Acenaphthylene	t/d	4.18E-08	4.18E-08	4.18E-08	4.18E-08	4.18E-08	4.18E-08	4.18E-08
Acetaldehyde	t/d	5.389E-05	5.389E-05	5.389E-05	5.389E-05	5.389E-05	5.389E-05	5.389E-05
Acrolein	t/d	6.356E-05	6.356E-05	6.356E-05	6.356E-05	6.356E-05	6.356E-05	6.356E-05
Aliphatic aldehydes	t/d	0	0	0	0	0	0	0
Aliphatic C_{17}-C_{34}	t/d	0	0	0	0	0	0	0
Aliphatic C_5-C_8	t/d	0.006916	0.006916	0.006916	0.006916	0.006916	0.006916	0.006916
Aliphatic C_9-C_{16}	t/d	0.000266	0.000266	0.000266	0.000266	0.000266	0.000266	0.000266
Aliphatic ketones	t/d	0	0	0	0	0	0	0
Anthracene	t/d	5.562E-09	5.562E-09	5.562E-09	5.562E-09	5.562E-09	5.562E-09	5.562E-09
Aromatic C_{17}-C_{34}	t/d	6.213E-09	6.213E-09	6.213E-09	6.213E-09	6.213E-09	6.213E-09	6.213E-09
Aromatic C_9-C_{16}	t/d	1.509E-07	1.509E-07	1.509E-07	1.509E-07	1.509E-07	1.509E-07	1.509E-07
Benzaldehyde	t/d	5.665E-05	5.665E-05	5.665E-05	5.665E-05	5.665E-05	5.665E-05	5.665E-05
Benzene	t/d	3.869E-05	3.869E-05	3.869E-05	3.869E-05	3.869E-05	3.869E-05	3.869E-05
Benzo(a)pyrene	t/d	3.385E-09	3.385E-09	3.385E-09	3.385E-09	3.385E-09	3.385E-09	3.385E-09
Benzo(b)fluoranthene	t/d	3.938E-09	3.938E-09	3.938E-09	3.938E-09	3.938E-09	3.938E-09	3.938E-09
Benzo(g,h,i)perylene	t/d	4.318E-09	4.318E-09	4.318E-09	4.318E-09	4.318E-09	4.318E-09	4.318E-09
Benzo(k)fluoranthene	t/d	3.42E-09	3.42E-09	3.42E-09	3.42E-09	3.42E-09	3.42E-09	3.42E-09
Carboxylic acids	t/d	0	0	0	0	0	0	0
Chrysene	t/d	4.802E-09	4.802E-09	4.802E-09	4.802E-09	4.802E-09	4.802E-09	4.802E-09
Dibenz(a,h)anthracene	t/d	3.168E-09	3.168E-09	3.168E-09	3.168E-09	3.168E-09	3.168E-09	3.168E-09
Ethylbenzene	t/d	7.773E-06	7.773E-06	7.773E-06	7.773E-06	7.773E-06	7.773E-06	7.773E-06
Fluoranthene	t/d	4.111E-08	4.111E-08	4.111E-08	4.111E-08	4.111E-08	4.111E-08	4.111E-08
Fluorene	t/d	1.586E-08	1.586E-08	1.586E-08	1.586E-08	1.586E-08	1.586E-08	1.586E-08
Formaldehyde	t/d	0.0007635	0.0007635	0.0007635	0.0007635	0.0007635	0.0007635	0.0007635
Hexane	t/d	0	0	0	0	0	0	0
Indeno(1,2,3-cd)pyrene	t/d	4.042E-09	4.042E-09	4.042E-09	4.042E-09	4.042E-09	4.042E-09	4.042E-09
Naphthalene	t/d	3.869E-06	3.869E-06	3.869E-06	3.869E-06	3.869E-06	3.869E-06	3.869E-06
Phenanthrene	t/d	1.164E-07	1.164E-07	1.164E-07	1.164E-07	1.164E-07	1.164E-07	1.164E-07
Propylene	t/d	0.0008118	0.0008118	0.0008118	0.0008118	0.0008118	0.0008118	0.0008118
Pyrene	t/d	1.935E-08	1.935E-08	1.935E-08	1.935E-08	1.935E-08	1.935E-08	1.935E-08
Toluene	t/d	0.0001019	0.0001019	0.0001019	0.0001019	0.0001019	0.0001019	0.0001019
Xylenes	t/d	9.535E-05	9.535E-05	9.535E-05	9.535E-05	9.535E-05	9.535E-05	9.535E-05
Aluminum (Al)	t/d	1.479E-05	1.479E-05	1.479E-05	1.479E-05	1.479E-05	1.479E-05	1.479E-05
Arsenic (As)	t/d	4.929E-07	4.929E-07	4.929E-07	4.929E-07	4.929E-07	4.929E-07	4.929E-07
Barium (Ba)	t/d	1.29E-06	1.29E-06	1.29E-06	1.29E-06	1.29E-06	1.29E-06	1.29E-06

Point Source (cont'd)								
Facility	**Units**	**Christina Lake Phase 3B**						
Emission Source		**Steam Generator 8**	**Steam Generator 9**	**Steam Generator 10**	**Steam Generator 11**	**Steam Generator 12**	**Steam Generator 13**	**Steam Generator 14**
Cadmium (Cd)	t/d	1.631E-07	1.631E-07	1.631E-07	1.631E-07	1.631E-07	1.631E-07	1.631E-07
Calcium (Ca)	t/d	4.929E-05	4.929E-05	4.929E-05	4.929E-05	4.929E-05	4.929E-05	4.929E-05
Chromium (Cr)	t/d	1.305E-07	1.305E-07	1.305E-07	1.305E-07	1.305E-07	1.305E-07	1.305E-07
Cobalt (Co)	t/d	3.548E-06	3.548E-06	3.548E-06	3.548E-06	3.548E-06	3.548E-06	3.548E-06
Copper (Cu)	t/d	6.161E-06	6.161E-06	6.161E-06	6.161E-06	6.161E-06	6.161E-06	6.161E-06
Iron (Fe)	t/d	2.711E-05	2.711E-05	2.711E-05	2.711E-05	2.711E-05	2.711E-05	2.711E-05
Lead (Pb)	t/d	3.697E-07	3.697E-07	3.697E-07	3.697E-07	3.697E-07	3.697E-07	3.697E-07
Magnesium (Mg)	t/d	0	0	0	0	0	0	0
Manganese (Mn)	t/d	1.232E-06	1.232E-06	1.232E-06	1.232E-06	1.232E-06	1.232E-06	1.232E-06
Nickel (Ni)	t/d	6.161E-06	6.161E-06	6.161E-06	6.161E-06	6.161E-06	6.161E-06	6.161E-06
Potassium (K)	t/d	1.232E-05	1.232E-05	1.232E-05	1.232E-05	1.232E-05	1.232E-05	1.232E-05
Silver (Ag)	t/d	0	0	0	0	0	0	0
Silicon (Si)	t/d	7.14E-05	7.14E-05	7.14E-05	7.14E-05	7.14E-05	7.14E-05	7.14E-05
Strontium (Sr)	t/d	1.232E-07	1.232E-07	1.232E-07	1.232E-07	1.232E-07	1.232E-07	1.232E-07
Titanium (Ti)	t/d	1.232E-06	1.232E-06	1.232E-06	1.232E-06	1.232E-06	1.232E-06	1.232E-06
Vanadium (V)	t/d	2.464E-06	2.464E-06	2.464E-06	2.464E-06	2.464E-06	2.464E-06	2.464E-06
Zinc (Zn)	t/d	9.858E-06	9.858E-06	9.858E-06	9.858E-06	9.858E-06	9.858E-06	9.858E-06
Zirconium (Zr)	t/d	1.45E-08	1.45E-08	1.45E-08	1.45E-08	1.45E-08	1.45E-08	1.45E-08
Molybdenum (Mo)	t/d	1.631E-09	1.631E-09	1.631E-09	1.631E-09	1.631E-09	1.631E-09	1.631E-09
Selenium (Se)	t/d	8.698E-07	8.698E-07	8.698E-07	8.698E-07	8.698E-07	8.698E-07	8.698E-07

Point Source (cont'd)								
Facility	**Units**	**Christina Lake Phase 3B**						
Emission Source		**Glycol Heater 1**	**Glycol Heater 2**	**Slop Treater 1A**	**Slop Treater 1B**	**Slop Treater 2A**	**Slop Treater 2B**	**Amine Preheater 1**
UTMmN	m	506700	506701	506928	506928	506997	506997	506745
UTMmE	m	6174763	6174727	6174762	6174761	6174762	6174761	6174783
Elevation	masl	585	585	584	584	584	584	585
Stack Height	m	15	15	15	15	15	15	15
Stack Diameter	m	1.52	1.52	0.61	0.61	0.61	0.61	0.31
Exit Velocity	m/s	10.2	10.2	5.7	5.7	5.7	5.7	29.8
Exit Temperature	K	618	618	533	533	533	533	533
1,3-butadiene	t/d	0	0	0	0	0	0	0
Acenaphthene	t/d	1.264E-09	1.264E-09	0	0	0	0	2.527E-10
Acenaphthylene	t/d	1.1E-08	1.1E-08	0	0	0	0	2.2E-09
Acetaldehyde	t/d	1.418E-05	1.418E-05	0	0	0	0	2.836E-06
Acrolein	t/d	1.673E-05	1.673E-05	0	0	0	0	3.345E-06
Aliphatic aldehydes	t/d	0	0	0	0	0	0	0
Aliphatic C_{17}-C_{34}	t/d	0	0	0	0	0	0	0
Aliphatic C_5-C_8	t/d	0.00182	0.00182	0	0	0	0	0.000364
Aliphatic C_9-C_{16}	t/d	0.00007	0.00007	0	0	0	0	0.000014
Aliphatic ketones	t/d	0	0	0	0	0	0	0
Anthracene	t/d	1.464E-09	1.464E-09	0	0	0	0	2.927E-10
Aromatic C_{17}-C_{34}	t/d	1.635E-09	1.635E-09	0	0	0	0	3.27E-10
Aromatic C_9-C_{16}	t/d	3.97E-08	3.97E-08	0	0	0	0	7.94E-09
Benzaldehyde	t/d	1.491E-05	1.491E-05	0	0	0	0	2.982E-06
Benzene	t/d	1.018E-05	1.018E-05	0	0	0	0	2.036E-06
Benzo(a)pyrene	t/d	8.909E-10	8.909E-10	0	0	0	0	1.782E-10
Benzo(b)fluoranthene	t/d	1.036E-09	1.036E-09	0	0	0	0	2.073E-10
Benzo(g,h,i)perylene	t/d	1.136E-09	1.136E-09	0	0	0	0	2.273E-10
Benzo(k)fluoranthene	t/d	9E-10	9E-10	0	0	0	0	1.8E-10
Carboxylic acids	t/d	0	0	0	0	0	0	0
Chrysene	t/d	1.264E-09	1.264E-09	0	0	0	0	2.527E-10
Dibenz(a,h)anthracene	t/d	8.336E-10	8.336E-10	0	0	0	0	1.667E-10
Ethylbenzene	t/d	2.045E-06	2.045E-06	0	0	0	0	4.091E-07
Fluoranthene	t/d	1.082E-08	1.082E-08	0	0	0	0	2.164E-09
Fluorene	t/d	4.173E-09	4.173E-09	0	0	0	0	8.345E-10
Formaldehyde	t/d	0.0002009	0.0002009	0	0	0	0	4.018E-05
Hexane	t/d	0	0	0	0	0	0	0
Indeno(1,2,3-cd)pyrene	t/d	1.064E-09	1.064E-09	0	0	0	0	2.127E-10
Naphthalene	t/d	1.018E-06	1.018E-06	0	0	0	0	2.036E-07
Phenanthrene	t/d	3.064E-08	3.064E-08	0	0	0	0	6.127E-09
Propylene	t/d	0.0002136	0.0002136	0	0	0	0	4.273E-05
Pyrene	t/d	5.091E-09	5.091E-09	0	0	0	0	1.018E-09
Toluene	t/d	2.682E-05	2.682E-05	0	0	0	0	5.364E-06
Xylenes	t/d	2.509E-05	2.509E-05	0	0	0	0	5.018E-06
Aluminum (Al)	t/d	3.834E-06	3.834E-06	0	0	0	0	5.477E-07
Arsenic (As)	t/d	1.278E-07	1.278E-07	0	0	0	0	1.826E-08

Point Source (cont'd)								
Facility	**Units**	**Christina Lake Phase 3B**						
Emission Source		**Glycol Heater 1**	**Glycol Heater 2**	**Slop Treater 1A**	**Slop Treater 1B**	**Slop Treater 2A**	**Slop Treater 2B**	**Amine Preheater 1**
Barium (Ba)	t/d	3.345E-07	3.345E-07	0	0	0	0	4.779E-08
Cadmium (Cd)	t/d	4.228E-08	4.228E-08	0	0	0	0	6.04E-09
Calcium (Ca)	t/d	1.278E-05	1.278E-05	0	0	0	0	1.826E-06
Chromium (Cr)	t/d	3.383E-08	3.383E-08	0	0	0	0	4.832E-09
Cobalt (Co)	t/d	9.199E-07	9.199E-07	0	0	0	0	1.314E-07
Copper (Cu)	t/d	1.597E-06	1.597E-06	0	0	0	0	2.282E-07
Iron (Fe)	t/d	7.028E-06	7.028E-06	0	0	0	0	1.004E-06
Lead (Pb)	t/d	9.584E-08	9.584E-08	0	0	0	0	1.369E-08
Magnesium (Mg)	t/d	0	0	0	0	0	0	0
Manganese (Mn)	t/d	3.195E-07	3.195E-07	0	0	0	0	4.564E-08
Nickel (Ni)	t/d	1.597E-06	1.597E-06	0	0	0	0	2.282E-07
Potassium (K)	t/d	3.195E-06	3.195E-06	0	0	0	0	4.564E-07
Silver (Ag)	t/d	0	0	0	0	0	0	0
Silicon (Si)	t/d	1.851E-05	1.851E-05	0	0	0	0	2.644E-06
Strontium (Sr)	t/d	3.195E-08	3.195E-08	0	0	0	0	4.564E-09
Titanium (Ti)	t/d	3.195E-07	3.195E-07	0	0	0	0	4.564E-08
Vanadium (V)	t/d	6.389E-07	6.389E-07	0	0	0	0	9.128E-08
Zinc (Zn)	t/d	2.556E-06	2.556E-06	0	0	0	0	3.651E-07
Zirconium (Zr)	t/d	3.758E-09	3.758E-09	0	0	0	0	5.369E-10
Molybdenum (Mo)	t/d	4.228E-10	4.228E-10	0	0	0	0	6.04E-11
Selenium (Se)	t/d	2.255E-07	2.255E-07	0	0	0	0	3.221E-08

Point Source (cont'd)							
Facility	**Units**	**Christina Lake Phase 3B**					
Emission Source		**Amine Preheater 2**	**Flare 1**	**Flare 2**	**SRU Incinerator 1**	**SRU Incinerator 2**	**SRU Incinerator 3**
UTMmN	m	506745	506902	506902	517929	517950	517967
UTMmE	m	6174708	6174959	6174532	6168916	6168923	6168927
Elevation	masl	585	585	584	578	578	578
Stack Height	m	15	55.2	55.2	45.7	80	80
Stack Diameter	m	0.31	7.19	7.19	0.61	0.41	0.41
Exit Velocity	m/s	29.8	0	0	6.9	18.3	18.3
Exit Temperature	K	533	1273	1273	873	873	873
1,3-butadiene	t/d	0	0	0	0	0	0
Acenaphthene	t/d	0	0	0	0	0	0
Acenaphthylene	t/d	0	0	0	0	0	0
Acetaldehyde	t/d	3.608E-06	3.608E-06	0	0	0	3.608E-06
Acrolein	t/d	1.18E-06	1.18E-06	0	0	0	1.18E-06
Aliphatic aldehydes	t/d	0	0	0	0	0	0
Aliphatic C_{17}-C_{34}	t/d	0	0	0	0	0	0
Aliphatic C_5-C_8	t/d	0.000728	0.000728	0	0	0	0.000728
Aliphatic C_9-C_{16}	t/d	0.000028	0.000028	0	0	0	0.000028
Aliphatic ketones	t/d	0	0	0	0	0	0
Anthracene	t/d	0	0	0	0	0	0
Aromatic C_{17}-C_{34}	t/d	1.928E-09	1.928E-09	0	0	0	1.928E-09
Aromatic C_9-C_{16}	t/d	1.46E-06	1.46E-06	0	0	0	1.46E-06
Benzaldehyde	t/d	0	0	0	0	0	0
Benzene	t/d	2.559E-06	2.559E-06	0	0	0	2.559E-06
Benzo(a)pyrene	t/d	2.951E-07	2.951E-07	0	0	0	2.951E-07
Benzo(b)fluoranthene	t/d	2.951E-07	2.951E-07	0	0	0	2.951E-07
Benzo(g,h,i)perylene	t/d	2.951E-07	2.951E-07	0	0	0	2.951E-07
Benzo(k)fluoranthene	t/d	2.951E-07	2.951E-07	0	0	0	2.951E-07
Carboxylic acids	t/d	0	0	0	0	0	0
Chrysene	t/d	2.965E-07	2.965E-07	0	0	0	2.965E-07
Dibenz(a,h)anthracene	t/d	2.951E-07	2.951E-07	0	0	0	2.951E-07
Ethylbenzene	t/d	0	0	0	0	0	0
Fluoranthene	t/d	3.175E-07	3.175E-07	0	0	0	3.175E-07
Fluorene	t/d	0	0	0	0	0	0
Formaldehyde	t/d	0.0004126	0.0004126	0	0	0	0.0004126
Hexane	t/d	0	0	0	0	0	0
Indeno(1,2,3-cd)pyrene	t/d	2.951E-07	2.951E-07	0	0	0	2.951E-07
Naphthalene	t/d	0.0001818	0.0001818	0	0	0	0.0001818
Phenanthrene	t/d	3.916E-07	3.916E-07	0	0	0	3.916E-07
Propylene	t/d	0	0	0	0	0	0
Pyrene	t/d	3.119E-07	3.119E-07	0	0	0	3.119E-07
Toluene	t/d	0.0002462	0.0002462	0	0	0	0.0002462
Xylenes	t/d	7.748E-06	7.748E-06	0	0	0	7.748E-06
Aluminum (Al)	t/d	0	0	0	0	0	0
Arsenic (As)	t/d	0	0	0	0	0	0

Point Source (cont'd)							
Facility	**Units**	**Christina Lake Phase 3B**					
Emission Source		**Amine Preheater 2**	**Flare 1**	**Flare 2**	**SRU Incinerator 1**	**SRU Incinerator 2**	**SRU Incinerator 3**
Barium (Ba)	t/d	0	0	0	0	0	0
Cadmium (Cd)	t/d	0	0	0	0	0	0
Calcium (Ca)	t/d	0	0	0	0	0	0
Chromium (Cr)	t/d	0	0	0	0	0	0
Cobalt (Co)	t/d	0	0	0	0	0	0
Copper (Cu)	t/d	0	0	0	0	0	0
Iron (Fe)	t/d	0	0	0	0	0	0
Lead (Pb)	t/d	0	0	0	0	0	0
Magnesium (Mg)	t/d	0	0	0	0	0	0
Manganese (Mn)	t/d	0	0	0	0	0	0
Nickel (Ni)	t/d	0	0	0	0	0	0
Potassium (K)	t/d	0	0	0	0	0	0
Silver (Ag)	t/d	0	0	0	0	0	0
Silicon (Si)	t/d	0	0	0	0	0	0
Strontium (Sr)	t/d	0	0	0	0	0	0
Titanium (Ti)	t/d	0	0	0	0	0	0
Vanadium (V)	t/d	0	0	0	0	0	0
Zinc (Zn)	t/d	0	0	0	0	0	0
Zirconium (Zr)	t/d	0	0	0	0	0	0
Molybdenum (Mo)	t/d	0	0	0	0	0	0
Selenium (Se)	t/d	0	0	0	0	0	0

Note: "0" – No emissions.

Area Source						
Facility	Units	Christina Lake Phase 1	Christina Lake Phase 2	Christina Lake Phase 2B	Christina Lake Phase 3A	Christina Lake Phase 3B
Emission Source		Plant Fugitive	Plant Fugitive	Plant Fugitive	Plant Fugitive	Plant Fugitive
Corner 1 UTM N	m	517546	517522	517123	525293	506193
Corner 1 UTM E	m	6169093	6169086	6169390	6163052	6175153
Corner 2 UTM N	m	518046	518022	517623	525793	506693
Corner 2 UTM E	m	6169093	6169086	6169390	6163052	6175153
Corner 3 UTM N	m	518046	518022	517623	525793	506693
Corner 3 UTM E	m	6168593	6168586	6168890	6162552	6174653
Corner 4 UTM N	m	517546	517522	517123	525293	506193
Corner 4 UTM E	m	6168593	6168586	6168890	6162552	6174653
Area	m^2	250000	250000	250000	250000	250000
Elevation (m)	masl	578	578	579	585	586
1,3-butadiene	t/d	4.442E-08	3.257E-07	5.182E-07	1.11E-06	1.11E-06
Acenaphthene	t/d	0	0	0	0	0
Acenaphthylene	t/d	0	0	0	0	0
Acetaldehyde	t/d	0	0	0	0	0
Acrolein	t/d	0	0	0	0	0
Aliphatic aldehydes	t/d	0.0002651	0.001944	0.0030928	0.0066274	0.0066274
Aliphatic C_{17}-C_{34}	t/d	0.0001231	0.0009027	0.0014361	0.0030773	0.0030773
Aliphatic C_5-C_8	t/d	0.0020812	0.0152618	0.0242802	0.052029	0.052029
Aliphatic C_9-C_{16}	t/d	0.0085674	0.0628276	0.099953	0.214185	0.214185
Aliphatic ketones	t/d	0.0009389	0.0068855	0.0109542	0.0234733	0.0234733
Anthracene	t/d	0	0	0	0	0
Aromatic C_{17}-C_{34}	t/d	0	0	0	0	0
Aromatic C_9-C_{16}	t/d	0.0002204	0.0016165	0.0025716	0.0055106	0.0055106
Benzaldehyde	t/d	0	0	0	0	0
Benzene	t/d	0.0001645	0.0012061	0.0019187	0.0041116	0.0041116
Benzo(a)pyrene	t/d	0	0	0	0	0
Benzo(b)fluoranthene	t/d	0	0	0	0	0
Benzo(g,h,i)perylene	t/d	0	0	0	0	0
Benzo(k)fluoranthene	t/d	0	0	0	0	0
Carboxylic acids	t/d	3.553E-08	2.606E-07	4.145E-07	8.883E-07	8.883E-07
Chrysene	t/d	0	0	0	0	0
Dibenz(a,h)anthracene	t/d	0	0	0	0	0
Ethylbenzene	t/d	9.898E-06	7.259E-05	0.0001155	0.0002475	0.0002475
Fluoranthene	t/d	0	0	0	0	0
Fluorene	t/d	0	0	0	0	0
Formaldehyde	t/d	0	0	0	0	0
Hexane	t/d	0.0001358	0.0009957	0.0015841	0.0033946	0.0033946
Indeno(1,2,3-cd)pyrene	t/d	0	0	0	0	0
Naphthalene	t/d	1.269E-09	9.306E-09	1.481E-08	3.173E-08	3.173E-08
Phenanthrene	t/d	0	0	0	0	0
Propylene	t/d	0	0	0	0	0
Pyrene	t/d	0	0	0	0	0
Toluene	t/d	7.36E-05	0.0005397	0.0008587	0.0018401	0.0018401

Area Source						
Facility	**Units**	**Christina Lake Phase 1**	**Christina Lake Phase 2**	**Christina Lake Phase 2B**	**Christina Lake Phase 3A**	**Christina Lake Phase 3B**
Emission Source		**Plant Fugitive**	**Plant Fugitive**	**Plant Fugitive**	**Plant Fugitive**	**Plant Fugitive**
Xylenes	t/d	4.315E-05	0.0003164	0.0005034	0.0010787	0.0010787
Carbon disulphide	t/d	7.149E-05	0.0005242	0.000834	0.0017872	0.0017872
Hydrogen Sulphide	t/d	5.876E-06	4.309E-05	6.856E-05	0.0001469	0.0001469
Mercaptans	t/d	7.378E-05	0.000541	0.0008608	0.0018445	0.0018445
Thiophenes	t/d	9.788E-05	0.0007178	0.001142	0.002447	0.002447

Note: "0" – No emissions

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3.0 COMMUNITIES AND HIGHWAYS

The emissions from communities and highways located within the AQRSA are included in all three of the emission scenarios. Tables B4-18 and B4-19 present a summary of the emission data.

Table B4-18: Summary of Community and Highways VOC, PAH and Metal Air Emissions Used for Baseline and Application Cases

		Area Source		
Emission Source	**Units**	**Hwy 663**	**Hwy 881**	**Community**
Area	m^2	106828	1164312	7438210000
1,3-butadiene	t/d	1.152E-06	0.0001944	0
Acenaphthene	t/d	0	0	3.474E-10
Acenaphthylene	t/d	0	0	0
Acetaldehyde	t/d	3.026E-05	0.0051085	3.899E-06
Acrolein	t/d	2.421E-06	0.0004087	4.599E-06
Aliphatic aldehydes	t/d	3.154E-05	0.0053243	0
Aliphatic C_{17}-C_{34}	t/d	8.27E-07	0.0001396	0
Aliphatic C_5-C_8	t/d	5.722E-05	0.0096592	0.0003954
Aliphatic C_9-C_{16}	t/d	1.188E-05	0.0020056	1.922E-05
Aliphatic ketones	t/d	6.26E-06	0.0010566	0
Anthracene	t/d	0	0	4.023E-10
Aromatic C_{17}-C_{34}	t/d	1.449E-07	2.447E-05	4.49E-10
Aromatic C_9-C_{16}	t/d	2.05E-05	0.0034598	1.09E-08
Benzaldehyde	t/d	2.787E-06	0.0004705	4.091E-06
Benzene	t/d	8.825E-06	0.0014897	2.801E-06
Benzo(a)pyrene	t/d	0	0	0
Benzo(b)fluoranthene	t/d	0	0	0
Benzo(g,h,i)perylene	t/d	0	0	0
Benzo(k)fluoranthene	t/d	0	0	0
Carboxylic acids	t/d	0	0	0
Chrysene	t/d	2.196E-09	3.707E-07	3.474E-10
Dibenz(a,h)anthracene	t/d	0	0	2.293E-10
Ethylbenzene	t/d	2.842E-06	0.0004796	5.615E-07
Fluoranthene	t/d	3.608E-08	6.09E-06	2.966E-09
Fluorene	t/d	0	0	0
Formaldehyde	t/d	1.797E-05	0.0030325	5.519E-05
Hexane	t/d	1.316E-06	0.0002221	0.0002732
Indeno(1,2,3-cd)pyrene	t/d	0	0	0
Naphthalene	t/d	7.765E-07	0.0001311	2.801E-07
Phenanthrene	t/d	6.337E-08	1.07E-05	8.416E-09
Propylene	t/d	0	0	0
Pyrene	t/d	0	0	1.4E-09
Toluene	t/d	2.051E-05	0.0034621	7.359E-06
Xylenes	t/d	1.218E-05	0.0020558	6.892E-06
Aluminum (Al)	t/d	7.266E-08	1.363E-05	7.623E-07
Arsenic (As)	t/d	3.997E-10	7.5E-08	2.547E-08

Area Source				
Emission Source	**Units**	**Hwy 663**	**Hwy 881**	**Community**
Barium (Ba)	t/d	3.179E-08	5.965E-06	6.654E-08
Cadmium (Cd)	t/d	4.502E-09	8.448E-07	8.352E-09
Calcium (Ca)	t/d	1.387E-07	2.602E-05	0
Chromium (Cr)	t/d	2.345E-09	4.401E-07	6.682E-09
Cobalt (Co)	t/d	3.62E-10	6.793E-08	1.829E-07
Copper (Cu)	t/d	1.067E-08	2.002E-06	3.177E-07
Iron (Fe)	t/d	2.096E-07	3.932E-05	0
Lead (Pb)	t/d	2.618E-08	4.912E-06	1.907E-08
Magnesium (Mg)	t/d	2.778E-08	5.212E-06	0
Manganese (Mn)	t/d	1.916E-09	3.594E-07	6.347E-08
Nickel (Ni)	t/d	2.986E-09	5.604E-07	3.177E-07
Potassium (K)	t/d	8.899E-09	1.67E-06	0
Silver (Ag)	t/d	4.284E-09	8.038E-07	0
Silicon (Si)	t/d	3.05E-07	5.722E-05	0
Strontium (Sr)	t/d	4.977E-10	9.34E-08	6.403E-09
Titanium (Ti)	t/d	2.511E-09	4.712E-07	0
Vanadium (V)	t/d	8.974E-10	1.684E-07	1.271E-07
Zinc (Zn)	t/d	1.368E-07	2.566E-05	5.082E-07
Zirconium (Zr)	t/d	4.072E-10	7.642E-08	0
Carbon disulphide	t/d	0	0	0
Hydrogen Sulphide	t/d	0	0	0
Mercaptans	t/d	0	0	0
Thiophenes	t/d	0	0	0

Note: “0” – No emissions.

Table B4-19: Summary of Community and Highways VOC, PAH and Metal Air Emissions Used for Baseline, Application and Planned Development Case

Area Source				
Emission Source	**Units**	**Hwy 663**	**Hwy 881**	**Community**
Area	m^2	106828	1164312	7438210000
1,3-butadiene	t/d	2.411E-06	0.000407	0
Acenaphthene	t/d	0	0	7.273E-10
Acenaphthylene	t/d	0	0	0
Acetaldehyde	t/d	6.337E-05	0.0106961	8.164E-06
Acrolein	t/d	5.07E-06	0.0008558	9.63E-06
Aliphatic aldehydes	t/d	6.604E-05	0.0111478	0
Aliphatic C_{17}-C_{34}	t/d	1.732E-06	0.0002923	0
Aliphatic C_5-C_8	t/d	0.0001198	0.0202243	0.0008279
Aliphatic C_9-C_{16}	t/d	2.488E-05	0.0041993	4.025E-05
Aliphatic ketones	t/d	1.311E-05	0.0022123	0
Anthracene	t/d	0	0	8.423E-10
Aromatic C_{17}-C_{34}	t/d	3.035E-07	5.123E-05	9.4E-10
Aromatic C_9-C_{16}	t/d	4.292E-05	0.0072441	2.282E-08
Benzaldehyde	t/d	5.836E-06	0.0009851	8.567E-06
Benzene	t/d	1.848E-05	0.0031191	5.864E-06
Benzo(a)pyrene	t/d	0	0	0
Benzo(b)fluoranthene	t/d	0	0	0
Benzo(g,h,i)perylene	t/d	0	0	0
Benzo(k)fluoranthene	t/d	0	0	0
Carboxylic acids	t/d	0	0	0
Chrysene	t/d	4.598E-09	7.762E-07	7.273E-10
Dibenz(a,h)anthracene	t/d	0	0	4.801E-10
Ethylbenzene	t/d	5.949E-06	0.0010043	1.176E-06
Fluoranthene	t/d	7.554E-08	1.275E-05	6.209E-09
Fluorene	t/d	0	0	0
Formaldehyde	t/d	3.762E-05	0.0063493	0.0001156
Hexane	t/d	2.755E-06	0.000465	0.0005721
Indeno(1,2,3-cd)pyrene	t/d	0	0	0
Naphthalene	t/d	1.626E-06	0.0002744	5.864E-07
Phenanthrene	t/d	1.327E-07	2.24E-05	1.762E-08
Propylene	t/d	0	0	0
Pyrene	t/d	0	0	2.932E-09
Toluene	t/d	4.294E-05	0.0072488	1.541E-05
Xylenes	t/d	2.55E-05	0.0043043	1.443E-05
Aluminum (Al)	t/d	1.521E-07	2.855E-05	1.596E-06
Arsenic (As)	t/d	8.369E-10	1.57E-07	5.334E-08
Barium (Ba)	t/d	6.656E-08	1.249E-05	1.393E-07
Cadmium (Cd)	t/d	9.427E-09	1.769E-06	1.749E-08
Calcium (Ca)	t/d	2.903E-07	5.448E-05	0
Chromium (Cr)	t/d	4.911E-09	9.215E-07	1.399E-08
Cobalt (Co)	t/d	7.579E-10	1.422E-07	3.83E-07

Area Source				
Emission Source	**Units**	**Hwy 663**	**Hwy 881**	**Community**
Copper (Cu)	t/d	2.234E-08	4.193E-06	6.651E-07
Iron (Fe)	t/d	4.388E-07	8.233E-05	0
Lead (Pb)	t/d	5.481E-08	1.028E-05	3.993E-08
Magnesium (Mg)	t/d	5.816E-08	1.091E-05	0
Manganese (Mn)	t/d	4.011E-09	7.526E-07	1.329E-07
Nickel (Ni)	t/d	6.253E-09	1.173E-06	6.651E-07
Potassium (K)	t/d	1.863E-08	3.496E-06	0
Silver (Ag)	t/d	8.969E-09	1.683E-06	0
Silicon (Si)	t/d	6.385E-07	0.0001198	0
Strontium (Sr)	t/d	1.042E-09	1.956E-07	1.341E-08
Titanium (Ti)	t/d	5.258E-09	9.867E-07	0
Vanadium (V)	t/d	1.879E-09	3.526E-07	2.661E-07
Zinc (Zn)	t/d	2.863E-07	5.373E-05	1.064E-06
Zirconium (Zr)	t/d	8.527E-10	1.6E-07	0
Carbon disulphide	t/d	0	0	0
Hydrogen Sulphide	t/d	0	0	0
Mercaptans	t/d	0	0	0
Thiophenes	t/d	0	0	0

Note: "0" – No emissions.

4.0 PROJECT EMISSIONS

Table B4-20 presents a summary of the emission data for the Project for the Application and Planned Development cases.

Table B4-20: Project Emissions for Application and Planned Development Cases

Point Source								
Facility	Units	Pike 2						
Emission Source		OTSG 1	OTSG 2	OTSG 3	OTSG 4	OTSG 5	OTSG 6	COGEN
UTM N	m	520144	520136	520127	520119	520110	520102	520130
UTM E	m	6133296	6133287	6133279	6133270	6133262	6133253	6133424
Elevation	masl	679	679	679	679	679	679	679
Stack Height	m	28.3	28.3	28.3	28.3	28.3	28.3	30.0
Stack Diameter	m	1.68	1.68	1.68	1.68	1.68	1.68	3.35
Exit Velocity	m/s	19.75	19.75	19.75	19.75	19.75	19.75	17.75
Exit Temperature	K	458	458	458	458	458	458	443
1,3-butadiene	t/d	0	0	0	0	0	0	1.187E-05
Acenaphthene	t/d	5.055E-09	5.055E-09	5.055E-09	5.055E-09	5.055E-09	5.055E-09	0
Acenaphthylene	t/d	4.400E-08	4.400E-08	4.400E-08	4.400E-08	4.400E-08	4.400E-08	0
Acetaldehyde	t/d	5.673E-05	5.673E-05	5.673E-05	5.673E-05	5.673E-05	5.673E-05	8.725E-03
Acrolein	t/d	6.691E-05	6.691E-05	6.691E-05	6.691E-05	6.691E-05	6.691E-05	1.401E-03
Aliphatic aldehydes	t/d	0	0	0	0	0	0	0
Aliphatic C_{17}-C_{34}	t/d	0	0	0	0	0	0	0
Aliphatic C_5-C_8	t/d	7.280E-03	7.280E-03	7.280E-03	7.280E-03	7.280E-03	7.280E-03	5.280E-02
Aliphatic C_9-C_{16}	t/d	2.800E-04	2.800E-04	2.800E-04	2.800E-04	2.800E-04	2.800E-04	2.800E-03
Aliphatic ketones	t/d	0	0	0	0	0	0	0
Anthracene	t/d	5.855E-09	5.855E-09	5.855E-09	5.855E-09	5.855E-09	5.855E-09	0
Aromatic C_{17}-C_{34}	t/d	6.540E-09	6.540E-09	6.540E-09	6.540E-09	6.540E-09	6.540E-09	9.927E-08
Aromatic C_9-C_{16}	t/d	1.588E-07	1.588E-07	1.588E-07	1.588E-07	1.588E-07	1.588E-07	8.676E-06
Benzaldehyde	t/d	5.964E-05	5.964E-05	5.964E-05	5.964E-05	5.964E-05	5.964E-05	5.964E-04
Benzene	t/d	4.073E-05	4.073E-05	4.073E-05	4.073E-05	4.073E-05	4.073E-05	5.799E-03
Benzo(a)pyrene	t/d	3.564E-09	3.564E-09	3.564E-09	3.564E-09	3.564E-09	3.564E-09	8.779E-07
Benzo(b)fluoranthene	t/d	4.145E-09	4.145E-09	4.145E-09	4.145E-09	4.145E-09	4.145E-09	7.179E-07
Benzo(g,h,i)perylene	t/d	4.545E-09	4.545E-09	4.545E-09	4.545E-09	4.545E-09	4.545E-09	8.687E-07
Benzo(k)fluoranthene	t/d	3.600E-09	3.600E-09	3.600E-09	3.600E-09	3.600E-09	3.600E-09	6.974E-07
Carboxylic acids	t/d	0	0	0	0	0	0	0
Chrysene	t/d	5.055E-09	5.055E-09	5.055E-09	5.055E-09	5.055E-09	5.055E-09	1.587E-06
Dibenz(a,h)anthracene	t/d	3.335E-09	3.335E-09	3.335E-09	3.335E-09	3.335E-09	3.335E-09	1.475E-06
Ethylbenzene	t/d	8.182E-06	8.182E-06	8.182E-06	8.182E-06	8.182E-06	8.182E-06	1.143E-03
Fluoranthene	t/d	4.327E-08	4.327E-08	4.327E-08	4.327E-08	4.327E-08	4.327E-08	2.836E-06
Fluorene	t/d	1.669E-08	1.669E-08	1.669E-08	1.669E-08	1.669E-08	1.669E-08	0
Formaldehyde	t/d	8.036E-04	8.036E-04	8.036E-04	8.036E-04	8.036E-04	8.036E-04	5.981E-02
Hexane	t/d	0	0	0	0	0	0	1.614E-02
Indeno(1,2,3-cd)pyrene	t/d	4.255E-09	4.255E-09	4.255E-09	4.255E-09	4.255E-09	4.255E-09	1.478E-06
Naphthalene	t/d	4.073E-06	4.073E-06	4.073E-06	4.073E-06	4.073E-06	4.073E-06	1.170E-04
Phenanthrene	t/d	1.225E-07	1.225E-07	1.225E-07	1.225E-07	1.225E-07	1.225E-07	1.991E-05
Propylene	t/d	8.545E-04	8.545E-04	8.545E-04	8.545E-04	8.545E-04	8.545E-04	0

Point Source								
Facility	**Units**	**Pike 2**						
Emission Source		**OTSG 1**	**OTSG 2**	**OTSG 3**	**OTSG 4**	**OTSG 5**	**OTSG 6**	**COGEN**
Pyrene	t/d	2.036E-08	2.036E-08	2.036E-08	2.036E-08	2.036E-08	2.036E-08	1.794E-06
Toluene	t/d	1.073E-04	1.073E-04	1.073E-04	1.073E-04	1.073E-04	1.073E-04	4.781E-03
Xylenes	t/d	1.004E-04	1.004E-04	1.004E-04	1.004E-04	1.004E-04	1.004E-04	1.961E-03
Aluminum (Al)	t/d	1.300E-05	1.300E-05	1.300E-05	1.300E-05	1.300E-05	1.300E-05	1.554E-05
Arsenic (As)	t/d	4.335E-07	4.335E-07	4.335E-07	4.335E-07	4.335E-07	4.335E-07	7.378E-07
Barium (Ba)	t/d	1.135E-06	1.135E-06	1.135E-06	1.135E-06	1.135E-06	1.135E-06	1.931E-06
Cadmium (Cd)	t/d	1.434E-07	1.434E-07	1.434E-07	1.434E-07	1.434E-07	1.434E-07	2.441E-07
Calcium (Ca)	t/d	4.335E-05	4.335E-05	4.335E-05	4.335E-05	4.335E-05	4.335E-05	3.562E-05
Chromium (Cr)	t/d	1.147E-07	1.147E-07	1.147E-07	1.147E-07	1.147E-07	1.147E-07	2.555E-06
Cobalt (Co)	t/d	3.120E-06	3.120E-06	3.120E-06	3.120E-06	3.120E-06	3.120E-06	1.901E-06
Copper (Cu)	t/d	5.418E-06	5.418E-06	5.418E-06	5.418E-06	5.418E-06	5.418E-06	4.870E-06
Iron (Fe)	t/d	2.384E-05	2.384E-05	2.384E-05	2.384E-05	2.384E-05	2.384E-05	3.680E-05
Lead (Pb)	t/d	3.251E-07	3.251E-07	3.251E-07	3.251E-07	3.251E-07	3.251E-07	5.927E-07
Magnesium (Mg)	t/d	0	0	0	0	0	0	6.736E-06
Manganese (Mn)	t/d	1.084E-06	1.084E-06	1.084E-06	1.084E-06	1.084E-06	1.084E-06	1.268E-06
Nickel (Ni)	t/d	5.418E-06	5.418E-06	5.418E-06	5.418E-06	5.418E-06	5.418E-06	3.768E-06
Potassium (K)	t/d	1.084E-05	1.084E-05	1.084E-05	1.084E-05	1.084E-05	1.084E-05	1.105E-05
Silver (Ag)	t/d	0	0	0	0	0	0	4.654E-06
Silicon (Si)	t/d	6.279E-05	6.279E-05	6.279E-05	6.279E-05	6.279E-05	6.279E-05	1.069E-04
Strontium (Sr)	t/d	1.084E-07	1.084E-07	1.084E-07	1.084E-07	1.084E-07	1.084E-07	3.064E-07
Titanium (Ti)	t/d	1.084E-06	1.084E-06	1.084E-06	1.084E-06	1.084E-06	1.084E-06	2.125E-06
Vanadium (V)	t/d	2.167E-06	2.167E-06	2.167E-06	2.167E-06	2.167E-06	2.167E-06	1.842E-06
Zinc (Zn)	t/d	8.669E-06	8.669E-06	8.669E-06	8.669E-06	8.669E-06	8.669E-06	7.082E-06
Zirconium (Zr)	t/d	1.275E-08	1.275E-08	1.275E-08	1.275E-08	1.275E-08	1.275E-08	1.664E-07
Molybdenum (Mo)	t/d	1.434E-09	1.434E-09	1.434E-09	1.434E-09	1.434E-09	1.434E-09	0
Selenium (Se)	t/d	7.649E-07	7.649E-07	7.649E-07	7.649E-07	7.649E-07	7.649E-07	0

Point Source (cont'd)						
Facility	**Units**	**Pike 2**				
Emission Source		**Glycol Heater 1**	**Glycol Heater 2**	**Flash Treater 1**	**Flash Treater 2**	**Flare Stack (Normal Purge)**
UTM N	m	520325	520318	520265	520257	520496
UTM E	m	6133466	6133459	6133343	6133334	6133217
Elevation	masl	678	678	679	679	681
Stack Height	m	6.7	6.7	5.56	5.56	41.15
Stack Diameter	m	0.71	0.71	0.20	0.20	0.406
Exit Velocity	m/s	10.7	10.7	30.8	30.8	0.4150
Exit Temperature	K	424	424	443	443	2777
1,3-butadiene	t/d	0	0	0	0	0
Acenaphthene	t/d	5.055E-10	5.055E-10	2.527E-10	2.527E-10	0
Acenaphthylene	t/d	4.400E-09	4.400E-09	2.200E-09	2.200E-09	0
Acetaldehyde	t/d	5.673E-06	5.673E-06	2.836E-06	2.836E-06	3.609E-07
Acrolein	t/d	6.691E-06	6.691E-06	3.345E-06	3.345E-06	1.181E-07
Aliphatic aldehydes	t/d	0	0	0	0	0
Aliphatic C_{17}-C_{34}	t/d	0	0	0	0	0
Aliphatic C_5-C_8	t/d	7.280E-04	7.280E-04	3.640E-04	3.640E-04	7.281E-05
Aliphatic C_9-C_{16}	t/d	2.800E-05	2.800E-05	1.400E-05	1.400E-05	2.800E-06
Aliphatic ketones	t/d	0	0	0	0	0
Anthracene	t/d	5.855E-10	5.855E-10	2.927E-10	2.927E-10	0
Aromatic C_{17}-C_{34}	t/d	6.540E-10	6.540E-10	3.270E-10	3.270E-10	1.928E-10
Aromatic C_9-C_{16}	t/d	1.588E-08	1.588E-08	7.940E-09	7.940E-09	1.460E-07
Benzaldehyde	t/d	5.964E-06	5.964E-06	2.982E-06	2.982E-06	0
Benzene	t/d	4.073E-06	4.073E-06	2.036E-06	2.036E-06	2.560E-07
Benzo(a)pyrene	t/d	3.564E-10	3.564E-10	1.782E-10	1.782E-10	2.951E-08
Benzo(b)fluoranthene	t/d	4.145E-10	4.145E-10	2.073E-10	2.073E-10	2.951E-08
Benzo(g,h,i)perylene	t/d	4.545E-10	4.545E-10	2.273E-10	2.273E-10	2.951E-08
Benzo(k)fluoranthene	t/d	3.600E-10	3.600E-10	1.800E-10	1.800E-10	2.951E-08
Carboxylic acids	t/d	0	0	0	0	0
Chrysene	t/d	5.055E-10	5.055E-10	2.527E-10	2.527E-10	2.965E-08
Dibenz(a,h)anthracene	t/d	3.335E-10	3.335E-10	1.667E-10	1.667E-10	2.951E-08
Ethylbenzene	t/d	8.182E-07	8.182E-07	4.091E-07	4.091E-07	0
Fluoranthene	t/d	4.327E-09	4.327E-09	2.164E-09	2.164E-09	3.175E-08
Fluorene	t/d	1.669E-09	1.669E-09	8.345E-10	8.345E-10	0
Formaldehyde	t/d	8.036E-05	8.036E-05	4.018E-05	4.018E-05	4.126E-05
Hexane	t/d	0	0	0	0	0
Indeno(1,2,3-cd)pyrene	t/d	4.255E-10	4.255E-10	2.127E-10	2.127E-10	2.951E-08
Naphthalene	t/d	4.073E-07	4.073E-07	2.036E-07	2.036E-07	1.818E-05
Phenanthrene	t/d	1.225E-08	1.225E-08	6.127E-09	6.127E-09	3.916E-08
Propylene	t/d	8.545E-05	8.545E-05	4.273E-05	4.273E-05	0
Pyrene	t/d	2.036E-09	2.036E-09	1.018E-09	1.018E-09	3.119E-08
Toluene	t/d	1.073E-05	1.073E-05	5.364E-06	5.364E-06	2.462E-05
Xylenes	t/d	1.004E-05	1.004E-05	5.018E-06	5.018E-06	7.749E-07
Aluminum (Al)	t/d	1.412E-06	1.412E-06	3.162E-07	3.162E-07	0
Arsenic (As)	t/d	4.707E-08	4.707E-08	1.054E-08	1.054E-08	0

Point Source (cont'd)						
Facility	**Units**	**Pike 2**				
Emission Source		**Glycol Heater 1**	**Glycol Heater 2**	**Flash Treater 1**	**Flash Treater 2**	**Flare Stack (Normal Purge)**
Barium (Ba)	t/d	1.232E-07	1.232E-07	2.759E-08	2.759E-08	0
Cadmium (Cd)	t/d	1.557E-08	1.557E-08	3.488E-09	3.488E-09	0
Calcium (Ca)	t/d	4.707E-06	4.707E-06	1.054E-06	1.054E-06	0
Chromium (Cr)	t/d	1.246E-08	1.246E-08	2.790E-09	2.790E-09	0
Cobalt (Co)	t/d	3.388E-07	3.388E-07	7.588E-08	7.588E-08	0
Copper (Cu)	t/d	5.884E-07	5.884E-07	1.318E-07	1.318E-07	0
Iron (Fe)	t/d	2.589E-06	2.589E-06	5.797E-07	5.797E-07	0
Lead (Pb)	t/d	3.530E-08	3.530E-08	7.905E-09	7.905E-09	0
Magnesium (Mg)	t/d	0	0	0	0	0
Manganese (Mn)	t/d	1.177E-07	1.177E-07	2.635E-08	2.635E-08	0
Nickel (Ni)	t/d	5.884E-07	5.884E-07	1.318E-07	1.318E-07	0
Potassium (K)	t/d	1.177E-06	1.177E-06	2.635E-07	2.635E-07	0
Silver (Ag)	t/d	0	0	0	0	0
Silicon (Si)	t/d	6.818E-06	6.818E-06	1.527E-06	1.527E-06	0
Strontium (Sr)	t/d	1.177E-08	1.177E-08	2.635E-09	2.635E-09	0
Titanium (Ti)	t/d	1.177E-07	1.177E-07	2.635E-08	2.635E-08	0
Vanadium (V)	t/d	2.353E-07	2.353E-07	5.270E-08	5.270E-08	0
Zinc (Zn)	t/d	9.414E-07	9.414E-07	2.108E-07	2.108E-07	0
Zirconium (Zr)	t/d	1.384E-09	1.384E-09	3.100E-10	3.100E-10	0
Molybdenum (Mo)	t/d	1.557E-10	1.557E-10	3.488E-11	3.488E-11	0
Selenium (Se)	t/d	8.306E-08	8.306E-08	1.860E-08	1.860E-08	0

Point Source (cont'd)						
Facility	**Units**	**Pike 2**				
Emission Source		**Pad 202 Steam Heater**	**Pad 203 Steam Heater**	**Pad 205 Steam Heater**	**Pad 206 Steam Heater**	**Pad 207 Steam Heater**
UTM N	m	521904	524838	520410	520035	519961
UTM E	m	6133205	6133032	6133842	6134676	6135289
Elevation	masl	681	677	673	660	659
Stack Height	m	15.24	15.24	15.24	15.24	15.24
Stack Diameter	m	1.22	1.22	1.22	1.22	1.22
Exit Velocity	m/s	2.9	2.9	2.9	2.9	2.9
Exit Temperature	K	595	595	595	595	595
1,3-butadiene	t/d	0	0	0	0	0
Acenaphthene	t/d	2.184E-11	2.184E-11	2.184E-11	2.184E-11	2.184E-11
Acenaphthylene	t/d	1.901E-10	1.901E-10	1.901E-10	1.901E-10	1.901E-10
Acetaldehyde	t/d	2.451E-07	2.451E-07	2.451E-07	2.451E-07	2.451E-07
Acrolein	t/d	2.890E-07	2.890E-07	2.890E-07	2.890E-07	2.890E-07
Aliphatic aldehydes	t/d	0	0	0	0	0
Aliphatic C_{17}-C_{34}	t/d	0	0	0	0	0
Aliphatic C_5-C_8	t/d	3.145E-05	3.145E-05	3.145E-05	3.145E-05	3.145E-05
Aliphatic C_9-C_{16}	t/d	1.210E-06	1.210E-06	1.210E-06	1.210E-06	1.210E-06
Aliphatic ketones	t/d	0	0	0	0	0
Anthracene	t/d	2.529E-11	2.529E-11	2.529E-11	2.529E-11	2.529E-11
Aromatic C_{17}-C_{34}	t/d	2.825E-11	2.825E-11	2.825E-11	2.825E-11	2.825E-11
Aromatic C_9-C_{16}	t/d	6.860E-10	6.860E-10	6.860E-10	6.860E-10	6.860E-10
Benzaldehyde	t/d	2.576E-07	2.576E-07	2.576E-07	2.576E-07	2.576E-07
Benzene	t/d	1.759E-07	1.759E-07	1.759E-07	1.759E-07	1.759E-07
Benzo(a)pyrene	t/d	1.539E-11	1.539E-11	1.539E-11	1.539E-11	1.539E-11
Benzo(b)fluoranthene	t/d	1.791E-11	1.791E-11	1.791E-11	1.791E-11	1.791E-11
Benzo(g,h,i)perylene	t/d	1.964E-11	1.964E-11	1.964E-11	1.964E-11	1.964E-11
Benzo(k)fluoranthene	t/d	1.555E-11	1.555E-11	1.555E-11	1.555E-11	1.555E-11
Carboxylic acids	t/d	0	0	0	0	0
Chrysene	t/d	2.184E-11	2.184E-11	2.184E-11	2.184E-11	2.184E-11
Dibenz(a,h)anthracene	t/d	1.441E-11	1.441E-11	1.441E-11	1.441E-11	1.441E-11
Ethylbenzene	t/d	3.535E-08	3.535E-08	3.535E-08	3.535E-08	3.535E-08
Fluoranthene	t/d	1.869E-10	1.869E-10	1.869E-10	1.869E-10	1.869E-10
Fluorene	t/d	7.210E-11	7.210E-11	7.210E-11	7.210E-11	7.210E-11
Formaldehyde	t/d	3.472E-06	3.472E-06	3.472E-06	3.472E-06	3.472E-06
Hexane	t/d	0	0	0	0	0
Indeno(1,2,3-cd)pyrene	t/d	1.838E-11	1.838E-11	1.838E-11	1.838E-11	1.838E-11
Naphthalene	t/d	1.759E-08	1.759E-08	1.759E-08	1.759E-08	1.759E-08
Phenanthrene	t/d	5.294E-10	5.294E-10	5.294E-10	5.294E-10	5.294E-10
Propylene	t/d	3.692E-06	3.692E-06	3.692E-06	3.692E-06	3.692E-06
Pyrene	t/d	8.797E-11	8.797E-11	8.797E-11	8.797E-11	8.797E-11
Toluene	t/d	4.634E-07	4.634E-07	4.634E-07	4.634E-07	4.634E-07
Xylenes	t/d	4.336E-07	4.336E-07	4.336E-07	4.336E-07	4.336E-07
Aluminum (Al)	t/d	5.678E-06	5.678E-06	5.678E-06	5.678E-06	5.678E-06
Arsenic (As)	t/d	1.893E-07	1.893E-07	1.893E-07	1.893E-07	1.893E-07

Point Source (cont'd)						
Facility	**Units**	**Pike 2**				
Emission Source		**Pad 202 Steam Heater**	**Pad 203 Steam Heater**	**Pad 205 Steam Heater**	**Pad 206 Steam Heater**	**Pad 207 Steam Heater**
Barium (Ba)	t/d	4.954E-07	4.954E-07	4.954E-07	4.954E-07	4.954E-07
Cadmium (Cd)	t/d	6.263E-08	6.263E-08	6.263E-08	6.263E-08	6.263E-08
Calcium (Ca)	t/d	1.893E-05	1.893E-05	1.893E-05	1.893E-05	1.893E-05
Chromium (Cr)	t/d	5.010E-08	5.010E-08	5.010E-08	5.010E-08	5.010E-08
Cobalt (Co)	t/d	1.362E-06	1.362E-06	1.362E-06	1.362E-06	1.362E-06
Copper (Cu)	t/d	2.366E-06	2.366E-06	2.366E-06	2.366E-06	2.366E-06
Iron (Fe)	t/d	1.041E-05	1.041E-05	1.041E-05	1.041E-05	1.041E-05
Lead (Pb)	t/d	1.420E-07	1.420E-07	1.420E-07	1.420E-07	1.420E-07
Magnesium (Mg)	t/d	0	0	0	0	0
Manganese (Mn)	t/d	4.732E-07	4.732E-07	4.732E-07	4.732E-07	4.732E-07
Nickel (Ni)	t/d	2.366E-06	2.366E-06	2.366E-06	2.366E-06	2.366E-06
Potassium (K)	t/d	4.732E-06	4.732E-06	4.732E-06	4.732E-06	4.732E-06
Silver (Ag)	t/d	0	0	0	0	0
Silicon (Si)	t/d	2.742E-05	2.742E-05	2.742E-05	2.742E-05	2.742E-05
Strontium (Sr)	t/d	4.732E-08	4.732E-08	4.732E-08	4.732E-08	4.732E-08
Titanium (Ti)	t/d	4.732E-07	4.732E-07	4.732E-07	4.732E-07	4.732E-07
Vanadium (V)	t/d	9.463E-07	9.463E-07	9.463E-07	9.463E-07	9.463E-07
Zinc (Zn)	t/d	3.785E-06	3.785E-06	3.785E-06	3.785E-06	3.785E-06
Zirconium (Zr)	t/d	5.567E-09	5.567E-09	5.567E-09	5.567E-09	5.567E-09
Molybdenum (Mo)	t/d	6.263E-10	6.263E-10	6.263E-10	6.263E-10	6.263E-10
Selenium (Se)	t/d	3.340E-07	3.340E-07	3.340E-07	3.340E-07	3.340E-07

Note: "0" – No emissions.

Tanks							
Facility	**Units**	**Pike 2**					
Emission Source		**T-1660**	**T-2100**	**T-2150**	**T-3100**	**T-3110**	**T-3190**
UTM N	m	510685	510783	510786	510739	510723	510771
UTM E	m	6144816	6144817	6144813	6144698	6144737	6144691
Elevation	masl	684	684	684	685	685	685
Release Height	m	2.930	6.096	6.096	12.198	6.409	14.637
Diameter	m	5	4	4	11	37	26
1,3-butadiene	t/d	1.70E-11	4.58E-08	4.58E-08	4.35E-08	2.44E-07	2.72E-07
Acenaphthene	t/d	0	0	0	0	0	0
Acenaphthylene	t/d	0	0	0	0	0	0
Acetaldehyde	t/d	0	0	0	0	0	0
Acrolein	t/d	0	0	0	0	0	0
Aliphatic aldehydes	t/d	1.02E-07	2.73E-04	2.73E-04	2.60E-04	1.46E-03	1.63E-03
Aliphatic C_{17}-C_{34}	t/d	4.71E-08	1.27E-04	1.27E-04	1.21E-04	6.77E-04	7.55E-04
Aliphatic C_5-C_8	t/d	7.97E-07	2.15E-03	2.15E-03	2.04E-03	1.15E-02	1.28E-02
Aliphatic C_9-C_{16}	t/d	3.28E-06	8.83E-03	8.83E-03	8.40E-03	4.71E-02	5.26E-02
Aliphatic ketones	t/d	3.60E-07	9.68E-04	9.68E-04	9.20E-04	5.17E-03	5.76E-03
Anthracene	t/d	0	0	0	0	0	0
Aromatic C_{17}-C_{34}	t/d	0	0	0	0	0	0
Aromatic C_9-C_{16}	t/d	8.44E-08	2.27E-04	2.27E-04	2.16E-04	1.21E-03	1.35E-03
Benzaldehyde	t/d	0	0	0	0	0	0
Benzene	t/d	6.30E-08	1.70E-04	1.70E-04	1.61E-04	9.05E-04	1.01E-03
Benzo(a)pyrene	t/d	0	0	0	0	0	0
Benzo(b)fluoranthene	t/d	0	0	0	0	0	0
Benzo(g,h,i)perylene	t/d	0	0	0	0	0	0
Benzo(k)fluoranthene	t/d	0	0	0	0	0	0
Carboxylic acids	t/d	1.36E-11	3.66E-08	3.66E-08	3.48E-08	1.96E-07	2.18E-07
Chrysene	t/d	0	0	0	0	0	0
Dibenz(a,h)anthracene	t/d	0	0	0	0	0	0
Ethylbenzene	t/d	3.79E-09	1.02E-05	1.02E-05	9.70E-06	5.45E-05	6.07E-05
Fluoranthene	t/d	0	0	0	0	0	0
Fluorene	t/d	0	0	0	0	0	0
Formaldehyde	t/d	0	0	0	0	0	0
Hexane	t/d	5.20E-08	1.40E-04	1.40E-04	1.33E-04	7.47E-04	8.33E-04
Indeno(1,2,3-cd)pyrene	t/d	0	0	0	0	0	0
Naphthalene	t/d	4.86E-13	1.31E-09	1.31E-09	1.24E-09	6.98E-09	7.78E-09
Phenanthrene	t/d	0	0	0	0	0	0
Propylene	t/d	0	0	0	0	0	0
Pyrene	t/d	0	0	0	0	0	0
Toluene	t/d	2.82E-08	7.59E-05	7.59E-05	7.21E-05	4.05E-04	4.52E-04
Xylenes	t/d	1.65E-08	4.45E-05	4.45E-05	4.23E-05	2.37E-04	2.65E-04
Carbon disulphide	t/d	3.71E-08	1.00E-04	1.00E-04	9.50E-05	5.34E-04	5.95E-04
Hydrogen Sulphide	t/d	3.05E-09	8.22E-06	8.22E-06	7.81E-06	4.39E-05	4.89E-05
Mercaptans	t/d	3.83E-08	1.03E-04	1.03E-04	9.81E-05	5.51E-04	6.14E-04
Thiophenes	t/d	5.08E-08	1.37E-04	1.37E-04	1.30E-04	7.31E-04	8.14E-04

Tanks (cont')						
Facility	**Units**	**Pike 2**				
Emission Source		**T-3800**	**T-4100**	**T-4110A**	**T-4110B**	**T-4130**
UTM N	m	510882	510826	510861	510851	510882
UTM E	m	6144568	6144579	6144546	6144596	6144857
Elevation	masl	685	686	686	686	686
Release Height	m	9.760	12.198	14.637	14.637	12.198
Diameter	m	11.60	14.60	21.07	21.07	14.60
1,3-butadiene	t/d	3.69E-08	7.30E-08	1.82E-07	1.82E-07	7.98E-08
Acenaphthene	t/d	0	0	0	0	0
Acenaphthylene	t/d	0	0	0	0	0
Acetaldehyde	t/d	0	0	0	0	0
Acrolein	t/d	0	0	0	0	0
Aliphatic aldehydes	t/d	2.20E-04	4.36E-04	1.09E-03	1.09E-03	4.77E-04
Aliphatic C_{17}-C_{34}	t/d	1.02E-04	2.02E-04	5.06E-04	5.06E-04	2.21E-04
Aliphatic C_5-C_8	t/d	1.73E-03	3.42E-03	8.55E-03	8.55E-03	3.74E-03
Aliphatic C_9-C_{16}	t/d	7.11E-03	1.41E-02	3.52E-02	3.52E-02	1.54E-02
Aliphatic ketones	t/d	7.79E-04	1.54E-03	3.86E-03	3.86E-03	1.69E-03
Anthracene	t/d	0	0	0	0	0
Aromatic C_{17}-C_{34}	t/d	0	0	0	0	0
Aromatic C_9-C_{16}	t/d	1.83E-04	3.62E-04	9.05E-04	9.05E-04	3.96E-04
Benzaldehyde	t/d	0	0	0	0	0
Benzene	t/d	1.37E-04	2.70E-04	6.75E-04	6.75E-04	2.96E-04
Benzo(a)pyrene	t/d	0	0	0	0	0
Benzo(b)fluoranthene	t/d	0	0	0	0	0
Benzo(g,h,i)perylene	t/d	0	0	0	0	0
Benzo(k)fluoranthene	t/d	0	0	0	0	0
Carboxylic acids	t/d	2.95E-08	5.84E-08	1.46E-07	1.46E-07	6.39E-08
Chrysene	t/d	0	0	0	0	0
Dibenz(a,h)anthracene	t/d	0	0	0	0	0
Ethylbenzene	t/d	8.22E-06	1.63E-05	4.07E-05	4.07E-05	1.78E-05
Fluoranthene	t/d	0	0	0	0	0
Fluorene	t/d	0	0	0	0	0
Formaldehyde	t/d	0	0	0	0	0
Hexane	t/d	1.13E-04	2.23E-04	5.58E-04	5.58E-04	2.44E-04
Indeno(1,2,3-cd)pyrene	t/d	0	0	0	0	0
Naphthalene	t/d	1.05E-09	2.09E-09	5.21E-09	5.21E-09	2.28E-09
Phenanthrene	t/d	0	0	0	0	0
Propylene	t/d	0	0	0	0	0
Pyrene	t/d	0	0	0	0	0
Toluene	t/d	6.11E-05	1.21E-04	3.02E-04	3.02E-04	1.32E-04
Xylenes	t/d	3.58E-05	7.09E-05	1.77E-04	1.77E-04	7.76E-05
Carbon disulphide	t/d	8.05E-05	1.59E-04	3.98E-04	3.98E-04	1.74E-04
Hydrogen Sulphide	t/d	6.62E-06	1.31E-05	3.27E-05	3.27E-05	1.43E-05
Mercaptans	t/d	8.31E-05	1.64E-04	4.11E-04	4.11E-04	1.80E-04
Thiophenes	t/d	1.10E-04	2.18E-04	5.45E-04	5.45E-04	2.39E-04

Note: "0" – No emissions.

Area Sources			
Facility	**Units**	**Pike 2**	
Emission Source		**CPF Fugitive**	**Well Pads**
Corner 1 UTM N	m	520341	520341
Corner 1 UTM E	m	6133476	6133476
Corner 2 UTM N	m	520282	520282
Corner 2 UTM E	m	6133324	6133324
Corner 3 UTM N	m	520096	520096
Corner 3 UTM E	m	6133240	6133240
Corner 4 UTM N	m	520109	520109
Corner 4 UTM E	m	6133415	6133415
Area	m^2	31561	31561
Elevation	masl	681	681
1,3-butadiene	t/d	7.58E-07	4.90E-07
Acenaphthene	t/d	0	0
Acenaphthylene	t/d	0	0
Acetaldehyde	t/d	0	0
Acrolein	t/d	0	0
Aliphatic aldehydes	t/d	0.004522	0.002926
Aliphatic C_{17}-C_{34}	t/d	0.0021	0.001359
Aliphatic C_5-C_8	t/d	0.035502	0.022972
Aliphatic C_9-C_{16}	t/d	0.14615	0.094568
Aliphatic ketones	t/d	0.016017	0.010364
Anthracene	t/d	0	0
Aromatic C_{17}-C_{34}	t/d	0	0
Aromatic C_9-C_{16}	t/d	0.00376	0.002433
Benzaldehyde	t/d	0	0
Benzene	t/d	0.002806	0.001815
Benzo(a)pyrene	t/d	0	0
Benzo(b)fluoranthene	t/d	0	0
Benzo(g,h,i)perylene	t/d	0	0
Benzo(k)fluoranthene	t/d	0	0
Carboxylic acids	t/d	6.06E-07	3.92E-07
Chrysene	t/d	0	0
Dibenz(a,h)anthracene	t/d	0	0
Ethylbenzene	t/d	0.000169	0.000109
Fluoranthene	t/d	0	0
Fluorene	t/d	0	0
Formaldehyde	t/d	0	0
Hexane	t/d	0.002316	0.001499
Indeno(1,2,3-cd)pyrene	t/d	0	0
Naphthalene	t/d	2.16E-08	1.40E-08
Phenanthrene	t/d	0	0
Propylene	t/d	0	0
Pyrene	t/d	0	0
Toluene	t/d	0.001256	0.000812
Xylenes	t/d	0.000736	0.000476
Carbon disulphide	t/d	0.001654	0.00107
Hydrogen Sulphide	t/d	0.000136	8.80E-05
Mercaptans	t/d	0.001707	0.001104
Thiophenes	t/d	0.002264	0.001465

Note: “0” – No emissions.

5.0 REFERENCES

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Appendix B5

Model Predictions

Appendix B5: Model Predictions
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1.0 INTRODUCTION

As required by Alberta Environment and Parks modelling guidelines, the highest receptor value of a pollutant at the required rank and averaging period was extracted from results of each modelling year. At each receptor, the maximum among the five modelling years was determined. In this appendix, Tables B5-1 to B5-4 provide the model predictions for ground-level pollutant concentrations at the maximum point of impingement, as well as the discrete receptors chosen for this assessment. The list of discrete receptors includes specific community, recreational and other potentially sensitive locations. Modelling results for both normal operation and construction are provided for the absolute maxima, as well as the values on which the Alberta Ambient Air Quality Objectives (AAAQO) are based to eliminate outlying data (e.g., 9th highest value, expressed as 99.9th percentile for 1-hour concentrations) as required by the Alberta Air Quality Model Guideline (ESRD 2013).

Although the framework indicates that they only apply at continuous air monitoring stations as reported through the Clean Air Strategic Alliance (CASA) data warehouse, a comparison can also be made to the Lower Athabasca Regional Plan (LARP) triggers and limits. Tables B5-5 to B5-7 show the 99th percentile 1-hour annual maximum, and annual average concentrations, and the corresponding LARP trigger levels for sulphur dioxide (SO_2) and nitrogen dioxide (NO_2) for each of the four assessment cases.

Potential acid input and nitrogen deposition results are provided in Tables B5-8 to B5-10 and the results are compared to the monitoring loads for potential acid input (CASA and AENV 1999) and critical loads for nitrogen (WHO 2000).

Complete input and output files have been provided to Alberta Environment and Parks and the Alberta Energy Regulator in electronic format.

Table B5-1: Predicted Sulphur Dioxide Concentrations in the Air Quality Regional Study Area

Receptor	Baseline ($\mu g/m^3$)	Application ($\mu g/m^3$)	Increase from Baseline to Application (%)	Planned Development ($\mu g/m^3$)	Construction ($\mu g/m^3$)
Maximum 1-Hour					
Overall Maximum (MPOI)	**487**	**487**	<1%	**487**	**10**
Winefred Lake IR 194b (NW)	21	21	<1%	22	0.038
Conklin	27	27	<1%	54	0.028
Chard	24	26	6%	26	0.012
Pti Christina Lake Lodge	20	20	<1%	25	0.022
Heart Lake IR 167	6	6	5%	8	0.007
Meg Clrp Camp	50	50	<1%	50	0.046
Cenovus Narrows Lake	146	146	<1%	147	0.035
CNRL Kirby	27	27	<1%	28	0.030
Devon Jackfish	94	94	<1%	95	0.040

Receptor	Baseline (µg/m³)	Application (µg/m³)	Increase from Baseline to Application (%)	Planned Development (µg/m³)	Construction (µg/m³)
KNOC BlackGold	88	88	<1%	88	0.037
Petrobank Whitesands and May River	198	198	<1%	212	0.020
Statoil Kkd	18	18	<1%	38	0.013
Winefred Lake Lodge 1	20	20	<1%	20	0.068
Trapper's Cabin (SW of Plant)	234	234	<1%	234	0.037
Camp Site (NW of Plant)	95	95	<1%	95	0.035
Fish Plant (Winefred Lake)	24	24	<1%	25	0.087
Cabin (Winefred Lake)	22	22	<1%	22	0.075
Cabin (NW Kirby Lake)	54	54	<1%	54	0.072
West Hay Lake	60	60	<1%	60	0.052
Cabins (North Hay Lake)	69	69	<1%	71	0.050
Martin's Cabins	65	65	<1%	66	0.034
Metis Trailer Camp	65	65	<1%	65	0.033
Conklin	27	27	<1%	52	0.028
Cabins (NW Christina Lake)	31	32	1%	50	0.028
Medicinal Plants	42	43	1%	49	0.034
Cabins Near Gravel Pit	25	26	5%	47	0.026
Cabins	28	29	4%	45	0.022
Leismer	26	28	5%	31	0.014
East Chard	21	22	7%	23	0.012
IR 194b	20	20	<1%	21	0.039
Fishing Camp (Christina Lake)	48	48	<1%	49	0.046
Fire Lookout 1	18	18	<1%	20	0.042
Altagas House (Renamed Meg House)	47	47	<1%	47	0.046
Grave Site (Christina Lake)	66	66	<1%	66	0.044
Grave Site (Winefred Lake)	20	20	<1%	21	0.043
Grist Lake Lodge 1	18	18	<1%	18	0.083
Grist Lake South	18	18	<1%	18	0.073
Winefred Lake Lodge 1	20	20	<1%	20	0.068
Winefred Lake West	20	20	<1%	22	0.057
EnCana Camp	55	55	<1%	56	0.045
Winefred Cabin/Station/Lookout	20	20	<1%	21	0.041
Campground (Christina Lake)	32	33	1.0%	44	0.029
Wild Rice Operation 1	19	19	<1%	19	0.062
Wild Rice Operation 2	47	48	<1%	48	0.025
Fire Lookout Tower	47	47	<1%	103	0.025
Devenish	37	37	<1%	42	0.029
Old Cabins and Settlement Area (Wiau Lake)	17	17	<1%	20	0.019

Receptor	Baseline (µg/m³)	Application (µg/m³)	Increase from Baseline to Application (%)	Planned Development (µg/m³)	Construction (µg/m³)
Conklin	27	27	<1%	54	0.028
Winefred Lake (IR 194b)	21	21	<1%	21	0.038
Operator's Residence (Meg House)	80	80	<1%	80	0.043
Hunter/Trapper B (Joe Black's Cabin)	31	32	4%	32	0.023
Hunter/Trapper A (Gary York's Cabin)	47	47	<1%	48	0.046
Christina Lake Lodge	34	34	1%	50	0.030
Janvier	13	13	<1%	16	0.011
Ipitiak Lake	23	23	<1%	23	0.046
Lakeramps94	34	36	6%	36	0.022
Conklin	29	30	<1%	46	0.029
Behan	19	19	4%	21	0.015
Margie	35	35	<1%	36	0.018
Devenish	37	37	<1%	42	0.029
First Nations Land - Heart Lake 167	6	6	2%	8	0.006
First Nations Land - Heart Lake 167	4	4	8%	7	0.005
First Nations Land - Heart Lake 167	8	9	3%	12	0.009
First Nations Land - Heart Lake 167	6	6	4%	7	0.007
Winefred Lake (IR 194b)	20	20	<1%	21	0.043
Winefred Lake (IR 194b)	17	17	<1%	17	0.035
Winefred Lake (IR 194b)	17	17	<1%	18	0.036
Winefred Lake (IR 194b)	24	24	<1%	25	0.040
Winefred Lake (IR 194b)	18	18	<1%	19	0.039
Winefred Lake (IR 194b)	19	19	<1%	20	0.038
Winefred Lake 194b	19	19	<1%	20	0.039
Winefred Lake	17	17	<1%	18	0.058
KNOC Bar None Camp	62	62	<1%	62	0.033
Jackfish Central Camp	94	94	<1%	95	0.040
J2 Operations Camp	158	159	<1%	159	0.045
J2 Operations Camp	157	157	<1%	157	0.045
J2 Operations Camp	157	157	<1%	158	0.045
J2 Operations Camp	157	158	<1%	158	0.045
J2 Operations Camp	158	159	<1%	159	0.045
Industrial Campsite	26	26	<1%	27	0.025
Industrial Campsite	37	37	<1%	37	0.022
Trapper's Cabin	14	15	<1%	15	0.047
Industrial Campsite	132	132	<1%	134	0.029
Trapper's Cabin	18	18	<1%	18	0.084
Recreational Campsites	19	19	<1%	19	0.064
Non-Industrial Campsite	18	19	<1%	19	0.062

Receptor	Baseline ($\mu g/m^3$)	Application ($\mu g/m^3$)	Increase from Baseline to Application (%)	Planned Development ($\mu g/m^3$)	Construction ($\mu g/m^3$)
Hunting/Fishing Lodge or Camp	20	20	<1%	20	0.068
Trapper's Cabin	20	20	<1%	20	0.068
Commercial Campsites	21	21	<1%	21	0.072
Commercial Campsites	19	19	3%	20	0.032
Industrial Campsite	67	67	<1%	67	0.044
Industrial Campsite	28	28	<1%	28	0.166
Industrial Campsite	20	20	<1%	22	0.119
Commercial Campsites	66	66	<1%	66	0.033
Industrial Campsite	62	62	<1%	63	0.033
Industrial Campsite	106	106	<1%	106	0.033
Industrial Campsite	23	24	7%	24	0.012
Industrial Campsite	26	28	6%	28	0.012
Commercial Recreational Development	32	33	1%	55	0.029
Industrial Campsite	24	26	7%	45	0.020
Industrial Campsite	27	27	<1%	28	0.030
Trapper's Cabin	70	70	<1%	70	0.033
Trapper's Cabin	33	33	<1%	62	0.032
Industrial Campsite	32	32	<1%	72	0.024
Industrial Campsite	36	36	<1%	68	0.024
Frank Nashim Trappers Cabin	30	30	2%	41	0.022
Trapper's Cabin	30	30	1%	40	0.022
Commercial Campsite	215	215	<1%	226	0.020
Industrial Campsite	150	150	<1%	174	0.020
Firefighter Base Camp Helipad Rapel Tower	63	63	<1%	82	0.018
Industrial Campsite	39	39	<1%	57	0.017
Industrial Campsite	24	24	<1%	43	0.016
Industrial Campsite	18	18	<1%	38	0.013
Industrial Campsite	18	18	<1%	32	0.013
Industrial Campsite	10	10	1%	13	0.010
Steep Banks and Wappau Lakes Recreation Area	14	14	1%	27	0.014
Steep Banks and Wappau Lakes Recreation Area	15	16	2%	25	0.014
Trapper's Cabin	16	16	2%	26	0.015
Industrial Campsite	24	24	2%	61	0.015
Industrial Campsite	21	21	<1%	42	0.010
Trapper's Cabin	9	9	4%	9	0.009
Trapper's Cabin	8	9	4%	9	0.009

Receptor	Baseline (µg/m³)	Application (µg/m³)	Increase from Baseline to Application (%)	Planned Development (µg/m³)	Construction (µg/m³)
Residence Outdated Expiry Still Listed Active	8	9	4%	9	0.009
Residence - Unserviced	8	9	4%	9	0.009
Limited to Metis Residence	8	9	4%	9	0.009
Commercial Recreational Development	10	11	3%	19	0.010
Industrial Campsite	12	12	2%	22	0.011
Steep Banks and Wappau Lakes Recreation Area	13	13	2%	20	0.012
Trapper's Cabin	12	12	2%	16	0.012
Commercial Recreational Development	24	24	<1%	25	0.087
Industrial Campsite	27	27	<1%	65	0.026
Industrial Campsite	58	58	<1%	85	0.022
Industrial Campsite	75	75	<1%	78	0.033
Industrial Campsite	20	20	3%	30	0.013
Commercial Campsites	36	36	<1%	80	0.025
Industrial Campsite	92	92	<1%	93	0.040
Industrial Campsite	172	172	<1%	172	0.038
Industrial Campsite	58	58	<1%	61	0.057
Hunting/Fishing Lodge or Camp	18	18	<1%	18	0.084
Hunting/Fishing Lodge or Camp	11	11	2%	15	0.009
Industrial Campsite	6	6	<1%	9	0.004
Trapper's Cabin	48	48	<1%	48	0.046
Trapper's Cabin	25	25	<1%	26	0.082
Indian Reserve	6	6	5%	7	0.007
Indian Reserve	8	8	6%	13	0.010
Metis Local	29	30	<1%	46	0.029
Indian Reserve	20	20	<1%	21	0.043
9th Highest 1-Hour					
Overall Maximum (MPOI)	**214**	**214**	**<1%**	**214**	**7**
Winefred Lake IR 194b (NW)	15	15	<1%	15	0.027
Conklin	16	17	2%	25	0.012
Chard	14	14	2%	14	0.008
Pti Christina Lake Lodge	14	14	<1%	15	0.014
Heart Lake IR 167	3	3	<1%	3	0.003
Meg Clrp Camp	27	28	<1%	28	0.025
Cenovus Narrows Lake	60	60	<1%	60	0.016
CNRL Kirby	16	16	<1%	17	0.020
Devon Jackfish	47	47	<1%	48	0.018
KNOC BlackGold	38	38	<1%	40	0.021

Receptor	Baseline ($\mu g/m^3$)	Application ($\mu g/m^3$)	Increase from Baseline to Application (%)	Planned Development ($\mu g/m^3$)	Construction ($\mu g/m^3$)
Petrobank Whitesands and May River	135	135	<1%	139	0.009
Statoil Kkd	11	11	2%	19	0.006
Winefred Lake Lodge 1	11	11	1%	13	0.053
Trapper's Cabin (SW of Plant)	95	95	<1%	95	0.025
Camp Site (NW of Plant)	40	40	<1%	41	0.023
Fish Plant (Winefred Lake)	16	16	<1%	17	0.061
Cabin (Winefred Lake)	13	13	<1%	14	0.058
Cabin (NW Kirby Lake)	31	31	<1%	32	0.052
West Hay Lake	32	32	<1%	34	0.038
Cabins (North Hay Lake)	34	34	<1%	35	0.035
Martin's Cabins	31	31	<1%	33	0.020
Metis Trailer Camp	31	31	<1%	33	0.020
Conklin	16	17	2%	25	0.012
Cabins (NW Christina Lake)	20	21	4%	23	0.013
Medicinal Plants	23	23	2%	25	0.014
Cabins Near Gravel Pit	15	16	5%	26	0.010
Cabins	15	16	4%	23	0.010
Leismer	17	17	4%	18	0.011
East Chard	12	13	2%	13	0.008
IR 194b	14	14	<1%	15	0.028
Fishing Camp (Christina Lake)	29	29	<1%	29	0.022
Fire Lookout 1	15	15	<1%	17	0.031
Altagas House (Renamed Meg House)	28	28	<1%	29	0.022
Grave Site (Christina Lake)	31	31	<1%	31	0.021
Grave Site (Winefred Lake)	15	15	<1%	15	0.030
Grist Lake Lodge 1	12	12	<1%	13	0.064
Grist Lake South	11	11	<1%	12	0.059
Winefred Lake Lodge 1	11	11	1%	13	0.053
Winefred Lake West	15	16	<1%	17	0.043
Encana Camp	29	29	<1%	31	0.023
Winefred Cabin/Station/Lookout	16	16	<1%	17	0.028
Campground (Christina Lake)	19	20	4%	22	0.012
Wild Rice Operation 1	11	11	1%	12	0.047
Wild Rice Operation 2	26	27	2%	27	0.015
Fire Lookout Tower	27	27	<1%	45	0.012
Devenish	20	20	<1%	26	0.014
Old Cabins and Settlement Area (Wiau Lake)	11	11	1%	13	0.012
Conklin	16	17	2%	25	0.012

Receptor	Baseline (μg/m³)	Application (μg/m³)	Increase from Baseline to Application (%)	Planned Development (μg/m³)	Construction (μg/m³)
Winefred Lake (IR 194b)	14	15	<1%	15	0.027
Operator's Residence (Meg House)	37	37	<1%	38	0.024
Hunter/Trapper B (Joe Black's Cabin)	20	20	<1%	20	0.012
Hunter/Trapper A (Gary York's Cabin)	28	28	<1%	29	0.022
Christina Lake Lodge	23	23	2%	24	0.014
Janvier	9	10	6%	10	0.007
Ipitiak Lake	12	12	2%	12	0.024
Lakeramps94	20	20	<1%	20	0.013
Conklin	17	18	3%	23	0.012
Behan	9	9	2%	12	0.007
Margie	17	17	<1%	17	0.010
Devenish	20	20	<1%	26	0.014
First Nations Land - Heart Lake 167	3	3	<1%	4	0.003
First Nations Land - Heart Lake 167	2	2	<1%	3	0.002
First Nations Land - Heart Lake 167	5	5	<1%	6	0.005
First Nations Land - Heart Lake 167	3	3	<1%	4	0.003
Winefred Lake (IR 194b)	15	15	<1%	15	0.030
Winefred Lake (IR 194b)	13	13	<1%	13	0.025
Winefred Lake (IR 194b)	12	12	<1%	13	0.027
Winefred Lake (IR 194b)	15	15	<1%	16	0.028
Winefred Lake (IR 194b)	13	13	<1%	14	0.028
Winefred Lake (IR 194b)	14	14	<1%	15	0.026
Winefred Lake 194b	14	14	<1%	14	0.028
Winefred Lake	12	12	<1%	13	0.046
KNOC Bar None Camp	30	30	<1%	32	0.020
Jackfish Central Camp	47	47	<1%	48	0.018
J2 Operations Camp	70	70	<1%	72	0.021
J2 Operations Camp	70	70	<1%	72	0.021
J2 Operations Camp	70	70	<1%	72	0.021
J2 Operations Camp	70	70	<1%	72	0.021
J2 Operations Camp	70	70	<1%	72	0.021
Industrial Campsite	15	15	<1%	15	0.015
Industrial Campsite	26	26	<1%	26	0.013
Trapper's Cabin	10	10	4%	11	0.034
Industrial Campsite	42	42	<1%	43	0.018
Trapper's Cabin	12	12	<1%	13	0.065
Recreational Campsites	11	11	<1%	12	0.046
Non-Industrial Campsite	11	11	1%	12	0.047
Hunting/Fishing Lodge or Camp	11	11	<1%	13	0.053

Receptor	Baseline ($\mu g/m^3$)	Application ($\mu g/m^3$)	Increase from Baseline to Application (%)	Planned Development ($\mu g/m^3$)	Construction ($\mu g/m^3$)
Trapper's Cabin	11	11	<1%	13	0.053
Commercial Campsites	12	12	<1%	13	0.055
Commercial Campsites	15	15	<1%	15	0.021
Industrial Campsite	31	31	<1%	31	0.022
Industrial Campsite	18	18	<1%	18	0.119
Industrial Campsite	15	15	3%	15	0.086
Commercial Campsites	31	31	<1%	33	0.020
Industrial Campsite	30	30	<1%	32	0.020
Industrial Campsite	46	46	<1%	47	0.019
Industrial Campsite	13	13	2%	14	0.008
Industrial Campsite	14	15	3%	15	0.008
Commercial Recreational Development	21	22	3%	24	0.013
Industrial Campsite	16	16	5%	22	0.011
Industrial Campsite	16	16	<1%	17	0.020
Trapper's Cabin	33	33	<1%	33	0.016
Trapper's Cabin	19	19	1%	29	0.016
Industrial Campsite	19	19	<1%	35	0.011
Industrial Campsite	21	21	<1%	37	0.010
Frank Nashim Trappers Cabin	13	14	1%	22	0.011
Trapper's Cabin	13	14	1%	22	0.011
Commercial Campsite	151	151	<1%	155	0.010
Industrial Campsite	101	101	<1%	112	0.009
Firefighter Base Camp Helipad Rapel Tower	29	29	<1%	44	0.009
Industrial Campsite	19	19	<1%	31	0.008
Industrial Campsite	12	13	1%	23	0.007
Industrial Campsite	11	11	2%	19	0.006
Industrial Campsite	10	11	3%	17	0.006
Industrial Campsite	5	5	2%	6	0.004
Steep Banks and Wappau Lakes Recreation Area	8	8	<1%	15	0.006
Steep Banks and Wappau Lakes Recreation Area	8	8	1%	13	0.006
Trapper's Cabin	9	9	<1%	15	0.006
Industrial Campsite	14	14	<1%	28	0.007
Industrial Campsite	9	10	3%	14	0.005
Trapper's Cabin	5	5	1%	6	0.004
Trapper's Cabin	4	5	2%	6	0.004
Residence Outdated Expiry Still Listed Active	4	5	1%	6	0.004

Receptor	Baseline (µg/m³)	Application (µg/m³)	Increase from Baseline to Application (%)	Planned Development (µg/m³)	Construction (µg/m³)
Residence - Unserviced	4	5	1%	6	0.004
Limited to Metis Residence	4	5	1%	6	0.004
Commercial Recreational Development	6	6	<1%	10	0.004
Industrial Campsite	6	6	<1%	11	0.005
Steep Banks and Wappau Lakes Recreation Area	6	6	1%	11	0.005
Trapper's Cabin	6	6	<1%	11	0.004
Commercial Recreational Development	16	16	<1%	17	0.062
Industrial Campsite	16	17	2%	31	0.011
Industrial Campsite	32	32	<1%	44	0.010
Industrial Campsite	28	29	1%	29	0.017
Industrial Campsite	11	12	3%	15	0.005
Commercial Campsites	21	22	1%	36	0.012
Industrial Campsite	46	46	<1%	47	0.018
Industrial Campsite	76	76	<1%	76	0.017
Industrial Campsite	38	38	<1%	39	0.035
Hunting/Fishing Lodge or Camp	12	12	<1%	13	0.064
Hunting/Fishing Lodge or Camp	6	7	<1%	9	0.004
Industrial Campsite	3	3	1%	4	0.002
Trapper's Cabin	28	29	<1%	29	0.022
Trapper's Cabin	17	17	<1%	18	0.056
Indian Reserve	3	3	<1%	4	0.003
Indian Reserve	5	5	<1%	6	0.005
Metis Local	17	18	3%	23	0.012
Indian Reserve	15	15	<1%	15	0.030
AAAQO	450	450	N/A	450	450
Maximum 24-Hour					
Overall Maximum (MPOI)	**88**	**88**	**<1%**	**88**	**4**
Winefred Lake IR 194b (NW)	7	7	<1%	7	0.013
Conklin	6	6	3%	7	0.004
Chard	5	5	2%	5	0.003
Pti Christina Lake Lodge	6	6	<1%	6	0.006
Heart Lake IR 167	1	1	<1%	2	0.001
Meg Clrp Camp	11	11	<1%	11	0.012
Cenovus Narrows Lake	23	23	1%	24	0.007
CNRL Kirby	6	6	<1%	6	0.007
Devon Jackfish	14	14	2%	14	0.006
KNOC BlackGold	13	13	<1%	13	0.007
Petrobank Whitesands and May River	55	55	<1%	56	0.003

Receptor	Baseline (µg/m^3)	Application (µg/m^3)	Increase from Baseline to Application (%)	Planned Development (µg/m^3)	Construction (µg/m^3)
Statoil Kkd	4	4	3%	8	0.002
Winefred Lake Lodge 1	5	5	<1%	6	0.023
Trapper's Cabin (SW of Plant)	35	35	<1%	35	0.009
Camp Site (NW of Plant)	12	13	1%	13	0.008
Fish Plant (Winefred Lake)	7	7	<1%	8	0.030
Cabin (Winefred Lake)	6	6	<1%	6	0.028
Cabin (NW Kirby Lake)	13	13	<1%	14	0.016
West Hay Lake	12	12	<1%	14	0.012
Cabins (North Hay Lake)	11	11	<1%	12	0.012
Martin's Cabins	12	12	2%	12	0.007
Metis Trailer Camp	12	12	2%	12	0.007
Conklin	6	6	3%	7	0.004
Cabins (NW Christina Lake)	7	8	3%	8	0.005
Medicinal Plants	8	8	2%	8	0.005
Cabins Near Gravel Pit	5	5	6%	7	0.004
Cabins	5	5	4%	7	0.004
Leismer	5	5	7%	7	0.003
East Chard	4	4	3%	5	0.004
IR 194b	6	6	<1%	7	0.014
Fishing Camp (Christina Lake)	10	10	<1%	10	0.011
Fire Lookout 1	6	6	2%	7	0.012
Altagas House (Renamed Meg House)	10	10	<1%	10	0.011
Grave Site (Christina Lake)	10	10	<1%	10	0.011
Grave Site (Winefred Lake)	6	6	<1%	7	0.014
Grist Lake Lodge 1	6	6	<1%	7	0.027
Grist Lake South	6	6	<1%	7	0.024
Winefred Lake Lodge 1	5	5	<1%	6	0.023
Winefred Lake West	6	6	<1%	7	0.018
Encana Camp	10	10	<1%	11	0.011
Winefred Cabin/Station/Lookout	6	6	1%	7	0.011
Campground (Christina Lake)	7	7	2%	7	0.005
Wild Rice Operation 1	5	5	<1%	6	0.020
Wild Rice Operation 2	8	8	1%	8	0.006
Fire Lookout Tower	10	10	<1%	14	0.004
Devenish	6	6	1%	9	0.005
Old Cabins and Settlement Area (Wiau Lake)	6	6	<1%	6	0.005
Conklin	6	6	3%	7	0.004
Winefred Lake (IR 194b)	6	6	<1%	7	0.013

Receptor	Baseline (µg/m³)	Application (µg/m³)	Increase from Baseline to Application (%)	Planned Development (µg/m³)	Construction (µg/m³)
Operator's Residence (Meg House)	14	14	<1%	14	0.012
Hunter/Trapper B (Joe Black's Cabin)	9	9	2%	9	0.007
Hunter/Trapper A (Gary York's Cabin)	10	10	<1%	10	0.011
Christina Lake Lodge	8	8	2%	8	0.005
Janvier	3	4	4%	4	0.004
Ipitiak Lake	6	6	<1%	6	0.010
Lakeramps94	9	9	1.0%	9	0.007
Conklin	6	6	3%	7	0.004
Behan	4	4	<1%	4	0.003
Margie	7	7	<1%	7	0.004
Devenish	6	6	1%	9	0.005
First Nations Land - Heart Lake 167	1	1	1%	2	0.001
First Nations Land - Heart Lake 167	1	1	<1%	1	0.001
First Nations Land - Heart Lake 167	2	2	<1%	3	0.002
First Nations Land - Heart Lake 167	1	1	<1%	2	0.001
Winefred Lake (IR 194b)	6	6	<1%	7	0.015
Winefred Lake (IR 194b)	6	6	<1%	6	0.012
Winefred Lake (IR 194b)	6	6	<1%	6	0.013
Winefred Lake (IR 194b)	6	6	<1%	7	0.013
Winefred Lake (IR 194b)	6	6	<1%	7	0.014
Winefred Lake (IR 194b)	7	7	<1%	7	0.012
Winefred Lake 194b	6	6	<1%	7	0.014
Winefred Lake	5	5	<1%	6	0.022
KNOC Bar None Camp	11	12	2%	12	0.007
Jackfish Central Camp	14	14	2%	14	0.006
J2 Operations Camp	26	26	<1%	27	0.006
J2 Operations Camp	26	26	<1%	26	0.006
J2 Operations Camp	26	26	<1%	26	0.006
J2 Operations Camp	26	26	<1%	26	0.006
J2 Operations Camp	27	27	<1%	27	0.006
Industrial Campsite	5	5	<1%	5	0.006
Industrial Campsite	11	11	<1%	11	0.004
Trapper's Cabin	6	6	<1%	6	0.014
Industrial Campsite	20	20	<1%	20	0.007
Trapper's Cabin	6	6	<1%	7	0.027
Recreational Campsites	5	5	<1%	6	0.017
Non-Industrial Campsite	5	5	<1%	6	0.019
Hunting/Fishing Lodge or Camp	5	5	<1%	6	0.022
Trapper's Cabin	5	5	<1%	6	0.022

Receptor	Baseline ($\mu g/m^3$)	Application ($\mu g/m^3$)	Increase from Baseline to Application (%)	Planned Development ($\mu g/m^3$)	Construction ($\mu g/m^3$)
Commercial Campsites	5	5	<1%	6	0.026
Commercial Campsites	6	6	<1%	7	0.009
Industrial Campsite	11	11	<1%	11	0.011
Industrial Campsite	7	7	<1%	7	0.054
Industrial Campsite	6	6	<1%	6	0.040
Commercial Campsites	11	11	2%	11	0.008
Industrial Campsite	11	12	2%	12	0.007
Industrial Campsite	16	16	<1%	16	0.009
Industrial Campsite	4	4	3%	5	0.004
Industrial Campsite	5	5	2%	5	0.004
Commercial Recreational Development	8	8	2%	8	0.005
Industrial Campsite	5	5	7%	6	0.004
Industrial Campsite	6	6	<1%	6	0.007
Trapper's Cabin	10	10	<1%	10	0.007
Trapper's Cabin	6	6	<1%	7	0.005
Industrial Campsite	7	7	2%	9	0.004
Industrial Campsite	6	6	6%	9	0.004
Frank Nashim Trappers Cabin	5	5	3%	8	0.005
Trapper's Cabin	5	5	4%	7	0.005
Commercial Campsite	62	62	<1%	63	0.003
Industrial Campsite	40	40	<1%	43	0.003
Firefighter Base Camp Helipad Rapel Tower	9	9	1%	13	0.003
Industrial Campsite	6	6	1%	10	0.003
Industrial Campsite	5	5	3%	7	0.003
Industrial Campsite	4	4	3%	8	0.002
Industrial Campsite	4	4	5%	6	0.002
Industrial Campsite	2	2	1%	3	0.002
Steep Banks and Wappau Lakes Recreation Area	3	3	3%	5	0.003
Steep Banks and Wappau Lakes Recreation Area	3	3	2%	4	0.003
Trapper's Cabin	4	4	2%	5	0.003
Industrial Campsite	5	5	1%	9	0.003
Industrial Campsite	4	4	4%	5	0.002
Trapper's Cabin	2	2	<1%	2	0.002
Trapper's Cabin	2	2	<1%	2	0.002
Residence Outdated Expiry Still Listed Active	2	2	<1%	2	0.002
Residence - Unserviced	2	2	<1%	2	0.002

Receptor	Baseline ($\mu g/m^3$)	Application ($\mu g/m^3$)	Increase from Baseline to Application (%)	Planned Development ($\mu g/m^3$)	Construction ($\mu g/m^3$)
Limited to Metis Residence	2	2	<1%	2	0.002
Commercial Recreational Development	2	3	1%	4	0.002
Industrial Campsite	3	3	2%	4	0.002
Steep Banks and Wappau Lakes Recreation Area	2	3	3%	4	0.002
Trapper's Cabin	2	2	3%	4	0.002
Commercial Recreational Development	7	7	<1%	8	0.031
Industrial Campsite	6	6	4%	8	0.004
Industrial Campsite	7	7	1%	11	0.004
Industrial Campsite	10	10	1%	10	0.006
Industrial Campsite	4	4	7%	5	0.002
Commercial Campsites	8	8	2%	11	0.004
Industrial Campsite	13	14	2%	14	0.005
Industrial Campsite	26	26	<1%	26	0.008
Industrial Campsite	17	17	<1%	18	0.010
Hunting/Fishing Lodge or Camp	6	6	<1%	7	0.027
Hunting/Fishing Lodge or Camp	3	3	3%	3	0.002
Industrial Campsite	2	2	<1%	2	0.001
Trapper's Cabin	10	10	<1%	10	0.011
Trapper's Cabin	7	7	<1%	8	0.022
Indian Reserve	1	1	<1%	2	0.001
Indian Reserve	2	2	<1%	3	0.002
Metis Local	6	6	3%	7	0.004
Indian Reserve	6	6	<1%	7	0.015
2nd 24 Hour					
Overall Maximum (MPOI)	**83**	**83**	**<1%**	**83**	**3**
Winefred Lake IR 194b (NW)	5	5	<1%	6	0.010
Conklin	5	6	4%	6	0.004
Chard	4	4	3%	4	0.002
Pti Christina Lake Lodge	6	6	<1%	6	0.004
Heart Lake IR 167	1	1	2%	2	0.001
Meg Clrp Camp	8	8	<1%	9	0.006
Cenovus Narrows Lake	19	19	<1%	19	0.006
CNRL Kirby	6	6	<1%	6	0.005
Devon Jackfish	12	12	2%	12	0.005
KNOC BlackGold	10	10	<1%	10	0.006
Petrobank Whitesands and May River	50	50	<1%	51	0.003
Statoil Kkd	3	3	5%	5	0.002
Winefred Lake Lodge 1	4	4	<1%	5	0.020

Receptor	Baseline ($\mu g/m^3$)	Application ($\mu g/m^3$)	Increase from Baseline to Application (%)	Planned Development ($\mu g/m^3$)	Construction ($\mu g/m^3$)
Trapper's Cabin (SW of Plant)	24	24	<1%	24	0.007
Camp Site (NW of Plant)	11	11	<1%	11	0.006
Fish Plant (Winefred Lake)	5	6	2%	6	0.026
Cabin (Winefred Lake)	5	5	4%	6	0.023
Cabin (NW Kirby Lake)	10	10	<1%	10	0.014
West Hay Lake	10	10	<1%	11	0.010
Cabins (North Hay Lake)	10	10	<1%	11	0.010
Martin's Cabins	8	8	<1%	8	0.006
Metis Trailer Camp	8	8	<1%	8	0.005
Conklin	5	6	4%	6	0.004
Cabins (NW Christina Lake)	6	6	4%	6	0.004
Medicinal Plants	7	7	4%	7	0.004
Cabins Near Gravel Pit	4	5	4%	5	0.004
Cabins	4	5	4%	6	0.004
Leismer	5	5	5%	5	0.003
East Chard	4	4	3%	4	0.002
IR 194b	5	5	<1%	6	0.011
Fishing Camp (Christina Lake)	8	8	<1%	8	0.007
Fire Lookout 1	5	5	<1%	6	0.009
Altagas House (Renamed Meg House)	8	8	<1%	8	0.007
Grave Site (Christina Lake)	8	8	<1%	9	0.006
Grave Site (Winefred Lake)	5	5	<1%	6	0.011
Grist Lake Lodge 1	4	4	<1%	5	0.023
Grist Lake South	4	4	2%	5	0.022
Winefred Lake Lodge 1	4	4	<1%	5	0.020
Winefred Lake West	6	6	<1%	7	0.015
Encana Camp	8	8	<1%	8	0.008
Winefred Cabin/Station/Lookout	5	5	1%	6	0.008
Campground (Christina Lake)	6	6	6%	6	0.004
Wild Rice Operation 1	4	4	<1%	5	0.018
Wild Rice Operation 2	6	7	4%	7	0.005
Fire Lookout Tower	7	8	5%	13	0.003
Devenish	5	5	<1%	8	0.004
Old Cabins and Settlement Area (Wiau Lake)	5	5	<1%	5	0.003
Conklin	5	6	4%	6	0.004
Winefred Lake (IR 194b)	5	5	<1%	6	0.010
Operator's Residence (Meg House)	11	11	<1%	11	0.006
Hunter/Trapper B (Joe Black's Cabin)	8	8	<1%	8	0.003

Receptor	Baseline (µg/m³)	Application (µg/m³)	Increase from Baseline to Application (%)	Planned Development (µg/m³)	Construction (µg/m³)
Hunter/Trapper A (Gary York's Cabin)	8	8	<1%	8	0.007
Christina Lake Lodge	6	6	5%	6	0.004
Janvier	2	3	6%	3	0.002
Ipitiak Lake	4	4	<1%	4	0.007
Lakeramps94	7	7	2%	7	0.003
Conklin	5	6	5%	6	0.004
Behan	4	4	1%	4	0.002
Margie	6	6	<1%	6	0.003
Devenish	5	5	<1%	8	0.004
First Nations Land - Heart Lake 167	1	1	<1%	2	0.001
First Nations Land - Heart Lake 167	0.9	0.9	1%	1	0.001
First Nations Land - Heart Lake 167	2	2	2%	3	0.002
First Nations Land - Heart Lake 167	1	1	1%	1	0.001
Winefred Lake (IR 194b)	5	5	<1%	6	0.011
Winefred Lake (IR 194b)	5	5	<1%	6	0.010
Winefred Lake (IR 194b)	5	5	<1%	6	0.011
Winefred Lake (IR 194b)	5	5	<1%	6	0.010
Winefred Lake (IR 194b)	5	5	<1%	6	0.011
Winefred Lake (IR 194b)	5	5	<1%	6	0.010
Winefred Lake 194b	5	5	<1%	6	0.011
Winefred Lake	5	5	<1%	6	0.020
KNOC Bar None Camp	8	8	<1%	9	0.005
Jackfish Central Camp	12	12	2%	12	0.005
J2 Operations Camp	20	20	<1%	20	0.006
J2 Operations Camp	20	20	<1%	20	0.006
J2 Operations Camp	20	20	<1%	20	0.006
J2 Operations Camp	20	20	<1%	20	0.006
J2 Operations Camp	20	20	<1%	20	0.006
Industrial Campsite	4	4	<1%	5	0.006
Industrial Campsite	8	8	<1%	9	0.004
Trapper's Cabin	3	4	3%	4	0.013
Industrial Campsite	15	15	<1%	15	0.007
Trapper's Cabin	4	4	<1%	5	0.023
Recreational Campsites	4	4	<1%	5	0.016
Non-Industrial Campsite	4	4	<1%	5	0.018
Hunting/Fishing Lodge or Camp	4	4	<1%	5	0.020
Trapper's Cabin	4	4	<1%	5	0.020
Commercial Campsites	4	5	4%	5	0.019
Commercial Campsites	5	5	<1%	6	0.007

Receptor	Baseline (μg/m^3)	Application (μg/m^3)	Increase from Baseline to Application (%)	Planned Development (μg/m^3)	Construction (μg/m^3)
Industrial Campsite	8	8	<1%	9	0.006
Industrial Campsite	6	6	<1%	6	0.026
Industrial Campsite	5	5	<1%	5	0.024
Commercial Campsites	8	8	<1%	8	0.006
Industrial Campsite	8	8	<1%	9	0.005
Industrial Campsite	12	12	<1%	12	0.006
Industrial Campsite	4	4	3%	4	0.002
Industrial Campsite	4	4	3%	4	0.002
Commercial Recreational Development	6	6	5%	6	0.004
Industrial Campsite	5	5	5%	5	0.004
Industrial Campsite	6	6	<1%	6	0.005
Trapper's Cabin	6	6	<1%	7	0.005
Trapper's Cabin	6	6	3%	7	0.004
Industrial Campsite	6	6	<1%	8	0.003
Industrial Campsite	5	5	<1%	8	0.003
Frank Nashim Trappers Cabin	4	4	1%	6	0.003
Trapper's Cabin	4	4	1%	6	0.003
Commercial Campsite	57	57	<1%	58	0.003
Industrial Campsite	37	37	<1%	39	0.003
Firefighter Base Camp Helipad Rapel Tower	7	7	<1%	12	0.002
Industrial Campsite	5	5	2%	8	0.002
Industrial Campsite	4	4	5%	6	0.002
Industrial Campsite	3	3	5%	5	0.002
Industrial Campsite	3	4	5%	5	0.002
Industrial Campsite	2	2	1%	2	0.002
Steep Banks and Wappau Lakes Recreation Area	3	3	2%	4	0.002
Steep Banks and Wappau Lakes Recreation Area	3	3	1%	4	0.002
Trapper's Cabin	3	3	<1%	4	0.002
Industrial Campsite	5	5	<1%	8	0.002
Industrial Campsite	3	3	3%	4	0.001
Trapper's Cabin	1	2	14%	2	0.002
Trapper's Cabin	1	1	13%	2	0.002
Residence Outdated Expiry Still Listed Active	1	1	13%	2	0.002
Residence - Unserviced	1	1	13%	2	0.002
Limited to Metis Residence	1	1	13%	2	0.002
Commercial Recreational Development	2	2	3%	3	0.002

Receptor	Baseline (µg/m³)	Application (µg/m³)	Increase from Baseline to Application (%)	Planned Development (µg/m³)	Construction (µg/m³)
Industrial Campsite	2	2	2%	4	0.002
Steep Banks and Wappau Lakes Recreation Area	2	2	2%	3	0.002
Trapper's Cabin	2	2	<1%	3	0.002
Commercial Recreational Development	5	6	2%	6	0.027
Industrial Campsite	5	5	1%	7	0.004
Industrial Campsite	7	7	<1%	10	0.003
Industrial Campsite	8	8	<1%	8	0.005
Industrial Campsite	4	4	5%	4	0.002
Commercial Campsites	7	7	3%	10	0.003
Industrial Campsite	12	12	2%	12	0.005
Industrial Campsite	21	21	<1%	21	0.007
Industrial Campsite	14	14	<1%	17	0.008
Hunting/Fishing Lodge or Camp	4	4	<1%	5	0.022
Hunting/Fishing Lodge or Camp	2	2	3%	3	0.001
Industrial Campsite	1	1	1.0%	1	0.001
Trapper's Cabin	8	8	<1%	8	0.007
Trapper's Cabin	6	6	<1%	7	0.020
Indian Reserve	1	1	1%	1	0.001
Indian Reserve	2	2	2%	3	0.002
Metis Local	5	6	5%	6	0.004
Indian Reserve	5	5	<1%	6	0.011
AAAQO	125	125	N/A	125	125
Maximum 30-Day					
Overall Maximum (MPOI)	**13**	**15**	15%	**16**	**1**
Winefred Lake IR 194b (NW)	2	2	3%	2	0.001
Conklin	2	2	4%	2	0.001
Chard	0.9	1	6%	1	0.000
Pti Christina Lake Lodge	1	1	1%	1	0.000
Heart Lake IR 167	0.2	0.3	6%	0.3	0.000
Meg Clrp Camp	3	3	1%	3	0.001
Cenovus Narrows Lake	5	5	1%	5	0.001
CNRL Kirby	2	2	1%	2	0.001
Devon Jackfish	3	3	3%	3	0.001
KNOC BlackGold	3	3	<1%	3	0.001
Petrobank Whitesands and May River	9	9	<1%	9	0.000
Statoil Kkd	1	1	3%	2	0.000
Winefred Lake Lodge 1	1	1	8%	2	0.004
Trapper's Cabin (SW of Plant)	5	5	<1%	5	0.001

Receptor	Baseline (µg/m³)	Application (µg/m³)	Increase from Baseline to Application (%)	Planned Development (µg/m³)	Construction (µg/m³)
Camp Site (NW of Plant)	3	3	<1%	4	0.001
Fish Plant (Winefred Lake)	2	2	9%	2	0.003
Cabin (Winefred Lake)	1	2	13%	2	0.004
Cabin (NW Kirby Lake)	3	3	<1%	3	0.002
West Hay Lake	3	3	<1%	3	0.002
Cabins (North Hay Lake)	3	3	<1%	3	0.002
Martin's Cabins	3	3	1%	3	0.001
Metis Trailer Camp	3	3	2%	3	0.001
Conklin	2	2	4%	2	0.001
Cabins (NW Christina Lake)	2	2	5%	2	0.001
Medicinal Plants	2	2	4%	2	0.001
Cabins Near Gravel Pit	2	2	5%	2	0.001
Cabins	1	2	5%	2	0.001
Leismer	2	2	5%	2	0.001
East Chard	0.8	0.9	6%	1.	0.000
IR 194b	2	2	3%	2	0.002
Fishing Camp (Christina Lake)	3	3	1%	3	0.001
Fire Lookout 1	1	1	13%	1	0.002
Altagas House (Renamed Meg House)	3	3	1%	3	0.001
Grave Site (Christina Lake)	3	3	1%	3	0.001
Grave Site (Winefred Lake)	2	2	4%	2	0.002
Grist Lake Lodge 1	1	1	17%	2	0.004
Grist Lake South	1	1	17%	2	0.003
Winefred Lake Lodge 1	1	1	8%	2	0.004
Winefred Lake West	2	2	5%	2	0.002
Encana Camp	3	3	1%	3	0.001
Winefred Cabin/Station/Lookout	1	1	12%	1	0.002
Campground (Christina Lake)	2	2	4%	2	0.001
Wild Rice Operation 1	1	1	8%	2	0.003
Wild Rice Operation 2	2	2	5%	2	0.001
Fire Lookout Tower	2	2	<1%	4	0.001
Devenish	1	1	2%	2	0.001
Old Cabins and Settlement Area (Wiau Lake)	1.	1	1%	1	0.000
Conklin	2	2	4%	2	0.001
Winefred Lake (IR 194b)	2	2	3%	2	0.001
Operator's Residence (Meg House)	3	3	1.0%	3	0.001
Hunter/Trapper B (Joe Black's Cabin)	1	1	3%	2	0.001
Hunter/Trapper A (Gary York's Cabin)	3	3	1%	3	0.001

Receptor	Baseline (µg/m³)	Application (µg/m³)	Increase from Baseline to Application (%)	Planned Development (µg/m³)	Construction (µg/m³)
Christina Lake Lodge	2	2	5%	2	0.001
Janvier	0.6	0.6	3%	0.7	0.000
Ipitiak Lake	1	1	2%	1	0.001
Lakeramps94	1	2	1%	2	0.001
Conklin	2	2	4%	2	0.001
Behan	0.7	0.7	2%	0.9	0.000
Margie	0.7	0.7	2%	1.	0.000
Devenish	1	1	2%	2	0.001
First Nations Land - Heart Lake 167	0.2	0.3	7%	0.4	0.000
First Nations Land - Heart Lake 167	0.2	0.2	7%	0.3	0.000
First Nations Land - Heart Lake 167	0.4	0.4	5%	0.6	0.000
First Nations Land - Heart Lake 167	0.2	0.2	4%	0.3	0.000
Winefred Lake (IR 194b)	2	2	4%	2	0.002
Winefred Lake (IR 194b)	2	2	3%	2	0.002
Winefred Lake (IR 194b)	2	2	3%	2	0.002
Winefred Lake (IR 194b)	2	2	3%	2	0.001
Winefred Lake (IR 194b)	2	2	3%	2	0.002
Winefred Lake (IR 194b)	2	2	3%	2	0.001
Winefred Lake 194b	2	2	3%	2	0.002
Winefred Lake	2	2	5%	2	0.003
KNOC Bar None Camp	2	3	2%	3	0.001
Jackfish Central Camp	3	3	3%	3	0.001
J2 Operations Camp	5	5	<1%	6	0.001
J2 Operations Camp	5	5	<1%	6	0.001
J2 Operations Camp	5	5	<1%	6	0.001
J2 Operations Camp	5	5	<1%	6	0.001
J2 Operations Camp	5	5	<1%	6	0.001
Industrial Campsite	0.9	1.	5%	1	0.001
Industrial Campsite	2	2	1%	2	0.000
Trapper's Cabin	1	1	9%	1	0.003
Industrial Campsite	3	3	<1%	3	0.001
Trapper's Cabin	1	1	17%	2	0.004
Recreational Campsites	1	1	10%	2	0.003
Non-Industrial Campsite	1	1	8%	2	0.003
Hunting/Fishing Lodge or Camp	1	1	8%	2	0.004
Trapper's Cabin	1	1	8%	2	0.004
Commercial Campsites	1	1	12%	2	0.004
Commercial Campsites	2	2	2%	2	0.001
Industrial Campsite	3	3	1%	3	0.001

Receptor	Baseline ($\mu g/m^3$)	Application ($\mu g/m^3$)	Increase from Baseline to Application (%)	Planned Development ($\mu g/m^3$)	Construction ($\mu g/m^3$)
Industrial Campsite	1	1	2%	2	0.004
Industrial Campsite	1	1	2%	1	0.003
Commercial Campsites	3	3	2%	3	0.001
Industrial Campsite	2	3	2%	3	0.001
Industrial Campsite	3	3	2%	4	0.001
Industrial Campsite	0.9	0.9	6%	1.	0.000
Industrial Campsite	1.	1	6%	1	0.000
Commercial Recreational Development	2	2	5%	2	0.001
Industrial Campsite	2	2	6%	2	0.001
Industrial Campsite	2	2	1%	2	0.001
Trapper's Cabin	2	2	1%	2	0.001
Trapper's Cabin	1	1	1%	2	0.001
Industrial Campsite	1	2	2%	2	0.001
Industrial Campsite	1	1	2%	2	0.001
Frank Nashim Trappers Cabin	0.7	0.7	2%	1	0.000
Trapper's Cabin	0.7	0.7	2%	1	0.000
Commercial Campsite	10	10	<1%	10	0.000
Industrial Campsite	6	6	<1%	7	0.000
Firefighter Base Camp Helipad Rapel Tower	2	2	3%	3	0.000
Industrial Campsite	1	1	4%	2	0.000
Industrial Campsite	1	1	4%	2	0.000
Industrial Campsite	1	1	3%	2	0.000
Industrial Campsite	1	1	4%	2	0.000
Industrial Campsite	0.4	0.4	3%	0.5	0.000
Steep Banks and Wappau Lakes Recreation Area	0.5	0.5	2%	0.9	0.000
Steep Banks and Wappau Lakes Recreation Area	0.4	0.4	3%	0.8	0.000
Trapper's Cabin	0.5	0.5	5%	0.9	0.000
Industrial Campsite	0.8	0.8	2%	1	0.000
Industrial Campsite	0.8	0.9	4%	1	0.000
Trapper's Cabin	0.3	0.3	2%	0.4	0.000
Trapper's Cabin	0.3	0.3	3%	0.4	0.000
Residence Outdated Expiry Still Listed Active	0.3	0.3	3%	0.4	0.000
Residence - Unserviced	0.3	0.3	3%	0.4	0.000
Limited to Metis Residence	0.3	0.3	3%	0.4	0.000
Commercial Recreational Development	0.4	0.4	3%	0.7	0.000
Industrial Campsite	0.4	0.4	2%	0.8	0.000

Receptor	Baseline (μg/m³)	Application (μg/m³)	Increase from Baseline to Application (%)	Planned Development (μg/m³)	Construction (μg/m³)
Steep Banks and Wappau Lakes Recreation Area	0.4	0.4	2%	0.8	0.000
Trapper's Cabin	0.3	0.3	3%	0.7	0.000
Commercial Recreational Development	2	2	10%	2	0.003
Industrial Campsite	1	1	4%	2	0.001
Industrial Campsite	2	2	1%	2	0.001
Industrial Campsite	2	2	2%	3	0.001
Industrial Campsite	1	1	4%	1	0.000
Commercial Campsites	2	2	1%	3	0.001
Industrial Campsite	3	3	3%	3	0.001
Industrial Campsite	5	5	<1%	6	0.001
Industrial Campsite	3	3	<1%	4	0.002
Hunting/Fishing Lodge or Camp	1	1	17%	2	0.004
Hunting/Fishing Lodge or Camp	0.4	0.4	3%	0.6	0.000
Industrial Campsite	0.2	0.2	5%	0.2	0.000
Trapper's Cabin	3	3	1%	3	0.001
Trapper's Cabin	2	2	7%	2	0.003
Indian Reserve	0.2	0.2	4%	0.3	0.000
Indian Reserve	0.4	0.4	6%	0.6	0.000
Metis Local	2	2	4%	2	0.001
Indian Reserve	2	2	4%	2	0.002
AAAQO	30	30	N/A	30	30
Annual Average					
Overall Maximum (MPOI)	**6**	**6**	**<1%**	**8**	**0.798**
Winefred Lake IR 194b (NW)	1	1	4%	1	0.001
Conklin	0.8	0.8	2%	1	0.000
Chard	0.4	0.5	4%	0.5	0.000
Pti Christina Lake Lodge	0.5	0.6	3%	0.7	0.000
Heart Lake IR 167	0.1	0.1	7%	0.1	0.000
Meg Clrp Camp	2	2	1%	2	0.000
Cenovus Narrows Lake	2	2	1%	2	0.000
CNRL Kirby	0.7	0.8	3%	1.	0.000
Devon Jackfish	1	1	2%	2	0.000
KNOC BlackGold	2	2	<1%	3	0.000
Petrobank Whitesands and May River	4	4	<1%	5	0.000
Statoil Kkd	0.5	0.5	2%	0.7	0.000
Winefred Lake Lodge 1	0.8	0.9	12%	1	0.001
Trapper's Cabin (SW of Plant)	3	3	<1%	3	0.001
Camp Site (NW of Plant)	2	2	<1%	3	0.000

Receptor	Baseline (µg/m³)	Application (µg/m³)	Increase from Baseline to Application (%)	Planned Development (µg/m³)	Construction (µg/m³)
Fish Plant (Winefred Lake)	1	1	8%	1	0.002
Cabin (Winefred Lake)	0.9	1	11%	1	0.002
Cabin (NW Kirby Lake)	2	2	2%	2	0.001
West Hay Lake	2	2	1%	2	0.001
Cabins (North Hay Lake)	2	2	1%	3	0.001
Martin's Cabins	2	2	<1%	2	0.000
Metis Trailer Camp	2	2	<1%	2	0.000
Conklin	0.8	0.8	2%	1	0.000
Cabins (NW Christina Lake)	0.8	0.8	1%	1	0.000
Medicinal Plants	0.9	0.9	2%	2	0.000
Cabins Near Gravel Pit	0.7	0.7	2%	1	0.000
Cabins	0.7	0.7	3%	1	0.000
Leismer	0.6	0.7	3%	0.8	0.000
East Chard	0.4	0.4	4%	0.5	0.000
IR 194b	1	1	4%	1	0.001
Fishing Camp (Christina Lake)	2	2	1%	2	0.000
Fire Lookout 1	0.7	0.7	13%	0.9	0.001
Altagas House (Renamed Meg House)	2	2	1%	2	0.000
Grave Site (Christina Lake)	2	2	1%	2	0.000
Grave Site (Winefred Lake)	1	1	4%	1	0.001
Grist Lake Lodge 1	0.6	0.8	23%	0.9	0.002
Grist Lake South	0.6	0.8	21%	0.9	0.002
Winefred Lake Lodge 1	0.8	0.9	12%	1	0.001
Winefred Lake West	1	1	5%	2	0.001
Encana Camp	2	2	1%	2	0.000
Winefred Cabin/Station/Lookout	0.7	0.7	12%	0.9	0.001
Campground (Christina Lake)	0.8	0.8	2%	1	0.000
Wild Rice Operation 1	0.8	0.9	13%	1	0.001
Wild Rice Operation 2	0.9	1.	1%	1	0.000
Fire Lookout Tower	1	1	1%	3	0.000
Devenish	0.7	0.8	2%	1	0.000
Old Cabins and Settlement Area (Wiau Lake)	0.4	0.4	4%	0.6	0.000
Conklin	0.8	0.8	2%	1	0.000
Winefred Lake (IR 194b)	1	1	4%	1	0.001
Operator's Residence (Meg House)	2	2	1%	2	0.000
Hunter/Trapper B (Joe Black's Cabin)	0.8	0.8	3%	1.	0.000
Hunter/Trapper A (Gary York's Cabin)	2	2	1%	2	0.000
Christina Lake Lodge	0.9	0.9	2%	1	0.000

Receptor	Baseline ($\mu g/m^3$)	Application ($\mu g/m^3$)	Increase from Baseline to Application (%)	Planned Development ($\mu g/m^3$)	Construction ($\mu g/m^3$)
Janvier	0.3	0.3	4%	0.4	0.000
Ipitiak Lake	0.5	0.5	6%	0.7	0.000
Lakeramps94	0.8	0.8	3%	1.	0.000
Conklin	0.8	0.8	2%	1	0.000
Behan	0.3	0.3	6%	0.3	0.000
Margie	0.4	0.4	3%	0.6	0.000
Devenish	0.7	0.8	2%	1	0.000
First Nations Land - Heart Lake 167	0.1	0.1	7%	0.1	0.000
First Nations Land - Heart Lake 167	0.1	0.1	7%	0.1	0.000
First Nations Land - Heart Lake 167	0.1	0.2	7%	0.2	0.000
First Nations Land - Heart Lake 167	0.1	0.1	6%	0.1	0.000
Winefred Lake (IR 194b)	1	1	4%	1	0.001
Winefred Lake (IR 194b)	1.	1	4%	1	0.001
Winefred Lake (IR 194b)	1.	1	4%	1	0.001
Winefred Lake (IR 194b)	1	1	4%	1	0.001
Winefred Lake (IR 194b)	1	1	4%	1	0.001
Winefred Lake (IR 194b)	1	1	4%	1	0.001
Winefred Lake 194b	1	1	4%	1	0.001
Winefred Lake	1	1	7%	1	0.001
KNOC Bar None Camp	2	2	<1%	2	0.000
Jackfish Central Camp	1	1	2%	2	0.000
J2 Operations Camp	3	3	1%	3	0.000
J2 Operations Camp	3	3	1%	3	0.000
J2 Operations Camp	3	3	1%	3	0.000
J2 Operations Camp	3	3	1%	3	0.000
J2 Operations Camp	3	3	1%	3	0.000
Industrial Campsite	0.6	0.6	6%	0.7	0.000
Industrial Campsite	0.6	0.6	2%	0.8	0.000
Trapper's Cabin	0.7	0.8	10%	1.	0.001
Industrial Campsite	1	1	2%	2	0.000
Trapper's Cabin	0.6	0.8	23%	0.9	0.002
Recreational Campsites	0.7	0.8	18%	1.	0.002
Non-Industrial Campsite	0.8	0.9	12%	1	0.001
Hunting/Fishing Lodge or Camp	0.8	0.9	13%	1	0.001
Trapper's Cabin	0.8	0.9	13%	1	0.001
Commercial Campsites	0.9	1.	12%	1	0.001
Commercial Campsites	1	1	3%	1	0.000
Industrial Campsite	2	2	1%	2	0.000
Industrial Campsite	0.8	0.8	7%	1.	0.002

Receptor	Baseline ($\mu g/m^3$)	Application ($\mu g/m^3$)	Increase from Baseline to Application (%)	Planned Development ($\mu g/m^3$)	Construction ($\mu g/m^3$)
Industrial Campsite	0.7	0.8	8%	1.	0.001
Commercial Campsites	2	2	<1%	2	0.000
Industrial Campsite	2	2	<1%	2	0.000
Industrial Campsite	2	2	<1%	2	0.000
Industrial Campsite	0.4	0.4	4%	0.5	0.000
Industrial Campsite	0.5	0.5	4%	0.6	0.000
Commercial Recreational Development	0.8	0.9	2%	1	0.000
Industrial Campsite	0.7	0.7	3%	0.9	0.000
Industrial Campsite	0.7	0.8	3%	1.	0.000
Trapper's Cabin	1.	1.	2%	1	0.000
Trapper's Cabin	0.9	0.9	2%	2	0.000
Industrial Campsite	1	1	1%	2	0.000
Industrial Campsite	1	1	1%	2	0.000
Frank Nashim Trappers Cabin	0.4	0.4	4%	0.6	0.000
Trapper's Cabin	0.4	0.4	4%	0.6	0.000
Commercial Campsite	5	5	<1%	6	0.000
Industrial Campsite	3	3	<1%	4	0.000
Firefighter Base Camp Helipad Rapel Tower	0.7	0.8	2%	1	0.000
Industrial Campsite	0.5	0.6	2%	0.8	0.000
Industrial Campsite	0.5	0.5	3%	0.7	0.000
Industrial Campsite	0.5	0.5	2%	0.7	0.000
Industrial Campsite	0.5	0.5	3%	0.6	0.000
Industrial Campsite	0.1	0.2	5%	0.2	0.000
Steep Banks and Wappau Lakes Recreation Area	0.3	0.3	4%	0.4	0.000
Steep Banks and Wappau Lakes Recreation Area	0.3	0.3	3%	0.4	0.000
Trapper's Cabin	0.3	0.3	3%	0.4	0.000
Industrial Campsite	0.5	0.5	2%	0.7	0.000
Industrial Campsite	0.3	0.3	3%	0.5	0.000
Trapper's Cabin	0.1	0.1	5%	0.2	0.000
Trapper's Cabin	0.1	0.1	5%	0.1	0.000
Residence Outdated Expiry Still Listed Active	0.1	0.1	5%	0.1	0.000
Residence - Unserviced	0.1	0.1	5%	0.1	0.000
Limited to Metis Residence	0.1	0.1	5%	0.1	0.000
Commercial Recreational Development	0.2	0.2	4%	0.3	0.000
Industrial Campsite	0.2	0.2	4%	0.3	0.000

Receptor	Baseline (μg/m³)	Application (μg/m³)	Increase from Baseline to Application (%)	Planned Development (μg/m³)	Construction (μg/m³)
Steep Banks and Wappau Lakes Recreation Area	0.2	0.2	4%	0.3	0.000
Trapper's Cabin	0.2	0.2	3%	0.3	0.000
Commercial Recreational Development	1	1	8%	1	0.002
Industrial Campsite	0.9	0.9	1%	2	0.000
Industrial Campsite	1	1	<1%	2	0.000
Industrial Campsite	2	2	1%	2	0.000
Industrial Campsite	0.4	0.4	3%	0.6	0.000
Commercial Campsites	1	1	1%	2	0.000
Industrial Campsite	1	1	2%	2	0.000
Industrial Campsite	3	3	<1%	4	0.000
Industrial Campsite	2	2	1%	3	0.001
Hunting/Fishing Lodge or Camp	0.6	0.8	23%	0.9	0.002
Hunting/Fishing Lodge or Camp	0.2	0.2	3%	0.3	0.000
Industrial Campsite	0.1	0.1	7%	0.1	0.000
Trapper's Cabin	2	2	1%	2	0.000
Trapper's Cabin	1	1	6%	2	0.001
Indian Reserve	0.1	0.1	6%	0.1	0.000
Indian Reserve	0.1	0.2	7%	0.2	0.000
Metis Local	0.8	0.8	2%	1	0.000
Indian Reserve	1	1	4%	1	0.001
AAAQO	20	20	N/A	20	20

devon

Table B5-2: Predicted Nitrogen Dioxide Concentrations in the Air Quality Regional Study Area

Receptor	Baseline ($\mu g/m^3$)	Application ($\mu g/m^3$)	Increase from Baseline to Application (%)	Planned Development ($\mu g/m^3$)	Construction ($\mu g/m^3$)
Maximum 1-hour					
Overall Maximum (MPOI)	**501**	**501**	**<1%**	**501**	**252**
Winefred Lake IR 194B (NW)	74	74	<1%	74	7
Conklin	85	85	<1%	85	5
Chard	66	67	<1%	67	2
PTI Christina Lake Lodge	63	63	<1%	63	4
Heart Lake IR 167	21	21	<1%	21	1
MEG CLRP Camp	90	90	<1%	90	8
Cenovus Narrows Lake	92	92	<1%	92	6
CNRL Kirby	71	71	<1%	71	5
Devon Jackfish	79	79	<1%	79	7
KNOC BlackGold	83	83	<1%	83	6
Petrobank Whitesands and May River	97	97	<1%	97	3
Statoil KKD	79	79	<1%	79	2
Winefred Lake Lodge 1	67	67	<1%	67	12
Trapper's Cabin (SW of Plant)	88	88	<1%	88	6
Camp Site (NW of Plant)	91	91	<1%	91	6
Fish Plant (Winefred Lake)	87	87	<1%	87	15
Cabin (Winefred Lake)	79	79	<1%	79	13
Cabin (NW Kirby Lake)	92	92	<1%	92	12
West Hay Lake	88	88	<1%	88	9
Cabins (North Hay Lake)	82	82	<1%	82	9
Martin's Cabins	90	90	<1%	90	6
Metis Trailer Camp	92	92	<1%	92	6
Conklin	84	84	<1%	84	5
Cabins (NW Christina Lake)	76	76	<1%	76	5
Medicinal Plants	74	74	<1%	74	6
Cabins near Gravel Pit	88	88	<1%	88	4
Cabins	72	72	<1%	72	4
Leismer	74	75	<1%	75	2
East Chard	66	66	<1%	66	2
IR 194B	72	72	<1%	72	7
Fishing Camp (Christina Lake)	82	82	<1%	82	8
Fire Lookout 1	76	76	<1%	76	7
AltaGas House (renamed MEG House)	83	83	<1%	83	8
Grave Site (Christina Lake)	82	82	<1%	82	7

Receptor	Baseline ($\mu g/m^3$)	Application ($\mu g/m^3$)	Increase from Baseline to Application (%)	Planned Development ($\mu g/m^3$)	Construction ($\mu g/m^3$)
Grave Site (Winefred Lake)	74	74	<1%	74	8
Grist Lake Lodge 1	75	75	<1%	75	14
Grist Lake South	65	65	<1%	65	13
Winefred Lake Lodge 1	67	67	<1%	67	12
Winefred Lake West	71	71	<1%	71	10
EnCana Camp	89	89	<1%	89	7
Winefred Cabin/Station/Lookout	77	77	<1%	77	7
Campground (Christina Lake)	79	79	<1%	79	5
Wild Rice Operation 1	61	61	<1%	61	11
Wild Rice Operation 2	83	83	<1%	83	4
Fire Lookout Tower	80	80	<1%	81	4
Devenish	59	59	<1%	60	5
Old Cabins and Settlement Area (Wiau Lake)	61	61	<1%	61	3
Conklin	85	85	<1%	85	5
Winefred Lake (IR 194B)	74	74	<1%	74	7
Operator's Residence (MEG House)	95	95	<1%	95	7
Hunter/Trapper B (Joe Black's cabin)	71	71	<1%	71	4
Hunter/Trapper A (Gary York's cabin)	83	83	<1%	83	8
Christina Lake Lodge	73	73	<1%	73	5
Janvier	61	61	<1%	61	2
Ipitiak Lake	58	59	<1%	59	8
LakeRAMPs94	70	70	<1%	70	4
Conklin	82	82	<1%	82	5
Behan	51	52	<1%	52	3
Margie	53	53	<1%	54	3
Devenish	59	59	<1%	60	5
First Nations land - Heart Lake 167	29	29	<1%	29	0.967
First Nations land - Heart Lake 167	18	18	<1%	18	0.828
First Nations land - Heart Lake 167	30	30	<1%	31	2
First Nations land - Heart Lake 167	22	22	<1%	22	1
Winefred Lake (IR 194B)	74	74	<1%	74	7
Winefred Lake (IR 194B)	67	67	<1%	67	6
Winefred Lake (IR 194B)	65	65	<1%	65	6
Winefred Lake (IR 194B)	78	78	<1%	78	7
Winefred Lake (IR 194B)	71	71	<1%	71	7
Winefred Lake (IR 194B)	74	74	<1%	74	7
Winefred Lake 194B	72	72	<1%	72	7
Winefred Lake	67	67	<1%	67	10

Receptor	Baseline (µg/m³)	Application (µg/m³)	Increase from Baseline to Application (%)	Planned Development (µg/m³)	Construction (µg/m³)
KNOC Bar None Camp	91	91	<1%	91	6
Jackfish Central Camp	79	79	<1%	79	7
J2 Operations Camp	87	87	<1%	87	8
J2 Operations Camp	87	87	<1%	87	8
J2 Operations Camp	87	87	<1%	87	8
J2 Operations Camp	87	87	<1%	87	8
J2 Operations Camp	87	87	<1%	87	8
Industrial Campsite	93	93	<1%	94	4
Industrial Campsite	55	56	1.0%	56	4
Trapper's Cabin	57	57	1%	57	8
Industrial Campsite	103	103	<1%	106	5
Trapper's Cabin	75	75	<1%	75	15
Recreational Campsites	64	64	<1%	64	11
Non-industrial campsite	59	59	<1%	59	11
Hunting/Fishing Lodge or Camp	67	67	<1%	67	12
Trapper's Cabin	67	67	<1%	67	12
Commercial Campsites	71	71	<1%	71	13
Commercial Campsites	76	76	<1%	76	6
Industrial Campsite	83	83	<1%	83	7
Industrial Campsite	97	97	<1%	97	29
Industrial Campsite	89	89	<1%	89	21
Commercial Campsites	93	93	<1%	93	6
Industrial Campsite	91	91	<1%	91	6
Industrial Campsite	119	119	<1%	119	6
Industrial Campsite	66	66	<1%	66	2
Industrial Campsite	68	68	<1%	68	2
Commercial Recreational Development	71	71	<1%	71	5
Industrial Campsite	72	73	<1%	73	3
Industrial Campsite	71	71	<1%	71	5
Trapper's Cabin	64	64	<1%	64	6
Trapper's Cabin	63	63	<1%	63	5
Industrial Campsite	78	78	<1%	78	4
Industrial Campsite	79	79	<1%	79	4
Frank Nashim Trappers Cabin	57	58	<1%	58	4
Trapper's Cabin	57	57	<1%	58	4
Commercial Campsite	97	97	<1%	97	3
Industrial Campsite	98	98	<1%	98	3
Firefighter Base Camp Helipad Rapel Tower	112	112	<1%	112	3

Receptor	Baseline (μg/m³)	Application (μg/m³)	Increase from Baseline to Application (%)	Planned Development (μg/m³)	Construction (μg/m³)
Industrial Campsite	92	92	<1%	92	3
Industrial Campsite	80	80	<1%	80	3
Industrial Campsite	79	79	<1%	79	2
Industrial Campsite	70	70	<1%	70	2
Industrial Campsite	32	32	<1%	33	2
Steep Banks and Wappau Lakes Recreation Area	43	43	<1%	43	2
Steep Banks and Wappau Lakes Recreation Area	42	42	<1%	42	2
Trapper's Cabin	46	46	<1%	46	3
Industrial Campsite	74	74	<1%	74	2
Industrial Campsite	62	62	<1%	62	2
Trapper's Cabin	19	20	<1%	20	2
Trapper's Cabin	19	19	<1%	19	2
Residence Outdated Expiry Still Listed Active	19	19	<1%	19	2
Residence - Unserviced	19	19	<1%	19	2
Limited to Metis Residence	19	19	<1%	19	2
Commercial Recreational Development	31	31	<1%	32	2
Industrial Campsite	32	32	<1%	32	2
Steep Banks and Wappau Lakes Recreation Area	30	30	<1%	30	2
Trapper's Cabin	31	31	<1%	31	2
Commercial Recreational Development	85	85	<1%	85	15
Industrial Campsite	87	87	<1%	87	4
Industrial Campsite	79	79	<1%	79	4
Industrial Campsite	88	88	<1%	88	6
Industrial Campsite	64	64	<1%	64	2
Commercial Campsites	79	79	<1%	79	4
Industrial Campsite	78	78	<1%	78	7
Industrial Campsite	84	84	<1%	84	6
Industrial Campsite	90	90	<1%	90	10
Hunting/Fishing Lodge or Camp	75	75	<1%	75	15
Hunting/Fishing Lodge or Camp	35	35	<1%	35	2
Industrial Campsite	19	19	<1%	19	0.621
Trapper's Cabin	83	83	<1%	83	8
Trapper's Cabin	84	84	<1%	84	14
Indian Reserve	21	21	<1%	22	1
Indian Reserve	30	30	<1%	31	2
Metis Local	82	82	<1%	82	5

Receptor	Baseline (µg/m³)	Application (µg/m³)	Increase from Baseline to Application (%)	Planned Development (µg/m³)	Construction (µg/m³)
Indian Reserve	74	74	<1%	74	7
9th Highest 1-Hour					
Overall Maximum (MPOI)	**175**	**175**	**<1%**	**175**	**185**
Winefred Lake IR 194B (NW)	63	63	<1%	63	5
Conklin	68	68	<1%	68	2
Chard	45	45	<1%	46	1
PTI Christina Lake Lodge	35	36	1%	36	2
Heart Lake IR 167	11	11	<1%	11	0.449
MEG CLRP Camp	73	73	<1%	73	4
Cenovus Narrows Lake	73	73	<1%	73	3
CNRL Kirby	45	45	<1%	45	3
Devon Jackfish	57	58	<1%	58	3
KNOC BlackGold	63	63	<1%	63	4
Petrobank Whitesands and May River	77	77	<1%	77	2
Statoil KKD	52	52	<1%	53	0.953
Winefred Lake Lodge 1	53	53	<1%	53	9
Trapper's Cabin (SW of Plant)	74	74	<1%	74	4
Camp Site (NW of Plant)	69	69	<1%	69	4
Fish Plant (Winefred Lake)	70	70	<1%	70	11
Cabin (Winefred Lake)	58	58	<1%	58	10
Cabin (NW Kirby Lake)	79	79	<1%	79	9
West Hay Lake	67	67	<1%	67	7
Cabins (North Hay Lake)	64	64	<1%	64	6
Martin's Cabins	67	67	<1%	67	4
Metis Trailer Camp	69	69	<1%	69	3
Conklin	67	67	<1%	68	2
Cabins (NW Christina Lake)	59	59	<1%	59	2
Medicinal Plants	53	53	<1%	54	2
Cabins near Gravel Pit	66	66	<1%	66	2
Cabins	49	49	<1%	49	2
Leismer	49	49	<1%	49	2
East Chard	42	42	<1%	42	1
IR 194B	57	57	<1%	57	5
Fishing Camp (Christina Lake)	65	65	<1%	65	4
Fire Lookout 1	54	54	<1%	54	5
AltaGas House (renamed MEG House)	66	66	<1%	66	4
Grave Site (Christina Lake)	66	66	<1%	66	4
Grave Site (Winefred Lake)	58	58	<1%	58	5
Grist Lake Lodge 1	53	53	<1%	53	11

Receptor	Baseline (µg/m³)	Application (µg/m³)	Increase from Baseline to Application (%)	Planned Development (µg/m³)	Construction (µg/m³)
Grist Lake South	51	51	<1%	51	10
Winefred Lake Lodge 1	53	53	<1%	53	9
Winefred Lake West	54	54	<1%	54	7
EnCana Camp	70	70	<1%	70	4
Winefred Cabin/Station/Lookout	53	53	<1%	53	5
Campground (Christina Lake)	65	65	<1%	65	2
Wild Rice Operation 1	50	50	<1%	50	8
Wild Rice Operation 2	59	59	<1%	59	2
Fire Lookout Tower	65	65	<1%	65	2
Devenish	43	43	<1%	44	2
Old Cabins and Settlement Area (Wiau Lake)	30	30	<1%	30	2
Conklin	68	68	<1%	68	2
Winefred Lake (IR 194B)	62	62	<1%	62	5
Operator's Residence (MEG House)	79	79	<1%	79	4
Hunter/Trapper B (Joe Black's cabin)	55	55	<1%	55	2
Hunter/Trapper A (Gary York's cabin)	66	66	<1%	66	4
Christina Lake Lodge	53	53	<1%	53	2
Janvier	42	43	<1%	43	1
Ipitiak Lake	46	46	<1%	46	4
LakeRAMPs94	55	55	<1%	55	2
Conklin	68	68	<1%	68	2
Behan	22	22	<1%	22	1
Margie	33	33	<1%	33	2
Devenish	43	44	<1%	44	2
First Nations Land - Heart Lake 167	17	17	<1%	17	0.436
First Nations Land - Heart Lake 167	10	10	<1%	10	0.353
First Nations Land - Heart Lake 167	15	15	<1%	15	0.759
First Nations Land - Heart Lake 167	11	12	<1%	12	0.497
Winefred Lake (IR 194B)	57	57	<1%	57	5
Winefred Lake (IR 194B)	51	51	<1%	51	4
Winefred Lake (IR 194B)	50	50	<1%	50	5
Winefred Lake (IR 194B)	68	68	<1%	68	5
Winefred Lake (IR 194B)	54	54	<1%	54	5
Winefred Lake (IR 194B)	61	61	<1%	61	5
Winefred Lake 194B	56	56	<1%	56	5
Winefred Lake	51	51	<1%	51	8
KNOC Bar None Camp	67	67	<1%	67	3
Jackfish Central Camp	57	58	<1%	58	3

Receptor	Baseline ($\mu g/m^3$)	Application ($\mu g/m^3$)	Increase from Baseline to Application (%)	Planned Development ($\mu g/m^3$)	Construction ($\mu g/m^3$)
J2 Operations Camp	67	67	<1%	67	4
J2 Operations Camp	67	67	<1%	67	4
J2 Operations Camp	67	67	<1%	67	4
J2 Operations Camp	67	67	<1%	67	4
J2 Operations Camp	67	68	<1%	68	4
Industrial Campsite	72	72	<1%	73	3
Industrial Campsite	37	37	<1%	37	2
Trapper's Cabin	43	43	<1%	43	6
Industrial Campsite	84	84	<1%	86	3
Trapper's Cabin	52	52	<1%	52	11
Recreational Campsites	48	48	<1%	48	8
Non-Industrial Campsite	50	50	<1%	50	8
Hunting/Fishing Lodge or Camp	53	53	<1%	53	9
Trapper's Cabin	53	53	<1%	53	9
Commercial Campsites	54	54	<1%	54	9
Commercial Campsites	61	61	<1%	61	4
Industrial Campsite	66	66	<1%	66	4
Industrial Campsite	77	77	<1%	77	20
Industrial Campsite	71	71	<1%	71	15
Commercial Campsites	70	70	<1%	70	3
Industrial Campsite	68	68	<1%	68	3
Industrial Campsite	90	90	<1%	90	3
Industrial Campsite	44	44	<1%	44	1
Industrial Campsite	48	48	<1%	48	1
Commercial Recreational Development	54	54	<1%	54	2
Industrial Campsite	50	50	<1%	50	2
Industrial Campsite	45	45	<1%	45	3
Trapper's Cabin	46	46	<1%	46	3
Trapper's Cabin	46	46	<1%	46	3
Industrial Campsite	58	58	<1%	58	2
Industrial Campsite	57	57	<1%	57	2
Frank Nashim Trappers Cabin	35	35	<1%	35	2
Trapper's Cabin	34	34	<1%	34	2
Commercial Campsite	76	76	<1%	76	2
Industrial Campsite	81	81	<1%	81	2
Firefighter Base Camp Helipad Rapel Tower	92	92	<1%	92	1
Industrial Campsite	71	71	<1%	71	1
Industrial Campsite	54	54	<1%	54	1

Receptor	Baseline (µg/m³)	Application (µg/m³)	Increase from Baseline to Application (%)	Planned Development (µg/m³)	Construction (µg/m³)
Industrial Campsite	52	52	<1%	53	0.952
Industrial Campsite	49	49	<1%	49	0.877
Industrial Campsite	17	17	<1%	17	0.740
Steep Banks and Wappau Lakes Recreation Area	28	28	<1%	28	1
Steep Banks and Wappau Lakes Recreation Area	25	25	<1%	25	0.945
Trapper's Cabin	29	29	<1%	29	1
Industrial Campsite	49	49	<1%	49	1
Industrial Campsite	41	41	<1%	41	0.845
Trapper's Cabin	12	12	<1%	13	0.640
Trapper's Cabin	11	11	<1%	12	0.635
Residence Outdated Expiry Still Listed Active	11	11	<1%	12	0.634
Residence - Unserviced	11	11	<1%	12	0.635
Limited to Metis Residence	11	11	<1%	12	0.634
Commercial Recreational Development	19	19	<1%	19	0.731
Industrial Campsite	21	21	<1%	21	0.790
Steep Banks and Wappau Lakes Recreation Area	19	19	<1%	19	0.778
Trapper's Cabin	18	18	<1%	18	0.741
Commercial Recreational Development	70	70	<1%	70	11
Industrial Campsite	64	64	<1%	64	2
Industrial Campsite	57	57	<1%	57	2
Industrial Campsite	64	64	<1%	64	3
Industrial Campsite	43	43	<1%	43	0.853
Commercial Campsites	60	60	<1%	60	2
Industrial Campsite	57	57	<1%	57	3
Industrial Campsite	70	70	<1%	70	3
Industrial Campsite	71	71	<1%	71	6
Hunting/Fishing Lodge or Camp	53	53	<1%	53	11
Hunting/Fishing Lodge or Camp	20	20	<1%	20	0.694
Industrial Campsite	10	10	<1%	10	0.387
Trapper's Cabin	65	65	<1%	66	4
Trapper's Cabin	68	68	<1%	68	10
Indian Reserve	11	11	<1%	11	0.505
Indian Reserve	15	15	<1%	15	0.824
Metis Local	68	68	<1%	68	2
Indian Reserve	57	57	<1%	57	5
AAAQO	300	300	n/a	300	300

Receptor	Baseline (µg/m³)	Application (µg/m³)	Increase from Baseline to Application (%)	Planned Development (µg/m³)	Construction (µg/m³)
Annual Average					
Overall Maximum (MPOI)	**27**	**27**	**1%**	**27**	**59**
Winefred Lake IR 194B (NW)	6	6	<1%	6	0.108
Conklin	4	4	<1%	4	0.034
Chard	2	2	<1%	2	0.020
PTI Christina Lake Lodge	2	2	<1%	2	0.032
Heart Lake IR 167	0.4	0.4	<1%	0.5	0.007
MEG CLRP Camp	6	6	<1%	6	0.070
Cenovus Narrows Lake	6	6	<1%	6	0.049
CNRL Kirby	2	2	<1%	3	0.042
Devon Jackfish	4	4	<1%	4	0.053
KNOC BlackGold	5	5	<1%	5	0.069
Petrobank Whitesands and May River	3	3	<1%	4	0.022
Statoil KKD	2	2	<1%	2	0.012
Winefred Lake Lodge 1	4	4	<1%	4	0.250
Trapper's Cabin (SW of Plant)	6	6	<1%	6	0.086
Camp Site (NW of Plant)	5	5	<1%	5	0.074
Fish Plant (Winefred Lake)	5	5	<1%	5	0.287
Cabin (Winefred Lake)	4	4	<1%	5	0.278
Cabin (NW Kirby Lake)	5	6	<1%	6	0.179
West Hay Lake	5	5	<1%	5	0.130
Cabins (North Hay Lake)	5	5	<1%	5	0.124
Martin's Cabins	5	5	<1%	5	0.065
Metis Trailer Camp	5	5	<1%	5	0.064
Conklin	4	4	<1%	4	0.034
Cabins (NW Christina Lake)	4	4	<1%	4	0.040
Medicinal Plants	3	3	<1%	4	0.043
Cabins near Gravel Pit	4	4	<1%	4	0.031
Cabins	3	3	<1%	3	0.028
Leismer	3	3	<1%	3	0.029
East Chard	2	2	<1%	2	0.021
IR 194B	5	5	<1%	5	0.118
Fishing Camp (Christina Lake)	6	6	<1%	6	0.067
Fire Lookout 1	3	3	1%	3	0.134
AltaGas House (renamed MEG House)	6	6	<1%	6	0.067
Grave Site (Christina Lake)	6	6	<1%	6	0.064
Grave Site (Winefred Lake)	5	5	<1%	5	0.121
Grist Lake Lodge 1	4	4	1%	4	0.304
Grist Lake South	4	4	1%	4	0.270

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Receptor	Baseline (µg/m³)	Application (µg/m³)	Increase from Baseline to Application (%)	Planned Development (µg/m³)	Construction (µg/m³)
Winefred Lake Lodge 1	4	4	<1%	4	0.250
Winefred Lake West	5	5	<1%	5	0.172
EnCana Camp	7	7	<1%	7	0.077
Winefred Cabin/Station/Lookout	3	3	1%	3	0.120
Campground (Christina Lake)	4	4	<1%	4	0.037
Wild Rice Operation 1	4	4	<1%	4	0.230
Wild Rice Operation 2	5	5	<1%	5	0.046
Fire Lookout Tower	3	3	<1%	3	0.030
Devenish	2	2	<1%	2	0.035
Old Cabins and Settlement Area (Wiau Lake)	2	2	<1%	2	0.028
Conklin	4	4	<1%	4	0.034
Winefred Lake (IR 194B)	6	6	<1%	6	0.108
Operator's Residence (MEG House)	7	7	<1%	7	0.066
Hunter/Trapper B (Joe Black's cabin)	4	4	<1%	4	0.037
Hunter/Trapper A (Gary York's cabin)	6	6	<1%	6	0.067
Christina Lake Lodge	4	4	<1%	4	0.044
Janvier	2	2	<1%	2	0.017
Ipitiak Lake	2	2	<1%	2	0.069
LakeRAMPs94	4	4	<1%	4	0.038
Conklin	5	5	<1%	5	0.035
Behan	1	1	<1%	1	0.019
Margie	2	2	<1%	2	0.022
Devenish	2	2	<1%	2	0.035
First Nations Land - Heart Lake 167	0.5	0.5	<1%	0.5	0.007
First Nations Land - Heart Lake 167	0.3	0.3	<1%	0.4	0.006
First Nations Land - Heart Lake 167	0.7	0.7	<1%	0.7	0.013
First Nations Land - Heart Lake 167	0.5	0.5	<1%	0.5	0.007
Winefred Lake (IR 194B)	5	5	<1%	5	0.122
Winefred Lake (IR 194B)	5	5	<1%	5	0.105
Winefred Lake (IR 194B)	5	5	<1%	5	0.114
Winefred Lake (IR 194B)	6	6	<1%	6	0.110
Winefred Lake (IR 194B)	5	5	<1%	5	0.121
Winefred Lake (IR 194B)	5	5	<1%	6	0.105
WINEFRED LAKE 194B	5	5	<1%	5	0.117
Winefred Lake	4	4	<1%	4	0.207
KNOC Bar None Camp	5	5	<1%	5	0.063
Jackfish Central Camp	4	4	<1%	4	0.053
J2 Operations Camp	5	5	<1%	5	0.063

Receptor	Baseline ($\mu g/m^3$)	Application ($\mu g/m^3$)	Increase from Baseline to Application (%)	Planned Development ($\mu g/m^3$)	Construction ($\mu g/m^3$)
J2 Operations Camp	5	5	<1%	5	0.063
J2 Operations Camp	5	5	<1%	5	0.063
J2 Operations Camp	5	5	<1%	5	0.063
J2 Operations Camp	5	5	<1%	5	0.063
Industrial Campsite	6	6	<1%	6	0.047
Industrial Campsite	2	2	<1%	2	0.026
Trapper's Cabin	4	4	<1%	4	0.167
Industrial Campsite	11	11	<1%	12	0.059
Trapper's Cabin	4	4	2%	4	0.307
Recreational Campsites	4	4	1%	4	0.263
Non-Industrial Campsite	4	4	<1%	4	0.221
Hunting/Fishing Lodge or Camp	4	4	<1%	4	0.252
Trapper's Cabin	4	4	<1%	4	0.253
Commercial Campsites	4	4	<1%	4	0.254
Commercial Campsites	5	5	<1%	5	0.079
Industrial Campsite	6	6	<1%	6	0.064
Industrial Campsite	5	5	<1%	5	0.252
Industrial Campsite	3	3	<1%	3	0.218
Commercial Campsites	5	5	<1%	5	0.065
Industrial Campsite	5	5	<1%	5	0.063
Industrial Campsite	7	7	<1%	7	0.064
Industrial Campsite	2	2	<1%	2	0.020
Industrial Campsite	2	2	<1%	2	0.022
Commercial Recreational Development	4	4	<1%	4	0.041
Industrial Campsite	3	3	<1%	3	0.031
Industrial Campsite	2	2	<1%	3	0.042
Trapper's Cabin	3	3	<1%	3	0.037
Trapper's Cabin	3	3	<1%	3	0.041
Industrial Campsite	3	3	<1%	3	0.028
Industrial Campsite	3	3	<1%	3	0.027
Frank Nashim Trappers Cabin	2	2	<1%	2	0.023
Trapper's Cabin	2	2	<1%	2	0.023
Commercial Campsite	3	3	<1%	4	0.022
Industrial Campsite	3	3	<1%	3	0.021
Firefighter Base Camp Helipad Rapel Tower	4	4	<1%	4	0.020
Industrial Campsite	3	3	<1%	3	0.018
Industrial Campsite	2	2	<1%	2	0.016
Industrial Campsite	2	2	<1%	2	0.012

Receptor	Baseline ($\mu g/m^3$)	Application ($\mu g/m^3$)	Increase from Baseline to Application (%)	Planned Development ($\mu g/m^3$)	Construction ($\mu g/m^3$)
Industrial Campsite	2	2	<1%	2	0.012
Industrial Campsite	0.8	0.8	<1%	0.9	0.011
Steep Banks and Wappau Lakes Recreation Area	1	1	<1%	1	0.012
Steep Banks and Wappau Lakes Recreation Area	1	1	<1%	1	0.012
Trapper's Cabin	1	1	<1%	1	0.013
Industrial Campsite	2	2	<1%	2	0.018
Industrial Campsite	1	1	<1%	2	0.008
Trapper's Cabin	0.5	0.5	<1%	0.5	0.009
Trapper's Cabin	0.5	0.5	<1%	0.5	0.009
Residence Outdated Expiry Still Listed Active	0.5	0.5	<1%	0.5	0.009
Residence - Unserviced	0.5	0.5	<1%	0.5	0.009
Limited to Metis Residence	0.5	0.5	<1%	0.5	0.009
Commercial Recreational Development	0.8	0.8	<1%	0.8	0.009
Industrial Campsite	0.8	0.8	<1%	0.9	0.010
Steep Banks and Wappau Lakes Recreation Area	0.8	0.8	<1%	0.8	0.010
Trapper's Cabin	0.7	0.7	<1%	0.8	0.010
Commercial Recreational Development	5	5	<1%	5	0.297
Industrial Campsite	3	3	<1%	4	0.030
Industrial Campsite	3	3	<1%	3	0.025
Industrial Campsite	5	5	<1%	5	0.054
Industrial Campsite	2	2	<1%	2	0.011
Commercial Campsites	3	3	<1%	3	0.030
Industrial Campsite	3	4	<1%	4	0.053
Industrial Campsite	7	7	<1%	7	0.054
Industrial Campsite	5	5	<1%	5	0.111
Hunting/Fishing Lodge or Camp	4	4	1%	4	0.303
Hunting/Fishing Lodge or Camp	0.8	0.8	<1%	0.8	0.009
Industrial Campsite	0.3	0.3	<1%	0.3	0.005
Trapper's Cabin	6	6	<1%	6	0.067
Trapper's Cabin	5	5	<1%	5	0.233
Indian Reserve	0.5	0.5	<1%	0.5	0.007
Indian Reserve	0.7	0.7	<1%	0.7	0.014
Metis Local	5	5	<1%	5	0.035
Indian Reserve	5	5	<1%	5	0.122
AAAQO	45	45	n/a	45	45

Table B5-3: Predicted Carbon Monoxide Concentrations in the Air Quality Regional Study Area

Receptor	Baseline (µg/m³)	Application (µg/m³)	Increase from Baseline to Application (%)	Planned Development (µg/m³)	Construction (µg/m³)
Maximum 1-hour					
Overall Maximum (MPOI)	**2,627**	**2,630**	**<1%**	**2,630**	**1,068**
Winefred Lake IR 194B (NW)	160	160	<1%	161	3
Conklin	202	211	4%	217	2
Chard	215	223	3%	224	0.756
PTI Christina Lake Lodge	144	145	<1%	145	2
Heart Lake IR 167	45	46	3%	47	0.477
MEG CLRP Camp	366	366	<1%	366	3
Cenovus Narrows Lake	804	804	<1%	804	2
CNRL Kirby	182	182	<1%	182	3
Devon Jackfish	310	312	<1%	313	3
KNOC BlackGold	503	504	<1%	504	3
Petrobank Whitesands and May River	127	131	4%	135	2
Statoil KKD	122	122	<1%	122	0.655
Winefred Lake Lodge 1	107	107	<1%	107	6
Trapper's Cabin (SW of Plant)	499	499	<1%	499	3
Camp Site (NW of Plant)	612	612	<1%	612	3
Fish Plant (Winefred Lake)	141	141	<1%	141	8
Cabin (Winefred Lake)	114	114	<1%	114	7
Cabin (NW Kirby Lake)	324	324	<1%	324	6
West Hay Lake	360	360	<1%	361	4
Cabins (North Hay Lake)	352	352	<1%	353	4
Martin's Cabins	646	646	<1%	646	3
Metis Trailer Camp	721	721	<1%	721	3
Conklin	203	212	4%	218	2
Cabins (NW Christina Lake)	287	295	3%	301	2
Medicinal Plants	287	288	<1%	290	3
Cabins near Gravel Pit	213	221	4%	228	2
Cabins	197	205	4%	208	2
Leismer	204	210	3%	214	1
East Chard	177	184	4%	186	0.751
IR 194B	146	146	<1%	146	3
Fishing Camp (Christina Lake)	436	436	<1%	437	3
Fire Lookout 1	128	129	1%	132	4
AltaGas House (renamed MEG House)	432	432	<1%	432	3
Grave Site (Christina Lake)	409	410	<1%	410	3

Receptor	Baseline (µg/m³)	Application (µg/m³)	Increase from Baseline to Application (%)	Planned Development (µg/m³)	Construction (µg/m³)
Grave Site (Winefred Lake)	176	176	<1%	176	4
Grist Lake Lodge 1	106	107	1.0%	108	8
Grist Lake South	106	107	<1%	108	7
Winefred Lake Lodge 1	107	107	<1%	107	6
Winefred Lake West	198	198	<1%	199	5
EnCana Camp	658	658	<1%	659	3
Winefred Cabin/Station/Lookout	129	132	2%	136	4
Campground (Christina Lake)	248	257	4%	264	2
Wild Rice Operation 1	103	103	<1%	104	6
Wild Rice Operation 2	406	410	<1%	413	2
Fire Lookout Tower	276	276	<1%	276	2
Devenish	149	149	<1%	150	2
Old Cabins and Settlement Area (Wiau Lake)	97	98	<1%	98	2
Conklin	202	211	4%	217	2
Winefred Lake (IR 194B)	158	158	<1%	158	3
Operator's Residence (MEG House)	348	348	<1%	348	3
Hunter/Trapper B (Joe Black's cabin)	197	200	1%	200	1
Hunter/Trapper A (Gary York's cabin)	431	431	<1%	432	3
Christina Lake Lodge	324	327	<1%	329	2
Janvier	115	116	<1%	116	0.683
Ipitiak Lake	159	159	<1%	159	4
LakeRAMPs94	184	184	<1%	184	1
Conklin	223	231	4%	238	2
Behan	101	104	3%	105	1
Margie	113	113	<1%	113	1
Devenish	150	151	<1%	151	2
First Nations Land - Heart Lake 167	66	69	4%	69	0.456
First Nations Land - Heart Lake 167	38	41	8%	42	0.382
First Nations Land - Heart Lake 167	62	66	6%	67	0.685
First Nations Land - Heart Lake 167	51	53	3%	54	0.568
Winefred Lake (IR 194B)	167	167	<1%	167	4
Winefred Lake (IR 194B)	127	127	<1%	127	3
Winefred Lake (IR 194B)	124	124	<1%	124	3
Winefred Lake (IR 194B)	188	188	<1%	188	4
Winefred Lake (IR 194B)	138	138	<1%	138	3
Winefred Lake (IR 194B)	154	154	<1%	154	3
Winefred Lake 194B	141	141	<1%	141	3
Winefred Lake	125	125	<1%	125	5

Receptor	Baseline (μg/m^3)	Application (μg/m^3)	Increase from Baseline to Application (%)	Planned Development (μg/m^3)	Construction (μg/m^3)
KNOC Bar None Camp	686	686	<1%	686	3
Jackfish Central Camp	310	312	<1%	313	3
J2 Operations Camp	452	452	<1%	452	4
J2 Operations Camp	451	451	<1%	451	4
J2 Operations Camp	451	451	<1%	451	4
J2 Operations Camp	451	451	<1%	451	4
J2 Operations Camp	452	452	<1%	452	4
Industrial Campsite	368	369	<1%	456	2
Industrial Campsite	122	124	1%	125	2
Trapper's Cabin	102	102	<1%	102	4
Industrial Campsite	1,115	1,115	<1%	1,364	2
Trapper's Cabin	106	107	1.0%	108	8
Recreational Campsites	107	107	<1%	108	6
Non-industrial campsite	104	104	<1%	105	6
Hunting/Fishing Lodge or Camp	105	105	<1%	106	6
Trapper's Cabin	106	106	<1%	106	6
Commercial Campsites	114	114	<1%	114	6
Commercial Campsites	166	167	<1%	168	3
Industrial Campsite	406	407	<1%	407	3
Industrial Campsite	561	561	<1%	564	15
Industrial Campsite	205	205	<1%	205	10
Commercial Campsites	752	752	<1%	752	3
Industrial Campsite	695	695	<1%	696	3
Industrial Campsite	1,593	1,593	<1%	1,593	3
Industrial Campsite	195	203	4%	205	0.754
Industrial Campsite	230	238	3%	240	0.818
Commercial Recreational Development	298	306	3%	312	2
Industrial Campsite	178	186	4%	191	2
Industrial Campsite	182	182	<1%	182	3
Trapper's Cabin	178	178	<1%	178	2
Trapper's Cabin	167	167	<1%	168	2
Industrial Campsite	172	180	4%	185	2
Industrial Campsite	171	179	4%	184	2
Frank Nashim Trappers Cabin	153	153	<1%	153	2
Trapper's Cabin	153	153	<1%	154	2
Commercial Campsites	123	128	4%	132	2
Industrial Campsite	132	135	2%	137	2
Firefighter Base Camp Helipad Rapel Tower	220	220	<1%	220	1

Receptor	Baseline (µg/m³)	Application (µg/m³)	Increase from Baseline to Application (%)	Planned Development (µg/m³)	Construction (µg/m³)
Industrial Campsite	120	121	1%	123	1
Industrial Campsite	99	102	3%	102	0.902
Industrial Campsite	122	122	<1%	122	0.654
Industrial Campsite	107	108	1%	108	0.631
Industrial Campsite	77	79	3%	80	0.817
Steep Banks and Wappau Lakes Recreation Area	96	96	<1%	96	1
Steep Banks and Wappau Lakes Recreation Area	78	78	<1%	78	1
Trapper's Cabin	83	83	<1%	84	1
Industrial Campsite	134	134	<1%	134	1
Industrial Campsite	105	106	<1%	106	0.589
Trapper's Cabin	50	52	3%	52	0.725
Trapper's Cabin	50	52	4%	52	0.736
Residence outdated expiry still listed active	50	52	4%	52	0.736
Residence - Unserviced	50	52	4%	52	0.736
Limited to Metis Residence	50	52	4%	52	0.736
Commercial Recreational Development	66	67	<1%	67	0.779
Industrial Campsite	66	67	1%	68	0.897
Steep Banks and Wappau Lakes Recreation Area	62	63	2%	64	0.910
Trapper's Cabin	55	56	2%	57	0.900
Commercial Recreational Development	144	144	<1%	144	8
Industrial Campsite	190	198	4%	204	2
Industrial Campsite	154	161	4%	166	2
Industrial Campsite	410	410	<1%	411	3
Industrial Campsite	131	135	3%	138	0.634
Commercial CampsitesS	226	230	1%	232	2
Industrial Campsite	303	304	<1%	305	3
Industrial Campsite	610	611	<1%	612	3
Industrial Campsite	418	418	<1%	418	5
Hunting/Fishing Lodge or Camp	106	107	1.0%	108	8
Hunting/Fishing Lodge or Camp	76	77	<1%	77	0.681
Industrial Campsite	50	50	<1%	50	0.250
Trapper's Cabin	434	434	<1%	435	3
Trapper's Cabin	154	154	<1%	154	7
Indian Reserve	52	54	3%	54	0.579
Indian Reserve	62	66	7%	67	0.711
Metis Local	223	231	4%	238	2

Receptor	Baseline ($\mu g/m^3$)	Application ($\mu g/m^3$)	Increase from Baseline to Application (%)	Planned Development ($\mu g/m^3$)	Construction ($\mu g/m^3$)
Indian Reserve	168	168	<1%	168	4
9th Highest 1-Hour					
Overall Maximum (MPOI)	**817**	**817**	**<1%**	**817**	**790**
Winefred Lake IR 194B (NW)	116	116	<1%	116	2
Conklin	111	112	1.0%	112	0.839
Chard	108	110	2%	110	0.443
PTI Christina Lake Lodge	84	84	<1%	84	1
Heart Lake IR 167	27	27	<1%	27	0.200
MEG CLRP Camp	212	212	<1%	212	2
Cenovus Narrows Lake	327	328	<1%	329	1
CNRL Kirby	107	107	<1%	107	2
Devon Jackfish	169	169	<1%	169	2
KNOC BlackGold	281	281	<1%	281	2
Petrobank Whitesands and May River	79	80	<1%	80	0.616
Statoil KKD	65	66	2%	67	0.366
Winefred Lake Lodge 1	80	81	1%	82	5
Trapper's Cabin (SW of Plant)	329	329	<1%	329	2
Camp Site (NW of Plant)	349	349	<1%	349	2
Fish Plant (Winefred Lake)	99	99	<1%	99	5
Cabin (Winefred Lake)	87	88	1%	88	5
Cabin (NW Kirby Lake)	198	198	<1%	198	5
West Hay Lake	243	243	<1%	244	3
Cabins (North Hay Lake)	235	235	<1%	235	3
Martin's Cabins	309	309	<1%	309	2
Metis Trailer Camp	319	319	<1%	319	2
Conklin	111	112	1%	112	0.842
Cabins (NW Christina Lake)	150	152	1%	152	0.958
Medicinal Plants	155	156	<1%	157	1
Cabins near Gravel Pit	98	100	2%	100	0.795
Cabins	93	97	4%	98	0.764
Leismer	118	124	5%	127	0.763
East Chard	98	98	<1%	98	0.457
IR 194B	108	108	<1%	108	2
Fishing Camp (Christina Lake)	269	269	<1%	269	2
Fire Lookout 1	91	93	1%	97	3
AltaGas House (renamed MEG House)	263	263	<1%	263	2
Grave Site (Christina Lake)	251	251	<1%	252	2
Grave Site (Winefred Lake)	125	125	<1%	125	2
Grist Lake Lodge 1	70	73	4%	73	6

Receptor	Baseline (µg/m³)	Application (µg/m³)	Increase from Baseline to Application (%)	Planned Development (µg/m³)	Construction (µg/m³)
Grist Lake South	72	73	2%	74	5
Winefred Lake Lodge 1	80	81	1%	82	5
Winefred Lake West	142	142	<1%	142	4
EnCana Camp	332	332	<1%	333	2
Winefred Cabin/Station/Lookout	92	92	<1%	97	2
Campground (Christina Lake)	123	124	<1%	124	0.933
Wild Rice Operation 1	77	79	3%	80	4
Wild Rice Operation 2	196	199	1%	199	1
Fire Lookout Tower	108	108	<1%	109	0.874
Devenish	89	89	<1%	90	1
Old Cabins and Settlement Area (Wiau Lake)	66	66	<1%	66	1
Conklin	111	112	1.0%	112	0.839
Winefred Lake (IR 194B)	115	115	<1%	115	2
Operator's Residence (MEG House)	200	200	<1%	200	2
Hunter/Trapper B (Joe Black's cabin)	123	125	1%	126	0.877
Hunter/Trapper A (Gary York's cabin)	262	262	<1%	263	2
Christina Lake Lodge	179	179	<1%	179	1
Janvier	69	69	<1%	69	0.394
Ipitiak Lake	105	105	<1%	105	2
LakeRAMPs94	118	118	<1%	118	0.906
Conklin	117	118	1%	119	0.878
Behan	50	51	<1%	51	0.548
Margie	72	72	<1%	72	0.806
Devenish	90	90	<1%	90	1
First Nations land - Heart Lake 167	32	33	1%	33	0.187
First Nations land - Heart Lake 167	22	22	<1%	22	0.157
First Nations land - Heart Lake 167	37	38	1%	38	0.334
First Nations land - Heart Lake 167	26	26	<1%	27	0.207
Winefred Lake (IR 194B)	119	120	<1%	120	2
Winefred Lake (IR 194B)	97	97	<1%	97	2
Winefred Lake (IR 194B)	94	94	<1%	94	2
Winefred Lake (IR 194B)	127	127	<1%	128	2
Winefred Lake (IR 194B)	101	102	<1%	102	2
Winefred Lake (IR 194B)	111	111	<1%	111	2
Winefred Lake 194B	105	106	<1%	106	2
Winefred Lake	106	106	<1%	107	4
KNOC Bar None Camp	313	313	<1%	313	2
Jackfish Central Camp	169	169	<1%	169	2

Receptor	Baseline ($\mu g/m^3$)	Application ($\mu g/m^3$)	Increase from Baseline to Application (%)	Planned Development ($\mu g/m^3$)	Construction ($\mu g/m^3$)
J2 Operations Camp	240	240	<1%	240	2
J2 Operations Camp	239	239	<1%	239	2
J2 Operations Camp	240	240	<1%	240	2
J2 Operations Camp	240	240	<1%	240	2
J2 Operations Camp	240	240	<1%	240	2
Industrial Campsite	201	203	<1%	243	1
Industrial Campsite	78	79	<1%	79	0.949
Trapper's Cabin	71	72	3%	73	3
Industrial Campsite	481	482	<1%	578	2
Trapper's Cabin	70	74	5%	74	6
Recreational Campsites	70	81	15%	81	4
Non-industrial campsite	75	76	2%	76	4
Hunting/Fishing Lodge or Camp	80	82	3%	82	5
Trapper's Cabin	80	82	3%	82	5
Commercial Campsites	86	87	2%	87	5
Commercial Campsites	115	116	<1%	116	2
Industrial Campsite	247	247	<1%	248	2
Industrial Campsite	375	375	<1%	375	10
Industrial Campsite	107	108	<1%	108	8
Commercial Campsites	322	322	<1%	322	2
Industrial Campsite	315	315	<1%	315	2
Industrial Campsite	625	625	<1%	626	2
Industrial Campsite	102	103	<1%	104	0.450
Industrial Campsite	118	120	2%	120	0.472
Commercial Recreational Development	159	159	<1%	160	1
Industrial Campsite	110	117	6%	120	0.846
Industrial Campsite	107	107	<1%	107	2
Trapper's Cabin	110	111	1%	112	1
Trapper's Cabin	104	105	1%	107	1
Industrial Campsite	97	98	2%	99	0.752
Industrial Campsite	91	93	2%	93	0.722
Frank Nashim Trappers Cabin	73	74	2%	74	0.942
Trapper's Cabin	73	74	2%	74	0.947
Commercial Campsites	80	80	<1%	80	0.615
Industrial Campsite	76	76	<1%	76	0.588
Firefighter Base Camp Helipad Rapel Tower	96	97	<1%	97	0.549
Industrial Campsite	71	73	2%	75	0.507
Industrial Campsite	68	70	3%	70	0.477

Receptor	Baseline ($\mu g/m^3$)	Application ($\mu g/m^3$)	Increase from Baseline to Application (%)	Planned Development ($\mu g/m^3$)	Construction ($\mu g/m^3$)
Industrial Campsite	65	66	2%	67	0.366
Industrial Campsite	63	64	2%	65	0.367
Industrial Campsite	39	39	1%	40	0.351
Steep Banks and Wappau Lakes Recreation Area	54	54	<1%	54	0.479
Steep Banks and Wappau Lakes Recreation Area	47	48	2%	48	0.424
Trapper's Cabin	51	51	<1%	51	0.467
Industrial Campsite	64	64	<1%	65	0.545
Industrial Campsite	51	54	5%	54	0.275
Trapper's Cabin	28	29	4%	29	0.292
Trapper's Cabin	27	28	5%	29	0.286
Residence outdated expiry still listed active	27	28	5%	29	0.286
Residence - Unserviced	27	28	5%	29	0.286
Limited to Metis Residence	27	28	5%	29	0.286
Commercial Recreational Development	39	39	<1%	39	0.317
Industrial Campsite	39	39	<1%	40	0.363
Steep Banks and Wappau Lakes Recreation Area	36	36	<1%	37	0.374
Trapper's Cabin	36	36	1%	36	0.357
Commercial Recreational Development	99	99	<1%	99	6
Industrial Campsite	103	106	3%	106	0.781
Industrial Campsite	83	84	<1%	84	0.671
Industrial Campsite	246	246	<1%	246	1
Industrial Campsite	81	83	2%	83	0.319
Commercial CampsitesS	110	111	1.0%	111	0.831
Industrial Campsite	167	167	<1%	167	2
Industrial Campsite	304	304	<1%	305	1
Industrial Campsite	247	247	<1%	247	3
Hunting/Fishing Lodge or Camp	70	73	4%	73	6
Hunting/Fishing Lodge or Camp	43	43	<1%	43	0.311
Industrial Campsite	23	23	<1%	25	0.159
Trapper's Cabin	266	266	<1%	266	2
Trapper's Cabin	106	106	<1%	106	5
Indian Reserve	25	25	<1%	26	0.213
Indian Reserve	37	38	1%	38	0.351
Metis Local	117	118	1%	119	0.878
Indian Reserve	120	120	<1%	120	2
AAAQO	15,000	15,000	n/a	15,000	15,000

Receptor	Baseline ($\mu g/m^3$)	Application ($\mu g/m^3$)	Increase from Baseline to Application (%)	Planned Development ($\mu g/m^3$)	Construction ($\mu g/m^3$)
Maximum 8-hour					
Overall Maximum (MPOI)	**935**	**935**	**<1%**	**935**	**584**
Winefred Lake IR 194B (NW)	88	88	<1%	88	2
Conklin	117	123	5%	127	1
Chard	83	87	5%	90	0.463
PTI Christina Lake Lodge	59	59	<1%	59	0.959
Heart Lake IR 167	33	35	6%	36	0.218
MEG CLRP Camp	178	178	<1%	179	2
Cenovus Narrows Lake	259	259	<1%	259	1
CNRL Kirby	87	87	<1%	87	1
Devon Jackfish	108	109	1%	110	1
KNOC BlackGold	189	189	<1%	189	1
Petrobank Whitesands and May River	71	74	5%	78	0.630
Statoil KKD	52	54	4%	54	0.326
Winefred Lake Lodge 1	75	75	<1%	76	4
Trapper's Cabin (SW of Plant)	320	320	<1%	320	2
Camp Site (NW of Plant)	247	247	<1%	247	2
Fish Plant (Winefred Lake)	78	78	<1%	79	4
Cabin (Winefred Lake)	74	74	<1%	75	4
Cabin (NW Kirby Lake)	197	197	<1%	197	4
West Hay Lake	163	163	<1%	166	3
Cabins (North Hay Lake)	184	184	<1%	185	3
Martin's Cabins	238	238	<1%	238	1
Metis Trailer Camp	255	255	<1%	255	1
Conklin	117	123	5%	128	1
Cabins (NW Christina Lake)	146	153	5%	158	1
Medicinal Plants	110	114	4%	118	1
Cabins near Gravel Pit	121	127	5%	132	0.986
Cabins	103	109	6%	112	0.894
Leismer	96	99	3%	103	0.632
East Chard	77	80	4%	83	0.496
IR 194B	81	81	<1%	81	2
Fishing Camp (Christina Lake)	206	207	<1%	207	2
Fire Lookout 1	65	65	<1%	76	2
AltaGas House (renamed MEG House)	207	207	<1%	208	2
Grave Site (Christina Lake)	180	180	<1%	181	2
Grave Site (Winefred Lake)	97	97	<1%	97	2
Grist Lake Lodge 1	77	77	<1%	78	5
Grist Lake South	76	76	<1%	77	4

Receptor	Baseline (µg/m³)	Application (µg/m³)	Increase from Baseline to Application (%)	Planned Development (µg/m³)	Construction (µg/m³)
Winefred Lake Lodge 1	75	75	<1%	76	4
Winefred Lake West	113	113	<1%	113	3
EnCana Camp	259	259	<1%	259	2
Winefred Cabin/Station/Lookout	65	65	<1%	71	2
Campground (Christina Lake)	133	140	5%	144	1
Wild Rice Operation 1	74	75	<1%	75	4
Wild Rice Operation 2	160	166	4%	167	0.981
Fire Lookout Tower	82	85	4%	89	0.844
Devenish	62	62	<1%	62	0.864
Old Cabins and Settlement Area (Wiau Lake)	46	46	<1%	46	0.782
Conklin	117	123	5%	127	1
Winefred Lake (IR 194B)	87	87	<1%	87	2
Operator's Residence (MEG House)	159	159	<1%	159	2
Hunter/Trapper B (Joe Black's cabin)	106	106	<1%	107	0.883
Hunter/Trapper A (Gary York's cabin)	206	206	<1%	207	2
Christina Lake Lodge	142	148	4%	152	1
Janvier	50	51	3%	52	0.474
Ipitiak Lake	101	101	<1%	101	2
LakeRAMPs94	117	117	<1%	118	0.909
Conklin	126	132	5%	137	1
Behan	44	46	4%	47	0.430
Margie	50	50	1%	50	0.771
Devenish	62	62	<1%	62	0.855
First Nations land - Heart Lake 167	40	43	6%	43	0.233
First Nations land - Heart Lake 167	29	31	7%	31	0.193
First Nations land - Heart Lake 167	43	47	8%	48	0.289
First Nations land - Heart Lake 167	34	36	5%	37	0.186
Winefred Lake (IR 194B)	93	93	<1%	94	2
Winefred Lake (IR 194B)	78	78	<1%	78	2
Winefred Lake (IR 194B)	75	75	<1%	75	2
Winefred Lake (IR 194B)	90	90	<1%	90	2
Winefred Lake (IR 194B)	80	80	<1%	80	2
Winefred Lake (IR 194B)	88	88	<1%	88	2
Winefred Lake 194B	80	80	<1%	80	2
Winefred Lake	74	75	<1%	75	3
KNOC Bar None Camp	244	244	<1%	244	1
Jackfish Central Camp	108	109	1%	110	1
J2 Operations Camp	174	174	<1%	174	1

Receptor	Baseline (µg/m³)	Application (µg/m³)	Increase from Baseline to Application (%)	Planned Development (µg/m³)	Construction (µg/m³)
J2 Operations Camp	172	172	<1%	172	1
J2 Operations Camp	173	173	<1%	173	1
J2 Operations Camp	174	174	<1%	174	1
J2 Operations Camp	175	175	<1%	175	1
Industrial Campsite	186	187	<1%	219	1
Industrial Campsite	51	51	<1%	51	0.907
Trapper's Cabin	66	67	<1%	67	3
Industrial Campsite	397	399	<1%	480	2
Trapper's Cabin	77	77	<1%	78	5
Recreational Campsites	76	76	<1%	77	3
Non-industrial campsite	74	74	<1%	75	3
Hunting/Fishing Lodge or Camp	75	76	<1%	76	4
Trapper's Cabin	75	76	<1%	76	4
Commercial Campsites	74	74	<1%	75	4
Commercial Campsites	100	101	1%	102	1
Industrial Campsite	182	182	<1%	183	2
Industrial Campsite	257	257	<1%	258	8
Industrial Campsite	91	91	<1%	91	6
Commercial Campsites	263	264	<1%	264	1
Industrial Campsite	247	247	<1%	247	1
Industrial Campsite	664	664	<1%	664	2
Industrial Campsite	79	83	5%	85	0.479
Industrial Campsite	91	95	4%	97	0.487
Commercial Recreational Development	143	150	5%	155	1
Industrial Campsite	102	108	6%	112	0.829
Industrial Campsite	87	87	<1%	87	1
Trapper's Cabin	76	77	1%	78	1
Trapper's Cabin	73	73	<1%	74	0.874
Industrial Campsite	98	104	5%	108	0.922
Industrial Campsite	98	103	5%	108	0.907
Frank Nashim Trappers Cabin	49	49	<1%	49	1
Trapper's Cabin	49	49	<1%	49	1
Commercial Campsites	70	74	5%	78	0.626
Industrial Campsite	67	70	4%	73	0.573
Firefighter Base Camp Helipad Rapel Tower	82	83	<1%	84	0.555
Industrial Campsite	62	66	7%	69	0.561
Industrial Campsite	56	59	5%	60	0.492
Industrial Campsite	52	54	4%	54	0.327

Receptor	Baseline (µg/m³)	Application (µg/m³)	Increase from Baseline to Application (%)	Planned Development (µg/m³)	Construction (µg/m³)
Industrial Campsite	52	54	4%	54	0.346
Industrial Campsite	45	48	5%	48	0.302
Steep Banks and Wappau Lakes Recreation Area	41	41	<1%	41	0.550
Steep Banks and Wappau Lakes Recreation Area	38	38	<1%	38	0.577
Trapper's Cabin	40	40	<1%	40	0.629
Industrial Campsite	47	47	<1%	48	0.390
Industrial Campsite	36	37	3%	37	0.208
Trapper's Cabin	29	30	4%	30	0.287
Trapper's Cabin	29	31	5%	31	0.281
Residence outdated expiry still listed active	29	31	5%	31	0.281
Residence - Unserviced	29	31	5%	31	0.281
Limited to Metis Residence	29	31	5%	31	0.281
Commercial Recreational Development	30	30	<1%	30	0.344
Industrial Campsite	31	31	<1%	31	0.412
Steep Banks and Wappau Lakes Recreation Area	29	29	<1%	29	0.429
Trapper's Cabin	27	27	<1%	27	0.437
Commercial Recreational Development	77	77	<1%	77	4
Industrial Campsite	108	114	5%	118	0.978
Industrial Campsite	89	94	6%	98	0.817
Industrial Campsite	165	166	<1%	166	1
Industrial Campsite	70	71	2%	72	0.314
Commercial CampsitesS	90	96	6%	100	0.936
Industrial Campsite	107	109	1%	110	1
Industrial Campsite	274	274	<1%	274	1
Industrial Campsite	204	204	<1%	204	2
Hunting/Fishing Lodge or Camp	76	77	<1%	78	5
Hunting/Fishing Lodge or Camp	33	33	<1%	33	0.325
Industrial Campsite	21	23	10%	24	0.125
Trapper's Cabin	207	207	<1%	208	2
Trapper's Cabin	84	84	<1%	85	4
Indian Reserve	34	36	5%	37	0.191
Indian Reserve	43	47	9%	48	0.302
Metis Local	126	132	5%	137	1
Indian Reserve	93	93	<1%	94	2

Receptor	Baseline ($\mu g/m^3$)	Application ($\mu g/m^3$)	Increase from Baseline to Application (%)	Planned Development ($\mu g/m^3$)	Construction ($\mu g/m^3$)
2nd Highest 8-hour					
Overall Maximum (MPOI)	**703**	**705**	**<1%**	**705**	**527**
Winefred Lake IR 194B (NW)	78	78	<1%	79	1
Conklin	75	76	2%	77	0.570
Chard	70	72	3%	73	0.285
PTI Christina Lake Lodge	52	52	<1%	52	0.904
Heart Lake IR 167	18	18	<1%	18	0.130
MEG CLRP Camp	155	155	<1%	156	1
Cenovus Narrows Lake	197	198	<1%	198	0.897
CNRL Kirby	64	64	<1%	64	1
Devon Jackfish	90	91	<1%	92	1
KNOC BlackGold	143	143	<1%	143	1
Petrobank Whitesands and May River	52	53	2%	53	0.457
Statoil KKD	42	43	2%	43	0.228
Winefred Lake Lodge 1	64	64	<1%	64	4
Trapper's Cabin (SW of Plant)	180	180	<1%	180	1
Camp Site (NW of Plant)	196	196	<1%	196	1
Fish Plant (Winefred Lake)	71	72	<1%	72	4
Cabin (Winefred Lake)	70	70	<1%	70	3
Cabin (NW Kirby Lake)	103	103	<1%	103	3
West Hay Lake	138	139	<1%	140	2
Cabins (North Hay Lake)	131	131	<1%	131	2
Martin's Cabins	183	183	<1%	183	1
Metis Trailer Camp	190	190	<1%	190	1
Conklin	75	77	2%	77	0.572
Cabins (NW Christina Lake)	102	105	2%	105	0.691
Medicinal Plants	92	93	1.0%	93	0.727
Cabins near Gravel Pit	77	79	3%	80	0.485
Cabins	72	73	2%	74	0.465
Leismer	73	78	6%	79	0.584
East Chard	64	65	2%	66	0.294
IR 194B	72	72	<1%	73	2
Fishing Camp (Christina Lake)	174	174	<1%	174	1
Fire Lookout 1	60	62	3%	62	2
AltaGas House (renamed MEG House)	173	174	<1%	174	1
Grave Site (Christina Lake)	136	136	<1%	137	1
Grave Site (Winefred Lake)	78	78	<1%	79	2
Grist Lake Lodge 1	47	48	2%	48	4
Grist Lake South	49	50	<1%	50	4

Receptor	Baseline ($\mu g/m^3$)	Application ($\mu g/m^3$)	Increase from Baseline to Application (%)	Planned Development ($\mu g/m^3$)	Construction ($\mu g/m^3$)
Winefred Lake Lodge 1	64	64	<1%	64	4
Winefred Lake West	89	89	<1%	90	2
EnCana Camp	215	215	<1%	215	1
Winefred Cabin/Station/Lookout	61	63	2%	63	1
Campground (Christina Lake)	90	91	2%	92	0.597
Wild Rice Operation 1	60	60	<1%	60	3
Wild Rice Operation 2	140	144	3%	146	0.768
Fire Lookout Tower	64	64	1%	65	0.647
Devenish	53	54	<1%	54	0.775
Old Cabins and Settlement Area (Wiau Lake)	43	43	<1%	43	0.729
Conklin	75	76	2%	77	0.570
Winefred Lake (IR 194B)	77	77	<1%	78	1
Operator's Residence (MEG House)	126	126	<1%	127	1
Hunter/Trapper B (Joe Black's cabin)	85	85	<1%	85	0.493
Hunter/Trapper A (Gary York's cabin)	172	172	<1%	173	1
Christina Lake Lodge	113	115	2%	116	0.794
Janvier	43	44	4%	45	0.259
Ipitiak Lake	56	56	<1%	56	1
LakeRAMPs94	82	82	<1%	82	0.526
Conklin	81	83	2%	84	0.585
Behan	34	35	3%	35	0.393
Margie	46	46	<1%	47	0.552
Devenish	54	54	<1%	54	0.773
First Nations land - Heart Lake 167	24	24	<1%	24	0.118
First Nations land - Heart Lake 167	16	16	<1%	16	0.094
First Nations land - Heart Lake 167	26	27	4%	27	0.257
First Nations land - Heart Lake 167	18	18	<1%	19	0.161
Winefred Lake (IR 194B)	77	77	<1%	77	2
Winefred Lake (IR 194B)	71	71	<1%	71	1
Winefred Lake (IR 194B)	69	69	<1%	70	1
Winefred Lake (IR 194B)	79	79	<1%	80	2
Winefred Lake (IR 194B)	72	72	<1%	73	2
Winefred Lake (IR 194B)	78	78	<1%	79	1
Winefred Lake 194B	72	72	<1%	72	2
Winefred Lake	72	72	<1%	72	3
KNOC Bar None Camp	186	186	<1%	186	1
Jackfish Central Camp	90	91	<1%	92	1
J2 Operations Camp	143	143	<1%	143	1

Receptor	Baseline ($\mu g/m^3$)	Application ($\mu g/m^3$)	Increase from Baseline to Application (%)	Planned Development ($\mu g/m^3$)	Construction ($\mu g/m^3$)
J2 Operations Camp	140	141	<1%	141	1
J2 Operations Camp	141	141	<1%	141	1
J2 Operations Camp	142	142	<1%	142	1
J2 Operations Camp	143	144	<1%	144	1
Industrial Campsite	133	133	<1%	160	1
Industrial Campsite	49	49	<1%	49	0.652
Trapper's Cabin	51	51	<1%	51	2
Industrial Campsite	331	333	<1%	392	1
Trapper's Cabin	47	47	2%	48	4
Recreational Campsites	57	58	<1%	58	3
Non-industrial campsite	60	60	<1%	60	3
Hunting/Fishing Lodge or Camp	63	63	<1%	64	4
Trapper's Cabin	64	64	<1%	64	4
Commercial Campsites	66	66	<1%	66	3
Commercial Campsites	95	96	<1%	97	1
Industrial Campsite	136	137	<1%	137	1
Industrial Campsite	221	221	<1%	223	6
Industrial Campsite	69	70	<1%	70	5
Commercial Campsites	194	194	<1%	194	1
Industrial Campsite	187	187	<1%	187	1
Industrial Campsite	349	350	<1%	350	0.959
Industrial Campsite	67	69	2%	69	0.291
Industrial Campsite	76	79	3%	80	0.316
Commercial Recreational Development	103	105	2%	105	0.716
Industrial Campsite	86	89	3%	90	0.625
Industrial Campsite	64	64	<1%	64	1
Trapper's Cabin	64	64	<1%	64	0.815
Trapper's Cabin	63	63	<1%	63	0.827
Industrial Campsite	65	66	2%	66	0.529
Industrial Campsite	65	66	2%	66	0.521
Frank Nashim Trappers Cabin	41	41	<1%	41	0.549
Trapper's Cabin	41	41	<1%	41	0.547
Commercial Campsites	52	53	2%	53	0.460
Industrial Campsite	50	51	1%	51	0.446
Firefighter Base Camp Helipad Rapel Tower	66	68	2%	69	0.395
Industrial Campsite	46	47	2%	48	0.329
Industrial Campsite	40	41	2%	42	0.292
Industrial Campsite	42	43	2%	43	0.228

Receptor	Baseline (µg/m³)	Application (µg/m³)	Increase from Baseline to Application (%)	Planned Development (µg/m³)	Construction (µg/m³)
Industrial Campsite	40	41	4%	42	0.225
Industrial Campsite	30	30	<1%	30	0.247
Steep Banks and Wappau Lakes Recreation Area	37	37	<1%	37	0.284
Steep Banks and Wappau Lakes Recreation Area	29	29	<1%	29	0.298
Trapper's Cabin	31	31	<1%	31	0.337
Industrial Campsite	42	42	1%	43	0.374
Industrial Campsite	35	36	5%	37	0.187
Trapper's Cabin	19	19	2%	20	0.248
Trapper's Cabin	19	19	<1%	19	0.239
Residence outdated expiry still listed active	19	19	<1%	19	0.239
Residence - Unserviced	19	19	<1%	19	0.239
Limited to Metis Residence	19	19	<1%	19	0.238
Commercial Recreational Development	26	27	<1%	27	0.224
Industrial Campsite	28	28	<1%	28	0.234
Steep Banks and Wappau Lakes Recreation Area	25	25	<1%	25	0.234
Trapper's Cabin	20	20	<1%	20	0.236
Commercial Recreational Development	72	72	<1%	73	4
Industrial Campsite	70	71	2%	72	0.518
Industrial Campsite	60	61	2%	61	0.480
Industrial Campsite	135	135	<1%	135	0.958
Industrial Campsite	47	48	2%	49	0.222
Commercial CampsitesS	65	66	<1%	66	0.594
Industrial Campsite	90	90	<1%	91	1
Industrial Campsite	187	187	<1%	187	0.975
Industrial Campsite	140	140	<1%	140	2
Hunting/Fishing Lodge or Camp	47	48	2%	48	4
Hunting/Fishing Lodge or Camp	27	28	1%	28	0.223
Industrial Campsite	18	18	<1%	18	0.107
Trapper's Cabin	174	174	<1%	175	1
Trapper's Cabin	72	72	<1%	73	3
Indian Reserve	19	19	<1%	20	0.163
Indian Reserve	27	27	1%	27	0.268
Metis Local	81	83	2%	84	0.585
Indian Reserve	77	77	<1%	78	2
AAAQO	6,000	6,000	n/a	6,000	6,000

Table B5-4: Predicted Particulate Matter Concentrations in the Air Quality Regional Study Area

Receptor	Baseline ($\mu g/m^3$)	Application ($\mu g/m^3$)	Increase from Baseline to Application (%)	Planned Development ($\mu g/m^3$)	Construction ($\mu g/m^3$)
Maximum 1-hour					
Overall Maximum (MPOI)	**79**	**79**	**<1%**	**79**	**73**
Winefred Lake IR 194B (NW)	22	22	<1%	22	0.263
Conklin	27	28	2%	28	0.187
Chard	22	23	2%	23	0.077
PTI Christina Lake Lodge	13	13	<1%	13	0.149
Heart Lake IR 167	9	9	4%	9	0.044
MEG CLRP Camp	25	25	<1%	25	0.302
Cenovus Narrows Lake	35	35	1%	36	0.237
CNRL Kirby	13	13	3%	14	0.203
Devon Jackfish	25	26	3%	26	0.274
KNOC BlackGold	26	26	<1%	27	0.253
Petrobank Whitesands and May River	19	20	2%	20	0.136
Statoil KKD	14	14	2%	15	0.083
Winefred Lake Lodge 1	18	18	<1%	18	0.469
Trapper's Cabin (SW of Plant)	34	34	<1%	35	0.252
Camp Site (NW of Plant)	29	29	<1%	29	0.241
Fish Plant (Winefred Lake)	16	16	<1%	17	0.589
Cabin (Winefred Lake)	17	17	<1%	18	0.516
Cabin (NW Kirby Lake)	19	20	1%	20	0.491
West Hay Lake	21	21	1%	21	0.366
Cabins (North Hay Lake)	21	22	1%	22	0.346
Martin's Cabins	31	31	<1%	31	0.230
Metis Trailer Camp	34	35	<1%	35	0.228
Conklin	27	28	2%	28	0.188
Cabins (NW Christina Lake)	31	31	2%	32	0.190
Medicinal Plants	30	30	2%	31	0.230
Cabins near Gravel Pit	28	29	2%	29	0.170
Cabins	27	28	2%	28	0.146
Leismer	27	27	2%	27	0.092
East Chard	20	21	3%	21	0.077
IR 194B	22	22	<1%	22	0.267
Fishing Camp (Christina Lake)	27	27	<1%	27	0.303
Fire Lookout 1	19	19	<1%	19	0.348
AltaGas House (renamed MEG House)	26	26	<1%	27	0.304
Grave Site (Christina Lake)	28	28	<1%	29	0.285

Receptor	Baseline ($\mu g/m^3$)	Application ($\mu g/m^3$)	Increase from Baseline to Application (%)	Planned Development ($\mu g/m^3$)	Construction ($\mu g/m^3$)
Grave Site (Winefred Lake)	24	24	<1%	24	0.297
Grist Lake Lodge 1	18	18	<1%	18	0.659
Grist Lake South	18	18	<1%	18	0.588
Winefred Lake Lodge 1	18	18	<1%	18	0.469
Winefred Lake West	17	18	1%	18	0.380
EnCana Camp	32	33	1.0%	33	0.295
Winefred Cabin/Station/Lookout	18	19	<1%	19	0.317
Campground (Christina Lake)	29	30	2%	31	0.195
Wild Rice Operation 1	18	18	<1%	18	0.429
Wild Rice Operation 2	34	35	2%	35	0.166
Fire Lookout Tower	21	21	2%	22	0.173
Devenish	18	18	1.0%	18	0.194
Old Cabins and Settlement Area (Wiau Lake)	12	12	<1%	13	0.132
Conklin	27	28	2%	28	0.187
Winefred Lake (IR 194B)	22	22	<1%	22	0.262
Operator's Residence (MEG House)	26	26	<1%	26	0.281
Hunter/Trapper B (Joe Black's cabin)	24	24	1%	24	0.151
Hunter/Trapper A (Gary York's cabin)	26	26	<1%	27	0.304
Christina Lake Lodge	31	32	2%	32	0.201
Janvier	15	15	<1%	15	0.070
Ipitiak Lake	16	16	<1%	16	0.315
LakeRAMPs94	24	24	<1%	24	0.147
Conklin	28	29	2%	30	0.192
Behan	12	12	2%	12	0.103
Margie	14	14	3%	15	0.123
Devenish	18	18	1.0%	18	0.193
First Nations land - Heart Lake 167	9	9	5%	9	0.038
First Nations land - Heart Lake 167	8	8	4%	8	0.033
First Nations land - Heart Lake 167	12	13	3%	13	0.061
First Nations land - Heart Lake 167	10	10	2%	10	0.049
Winefred Lake (IR 194B)	24	24	<1%	24	0.292
Winefred Lake (IR 194B)	20	21	2%	21	0.238
Winefred Lake (IR 194B)	20	21	2%	21	0.243
Winefred Lake (IR 194B)	24	24	<1%	24	0.275
Winefred Lake (IR 194B)	22	22	1%	22	0.266
Winefred Lake (IR 194B)	21	22	1%	22	0.258
Winefred Lake 194B	22	22	1%	22	0.264
Winefred Lake	17	18	5%	18	0.394

Receptor	Baseline ($\mu g/m^3$)	Application ($\mu g/m^3$)	Increase from Baseline to Application (%)	Planned Development ($\mu g/m^3$)	Construction ($\mu g/m^3$)
KNOC Bar None Camp	34	34	<1%	35	0.227
Jackfish Central Camp	25	26	3%	26	0.274
J2 Operations Camp	25	26	2%	26	0.311
J2 Operations Camp	26	26	2%	26	0.311
J2 Operations Camp	26	26	2%	26	0.311
J2 Operations Camp	26	26	2%	26	0.311
J2 Operations Camp	25	26	2%	26	0.311
Industrial Campsite	20	20	1%	22	0.168
Industrial Campsite	15	15	2%	16	0.149
Trapper's Cabin	17	17	<1%	17	0.321
Industrial Campsite	38	38	<1%	44	0.194
Trapper's Cabin	18	18	<1%	18	0.669
Recreational Campsites	18	18	<1%	18	0.463
Non-industrial campsite	18	18	<1%	18	0.425
Hunting/Fishing Lodge or Camp	18	18	<1%	18	0.468
Trapper's Cabin	18	18	<1%	18	0.470
Commercial Campsites	18	18	<1%	18	0.494
Commercial Campsites	23	23	<1%	23	0.222
Industrial Campsite	28	28	<1%	28	0.285
Industrial Campsite	15	15	<1%	16	1
Industrial Campsite	15	15	<1%	16	0.813
Commercial Campsites	35	35	<1%	35	0.228
Industrial Campsite	35	35	<1%	35	0.227
Industrial Campsite	55	55	<1%	55	0.227
Industrial Campsite	21	22	3%	22	0.078
Industrial Campsite	23	24	2%	24	0.082
Commercial Recreational Development	31	31	2%	32	0.199
Industrial Campsite	29	29	2%	30	0.134
Industrial Campsite	13	13	3%	14	0.203
Trapper's Cabin	18	19	2%	19	0.224
Trapper's Cabin	20	20	<1%	20	0.217
Industrial Campsite	25	25	2%	26	0.160
Industrial Campsite	25	26	2%	26	0.159
Frank Nashim Trappers Cabin	14	14	1%	14	0.153
Trapper's Cabin	14	14	1%	15	0.153
Commercial Campsites	19	20	2%	20	0.137
Industrial Campsite	19	19	2%	19	0.133
Firefighter Base Camp Helipad Rapel Tower	19	20	2%	20	0.124

Receptor	Baseline (µg/m³)	Application (µg/m³)	Increase from Baseline to Application (%)	Planned Development (µg/m³)	Construction (µg/m³)
Industrial Campsite	21	22	2%	22	0.112
Industrial Campsite	19	19	2%	20	0.105
Industrial Campsite	14	14	2%	15	0.083
Industrial Campsite	14	15	2%	15	0.087
Industrial Campsite	13	13	2%	13	0.069
Steep Banks and Wappau Lakes Recreation Area	10	11	2%	11	0.097
Steep Banks and Wappau Lakes Recreation Area	10	10	<1%	10	0.096
Trapper's Cabin	10	11	1%	11	0.102
Industrial Campsite	12	12	1.0%	12	0.099
Industrial Campsite	12	12	<1%	12	0.063
Trapper's Cabin	10	11	2%	11	0.060
Trapper's Cabin	10	11	2%	11	0.061
Residence outdated expiry still listed active	10	11	2%	11	0.061
Residence - Unserviced	10	11	2%	11	0.061
Limited to Metis Residence	10	11	2%	11	0.061
Commercial Recreational Development	9	9	2%	9	0.068
Industrial Campsite	9	9	2%	9	0.078
Steep Banks and Wappau Lakes Recreation Area	9	9	2%	9	0.079
Trapper's Cabin	8	8	2%	8	0.078
Commercial Recreational Development	16	16	<1%	17	0.592
Industrial Campsite	26	26	2%	27	0.170
Industrial Campsite	24	24	2%	25	0.144
Industrial Campsite	31	31	2%	32	0.224
Industrial Campsite	14	14	2%	14	0.084
Commercial CampsitesS	23	24	2%	24	0.169
Industrial Campsite	25	25	3%	26	0.273
Industrial Campsite	31	31	<1%	31	0.253
Industrial Campsite	20	20	2%	20	0.388
Hunting/Fishing Lodge or Camp	18	18	<1%	19	0.656
Hunting/Fishing Lodge or Camp	9	9	3%	9	0.059
Industrial Campsite	7	8	7%	8	0.025
Trapper's Cabin	26	27	<1%	27	0.304
Trapper's Cabin	16	16	<1%	16	0.553
Indian Reserve	10	10	2%	10	0.050
Indian Reserve	12	13	4%	13	0.065
Metis Local	28	29	2%	30	0.192

Receptor	Baseline ($\mu g/m^3$)	Application ($\mu g/m^3$)	Increase from Baseline to Application (%)	Planned Development ($\mu g/m^3$)	Construction ($\mu g/m^3$)
Indian Reserve	24	24	<1%	24	0.292
9th highest 1-Hour					
Overall Maximum (MPOI)	**29**	**29**	**<1%**	**29**	**52**
Winefred Lake IR 194B (NW)	13	13	<1%	13	0.182
Conklin	14	14	2%	15	0.079
Chard	15	15	2%	15	0.051
PTI Christina Lake Lodge	9	9	<1%	9	0.098
Heart Lake IR 167	4	4	<1%	5	0.018
MEG CLRP Camp	15	15	1%	15	0.166
Cenovus Narrows Lake	20	21	2%	21	0.107
CNRL Kirby	9	9	3%	9	0.134
Devon Jackfish	13	14	1%	14	0.122
KNOC BlackGold	16	16	3%	16	0.146
Petrobank Whitesands and May River	12	12	2%	12	0.064
Statoil KKD	8	8	2%	8	0.038
Winefred Lake Lodge 1	12	12	1%	12	0.358
Trapper's Cabin (SW of Plant)	15	15	<1%	15	0.173
Camp Site (NW of Plant)	17	18	1%	18	0.157
Fish Plant (Winefred Lake)	12	13	2%	13	0.419
Cabin (Winefred Lake)	12	12	2%	13	0.397
Cabin (NW Kirby Lake)	12	13	1%	13	0.356
West Hay Lake	13	14	<1%	14	0.262
Cabins (North Hay Lake)	14	14	<1%	14	0.241
Martin's Cabins	17	17	2%	17	0.139
Metis Trailer Camp	17	17	1%	17	0.136
Conklin	14	14	2%	15	0.079
Cabins (NW Christina Lake)	17	17	2%	18	0.087
Medicinal Plants	16	16	1%	16	0.094
Cabins near Gravel Pit	16	16	2%	17	0.069
Cabins	18	18	1%	18	0.065
Leismer	20	20	1%	20	0.070
East Chard	14	14	2%	15	0.051
IR 194B	12	13	2%	13	0.189
Fishing Camp (Christina Lake)	16	16	2%	17	0.147
Fire Lookout 1	11	12	<1%	12	0.215
AltaGas House (renamed MEG House)	16	16	2%	17	0.149
Grave Site (Christina Lake)	16	16	2%	17	0.145
Grave Site (Winefred Lake)	12	13	4%	13	0.201
Grist Lake Lodge 1	12	12	3%	12	0.456

Receptor	Baseline ($\mu g/m^3$)	Application ($\mu g/m^3$)	Increase from Baseline to Application (%)	Planned Development ($\mu g/m^3$)	Construction ($\mu g/m^3$)
Grist Lake South	12	12	6%	12	0.419
Winefred Lake Lodge 1	12	12	1%	12	0.358
Winefred Lake West	12	12	2%	13	0.284
EnCana Camp	17	17	<1%	17	0.154
Winefred Cabin/Station/Lookout	11	11	<1%	12	0.197
Campground (Christina Lake)	16	16	2%	16	0.082
Wild Rice Operation 1	12	12	<1%	12	0.312
Wild Rice Operation 2	19	19	<1%	20	0.097
Fire Lookout Tower	13	13	1%	14	0.080
Devenish	11	11	<1%	11	0.095
Old Cabins and Settlement Area (Wiau Lake)	8	8	1%	8	0.084
Conklin	14	14	2%	15	0.079
Winefred Lake (IR 194B)	13	13	<1%	13	0.182
Operator's Residence (MEG House)	15	16	2%	16	0.163
Hunter/Trapper B (Joe Black's cabin)	15	16	1%	16	0.082
Hunter/Trapper A (Gary York's cabin)	16	16	2%	17	0.149
Christina Lake Lodge	17	18	2%	18	0.095
Janvier	11	11	3%	11	0.042
Ipitiak Lake	10	10	1%	10	0.165
LakeRAMPs94	15	16	1%	16	0.085
Conklin	15	15	2%	16	0.081
Behan	6	6	<1%	6	0.045
Margie	8	9	4%	9	0.068
Devenish	11	11	<1%	11	0.094
First Nations land - Heart Lake 167	4	4	1%	4	0.017
First Nations land - Heart Lake 167	4	4	<1%	4	0.014
First Nations land - Heart Lake 167	7	7	2%	7	0.030
First Nations land - Heart Lake 167	4	4	<1%	4	0.020
Winefred Lake (IR 194B)	12	13	4%	13	0.200
Winefred Lake (IR 194B)	12	12	1%	12	0.172
Winefred Lake (IR 194B)	12	12	3%	12	0.182
Winefred Lake (IR 194B)	14	14	<1%	14	0.189
Winefred Lake (IR 194B)	12	12	4%	12	0.190
Winefred Lake (IR 194B)	13	13	<1%	13	0.177
Winefred Lake 194B	12	12	2%	13	0.187
Winefred Lake	11	12	1%	12	0.309
KNOC Bar None Camp	16	17	1%	17	0.134
Jackfish Central Camp	13	14	1%	14	0.122

Receptor	Baseline (μg/m³)	Application (μg/m³)	Increase from Baseline to Application (%)	Planned Development (μg/m³)	Construction (μg/m³)
J2 Operations Camp	13	14	<1%	14	0.146
J2 Operations Camp	13	14	<1%	14	0.146
J2 Operations Camp	13	14	<1%	14	0.146
J2 Operations Camp	13	14	<1%	14	0.146
J2 Operations Camp	13	14	<1%	14	0.146
Industrial Campsite	12	12	2%	14	0.099
Industrial Campsite	9	9	4%	9	0.085
Trapper's Cabin	11	11	<1%	11	0.229
Industrial Campsite	17	17	<1%	20	0.123
Trapper's Cabin	12	12	3%	12	0.463
Recreational Campsites	12	12	1%	12	0.335
Non-industrial campsite	12	12	<1%	12	0.309
Hunting/Fishing Lodge or Camp	12	12	<1%	12	0.360
Trapper's Cabin	12	12	<1%	12	0.362
Commercial Campsites	12	13	6%	13	0.372
Commercial Campsites	16	16	<1%	17	0.143
Industrial Campsite	16	16	2%	17	0.147
Industrial Campsite	13	13	1%	13	0.794
Industrial Campsite	11	11	<1%	12	0.588
Commercial Campsites	17	17	2%	17	0.138
Industrial Campsite	17	17	1%	17	0.134
Industrial Campsite	22	22	<1%	22	0.131
Industrial Campsite	14	15	2%	15	0.051
Industrial Campsite	16	16	2%	16	0.053
Commercial Recreational Development	17	17	2%	17	0.090
Industrial Campsite	19	20	3%	20	0.072
Industrial Campsite	9	9	3%	9	0.134
Trapper's Cabin	11	11	<1%	11	0.106
Trapper's Cabin	12	12	<1%	12	0.107
Industrial Campsite	12	13	2%	13	0.071
Industrial Campsite	12	12	2%	12	0.067
Frank Nashim Trappers Cabin	9	9	<1%	9	0.074
Trapper's Cabin	9	9	<1%	9	0.074
Commercial Campsites	12	12	2%	12	0.065
Industrial Campsite	11	11	1%	12	0.063
Firefighter Base Camp Helipad Rapel Tower	10	10	1%	10	0.058
Industrial Campsite	10	10	2%	11	0.053
Industrial Campsite	9	9	2%	10	0.047

Receptor	Baseline ($\mu g/m^3$)	Application ($\mu g/m^3$)	Increase from Baseline to Application (%)	Planned Development ($\mu g/m^3$)	Construction ($\mu g/m^3$)
Industrial Campsite	8	8	2%	8	0.038
Industrial Campsite	8	8	2%	8	0.035
Industrial Campsite	6	6	<1%	6	0.029
Steep Banks and Wappau Lakes Recreation Area	6	6	<1%	7	0.040
Steep Banks and Wappau Lakes Recreation Area	6	6	<1%	6	0.037
Trapper's Cabin	6	7	<1%	7	0.040
Industrial Campsite	8	8	1%	8	0.048
Industrial Campsite	6	6	2%	7	0.033
Trapper's Cabin	4	4	<1%	4	0.025
Trapper's Cabin	4	4	<1%	4	0.025
Residence outdated expiry still listed active	4	4	<1%	4	0.025
Residence - Unserviced	4	4	<1%	4	0.025
Limited to Metis Residence	4	4	<1%	4	0.025
Commercial Recreational Development	5	5	1%	5	0.029
Industrial Campsite	5	5	1%	6	0.031
Steep Banks and Wappau Lakes Recreation Area	5	5	1%	5	0.031
Trapper's Cabin	5	5	1%	5	0.029
Commercial Recreational Development	12	13	3%	13	0.428
Industrial Campsite	13	13	3%	14	0.072
Industrial Campsite	12	12	2%	12	0.062
Industrial Campsite	16	16	2%	16	0.115
Industrial Campsite	8	8	3%	8	0.034
Commercial CampsitesS	13	13	2%	14	0.078
Industrial Campsite	13	14	2%	14	0.121
Industrial Campsite	19	19	<1%	20	0.115
Industrial Campsite	14	14	<1%	15	0.240
Hunting/Fishing Lodge or Camp	12	12	2%	12	0.453
Hunting/Fishing Lodge or Camp	5	5	2%	6	0.027
Industrial Campsite	4	4	<1%	4	0.015
Trapper's Cabin	16	16	2%	17	0.148
Trapper's Cabin	12	12	<1%	13	0.383
Indian Reserve	4	4	<1%	4	0.020
Indian Reserve	7	7	2%	7	0.033
Metis Local	15	15	2%	16	0.081
Indian Reserve	12	13	4%	13	0.200
AAAQO	80	80	n/a	80	80

Receptor	Baseline (µg/m³)	Application (µg/m³)	Increase from Baseline to Application (%)	Planned Development (µg/m³)	Construction (µg/m³)
Maximum 24-hour					
Overall Maximum (MPOI)	**13**	**13**	**<1%**	**13**	**29**
Winefred Lake IR 194B (NW)	7	7	2%	7	0.082
Conklin	7	7	2%	7	0.030
Chard	6	6	2%	6	0.023
PTI Christina Lake Lodge	4	5	5%	5	0.040
Heart Lake IR 167	3	3	3%	3	0.008
MEG CLRP Camp	7	7	2%	7	0.083
Cenovus Narrows Lake	10	10	2%	10	0.045
CNRL Kirby	5	5	4%	5	0.050
Devon Jackfish	6	6	2%	6	0.037
KNOC BlackGold	7	7	3%	7	0.047
Petrobank Whitesands and May River	6	6	2%	6	0.021
Statoil KKD	4	4	2%	5	0.013
Winefred Lake Lodge 1	6	6	<1%	6	0.154
Trapper's Cabin (SW of Plant)	7	7	2%	8	0.062
Camp Site (NW of Plant)	7	7	3%	7	0.058
Fish Plant (Winefred Lake)	6	6	<1%	6	0.206
Cabin (Winefred Lake)	6	6	<1%	6	0.192
Cabin (NW Kirby Lake)	6	6	2%	6	0.125
West Hay Lake	7	7	2%	7	0.083
Cabins (North Hay Lake)	7	7	2%	7	0.086
Martin's Cabins	7	7	2%	7	0.050
Metis Trailer Camp	7	7	2%	7	0.049
Conklin	7	7	2%	7	0.030
Cabins (NW Christina Lake)	8	8	2%	9	0.032
Medicinal Plants	7	8	2%	8	0.033
Cabins near Gravel Pit	8	8	2%	8	0.028
Cabins	8	8	2%	8	0.026
Leismer	9	9	2%	9	0.021
East Chard	6	6	2%	6	0.024
IR 194B	6	7	3%	7	0.090
Fishing Camp (Christina Lake)	7	7	2%	8	0.075
Fire Lookout 1	8	8	<1%	8	0.102
AltaGas House (renamed MEG House)	7	7	2%	8	0.076
Grave Site (Christina Lake)	8	8	2%	8	0.072
Grave Site (Winefred Lake)	6	6	2%	7	0.095
Grist Lake Lodge 1	6	6	<1%	6	0.183
Grist Lake South	6	6	<1%	6	0.164

Receptor	Baseline (μg/m³)	Application (μg/m³)	Increase from Baseline to Application (%)	Planned Development (μg/m³)	Construction (μg/m³)
Winefred Lake Lodge 1	6	6	<1%	6	0.154
Winefred Lake West	6	6	<1%	6	0.119
EnCana Camp	8	8	1%	8	0.071
Winefred Cabin/Station/Lookout	8	8	<1%	8	0.090
Campground (Christina Lake)	8	8	2%	8	0.031
Wild Rice Operation 1	6	6	<1%	6	0.134
Wild Rice Operation 2	10	10	2%	10	0.039
Fire Lookout Tower	6	6	2%	6	0.027
Devenish	5	5	1%	5	0.032
Old Cabins and Settlement Area (Wiau Lake)	4	4	4%	5	0.035
Conklin	7	7	2%	7	0.030
Winefred Lake (IR 194B)	7	7	2%	7	0.082
Operator's Residence (MEG House)	7	8	2%	8	0.080
Hunter/Trapper B (Joe Black's cabin)	7	8	2%	8	0.045
Hunter/Trapper A (Gary York's cabin)	7	7	2%	8	0.076
Christina Lake Lodge	8	8	2%	9	0.034
Janvier	5	5	2%	5	0.023
Ipitiak Lake	4	4	<1%	5	0.069
LakeRAMPs94	7	8	1%	8	0.047
Conklin	7	8	2%	8	0.030
Behan	4	4	2%	4	0.021
Margie	4	4	5%	4	0.025
Devenish	5	5	<1%	5	0.032
First Nations land - Heart Lake 167	3	3	3%	3	0.007
First Nations land - Heart Lake 167	2	2	3%	2	0.006
First Nations land - Heart Lake 167	3	4	3%	4	0.014
First Nations land - Heart Lake 167	3	3	2%	3	0.008
Winefred Lake (IR 194B)	6	6	2%	7	0.096
Winefred Lake (IR 194B)	7	7	3%	7	0.082
Winefred Lake (IR 194B)	6	7	4%	7	0.089
Winefred Lake (IR 194B)	7	7	2%	7	0.085
Winefred Lake (IR 194B)	6	6	3%	7	0.092
Winefred Lake (IR 194B)	7	7	2%	7	0.080
Winefred Lake 194B	6	7	3%	7	0.089
Winefred Lake	6	6	<1%	6	0.148
KNOC Bar None Camp	7	7	2%	7	0.048
Jackfish Central Camp	6	6	2%	6	0.037
J2 Operations Camp	7	7	2%	7	0.042

Receptor	Baseline (µg/m³)	Application (µg/m³)	Increase from Baseline to Application (%)	Planned Development (µg/m³)	Construction (µg/m³)
J2 Operations Camp	7	7	2%	7	0.042
J2 Operations Camp	7	7	2%	7	0.042
J2 Operations Camp	7	7	2%	7	0.042
J2 Operations Camp	7	7	2%	7	0.042
Industrial Campsite	7	8	3%	8	0.041
Industrial Campsite	4	4	5%	5	0.030
Trapper's Cabin	6	6	<1%	6	0.092
Industrial Campsite	8	8	3%	9	0.050
Trapper's Cabin	6	6	<1%	6	0.185
Recreational Campsites	6	6	<1%	6	0.115
Non-industrial campsite	6	6	<1%	6	0.129
Hunting/Fishing Lodge or Camp	6	6	<1%	6	0.150
Trapper's Cabin	6	6	<1%	6	0.151
Commercial Campsites	6	6	<1%	6	0.176
Commercial Campsites	7	7	1%	8	0.059
Industrial Campsite	8	8	2%	8	0.073
Industrial Campsite	6	6	1%	7	0.364
Industrial Campsite	6	6	<1%	6	0.272
Commercial Campsites	7	7	2%	7	0.051
Industrial Campsite	7	7	2%	7	0.048
Industrial Campsite	10	10	<1%	10	0.058
Industrial Campsite	6	6	2%	6	0.023
Industrial Campsite	6	7	2%	7	0.024
Commercial Recreational Development	8	8	2%	8	0.032
Industrial Campsite	9	9	2%	9	0.026
Industrial Campsite	5	5	4%	5	0.050
Trapper's Cabin	4	5	2%	5	0.045
Trapper's Cabin	5	5	<1%	5	0.031
Industrial Campsite	6	6	2%	6	0.028
Industrial Campsite	6	6	2%	6	0.027
Frank Nashim Trappers Cabin	4	4	4%	4	0.036
Trapper's Cabin	4	4	4%	4	0.036
Commercial Campsites	6	6	2%	6	0.021
Industrial Campsite	5	5	2%	5	0.020
Firefighter Base Camp Helipad Rapel Tower	5	5	2%	5	0.019
Industrial Campsite	5	5	2%	5	0.018
Industrial Campsite	5	5	2%	5	0.016
Industrial Campsite	4	4	2%	5	0.013

Receptor	Baseline (μg/m³)	Application (μg/m³)	Increase from Baseline to Application (%)	Planned Development (μg/m³)	Construction (μg/m³)
Industrial Campsite	4	4	2%	4	0.013
Industrial Campsite	4	4	2%	4	0.012
Steep Banks and Wappau Lakes Recreation Area	3	3	4%	3	0.018
Steep Banks and Wappau Lakes Recreation Area	3	3	3%	3	0.019
Trapper's Cabin	3	3	3%	3	0.022
Industrial Campsite	4	5	1%	5	0.017
Industrial Campsite	3	3	1%	4	0.011
Trapper's Cabin	3	3	3%	3	0.011
Trapper's Cabin	3	3	3%	3	0.011
Residence outdated expiry still listed active	3	3	3%	3	0.011
Residence - Unserviced	3	3	3%	3	0.011
Limited to Metis Residence	3	3	3%	3	0.011
Commercial Recreational Development	3	3	4%	3	0.012
Industrial Campsite	3	3	4%	3	0.013
Steep Banks and Wappau Lakes Recreation Area	3	3	4%	3	0.014
Trapper's Cabin	3	3	3%	3	0.014
Commercial Recreational Development	6	6	<1%	6	0.212
Industrial Campsite	7	7	2%	7	0.029
Industrial Campsite	6	6	2%	6	0.025
Industrial Campsite	8	8	2%	8	0.039
Industrial Campsite	4	4	2%	4	0.012
Commercial CampsitesS	6	6	2%	6	0.029
Industrial Campsite	6	6	2%	6	0.037
Industrial Campsite	9	9	2%	9	0.052
Industrial Campsite	7	7	<1%	7	0.062
Hunting/Fishing Lodge or Camp	6	6	<1%	6	0.182
Hunting/Fishing Lodge or Camp	3	3	4%	3	0.012
Industrial Campsite	2	2	5%	2	0.006
Trapper's Cabin	7	7	2%	8	0.076
Trapper's Cabin	6	6	<1%	6	0.147
Indian Reserve	3	3	2%	3	0.008
Indian Reserve	3	4	3%	4	0.014
Metis Local	7	8	2%	8	0.030
Indian Reserve	6	6	2%	7	0.096
AAAQO	29	29	n/a	29	29

Table B5-5: Baseline Sulphur Dioxide and Nitrogen Dioxide Concentrations and Comparison to Lower Athabasca Regional Plan Triggers

Maximum Concentrations	Maximum AQRSA	LARP Trigger Level	Maximum AQLSA	LARP Trigger Level
SO_2 1-h 99th percentile (µg/m^3)	249	Level 4	166	Level 4
SO_2 annual (µg/m^3)	35.8	Exceeds limit	27.0	Level 2
NO_2 1-h 99th percentile (µg/m^3)	211	Level 4	211	Level 3
NO_2 annual (µg/m^3)	80.0	Exceeds limit	80.0	Exceeds limit

Notes:
The values incorporate all applicable background sources.

Table B5-6: Project-Alone and Application Case Sulphur Dioxide and Nitrogen Dioxide Concentrations and Comparison to Lower Athabasca Regional Plan Triggers

Maximum Concentrations	Maximum AQRSA	LARP Trigger Level	Maximum AQLSA	LARP Trigger Level
Project-Alone Case				
SO_2				
1-h 99th percentile (µg/m^3)	150	Level 4	150	Level 1
Annual (µg/m^3)	18.0	Level 3	18.0	Level 1
NO_2				
1-h 99th percentile (µg/m^3)	65.8	Level 2	65.8	Level 1
Annual (µg/m^3)	10.4	Level 1	10.4	Level 1
Application Case				
SO_2				
1-h 99th percentile (µg/m^3)	249	Level 4	166	Level 4
Annual (µg/m^3)	35.9	Exceeds limit	27.1	Level 2
NO_2				
1-h 99th percentile (µg/m^3)	211	Level 4	211	Level 3
Annual (µg/m^3)	80.0	Exceeds limit	80.0	Exceeds limit

Notes:
The values incorporate all applicable background sources.

Table B5-7: Planned Development Case Sulphur Dioxide and Nitrogen Dioxide Concentrations and Comparison to Lower Athabasca Regional Plan Triggers

Maximum Concentrations	Maximum AQRSA	LARP Trigger Level	Maximum AQLSA	LARP Trigger Level
SO_2 1-h 99th percentile (µg/m^3)	249	Level 4	166	Level 4
SO_2 annual (µg/m^3)	41.8	Exceeds limit	28.1	Level 2
NO_2 1-h 99th percentile (µg/m^3)	211	Level 4	211	Level 3
NO_2 annual (µg/m^3)	80.1	Exceeds limit	80.1	Exceeds limit

Note:
The values incorporate all applicable background sources.

Table B5-8: Annual Potential Acid Deposition Predicted by CALPUFF for the Baseline, Application and Planned Development Cases

Deposition Parameter	Baseline	Application	Planned Development
Maximum annual average deposition in the AQRSA (keq H^+/ha/y)	2.86	2.88	2.89
Maximum annual average deposition in the AQLSA (keq H^+/ha/y)	2.86	2.88	2.89
Area above 0.17 keq H^+/ha/y (kha)	68.2	71.4	78.2
Area above 0.22 keq H^+/ha/y (kha)	27.4	30.5	32.4
Area above 0.25 keq H^+/ha/y (kha)	18.5	18.5	20.8
Area above 0.50 keq H^+/ha/y (kha)	2.0	2.1	2.3
Area above 1.00 keq H^+/ha/y (kha)	0.4	0.4	0.4

Table B5-9: CALPUFF Predicted One-Degree Averaged Potential Acid Deposition Values

Longitude (°)	Latitude (°)	Baseline (keq H^+/ha/y)	Application (keq H^+/ha/y)	Planned Development (keq H^+/ha/y)
-111	55	0.053	0.054	0.057
-110	55	0.011	0.012	0.013

Table B5-10: Annual Nitrogen Deposition Predicted by CALPUFF

Deposition Parameter	Baseline	Application	Planned Development
Maximum annual average deposition in the AQRSA (kg/ha/y)	40.9	41.1	41.1
Maximum annual average deposition in the AQLSA (kg/ha/y)	40.9	41.1	41.1
Area above 5 kg/ha/y (kha)	7.54	7.63	8.09
Area above 10 kg/ha/y (kha)	1.01	1.02	1.04
Area above 15 kg/ha/y (kha)	0.417	0.421	0.424
Area above 20 kg/ha/y (kha)	0.086	0.087	0.089

2.0 REFERENCES

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