Environment

Simplot

Appendix A. Air Quality Dispersion Modelling Report

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Date:

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AECOM: 2015-01-06

Revision Log

Revision #	Revised By	Date	Issue / Revision Description
1	EP	May 29, 2015	Draft Report v1
2	MG	June 15, 2015	Final Report
3			
4			

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Executive Summary

The J.R. Simplot Company potato processing plant is located within the Poplar Bluff Industrial Park in the Rural Municipality of Portage la Prairie, Manitoba. The plant processes raw potatoes into french fries and pre-formed potato products and is proposing to increase its capabilities and capacity. The emissions associated with the potato processing and facility operations have been modelled as per Manitoba Conservation and Water Stewardship *Draft Guidelines for Air Quality Dispersion Modelling Manitoba (MCWS, November 2006)* and *Draft Air Dispersion Modelling Protocol for Assessing Odour Impacts in Manitoba (MCWS, November 2006)*.

An air dispersion modelling assessment was completed to estimate the maximum modelled concentrations of particulate matter less than 2.5 micrometers ($PM_{2.5}$), particulate matter less than 10 micrometers (PM_{10}), carbon monoxide (CO), nitrogen dioxide (NO_2), sulphur dioxide (SO_2) and odours. Two scenarios were modelled - the existing baseline conditions and the proposed alteration. AERMOD (Version #14134) is a steady-state Gaussian plume model that was selected as the preferred model for this application.

The modelled concentration of the pollutants was then added to existing background ambient air quality conditions to determine their cumulative impact. This cumulative impact was then compared to the applicable air quality criteria based on the Manitoba Conservation and Water Stewardship (MCWS) Ambient Air Quality Criteria.

To provide the worst case results, the emission parameters used in the air quality assessment for both the baseline and the proposed alteration were based on conservative emission rates with the plant at maximum production rates. If any of modelled results showed cumulative concentrations greater than the ambient air quality criteria, an additional model was run showing normal or average emission parameters.

$PM_{2.5}$, PM_{10} and NO_2 show a predicted maximum concentration above the respective Maximum Acceptable Level ("MAL"). The maximum predicted concentrations occur within 20m of the property boundary in a portion for former plant property that was sold to a private co-op grower for potato storage.

Although NO_2 exceeds the 1-hr average MAL of 400 $\mu g/m^3$, it is below the 1-hr average Maximum Tolerable Level ("MTL") of 1000 $\mu g/m^3$. The 24-hour and annual averaging periods are below the MAL.

The predicted maximum PM_{10} concentrations exceed the 24-hr average MAL of 50 $\mu g/m^3$. This exceedance is partially due to the high background ambient concentration of 37.3 $\mu g/m^3$, which is already 75% of the MAL. The concentrations due to the project itself are below the MAL. Furthermore, while the cumulative maximum predicted concentration is above the MAL, the concentrations at the nearest residence and the Dakota Tipi First Nation are below the threshold.

Due to the lack of data on $PM_{2.5}$ emissions, it has been conservatively assumed that $PM_{2.5}$ emission rates are equal to PM_{10} emission rates. The only difference between $PM_{2.5}$ and PM_{10} in this air quality assessment is the background concentration. While the maximum predicted $PM_{2.5}$ concentration is above the MAL, the concentrations at the nearest residence and the Dakota Tipi First Nation are below the threshold.

It is also important to note that the proposed alteration shows a 63% reduction in the maximum predicted $PM_{2.5}$ and a 54% reduction in PM_{10} concentration due to the addition of the WESP. The WESP will not only treat emissions from the proposed batter fryer line, but the existing Fryer 2 and Dryer 1 will also be connected. This increases the amount of overall $PM_{2.5}$ and PM_{10} mitigation at the Facility. For the purposes of modelling an 85% removal efficiency on PM from the fryer was assumed based on historical stack testing at comparable facilities. A zero removal efficiency on PM from the dryer was assumed because of the uncertainty in the ability to remove condensable PM (which typically is primarily $PM_{2.5}$) emitting from the process. In reality, there is likely to be some degree of removal of PM from the dryer emissions by the WESP.

In summary, no significant impacts to ambient air quality from the proposed alteration to the Facility are expected, especially given the reasonably isolated location of the Facility and the absence of sensitive receptors. Modelled ambient concentrations of CO, SO_2, NO_2 (24-hour and annual) and odour are all expected to be below the MAAQC. For 1-hour NO_2, there are no changes predicted from the baseline. For $PM_{2.5}$ and PM_{10}, predicted concentrations are expected to be reduced by over 50% of the baseline.

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Attachments

1. Introduction

The J.R Simplot Company ("Simplot") potato processing plant is located within the Poplar Bluff Industrial Park in the Rural Municipality of Portage la Prairie, Manitoba. The J.R Simplot Company potato processing plant (herein referred to as "the Facility") processes raw potatoes into french fries and pre-formed potato products and is proposing to increase its capabilities and capacity. The current Facility operates two production lines: Line 1 for conventional cut frozen french fries and Line 2 for pre-formed frozen product (*e.g.,* hash brown patties). Simplot is proposing to add a batter application system to the existing conventional french fry production line at their Portage facility. The location of the Facility is shown in **Figure 1.**

An air dispersion modelling assessment was completed to estimate the maximum modelled concentrations of particulate matter less than 2.5 micrometers ($PM_{2.5}$), particulate matter less than 10 micrometers (PM_{10}), carbon monoxide (CO), nitrogen dioxide (NO_2), sulphur dioxide (SO_2) and odours. The emissions associated with the current and proposed potato processing and facility operations have been modelled as per Manitoba Conservation and Water Stewardship (MCWS) Stewardship *Draft Guidelines for Air Quality Dispersion Modelling Manitoba (MCWS, November 2006)* and *Draft Air Dispersion Modelling Protocol for Assessing Odour Impacts in Manitoba (MCWS, November 2006)*. The maximum modelled concentrations were then compared to the MCWS thresholds as a means to evaluate the air quality impacts of the Facility.

Section 2 provides a Facility description including the buildings and emission sources. **Section 3** discusses the proposed alterations and impacts to the air emissions. **Section 4** discusses the various guidance documents referenced for Manitoba and other appropriate jurisdictions as they pertain to air dispersion modelling and air criteria/odour thresholds. **Section 5** describes, in detail, the methodology, procedures, and inputs into the dispersion modelling analysis. **Section 6** provides a discussion of the modelling results. **Section 7** summarizes the conclusions and significant findings of the study.

2. Facility Description

General Facility description and location information is included in Section 2 of the Notice of Alteration. **Table 1** details the Facility information including the name, address, and type. A site plan is shown in **Figure 1** depicting the property lines, location and orientation of current and proposed buildings, and location of the existing and proposed emission sources. The Facility currently comprises of two main buildings and plans to expand the manufacturing building to accommodate a new batter application system. Building dimensions are included in **Table 2.**

Emission sources, including seven (7) existing point sources for stacks and a flare, and twenty (20) existing volume sources for building area heaters are included in **Table 3**. Proposed emission source alterations are included in **Table 4.** The proposed alteration will add a point source (i.e., exhaust from a wet electrostatic precipitator) that treats and control the emissions from the proposed batter line fryer, existing Line 2 Fryer and the existing Line1 Dryer. The re-routing of the existing Line 2 Fryer and the existing Line1 Dryer exhausts eliminate those point sources in the proposed alteration model.

Table 1. Facility Information

Name of Facility	**J.R. Simplot Canada**
Facility Address	P.O. Box 1180; Portage La Prairie, MB; R1N 3J9
Type of Facility	Manufacturing plant

Table 2. Building Locations and Dimensions, as Modelled

	Location	Length (x) (m)	Width (y) (m)	Height (m)
Existing Cold Storage Warehouse	543180.83, 5535674.53	77.95	98.48	12.80
Existing Main Processing Area	543258.83, 5535706.22	301.20	49.04	10.82
Existing Waste Loadout and Oil Storage Area	543274.90, 5535692.82	36.58	13.71	9.14
Existing Truck Unloading and Wastewater Area	543498.93, 5535683.29	61.47	22.93	9.14
Proposed Expansion	543345.70, 5535755.05	159.85	24.82	10.82

Notes:

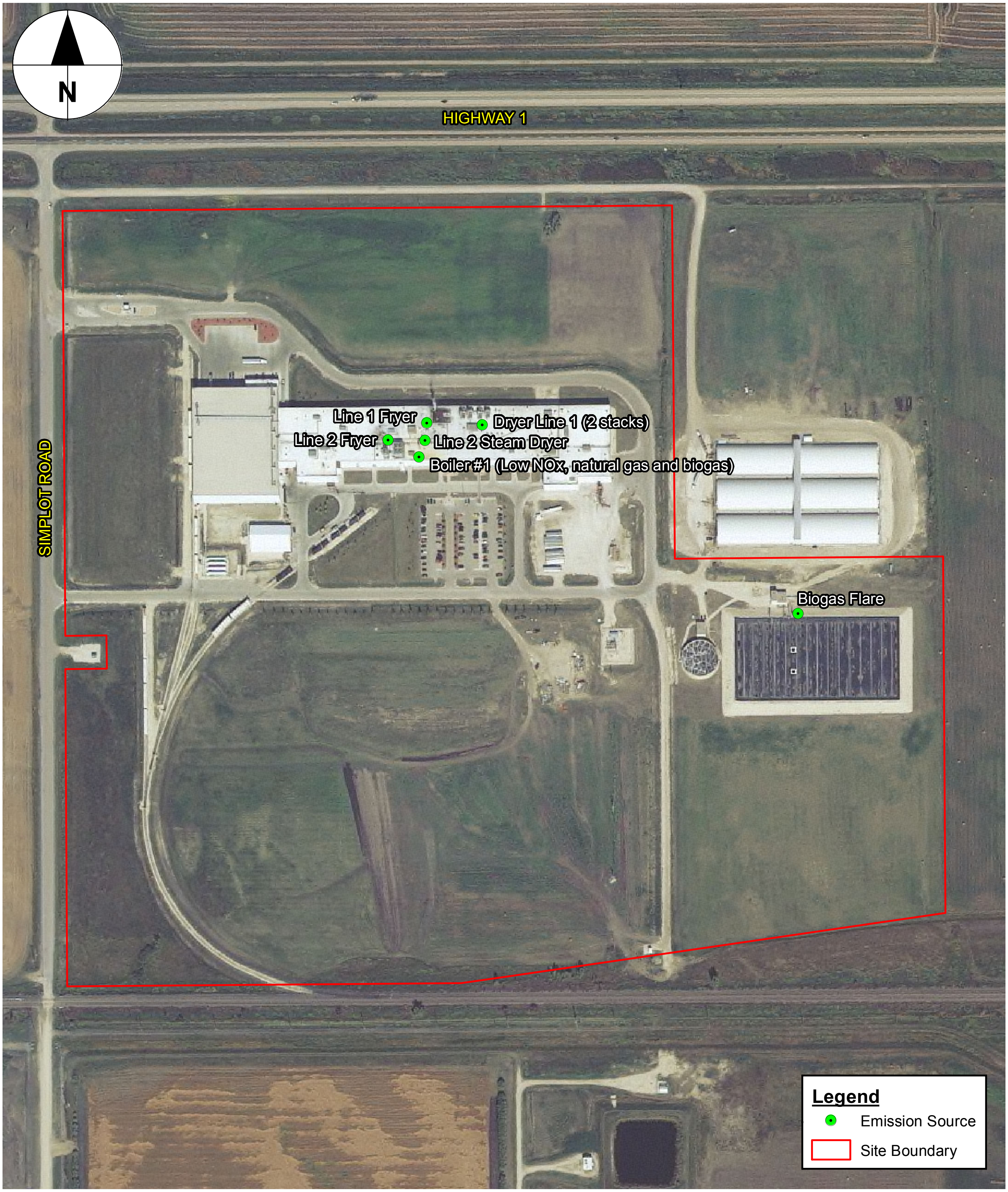
[1] All building segments listed above are part of a single continuous building but were segmented to facilitate insertion into AERMOD.

Table 3. Baseline Scenario Emission Source Locations

Emissions Source	Type	Easting (m)	Northing (m)	Existing/Proposed
Line 2 Fryer	Point	543361.00	5535731.00	Existing
Line 1 Fryer	Point	543396.29	5535746.5	Existing
Line 1 Dryer (4 stacks)	Point	543447.19	5535744.65	Existing
Line 2 Dryer	Point	543394.63	5535730.40	Existing
Boiler #1 (Low NO_x, Natural gas and Biogas)	Point	543389.16	5535715.16	Existing
Biogas Flare	Point	543736.80	5535571.68	Existing
Truck Unloading Room	Volume	543547.19	5535710.58	Existing
Raw Receiving Room	Volume	543539.21	5535740.77	Existing
Peeling/Trimming Room	Volume	543509.47	5535738.50	Existing
Waste Management/Raw Processing Room	Volume	543509.47	5535715.01	Existing
Waste Loading Room	Volume	543518.83	5535693.72	Existing
Main Processing/Service Area Room	Volume	543475.47	5535738.50	Existing
Line 1 Fryer Room	Volume	543450.00	5535740.00	Existing
Line 2 Fryer Room	Volume	543383.30	5535728.79	Existing
Packaging Room	Volume	543301.02	5535729.79	Existing
Scale Shaker Room	Volume	543350.30	5535742.79	Existing
Cold Grading Room	Volume	543375.30	5535738.79	Existing
Palletizing Room	Volume	543279.47	5535703.05	Existing
RTU1,2	Volume	543305.42	5535712.18	Existing
RTU3,12	Volume	543337.14	5535715.78	Existing
MUA1	Volume	543405.45	5535715.29	Existing
RTU4,5	Volume	543442.36	5535710.58	Existing
RTU6,7	Volume	543481.31	5535715.42	Existing
RTU8,9	Volume	543410.91	5535726.45	Existing
RTU10	Volume	543521.42	5535739.70	Existing
RTU11	Volume	543287.44	5535737.17	Existing

Table 4. Proposed Alteration Scenario Emission Source Locations

Emissions Source	Type	Easting (m)	Northing (m)	Existing/Proposed
Line 2 Steam Dryer	Point	543394.63	5535730.40	Existing
Boiler #1 (Low NO_x, Natural gas and Biogas)	Point	543389.16	5535715.16	Existing
Biogas Flare	Point	543736.80	5535571.68	Existing
Truck Unloading Room	Volume	543547.19	5535710.58	Existing
Raw Receiving Room	Volume	543539.21	5535740.77	Existing
Peeling/Trimming Room	Volume	543509.47	5535738.50	Existing
Waste Management/Raw Processing Room	Volume	543509.47	5535715.01	Existing
Waste Loading Room	Volume	543518.83	5535693.72	Existing
Main Processing/Service Area Room	Volume	543475.47	5535738.50	Existing
Line 1 Fryer Room	Volume	543450.00	5535740.00	Existing
Line 2 Fryer Room	Volume	543383.30	5535728.79	Existing
Packaging Room	Volume	543301.02	5535729.79	Existing
Scale Shaker Room	Volume	543350.30	5535742.79	Existing
Cold Grading Room	Volume	543375.30	5535738.79	Existing
Palletizing Room	Volume	543279.47	5535703.05	Existing
RTU1,2	Volume	543305.42	5535712.18	Existing
RTU3,12	Volume	543337.14	5535715.78	Existing
MUA1	Volume	543405.45	5535715.29	Existing
RTU4,5	Volume	543442.36	5535710.58	Existing
RTU6,7	Volume	543481.31	5535715.42	Existing
RTU8,9	Volume	543410.91	5535726.45	Existing
RTU10	Volume	543521.42	5535739.70	Existing
RTU11	Volume	543287.44	5535737.17	Existing
Wet Electrostatic Precipitator	Point	543382.55	535772.56	Proposed



50 0 50 100 m

1:5,000

NAD83 UTM zone 14N

Property Boundaries and Ortho Imagery: Manitoba Land Initiative

ANSI A 215.9mm x 279.4mm

Approved:

Checked:

Designer:

Project Management Initials:

Last saved by: KNOTTJ (2015-06-16) Last Plotted: 2015-05-25

Filename: P:\60343084\900-WORK\920-929 (GIS-GRAPHICS)\02_MXDS\H001_60343084_01V1_LTR_150506_SITE_PLAN.MXD

PORTAGE BATTER NOA
AIR DISPERSION MODELLING
J.R. SIMPLOT COMPANY
Project No.: 60343084 Date: 2015-05-25

SITE PLAN

AECOM

Figure: 1

3. Process Description

A detailed process description can be found in the Section 2 of the Notice of Alteration. Air emissions from the process come from combustion of natural gas/biogas and the processing equipment. The following are the existing primary air emission sources:

- Fryers (2);
- Dryers (2);
- Boiler (1);
- Biogas flare (1), and
- Building area heaters.

Minor and incidental emission sources have been evaluated but excluded from modelling because they have been deemed negligible or not measurable. These include:

- Fugitive dust from on-site roadways;
- Exhaust from transport trucks on site;
- Various fugitive building exhaust points;
- Vapours of solvents, maintenance chemicals and adhesives from the packaging area;
- Blancher exhaust (primarily water vapour);
- Peeler exhaust (primarily water vapour);
- Cooling tower (primarily water vapour);
- Sulphide oxidation system;
- Incidental emissions from fueling of vehicles;
- Welding/grinding associated with construction or maintenance repairs of the processing plant;
- Fugitive emissions from storage tanks and vessels for facility chemicals such as sodium hydroxide, magnesium hydroxide and various sanitary cleansers; and,
- Fugitive ammonia leaks from the refrigeration system.

The boiler is fueled with a combination of natural gas and biogas generated in the low rate anaerobic reactor (LRAR) process. Biogas is used as a natural gas supplement. Emissions from the boiler are normal products of natural gas combustion, although sulphur content in biogas is higher than natural gas which results in higher SO_2 emissions. Any biogas not consumed in the facility’s steam boiler is flared to reduce emissions. Combustion of natural gas and biogas at the facility is the source of CO and NO_2 emitted from the facility. The fryers and dryers are the major sources of PM to atmosphere, with a small amount from all of the other sources. The fryers are also the primary source of odour released from the Facility. The fryer lines are currently equipped with a mist eliminator that provides some mitigation of odours from the frying process.

As part of the proposed alteration, a wet electrostatic precipitator (“WESP”) will be installed and will tie in the proposed batter line fryer stack, the existing Line 2 fryer stack, as well as the four existing dryer stacks from the Line 1 Dryer. The WESP is a control device primarily designed for removal of particulate matter. The WESP is a Geoenergy E-Tube® with a design capacity of 68,500 ACFM. Note that the mist eliminators on the fryer lines will remain in place and operate in series with the proposed WESP.

All modelled emission sources for the baseline and proposed alteration are defined in **Section 5.2.5**.

4. Regulations, Guidelines, and Air Quality Criteria

4.1 Regulations and Guidelines

Table 5 outlines the guidelines used to provide a structured and reliable assessment of potential impacts that the Facility may have on ambient air quality. The Manitoba guidelines were used as the primary reference. Other out-of-province guidelines were used to supplement when necessary.

Table 5. Applicable Guidelines

Guideline	Agency	Rationale for Use
Draft Guidelines for Air Dispersion Modelling in Manitoba	Manitoba Conservation and Water Stewardship	This guideline is a resource that provides consistency in dispersion modelling across all regulatory applications.
Draft Air Dispersion Modelling Protocol for Assessing Odour Impacts in Manitoba	Manitoba Conservation and Water Stewardship	This guideline is a resource that provides consistency in dispersion modelling for odours across all regulatory applications.
Manitoba Ambient Air Quality Criteria (MAAQC)	Manitoba Conservation and Water Stewardship	Manitoba provides a listing of Ambient Air Quality Criteria and Guidelines for various air pollutants.
Alberta Air Quality Modelling Guideline	Alberta Environment and Sustainable Resource Development	This for dispersion modelling provides guidance on appropriate surface characteristics and receptor grids to supplement the Manitoba guidelines.
US EPA AERMOD Implementation Guide	Unites States Environmental Protection Agency	This guideline is a resource that helps with the use of the related modelling modules and programs (AERMOD, AERMAP, AERMET, AERSURFACE, AERSCREEN) and the required additional information.

4.2 Air Quality Criteria

The evaluation of ambient air quality typically relies on comparison of modelled concentrations to regulatory standards or objectives. The regulatory standards or objectives are designed by the local, provincial, or federal authority to be conservative and protective of air quality. MAAQC was used in this assessment. The assessment of air quality impacts are used to determine appropriateness of Facility design such as establishing preferred stack heights and control devices.

The parameters of concern for the Facility include:

- Fine Particulate ($PM_{2.5}$ and PM_{10});
- Carbon Monoxide (CO);
- Nitrogen Dioxide (NO_2);
- Sulphur Dioxide (SO_2); and
- Odours.

PM_{10} was selected to best represent particulate matter emissions from the development. As a part of the original environmental assessment (EA) conducted in 2001, the proponent was advised by Ms. Jean Van Dusen, P. Eng. of MCWS to model PM_{10} rather than total suspended particulate (TSP) as it was considered to be the parameter of concern.

Emissions of $PM_{2.5}$ also were not modelled in the original EIA. $PM_{2.5}$ emissions for the proposed alteration cannot be accurately quantified because stack test data was unavailable and other sources for emission factors do not address $PM_{2.5}$. Simplot's processes that potentially emit $PM_{2.5}$ create a wet stack environment. Methods requiring in-stack cyclone separators and filters cannot be used on wet sources of emissions. As a result, Simplot has assumed that both $PM_{2.5}$ and PM_{10} emissions are equal to TSP emissions based on data collected by third party stack testers at other Simplot facilities. While this approach may lead to overly conservative estimates of $PM_{2.5}$; any data quantifying $PM_{2.5}$ emissions would be speculative.

CO, NO_2, and SO_2 were selected as they are the by-products of fuel combustion from the dryers, boilers, flare and building heating system.

VOC emission rates have been evaluated because VOCs are a precursor to ozone formation. However, because ozone is a reactive air pollutant influenced by sunlight in the presence of NO_x, it is typically not included in modeling scenarios. Furthermore, there are no significant sources of VOCs at the Facility nor was it included in the original 2001 EIA.

The applicable air quality criteria are summarized in **Table 6.**

Table 6. Manitoba Ambient Air Quality Criteria

Name of Pollutant	Units of Measurement	Averaging Period	Maximum Tolerable Level Concentration	Maximum Acceptable Level Concentration	Maximum Desirable Level Concentration
$PM_{2.5}$	µg/m³	24 hours		30	
PM_{10}	µg/m³	24 hours		50	
CO	mg/m³	1 hour 8 hours	20	35 15	15 6
NO_2	µg/m³	1 24 Annual	1000	400 200 100	60
Odours	Odour Units	3 min		2 – residential 7 – industrial	<1
SO_2	µg/m³	1 24 Annual	800	900 300 60	450 150 30

5. Methodology

The Facility was assessed in the format of a Refined Assessment in accordance with the *Draft Guidelines for Air Quality Dispersion Modelling Manitoba* (MCWS, November 2006) and *Draft Air Dispersion Modelling Protocol for Assessing Odour Impacts in Manitoba (MCWS, November 2006)*.

The air emissions from the Facility were modelled using emission estimates based on design information as described in **Section 5.2.5**. The modelling results are summarized in the form of tables, in **Section 6**, and isopleths, in **Attachment A**. Isopleths provide pollutant concentration contour plots. The isopleths and the maximum modelled concentration results were used to assess the potential for concerns at the receptor with the highest modelled concentration and to compare to the MAAQC.

Details on the preparation of the modelled source emissions, stack parameters and the dispersion modelling methods (i.e. meteorological and terrain data) are discussed in detail in this Section.

5.1 Boundaries

Boundaries for the air quality modelling assessment are categorized in two ways: spatial and temporal. The modelled concentrations from the Facility and comparison with air quality criteria (as noted in **Section 4**) are investigated within these defined boundaries.

5.1.1 Spatial Boundary

The study area for this modelling assessment was based on a 10 km by 10 km domain surrounding the Facility to assess where the emissions may impact. This is based on the conservative model approach from the *Draft Guidelines for Air Quality Dispersion Modelling in Manitoba* . A survey of this area showed that there were not any sensitive receptors such as schools, hospitals, senior homes, community centers or public recreation areas as defined by the Guidelines within the spatial boundary. Nonetheless, discrete receptors were added to the model to show predicted concentrations at nearby residences and at the Dakota Tipi First Nation, approximately 4 km away from the Facility. There were receptors set around the property boundary and a fine and coarse receptor grid was defined for the whole domain. For further discussion on the receptor grid and discrete receptors included in the model please see **Section 5.2.4**.

5.1.2 Temporal Boundary

Temporal boundaries for this assessment have been developed in consideration of continuous operations and emissions from the facility. The maximum concentrations modelled are based on the Facility operating 24 hours per day, seven days per week. The Facility typically operates 282 days per year, however after the proposed addition is complete will likely run 300 days per year. The model assumed 365 days of operation to assess worst case emission scenarios.

For air emissions, the temporal boundary also includes several time averaging periods including 3 minute, 1-hour, 8-hour, 24-hour, and annual time periods. The potential effects on air quality are presented in accordance with the time periods outlined for the identified air quality criteria in **Section 2.1**.

Other temporal boundaries include the time period for which meteorological conditions were assessed. Meteorological data for five (5) years, 2006-2010, were considered for the modelling assessment as they were the 5 most recent consecutive years with complete data available. Refer to **Section 5.2.1** for details.

5.2 Dispersion Modelling

Air dispersion models can be used to assess the likelihood of airborne contaminants from the Facility impacting a particular location. The use of these tools comes with a certain amount of uncertainty. Dispersion models mathematically predict the behaviour of emitted plumes by accounting for: emission rates, physical characteristics of the release, geometry and location of the sources as related to receptor locations, terrain effects, meteorology, and atmospheric dispersion.

The American Meteorological Society/Environmental Protection Agency Regulatory Model Improvement Committee (AERMIC) was formed to introduce state-of-the-art modelling concepts into the United States Environmental

Protection Agency's (US EPA's) air quality models. Through AERMIC, a modelling system, AERMOD, was introduced that incorporated air dispersion based on planetary boundary layer turbulence structure and scaling concepts, including treatment of both surface and elevated sources and both simple and complex terrain (US EPA, 2004). One of the regulatory approved dispersion models in Manitoba is AERMOD, as outlined in the *Draft Guidelines for Air Quality Dispersion Modelling in Manitoba (MCWS, 2006)*.

Given the likelihood that the highest modelled concentrations will occur in the near-field (within 1 km), it was decided that AERMOD was the preferred model for this assessment. AERMOD (Version #14134) was also selected for this application because of its ability to account for:

1. Directional and seasonal variations in land-use;
2. Building induced plume downwash, which can affect the sources plume rise;
3. Dispersion in a mixed urban/forested environment; and
4. Terrain influences.

AERMOD also considers variable urban treatment as a function of city population and can selectively model sources as rural or urban. Based on the *Draft Guidelines for Air Quality Dispersion Modelling in Manitoba (MCWS, 2006)* the Facility was modelled as Rural, as types I1, I2, C1, R2, and R3 account for less than 50% of the 3km area.

In addition, AERMET and AERMAP, AERMOD's meteorological and terrain pre-processors, were employed to process meteorological data and terrain data inputs for AERMOD. Modelling was conducted in accordance with the 2006 *Draft Guidelines for Air Quality Dispersion Modelling in Manitoba*, where applicable. Where the Guidelines did not address a particular modelling element, the Alberta *Air Quality Modelling Guideline (ESRD 2013)* and the US EPA *AERMOD Implementation Guide (Revised)* (2009) were used as guidance.

5.2.1 Meteorology

Air quality is dependent on the rate of pollutant emissions into the atmosphere and the ability of the atmosphere to disperse the pollutant emissions. The dispersion of air pollutants is affected by local meteorological patterns. The wind direction controls the path that air pollutants follow from the point of emission to the receptors. In addition, wind speeds affect the time taken for pollutants to travel from source to receptor and the distance over which air pollutants travel. As a result, wind speeds also impact the dispersion of air pollutants. Therefore, it is important to assess local meteorological patterns to assess potential air quality effects.

AERMET (Version #14134), AERMOD's meteorological pre-processor requires hourly surface observations along with concurrent twice-daily upper air observations. As such, the dispersion modelling used five years (2006-2010) of meteorological data from Winnipeg James Armstrong International Airport along with concurrent upper air data from International Falls, Minnesota as the closest source of complete upper air quality data with a similar thermal profile and elevation to Portage la Prairie. 2006-2010 were chosen for the surface and upper air data as they were the most recent consecutive data set with acceptable quality and completeness. **Figure 2** shows a 5-year (2006-2010) wind rose for Winnipeg International Airport and **Figure 3** shows a frequency distribution of the wind over 7 wind speed class ranges.

Figure 2 shows that the winds are calm approximately 2.4 percent of the time over the five-year period. Calm is defined in this instance as when the winds are less than the starting threshold of the anemometer (0.5 m/s). It is not likely the 2.4 percent calm hours represented are truly calm for the entire hour; rather the winds are below the threshold of the anemometer at the time when the observation is taken.

AERMOD does not have the ability to model calm winds. As such, these events were not assessed as part of the dispersion modelling analysis. Conversely, AERMOD is conservative (over-predicts) during very low non-calm periods.

Figure 2. Windrose of Meteorological Data (Jan. 1, 2006 – Dec. 31, 2010)

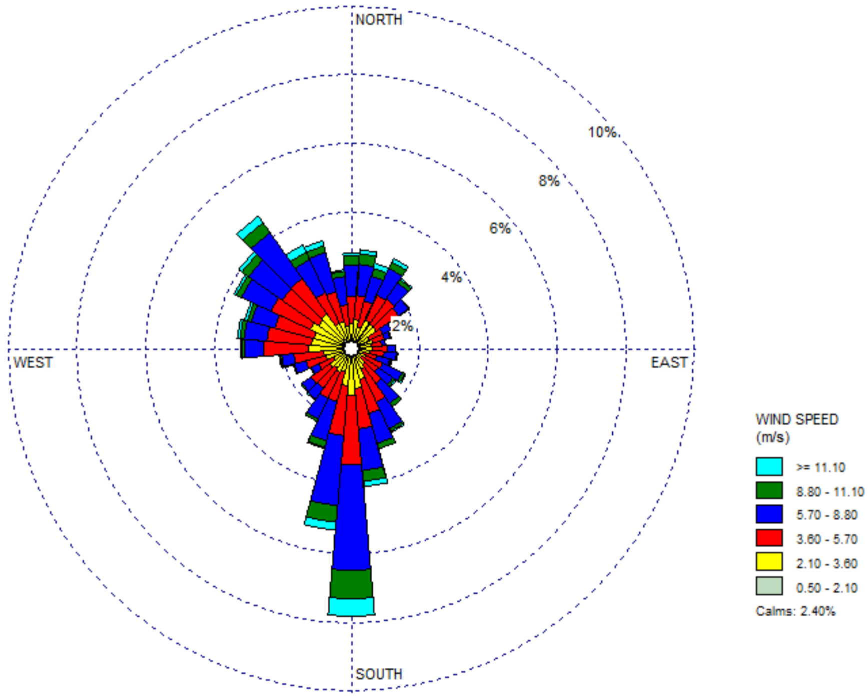
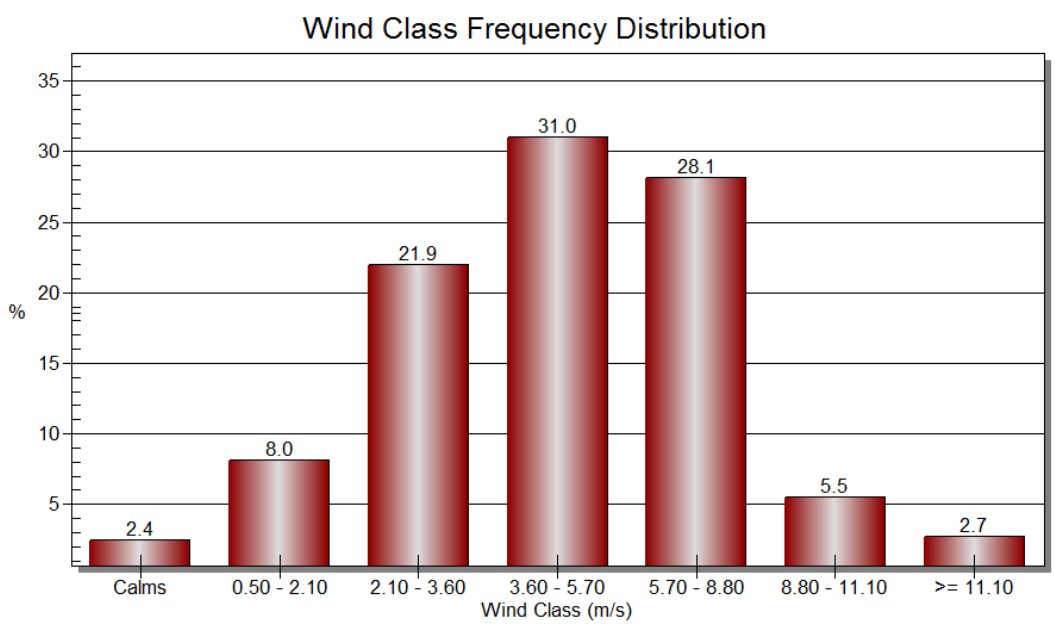


Figure 3. Wind Class Frequency Distribution of Meteorological Data (Jan. 1, 2006 – Dec. 31, 2010)



The five years of surface meteorological data, taken from the Winnipeg James Armstrong International Airport, were obtained from the National Climate Data Center's (NCDC) ftp site (ftp://ftp.ncdc.noaa.gov/pub/data/noaa) in the Integrated Surface Hourly (ISH) format. The ISH-formatted surface data is able to be used directly by AERMET.

Data from more recent years were missing important meteorological readings including cloud cover and wind direction for more than 10% of the available data.

The five years of upper air data were obtained from the National Oceanic and Atmospheric Administration / Earth System Research Laboratory (NOAA/ESRL) Radiosonde Database in Forecast System Laboratory (FSL) format. The FSL-formatted upper air data is able to be used directly by AERMET.

AERMET produces surface scalar parameters and vertical profiles of meteorological data as an input for AERMOD. In order to quantify the boundary layer parameters needed by AERMOD, AERMET also requires specification of site-specific land use characteristics including surface roughness (z_o), albedo (r) and Bowen ratio (B_o). These site characteristics are used by AERMET, along with the meteorological data to help characterize the atmospheric boundary layer and dispersion. The boundary layer is quantified by AERMET in calculating parameters such as:

- Sensible heat flux;
- Surface friction velocity;
- Convective velocity scale;
- Vertical potential temperature gradient;
- Height of convectively-generated boundary layer;
- Height of mechanically-generated boundary layer; and
- Monin-obukhov length (m).

These boundary layer parameters are calculated on an hourly basis and are contained in AERMET's surface file. The surface file is read into AERMOD and these values are used to quantify the atmospheric dispersion.

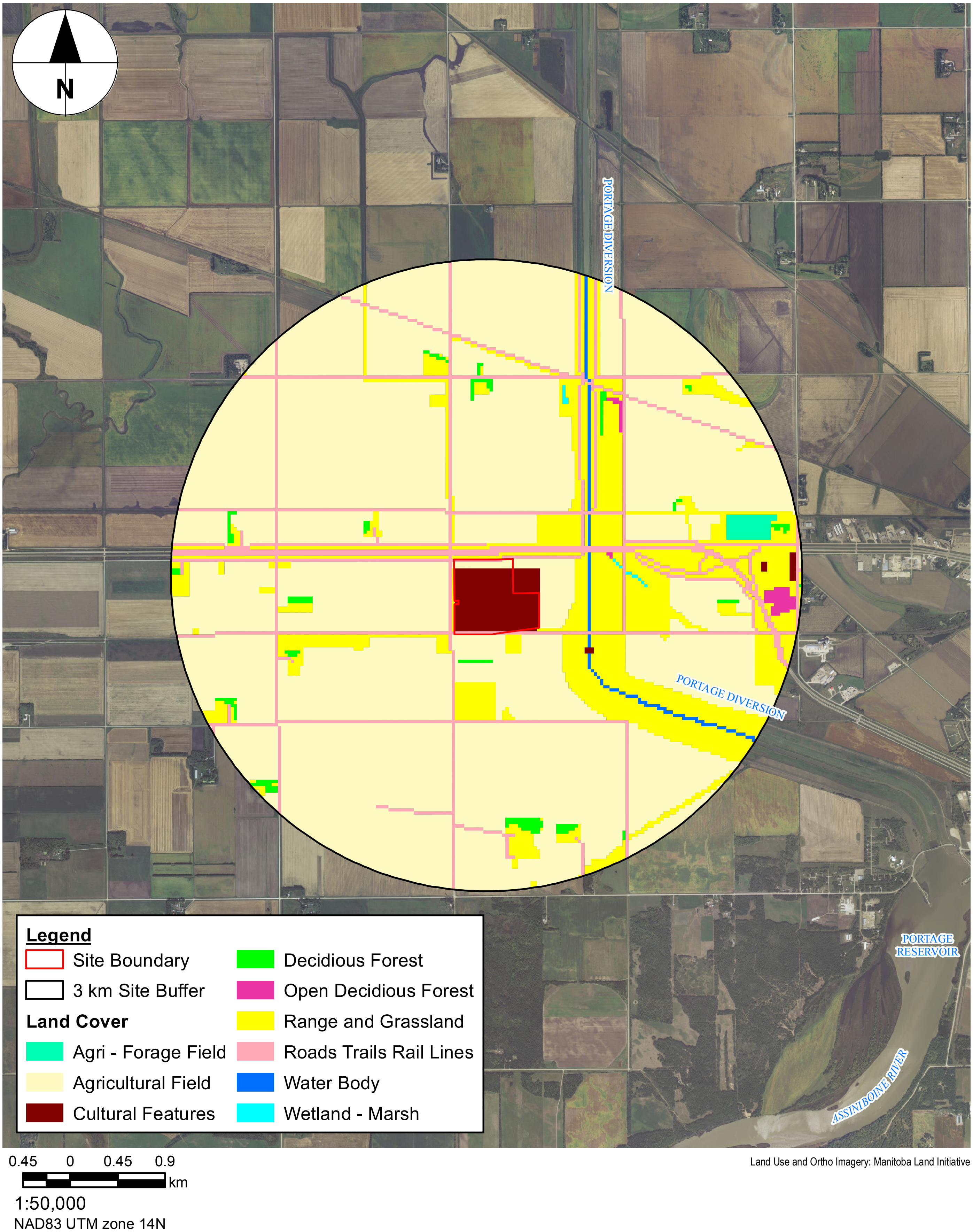
The land use surface characteristics surrounding the Facility site were quantified for this project and were determined based on specific land use surface characteristics provided to AERMET. The land use characteristics for this assessment were developed using the *Alberta Air Quality Model Guideline* (ESRD,2009) for calculating albedo, Bowen ratio, and surface roughness.

In the *Alberta Air Quality Model Guideline* (ESRD, 2009), the various land use categories are linked to a set of seasonal surface characteristics. As such, AERMET requires specification of the seasonal category for each month of the year. The following four seasonal categories are supported by the Guidelines, with the applicable months of the year specified for this assessment.

1. Spring when vegetation is emerging or partially green (April-May);
2. Summer when vegetation is lush and healthy (June-September);
3. Autumn when periods of freezing conditions are common, grass is brown and no snow is present (October - November); and
4. Winter when there are subfreezing temperatures and snow-covered services (December-March).

The calculated albedo, Bowen ratio, and surface roughness values for this specific assessment was based on the Manitoba Land Initiative digital land use data, more specifically the Land Use/Land Cover Land Sat and TM maps version 2005-2006 for the Winnipeg Region.

Figure 4 shows the applicable land use data within 3 km (as edited based on the aerial photo graph) that was used to calculate land characteristics for this assessment.
Specifically, the land use values for input to AERMET were varied monthly. The calculation for each land use parameter is discussed below.



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PORTAGE BATTER NOA
AIR DISPERSION MODELLING
J.R. SIMPLOT COMPANY
Project No.: 60343084 Date: 2015-05-25

LAND USE
OVER A 3 km RADIUS

AECOM

Figure: 4

5.2.1.1 Topography

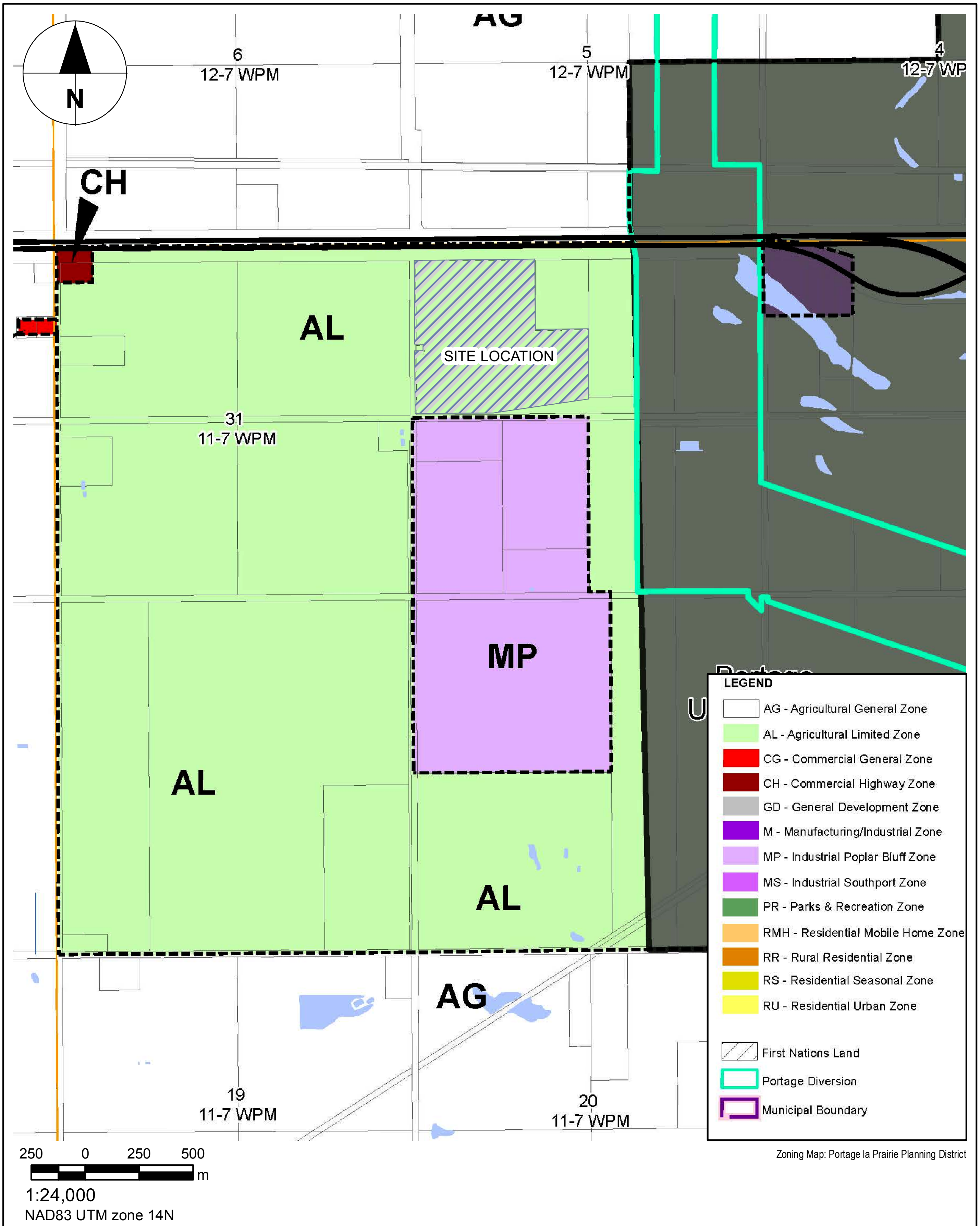
Topographical features, such as river valleys and mountainous terrain, can have an important effect on airflow and, therefore, the atmospheric dispersion. Examples of topographically induced circulations include mountain-valley circulations and flow around topographical boundaries. A valley in which a river flows could introduce wind tunnelling.

The terrain in the immediate vicinity of the Facility is relatively flat. The Facility's elevation is approximately 269m above sea level. Nevertheless, for this dispersion modelling assessment, terrain data was included and based on Canadian digital elevation data (CDED). This data was obtained from the GeoGratis Canada website. The appropriate region was selected based on the Universal Transverse Mercator (UTM) coordinates of the Project site. AERMAP, AERMOD's terrain pre-processor program prepares the input receptor terrain elevation data file for AERMOD. AERMAP (Model Version #11103) was employed to extract CDED DEM files for a 1:50,000 for the study area.

As seen in **Figure 4** and **Figure 5,** around the Facility there are multiple farms, Highway 1 to the immediate north of the facility, commercial/industrial development to the east. There are multiple water bodies in the area including Lake Manitoba to the North, and the Portage Diversion, the Assiniboine River and Crescent Lake are to the east of the Facility. There is no known terrain within 50km of the Facility that is higher than any of the modelled stacks. There are no significant terrain effects or predominant features within 3km of the Facility. The US border lies approximately 150 km south of the Facility.

5.2.1.2 Land-Use Characteristics

The *Draft Guidelines for Air Dispersion Modelling in Manitoba* stipulate that the land use of the surrounding 3km must be assessed using the Auer land use classification method to determine whether the urban dispersion coefficients should be based on rural or urban coefficients. In the model a rural coefficient was utilized to represent the surrounding area as less than 50% of the surrounding 3km were zones as heavy industrial, light-moderate industrial, commercial, single-family compact residential, and multifamily compact residential, as seen in **Figure 5**. In addition, in order to complete the meteorological preprocessing surface roughness, Albedo and Bowen ratio must be input. The land use characteristics were modelled for Cultivated Land.



Zoning Map: Portage la Prairie Planning District

1:24,000
NAD83 UTM zone 14N

PORTAGE BATTER NOA
AIR DISPERSION MODELLING
J.R. SIMPLOT COMPANY
Project No.: 60343084 Date: 2015-05-26

LAND USE ZONING

AECOM

Figure: 5

5.2.1.3 Surface Roughness

The surface roughness was calculated based on a 3-km radius surrounding the site from **Figure 4**. **Table 7** lists the surface roughness values that were input to AERMET for each month.

Table 7. Surface Roughness by Month as Input to AERMET

Month	Season	Monthly Weighted Surface Roughness
January	Winter	.01
February	Winter	.01
March	Winter	.01
April	Spring	.03
May	Spring	.03
June	Summer	.20
July	Summer	.20
August	Summer	.20
September	Summer	.20
October	Autumn	.05
November	Autumn	.05
December	Winter	.01

5.2.1.4 Albedo

The Albedo was calculated based on a 3-km radius surrounding the site from **Figure 4**. **Table 8** lists the Albedo values for each month that were input to AERMET.

Table 8. Albedo by Month used as Input to AERMET

Month	Season	Monthly Weighted Albedo by Sector
January	Winter	.60
February	Winter	.60
March	Winter	.60
April	Spring	.14
May	Spring	.14
June	Summer	.20
July	Summer	.20
August	Summer	.20
September	Summer	.20
October	Autumn	.18
November	Autumn	.18
December	Winter	.60

5.2.1.5 Bowen Ratio

The Bowen Ratio was calculated based on a 3-km radius surrounding the site shown in **Figure 4**. **Table 9** lists the Bowen ratio values for each month that were input to AERMET.

Table 9. Bowen Ratio by Month Used as Input to AERMET

Month	Season	Monthly Weighted Bowen Ratio by Sector
January	Winter	1.5
February	Winter	1.5
March	Winter	1.5
April	Spring	0.3
May	Spring	0.3
June	Summer	0.5
July	Summer	0.5
August	Summer	0.5
September	Summer	0.5
October	Autumn	0.7
November	Autumn	0.7
December	Winter	1.5

5.2.2 Background Ambient Air Quality

Background air quality information will be added to modelled conditions to appropriately assess the cumulative impacts of the Facility. The background concentrations of the modelled parameters were obtained from the nearest sources with available data. The locations of the data sources include Brandon, Manitoba (approximately 120 km west of the facility), and Winnipeg, Manitoba (approximately 85 km east of the facility). The background conditions at the applicable averaging periods over a period of 5 years from 2010 to 2015 are summarized in **Table 10**. The MAQQC is also shown for context, including the Maximum Tolerable Level ("MTL"), Maximum Acceptable Level ("MAL"), and the Maximum Desirable Level ("MDL") where applicable.

Table 10. Ambient Background Air Quality

Pollutant	Data Source Location	Units of Measurement	Averaging Period	Ambient Background Air Quality	Manitoba AAQC		
					MTL Concentration	MAL Concentration	MDL Concentration
$PM_{2.5}$	Brandon, Manitoba	$\mu g/m^3$ [1]	24 hour 90^{th} percentile[2]	10.6		30	
PM_{10}	Brandon, Manitoba	$\mu g/m^3$ [1]	24 hour 90^{th} percentile[2]	37.3		50	
CO	Winnipeg, Manitoba	mg/m^3	1 hour maximum 8 hour maximum	2.93 1.86	20	35 15	15 6
NO_2	Brandon, Manitoba	$\mu g/m^3$	1 hour 90^{th} percentile[2] 24 hour 90^{th} percentile[2] Annual Mean	23.3 20.5 9.7	1000	400 200 100	60

Pollutant	Data Source	Units of	Averaging Period	Ambient	Manitoba AAQC		
SO_2	Winnipeg, Manitoba	µg/m³	1 hour maximum 24 hour maximum Annual mean	53.6 8.5 0.0	800	900 300 60	450 150 30
Odours		Odour units	3 minutes	None assumed		Residential :2 Industrial: 7	<1.0 (less than odour threshold)

Notes:

[1] Assuming that $PM_{2.5}$/PM_{10} is reported at standard temperature and pressure.

[2]The 90th percentile for 1-hr and 24-hr averaging periods for PM and NOx were applied to the background concentrations for consistency with the guidance from the Manitoba Conservation and Water in the 2001 EIA.

5.2.3 Study Area and Receptors

Receptor grids and discrete receptors are required to define the locations where the model will estimate concentrations. The receptor grid was designed to ensure that the model captures the maximum modelled concentrations and assess the area where the emissions may have a significant impact. The receptor grid was developed based on the *Draft Guidelines for Air Dispersion Modelling in Manitoba* and was supplemented with the *Alberta Air Quality Model Guidelines*. A Cartesian receptor grid was utilized as there were multiple emission sources modelling. The receptor grid used the following spacing and distances:

- 20 m receptor spacing along the Facility boundary;
- 50 m receptor spacing within 500 m of Facility;
- 250 m receptor spacing within 2 km of Facility;
- 500 m receptor spacing within 5 km of Facility; and
- 1000 m receptor spacing beyond 5 km of Facility.

To be conservative, the 20 m receptor spacing was implemented within 250 m of the Facility boundary.

The nearest receptors to the points of impingement are residential properties and businesses surrounding the Facility. There are no sensitive receptors such as schools, daycares, hospitals, community centers or public recreation areas, as defined by *Draft Guidelines for Air Dispersion Modelling in Manitoba* within 5 km of the Facility boundary. Nonetheless, for reference, two discrete receptors were modelled including the nearest residential property (542316.1, 5536216) and the Dakota Tipi First Nation (543812, 5532624).

5.2.4 Buildings

To account for the dispersion impacts of the buildings on site, several buildings were included in the model. The buildings were modelled based on dimensions from the Facility design drawings. Buildings produce building induced plume downwash that affects the air dispersion around the emission sources. Building downwash is a phenomenon that occurs when the winds blow across the top of a building and create enhanced turbulence that would not otherwise be present if the building did not exist. The enhanced turbulence created by the presence of the building causes more vertical mixing and thus a lower ground-level concentration when the plume actually reaches the ground. **Table 2** includes the dimensions of the modelled buildings.

5.2.5 Facility Emission Sources

The existing Facility consists of 27 modelled sources, as listed in **Table 3**. The Facility with the proposed alteration only has 24 sources because the proposed batter line fryer, the existing Line 2 fryer and the Line 1 Dryer will be tied into the WESP to limit air emissions and assist with dispersion.

The point source input parameters that apply to all the operating scenarios and are summarized in **Table 11**.

Table 11. Point Source Input Parameters

Emission Source	Stack ID (mm)	Stack area (sq. m)	Stack Height (m)[1]	Volumetric Flow (m^3/s)	Exit Velocity (m/s)	Outlet Gas Temp[1] (°C)
Line 2 Fryer	203	0.033	14.17	0.40	12.21	54
Line 1 Fryer	508	0.203	14.17	3.46	17.06	54
Line 1 Low NOx Dryer (Stacks 1&2)	660 x 889 per stack (1220 eqD)	1.17	16.00	13.74	11.77	60
Line 1 Low NOx Dryer (Stacks 3&4)	660 x 889 per stack (1220 eqD)	1.17	14.17	13.74	11.77	60
Line 2 Steam Dryer	610 x 803 (795 eqD)	0.495	14.17	4.72	9.51	43
Boiler #1 (Low NO_x, natural gas and biogas)	1060	0.894	18.44	15.75	17.62	176
Biogas Flare	203	0.033	4.57	0.02	0.60	999
WESP	1970	3.04	19.05	32.56	10.70	55

Note:

[1] Emission rates were calculated with the assumption that the exit temperature of the gas was at the specified temperature.

The air quality modelling assessment was based on maximum production. This involves both production and equipment at maximum rates. This provides the worst case results. If any of modelled results showed cumulative concentrations greater than the respective ambient air quality criteria, an additional model was run showing normal/average emission parameters. Normal conditions for emission sources with factors linked to production (e.g. fryers) are based on average expected production figures. For emission sources with factors linked to equipment capacity (e.g. boilers), 80% of equipment rated capacity was applied. Note that building area heaters are assumed at 100% capacity for all scenarios. This is a conservative approach as not all heaters are expected to operate simultaneously and continuously – especially on the shoulder and summer seasons.

The maximum concentrations modelled are based on the Facility operating 24 hours per day, seven days per week. The Facility currently operates a maximum of 282 days per year and an expected average of 280 days. After the proposed alteration is complete, the Facility will operate for a maximum of 320 days per year and an expected average of 300 days. The model assumed 365 days of operation to assess worst case emission scenarios.

Emission rates are included in **Table 12** and **Table 13.** Annual emission rates were based on the maximum run days. The basis for emission rates and emission factors for each source are:

- Fryers: Historical Simplot production-based emission factors used in the 2001 EIA.
- Dryers: Process-based component of dryer emissions is based on stack tests at other Simplot facility.
- Boilers: Emission factors are from US EPA AP 42 for natural gas combustion. Biogas emission factors are also from US EPA AP 42 except where noted. Total fuel consumption is based on the equipment rated capacity. The amount of biogas consumed is based on the observed daily peak value of biogas generated for the maximum conditions and average daily generation for normal conditions. The natural gas consumed is therefore the total equipment rated capacity less the amount of biogas.

- Flare: The biogas flare emission factor for SO_2 is based on a sulphur mass balance of the Facility completed by the Simplot Food Group Engineering and provides a more accurate SO_2 emission rate for the on-site biogas. All other contaminant emission factors for the biogas are from US EPA AP 42. It is assumed 10% of biogas generated is flared with 90% consumed at the boiler.
- WESP: Both the fryer-derived and dryer-derived emissions are based on stack tests at comparable Simplot operated facilities. A control efficiency of 85% removal has been used on fryer-derived particulate. To be conservative, no control on dryer-derived particulate has been accounted for since it is expected that dryer emissions will primarily be in the gaseous phase and no data is available to support a removal efficiency.
- Building Area Heaters (Volume sources): All building area heaters used emission factors from US EPA AP 42 and were scaled based on the specific equipment capacity. The building heating system includes direct-fired and indirect-fired natural gas units. To simplify the model, the building heating system has been modelled as volume sources.

Table 12. Emission Rates for Existing Facility

Emission Source	Annual Emissions (tonnes/year)	Maximum Emission Rate (grams/hour)	Emission Factor
PM_{10} / $PM_{2.5}$			
Line 2 Fryer	Max: 12.3 Ave: 9.19	Max: 1,820 Ave: 1,370	0.67 lb PM/M lb production
Line 1 Fryer	Max: 32.7 Ave: 26.8	Max: 4,830 Ave: 4,000	0.1835 lb PM/M lb production
Line 1 Low NOx Dryer	Max: 34.0 Ave: 28.0	Max: 5,020 Ave: 4,160	0.191 lb PM/M lb production
Line 2 Steam Dryer	Max: 2.10 Ave: 1.56	Max: 310 Ave: 233	0.114 lb PM/M lb production
Boiler #1 (Natural Gas and Biogas)	Max: 2.19 Ave: 1.69	Max: 323 Ave: 251	7.6 lb PM/MMscf natural gas 4.5 lb PM/MMscf biogas
Biogas Flare	Max: 0.03 Ave: 0.02	Max: 5.12 Ave: 3.45	4.5 lb PM/MMscf biogas
Building Area Heaters	Max: 2.51 Ave: 2.49	Max: 371 Ave: 371	7.6 lb PM/MMscf natural gas
NO_x			
Line 2 Fryer	-	-	N/A
Line 1 Fryer	-	-	N/A
Line 1 Low NOx Dryer	4.24	626	50 lb NO_x /MMscf natural gas
Line 2 Steam Dryer	-	-	N/A
Boiler #1 (Natural Gas and Biogas)	16.4	2,420	50 lb NO_x /MMscf natural gas 59 lb NO_x/MMscf biogas
Biogas Flare	0.45	67.1	59 lb NO_x/MMscf biogas
Building Area Heaters	33.0	4,880	100 lb NO_x/MMscf natural gas
CO			
Line 2 Fryer	-	-	N/A
Line 1 Fryer	-	-	N/A
Line 1 Low NOx Dryer	7.12	1,050	84 lb CO/MMscf natural gas

Emission Source	Annual Emissions (tonnes/year)	Maximum Emission Rate (grams/hour)	Emission Factor
Line 2 Steam Dryer	-	-	N/A
Boiler #1 (Natural Gas and Biogas)	24.1	3,560	84 lb CO/MMscf natural gas 49 lb CO/MMscf biogas
Biogas Flare	0.38	55.7	49 lb CO/MMscf biogas
Building Area Heaters	27.7	4,100	84 lb CO/MMscf natural gas
		SO_2	
Line 2 Fryer	-	-	N/A
Line 1 Fryer	-	-	N/A
Line 1 Low NOx Dryer	0.05	7.52	0.6 lb SO_2/MMscf natural gas
Line 2 Steam Dryer	-	-	N/A
Boiler #1 (Natural Gas and Biogas)	74.4	11,000	0.6 lb SO_2/MMscf natural gas 1,075 lb SO_2/MMscf biogas[1]
Biogas Flare	8.28	1,223	1,075 lb SO_2/MMscf biogas[1]
Building Area Heaters	0.20	29.28	0.6 lb SO_2/MMscf natural gas
		Odour	
Line 2 Fryer	N/A	420 OU/s	120 OU/scf fryer exhaust gas[1]
Line 1 Fryer	N/A	3,665 OU/s	120 OU/scf fryer exhaust gas[1]

Note:

[1] Odour unit emission factors were based on information from the 1989 Wardrop Engineering study at the McCain Foods potato processing facility.

Table 13. Emission Rates for Proposed Alterations

Emission Source	Annual Emissions (tonnes/year)	Maximum Emission Rate (grams/hour)	Emission Factor
		PM_{10}	
Line 2 Steam Dryer	Max: 2.38 Ave: 1.68	Max: 310 Ave: 233	0.114 lb PM/M lb production
Boiler #1 (Natural Gas and Biogas)	Max: 2.48 Ave: 1.83	Max: 323 Ave: 254	7.6 lb PM/MMscf natural gas 4.5 lb PM/MMscf biogas
Biogas Flare	Max: 0.04 Ave: 0.03	Max: 5.12 Ave: 3.64	4.5 lb PM/MMscf biogas
WESP (Fryers and Line 1 Dryer)	Max: 51.0 Ave: 43.6	Max: 6,640 Ave: 6,060	0.239 lb PM/M lb production[1]
Building Area Heaters	Max: 2.85 Ave: 2.67	Max: 371 Ave: 371	7.6 lb PM/MMscf natural gas
		NO_x	
Line 2 Steam Dryer	-	-	N/A
Boiler #1 (Natural Gas and Biogas)	18.6	2,425	50 lb NO_x /MMscf natural gas 59 lb NO_x/MMscf biogas
Biogas Flare	0.52	67.1	59 lb NO_x/MMscf biogas

Emission Source	Annual Emissions (tonnes/year)	Maximum Emission Rate (grams/hour)	Emission Factor
WESP	4.81	626	50 lb NO_x /MMscf natural gas
Building Area Heaters	37.5	4,880	100 lb NO_x/MMscf natural gas
		CO	
Line 2 Steam Dryer	-	-	N/A
Boiler #1 (Natural Gas and Biogas)	27.4	3,560	84 lb CO/MMscf natural gas 49 lb CO/MMscf biogas
Biogas Flare	0.428	55.7	49 lb CO/MMscf biogas
WESP	8.08	1,052	84 lb CO/MMscf natural gas
Building Area Heaters	31.48	4,099	84 lb CO/MMscf natural gas
		SO_2	
Line 2 Steam Dryer	-	-	N/A
Boiler #1 (Natural Gas and Biogas)	84.5	11,000	0.6 lb SO_2/MMscf natural gas 1075.2 lb SO_2/MMscf biogas
Biogas Flare	9.39	1,220	1075.2 lb SO_2/MMscf biogas
WESP	-	-	N/A
Building Area Heaters	0.22	29.3	0.6 lb SO_2/MMscf natural gas

Note:

[1] Emission factor on WESP is sum of emission factors on Line 1 Fryer, New Line 1 Fryer and production-based component of Dryer 1.

Note that odour emissions are only presented for the baseline case. Odour emission rates in the baseline model are based on emission factors from a study from a comparable potato processing facility (Wardrop, 1989). This provides an indication of the potential odour units. There is no accurate way to predict changes to the odour emission rates based on the proposed alteration. Furthermore, the proposed alteration is not expected to increase the amount of odour. It is only expected to change the odour profile due to, for example, different spices used in the process. For these reasons, the baseline odour model is intended to be representative of odour levels for both the baseline and the proposed alteration.

5.2.6 Summary of Conservative Approach to Modelling

The modelling assessment used a conservative approach to provide worst-case scenario results. The key assumptions, attributes and methodologies leading to this conservative approach include:

- Emission rates were based on constant maximum production rates. In reality, production rates are expected to vary.
- Emission factors such as those from US EPA AP 42 are generally inherently conservative.
- Building area heaters are modelled as running continuously and at full capacity throughout the year. In reality, their use will vary.
- Speciation of particulate matter fraction sizes was not available; therefore emission rates of $PM_{2.5}$ and PM_{10} were both assumed equal to TSP.
- Control efficiencies for the proposed WESP were assumed to be 85% on the fryer emissions and 0% on the dryer emissions. In reality, there is expected to be higher control efficiencies.

- Background ambient concentrations were obtained from Winnipeg and Brandon and likely have higher ambient pollutant concentrations due to the larger nature of the cities compared to the outskirts of Portage la Prairie. Furthermore, the background concentrations used (specifically for PM) have increased since 2003 (i.e. plant start-up).
- All NO_x has been assumed as NO_2.
- The inherent nature of dispersion modelling involves assuming that that all sources are operating at peak worst case conditions at the same time as worst case meteorological conditions. In reality, different sources will be at varying conditions (e.g. different exhaust concentrations, temperature, etc.). The probability of all sources operating at peak conditions at the same time as worst case meteorological conditions is low.

6. Results

All of the maximum concentrations for all averaging periods, for all parameters, are predicted to occur within 20 meters of the property boundary. The maximum concentrations are expected to occur during the night time, under stable conditions and very light winds. **Table 14** and **Table 15** include the maximum concentrations for the existing Facility, and **Table 16** includes the maximum concentrations with the proposed alteration. Isopleths showing the distribution of predicted concentrations over the study area for all contaminants and averaging periods can be seen in **Attachment A**.

As the NO_x emission rate was known, NO_2 was modelled as NO_x and compared to the NO_2 threshold. This is a conservative estimate and assumes that all NO_X is converted to NO_2 in the atmosphere.

Table 14. Maximum Predicted Concentrations for Baseline on Receptor Grid

Pollutant	Units	Averaging Period	Maximum Modelled Concentration (including Background)	Maximum Concentration Location	% of MTL	% of MAL	% of MDL
$PM_{2.5}$	µg/m^3	24 hour	Max: 155.4 Ave: 128.3	Max: 543371.3, 5535950 Ave: 543391.3, 5535950		Max: 518% Ave: 428%	
PM_{10}	µg/m^3	24 hour	Max: 182.1 Ave: 155.0	Max: 543371.3, 5535950 Ave: 543391.3, 5535950		Max: 364% Ave: 310%	
CO	mg/m^3	1 hour 8 hour	3.63 2.09	543631.3, 5535730 543631.3, 5535730	10%	10% 14%	24% 35%
NO_2	µg/m^3	1 hour 24 hour Annual	826 265 34.4	543631.3, 5535730 543631.3, 5535750 543631.3, 5535710	83%	206% 132% 34%	57%
SO_2	µg/m^3	1 hour 24 hour Annual	650 255 32.1	543711.31,5535630 543731.3, 5535610 543731.3, 5535630	32%	72% 85% 54%	144% 170% 107%
Odours	Odour units	3 minutes	3.59	543351.3, 5535970		51%	359%

Table 15. Maximum Predicted Concentrations for Baseline at Discrete Receptors

Contaminant			Nearest Residence		Dakota Tipi First Nation	
Pollutant	Units	Averaging Period	Maximum Modelled Concentration (including Background)	% of MAL	Maximum Modelled Concentration (including Background)	% of MAL
$PM_{2.5}$	µg/m³	24 hour	Max: 34.6 Ave: 30.3	Max: 115% Ave: 101%	Max: 15.9 Ave: 14.9	Max: 53% Ave: 50%
PM_{10}	µg/m³	24 hour	Max: 61.3 Ave: 57.0	Max: 123% Ave: 114%	Max: 42.6 Ave: 41.6	Max: 85% Ave: 83%
CO	mg/m³	1 hour 8 hour	3.15 1.92	9% 13%	3.02 1.88	9% 13%
NO_2	µg/m³	1 hour 24 hour Annual	141 30.5 10.2	35% 15% 10%	40.7 23.3 9.81	10% 15% 10%
SO_2	µg/m³	1 hour 24 hour Annual	180 26.0 0.53	20% 9% <1%	42.7 11.9 0.210	5% 4% <1%
Odours	Odour units	3 minutes	0.89	13%	0.230	3%

Table 16. Maximum Predicted Concentration for Proposed Alteration on Receptor Grid

Pollutant	Units	Averaging Period	Maximum Modelled Concentration (including Background)	Maximum Concentration Location	% of MTL	% of MAL	% of MDL	% of Baseline
$PM_{2.5}$	µg/m³	24 hour	Max: 57.2 Ave: 52.6	Max: 543691.3, 5535690 Ave: 543391.3, 5535950		Max: 191% Ave: 175%		Max: 37% Ave: 41%
PM_{10}	µg/m³	24 hour	Max: 84.0 Ave: 79.3	Max: 543691.3, 5535690 Ave: 543391.3, 5535950		Max: 168% Ave: 158%		Max: 46% Ave: 51%
CO	mg/m³	1 hour 8 hour	3.67 2.10	543631.3, 5535710 543631.3, 5535710	11%	10% 14%	24% 35%	101% 100%
NO_2	µg/m³	1 hour 24 hour Annual	840 145 25.0	543631.3, 5535730 543631.3, 5535690 543631.3, 5535690	84%	210% 72% 25%	42%	101% 55% 73%
SO_2	µg/m³	1 hour 24 hour Annual	677 254 32.0	543771.3, 5535610 543731.3, 5535610 543731.3, 5535630	32%	75% 85% 53%	151% 169% 107%	104% 100% 100%

Table 17. Maximum Predicted Concentration for Proposed Alteration at Discrete Receptors

Contaminant			Nearest Residence		Dakota Tipi First Nation	
Pollutant	Units	Averaging Period	Maximum Modelled Concentration (including Background)	% of MAL	Maximum Modelled Concentration (including Background)	% of MAL
$PM_{2.5}$	µg/m^3	24 hour	Max: 18.7 Ave: 18.0	Max: 62% Ave: 60%	Max: 12.1 Ave: 11.9	Max: 41% Ave: 40%
PM_{10}	µg/m^3	24 hour	Max: 45.4 Ave: 44.7	Max: 91% Ave: 89%	Max: 38.8 Ave: 38.6	Max: 77% Ave: 77%
CO	mg/m^3	1 hour 8 hour	3.16 1.93	9% 13%	3.03 1.88	9% 13%
NO_2	µg/m^3	1 hour 24 hour Annual	263 46.1 10.4	66% 23% 10%	133 31.5 10.1	33% 16% 10%
SO_2	µg/m^3	1 hour 24 hour Annual	232 26.0 0.530	26% 9% <1%	95.7 11.9 0.210	11% 4% <1%

Table 16 identifies the $PM_{2.5}$, PM_{10} and 1-hour NO_2 maximum concentrations are the only contaminants with exceedances of the MALs. Note that the 1-hour NO_2 is below the MTL and the 24-hour and annual averaging periods for NO_2 are both below the MALs.

As seen in **Table 17**, concentrations at the discrete receptors show no exceedances for any of the contaminants.

The frequency of exceedance provides additional context for those parameters showing exceedances. The frequency of exceedance is defined by taking a percentage of the number of days out of the 5-year meteorology dataset with conditions that led to concentrations greater than the MAL.

For the proposed alteration, the frequency of exceedance was:

- 16% for the NO_2 1-hour averaging period;
- 76% for PM_{10} under maximum production rates;
- 47% for PM_{10} under average production rates;
- 40% for $PM_{2.5}$ under maximum production rates; and
- 36% for $PM_{2.5}$ under average production rates.

The background concentration has a considerable impact on the cumulative concentrations. When taking the project itself into account only, the frequency of exceedance for PM_{10} and $PM_{2.5}$ drop considerably. There are no exceedances for PM_{10} and the frequency for $PM_{2.5}$ reduces to 14% under maximum production rates and 13% under average production rates.

7. Summary and Discussion

An air dispersion model was conducted to determine the current and proposed impacts of the J.R. Simplot potato processing facility. Modelling results of the proposed alteration predict that $PM_{2.5}$, PM_{10} and NO_2 maximum concentrations are the only contaminants with potential exceedances.

Although NO_2 exceeds the 1-hr average MAL of 400 µg/m^3, it is below the 1-hr average MTL of 1,000 µg/m^3. The maximum predicted concentrations also occur within 20m of the property boundary. Concentrations at the nearest discrete receptors are well below the MAL. For example, the proposed alteration shows predicted concentrations at only 66% of the MAL at the nearest residence and 33% of the MAL at the Dakota Tipi First Nation. Note that maximum predicted concentrations for the 24-hr and annual averaging periods are always below the MALs. The proposed alteration also does not provide any tangible change to the modelled 1-hour baseline concentrations and actually leads to a decrease in concentrations for the 24-hr and annual averaging periods.

The predicted maximum PM_{10} concentrations exceed the 24-hr average MAL of 50 µg/m^3 due to the high background ambient concentration of 37.3 µg/m^3. This already makes up 75% of the MAL. While the maximum cumulative predicted concentration of the property boundary is above the MAL, it occurs within 20m of the property boundary. It occurs in the area of former factory grounds sold to a private grower co-op for potato storage. Concentrations at the nearest residence and the Dakota Tipi First Nation are below the threshold (i.e. 91% and 77% respectively). A full representation of the distribution of predicted concentrations can be seen in the isopleth figure in **Attachment A**.

The predicted maximum $PM_{2.5}$ concentrations exceed the 24-hr average MAL of 30 µg/m^3 partially due to the high background ambient concentration of 10.3 µg/m^3. This already makes up 35% of the MAL. While the maximum cumulative predicted concentration is above the MAL at the same location as the PM_{10} maximum, the concentrations at the nearest residence and the Dakota Tipi First Nation are below the threshold (i.e. 62% and 40% respectively). A full representation of the distribution of predicted concentrations can be seen in the isopleth figure in **Attachment A**.

It is also important to note that the proposed alteration shows a 63% reduction in the maximum predicted $PM_{2.5}$ and a 54% reduction in PM_{10} concentration due to the addition of the WESP. The WESP will not only treat emissions from the proposed batter fryer line, but the existing Fryer 2 and Dryer 1 will also be connected. This increases the amount of overall $PM_{2.5}$ and PM_{10} mitigation at the Facility. For the purposes of modelling, an 85% removal efficiency on PM from the fryer was assumed based on historical stack testing at comparable facilities. A zero removal efficiency on PM from the dryer was assumed because of the uncertainty in the ability to remove condensable PM (which typically is primarily $PM_{2.5}$) emitting from the process. In reality, there is likely to be some degree of removal of PM from the dryer emissions by the WESP.

In summary, no significant impacts to ambient air quality from the proposed alteration to the Facility are expected, especially given the reasonably isolated location of the Facility and the absence of sensitive receptors. Modelled ambient concentrations of CO, SO_2, NO_2 (24-hour and annual) and odour are all expected to be below the MAAQC. For 1-hour NO_2, there are no changes predicted from the baseline. For $PM_{2.5}$ and PM_{10}, predicted concentrations are expected to be reduced by over 50% of the baseline.

8. References

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