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Northern Engineered Wood Products (2007) Inc.

Technical Assessment Report

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Technical Assessment Report

Prepared for:

Northern Engineered Wood Products (2007) Inc.
2749 Railway Ave
Smithers B.C. V0J 2N0

This document has been prepared by SLR Consulting (Canada) Ltd. The material and data in this report were prepared under the supervision and direction of the undersigned.

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APPENDICES

ACRONYMS

AAQO	BC Ambient Air Quality Objectives
ADS	Air Density Separator
BAT	Best Achievable Technology
BC	British Columbia
CAAQS	Canada Ambient Air Quality Standards
CO	Carbon monoxide
EPA	Environmental Protection Agency
HSE	Health, Safety, & Environment
K	Kelvin
Km	kilometre
m	metre
m/s	metres per second
mg/m^3	milligram per cubic metre
$\mu g/m^3$	microgram per cubic metre
mg/Nm^3	milligram per normal cubic metre
MOE	British Columbia Ministry of Environment
NO	Nitrogen Oxide
NO_X	Nitrogen Oxide Compounds
PM_{10}	Particulate Matter equal to or less than 10-micron in diameter
$PM_{2.5}$	Particulate Matter equal to or less than 2.5-micron in diameter
SLR	SLR International Corporation
SO_2	Sulphur dioxide
TPY	tonnes per year
TSP	Total Suspended Particulate
US	United States
yr	year

EXECUTIVE SUMMARY

This Technical Assessment Report is submitted in conjunction with an operating permit amendment application for the Northern Engineered Wood Products (2007) Inc. (NewPro's) proposed conversion to a pellet manufacturing plant located in northwestern British Columbia (BC), on the southern end of the town of Smithers. The applicant's authorized agent, SLR Consulting (Canada) Ltd. (SLR), has prepared this application and technical assessment report on behalf of NewPro.

NewPro is repurposing its particle board plant as a wood pellet plant. As part of the repurposing, NewPro will remove their existing Dryers and install a new Stela Dryer. The air pollutants of concern from the proposed pellet manufacturing plant are total suspended particulate matter (TSP), particulate matter less than 10-microns in diameter (PM_{10}), and particulate matter less than 2.5-microns in diameter ($PM_{2.5}$). As a result of the project, the facility-wide emissions of TSP, PM_{10}, and $PM_{2.5}$ will be reduced by 406, 355 and 231 tonnes per year, respectively. If the amendment is not approved, the facility will continue operations as a particle board plant. The plant is fully authorized to recommence particle board manufacturing at any time.

The existing air quality in the area was characterized by monitoring data from the St. Josephs monitor in Smithers for the year 2014. As a result of recent changes in monitoring technology, many interior airsheds in BC, including Smithers, are now above the Provincial Ambient Air Quality Objective (AAQO) for $PM_{2.5}$ due to the replacement of older analyzers with equipment using different measurement techniques.

SLR has performed an air dispersion modelling analysis to assess the worst-case potential air quality concentration levels due to the future operation of the NewPro facility with the proposed permit amendment. The concentration levels predicted by the model for the proposed project were found to be below the applicable air quality objectives or standards, except for 24-hour $PM_{2.5}$ which is 101% of the Provincial AAQO. The maximum project impacts are shown to occur immediately adjacent to the facility with a rapid decrease in model-predicted concentrations away from the facility. All sensitive receptors were modelled to be less than 10% of the 24-hour $PM_{2.5}$ Provincial AAQO. PM_{10} concentrations resulting from the proposed pellet mill operations are predicted to be below the AAQO at all locations off-property.

Conversion to pellet mill will significantly reduce NewPro particulate emissions in the town of Smithers relative to emissions for the current panel board facility. The project will result in an improvement in the contribution of particulate emissions to ambient air in Smithers because pellet mill emissions will be reduced to less than ten percent of panel board emissions on a tonne per year basis.

INTRODUCTION

Northern Engineered Wood Products (2007) Inc. (NewPro) proposes to repurpose its former particle board plant as a wood pellet plant. The project will require an amended discharge permit under the Environmental Management Act from the British Columbia Ministry of Environment (MOE).

On behalf of NewPro, SLR Consulting (Canada) Ltd. (SLR) has prepared this Technical Assessment Report in order to define the nature of the discharge and to evaluate potential impacts to the receiving environment. As part of the application, the MOE requested an air quality analysis to evaluate predicted ambient air concentrations from PM_{10} and $PM_{2.5}$ emissions with respect to Canadian Ambient Air Quality Standards (CAAQS) and BC Ambient Air Quality Objectives (AAQO). The CAAQS and AAQO are health-based air quality standards and objectives for pollutant concentrations in outdoor air. The MOE uses these standards and objectives to implement air quality improvements and undertake actions to achieve them. This report is intended to support NewPro's application for an amended operating permit for their proposed pellet plant. NewPro continues to be fully authorized to operate the facility as a panel board manufacturing plant, and could recommence operations at any time.

The sustainable biomass pellet manufacturing industry is growing rapidly in British Columbia, and NewPro is prepared to repurpose most of their existing equipment to adapt to the increasing demand for pellet fuel in BC. The pellet industry creates a useful product from forest industry waste wood slash piles, and prevents slash pile open burning as the waste is salvaged for use. They also use sawdust and planer shavings from local sawmills. Open burning contributes pollution to airsheds and obtains no benefit in the form of heat recovery for residential heating or electrical production. Pellet fuel appliances are growing in popularity because they are more convenient to operate than ordinary wood stoves or fireplaces, and some have much higher combustion and heating efficiencies. As a result, they produce very little air pollution. In fact, pellet stoves are the cleanest solid fuel, residential heating appliance. The pellets can also be used to replace coal combustion in coal-fired boilers for power generation. Local production of pellets will benefit Smithers due to several environmental facets associated with the project.

1.1 COMPANY OVERVIEW

Northern Engineered Wood Products (2007) Inc.
2749 Railway Ave
Smithers BC
V0J 2N4

Dave Jacobs
Vice President
djacobs@newpro.ca

Health, Safety, & Environment (HSE) Policy:

NewPro is committed to operational integrity, conducting all activities safely and reliably so the public is protected, impact to the environment is minimized, the health and well-being of employees is safeguarded, contractors and customers are safe, and physical assets (such as facilities and equipment) are protected from damage or loss. It conducts business to maximize positive impacts on current and future generations in accordance with corporate values, while minimizing the use of non-renewable resources.

1.2 PROPERTY DESCRIPTION

The NewPro Plant is located in northwestern British Columbia, (54° 45’ 42” Latitude North, 127° 9’ 26” Longitude West), on the southern end of the town of Smithers. The area map shows the site property relative to predominant geographical features such as railroads, streams, and roads. Elevation of the site is approximately 500 metres above mean sea level. The Site surface consists primarily of asphalt and concrete. A site location map is included in the attachments as Figure 1-1.

PROJECT DESCRIPTION

2.1 EXISTING FACILITY

Feedstock for particle board production consists of wood waste material in the form of planer shavings and sawdust of spruce, pine, and fir. These waste materials are primarily transported by truck from local suppliers. The shavings and sawdust are stored in stockpiles located on the facility site. The stockpiles are walled on three sides to prevent fugitive dust from wind erosion.

The feedstock is dumped into an in-feed hopper by loaders, where it is routed into the two direct contact rotary drum dryers through a closed conveyor system. Both dryers are wood dust-fired and dry the feedstock from a moisture content of about 15 to 45 percent to approximately 2 percent. The dried materials are stored in the A-frame building then transferred to blenders, in which the particles are mixed with Urea formaldehyde resin and other additives.

The blended material is transported on a belt conveyor to the forming machine. The formed mats are trimmed and fed to the particle board presses. A natural gas fired Konus system heats thermal oil that provides heat to the presses. After cooling, particleboard panels are then sanded and trimmed to final dimensions and the finished product was packaged for shipment. Product is transported by rail from the inside storage area and sent to domestic and international markets.

The panel board facility is permitted to operate 24 hours a day, seven days a week, and is capable of producing 150,000 sq feet of particle board per day. Other than general housekeeping practices, dust suppression controls are not currently employed at the Smithers facility. The moisture content of the stockpiles prevents fugitive visible emissions. Road dust is controlled by sweeping during dry conditions.

NewPro's particle board plant received Permit No. 6099 to discharge air contaminants on February 23, 1981 and was last amended on January 9, 2014. The following sources are approved to operate in accordance with the discharge permit:

- Primary Dryer (Outside Dryer Cyclone (E220356))
- Secondary Dryer (Inside Dryer Twin Cyclones (E215976))
- Press Scale Vent Fan (E215981)
- Three Press Vent Fans (E215982)
- A-Frame Cyclone (E215975)
- Cross Cut Saw Cyclone (E215978)
- Mat Former Cyclone (E215979)
- Flaker Cyclone (E215980)
- Mat Saw Recovery Cyclone (E234491)

- Air Density Separator (ADS) Cyclone (E275823)
- Refiner Cyclone (E215977)
- Cyclone Dust Recovery Baghouse (E234695)
- Refiner-Flaker Baghouse (E234696)
- Thermal Oil Heater

The current permit remains active.

2.2 PROPOSED FACILITY

NewPro temporarily shut down the particle board plant in December 2013 and is proposing to convert the facility to a wood pellet plant. As part of this project NewPro proposes the removal of the following air discharge sources, which were used for the particleboard plant:

- Primary Dryer (Outside Dryer Cyclone (E220356))
- Secondary Dryer (Inside Dryer Twin Cyclones (E215976))
- Press Scale Vent Fan (E215981)
- Three Press Vent Fans (E215982)
- A-Frame Cyclone (E215975))
- Cross Cut Saw Cyclone (E215978)
- Mat Former Cyclone (E215979)
- Flaker Cyclone (E215980)
- Mat Saw Recovery Cyclone (E234491)

The existing Cyclone Dust Recovery Baghouse, Refiner-Flaker Baghouse, and natural gas-fired Thermal Oil Heater will remain in service. The existing Air Density Separator Cyclone will be vented to the Cyclone Dust Recovery Baghouse. The existing Refiner Cyclone will be vented to the Refiner-Flaker Baghouse. In addition, NewPro will install a new Stela Belt Dryer. The Stela Belt Dryer will be heated by the existing Thermal Oil Heater and can dry up to 80,000 oven-dry tons of product per year.

2.2.1 PELLET PLANT PROCESS DESCRIPTION

2.2.1.1 Fiber Arrival

The sawdust and shavings will be trucked from the Pacific Inland Resources (PIR) sawmill next door to the facility and stockpiled in the paved storage area, which is covered. The bush grind material will also be trucked in and stockpiled separately from the sawdust and shavings. All three types of fiber will have separate piles as they have different moisture content and require different drying times and speeds.

2.2.1.2 Drying

The fibre will be moved from the designated storage area and loaded into a bin so it can be fed into the hogger to create a consistent fibre size prior to drying. The fibre will then enter into a conveyor to be fed into the Stela Dryer. Once the fibre is dried it will enter an infeed bin leading to the hammer mills where it will be further reduced in size at which point it will go into either the A-frame storage or directly into the in-feed system. The dryer has a throughput capacity of 80,000 bone-dry tons of material.

2.2.1.3 Transport to Pellet Mills

From the in-feed bins the fibre will be transferred through a series of covered conveyors to an Air Density Separation system (ADS) to remove any rocks or foreign debris. Once past the ADS the fibre will travel on covered conveyors through the plant to the pellet mills to produce pellets.

2.2.1.4 Storage and Loading

From the pellet mill the pellets will travel on a covered conveyor that will cool the pellets by cross draft ventilation and transport them to a belt tripper which will put them into a storage area. The pellet press, cooling conveyor, and pellet storage area will all be housed within the existing building, minimizing fugitive emissions from pellet handling and storage. From the storage area the pellets will be moved pneumatically to the waiting rail cars. The rail cars will be loaded and weighed and sent to the Westview Terminal in Prince Rupert B.C

AIR DISCHARGES AND TREATMENT

3.1 CONTAMINANTS TO BE EVALUATED

The main air contaminants of concern from the proposed pellet manufacturing plant are total suspended particulate (TSP), particulate matter less than 10-microns in diameter (PM_{10}), and particulate matter less than 2.5-microns in diameter ($PM_{2.5}$). Carbon monoxide (CO) and nitrogen oxides (NO_X) will also be emitted from the hot oil heater. Currently, the existing rotary drum dryer heaters also result in combustion emissions, but those will be removed and replaced by the belt dryer which has lower emissions. An emissions inventory was completed for CO, PM_{10}, $PM_{2.5}$, and NO_X from the facility. The total emissions of CO and NO_X were found to be relatively insignificant. In addition, current background levels of NO_2 measured at the St. Joseph monitor are well below ambient objectives. Therefore, the analysis is focused on an evaluation of TSP, PM_{10}, and $PM_{2.5}$ impacts.

3.2 DISCHARGE SOURCES

The following equipment and processes are sources of air emissions (fugitive and point source) for the proposed pellet plant. The following sections describe the control, abatement, and air emissions to atmosphere from these pieces of equipment.

- Hoggers
- Hammer Mills
- ADS System
- Pellet Press
- Stela Belt Dryer
- Thermal Oil Heater
- Raw Material Handling and Storage
- Dried Material Handling and Storage
- Product Material Handling and Storage
- Road Dust
- Vehicle Exhaust

3.3 POINT SOURCES

Particulates escaping from the hoggers, hammer mills, ADS System, and pellet production area (within the main building) will all be controlled by the Cycle Dust Recovery Baghouse and Refiner-Flaker Baghouse.

The Stela Belt Dryer will be indirectly heated by the Thermal Oil Heater and will have two air exhaust points with one point recirculating hot air back into the dryer. The other exhaust point will be discharged to atmosphere.

The Thermal Oil Heater burns natural gas and emits the combustion-related pollutants NO_X, CO, and greenhouse gases. Minimal amounts of particulates, sulphur dioxide (SO_2), and volatile organic compounds (VOCs) are also emitted from natural gas combustion.

The following four discharge points will be part of the new source:

- Cyclone Dust Recovery Baghouse
- Refiner-Flaker Baghouse
- Thermal Oil Heater
- Stela Belt Dryer

3.3.1 FUGITIVE SOURCES

All potential emissions from fugitive dust sources are considered negligible for the facility for the reasons described below; therefore fugitive emission sources are not included in the impacts analysis.

All conveyor systems within the facility will be enclosed and gasketed for zero-emission operation. Therefore, no transport/conveyor system sources of particulate emissions are anticipated for the facility.

Fibre (raw material) will be unloaded within the covered storage area. A loader will transfer fibre from the covered storage pile into an in-feed bin for transfer by way of a closed conveyor to the dryer. Due to the high moisture content of the fibre, fugitive particulate will be negligible and contained within the walls of the pit.

Dried material is moved from the dryers on enclosed conveyors to the A-frame storage shed. This storage shed has three walls and a roof. Due to the enclosures, fugitive particulate matter emissions from the dried material handling and storage are expected to be negligible.

Finished pellets are stored within the main building and conveyed to enclosed rail. No emissions are expected from product handling and storage because the conveyor is enclosed and located inside the building. The load out and enclosed rail cars are located adjacent to this main building.

Vehicle exhaust generated from operations at the facility will be minimal due to the short distance from feedstock supplies to the facility and the load out by rail car moving on on-site tracks.

All driving surfaces and process areas at the facility are paved or covered in a dust free covering to reduce road dust re-suspension. NewPro will conduct sweeping of paved surfaces as necessary.

The fugitive control measures will be established and tracked in the Environmental Management Plan (EMP) for the facility. The EMP will cover the environmental and emergency response issues as well as new employee training. The EMP is updated and reviewed annually to ensure all control measures are being implemented effectively.

3.4 BEST ACHIEVABLE TECHNOLOGY

Best Achievable Technology (BAT) is the technology which can achieve the best discharge standards that has demonstrated economic feasibility through commercial application. BAT evaluations are generally required when new discharges are proposed or when a significant amendment is proposed to an existing authorized discharge. The MOE outlined BAT requirements for the pellet manufacturing industry in the “Emissions and Air Pollution Controls for the Biomass Pellet Manufacturing Industry", a guidance document prepared for the MOE by Environchem Services Inc., May 12, 2010. The control technology and emissions standards from this guideline are provided in Table 3-1. The proposed project will implement these BAT guidelines to control emissions from the process.

Table 3-1. Summary of PM BAT – Pellet Manufacturing

Emission Sources	Achievable TPM Emissions Level (mg/m^3) - < 100,000 tonnes/yr	BC Guidance Control Technology
Rotary Dryer Exhaust	100	Scrubber
Pellet Cooler Exhaust	115	Cyclone
Other Plant Processes (pelletizers, hammermills, storage, screening, and conveyor)	20	Baghouse
Raw Material Storage Piles and Roads (fugitive emissions)		
Sawdust and Wet Material	Visual monitoring with controls as required including: Limit pile heights; limit exposed pile faces to high winds (e.g. wind breaks vegetative or screens)	
Planer Shavings and Dry Material	As above plus three sided and covered containment Prevent vehicle traffic from grinding material finer	
On-site Haul Roads	Dust suppression in dry season or paving	

TPM – total particulate matter

Table 3-2 shows a summary of how each source meets the BAT standards as recommended in the BC guideline.

Table 3-2. Summary of Best Achievable Technology

Emission Source	Summary of BAT
Raw Material Stockpile	The stockpile is covered
Grinder	Enclosed, no emissions.
Pneumatic System (grinder to dryer)	The emissions from this pneumatic system will be vented through the ADS cyclone. The exhaust from this cyclone will be vented through a baghouse in order to lower the emissions to the required BC guidance level of 20 mg/m^3.
Dried Material Stockpile	The stockpile is walled on 3 sides and covered.
Stela Belt Dryer	Based on recent stack tests on similar units, emissions are expected to be well below the emissions limits contained in recent permits for belt dryers, 25 mg/m^3.
Hammermills	The emissions from the Hammermills will be vented through the Cyclone Dust Recovery Baghouse.
Infeed Bins	Enclosed, no emissions.
Conveyors	Enclosed, no emissions.
Screening	Enclosed, no emissions.
Pellet Press	Enclosed, no emissions.
Pellet Cooler	The proposed operation will have a cooling conveyor rather than a pellet cooler. This cooling conveyor is enclosed and the air flow will be vented through the Refiner-Faker Baghouse. This baghouse is able to achieve the emission level of 20 mg/m^3. This is lower than the recommended BAT of 115 mg/m^3.
Pellet Storage – Pneumatic System (loading to railcar)	Pellet storage will occur within the building, preventing fugitive emissions. The emissions from the pneumatic loading system will be vented through the Refiner Cyclone followed by the Refiner-Flaker Baghouse. This baghouse is able to achieve the emission level of 20 mg/m^3.
On-site Haul Roads	The facility is 90% paved. NewPro will sweep or vacuum whenever there is potential for high dust. The criteria for fugitive dust control will be outlined in the facility's Environmental Management Plan.

3.5 SOURCE EMISSION RATES

The emissions from the previous particle board plant and proposed pellet plant are estimated using the information provided by the manufacturers, emission rates from stack testing on similar units, and published emission factors. Detailed emissions calculations and methods are provided in Appendix A.

3.5.1 EXISTING FACILITY

Emissions from the existing facility were quantified based on information in the current permit and emission factors obtained from the following sources:

- NewPro's Permit No. 06099 amended January 9, 2014.
- "Emissions and Air Pollution Controls for the Biomass Pellet Manufacturing Industry", prepared for BC MOE by Environchem Services Inc., May 12, 2010, Table 22.
- Oregon DEQ "Emission Factors - Wood Products $PM_{10}/PM_{2.5}$ Fraction" Form AQ-EF03 revision 08/01/11.
- US EPA AP-42, Chapter 10.6.2, Table 10.6.2-2 (February 2002), Emission Factors for Particleboard Dryers.
- US EPA AP-42, Chapter 1.5, Table 1.4-1, Emission Factors from Nitrogen Oxides (NO_X) and Carbon Monoxide (CO) from Natural Gas Combustion.

One change is made to the permitted emission estimates. The current permit overstates the expected particulate loading for baghouses. Both the filter bag manufacturer and the MOE guidance on biomass pellet manufacturing[1] report a particulate loading of 20 mg/m^3.

3.5.2 BAGHOUSES

Dust emissions from the hoggers, hammer mills, ADS System, and pellet production area (within the main building) are all controlled by the Cycle Dust Recovery Baghouse and Refiner-Flaker Baghouse. Emissions for the baghouse are estimated using the flow rate capacity of the baghouse and particulate loading. These existing sources are already regulated under the current permit. The flow capacity of these sources will not change, but the particulate loading was updated to 20 mg/m^3, as discussed in Section 3.4.1, for the existing source emission calculations. Particulate size breakdown to PM_{10} and $PM_{2.5}$ is based on Oregon Department of Environmental Quality emission factors.[2]

[1] "Emissions and Air Pollution Controls for the Biomass Pellet Manufacturing Industry", prepared for BC MOE by Environchem Services Inc., May 12, 2010.

[2] "Emission Factors - Wood Products $PM_{10}/PM_{2.5}$ Fraction" Form AQ-EF03 revision 08/01/11, Process Equipment - Bag Filter System.

3.5.3 THERMAL OIL HEATER

Emissions from natural gas combustion in the Thermal Oil Heater are based on the United States Environmental Protection Agency (US EPA) AP-42 emission factor document[3]. All particulate emissions from natural gas combustion are assumed to be less than 2.5 microns in size.

3.5.4 STELA BELT DRYER

Several Stela Belt Dryers of similar design to the proposed design for the NewPro facility have been permitted in BC. Previous PM estimates for these permits were based on stack testing conducted in Germany (the location of the manufacturer). However, these test methods do not exactly match those used in BC for compliance demonstrations. One Stela Belt Dryer has been constructed and is operating at Diacarbon Energy's facility in Merritt, BC. A stack test for both filterable and condensable PM was conducted on December 12, 2014. The particulate loading from this stack test is used to estimate particulate emissions from the proposed source along with the estimated stack flow rate provided by Stela[4]. The emission factor calculated and proposed as the permit limit of 16.7 mg/Nm^3 is based on the average of three tests performed on each of the two stacks from the Diacarbon Energy test report, plus two standard deviations. Total PM is the sum of the calculated filterable and condensable PM.

The PM_{10} and $PM_{2.5}$ fractions are based on the Müller-BBM stack testing report dated March 16, 2007. The fractions are only applied to the filterable portion of the PM and all condensable PM is assumed to be less than 2.5 microns.

3.5.5 PROPOSED EMISSIONS SUMMARY

The estimated annual emissions of the existing facility based on the current permitted rates and the proposed pellet plant are summarized in Table 3-3. The proposed pellet plant emissions presented below are based on maximum projected rating of the equipment and full 8,760 hours of operation per year. A reduced operating schedule may be considered which would reduce the annual emission rates, but the equipment would be run at these maximum hourly rates for each operating hour.

Table 3-3. Proposed Emissions Summary

	Annual Emissions (tonnes/yr)				
Scenario	**TSP**	**PM_{10}**	**$PM_{2.5}$**	**NO_X**	**CO**
Existing Facility	432	380	255	43	47
Proposed Pellet Plant	26	25	24	8	7
Emission Reduction	-406 (94%)	-355 (93.5%)	-231 (90.5%)	-35 (81%)	-41 (87%)

[3] AP-42 Table 1.4-1, Emission Factors from Nitrogen Oxides (NOX) and Carbon Monoxide (CO) from Natural Gas Combustion
[4] Email from Bernhard Stummer, Stela Laxhuber GmbH, on October 20, 2014.

3.6 SOURCE RELEASE PARAMETERS

Typical dispersion modelling allows for emissions units to be represented as point, area, line, or volume sources. Because all of the emissions points associated with this modelling analysis are stacks, they are represented as point sources in the dispersion model. The stack parameters for each source are shown in Table 3-4.

Table 3-4. Stack Parameters

Source ID	Source Description	Exit Temp. (K)	Stack Diameter (m)	Release Height (m)	Exit Velocity (m/s)
STELA1	Stela Dryer Exhaust Fan	300.4	1.40	19.4	21.83
NGHEAT	Thermal Oil Heater	672.0	0.51	15.5	16.26
CRBAG	Cyclone Dust Recovery Baghouse	293.0	0.56	14.6	24.47
RFBAG	Refiner/flaker Baghouse	293.0	0.51	16.2	49.34

AIR QUALITY ASSESSMENT

Air dispersion modelling is used to estimate and predict air quality concentration levels due to the future operation of the NewPro facility as a result of the proposed permit amendment. The concentration levels predicted by the model are then compared to the relevant ambient air quality objectives or standards for $PM_{2.5}$ and PM_{10}. The existing air quality in the area is also summarized and added to the potential facility concentrations for a final comparison to the ambient air quality objectives and standards.

The modelling analysis was executed in order to demonstrate the potential worst-case (highest) air quality concentrations due to the operation of the facility. It is not intended to provide the most realistic air quality concentrations (e.g., what a monitor might observe); rather the model itself and important inputs such as emission rates and background air quality levels are designed to provide the upper end of potential impacts. For instance, as discussed in Section 3, the proposed pellet plant is assumed to operate at its maximum projected equipment rating and the full 8,760 hours of operation per year. Manufacturing facilities typically require downtime for maintenance.

Several dispersion modelling systems are available to complete this type of air quality assessment. The CALPUFF modelling system (including the CALMET meteorological processor) was chosen because it is best at capturing complex meteorological regimes, such as those found in the Smithers area. It is able to handle the low wind speed, stable atmospheric conditions that are often found in the area in the winter months and are most likely to result in high levels of measured and modelled particulate matter. A discussion and results of the modelling analysis are provided below.

4.1 ASSESSMENT METHODOLOGY

The dispersion modelling was performed using the model inputs and methodology described in the April 2015 Dispersion Modelling Plan for the NewPro Permit Amendment (the Modelling Plan)[5]. The Modelling Plan is included in full in Appendix B and includes detailed information about:

- Facility and project information;
- The modelling domain size and grid cell resolution;
- The modeled meteorology and CALMET options;
- The modeled sources and CALPUFF options;
- Modelled receptors and sensitive areas;
- Discussion of air quality standards and objectives; and
- Existing air quality data.

[5] This Modelling Plan included the final SLR-MOE agreed-upon revisions to the original Modelling Plan submitted in January 2015. The final Modelling Plan was provided via email to MOE on April 3, 2015.

A respective model performance evaluation, as required by the Modelling Plan, for the MM5 prognostic modelling and a quality assurance and analysis of the CALMET diagnostic model are provided in Appendix C and Appendix D, respectively. The assessment results below are based on the modelling methodology and inputs described in the Modelling Plan.

4.2 EXISTING CONDITIONS

The existing air quality conditions of the project area are characterized by a background air quality data value for each pollutant of concern. The background air quality is used to represent non-modelled sources in the area that may come from other industrial activity, traffic, regional transport, or natural emissions. The modelled concentrations from the proposed project are added to these background values to characterize the cumulative or total air quality impact.

The selected background values for $PM_{2.5}$ and PM_{10} from the Modelling Plan are provided in Table 4-1[6] and the daily, 24-hour averaged concentrations for the year 2014 are illustrated in Figure 4-1. Review of Table 4-1 indicates that all background values are equal to, or above, the lowest air quality objective or standard for both $PM_{2.5}$ and PM_{10}. These findings are consistent with other interior airsheds in BC[7] and the recent change in particulate matter monitoring technology[8].

Review of Figure 4-1 indicates that the selected background PM_{10} value occurred during an abnormal elevated period from November 12th- 15th, 2014. The typical (average) 24-hour PM_{10} concentration in 2014 was 13.4 µg/m^3, although the first portion of the year had missing data. It is unknown what caused this period of elevated PM_{10} concentrations, but they are unlikely to be representative of local background air quality levels. Review of the $PM_{2.5}$ in Figure 4-1 indicates the expected seasonal variation in background values with higher values in winter than in summer. The 2014 monitored data shows that peak 24-hour concentrations of $PM_{2.5}$ are typically around 30 µg/m^3 in the winter months with summer peaks typically around 17 µg/m^3. The background $PM_{2.5}$ value in Table 4-1 is the 98th percentile of the 2014 24-hour averaged concentrations.

Table 4-1. 2014 Design Concentration from St Joseph's Monitor

Pollutant	Averaging Period	Design Concentration Level (µg/m^3) [(1)]	Lowest Air Quality Objective or Standard (µg/m^3)	Percentage of Objective or Standard (µg/m^3)
PM_{10}	24-Hour	78	50	156%
$PM_{2.5}$	Annual	8	8	100%
	24-Hour	28	25	112%

(1) Maximum 24-hour concentration for PM_{10}; maximum annual concentration for $PM_{2.5}$; and 98th percentile 24-hour concentration for $PM_{2.5}$.

6 Phone call between SLR (Jason Reed) and the Ministry of Environment (Ralph Adams) on April 1, 2015.
7 Ibid.
8 BVLD Airshed Management Plan, June 21, 2012.

The methodology to collect particulate matter concentrations monitored at St. Josephs has recently undergone a change in technology[9]. In 2010, a Sharp monitor replaced a TEOM™ monitor at St. Josephs. It has been shown that TEOM™ monitors have consistently lower measured $PM_{2.5}$ concentrations than the Sharp instruments with the Sharp data considered more accurate. The under-measurement by TEOMs is most significant during the cold weather months. As a result of this change in technology, many interior airsheds in BC now regularly exceed the provincial AAQO for 24-hour $PM_{2.5}$. The background values listed in Table 4-1 are from the newer Sharp monitors.

A study in Smithers, BC has also demonstrated that the observed $PM_{2.5}$ concentrations can change dramatically over a short distance[10]. This study observed the spatial distribution of $PM_{2.5}$ in Smithers during the winter months of 2007 and 2008 using mobile monitors. It was found that higher $PM_{2.5}$ values tended to occur in the older and denser neighborhoods and mobile home parks. The St. Josephs monitor is located in the more-densely populated part of Smithers and is likely subject to very localized sources such as residential burning and vehicle traffic. According to the data from this study, the part of Smithers in which NewPro is located tended to have lower monitored $PM_{2.5}$ values (equivalent to the bottom or mid-third of the distribution). The poor atmospheric mixing during the winter months likely exacerbates the potential for significant changes in particulate matter concentrations over short distances.

4.3 PROPOSED FACILITY ASSESSMENT RESULTS

The results of the CALPUFF modelling are provided in the tables and figures discussed below. The modelled concentrations are the result of the modelling methodology referenced above and the assumption that the project sources operate at their maximum hourly emission rates for every hour of the year. The model concentrations are predicted for each of the receptors included in the modelling, which were placed throughout the modelling domain on a grid layout with various spacing (gridded receptors)[11] as well as at sensitive locations, such as schools and health care facilities[12]. A background value is also added to the predicted model concentrations from the proposed project. This allows an assessment of the potential, future air quality in the area; however, as described in Section 4.2 the background value used to represent the existing air quality in the area should be considered conservative.

The maximum[13] project-only concentration at any modelled receptor is provided in Table 4-2. These results indicate that the maximum predicted 24-hour PM_{10} concentration is 73 percent of the most stringent air quality objective while the 24-hour and annual $PM_{2.5}$ modelled concentrations are predicted to be 101 percent and 98 percent of the most stringent air quality objectives, respectively. The $PM_{2.5}$ modelled concentrations are below their respective CAAQS. As noted in Table 4-2, the appropriate modelled concentration for comparison to the 24-hour CAAQS should be the 3-year average of the 98th percentiles, which would be equal to or lower, than the maximum, one-year value that is shown.

[9] Ibid.
[10] Ibid.
[11] Refer to Modelling Plan Figures 9 and 10.
[12] Refer to Modelling Plan Figure 10 and Table 3-7.
[13] The maximum concentration presented in the report is based on the form of the applicable standard or objective, e.g. the 98th percentile for $PM_{2.5}$ 24-hour average.

Table 4-2. Maximum Modelled Project Concentrations on Gridded Receptors without Background

Contaminant	Averaging Period	Predicted Concentration(1) (µg/m³)	Air Quality Objective or Standard (µg/m³)	Percentage of Objective or Standard (µg/m³)
PM_{10}	24-hour	36.5	50	73%
$PM_{2.5}$	24-hour	25.3	25(2)	101%
	24-hour		28(3)	89%
	Annual	7.8	8(2)	98%
	Annual		10(3)	78%

(1) The maximum impacts are shown for 24-hour PM_{10} and annual $PM_{2.5}$. The maximum, one-year 98th percentile impact is shown for the 24-hour $PM_{2.5}$ consistent with the form of the Provincial AAQO for this contaminant and averaging period.

(2) Provincial AAQO. Achievement based on annual 98th percentile of daily average, over one year.

(3) CAAQS. Achievement based on annual 98th percentile of daily average, averaged over three consecutive years. Note the modelled value that is used for comparison is the one-year average of the 98th percentile value.

Illustrations of the modelled project concentrations within 5-km of the facility for 24-hour PM_{10}, 24-hour $PM_{2.5}$ and annual $PM_{2.5}$ are shown in Figures 4-2, 4-3 and 4-4, respectively. Analysis of the figures shows that the model-predicted concentrations follow the predominant north-south along-valley wind direction. The highest impacts tend to occur to the north-northeast of the facility due to the predominant wind directions and potentially the source layouts.

Detailed analysis of Figure 4-2 indicates that the maximum PM_{10} concentration occurs adjacent to the facility with a rapid decrease in concentrations away from the facility:

- To the north, the modelled concentrations drop to less than 10 percent of the lowest AAQO within 1-km of the facility[14];
- To the south, they drop to less than 10 percent of the AAQO within 600-m of the facility; and
- To the east and west, they drop to less than 10 percent of the AAQO within 500-m of the facility.

Detailed analysis of Figure 4-3 illustrates that the maximum 24-hour $PM_{2.5}$ modelled concentration also occurs adjacent to the facility with a rapid decrease in concentrations away from the facility:

- To the north, the modelled concentrations drop to less than 10 percent of the lowest AAQO within 1.1-km of the facility;
- To the south, they drop to less than 10 percent of the AAQO within 700-m of the facility; and

[14] Approximate centroid of the facility.

- To the east and west, they drop to less than 10 percent of the AAQO within 400-m of the facility.

Detailed analysis of Figure 4-4 illustrates that the maximum annual $PM_{2.5}$ modelled concentration also occurs adjacent to the facility with a rapid decrease in concentrations away from the facility:

- To the north, the modelled concentrations drop to less than 10 percent of the lowest AAQO within 900-m of the facility;
- To the south, they drop to less than 10 percent of the AAQO within 600-m of the facility; and
- To the east and west, they drop to less than 10 percent of the AAQO within 200-m of the facility.

Modelled 24-hour $PM_{2.5}$ results for the proposed project for the sensitive receptors near the NewPro facility are summarized in Table 4-3. All model-predicted concentrations are less than 10 percent of the Provincial AAQO. This finding is consistent with the contour plots described above that demonstrate a sharp drop-off in model-predicted concentrations away from the facility.

Table 4-3. Maximum Modelled 24-hour $PM_{2.5}$ Project Concentrations on Sensitive Receptors without Background

Site Number	Sensitive Receptor	Predicted Concentration ($\mu g/m^3$)		
		24-hour $PM_{2.5}$ (1)	Annual $PM_{2.5}$ (2)	24-hour PM_{10} (3)
1	Ebenezer Canadian Reformed School	0.22	0.06	0.65
2	St. Joseph's School	0.55	0.14	1.05
3	Bulkley Valley Christian School	1.45	0.37	2.57
4	Walnut Park Elementary	1.01	0.23	1.73
5	Mulheim Elementary	1.45	0.32	2.39
6	Lake Kathlyn Elementary	0.55	0.12	0.90
7	Bulkley Valley Learning Centre	1.01	0.21	1.63
8	Smithers Secondary School	0.78	0.15	1.45
9	Growing Together Playhouse	1.29	0.28	2.08
10	Early Childhood Development Program	1.10	0.23	1.60
11	Bulkley Valley Child Development Centre	0.30	0.08	0.66
12	Growing Together Playhouse 2	1.07	0.26	1.71
13	Smithers Preschool Programs	1.09	0.26	1.95
14	Cutt and Paste Licensed Family Care	1.02	0.22	1.72
15	Discovery House Daycare	0.79	0.20	1.33
16	Smithers & Area Child Care	1.29	0.28	2.09
17	Bulkley Valley District Hospital	1.10	0.27	2.48
18	Bulkley Valley Adult Care Centre	1.33	0.35	2.41
19	The Meadow Senior Assisted Living Complex	1.96	0.44	3.36
20	Ptarmigan Meadow Senior Living Complex	1.28	0.34	2.75
21	Ambleside subdivision	2.20	0.49	3.77

(1) The maximum, one-year 98th percentile impact is shown for the 24-hour $PM_{2.5}$ consistent with the form of the Provincial AAQO for this contaminant and averaging period.

(2) The annual average impact.

(3) The maximum 24-hour impact.

The maximum project-only concentrations from Table 4-2 were added to the background values of $PM_{2.5}$ and PM_{10} from the St. Joseph's school in Smithers. The total impact from the proposed project and the background concentrations is shown in Table 4-3. As discussed in Section 4.2, the background values, by themselves, are equal to or above the Provincial AAQO and CAAQS. Therefore, all cumulative impacts are above the Provincial AAQO and CAAQS.

The background values, and therefore the cumulative air quality concentrations, used in this analysis are likely to be conservative for the following reasons:

- It is assumed that they are constant and do not reflect daily (day to night) or seasonal variations;
- It is assumed that they are the same for the entire modelling domain when it has been shown there is significant spatial variability;

- They are based on anomalously high periods (PM_{10}) and may reflect highly localized sources such as residential wood stoves ($PM_{2.5}$); and,
- The AAQOs were adopted prior to the widespread implementation of the new Sharp monitors that have significantly higher monitored values than the previous instrumentation.

Note that in addition to the conservatism of the background concentration values, that the high cumulative concentrations shown in Table 4-3 are only predicted to occur in the immediate vicinity of the facility. The pollutant concentration contribution from NewPro is dramatically reduced for locations within the central, more densely populated part of Smithers.

Table 4-3. Maximum Modelled Project Concentrations on Gridded Receptors with Background

Contaminant	Averaging Period	Background Concentration(1) (µg/m^3)	Cumulative Concentration (µg/m3)	Air Quality Objective or Standard (µg/m^3)	Percentage of Objective or Standard (µg/m^3)
PM_{10}	24-hour	78	114.5	50	229%
$PM_{2.5}$	24-hour	28	53.3	25(2)	213%
	24-hour			28(3)	190%
	Annual	8	15.8	8(2)	198%
	Annual			10(3)	158%

(1) The maximum observed concentrations from 2014 are shown for 24-hour PM_{10} and annual $PM_{2.5}$. The maximum, 98th percentile concentration in 2014 is shown for the 24-hour $PM_{2.5}$ consistent with the form of the Provincial AAQO for this contaminant and averaging period.
(2) Provincial AAQO. Achievement based on annual 98th percentile of daily average, over one year.
(3) CAAQS. Achievement based on annual 98th percentile of daily average, averaged over three consecutive years. Note the modelled value that is used for comparison is the one-year average of the 98th percentile value.

4.4 EXISITING FACILITY ASSESSMENT RESULTS

As discussed in Section 3, the proposed permit amendment will result in a significant reduction of $PM_{2.5}$ and PM_{10} emissions of -231 TPY and -355 TPY, respectively. The CALPUFF model was also run for the existing NewPro emission sources in order to quantify the reduction in air quality concentration levels in the Smithers area. Using the emission limits from the existing permit and sources, along with the same modelling methodology and inputs, the modelled impacts were plotted as shown in Figure 4-5 to allow for direct comparison to the proposed project modelled concentrations.

Figure 4-5 illustrates the modelled impacts from the existing sources and emissions for 24-hour $PM_{2.5}$, which is directly comparable to Figure 4-3. Note that the general shape and extent of the modelled concentrations is the same, but the magnitude of the modelled concentrations is much greater in Figure 4-5. The overall maximum value for the existing source run (554 µg/m^3) is

20 times larger than for the proposed sources (25.3 μg/m^3). Further comparison of Figures 4-3 and 4-5 indicates that, of the portion of the modelling domain shown in the figures, virtually all of it is greater than 10 percent of the AAQO for $PM_{2.5}$ 24-hour for the existing source run. This is in contrast to the small areas predicted to be above the same threshold for the proposed project described in the prior section. Because everything else in the modelling analysis remained the same between the two runs, except the emissions, the dramatic reduction in modelled concentrations is due solely to the proposed operations requested in the permit amendment. In addition, the reduction in PM_{10} emissions is greater than for $PM_{2.5}$, therefore the corresponding reduction in modelled concentrations is expected to be larger as well.

These concentrations are expected if the amendment to the permit is not approved and the facility continues operations as a particle board plant.

4.5 SUMMARY

The objective of the air dispersion modelling analysis was to provide a method to assess the worst-case potential air quality concentrations due to the future operation of the NewPro facility as a result of the proposed permit amendment. The concentration levels predicted by the model for the proposed project were found to be below the applicable air quality objectives or standards, except for 24-hour $PM_{2.5}$ which was close to meeting the objective at 101 percent of the Provincial AAQO. The maximum project impacts are shown to occur immediately adjacent to the facility with a rapid decrease in model-predicted concentrations away from the facility. All sensitive receptors were modelled to be less than 10 percent of the 24-hour $PM_{2.5}$ Provincial AAQO.

Background air quality data were added to the maximum project-only modelled impacts to assess the worst-case cumulative air quality concentrations. The background data for this analysis were obtained from the St. Josephs monitor, which received new monitoring technology in 2010 that has resulted in much higher measured winter $PM_{2.5}$ concentrations. The high monitored values, combined with simplified, conservative assumptions of a constant (in time and space) background value, results in cumulative concentrations above the ambient air quality objectives and standards.

Importantly, operation of the facility under the proposed permit amendment will result in a significant reduction of $PM_{2.5}$ and PM_{10} emissions of -355 TPY and -231 TPY, respectively. The reduction in emissions results in dramatically lower modelled-concentrations in Smithers. Therefore, this project will result in a net air quality benefit for the region. The quantification of this net air quality benefit does not include any potential airshed benefits resulting from the use of forestry slash waste which would no longer be burned within the Bulkley Valley.

LIMITATIONS

The services described in this work product were performed in accordance with generally accepted professional consulting principles and practices. No other representations or warranties, expressed or implied, are made. These services were performed consistent with our agreement with our client. This work product is intended solely for the use and information of our client unless otherwise noted. Any reliance on this work product by a third party is at such party's sole risk.

Opinions and recommendations contained in this work product are based on conditions that existed at the time the services were performed and are intended only for the client, purposes, locations, time frames, and project parameters indicated. The data reported and the findings, observations, and conclusions expressed are limited by the scope of work. We are not responsible for the impacts of any changes in environmental standards, practices, or regulations subsequent to performance of services. We do not warrant the accuracy of information supplied by others, or the use of segregated portions of this work product.

The purpose of this document is to reasonably evaluate the potential for, or actual impact of, future practices on a given site area, and it is understood that a balance must be struck between a reasonable inquiry into the environmental issues and an appropriate level of analysis for each conceivable issue of potential concern. The following paragraphs discuss the assumptions and parameters under which this document was prepared.

Environmental conditions that are not apparent may exist at the Site. Our professional opinions are based in part on interpretation of data from a limited number of discrete sampling locations and therefore may not be representative of the actual overall regional environmental conditions.

The passage of time, manifestation of latent conditions, or occurrence of future events may require further study at the Site, analysis of the data, and/or re-evaluation of the findings, observations, and conclusions in the work product.

This work product presents professional opinions and findings of a scientific and technical nature. The work product shall not be construed to offer legal opinion or representations as to the requirements of, nor the compliance with, environmental laws rules, regulations, or policies of federal, provincial or local governmental agencies.

Our client may submit this report to Environmental Regulatory Authorities (Municipal, Provincial, Federal) and/or other designated persons of authority (collectively called "Authorities"). Furthermore, those Authorities may rely on this report for review and comment purposes on matters pertaining directly to this report or to the subject project.

FIGURES

Figure 1-1. Site Location Map

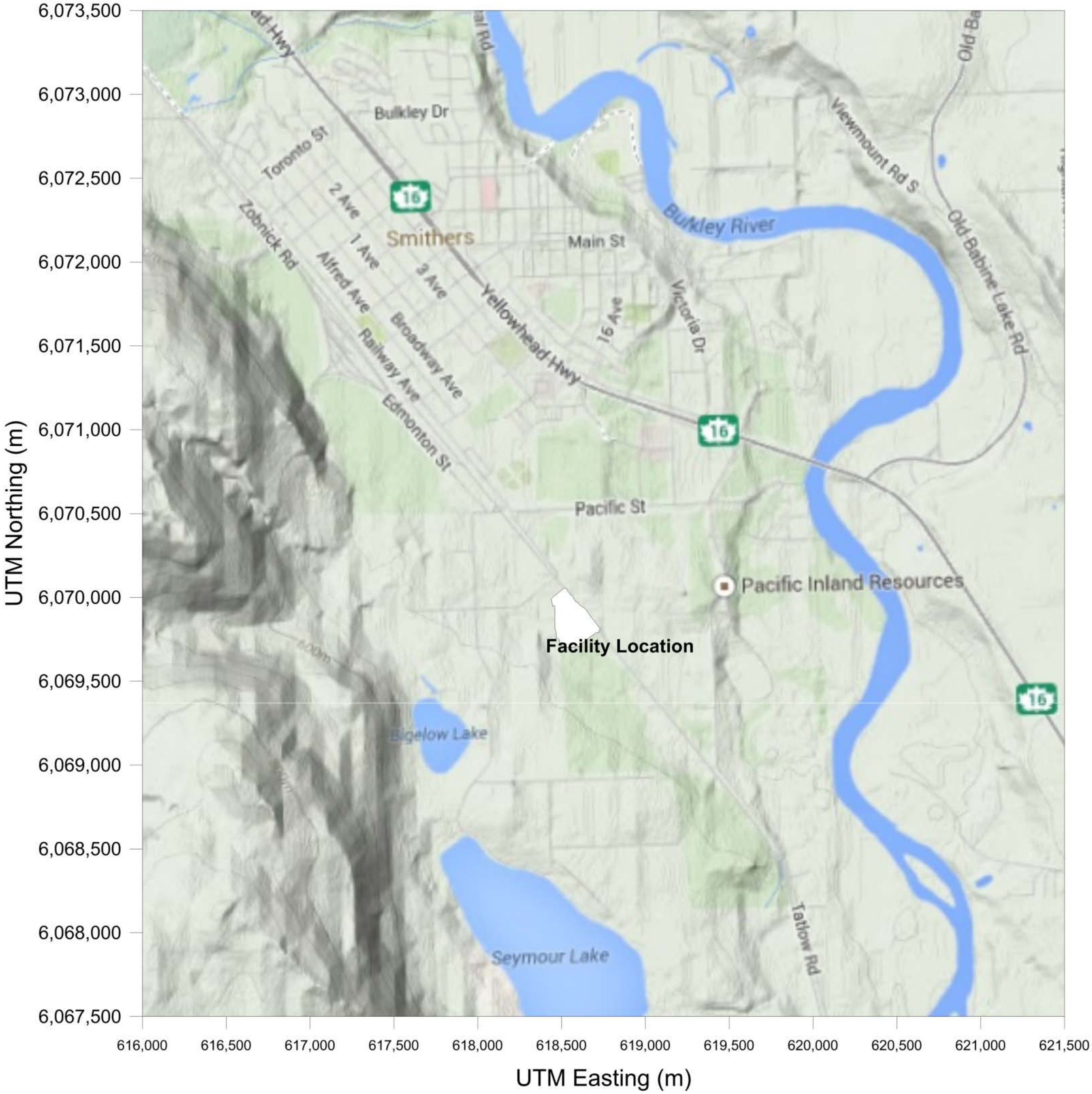


Figure 4-1. Year 2014 24-Hour Averaged Concentrations of $PM_{2.5}$ and PM_{10} at St. Josephs Monitor

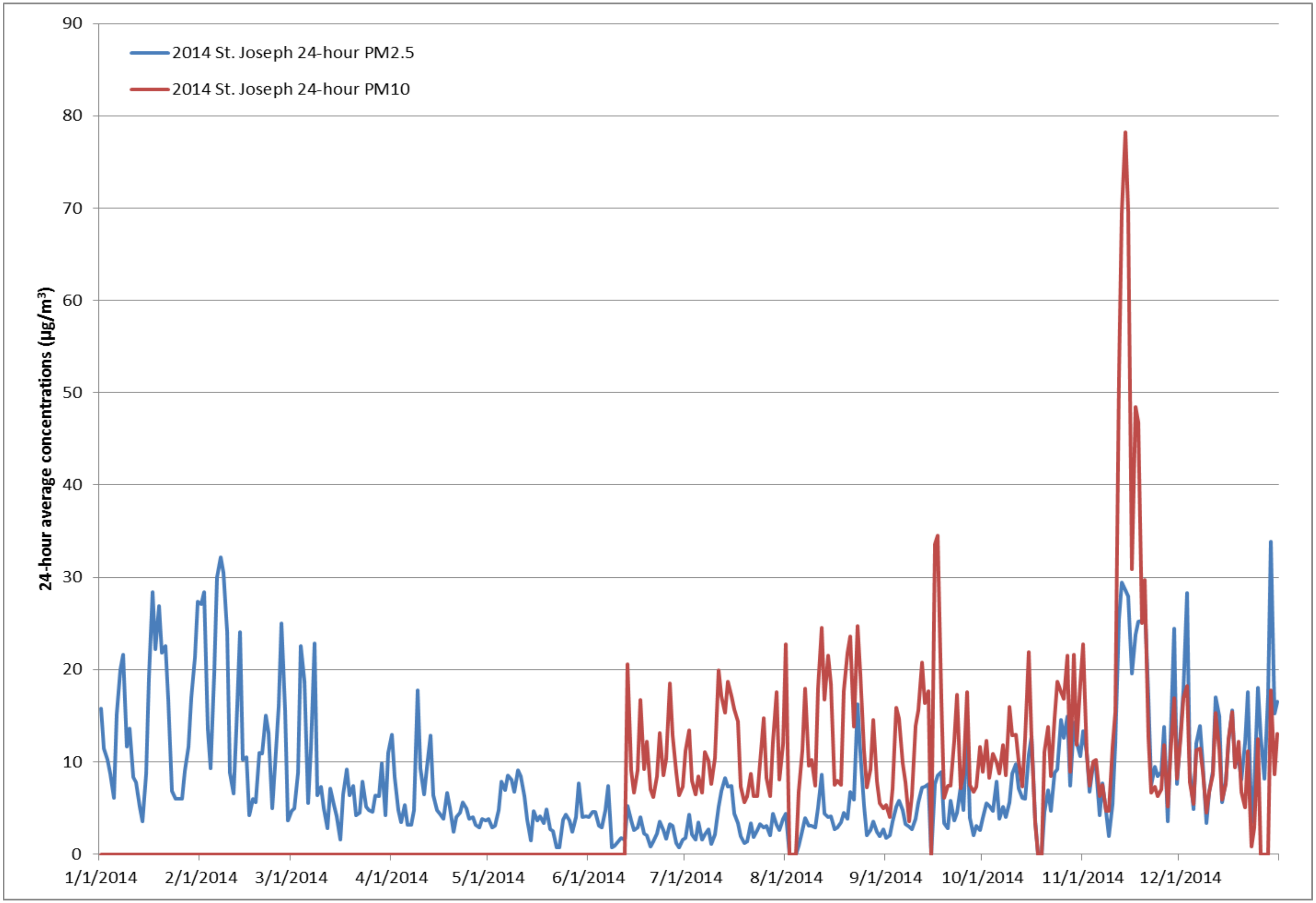
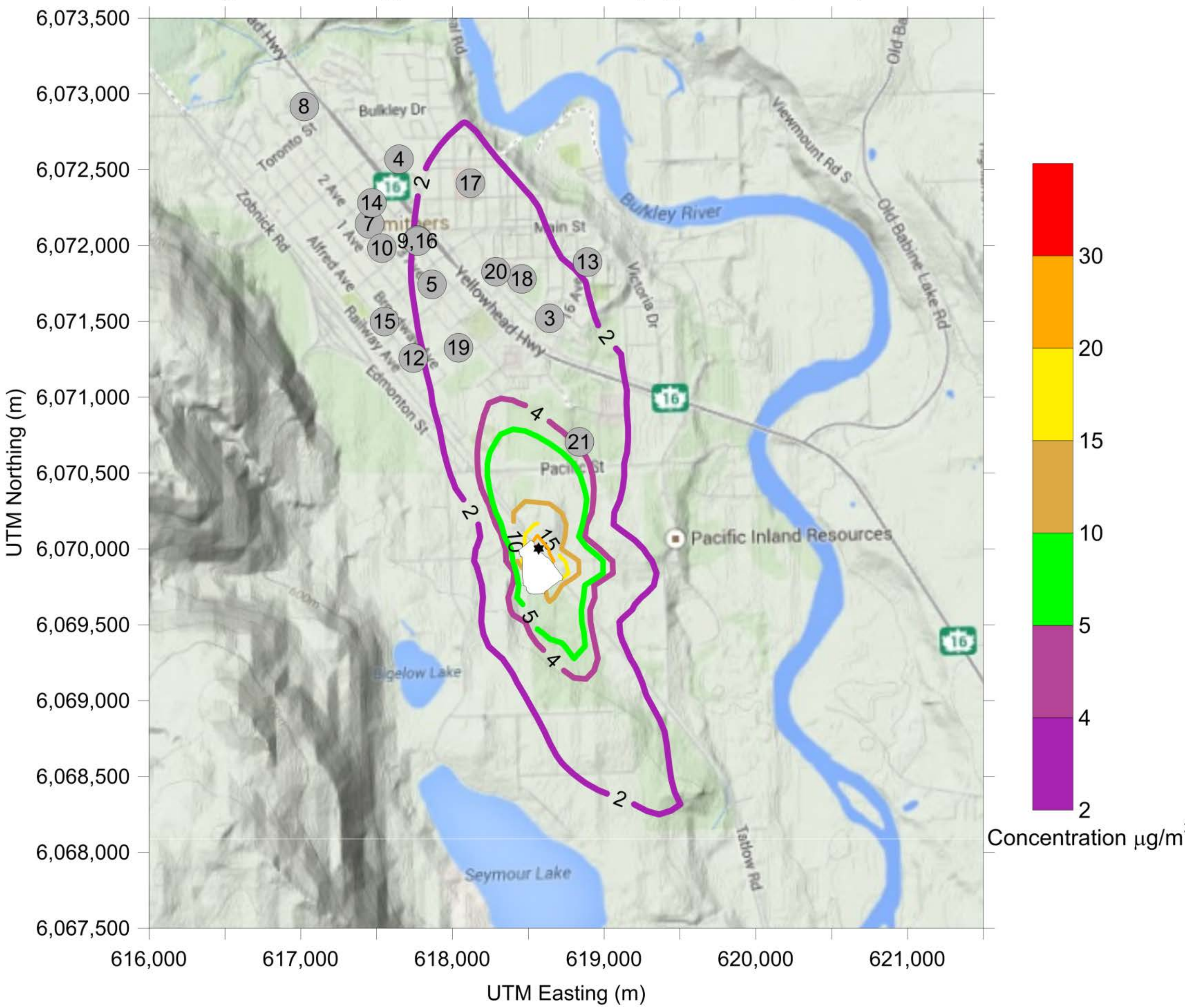


Figure 4-2. PM_{10} 24-hour Maximum (highest of 3 years)



Maximum Concentration (36.5 µg/m³)

10% of ambient air quality objective

Figure 4-3. $PM_{2.5}$ 24-hour 98th Percentile (highest of 3 years)

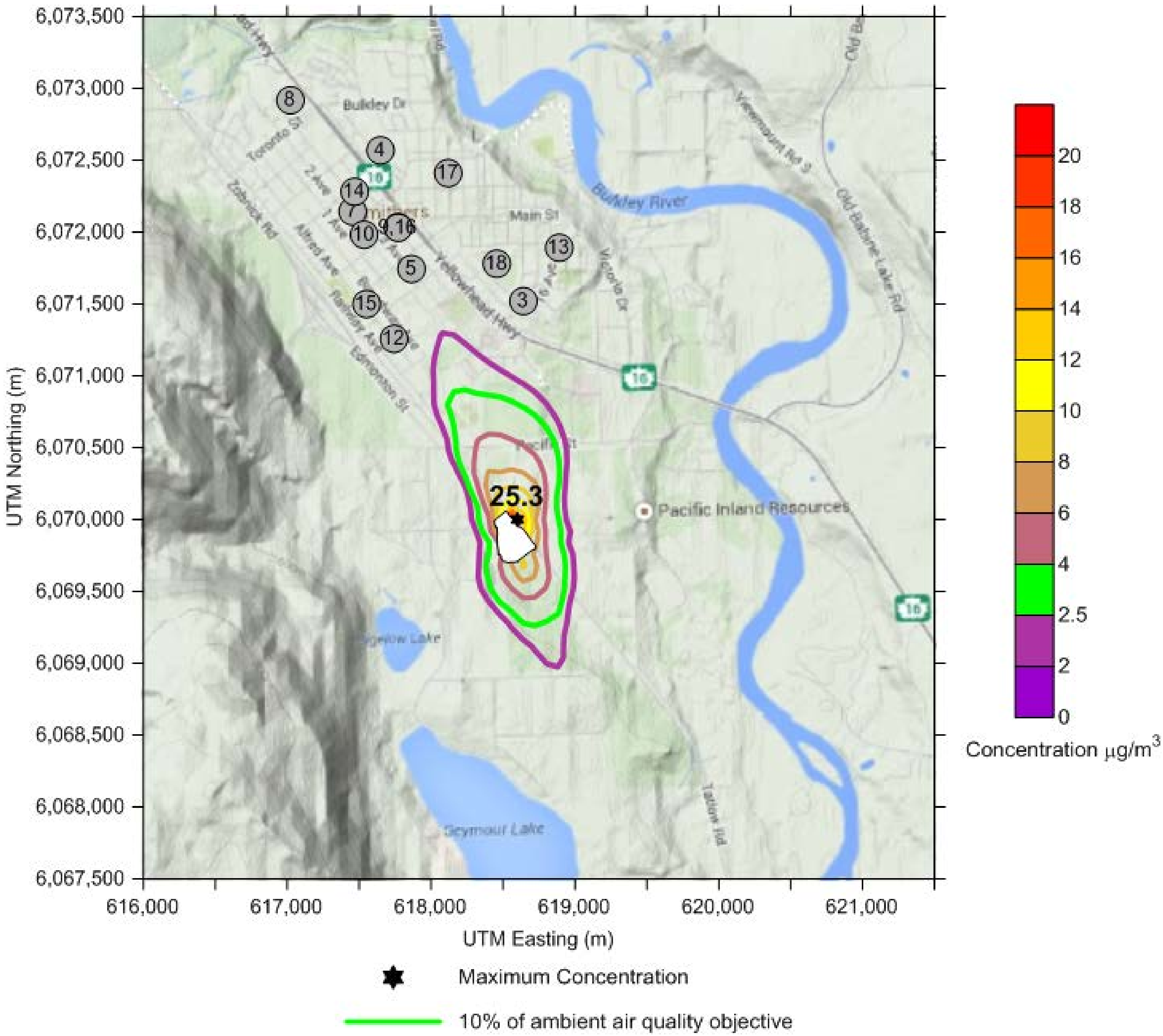
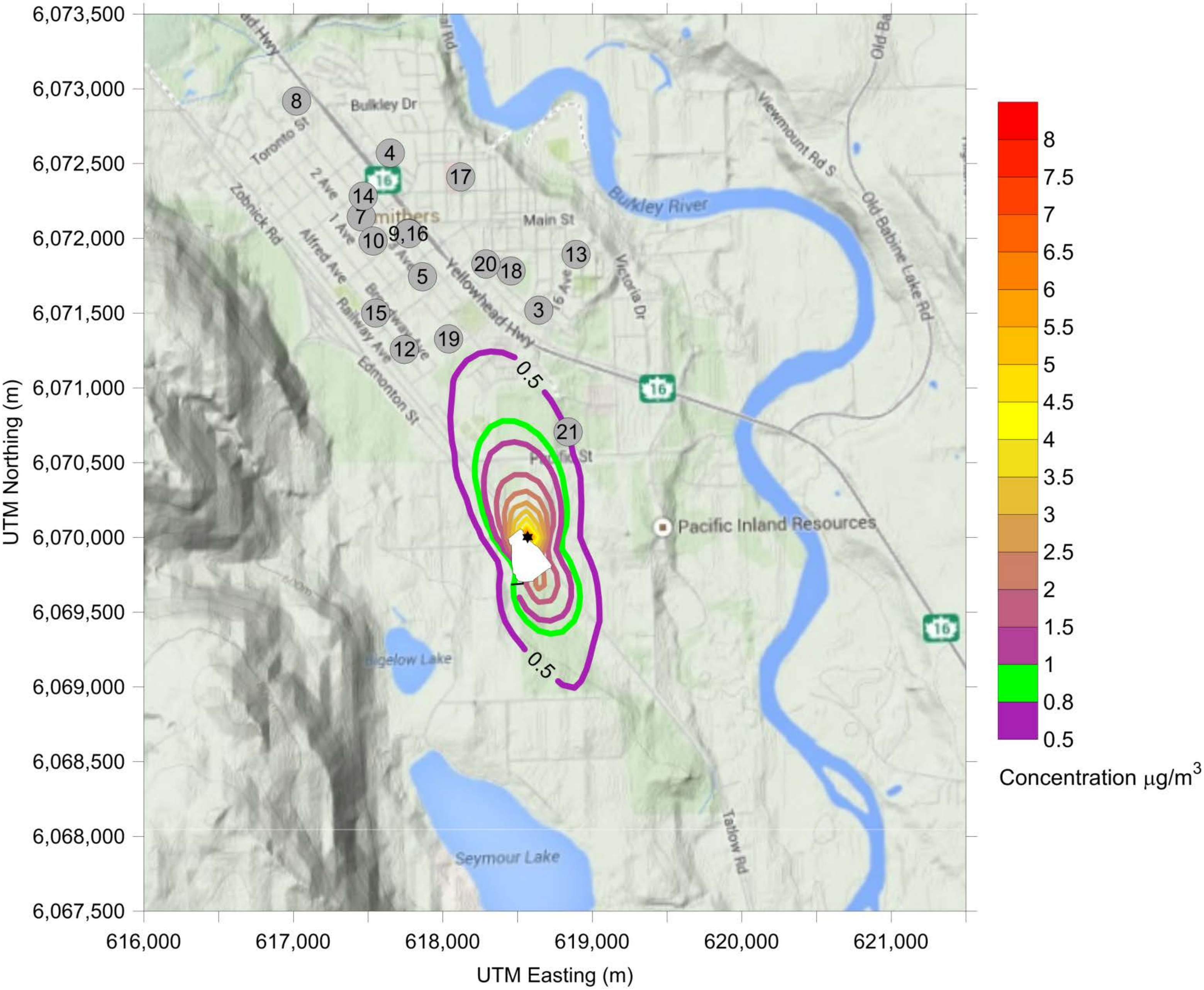


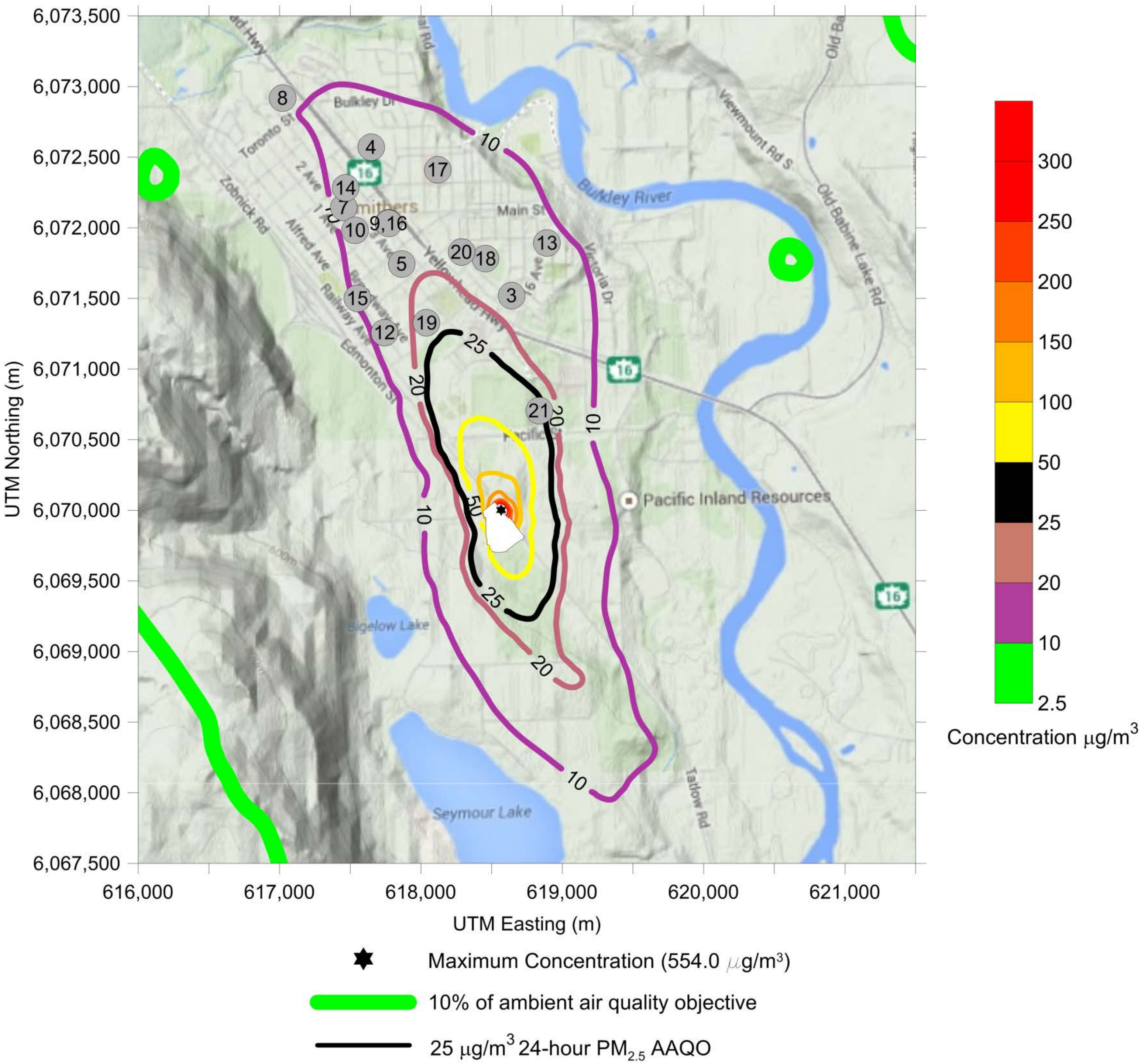
Figure 4-4. $PM_{2.5}$ Annual Maximum (highest of 3 years)



★ Maximum Concentration (7.8 µg/m³)

10% of ambient air quality objective

Figure 4-5. Existing Emissions $PM_{2.5}$ 24-hour 98th Percentile (highest of 3 years)



APPENDIX A

EXCEL-BASED EMISSION CALCULATIONS

Technical Assessment Report

Northern Engineered Wood Products (2007) Inc.

2749 Railway Ave

Smithers B.C. V0J 2N0

June 2015

Table 1. Production and Process Rates
Emissions Inventory
NewPro, Smithers, British Columbia

Emission Source	Flow (m^3/min)	Maximum Rates: Hourly Rates[(a)]			Maximum Rates: Annual Rates[(b)]		
Existing Facility							
Cross Cut Saw Cyclone	360	21,600	m^3/hr	(1)	189,216,000	m^3/yr	
Mat Former Cyclone	360	21,600	m^3/hr	(1)	189,216,000	m^3/yr	
Press Scale Vent Fan	977	58,620	m^3/hr	(1)	513,511,200	m^3/yr	
Three Press Vent Fans	2,931	175,860	m^3/hr	(1)	1,540,533,600	m^3/yr	
Mat Saw Recovery Cyclone	90	5,400	m^3/hr	(1)	47,304,000	m^3/yr	
Cyclone Dust Recovery Baghouse	360	21,600	m^3/hr	(2)	189,216,000	m^3/yr	
Refiner-Flaker Baghouse	600	36,000	m^3/hr	(1)	315,360,000	m^3/yr	
Air Density Separator Cyclone	400	24,000	m^3/hr	(1)	210,240,000	m^3/yr	
Secondary Dryer Twin Cylones	850	51,000	m^3/hr	(1)	446,760,000	m^3/yr	
Primary Dryer Cyclone	1,000	60,000	m^3/hr	(1)	525,600,000	m^3/yr	
Proposed Pellet Plant							
Cyclone Dust Recovery Baghouse	360	21,600	m^3/hr	(2)	189,216,000	m^3/yr	
Refiner-Flaker Baghouse	600	36,000	m^3/hr	(1)	315,360,000	m^3/yr	
Stela Dryer Exhaust Fan	1,783	107,000	Nm^3/hr	(4)	937,320,000	Nm^3/yr	
Stela Dryer Throughput		--			80,000	ODT	(2)
Maximum Hours of Operation		--			8,760	hours	
Average Hours of Operation		--			8,160	hours	(2)
2011 Actual Hours of Operation					8,574	hours	
2012 Actual Hours of Operation					7,608	hours	
2013 Actual Hours of Operation					6,576	hours	

Calculations:

(a) Hourly discharge rate (m^3/hr) = (maximum flow [m^3/min]) x (60 minutes/hour)

(b) Annual discharge rate (m^3/yr) = (hourly discharge rate [m^3/min]) x (60 minutes/hour) x (maximum hours of operation [hrs/yr])

Notes:

(1) From Air Permit No. PA-06099 dated June 12, 2009 for Nothern Engineered Wood Products (2007) inc.

(2) E-mail from Dave Jacobs, dated 6/4/2014. Maximum rates for primary and secondary dryers are assumed to be 10% higher than the average rates.

(3) Vented to Refiner-Flaker Baghouse

(4) Stela dryer specifications for maximum dry flow under standard conditions (email from Bernhard Stummer, STELA Laxhuber GmbH, on October 20, 2014).

Table 2. Existing Facility Potential Emissions
Emissions Inventory
NewPro, Smithers, British Columbia

Emission Source	Pollutant	Emission Factor			Hourly Emissions (kg/hr)	Annual Emissions (tonnes/yr)	
Cross Cut Saw Cyclone	Total PM	115	mg/m^3	(1)	2.5	22	(a)
	PM_{10}	85	% of Total PM	(2)	2.1	18	(b)
	$PM_{2.5}$	50	% of Total PM	(2)	1.2	11	(b)
Mat Former Cyclone	Total PM	115	mg/m^3	(1)	2.5	21.8	(a)
	PM_{10}	85	% of Total PM	(2)	2.1	18.5	(b)
	$PM_{2.5}$	50	% of Total PM	(2)	1.2	10.9	(b)
Press Scale Vent Fan	Total PM	115	mg/m^3	(1)	6.7	59.1	(a)
	PM_{10}	85	% of Total PM	(2)	5.7	50.2	(b)
	$PM_{2.5}$	50	% of Total PM	(2)	3.4	29.5	(b)
Three Press Vent Fans	Total PM	115	mg/m^3	(1)	20.2	177	(a)
	PM_{10}	85	% of Total PM	(2)	17.2	151	(b)
	$PM_{2.5}$	50	% of Total PM	(2)	10.1	89	(b)
Mat Saw Recovery Cyclone	Total PM	115	mg/m^3	(1)	0.6	5	(a)
	PM_{10}	85	% of Total PM	(2)	0.5	5	(b)
	$PM_{2.5}$	50	% of Total PM	(2)	0.3	2.7	(b)
Cyclone Dust Recovery Baghouse	Total PM	20	mg/m^3	(1)	0.4	3.78	(a)
	PM_{10}	99.5	% of Total PM	(2)	0.4	3.77	(b)
	$PM_{2.5}$	99	% of Total PM	(2)	0.4	3.7	(b)
Refiner-Flaker Baghouse	Total PM	20	mg/m^3	(1)	0.7	6.3	(a)
	PM_{10}	99.5	% of Total PM	(2)	0.7	6.3	(b)
	$PM_{2.5}$	99	% of Total PM	(2)	0.7	6.2	(b)
Air Density Separator Cyclone	Total PM	115	mg/m^3	(1)	2.8	24	(a)
	PM_{10}	85	% of Total PM	(2)	2.3	21	(b)
	$PM_{2.5}$	50	% of Total PM	(2)	1.4	12	(b)
Secondary Dryer Twin Cyclones	Total PM	115	mg/m^3	(1)	5.9	51	(a)
	PM_{10}	95	% of Total PM	(2)	5.6	49	(b)
	$PM_{2.5}$	80	% of Total PM	(2)	4.7	41	(b)
	NO_X	0.26	kg/ODT	(3)	1.3	12	(c)
	CO	0.3	kg/ODT	(3)	2	14	(c)

Table 2. Existing Facility Potential Emissions
Emissions Inventory
NewPro, Smithers, British Columbia

Emission Source	Pollutant	Emission Factor			Hourly Emissions (kg/hr)	Annual Emissions (tonnes/yr)	
Primary Dryer Cyclone	Total PM	115	mg/m^3	(1)	6.9	60	(a)
	PM_{10}	95	% of Total PM	(2)	6.6	57	(b)
	$PM_{2.5}$	80	% of Total PM	(2)	5.5	48	(b)
	NO_X	0.26	kg/ODT	(3)	2.6	23	(c)
	CO	0.3	kg/ODT	(3)	3	27	(c)
Hot Oil Heater (Natural Gas Fired)	Total PM	3,380	mg/MMBtu	(4)	0.068	0.59	(d)
	PM_{10}	100	% of Total PM	(4)	0.068	0.59	(b)
	$PM_{2.5}$	100	% of Total PM	(4)	0.068	0.59	(b)
	SO_2	267	mg/MMBtu	(4)	0.0053	0.047	(d)
	NO_X	44,470	mg/MMBtu	(6)	0.89	7.8	(d)
	CO	37,355	mg/MMBtu	(6)	0.75	6.5	(d)

Calculations:

(a) Hourly emissions (kg/hr) = (Hourly Discharge Rate [m^3/hr]) x (emission factor [mg/m^3]) / (10^6 mg/1 kg)
Maximum emissions (tonnes/yr) = (Maximum Annual Discharge Rate [m^3/year]) x (emission factor [mg/m^3]) /
(b) PM_{10}, $PM_{2.5}$ = (Total PM [mg/m^3]) x (% of Total PM)/100
(c) Annual Emissions (tonnes/yr) = (Annual throughput [ODT]) x (emission factor [kg/ODT]) x (1 tonne/1000 kg)
Hourly emissions (kg/hr) = (Annual throughput [ODT]/365) x (emission factor [kg/ODT])
(d) Hourly emissions (kg/hr) = (emission factor [mg/MMBtu]) x (Heat Input [MMBtu/hr]) / (10^6 mg/1 kg)
Annual emissions (tonnes/yr) = (emission factor [mg/MMBtu]) x (Heat Input [MMBtu/hr]) x 24 (hr/day) x 365 (day/yr) x (1
Heat Input (MMBtu/hr) = 20 MMBtu/hr (5)

Notes:

(1) Emission factor taken from the Nothern Engineered Wood Products permit, amended June 2009, and is equal to the allowable total particulate matter and condensable organics.
(2) Ratio taken from Oregon DEQ "Emission Factors - Wood Products PM10/PM2.5 Fraction" Form AQ-EF03 revision 08/01/11, Particle Dryer - Multiclone high pressure and Cyclone - medium efficiency.
(3) Emission factor was taken from AP-42, Chapter 10.6.2, Table 10.6.2-2 February 2002), Emission Factors for Particleboard Dryers - NOx, CO, and CO_2.
(4) AP-42 Table 1.4-2, converted from lb/MMscf to mg/MMBtu
(5) From June 4, 2014 e-mail from Dave Jacobs.
(6) AP-42 Table 1.4-1, Uncontrolled <100 MMBtu/hr, converted from lb/MMscf to mg/MMBtu using the default higher heat input of 1,020 Btu/scf.

Table 3. Proposed Pellet Plant Potential Emissions
Emissions Inventory
NewPro, Smithers, British Columbia

Emission Source	Pollutant	Emission Factor			Hourly Emissions (kg/hr)	Annual Emissions (tonnes/yr)	
Cyclone Dust Recovery Baghouse	Total PM	20	mg/m^3	(1)	0.4	3.8	(a)
	PM_{10}	99.5	% of Total PM	(2)	0.4	3.8	(b)
	$PM_{2.5}$	99	% of Total PM	(2)	0.4	3.7	(b)
Refiner-Flaker Baghouse	Total PM	20	mg/m^3	(1)	0.7	6.3	(a)
	PM_{10}	99.5	% of Total PM	(2)	0.7	6.3	(b)
	$PM_{2.5}$	99	% of Total PM	(2)	0.7	6.2	(b)
Stela Dryer Exhaust Fan	Total PM	16.7	mg/Nm^3		1.8	16	(a)
	filterable PM	4.8	mg/Nm^3	(3)			
	condensable PM	11.9	mg/Nm^3	(3)			
	PM_{10}	75	% of FPM+CPM	(7)	1.7	15	(b)
	$PM_{2.5}$	50	% of FPM+CPM	(7)	1.5	13	(b)
Hot Oil Heater (Natural Gas Fired)	Total PM	3,380	mg/MMBtu	(4)	0.068	0.59	(c)
	PM_{10}	100	% of Total PM	(4)	0.068	0.59	(b)
	$PM_{2.5}$	100	% of Total PM	(4)	0.068	0.59	(b)
	SO_2	267	mg/MMBtu	(4)	0.0053	0.047	(c)
	NO_X	44,470	mg/MMBtu	(6)	0.89	7.8	(c)
	CO	37,355	mg/MMBtu	(6)	0.75	6.5	(c)

Calculations:

(a) Hourly emissions (kg/hr) = (Hourly Discharge Rate [m^3/hr]) x (emission factor [mg/m^3]) / (10^6 mg/kg)

Annual emissions (tonnes/yr) = (Maximum Annual Discharge Rate [m^3/year]) x (emission factor [mg/m^3]) / (1,000,000,000 mg/tonne)

(b) PM_{10}, $PM_{2.5}$ = (Filterable PM [mg/m^3]) x (Filterable PM Fraction [%]) + Condensable PM (mg/m^3)

(c) Hourly emissions (kg/hr) = (emission factor [mg/MMBtu]) x (Heat Input [MMBtu/hr]) / (10^6 mg/1 kg)

Annual emissions (tonnes/yr) = (emission factor [mg/MMBtu]) x (Heat Input [MMBtu/hr]) x 24 (hr/day) x 365 (day/yr) x (1 tonne/10^9 mg)

Heat Input (MMBtu/hr) = 20 MMBtu/hr (5)

Notes:

(1) Emission factor taken from "Emissions and Air Pollution Controls for the Biomass Pellet Manufacturing Industry", prepared for Bc MoE by Environchem Services Inc., May 12, 2010, Table 22.

(2) Emission factors taken from Oregon DEQ "Emission Factors - Wood Products PM10/PM2.5 Fraction" Form AQ-EF03 revision 08/01/11, Process Equipment - Bag Filter System.

(3) Stack test of a Stela Dryer at Diacarbon Energy Inc. on December 12, 2014. Average of 3 tests on each of two stacks plus two standard deviations. Total PM is the sume of the calculated filterable and condensable PM.

(4) AP-42 Table 1.4-2, converted from lb/MMscf to mg/MMBtu

(5) From June 4, 2014 e-mail from Dave Jacobs.

(6) AP-42 Table 1.4-1, Uncontrolled <100 MMBtu/hr, converted from lb/MMscf to mg/MMBtu using the default higher heat input of 1,020 Btu/scf.

(7) Filterable fraction from Müller-BBM stack testing report dated March 16, 2007. All condensable PM is assumed to be less than 2.5 microns.

Table 4. Facility-wide Potential Emissions Summary
Emissions Inventory
NewPro, Smithers, British Columbia

Scenario	Emission Source	Annual Emissions (tonnes/yr)					
		Total PM	PM_{10}	$PM_{2.5}$	NO_X	CO	SO_2
Existing Facility	Cross Cut Saw Cyclone	21.8	18.5	10.9	--	--	--
	Mat Former Cyclone	21.8	18.5	10.9	--	--	--
	Press Scale Vent Fan	59.1	50.2	29.5	--	--	--
	Three Press Vent Fans	177.2	150.6	88.6	--	--	--
	Mat Saw Recovery Cyclone	5.4	4.6	2.7	--	--	--
	Cyclone Dust Recovery Baghouse	3.8	3.8	3.7	--	--	--
	Refiner-Flaker Baghouse	6.3	6.3	6.2	--	--	--
	Air Density Separator Cyclone	24.2	20.6	12.1	--	--	--
	Secondary Dryer Twin Cylones	51.4	48.8	41.1	11.6	13.6	--
	Primary Dryer Cyclone	60.4	57.4	48.4	23.2	27.1	--
	Hot Oil Heater (Natural Gas Fired)	0.6	0.6	0.6	7.8	7	0.047
	Total Emissions	**432**	**380**	**255**	**43**	**47**	**0.047**
Proposed Pellet Plant	Cyclone Dust Recovery Baghouse	3.78	3.77	3.75	--	--	--
	Refiner-Flaker Baghouse	6.31	6.28	6.24	--	--	--
	Stela Dryer Exhaust Fan	15.7	14.5	13.4	--	--	--
	Hot Oil Heater (Natural Gas Fired)	0.59	0.6	0.6	7.8	6.5	0.047
	Total Emissions	**26**	**25**	**24**	**8**	**7**	**0.047**
Proposed Project Emission Change		**-406**	**-355**	**-231**	**-35**	**-41**	**0**

APPENDIX B

DISPERSION MODELLING PLAN FOR THE NEWPRO PERMIT AMENDMENT

Available until July 15, 2015 at:
https://www3.ibackup.com/qmanager/servlet/share?key=xosix77897

Technical Assessment Report

Northern Engineered Wood Products (2007) Inc.

2749 Railway Ave

Smithers B.C. V0J 2N0

June 2015

APPENDIX C

MM5 MODEL PERFORMANCE EVALUATION REPORT

Available until July 15, 2015 at:
https://www3.ibackup.com/qmanager/servlet/share?key=vnrjx12941

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June 2015

APPENDIX D

CALMET QUALITY ASSURANCE AND VERIFICATION PLOTS

Available until July 15, 2015 at:
https://www3.ibackup.com/qmanager/servlet/share?key=vqwfx64523

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June 2015