Request to Amend Manitoba Environment Act Licence 1900 S4
Emission Limits for Pressing and Drying Operations

Louisiana-Pacific Canada Ltd.
Swan Valley OSB

November 18, 2008

Louisiana-Pacific Canada Ltd.
Swan Valley OSB
5 km East of Minitonas on Hwy. 10 Box 189 Minitonas, MB R0L 1G0 **204.525.2479 fax: 204.525.4327**
www.lpcorp.com

Introduction

LP Swan Valley OSB currently operates three Regenerative Thermal Oxidizers (RTOs) for the control of volatile organic compounds (VOCs) from the press and dryer exhaust gas streams. Swan Valley is the only wood products mill in Canada that is required to operate RTOs. While RTOs are highly effective at destroying VOCs, there are environmental tradeoffs, most notably significant increases in emissions of other substances such as carbon dioxide, the primary greenhouse gas, and nitrogen oxides from the combustion of large amounts of natural gas. Also, RTOs have high operating, maintenance and replacement costs, placing Swan Valley OSB at a significant competitive disadvantage compared to the rest of the industry in Canada.

Since the installation of the state-of-the-art single pass dryers and wood-fired energy system in 2004, LP has frequently and openly discussed the eventual decommissioning of the RTOs in both public settings, such as Community Liaison Committee meetings, as well as meetings with senior Manitoba Conservation and Manitoba Government officials. This submittal is the culmination of those discussions.

In order to accommodate the decommissioning of the RTOs, changes to emission limits and associated licence conditions in the Environment Act Licence 1900S4 are required. This submittal outlines the required changes with the necessary justification for each to demonstrate that there will be no significant impact on human health or the environment, allowing Manitoba Conservation to approve the changes as a minor alteration to the development.

Objectives

The objectives of this submittal are three-fold:

1. To request and provide justification for an amendment to the following emission limits from the press vent:
    i. Formaldehyde - increase limit to 1.1 g/s
    ii. Benzene – increase limit to 0.0197 g/s
    iii. MDI – increase limit to 0.089 g/s
    iv. VOC – increase limit to 2.78 g/s

2. To request and provide justification for an amendment to the following emission limits from the WESPs:
    i. Formaldehyde – increase limit to 4.0 g/s
    ii. Benzene – increase limit to 0.172 g/s

3. To clearly demonstrate that the proposed changes in emission limits will not result in significant impact to the surrounding environment and community health.

While the key emission limit changes are identified above, additional administrational amendments to various licence conditions are required to support the decommissioning of the

RTOs. These are summarized in Appendix D. It should be noted that LP Swan Valley will maintain Wet Electrostatic Precipitators (WESPs) for particulate emission control on its single-pass dryers which is still considered state-of-the-art for dryer particulate emission control in the OSB industry.

Through dispersion modeling of total facility emissions and an assessment of ambient air quality parameters, we will demonstrate that the required emission limit increases will not result in significant impact to the surrounding environment or community health. The modeling scenario described here is based on the construction of a single, 49.5 metre stack to capture the exhaust from the existing four single-pass drying systems with WESPs. A single, common stack is the current preferred approach based on similar configurations at other new plants constructed by both by LP and others, however, LP is continuing to explore other options to meet the same objectives utilizing existing equipment so this may not be the final configuration. Emissions from the press will be exhausted through the existing 30.5 metre press RTO stack, although the RTO itself will not be operational.

It must be recognized that, under the proposed configuration, this project will require significant capital for the construction of a new dryer stack and therefore may take 6 – 8 months from project approval to implementation. Assuming Manitoba Conservation's favourable consideration of our application, there will be a period of transition where LP will request the RTOs be decommissioned during the construction phase of the stack with dryer emissions released either through the existing WESP stacks or through the "cold" dryer RTOs. LP suggests that it would be appropriate for LP and Manitoba Conservation to enter into further discussions regarding this transition period at a future date to give proper consideration to existing and projected operating conditions and emission rates at that time, which in all likelihood are expected to be lower than presented in this application as a result of reduced mill operation due to current market conditions

The remainder of this document provides the justification for the emission limit increases following the format outlined in the document "Guidelines for Air Dispersion Modelling in Manitoba"[1] provided by Mr. Ryan Coulter on August 1, 2007.

1.0 Project Description

Elimination of RTOs from Pressing and Drying Operations

History

The 1994 Environmental Impact Assessment (EIA)[2] submitted by LP in support of its application for a licence under the *Manitoba Environment Act* determined that all applicable

[1] Manitoba Conservation "Draft - Guidelines for Air Dispersion Modelling in Manitoba" November 2006. Report No. 2006-0x

[2] Sentar Consultants Ltd., 1994 "Environmental Impact Assessment Louisiana-Pacific Oriented Strand Board Plant, Minitonas, Manitoba"

ambient air quality criteria would be met without RTOs. During the Clean Environment Commission (CEC) hearings, LP proposed the installation of RTOs to alleviate concerns raised by a small group of citizens opposed to an OSB facility in the Swan Valley. Much of this opposition was based on the uncertainty associated with bringing a large wood products manufacturing operation to the valley. As well, due to emerging regulatory requirements in the US at the time, it was believed that all OSB mills built in Canada after Swan Valley would require RTOs and existing mills would be retrofitted with RTOs. In reality, after nearly 13 years of operation, LP Swan Valley is still the only OSB mill in Canada with RTOs including a number of substantially larger or expanded capacity OSB mills constructed after Swan Valley. In addition, while VOC reductions from the wood products sector were initially under consideration in the federal government's air quality initiative, this issue has been set aside due to the recognition that effective VOC control could only be achieved with RTOs, which would result in offsetting and undesirable environmental trade-offs, primarily the emission of significant amounts of greenhouse gases and nitrogen oxides associated with the combustion of significant amounts of natural gas. In fairness, if the federal government does eventually pursue VOC reductions from wood products facilities in Canada, these requirements would apply equally to all facilities in Canada which would put LP Swan Valley on equal footing with the rest of the industry. It must be stated that if this were an application for a new facility, RTOs would not be proposed under the current provincial and/or federal regulatory frameworks.

Economics

The following costs are associated with operating the RTOs. It must be emphasized that the costs incurred are what no other Canadian OSB mill has to endure, placing LP Swan Valley at a significant cost disadvantage in the industry.

Operating Costs

- Natural gas operating costs of $2.5 million annually (at a price of $13/GJ)
- Maintenance costs of $300,000 annually
- Electricity costs of $400,000 annually
- Lost production occurs during an upset condition when an RTO goes down and the corresponding dryers or press are immediately shutdown. This lost production only impacts Swan Valley OSB. For example, our mill lost 3 weeks of production due to a mechanical failure of our Press RTO fan early in 2008. No other facility in Canada would have been impacted or incurred down time.

Replacement Costs

RTOs have a finite life span in the range of 10 – 12 years, therefore Swan Valley's RTOs have already reached the end of their operational life cycle and will require replacement at a cost of $10 million (US). Given that no other OSB facility in Canada, operating or proposed, will face this cost, it seems inconceivable that LP Swan Valley be placed at such a disadvantage. Given the current economic environment, there is no guarantee the plant would remain operational if capital replacement costs had to be incurred.

Benefits

Decommissioning the RTOs will result in substantially reduced GHG emissions from the facility, helping Manitoba meet its GHG reduction targets. While RTOs are effective in controlling VOCs, they produce tremendous amounts of CO_2 (the primary GHG) and NOx through the combustion of natural gas. Based on average annual natural gas consumption for the RTOs from 2004 through 2007 and internationally accepted GHG emission inventory protocols, the reduction in natural gas consumption due to the decommissioning of the RTOs will equate to a GHG emission reduction of approximately 11,830 tonnes of CO_2 equivalents per year. This equates to a 0.92% decrease in Manitoba's GHG emissions from stationary combustion sources from manufacturing industries.[3]

Furthermore, an article published by Sauer, et. al[4] in Forest Products Journal titled *"Environmental Tradeoffs: Life Cycle Approach to Evaluate the Burdens and Benefits of Emission Control Systems in the Wood Panel Industry"* clearly identifies the trade-offs involved in controlling VOC and hazardous air pollutant (HAP) emissions from panel plant press and dryer vents. The report suggests a zero net benefit to installing RTOs as the on-site reductions in VOC come at the expense of higher energy consumption and associated increases in life cycle emissions of nitrogen oxides, sulfur oxides, greenhouse gases and solid waste, as well as a variety of fossil fuel combustion-related HAPs including hydrochloric acid, hydrofluoric acid, and mercury.

Ambient Air Quality Monitoring

A comprehensive ambient air quality monitoring network has been in place in the vicinity of the plant since 1995. Parameters measured currently include PM10, formaldehyde, total VOCs, benzene, MDI, phenol and hydrogen cyanide. There has not been one exceedance of air quality parameters attributed to the mill operation since the inception of the monitoring program. In fact, measured ambient levels of organic compounds are typically below detection limit or at background levels with measurements between the stations closely correlated, indicating that ambient air quality in the area is dominated by regional sources rather than point sources, such as the LP mill. These findings are documented in the quarterly ambient air quality monitoring reports submitted to Manitoba Conservation. It is LP's contention that the existing ambient air quality monitoring programs will continue to ensure protection of human health and the environment following the decommissioning of the RTOs.

---

[3] Manitoba GHG Emissions Stationary Source (1990 – 2005). Climate Change Connection, December 2007

[4] Sauer, et. al 2002. *"Environmental Tradeoffs: Life Cycle Approach to Evaluate the Burdens and Benefits of Emission Control Systems in the Wood Panel Industry"* Forest Products Journal Vol. 52, No. 3

Commitment to Sustainable Development

As mentioned, LP Swan Valley is the only OSB mill in Canada with RTOs controlling emissions from its pressing and drying operations. The current accepted standard in other Canadian jurisdictions is directed toward particulate control for dryer emissions, where WESPs are still considered state-of-the-art, with no controls typically required on pressing operations. Rather than installing end-of-pipe dryer VOC controls, new OSB mills have incorporated single-pass drying technology as a means of reducing organic emissions at the source. In 2004, LP spent $26 million dollars and installed these state-of-the-art single-pass dryers with flue gas recirculation and a wood fuel energy system.

The project was successful in meeting all of its objectives, including consuming all wood residuals, reducing dryer system emissions, improving raw material usage efficiency, and reducing net operating costs. As a result of this project, all wood residuals generated, previously the plant's primary waste stream, are now utilized as a renewable energy source for the plant's manufacturing processes.

The project received an Honourable Mention at the 2005 CCME P2 Awards (Medium Business Category) for Overall Pollution Prevention Efforts with emphasis on:

- **Sustainable Development** – generating usable energy from renewable fuels, improving overall fibre utilization, eliminating wood waste, energy conservation, reduction in operating costs thereby securing longer term viability of the plant
- **Pollution Prevention (P2)** - eliminating emissions at the source through the application of process technologies that reduce pollution (pollution prevention or P2).

These process improvements illustrate the company's commitment to pollution prevention planning and the fundamentals of sustainable development and reinforces the company's commitment to the long-term viability of the Swan Valley OSB operation.

Mill Environmental License to reflect industry standards

Depending on the jurisdiction, many OSB facilities in Canada do not have air emission limits in their operating permits or if they do, they are typically limited only to key emission parameters such as formaldehyde and particulate matter. As previously indicated, Swan Valley OSB operates WESP particulate control devices on its dryers, which is still considered state-of-the-art particulate control in Canada. As such, particulate emissions are not an issue that will be addressed in the comparison to other facilities. The following discussion will focus primarily on formaldehyde, which is the only other emission parameter commonly regulated across most other Canadian jurisdictions.

Table 1 below provides representative information on dryer and press formaldehyde emission limits from LP plants in Canada as well as large competitor OSB facilities that were constructed or underwent major expansions after the start-up of Swan Valley. Note that this is for comparative purposes only to generally indicate the level of allowable emissions at other facilities and does not account for mill press production or dryer throughput capacity.

Table 1. Representative formaldehyde emission limits at Canadian OSB plants

Company –Location	Dryer limit (g/s)	Press limit (g/s)	Comment
LP - Swan Valley, MB	0.085 (current w/RTOs) 1.0 (current w/WESPs only) 4.0 (proposed)	0.08 (current w/RTO) 1.1 (proposed)	
LP - Dawson Creek, BC	2.08	n/a	
LP - Maniwaki, QC	n/a	n/a	Compliance based on testing and dispersion modeling with comparison to ambient standard
LP - Chambord, QC*	n/a	n/a	Compliance based on testing and dispersion modeling with comparison to ambient standard
Canfor-LP – Fort St. John, BC	2.5	0.72	
Canfor - Fort Nelson, BC*	3.58	n/a	
Weyerhaeuser - Hudson Bay, SK*	n/a	n/a	Compliance based on testing and dispersion modeling with comparison to ambient standard
Ainsworth - Grande Prairie, AB	4.5	1.9	Dryer rate estimated based on emission limit of 100mg/m^3 and assumed volumetric discharge rate of 45 m^3/s. Press rate estimated based on emission limit of 40 mg/m^3 and assumed volumetric discharge rate of 100,000 DSCFM.
Footner – High Level, AB*	6.75	1.9	Dryer rate estimated based on emission limit of 100mg/m^3 and assumed volumetric discharge rate of 67.5 m^3/s. Press rate estimated based on emission limit of 40 mg/m^3

			and assumed volumetric discharge rate of 100,000 DSCFM.

* currently indefinitely curtailed or shutdown due to current market conditions

The information in Table 1 above clearly demonstrates that the proposed emission limits for formaldehyde from the dryers and press at Swan Valley OSB are well within the range of those established in other OSB facility's operating permits, particularly if the total dryer and press emissions are considered collectively at those few facilities where limits for both sources exist.

As also evidenced by Table 1, a number of facilities do not have any point source emission limits for formaldehyde. This is generally true for facilities operating in Quebec, Ontario and Saskatchewan, where compliance with applicable air quality parameters under the air quality regulations in those jurisdictions is demonstrated through periodic stack emission monitoring or estimation and dispersion modeling for comparison to ambient standards. In addition, other than formaldehyde, few point source emission limits for speciated organics or total VOCs are included in operating permits for other OSB mills in Canada. Despite that fact, LP Swan Valley is not requesting the removal of any of these "unique" emission limits from its licence, only that they be amended to allow for the decommissioning of the RTOs where applicable. By maintaining limits for these parameters, LP contends that Swan Valley OSB's licence will continue to provide more protection of human health and the environment than any other OSB mill in Canada.

It should be mentioned that, while Clause 51b) of Swan Valley OSB's licence does currently contain emission limits from the WESP stacks, a number of these limits, most notably for formaldehyde and benzene, were generated based on limited information available at the time of the original application. Both Swan Valley OSB and the industry in general have improved their understanding of emissions and have invested in emissions characterization research over the past 13 years, and this application reflects the current state of knowledge for the industry.

In summary, the requested amendments to our operating licence will bring LP Swan Valley to the level of the industry standard in terms of those emission limits generally applicable in other Canadian jurisdictions, and will in fact provide additional protection of environment and human health through the limitation of emissions of other organic parameters. It is worth reiterating that, with four WESPs, a Dry Electrostatic Precipitator (DESP) and five baghouses, Swan Valley OSB will still be at the leading edge of emission control technology for OSB plants in Canada.

2.0 Dispersion Modeling

The preceding discussion focused on the economic burden of RTOs and the competitive disadvantage towards LP Swan Valley in the OSB industry. This section focuses on the

dispersion modeling for all parameters where licence limits apply including formaldehyde, phenol, MDI, benzene, hydrogen cyanide, and total VOCs. Other substances for which there are emission limits are TPM and NOx. Since the dryer WESPs will be retained, TPM is not expected to be impacted by the RTO elimination project, and there will be a reduction in NOx emissions corresponding to the reduction in usage of natural gas.

The following section is a summary of the dispersion modeling using ISC-Prime. Dispersion model isoconcentration graphs plus the raw dispersion model output files are provided in the appendices. Electronic versions will be provided as well.

Pre-approval of modelling approach

Dispersion modeling was conducted in order to estimate worst-case ground level ambient concentrations of licence parameters resulting from the elimination of the RTOs and based on local meteorology. These ambient concentrations are then compared to applicable standards and guidelines (where standards exist) to determine whether the environmental and human health impacts will be within acceptable limits.

As with the dispersion modeling conducted in 1994 during the plant's original permit application process, LPC proposed to use the ISC dispersion model, ISCST3 (Industrial Source Complex Short Term model version 3). This model uses ISCST for simple terrain, and COMPLEX 1 for complex terrain (whichever gives higher results). The specific model version is ISC3P Version 99020, which incorporates the improved building downwash algorithms of ISC-Prime.

This protocol was approved via e-mail correspondence from Mr. Richard Johns, Environmental Approvals and Licensing Branch, Manitoba Conservation, November 20, 2003.

The model inputs are illustrated in Table 2. In this particular scenario, all emission point sources were included in the dispersion model. As mentioned, the modeling scenario is based on the installation of a single, 49.5 metre stack capturing the emissions from four single-pass dryers and WESPs, although this may not be the final configuration as other options that will generate similar modeling results are currently under evaluation. Press emissions will be vented through the existing 30.5 metre press RTO stack, although the RTO itself will not be operational.

These model results are based on the dispersion of maximum emission rates from the facility's point source emissions only and do not account for background concentrations of any of the modeled parameters. As previously indicated, data collected from the existing ambient air quality monitoring network indicate that levels of measured compounds are either below detection limit or at very low levels. As these data have been collected with the mill currently in operation, they can be considered conservative estimates of background concentrations. As will be described below, all modeled results, with the possible exception of formaldehyde, are well below applicable ambient standards or guidelines therefore the addition of a very low baseline

concentration will have a negligible effect. With respect to formaldehyde, the worst case average of 1-hr measured ambient formaldehyde concentrations at either station was 2.32 ug/m3 in 2005. The addition of this conservative baseline formaldehyde concentration to the worst-case model results will still result in the ambient objectives being achieved.

Table 2. Air Dispersion Model Inputs - Source Data

ID	Source	Description	Type	Northing	Easting	Elevation (m)	Stack Ht (m)	Stack Inside Diam. (m)	Gas Temp. (K)	Gas Exit Vel (m/s)	HCHO Emission Rate (g/s)	Benzene Emission Rate (g/s)	Phenol Emission Rate (g/s)	MDI Emission Rate (g/s)	HCN Emission Rate (g/s)	PM (
SRC1	Baghouse	Trim Saw	POINT	365121	5772764	335.28	22.4	1.02	310.93	12.65	NA	NA	NA	NA	NA	
SRC2	Baghouse	Formers	POINT	365127	5772860	335.28	25.4	0.71	317.59	7.85	0.0122	NA	0.3	2.30E-05	NA	
SRC3	Baghouse	Raw Fuel Storage Bin	POINT	365115	5772929	335.28	23.9	0.71	289.15	13.35	NA	NA	NA	NA	NA	
SRC4	Baghouse	Sander	POINT	365109	5772779	335.28	22.4	0.91	289.15	14.67	NA	NA	NA	NA	NA	
SRC5	Baghouse	Flying Cut-Off Saw	POINT	365130	5772860	335.28	25.5	0.91	309.82	20.83	NA	NA	NA	NA	NA	
SRC10	Thermal Oil Heater DESP	GEKA	POINT	365050	5772934	335.28	30.5	1.63	511.48	15.73	0.0088	0.0066	0.4	NA	0.00053	
SRC13	Thermal Oil Emergency		POINT	365066	5772936	335.28	22.9	1.27	0	0.00	NA	NA	NA	NA	NA	
SRC12	WESP Single Stack	Combined WESP 1,2,3,4	POINT	365073	5772903	335.28	49.5	2.59	353.43	16.76	4.0	0.172	0.5	NA	0.4	
SRC9	Press	Press Only (No RTO)	POINT	365075	5772807	335.28	30.5	2.18	328.15	17.93	1.1	0.0197	0.7	0.089	0.00066	

Model Receptors:

The model computes ambient concentrations along the following receptor grids, starting at the center of the plant:

- A fine grid 4 KM square with receptors every 100 metres,
- A medium grid 10 KM square with receptors every 500 metres,
- A course grid 22 KM square with receptors every 1000 metres

Additional receptors were included in the model at the following locations:

- LPC's ambient air monitoring station located approximately 1.5 KM north-northeast of the plant (LP 1)
- LPC's ambient air monitoring station located approximately 2.0 KM West of the plant (LP 2);

Receptors were also placed along the LPC property boundary. There were no receptors located within the property boundary.

Meteorological Data

Meteorological data collected by LPC's ambient air monitoring network located in the vicinity of the plant was utilized in the modeling program. In accordance with US EPA modeling protocols, one year of meteorological data from our monitoring network was utilized to determine the worst-case meteorological conditions from an environmental impact perspective. In this case, meteorological data from 2006 was utilized based on approval from Mr. Ryan Coulter via telephone conversation in August 2008. The meteorological data set satisfies the criteria outlined in the US EPA's "Meteorological Monitoring Guidance for Regulatory Modeling Applications". Upper air data from The Pas was used to compute stability class (1 – 6), and rural/urban mixing height in meters for each hour.

Modeled Emission Rates

Modeling was conducted based on emissions from all licensed sources at the facility normally in operation (i.e. backup or ancillary processes such as the use of the back-up thermal oil heater or

the operation of dryers on back-up fuel were not included) using the licensed emission limits for all other substances. Table 2 (above) lists the emission rates for all other sources emitting based on current licence emission limits. Fugitive sources and sources without emission limits were not included in the model.

3.0 Assessment of Air Quality Modeling Results

Environmental Risk Assessment

Table 3 is a summary of the ISC-PRIME Model output data showing the maximum one-hour ground-level concentrations for all of the emission parameters described in Table 2. All maximum one-hour ground level concentrations are below applicable ambient air quality objectives and guidelines. The maximum one-hour ground level concentration model result for formaldehyde of 56.86 ug/m^3 approaches the ambient standard of 60 ug/m^3 and therefore could represent an issue of concern. However, it should be noted that this is a worst case estimate based on maximum emission rates and worst case local meteorology. To put these results in perspective, frequency analyses have been presented for all parameters, including formaldehyde, to demonstrate that the maximum results are rare events that would only occur under specific conditions and that ambient air quality will be well below all applicable guidelines for nearly all hours of the year.

Detailed ISC-PRIME Model Results including frequency analyses for each pollutant modeled are provided in Appendix A. Appendix B includes the raw dispersion model data. A more detailed discussion on each modeled emission parameter is provided below:

Table 3. ISC-PRIME Dispersion Model Results

Summary of Multi-chemical Model Output Data. Results based on 2006 Meteorological data for all emission sources combined.

Name of Contaminant	*Contaminant Classification*	*Period of Time Contaminant is Measured*	*Maximum Acceptable Level Concentration*	*ISC-PRIME Model Output (1st Highest Max.)*	*Maximum at LP*	*Ambient Air Stations*
					LP 1	*LP 2*
			ug/m³	*ug/m³*	*ug/m³*	*ug/m³*
Formaldehyde	Interim Guideline	1-hour average	60	56.86	7.964	10.378
		24-hour avg.		15.45	1.42	3.01
		Annual avg.		1.27	0.052	0.203
Hydrogen Cyanide	Guideline	1-hour average	40	3.873	0.518	0.796
		Annual average	3	0.045	0.002	0.012
Methylene Diphenyl Diisocyanate (MDI)	Guideline	1-hour average	3	1.895	0.508	0.432
		Annual average	0.5	0.0676	0.0024	0.0064
Nitrogen Dioxide (NO2)	Objective	1-hour average	400	147.783	30.303	26.152
		24-hour average	200	64.478	4.903	8.592
		Annual arithmetic mean	100	8.536	0.167	0.541
Phenol	Guideline	1-hour average	63	38.546	9.643	8.910
Total Suspended Particulate Matter	Objective	24-hour average	120	39.679	3.73	6.97
		Annual Geometric mean	70	6.638	0.177	0.510
Benzene	Guideline (AB & PQ)	1-hour average	30	2.058	0.278	0.396
		24-hour average	10	0.592	0.050	0.112
		Annual average	---	0.029	0.0016	0.007
VOC		1-hour average	---	263.882	35.973	50.593
		24-hour average	---	75.650	6.684	14.406
		Annual average	---	5.204	0.211	0.910

Formaldehyde:

Modeled total facility formaldehyde emissions based on the model inputs (Table 2) results in a maximum predicted one-hour average ambient concentration of 56.86 ug/m^3, below the Manitoba ambient air quality objective Maximum Acceptable Level of 60 ug/m3, which is deemed essential to provide adequate protection for soils, water, vegetation, materials, animals, visibility, personal comfort and well-being. It should be emphasized here that the maximum predicted one-hour average is the worst case situation occurring in one hour out of an entire year (8760 hours) under specific meteorological conditions. Table 3 also shows 24-hour and annual average formaldehyde concentrations.

The iso-concentration analysis for formaldehyde (Appendix A) shows the maximum ground level concentration occurring three KM Southeast of the mill in the middle of the forest. Maximum concentrations predicted for the ambient air monitoring stations (which are more indicative of community health impacts) are shown in Table 3 which indicates maximum predicted one-hour levels of 7.96 ug/m^3 1 KM Northeast of the plant (LP1) and 10.38 ug/m^3 1.5 KM due West of the plant (LP2).

A frequency analysis of the dispersion modeling results for formaldehyde is also provided in Appendix A. The frequency graph shows maximum concentrations of formaldehyde occur less than 0.1 percent of the time. This is further reflected in the table that shows ground level concentrations of formaldehyde are less than one-half the Manitoba ambient air quality objective over 99% of the time. Further discussion on formaldehyde is provided in the following section on Health Risk

Hydrogen Cyanide

Modeled total facility hydrogen cyanide emissions results in a maximum predicted one-hour average of 3.87 ug/m^3 and an annual average of 0.045 ug/m^3, well below ambient air quality objectives. The frequency analysis is provided in Appendix A.

MDI

Modeled total facility methylene diphenol diisocyanate (MDI) emissions results in a maximum predicted one-hour average of 1.895 ug/m^3 and an annual average of 0.068 ug/m^3, well below Manitoba ambient air quality guidelines. The facility had limited source test data on MDI emissions prior to the Press RTO so a NCASI emission factor was used. This emission factor is intentionally conservative to ensure MDI is not underestimated in the licensing process. The Frequency Analysis provided in Appendix A shows the maximum ground level concentration will occur less than 0.1% of the time. The extremely low risk of exposure is further demonstrated by the fact that ground level concentrations of MDI are predicted to be less than one-half the ambient guideline 99% of the time.

NOx

NOx emissions will be reduced with the decommissioning of the RTOs. However, modeled total facility NOx emissions using an emission rate of 12.1 grams per second results in a maximum predicted one-hour average of 147.783 ug/m^3 ,a 24-hour average of 64.478 ug/m^3 and an annual arithmetic mean 8.536 ug/m^3, well below Manitoba ambient air quality objectives. Modeled emission rates were based on the current licence emission rates on the thermal oil heater and combined WESP stacks. The reduced emission rate for the press vent was based on site specific engineering source testing prior to the press RTO.

Phenol

Modeled total facility phenol emissions results in a maximum predicted one-hour average of 38.546 ug/m^3 well below Manitoba ambient air quality guidelines. Modeled emission rates were based current emission rates established in the mill's Environment Act Operating Licence 1900 S4 for the press, WESP stacks, and forming line aspiration system (baghouse). The Frequency Analysis provided in Appendix A shows the maximum ground level concentration will occur less than 0.1% of the time. The extremely low risk of exposure is further demonstrated by the fact that ground level concentrations of phenol are predicted to be less than one-half the ambient guideline 99.9% of the time.

Total Suspended Particulate Matter

RTOs are not designed to control particulate matter therefore particulate emissions are not expected to change with the decommissioning of the RTOs. Modeled total facility TPM emissions results in a maximum predicted one-hour average of 36.679 ug/m^3 , and an annual geometric mean of 6.638 ug/m^3 , well below Manitoba ambient air quality objectives. Modeled emission rates were based on the current licence emission limits press, combined WESP stacks, baghouses, and thermal oil heater.

Benzene

Benzene emissions present a unique problem for LP Swan Valley. The current licence limit in Clause 57 was generated at a time when little or no benzene emissions information from panel plant presses was available. Discussions initiated in 2002 with Mr. Larry Strachan and Mr. Richard Johns of Manitoba Conservation identified a path forward that included a review of available literature and dispersion modeling to identify any impacts associated with an increase in the emission limit. The modeling was to be done in conjunction with the Dryer RTO Elimination Project.

Reference information used to develop a more relevant emission rate was EPA's AP42 Document, March 2002, Table 10.6.1-6 for hot presses from panel plants using phenol-formaldehyde resin and MDI, which is then applied to LP Swan Valley's operating conditions. This equates to an emission rate of 0.0197 grams per second.

Table 3 shows a summary of the model output data for benzene. Ambient air modeling of total facility benzene emissions using a press benzene emission rate of 0.0197 g/s and a dryer benzene emission rate of 0.172 g/s results in a maximum one-hour average ambient benzene concentration of 2.058 ug/m^3, a maximum 24-hour average of 0.592 ug/m^3, and an annual average of 0.029 ug/m^3 . Alberta (30 ug/m^3, 1-hr), Ontario and Quebec (both 10 ug/m^3, 24-hr) are the only provinces in Canada to have adopted air quality standards or objectives for benzene. The summary in Table 3 indicates that benzene emissions will be well below these standards. The Frequency Analysis provided in Appendix A shows the extremely low risk of exposure as demonstrated by the fact that the maximum ground level concentration of benzene is predicted to be less than 7% of the ambient guideline. Further discussion on benzene is provided in the following section on Health Risk Assessment.

VOC

Modeled total facility VOC emissions results in a maximum predicted one-hour average of 263.882 ug/m^3 , a 24-hour average of 75.650 ug/m^3, and a annual average of 5.204 ug/m^3. Currently, ambient air quality objectives or guidelines for total VOCs do not exist. Modeled emission rates were based current emission rates established in the mill's Environment Act Operating Licence 1900 S4 on the combined WESP stacks, and thermal oil heater. The VOC emission rate from the press vent is based on the emission rate used for the 1994 EIA without the press RTO.

Health Risk Assessment

As shown, all of the modeled emission parameters are below applicable ambient air standards and objectives. Of those, formaldehyde and benzene are considered potential carcinogens requiring further analysis to demonstrate that any health risks are below acceptable risk criteria.

The following risk analysis was provided by Dr. Vickie Tatum of the National Council of Air & Stream Improvement (NCASI) regarding the health risk associated with the maximum predicted ambient concentrations for formaldehyde and benzene. The complete report is provided as an attachment in appendix C. Please note that the report refers to "fenceline" concentrations that, in fact, means maximum ground level concentrations based on the model outputs shown in Table 3.

Formaldehyde:

The IRIS listing for formaldehyde is currently being revised and since 1999, US EPA has utilized a unit risk level derived by the CIIT Centers for Health Research. It is anticipated that the revised IRIS listing for formaldehyde will adopt this CIIT unit risk estimate, which is 5.5 x 10^{-9}/ ug/m^3.

The ISC-PRIME dispersion model predicts an annual average ground level formaldehyde concentration of 1.27 ug/m^3 following RTO elimination. The risk level associated with this concentration is:
1.27 ug/m^3 x 5.5 x 10^{-9} /ug/m^3 = 6.99 x 10^{-9}

This risk level is three orders of magnitude lower than the 10^{-6} (1 in a million) risk level considered acceptable. Thus, the proposed RTO elimination does not represent any unacceptable risk of increased cancer associated with formaldehyde exposure.

Expected ambient concentrations of formaldehyde following RTO elimination can also be compared to exposure limits based on non-cancer endpoints in order to determine whether any non-cancer health effects are likely to be associated with formaldehyde emissions. There is no universal consensus as to which exposure limits are most appropriate for these comparisons. The table below lists several exposure limits based on non-cancer endpoints.

Type of exposure limit	Exposure Limit (ug/m^3)
Manitoba 1-hr average ambient	60.0
ATSDR MRL[1] Acute[2]	49.1
ATSDR MRL Intermediate[3]	36.8
ATSDR MRL Chronic[4]	9.82

[1]Agency for Toxic Substances and Disease Registry Minimal Risk Level
[2] Exposure duration = 1-14 days
[3]Exposure duration = >14-365 days
[4]Exposure duration = >365 days

The ISC-PRIME dispersion model prediction for the maximum 1-hour average ambient ground level concentration of formaldehyde following RTO elimination (56.86 ug/m^3) may best be compared to the Manitoba 1-hour average ambient limit. The model prediction for the maximum 24-hour average ambient fenceline concentration (15.45 ug/m^3) may best be compared to the ATSDR acute MRL and that for the maximum annual average (1.27 ug/m^3) can be compared to the ATSDR intermediate or chronic MRLs. In every case, the predicted formaldehyde concentration is lower than the regulatory limit, therefore the likelihood of non-cancer adverse effects associated with the proposed RTO elimination is negligible.

Benzene

The IRIS unit risk factor for benzene is expressed as a range (2.2 x 10^{-6} to 7.8 x 10^{-6}) rather than a single number. The ISC-PRIME dispersion model predicts an annual average ground level benzene concentration of 0.029 ug/m^3 following RTO elimination. The lower and upper bounds of the range of risk levels associated with this concentration are:

0.029 ug/m^3 x 2.2 x 10^{-6} /ug/m^3 = 6.38 x 10^{-8}

0.029 ug/m^3 x 7.8 x 10^{-6}/ug/m^3 = 2.26 x 10^{-7}

These risk levels are well below the 10^{-6} (1 in a million) risk level considered acceptable. Thus, the proposed RTO elimination does not represent any unacceptable risk of increased cancer associated with benzene exposure.

There are a number of exposure limits for benzene that are based on non-cancer endpoints. The ISC-PRIME dispersion model predictions for ambient benzene concentrations can be compared to these limits in order to assess the likelihood that any non-cancer adverse effects would be associated with the proposed RTO elimination. The table below lists several of these exposure limits. There is no universal consensus as to which exposure limits are most appropriate for these comparisons.

Type of Exposure Limit	Exposure Limit (ug/m^3)
IRIS RfC[1]	30
ATSDR MRL[2] Acute[3]	28.8
ATSDR MRL Intermediate[4]	19.2
ATSDR MRL Chronic[5]	9.6
ACGIH TLV[6]	1,579
ACGIH STEL[7]	7,987

[1]US EPA IRIS Reference Concentration (RfC), the concentration at which a lifetime exposure is expected to have no adverse effect
[2]Agency for Toxic Substances and Disease Registry Minimal Risk Level
[3] Exposure duration = 1-14 days
[4]Exposure duration = >14-365 days
[5]Exposure duration = >365 days
[6]American Conference of Governmental Industrial Hygienists Threshold Limit Value, an 8-hour time weighted average occupational exposure limit
[7]American Conference of Governmental Industrial Hygienists Short Term Exposure Limit, a 15-minute average occupational exposure limit

The ISC-PRIME dispersion model prediction for the maximum 1-hour average ambient ground level concentration of benzene following RTO elimination (2.058 ug/m^3) might be compared to the ACGIH TLV or STEL. The model prediction for the maximum 24-hour average ambient ground level concentration (0.592 ug/m^3) may best be compared to the ATSDR acute MRL and that for the maximum annual average (0.029 ug/m^3) can be compared to the ATSDR intermediate or chronic MRLs or the IRIS RfC. In every case, the predicted benzene concentration is considerably lower than the regulatory limit, therefore the likelihood of non-cancer adverse effects associated with the proposed RTO elimination is essentially non-existent.

Four of the other compounds on the list, hydrogen cyanide, methylene diphenyl diisocyanate (MDI), nitrogen dioxide, and phenol, are not carcinogens, but various regulatory agencies do set health-based exposure or air quality limits for them. The ISC-PRIME dispersion model predictions for ambient concentrations of these compounds can be compared to these limits in

order to assess the likelihood that any non-cancer adverse effects would be associated with the proposed RTO elimination.

Hydrogen Cyanide

Type of exposure limit	Exposure Limit (ug/m^3)
Manitoba 1-hr average ambient	40
Manitoba annual average ambient	3
IRIS RfC[1]	3
ACGIH STEL[2]	5.2 x 10^3 (Ceiling limit)

[1]US EPA IRIS Reference Concentration (RfC), the concentration at which a lifetime exposure is expected to have no adverse effect
[2]American Conference of Governmental Industrial Hygienists Short Term Exposure Limit, a 15-minute average occupational exposure limit

The ISC-PRIME dispersion model prediction for the maximum 1-hour average ambient ground level concentration of hydrogen cyanide following RTO elimination (3.873 ug/m^3) might be compared to the Manitoba 1-hour guideline or the ACGIH STEL. The model prediction for the maximum annual average (0.045 ug/m^3) can be compared to the Manitoba annual average guideline or the IRIS RfC. In every case, the predicted hydrogen cyanide concentration is considerably lower than the regulatory limit, meaning that there is virtually no chance of experiencing non-cancer adverse effects associated with the proposed RTO elimination.

MDI

Type of exposure limit	Exposure Limit (ug/m^3)
Manitoba 1-hr average ambient	3
Manitoba annual average ambient	0.5
IRIS RfC[1]	0.6
ACGIH TLV[2]	51.2

[1]US EPA IRIS Reference Concentration (RfC), the concentration at which a lifetime exposure is expected to have no adverse effect
[2]American Conference of Governmental Industrial Hygienists Threshold Limit Value, an 8-hour time weighted average occupational exposure limit

The ISC-PRIME dispersion model prediction for the maximum 1-hour average ambient ground level concentration of MDI following RTO elimination (1.895 ug/m^3) might be compared to the Manitoba 1-hour guideline or the ACGIH TLV. The model prediction for the maximum annual average (0.068 ug/m^3) can be compared to the Manitoba annual average guideline or the IRIS RfC. In every case, the predicted MDI concentration is well below the regulatory limit, which means that the likelihood of non-cancer adverse effects associated with the proposed RTO elimination is negligible.

Nitrogen Dioxide

Type of exposure limit	Exposure Limit (ug/m^3)
Manitoba[1] 1-hr average ambient	400
Manitoba[1] 24-hour average ambient	200
Manitoba[1] annual average[2] ambient	100
US EPA NAAQS[3] annual average[2]	100
ACGIH TLV[4]	5,650
ACGIH STEL[5]	9,410

[1]These are "Objectives" rather than "Guidelines"
[2]Average calculated as arithmetic mean
[3]US Environmental Protection Agency National Ambient Air Quality Standard
[4]American Conference of Governmental Industrial Hygienists Threshold Limit Value, an 8-hour time weighted average occupational exposure limit
[5]American Conference of Governmental Industrial Hygienists Short Term Exposure Limit, a 15-minute average occupational exposure limit

The ISC-PRIME dispersion model prediction for the maximum 1-hour average ambient ground level concentration of NO_2 following RTO elimination (147.78 ug/m^3) might be compared to the Manitoba 1-hour average or the ACGIH TLV or STEL. The model prediction for the maximum 24-hour average ambient ground level concentration (64.48 ug/m^3) may best be compared to the Manitoba 24-hour ambient average objective and that for the annual average (8.54 ug/m^3) can be compared to the Manitoba annual ambient objective or the EPA NAAQS. In every case, the predicted nitrogen dioxide concentration is much lower than the regulatory limit, therefore the likelihood of non-cancer adverse effects associated with the proposed RTO elimination is negligible.

Phenol

Type of exposure limit	Exposure Limit (ug/m^3)
Manitoba 1-hr average ambient	63
ACGIH TLV[1]	19,250
ATSDR MRL[2] Acute[3]	76.98

[1]American Conference of Governmental Industrial Hygienists Threshold Limit Value, an 8-hour time weighted average occupational exposure limit
[2]Agency for Toxic Substances and Disease Registry Minimal Risk Level
[3] Exposure duration = 1-14 days

The ISC-PRIME dispersion model prediction for the maximum 1-hour average ambient ground level concentration of phenol following RTO elimination (38.546 ug/m^3) might be compared to the Manitoba 1-hour average, the ACGIH TLV, or the ATSDR MRL Acute. In every case, the predicted phenol concentration is much lower than the regulatory limit, so there is little chance that any non-cancer adverse effects will be associated with the elimination of the RTO.

4.0 Summary

To summarize, for the past 13 years, LP Swan Valley has been the only wood products manufacturing mill in Canada required to operate RTOs for the control VOC emissions from its pressing and drying operations. In 2004, the plant installed state-of-the-art single pass dryers and a wood fired energy system – the same equipment that has been installed in newer or expanded facilities to eliminate the need for additional end-of-pipe VOC controls. A favourable review and approval of the proposed licence amendments will allow LP Swan Valley to decommission its RTOs thereby reducing operating costs associated with the combustion of natural gas, allowing LP Swan Valley to remain competitive in the OSB industry. This submittal provides the necessary justification to demonstrate that there will be no significant impact on human health or the environment, allowing Manitoba Conservation to approve decommissioning the RTOs (and applicable licence amendments) as a minor alteration to the development.

Through RTO elimination, Manitoba will realize the positive impact of GHG reductions. The reduction in natural gas consumption equates to a GHG emission reduction of approximately 11,830 tonnes of CO_2 equivalents per year, which represents 0.92 percent reduction in GHG emissions for all stationary combustion sources in Manitoba's manufacturing sector.

This proposal demonstrates that the environmental and human health risks associated with RTO elimination are negligible based on the fact that maximum ground level concentrations for all emission parameters modeled are below applicable ambient standards and guidelines. The model prediction of maximum ground level concentration of formaldehyde approaches the 1-hour ambient standard, however the frequency analysis shows this occurs 0.1% of the time while ground level concentrations are less than one-half the Manitoba ambient air quality objective over 99% of the time.

In addition, while formaldehyde and benzene are considered potential carcinogens, the risk analysis demonstrates that the risk level for each is well below the 1.0^{-6} (one in a million) risk level considered acceptable, therefore the proposed RTO elimination does not represent any unacceptable risk of increased cancer associated with formaldehyde and benzene exposure. Additionally, a detailed health risk analysis of all emission parameters modeled show that the risk of adverse effects associated with the proposed RTO elimination is negligible.

Lastly, it must be stressed that the economic burden of operating RTOs places LP Swan Valley at a significant competitive disadvantage of over $3,000,000 annually. With the current market conditions forecasted into 2010 it is highly conceivable that the Swan Valley OSB mill would shut down indefinitely. This would impact 175 staff and hourly personnel plus the associated contracted log yard handlers and logging contractors, should the requirement remain to operate RTOs. RTO elimination provides a win for the community by enhancing the long term viability of the plant and therefore the continued prosperity of the communities in and around the valley.