Manitoba Clean Environment Commission

An investigation into changes requested to Louisiana-Pacific Environment Act Licence

August 2010

Manitoba CLEAN·ENVIRONMENT™ COMMISSION

Manitoba

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August 16, 2010

Honourable Bill Blaikie
Minister of Conservation
Room 330 Legislative Building
450 Broadway
Winnipeg, Manitoba R3C 0V8

Dear Minister Blaikie:

Re: Louisiana-Pacific Canada Limited's request for permanent alterations to its Swan Valley oriented strand board (OSB) plant's *Environment Act* Licence Number 1900 S4.

The Panel is pleased to submit the Clean Environment Commission's report on its investigation into changes requested to Louisiana-Pacific Environment Act Licence.

Sincerely,

Edwin Yee, Chair

Ken Gibbons

Patricia MacKay

Ken Wait

Manitoba

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Executive Summary

Mandate and terms of reference

In March 2009, in accordance with section 6(5) of *The Environment Act*, the Manitoba Minister of Conservation requested that the Manitoba Clean Environment Commission (the Commission/CEC) conduct an investigation into Louisiana-Pacific Canada Limited's request for permanent alterations to its Swan Valley oriented strand board (OSB) plant's Manitoba *Environment Act* Licence Number 1900 S4.

The request included the following terms of reference:

1. The CEC will conduct an investigation and provide advice and recommendations to the Minister regarding the potential health and environmental effects of the increased emission limits and the subsequent decommissioning of the Regenerative Thermal Oxidizer technology which is contained in Louisiana Pacific's requested licence change.
2. In conducting this investigation and in providing advice and recommendations, the CEC will provide members of the public an opportunity for input regarding LP's

proposal at a public meeting in the affected community.

3. As LP's current licence has a requirement for the Director of Environmental Assessment and Licensing to review the terms and conditions of the licence prior to June 1, 2009, the CEC process should begin as soon as possible, and should be completed prior to that date.

The Commission communicated to the Minister on April 28, 2009 that due to the complexity of the issues and the requirement to consult with the public it would not be able to meet that deadline. To address these issues, the Director of Environmental Assessment and Licensing reviewed the emission limits in *Environment Act* Licence Number 2861 (the licence that currently regulates the operation of the Swan Valley OSB plant) and concluded that no alteration to the licence was required and it would remain in place until the Commission's investigation has been completed. At that time the Director would conduct a further review of the licence.

The panel reviewed the relevant *Environment Act* licences, documentation provided by Louisiana-Pacific and Manitoba Conservation, along with published resources. It also commissioned a background paper on the issues under investigation, which was made available to the public prior to the public meeting in Swan River. The panel met with representatives of Louisiana-Pacific and Manitoba Conservation and toured Louisiana-Pacific's Swan Valley OSB plant. As mandated, it held a public meeting in Swan River, Manitoba from July 28 to July 29, 2009. The Commission also received written submissions from the public and interested parties. In October 2009, the Commission requested that Louisiana-Pacific provide it with additional information regarding air dispersion modelling, which was received in May 2010. Through its investigation, the Commission has been able to receive input from all concerned organizations and gather all the information that it has deemed necessary to prepare a full report that addresses the issues set out in its mandate.

The application under consideration

The regenerative thermal oxidizers (RTOs) are estimated to reduce the emission of volatile organic compounds (VOCs) into the atmosphere by between 90 and 95 per cent. Removing the RTOs will increase VOC emissions, often by more than one order of magnitude, and require adjustments to the emission limits in the *Environment Act* licence governing the Swan Valley oriented strand board (OSB) plant.

Louisiana-Pacific's initial proposal for the Swan Valley OSB plant did not include the installation of RTOs. However, during the course of a Clean Environment Commission hearing in 1994, members of the public pointed out that in the United States Louisiana-Pacific, as the result of a court settlement, was in the process of installing RTOs (or equivalent technology) at its OSB plants to control the emission of VOCs. Throughout the Manitoba hearing, Louisiana-Pacific took the position that, without RTOs, the Swan Valley OSB plant would be compliant with all applicable Manitoba Ambient Air Quality Criteria. However, on the final day of the hearing, the company informed the Commission that it intended to install RTOs in the plant. As a result, the 1994 Commission report recommended that the plant be issued an *Environment Act* licence and that that licence require the installation of RTOs, even though

the Commission concluded that without RTOs, the Louisiana-Pacific application met all applicable Manitoba environmental criteria. The fact that RTOs would have been required if the plant were located in the United States was not the basis of the Commission's decision to recommend that they be installed at the Swan Valley OSB plant. The plant was subsequently constructed and licensed in accordance with that recommendation.

The current application before the Commission was driven by a number of factors:

- The RTOs are reaching the end of their lifespan.
- Louisiana-Pacific has made changes in its dryer operation technology that allowed it to decrease emissions of VOCs from the dryers.
- Contrary to Louisiana-Pacific's expectations, no other OSB plant in Canada is required to install RTOs.
- Louisiana-Pacific maintained that without RTOs—and with changes to its stack configuration—its air emissions would not represent a risk to human or environmental health.

The regulatory approach adopted in Manitoba is to use technology requirements, air quality criteria, and risk assessments in a site-specific manner to determine how a development will affect air quality. The Commission accepts the legitimacy of this approach, which allows for an examination of research and standards that have been developed throughout the world. In assessing this proposal for a change to Louisiana-Pacific's licence, the Commission has been guided by Manitoba policy and has sought to ensure a full application of that policy.

The Commission also wishes to make clear that Canadian and American jurisdictions have taken different approaches to the regulation of VOCs. Volatile organic compounds, as the name suggests, are not a single contaminant but a chemical category, which depending on the situation can be made up of thousands of different chemical substances. Because of difficulties in developing emission limits for each of these substances, the United States has adopted a policy of requiring that plants with significant VOC emissions be required to use the best available control technology. This requirement is made without any assessment of the specific VOCs or their impact on the receiving environment.

The Canadian approach is to determine the maximum output of specific contaminants and assess the impact of those contaminants on the receiving environment. This is done through the use of air dispersion modelling and the comparison of modelling results with established ambient air quality criteria and the application of health risk assessments. In making its recommendations, the Commission has followed this approach.

The Commission's concern is not, for the most part, with the magnitude of the increase, but the impact of the increase. While the total number of different VOCs being emitted by the Swan Valley OSB plant is not known, the VOCs most commonly associated with OSB production have been identified: acetaldehyde, acrolein, benzene, formaldehyde, diphenyl methane diisocyanate (MDI), methanol, phenol, and propionaldehyde.

Key issues that have arisen during this investigation are:

- The proposed increase in the emissions limits (in grams per second) for total VOCs from 1.1 to 20.96 from the dryer operations and

0.28 to 2.78 from the press. (In total, from 1.38 grams per second to 22.74 grams per second.)

- The proposed increase in the emissions limits (in grams per second) for benzene from 0.008 to 0.172 from the dryers and 0.0003 to 0.0197 from the press. (In total, from 0.0083 grams per second to 0.1917 grams per second.)
- The fact that acrolein emissions under certain circumstances exceed the Ontario Ambient Air Quality Criteria.

Modelling results indicate that the proposed emission rates for the VOCs associated with OSB production will not—with one exception—lead to exceedances of applicable ambient air quality criteria. In the case of that one exception, acrolein, the predicted exceedances are rare (only two days a year), are on the company fence line, and are two orders of magnitude below the lowest concentrations at which negative health impacts have been observed in humans. The predicted levels at any of the human receptor points used in the study are even lower. The Commission accepts the health-risk analysis conclusion that acrolein emissions would not result in an appreciable health risk to the surrounding population. At the same time, the Commission also will be recommending that the proposed design be reviewed to determine whether the exceedances could be prevented or minimized by engineering considerations such as alternative stack heights, locations or diameters.

The Commission has concluded that the increased emissions associated with a decision to operate the plant as proposed would not present a statistically significant risk to human or environmental health.

The Commission is not, however, satisfied with all of the proposed emission limits. Specifically it is concerned with the dryer limits for total VOC emissions. If the VOC limit had been developed using the same criteria as the other limits—site-specific data and/or published emission factors, whichever was the most conservative—it would appear that the VOC emission limit for the wet electrostatic precipitators (WESPs) would be considerably lower than the proposed 20.96 grams per second. Throughout this process, Louisiana-Pacific has stated that it has decreased VOC emissions from its dryers. This change should be reflected in the licence.

Finally, the additional information received by the Commission in May 2010 made it clear that modelling was based on limited site-specific data on plant emissions. Six of the 13 materials modelled showed ambient air levels reaching 60 per cent of the maximum acceptable ambient air quality criteria levels or higher. Further in-stack and ambient monitoring is needed to verify the modelling results and to make operational adjustments as necessary.

Recommendations

The Commission recommends:

1) That Louisiana-Pacific be granted an environment licence to operate its Swan Valley OSB plant without the use of regenerative thermal oxidizers.
2) That all air emission limits in the licence for the Swan Valley OSB plant be developed on the basis of site-specific data and/or relevant published emission factors, whichever is the most conservative. This will require regular stack testing and review of monitoring results.
3) That the proposed design for the Swan Valley OSB plant be reviewed to determine

whether the exceedances of the Ontario acrolein value could be prevented or minimized by engineering considerations such as alternative stack heights, locations, or diameters.

In addition to the above, the Commission is making the following recommendations in relation to:

- Ambient air monitoring.
- The community health study.
- The Community Liaison Committee.

The Commission recommends:

4) That the licence for the Swan Valley OSB plant require the ambient air monitoring of diphenyl methane diisocyanate, phenol, and hydrogen cyanide be made on the following schedule: one 24-hour sample every six days. Ambient air monitoring of formaldehyde should be carried out on the basis of 24 one-hour samples every six days.
5) That the licence for the Swan Valley OSB plant require an ambient air-monitoring network be established for the Swan Valley OSB plant that is capable of providing the data required to validate the predicted ground-level concentrations produced by the air-dispersion model for emissions from the Swan Valley oriented strand board plant. This may require a minimum of three additional locations close to the area of predicted high ground-level concentrations.
6) That Manitoba Conservation develop a policy on the use of surrogates in ambient air monitoring.
7) That acceptable methods of ambient air quality sampling be established and be communicated to the proponent and the public at large.
8) That the licence for the Swan Valley OSB plant require a baseline community health study and a follow-up community health study, including psychological and physiological parameters.
9) That Manitoba Conservation, in consultation with the community, conduct a review of the mandate and operations of the Community Liaison Committee established under *The Environment Act* licence for the Swan Valley OSB plant.

General policy issues

Finally, this investigation has led the Commission to identify two general policy concerns: 1) the degree of clarity and guidance that exists in relation to environmental assessment in general and 2) deficiencies in provincial air quality policy. To address these issues, the Commission is making the following recommendations.

The Commission recommends:

10) That Manitoba Conservation establish and implement a concrete environmental assessment framework using the most appropriate regulatory tools and follow-up with a comprehensive applicant instruction manual.
11) That Manitoba Conservation develop and establish policy and guidelines regarding Human Health Risk Assessments and communicate such to practitioners.
12) That Manitoba Conservation review the *Air Quality Management Strategy* and *The Guidelines for Air Dispersion Modelling in Manitoba* to ensure they are inclusive, clear and reflective of the current state of knowledge, and then finalize and formally accept them.

13) That Manitoba Conservation make documents relating to air quality standards in an easily readable and accessible format available to the public. These should include explanations of the derivation of, and rationale for, inclusion of the values as well definitions of key terms used in the documents.
14) That Manitoba Conservation develop a detailed Best Available Control Technology Economically Achievable policy.
15) That Manitoba Conservation develop and adopt a protocol for the acceptance and application of air quality guidelines from other jurisdictions.
16) That Manitoba Conservation develop and adopt a policy that will guide applicants in determining which substances should be subjected to air dispersion modelling and health risk assessment and the circumstances under which they should be modelled.

Chapter One: Introduction

Mandate and terms of reference

In March 2009, in accordance with section 6(5) of *The Environment Act*, the Manitoba Minister of Conservation requested that the Manitoba Clean Environment Commission (the Commission/CEC) conduct an investigation into Louisiana-Pacific Canada Limited's request for permanent alterations to its Swan Valley oriented strand board (OSB) plant's Manitoba *Environment Act* Licence Number 1900 S4.

The request included the following terms of reference (produced in full in Appendix 1):

1. The CEC will conduct an investigation and provide advice and recommendations to the Minister regarding the potential health and environmental effects of the increased emission limits and the subsequent decommissioning of the Regenerative Thermal Oxidizer technology which is contained in Louisiana Pacific's requested licence change.
2. In conducting this investigation and in providing advice and recommendations, the CEC will provide members of the public an opportunity for input regarding LP's

proposal at a public meeting in the affected community.

3. As LP's current licence has a requirement for the Director of Environmental Assessment and Licensing to review the terms and conditions of the licence prior to June 1, 2009, the CEC process should begin as soon as possible, and should be completed prior to that date.

A number of observations are in order in relation to the terms of reference. Term 1 refers to increased emission limits linked with the decommissioning of regenerative thermal oxidization (RTO) technology. It also refers to Louisiana-Pacific's requested licence change. The matter is complicated by the fact that between November 2008 and January 2009 Louisiana-Pacific has made three separate requests for licence changes. While the details of these requests are discussed in detail in Chapter Nine of this report, the Commission has interpreted its mandate as encompassing all increases to the emission limits that were included in *Environment Act* Licence Number 1900 S4, which was in effect from October 31, 1997 until January 8, 2009, when *Environment Act* Licence Number 2861 came into force.

Term 3 requests that the Commission complete its report prior to June 1, 2009. The Commission communicated to the Minister on April 28, 2009 (Appendix 2) that due to the complexity of the issues and the requirement to consult with the public it would not be able to meet that deadline. To address these issues, the Director of Environmental Assessment and Licensing reviewed the emission limits in *Environment Act* Licence Number 2861 (the licence that currently regulates the operation of the Swan Valley OSB plant) and concluded that no alteration to the licence was required and it would remain in place until the Commission's investigation has been completed. At that time the Director would conduct a further review of the licence (Appendix 3).

The Commission

The Manitoba Clean Environment Commission is an arm's-length provincial agency established under *The Environment Act* of Manitoba. The Commission encourages and facilitates public involvement in environmental matters and offers advice and recommendations to the Minister of Conservation with respect to environmental issues, project approvals, and environmental licenses.

Its mandate is exercised through public hearings, investigations, and mediation. The Commission consists of a full-time chairperson and part-time commissioners appointed by Order-in-Council. A four-person panel was formed to carry out the investigation that is the subject of this report. The Panel members were Ken Gibbons, Patricia MacKay, Ken Wait, and Edwin Yee (who also served as chair of the panel).

The Process

The panel reviewed the relevant *Environment Act* licences, documentation provided by Louisiana-Pacific and Manitoba Conservation, along with published resources. It also commissioned a background paper on the issues under investigation, which was made available to the public prior to the public meeting in Swan River (Theobald et al. 2009). The panel met with representatives of Louisiana-Pacific and Manitoba Conservation and toured Louisiana-Pacific's Swan Valley OSB plant. As mandated, it held a

public meeting in Swan River, Manitoba from July 28 to July 29, 2009. The Commission also received written submissions from the public and interested parties. In October 2009, the Commission requested that Louisiana-Pacific provide it with additional information regarding air dispersion modelling, which was received in May 2010. Through its investigation, the Commission has been able to receive input from all concerned organizations and gather all the information that it has deemed necessary to prepare a full report that addresses the issues set out in its mandate.

Principles and Guidelines for Sustainable Development

In its deliberations, the Commission draws on the Manitoba *Sustainable Development Act*'s Principles and Guidelines for Sustainable Development (Appendix 4). Several of the principles appear to be particularly applicable to the issues at hand. These are principles 1, 2, 4, 5, and 7, which read as follows.

1. Integration of Environmental and Economic Decisions

1(1) Economic decisions should adequately reflect environmental, human health and social effects.

1(2) Environmental and health initiatives should adequately take into account economic, human health and social consequences.

2. Stewardship

2(1) The economy, the environment, human health and social well-being should be managed for the equal benefit of present and future generations.

2(2) Manitobans are caretakers of the economy, the environment, human health and social well-being for the benefit of present and future generations.

2(3) Today's decisions are to be balanced with tomorrow's effects.

4. Prevention

Manitobans should anticipate, and prevent or mitigate, significant adverse economic, environmental, human health and social effects of decisions and actions, having particular careful regard to decisions whose impacts are not entirely certain but which, on reasonable and well-informed grounds, appear to pose serious threats to the economy, the environment, human health and social well-being.

5. Conservation and Enhancement

Manitobans should

(a) maintain the ecological processes, biological diversity and life-support systems of the environment;

(b) harvest renewable resources on a sustainable yield basis;

(c) make wise and efficient use of renewable and non-renewable resources; and

(d) enhance the long-term productive capability, quality and capacity of natural ecosystems.

7. Global Responsibility

Manitobans should think globally when acting locally, recognizing that there is economic, ecological and social interdependence among provinces and nations, and working cooperatively, within Canada and internationally, to integrate economic, environmental, human health and social factors in decision-making while developing

comprehensive and equitable solutions to problems.

Principle 1 raises the need to take economic and social factors into consideration when addressing environmental concerns. The presentations made to the Commission have made the case that the future of the Louisiana-Pacific Swan Valley plant may be jeopardized by environmental regulations, raising potential social and economic implications. Similarly, any negative health or environmental impacts experienced as a result of the operation of the plant could have social and economic implications. Principle 2 is an injunction to look to long-term effects. The Commission is aware of the fact that many of the health impacts associated with some of the substances emitted from the Swan Valley OSB plant have lengthy latency periods. Similarly, decisions that impact negatively on economic activity in the Swan Valley can have long-term social and economic impacts. Principle 4 is similar to the Precautionary Principle adopted at the United Nations Earth Summit in 1992. That principle holds that "In order to protect the environment, the precautionary approach shall be widely applied by States according to their capabilities. Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation" (United Nations Environment Program 1992). Principle 5 stresses the importance of conserving non-renewable resources. Natural gas, a non-renewable resource, is used to fire the RTO technology while the RTOs themselves emit greenhouse gases. The RTOs however, reduce the emission of contaminants. Principle 7 stresses global responsibilities, an issue of potential relevance in light of a number of issues raised during the hearing, including natural-gas use and greenhouse-gas production.

Guidelines 2 and 3 of the Principles and Guidelines are applicable and state:

2. Public Participation - which means

(a) establishing forums which encourage and provide opportunity for consultation and meaningful participation in decision making processes by Manitobans;

(b) endeavouring to provide due process, prior notification and appropriate and timely redress for those adversely affected by decisions and actions; and

(c) striving to achieve consensus amongst citizens with regard to decisions affecting them.

3. Access to Information - which means

(a) encouraging and facilitating the improvement and refinement of economic, environmental, human health and social information; and

(b) promoting the opportunity for equal and timely access to information by all Manitobans.

These guidelines are relevant to this application in that they speak to the need for the provision of all relevant information in an accessible, appropriate, and timely manner.

Guideline 5 of the Principles and Guidelines is also applicable. It states:

5. Waste Minimization and Substitution - which means

(a) encouraging and promoting the development and use of substitutes for scarce resources where such substitutes are both environmentally sound and economically viable; and

(b) reducing, reusing, recycling and recovering the products of society.

This guideline's focus on the use of scarce resources is relevant given the fact that natural gas is a non-renewable resource.

The Report

Based on the above, the Commission has reached the conclusions and recommendations presented in Chapter Twelve of this Report.

The following chapters:

- Outline the process for manufacturing oriented strand board. (Chapter 2)
- Describe substances of concern emitted by the Swan Valley plant's dryer and press operation. (Chapter 3)
- Describe various applicable pollution-control technologies. (Chapter 4)
- Describe Canadian and American approaches to regulatory control. (Chapter 5)
- Describe the background to the licensing of the Swan Valley OSB plant. (Chapter 6)
- Describe *Environment Act* Licence Number 1900 S4 that was issued for the Swan Valley OSB plant (with a focus on provisions related to the dryer and press operations). (Chapter 7)
- Describe changes to the Swan Valley OSB plant *Environment Act* licence that were sought prior to 2008. (Chapter 8)
- Describe the changes being sought to *Environment Act* Licence Number 1900 S4. (Chapter 9)
- Summarize the presentations made at the public meeting in Swan Valley and written submissions received by the Commission. (Chapter 10)
- Summarize the additional information provided by Louisiana Pacific to the Commission. (Chapter 11)
- Present the Commission's discussion of the issues raised by the application for a licence amendment and the Commission's advice and recommendations. (Chapter 12)

Chapter Two: Oriented strand board

Oriented strand board (OSB) is an engineered wood product, typically made from aspen, southern yellow pine, or mixed hardwoods using a process that was developed in the 1970s. The trees used in this process are generally considered to be abundant and fast growing, while the OSB process allows for the use of small-diameter and irregularly shaped trees. Those portions of the tree that are not used in the final product are usually consumed as fuel in the manufacturing process. The boards are made up of a number of panels of fine strands of wood that are bonded together with wax and resin. The strands in the outer panels are oriented in the same direction, increasing the board's strength in that direction and giving rise to the term "oriented strand board".

There are seven basic steps in the OSB production process: log conditioning, stranding (or waferizing), drying, blending, forming, pressing, and final processing. In the following description of the process, special attention is devoted to the dryer and press operations, since the Commission was asked to review increases to

the emission limits that apply to those processes at the Swan Valley OSB plant.

Log conditioning

In the conditioning stage, the logs are soaked and their bark (which usually is subsequently used as fuel) is removed.

Stranding

In the stranding (or waferizing) stage, the logs are shaved along the grain into strands (75 to 150 millimetres in length, 12 to 35 millimetres wide and less than 1 millimetre thick).

Drying

Since strands usually have a moisture content of up to 60 per cent, they are run through dryers that reduce the moisture content to approximately 3 to 5 per cent. There are two types of dryers used in the industry: rotary dryers (in which the wood strands are exposed to a hot air stream in a rotating cylinder) and conveyor dryers (which carry the strands through the dryer on a conveyor). Rotary dryers are more common in the industry than conveyor dryers, which require considerable space and have higher operating costs. The rotary dryers can be either single pass (the strands are rotated through the cylinder once) or triple pass (the strands are rotated through the cylinder three times). Inlet temperatures for rotary dryers can vary from 426 degrees Celsius to 870 degrees Celsius, while the inlet temperature for conveyor dryers is approximately 150-160 degrees Celsius.

Emissions from the dryer operation can come from the combustion of the fuels used to heat the dryers (wood products, natural gas, or oil) or from the drying wood. The fuel-related emissions vary with the type of fuel used, but can include particulate matter (PM), oxides of nitrogen (NO_x), carbon dioxide (CO_2), carbon monoxide (CO), volatile organic compounds (VOCs), and other substances. The emissions from the wood can include VOCs emitted during the drying process (these substances are discussed in Chapter Three). The emission of wood fines (strands too small to be used) can also result in particulate matter emissions.

The levels of VOC emissions are influenced by the inlet temperature (the higher the inlet temperature, the greater the VOC emissions), the wood species (both softwoods and hardwoods emit formaldehyde and methanol, softwoods also emit pine-scented VOCs known as terpenes), final moisture content attained (the lower the final moisture content, the greater the VOC emissions), the presence of wood fines, the type of dryer being used (single-pass rotary dryers produce lower levels of PM emissions than triple-pass rotary dryers, while conveyor dryers produce lower levels of VOC and PM emissions than rotary dryers). Increased release of VOCs is also associated with large surface-area-to-mass ratios and shorter periods of time between the harvesting and drying of the wood.

Blending

The strands are sorted and screened (at this stage wood fines are removed to be used as fuel). Smaller strands are used to create the core panels, while the larger strands are reserved for the external panels. The separated strands are blended with resins to hold the finished boards together. Commonly, the smaller strands are blended with diphenyl methane diisocyanate (MDI) resin and wax and the larger strands are blended with phenolformaldehyde (PF) resins and wax.

Forming

The blended strands are formed into large mats containing the desired number of layers (usually three to five). The outer layers are oriented along the length of the board, while the core layers are either laid down at random or against the orientation of the outer layers.

Pressing

The mats are placed in presses that use heat, pressure, and the remaining moisture in the wood to bond the resins and wax, creating sheets of oriented strand board. The heat is generally provided by steam from a boiler fired by wood waste.

The emissions from the presses depend on the types and amounts of resins used, the board thickness, press temperature, the length of the pressing process, application of catalysts to the drying process, wood species (softwoods emit more VOCs than hardwoods) and wood moisture content. The emissions come from the combustion process, the wood, and the resins. As with the dryer, fuel-related emissions vary with the type of fuel used, but can include particulate matter, oxides of nitrogen, carbon dioxide, carbon monoxide, volatile organic compounds, and other substances. Unlike the dryer, the press is not a large source of particulate matter emissions. Resin emissions would include phenol, formaldehyde, and MDI.

Final processing

The boards are trimmed and the edges coated with a sealant. In some cases, the boards are subject to secondary finishing (Canada Wood Council n.d.; National Council of Air and Stream Improvement 2008; Theobald et al. 2009). Scraps from the trimming process are often used as fuel, potentially adding resin-related emissions to the combustion emissions in the drying and pressing process.

Chapter Three: Substances of concern for this investigation

The *Environment Act* licence changes that Louisiana-Pacific is seeking would increase the limits on emissions to the atmosphere for certain substances from the dryer and press operations at its Swan Valley oriented strand board (OSB) plant. This chapter provides a brief description of those substances. It also identifies four volatile organic compounds (acetaldehyde, acrolein, methanol, and proprionaldehyde) whose emissions would be increased but are not directly regulated by the plant's *Environment Act* licence. The chapter also discusses the emission of greenhouse gases from the plant.

Regulated substances

Environment Act Licence Number 1900 S4 sets dryer and press emission limits for the following substances.

- nitrogen oxides
- volatile organic compounds (VOCs), which include:
  - benzene
  - diphenyl methane diisocyanate (MDI)

- formaldehyde
- phenol

- hydrogen cyanide
- total particulate matter (TPM)

Nitrogen oxides

Nitrogen oxides (NO_x) (or oxides of nitrogen) are a group of highly reactive gases that include nitrogen dioxide (NO_2), nitrous oxide (N_2O), and nitric oxide (NO) They contribute to the formation of ground-level ozone (through their reactions with volatile organic compounds), which in turn is a contributor to the development of smog and particulate matter pollution. Nitrogen dioxide is linked to respiratory problems. Regenerative thermal oxidizers (RTOs) and regenerative catalytic oxidizers (RCOs) used to oxidize pollutants emitted from OSB plants also generate nitrogen oxides. These are produced by the high temperature combustion, which is achieved through the use of natural gas as a fuel (U.S. Environmental Protection Agency n.d. *Nitrogen dioxide*). Other technologies, such a biofilters and bioreactors do not generate nitrogen oxides.

Volatile organic compounds

Volatile organic compounds are organic (organic because they contain carbon atoms and all life-forms are carbon-based) chemical compounds (because the carbon atoms are linked to atoms of other elements) that are referred to as volatile because they readily evaporate (they are usually gases at room temperature). There are thousands of VOCs: some are emitted naturally, some through industrial processes, and some through consumer use (for example, vehicle exhaust emissions). Given the large number of VOCs, attention is usually focused on the most abundant compounds in any given process.

Airborne VOCs can interact with nitrogen oxides and sunlight to create ozone, which, in turn, is a contributor to the development of smog. In addition, some VOCs are directly harmful to human health. A number of specific VOCs are also defined as toxic substances under the *Canadian Environmental Protection Act* on the basis of their specific toxic effects in addition to any role they may play in ozone formation (Environment Canada. n.d. *Volatile organic compounds: History*; U.S. Environmental Protection Agency, n.d. *Volatile organic compounds emissions*).

Environment Canada estimates that in 2005, 1.9-million tonnes of VOCs were emitted in Canada. It is estimated that over 50 per cent of the emissions came from transportation sources and the oil and gas industry. This estimate does not include emissions from open sources such agricultural animals, forest fires, and prescribed burning (Environment Canada. n.d. *Volatile organic compounds: Main emission sources;* Encyclopaedia Britannica. 2009. *Environmental works*).

VOCs are byproducts of both drying and pressing in OSB production, arising, for the most part, from the thermal breakdown of wood and the combustion of wood used to provide heat for both drying and pressing. Specific VOCs regulated by Louisiana-Pacific's *Environment Act* Licence Number 1900 S4 are benzene, diphenyl methane diisocyanate (MDI), formaldehyde, and phenol.

A study carried out by National Council of Air and Stream Improvement (NCASI), a U.S.-based industry-established research institute (with offices in Montreal) that focuses on

environmental topics of interest to the forest products industry (2008) provides this summary of the current understanding of VOC release during the wood drying process:

> [T]he potential exists for hundreds of individual organic compounds to be released from wood drying operations. While there is a fair amount of sampling data for a few of these, the available data are certainly not comprehensive in terms of providing a complete characterization of VOCs associated with wood drying. Simultaneous measurements with EPA Method 25A [a sampling method] for total VOCs and with methods that provide results for selected individual compounds often show not all of the individual VOCs present in drying sources have been measured. In terms of accounting for the total mass of VOCs released during drying it appears that a relatively small number of VOCs make up the majority of the total mass released from softwood drying sources, including those that are direct-fired. The same cannot be said for hardwood drying sources, where terpenes are not present (28).

The NCASI report also stated that the U.S. EPA had determined that:

> just six compounds comprised the vast majority of volatile organic hazardous air pollutants released from wood drying and pressing: acetaldehyde, acrolein, formaldehyde, methanol, phenol, and prioprionaldehyde. Thus, the MACT [maximum achievable control technology] regulation focused on limiting emissions of these compounds (92).

Benzene

Benzene, an aromatic hydrocarbon (a sweetly scented compound of hydrogen and carbon) and a volatile organic compound, is toxic and a known carcinogen. There is no exposure threshold for benzene below which there is no probability of critical, harmful effects. Because benzene is a non-threshold toxicant (toxic substance), the primary long-term air-quality management strategy is to reduce exposure to the extent possible and practicable. The major human activities that generate benzene releases in Canada are transportation, natural gas dehydration (part of the industrial treatment of natural gas), residential wood combustion, and miscellaneous combustion.

Formaldehyde

Formaldehyde is a volatile organic compound that can be formed by the combustion of organic materials (particularly methanol) and a range of natural and human activities (this is referred to as primary formation). It is also formed by the oxidation in the atmosphere of volatile organic compounds (secondary formation).

While formaldehyde is not implicated in the depletion of stratospheric ozone or in climate change, it does play a role in the formation of ground-level ozone. A 1999 Environment Canada-Health Canada study of formaldehyde stated that while, "on the basis of a biologically motivated case specific model with calculated exposure in air of the general population in Canada," formaldehyde was considered to present a carcinogenic hazard to humans, "priority for investigation of options to reduce exposure on the basis of carcinogenicity is considered to be low" (2).

The report recommended that while current concentrations of formaldehyde in air and water were not causing environmental harm to biota, continued and improved monitoring at "sites likely to release formaldehyde is desirable, notably with regards to industrial uses for resins and for fertilizers as well as releases from pulp and paper

mills" (Environment Canada/Health Canada 1999; 2).

Diphenyl methane diisocyanate (MDI)

Diphenyl methane diisocyanate (methane diphenyl diisocyanate, methylene diphenyl diisocyanate or MDI) is the generic name of a volatile organic compound used in industrial settings. It exists as a fused solid or as flakes that are combustible. It is not known to occur naturally, but is synthesized for a variety of industrial purposes, including the manufacture of resins used in the manufacture of OSB. While acute toxicity is observed only at high levels of exposure to MDI, chronic toxicity such as asthma, chronic bronchitis and hypersensitivity pneumonitis can be observed in individuals who are occupationally exposed to MDI. Individuals may become increasingly allergic to MDI through chronic exposure or short-term exposure to high concentrations of MDI (a process known as sensitization) (Ontario Ministry of the Environment 2002).

Phenol

Phenol (commonly referred to as carbolic acid) is a volatile organic compound manufactured from coal, wood tar, or benzene as well as occurring at low concentrations in the environment. It can be highly toxic and caustic. One of the major forms of phenol production is resin, including phenol-formaldehyde resins (Encyclopaedia Britannica. 2009. *phenol*).

Particulate matter

Particulate matter (PM), which can be emitted at a number of different points in the production of OSB, including the drying and pressing operations, is made up of airborne solid and liquid particles (other than pure water) that range in size from .005 micrometres (formerly microns or one millionth of a metre) to 100 micrometres in diameter and may also be referred to as total particulate matter (TPM). The major particulate emissions from an OSB plant would be in the form of wood dust and as a product of combustion (both from the wood-fired dryers and certain pollution-control equipment). Unlike other pollutants, PM is not defined on the basis of its chemical composition but by size. PM_{10} refers to particles 10 micrometres or less in diameter (PM_{10} is a subset of TPM), while $PM_{2.5}$ refers to particles 2.5 micrometres in diameter or smaller ($PM_{2.5}$ is a subset of PM_{10}). It can exist as both primary PM (emitted into the atmosphere) and secondary PM (created through chemical and physical transformations in the atmosphere) (Canadian Environmental Protection Agency Federal-Provincial Advisory Committee Working Group on Air Quality Objectives and Guidelines 1998). Those particles in the PM_{10} and below category can be inhaled and have been linked with serious heart and lung conditions. PM_{10} has also been linked with reductions in visibility, and changes in the acidity of lakes and streams, changes in the nutrient balance in water and on land, and damage to forests and crops, and reduced ecosystem diversity. Particulate matter can travel significant distances before having any of these effects (U.S. Environmental Protection Agency. n.d. *Particulate matter: Health and environment*).

Hydrogen cyanide

Hydrogen cyanide, a volatile (boiling point 26 degrees Celsius) colourless gas, is used in a variety of industrial processes. Exposures to concentrations of 200 – 500 parts of hydrogen cyanide per million of air for 30 minutes is usually fatal to adult humans. It can be the

product of chemical decomposition created by heat and combustion (Encyclopaedia Britannica. 2009. *hydrogen cyanide*; Health Protection Agency. n.d. *Hydrogen cyanide*).

Emitted substances not regulated under the current ***Environment Act*** licence

Volatile organic compounds

There are four other volatile organic compounds of note (acetaldehyde, acrolein, methanol, and propionaldehyde) that are emitted from OSB operations whose emissions are not regulated under the current or proposed *Environment Act* licence for the OSB plant.

Acetaldehyde

Acetaldehyde is a volatile organic compound that is commonplace in the environment. Short-term exposure can result in irritation of the eyes, skin, and respiratory tract. The U.S. Environmental Protection Agency identifies it as a probable human carcinogen. It can be formed through incomplete wood combustion in fireplaces and woodstoves, coffee roasting, burning of tobacco, vehicle exhaust fumes, and coal refining and waste processing. According to the U.S. EPA, residential fireplaces and woodstoves are the two most significant sources of emissions, followed by various industrial emissions (U.S. Environmental Protection Agency. nd. *Acetaldehyde*).

Acrolein

Acrolein is a volatile organic compound used in the manufacture of acrylic acid. The U.S. EPA describes it as "extremely toxic to humans from inhalation and dermal exposure." It is associated with upper respiratory tract irritation and congestion. The U.S. EPA has concluded that the data is inadequate to assess its potential as a human carcinogen (U.S. Environmental Protection Agency. n.d. *Acrolein*).

Methanol

Methanol is a volatile organic compound that occurs naturally in wood. It is poisonous to humans if consumed as a liquid. The health effects of breathing or consuming small amounts of methanol over a longer period are not well known, although workers have experienced adverse effects after repeated exposure to methanol. When it reacts with other VOCs, it can contribute to the formation of smog (U.S. Environmental Protection Agency 1994).

Propionaldehyde

Propionaldehyde is a volatile organic compound released to the environment primarily through the combustion of wood, gasoline, diesel fuel, and polyethylene. It is a component of both cigarette smoke and food colouring.

Based on the limited number of studies carried out on propionaldehyde, the U.S. EPA has concluded that the most likely adverse human health effects from exposure to propionaldehyde would be respiratory tract irritation and cardiovascular problems. According to the EPA there are no human health effects data or chronic animal studies available on the carcinogenic effects of propionaldehyde (U.S. Environmental Protection Agency 2008.)

Greenhouse gases

The major greenhouse gases (which trap heat in the earth's lower atmosphere) are carbon dioxide, methane, and surface level ozone, while the lesser gases are nitrous oxide and fluorinated gases such as hexafluoride, hydrofluorocarbons (HFCs),

and perfluorocarbons (PFCs). For comparative purposes, greenhouse-gas loads are often reported as carbon dioxide equivalents.

Facilities that emit greater than 100,000 tonnes of carbon dioxide equivalents per year are required to report to Canada's Greenhouse Gas Inventory. In 2007, no OSB facility in Canada was required to report to the inventory (Theobald et al. 2009). OSB plants emit greenhouse gases primarily through the combustion of residual wood products (a renewable resource) used to provide heat for drying and pressing operations (Theobald et al. 2009; 16). These biomass emissions are categorized as carbon neutral (because they come from a renewable resource) and are not included in Canada's national inventory of greenhouse-gas emissions.

The OSB industry's emission load in the Canadian context

The National Pollutant Release Inventory (NPRI) is a federal inventory of the emission of pollutants. The consultant retained by the Commission examined the 2007 NPRI, comparing OSB emissions to all other Canadian industries, and concluded that:

> The OSB industry contributes most significantly to the overall Canadian acrolein (71%), dimethyl methane diisocyanate (MDI) (43%), formaldehyde (37%), and acetaldehyde (21%) atmospheric emissions. Other air pollutants such as total VOCs, benzene, phenol, particulate matter, nitrogen oxides and carbon monoxide are all less than 5% for Canada's total emissions for each pollutant (Theobald et al. 2009; 12).

Louisiana-Pacific has raised concerns about the reliability of the NPRI emission figures, stating that they exclude a significant portion of national emissions and may overestimate emissions from the OSB sector.

Chapter Four: Controlling emissions from OSB dryers and presses

The two major categories of emissions from oriented strand board (OSB) plant dryers and presses are particulate matter (PM) and volatile organic compounds (VOCs). This chapter outlines the main technologies used to control these emissions.

Particulate matter

Two common technologies used to remove particulate matter emissions from OSB presses and dryers are cyclones and wet electrostatic precipitators.

Cyclones

In a cyclone collector, centrifugal force drives larger, denser particles to the sides of a conical-shaped filter. The particles drop to the bottom, while the gas rises to the top. This sort of collector is most effective in controlling large, dry particles (Guyer 1998).

Wet electrostatic precipitators (WESPs)

Wet electrostatic precipitators (WESPs or E-tubes—a brand name) remove particulate matter from a gaseous waste stream by subjecting it to a strong electrical field generated

by electrodes. The electrical field forces the particulate matter to the walls of the collection tubes in the WESP. A spray of liquid (either continuous or intermittent) is used to remove the particulate matter. New WESP technology has a design efficiency of between 99 and 99.9 per cent (U.S. Environmental Protection Agency. n.d. *Air control technology fact sheet*; Industry Canada. n.d. *Wood-Based Panel Products: Technology Roadmap Appendix I: Environmental Technologies*). While WESPs can remove a portion of condensable organic compounds in emissions, they are not intended as controls for VOCs.

Use in OSB dryer and press settings

In OSB plants, cyclones and WESPs are used to control particulate matter emissions from dryer operations.

Controlling VOCs

In industrial settings, the most common form of VOC control is combustion (the chemical process referred to as oxidation). In this process the VOCs react with oxygen at a high temperature in a controlled environment. With the appropriate mixture of heat, burn time, and turbulence, the oxidation produces carbon dioxide and water (Encyclopaedia Britannica. 2009. *environmental works*). Biofilters represent another control alternative.

Regenerative thermal oxidizers

Regenerative thermal oxidizers (RTOs) are one of a number of different technologies that can be employed to oxidize VOCs at very high temperatures (815 to 1100 degrees Celsius). They are called regenerative because they recycle energy that is released through the oxidation process. They have a removal efficiency of over 90 per cent for VOCs and PM. The most common fuel source for RTOs is natural gas. Up until the 1990s, RTOs were used for the most part by the printing and graphics sector for the removal of VOCs arising from solvent-based inks (Heuvelen and Rosenberg 1994).

RTOs not only remove emissions, they create them. These can include carbon dioxide (a greenhouse gas), carbon monoxide, oxides of nitrogen, and particulate matter. These are formed by the oxidation of VOCs and the use of auxiliary fuels such as natural gas.

Typically, RTOs do not function as stand-alone technologies when used on dryer operations: instead they are preceded by wet electro-static precipitators, which remove particulate matter, thereby improving the efficiency of the RTOs.

Regenerative catalytic oxidizers

As with RTOs, regenerative catalytic oxidizers (RCOs) use recovered energy to pre-heat incoming process air. In addition, RCOs use a metal or metal-coated catalyst that allows for the oxidation of VOCs at inlet temperatures considerably lower than those required by RTOs (often fifty per cent lower). While they require less fuel than RTOs, they have higher maintenance costs than RTOs (Theobald et al. 2009).

Biofilters/Bioreactors

Biofilters use natural material and micro-organisms to decompose organic compounds and remove pollutants. Exhaust is cooled, saturated with moisture, and forced through moist packing media such as bark, woodchips, or synthetic material. The packing media is inoculated with micro-organisms that turn pollutants to carbon dioxide, water, and salts. The proper functioning of the system depends on maintaining adequate

moisture content, temperature, alkalinity and acidity levels, and nutrients. Compared to RTOs and RCOs, they are not as efficient in controlling VOCs, but they use less energy.

Exhaust from dryers needs to be cooled and fed through a wet electro-static precipitator before being introduced to a biofilter. For these reasons, to the Commission's knowledge, biofilters are not used to control dryer emissions. Biofilters do not produce carbon monoxide or oxides of nitrogen. However, they require considerably more space than RTOs and RCOs and may not function well in Canadian winters (National Council of Air and Stream Improvement 2008; Theobald et al. 2009).

It was also submitted to the Commission during the course of the investigation that a new generation of biologically based control technologies may be more adaptable to the OSB industry in Canada than biofilters due to the amount of incoming heat generated by the production process (Simon 2009; 10).

Controlling VOCs in OSB dryer and press settings

RTOs are used extensively throughout the United States to control VOC emissions from OSB dryer and press operations. In Canada, the Swan Valley OSB plant is the only OSB operation that has used RTOs to control VOC emissions from dryer and press operations.

While RCOs are used to control VOC emissions from some press operations in the United States, the information presented to the Commission indicates that high operating costs prohibit their use on dryers.

According to information presented to the Commission biofilters are used to control emissions from press vents at three OSB plants in the U.S. (National Council of Air and Stream Improvement 2008).

Pollution prevention

Input and process factors that can be used to reduce pollution production are referred to as pollution prevention measures (as opposed to pollution control measures which control or eliminate pollution after it has been produced). In OSB production they can include:

- The wood used. Hardwoods emit fewer VOCs than softwoods.
- Dryer type. Single-pass rotary dryers emit less particulate matter than triple-pass dryers. Conveyor dryers emit fewer VOCs than rotary dryers.
- Dryer temperature. Lower dryer inlet temperatures result in lower VOC emission rates.
- The recycling of exhaust gas. The recycling of exhaust gas allows for a reduction in fuel use and a reduction in VOC emissions.
- The final moisture level. Lower moisture levels result in higher VOC emission rates.
- The resins used. (The use of phenol-formaldehyde resins results in greater phenol and formaldehyde emissions, the use of MDI resins, results in greater MDI emissions).

Chapter Five: Regulating air emissions

The four basic regulatory approaches to controlling air pollution and ensuring air quality are:

1) Emission standards. These set limits on the emissions from end-of-pipe point sources. In Manitoba, these are usually included in *The Environment Act* licence granted to a development.
2) Ambient air quality standards. These focus on the impact of emissions on the receiving environment. In Canada, these have been developed at the federal and provincial levels and are usually based on time-averaged ground-level ambient air concentrations. In Manitoba, these standards are usually not included in licences. Instead, in conjunction with air dispersion modelling, they are used to determine if anticipated emissions will have a negative impact on human and environmental health.
3) Technology standards. These prescribe the sorts of technologies and processes that are to be used. There are a number of different technology standards, including best available control technology (BACT), best available control technology economically achievable

(BACTEA), and maximum achievable control technology (MACT).

4) Pollution prevention. These measures focus on reducing or eliminating pollution at source through the use of alternative processes, materials, and energy sources.

Canadian jurisdictions have tended to rely on emission standards and ambient air quality standards (although, as noted below, these standards often do not have legal force and are, in effect, guidelines) (Boyd 2003).

In applying these approaches, some jurisdictions regulate on a largely case-by-case risk-based approach, both in terms of setting the limits on emissions and reporting on emissions. This approach recognizes different processes, different components, and different airsheds. Some jurisdictions have overall or sector-by-sector standards that outline, for example, when continuous emissions monitoring might be required and outline what is required from performance tests. Furthermore, there is a growing trend towards the development of national standards for the reporting of emissions.

Canada

The federal, provincial, and territorial governments all have the responsibility for setting ambient air quality standards in Canada.

National policy

Canada-wide Standards

In Canada, national ambient air quality objectives (NAAQOs) were first established by the federal government in 1969 under the *Clean Air Act*. In 1976, standards for ozone and particulate matter were established under this act. In 1998 Canada's environment ministers, acting through the Canadian Council of Ministers of the Environment (CCME), adopted the Canada-wide Standards (CWS) process. Under this process Canada-wide Standards were approved for particulate matter, ozone and benzene in 2000. These Canada-wide Standards are in essence guidelines, unless they are adopted by provincial governments in their regulatory regime (for example, in legislation, regulation, or licences). The CWS process has largely replaced the development of further national ambient air quality objectives.

Benzene Canada-wide Standard

The benzene CWS, which is industry-specific and does not include the wood-products sector, called for a 30 per cent reduction in benzene emissions from 1995 levels. In 2001, the CCME agreed upon Phase 2 of the benzene CWS. In the case of facilities covered by the first phase of the CWS, the 2001 standard set a further 6-kilotonne reduction in benzene emissions. This reduction was to be reached by 2010. New and expanding facilities were to minimize benzene emissions by the application of best available pollution prevention and control techniques (Canadian Council of Ministers of the Environment 2001). According the federal government, the Phase 2 benzene emissions reduction target, originally set for achievement by 2010, has almost been reached (Environment Canada. n.d. Canada-Wide Standards (CWS) Implementation Plan Benzene - Phase 2). According to Manitoba Conservation, the benzene reductions were achieved by addressing the major sources of benzene release in Canada (transportation fuels, vehicle emissions, chemical manufacturing, and miscellaneous combustion).

Particulate Matter Canada-wide Standard

Manitoba has adopted the CWS for ambient fine particulate matter ($PM_{2.5}$) for its own application and has applied this limit to assess the air quality conditions in all regions based on air quality monitoring or as may be predicted from air quality dispersion modelling. For national reporting purposes, achievement of the $PM_{2.5}$ CWS in Manitoba is only focused on larger population areas (essentially the City of Winnipeg).

Toxic substances

Under the *Canadian Environmental Protection Act,* the federal government can define a substance as "toxic" if it is entering the environment in a quantity or concentration or under conditions that:

1. have or may have an immediate or long-term harmful effect on the environment or its biological diversity;
2. constitute or may constitute a danger to the environment on which life depends; or
3. constitute or may constitute a danger in Canada to human life or health.

For each substance defined as toxic, Environment Canada and Health Canada are to propose actions for managing the substance and its release into the environment (Environment Canada. n.d. *What does toxic mean under CEPA 1999?*). While both benzene and formaldehyde have been declared toxic substances, measures have not yet been proposed that target emission reductions from the forest products sector.

The Regulatory framework for air emission

In 2007, the federal government published its *Regulatory Framework For Air Emissions*. It set out mandatory and enforceable reductions in emissions of greenhouse gases and air pollutants. The forest products sector is among the industrial sectors covered by the framework. In the case of greenhouse gases, the government announced its intention to develop short-term emissions reduction targets under which, in the case of existing facilities, it expected to achieve a 6 per cent improvement in each year from 2007 to 2010, with a 2 per cent reduction in each year to 2015. Reduction could be achieved through:

- Direct reduction.
- Contributions to a technology fund.
- Use of emissions trading.
- Use of a one-time recognition of early action in the case of firms that took action between 1992 and 2006.

Through these actions, the government intended to reduce total greenhouse-gas emissions, relative to 2006 levels, by 2020.

In the case of air pollutants, including volatile organic compounds, the government intends to set fixed targets that are "at least as rigorous as those in the U.S. or other environmental performance-leading countries" (Canada 2007; v). The following national emission targets caps were set out relative to 2006 emission levels:

- 40 per cent for nitrogen oxides.
- 55 per cent for sulphur oxides.
- 45 per cent for volatile organic compounds.
- 20 per cent for particulate matter.

The targets were to come into force as early as 2012. Sector-specific regulations were to begin development in the spring of 2008. According to the framework document, when this policy was fully implemented, Canada would have "one of the most stringent sets of regulated targets for greenhouse gases and air pollutants in the world" (Canada 2007; v). The Commission has been

informed by the federal government that the proposed federal regulation regarding VOCs for the wood products sector is currently under evaluation.

Provincial air quality policy

Provincial governments address air quality issues through a mixture of ambient air-quality guidelines and standards, regulations that focus on specific pollutants or industries, and licensing and permitting regulations. Manitoba Conservation's draft *Air Quality Management Strategy* (2006a) endorses a policy of "'keeping clean areas clean' in those areas that currently do not have any air quality challenges." Pollution prevention is intended to be a key element of provincial air quality management. When licensing new facilities, one of Manitoba Conservation's stated goals is to ensure that new facilities are built to meet, and that they continue to meet, the highest level of environmental quality with respect to air emissions.

The province has identified the following as components of air quality management:

- Emission control technology.
- Emission standards.
- Air dispersion modelling.
- Ambient air quality criteria.
- Risk assessment.
- Odour nuisance management.
- Noise nuisance management.

Manitoba has also identified an "Other" category to address any other special releases of concern such as water vapour and greenhouse gases.

Table 5.1 sets out the components and recommended strategies for protecting provincial air quality that are relevant to this investigation.

Table 5.1 Manitoba Conservation Air Quality Components for the Licensing of New Facilities

Air Quality Management Component	Recommendation
Emission control technology	Implement the best available control technology economically achievable (BACTEA) that is applicable to the sector or implement pollution prevention to achieve an equivalent endpoint.
Emission standards	Meet environmental performance standards, emission guidelines or codes of practice as published by the CCME, Environment Canada, the U.S. Environmental Protection Agency, or other guidelines that may be available in other jurisdictions, as applicable.
Air dispersion modelling	Assess the air quality impacts of residual air emissions from the facility using acceptable air dispersion modelling. [Provincial guidelines for this modelling are discussed later in this chapter.]
Ambient air quality criteria	Meet all applicable ambient air quality criteria as set by Manitoba Conservation, or other jurisdictions as appropriate.
Risk assessment	Undertake a chronic human health risk assessment, as may be required, for any pollutants being emitted that are classified as air toxics, considering both carcinogenic and non-carcinogenic long-term effects.

Source: Manitoba Conservation: Air Quality Management Strategy

One concern that the Commission has is that while the *Strategy* makes use of the term air toxics, it does not define the concept.

Manitoba has established *Ambient Air Quality Criteria* for pollutant concentration levels (Appendix 5 of this report). Typically, these criteria represent time-averaged ground-level ambient air concentrations at which adverse health and environmental effects are not expected. These AAQCs can have a number of different averaging times (for example, 24 hours, 1 hour, and 15 minutes) each of which is appropriate for the effect that it is intended to protect against (such as impacts on health, odour, vegetation, or visibility). Contaminants with more than one AAQC should be evaluated on the basis of all of them. In Manitoba, the criteria take the form of objectives, guidelines and Canada-wide Standards.

Objectives apply to air pollutants that are sufficiently widespread in presence and potential environmental effect that national limits have been developed by a federal/provincial working group.

Guidelines apply to those pollutants of a more localized presence. Some guidelines are developed provincially on the basis of a review of peer-reviewed scientific literature while others were adopted from other jurisdictions.

Canada-wide Standards apply to contaminants of national priority and have been developed under the Canada-wide Environmental Standards Sub-agreement by the federal, provincial and territorial governments and adopted by Manitoba.

The development of these criteria takes the following information into consideration:

- Scientific literature.
- Physical properties.
- Sources and uses.
- Environmental fate.
- Environmental levels.
- Sensitive receptors.
- Adverse effects.

The criteria are intended to protect against adverse effects while recognizing the socio-economic feasibility of achieving such levels.

The Manitoba government has also established concentration levels for pollutants in ambient air (the concentrations are measured in units per volume of air over a given time period).

- Maximum tolerable level: a time-based concentration of air contaminant beyond which appropriate action is required to protect the health of the general population.
- Maximum acceptable levels: essential to adequately protect soils, water, vegetation, materials, animals, visibility, personal comfort and well-being. These should not be exceeded in urban centres, including areas that are in the vicinity of industries with atmospheric emissions.
- Maximum desirable levels: the long-term goal for air quality and a basis for an anti-degradation policy for the pristine areas of Manitoba and for the continuing development of control technology. It is the goal to maintain pollutant concentrations at or below Maximum Desirable Levels within rural areas. (Manitoba Conservation. n.d.)

Establishing criteria is a difficult, time-consuming and controversial approach and Manitoba has not adopted new criteria or updated its existing criteria in a number of years. Manitoba Conservation indicated that it takes synergistic effects, long-term

effects, and loading to the environment into account when developing new guidelines. It acknowledged that its efforts in this regard are limited by existing research. For example, the Commission was told that synergistic studies of air pollutants are rarely, if ever, undertaken due to the complexity of these types of studies while the loading to the environment can be more appropriately incorporated into a site-specific environmental impact assessment. In regard to cumulative effects, Manitoba Conservation informed the Commission that toxicology is not sufficiently advanced to allow the assessment of the combined effect of pollutants, especially in the situation where the air pollutants affect different systems in the body through different mechanisms of action.

These standards, objectives, and guidelines are intended to serve as a guide for the evaluation of air quality and for planning purposes and, on their own, have no legal force. They do, however, play a role in the setting of emission limits in *Environment Act* licences. That role is described in the *Licensing* section of this chapter.

In terms of the emissions from the dryer and press operations that are regulated under *Environment Act* licence 1900 S4 issued for the Swan Valley OSB plant, Manitoba has adopted ambient air quality criteria for diphenyl methane diisocyanate (MDI), formaldehyde, hydrogen cyanide, nitrogen dioxide, phenol, $PM_{2.5}$, PM_{10}, and suspended particulate matter (total particulate matter). Table 5.2 sets out the Manitoba ambient air quality criteria for the key contaminants that are emitted by the Swan Valley OSB press and dryer and regulated by the plant's *Environment Act* licence. There are no Manitoba ambient air quality criterion for benzene, acetaldehyde, acrolein, methanol, and prorionaldehyde; nor is there a criterion for VOCs as a generalized category.

Provincial greenhouse-gas emission policy

Due in large measure to the role that hydroelectric power plays in the provincial economy, Manitoba has one of the lowest rates of greenhouse-gas emissions in Canada and the lowest of the western provinces. In 2008, the Manitoba government proclaimed *The Climate Change and Emissions Reductions Act*, which included targets for reducing provincial greenhouse-gas emission rates. This made Manitoba the first North American jurisdiction to commit to meeting its Kyoto Accord targets. The initial reduction target set out in *The Act* was a six per cent reduction in Manitoba's 1990 emissions (18 megatonnes of carbon dioxide equivalent) by December 31, 2012. In 2005, the provincial emission rate was 20.3 megatonnes of carbon dioxide equivalent, while the goal for 2012 is 17 megatonnes of carbon dioxide equivalent. Table 5.3 sets out the Manitoba greenhouse-gas emissions sources by category (Manitoba. n.d. *Next Steps: 2008 Action on Climate Change*). A 2009 amendment to *The Environment Act* requires Manitoba Conservation to take into account the amount of greenhouse gases to be generated and energy efficiency when considering a proposal for an *Environment Act* licence.

Licensing

Developments that meet certain criteria require some form of provincial permit or licence in order to operate. These licences can include listings of the pollutants that must be monitored and reported on, how often reporting must take place, emission limits, maintenance and

operation requirements, monitoring regime, and requirements for the use of specific technologies. According to the strategy, Manitoba *Environment Act* licences may require that operational plants be assessed on one or a combination of the following methods:

- Source sampling of emission sources at the facility using Environment Canada or U.S. EPA approved sampling methodologies.
- Continuous emission monitoring of gaseous or particulate stack emissions following, where applicable, protocols available from other government agencies.
- Air dispersion modelling of measured emissions from the facility using a U.S. EPA approved model applicable to the source.
- Ambient air quality monitoring in the vicinity of the facility of pollutants emitted by the facility.
- Annual reporting of emissions of selected air contaminants, greenhouse gases, or any

Table 5.2: Ambient Air Quality Criteria for Contaminants Relevant to the OSB Industry. All concentrations are in units of micrograms per cubic metre.

Pollutant	Averaging Period (hr)	Manitoba Criteria	Type	Developed by
Formaldehyde	1	60	Guideline	Manitoba Environment[1] 1999
Hydrogen cyanide	1 Annual	40 3	Guideline	Manitoba Environment 1996
MDI	1 Annual	3 0.5	Guideline	Manitoba Environment 1996
Nitrogen dioxide	1 24 Annual	400 200 100	Objective	Federal - provincial committee on air pollution, 1976 and 1982
Phenol	1	63	Guideline	Manitoba Environment 1999
Suspended particulate matter (Total particulate matter)	24 Annual	120 70	Objective	Federal - provincial committee on air pollution, 1976
PM_{10}	24	50	Guideline	Ontario Ministry of Environment and Energy, 1997
$PM_{2.5}$[2]	24	30	Canada-wide standard	Canada-wide standard

Source: Manitoba Conservation

1. Manitoba Environment is now Manitoba Conservation

2. The Canada-Wide Standard (CWS) for $PM_{2.5}$ is based on the 98th percentile ambient measurement annually, averaged over three consecutive years.

other pollutants of concern. (Manitoba Conservation 2006a; 3)

In applying for an *Environment Act* licence, proponents generally hire consultants to prepare environmental impact studies. These studies use an approved air dispersion model to determine how the exhaust plume from the development's exhaust stacks and the pollutants contained in that plume would behave in the environment. The modelling allows for an assessment of the changes in emission levels in ambient air in the receiving environment and requires specific meteorological data, topographical data, and emission data, such as exhaust flow rate, temperature, stack height, and maximum emission rates for each compound (typically estimated through a review of the available technical information such as past stack testing results from similar facilities and accepted industry emission rates and the specifications provided by equipment manufacturers). The model has a built-in worst-case bias and is used to determine maximum ground-level concentration of the emitted compounds (Tessitore 1994). Once a facility is constructed, source sampling can then be used to verify the emission rates and revise the air dispersion modelling if necessary.

Table 5.3: Manitoba greenhouse-gas emissions by category, 2005.

Category	Megatonnes	Percent
Agriculture	6.0	29.6
Fugitive sources	0.6	2.3
Industrial processes[1]	0.46	2.3
Stationary combustion[2]	4.7	23.2
Transportation	7.5	37
Waste	1.0	4.9

1. Industrial process emissions are those involving chemical reactions other than combustion where the primary purpose is not energy production.

2. Stationary combustion sources include emission from facilities where fuel is burned to produce energy such as electricity, heat or steam. This includes on-site waste incineration if the waste is combusted for energy. (Canada. n.d. *Greenhouse gas reporting site*).

Source: Province of Manitoba | Next Steps: 2008 Action on Climate Change

Air dispersion modelling guidelines in Manitoba

Manitoba Conservation's draft *Guidelines for Air Dispersion Modelling in Manitoba* (2006b) set out the provincial government's expectations in relation to air dispersion modelling carried out to support a licence application. The guidelines distinguish between screening and refined assessments.

The following is a summary of the topics and requirements set out in the Guidelines.

Model selection

For most modelling situations, the Manitoba Guideline recommends the latest version of a number of U.S. EPA models. (The model that was selected by Louisiana-Pacific for air dispersion modelling related to this project, is on the list of models recommended for refined modelling). The Guideline states that:

> The air dispersion model, including version and issue date, should be identified along with the rationale for the choice of model. Any limitations regarding the appropriateness of the proposed model should be discussed (Manitoba Conservation 2006b; 4).

Screening assessments requirements state that "the plant operating conditions and resulting emissions that will lead to the maximum pollutant concentrations in the environment are

to be incorporated. The effect of facility start-up, shutdown or upset conditions on the air pollutant emission rates are also to be assessed" (Manitoba Conservation 2006b; 4). Refined air dispersion modelling is required to take account of:

- normal plant operating conditions and the resulting emissions, including any variation in the emissions on a daily, weekly, monthly or longer cycle
- peak plant operating conditions and the resulting emissions
- facility start-up, shutdown or upset conditions and the resulting emissions during these time periods

> All model options incorporated in the modelling, such as plume rise, buoyancy induced dispersion, vertical potential temperature gradients, treatment of calms, wind profile exponents and enhanced dispersion coefficients, must be documented. An explanation must be provided if the regulatory default mode was **not** [emphasis in original] implemented. (Manitoba Conservation 2006b; 5)

Project overview

There is a requirement for a Project Description that includes a project overview (in this context, the project is the air dispersion modelling), a facility description, and a process description. This would include a rationale for the approach (whether one is doing a screening or a refined assessment) and model selection.

Air dispersion model inputs

In terms of reporting the emissions rates, the Guidelines state:

> The emissions from each source for each pollutant must be stated as annual emissions in tonnes/year and average and maximum hourly emissions in grams/hour. The preferred source of emission rate data is site-specific source sampling. Where measured emission rates are not available, emissions may be estimated using emission rate factors. The source of these factors must be referenced, and the supporting quality and quality of data on which they have been based must be discussed. (Manitoba Conservation 2006b; 6)

Receptor grids of different definitions are established for both screening and refined assessment. For meteorological data, the screening assessment requires that worst case meteorological conditions be used to estimate short term conditions. In the case of a refined assessment, the Guidelines state that:

> [T]he five most recent, consecutive years of meteorological data with five concurrent years of mixing height data, including hourly observations of wind direction and speed, temperature, cloud cover, and ceiling height is required. These meteorological data should be from the nearest representative weather station. If possible, the surface temperature data should be from the same station as the mixing height data.
>
> If a minimum of one year of site specific hourly data that has undergone QA/QC [quality assurance/quality control] is available, the five year requirement may be waived. Any meteorological data gaps should be identified as well as how they were dealt with.
>
> The quality and quantity of the meteorological data input will, in part, determine the level of confidence given to the modelling results. A discussion of the meteorological data to be used and the appropriateness of these data to the specific site needs to be included in the report. (Manitoba Conservation 2006b; 8)

A land use analysis must be included, designating the surrounding area as being either rural or urban. The report shall identify whether the regional topography is simple or complex. In regard to background ambient air concentrations, the Guidelines state:

> If a source has a potentially significant impact, background ambient air quality needs to be considered and included in air dispersion modelling results. These background concentrations must be considered in the assessment of both screening and refined models. (Manitoba Conservation 2006b; 9)

A formula is provided for calculating appropriate stack height according to good engineering practice.

Assessment of results

The assessment of results should include an environmental assessment, a health-risk assessment, and documentation. The environmental assessment must include: the location and magnitude of predicted concentrations for each pollutant for each averaging period of concern where the predicted concentrations include the existing background concentrations and a comparison of the predicted concentrations to available Manitoba air quality criteria. Where there are no criteria, the Guideline sets out a list of alternative authorities.

The Guidelines state that:

> A health risk assessment may be requested based on the air pollutants being emitted and the modelling results. This assessment will likely be requested for any air pollutants that are carcinogens or have other chronic long-term health effects. If requested, the methodology and level of detail shall be determined on a case specific basis. (Manitoba Conservation 2006b; 11)

The Commission, notes that the health risk requirements described above are cursory. By comparison, the federal government has, in relation to work done on contaminated sites, prepared a detailed document on expectations of such assessments.

In regard to documentation, the Guidelines state:

> The report should contain a discussion of the input data, and a description of the modelling methodology and modelling results in sufficient detail to allow Manitoba Conservation to verify the results. (Manitoba Conservation 2006b; 11)

Setting the licence limits

In setting licence limits key issues for Manitoba Conservation have been whether a proponent is adopting appropriate pollution control technology and whether the maximum ground-level concentration predictions produced by the model are within the provincial ambient air quality criteria. If control equipment is appropriate and the air quality criteria are not exceeded, the conclusion would be that the development would have no statistically significant negative impact on the environment or human health. If there are predicted exceedances of the ambient air quality criteria, regulators then examine site-specific data and the health-risk assessment to determine whether the exceedances constitute a significant negative impact on the environment or human health.

If it is concluded that there is no statistically significant risk, Manitoba Conservation would issue a licence setting substance-specific emission limits for each of the facility exhaust stacks and vents in grams per second. These limits are generally set at the maximum emission rates (for

each compound to be regulated) that were used in the air dispersion modelling.

It is important to recognize that the original emission limit in the licence for a new plant would represent the consultant's estimate, based on the available data, of the maximum emission rate (which usually corresponds with maximum production rates) along with additional testing that may be conducted as the plant is commissioned. The emission limit does not necessarily represent the point at which provincial ambient air quality criteria would be exceeded and human health and environment placed at risk. In other words, exceedances of the emission rate would not necessarily compromise human and environmental health, but emission exceedances that led to ground-level concentrations that surpassed the air quality criteria might represent a threat to human and environmental health. Furthermore, emission limits can be amended as plant-specific information emerges and stack sampling tests the assumptions used in the original modelling. Ambient air monitoring can also provide additional data on the resulting ambient air concentration of certain compounds.

This site-specific approach means that similar facilities in different locations could have different conditions in their licence depending on such factors as the use of different fuels, different inputs, differences in output, differences in proximity to sensitive receptors, differences in the airshed weather and mixing patterns, and different regional pollution management strategies. Despite this, there is a considerable similarity in the permitting of OSB plants across the country. Of nine provinces surveyed for the Commission:

- All required some form of approval, certificate, licence or permit to operate an OSB plant.
- All required approval for changes in production processes.
- Five had expiry dates on their permits
- Eight take ambient air quality criteria into consideration in permitting.
- Seven impose stack emission limits, while an eighth can impose such limits, but typically does not do so
- Eight regulate nitrogen oxides and particulate matter.
- Two regulate opacity.
- Five regulate the emission of some VOCs .

Saskatchewan, the outlier, does not take into account ambient air quality criteria, does not impose stack emission limits and issues permits based on control technology, rather than emission limits (Theobald et al. 2009).

The United States

The *Clean Air Act* is the central piece of air pollution control legislation in the United States. Amendments to the *Act* in 1970 established the Environmental Protection Agency and set out a number of key regulatory approaches. In particular, the *Act* provided for:

- The establishment of National Ambient Air Quality Standards for criteria pollutants.
- National emission standards for hazardous air pollutants.

The U.S. *Clean Air Act* (CAA) divided air pollutants into criteria pollutants and hazardous air pollutants (HAPs). Criteria pollutants include carbon monoxide, nitrogen dioxide, sulfur dioxide, particulate matter (PM), lead and ozone. They are called criteria pollutants because they

are regulated through human-health-based and/or environmentally based criteria for setting permissible levels. In the U.S. these criteria are referred to as the National Ambient Air Quality Standards.

The CAA defines a HAP as:

> an air pollutant to which no ambient air quality standard is applicable and which in the judgment of the Administrator [of the EPA] causes, or contributes to, air pollution which may reasonably be anticipated to result in an increase in mortality or an increase in serious irreversible or incapacitating reversible illness. (Reitze 2001; 129)

The 1970 U.S. CAA amendments required the EPA to publish a list of HAPs. Within a year of the pollutant being listed, the EPA was to develop an emission standard for that pollutant. In reality, it took four to seven years from the time a pollutant was listed until a regulation was adopted. The process was complicated by controversies over data, testing methods, and approaches to risk analysis. The EPA itself was reluctant to list substances because it had concluded that the CAA did not allow cost and technology availability to be considered in setting standards and provided very short timelines for industry compliance. In a number of cases, the EPA had been forced by court action to adopt standards.

From 1970 to 1990 the EPA developed regulations for seven substances: asbestos, beryllium, mercury, radionuclides, inorganic arsenic, benzene, and vinyl chloride. The regulatory process for an additional 25 was commenced but never completed. By 1990 this approach had been judged to be a failure in light of the number of chemicals emitted in U.S. industrial processes (5,000 plus).

In 1990 the *Clean Air Act* was amended and the chemical-by-chemical risk-based approach was replaced with one based on requiring major sources to employ the best demonstrated technology used by firms in an industrial category. The *Act* listed 189 HAPS (generally carcinogens, mutagens, and reproductive toxins) for which the EPA would be required to identify emission sources and develop technology-based emission standards. Of the 189 HAPs listed in the CAA (over time some substances have been delisted), 149 were VOCs. Sources that emitted 10 tons per year of a hazardous air pollutant, or 25 tons per year of more than one hazardous air pollutant, were defined as major sources. Major sources would be required to install the maximum achievable control technology (MACT). As Schnelle and Brown commented, "The idea was to stop worrying about the specifics of health and risk for specific chemicals and start taking action by applying established control technologies to industrial sources." In comparison to the Canadian model, the U.S. model has been described as a "one size fits all" approach. This description reflects the fact that the U.S. model can require the use of pollution control equipment without consideration of existing ambient air conditions in the receiving environment (Bradstreet 1995; Pratt et al. 2000; Reitze and Lowell 2001; Schnelle and Brown 2002; 21; Theobald et al. 2009; 28; and U.S. Environmental Protection Agency. n.d. What Are the Six Common Air Pollutants?).

The MACT for the wood products sector is based on the control levels achieved by RTOs, RCOs, and biofilters. While plants are not required install these technologies, they must meet the emission control levels that would be achieved if the technologies were installed.

The U.S. wood products industry has used an energy lifecycle analysis to advance an argument to the effect that combustion-based controls such as RTOs and RCOs, when compared to a no-control scenario, lead to significant increases in the emission of nitrogen oxides, sulphur dioxide and greenhouse gases, along with increase in solid wastes and energy use. To this point in time, the argument has not led to a change in U.S. regulation, in part because the U.S. *Clean Air Act* does not allow for the consideration of these lifecycle factors in determining the required pollution control technology (National Council of Air and Stream Improvement 2008; Theobald et al. 2009).

Chapter Six: Background to the Swan Valley OSB plant

The proposed plant and the 1994 Commission hearing

The Louisiana-Pacific Corporation is a Nashville, Tennessee-based supplier of building products. Founded in 1973, in 2009 Louisiana-Pacific had six mills in Canada (four of them oriented strand board (OSB) mills) and was engaged in four joint ventures. It had 4,600 employees, including 1,400 employees in Canada.

In May 1994 Louisiana-Pacific filed an application for a licence under *The Environment Act* to construct and operate an OSB plant near Minitonas, Manitoba in the Swan Valley. In June of that year, the Commission held a ten-day hearing in the community of Swan River. During the course of the hearing, over 90 presentations were made to the Commission panel.

The proposed plant was projected to produce 277,000 tonnes of OSB per year. The Commission was told that, at full production, the plant would operate 24 hours a day, seven days a week, employing 160 people (Manitoba Clean Environment Commission 1994b; 5). It would consume 735,000 tonnes of wood (80 per cent hardwood, in this case, aspen; 20 per cent softwood), 7,200 tonnes of resin, and 2,770 tonnes of wax per year (Manitoba Clean Environment Commission 1994b; 10).

The strands were to be dried by one of four direct-fired, triple-pass, 18.2-metre-long rotary dryers. Following this, strands intended for the surface layers were to be blended with phenol-

formaldehyde resins and wax, while strands intended for the core layers were to be blended with liquid diphenyl methane diisocyanate (MDI) resin and wax. The press was to use heat (232 degrees Celsius) and pressure (4,480 kilopascals) to press 14 2.4-x-7.3 metre mats at a time.

The original Louisiana-Pacific proposal included:

- no emission control technology for the press vents
- cyclones and wet electrostatic precipitators (WESPs or E-tubes) for the dryer vents.

Louisiana-Pacific projected an annual production of 572,000 tonnes of byproducts and emissions a year. While some of the byproducts could be used in the manufacturing process, it was initially estimated that there would be 3,750 tonnes of pollutants produced annually. The projected emissions for the plant included total suspended particulate matter, carbon monoxide, oxides of nitrogen, sulphur dioxide, and VOCs (Manitoba Clean Environment Commission 1994b; 11). The original estimate was revised when, during the course of the hearings, the company made a commitment to install regenerative thermal oxidizers (RTO) on the dryer stacks and press vents. In the case of the dryers, gases would pass through WESPs and then RTOs before discharge into the atmosphere.

During the initial stages of the hearing, Louisiana-Pacific had expressed reservations about the reliability of RTOs in the Canadian context. Presenters, including an organization known as Concerned Citizens of the Valley (CCV) however, pointed out that, as part of a consent agreement reached with the U. S. Environmental Protection Agency, the company had agreed to install RTO technology (or its equivalent) at its oriented strand board plants in the United States.

The EPA consent agreement

In the early 1990s, the EPA took the position that a number of wood products companies had failed to apply for required *Clean Air Act* permits and had provided incomplete or low estimates of certain air emissions. Between 1993 and 2000 agreements were reached with three of the largest wood products corporations (Louisiana-Pacific, Georgia-Pacific, and Willamette Industries) in which the companies agreed to pay penalties totalling $289-million. A fourth corporation, Weyerhaeuser, came to similar agreements with the governments of the states in which it operated. The agreements required the companies to install Best Available Control Technology (BACT) (U.S. Environmental Protection Agency. n.d. *Wood products enforcement initiative*). According to the EPA:

> BACT is an emissions limitation which is based on the maximum degree of control that can be achieved. It is a case-by-case decision that considers energy, environmental, and economic impact. BACT can be add-on control equipment or modification of the production processes or methods. This includes fuel cleaning or treatment and innovative fuel combustion techniques. BACT may be a design, equipment, work practice, or operational standard if imposition of an emissions standard is infeasible (U.S. Environmental Protection Agency. n.d. *Prevention of significant deterioration (PSD) basic information*).

As part of this process, Louisiana-Pacific reached a consent agreement with the EPA in 1993 under which it agreed to pay an $11-million penalty and install RTO technology at 11 OSB operations in the United States at an estimated cost of $70-million (Heuvelen and

Rosenberg 1994). These agreements marked the first major use of RTO technology by the wood products sector. At the time of the Manitoba hearing, the company was in the process of coming into compliance with that agreement.

The Louisiana-Pacific decision to install RTOs on the dryer and press stacks and vents at Swan Valley

An analysis of air dispersion modelling presented to the Commission at the 1994 hearing concluded that air emissions from the Swan Valley plant would be within acceptable air quality guidelines for those substance for which standards existed at that time without RTOs (Manitoba Clean Environment Commission 1994b; 18).

The 1994 Louisiana-Pacific submission did not contain any proposals for the limiting of nitrogen oxide emissions since the U.S. EPA had not required such controls for OSB plants in that country and the proposed emissions were within Manitoba air quality guidelines.

On the second-last day of the 1994 hearing in Swan River, Louisiana-Pacific informed the Commission that it would be installing RTOs on the dryer and press stacks and vents. In making the announcement, a company representative told the Commission:

> When we started these proceedings, we stated that we did not have any test data, and we did not have enough running experience to be able to commit or not to commit to this technology. What I have here is a communication from the manufacturing [sic] of this equipment, saying he understands what the problems are, he thinks that they are resolvable and he is going to go forward with those resolutions (Manitoba Clean Environment Commission 1994a; June 27, 1994, page 1505, lines 17-24).

Louisiana-Pacific proposed to conduct ambient air monitoring for formaldehyde, total suspended particulates, and PM_{10} in the surrounding environment and to cooperate with Manitoba Natural Resources (now Manitoba Conservation) in the monitoring of impacts on vegetation. The company also proposed to monitor water from eight wells. During the hearing, Manitoba Health proposed that a community health study be undertaken at the start up to establish a baseline for tracing health impacts of the plant and that follow-up studies be conducted regularly.

The 1994 Clean Environment Commission Report

The Commission concluded that it was possible to develop the Swan Valley OSB plant in a manner that would meet the economic and environmental objectives of Manitobans and be consistent with the principles of sustainable development. On the emissions-related issues, the Commission panel reached the following significant conclusion:

> According to the evidence presented at the hearings, electrostatic precipitators would control pollutants to the degree necessary to meet air quality guidelines. The addition of the regenerative thermal oxidation technology would enhance the quality of the emissions even further.

While noting that the oxides of nitrogen would be within the provincial air quality guidelines, the Commission stated that these emissions "would not be well controlled by the current technology" (Manitoba Clean Environment Commission 1994b; 42). The Commission recommended that the Manitoba government should control these emissions.

The Commission made the following comment on provincial air quality regulations:

> Manitoba Environment [now Manitoba Conservation] has developed a schedule of air quality objectives and guidelines for the preservation and protection of ambient air quality in Manitoba. However, the schedule is limited in the number of pollutants considered. Therefore, objectives and guidelines for pollutants not included in the schedule must be considered on an *ad hoc* basis in response to individual project proposals. Since the schedule helps investors to plan their projects and assists regulators and the public in assessing those projects, it would be important to update the schedule and to expand the list of pollutants.
>
> The Panel observes that, based on current knowledge of the environmental and health impacts of air pollutants, Manitoba should develop a more comprehensive schedule of air quality objectives and guidelines, including primary pollutants which would be emitted from the proposed oriented strand board plant. (Manitoba Clean Environment Commission 1994b; 49)

The Commission recommended that the plant be licensed based on its application (as amended during the hearing) and the supporting environmental impact statement. Specifically, it stated that:

> The equipment to be installed in the plant shall include pollution control equipment as identified in the Environmental Impact Statement and the Notice of Alteration. This equipment shall include wet electrostatic precipitators and regenerative thermal oxidizers on the dryers, regenerative thermal oxidizers on the press, either an electrified filter bed or electrostatic precipitator on the thermal-oil heater, and either an electrified filter bed or an electrostatic precipitator on the incinerator. In addition, low NO_x burners or alternative technologies shall be used to control emissions of oxides of nitrogen from the plant.
>
> (Manitoba Clean Environment Commission 1994b; 53)

The Commission report did not recommend emission or control levels, simply stating that levels should be specified in the licence. It noted that levels should be set for particulate matter, volatile organic compounds, and oxides of nitrogen.

Aside from recommendations dealing with air emissions, the following recommendations were made in relation to the establishment of various baselines and monitoring of environmental impacts.

16. Baseline ambient air, water, soil, flora and fauna monitoring shall be taken to provide baseline data prior to the construction of the plant.
17. A schedule shall also be established to ensure ongoing monitoring of water, soil, flora and fauna.
18. Periodic and continuous emission monitoring reporting requirements for the plant shall be specified in the licence.
20. Groundwater monitoring wells shall be installed and operated according to the requirements identified by Manitoba Environment [now Manitoba Conservation].
21. Manitoba Environment shall prescribe a reporting procedure for the environmental monitoring program and ensure public access to the results.
27. A health study consistent with the direction of a plan suggested at the hearings by Manitoba Health shall be undertaken to provide ongoing health monitoring of workers and residents of the area. Community involvement in the health study

shall be consistent with Manitoba Health's proposal.

28. A community liaison committee reflecting a reasonable balance of the various residents of the Swan River Valley shall be established. This committee would facilitate the exchange of information between residents of the Swan River Valley and the Corporation on matters related to the operation of the facility and its impact upon the Valley residents.

Manitoba Government response to the Commission report

The Manitoba Government issued a series of staged licences for the Louisiana-Pacific project that were, in large measure, in keeping with the Commission recommendations. The following explanation was provided for the decision not to require low nitrogen oxide burners as the Commission had recommended:

> The environmental impact assessment estimated that impacts associated with NO_x emission from the Development would be acceptable. At this time the Director does not deem low NO_x burners or alternative technologies necessary. The baseline monitoring and ambient monitoring program during the start-up phase will identify the accuracy of the estimated impacts. The Licence will include the provision for any remedial measures or modifications to the construction works which may be required by the Director. (Manitoba Environment 1994; 3)

Construction was allowed to commence prior to the completion of a series of baseline monitoring studies. Furthermore, baseline ambient monitoring of soil was not considered necessary.

In response to a Commission recommendation that the province prescribe a reporting procedure for the environmental monitoring program and ensure public access to the results, the province stated that the recommendation had been incorporated into Clause 8 of the licence and would be incorporated into subsequent licences as necessary. Public access was to be provided to the monitoring results through the Public Registry. The Commission has concerns that this was not done.

Chapter Seven: The Louisiana-Pacific Licences

The Manitoba Government chose to license the Louisiana-Pacific plant in stages. The first two stages dealt with site preparation and foundation construction, plant construction, and the submission and implementation of monitoring programs. Clauses 6 and 7 of the Stage 2 (*Environment Act* Licence Number 1900 S2) licence called for emission monitoring plans, ambient air monitoring plans (including the establishment of a meteorological station), an ambient surface-water-quality monitoring plan, and a groundwater-quality monitoring plan. Clause 8 required that monitoring results be reported to the province within 60 days of each sampling.

The third stage dealt with start up and testing of pollution control equipment, while stage four (*Environment Act* Licence Number 1900 S4) prescribed the on-going operating requirements. Construction began in the fall of 1994 and production commenced in early 1996. The stage-four licence was issued in October 1997. Among other stipulations, it required Louisiana-Pacific to:

- Participate in a Community Liaison Committee for the purpose of facilitating the exchange of information between the residents of the Swan River Valley and Louisiana Pacific.
- Implement a continuing health status study.
- Implement the continuing flora and fauna study.
- Conduct stack emission monitoring once every two years. (Aside from the

substances whose emissions were regulated in *Environment Act* Licence Number 1900 S4, stack-testing was also to be conducted for emissions of a number of additional substances including acrolein and acetaldehyde).

- Implement an ambient air quality monitoring plan and meteorological monitoring station, at approved monitoring site locations. (Louisiana-Pacific established two monitoring stations: LP1 is approximately 1.5 kilometres north-east of the plant and monitoring station LP2 is approximately 2 kilometres west of the plant. Louisiana-Pacific was required to monitor ambient air quality for PM_{10}, formaldehyde, benzene, total volatile organic compounds (VOCs), phenols, MDI, and hydrogen cyanide and additionally for a number of years, for nitrogen oxides and ozone. The requirements for the latter two substances were subsequently deleted from the licence.)
- Install specific emission control systems for specific processes.
- Install emission stacks of specific heights.
- Provide computer-generated estimates of the maximum concentrations of certain pollutants in the ambient air. The modelling used to produce these estimates was to be based on two scenarios: 1) RTOs in use and 2) RTOs being bypassed. A report on the human health risk of exposure to the maximum concentrations identified was to be submitted.

Emission limits

Tables 7.1 through 7.3 outline the emission restrictions placed on the dryer and press operations. Table 7.1 sets out the control equipment and stack height mandated for the dryers and press. The abort stacks listed were to be used during RTO shutdowns, emergency situations, or when wood was not being dried.

Table 7.2 sets out the emission limits in grams per second for the dryers (these are found in Clause 51 of *Environment Act* License Number 1900 S4). Under normal operations the dryer emissions would first pass through the WESPs and then through the RTOs. Under these conditions, the dryer RTOs would be the only source of emissions from the dryer operation and the limits for the combined dryer RTOs would apply. If the RTOs were shutdown, the dryer operation would vent through the abort stacks

Table 7.1: Pollution sources, control equipment and stack heights in Louisiana-Pacific's 1997 Licence 1900 S4.

Pollutant Source	Control Equipment	Stack Height
Dryers 1 and 2	E-tube (WESPs) and RTO	30.5 metres
Dryers 1 and 2 abort stack	E-tube (WESPs)	22.9 metres
Dryers 3 and 4	E-tube and RTO	30.5 metres
Dryers 3 and 4 abort stack	E-tube (WESPs)	22.9 metres
Oriented Strand Press	RTO	30.5 metres

Source: Environment Act Licence 1900 S4.

and the limits for the combined dryer E-tubes (WESPs) would apply.

In reviewing Table 7.2 it is important to bear in mind that in normal operation, the exhaust would be routed first through the WESPs and then through the RTOs. A comparison of the two sets of limits demonstrates the impact of the RTO. Specifically:

1) The RTO was expected to have no impact on the emission rate of total particulate matter or hydrogen cyanide.
2) The RTOs were expected reduce the emission of volatile organic compounds in general,

Table 7.2: Emission limits for the dryer operation in Louisiana-Pacific's 1997 Licence Number 1900 S4

Pollutant Source	Pollutant	Limit in grams per second
Combined Dryer RTOs	nitrogen oxides	6.5[1]
	volatile organic compounds[2]	1.1
	phenol	0.05
	total particulate matter	5.14
	formaldehyde	0.085
	benzene	0.008
	hydrogen cyanide	0.4
Combined Dryer E-tubes (WESPs)	nitrogen oxides	5.24
	volatile organic compounds	20.96
	phenol	0.5
	total particulate matter [3]	5.14
	formaldehyde	1.0
	benzene	0.02
	hydrogen cyanide	0.4

Source: Environment Act Licence 1900 S4.

1. Nitrogen oxide emissions from the dryer RTOs could exceed 6.5 grams per second as long as the total emission of nitrogen oxides from the dryer and press RTOs did not exceed 7.4 grams per second.

2. Environment Act Licence Number 1900 defined volatile organic compound as any organic compound which participates in atmospheric photochemical reactions, excluding methane, carbon monoxide, carbon dioxide, carbonic acid, metallic carbides and carbonates, ammonium carbonate, and other compounds which may be exempt by the director.

3. Environment Act Licence Number 1900 defined total particulate matter as the total of both the condensable and non-condensable particulate matter. It defines particulate matter as any finely divided liquid or solid matter other than water droplets.

and phenol, formaldehyde and benzene in particular, by 90 per cent or more.

3) The RTOs were expected to increase the maximum emission of nitrogen oxides by 25 per cent from (from 5.24 to 6.5 grams per second). This would be the result of the combustion of natural gas associated with the operation of the RTOs.

Table 7.3 sets out the emission limits for the press operation (found in clause 57 of *Environment Act* Licence Number 1900 S4).

These limits were based on the original environmental impact statement that was prepared for Louisiana-Pacific by its consultant and submitted to the Commission in 1994 and additional work carried out by the consultant following the company's announcement that it would be installing RTOs at its Swan Valley operation. The figures in the limits are based upon the estimated emission rates at maximum production in the Swan Valley OSB plant. Because air dispersion modelling indicated that these rates would not result in ground-level concentrations that violated Manitoba's *Ambient Air Quality Criteria* (or the criteria of other jurisdictions, if Manitoba did not have its own criteria for the substance in question (as was the case with benzene)), those rates were adopted as the emission limits in the licence.

Table 7.3: Emission limits for the press operation in Louisiana-Pacific's 1997 Licence 1900 S4

Pollutant	Limit in grams per second
nitrogen oxides	0.9[1]
volatile organic compounds	0.28
phenol	0.7
total particulate matter	2.10
formaldehyde	0.08
benzene	0.0003
diphenyl methane diisocyanate (MDI)	0.0141

Source: Environment Act Licence 1900 S4.

1. Nitrogen oxide emissions from the press RTOs could exceed 0.9 grams per second as long as the total emission of nitrogen oxides from the dryer and press RTOs did not exceed 7.4 grams per second.

Studies

Louisiana-Pacific contracted with Toxcon Health Sciences Research Centre Inc. to carry out an initial community-health baseline study. The study plan, which was approved by Manitoba Environment, was to include:

- A baseline lung health study.
- A baseline health perceptions survey.
- A background demographic, socioeconomic and disease rate profile of local communities.

The study, undertaken in 1995, focused on Minitonas and environs and used the community of Benito as a control community for making comparisons with health outcomes in Minitonas. Louisiana-Pacific commissioned Toxcon to undertake a follow-up study in 2001. That study found no differences in respiratory symptoms or conditions between Minitonas and Benito. It should be noted that the second study did not include a follow-up lung-health study.

While there was a moderate decline in physical health status from 1995 to 2001, this was true for both Minitonas and the surrounding areas and for Benito. The majority of respondents in the study areas felt that mill operations had had

no effect on their health during the past twelve months (Toxcon Health Sciences Research Centre Inc. 1996; Toxcon Health Sciences Research Centre Inc. 2002).

Manitoba Conservation concluded that since the second study addressed the parameters of the approved plan and did not identify any significant deleterious health impacts to the community, Louisiana-Pacific Canada had complied with the requirements of Clause 20 of *Environment Act* Licence Number 1900 S4.

Louisiana-Pacific's Stage 2 Licence stated that the company must submit a plan for a baseline flora and fauna study by February 1, 1995 (although, Manitoba Environment could grant an extension to this deadline). A baseline study was completed in August 1995 and accepted by Manitoba Environment in early 1996. A plan for a continuing study of flora and fauna was approved in June 1997. The study commenced that summer and continued until 2000 (TetrES Consultants 2000). A further follow-up study was conducted in 2005. The report based on that study concluded that ten years of monitoring had not detected "any substantial changes to local bird populations and ozone sensitive plants" and advised that "further monitoring of local flora and fauna is not warranted unless ozone precursors or other emissions from the LPC mill increase over levels that have been emitted to date" (TetrES Consultants 2005; 7-1).

The Community Liaison Committee

In keeping with the provisions of its *Environment Act* Licence, a Community Liaison Committee (CLC) was established to facilitate the exchange of information between the residents of the Swan River Valley and Louisiana Pacific. The terms of reference of the CLC (Appendix 6) state that the role of the committee (which is referred to as a Citizens Liaison Committee in the terms of reference) is to facilitate implementation of the *Environment Act* licence by providing Manitoba Conservation and Louisiana-Pacific with input and advice and by providing a forum in which information could be exchanged and issues discussed. The CLC was to be chaired by a Manitoba Conservation appointee (whose decisions on CLC matters would be final), information exchanged and advice provided was to be pertinent to monitoring and operations with a potential environmental impact, there was no requirement to reveal proprietary or confidential information, and minutes would be made public.

The terms did not state how frequently the CLC should meet nor how members were to be selected. The initial membership included Louisiana-Pacific, Manitoba Conservation, the rural municipalities of Swan River and Minitonas, and the towns of Swan River and Minitonas, and the Concerned Citizens of the Valley.

Chapter Eight: Changes to the Swan Valley OSB plant and Licence 1900 S4 prior to 2008

From the period 1997 to 2007, Louisiana-Pacific sought a number of changes to *Environment Act* Licence Number 1900 S4. A number of these changes were accepted by Manitoba Conservation and appended into the licence by way of agreement while others were not accepted. This chapter discusses the proposed changes to provisions that dealt with emissions from either the dryer or the press operation and with changes to the stack sampling method.

In addition to the changes to its licence during this period Louisiana-Pacific undertook a significant change to its dryer operation.

Changes in dryer technology: 2004

In 2004, Louisiana-Pacific replaced its triple-pass rotary dryer system with four single-pass dryers, exhaust gas recirculation (which allows a recirculation of up to 40 per cent of the exhaust), and a wood-fired energy system. This $26-million system consumes all wood residuals, which previously constituted the plant's primary waste stream. According to Louisiana-Pacific, the single-pass dryer system reduces organic emissions at the source (Louisiana-Pacific 2008). The dryer exhaust-gas recirculation system allows

for lower dryer inlet temperatures and a reduction in the volume of exhaust gas being discharged. As a result, the primary thermal energy for both the dryer and press operations comes from two wood-fired energy systems.

The conversion to a single-pass dryer system received a Honourable Mention at the 2005 Canadian Council of Ministers of the Environment Pollution Prevention 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 – eliminating emissions at the source through the application of process technologies that reduce pollution.

Nitrogen oxide limits in the Swan Valley OSB plant licence: 2004

In 2004, Louisiana-Pacific was granted an alteration to *Environment Act* Licence Number 1900 S4 that increased the limits for nitrogen oxide emissions from the press operation from 0.9 grams per second to 4.62 grams per second. The total allowable nitrogen oxide emissions from the dryer and press RTOs was also increased from 7.4 grams per second to 11.18 grams per second.

Louisiana-Pacific has informed the Commission that the request for the increase in the nitrogen oxide limits arose from the company's recognition that the original limit did not reflect the nitrogen oxide emissions under conditions of maximum production. According to the company, in the mid-1990s RTOs were a relatively new technology on OSB press operations, and, as a result, the emission rate had been underestimated. The prime source of nitrogen oxide emissions from the press operation is the RTO combustion process.

Manitoba Conservation stated that the potential environmental impacts of this increase were insignificant. When the increase was granted, Louisiana-Pacific was required to resume ambient testing for ozone (in 1999 Louisiana-Pacific had been given permission to stop ambient testing for ozone and nitrogen oxides) and carry out an assessment of the ambient ozone concentrations and other parameters of interest.

Limits on benzene emissions from the press in the L-P licence

In 2002, Louisiana-Pacific commenced discussions with Manitoba Conservation to determine the impacts that would be associated with increasing the dryer benzene emission limits. As was the case with nitrogen oxide, Louisiana-Pacific maintained that the benzene limits in its licence were established at a time when little or no benzene emissions information from OSB plant presses was available. In particular, according to the company, the benzene press limits were based solely on benzene produced through combustion and did not include benzene emitted from the wood. The company's inquiries in regard to the benzene limit were part of what Louisiana-Pacific described as the Dryer RTO Elimination Project. These efforts were incorporated into Louisiana-Pacific's 2007 proposal to convert the press RTOs to RCOs (Louisiana-Pacific 2007).

The 2007 RCO conversion proposal

In 2007 Louisiana-Pacific sought permission from Manitoba Conservation to convert the press RTO to a Regenerative Catalytic Oxidizer (RCO). This would have involved adding a metal or metal-coated catalyst that would allow oxidation of VOCs to take place at a temperature of 425-450 degrees Celsius as opposed to the 760 degrees Celsius required by the RTOs. With RCOs the company could reduce its natural-gas consumption (for the press RTO) by fifty per cent.

The company stated that the conversion to RCO technology would lead to a significant decrease in nitrogen oxide emissions as the result of the decrease in the use of natural gas. It would also lead to the reduction of the emission of 3,000 tonnes of carbon dioxide equivalent per year (Louisiana Pacific 2007).

The proposal for a licence change involved a request for a change in two emissions limits for the press vents. The company was seeking to have the benzene limit increased from 0.0003 grams per second to 0.0197 grams per second and to have the formaldehyde limit increased from 0.08 grams per second to 0.622 grams per second.

In the case of benzene, Louisiana-Pacific was making this request because it recognized that it was not able to maintain its benzene emissions below the maximum licensed limits for its press operation under all conditions. It stated that a reasonable and achievable limit would be 0.0197 grams per second, which, according to air dispersion modelling, would result in worst-case one-hour average ambient air levels of 0.491 micrograms per cubic metre. This was below the Alberta Air Quality Objective of 30 micrograms per cubic metre (Louisiana-Pacific made comparison with the Alberta standard since Manitoba does not have a benzene criterion). The application also included comments from a physician associated with the National Council of Air and Stream Improvement (NCASI) that concluded that the proposed RCO conversion did not present any unacceptable risk of increased cancer associated with benzene exposure.

The proposed increase to the formaldehyde emission limit was based on the vendor's performance specification of 10 parts per million in the gas emissions. Louisiana-Pacific stated that this was equivalent to an emission of 0.62 grams per second from the Swan Valley plant. As was the case with benzene, a physician associated with NCASI concluded that the proposed RCO conversion did not present any unacceptable risk of increased cancer associated with formaldehyde exposure (Louisiana Pacific 2007).

Manitoba government response to the RCO conversion proposal

The Manitoba government approved the conversion of the RTOs to RCOs. However, in granting that approval the Manitoba government did not grant the requested increases in emission limits. In the case of formaldehyde, Manitoba Conservation stated that while the environmental impacts would not be significant, it was deferring its decision on a limit increase until appropriate source testing had demonstrated the efficiency of the RCOs. Because benzene is a human carcinogen, Manitoba Conservation stated that it required that, wherever possible, benzene emissions be reduced or eliminated. For this reason, Manitoba Conservation did not allow an increase in the benzene emission limit. It should be noted that this decision did not address the underlying fact that under certain conditions, Louisiana-Pacific was not able to

maintain benzene emissions below licence limits for its presses. Manitoba Conservation has told the Commission that when it rejected the Louisiana-Pacific application, the department, due to changes in personnel, was not aware that Louisiana-Pacific was not able to consistently maintain its benzene emissions below the limits in its existing licence.

Louisiana-Pacific decided not to go ahead with the contemplated RCO conversion. In consideration of the cost (estimated at $800,000) involved in converting to an RCO and the fact that RCOs could not, in the company's opinion, be adapted to treat dryer emissions, the company instead opted to move forward with its RTO elimination project. This was to lead to Louisiana-Pacific's requests for licence changes that were received by Manitoba Conservation in November 2008.

Chapter Nine: The proposal under consideration

This chapter reviews the Louisiana-Pacific application for a major alteration to *Environment Act* Licence Number 1900 S4. It is divided into four sections:

1) A chronology of applications for licence amendments 2008-2009.
2) The proposed changes.
3) The rationale for the proposed changes.
4) Manitoba Conservation's assessment of the proposed changes.

Chronology of applications for licence amendments 2008-2009

Between November 18, 2008 and January 19, 2009 Louisiana-Pacific prepared and submitted three separate applications for changes to its *Environment Act* licence for the Swan Valley oriented strand board (OSB) plant. The Commission is reviewing the requests for emission limit increases contained in the request that was received by Manitoba Conservation on January 19, 2009 (dated January 13, 2009). However, the background information for that request is the same information that accompanied

the request that was received by Manitoba Conservation on November 20, 2008 (dated November 18, 2008). The following chronology briefly describes the three applications and their fates.

1) The November 2008 request

On November 20, 2008, Manitoba Conservation's Environmental Assessment and Licensing Branch received an application (dated November 18, 2008) from Louisiana-Pacific for an amendment to its Swan Valley OSB plant licence that would allow it to undertake what Louisiana-Pacific deemed to be a minor alteration to the plant.

This application consisted of the following documents:

- Licence Amendment Request RTO Elimination Cover Letter (Dated November 18, 2008).
- Licence Amendment Request RTO Elimination Report (Dated November 18, 2008 on cover, dated January 9, 2009 on inside pages).
- Table 2. Swan Scenario E Source List (a reprint of Table 2 from Licence Amendment Request RTO Elimination Report, which is only partially legible in the portable document format (PDF) copy of the report).
- Appendix A. Dispersion Model Results.
- Appendix B. Dispersion Models Raw Output Data.
- Appendix C. Health Risk Assessment.
- Appendix D. Required Changes to EAL 1900S4.
- Appendix E. An article dealing with emission-control issues in the wood-products industry.

On December 11, 2008, Manitoba Conservation Environmental Assessment and Licensing (EAL) Branch issued a letter informing Louisiana-Pacific that it had determined that its application constituted a major (as opposed to minor) alteration. As such it required an *Environment Act* proposal and would be subject to the environmental assessment and licensing process.

The Environment Act defines minor alterations as those with insignificant potential environmental effects or effects that can be accommodated by the ongoing assessment process and do not alter provisions that had been put in place as the result of an appeal under the provisions of *The Act*. All other alterations are deemed to be major alterations. The Minister or the Director of Environmental Assessment and Licensing may approve a minor alteration with any required limits, terms and conditions. In the case of major alteration, the proponent must seek approval for the proposed alteration in accordance with sections 10, 11 or 12 of *The Environment Act*, as the case may be. The approval processes in these sections allow for a broader assessment and greater public notification than is required for minor alterations.

According to Manitoba Conservation, an internal review conducted by EAL Branch staff and a review conducted by an outside reviewer of the Louisiana-Pacific proposal had led its EAL Branch to determine by December 11, 2008, that the environmental effects of the proposed alteration were acceptable. Despite this, the Branch concluded that the changes being requested by Louisiana-Pacific amounted to a major alteration on the basis of the degree of public attention that had been focused on the

regenerative thermal oxidizers (RTOs) during the 1994 Clean Environment Commission hearings.

2) The December 2008 request

On December 22, 2008, Manitoba Conservation's Environmental Assessment and Licensing Branch received an application (dated December 18, 2008) from Louisiana-Pacific for an amendment to its Swan Valley OSB plant licence that would allow it to undertake what Louisiana-Pacific deemed to be a minor alteration to the plant that would allow Louisiana-Pacific to discontinue the operation of the RTOs subject to certain restrictions on production levels and dryer temperatures.

On January 8, 2009, Manitoba Conservation 's Environmental Assessment and Licensing Branch approved Louisiana-Pacific's December 18, 2008, request for a minor alteration with certain conditions. In doing so, Manitoba Conservation rescinded *Environment Act* Licence Number 1900 S4 and issued a new licence, *Environment Act* Licence Number 2861, to Louisiana-Pacific for its Swan Valley OSB plant. This new licence allowed Louisiana-Pacific to discontinue operation of the RTOs as long as it adhered to specific restrictions on production levels (essentially by holding dryer temperatures below 1,100 Fahrenheit/593 Celsius). The emission rates for overall and specific VOCs are lower than those requested by Louisiana-Pacific in its November 18, 2008 application. The licence also contained a requirement that the Director of Environmental Assessment and Licensing must review the licence prior to June 1, 2009.

3) The January 2009 request

On January 19, 2009, Manitoba Conservation's Environmental Assessment and Licensing Branch received an application (dated January 13, 2009) from Louisiana-Pacific for an amendment to its Swan Valley OSB plant that would allow it to undertake a major alteration to the plant. Louisiana-Pacific was seeking the same changes as it was seeking in its application dated November 18, 2008. For this reason Louisiana-Pacific simply re-filed the supporting documentation for the November18, 2008 application.

The emission limit increases that the Commission is reviewing are the ones proposed in the Louisiana-Pacific request for a major alteration that was received by Manitoba Conservation on January 19, 2009. The details of that application are, however, contained in the earlier application received on November 20, 2008 (dated November 18, 2009). The Commission does not intend to discuss the limits that were placed in *Environment Act* Licence Number 2861. While, under Manitoba statute there is no provision for a temporary licence, the Commission recognizes that the changes granted in *Environment Act* Licence Number 2861 are meant to be temporary changes to be in effect only until the Commission's report has been received and acted upon. As noted earlier, the Commission is reviewing proposed changes to *Environment Act* Licence Number 1900 S4.

The proposed changes

In Appendix D of its November 18, 2008, application, Louisiana-Pacific made the following requests (the text in square brackets constitutes the Commission's explanatory comments on the change) for amendments to *Environment Act* Licence 1900 S4:

- Repeal Clause 51(a) - Combined Dryer RTO limits. [Clause 51(a) sets the emission limits for the dryer RTOs. With this clause deleted, the limits on the dryer wet electro-

static precipitators (WESPs) would be the sole dryer emission limits. While this proposal does not directly request emission limit increases, by eliminating the clause that contains the RTO limits, it has the impact of significantly increasing all dryer limits.].

- Amend Clause 51(b) as follows [this clause sets out the emission limits for the dryer WESPs]:

  i. Formaldehyde – 4.0 grams per second [this represents an increase in formaldehyde emissions from the WESP limit in *Environment Act* Licence 1900 S4].

  ii. Benzene – 0.172 grams per second [this represents an increase in benzene emissions from the WESP limit in *Environment Act* Licence 1900 S4].

- Repeal Clause 52 [This clause places limitations on the use of the dryer abort stacks. It would not be applicable if the RTOs were no longer in operation.]
- Clause 54 – Remove "or Dryer RTO" from the first sentence in the clause, and remove 54(g) [This clause sets out the conditions for recording shutdowns of various pollution control technologies.]
- Amend Clause 57(a) as follows:

  i. Pollutant source should read "Press", not Press RTO [This provision requires that emission from the press operation be treated by RTO technology. The deletion of the word "RTO", eliminates the requirement for such treatment.]

  ii. VOC – 2.78 grams per second [This represents an increase in volatile organic compound (VOC) emissions from the press limit in *Environment Act* Licence 1900 S4.]

  iii. Formaldehyde – 1.1 grams per second [This represents an increase in formaldehyde from the press limit in *Environment Act* Licence 1900 S4.]

  iv. Benzene – 0.0197 grams per second [This represents an increase in benzene emissions from the press limit in *Environment Act* Licence 1900 S4.]

  v. MDI – 0.089 grams per second [This represents an increase in diphenyl methane diisocyanate (MDI) emissions from the press limit in *Environment Act* Licence 1900 S4.]

- Repeal Clause 58 (the major sources of nitrogen oxides will be removed) [This clause permitted nitrogen oxide emissions from either the dryer or the press to exceed the licence limits providing the combined nitrogen oxide emissions from the dryer and press operations did not exceed the sum of the emissions grams per second.]
- Repeal Clause 59 [This clause required a shutdown of the press in the event of a shutdown or a failure of the RTO emission control system.]

In addition, Louisiana-Pacific was requesting changes to a number of schedules appended to the licence to delete reference to the RTOs and to reflect changes to resulting stack configurations.

Table 9.1 sets out the requested changes in emission limits from both the dryer and press operations.

The following observations can be made about the changes highlighted in Table 9.1:

1) There are no proposed changes to the emission rate limits of total particulate matter or hydrogen cyanide from the dryer operation.
2) There are no proposed changes to the emission rate limits of total particulate matter or phenol from the press operation.
3) There is a proposed decrease in the nitrogen oxide emission rate limit from the dryer operation. Furthermore, although Louisiana-Pacific did not include a request for a reduction in the press operation nitrogen oxide emission limit, supporting documentation provided by Louisiana-Pacific indicates that the nitrogen oxide emissions from the press at full production would be 1.5 grams per second (down from the 4.62

Table 9.1: Comparison of dryer and press emission limits in *Environment Act* Licence Number 1900 S4 and the dryer and press limits requested by Louisiana-Pacific.

Wood strand dryer (Limits in grams per second)

Pollutant	Licence 1900 S4 Limit	L-P requested limit
nitrogen oxides	6.5[1]	5.24
volatile organic compounds	1.1	20.96
phenol	0.05	0.5
total particulate matter	5.14	5.14
formaldehyde	0.085	4.0
benzene	0.008	0.172
hydrogen cyanide	0.4	0.4

Press (Limits in grams per second)

Pollutant	Licence 1990 S-4 Limit	L-P requested limit
nitrogen oxides	4.62[1]	4.62
volatile organic compounds	0.28	2.78
phenol	0.7	0.7
total particulate matter	2.10	2.10
formaldehyde	0.08	1.1
benzene	0.0003	0.0197
diphenyl methane diisocyanate (MDI)	0.0141	0.089

Source: Louisiana-Pacific 2008; Environment Act Licence Number 1900 S4.

1. Nitrogen oxide emissions from the dryer RTOs could exceed 6.5 grams per second as long as the total emission of nitrogen oxides from the dryer and press RTOs did not exceed 11.18 grams per second. This provision would be eliminated under the changes proposed by Louisiana-Pacific.

grams per second in *Environment Act* Licence Number 1900 S4). These reductions would be achieved by the decommissioning of the RTOs, which generate nitrogen oxide emissions.

4) There are increases, usually of more than one order of magnitude, proposed to the emission rate limits of overall volatile organic compounds from both the press and dryer operations, and of phenol, benzene and formaldehyde from the dryer and of benzene, formaldehyde, and MDI from the press.

The company indicated in the supporting documents for its 2008 application that it would be changing the stack configuration for the dryer. While it had not finalized its plans, it was basing its application for changes to the licence on a new 49.5-metre stack from the dryer system. Louisiana-Pacific noted that it may, in the end, use a different exhaust configuration, but would achieve the same objectives as set out in its application.

The rationale for the proposed changes

In the supporting documentation for its application for approval to decommission the RTOs (Louisiana-Pacific 2008), Louisiana-Pacific made, in essence, three separate arguments:

1) An equity argument.
2) An economic argument.
3) An environmental argument.

The equity argument

Louisiana-Pacific argued that it is the only OSB plant in Canada that is required to operate RTOs. The company stated that in 1994, it was its expectation that Canada would follow the U.S. lead and require all future OSB plants to install RTOs. However, this development has not taken place.

According to the Louisiana-Pacific submission, many Canadian OSB plants do not have air-emission limits in their operating permits. Those limits that do exist generally limit "key emission parameters such as formaldehyde and particulate matter " (Louisiana-Pacific 2008; 6). If the formaldehyde emission limits were increased to the levels requested by Louisiana-Pacific, the company maintains that its emissions would be "well within the range of those established in other OSB facilities' operating permits" Louisiana-Pacific 2008; 8). The company noted that even though "few point source emission limits for speciated [specific] organics or total VOCs are included in operating permits for other OSB mills in Canada" it was not asking that the Swan Valley plant be relieved of these limits, simply that, in a number of cases, the emission limits be increased (Louisiana-Pacific 2008; 8).

The economic argument

The economic argument, which is linked to the equity argument, points out that the cost of operating, maintaining, and replacing RTOs places the Swan Valley operation at a competitive disadvantage. According to Louisiana-Pacific, the RTOs have an annual natural gas operating cost of $2.5-million, an annual maintenance cost of $300,000, electricity costs of $400,000, and additional costs related to lost production should an RTO experience a mechanical problem and need to be shut down. The total cost of RTOs to the company was over $3-million a year with an estimated replacement cost of $10-million. The three RTOs (two on the dryer operation and one on the press operation) at the Swan Valley plant are all approaching the end of their operational lifespans. The company stated that in the "current

economic environment, there is no guarantee the plant would remain operational if capital replacement costs had to be incurred" (Louisiana-Pacific 2008; 4).

The environmental argument

There are two parts to Louisiana-Pacific's environmental argument. The first is that there is a significant environmental cost to the operation of the RTOs since they combust natural gas. Louisiana-Pacific estimated that, based on the average annual RTO consumption of natural gas from 2004 – 2007, eliminating the RTOs would result in an annual greenhouse-gas emission reduction of 11,803 tonnes of carbon dioxide equivalents. It estimated that this was equivalent to 0.92 per cent of the GHG emission from stationary combustion sources from manufacturing industries in Manitoba.

The company also referenced a study conducted for the American Forest and Paper Association that concluded that while emission control technologies such as RTOs, RCOs, and biofilters may reduce the emission of VOCs from press and dryer operations in the wood-panel industry, these onsite benefits "come at the expense of higher energy consumption and associated increases in life cycle emission of nitrogen oxides, sulfur oxides, greenhouse gases, and solid waste, as well as a variety of fossil fuel combustion-related HAPs [hazardous air pollutants] including hydrochloric acid, hydrofluoric acid, and mercury" (Sauer et al. 2002; 50). These additional environmental burdens were attributed to the production, transport and disposal of materials used by the control systems, and the production, transport, and combustion or generation of the energy sources used by the systems. The paper concluded that "the application of the control technologies examined in this report [RTOs, RCOs, and biofilters] can be expected to result in increased life cycle burdens for energy, solid waste, and essentially every fossil fuel combustion-related parameter except VOCs, the total mass of HAPs, and particulates" (Sauer et al. 2002; 59).

The second argument is that RTOs are not required to meet existing Manitoba health and environment criteria. Louisiana-Pacific noted that its original 1994 environmental impact statement had concluded that all applicable ambient air-quality criteria would have been met without RTOs. It states that the company only proposed the installation of RTOs to "alleviate concerns raised by a small group of citizens opposed to an OSB facility in Swan Valley" (Louisiana-Pacific 2008; 4).

Setting aside what the rationale was for the company's 1994 decision to propose the installation of RTOs, the company's 2009 position is that, just as in 1994, the Swan Valley OSB plant—with only WESPs on the dryer and no pollution control equipment on the press—would not create any significant impact on human health or the environment.

To support its environmental argument, the company provided air-quality dispersion modelling results and a health-risk assessment.

Air-quality dispersion modelling

The air quality dispersion modelling (which was done with the Industrial Source Complex (ISC3) Prime model using 2006 meteorological data) was intended to identify the worst-case ground-level ambient concentrations of the substances that were regulated in the Louisiana-Pacific licence if the RTOs were not in place.

In its application, Louisiana-Pacific provided the following information regarding its emission

rates. Table 9.2 lists the substances for which Louisiana-Pacific provided emission rate source information and the source that was provided in the November 18, 2008, Louisiana-Pacific application.

In subsequent communication with the Commission, Louisiana-Pacific indicated that site-specific data were incorporated in determining the emission rates for formaldehyde and benzene from the dryer and that the hydrogen cyanide rate was based on the limits in *Environment Act* Licence Number 1900 S4.

Table 9.3 compares the modelling results with the principal ambient air quality criteria (and

Table 9.2 Emission rate source (dryer and press operations) data for air modelling provided by Louisiana-Pacific as cited in Louisiana-Pacific's November 18, 2008 application.

Substance	Source for emission rate used in air modelling
Formaldehyde	A reflection of the current state of knowledge for the industry (page 8)
Hydrogen cyanide	No source cited.
MDI	National Council for Air and Stream Improvement emission factor (page 15).
Phenol	*Environment Act* Licence Number1900 S4 (page 16).
Total suspended particulate matter	*Environment Act* Licence Number 1900 S4 (page 16).
Benzene from the press	EPA's AP42 Document, March 2002, Table 10.6.1-6 for hot presses from panel plants using phenolformaldehyde resin and MDI (page 16).
Benzene from the dryer	A reflection of the current state of knowledge for the industry (page 8).
NO_x from thermal oil heater and combined WESP stacks	*Environment Act* Licence Number1900 S4 (page 16)
NO_x from press vent	Site-specific engineering source testing prior to the press RTO (page 16)
VOCs from WESP stacks and thermal oil heater	*Environment Act* Licence Number1900 S4 (page 17).
VOCs from press vent	1994 Environmental Impact Statement (page 17).

Source: Louisiana-Pacific 2008

the Alberta and Quebec criteria in the case of benzene) and with the maximum ground-level concentrations detected at the Louisiana-Pacific ambient air monitoring stations. It should be noted that the monitoring station concentrations were collected during a period when the RTOs were operational.

Table 9.3: The Industrial Source Complex 3 Air Dispersion Model results for the Swan Valley Louisiana Pacific OSB plant, based on 2006 meteorological data. All concentrations in micrograms per cubic metre. Substances listed are those whose emission is regulated by Environment Act Licence 1900 S4.

Name of Contaminant	Criteria Classification	Period of Time Contaminant is Measured	Maximum Acceptable Level Concentration	ISC-PRIME Model Output (Highest Maximum Concentration)	Maximum Concentration at the two Louisiana-Pacific Ambient Air Stations	
Formaldehyde	Guideline	1 hour 24 hour Annual	60	56.86 15.45 1.27	7.964 1.42 0.052	10.378 3.01 0.203
Hydrogen cyanide	Guideline	1 hour Annual	40 3	3.928 0.0496	0.518 0.002	0.796 0.012
Methylene diphenyl diisocyanate (MDI)	Guideline	1 hour Annual	3 0.5	1.895 0.0882	0.508 0.0024	0.432 0.0064
Nitrogen Dioxide (NO_2)	Objective	1 hour 24 hour Annual[1]	400 200 100	147.783 64.478 8.536	30.303 4.903 0.167	26.152 8.592 0.541
Phenol	Guideline	1 hour	63	38.546	9.643	8.910
Total Suspended Particulate Matter	Objective	24 hour Annual[2]	120 70	39.679 6.638	3.73 0.177	6.97 0.510
Benzene	Objective (Alberta) Criteria (Quebec)	1 hour 24 hour Annual	30 10 ---	2.058 0.592 0.0355	0.278 0.050 0.0016	0.396 0.112 0.007
VOCs		1 hour 24 hour Annual	--- --- ---	263.882 75.650 5.204	35.973 6.684 0.211	50.593 14.406 0.910

Source: Louisiana-Pacific 2008, amended.

1. Annual arithmetic mean

2 Annual geometric mean

The air quality dispersion modelling results led Louisiana-Pacific to summarize that:

> 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 [micrograms per cubic metre] approaches the ambient standard of 60 [micrograms per cubic metre] 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. (Louisiana-Pacific 2008; 13)

In addition, Louisiana-Pacific reported the following results:

- Maximum concentrations of formaldehyde occur less than 0.1 percent of the time.
- Ground-level concentrations of formaldehyde are less than one-half the Manitoba ambient air quality objective over 99 per cent of the time.
- The maximum ground-level concentration of MDI will occur less than 0.1 per cent of the time.
- Ground-level concentrations of MDI are predicted to be less than one-half the ambient guideline 99 per cent of the time.
- Nitrogen oxide emissions will be reduced with the decommissioning of the RTOs.
- The maximum ground-level concentration of phenol will occur less than 0.1 per cent of the time.
- Ground-level concentrations of phenol are predicted to be less than one-half the ambient guideline 99.9 per cent of the time.
- The maximum ground level concentration of benzene is predicted to be less than 7 per cent of the ambient guideline.

Health-risk assessment

The Louisiana-Pacific application also included what it termed a health-risk assessment, which was carried out for it by the National Council of Air and Stream Improvement. The cancer and non-cancer risks were assessed separately.

Cancer

Regulatory agencies assume that any exposure level to a carcinogen is associated with a hypothetical cancer risk. This is usually expressed as an incremental (additive) lifetime risk of developing cancer: this reflects the incremental probability of a person developing cancer over a lifetime as a result of an exposure to a carcinogen. The Canadian lifetime probability of developing cancer is one in four (or 0.25)—the incremental risk represent an increase in that risk. An incremental risk of one in a million (1×10^{-6}) would increase a person's lifetime cancer risk from 0.25000 to 0.250001 (or from 1 in 4 to 1 in 3.999996).

The cancer risk assessment looked at formaldehyde (a potential human carcinogen) and benzene (a confirmed human carcinogen). The U.S. EPA employs a one-in-a-million risk rate (10^{-6}), which represents an incremental lifetime risk of developing cancer of one in a million, to determine acceptable exposure rates to carcinogens within the general population (Health Canada 2004). The report prepared for Louisiana-Pacific stated the cancer risk level

associated with the formaldehyde emissions from the Swan Valley OSB plant with the proposed emission limit increases was approximately seven in a billion (6.99×10^{-9}). For benzene, the risk level was shown as a range from approximately 64 in a billion (6.38×10^{-8}) to 226 in a billion (2.26×10^{-7}). These were all significantly less than one-in-a million. Making use of exposure limits developed by the Agency for Toxic Substance and Disease Registry, the report prepared for Louisiana-Pacific concluded that the likelihood of non-cancer adverse health effects as a result of the removal of the RTOs were:

- Negligible for formaldehyde.
- Essentially non-existent for benzene.

Non-cancer risks

Making use of Manitoba, EPA, and American Conference of Governmental Industrial Hygienists limits and guidelines, as well as the Agency for Toxic Substance and Disease Registry, the report concluded that the likelihood of non-cancer adverse health effects as a result of the removal of the RTOs in the case of hydrogen cyanide, MDI, nitrogen dioxide, and phenol was negligible.

Non-regulated substances

In July 2009, Louisiana-Pacific provided Manitoba Conservation with an air-dispersion model and a risk analysis for acetaldehyde, acrolein, methanol, and priopionaldehyde, all VOCs that are associated with OSB manufacture, but emissions of which are not regulated in any of the licences issued to Louisiana-Pacific. The company also provided air-dispersion modelling for PM_{10} (particulate matter with particles 10 micrometres or less in diameter) and $PM_{2.5}$ (particulate matter with particles 2.5 micrometres or less in diameter) (the licences issued to Louisiana-Pacific simply regulate the emission of total particulate matter).

Table 9.4 (based on information that Louisiana-Pacific provided to its consultant, Olsson Associates) shows the maximum emissions (from the dryer and press operations) for these substances with the plant operating without RTOs. The emissions are in grams per second. The documentation did not provide the basis on which the emissions had been calculated.

Table 9.4: Maximum emissions (grams per second) by Swan Valley OSB plant without RTOs of acetaldehyde, acrolein, methanol, propionaldehyde, PM_{10} and $PM_{2.5}$; substances whose emission are not regulated in Environment Act Licence 1900 S4.

	Acetaldehyde	Acrolein	Methanol	Propionaldehyde	PM_{10}	$PM_{2.5}$
Press	0.09	ND[1]	2.23	ND[1]	2.10	1.81
Combined WESP Stack	0.43	0.14	2.46	0.25	4.23	4.23

Source: Olsson Associates 2009.

1. Not detectable

Table 9.5 shows the results of the air dispersion modelling that was conducted by Olsson Associates on the basis of the above inputs. The concentrations are in micrograms per cubic metre. The table also includes the existing Canadian criteria that were cited in the NCASI health risk analysis of the air-dispersion model. Manitoba criteria exist solely for $PM_{2.5}$ and PM_{10}.

With the exception of acrolein, all the maximum ground-level concentrations are within the criteria selected by NCASI. It should be noted that since the NCASI health risk analysis was undertaken, Ontario has proposed new acrolein criteria. For one hour the proposed criterion is 4.5 micrograms per cubic metre and for 24 hours it is 0.4 micrograms per cubic

Table 9.5: The Industrial Source Complex 3 Air Dispersion Model results for the Swan Valley Louisiana Pacific OSB plant, based on 2006 meteorological data. All concentrations in micrograms per cubic metre. Non-regulated substances compared to Canadian Classification Criteria.

Name of Contaminant	Criteria Classification	Period of Time Contaminant is Measured	Maximum Acceptable Level Concentration	ISC-PRIME Model Output (Maximum Concentration)
Acetaldehyde	Alberta (ambient) Ontario (ambient)[1]	1 hour 24 hour Annual	90 500	5.63 1.54 0.11
Acrolein	Ontario (AAQC)[2] Health Canada	1 hour 24 hour Annual	0.08[2] 0.4-0.6[3]	1.35 0.42 0.02
Methanol	Alberta (ambient) Ontario (ambient)[1]	1 hour 24 hour Annual	2,600 4,000	63.57 18.66 2.25
Propionaldehyde	Ontario AAQC	1 hour 24 hour Annual	10 (10-minute average ambient)	2.41 0.74 0.03
PM_{10}	Guideline	24 hour	50	32.29
$PM_{2.5}$	Canada-wide Standard	24 hour[4]	30	22.26

Source: Olsson Associates 2009; NCASI 2009.

1. NCASI used the term ambient to refer to air quality standards and guidelines developed under Ontario Regulation 419: Air Pollution -- Local Air Quality (O. Reg. 419)

2. This figure has subsequently been changed to 0.4.

3. Tolerable Concentration - levels to which a person may be exposed daily over a lifetime without deleterious effect.

4. The 24-hour average objective for $PM_{2.5}$ is the national CWS for $PM_{2.5}$.

metre. The projected acrolein ground-level concentrations for one hour is 1.35 micrograms per cubic metre and for 24 hours is 0.42 micrograms per cubic metre. For a number of the parameters, NCASI also supplied non-Canadian criteria (or in two cases, hypothetical Canadian standards). Table 9.6 compares these standards against the air-dispersion modelling results.

Table 9.6: The Industrial Source Complex 3 Air Dispersion Model results for the Swan Valley Louisiana Pacific OSB plant, based on 2006 meteorological data. All concentrations in micrograms per cubic metre. Non-regulated substances compared to non-Canadian classification criteria.

Name of Contaminant	Criteria Classification	Period of Time Contaminant is Measured	Maximum Acceptable Level Concentration	ISC-PRIME Model Output (Maximum Concentration)
Acetaldehyde	California Acute REL[1]	1 hour	470	5.63
		24 hour		1.54
		Annual		0.11
Acrolein	California Acute REL[1]	1 hour	2.5	1.35
	US EPA AEGL-1[2] 1/2-hr or 1-hr		68.8	
	ATSDR MRL[3] Acute (1-14 days)	24 hour	6.88	0.42
	IRIS RfC[4]	Annual	0.5	0.02
Methanol	California Acute REL[1]	1 hour	28,000	63.57
		24 hour		18.66
		Annual		2.25
PM_{10}	US EPA NAAQS[5]	24 hour	150	32.29
$PM_{2.5}$	US EPA NAAQS[5]	24 hour	35	22.26
Propionaldehyde		1 hour		2.41
		24 hour		0.74
	IRIS RfC[6]	Annual	8	0.03

Source: Olsson Associates 2009; NCASI 2009.

1. Reference Exposure Level

2. Acute Exposure Guideline Level-1

3. Agency for Toxic Substances and Disease Registry Minimal Risk Level

4. US EPA IRIS Reference Concentration (RfC), the concentration at which a lifetime exposure is expected to have no adverse effect

5. US Environmental Protection Agency National Ambient Air Quality Standard

6. US EPA IRIS Reference Concentration (RfC), the concentration at which a lifetime exposure is expected to have no adverse effect

Using these criteria, all of the modelled concentrations are below the maximum acceptable levels. In its health-risk analysis, NCASI provided a cancer risk estimate for acetaldehyde of 2.4×10^{-7} or an incremental life-time cancer risk of one in 24 million. NCASI concluded that for modelled maximum concentrations of acetaldehyde, acrolein, methanol, propionaldehyde, PM_{10}, and $PM_{2.5}$, the risk of non-cancer of adverse health effects was negligible.

Manitoba Conservation's assessment of the proposed changes

Manitoba Conservation subjected the Louisiana-Pacific application to both an external and internal assessment.

The external expert assessment

Manitoba Conservation contracted with an outside consultant to review Louisiana-Pacific's November 2008 application for increases to the emission limits.

The resulting report made the following observations:

- While the Manitoba plant may be the only OSB plant in Canada required to use RTO technology, such technology is common at OSB plants in the United States.
- Due to the small number of sampling stations and infrequent sampling, ambient air-quality monitoring results are not reliable guides in determining whether or not the Louisiana-Pacific operation was exceeding its emission limits.
- The air dispersion modelling done in support of the Louisiana-Pacific application was acceptable.
- If the company did not proceed with the construction of a 49.5-metre stack for the dryer operation, the emissions would have to be remodelled to confirm that ambient-air-quality guidelines were not exceeded.
- In 1994, when the Swan Valley plant was originally assessed and licensed, particulate matter emissions were based on total suspended particulate. Since then, air quality criteria have been developed for PM_{10} and $PM_{2.5}$. While there are no data about the ratio of $PM_{2.5}$ to total suspended particulate, the $PM_{2.5}$ criteria may be exceeded. (It was in response to this, that Louisiana-Pacific provided the modelling on PM_{10} and $PM_{2.5}$ cited above).

The review of the health-risk assessment made the following observations:

- The modelled results confirm that the predicted ambient concentrations of pollutants will not exceed any relevant air quality criteria (provided the stack height is increased).
- Occupational exposure limits are not appropriate in assessing ambient levels of contaminants. (The reviewer also concluded that when other, more appropriate criteria were used, the ambient levels are acceptable.)

The report concluded that "decommissioning the RTOs is not likely to lead to exceedances of the air quality criteria. However, as noted, if the final stack height chosen is significantly different from 49.5 [metres], then this conclusion may no longer be valid."

Internal assessment

Manitoba Conservation's Environmental Assessment and Licensing Branch staff carried out an internal review and determined the

air dispersion modelling was completed appropriately; compared the results of the air dispersion modelling to air quality criteria; and concluded that no unacceptable environmental or human health effects would result from the approval of the project.

Public notification

Manitoba Conservation provided public notification of the application dated January 13, 2009 in the following manner:

- On January 23, 2009, copies of the Louisiana-Pacific proposal were placed in public registries located at 123 Main St., Winnipeg, the Winnipeg Public Library, the Manitoba Eco-Network, the Millennium Public Library (Winnipeg), the North-West Regional Library (Swan River) and the rural municipality of Minitonas municipal office.
- On January 31, 2009 a notice of *The Environment Act* proposal was placed in the Winnipeg *Free Press*.
- On February 3, 2009 a notice of *The Environment Act* proposal was placed in the Swan River *Star & Times* and the *Dauphin Herald*.

The newspaper notices invited members of the public to provide comments on the proposal. The initial deadline for comment was March 4, 2009. It was extended to March 16, 2009.

The Technical Advisory Committee

Manitoba Conservation circulated the proposal to the Technical Advisory Committee (TAC) members. These are federal and provincial government officials who are requested to make technical comments on *Environment Ac*t applications. Responses from the TAC participants were included in a preliminary report to Manitoba Conservation that was reviewed by the Commission.

Chapter Ten: Public input

There were two major forms of public input into the Commission's investigation: 1) the public meeting and 2) written submissions. This chapter summarizes the information that the Commission received at the meetings and in the submissions.

The public meeting

The terms of reference for this investigation included a requirement to "provide members of the public an opportunity for input regarding LP's proposal at a public meeting in the affected community." To fulfill the requirement, the Commission held two days of public meetings in Swan River, Manitoba on July 28 and July 29, 2009. A full listing of the presenters appears in Appendix 7 of this report and the full transcript can be accessed through the Commission's website (http://www.cecmanitoba.ca). Presentations were made by Louisiana-Pacific, local government officials, the Concerned Citizens of the Valley, business and industry organizations, conservation organizations, the Boreal Forest Network, a non-affiliated presenter,

and members of United Steelworkers Local 1-324.

Louisiana-Pacific

The Louisiana-Pacific presentation covered issues dealt with in the previous chapter of this report. It stressed that:

- Without regenerative thermal oxidizers (RTOs) the Swan Valley oriented strand board (OSB) plant would still be subject to the highest level of pollution control of any OSB plant in Canada.
- The proposed emission limits would meet all Manitoba *Ambient Air Quality Criteria* 100 per cent of the time.
- A health risk assessment carried out for the company determined that the emission limits in the proposal created an incremental lifetime cancer health risk of less than one in a million and there were no identifiable non-cancer adverse effects associated with the emissions.
- Ongoing air monitoring had indicated that during the plant's operation to date ambient air quality criteria had not been exceeded.
- Turning off the RTOS would lead to an annual greenhouse-gas emission reduction of approximately 12,000 tonnes in carbon dioxide equivalents.
- Louisiana-Pacific's new dryer systems had received a pollution prevention honourable mention award and the company was using the lowest formaldehyde resins available, while the use of MDI allowed for lower drying temperatures.
- A requirement to operate the RTOs jeopardizes the plant's economic future.

Local government officials

Presentations in support of the Louisiana-Pacific application were made by the mayor of Minitonas, the reeve of the Rural Municipality of Minitonas, and the mayor of Swan River. These presentations stressed the fact that Louisiana-Pacific:

- Was a good corporate citizen that supported community initiatives and was responsive to community concerns.
- Contributed significantly to the local economy.
- Had made its intent to seek permission to remove the RTOs known to the Community Liaison Committee as far back as 2001.

The local government representatives said that it was their opinion that the removal of the RTOs would enhance the plant's economic viability at a time when the wood products industry is undergoing a sustained downturn and would not have a negative impact on the local economy. Therefore, they were supporting the application.

Business, industry, and conservation organizations

Representatives of Swan River Chamber of Commerce and the Forest Industry Association of Manitoba also spoke in favour of the Louisiana-Pacific application. They identified the benefits the plant had brought to the regional economy in general, and to the management of the local forestry sector in particular. Their presentations stressed that the RTOs provided an unnecessary level of environmental protection and, unless removed, could jeopardize the plant's continued operation.

A representative from Ducks Unlimited attested to Louisiana-Pacific's work in enhancing wetlands conservancy, citing, as examples, the work the company has done with Ducks

Unlimited on several conservancy projects in the Duck Mountain region.

United Steelworkers Local 1-324

Three members of the United Steelworkers Local 1-324, the union that represents production workers at the Swan Valley OSB plant, made presentations in support of the Louisiana-Pacific application. They spoke of the significant employment opportunity the plant presented for them and how the current economic downturn had affected plant operation. They said the economic viability of the Swan Valley plant is jeopardized by the continued operation of the RTOs. Their presentation stressed that the company was fully compliant with existing environmental regulation and would be if the RTOs were removed. They also stressed it was company policy to operate pollution controls according to existing regulations.

Concerned Citizens of the Valley and the Boreal Forest Network

Members of the Concerned Citizens of the Valley and the Boreal Forest Network and one unaffiliated individual made presentations that opposed to the removal of the RTOs and the granting of increased emission limits to Louisiana-Pacific at this time.

These presenters argued that it was largely the work of their organizations in the early 1990s that raised public concerns about potential emissions and Louisiana-Pacific's environmental record in other jurisdictions. This publicity had, in turn, they said, led Louisiana-Pacific to propose the installation of RTOs at the Swan Valley OSB plant. Little had changed in the meantime, yet the company was now asking for the right to significantly increase the emission of a number of pollutants, a number of which were carcinogens. These presenters stated that in 1994 residents had been promised that the plant would have the best available pollution controls, now it appeared the company was seeking provincial approval to back away from that promise. There was also frustration with the fact that the company had been allowed to turn off the RTOs prior to the Commission investigation.

Just as in 1994, they noted, if the Swan Valley OSB plant were operating in the U.S. it would have to install either RTOs or equivalent pollution prevention technology. Environmental protection should not, they felt, be held hostage to the threat of local job loss. If there was an issue of plant viability, which the presenters questioned, the proper role for government would be to take steps to protect both the environment and the workers.

They described the proposal as an ill-conceived plan to enhance profitability while reducing pollution control.

Their presentations questioned whether:

- A public meeting process as opposed to a full Clean Environment Commission hearing was adequate.
- The lack of intervener funding limited public involvement in the process.
- Given Manitoba Conservation's 2007 rejection of a Louisiana-Pacific application to increase the benzene emission rate for health reasons, Manitoba Conservation should approve a much more dramatic increase than had been requested in 2007.
- The air-monitoring stations had been properly located.
- Air-monitoring was conducted on a sufficiently frequent basis.

- The community health study had been carried out in an adequate fashion.
- It was appropriate that a stand-alone consultants' report on the air-dispersion model had not been supplied.
- The plant's viability was threatened by the RTOs, given that the company would take a range of issues including past profits, comparable cost of wood, and changing market allotments, into consideration when determining whether to keep a plant open. It was pointed out that numerous plants without RTOs in Canada had already been closed.
- The plant's future was in jeopardy, given a number of predictions that Louisiana-Pacific was well positioned to emerge in a strong position when the economy recovered.
- The studies undertaken for the company had given adequate consideration to background levels of various pollutants.
- Alternatives to RTOS, such as biofilters, RCOs, the control of nitrous oxides, and the purchase of greenhouse-gas offsets, had been considered and assessed.
- The current regulations were adhered to and enforced.
- The health-risk analysis had been conducted by an organization with a sufficient level of independence and whether the information contained in the health-risk analysis was accurate.
- The monitoring regime made it possible to test predictions to see if they were accurate and make changes in light of new information.
- Synergistic effects had been taken into consideration in the determination of the health-risk associated with the removal of the RTOs.
- The testing and monitoring regimes recommended by the Commission in 1994 had been implemented.
- The low-dose impacts of certain of the substances emitted had been fully studied.
- The reduction in greenhouse-gas emissions that would accompany the shutting off of the RTOs would justify the increase in emissions of VOCs. It was held that Louisiana-Pacific's primary responsibility was to control toxic emissions and its ongoing challenge would be to find ways of reducing fossil fuel usage.
- There would be long-term accumulation of these toxic chemicals in air, soil, surface water groundwater or watersheds.
- Studies had been undertaken into the long-term effects on human health of removing the RTOs.

Aside from a rejection of the current application at this time, these presenters called for:

- A comprehensive epidemiological study that would examine the hypothesis that contaminant-related health impacts have occurred since the Louisiana-Pacific plant went into operation.
- Independent analysis of mill compliance with existing regulations.
- A full-scale Manitoba Clean Environment Commission hearing into the proposal.

Submissions

The Commission also received submissions, which were posted on the Commission's website (www.cecmanitoba.ca). A full list of the individuals and organizations that made

submissions are contained in Appendix 8. In a number of cases, the submissions either reiterated points made at the public meeting or responded to comments made by various presenters at the public meeting.

In terms of the issues before this investigation the following points were raised in the submissions:

- The Commission's terms of reference are limited to the health and environmental impacts that would arise from the removal of the RTOs. Therefore the Commission should not address the impact that the RTOs have on the plant's economic viability.
- Application of the Precautionary Principle should lead the Commission to require continued operation of RTOs since future research may demonstrate as yet undetermined health risks or require existing estimates of safe exposure levels to be reduced.
- That, in regard to the supposition that the Swan Valley OSB plant is being subject to stricter regulation that other Canadian OSB plants, this is an argument for stricter regulation in other jurisdictions, not a loosening of Manitoba regulations.
- The Commission should not rely upon exposure limits to protect the health of workers and the community due to the lack of established exposure limits for some of the substances emitted from the plant, the fact that exposure limits may not protect vulnerable populations, and the fact that the existing limits do not adequately address the issue of cumulative effects.

Louisiana-Pacific responded to a number of the criticisms that had been directed towards it during the hearings. The company denied having turned off pollution control equipment at inappropriate times and referenced its positive health-and-safety record. In addressing a proposal that the company purchase greenhouse-gas offset credits rather than turning off its RTOs, the company stated that the wood products industry is committed to being carbon neutral by 2015 without the purchase of carbon credits. It also argued that while the reduction in greenhouse-gas emissions that would be achieved by turning off the RTOs would be small compared to Manitoba's overall greenhouse gas emissions, the cumulative impact of incremental reductions would allow Manitoba to achieve its greenhouse-gas reduction goals.

It noted that the air-monitoring stations were in locations approved by Manitoba Conservation. It also indicated it was open to discussion of changes to the monitoring regime. The company noted that while there had been an error in one of the figures referenced in the health risk analysis information provided for acrolein, when the appropriate figure was referenced the predicted ground-level concentrations did not exceeded the recommended limit. The company also defended the independence of the agency that had carried out its health risk analysis. The Louisiana-Pacific submission also sought to place statements about the hazardous nature of the VOCs into a broader context.

The company also stated that the level of inspection to which it has been subjected was reflective of its credibility, integrity, and transparency. It also indicated that in seeking to have the RTOs shutdown, it had followed the process established in the Manitoba *Environment Act*. It also noted that it has participated in the Community Liaison Committee required by

its licence, while the community critics have resigned from the committee.

The Commission also received submissions from professionals contracted by the Public Interest Law Centre (PILC) on behalf of opponents of the licence application. The papers presented by these witnesses raised questions as to whether:

- The Louisiana-Pacific application met accepted industry practices.
- Background levels should have been included in the consideration of ground-level concentrations of the modelled substances.
- There should have been a presentation of the incremental risk of removing the RTOs.
- Risk estimates should have been generated for nearby human receptor locations.
- Odour generation should have been assessed.
- Appropriate rationales had been presented for the selection of exposure limits.
- Country food and water ingestion pathways should been assessed.
- All hazardous contaminants were accounted for.
- All potential emissions were included in the air-dispersion modelling.
- Monitoring stations were properly located.
- The full range of appropriate technology had been assessed.

Based on these conclusions, PILC recommended that the application not be approved, that a new application meet industry standards and include an assessment of alternative technologies. Any new application should, it recommended, be subjected to review by a full Commission hearing process.

Chapter Eleven: Additional information

Through its draft *Air Quality Management Strategy*, draft *Guidelines for Air Dispersion Modelling in Manitoba*, and *Ambient Air Quality Criteria* (all described earlier in Chapter Five), Manitoba has the basic tools in place to implement a science-based, case-by-case air-emissions-regulatory regime that protects human health and the environment. The full and appropriate application of these strategies, guidelines, and criteria should lead to the development of appropriate licence conditions.

For this to happen, however, applications for licence alterations should fully comply with the strategies, guidelines, and criteria. This is necessary to provide regulators and the public with the information needed to assess any potential health and environmental effects. While applicants should strive to ensure that their applications meet these requirements, it is Manitoba Conservation's responsibility to communicate its expectations to applicants and to ensure that applications are not accepted for evaluation if they fail to meet those expectations.

The requirements set out in Manitoba's *Air Quality Management Strategy*, *Guidelines for Air Dispersion Modelling in Manitoba*, and *Ambient Air Quality Criteria* not only allow for a full and adequate assessment of the application, they provide the public with a clear understanding of the licence proposal under consideration. This is in keeping with Guidelines 2 and 3 of the *Principles and Guidelines for Sustainable Development.* These Guidelines underscore the importance of public participation and access to information. Applications for a major alteration to an *Environment Act* licence should be based on technical reports that can stand alone. The reports must contain all the relevant information, rationales, discussions of uncertainty, and citations needed to assess the application and be appropriately referenced. Stand-alone reports provide an additional level of verification and transparency to the assessment process.

While the process should allow for delivery of supplemental information as the evaluation proceeds, if an application is significantly deficient from the outset, it is not possible to make an appropriate evaluation of its potential health and environmental effects.

In October 2009, after reviewing all the evidence before it, the Commission concluded that the material presented by Louisiana-Pacific did not address or meet the requirements set out in Manitoba policy documents. For these reasons, the Commission requested that Louisiana-Pacific provide a more detailed report in keeping with the guidelines.

The Commission's request

In an October 8, 2009 letter to Louisiana-Pacific (Appendix 9), the Commission stated that:

> To allow the Commission to complete its investigation and make recommendations with confidence, we are requesting Louisiana-Pacific to provide a stand-alone report on air dispersion modelling (including a health risk assessment) that contains all the relevant information, rationales, discussions of uncertainty, assumptions, models, and citations needed to assess the application and appropriately referenced be provided to the Commission.

The Commission had concluded that in its November 18, 2008 document, Louisiana-Pacific had, in a number of areas, departed from or not followed the *Guidelines for Air Dispersion Modelling in Manitoba*. Issues that the Commission specifically identified as being in need of discussion were:

- Level (screening or refined) and rationale for modelling selections. The Commission requested that Louisiana-Pacific make it clear which level of modelling was being undertaken and provide a rationale for the level of modelling and the selection of the model being used.
- Start-up, shutdown or upset conditions.
- Project overview.
- Pollutants to be released during the process/ rationale for pollutants to be modelled.
- Emission rates: annual emissions in tonnes/ year and average and maximum hourly emissions in grams/hour. Given the fact that the plant has been in operation for over a decade, the Commission requested that site-specific data be incorporated into the development of all emission rates. Failing that, it requested rationales for the substitution of rates that were based on the

previous licence and environmental impact assessments.

- Fugitive emissions.
- Meteorological data. The Commission requested that unless an acceptable rationale were provided, that five-years of meteorological data be used to model emission rates based on site-specific data.
- Land analysis.
- Topography.
- Background ambient air concentrations of pollutants. The Commission requested that where modelling indicated that the level of an emitted substance approaches ambient air quality criteria (AAQC), background levels be included in air dispersion modelling.
- Good engineering practice.
- Assessment of air quality modelling results. The Commission requested rationales for the use of criteria to assess pollutants such as acetaldehyde, acrolein, benzene, methanol, and propionaldehyde, for which Manitoba lacks ambient air quality criteria.
- Health risk assessment. The Commission requested a health risk assessment that included a description of the applicable pathways and rationale for the selection of the pathways and choice of standards by which the risks are assessed, and be fully referenced to allow peer review.

Louisiana-Pacific's response

In May 2010, Louisiana-Pacific provided a response (dated April 2010) to the Commission request. It included:

- An overall report prepared for Louisiana-Pacific by TetrES Consultants Inc. (April 2010).
- A dispersion modelling report prepared by Olsson Associates (April 2010).
- A human health risk analysis prepared by Stantec Limited (April 2010).

In combination, these documents address the issues raised by the Commission.

Screening level

The submissions indicated that a refined level modelling exercise had been undertaken. The Olsson report stated that "Olsson selected the Industrial Source Complex 3 Plume Rise Model Enhancements version 04269 (ISC3-PRIME) steady-state Gaussian plume dispersion modeling executable for use in all phases of this modeling to ensure consistency with modeling approaches and parameters previously approved by Manitoba Conservation" (Olsson 2010; 5).

Start-up, shutdown or upset conditions

The Olsson report stated that "Controlled start-up and shutdown scenarios have not been included in this dispersion modelling assessment as any impacts would be lower than those predicted during normal operations" (Olsson 2010; 4).

Project overview

The Olsson report contained a detailed overview of the Louisiana-Pacific process (Olsson 2010; 8-17) with appropriate maps diagrams and charts. This included a discussion of land use and topography.

Rationale for pollutants to be modelled

The Olsson report stated that:

> As the Swan Valley OSB facility is an existing operation, the facility's Environment Act License was utilized to establish the emission parameters to be included in this modeling assessment.

> Emissions modeled are those that are regulated under Clauses 49 (Baghouses), 50 (Thermal Oil Heater system), 51 (Wood Strand Dryers) and 57 (Oriented Strand Board Press) of Manitoba Environment Act License 1900S4. (Olsson 2010; 29)

Subsequently, at the request of Manitoba Conservation, methanol, acetaldehyde, acrolein and propionaldehyde were modelled. Louisiana-Pacific also modelled particulate matter (PM_{10}) and particulate matter ($PM_{2.5}$) emission rates.

Emission rates

Olsson provided the requested annual emission rates in terms of grams per second, grams per hour, and tonnes per year. Appendix C of the Olsson report stated there was a rationale for the emission factors selected. According to the Appendix the existing limits in the licence were used as the "maximum authorized emission rate" where the system would not be impacted by the removal of the regenerative thermal oxidizers (RTO) or "where the equipment/ system *is* impacted by the pending application to decommission the RTOs (press and dryer WESPs [wet electro-static precipitators]), however the existing emission limit can be met without the RTOs (i.e., no amendment has been requested for that limit)" (Olsson 2010 Appendix C; unpaginated). In the cases where Louisiana-Pacific was requesting alterations to emission limits, Olsson used site-specific data and/or published emission factors, whichever was the most conservative. For those substances for which there was no existing licence limit, Olsson used site-specific data or published emission-factor data. It should be noted that Olsson characterized all the site-specific data for press emissions as limited, and characterized the data for the site-specific emission rates for VOCs, benzene, hydrogen cyanide, phenol, and total particulate matter as limited.

Fugitive emissions

The Olsson report stated that there are two potential sources of fugitive emission: the yard and the plant. It concluded that emissions from the yard were not included because 1) they are difficult to estimate with any certainty, 2) there is a control program in place, and 3) emissions from the yard will not be impacted by the removal of the RTOs. Because the plant has a high demand for air it constantly draws air into the plant through any open doors or events, largely eliminating the possible escape of fugitive emissions.

Meteorological data

The TetrES report explained that the five most recent, consecutive years of meteorological data from the nearest representative weather station, were not used because the 90 per cent data-completeness requirement was not met for three of the five most consecutive years. For 2006, the 90 per cent data completeness requirement was met with an overall data collection efficiency of 99.6 per cent and a minimum quarterly data-collection efficiency for any parameter of 98.6 per cent (TetrES 2010; 4-1).

Background ambient air concentrations of pollutants

Olsson provided the rationales for not including background levels in air dispersion modelling for the following substances.

Benzene

Background levels of benzene were not included because the modelled maximum 24-hour and annual benzene ground level

concentrations do not approach the applicable Ontario Ambient Air Quality Criteria (AAQC). Furthermore, because there have been only two detectable measurements of ambient benzene concentrations over five years of monitoring data, background benzene concentrations were considered to be insignificant.

Total volatile organic compounds

Background total volatile organic compound (VOC) concentrations were not included as there are no applicable AAQC for total VOCs to compare predicted model results to.

Diphenyl methane diisocyanate (MDI)

Background levels of diphenyl methane diisocyanate (MDI) were not included because it is not a substance that is naturally present in the environment background. For this reason, MDI levels were considered to be zero.

Phenol

Background levels of phenol were not included because no detectable levels of phenol have been measured over five years of monitoring data.

Hydrogen cyanide

Background levels of hydrogen cyanide were not included because the modelled maximum ground-level concentration does not approach the applicable Manitoba AAQC, and because there has been only one detectable measurement of ambient hydrogen cyanide uninfluenced by facility operations over five years of monitoring data. For these reasons, background hydrogen cyanide concentrations were considered to be insignificant.

Good engineering practice

Olsson provided a discussion of good engineering practices (GEP) in relationship to the proposed new stack. It concluded that while GEP would allow for a taller stack to be constructed, Louisiana-Pacific is of the view that it is undesirable to install a taller stack from an aesthetic perspective and unnecessary from a human-health perspective.

Assessment of air quality modelling results

The TetrES report stated that:

> Where no Manitoba AAQC exists, model outputs are compared to Ontario AAQC, per the 2006 draft Manitoba Air Dispersion Modelling Guidelines. The reason for selecting Ontario criteria is due to the fact that Ontario has the most comprehensive and current list of AAQC available of any Canadian jurisdiction, based on the recent promulgation of new air quality rules and standards. It is also a standard and Manitoba Conservation-approved procedure in air assessments to apply Ontario air quality criteria for pollutants with no corresponding Manitoba air quality criteria. (13 – 1)

The TetrES and Olsson reports also indicated the areas in which the air quality modelling guidelines meet or exceed Manitoba or Ontario AAQC. The reports did not however provide full details on the expected maximum concentrations and the specific criteria against which they were being examined. The Commission requested that Louisiana-Pacific supply this information, which appears in Appendix 10. Tables 11.1 and 11.2 are based on this information and formatted in a manner to allow for comparison with tables 9.3 and 9.5.

It should be noted that Table 11.2 represents a departure from the initial application, in which the benzene emissions were compared to Alberta and Quebec criteria. It also departs from additional submissions to Manitoba Conservation and the Commission that had made use of U.S. criteria.

Health risk assessment.

The Stantec health risk analysis provided an analysis of adverse human health outcomes for short-term and long-term air, land and water exposures to environmental releases from Louisiana-Pacific. The focus was on the impact of human inhalation of these releases (based on an assessment of the properties of the substances being released).

Table 11.1: The Industrial Source Complex 3 Air Dispersion Model results for the Swan Valley Louisiana Pacific OSB plant, based on requested information provided by Louisiana-Pacific in 2010. All concentrations in micrograms per cubic metre. Substances listed are those for which there are existing Manitoba Ambient Air Quality Criteria.

Name of Contaminant	Criteria Classification	Period of Time Contaminant is Measured	Maximum Acceptable Level Concentration	ISC-PRIME Model Output (Highest Maximum Concentration)	Maximum ground level concentration (key receptor)
Formaldehyde	Guideline	1 hour	60	58.452	23.562
Hydrogen cyanide	Guideline	1 hour Annual	40 3	3.873 0.045	1.664 0.023
Methylene diphenyl diisocyanate (MDI)	Guideline	1 hour Annual	3 0.5	1.895 0.088	0.964 0.013
Nitrogen Dioxide (NO_2)	Objective	1 hour 24 hour Annual[1]	400 200 100	147.78 64.478 8.536	62.207 13.456 0.99
Phenol	Guideline	1 hour	63	38.546	24.3
Particulate Matter	Objective	24 hour Annual[2]	120 70	39.679 6.638	11.04 0.857
PM_{10}		24 hour	50	44.88	21.736
$PM_{2.5}$		24 hour	30[1]	22.26	6.9

Source: Louisiana-Pacific 2008, amended.

1. Annual arithmetic mean

2 Annual geometric mean

The report set out the criteria to be used to evaluate both carcinogenic and non-carcinogenic emissions. For carcinogenic emissions, it was the Health Canada level of an increase in the incremental lifetime cancer risk of greater than one in 100,000 (Health Canada 2004; 5). This is a departure from the original health risk analysis provided by Louisiana-Pacific, which had used a more stringent one-in-a-million risk level. For non-carcinogenic emissions, it is a concentration ratio based on a threshold limit.

The report also provided a hierarchy of assessment criteria, which gave preference to Manitoba criteria.

Baseline levels of the substances being measured were determined to be below the adopted assessment criteria. Assessment was made of both the Project emissions and the Cumulative emissions (the Project emission plus Baseline emissions). For both the Project and the Cumulative cases, the results indicated that with one exception, the 1-hour, 24-hour or annual air concentrations for all tested emissions did not exceed the recommended benchmark of 1.0 for non-cancer risks. That exception was acrolein, which exceeded, the 24-hour at maximum ground level concentration. Acrolein is potentially toxic: the highest predicted level of

Table 11.2: The Industrial Source Complex 3 Air Dispersion Model results for the Swan Valley Louisiana Pacific OSB plant, based on requested information provided by Louisiana-Pacific in 2010. All concentrations in micrograms per cubic metre. Substances listed are those for which there are no existing Manitoba Ambient Air Quality Criteria. The maximum acceptable concentrations are those of the Ontario Ministry of the Environment.

Name of Contaminant	Period of Time Contaminant is Measured	Maximum Acceptable Level Concentration	ISC-PRIME Model Output (Highest Maximum Concentration)	Maximum ground level concentration (key receptor)
Acetaldehyde	24 hour	500	2.808	0.811
Acrolein	1 hour	4.5	2.699	1.161
	24 hour	0.4	0.832	0.232
Benzene	24 hour	2.3	0.592	0.173
	Annual	0.45	0.036	0.013
Methanol	24 hour	4000	18.66	5.061
Propionaldehyde	10 minute	10	3.98[1]	1.71[1]
VOCs[2]				

Source: Louisiana-Pacific 2010, amended.

1. One-hour model output converted to 10-minute value based on Ontario Ministry of the Environment procedures for comparison to AAQC

2. There is no applicable AAQC for total VOCs. These are included in the table for completeness only.

acrolein exposure was 0.83 micrograms per cubic metre at the company property line. The highest level at any of 43 measured receptor points was 0.232 micrograms per cubic metre. The threshold for the two most common health complaints related to acrolein were cited by Stantec as 210 micrograms per cubic metre (eye irritation), 350 micrograms per cubic metre (nasal irritation) and 700 micrograms per cubic metre (throat irritation and decreased respiration). Stantec stated that "As such, it is unlikely that concentrations of acrolein would result in a substantive health risk" (Stantec 2010; vi).

The assessment of carcinogenic substances indicated that under the Project Case, none of the incremental lifetime cancer risk values would lead to exceedances of the 1-in-100,000 risk level (a cumulative lifetime-cancer-risk case was not calculated because incremental lifetime cancer risk values are not cumulative). Therefore Stantec stated, "no adverse carcinogenic effects are expected from the Project Case" (Stantec 2010; vi).

The TetrES report also identified a number of errors in the previous work submitted to the Commission: specifically, the acrolein and acetaldehyde emissions were too low. It also recommended that:

- Louisiana-Pacific continue its stack sampling and other emissions monitoring to make the current site-specific emissions database for such parameters more robust and helpful to ongoing data interpretation, trends analysis, liaison with regulators and dispersion modelling.
- the proposed stack design be reviewed to determine whether the exceedance of the Ontario acrolein value could be prevented or minimized by alternative stack heights, locations or diameters.
- changes be considered to the spatial distribution or number of the local ambient air quality monitoring stations.

Conclusion

The material submitted in response to the Commission request for information provides an acceptable basis of information on which the Commission can confidently assess the proposal and make recommendations.

These reports provided more data, provided it in a way that is available to the public and in a context that can be understood. In the process it was identified that the acrolein and acetaldehyde emission rates had to be increased in the modelling, that certain emission rates for the thermal oil heater and the baghouse should be decreased, and that newly adopted criteria could be applied.

Furthermore, the Olsson report provide the Commission with far more detailed information on the rationale for a number of key decisions, particularly around the emission rates modelled than had been provided in previous submissions from Louisiana-Pacific.

Chapter Twelve: Discussion and Recommendations

This chapter is divided into three sections. The first section outlines the Commission's assessment of the application under consideration and constitutes its rationale for its recommendation to approve. The second section presents the Commission's views on a number of decision-making criteria that were raised during the investigation in relation to the Louisiana-Pacific application. The final section deals with the overall issue of provincial air quality and environmental assessment policy.

The Louisiana-Pacific Application

The Minister of Conservation has directed the Commission:

> To provide advice and recommendations to the Minister regarding the potential health and environmental effects of the increased emission limits and the subsequent decommissioning of the Regenerative Thermal Oxidizer technology.

As the preceding chapters have indicated, the regenerative thermal oxidizers (RTOs) are estimated to reduce the emission of volatile organic compounds (VOCs) into the atmosphere

by between 90 and 95 per cent. Removing the RTOs will increase VOC emissions, often by more than one order of magnitude, and require adjustments to the emission limits in *The Environment Act* licence governing the Swan Valley oriented strand board (OSB) plant.

Key issues that have arisen during this investigation are:

- The proposed increase in the emissions limits (in grams per second) for total VOCs from 1.1 to 20.96 from the dryer operations and 0.28 to 2.78 from the press. (In total, from 1.38 grams per second to 22.74 grams per second.)
- The fact that while Louisiana-Pacific has stated that changes in dryer technology have allowed it to decrease emissions of VOCs from the dryers, the company has not requested reductions in the 20.96 grams per second VOC limit that was established for the WESP stacks in its 1997 licence. Louisiana-Pacific's 2006 test data indicates VOC emissions range from 3.358 to 3.84 grams per second.
- The proposed increase in the emissions limits (in grams per second) for benzene from 0.008 to 0.172 from the dryers and 0.0003 to 0.0197 from the press. (In total, from 0.0083 grams per second to 0.1917 grams per second.)
- The fact that acrolein emissions under certain circumstances exceed the Ontario Ambient Air Quality Criteria.

These points are closely related. The Commission first wishes to remind members of the public that the emission limits in Manitoba *Environment Act* licences are meant to reflect maximum production levels, not the limit beyond which any further emissions will have a statistically significant negative impact. The total 1.38 grams per second set for the dryers in the 1997 *Environment Act* Licence 1900 S4 for VOCs did not reflect a finding that any emissions beyond that level would have a statistically significant negative impact.

The Commission's concern then, is not, for the most part, with the magnitude of the increase, but the impact of the increase. While the total number of different VOCs being emitted by the Swan Valley OSB plant is not known, the VOCs most commonly associated with OSB production have been identified: acetaldehyde, acrolein, benzene, formaldehyde, diphenyl methane diisocyanate (MDI), methanol, phenol, and propionaldehyde.

The information provided by Louisiana-Pacific through its April 2010 submission (the TetrES report, the Olsson report, and the Stantec report) provide information that indicates that the proposed emission rates for the VOCs associated with OSB production will not—with one exception—lead to exceedances of applicable ambient air quality criteria.

In the case of that one exception, acrolein, it is appropriate and necessary to look at site-specific information. This information shows that the predicted exceedances are rare (only two days a year), are on the company fence line, and are two orders of magnitude below the lowest concentrations at which negative health impacts have been observed in humans. The predicted levels at any of the human receptor points used in the study are even lower. The Commission accepts the health-risk analysis conclusion that acrolein emissions would not result in an appreciable health risk to the surrounding population (Stantec 2010; 30). At the same time, the Commission also will be recommending that

the proposed design be reviewed to determine whether the exceedance of the Ontario acrolein value could be prevented or minimized by engineering considerations such as alternative stack heights, locations or diameters.

In 2007, Manitoba Conservation stated that because benzene is a human carcinogen, it required that, wherever possible, benzene emissions be reduced or eliminated. For this reason, Manitoba Conservation rejected an earlier Louisiana-Pacific request for an increase in its benzene emission limit. As subsequently became apparent, the Manitoba Conservation decision was in error for two reasons. First, it ignored the fact that at that time Louisiana-Pacific was asking for a licence increase because it could not comply with its current licence limits at maximum production. The Manitoba Conservation decision left the plant in a potentially out of compliance situation, but did not address the underlying issues. Secondly, the decision did not apply site-specific human health-risk analysis criteria. The Stantec health risk analysis indicates that the lifetime incremental cancer risk associated with the proposed benzene emissions under consideration by this panel is 1.98 in a million. This exceeds the U.S. EPA's one in a million incremental lifetime cancer risk but is substantially less than Health Canada's one in one hundred thousand incremental lifetime cancer risk. The Commission has concluded that it does not represent a statistically significant increase in incremental lifetime cancer risk.

The Commission has concluded that the increased emissions associated with a decision to operate the plant as proposed (i.e., without RTOs and with a stack configuration that yields the emissions as modelled by Olsson) would not present a statistically significant risk to human or environmental health.

The Commission is not, however, satisfied with all of the proposed emission limits. Specifically it is concerned with the dryer limits for total VOC emissions. As noted in Chapter Eleven, Olsson used the existing limits in the licence as the "maximum authorized emission rate" where the system would not be impacted by the removal of the regenerative thermal oxidizers (RTO) or "where the equipment/system *is* impacted by the pending application to decommission the RTOs (press and dryer WESPs [wet electro-static precipitators]), however the existing emission limit can be met without the RTOs (i.e., no amendment has been requested for that limit)". In all other cases, Olsson used site-specific data and/or published emission factors, whichever was the most conservative. The impact of this decision is most obvious in the decision not to request a change to the VOC emission limits from the dryer WESPs. Site-specific testing in September 2006 indicated a range of VOC emissions from the dryer WESPs of 1.679 grams per second to 1.920 grams per second, with an average of 1.81 grams per second (a range 3.358 grams per second to 3.840 grams per second and an average of 3.62 grams per second if estimated for both WESP stacks), or 17 per cent of the emission limit of 20.96 grams per second that currently exists for the WESPs and that Louisiana-Pacific is requesting be unchanged (Olsson 2010, Appendix C, unpaginated). If the VOC limit had been developed using the same criteria as the other limits—site-specific data and/or published emission factors, whichever was the most conservative—it would appear that the VOC emission limit for the WESPs would be considerably lower than 20.96 grams per second.

The decision not to use this approach when it might result in a limit reduction as opposed to an increase is not acceptable. All limits should be developed on the same basis. Throughout this process, Louisiana-Pacific has stated that it has decreased VOC emissions from its dryers. This change should be reflected in the licence. The decision to continue with a limit based on data from other OSB plants, using different technology in the 1990s, has, in all likelihood, led to an unnecessarily high VOC emission limit.

Finally, the additional information provided to the Commission in April 2010 made it clear that modelling was based on limited site-specific data on plant emissions. Based on the data in Tables 11.1 and 11.2, six of the 13 materials listed (formaldehyde, MDI, phenol, PM_{10}, $PM_{2.5}$, acrolein) showed modelled ambient air levels reaching 60% of the maximum acceptable AAQC levels or higher. Further in-stack and ambient monitoring is needed to verify the modelling results and make operational adjustments as needed.

Recommendations

The Commission recommends:

1) That Louisiana-Pacific be granted an environment licence to operate its Swan Valley OSB plant without the use of regenerative thermal oxidizers.
2) That all air emission limits in the licence for the Swan Valley OSB plant be developed on the basis of site-specific data and/or relevant published emission factors, whichever is the most conservative. This will require regular stack testing and review of monitoring results.
3) That the proposed design for the Swan Valley OSB plant be reviewed to determine whether the exceedances of the Ontario acrolein value could be prevented or minimized by engineering considerations such as alternative stack heights, locations, or diameters.

In addition to the above, Commission wishes to comment and make recommendations on the following issues related to the Louisiana-Pacific application.

- Ambient air monitoring.
- The community health study.
- The Community Liaison Committee.

Ambient air monitoring

Environment Act Licence Number 1900 S2 (issued in 1994) required Louisiana-Pacific to establish an ambient air quality monitoring plan and a meteorological station at monitoring sites approved by the Manitoba Government. The provision was carried forward in *Environment Act* Licence Number 1900 S4. The station was required to monitor total suspended particulate (TSP), PM_{10}, formaldehyde, nitrogen oxides, volatile organic compounds (including benzene), phenol, MDI, hydrogen cyanide, and ozone.

Two issues have developed in relation to this monitoring regime: 1) The frequency of the monitoring, and 2) the location of the monitoring stations.

Frequency of monitoring

In its review of the Louisiana-Pacific licence, Manitoba Conservation indicated that it might be appropriate to increase the frequency of monitoring for MDI, phenol, and hydrogen cyanide from a quarterly to a six-day cycle. In the case of formaldehyde, Manitoba Conservation also stated that it might be appropriate to add a requirement for 24 one-hour samples every six days to the current requirement for a one-

hour sample every six days. This increase was considered necessary to increase the probability of capturing air samples impacted by plant emissions.

Louisiana-Pacific stated that a requirement for an increase in the frequency of testing for MDI, phenol, and hydrogen cyanide would be unreasonable because of the fact that the sampling requires the use of out-of-province experts and the predicted concentrations of these substances are well below the standards set out in Manitoba's Ambient Air Quality Criteria. The company indicated that it was receptive to increases in the frequency of monitoring of formaldehyde and the use of the formaldehyde results as a surrogate for MDI, phenol, and hydrogen cyanide.

Placement of the monitoring locations

The Commission questions whether the criteria used to establish the placement of the two monitoring locations (population distribution and wind direction) remain appropriate under current conditions. Ambient air monitoring should be used to validate the predicted ground-level concentrations produced by the air-dispersion model. While the two existing monitoring locations may serve a number of valid purposes, a minimum of three locations, placed in a triangular pattern close to the area of predicted high ground-level concentrations, is required to provide the data needed for validation of the air dispersion model. The existing stations may serve other, desired functions, but they do not provide data that can be used to validate the predictions made by the air dispersion model, which, in the Commission's view, is the central value of monitoring.

Finally, while the current *Environment Act* licence for the Swan Valley OSB plant contains detailed instructions as to how emissions should be sampled, there is no description as to the process to be used in ambient air sampling.

Recommendations

The Commission recommends:

4) That the licence for the Swan Valley OSB plant require the ambient air monitoring of diphenyl methane diisocyanate, phenol, and hydrogen cyanide be made on the following schedule: one 24-hour sample every six days. Ambient air monitoring of formaldehyde should be carried out on the basis of 24 one-hour samples every six days.
5) That the licence for the Swan Valley OSB plant require an ambient air-monitoring network be established for the Swan Valley OSB plant that is capable of providing the data required to validate the predicted ground-level concentrations produced by the air-dispersion model for emissions from the Swan Valley oriented strand board plant. This may require a minimum of three additional locations close to the area of predicted high ground-level concentrations.
6) That Manitoba Conservation develop a policy on the use of surrogates in ambient air monitoring.
7) That acceptable methods of ambient air quality sampling be established and be communicated to the proponent and the public at large.

The community health study

When the concept of a community health study was first raised by Manitoba Health officials during the 1994 CEC hearing it was referred to

as a *Baseline and follow-up health status study*. It was proposed that it include:

1) A demographic and socioeconomic profile of affected communities.
2) The disease rates of affected communities.
3) A community health perception study of affected communities.
4) Community baseline and follow-up health monitoring and biological testing of affected communities.

The last point was to include both lung function testing and collection of blood serum for future testing of biologic markers. The Manitoba Health submission to the CEC stated that the testing should be "conducted on separate occasions at appropriate intervals during the first year of operation and again at two year intervals" (Manitoba Health 1994; 3).

The baseline community health study that was carried out in 1995 included:

1. A baseline lung health study.
2. A baseline health perceptions survey.
3. A background demographic, socioeconomic and disease rate profile of local communities.

The report noted that the lung function study "establishes a baseline (as of 1995) so that ongoing monitoring of respiratory health can be objectively evaluated in the future." (Toxicon 1996; xv). The 1995 lung health study included both a questionnaire component and a lung function test conducted using spirometric technology.

The 2001 follow-up study included a review of respiratory health and general health perceptions. Both reviews were undertaken by means of a telephone survey conducted by Louisiana-Pacific's Edmonton-based consultant. In the respiratory health review, the same people were surveyed who were surveyed as part of the 1995 base-line study. The report prepared on the basis of this review concluded that an "analysis of change in respiratory symptoms and conditions for Minitonas and Benito showed no suggestion that the residents of Minitonas were at elevated risk" (Toxicon 2001; 44).

The Commission recognizes that the appropriate provincial government authorities approved both the 1995 study and the 2001 study in advance. It does note, however, that over time the scope and intent of the studies were reduced. The decision not to include serum collection or a survey of disease rates may have been appropriate given the available resources and the size of the affected communities. Of greater concern was the decision in 2001 not to gather direct data on lung function through the use of spirometric techniques.

By not continuing with the spirometric testing, an important opportunity to develop a significant community health profile was lost. If the plant is allowed to operate without RTOs, it would be appropriate to revisit the issue of community health studies. If the studies were deemed to be appropriate when VOC emissions were being controlled, it would be logical to establish a new baseline and carry out a full follow-up study if there are to be no VOC control technologies in place.

Recommendations

The Commission recommends:

8) That the licence for the Swan Valley OSB plant require a baseline community health study and a follow-up community health study, including psychological and physiological parameters.

The Community Liaison Committee

In keeping with *The Environment Act* licence issued to Louisiana-Pacific, a Community Liaison Committee was established to facilitate the exchange of information between the residents of the Swan River Valley and Louisiana-Pacific. While the Concerned Citizens of the Valley (CCV) were initially members, they subsequently withdrew from the Committee. At the public meeting held by the Commission in Swan River, CCV members stated that they withdrew over a lack of responsiveness to issues that they raised. While the CCV did not provide a date for their withdrawing from the Committee, Louisiana-Pacific has stated to the Commission that the CCV formally withdrew in 2003.

According to Manitoba Conservation, in recent years the CLC has met two to three times a year. However, Manitoba Conservation was not able to provide the Commission with a set of CLC minutes nor was it able to describe how the meetings or the minutes were publicized.

The Commission has also been informed of a Stakeholders Advisory Committee (SAC) that was established under *Environment Act* Licence Number 2191 E. This licence deals with Louisiana-Pacific's harvesting rights. The SAC includes representations from a cross-section of forest users and interest groups and it was tasked with:

- Identifying resources or land uses that may be impacted by the proposed activities and to recommend alternative harvest and renewal plans to minimize those impacts.
- Assisting in the development of Standard Operating Procedures to minimize potential impacts.

The Commission observes that there is a need for a review of the Community Liaison Committee to ensure it is providing appropriate two-way communication regarding the Swan Valley OSB plant, its environmental effects and licensing conditions. Among the issues to be addressed in such a review would be the Committee's terms of reference, membership, public profile, notification of meetings, public posting of minutes, and its relationshipóif anyóto the SAC.

Recommendations

The Commission recommends:

9) That Manitoba Conservation, in consultation with the community, conduct a review of the mandate and operations of the Community Liaison Committee established under *The Environment Act* licence for the Swan Valley OSB plant.

Issues relating to decision-making criteria that arose during the investigation

As noted above the Commission is making its licensing decision based on the application of provincial government policies regarding air quality. The following other issues related to decision-making were raised during the course of the hearing:

- The applicability of regulations in other jurisdictions.
- Economic viability.
- Greenhouse-gas emissions.
- The precautionary principle.

These issues did not play a central role in Commission decision-making. However, because they were raised on numerous occasions, the Commission is expressing its views on their applicability.

The applicability of regulations from other jurisdictions

Arguments have been presented to the Commission that the emission limits placed on the Swan Valley OSB plant should be at least as stringent as those placed on similar OSB plants in the United States. Arguments have been made that compared to other Canadian jurisdictions, the license provisions imposed on the Swan Valley OSB plant are too stringent. The Commission recognizes that there is much to be gained by examining the way in which other jurisdictions regulate substances that are potentially hazardous to human health and the environment. That does not mean that it is appropriate to require that control technologies be put in place in the absence of risk. Nor does it mean that Manitoba's standards can be no more stringent than those in other Canadian jurisdictions.

The regulatory approach adopted in Manitoba is to use technology requirements, air quality criteria, and risk assessments in a site-specific manner to determine how development will affect air quality. The Commission accepts the legitimacy of this approach, which allows for an examination of research and standards that have been developed throughout the world.

The Commission notes that (as described in Chapter Five) the U.S. adopted its current technology-based approach to control certain pollutants not out of a belief that it necessarily provides superior environmental and health protection to an ambient-air-quality-standard approach but because of the political and administrative difficulties that it experienced in developing those standards. In 1994, the Commission concluded that without RTOs, the Louisiana-Pacific application met all applicable Manitoba environmental criteria. Because Louisiana-Pacific included RTOs in its application (at what amounted to the last minute), the Commission recommended that RTOs be included in the licence. The fact that RTOs would have been required if the plant were located in the United States was not the basis of the Commission's decision to recommend that they be installed at the Swan Valley OSB plant. In reaching its conclusions in this case, the Commission again is not acting on the basis of U.S. regulatory policy nor is it passing judgment on whether one approach is superior to another.

Economic viability

Manitoba's *Principles and Guidelines for Sustainable Development* require that "Environmental and health initiatives should adequately take into account economic, human health and social consequences." The case has been put before the Commission that to decline to authorize the removal of the RTOs would place the future of the Swan Valley OSB plant in jeopardy. A plant closure would have significant social and economic consequences. However, the issue of plant viability would not justify increasing emission rates to the point that they exceeded ambient air quality criteria and generated ground-level concentrations of hazardous substances that could have a statistically significant negative impact on the environment or human health. It should be noted that issues of economic viability are taken into consideration in the development of those criteria.

In reaching the decisions in this report, the Commission has not assessed the plant's economic viability (which would have required the submission of a great deal more information and testimony than was presented

to the Commission) nor is it making its recommendations on the basis of viability.

Greenhouse-gas emissions

The Commission recognizes the importance of reducing greenhouse-gas emissions. It further recognizes that emission-control technologies that generate additional greenhouse-gas emissions constitute a challenge for environmental regulators. The shutting down of the RTOs would lead to a reduction in greenhouse-gas emissions from the Swan Valley OSB plant. This, the Commission notes, is a positive development and one it would not wish to disparage. However, the reduction would not justify increasing emission rates to the point that they generated ground-level concentrations of hazardous substances that could have a statistically significant negative impact on the environment or human health.

The precautionary principle

Manitoba's *Principles and Guidelines for Sustainable Development* state that:

> Manitobans should anticipate, and prevent or mitigate, significant adverse economic, environmental, human health and social effects of decisions and actions, having particular careful regard to decisions whose impacts are not entirely certain but which, on reasonable and well-informed grounds, appear to pose serious threats to the economy, the environment, human health and social well-being.

This principle is in keeping with the precautionary principle. Many submissions urged the Commission to require the RTOs remain in place as a precautionary measure, since a number of VOCs are known to have negative impacts at certain concentrations. The case was argued that even if the air dispersion modelling predicted that the ground-level concentrations of these substances would be below existing ambient air quality criteria and health-risk assessments concluded that the cancer and non-cancer health risks were negligible, future research could lead to a re-evaluation and adjustment of the existing criteria. The precautionary principle, however, calls for application of control measures to deal with uncertainty within the research community not to deal with the results of future research.

The Commission has been urged by some presenters to require that Louisiana-Pacific install biological control technology. The Commission is of the view that the issue of alternatives should be addressed through the application of a policy that assesses whether the Best Available Control Technology Economically Achievable is being installed to ensure compliance with Manitoba ambient air quality criteria. For the Commission to recommend on what control technologies should be put in place at the Swan Valley OSB plant would be to prejudge this issue.

General policy issues

Finally, this investigation has led the Commission to identify two general policy concerns: 1) the degree of clarity and guidance that exists in relation to environmental assessment in general and 2) deficiencies in provincial air quality policy. There is, however, a measure of overlap between these two issues.

Quality of environment assessment

Applications for *Environment Act* licence alterations should fully comply with existing strategies, guidelines, and criteria. This is necessary to provide regulators and the public with the information needed to assess any potential health and environmental effects.

While applicants should strive to ensure that their applications meet these requirements, it is Manitoba Conservation's responsibility to communicate its expectations to applicants and to ensure that applications are not accepted for review if they fail to meet those expectations.

This is in keeping with Guidelines 2 and 3 of the *Principles and Guidelines for Sustainable Development.* These Guidelines underscore the importance of public participation and access to information. Applications for a major alteration to an *Environment Act* licence should be based on technical reports that can stand on their own. The reports must contain all the relevant information, rationales, discussions of uncertainty, and citations needed to assess the application and must be appropriately referenced. Stand-alone reports provide an additional level of verification and transparency to the assessment process.

The Commission has been raising concerns over the quality of environmental assessments for much of the past decade. In its 2004 report on the Wuskwatim hearings and its 2005 report on Floodway Expansion, the Commission recommended that Manitoba:

- Enact environmental assessment legislation.
- Provide guidance for proponents, consultants, and practitioners.
- Establish protocols for best professional practice that includes cumulative effects assessment. (Manitoba Clean Environment Commission 2004; 2005)

In its 2007 Report on the proposed Pembina Valley Water Cooperative Pipeline, the Commission recommended that Manitoba establish and require higher standards of performance in environmental assessment. To that end, the government should provide comprehensive and clear guidance for proponents, consultants, and practitioners by:

- Issuing Guidelines for projects seeking a licence under The Environment Act that are more prescriptive as to what constitutes an acceptable environmental assessment.
- Establishing protocols for best professional practice. (Manitoba Clean Environment Commission 2007).

The current investigation has once more raised concerns about the need to ensure that applications for *Environment Act* licences and amendments to those licences are full and complete. The process was delayed because the Commission had to request that Louisiana-Pacific provide it with essential information that was not included in its initial proposal. The Commission recognizes that Louisiana-Pacific was guided by Manitoba Conservation in the decisions that were made regarding the content of its original application. The Commission also recognizes that Manitoba Conservation provided this guidance in the context of its ongoing communication with Louisiana-Pacific. The result, unfortunately, was an original application that contained a number of deficiencies.

There is a need for the province to set out a concrete framework that will serve as the basis for environmental assessment in Manitoba. A number of regulatory options exist for housing such a framework, ranging from an Environmental Assessment Act, an Environmental Assessment Regulation under *The Environment Act* or expansion and alteration of existing regulations. Manitoba Conservation should assess the options and choose the appropriate tool. The Commission expects that such a framework would include:

- Clear definitions of major alterations and minor alterations to an *Environment Act* license that are sufficient to clearly distinguish between the two.
- Reporting requirements for an environmental assessment, which are inclusive and are consistent for all types of applications (minor or major alterations and new projects).
- Clarity as to the roles and responsibilities of the department in providing guidance and the applicant in developing the proposal.
- Direct references to established criteria, guidelines and protocols that exist to address differing aspects of the environment. This would include for example, the Air Quality Management Strategy, Air Dispersion Modelling Guidelines for Manitoba, Water Quality Criteria and Guidelines, greenhouse-gas policy, and human health risk assessment.
- Guidance for providing information to the public. This would include information provided in or supporting proposals as well as follow-up monitoring data.
- Requirements for written rationales for decisions not to apply regulatory provisions.

Once the regulatory mechanism is in place, the province should develop a comprehensive information package to guide proponents and their consultants. This guide would, preferably, take the form of a plain-language stand-alone manual that fully describes the information required, the rationale for this information, and the acceptable format for a submission.

Instructions and guidance of this sort would contribute to improvements in the quality of both the proposals and of the assessment of proposals. There would, however, continue to be a requirement for Manitoba Conservation to provide in-depth specific guidance for certain projects by way of guidance documents specifically prepared to address certain proposals.

Recommendations

The Commission recommends:

10) That Manitoba Conservation establish and implement a concrete environmental assessment framework using the most appropriate regulatory tools and follow-up with a comprehensive applicant instruction manual.

As noted in Chapter Five, Manitoba does not have Human Health Risk Assessment guidelines. This is a critical component of air dispersion modelling as well as many other aspects of environmental assessment (including the assessment of contaminated sites). There is no guidance on what constitutes an acceptable health risk assessment and little guidance on what health standards are to be used in general or where there is a limited number of data sources. Health Canada has published comprehensive guidelines (2004) for human health risk analysis at federal contaminated sites. Manitoba should follow this lead and provide similar guidelines to practitioners of environmental assessment in this province.

Recommendations

The Commission recommends:

11) That Manitoba Conservation develop and establish policy and guidelines regarding Human Health Risk Assessments and communicate such to practitioners.

Provincial air quality policy

The three tools for guiding air quality environment assessments are Manitoba's *Air Quality Management Strategy*, *The Guidelines for Air Dispersion Modelling in Manitoba*, and

the *Ambient Air Quality Criteria*. Both the Air Quality Management Strategy and The Guidelines for Air Dispersion Modelling in Manitoba have been draft documents since 2006. They must be finalized and formally accepted. The Commission has the following additional observations on issues raised in these documents.

Air Quality Management Strategy

Emission control technology

Manitoba's *Air Quality Management Strategy* recommends that facilities "implement the best available control technology economically achievable (BACTEA) that is applicable to the sector or implement pollution prevention to achieve an equivalent endpoint" (Manitoba Conservation 2006a; 2). Manitoba Conservation stressed to the Commission the importance of making sure that BACTEA is in place when a new facility is being licensed. In the case of existing plants Manitoba's *Air Quality Management Strategy* recognizes that:

> Dealing with air quality issues with an existing facility can sometimes be more challenging than with a new facility because retrofitting air pollution controls on an existing operation can be expensive and may not always be effective. As a result, economically available mitigation measures may differ from those available for new operations. (Manitoba Conservation 2006a; 3)

Manitoba Conservation has informed the Commission that it does not have a definition of BACTEA nor does it have a defined policy process for assessing BACTEA nor is there a defined process for determining when BACTEA should be required and what BACTEA constitutes. As a result Manitoba Conservation cannot clearly convey to applicants how they are expected to demonstrate that they meet BACTEA requirements. Similarly, Manitoba Conservation cannot demonstrate to the public that BACTEA is in place. This differs from other jurisdictions, such as Ontario, which has, for certain substances, detailed processes for identifying BACTEA (2005). The United States also has set out a process for identifying whether a control technology is the Maximum Achievable Control Technology, Best Available Control Technology (BACM), or Reasonably Available Control Technology (RACT).

Guidelines from other jurisdictions

Manitoba's *Air Quality Management Strategy* requires that emissions meet Manitoba Conservation Ambient Air Quality Criteria, Canadian Council of Ministers of the Environment (CCME) standards, or applicable ambient air quality criteria of other jurisdictions as appropriate. Since Manitoba Conservation has no formal policy for the acceptance of air quality guidelines from other jurisdictions, applicants for *Environment Act* licences lack clear criteria as to which standards to employ in assessing substances not covered by Manitoba emission standards. Furthermore, Manitoba Conservation cannot clearly demonstrate to the public why certain limits have been accepted while others have not.

Maximum desirable levels

The *Strategy* sets out goals for maximum desirable levels, which are described as "the long-term goal for air quality and a basis for anti-degradation policy for pristine areas of Manitoba and for the continuing development of control technology. It is the goal to maintain pollutant concentrations at or below Maximum Desirable Levels within rural areas" (Manitoba

Conservation n.d.). It would appear that the intent is to have this policy implemented through application of Manitoba's *Ambient Air Quality Criteria*, which identifies maximum desirable levels for eight substances. The policy does not provide an explanation as to the basis on which the levels were identified or why there are levels for only certain substances.

Lack of definition

BACTEA is not the only undefined concept or term in the *Air Quality Management Strategy*. "Air toxins" and "pristine areas" are two terms that are used but not defined, in the process creating difficulty for applicants, regulators, and the public at large to determine public policy expectations and to assess whether the expectations have been met.

Manitoba Ambient Air Quality Criteria

Manitoba's *Ambient Air Quality Criteria* addresses the emission of 23 substances and includes a generic odour category. In its 1994 report on the initial Louisiana-Pacific application, the Commission noted that the existing air quality criteria were limited in the number of pollutants considered, resulting in an *ad hoc* assessment process when developments emitted substances not covered by the criteria. It called on the provincial government to expand the list of pollutants to include the primary pollutants that would be emitted from an OSB plant.

While guidelines for formaldehyde, hydrogen cyanide, MDI, and phenol were specifically developed in response to the development of the Swan Valley OSB plant, the number of criteria listed is still limited, given the thousands of chemicals that might potentially be emitted by any industrial development. As has become apparent through this process, Manitoba lacks criteria for VOCs in general and for acetaldehyde, acrolein, benzene, methanol, and propionaldehyde (all VOCs whose emissions are associated with the production of OSB). Finally, compared to other jurisdictions (see, for instance Ontario Ministry of the Environment, Standards Development Branch 2008), Manitoba's *Ambient Air Quality Criteria* lacks any introductory or descriptive language that would allow a member of the public to understand what the criteria are or how they are intended to be applied.

Recommendations

The Commission recommends:

12) That Manitoba Conservation review the Air Quality Management Strategy and The Guidelines for Air Dispersion Modelling in Manitoba to ensure they are inclusive, clear and reflective of the current state of knowledge, and then finalize and formally accept them.
13) That Manitoba Conservation make documents relating to air quality standards in an easily readable and accessible format available to the public. These should include explanations of the derivation of, and rationale for, inclusion of the values as well definitions of key terms used in the documents.
14) That Manitoba Conservation develop a detailed Best Available Control Technology Economically Achievable policy.
15) That Manitoba Conservation develop and adopt a protocol for the acceptance and application of air quality guidelines from other jurisdictions.
16) That Manitoba Conservation develop and adopt a policy that will guide applicants in determining which substances should

be subjected to air dispersion modelling and health risk assessment and the circumstances under which they should be modelled.

Works cited

Boyd, David R. 2003. *Unnatural law: rethinking Canadian environmental law and policy*. Vancouver: University of British Columbia Press.

Bradstreet, Jeffrey. 1995. Hazardous air pollutants: assessment, liabilities, and regulatory compliance. Noyes Data Corporation, Park Ridge, New Jersey.

Canada Wood Council. n.d. *Oriented strand board*. http://www.cwc.ca/Products/OSB. accessed May 18, 2009.

Canada. 2007. *Regulatory framework for air emissions*. Ottawa. TD883.148.C3C36 2007 344.7104'6342 C2007-980080-7E.

Canada. n.d. *Greenhouse gas reporting site*. http://www.ghgreporting.gc.ca/GHG-GES/page19_c4.aspx#s421 accessed July 22, 2009.

Canadian Council of Ministers of the Environment. 2001. *Benzene Canada-wide Standard – Phase 2*.

Canadian Environmental Protection Agency Federal-Provincial Advisory Committee Working Group on Air Quality Objectives and Guidelines. 1998. *National ambient air quality objectives for particulate matter*. Ottawa.

Encyclopaedia Britannica. 2009. *environmental works*. Encyclopaedia Britannica Online. http://www.britannica.com/EBchecked/topic/189203/environmental-works. Accessed May 18, 2009.

Encyclopaedia Britannica. 2009. *hydrogen cyanide*. Encyclopaedia Britannica Online. http://www.britannica.com/EBchecked/topic/278704/hydrogen-cyanide. Accessed July 1, 2009.

Encyclopaedia Britannica. 2009. *phenol*. Encyclopaedia Britannica Online. http://www.britannica.com/EBchecked/topic/455507/phenol. Accessed June 30, 2009.

Environment Canada. n.d. *Canada-Wide Standards (CWS) Implementation Plan Benzene - Phase 2*. http://www.ec.gc.ca/CEPARegistry/

documents/agree/bp2.cfm#6. Accessed May 25, 2009

Environment Canada. n.d. *Volatile organic compounds: History*. http://www.ec.gc.ca/cleanair-airpur/History-WSA1E9E2EE-1_En.htm. Accessed May 18, 2009.

Environment Canada. n.d. *Volatile organic compounds: Main emission sources*. http://www.ec.gc.ca/cleanair-airpur/Main_Emission_Sources-WSD130165D-1_En.htm. accessed May 18, 2009.

Environment Canada. n.d. What does toxic mean under CEPA 1999? http://www.ec.gc.ca/CEPARegistry/gene_info/fact_01.cfm. accessed May 29, 2009.

Environment Canada/Health Canada. 1999. *Formaldehyde: Canadian Environmental Protection Act, 1999*. Environment Canada/Health Canada. Cat. no. En40-215/61E. 2.

Guyer, Howard H. 1998. *Industrial processes and waste stream management*. New York, Wiley.

Health Canada. 2004. *Federal contaminated risk assessment in Canada, Part I, Guidance on human health preliminary quantitative risk assessment*. Ottawa: Health Canada.

Health Protection Agency. n.d. *Hydrogen cyanide*. www.hpa.org.uk/web/HPAwebFile/HPAweb_C/1202487077488. Accessed July 1, 2009.

Heuvelen, Robert Van and Peter Rosenberg. 1994. Successful compliance and enforcement approaches, in *Proceedings of The Third International Conference on Environmental Enforcement, Volume 1*. 163-174.

Industry Canada. n.d. *Wood-based panel products: Technology roadmap appendix I: environmental technologies*. http://www.ic.gc.ca/eic/site/fi-if.nsf/eng/oc01531.html. accessed May 15, 2009.

Louisiana-Pacific. 2007. *Air dispersion modelling results in support of Louisiana-Pacific Canada Ltd's Request to Amend Manitoba Environment Act Licence 1900 S4 Emission Limits for Formaldehyde and Benzene from its Oriented Strand Board Press*. August 22, 2007.

Louisiana-Pacific. 2008. *Request to Amend Manitoba Environment Act Licence 1900 S4 Emission Limits for Pressing and Drying Operations.* November 18. 2008.

Manitoba Clean Environment Commission. 1994a. Transcript of Public Hearings: Louisiana-Pacific Corporation Oriented Strand Board Plant Rural Municipality of Minitonas.

Manitoba Clean Environment Commission. 1994b. *Report on Public Hearings: Louisiana-Pacific Corporation Oriented Strand Board Plant Rural Municipality of Minitonas*. Manitoba Clean Environment Commission, Steinbach.

Manitoba Clean Environment Commission. 2004. Report on Public Hearing: Wuskwatim Generation and Transmission Projects. Manitoba Clean Environment Commission, Winnipeg.

Manitoba Clean Environment Commission. 2005. Report on Public Hearing: Red River Floodway Expansion. Manitoba Clean Environment Commission, Winnipeg.

Manitoba Clean Environment Commission. 2006. Report on Public Hearing: Pembina Valley Water Cooperative: Supplemental Groundwater Supply System. Manitoba Clean Environment Commission, Winnipeg.

Manitoba Conservation. 2006a. *Air Quality Management Strategy* (draft).

Manitoba Conservation. 2006b. *Guidelines for Air Dispersion Modelling in Manitoba* (draft).

Manitoba Conservation. n.d. *Objectives and guidelines for various air pollutants: Ambient Air Quality Criteria (updated July, 2005*). http://www.gov.mb.ca/conservation/pollutionprevention/airquality/aq-criteria/ambientair_e.html. Accessed May 26, 2009.

Manitoba Environment. 1994. *Summary of Stage 2 Licence Implementation and Justification for Alteration to the Recommendations of the Clean Environment Commission Respecting Louisiana-Pacific Ltd. – R.M. of Minitonas.*

Manitoba. n.d. Next Steps: 2008 *Action on Climate Change*. http://manitoba.ca/beyond_kyoto/index.html accessed July 22, 2009.

National Council for Air and Stream Improvement (NCASI), 2008. *Wood Products Air Quality Technical Information Document.* Special Report No. 08-01, May.

National Council for Air and Stream Improvement (NCASI). 2009. Letter to Al Hambley, Louisiana-Pacific from Vickie Tatum, July 1 2009.

National Pollutant Release Inventory. n.d. *glossary*, http://www.ec.gc.ca/inrp-npri/default.asp?lang=En&n=9264E929-1 accessed July 20, 2009.

Olsson Associates. 2009 Letter to Al Hambley, Louisiana-Pacific from Zach Kimball. June 22, 2009.

Olssson Associates. 2010. Dispersion modelling report: Louisiana-Pacific Canada Limited, Swan Valley OSB plant, Minitonas, Manitoba. Golden, Colorado.

Ontario Ministry of the Environment, Standards Development Branch. 2008. *Ontario's Ambient Air Quality Criteria*. Toronto, PIBS # 6570e.

Ontario Ministry of the Environment. 2002. *Information draft on the development of air standards for methane diphenyl diisocyanate*. Toronto, Ontario.

Pratt, G.C., K. Palmer, C.Y. Wu, F. Oliaei, C. Hollerbach and M. Je. Fenske. 2000. An Assessment of Air Toxics in Minnesota in *Environmental Health Perspectives*, Vol. 108, No. 9 815-825.

Reitze, A.W. and Randy Lowell. 2001. Control of Hazardous Air Pollution Boston College Environmental Affairs Law Review28. Pages 229-350.

Reitze. A.W. 2001. *Air pollution control law: compliance and enforcement*. Washington, D.C.: Environmental Law Institute.

Sauer, B., W. Franklin, R. Miner, D. Word, and B. Upton, 2002. Environmental Tradeoffs: Life Cycle Approach to Evaluate the Burdens and Benefits of Emission Control Systems in the Wood Panel Industry. *Forest Products Journal*, 52(3): 51-58.

Schnelle, K. B. and C. A. Brown 2002.Air pollution control technology handbook. Boca Raton: CRC Press.

Simon, Charles. 2009. *Comments on Louisiana Pacific Swan Valley, Manitoba orientated strandboard facility's proposal to permanently eliminate abatement of hazardous air pollutant and volatile organic compound emissions from flake dryers and the board process, September 8, 2009*.

Stantec Limited. 2010. *Louisiana-Pacific Canada Ltd. Swan Valley OSB plant Human Health Risk Assessment*. Markham, Ontario.

Tessitore, Joseph L. 1994. "Permit requirements for new and retrofit systems (including toxic modelling)" in *Sizing and Selecting Air Pollution Control Systems*. Howard E. Hesketh and Frank L. Cross, editors. CRC Press, 11-24.

TetrES Consultants. 2000. *Ambient flora & fauna study 2000, Louisiana-Pacific OSB Plant*. Winnipeg.

TetrES Consultants. 2005. *Ambient flora and fauna study 2005, Louisiana-Pacific OSB Plan*t. Winnipeg.

TetrES Consultants. 2010. Response to Clean Environment Commission. Winnipeg.

Theobald, K., M. Smith, and J.W.S. Young. 2009. *North American oriented strand board industry review. Prepared for the Manitoba Clean Environment Commission*. Richmond Hill, Ont. SENES Consultants Limited.

Toxcon Health Sciences Research Centre Inc. 1996. *Louisiana-Pacific Canada Ltd. Community baseline health study for the Minitonas, Manitoba area oriented strand board plant*. Edmonton.

Toxcon Health Sciences Research Centre Inc. 2002. *Follow-up Community Health Study for the Minitonas, Manitoba Area Oriented Strand Board Plant*. Edmonton.

U.S. Environmental Protection Agency. 1994. Chemicals in the environment: *Methanol* (CAS NO. 67-56-1) http://www.epa.gov/chemfact/f_methan.txt. Accessed August 28, 2009).

U. S. Environmental Protection Agency. n.d. *Acetaldehyde*. http://www.epa.gov/ttn/atw/hlthef/acetalde.html. Accessed August 10, 2009.

U.S. Environmental Protection Agency. n.d. *Acrolein*. http://www.epa.gov/ttn/uatw/hlthef/acrolein.html#ref3). Accessed August 10, 2009.

U. S. Environmental Protection Agency. n.d. *Air control technology fact sheet*, EPA-452/F-03-030.

U.S. Environmental Protection Agency, n.d. *Nitrogen dioxide*. http://www.epa.gov/air/nitrogenoxides/. Accessed June 30, 2009).

U.S. Environmental Protection Agency. n.d. *Particulate matter: Health and environment*. http://www.epa.gov/particles/health.html. Accessed May 18, 2009.

U.S. Environmental Protection Agency. n.d. *Prevention of significant deterioration (PSD) basic information*. http://www.epa.gov/nsr/psd.html#best. Accessed May 28, 2009

U.S. Environmental Protection Agency. n.d. *Volatile organic compounds emissions.* http://cfpub.epa.gov/eroe/index.cfm?fuseaction=detail.viewInd&lv=list.listByAlpha&r=188211&subtop=341. Accessed May 18, 2009.

U.S. Environmental Protection Agency. n.d. *Wood products enforcement initiative*. http://www.epa.gov/compliance/resources/cases/civil/caa/wood/. Accessed .May 28, 2009.

U.S. Environmental Protection Agency. n.d. *What Are the Six Common Air Pollutants?* http://www.epa.gov/air/urbanair/ consulted August 6, 2009.

U.S Environmental Protection Agency. 2008. *Toxicological Review of Propionaldehyde*. (CAS No. 123-38-6) Washington, D.C.

United Nations Environmental Program. 1992. *Rio Declaration on Environment and Development*. www.unep.org/Documents.multilingual/Default.asp?DocumentID=78&ArticleID=1163, accessed December 16, 2008.

Appendix 1: Terms of reference

MINISTER OF CONSERVATION

Legislative Building
Winnipeg, Manitoba, CANADA
R3C 0V8

March 26, 2009

Mr. Terry Sargeant
Chair
Clean Environment Commission
305-155 Carlton Street
Winnipeg MB R3C 3H8

Dear Mr. Sargeant:

I announced on March 16th that I would be asking the Clean Environment Commission (CEC) to review Louisiana Pacific's (LP) request for permanent alterations to its Swan Valley oriented strand board plant's Environment Act Licence.

As you are aware, the CEC initially reviewed this plant when it was first proposed in 1994. Included in the original CEC report was a recommendation that the company operate pollution control equipment including RTOs. LP's recent application states that upgrades have reduced emission levels since the plant was first constructed.

Therefore, pursuant to section 6(5) of *The Environment Act*, I am asking that the CEC conduct an investigation and provide advice and recommendations to me regarding Louisiana Pacific's request.

I have provided a terms of reference which will help guide your exercise. LP's current licence has a requirement for the Director of Environmental Assessment and Licencing to review the terms and conditions of the licence prior to June 1, 2009, so completion of the CEC process in advance of this date would be welcome.

Thank you for undertaking this important task.

Yours sincerely,

Stan Struthers

Stan Struthers
Minister

Terms of Reference

Clean Environment Commission Investigation into

Louisiana Pacific's Licence Change Request

Mandate of the Investigation

In accordance with section 6(5) (a), (b) and (c) of the Environment Act, the CEC, at the request of the Minister of Conservation, shall conduct an investigation into Louisiana Pacific's request for permanent alterations to its Swan Valley oriented strand board plant's Environment Act Licence. The CEC will provide advice and recommendations to the Minister in accordance with the following terms of reference.

Terms of Reference

1. The CEC will conduct an investigation and provide advice and recommendations to the Minister regarding the potential health and environmental effects of the increased emission limits and the subsequent decommissioning of the Regenerative Thermal Oxidizer technology which is contained in Louisiana Pacific's requested licence change.

2. In conducting this investigation and in providing advice and recommendations, the CEC will provide members of the public an opportunity for input regarding LP's proposal at a public meeting in the affected community.

3. As LP's current licence has a requirement for the Director of Environmental Assessment and Licencing to review the terms and conditions of the licence prior to June 1, 2009, the CEC process should begin as soon as possible, and should be completed prior to that date.

Appendix 2:
Letter to Minister

DATE: April 28, 2009

TO: The Honourable Stan Struthers
Minister of Conservation
Room 330 Legislative Building

FROM: Edwin Yee
Chair, Louisiana Pacific Air
Emissions Investigation Panel
Clean Environment Commission
305-155 Carlton St.
PHONE NO.: 945-7091

SUBJECT: **Louisiana Pacific Air Emission Investigation**

Mr. Minister:

As Chair of the Louisiana Pacific Air Emission Investigation I would like to bring you up to date on the panel's progress and projected time frame for completion of this review.

Joining me on the panel are Ken Gibbons, Ken Wait and Patricia MacKay.

We have begun to assess the available materials and have determined a plan of action to address the necessary activities. Our initial assessment is that the investigation will not be completed by June 1, 2009, as prescribed in our Terms of Reference. It is estimated that this review will take approximately six months, bringing the completion date into mid autumn or at the latest the end of the calendar year.

It is expected that the panel will provide an initial assessment of materials and meet with the proponent and departmental representatives during the spring and early summer to seek explanations and clarifications. We will also engage the services of a consultant to assist the panel in evaluating air standards and pollution control technologies employed by the Oriented Strand Board industry in North America. We are targeting mid-July for the public meeting. Following this meeting, further deliberation and perhaps information gathering will be required to formulate our recommendations and complete the report.

Should you have any questions regarding the process or our progress, please do not hesitate to contact me.

Sincerely,

Edwin Yee
Chair

cc: Terry Sargeant
Serge Scrafield
Tracey Braun

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Appendix 3: Licence extension

Manitoba

Conservation

Environmental Stewardship Division
Environmental Assessment and Licensing Branch
123 Main Street, Suite 160, Winnipeg, Manitoba R3C 1A5
T 204 945-7100 F 204 945-5229
www.gov.mb.ca/conservation/eal

June 8, 2009
File: 3741.10

Mr. Allan Hambley
Plant Environmental Manager
Louisiana-Pacific Canada Ltd.
Swan Valley OSB
P.O. Box 189
Minitonas, MB R0L 1G0

Dear Mr. Hambley:

Re: Director's Review of Environment Act Licence No. 2861

Thank you for your letter dated May 20, 2009 in which you requested an extension to the terms and conditions of Environment Act Licence No. 2861 beyond the June 1, 2009 review date. As per clause D of Environment Act Licence No. 2861, I have completed a review of the Licence and have concluded that the terms and conditions of the Licence do not require alteration at this time. I will conduct a further review of the Licence upon completion of the Clean Environment Commission investigation into the Environment Act Proposal that you filed requesting increased emission limits to allow permanent decommissioning of your thermal regenerative oxidizers. I reserve the right to alter the terms and conditions of Environment Act Licence No. 2861 at that time.

If you have any questions regarding this matter, please contact Mr. Ryan Coulter at (204) 945-7023.

Yours truly,

Tracey Braun

Tracey Braun, M. Sc.
Director
Environmental Assessment and
Licensing Branch

c: Don Labossiere, Manitoba Conservation

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Appendix 4: Principles and Guidelines for Sustainable Development

Principles

1. Integration of Environmental and Economic Decisions

1(1) Economic decisions should adequately reflect environmental, human health and social effects.

1(2) Environmental and health initiatives should adequately take into account economic, human health and social consequences.

2. Stewardship

2(1) The economy, the environment, human health and social well-being should be managed for the equal benefit of present and future generations.

2(2) Manitobans are caretakers of the economy, the environment, human health and social well-being for the benefit of present and future generations.

2(3) Today's decisions are to be balanced with tomorrow's effects.

3. Shared Responsibility and Understanding

3(1) Manitobans should acknowledge responsibility for sustaining the economy, the environment, human health and social well-being, with each being accountable for decisions and actions in a spirit of partnership and open cooperation.

3(2) Manitobans share a common economic, physical and social environment.

3(3) Manitobans should understand and respect differing economic and social views, values, traditions and aspirations.
3(4) Manitobans should consider the aspirations, needs and views of the people of the various geographical regions and ethnic groups in Manitoba, including aboriginal peoples, to facilitate equitable management of Manitoba's common resources.

4. Prevention

Manitobans should anticipate, and prevent or mitigate, significant adverse economic, environmental, human health and social effects of decisions and actions, having particular careful regard to decisions whose impacts are not entirely certain but which, on reasonable and well-informed grounds, appear to pose serious threats to the economy, the environment, human health and social well-being.

5. Conservation and Enhancement

Manitobans should
(a) maintain the ecological processes, biological diversity and life-support systems of the environment;
(b) harvest renewable resources on a sustainable yield basis;
(c) make wise and efficient use of renewable and non-renewable resources; and
(d) enhance the long-term productive capability, quality and capacity of natural ecosystems.

6. Rehabilitation and Reclamation

Manitobans should
(a) endeavour to repair damage to or degradation of the environment; and
(b) consider the need for rehabilitation and reclamation in future decisions and actions.

7. Global Responsibility

Manitobans should think globally when acting locally, recognizing that there is economic, ecological and social interdependence among provinces and nations, and working cooperatively, within Canada and internationally, to integrate economic, environmental, human health and social factors in decision-making while developing comprehensive and equitable solutions to problems.

Guidelines

1. Efficient Use of Resources - which means

(a) encouraging and facilitating development and application of systems for proper resource pricing, demand management and resource allocation together with incentives to encourage efficient use of resources; and
(b) employing full-cost accounting to provide better information for decision makers.

2. Public Participation - which means

(a) establishing forums which encourage and provide opportunity for consultation and meaningful participation in decision making processes by Manitobans;
(b) endeavouring to provide due process, prior notification and appropriate and timely redress for those adversely affected by decisions and actions; and
(c) striving to achieve consensus amongst citizens with regard to decisions affecting them.

3. Access to Information - which means

(a) encouraging and facilitating the improvement and refinement of economic,

environmental, human health and social information; and

(b) promoting the opportunity for equal and timely access to information by all Manitobans.

4. Integrated Decision Making and Planning - which means

encouraging and facilitating decision making and planning processes that are efficient, timely, accountable and cross-sectoral and which incorporate an inter-generational perspective of future needs and consequences.

5. Waste Minimization and Substitution - which means

(a) encouraging and promoting the development and use of substitutes for scarce resources where such substitutes are both environmentally sound and economically viable; and

(b) reducing, reusing, recycling and recovering the products of society.

6. Research and Innovation - which means

encouraging and assisting the researching, development, application and sharing of knowledge and technologies which further our economic, environmental, human health and social well-being.

Appendix 5: Ambient Air Quality Criteria

Name of Contaminant	***Criteria Classification***	***Units of Concentration Measurement***	***Period of Time Contaminant is Measured***	***Maximum Tolerable Level Concentration***	***Maximum Acceptable Level Concentration***	***Maximum Desirable Level Concentration***	***Reference***
Ammonia	Guideline	Milligrams per cubic metre (parts per million) of air	1 - hour average		1.4 (2.0)		7
Arsenic	Guideline (***new***)	Micrograms per cubic metre of air	24 - hour average		0.3		20
Cadmium	Guideline (***new***)	Micrograms per cubic metre of air	24 - hour average		2		20
Carbon Monoxide	Objective	Milligrams per cubic metre (parts per million) of air	1 - hour average 8 - hour average	20 (17)	35 (30) 15 (13)	15 (13) 6 (5)	5,9
Chromic Acid (as Cr^{+6})	Guideline	Micrograms per cubic metre of air	1 - hour average		4.5		11
Copper	Guideline (***new***)	Micrograms per cubic metre of air	24 - hour average		50		20
Fluorides (as HF)	Guideline	Micrograms per cubic metre (parts per billion) of air	24 - hour average 7 - day average 30 - day average 70 - day average		0.85 (1.06) 0.55 (0.69) 0.35 (0.44) 0.20 (0.25)	0.40 (0.50) 0.22 (0.28)	3
Formaldehyde	Guideline	Micrograms per cubic metre (parts per billion) of air	1 - hour average		60 (49)		16
Hydrogen Chloride	Guideline	Micrograms per cubic metre (parts per billion) of air	1 - hour average		100 (70)		8

Name of Contaminant	*Criteria Classification*	*Units of Concentration Measurement*	*Period of Time Contaminant is Measured*	*Maximum Tolerable Level Concentration*	*Maximum Acceptable Level Concentration*	*Maximum Desirable Level Concentration*	*Reference*
Hydrogen Sulfide	Guideline	Micrograms per cubic metre (parts per billion) of air	1 - hour average 24 - hour average	1400 (1000)	15 (11.0) 5 (4.0)	1 (0.7)	4,12
Hydrogen Cyanide	Guideline	Micrograms per cubic metre (parts per billion) of air	1 - hour average annual average		40 (36) 3 (2.7)		13
Lead	Guideline (***revised***)	Micrograms per cubic metre of air	24 - hour average 30 - day average		2.0 0.7		2
Methylene Diphenyl Diisocyanate (MDI)	Guideline	Micrograms per cubic metre (parts per billion) of air	1 - hour average annual average		3 (0.3) 0.5 (0.05)		14
Nickel	Guideline (***new***)	Micrograms per cubic metre of air	24 - hour average		2		20
Nitrogen Dioxide	Objective	Micrograms per cubic metre (parts per million) of air	1 - hour average 24 - hour average Annual arithmetic mean	1000 (0.53)	400 (0.213) 200 (0.106) 100 (0.053)	60 (0.032)	5,9
Odours (see note 1)	Guideline	Odour units	two tests not less than 15 minutes apart nor more than 60 minutes apart		<u>Residential Zone</u> 2.0 (see note 2) <u>Industrial Zone</u> 7.0 (see note 3)	<1.0 (less than the odour threshold)	6
Ground-level Ozone	Objective	Micrograms per cubic metre (parts per billion) of air	1 - hour average Annual arithmetic mean	400 (200)	160 (82) 30 (15)	100 (50)	5,9

Name of Contaminant	*Criteria Classification*	*Units of Concentration Measurement*	*Period of Time Contaminant is Measured*	*Maximum Tolerable Level Concentration*	*Maximum Acceptable Level Concentration*	*Maximum Desirable Level Concentration*	*Reference*
Ground-level Ozone	Canada-wide Standard (***new***)	Micrograms per cubic metre (parts per billion) of air	8 - hour average (see note 4)		128 (65)		18
Particulate Matter less than 2.5 µm in diameter ($PM_{2.5}$)	Canada-Wide Standard (***new***)	Micrograms per cubic metre of air	24 - hour average (see note 5)		30		18
Particulate Matter less than 10 µm in diameter (PM_{10})	Guideline (***new***)	Micrograms per cubic metre of air	24 - hour average		50		19
Phenol	Guideline	Micrograms per cubic metre (parts per billion) of air	1 - hour average		63 (16)		15
Styrene	Guideline	Micrograms per cubic metre (parts per billion) of air	24 - hour average		400 (94)		17
Sulphur Dioxide	Objective	Micrograms per cubic metre (parts per million) of air	1 - hour average 24 - hour average Annual arithmetic mean	800 (0.31)	900 (0.34) 300 (0.11) 60 (0.02)	450 (0.17) 150 (0.06) 30 (0.01)	5,9
Sulphuric Acid Mist	Guideline	Micrograms per cubic metre (parts per million) of air	1 - hour average		100 (0.025)		10
Suspended Particulate Matter	Objective	Micrograms per cubic metre of air	24 - hour average Annual geometric mean	400	120 70	 60	5
Zinc	Guideline (***new***)	Micrograms per cubic metre of air	24 - hour average		120		20

All measurements of air quality are corrected to a reference temperature of 25 °C and to a reference pressure of 101.3 kilopascals.

note 1: Nuisance odours from environmentally-regulated developments are managed using a strategy based on the prevention/minimization of odour releases and the use of a community base standard to determine the acceptability of the ambient odour in the community. It is intended that the odour unit limits be used only for evaluating potential impacts on a community d the environmental impact assessment of new or modified developments.

note 2: One volume of odorous air diluted with one volume of odour free air.

note 3: One volume of odorous air diluted with six volumes of odour free air.

note 4: The 8-hour average objective for ozone is the national Canada-wide Standard (CWS) for ozone. (See www.ccme.ca/initiatives/standards.html for more details.)

note 5: The 24-hour average objective for $PM_{2.5}$ is the national CWS for $PM_{2.5}$. (See www.ccme.ca/initiatives/standards.html for more details.)

REFERENCES

1 Environmental Health Laboratory, 1971. Internal Committee. Manitoba Department of Health.

2 Hazardous Contaminants Branch, October 1993. *Rationale for the Development of Soil, Drinking Water, and Air Quality Criteria for Lead.* Ontario Ministry of Environment and Energy.

3 Federal - Provincial Committee on Air Pollution, 1975. Environment Canada. Unpublished.

4 Federal - Provincial Committee on Air Pollution, 1976. Environment Canada. Unpublished.

5 Fisheries and Environment Canada, November 1976. *Criteria for National Air Quality Objectives*. Federal - Provincial Committee on Air Pollution. 41 pp.

6 Environment Management Division, 1978. *Internal Guideline.* Manitoba Department of Mines, Resources and Environmental Management.

7 Campbell, A. M., May 1982. *Proposed Manitoba Ambient Air Guideline for Ammonia*. Manitoba Environmental Management Division. 28 pp.

8 Environment Management Division, 1982. *Internal Tentative Guideline*. Manitoba Department of Environment and Workplace Safety and Health.

9 Federal - Provincial Committee on Air Pollution, 1982. Environment Canada. Unpublished.

10 Environment Management Division, 1983. *Internal Tentative Guideline*. Manitoba Department of Environment and Workplace Safety and Health.

11 Environment Management Division, 1985. *Internal Tentative Guideline*. Manitoba Department of Environment and Workplace Safety and Health.

12 Federal - Provincial Committee Advisory Committee on Air Quality, 1985. Environment Canada. Unpublished.

13 Van Dusen, J., 1996. *Ambient Air Quality Guidelines for Hydrogen Cyanide.* Manitoba Department of Environment.

14 Van Dusen, J., 1996. *Ambient Air Quality Guidelines for Methylene Diphenyl Diisocyanate (MDI).* Manitoba Department of Environment.

15 Van Dusen, J., 1996. *Ambient Air Quality Guidelines for Phenol.* Manitoba Department of Environment.

16 Air Quality Criteria Task Group, 1999. *Interim Ambient Air Quality Guideline for Formaldehyde.* Manitoba Department of Environment.

17 Air Quality Criteria Task Group, 1999. *Ambient Air Quality Guideline for Styrene.* Manitoba Department of Environment.

18 Canadian Council of Ministers of the Environment (CCME), 2000. *Canada-Wide Standards for Particulate Matter (PM) and Ozone.* CCME.

19 Ontario Ministry of Environment and Energy, 1997. *Interim Ambient Air Quality Criterion – PM10.* EBR Registry Number: PA7E0006.

20 Ontario Ministry of the Environment, September 2001. *Summary of Point of Impingement Standards, Point of Impingement Guidelines, and Ambient Air Quality Criteria (AAQCs).* Standards Development Branch.

Appendix 6: Terms of Reference Citizens Liaison Committee

ROLE FOR THE
CITIZENS LIAISON COMMITTEE

INTRODUCTION

The role of the Committee is to facilitate implementation of the Environment Act Licence, respecting the Louisiana-Pacific Canada Ltd. Oriented Strand Board Plant near Minitonas, Manitoba, in an environmentally sound manner and to develop strategies to address the health and environmental concerns related to the plant. The role will be achieved through two basic mechanisms:

1. To provide the Director and Louisiana-Pacific Canada Ltd. With input and advice regarding the on-going administration of the Licence. This may include such items as the:

   - Detailed plan for inspection and maintenance of emission control and monitoring equipment prepared by Manitoba Environment and Louisiana-Pacific;
   - Health related issues;
   - On-going inventory and monitoring programs;
   - Emission monitoring plan;
   - Contingency plans required by the Licence;
   - Information, data and analysis requirements; and
   - Public information activities.

2. Provide a forum for information to be exchanged and issues to be discussed. This may include such items as the:

   - Computer generated estimations of the ambient air conditions;
   - Ambient air, water and ground water results reports;
   - Health related data;
   - Emission monitoring data
   - Design details;
   - Design alterations; and
   - Design consideration; and
   - Operations at the plant; public concerns that may arise during plant operation.

PRIMARY TERMS OF REFERENCE

The committee may establish its own operating procedures; however, the Committee shall be governed by the following:

1. The Committee will be chaired by a Director as appointed under the Manitoba Environment Act.
2. The Committee will exchange information and may provide advice as appropriate for consideration related to monitoring activities and operations of the plant which may have an environmental impact.
3. No participants on the Committee will be required to provide information which is of a confidential or proprietary nature.
4. The minutes of the Committee meetings will be public information.
5. The member's consideration must be made in a timely manner.
6. The decision of the Chair is final with respect to Committee matters.
7. Construction scheduling is outside the scope of this Committee.

Appendix 7: Presenters to the public meeting

Henry Barkowski, Town of Minitonas
Kevin Betcher, Louisiana-Pacific
Darren Chmelowski, United Steelworkers Local 1-324
Al Hambley, Louisiana-Pacific
Iris Jonsson, Concerned Citizens of the Valley
Maria Kent, Concerned Citizens of the Valley
Susanne McCrea, Boreal Forest Network
Michael McIntosh, Rural Municipality of Minitonas
Glen McKenzie, Town of Swan River
Kevin Neely, Swan River Chamber of Commerce
Chris Parlow, United Steelworkers Local 1-324
Ward Perchuk, Spruce Products Limited
Margaret Romak, Concerned Citizens of the Valley
Lyle Sagert, United Steelworkers Local 1-324
Ken Sigurdson, Concerned Citizens of the Valley
Chris Smith, Ducks Unlimited Canada
Dan Soprovich, Concerned Citizens of the Valley
Kevin Warkentin, Louisiana-Pacific
Murray Wenstob, Private
Grant Wicks, Swan River Chamber of Commerce

Appendix 8: Submissions to the public meeting

James Beddome, Manitoba Green Party
Dale Garnham, Manitoba Wildlife Federation
Cheryl Kennedy Courcelles, Private
Archie Kichuk, Private
Anne Lindsey, Manitoba Eco-Network
Carol Loveridge, MFL Occupational Health Centre
Peter Miller, University of Winnipeg
David Skinner, Private
Dan Soprovich, Concerned Citizens of the Valley
Kate Storey, Green Party of Canada
Barry Waito, Private
Kevin Warkentin, Louisiana-Pacific
Gaile Whelan Enns, Manitoba Wildlands
Byron Williams, Public Interest Law Centre
Jacinta Willing, Private
Concerned Citizens of the Valley

Appendix 9: CEC letter to L-P

Manitoba CLEAN·ENVIRONMENT COMMISSION

Sent by e-mail

305 – 155 Carlton Street
Winnipeg, MB R3C 3H8

Ph: 204-945-7091
Toll Free: 1-800-597-3556
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October 8, 2009

Allan Hambley
Plant Environmental Manager
Louisiana-Pacific Canada Ltd.
P.O. Box 189
Minitonas, MB R0L 1G0

Dear Mr. Hambley:

Following a review of the material that has been presented to it throughout its investigation, the Commission has concluded that it requires additional information from Louisiana-Pacific before it can formulate its recommendations and make its report to the minister. The Commission is of the view that *Guidelines for Air Dispersion Modelling in Manitoba* provide the guidance for the provision of the information that the Commission is seeking. By supplying the requested information in a manner in keeping with the guidance in this document, Louisiana-Pacific would be assisting the Commission in the completion of its investigation.

In its November 18, 2008 document, Louisiana-Pacific stated that it was following the *Guidelines for Air Dispersion Modelling in Manitoba*. However a number of the provisions of those guidelines were not addressed while in other cases Louisiana-Pacific departed from the *Guidelines*. The Commission recognizes that Louisiana-Pacific was guided by Manitoba Conservation in the decisions that were made regarding the extent to which the *Guidelines* were adhered to in the November 18 document. The Commission also recognizes that Manitoba Conservation provided this guidance in the context of its ongoing communication with Louisiana-Pacific.

Guidelines for Air Dispersion Modelling in Manitoba

The following is a section-by-section description of the Commission's concerns over the information provided to the Commission in relation to the *Guidelines for Air Dispersion Modelling in Manitoba*. At a number of points in what follows, the Commission makes specific requests for information. These requests are included to provide added clarity; overall the Commission is requesting that Louisiana-Pacific provide it with a report that conforms to the *Guidelines*.

Manitoba

Model selection

The *Guidelines* identify two different types of modelling levels: screening and refined. The Louisiana-Pacific application does not indicate which level has been undertaken in this case, or the rationale for modelling at that level. The selected model used was appropriate for refined modelling and the reasons that the province provided for its approval of Louisiana-Pacific's decision to use a single year's meteorological data made reference to a section of the *Guidelines* that apply to refined modelling. Louisiana-Pacific received provincial government approval to use ISC dispersion model, ISCST3 (Industrial Source Complex Short Term model version 3) in 2003. While the Modelling Guideline allows for the use of this model for refined assessments, no rationale was provided for the selection of the model. In addition, no discussion was provided regarding the selected model options incorporated in the modelling. In addressing this section, the Commission requests that Louisiana-Pacific make it clear which level of modelling is being undertaken and provide a rationale for the level of modelling and the selection of the model being used.

The *Guidelines* recommend that facility start-up, shutdown or upset conditions be taken into consideration in both the screening and refined models. However, there was no discussion regarding facility start-up, shutdown, or upset conditions in the November 18 document. The Commission is requesting that discussion of the effect of these conditions be provided.

Project overview

A project overview was provided in the Louisiana-Pacific documentation. However, the facility was not described as required in the *Guidelines*. For example, a topographic map, site plan including location, orientation and dimensions of buildings was not provided nor was the OSB process described in any detail.

The *Guidelines* state that the process description is intended to determine which air pollutants are released and therefore which are to be modelled. The application does not contain a discussion of released pollutants or a rationale for the pollutants to be modelled. The Commission is requesting that Louisiana-Pacific include such a discussion.

Air dispersion model inputs

EMISSION RATES

In terms of reporting the emissions rates, the *Guidelines* state:

> The emissions from each source for each pollutant must be stated as annual emissions in tonnes/year and average and maximum hourly emissions in grams/hour. The preferred source of emission rate data is site-specific source sampling. Where measured emission rates are not available, emissions may be estimated using emission rate factors. The source of these factors

> must be referenced, and the supporting quality and quality [sic] of data on which they have been based must be discussed. (Manitoba Conservation 2006b; 6)

The Louisiana-Pacific application provided no information in terms of emissions in tonnes per year or in terms of maximum hourly emissions. Most emission rates were based on the 1997 licence or the 1994 Environmental Impact Assessment rather than site-specific data. In the case of benzene from the dryer, formaldehyde, and hydrogen cyanide no referenced sources were presented. A description of potential fugitive emissions was not provided or included in the modelling.

The application does state that the benzene and formaldehyde limits in *Environment Act* Operating Licence 1900 S4:

> 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. (Louisiana-Pacific 2008; 13)

In a supplementary submission, Louisiana-Pacific stated:

> [T]he proposed new limits are based on both site-specific and industry-wide data collected over the past 15 years using the most current test methods developed specifically for the wood products industry. (Louisiana-Pacific 2009; 8-9)

However, Louisiana-Pacific has not provided sufficient rationale and documentation on the source data or the methodology it used.

In addition, the air dispersion modelling report on acetaldehyde, acrolein, methanol, PM_{10}, $PM_{2.5}$ and propionaldehyde provided no information as to the source data for the emission rates of those substances.

Given the fact that the plant has been in operation for over a decade, the Commission is requesting that site-specific data be incorporated into the development of all emission rates. Failing that, it is requesting rationales for the substitution of rates that were based on the previous licence and environmental impact assessments.

RECEPTOR GRIDS

The receptor spacing requirements outlined in the Guidelines were followed.

METEOROLOGICAL DATA

The *Guidelines* require the use of the five most recent, consecutive years of meteorological data with five concurrent years of mixing height data, including hourly

observations of wind direction and speed, temperature, cloud cover, and ceiling height for complex modelling. This requirement may be waived if one year of site-specific, hourly data that has undergone quality assurance/quality control is available. Manitoba Conservation chose to waive the requirement and use the 2006 meteorological data from the Louisiana-Pacific meteorological station. No rationale was provided for the decision to use only one year's data. Furthermore, no discussion is provided of the quality assurance/quality control process.

The Commission requests that unless an acceptable rationale is provided, that five-years of meteorological data be used to model emission rates based on site-specific data.

LAND ANALYSIS

A discussion of the surrounding land use was not provided, however, a review of the ISC-Prime output files suggest that rural dispersion coefficients were used.

TOPOGRAPHY

A description of the topography surrounding the LP Facility was not provided.

BACKGROUND AMBIENT AIR CONCENTRATIONS

In its in November 18, 2008 Louisiana-Pacific document Louisiana-Pacific stated that the "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" (9). Background contaminant concentrations were discussed in the document and were suggested to not be significant. The *Guidelines* state that:

> If a source has a potentially significant impact, background ambient air quality needs to be considered and included in air dispersion modelling results. These background concentrations must be considered in the assessment of both screening and refined models. (Manitoba Conservation 2006b; 9)

Since some of the substances may have a potentially significant impact, background concentrations should be considered. Monitoring data should be analyzed based on wind direction to develop background contaminant concentrations and as required in the Guidelines "be shown to meet the quality assurance criteria of representativeness, completeness, precision and accuracy" (Manitoba Conservation 2006b; 9). The Commission requests that where modelling indicates that the level of an emitted substance approaches ambient air quality criteria, background levels be included in air dispersion modelling.

GOOD ENGINEERING PRACTICE

Building heights and configurations were not provided nor was there a discussion of GEP Stack Heights.

Assessment of Air Quality Modelling Results

ENVIRONMENTAL ASSESSMENT

Manitoba lacks ambient air quality criteria for acetaldehyde, acrolein, benzene, methanol, and propionaldehyde, all VOCs whose emissions are associated with OSB production. Louisiana-Pacific used a wide range of criteria to assess the ground-level concentrations of these substances. However, it did not provide rationales for the selection of these criteria. The Commission is requesting that Louisiana-Pacific provide full rationales for the selection of such criteria.

HEALTH RISK ASSESSMENT

The health risk analysis provided was not a stand-alone report, but a communication from a research institute to Louisiana-Pacific that was then incorporated into the supporting documentation to the application. It lacked rationales and detailed references. The Commission is requesting that the health risk assessment include a description of the applicable pathways and rationale for the selection of the pathways and choice of standards by which the risks are assessed, and be fully referenced to allow peer review.

DOCUMENTATION

The *Guidelines* require sufficient detail to allow Manitoba Conservation to verify the results. Manitoba Conservation has concluded that the application provided it with sufficient detail to analyze the proposal. As noted above, this may reflect the ongoing level of discussion that took place between Louisiana-Pacific and Manitoba Conservation prior to the filing of the application. As the above comments indicate, the Commission is requesting greater detail and discussion. The Commission notes that since the Swan Valley OSB Plant had been in operation for over a decade at the time of the application, some topics set out in the *Guidelines* would have limited applicability. In such cases, the Commission is requesting is that a rationale be provided if certain issues are not going to be addressed.

Conclusion

To allow the Commission to complete its investigation and make recommendations with confidence, we are requesting Louisiana-Pacific to provide a stand-alone report on air dispersion modelling (including a health risk assessment) that contains all the relevant information, rationales, discussions of uncertainty, assumptions, models, and citations needed to assess the application and appropriately referenced be provided to the Commission.

Louisiana-Pacific. 2008. *Request to Amend Manitoba Environment Act Licence 1900 S4 Emission Limits for Pressing and Drying Operations.* November 18. 2008.

Louisiana-Pacific to Edwin Yee, Manitoba Clean Environment Commission. September 1, 2009.Manitoba Conservation. 2006a. *Air Quality Management Strategy* (draft).

Manitoba Conservation. 2006b. *Guidelines for Air Dispersion Modelling in Manitoba* (draft).

We look forward to your forthcoming response.

Sincerely,

Edwin Yee
Chair

cc: Ken Gibbons
Ken Wait
Patricia MacKay

Appendix 10: Olsson table comparing GLCs to AAQC

Summary of Applied Ambient Air Quality Criteria (AAQC) and Modelled Emissions								
Chemical	**Manitoba AAQC?**	**MB 1-hr avg (ug/m3)**	**MB 24-hr avg (ug/m3)**	**MB annual avg (ug/m3)**	**ON 10-min avg (ug/m3)**	**ON 1-hr avg (ug/m3)**	**ON 24-hr avg (ug/m3)**	**ON annual avg (ug/m3)**
Formaldehyde								
AAQC	Y	60						
Max GLC		58.452						
Max GLC (key receptor)		23.562						
HCN								
AAQC	Y	40		3				
Max GLC		3.873		0.045				
Max GLC (key receptor)		1.664		0.023				
MDI								
AAQC	Y	3		0.5				
Max GLC		1.895		0.088				
Max GLC (key receptor)		0.964		0.013				
NO2								
AAQC	Y	400	200	100				
Max GLC		147.78	64.478	8.536				
Max GLC (key receptor)		62.207	13.456	0.99				
Phenol								
AAQC	Y	63						
Max GLC		38.546						
Max GLC (key receptor)		24.3						
PM								
AAQC	Y		120	70				
Max GLC			39.679	6.638				
Max GLC (key receptor)			11.04	0.857				
PM10								
AAQC	Y		50					
Max GLC			44.88					
Max GLC (key receptor)			21.736					
PM2.5								
AAQC	Y		30*					
Max GLC			22.26					
Max GLC (key receptor)			6.9					
Benzene								
AAQC	N						2.3	0.45
Max GLC							0.592	0.036
Max GLC (key receptor)							0.173	0.013
Acetaldehyde								
AAQC	N						500	
Max GLC							2.808	
Max GLC (key receptor)							0.811	
Acrolein								
AAQC	N					4.5	0.4	
Max GLC						2.699	0.832	
Max GLC (key receptor)						1.161	0.232	
Methanol								
AAQC	N						4000	
Max GLC							18.66	
Max GLC (key receptor)							5.061	
Propionaldehyde								
AAQC	N				10			
Max GLC					3.98**			
Max GLC (key receptor)					1.71**			
Total VOCs* **								
AAQC	N							
Max GLC								
Max GLC (key receptor)								

* 98th %-ile averaged over 3 years, while model results presented are the maximum GLC (100th %-ile)
** 1-hr model output converted to 10-min value based on Ontario MOE procedures for comparison to AAQC
*** There is no applicable AAQC for total VOCs. These are included in the table for completeness only.

Appendix 11: Glossary

acetaldehyde: a volatile organic compound that is commonplace in the environment. It can be formed though incomplete wood combustion in fireplaces and woodstoves, coffee roasting, burning of tobacco, vehicle exhaust fumes, and coal refining and waste processing.

acrolein: a volatile organic compound used in the manufacture of acrylic acid.

ambient air quality criteria: time-averaged ground-level ambient air concentrations at which adverse health and environmental effects are not expected.

benzene: an aromatic hydrocarbon (a sweetly scented compound of hydrogen and carbon) and volatile organic compound.

biofilters: a pollution control technology that uses natural material and micro-organisms to decompose organic compounds and remove pollutants.

Canada-wide Standards (CWS): intergovernmental agreements developed under the Canadian Council of Ministers of the Environment (CCME) Canada-wide Environmental Standards Sub-Agreement. They can include qualitative or quantitative standards, guidelines, objectives and criteria for protecting the environment and reducing risks to human health.

carbon monoxide (CO): A colourless, odourless, poisonous gas formed during the incomplete combustion of fossil fuels or the incomplete oxidation of carbon to carbon dioxide.

cyclone collector: In a cyclone collector, centrifugal force drives larger, denser particles to the sides of a conical-shaped filter. The particles drop to the bottom, while the gas rises to the top.

diphenyl methane diisocyanate: (Diphenyl methane diisocyanate (methane diphenyl diisocyanate or MDI) the generic name of an organic chemical compound used in industrial settings synthesized for a variety of industrial

purposes, including the manufacture of resins used in the manufacture of OSB.

formaldehyde: an organic chemical compound that can be formed by the combustion of organic materials.

greenhouse gases: gases that trap heat in the earth's lower atmosphere. The major greenhouse gases are carbon dioxide, methane, and surface level ozone while the lesser gases are nitrous oxides and fluorinated gases such as hexafluoride, hydrofluorocarbons (HFCs), and perfluorocarbons (PFCs). For comparison, greenhouse-gas loads are often reported as carbon dioxide equivalents.

ground-level ozone: created by the reaction of volatile organic compounds with nitrogen oxides.

hazardous air pollutants [HAP]: a U.S. Environmental Protection Agency category representing those pollutants that cause or may cause cancer or other serious health effects, such as reproductive effects or birth defects, or adverse environmental and ecological effects.

hydrogen cyanide: a volatile colourless compound is used in a variety of industrial processes

methanol: a volatile organic compound that occurs naturally in wood.

micrometre: one millionth of a metre (formerly referred to as microns)

national ambient air quality objectives (NAAQOs): benchmarks against which the government of Canada assesses the impact of human activities on air quality.

nitrogen oxide: (NO_x or oxides of nitrogen): a group of highly reactive gases that includes nitrogen dioxide (NO_2), nitrous, and nitric oxides .

oriented strand board (OSB): an engineered wood product, typically made from aspen, southern yellow pine, or mixed hardwoods.

oxidation: a chemical reaction resulting in a pollution control process in which contaminants react with oxygen at a high temperature in a controlled environment, thereby reducing them to carbon dioxide and water.

particulate matter (PM): airborne solid and liquid particles (other than pure water) that range in size from .005 micrometres to 100 micrometres in diameter

particulate $matter_{10}$ (PM_{10}): particulate matter that is 10 micrometres or less in diameter.

particulate $matter_{2.5}$ ($PM_{2.5}$): particulate matter that is 2.5 micrometres or less in diameter. ($PM_{2.5}$ is a subset of PM_{10}).

phenol: a volatile organic compound produced naturally from the decomposition of organic matter and manufactured from coal, wood tar, or benzene and is and used in the manufacture of synthetic resins.

proprionaldehyde: an organic compound that can be produced from the combustion of wood.

regenerative catalytic oxidizers (RCOs): a pollution control technology that uses a metal or metal-coated catalyst, allowing for the oxidation of VOCs at in-take temperatures considerable lower that those required by RTOs.

regenerative thermal oxidizers (RTOs): a pollution control technology that uses an energy recovery system to oxidize volatile organic compounds at very high temperatures. The most common fuel source for RTOs is natural gas.

standard cubic feet per minute (SCFM) (the number of cubic feet of air that pass by a stationary point in one minute under standard conditions of temperature, pressure, and humidity,

total particulate matter (TPM): particulate matter with a diameter less than 100 microns

volatile organic compounds (VOCs): organic chemical compounds that evaporate readily and are usually gases at room temperature.

wet electrostatic precipitators (WESPs or E-tubes—a brand name): Pollution control devise that removes particulate matter from a gaseous waste stream by subjecting it to a strong electrical field generated by electrodes. A spray of liquid is used to remove particles.

wood fines: in the OSB process these are strands of wood too small to be used in the manufacture of strand board.