FINAL REPORT

**Technical Peer Review and Overall Opinion,
Request to Amend Air Emission Limits,
Louisiana-Pacific Canada Swan Valley OSB Plant
Minitonas, Manitoba**

Project Number: 0940873 **September 10, 2009**

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1. INTRODUCTION

David Chadder of RWDI AIR Inc. was retained by the Manitoba Public Interest Law Centre to conduct a peer review of a number of documents produced by Louisiana-Pacific Canada (LP Canada) in support of their request to amend their air emission limits at their Swan Valley OSB Plant and provide an expert opinion with respect to their technical merit from an air quality standpoint. Several documents were reviewed and relied upon to provide a professional opinion including the following main documents:

- American Industrial Hygiene Association. Odor Thresholds for Chemicals with Established Occupational Health Standards. 1989.
- Clean Environment Commission. LP Air Emissions Review Transcript, CEC Hearing. Reid Reporting Services. July 28, 2009.
- Interpoll Laboratories Inc. Results of the May 16-18, 2006 Air Emission Engineering Testing at the Louisiana Pacific OSB Plant in Minitonas, Manitoba. Report No. 6-22964. July 6, 2006.
- Louisiana–Pacific Canada Ltd. *Request to Amend Manitoba Environment Act License 1900 S4 Emission Limits for Pressing and Drying Operations and Appendix A, Dispersion Modeling Results:* Louisiana Pacific. November 18, 2008.
- Louisiana–Pacific Canada Ltd. Swan Valley OSB (Power Point) Presentation to Clean Environment Commission, July 28, 2009.
- Manitoba Conservation. *Draft Guidelines for Air Dispersion Modelling in Manitoba*. Report Number 2006-0x. November 2006.
- Manitoba Conservation. Environment Act License 2861. Issued by Manitoba Conservation to Louisiana –Pacific Canada Ltd. January 8, 2009.
- Olsson Associates. *Swan Valley Oriented Strand Board (OSB) Modelling Project, Dispersion Modelling Analysis, Minitonas, Manitoba, Canada.* June 22, 2009.
- Sentar Consultants. *Environmental Impact Assessment, Louisiana Pacific Oriented Strand Board Plant, Minitonas, Manitoba*. May 6, 1994.

Other documents in the form of letters and an internal memo were reviewed as well including:

- Letter from Mr. Kevin Warkentin, Louisiana –Pacific Canada Ltd. to Mr. Edwin Yee, Manitoba Clean Environment Commission. August 19, 2009.
- Letter from Mr. Kevin Warkentin, Louisiana –Pacific Canada Ltd. to Mr. Edwin Yee, Manitoba Clean Environment Commission. September 1, 2009.
- Manitoba Environment. Internal Memorandum from Ms. Jean Van Dusen to D. Peterson, October 31, 1994.

A copy of the curriculum vitae for Mr David Chadder is attached as Appendix A. A biography for his qualifications is provided in the following summary.

1.1 Reviewer Biography

David Chadder is a Vice-President, Western Operations and Project Director at RWDI AIR Inc. with experience in environmental consulting dating back to 1978. His area of specialty as Project Director involves the technical supervision of engineering teams involved with air quality, hazard and risk assessments, stack emissions testing and ambient air quality monitoring studies. Recently, he has supervised engineering teams that have provided air quality, odour, noise and vibration assessments, air emission audits, facility approvals and impact assessments over a broad range of applications. These have included pulp and paper facilities, continuous, emergency and intermittent flaring, sour gas handling and compression facilities, sour gas well test, SAGD and oil sands extraction, municipal and hazardous waste landfills, composting facilities, pipeline transmission, roadways, airports, hospitals, universities, and power generation plants. He is a member emeritus of the Air and Waste Management Association (AWMA) and the Canadian Meteorological and Oceanographic Society (CMOS). David is accredited as a Qualified Environmental Professional (QEP) and is recognized by the ERCB as an expert witness in air quality, hazard and risk.

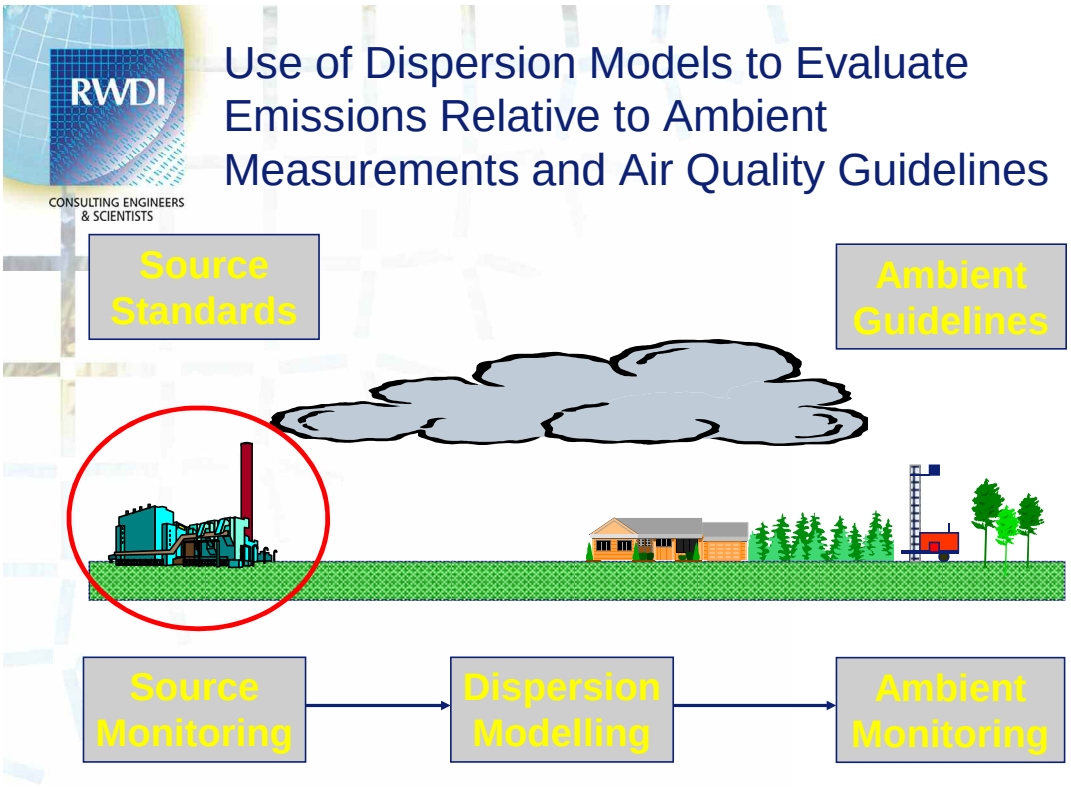
2. GENERAL COMMENTS

My comments and areas of concern with respect to the documents prepared by LP Canada can be summarised as follows, the documentation provided is incomplete and does not represent an acceptable level of technical information with which to make an informed decision. LP Canada has ignored many of the essential elements for submission requirements that are typically required for a proper engineering assessment. As such, an informed opinion for item 1 of the CEC Terms of Reference as outlined by the Minister of the Environment in his letter dated March 28, 2009, which stipulates "… regarding the potential health and environmental effects of the increased emission limits…" cannot be addressed from the information provided.

Specifically, detailed comments are provided for the following main subject areas: meeting minimum industry submission standards, quantifying air emissions, ambient air quality monitoring measurements and potential nuisance odours.

2.1 Overview of Modelling Process

The relationship between emission sources, dispersion models and ambient monitoring and ambient guidelines is shown in the figure below. Simply expressed, the physical stack parameters and contaminant emission rates are used in the dispersion model with hourly meteorological observations to predict downwind concentrations. These resultant concentrations are expressed in terms of $\mu g/m^3$, or micrograms of mass (one millionth or 10^{-6}) per cubic meter or air. These predicted concentrations should be added to measured background contaminant levels to calculate the complete ambient concentration burden.



2.2 Meeting Minimum Industry Submission Standards

In 2006 Manitoba Conservation created a draft document entitled Guidelines for Air Dispersion Modelling in Manitoba (Manitoba Conservation, 2006). As noted in the Forward, "this document reflects the expectation of Manitoba Conservation for the preparation and submission of air dispersion modelling projects…provide a level playing field for developments and to allow an expeditious and consistent evaluation…the following guidelines should be followed, wherever possible." Although this document remains a draft document, it outlines significant submission requirements and provides appropriate justification for meeting these requirements. Many of the Manitoba requirements are consistent with other air dispersion modelling requirements that have been formalised by provincial jurisdictions such as British Columbia, Alberta and Ontario and their associated Environment Ministries.

Among other considerations and requirements, the Manitoba Conservation dispersion modelling guideline requires the inclusion of fugitive emissions, providing a composition for any

pollutants emitted, determination of GEP stack height, use of recent stack sampling measurements to calculate emission rates, applying proper QA/QC treatment of site specific meteorological data, inclusion of background ambient air quality monitoring results or alternatively, modelling of regional sources in the model and use of ambient air quality criteria from other jurisdictions, if a contaminant of interest is not listed within the Manitoba Ambient Air Quality Criteria. As such, these submission requirements represent a minimum level of effort to properly detail the air quality impacts in a consistent manner. LP Canada has not adequately addressed these submission details in their air quality modelling reports.

In summary, LP Canada may not legally bound to follow this draft guideline at this time; however, there are compelling reasons to abide by its requirements at this time since they represent minimum industry standards in many provincial jurisdictions and address many of the concerns of this reviewer.

2.3 Quantifying Air Emissions

One of the important parameters in a dispersion model is the emission rate. An emission rate is the amount of mass of pollutant in grams that is continuously discharged into the atmosphere per unit time of seconds, based on maximum normal plant operating conditions. For a single point emission source used in a Gaussian model like ISC-PRIME, the predicted maximum 1-hour concentration will be in direct proportion to the emission rate. For example, a ten-fold increase in the emission rate will result in a ten-fold increase for the maximum predicted 1-hour concentration. Therefore, the emission rates used in the LP model must be accurate and representative of a maximum plant operating scenario. Our comments and concerns are as follows:

- LP is requesting a total VOC emission limit of 20.96 g/s. Table 2 of their model inputs (LP Canada, 2008) indicates that the sum of the listed VOC species such as benzene and formaldehyde is about 7.2 g/s or about 35% of the requested total VOC emission. In other words, about 65% of the VOC emissions have not been characterised, accounted for in the emission inventory, modelled in ISC-PRIME, evaluated for compliance, nuisance odour potential or investigated in the human health risk. In response to a letter from the CEC (August 10, 2009), LP Canada (August 19, 2009) failed to properly answer

questions (g), (h) and (i) from the CEC. A report was prepared by Olsson (Olsson Associates, 2009) which modelled emissions of additional contaminants including acrolein, acetaldehyde, methanol and propionaldehyde. These contaminants are VOC's so they would form part of the 20.96 g/s emission rate. Inclusion of these four contaminants accounts for about 50% of the requested total VOC emission limit. Within the two modelling reports (LP Canada, 2008; Olsson, 2009), background ambient air quality levels of these contaminants were not accounted for in the total concentration levels nor was any attempt made to evaluate these modelled predictions with respect to ambient air quality criteria from outside jurisdictions such as Ontario Ministry of the Environment which is contrary to Section V (1) of the Draft Guidelines for Air Dispersion Modelling in Manitoba (Manitoba Conservation, 2006). The concern is that, based on the requested VOC emission limit from LP Canada, additional contaminants of interest have been overlooked and as such, the air quality impacts are understated. This major discrepancy in reporting emissions is contrary to Section 3 of the Draft Guidelines for Air Dispersion Modelling in Manitoba (Manitoba Conservation, 2006) which requires that the composition of any contaminants being emitted, be reported to Manitoba Conservation.

- Section 3 of the Draft Guidelines for Air Dispersion Modelling in Manitoba (2006) requires: "As a minimum, the proponent is to provide information related to the following: … all sources of air emissions, whether they are directly emitted through stacks or vents or indirectly released as fugitive sources." In their report LP Canada (LP Canada, 2009) acknowledged that fugitive sources and sources without emission limits were not included in the model." In their testimony, LP Canada indicated that measureable levels of formaldehyde were present in the press area. Exhaust fans in the area and open doors and windows will vent formaldehyde and other VOC's as fugitive emissions. This is important because any benefit of plume rise and additional atmospheric dispersion from an elevated point source stack will be lost. As noted in their letter to the CEC (August 19, 2009), LP Canada indicated that maximum 1-h and 24-h concentrations from the point stack sources are predicted to occur during evening hours between midnight and 7 am. Inclusion of fugitive emissions in these modelled impacts will result in higher ambient contaminant levels than were reported by LP Canada and a greater potential for off-site nuisance odour complaints, particularly at night.

- Section 4(1) of the Draft Guidelines for Air Dispersion Modelling in Manitoba (Manitoba Conservation, 2006) states that the preferred source of emission rate data is site specific stack sampling. LP Canada has used emission rates in their updated report (LP Canada, 2008) based on their current license emission limits. Stack testing surveys at the plant have been conducted and some of these results have indicated higher than expected emission rates. For example, Interpoll Report No. 6-22964, "Results of the May 16-18, 2006 Air Emission Engineering Testing at the Louisiana-Pacific OSB Plant in Minitonas, Manitoba" indicated levels that are higher than were modelled by Olsson. Examples include acetaldehyde, acrolein and methanol where the 2006 Interpoll stack testing results indicated emission rates of 1.85, 0.76 and 4.35 g/s, respectively, for press and driers compared to the lower emission rates of 0.52, 0.14 and 2.46 g/s for the same three contaminants that were used with ISC-PRIME in the Olsson report (Olsson, 2009). Section 4(1) of the Draft Guidelines for Air Dispersion Modelling in Manitoba (Manitoba Conservation, 2006) also states that "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…As a minimum, operating conditions of 100% design load and as well as those that will generate the maximum concentration impact must be modelled."

2.4 Ambient Air Quality Monitoring Measurements

Suitable sites for the two ambient air quality stations were identified and discussed in an internal Manitoba Environment memorandum (dated October 31, 1994) and a copy is provided in Appendix B. Consideration was given to three locations based on stated criteria of addressing peak off-site contaminant concentrations (south of plant on Duck Mountain), prevailing winds (northeast of the plant) and local population (west of the plant). Station LP1 is located 1.5 km north-northeast of the plant and Station LP2 is located 2 km west of the plant. The memo notes that, due to its distance from the plant and the very low frequency of easterly winds, LP2 would provide a background location representative of upwind conditions even during plant operation. Manitoba Environment (now Manitoba Conservation) approved these two final sites.

- LP has indicated that the ambient monitoring results to date are consistently below the Manitoba AAQC. This is not surprising since LP2 has been identified as an upwind

background station and LP1 is sited north-northeast of the plant, which would be expected to encounter LP Canada emissions about 5% of the time (Sentar, 1994). These facts are at odds with the assertion by LP Canada in the recent CEC Hearing (CEC, 2009) that the stations were sited based on prevailing winds. Prevailing winds originate from the southwest through the west, not the south-southwest. Neither monitoring location reflects prevailing winds or maximum peak contaminant concentrations, which were two of the criteria identified by Manitoba Environment (memo dated October 31, 1994). As such, these data are more suitable for establishing regional background levels than LP Canada plant impact levels. They do not properly evaluate the impact of plant emissions at the point of plume impingement or maximum concentrations at grade.

- Because Station LP2 is considered to be an upwind background station reading, the measured results should be added to the modelled predictions. LP Canada did not account for any background values in their modelling reports (LP Canada, 2008; Olsson, 2009). For example, the LP Canada slide presentation to the CEC (LP Canada, 2009) showed measured 1-hour ambient formaldehyde concentrations from the quarterly survey dates. A 1-hour average formaldehyde level of about 4 $\mu g/m^3$ can be seen. When added to the predicted 1-hour level of 56.9 $\mu g/m^3$, the resultant concentration would be about 61 $\mu g/m^3$, which exceeds the interim AAQC of 60 $\mu g/m^3$. In the CEC Hearing, LP Canada indicated that the higher measured ambient levels of formaldehyde are due to regional sources, such as stubble burning (CEC, 2009). To provide a proper assessment of the cumulative effects from all emission sources, the ambient background must be accounted for all contaminants of interest not just those included in the Manitoba Ambient Air Quality Criteria.

- Section 6 of the Draft Guidelines for Air Dispersion Modelling in Manitoba (Manitoba Conservation, 2006) states that: "if a source has a potentially significant impact, background ambient air quality also needs to be considered and included in the air dispersion modelling results. The background air concentrations …may be due to either natural or other man-made sources in the area." LP did not account for the background contaminants in their modelling report (LP Canada, 2008) yet use explanations such as regional burning stubble to justify measured elevated levels of formaldehyde.

The predicted impacts are understated as reported by LP Canada without a proper inclusion of the background ambient levels for all of the contaminants of interest.

2.5 Potential Odour Impacts

Many of the contaminants handled in the LP plant and discharged to atmosphere have published odour detection and annoyance thresholds. For example, AIHA (1997) has published odour detection thresholds as low as 33.1 µg/m^3 for formaldehyde and 17.3 µg/m^3 for phenol. Published odour detection levels are based on a normal person's sense of smell. The published odour detection levels can vary broadly. An individual's sense of smell will also vary broadly. For example, some people can detect odours at levels lower than others.

In my 30-years of consulting experience, it is common for the public to consider nuisance odours to be hazardous and cause negative health effects, which qualifies to be part of item 1 of the CEC Terms of Reference as outlined by the Minister of the Environment in his letter dated March 28, 2009. As well, nuisance odours can cause loss of personal enjoyment of a residence. Comments with respect to the potential for nuisance odour issues are provided below:

- Typically, predicted concentrations are adjusted to 3-min averages to allow for odour threshold comparison which yields higher predicted levels. Using the unadjusted results from LP Canada (LP Canada, 2008), the maximum predicted 1-hour concentrations for formaldehyde and phenol were 56.8 and 38.5 µg/m^3, both of which exceed the odour detection thresholds noted above;
- The potential exists for odour complaints to occur in the near field (within a few hundred meters of the plant) from plant fugitive emission sources as noted earlier and which were not accounted for in the emission inventory or ISC-PRIME dispersion modelling;
- This point source and fugitive source emissions indicate the potential for off-site nuisance odour complaints, which is contrary to Condition 45 of the existing LP License (Manitoba Conservation, 2009); and
- Currently, LP Canada is not required by their License to communicate any odour complaints to Manitoba Conservation. While Manitoba Conservation has no odour complaints on record for LP Swan Valley, LP Canada could potentially be accumulating

complaints that the regulator is simply unaware of. Any amended license issued by Manitoba Conservation should rectify this deficiency by imposing an obligation to communicate any complaints.

3. SUMMARY / CONCLUSIONS

My overall general comments are that the air quality impacts have not been properly documented or accounted for by LP Canada. Specifically, LP Canada has failed to:

- meet the minimum industry submission requirements and/or those detailed in the Manitoba Conservation Draft Guidelines for Air Dispersion Modelling in Manitoba;
- account for all of the hazardous contaminants of interest in their normal maximum plant emissions;
- include all types of emissions sources such as fugitives in their dispersion modelling;
- complete a cumulative impact assessment that properly accounts for and includes background ambient measurements in their predictions; and
- consider potential nuisance odour impacts from the emitted contaminants.

4. REFERENCES

Reports Cited

American Industrial Hygiene Association. Odor Thresholds for Chemicals with Established Occupational Health Standards. 1989.

Clean Environment Commission. LP Air Emissions Review Transcript, CEC Hearing. Reid Reporting Services. July 28, 2009.

Interpoll. Results of the May 16-18, 2006 Air Emission Engineering Testing at the Louisiana Pacific OSB Plant in Minitonas, Manitoba. Report No. 6-22964.

Louisiana–Pacific Canada Ltd. Request to Amend Manitoba Environment Act License 1900 S4 Emission Limits for Pressing and Drying Operations and Appendix A, Dispersion Modeling Results: Louisiana Pacific. November 18, 2008.

Louisiana–Pacific Canada Ltd. Swan Valley OSB Presentation to Clean Environment Commission, July 28, 2009.

Manitoba Conservation. Draft Guidelines for Air Dispersion Modelling in Manitoba. Report Number 2006-0x. November 2006.

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Sentar Consultants. Environmental Impact Assessment, Louisiana Pacific Oriented Strand Board Plant, Minitonas, Manitoba, May 6, 1994.

Letters and Memos Cited

Letter from Mr. Kevin Warkentin, Louisiana –Pacific Canada Ltd. to Mr. Edwin Yee, Manitoba Clean Environment Commission. August 19, 2009.

Letter from Mr. Kevin Warkentin, Louisiana –Pacific Canada Ltd. to Mr. Edwin Yee, Manitoba Clean Environment Commission. September 1, 2009.

Manitoba Environment. Internal Memorandum from Ms. Jean Van Dusen to D. Peterson, October 31, 1994.