Toxikos Reply to DEWR request for additional information – TC190707-J

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Toxikos Comment TC190707-J

Query

"It would be desirable to identify as many results from other pulp mills as possible which show the dioxin effluent levels and sediment levels monitored over many years. Those examples which use comparable technologies to the proposed mill and have similar or more demanding receiving environments would be the most useful.

We would appreciate the following information in regard to the latest submitted information (British Columbia Coast and Marine Environment Project: 2005):

- *the technology used by each pulp mill,*
- *the tonnes of wood processed per year,*
- *the sample experimental description (procedures if is possible),*
- *the exact number of samples collected per year for each site,*
- *the exact location of the sediment sample collection site (relative to the effluent release),*
- *the hydrodynamic conditions of the release environments (eg. daily flushing, etc.)."*

At the meeting held on the 9th July 2007 Dr Drew requested clarification of the above question. We have not received any clarification to-date however we have collated available information on easily interpretable questions. No information was located on the hydrodynamic conditions of the release environments.

Reply

In our report titled "Response on submission citing dioxin calculation concerns" Toxikos provided summary figures on the average discharge level from British Columbia pulp mills and the corresponding decrease in the hepatopancreas of the Dungeness crab. (Toxikos reference number TR170607-RJF). Information on the British Columbia mills described in our report is provided in Table 1 and 2. Sampling methods for assessing dioxins in effluent, sediment and biota is also described. The detailed protocol for dioxin sampling is provided as an attachment. The data presented in this response was primarily obtained from the following four references:

1. BCMOE (2005). British Columbia Coast and Marine Environment Project: 2005, Industrial Contaminants. Strategic Policy Division, Ministry of Environment., Government of British Columbia. http://www.env.gov.bc.ca/soe/bcce/02_industrial_contaminants/technical_paper/industrial_contaminants.pdf (Accessed on June 4th, 2007).

2. Carey, J., Hall, E., and McCubbin, N. (2002). Review of scientific basis for AOX effluent standard in British Columbia. Prepared for the Minister of Water, Land and Air

Protection in British Columbia. This report is attached as it is no longer available over the internet.

3. Environment Canada (2005). Pulp and Paper - Data Enquires. The National Environmental Effects Monitoring Office. Environment Canada. http://www.ec.gc.ca/EEM/English/PulpPaper/Data/Default.cfm The Canadian Government requires that all biological monitoring data and sublethal toxicity testing data collected under the pulp and paper EEM program be submitted in an electronic format to Environment Canada. This data is provided at the above URL.

4. The Canadian National Pollutant Release Inventory – National Pollutant Release Inventory, 2005 Facility Information. http://www.ec.gc.ca/pdb/querysite/facility_information_e.cfm . As in Australia all companies are required to provide information on their discharges to the Canadian Government and this information is publicly available.

The Environmental Effects Monitoring (EEM) program was established as a requirement of the Canadian *1992 Pulp and Paper Effluent Regulations*. Under these regulations the pulp and paper industries are required to conduct receiving environment studies to determine what effect the effluent has on the aquatic ecosystem. Studies are carried out in 3-6 year cycles, depending on the results of the studies, and 3 cycles of monitoring and reporting were completed between 1992 and the program is ongoing. An EEM is an assessment of the effluent effects on fish, fish habitat, and fishery resources and consists of biological, effluent and water quality monitoring. The data collected under the EEM program must be submitted electronically to Environment Canada and are stored in the National EEM Database for Pulp and Paper (Environment Canada 2005).

Methodology and Data

Detailed protocols and procedures for sampling and analysis conducted as part of the pulp mill Environmental Effects Monitoring Program are described in Environment Canada (2005a) which is attached and can also be obtained by request from Environment Canada via http://www.ec.gc.ca/eem/english/PulpPaper/Guidance/default.cfm

The sampling methodology for dioxins is described in BCMOE (2005):

Data for this indicator were collected under two federal programs:

> The Pulp and Paper Mill Effluent Chlorinated Dioxins and Furans Regulations (1992), of the Canadian Environmental Protection Act. The regulations prohibited the release of 2,3,7,8-TCDD in pulp and paper mill effluents above 15 parts per quadrillion (ppq) and of 2,3,7,8-TCDF above 50 ppq by 1 January 1994.
>
> The Coastal Mills Dioxin and Furan Trend Monitoring Program. This federal program requires mills on the BC coast to monitor dioxins and furans in the environment around their effluent outfalls. Environment Canada specifies the sampling locations, species, and numbers of samples to be collected annually. Data are reviewed by Health Canada, which conducts a human health risk assessment for consumption of Dungeness crab. Fisheries and Oceans Canada reviews the data and health risk assessment to evaluate the need for fisheries closures and advisories.

Sampling Methods (BCMOE 2005)

Mill effluent: Under the Pulp and Paper Mills Chlorinated Dioxins and Furans Regulations, mill operators are required to collect 24-hour composite samples of their final effluent and determine the concentrations of all toxic congeners of dioxins and furans. Data for this indicator came from samples collected at least once a year, more frequently if the mill found a measurable concentration of dioxins or furans. Samples were analyzed with high-resolution gas chromatography/high-resolution mass spectrometry for 27 different dioxin and furan congeners (Environment Canada 1992).

In 1991, nine pulp and paper mills discharged secondary-treated effluent to BC's coastal waters and were included in the monitoring program. Since then, some mills have closed and others have switched to bleaching technology that does not use elemental chlorine. By 2002, six mills and by 2004 only three mills required annual monitoring.

Sediment: Three sediment samples were taken annually at the same location close to each mill outfall. A composite of the top 2 cm of the three samples was analyzed similarly to the mill effluent. TEQs were derived using internationally accepted procedures (see text box: Toxic Equivalents).

Crab tissue: Adult Dungeness crabs (*Cancer magister*) concentrate POPs in their fat-rich digestive gland (hepatopancreas). This was chosen as an indicator species because the crabs do not move large distances and can therefore be used to indicate local levels of contamination. They have a relatively long life span and are widely distributed, preferring sandy-bottomed waters where contaminated sediments often accumulate. The crabs are also economically important because they are fished commercially and recreationally.

Dungeness crabs collected for analysis were legal-sized males (minimum carapace width, 165 mm). They were collected from sites near mill outfalls, usually in March. The hepatopancreas samples of up to seven crabs collected near each mill outfall were combined into a single sample. Dioxin and furan analyses were conducted using ultra-trace high-resolution gas chromatography/high-resolution mass spectrometry. TEQs were derived using the internationally accepted procedure (Van den Berg et al. 1998).

Data supporting escription of British Columbia Pulp Mills

Table 1 - Physical Characteristics

Mill	Location [1]	Year Built [2]	Process / Bleaching Technique [2]	Pulp Production (t/d)	Bleach Production (t/d)	Effluent Flow (m^3/day)	Dioxin Release (2002-2005) [2]
Crofton	Lat: 48.875 Long: -123.645	1957	Kraft ECF	1,889	994	160,717	Reported as zero
Elk Falls	Lat: 50.074 Long: -125.283 (Campbell River)	1956	Kraft, TMP ECF	2,326 (Based on yearly figures) [2]	No data	204,800	0.001 g/day (2005 estimate)
Gold River	(Gold River)	Built 1960's Closed 1999	N/A	N/A	N/A	N/A	N/A
Harmac	Lat: 49.137 Long: -123.856 (Nanaimo)	1950	Kraft ECF	1,062	1,062	131,472	Reported as zero
Port Alberni	Lat: 49.250 Long: -124.809	1947	TMP Peroxide	890 (Based on yearly figures) [2]	No data	180,000 (permit level) [2]	Reported as zero
Port Mellon	Lat: 49.524 Long: -123.484	1947	TMP Peroxide	1,484 (Based on yearly figures) [2]	1,046	78,800	Reported as zero
Powell River	Lat: 49.873 Long: -124.552	1912	TMP Kraft, ECF	1,220	No data	245,000 (permit level) [2]	Reported as zero (2005)
Squamish	Lat: 49.667 Long: -123.250	1918	Kraft ECF	744	744	66,616	Reported as zero (2005)

ECF = Elemental Chlorine Free TMP = Thermo-mechanical N/A = Not applicable

All data, except where specifically indicated, is taken form Carey et al (2002). Data taken from this report are based on 1999 averages reported to the Minister of Water, Land and Air Protection in British Columbia (BCMWLAP).

[1] NPRI – National Pollutant Release Inventory, 2005 Facility Information. http://www.ec.gc.ca/pdb/querysite/facility_information_e.cfm

[2] RFU (date unknown) - Reach for Unbleached Foundation, BC Mill Tour. http://www.rfu.org/cacw/BC%20Mill%20Tour2.htm

Data for British Columbia Mills

Primary information on the number of samples and exact location of sampling is difficult to provide without further clarification of the request. The Canadian Government requires that all biological monitoring data and sublethal toxicity testing data collected under the pulp and paper EEM program be submitted in an electronic format to Environment Canada. Table 2 provides the URL for the location of the EEM data for each British Columbia mill. The data is contained in Excel spreadsheets and includes all data collected in the three cycles of EEM between 1992 and 2006.

Table 2 – EEM data for British Columbia Mills

Mill	Location [1]	URL for primary data
Crofton	Lat: 48.875 Long: -123.645	http://www.ec.gc.ca/eem/English/PulpPaper/data/showinfo.cfm?Mill_id=PP1119
Elk Falls	Lat: 50.074 Long: -125.283 (Campbell River)	http://www.ec.gc.ca/eem/English/PulpPaper/data/showinfo.cfm?Mill_id=PP1122
Gold River	(Gold River)	Not available due to mill closure.
Harmac	Lat: 49.137 Long: -123.856 (Nanaimo)	http://www.ec.gc.ca/eem/English/PulpPaper/data/showinfo.cfm?Mill_id=PP1150
Port Alberni	Lat: 49.250 Long: -124.809	http://www.ec.gc.ca/eem/English/PulpPaper/data/showinfo.cfm?Mill_id=PP1052
Port Mellon	Lat: 49.524 Long: -123.484	http://www.ec.gc.ca/eem/English/PulpPaper/data/showinfo.cfm?Mill_id=PP1067
Powell River	Lat: 49.873 Long: -124.552	http://www.ec.gc.ca/eem/English/PulpPaper/data/showinfo.cfm?Mill_id=PP1053
Squamish	Lat: 49.667 Long: -123.250	http://www.ec.gc.ca/eem/English/PulpPaper/data/showinfo.cfm?Mill_id=PP1059

References

BCMOE (2005). British Columbia Coast and Marine Environment Project: 2005, Industrial Contaminants. Strategic Policy Division, Ministry of Environment., Government of British Columbia.
http://www.env.gov.bc.ca/soe/bcce/02_industrial_contaminants/technical_paper/industrial_contaminants.pdf (Accessed on June 4th, 2007).

Carey, J., Hall, E., and McCubbin, N. (2002). Review of scientific basis for AOX effluent standard in British Columbia. Prepared for the Minister of Water, Land and Air Protection in British Columbia. This report is attached as it is no longer available over the internet.

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http://www.ec.gc.ca/EEM/English/PulpPaper/Data/Default.cfm The Canadian Government requires that all biological monitoring data and sublethal toxicity testing data collected under the pulp and paper EEM program be submitted in an electronic format to Environment Canada. These data are compiled and stored in the National EEM Database for Pulp and Paper. URLs for each mill is provided to assist DEWR to access further information if required.

Environment Canada (2005a). Pulp and Paper – Measurement of Supporting Environmental Variables. Chapter 5, Pulp and Paper Technical guidance. The National Environmental Effects Monitoring Office. Environment Canada.
http://www.ec.gc.ca/eem/english/PulpPaper/Guidance/default.cfm

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RFU (date unknown) - Reach for Unbleached Foundation, BC Mill Tour.
http://www.rfu.org/cacw/BC%20Mill%20Tour2.htm