Submission to the Department of Environment and Conservation
Government of Newfoundland and Labrador

Response to Corner Brook Pulp & Paper Tire Derived Fuel (TDF) Co-Firing Trial Project
Proponent: Corner Brook Pulp & Paper Ltd. (Reg. 1539)

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Submitted by the Environmental Policy Unit

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Executive Summary

While acknowledging potential economic benefits for Corner Brook Pulp and Paper (CBPP) in using tire-derived fuel (TDF), we remain unconvinced of the net public and environmental health benefits of its use and are concerned with the methodology of the proposed test. We hope that this overview of our concerns can help the Department of Environment and Conservation (DEC) make an informed decision regarding the testing of TDF at CBPP. Guiding our submission is the precautionary principle, which has been adopted by all relevant parties, including the Government of Canada, the Government of Newfoundland and Labrador and CBPP. As such and in light of the issues below, it is our position that additional research is required **before** moving to a test trial. This can be achieved either by conducting a full Environmental Impact Statement, including component studies and additional public hearings, or by rejecting the undertaking outright.

Issue #1 – Mill Technology Insufficient

- Increased fine particulate matter ($PM_{2.5}$) due in part to increases in zinc emissions will reduce the efficiency of existing air pollution technology (scrubbers).
- No upgrades to CBPP air pollution technology have been done since 1995.
- Research has identified most favourable combustion and emissions results often occur with the use of fluidized bed burners and electrostatic precipitators. CBPP possesses neither of these technologies.
- A contingency plan needs to be elaborated for boiler corrosion and plugging problems.
- A detailed ash disposal plan is required in light of anticipated elevated Zn concentrations.
- Boilers #3 and #6 be decommissioned until air pollution control technology is installed for them.

Issue #2 – Proposed Testing Methodology Unclear and Insufficient

- TDF emissions are highly variable.
- Proposed testing and monitoring methodology will not accurately capture this variability.

Prior to approval,

- Research be conducted to determine cumulative effects to TDF usage when exposed to continuous emissions in light of the nearby population centre, especially schools.

If approved for testing,

- Testing needs to be done by an independent third party with results reviewed by a panel of community members (citizens, academics).
- Testing needs to be done at all increments of TDF use—1, 2, 3, 4, and 5% to accurately quantify air pollution emissions.
- Provisions need to be elaborated to terminate the trial if rapid increases in emissions occur to protect public and environmental health.

- Continuous monitoring of emissions (in stack and in the community), residual ashes and sludge; and, reporting by an independent third party is required.
- Continuous monitoring to include metal emissions (e.g. zinc, cadmium, titanium, copper, nickel...), gases (e.g. CO, NOx, SO_2), PAH, dioxins, furans and VOC emissions and particulate matter (e.g. total, PM_{10}, $PM_{2.5}$).

Issue #3 – Known Health Effects of TDF Emissions

- Known public health effects of TDF emissions are well verified, particularly for emissions of zinc, dioxins and furans, and sulfur dioxide.
- This underscores our concern regarding mill technology and the proposed testing procedures.
- Our concerns are elevated given the proximity of several schools in the immediate area.

Issue #4 – Tire Supply and Economic Analysis

- No cost-benefit analysis has been provided nor has any concrete evidence been presented regarding the necessity of TDF use; rather, mill representatives have provided contradictory statements about the economic importance of TDF.
- Need to clarify and assess whether tires will be imported and the legality of doing so.
- Need to clarify and assess whether coal will be used as a supplemental fuel.
- Need to clarify and assess the processing of the scrap tires into shreds.

Issue #5 – Concerns with MMSB and DEC Support for Proposed Undertaking

- TDF usage at the CBPP mill has long been pursued by Kruger Inc..
- Public and environmental health risks remain inconclusive as to TDF usage.
- Both the MMSB and Department of Environment and Conservation (DEC) have already made public statements in support of the use of TDF.
- The MMSB states the need for suitable emissions technology. CBPP does not have such technology.
- DEC admits, which undermines their support for the proposal, that even after boiler upgrades in 2007 were completed, air emission exceedances continued. Current compliance is unclear.
- The lack of publicly available documents from the MMSB and the DEC, including their research on the matter, undermines the public trust and calls into question their support for the project.

Issue #6 – Legislative Framework

- The environmental assessment framework in Newfoundland and Labrador mandates that further testing be undertaken if evidence provided in a registration is incomplete, or if the proposed activity is considered *significant*. Both of these principles have been met.
- The *Environmental Protection Act* of 2002 relies upon several principles, notably the precautionary principle, which states that in the absence of verifiable scientific evidence, possibly hazardous activities should not be undertaken.

- In light of this and given the inconclusiveness of scientific evidence, it is our position that either a full EIS is required, including component studies and additional public hearings, or the undertaking should be denied outright.

Additionally,

- The province's ambient air quality standards need to be strengthened to account for continuous emissions monitoring by independent third parties for a wider range of toxic substances including toxic metals, dioxins, furans and zinc among others. These substances need to be measured during the test trial and continuously afterwards.
- TDF usage is inconsistent with stated Government of Newfoundland and Labrador goals:
    - The Waste Management Strategy clearly identifies scrap tires as a waste product and the need to stop the incineration of waste to improve public and environmental health.
    - Both the 2007 *Energy Plan* and 2010 *Climate Change Discussion Document* chart a clean green renewable energy future for Newfoundland and Labrador. The use of TDF does not satisfy these goals.

Issue #7 – Alternative Scrap Tire Uses

- A host of viable alternative scrap tire uses have been proposed including for road and highway construction, landfill construction, other building materials, and reuse, along with the production of various consumer products.
- Use in landfills as part of a leachate collection system is promising with all scrap tires able to be used for the next 86 years as detailed in the one example.

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1.0 Introduction

The Environmental Policy Unit (EPU) at Grenfell Campus, Memorial University of Newfoundland, welcomes the opportunity to comment on the proposed use of tire-derived fuel (TDF) in the #7 boiler at Corner Brook Pulp and Paper (CBPP) in Corner Brook, Newfoundland.

The EPU and Our Approach

The EPU is a new initiative at the Grenfell Campus - MUN dedicated to addressing environmental policy issues in Newfoundland and Labrador with a current emphasis on climate change, energy and related areas. Our three main objectives include 1) facilitating debate on critical environmental policy issues, 2) conducting, facilitating and disseminating research on these issues and 3) enhancing provincial capacity in environmental policy. Given this mandate, we are pleased to contribute to the public discussion on the proposed use of TDF at CBPP.

Soon after CBPP registered their proposal pursuant to section 49 of the *Environmental Protection Act*, the EPU invited faculty and staff at the Grenfell Campus - MUN to research and write a joint submission. The team[1] reviewed the submission and agreed our contribution would be to suggest policy issues of concern to citizens and decision makers alike.

Note that these are initial analyses and we look forward to further opportunities to provide assistance in reviewing the use of TDF at CBPP.

In order to respond to the proposed use of TDF, we evaluated the submitted Environmental Assessment (EA) registration, all documents referenced within the registration, and peer-reviewed and gray literature about the usage of TDF in other locations. We also attended public meetings, seeking clarification of the proposed practice, and contacted experts who have experience with TDF. We want to acknowledge the efforts put forward by CBPP to engage the public and to encourage discussion about TDF. CBPP has held multiple public meetings, has made information available on its website, and has responded to each of our emails in detail.

Submission Framework: The Precautionary Principle

Guiding our submission is the precautionary principle, which has been recognized by all relevant parties, including the Government of Canada, the Government of Newfoundland and Labrador, and Corner Brook Pulp and Paper. The precautionary principle states that,

[1] The team includes (in alphabetical order): Dr. Gerard Curtis, Associate Professor (Visual Arts); Dr. Shoshannah Ganz, Assistant Professor (English); Kim Hancock, Regional Library Services, Western Health; Dr. Erin Kelly, Post-Doctoral Fellow (Forestry), EPU; Dr. Mario Levesque, EPU Co-facilitator and Assistant Professor (Environmental Studies & Political Science); Dr. Nick Novakowski, Associate Professor (Environmental Studies & Geography); Osman Parpia, Lab Instructor (Chemistry); Tom Philpott (Geography); and, Susan Pottle, EPU Research Assistant.

> "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 1992).

As Environment Canada's Sustainable Development Office (2010) states "the absence of complete scientific evidence to take precautions does not mean that precautions should not be taken – especially when there is a possibility of irreversible damage." In simple terms, the precautionary principle means "better safe than sorry" (Cooper and Vanderlinden 2009, 206). Important in this process is that the onus to prove a potential threat or harm is benign to public and environmental health remains with those proposing the activity and not citizens, communities and governments (Cooper et al. 2000).

The Government of Newfoundland and Labrador is committed to the precautionary principle. The province's *Environmental Protection Act* states "Where there is a threat of serious or irreversible damage to the environment, all reasonable environmental protection measures will be taken, even if full scientific knowledge is lacking" (DEC 2002, principle 2). Further commitment by the Government of Newfoundland and Labrador can be found in its Species at Risk Policy where it states "A lack of full scientific certainty must not be used as a reason to delay measures to avoid or minimize threats to species at risk" (DEC n.d.).

Moreover, CBPP has in the past recognized and been committed to the precautionary principle. For instance, CBPP signed a Memorandum of Understanding between it and the Sierra Club of Canada on the formation of a Main River Advisory Group to assess logging activities in the Main River Watershed. CBPP accepted the fact that "scientific uncertainty shall not be used to postpone measures to prevent environmental degradation" (MOU 2000).

It is within this framework that all parties must address the current CBPP proposal.

2.0 Context

2.1 Historical Situation

Proposed use of TDFs in Newfoundland and Labrador and for CBPP is not new. In 2002, TDF was considered by Abitibi-Consolidated for use in its mill in Stephenville (Roberts 2002). A permit for a test trial was granted by the Pollution Prevention Division of the Department of Environment and Conservation. Yet the planned test trial was later abandoned due to public concerns over health concerns and environmental effects (Kean 2005; "Abitibi postpones" 2005).

In 2005, CBPP similarly obtained a permit from the Pollution Prevention Division to do a test trial. The test trial was conducted in March of 2005 and examined various combustion chamber parameters with the use of TDF at different volumes, the results of

which are attached as an addendum in the current proposal (see CBPP 2010). Emissions test results for the test trial are not available because they were not conducted. The Pollution Prevention Division felt that due to the short duration of the test trial—May 20-24, 2005—and due to the perceived minimal detrimental health and environmental effects, emissions testing was not warranted (Telephone Conversation with Pollution Prevention Division official, DEC, November 17, 2010).

Later in 2005, CBPP applied to use TDF on a permanent basis. Strong and vocal public opposition to the proposal, including a protest march and numerous letters to local papers (e.g. *The Western Star*) and members of government, ensued. CBPP also held a public meeting at the Glynmill Inn which proved to be tumultuous (see, for example, letters to the editor in *The Western Star* that followed the meeting). In November 2005, CBPP withdrew its proposal to burn TDF at the mill citing it could not reach agreement between the Department of Environment and Conservation and the Multi-Material Stewardship Board (MMSB) regarding the merits of proposal ("Tired out..." 2005).

In 2002 Kruger Inc. commissioned a study examining the feasibility of using TDF at its Trois-Rivières, Quebec mill (see Sandwell 2002). A similar study was commissioned for the CBPP mill in 2004 by Kruger (see Sandwell 2005A). Its purpose was to study 3 options for the use of TDF fuel at the CBPP mill. A preferred option was identified and a further study was commissioned to determine capital cost estimates (Sandwell 2005B). These studies have led to some boiler modifications completed in 2007 and to the current proposal to handle and burn TDF at the CBPP mill. Some of the results of these studies are presented in the current proposal (see proposal appendices). It is important to note that despite the withdrawal of CBPP's proposal to use TDF in 2005, Kruger Inc. has continued to prepare for its eventual use as indicated by the boiler modifications completed in 2007.

2.2 Current Proposal Overview

- CBPP has applied for a test trial to permit it to burn TDF at various rates up to 5% in boiler #7.
- If testing is successful, CBPP plans to utilize TDF at a rate of 4% in boiler # 7 on an ongoing basis.
- TDF is a low cost product with high heat content.
- The use of TDF will allow the mill to burn lower grade biomass such as bark and sawdust piles which typically have a higher moisture content. More fuel is required to burn wetter material which is cost prohibitive unless the fuel used such as TDF has a high heat content and is inexpensive.
- CBPP representatives note the use of TDF will replace 10-25% (5,000 -12,500 barrels) of Bunker C oil the mill currently uses (50,000 barrels per year).
- CBPP representatives note the use of TDF will save approximately $500,000 to $1,000,000 in the first year alone, though savings may vary depending on a number of factors including the price of oil.
- According to CBPP, public and environmental health risks **should** be minimal and **should** be within limits as prescribed by government laws and regulations.

3.0 Specific Comments and Concerns Regarding the Proposal

TDF has been used at facilities across the United States and Canada for many years. We were therefore surprised to find a paucity of information about its public health and environmental effects. In this document, we outline our concerns regarding TDF and suggest ways to ensure its better usage, beginning with the mill's technology and proposed TDF test. Our concerns surrounding CBPP's proposal should be evaluated in light of all available evidence. We emphasize, however, that the burden of evidence lies with the proponents of the project to explicitly document (in addition to potential economic benefits) the net positive public and environmental health effect and not with citizens who may be affected by mill practices.

3.1 Mill Technology

Research suggests that TDF emissions vary with technology employed at the facility, particularly combustion and stack emissions technology. Very few peer-reviewed papers exist regarding pulp and paper mill technology and TDF usage. The primary report submitted by CBPP for the EA registration (Sandwell 2005B), commissioned by Kruger, was not peer-reviewed. Of the references within the CBPP EA registration, only 1 was peer reviewed (Jones et al. 1990), and 1 was peer-reviewed, but in a later form (Duo et al. 2002, later published as Duo and Karidio 2007). Additional effort is required to collect peer-reviewed data for consideration of the proposed TDF test trial by CBPP.

The Sandwell report (2005B) reviewed the reported emissions from 12 pulp and paper mills that have used or were using TDF in 2002.[2] Of these 12 pulp and paper mills, 10 were located in the United States, and two were located in Canada. One of the mills did not have any information provided, and so the report provides data from 11 mills, though inconsistently. Of the data reported, only the results from the Kruger mill in Trois-Rivières, Quebec included testing methodology. Results from the Trois-Rivières, Quebec facility indicated a high level of variability between testing conditions, and a general absence of linear relationships between percentage TDF and emissions data. This variability was noted in the Sandwell report, but not adequately addressed, thus calling into question any conclusions drawn from it in support of a TDF test trial.

Three of the mills utilized fluidized bed boilers, 8 used fixed or traveling grate boilers (Sandwell 2005B). Only 1 facility with a fluidized bed boiler had emissions results in the report, so we have disregarded this variable within our summary. However, the limited peer-reviewed data available often relies upon fluidized bed technology (e.g. Duo and Karidio 2007; Holikova et al. 2005), a technology which CBPP does not have.

[2] An additional mill, identified as "mill <<A>>" in Washington, in the report, was not included in our summary because it was unclear where or what this mill was. It was not in the summary on Page I-3. It had a multiclone and venturi scrubber fumes treatment system, and zinc emissions rose from 1440 g/h (with 5% oil) to 22,200 g/h (with 7% TDF), affirming the general pattern of rising zinc emissions in the absence of an electrostatic precipitator.

For fume treatment, 6 of the mills used electrostatic precipitators; 5 did not, instead relying on venturi scrubbers, multicyclone separators, and other technologies (Sandwell 2005B). Most mills used some combination of fume treatment technologies, but the fundamental differences in zinc emissions were almost entirely determined by presence or absence of an electrostatic precipitator. The Sandwell (2005B) report included zinc emissions data for 7 of the mills. Of these, 4 mills did *not* have electrostatic precipitators, and reported increases in zinc emissions of between 6.7 and 391 times baseline emissions, depending on levels of TDF and other variables. As noted in the report, "mills using electrostatic precipitators generally show no change in zinc emissions" (Sandwell 2005B, p. I-11). CBPP does not have an electrostatic precipitator, but a combination of lesser conventional scrubbers (wet venturi scrubber, mechanical collectors). Using similar technologies, at the Champion International mill in Sartell, MN, zinc emissions were 1,391% higher at 4% TDF than baseline, 0% TDF (Reisman 1997 Table A-17B). Note that no upgrades to CBPP emissions technology has been done since 1995 for boiler #7. As Newfoundland and Labrador's Department of Environment and Conservation states, "[t]he efficiency of a mechanical dust collector and wet scrubber is *reduced* when handling smaller particulate sizes (i.e. <0.25 μm)" [emphasis added] such as is found with zinc oxide particles (DEC 2010A). The age of and reduction in efficiency of the air emissions control technology concerns us given the need to have equipment perform at an optimal level to ensure public and environmental health.

The Sandwell report (Sandwell 2005B) included SO_2 emissions from 4 mills, two with electrostatic precipitators and two without. These results showed, generally, a rise in SO_2, though the small sample does not allow for much comparison. Test results varied widely, with SO_2 *reductions* at 2% TDF at the Norske Skog mill in Port Alberni, British Columbia, a facility that has both an electrostatic precipitator and fluidized bed boiler. At the same mill, at 5% TDF, SO_2 emissions again rose. Because of the low number of trials and few facilities, general trends, aside from several notable increases in SO_2, are difficult to detect. Additional research gathered from mills across North America is required to ascertain trends.

PAH and dioxin and furan data also showed few trends and had exceptionally low *n* (sample number). PAH emissions were reported for 5 facilities[3] and while total PAH emissions do not appear to vary with TDF usage, variability exists among PAH types and with varying TDF levels. Further, in the report, results were difficult to understand; for example, under the reported PAH emissions (Sandwell 2005B, I-18), no facility is mentioned; we assume that this refers to the Trois-Rivières facility in Quebec though this is not certain.

Only one mill (again, presumably the Trois-Rivières facility) had dioxins and furans emissions results, which showed high variability, with rising dioxin and furan levels at 8.8% TDF and declining dioxin and furan emissions at 9.5% and 12.3% TDF. These results are insufficient to analyze the impacts of TDF on PAH emissions, and particularly dioxin and furan emissions. Dioxin and furan levels in grate ash and fly ash were also

[3] Including Mill <<A>> in Washington. We have included the results from this mill in this section because of the absolute dearth of information provided regarding PAHs.

highly variable, and only reported for one mill, presumably Trois-Rivières. Again, the paucity of data is noteworthy, and this *lack* of data is the most striking feature of the Sandwell report (Sandwell 2005B).

A study that was not cited, EPA (1991) noted that particulate emissions from using TDF in pulp and paper mills generally increased, and it stated that "the reason for this is probably due to the type of emissions control devices used on hog fuel boilers: venturi scrubbers" (EPA 1991, ES-6). While this study is dated, we suggest that the fume emission technology employed at CBPP is similarly dated. The EPA study also claims that fluidized bed boilers have more complete combustion than other types of boilers (EPA 1991, 2-11).

Furthermore, disposal for the ash will require some level of sophistication and a well-considered plan, which is entirely absent from the EA registration. Other grate ash and fly ash results reported in Sandwell (2005B) indicated increases in both zinc and iron levels (Sandwell 2005B). Ash disposal plans need to be provided for consideration as part of the EA process. This calls into question the adequacy of technology at waste disposal facilities in Newfoundland and Labrador. In Newfoundland, the majority of landfills are not lined and thus, the potential of leaching is very high, especially because Zinc Oxide (ZnO) powder is relatively light and easily disperses in water. CBPP proposes that ZnO would be disposed of along with the ash in landfills, where the ash would have a pH of between 8 and 12, rendering Zn inert. Current landfills are open to the atmosphere and therefore come into direct contact with rain water. Rain water has a pH of between 5 and 6, much lower than the proposed pH of between 8 and 12. ZnO is soluble in both high and low pH solutions and would therefore be present in high concentrations in water runoff. Furthermore, rain water pH changes constantly depending on various environmental factors.

Overall, the Sandwell results were from unduplicated trials; most data were self-reported; the data were incomplete and perhaps selectively reported, as data for the same emissions were not methodically reported for all facilities, and no explanation was given. As such, very few conclusions can be drawn based on their reported results, particularly considering the high variability of results.

The EA registration cited the Paprican study (Uloth et al. n.d.), which was written for a pulp and paper research institute. Uloth et al. (n.d.) indicated that TDF could decrease dioxin emissions in mills, though overall test results showed that dioxin levels were highly variable, furan levels possibly increased[4], and that sulphur introduced with TDF could "adversely affect boiler plugging and increase boiler corrosion problems" (Uloth et al. n.d., 15). Contingency plans for such problems need to be provided by CBPP in order to fully consider their proposal. Further, the Uloth et al. study indicated that lower emissions result from using the *most recent technology*, fluidized bed combustors and

[4] Though dioxins and furans are often mentioned in one breath, the Uloth et al. (n.d.) results suggest that dioxins and furans may be emitted at different temperatures. Therefore, they may need to be tested separately.

electrostatic precipitators (Uloth et al. n.d., 8) technology which CBPP does not currently possess.

Lastly, data from Reisman (1997), also cited in the EA registration, mirrors the Sandwell report precisely. Since it was published prior to the Sandwell report, we conclude that the Sandwell report used the Reisman (1997) data. The Reisman study suggests that TDF can be safely used in "properly designed solid-fuel combustors with good combustion control and *add-on particulate controls, such as electrostatic precipitators or fabric filters*" (Reisman 1997, Executive Summary x, emphasis added).[5]

On a related note, CBPP has no air pollution control technology for boilers #3 and #6 (DEC 2010A). We are told that these are supplementary boilers and not required for normal mill operation yet exactly when these boilers are used is unclear and needs to be detailed to assess the current proposal.[6] The lack of air pollution control technology for boilers #3 and #6 is significant in that when they operate, the combined emissions with the use of TDF in boiler #7 may exceed provincial and federal emissions standards. As a result, public and environmental health may suffer. It is our position that any alteration to CBPPs Certificate of Compliance to allow for the use of TDF must include a clause mandating the decommissioning of boilers #3 and #6 (i.e. mothballed) until such time they are retrofitted with current air pollution control equipment.

3.1.1 Issue Summary – Mill Technology

Most studies, including the Sandwell report, submitted as part of the EA registration, indicate that electrostatic precipitators are a key technology for stack emissions reduction. However, the very small sample sizes, variable results, unduplicated studies, and incomplete results from both the Sandwell report and other reports cited in the EA registration lead us to conclude that more research is necessary to determine the efficacy of various fume treatment technologies, especially regarding dioxins, furans, and SO_2 before proceeding to a test trial. This additional research is urgent given the anticipated increase in fine particulate due to increases in zinc emissions which tend to reduce the efficiency of scrubbers such as that currently in place at CBPP. Other technologies, such as the boiler technology, are also uncertain, with most peer-reviewed research utilizing the latest technology, fluidized bed combustors. Because the mill does not have an electrostatic precipitator or fluidized bed combustor, evidence of technological capacity is insufficient. Furthermore, a contingency plan needs to be elaborated for boiler corrosion and plugging problems and a detailed plan to address ash disposal is required in light of elevated Zn concentrations.

[5] Fabric filters may, in fact, be one of the most effective technologies in controlling dioxin and furan emissions (Kilgroe 1996), though again, CBPP does not possess this technology.

[6] This sets aside the issue of how industrial boilers can be built without air pollution control technology and why upgrades have not been pursued to protect public and environmental health.

3.2 Proposed Testing Methodology

We are concerned about several aspects of the proposed testing methodology, particularly the very low *n* value (3 TDF percentages, each tested 3 times), which is consistent with flaws in prior studies of TDF. The testing undertaken by Sandwell (2005B) was notably insufficient, with *one* sample at 0, 8.8, 9.5, and 12% TDF, and highly variable, usually non-linear results. Similarly, using such a small *n* for the tests in Corner Brook will likely result in data that cannot be confidently interpolated or extrapolated. Therefore, it is a concern that the testing will occur only at 1, 3, and 5% TDF by weight, when regular operations call for an average of 4% TDF by weight. To be clear, testing needs to be done at all increments—1, 2, 3, 4, and 5%.

We are also concerned about uncertainties regarding test results, and who gets to evaluate them. There is no evaluative framework provided in the EA registration for determining whether the tests meet provincial guidelines. If the only criterion is that stack emissions meet requirements at 3 TDF percentages, each tested 3 times, then we suggest that the testing is a formality and not adequate for evaluation of health effects. Further, the testing and results should be observed and evaluated by an independent entity, and this entity should be made explicit in the EA registration.

In the longer term, following the pilot testing, we support much more thorough emissions testing than currently occurs. We note the lack of cumulative effects analysis or continuous emissions monitoring, particularly of PAHs, which are highly variable in prior testing.[7] While cumulative effects analysis is difficult to undertake, the proximity of the mill to the residents of Corner Brook raises questions about the long-term impact of TDF emissions in air, water, and soils. In particular, leaching of metals from ash into groundwater may be a concern. The EA registration does not indicate any testing for dispersion patterns of emissions, bioaccumulation[8], or other components of cumulative effects.

Continuous emissions monitoring would capture potential variability in emissions that occur with routine operations. One pulp and paper company utilizing a venturi scrubber and cited in the Sandwell (2005B) report had highly variable particulate emissions among trials, with 45.6 pounds/hr and 30 pounds/hr emitted, **both at 1% TDF levels** (see EPA 1991, 5-10). The mill had reductions in volatile organic compounds (VOC) at 1% TDF, followed by dramatic increases in VOC levels at 1.5% TDF. NOx and CO emissions were also variable when 1% TDF levels were used on different dates (EPA 1991, 5-11). To be clear, when TDF levels were held constant, multiple trials produced different emissions data.

In one of the very few peer-reviewed papers regarding TDF, Holikova et al. (2005), using controlled laboratory testing, found an "explosion" of volatiles at the start of TDF combustion. This result points toward a concern with TDF: the highly variable rate of

[7] This includes the NAPS station in Corner Brook, which does not test for PAHs and other emissions of concern.
[8] For example, zinc bioaccumulates in organisms.

emissions and the inadequacy of capturing this variability with only a handful of one-time tests, followed by inadequate long-term monitoring. For example, under *much* more thorough testing conditions than those suggested by CBPP, tests undertaken at an International Paper facility in New York in 2006 were discontinued because of highly variable and unexpected results (Vermont ANR 2008).

The usage of TDF at CBPP will occur under very particular conditions and with a particular mix of fuels; this is why it is important to *effectively* capture, document, and monitor emissions over time. The EA registration should further guarantee that the TDF used in the testing and in regular operation will be of similar chemical makeup, and that other conditions, such as temperature and TDF feeding, will be identical under testing and regular operations. Continuous monitoring and reporting by an independent third party is required to ensure validity in results and in order to maintain public confidence.

3.2.1 Issue Summary – Proposed Testing Methodology

The proposed testing methodology under the EA registration has a very small sample size and only three levels (1, 3, 5% TDF by weight) of TDF. It does not include cumulative effects, continuous emissions, or other testing that we view as necessary, particularly in light of the nearby population centre. Other research, though preliminary, indicates that TDF emissions are highly variable. Current testing and monitoring methodology will not accurately capture this variability. We maintain that,

- testing needs to be done at all increments—1, 2, 3, 4, and 5%;
- cumulative effects studies be researched or conducted before testing;
- if the test trail is approved, provisions be elaborated to terminate the trial if rapid increases in emissions occurs;
- if approved, that regular operations follow the exact procedures used during the test trial; and
- continuous monitoring and reporting by an independent third party is required.

3.3 Known Health Effects of TDF Emissions

The following section is a very brief overview of some health effects associated with TDF usage. It should not be viewed as exhaustive or authoritative, but a summary of some of the more glaring issues.

3.3.1 Zinc and Zinc Oxide

Tires are known to contain about 20 different metals including aluminum, antimony, arsenic, barium, beryllium, cadmium, cobalt, copper, iron, lead, magnesium, manganese, mercury, nickel, selenium, silicon, tin, titanium and zinc (Reisman 1997). Zinc oxide is especially present in large amounts as it is used in the vulcanization process.

Zinc, at appropriate levels, is a critical element for normal functioning of the human body, where catastrophic consequences such as diabetes and stroke are linked to zinc cellular concentrations being too high or too low (Samman 2007; Sekler et al. 2007).

Zinc oxide (ZnO) is an amphoteric oxide. It is nearly insoluble in water (pH 7) and alcohol, but is degraded in acid and basic conditions. When heated, ZnO decomposes into zinc vapor and oxygen at about 1975 ^{o}C, reflecting its considerable stability. When heated with carbon (readily present in boilers at pulp and paper mills), ZnO is converted to the metal and carbon-monoxide. Zinc metal is more volatile than ZnO.

Toxicity from airborne zinc and zinc oxide is high, and the effects of zinc are most acute when emissions involve ultrafine zinc particles (Beckett et al. 2005). Very fine zinc emissions have been linked to TDF usage (Vermont ANR 2008). Diffusion of zinc into the blood stream is facilitated by the dust that is trapped in the lungs (Cooper 2008). Inhalation of ZnO results in metal fume fever, which is characterized by fatigue, chills, fever, muscle pain, cough, leukocytosis, thirst, metallic taste and salivation (Beckett et al. 2005). It has been clinically shown that exposure to ZnO-SO_2 mixtures adversely affect the lungs. Total lung capacity, vital capacity, functional residual volume, alveolar volume and the diffusing capacity for monoxide did not return to normal, even 72 hours after the last exposure (Conner et al. 1985).

Zinc exposure is particularly harmful in occupational settings, resulting in metal fume fever, inflammation of the respiratory tract, copper deficiency, and immune response similar to an allergic reaction (US Department of Health and Human Services 2005A).

In fish, zinc has long been known to be toxic (Skidmore 1964; many more recent studies exist, see van Dyk et al. 2007 as an example). Both acute and chronic zinc exposure lead to fish death, and zinc bioaccumulates within systems, leading to greater and greater concentrations within ecosystems over time.

Finally, ZnO is one of the metal ions that facilitates the formation of dioxins and furans by reacting with precursor compounds (Kilgroe 1996). Our concerns about dioxins and furans are outlined below (section 3.3.3).

3.3.2 Particulate Matter

TDF displays highly variable results regarding particulate matter, with some evidence of increases (Reisman 1997). Particulate matter is linked to asthma, lung cancer, and other respiratory illnesses, particularly for the young and the elderly, and particulate matter levels are positively correlated with hospitalization rates, increased respiratory and cardiovascular illness and mortality, decreased lung function, and inflammation and changes in heart rate variability (Health Canada 2008). Respiratory illnesses, including asthma, pneumonia and respiratory infections accounted for 9.5% of all health care expenditures in Canada in 2004, the third-highest health care expenditure (Canadian Institute of Health Information 2004).

3.3.3 Dioxins and Furans

Dioxins and furans present both the greatest possible health risks, and the greatest unknowns in terms of emissions. These unknowns, generally, are a result of highly variable emission rates, because "the mechanism and rate of dioxin/furan formation is still unknown" (Pegg et al. 2007). We refer to the discussions of precautionary principle (Introduction and in section 3.7) and reiterate here our concern with dioxin and furan emission variability, and proposed testing and monitoring methodology.

In terms of risks from dioxin and furan emissions, we defer to the extensive report from the World Health Organization (Van den Berg et al. 1998) and to the U.S. Environmental Protection Agency (2010), both of which characterize dioxins and furans as carcinogens, with "adverse effects on reproduction, development, and endocrine functions" (Van den Berg et al. 1998: 775).

3.3.4 Sulfur Dioxide

Sulfur dioxide levels increased in a number of TDF tests (Reisman 1997; Sandwell 2005B). At low levels, sulfur dioxide creates odours, discomfort, and irritation, but at higher levels, it exacerbates asthma and other respiratory illnesses such as bronchitis, lung infections, and bronchopneumonia (Environmental Protection Agency 2008). Higher risks exist for children, the elderly, pulp and paper mill workers, and those who exercise (EPA 2008).

3.3.5 Other Emissions

In tests conducted at a cement facility in the U.S., emissions increased for the toxic compounds CO, acetaldehyde, benzene, formaldehyde, methyl chloride, PAHs, arsenic, cadmium, copper, lead, and mercury, among other chemicals (CEMEX 2003). Though these chemicals did not surpass legal limits in Colorado, we wish to again highlight the precautionary principle, the stated goals of the province regarding emissions, and the highly variable results gleaned from TDF studies, which could contribute to a wide range of adverse health effects.

3.3.6 Additional Considerations Regarding Children

Children are at greater risk from exposure to hazardous substances: children play outside and there is more ground to hand and mouth contact; and children have lower body weight and thus a higher concentration of intake than adults which results in greater doses of any of the above hazardous substances (American Academy of Pediatrics 2004). Further, if toxic exposure occurs during key growth stages, there can be permanent damage. The lungs are particularly vulnerable to the release of large and small particulate matter (US Department of Health and Human Services 2005B). The American Academy of Pediatrics suggests that exposure to any metal pollutants should be avoided, and even levels of exposure well within legal limits can have long term and permanent health

effects, including neurological, on children and infants, particularly during prenatal development (see American Academy of Pediatrics 2004; Marlowe 1986).

Beyond the day to day exposure to possibly increased but still "low" levels of deadly metals, there are well-documented cases of more direct exposure to higher levels of the metal contaminants as part of the unexpected but still normal functioning of industry. For example, *The Hillman Power Company Health Assessment* followed the unexpected power failure of April 8, 2004. Shutdown of the pollution control equipment meant that the toxic ash byproduct was released into the air. The ash settled on a local elementary school playground while children were outside for recess. The study was commissioned to look into the health effects of this direct exposure. The school was normally upwind from the plant and thus was believed not to be at risk. The direct contact with the ash caused dermal irritation and an exacerbation of asthma. This type of large particulate matter is known to lead to "aggravation of asthma and increased upper respiratory illness" (US Department of Health and Human Services 2005B).

In the event of shut downs or malfunctions, people will experience direct exposure to varying degrees of the chemicals and metals known to have detrimental effects on childhood development and functioning. There are also unknown chronic effects of emissions from TDF. This seems an especially important consideration in terms of children's health in Corner Brook because of the ring of preschools, elementary, and middle schools that form a half crescent around the mill.

3.3.7 Issue Summary - Known Health Effects of TDF Emissions

The human health effects of TDF emissions are well verified, particularly for emissions of zinc, dioxins and furans, and sulfur dioxide. Whether these levels will be sufficiently high for human or ecosystem harm remains to be seen, but we reiterate our concerns regarding the adequacy of current testing methods to capture emission levels, or to test effectively for dispersion. Our concerns are elevated given the proximity of several schools in the immediate area.

3.4 Tire Supply and Economic Analysis

The jobs of all employees at the mill, associated employment in the woods, and employment at possible tire chip processing facilities in the future are important to the community of Corner Brook and the province of Newfoundland and Labrador. Safe, sustainable practices that contribute to the continued operation of CBPP should be encouraged. But it is unclear precisely how, and how much, CBPP will benefit economically from the practice of using TDF. In weighing the costs and benefits of using TDF, such information is vital.

For example, at the meeting held at Memorial University, Grenfell Campus on Friday, November 4, 2010, a representative of CBPP stated that the mill would reduce its TDF usage from an average of 4% to an average of 2% after several years because of tire

depletion within the province (~3 years). This reduction undermines the argument that TDF is therefore necessary for continued mill operation, as alternative fuel sources are unlikely to be more affordable in the future (e.g. oil).

This raises the question of whether scrap or processed tires will be imported. The TDF proposal is silent on this issue and mill representatives were equally unclear at the public meetings held at the Pepsi Centre on the 9th and 10th of November. When asked to clarify their position on this issue on the first night, mill representatives eventually stated that they had no plans to import tires yet on the second night, the same mill representatives said that tire chips will be imported *at least* for the trial burn. The mill clearly recognizes this problem given their own background study, Sandwell 2005A, highlights this as an issue and goes so far as to provide an inventory of scrap tires across Canada and selected US states. This indicates that CBPP has seriously considered the importation of scrap or processed tires.

We are concerned with the mill's response given the fact the chemical composition of tires varies based on the type of tire in question (e.g. car or truck) and on who made the tires (manufacturer and country of manufacturer). As such, public and environmental health risks—good and bad—will be directly affected. Additional information is required to clarify this matter especially since it may contravene Newfoundland and Labrador's laws on the importation of waste for final disposal (E-mail communication with Pollution Prevention Division official, DEC, November 2010).

A related issue is the possible use of coal as an alternative to supplement TDF usage at CBPP. This is a very real possibility given the boiler upgrades completed in 2007 can accommodate coal as noted by the mill's background study, Sandwell 2005B and the fact that CBPP has previously received a permit to conduct a test trial using coal, but has, to our information, not conducted such tests (Telephone Conversation with Pollution Prevention Division official, DEC, November 17, 2010). Further clarification of CBPP's intent is required especially since governments across Canada (e.g. Ontario) are working to phase out the use of coal in their power generation due to its negative health and environmental impacts.

While the economics of the proposal may be sound from CBPP's perspective, they nonetheless do not include public and environmental health costs. In 2005, the necessary agreements between CBPP, the NL Department of Environment and Conservation and the MMSB were not reached due to the inconclusive evidence as to the effects of TDF usage on public and environmental health. The long term health effects on people and the natural environment were simply not known. This is cause for concern and may pose formidable challenges to the Government of Newfoundland and Labrador in the future in terms of elevated health care and environmental remediation costs. The same inconclusive evidence exists today.

We are also concerned with the lack of information regarding where the tires will be processed. While the EA registration suggests that processing tires into 1" chips will create jobs, there are no details about where this processing will occur, or who will be

employed at the processing facilities. Chien et al. (2003) found evidence of health hazards at a tire shredding facility in Taiwan, including the presence of mutagenic and potentially carcinogenic compounds. Without information about how the tires will be shredded and by whom, it is difficult to assess this component of the EA registration, or give credit to the argument of more job creation as a result of tire shredding. It is conceivable that public health and environmental costs will negate employment benefits. Finally, processing will require de-wiring tires, an expensive practice according to the US EPA (see EPA n.d.). Complete de-wiring has been a problem at other facilities (Vermont ANR 2008, Appendix 1). The EA registration states that tires will be de-wired prior to burning, but without statement of where the tires will be shredded, this is not possible to verify. The lack of information regarding the processing of tires leaves large questions about where the tires will be processed, and by whom.

3.4.1 Issue Summary – Tire Supply and Economic Analysis

While the use of TDF may be economically beneficial for CBPP, the current EA registration documents do not provide a cost-benefit analysis, nor have we seen concrete evidence regarding the necessity of TDF use. Rather, we have received contradictory statements about the economic importance of TDF from mill representatives. Additional information is required to clarify and assess,

- whether tires will be imported and the legality of doing so;
- whether coal will be used as a supplemental fuel; and
- the processing of the scrap tires.

3.5 Concerns with MMSB and DEC Support for Proposal

We question the objectivity of the government regarding the use of TDF. Currently, the NL Department of Environment and Conservation supports the proposal as outlined in their discussion document dated March 2010 entitled "Tire Derived Fuel Assessment – Corner Brook Pulp and Paper". The MMSB also supports the proposal as evidenced by their letter of support included in the proposal (The letter is included as Appendix A in the proposal). Our concerns are outlined for each agency, below.

3.5.1 Questionable Support: MMSB

The MMSB letter in support of CBPP's proposal unduly emphasizes the economic importance of the proposal alluding to the mill's "very survival" yet does not provide a cost-benefit analysis (see section 3.4), nor does it adequately discuss the merits of the proposal in terms of public and environmental health. We reiterate our concerns with the mill's technology, especially in light of the statement from MMSB that "Our research suggests that used tires can be an environmentally-acceptable, alternative energy resource when used in appropriate applications *with suitable equipment to control emissions and particulate matter*" [emphasis added]. CBPP does not have suitable technology. We ask that the MMSB's research be provided for review and evaluation.

We are also concerned that the MMSB has not publicly made available their research on this matter, but instead relied on a private consultant to communicate their positions regarding TDF.[9]

We submit that the MMSB may be eager to rid itself of the stockpiled scrap tires, given its inability to meet the objectives of the Used Tire Recycling Program (see Auditor General (2008) for details). As such, a simple solution is being pursued – the incineration of tires – which is in conflict with the province's Waste Management Strategy, which explicitly states that the need to move away from such simple solutions (Waste Management Strategy 2002, Minister's Message).

3.5.2 Questionable Support: Department of Environment and Conservation

We are concerned with the Department of Environment and Conservation's assessment of the CBPP's proposal as documented in their discussion document entitled "Tire Derived Fuel Assessment – Corner Brook Pulp and Paper" (DEC 2010A). As with the MMSB's Letter of Support, we are concerned that the DEC did not publicly make available their discussion document, nor their research on this matter. Full transparency is important in reviewing and assessing matters so that the public is kept informed and that the public interest is protected.

We also question the research done on the topic by the DEC. Only five references are included in their assessment, with only one of those peer reviewed. These are the same sources found in CBPP's proposal. We maintain that much more work is required to properly assess the proposal. We are also concerned that the DEC used the same words, verbatim, as CBPP's proposal in several places (compare, for example, paragraphs 3 and 4 on p. 3 of the DEC discussion document with paragraph 3 on p. 8 of the CBPP proposal). This suggests the Pollution Prevention Division, DEC, relied on biased research findings as evidenced by the verbatim text in their report. This questions the objectivity of the DEC in their review of the proposal and undermines the validity and credibility of their conclusions. Our concerns deepen given repeated exceedances of the 24 hour concentration limit even after boiler upgrades were completed in 2007 (DEC 2010A, 5). We maintain that objective independent study is warranted to remove potential bias given the potential detrimental public health and environmental effects. Other conclusions from the DEC report are addressed in other sections of our comments.

3.5.3 Issue Summary – Concerns with MMSB and DEC Support for Proposal

The proposed use of TDF at the CBPP mill has long been pursued by Kruger Inc. While public and environmental health risks remain inconclusive, both MMSB and DEC, agencies that should be protecting the environment and the health of citizens of Newfoundland and Labrador, have already made public statements in support of the use of TDF. The lack of publicly available documents from the MMSB and the DEC undermines the public trust and calls into question their support for the project.

[9] Mr. Terry Gray did not claim to represent MMSB, but he was a paid advisor to MMSB. We note that in a survey of his available prior work, there is no record of his participation in peer-reviewed research of TDF.

3.6 Legislative Framework

3.6.1 The EA Registration

The EA registration is the first step in the environmental assessment process in Newfoundland and Labrador. In order to clarify our concerns, we briefly review the environmental assessment process, and suggest ways to proceed with the EA registration submitted by Kruger regarding TDF usage.

Step 1. Registration. The proponent (Kruger) submits 40 copies of the registration document and pays a 200$ fee plus HST (harmonized sales tax). The public then has 35 days to comment on it. Kruger has registered its TDF proposal.

Step 2. Once registered, the Minister of Environment must make a decision within 45 days, the 35 day comment period plus 10 days for the Minister to review the comments and formulate a decision. There are 4 possible decisions that the Minister can make:

1. The undertaking is released (i.e., released from further investigation) and is permitted to proceed. The vast majority of EA registration documents fall into this category.
2. An Environmental Preview Report (EPR) is required, in order to give more information than that provided in the registration form. No original fieldwork is required for an EPR.
3. An Environmental Impact Statement (EIS) is required. An EIS is required when significant environmental effects are indicated or if there is significant public concern (see below for a discussion on the term *significance*). Original field work may be required; in Newfoundland and Labrador, an EIS is legally termed a Component Study. An EIS requires a monitoring program, and the public must be consulted by the proponent within 7 days of submission of the EIS.
4. The undertaking is rejected.

Step 3. If an EPR or an EIS is required, then the government prepares guidelines for their implementation. The guidelines are also subject to public comment. For the EIS, original research is often required as per the requirements in Sections 8, 57 and 58 of the *Environmental Protection Act.*

Step 4. The proponent prepares the required EPR or EIS. Component studies may be required if a valued ecosystem component (VEC) is relevant. The valued ecosystem components in this case are, human health, property values, ecological health, and economic concerns surrounding tourism.

Step 5. Review of the EPR/EIS. If there is significant public concern revealed during the review period, then public hearings may be called.

Cabinet is empowered to reject any EPR/EIS if:

1. there are unacceptable impacts identified;
2. the undertaking turns out to be contrary to existing laws; and,
3. there is public interest in doing so.

3.6.1.2 The Relevance of the Term *Significance*

A declaration of *significance* means that the environmental assessment must go beyond mere registration. *Significance* in Newfoundland and Labrador is implied but not clearly defined in Section 25 of the Regulations in the following ways:

1) Is there sufficient baseline information to predict environmental effects?
2) Is the undertaking to be located in an environmentally sensitive area?
3) Are hazardous substances or experimental technologies involved?
4) Will any of the emissions, discharges or effluent potentially exceed limits imposed by the law?
5) Will rare or endangered species be affected by the undertaking?
6) Are the impacts going to be economically important?

We briefly address each of these points below.

1) There is not sufficient information to predict the environmental effects of TDF usage, as summarized in our concerns (sections 3.1-3.5, above).
2) The city of Corner Brook and the Humber Valley region are environmentally sensitive areas, with high human and wildlife populations and important waterways.
3) The use of TDF clearly involves hazardous substances. It also clearly involves experimental technologies, evident in the lack of peer-reviewed research.
4) Emissions and discharges may or may not exceed legal limits, but proposed testing methodology will not accurately capture regular emissions levels or cumulative effects (see section 3.2).
5) Rare or endangered species may be affected by the undertaking, but again, current testing methodology cannot determine the impact of TDF usage on habitat.
6) The impacts will likely be economically important, to health care costs, property values, the tourism industry, and future private industry investment. To our knowledge, no economic analysis has taken into account these variables.

3.6.1.3 Principles of the *Environmental Protection Act*

Environmental assessment in Newfoundland and Labrador is nested within the *Environmental Protection Act* (EPA), 2002. The following principles stated in the Act are directly triggered by the proposal to use TDF: protection of human health, pollution prevention, polluter pays, and the precautionary approach.

- **Protection of human health** cannot be substantiated by the current proposal. Known carcinogenic and teratogenic agents will be released into the ambient air of Corner Brook and any increase in these variables is entirely unacceptable for an urbanized area. This principle states the following: *Only by safeguarding the*

environment can the conditions needed for physical, mental and social well-being be sustained.

- **Pollution prevention** as a principle means recognizing that preventing pollution is much less expensive than cleaning up its problems after-the-fact. Health care costs associated with carcinogenic and teratogenic effluent could far outweigh the monetary benefits to Kruger. The minimization of pollution and waste is a cornerstone of the *Environmental Protection Act.*
- The **polluter pays principle** states that *no person should financially benefit from polluting and taxpayers should not bear the costs*. Clearly, Kruger will benefit from being allowed to pollute the environment of Corner Brook.
- The **precautionary approach** principle means *that when scientific knowledge is lacking regarding an undertaking, then all reasonable e*nvironmental protection measures will be taken. The precautionary principle says: *emphasize human and environmental safety and protection in the absence of clear science-based evidence.* Another way of stating that is to not do the undertaking if the implications of doing so are not clearly understood.

3.6.1.4 Policy Options Worth Exploring

1) Undertake an EIS in order to better evaluate the testing and regular operations of TDF usage.
2) Improve the testing conditions for TDF overall. Create an evaluative framework for assessing testing methodology; improve monitoring capacity; include cumulative effects and dispersion (including water) analyses. Because of the lack of peer-reviewed data, small-scale tests could be conducted in a laboratory using various combustion emissions technologies. The only peer-reviewed data currently available does not use the technology available at CBPP.
3) Deny the undertaking outright, using any of the four principles at the core of the *Environmental Protection Act* (2002). These principles, explained above, are: protection of human health, pollution prevention, polluter pays, and the precautionary approach.
4) Have the government fully subsidize the top-of-the-line technologies required to make this proposal acceptable: electrostatic precipitators and fluidized bed burners.
5) Have all emission test results, public hearings, and data used for the supportive documents provided by MMSB and DEC made available online.[10]
6) Generate a compensation package for property owners in the Humber Heights and Townsite areas. This could take the form of a security or contingency bond (e.g. set fee per ton TDF used). Such a fund could also be used to offset potential increases in health care and environmental remediation costs.

[10] A suggestion was made to CBPP to have all questions and answers from public hearings made available. CBPP made available a condensed version of the meetings albeit quite late in the process (only a few days ago): http://www.cbppl.com/TDF/FeedbackSessions.pdf. Other data should be made available.

3.6.2 Air Pollution Framework

Emissions regulations are shared between federal and provincial governments. The 2004 *Air Pollution Control Regulations* (hereafter *Regulations*) for Newfoundland and Labrador set out the ambient air quality standards that are to be met (see Appendix 1 for a partial summary of the air quality standards). While Schedule E of the Regulations bans the burning of many items including tires, the Minister may as per s. 12 and 13 permit such burning to occur. We encourage the Minister to utilize s. 20 and 21 of the Regulations to mandate continuous and independent monitoring of stack emissions. We also encourage the Minister to mandate the use of best available control technology as outlined in s. 6 yet to go beyond s. 6.4(d) and to consult with CBPP *and representatives from the academic and environmental community*. It is our position that careful consideration must be given to all parameters—economic, public and environmental health—hence the need for broader consultation.

We agree with the Minister's statement at the Canadian Council of Ministers of the Environment meetings held in St. John's this past October that "Air pollution has a huge impact on the environment, human health and the economy" (GlobeNet 2010). We support the Minister's efforts to set "clear standards [to] ensure closer links between strong economic development and a sustainable, healthy environment" (GlobeNet 2010). These are efforts to develop "more ambitious Canadian air quality standards and consistent industrial emissions standards across the country" (GlobeNet 2010).

It is in this spirit that we encourage the Government of Newfoundland and Labrador to adopt more stringent measures such as the National Ambient Air Quality Objectives For Particulate Matter. These Reference Levels are 25 $\mu g/m^3$ for PM_{10} and 15 $\mu g/m^3$ for $PM_{2.5}$ (24 hour averages) which are much more stringent than the current provincial standards of 50 $\mu g/m^3$ for PM_{10} and 25 $\mu g/m^3$ for $PM_{2.5}$ (24 hour averages). We also encourage the Minister to move away from the one-day-in-six sampling regime for particulates because it underestimates the particulate peaks by 20-30% (Health Canada 1998). Continuous monitoring (24hrs 7dys per week all year long) by an independent third party is required given the health and environmental risks associated with the CBPP proposal.

Similar measures for other contaminants are required. While CBPP assesses ambient air quality via its two monitoring stations, we note that they are inadequate. For instance, the station at the Corner Brook Hotel only monitors total particulate matter, $S0_2$ and $PM_{2.5}$ while the site at *The Western Star* building only monitors total particulate matter (DEC 2010A). This is inadequate because they do not measure toxic metals or dioxins or furans or zinc. Likewise, the federal government's National Air Pollution Surveillance (NAPS) Network Station in Corner Brook is inadequate for the same reasons (only SO_2, CO, NO_2, Ozone and $PM_{2.5}$ are measured; DEC 2010A). More continuous emissions testing and monitoring both "in stack" and in the community is required. Furthermore, the data need to be made publicly available (e.g. real time or weekly basis).

These measures would do much to make Newfoundland and Labrador a world leader for the positive regulation of air emissions for the pulp and paper industry (Tilman 2008) and to "ensure closer links between strong economic development and a sustainable, healthy environment."

3.6.3 Consistency With Stated Government Goals

All undertakings need to be considered for consistency with the Government of Newfoundland and Labrador's stated goals to ensure government objectives and plans are met. Of significance to this proposal are the province's Waste Management Strategy, the 2007 *Energy Plan* and the Climate Change Plan.

The province's 2002 Waste Management Strategy is unequivocal in the need to stop the incineration of waste. As Kevin Aylward, the Minister of the Department of Environment stated at the time:

> For generations, the people of our province have taken the simple solution to dealing with garbage – dump it into a landfill site or burn it. However, our current practices cannot continue. We need to move from simply dumping solid waste into landfill sites to developing long-term solutions which will benefit our environment, our communities, and our people.
> (Waste Management Strategy 2002, Minister's Message)

The plan outlines the closure or consolidation of the province's many smaller landfills, the creation of larger regional landfills and to phase out the incineration of waste. The Strategy stressed the need for "modern and effective waste management practices" (Waste Management Strategy 2002, Executive Summary). To achieve its goals it set out to divert 50% of materials then going for disposal. Waste materials to be diverted from landfills include "paper, corrugated cardboard, newsprint and bond paper; organic material, **used tires**, and used oil" [emphasis added] (Waste Management Strategy 2002, 7). In effect, a ban on the disposal of tires in landfills was put in place.

The Multi-Materials Stewardship Board was charged with the task of "support[ing] and promot[ing] modern waste management practices in the province, with a particular focus on waste reduction and recycling, as a means of helping to ensure a clean and healthy environment throughout the province" (MMSB 2007, 2). In regards to scrap tires, the MMSB assumed responsibility for administering the Used Tire Recycling Program in order to meet the province's waste diversion goals, something for which it has had limited success (Auditor General 2008, for details).

Given the above goals of the Government of Newfoundland and Labrador, the incineration of waste including scrap tires to derive energy is inconsistent with its Waste Management Strategy.

Moreover, the CBPP proposal deviates from the province's 2007 *Energy Plan*. The Energy Plan's first goal is that of ensuring "our environment is continually protected and improved, through the responsible development of clean, renewable sources of energy, including, but not limited to, hydroelectric and wind generation, investing in energy efficiency and conservation programs, and funding energy innovation" (Department of Natural Resources 2007, 3). Such clean renewable energy involves the development of the Lower Churchill River for hydroelectric power which has negligible greenhouse gas emissions unlike the use of TDFs. In other words, TDF is not a clean energy source.

Furthermore, the incineration of tire chips is further undermined given the province's "recognition of the seriousness of climate change" and its actions and commitment to reduce greenhouse gas emissions (see DEC 2010B). As Minister Johnson states, "[t]here is strong and indisputable evidence that climate change is happening and is mainly caused by human activity" (DEC 2010B, ii). The use of TDF is inconsistent with the province's climate change goals.

3.6.4 Land Use Planning Considerations

From a land use planning perspective, the TDF proposal contravenes a majority of the dominant principles of land use planning. These include the following:

1. Separation of incompatible land uses (e.g., keeping industrial areas away from residential areas).
2. Separation of antagonistic traffic modes (e.g., keep cars away from cyclists through providing bikeways).
3. Nourishment of neighbourhood integrity (e.g., maintaining social cohesion by providing a variety of housing types and schools, playgrounds and other amenities).
4. Facilitation of sustainability.
5. Facilitation of public participation.
6. Prioritization of public welfare (Hodge and Gordon 2008).

The TDF proposal contravenes four of the six fundamental principles of land use planning: principles 1, 3, 4, and 6. The proposal will enlarge the activity of an incompatible land use, it will interfere with neighbourhood integrity and sustainability, and it detracts from overall public welfare by introducing furans and dioxins into the ambient air.

3.6.5 Issue Summary – Legislative Framework

The environmental assessment framework in Newfoundland and Labrador mandates that further testing be undertaken if evidence provided in a registration is incomplete, or if the proposed activity is considered *significant*. We believe that both of these principles have been met, for reasons outlined in previous sections. In addition, the *Environmental Protection Act* of 2002 relies upon several principles, notably the precautionary principle,

which states that in the absence of verifiable scientific evidence, possibly hazardous activities should not be undertaken. In light of this and given the inconclusiveness of scientific evidence, it is our position that either a full EIS is required, including component studies and additional public hearings, or the undertaking should be denied outright, especially given current technologies employed at the mill.

At the same time, we encourage the Government of Newfoundland and Labrador to strengthen the provincial ambient air quality standards as the Minister has recently detailed. In reference to CBPP's proposal we ask for consultation with the academic and environmental community in determining best available technology prior to the conduction of test trials and for continuous emissions monitoring by independent third parties for a wider range of toxic substances including toxic metals, dioxins, furans and zinc among others.

Lastly, the Government of Newfoundland and Labrador has in its Waste Management Strategy clearly identified scrap tires as a waste product and the need to stop the incineration of waste. This has been deliberately done to improve the health of the province's citizens and the environment, something which both the Department of Environment and the MMSB have elaborated as priorities. The use of TDF is also inconsistent with the province's 2007 *Energy Plan* and 2010 *Climate Change Discussion Document*. A clean green renewable energy future has been charted for Newfoundland and Labrador, something which Premier Williams himself noted in his resignation speech on November 25, 2010. The use of TDF does not satisfy these goals.

3.7 Alternative Scrap Tire Uses

It is important to note at the outset that the land filling of whole tires is undesirable. Tires are naturally buoyant and therefore tend to work themselves up to the surface. Similarly undesirable is the storage of tires in piles due to the fire risk involved. Uncontrolled tire fires produce thick black smoke and release toxic oils. Such fires are extremely difficult to extinguish and can burn for weeks or months as the 1990 Hagersville tire fire in Ontario and the 1983-1984 Winchester, Virginia tire fire demonstrated, the latter of which burned for six months (Murray 1996; Virginia Department of Environmental Quality 2002; Korte 1988). The storage of whole tires also poses other health risks including being a good breeding ground for mosquitoes and other insects that can transmit infectious diseases (Polasek and Jervis 1994; Andreadis 1988).

TDF may be one use for scrap tires (Lamarre 1995) yet many other uses for scrap tires exist that are not only more environmentally friendly but that also pose less of a public health risk. Research has long identified the positive use of tires in civil engineering applications, building products and consumer products. A brief summary of these alternatives is profiled here to indicate the need to explore these options in the Newfoundland and Labrador context given their superior combined economic, public and environmental health performance before moving to adopt TDF as the preferred or only option for the province. Note that the summary provided is merely to illustrate the range

of possible uses for scrap tires and not meant to be exhaustive—much more research is required for this.

3.7.1 Civil Engineering Applications

a/ road and highway construction

Tire shreds have long been an important and growing use for scrap tires in road and highway construction projects (Fehr 1992). From 1996-1998 alone, the use of tire shreds in these projects increased from 10 to 18 million tires (STMC 1997; Humphrey 1999). Tire shreds have successfully been used in road construction across the United States and Canada including the New England states and Quebec (e.g. Dore et al. 1995; Lawrence et al. 1998). This is largely due to the unique properties of tire shreds. They are lightweight—typically half that of soils—making them an excellent fill material that improves the stability of embankments (Humphrey et al. 1998; Jang et al. 1998; Edil et al. 1992). Tire shreds are also compactable and pose low horizontal stresses which make them an excellent fill material for use behind retaining walls (Tweedie et al 1998A, B; Humphrey 1999). Such properties allow for design modifications leading to cost savings in construction projects (Humphrey 1999). Moreover, tire shreds are highly permeable—typically ten times better than soil—allowing for their use as drainage layers in roads and landfills. Combined with their superior ability to conduct heat (up to eight times better insulation than gravel), frost penetration in roads is limited (Humphrey 1999; Chalmers 1995; Edil et al. 1992). Over heating of tire shreds used to be a problem in civil engineering applications yet with the adoption of engineered standards, over heating has been negated thus allowing for the full benefits of tire shreds to be realized (Ad Hoc Civil Engineering Committee 1997; ASTM 1998).

The Government of Newfoundland and Labrador can capitalize on the economic viability and environmentally friendly aspect of using tire shreds in road construction by mandating a set percentage of tire chips be used for such construction.

b/ landfill construction

The same properties that make tire shreds desirable in road construction also make them suitable in landfill construction.[11] The use of shredded tires in landfills includes being part of leachate collection layers, foundation layers, drainage layer in landfill cap and as an alternate daily cover (Baykal and Alpatli 1995).

In particular, Park et al. (1996) have found shredded tires to be economically and environmentally feasible when used to remove organic compounds from landfill leachate. As they state, "the potential leaching of toxic pollutants from scrap tires [in such applications] is minimal" (p. 4; see also Tuncer et al. 2004; Kalbe et al. 2001 and Brown and Thomas 1998). Furthermore, Leff et al. (2007) have found that the bacterial "load" of

[11] Consideration of wire or wireless (debeaded) tire shreds is needed to ensure landfill liners are not punctured. See GeoSyntec Consultants 1999 for a discussion.

the leachate rarely exceeds that found in surface water while the species composition of the bacterial community is similar to natural surface and subsurface water.

The potential for this use of tires in Newfoundland and Labrador is great considering the province is currently planning fewer but larger regional landfills as part of its waste management strategy (Provincial Waste Management Strategy). Given the fact a 1 ha (hectare) landfill requires approximately 300,000 scrap tires to form a 0.3 m (metre) layer in a leachate collection system (Tuncer et al. 2004), Newfoundland and Labrador could easily use its current 1.9 million stockpile of tires (CBPP 2010) and future production for years to come in the construction of these large regional landfills.

For instance, the proposed Regional Waste Management Facility site in Central Newfoundland, near the community of Norris Arm North, is to be approximately 369 hectares in size (BAE-Newplan Group Limited 2004). Even if a fraction of this area, say 100 hectares, is for the actual landfill and given the above figures, 30 million scrap tires would be required to form a 0.3m layer as part of a leachate collection system. This represents roughly an 86 year supply of tires from the province based on 346,000 tires per year collected for recycling in the province (yearly tire figure given by mill representatives at public meetings). Likely the landfill will be much larger. This estimate also does not include tire usage at other landfills in the province or other uses over all.

Such systems are in use in many US states. As a comparison, in Iowa, the use of shredded tires as part of leachate collection systems represented 33% of recovered tires in 1999 alone not including the use of tire shreds in septic filtration systems (Satkofsky 2001). This latter use is also of significance to this province given its many small rural communities and homes in need of sewage upgrades.

As for drainage layers and as a component in final cap covers in landfills, Reddy (2010) has found that shredded scrap tires “meet or exceed the minimum requirements for a drainage material in landfill covers” (59). Furthermore, there were no problems with slope stability, settlement or subsidence, and, “no indication of [of them being a] hazard to public health or the environment” leading Reddy to conclude they are an “economical, efficient and safe ...solution... to the problem of scrap tire disposal” (59-60).

3.7.2 Other Building Materials

The use of scrap tires in other building materials is also well known. Tire chips, for instance, are used as an aggregate substitute in portland-cement concrete mixes (rubberized concrete) to increase the flexibility and longevity of the concrete (e.g. Baoshan et al. 2004; Eidin and Senouci 1993). Similar applications are found in asphalt concrete mixes (Blumenthal 1995) while tire shreds can be used as gravel and wood chip substitutes (Hope 1985). The use of rubberized sidewalks has received much attention in recent years with many Canadian cities including Calgary, Mississauga, Toronto, Welland and Barrie having installed such systems with excellent results. Both sidewalk cracking and frost heaving have been reduced while the surface remains more pliable leading to a more forgiving surface to walk on. One product, “EcoWalk”, is

manufactured in Western Canada (Alberta) and uses 500,000 tires per *month*, which is 150,000 tires used per month *more* than Newfoundland and Labrador's yearly production, with plans to expand production to Eastern Canada (City of Calgary 2010; Ecoflex Solutions 2010). Investigation of rubberized sidewalks for use in this province is required and has been long called for by citizens of Corner Brook and area (e.g. Russell 2005; Smith 2005).

3.7.3 Various Consumer Products

Scrap tires have also been reconstituted and used in various consumer products. Hoshino (1992), for instance documents their use as shrink-resistant moldings to be used in athletic fields (e.g. golf, tennis fields). Other products include blasting mats in the mining and quarrying process (Canadian Council of Ministers of the Environment 1991) and rubber products in railroad crossings ("Manual" n.d.). Capelle (1992) long ago noted the use of scrap tires as raw materials or filler in various flooring applications. Used tires are also used in floor, wall and ceiling tile applications (Rothhaar 1993).

3.7.4 The Second "R"

The above recycling options for scrap tires ignore the second "R" in recycling initiatives: Reuse. Whole tires can be and are re-used in many applications. When combined with geotextile membranes, they offer an economical and environmentally friendly way to stabilize slopes (Poh and Broms 1995; Kersten 1997). Many states in the eastern US have long used whole tires as artificial reefs improving habitat for some types of game fish while aiding the rehabilitation of polluted ocean bottoms (Stone et al 1974; Smith and Klingen-Smith 1990; Hershey 1987). In Canada, used tires have been used to stabilize slopes in reservoirs and in mine tailings ponds and to construct dredges for scallop fishing in the Maritimes. At a more basic level, used tires have been used for years in playground equipment and in docking facilities as boat fenders (Murray 1996). Whole tires have also been used successfully to build dams. In one case in Arkansas, 4.5 million tires were used to build a ten acre dam (see Rooke 2001).

3.7.5 Issue Summary – Alternative Scrap Tire Uses

We acknowledge that landfilled tires are an unacceptable health and environmental hazard. We have therefore proposed a host of viable alternative post-consumer tire uses that have been utilized elsewhere. These include road and highway construction, landfill construction, other building materials, and reuse, along with the production of various consumer products.

4.0 Conclusion:

The proposal to use TDF in the boilers at CBPP is fundamentally anachronistic. At one time, profit concerns of the mill dominated public decision-making (White 2004) and emission levels were unfettered by concerns about health, ecological damage, or environmental legislation. At that time, the proposal to use TDF may have been appropriate and the documents and arguments put forward by CBPP may have been sufficient. The fact that the issue is today so public and so contentious is evidence that the role of the mill within the community has changed, and our expectations regarding health, safety, and environmental practices have also changed.

We value the role of the mill in town, as an employer, a producer of useful products, and a citizen of the community. But with major changes in direction economically, socially, and politically, both within the province and within the community of Corner Brook, it is not enough to simply reassure people that relatively untested fuels and technologies will do no harm. The province has stated its intention to burn cleaner energy, and it has created policy that reflects consideration of the precautionary principle. The current proposal violates both these commitments.

Implicit to many of our concerns throughout this paper is an underlying concern about the direction of the development of Corner Brook, which is likely toward sectors outside the pulp and paper industry. This is not to suggest that the pulp and paper industry has no future in Newfoundland, though it would take much more than burning TDF to make the industry viable in the long term (Milley 2008).

This report, though preliminary, represents our concerns about using TDF. We have emphasized that:

- **The emissions and combustor technology at CBPP is not adequate** according to documents submitted by the proponents and other research available;
- **Scientific evidence is inconclusive** regarding the safety of TDF emissions, and especially the variability of dioxin and furan emissions, sulfur dioxide, and zinc and other metals;
- The **proposed testing methodology is entirely insufficient** to gauge the safety of TDF, and no independent analysis or data collection has been proposed;
- The **health effects** of several known TDF emissions are **severe**;
- The proposal **contradicts stated governmental policy**;
- The economic analysis regarding TDF is not provided, but evidence submitted has been vague and has not included environmental or health effects; and
- **Viable alternatives exist** for the disposal of scrap tires in Newfoundland.

We disagree with the release of the EA Registration as currently written. We propose further research, including a full EIS, as well as more lengthy and involved public participation and discussion. Alternatively, the Minister should reject the proposal.

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