APPENDIX C

Questions & Answers

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1. Air

1.1. Air Quality General

1.1.1. What will be the effect on the Williams Lake Airshed Management Plan to continuous improvement of particulate matter (PM10 and PM2.5) on the air shed? Will there be an improvement?

Yes. The pollution controls in place at the Williams Lake Power Plant (WLPP) are such that particulate emissions are extremely low. The trial burn using 100% railway ties (RRT) showed that the plant will continue to operate well below its permitted levels for particulate. Based on the documented improvements in Williams Lake's particulate levels after the plant came on-line, it is concluded that continued operation of the plant going forward is beneficial to maintaining the continuous improvement in the area's air quality.

1.1.2. What will be the medium to long term effect of emissions on in the entire airshed?

This question sums up the purpose behind the RWDI Dispersion Modelling Study. The report is attached in Appendix D. The model projects that any increases due to the burning of rail ties will not cause exceedances of the BC Ambient Air Quality Objectives (BCAAQO).

1.1.3. Will the air quality in Williams Lake be generally worse that it is now?

All predicted results in the community are within the BC Ambient Air Quality Standards or, absent a BC Standard, the Ontario Ambient Air Quality Standard. The testing and dispersion modelling show that some emissions (e.g. hydrogen chloride and sulphur dioxide) may increase and some (e.g. particulate and some trace metals) may decrease. When our plant opened in 1993, there was an immediate improvement in air quality because we consumed the material that used to be burned in beehive burners. If we keep operating, Williams Lake continues to have cleaner air, local sawmills continue to have a wood residue disposal solution, and fossil fuels like coal, oil and natural gas are displaced with renewable fuels.

1.1.4. What actual evidence does Atlantic Power have that ties can be burned safely and efficiently, as is stated but not really supported in the fact sheet?

The WLPP conducted a multi-day test in 2001, burning 100% rail ties, and the air testing results were well below permit standards. Since then, there have been no material changes to the plant process that would alter the results. Within that context, and given that we will be burning at most a 50/50 mixture of rail ties and traditional fuel sources, we are assured the process will meet all standards.

1.1.5. I understand that guideline levels are derived from using the best available control technology (BACT) to mitigate general emissions. As far as I know, guideline levels are not based on any health measure. This is still correct?

The design of the Williams Lake Plant was reviewed and approved by the MOE. The subsequent emission limits established for the plant were based on British Columbia's regulatory structure at the time of the plant's start-up, which do consider health impacts.

Similarly, any additional emission limits that may result from this permit amendment will be based on British Columbia regulations, as directed by the MOE.

However, in a Human Health Risk Study (See Appendix E) completed by Intrinsik Environmental Sciences, Inc., (Intrinsik), emissions from the plant were compared to other scientific and regulatory exposure limits, and were determined to pose a negligible risk, as described below:

Potential health risks were determined by comparing the predicted maximum ground-level air concentrations of the COPC at the MPOI for averaging times associated with both short-term and long-term exposures with exposure limits established by regulatory and leading scientific authorities responsible for the protection of public health. These limits incorporate a high degree of protection to accommodate vulnerable members of the population in order to determine the potential health risks to the people living in the area or who might frequent the area for work, recreation or other purposes. In accordance with accepted HHRA protocol, the exposure limits were based on a COPC's most sensitive toxicological endpoint. In all cases, the cancer risk estimates were predicted to be less than one in 100,000 (i.e., one extra cancer case in a population of 100,000 people), indicating that the chemical emissions from the WLPP burning 100% rail ties are associated with a negligible level of risk, as defined by BC MOE and Health Canada.

1.1.6. Is there a plan to reduce thee amount of ties in the fuel mix during inversion conditions?

Based on the results of the RWDI Air modeling, the potential air quality effects due to inversions were not significant with respect to burning rail ties. The dispersion modelling, which is calculated on an hourly basis (i.e. taking into account inversions), is conducted using the CALPUFF modelling system as required by the Guidelines for Dispersion Modelling in British Columbia (Section 2.3.2.4). Accordingly, there is no need to alter and/or reduce the amount of ties during inversion conditions.

1.2. Emissions

1.2.1. What assurances can Atlantic Power provide that incomplete combustion of treated chips would never occur?

Excess oxygen in the boiler flue gas is consistently maintained at the required boiler design level which supports complete combustion. In addition, the plant has a continuous emission monitoring system (CEMS) unit which monitors opacity and NOx, Carbon Monoxide (CO) and Oxygen (O2), that alerts operators to conditions where complete combustion may not occur. The results from the CEMS monitoring relative to permit compliance (opacity and NOx) are regularly reported to the MOE. Incomplete combustion occurs in an uncontrolled environment, whereas fuel burnt in a wood-fired boiler is part of a tightly controlled high-temperature combustion environment. In addition, the shredded rail ties have a higher heating value and tend to burn more quickly and completely than green / wet wood.

Please see Q&A # 1.2.2 and 1.2.8 for additional answers to this question.

1.2.2. What steps will be taken if rail ties are burned in the plant to prevent clogging of the air vents to ensure complete combustion to destroy toxic organic compounds in the treated wood chips.

There is only a small amount of RRT burning at any one time (<1 ton/min at the 50% limit). If there is a significant equipment malfunction, the plant would trip and shut down. Upset conditions happen quickly, typically in a second or two. So with the RRT being contained in the large metal furnace, if there is a significant equipment malfunction, the RRT will stay in place and burn out very quickly, in a matter of minutes. Also, shredding the RRT only as they are consumed, with only a small quantity of shredded RRT in an enclosed bin or silo eliminates any issues with handling shredded RRT and any potential for spontaneous combustion.

1.2.3. Will any of the equipment change in order to burn ties?

No. The same combustion equipment is in place and operating as it did during the 2001 test burn. We will be adding a shredder to process the ties on site, as well as conveyor equipment and a silo to contain the shredded ties.

Also, please see Q&A #'s 2.1.2 and 2.6.2 for additional answers to this question.

1.2.4. What is BACT for the proposed emissions and how does your plant compare?

The following table is offered for comparison.

Standards for Emissions from New Large Biomass Energy Facilities			
	Particulate milligrams/m³	**Dioxins/Furans nanograms/m³**	**Opacity**
BCMoE FactSheet on Air Emissions from *(new)* Biomass-Fired Electrical Power Generation – Nov 2011	20	0.1	10
WLPP Average emissions	4.0[1]		1.12[2]
WLPP Burning 100% Rail Ties	2.3	0.0034	

Notes:

1. 2008 – 14 average
2. 2015 average

Also please see Q&A #'s 1.2.5 and 1.2.8 for further answers to this question.

1.2.5. It is my understanding that railway ties are treated with either creosote or pentachlorophenol (PCP) and that diesel fuel is used as the carrier into the wood. Are you able to supply Plant temperature specifications in comparison to those adequate enough to destroy chemicals (example dioxins and furans, or other) to thereby render stack emissions of non-concern in this context?

Modeling of the furnace temperature by Jansen Combustion and Boiler Technologies confirmed the operating temperature of the WLPP system is in excess of 2000 degrees F (1400 degrees K,), which is more than adequate to destroy the contaminants of concern in creosote (dioxins, furans, pentachlorophenols), all of which decompose at temperatures significantly below 2000 degrees F. This was verified in our trial burn of 100% railway ties where dioxins and furans were measured at 30 times lower than required by the BCMoE FactSheet on Air Emissions from (new) Biomass-Fired Electrical Power Generation – Aug 2013. The very low levels of dioxins/furans in the stack emissions during the 2001 test burn was expected given the plant's boiler design with a furnace temperature in excess of 2,000 F and long residence time.

Also, please see Q&A # 1.2.8 for additional answers to this question.

1.2.6. The presence of the element chlorine in pentachlorophenol promotes the formation of dioxins/furans during combustion process.

True, however, the proportion of penta treated ties is expected to be relatively low, (less than 10% on an infrequent basis), and the other factors that lead to formation of dioxins/furans (low furnace temperatures and low residence times in the furnace) do not exist for this boiler.

Also, please see Q&A # 1.2.5 for additional answers to this question.

1.2.7. How does the height of the power plant discharge to air compare to the upper limit of stable air formed during inversion conditions? Is it possible to raise the height of the power plant discharge through a piped system to a height above the maximum stable air upper limit, such as appears to be used at the pulp mill in Kamloops?

The RWDI air dispersion modeling (Appendix D) includes the effects of inversions for our project and finds no significant deterioration in Williams Lake air quality due to the inclusion of rail ties as a fuel source.

The WLPP stack measures 60.7 meters in height. The stack was designed to discharge at this elevation for optimal dispersion while maintaining stability of the structure. In addition, the ground elevation of WLPP is approximately 17 meters above the ground elevation of downtown Williams Lake.

Accordingly, the stack is of sufficient height to avoid air quality impacts during inversions and thus there is no need to increase the stack's height.

1.2.8. Can you provide information on the design of the burner system that would help to understand the efficiency of the wood waste combustion processes, what type of incineration occurs, what temperatures are reached in the different parts of the combustion and heat recovery processes, how air or oxygen is introduced into the system to ensure that the time, temperature and turbulence conditions are sufficient to break down the toxic organic chemicals introduced into the burner and to ensure that toxic products are not reformed where temperatures are reduced following heat recovery?

The effectiveness of the plant's combustion system was verified in our trial burn of 100% railway ties where dioxins and furans were measured at 30 times lower than required by the BCMoE FactSheet on Air Emissions from (new) Biomass-Fired Electrical Power Generation – Aug 2013.

The boiler is made by Babcock & Wilcox, Canada. It is a Stirling type boiler with a specifically designed furnace for biomass fuel called a CCZ (controlled combustion zone), and the boiler has a Detroit stoker hydro-grate, which holds the combusting wood. Heat input to the boiler typically ranges between 900 - 1,000 million Btu/hr depending on the moisture content of the fuel. Boiler efficiency is approximately 75% to 68% over the same range, and the thermal output of the boiler (which does not vary with fuel moisture content) is approximately 680 million Btu /hr. The boiler can produce about 615,000 lb/hr of steam at 950 degrees F and 1550 psi.

The attached table shows the operating temperatures of the boiler at full load. Most of the values are from field measurements collected on 8/14/14. Our consultant used these field measurements to calculate other parameters which cannot be measured by typical instruments due to accessibility and very high temperatures. For the flue gas temperatures (identified as FG), we have highlighted the calculated values including the flue gas temperature at the inlet to the superheater of 1,978 F. The corresponding lower furnace temperature (above the grate) is about 2,500 F. The Adiabatic Flame Temperature provided in the table is a theoretical value and is not a physical parameter. The retention time is approximately 1 second. Reformation of toxic substances does not occur in this boiler due to insufficient time in the reformation temperature range as well as flue gas characteristics. The lack of reformation is demonstrated by the results of the 2001 stack test which showed very low levels of polychlorinated dibenzo-dioxins (PCDD) and polychlorinated dibenzofurans (PCDF).

Boiler Test Summary - Jansen

JANSEN	Company: Atlantic Power Inc. Location: Williams Lake, B.C. Canada Job No.: 2013-0132	
Combustion and Boiler Technologies, Inc.	By: MAA	
Subject: Summary	**Date: 9/01/2014**	
TEST NO.		**Site Visit**
		(08/20/14)
Steam Flow	lb/hr	613,398
Type of Fuel	-	Wood
Excess Air	%	20.7
Flue Gas 02 (wet base), BB Outl.	vol.%	2.90%
Flue Gas 02 (dry base)	vol.%	3.60%
Flue Gas 02 from TAH (dry)	vol.%	3.60%
Higher Heating Value Mix. (Dry)	Btu/lb	9,100
Fuel Mixture Moisture Content	%	34.70%
Heat Input from Natural Gas	Btu %	0.0%
Quantities (As-received)		
RR Ties	lb/hr	0
S.V. Wood	lb/hr	150,586
Wood 50% moisture	lb/hr	0
No. 6 0il	lb/hr	0
Nat. Gas	scfh	0
Spray Water	lb/hr	57,260
FGR	lb/hr	0
Flue Gas leaving Furnace	lb/hr	880,127
Flue Gas leaving TAH w/ Leakage	lb/hr	956,157
Air to Unit (Incl. HVLC NCG)	lb/hr	737,143
Air to FD Fan (Incl. Leakage) Pressures	lb/hr	813,173
Pressures		
Steam at SH Outlet	psig	1,530
Boiler Drum	psig	1,620
Drop, Drum to SH Outlet	psi	90
Temperatures		
Superheated Steam at SH Outlet	OF	945
Adiabatic Flame Temperature	OF	3,121
FG Superheater Inlet	OF	1,978
FG Generating Bank Inlet	OF	1,581
FG Generating Bank Outlet	OF	797
FG Economizer Outlet	OF	583
FG TAH Outlet	OF	335
Feedwater to Unit	OF	382
Feedwater to Steam Drum	OF	480
Combustion air from TAH	OF	479
Air to TAH	OF	160
Flue Gas Volume Flows At TAH Outlet		
At TAH Outlet	scfm	214,533
at elevation of 2,150ft	acfm	354,790
Total Heat Input (fuel, air)	MBtu/hr	909.8
Total Heat Input on Grate	MBtu/hr	894.8
Total Heat per Grate Area	MBtu/hr-ft	1.29
Total Heat per Furnace Volume	Btu/hr-ft3	24,246
Efficiency of Unit	%	74.6

1.3. Emissions Monitoring

1.3.1. I understand that WLPP is requesting to discontinue the continuous emission monitors (CEMs). With the request to burn more RRT, this is not the time to remove emission monitors. (paraphrased phone call)

We are not asking to remove emission monitors. The application seeks to remove the requirement to follow a federal protocol for maintaining and auditing the CEMs that was not designed for biomass facilities. The CEMs at WLPP will continue to operate and will continue to be verified by the MoE auditing program and by third party stack testing (in accordance with BC Manual for Continuous Monitoring and Collection of Air Samples, 2003 Edition).This is consistent with all similar CEMs at pulp mills and power plants throughout the province.

Also please see Q&A # 1.3.2 for additional answers to this question.

1.3.2. The amendment proposes to delete the provisions for continuous emission monitors audited in accordance with Environment Canada's EPS 1/PG/7 Protocols and Performance Specifications, for the reason that these protocols are intended for fossil fuel burning systems. In that treated railway ties, contaminated absorbent materials, and 872 liters/day of waste oil contains fossil fuels, can you explain justification for deletion of the provisions mentioned, and describe what will be in place to suffice?

The continuous emission monitors (CEMs) at the Williams Lake Power Plant are currently and will continue to be subjected to the same rigorous calibration protocols as other similar systems in the province (BC Manual for Continuous Monitoring and Collection of Air Samples, 2003 Edition). This includes hog and recovery boilers at pulp mills (some of which are permitted to burn waste oil, RRT and other fuel types) and other biomass energy systems. All Permitted CEMs are audited by Ministry of Environment twice yearly and must meet a series of requirements. In addition, the CEM readings are compared with the annual stack testing required by the Permit. We believe that the federal EPS Protocols are redundant to the provincial requirements. When compared to the large amount of non-fossil-fuel containing biomass which will still be used in the event the permit amendment is approved, the amount of fossil fuel contained in the waste streams noted above is considered to be a minor percentage. Accordingly, it is concluded that the Provincial rules and protocols are more than sufficient to ensure comprehensive quality control of the CEMs.

The current permit allows the burning of hydrocarbon contaminated materials with the prior written approval of MOE along with recordkeeping provisions. The permit amendment seeks to broaden the type of contaminated materials allowed (i.e. absorbent materials), eliminate the prior written approval administrative burden while maintaining the recordkeeping provisions. The provision to burn "hydrocarbon contaminated absorbent materials originating from accidental spills" up to a maximum of 872 liters/day is intended to allow for spill recovery materials (obtained through cleanup efforts within the local area) to be disposed of in the energy system. These occurrences are rare, the volumes would normally be low and the high temperatures within our furnace ensure complete destruction. The burning of these materials is allowed under our current permit but requires written authorization by the Director.

We believe that eliminating the time consuming step of obtaining prior written approval to burn hydrocarbon contaminated materials will allow us to accept these materials from 3rd parties in an expeditious manner to ensure they are handled properly.

1.3.3. Will there be additional air testing?

We have continuous emission monitors measuring nitrogen oxides and opacity (particulate). We report monthly to the MOE and a 3rd party test is done annually. This is in addition to the spot checks that the MOE performs twice a year. The MOE may require additional testing.

1.3.4. Has recent testing been done with effects burning fuel mixes as high as 50% railways tie material to determine toxic emissions?

Out of caution, the 2001 trial was conducted using 100% RRT. The stack testing technology and methodology have not changed. Our data, which is representative of a fuel mix consisting of 100 % rail-ties, is considered to be very conservative and indicative of insignificant impacts on human health and the environment.

1.3.5. Has this type of testing been carried out over longer time periods to look at effects of variations in the process over time?

Yes. Electrical power plants across North America have been burning used RRT for many years. For reference, please see an interview conducted by the Williams Lake Tribune, on August 4, 2015, with a plant representative from the French Island plant in Wisconsin, which summarizes their experience with burning rail-ties, wood waste and RDF. In addition, our pollution control equipment delivers emissions that are well within our permit limits. This added to the highly controlled, high temperature furnace results in almost no variability over time.

As stated above, the data from our test in 2001 are considered conservative and representative. If Williams Lake is approved to use a higher percentage of rail-ties in its fuel mix, testing of the emissions (continuous emissions monitoring and annual stack tests) will be conducted on a routine basis going forward, so as to confirm the lack of any adverse impact on the Williams Lake air shed.

1.3.6. Is planned annual stack testing adequate to guarantee that toxic emissions will not occur periodically throughout the year. Should random testing by a third party be required?

As stated above, there is almost no variability in our process and the continuous emissions monitoring system provides a thorough check of combustion effectiveness. All of our stack testing is conducted by a qualified, independent firm and Ministry of Environment conducts verification audits of our continuous emission monitors twice yearly.

1.4. Ambient Monitoring

1.4.1. An air quality monitoring program should be provided to confirm air quality objectives are met during potential operation and identify any meteorological conditions in which the fuel mix should be altered to reduce the occurrence of exceedances.

There is no background data for ambient levels of sulphur dioxide, hydrogen chloride or Total PAHs.

Notable increases in contaminant concentrations to the Williams Lake air shed are predicted for sulphur dioxide (no background data to 57% of the BC Ambient Objective @ 50% rail ties), hydrogen chloride (no background data to 66% of the Ontario Objective @ 100% rail ties) and total PAHs (no background data to 27% of the Ontario Objective at 100% rail ties). The 2001 trial burn identified very high concentrations of sulphur dioxide and hydrogen chloride associated with burning of the rail tie fuel relative to regular wood waste. For example, sulphur oxides increased from 1 to 172mg/m3 (180 requirement) and hydrogen chloride increased from non-detectable to 59.8 mg/m3 (50 standard) when burning 100% rail ties vs regular hog fuel. The modelling results also indicate that small particulate matter PM2.5 and PM10 concentrations are already predicted to be 82% of the ambient air quality objective with negligible contribution from the rail tie fuel.

The Ministry of Environment, with financial support from local industry, is responsible for monitoring air contaminants. It is the Ministry's role to determine whether the current monitoring system should be expanded to include other contaminants of concern. Note that because the trial burn was run using 100% rail ties, and that we are applying to raise the limit to a 50% maximum, it is concluded that emissions of all the compounds of concern noted above will be within the applicable Provincial standards. This conclusion is documented in the RWDI Air Modeling Report.

1.4.2. Who would be in charge of measuring any toxic build up?

As noted above, the Ministry of Environment, with financial support from local industry, is responsible for monitoring air contaminants. Monitoring is done on a continuous basis and results are available on the Ministry website. AP will continue to support and participate in the community airshed monitoring system. The decision to add monitors should continue to be based on health and environmental concerns. If that rationale indicates a new monitor and AP is a key source of the contaminant in question we will support the cost of the new monitoring equipment.

1.5. Emissions – Fugitive

1.5.1. How will you control fugitive dust from piles and roadways?

We have a dust suppression program plan in place, and respond accordingly as weather conditions warrant. In addition, we work with the MOE to meet their requirements in addressing any public complaints. Our project will not materially change the total truck deliveries to the plant site since the rail tie deliveries replace current residual wood waste deliveries. In addition, in the event the permit amendment is approved, it is anticipated that truck deliveries of fiber to the plant, as well as use of the truck dumper, will be reduced, due to the supplemental use of rail-ties in its place. The rail ties will be stored whole on the power plant site until needed. Once the rail ties are shredded, the shredded material will be stored in a bunker or silo (not in open piles) which will minimize fugitive dust.

Also, please see Q&A # 1.8.1.8 for additional answers to this question.

1.5.2. The RWDI report (see Appendix D) estimates emissions for parameters with AQOs. Has any evaluation been made for any potential nuisance impacts from the combustion/storage of rail ties, such as odour?

As noted in the following response, it is not expected that there will be sufficient emissions of any potentially odiferous compounds emitted from the ties well stored in their whole state that could result in offsite odours**.** The rail ties being used for fuel will typically have been removed from service after 20-30 years or more. These end-of-service ties that have experienced several decades of chemical loss mechanisms including exposure to the sun's UVs and radiation, freezing and leaching due to heat and precipitation. The shredded rail ties will be stored in a silo or bin to minimize odours.

1.5.3. Naphthalene is a volatile parameter and constituent of creosote. It is regulated in the workplace, and under BC Contaminated Sites Regulation (CSR) in soil vapour. Where there is proposed large scale storage of creosote-treated rail ties, has there been any assessment performed to determine the impact to neighbours and for worker exposure?

Onsite worker exposure is regulated by WorkSafe BC and is not part of the regulatory environmental permitting process. The 2001 study did include a list of speciated PAH substances that were included in the Total PAH emission rate and predicted concentrations in the stack. Within the data, naphthalene is noted as being an “artifact” and therefore there is no data available for a direct evaluation. Therefore, total PAHs were assessed and related to the potential impact to neighbours in the report (see Table 8, for example).

The ties being used for fuel will be ‘aged’ in the sense that as a result of weathering in place they should be relatively depleted of volatiles and semi- volatility in the outer layers. As such, there will be limited off-gassing associated with the ties when stored whole prior to shredding and consumption.

AP routinely assesses the exposure of our employees to hazards. In addition, Intrinsik is being contracted to conduct a work-place health and safety evaluation of the use of rail-ties as a supplement to our combustion fuel, so as to ensure there are no adverse health impacts posed to our workers. In addition, WorkSafe BC provides routine oversight and reviews of our worker safety program.

1.6. Rail Tie Variability/Sources

1.6.1. The RWDI report (See Appendix D) identifies predicted emissions of total PAHs (particulate and vapour phase) in Table 8.

a. **Has there been any account taken in the emissions estimate to address the variability of PAH concentrations for the feedstock?**
b. **Similarly, have the emissions estimates for metals, chlorophenol, dioxins and furans been assessed based on the potential variability of contaminants within feedstock?**

The PAH levels in Table 8 of the 2001 test report show a wide range of PAH levels between regular fuel and rail tie fuel, yet the PAH emission levels in the stack did not show a significant difference. Therefore, it is expected that further variations of the PAH levels in the rail tie fuel will also not show a significant difference in stack PAH levels.

Table 8 of the RWDI report shows the maximum predicted concentration of metals, chlorophenol, and dioxins/furans, all of which are well below 1% of the AAQOs. Therefore, variations in the feedstock mixture are not expected to significantly change the results of the air dispersion model.

1.6.2. RWDI report does not report the assessment and quantification of the feedstock utilized during the trial burn. Concentrations of preservatives retained within the ties are likely to vary (wood species, age, weathering factors, etc.) and the ratio of each treatment e.g. creosote, pentachlorophenol (PCP), chromated copper arsenate (CCA) will depend on their source.

a. **Although creosote is the dominant preservative used in the rail industry, it is anticipated that there may be ties burned that are treated with PCP, CCA or more recently, ACQ (alkaline copper quaternary), rather than creosote. Have these other feedstocks been considered and accounted for within the trial burn scenario considering their ratios may vary through time?**
b. **What was the PAH concentration range within the rail ties used as feedstock?**
c. **Were the rail ties used in the trial burn randomly selected from the feedstock, and if so, what were their treatment characteristics and/or PAH (PCP, CCA etc.) concentration ranges?**

The combustion of wood residue treated with metal derived preservatives (such as CCA or ACQ) is prohibited in the current permit, and no changes to this provision are being requested. Further, CN (the expected primary rail tie supplier) has confirmed that they have not used metal treated ties in their system, and our fuel supply agreement with CN (and others) will prohibit any metal treated rail ties.

CN has indicated that the expected rail tie supply will consist of mostly creosote treated ties with some penta treated ties. The ties used in the 2001 test were randomly selected and are expected to be representative of the future supply. The PAH levels of the ties are shown in Table 8 of the 2001 test report (appended to the RWDI report (see Appendix D)). The PAH emission levels in the stack during the 2001 test did not show a significant difference between regular wood fuel and rail tie fuel, indicating that the PAH emission rate is not directly related to the PAH levels in the fuel.

Also, see Q&A # 1.5.2, 1.5.3 and 1.6.1 for additional answers to this question.

1.6.3. WLPP declined to clarify the source of the future waste rail ties so it should be assumed the treated wood may be sourced anywhere in North America. Evidence

is required to ensure that waste rail ties from CN Rail, CP Rail or Burlington Northern etc. are indistinguishable in contaminant types and concentrations. If there are material differences, then each rail tie source should undergo testing and/or trials.

Please see Q&A # 1.6.1 and 1.6.2 for an answer to this question.

1.6.4. Where will the ties come from? How much will the chemical composition vary? For how long will the 50% burn last? Will RRT be burned seasonally or at an even rate throughout the year?

Based on our discussions with CN, the rail ties will be coming from the western Canada portion of their system. We anticipate that deliveries of rail ties may diminish at certain times of the year. At no time will our fuel mix show greater than 50% RRT.

We expect that on average the plant would consume between 55,000 - 85,000 tonnes of rail ties per year up to a maximum of 100,000 tonnes per year. The plant consumed about 410,000 tonnes of fuel in 2014, so the expected rail tie use would equate to about 25% of the annual fuel mix if the plant continues to operate as it did in 2014. However, in the future the plant may operate less frequently causing the percentage of rail tie use to approach as much as one third of the total fuel use on an annual basis. Over shorter durations, rail ties would not exceed 50% of the plant fuel mix.

Also please see Q&A # 1.6.2 for additional answers to this question.

1.6.5. Are you able to easily differentiate ties that are treated with PCPs and creosote and modify the processes to deal with these more risky chemicals? What percent will contain PCP?

Table 8 of the RWDI report shows the maximum predicted concentration of metals, chlorophenol, and dioxins/furans, all of which are well below 1% of the AAQOs. Therefore, variations in the feedstock mixture are not expected to significantly change the results of the air dispersion model.

1.7. Trial Burn

1.7.1. The April 2001 stack test results indicates that there would be significant increases in concentrations of several air contaminants released when burning 100% rail ties i.e. hydrogen chloride, sulphur dioxide, and total chlorophenols as well as minor increases for other contaminants including some metals and furans etc. Is a 14 year old stack test of one hour duration on 3 consecutive days sufficient to characterize a worst case scenario for modelling airshed conditions in Williams Lake?

AP engaged independent consultants to conduct both air modeling (RWDI) and human health evaluations (Intrinsik), both of which concluded that emissions from burning rail-ties at a 50 %

mixture are within the applicable BC or Ontario provincial standards, and do not pose a risk to the environment or human health.

The decision to use the April 2001 Stack test was based on a determination that the testing methods, fuels, and worst-case scenario (100 % rail-ties) would be a scientifically valid basis for evaluating the permit amendment request to burn a 50 % rail-tie mixture. In addition, prior to conducting the modeling effort by RWDI, the use of the 2001 report was evaluated and approved by the MOE.

1.7.2. Emissions utilized in the air dispersion modelling are based on 2001 stack testing program at WLPP, with the power plant combusting 100% rail ties. Confirmation is required to determine whether changes to the operating conditions or infrastructure through upgrades have occurred within the subsequent 14 years. Any such changes may affect the point source stack parameters, which may affect the confidence in the emission data.

There have not been any material changes to plant design or configuration since 2001 that would affect the point source stack parameters, beyond an increase in allowable flow rate (100 - 110 m3/sec) made to the Discharge permit in 2010. Given a constant stack concentration, an increase in flow rate would result in a similar increase in emissions. But the increased flow would also result in a greater exit velocity which would enhance dispersion, offsetting the increase in emissions. In addition, the total pollutant emissions are controlled by the amount of fuel burned. If the same amount of fuel was burned using a higher air flow, overall pollutant emissions would remain constant and the higher flow rate would again increase dispersion. For these reasons, the flow rate increase is not expected to have a material impact on the test results.

1.7.3. The trial burn and stack survey were conducted 14.5 years ago. It is understood that once granted a permit authorization becomes a right which cannot be revoked except under extreme and rare circumstances. The power boiler and its associated pollution control equipment is 14 years older and maintenance, process and equipment modifications and/or changes over the last 14 years may have changed the performance characteristics. For example, the authorized flow rate during the trial burn was 100m/s; the current authorization is for 110m/s. A new trial burn which would reflect current plant conditions and use up-to-date laboratory and testing technologies is warranted.

If WLPP is approved to use a higher percentage of rail-ties in its fuel mix, testing of the emissions from the stack will be conducted on a routine basis going forward, so as to ensure the lack of impact from the combustion of rail-ties.

Also, please see Q&A #'s 1.3.5. 1.7.1 and 1.7.2 for additional answers to this question.

1.7.4. The authorized flow rate during the trial burn was 100m3/s. The current authorization is for 110m3/sed. A new trial burn would reflect current plant conditions and use up-to-date laboratory and testing technologies.

The pollution control equipment was oversized for the system meaning that we are able to achieve much lower emissions than industry standard. Our equipment and associated controls are all functioning as they did during the trial. Similarly, stack testing methods and lab technologies have not changed.

Please see Q&A #'s 1.7.1, 1.7.2 and 1.7.3 for additional answers to this question.

1.7.5. The RWDI report uses data obtained from a 2001 trial and stack test report.

- **a. Have emission controls at the Facility changed since this stack test was completed?**
- **b. If so, how would these changes likely influence the emissions?**

There have not been any changes to our emission controls at the plant since the 2001 stack test. Our CEMs and third party stack test results verify that the electrostatic precipitator (ESP) is functioning at high efficiency.

Also please see Q&A 1.7.2 for additional answers to this question.

1.7.6. Atlantic Power indicates that the elevated boiler operating temperatures (2,000 °F) keep emissions below provincial health and environmental standards.

- **a. What were the boiler operating temperatures during the trial?**
- **b. What are typical boiler operating temperatures and ranges?**
- **c. What were the boiler temperatures during the month preceding and following the trial?**

The design temperature of the furnace, and its effectiveness in ensuring complete combustion with low emissions was confirmed by the 2001 stack test and the recent air modelling. The primary parameters for measuring combustion effectiveness (and therefore reaching the design combustion temperatures) are carbon monoxide (CO) and excess oxygen (O2). If combustion is inefficient CO levels will rise and excess O2 levels will drop, typically. CO levels and excess O2 levels are monitored closely, and fuel and air flow to the boiler are regulated to ensure complete combustion, regardless of fuel composition. Table 6 of the 2001 test report shows CO levels were within their normal range during the test, and dropped slightly from the regular-wood-fuel portions of the test to the rail-tie-fuel portions of the test.

Furnace temperature (fireball temperature) is not measured routinely, and we do not have the requested historical values.

Also, please see Q&A # 1.2.8 for additional answers to this question.

1.7.7. Atlantic Power suggests that the higher heating value of the shredded rail ties burns more quickly and completely than green wood.

- **a. Could the 50% estimate for SO2 concentrations (i.e. 50% of emissions from combustion of 100% rail ties) underestimate SO2 emissions considering the potential for incomplete combustion when burning ties with other wood waste?**

b. Has historical combustion of wet/green wood waste presented evidence indicating a reduction of boiler temperatures and/or increased incomplete combustion?

The plant ensures good combustion using regular wood fuel today, and given the higher energy content and lower moisture content of rail ties, continued operation of the plant with good combustion can be assured. Combusting rail ties with regular wood fuel will not result in incomplete combustion. The boiler is monitored closely for combustion efficiency and the fuel and air flow are adjusted to ensure complete combustion. The introduction of some rail tie fuel will only enhance the current excellent operating conditions of the boiler.

The Williams Lake boiler was specifically designed for biomass with the ability to achieve full steam output with fuel moisture contents up to 55%. The plant's wood deliveries range from green wood and bark (~40% moisture content) to mill shavings (~15% moisture content). The plant maintains a large wood inventory in the fuel yard, and the fuel in the yard is well mixed. The moisture level of the fuel fed into the boiler typically stays in the 30-40% range.

Also, please see Q&A # 1.2.8 for additional answers to this question.

1.7.8. We do not know the weight or volumetric mix of creosote treated ties to pentachlophenol treated ties fed to the burners during the trial. Feed from these tests should be characterized and possibly each type of treated tie tested separately to determine efficiency of organic compound destruction during the combustion and heat recovery processes.

CN has indicated that the expected rail tie supply will consist of mostly creosote treated ties with some penta treated ties. The ties used in the 2001 test were randomly selected and are expected to be representative of the future supply. The PAH levels of the ties are shown in Table 8 of the 2001 test report (appended to the RWDI report). The PAH emission levels in the stack during the 2001 test did not show a significant difference between regular wood fuel and rail tie fuel, indicating that the PAH emission rate is not directly related to the PAH levels in the fuel.

In addition, Table 8 of the RWDI report shows the maximum predicted concentration of metals, chlorophenol, and dioxins/furans, all of which are well below 1% of the AAQOs. Therefore, variations in the feedstock mixture are not expected to significantly change the results of the air dispersion model.

1.8. Dispersion Model – See Report in Appendix D

1.8.1. Model Design

1.8.1.1. Confirm modelling was conducted following the Guidelines for Air Dispersion Modelling in British Columbia, with results compared to applicable BC Air Quality Objectives (AQOs).

This is correct. The modelling was conducted in accordance with regulatory guidelines and a detailed model plan was approved by MOE staff prior to commencement of the study.

1.8.1.2. In the absence of a provincial or national objective, rationale should be provided for comparison to Ontario ambient air quality criteria (AAQC) rather than potentially more conservative EPA or WHO guidelines.

Where applicable, preference is given to Canadian objectives developed in regard to similar industry under similar national guidelines and objectives. This is a standard approach for BC applications.

1.8.1.3. What are the air quality standards referred to by the applicant?

Where they exist air quality standards for British Columbia are used. In absence of local standards, ambient air standards from Ontario are used for reference.

B.C. Ambient Air Quality Objectives – Updated October 30, 2015 can be found at http://www.bcairquality.ca/reports/pdfs/aqotable.pdf

Ontario Ambient Air Quality Criteria - April 2012 can be found at http://www.airqualityontario.com/downloads/AmbientAirQualityCriteria.pdf

1.8.1.4. CALMET was applied for a 1-year model period of January 1, 2012 to December 31, 2012. Confirmation is required to confirm why one years' worth of data was utilized and whether the 2012 meteorological data is reflective of typical meteorological conditions.

A one year period is a standard approach for a study of this type and conforms to BC Modelling Guidelines. As noted in the report, BC MOE has provided province-wide WRF data for certain years to assist with standardized dispersion studies in BC. The 2012 was selected by MOE as a representative year for those inputs. The data provided was included in our monitoring plan that was approved by the Ministry (see correspondence in Appendix B of the modelling report).

1.8.1.5. The RWDI report references background concentrations and compares these to the emissions estimates:

- **How did the background concentrations in 2012 compare to other years?**
- **What is the long-term trend in background concentrations for the available parameters?**

A study of trends in PM up to 2011 has been completed previously by MOE. http://www.bcairquality.ca/reports/pdfs/aq_williams_lake_Sept2012.pdf

The results of that study show that the PM background values of 20.2 µg/m^3 from 2012 used for the study is higher than 2011 and equal or higher than all years since 2006, within the exception of 2010 which was dominated by forest fires. When the effects of forest fires are removed from the historical measurements, then the $PM_{2.5}$ value of 20.2 µg/m used for background is higher than 2010 also. In general $PM_{2.5}$ values, with the exclusion of forest fires, show a slight downward trend since 2006. Similar trend is seen for PM_{10}.

The BC Lung Association also publishes historical summary of air quality in BC. http://www.bc.lung.ca/airquality/stateoftheair-report.html Although William's Lake is not specifically noted, the results show that both PM and NO_X show downward trends across the province. This is due to factors such as vehicle emission standards and restrictions on open burning and reduced use of wood as fuel for home heating.

1.8.1.6. Atlantic Power said that their modelling would consider the effect of inversion. No direct reference to inversions is provided by RWDI in their Report.

Inversions are considered. The dispersion modelling, calculated on an hourly basis, was conducted using the CALPUFF modelling system as required by the Guidelines for Dispersion Modelling in British Columbia. The BC guideline states in Section 2.3.2.4 regarding CALPUFF and CALMET:

CALPUFF is a Gaussian puff model that can account for time- and space-varying meteorological conditions, different source configurations and contaminants, and chemical transformations. The specific treatments include curved trajectories, building downwash, plume penetration into a capping inversion, fumigation, coastal interaction effects, terrain impingement, stagnation, and transformation- related effects (contaminant removal due to wet scavenging and dry deposition, chemical reactions) and visibility effects of particulates. It can be applied to model near field effects (in the order of tens of metres) to transport distances of hundreds of kilometers. CALPUFF is a modelling system comprised of three component sub models: CALMET (meteorological model), CALPUFF (calculates output), CALPOST (analysis and display of output). The meteorological fields used by CALPUFF are produced by CALMET — a meteorological model that includes a diagnostic wind field model. This model contains treatments of slope flows, valley flows, terrain blocking effects, kinematic terrain effects (i.e., speed up over hills), lake and sea breeze circulations, and a procedure to insure mass is conserved in the domain. CALMET inputs include surface and upper-air meteorological data as well as the option to use the gridded meteorological fields produced by mesoscale meteorological models.

The excerpted portions above all pertain to the model's ability to include atmospheric processes in complex terrain, including inversions.

1.8.1.7. Does the dispersion model consider emissions from other sources? If no, how will the overall impact be assessed?

The model considers point sources from WLPP and adds the predicted impact to the ambient levels experienced in the airshed over the period of 2012. In this way, the combined impact from all sources in the community is considered.

1.8.1.8. Onsite shredding of rail ties is proposed as part of the renewal project. Inclusion of this particulate source, or identification of associated emission control equipment, does not appear to have been included in the renewal material. All potential sources associated with the renewal project should be included, especially given that PM10 concentrations are already predicted to be 82% of the objective (including background concentrations).

Fugitive dust sources are not typically covered in discharge permits and are thus also not included in the modelling. The design of the equipment to be used for the shredding of railroad ties includes measures that will be used to reduce and eliminate fugitive emissions from the shredding activities. In addition, a Fugitive Dust Plan is in-place at the Plant, which specifies steps taken to minimize fugitive dust generated by plant activities. Further, any fugitive dust created by this process would be mechanically generated wood particles (as opposed to being the result of combustion, for example) and would therefore likely occur in large size fractions greater than PM2.5 and PM10 that would be easily captured by mitigation efforts, and that would settle within or close to the plant should they occur. There would be negligible influence on ambient PM2.5 or PM10 on or off site.

Per RWDI's response above, the air dispersion model focuses on point sources (e.g. the stack) and does not include fugitive sources. Nevertheless, management of fugitive emissions is a key element of the design process for the new rail tie (RRT) shredding system and the Fugitive Dust Plan will be modified in coordination with the MOE to account for the potential for fugitive dust from the rail-tie handling activities that will occur. The preliminary design of the rail-tie handling system includes these measures:

- Receipt of whole ties and unloading with a grapple arm (i.e. no dumping).
- Covered conveyors will be used.
- The collecting conveyor beneath the shredder will be equipped with an enclosed skirtboard, just below the shredder's discharge chute, and the outlet opening of the skirtboard will be enclosed with dust curtains.
- The stream of shredded RRTs through the disc screen and hog tower (or secondary shredder) will be enclosed with chutes that are fitted with dust curtains at the inlet and outlet chute openings.
- The collecting conveyor below the disc screen and hog (or secondary shredder) will be fitted with an enclosed skirtboard, just below the disc screen's and hog's discharge chute, and the outlet opening of the skirtboard will be enclosed with dust curtains.
- Shredded RRTs will be stored in an enclosed area (e.g. silo or bin).

These design features, while still preliminary, will ensure minimal fugitive dust from the receipt, handling, and storage of the rail ties.

1.8.1.9. Does the RWDI airshed model take into account the organic contaminant loading from volatilization of creosote and PCP compounds from ties stored at the plant and in shredded chips waiting to be feed to the burner.

The model does not consider fugitive emissions (particulate or vapor) from RRT or chips. However, these emissions will be minimized by limited onsite storage of shredded rail-tie fuel supply, containing shredded rail ties in a bin or silo and managing the volume of whole RRT.

In addition, please see Q&A #'s 1.5.2, 1.5.3, 2.4.3 and 2.5.3 for additional answers to this question.

1.8.2. Particulate

1.8.2.1. The trial burn and modelling results indicate that small particulate matter PM2.5 and PM10 concentrations are already predicted to be 82% of the ambient air quality objective with negligible contribution from the rail tie fuel.

Particulate emissions from the plant are consistently lower than the permitted limits of 50 mg/m3, averaging 6.3 mg/m3, or 12.5 % % of that limit, in the last thirteen years of testing. In addition, as detailed in Table 6 of RWDI's Report, the plant's particulate emissions are less than 2% of the ambient air quality standard, while 80% of the 82% of such emissions in the Williams Lake area come from other sources. The addition of rail ties to the fuel mixture does not increase the particulate emissions. Furthermore, the studies by RWDI and Intrinsik conclude there are no significant impacts to either human health or the environment from the proposed amendment.

1.8.3. Sulphur Dioxide (SO2)

1.8.3.1. Figure 6 states "Predicted Ninety-Ninth Percentile Peak 1-Hour Maximum SO2 Including Ambient Background Value for 50% Rail Ties"; however, Table 7 indicates that no background concentrations were applied for comparison.

Figure 6 contains a typographic error and Table 7 is correct. To confirm, no background data was available for SO_2.

1.8.3.2. Background concentrations of sulphur dioxide were not provided resulting in a lower potential maximum predicted concentration at 57% of the objective value (50% rail ties). Sulphur dioxide exceeds the maximum predicted concentration (at 100% rail ties) without the inclusion of a background value. The region will have pollution contributed from other industrial sites, residential pollution, and/or naturally occurring pollution. In order to appropriately predict the overall air quality in the area once the proposed fuel source is implemented, a background concentration is required for all contaminants.

Ideally background concentrations for all contaminants would be assessed with the modelling for comparison to the AAQOs. However, in many cases, not all contaminants have existing background data for comparison. Local background concentrations vary, so we would be concerned about applying a background concentration from another area to this area. We would also note that typically air quality monitors are only deployed when potential concerns with specific facilities are suggested based on permitted emissions or modeling studies. Thus the fact that there are no specific monitors for SO_2, (while PM and NO_X are currently monitored) tends to suggest that there are no existing major facilities or sources in the area for which resulting ambient concentrations of SO_2 are a concern.

In addition, Intrinsik's human health evaluation (see Appendix E) concludes, based on "the potential change in SO2 emissions associated with the proposed increase in the volume of rail ties in the fuel mix at the WLPP; the conservatism incorporated in the predicted ground-level air concentrations of SO2; the areal extent of the predicted exceedances of the BC MOE AAQO; the likelihood of an exceedance of the BC MOE

AAQO occurring; and the levels of exposure that have resulted in observed adverse health effects in humans, as documented in the most recent scientific literature, the predicted short-term SO2 air concentrations are not expected to adversely affect the health of people living in the area or who might frequent the area for work, recreation or other purposes.”

1.8.3.3. Diesel fuel, in particular fuel of previous decades contained sulphur. How do you see the proposed new sources of fuel impacting sulphur emissions?

The RWDI Modelling study showed Sulphur dioxide levels all below the BC Ambient Air Quality Standard at 50% rail ties.

In addition, please see Q&A # 1.8.3.2 for additional answers to this question.

1.8.4. Nitrogen Oxides (NOx)

1.8.4.1. RWDI indicates that 1-hour predicted concentrations were at or slightly above the AQOs however, the adjustment for background potentially double counts the plant emissions. Modelling should be updated to confirm the corrected concentrations to determine whether NO2 predicted concentrations are actually above or below the AQO.

In general, modeling must account for the effect of emissions both from the facility being evaluated (typically a new facility) and existing emissions from other sources. That is why modeling results for a proposed facility alone are added to the background from existing sources as measured by the ambient monitoring. However, because this facility is already in operation, emissions from the plant that do not change (such as NO_X) will also be captured in the background-monitoring data, hence the potential for double counting. It is not possible to completely remove the effect of current facility operations from the monitoring results. As such there is no update that can be done to remove the artifact of double counting. The NO_2 results were presented with and without the background included so as to bound the results. As stated below, the inclusion of rail ties in the fuel mix has no or very little effect on the plant NO_X emissions.

1.8.4.2. For instances where emissions are predicted to be above the AQOs emission control, or mitigation methods should be presented for consideration.

The inclusion of rail ties in the fuel mix has no or very little effect on the plant NO_X emissions, and, therefore, there is no impact expected from revising the permit from the current 5% RRT limit to a higher limit. Further mitigation is not warranted given the conservatism of the model study and the limited potentially affected area.

1.8.4.3. The model suggests that current power plant emissions exceed provincial air quality objectives for nitrogen dioxide.

RWDI points out in the report that the process of adding background ambient values to the modeled emissions data has the effect of double counting. This is consistent with the fact that nitrogen dioxide emissions are virtually unchanged whether burning traditional wood fibre or 100% rail way ties. This, and other conservative assumptions in the analysis, indicates that the BC Ambient Air Quality Standards for this compound will not be exceeded during actual operations.

In addition, please see Q&A # 1.8.4.1 for additional answers to this question.

1.8.4.4. The evidence suggests that current power plant emissions exceed provincial air quality objectives for nitrogen dioxide.

Measured ambient nitrogen dioxide levels are significantly lower than the BCAAQO and the plant's emissions are less than its permit limits. NOx emission remained largely unchanged when burning 100% rail ties versus traditional wood fibre. We expect that Williams Lake will continue to achieve the AAQO for nitrogen dioxide.

In addition, please see Q&A #'s 1.8.4.1, 1.8.4.2 and 1.8.4.3 for additional answers to this question.

1.8.4.5. RWDI indicates that the exceedances of the AAQO are limited to area within one to two kilometers to the northwest of the facility with a smaller area within a few hundred meters to the southwest. Sensitive receptors or receptors of concern to the Williams Lake Indian Band (WLIB) (cultural and/or traditional significance) within this area should be identified on maps that show the frequency of exceedance of objectives or guidelines at each receptor.

RWDI will complete this analysis in cooperation with WLIB. Note: the potential exceedances of the objectives relate to NO_X, and the inclusion of rail ties in the fuel mix has no or very little effect on the plant NO_X emissions.

1.8.5. Miscellaneous

1.8.5.1. I am concerned about using a model to predict the concentrations of emissions at various locations in the valley. Can we expect that there will be ongoing monitoring of the emissions at various locations, and under various climate conditions? This will serve to confirm the predicted values from the model. If the actual emissions vary unfavourably to the predicted emissions and exceed the thresholds, then what? Will the amendment be rescinded?

The Calpuff model is utilized for airshed management and regulatory decision making throughout North America and is routinely compared with local ambient data. There are a number of ambient monitors in Williams Lake and the Ministry of Environment is responsible for ensuring that the monitoring program is protective of residents and the environment.

The Ministry of Environment, with financial support from local industry, is responsible for monitoring air contaminants. Monitoring is done on a continuous basis and results are available on the Ministry website. AP will continue to support and participate in the community airshed monitoring system. The decision to add monitors should continue to be based on health and environmental concerns. If that rationale indicates a new monitor and AP is a key source of the contaminant in question we will support the cost of the new monitoring equipment.

Please see Q&A # 1.8.1.6 for additional answers to this question.

1.8.5.2. What assurances can you provide that we can trust the science?

The RWDI modelling study was designed with input from the Ministry of Environment. The dispersion model (Calpuff/Calmet) is the model system routinely used for airshed management and regulatory purposes throughout the US and Canada. In addition, the RWDI study used test data from a 100 % rail-tie test burn (performed by a certified, independent third party and laboratory), a conservative approach when compared to the maximum limit of 50 % rail-ties requested in the permit amendment request.

Furthermore, in a health study completed by Intrinsik, an independent third party (see Appendix E for their report), they concluded that the proposed increase in the rail ties used to fuel the WLPP would not be expected to result in an increase in health risks to the neighboring area.

Also, please see Q&A # 1.7.1 for additional answers to this question.

1.8.5.3. The modelling study appears to use outdated data (from 2001) and fails to recognize other nearby industrial inputs to the air shed. Does this air quality monitoring study take into account the cumulative effects of all industrial inputs or only that of Atlantic Power? Further, this study predicts that burning rail ties will result in levels of nitrogen dioxide that exceed allowable limits in BC.

The dispersion model uses emission data from the WLPP, local topography, and one year of weather data to predict the path and concentration of those emissions as they leave the site. These predictions are then added to the currently measured ambient data at monitors in the airshed. All other sources, including industrial, residential, transportation, etc. are accounted for in the ambient measurements. The fact that the full emissions from the WLPP are input to the model, and not just the projected changes, explains how double counting can occur. Further, nitrogen dioxide emissions are not predicted to change materially with an increase in RRT.

Also, please see Q&A #'s 1.3.2, 1.7.1, 1.7.2 and 1.7.5 for additional answers to this question.

1.8.5.4. How much will dioxins and furan residues increase in the air around town?

From the RWDI Air Dispersion Modelling Report - Executive Summary and Table 8, (see Appendix D) the maximum predicted "Dioxin and furan concentrations were less than 0.01% of the regulatory objective (Ontario's objective in the absence of a British Columbia objective)."

1.8.5.5. The RWDI report fails to use common language and model output mapping which is easily assessed by city residents.

We acknowledge that dispersion modelling reports take some time to interpret. However, we opted to provide the full report to the public. This Q&A document provides specific responses to resident's questions.

1.8.5.6. The dispersion modeling output scale is too small for residents to assess the impact in their local area. The scale of the map in the report is 1:160 000, which is inadequate to evaluate neighbourhood scale effects. Can a map with greater resolution be produced such that local residents can read the modeled effects at a neighbourhood scale?

From the air dispersion model, contaminants were demonstrated to be below their respective AAQO's or AAQC's for 50% rail ties, except the 1-hour NO_2 predicted concentrations were at or slightly above the air quality objective, but the adjustment for background potentially double counts the plant NO_x emissions. The effect of double counting and other conservative assumptions leads to the conclusion that actual NO_2 levels will be within the air quality objective and an assessment on a neighborhood level is not needed.

The design of the modelling study and the final report were agreed between the qualified professionals at RWDI and at Ministry of Environment. See previous answer.

Dispersion modelling was conducted over a 25 km by 25 km study area surrounding WLPP using CALPUFF 6.42 in full three-dimensional CALMET mode. This is a recommended approach under the *Guidelines for Air Dispersion Modelling in British Columbia* (British Columbia Ministry of Environment [B.C. MOE] 2008) for studies of this type. All aspects of the dispersion model set-up, including meteorological data (CALMET), land use data, terrain data, receptor grid and various other model assumptions were established as per the *Guidelines for Air Dispersion Modelling in British Columbia*. A detailed model plan for the dispersion modelling study area was submitted for review by B.C. MOE. The Ministry approved the plan with additional suggestions that have also been incorporated in the modelling.

1.8.5.7. Who would be in charge of measuring any toxic build up?

The Ministry of Environment, with financial support from local industry, is responsible for monitoring air contaminants. Monitoring of the plant's stack is done on a continuous basis and results are available on the Ministry website. Previously completed stack tests by WLPP document that plant emissions have all been within the permit limits established by the MOE.

Please see Q&A #'s 1.3.3, 1.3.5 and 1.3.6 for additional answers to this question.

1.8.5.8. Does this take into consideration the residual buildup of toxins?

Yes. The model does include accumulated pollutants including worst cases where inversion conditions and/or calm winds limit dispersion.

Please see Q&A # 4.2.1 for additional answers to this question.

1.8.5.9. How would this buildup of toxins be measured?

The model, which was run in compliance with the Guidelines for Air Quality Dispersion Modelling in British Columbia, considered worst case scenarios. Existing ambient monitors can be used to verify model predictions.

Please see Q&A # 4.2.1 for additional answers to this question.

1.8.5.10. Would this eventually make Williams Lake a toxic place to live, raise children and breathe?

As discussed in Q&A # 1.7.1, AP engaged independent consultants to conduct both air modeling (RWDI) and human health evaluations (Intrinsik), both of which concluded that emissions from burning rail-ties at a 50 % mixture are within the applicable BC or Ontario provincial standards, and do not pose a risk to the environment or human health.

We refer you to the RWDI modelling report and Intrinsik report on health impacts for the results. All impacts in the community, including worst case scenarios, are predicted to be within B.C. Ambient Air Quality Objectives – Updated October 30, 2015

Also, please see the Q&A's in Sections 4.1 and 4.2 for additional answers to this question.

1.8.5.11. Has testing and modelling adequately considered the cumulative effects of all emissions in the air shed especially during inversion conditions which are common here at certain times of year? Is there a plan to reduce the amount of ties in the fuel mix under these conditions?

The RWDI modelling considered weather patterns for a full year, in this case 2012. Based on the results of the RWDI Air modeling, the modeling demonstrated that potential air quality effects due to inversions were not significant, and that there was no demonstrated need to alter and/or reduce the amount of ties during inversion conditions.

Also, please see Q&A #'s 1.1.6, 1.2.7, 1.8.1.2 and 1.8.1.6, for additional answers to this question.

1.8.5.12. The reference summary provided by Atlantic Power suggests that most toxic substances will be mitigated by treatment to be within allowed guidelines. Which substances do tests suggest will not be mitigated to this level? And what plans are in place to monitor and mitigate these substances?

From the air dispersion model, contaminants were below their respective AAQO's or AAQC's for 50% rail ties, except the 1-hour NO2 predicted concentrations were at or slightly above the air quality objective, but the adjustment for background potentially double counts the plant NOx emissions. The effect of double counting and other conservative assumptions leads to the conclusion that actual NO2 levels will be within the air quality objective.

The results indicate that emissions associated with all compounds evaluated are adequately mitigated by a combination of the plant's boiler design and its air pollution control system.

Also, and as previously noted, testing of the emissions from the stack will be conducted on a routine basis going forward, so as to ensure the lack of impact from the combustion of rail-ties.

1.8.5.13. The study by R.W.D.I. Air Inc. was commissioned by Atlantic Power. Is the Ministry of Environment also commissioning a control study to verify this information and expand the parameters to address some of our concerns in regard to airborne toxins that were not addressed?

The RWDI study was designed and completed following Ministry of Environment protocols and with input from the Ministry of Environment. The 2001 trial burning 100% RRT was also designed, with Ministry guidance, to identify all contaminants of concern.

2. Fuel Management

2.1. Rail Tie Quantities

2.1.1. The public notice fails to clearly describe both the volume and hazardous components of waste rail ties proposed for incineration at the power plant.

The Environmental Protection Notice is a brief outline of key amendments and was drafted following Ministry guidance. Here we refer to the application to "Raise the limit on waste rail ties as a proportion of the authorized fuel from the current 5% to 50%." Further detailed information has been provided in the form of these Q&A, in our Fact Sheet and, more specifically, in the Technical Assessment Report (separate Report submitted to the MOE).

2.1.2. An Atlantic Power information sheet suggests that 600,000 tonnes of wood waste is burned annually so, conceivably, up to 300,000 tonnes of treated rail ties could be burned on an annual basis. How many rail ties is this and how would they be shipped to the plant? It is likely that they would arrive by rail where they would be unloaded and transported by truck. Will this result in rail ties being stockpiled in the railway yard or at a nearby siding, and increased industrial traffic through the city?

600,000 tonnes of wood waste is the maximum quantity of wood waste that could be burned by WLPP. In recent years the total annual quantity of wood waste consumed has been closer to 400,000 tonnes. We expect the lower annual consumption to continue or be reduced further. We expect that the plant would consume between 55,000 and 85,000 tonnes of rail ties per year, up to a maximum of approximately 100,000 tonnes per year. 85,000 tonnes of rail ties per year would be equivalent to about 1.2 million rail ties per year (~14 whole ties per tonne).

The size of the whole tie pile would vary seasonally. On average, we expect an inventory of approximately 10,000 tonnes, but, to be conservative, it is estimated that approximately 20,000 tons of whole ties may be stored onsite for a limited period of time, in addition to a small quantity of shredded ties stored onsite in an enclosed bin or silo. The 20,000 tons of whole ties constitutes approximately 21 days of fuel supply, if the ties are being burned at a 50:50 mixture with other traditional wood fibre.

We envision rail ties being delivered as we require them. We would develop a rail tie storage area at the plant for whole ties. It would be close to the shredder, which is the piece of equipment that would take whole rail ties and 'shred' them into smaller pieces that would be mixed with other residual wood fibre before entering the plant on conveyors for combustion. We would maintain a limited supply of shredded rail ties at our site stored only for short periods of time so as not to create a fire hazard and minimize fugitive dust blowing off the plant site and any runoff from the shredded material.

Our project proposes to receive used rail ties at a rail yard location in an industrial area of the City. The ties will be loaded onto trucks and transported to our plant primarily by highway and then a short distance on Mackenzie Avenue North. Our project will not materially change the total truck deliveries to the plant site since the rail tie deliveries replace current residual wood waste deliveries. We envision rail ties being delivered as we require them with some storage of whole ties on the power plant site.

2.1.3. What quantity of rail ties would be on site at a given time?

The size of the whole-tie pile would vary seasonally. On average, we expect an inventory of approximately 10,000 tonnes, but this could range as high as 20,000 tonnes during peak periods (approximately 300,000 ties).

2.1.4. Your information states that only three days' worth of ties will be stored on site. Elsewhere it states that the amount is 20,000 tonnes or 300,000 rail ties. Is this still three days' worth of burning? I.e.: Will you burn about 100,000 rail ties in day? How many tonnes per day?

It is conservatively estimated that approximately 20,000 tons of whole ties may be stored onsite for a limited period of time, in addition to approximately three days of shredded ties stored onsite in an enclosed bin or silo. The 20,000 tons of whole ties constitutes approximately 21 days of fuel supply, if the ties are being burned at a 50:50 mixture with other traditional wood fibre.

2.2. Fire Prevention

2.2.1. How will spontaneous fires be prevented in tie chip piles?

Spontaneous combustion can occur when piles of shredded wood have been left for long periods of time (typically >3 months), and when certain other ambient conditions are met. The rail ties in this case will only be shredded as needed and will be maintained in a controlled environment in relatively small quantities (up to a 3 day supply).

2.2.2. The plant location is in the urban/wildland interface. Is there evidence that an irrigation and water deluge system would be effective at extinguishing a fire within 150,000 –300,000 ties?

The plant has an irrigation sprinkler system surrounding the fuel pile, a fire water loop with deluge stations around the perimeter, and qualified and trained staff to manage any potential fire situations. Although we have not experienced a fire requiring the deluge systems to be used, the deluge system is designed to manage a fire associated with the much larger wood waste pile.

2.2.3. What are the risks and contingency plans for fire risk for stored ties during wildfire events such as we experienced in 2010?

Please see Q&A # 2.2.2 for an answer to this question.

2.2.4. When passing the power plant each day, spot fires are visible and a continual occurrence in the fibre pile which currently contains some chipped rail ties in the mixed. What are the consequences with this fibre in the mix with regards to low temperature combustion?

There are no rail ties, chipped or whole at the WLPP currently and rail ties have not been used as fuel at the plant since 2010. The volume of shredded ties will be maintained at or less than a 3 day supply and these will be stored in a controlled environment, not in the fibre pile.

While small fires do occur in the larger wood stockpile, plant systems, including video camera monitoring and rapid response of plant operators with bulldozers and front end loaders, are effective in minimizing the significance of such fires.

2.3. Transportation, Receiving Rail Ties

2.3.1. Considering the proximity of neighbors (hockey rink, stockyards, homes), and the concern for dust and odour emissions, can you locate your storage and chipping facilities out of town?

Our project proposes to receive used rail ties at a railyard location in an industrial area of the City. The ties will be loaded onto trucks and transported to our plant primarily by highway and then a short distance on Mackenzie Avenue North. Traffic will not increase as a result of rail tie fuel offsetting other fuel deliveries. We will use slow speed shredding equipment to prepare the ties on site to minimize dust in addition to numerous other dust suppression design features previously discussed.

Also, please see Q&A #'s 1.5.2, 1.5.3, 2.4.3 and 2.5.3 for additional answers to this question.

2.4. Storage

2.4.1. What strategy will be use to prevent run-off from un-shredded and shredded ties stored on location?

The shredded ties represent larger concerns than the whole ties due to the increase in the overall surface area of the material. In order to reduce the risk of run-off, ties will only be shredded as needed and stored in small quantities in an enclosed bin or silo and will not be exposed to wind, rain or snow. The whole ties will be stored in a designated area on site, and will be managed in accordance with an updated Storm Water Management and Monitoring Plan (SWMMP). The SWMMP will conform to all provincial requirements and current best practices for storage of end-of-service whole rail ties. The provisions of the SWMMP will be finalized prior to the storage of any shredded and whole rail-ties onsite.

2.4.2. As PCP and creosote are toxic, how will leaching from stored ties be controlled, measured, and monitored to avoid contamination of the site?

Please see Q&A # 2.4.1 for an answer to this question.

2.4.3. What measures are in place to measure the consequences of off gassing from this fibre in the storage pile? Is this a potential health issue for your immediate neighbours?

This was a key concern from past years due to the large volume of chipped ties that was stored at a downtown location. Removal of the RRT processing from the downtown to the plant will allow us to maintain control over the shredding process. The inventory of shredded ties will be minimized with all shredded ties stored in a bin or silo.

Please see Q&A # 1.8.1.9 for additional answers to this question.

2.4.4. Fugitive dust from the storage area can far exceed any permitted source but cannot be practically measured. What is planned to ensure this does not occur at the power plant?

WLPP has prepared and submitted a Fugitive Dust Management Plan to the MOE. The Plan will be modified in the event the permit application is approved. This Plan specifies the controls and practices used by the plant in managing fugitive dusts that arise from both its operations, as well as adjacent properties. The Plan includes provisions for managing fugitives that can be generated by the various trucking, material transfer, fuel pile, roadway and ash handling activities that occur at the plant. This Plan includes actions to be taken when either plant-related or weather conditions warrant. In addition, we work with the MOE to meet their requirements in addressing any public complaints

Please see Q&A # 1.5.1 and 1.8.1.8 for additional answers to this question.

2.4.5. There is a history of contaminated creosote treating plants. How will leaching from stored ties be measured, monitored and dealt with so as not to contaminate foodchains, the site and groundwater with heavy metals and other toxic compounds?

There are a number of former and operating creosote treating plants that are contaminated. There is a significant difference between a creosote treating plant, where the liquid chemicals are applied under pressure and charges of wet rail way ties or utility poles are then taken from the treatment vessel out into the yard for storage, and end-of-service ties. End of service ties have experienced several decades of chemical loss mechanisms including exposure to the sun's UVs and radiation, freezing and leaching due to heat and precipitation. In addition, creosote treating plants of earlier years did not have final vacuum phases to remove excess liquid creosote from ties before removal from the vessel nor contained staging yards.

As noted above, shredded ties will be kept in an enclosed bin or silo, and whole ties will be stored in a designated area on site, and managed in accordance with an updated Storm Water Management and Monitoring Plan (SWMMP The provisions of the SWMMP will be in accordance with MOE requirements, and will be finalized prior to the storage of any shredded and whole rail-ties onsite

2.5. Shredding

2.5.1. How will toxic dust generated from the shredding process be managed to prevent inhalation and spread into environment?

The process will involve the use of a low speed shredder, not a high speed hog as had been used in the past during previous grinding activities. This process would emit very little fugitive dust; Management of fugitive emissions is a key element of the design process for the new rail tie (RRT) shredding system.

Please see Q&A # 1.5.1 and 1.8.1.8 for additional answers to this question.

2.5.2. Atlantic Power indicates that chipping of rail ties will occur at the plant site

a. Is this the only location where ties will be chipped and stored?

b. What management practices are in place to recover dust and/or chip deposited over the site?

Yes. Our plan is to install an extensive, permanent rail tie shredding system (see previous answer) at the power plant site. The system will include numerous measures to control fugitive dust such as covered belts. Similar to current operating practices, the plant staff will periodically clean up any of the limited amounts of dust and chips near the shredding equipment that are not addressed by the fugitive dust mitigation measures noted previously, and this material will be deposited in the shredded rail tie silo or bin.

2.5.3. The area where the creosote ties would be chipped is located within 1.5 km of residential areas. How will you prevent odour emissions from this process?

The rail ties being used for fuel will typically have been removed from service after 20-30 years or more and will be stored whole. Shredded rail ties will be stored in a silo or bin to minimize odours.

Also please see Q&A #'s 1.5.2, 1.5.3 and 1.8.1.9 for additional answers to this question.

2.6. Fuel Blending

2.6.1. How does Atlantic Power define the term "periodic basis" with regard to the desired intention to burn a 50/50 tie and untreated wood mix?

The amount of rail ties burned will vary on the supply and availability of the ties, as well as supply and availability of traditional biomass supply. We expect to burn an average concentration of rail ties of approximately 15%-25% on an annual basis. However, we are requesting the flexibility to go up to a 50/50 mix. The 50/50 ratio is being used as the basis for all modeling as a proactive measure.

Please see Q&A #'s 1.6.4 and 2.1.2 for additional answers to this question.

2.6.2. The amount of treated wood, in tonnes/day represented by 50% of the total fuel supply has not been defined. It is unknown how many days/year the plant typically

operates. The amount of treated wood in tonnes/day is required to better understand what a 50% concentration of treated wood in the fuel supply actually represents.

As previously discussed, we expect that the plant would consume between 55,000 and 85,000 tonnes of rail ties per year, up to a maximum of 100,000 tonnes per year. 85,000 tonnes of rail ties per year would be equivalent to about 1.2 million rail ties per year (~14 whole ties per tonne). In recent years the total annual quantity of wood waste consumed has been about 400,000 tonnes. We expect this lower annual consumption to continue or be reduced further.

We envision rail ties being delivered as we require them. We would develop a rail tie storage area at the plant for whole ties. It would be close to the shredder, which is the piece of equipment that would take whole rail ties and 'shred' them into smaller pieces that would be mixed with other residual wood fibre before entering the plant on conveyors for combustion. We would maintain a limited supply of shredded rail ties at our site stored only for short periods of time in a bin or silo, so as not to create a fire hazard and minimize fugitive dust blowing off the plant site and any runoff from the shredded material.

Our project proposes to receive used rail ties at a rail yard location in an industrial area of the City. The ties will be loaded onto trucks and transported to our plant primarily by highway and then a short distance on Mackenzie Avenue North. Our project will not materially change the total truck deliveries to the plant site since the rail tie deliveries replace current residual wood waste deliveries.

Please see Q&A # 2.1.2 for additional answers to this question.

2.6.3. If Atlantic Power were to get approval to burn more ties, what is the likelihood of Williams Lake becoming the primary rail tie disposal destination for Western Canada and/or beyond?

Our primary fuel source will always be our traditional fuel supply from the local mills. In the event that additional area mills are closed, no more than 50% of our fuel supply would come from rail ties as permitted. Furthermore, the availability of rail ties is also subject to supply and transportation limitations.

2.6.4. Is there a plan to reduce the amount of ties in the fuel mix during inversion conditions?

Please see Q&A # 1.8.5.11 for an answer to this question.

2.7. Boiler Operation

2.7.1. It is assumed that the operation of the facility is 24/7; however, it is likely that there are shutdowns for routine maintenance and potentially during an emergency.

- **a. Have there been any emergency shutdowns during operation of the Facility?**
- **b. How long does it take for the Facility to be shut down?**

c. **Is there any data available for combustion temperatures during a shutdown (until combustion is complete)?**

d. **What are the NOx concentrations recorded by the CEMs during this process?**

Yes, the facility operates 24/7. During planned maintenance shutdowns, fuel flow to the boiler is gradually reduced to empty the fuel feed bins for maintenance, and combustion parameters and emissions are normal during the shutdown which occurs over about 2 hours. During a recent (11/2) planned shutdown, flue gas temperatures in the economizer reduced by about 125 F over the 2 hour shutdown period, and NOx decreased from about 120 ppm to 40ppm.

An unplanned shutdown can occur, for example if the BC Hydro transmission system goes down or if a major piece of equipment fails. In these cases, the plant would trip (which means the steam turbine generator is electrically disconnected from the grid and the fuel flow to the boiler is stopped). Such an upset condition happens quickly, typically in less than a minute. Even with the fans shut down, air continues to flow to the boiler immediately after a trip and any fuel already in the boiler on the grate continues to combust.

There is only a small amount of RRT burning at any one time (<1 ton/min at the 50% limit). Because the RRT/regular wood fuel mixture on the grate is contained in the large metal furnace, the RRT will stay in place and burn out very quickly in matter of minutes. Plant trips are rare, but during a 2014 plant trip, flue gas temperatures were steady up to the point of the trip and then began a gradual decline. NOx was 110ppm immediately prior to the trip, and then also began a slow decline (5 minutes later it was 76ppm)

2.8. Combustion of Spill Absorbents

2.8.1. The existing clause requires written approval of the Director to incinerate hydrocarbon contaminated wood residues with no daily limit specified. The proposed changes will preauthorize acceptance at the power plant of up to 872 litres/day of commercial sorbents used in spill clean-ups for incineration. Why the proposed change to allow up to 872 liters/day of hydrocarbon contaminated absorbent materials originating from accidental spills without the written approval of the Director?

The provision to burn "hydrocarbon contaminated absorbent materials originating from accidental spills" up to a maximum of 872 liters/day is intended to allow for spill recovery materials to be disposed of in the energy system. These occurrences are rare, the volumes would normally be low and the high temperatures within our furnace ensure complete destruction. The only material change is that formal authorizations will not be required, offloading Ministry staff from this administrative function and allowing for spill clean-up material to be disposed of quickly.

Please see Q&A # 1.3.2 for additional answers to this question.

2.8.2. The amendment proposes to delete the provisions for continuous emission monitors audited in accordance with Environment Canada's EPS 1/PG/7 Protocols and Performance Specifications, for the reason that these protocols are intended for fossil fuel burning systems. In that treated railway ties, contaminated absorbent materials, and 872 liters/day of waste oil contains fossil fuels, can you

explain justification for deletion of the provisions mentioned, and describe what will be in place to suffice?

Please see Q&A #'s 1.3.1 and 1.3.2 for answers to this question.

2.9. Other Non-hazardous Biomass

2.9.1. What procedures will be in place to ensure demolition waste is clean and free of non-biomass ingredients such as asbestos-containing drywall filler, and what provisions are in place for particulate matter (PM) reduction?

The use of any contaminated (i.e. asbestos-containing drywall) construction and/or demolition wastes as fuel would be prohibited under the terms of the revised Permit Amendment. Furthermore, any construction and/or demolition wastes received for fuel would be subject to specific Contract terms prohibiting the supplier of such materials from including such materials in any shipments sent to the plant. In addition, such materials would be subject to onsite visual and remote video camera monitoring by the plant's operations staff, so as to prevent such materials from being introduced into the plants material handling system.

3. Ash

3.1.1. Atlantic Power indicates that the high boiler operating temperatures (and the emissions controls) are effective in removing contaminants of concern.

- **a. Have there been any analyses of the ash generated from the trial to determine residual (if any) amounts of PAH, PCP and metals?**
- **b. What is the pH of the ash and have there been any leachate tests performed with the ash?**

Table 8 of the 2001 test report (Appended to the RWDI report (see Appendix D)) shows the referenced constituents of the ash (dioxins/furans, PAH, chlorophenols, and total metals) which are all within the applicable standards. Section 5.0 of the 2001 test report indicates that "Extractable metals met the leachate quality criteria under the BC Special Waste Regulation and that pH ranged from 5.15 (final) to 9.73 (initial). The BC Special Waste Regulation has been replaced by the BC Hazardous Waste Regulation which can be found at http://www.bclaws.ca/civix/content/complete/statreg/414786120/03053/reg03053/1871199216/?xsl=/templates/browse.xsl

The leachate quality standards did not change between the two regulations.

3.1.2. While controlled combustion conditions can destroy dioxins and other chlorinated aromatic substances in treated ties, dioxins can reform within the convection zone of the boiler, which are assumed to be collected by the flue gas treatment system.

- **a. Are solids trapped by the emissions control consolidated with the boiler ash for disposal, or segregated for separate testing and disposal?**
- **b. Have there been any analyses performed on solids recovered from the emissions control system?**

All ash (bottom ash from the bottom of the boiler, ash from the mechanical collectors, and fly ash from the electrostatic precipitator) is consolidated for disposal at the project's ash landfill.

Also see Q&A # 3.1.1 for a further answer to this question

3.1.3. PLACE HOLDER

3.1.4. Atlantic Power identifies that the pollutant levels in the ash from rail ties, although somewhat higher than from traditional fuel sources, are still well within BC Regulations.

- **a. What analyses have been performed for ash samples?**
- **b. To which regulation(s) is Atlantic Power comparing this data?**

See Q&A #'s 3.1.1 and 3.1.2 answers to this question

3.1.5. If incomplete combustion does occur, how will the ash be treated differently from the current ash dumping process so that leaching into the soil and potentially the Williams Lake River below the dump site does not occur?

The potential for incomplete combustion would be highlighted by the boilers air monitors and visually detected at the submerged ash bunker. In the unlikely event that wood is not completely burned and is apparent in the ash, this ash would be collected by a loader and re-introduced back to the furnace.

3.1.6. The wood waste ash hauled to the ash dump site is so caustic it eats metal

The uptake of CO_2, mainly from precipitation, serves to neutralize ash in a relatively short period of time. This natural process of carbonation is what allows for the landfilling of ash and the common practice of using ash from traditional wood fibre as an agricultural fertilizer in most Canadian provinces.

The plant's ash landfill is subject to a Management Plan approved by the MOE. An engineering firm (AMEC Foster Wheeler) is contracted by the plant to oversee the activities associated with the ash landfill, and to prepare an Annual Report in accordance with the requirements of both the Discharge Permit for the Landfill (# 8809) as well as the Management Plan. The Discharge Permit and Management Plan contain specific requirements relative to the development and closure of the landfill; fugitive dust management; site preparation and restoration; surface runoff and erosion control; monitoring, sampling and analysis of groundwater, surface water, stability and settlement; quality assurance; and reporting. These mandates have been developed in conjunction with the MOE to ensure the operation of the landfill is protective of human health and the environment. The most recent sampling of the groundwater monitoring system did not indicate any levels of concern relative to groundwater contamination.

3.1.7. How do pollutant levels in the ash differ from those in untreated wood ash?

The pollutant levels in the ash from rail ties, although higher for some compounds than those from traditional fuel sources, are still extremely low. For example, dioxins and furans in 100% RRT ash were 788 picograms / gram. To put this in context, a picogram is 1/1,000,000,000,000 of one gram so the result was less than one part per billion (ppb), versus the limit of 100 ppb. The BC Hazardous Waste Regulation defines waste containing dioxin as "a waste containing a concentration greater than 100 parts per billion". PAHs and metals were not significantly higher when burning RRT and many of the metals were lower than the ash from the traditional wood fibre baseline.

3.1.8. Waste ash requires secure long term disposal and contaminant levels must be understood in the context of the relevant regulations. What BC regulations and standards are used to determine acceptable pollution from rail tie ash? As the current ash dump is close to capacity, will this assessment consider the location of a new landfill for ash containing rail tie contaminants?

As discussed below, the combustion ash is applied to the landfill and covered with a soil layer to prevent exposure to the environment. In addition, when the concentration of dioxins in the rail tie ash is compared to the applicable soil standard for dioxins (0.00035 mg/kg), it is concluded that the potential for significant human health and/or environmental impacts is negligible. It is anticipated that an updated Management Plan will be prepared and submitted to the MOE for review and approval. Any revisions needed to ensure the landfill activities are protective of human health and the environment will be incorporated at that time.

WLPP will apply to the MOE and the Ministry of Forestry, Lands and Natural Resources Operations (MFLNRO), prior to the landfill reaching full capacity, in accordance with the procedural requirements of both Ministries, to amend its current landfill permit to allow for any expansion of its current Landfill to accommodate future ash deposits.

Also see Q&A #'s 3.1.1 and 3.1.6 for additional answers to this question.

3.1.9. Table 8 of the 2001 Trial Report (see appendix D) indicates that rail tie ash contained 788pg/g of Dioxin/Furan or 33 times more than was present in the regular hog fuel ash (23.8pg/g). Table 8 also indicates there are ~40% more polycyclic aromatic hydrocarbons (PAH) in the rail tie ash than the regular ash. Their elevated presence in the waste ash stream warrants further investigation.

Although the levels of the dioxin/furans was higher in the rail-tie ash, when compared to the regular hog fuel ash, these levels are still protective of human health and the environment, and do not exceed the applicable limits for leaching content. A study conducted for the MOE (Organochlorine Contamination in Various Environmental Compartments-Hatfield Consultants Ltd-1991) concluded that the levels off dioxins/furans observed in combustion ash was not indicative of any significant concern for public exposure.

Ash is applied to the landfill and covered with a soil layer to prevent exposure to the environment. In addition, when the concentration of dioxins in the rail tie ash is compared to the applicable soil standard for dioxins (0.00035 mg/kg), it is concluded that the potential for significant human health and/or environmental impacts is negligible. An updated Management Plan will be prepared and submitted to the MOE for review and approval. Any revisions needed to ensure the landfill activities are protective of human health and the environment will be incorporated at that time.

Also see Q&A #'s 3.1.1 and 3.1.7 for additional answers to this question.

3.1.10. Performance bonding is warranted to ensure long term liabilities associated with the ash landfills are addressed.

If the BC Ministry of Environment implements performance bonding for forest and biomass sector power operations then this would apply to the WLPP landfill. Currently no such security has been required for wood residue, pulpmill dregs, pulpmill lime, wood ash, ash from traditional wood fibre /RRT mixed fuels. We are not aware of wood ash landfills that have resulted in contaminated groundwater or surrounding soils.

3.1.11. The properties and contents of wood ash, and the nature of the existing landfill site, present a significant risk to the aquatic environment.

All terms of the Landfill Permit will be adhered to for the protection of soil, groundwater and the aquatic environment.

4. Human Health

4.1. General

4.1.1. What are the expected health effects on the most vulnerable population: young children, asthmatics and immuno-compromised of the added emissions in the immediate term? The medium term? The long term? When we experience a temperature inversion, often in the fall?

As discussed above, the air modeling conducted by RWDI includes consideration of the occurrence of inversions in its modeling design, as per the MOE's guidelines. Based on the RWDI modeling outputs, Atlantic Power commissioned Intrinsik to complete a screening-level HHRA based on the results of an air dispersion modelling study of the emissions from the proposed increase in the volume of rail ties to be consumed annually at the WLPP. The primary aim of the screening-level HHRA was to identify and understand the potential health risks posed to the area residents as a result of the proposed changes in the WLPP emissions. In order to do so, consideration was given to the nature of the emissions, the nature of the exposures that might occur (i.e., amount, frequency and duration), and the nature of the potential health effects that may occur following exposure to the chemicals contained in the emissions.

By convention, the screening-level HHRA embraced a high degree of conservatism through the use of assumptions intentionally selected to represent worst-case or near worst-case conditions. Using this approach, any health risks identified in the screening-level HHRA were unlikely to be understated. Intrinsik concluded that the proposed increase in the rail ties used to fuel the WLPP would not be expected to result in an increase in health risks to the neighboring area.

The Intrinsik Assessment of Human Health Risks Associated with the Proposed Changes in the Emissions from the Williams Lake Power Plant can be found in Appendix E.

4.1.2. Williams Lake is located in a narrow deep valley which has strong temperature inversions. There is a probability, however small, that there could be the release of toxic chemicals into the valley with the burning of ties, due to such possibilities as inadequate monitoring, human error during the operation and machine malfunctions. If this event occurred there would be, especially during an inversion, a serious detrimental effect on the health of our residents.

See Q&A # 4.1.1 for an answer to this Question.

4.1.3. If there are adverse health effects, directly or indirectly, from the plant, could we realize just as many if not more jobs from another use of the existing wood fibre with fewer health effects?

As discussed in Q&A # 4.2.4, Intrinsik concluded that "the proposed increase in the rail ties used to fuel the WLPP would not be expected to result in an increase in health risks to the neighbouring areas."

See Q&A # 4.1.1 for an answer to this Question.

4.1.4. How will you ensure that drinking water sources are not contaminated?

As previously addressed, both the Williams Lake plant, as well as the landfill site, is subject to MOE Discharge Permit. In addition, the plant's Storm Water Management Plan and the landfill's Management Plan, contain provisions that are also designed to ensure that there are no adverse impacts to receiving waters, both surface water and ground water.

4.2. Long-term and Cumulative Effects

4.2.1. Has there been any work done to assess the expected cumulative effects of long-term emissions from rail-tie burning into the Williams Lake Airshed, which regularly experiences temperature inversions?

It is the Province's role to manage the airshed, and in doing so they impose standards which we must assess as part of our dispersion modelling. This modelling considered all meteorological conditions experienced by the airshed, including temperature inversions over the course of 2012 the representative year to be used in modeling, as designated by MOE.

The regulatory limits evaluated in the air modeling by RWDI are designed to be protective of human health and the environment. The RWDI study concluded that the emissions from the plant would be within allowable British Columbia and Ontario limits for the various compounds considered.

In addition, the Intrinsik study evaluated the long-term human health impacts. Apart from the assessment of the potential health risks related to the exposures to the chemical emissions that may occur *via* the primary pathway of inhalation, consideration also was given to the risks that may have occurred as a result of chemical fall-out or deposition from the air onto the ground, resulting in additional pathways of exposure (i.e., secondary pathways). For the purpose of the screening-level HHRA, concentrations of the non-gaseous chemicals (i.e., metals, PAHs and chlorinated compounds) were predicted in soil and compared with BC's Contaminated Sites Regulation (CSR) numerical soil standards and background soil concentrations in the Cariboo Region (Gov. BC 2014). Specifically, the predicted maximum annual average air concentrations of the non-gaseous COPC associated with the WLPP were assumed to deposit onto the ground at the maximum point of impingement over an 80 year period (i.e., the lifespan of a person, as per Health Canada 2012). The study concluded that the proposed increase in the rail ties used to fuel the WLPP would not be expected to result in an increase in either short-term or long-term health risks to the neighboring area.

4.2.2. Williams Lake has an aging population, many with respiratory problems. If we run presently at an average of 82% of our allowed particulate emission targets, what are the health risks if we add dioxins, toxic hydrocarbons and pentachlorophenol to the air shed?

Table 6 of the RWDI report shows that the plant's impact due to particulate on ambient air quality with a 50% rail tie mixture, is less than 2% of the air quality objective. Combining the plant's emissions with the existing background emissions, total particulate matter is 26% of the annual average air quality objective while the 24 hour maximums are 82% for PM10 and PM2.5.

As stated above, the studies by RWDI and Intrinsik conclude there are no significant impacts to either human health or the environment from the proposed amendment.

Please see Q&A # 1.8.2.1 additional answers to this question

4.2.3. The treatment of railway ties with PCP raises the possibility of release of chlorinated hydrocarbons such as Dioxin which are very persistent, very toxic and subject to bioaccumulation in soil and water. How will this be measured and mitigated for soil and water in surrounding areas?

In the trial burn using 100 % RRT, dioxins and furans were measured at 788 picograms /gram. To put this in context, a picogram is 1/1,000,000,000,000 of one gram so the result was less than one ppb, which is less than the BC Hazardous Waste Regulation limit, which defines waste containing dioxin as "a waste containing a concentration greater than 100 parts per billion".

As discussed above, with regards to the combustion ash, it is applied to the landfill and covered with a soil layer to prevent exposure to the environment. In addition, when the concentration of dioxins in the rail tie ash is compared to the applicable soil standard for dioxins (0.00035 mg/kg), it is concluded that the potential for significant human health and/or environmental impacts is negligible. In conjunction with the necessary permitting associated with the Landfill, an updated Management Plan for Landfill activities will be prepared and submitted to the MOE for review and approval. Any revisions needed to ensure the landfill activities are protective of human health and the environment will be incorporated at that time.

In addition, please see Q&A #'s 4.2.1 and 4.2.2, above, for answers to this question regarding human health and bioaccumulation.

4.2.4. It is unclear to us whether modeling adequately considered long term cumulative effects on soils and water including potential for bioaccumulation. We submit that potential long-term effects must be seriously and thoroughly assessed.

In order to ensure there are no adverse human health impacts associated with the burning of railroad ties, AP engaged a Qualified Professional (Intrinsik), a firm specializing in Health Heath Risk Assessment, out of Calgary, Alberta (AB).

They conducted a screening-level assessment to identify and understand the potential health impacts that could result from exposure to the emissions associated with the William Lake Power Plant change in fuel mix, with consideration given to the nature of the emissions, the nature of the exposures that might occur (i.e., amount, frequency and duration), and the nature of the health effects that are known to occur following "over-exposure" to the chemicals contained in the emissions (see Appendix E for their report). In addition, the assessment evaluated the nature of the exposures that residents might experience on a short-term (acute) and/or long-term (chronic) basis as a result of the changes to the fuel at the plant, and to determine the significance of these exposures from a human health perspective. The modeling calculated soil concentrations for various compounds of concern, and compared them to Contaminated Site Soil Standards. Based on their modeling and analyses, Intrinsik concluded that "the proposed increase in the rail ties used to fuel the WLPP would not be expected to result in an increase in health risks to the neighbouring areas."

4.2.5. Have testing and modelling adequately considered longer term cumulative effects on soils and water including potential for bioaccumulation of chlorinated hydrocarbons?

Please see Q&A #'s 4.2.1, 4.2.3 and 4.2.4 for answers to this question regarding cumulative effects and bioaccumulation.

5. Miscellaneous

5.1. Alternatives to Railway Ties

5.1.1. Lack of natural fibre is sited as a long term concern yet we continue to burn millions of tonnes in the bush. Would it not be more efficient, both in transport/greenhouse gas emissions, and provide sustainable local employment (i.e. trucking from within the Cariboo) to explore increasing the use of accessible local waste wood directly from logging sites?

WLPP is attempting to diversity its fuel supply with economical alternatives to mitigate an expected decline in forestry and wood processing wastes to ensure the long term economic viability of the plant and its associated economic and environmental benefits to the Williams Lake community. Rail ties provide that diversification. Greater use of forestry wastes may be part of WLPP's long term plan, but traditionally this source of fuel is relatively expensive. If, in the future, the province provides incentives for the removal of this material the cost of this material could become more competitive.

Shredding and combusting rail ties to generate electricity at our plant helps solve the issue of rail ties accumulating over time at the side of rail lines, and eventually in landfills, which results in GHG emissions in the form of methane during decomposition.

Our proposal would see the rail ties collected and transported to Williams Lake. They would be carefully handled, stored and shredded and combusted at very high temperatures which result in emissions that are well below provincial standards. The fuel-handling system to be installed for railroad ties will also be capable of processing roadside logging debris. We see this as a long-term win for the environment and a way to sustain the jobs and economic activity at our plant.

5.2. Location

What are the alternatives to the Williams Lake site? Surely there is a facility whose geographical disposition area is less populated and more topographically suited for dispersal of treated railway ties.

Currently used rail ties are accumulating along the tracks throughout western Canada. The modelling study has indicated that Ambient Air Quality Standards will be met throughout the community when WLPP burns up to 50% rail ties. Further the Intrinsik report concludes there will be no adverse health impacts.

Please see Section 1 (Air), Q&A #'s 1.2, 1.3 and 1.8, as well as Section 4 (Human Health), Q&A #'s 4.1 and 4.2, for answers to this Question.

5.3. Community/Region

5.3.1. SO2 and NO2 emissions identified in the trial burn in the vicinity of the facility are already elevated near or above some of the AQOs presented in the RWDI Report

(See Appendix D). Could the estimated emissions to the local air shed limit the development of other industries that could produce TPM, SO2, NOx and PAH's?

The estimated impacts (developed with a conservative methodology) are in the vicinity of the plant. The vast majority of future potential industry in the airshed would not be likely to have significant impacts in the same areas. The long term management of airshed emissions and air quality is the responsibility of the BC MOE. This air dispersion modelling report was also provided to the BC Ministry for review and comment.

5.3.2. I am concerned that Williams Lake is the guinea pig for RRT disposal.

The use of rail-ties as a combustion fuel for biomass power plants is a well-developed technology and not experimental or prototypical. RRT has successfully served as the feedstock for a number of biomass facilities across North America for many years. . As discussed in Q&A # 1.3.5, please see an interview conducted by the Williams Lake Tribune, on August 4, 2015, with a plant representative from the French Island plant in Wisconsin, which summarizes their experience with burning rail-ties, wood waste and RDF. .

5.3.3. PLACEHOLDER

5.3.4. If our city ends up with a reputation of having a plant which burns railway ties and has possible negative impacts on health then potential new residents, including professionals, will rightfully decide to live elsewhere. I have great concerns for residential attraction and retention as well as a potential reduction in property values.

As discussed in Section 4.2.4, Intrinsik concluded that "the proposed increase in the rail ties used to fuel the WLPP would not be expected to result in an increase in health risks to the neighbouring areas."

Please see Section 1, Air (Q&A #'s 1.1 – 1.6) and Section 4, Human Health (Q&A #'s 4.1- 4.2) for answers to this question.

5.3.5. Waste Management Permit number 103943, issued to Aboriginal Cogeneration Corporation in Kamloops in 2010 for burning railroad ties to generate power specifically prohibits use of rail ties treated with pentachlorophenol as an authorized fuel along with a long list of other types of combustible wastes. Kamloops appears to be a much larger air shed than Williams Lake. Why should Atlantic Power be permitted to be burn chlorophenol treated rail ties in the in the William's Lake airshed?

We do not have information regarding the reason for the penta-chlorophenol prohibition for the referenced permit, for that proposed Project. With regards to the Williams Lake plant, our test in 2001 ((including penta-chlorophenol rail-ties per Table 8 of the test report) documents that the emissions associated with the test (while burning RRT at twice the maximum expected rate) were within provincial and/or Ontario standards for PAHs, the class of compounds which includes pentachlorophenols.

Please see QA # 1.2.5 for a further answer to this Question.

5.3.6. I would like to recommend that the amendment not be considered outside of a renewed commitment and direction from the Williams Lake Air Quality Roundtable and within the context of a revised Air Quality Management Plan. I believe that the risk to community health will be unacceptable if this proposal goes ahead outside of the context of a collaborative Management Plan that addresses documentable risks.

WLPP agrees with the importance of science-based airshed management. We cannot make commitments as to the future role of the Roundtable but if that group continues we will actively support it as before.

5.4. Greenhouse Initiative

5.4.1. An Economic Development group in Williams Lake is looking at the feasibility of developing a greenhouse operation to grow local vegetables and fruit and help diversify the local economy. Would Atlantic Power be willing to join this group?

Atlantic Power representatives have been part of this group since the idea was first proposed. It would involve our plant sending excess hot water through a pipe to help warm the greenhouses. We produce a large quantity of excess hot water in generating electricity at the plant and sending some to heat greenhouses would mean a reduction of our cooling requirements, which in turn would result in a reduction of the water we use each year.

5.5. Drinking Water

5.5.1. How sustainable is the Williams Lake drinking water supply while the WLPP uses "millions upon millions" of gallons per year?

Please see Q&A # 5.5.2 for an answer to this Question.

5.5.2. The original location for the power plant was to be out of town and on top of a mountain water system, not our limited aquifer treated drinking water, was to be used.

We do not have a comprehensive history of pre-design considerations for the WLPP. It may be that the benefit of replacing multiple beehive burners with one tightly controlled system with extremely low emissions outweighed an earlier plan that did not prove economically viable.

This project will not increase water usage. More than 90% of our water consumption is used in the power plant's cooling system. If the greenhouse project goes ahead, heat from the plant that goes to the greenhouse will decrease the amount of water that evaporates in the cooling tower, resulting in less make-up water needed for the plant's cooling system.

Additionally, under a recent curtailment agreement that is also expected to continue if we execute an Electricity Purchase Agreement (EPA) extension, we would not normally operate the plant during the hot summer months when our water needs would be the highest. This in itself has and will continue to have a significant impact on the water consumption rates at the plant during the times when the local aquifer is most used.

5.6. Alternative Uses for Wood Waste

5.6.1. There are now more options for the use of wood waste in general than there were when the WLPP was built. Is there a better use now for this material given the caustic nature of the ash, even from untreated wood?

The pH of the ash is neutralized by carbonation (CO2 in rainwater and air) in a relatively short time. This natural process of carbonation is what allows for the safe landfilling of ash and the common practice of using ash from traditional wood fibre wood fuel as an agricultural fertilizer (lime substitute) in most Canadian provinces. The neutralization of acidic soils and the natural process of CO2 uptake combine to reverse causticity and avoid negative environmental impacts.

We view the use of wood residue (a renewable fuel) in the production of green energy as a very positive alternative to energy produced from fossil fuels, In particular, end-of-service rail ties tend to accumulate along rail corridors over long periods of time, and converting them to energy is an environmental improvement.