Brule Mine Project - Application Review Stage
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# ID	**Submitted by**	**Issues Raised**	**Proponent Response**	**Review Status**	**Responsible Agency**
B.C. Ministry of Environment Dave Sutherland					
1	**Dave Sutherland Environmental Quality Section Head Omineca-Peace Region**	Our review indicates that modeling will either have to be re-done to more accurately reflect expected coal dust emissions from wind erosion, or if not feasible, that more conservative management measures will have to be implemented at Falling Creek to compensate.	*Response by RWDI, on behalf of WCCC:* RWDI demonstrated to Dennis Fudge of the MOE that emissions from all sources, including variable emissions from stockpiles, were included in the modelling. Our understanding is that this was the MOE's primary concern regarding the modelling and therefore remodelling should no longer be required.	Response satisfactory. Issue addressed.	MOE
2	**Dave Sutherland**	The comments also indicate some significant uncertainties in the assessment of residual project effects, and of residual cumulative effects from combining the Falling Creek Loadout increments with background and with potential future sources in the same area.	*Response by RWDI, on behalf of WCCC:* We are confident in the residual project and cumulative effects assessments of existing and known future projects. Cumulative effects of a future processing plant near the Falling Creek Flats Loadout can not be predicted without the relevant design and emissions information for any such facility. At present, this information is not available. There is no proposed project in the vicinity of the Falling Creek Flats Loadout that meets the criterion specified in the Application for consideration in a cumulative effects assessment. "The criterion for known projects or activities was that there must be a public record – usually based on application for, or approval of, a permit or other government authorization….Within the 5 year future timeframe, there must be a publicly available application in order for the project or activity to be considered." (Refer to Section 6.3.2 of the Application). Additional analysis of the Falling Creek Loadout increments with background is	Response satisfactory. Issue addressed.	MOE

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			provided In Appendix D3.4 using the Pomeroy $PM_{2.5}$ data and PVC pre-construction PM_{10} data.		
3	**Dave Sutherland**	The principal issues are: 1. We need more documentation that the coal dust emission estimates used in the modelling of Falling Creek loadout effects include all the sources specific to the proposed activities at that site (including the bulldozing of stockpiled coal and conveyor and truck drops).	*Response by RWDI, on behalf of WCCC:* All sources of fugitive dust emissions at the loadout described in Section 11 of the EA were included in the modelling. Calpuff model input files were provided to the MOE at the end of 2005 and again in early February 2006. On March 7, 2006 RWDI demonstrated to Dennis Fudge of the MOE that these files contain the requested information. These files are large; however, the relevant pages of the main input file are reproduced in Appendix D3.1 for the two stockpile, unmitigated scenario. The variable emission rates are contained in an external file called CASEA_UnCONTROLLED_2_AREAS.DAT. Furthermore, under Input Subgroup 14a, it is stated that there are 5 buoyant polygon area sources with variable emission rates. The first page of CASEA_UnCONTROLLED_2_AREAS.DAT is reproduced in Appendix D3.1. The emission parameters for the 5 area sources (PileOne, PileTwo, SideDump, CoalStacker and BinChute) are shown for the first two hours of Julian day 092 of 2003. Maintenance of active coal stockpiles, including bulldozing, is accounted for in the USEPA AP-42, Section 11.9 emission factor for stockpile wind erosion.	Response satisfactory. Issue addressed.	MOE

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4	**Dave Sutherland**	2. The modelling emissions inventory for the Falling Creek coal dust sources used only an average annual wind speed, and not individual hourly data (Tables, pages 11-62/63 and 11-72/73). Therefore, it appears that emissions from all sources, but especially the stockpile, have been incorrectly assessed. Suspension of dust from static sources such as stockpiles would be expected to be greatly underestimated using an average wind speed, since the rate of dust suspension depends on short-term wind speed, including minimum, threshold speeds that vary depending on the size of the surface dust particles. Dispersion of both static and active (e.g. bulldozing, truck dumping) dust emissions also depends on wind speed, with stronger winds dispersing particles greater distances than lighter winds, with distance varying again based on particle size.	*Response by RWDI, on behalf of WCCC:* We agree that fugitive dust emissions for coal handling activities and stockpiles will be a function of wind speed and therefore we applied wind-speed dependent emission factors. The emission rates for the five handling and stockpile sources were calculated for every hour modelled (13,835 hours). This is clearly too much data to reproduce in a table in the report. Therefore two sets of numbers were presented in the tables in Section 11 for illustration purposes: the maximum and the annual average emission rates. The emission rates shown in the tables were not used to model fugitive dust from handling activities or stockpiles. The variable emission rates were used. Fugitive dust emission estimates for conveyor transfer points are not a function of wind speed. Therefore the maximum hourly emission rates shown in the tables were used to model conveyor transfer points.	Response satisfactory. Issue addressed.	MOE
5	**Dave Sutherland**	3. The model input files do not indicate that the Falling Creek stockpile emissions were included in the modelling which, along with exclusion of hourly wind speeds, would result in underestimation of effects on ambient particulate levels. This needs to be clarified.	*Response by RWDI, on behalf of WCCC:* Appendix D3.2, which reproduces the first two hours of the variable emission rate file for the unmitigated, two-stockpile scenario, lists emissions for the two stockpiles under the headings PileOne and PileTwo. As discussed above, the effect of hourly wind speeds on emission rates was included in the modelling.	Response satisfactory. Issue addressed.	MOE
6	**Dave Sutherland**	4. The isopleths of predicted Falling Creek PM_{10} and $PM_{2.5}$ maximum levels show more of a cross-valley effect than the down-valley effect that would be expected from the predominance of downvalley winds, including the highest wind speeds measured	*Response by RWDI, on behalf of WCCC:* As discussed above, hourly wind speeds were used to estimate emissions that were input to the model. Higher winds result in more dust from wind dependent sources but	Response satisfactory. Issue addressed.	MOE

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		at Willow Flats. This result likely results from not using the hourly wind speeds in estimating emissions, therefore the model results demonstrate the effect of dispersion by the lowest wind speeds, such as those expected from cross-valley winds, but not the effect of coal dust suspension by the higher wind speeds, which occur mainly with down-valley winds, as indicated by the Willow Flats windrose.	also in increased dispersion. As such, though suspension of dust will be increased during high winds, this will not always result in higher ambient concentrations downwind. Close to the piles, i.e. onsite, dust loading will definitely be worst during higher winds. Downwind, beyond the fenceline, dust concentrations will quickly drop to much lower levels to due both increased dispersion and settling of suspended dust. Low speed valley winds wind result in reduced dispersion of non-wind speed dependent sources. This is likely what causes the observed isopleth pattern.		
7	**Dave Sutherland**	5. It appears that the modelling needs to include particle dynamics (that is, the resistance deposition model mentioned on page Appendix page AG-4), to adequately assess dustfall effects. If deposition rates of $PM_{2.5}$ were set at 1/100th of the PM_{10}/TSP rates, then do the isopleth levels reflect this relationship? One unit of $PM_{2.5}$ would be expected to travel 100 times as far as a PM_{10} unit.	*Response by RWDI, on behalf of WCCC:* Use of the resistance deposition model requires knowledge of the geometric mean and standard deviation of the deposited particles. This in turn requires detailed knowledge of the particle size distribution of coal dust. Such information was not available at the time of the assessment. In addition, the particle resistance method uses information about the underlying surface and should be applied with estimates of varying land use throughout the model domain, i.e. within a full 3-D CALMET/CALPUFF application. This additional level of sophistication of the modelling will result in a refinement of predicted concentrations, but will not change model results by an order of magnitude. Given that maximum predicted concentrations of PM_{10} and $PM_{2.5}$ at occupied residences are two orders of magnitude less than the BC objective and	Response satisfactory. Issue addressed.	MOE

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			Canada-wide standard, we do not feel that the additional level of effort and sophistication in the modelling is warranted. Further, the actual deposition rate, in g/m2, is a function of both the settling velocity and the atmospheric loading. The assertion that "$PM_{2.5}$ would be expected to travel 100 times as far as a PM_{10} unit" would be accurate if the initial atmospheric loading and subsequent dispersion of the two species were identical (e.g., if the concentrations of $PM_{2.5}$ and PM_{10} at the sources were always exactly equal and they always dispersed in exactly the same manner, then $PM_{2.5}$ would settle out approximately 100 times slower than PM_{10}.) Given that the two species are emitted by different sources from different heights at different rates, the initial loading and subsequent dispersion clearly differ and the 1 to 100 relationship will be difficult to observe.		
8	**Dave Sutherland**	6. We acknowledge the proponent's support for shared use of the FC loadout, which will reduce the terrestrial footprint of future activities. Concentration of facilities does increase the risk of air and water quality effects in the area, thus, we are recommending an approach that we hope will address this risk adequately while equitably balancing responsibility between current and future uses of this area, including the expansion of the current proposed project.	*WCCC*: No response required.	Response satisfactory. Issue addressed.	MOE

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9	**Dave Sutherland**	7. Does the assessment of the combination of Brule and Cline loadout increments include the increased stacking and other stockpile disturbance activities that would expected from two simultaneous operations? If the cumulative effects of two loadout operations are to be assessed, then a doubling of all handling activities (including rail car loading as well?) should be included in the "expanded operations" scenario. The cumulative effects analysis appears to be limited to the static emissions from six stockpiles, compared to the two in the normal operations scenario, since the stockpile emissions are simply multiplied by three times for the expanded operations. As mentioned above, even though the stockpile emissions are included in the inventories, we cannot find evidence that the stockpile emissions were used in the model runs.	*Response by RWDI, on behalf of WCCC:* Yes, the assessment of the combination of Brule and Cline loadout increments does include the increased stacking and other stockpile disturbance activities that would be expected from two simultaneous operations. A comparison of Tables 11.3.2-1 and 11.3.2-2 for the unmitigated two- and six-stockpile scenarios, respectively, indicates that there are more sources included in the six-stockpile scenario. The same is true for the mitigated emissions tables (Table 11.3.3-1 and 11.3.3-2). New sources related to the expansion are identified in Tables 11.3.2-2 and 11.3.3-2 with the word "expansion" in brackets. In particular, under the subheading "Coal Handling Activities", Table 11.3.2-2 has two additional rows for coal unloading and stockpiling for the expansion scenario. The same railcar loading facility will be used for the expanded scenario. For modelling purposes, railcar loading emissions were based on the maximum design throughput (3,000 tonnes/hour) and were conservatively assumed to occur continuously throughout the year. The maximum design throughput of the rail loadout does not change based on the number of stockpiles; therefore it was not necessary to increase the hourly emissions for the six-stockpile scenario. Similarly, maximum design throughput was used to estimate hourly emissions from the truck receiving pits and conveyor transfer and drop points in both the 2-and 6-stockpile scenarios. Therefore, in the 6-stockpile	Response satisfactory. Issue addressed.	MOE

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			scenario, the hourly emission rates for these sources did not increase, the number of sources increased instead. The variable emission rate file used for the six-stockpile scenario is called CASEA_CONTROLLED_6_AREAS.DAT. This file was provided to the MOE for their review. The first page of this file is reproduced in Appendix D3.3 and shows that 11 variable emission sources were included in the modelling for the six-stockpile scenario (PileOne, PileTwo, PileThree, PileFour, PileFive, PileSix, SideDump, CoalStacker, BinChute, FutureDump, FutureStacker) compared to five for the 2-stockpile scenario. Furthermore, 10 volume sources were included in the six-stockpile modelling scenario compared to six for the 2-stockpile scenario.		
10	**Dave Sutherland**	8. The proponent should indicate how assessment of the cumulative effects of activities associated with a future processing plant near the Falling Creek loadout should be done. Alternately, if such planned emissions cannot be satisfactorily estimated, then we would like the proponent's suggestions for how such potential cumulative effects should be assessed. Plant emissions would be expected to include contributions from crushing, conveying and stockpiling of raw (unwashed) coal, coarse coal refuse and tailings, in addition to the final product stockpiling and loading included in this assessment.	*WCCC*: WCCC cannot predict the cumulative effects of a future processing plant near the Falling Creek Flats Loadout without the relevant design and emissions information for any such facility. At present, this information is not available. There is no proposed project in the vicinity of the Falling Creek Flats Loadout that meets the criterion specified in the Application for consideration in a cumulative effects assessment. “The criterion for known projects or activities was that there must be a public record – usually based on application for, or approval of, a permit or other government authorization….Within the 5 year future timeframe, there must be a publicly available application in order for the project	Response satisfactory. Issue addressed.	MOE

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			or activity to be considered.” (Refer to Section 6.3.2 of the Application). It is WCC’s position that given this situation, the responsibility for assessing cumulative effects related to any such new future development in the Falling Creek Flats area rests either with the proponents of any such development or with government. WCCC is and has been made responsible for determining the potential air quality effects of our proposed development in conjunction with other development already present in the area. Logically, any future applicants should be the ones responsible for assessing their effects in conjunction with projects that are already approved. Despite the above, WCCC has – at the request of government representatives – made best efforts to design the Falling Creek Flats Loadout with sufficient capacity to accommodate other users. Air quality effects of the loadout at an increased use level have also been assessed.		
11	**Dave Sutherland**	9. PM_{10} and $PM_{2.5}$ levels appear to be based on the multipliers, or dividers, derived from the modelled TSP values. Since the physics of suspension and dispersion of smaller particles would not be expected to be a simple multiple of coarser particles, is the use of these conversion factors sufficiently conservative for PM_{10} and $PM_{2.5}$ predictions? (Or was each particle size derived for the emission inventory, and then modeled using particle-size specific dispersion physics?)	*Response by RWDI, on behalf of WCCC:* TSP, PM_{10} and $PM_{2.5}$ were modelled individually. PM_{10} and $PM_{2.5}$ levels are not based on multipliers, or dividers, derived from the modelled TSP values. Where available, specific emission factors for PM_{10} and $PM_{2.5}$ were used (e.g., for conveyor transfer points factors for PM_{10} are available). Otherwise, the PM_{10} and $PM_{2.5}$ size fraction multipliers, provided in AP-42 Section 13.2.4 and reproduced in Table 11.2.2-2, were applied to TSP emission	Response satisfactory. Issue addressed.	MOE

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			factors. In addition, different settling velocities were given to each species for modeling of dry deposition.		
12	**Dave Sutherland**	10. Given the monitored dustfall and PM_{10} results at Willow Flats and at locations closer to the Willow Creek Mine plantsite, the Brule FC loadout predictions are lower than we would expect, especially for the unmitigated emission rates. We would expect a more significant area of elevated PM_{10} and $PM_{2.5}$ ambient increments than predicted by this modelling. Again, omission of hourly wind speeds from the emission calculations is likely the principal reason for this result.	*Response by RWDI, on behalf of WCCC:* As discussed above, hourly wind speeds were accounted for in the emission calculations. Only concentrations outside the loadout property line were reported in Section 11. Higher concentrations were predicted on the property. It is difficult to directly compare the model results with measured PM_{10} concentrations and dustfall levels because the ambient data will be influenced by all potential sources of PM, not just coal-related sources whereas the model results reflect the influence of fugitive coal dust only. The PM_{10} station will be influenced by emissions from the PVC loadout and plant site, located approximately 3,600 m southwest of PM_{10} station. It will also be influenced by emissions from the Willow Creek open pit mine, located 2000 m south of the station. Other sources of PM_{10} located closer to the PM_{10} station include a rail line (750 m away), roadways (two-lane paved road is 60 m from the station) and private residences that may have wood burning stoves (the closest is 100 m away and there are two 600 m away). Since the PVC PM_{10} and dustfall measurements are influenced by a variety of PM sources other than fugitive coal dust from the PVC loadout, they will measure higher concentrations than if they were	Response satisfactory. Issue addressed.	MOE

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			influenced by emissions from the PVC loadout alone. Thus, we do not expect our model results for fugitive coal dust emissions from the Falling Creek Flats loadout alone to be comparable to the ambient PVC measurements; we expect them to be lower.		
13	**Dave Sutherland**	11. We expect the air emissions permit to set an allowable frequency of exceedance of baseline levels of PM_{10} and $PM_{2.5}$, as well as an allowance for rare exceedances of the objectives for these pollutants. The compliance point is expected to be at a location between Falling Creek and Willow Creek, at a suitable spot for monitoring of PM levels and meteorology.	*Response by RWDI, on behalf of WCCC:* Our understanding of how the Ministry will set the allowable frequency of exceedance is set out in Section 11.6.2.3. The proposed location for the PM_{10} and $PM_{2.5}$ monitoring is indicated in Figure 11.6.1-2. This location is between Falling Creek and Willow Creek.	Details at permitting.	MOE
14	**Dave Sutherland**	12. I have not commented on the Brule Mine impact assessment because no model prediction was done and management of coal dust emissions will be based on best practices, and the incorporation of ambient monitoring results into a dust management plan. I have included some comments on the dust management technology at the minesite.	*WCCC*: Comments noted. No response required.	n/a. No response required.	MOE
15	**Dave Sutherland**	Detailed Comments Falling Creek Meteorology Baseline: Should a portion of the Willow Flats wind direction data be turned to correspond to the southwest orientation of the valley at Falling Creek? The accuracy of the Falling Creek dispersion modelling might be improved by turning the Willow Flats windfield to better reflect the southwest-northeast valley orientation in the proposed plantsite area. The Willow Flats multi-year wind rose, on page 11-44, shows a relatively high proportion of west winds, and proportion of higher speed winds, which is comparable to the proportion of southwest winds. It is likely that the high frequency of west winds is	*Response by RWDI, on behalf of WCCC:* The wind rose presented on page 11-44 was not used in the modelling. The wind rose used for the modelling is shown in Figure G-1.1 of Appendix G1 and has a stronger south-southwest component. Meteorology used in the modelling was developed by combining observations from three local stations under the guidance of MOE. Email records of this process are available upon request. Prior to modelling the MOE were asked if they had any further concerns with the meteorological data set that we had prepared in consultation with	Response satisfactory. Issue addressed.	MOE

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		due to the position of the instrument, at Willow Flats, where the valley begins to turn to the east, southeast, causing high speed winds especially, to veer to the west from the prevailing southwest orientation of the valley. While turning the westerly portion of the Willow Flats wind data might not affect the prediction of maximum values, it would be expected to affect the distribution of project PM increments.	them and they stated that they did not. We agree that rotating the wind rose would not affect the magnitude of maximum predicted concentrations and would only change the distribution or location of maximum predicted concentrations. Thus, this refinement to the modelling would not result in an order of magnitude increase of maximum predicted $PM_{2.5}$ and PM_{10} concentrations at residences. Hence, this refinement would not alter the conclusions of the affects assessment.		
16	**Dave Sutherland**	Management of Construction Activities: Open burning and dust from construction activities, while relatively short-term emission sources, could cause significant air quality effects due to the potential for both wind channelling and for build-up of emissions from inversions and stagnant air in the Pine River valley. Alternatives to open burning should be considered, and best practices for any burning, including stacking and drying of clean debris, and selection of venting conditions, need to be identified in the Environmental Management Plan. Open burning will require an approval. A dust management plan, including effective ambient monitoring of episodic emissions, should also be in place prior to start of construction.	*Response by RWDI, on behalf of WCCC:* We agree that open burning could cause significant air quality effects if conducted during adverse meteorological conditions. Alternatives to open burning will be considered. An Air Quality and Dust Control Plan is provided in Section 4.10. Requirements for open burning are outlined in that section, including ensuring that the ventilation is "good" on the day the burn starts and forecast to be "good" or "fair" the following day. WCCC (additional comments) April 10 – Material will be piled properly and dried prior to burning. Alternatives to open burning such as chipping of woody waste or burial on site will be considered.	Response satisfactory. Issue addressed.	MOE
17	**Dave Sutherland**	Conservativeness of Emission Estimates: In the emission inventory for the Falling Creek modelling, it is contended that the emission inputs are conservative because continuous, rather than intermittent dust emission activities were incorporated into the inventory. An estimate of the percentage of operating time would be useful for	*Response by RWDI, on behalf of WCCC:* As previously discussed, wind-dependent, variable emission rates were used to model coal handling and stockpile fugitive dust emissions. The discussion of the conservativeness of the emission estimates related to the conveyor transfer points and	Response satisfactory. Issue addressed.	MOE

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		each activity, to provide an estimate of the degree of conservativeness. However, most dust effects would be controlled by wind speeds, with the minimum wind speeds necessary to suspend and disperse coal dust occurring intermittently. The continuousness of emission activities is an insignificant factor; however, compared with the omission of hourly wind speeds in the emission inventory.	handling activities only. Emission factors for conveyor transfer points are not wind-speed dependent. The truck dump and the associated stockpiling conveyors at the loadout will operate only during truck unloading which is estimated to occur approximately 11 hours per day during normal operations. The rail loadout and associated conveyors will only operate when an empty train arrives. It is estimated that there will be 1 train every 2 days during normal operations and 3 trains every 2 days during expanded operations. There is no pre-determined schedule for these operations and therefore it was conservatively assumed that these operations would be continuous.		
18	**Dave Sutherland**	Coal Dust Mitigation: Control of coal dust emissions so as to meet the dustfall objectives at Beaudette and Falling Creek will require tight management of dust emissions, as will prevention of significant degradation of PM_{10} and $PM_{2.5}$ baselines at an appropriate location for cumulative effects management. The mitigated emission factors don't appear to include consideration of particle sizes. Finer particles would not be expected to be mitigated by enclosures, reduced drop heights and filters as effectively as coarser particles. An assessment of the uncertainty of emission mitigation measures for fine dust is required.	*Response by RWDI, on behalf of WCCC:* The mitigation factors that were applied in the emission inventory are published values. They do not consider particle size but neither do most of the emission factors. To our knowledge, mitigation factors for fugitive coal dust that account for particle size are not readily available and therefore it is difficult to assess the uncertainty in the mitigation measures that were applied. However, the unmitigated two-stockpile scenario was modelled and model results for this scenario indicate that at occupied residences, the maximum predicted PM_{10} and $PM_{2.5}$ concentrations are less than 5 and 2 μg/m3, respectively (see Figures 11.3.2-2 and 11.3.2-3). Thus, even if no mitigation factors were applied, our conclusions would remain the same. This indicates that the uncertainty associated	Response satisfactory. Issue addressed.	

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			with the mitigation factors is not significant for this assessment.		
19	**Dave Sutherland**	The proponent needs to indicate why baghouse dust collectors should not be used as the best practice for truck dumping and rail loading, and possibly other sources.	*WCCC:* WCCC will use adequate controls to manage fugitive dust emissions. Assessments conducted to date indicate that baghouses are not needed because the washed product will maintain a higher moisture content than dry coal, and therefore are far less likely to generate dust. However, WCCC has identified the use of baghouses at the truck unloading and rail loading stations at the loadout as part of their contingency plan outlined in the air quality and dust control plan (Section 4.10). The cost associated with baghouses is high and will be considered in the event that the target ambient levels of dustfall, $PM_{2.5}$, and PM_{10} are continuously exceeded. WCCC (additional comments) April 10 – Managing dust emissions from the clean coal stockpiles will occur as follows: The traveling luffing stacker is designed to allow adjustment of the discharge end of the stacker in relation to the top of the coal stockpile; the drop height can be minimized to control coal dust creation. Rainbird water sprays installed around the perimeter of the stockpiles will be used to wet the coal as required. When loading trains, product coal is reclaimed from stockpiles by using dozers to push coal to a trap loadout where coal is transferred onto the conveyors. Excessive dusting is not expected during reclamation	Response satisfactory. Issue addressed.	MOE

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			since the moisture content of the washed coal is in the 6% to 8% level. Coal reclaim dozers are equipped with large blades designed for coal handling. The quantity of coal moved during each cycle is maximized. The blades deflect radiator cooling fan airflow away from the coal and therefore help reduce dust creation. The distance coal is pushed from the stockpile to the trap loadout is minimized through optimal feeder location in relation to stockpiles. Rainbird water sprays (with chemical additives such as calcium chloride in winter) can be turned on as required to wet down the active working areas. Dust emissions occurring while recovering coal from stockpiles will be monitored and appropriate action taken to manage dust creation.		
20	**Dave Sutherland**	Cumulative Effects Assessment: The cumulative effect of adding in baseline levels was done by adding average baseline levels from Fort St. John to maximum predicted Brule loadout increments. We have recommended, below, that this assessment should be done by adding exceedance frequencies of selected PM_{10} and $PM_{2.5}$ objectives from both the baseline and modelled databases, at a selected compliance location. The adequacy of proposed mitigation measures can then be assessed based on whether or not baseline frequencies of these objectives are predicted to be exceeded.	*Response by RWDI, on behalf of WCCC:* As stated in Section 11.5.2.1.3, the cumulative effects of the Project were assessed in two ways: 1) average ambient background concentrations were added to predicted concentrations and 2) maximum ambient background concentrations were added to predicted concentrations. For both methods, PM_{10} data from the PVC PM_{10} station were used. The only way that Fort St. John data were used was to derive a ratio of $PM_{2.5}$ to PM_{10} to estimate the fraction of average PM_{10} observed at the PVC PM_{10} station that is in the $PM_{2.5}$ size fraction. The change in observed frequency of exceedance of the PM_{10} objective and half the objective is discussed on page 11-103. Notwithstanding the above, in Appendix	Response satisfactory. Issue addressed.	MOE

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			D3.4 we provide the requested additional analysis of model results using the pre-construction PVC baseline data for PM_{10} and the Fort St. John Pomeroy data for $PM_{2.5}$.		
21	**Dave Sutherland**	Baseline Databases: When finalizing the terms-of-reference for this assessment, we had told the proponent that an external baseline (that is outside the valley) could be used to do the impact prediction of $PM_{2.5}$ effects, since a local one was not available. We had suggested that $PM_{2.5}$ data from Fort St. John be used, and recommended the Pomeroy subdivision one as the most appropriate. The Fort St. John $PM_{2.5}$ baseline values, in the table on page 11-100, were taken from the Cultural Center database, which we don't recommend because the results were periodically affected by severe dust episodes. The more appropriate Fort St. John baseline is the data from the Pomeroy subdivision. We are recommending that the pre-construction PM_{10} baseline from Willow Flats (modified as suggested here) be used as an initial assessment of the combined effect of the project contributions with the local baseline. The dustfall baseline should be based on the pre-construction data around the Willow Creek Mine plantsite.	*Response by RWDI, on behalf of WCCC:* The discussion that is referred to in this comment regarding Fort St. John Pomeroy data was for another project and took place after the modelling was completed for the Brule project. As discussed above, data from the PVC PM_{10} station were used to assess cumulative effects of both PM_{10} and $PM_{2.5}$. In Appendix D3.4 we provide additional analysis of the model results using the Pomeroy $PM_{2.5}$ data and PVC pre-construction PM_{10} data.	Response satisfactory. Issue addressed.	MOE
22	**Dave Sutherland**	However, we want to make it clear that, for assessment of effects during the operational phase, we require collection of a local $PM_{2.5}$ baseline prior to operation. We agreed to use of the local, Willow Flats data as an option for the pre-operational PM_{10} baseline. The local baseline is required because regulation of coal dust impacts will be done by setting a locally-based objective using baseline PM_{10} and $PM_{2.5}$.	*WCCC*: Acknowledged. WCCC will collect baseline PM_{10} and $PM_{2.5}$ data at the proposed compliance site located northeast of the loadout on Gary Loiselle's property (FC4 in Figure 11.6.1-2).	Details at permitting.	MOE

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23	**Dave Sutherland**	The Willow Creek baseline dustfall data, as provided on pages 11-46 to 11-51, should not be affected by the insects or insect parts noted in the sample logs, since material coarser than about 2 mm should have been screened out before sample analysis. The Willow Creek baseline PM_{10} data referred to on page 11-52 should not include data collected after May 2005 when mine construction began. Although part of the pre-construction database, the February 2002 level of 87 µg/m3, which was most likely affected by a bulk sample crushing operation, and a number of invalid values should be removed from the PM_{10} baseline before it is used to assess cumulative effects. Validated PM_{10} data, including separation of pre- and post-construction data, has been provided to the proponent.	*Response by RWDI, on behalf of WCCC:* The validated PM_{10} data was provided to RWDI in February 2006, after submission of the EA Application. The requested additional analysis of model results is presented in Appendix D3.4 using the validated pre-construction data.	Response satisfactory. Issue addressed.	MOE
24	**Dave Sutherland**	Residual Cumulative Effects: The PVC residents (page 11-100) are treated no differently than any others in the Willow Flats for management of coal dust emissions.	*Response by RWDI, on behalf of WCCC:* Acknowledged. Residences were differentiated so that predicted particulate concentrations at locations where the concerned parties reside could be easily identified.	Response satisfactory. Issue addressed.	MOE
25	**Dave Sutherland**	The effect on ambient TSP levels has been ignored in our assessment because the critical health indicators are the finer PM_{10} and $PM_{2.5}$ particulate. Deposition is assessed using the dustfall objective.	*WCCC*: Comments noted. No response required.	n/a. No response required.	MOE
26	**Dave Sutherland**	Dust Control Plans: At the minesite, dust management will be directed at protection of nearby waterbodies, as is the case for the Dillon and NEMI mines and the Wolverine mine and processing/loading site because of the absence of private properties and residents. However, minimum management practice standards need to be established for the Brule minesite activities. Crushers should be enclosed to mitigate wind blown coal dust.	*WCCC*: WCCC feels that it is currently using BMPS as the Brule crushing and coal handling system will incorporate the following measures to control and reduce the generation of fugitive dust: • Raw coal feeder will be semi-enclosed; • All outside belt conveyors (excluding the reject belt conveyor RJ-1) will have belt covers/hoods over the carry side of the belt to minimize dust generation and reduce the	Response satisfactory. Issue addressed.	MOE

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			effects from wind. These belt covers will be hinged on one side to facilitate maintenance and repair work. Belt covers will not be necessary over the reject conveyor RJ-1, because the reject product will consist primarily of rock material; • All conveyor transfer points will be contained by chutes to control the generation of dust; • Raw coal screener and primary crusher are enclosed units with vents; • A dry dust collection system (bag house) will be integral to the dry screening process in the preparation plant; • Product coal conveyor will contain fines on the bottom with washed coal on top; and • Rubber skirting will be used to contain coal dust from loadout bin to trucks. Note: The use of a wet suppression type system before the wash plant would not be appropriate since the additional moisture added to the raw coal may reduce the effectiveness of the dry screens (flip-flow live deck type) located in the preparation plant. WCCC (additional comments) April 10 – The existing Dillon crusher will be used during Phase 1 (production to 1 million tonnes per year (Mt/Y)). The raw coal process generates fugitive dust as a result of the low inherent moisture in the run-of-mine coal. Raw coal stockpiles tend to readily adsorb moisture from precipitation over time thus reducing dust emissions from the crushing operation. The wheeled loader working around the crushed coal pile generates dust when traveling between the		

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			coal trucks and stockpile area. During operation over the winter (2005/2006), measures expected to reduce fugitive dust were identified and include the following: • The existing passive collection (i.e. chutes built with gradual transitions, skirting, dust curtains, skirt board covers, hoods, etc.) will be monitored and repaired and upgraded when required. • The existing cover on the screen deck is not functioning properly and will be replaced with a maintenance friendly version. • The foam dust suppression system, which was operated intermittently during the last year while design and installation problems were rectified, will operate on a continuous basis and the resulting impact on dust levels results monitored. • The coal loading area around the loading dock will be equipped with water sprays for use in dry weather. The sprays will supplement water truck use on the coal loading area roads. • A mist system will be installed over the truck box for use during coal loading cycle. • Water sprays will be installed at the discharge end of the coal stacker conveyor. For Phase 2 operation, (production to 2 Mt/Y, WCCC feels that it is currently using BMPS as the Brule crushing and coal handling system will incorporate the following measures to control and reduce		

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			the generation of fugitive dust: • Raw coal feeder will be semi-enclosed and equipped with a water/calcium chloride spray system; • All outside belt conveyors (excluding the reject belt conveyor RJ-1) will have belt covers/hoods over the carry side of the belt to minimize dust generation and reduce the effects from wind. These belt covers will be hinged on one side to facilitate maintenance and repair work. Belt covers will not be necessary over the reject conveyor RJ-1, because the reject product will consist primarily of coarse rock material; • All conveyor transfer points will be contained by chutes to control the generation of dust. Passive dust control measures will be incorporated in the design and construction of transfer points; • Raw coal screener and primary crusher are enclosed units with vents. The crusher will be equipped with a water/calcium chloride spray system; • A dry dust collection system (bag house) will be integral to the dry screening process in the preparation plant; • Product coal conveyor will contain dry fines on the bottom with moist washed coal on top. Mixing is expected as the conveyor discharges; • Rubber skirting will be used to contain coal dust from loadout bin while loading trucks; • The outside crushed coal stockpile will be equipped with a water/calcium chloride spray system for dust suppression. Note: The use of a wet suppression type		

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			system before the wash plant would not be appropriate since the additional moisture added to the raw coal may reduce the effectiveness of the dry screens (flip-flow live deck type) located in the preparation plant.		
27	**Dave Sutherland**	At the Falling Creek loadout, more specific operating procedures need to be identified, especially for managing emissions during higher wind speeds, including having an operator present during stockpiling and rail car loading. A procedures checklist and training should be established that includes: * use of a windspeed monitor along with criteria for initiating specific dust reduction measures, including application of water or other dust suppressants, reduction or shutdown of activities; * having the water sprayers and the water supply in place prior to any stockpiling.	*WCCC*: Inclusion of a windspeed monitoring at the Falling Creek loadout is anticipated. Furthermore, the windspeed monitor can checked on a regular basis as there will be a full time operator located in a work station adjacent to the truck dump. WCCC commits to watering or applying chemical dust suppressant to the stockpiles if needed.	Details at permitting.	MOE
28	**Dave Sutherland**	Dennis Fudge's Detailed Modelling Comments Based on the input data that was provided to me by RWDI it seems that the conveyor transfer points were modelled. The Coal Handling Activities and the stockpiles were not included.	*Response by RWDI, on behalf of WCCC:* As discussed above, coal handling and stockpile emissions were included in the model as variable emission sources.	Response satisfactory. Issue addressed.	MOE
29	**Dave Sutherland**	The emissions were based on those calculated using a wind speed of 1.85. This means that the emission rate for light winds were the same as those for strong winds.	*Response by RWDI, on behalf of WCCC:* As stated above, variable emission rates were modelled for wind-dependent sources. Therefore coal handling and stockpile emission rates were lower during light winds and higher during strong winds. Since emission rates for each hour could not be presented in the report, maximum and average emission rates were presented. Average emission rates were shown in the report based on a wind speed of 1.85 m/s.	Response satisfactory. Issue addressed.	MOE

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30	**Dave Sutherland**	The Monin-Obukhov length was calculated based on a matrix provided in the New South Wales Modelling Assessment which uses Golder's approach in 1972 (1/L=X + Y x LOG(Zo)). However in "Plume Dispersion in Alberta" the Monin-Obukhov length is calculated based on the Lui and Durran (1977) approach (1/L = X x (Zo)^Y). I don't know if there is another equation that would be better? I would assume a later calculation would be the better equation.	*Response by RWDI, on behalf of WCCC:* For a roughness length of 1.0 m, as was assumed for the rural terrain of the model domain, both equations collapse to L =1/X and give the same answer.	Response satisfactory. Issue addressed.	MOE
31	**Dave Sutherland**	I don't know why the frictional velocity calculation provided in the New South Wales Modelling Assessment was not used, since the Monin-Obukhov length was taken from the same document.	*Response by RWDI, on behalf of WCCC:* The method for calculating friction velocity in the New South Wales document is rather detailed. It was deemed that the simpler method of Stull would provide an acceptable estimate while being less prone to calculation error. The difference in the two methods is likely of little consequence to the final model results.	Response satisfactory. Issue addressed.	MOE
32	**Dave Sutherland**	The frictional velocity was constant throughout the year but should have varied seasonally.	*Response by RWDI, on behalf of WCCC:* Friction velocity was varied hourly according the equation from Stull as outlined in the report. The hourly varying value of the friction velocity is given in column 11 of the ISC format meteorology file (Brule_isc.met) supplied to MOE. For reference the format of this file, including column labels, is provided on pg 4-94 of the CALPUFF user guide Scire (2000).	Response satisfactory. Issue addressed.	MOE
33	**Dave Sutherland**	The maximum concentrations shown in the figures does not match the isopleths	*Response by RWDI, on behalf of WCCC:* This is an artifact of the gridding algorithm used by Surfer. It is caused by two factors. First, highest concentrations are predicted at or near the fenceline. Second, data points inside the fenceline are excluded from post-processing analysis. Because the highest concentrations occur near a region	Response satisfactory. Issue addressed.	MOE

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			with no data, the gridding algorithm 'smooths' the higher concentrations over the area where data is missing. This slightly distorts the isopleths. However, the maximum results from the modelling are provided in tables in the report.		
34	**Dave Sutherland**	I can't comment on dustfall calculations (1 cm/min for $PM_{2.5}$ and 1 m/min for PM_{10}) used because I have not dealt with this before. It would be better if I had the paper that RWDI refers to in their calculations.	*Response by RWDI, on behalf of WCCC:* The applicable section of the reference is provided in Appendix D3.5. The paper provides order of magnitude estimate of PM settling velocities that were used for modelling.	Response satisfactory. Issue addressed.	MOE
35	**Dave Sutherland**	RWDI re-calculates the wind reduction based on what was stated in the report. It seems that they used this new calculated wind speed to calculate the emission rates. I don't think these adjusted wind speeds were used in the modelling. So 1) there needs to be consistency, 2) I don't agree with using this approach. Some of these sources are at or above the tree top canopy so the effect will be a lot less than what was calculated. Also the meteorological tower was in a similar area but with less trees. As stated in the report "wind speed can be reduced by more that 50% at a downwind distance of 20 times barrier height. This would indicate that this reduction in wind speed was already measured with the existing meteorological tower and does not have to be done again.	*Response by RWDI, on behalf of WCCC:* In the coal handling and stockpile emission rate calculations, wind speed was reduced by a factor of 0.5 to account for the tree sheltering effect. Wind speed was not reduced in the dispersion modelling since wind speed would be reduced throughout the whole model domain and not just the limited area experiencing wind sheltering effects. This is because the CALPUFF model was run in ISC mode, which applies identical meteorological conditions over the whole domain for each hour. All sources modelled are below the canopy height of 25 to 30 metres, furthermore, all wind-dependent emission sources are at least ten metres below the canopy. Therefore, the wind-dependent sources will experience a sheltering effect. As described in Appendix G-1, dispersion modelling was conducted using meteorological data from three different stations. We cannot comment on the tree cover surrounding these towers; however, we have assumed that these towers were	Response satisfactory. Issue addressed.	MOE

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			sited and installed in accordance with meteorological tower guidelines such that obstructions do not interfere with the wind data collection. It is of note that the emission factor used for stockpile wind erosion does not account for the moisture content of the stockpile, which will be 6 to 8%. Moisture content is only considered in the coal handling emission factors. In addition, a mitigation factor was not applied to account for the use of water sprays on the stockpile although the CCME 2001 "Fugitive Coal Dust Emissions in Canada" document suggests the use of an 80% dust control efficiency factor. Given that the stockpiled coal will be wet, we believe that the use of a 50% mitigation factor for the stockpiles is conservative.		
36	**Dave Sutherland**	I don't know why Figure 11.3.1-2 showed a high frequency of winds from the north when RWDI had the correct data which had all of these incorrect northerly flows removed.	*Response by RWDI, on behalf of WCCC:* Figure 11.3.1-2 was not used for dispersion modelling but it does reflect the data that were provided for Pine River Hasler. The wind rose used for dispersion modelling, which is based on data from PVC, Lemoray and Hasler, is presented in Figure G-1.1. The combined wind rose does not have a strong component of northerly flows.	Response satisfactory. Issue addressed.	MOE
37	**Dave Sutherland**	Recommendations 1. The modelling of coal dust dispersion at the Falling Creek Loadout should be re-done, addressing the deficiencies raised here. The proponent and the ministry should meet to discuss these issues prior to re-modelling.	*Response by RWDI, on behalf of WCCC:* We have demonstrated to the MOE that all sources of coal dust emissions at the loadout were included in the modelling and that variable emission rates were used for wind-dependent sources. These appear to be the MOE's primary concerns regarding the dispersion modelling. All other concerns with the modelling are relatively minor in nature and would not alter the conclusions	Response satisfactory. Issue addressed.	MOE

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			of our study. Therefore remodelling should no longer be required.		
38	**Dave Sutherland**	2. We recommend that the proponent initiate collection of baseline PM_{10}, $PM_{2.5}$ and dustfall within three months of Certificate issuance, and that construction permits should not be issued before a satisfactory baseline has been collected. We appreciate that there are uncertainties with project scheduling, but effective management of the air quality effects from this and any subsequent projects at this location relies on the availability of a representative baseline. This dependence results from the uncertainties of dust modelling, the potential for cumulative effects with future co-located projects, and the lack of PM thresholds for human health effects. These factors create the need to minimize degradation of existing PM levels which requires a quality baseline.	*WCCC*: WCCC intends to install TEOMs to monitor PM_{10}, $PM_{2.5}$ and dustfall monitors within 3 months of Certificate issuance. WCCC (additional comments) April 10 – As a minimum, one complete year of background data will be collected prior to the start of construction at the loadout.	Response satisfactory. Issue addressed.	MOE
39	**Dave Sutherland**	3. We recommend that a minimum of one-year's baseline monitoring is needed, prior to any construction activities or other land disturbances that might affect baseline air quality. Two or more years of pre-construction monitoring is desirable, to provide a more adequate representation of the variability in baseline dust and suspended particulate sources. More than one year should also be planned to compensate for any significant gaps in data, due to instrument malfunction, or other interruptions in data collection that may occur in the first year.	*WCCC*: WCCC commits to 1 year of pre-disturbance baseline monitoring.	Response satisfactory. Issue addressed.	MOE
40	**Dave Sutherland**	4. We recommend that the most certain method for managing the cumulative effects of this operation with one or more additional operations at the loadout site is to manage the incremental Brule contributions so as to minimize increases to background PM levels at an appropriate compliance site. By setting the compliance point	*WCCC*: WCCC will collect PM_{10} and $PM_{2.5}$ data throughout the life of the loadout at the proposed compliance site located on the west side of Willow Creek, northeast of the loadout (FC4 in Figure 11.6.1-2). WCCC (additional comments). April 10 – During operations, the monitor will	Response satisfactory. Issue addressed. Additional details at permitting.	MOE

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		on the west side of Willow Creek, the effects of the Brule project can be managed to prevent increased cumulative effects on the Willow Flats residents and properties, and to adequately protect the Willow Creek Mine plantsite workers.	be located downwind of the loadout, based on prevailing winds, in line with PVC operations.		
41	**Dave Sutherland**	5. We recommend that the proponent combine the modelled Falling Creek PM increments with baseline PM levels to determine the frequency of exceedance of the following air quality objectives: * 50 µg/m3 and 25 µg/m3 PM_{10}; and * 30 µg/m3 and 15 µg/m3 $PM_{2.5}$.	*Response by RWDI, on behalf of WCCC:* This exercise was completed for PM_{10} using all available data from the PM10 station in Section 11.5.2.1.3. In Appendix D3.4 we provide additional analysis of model results based on the pre-construction validated PM_{10} data provided in February 2006 and using Fort St John Pomeroy data for $PM_{2.5}$. WCCC (additional comments) April 10 – This calculation exercise will be repeated after one year of site-specific baseline ambient data has been collected.	Response satisfactory. Issue addressed.	MOE
42	**Dave Sutherland**	6. We recommend that an initial estimate of the potential for significant cumulative effects should be done with the Willow Flats pre-construction PM_{10} baseline. This assessment should be done at a point between Falling Creek and Willow Creek, at a location where the ministry's chemical and meteorological siting guidelines can be satisfactorily met, which is the point where we expect to apply air quality objectives to the Falling Creek PM emissions. The selection of this location should be confirmed with the ministry.	*Response by RWDI, on behalf of WCCC:* We consulted with the MOE regarding locations at which to perform the requested additional analysis of model results. The results are presented in Appendix D3.4.	Response satisfactory. Issue addressed.	MOE
43	**Dave Sutherland**	7. We recommend that percentiles of the predicted PM_{10} and $PM_{2.5}$ levels should be provided for all four options (mitigated/unmitigated and normal/expanded) at selected receptor points to determine if distributions differ by location, and most importantly to determine the effect of adding the increments to background increments.	*Response by RWDI, on behalf of WCCC:* Percentiles of model results are provided in Appendix D3.4 for the three options that were modelled (2 stockpiles unmitigated, 2 stockpiles mitigated and 6 stockpiles unmitigated).	Response satisfactory. Issue addressed.	MOE
44	**Dave Sutherland**	8. We recommend that dust control technology and practices should be as effective at the Brule	*Response by RWDI, on behalf of WCCC:* The Falling Creek Loadout will be equipped	Response satisfactory.	MOE

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		loadout as at the Pine Valley Coal operations on Willow Creek.	with the following dust control mitigation measures: • Maintaining a forest section in the rail loop to help minimize wind speeds; • Watering road ways on an as needed basis; • Drive-through enclosure at the truck dump hopper; • Filtered vent on the loadout bin; • Luffing stacker to place coal on storage piles; • Articulating loadout chute for loading coal from surge bin to railcars; • Dust hoods or covers for most conveyors; • Luffing stacker that can be raised or lowered to minimize the drop height of coal onto the storage pile; and • Enclosed transfer chutes, complete with dust curtains at the inlet and discharge, at conveyor transfer points. WCCC believes that the mitigation measures listed will be as effective as those at the Pine Valley Operations. However in the event that they are not WCCC will consider the following contingency measures; • Water spray system at truck unloading station (excluding winter months) • Baghouse at truck unloading station • Baghouse at rail loading station • Filtered bin vents at transfer points (where feasible) • Water sprays at dusty transfer points (excluding winter months) Additional water or chemical dust	Issue addressed.	

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			suppression at problematic areas. WCCC (additional comments) April 10 – • Limit vehicle speed on the loadout area roads; • Maintain road surfaces so as to remove dust and keep the durable rock surface intact. Chemical dust suppressant (such as calcium chloride) will be used as necessary for winter dust control.		
45	**Dave Sutherland**	9. We recommend that crustal dust emissions be managed by requiring a dust management plan that incorporates best management practices, and also includes enhanced management practices if total dustfall objectives cannot be met at the selected compliance points.	*Response by RWDI, on behalf of WCCC:* A preliminary dust control plan that addresses the management of crustal dust emissions and provides contingency measures in the event of continuous exceedences of dustfall objectives at the proposed compliance point is contained in Section 4.10. This plan will be refined at the air permitting stage.	Response satisfactory. Issue addressed. Additional details at permitting.	MOE