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BEFORE THE
SURFACE TRANSPORTATION BOARD

DOCKET FD 35557

REASONABLENESS OF BNSF RAILWAY COMPANY
COAL DUST MITIGATION TARIFF PROVISIONS

ARKANSAS ELECTRIC COOPERATIVE CORPORATION'S MOTION FOR LEAVE TO FILE SUPPLEMENT TO DOCUMENTARY APPENDIX TO OPENING EVIDENCE AND ARGUMENT

Arkansas Electric Cooperative Corporation (AECC) respectfully submits leave to file a supplement to the documentary appendix to its opening evidence and argument.

AECC intended to include with its opening evidence and argument an appendix containing all of the documents that are referred to in the argument and in the verified statement of Michael A. Nelson. Although the appendix as filed included over 300 pages of documents, because of production difficulties it was not possible to include all the referenced documents. Accordingly, AECC now requests leave to file a supplement to the appendix, which contains an additional 103 pages of documents. Most of the documents in the supplement are classified as Highly Confidential by the parties that produced them is discovery. Smaller numbers of documents are classified as Confidential or Public, so there are three versions of the supplement.

We respectfully submit that no party will be prejudiced by granting this motion.

Respectfully submitted,

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Dated: October 18, 2012

CERTIFICATE OF SERVICE

I hereby certify that on this 18th day of October, 2012, I caused a copy of this motion to be served electronically on all parties of record on the service list in this action, together with (a) a copy of the HIGHLY CONFIDENTIAL version of the supplement referred to herein to all parties of record on the service list in this action who are entitled to receive HIGHLY CONFIDENTIAL material in accordance with the Protective Order herein, (b) a copy of the CONFIDENTIAL version of the same to all parties of record on the service list in this action who are entitled to receive CONFIDENTIAL material in accordance with the Protective Order herein, and (c) a copy of the PUBLIC version of the same to all parties of record on the service list in this action.

Eric Von Salzen

APPENDIX A

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[redacted] do not necessarily reflect conditions within the portion of the ballast that actually supports the ties and track. Indeed, regardless of the amount of foreign matter resting on top of the ballast or ties, or even occupying the spaces, or "cribs", between ties, the portion of the ballast that bears the weight of passing trains experiences wear and breakdown of ballast particles. On a heavy-haul line like the Joint Line, such wear generates fouling that may not be visible from the surface, but nevertheless necessitates periodic cleaning. While the surface accumulation of fugitive coal is quite visible, BNSF's analyses [redacted]

Even more significantly, BNSF's rush to fault coal dust for "soft track conditions" neglects to mention the fact that most of the Joint Line was constructed over soils very high in clay, which has poor load-bearing properties when wet. With proper construction techniques, including use of additives and compaction as well as appropriate track structure specifications, stable construction on such soils is generally feasible. However, at the same time BNSF was publicly blaming coal dust for the derailments, [redacted]

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18 [redacted]

19 [redacted]

[redacted]

In the discussion presented below, information from each derailment is highlighted, and common factors between the derailments are analyzed. The conclusion - that [redacted]

[20] See BNSF COALDUST 0016753, 0016940.

[redacted]

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[25] See BNSF COALDUST 0016743.

[26] [redacted]

[redacted]

[redacted]

[27] See UP-AECCBN-0000825.
[28] See UP-AECCBN-0000833.
[29] See BNSF COALDUST 0023526.
[30] See BNSF COALDUST 00002610; 0023530, [redacted]

[redacted]

It is highly improbable that two derailments would have occurred by chance at these two locations – which share several characteristics that are not common elsewhere on the Joint Line -- if they were caused by fugitive coal dust, which is found throughout the Joint Line. This can be demonstrated by probabilistic modeling. This tool permits assessment of the likelihood that the observed outcome was generated randomly through a process driven by the deposition of coal dust. To simplify the analysis, it is assumed that the deposition of coal dust, as well as the occurrence of [redacted] all occur along the Joint Line in a distribution that is essentially uniform. Analytically, the issue is then reduced to the following simple question: if a derailment follows the assumed uniform distribution of the deposition of coal dust, what is the probability that 2 derailments would occur on the [redacted]

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31 [redacted]

[redacted]

[redacted]

[32] See BNSF COALDUST 0016474.
[33] [redacted]

REDACTED

[redacted] The repetition of BNSF's argument does not establish its validity, and is entitled to no weight in the context of coal dust issues.

[redacted]

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44 [redacted]

45 See BNSF COALDUST 0020532.

46 See BNSF COALDUST 0020582.

47 See BNSF COALDUST 0020229+.

48 See BNSF COALDUST 0019796; 0020348.

APPENDIX B

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Ultimately, BNSF provides no credible foundation for its argument that coal dust is more damaging to ballast stability than are other common ballast contaminants.

2. <u>Continued Accumulation of Coal Dust</u>

BNSF and UP complain repeatedly that coal dust continues to accumulate despite their ongoing maintenance efforts.[7] This complaint is absurd on its face: UP and BNSF are moving hundreds of millions of tons of coal annually from the PRB, and there is no viable way to eliminate fugitive coal dust. Toppers do not eliminate all fugitive coal dust from open-top cars, rapid-discharge doors can leak product directly onto the ballast, and other leakage may occur from drainage holes, car body panel seams and other sources. If the railroads intend to keep moving coal, they need to plan and execute a maintenance program that is consistent with actual dust levels.

Given the impossibility of eliminating coal dust entirely, the railroad complaints regarding the accumulation of coal dust and its lack of visibility reveal the inadequacy of rail efforts to understand and address two fundamental aspects of coal dust control and remediation.

A. Patterns of Accumulation

BNSF claims that shippers alone are responsible for coal dust accumulating on the Joint Line track,[8] but in fact the patterns of coal dust accumulation the railroads have identified indicate that railroads' own operating and maintenance practices may be responsible for causing a substantial amount of fugitive coal dust. Both BNSF and UP have apparently noticed a pattern wherein accumulations of coal dust have tended to

[7] See, for example, BNSF Argument at 1; UP Argument at 8.
[8] BNSF Argument at 5.

occur at switches and bridges,[9] but neither railroad appears to have grasped fully the significance of this pattern for coal dust control efforts.

The railroads' opening filings document several locations where substantial visible accumulations of coal dust have occurred in recent years. Essentially all of these locations involve bridges[10] or switches.[11] BNSF witness Sloggett begins to touch on the significance of this pattern when he makes reference to the "increased vibration" experienced by a train passing through a switch.[12] Such vibration can occur, for example, due to changes in track modulus associated with the use of wood crossties under switches or through the passage of car wheels over the gap in manganese frogs (the vibration from which may be increased if the frog is not properly maintained).

Vibration of cars at such locations likely causes downward movement of coal particles in the load, including movement through drainage holes and rapid discharge door seals onto the track. The railroads ought to recognize this possibility, as their [redacted]

In short, the presence of notable coal accumulations at switches ought to lead the railroads to understand that a disproportionate amount of fugitive coal dust may result from the coal being moved out the bottoms of cars by vibration. Poor maintenance of frogs and inattentiveness to modulus changes may cause increased vibration. Thus, while the railroads complain that coal dust necessitates maintenance, in fact poor maintenance

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[9] BNSF VS VanHook at 3; UP Argument at 5, Footnote 1.
[10] For example, MP 62 and the bridge near Nacco Junction, as referenced in BNSF VS Sloggett at 8.
[11] "Many switches", as referenced in BNSF VS Sloggett at 6. [redacted]
[12] BNSF VS Sloggett at 5.
[13] [redacted]

may cause a proportion of fugitive coal dust in the first place. Such contributions to fugitive coal dust deposition are completely in the hands of the railroads, but BNSF would have the Board ignore them.

Railroad operating practices may also contribute to the observed deposition of fugitive coal dust on bridges. In addition to changes in track modulus that may occur at the transition between a bridge's structure and its approaches, the bridge locations the railroads cite as showing coal dust accumulations are all located at or immediately adjacent to the bottoms of "big sags".[14] This suggests that slack action forces may play a significant role in the deposition of coal on the bridges. Indeed, [redacted] slack action in big sags sometimes results in the spillage of coal over the sides or ends of cars.[16] This is corroborated by the [redacted] Thus, train handling practices may increase the deposition of concentrated amounts of fugitive coal on the ballast. This is also a factor completely in the hands of the railroads, but which BNSF would have the Board ignore.

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14 [redacted]

15 [redacted]

16 It is often assumed that slack action on PRB coal trains is able to be managed effectively through the use of DPU's. However, in the typical PRB unit train consist, no locomotive is placed in the middle. In a 135-car train, this may leave in excess of 19,000 tons of railcars and coal subject to slack action between the lead and trailing locomotives. In the hands of a crew that has not mastered the complex slack handling requirements imposed by the saw-toothed profile of the Joint Line, or even a more experienced crew that "bunches slack" on the descending side of a sag to facilitate the subsequent ascent, slack action forces may play a significant role in the observed depositions of coal on the bridges at the bottoms of big sags. Indeed, the railroads' observations regarding the increased deposition of fugitive coal beginning in the late 1990's correlates closely with the proliferation of the longer PRB unit coal trains, for which slack action likely would be most significant.

17 [redacted]

APPENDIX C

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[redacted] However, using the 225 pounds per car loss measured in the study cited by UP, and the passing train volume figures assumed in the BNSF analysis, the quantity of fugitive coal is [redacted] Put another way, only abou[redacted] coal that leaves the tops of railcars is deposited on the right-of-way via the airborne suspension of dust measured by the TSM. While it may be reasonable to assume that [redacted] falls onto the track ballast from the cars, if it does so it is through methods that do not involve airborne suspension.[19] Combined with the previous finding that [redacted] the net result is that airborne dust, which is all that is measured by the BNSF monitoring program, [redacted] of the coal that actually lands on rail ballast.

Ultimately, the available evidence demonstrates that the monitoring system proposed by BNSF does not reliably measures the deposition of fugitive coal on rail ballast.

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[17] Developed using information presented in Workpaper 1 regarding "East Side" values from MP 88-113.5, inclusive.
[18] See BNSF COALDUST 0034270.
[19] As discussed further below, means other than airborne suspension include various specific mechanisms, including saltation, vibration from various forces and slack action.

2. Railroad Operating and Maintenance Practices Largely Determine Coal Deposition

Various information sources show that substantial depositions of fugitive coal result from specific railroad operating and maintenance practices, and not from the propensity of coal to issue dust under normal conditions. BNSF's evidence in this proceeding has consistently documented a pattern in which fugitive coal accumulates disproportionately on turnouts and bridges. Indeed, BNSF reply witness VanHook estimates that turnouts and bridges require removal of fugitive coal accumulations at a frequency [redacted][20]

My reply VS described how this pattern of deposition results from vibrations associated with modulus changes and/or maintenance practices. This is corroborated and illustrated by a video contained in BNSF's reply evidence, which shows {the sequential agitation of each car in a train as it passes over the south switch (at MP 91.15) of a set-out track.}[21] It is not possible to determine conclusively from this video whether the vibration and load disturbance result from a worn frog, a worn switch point, low joints, or some other specific cause. However, there is abundant evidence that such conditions, which produce unnecessary disturbance of the load, have been commonplace under BNSF's maintenance practices on the Joint Line.[22] Thus, BNSF's lax maintenance practices are contributing materially to the high concentrations of coal dust that BNSF observes in specific locations.[23]

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[20] BNSF Reply VS VanHook, Exhibit 7.
[21] BNSF Reply VS Emmitt, Exhibit 8, UP 6695.
[22] See Exhibit 3.
[23] Toward this end, it is interesting to note that the time period during which BNSF began to notice increased dust deposition corresponds to the time period during which it performed less maintenance than its own evidence indicates was required. For example, as shown in [redacted]

Witness Emmitt's dustfall monitors encompass an assortment of profile positions, and reveal that comparatively high levels of fugitive coal accumulate [redacted] Focusing on the dustfall observations from the most recent available month (October 2009) for the set of dust jars located immediately (9-13 feet) east of Main 1 at locations south of Reno Junction (i.e., so that the passing southbound ["eastbound", by convention in Joint Line dispatching] coal volumes are reasonably comparable), by far the greatest dustfall readings occur at [redacted]

A video contained in BNSF's reply highlights the apparent role of excessive train speed as a cause of fugitive coal deposition in such locations.[25] This video shows a

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[redacted] year undercutting cycle identified in BNSF Reply VS VanHook, Exhibit 7.

[24] Data from October 2008 due to missing data from October 2009.

loaded train on the descending side of a big sag, approaching MP 75 just north of the Cheyenne River bridge. The train is generating a large cloud of dust, and time/distance relationships observable in the video indicate that the train is travelling approximately 50 mph.[26] Although BNSF (and even train crews) may view it as advantageous in the short term to build up downhill momentum to carry through the following ascent, such a practice may run contrary to the results of research, which indicates that in the longer term high speeds in heavy haul operations produce excessive wear and maintenance requirements.[27] High speeds also result in sharply increased aerodynamic pressures, which can dislodge from the tops of coal cars larger quantities of larger pieces of coal that land on the ballast. Indeed, aerodynamic pressures increase nonlinearly - at 50 mph air drag on a loaded coal gondola is about 56 percent higher than it is at 40 mph, and more than double what it is at 35 mph.[28] Prudent management would incorporate fugitive coal deposition as an additional consideration in the establishment of Maximum Authorized Speed (MAS) levels for PRB coal trains, and almost certainly would limit such speeds to less than 50 mph.

Evidence also suggests strongly that trainhandling issues, particularly related to slack action, play a considerable role in coal deposition. Above and beyond the discussions of slack action in my opening and reply statements, BNSF has known at least since 1926 that slack action tends to be most significant on longer, heavier trains.[29]

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[25] See BNSF Counsel's Exhibit 4 (March 16, 2010), CD1, BNSF 0022999. This video is also noteworthy because it shows, on the upwind side of the train, a telltale dust cloud indicative of coal falling directly from the tops of railcars onto the track ballast. The video does not indicate clearly whether this is resulting from rough track, slack action or some other specific cause.
[26] See Workpaper 2.
[27] See, for example, BNSF COALDUST 0019798+.
[28] See Workpaper 3.
[29] See http://thelibrary.springfield.missouri.org/lochist/frisco/magazines/fem_1926_03/fem_1926_03_16.pdf .

Moreover, materials produced by BNSF in discovery acknowledge that slack action contributes to [redacted]

A video provided by BNSF captures a comparatively gentle occurrence of slack action, in which a shock wave disturbs the top of the load on sequential cars as it propagates from the front to the rear of the train.[32] Evidence of more serious episodes of slack action was cited in my opening VS, including [redacted][33] The proposition that significant quantities of fugitive coal leave railcars in clumps, rather than as airborne dust, is further corroborated by the findings of the GPR study cited in my reply VS, which found distinct and isolated concentrations of fouling near the surface of the ballast (i.e., "shallow mudspots") rather than more broad and uniform pattern of fouling that reasonably could be expected from deposition of airborne dust.

In short, the available evidence illustrates multiple ways in which operating and maintenance issues solely under the purview of BNSF, including the presence of rough track, slack action and excessive speeds, create or exacerbate the depositions of fugitive coal on rail ballast for which BNSF seeks to assign responsibility to shippers. Whatever the effectiveness of toppers might be in controlling airborne dust releases from coal cars,

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[30] See BNSF COALDUST 0001871+. Even with the maintenance of bottom-dump cars that the railroads assert they have performed, there is no reason to believe that all seals are now so secure as to be impervious to vibration or slack action forces.

[31] See BNSF COALDUST 0021521. [redacted]

[32] See BNSF Counsel's Exhibit 4 (March 16, 2010), CD1, BNSF 0022995.

[33] See AECC Opening VS Nelson at 18, n26.

there is no reason to anticipate that the comparatively thin and fragile crust provided by low-water toppers will remain effective in the face of excessive aerodynamic, vibration and slack action forces to which PRB coal cars are currently subjected.

3. Unanimous Agreement on the Role of Cubic Volume Voids BNSF's Reliance on the Proposition that Coal Dust is More Damaging than Other Ballast Foulants

Although BNSF stated in its opening argument that coal dust was the worst ballast-fouling material, the only evidence it submitted to support that argument was a study by Prof. Tutumluer. In my Reply VS at pages 2-4, I showed that witness Tutumluer's conclusions were flawed, because he compared the performance of ballast fouled by coal dust with the performance of ballast fouled by other contaminants in tests involving equal weights of each contaminant. Fouling results from contaminants filling the voids in the ballast, so a proper comparison would be based on equal cubic volumes of different contaminants, not equal weights. Because coal dust is substantially less dense than the other contaminants witness Tutumluer studied, he was comparing the fouling effect of a large cubic volume of coal dust with a much smaller cubic volume of the other contaminants.

All the railroad reply witnesses who addressed this issue supported my position regarding the importance of accounting for the low density (i.e., high cubic volume per unit of weight) of coal dust in the fouling of rail ballast. UP reply witness McCulloch provides a lengthy discussion of the role of the cubic volume of ballast contaminants, rather than their weight, as the relevant indicator of ballast fouling for PRB coal. BNSF reply witness VanHook also mentions it.[34]

[34] BNSF Reply VS VanHook at 6.

Basically, there is no dispute in this proceeding regarding the way the filling of the voids in ballast constitutes fouling. While "percent by weight" in the past has provided a consistent method of quantifying ballast foulants, the comparatively low density of PRB coal relative to other foulants makes it appropriate, if not essential, to take into account density differences among ballast contaminants and their cubic volumes.

As described in detail in my Reply VS, this consideration voids the conclusions reached by BNSF witness Tutumluer regarding the allegedly harmful nature of coal dust relative to other ballast foulants. As explained by UP witness McCulloch, rail ballast may be fully fouled by coal dust at or near the 15 percent by weight level (let alone the 25 percent by weight level tested by witness Tutumluer).[35] This confirms the conclusion in my Reply VS that witness Tutumluer was improperly comparing ballast that was fully fouled with coal dust to ballast that was only partially fouled by the other substances, and that his findings reflect nothing more than the obvious proposition that fully fouled ballast is less stable than partially fouled ballast, especially when wet.[36]

With witness Tutumluer's study out of the picture, the lack of evidence to support BNSF's more extreme claims regarding the "pernicious" nature of coal dust is particularly apparent:

- On page 2, BNSF asserts that coal dust expands when exposed to water. The absence of a citation for this assertion is consistent with the fact that this has not

[35] Assuming that witness McCulloch is correct that coal dust substantially below the 25 percent by weight level produces fully fouled ballast while other ballast foulants do not, it appears unusual that witness Tutumluer made no mention of this, which should have been obvious during the testing he described.
[36] On page 14 and in Appendix A, BNSF tries to claims that it had no way to know that fully fouled ballast, when wet, may become unstable. As described in detail in my Reply VS at page 2, this is well-documented and common knowledge.

been demonstrated by a witness in this case, or, to the best of my knowledge, in any relevant literature.

- Also on page 2, BNSF asserts that even in very small quantities, coal dust can weaken the strength, stability and load-bearing capacity of rail ballast. Again, this ventures far from anything that has been demonstrated, and on its face is inconsistent with the fact that rail ballast on thousands of miles of track has been exposed to varying quantities of coal dust over periods of decades without any indication that it poses threats any more severe than those of other ballast fouling materials.

There simply is no evidence that coal as a ballast foulant is any more dangerous than any other foulant.

4. BNSF Cannot Rely on the May 2005 PRB Derailments for Its Claims that Coal Dust Threatens Rail Network Stability and PRB Coal Supply

BNSF relies in large part on the Joint Line derailments of May 2005 for its claims that coal dust poses unmanageable threats to the stability of the rail network and PRB coal supply. While BNSF reply witness VanHook asserts that this proceeding "...is not about determining cause of 2005 derailments", he simultaneously claims that instability caused by coal dust was shown in 2005 derailments. Witness VanHook cannot credibly claim that the 2005 derailments demonstrate anything about coal dust if he cannot provide an explanation of the role of coal dust in the derailments that is consistent with known facts.

In my opening VS I presented an analysis that concluded that factors other than coal dust were primarily responsible for the 2005 derailments. Witness VanHook makes

Subgrade problems and coal dust accumulations can easily be correlated without having a causal connection.

In the absence of actual data, BNSF reply witness Emmitt's dustfall data provide the best available information regarding the likely accumulation of dust at the initial points of the May 2005 derailments. These data support the conclusion that the derailment sites most likely did not have an unusually large accumulation of coal dust.

Specifically, as indicated in my opening VS, both of the derailments occurred on the ascending side of big sags. Witness Emmitt's dustfall data include a sampling location (MP 98) that is on the ascending side of a big sag. At this location, the measured dustfall rate of 185.73 is virtually identical to the average of the five "unremarkable" profile locations (189.58), and far less than the average of the four readings from the descending sides of big sags (929.07) discussed previously. This is consistent with the fact that the trains tend to slow down on ascents, so the extreme aerodynamic pressures generated by high train speeds on descents are avoided.[38] In any event, witness Emmitt's data refute Mr. VanHook's unsupported assertion regarding the concentration of coal dust at the derailment locations.

In addition, Mr. VanHook appears to offer no meaningful response to the evidence presented in my opening VS regarding BNSF's use of [redacted]

[38] Indeed, at the time of the derailments there were signals at MP 75.3, so some loaded trains passing the initial point of the BNSF derailment may have been proceeding from a stand-still.
[39] See BNSF COALDUST 0016743.

5. <u>Cost/Benefit Analysis Shows That BNSF's Coal Dust Tariff Is Unjustified</u>

On page 15, BNSF argues that comparative cost analysis is not the right way to assess the reasonableness of its coal dust requirements. This contention is not only unsupported, but also is voided by BNSF's own advocacy of "efficiency" considerations as determining factors.[47]

The costs of needed rail maintenance and capacity are certainly legitimate considerations, but in the public interest they are no more legitimate than are the costs that would be incurred by shippers to satisfy BNSF's requirements. BNSF has pressed forward with its requirements in the apparent hope that the Board will attach overriding significance to the costs BNSF incurs, irrespective of the impacts on shippers. That would be wholly inconsistent with the Board's mandate to administer the public interest, as opposed to BNSF's private interests.

On page 16, BNSF describes as "meaningless" the cost comparison presented in my opening VS, in part because it supposedly ignores the impact of increased maintenance needs on PRB rail capacity. The values I presented were drawn from BNSF's own studies, which purported to [redacted]

The cost-benefit analysis offered in reply [redacted] It is important to note that having

[47] BNSF Reply Argument at 15 and VS VanHook at 24.

benefits exceed costs is a necessary condition, but not a sufficient condition, to proceed along any given course of action regarding coal dust control. As indicated in my opening VS at page 28 n40, the action would also need to maximize the excess of benefits over costs. However, for the Tariff the analysis does not need to consider such issues, since [redacted] the cost-benefit analysis reaffirms the conclusion of my opening VS that the application of toppers would not be cost-effective.

(a) Costs

The railroad reply witnesses present anecdotal evidence suggesting that toppers may not be as costly as indicated in the railroads' earlier study. However, that study contemplated that costs would vary according to the circumstances at different mines, and the anecdotal evidence appears to fall within the expected range. Moreover, neither shippers nor the Board can have any confidence that the "introductory" pricing of a topping supplier seeking to establish a presence in this new market, especially during a recessionary period, will reflect fully the longer-term cost components captured in the railroads' study. In short, the railroads have provided no basis for relying on costs lower than those contained in the railroads' study. If anything, those estimates may need to be increased somewhat to account for general price inflation, though as a practical matter that has been minimal.

(b) Benefits – Joint Line Maintenance/Operational

The principal benefit from the use of toppers would be the reduction of Joint Line maintenance costs and operational impacts that could be achieved through reduced coal deposition. Even before the [redacted][48] Essentially the same analytical framework was used by witness VanHook to develop the estimate presented in Exhibit 7 of his Reply VS.[49] In 2005, the annual maintenance cost impact of coal dust on the Joint Line estimated using this framework was [redacted]/year,[50] with the operational impacts of maintenance windows and slow orders adding [redacted] year, for a total of [redacted]; Mr. VanHook's estimates include annual maintenance cost impacts of [redacted] and operational impacts of [redacted] for a total of [redacted]

The specific numerical results produced by the framework reflect a series of implicit and explicit assumptions and data inputs. The differences between the 2005 estimate and witness VanHook's estimate can best be understood, and the reasonableness of Mr. VanHook's estimate can best be assessed, by reviewing those assumptions and data inputs.

Obviously, some underlying facts have changed that may affect the numerical results. For example, the numbers of track miles and turnouts are higher now than they were in 2005, and my estimate relies on the values for those parameters supplied by Mr.

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[48] See BNSF COALDUST 0015810. The fact that this document was composed before the Joint Line derailments confirms that BNSF from the outset viewed coal dust as a cost reduction issue. The entire purpose of the extra maintenance costs estimated in the framework is to ensure that track instability does not occur. The threat of track instability certainly contributes to the need for the measured incremental maintenance, but does not .provide "extra" benefits if the costs of incremental maintenance have properly been estimated.

[49] This discussion addresses the estimation of the cost impacts of fugitive coal dust on the Orin Subdivision (i.e., the Joint Line). Witness VanHook's methods of extrapolating these results to other trackage are discussed separately.

[50] The original reported result of $13,888,525 included a line item for a one-time, nonrecurring right-of-way cleanup cost of $640,000 (which itself appears to have been miscalculated, since 80,000 x 40 = 3,200,000, not 640,000). That line item properly was [redacted]

VanHook. Likewise, all else equal, general price inflation has added approximately 12 percent to unit costs since 2005. In addition, information developed since 2005 now permits greater accuracy in the development of estimates of rail cost savings that would be associated with the use of toppers. The reasonableness of specific elements of Mr. VanHook's estimate of incremental coal dust maintenance costs is examined below in light of these considerations, and a revised estimate is developed that corrects for the problems in Mr. VanHook's analysis that are identified.

Unit costs – One of the most striking features of [redacted] a figure that was somewhat higher than the figure used by UP and BNSF to apportion Joint Line maintenance costs.[51] Mr. VanHook's use of [redacted]/mile as the unit cost is unexplained and inconsistent with the available evidence.

In other categories, the amount of [redacted] my analysis generally assumes that unit costs from 2005 to 2010 increased by 12 percent, reflecting general price inflation. As discussed further below, for some line items I use the unit cost information provided by Mr. VanHook, and for some line items the unit costs I used, based on a 12 percent increase over 2005 levels, are higher that Mr. VanHook's.

[51] See BNSF COALDUST 0001642.

Undercutting requirements – Mr. VanHook's estimate assumes that [redacted] reasonably consistent with a value developed in my reply VS.[52] However, his use of a [redacted] First, BNSF's own data show that coal constitutes only [redacted] by volume of the undercutter waste on the Joint Line. Even this figure likely represents an upper bound on the percentage that coal forms of the material occupying the voids of fouled ballast, since the undercutter typically takes in materials sitting on top of the ballast that are not in the voids. Using the [redacted] figure as an upper bound for the purpose of this analysis, even if no coal were deposited on the ballast, BNSF would need to undercut every [redacted] years to ensure that the fouling of ballast was no more severe than it would be on a [redacted] year cycle with no toppers.

This leads to the second consideration, which is that, even with toppers, a substantial quantity of fugitive coal will still land on the ballast. As the study cited by UP found, an average of [redacted] pounds of coal will leave the top of each railcar even with a topper applied (compared to 225 pounds if no topper is used).[53] All else equal, fugitive coal will still accumulate at a rate approximately [redacted] of the rate at which it

[52] AECC Reply VS Nelson at 10. I believe that BNSF has further opportunities to reduce the need for undercutting in response to coal dust through more careful analysis of fugitive coal accumulation patterns and application of improved procedures, including GPR (as discussed in my reply VS), to target undercutting to the areas where it is needed. However, my analysis includes no adjustment that would reduce the estimated coal dust costs to reflect this consideration.
[53] Coal will also continue to leave the bottoms of railcars. This is discussed under turnout/bridge undercutting (below).

accumulates with no topper.[54] With only [redacted] percent (rather than 100 percent) of the fugitive coal accumulation eliminated by the topper, BNSF would need to undercut every [redacted] years to ensure that the fouling of ballast was no more severe than it would be on a [redacted] year cycle with no toppers.[55] This is the value used in the corrected estimate.

Due to witness VanHook's failure to account for [redacted] he has overstated (by about [redacted] percent) the size of the impact that the application of toppers would have on annual undercutting requirements. Combined with his apparent [redacted], Mr. VanHook's estimate of increased annual undercutting cost [redacted] is approximately [redacted]

<u>Turnout/Bridge Undercutting</u> – Mr. VanHook utilizes an estimate that turnouts and bridges need to be undercut on a cycle that is [redacted] my observation that vibration issues at turnouts and bridges cause the deposition of fugitive coal to be concentrated at such locations. Since vibration-related deposition, especially from the bottoms of cars, is not known to be susceptible to effective control through the application of toppers, my estimate preserves in the "topper" scenario the [redacted] In this category I have utilized [redacted] rather than the inflation adjusted

[54] Computed as [redacted]
[55] Computed as [redacted]

unit cost from 2005 to account for the possible higher unit costs of undercutting on bridges [redacted]

Ties, Insulated Joints, Frogs, Switches and Rails – [redacted]

For the purposes of my analysis I include requirements for these track components, but correct [redacted] I note that inclusion of these components, even as I have calculated them, may tend to overstate actual maintenance cost impacts.

Switch winterization (vacuum trucks) and switch failures – [redacted] My analysis adjusts the requirements from the 2005 estimate to account for the increased number of turnouts and [redacted]

<u>Track availability (slow orders)</u> – The 2005 estimate included [redacted] a central purpose of the incremental maintenance costs estimated in this analysis is to minimize or eliminate the occurrence of unforeseen events related to coal dust that would cause the need for a slow order in the first place.

[redacted] the infrastructure changes that have occurred on the Joint Line since the 2005 analysis, and that dramatically reduce the operational impact of slow orders. Subsequent to the 2005 analysis, the entire Joint Line became triple-tracked, so even if one track has to be taken out of service, two tracks remain to support high-capacity directional operations. Moreover, BNSF has built the new track and relocated existing track to produce 25' on-center separations between adjacent tracks.[56] This generally permits full-speed operation even when maintenance is being performed on an adjacent track.

On the basis of these considerations, [redacted] For the purposes of this analysis, I have used 50 percent of the 2005 estimate, adjusted to reflect general price inflation since 2005, as well as [redacted]

[56] BNSF Reply VS VanHook at 16, n3.

[redacted]

[redacted]

My analysis shows that the annual maintenance savings achieved through the use of toppers would be no more than $10.95 million, and that the total savings would be no more than $13.59 million. These figures are [redacted] because the increases in the amount of Joint Line infrastructure and in general price levels that have occurred since 2005 have been [redacted] Mr. VanHook's own description of the way that Joint Line infrastructure improvements have mitigated the need for and operational impacts of slow orders.

Benefits – Other Lines

[redacted]

[redacted] the entire body of evidence in this proceeding uniformly shows that (a) the deposition of fugitive coal declines significantly with distance; (b) coal volumes dissipate as Joint Line traffic moves onto different routes away from the Basin; and, (c) the effectiveness of the low-water toppers under consideration declines with distance. There is no need to perform a formal correction of Mr. VanHook's methodology in this area, because the number of multiples of the corrected Joint Line maintenance and operational savings that would be needed to justify the costs of the toppers would not comport with these realities.

Benefits – Retention of Coal

I concur in principle with the general proposition advanced by BNSF reply witness VanHook[59] and UP reply witness Glass[60] that it is appropriate to take into

[57] See BNSF COALDUST 0019748+.
[58] See BNSF Reply VS VanHook, Exhibit 11.
[59] BNSF Reply VS VanHook at 32-33.
[60] UP Reply VS Glass at 7.

account the value of any increase in the quantity of coal actually delivered to customers by virtue of the improved retention of coal provided by a topping agent (or any other dust control strategy). Depending upon such factors as the quantity of the coal retained and the value of that coal, the retention of coal can be a significant consideration in some circumstances. However, I believe the railroad witnesses have overlooked an important consideration that appears to moot this issue, at least for PRB coal.

The additional consideration that must be taken into account before such a benefit can be ascribed to a topper program is that the weight the treatment material itself adds to the car must be subtracted from any improvement in coal retention to account for the fact that, all else equal, the weight of the treatment reduces (by a very small percentage) the amount of coal that can be loaded into a treated car relative to an untreated one. Using an exaggerated example for illustration, if a car can carry a total net weight of 240,000 pounds without going overweight, an untreated car can be loaded with as close to 240,000 lb. of coal as such circumstances as the accuracy of loading equipment and scales will permit, while a car that is to receive 1000 pounds of topper can only be loaded with as close to 239,000 pounds of coal as such circumstances will permit. Put another way, the amount of coal the shipper receives from each car is determined not only by the ability of the topper to retain coal, but also by the restriction on lading imposed by the weight of the topper itself.

For PRB coal, the weight measurement study cited by UP concluded that coal loss from the tops of untreated cars averages 225 pounds,[61] and that the average coal loss from

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[61] See UP Reply VS Beck at 2. BNSF witness VanHook relies on [redacted]

the tops of treated cars is [redacted] pounds.[62] That study further estimated the weight of the added topper (including water and solids) as [redacted] pounds per car.[63] In theory, the mine could load the car with [redacted] pounds of coal, add [redacted] pounds of topper and stay within the assumed 240,000 lb net weight limit. Holding aside any changes in moisture content, such a car would lose [redacted] pounds of coal enroute, and the shipper would receive [redacted] pounds of coal. However, if the mine loaded 240,000 pounds of coal and applied no topper, the shipper would receive 239,775 pounds of coal. In short, the best available evidence indicates that in the case of PRB coal [redacted] would be created by the introduction of a topper spraying program. Therefore, it would not be proper to include any benefit of this type in the cost-benefit analysis.

Even though the retention of coal does not lead to a net benefit, BNSF claims that its maintenance savings from the control of coal dust through the application of toppers would be greater than the costs that would be incurred by shippers to do so. However, it never explains why, if this is correct, BNSF long ago did not ask shippers for permission to apply toppers at its own expense, or implement a simple rate incentive to obtain such permission.

(c) Other Applications of Toppers

BNSF's argues that "(T)he State of Virginia requires that steps be taken to curtail coal dust emissions from moving coal trains."[64] As it did when it first attempted to threaten shippers with draconian penalties for failure to comply with its unilateral coal

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[redacted] and estimated the actual coal loss to be 225 pounds/car.

[62] See BNSF COALDUST 0033110.

[63] Calculated as [redacted] See BNSF COALDUST 0033108.

[64] BNSF Reply Argument at 7.

[redacted] The fact that this is the only domestic example of coal dust control BNSF can offer is indicative of how unprecedented its program would be.

BNSF also claims that "other jurisdictions", including Canada, Australia and Colombia, ". . . have adopted measures to curtail ...coal dust emissions." [65] However, I am unable to locate any portion of the testimony of BNSF's witnesses that substantiates this claim. Mr. VanHook says that coal shippers in Colombia "apply compaction rollers to prevent coal losses,"[66] but provides no substantiation for the proposition that this is a requirement.[67] Mr. VanHook also says that surfactants "are applied in Canada and Australia to curtail coal dust",[68] but he does not cite any legal requirement from either of those "jurisdictions" imposing that measure on coal shippers. He also neglects to mention that the Canadian application also involves [redacted] and is premised on a loss rate of coal more than 10 times as high as the rate that has been measured in the PRB. Mr. Emmitt describes track side monitoring and weather stations in Australia installed for the purpose of "establishing an acceptable standard of particle levels with targeted mitigation response to dusty coal",[69] but never claims that any Australian "jurisdiction" has ever imposed a dust curtailment obligation on coal shippers.

BNSF's citation of Australia is particularly incongruous, because the so-called Connell Hatch report on coal dust for Queensland Rail[70] validates AECC's position and refutes BNSF's positions on a number of critical issues. Specifically, the report indicates that at least 95 percent of coal fouling is from lumps of coal, not from the

[65] BNSF Reply Argument at 7.
[66] BNSF Reply VS VanHook at 2.
[67] See also BNSF Reply VS Emmitt at 7 n. 2.
[68] BNSF Reply VS VanHook at 2-3.
[69] BNSF Reply VS Emmitt at 7-9.
[70] "Coal Loss Literature Review", Coal Loss Management Project (January 11, 2008)

airborne suspension of dust (Section 2.3.2); that because of the comparatively low density of coal, a volumetric measure (and not the weight measure used by BNSF witness Tutumluer) must be used to assess ballast contamination (Section 2.3.4); and that dusting is nonlinearly related to speed (Section 3.1). The report provides no support for BNSF's oft-repeated proposition that coal possesses special properties other than its straightforward volumetric contribution to ballast fouling (as applied in my restatement of Mr. VanHook's analysis of maintenance cost impacts).

In short, BNSF's attempts to draw support from other "jurisdictions" underscore how aberrant BNSF's proposal really is. No coal shippers anywhere are subjected to a threat that all of their shipments will be surcharged, or subjected to denial of service, based solely on the judgment of the railroad regarding the adequacy of the shipper's performance under a measurement system that itself is designed, implemented, interpreted and controlled by the railroad. Perhaps BNSF should ask NASA if it has detected evidence of such programs on other planets, because there is no precedent for it on this one.

(d) Other Issues

Deferred Maintenance -- BNSF argues in Appendix A at pages 8-9 that I have somehow misconstrued a memorandum by William Seeger, then General Director – Maintenance, regarding the changes in the ballast cleaning schedule on the track where the BNSF derailment occurred. BNSF asserts specifically that "no maintenance was deferred", but this assertion apparently is based on a definition of the term "deferred" that only BNSF understands. Indeed, BNSF does not dispute that it knew this line needed to be undercut, and that at one point in time, it was scheduled to be undercut in 2004. While BNSF tries to portray the schedule for "the undercutter" as some type of exogenous consideration,

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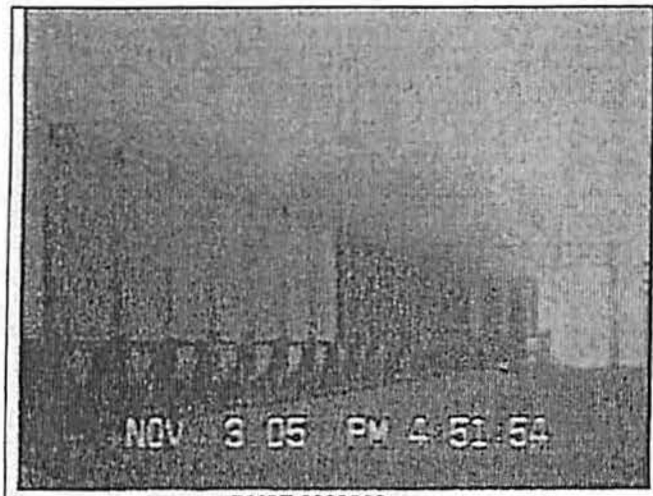
The 2005 Joint Line Derailments Led to a Concerted and High Priority Effort to Understand and Address the Problem of Coal Dust.

In 2004, I became aware of the persistent and difficult problems that were caused by coal dust that was being blown out of loaded coal cars in transit from PRB coal mines. Spontaneous fires were occurring along the right of way on the PRB lines from the large volumes of accumulated coal dust. Rail switches were being fouled by the coal dust. Coal dust was piling up along bridge abutments and creek beds. Slow orders on the heavily traveled PRB lines were increasing as BNSF carried out increased maintenance activity to deal with the coal accumulations. I also became aware of complaints from local ranchers in Wyoming about coal dust deposits on their property.

I did not have primary responsibility for dealing with coal dust issues in 2004 but I participated in several presentations and discussions of the issue. Indeed, just a few days before the derailments occurred in 2005, I participated in a high level internal meeting that addressed BNSF's on-going study of the coal dust problem. *See* Exhibit 1. At the meeting, we were informed about the efforts of BNSF's division managers to understand the sources and amount of coal dust accumulating on the right of way and BNSF's preliminary views regarding alternatives to deal with the problem. BNSF had already conducted field measurements of coal dust and analyses of ballast contaminated by coal dust.

On May 14 and 15, 2005, two derailments occurred on the Joint Line within a few miles of one another. Gregory Fox, who was BNSF's Vice President, Engineering at the time, took the lead in dealing with the immediate consequences of the derailments. The sites were cleaned and the track was put back into service. Over the next several months, BNSF undertook a comprehensive rehabilitation of the Joint Line which reduced track availability and coal shipments. BNSF studied the causes of the derailments and concluded that the derailments had

Counsel's Exhibit #4 (On CD)



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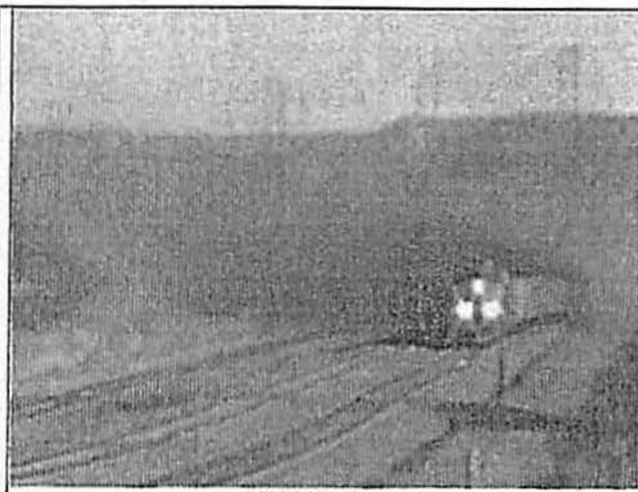
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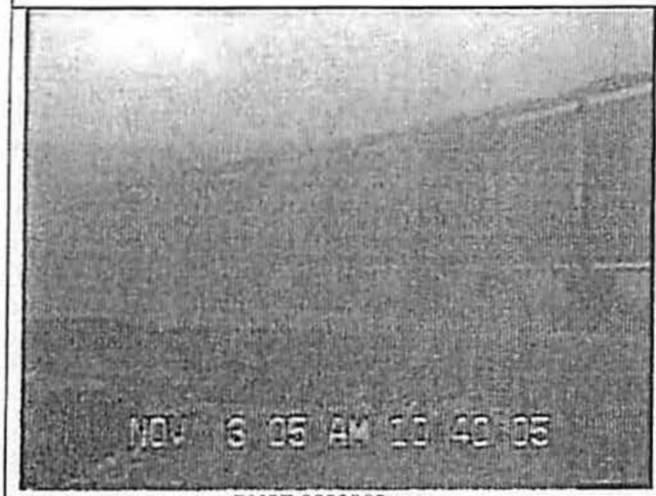
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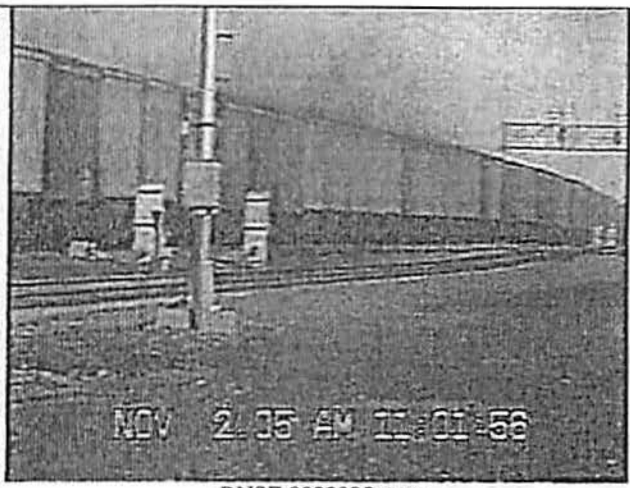

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MP 90.7 (Orin) TrackSide Monitor (TSM) Integrated Dust Value Analysis of Loaded and Empty Coal Trains

April 28, 2010

E. D. Carré and G. D. Emmitt
Simpson Weather Associates
Charlottesville, Virginia

Methodology

- MP 90.7 TSM data for all trains during January 2008 – December 2008 were filtered to remove trains with high/erratic background dust, coincident train passage, or problems with equipment, such as train identification or data acquisition system malfunction
  - The remaining trains are considered "usable" for analysis
- Trains were separated into loaded coal trains and empty coal trains to compare the Integrated Dust Values of each subset of data

MP 90.7 TrackSide Monitor (TSM) Data for 2008
Loaded vs. Empty Coal Trains

Integrated Dust Values of Usable Trains

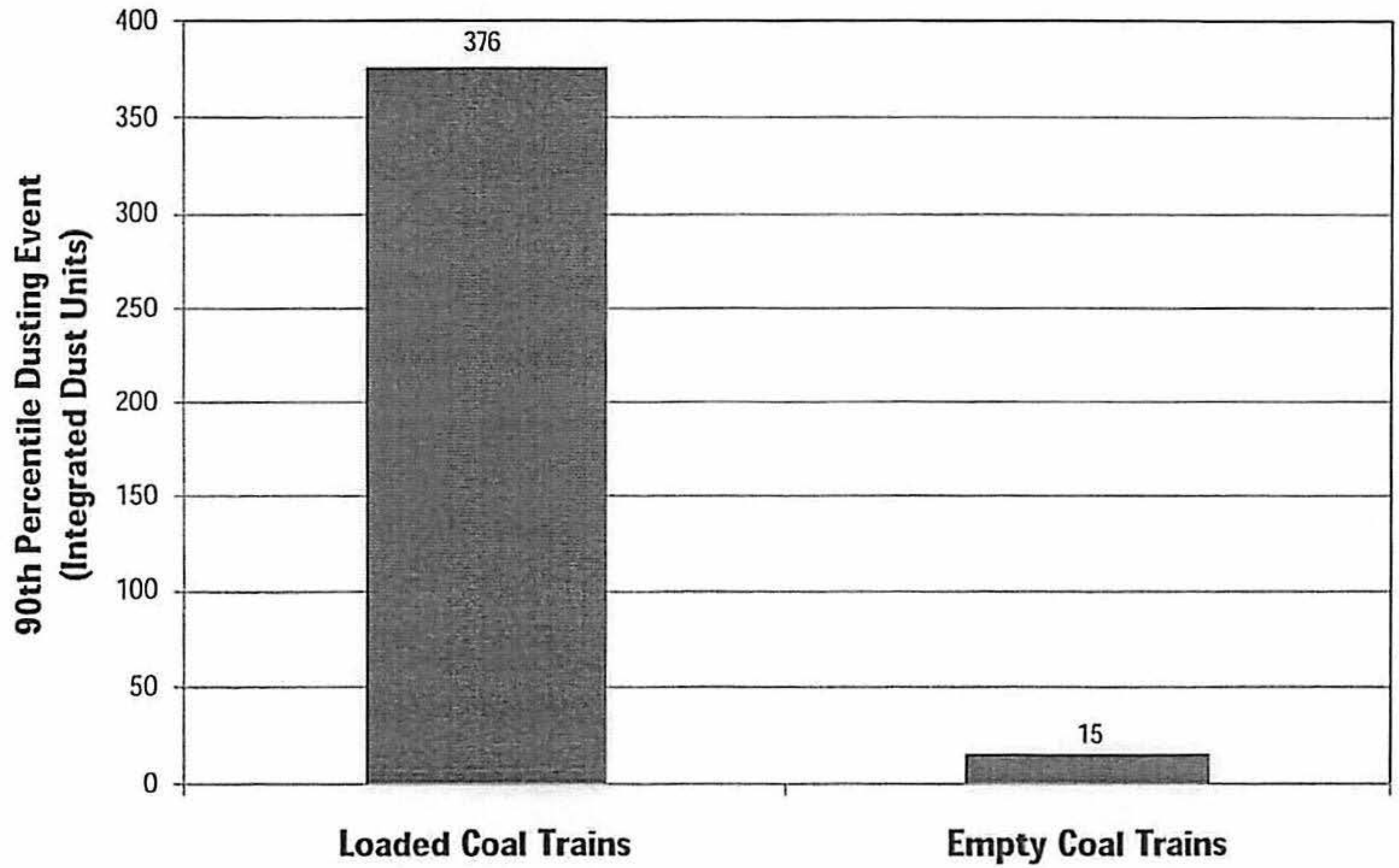
(6 minute window for coincident train removal)

	Loaded Coal Trains	Empty Coal Trains
Number of Usable Trains	6064	7319
90th Percentile Dusting Event (Integrated Dust Units)[1]	376	15

[1] Represents the Integrated Dust Value Below Which 90 Percent of Usable Trains Are Observed

MP 90.7 TrackSide Monitor (TSM) Data – 2008

Usable Loaded and Empty Coal Trains' Integrated Dust Values



E #5
Produced in Digital Format
BNSF' Counsel Exhibit (March 16, 2010) CD1 – BNSF 0022995 Video

E#6
Produced in Digital Format
BNSF' Counsel Exhibit (March 16, 2010) CD1 – BNSF 0022999 Video

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detriment of service to rail customers. Coal dust rules that prevent such accumulation promote safe, reliable and efficient rail transportation.

A. SPRB Coal Cars Emit Excessive Coal Dust that Threatens Track Integrity

AECC suggests that BNSF has not provided facts showing that "coal or coal dust emitted from coal cars during transit can have adverse effects on rail roadbeds, and thus overall rail operations." (AECC Pet. at 3.) AECC even goes as far to question "if there even is" a coal dust problem. (AECC Pet. at 6.) But as explained below, the overwhelming factual information and observation of railroad inspectors, maintenance personnel and scientific researchers demonstrate otherwise. (Connell VS at 9, 12-14; Muleski VS at 2-3.) The fact that coal dust is dispersed by coal trains, accumulates on railroad right-of-way, and has a harmful impact on ballast and track is well-documented by scientific and engineering studies. (Connell VS at 13-17, Ex. DC-1.)

After the two Joint Line derailments in May 2005 and the accompanying unparalleled damage and widespread instability throughout the Joint Line, Union Pacific undertook to learn how these events occurred and so that it could prevent a recurrence, has developed an understanding of how serious a threat coal dust is to rail ballast integrity.[1] (Connell VS at 5, 9-17.) "[T]he root cause of the instability of the ballast was excessive coal dust that had become unstable when mixed with the substantial

1 Prior to those derailments, BNSF found coal dust accumulating primarily near switches and bridges during the 2002 to 2003 time period, and increased levels of coal on the Joint Line right-of-way resulted in spontaneous fires. (Connell VS at 6.) Both railroads approved additional maintenance in those areas of concern. (*Id.*). As a result of those efforts, key indicators suggested the track was in a stable and safe condition by late 2004 and during the first quarter of 2005. (*Id.*) These indicators included a joint inspection in October 2004, a decrease in slow orders, good geometry car readings and improved volume. (*Id.*)

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Project Update

Opacity monitoring units [illegible] coal trains

Strategically placed opacity monitoring units in central Queensland are beginning to identify coal dust from trains.

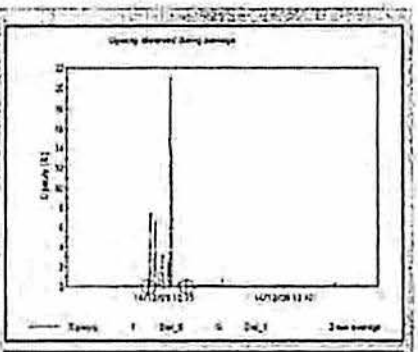
All three planned units are now installed and operational, with one at Marmor south of Rockhampton on the North Coast line, one at Schillings Lane on the Moura system just west of Gladstone and one at Mindi on the Goonyella system near Coppabella.

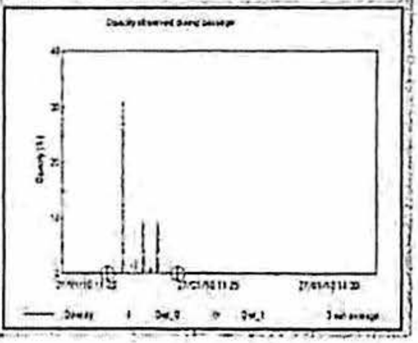
Light beams on either side of the track pick up signs of visible dust particles and feed information back to a central recording point. The data is then compiled into a report and analysed determining whether a passing coal train is emitting excessive dust.

While the systems are still being fine-tuned, QR Network is working in consultation with industry and the Department of Environment and Resource Management (DERM) to set a dust emission standard.

Current collated data indicate coal dust can be seen by the naked eye when the opacity reads between eight to ten per cent. QR Network has recorded trains emitting dust at as high as 30 per cent opacity.

The monitoring units, which are permanent, will also measure the effectiveness of veneer spray stations once installed.





"Not only will coal now have to be veneered before it leaves the mine but the coal will also have to be loaded and profiled to set standards to complement the veneering."

Mr Dall said QR Network was currently making changes to existing and new mine commercial agreements to ensure dust mitigation methods were included.

"We feel very strongly about reducing our operational impact on the environment and communities and that's why we are making these changes.

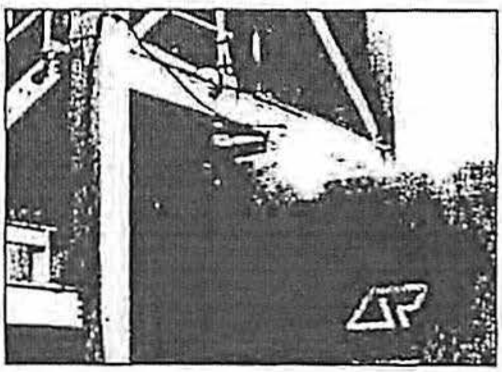
"Once these new agreements are in place, mines will be required to load coal in a 'garden bed' profile to ensure the veneer sprayed onto the surface of the coal is at its most effective, as recommended in the Environmental Evaluation.

"QR Network is offering to coordinate the implementation of spray stations as an added service to our customers to take full advantage of competitive prices, however, mines still have the option of independently installing their own spray stations," Mr Dall said.

QR Network's Environmental Evaluation submitted to DERM in 2008 found the veneer products, to be used in the spray stations, can reduce coal dust from trains in transit by up to 75 per cent.

The Coal Dust Management Plan will be publicly available on the Coal Loss Management Project website by April.

www.qrnetwork.com.au/About-us/Environmental-policies/Coal-loss-management.aspx



[illegible]

QR Network encourages feedback from the community. If you would like to register feedback about coal loss in your area, please mail to: Communication and Stakeholder Manager, Coal Loss Management Project, GPO Box 1429, Brisbane QLD 4001, or call us on (07) 3235 5527. Alternatively, you can email coalloss@qr.com.au

QR Network

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