Appendix G13

Report: 2014 AWAR Dust Monitoring Report

MEADOWBANK GOLD PROJECT

2014 All-Weather Access Road Dust Monitoring Report

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EXECUTIVE SUMMARY

AEM has conducted studies of dustfall along the Meadowbank AWAR to Baker Lake since 2012. These studies aimed to characterize dust deposition rates with respect to distance from the AWAR in order to determine the potential for degradation of vegetation (habitat) in excess of impacts predicted in the Final Environmental Impact Statement (FEIS). While predicted dustfall rates were not specified, the FEIS indicated that the majority of dustfall was anticipated to occur within 100 m of the road. The smallest zone of influence (ZOI; area where habitat is assumed lost due to sensory disturbance and other factors) for any wildlife VEC is also 100 m, with the prediction that impacts to VECs outside this zone would not be significant (< 1% change from baseline). Therefore, dustfall studies focused around the 100 m distance, and particularly on the downwind (most impacted) side of the road. Through these studies, AEM aimed to quantify dustfall with respect to distance from the AWAR, and compare results to background levels and regulatory guidelines.

While data from previous studies is referenced in this report, it should be noted that the study in 2012 was preliminary with only 10 sample locations, and in 2013 only seven samples were able to be analyzed due to disruption of sample canisters in the field. Based on these studies, improvements to methods were made and the 2014 study was successful with 41 canisters deployed and analyzed.

Results of the 2012-2014 AWAR dustfall studies have shown that there is more than a 2x reduction in dustfall from 50 m to 100 m on the downwind (most impacted) side of the AWAR, from an average of 1.24 mg/cm^2/30d (n = 7) at 50 m to 0.53 mg/cm^2/30d (n = 9) at 100 m (km 18, 76 and 78 data; all study years combined). Effect of distance from the road on dustfall rates in transects was also assessed by non-linear regression for upwind and downwind samples collected since 2012. For dustfall downwind of the road, all measured values at 300 m were within the 95% confidence interval of background samples, 5 out of 6 samples were within this range at 150 m, and 3 out of 6 were in the range at 100 m. These comparisons suggest that the majority of dustfall does settle within the predicted 100 m zone, and that dustfall rates reach background levels at around 150 m on the downwind side of the AWAR. However, only two true background reference samples were collected in 2014, so further collection is proposed for 2015 to confirm these results.

Alberta Environment presents a recreational area guideline for dustfall of 0.53 mg/cm^2/30d, and a guideline for industrial areas of 1.58 mg/cm^2/30d. The Ontario Ministry of the Environment and Climate Change uses a standard of 0.7 mg/cm^2/30d (above background) for industrial emissions. These values are based on aesthetic or nuisance concerns, and not environmental or human health. Only two samples on the AWAR have ever exceeded the industrial area guideline, and these were at 50 m. At 100 m or more from the AWAR, nine out of 33 samples have exceeded the lowest guideline of 0.53 mg/cm^2/30d (4/8 in 2012; 2/4 in 2013; 3/21 in 2014). At 150 m or more, three samples have exceeded this guideline (1/2 in 2012; 1/2 in 2013 and 1/9 in 2014).

Direct measurements of dustfall have been used in these studies as a conservative screening tool to assess the potential for effects on habitat. Considering results to date, most dustfall does occur within the predicted 100 m zone, and generally reaches the range of background levels within approximately 150 m of the road. It is therefore unlikely that impacts to VECs (vegetation community productivity and wildlife) due to dust are occurring beyond the smallest assumed ZOI (100 m).

These results are supported by wildlife monitoring conducted under the Terrestrial Ecosystem Management Plan, including the Wildlife Screening Level Risk Assessment. In order to assess potential effects of ingestion of chemical contaminants, wildlife screening level risk assessments were conducted in 2005 (baseline), 2011 and 2014. The 2014 assessment included analysis of soil and plant samples collected at 100 m on the downwind side of the AWAR, and indicated no incremental

risk to wildlife associated with consumption of soil and vegetation in this area. Road-related effects on wildlife populations have also been assessed directly through the wildlife monitoring program. Impacts to breeding bird populations (which were determined to have the smallest zone of influence – 100 m from the road) were assessed using thresholds for relative abundance, species richness and species diversity. Breeding bird surveys were conducted along the AWAR for four years (2007 – 2011), and all results indicated that no thresholds were surpassed; therefore road-related effects on bird populations were not considered to be significant.

Despite this evidence that wildlife is not being impacted beyond established thresholds, and that dust suppression measures around the mine site and in high traffic areas have proven effective, AEM plans to continue dustfall monitoring along the AWAR in 2015 and will conduct bird studies along the AWAR to confirm these results.

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SECTION 1 • INTRODUCTION

1.1 BACKGROUND

In accordance with NIRB Project Certificate No.004 and the associated Terrestrial Ecosystem Management Plan, AEM has conducted annual dustfall and air quality monitoring around the Meadowbank site since 2011. Evaluation and monitoring of fugitive dust along the AWAR was not required as a component of this program, because air quality modelling in support of the FEIS predicted that the worst case levels of dust would occur onsite, and would be in the range of air quality objectives.

In 2012, the hamlet of Baker Lake raised concerns about high dust levels along the AWAR near the community. In response, AEM provided calcium chloride to the hamlet as a dust suppressant, and conducted a preliminary study to begin to evaluate spacial extents of dustfall along the AWAR. A larger-scale study was conducted in 2013, but insufficient data was obtained due to disruption of the majority of the sampling canisters. As a result, the study was repeated with more robust methods in 2014.

The primary goal of these studies was to confirm the accuracy of impacts predicted in the FEIS related to AWAR road dust. The Terrestrial Ecosystem Impact Assessment (Cumberland, 2005) indicated:

> "Potential effects from roads (e.g., all-weather access road)…will include … reduced habitat effectiveness and habitat degradation due to dust and exhaust, and potential for increased contaminant loading in food sources (Auerbach et al, 1997; Fisk et al, 2003). With or without mitigation, these overall impacts in the LSA (local study area) are not expected to be significant."

While predicted dustfall rates were not specified, the FEIS indicated that the majority of dustfall was anticipated to occur within 100 m of the road. The smallest zone of influence (ZOI; area where habitat is assumed lost due to sensory disturbance and other factors) for any wildlife VEC is also 100 m, with the prediction that impacts to VECs outside this zone would not be significant (< 1% change from baseline). Therefore, dustfall studies focused around the 100 m distance, and particularly on the downwind (most impacted) side of the road. Through these studies, AEM aimed to quantify dustfall with respect to distance from the AWAR, and compare results to background levels and regulatory guidelines.

Potential impacts of the road on contaminant loading in food sources are addressed in the 2014 Wildlife Screening Level Risk Assessment, conducted in conjunction with this study (see 2014 Annual Report).

1.2 PRELIMINARY STUDIES (2012 AND 2013)

The initial dustfall study was conducted along the AWAR in 2012, and included sampling of two single transects along the road (km 76 and 78), and two clusters on the minesite. This initial study was used to assess methods, and assist in the design of the larger scale study to be completed in 2013. Results in 2012 indicated that the majority of dustfall occurs within 50 m of the road (the shortest distance sampled), as anticipated based on previously published studies (e.g. Walker and Everett, 1987). The average rate of dustfall at this distance was 1.13 $mg/cm^2/30d$, and no samples exceeded Alberta Environment's industrial/commercial guideline of 1.58 $mg/cm^2/30d$. Dustfall rates dropped to an average of 0.47 mg/cm^2/30d at 100 m, but were notably variable, and half of the samples at this distance still exceeded Alberta Environment's recreational area guideline of 0.53 mg/cm^2/30d. No statistically significant difference was found between average dustfall at 100 m and 150 m, and no samples at 150 m exceeded the recreational area guideline. No analyses of background dustfall rates were conducted in this preliminary study.

In 2013 an expanded study was conducted to more fully characterize dustfall rates in relation to distance from the AWAR, but due to disruption of the sampling equipment, only 7 of 35 samplers deployed could be analyzed. Dustfall rates in comparable locations were higher in 2013 compared to 2012, which may have been due to increased traffic, reduced precipitation or natural variability (only two samples could be compared). The study was conducted again in 2014 after establishing more robust sampling methods.

1.3 2014 STUDY OBJECTIVES

As in 2013, the 2014 study aimed to characterize dust deposition rates with respect to distance from the AWAR in order to determine the potential for impacts to habitat in excess of those predicted in the FEIS.

The objectives of the study conducted in 2014 were to:

1. Characterize the dustfall gradient in relation to distance from the AWAR.
2. Obtain supplementary analyses of dustfall rates at 50 m from the road in representative locations.
3. Compare rates of dustfall with background concentrations, regulatory guidelines and effects values for northern species from the literature, where available.
4. Relate results to predictions of impacts to habitat as described in the Terrestrial Ecosystem Impact Assessment (Cumberland, 2005).

SECTION 2 • METHODS

2.1 SAMPLE COLLECTION AND ANALYSIS

Dustfall samples were collected in open vessels containing a purified liquid matrix provided by an accredited laboratory (Maxxam Analytics). Particles are deposited and retained in the liquid, which is then analyzed by the accredited laboratory for total and fixed (non-combustible) dustfall.

Dustfall canisters were deployed for the duration of August 18 or 19 – September 19, 2014, and calculated dustfall rates were normalized to 30 days (mg/cm^2/30 days, per ASTM 1739-98).

ASTM and Ontario MOE methods suggest collection of the dustfall sample at 2-3 m height on a utility pole to prevent re-entrainment of particulates from the ground, and to reduce vandalism. Due to the difficulty of constructing and deploying stands to hold the sample containers in this remote location, the 2012 study compared dustfall at ground level and at 2 m height to inform future sampling method decisions. Based on these results and the assumption that any re-entrainment would result in conservatively high estimates of dustfall, all sampling canisters were deployed at ground level in 2014.

Difficulty with maintaining canisters upright in 2013 resulted in the use of heavy plastic pipe pieces to surround and support canisters in 2014. These supports were maintained at a height lower than the canister opening so that dust deposition was not impeded.

2.2 SAMPLE LOCATIONS

Sampling canisters were deployed at 50 m, 100 m, and 150 m from both sides of the road (east and west) in duplicated transects at AWAR km 18 and 78. These distances were chosen to bracket the smallest predicted zone of influence (ZOI) of 100 m. Canisters were also deployed on the east (downwind, or worst case) side of the road at 300 m. The zone of maximum dustfall has previously been reported to be within 300 m of roads under heavier use than the Meadowbank AWAR (Auerbach et al. 1997). Sampling transects were located perpendicular to road segments that are relatively straight with few notable topographical features, in order to limit confounding factors that alter prevailing winds and create different micro-climates.

Canisters were also deployed at 50 m on either side of the road in three strategic locations to obtain supplementary information on dustfall rates -

1. Between Airplane Lake and the gatehouse at Baker Lake, to address concerns raised by the community of excess dust (km 1).
2. Immediately south of the emulsion plant turn-off, because this area receives the highest traffic rates on the AWAR (km 103).
3. Mid-way along the Vault haul road, approximately in line with air quality station DF-4. This is a new haul road, with operations at Vault beginning in January of 2014. As a result of hauling activity from Vault Pit to the Meadowbank mill, this road was predicted in the FEIS to receive higher traffic rates than the AWAR.

In addition, one sample was collected at Screening Level Risk Assessment sampling location T7 (14W 0640847 7218280), which is located approximately 600 m northwest of the Vault haul road, between the Vault pit and the Waste Rock Storage Facility.

Two background samples were collected at Screening Level Risk Assessment sampling location C2 (14W 06255518 7221488), on the east side of Inuggugayualik Lake, which is approximately 10km northwest of the mine site.

Onsite and AWAR sampling locations are shown in Figure 2-1 and 2-2.

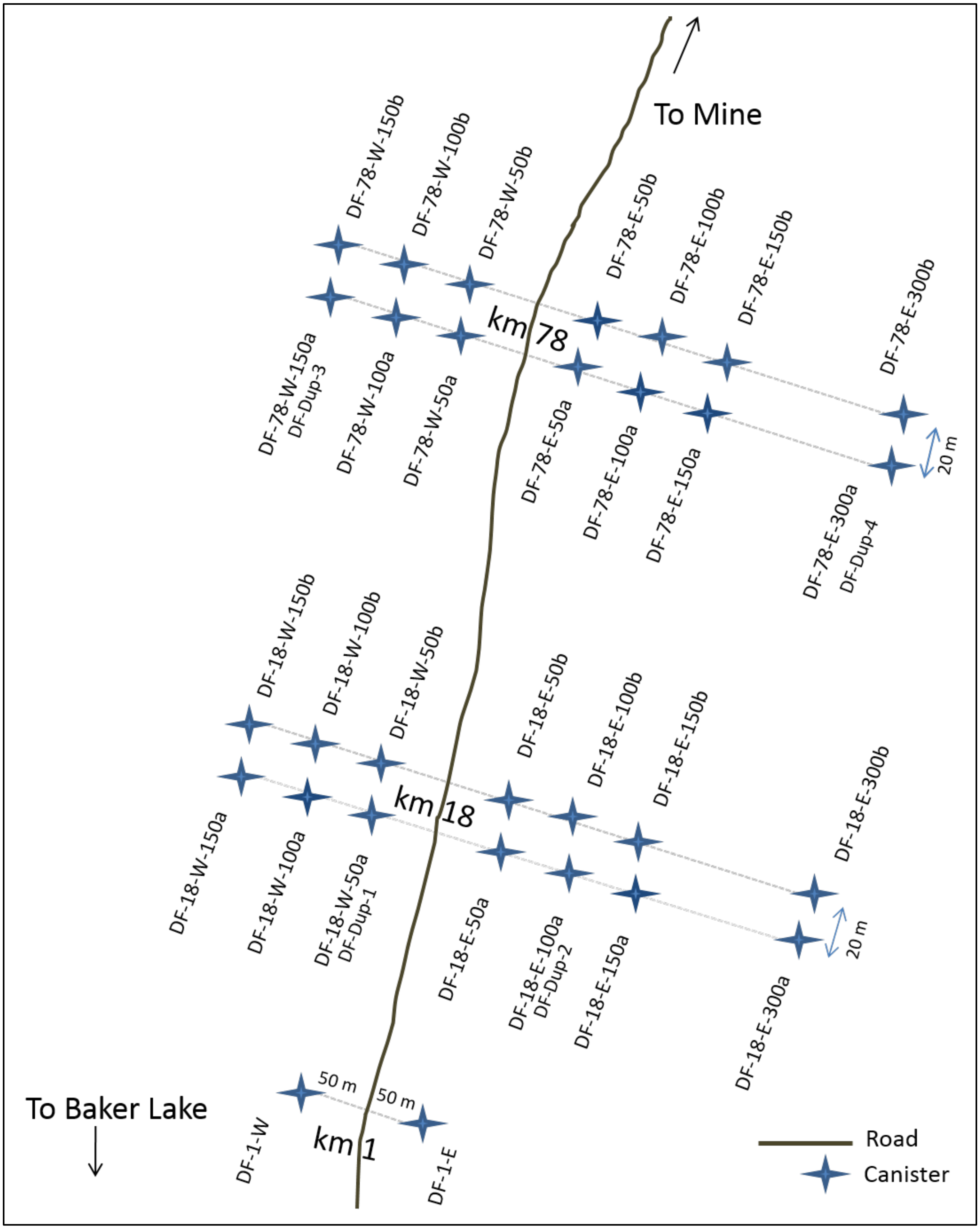

Figure 2-1. Approximate dustfall sample locations along the Meadowbank AWAR in 2014. Not to scale.

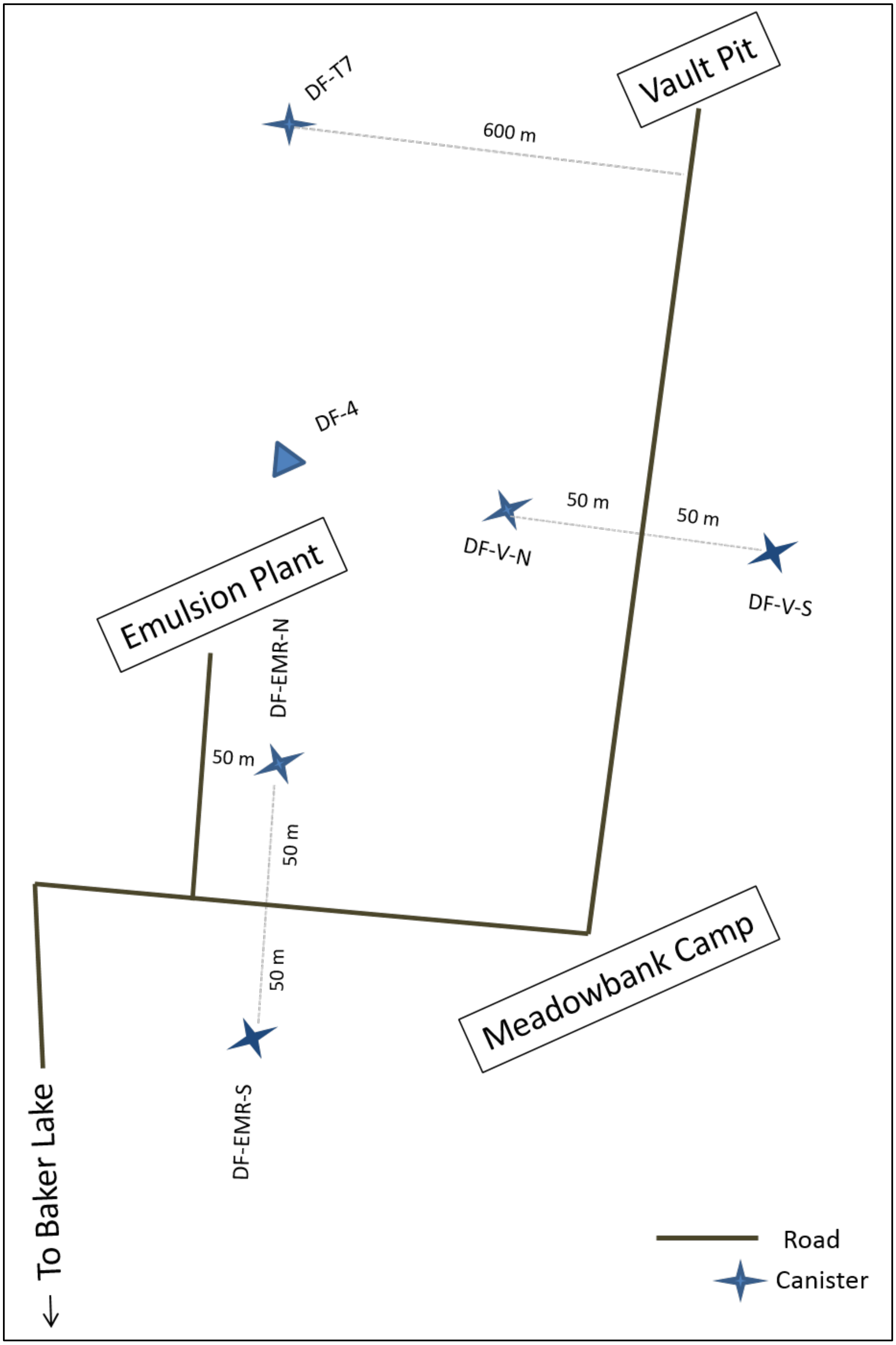

Figure 2-2. Diagram of approximate dustfall sample locations along the Meadowbank AWAR and Vault haul road in 2014. Not to scale.

2.3 QA/QC

2.3.1 Sample Handling

Sampling canisters and analytical services were provided by an accredited laboratory (Maxxam Analytics Inc.). Canisters were received and deployed by appropriately trained personnel. Sample collection containers remained sealed until they were installed at the specified sampling points. Once containers were installed, container lids will be removed and sampling commenced. All sample collection containers were labeled with time, date and sampling location. At the end of the sampling period, only upright containers were resealed and submitted to the laboratory for analysis. To avoid contamination or sample loss, no material was removed from the containers.

2.3.2 Field Duplicates

Precision of the study results was assessed by calculating the relative percent difference (RPD) between duplicate measurements. For samples that are > 5x the method detection limit, RPD can be calculated as:

$$RPD = \frac{(A - B)}{((A + B)/2)} \times 100$$

where: A = analytical result

B = duplicate result

Samples for the purpose of determining precision were collected at a rate of 10%, including one canister at each distance from the road. These duplicates consisted of two canisters within approximately 30 cm proximity.

2.4 DATA ANALYSIS

A qualitative comparison of dustfall rates at 50 m (2014 data) is also provided to assess differences in deposition along the length of the road, including samples collected near town, in the highest traffic area of the AWAR (near the EMR) and along the Vault haul road.

All samples are compared to available regulatory guidelines from Alberta Environment and the Ontario Ministry of the Environment, and are compared to those reported in 2012 and 2013.

Finally, a qualitative year-over-year comparison of data for previously-sampled locations is presented, and effect of distance from the road on dustfall rates in transects is assessed by non-linear regression on untransformed data for upwind and downwind samples collected since 2012.

SECTION 3 • REGULATORY GUIDELINES

No regulatory standards for dustfall are available for the territory of Nunavut, and those available elsewhere are based on aesthetic or nuisance concerns, not environmental or human health. On this basis, Alberta Environment has published a guideline for recreational/residential areas of 0.53 $mg/cm^2/30d$, and a guideline for commercial/industrial areas of 1.58 $mg/cm^2/30d$. The Ontario Ministry of the Environment provides a 30-d guideline level of 0.7 mg/cm^2 (above background) for industrial emissions. Total dustfall results are compared to these guidelines to provide context.

SECTION 4 • 2014 RESULTS

4.1 QA/QC

4.1.1 Relative Percent Difference

The RPD values calculated for duplicate canisters were 6, 27, 4 and 26% at distances of 50, 100, 150 and 300 m from the road, respectively (one duplicate per distance). Alberta Environment (2006) indicates results should be treated with caution when field duplicates exceed 25% (in water samples), and that the source of the difference should be investigated (e.g. field or laboratory contamination). While no similar recommendations were found for specifically for dustfall samples, this type of variability does not appear to be unusual; a range of 8 – 25% was previously reported in a study assessing passive dustfall collector design (Sanderson et al. 1963).

The RPD of the two background samples could not be calculated with confidence, because one sample was less than 5x the detection limit. However, there was approximately a 4x difference between the two background samples.

This relatively large apparent natural variability should be noted, as it reduces the ability to distinguish statistically significant differences between sample sites.

4.1.2 Outliers

Based on Grubbs' test, the 150 m upwind sample at km 18 was identified as a significant outlier. This sample represents the second greatest value measured in the study, at 2.7 mg/cm^2/30d, and is more than twice as high as the next highest sample. It also contained an unusually high proportion of combustible material (60%, compared to the average of 7.6%) suggesting it is not a representative sample and may have been compromised in the field. As a result, statistical analyses were conducted with and without this value, but it is generally excluded from qualitative comparisons (i.e. Sections 4.3 and 4.4).

4.2 DATA SUMMARY

Results for all samples along with location and duplicate information are provided in Table 1. Total dustfall rates are shown in comparison to regulatory guidelines and background samples on Figure 1.

Table 1. 30-d total and fixed dustfall rates for samples collected in 2014 along the Meadowbank AWAR and Vault haul road. * = identified outlier.

Location	Sample Name	Distance from Road	Upwind /Downwind	Total Dusfall Rate (mg/cm^2/30 d)	Fixed Dustfall Rate (mg/cm^2/30 d)
Vault Road	DF-T7	600 m	U	0.110	0.076
	DF-V-S-50	50 m	D	3.030	2.886
	DF-V-N-50	50 m	U	0.576	0.540
AWAR km 1	DF-1E	50 m	D	0.327	0.291
	DF-1W	50 m	U	0.185	0.149
AWAR km 18	DF-18E-50A	50 m	D	0.789	0.768
	DF-18E-50B	50 m	D	0.704	0.675
	DF-18E-100A	100 m	D	0.462	0.455

Location	Sample Name	Distance from Road	Upwind /Downwind	Total Dusfall Rate ($mg/cm^2/30\ d$)	Fixed Dustfall Rate ($mg/cm^2/30\ d$)
	DUP-2	Duplicate of DF-18E-100A		0.355	0.348
	DF-18E-100B	100 m	D	0.306	0.299
	DF-18E-150A	150 m	D	0.242	0.242
	DF-18E-150B	150 m	D	0.313	0.313
	DF-18E-300A	300 m	D	0.199	0.192
	DF-18E-300B	300 m	D	0.213	0.199
	DF-18W-50A	50 m	U	0.455	0.434
	DUP -1	Duplicate of DF-18W-50A		0.412	0.405
	DF-18W-50B	50 m	U	0.370	0.363
	DF-18W-100A	100 m	U	0.334	0.320
	DF-18W-100B	100 m	U	0.306	0.284
	DF-18W-150A	150 m	U	2.709*	1.088
	DF-18W-150B	150 m	U	0.171	0.164
AWAR km 78	DF-78E-50A	50 m	D	1.159	1.123
	DF-78E-50B	50 m	D	1.102	1.074
	DF-78E-100A	100 m	D	0.675	0.640
	DF-78E-100B	100 m	D	0.512	0.483
	DF-78E-150A	150 m	D	0.357	0.357
	DF-78E-150B	150 m	D	0.834	0.806
	DF-78E-300A	300 m	D	0.299	0.277
	DUP-4	Duplicate of DF-78E-300A		0.228	0.213
	DF-78E-300B	300 m	D	0.216	0.191
	DF-78W-50A	50 m	U	0.491	0.441
	DF-78W-50B	50 m	U	0.391	0.384
	DF-78W-100A	100 m	U	0.213	0.199
	DF-78W-100B	100 m	U	0.228	0.199
	DF-78W-150A	150 m	U	0.241	0.232
	DUP-3	Duplicate of DF-78W-150A		0.257	0.241
	DF-78W-150B	150 m	U	0.206	0.192
AWAR at Emulsion (km 103)	DF-EMR-S-50	50 m	D	0.489	0.464
	DF-EMR-N-50	50 m	U	0.738	0.722
Background	DF-C-1	~ 4 km	-	0.136	0.117
	DF-C-2	~ 4 km	-	0.032	0.026

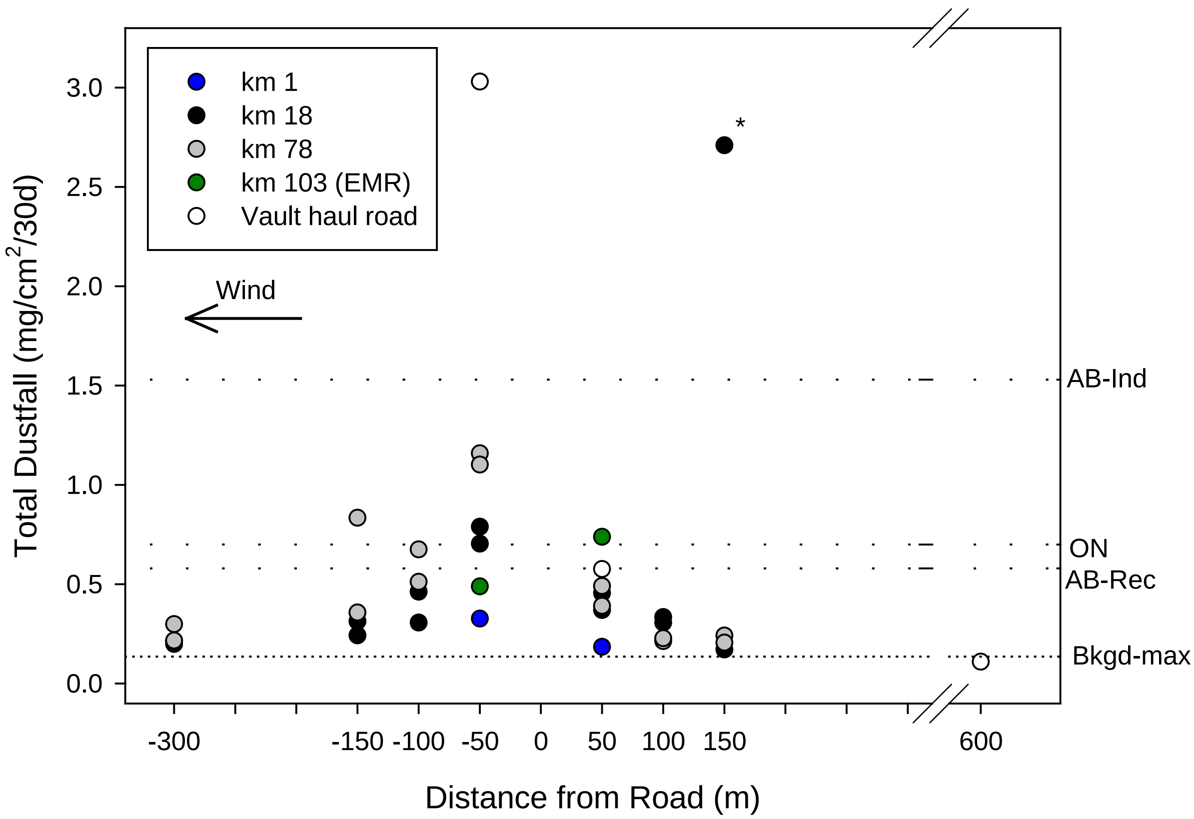

Figure 4-1. Total dustfall samples collected in 2014 along the Meadowbank AWAR and Vault haul road, showing Alberta Environment guidelines for recreational areas (AB-Rec) and industrial areas (AB-Ind), Ontario MOECC guideline (ON) and the maximum of two background samples collected (Bkgd-max). The asterisk (*) indicates an identified outlier. The downwind direction relative to the road in the sampled location is indicated as a negative distance.

4.3 COMPARISON TO REGULATORY GUIDELINES

At km 1 near Baker Lake, samples collected at 50 m on both sides of the AWAR were well below the lowest available dustfall guideline of 0.53 mg/cm^2/30d, with values of 0.19 and 0.33 mg/cm^2/30d.

In the two sets of transects located at km 18 and 78, all samples on the upwind side of the road were also below this guideline, with a maximum value at 50 m of 0.491 mg/cm^2/30d (with the exception of the outlier discussed in Section 4.2).

All samples on the downwind side of the road at 50 m were above this recreational area guideline, as well at one sample each at 100 m and 150 m (both at km 78). No samples were above the industrial area guideline of 1.58 mg/cm^2/30d.

All samples collected at a distance of 300 m from the road at km 18 and 78 (downwind side only) were below recreational area guidelines.

Samples collected at 50 m from the AWAR at the EMR turnoff (km 103; high traffic area) were just above and below the recreational area guideline, at 0.49 and 0.74 mg/cm^2/30d.

The highest total dustfall rate recorded (3.03 $mg/cm^2/30d$) was on the south (downwind) side of the Vault haul road, and was about twice the Alberta Environment industrial area guideline. The sample collected on the upwind (north) side of the road at this location was substantially lower and just above the Alberta recreational guideline, at 0.54 $mg/cm^2/30d$.

Finally, the dustfall sample collected approximately 600 m north of the Vault haul road (DF-T7) (between the Vault pit and main waste rock storage facility) was lower than the highest recorded background sample, and approximately 5x lower than the Alberta recreational area guideline, at 0.110 $mg/cm^2/30d$.

4.4 COMPARISON BY LOCATION (KM)

Samples collected 50 m from the AWAR at km 1, 18, 78, 103 and along the Vault haul road were compared qualitatively to begin to understand patterns of dustfall rates along the AWAR. As anticipated, the highest dustfall rate was recorded on the downwind side of the Vault haul road, with a value approximately 2x the Alberta Environment industrial area guideline. Interestingly, dustfall on the upwind side of the road at this location was nearly 6x lower, and within the range of values observed elsewhere at 50 m.

Samples were collected at km 103 (EMR) since this represents one of the highest traffic areas of the AWAR. However, total dustfall rates were generally similar to those collected elsewhere at 50 m. In this case, the upwind sample showed a higher dustfall rate than the downwind sample, likely since the upwind sample is actually located between the emulsion plant spur road and the AWAR.

At 50 m on the upwind side of the road, dustfall rates at km 78 and 18 were nearly identical. However, on the downwind side, rates were higher at km 78 than any other location with the exception of the Vault haul road.

Samples collected at km 1 were the lowest recorded, with values near background on the upwind side. This reflects the lower traffic rates in this region and application of dust suppressant.

SECTION 5 • ANALYSIS OF HISTORICAL DATA

5.1 INTER-ANNUAL VARIATION

Results for locations with 2+ years of sample collection are shown in Figure 3. In general, samples collected in 2014 showed lower or similar dustfall rates compared to previous years. Two samples demonstrated higher dustfall in 2014; one was collected along the Vault haul road, which experienced increased traffic in 2014 after operations began at the Vault pit, and one of two samples at km 78-150 m downwind showed greater dustfall than the previous sample in 2013. However, in both cases, differences were well within the range of variability seen throughout the study and in comparison to dustfall rates at other mine sites. For instance, a variation of up to 1.8 $mg/cm^2/30d$ was observed between Ekati haul roads at the 50 m distance (Male and Nol, 2005).

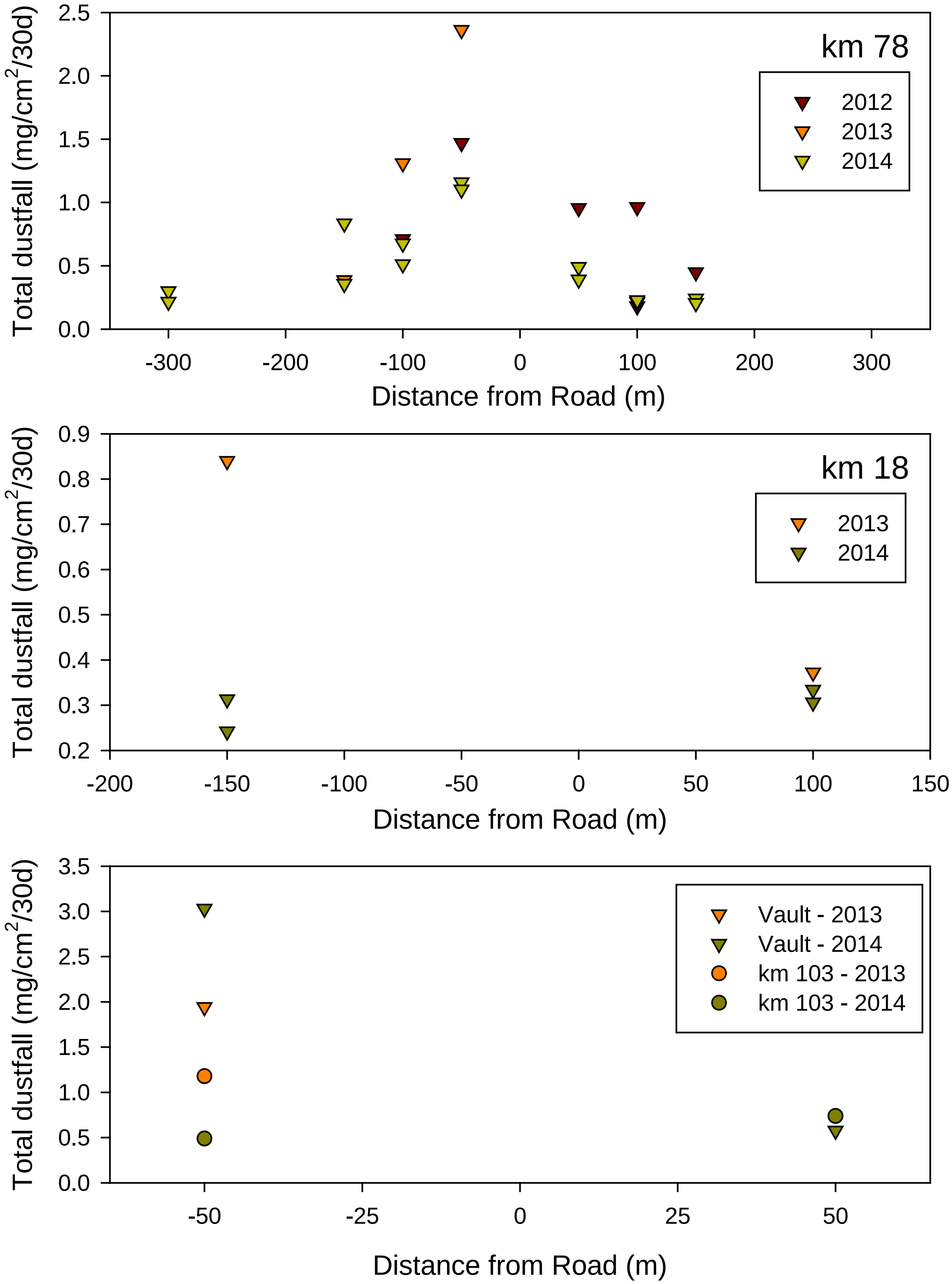

Figure 5-1. Historical comparison of total dustfall rates for locations with 2+ years of collection. The downwind side of each road is designated with a negative distance.

5.2 EFFECT OF DISTANCE FROM THE ROAD

Results of the 2012-2014 AWAR dustfall studies have shown that dustfall rates decline by more than 50% from 50 m to 100 m on the downwind (most impacted) side of the AWAR, from an average of 1.24 $mg/cm^2/30d$ (n = 7) at 50 m to 0.53 $mg/cm^2/30d$ (n = 9) at 100 m (km 18, 76 and 78 data; all study years combined). A further halving of dustfall rates to an average of 0.230 $mg/cm^2/30$ d (average) occurs by 300 m.

Effect of distance from the road on dustfall rates in transects was assessed using non-linear regression by fitting the equation $f=y0+a*e^{(-b*x)}$ to untransformed data for upwind and downwind samples collected since 2012. This includes data collected at km 18, 76 and 78 at ground level. In both cases, background samples are included at a distance of 10 km. For the upwind analysis, the sample collected 600 m north of the Vault haul road was included, since this sample appears representative of background.

For dustfall downwind of the road, all measured values at 300 m were within the 95% confidence interval of background samples, 5 out of 6 samples were within this range at 150 m, and 3 out of 6 were within the range at 100 m. These results suggest that dustfall rates in most locations reach background levels within 150 m of the AWAR, and in many cases this occurs within 100 m. However, only two true background reference samples were collected in 2014, so further analysis is proposed for 2015 to confirm these results.

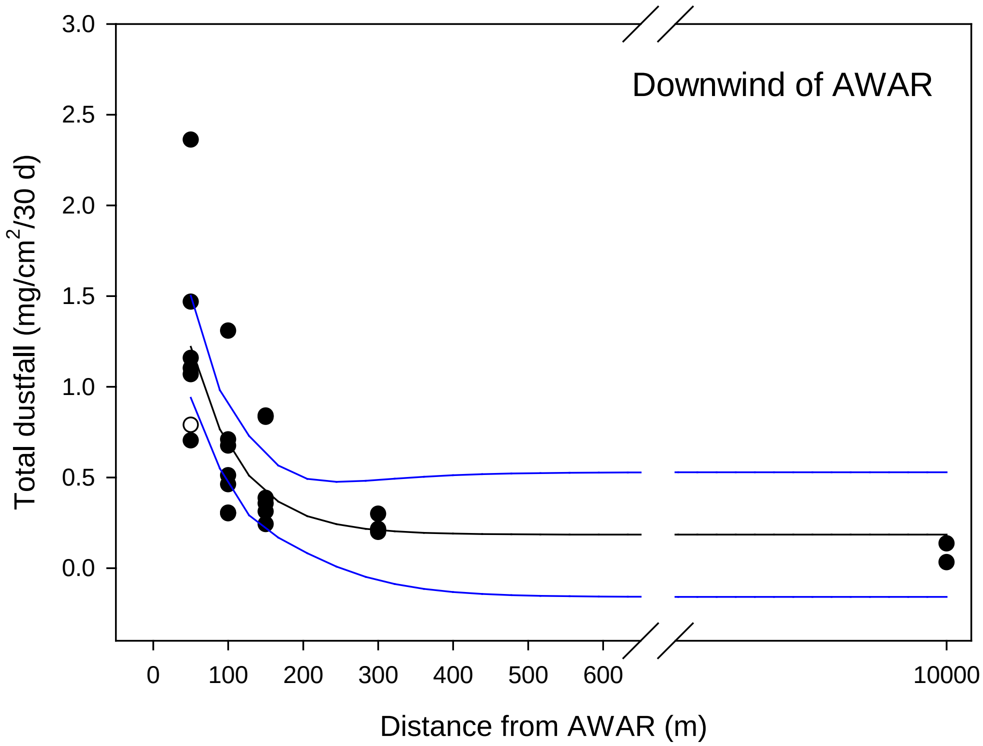

Figure 5-2. Measured (black dots) and predicted (black line) rates of total dustfall downwind of the Meadowbank AWAR, with 95% confidence bands (blue lines). The model $f=y0+a*e^{(-b*x)}$ was fit to all data collected at ground level at km 18, 76 and 78 from 2012 to 2014.

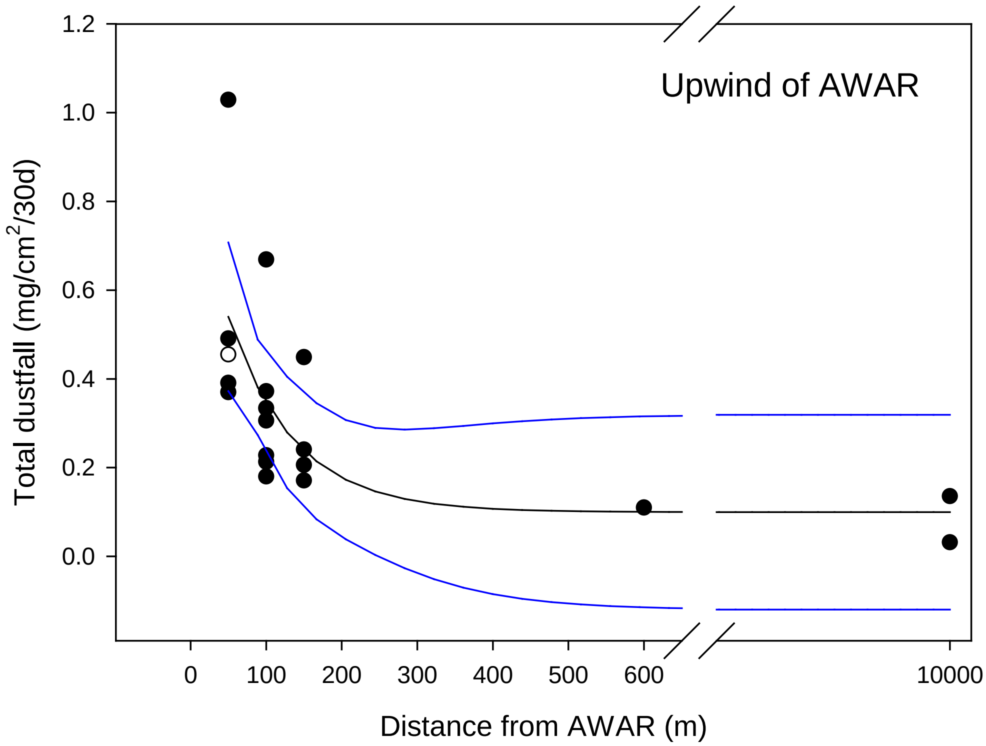

Figure 5-3. Measured (black dots) and predicted (black line) rates of total dustfall downwind of the Meadowbank AWAR, with 95% confidence bands (blue lines). The model $f=y0+a*e^{(-b*x)}$ was fit to all data collected at ground level at km 18, 76 and 78 from 2012 to 2014.

SECTION 6 • CONCUSIONS

The model assumptions of continuous, long-term dust emissions from AWAR traffic used in the FEIS, predicted that effects of dust on vegetation and wildlife would not be significant (<1% change outside an assumed zone of influence), even without the use of mitigation measures such as minimizing traffic and applying dust suppressants on mine haul roads (i.e. Vault Road).

Although the FEIS does not quantify anticipated dust levels in relation to the AWAR, it is stated that "Results from modeling, air monitoring, and snow surveys indicate that most dust particles will settle out within 100 m of the source (BHP, 2000)." The smallest zone of influence (ZOI; area where habitat is assumed lost due to sensory disturbance and other factors) for any wildlife VEC is also 100 m, Therefore, the main goal of this AWAR dustfall study was to determine whether the majority of dustfall does settle out within 100 m, and at what distance rates decline to background levels.

Unfortunately, quantitative relationships between road dust and habitat degradation are not well defined, and no guidelines are available for dustfall based on ecological considerations. As a result, direct measurements of dustfall have been used in this study as a conservative screening tool to assess the potential for effects on habitat.

Based on non-linear regression analysis, all samples collected 300 m downwind of the AWAR and the majority of samples from 150 m downwind of the AWAR were within the range (95% confidence interval) of background samples. In addition, more than a 50% reduction in average total dustfall occurred from 50 m to 100 m on the downwind (most impacted) side of the road, indicating that the majority of dustfall does settle within the predicted 100 m zone. Based on these results, it is unlikely that FEIS predictions are being exceeded and that impacts to VECs (vegetation community productivity and wildlife) due to dust are occurring beyond the smallest assumed ZOI (100 m).

These results are supported by wildlife monitoring conducted under the Terrestrial Ecosystem Management Plan, including the Wildlife Screening Level Risk Assessment. In order to assess potential effects of ingestion of chemical contaminants, wildlife screening level risk assessments were conducted in 2005 (baseline), 2011 and 2014. The 2014 assessment included analysis of soil and plant samples collected at 100 m on the downwind side of the AWAR, and indicated no incremental risk to wildlife associated with consumption of soil and vegetation in this area. Road-related effects on wildlife populations have also been assessed directly through the wildlife monitoring program. Impacts to breeding bird populations (which were determined to have the smallest zone of influence – 100 m from the road) were assessed using thresholds for relative abundance, species richness and species diversity. Breeding bird surveys were conducted along the AWAR for four years (2007 – 2011), and all results indicated that no thresholds were surpassed; therefore road-related effects on bird populations were not considered to be significant.

Despite this evidence that wildlife is not being impacted beyond established thresholds, AEM plans to continue dustfall monitoring along the AWAR in 2015. This is considered to be important in part due to the relatively high variability between duplicate samples collected in 2014 (up to 27% RPD at a scale < 1m), and the limited number of background samples obtained.

Based on these results which support the previous studies conducted in 2012 and 2013, AEM will continue to implement measures to control dust on the AWAR and onsite. The dust suppression program includes:

- Continuous watering of mine site roads, including Vault haul road, in the summer;

- Application of calcium chloride along the highest-use segment of the AWAR (from the Meadowbank Gatehouse to the Exploration Camp); and
- Watering of airstrip 30 min or less prior to arrival of aircraft, and 15 min or less prior to take-off.

SECTION 7 • REFERENCES

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