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**Brenda Backen**

**From:** Butler, Helen HM [Helen.M.Butler@BHPBilliton.com]  
**Sent:** Friday, October 26, 2001 2:15 PM  
**To:** Craig Broome (E-mail)  
**Subject:** Dust Suppressant Report

Craig, please find attached a report on dust suppressant trials conducted at the EKATI Minesite this summer. Darren Unrau had requested this information on his inspection report August 13, 2001. I've also attached figures of the locations that the products were applied. The writing on the image is not that clear so I'm including colour codes for these figures (red - DL 10, blue - DSF 65, green - Pennzsuppress D).

If you require MSDS Sheets please let me know and I will have them faxed to you.

We can discuss these trials further when you next visit the minesite.  
Regards, Helen

<<Dust Suppressant Report - DIAND.doc>>

<<main camp.jpg>> <<panda haul road.jpg>> <<fox haul road.jpg>>

**Helen Butler**  
Environmental Specialist

**BHP Diamonds Inc.**  
#1102 4920 - 52nd Street  
Yellowknife, NT Canada X1A 3T1

☎ phone: (867) 880-2292  
☎ cell: (867) 880-5114  
☎ fax: (867) 880-4012  
✉ e-mail: [helen.m.butler@bhpbilliton.com](mailto:helen.m.butler@bhpbilliton.com)

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**bhpbilliton**

**BHP Diamonds Inc.**

**Dust Suppressant Trials Report**  
October 26, 2001

BHP Diamonds Inc.  
#1102 4920-52<sup>nd</sup> Street  
Yellowknife NT Canada X1A 3T1  
Tel (867) 669 9292 Fax (867) 669 9293  
[www.bhpbilliton.com](http://www.bhpbilliton.com)

### **1. Background**

The EKATI™ Diamond Mine is located in a desert environment where summer seasons can be hot and dry. Precipitation in the form of rain falls mostly in late summer months. Over early spring and through the summer months precipitation on roadways is minimal. During this time road dust from hauling equipment, light traffic and aircraft can cause dust aggregates to be dispersed over surrounding tundra and main camp area. To reduce dust dispersion BHP Diamonds Inc. has previously sprayed water over roadways and airstrip with the use of water trucks. In the summer of 1999 BHP did trial applications of the dust suppressant Calcium Lignosulfonate on haul roads at the minesite. This product came in a powder form and proved difficult to mix and apply to roadways. It was also noted as a wildlife attractant.

### **2. Purpose**

In 2001 three dust suppressant products, DSF65, Pennzsuppress D, and DL10 were shipped to the EKATI™ Minesite for road trials through the summer months. The purpose of this project was to determine a dust suppressant that would be effective in controlling dust from haul roads, intermediate roads, main camp roads and pit ramp roads through the early spring to late fall. The three products were monitored and analyzed to identify a final product which satisfies possible regulatory requirements concerning environmental impacts at the mine, and which is compatible with equipment, road material and climatic conditions unique to the minesite.

### **3. Objectives**

The main objectives in determining a suitable dust suppressant were:

- Determine one dust suppressant from the three trial products that would be suitable for future application and use on roadways at the BHP mine.
- Analyze dust suppressant information collected by BHP staff for application use, durability, effect on equipment, wildlife use and water quality in nearby streams.
- Select a product that would work within guidelines set by BHP (e.g., not be attractant for wildlife, will not harm aquatic habitats, will remain effective with repeated grading of the roads, and can be frozen while shipped and stored).
- Production of a final report indicating application procedures, environmental effects, safety information (MSDS), cost, and equipment compatibility.

#### **4. Product Use Guidelines**

The EKATI™ Diamond Mine location governs that products used be appropriate for climate, road material and shipping characteristics of the area. Also, BHP is committed to high standards in Safety and Environment. It is important that products used to control dust not be harmful or attractants for wildlife and non-toxic or harmful for aquatic habitats. The following list of guidelines will be used in final product selection.

- Dust suppressants will be shipped on winter roads and stored at the mine site over winter. The product should either not freeze, or in the process of freezing should not be denatured to where it is unusable.
- The product should be non-toxic to humans and safe for human use.
- Large herds of caribou migrate through the EKATI™ mine area, also wolf, bear, fox and hare all use the tundra which surround the minesite. The product should not be an attractant for wildlife nor be harmful for these animals.
- Haul roads and intermediate roads at the mine intersect with a large number of lakes and streams. The final product should not be harmful to fish and aquatic life. Water quality of streams intersecting road test sections will be monitored.
- Road materials consist of local granite (waste rock from pits) and esker sand materials. Also the minesite has equipment onsite that is used for local mine and road operations. The product selected must be compatible for use on local materials and with existing mine equipment.

#### **5. Methodology**

##### **Road Application Trials**

The three dust suppressants were applied to roadways around the EKATI™ Minesite between July 26<sup>th</sup> and July 28<sup>th</sup>. Locations of test sections are attached with this report.

##### **5.1 Application Equipment, Volumes and Rates.**

Dust Suppressants were applied by BHP Site Services.

The Site Service's Vacuum Truck was used for applying all products.

- DSF65: Two application truck speed rates were tested – 14 km/hr and 10km/hr. The later rate proved the most effective for volume of product applied to roadway.
- Pennzsuppress D: this product set up as a solid in the tanker after it had been transported to site on the winter road. Site Services was able to remove enough of the liquid portion in the tank which was then applied to roadway test sections. Mixing volume was 4:1, water to suppressant. Application was applied at 10km/hr.
- DL10: Application was straight onto the roadway; no mixing with water was required. The roadway was graded prior to application.

##### **5.2 Product Cost**

The cost of each product for the 2000 Trials has been provided in Table 1.

Table 1: Application Rates and Cost for the Trial Products

Dust Suppressant	Area (m <sup>2</sup> )	Application Rate (L/m <sup>2</sup> )	Product Cost	Rental Cost (Tankers)	Freight Cost	Overall Cost	Product Cost /m <sup>2</sup>	Overall Cost /m <sup>2</sup>
DSF 65	37,427	1.51	101,250.00	40,000.00	12,000.00	153,250.00	2.71	4.09
Pennzsuppress D	45,828	0.37	9,971.07	24,000.00	5,127.94	39,099.01	0.22	0.85
DL 10	49,796	1.50	55,500.00	31,000.00	included	86,500.00	1.11	1.74

All three dust suppressants were brought to the EKATI™ Minesite over the winter road. Tankers containing these products were stored in the B-train storage area, and the material was later pumped from these tankers to the Site Services truck for application.

### 5.3 Product Monitoring.

- Pit Team Leaders, Mine Operations Advisors, Truck Maintenance and Site Services personnel were all advised of the product application and were asked to observe the application methods, effectiveness on suppressing dust, and possible effects on equipment.
- Kingland Ford was requested to study the effects of the product on rubber sealing on light trucks. Three samples of rubber were soaked in each of the three suppressant products for approx 1 week.
- Environment Department technicians set up water quality monitoring stations at stream areas intersecting application sites on the Fox Road and Panda Haul Road. Water samples were completed once per week and on two occasions after rainfall.

Wildlife technicians monitored wildlife, including caribou on roadways where the product was applied. Three 100m observation plots for each of the three products and one control plot were used for monitoring wildlife. Any signs of wildlife (actual animal, scat, and tracks) were recorded. Also, all wildlife/Suppressant interactions were recorded (ie: eating, licking, sniffing, or lying down).

### 6.0 Monitoring Results

**Application:** Site Services had difficulty using the Pennzsuppress D because the product had solidified in the tanker after shipping up the winter road and storage at site during the winter and early spring. The company where the product was purchased, Pennzoil Products, was contacted and advice was sort on best treatment of this product. No difficulty in application of DSF 65 and DL10 was reported.

**Use:** Site Services and individuals using the roads where test strips were located reported that the DSF65 became slick after rainfall. Users found that of the three products the DL10 was the most durable in the long term and the most functional for suppressing dust.

**Effect on Equipment:** Initial reports from road users stated that vehicles (especially light trucks) had more 'squeaking' noises when doors were opened or closed. Kingland Ford

completed a study of the effect of the product on rubber samples. They found that the Pennzsuppress D and DL10 had no effect on the rubber samples. The DSF65 softened the rubber sample considerably, to where it was softer and more flexible than before it was added to the liquid.

### **Environmental Results:**

- **Water Quality:**

The three products were ranked for their suitability for large scale use at the EKATI™ Mine. Samples were shipped to Enviro-Test Laboratories in Edmonton, and data analysis was completed by Rescan Environmental Services Ltd, Vancouver. Table 2 provides the products that resulted in the most favorable surface water quality concentration (e.g. the lowest concentration for parameters with toxicological concerns) for each of the parameters. For example, the introduction of copper to the aquatic environment should be minimized. The product resulting in the lowest concentration of copper in surface waters would be the best environmental option for that parameter.

Overall, DL10 is the most 'environmentally friendly' product, having the least adverse affects on surface water quality. Surface water quality immediately adjacent to the test road had parameter concentrations that were below guidelines for the protection of aquatic life. The only exception was for total copper, although resulting concentrations were close to the recommended guideline. Given the recent focus on the risks of copper to aquatic life within the Koala Watershed, it is advisable to minimize any further input of copper into the aquatic ecosystems. DL10 was by far the best option with respect to potential ammonia and nitrite toxicity issues. Water concentrations resulting from this product were significantly lower than concentrations resulting from the other two products.

DSF65 would be the second option, but the resulting high ammonia, nitrite, and zinc concentrations could be a concern.

Pennzsuppress D was by far the worst product, given the data available. High concentrations of copper, nickel, ammonia and nitrite could result in undesirable biological effects. It was also the only product resulting in measurable hydrocarbons in surface water.

Table 2: Comparison of Ecologically Relevant Parameters for the Three Possible Dust Suppressant Products.

Parameter	Units	PS	DL 10	DSF 65	Best Option	CCME Guideline
TEH (C11-C30)	mg/L	0.30	<0.05	<0.05	DL10, DSF65	
T. Aluminum	mg/L	0.12	0.16	0.12	=	0.005-0.1
T. Arsenic	mg/L	<0.0004	<0.0004	<0.0004	=	0.005
T. Cadmium	mg/L	<b>0.0007</b>	<0.0002	<0.0002	DL10, DSF65	0.000017
T. Chromium	mg/L	<0.0008	<0.0008	<0.0008	=	0.001
T. Copper	mg/L	<b>0.063</b>	<b>0.003</b>	0.001	DSF65 (DL10 close 2 <sup>nd</sup> )	0.002
T. Molybdenum	mg/L	0.0196	0.0048	0.0001	DSF65	0.073
T. Nickel	mg/L	<b>0.107</b>	0.0051	0.0077	DL10	0.025
T. Zinc	mg/L	<b>0.029</b>	0.008	<b>0.333</b>	DL10	0.03
pH	pH units	7.2	6.7	6.6	PS, but all OK	6.5-9.0
Ammonia	mg/L	<b>6.55</b>	0.023	<b>67.5</b>	DL10	1.37-2.20
Nitrite	mg/L	<b>2.12</b>	0.054	<b>0.244</b>	DL10	0.06
Nitrate	mg/L	72.0	1.03	103	DL10	n/a
Total Phosphate	mg/L	0.008	0.006	0.009	DL10	n/a
Hardness	mg/L	689	55	119	DL10	n/a

Notes: CCME guidelines are for the protection of freshwater aquatic life  
 Bolded values indicate that the concentration exceeds the CCME guideline

- Wildlife:

Monitoring began July 31/01 and ended September 17/01.

Throughout the monitoring program wildlife continued to utilize the road as a corridor. The Southern migration of the Bathurst caribou herd occurred while these wildlife trials took place, and at no time did the animals appear to avoid or be attracted to the three types of dust suppressant tested. No apparent interaction was observed with any other wildlife species. Methodology and individual results are included in the attached Appendices.

### 7.0 Conclusions from Dust Suppressant Trials

Of the three dust suppressants used at the EKATI™ Minesite in 2001 DL10 has proven to be the most effective in application and safest for the environment, as indicated by the following observations.

1. Already approved by Resources, Wildlife and Economic Development (RWED) as one of three dust suppressants used in the NT. (Still requires DIAND approval).
2. Can be shipped and stored in winter conditions without denaturing of the product and does not require a need for maintenance of the product before application.
3. Is compatible with trucks and other machinery on roadways. This product does not have a negative affect on rubber seals, tires or brake cables.
4. Does not attract wildlife, or show harmful affect to wildlife when they are observed on or near the product.
5. Analysis does not indicate adverse effects to surface water quality.

### **8.0 Observations For Discussion**

The following is a list of observations based on the above results and other field observations during 2001.

- The DL 10 Dust Suppressant has meet the criteria for transportation, environmental effects, application and equipment compatibility.
- Fugitive dust from road ways during the winter and early spring can create a dust shadow in the vicinity of the main camp and roadways outside the camp. This could potentially cause early melt around these sites. A dust suppressant would be effective in reducing some winter fugitive dust. Roads cannot be watered in late fall or through the winter and would have no effect on fugitive dust control at this time of year. Control of dust with DL 10 is effective over a longer period of time – late fall and early spring.
- Continuous road watering causes the break down of road aggregate and road structure. Grading is required to repair roads during the summer. DL 10 would require grading for each application. The volume of crush applied to roads in the winter will not be reduced whether water or dust suppressant are used, because of the need to improve road traction.
- High evaporation rates during summer months reduces the long term effectiveness of road watering.
- The DL 10 dust suppressant can be used to control dust on all mine roads, or a combination of the two control methods (water and suppressant) could be used.

## Appendices:

### Wildlife Report Prepared by EKATI™ Wildlife Technicians, for Dust Suppressant Trials, 2001.

#### i. Objective

The objective of these trials was to monitor the potential effect of three types of dust suppressant products on various wildlife species that are present in and around the EKATI™ mine site.

#### ii. Methodology

In late July 2001, three dust suppressant products were applied to three separate roadways around the mine site. The wildlife trials focused on the Fox Road between the AN building and the Long Lake Outlet Dam. The control plot was set up on Long Lake Road.

Three wildlife monitoring plots were created within the dust suppressant test areas as well as one control plot.

Each plot was 100m in length, each was monitored for 30 minutes a minimum of twice weekly.

Any signs of wildlife (actual animal, scat, and tracks) were recorded.

Wildlife/Suppressant interactions recorded were recorded (ie: eating, licking, sniffing, or lying down).

Any other wildlife activity relative to the suppressant was recorded ie: avoidance.

Observations were also made of weather conditions and vehicle traffic, during monitoring sessions.

Incidental observations were to be recorded at times where wildlife was sighted interacting with the suppressant outside regular monitoring sessions.

#### iii. Results

Monitoring began July 31/01 and ended September 17/01. Datasheets attached.

A brief summary of each dust suppressant product and respective wildlife interactions are listed below:

**DL10** – Caribou were observed along side of this product on one occasion. Caribou tracks and scat were also observed on the road. No direct interaction with suppressant was observed.

**DSF65** – Caribou were observed walking on this product on one occasion. Along side of it two times. Caribou tracks and scat also observed on the road. No direct interaction with suppressant was observed.

**PennzsuppressD** – Caribou were observed walking on this product on two occasions. Along side of it once. Caribou tracks and scat also observed on the road. Arctic Hares were spotted twice on this product. On one occasion a caribou appeared to “sniff” at the road. No other direct interactions were observed.

**Control Plot** – Caribou were observed along side of the road once. Fox scat was observed as well.



**iv Discussion**

Throughout the monitoring program wildlife continued to utilize the road as a corridor. The Southern migration of the Bathurst caribou herd occurred while these wildlife trials took place, and at no time did the animals appear to avoid or be attracted to the three types of dust suppressant tested. No apparent interaction was observed with any other wildlife species.

Template for Wildlife Monitoring Program

EKATI™ Wildlife/Dust Suppressant Monitoring Program 2001			
Plot: _____			
Date: _____	Time: _____	Observers: _____	
Temp: _____	Precip: _____	Precip Type: _____	
Number of vehicles during survey: _____			
Wildlife or Wildlife Sign Present?		Yes	No
<b>Species</b>	<b>Activity Relative to Suppressant</b>		
<b>Sign</b>	<b>Description of Sign</b>		