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January 18, 2012

Andrew Keim
Water Resources Officer
Aboriginal Affairs and Northern Development Canada
P.O. Box 2000
Iqaluit, NU X0A 0H0
(867) 975-4289

David Hohnstein
Director Technical Services
Nunavut Water Board
PO Box 119
Gjoa Haven, NU X0B 1J0

Dear Mr. Keim and Mr. Hohnstein,

Re: 2AM-DOH0713 Use of EK-35 Dust Suppressant for Doris North Project

In 2010 and 2011, Hope Bay Mining Ltd. (HBML) used EK-35 as a dust suppressant on the airstrip at Doris North after corresponding with AANDC and GN (documentation attached). In 2010, HBML applied this product on other high traffic roads as well as the airstrip. HBML intends to continue use of EK-35 on the airstrip and main roads where the product will not enter any waterbodies.

While this issue is not specifically referenced any of the applicable licences, HBML is wishes to again inform the NWB and AADC that the application of EK-35 may be continued as a routine practice, in areas where the product will not enter any waterbodies. This letter is intended to summarize the previous information submissions and notification letters.

Water Licence and Project Certificate Commitments
Licence 2AM-DOH0713 does not directly address the use of dust suppressants at Doris except as a monitoring condition for a Construction Monitoring Report. HBML is required to report on the "Monitoring of dust generation and use of water by the contractor to manage dust emissions from crushing and construction activity," as per Schedule D Item i.

Under the NIRB Project Certificate Appendix A, HBML commitments with regards to dust include that dust suppression methods will be used on the airstrip and roads during the snow-ice

free period. In light of the amount of dust that is currently being managed on site, and the fact that water is not very effective, HBML is planning to use EK-35 to control dust.

Use of Water as a Dust Suppressant

In the NIRB Project Certificate, water was selected as the preferred dust suppressant, rather than chemical suppressants. Currently, HBML is applying water to control dust on most roads and work areas at Doris North. Due to the high level of activity at the project, a large amount of dust is being generated that affects the surrounding environment and the health of employees. Water has a short period of effectiveness, requiring a large amount of water to be applied continuously for dust suppression. Due to the limited success of water as an effective dust suppressant, HBML plans to switch to chemical dust suppressants in high traffic areas.

Chemical Dust Suppressants

Currently, the Government of Nunavut Department of Environment (GN DoE) has approved use of calcium chloride, bunker C and DL-10 as dust suppressants. This list has not been updated since 2002. Dust suppressants that are not on the approved products list must undergo an assessment before being approved for use (GN Dust Suppression Guidelines, 2002).

HBML does not consider bunker C an acceptable product for use on the project due to the environmental risks, such as soil contamination and toxicity to organisms. In addition, HBML has not considered calcium chloride as an appropriate dust suppressant due to risks of salt damage to vegetation after rain or snowmelt washes the product off of the roads, and this product is also a wildlife attractant, which could result in wildlife-vehicle interactions.

HBML will consider use of DL-10, or possibly other non-toxic dust suppressants for use on main roads, other than the airstrip.

EK-35

HBML has selected EK-35 for use on the airstrip because Boeing has approved this product for use on active airstrips. In addition, this product has been used in other areas of the North, including Ekati (where is has been approved for use by AANDC) and airports in the NWT and Nunavut.

EK-35 is a synthetic organic substance composed of high-viscosity synthetic iso-alkane (severely hydrotreated) and carboxylic acids (fatty acids). This chemical is insoluble in water. EK-35 is not intended for use near waterbodies. When used and applied properly EK-35 is not known to cause any ecological problems (Midwest MSDS and Environmental Data, 2009).

Based on the analyses that were completed as part of the US EPA Environmental Technology Verification Program, the manufacturer provided a data verification report summarizing the following independent tests:

- EK-35 was tested by Tri-State Laboratories for metals, Volatile Organic Compounds (VOC), Semi-volatiles, pesticides, herbicides, PAHs, and leaching potential. The results indicate that EK-35 does not contain most of the analytes tested or TCLP elements or compounds above US Environmental Protection Agency regulatory levels.

    - The toxicity results provided by the Tri-State Laboratories indicate that EK-35 will not negatively impact soil quality if applied properly.

- EK-35 was also tested for acute and chronic aquatic toxicity by ABC Laboratories, Inc. Aquatic toxicity tests ranged from practically non-acutely toxic to the zooplankton and small-bodied fish test species to moderately toxic (chronic) to rainbow trout.
    - The results indicate that EK-35 has low aquatic toxicity levels
    - Rainbow trout are more sensitive to chronic exposure to EK-35

The data verification report provided by Midwest includes the results of the dust suppression efficiency testing conducted by the company, showing that this product is an effective dust suppressant.

Site Specific Application Information

HBML had provided a standard operating procedure written for handling and application of EK-35 in the 2010 and 2011 notification letters. Based on the information provided by Ekati, and the environmental information provided by the manufacturer, HBML will only apply EK-35 in areas where the product will not contact waterbodies. To prevent overspray, the product will be applied near the road surface and the product will not be applied in strong winds (HBML SOP, 2010).

Previous Correspondence

In 2010, HBML provided the first notification that EK-35 was going to be trialed at the Doris North Project (letter from HBML dated June 3, 2010). In response to this notification, AANDC responded with a request for additional information and also requested that HBML collect water samples near the trial site (see email from Melissa Joy, June 6, 2010). HBML collected water samples before and after application of EK-35. Results of these samples indicated that EK-35 was not present in the water pools after application of EK-35.

HBML provided detailed information for EK-35, including toxicity testing results to the GN DoE in June 2010. The GN DoE provided an email response indicating that a blanket approval for use of the product has been issued to HBML until EK-35 can be added to the list of approved dust suppressants (see email from Robert Eno, June 3, 2010).

Please do not hesitate to contact me at Angela.Holzapfel@Newmont.com or 604-345-3122, or Chris Hanks at Chris.Hanks@Newmont.com or 720-917-4489 if you have questions about this information package. Your acknowledgement of this notification is appreciated.

Sincerely,
Angela Holzapfel

Digitally signed by Angela Holzapfel
DN: cn=Angela Holzapfel, o=Hope Bay Mining Ltd, ou=Manager of Environmental Compliance, email=angela.holzapfel@newmont.com, c=CA
Date: 2012.01.18 15:20:26 -07'00'

Angela Holzapfel
Manager of Environmental Compliance
Environment and Social Responsibility

cc: Stanley Anablak, KIA; Li Wan, NIRB

Attachments:
Letter: Notification of EK-35 Use as Dust Suppressant for Doris North Project. June 3, 2010
Email: Use of dust suppressant EK-35, Melissa Joy, INAC. June 6, 2010
Email: HBML Request to Use EK-35 as a Dust Suppressant, Robert Eno, GN. June 3, 2010
Letter: Update on the Use of EK-35 Dust Suppressant for Doris North Project. July 30, 2010 (repeat attachments removed)
Letter: 2AM-DOH0713 Use of EK-35 Dust Suppressant for Doris North Project. July 22, 2011(attachments removed)

Attachments included in the previous notification letters, which are also attached to this letter:
MSDS and Environmental Data, Midwest. 2009
Environmental Technology Verification Report, Midwest. 2005
EK-35 Environmental Data: VOC, Semi-Volatiles, Metals, Toxicity Characteristic Leaching Procedure, PAH Tests, Tri-State Laboratories. July 15, 2002
EK-35 Environmental Data: Acute and Chronic Aquatic Toxicity, ABC Laboratories, Inc. September 12, 2002
Letter: Boeing letter of approval for use of EK-35 on airstrips. December 1, 2000
Boeing's analytical tests for safety of EK-35 in aircraft operations. September 26, 2000
Standard Operating Procedure for Handling, Storage and Application of Dust Suppressant EK-35 (Draft). HBML. June 2, 2010
EK-35 Gravel Runways Fines Preservation (Brochure), Midwest.
Mine Road Stabilization (Brochure), Midwest. 2006
Letter: Midwest information letter to Helen Butler, BHP Diamonds (Ekati). September 26, 2003
ALS Laboratory Sample Results for HBML's EK 35 trial. June 10, 2010

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June 3, 2010

Melissa Joy
Water Resource Officer Kitikmeot Region
Indian and Northern Affairs Canada
P.O. Box 278
Kugluktuk, NU
X0B 0E0

Re: Notification of EK-35 Use as Dust Suppressant for Doris North Project

Dear Ms. Joy,

As per our conversation on June 1, 2010, Hope Bay Mining Ltd. (HBML) would like to notify you of our plan to use EK-35 as a dust suppressant at the Doris North project in the Kitikmeot Region of Nunavut. Included with this letter is information relating to EK-35 such as:

- MSDS
- Environmental Data Report
- Boeing Approval for Use
- SOP for use on site
- Midwest Industrial Supply, Inc. Information Material

Currently, HBML is applying water to control dust at Doris North. Due to the high level of activity at the project, and the large amount of dust being generated that affects the surrounding environment and the health of employees, water is no longer as effective as needed because of its short period of effectiveness. Licence 2AM-DOH0713 does not directly address the use of dust suppressants at Doris except as a monitoring condition for a Construction Monitoring Report. HBML is required to report on the "Monitoring of dust generation and use of water by the contractor to manage dust emissions from crushing and construction activity," as per Schedule D Item i. Under the NIRB Project Certificate Appendix A, HBML commitments with regards to dust include that dust suppression methods will be used on the airstrip and roads during the snow-ice free period. In light of the amount of dust that is currently being managed on site, and the fact that water is not being effective, HBML is planning to use EK-35 to control dust.

EK-35 will be applied on the airstrip and areas of high vehicle traffic. It has been used in other areas of the North, including Ekati (where is has been approved for use by INAC) and airports in the NWT and Nunavut. When received, we will forward you a letter from the GN Department of

the Environment on the status of the use of EK-35 as a dust suppressant in Nunavut. We will also forward materials from Ekati once we receive them.

Considering the wide use of EK-35 over an extended period of time in the North, HBML feels that it is an appropriate product for use at Doris North. Under the supervision of a representative of the manufacturer, HBML will conduct a trial application that will include appropriate monitoring. The trial will take place on the Doris all-weather road between the crusher and Doris Camp. The area is more than 30 m from any flowing water. Results from this trial will be shared with INAC. Sould you have any questions regarding this notification, please do not hesitate to contact me at Lea-Marie.Bowes-Lyon@Newmont.com.

Sincerely,

Léa-Marie Bowes-Lyon
Regulatory Reporting Manager
Hope Bay Mining Ltd.

Cc.: KIA, NIRB

MATERIAL SAFETY DATA SHEET

EK35®
Synthetic Organic Dust Control®

Midwest Dust Control

SECTION I — IDENTIFICATION OF SUBSTANCE/PREPARATION AND COMPANY/ UNDERTAKING

TRADE NAME: EK35® Synthetic Organic Dust Control®
CHEMICAL NAME: Isoalkane and Binder System
SYNONYMS: Dust Retardant and Stabilization Agent
CHEMICAL FAMILY: Formulated Isoalkand and Binder (Patents #7,081,270 and #7,074,266)
CAS REGISTRY NO.: Product A Blend - No Number Assigned

SECTION II — COMPOSITION/INFORMATION ON INGREDIENTS

NAME	%	CAS REG NO.
Severely hydrotreated, high viscosity synthetic iso-alkane	30 - 70%	Non-hazardous
Carboxylic Acids (fatty acids)	30 - 70%	Non-hazardous

SECTION III — HAZARDS IDENTIFICATION

Synthetic Isoalkane May be irritating to breathing passages upon excessive heating, otherwise this product is essentially non-hazardous
Mist 8 hour TLV-TWA = 5mg/m3 (ACGIH)

SECTION IV — FIRST AID MEASURES

EYES: Flush eyes with flowing water at least 15 minutes, get medical attention. Do not use any eye ointment. Remove contact lenses.
INHALATION: Move subject to fresh air. If victim is not breathing perform artificial respiration. Administer oxygen if available. Keep victim warm and at rest. Seek medical attention as soon as possible.
SKIN: Flush with large amount of water or wash with soap and water. Seek medical attention if irritation persists.
INGESTION: Do NOT induce vomiting because of aspiration into the lungs. EK35® has a laxative effect and will be eliminated quickly. Seek medical attention.

NEVER GIVE FLUIDS OR INDUCE VOMITING IF PATIENT IS UNCONSCIOUS OR HAVING CONVULSIONS.

NOTE TO PHYSICIAN: Monitor respiratory distress. If cough or difficulty breathing develops, evaluate for respiratory tract irritation, bronchitis or pneumonitis.

SECTION V — FIRE FIGHTING MEASURES

FLAMMABILITY: Nonflammable, but will burn on prolonged exposure to flame or high temperature.
FLASH POINT (TEST METHOD): >284°F (>140°C), open cup, ASTM D92, Cleveland
AUTOIGNITION TEMPERATURE: >455°F (235°C)
UNUSUAL FIRE AND EXPLOSION HAZARDS: Do not cut, weld, heat or drill or pressurize empty container.
MATERIALS TO AVOID: Low fire hazard. Must be moderately heated before ignition will occur. Avoid contact with strong oxidizing agents, including peroxides, chlorine and strong acids.
PRODUCTS OF COMBUSTION: Carbon dioxide, carbon monoxide, smoke and irritating fumes as products of incomplete combustion.
EXTINGUISHING MEDIA AND INSTRUCTIONS: If a tank, railcar of a tank truck is involved in a fire isolate for 0.5 miles in all directions. Shut off fuel to fire if it is possible to do so without hazard. If this is impossible, withdraw from the area and let the fire burn itself out under controlled conditions. Withdraw immediately in case of rising sound from venting safety device or any discoloration of the tank due to fire. Cool containing vessels with water spray in order to prevent pressure build-up, autoignition or explosion.
SMALL FIRE: use dry chemicals, foam, CO_2
LARGE FIRE: use water spray, fog or foam. For small outdoor fires portable extinguishers may be used and SCBA (self-contained breathing apparatus) may not be required. For all indoor fires and any significant outdoor fires SCBA is required. Respiratory and eye protection are required for fire fighting personnel.

SECTION VI - ACCIDENTAL RELEASE MEASURES

SPILL AND LEAK PROCEDURES: ELIMINATE ALL IGNITION SOURCES. Stop leak without risk and contain spill. Absorb with inert absorbent materials such as clay or sand. Place absorbent materials in closed metal containers for later disposal or burn in appropriate facility. Keep spills out of sewers and open bodies of water.

SECTION VII — HANDLING AND STORAGE

STORAGE: Keep in a cool, dry, ventilated storage area and in closed containers. Keep away from sources of ignition and oxidizing materials.
HANDLING: KEEP AWAY FROM SOURCES OF IGNITION. Do not reuse empty containers. Practice good hygiene. Wash hands before eating. Launder clothes before reuse. Discard saturated leather goods.

SECTION VIII — EXPOSURE CONTROL/PERSONAL PROTECTION

RESPIRATORY PROTECTION: None required if good ventilation is maintained. If mist is generated by heating or spraying use a NIOSH approved organic respirator with a mist filter.
VENTILATION: Under normal handling conditions special ventilation is not necessary. If operation generates mist or fumes use ventilation to keep exposure to airborne contaminants below exposure limits.
EYE PROTECTION: Chemical splash, goggles recommended.
PROTECTIVE CLOTHING: Clothing to minimize skin contact, long sleeves, boots or shoes. For casual contact PVC gloves are suitable, for prolonged contact use neoprene or nitrile gloves.

Midwest Industrial Supply, Inc.
1101 3rd Street Southeast
Canton, Ohio 44711

www.midwestind.com

Tel 330.456.3121
Fax 330.456.3247
Emergency Phone Number 1.800.321.0699

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SECTION IX — PHYSICAL AND CHEMICAL PROPERTIES

BOILING/MELTING POINT @ 760 mm Hg:	>493°F (>256°C)
VAPOR PRESSURE mm Hg @ 20°C:	Negligible at ambient temperature
SPECIFIC GRAVITY OR BULK DENSITY:	0.85 - 0.95
SOLUBILITY IN WATER:	Insoluble in water
APPEARANCE:	Viscous, brown-colored liquid
ODOR:	None
POUR POINT:	<15°F (<9°C)
VISCOSITY (Brookfield):	150 - 250 cps @ 20°C 550 - 650 cps @ 0°C 750 - 850 cps @ -5°C
pH:	N/A, not an aqueous solution or emulsion
ACIDITY:	None
ALKILINITY:	None

SECTION X — STABILITY AND REACTIVITY

STABILITY:	Stable under normal handling conditions. Stable stored at temperatures between -40°F and +180°F.
CHEMICAL INCOMPATIBILITY:	Can react with strong organic oxidizing materials.
HAZARDOUS DECOMPOSITION PRODUCTS:	Thermal decomposition in the presence of air may yield carbon monoxide and/or carbon dioxide, smoke, hydrocarbons and irritating fumes.
HAZARDOUS POLYMERIZATION:	Does not occur under normal industrial conditions.
CONDITIONS TO AVOID:	Excessive heat and flame.
CORROSIVE TO METAL:	No

SECTION XI — TOXICOLOGICAL INFORMATION

EFFECTS OF OVEREXPOSURE

INHALATION: Inhalation is highly unlikely. However prolonged or repeated inhalation of fumes or mists may cause irritation to the respiratory tract. Product deposits in lungs may lead to fibrosis and reduce pulmonary function.

SKIN: It is not a skin irritant. However, prolonged or repeated contact may cause skin irritation, dermatitis or oil acne.

EYES: Prolonged or repeated contact may be irritating to eyes. Will not cause permanent damage.

INGESTION: Relatively non toxic to digestive tract.

MUTAGENIC: Mutagenic activity test are negative toward: Salmonella Typhimurium, Salmonella-Eschrichia coli and Chinese Hamster ovary.

REPRODUCTIVE TOXICITY: Based on data to date it does not pose a reproductive risk.

CARCINOGENICITY: Based on studies to date EK35® is not known to be carcinogenic to humans.

- ACGIH (mists) - Based on available human studies, exposure to product mist alone has not demonstrated to cause human effects at levels below 5 mg/m3.
- IARC - IARC group 3; cannot be classified as to carcinogenicity to humans.
- NTP - No studies were found.
- IRIS - No studies were found.
- OSHA - OSHA PEL (8 hour TWA) = 5 mg/m3 for synthetic product mists.

SECTION XII — ECOLOGICAL INFORMATION

EK35® Aquatic Toxicity Test Results

- Methods for Measuring the Acute Toxicity of Effluents and Receiving Water to Freshwater and Marine Organisms, EPA/600/4-90/027F.
- Short-term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms, EPA/600/4-91/002.
- Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Water to Marine and Estuarine Organisms, EPA/600/4-91/003.

SECTION XII — ECOLOGICAL INFORMATION - continued

	Ceriodaphnia dubia	Fathead minnow	Americamysis bahia	Rainbow trout
ACUTE/SURVIVAL (mg/L)				
LC50	>1000	271	111	--
NOEC	1000	125	63	--
LOEC	>1000	250	130	--
CHRONIC/SURVIVAL (mg/L)				
LC50	>1000	97.3	58.6	23
NOEC	500	31.3	25	10
LOEC	1000	62.5	50	20
CHRONIC/GROWTH/ REPRODUCTION (mg/L)				
LC50	375	114	>50	>10
NOEC	250	31.3	50	10
LOEC	500	62.5	>50	>10

See attached test results:

1. ABC Laboratories, Inc. Americamysis bahia, Fathead minnow, Ceriodaphnia dubia.
2. ABC Laboratories, Inc. Rainbow trout

LC50 - Lethal Concentration, 50%
NOEC - No Observable Effects Concentration
LOEC - Lowest Observable Effects Concentration

The LC50 level is the lethal concentration of the chemical under test that kills 50% of the test organisms in the specified amount of time. According to the EPA-540-9-85-006, suggested toxicity criteria for materials are listed in the table below. Comparison of the EPA guidelines to the LC50 of EK35® show a range of toxicity from practically non-toxic to moderately toxic depending on the species and the exposure time. When used and applied properly EK35® is not known to pose any ecological problems.

SECTION XIII — DISPOSAL CONSIDERATIONS

WASTE DISPOSAL METHOD: Consult your local authorities for regulations. Preferred waste management: recycle or reuse, incinerate with energy recovery, disposal in a licensed facility. Disposal facility should be compliant with state, local and federal government regulations.

SECTION XIV — TRANSPORTATION INFORMATION

D.O.T. PROPER SHIPPING NAME (49CFR172.101):	None
HAZARDOUS SUBSTANCE (40CFR116):	N/A
REPORTABLE QUANTITY (RQ):	N/A
D.O.T. HAZARD CLASSIFICATION (49CFR172.101):	Non-regulated
D.O.T. PLACARDS REQUIRED:	None
POISON CONSTITUENT (49CFR173.343):	N/A
BILL OF LADING DESCRIPTION:	dust control agent
C NO.:	N/A
UN/NA CODE:	N/A

SECTION XV— REGULATORY INFORMATION

EPA SARA Title III hazard class:	None
OSHA HCS hazard class:	Non-OSHA hazardous (29CFR1910.1200)
EPA SARA Title III Section 313(40CFR372) Toxic Chemicals present in quantities greater than the "de minimus" level are:	None
Canadian WHMIS:	This product is not a "controlled product" under the Canadian Workplace Hazardous Material Information System (WHMIS)
Canadian DSL:	All components of this product are listed on DSL (Domestic Substance List).
California Proposition 65:	Does not contain any Prop 65 chemicals.

SECTION XVI — OTHER INFORMATION

ABBREVIATIONS AND SYMBOLS:

N.D. - Not Determined
N.A. - Not Applicable
N.T. - Not Tested
< - Less Than
> - Greater Than

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Environmental Data

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Environmental Perspective

Midwest Industrial Supply, Inc. is committed to providing comprehensive and relevant environmental information about our products. Working with various testing laboratories and regulatory organizations enables us to provide unbiased environmental and toxicity data that we use to develop the best dust control and stabilization programs for our customers.

Choosing the right product for an application is more that picking the product with good or sufficient dust control efficiency. It means evaluating the application and understanding all the needs of the customer including environmentally sensitive areas, regulatory constraints, aesthetics, customer preferences, operational or process concerns, and climate. Understanding the environmental and toxicity data and relating it to typical applications and site-specific needs is an important aspect of what Midwest does when working with our customers.

The conclusion of the information presented herein is that all testing shows EK35®, when applied properly, will not negatively impact soil quality. Aquatic toxicity testing of EK35 shows a range of toxicity from practically non-toxic to moderately toxic depending on the species and the exposure time. This information is critical in determining the suitability of EK35 for an application. EK35 was developed for and is recommended for industrial applications where aquatic exposure is not an issue. Generic risk assessment will not replace a conscientious site-specific evaluation, but the data used in this perspective is a necessary component for all risk assessments.

The US EPA Environmental Technology Verification (ETV) Program protocol for Dust Suppression Products evaluated bulk constituents as well as aquatic toxicity on EK35. The purpose of the program was to verify the level of dust control (particulate matter, PM, control efficiency) of EK35 and accumulate environmental data. The US EPA protocol did not allow for commentary on the environmental data.

The US EPA does however have regulatory guidelines that enable us to assess the potential impact of EK35 on the environment. The test results used for this Environmental Impact Perspective can be found in Appendix A and B of the US EPA ETV report on EK35 or on the Midwest Website.

1. Tri-State Laboratories, Chemical Analysis, July 2002
2. ABC Laboratories, Various Species Toxicity, September 2002
3. ABC Laboratories, Rainbow Trout Toxicity, September 2003

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Chemically, EK35 is a patent pending synthetic fluid. It is produced by a reaction of specific purified chemical feedstock that is treated via extreme heat, pressure and catalyst during hydrocracking, hydrotreating and hydroisomerization to create a synthetic iso-alkane. Further formulating and blending with naturally occurring rosins impart the rheological and cohesive properties unique to EK35. EK35 is a non-aqueous liquid that is not water soluble or dilutable.

Application rates vary with soil type and properties and the desired end result of the project. EK35 is applied topically to the surface of the road with specially designed applicator trucks. Typical application rates range from 0.09 gal / yd^2 to 0.30 gal / yd^2. For purposes of this environmental impact analysis the application used in calculations was 0.45 gal / yd2, the same total application as that used in the dust control efficiency analysis at Fort Leonard Wood in October 2003.

A full range chemical analysis was performed on EK35 by Tri-State Labs. Composition analysis included: volatile organic compounds (VOC), semi-volatile organic compounds (SVOC), metals, herbicides/herbicides and polynuclear aromatic hydrocarbons (PAH). Please see TSL, September 2003 for full analysis. Seven metals and 1 VOC were detected in EK35.

The US EPA has developed Risk Based Concentrations (RBC) tables for numerous toxic chemicals. These tables list the levels in various media (i.e.: fish, tap water, ground water, ambient air, industrial soil and residential soil) that a chemical can be present in that media and impart little if any risk to humans. The October 2005 Risk Based Concentrations (RBC) Table from EPA Region III was used in this evaluation. The EK35 application rate used was 0.40 gal / yd2, one (1) inch depth penetration was assumed and a soil density of 2.8 g/cm3 was used for calculations. Chemical level in the soil was compared to the RBC levels in residential soil. Analysis shows that at a heavy application of EK35, for all detected constituents, the levels are significantly lower than the RBC levels in residential soil. Therefore, EK35 is safe for use in terms of environmental impact. The results are tabulated in the table below.

Chemical Constituent	**EK35® Level (mg/kg)**	**Soil Level (mg/kg)**	**RBC level (mg/kg)**
Aluminum	1.2500	0.0320	78,000
Cadmium	0.0440	0.0011	78
Copper	0.0440	0.0011	3100
Iron	31.8000	0.8080	23,000
Manganese	0.1600	0.0040	1,600
Zinc	0.1420	0.0036	23,000
1,2-dichloroethane	150.0000	3.8100	7

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Toxicological evaluation of EK35® utilized EPA methods for both acute and chronic toxicity determination for aquatic organisms. LC50 values were determined for each of the species. The table below contains a synopsis of the results.

EK35 Aquatic Toxicity Test Results

*Methods for Measuring the Acute Toxicity of Effluents and Receiving Water to Freshwater and Marine Organisms, EPA/600/4-90/027F.
*Short-term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms, EPA/600/4-91/002.
*Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Water to Marine and Estuarine Organisms, EPA/600/4-91/003.

	Ceriodaphnia dubia	Fathead minnow	Americamysis bahia	Rainbow Trout
ACUTE/SURVIVAL (mg/L)				
LC50	>1000	271	111	--
NOEC	1000	125	63	--
LOEC	>1000	250	130	--
CHRONIC/SURVIVAL (mg/L)				
LC50	>1000	97.3	58.6	23
NOEC	500	31.3	25	10
LOEC	1000	62.5	50	20
CHRONIC/GROWTH/ REPRODUCTION (mg/L)				
LC50	375	114	>50	>10
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See attached test results:
1. ABC Laboratories, Inc. Americamysis bahia, Fathead minnow, Ceriodaphnia dubia.
2. ABC Laboratories, Inc. Rainbow trout

LC50 -Lethal Concentration, 50%
NOEC - No Observable Effects Concentration
LOEC - Lowest Observable Effects Concentration

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The LC50 level is the lethal concentration of the chemical under test that kills 50% of the test organisms in the specified amount of time. According to the EPA-540- 9-85-006, suggested toxicity criteria for materials are listed in the table below.

LC50 (mg/L)	**Category Description**
<0.1	Very highly toxic
0.1 – 1	Highly toxic
1 – 10	Moderately toxic
10 –100	Slightly toxic
>100	Practically non-toxic

Comparison of the EPA guidelines to the LC50 of EK35 show a range of toxicity from practically non-toxic to moderately toxic depending on the species and the exposure time. In conclusion, all testing shows EK35, when applied properly, will not negatively impact soil quality. Aquatic toxicity testing of EK35 shows a range of toxicity from practically non-toxic to moderately toxic depending on the species and the exposure time. This information is critical in determining the suitability of EK35 for an application. EK35 was developed for and is recommended for industrial applications where aquatic exposure is not an issue. Generic risk assessment will not replace a conscientious site-specific evaluation, but the data used in this perspective is a necessary component for all risk assessments.

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Environmental Technology Verification Draft Report

Dust Suppressant Products

Midwest Industrial Supply, Inc.'s EK35

Prepared by:

RTI International
Midwest Research Institute

EPA Cooperative Agreement No. CR829434-01-1
RTI Project No. 09309

EPA Project Manager:
Michael Kosusko
National Risk Management Research Laboratory
Air Pollution Prevention and Control Division
Office of Research and Development
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Notice

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* RTI International is a trade name of Research Triangle Institute.

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Abstract

Dust suppressant products used to control particulate emissions from unpaved roads are among the technologies evaluated by the Air Pollution Control Technology (APCT) Verification Center, part of the U.S. Environmental Protection Agency's Environmental Technology Verification (ETV) Program. The critical performance factor for dust suppressant verification is the dust control efficiency (CE). CE was evaluated in terms of total particulate (TP), particulate matter less than or equal to 10 micrometers (µm) in aerodynamic diameter (PM_{10}), and particulate matter less than or equal to 2.5 micrometers (µm) in aerodynamic diameter ($PM_{2.5}$).

Midwest Industrial Supply, Inc., submitted the EK35 dust suppressant to the APCT Center for testing. The test and quality assurance (QA) plans, prepared in accordance with the Generic Verification Protocol (GVP), addressed the site-specific issues associated with these verification tests. The 1-year testing was conducted at two sites: Fort Leonard Wood, Missouri, and Maricopa County, Arizona. Testing at Fort Leonard Wood was conducted during October 2002, May 2003, and October 2003. Testing at Maricopa County was conducted during May 2003 and August 2003. This verification report summarizes the results of the 1-year test. The verified CE will be based on all tests at each site, as specified in the test/QA plan. Test conditions were measured and documented.

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List of Acronyms and Abbreviations

ADEQ	Arizona Department of Environmental Quality
ADT	average daily traffic
ANOVA	analysis of variance
APCT	air pollution control technology
AZMET	Arizona Meteorological Network
BOD	biological oxygen demand
CE	control efficiency
cfm	cubic feet per minute
CI	confidence interval
cm	centimeters
COD	chemical oxygen demand
DQO	data quality objective
DPW	Directorate of Public Works
EC_{50}	effective concentration, 50 percent
EPA	U.S. Environmental Protection Agency
ETV	environmental technology verification
FLW	Fort Leonard Wood, Missouri
ft	feet
g	grams
g/mL	grams per milliliter
gal	gallons
GPS	global positioning system
GVP	generic verification protocol
hi-vol	high volume
in.	inches
km	kilometer
l or L	liters
lb	pounds
LC_{50}	lethal concentration, 50 percent
LOEC	lowest observed effective concentration
lpm	liters per minute
µg	micrograms
µm	micrometer
m	meters
MC	Maricopa County, Arizona
mg	milligrams
min	minutes
ml	milliliters
mph	miles per hour
MRI	Midwest Research Institute
MSDS	material safety data sheet
NA	not applicable
NOEC	no observed effect concentration
PM	particulate matter

PM_{10}	particulate matter equal to or less than 10 µm in aerodynamic diameter
$PM_{2.5}$	particulate matter equal to or less than 2.5 µm in aerodynamic diameter
QA	quality assurance
QC	quality control
RSD	relative standard deviation
RTI	RTI International
s	seconds
TA	training area
TCLP	toxicity characteristic leaching procedure
TP	total particulate
WAF	water accommodated fractions
yd	yard

1.0 Introduction

The objective of the Air Pollution Control Technology (APCT) Verification Center, part of the U.S. Environmental Protection Agency's (EPA's) Environmental Technology Verification (ETV) Program, is to verify, with high data quality, the performance of air pollution control technologies. One such set of air pollution control technologies consists of products used to control dust emissions from unpaved roads. Dust suppressant products are, in general, designed to alter the roadway by lightly cementing the particles together or by forming a surface that attracts and retains moisture. Control of dust emissions from unpaved roads is of increasing interest, particularly related to attainment of the ambient particulate matter (PM) standard. EPA issued a new ambient standard for PM in 1997 that specifies new air quality levels for particulate matter less than or equal to 2.5 micrometer (μm) in aerodynamic diameter ($PM_{2.5}$).[1]

The APCT Center's verification of dust suppression products started with a preliminary 3-month testing program at Fort Leonard Wood, Missouri (FLW). The objective of this preliminary test program was to develop a cost-effective technique to measure the relative performance of dust suppressant products. The more common, but resource intensive, exposure profiling method to measure fugitive dust was compared to a mobile dust sampler. It was concluded that the mobile dust sampler could be used for future testing. A total of seven dust suppressant products were evaluated in the preliminary testing. Seven reports documenting the performance of these products were finalized in November 2002.[2]

After completion of the preliminary study, a 1-year field test program was designed by RTI and Midwest Research Institute (MRI) to evaluate the performance of dust suppressant products. Five dust suppressants manufactured or distributed by three firms were tested in this program. One of those dust suppressants was EK35, developed by Midwest Industrial Supply, Inc. EK35 is a product for dust control and soil stabilization that acts as a durable reworkable binder. The material safety data sheet (MSDS) for EK35 is retained in the RTI project files and is available on Midwest Industrial Supply's Web site (http://www.midwestind.com/problemsolver/productmaterials/EK35MSDS.pdf) [accessed July 2005].

The field test program for EK35 was conducted at two sites: FLW and Maricopa County, Arizona (MC). Testing was conducted at two different sites to account for differences in climate and soil types. In July 2003, test and quality assurance (QA) plans for the field testing at FLW and MC were developed and approved by EPA.[3,4] The July 2003 versions of each test/QA plan were based on an October 2002 version and a subsequent test/QA plan addendum (dated February 19, 2003, for FLW, and February 10, 2003, for MC). These test/QA plans describe the procedures and methods used for the tests. The goal of each test was to measure the performance of the products relative to uncontrolled sections of road over a 1-year period. Field testing was planned quarterly over a 1-year period; however, some logistical difficulties related to the weather and maintenance activities on the roads of interest arose, and the test/QA plans were modified (Rev 3) to address those issues. At FLW, test periods occurred per the test/QA plan for three roughly 6-month periods, during October 2002, May 2003, and October 2003. At MC, testing was conducted per the test/QA plans for only two quarterly test periods, during May

2003 and August 2003. Emissions measurements were made for total particulate (TP), particulate matter less than or equal to 10 μm in aerodynamic diameter (PM_{10}), and for $PM_{2.5}$.

This report contains only summary information and data from the 1-year test program, as well as the verification statement related to the dust control efficiency (CE) measured for EK35 during testing at FLW and MC. Complete documentation of the test results is provided in a separate test report[5] for FLW and MC and a data quality audit report.[6] Those reports include the raw test data from product testing and supplemental testing, equipment calibration results, and QA and quality control (QC) activities and results. Complete documentation of QA/QC activities and results, raw test data, and equipment calibration results are retained in MRI's files for 7 years.

The results of the tests are summarized and discussed in Section 2. The conditions in which the tests were conducted are presented in Section 3, and references are presented in Section 4.

2.0 Summary and Discussion of Results

Verification tests were conducted over a 1-year period on Midwest Industrial Supply's EK35 dust suppressant as applied to unpaved roads at FLW and MC. Original plans called for testing to occur on a quarterly basis; however, one quarterly test was abandoned due to persistently unfavorable wintertime weather at FLW. In addition, at MC, the original test site (Lower Buckeye Road) was disturbed after the original treatment. As a result, a 6-month (rather than 1-year) verification study was conducted with quarterly measurements at a second site (Broadway Road) in MC.

The mobile dust sampling system used in this test program provides quantitative information on relative emissions levels. The mobile system consists of a high-volume (hi-vol) PM_{10} cyclone combined with a $PM_{2.5}$ cyclone. The sampler inlet sits above the densest portion of the dust plume, immediately behind the test vehicle. In this location, the sampler collects PM that is truly airborne. The hi-vol sampler is operated with a nozzle matched to the test vehicle's travel speed to best approximate isokinetic sampling. The test plans provide additional details on the construction and operation of the mobile sampler.

The results of the quarterly tests are summarized in Section 2.1. The results of laboratory toxicity tests on the product are included in Section 2.2. The results of QC checks performed during these quarterly tests are summarized in Section 2.3. Deviations from the test plans are discussed in Section 2.4.

2.1 Verification Results

Tables 1 and 2 present summary statistics for results from each test period. The mobile sampler provides a test result in terms of particulate mass collected per distance traveled [milligrams per 1,000 feet (mg/1,000 ft)]. The tables show the number of days after product application, the mean controlled and uncontrolled emissions values, and the resulting CEs. The relative standard deviation (RSD) for the emissions values is shown in parentheses.

The uncontrolled and controlled emissions values for the mobile dust sampler are means of five replicate measurements. Each of the five replicate measurements consisted of twelve passes over a 500-ft length test section of the treated road segment, to total approximately 6,000 ft of distance covered. Detection limits were set at two standard deviations above the average filter blank correction for sample mass. Values below the detection limits (quantification level) were included in the averaging process at half the detection limit.

Table 1 presents data for the test periods when no unexpected road maintenance occurred between product application and testing. These data are considered the most representative of the product's performance. Table 2 presents data when unexpected road maintenance occurred. These data provide an example of performance under the described circumstances.

Table 1. Summary of Test Results for EK35 (No Road Maintenance)

Test period	Uncontrolled emissions, mg/1,000 ft *(RSD, %)*			Time since last application, days	Controlled emissions, mg/1,000 ft *(RSD, %)*			Control efficiency, %		
	TP	PM_{10}	$PM_{2.5}$		TP	PM_{10}	$PM_{2.5}$	TP	PM_{10}	$PM_{2.5}$
FLW										
October 2003[a]	7.9	0.68	1.5	119	2.9	0.11	1.6	63	84	[b]
	(59)	*(78)*	*(27)*		*(30)*	*(53)*	*(10)*			
May 2003[c]	9.1	1.2	0.71	77	2.4	0.13	0.31	74	86	56
	(14)	*(21)*	*(29)*		*(54)*	*(78)*	*(41)*			
MC										
May 2003	50	14	3.7	70	6.5	1.4	<0.24[d]	87	90	>94
	(76)	*(84)*	*(65)*		*(32)*	*(45)*	*(0.0)*			

[a] All test sections were wet from rain the previous day. The uncontrolled section was heavily potholed and another section was used for the test. MRI used traffic to dry the road before testing.
[b] No emissions reduction was observed.
[c] Rainfall in the morning meant that the uncontrolled section of the road was wet and another section was used for the test.
[d] All values were below the detection limit.

Table 2. Summary of Test Results for EK35 (After Road Maintenance Occurred)

Test period	Uncontrolled emissions, mg/1,000 ft *(RSD, %)*			Time since last application, days	Controlled emissions, mg/1,000 ft *(RSD, %)*			Control efficiency, %		
	TP	PM_{10}	$PM_{2.5}$		TP	PM_{10}	$PM_{2.5}$	TP	PM_{10}	$PM_{2.5}$
FLW										
October 2002[a]	9.5	2.3	2.5	121	11	1.1	<0.65[b]	[c]	52	>74
	(36)	*(55)*	*(41)*		*(30)*	*(21)*	*(0.0)*			
MC										
August 2003[d]	74	24	4.5	84	60	16	2.6	18	34	42
	(34)	*(47)*	*(37)*		*(17)*	*(37)*	*(22)*			

[a] Unexpected road maintenance activity occurred at FLW in September 2002 prior to the October 2002 test period. After consideration, it was decided to continue with planned testing; however, in retrospect, the treated surface evaluated during this test period was not representative, and controlled values from the test period should be viewed as conservatively low.

[b] All values were below the detection limit.

[c] No emissions reduction was observed.

[d] Unexpected road maintenance activity appeared to have occurred at MC after the time of the May 2003 visit and prior to the August 2003 test period. The entire test road appeared to have been bladed. The vendor interviewed persons living near the test site who remarked that the road had been bladed prior to the test visit. In this case, the control efficiency values from this test period should be viewed as conservatively low.

The dust emissions CE is calculated as follows:

$$CE = 100 \times (e_{um} - e_{cm})/e_{um} \qquad \text{Eq. 1}$$

where

CE = control efficiency (percent)

e_{um} = uncontrolled emissions value, expressed as sample mass divided by the cumulative length of road traveled by the mobile sampler (mg/1,000 ft)

e_{cm} = controlled emissions value, expressed as sample mass divided by the cumulative length of road traveled by the mobile sampler (mg/1,000 ft).

Control efficiencies can vary considerably between test periods, and some of the variation can be related to two factors: (1) the time since the most recent application and (2) the application rate of the dust suppressant. A complete history of the test road treatment is given in Section 3.2. The time since the most recent application is shown in Tables 1 and 2, in addition to information on road maintenance activities and rainfall. Beyond the application rate and the time since application factors, additional variation can arise from changing site conditions. For example, unplanned road maintenance occurred at both sites, as noted in Table 2. In addition, precipitation before or during a field test could cause variation in both uncontrolled and controlled test results. That is to say, measured emissions could change after precipitation so that back-to-back tests would not necessarily be "replicates" in the sense of having identical test conditions. MRI always attempted to dry the road with traffic to the point that it appeared visibly dry before beginning a test period.

2.2 Laboratory Toxicity Test Results

A sample of EK35 was taken when the product was applied at FLW. The product was sent to ABC Laboratories, Columbia, Missouri, and to Tri-State Laboratories, Inc., Youngstown, Ohio, for analysis. The following test methods were used in accordance with the test/QA plan:[3]

- **Environmental/Chemical Testing**
  - EPA Method 24[7] Volatile Organics
  - EPA Method 405.1[8] 5-day Biochemical Oxygen Demand (BOD) of product
  - EPA Method 410.4[9] Chemical Oxygen Demand (COD)
  - EPA Method 1311[10] Toxicity Characteristics Leaching Procedure (TCLP)
  - EPA Method 6010B[10] Inorganics/Metals
  - EPA Method 6010B[10] Title 22 Metals
  - EPA Method 8260B[10] Volatile Organics
  - EPA Method 8270[10] Semivolatile Organics
  - EPA Method 8270D[10] Semivolatile Organics
  - EPA Method 8270D[10] Pesticides and Herbicides

- **Effluent Toxicity Testing**
  - EPA600/4-90/027F[11] Acute toxicity: Water fleas lethal concentration, 50 percent (LC_{50}), Fathead minnow LC_{50}, and Mysid shrimp LC_{50}
  - EPA/600/4-91/002[12] Chronic Toxicity: Water fleas LC_{50}, Fathead minnow LC_{50}, and Mysid shrimp LC_{50}.

See Appendices A and B for the environmental and chemical test results, respectively.[13,14] RTI also conducted Method 24 tests on the product samples;[15] see Appendix C for those results.

2.3 Discussion of QA/QC

The testing process was based on the approved *Generic Verification Protocol for Dust Suppression and Soil Stabilization Products* (GVP);[16] the *Test/QA Plan for Testing of Dust Suppressant Products at Fort Leonard Wood, Missouri*, Rev 3 (July 24, 2003);[3] and the *Test/QA Plan for Testing of Dust Suppressant Products at Maricopa County, Arizona*, Rev 3 (July 24, 2003).[4] The MRI task leader and QA manager verified that the quality criteria specified in these test plans (Sections 3.4 and A4, respectively) were met (see Section 2.4) for the overall test (the within-site, -suppressant, and -particle size fraction variability was often higher than planned). Assessments specified in Section 8 of the GVP were performed. Reconciliation of the data quality objectives (DQOs) with test results is summarized in Table 3. Data from all three test periods are included in the analysis, including those data collected during the test period following unexpected road maintenance.

Table 3. DQOs versus Final Control Efficiency Variability for EK35

		Number of test periods	Final CE, fractional	90% confidence interval			DQO[a]	Is the half-width interval less than the DQO (i.e., DQO met)?
				Lower limit	Upper limit	Half width		
TP	FLW	3	0.41	0.31	0.51	0.10	0.14	Yes
	MC	2	0.53	0.43	0.62	0.097	0.11	Yes
PM_{10}	FLW	3	0.74	0.69	0.79	0.051	0.060	Yes
	MC	2	0.62	0.56	0.69	0.066	0.087	Yes
$PM_{2.5}$	FLW	3	0.39	0.28	0.50	0.11	0.14	Yes
	MC	2	0.67	0.61	0.73	0.063	0.076	Yes

[a] Final CE DQO is interpolated from Table 6 in the test/QA plans using the equation:
Half width DQO = -0.2295 CE + 0.22972.

In all cases, the testing process and the resulting data were determined by the MRI QA manager to have met the specified quality criteria, although there were significant uncontrollable plan deviations related to field conditions.

The RTI quality manager has reviewed the above information (including the deviations from the test plan, noted in Section 2.4), has sampled the data against the specified criteria, and concurs with the MRI assessment that the DQOs were met for the overall test. The APCT director has determined that the data are usable as intended in the planning documents.

2.4 Deviations from Test Plan

Significant deviations from the test/QA plan are discussed below and are shown in Tables 4 and 5 for FLW and MC, respectively. Changes in the application dates are also summarized in the tables.

Table 4. Summary of Test Event Deviations for FLW

Project activities	Planned date	Actual date	Test period[a]
Unexpected road maintenance	Not planned	September 16, 2002	Not applicable (NA)
End of 1st test period	September 2002	October 12–14, 2002	5U, 5C
Suppressant reapplication	September 2002	October 18–28, 2002	NA
End of 2nd test period	January 2003	Not performed because of consistently bad weather	None, per modified Test/QA Plan
Suppressant reapplication	January 2003	March 8, 2003	NA
End of 3rd test period	April 2003	May 24–26, 2003	5U, 5C
Suppressant reapplication	April 2003	June 14, 2003	NA
Road traffic increased with construction	Not planned	July 21–October 10, 2003	NA
End of 4th test period	July 2003	October 10–12, 2003	5U, 5C

[a] 5U means five uncontrolled replicate measurements; 5C means five controlled replicate measurements.

Table 5. Summary of Test Event Deviations for MC[a]

Test event deviations	Planned	Actual	Test period[b]
Initial suppressant application, site #2	February 2003	March 5, 2003	NA
End of 1st test period	May 2003	May 13–15, 2003	5U, 5C
Suppressant reapplication	May 2003	May 14, 2003	NA
Unexpected road maintenance	Not planned	Late July 2003	NA
End of 2nd test period	August 2003	August 6–7, 2003	5U, 5C

[a] Due to early, unauthorized test road disturbance, this summary is based on Rev 3 of the test/QA plan, which specified 6 months of testing (2 quarterly test periods).
[b] 5U means five uncontrolled replicate measurements; 5C means five controlled replicate measurements.

The FLW test/QA plan stated that background PM concentration values would be collected from an ambient PM monitor; however, the monitoring station in question collects only meteorological data and does not contain a PM monitor. Therefore, MRI operated a background PM sampler at the Range 12 building [located approximately 1 kilometer (km) east of the test section] where line electrical power was available.

The FLW and MC test/QA plans stated that the CE "will be determined relative to its decay over time and with traffic." Because the vendor chose to reapply the dust suppressants following each test period, this was not achievable. At least three test periods between applications would have been required to calculate a CE decay rate. Moreover, the decay rate would have changed from application to application because of the increasing inventory of dust suppressant in a specific road segment.

The projected schedule for the dust suppressant tests at FLW called for four quarters of planned tests starting in June 2002. The time between test periods was originally planned to be approximately 90 days, to represent seasonal differences in CE; however, not all of the planned four quarters of testing were conducted. Testing was conducted for three 6-month periods at FLW and was conducted for two quarterly test periods at MC.

As noted earlier, damage to the original controlled test section led to the revision of the MC test/QA plan. This revised plan substituted a 6-month study, with test periods in May and August, in place of the original year-long verification program and four test periods.

Both the FLW and MC test plans mentioned a pneumatic traffic counter and a data logger for on-site wind measurements; however, neither of these was deployed during the test program. Instead, training records supplied by the Army were used to estimate the total convoy traffic during the field program at FLW. Maricopa County Department of Transportation personnel were asked to provide an estimate for the average daily traffic (ADT) value for the Arizona test site. Traffic data are described in Section 3.1.1. The Army supplied meteorological records for both the Forney Army Airfield (located within 5 km of the test site) and the Bailey wind station (located immediately west of the test site). Meteorological data for the MC site were obtained through Arizona Meteorological Network (AZMET) for a station 12 km to the east of the Broadway test site. Meteorological data are described in Section 3.1.2.

Deviations during the individual test periods at FLW and in MC are discussed in the following paragraphs.

October 2002 Test Period at FLW. Both the field tests and the reporting of results occurred later than originally called for in the test/QA plan. The delay in testing was directly due to the unexpected road maintenance during the week of September 16, 2002, which occurred at the request of a Directorate of Public Works (DPW) contractor. This action required a delay of approximately 2 weeks to assess the extent to which the treated surface had been affected and whether testing of the surface would produce results useful to the program. Based on anecdotal information from the grader operator as well as photographs of the surface, it was determined that the surface had been covered with loose material (pulled from the side of the road). Subsequent discussions between DPW, the product vendors, RTI, and MRI led to general agreement to continue with conducting a first test in October 2002.

January 2003 Test Period at FLW. As noted above, persistently unfavorable winter weather during January and February 2003 forced the abandonment of the second quarterly test.

May 2003 Test Period at FLW. During the field audit conducted on May 26, 2003, it was determined that the $PM_{2.5}$ background monitor operated at a flow of approximately 9 liters per minute (lpm) [0.32 cubic feet per minute (cfm)] rather than the target of 16.7 lpm (0.59 cfm). Because the background concentration was used only to estimate the maximum contribution that ambient PM levels could contribute to the mass collected by the mobile sampler, the contribution for $PM_{2.5}$ was conservatively estimated using the PM_{10} background level. This point is discussed further in Section 3.1.

Another deviation concerned the location of the uncontrolled test section during the May 26, 2003, tests. On that day, a portion of uncontrolled test section (Section F in the test plan) was still damp from rain during the morning of May 25. For that reason, an uncontrolled 150-m (500-ft) section farther west along the same road was substituted.

October 2003 Test Period at FLW. Both the field tests and the reporting of results occurred later than originally called for in the test/QA plan. The delay in testing was due to rainfall over Labor Day weekend. Testing was rescheduled for Columbus Day weekend. No quarterly test report was prepared pending preparation of the final report.

Rainfall on the day before MRI's arrival left all sections damp. In addition, the uncontrolled test site (Section F) was so heavily potholed that the mobile sampler could not be safely operated at the designated vehicle speed. Uncontrolled tests were moved to an untreated section of the same road to the west that exhibited better drainage than Section F. As noted earlier, MRI used traffic to dry the road before beginning a test period.

May 2003 Test Period at MC. The speedometer on the test vehicle was inoperative because of a fuse problem. For that reason, vehicle speed was monitored using a new handheld global positioning system (GPS) unit. The GPS readings were checked against a rental car's speedometer and were found to agree within 2 mph at 25 and 35 miles per hour (mph).

A filter used on test run CKO-131 did not pass initial audit during the tare weighing, but was not reweighed as required by MRI SOP-8403.

August 2003 Test Period at MC. No quarterly report was prepared for this test period, pending preparation of the final report. Test speeds were monitored using the same handheld GPS as used during the May 2003 tests. Some unexpected road maintenance appeared to have occurred since the time of the May 2003 visit. The entire test road in MC appeared to have been bladed. The vendor interviewed persons living near the test site who remarked that the road had been bladed prior to the test visit.

3.0 Test Conditions

3.1 General Test Site Conditions

The test/QA plans for FLW and MC document the sites and road sections used during dust suppressant testing.

One of the host facilities for the field test program, FLW, is a U.S. Army base. The test site at FLW used unpaved Roads P and PA in training area (TA) 236. Roads P and PA are the main access routes to TA 236 and are traveled by truck convoys, as well as traffic into and out of TA 236. Test sections A, B, C, and D are located on Road PA, while test section E is located along Road P. EK35 was applied to test section A. Other products tested during this program were applied to the other test sections. The sixth test section (F), also located on Road P, was left untreated as the experimental control. The EK35 product was tested on a curved section of road, which would have subjected the treated road surface to greater shear stress. Figure 1 shows the test locations at FLW.[3]

The other host facility for the field test program, MC, is located on Broadway Road (a county road) near the towns of Buckeye and Wintersburg, Arizona. The sections used for dust suppressant testing were on portions of the road constructed of shale. The road typically experiences approximately 150 vehicle passes per day, with the majority of passes by light-duty cars and trucks. Much of the traffic appears to be associated with local residents commuting to their workplaces and thus occurs during the early morning and late afternoon hours. Test sections were located on Broadway Road east of 355thAvenue. EK35 was evaluated on the section farther east of 355th Avenue. The uncontrolled measurements were conducted on a separate section of Broadway Road. Figure 2 shows the test locations at MC.[4]

Figure 1. Test locations at FLW

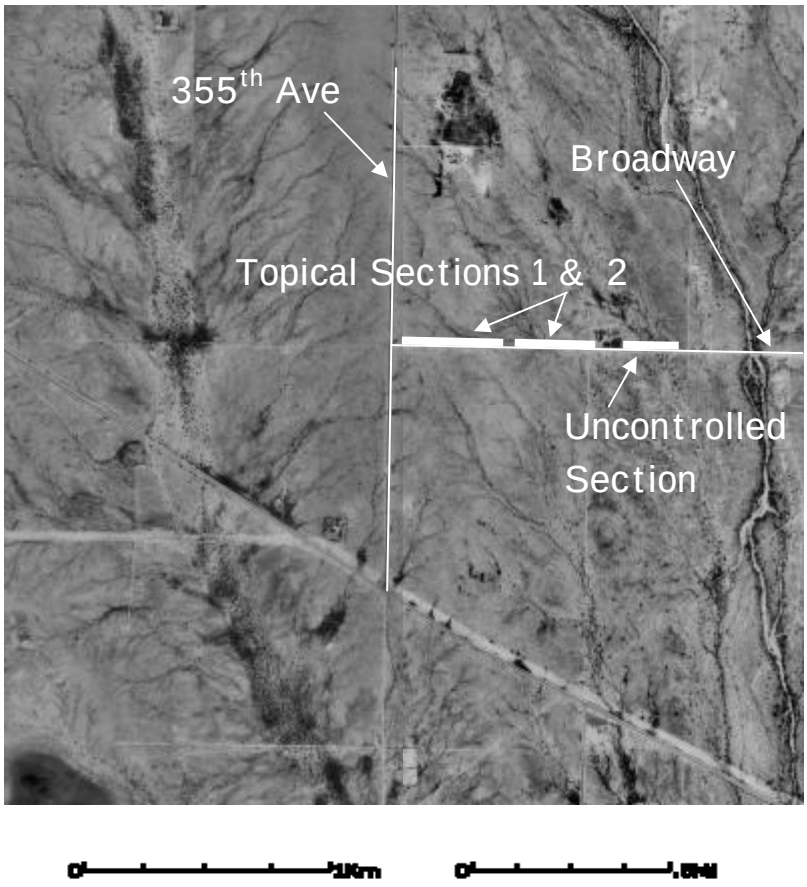

Figure 2. Test locations at MC

3.1.1 Traffic

All sections of the test site at FLW were exposed to military traffic, consisting of 2.5- and 5-ton trucks, as well as sport-utility type vehicles (such as Chevrolet Blazers). This traffic occurred during training days (typically Monday through Friday). Based on records supplied by the Army, an estimated 3,650 convoy vehicles traveled over the test surface during the entire field program. This does not include other Army-related traffic, for which records are not kept. Furthermore, additional light-duty vehicular traffic took place due to recreational use of the fort during weekends. Finally, an additional 60 passes by a Ford F-250 pickup occurred during each of the test periods. (Note that testing took place on days with no scheduled Army training activities.)

From July 21, 2003, to the final test period in October 2003, the EK35 test section at FLW experienced additional traffic associated with construction activities in TA 236. This traffic, which occurred Monday through Friday, averaged 40 loaded (27 ton) dump truck passes, 40 empty (11 ton) dump truck passes, and 30 to 50 car/pickup passes per day.

The Arizona test section was exposed to the naturally occurring traffic along Broadway Road in MC. Traffic consisted mostly of light-duty vehicles such as cars and pickups, with a few passes by school buses during weekdays. Based on the county's plans to pave the road in the future, an approximate value of 200 ADT can be applied to the test section. (The ADT level was measured at 247 in March 2004, approximately 7 months after the conclusion of the field measurements.) An additional 60 to 120 passes by a Ford F-150 pickup occurred during each of the test periods.

3.1.2 Area Climatic Conditions

Table 6 presents the weekly weather over the entire FLW verification period (i.e., from June 2002 when the product was first applied until the final set of tests in October 2003). These data were collected at Forney Airfield, which is located approximately 5 km (3 miles) north-northeast from the test section. (Note that the Forney station operating hours were 0600–2100 Monday through Friday, 0700–1500 Saturday, and 1100–1900 Sunday. The temperature extremes are officially valid for those timeframes.)

Table 7 contains weekly weather data for the MC site for the period of March to August 2003. The meteorological data were taken at a station in Buckeye maintained by the Roosevelt Irrigation District. The station, located at latitude 33° 24' north and longitude 112° 41' west, lies approximately 12 km (8 miles) to the east of the Broadway test site.

A summary of the precipitation for all the test periods at FLW and MC is shown in Table 8.

Table 6. Weekly Weather for FLW

Site weather				
Week beginning	Air temp, ºC (°F)		Precipitation, cm (in.)	
	Maximum	Minimum	Liquid	Frozen
06/02/02	32 (90)	13 (56)	2.2 (0.88)	0 (0)
06/09/02	31 (87)	14 (58)	1.2 (0.48)	0 (0)
06/16/02	33 (91)	13 (56)	0 (0)	0 (0)
06/23/02	33 (92)	19 (66)	0.61 (0.24)	0 (0)
06/30/02	33 (92)	20 (68)	2.0 (0.79)	0 (0)
07/07/02	36 (97)	20 (68)	1.0 (0.41)	0 (0)
07/14/02	35 (95)	18 (64)	0.03 (0.01)	0 (0)
07/21/02	37 (98)	19 (67)	2.6 (1.0)	0 (0)
07/28/02	37 (99)	21 (69)	0.03 (0.01)	0 (0)
08/04/02	36 (97)	16 (61)	0.2 (0.07)	0 (0)
08/11/02	31 (87)	18 (64)	4.1 (1.6)	0 (0)
08/18/02	33 (92)	20 (68)	0.89 (0.35)	0 (0)
08/25/02	29 (85)	17 (62)	0 (0)	0 (0)
09/01/02	31 (88)	17 (63)	0 (0)	0 (0)
09/08/02	32 (90)	14 (58)	0 (0)	0 (0)

(continued)

Table 6. (continued)

Site weather				
Week beginning	**Air temp, ºC (°F)**		**Precipitation, cm (in.)**	
	Maximum	**Minimum**	**Liquid**	**Frozen**
09/15/02	31 (87)	17 (63)	3.6 (1.4)	0 (0)
09/22/02	27 (81)	8 (46)	0 (0)	0 (0)
09/29/02	32 (89)	16 (60)	0.58 (0.23)	0 (0)
10/06/02	20 (68)	5 (41)	0.48 (0.19)	0 (0)
10/13/02	18 (64)	1 (33)	0.56 (0.22)	0 (0)
10/20/02	19 (67)	2 (36)	5.1 (2.0)	0 (0)
10/27/02	11 (52)	0 (32)	4.1 (1.6)	0 (0)
11/03/02	22 (71)	2 (36)	1.8 (0.72)	0 (0)
11/10/02	18 (64)	-2 (28)	1.7 (0.65)	0 (0)
11/17/02	18 (65)	0 (32)	0 (0)	0 (0)
11/24/02	16 (61)	-6 (21)	0.03 (0.01)	0 (0)
12/01/02	15 (59)	-9 (15)	1.7 (0.68)	16 (6.2)
12/08/02	11 (52)	-4 (24)	0.38 (0.15)	0 (0)
12/15/02	18 (65)	1 (33)	3.7 (1.4)	0 (0)
12/22/02	4 (40)	-12 (11)	3.4 (1.4)	34 (14)
12/29/02	18 (65)	-7 (19)	1.3 (0.52)	0.8 (0.3)
01/05/03	21 (70)	-6 (22)	0.43 (0.17)	0 (0)
01/12/03	6 (43)	-14 (7)	0.33 (0.13)	4.8 (1.9)
01/19/03	13 (56)	-19 (-2)	0.43 (0.17)	4.3 (1.7)
01/26/03	19 (67)	-10 (14)	0.38 (0.15)	0 (0)
02/02/03	23 (74)	-15 (5)	0.69 (0.27)	7.9 (3.1)
02/09/03	14 (57)	-4 (24)	2.7 (1.1)	2 (0.9)
02/16/03	12 (54)	-6 (22)	2.1 (0.83)	0.3 (0.1)
02/23/03	4 (40)	-14 (6)	1.7 (0.66)	18 (7.2)
03/02/03	24 (76)	-7 (20)	0.05 (0.02)	0 (0)
03/09/03	25 (77)	-8 (17)	1.7 (0.66)	0 (0)
03/16/03	22 (72)	4 (39)	3.6 (1.4)	0 (0)
03/23/03	25 (77)	0 (32)	2 (0.7)	0 (0)
03/30/03	29 (85)	2 (35)	0.03 (0.01)	0 (0)
04/06/03	27 (81)	0 (32)	4.7 (1.8)	0 (0)
04/13/03	29 (85)	9 (48)	0.91 (0.36)	0 (0)
04/20/03	22 (71)	5 (41)	4.2 (1.7)	0 (0)
04/27/03	30 (86)	10 (50)	1.7 (0.67)	0 (0)
05/04/03	30 (86)	14 (57)	2.3 (0.92)	0 (0)
05/11/03	26 (79)	9 (48)	3.2 (1.3)	0 (0)
05/18/03	26 (79)	9 (48)	2.1 (0.83)	0 (0)
05/25/03	31 (87)	9 (48)	1.6 (0.63)	0 (0)
06/01/03	25 (77)	9 (48)	3.7 (1.4)	0 (0)
06/08/03	28 (83)	13 (56)	6.6 (2.6)	0 (0)
06/15/03	29 (84)	14 (57)	2 (0.6)	0 (0)

(continued)

Table 6. (continued)

Site weather				
Week beginning	Air temp, ºC (°F)		Precipitation, cm (in.)	
	Maximum	Minimum	Liquid	Frozen
06/22/03	32 (90)	13 (56)	2.6 (1.0)	0 (0)
06/29/03	34 (94)	19 (66)	0 (0)	0 (0)
07/06/03	34 (93)	17 (63)	1.2 (0.46)	0 (0)
07/13/03	36 (96)	21 (69)	3.9 (1.5)	0 (0)
07/20/03	35 (95)	14 (58)	0.03 (0.01)	0 (0)
07/27/03	37 (98)	17 (63)	4.0 (1.6)	0 (0)
08/03/03	33 (91)	18 (64)	0.1 (0.04)	0 (0)
08/10/03	34 (94)	18 (65)	0.03 (0.01)	0 (0)
08/17/03	39 (102)	21 (69)	1.5 (0.59)	0 (0)
08/24/03	37 (98)	21 (69)	4.2 (1.6)	0 (0)
08/31/03	28 (82)	12 (54)	6.4 (2.5)	0 (0)
09/07/03	31 (87)	14 (57)	2.0 (0.78)	0 (0)
09/14/03	29 (84)	7 (45)	3.3 (1.3)	0 (0)
09/21/03	29 (85)	11 (52)	3.8 (1.5)	0 (0)
09/28/03	20 (68)	4 (39)	1.7 (0.68)	0 (0)
10/05/03	24 (76)	8 (47)	1.8 (0.72)	0 (0)
10/12/03	23 (74)	8 (46)	0.2 (0.07)	0 (0)

Table 7. Weekly Weather for Buckeye, Arizona

Site weather			
Week beginning	Air temperature, ºC (°F)		Precipitation, cm (in.)
	Maximum	Minimum	
03/02/03	27 (80)	4 (40)	0 (0)
03/09/03	30 (86)	7 (45)	0 (0)
03/16/03	27 (81)	4 (39)	0.97 (0.38)
03/23/03	31 (88)	8 (47)	0 (0)
03/30/03	32 (90)	4 (40)	0 (0)
04/06/03	33 (91)	2 (35)	0 (0)
04/13/03	30 (86)	7 (44)	0.30 (0.12)
04/20/03	31 (88)	6 (42)	0 (0)
04/27/03	32 (90)	8 (47)	0 (0)
05/04/03	29 (85)	7 (44)	0 (0)
05/11/03	39 (102)	9 (48)	0 (0)
05/18/03	40 (104)	15 (59)	0 (0)
05/25/03	42 (108)	16 (60)	0 (0)
06/01/03	41 (105)	20 (68)	0 (0)
06/08/03	42 (107)	15 (59)	0 (0)
06/15/03	42 (108)	17 (62)	0 (0)
06/22/03	44 (111)	18 (64)	0 (0)
06/29/03	43 (110)	21 (70)	0 (0)
07/06/03	43 (109)	20 (68)	0 (0)
07/13/03	46 (115)	26 (79)	0.1 (0.05)
07/20/03	43 (109)	24 (75)	0.38 (0.15)
07/27/03	39 (103)	22 (72)	2.4 (0.96)
08/03/03	43 (109)	23 (74)	0 (0)

Table 8. Summary of Precipitation for All Test Periods at FLW and MC

Parameter	FLW, weekly precipitation range, cm	MC, weekly precipitation range, cm
Precipitation during test week	0.2–3.7	0
Precipitation during week before testing	0.58–3.2	0–2.4
Precipitation between application and testing, total	17–39	1.3–2.9

3.1.3 Background Particulate Concentration

During the FLW test periods, TP and PM_{10} background concentrations were measured approximately 1 km (0.6 miles) east of the test site. Background concentration data are presented in Table 9.

Table 9. Measured Background PM Concentrations at FLW

Date	Concentration, µg/m^3	
	PM_{10}	TP
10/12/02	7.1	14
10/13/02	6.5	16
10/14/02	9.1	28
5/24/03	19	23
5/26/03	19	38
10/11/03	13	19
10/12/03	5.7	7.9
10/13/03	7.2	14
Average	11	20
Maximum	19	38

Because of the previously mentioned problem with the $PM_{2.5}$ background monitor at FLW (see Section 2.4), it was not possible to measure background $PM_{2.5}$ concentrations accurately. Therefore, the $PM_{2.5}$ concentration was assumed equal to the PM_{10} concentration value. This yielded a conservatively high estimate for the contribution of background PM concentrations to the $PM_{2.5}$ sample mass catches at FLW.

Estimates made of the contributions to net sampler catches at FLW by background concentrations of TP and PM_{10} are also conservatively high because estimates assume a 30-minute (min) sampling period. As noted in the test/QA plan, the hi-vol sampler is activated only when passing over the test section; 12 passes over a 500-ft test section at 25 mph is only 160 s or 2.7 min. The conservatively high estimates of background contributions to sample catches at FLW are compared to blank filter data in Table 10. Background mass contributions were estimated by multiplying background concentration times flow rate and sampling time to arrive at a mass collected that could have been contributed by ambient air.

Table 10. Estimated Background Contribution to Sampler Catch at FLW Compared to Mean Blank Filter Data

	Weight, mg		
	TP	**PM_{10}**	**$PM_{2.5}$**
Average estimated background contribution	0.67	0.37	0.0055
Average blank filter weight	2.5	2.2	0.029

The estimated background contributions are significantly lower than the mean blank filter masses collected at FLW. Thus, background PM contributed negligibly to the net catches for the mobile sampler.

The Arizona Department of Environmental Quality (ADEQ) maintains the Palo Verde ambient air monitoring site at 36248 W. Elliott Road. The Palo Verde monitoring site is 16 km (10 miles) from the general test site area. PM_{10} and $PM_{2.5}$ are monitored on a one-day-in-six basis using reference method dichotomous samplers. The site was established to determine background concentrations on a regional scale.

The ADEQ provided the data in Table 11 for the Palo Verde site.

Table 11. Background Concentration Measurements at Palo Verde, Arizona

Date	**Concentration, µg/m^3**	
	PM_{10}	**$PM_{2.5}$**
5/9/03	24	9.0
5/15/03	103	20
5/21/03	41	12

Note that the May 15 and May 21, 2003, values represent the highest and second highest concentrations monitored at the Palo Verde site in 2003 through May 21. Conservatively high estimates of background contribution were developed for the MC site in the same manner as described above for FLW. Based on these assumptions**,** background particulate would account for no more than 3.5 mg of PM_{10} or 0.010 mg of $PM_{2.5}$ sample mass. The mean sample mass corresponding to the EK35 entries in Tables 1 and 2 was more than five times higher than these maximum background contributions.

3.2 Application of Dust Suppressant

MRI observed and documented all steps in the various applications of the dust suppressant to the road test section. EK35 is applied as received and requires no mixing with water for application. Table 12 presents the application intensity for both FLW and MC as determined through use of sampling pans located on a grid each time the product was applied.

Table 12. Application History

Date	Application intensity		Comments
	Mean, l/m^2 (gal/yd^2)[a]	Standard deviation, l/m^2 (gal/yd^2)	
FLW			
June 7–8, 2002	1.3 (0.28)	0.15 (0.034)	Applied in five passes, east half of road received slightly less than west half.
October 26, 2002	0.52 (0.12)	0.13 (0.029)	Applied in two passes, west half slightly less than east half.
March 8, 2003	0.30 (0.067)	0.027 (0.0059)	Applied in three passes, very even spray pattern.
June 14, 2003	0.75 (0.16)	0.03 (0.01)	Applied in four passes, intensity based on only two pans (misunderstanding between driver and MRI field personnel). Applied using pallet-mounted spray system housed in box truck.
MC			
March 5, 2003	0.85 (0.19)	0.063 (0.014)	Applied in four passes, very even spray pattern.
May 14, 2003	0.33 (0.074)	0.055 (0.012)	Applied in four passes, upon completion of quarterly test. Pull-behind trailer used rather than spray truck used in March 2003 application.

[a] The mean is based on the total amount applied to the surface of the road summed over all passes.

Three different pieces of spray equipment were used to apply the product. As noted in Table 12, the June 14, 2003, application at FLW and the May 14, 2003, application at MC relied on pallet- and trailer-mounted spray systems, respectively. All other applications were by a spray truck. Figure 3 shows application of EK35 product at FLW, and Figure 4 shows application of product at MC.

Treatment of the 270-m (900-ft) road segment required approximately 1 man-hour using the spray truck. Treatment using the trailer- and pallet-mounted systems required approximately 50 percent more effort because of time required to set up the system.

Figure 3. Application of EK35 product at FLW

Figure 4. Application of EK35 product at MC

3.3 Conditions During Dust Suppressant Test Runs

Table 13 presents the dates and times when dust suppressant testing was conducted at FLW and MC, including the length of road measured and meteorological conditions during each test run. As discussed previously, Tables 6 and 7 present the climatic conditions for the week during which the dust emissions tests were conducted.

Table 13. Test Run Parameters

Run	Test section	Date	Test start time	Total distance, m (ft)	Temperature, °C (°F)	Barometric pressure, mm Hg (in. Hg)
FLW						
CKO-2	Uncontrolled	10/12/02	10:36	1,800 (6,000)	22 (72)	745 (29.4)
CKO-13	Uncontrolled	10/12/02	16:50	1,800 (6,000)	23 (74)	744 (29.3)
CKO-23	Uncontrolled	10/13/02	17:14	1,800 (6,000)	13 (56)	753 (29.6)
CKO-24	Uncontrolled	10/14/02	9:28	1,800 (6,000)	13 (55)	749 (29.5)
CKO-35	Uncontrolled	10/14/02	16:21	1,800 (6,000)	19 (66)	747 (29.4)
CKO-211	Uncontrolled	5/24/03	16:15	1,800 (6,000)	24 (75)	733 (28.8)
CKO-212	Uncontrolled	5/24/03	16:40	1,800 (6,000)	26 (78)	733 (28.8)
CKO-230	Uncontrolled	5/26/03	16:16	1,800 (6,000)	26 (78)	735 (29.0)
CKO-231	Uncontrolled	5/26/03	16:45	1,800 (6,000)	26 (78)	735 (29.0)
CKO-232	Uncontrolled	5/26/03	17:08	1,800 (6,000)	24 (76)	737 (29.0)
CKO-1022	Uncontrolled	10/12/03	15:35	1,800 (6,000)	24 (76)	734 (28.9)
CKO-1028	Uncontrolled	10/13/03	11:07	1,800 (6,000)	21 (69)	729 (28.7)
CKO-1029	Uncontrolled	10/13/03	11:28	1,800 (6,000)	23 (73)	729 (28.7)
CKO-1030	Uncontrolled	10/13/03	11:49	1,800 (6,000)	23 (74)	729 (28.7)
CKO-1031	Uncontrolled	10/13/03	12:12	1,800 (6,000)	24 (76)	730 (28.8)
CKO-25	EK35, A	10/14/02	10:17	1,800 (6,000)	11 (52)	748 (29.4)
CKO-26	EK35, A	10/14/02	10:42	1,800 (6,000)	19 (67)	747 (29.4)
CKO-27	EK35, A	10/14/02	11:06	1,800 (6,000)	13 (55)	747 (29.4)
CKO-28	EK35, A	10/14/02	11:28	1,800 (6,000)	15 (59)	747 (29.4)
CKO-29	EK35, A	10/14/02	11:52	1,800 (6,000)	13 (56)	747 (29.4)
CKO-201	EK35, A	5/24/03	8:40	1,800 (6,000)	21 (69)	732 (28.8)
CKO-202	EK35, A	5/24/03	9:14	1,800 (6,000)	21 (70)	732 (28.8)
CKO-203	EK35, A	5/24/03	9:42	1,800 (6,000)	22 (72)	730 (28.8)
CKO-204	EK35, A	5/24/03	10:12	1,800 (6,000)	23 (73)	732 (28.8)
CKO-205	EK35, A	5/24/03	10:44	1,800 (6,000)	24 (76)	734 (28.9)
CKO-1012	EK35, A	10/11/03	17:03	1,800 (6,000)	24 (75)	726 (28.6)
CKO-1013	EK35, A	10/11/03	17:28	1,800 (6,000)	26 (78)	732 (28.8)

(continued)

Table 13. (continued)

Run	Test section	Date	Test start time	Total distance, m (ft)	Temperature, °C (°F)	Barometric pressure, mm Hg (in. Hg)
CKO-1014	EK35, A	10/11/03	17:53	1,800 (6,000)	21 (69)	728 (28.6)
CKO-1015	EK35, A	10/11/03	18:16	1,800 (6,000)	20 (68)	728 (28.6)
CKO-1016	EK35, A	10/11/03	18:40	1,800 (6,000)	18 (65)	730 (28.8)
MC						
CKO-111	Uncontrolled	5/13/03	17:05	3,700 (12,000)	34 (94)	734 (28.9)
CKO-112	Uncontrolled	5/13/03	17:40	3,700 (12,000)	33 (92)	734 (28.9)
CKO-131	Uncontrolled	5/15/03	8:32	3,700 (12,000)	24 (76)	734 (28.9)
CKO-132	Uncontrolled	5/15/03	9:04	3,700 (12,000)	24 (76)	734 (28.9)
CKO-133	Uncontrolled	5/15/03	9:42	3,700 (12,000)	26 (79)	734 (28.9)
CKO-406	Uncontrolled	8/6/03	11:42	1,800 (6,000)	41 (106)	737 (29.0)
CKO-407	Uncontrolled	8/6/03	12:53	1,800 (6,000)	43 (110)	735 (29.0)
CKO-413	Uncontrolled	8/7/03	8:30	1,800 (6,000)	34 (93)	735 (29.0)
CKO-414	Uncontrolled	8/7/03	8:52	1,800 (6,000)	35 (95)	737 (29.0)
CKO-415	Uncontrolled	8/7/03	9:11	1,800 (6,000)	35 (95)	734 (28.9)
CKO-122	EK35, A	5/14/03	9:31	3,700 (12,000)	28 (82)	733 (28.8)
CKO-123	EK35, A	5/14/03	9:52	3,700 (12,000)	29 (85)	733 (28.8)
CKO-124	EK35, A	5/14/03	10:30	3,700 (12,000)	33 (92)	733 (28.8)
CKO-125	EK35, A	5/14/03	10:57	3,700 (12,000)	32 (90)	732 (28.8)
CKO-126	EK35, A	5/14/03	11:35	3,700 (12,000)	33 (92)	734 (28.9)
CKO-401	EK35, A	8/6/03	9:13	3,700 (12,000)	38 (100)	737 (29.0)
CKO-402	EK35, A	8/6/03	9:52	3,700 (12,000)	39 (103)	737 (29.0)
CKO-403	EK35, A	8/6/03	10:24	1,800 (6,000)	41 (105)	737 (29.0)
CKO-404	EK35, A	8/6/03	10:51	1,800 (6,000)	40 (104)	737 (29.0)
CKO-405	EK35, A	8/6/03	11:13	1,800 (6,000)	39 (103)	737 (29.0)

Road surface samples were collected on a section each day that section was tested. The surface samples were analyzed for moisture and silt (i.e., fraction passing 200 mesh upon dry sieving). Table 14 presents the moisture content and silt content results for both FLW and MC. With the exception of test periods when unexpected road maintenance occurred (i.e., October 2002 at FLW and August 2003 at MC), the silt content of the treated road surface tends to be less than that for the untreated road section.

Table 14. Road Surface Properties

Test section	Date	Moisture content, %	Silt content, %
FLW			
Uncontrolled	10/12/02[a]	0.4	1.6
	10/13/02[a]	0.63	1.5
	10/14/02[a]	0.75	1.7
	5/24/03	1.8	4.3
	5/26/03	0.01	1.6
	10/12/03	1.4	3.0
	10/13/03	1.5	5.4
	10/13/03	0.62	1.7
EK35	10/14/02[a]	1.1	6.6
	5/24/03	0.31	2.3
	10/11/03	0.71	1.1
	10/11/03	1.0	1.7
MC			
Uncontrolled	5/14/03	0.22	4.7
	8/6/03[b]	0.32	8.8
	8/6/03[b]	0.32	9.2
EK35	5/14/03	0.17	1.7
	8/6/03[b]	0.33	2.9

[a] Unexpected road maintenance activity occurred at FLW in September 2002 prior to the October 2002 test period.
[b] Unexpected road maintenance activity appeared to have occurred at MC after the time of the May 2003 visit and prior to the August 2003 test period.

4.0 References

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13. ABC Laboratories, Inc. 2002. A*cute and Chronic Toxicity of Dust Suppression Products A, B, E, Perma-Zyme 11X, and Soil Sement Engineered Formula to Ceriodaphnia dubia, Fathead Minnow (Pimephales promelas), and Americamysis bahia.* Columbia, Missouri. September.

14. Tri-State Laboratories, Inc. 2002. Laboratory Analysis Report. Youngstown, Ohio. July. Report may be obtained from RTI International.

15. Peterson, M. 2002. "Laboratory analysis report for dust suppressants." E-mail and attachments from M. Peterson, RTI, to D. Franke, RTI. November 18, 2002.

16. ETV. 2004. *Generic Verification Protocol for Dust Suppression and Soil Stabilization Products*. RTI International, Research Triangle Park, NC.

Appendix A

Environmental Testing Results

A copy of ABC Laboratories' summary report for aquatic toxicity testing on five dust suppression products[13] is retained in the RTI International project files. The results for EK35 are summarized below.

Solution Preparation

Solutions were prepared on a weight-to-volume basis for all compounds. The liquid sample for EK35 was not water soluble and was conducted as Water Accommodated Fractions (WAF). Liquid sample EK35 was weighed out on large glass microscope slides and suspended in a beaker of water containing a Teflon stir bar. The beakers were placed on a stir plate and stirred overnight. Solutions were drawn off by siphoning the solutions into another glass container leaving a small amount of solution in the beaker. The remaining solution contained undissolved test compound that was floating on the surface of the water in the beaker. This undissolved test compound was not included in solutions for two reasons: (1) so that it would not cause a decrease in dissolved oxygen transfer by covering the surface of the test vessels, and (2) so that it would not cause secondary toxicity from impairment of the animal's respiratory system in the case of the fathead minnow's gills or cause any impairment in the appendages of the *Ceriodaphnia dubia* or *Americamysis bahia*.

Test Design

Where preliminary testing indicated no mortality at concentrations of 1,000 milligrams per liter (mg/L), abbreviated or limit studies were performed. Acute studies run as limit tests were conducted with a control and a single concentration at 1,000 mg/L. Chronic studies were conducted with a control and three test levels: 250, 500, and 1,000 mg/L. All other studies were conducted with five or six test levels and a control.

Statistical Analysis

Statistical analysis of the concentration versus effect data was performed using a custom computer program, ToxCalc from Tidepool Scientific Software. This program is designed to calculate the lethal concentration, 50 percent (LC_{50}) / effective concentration, 50 percent (EC_{50}) statistic and its 95 percent confidence interval (CI), as applicable, using the appropriate EPA recommended analysis. Statistical significance of comparison of means for *Ceriodaphnia dubia*, fathead minnow, and *Americamysis bahia* survival and reproduction, growth, and fecundity was determined by hypothesis testing using either Fisher's Exact test or Dunnett's test. Point estimate testing to calculate the LC_{50} or EC_{50} were determined with the Trimmed Spearman-Karber method.

Generally, the statistical approach was as follows: Analysis of each endpoint between samples was evaluated by first analyzing the data for normality and homogeneity of variances with Shapiro-Wilk's Test and Kolmogorov D's Test before comparison of means. If the data were normally distributed and the variances were homogeneous, then analysis of variances (ANOVA) was used for the weight data, along with Fisher's Exact Test or Dunnett's procedure for comparing the means. Survival data were analyzed using Fisher's Exact test, and growth or reproduction data were analyzed using Dunnett's. If the assumptions of normality or homogeneity of variance were not met, transformations of the survival data were employed to allow the use of parametric procedures. If transformations (e.g., arc sine-square root transformation) of the survival data still did not meet assumptions of normality and homogeneity, then the nonparametric test, Steel's Many-One Rank Test, was used to analyze these data.

47551 *Ceriodaphnia dubia* Acute Tests (August 20–22, 2002)

This test was conducted as a limit test with levels of control and 1,000 mg/L. Mortality was 0 percent in both the control and the 1,000 mg/L concentration. The 48-hour LC_{50} for survival was greater than (>) 1,000 mg/L. The no observed effect concentration (NOEC) was 1,000 mg/L, and the lowest observed effective concentration (LOEC) was >1,000 mg/L.

47552 Fathead Minnow Acute Tests (August 14–21, 2002)

This test was conducted as a multi-concentration test with levels of control, 31.3, 62.5, 125, 250, 500, and 1,000 mg/L. Mortality was 5 percent in the control. Mortality was 0, 5, 10, 30, 100, and 100 percent in the 31.3, 62.5, 125, 250, 500, and 1,000 mg/L test levels, respectively. The 96-hour LC_{50} for survival was 271 mg/L with 95 percent CIs of 229 to 321 mg/L. The NOEC was 125 mg/L and the LOEC was 250 mg/L.

47553 *Americamysis bahia* Acute Tests (August 22–26, 2002)

This test was conducted as a multi-concentration test with levels of control, 31, 63, 130, 250, and 500 mg/L. Mortality was 0 percent in the control. Mortality was 0, 5, 65, 100, and 100 percent in the 31, 63, 130, 250, and 500 mg/L test levels, respectively. The 96-hour LC_{50} for survival was 111 mg/L with 95 percent CIs of 94 to 131 mg/L. The NOEC was 63 mg/L and the LOEC was 130 mg/L.

47554 *Ceriodaphnia dubia* Chronic Tests (August 21–28, 2002)

This test was conducted as a multi-concentration test with levels of control, 250, 500, and 1,000 mg/L. Mortality was 0 percent in the control. Mortality was 0, 20, and 50 percent in the 250, 500, and 1,000 mg/L concentrations, respectively. The 7-day LC_{50} for survival was >1,000 mg/L. For survival, the NOEC was 500 mg/L and the LOEC was 1,000 mg/L. The 7-day EC_{50} for reproduction was 375 mg/L with 95 percent CIs of 332 to 425 mg/L. For reproduction, the NOEC was 250 mg/L and the LOEC was 500 mg/L.

47555 Fathead Minnow Chronic Tests (August 14–21, 2002)

This test was conducted as a multi-concentration test with levels of control, 15.6, 31.3, 62.5, 125, and 250 mg/L. Mortality was 3 percent in the control. Mortality was 3, 13, 23, 57, and 100 percent in the 15.6, 31.3, 62.5, 125, and 250 mg/L test levels, respectively. The 7-day LC_{50} for survival was 97 mg/L with 95 percent CIs of 81 to 116 mg/L. For survival, the NOEC was 31.3 mg/L and the LOEC was 62.5 mg/L. The 7-day EC_{50} for growth was 114 mg/L with 95 percent CIs of 14 to 959 mg/L. For growth, the NOEC was 31.3 mg/L and the LOEC was 62.5 mg/L.

47556 *Americamysis bahia* Chronic Tests (August 29–September 5, 2002)

This test was conducted as a multi-concentration test with levels of control, 25, 50, 100, 200, and 400 mg/L. Mortality was 8 percent in the control. Mortality was 13, 33, 100, 100, and 100 percent in the 25, 50, 100, 200, and 400 mg/L test levels, respectively. The 7-day LC_{50} for survival was 59 mg/L. For survival, the NOEC was 25 mg/L and the LOEC was 50 mg/L. The 7-day EC_{50} for growth was >50 mg/L. For growth, the NOEC was 50 mg/L and the LOEC was >50 mg/L. The 7-day EC_{50} for fecundity was >50 mg/L. For fecundity, the NOEC was 50 mg/L and the LOEC was >50 mg/L.

Appendix B

Chemical Testing Results

Tri-State Laboratories' analysis report of five dust suppression products[14] is retained in the RTI International project files. The results for EK35 are included on the pages that follow.

Appendix C

Method 24 Results

Table C-1 shows the results of the Method 24 analysis conducted by RTI International.[15]

Table C-1. Summary of EPA Method 24 Analysis for EK35

Sample ID	ASTM D1475	ASTM D2369	ASTM D3792
	Density, g/mL	Total Volatiles, wt %	Water, wt %
EK35	0.8956	10.96[a]	0.00

NOTE: Each value is the average of two measurements.

[a] Duplicate measurements did not meet criterion (analysis repeated four times).

EK-35® ENVIRONMENTAL DATA

VOC, SEMI-VOLATILES, METALS,TCLP, PAH TESTS

PERFORMED BY: TSL, Tri-State Laboratories

REPORT DATA: July 15, 2002

SUMMARY: As part of the US EPA Environmental Technology Verification (ETV) Program EKK 35® was tested to determine major, minor and trace constituents using various EPA test methods.

Bulk analysis techniques were used to quantitatively determine the presence of Title 22 metals, Volatile Organic Compounds (VOC), Semi-volatiles, pesticides herbicides and Polynuclear Aromatic Hydrocarbons (PAH) in EK 35®. Bulk analysis is performed on the sample in the "as received" form and does not consider application rates, dilution ratios or environmental conditions. The vast majority of the analytes were found to be Below Detection Limits (BDL). Ever evolving sophistication of analytical methods and techniques have made detection limits well below regulatory levels. Some metals were detected at low levels, primarily iron and that can be attributed to the use of carbon steel tanks in transportation and storage.

Toxicity Characteristic Leaching Procedure (TCLP) is a sample preparation and battery of tests that can determine the presence of various elements and chemical compounds in a landfill type situation. In this test EK-35® is subjected to chemical extractions to “leach” the analytes from the product. This includes metals, volatiles and semivolatiles analysis. Once again most analytes were determined to be "below detection limits" and all were well below regulatory levels. Low level "hits" of cadmium and silver can be attributed to processing and handling.

RESULTS: Results indicate that EK-35® contains no bulk analysis or TCLP elements or compounds above regulatory levels. Most materials were not detected in EK-35® Please see attached for results..

EK 35®
ENVIRONMENTAL DATA

Acute and Chronic Aquatic Toxicity

PERFORMED BY: ABC Laboratories, Inc.

REPORT DATA: September 16, 2002

SUMMARY: As part of the US EPA Environmental Technology Verification (ETV) Program EK 35® (Liquid Sample A) was tested to determine chronic and acute toxicity to aquatic species: Ceriodaphnia dubia, Fathead minnow and Americamysis bahia (Mysid shrimp).

Concentrated EK 35® was evaluated per the following EPA test methods:

*Methods for Measuring the Acute Toxicity of Effluents and Receiving Water to Freshwater and Marine Organisms, EPA/600/4-90/027F.

*Short-term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms, EPA/600/4-91/002.

*Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Water to Marine and Estuarine Organisms, EPA/600/4-91/003.

RESULTS: The results indicate that EK 35® has low aquatic toxicity levels and is not considered an aquatic pollutant.

Ceriodaphnia dubia Acute, EC_{50}:	>1000mg/L
Fathead minnow Acute, LC_{50}:	271mg/L
Americamysis bahia Acute, EC_{50}:	111mg/L
Ceriodaphnia dubia Chronic, EC_{50}:	>1000mg/L
Fathead minnow Chronic, LC_{50}:	97.3mg/L
Americamysis bahia Chronic, EC_{50}:	58.6mg/L

STUDY TITLE

7-Day Survival and Growth Tests of Dust Suppression Products EK-35 and EnviroKleen to the Rainbow Trout, *Oncorhynchus mykiss*, Determined Under Static Renewal Conditions

SPONSOR

Midwest Industrial Supply
1101 3rd Street Southeast
Canton, Ohio 44707

AUTHOR

Chris Hughes
Associate Scientist

REPORT COMPLETED ON

September 3, 2003

PERFORMING LABORATORY

ABC Laboratories, Inc.
7200 E. ABC Lane
Columbia, Missouri 65202

PROJECT ID

48341

SIGNATURE PAGE

Submitted by: ABC Laboratories, Inc.
7200 E. ABC Lane
Columbia, Missouri 65202

Prepared by:

_____

Chris Hughes Date
Associate Scientist
ABC Laboratories, Inc.

ACUTE TOXICITY COMPENDIUM

Subject: 7-Day Survival and Growth Tests of Dust Suppression Products EK-35 and EnviroKleen to the Rainbow Trout, *Oncorhynchus mykiss*, Determined Under Static Renewal Conditions

Sponsor: Midwest Industrial Supply
1101 3rd Street Southeast
Canton, Ohio 44707

Test Substances: EK-35 and EnviroKleen

Definitive Test Concentrations: EK-35: 0 (control), 5.0, 10, 20, 40, and 80 mg/L
EnviroKleen: 0 (control), 250, 500, and 1,000 mg/L

Solution Preparation: WAF (Water Accommodated Fraction), Stirred overnight

Definitive Test Dates: August 6 to 13, 2003

Duration of Test: 7 days

Organism Source: In-house cultures

Age at Initiation: 57 days post-hatch

Test Procedures and Conditions:

Temperature:	12 ± 2°C
Lighting:	Ambient laboratory lighting, 16:8-hr light:dark
Observations:	Days 1, 2, 3, 4, 5, 6, and 7
Test chambers:	4-L glass containers
Volume per chamber:	3.0 L
Replicates per treatment:	4
Organisms per chamber:	5
Organisms per treatment:	20
Dilution water:	Blended freshwater
Solution renewal:	Daily
Aeration:	60-100 bubbles/minute

Methods:

U.S. EPA. 2002. Methods for Measuring the Acute Toxicity of Effluents and Receiving Waters to Freshwater and Marine Organisms, 5th ed. U.S. Environmental Protection Agency, EPA/84/R-02/012.

U.S. EPA. 2002. Short-Term Methods For Estimating The Chronic Toxicity Of Effluents And Receiving Water To Freshwater Organisms, Fourth Edition. EPA/821/R-02/013. 335 p.

U.S. EPA. 1994. Short-Term Methods For Estimating The Chronic Toxicity Of Effluents And Receiving Water To Marine and Estuarine Organisms, Third Edition. EPA/821/R-02/014.

Toxcalc™ Version 5.0, Release 6.12. Copyright 1994 by Tidepool Scientific Software: Michael A. Ives.

Results:

Rainbow Trout 7-Day Static Renewal Test with EK-35 Cumulative Percent Mortality							
Nominal Loading Concentration (mg/L)	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
Control	0	0	0	0	0	0	0
5.0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0
20	0	0	0	10	10	10	35
40	65	75	80	90	95	95	95
80	100	100	100	100	100	100	100
Note: Five fish per replicate, 20 fish per treatment.							

Rainbow Trout 7-Day Static Renewal Test with EnviroKleen Cumulative Percent Mortality							
Nominal Loading Concentration (mg/L)	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
Control	0	0	0	0	0	0	0
250	0	0	0	0	0	0	0
500	0	0	0	0	0	0	0
1,000	0	0	0	0	0	0	0
Note: Five fish per replicate, 20 fish per treatment.							

Rainbow Trout 7-Day Static Renewal Test with EK-35 Mortality and Growth		
Nominal Loading Concentration (mg/L)	Mortality at 7 Days (%)	Mean Weight per Fish (mg)
Control	0	153.5
5.0	0	174.7
10	0	151.5
20	35	110.2
40	95	115.2
80	100	NA

Rainbow Trout 7-Day Static Renewal Test with EnviroKleen Mortality and Growth		
Nominal Loading Concentration (mg/L)	Mortality at 7 Days (%)	Mean Weight per Fish (mg)
Control	0	140.0
250	0	149.9
500	0	152.9
1,000	0	155.2

Rainbow Trout 7-Day Static Renewal Test with EK-35 Water Quality Ranges			
Solution ID	Temperature (ºC)	Dissolved Oxygen as mg/L (% Saturation)	pH
New Solutions	12.4 – 13.0	8.5 – 9.9 (84 – 98)	8.2 – 8.6
Old Solutions	11.7 – 12.9	3.6 – 11.5 (35 – 112)	7.5 – 8.5

Notes: Beginning at Day 1, gentle aeration was provided on all new solutions after renewals at a rate of 60-100 bubbles/minute. After aeration was provided, dissolved oxygen remained ≥4.0 mg/L (40% saturation) for the remainder of the study.

100% saturation at 12 and 13°C corrected for local altitude and mean barometric pressure is 10.3 and 10.1 mg/L, respectively.

Rainbow Trout 7-Day Static Renewal Test with EnviroKleen Water Quality Ranges			
Solution ID	Temperature (ºC)	Dissolved Oxygen as mg/L (% Saturation)	pH
New Solutions	12.3 – 13.2	8.4 – 10.1 (83 – 100)	8.2 – 8.5
Old Solutions	11.7 – 12.7	3.3 – 10.8 (32 – 105)	7.6 – 8.3

Notes: Beginning at Day 1, gentle aeration was provided on all new solutions after renewals at a rate of 60-100 bubbles/minute. After aeration was provided, dissolved oxygen remained ≥6.9 mg/L (67% saturation) for the remainder of the study.

100% saturation at 12 and 13°C corrected for local altitude and mean barometric pressure is 10.3 and 10.1 mg/L, respectively.

Statistical Analysis:

Rainbow Trout 7-Day Static Renewal Test Statistical Analysis (mg/L)						
Sample ID	7-Day Survival			7-Day Growth		
	LC_{50} (95% CI)	NOEC	LOEC	EC_{50} (95% CI)	NOEC	LOEC
EK-35	23 (19 – 27)	10	20	>10	10	>10
EnviroKleen	>1,000	1,000	>1,000	>1,000	1,000	>1,000

Discussion:

Solution Preparation:

Solutions were prepared on a weight to volume basis for both compounds. EK-35 and EnviroKleen were not water-soluble and were conducted as the water accommodated fraction (WAF). EK-35 was weighed out on glass microscope slides and added to the preparation jars of water. The jars were placed on a stir plate and stirred overnight. Solutions were drawn off by siphoning the solutions into replicate test chambers. This undissolved test compound was not included in solutions for two reasons. One, so that it would not cause a decrease in dissolved oxygen transfer by covering the surface of the test vessels, and two, so that it would not cause secondary toxicity from impairment of the test fish respiratory system in the case of the rainbow trout gills. The EnviroKleen sample was weighed out into 20-mL glass vials and mixed directly into the WAF preparation jars to stir overnight.

Test Design:

A 72-hour static range-finding study was conducted at nominal loading concentrations of 0 (control), 10, 100, and 1,000 mg/L. Mortality was 0, 0, 100, and 100% in the EK-35 concentrations of 0 (control), 10, 100, and 1,000 mg/L, respectively. No mortality was observed in the any of the EnviroKleen concentrations. Based upon the results of the range-finding test, the definitive tests were conducted at nominal loading concentrations of 0 (control), 5.0, 10, 20, 40, and 80 mg/L for EK-35, and as an abbreviated definitive for EnviroKleen with nominal loading concentrations of 0 (control), 250, 500, and 1,000 mg/L.

Statistical Analysis:

Statistical analysis of the concentration versus effect data was performed using a custom computer program, ToxCalc. This program is designed to calculate the LC_{50}/EC_{50} statistic and its 95% confidence interval (CI), where possible, using the appropriate EPA recommended analysis. Statistical significance of comparison of means for Rainbow Trout survival and growth was determined by hypothesis testing using EPA recommended methods, typically either Fisher's Exact test or Dunnett's test. Point estimates testing to calculate the LC_{50} or EC_{50} was determined with the Trimmed Spearman-Karber method where possible.

Generally, the statistical approach was as follows. Analysis of each endpoint between samples was evaluated by first analyzing the data for normality and homogeneity of variance with Shapiro-Wilk's Test and Kolmogorov D's Test before comparison of means. If the data were normally distributed and the variances were homogeneous, then analysis of variance (ANOVA) was utilized for the weight data along with Fisher's Exact Test or Dunnett's procedure for comparing the means. Survival data were analyzed using Fisher's Exact test and growth was analyzed using Dunnett's. If the assumptions of normality or homogeneity of variance were not met, transformations of the survival data were employed to allow the use of parametric procedures. If transformations (e.g., arcsine-square root transformation) of the survival data still did not meet assumptions of

normality and homogeneity, then the non-parametric test, Steel's Many-One Rank Test, was used to analyze these data.

Biological Results:

EK-35:

This study was conducted as a multi-concentration test with levels of 0 (control), 5.0, 10, 20, 40, and 80 mg/L. Mortality was 0% in the control. After seven days, mortality was 0, 0, 35, 95, and 100% in the 5.0, 10, 20, 40, and 80 mg/L, respectively. The 7-day LC_{50} for survival was 23 mg/L with 95% confidence intervals of 20 to 27 mg/L. For survival the no-observed effect concentration, or NOEC was 10 mg/L and the lowest observed effective concentration, or LOEC, was 20 mg/L. The 7-day EC_{50} for growth was 23 mg/L with 95% confidence intervals of 19 to 27 mg/L. For growth, the NOEC was 10 mg/L and the LOEC was >10 mg/L.

EnviroKleen:

This study was conducted as an abbreviated test with levels of 0 (control), 250, 500, and 1,000 mg/L. After seven days, no mortality was observed in any control or test substance treatment. The 7-day LC_{50} for survival was >1,000 mg/L and a 95% confidence intervals could not be calculated. For survival the NOEC was 1,000 mg/L and the LOEC was >1,000 mg/L. The 7-day LC_{50} for growth was >1,000 mg/L and the 95% confidence intervals could not be calculated. For growth the NOEC was 1,000 mg/L and the LOEC was >1,000 mg/L.

The Boeing Company
P.O. Box 3707
Seattle, WA 98124-2207

December 1, 2000
BTS #6890
Contract #6-1171-10A6890

Mr. Robert Vitale
Midwest Industrial Supply, Inc.
1101 3rd Street SE
Canton, Ohio 44707
Phone: (330) 456-3121
Fax: (330) 456-3247

Dear Mr. Vitale:

Midwest's EK35 product has been confirmed by Boeing-performed testing to meet the Boeing Specification D6-17487, Evaluation of Aircraft Maintenance Materials. EK35 will be non-injurious to aircraft surfaces when used as a stabilizing agent and dust suppressant as specified by Midwest Industrial Supply, Inc.

Sincerely,

The Boeing Company
Acting through
BOEING TECHNOLOGY LICENSING & SERVICES

Kenneth J. Cooper
Contracts & Licensing Manager

SR 10135 **Date: 26 September, 2000**

To: Bob Renz 19-JL

cc: Matthias Schriever 73-40
David Pollock 73-40
Eric Barta 73-40

Subject: Evaluation of Midwest Industrial's EK35 Product in Accordance with D6-17487 "Evaluation of Airplane Maintenance Materials" for Possible Use as a Dust Suppressant for Unimproved Runways

ABSTRACT

Midwest Industrial Supply, Inc. of Canton, Ohio supplied BTS with a sample of their EK35 product for evaluation. They requested that four tests be run in accordance with D6-17487 "Evaluation of Airplane Maintenance Materials" for possible use as a dust suppressant for unimproved runways. The tests were Sandwich Corrosion, Acrylic Crazing, Paint Softening and Hydrogen Embrittlement. Note: This testing was carried out to the intent of D6-17487 Sections 2 a and b. This is not material qualification.

All tests passed.

Prepared by
Loren R. Franz, Jr.
B-KC11 M/S 73-40
(425)234-7913

Approved by 11/7/00
Barbara Lord MacLean
B-KC11 M/S 73-40
(425)234-8246

PURPOSE:

To evaluate Midwest Industrial's EK35 material in accordance with Reference (c) for possible use as a dust suppressant on unimproved airfields. Note: This testing was carried out to the intent of Reference (c), Sections 2a and b. This is not a material qualification.

TEST PROCEDURE:

The tests required by References (a) and (b) are as follows:

1. Sandwich Corrosion
   The Sandwich Corrosion test was performed in accordance with Reference (g) with the modifications specified in Reference (c).

2. Acrylic Crazing
   The test was performed in accordance with Reference (d) using Type C acrylic stressed to an outer fiber stress of 4500 psi.

3. Paint Softening
   Paint Softening was performed in accordance with Reference (e).

4. Hydrogen Embrittlement
   The test was performed in accordance with Reference (f) using 3 type 1a.2 specimens and loaded for 150 hours at 45% of ultimate stress.

TEST RESULTS:

Test results are shown in Table I, below. All tests passed.

The following are the criteria of passage for each specific test:

- Sandwich Corrosion

  When tested in accordance with Reference (g) with the modifications specified in Reference (c), the material, when compared with a distilled water control, shall exhibit no corrosion in excess of that control.

- Acrylic Crazing

  No crazing, cracking or etching after 8 hours of exposure in accordance with Reference (d) using Type C acrylic stressed to an outer fiber stress of 4500 psi.

- Paint Softening

  The material, tested in accordance with Reference (e) shall not produce a decrease in film hardness greater than 2 pencils, or any discoloration or staining. The order of pencil hardness in accordance with Reference (e) is the following: 6B, 5B, 4B, 3B, 2B, B, HB, F, H, 2H, 3H, 4H, 5H, 6H, 7H, 8H, 9H.

- Hydrogen Embrittlement

  When tested in accordance with Reference (f) using type 1a.2 specimens, the material shall not cause a specimen to break within 150 hours of loading in stress.

Table I			**Midwest EK 35**		
Sandwich Corrosion		Clad	Pass	Pass	
		CAA	Pass	Pass	
Acrylic Crazing			Pass	Pass	Pass
Paint Softening	BMS 10-11	Wet	5H	5H	5H
		Dry	5H	5H	5H
	BMS 10-100	Wet	3H	3H	3H
		Dry	3H	3H	3H
Hydrogen Embrittlement			Pass	Pass	Pass

REFERENCES:

(a) WR# 200001238 “Dust Suppressant”
(b) BTS Job #3530 “Midwest Industrial Supply - EK35”
(c) D6-17487 Rev. N “Evaluation of Airplane Maintenance Materials”
(d) ASTM F 484 “Standard Test Method for Stress Crazing of Acrylic Plastics in Contact with Liquid or Semi-Liquid Compounds”
(e) ASTM F 502 “Standard Test Method for Effects of Cleaning and Chemical Maintenance Materials on Painted Aircraft Surfaces”
(f) ASTM F 519“Standard Test Method for Mechanical Hydrogen Embrittlement Evaluation of Plating Processes and Service Environments”
(g) ASTM F 1110“Standard Test Method for Sandwich Corrosion Test”

Standard Operating Procedure: Handling, Storage and Application of Dust Suppressant EK-35

1. PURPOSE

This document describes procedures for working safely and in an environmentally sound manner with dust suppressant EK-35 at Hope Bay project sites in order to achieve effective suppression of dust.

2. SCOPE

This procedure applies to all applications of EK-35 and all personnel at Hope Bay that may have the potential to come into contact with, handle, store or apply EK-35.

3. DEFINITIONS

EK-35	Synthetic, organic, non-toxic, non-hazardous, non-flammable dust control product
ESR	Department of Environmental and Social Responsibility
HSLP	Department of Health, Safety and Loss Prevention

4. RESPONSIBILITY

Title or Position	Key Responsibilities
Application Operator	Review this SOP and the product MSDS prior to handling or applying EK-35, utilize appropriate PPE ,observe proper environmental protection and be familiar with spill response procedures
Supervisor	Ensure this SOP is current, relevant, and reviewed and understood by all personnel involved with the handling, storage or application of EK-35, including environmental protection measures and emergency response protocols.
Manager	Review and approve this SOP
Facilities Manager	Ensure appropriate facilities are provided to for proper protected storage of EK-35
ESR	Ensure appropriate regulatory approvals/notifications are in place before any application of EK-35 and that sampling and monitoring of the application of product is conducted
HSLP	

5. REGULATORY APPROVAL FOR USE

The application of EK-35 at the Hope Bay project site is contingent on special regulatory approval as this product is not approved for use as a dust suppressant in Nunavut. Refer to the site Environmental Department for permission to apply.

6. NOTIFICATION TO REGULATOR

Standard Operating Procedure: Handling, Storage and Application of Dust Suppressant EK-35

In accordance with the *Environmental Guideline for Dust Suppression* – Nunavut Department of Sustainable Development, the local Environmental Protection Officer will be notified with the following information when dust suppressants are planned for use:

- The location of the site
- The product used
- A timetable for the work

This information will be conveyed to the Environmental Department for notification to the regulator before the application of the EK-35 is scheduled to commence.

7. ENVIRONMENTAL PROTECTION AND CONTROLS

Nozzles on the EK-35 truck-mounted applicator will be set in position as low to the application surface as practicable to prevent airborne transport of any product.

EK-35 will not be applied to road surfaces within 30 metres of any active culvert/watercourse and will not be applied during periods of wind speed greater than 20km/hr.

The product will be applied in a manner that will not allow pooling or permit any runoff beyond the road/laydown pad margins.

Water sampling pre- and post-application in water adjacent to the application area will be undertaken by the environmental department and results provided to the regulatory agency if requested.

8. SAFE STORAGE AND HANDLING

- EK-35 should be stored in a cool, dry, well ventilated area in secondary containment
- EK-35 is non-flammable, but will burn on prolonged exposure to flame or high temperature.
- Keep away from sources of ignition and separate from oxidizing agents
- EK-35 can be stored indefinitely at any temperature

9. EXPOSURE CONTROL/PERSONAL PROTECTION

- RESPIRATORY PROTECTION: None required if good ventilation is maintained. If mist is generated by heating or spraying use a NIOSH approved organic respirator with a mist filter.
- VENTILATION: Under normal handling conditions special ventilation is not necessary. If operation generates mist or fumes use ventilation to keep exposure to airborne contaminants below exposure limits.
- EYE PROTECTION: Chemical splash, goggles recommended.
- PROTECTIVE CLOTHING: Clothing to minimize skin contact, long sleeves, boots or shoes. For casual contact PVC gloves are suitable, for prolonged contact use neoprene or nitrile gloves.

10. GENERAL INFORMATION ON EK-35

- EK-35 is applied “neat” without mixing with any other substance
- Weather (rain) is not a consideration in the application of EK-35 as it will not “wash” away
- The application of EK-35.by sprayer should be applied in one continuous operation to ensure a consistent finish.

Standard Operating Procedure: Handling, Storage and Application of Dust Suppressant EK-35

- Multiple passes may be required to achieve a desired finish without run-off and excessive puddling of excess product.
- EK-35 can be re-worked without re-application.

11. APPLICATION OF EK-35

The application of EK-35 will be performed in accordance with the Site Services Work Package: *Placing Crush and EK-35 on the Airstrip*. This application is in accordance with the application amount as determined by the vendor of the product, and utilizing truck-mounted rented application equipment supplied by them (Midwest industrial Supply, Inc.). The vendor is to provide instructions on how to use the application equipment safely and effectively. All employees involved in handling or applying the EK-35 are to read the MSDS for the product.

Monitoring of application will be conducted by the on site quality control consultant identified in the Site Services work package to verify and adjust as needed the correct rate and volume of application . A daily log of application of EK-35 will be maintained.

12. SPILL CLEAN-UP

Clean-up of spilled EK-35 should be performed with inert sorbents. Soiled sorbent material can be burned in the incinerator. All spills must be reported immediately to the Environmental Department.

13. ASSOCIATED DOCUMENTS

Environmental Guideline for Dust Suppression – Nunavut Department of Sustainable Development

14. REQUIRED RECORDS

Application records: date, location, volumes, operator, etc.

Standard Operating Procedure: Handling, Storage and Application of Dust Suppressant EK-35

MSDS

http://www.midwestind.com/products-services/dust-control-products/ek35-dustcontrol/ek35-brochure-msds.html

Standard Operating Procedure: Handling, Storage and Application of Dust Suppressant EK-35

EK-35 Application Log Sheet

Date	Location	Volume Applied (L)	Operator Name	Comments

Standard Operating Procedure: Handling, Storage and Application of Dust Suppressant EK-35

REVISION RECORD

Version	*Date*	*Description*	*Author*	*Signature*
	April 10/10	Draft	J. Turk	
	May 15/10	Draft Revision – include notification to regulator prior to use Section 6. Application Log Sheet	J. Turk	
	June 2/10	Updates to Environmental Controls	J. Turk	

SOP ACTIVATION RECORD
THIS SOP WILL BE IN EFFECT ON THE ISSUE DATE APPROVED BY THE UNDERSIGNED.

POSITION	NAME	SIGNATURE	DATE OF ACCEPTANCE

Standard Operating Procedure: Handling, Storage and Application of Dust Suppressant EK-35

STANDARD OPERATING PROCEDURE REVIEW AND ACKNOWLEDGEMENT

By signing off on this Standard Operating Procedure, (SOP) you acknowledge that you have reviewed, understand and accept the terms of this SOP.

First Name (Print)	Last Name (Print)	Company	Position	Date	Signature	HBML Representative

creating verifiable value
through best products, services and knowledge

EK35® GRAVEL RUNWAYS FINES PRESERVATION

A Practical Overview of Improving Performance and Achieving Significant Lower Life Cycle Costs of Gravel Runways

Situation Overview

The smoothness of gravel runways is critical to efficient and economical aircraft operation. This smoothness is a function of strength. The ability of a runway to sustain the required strength is quantified in terms of California Bearing Ratio (CBR). An increase in CBR is the principle objective of runway stabilization and dust control. The increase in CBR will provide aircraft with safer operation by reducing gravel spray, rolling resistance, and take-off and landing distances. Aircraft manufacturers specify minimum runway CBR for their aircraft. Runway repair and maintenance is governed in terms of minimum CBR as a function of aircraft tire pressure. Maintenance crews are continuously battling decreasing runway CBR.

The deformation and permanent loss of fines results in continuous and costly runway reconstruction and fines replacement. The estimated, typical cost of such maintenance is approximately $1,000 per take off or landing for a 25,000 square foot runway.

Obstacles to Economical Runway Performance

The primary obstacles to sustaining the required runway strength are the permanent deformation under aircraft wheel loads and the permanent loss of fines from props or jet blast. Gravel runway surface strength depends on the surface composition, moisture content, gradation, compaction and aggregate interlock. Gravel surfaces are susceptible to weakening from moisture penetration and frost action. Loose material associated with gravel runway surfaces also results in the requirement to protect the aircraft from debris. The rough texture of gravel surfaces contribute to increased tire wear.

There are two principle factors creating the need for periodic surface smoothness:

First is the permanent surface deformation under the airplane wheel loads and random loss of surface from engine props or jet blast. In the long term this lost material must be replaced. The loss of material is not uniform and this results in an uneven surface and eventual roughness. The stones are not blown off, so the surface tends toward a condition of deep loose gravel. These areas of loose gravel increase the take off distance and the wear and tear on the airplane and must be recombined with fine material which will compact and better withstand the wheel loads and jet blast. The added material, with grading and compaction, automatically corrects the surface irregularities due to soil deformation. This cycle is very expensive.

Second is the surface strength must be routinely monitored during all weather conditions to assure the strength is up to requirements. The most common cause of operational problems on gravel runways is the failure of the surface layers due to shear caused by high aircraft tire loading. Surface shear strength can be estimated by measuring the force required to deflect or penetrate the surface to a specified depth. This force, divided by the area over which it is applied, can be taken as the soil failure pressure. This soil failure pressure can be obtained using the Samitron® (Stiffness and Modulus Instrument), a measurement device correlated to CBR to determine the current specific strength characteristics of the runways. This information will be compared to the strength requirements for aircraft performance.

Solution - EK35® Gravel Runway Fines Preservation

Since locally available aggregates generally do not possess cohesion, methods are required to provide compaction to optimum density and maintenance over time of optimum density. A new, effective and economical method of managing gravel runway stability has long been needed. This new method must achieve optimum density and effectively bind the surface material together if it is to provide the runway with a high resistance to rutting, aggregate segregation and loss of material, fines and larger aggregate, caused by aircraft wheel loading and jet blast. Many older methods have addressed the symptom of runway instability, i.e. airborne dust, but not the root-cause.

Midwest Industrial Supply, Inc. has developed a Gravel Runway Fines Preservation Program which has proven successful in Alaska and Canada. The program utilizes Midwest Industrial Supply, Inc.'s EK35®. EK35® improves runway surface stability by unique controlled coating of the full particle size range of aggregate to achieve compaction and to maintain the bearing capacity by durably bonding the particle size range together. The combination of cohesion and adhesion mechanisms produce a runway surface is highly resistant to damage from aircraft related loading and abrasion. This program has demonstrated increases in CBR beyond the minimum required (e.g., > 15% increase). These increases are sustainable for over time with at least a 60% reduction in runway maintenance.

A principle of Midwest's Gravel Runway Fines Preservation Program is the achievement of fines retention over time and traffic and a resulting increase in CBR of the runway. EK35® fines preservation captures fines as they are generated over time by traffic and wheel friction and stabilizes them into the surface preventing them from escaping as dust.

The runway surface can be reworked when needed and re-compacted because of the continuously active and re-workable nature of EK35®.

The increase in CBR will provide aircraft with safer operation by reducing gravel spray, rolling resistance, and take-off and landing distances. CBR is considered a valid proxy for estimating the level of dust control, given if the fines are lost to dust, CBR will be less; if fines are retained over time, CBR will be the same or greater.

Here is what sets this technology apart!

Midwest's Gravel Runway Fines Preservation Program utilizes EK35®, a patented Synthetic Organic Dust Control® technology formulated of 99.9% ultra pure synthetic fluid and a Rosin Binder System which is derived from renewable resources

Midwest's Rosin Binder System is necessary as it interlocks and binds the full particle size range the aggregate including fines utilizing the combination of adhesive and cohesive mechanisms. This system prevents fines from escaping and prevents particles from moving apart leaving open voids for water to occupy. In this fashion, the Gravel Runway Fines Preservation Program addresses the root-cause of the problem rather than just addressing dust, the symptom of the problem.

This new technology offers improved "service life of runway", reduced maintenance expense, and additional value added results:

Fines preservation, stabilization, dust control

- Take off and landing - preserves fines with resulting elimination of "dust"
- Taxiing - preserves fines with resulting elimination of "dust"
- Minimizes aggregate segregation
- Eliminates watering and water usage
- Reduces material loss and cycle of aggregate crushing, replacement, grading & compaction activity
- Reduces grading frequency
- Compaction recommended as performance improves over time with compaction
- Reduces other maintenance
- Minimizes dust/aggregate related aircraft damage
- Reduces aircraft maintenance
- Eliminates nearby community dust intrusion

Runway surface improvement

- Increases CBR
- Reduces rolling resistance
- Improves braking
- Improves runway smoothness
- Minimizes rutting
- Improves rated performance of runway
- Improves surface drainage and frost protection

What is EK35® and what are the performance and environmental benefits it delivers

EK35® is manufactured by Midwest Industrial Supply, Inc at its facilities in Canton Ohio

EK35® is a formulation of a synthetic iso-alkaine and a rosin binder system.

EK35® is manufactured under two patents issued by the United States Patent & Trademark Office.

“Synthetic Organic Dust Control®” is a Registered Trademark Of Midwest Industrial Supply, Inc

EK35®’s synthetic iso-alkaine

- Is “synthetic” as determined by the US EPA definition and criteria for being synthetic
- Passes the US EPA testing criteria for sediment toxicity to be defined as synthetic
- Passes the US EPA testing criteria for biodegradability to be defined as synthetic
- Passes the US EPA testing criteria for PAH content to be defined as synthetic
- Passes the US EPA testing criteria for being oil sheen free per EPA 40CFR Part 435 Appendix 1 to subpart A to be defined as synthetic
- Meets the criteria required to be “Synthetic Organic Dust Control®”

EK35®’s binder system

- Is essential to Gravelrunway Fines Preservation Program performance
- Is the source of important stabilization properties of cohesion and adhesion
- Eliminates the root cause – surface instability and loss of fines
- Durably binds full particle size range of aggregate and fines in a matrix
- Prevents particles from moving apart leaving voids for water to occupy
- Prevents fines from escaping over time and traffic
- Is continuously active and reworkable
- Is enhanced by traffic
- Is intended for soil stabilization
- Is intended for erosion control
- Is intended for dust control

EK35® does not contain petroleum distillates.

Petroleum distillates contain both aromatic hydrocarbons (carbon rings) and aliphatic hydrocarbons (straight carbon chains). The chemical structure of the hydrocarbon largely defines the nature and behavior of these compounds. Aromatic hydrocarbons are the most toxic compounds found in petroleum products. Most aromatic hydrocarbons are long-term toxins and known cancer causing agents. These aromatic compounds are found in all crude oils and most petroleum products.

Aliphatics and aromatics pose a special health risks, including carcinogenicity, reproductive and developmental toxicity, neurotoxicity, and acute toxicity. Aliphatics and aromatics have proven toxicity to aquatic organisms and affect water quality standards.

EK 35® has been tested and approved by Boeing to meet Boeing requirements

EK 35® is certified by the USEPA ETV Program

Boeing Document D6-17487 Testing and Approval

Synthetic Organic Dust Control® as formulated in EK35® meets the stringent requirements of Boeing Document D6-17487 with respect to corrosion, hydrogen embrittlement and effect on acrylic plastics and painted surfaces.

Boeing letters of confirmation that EK35® has been tested and passed the required series of tests called for in Boeing Document D6-17487 are available from Midwest.

Boeing Document D6-17487 and its test requirements reference the proper types of fluids for use on Boeing planes and set industry standards that are appropriate to apply to any aircraft regarding safety and performance.

Boeing Specification D6-17487 requires that chemicals, including dust palliatives and stabilization agents, to which Boeing aircraft are exposed air side must pass the following tests:

- Sandwich Corrosion (ASTM F1110)
- Acrylic Crazing (ASTM F484)
- Paint Softening (ASTM F502)
- Lawrence Hydrogen Embrittlement (ASTM F519-93)

Note: Because a product consists of base oils does not mean it is free of potentially corrosive elements. Hydrotreating can reduce polar compounds and make base oil look water white, but uninhibited oil may still contain significant impurities, especially sulfur, nitrogen and oxygen which could lead to rust or corrosion to critical aircraft components. Boeing Document D6-17487 test results or other laboratory test documentation that establishes the safety to aircraft and aircraft components is recommended even when Boeing aircraft do not utilize the runway.

Environmental Importance - Alaska and Canada

Synthetic Organic Dust Control® is a deliberate and intended technology invented by Midwest Industrial Supply, Inc. in response to the requirements of its customers for increased control of PM10 and PM2.5 particulate matter emissions.

"Synthetic" as used in Synthetic Organic Dust Control® meets the definition and criteria for the term "synthetic" as established by the US EPA. This includes EPA Guidelines for sediment toxicity, biodegradability, PAH content, aquatic toxicity and being oil sheen free

EK35® is certified by the U S Environmental Protection Agency (EPA) with its Environmental Technology Verification (ETV) program. This certification is an independent, credible and expert confirmation of Midwest's claims about its products.

EK35® has comprehensive aquatic toxicity test data available which confirms its safety to water supplies. It is non-corrosive and applied neat. EK35® is thermally stable and does not volatilize or evaporate from the road surface.

Synthetic Organic Dust Control® is the best available technology for use in Alaska and Canada. Synthetic Organic Dust Control® advanced environmental benefit offers consistent and appropriate value to Alaska and Canada as it recognizes:

> *One of your most important assets is invisible… it's called air.*
>
> *The other is clear… it's called water.*

Runway Life-Cycle Benefit/Cost Analysis

We expect a net present value comparative analysis of runway life cycle cost before EK35® Gravel Runway Fines Preservation and after EK35® Gravel Runway Fines Preservation to produce a cost savings of 30% or more as a result of the EK35® Gravel Runway Fines Preservation Program.

BENEFITS:

- Reduced Gravel Loss Rate
- Reduced Frequency of Replacing Gravel
- Reduction in Frequency of Gravel Crushing and Stockpiling Projects
- Reduced maintenance Time on Runway
- Increased Service Life of Runway Surface
- Savings in Airport Maintenance Cost
- Savings in Air Carrier Equipment Cost

Midwest can, as part of the EK35® Fines Preservation program, statistically analyze and evaluate the data and maintenance history so as to develop a quantitative profile of runway performance as a function of time and maintenance. All activities, data and findings can be formally reported to develop a gravel runway performance profile utilizing CBR, opacity and visual observations. In addition, an ROI based economic profile utilizing life-cycle cost data can also be developed. These profiles can be used as the basis for new performance specifications for gravel runways that could be applied uniformly throughout to improve service life of runway surfaces and substantially reduce runway life cycle costs.

Runway Life-Cycle Benefit/Cost Analysis - A Model

Before EK35®			After EK35® Fines Preservation		
Resurface	Year 1	$	Resurface	Year 1	$
Overlay	Year 5	$	EK35	Year 1	$
Resurface	Year 10	$	EK35	Year 2	$
Overlay	Year 15	$	EK35	Year 3	$
Resurface	Year 20	$	EK35	Year 7	$
			EK35	Year 10	$
(To Be Determined)			EK35	Year 11	$
			EK35	Year 15	$
			EK35	Year 17	$
			(To Be Determined)		

Intellectual Property Evidence

Synthetic Organic Dust Control®" is a registered trademark of Midwest Industrial Supply, Inc.

Two patents have been awarded by the United States Patent and Trademark Office, U.S. Patent No. 7,074,266 and U.S. Patent No. 7,081,270, which evidence Midwest Industrial Supply, Inc.'s state of the art technology developing compounds and their use to produce its new category of soil stabilization and dust control called Synthetic Organic Dust Control®.

EK35® is a registered trademark and patented product of Midwest Industrial Supply, Inc.

Credits

"Gravel Runway Surface Strength Measurements and Aircraft Certification Requirements," Roman A. Marushko, Flight Test Engineer, Transport Canada Aircraft Certification, with the assistance of Bruce Denyes, Airport Pavement Engineer, Transport Canada Aerodrome Safety.
"Boeing Unpaved Runway Maintenance - D6-48945"
Melvin Main, Main Associates

Mine Road
STABILIZATION

Engineered for
Air Quality, Road Quality
and
Financial Return

EK35®
Synthetic Organic Dust Control™

The Future Of Heavy-Duty Mine Road Maintenance is Here!

- **Decrease O & O Costs!**
- **Decrease Haul Road Maintenance Costs!**
- **Increase Air Pollution Compliance!**
- **Increase Asset Utilization!**

Haul Road Expenditures can pay BIG Dividends... starting TODAY!

Introducing EK35® - Synthetic Organic Dust Control™, the revolutionary NEW patented formulation that can produce hundreds of thousands of dollars in savings by reducing operational costs and increasing asset utilization.

EK35® is applied neat to haul road surfaces providing a dual patent-pending mechanism for dust control and soil stabilization. The penetration ability provides a new dust suppressing mechanism, which acts as a durable, reworkable binder. **EK35®** works well with all aggregate materials and soil types. It effectively stabilizes deep dust and loose surface materials.

EK35® applications last longer than other ordinary chemical suppressants, therefore requiring fewer maintenance applications. The surfaces are reworkable. This continuously active suppressant is resistant to rain for long periods of time.

EK35® will stop the cycle of roadway deterioration caused by watering, grading, lost aggregate and heavy traffic on mine haul roads. **EK35®** will preserve fines, increase density and maintain the stability of the surface. Along with the road's natural crown, **EK35®** will work to allow better drainage, reducing or greatly eliminating washboarding, potholing and rutting.

Midwest Industrial Supply, Inc.'s technical service personnel, using our *Samitron*® (Stiffness and Modulus Instrument), derive Young's modulus, shear modulus, CBR and rolling resistance values from in-situ soil stiffness values. These values are obtained using *Samitron's*® ability to measure the stress imparted to the surface and the resulting surface velocity as a function of time.

We provide general guidelines for estimating and designing the optimum road conditions for higher efficiencies, lower maintenance and fuel consumption.

Revolutionary, Intense Use, Continuous Life Dust Control/Stabilization

On weaker haul road surfaces, the rolling coefficient of friction has an adverse effect on haul truck rolling resistance. Recommended tire pressures may cause shear failures of the surface and deflections in the form of rutting on unstabilized haul road surfaces. These actions extract energy from the wheel motion and cause an increased rolling coefficient of friction. The result is increased O & O costs! Using *Samitron*® technology and algorithms constructed from testing conducted by the U.S. Corps of Engineers, rolling resistance values can be measured, optimized, and monitored for given haul truck tire pressures.

Midwest Industrial Supply, Inc.'s experienced laboratory professionals and facilities provide you with comprehensive testing capabilities.

To stay profitable, mining operations today are investing in greater contamination control. **EK35®** is the answer by controlling contamination and maintaining high density and compaction on the roadway, which will translate into reduced rolling resistance and improved asset utilization. The **EK35®** road "pays" for itself with better efficiency, lower vehicle maintenance, and *DECREASED O & O COSTS!*

Engineering Services

Midwest Industrial Supply, Inc. can provide full scale road design and analytical testing that utilizes proprietary design practices as well as testing in accordance with ASTM and AASHTO specifications. Utilizing a fully-equipped laboratory staffed with experienced professionals, designs can be optimized to achieve customer objectives in the most efficient and cost-effective manner possible.

Samitron®

Samitron®

Midwest's *Samitron*® (Stiffness and Modulus Instrument) can be brought on-site to provide precise measurements before, during and after an application. This will provide us with objective data for analysis and assurance of realizing project goals.

EK35®

Synthetic Organic Dust Control™

- **Longer Lasting than Ordinary Chemical Suppressants**
- **Works Well with All Soil Types and Materials**
- **Durable Enough for Tracked and Chained Vehicles**
- **Stabilizes Deep Dust and Heavy Powder**
- **Works Well on Surface Dust and Loose Surface Materials**
- **Requires Fewer Maintenance Applications**
- **A Continuously Active Suppressant**
- **Applied Neat — NO Water Required**
- **For Intense Use Traffic Sites**
- **Environmentally Friendly**
- **Resistant to Rain**
- **Best Contamination Control**
- **Reworkable**

Much of today's haul road maintenance involves an intense schedule of around the clock watering and an ongoing program of grading and materials replacement. Many road materials are difficult to wet with water, and water contributes to destabilization and wear of the surface as much as it does to dust control. Dust creates friction that results in wear, which ultimately causes mechanical stress and mechanical failure.

The mechanical drive systems of today's haul trucks challenge haul roads because of better braking and steering control. As haul trucks travel at higher speeds they challenge haul road design to accept these higher speeds. As haul trucks get wider, haul roads must get wider, which increases haul road maintenance costs. Haul truck utilization must offset increased haul road costs. Road maintenance plays a major role in haulage operations and has a direct influence on truck maintenance costs, road maintenance costs, and owning and operating costs (fuel consumption, tire wear). Our program fits nicely with the high priority of mining companies for improving equipment performance through better operations and maintenance practices and technologies applied to roads. When it can cost between $6,000 and $90,000 to rebuild an engine and anywhere from $5,000 to $50,000 to rebuild a transmission, it makes sense to eliminate the dust as a contributing factor to the friction, wear and failure.

An effective haul road maintenance stabilization and dust control program can produce savings from haul truck repair and maintenance. A typical 218 ton haul truck costs approximately $2.5 million dollars, and over the life of that truck, repair and maintenance costs are projected to be another $2.3 million. A road maintenance stabilization and dust control program that controls dust can save as much as $300,000 over the life of each haul truck. Even greater financial benefits are available in reduction of owning and operating costs and improved asset utilization.

EK35® maintains the integrity of the road surface through stabilization and fines preservation. A by-product is elimination of dust. The financial benefits are 1) the reduction in haul truck maintenance repairs, 2) lower road maintenance, 3) eliminated watering expenses, 4) a reduction in owning and operating costs, and 5) increased productivity and improved asset utilization.

Focus On Performance

For over twenty-five years we have been successfully helping to control dust and erosion in various industries. When you consider the alternative "waiting-til-it's-broke-to-fix-it", to being pro-active, can you really afford to wait? To find out how we can help you solve your challenges, call one of our sales representatives at **1-800-321-0699** and let's get something going for you!

MIDWEST INDUSTRIAL SUPPLY, INC.

Working to Make a Difference

MIDWEST INDUSTRIAL SUPPLY, INC.
P.O. Box 8431 • Canton, OH 44711 • USA
Telephone: 1-800-321-0699 • Fax: 1-330-456-3247

www.midwestind.com

 Patent No. 7,074,266 B2 & 7,081,270 B2

The E-SPRAYER™ System

Custom designed and built to perform under the most demanding dust conditions.

The Midwest's E-Sprayer™ System efficiently dispenses world-class Soil-Sement®, EnviroKleen® and EK35® environmentally-safe dust control agents. The heavy-duty system will efficiently spray virtually any product.

E-Sprayer™ Features:

- One-man operation
- Easy-to-use, fill and dispense unit
- Mobile and versatile
- Rugged construction
- Universal application - spray with 8' spray bar
- 4.7 hp Diesel /JP8 fuel electric start engine and Gorman-Rupp pump
- Lightweight yet durable
- Modular design for service ease and reliability
- Completely self-contained
- Self-transfer capability (50 gal/min)
- 12-volt electrical system
- Instant on/off from in-cab controls
- Flow control with throttle and/or motorized regulator
- 275-gallon chemical tank vessel

The E-Sprayer™ System is ready when you need it...to apply environmentally safe dust suppressants... exactly where you want it.

Contact Midwest Industrial Supply, Inc. for more details on pricing and availability

1-800-321-0699

MIDWEST INDUSTRIAL SUPPLY, INC.
Working to Make a Difference

P.O. Box 8431 • Canton, OH 44711
Phone: 330-456-3121 • Fax: 330-456-3247
E-mail: custserv@midwestind.com • Web site: www.midwestind.com

Made with Pride in the USA!

September 26, 2003

Helen Butler
BHP Diamonds, Inc.

PH: (867)880-2292
Helen.M.Butler@bhpbilliton.com

Dear Helen Butler:

Per your discussion with Robert Vitale, I have enclosed the following environmental test materials on EK 35®:

1. Material Safety Data Sheet
2. Tri State Laboratories Report 7/15/02 "Sample A"
   - Bulk Analysis: metals, volatiles, semi-volatiles
   - TCLP Data: metals, volatiles, semi-volatiles
   - Pesticides
   - Herbicides
   - Polynuclear Aromatic Hydrocarbons (PAH)
3. Tri State Laboratories Report 10/21/02,
   - SPLP Data: metals, volatiles, semi-volatiles
4. Tri State Laboratories Report 5/27/03
   - SPLP Data: metals, inorganics
5. ABC Laboratories Report 9/16/02
   - Acute and Chronic Toxicity: Ceriodaphnia dubia, Fathead minnow and Americamysis bahia
6. ABC Laboratories Report 9/03/03
   - Chronic Toxicity: Rainbow Trout

Bob also noted that you had several questions pertaining to the potential environmental and ecological exposure of EK 35®. I will try to address each one, but feel free to contact me to at any time with additional or more specific questions.

Chemistry of EK 35®

EK 35® is formulated with a synthetic iso-alkane and naturally occurring proprietary tall oil pitch and rosin blend that when blended together work to stabilize soil and control dust. The synthetic iso-alkane is manufactured by Petro-Canada using a patented and highly specialized process of heat, pressure and catalysts to "blow apart" the chemical structure. Upon re-alignment the new, synthetic molecule is highly refined and free of impurities that can be hazardous to the environment or human health. The proprietary tall oil pitch and rosin blend that is used in the formulation is naturally occurring have been for centuries as binding agents or sealants for homes and canoes and are currently used in numerous soaps and detergents. The ingredients used in the product are a result of over three years of evaluation and testing of all possible iso-alkanes and tall oil pitch and rosin products available. The final raw material

sources were chosen because of their unique ability to deliver ingredients that when formulated properly provide the intended performance results.

Water Quality and Aquatic Toxicity

Midwest Industrial Supply, Inc. has contracted third party testing laboratories to evaluate the potential exposure risks of EK 35® in the environment, specifically how it affects water quality and aquatic life. The attached test data shows that EK 35® does not contain any metals, volatiles or semi-volatiles over regulatory levels. Nor does it contain any detectable level of pesticides, herbicides or PAH's. The TCLP and SPLP data specifically speaks to the potential for ground water contamination. TCLP is used by the EPA to characterize the ground water contamination potential for landfills over the life of the landfill. SPLP testing mimics acid rain and shows potential for EK 35® constituents leaching from the soil in "real life" conditions. Both indicate that EK 35® does not release hazardous material into the water. Aquatic toxicity data shows that EK 35® is considered to have low to moderate toxicity to representative aquatic species, both on an acute and chronic basis.

Potential for storm water, ground water and other bodies of water contamination is minimal. First, the testing referenced above is performed on the concentrated EK 35®, thereby simulating a worst case scenario of a large quantity spill of EK 35® into a body of water. EK 35® is applied neat, requiring no water for dilution. Because EK 35® is 100% active, much smaller quantities of the product are used to stabilize a surface or control erosion as compared to most conventional chemical stabilizers. EK 35® penetrates into the particles of dust, soil and aggregate and because it is not water soluble, cannot be washed away with precipitation or diluted with high ground water content. Because of the small quantities of product used there is a very low potential for runoff or tracking.

Animal Toxicity

We have not performed animal toxicity studies on EK 35®, however there is history on the potential for human and mammalian toxicity for the raw material used in the product. Based on the chemistry, manufacturing process and toxicity data on the iso-alkane there is no indication that it will have any detrimental long or short term effects via dermal contact or ingestion. The iso-alkane is much like baby oil or other similar health and beauty aids.

The naturally occurring rosin or tall oil pitch and rosin are currently under evaluation by the US EPA under the High Production Volume (HPV) Chemical Program. The US EPA has earmarked chemical that are produced in large volumes and requested representative groups to evaluate products for potential environmental, animal and human health effects. They perform this task by evaluating current data, theorizing on the untested criteria and proposing test protocols for the "unknowns". The Pine Chemical Association (PCA) has developed such a evaluation and protocol for Tall Oil and Related Substances. Tall Oil Pitch in included in this group of chemicals. Tall Oil has been evaluated for animal toxicity and is considered non-toxic (acute oral toxicity on rats). The PCA will be conducting acute oral toxicity on an animal species to show that it is non-toxic like the base material Tall Oil. The chemical structure of Tall Oil Pitch and Rosin is somewhat unknown and very complex and for this reason the USEPA recommended the additional testing.

I am aware that protecting the caribou population is a high priority and Midwest Industrial Supply, Inc. will do what ever is necessary to ensure their health and safety. There is no data that indicates that EK 35® will have toxic effects on the caribou should they ingest the product or treated runways. EK 35® has a slight woodsy odor and a dark brown color, neither of which should attract animals. We have done numerous applications in the Northwest Territories and Alaska with bears, deer and other indigenous animals present. The animals were interested in our presence, but never showed any indication that they saw the product or treated soil as a food source.

Environmental Fate

Biodegradability of EK 35® has not been tested as formulated; however testing has been performed on the raw materials. The iso-alkane is considered "readily biodegradable" when tested under OEDC (Organization for Economic Cooperation and Development) guidelines for biodegradability. The synthetic iso-alkane was 60% degraded under aerobic conditions after 28 days. Tall Oil Pitch and Rosin was classified as "not readily biodegradable" under the same conditions with 41% degradation. The tall oil pitch and rosin blends are not volatile under ambient conditions, and will not be carried away with water. Based on the raw material data EK 35® will partially degrade relatively quickly and the residual material will remain in the gravel with no know detrimental effects on the environment.

Storage

EK 35® will not freeze or separate with cold temperature of long term storage. It is not an emulsion or suspension, but rather a solution and is very stable over a wide range of storage conditions.

Environmental Benefits Based on Superior Performance

EK 35® was developed with the environment in mind. When researching the possibilities for raw materials and formulas several criteria were considered: stabilization, erosion control and dust suppression performance; possible negative impact on the environment and positive impact on the environment. EK 35® is proven to significantly reduce the need for maintenance grading and the addition of new aggregate. It maintains the integrity of the surface, thereby reducing the potential for surface erosion which minimizes sediment delivery to aquatic habitats. The use of EK 35® is an important part is a "fines preservation program".

EK 35® = fines preservation program = increased surface stability = less sediment = dust suppression

The EK 35® "fines preservation program" positively impacts the environment by ultimately decreasing both air and water pollution.

I hope that I have answered your questions about EK 35®. Please feel free to contact me to discuss the product or if you require further information. You may contact me at 330/456-3121 or via e-mail at Cheryl@midwestind.com.

Sincerely,

MIDWEST INDUSTRIAL SUPPLY, INC.

Cheryl Detloff
Chief Chemist

cc: Al Kaylo
Bob VItale

Enclosures

TSL *Tri-State Laboratories, Inc.*

2870 Salt Springs Road • Youngstown, Ohio 44509
Ph: (330) 797-8844 • Fax: (330) 797-3264 • 1-800-523-0347
E-mail: trislabs@aol.com

Laboratory Analysis Report

Client: RTI
Attn: DEBBIE FRANKE
PO BOX 12194
RESEARCH TRIANGLE PARK, NC 27709

Date Sampled:
Time Sampled:
Date Received: 6/14/2002
Report Date: 7/15/2002
Comments:

Lab Number: 22061405
Sample ID: SAMPLE A-MIDWEST KANSAS CITY
Sample Description:
Sampler Name:
Sample Matrix: Aqueous
PO#: 19820

Analyte	Result	Unit	Detection Limit	Method	Analysis Date	Analyst
Aluminum	1.25	mg/kg	0.44	200.7	6/19/2002	SCB
Antimony	BDL	mg/kg	0.044	200.7	6/19/2002	SCB
Arsenic-TCLP	BDL	mg/L	0.10	6010B	6/19/2002	SCB
Arsenic	BDL	mg/kg	0.13	200.7	6/19/2002	SCB
Barium-TCLP	BDL	mg/L	0.040	6010B	6/19/2002	SCB
Barium	BDL	mg/kg	0.044	200.7	6/19/2002	SCB
Beryllium	BDL	mg/kg	0.007	200.7	6/19/2002	SCB
Cadmium-TCLP	0.040	mg/L	0.020	6010B	6/19/2002	SCB
Cadmium	0.044	mg/kg	0.022	200.7	6/19/2002	SCB
Chromium	BDL	mg/kg	0.022	200.7	6/19/2002	SCB
Chromium-TCLP	BDL	mg/L	0.020	6010B	6/19/2002	SCB
Copper	0.044	mg/kg	0.022	200.7	6/19/2002	SCB
Iron	31.8	mg/kg	0.44	200.7	6/19/2002	SCB
Lead	BDL	mg/kg	0.11	200.7	6/19/2002	SCB
Lead-TCLP	BDL	mg/L	0.10	6010B	6/19/2002	SCB
Manganese	0.160	mg/kg	0.044	200.7	6/19/2002	SCB
Mercury	BDL	mg/kg	0.0011	245.2	6/21/2002	SCB
Mercury-TCLP	BDL	mg/L	0.001	7472	6/21/2002	SCB
Nickel	BDL	mg/kg	0.044	200.7	6/19/2002	SCB
Selenium	BDL	mg/kg	0.18	200.7	6/19/2002	SCB
Selenium-TCLP	BDL	mg/L	0.16	6010B	6/19/2002	SCB
Silver-TCLP	0.0252	mg/L	0.020	6010B	6/19/2002	SCB
Silver	0.030	mg/kg	0.022	200.7	6/19/2002	SCB
Thallium	BDL	mg/kg	0.030	200.7	6/19/2002	SCB
Zinc	0.142	mg/kg	0.044	200.7	6/19/2002	SCB
Herbicides	SEE ATTACHED			8270	6/19/2002	JP
Pesticides	SEE ATTACHED			8270	6/19/2002	JP
Polynuclear Aromatic Hydrocarbons	SEE ATTACHED			8270/610	6/19/2002	JP
Semi-Volatile Organic Compounds	SEE ATTACHED			8270A/625	6/19/2002	JP
TCLP-Semi-Volatiles	SEE ATTACHED			1311/8270	6/19/2002	JP
TCLP-Volatiles (VOC)	SEE ATTACHED			1311/8260	6/17/2002	JP
Volatile Organic Compounds (VOC)	SEE ATTACHED			8260/624	6/17/2002	JP

BDL = Below Detection Limit

Results approved by:

John Pflugh, Lab Manager

Scott Bolam, QA/QC Officer

TRI-STATE LABORATORIES
2870 Salt Springs Road
Youngstown, OH 44509
Phone: (330) 797-8844/1-800-523-0347
Fax: (330) 797-3264

Client: RTI

Sample: 22061405

Sample Description: A

Date Received: 06.14.02

Date Analyzed: 06.19.02

Date Reported: 07.15.02

HERBICIDES

Method #: 8270

COMPOUND	CONCENTRATION (mg/L)	MDL (mg/L)
2,4-D	BDL	0.138
Silvex	BDL	0.138

Surrogates	Recovery	Accept. Limits
DCAA	109	35-114

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Sample: 22061405

Sample Description: A

Date Received: 06.14.02

Date Analyzed: 06.19.02

Date Reported: 07.15.02

PESTICIDES
Method #: 8270

COMPOUND	CONCENTRATION (mg/L)	MDL (mg/L)
TECHNICAL CHLORDANE	BDL	0.008
ENDRIN	BDL	0.003
HEPTACHLOR	BDL	0.003
LINDANE	BDL	0.003
METHOXYCHLOR	BDL	0.003
TOXAPHENE	BDL	0.07

Surrogates	Recovery	Accept. Limits
TCMX	61	35-114
DBCP	71	43-116

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Fax: (330) 797-3264

Client: RTI

Sample: 22061405

Sample Description: A

Date Received: 06/14/02

Date Analyzed: 06/19/02

Date Reported: 06/28/02

POLYNUCLEAR AROMATIC HYDROCARBONS

Method #: 8270

COMPOUND	CONCENTRATION (mg/kg)	MDL(mg/kg)
Acenaphthene	BDL	50
Acenaphthylene	BDL	50
Anthracene	BDL	50
Benzo [a] anthracene	BDL	50
Benzo [a] pyrene	BDL	50
Benzo [b] fluoranthene	BDL	50
Benzo [k] fluoranthene	BDL	50
Benzo [g,h,I] perylene	BDL	50
Chrysene	BDL	50
Dibenzo [a,h] anthracene	BDL	50
Fluoranthene	BDL	50
Fluorene	BDL	50
Indeno (1,2,3-cd) pyrene	BDL	50
Naphthalene	BDL	50
Phenanthrene	BDL	50
Pyrene	BDL	50

Surrogates	Recovery	Accept.Limits
Nitrobenzene-d5	58	23-123
2-Fluorobiphenyl	109	30-107
p-Terphenyl	109	18-129

BDL = below detection limit
MDL = method detection limit

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Youngstown, OH 44509
Phone: (330) 797-8844/1-800-523-0347
Fax: (330) 797-3264

Client: RTI

Sample: 22061405

Sample Description: A

Date Received: 06/14/02

Date Analyzed: 06/19/02

Date Reported: 06/28/02

BASE/NEUTRAL & ACID COMPOUNDS: PRIORITY POLLUTANTS

Method #: EPA 8270

COMPOUND	CONCENTRATION (mg/kg)	MDL (mg/kg)
Acenaphtene	BDL	50
Acenaphthylene	BDL	50
Anthracene	BDL	50
Benzidine	BDL	500
Benzo [a] anthracene	BDL	50
Benzo [a] pyrene	BDL	50
3,4-Benzofluoranthene	BDL	50
Benzo (g,h,i) perylene	BDL	50
Benzo (b) fluoranthene	BDL	50
Benzo (k) fluoranthene	BDL	50
Bis (2-chloroethoxy) methane	BDL	50
Bis (2-chloroethyl) ether	BDL	50
Bis (2-chloroisopropyl) ether	BDL	50
Bis (2-ethylhexyl) phthalate	BDL	50
4-Bromophenyl phenyl ether	BDL	50
Butyl benzyl phthalate	BDL	50
Carbazole	BDL	50
2-Chloronaphthalene	BDL	50
4-Chlorophenyl phenyl ether	BDL	50
Chrysene	BDL	50
Dibenzo [a,h] anthracene	BDL	50
1,2-Dichlorobenzene	BDL	50
1,3-Dichlorobenzene	BDL	50
1,4-Dichlorobenzene	BDL	50
3,3'-Dichlorobenzidine	BDL	500
Diethyl phthalate	BDL	50
Dimethyl phthalate	BDL	50
Di-n-octyl phthalate	BDL	50
2,4-Dinitrotoluene	BDL	50
2,6-Dinitrotoluene	BDL	50
Di-n-octyl phthalate	BDL	50
1,2-Diphenylhydrazine (as azobenzene)	BDL	50

BDL = below detection limit
MDL = method detection limit

Client: RTI Sample: 22061405

COMPOUND	CONCENTRATION (mg/kg)	MDL (mg/kg)
Fluoranthene	BDL	50
Fluorene	BDL	50
Hexachlorobenzene	BDL	50
Hexachlorobutadiene	BDL	50
Hexachlorocyclopentadiene	BDL	50
Hexachloroethane	BDL	50
Indeno (1,2,3-cd) pyrene	BDL	50
Isophorone	BDL	50
Naphthalene	BDL	50
Nitrobenzene	BDL	50
N-Nitrosodimethylamine (as diphenylamine)	BDL	50
N-Nitrosodi-n-propylamine	BDL	50
N-Nitrosodiphenylamine	BDL	50
Phenanthrene	BDL	50
Pyrene	BDL	50
1,2,4-Trichlorobenzene	BDL	50
2-Chlorophenol	BDL	100
2,4-Dichlorophenol	BDL	100
2,4-Dimethylphenol	BDL	100
4,6-Dinitro-o-cresol	BDL	100
2,4-Dinitrophenol	BDL	100
2-Methyl phenol	BDL	100
3&4-Methyl phenol	BDL	100
2-Nitrophenol	BDL	100
4-Nitrophenol	BDL	100
Pentachlorophenol	BDL	100
Phenol	BDL	100
2,4,5-Trichlorophenol	BDL	100
2,4,6-Trichlorophenol	BDL	100
4-Chloro-3-Methyl Phenol	BDL	100
Benzoic Acid	BDL	100
2,3,7,8-tetrachloro-dibenzo-p-dioxin	ABSENT	

Surrogates	Recovery	Accept.Limits
Nitrobenzen-d5	58	35-114
2-Fluorobiphenyl	109	43-116
p-Terphenyl	109	33-141
Phenol-d6	71	11-94
2-Fluorophenol	61	25-100
2,4,6- Tribromophenol	78	16-123

BDL = below detection limit
MDL = method detection limit

TRI-STATE LABORATORIES
2870 Salt Springs Road
Youngstown, OH 44509
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Client: RTI

Sample: 22061405

Sample Description: A

Date Received: 06.14.02

Date Analyzed: 06.19.02

Date Reported: 06.28.02

TCLP SEMI-VOLATILES - GC/MS

Method #: 1311/8270

COMPOUND	CONCENTRATION (mg/L)	MDL (mg/L)
Cresols	BDL	0.55
1,4-Dichlorobenzene	BDL	0.66
2,4-Dinitrotoluene	BDL	0.66
Hexachlorobenzene	BDL	0.66
Hexachloro-1,3-butadiene	BDL	0.66
Hexachloroethane	BDL	0.66
Nitrobenzene	BDL	0.66
Pentachlorophenol	BDL	0.55
Pyridine	BDL	0.28
2,4,5-Trichlorophenol	BDL	0.55
2,4,6-Trichlorophenol	BDL	0.55

Surrogates	Recovery	Accept.Limits
Nitrobenzene-d5	64	35-114
2-Flurobiphenyl	99	43-116
p-Terphenyl	120	33-141
Phenol-d6	67	25-100
2-Fluorphenol	78	11-94
2,4,6-Tribromophenol	86	16-123

BDL = below detection limits
MDL = method detection limit
GC/MS = gas chromatography/mass spectrometry

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2870 Salt Springs Road
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Client: RTI

Sample: 22061405

Sample Description: A

Date Received: 06.14.02

Date Analyzed: 06.17.02

Date Reported: 06.28.02

TCLP VOLATILES - GC/MS

Method #: 1311/8260

COMPOUND	CONCENTRATION (mg/L)	MDL (mg/L)
Benzene	BDL	2.27
Carbon Tetrachloride	BDL	2.27
Chlorobenzene	BDL	2.27
Chloroform	BDL	2.27
1,2-Dichloroethane	BDL	2.27
1,1-Dichloroethene	BDL	2.27
Methyl ethyl ketone (2-Butanone)	BDL	2.27
Tetrachloroethene	BDL	2.27
Trichloroethene	BDL	2.27
Vinyl Chloride	BDL	4.53

Surrogates	Recovery	Accept. Limits
Dibromofluorobenzene	115	86-118
Toluene-d8	94	88-110
Bromoflurobenzene	100	86-115

BDL = below detection limit
MDL = method detection limit
GC/MS = gas chromatography/mass spectrometry

TRI-STATE LABORATORIES

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Fax: (330) 797-3264

Client: RTI

Sample: 22061405

Sample Description: A

Date Received: 06.14.02

Date Analyzed: 06.17.02

Date Reported: 06.22.02

8260 WASTE DILUTION

Method #: 8260/5030

COMPOUND	CONCENTRATION (mg/kg)	MDL (mg/kg)
Acetone	BDL	25
Benzene	BDL	2.5
Bromobenzene	BDL	2.5
Bromochloromethane	BDL	2.5
Bromodichloromethane	BDL	2.5
Bromoform	BDL	2.5
Bromomethane	BDL	5.0
2-Butanone	BDL	25
n-Butylbenzene	BDL	2.5
sec-Butylbenzene	BDL	2.5
tert-Butylbenzene	BDL	2.5
Carbon Tetrachloride	BDL	2.5
Chlorobenzene	BDL	2.5
Chloroethane	BDL	5.0
Chloroform	BDL	2.5
Chloromethane	BDL	5.0
2-Chlorotoluene	BDL	2.5
4-Chlorotoluene	BDL	2.5
1,2-Dibromo-3-chloropropane	BDL	2.5
Dibromochloromethane	BDL	2.5
1,2-Dibromoethane	BDL	2.5
Dibromomethane	BDL	2.5
1,2-Dichlorobenzene	BDL	2.5
1,3-Dichlorobenzene	BDL	2.5
1,4-Dichlorobenzene	BDL	2.5
Dichlorodifluoromethane	BDL	5.0
1,1-Dichloroethane	BDL	2.5
1,2-Dichloroethane	150	2.5
1,1,-Dichloroethene	BDL	2.5
cis-1,2-Dichloroethene	BDL	2.5
trans-1,2-Dichloroethene	BDL	2.5
1,2-Dichloropropane	BDL	2.5
1,3-Dichloropropane	BDL	2.5
2,2-Dichloropropane	BDL	2.5
1,1-Dichloropropene	BDL	2.5
Ethyl Benzene	BDL	2.5
Hexachlorobutadiene	BDL	2.5

BDL = below detection limit
MDL = method detection limit

COMPOUND	CONCENTRATION (mg/kg)	MDL (mg/kg)
2-Hexanone	BDL	25
Isopropylbenzene	BDL	2.5
p-Isopropyltoluene	BDL	2.5
Methylene Chloride	BDL	2.5
Methyl Isobutyl Ketone	BDL	25
Naphthalene	BDL	2.5
n-Propylbenzene	BDL	2.5
Styrene	BDL	2.5
1,1,1,2-Tetrachloroethane	BDL	2.5
1,1,2,2-Tetrachloroethane	BDL	2.5
Tetrachloroethene	BDL	2.5
Toluene	BDL	2.5
1,2,3-Trichlorobenzene	BDL	2.5
1,2,4-Trichlorobenzene	BDL	2.5
1,1,1-Trichloroethane	BDL	2.5
1,1,2-Trichloroethane	BDL	2.5
Trichloroethene	BDL	2.5
Trichlorofluoromethane	BDL	5.0
1,2,3-Trichloropropane	BDL	2.5
1,2,4-Trimethylbenzene	BDL	2.5
1,3,5-Trimethylbenzene	BDL	2.5
Vinyl Chloride	BDL	5.0
m,p-Xylene	BDL	2.5
o-Xylene	BDL	2.5

Surrogates	**Recovery**	**Accept.Limits**
Dibromofluorobenzene	112	86-118
Toluene-d8	95	88-110
Bromofluorobenzene	87	86-115

BDL = below detection limit
MDL = method detection limit

TSL *Tri-State Laboratories, Inc.*

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E-mail: trislabs@aol.com

Laboratory Analysis Report

Client: MIDWEST INDUSTRIAL SUPPLY
Attn: CHERYL DETLOFT
P.O. BOX 8431
CANTON, OH 44711

Date Sampled: 10/16/2002
Time Sampled:
Date Received: 10/21/2002
Report Date: 11/7/2002
Comments:

Lab Number: 22102107
Sample ID: EK - 35

Sample Description: GRAB
Sampler Name: DEHOFF
Sample Matrix: Aqueous
PO#: 17899

Analyte	Result	Unit	Detection Limit	Method	Analysis Date	Analyst
Arsenic	BDL	mg/L	0.91	6010B	10/25/2002	SCB
Barium	BDL	mg/L	0.30	6010B	10/25/2002	SCB
Cadmium	BDL	mg/L	0.16	6010B	10/25/2002	SCB
Chromium	0.46	mg/L	0.16	6010B	10/25/2002	SCB
Lead	BDL	mg/L	0.78	6010B	10/25/2002	SCB
Mercury	0.042	mg/L	0.011	7472	10/30/2002	SCB
Selenium	BDL	mg/L	1.3	6010B	10/25/2002	SCB
Silver	8.93	mg/L	0.16	6010B	10/25/2002	SCB
Semi-Volatile Organic Compounds	SEE ATTACHED			8270A/625	10/22/2002	JP
Volatile Organic Compounds (VOC)	SEE ATTACHED			8260/624	10/31/2002	JP

BDL = Below Detection Limit

Results approved by:

John Pflugh, Lab Manager

Scott Bolam, QA/QC Officer

TRI-STATE LABORATORIES
2870 Salt Springs Road
Youngstown, OH 44509
Phone: (330) 797-8844/1-800-523-0347
Fax: (330) 797-3264

Client: MIDWEST INDUSTRIAL SUPPLY

Sample: 22102107

Sample Description: EK-35

Date Received: 10-21-02

Date Analyzed: 10-22-02

Date Reported: 11-01-02

SLP BNAs

COMPOUND	CONCENTRATION (mg/L)	MDL (mg/L)
Cresols	BDL	0.183
1,4-Dichlorobenzene	BDL	0.037
2,4-Dinitrotoluene	BDL	0.037
Hexachlorobenzene	BDL	0.037
Hexachloro-1,3-butadiene	BDL	0.037
Hexachloroethane	BDL	0.037
Nitrobenzene	BDL	0.037
Pentachlorophenol	BDL	0.183
Pyridine	BDL	0.091
2,4,5-Trichlorophenol	BDL	0.183
2,4,6-Trichlorophenol	BDL	0.183

Surrogates	Recovery	Accept.Limits
Nitrobenzene-d5	58	35-114
2-Flurobiphenyl	50	43-116
p-Terphenyl	50	33-141
Phenol-d6	46	11-94%
2-Fluorphenol	69	25-100
2,4,6-Tribromophenol	26	16-123

BDL = below detection limits
MDL = method detection limit
GC/MS = gas chromatography/mass spectrometry

TRI-STATE LABORATORIES
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Client: MIDWEST INDUSTRIAL SUPPLY

Sample: 22102107

Sample Description: EK-35

Date Received: 10-21-02

Date Analyzed: 10-31-02

Date Reported: 11-01-02

TCLP VOLATILES

COMPOUND	CONCENTRATION (mg/L)	MDL (mg/L)
Benzene	BDL	0.046
Carbon Tetrachloride	BDL	0.046
Chlorobenzene	BDL	0.046
Chloroform	BDL	0.046
1,2-Dichloroethane	BDL	0.046
1,1-Dichloroethene	BDL	0.046
2-Butanone(MEK)	BDL	0.460
Tetrachloroethene	BDL	0.046
Trichloroethene	BDL	0.046
Vinyl Chloride	BDL	0.915

Surrogates	Recovery	Accept. Limits
Dibromofluorobenzene	92	86-118
Toluene-d8	95	88-110
Bromoflurobenzene	98	86-115

BDL = below detection limit
MDL = method detection limit
GC/MS = gas chromatography/mass spectrometry

TSL *Tri-State Laboratories, Inc.*

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E-mail: trislabs@aol.com

Laboratory Analysis Report

Client: MIDWEST INDUSTRIAL SUPPLY
Attn: CHERYL DETLOFT
P.O. BOX 8431
CANTON, OH 44711

Lab Number: 23052705
Sample ID: EK-35

Date Sampled: 5/23/03
Time Sampled:
Date Received: 5/27/03
Report Date: 6/9/03
Comments:

Sample Description:
Sampler Name:
Sample Matrix: Aqueous
PO#: 19304

Analyte	Result	Unit	Detection Limit	Method	Analysis Date	Analyst
Chloride	BDL	mg/L	5.0	SM4500-Cl-B	6/2/03	JK
Cyanide, Total	BDL	mg/L	0.02	335.3	5/30/03	JK
Nitrate	15.5	mg/L	1.0	353.2	5/29/03	JK
Sulfate, SO4	4.8	mg/L	1.0	SM4500-SO4-D	6/2/03	JK
Aluminum	BDL	ug/L	50.0	200.7	6/2/03	SCB
Antimony	BDL	ug/L	30.0	200.7	6/2/03	SCB
Boron	146	ug/L	100	200.7	6/2/03	SCB
Copper	BDL	ug/L	5.0	200.7	6/2/03	SCB
Iron	206	ug/L	40.0	200.7	6/2/03	SCB
Manganese	BDL	ug/L	10.0	200.7	6/2/03	SCB
Molybdenum	BDL	ug/L	3.0	200.7	6/2/03	SCB
Nickel	BDL	ug/L	10.0	200.7	6/2/03	SCB
Silver	BDL	ug/L	5.0	200.7	6/2/03	SCB
Zinc	BDL	ug/L	10.0	200.7	6/2/03	SCB

BDL = Below Detection Limit

Results approved by:

John Pflugh, Lab Manager

Scott Bolam, QA/QC Officer

CHAIN OF CUSTODY

TRI-STATE LABORATORIES, INC.
2870 SALT SPRINGS ROAD, YOUNGSTOWN, OH 44509
PHONE: (330) 797-8844 FAX: (330) 797-3264
E-MAIL: trislabs@aol.com

Billing Information (If different from Customer Information)

Client Name_____ PO #_____

Address_____ City/State_____ Zip_____ Phone_____

CUSTOMER INFORMATION

Company Name Midwest Industrial

Address_____

City/State/Zip_____

Contact Person_____

Phone_____ Fax_____

ANALYSIS REQUIRED

TSL Lab #	Customer Sample ID	Date Collected	Time Collected	Grab/ Comp.	Matrix	No. Cont.	Remarks	SPLP - Al, B, Cu, Fe	Mn, Mo, Ni, Sb, Zn	SPLP-CaU	SPLP-NO3	SPLP-SO4	SPLP-CL	SPLP-Hg	SPLP, Ag		
23052704	Soil Sement	5/23						X	X	X	X	X	X	X			
23052705	EK-35	↓						X	X	X	X	X	X		X		
23052706	Enviro kleen	↓						X	X	X	X	X	X				

Collector's Name	Relinquished By	Date/Time	Received By	Date/Time
Collector's Signature	Relinquished By	Date/Time	Received By	Date/Time
FOR PUBLIC WATER SUPPLY (PWS) ONLY	Relinquished By	Date/Time	Received By	Date/Time
Copy sent to EPA? Yes No If Yes, Which Branch? _____	Received for Laboratory By Wendy Jana	Date/Time 5/27/03	Remarks	
PWS ID Number _____	Method of Shipment		Cooler Temperature	
County _____				
Type of Sample (Raw, Distribution, Plant, etc.) _____				

WHITE - LAB COPY YELLOW - REPORT COPY PINK - CUSTOMER COPY

From: Melissa Joy <Melissa.Joy@inac-ainc.gc.ca>
Sent: Tuesday, June 01, 2010 12:00 PM
To: Lea-Marie Bowes-Lyon
Cc: curtis.didham@ec.gc.ca
Subject: Re: Use of dust suppressant EK-35

Hi Lea-Marie,
Message received -I need some more info from you on the product -do you have an MSDS or supplementary info on this product, as well an operating procedure regarding how, when, where and quantities to be used on site.

As well (I don't have your license in front of me) -you should check the terms of your licence to see if there is a specific reference regarding use of dust suppressant.

Call me back and we can discuss further; you should also contact EnvCan or DFO to ensure they are ok as well with the product you are proposing.
I have cc'd EnvCan Officer Curtis Didham -hopefully he can refer you to the correct contact from EnvCan/DFO regarding your request.

Melissa

>>> "Lea-Marie Bowes-Lyon" <Lea-Marie.Bowes-Lyon@Newmont.com>
31/05/2010 4:26 pm >>>
Hi Melissa,

I left you a message on your voice mail about the use of the dust suppressant EK-35 at Doris North. Could you call me when you are able to discuss this further at (604) 904-5585? I will be in the office until 5PM Pacific today.

Thank you,

Lea-Marie

Léa-Marie Bowes-Lyon
Land Tenure and Permitting Coordinator

T 604-904-5585

From: Eno, Robert [REno@GOV.NU.CA]
Sent: June 3, 2010 2:34 PM
To: Lea-Marie Bowes-Lyon
Cc: Bill Patterson; Jill Turk; Chris Hanks
Subject: RE: HBML Request to Use EK-35 as a Dust Suppressant

Hello Lea-Marie,

I have examined the data on this substance. Included in the review, is a USEPA report which suggests that this product does not pose a risk to the environment. Canadian data suggests that:

EK35 shows a range of toxicity from practically non-toxic to moderately toxic depending on the species and the exposure time; when used and applied properly EK35 is not known to pose any ecological problems.

I have also searched out other jurisdictions to determine if EK35 is in use elsewhere.

Based on our review, DoE does not object to your using this substance for dust suppression, provided that you adhere to the manufacturer's instructions. Other considerations include but are not restricted to:

·Use should be limited to roadways or areas subject to frequent vehicular traffic

·Ensure that the substance is evenly-distributed and thoroughly incorporated into the road way to ensure minimal runoff; avoid any pooling of the product

Please refer to DoE's Environmental Guideline for Dust Suppression for details on how to employ this substance and remain in compliance with our Environmental Protection Act. You can find copies of all pertinent GN environmental legislation and guidelines here:

http://www.gov.nu.ca/env/environment.shtml

Please note that until we are able to formally list EK35 as an approved dust suppressant in our proposed revisions to the above-mentioned dust suppression guideline, this note should be considered as a blanket approval for any future activities.

You should also be aware that the Nunavut Water Board and/or Indian and Northern Affairs Canada must be consulted as they have ultimate regulatory authority over your activities. Feel free to provide them with a copy of this note.

Robert Eno
Director/Chief Environmental Protection Officer
Environmental Protection Division
Dept. of Environment
Gov't of Nunavut
Iqaluit, NU
867-975-7729

Hope Bay Mining Ltd.
Suite 300
889 Harbourside Drive
North Vancouver, BC
V7P 3S1
T 604.985.2572
F 604.980.0731
www.newmont.com

July 30, 2010

Melissa Joy
Water Resource Officer Kitikmeot Region
Indian and Northern Affairs Canada
P.O. Box 278
Kugluktuk, NU
X0B 0E0

Re: Update on the Use of EK-35 Dust Suppressant for Doris North Project

Dear Ms. Joy,

On June 3, 2010, Hope Bay Mining Ltd. (HBML) notified you of its planned use of EK-35 dust suppressant at the Doris North Project. This letter is a follow-up to the notification and provides additional information about the test run that was performed.

A test application of EK-35 was performed on June 3, 2010 in the presence of the Midwest company representative, Lynn Edwards, and HBML site supervisors Norm Stevens and Glenn Winsor. The application was performed by two operators, trained by Ms. Edwards, and overseen by their Nuna Logistics supervisor.

The following points summarize the activity:

- The application was made on the road between the crusher and the south end of the airstrip over a distance of approximately 300 meters.
- Samples of pooled water were taken prior to the test (June 3, 2010 – see attached).
- Application was performed in accordance with the SOP submitted to you on June 3, 2010
- Minor revisions were made to the SOP based on this test application and comments provided by Lynn Edwards (see attached).
- The application is very direct and no pooling of EK-35 occurred. The chance of run-off is nil.
- The chance of air-borne transport is low and to avoid this, application will take place when wind speed is <20 km/hr.

Subsequent applications of EK-35 have occurred on site to help manage dust in areas where the application of water has not been successful at controlling dust. The following points summarize the applications:

- Three applications have been made to the airstrip.
- One application was made from the south end of the airstrip to Doris Camp.
- Water samples were taken prior to and after the first application on the airstrip (June 20, 2010 – see attached)

Attached are some photos taken prior to, during, and after the test application, as well as the test sample results taken prior to and after the applications. The test results show that no EK-35 has reached any water. We have also attached an e-mail from the GN regarding the use of EK-35 as a dust suppressant in Nunavut.

Should you have any questions regarding this notification, please do not hesitate to contact me at Chris.Hanks@newmont.com.

Sincerely,

Chris Hanks
Director Environmental and Social Responsibility
Hope Bay Mining Ltd.

Cc.: KIA, NIRB

Figure 1 - Driving on road prior to EK-35 application.

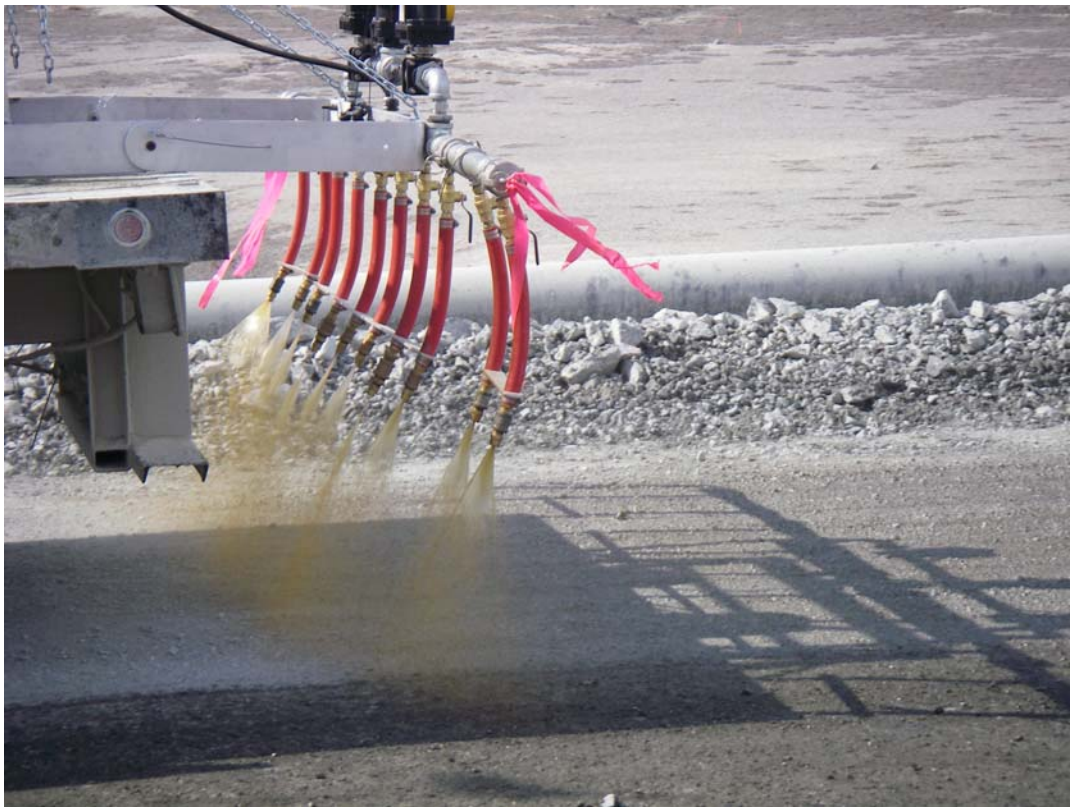


Figure 2 - EK-35 Application

Figure 3 - Road after application of EK-35.

Certificate of Analysis

HOPE BAY MINING LTD
ATTN: JILL TURK
300, 889 HARBOURSIDE DRIVE
NORTH VANCOUVER BC V7P 3S1

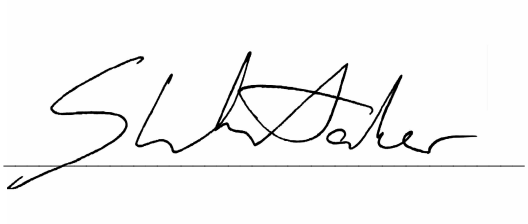
Report Date: 10-JUN-10 15:18 (MT)
Version: FINAL

Lab Work Order #: **L894110** **Date Received:** **04-JUN-10**

Project P.O. #: H00288
Job Reference: COMPLIANCE WATER SAMPLES
Legal Site Desc:
CofC Numbers:

Other Information:

Comments:



ALS LABORATORY GROUP ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L894110-1 EK-35 #1							
Sampled By: JT on 03-JUN-10 @ 12:00							
Matrix: WATER							
BTEX & F1-F4							
BTEX and F1 (C6-C10)							
Benzene	<0.00050		0.00050	mg/L	08-JUN-10	08-JUN-10	R1271010
Toluene	<0.00050		0.00050	mg/L	08-JUN-10	08-JUN-10	R1271010
Ethylbenzene	<0.00050		0.00050	mg/L	08-JUN-10	08-JUN-10	R1271010
o-Xylene	<0.00050		0.00050	mg/L	08-JUN-10	08-JUN-10	R1271010
m+p-Xylene	<0.00050		0.00050	mg/L	08-JUN-10	08-JUN-10	R1271010
F1(C6-C10)	<0.10		0.10	mg/L	08-JUN-10	08-JUN-10	R1271010
F1-BTEX	<0.10		0.10	mg/L	08-JUN-10	08-JUN-10	R1271010
Xylenes	<0.0010		0.0010	mg/L	08-JUN-10	08-JUN-10	R1271010
F2, F3, F4							
F2 (>C10-C16)	<0.25		0.25	mg/L	08-JUN-10	08-JUN-10	R1272345
F3 (C16-C34)	<0.25		0.25	mg/L	08-JUN-10	08-JUN-10	R1272345
F4 (C34-C50)	<0.25		0.25	mg/L	08-JUN-10	08-JUN-10	R1272345
L894110-2 EK-35 #2							
Sampled By: JT on 03-JUN-10 @ 12:00							
Matrix: WATER							
BTEX & F1-F4							
BTEX and F1 (C6-C10)							
Benzene	<0.00050		0.00050	mg/L		08-JUN-10	R1271010
Toluene	<0.00050		0.00050	mg/L		08-JUN-10	R1271010
Ethylbenzene	<0.00050		0.00050	mg/L		08-JUN-10	R1271010
o-Xylene	<0.00050		0.00050	mg/L		08-JUN-10	R1271010
m+p-Xylene	<0.00050		0.00050	mg/L		08-JUN-10	R1271010
F1(C6-C10)	<0.10		0.10	mg/L		08-JUN-10	R1271010
F1-BTEX	<0.10		0.10	mg/L		08-JUN-10	R1271010
Xylenes	<0.0010		0.0010	mg/L		08-JUN-10	R1271010
F2, F3, F4							
F2 (>C10-C16)	<0.25		0.25	mg/L	08-JUN-10	08-JUN-10	R1272345
F3 (C16-C34)	<0.25		0.25	mg/L	08-JUN-10	08-JUN-10	R1272345
F4 (C34-C50)	<0.25		0.25	mg/L	08-JUN-10	08-JUN-10	R1272345

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
BTX,F1-ED	Water	BTEX and F1 (C6-C10)	EPA 5021/8015&8260 GC-MS & FID
F2,F3,F4-ED	Water	F2, F3, F4	EPA 3510/CCME PHC CWS-GC-FID

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
ED	ALS LABORATORY GROUP - EDMONTON, ALBERTA, CANADA

Chain of Custody Numbers:

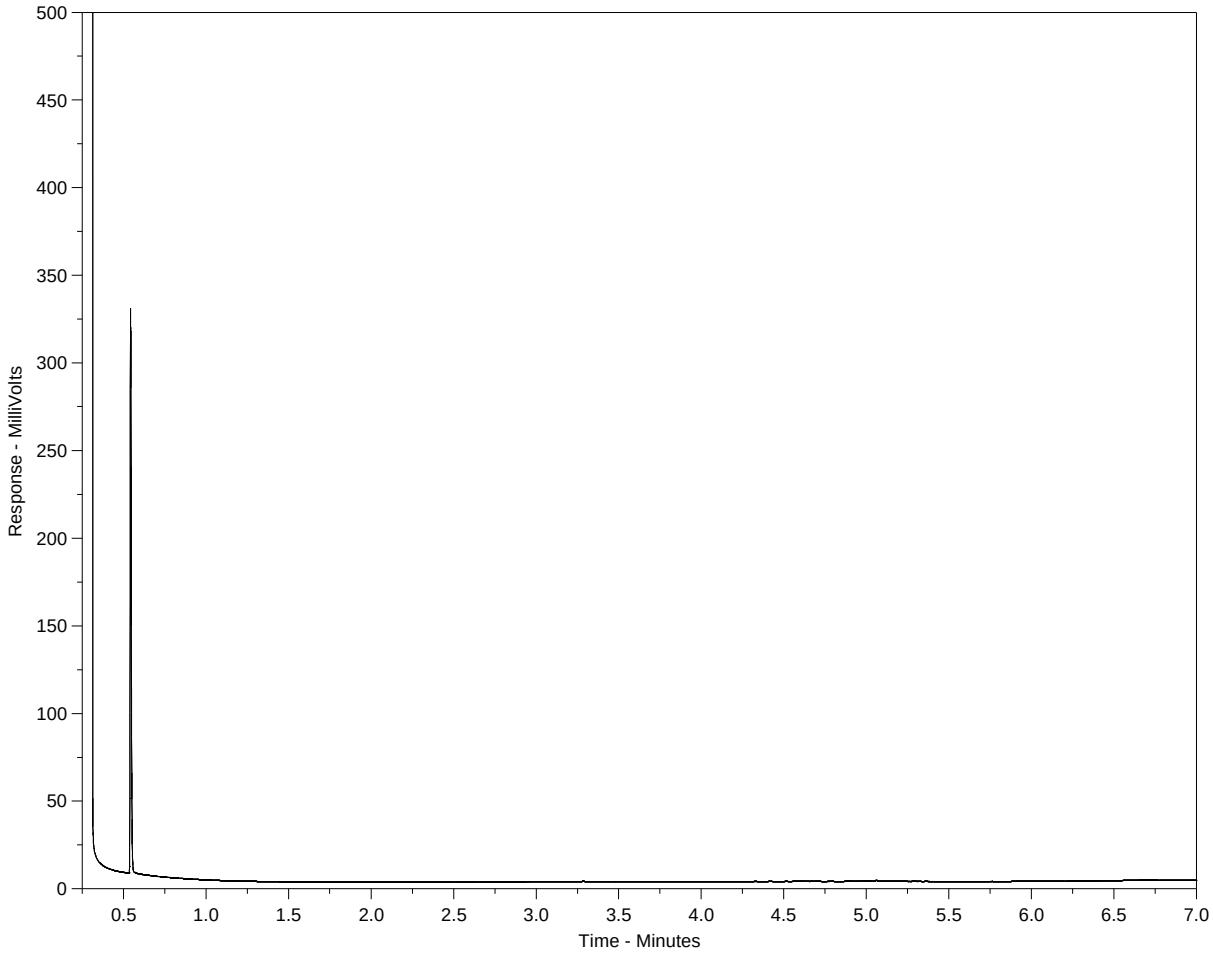
GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.
mg/kg - milligrams per kilogram based on dry weight of sample
mk/kg wwt - milligrams per kilogram based on wet weight of sample
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight
mg/L - unit of concentration based on volume, parts per million.
< - Less than.
D.L. - The reporting limit.
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Hydrocarbon Distribution Report

ALS Sample ID: **L894110-1**
Client ID: **EK-35 #1**



<-nC10----------nC16----------nC34----------nC50->
<----------Gasoline----------> <----------Heavy Oils---------->
|----------Diesel----------|

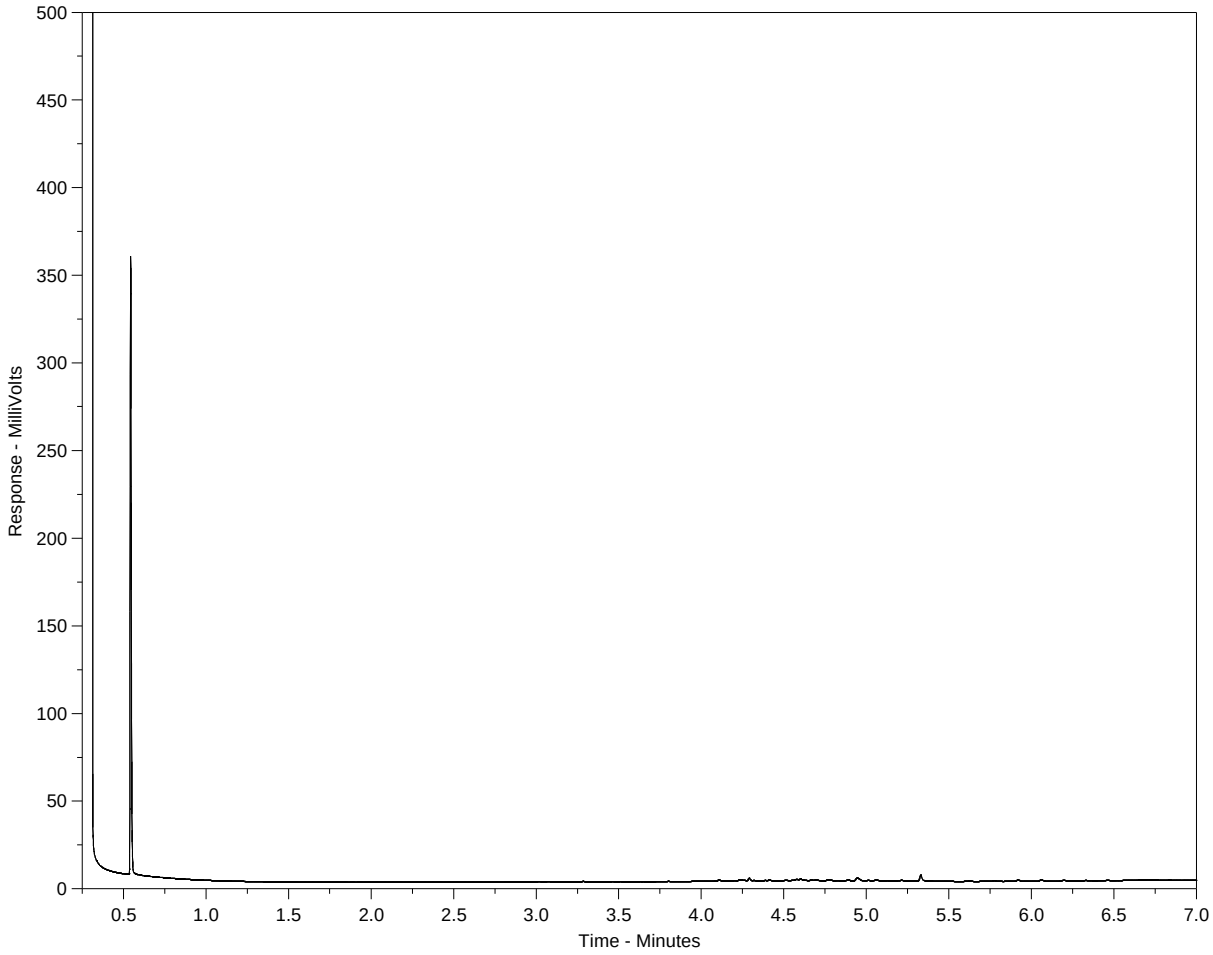
The Canada Wide Standard Hydrocarbon Distribution Report is intended to assist you in characterizing hydrocarbon products that may be present in your sample. The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products as well as a number of specified n-alkane hydrocarbon marker compounds. Comparison of this report with those of reference standards may also assist in characterizing hydrocarbons present in the sample.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

Note: This chromatogram was produced with a high temperature GC method that is specific to the Canada-Wide Standard method (December 2007 version). Note that retention times and distribution profiles from reports produced using different GC programs will differ.

Hydrocarbon Distribution Report

ALS Sample ID: **L894110-2**
Client ID: **EK-35 #2**



<-nC10----------nC16----------nC34----------nC50->
<----------Gasoline----------> <----------Heavy Oils---------->
|----------Diesel----------|

The Canada Wide Standard Hydrocarbon Distribution Report is intended to assist you in characterizing hydrocarbon products that may be present in your sample. The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products as well as a number of specified n-alkane hydrocarbon marker compounds. Comparison of this report with those of reference standards may also assist in characterizing hydrocarbons present in the sample.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

Note: This chromatogram was produced with a high temperature GC method that is specific to the Canada-Wide Standard method (December 2007 version). Note that retention times and distribution profiles from reports produced using different GC programs will differ.

Certificate of Analysis

HOPE BAY MINING LTD
ATTN: JILL TURK
300, 889 HARBOURSIDE DRIVE
NORTH VANCOUVER BC V7P 3S1

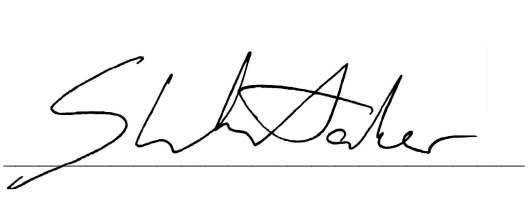
Report Date: 06-JUL-10 17:20 (MT)
Version: FINAL

Lab Work Order #: **L902066** **Date Received:** **25-JUN-10**

Project P.O. #: H00288
Job Reference: COMPLIANCE WATER SAMPLES
Legal Site Desc:
CofC Numbers:

Other Information:

Comments:



ALS LABORATORY GROUP ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L902066-1 DORIS AIRSTRIP STR #1 (PRE-EK-35)							
Sampled By: DV on 20-JUN-10 @ 14:00							
Matrix: WATER							
BTEX & F1-F4							
BTEX and F1 (C6-C10)							
Benzene	<0.00050		0.00050	mg/L		05-JUL-10	R1322846
Toluene	<0.00050		0.00050	mg/L		05-JUL-10	R1322846
Ethylbenzene	<0.00050		0.00050	mg/L		05-JUL-10	R1322846
o-Xylene	<0.00050		0.00050	mg/L		05-JUL-10	R1322846
m+p-Xylene	<0.00050		0.00050	mg/L		05-JUL-10	R1322846
F1(C6-C10)	<0.10		0.10	mg/L		05-JUL-10	R1322846
F1-BTEX	<0.10		0.10	mg/L		05-JUL-10	R1322846
Xylenes	<0.0010		0.0010	mg/L		05-JUL-10	R1322846
F2, F3, F4							
F2 (>C10-C16)	<0.25		0.25	mg/L	02-JUL-10	02-JUL-10	R1326463
F3 (C16-C34)	<0.25		0.25	mg/L	02-JUL-10	02-JUL-10	R1326463
F4 (C34-C50)	<0.25		0.25	mg/L	02-JUL-10	02-JUL-10	R1326463
L902066-2 DORIS AIRSTRIP STR #2 (PRE-EK-35)							
Sampled By: DV on 20-JUN-10 @ 14:30							
Matrix: WATER							
BTEX & F1-F4							
BTEX and F1 (C6-C10)							
Benzene	<0.00050		0.00050	mg/L		05-JUL-10	R1322846
Toluene	<0.00050		0.00050	mg/L		05-JUL-10	R1322846
Ethylbenzene	<0.00050		0.00050	mg/L		05-JUL-10	R1322846
o-Xylene	<0.00050		0.00050	mg/L		05-JUL-10	R1322846
m+p-Xylene	<0.00050		0.00050	mg/L		05-JUL-10	R1322846
F1(C6-C10)	<0.10		0.10	mg/L		05-JUL-10	R1322846
F1-BTEX	<0.10		0.10	mg/L		05-JUL-10	R1322846
Xylenes	<0.0010		0.0010	mg/L		05-JUL-10	R1322846
F2, F3, F4							
F2 (>C10-C16)	<0.25		0.25	mg/L	02-JUL-10	02-JUL-10	R1326463
F3 (C16-C34)	<0.25		0.25	mg/L	02-JUL-10	02-JUL-10	R1326463
F4 (C34-C50)	<0.25		0.25	mg/L	02-JUL-10	02-JUL-10	R1326463
L902066-3 DORIS AIRSTRIP STR #1 (POST-EK-35)							
Sampled By: DV on 24-JUN-10 @ 15:20							
Matrix: WATER							
BTEX & F1-F4							
BTEX and F1 (C6-C10)							
Benzene	<0.00050		0.00050	mg/L		05-JUL-10	R1322846
Toluene	<0.00050		0.00050	mg/L		05-JUL-10	R1322846
Ethylbenzene	<0.00050		0.00050	mg/L		05-JUL-10	R1322846
o-Xylene	<0.00050		0.00050	mg/L		05-JUL-10	R1322846
m+p-Xylene	<0.00050		0.00050	mg/L		05-JUL-10	R1322846
F1(C6-C10)	<0.10		0.10	mg/L		05-JUL-10	R1322846
F1-BTEX	<0.10		0.10	mg/L		05-JUL-10	R1322846
Xylenes	<0.0010		0.0010	mg/L		05-JUL-10	R1322846
F2, F3, F4							
F2 (>C10-C16)	<0.25		0.25	mg/L	02-JUL-10	02-JUL-10	R1326463
F3 (C16-C34)	0.35		0.25	mg/L	02-JUL-10	02-JUL-10	R1326463
F4 (C34-C50)	<0.25		0.25	mg/L	02-JUL-10	02-JUL-10	R1326463

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS LABORATORY GROUP ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L902066-4 DORIS AIRSTRIP STR #2 (POST-EK-35)							
Sampled By: DV on 24-JUN-10 @ 15:30							
Matrix: WATER							
BTEX & F1-F4							
BTEX and F1 (C6-C10)							
Benzene	<0.00050		0.00050	mg/L		05-JUL-10	R1322846
Toluene	<0.00050		0.00050	mg/L		05-JUL-10	R1322846
Ethylbenzene	<0.00050		0.00050	mg/L		05-JUL-10	R1322846
o-Xylene	<0.00050		0.00050	mg/L		05-JUL-10	R1322846
m+p-Xylene	<0.00050		0.00050	mg/L		05-JUL-10	R1322846
F1(C6-C10)	<0.10		0.10	mg/L		05-JUL-10	R1322846
F1-BTEX	<0.10		0.10	mg/L		05-JUL-10	R1322846
Xylenes	<0.0010		0.0010	mg/L		05-JUL-10	R1322846
F2, F3, F4							
F2 (>C10-C16)	<0.25		0.25	mg/L	02-JUL-10	02-JUL-10	R1326463
F3 (C16-C34)	<0.25		0.25	mg/L	02-JUL-10	02-JUL-10	R1326463
F4 (C34-C50)	<0.25		0.25	mg/L	02-JUL-10	02-JUL-10	R1326463

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
BTX,F1-ED	Water	BTEX and F1 (C6-C10)	EPA 5021/8015&8260 GC-MS & FID
F2,F3,F4-ED	Water	F2, F3, F4	EPA 3510/CCME PHC CWS-GC-FID

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
ED	ALS LABORATORY GROUP - EDMONTON, ALBERTA, CANADA

Chain of Custody Numbers:

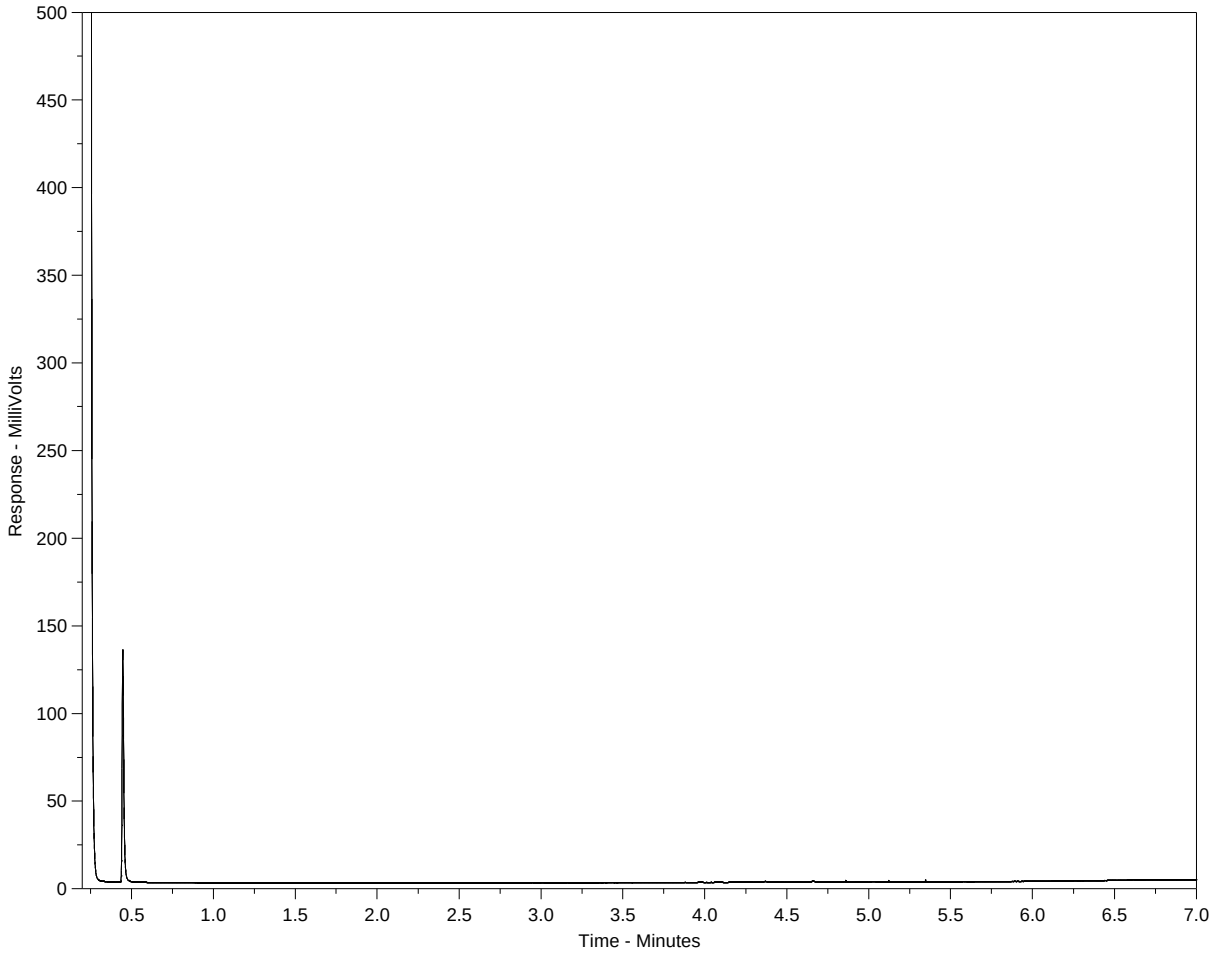
GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.
mg/kg - milligrams per kilogram based on dry weight of sample
mg/kg wwt - milligrams per kilogram based on wet weight of sample
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight
mg/L - unit of concentration based on volume, parts per million.
< - Less than.
D.L. - The reporting limit.
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Hydrocarbon Distribution Report

ALS Sample ID: **L902066-1**
Client ID: **DORIS AIRSTRIP STR #1 (PRE-EK-35)**



<-nC10----------nC16----------nC34----------nC50->
<---------nC11----------nC30---------->
<----------Gasoline----------> <----------Heavy Oils---------->
|----------Diesel----------|

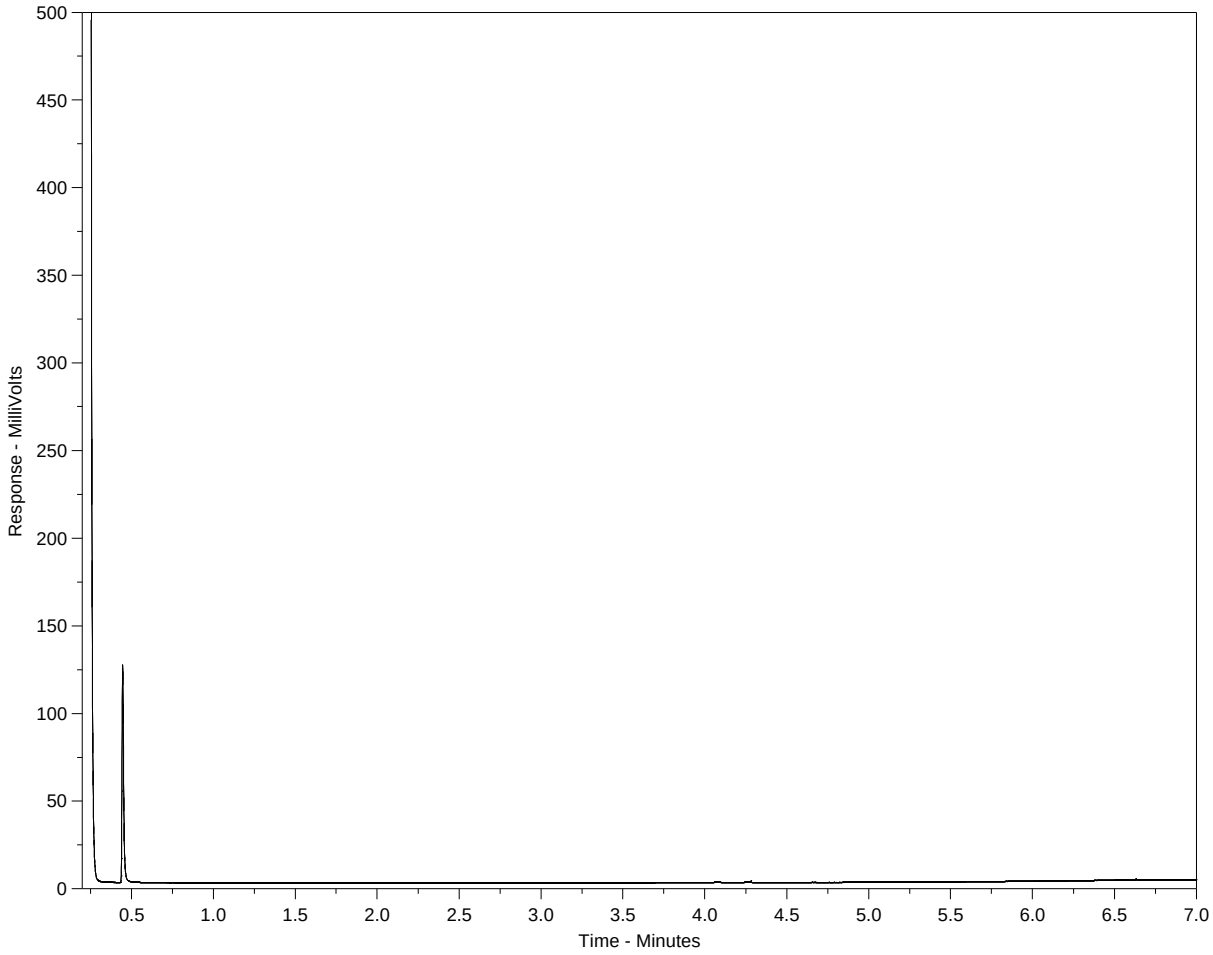
The Canada Wide Standard Hydrocarbon Distribution Report is intended to assist you in characterizing hydrocarbon products that may be present in your sample. The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products as well as a number of specified n-alkane hydrocarbon marker compounds. Comparison of this report with those of reference standards may also assist in characterizing hydrocarbons present in the sample.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

Note: This chromatogram was produced with a high temperature GC method that is specific to the Canada-Wide Standard method (December 2007 version). Note that retention times and distribution profiles from reports produced using different GC programs will differ.

Hydrocarbon Distribution Report

ALS Sample ID: **L902066-2**
Client ID: **DORIS AIRSTRIP STR #2 (PRE-EK-35)**



<-nC10----------nC16----------nC34----------nC50->
<----------nC11----------nC30---------->
<----------Gasoline----------> <----------Heavy Oils---------->
|----------Diesel----------|

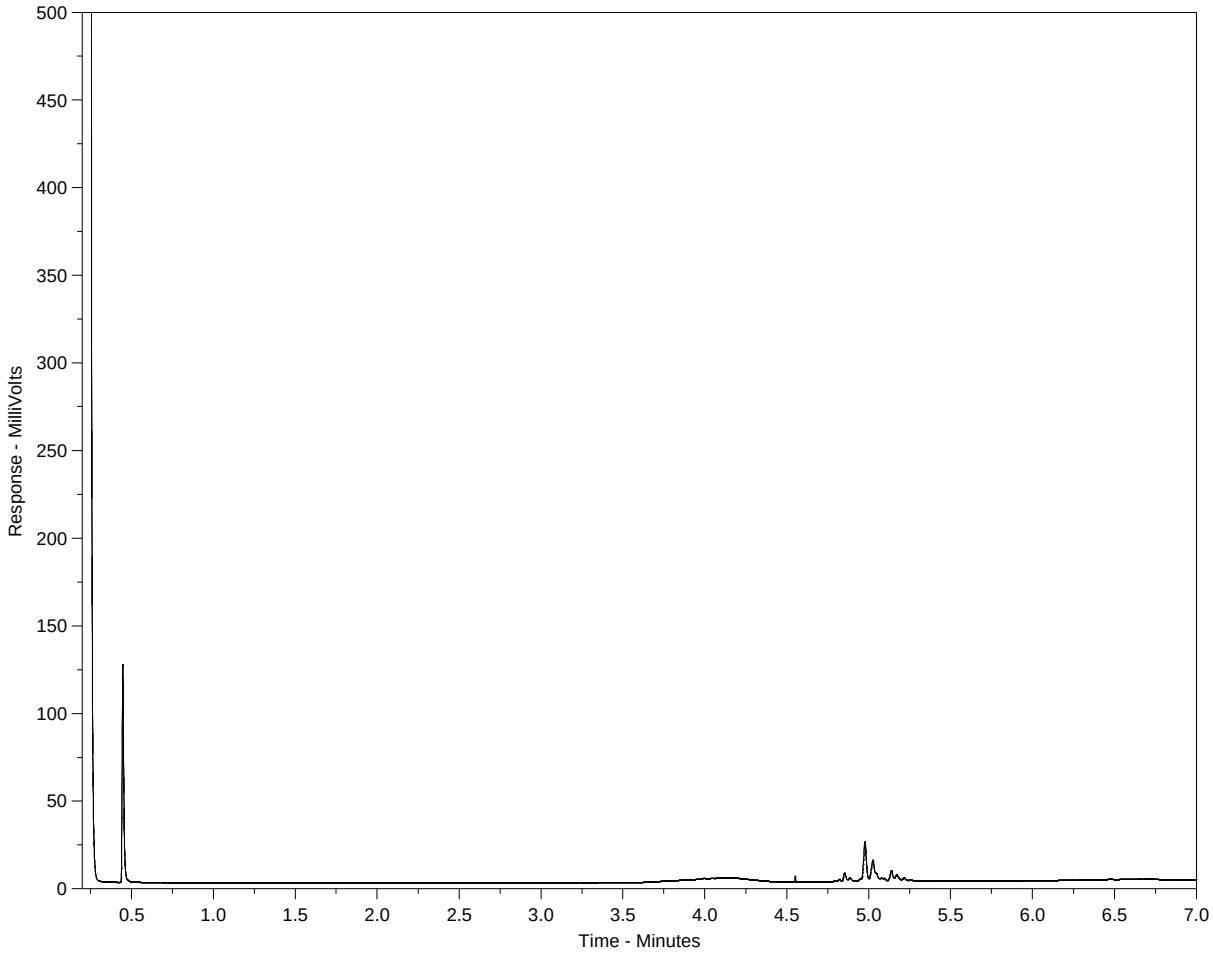
The Canada Wide Standard Hydrocarbon Distribution Report is intended to assist you in characterizing hydrocarbon products that may be present in your sample. The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products as well as a number of specified n-alkane hydrocarbon marker compounds. Comparison of this report with those of reference standards may also assist in characterizing hydrocarbons present in the sample.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

Note: This chromatogram was produced with a high temperature GC method that is specific to the Canada-Wide Standard method (December 2007 version). Note that retention times and distribution profiles from reports produced using different GC programs will differ.

Hydrocarbon Distribution Report

ALS Sample ID: **L902066-3**
Client ID: **DORIS AIRSTRIP STR #1 (POST-EK-35)**



<-nC10----------nC16----------nC34----------nC50->
<----------nC11----------nC30---------->
<----------Gasoline----------> <----------Heavy Oils---------->
|----------Diesel----------|

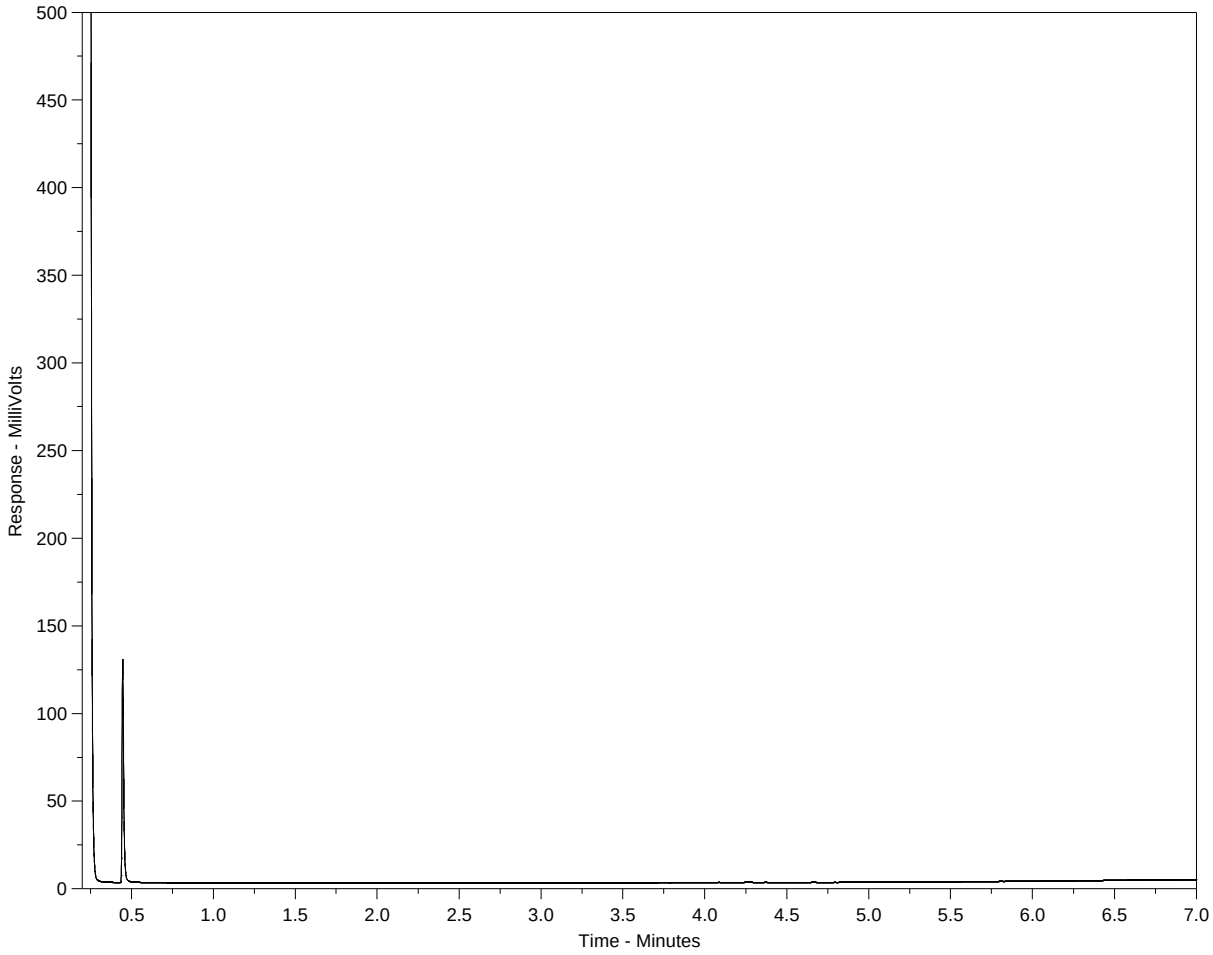
The Canada Wide Standard Hydrocarbon Distribution Report is intended to assist you in characterizing hydrocarbon products that may be present in your sample. The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products as well as a number of specified n-alkane hydrocarbon marker compounds. Comparison of this report with those of reference standards may also assist in characterizing hydrocarbons present in the sample.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

Note: This chromatogram was produced with a high temperature GC method that is specific to the Canada-Wide Standard method (December 2007 version). Note that retention times and distribution profiles from reports produced using different GC programs will differ.

Hydrocarbon Distribution Report

ALS Sample ID: **L902066-4**
Client ID: **DORIS AIRSTRIP STR #2 (POST-EK-35)**



<-nC10----------nC16----------nC34----------nC50->
<----------nC11----------nC30---------->
<----------Gasoline----------> <----------Heavy Oils---------->
|----------Diesel----------|

The Canada Wide Standard Hydrocarbon Distribution Report is intended to assist you in characterizing hydrocarbon products that may be present in your sample. The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products as well as a number of specified n-alkane hydrocarbon marker compounds. Comparison of this report with those of reference standards may also assist in characterizing hydrocarbons present in the sample.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

Note: This chromatogram was produced with a high temperature GC method that is specific to the Canada-Wide Standard method (December 2007 version). Note that retention times and distribution profiles from reports produced using different GC programs will differ.

ALS Environmental
ANALYTICAL CHEMISTRY & TESTING SERVICES

www.alsenviro.com

Vancouver BC, 1988 Triumph Street, V5L 1K5, Tel: 604-253-4188 Toll Free: 1-800-665-0243 Fax: 604-253-6700
Fort St. John BC, Box 256, 9831 - 98A Avenue, V1J 6W7, Tel: 250-261-5517 Fax: 250-261-5587
Grand Prairie AB, 9505 - 111 Street, T8V 5W1, Tel: 780-539-5196 Toll Free: 1-800-668-9878 Fax: 780-513-2191
Fort McMurray AB, Bay 1, 245 Macdonald Cr, T9H 4B5, Tel: 780-791-1524 Fax: 780-791-1586
Edmonton AB, 9936 - 67th Avenue, T6E 0P5, Tel: 780-413-5227 Toll Free: 1-800-668-9878 Fax: 780-437-2311
Calgary AB, Bay 7, 1313 - 44th Avenue NE, T2E 6L5, Tel: 403-291-9897 Toll Free: 1-800-668-9878 Fax: 403-291-0298
Saskatoon SK, 819 - 58th Street East, S7K 6X5, Tel: 306-668-8370 Toll Free: 1-800-667-7645 Fax: 306-668-8383

L902066

SEND REPORT TO:

CHAIN OF CUSTODY FORM

COMPANY:	Hope Bay Mining Limited			ATTN:	Sr. Env. Co-ordinator
ADDRESS:	300-889 Habourside Drive				
CITY:	North Vancouver	PROV:	British Columbia	POSTAL CODE:	V7P 3S1
TEL:	1-604-985-2572	FAX:	1-604-980-0731	SAMPLER:	D. Vokey
PROJECT NAME AND NO.:	Compliance Water Samples			QUOTE NO:	
PO NO.:	H00288	ALS CONTACT:	Jessica Spira		
REPORT FORMAT:	☐ HARDCOPY ☑ EMAIL - ADDRESS: Jill.Turk@Newmont.com ☐ FAX ☑ EXCEL ☑ PDF ☐ OTHER:				

ANALYSIS REQUESTED:

FOR LAB USE ONLY WO#	SAMPLE IDENTIFICATION	DATE / TIME COLLECTED: YYYY-MM-DD	DATE / TIME COLLECTED: TIME	MATRIX	BTEX, F1	F2-F4	NOTES (sample specific comments, due dates, etc.)
	Doris Airstrip STR # 1 (pre-EK-35)	2010-06-20	1400 hrs	water	X		precharged
	Doris Airstrip STR # 1 (pre-EK-35)	2010-06-20	1400 hrs	water		X	
	Doris Airstrip STR # 2 (pre-EK-35)	2010-06-20	1430 hrs	water	X		precharged
	Doris Airstrip STR # 2 (pre-EK-35)	2010-06-20	1430 hrs	water		X	
	Doris Airstrip STR # 1 (post-EK-35)	2010-06-24	1520 hrs	water	X		
	Doris Airstrip STR # 1 (post-EK-35)	2010-06-24	1520 hrs	water		X	
	Doris Airstrip STR # 2 (post-EK-35)	2010-06-24	1530 hrs	water	X		
	Doris Airstrip STR # 2 (post-EK-35)	2010-06-24	1530 hrs	water		X	

TURN AROUND REQUIRED: ◉ ROUTINE ○ RUSH **SPECIFY DATE:** _____ (surcharge may apply)

SEND INVOICE TO: ☑ SAME AS REPORT ☐ DIFFERENT FROM REPORT (provide details below)

INVOICE FORMAT: ☑ HARDCOPY ☑ PDF ☐ FAX

SPECIAL INSTRUCTIONS: Please send invoice to Attention: HBML Accounting Section using the above address: Please quote this PO #: H00288 Electronic results to:Jill.Turk@Newmont.com and MHBLEnvironmental@Newmont.com

RELINQUISHED BY:	DATE:	June 25/10	RECEIVED BY:	DATE:	
D. Vokey	TIME:	9:00am		TIME:	
RELINQUISHED BY:	DATE:		RECEIVED BY:	DATE:	
	TIME:			TIME:	

FOR LAB USE ONLY

Cooler Seal Intact? ___Yes ___No ___N/A | Sample Temperature: ____°C Frozen? ___Yes ___No | Cooling Method? ___Icepacks ___Ice ___None

Hope Bay Mining Ltd.
Suite 300
889 Harbourside Drive
North Vancouver, BC
V7P 3S1
T 604.985.2572
F 604.980.0731
www.newmont.com

July 22, 2011

Ian Rumbolt VIA EMAIL
Water Resource Officer
Aboriginal Affairs and Northern Development Canada
P.O. Box 100, Iqaluit, NU X0A 0H0
Ian.Rumbolt@inac-ainc.gc.ca

Dear Mr. Rumbolt,

Re: 2AM-DOH0713 Use of EK-35 Dust Suppressant for Doris North Project

In 2010, HBML used EK-35 as a dust suppressant on the airstrip and high traffic areas of the Doris North Project. Please be advised that HBML plans to use EK-35 again in 2011. Included with this letter is the previous correspondence submitted to Melissa Joy, including results from last year's trial period, approval for use by the Government of Nunavut Department of Environment, and information relating to EK-35 such as:

- MSDS
- Environmental Data Report
- Boeing Approval for Use
- SOP for use on site
- Midwest Industrial Supply Inc. Information Material

Currently, HBML is applying water to control dust at Doris North. Due to the high level of activity at the project, and the large amount of dust being generated that affects the surrounding environment and the health of employees, water has a short period of effectiveness, requiring a large amount of water to be used for dust suppression. Licence 2AM-DOH0713 does not directly address the use of dust suppressants at Doris except as a monitoring condition for a Construction Monitoring Report. HBML is required to report on the "Monitoring of dust generation and use of water by the contractor to manage dust emissions from crushing and construction activity," as per Schedule D Item i. Under the NIRB Project Certificate Appendix A, HBML commitments with regards to dust include that dust suppression methods will be used on the airstrip and roads during the snow-ice free period. In light of the amount of dust that is currently being managed on site, and the fact that water is not very effective, HBML is planning to use EK-35 to control dust.

EK-35 will be applied on the airstrip and areas of high vehicle traffic. It has been used in other areas of the North, including Ekati (where is has been approved for use by INAC) and airports in the NWT and Nunavut.

Considering the wide use of EK-35 over an extended period of time in the North, HBML feels that it is an appropriate product for use at Doris North.

Kindly acknowledge receipt of this notification and direct any questions to the undersigned. If you have any questions please feel free to contact me at angela.holzapfel@newmont.com .

Sincerely,

Angela Holzapfel
Manager of Environmental Compliance
Hope Bay Mining Ltd.

cc. NWB, KIA, NIRB