Lake Davis Pike Eradication Project Personal Air Monitoring Report

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BACKGROUND

On September 11, 12, 25, 26 and 27, 2007, air monitoring was performed to determine worker exposure to CFT Legumine™ during pesticide application activities conducted as part of the Lake Davis Pike Eradication Project.

Air samples were collected for the following components of CFT Legumine™ based on information provided on the manufacturer's Material Safety Data Sheet (MSDS) and analysis performed by the Department of Fish and Game Water Pollution Control Lab:

- ***Rotenone:*** Rotenone is the active ingredient in CFT Legumine™. Rotenone is a naturally occurring chemical with insecticidal and piscicidal properties obtained from the roots of several tropical and subtropical plant species. Rotenone acts as a general inhibitor of cellular respiration. In humans acute poisoning can cause nausea, vomiting, numbness, and tremors. Occupational exposure to *powdered* rotenone containing plant materials has been reported to induce dermatitis, ulcers in the nose, and irritation of mucous membranes.

- ***Diethylene Glycol Monoethyl Ether (DEGEE):*** Analysis by the Department of Fish and Game Water Pollution Control Lab (DFG WPCL) determined that the CFT Legumine™ is composed of over 50% DEGEE by weight. It is a clear, colorless, flammable liquid. Direct contact with it causes drying of skin by leaching fats, and it is irritating to the eyes.

- ***N-Methylpyrrolidone:*** The DFG WPCL analysis found that CFT Legumine™ is over 10% N-Methylpyrrolidone (NMP) by weight. NMP has been shown to harm the developing fetus when tested in pregnant animals, however the reproductive effects in humans have not been studied. NMP can cause headache, nausea, dizziness, clumsiness, drowsiness and other effects similar to those of being drunk. It is irritating to the eyes, nose, and throat and can quickly be absorbed into your body through your skin. NMP also dissolves the natural protective oils in the skin resulting in dermatitis.

- ***Naphthalene:*** Naphthalene is best known as the primary ingredient of mothballs. In humans, exposure to large amounts of naphthalene may damage or destroy red blood cells, and can cause nausea, vomiting, diarrhea, blood in the urine, and jaundice. The International Agency for Research on Cancer (IARC) classifies naphthalene as possibly carcinogenic to humans [Group 2B]. The DFG WPCL analysis found the amount of naphthalene in CFT Legumine™ to be very low. However, naphthalene had been an ingredient of concern in a previously used rotenone formulation, and therefore some samples were collected for this compound during the September 2007 project.

- ***Industrial Solvent Profile:*** The remainder of the ingredients in CFT Legumine™ consisted of low levels of "Other Associated Resins" and various hydrocarbon solvents. As such, some general hydrocarbon / industrial solvent samples were collected in addition to those for the chemical components listed above.

The individual job tasks selected for the employee air monitoring were based on subjective assessments of those tasks determined to have the greatest potential exposures. These selected jobs tasks were:

- Manual Backpack Sprayer / Drip Can Operator
- Powered Backpack Pesticide Sprayer
- Boat Applicators
- CFT Legumine™ measurement and dilution station
- Secondary CFT Legumine™ drum rinse station

This report provides technical information on the contaminant levels measured and the hazard determinations performed.

METHODS

Air monitoring was performed to determine the airborne levels of the selected compounds DFG workers were exposed to during the pre-determined job activities.

The following table shows the sampling media and analytical method used for each compound collected. The analytical methods are established by the *National Institute for Occupational Safety and Health* (NIOSH).

Compound	Media	Analytical Method
Rotenone	37-mm, two-piece cassette containing 1-µm PTFE membrane filter with backup pad.	NIOSH 5007
Diethylene Glycol Monoethyl Ether	Anasorb 747 Solid Sorbent Tube	NIOSH 2554*
N-Methylpyrrolidone	Anasorb CSC Coconut Charcoal Sorbent Tube	NIOSH 1302
Naphthalene	Anasorb CSC Coconut Charcoal Sorbent Tube	NIOSH 1501
Industrial Solvent Profile	Anasorb CSC Coconut Charcoal Sorbent Tube	(See Next Table)

* *Prior to September 2007, the laboratory under contract to analyze these air samples informed the OSPR Industrial Hygienists that the Diethylene Glycol Monoethyl Ether samples would be analyzed via NIOSH method 2554. The lab also provided Anasorb 747 Solid Sorbent tubes for sample collection as required by this method. When the air monitoring results were received it was discovered that the Diethylene Glycol Monoethyl Ether samples had instead been analyzed via NIOSH method 1403. Following this discovery, the Manager of the Laboratory's Organics Department was contacted. He reported that although the samples were collected in accordance with NIOSH method 2554, the analysis via method 1403 would not have an affect on the accuracy of the samples.*

Industrial Solvent Profile Methods	
Compound	**Analysis Method**
Acetone	NIOSH 1300
Benzene	NIOSH 1501
Carbon Tetrachloride	NIOSH 1003
Chlorobenzene	NIOSH 1003
1,2-Dichloroethane	NIOSH 1003
Ethylbenzene	NIOSH 1501
Heptane	NIOSH 1500
Hexane	NIOSH 1500
Methyl Ethyl Ketone	NIOSH 2500
Methyl isobutyl Ketone	NIOSH 1300
Methylene Chloride	NIOSH 1005
Octane	NIOSH 1500
Styrene	NIOSH 1501
Tetrachloroethylene	NIOSH 1003
Toluene	NIOSH 1500
1,1,1-Trichloroethane	NIOSH 1003
1,1,2-Trichloroethane	NIOSH 1003
Trichloroethylene	NIOSH 1022
m,p-Xylene	NIOSH 1501
o-Xylene	NIOSH 1501

All samples were collected using *SKC Aircheck* sampling pumps (*SKC Model 224-PCXR8*). Each pump was calibrated before and after sampling with a *BIOS DryCell DC Lite*, which is a primary standard. After collection, the samples were sealed and delivered to *Schneider Laboratories* for analysis. *Schneider Laboratories* is certified and accredited by the American Industrial Hygiene Association (AIHA) and the National Environmental Laboratory Accreditation Conference (NELAC).

All pesticide sprayer/applicator samples were collected as personal air samples. After calibration, the air pumps and media were placed on each worker with the media positioned in the worker's breathing zone.

Samples at the CFT Legumine™ measurement and dilution station, and at the secondary drum rinse station, were collected as area samples. After calibration each air pump and media were placed in positions that would approximate the breathing zones of workers in each location.

All samples were collected in accordance with the above stated NIOSH methods. The rotenone samples were collected on filter cassettes containing 1 mm PTFE membrane filters, at flow rates of approximately 2 L/min. The NMP, naphthalene and general hydrocarbon (industrial solvent) samples were collected on coconut shell charcoal tubes, at flow rates from 0.16 to 0.2 L/min. The DEGEE samples were collected on Anasorb® 747 solid sorbent tubes, at flow rates from 0.16 to 0.2 L/min.

The actual sampling periods were determined by pump flow rates, media capacity and the length of the particular job task. Due to sampling pump flow rate limitations, and collection media capacity, the shortest sampling periods were those for the Diethylene Glycol Monoethyl Ether samples. These samples typically ran for approximately one hour each, and not the entire work shifts. However, the activities conducted during these periods were consistent with activities conducted during the remainder of the shifts.

Additionally, since some of the selected job tasks were of limited durations, the sampling performed in conjunction with these tasks was limited to these time periods. In particular, the powered backpack applications of September 11 and 25, 2007 were conducted over approximately one hour periods. Since the intent of collecting these samples was to determine exposures for these particular tasks, the sampling was only performed during the periods these tasks were conducted, and not for the duration of an entire work shift.

FINDINGS

The following tables contain the results of the air monitoring conducted during the Lake Davis Pike Eradication Project:

Manual Backpack Sprayers / Drip Can Operators

Date Sampled	Compound	Results
9/11/07	Rotenone	Below Detection Limit
9/12/07	Rotenone	Below Detection Limit
9/26/07	Rotenone	Below Detection Limit
9/12/07	Diethylene Glycol Monoethyl Ether	Below Detection Limit
9/26/07	Diethylene Glycol Monoethyl Ether	Below Detection Limit
9/26/07	Diethylene Glycol Monoethyl Ether	Below Detection Limit
9/11/07	N-Methylpyrrolidone	Below Detection Limit
9/11/07	N-Methylpyrrolidone	Below Detection Limit
9/12/07	N-Methylpyrrolidone	Below Detection Limit
9/11/07	Naphthalene	Below Detection Limit
9/11/07	Naphthalene	Below Detection Limit
9/11/07	Industrial Solvent Profile (sample 1)	(See Next Table)
9/11/07	Industrial Solvent Profile (sample 2)	(See 2nd Table Below)

Industrial Solvent Profile (sample 1)		
Date Sampled	**Compound**	**Results**
9/11/07	Acetone	Below Detection Limit
	Benzene	Below Detection Limit
	Carbon Tetrachloride	Below Detection Limit
	Chlorobenzene	Below Detection Limit
	1,2-Dichloroethane	Below Detection Limit
	Ethylbenzene	Below Detection Limit
	Heptane	Below Detection Limit
	Hexane	Below Detection Limit
	Methyl Ethyl Ketone	Below Detection Limit
	Methyl isobutyl Ketone	Below Detection Limit
	Methylene Chloride	Below Detection Limit
	Octane	Below Detection Limit
	Styrene	Below Detection Limit
	Tetrachloroethylene	Below Detection Limit
	Toluene	Below Detection Limit
	1,1,1-Trichloroethane	Below Detection Limit
	1,1,2-Trichloroethane	Below Detection Limit
	Trichloroethylene	Below Detection Limit
	m,p-Xylene	Below Detection Limit
	o-Xylene	Below Detection Limit

Industrial Solvent Profile (sample 2)		
Date Sampled	**Compound**	**Results**
9/11/07	Acetone	Below Detection Limit
	Benzene	Below Detection Limit
	Carbon Tetrachloride	Below Detection Limit
	Chlorobenzene	Below Detection Limit
	1,2-Dichloroethane	Below Detection Limit
	Ethylbenzene	Below Detection Limit
	Heptane	Below Detection Limit
	Hexane	Below Detection Limit
	Methyl Ethyl Ketone	Below Detection Limit
	Methyl isobutyl Ketone	Below Detection Limit
	Methylene Chloride	Below Detection Limit
	Octane	Below Detection Limit
	Styrene	Below Detection Limit
	Tetrachloroethylene	Below Detection Limit
	Toluene	Below Detection Limit
	1,1,1-Trichloroethane	Below Detection Limit
	1,1,2-Trichloroethane	Below Detection Limit
	Trichloroethylene	Below Detection Limit
	m,p-Xylene	Below Detection Limit
	o-Xylene	Below Detection Limit

Powered Backpack Sprayers

Date Sampled	Compound	Results
9/11/07	Rotenone	Below Detection Limit
9/25/07	Rotenone	Below Detection Limit
9/11/07	Diethylene Glycol Monoethyl Ether	Below Detection Limit
9/25/07	Diethylene Glycol Monoethyl Ether	Below Detection Limit
9/11/07	N-Methylpyrrolidone	3 ppm
9/25/07	N-Methylpyrrolidone	Below Detection Limit
9/27/07	N-Methylpyrrolidone	Below Detection Limit
9/27/07	N-Methylpyrrolidone	Below Detection Limit
9/11/07	Naphthalene	Below Detection Limit
9/11/07	Industrial Solvent Profile	(See Next Table)

Industrial Solvent Profile		
Date Sampled	**Compound**	**Results**
9/11/07	Acetone	Below Detection Limit
	Benzene	Below Detection Limit
	Carbon Tetrachloride	Below Detection Limit
	Chlorobenzene	Below Detection Limit
	1,2-Dichloroethane	Below Detection Limit
	Ethylbenzene	Below Detection Limit
	Heptane	Below Detection Limit
	Hexane	Below Detection Limit
	Methyl Ethyl Ketone	Below Detection Limit
	Methyl isobutyl Ketone	Below Detection Limit
	Methylene Chloride	Below Detection Limit
	Octane	Below Detection Limit
	Styrene	Below Detection Limit
	Tetrachloroethylene	Below Detection Limit
	Toluene	Below Detection Limit
	1,1,1-Trichloroethane	Below Detection Limit
	1,1,2-Trichloroethane	Below Detection Limit
	Trichloroethylene	Below Detection Limit
	m,p-Xylene	Below Detection Limit
	o-Xylene	Below Detection Limit

Boat Applicators

Date Sampled	Compound	Results
9/25/07	Rotenone	Below Detection Limit
	Rotenone	Below Detection Limit
	Diethylene Glycol Monoethyl Ether	Below Detection Limit
	Diethylene Glycol Monoethyl Ether	Below Detection Limit
	N-Methylpyrrolidone	Below Detection Limit
	N-Methylpyrrolidone	Below Detection Limit
	Naphthalene	Below Detection Limit
	Naphthalene	Below Detection Limit
	Industrial Solvent Profile (sample 1)	(See Next Table)
	Industrial Solvent Profile (sample 2)	(See 2nd Table Below)

Industrial Solvent Profile (sample 1)		
Date Sampled	**Compound**	**Results**
9/25/07	Acetone	Below Detection Limit
	Benzene	Below Detection Limit
	Carbon Tetrachloride	Below Detection Limit
	Chlorobenzene	Below Detection Limit
	1,2-Dichloroethane	Below Detection Limit
	Ethylbenzene	Below Detection Limit
	Heptane	Below Detection Limit
	Hexane	Below Detection Limit
	Methyl Ethyl Ketone	Below Detection Limit
	Methyl isobutyl Ketone	Below Detection Limit
	Methylene Chloride	Below Detection Limit
	Octane	Below Detection Limit
	Styrene	Below Detection Limit
	Tetrachloroethylene	Below Detection Limit
	Toluene	Below Detection Limit
	1,1,1-Trichloroethane	Below Detection Limit
	1,1,2-Trichloroethane	Below Detection Limit
	Trichloroethylene	Below Detection Limit
	m,p-Xylene	Below Detection Limit
	o-Xylene	Below Detection Limit

Industrial Solvent Profile (sample 2)		
Date Sampled	**Compound**	**Results (ppm)**
9/25/07	Acetone	1.18
	Benzene	Below Detection Limit
	Carbon Tetrachloride	0.44
	Chlorobenzene	Below Detection Limit
	1,2-Dichloroethane	0.44
	Ethylbenzene	Below Detection Limit
	Heptane	Below Detection Limit
	Hexane	Below Detection Limit
	Methyl Ethyl Ketone	0.24
	Methyl isobutyl Ketone	Below Detection Limit
	Methylene Chloride	0.32
	Octane	Below Detection Limit
	Styrene	Below Detection Limit
	Tetrachloroethylene	Below Detection Limit
	Toluene	0.16
	1,1,1-Trichloroethane	Below Detection Limit
	1,1,2-Trichloroethane	Below Detection Limit
	Trichloroethylene	0.32
	m,p-Xylene	Below Detection Limit
	o-Xylene	Below Detection Limit

Secondary Drum Rinse Station (Area Samples)

Date Sampled	Compound	Results
9/26/07	Rotenone	Below Detection Limit
	Diethylene Glycol Monoethyl Ether	Below Detection Limit
	N-Methylpyrrolidone	Below Detection Limit

CFT Legumine™ Measuring and Dilution Station (Area Samples)

Date Sampled	Compound	Results
9/26/07	Rotenone	Below Detection Limit
	Diethylene Glycol Monoethyl Ether	Below Detection Limit
	N-Methylpyrrolidone	Below Detection Limit

CONCLUSIONS

The results of the air monitoring conducted during the Lake Davis Pike Eradication Project showed most exposures were below the analytical laboratory's minimum detection limit for the compounds of interest. There were two samples above the minimum detection limits (an N-Methylpyrrolidone sample collected during a powered backpack application on September 11, 2007, and an Industrial Solvent Profile collected from a boat applicator on September 25, 2007), but neither of these exceeded any published exposure limits.

The N-Methylpyrrolidone (NMP) sample collected during the powered backpack application on September 11, 2007 showed an exposure of 3 ppm. No OSHA Permissible Exposure Limit (PEL) has been established for NMP. However, the American Industrial Hygiene Association's *Workplace Environmental Exposure Level* (WEEL) for NMP is 10 ppm averaged over an eight hour work period. The California Department of Health Services *Hazard Evaluation System & Information Service* (HESIS) recommends that workplace exposure to NMP be kept to a minimum and below 5 ppm (averaged over an eight hour work period) until a safe level has been determined.

It should be noted that the powered backpack application being conducted when this sample was collected lasted for approximately one hour and not a full eight hour workshift. As previously noted, the samples collected on September 11, 2007 were collected only during the period these workers were operating the powered backpack sprayers and not for the duration of their entire work shift. The remainders of the employees' workshifts were spent using the manual backpack sprayers and tending to drip stations. Since the CFT Legumine™ is less prone to be aerosolized by the low pressure manual backpack sprayer and the drip stations, and since all samples collected from manual backpack sprayers were below the minimum detection limits, it is likely that this employee's true eight hour time-weighted average exposure was lower than 3 ppm.

The Industrial Solvent Profile collected from the boat applicator on September 25, 2007, was somewhat unusual in that the majority of compounds identified (and all of the chlorinated compounds) were not part of the CFT Legumine™ formulation utilized during the project. It appears that these sample results may have been from the applicator's exposure to gasoline vapors while fueling the boat. Due to the nature of the laboratory's analysis, identification was based on the gas chromatograph's peak retention time. The resulting chromatogram exhibited a pattern similar to gasoline. Since gasoline is composed of a broad range of individual analytes, it is possible that, based on the methodology of the analysis, those individual gasoline compounds may elute at the same time as the reported compounds and therefore be reported as such.

In conclusion, the personal air samples collected during the Lake Davis Pike Eradication Project of September 2007 indicate that employee exposures to CFT Legumine™ during the project were well below levels determined to be hazardous to human health.