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Substance Risk Evaluation for Determining Environmental Emergency Planning under the *Environmental Emergency Regulations* Set under the *Canadian Environmental Protection Act, 1999* (CEPA 1999)

Hexane
(CAS No. 110-54-3)

Risk Evaluation Conclusion:

- **Threshold quantity of 4.5 tonnes (minimum concentration 10%) due to aquatic toxicity**
- **Is a candidate for the *Environmental Emergency Regulations***

1.0 INTRODUCTION

The *Environmental Emergency Regulations*, developed under Part 8 of CEPA 1999 (Government of Canada, 2011), establish a list of substances for which fixed facilities must notify Environment Canada that they store or use the substance on-site, by providing notices to Environment Canada, reporting when the substance is released into the environment, and developing an environmental emergency plan (E2 plan) for each substance stored or used at a fixed facility at or above specified threshold quantities.

To determine if a substance is a candidate to be added to the *Environmental Emergency Regulations*, Environment Canada developed a risk evaluation methodology based on the following hazard categories:

- Physical: flammable and combustible or oxidizing substances, or those having a potential to cause vapour cloud explosions or pool fires.
- Human Health: substances that are toxic by inhalation, are carcinogenic, or are corrosive.
- Environmental Health: substances that are: corrosive, persistent, bioaccumulative, or aquatically toxic.

For more information on the methodology for setting threshold quantities in the *Environmental Emergency Regulations*, please refer to Environment Canada (2015).

Hexane (CAS No. 110-54-3) was selected for risk evaluation because it is a substance (under the Government of Canada's Chemicals Management Plan [http://www.ec.gc.ca/ese-ees/default.asp?lang=En&xml=C1B542C5-4A04-DD1F-74D8-0E7B1459065C]) that, if spilled, could be immediately harmful to humans and/or the environment.

Following the risk evaluation, Environment Canada recommends that this substance be proposed for addition to Schedule 1 of the *Environmental Emergency Regulations* at a threshold quantity of 4.5 tonnes with a minimum concentration of 10%.

2.0 SUMMARY OF THE RISK EVALUATION

2.1 Physical Hazard: Flammable, Combustible or Oxidizing Substances

Because hexane has a flash point of -22°C (HSDB, 2005) and has a boiling point of 68.7°C (Government of Canada, 2009), this substance have the possibility of a vapour cloud explosion.

Therefore, a threshold of 18 tonnes is set for this substance as a result of its potential for combustibility.

2.2 Physical Hazard: Potential for Pool Fires

Environment Canada determined, via the Process Hazard Analysis Software Tools (PHAST) software, that hexane is capable of causing a pool fire at a quantity of 33 tonnes.

2.3 Human Health Hazard: Inhalation Toxicity

Because hexane has a vapour pressure greater than 10 mmHg (1.33 kPa) at 25°C (ATSDR, 1999), the substance has sufficient volatility to constitute an inhalation danger. The substance has a lethal concentration required to kill 50% of the population (LC50) of 48,000 ppm (4 hours) (RTECS, 2007) and an Immediately Dangerous to Life and Health (IDLH) of 1,100 ppm (NIOSH, 1995); however the, IDLH is based on the Lower Explosive Limit (LEL) and is not a measure of toxicity. The LEL has been taken into account in regards to the substance's combustibility, and therefore, the IDLH will not be considered with regards to inhalation toxicity.

Both the LC50 of 48,000 ppm (4 hours) (RTECS, 2007) and the lethal dose at which 50% of the population is killed in a given period of time (LD50) of 28,710 ppm (U.S. DOE, 2007) have been rejected. US Environmental Protection Agency suggested that for levels greater than 20,000 ppm for LC50 values, and 5,000 ppm for LD50 values, these concentrations are considered to be relatively non-hazardous (Waxman, 1998).

Therefore, no threshold is set for the inhalation toxicity to humans.

2.4 Human Health Hazard: Carcinogenicity

Because hexane is not classified in any group of the International Agency for Research on Cancer (IARC, 2014) or the U.S. Environmental Protection Agency (U.S. EPA, 2005), and because the substance does not have a half-life longer than five years in any medium, no threshold is set for the carcinogenicity of this substance.

2.5 Human and Environmental Health Hazard: Corrosive Substances

The measured pH is greater than 2 and less than 11.5,therefore the substance is not considered corrosive and there is no associated threshold with this category.

2.6 Environmental Health Hazard: Persistent, Bioaccumulative, or Aquatically Toxic

Lethal concentration

The acute (short-term) aquatic toxicity for hexane has been determined to be moderately toxic based on studies of the most sensitive species, Fathead minnow (*Pimephales promelas*), with a lethal concentration (LC50 96 hours) of 2.5 mg/L (Geiger, *et al*., 1990).

Persistence

Environment Canada determined that hexane is non-persistent in water according to our risk evaluation methodology (Environment Canada, 2015).

Bioaccumulation

Environment Canada determined that hexane is slightly bioaccumulative according to our risk evaluation methodology (Environment Canada, 2015).

Threshold

Following the evaluation of the aquatic toxicity, the threshold is set at 4.5 tonnes.

2.7 Assigned Concentration

Hexane is subject to the *Environmental Emergency Regulations* for aquatic toxicity. The minimum concentration assigned in the category for aquatic toxicity is either 10% (not a carcinogen) or 1% (a carcinogen). Since hexane is not carcinogenic, then the minimum concentration set for hexane is 10% (Environment Canada, 2015).

2.8 Assigned Threshold

Following the risk evaluation methodology developed under section 200 of CEPA 1999, the categories (flammability, combustibility, oxidizers, inhalation toxicity, aquatic toxicity, carcinogenicity, corrosiveness, pool fires) having the lowest scientific threshold will be compared against other risk management considerations. For example, the threshold will be compared to other

provincial and federal legislation or voluntary programs that may already provide adequate management of the risk from an environmental emergency. Proposed thresholds may also be modified based on policy and other considerations as assessed during the public consultation period. For more information regarding the determination of thresholds, please refer to the *Implementation Guidelines for the Environmental Emergency Regulations 2011* (Environment Canada, 2011).

Other Considerations

At this time, there are no other considerations to take into account for this substance that would result in an increase or a decrease in the calculated threshold quantity.

Findings

A proposed threshold of 4.5 tonnes with a minimum concentration of 10% is assigned for hexane based on its assessed aquatic toxicity. The threshold quantity and its respective concentration will not be finalized until after public consultation.

3.0 CONCLUSION

Information concerning the quantities of hexane (CAS No. 110-54-3) in use in Canada indicates that the substance exists in commerce. Following the risk evaluation and policy considerations of hexane and taking into consideration the quantities in use in Canada, Environment Canada recommends that this substance be proposed for addition to Schedule 1 of the *Environmental Emergency Regulations* under CEPA 1999 at a threshold quantity of 4.5 tonnes at a minimum concentration of 10%.

When doing the emergency planning of a substance, it is important to take into consideration not only the most stringent assigned threshold quantity, but all of the other higher-threshold quantities that are noted in association with this substance. Other notable thresholds of concern also determined for this substance are: 18 tonnes for combustibility; and 33 tonnes for pool fire.

Even if the quantity of a substance in use is below the threshold quantity indicated in the *Environmental Emergency Regulations*, Environment Canada recommends that emergency planning be applied to this substance in order to minimize, or prevent, any impacts on humans or the environment in the event of a release of the substance.

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5.0 FURTHER READING

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