

**MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY**

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**INTEROFFICE COMMUNICATION**

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TO: Heavy aromatic solvent naphtha file (CAS # 64742-94-5)

FROM: Keisha Williams, Air Quality Division (AQD)

SUBJECT: Screening level update for heavy aromatic solvent naphtha

DATE: October 21, 2015

The initial threshold screening level (ITSL) for heavy aromatic solvent naphtha is 70  $\mu\text{g}/\text{m}^3$  (annual averaging time) based on United States Environmental Protection Agency's (USEPA's) guidance for derivation of reference concentrations (RfCs) (Jarabek, 1990). The ITSL value was established by a Scientific Advisory Panel (SAP) on June 13, 1994 (SAP, 1994; see attached).

The ITSL was originally established with an averaging time set at 24 hours, the default averaging time, per AQD Rule 232 (2). It is being changed at this time to annual, as allowed per AQD Rule 229 (2), because the derivation accounted for chronic exposure.

References

Act 451 of 1994, Natural Resources and Environmental Protection Act and Air Pollution Control Rules, Michigan Department of Environmental Quality.

Jarabek, A., M. Dourson, J. Overton. Interim Methods for Development of Inhalation Reference Concentrations. U.S. Environmental Protection Agency, Washington, D.C., EPA/600/8-90/066A (NTIS PB90238890).

SAP. 1994. Recommendations of the Scientific Advisory Panel: Heavy Aromatic Solvent Naphtha, CAS Number 64742-94-5. June 13, 1994.

Recommendations of the Scientific Advisory Panel

**HEAVY AROMATIC SOLVENT NAPHTHA**

CAS Number 64742-94-5

June 13, 1994

Heavy aromatic solvent naphtha (64742-94-5) is described in the U.S. Environmental Protection Agency (EPA) Toxic Substance Control Act (ToSCA) inventory as being 'A complex combination of hydrocarbons obtained from distillation of aromatic streams. It consists predominantly of aromatic hydrocarbons having carbon numbers predominantly in the range of C9 through C16 and boiling in the range of approximately 165° C to 290° C.'

A Chemical Abstract Service (CAS) on-line search did not locate any toxicity studies being associated with this specific CAS number. However, in the series of toxicity studies reported by Carpenter et al, the study on high aromatic solvent contains a description for high aromatic solvent that is similar to the description of heavy aromatic solvent naphtha. The characteristics in the Carpenter et al (1977) description include: boiling point range of 364 to 403 degrees F (or 184 to 206 degree C), hydrocarbon lengths 8 to 13, and consisting of 0.3 % paraffins, 98.9 % aromatic, 0.8 % naphthenes and less than 0.1 % olefins. These property descriptions from Carpenter seem to be more focused, with a narrower boiling point range than the ToSCA description and a slightly narrower range of hydrocarbon chain lengths. While the description of heavy aromatic solvent naphtha, under CAS # 64742-94-5, resembles the Carpenter definition, the complete identity of the range of products under CAS # 64742-94-5 is not assured. For the purposes of developing an initial threshold screening level (ITSL), it will be assumed that the hydrocarbon fraction used by Carpenter et al (high aromatic solvent) is similar enough to ToSCA's heavy aromatic solvent naphtha, that the toxicity information from Carpenter et al can be used to develop the ITSL for heavy aromatic solvent naphtha.

In the Carpenter study, groups of 25 male Harlan-Wistar rats and 4 male beagle dogs were exposed to vapors of high aromatic solvent at concentrations of 0, 0.1, 0.22, 0.38 mg/L during a 13 week study. No treatment related changes were observed in any of the exposed animals. Therefore the highest dose tested, 0.38 mg/L or 380 mg/m<sup>3</sup>, could be assumed to be a no observed effect level (NOEL) for this study. The Panel recognized the NOEL from this study as being a 'free standing NOEL.' That is to say, this study doesn't indicate how much higher the dose levels could be before adverse effects occur.

In an unpublished inhalation teratology study, rats were exposed to 0, 100 or 400 ppm of high aromatic solvent on gestation days 6 through 15 (Litton Bionetics 1979). Unfortunately, there was no detailed description of the characteristics of the high aromatic solvent. Because it has the same name, it will be assumed to be the same material. There was reduced food consumption, reduced maternal body weights and 12 deaths observed at 400 ppm. Of the few litters surviving 400 ppm, fetal body weights were also observed reduced. At 100 ppm, adult females exhibited evidence of mucous membrane irritation. Fetuses, at this dose level, had no evidence of teratogenicity or toxicity. A no observed adverse effect level (NOAEL) of 100 ppm could be identified from this study. Based on the molecular weight of 140 for high aromatic solvent, which was listed by Carpenter et al, the 100 ppm dose level converts to an exposure of 570 mg/m<sup>3</sup>. The NOAEL from Litton Bionetic's

relatively short term teratology study seems to support the longer exposure duration (13 week) NOEL of 380 mg/m<sup>3</sup> from Carpenter et al.

The study duration of the study by Carpenter et al was sufficiently long enough to meet the minimal requirements for calculating a reference concentration (RfC), EPA (1990). An ITSL and RfC can be developed as follows:

$$\text{NOEL(adj)} = (380 \text{ mg/m}^3) \times (6/24 \times 5/7) = 68 \text{ mg/m}^3$$

$$\text{NOEL(hec)} = \text{NOEL(adj)} = 68 \text{ mg/m}^3$$

$$\text{RfC} = \text{NOEL(hec)}/\text{UF} = (68 \text{ mg/m}^3)/(1000) = 68 \text{ }\mu\text{g/m}^3 \text{ rounded to } 70 \text{ }\mu\text{g/m}^3$$

where :

- in the determination of the NOEL(hec) from the NOEL(adj), it has been assumed that periodicity was achieved, and the ratio of animal to human blood to air partition coefficients was 1 which is the default value.

- the above UF of 1000 is composed of a factor of 10 for each of the following: subchronic to chronic, animal to human, and sensitive individuals within the population.

The ITSL can be established as being equivalent to the above RfC, based on Rule 232(1)(a).

Therefore ITSL = RfC = 70  $\mu\text{g/m}^3$  with a 24 hour averaging time.

#### References:

Carpenter et al. 1977. Petroleum hydrocarbon toxicity studies. XIV. Animal and human response to vapors of high aromatic solvent. Toxicol Appl Pharmacol 41:235-249.

EPA. 1980. ToSCA inventory appendix A.

EPA. 1990. Interim methods for development of inhalation reference concentrations. EPA/600/8-90/066A.

Litton Bionetics. 1979. Teratology study in rats, high aromatic solvent, Final report. LBI Project # 20698-7. EPA document # FYI-AX-0183-0232.