

# Nitrous NF 7 In 1

## Nitrous Formula Products

Chemwatch Hazard Alert Code: 2

Chemwatch: 71-27697

Version No: 2.1.1.1

Safety Data Sheet according to WHS and ADG requirements

Issue Date: 01/10/2019

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L.GHS.AUS.EN

## SECTION 1 IDENTIFICATION OF THE SUBSTANCE / MIXTURE AND OF THE COMPANY / UNDERTAKING

### Product Identifier

|                               |                   |
|-------------------------------|-------------------|
| Product name                  | Nitrous NF 7 In 1 |
| Synonyms                      | Not Available     |
| Other means of identification | Not Available     |

### Relevant identified uses of the substance or mixture and uses advised against

|                          |   |
|--------------------------|---|
| Relevant identified uses | Combustion catalyst stabilizer and improver for petrol engines. |
|--------------------------|---|

### Details of the supplier of the safety data sheet

|                         |   |
|-------------------------|---|
| Registered company name | Nitrous Formula Products                |
| Address                 | LOT 1850 Tudor Street WA 6315 Australia |
| Telephone               | +61 0417181920                          |
| Fax                     | Not Available                           |
| Website                 | nitrous.com.au                          |
| Email                   | nitrous@live.com.au                     |

### Emergency telephone number

|                                   |                              |
|-----------------------------------|------------------------------|
| Association / Organisation        | CHEMWATCH EMERGENCY RESPONSE |
| Emergency telephone numbers       | +61 1800 951 288             |
| Other emergency telephone numbers | +61 2 9186 1132              |

## SECTION 2 HAZARDS IDENTIFICATION

### Classification of the substance or mixture

COMBUSTIBLE LIQUID, regulated for storage purposes only

|                               |  |
|-------------------------------|--|
| Poisons Schedule              | S5   |
| Classification <sup>[1]</sup> | Flammable Liquid Category 4, Acute Toxicity (Dermal) Category 4, Acute Toxicity (Inhalation) Category 4, Carcinogenicity Category 2, Specific target organ toxicity - single exposure Category 3 (respiratory tract irritation), Specific target organ toxicity - single exposure Category 3 (narcotic effects), Aspiration Hazard Category 1, Chronic Aquatic Hazard Category 2 |
| Legend:                       | 1. Classified by Chemwatch; 2. Classification drawn from HCIS; 3. Classification drawn from Regulation (EU) No 1272/2008 - Annex VI  |

### Label elements

|                     |   |
|---------------------|---|
| Hazard pictogram(s) |  |
| SIGNAL WORD         | DANGER  |

### Hazard statement(s)

Continued...

|        |  |
|--------|--|
| H227   | Combustible liquid.                                    |
| H312   | Harmful in contact with skin.                          |
| H332   | Harmful if inhaled.                                    |
| H351   | Suspected of causing cancer.                           |
| H335   | May cause respiratory irritation.                      |
| H336   | May cause drowsiness or dizziness.                     |
| H304   | May be fatal if swallowed and enters airways.          |
| H411   | Toxic to aquatic life with long lasting effects.       |
| AUH066 | Repeated exposure may cause skin dryness and cracking. |

**Precautionary statement(s) Prevention**

|      |  |
|------|--|
| P201 | Obtain special instructions before use.                                    |
| P210 | Keep away from heat/sparks/open flames/hot surfaces. - No smoking.         |
| P271 | Use in a well-ventilated area.   |
| P281 | Use personal protective equipment as required.                             |
| P261 | Avoid breathing mist/vapours/spray.  |
| P273 | Avoid release to the environment.  |
| P280 | Wear protective gloves/protective clothing/eye protection/face protection. |

**Precautionary statement(s) Response**

|           |  |
|-----------|--|
| P301+P310 | IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician.                              |
| P308+P313 | IF exposed or concerned: Get medical advice/attention.   |
| P322      | Specific measures (see advice on this label).  |
| P331      | Do NOT induce vomiting.  |
| P363      | Wash contaminated clothing before reuse.   |
| P370+P378 | In case of fire: Use alcohol resistant foam or normal protein foam for extinction.               |
| P312      | Call a POISON CENTER or doctor/physician if you feel unwell.                                     |
| P391      | Collect spillage.  |
| P302+P352 | IF ON SKIN: Wash with plenty of soap and water.  |
| P304+P340 | IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. |

**Precautionary statement(s) Storage**

|           |  |
|-----------|--|
| P403+P235 | Store in a well-ventilated place. Keep cool. |
| P405      | Store locked up.                             |

**Precautionary statement(s) Disposal**

|      |   |
|------|---|
| P501 | Dispose of contents/container in accordance with local regulations. |
|------|---|

**SECTION 3 COMPOSITION / INFORMATION ON INGREDIENTS****Substances**

See section below for composition of Mixtures

**Mixtures**

| CAS No        | %[weight]   | Name  |
|---------------|-------------|---|
| 64742-95-6.   | >41.65      | <u>aromatic 150</u>                                   |
| Not Available | 18.66-37.33 | surfactants, proprietary                              |
| Not Available | 18.66-37.33 | alkoxy propanols, proprietary                         |
| Not Available | >7.43       | polymer NJTSN00850201001-5447P, proprietary           |
| Not Available | >6.18       | aliphatic hydrocarbon, proprietary                    |
| 64742-95-6.   | >3.07       | <u>naphtha petroleum, light aromatic solvent</u>      |
| 12108-13-3    | >1.82       | <u>manganese 2-methylcyclopentadienyl tricarbonyl</u> |
| 108-67-8      | >1.82       | <u>1,3,5-trimethyl benzene</u>                        |

Continued...

|               |         |                                |
|---------------|---------|--------------------------------|
| Not Available | <0.06   | dye, proprietary               |
| 95-63-6       | NotSpec | <u>1,2,4-trimethyl benzene</u> |

## SECTION 4 FIRST AID MEASURES

### Description of first aid measures

|                     |  |
|---------------------|--|
| <b>Eye Contact</b>  | <p>If this product comes in contact with the eyes:</p> <ul style="list-style-type: none"> <li>▶ Wash out immediately with fresh running water.</li> <li>▶ Ensure complete irrigation of the eye by keeping eyelids apart and away from eye and moving the eyelids by occasionally lifting the upper and lower lids.</li> <li>▶ Seek medical attention without delay; if pain persists or recurs seek medical attention.</li> <li>▶ Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.</li> </ul>  |
| <b>Skin Contact</b> | <p>If skin contact occurs:</p> <ul style="list-style-type: none"> <li>▶ Immediately remove all contaminated clothing, including footwear.</li> <li>▶ Flush skin and hair with running water (and soap if available).</li> <li>▶ Seek medical attention in event of irritation.</li> </ul>  |
| <b>Inhalation</b>   | <ul style="list-style-type: none"> <li>▶ If fumes or combustion products are inhaled remove from contaminated area.</li> <li>▶ Lay patient down. Keep warm and rested.</li> <li>▶ Prostheses such as false teeth, which may block airway, should be removed, where possible, prior to initiating first aid procedures.</li> <li>▶ Apply artificial respiration if not breathing, preferably with a demand valve resuscitator, bag-valve mask device, or pocket mask as trained. Perform CPR if necessary.</li> <li>▶ Transport to hospital, or doctor, without delay.</li> </ul>   |
| <b>Ingestion</b>    | <ul style="list-style-type: none"> <li>▶ <b>If swallowed do NOT induce vomiting.</b></li> <li>▶ If vomiting occurs, lean patient forward or place on left side (head-down position, if possible) to maintain open airway and prevent aspiration.</li> <li>▶ Observe the patient carefully.</li> <li>▶ Never give liquid to a person showing signs of being sleepy or with reduced awareness; i.e. becoming unconscious.</li> <li>▶ Give water to rinse out mouth, then provide liquid slowly and as much as casualty can comfortably drink.</li> <li>▶ Seek medical advice.</li> <li>▶ Avoid giving milk or oils.</li> <li>▶ Avoid giving alcohol.</li> <li>▶ If spontaneous vomiting appears imminent or occurs, hold patient's head down, lower than their hips to help avoid possible aspiration of vomitus.</li> </ul> |

### Indication of any immediate medical attention and special treatment needed

Any material aspirated during vomiting may produce lung injury. Therefore emesis should not be induced mechanically or pharmacologically. Mechanical means should be used if it is considered necessary to evacuate the stomach contents; these include gastric lavage after endotracheal intubation. If spontaneous vomiting has occurred after ingestion, the patient should be monitored for difficult breathing, as adverse effects of aspiration into the lungs may be delayed up to 48 hours.

53cardio

For petroleum distillates

- In case of ingestion, gastric lavage with activated charcoal can be used promptly to prevent absorption - decontamination (induced emesis or lavage) is controversial and should be considered on the merits of each individual case; of course the usual precautions of an endotracheal tube should be considered prior to lavage, to prevent aspiration.
- Individuals intoxicated by petroleum distillates should be hospitalized immediately, with acute and continuing attention to neurologic and cardiopulmonary function.
- Positive pressure ventilation may be necessary.
- Acute central nervous system signs and symptoms may result from large ingestions of aspiration-induced hypoxia.
- After the initial episode, individuals should be followed for changes in blood variables and the delayed appearance of pulmonary oedema and chemical pneumonitis. Such patients should be followed for several days or weeks for delayed effects, including bone marrow toxicity, hepatic and renal impairment. Individuals with chronic pulmonary disease will be more seriously impaired, and recovery from inhalation exposure may be complicated.
- Gastrointestinal symptoms are usually minor and pathological changes of the liver and kidneys are reported to be uncommon in acute intoxications.
- Chlorinated and non-chlorinated hydrocarbons may sensitize the heart to epinephrine and other circulating catecholamines so that arrhythmias may occur. Careful consideration of this potential adverse effect should precede administration of epinephrine or other cardiac stimulants and the selection of bronchodilators.

BP America Product Safety & Toxicology Department

Both dermal and oral toxicity of manganese salts is low because of limited solubility of manganese. No known permanent pulmonary sequelae develop after acute manganese exposure. Treatment is supportive.

[Ellenhorn and Barceloux: Medical Toxicology]

In clinical trials with miners exposed to manganese-containing dusts, L-dopa relieved extrapyramidal symptoms of both hypo kinetic and dystonic patients. For short periods of time symptoms could also be controlled with scopolamine and amphetamine. BAL and calcium EDTA prove ineffective.

[Gosselin et al: Clinical Toxicology of Commercial Products.]

## SECTION 5 FIREFIGHTING MEASURES

### Extinguishing media

- Foam.
- Dry chemical powder.
- BCF (where regulations permit).
- Carbon dioxide.
- Water spray or fog - Large fires only.

### Special hazards arising from the substrate or mixture

|                             |  |
|-----------------------------|--|
| <b>Fire Incompatibility</b> | ‣ Avoid contamination with oxidising agents i.e. nitrates, oxidising acids, chlorine bleaches, pool chlorine etc. as ignition may result |
|-----------------------------|--|

### Advice for firefighters

|                              |  |
|------------------------------|--|
| <b>Fire Fighting</b>         | <ul style="list-style-type: none"> <li>‣ Alert Fire Brigade and tell them location and nature of hazard.</li> <li>‣ Wear full body protective clothing with breathing apparatus.</li> <li>‣ Prevent, by any means available, spillage from entering drains or water course.</li> <li>‣ Use water delivered as a fine spray to control fire and cool adjacent area.</li> <li>‣ Avoid spraying water onto liquid pools.</li> <li>‣ <b>DO NOT</b> approach containers suspected to be hot.</li> <li>‣ Cool fire exposed containers with water spray from a protected location.</li> <li>‣ If safe to do so, remove containers from path of fire.</li> </ul>               |
| <b>Fire/Explosion Hazard</b> | <ul style="list-style-type: none"> <li>‣ Combustible.</li> <li>‣ Slight fire hazard when exposed to heat or flame.</li> <li>‣ Heating may cause expansion or decomposition leading to violent rupture of containers.</li> <li>‣ On combustion, may emit toxic fumes of carbon monoxide (CO).</li> <li>‣ May emit acrid smoke.</li> <li>‣ Mists containing combustible materials may be explosive.</li> </ul> <p>Combustion products include:<br/>carbon dioxide (CO<sub>2</sub>)<br/>sulfur oxides (SO<sub>x</sub>)<br/>metal oxides<br/>other pyrolysis products typical of burning organic material.<br/>May emit poisonous fumes.<br/>May emit corrosive fumes.</p> |

HAZCHEM | Not Applicable

**SECTION 6 ACCIDENTAL RELEASE MEASURES****Personal precautions, protective equipment and emergency procedures**

See section 8

**Environmental precautions**

See section 12

**Methods and material for containment and cleaning up**

| <b>Minor Spills</b>                | <ul style="list-style-type: none"> <li>▶ Remove all ignition sources.</li> <li>▶ Clean up all spills immediately.</li> <li>▶ Avoid breathing vapours and contact with skin and eyes.</li> <li>▶ Control personal contact with the substance, by using protective equipment.</li> <li>▶ Contain and absorb spill with sand, earth, inert material or vermiculite.</li> <li>▶ Wipe up.</li> <li>▶ Place in a suitable, labelled container for waste disposal.</li> </ul>   |              |            |                 |            |             |                           |  |  |  |  |                                    |   |        |        |          |                               |   |       |           |            |                     |   |       |           |               |                            |   |       |           |         |                            |   |        |        |         |                       |   |       |           |               |                            |  |  |  |  |                                    |   |        |            |         |                               |   |       |            |            |                            |   |        |            |         |                             |   |        |            |            |                                |   |        |            |                 |                     |   |       |            |         |
|------------------------------------|--|--------------|------------|-----------------|------------|-------------|---------------------------|--|--|--|--|------------------------------------|---|--------|--------|----------|-------------------------------|---|-------|-----------|------------|---------------------|---|-------|-----------|---------------|----------------------------|---|-------|-----------|---------|----------------------------|---|--------|--------|---------|-----------------------|---|-------|-----------|---------------|----------------------------|--|--|--|--|------------------------------------|---|--------|------------|---------|-------------------------------|---|-------|------------|------------|----------------------------|---|--------|------------|---------|-----------------------------|---|--------|------------|------------|--------------------------------|---|--------|------------|-----------------|---------------------|---|-------|------------|---------|
| <b>Major Spills</b>                | <p>Chemical Class: aliphatic hydrocarbons<br/>For release onto land: recommended sorbents listed in order of priority.</p> <table border="1"> <thead> <tr> <th>SORBENT TYPE</th> <th>RANK</th> <th>APPLICATION</th> <th>COLLECTION</th> <th>LIMITATIONS</th> </tr> </thead> <tbody> <tr> <td colspan="5"><b>LAND SPILL - SMALL</b></td> </tr> <tr> <td>cross-linked polymer - particulate</td> <td>1</td> <td>shovel</td> <td>shovel</td> <td>R, W, SS</td> </tr> <tr> <td>cross-linked polymer - pillow</td> <td>1</td> <td>throw</td> <td>pitchfork</td> <td>R, DGC, RT</td> </tr> <tr> <td>wood fiber - pillow</td> <td>2</td> <td>throw</td> <td>pitchfork</td> <td>R, P, DGC, RT</td> </tr> <tr> <td>treated wood fibre- pillow</td> <td>2</td> <td>throw</td> <td>pitchfork</td> <td>DGC, RT</td> </tr> <tr> <td>sorbent clay - particulate</td> <td>3</td> <td>shovel</td> <td>shovel</td> <td>R, I, P</td> </tr> <tr> <td>foamed glass - pillow</td> <td>3</td> <td>throw</td> <td>pitchfork</td> <td>R, P, DGC, RT</td> </tr> <tr> <td colspan="5"><b>LAND SPILL - MEDIUM</b></td> </tr> <tr> <td>cross-linked polymer - particulate</td> <td>1</td> <td>blower</td> <td>skiploader</td> <td>R,W, SS</td> </tr> <tr> <td>cross-linked polymer - pillow</td> <td>2</td> <td>throw</td> <td>skiploader</td> <td>R, DGC, RT</td> </tr> <tr> <td>sorbent clay - particulate</td> <td>3</td> <td>blower</td> <td>skiploader</td> <td>R, I, P</td> </tr> <tr> <td>polypropylene - particulate</td> <td>3</td> <td>blower</td> <td>skiploader</td> <td>W, SS, DGC</td> </tr> <tr> <td>expanded mineral - particulate</td> <td>4</td> <td>blower</td> <td>skiploader</td> <td>R, I, W, P, DGC</td> </tr> <tr> <td>polypropylene - mat</td> <td>4</td> <td>throw</td> <td>skiploader</td> <td>DGC, RT</td> </tr> </tbody> </table> <p>Legend<br/>DGC: Not effective where ground cover is dense<br/>R; Not reusable<br/>I: Not incinerable<br/>P: Effectiveness reduced when rainy<br/>RT: Not effective where terrain is rugged<br/>SS: Not for use within environmentally sensitive sites<br/>W: Effectiveness reduced when windy<br/>Reference: Sorbents for Liquid Hazardous Substance Cleanup and Control;<br/>R.W Melvold et al: Pollution Technology Review No. 150: Noyes Data Corporation 1988<br/>Moderate hazard.</p> <ul style="list-style-type: none"> <li>▶ Clear area of personnel and move upwind.</li> <li>▶ Alert Fire Brigade and tell them location and nature of hazard.</li> <li>▶ Wear breathing apparatus plus protective gloves.</li> <li>▶ Prevent, by any means available, spillage from entering drains or water course.</li> <li>▶ No smoking, naked lights or ignition sources.</li> <li>▶ Increase ventilation.</li> <li>▶ Stop leak if safe to do so.</li> <li>▶ Contain spill with sand, earth or vermiculite.</li> <li>▶ Collect recoverable product into labelled containers for recycling.</li> <li>▶ Absorb remaining product with sand, earth or vermiculite.</li> <li>▶ Collect solid residues and seal in labelled drums for disposal.</li> <li>▶ Wash area and prevent runoff into drains.</li> <li>▶ If contamination of drains or waterways occurs, advise emergency services.</li> </ul> | SORBENT TYPE | RANK       | APPLICATION     | COLLECTION | LIMITATIONS | <b>LAND SPILL - SMALL</b> |  |  |  |  | cross-linked polymer - particulate | 1 | shovel | shovel | R, W, SS | cross-linked polymer - pillow | 1 | throw | pitchfork | R, DGC, RT | wood fiber - pillow | 2 | throw | pitchfork | R, P, DGC, RT | treated wood fibre- pillow | 2 | throw | pitchfork | DGC, RT | sorbent clay - particulate | 3 | shovel | shovel | R, I, P | foamed glass - pillow | 3 | throw | pitchfork | R, P, DGC, RT | <b>LAND SPILL - MEDIUM</b> |  |  |  |  | cross-linked polymer - particulate | 1 | blower | skiploader | R,W, SS | cross-linked polymer - pillow | 2 | throw | skiploader | R, DGC, RT | sorbent clay - particulate | 3 | blower | skiploader | R, I, P | polypropylene - particulate | 3 | blower | skiploader | W, SS, DGC | expanded mineral - particulate | 4 | blower | skiploader | R, I, W, P, DGC | polypropylene - mat | 4 | throw | skiploader | DGC, RT |
| SORBENT TYPE                       | RANK   | APPLICATION  | COLLECTION | LIMITATIONS     |            |             |                           |  |  |  |  |                                    |   |        |        |          |                               |   |       |           |            |                     |   |       |           |               |                            |   |       |           |         |                            |   |        |        |         |                       |   |       |           |               |                            |  |  |  |  |                                    |   |        |            |         |                               |   |       |            |            |                            |   |        |            |         |                             |   |        |            |            |                                |   |        |            |                 |                     |   |       |            |         |
| <b>LAND SPILL - SMALL</b>          |  |              |            |                 |            |             |                           |  |  |  |  |                                    |   |        |        |          |                               |   |       |           |            |                     |   |       |           |               |                            |   |       |           |         |                            |   |        |        |         |                       |   |       |           |               |                            |  |  |  |  |                                    |   |        |            |         |                               |   |       |            |            |                            |   |        |            |         |                             |   |        |            |            |                                |   |        |            |                 |                     |   |       |            |         |
| cross-linked polymer - particulate | 1  | shovel       | shovel     | R, W, SS        |            |             |                           |  |  |  |  |                                    |   |        |        |          |                               |   |       |           |            |                     |   |       |           |               |                            |   |       |           |         |                            |   |        |        |         |                       |   |       |           |               |                            |  |  |  |  |                                    |   |        |            |         |                               |   |       |            |            |                            |   |        |            |         |                             |   |        |            |            |                                |   |        |            |                 |                     |   |       |            |         |
| cross-linked polymer - pillow      | 1  | throw        | pitchfork  | R, DGC, RT      |            |             |                           |  |  |  |  |                                    |   |        |        |          |                               |   |       |           |            |                     |   |       |           |               |                            |   |       |           |         |                            |   |        |        |         |                       |   |       |           |               |                            |  |  |  |  |                                    |   |        |            |         |                               |   |       |            |            |                            |   |        |            |         |                             |   |        |            |            |                                |   |        |            |                 |                     |   |       |            |         |
| wood fiber - pillow                | 2  | throw        | pitchfork  | R, P, DGC, RT   |            |             |                           |  |  |  |  |                                    |   |        |        |          |                               |   |       |           |            |                     |   |       |           |               |                            |   |       |           |         |                            |   |        |        |         |                       |   |       |           |               |                            |  |  |  |  |                                    |   |        |            |         |                               |   |       |            |            |                            |   |        |            |         |                             |   |        |            |            |                                |   |        |            |                 |                     |   |       |            |         |
| treated wood fibre- pillow         | 2  | throw        | pitchfork  | DGC, RT         |            |             |                           |  |  |  |  |                                    |   |        |        |          |                               |   |       |           |            |                     |   |       |           |               |                            |   |       |           |         |                            |   |        |        |         |                       |   |       |           |               |                            |  |  |  |  |                                    |   |        |            |         |                               |   |       |            |            |                            |   |        |            |         |                             |   |        |            |            |                                |   |        |            |                 |                     |   |       |            |         |
| sorbent clay - particulate         | 3  | shovel       | shovel     | R, I, P         |            |             |                           |  |  |  |  |                                    |   |        |        |          |                               |   |       |           |            |                     |   |       |           |               |                            |   |       |           |         |                            |   |        |        |         |                       |   |       |           |               |                            |  |  |  |  |                                    |   |        |            |         |                               |   |       |            |            |                            |   |        |            |         |                             |   |        |            |            |                                |   |        |            |                 |                     |   |       |            |         |
| foamed glass - pillow              | 3  | throw        | pitchfork  | R, P, DGC, RT   |            |             |                           |  |  |  |  |                                    |   |        |        |          |                               |   |       |           |            |                     |   |       |           |               |                            |   |       |           |         |                            |   |        |        |         |                       |   |       |           |               |                            |  |  |  |  |                                    |   |        |            |         |                               |   |       |            |            |                            |   |        |            |         |                             |   |        |            |            |                                |   |        |            |                 |                     |   |       |            |         |
| <b>LAND SPILL - MEDIUM</b>         |  |              |            |                 |            |             |                           |  |  |  |  |                                    |   |        |        |          |                               |   |       |           |            |                     |   |       |           |               |                            |   |       |           |         |                            |   |        |        |         |                       |   |       |           |               |                            |  |  |  |  |                                    |   |        |            |         |                               |   |       |            |            |                            |   |        |            |         |                             |   |        |            |            |                                |   |        |            |                 |                     |   |       |            |         |
| cross-linked polymer - particulate | 1  | blower       | skiploader | R,W, SS         |            |             |                           |  |  |  |  |                                    |   |        |        |          |                               |   |       |           |            |                     |   |       |           |               |                            |   |       |           |         |                            |   |        |        |         |                       |   |       |           |               |                            |  |  |  |  |                                    |   |        |            |         |                               |   |       |            |            |                            |   |        |            |         |                             |   |        |            |            |                                |   |        |            |                 |                     |   |       |            |         |
| cross-linked polymer - pillow      | 2  | throw        | skiploader | R, DGC, RT      |            |             |                           |  |  |  |  |                                    |   |        |        |          |                               |   |       |           |            |                     |   |       |           |               |                            |   |       |           |         |                            |   |        |        |         |                       |   |       |           |               |                            |  |  |  |  |                                    |   |        |            |         |                               |   |       |            |            |                            |   |        |            |         |                             |   |        |            |            |                                |   |        |            |                 |                     |   |       |            |         |
| sorbent clay - particulate         | 3  | blower       | skiploader | R, I, P         |            |             |                           |  |  |  |  |                                    |   |        |        |          |                               |   |       |           |            |                     |   |       |           |               |                            |   |       |           |         |                            |   |        |        |         |                       |   |       |           |               |                            |  |  |  |  |                                    |   |        |            |         |                               |   |       |            |            |                            |   |        |            |         |                             |   |        |            |            |                                |   |        |            |                 |                     |   |       |            |         |
| polypropylene - particulate        | 3  | blower       | skiploader | W, SS, DGC      |            |             |                           |  |  |  |  |                                    |   |        |        |          |                               |   |       |           |            |                     |   |       |           |               |                            |   |       |           |         |                            |   |        |        |         |                       |   |       |           |               |                            |  |  |  |  |                                    |   |        |            |         |                               |   |       |            |            |                            |   |        |            |         |                             |   |        |            |            |                                |   |        |            |                 |                     |   |       |            |         |
| expanded mineral - particulate     | 4  | blower       | skiploader | R, I, W, P, DGC |            |             |                           |  |  |  |  |                                    |   |        |        |          |                               |   |       |           |            |                     |   |       |           |               |                            |   |       |           |         |                            |   |        |        |         |                       |   |       |           |               |                            |  |  |  |  |                                    |   |        |            |         |                               |   |       |            |            |                            |   |        |            |         |                             |   |        |            |            |                                |   |        |            |                 |                     |   |       |            |         |
| polypropylene - mat                | 4  | throw        | skiploader | DGC, RT         |            |             |                           |  |  |  |  |                                    |   |        |        |          |                               |   |       |           |            |                     |   |       |           |               |                            |   |       |           |         |                            |   |        |        |         |                       |   |       |           |               |                            |  |  |  |  |                                    |   |        |            |         |                               |   |       |            |            |                            |   |        |            |         |                             |   |        |            |            |                                |   |        |            |                 |                     |   |       |            |         |

Continued...

Personal Protective Equipment advice is contained in Section 8 of the SDS.

## SECTION 7 HANDLING AND STORAGE

### Precautions for safe handling

|                                 |   |
|---------------------------------|---|
| <p><b>Safe handling</b></p>     | <p>The conductivity of this material may make it a static accumulator., A liquid is typically considered nonconductive if its conductivity is below 100 pS/m and is considered semi-conductive if its conductivity is below 10 000 pS/m., Whether a liquid is nonconductive or semi-conductive, the precautions are the same., A number of factors, for example liquid temperature, presence of contaminants, and anti-static additives can greatly influence the conductivity of a liquid.</p> <ul style="list-style-type: none"> <li>▶ Containers, even those that have been emptied, may contain explosive vapours.</li> <li>▶ Do NOT cut, drill, grind, weld or perform similar operations on or near containers.</li> <li>▶ <b>DO NOT allow clothing wet with material to stay in contact with skin</b></li> <li>▶ Avoid all personal contact, including inhalation.</li> <li>▶ Wear protective clothing when risk of exposure occurs.</li> <li>▶ Use in a well-ventilated area.</li> <li>▶ Prevent concentration in hollows and sumps.</li> <li>▶ <b>DO NOT enter confined spaces until atmosphere has been checked.</b></li> <li>▶ Avoid smoking, naked lights or ignition sources.</li> <li>▶ Avoid contact with incompatible materials.</li> <li>▶ When handling, <b>DO NOT eat, drink or smoke.</b></li> <li>▶ Keep containers securely sealed when not in use.</li> <li>▶ Avoid physical damage to containers.</li> <li>▶ Always wash hands with soap and water after handling.</li> <li>▶ Work clothes should be laundered separately.</li> <li>▶ Use good occupational work practice.</li> <li>▶ Observe manufacturer's storage and handling recommendations contained within this SDS.</li> <li>▶ Atmosphere should be regularly checked against established exposure standards to ensure safe working conditions.</li> </ul> |
| <p><b>Other information</b></p> | <p>Consider storage under inert gas.<br/>Store in the dark.</p> <ul style="list-style-type: none"> <li>▶ Store in original containers.</li> <li>▶ Keep containers securely sealed.</li> <li>▶ No smoking, naked lights or ignition sources.</li> <li>▶ Store in a cool, dry, well-ventilated area.</li> <li>▶ Store away from incompatible materials and foodstuff containers.</li> <li>▶ Protect containers against physical damage and check regularly for leaks.</li> <li>▶ Observe manufacturer's storage and handling recommendations contained within this SDS.</li> </ul>  |

### Conditions for safe storage, including any incompatibilities

|                                       |   |
|---------------------------------------|---|
| <p><b>Suitable container</b></p>      | <ul style="list-style-type: none"> <li>▶ Metal can or drum</li> <li>▶ Packaging as recommended by manufacturer.</li> <li>▶ Check all containers are clearly labelled and free from leaks.</li> </ul>  |
| <p><b>Storage incompatibility</b></p> | <p>For alkyl aromatics:<br/>The alkyl side chain of aromatic rings can undergo oxidation by several mechanisms. The most common and dominant one is the attack by oxidation at benzylic carbon as the intermediate formed is stabilised by resonance structure of the ring.</p> <ul style="list-style-type: none"> <li>▶ Following reaction with oxygen and under the influence of sunlight, a hydroperoxide at the alpha-position to the aromatic ring, is the primary oxidation product formed (provided a hydrogen atom is initially available at this position) - this product is often short-lived but may be stable dependent on the nature of the aromatic substitution; a secondary C-H bond is more easily attacked than a primary C-H bond whilst a tertiary C-H bond is even more susceptible to attack by oxygen</li> <li>▶ Monoalkylbenzenes may subsequently form monocarboxylic acids; alkyl naphthalenes mainly produce the corresponding naphthalene carboxylic acids.</li> <li>▶ Oxidation in the presence of transition metal salts not only accelerates but also selectively decomposes the hydroperoxides.</li> <li>▶ Hock-rearrangement by the influence of strong acids converts the hydroperoxides to hemiacetals. Peresters formed from the hydroperoxides undergo Criegee rearrangement easily.</li> <li>▶ Alkali metals accelerate the oxidation while CO<sub>2</sub> as co-oxidant enhances the selectivity.</li> <li>▶ Microwave conditions give improved yields of the oxidation products.</li> <li>▶ Photo-oxidation products may occur following reaction with hydroxyl radicals and NO<sub>x</sub> - these may be components of photochemical smogs.</li> </ul> <p>Oxidation of Alkylaromatics: T.S.S Rao and Shubhra Awasthi: E-Journal of Chemistry Vol 4, No. 1, pp 1-13 January 2007</p> <ul style="list-style-type: none"> <li>▶ Vigorous reactions, sometimes amounting to explosions, can result from the contact between aromatic rings and strong oxidising agents.</li> <li>▶ Aromatics can react exothermically with bases and with diazo compounds.</li> </ul> <p>Metal carbonyls:</p> <ul style="list-style-type: none"> <li>▶ are unstable in air, react vigorously with oxygen and may ignite spontaneously.</li> <li>▶ react with water and steam releasing carbon monoxide</li> <li>▶ decompose, when heated, to carbon monoxide and finely divided metal powder which is readily ignited.</li> </ul> |

**SECTION 8 EXPOSURE CONTROLS / PERSONAL PROTECTION**

**Control parameters**

**OCCUPATIONAL EXPOSURE LIMITS (OEL)**

**INGREDIENT DATA**

| Source                       | Ingredient                                     | Material name  | TWA       | STEL          | Peak          | Notes         |
|------------------------------|--|--|-----------|---------------|---------------|---------------|
| Australia Exposure Standards | manganese 2-methylcyclopentadienyl tricarbonyl | Methylcyclopentadienyl manganese tricarbonyl (as Mn) | 0.2 mg/m3 | Not Available | Not Available | Not Available |

**EMERGENCY LIMITS**


| Ingredient                                     | Material name                                | TEEL-1        | TEEL-2        | TEEL-3      |
|--|--|---------------|---------------|-------------|
| manganese 2-methylcyclopentadienyl tricarbonyl | Manganese tricarbonyl methylcyclopentadienyl | 0.3 mg/m3     | 0.6 mg/m3     | 6.9 mg/m3   |
| 1,3,5-trimethyl benzene                        | Mesitylene; (1,3,5-Trimethylbenzene)         | Not Available | Not Available | 480 ppm     |
| 1,2,4-trimethyl benzene                        | Permafluor E+                                | 140 mg/m3     | 360 mg/m3     | 2,200 mg/m3 |
| 1,2,4-trimethyl benzene                        | Trimethylbenzene, 1,2,4-; (Pseudocumene)     | Not Available | Not Available | 480 ppm     |

| Ingredient                                     | Original IDLH | Revised IDLH  |
|--|---------------|---------------|
| aromatic 150                                   | Not Available | Not Available |
| naphtha petroleum, light aromatic solvent      | Not Available | Not Available |
| manganese 2-methylcyclopentadienyl tricarbonyl | 500 mg/m3     | Not Available |
| 1,3,5-trimethyl benzene                        | Not Available | Not Available |
| 1,2,4-trimethyl benzene                        | Not Available | Not Available |

**MATERIAL DATA**

**Exposure controls**

|  |   |                              |
|--|---|------------------------------|
| <b>Appropriate engineering controls</b>                    | <p>Engineering controls are used to remove a hazard or place a barrier between the worker and the hazard. Well-designed engineering controls can be highly effective in protecting workers and will typically be independent of worker interactions to provide this high level of protection.</p> <p>The basic types of engineering controls are:</p> <p>Process controls which involve changing the way a job activity or process is done to reduce the risk.</p> <p>Enclosure and/or isolation of emission source which keeps a selected hazard "physically" away from the worker and ventilation that strategically "adds" and "removes" air in the work environment. Ventilation can remove or dilute an air contaminant if designed properly. The design of a ventilation system must match the particular process and chemical or contaminant in use.</p> <p>Employers may need to use multiple types of controls to prevent employee overexposure.</p> <p>Local exhaust ventilation usually required. If risk of overexposure exists, wear approved respirator. Correct fit is essential to obtain adequate protection. Supplied-air type respirator may be required in special circumstances. Correct fit is essential to ensure adequate protection.</p> <p>An approved self contained breathing apparatus (SCBA) may be required in some situations.</p> <p>Provide adequate ventilation in warehouse or closed storage area. Air contaminants generated in the workplace possess varying "escape" velocities which, in turn, determine the "capture velocities" of fresh circulating air required to effectively remove the contaminant.</p> |                              |
|  | Type of Contaminant:  | Air Speed:                   |
|  | solvent, vapours, degreasing etc., evaporating from tank (in still air).  | 0.25-0.5 m/s (50-100 f/min.) |
|  | aerosols, fumes from pouring operations, intermittent container filling, low speed conveyer transfers, welding, spray drift, plating acid fumes, pickling (released at low velocity into zone of active generation)   | 0.5-1 m/s (100-200 f/min.)   |
|  | direct spray, spray painting in shallow booths, drum filling, conveyer loading, crusher dusts, gas discharge (active generation into zone of rapid air motion)  | 1-2.5 m/s (200-500 f/min.)   |
|  | grinding, abrasive blasting, tumbling, high speed wheel generated dusts (released at high initial velocity into zone of very high rapid air motion).  | 2.5-10 m/s (500-2000 f/min.) |
| <p>Within each range the appropriate value depends on:</p> |   |                              |

|  | <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 50%; text-align: left;">Lower end of the range</th> <th style="width: 50%; text-align: left;">Upper end of the range</th> </tr> </thead> <tbody> <tr> <td>1: Room air currents minimal or favourable to capture</td> <td>1: Disturbing room air currents</td> </tr> <tr> <td>2: Contaminants of low toxicity or of nuisance value only.</td> <td>2: Contaminants of high toxicity</td> </tr> <tr> <td>3: Intermittent, low production.</td> <td>3: High production, heavy use</td> </tr> <tr> <td>4: Large hood or large air mass in motion</td> <td>4: Small hood-local control only</td> </tr> </tbody> </table> <p>Simple theory shows that air velocity falls rapidly with distance away from the opening of a simple extraction pipe. Velocity generally decreases with the square of distance from the extraction point (in simple cases). Therefore the air speed at the extraction point should be adjusted, accordingly, after reference to distance from the contaminating source. The air velocity at the extraction fan, for example, should be a minimum of 1-2 m/s (200-400 f/min) for extraction of solvents generated in a tank 2 meters distant from the extraction point. Other mechanical considerations, producing performance deficits within the extraction apparatus, make it essential that theoretical air velocities are multiplied by factors of 10 or more when extraction systems are installed or used.</p>  | Lower end of the range | Upper end of the range | 1: Room air currents minimal or favourable to capture | 1: Disturbing room air currents | 2: Contaminants of low toxicity or of nuisance value only. | 2: Contaminants of high toxicity | 3: Intermittent, low production. | 3: High production, heavy use | 4: Large hood or large air mass in motion | 4: Small hood-local control only |
|--|--|------------------------|------------------------|---|---------------------------------|--|----------------------------------|----------------------------------|-------------------------------|---|----------------------------------|
| Lower end of the range                                     | Upper end of the range   |                        |                        |   |                                 |  |                                  |                                  |                               |   |                                  |
| 1: Room air currents minimal or favourable to capture      | 1: Disturbing room air currents  |                        |                        |   |                                 |  |                                  |                                  |                               |   |                                  |
| 2: Contaminants of low toxicity or of nuisance value only. | 2: Contaminants of high toxicity   |                        |                        |   |                                 |  |                                  |                                  |                               |   |                                  |
| 3: Intermittent, low production.                           | 3: High production, heavy use  |                        |                        |   |                                 |  |                                  |                                  |                               |   |                                  |
| 4: Large hood or large air mass in motion                  | 4: Small hood-local control only   |                        |                        |   |                                 |  |                                  |                                  |                               |   |                                  |
| <b>Personal protection</b>                                 |   |                        |                        |   |                                 |  |                                  |                                  |                               |   |                                  |
| <b>Eye and face protection</b>                             | <ul style="list-style-type: none"> <li>▶ Safety glasses with side shields.</li> <li>▶ Chemical goggles.</li> <li>▶ Contact lenses may pose a special hazard; soft contact lenses may absorb and concentrate irritants. A written policy document, describing the wearing of lenses or restrictions on use, should be created for each workplace or task. This should include a review of lens absorption and adsorption for the class of chemicals in use and an account of injury experience. Medical and first-aid personnel should be trained in their removal and suitable equipment should be readily available. In the event of chemical exposure, begin eye irrigation immediately and remove contact lens as soon as practicable. Lens should be removed at the first signs of eye redness or irritation - lens should be removed in a clean environment only after workers have washed hands thoroughly. [CDC NIOSH Current Intelligence Bulletin 59], [AS/NZS 1336 or national equivalent]</li> </ul>  |                        |                        |   |                                 |  |                                  |                                  |                               |   |                                  |
| <b>Skin protection</b>                                     | See Hand protection below  |                        |                        |   |                                 |  |                                  |                                  |                               |   |                                  |
| <b>Hands/feet protection</b>                               | <ul style="list-style-type: none"> <li>▶ Wear chemical protective gloves, e.g. PVC.</li> <li>▶ Wear safety footwear or safety gumboots, e.g. Rubber</li> </ul> <p>The selection of suitable gloves does not only depend on the material, but also on further marks of quality which vary from manufacturer to manufacturer. Where the chemical is a preparation of several substances, the resistance of the glove material can not be calculated in advance and has therefore to be checked prior to the application. The exact break through time for substances has to be obtained from the manufacturer of the protective gloves and has to be observed when making a final choice.</p> <p>Personal hygiene is a key element of effective hand care. Gloves must only be worn on clean hands. After using gloves, hands should be washed and dried thoroughly. Application of a non-perfumed moisturiser is recommended.</p> <p>Suitability and durability of glove type is dependent on usage. Important factors in the selection of gloves include:</p> <ul style="list-style-type: none"> <li>· frequency and duration of contact,</li> <li>· chemical resistance of glove material,</li> <li>· glove thickness and</li> <li>· dexterity</li> </ul> <p>Select gloves tested to a relevant standard (e.g. Europe EN 374, US F739, AS/NZS 2161.1 or national equivalent).</p> <ul style="list-style-type: none"> <li>· When prolonged or frequently repeated contact may occur, a glove with a protection class of 5 or higher (breakthrough time greater than 240 minutes according to EN 374, AS/NZS 2161.10.1 or national equivalent) is recommended.</li> <li>· When only brief contact is expected, a glove with a protection class of 3 or higher (breakthrough time greater than 60 minutes according to EN 374, AS/NZS 2161.10.1 or national equivalent) is recommended.</li> <li>· Some glove polymer types are less affected by movement and this should be taken into account when considering gloves for long-term use.</li> <li>· Contaminated gloves should be replaced.</li> </ul> <p>As defined in ASTM F-739-96 in any application, gloves are rated as:</p> <ul style="list-style-type: none"> <li>· Excellent when breakthrough time &gt; 480 min</li> <li>· Good when breakthrough time &gt; 20 min</li> <li>· Fair when breakthrough time &lt; 20 min</li> <li>· Poor when glove material degrades</li> </ul> <p>For general applications, gloves with a thickness typically greater than 0.35 mm, are recommended.</p> <p>It should be emphasised that glove thickness is not necessarily a good predictor of glove resistance to a specific chemical, as the permeation efficiency of the glove will be dependent on the exact composition of the glove material. Therefore, glove selection should also be based on consideration of the task requirements and knowledge of breakthrough times.</p> <p>Glove thickness may also vary depending on the glove manufacturer, the glove type and the glove model. Therefore, the manufacturers' technical data should always be taken into account to ensure selection of the most appropriate glove for the task.</p> <p>Note: Depending on the activity being conducted, gloves of varying thickness may be required for specific tasks. For example:</p> <ul style="list-style-type: none"> <li>· Thinner gloves (down to 0.1 mm or less) may be required where a high degree of manual dexterity is needed. However, these gloves are only likely to give short duration protection and would normally be just for</li> </ul> |                        |                        |   |                                 |  |                                  |                                  |                               |   |                                  |



|                         |  |
|-------------------------|--|
|                         | <p>single use applications, then disposed of.</p> <ul style="list-style-type: none"> <li>Thicker gloves (up to 3 mm or more) may be required where there is a mechanical (as well as a chemical) risk i.e. where there is abrasion or puncture potential</li> </ul> <p>Gloves must only be worn on clean hands. After using gloves, hands should be washed and dried thoroughly. Application of a non-perfumed moisturiser is recommended.</p> |
| <b>Body protection</b>  | See Other protection below   |
| <b>Other protection</b> | <ul style="list-style-type: none"> <li>Overalls.</li> <li>P.V.C. apron.</li> <li>Barrier cream.</li> <li>Skin cleansing cream.</li> <li>Eye wash unit.</li> </ul>  |

## Respiratory protection

Type A-P Filter of sufficient capacity. (AS/NZS 1716 & 1715, EN 143:2000 & 149:2001, ANSI Z88 or national equivalent)

Where the concentration of gas/particulates in the breathing zone, approaches or exceeds the "Exposure Standard" (or ES), respiratory protection is required.

Degree of protection varies with both face-piece and Class of filter; the nature of protection varies with Type of filter.

| Required Minimum Protection Factor | Half-Face Respirator | Full-Face Respirator | Powered Air Respirator  |
|------------------------------------|----------------------|----------------------|-------------------------|
| up to 10 x ES                      | A-AUS P2             | -                    | A-PAPR-AUS / Class 1 P2 |
| up to 50 x ES                      | -                    | A-AUS / Class 1 P2   | -                       |
| up to 100 x ES                     | -                    | A-2 P2               | A-PAPR-2 P2 ^           |

^ - Full-face

A(All classes) = Organic vapours, B AUS or B1 = Acid gasses, B2 = Acid gas or hydrogen cyanide(HCN), B3 = Acid gas or hydrogen cyanide(HCN), E = Sulfur dioxide(SO<sub>2</sub>), G = Agricultural chemicals, K = Ammonia(NH<sub>3</sub>), Hg = Mercury, NO = Oxides of nitrogen, MB = Methyl bromide, AX = Low boiling point organic compounds(below 65 degC)

- Cartridge respirators should never be used for emergency ingress or in areas of unknown vapour concentrations or oxygen content.
- The wearer must be warned to leave the contaminated area immediately on detecting any odours through the respirator. The odour may indicate that the mask is not functioning properly, that the vapour concentration is too high, or that the mask is not properly fitted. Because of these limitations, only restricted use of cartridge respirators is considered appropriate.
- Cartridge performance is affected by humidity. Cartridges should be changed after 2 hr of continuous use unless it is determined that the humidity is less than 75%, in which case, cartridges can be used for 4 hr. Used cartridges should be discarded daily, regardless of the length of time used

## SECTION 9 PHYSICAL AND CHEMICAL PROPERTIES

### Information on basic physical and chemical properties

|   |   |  |                |
|---|---|--|----------------|
| <b>Appearance</b>                                   | Clear thin amber coloured liquid with petroleum distillate like odour; does not mix with water. |  |                |
| <b>Physical state</b>                               | Liquid  | <b>Relative density (Water = 1)</b>            | 0.828          |
| <b>Odour</b>  | Not Available   | <b>Partition coefficient n-octanol / water</b> | Not Available  |
| <b>Odour threshold</b>                              | Not Available   | <b>Auto-ignition temperature (°C)</b>          | Not Available  |
| <b>pH (as supplied)</b>                             | Not Applicable  | <b>Decomposition temperature</b>               | Not Available  |
| <b>Melting point / freezing point (°C)</b>          | Not Applicable  | <b>Viscosity (cSt)</b>                         | Not Available  |
| <b>Initial boiling point and boiling range (°C)</b> | >190  | <b>Molecular weight (g/mol)</b>                | Not Applicable |
| <b>Flash point (°C)</b>                             | 75  | <b>Taste</b>                                   | Not Available  |
| <b>Evaporation rate</b>                             | Not Available   | <b>Explosive properties</b>                    | Not Available  |
| <b>Flammability</b>                                 | Combustible.  | <b>Oxidising properties</b>                    | Not Available  |
| <b>Upper Explosive Limit (%)</b>                    | Not Available   | <b>Surface Tension (dyn/cm or mN/m)</b>        | Not Available  |
| <b>Lower Explosive Limit (%)</b>                    | Not Available   | <b>Volatile Component (%vol)</b>               | Not Available  |
| <b>Vapour pressure (kPa)</b>                        | <0.13 @20C  | <b>Gas group</b>                               | Not Available  |
| <b>Solubility in water</b>                          | Immiscible  | <b>pH as a solution (1%)</b>                   | Not Applicable |
| <b>Vapour density (Air = 1)</b>                     | >1  | <b>VOC g/L</b>                                 | Not Available  |

Continued...

**SECTION 10 STABILITY AND REACTIVITY**

|   |  |
|---|--|
| <b>Reactivity</b>                         | See section 7  |
| <b>Chemical stability</b>                 | <ul style="list-style-type: none"> <li>▶ Unstable in the presence of incompatible materials.</li> <li>▶ Product is considered stable.</li> <li>▶ Hazardous polymerisation will not occur.</li> </ul> |
| <b>Possibility of hazardous reactions</b> | See section 7  |
| <b>Conditions to avoid</b>                | See section 7  |
| <b>Incompatible materials</b>             | See section 7  |
| <b>Hazardous decomposition products</b>   | See section 5  |

**SECTION 11 TOXICOLOGICAL INFORMATION****Information on toxicological effects**

|                |   |
|----------------|---|
| <b>Inhaled</b> | <p>Inhalation of vapours or aerosols (mists, fumes), generated by the material during the course of normal handling, may be harmful.</p> <p>Evidence shows, or practical experience predicts, that the material produces irritation of the respiratory system, in a substantial number of individuals, following inhalation. In contrast to most organs, the lung is able to respond to a chemical insult by first removing or neutralising the irritant and then repairing the damage. The repair process, which initially evolved to protect mammalian lungs from foreign matter and antigens, may however, produce further lung damage resulting in the impairment of gas exchange, the primary function of the lungs. Respiratory tract irritation often results in an inflammatory response involving the recruitment and activation of many cell types, mainly derived from the vascular system.</p> <p>Inhalation of vapours may cause drowsiness and dizziness. This may be accompanied by narcosis, reduced alertness, loss of reflexes, lack of coordination and vertigo.</p> <p>Signs of toxic response to MMT, after administration by all routes, appear quickly and involve the central nervous system. They include mild excitement, hyperactivity, tremours, severe clonic spasms, weakness, slow and laboured respiration, occasional mild, clonic convulsions and terminal coma.</p> <p>Animals surviving convulsive episodes failed to eat, lost weight rapidly and died within a few days. Central nervous system effects of MMT are similar to those produced by tetraethyl lead.</p> <p>Acute exposure produces liver and kidney damage. All viscera were hyperaemic after exposure and petechial haemorrhage was evident in the lung. Histological examination showed degeneration and necrosis of the liver cells and renal tubules and degeneration of the cells of the cerebral cortex. Other changes include perivascular oedema of the lung, swelling and pyknosis of the cells of the intima and media. In use, MMT may degrade to produce carbon monoxide</p> <p>High inhaled concentrations of mixed hydrocarbons may produce narcosis characterised by nausea, vomiting and lightheadedness. Inhalation of aerosols may produce severe pulmonary oedema, pneumonitis and pulmonary haemorrhage. Inhalation of petroleum hydrocarbons consisting substantially of low molecular weight species (typically C2-C12) may produce irritation of mucous membranes, incoordination, giddiness, nausea, vertigo, confusion, headache, appetite loss, drowsiness, tremors and anaesthetic stupor. Massive exposures may produce central nervous system depression with sudden collapse and deep coma; fatalities have been recorded. Irritation of the brain and/or anoxic anoxia may produce convulsions. Although recovery following overexposure is generally complete, cerebral micro-haemorrhage of focal post-inflammatory scarring may produce epileptiform seizures some months after the exposure. Pulmonary episodes may include chemical pneumonitis with oedema and haemorrhage. The lighter hydrocarbons may produce kidney and neurotoxic effects. Pulmonary irritancy increases with carbon chain length for paraffins and olefins. Alkenes produce pulmonary oedema at high concentrations. Liquid paraffins may produce anaesthesia and depressant actions leading to weakness, dizziness, slow and shallow respiration, unconsciousness, convulsions and death. C5-7 paraffins may also produce polyneuropathy. Aromatic hydrocarbons accumulate in lipid rich tissues (typically the brain, spinal cord and peripheral nerves) and may produce functional impairment manifested by nonspecific symptoms such as nausea, weakness, fatigue and vertigo; severe exposures may produce inebriation or unconsciousness. Many of the petroleum hydrocarbons are cardiac sensitisers and may cause ventricular fibrillations.</p> <p>Central nervous system (CNS) depression may include nonspecific discomfort, symptoms of giddiness, headache, dizziness, nausea, anaesthetic effects, slowed reaction time, slurred speech and may progress to unconsciousness. Serious poisonings may result in respiratory depression and may be fatal.</p> <p>A significant number of individuals exposed to mixed trimethylbenzenes complained of nervousness, tension, anxiety and asthmatic bronchitis. Peripheral blood showed a tendency to hypochromic anaemia and a deviation from normal in coagulability of the blood. Hydrocarbon concentrations ranged from 10 to 60 ppm. Contamination of the mixture with benzene may have been responsible for the blood dyscrasias.</p> <p>High concentrations of mesitylene vapour (5000 to 9000 ppm) caused central nervous system depression in mice. Similar exposures of pseudocumene also produced evidence of CNS involvement.</p> <p>Manganese fume is toxic and produces nervous system effects characterised by tiredness. Acute poisoning is rare although acute inflammation of the lungs may occur. A chemical pneumonia may also result from frequent exposure. Inhalation of freshly formed metal oxide particles sized below 1.5 microns and generally between 0.02 to 0.05 microns may result in "metal fume fever". Symptoms may be delayed for up to 12 hours and begin with the sudden onset of thirst, and a sweet, metallic or foul taste in the mouth. Other symptoms include upper respiratory tract irritation</p> |
|----------------|---|

|  |  |
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|  | <p>accompanied by coughing and a dryness of the mucous membranes, lassitude and a generalised feeling of malaise. Mild to severe headache, nausea, occasional vomiting, fever or chills, exaggerated mental activity, profuse sweating, diarrhoea, excessive urination and prostration may also occur. Tolerance to the fumes develops rapidly, but is quickly lost. All symptoms usually subside within 24-36 hours following removal from exposure.</p> <p>Acute effects from inhalation of high concentrations of vapour are pulmonary irritation, including coughing, with nausea; central nervous system depression - characterised by headache and dizziness, increased reaction time, fatigue and loss of co-ordination</p> <p>The acute toxicity of inhaled alkylbenzenes is best described by central nervous system depression. As a rule, these compounds may also act as general anaesthetics.</p> <p>Systemic poisoning produced by general anaesthesia is characterised by lightheadedness, nervousness, apprehension, euphoria, confusion, dizziness, drowsiness, tinnitus, blurred or double vision, vomiting and sensations of heat, cold or numbness, twitching, tremors, convulsions, unconsciousness and respiratory depression and arrest. Cardiac arrest may result from cardiovascular collapse. Bradycardia, and hypotension may also be produced.</p> <p>Inhaled alkylbenzene vapours cause death in animals at air levels that are relatively similar (typically LC50s are in the range 5000 -8000 ppm for 4 to 8 hour exposures). It is likely that acute inhalation exposure to alkylbenzenes resembles that to general anaesthetics.</p> <p>Alkylbenzenes are not generally toxic other than at high levels of exposure. This may be because their metabolites have a low order of toxicity and are easily excreted. There is little or no evidence to suggest that metabolic pathways can become saturated leading to spillover to alternate pathways. Nor is there evidence that toxic reactive intermediates, which may produce subsequent toxic or mutagenic effects, are formed</p>  |
| <p style="text-align: center;"><b>Ingestion</b></p>    | <p>Swallowing of the liquid may cause aspiration of vomit into the lungs with the risk of haemorrhaging, pulmonary oedema, progressing to chemical pneumonitis; serious consequences may result.</p> <p>Signs and symptoms of chemical (aspiration) pneumonitis may include coughing, gasping, choking, burning of the mouth, difficult breathing, and bluish coloured skin (cyanosis).</p> <p>Accidental ingestion of the material may be damaging to the health of the individual.</p> <p>Ingestion of petroleum hydrocarbons may produce irritation of the pharynx, oesophagus, stomach and small intestine with oedema and mucosal ulceration resulting; symptoms include a burning sensation in the mouth and throat. Large amounts may produce narcosis with nausea and vomiting, weakness or dizziness, slow and shallow respiration, swelling of the abdomen, unconsciousness and convulsions. Myocardial injury may produce arrhythmias, ventricular fibrillation and electrocardiographic changes. Central nervous system depression may also occur. Light aromatic hydrocarbons produce a warm, sharp, tingling sensation on contact with taste buds and may anaesthetise the tongue. Aspiration into the lungs may produce coughing, gagging and a chemical pneumonitis with pulmonary oedema and haemorrhage.</p> <p>Poisonings rarely occur after oral administration of manganese salts as they are generally poorly absorbed from the gut (generally less than 4%) and seems to be dependent, in part, on levels of dietary iron and may increase following the consumption of alcohol. A side-effect of oral manganese administration is an increase in losses of calcium in the faeces and a subsequent lowering of calcium blood levels. Absorbed manganese tends to be slowly excreted in the bile. Divalent manganese appears to be 2.5-3 times more toxic than the trivalent form.</p>   |
| <p style="text-align: center;"><b>Skin Contact</b></p> | <p>Skin contact with the material may be harmful; systemic effects may result following absorption. Repeated exposure may cause skin cracking, flaking or drying following normal handling and use.</p> <p>Limited evidence exists, or practical experience predicts, that the material either produces inflammation of the skin in a substantial number of individuals following direct contact, and/or produces significant inflammation when applied to the healthy intact skin of animals, for up to four hours, such inflammation being present twenty-four hours or more after the end of the exposure period. Skin irritation may also be present after prolonged or repeated exposure; this may result in a form of contact dermatitis (nonallergic). The dermatitis is often characterised by skin redness (erythema) and swelling (oedema) which may progress to blistering (vesiculation), scaling and thickening of the epidermis. At the microscopic level there may be intercellular oedema of the spongy layer of the skin (spongiosis) and intracellular oedema of the epidermis. MMT penetrates the skin rapidly. A small quantity, estimated to be 5-15 ml, spilled on one hand and wrist was reported to cause a "thick tongue", giddiness, nausea, and headache within 3-5 minutes.</p> <p>Open cuts, abraded or irritated skin should not be exposed to this material</p> <p>The liquid may be miscible with fats or oils and may degrease the skin, producing a skin reaction described as non-allergic contact dermatitis. The material is unlikely to produce an irritant dermatitis as described in EC Directives .</p> <p>The material may accentuate any pre-existing dermatitis condition</p> <p>Entry into the blood-stream through, for example, cuts, abrasions, puncture wounds or lesions, may produce systemic injury with harmful effects. Examine the skin prior to the use of the material and ensure that any external damage is suitably protected.</p> <p>Aromatic hydrocarbons may produce skin irritation, vasodilation with erythema and changes in endothelial cell permeability. Systemic intoxication, resulting from contact with the light aromatics, is unlikely due to the slow rate of permeation. Branching of the side chain appears to increase percutaneous absorption.</p> |
| <p style="text-align: center;"><b>Eye</b></p>          | <p>Petroleum hydrocarbons may produce pain after direct contact with the eyes. Slight, but transient disturbances of the corneal epithelium may also result. The aromatic fraction may produce irritation and lachrymation.</p> <p>Limited evidence or practical experience suggests, that the material may cause moderate eye irritation in a substantial number of individuals and/or may produce significant ocular lesions which are present twenty-four hours or more after instillation into the eye(s) of experimental animals. Repeated or prolonged exposure may cause moderate inflammation (similar to windburn) characterised by a temporary redness of the conjunctiva (conjunctivitis); temporary impairment of vision and/or other transient eye damage/ulceration may occur.</p>   |
| <p style="text-align: center;"><b>Chronic</b></p>      | <p>On the basis, primarily, of animal experiments, concern has been expressed that the material may produce carcinogenic or mutagenic effects; in respect of the available information, however, there presently exists inadequate data for making a satisfactory assessment.</p>  |

Long-term exposure to respiratory irritants may result in disease of the airways involving difficult breathing and related systemic problems.

Prolonged or repeated skin contact may cause drying with cracking, irritation and possible dermatitis following.

Limited evidence suggests that repeated or long-term occupational exposure may produce cumulative health effects involving organs or biochemical systems.

There is some evidence that human exposure to the material may result in developmental toxicity. This evidence is based on animal studies where effects have been observed in the absence of marked maternal toxicity, or at around the same dose levels as other toxic effects but which are not secondary non-specific consequences of the other toxic effects.

Long-term (chronic) exposure to low levels of carbon monoxide may produce heart disease and damage to the nervous system. Exposure of pregnant animals to carbon monoxide may cause low birthweight, increased foetal mortality and nervous system damage to the offspring.

Carbon monoxide is a common cause of fatal poisoning in industry and homes. Non fatal poisoning may result in permanent nervous system damage. Carbon monoxide reduces the oxygen carrying capacity of the blood. Effects on the body are considered to be reversible as long as brain cell damage or heart failure has not occurred. Avoid prolonged exposure, even to small concentrations. A well-established and probably causal relationship exists between maternal smoking (resulting in carboxyhaemoglobin levels of 2-7% in the foetus) and low birth weight. There also appears to be a dose-related increase in perinatal deaths and a retardation of mental ability in infants born to smoking mothers.

The foetus and newborn infant are considered to be very susceptible to CO exposure for several reasons:

- Foetal hemoglobin has a greater affinity for CO than maternal hemoglobin.
- Due to differences in uptake and elimination of CO, the fetal circulation is likely to have COHb levels higher (up to 2.5 times) than seen in the maternal circulation.
- The half-life of COHb in fetal blood is 3 times longer than that of maternal blood.
- Since the fetus has a comparatively high rate of O<sub>2</sub> consumption, and a lower O<sub>2</sub> tension in the blood than adults, a compromised O<sub>2</sub> transport has the potential to produce a serious hypoxia.

Carbon monoxide gas readily crosses the placenta and CO exposure during pregnancy can be teratogenic.

Carbon dioxide at low levels may initiate or enhance deleterious myocardial alterations in individuals with restricted coronary artery blood flow and decreased myocardial lactate production. - Linde

Long-term MMT inhalation, by animals, produced chronic bronchitis, peribronchitis, interstitial pneumonia and lung abscesses.

In rats and mice, repeated oral exposure was associated with weight loss and mild neurological and developmental effects. Repeated inhalation exposure, in rats and mice, produced severe weight loss and fatalities. Histopathology showed degenerative changes in the lungs, liver and kidney

Repeated or prolonged exposure may also damage the liver and may cause a decrease in the heart rate. Systemic poisoning may result from inhalation or chronic ingestion of manganese containing substances. Progressive and permanent disability can occur from chronic manganese poisoning if it is not treated, but it is not fatal.

Chronic exposure has been associated with two major effects; bronchitis/pneumonitis following inhalation of manganese dusts and "manganism", a neuropsychiatric disorder that may also arise from inhalation exposures. Chronic exposure to low levels may result in the accumulation of toxic concentrations in critical organs. The brain in particular appears to sustain cellular damage to the ganglion. Symptoms appear before any pathology is evident and may include a mask-like facial expression, spastic gait, tremors, slurred speech, sometimes dystonia (disordered muscle tone), fatigue, anorexia, asthenia (loss of strength and energy), apathy and the inability to concentrate. Insomnia may be an early finding. Chronic poisoning may occur over a 6-24 month period depending on exposure levels.

The onset of chronic manganese poisoning is insidious, with apathy, anorexia weakness, headache and spasms.

Manganese psychosis follows with certain definitive features: unaccountable laughter, euphoria, impulsive acts, absentmindedness, mental confusion, aggressiveness and hallucinations. The final stage is characterised by speech difficulties, muscular twitching, spastic gait and other nervous system effects. Symptoms resemble those of Parkinson's disease. Rat studies indicate the gradual accumulation of brain manganese to produce lesions mimicking those found in Parkinsonism. If the disease is diagnosed whilst still in the early stages and the patient is removed from exposure, the course may be reversed.

Inhalation of manganese fumes may cause 'metal fume fever' characterised by flu-like symptoms: fever, chill, nausea, weakness and body aches. Manganese dust is no longer believed to be a causative factor in pneumonia. If there is any relationship at all, it appears to be as an aggravating factor to a preexisting condition.

Prolonged or repeated eye contact may result in conjunctivitis.

Manganese is an essential trace element in all living organisms with the level of tissue manganese remaining remarkably constant throughout life.

Repeated or prolonged exposure to mixed hydrocarbons may produce narcosis with dizziness, weakness, irritability, concentration and/or memory loss, tremor in the fingers and tongue, vertigo, olfactory disorders, constriction of visual field, paraesthesias of the extremities, weight loss and anaemia and degenerative changes in the liver and kidney. Chronic exposure by petroleum workers, to the lighter hydrocarbons, has been associated with visual disturbances, damage to the central nervous system, peripheral neuropathies (including numbness and paraesthesias), psychological and neurophysiological deficits, bone marrow toxicities (including hypoplasia possibly due to benzene) and hepatic and renal involvement. Chronic dermal exposure to petroleum hydrocarbons may result in defatting which produces localised dermatoses. Surface cracking and erosion may also increase susceptibility to infection by microorganisms. One epidemiological study of petroleum refinery workers has reported elevations in standard mortality ratios for skin cancer along with a dose-response relationship indicating an association between routine workplace exposure to petroleum or one of its constituents and skin cancer, particularly melanoma. Other studies have been unable to confirm this finding.

Animal studies:

No deaths or treatment related signs of toxicity were observed in rats exposed to light alkylate naphtha (paraffinic hydrocarbons) at concentrations of 668, 2220 and 6646 ppm for 6 hrs/day, 5 days/wk for 13 weeks. Increased liver weights and kidney toxicity (male rats) was observed in high dose animals. Exposure to pregnant rats at concentrations of 137, 3425 and 6850 ppm did not adversely affect reproduction or cause maternal or foetal toxicity. Lifetime skin painting studies in mice with similar naphthas have shown weak or no carcinogenic activity following prolonged and repeated

## Nitrous NF 7 In 1

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|  | <p>exposure. Similar naphthas/distillates, when tested at nonirritating dose levels, did not show any significant carcinogenic activity indicating that this tumorigenic response is likely related to chronic irritation and not to dose. The mutagenic potential of naphthas has been reported to be largely negative in a variety of mutagenicity tests. The exact relationship between these results and human health is not known. Some components of this product have been shown to produce a species specific, sex hormonal dependent kidney lesion in male rats from repeated oral or inhalation exposure. Subsequent research has shown that the kidney damage develops via the formation of a alpha-2u-globulin, a mechanism unique to the male rat. Humans do not form alpha-2u-globulin, therefore, the kidney effects resulting from this mechanism are not relevant in human</p> |   |
| Nitrous NF 7 In 1                              | <b>TOXICITY</b>   | <b>IRRITATION</b>   |
|  | Not Available   | Not Available   |
| aromatic 150                                   | <b>TOXICITY</b>   | <b>IRRITATION</b>   |
|  | Dermal (rabbit) LD50: >1900 mg/kg <sup>[1]</sup>  | Eye: no adverse effect observed (not irritating) <sup>[1]</sup> |
|  | Inhalation (rat) LC50: >7331.62506 mg/l/8h* <sup>[2]</sup>  | Skin: adverse effect observed (irritating) <sup>[1]</sup>       |
|  | Oral (rat) LD50: >4500 mg/kg <sup>[1]</sup>   |   |
| naphtha petroleum, light aromatic solvent      | <b>TOXICITY</b>   | <b>IRRITATION</b>   |
|  | Dermal (rabbit) LD50: >1900 mg/kg <sup>[1]</sup>  | Eye: no adverse effect observed (not irritating) <sup>[1]</sup> |
|  | Inhalation (rat) LC50: >7331.62506 mg/l/8h* <sup>[2]</sup>  | Skin: adverse effect observed (irritating) <sup>[1]</sup>       |
|  | Oral (rat) LD50: >4500 mg/kg <sup>[1]</sup>   |   |
| manganese 2-methylcyclopentadienyl tricarbonyl | <b>TOXICITY</b>   | <b>IRRITATION</b>   |
|  | dermal (rat) LD50: 665 mg/kg <sup>[2]</sup>   | Skin (rabbit): 100 mg/24h - mild                                |
|  | Inhalation (rat) LC50: 0.055 mg/l/1h* <sup>[2]</sup>  |   |
|  | Oral (rat) LD50: 8 mg/kg <sup>[2]</sup>   |   |
| 1,3,5-trimethyl benzene                        | <b>TOXICITY</b>   | <b>IRRITATION</b>   |
|  | Inhalation (rat) LC50: 24 mg/l/4hd <sup>[2]</sup>   | Eye (rabbit): 500 mg/24h mild                                   |
|  | Oral (rat) LD50: 5000 mg/kg <sup>[1]</sup>  | Eye: adverse effect observed (irritating) <sup>[1]</sup>        |
|  |   | Skin (rabbit): 20 mg/24h moderate                               |
|  |   | Skin: adverse effect observed (irritating) <sup>[1]</sup>       |
| 1,2,4-trimethyl benzene                        | <b>TOXICITY</b>   | <b>IRRITATION</b>   |
|  | Dermal (rabbit) LD50: >3160 mg/kg <sup>[2]</sup>  | Not Available   |
|  | Inhalation (rat) LC50: 18 mg/l/4hd <sup>[2]</sup>   |   |
|  | Oral (rat) LD50: 5000 mg/kg <sup>[1]</sup>  |   |
| <b>Legend:</b>                                 | <p>1. Value obtained from Europe ECHA Registered Substances - Acute toxicity 2. * Value obtained from manufacturer's SDS. Unless otherwise specified data extracted from RTECS - Register of Toxic Effect of chemical Substances</p>  |   |

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| NAPHTHA PETROLEUM, LIGHT AROMATIC SOLVENT | <p>Inhalation (rat) TCLo: 1320 ppm/6h/90D-I * [Devoe]<br/>For Low Boiling Point Naphthas (LBPNS):</p> <p><b>Acute toxicity:</b><br/>LBPNS generally have low acute toxicity by the oral (median lethal dose [LD50] in rats &gt; 2000 mg/kg-bw), inhalation (LD50 in rats &gt; 5000 mg/m<sup>3</sup>) and dermal (LD50 in rabbits &gt; 2000 mg/kg-bw) routes of exposure<br/>Most LBPNS are mild to moderate eye and skin irritants in rabbits, with the exception of heavy catalytic cracked and heavy catalytic reformed naphthas, which have higher primary skin irritation indices.</p> <p><b>Sensitisation:</b><br/>LBPNS do not appear to be skin sensitizers, but a poor response in the positive control was also noted in these studies</p> <p><b>Repeat dose toxicity:</b><br/>The lowest-observed-adverse-effect concentration (LOAEC) and lowest-observed-adverse-effect level (LOAEL) values identified following short-term (2-89 days) and subchronic (greater than 90 days) exposure to the LBPNS substances. These values were determined for a variety of endpoints after considering the toxicity data for all LBPNS in the group. Most of the studies were carried out by the inhalation route of exposure. Renal effects, including increased kidney weight, renal lesions (renal tubule dilation, necrosis) and hyaline droplet formation, observed in male rats exposed orally or by inhalation to most LBPNS, were considered species- and sex-specific<br/>These effects were determined to be due to a mechanism of action not relevant to humans -specifically, the interaction between hydrocarbon metabolites and alpha-2-microglobulin, an enzyme not produced in substantial amounts in female rats, mice and other species, including humans. The resulting nephrotoxicity and subsequent</p> |
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carcinogenesis in male rats were therefore not considered in deriving LOAEC/LOAEL values.

Only a limited number of studies of short-term and subchronic duration were identified for site-restricted LBPNs. The lowest LOAEC identified in these studies, via the inhalation route, is 5475 mg/m<sup>3</sup>, based on a concentration-related increase in liver weight in both male and female rats following a 13-week exposure to light catalytic cracked naphtha. Shorter exposures of rats to this test substance resulted in nasal irritation at 9041 mg/m<sup>3</sup>

No systemic toxicity was reported following dermal exposure to light catalytic cracked naphtha, but skin irritation and accompanying histopathological changes were increased, in a dose-dependent manner, at doses as low as 30 mg/kg-bw per day when applied 5 days per week for 90 days in rats

No non-cancer chronic toxicity studies (= 1 year) were identified for site-restricted LBPNs and very few non-cancer chronic toxicity studies were identified for other LBPNs. An LOAEC of 200 mg/m<sup>3</sup> was noted in a chronic inhalation study that exposed mice and rats to unleaded gasoline (containing 2% benzene). This inhalation LOAEC was based on ocular discharge and ocular irritation in rats. At the higher concentration of 6170 mg/m<sup>3</sup>, increased kidney weight was observed in male and female rats (increased kidney weight was also observed in males only at 870 mg/m<sup>3</sup>).

Furthermore, decreased body weight in male and female mice was also observed at 6170 mg/m<sup>3</sup>

A LOAEL of 714 mg/kg-bw was identified for dermal exposure based on local skin effects (inflammatory and degenerative skin changes) in mice following application of naphtha for 105 weeks. No systemic toxicity was reported.

#### **Genotoxicity:**

Although few genotoxicity studies were identified for the site-restricted LBPNs, the genotoxicity of several other LBPN substances has been evaluated using a variety of in vivo and in vitro assays. While in vivo genotoxicity assays were negative overall, the in vitro tests exhibited mixed results.

For in vivo genotoxicity tests, LBPNs exhibited negative results for chromosomal aberrations and micronuclei induction, but exhibited positive results in one sister chromatid exchange assay although this result was not considered definitive for clastogenic activity as no genetic material was unbalanced or lost. Mixtures that were tested, which included a number of light naphthas, displayed mixed results (i.e., both positive and negative for the same assay) for chromosomal aberrations and negative results for the dominant lethal mutation assay. Unleaded gasoline (containing 2% benzene) was tested for its ability to induce unscheduled deoxyribonucleic acid (DNA) synthesis (UDS) and replicative DNA synthesis (RDS) in rodent hepatocytes and kidney cells. UDS and RDS were induced in mouse hepatocytes via oral exposure and RDS was induced in rat kidney cells via oral and inhalation exposure. Unleaded gasoline (benzene content not stated) exhibited negative results for chromosomal aberrations and the dominant lethal mutation assay and mixed results for atypical cell foci in rodent renal and hepatic cells. For in vitro genotoxicity studies, LBPNs were negative for six out of seven Ames tests, and were also negative for UDS and for forward mutations LBPNs exhibited mixed or equivocal results for the mouse lymphoma and sister chromatid exchange assays, as well as for cell transformation and positive results for one bacterial DNA repair assay. Mixtures that were tested, which included a number of light naphthas, displayed negative results for the Ames and mouse lymphoma assays Gasoline exhibited negative results for the Ames test battery, the sister chromatid exchange assay and for one mutagenicity assay. Mixed results were observed for UDS and the mouse lymphoma assay.

While the majority of in vivo genotoxicity results for LBPN substances are negative, the potential for genotoxicity of LBPNs as a group cannot be discounted based on the mixed in vitro genotoxicity results.

#### **Carcinogenicity:**

Although a number of epidemiological studies have reported increases in the incidence of a variety of cancers, the majority of these studies are considered to contain incomplete or inadequate information. Limited data, however, are available for skin cancer and leukemia incidence, as well as mortality among petroleum refinery workers. It was concluded that there is limited evidence supporting the view that working in petroleum refineries entails a carcinogenic risk (Group 2A carcinogen). IARC (1989a) also classified gasoline as a Group 2B carcinogen; it considered the evidence for carcinogenicity in humans from gasoline to be inadequate and noted that published epidemiological studies had several limitations, including a lack of exposure data and the fact that it was not possible to separate the effects of combustion products from those of gasoline itself. Similar conclusions were drawn from other reviews of epidemiological studies for gasoline (US EPA 1987a, 1987b). Thus, the evidence gathered from these epidemiological studies is considered to be inadequate to conclude on the effect of human exposure to LBPN substances.

No inhalation studies assessing the carcinogenicity of the site-restricted LBPNs were identified. Only unleaded gasoline has been examined for its carcinogenic potential, in several inhalation studies. In one study, rats and mice were exposed to 0, 200, 870 or 6170 mg/m<sup>3</sup> of a 2% benzene formulation of the test substance, via inhalation, for approximately 2 years. A statistically significant increase in hepatocellular adenomas and carcinomas, as well as a non-statistical increase in renal tumours, were observed at the highest dose in female mice. A dose-dependent increase in the incidence of primary renal neoplasms was also detected in male rats, but this was not considered to be relevant to humans, as discussed previously. Carcinogenicity was also assessed for unleaded gasoline, via inhalation, as part of initiation/promotion studies. In these studies, unleaded gasoline did not appear to initiate tumour formation, but did show renal cell and hepatic tumour promotion ability, when rats and mice were exposed, via inhalation, for durations ranging from 13 weeks to approximately 1 year using an initiation/promotion protocol. However, further examination of data relevant to the composition of unleaded gasoline demonstrated that this is a highly-regulated substance; it is expected to contain a lower percentage of benzene and has a discrete component profile when compared to other substances in the LBPN group.

Both the European Commission and the International Agency for Research on Cancer (IARC) have classified LBPN substances as carcinogenic. All of these substances were classified by the European Commission (2008) as Category 2 (R45: may cause cancer) (benzene content = 0.1% by weight). IARC has classified gasoline, an LBPN, as a Group 2B carcinogen (possibly carcinogenic to humans) and "occupational exposures in petroleum refining" as Group 2A carcinogens (probably carcinogenic to humans).

Several studies were conducted on experimental animals to investigate the dermal carcinogenicity of LBPNs. The majority of these studies were conducted through exposure of mice to doses ranging from 694-1351 mg/kg-bw, for

durations ranging from 1 year to the animals' lifetime or until a tumour persisted for 2 weeks. Given the route of exposure, the studies specifically examined the formation of skin tumours. Results for carcinogenicity via dermal exposure are mixed. Both malignant and benign skin tumours were induced with heavy catalytic cracked naphtha, light catalytic cracked naphtha, light straight-run naphtha and naphtha. Significant increases in squamous cell carcinomas were also observed when mice were dermally treated with Stoddard solvent, but the latter was administered as a mixture (90% test substance), and the details of the study were not available. In contrast, insignificant increases in tumour formation or no tumours were observed when light alkylate naphtha, heavy catalytic reformed naphtha, sweetened naphtha, light catalytically cracked naphtha or unleaded gasoline was dermally applied to mice. Negative results for skin tumours were also observed in male mice dermally exposed to sweetened naphtha using an initiation/promotion protocol.

#### Reproductive/ Developmental toxicity:

No reproductive or developmental toxicity was observed for the majority of LBPN substances evaluated. Most of these studies were carried out by inhalation exposure in rodents.

NOAEC values for reproductive toxicity following inhalation exposure ranged from 1701 mg/m<sup>3</sup> (CAS RN 8052-41-3) to 27 687 mg/m<sup>3</sup> (CAS RN 64741-63-5) for the LBPNs group evaluated, and from 7690 mg/m<sup>3</sup> to 27 059 mg/m<sup>3</sup> for the site-restricted light catalytic cracked and full-range catalytic reformed naphthas. However, a decreased number of pups per litter and higher frequency of post-implantation loss were observed following inhalation exposure of female rats to hydrotreated heavy naphtha (CAS RN 64742-48-9) at a concentration of 4679 mg/m<sup>3</sup>, 6 hours per day, from gestational days 7-20. For dermal exposures, NOAEL values of 714 mg/kg-bw (CAS RN 8030-30-6) and 1000 mg/kg-bw per day (CAS RN 68513-02-0) were noted. For oral exposures, no adverse effects on reproductive parameters were reported when rats were given site-restricted light catalytic cracked naphtha at 2000 mg/kg on gestational day 13.

For most LBPNs, no treatment-related developmental effects were observed by the different routes of exposure. However, developmental toxicity was observed for a few naphthas. Decreased foetal body weight and an increased incidence of ossification variations were observed when rat dams were exposed to light aromatized solvent naphtha, by gavage, at 1250 mg/kg-bw per day. In addition, pregnant rats exposed by inhalation to hydrotreated heavy naphtha at 4679 mg/m<sup>3</sup> delivered pups with higher birth weights. Cognitive and memory impairments were also observed in the offspring.

#### Low Boiling Point Naphthas [Site-Restricted]

Studies indicate that normal, branched and cyclic paraffins are absorbed from the mammalian gastrointestinal tract and that the absorption of n-paraffins is inversely proportional to the carbon chain length, with little absorption above C30. With respect to the carbon chain lengths likely to be present in mineral oil, n-paraffins may be absorbed to a greater extent than iso- or cyclo-paraffins.

The major classes of hydrocarbons have been shown to be well absorbed by the gastrointestinal tract in various species. In many cases, the hydrophobic hydrocarbons are ingested in association with dietary lipids. The dependence of hydrocarbon absorption on concomitant triglyceride digestion and absorption, is known as the "hydrocarbon continuum hypothesis", and asserts that a series of solubilising phases in the intestinal lumen, created by dietary triglycerides and their digestion products, afford hydrocarbons a route to the lipid phase of the intestinal absorptive cell (enterocyte) membrane. While some hydrocarbons may traverse the mucosal epithelium unmetabolised and appear as solutes in lipoprotein particles in intestinal lymph, there is evidence that most hydrocarbons partially separate from nutrient lipids and undergo metabolic transformation in the enterocyte. The enterocyte may play a major role in determining the proportion of an absorbed hydrocarbon that, by escaping initial biotransformation, becomes available for deposition in its unchanged form in peripheral tissues such as adipose tissue, or in the liver.

For C9 aromatics (typically trimethylbenzenes - TMBs)

#### Acute Toxicity

Acute toxicity studies (oral, dermal and inhalation routes of exposure) have been conducted in rats using various solvent products containing predominantly mixed C9 aromatic hydrocarbons (CAS RN 64742-95-6). Inhalation LC50's range from 6,000 to 10,000 mg/m<sup>3</sup> for C9 aromatic naphtha and 18,000 to 24,000 mg/m<sup>3</sup> for 1,2,4 and 1,3,5-TMB, respectively. A rat oral LD50 reported for 1,2,4-TMB is 5 grams/kg bw and a rat dermal LD50 for the C9 aromatic naphtha is >4 ml/kg bw. These data indicate that C9 aromatic solvents show that LD50/LC50 values are greater than limit doses for acute toxicity studies established under OECD test guidelines.

#### Irritation and Sensitization

Several irritation studies, including skin, eye, and lung/respiratory system, have been conducted on members of the category. The results indicate that C9 aromatic hydrocarbon solvents are mildly to moderately irritating to the skin, minimally irritating to the eye, and have the potential to irritate the respiratory tract and cause depression of respiratory rates in mice. Respiratory irritation is a key endpoint in the current occupational exposure limits established for C9 aromatic hydrocarbon solvents and trimethylbenzenes. No evidence of skin sensitization was identified.

#### Repeated Dose Toxicity

Inhalation: The results from a subchronic (3 month) neurotoxicity study and a one-year chronic study (6 hr/day, 5 days/week) indicate that effects from inhalation exposure to C9 Aromatic Hydrocarbon Solvents on systemic toxicity are slight. A battery of neurotoxicity and neurobehavioral endpoints were evaluated in the 3-month inhalation study on C9 aromatic naphtha tested at concentrations of 0, 101, 452, or 1320 ppm (0, 500, 2,220, or 6,500 mg/m<sup>3</sup>). In this study, other than a transient weight reduction in the high exposure group (not statistically significant at termination of exposures), no effects were reported on neuropathology or neuro/behavioral parameters. The NOAEL for systemic and/or neurotoxicity was 6,500 mg/m<sup>3</sup>, the highest concentration tested. In an inhalation study of a commercial blend, rats were exposed to C9 aromatic naphtha concentrations of 0, 96, 198, or 373 ppm (0, 470, 970, 1830 mg/m<sup>3</sup>) for 6 hr/day, 5 days/week, for 12 months. Liver and kidney weights were increased in the high exposure group but no accompanying histopathology was observed in these organs.

The NOAEL was considered to be the high exposure level of 373 ppm, or 1830 mg/m<sup>3</sup>. In two subchronic rat

inhalation studies, both of three months duration, rats were exposed to the individual TMB isomers (1,2,4- and 1,3,5-) to nominal concentrations of 0, 25, 100, or 250 ppm (0, 123, 492, or 1230 mg/m<sup>3</sup>). Respiratory irritation was observed at 492 (100 ppm) and 1230 mg/m<sup>3</sup> (250 ppm) and no systemic toxicity was observed in either study. For both pure isomers, the NOELs are 25 ppm or 123 mg/m<sup>3</sup> for respiratory irritation and 250 ppm or 1230 mg/m<sup>3</sup> for systemic effects.

Oral: The C9 aromatic naphtha has not been tested via the oral route of exposure. Individual TMB isomers have been evaluated in a series of repeated-dose oral studies ranging from 14 days to 3 months over a wide range of doses. The effects observed in these studies included increased liver and kidney weights, changes in blood chemistry, increased salivation, and decreased weight gain at higher doses. Organ weight changes appeared to be adaptive as they were not accompanied by histopathological effects. Blood changes appeared sporadic and without pattern. One study reported hyaline droplet nephropathy in male rats at the highest dose (1000 mg/kg bw-day), an effect that is often associated with alpha-2mu-globulin-induced nephropathy and not considered relevant to humans. The doses at which effects were detected were 100 mg/kg-bw day or above (an exception was the pilot 14 day oral study - LOAEL 150 mg/kg bw-day - but the follow up three month study had a LOAEL of 600 mg/kg/bw-day with a NOAEL of 200 mg/kg bw-day). Since effects generally were not severe and could be considered adaptive or spurious, oral exposure does not appear to pose a high toxicity hazard for pure trimethylbenzene isomers.

#### Mutagenicity

In vitro genotoxicity testing of a variety of C9 aromatics has been conducted in both bacterial and mammalian cells. In vitro point mutation tests were conducted with *Salmonella typhimurium* and *Escherichia coli* bacterial strains, as well as with cultured mammalian cells such as the Chinese hamster cell ovary cells (HGPRT assay) with and without metabolic activation. In addition, several types of in vitro chromosomal aberration tests have been performed (chromosome aberration frequency in Chinese hamster ovary and lung cells, sister chromatid exchange in CHO cells). Results were negative both with and without metabolic activation for all category members. For the supporting chemical 1,2,3-TMB, a single in vitro chromosome aberration test was weakly positive. In in vivo bone marrow cytogenetics test, rats were exposed to C9 aromatic naphtha at concentrations of 0, 153, 471, or 1540 ppm (0, 750, 2,310, or 7,560 mg/m<sup>3</sup>) 6 hr/day, for 5 days. No evidence of in vivo somatic cell genotoxicity was detected. Based on the cumulative results of these assays, genetic toxicity is unlikely for substances in the C9 Aromatic Hydrocarbon Solvents Category

#### Reproductive and Developmental Toxicity

Results from the three-generation reproduction inhalation study in rats indicate limited effects from C9 aromatic naphtha. In each of three generations (F0, F1 and F2), rats were exposed to High Flash Aromatic Naphtha (CAS RN 64742-95-6) via whole body inhalation at target concentrations of 0, 100, 500, or 1500 ppm (actual mean concentrations throughout the full study period were 0, 103, 495, or 1480 ppm, equivalent to 0, 505, 2430, or 7265 mg/m<sup>3</sup>, respectively). In each generation, both sexes were exposed for 10 weeks prior to and two weeks during mating for 6 hrs/day, 5 days/wks. Female rats in the F0, F1, and F2 generation were then exposed during gestation days 0-20 and lactation days 5-21 for 6 hrs/day, 7 days/wk. The age at exposure initiation differed among generations; F0 rats were exposed starting at 9 weeks of age, F1 exposure began at 5-7 weeks, and F2 exposure began at postnatal day (PND) 22. In the F0 and F1 parental generations, 30 rats/sex/group were exposed and mated. However, in the F2 generation, 40/sex/group were initially exposed due to concerns for toxicity, and 30/sex/group were randomly selected for mating, except that all survivors were used at 1480 ppm. F3 litters were not exposed directly and were sacrificed on lactation day 21.

#### Systemic Effects on Parental Generations:

The F0 males showed statistically and biologically significantly decreased mean body weight by ~15% at 1480 ppm when compared with controls. Seven females died or were sacrificed in extremis at 1480 ppm. The F0 female rats in the 495 ppm exposed group had a 13% decrease in body weight gain when adjusted for initial body weight when compared to controls. The F1 parents at 1480 ppm had statistically significantly decreased mean body weights (by ~13% (females) and 22% (males)), and locomotor activity. F1 parents at 1480 ppm had increased ataxia and mortality (six females). Most F2 parents (70/80) exposed to 1480 ppm died within the first week. The remaining animals survived throughout the rest of the exposure period. At week 4 and continuing through the study, F2 parents at 1480 ppm had statistically significant mean body weights much lower than controls (~33% for males; ~28% for females); body weights at 495 ppm were also reduced significantly (by 13% in males and 15% in females). The male rats in the 495 ppm exposed group had a 12% decrease in body weight gain when adjusted for initial body weight when compared to controls. Based on reduced body weight observed, the overall systemic toxicity LOAEC is 495 ppm (2430 mg/m<sup>3</sup>).

Reproductive Toxicity-Effects on Parental Generations: There were no pathological changes noted in the reproductive organs of any animal of the F0, F1, or F2 generation. No effects were reported on sperm morphology, gestational period, number of implantation sites, or post-implantation loss in any generation. Also, there were no statistically or biologically significant differences in any of the reproductive parameters, including: number of mated females, copulatory index, copulatory interval, number of females delivering a litter, number of females delivering a live litter, or male fertility in the F0 or in the F2 generation. Male fertility was statistically significantly reduced at 1480 ppm in the F1 rats. However, male fertility was not affected in the F0 or in the F2 generations; therefore, the biological significance of this change is unknown and may or may not be attributed to the test substance. No reproductive effects were observed in the F0 or F1 dams exposed to 1480 ppm (7265 mg/m<sup>3</sup>). Due to excessive mortality at the highest concentration (1480 ppm, only six dams available) in the F2 generation, a complete evaluation is precluded. However, no clear signs of reproductive toxicity were observed in the F2 generation. Therefore, the reproductive NOAEC is considered 495 ppm (2430 mg/m<sup>3</sup>), which excludes analysis of the highest concentration due to excessive mortality.

Developmental Toxicity - Effects on Pups: Because of significant maternal toxicity (including mortality) in dams in all generations at the highest concentration (1480 ppm), effects in offspring at 1480 ppm are not reported here. No significant effects were observed in the F1 and F2 generation offspring at 103 or 495 ppm. However, in F3 offspring, body weights and body weight gain were reduced by ~ 10-11% compared with controls at 495 ppm for approximately a week (PND 14 through 21). Maternal body weight was also depressed by ~ 12% throughout the gestational period



|  |   |
|--|---|
|  | <p>compared with controls. The overall developmental LOAEC from this study is 495 ppm (2430 mg/m3) based on the body weights reductions observed in the F3 offspring.</p> <p>Conclusion: No effects on reproductive parameters were observed at any exposure concentration, although a confident assessment of the group exposed at the highest concentration was not possible. A potential developmental effect (reduction in mean pup weight and weight gain) was observed at a concentration that was also associated with maternal toxicity.</p>  |
| <p><b>MANGANESE<br/>2-METHYLCYCLOPENTADIENYL<br/>TRICARBONYL</b></p>                             | <p>551carbonyl<br/>For manganese 2-methylcyclopentadienyl tricarbonyl (MMT):</p> <p><b>Genetic Toxicity</b></p> <p><b>Bacterial Reverse Mutation Assay</b> The test substance was not mutagenic in this assay with or without metabolic activation.</p> <p><b>In Vitro Chromosomal Aberration Assay in CHO Cells</b> An increase in the percentage of cells that contained chromosome aberrations was observed in the presence of metabolic activation, but not in the absence of metabolic activation.</p> <p><b>Mammalian Erythrocyte Micronucleus Test</b> Two studies were performed, both of which showed no elevation in micronuclei, thus no genotoxicity.</p> <p><b>Repeated-dose Toxicity</b></p> <p>A 14 week inhalation study was conducted in rats, mice, and primates at dose levels of 0.3, 3.5, 30.2 ug/L. Significant toxicity was observed at the mid and high exposure levels.</p> <p>Based on the results of this study, it was concluded that the mouse was the species most sensitive to vapor inhalation exposure to this test material followed by the rat and monkey respectively. In addition female rodents appeared to be more sensitive than male rodents.</p> <p>A NOAEL of 0.3 ug/L was selected based on the increased blood urea nitrogen levels observed in rats at all exposure levels.</p> <p><b>Developmental Toxicity</b></p> <p>Pregnant female rats were dosed on gestation days 6-15 with 0, 2.0, 4.5, 6.5, or 9.0 mg/kg/day. Maternal toxicity was observed at the high dose level, 9 mg/kg, as evidenced by anogenital staining and maternal weight loss early in the treatment period. A slight reduction in mean fetal body weights and a slight to moderate reduction in mean maternal body weight over the entire gestation period were noted at all treatment dose levels. No significant developmental toxicity was observed. The NOAEL for maternal effects was 6.5 mg/kg and the NOAEL for developmental effects was &gt;9 mg/kg (the highest dose tested).</p> <p><b>Reproductive Toxicity</b></p> <p>No published or unpublished reproductive toxicity studies on MMT were located; however, the 14 week repeat exposure inhalation study conducted in rats, mice and primates discussed above (dose levels of 0.3, 3.5, 30.2 ug/L) included the microscopic evaluation of both male and female rat and mouse and male primate reproductive organs. No reproductive toxicity was observed at the high exposure level (30.2 ug/L) in any species.</p> <p>The material may cause skin irritation after prolonged or repeated exposure and may produce a contact dermatitis (nonallergic). This form of dermatitis is often characterised by skin redness (erythema) and swelling epidermis. Histologically there may be intercellular oedema of the spongy layer (spongiosis) and intracellular oedema of the epidermis.</p> <p>NOAEL (inhalation) 6.2 mg/m3 (rats and mice) * * Worksafe Australia</p> |
| <p><b>1,3,5-TRIMETHYL BENZENE</b></p>  | <p>The material may be irritating to the eye, with prolonged contact causing inflammation. Repeated or prolonged exposure to irritants may produce conjunctivitis.</p> <p>The material may cause skin irritation after prolonged or repeated exposure and may produce a contact dermatitis (nonallergic). This form of dermatitis is often characterised by skin redness (erythema) and swelling the epidermis. Histologically there may be intercellular oedema of the spongy layer (spongiosis) and intracellular oedema of the epidermis.</p> <p>CHEMWATCH 12171 1,2,4-trimethylbenzene</p>  |
| <p><b>1,2,4-TRIMETHYL BENZENE</b></p>  | <p>CHEMWATCH 2325 1,3,5-trimethylbenzene</p>  |
| <p><b>AROMATIC 150 &amp; 1,3,5-<br/>TRIMETHYL BENZENE &amp; 1,2,4-<br/>TRIMETHYL BENZENE</b></p> | <p>Asthma-like symptoms may continue for months or even years after exposure to the material ceases. This may be due to a non-allergenic condition known as reactive airways dysfunction syndrome (RADS) which can occur following exposure to high levels of highly irritating compound. Key criteria for the diagnosis of RADS include the absence of preceding respiratory disease, in a non-atopic individual, with abrupt onset of persistent asthma-like symptoms within minutes to hours of a documented exposure to the irritant. A reversible airflow pattern, on spirometry, with the presence of moderate to severe bronchial hyperreactivity on methacholine challenge testing and the lack of minimal lymphocytic inflammation, without eosinophilia, have also been included in the criteria for diagnosis of RADS. RADS (or asthma) following an irritating inhalation is an infrequent disorder with rates related to the concentration of and duration of exposure to the irritating substance. Industrial bronchitis, on the other hand, is a disorder that occurs as result of exposure due to high concentrations of irritating substance (often particulate in nature) and is completely reversible after exposure ceases. The disorder is characterised by dyspnea, cough and mucus production.</p>   |
| <p><b>AROMATIC 150 &amp; NAPHTHA<br/>PETROLEUM, LIGHT<br/>AROMATIC SOLVENT</b></p>               | <p>for petroleum:</p> <p>Altered mental state, drowsiness, peripheral motor neuropathy, irreversible brain damage (so-called Petrol Sniffer's Encephalopathy), delirium, seizures, and sudden death have been reported from repeated overexposure to some hydrocarbon solvents, naphthas, and gasoline</p> <p>This product may contain benzene which is known to cause acute myeloid leukaemia and n-hexane which has been shown to metabolize to compounds which are neuropathic.</p> <p>This product contains toluene. There are indications from animal studies that prolonged exposure to high concentrations of toluene may lead to hearing loss.</p> <p>This product contains ethyl benzene and naphthalene from which there is evidence of tumours in rodents</p>  |

**Carcinogenicity:** Inhalation exposure to mice causes liver tumours, which are not considered relevant to humans. Inhalation exposure to rats causes kidney tumours which are not considered relevant to humans.

**Mutagenicity:** There is a large database of mutagenicity studies on gasoline and gasoline blending streams, which use a wide variety of endpoints and give predominantly negative results. All in vivo studies in animals and recent studies in exposed humans (e.g. petrol service station attendants) have shown negative results in mutagenicity assays.

**Reproductive Toxicity:** Repeated exposure of pregnant rats to high concentrations of toluene (around or exceeding 1000 ppm) can cause developmental effects, such as lower birth weight and developmental neurotoxicity, on the foetus. However, in a two-generation reproductive study in rats exposed to gasoline vapour condensate, no adverse effects on the foetus were observed.

**Human Effects:** Prolonged/ repeated contact may cause defatting of the skin which can lead to dermatitis and may make the skin more susceptible to irritation and penetration by other materials.

Lifetime exposure of rodents to gasoline produces carcinogenicity although the relevance to humans has been questioned. Gasoline induces kidney cancer in male rats as a consequence of accumulation of the alpha2-microglobulin protein in hyaline droplets in the male (but not female) rat kidney. Such abnormal accumulation represents lysosomal overload and leads to chronic renal tubular cell degeneration, accumulation of cell debris, mineralisation of renal medullary tubules and necrosis. A sustained regenerative proliferation occurs in epithelial cells with subsequent neoplastic transformation with continued exposure. The alpha2-microglobulin is produced under the influence of hormonal controls in male rats but not in females and, more importantly, not in humans.

For trimethylbenzenes:

Absorption of 1,2,4-trimethylbenzene occurs after oral, inhalation, or dermal exposure. Occupationally, inhalation and dermal exposures are the most important routes of absorption although systemic intoxication from dermal absorption is not likely to occur due to the dermal irritation caused by the chemical prompting quick removal. Following oral administration of the chemical to rats, 62.6% of the dose was recovered as urinary metabolites indicating substantial absorption. 1,2,4-Trimethylbenzene is lipophilic and may accumulate in fat and fatty tissues. In the blood stream, approximately 85% of the chemical is bound to red blood cells. Metabolism occurs by side-chain oxidation to form alcohols and carboxylic acids which are then conjugated with glucuronic acid, glycine, or sulfates for urinary excretion. After a single oral dose to rats of 1200 mg/kg, urinary metabolites consisted of approximately 43.2% glycine, 6.6% glucuronic, and 12.9% sulfuric acid conjugates. The two principle metabolites excreted by rabbits after oral administration of 438 mg/kg/day for 5 days were 2,4-dimethylbenzoic acid and 3,4-dimethylhippuric acid. The major routes of excretion of 1,2,4-trimethylbenzene are exhalation of parent compound and elimination of urinary metabolites. Half-times for urinary metabolites were reported as 9.5 hours for glycine, 22.9 hours for glucuronide, and 37.6 hours for sulfuric acid conjugates.

**Acute Toxicity** Direct contact with liquid 1,2,4-trimethylbenzene is irritating to the skin and breathing the vapor is irritating to the respiratory tract causing pneumonitis. Breathing high concentrations of the chemical vapor causes headache, fatigue, and drowsiness. In humans liquid 1,2,4-trimethylbenzene is irritating to the skin and inhalation of vapor causes chemical pneumonitis. High concentrations of vapor (5000-9000 ppm) cause headache, fatigue, and drowsiness. The concentration of 5000 ppm is roughly equivalent to a total of 221 mg/kg assuming a 30 minute exposure period (see end note 1). 2. Animals - Mice exposed to 8130-9140 ppm 1,2,4-trimethylbenzene (no duration given) had loss of righting response and loss of reflexes. Direct dermal contact with the chemical (no species given) causes vasodilation, erythema, and irritation (U.S. EPA). Seven of 10 rats died after an oral dose of 2.5 mL of a mixture of trimethylbenzenes in olive oil (average dose approximately 4.4 g/kg). Rats and mice were exposed by inhalation to a coal tar distillate containing about 70% 1,3,5- and 1,2,4-trimethylbenzene; no pathological changes were noted in either species after exposure to 1800-2000 ppm for up to 48 continuous hours, or in rats after 14 exposures of 8 hours each at the same exposure levels. No effects were reported for rats exposed to a mixture of trimethylbenzenes at 1700 ppm for 10 to 21 days.

**Neurotoxicity** 1,2,4-Trimethylbenzene depresses the central nervous system. Exposure to solvent mixtures containing the chemical causes headache, fatigue, nervousness, and drowsiness. Occupationally, workers exposed to a solvent containing 50% 1,2,4-trimethylbenzene had nervousness, headaches, drowsiness, and vertigo (U.S. EPA). Headache, fatigue, and drowsiness were reported for workers exposed (no dose given) to paint thinner containing 80% 1,2,4- and 1,3,5-trimethylbenzenes.

Results of the developmental toxicity study indicate that the C9 fraction caused adverse neurological effects at the highest dose (1500 ppm) tested.

**Subchronic/Chronic Toxicity** Long-term exposure to solvents containing 1,2,4-trimethylbenzene may cause nervousness, tension, and bronchitis. Painters that worked for several years with a solvent containing 50% 1,2,4- and 30% 1,3,5-trimethylbenzene showed nervousness, tension and anxiety, asthmatic bronchitis, anemia, and alterations in blood clotting; haematological effects may have been due to trace amounts of benzene.

Rats given 1,2,4-trimethylbenzene orally at doses of 0.5 or 2.0 g/kg/day, 5 days/week for 4 weeks. All rats exposed to the high dose died and 1 rat in the low dose died (no times given); no other effects were reported. Rats exposed by inhalation to 1700 ppm of a trimethylbenzene isomeric mixture for 4 months had decreased weight gain, lymphopenia and neutrophilia.

**Genotoxicity:** Results of mutagenicity testing, indicate that the C9 fraction does not induce gene mutations in prokaryotes (Salmonella typhimurium/mammalian microsome assay); or in mammalian cells in culture (in Chinese hamster ovary cells with and without activation). The C9 fraction does not induce chromosome mutations in Chinese hamster ovary cells with and without activation; does not induce chromosome aberrations in the bone marrow of Sprague-Dawley rats exposed by inhalation (6 hours/day for 5 days); and does not induce sister chromatid exchange in Chinese hamster ovary cells with and without activation.

**Developmental/Reproductive Toxicity:** A three-generation reproductive study on the C9 fraction was conducted. CD rats (30/sex/group) were exposed by inhalation to the C9 fraction at concentrations of 0, 100, 500, or 1500 ppm (0, 100, 500, or 1500 mg/kg/day) for 6 hours/day, 5 days/week. There was evidence of parental and reproductive toxicity at all dose levels. Indicators of parental toxicity included reduced body weights, increased salivation, hunched posture, aggressive behavior, and death. Indicators of adverse reproductive system effects included

**NAPHTHA PETROLEUM, LIGHT AROMATIC SOLVENT & 1,3,5-TRIMETHYL BENZENE & 1,2,4-TRIMETHYL BENZENE**

|  |   |
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|  | reduced litter size and reduced pup body weight. The LOEL was 100 ppm; a no-observed-effect level was not established. Developmental toxicity, including possible developmental neurotoxicity, was evident in rats in a 3-generation reproductive study.<br>No effects on fecundity or fertility occurred in rats treated dermally with up to 0.3 mL/rat/day of a mixture of trimethylbenzenes, 4-6 hours/day, 5 days/week over one generation. |
| <b>1,3,5-TRIMETHYL BENZENE &amp; 1,2,4-TRIMETHYL BENZENE</b> | Other Toxicity data is available for CHEMWATCH 12172 1,2,3-trimethylbenzene   |

|  |   |                                 |   |
|--|---|---------------------------------|---|
| <b>Acute Toxicity</b>                    | ✓ | <b>Carcinogenicity</b>          | ✓ |
| <b>Skin Irritation/Corrosion</b>         | ✗ | <b>Reproductivity</b>           | ✗ |
| <b>Serious Eye Damage/Irritation</b>     | ✗ | <b>STOT - Single Exposure</b>   | ✓ |
| <b>Respiratory or Skin sensitisation</b> | ✗ | <b>STOT - Repeated Exposure</b> | ✗ |
| <b>Mutagenicity</b>                      | ✗ | <b>Aspiration Hazard</b>        | ✓ |

**Legend:** ✗ – Data either not available or does not fill the criteria for classification  
 ✓ – Data available to make classification

## SECTION 12 ECOLOGICAL INFORMATION

### Toxicity

|   | ENDPOINT      | TEST DURATION (HR) | SPECIES                       | VALUE         | SOURCE        |
|---|---------------|--------------------|-------------------------------|---------------|---------------|
| <b>Nitrous NF 7 In 1</b>                              | Not Available | Not Available      | Not Available                 | Not Available | Not Available |
| <b>aromatic 150</b>                                   | LC50          | 96                 | Fish                          | 0.58mg/L      | 2             |
|   | EC50          | 48                 | Crustacea                     | 0.76mg/L      | 2             |
|   | EC50          | 72                 | Algae or other aquatic plants | <1mg/L        | 1             |
|   | NOEC          | 96                 | Algae or other aquatic plants | 0.12mg/L      | 2             |
|   | LC50          | 96                 | Fish                          | 4.1mg/L       | 2             |
|   | EC50          | 48                 | Crustacea                     | 3.2mg/L       | 2             |
|   | EC50          | 72                 | Algae or other aquatic plants | >1-mg/L       | 2             |
|   | NOEC          | 72                 | Algae or other aquatic plants | =1mg/L        | 1             |
| <b>naphtha petroleum, light aromatic solvent</b>      | LC50          | 96                 | Fish                          | 4.1mg/L       | 2             |
|   | EC50          | 48                 | Crustacea                     | 3.2mg/L       | 2             |
|   | EC50          | 72                 | Algae or other aquatic plants | >1-mg/L       | 2             |
|   | NOEC          | 72                 | Algae or other aquatic plants | =1mg/L        | 1             |
| <b>manganese 2-methylcyclopentadienyl tricarbonyl</b> | LC50          | 96                 | Fish                          | 0.21mg/L      | 2             |
|   | EC50          | 48                 | Crustacea                     | 0.83mg/L      | 2             |
|   | EC10          | 48                 | Algae or other aquatic plants | 0.11mg/L      | 2             |
|   | NOEC          | 48                 | Algae or other aquatic plants | 0.07mg/L      | 2             |
| <b>1,3,5-trimethyl benzene</b>                        | LC50          | 96                 | Fish                          | 1.318mg/L     | 3             |
|   | EC50          | 48                 | Crustacea                     | 13mg/L        | 5             |
|   | EC50          | 96                 | Algae or other aquatic plants | 2.154mg/L     | 3             |
|   | NOEC          | 384                | Crustacea                     | 0.257mg/L     | 2             |
| <b>1,2,4-trimethyl benzene</b>                        | LC50          | 96                 | Fish                          | 1.318mg/L     | 3             |
|   | EC50          | 48                 | Crustacea                     | ca.6.14mg/L   | 2             |

Continued...

## Nitrous NF 7 In 1

|      |    |                               |           |   |
|------|----|-------------------------------|-----------|---|
| EC50 | 96 | Algae or other aquatic plants | 2.154mg/L | 3 |
|------|----|-------------------------------|-----------|---|

**Legend:** Extracted from 1. IUCLID Toxicity Data 2. Europe ECHA Registered Substances - Ecotoxicological Information - Aquatic Toxicity 3. EPIWIN Suite V3.12 (QSAR) - Aquatic Toxicity Data (Estimated) 4. US EPA, Ecotox database - Aquatic Toxicity Data 5. ECETOC Aquatic Hazard Assessment Data 6. NITE (Japan) - Bioconcentration Data 7. METI (Japan) - Bioconcentration Data 8. Vendor Data

Harmful to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

Do NOT allow product to come in contact with surface waters or to intertidal areas below the mean high water mark. Do not contaminate water when cleaning equipment or disposing of equipment wash-waters.

Wastes resulting from use of the product must be disposed of on site or at approved waste sites.

When spilled this product may act as a typical oil, causing a film, sheen, emulsion or sludge at or beneath the surface of the body of water. The oil film on water surface may physically affect the aquatic organisms, due to the interruption of the oxygen transfer between the air and the water

Oils of any kind can cause:

- ▶ drowning of water-fowl due to lack of buoyancy, loss of insulating capacity of feathers, starvation and vulnerability to predators due to lack of mobility
- ▶ lethal effects on fish by coating gill surfaces, preventing respiration
- ▶ asphyxiation of benthic life forms when floating masses become engaged with surface debris and settle on the bottom and
- ▶ adverse aesthetic effects of fouled shoreline and beaches

In case of accidental releases on the soil, a fine film is formed on the soil, which prevents the plant respiration process and the soil particle saturation. It may cause deep water infestation.

For 1,2,4-trimethylbenzene:

Half-life (hr) air : 0.48-16

Half-life (hr) H<sub>2</sub>O surface water : 0.24-672

Half-life (hr) H<sub>2</sub>O ground : 336-1344

Half-life (hr) soil : 168-672

Henry's Pa m<sup>3</sup> /mol: 385-627

Bioaccumulation : not significant

1,2,4-Trimethylbenzene is a volatile organic compound (VOC) substance. As a VOC, 1,2,4-trimethylbenzene can contribute to the formation of photochemical smog in the presence of other VOCs.

#### Environmental fate:

**Transport:** 1,2,4-Trimethylbenzene volatilises rapidly from surface waters as predicted by a Henry's law constant of  $5.18 \times 10^{-3}$  (vapor pressure, 2.03 mm Hg). The volatilisation half-life from a model river is calculated to be 3.4 hours. The chemical also volatilises from soils, however, based on an estimated K<sub>oc</sub> of 472, moderate adsorption to soils and sediments may occur

#### Transformation/Persistence

**Air** - Degradation of 1,2,4-trimethylbenzene in the atmosphere occurs by reaction with hydroxyl radicals. Reaction also occurs with ozone but very slowly (half life, 8820 days). In the atmosphere, two estimates of the half-life are approximately 6 hours and, in the presence of hydroxyl radicals, 0.5 days

**Soil** - Volatilisation is the major route of removal of 1,2,4-trimethylbenzene from soils; although, biodegradation may also occur. Due to the high volatility of the chemical it is unlikely to accumulate in soil or surface water to toxic concentrations

**Water** - Because of 1,2,4-trimethylbenzene's water solubility and its vapor pressure of 2.03 mm Hg, the chemical will rapidly volatilise from surface waters. Biodegradation of 1,2,4-trimethylbenzene occurred with inoculums from both seawater and ground water. Various strains of Pseudomonas can biodegrade 1,2,4-trimethylbenzene.

**Biota** - The estimated bioconcentration factor (439) and high volatility of 1,2,4-trimethylbenzene indicates that bioaccumulation of the chemical will not be significant

#### Ecotoxicity:

Fish LC<sub>50</sub> (96 h): fathead minnow 7.72 mg/l

No stress was observed in *Oncorhynchus mykiss* (rainbow trout, fingerling) or *Petromyzon marinus* (sea lamprey, larvae) at 5 mg/L for 24 hours

Daphnia magna EC<sub>50</sub> (48 h): 3.61 mg/l

Cancer magister (dungeness crab) LC<sub>50</sub> 996 h): 5.1 mg/l

1,2,4-Trimethylbenzene has moderate acute toxicity to aquatic organisms; acute toxicity values fall within the range of greater than 1 mg/L and 100 mg/L. LC<sub>50</sub> values for specific aquatic organisms range from approximately 5 to 8 mg/L which is orders of magnitude greater than any measured concentration in seawater (0.002 - 0.54 microgram/L). The high concentrations required to induce toxicity in laboratory animals are not likely to be reached in the environment.

Within an aromatic series, acute toxicity increases with increasing alkyl substitution on the aromatic nucleus. For example, there is an increase in toxicity as alkylation of the naphthalene structure increases. The order of most toxic to least in a study using grass shrimp (*Palaemonetes pugio*) and brown shrimp (*Penaeus aztecus*) was dimethylnaphthalenes > methylnaphthalenes > naphthalenes.

Studies conclude that the toxicity of an oil appears to be a function of its di-aromatic and tri-aromatic hydrocarbons, which includes three-ring hydrocarbons such as phenanthrene.

The heavier (4-, 5-, and 6-ring) PAHs are more persistent than the lighter (2- and 3-ring) PAHs and tend to have greater carcinogenic and other chronic impact potential. PAHs in general are more frequently associated with chronic risks. These risks include cancer and often are the result of exposures to complex mixtures of chronic-risk aromatics (such as PAHs, alkyl PAHs, benzenes, and alkyl benzenes), rather than exposures to low levels of a single compound.

Anthracene is a phototoxic PAH. UV light greatly increases the toxicity of anthracene to bluegill sunfish. Benchmarks developed in the absence of UV light may be under-protective, and biological resources in strong sunlight are at more risk than those that are not.

For C9 aromatics (typically trimethylbenzene - TMBs)

Chemicals in this category possess properties indicating a hazard for the environment (acute toxicity for fish, invertebrates, and algae from 1 to 10 mg/L). Category members are readily biodegradable, except 1,3,5-trimethylbenzene (CAS RN 108-67-8). Category members are not expected to be bioaccumulative.

#### Environmental Fate:

In the air, category member constituents have the potential to rapidly degrade through indirect photolytic processes mediated primarily by hydroxyl radicals with calculated degradation half-lives ranging from 0.54 to 2.81 days (based on a 12-hour day and a hydroxyl radical concentration of  $5 \times 10^{-5}$ ).

Aqueous photolysis and hydrolysis will not contribute to the transformation of category chemical constituents in aquatic environments because they are either poorly reactive or not susceptible to these reactions.

Results of the Mackay Level I environmental distribution model show that chemical constituents of C9 Aromatic Hydrocarbon Solvents Category members have the potential to partition to air (96.8 to 98.9 %), with a negligible amount partitioning to water (0.2 to 0.6%) and soil (0.9 to 2.7%). In comparison, Level III modeling indicates that category members partition primarily to soil (66.3 to 79.6%) and water (17.8 to 25.0%) compartments rather than air (2.4 to 8.4%) when an equal emission rate (1000 kg/hr) is assumed to each of the air, water, and soil compartments. When release (1000 kg/hr) is modeled only to either the air, water, or soil compartment, constituents are indicated in the modeling to partition primarily (>94%) to the compartment to which they are emitted as advection and degradation influence constituent concentration in compartments to which constituents are not released. Solvent naphtha, (pet.), light aromatic (CAS RN 64742-95-6), 1,2,4-trimethylbenzene (CAS RN 95-63-6), and 1-ethyl-3-methylbenzene (CAS RN 620-14-4) were determined to be readily biodegradable based on the studies that used the TG OECD 301F (the latter substance is used to characterize the potential biodegradability of the category member, ethylmethylbenzene (CAS RN 25550-14-5)). These three substances exceed 60% biodegradation in 28 days and met the 10-day window criterion for ready biodegradation. In comparison 1,3,5-trimethylbenzene (CAS RN 108-67-8) was not readily biodegradable. It achieved 42% biodegradation after 28 days and 60% biodegradation after 39 days. The result for the multi-constituent substance (CAS RN 64742-95-6), a UVCB, characterizes the biodegradability of that substance as a whole, but it does not suggest that each constituent is equally biodegradable. As with all ready biodegradation test guidelines, the test system and study design used with these substances (OECD TG 301F) is not capable of distinguishing the relative contribution of the substances' constituents to the total biodegradation measured.

Based on Henry's Law constants (HLCs) representing a potential to volatilize from water that range from 590 to 1000 Pa-m<sup>3</sup>/mole, the potential to volatilize from surface waters for chemicals in the C9 Aromatic Hydrocarbon Solvents Category is expected to be high.

Based on the measured bioconcentration factors that range from 23 to 342 for 1,2,4-trimethylbenzene and 1,3,5-trimethylbenzene, the category members are not expected to be bioaccumulative.

#### Ecotoxicity

Acute toxicity values used to characterize this category for fish (LL50; LC50) and invertebrates (EL50; EC50) range from 3.5 to 9.2 mg/L, based on measured data. For algae, one study for a category member (CAS RN 64742-95-6) resulted in a 72-hr EC50 of 2.4 mg/L (biomass) and 2.7 mg/L (growth rate) based on measured concentrations.

The algal 72-hour NOEC (no observed effect concentration) for biomass and growth rate is 1.3 mg/L, based on mean measured concentrations. A 21-day Daphnia magna reproduction study with 1,3,5-trimethylbenzene (CAS RN 108-67-8) resulted in a NOEC value of 0.4 mg/L, based on a minimum measured value.

For petroleum distillates:

#### Environmental fate:

When petroleum substances are released into the environment, four major fate processes will take place: dissolution in water, volatilization, biodegradation and adsorption. These processes will cause changes in the composition of these UVCB substances. In the case of spills on land or water surfaces, photodegradation-another fate process-can also be significant.

As noted previously, the solubility and vapour pressure of components within a mixture will differ from those of the component alone. These interactions are complex for complex UVCBs such as petroleum hydrocarbons.

Each of the fate processes affects hydrocarbon families differently. Aromatics tend to be more water-soluble than aliphatics of the same carbon number, whereas aliphatics tend to be more volatile. Thus, when a petroleum mixture is released into the environment, the principal water contaminants are likely to be aromatics, whereas aliphatics will be the principal air contaminants. The trend in volatility by component class is as follows: alkenes = alkanes > aromatics = cycloalkanes.

The most soluble and volatile components have the lowest molecular weight; thus there is a general shift to higher molecular weight components in residual materials.

#### Biodegradation:

Biodegradation is almost always operative when petroleum mixtures are released into the environment. It has been widely demonstrated that nearly all soils and sediments have populations of bacteria and other organisms capable of degrading petroleum hydrocarbons. Degradation occurs both in the presence and absence of oxygen. Two key factors that determine degradation rates are oxygen supply and molecular structure. In general, degradation is more rapid under aerobic conditions. Decreasing trends in degradation rates according to structure are as follows:

- (1) n-alkanes, especially in the C10–C25 range, which are degraded readily;
- (2) isoalkanes;
- (3) alkenes;
- (4) benzene, toluene, ethylbenzene, xylenes (BTEX) (when present in concentrations that are not toxic to microorganisms);
- (5) monoaromatics;
- (6) polynuclear (polycyclic) aromatic hydrocarbons (PAHs); and
- (7) higher molecular weight cycloalkanes (which may degrade very slowly).

Three weathering processes-dissolution in water, volatilization and biodegradation-typically result in the depletion of the more readily soluble, volatile and degradable compounds and the accumulation of those most resistant to these processes in residues.

When large quantities of a hydrocarbon mixture enter the soil compartment, soil organic matter and other sorption sites in soil are fully saturated and the hydrocarbons will begin to form a separate phase (a non-aqueous phase liquid, or NAPL) in the soil. At concentrations below the retention capacity for the hydrocarbon in the soil, the NAPL will be immobile. This is referred to as residual NAPL. Above the retention capacity, the NAPL becomes mobile and will move within the soil.

#### Bioaccumulation:

Bioaccumulation potential was characterized based on empirical and/or modelled data for a suite of petroleum hydrocarbons expected to occur in petroleum substances. Bioaccumulation factors (BAFs) are the preferred metric for assessing the bioaccumulation potential of substances, as the bioconcentration factor (BCF) may not adequately account for the bioaccumulation potential of substances via the diet, which predominates for substances with log Kow > -4.5

In addition to fish BCF and BAF data, bioaccumulation data for aquatic invertebrate species were also considered. Biota-sediment/soil accumulation factors (BSAFs), trophic magnification factors and biomagnification factors were also considered in characterizing bioaccumulation potential.

Overall, there is consistent empirical and predicted evidence to suggest that the following components have the potential for high bioaccumulation, with BAF/BCF values greater than 5000: C13–C15 isoalkanes, C12 alkenes, C12–C15 one-ring cycloalkanes, C12 and C15 two-ring cycloalkanes, C14 polycycloalkanes, C15 one-ring aromatics, C15 and C20 cycloalkane monoaromatics, C12–C13 diaromatics, C20 cycloalkane diaromatics, and C14 and C20 three-ring PAHs

These components are associated with a slow rate of metabolism and are highly lipophilic. Exposures from water and diet, when combined, suggest that the rate of uptake would exceed that of the total elimination rate. Most of these components are not expected to biomagnify in aquatic or terrestrial foodwebs, largely because a combination of metabolism, low dietary assimilation efficiency and growth dilution allows the elimination rate to exceed the uptake rate from the diet; however,



one study suggests that some alkyl-PAHs may biomagnify. While only BSAFs were found for some PAHs, it is possible that BSAFs will be > 1 for invertebrates, given that they do not have the same metabolic competency as fish.

In general, fish can efficiently metabolize aromatic compounds. There is some evidence that alkylation increases bioaccumulation of naphthalene but it is not known if this can be generalized to larger PAHs or if any potential increase in bioaccumulation due to alkylation will be sufficient to exceed a BAF/BCF of 5000.

Some lower trophic level organisms (i.e., invertebrates) appear to lack the capacity to efficiently metabolize aromatic compounds, resulting in high bioaccumulation potential for some aromatic components as compared to fish.

This is the case for the C14 three-ring PAH, which was bioconcentrated to a high level (BCF > 5000) by invertebrates but not by fish. There is potential for such bioaccumulative components to reach toxic levels in organisms if exposure is continuous and of sufficient magnitude, though this is unlikely in the water column following a spill scenario due to relatively rapid dispersal

Bioaccumulation of aromatic compounds might be lower in natural environments than what is observed in the laboratory. PAHs may sorb to organic material suspended in the water column (dissolved humic material), which decreases their overall bioavailability primarily due to an increase in size. This has been observed with fish

**Ecotoxicity:**

Diesel fuel studies in salt water are available. The values varied greatly for aquatic species such as rainbow trout and *Daphnia magna*, demonstrating the inherent variability of diesel fuel compositions and its effects on toxicity. Most experimental acute toxicity values are above 1 mg/L. The lowest 48-hour LC50 for salmonids was 2.4 mg/L. *Daphnia magna* had a 24-hour LC50 of 1.8 mg/L. The values varied greatly for aquatic species such as rainbow trout and *Daphnia magna*, demonstrating the inherent variability of diesel fuel compositions and its effects on toxicity. Most experimental acute toxicity values are above 1 mg/L. The lowest 48-hour LC50 for salmonids was 2.4 mg/L. *Daphnia magna* had a 24-hour LC50 of 1.8 mg/L

The tropical mysid *Metamysidopsis insularis* was shown to be very sensitive to diesel fuel, with a 96-hour LC50 value of 0.22 mg/L. This species has been shown to be as sensitive as temperate mysids to toxicants. However, this study used nominal concentrations, and therefore was not considered acceptable. In another study involving diesel fuel, the effect on brown or common shrimp (*Crangon crangon*) a 96-hour LC50 of 22 mg/L was determined. A "gas oil" was also tested and a 96-hour LC50 of 12 mg/L was determined

The steady state cell density of marine phytoplankton decreased with increasing concentrations of diesel fuel, with different sensitivities between species. The diatom *Phaeodactylum tricorutum* showed a 20% decrease in cell density in 24 hours following a 3 mg/L exposure with a 24-hour no-observed effect concentration (NOEC) of 2.5 mg/L. The microalga *Isochrysis galbana* was more tolerant to diesel fuel, with a 24-hour lowest-observed-effect concentration (LOEC) of 26 mg/L (14% decrease in cell density), and a NOEC of 25 mg/L.

Finally, the green algae *Chlorella salina* was relatively insensitive to diesel fuel contamination, with a 24-hour LOEC of 170 mg/L (27% decrease in cell density), and a NOEC of 160 mg/L. All populations of phytoplankton returned to a steady state within 5 days of exposure

In sandy soils, earthworm (*Eisenia fetida*) mortality only occurred at diesel fuel concentrations greater than 10 000 mg/kg, which was also the concentration at which sub-lethal weight loss was recorded

Nephrotoxic effects of diesel fuel have been documented in several animal and human studies. Some species of birds (mallard ducks in particular) are generally resistant to the toxic effects of petrochemical ingestion, and large amounts of petrochemicals are needed in order to cause direct mortality

For manganese and its compounds:

**Environmental fate:**

It has been established that while lower organisms (e.g., plankton, aquatic plants, and some fish) can significantly bioconcentrate manganese, higher organisms (including humans) tend to maintain manganese homeostasis. This indicates that the potential for biomagnification of manganese from lower trophic levels to higher ones is low.

There were two mechanisms involved in explaining the retention of manganese and other metals in the environment by soil. First, through cation exchange reactions, manganese ions and the charged surface of soil particles form manganese oxides, hydroxides, and oxyhydroxides which in turn form absorption sites for other metals. Secondly, manganese can be adsorbed to other oxides, hydroxides, and oxyhydroxides through ligand exchange reactions. When the soil solution becomes saturated, these manganese oxides, hydroxides, and oxyhydroxides can precipitate into a new mineral phase and act as a new surface to which other substances can adsorb. The tendency of soluble manganese compounds to adsorb to soils and sediments depends mainly on the cation exchange capacity and the organic composition of the soil. The soil adsorption constants (the ratio of the concentration in soil to the concentration in water) for Mn(II) span five orders of magnitude, ranging from 0.2 to 10,000 mL/g, increasing as a function of the organic content and the ion exchange capacity of the soil; thus, adsorption may be highly variable. In some cases, adsorption of manganese to soils may not be a readily reversible process. At low concentrations, manganese may be "fixed" by clays and will not be released into solution readily. At higher concentrations, manganese may be desorbed by ion exchange mechanisms with other ions in solution. For example, the discharge of waste water effluent into estuarine environments resulted in the mobilization of manganese from the bottom sediments. The metals in the effluent may have been preferentially adsorbed resulting in the release of manganese. The oxidation state of manganese in soil and sediments may be altered by microbial activity; oxidation may lead to the precipitation of manganese. Bacteria and microflora can increase the mobility of manganese.

The transport and partitioning of manganese in water is controlled by the solubility of the specific chemical form present, which in turn is determined by pH, Eh (oxidation-reduction potential), and the characteristics of the available anions. The metal may exist in water in any of four oxidation states. Manganese(II) predominates in most waters (pH 4-7) but may become oxidized at a pH >8 or 9. The principal anion associated with Mn(II) in water is usually carbonate (CO<sub>3</sub><sup>2-</sup>), and the concentration of manganese is limited by the relatively low solubility (65 mg/L) of MnCO<sub>3</sub>. In relatively oxidized water, the solubility of Mn(II) may be controlled by manganese oxide equilibria, with manganese being converted to the Mn(II) or Mn(IV) oxidation states. In extremely reduced water, the fate of manganese tends to be controlled by formation of a poorly soluble sulfide. Manganese in water may undergo oxidation at high pH or Eh and is also subject to microbial activity. For example, Mn(II) in a lake was oxidized during the summer months, but this was inhibited by a microbial poison, indicating that the oxidation was mediated by bacteria. The microbial metabolism of manganese is presumed to be a function of pH, temperature, and other factors.

Manganese in water may be significantly bioconcentrated at lower trophic levels. A bioconcentration factor (BCF) relates the concentration of a chemical in plant and animal tissues to the concentration of the chemical in the water in which they live. The BCF of manganese was estimated as 2,500 - 6,300 for phytoplankton, 300 - 5,500 for marine algae, 80 - 830 for intertidal mussels, and 35 - 930 for coastal fish. Similarly, the BCF of manganese was estimated to be 10,000 - 20,000 for marine and freshwater plants, 10,000 - 40,000 for invertebrates, and 10 - 600 for fish. In general, these data indicate that lower organisms such as algae have larger BCFs than higher organisms. In order to protect consumers from the risk of manganese bioaccumulation in marine mollusks, the U.S. EPA has set a criterion for manganese at 0.1 mg/L for marine waters.

Elemental manganese and inorganic manganese compounds have negligible vapor pressures but may exist in air as suspended particulate matter derived from industrial emissions or the erosion of soils. Manganese-containing particles are mainly removed from the atmosphere by gravitational settling, with large particles tending to fall out faster than small particles. The half-life of airborne particles is usually on the order of days, depending on the size of the particle and atmospheric conditions. Some removal by washout mechanisms such as rain may also occur, although it is of minor significance in comparison to dry deposition.

**Ecotoxicity:**

Manganese ion is toxic to aqueous organisms  
 Fish LC50 (28 d): orfe 2490 mg/l, trout 2.91 mg/l  
 Daphnia magna LC50: 50 mg/l  
 Pseudomonas putida LC50: 10.6 mg/l  
 Photobacterium phosphoreum LC50: 14.7 mg/l  
 Turbellarian worms (ECO): Polycelis nigra 660 mg/l (interference threshold); microregma 31 mg/l

**DO NOT discharge into sewer or waterways.**

### Persistence and degradability

| Ingredient              | Persistence: Water/Soil   | Persistence: Air            |
|-------------------------|---------------------------|-----------------------------|
| 1,3,5-trimethyl benzene | HIGH                      | HIGH                        |
| 1,2,4-trimethyl benzene | LOW (Half-life = 56 days) | LOW (Half-life = 0.67 days) |

### Bioaccumulative potential

| Ingredient              | Bioaccumulation |
|-------------------------|-----------------|
| aromatic 150            | LOW (BCF = 159) |
| 1,3,5-trimethyl benzene | LOW (BCF = 342) |
| 1,2,4-trimethyl benzene | LOW (BCF = 275) |

### Mobility in soil

| Ingredient              | Mobility          |
|-------------------------|-------------------|
| 1,3,5-trimethyl benzene | LOW (KOC = 703)   |
| 1,2,4-trimethyl benzene | LOW (KOC = 717.6) |

## SECTION 13 DISPOSAL CONSIDERATIONS

### Waste treatment methods

|                                     |   |
|-------------------------------------|---|
| <b>Product / Packaging disposal</b> | <ul style="list-style-type: none"> <li>▶ Containers may still present a chemical hazard/ danger when empty.</li> <li>▶ Return to supplier for reuse/ recycling if possible.</li> </ul> <p>Otherwise:</p> <ul style="list-style-type: none"> <li>▶ If container can not be cleaned sufficiently well to ensure that residuals do not remain or if the container cannot be used to store the same product, then puncture containers, to prevent re-use, and bury at an authorised landfill.</li> <li>▶ Where possible retain label warnings and SDS and observe all notices pertaining to the product.</li> </ul> <p>Legislation addressing waste disposal requirements may differ by country, state and/ or territory. Each user must refer to laws operating in their area. In some areas, certain wastes must be tracked.</p> <p>A Hierarchy of Controls seems to be common - the user should investigate:</p> <ul style="list-style-type: none"> <li>▶ Reduction</li> <li>▶ Reuse</li> <li>▶ Recycling</li> <li>▶ Disposal (if all else fails)</li> </ul> <p>This material may be recycled if unused, or if it has not been contaminated so as to make it unsuitable for its intended use. If it has been contaminated, it may be possible to reclaim the product by filtration, distillation or some other means. Shelf life considerations should also be applied in making decisions of this type. Note that properties of a material may change in use, and recycling or reuse may not always be appropriate.</p> <ul style="list-style-type: none"> <li>▶ <b>DO NOT allow wash water from cleaning or process equipment to enter drains.</b></li> <li>▶ It may be necessary to collect all wash water for treatment before disposal.</li> <li>▶ In all cases disposal to sewer may be subject to local laws and regulations and these should be considered first.</li> <li>▶ Where in doubt contact the responsible authority.</li> <li>▶ Recycle wherever possible or consult manufacturer for recycling options.</li> <li>▶ Consult State Land Waste Authority for disposal.</li> <li>▶ Bury or incinerate residue at an approved site.</li> <li>▶ Recycle containers if possible, or dispose of in an authorised landfill.</li> </ul> |
|-------------------------------------|---|

## SECTION 14 TRANSPORT INFORMATION

### Labels Required

|                           |   |
|---------------------------|---|
| <b>COMBUSTIBLE LIQUID</b> | COMBUSTIBLE LIQUID, regulated for storage purposes only |
|---------------------------|---|

|                         |   |
|-------------------------|---|
| <b>Marine Pollutant</b> |  |
| <b>HAZCHEM</b>          | Not Applicable  |

**Land transport (ADG): NOT REGULATED FOR TRANSPORT OF DANGEROUS GOODS**

**Air transport (ICAO-IATA / DGR): NOT REGULATED FOR TRANSPORT OF DANGEROUS GOODS**

**Sea transport (IMDG-Code / GGVSee): NOT REGULATED FOR TRANSPORT OF DANGEROUS GOODS**

**Transport in bulk according to Annex II of MARPOL and the IBC code**

Not Applicable

## SECTION 15 REGULATORY INFORMATION

### Safety, health and environmental regulations / legislation specific for the substance or mixture

#### AROMATIC 150 IS FOUND ON THE FOLLOWING REGULATORY LISTS

|  |   |
|--|---|
| Australia Dangerous Goods Code (ADG Code) - Dangerous Goods List             | Australia Standard for the Uniform Scheduling of Medicines and Poisons (SUSMP) - Schedule 5 |
| Australia Dangerous Goods Code (ADG Code) - List of Emergency Action Codes   | International Air Transport Association (IATA) Dangerous Goods Regulations                  |
| Australia Hazardous Chemical Information System (HCIS) - Hazardous Chemicals | International Maritime Dangerous Goods Requirements (IMDG Code)                             |
| Australia Inventory of Chemical Substances (AICS)                            | United Nations Recommendations on the Transport of Dangerous Goods Model Regulations        |

#### NAPHTHA PETROLEUM, LIGHT AROMATIC SOLVENT IS FOUND ON THE FOLLOWING REGULATORY LISTS

|   |   |
|---|---|
| Australia Dangerous Goods Code (ADG Code) - Dangerous Goods List                            | IMO IBC Code Chapter 17: Summary of minimum requirements  |
| Australia Dangerous Goods Code (ADG Code) - List of Emergency Action Codes                  | IMO MARPOL (Annex II) - List of Noxious Liquid Substances Carried in Bulk   |
| Australia Hazardous Chemical Information System (HCIS) - Hazardous Chemicals                | IMO Provisional Categorization of Liquid Substances - List 2: Pollutant only mixtures containing at least 99% by weight of components already assessed by IMO |
| Australia Inventory of Chemical Substances (AICS)   | International Air Transport Association (IATA) Dangerous Goods Regulations  |
| Australia Standard for the Uniform Scheduling of Medicines and Poisons (SUSMP) - Schedule 5 | International Maritime Dangerous Goods Requirements (IMDG Code)   |
| GESAMP/EHS Composite List - GESAMP Hazard Profiles  | United Nations Recommendations on the Transport of Dangerous Goods Model Regulations  |

#### MANGANESE 2-METHYLCYCLOPENTADIENYL TRICARBONYL IS FOUND ON THE FOLLOWING REGULATORY LISTS

|   |  |
|---|--|
| Australia Dangerous Goods Code (ADG Code) - Dangerous Goods List                            | GESAMP/EHS Composite List - GESAMP Hazard Profiles                                   |
| Australia Dangerous Goods Code (ADG Code) - List of Emergency Action Codes                  | IMO IBC Code Chapter 17: Summary of minimum requirements                             |
| Australia Exposure Standards  | IMO MARPOL (Annex II) - List of Noxious Liquid Substances Carried in Bulk            |
| Australia Hazardous Chemical Information System (HCIS) - Hazardous Chemicals                | International Air Transport Association (IATA) Dangerous Goods Regulations           |
| Australia Inventory of Chemical Substances (AICS)   | International Maritime Dangerous Goods Requirements (IMDG Code)                      |
| Australia Standard for the Uniform Scheduling of Medicines and Poisons (SUSMP) - Schedule 6 | United Nations Recommendations on the Transport of Dangerous Goods Model Regulations |
| Australia Standard for the Uniform Scheduling of Medicines and Poisons (SUSMP) - Schedule 7 |  |

#### 1,3,5-TRIMETHYL BENZENE IS FOUND ON THE FOLLOWING REGULATORY LISTS

|  |   |
|--|---|
| Australia Dangerous Goods Code (ADG Code) - Dangerous Goods List             | IMO MARPOL (Annex II) - List of Noxious Liquid Substances Carried in Bulk   |
| Australia Dangerous Goods Code (ADG Code) - List of Emergency Action Codes   | IMO Provisional Categorization of Liquid Substances - List 2: Pollutant only mixtures containing at least 99% by weight of components already assessed by IMO                           |
| Australia Hazardous Chemical Information System (HCIS) - Hazardous Chemicals | IMO Provisional Categorization of Liquid Substances - List 3: (Trade-named) mixtures containing at least 99% by weight of components already assessed by IMO, presenting safety hazards |
| Australia Inventory of Chemical Substances (AICS)                            | International Air Transport Association (IATA) Dangerous Goods Regulations  |
| GESAMP/EHS Composite List - GESAMP Hazard Profiles                           | International Maritime Dangerous Goods Requirements (IMDG Code)   |
| IMO IBC Code Chapter 17: Summary of minimum requirements                     | United Nations Recommendations on the Transport of Dangerous Goods Model Regulations  |



**1,2,4-TRIMETHYL BENZENE IS FOUND ON THE FOLLOWING REGULATORY LISTS**

Australia Dangerous Goods Code (ADG Code) - Dangerous Goods List  
 Australia Dangerous Goods Code (ADG Code) - List of Emergency Action Codes  
 Australia Hazardous Chemical Information System (HCIS) - Hazardous Chemicals  
 Australia Inventory of Chemical Substances (AICS)  
 GESAMP/EHS Composite List - GESAMP Hazard Profiles  
 IMO IBC Code Chapter 17: Summary of minimum requirements

IMO MARPOL (Annex II) - List of Noxious Liquid Substances Carried in Bulk  
 IMO Provisional Categorization of Liquid Substances - List 2: Pollutant only mixtures containing at least 99% by weight of components already assessed by IMO  
 IMO Provisional Categorization of Liquid Substances - List 3: (Trade-named) mixtures containing at least 99% by weight of components already assessed by IMO, presenting safety hazards  
 International Air Transport Association (IATA) Dangerous Goods Regulations  
 International Maritime Dangerous Goods Requirements (IMDG Code)  
 United Nations Recommendations on the Transport of Dangerous Goods Model Regulations

**National Inventory Status**

| National Inventory            | Status  |
|-------------------------------|---|
| Australia - AICS              | Yes   |
| Canada - DSL                  | Yes   |
| Canada - NDSL                 | No (manganese 2-methylcyclopentadienyl tricarbonyl; naphtha petroleum, light aromatic solvent; aromatic 150; 1,3,5-trimethyl benzene; 1,2,4-trimethyl benzene)  |
| China - IECSC                 | Yes   |
| Europe - EINEC / ELINCS / NLP | Yes   |
| Japan - ENCS                  | No (aromatic 150)   |
| Korea - KECI                  | Yes   |
| New Zealand - NZIoC           | Yes   |
| Philippines - PICCS           | Yes   |
| USA - TSCA                    | Yes   |
| Taiwan - TCSI                 | Yes   |
| Mexico - INSQ                 | Yes   |
| Vietnam - NCI                 | No (manganese 2-methylcyclopentadienyl tricarbonyl)   |
| Russia - ARIPS                | Yes   |
| <b>Legend:</b>                | <i>Yes = All CAS declared ingredients are on the inventory<br/>       No = One or more of the CAS listed ingredients are not on the inventory and are not exempt from listing(see specific ingredients in brackets)</i> |

**SECTION 16 OTHER INFORMATION**

|                      |            |
|----------------------|------------|
| <b>Revision Date</b> | 01/10/2019 |
| <b>Initial Date</b>  | 01/10/2019 |

**Other information**

Classification of the preparation and its individual components has drawn on official and authoritative sources as well as independent review by the Chemwatch Classification committee using available literature references.

The SDS is a Hazard Communication tool and should be used to assist in the Risk Assessment. Many factors determine whether the reported Hazards are Risks in the workplace or other settings. Risks may be determined by reference to Exposures Scenarios. Scale of use, frequency of use and current or available engineering controls must be considered.

**Definitions and abbreviations**

PC—TWA: Permissible Concentration-Time Weighted Average  
 PC—STEL: Permissible Concentration-Short Term Exposure Limit  
 IARC: International Agency for Research on Cancer  
 ACGIH: American Conference of Governmental Industrial Hygienists  
 STEL: Short Term Exposure Limit  
 TEEL: Temporary Emergency Exposure Limit.  
 IDLH: Immediately Dangerous to Life or Health Concentrations  
 OSF: Odour Safety Factor  
 NOAEL :No Observed Adverse Effect Level  
 LOAEL: Lowest Observed Adverse Effect Level  
 TLV: Threshold Limit Value

LOD: Limit Of Detection  
OTV: Odour Threshold Value  
BCF: BioConcentration Factors  
BEI: Biological Exposure Index

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