Material Safety Data Sheet
Dow AgroSciences Canada Inc.

Product Name: Frontline* 2,4-D A Suspension Concentrate Herbicide **Issue Date:** 2012.02.28

Dow AgroSciences Canada Inc. encourages and expects you to read and understand the entire (M)SDS, as there is important information throughout the document. We expect you to follow the precautions identified in this document unless your use conditions would necessitate other appropriate methods or actions.

1. Product and Company Identification

Product Name

Frontline* 2,4-D A Suspension Concentrate Herbicide

COMPANY IDENTIFICATION

Dow AgroSciences Canada Inc.
A Subsidiary of The Dow Chemical Company
Suite 2100, 450 1st Street SW,
Calgary, AB T2P 5H1
Canada

For MSDS updates and Product Information: 800-667-3852

Prepared By: Prepared for use in Canada by EH&S, Hazard Communications.
Revision 2012.02.28

Customer Information Number: 800-667-3852
solutions@dow.com

EMERGENCY TELEPHONE NUMBER

24-Hour Emergency Contact: 613-996-6666
Local Emergency Contact: 613-996-6666

2. Hazards Identification

Emergency Overview
Color: White to off-white
Physical State: Liquid
Odor: Mild
Hazards of product:

No significant immediate hazards for emergency response are known.

Potential Health Effects

Eye Contact: Essentially nonirritating to eyes.
Skin Contact: Brief contact is essentially nonirritating to skin.
Skin Absorption: Prolonged skin contact is unlikely to result in absorption of harmful amounts.
Inhalation: Vapors are primarily water; single exposure is not likely to be hazardous. No adverse effects are anticipated from single exposure to mist. Excessive exposure may cause irritation to upper respiratory tract (nose and throat). Based on the available data, narcotic effects were not observed.
Ingestion: Very low toxicity if swallowed. Harmful effects not anticipated from swallowing small amounts.
Aspiration hazard: Based on physical properties, not likely to be an aspiration hazard.
Effects of Repeated Exposure: For the active ingredient(s): In animals, effects have been reported on the following organs: Kidney. Liver. For the minor component(s): In rare cases, repeated excessive exposure to propylene glycol may cause central nervous system effects.

3. Composition/information on ingredients

Component	CAS #	Amount W/W
Florasulam	145701-23-1	4.8 %
Propylene glycol	57-55-6	8.6 %
Balance	Not available	86.6 %

Amounts are presented as percentages by weight.

4. First-aid measures

Description of first aid measures

General advice: If potential for exposure exists refer to Section 8 for specific personal protective equipment.
Inhalation: Move person to fresh air. If person is not breathing, call an emergency responder or ambulance, then give artificial respiration; if by mouth to mouth use rescuer protection (pocket mask etc). Call a poison control center or doctor for treatment advice.
Skin Contact: Take off contaminated clothing. Rinse skin immediately with plenty of water for 15-20 minutes. Call a poison control center or doctor for treatment advice.
Eye Contact: Hold eyes open and rinse slowly and gently with water for 15-20 minutes. Remove contact lenses, if present, after the first 5 minutes, then continue rinsing eyes. Call a poison control center or doctor for treatment advice.
Ingestion: No emergency medical treatment necessary.

Most important symptoms and effects, both acute and delayed

Aside from the information found under Description of first aid measures (above) and Indication of immediate medical attention and special treatment needed (below), no additional symptoms and effects are anticipated.

Indication of immediate medical attention and special treatment needed

No specific antidote. Treatment of exposure should be directed at the control of symptoms and the clinical condition of the patient. Have the Safety Data Sheet, and if available, the product container or label with you when calling a poison control center or doctor, or going for treatment.

5. Fire Fighting Measures

Suitable extinguishing media

This material does not burn. If exposed to fire from another source, use suitable extinguishing agent for that fire.

Special hazards arising from the substance or mixture

Hazardous Combustion Products: Under fire conditions some components of this product may decompose. The smoke may contain unidentified toxic and/or irritating compounds. Combustion products may include trace amounts of: Sulfur oxides. Nitrogen oxides. Hydrogen halides.

Unusual Fire and Explosion Hazards: If exposed to fire from another source and water is evaporated, exposure to high temperatures may cause toxic fumes.

Advice for firefighters

Fire Fighting Procedures: Keep people away. Isolate fire and deny unnecessary entry. This material does not burn. Fight fire for other material that is burning. Contain fire water run-off if possible. Fire water run-off, if not contained, may cause environmental damage. Review the "Accidental Release Measures" and the "Ecological Information" sections of this (M)SDS.
Special Protective Equipment for Firefighters: Wear positive-pressure self-contained breathing apparatus (SCBA) and protective fire fighting clothing (includes fire fighting helmet, coat, trousers, boots, and gloves). If protective equipment is not available or not used, fight fire from a protected location or safe distance.
See Section 9 for related Physical Properties

6. Accidental Release Measures

Personal precautions, protective equipment and emergency procedures: Use appropriate safety equipment. For additional information, refer to Section 8, Exposure Controls and Personal Protection.

Environmental precautions: Prevent from entering into soil, ditches, sewers, waterways and/or groundwater. See Section 12, Ecological Information.
Methods and materials for containment and cleaning up: Contain spilled material if possible. Small spills: Absorb with materials such as: Clay. Dirt. Sand. Sweep up. Collect in suitable and properly labeled containers. Large spills: Contact Dow AgroSciences for clean-up assistance.

7. Handling and Storage

Handling

General Handling: Keep out of reach of children. Do not swallow. Avoid contact with eyes, skin, and clothing. Avoid breathing vapor or mist. Use with adequate ventilation. Wash thoroughly after handling. See Section 8, EXPOSURE CONTROLS AND PERSONAL PROTECTION.

Storage

Store in a dry place. Store in original container. Keep container tightly closed when not in use. Do not store near food, foodstuffs, drugs or potable water supplies.

To maintain product quality, recommended storage temperature is > -5 °C

8. Exposure Controls / Personal Protection

Exposure Limits

Component	List	Type	Value
Propylene glycol	WEEL	TWA Aerosol.	10 mg/m3
	CAD ON OEL	TWAEV Total vapor and aerosol.	155 mg/m3 50 ppm

Consult local authorities for recommended exposure limits.
RECOMMENDATIONS IN THIS SECTION ARE FOR MANUFACTURING, COMMERCIAL BLENDING AND PACKAGING WORKERS. APPLICATORS AND HANDLERS SHOULD SEE THE PRODUCT LABEL FOR PROPER PERSONAL PROTECTIVE EQUIPMENT AND CLOTHING.

Personal Protection

Eye/Face Protection: Use safety glasses (with side shields).
Skin Protection: Wear clean, body-covering clothing.

Hand protection: Use gloves chemically resistant to this material when prolonged or frequently repeated contact could occur. Examples of preferred glove barrier materials include: Butyl rubber. Polyethylene. Ethyl vinyl alcohol laminate ("EVAL"). Natural rubber

("latex"). Neoprene. Nitrile/butadiene rubber ("nitrile" or "NBR"). Polyvinyl chloride ("PVC" or "vinyl"). NOTICE: The selection of a specific glove for a particular application and duration of use in a workplace should also take into account all relevant workplace factors such as, but not limited to: Other chemicals which may be handled, physical requirements (cut/puncture protection, dexterity, thermal protection), potential body reactions to glove materials, as well as the instructions/specifications provided by the glove supplier.

Respiratory Protection: Respiratory protection should be worn when there is a potential to exceed the exposure limit requirements or guidelines. If there are no applicable exposure limit requirements or guidelines, wear respiratory protection when adverse effects, such as respiratory irritation or discomfort have been experienced, or where indicated by your risk assessment process. For most conditions no respiratory protection should be needed; however, if discomfort is experienced, use an approved air-purifying respirator. The following should be effective types of air-purifying respirators: Organic vapor cartridge with a particulate pre-filter.

Ingestion: Use good personal hygiene. Do not consume or store food in the work area. Wash hands before smoking or eating.

Engineering Controls

Ventilation: Use local exhaust ventilation, or other engineering controls to maintain airborne levels below exposure limit requirements or guidelines. If there are no applicable exposure limit requirements or guidelines, general ventilation should be sufficient for most operations. Local exhaust ventilation may be necessary for some operations.

9. Physical and Chemical Properties

Appearance	
Physical State	Liquid
Color	White to off-white
Odor	Mild
Odor Threshold	No test data available
pH	4.36 (@ 1 %)
Melting Point	Not applicable
Freezing Point	No test data available
Boiling Point (760 mmHg)	No test data available
Flash Point - Closed Cup	*Pensky-Martens Closed Cup ASTM D 93* none below boiling point
Evaporation Rate (Butyl Acetate = 1)	No test data available
Flammable Limits In Air	**Lower**: No test data available **Upper**: No test data available
Vapor Pressure	Not applicable
Vapor Density (air = 1)	No test data available
Specific Gravity (H2O = 1)	1.0318 *Digital Density Meter (Oscillating Coil)*
Solubility in water (by weight)	No test data available
Partition coefficient, n-octanol/water (log Pow)	No data available for this product. See Section 12 for individual component data.
Autoignition Temperature	*EC Method A15* none below 400degC
Decomposition Temperature	No test data available
Kinematic Viscosity	No test data available
Explosive properties	Not explosive
Oxidizing properties	No significant increase (>5C) in temperature.
Liquid Density	1.0318 g/cm3 @ 20 °C *Digital density meter*

10. Stability and Reactivity

Reactivity

No dangerous reaction known under conditions of normal use.

Chemical stability

Thermally stable at typical use temperatures.

Possibility of hazardous reactions
Polymerization will not occur.
Conditions to Avoid: Active ingredient decomposes at elevated temperatures.

Incompatible Materials: None known.
Hazardous decomposition products
Decomposition products depend upon temperature, air supply and the presence of other materials.

11. Toxicological Information

Acute Toxicity
Ingestion
As product: LD50, rat, male and female > 5,000 mg/kg
Dermal
As product: LD50, rat, male and female > 2,000 mg/kg
No deaths occurred at this concentration.
Inhalation
As product: The LC50 has not been determined. Based on information for component(s): Estimated. LC50, 4 h, Aerosol, rat > 5 mg/l
Eye damage/eye irritation
Essentially nonirritating to eyes.
Skin corrosion/irritation
Brief contact is essentially nonirritating to skin.
Sensitization
Skin
Did not demonstrate the potential for contact allergy in mice.
Respiratory
No relevant data found.
Repeated Dose Toxicity
Repeated skin application to laboratory animals did not produce systemic toxicity. For the active ingredient(s): In animals, effects have been reported on the following organs: Kidney. Liver. For the minor component(s): In rare cases, repeated excessive exposure to propylene glycol may cause central nervous system effects.
Chronic Toxicity and Carcinogenicity
For the active ingredient(s): Did not cause cancer in laboratory animals.
Developmental Toxicity
For the active ingredient(s): Did not cause birth defects or other effects in the fetus even at doses which caused toxic effects in the mother.
Reproductive Toxicity
For the active ingredient(s): In animal studies, did not interfere with reproduction.
Genetic Toxicology
For the active ingredient(s): In vitro genetic toxicity studies were negative. Animal genetic toxicity studies were negative.

12. Ecological Information

Toxicity
Material is very highly toxic to aquatic organisms on an acute basis (LC50/EC50 <0.1 mg/L in the most sensitive species). Material is practically non-toxic to birds on an acute basis (LD50 > 2000 mg/kg).

Fish Acute & Prolonged Toxicity
LC50, Oncorhynchus mykiss (rainbow trout), semi-static test, 96 h: > 100 mg/l
Aquatic Invertebrate Acute Toxicity
EC50, Daphnia magna (Water flea), 48 h, immobilization: > 100 mg/l
Aquatic Plant Toxicity
EC50, Lemna minor (duckweed), Growth inhibition (cell density reduction), 14 d: 0.0413 mg/l
EbC50, Pseudokirchneriella subcapitata (green algae), static test, biomass growth inhibition, 72 h: 0.0611 mg/l

Toxicity to Above Ground Organisms
oral LD50, Anas platyrhynchos (Mallard duck): > 2250 mg/kg bodyweight.
oral LD50, Apis mellifera (bees): > 70.25 ug/bee
contact LD50, Apis mellifera (bees): > 100 ug/bee
Toxicity to Soil Dwelling Organisms
LC50, Eisenia fetida (earthworms): > 1,033 mg/kg

Persistence and Degradability

Data for Component: **Florasulam**

Material is expected to biodegrade only very slowly (in the environment). Fails to pass OECD/EEC tests for ready biodegradability.

OECD Biodegradation Tests:

Biodegradation	Exposure Time	Method	10 Day Window
2 %	28 d	OECD 301B Test	fail

Data for Component: **Propylene glycol**

Material is readily biodegradable. Passes OECD test(s) for ready biodegradability. Biodegradation may occur under anaerobic conditions (in the absence of oxygen).

OECD Biodegradation Tests:

Biodegradation	Exposure Time	Method	10 Day Window
81 %	28 d	OECD 301F Test	pass
96 %	64 d	OECD 306 Test	Not applicable

Indirect Photodegradation with OH Radicals

Rate Constant	Atmospheric Half-life	Method
1.28E-11 cm3/s	10 h	Estimated.

Biological oxygen demand (BOD):

BOD 5	BOD 10	BOD 20	BOD 28
69.000 %	70.000 %	86.000 %	

Chemical Oxygen Demand: 1.53 mg/mg
Theoretical Oxygen Demand: 1.68 mg/mg

Bioaccumulative potential

Data for Component: **Florasulam**

Bioaccumulation: Bioconcentration potential is low (BCF < 100 or Log Pow < 3).
Partition coefficient, n-octanol/water (log Pow): -1.22
Bioconcentration Factor (BCF): 0.8; Fish; Measured

Data for Component: **Propylene glycol**

Bioaccumulation: Bioconcentration potential is low (BCF < 100 or Log Pow < 3).
Partition coefficient, n-octanol/water (log Pow): -1.07 Measured
Bioconcentration Factor (BCF): 0.09; Estimated.

Mobility in soil

Data for Component: **Florasulam**

Mobility in soil: Potential for mobility in soil is very high (Koc between 0 and 50).
Partition coefficient, soil organic carbon/water (Koc): 4 - 54**Henry's Law Constant (H):** 2.29E-05 Pa*m3/mole.; 20 °C

Data for Component: **Propylene glycol**

Mobility in soil: Given its very low Henry's constant, volatilization from natural bodies of water or moist soil is not expected to be an important fate process., Potential for mobility in soil is very high (Koc between 0 and 50).
Partition coefficient, soil organic carbon/water (Koc): < 1 Estimated.
Henry's Law Constant (H): 1.2E-08 atm*m3/mole Measured

13. Disposal Considerations

If wastes and/or containers cannot be disposed of according to the product label directions, disposal of this material must be in accordance with your local or area regulatory authorities. This information presented below only applies to the material as supplied. The identification based on characteristic(s) or listing may not apply if the material has been used or otherwise contaminated. It is the

responsibility of the waste generator to determine the toxicity and physical properties of the material generated to determine the proper waste identification and disposal methods in compliance with applicable regulations. If the material as supplied becomes a waste, follow all applicable regional, national and local laws.

14. Transport Information

TDG Small container
NOT REGULATED

TDG Large container
NOT REGULATED

IMDG
Proper Shipping Name: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, LIQUID, N.O.S.
Technical Name: Florasulam
Hazard Class: 9 **ID Number:** UN3082 **Packing Group:** PG III
EMS Number: F-A,S-F
Marine pollutant.: Yes

ICAO/IATA
Proper Shipping Name: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, LIQUID, N.O.S.
Technical Name: Florasulam
Hazard Class: 9 **ID Number:** UN3082 **Packing Group:** PG III
Cargo Packing Instruction: 964
Passenger Packing Instruction: 964

15. Regulatory Information

CEPA - Domestic Substances List (DSL)
All substances contained in this product are listed on the Canadian Domestic Substances List (DSL) or are not required to be listed.

Hazardous Products Act Information: CPR Compliance
This product has been classified in accordance with the hazard criteria of the Canadian Controlled Products Regulations (CPR) and the MSDS contains all the information required by the CPR.

Hazardous Products Act Information: WHMIS Classification
This product is exempt under WHMIS.

Pest Control Products Act Registration number: 27242

National Fire Code of Canada
Not applicable

16. Other Information

Hazard Rating System

NFPA	Health	Fire	Reactivity
	1	0	0

Recommended Uses and Restrictions
Identified uses
Product use: End use herbicide product

Revision
Identification Number: 58401 / 1023 / Issue Date 2012.02.28 / Version: 7.4
DAS Code: EF-1343

Most recent revision(s) are noted by the bold, double bars in left-hand margin throughout this document.

Legend

N/A	Not available
W/W	Weight/Weight
OEL	Occupational Exposure Limit
STEL	Short Term Exposure Limit
TWA	Time Weighted Average
ACGIH	American Conference of Governmental Industrial Hygienists, Inc.
DOW IHG	Dow Industrial Hygiene Guideline
WEEL	Workplace Environmental Exposure Level
HAZ_DES	Hazard Designation
VOL/VOL	Volume/Volume

Dow AgroSciences Canada Inc. urges each customer or recipient of this (M)SDS to study it carefully and consult appropriate expertise, as necessary or appropriate, to become aware of and understand the data contained in this (M)SDS and any hazards associated with the product. The information herein is provided in good faith and believed to be accurate as of the effective date shown above. However, no warranty, express or implied, is given. Regulatory requirements are subject to change and may differ between various locations. It is the buyer's/user's responsibility to ensure that his activities comply with all federal, state, provincial or local laws. The information presented here pertains only to the product as shipped. Since conditions for use of the product are not under the control of the manufacturer, it is the buyer's/user's duty to determine the conditions necessary for the safe use of this product. Due to the proliferation of sources for information such as manufacturer-specific (M)SDSs, we are not and cannot be responsible for (M)SDSs obtained from any source other than ourselves. If you have obtained an (M)SDS from another source or if you are not sure that the (M)SDS you have is current, please contact us for the most current version.

Material Safety Data Sheet

Dow AgroSciences Canada Inc.

Product Name: Frontline* 2,4-D B Emulsifiable Concentrate Herbicide **Issue Date:** 2010.09.23

Dow AgroSciences Canada Inc. encourages and expects you to read and understand the entire (M)SDS, as there is important information throughout the document. We expect you to follow the precautions identified in this document unless your use conditions would necessitate other appropriate methods or actions.

1. Product and Company Identification

Product Name

Frontline* 2,4-D B Emulsifiable Concentrate Herbicide

COMPANY IDENTIFICATION

Dow AgroSciences Canada Inc.
A Subsidiary of The Dow Chemical Company
Suite 2100, 450 1st Street SW,
Calgary, AB T2P 5H1
Canada

For MSDS updates and Product Information: 800-667-3852

Prepared By: Prepared for use in Canada by EH&S, Hazard Communications.
Revision 2010.09.23

Customer Information Number: 800-667-3852

EMERGENCY TELEPHONE NUMBER

24-Hour Emergency Contact: 613-996-6666
Local Emergency Contact: 613-996-6666

2. Hazards Identification

Emergency Overview

Color: Yellow
Physical State: Liquid
Odor: Ester
Hazards of product:

DANGER! Combustible liquid and vapor. Causes eye burns. Harmful or fatal if swallowed; can enter lungs and cause damage. Evacuate area. Keep upwind of spill. Toxic fumes may be released in fire situations.

Potential Health Effects

Eye Contact: May cause permanent impairment of vision, even blindness.
Skin Contact: Brief contact may cause slight skin irritation with local redness. May cause drying and flaking of the skin.
Skin Absorption: Prolonged skin contact is unlikely to result in absorption of harmful amounts.
Inhalation: Vapor may cause irritation of the upper respiratory tract (nose and throat). Mist may cause irritation of upper respiratory tract (nose and throat).
Ingestion: Low toxicity if swallowed. Small amounts swallowed incidentally as a result of normal handling operations are not likely to cause injury; however, swallowing larger amounts may cause injury.
Aspiration hazard: Aspiration into the lungs may occur during ingestion or vomiting, causing lung damage or even death due to chemical pneumonia.
Effects of Repeated Exposure: For kerosene: In animals, effects have been reported on the following organs after exposure to aerosols: Central nervous system. Respiratory tract. Observations in animals include: Anesthetic or narcotic effects.
Cancer Information: For the solvent(s): In a lifetime animal dermal carcinogenicity study, an increased incidence of skin tumors was observed when kerosene was applied at doses that also produced skin irritation. This response was similar to that produced in skin by other types of chronic chemical/physical irritation. No increase in tumors was observed when non-irritating dilutions of kerosene were applied at equivalent doses, indicating that kerosene is unlikely to cause skin cancer in the absence of long-term continued skin irritation.
Birth Defects/Developmental Effects: For the active ingredient(s): 2,4-D 2-ethylhexyl ester. Has been toxic to the fetus in lab animals at doses nontoxic to the mother.
Reproductive Effects: For similar active ingredient(s). 2,4-Dichlorophenoxyacetic acid. In laboratory animals, excessive doses toxic to the parent animals caused decreased weight and survival of offspring.

3. Composition/information on ingredients

Component	CAS #	Amount W/W
2,4-D 2-ethylhexyl ester	1928-43-4	77.19 %
Kerosene (petroleum)	8008-20-6	>= 7.5 - <= 12.5 %
Balance		>= 10.4 - <= 15.4 %

Amounts are presented as percentages by weight.

4. First-aid measures

Eye Contact: Wash immediately and continuously with flowing water for at least 30 minutes. Remove contact lenses after the first 5 minutes and continue washing. Obtain prompt medical consultation, preferably from an ophthalmologist. Suitable emergency eye wash facility should be immediately available.
Skin Contact: Take off contaminated clothing. Rinse skin immediately with plenty of water for 15-20 minutes. Call a poison control center or doctor for treatment advice.
Inhalation: Move person to fresh air. If person is not breathing, call an emergency responder or ambulance, then give artificial respiration; if by mouth to mouth use rescuer protection (pocket mask etc). Call a poison control center or doctor for treatment advice.
Ingestion: Immediately call a poison control center or doctor. Do not induce vomiting unless told to do so by a poison control center or doctor. Do not give any liquid to the person. Do not give anything by mouth to an unconscious person.
Notes to Physician: Chemical eye burns may require extended irrigation. Obtain prompt consultation, preferably from an ophthalmologist. The decision of whether to induce vomiting or not should be made by a physician. If lavage is performed, suggest endotracheal and/or esophageal control. Danger from lung aspiration must be weighed against toxicity when considering emptying the

stomach. No specific antidote. Treatment of exposure should be directed at the control of symptoms and the clinical condition of the patient. Have the Safety Data Sheet, and if available, the product container or label with you when calling a poison control center or doctor, or going for treatment.
Medical Conditions Aggravated by Exposure: Skin contact may aggravate preexisting dermatitis.
Emergency Personnel Protection: First Aid responders should pay attention to self-protection and use the recommended protective clothing (chemical resistant gloves, splash protection). If potential for exposure exists refer to Section 8 for specific personal protective equipment.

5. Fire Fighting Measures

Extinguishing Media: Water fog or fine spray. Dry chemical fire extinguishers. Carbon dioxide fire extinguishers. Foam. Alcohol resistant foams (ATC type) are preferred. General purpose synthetic foams (including AFFF) or protein foams may function, but will be less effective.
Fire Fighting Procedures: Keep people away. Isolate fire and deny unnecessary entry. Burning liquids may be extinguished by dilution with water. Do not use direct water stream. May spread fire. Burning liquids may be moved by flushing with water to protect personnel and minimize property damage. Contain fire water run-off if possible. Fire water run-off, if not contained, may cause environmental damage. Review the "Accidental Release Measures" and the "Ecological Information" sections of this (M)SDS.
Special Protective Equipment for Firefighters: Wear positive-pressure self-contained breathing apparatus (SCBA) and protective fire fighting clothing (includes fire fighting helmet, coat, trousers, boots, and gloves). If protective equipment is not available or not used, fight fire from a protected location or safe distance.
Unusual Fire and Explosion Hazards: Container may rupture from gas generation in a fire situation. Violent steam generation or eruption may occur upon application of direct water stream to hot liquids. Dense smoke is produced when product burns.
Hazardous Combustion Products: During a fire, smoke may contain the original material in addition to combustion products of varying composition which may be toxic and/or irritating. Combustion products may include and are not limited to: Hydrogen chloride. Carbon monoxide. Carbon dioxide.

See Section 9 for related Physical Properties

6. Accidental Release Measures

Steps to be Taken if Material is Released or Spilled: Contain spilled material if possible. Small spills: Absorb with materials such as: Clay. Dirt. Sand. Sweep up. Collect in suitable and properly labeled containers. Large spills: Contact Dow AgroSciences for clean-up assistance. See Section 13, Disposal Considerations, for additional information.
Personal Precautions: Evacuate area. Refer to Section 7, Handling, for additional precautionary measures. Only trained and properly protected personnel must be involved in clean-up operations. Keep upwind of spill. Ventilate area of leak or spill. No smoking in area.
Environmental Precautions: Prevent from entering into soil, ditches, sewers, waterways and/or groundwater. See Section 12, Ecological Information.

7. Handling and Storage

Handling
General Handling: Keep out of reach of children. Do not swallow. Avoid breathing vapor or mist. Avoid contact with eyes, skin, and clothing. Use with adequate ventilation. Wash thoroughly after handling. Keep container closed. Containers, even those that have been emptied, can contain vapors. Do not cut, drill, grind, weld, or perform similar operations on or near empty containers. Use of non-sparking or explosion-proof equipment may be necessary, depending upon the type of operation. Keep away from heat, sparks and flame.

Storage
Store in a dry place. Store in original container. Keep container tightly closed when not in use. Do not store near food, foodstuffs, drugs or potable water supplies.

8. Exposure Controls / Personal Protection

Exposure Limits

Component	List	Type	Value
2,4-D 2-ethylhexyl ester	CAD BC OEL	TWA	10 mg/m3
	CAD BC OEL	STEL	20 mg/m3
	CAD ON OEL	TWAEV as 2,4-D	10 mg/m3
Kerosene (petroleum)	Dow IHG	TWA as total hydrocarbon vapor	10 mg/m3 SKIN
	CAD BC OEL	TWA Non-aerosol. as total hydrocarbon vapor	200 mg/m3 SKIN
	ACGIH	TWA Non-aerosol. as total hydrocarbon vapor	200 mg/m3 P: Application restricted to conditions in which there are negligible aerosol exposures.
	CAD ON OEL	TWAEV as total hydrocarbon vapor	200 mg/m3 SKIN
	CAD AB OEL	TWA Vapor. as total hydrocarbon vapor	200 mg/m3
	CAD AB OEL	SKIN_DES Vapor. as total hydrocarbon vapor	Can be absorbed through the skin.

Consult local authorities for recommended exposure limits.
RECOMMENDATIONS IN THIS SECTION ARE FOR MANUFACTURING, COMMERCIAL BLENDING AND PACKAGING WORKERS. APPLICATORS AND HANDLERS SHOULD SEE THE PRODUCT LABEL FOR PROPER PERSONAL PROTECTIVE EQUIPMENT AND CLOTHING.
A "skin" notation following the inhalation exposure guideline refers to the potential for dermal absorption of the material including mucous membranes and the eyes either by contact with vapors or by direct skin contact.
It is intended to alert the reader that inhalation may not be the only route of exposure and that measures to minimize dermal exposures should be considered.

Personal Protection
Eye/Face Protection: Use chemical goggles.
Skin Protection: Use protective clothing chemically resistant to this material. Selection of specific items such as face shield, boots, apron, or full body suit will depend on the task.

Hand protection: Use gloves chemically resistant to this material. Examples of preferred glove barrier materials include: Chlorinated polyethylene. Neoprene. Polyethylene. Ethyl

vinyl alcohol laminate ("EVAL"). Polyvinyl chloride ("PVC" or "vinyl"). Viton. Examples of acceptable glove barrier materials include: Butyl rubber. Natural rubber ("latex"). Nitrile/butadiene rubber ("nitrile" or "NBR"). NOTICE: The selection of a specific glove for a particular application and duration of use in a workplace should also take into account all relevant workplace factors such as, but not limited to: Other chemicals which may be handled, physical requirements (cut/puncture protection, dexterity, thermal protection), potential body reactions to glove materials, as well as the instructions/specifications provided by the glove supplier.

Respiratory Protection: Respiratory protection should be worn when there is a potential to exceed the exposure limit requirements or guidelines. If there are no applicable exposure limit requirements or guidelines, wear respiratory protection when adverse effects, such as respiratory irritation or discomfort have been experienced, or where indicated by your risk assessment process. In misty atmospheres, use an approved particulate respirator. The following should be effective types of air-purifying respirators: Organic vapor cartridge with a particulate pre-filter.

Ingestion: Avoid ingestion of even very small amounts; do not consume or store food or tobacco in the work area; wash hands and face before smoking or eating.

Engineering Controls

Ventilation: Use engineering controls to maintain airborne level below exposure limit requirements or guidelines. If there are no applicable exposure limit requirements or guidelines, use only with adequate ventilation. Local exhaust ventilation may be necessary for some operations.

9. Physical and Chemical Properties

Physical State	Liquid
Color	Yellow
Odor	Ester
Odor Threshold	No test data available
Flash Point - Closed Cup	60 °C *Pensky-Martens Closed Cup ASTM D 93*
Flammable Limits In Air	**Lower**: No test data available **Upper**: No test data available
Autoignition Temperature	No test data available
Vapor Pressure	No test data available
Boiling Point (760 mmHg)	No test data available.
Vapor Density (air = 1)	No test data available
Specific Gravity (H2O = 1)	1.08 *Digital Density Meter (Oscillating Coil)*
Liquid Density	1.080 g/cm3 @ 20 °C *Calculated*
Freezing Point	No test data available
Melting Point	Not applicable
Solubility in water (by weight)	emulsifiable
pH	3.7 (@ 1 %) *pH Electrode* (1% aqueous suspension)
Decomposition Temperature	No test data available
Partition coefficient, n-octanol/water (log Pow)	No data available for this product
Evaporation Rate (Butyl Acetate = 1)	No test data available
Dynamic Viscosity	27.2 mPa.s @ 20 °C
Kinematic Viscosity	No test data available

10. Stability and Reactivity

Stability/Instability

Thermally stable at recommended temperatures and pressures.

Conditions to Avoid: Exposure to elevated temperatures can cause product to decompose. Generation of gas during decomposition can cause pressure in closed systems.

Incompatible Materials: Avoid contact with: Acids. Oxidizers.

Hazardous Polymerization
Will not occur.

Thermal Decomposition
Decomposition products depend upon temperature, air supply and the presence of other materials. Decomposition products can include and are not limited to: Carbon monoxide. Carbon dioxide. Hydrogen chloride.

11. Toxicological Information

Acute Toxicity
Ingestion
As product. LD50, Rat, female 982 mg/kg
Dermal
As product. LD50, Rat > 2,000 mg/kg
No deaths occurred at this concentration.
Inhalation
As product. The LC50 has not been determined.
For the active ingredient(s): LC50, Aerosol, Rat > 5.39 mg/l

Eye damage/eye irritation
May cause permanent impairment of vision, even blindness.

Skin corrosion/irritation
Brief contact may cause slight skin irritation with local redness. May cause drying and flaking of the skin.

Sensitization
Skin
Did not cause allergic skin reactions when tested in guinea pigs.
Respiratory
No relevant information found.

Repeated Dose Toxicity
For the active ingredient(s): Based on available data, repeated exposures are not anticipated to cause additional significant adverse effects. For kerosene: In animals, effects have been reported on the following organs after exposure to aerosols: Central nervous system. Respiratory tract. Observations in animals include: Anesthetic or narcotic effects.

Chronic Toxicity and Carcinogenicity
For the active ingredient(s): 2,4-D 2-ethylhexyl ester. Did not cause cancer in laboratory animals. For the solvent(s): In a lifetime animal dermal carcinogenicity study, an increased incidence of skin tumors was observed when kerosene was applied at doses that also produced skin irritation. This response was similar to that produced in skin by other types of chronic chemical/physical irritation. No increase in tumors was observed when non-irritating dilutions of kerosene were applied at equivalent doses, indicating that kerosene is unlikely to cause skin cancer in the absence of long-term continued skin irritation.

Carcinogenicity Classifications:

Component	List	Classification
Kerosene (petroleum)	ACGIH	Confirmed animal carcinogen with unknown relevance to humans.; Group A3

Developmental Toxicity
For the active ingredient(s): 2,4-D 2-ethylhexyl ester. Has been toxic to the fetus in lab animals at doses nontoxic to the mother. Did not cause birth defects in laboratory animals.

Reproductive Toxicity
For similar active ingredient(s). 2,4-Dichlorophenoxyacetic acid. In laboratory animals, excessive doses toxic to the parent animals caused decreased weight and survival of offspring.

Genetic Toxicology
For the active ingredient(s): In vitro genetic toxicity studies were negative.

12. Ecological Information

ENVIRONMENTAL FATE

Data for Component: **2,4-D 2-ethylhexyl ester**

Movement & Partitioning

Bioconcentration potential is high (BCF > 3000 or Log Pow between 5 and 7).
Henry's Law Constant (H): 4.4E-05 atm*m3/mole; 25 °C Estimated.
Partition coefficient, n-octanol/water (log Pow): 5.78 Measured
Partition coefficient, soil organic carbon/water (Koc): 25,000 - 68,000 Estimated.

Persistence and Degradability

Biodegradation under aerobic laboratory conditions is below detectable limits (BOD20 or BOD28/ThOD < 2.5%). Biodegradation may occur under aerobic conditions (in the presence of oxygen).
Stability in Water (1/2-life):
48.3 d; 25 °C; pH 7
OECD Biodegradation Tests:

Biodegradation	Exposure Time	Method
77 %	29 d	OECD 301B Test

Biological oxygen demand (BOD):

BOD 5	BOD 10	BOD 20	BOD 28
0.84 %	0.92 %	1.32 %	

Theoretical Oxygen Demand: 1.87 mg/g

Data for Component: **Kerosene (petroleum)**

Movement & Partitioning

Bioconcentration potential is moderate (BCF between 100 and 3000 or Log Pow between 3 and 5). Expected to be relatively immobile in soil (Koc > 5000).
Henry's Law Constant (H): 8.24E+00 atm*m3/mole; 25 °C Measured
Partition coefficient, n-octanol/water (log Pow): 6.1 Measured
Partition coefficient, soil organic carbon/water (Koc): 5,900 Estimated.
Bioconcentration Factor (BCF): 314; fish; Estimated.
61 - 159; fish

Persistence and Degradability

Biodegradation under aerobic static laboratory conditions is high (BOD20 or BOD28/ThOD > 40%).
Indirect Photodegradation with OH Radicals

Rate Constant	Atmospheric Half-life	Method
1.393E-11 cm3/s	0.767 d	Estimated.

Biological oxygen demand (BOD):

BOD 5	BOD 10	BOD 20	BOD 28
31.000 %	39.700 %	58.600 %	

Chemical Oxygen Demand: 1.16 mg/mg

ECOTOXICITY

Material is practically non-toxic to aquatic organisms on an acute basis (LC50/EC50/EL50/LL50 >100 mg/L in the most sensitive species tested).

Fish Acute & Prolonged Toxicity
LC50, rainbow trout (Oncorhynchus mykiss), 96 h: > 100 mg/l
Aquatic Invertebrate Acute Toxicity
EC50, water flea Daphnia magna, 48 h, immobilization: > 100 mg/l
Aquatic Plant Toxicity
EbC50, green alga Pseudokirchneriella subcapitata (formerly known as Selenastrum capricornutum), biomass growth inhibition, 72 h: > 100 mg/l

13. Disposal Considerations

If wastes and/or containers cannot be disposed of according to the product label directions, disposal of this material must be in accordance with your local or area regulatory authorities. This information presented below only applies to the material as supplied. The identification based on characteristic(s) or listing may not apply if the material has been used or otherwise contaminated. It is the responsibility of the waste generator to determine the toxicity and physical properties of the material generated to determine the proper waste identification and disposal methods in compliance with applicable regulations. If the material as supplied becomes a waste, follow all applicable regional, national and local laws.

14. Transport Information

TDG Small container
NOT REGULATED

TDG Large container
Proper Shipping Name: FLAMMABLE LIQUID, N.O.S.
Technical Name: KEROSENE
Hazard Class: 3 **ID Number:** UN1993 **Packing Group:** PG III

IMDG
Proper Shipping Name: FLAMMABLE LIQUID, N.O.S.
Technical Name: KEROSENE
Hazard Class: 3 **ID Number:** UN1993 **Packing Group:** PG III

ICAO/IATA
Proper Shipping Name: FLAMMABLE LIQUID, N.O.S.
Technical Name: KEROSENE
Hazard Class: 3 **ID Number:** UN1993 **Packing Group:** PG III

15. Regulatory Information

CEPA - Domestic Substances List (DSL)
All substances contained in this product are listed on the Canadian Domestic Substances List (DSL) or are not required to be listed.

Hazardous Products Act Information: CPR Compliance
This product has been classified in accordance with the hazard criteria of the Canadian Controlled Products Regulations (CPR) and the MSDS contains all the information required by the CPR.

Hazardous Products Act Information: WHMIS Classification
This product is exempt under WHMIS.

Pest Control Products Act Registration number: 27243

National Fire Code of Canada
Class IIIA

16. Other Information

Hazard Rating System

NFPA	Health	Fire	Reactivity
	2	2	0

Recommended Uses and Restrictions

Product use: End use herbicide product

Revision

Identification Number: 50239 / 1023 / Issue Date 2010.09.23 / Version: 5.1
DAS Code: EF-1418
Most recent revision(s) are noted by the bold, double bars in left-hand margin throughout this document.

Legend

N/A	Not available
W/W	Weight/Weight
OEL	Occupational Exposure Limit
STEL	Short Term Exposure Limit
TWA	Time Weighted Average
ACGIH	American Conference of Governmental Industrial Hygienists, Inc.
DOW IHG	Dow Industrial Hygiene Guideline
WEEL	Workplace Environmental Exposure Level
HAZ_DES	Hazard Designation
VOL/VOL	Volume/Volume

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