Section 1: IDENTIFICATION

Product Name:	Commercially Formed Elemental Solid Sulphur
Synonyms:	Sulfur; Brimstone.
Product Use:	Chemical, Pulp/Paper, Fertilizer Production.
Restrictions on Use:	Not available.
Manufacturer/Supplier:	Husky Oil Operations Ltd. PO Box 6525 Station 'D' Calgary, Alberta T2P 3G7
Phone Number:	403-298-6111
Emergency Phone:	403-262-2111
Date of Preparation of SDS:	February 13, 2017

Section 2: HAZARD(S) IDENTIFICATION

GHS INFORMATION

Classification: Skin Irritation, Category 2

LABEL ELEMENTS

Hazard Pictogram(s):

Signal Word: Warning

Hazard Statements: Causes skin irritation.

Precautionary Statements

Prevention: Wash thoroughly after handling.
Wear protective gloves, protective clothing and eye protection.

Response: IF ON SKIN: Wash with plenty of soap and water.
If skin irritation occurs: Get medical advice/attention.
Take off contaminated clothing and wash it before reuse.

Storage: Not applicable.

Disposal: Not applicable.

Hazards Not Otherwise Classified: Not applicable.

Ingredients with Unknown Toxicity: None.

This material is considered hazardous by the OSHA Hazard Communication Standard, (29 CFR 1910.1200).

This material is considered hazardous by the Hazardous Products Regulations.

Section 3: COMPOSITION / INFORMATION ON INGREDIENTS

Hazardous Ingredient(s)	Common name / Synonyms	CAS No.	% wt./wt.
Sulfur	Not available.	7704-34-9	100

Impurities / Stabilizing additives: Hydrogen sulfide, H2S (CASRN 7783-06-4).

Section 4: FIRST-AID MEASURES

Inhalation:

If inhaled: Call a poison center or doctor if you feel unwell.

Acute and delayed symptoms and effects: May cause respiratory irritation. Signs/symptoms may include cough, sneezing, nasal discharge, headache, hoarseness, and nose and throat pain. This product may contain traces of Hydrogen sulphide which may accumulate in confined spaces. Hydrogen sulphide may cause symptoms such as digestive upset and loss of appetite, loss of sense of smell and pulmonary edema. At 500-1000 ppm Hydrogen sulphide may cause respiratory paralysis, collapse and death without rescue.

Eye Contact:

If in eyes: Rinse cautiously with water for at least 15 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Call a poison center or doctor if you feel unwell.

Acute and delayed symptoms and effects: May cause eye irritation. Signs/symptoms may include redness, swelling, pain, tearing, and blurred or hazy vision. This product may contain traces of Hydrogen sulphide which may accumulate in confined spaces. Hydrogen sulphide may cause eye irritation at 1-20 ppm and acute conjunctivitis at higher concentrations. Above 50 ppm H2S, eye irritation may include symptoms of redness, severe swelling, tearing, sensitivity to light and the appearance of 'Halos' around lights.

Skin Contact:

If on skin: Wash with plenty of soap and water. If skin irritation occurs: Get medical advice/attention. Take off contaminated clothing and wash it before reuse.

Acute and delayed symptoms and effects: Causes skin irritation. Signs/symptoms may include localized redness, swelling, and itching.

Ingestion:

If swallowed: Call a poison center or doctor/physician if you feel unwell. If vomiting occurs naturally, have victim lean forward to reduce the risk of aspiration. Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If breathing or the heart stops, trained personnel should immediately begin artificial respiration (AR) or cardiopulmonary resuscitation (CPR) respectively. Get medical attention immediately.

Acute and delayed symptoms and effects: May cause gastrointestinal irritation. Signs/symptoms may include abdominal pain, stomach upset, nausea, vomiting and diarrhea. Sulphur may be converted into Hydrogen sulphide in the intestine.

General Advice: In case of accident or if you feel unwell, seek medical advice immediately (show the label or SDS where possible).

Note to Physicians: Symptoms may not appear immediately. For inhalation of Hydrogen Sulphide, consider oxygen.

Section 5: FIRE-FIGHTING MEASURES

FLAMMABILITY AND EXPLOSION INFORMATION

Combusts slowly in air with pale flame which may be hard to see, especially in low humidity atmospheres. Flammable solid in powder form. Avoid contact with hot exhaust pipes and spark sources of ignition e.g. steel tracked vehicles. Does not meet criteria for classification as Class 4.1 Flammable Solids under IMOT/TDG Regulations. When heated, this material may evolve toxic and flammable Hydrogen sulphide.

Sensitivity to Mechanical Impact: This material is not sensitive to mechanical impact.

Sensitivity to Static Discharge: This material is sensitive to static discharge at temperatures at or above the flash point.

MEANS OF EXTINCTION

Suitable Extinguishing Media: Small Fire: Dry chemical, CO_2, water spray or regular foam.

Large Fire: Water spray, fog or regular foam. Move containers from fire area if you can do it without risk.

Unsuitable Extinguishing Media: Not available.

Products of Combustion: Oxides of sulphur. Hydrogen sulphide.

Protection of Firefighters: Fire may produce irritating, corrosive and/or toxic gases. Runoff from fire control or dilution water may cause pollution. Hydrogen sulphide is heavier than air and may collect in low lying areas and confined spaces. Wear positive pressure self-contained breathing apparatus (SCBA). Structural firefighters' protective clothing will only provide limited protection.

Section 6: ACCIDENTAL RELEASE MEASURES

Emergency Procedures: Keep unauthorized personnel away. Stay upwind. Keep out of low areas. Ventilate closed spaces before entering. ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area).

Personal Precautions: Do not touch or walk through spilled material. Use personal protection recommended in Section 8. Don full-face, positive pressure, self-contained breathing apparatus.

Environmental Precautions: Keep out of drains, sewers, ditches, and waterways.

Methods for Containment: Contain spill. Avoid dust creation. Reclaim material if possible. Reaction with environment minimal if kept cool and dry. Do not flush to sewer or allow to enter waterways.

Methods for Clean-Up: Use explosion-proof equipment. Dust can be a fire or explosion hazard. Sweep up and shovel into suitable containers for disposal.

Other Information: See Section 13 for disposal considerations.

Section 7: HANDLING AND STORAGE

Handling:
Do not swallow. Do not breathe dust. Keep away from heat, sparks, open flames, and hot surfaces. No smoking. Ground/bond container and receiving equipment. Use explosion-proof electrical, ventilating, and lighting equipment. Avoid contact with skin and eyes. Handle and open container with care. Protect from moisture. When using do not eat or drink. Wash hands before eating, drinking, or smoking. See Section 8 for information on Personal Protective Equipment. Protect equipment against wet elemental sulfur corrosion.

Storage:
Maintain adequate ventilation at all times. Head spaces in storage tanks may contain toxic Hydrogen sulfide gas. Keep product cool and dry. Keep away from sources of ignition. Avoid generation and accumulation of dust. Rotation of storage may minimize acidity build-up. Acid build-up can also lead to corrosive attack on metals and concrete structural materials. Store away from incompatible materials. See Section 10 for information on Incompatible Materials. Keep out of the reach of children.

Section 8: EXPOSURE CONTROLS / PERSONAL PROTECTION

Exposure Guidelines
Component

Sulphur (Solid) [CAS No. 7704-34-9]

ACGIH: 10 mg/m³ (TWA) (Inhalable.); 3 mg/m³ (TWA) (Respirable.); For Particles (Insoluble or Poorly Soluble) Not Otherwise Specified

OSHA: 15 mg/m³ (Total dust) (TWA), 5 mg/m³ (Respirable fraction) (TWA); For Particulates Not Otherwise Regulated (PNOR).

Hydrogen sulphide [CAS No. 7783-06-4]

ACGIH: 1 ppm (TWA); 5 ppm (STEL); (2009);

OSHA: 20 ppm (C); 50 ppm (Peak) (Maximum duration: 10 mins. once only if no other meas. exp. occurs.)
10 ppm (TWA); 15 ppm (STEL) [Vacated];

TWA: Time-Weighted Average
STEL: Short-Term Exposure Limit
C: Ceiling

Engineering Controls: Use ventilation adequate to keep exposures (airborne levels of dust, fume, vapour, gas, etc.) below recommended exposure limits. Non-ferrous tools and non-ferrous fittings recommended. Minimize all potential for product coming in contact with high temperature sources. Recognize corrosive properties of wet or moist elemental sulfur even at neutral pH. Avoid use of copper. Minimize impact and abrasion when handling. Monitor and treat runoff for acidity.

PERSONAL PROTECTIVE EQUIPMENT (PPE)

Eye/Face Protection:	Wear safety glasses. Indirect vented, dust-tight goggles are required if dust is generated when handling this product. Use equipment for eye protection that meets the standards referenced by OSHA regulations in 29 CFR 1910.133 for Personal Protective Equipment.
Hand Protection:	Wear protective gloves. Neoprene material is recommended. If product is hot, thermally protective gloves are recommended. Consult manufacturer specifications for further information.
Skin and Body Protection:	Wear protective clothing. Flame resistant clothing that meets the NFPA 2112 and CAN/CGSB 155.20 standards is recommended in areas where material is stored or handled.
Respiratory Protection:	If engineering controls and ventilation are not sufficient to control exposure to dust or sulfur dioxide to below the allowable limits then an appropriate NIOSH/MSHA approved air-purifying respirator with Acid Gas/P100 combination cartridge/filter, or self-contained breathing apparatus must be used. Supplied air breathing apparatus must be used when oxygen concentrations are low, if airborne concentrations exceed the limits of the air-purifying respirators or where hydrogen sulfide is present or possibly present in confined spaces at hazardous levels.
General Hygiene Considerations:	Handle according to established industrial hygiene and safety practices.

Section 9: PHYSICAL AND CHEMICAL PROPERTIES

Appearance:	Formed solid. (Spherical, hemispherical, and slate or flakes.) NOTE: These forms of solid sulfur are excluded from Class 4.1 under Schedule II, special provision 33(b), and are classified as Group “C” in the IMSBC Code (2009 edition).
Colour:	Yellow.
Odour:	Rotten eggs.
Odour Threshold:	0.0047 ppm, (Hydrogen sulphide) – rotten eggs 0.5 ppm (Sulfur dioxide) - acidic, pungent
Physical State:	Solid.
pH (1% solution in water):	2 to 4
Melting Point / Freezing Point:	112 to 119 °C (233.6 to 246.2 °F)

Initial Boiling Point:	Not available.
Boiling Point:	444 °C (831.2 °F)
Flash Point:	207 °C (404.6 °F)
Evaporation Rate:	Not available.
Flammability (solid, gas):	Not flammable in the form as supplied. Flammable solid in powder form.
Lower Flammability Limit:	35 g/m³
Upper Flammability Limit:	1400 g/m³
Vapor Pressure:	0.11 mmHg at 140 °C (284 °F)
Vapor Density:	Not available.
Relative Density:	2.07 (Water = 1)
Solubilities:	Insoluble in water. Soluble in carbon disulfide.
Partition Coefficient: n-Octanol/Water:	Not available.
Auto-ignition Temperature:	232 °C (449.6 °F) (Fine particulate dust cloud in air.)
Decomposition Temperature:	Not available.
Viscosity:	Not available.
Percent Volatile, wt. %:	Not available.
VOC content, wt. %:	Not available.
Density:	1.96 kg/m³
Coefficient of Water/Oil Distribution:	Not available.

Section 10: STABILITY AND REACTIVITY

Reactivity:	Contact with incompatible materials. Sources of ignition. Exposure to heat.
Chemical Stability:	Generally stable under atmospheric conditions but reacts slowly with air and water (microbial action) to yield acidic products (sulfur dioxide, sulfurous and sulfuric acids).
Possibility of Hazardous Reactions:	Combined with moisture, sulfur may form acidic / corrosive solutions. In the presence of moisture, iron, and oxygen, sulfur has the capacity to form spontaneously combustible pyrophoric iron.
Conditions to Avoid:	Contact with incompatible materials. Sources of ignition. Exposure to heat.
Incompatible Materials:	Water. Strong oxidizers. Halogens. Corrosive toward steel and certain other metals when wet, whether acidic or not.

Hazardous Decomposition Products: Hydrogen sulphide and/or sulphur dioxide, and related oxides of sulphur may be generated upon combustion.

Section 11: TOXICOLOGICAL INFORMATION

EFFECTS OF ACUTE EXPOSURE

Product Toxicity

Oral: Not available.

Dermal: Not available.

Inhalation: Not available.

Component Toxicity

Component	CAS No.	LD_{50} oral	LD_{50} dermal	LC_{50}
Sulfur	7704-34-9	> 8437 mg/kg (rat)	Not available.	Not available.
Hydrogen sulfide	7783-06-4	Not available.	Not available.	444 ppm (rat); 4H

Likely Routes of Exposure: Eye contact. Skin contact. Inhalation. Ingestion.

Target Organs: Skin. Eyes. Gastrointestinal tract. Respiratory system. Lungs. Blood. Cardiovascular system. Nervous system.

Symptoms (including delayed and immediate effects)

Inhalation: May cause respiratory irritation. Signs/symptoms may include cough, sneezing, nasal discharge, headache, hoarseness, and nose and throat pain. This product may contain traces of Hydrogen sulphide which may accumulate in confined spaces. Hydrogen sulphide may cause symptoms such as digestive upset and loss of appetite, loss of sense of smell and pulmonary edema. At 500-1000 ppm Hydrogen sulphide may cause respiratory paralysis, collapse and death without rescue.

Eye: May cause eye irritation. Signs/symptoms may include redness, swelling, pain, tearing, and blurred or hazy vision. This product may contain traces of Hydrogen sulphide which may accumulate in confined spaces. Hydrogen sulphide may cause eye irritation at 1-20 ppm and acute conjunctivitis at higher concentrations. Above 50 ppm H2S, eye irritation may include symptoms of redness, severe swelling, tearing, sensitivity to light and the appearance of 'Halos' around lights.

Skin: Causes skin irritation. Signs/symptoms may include localized redness, swelling, and itching.

Ingestion: May cause gastrointestinal irritation. Signs/symptoms may include abdominal pain, stomach upset, nausea, vomiting and diarrhea. Sulphur may be converted into Hydrogen sulphide in the intestine.

Skin Sensitization: Not available.

Respiratory Sensitization: Not available.

Medical Conditions Aggravated By Exposure: Not available.

EFFECTS OF CHRONIC EXPOSURE (from short and long-term exposure)

Target Organs: Skin. Eyes. Gastrointestinal tract. Respiratory system. Lungs. Blood. Cardiovascular system. Nervous system.

Chronic Effects: Prolonged or repeated contact may dry skin and cause irritation. Prolonged overexposure to Sulphur dust can produce possible skin sensitization and permanent eye damage (clouding of the lens and chronic irritation). Prolonged inhalation can cause irritation of mucous membranes. Hydrogen sulphide may reduce lung function; cause neurological effects such as headaches, nausea, depression and personality changes; eye and mucous membrane irritation: damage to cardiovascular system.

Carcinogenicity: This product does not contain any carcinogens or potential carcinogens as listed by ACGIH, IARC, OSHA, or NTP.

Mutagenicity: Not available.

Reproductive Effects: Not available.

Developmental Effects
Teratogenicity: Not available.

Embryotoxicity: Not available.

Toxicologically Synergistic Materials: Not available.

Section 12: ECOLOGICAL INFORMATION

Ecotoxicity:

Daphnia magna (Water flea, age <24 hr): EC50 >5000000 ug/L, 48-hr, freshwater, static; Effect: intoxication, immobilization;

Daphnia magna (Water flea, 1st instar larvae); EC50 = 3850000 ug/L, 96 hr, freshwater, static; Effect: intoxication, immobilization;

Americamysis bahia (Opossum Shrimp, age 24 hr): LC50 = 736000 ug/L, 96 hr (95% confidence interval: 646000-839000 ug/L), saltwater, static;

Lepomis macrochirus (Bluegill): LC50 < 14000 ug/L, 96 hr, freshwater, static;

Lepomis macrochirus (Bluegill, juvenile): LC50 > 180000 ug/L, 96 hr, freshwater, static;

Oncorhynchus mykiss (Rainbow trout): Concentration: LC50 > 180000 ug/L, 96 hr, freshwater, static.

Persistence / Degradability: Solid sulfur is biodegradable; microbiological reduction to hydrogen sulfide or oxidation to acidic oxy-sulfur species is possible. Both of these products can have environmental consequences. Reclamation of sulfur rich wastes is preferred over solid waste disposal. Commercial sulfur waste reclaimers are available. Disposal must be in a certified landfill site approved for the use of elemental sulfur. Special simultaneous application of limestone normally required.

Bioaccumulation / Accumulation:	Not anticipated to be bioaccumulative.
Mobility in Environment:	Fugitive sulfur dust can be carried considerable distances from origin especially in low humidity and windy conditions. Prolonged exposure of soil and vegetation to such dust can be harmful.
Other Adverse Effects:	Not available.

Section 13: DISPOSAL CONSIDERATIONS

Disposal Instructions: Disposal should be in accordance with applicable regional, national and local laws and regulations. Local regulations may be more stringent than regional or national requirements.

Section 14: TRANSPORT INFORMATION

Standard Transportation Commodity Code: **STCC #14-716-15**

U.S. Department of Transportation (DOT)

Proper Shipping Name:	Not regulated.
Class:	Not applicable.
UN Number:	Not applicable.
Packing Group:	Not applicable.
Label Code:	Not applicable.

Canada Transportation of Dangerous Goods (TDG)

Proper Shipping Name:	Not regulated.
Class:	Not applicable.
UN Number:	Not applicable.
Packing Group:	Not applicable.
Label Code:	Not applicable.

Section 15: REGULATORY INFORMATION

Chemical Inventories

US (TSCA)
The components of this product are in compliance with the chemical notification requirements of TSCA.

Canada (DSL)
The components of this product are in compliance with the chemical notification requirements of the NSN Regulations under CEPA, 1999.

Federal Regulations

United States
This SDS has been prepared to meet the U.S. OSHA Hazard Communication Standard, 29 CFR 1910.1200.

SARA Title III

Component	Section 302 (EHS) TPQ (lbs.)	Section 304 EHS RQ (lbs.)	CERCLA RQ (lbs.)	Section 313	RCRA CODE	CAA 112(r) TQ (lbs.)
Hydrogen sulphide	500	100	100	313s	U135	10000

State Regulations

Massachusetts

US Massachusetts Commonwealth's Right-to-Know Law (Appendix A to 105 Code of Massachusetts Regulations Section 670.000)

Component	CAS No.	RTK List
Sulphur (Solid)	7704-34-9	Listed.
Hydrogen sulphide	7783-06-4	E

Note: E = Extraordinarily Hazardous Substance

New Jersey

US New Jersey Worker and Community Right-to-Know Act (New Jersey Statute Annotated Section 34:5A-5)

Component	CAS No.	RTK List
Sulphur (Solid)	7704-34-9	Listed.
Hydrogen sulphide	7783-06-4	SHHS

Note: SHHS = Special Health Hazard Substance

Pennsylvania

US Pennsylvania Worker and Community Right-to-Know Law (34 Pa. Code Chap. 301-323)

Component	CAS No.	RTK List
Sulphur (Solid)	7704-34-9	Listed.
Hydrogen sulphide	7783-06-4	E

Note: E = Environmental Hazard

California

California Prop 65: This product does not contain chemicals known to the State of California to cause cancer, birth defects or other reproductive harm.

Section 16: OTHER INFORMATION

Disclaimer:

The information contained in this document applies to this specific material as supplied. It may not be valid for this material if it is used in combination with any other materials. It is the user's responsibility to satisfy oneself as to the suitability and completeness of this information for his own particular use.

Date of Preparation of SDS: February 13, 2017

Version: 3.0

MSDS Prepared by: **Deerfoot Consulting Inc.**

Phone: (403) 720-3700