1. Product and Company Identification

Product Name: Hydrogen Sulfide,
Synonym: H2S, Hydrogen Sulphide
Product use: Refining into sulfur or fertilizer production.
Manufacturer: Keyera
Address: Suite 600, Sunlife Plaza West
144 – 4th Avenue SW
Calgary, AB, T2P 3N4
Emergency Contact: 1-866-377-7110

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2. Hazards Identification

**EMERGENCY OVERVIEW**

This product is **extremely toxic and flammable** and will be easily ignited by heat, sparks or flames. Explosive mixtures form when vapors mix with air. Vapors may travel to a source of ignition and flash back. May be fatal if inhaled – high concentrations can cause immediate death. Hydrogen Sulfide that is an extremely toxic and flammable gas at low concentrations. Exposures to hydrogen sulfide above 100 ppm are immediately dangerous to life and health (IDLH) and may be fatal. Exposures to hydrogen sulfide between 10 ppm and 100 ppm may produce irritation to the respiratory tract. Refer to North American Emergency Response Guide (NAERG) 117.

**POTENTIAL HEALTH EFFECTS/ROUTES OF EXPOSURE**

- **Eye:** This product is a severe eye irritant.
- **Skin:** This product is a moderate irritant of the skin.
- **Ingestion:** This product is extremely unlikely to be swallowed and more likely to be inhaled.
- **Inhalation:** Harmful or fatal if inhaled. At high concentrations (500 - 1000 ppm), hydrogen sulfide acts as a systemic poison, causing unconsciousness and death. In lower concentrations (50 – 500 ppm), hydrogen sulfide acts as a respiratory irritant, and may cause fluid in the lungs or bronchial pneumonia. The rotten egg odor of hydrogen sulfide is not a reliable indicator for warning of exposure, since olfactory fatigue (loss of smell) readily occurs, especially at concentrations above 50 ppm.

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3. Composition/Information on Ingredients

<table>
<thead>
<tr>
<th>Ingredient Name</th>
<th>%</th>
<th>CAS No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hydrogen Sulfide</td>
<td>100</td>
<td>7783-06-4</td>
</tr>
</tbody>
</table>

Hydrogen Sulfide is a naturally occurring constituent of natural gas. The listed components are provided as guidance based on the available knowledge of the commingled stream.
4. First Aid Measures

Eyes: In case of contact with eyes, immediately flush with clean, low-pressure water for at least 20 minutes. Hold eyelids open to ensure adequate flushing. Seek medical attention.

Skin: Remove contaminated clothing. High pressure releases may inject gas under the skin and requires immediate medical attention. Wash contaminated areas thoroughly with soap and water (waterless hand cleanser may be used if water is not readily available). Obtain medical attention if irritation or redness develops.

Ingestion: This product is naturally a gas and is unlikely to be ingested and more likely to be inhaled. Rinse mouth with water. Do not induce vomiting. Never administer liquids to an unconscious person.

Inhalation: Ensure your own safety and use the appropriate respiratory protection to immediately remove the victim to an area free of inhalation hazards. If Hydrogen Sulfide is present or there is a potential for it to be present, all rescuers must wear positive pressure, full face shield, self contained breathing apparatus. Give CPR or artificial respiration as needed and give oxygen if breathing is difficult. Keep victim at rest and get immediate medical attention.

5. Fire Fighting Measures

FLAMMABLE PROPERTIES
Extremely Flammable Gas

HAZARDOUS COMBUSTION PRODUCTS
Irritating gases of incomplete combustion such as carbon monoxide, carbon dioxide sulfur dioxide may be produced.

FIRE AND EXPLOSION HAZARDS
This product is EXTREMELY FLAMMABLE. DO NOT ATTEMPT TO EXTINGUISH A LEAKING GAS FIRE UNLESS THE LEAK CAN BE STOPPED. Vapors will ignite easily in the presence of any source of ignition over a wide range of concentrations and even at very low temperatures.

EXTINGUISHING MEDIA

Small Fires: Dry chemical, CO2, water spray or regular foam.

Large Fires: Water spray, fog or regular foam. Move containers from fire area if possible without risk.

FIRE FIGHTING INSTRUCTIONS:
Water may be ineffective for fighting the fire, but may be used to cool fire-exposed containers. Consider initial downwind evacuation for at least 800 meters (1/2 mile). Cool containers with large quantities of water until well after the fire has been put out. Do not direct the water stream at the source of the leak or safety devices as icing may occur. Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank. ALWAYS stay away from tanks engulfed in fire. Fight fires from
maximum distance and for massive fires, use unmanned hose holders or monitor nozzles. If this is not possible, withdraw from the area and let the fire burn. Approved self-contained breathing apparatus (SCBA) with full-face piece and full protective firefighting clothing should be worn.

UNUSUAL FIRE & EXPLOSION HAZARDS
This product in purer concentrations will be heavier than air and may collect in lower lying areas. Burning occurs with a slightly luminous flame and very little noise. Pressurized containers of gas may explode due to heat generated by fires.

6. Accidental Release Measures

ACTIVATE SITE SPECIFIC EMERGENCY RESPONSE PLAN, IF AVAILABLE.

Small Leaks: Isolate spill or leak area immediately for at least 30 meters (100 feet) in all directions and protect downwind for 100 Meters (330 feet). Remove all ignition sources. Ventilate area of leak. Stop flow of gas. Do not attempt to extinguish a fire unless the leak can be stopped. Isolate area until gas has dispersed.

Large Leaks: Isolate spill or leak area immediately for at least 300 meters (1000 feet) in all directions and protect downwind for 2 kilometers (1.3 miles). Keep unauthorized personnel away and stay upwind. The proper use of water spray may effectively disperse product vapors, preventing contact with ignition sources or areas /equipment that require protection.

Evacuation: Fire: Evacuate unnecessary personnel and any without appropriate personal protection.

Caution: Ensure your own safety and use the appropriate respiratory protection. An approved self-contained breathing apparatus (SCBA) with full-face piece may be required. Clean-up crews must be properly trained and must utilize proper protective equipment.

7. Handling and Storage

HANDLING PRECAUTIONS
Handle as an extremely toxic flammable gas. Keep away from all sources of heat, sparks, open flame or any sources of ignition as well as flammable materials or oxidizers. Do not pressurize, cut, heat, weld or expose such containers to sources of ignition. Use only with adequate ventilation and avoid breathing vapors. Ground and bond all lines and equipment. Use intrinsically safe electrical equipment.

STORAGE PRECAUTIONS
Avoid storage in confined locations or near incompatible materials listed in Section 10 and flammable materials, oxidizers or materials that support combustion.

WORK/HYGIENIC PRACTICES
Use good personal hygiene practices. Avoid skin exposure and wash hands before eating, drinking, smoking, or using toilet facilities. Do not eat, drink or smoke in areas of use or storage. Promptly remove contaminated clothing, allow all gasses to dissipate and launder before reuse. Use care when laundering to prevent the formation of flammable or toxic vapors which could ignite via washer or dryer. Consider the need to discard contaminated leather shoes and gloves.
8. Exposure Controls / Personal Protection

ENGINEERING CONTROLS
Ensure adequate ventilation to keep vapor and gas concentrations of this product below occupational exposure and flammability limits, particularly in confined spaces. Ventilation system and other electrical equipment must be approved for flammable areas. Quick drench facilities and/or eyewash stations should be provided within the immediate work area for emergency use.

PERSONAL PROTECTIVE EQUIPMENT
Eye/Face Protection: Wear safety glasses with side shields when handling this product.
Skin Protection: Avoid skin contact. In the event of rapidly escaping gas wear appropriate gloves to prevent cryogenic burns
Respiratory Protection: Ensure your own safety and use the appropriate respiratory protection. Air purifying respirators are not adequate to protection for this product. If concentrations of Hydrogen Sulfide are high enough to warrant supplied air the workplace needs to be assessed for flammability and hydrogen sulfide.

Exposure Limits

<table>
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<th>Ingredient Name</th>
<th>CAS No.</th>
<th>Occupational Exposure Limits</th>
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<tbody>
<tr>
<td>Hydrogen Sulfide</td>
<td>7783-06-4</td>
<td>ACGIH TLV-TWA 1 ppm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ACGIH TLV-STEL 5 ppm</td>
</tr>
</tbody>
</table>

ACGIH – American Conference of Governmental Industrial Hygienists
TLV – Threshold Limit Value
TWA – Time Weighted Average
STEL – Short Term Exposure Limits

9. Physical and Chemical Properties

Appearance and state: Colorless gas
Odor: Rotten Egg Odor. The sense of smell is paralyzed at approximately 100ppm.
Odor Threshold: 0.05 ppm
Flash Point: Flammable Gas
Auto Ignition: 260°C
Lower Explosive Limit (%): 4.3%
Upper Explosive Limit (%): 45.0%
Boiling Point: -60.4°C
Melting Point: -85.5°C
10. Stability and Reactivity

STABILITY
Stable

CONDITIONS TO AVOID (STABILITY)
Hydrogen Sulfide reacts as an acid and a reducing agent. Explodes on contact with oxygen difluoride, bromine pentafluoride, chlorine trifluoride, dichlorine oxide, silver fulminate. May ignite and explode when exposed to powdered copper in oxygen. May react similarly with other powdered metals. Ignites on contact with metal oxides and peroxides (barium peroxide, chromium trioxide, copper oxide, lead dioxide, manganese dioxide, nickel oxide, silver oxide, silver dioxide, thallium trioxide, sodium peroxide, mercury oxide, calcium oxide). Ignites with silver bromate, lead(II) hypochlorite, copper chromate, nitric acid, lead(IV) oxide and rust. May ignite if passed through rusty iron pipes. Reacts exothermically with bases. The heat of the reaction with soda lime, sodium hydroxide, potassium hydroxide, barium hydroxide may lead to ignition or explosion of the unreacted portion in the presence of air / oxygen. Material is stable under normal conditions but can rapidly become volatile. Avoid high temperatures, open flames, sparks, welding, smoking and other ignitions sources.

INCOMPATIBLE MATERIALS
Explodes on contact with oxygen difluoride, bromine pentafluoride, chlorine trifluoride, dichlorine oxide, silver fulminate. May ignite and explode when exposed to powdered copper in oxygen. May react similarly with other powdered metals. Ignites on contact with metal oxides and peroxides (barium peroxide, chromium trioxide, copper oxide, lead dioxide, manganese dioxide, nickel oxide, silver oxide, silver dioxide, thallium trioxide, sodium peroxide, mercury oxide, calcium oxide). Ignites with silver bromate, lead(II) hypochlorite, copper chromate, nitric acid, lead(IV) oxide and rust.

May ignite if passed through rusty iron pipes. Reacts exothermically with bases. The heat of the reaction with soda lime, sodium hydroxide, potassium hydroxide, barium hydroxide may lead to ignition or explosion of the unreacted portion in the presence of air / oxygen. Keep away from strong oxidizers, ignition sources and heat.

HAZARDOUS DECOMPOSITION PRODUCTS
When heated to decomposition, it emits highly toxic fumes of oxides of sulfur. Incompatible with many materials including strong oxidizers, metals, strong nitric acid, bromine pentafluoride, chlorine trifluoride, nitrogen triiodide, nitrogen trichloride, oxygen difluoride and phenyl diazonium chloride. Avoid physical damage to containers; sources of ignition; storage near nitric acid, strong oxidizing materials, and corrosive liquids or gases.
POTENTIAL HEALTH EFFECTS

**Acute effects:** At high concentrations (500 - 1000 ppm), hydrogen sulfide acts as a systemic poison, causing unconsciousness and death. In lower concentrations (50 – 500 ppm), hydrogen sulfide acts as a respiratory irritant, and may cause fluid in the lungs or bronchial pneumonia. The rotten egg odor of hydrogen sulfide is not a reliable indicator for warning of exposure, since olfactory fatigue (loss of smell) readily occurs, especially at concentrations above 50 ppm. If rapidly escaping gas comes in contact with skin this product may result in frostbite and dermatitis.

**Chronic effects:** Chronic exposure to hydrogen sulfide of 50 ppm or greater may include bronchitis and inflammation of the mucous membrane of the respiratory system. At 250 ppm hydrogen sulfide, chronic effects may include brochial pneumonia and pulmonary edema.

**Sensitization:** Not available.

**Mutagenicity:** Not mutagenic.

**Reproductive effects:** Not known to cause reproductive effects.

**Carcinogenicity:** Ingredients are not identified as carcinogens by IARC, NTP or ACGIH.

**Target organs:** Eyes, respiratory system, central nervous system (CNS).

**12. Ecological Information**

This product is volatile and disperses rapidly. It is inherently toxic to aquatic organisms and is considered persistent.

**13. Disposal Considerations**

Vent through a flaring system. Preferred waste management priorities are recycle, reprocess or incinerate with heat recovery.

**14. Transport Information**

- **PROPER SHIPPING NAME:** Hydrogen Sulfide
- **TDG CLASS:** 2.3 (2.1)
- **TDG IDENTIFICATION NUMBER:** UN1053
- **TDG SHIPPING LABEL:** Poison gas
- **NAERG:** Guide 117
15. Regulatory Information

WORKPLACE HAZARDOUS MATERIALS INFORMATION SYSTEM (WHMIS)

Workplace Hazardous Materials Information Systems (WHMIS): This product has been classified in accordance with the hazard criteria of the CPR (Controlled Product Regulations), and the MSDS contains all of the information required by the CPR.

Class A – Compressed Gas
Class B1 – Flammable Gas
Class D1A – Very Toxic Materials Causing Immediate and Serious Toxic Effects
Class D2B – Materials Causing Serious and Other Toxic Effects

CANADIAN ENVIRONMENTAL PROTECTION ACT (CEPA)
All components of this product are listed on the Canadian DSL Inventory.

16. Other Information

Prepared for: Keyera Health and Safety
Issue Date: January 3, 2011
More Information: (403) 205-7698
Technical Preparation by: Deerfoot Consulting Inc.

Disclaimer of Expressed and Implied Warranties

The information presented in the Material Safety Data Sheet is based on data believed to be accurate as of the date this Material Safety Data Sheet was prepared. However, neither Keyera, Deerfoot Consulting Inc nor any of their subsidiaries assumes any liability whatsoever for the accuracy or completeness of the information contained herein. No responsibility is assumed for any damage or injury resulting from abnormal use or from any failure to adhere to recommended practices. The information provided above, and the product, are furnished on the condition that the person receiving them shall make their own determination as to the suitability of the product for their particular purpose and on the condition that they assume the risk of their use.