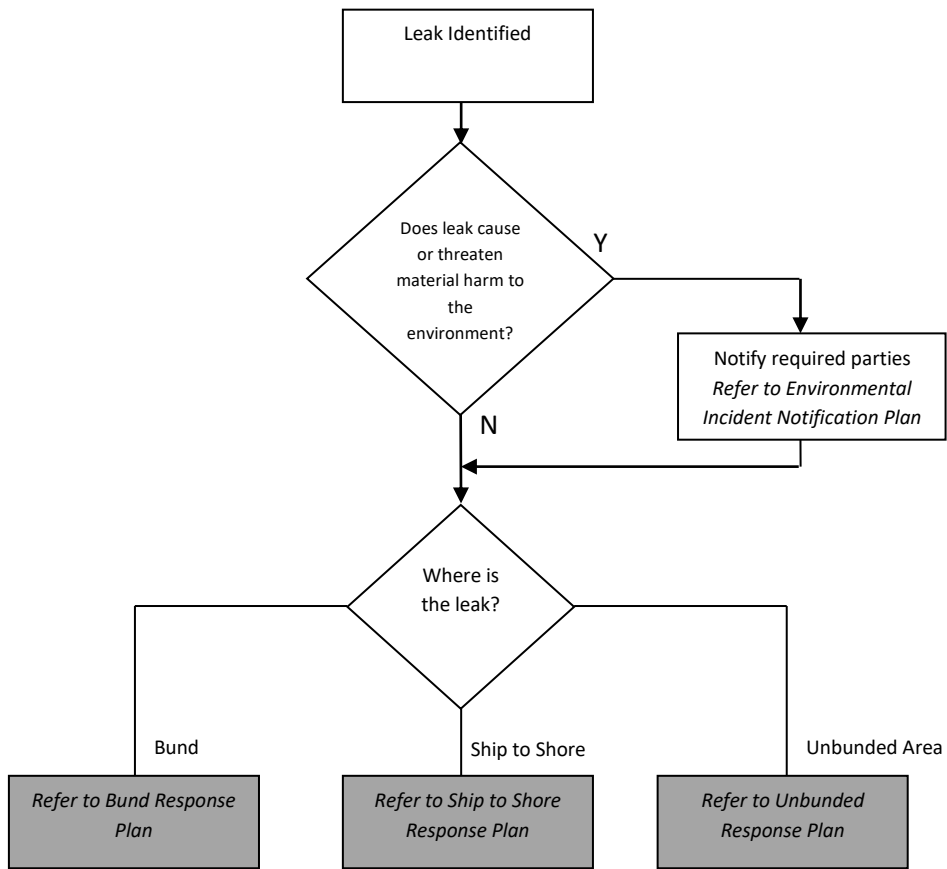
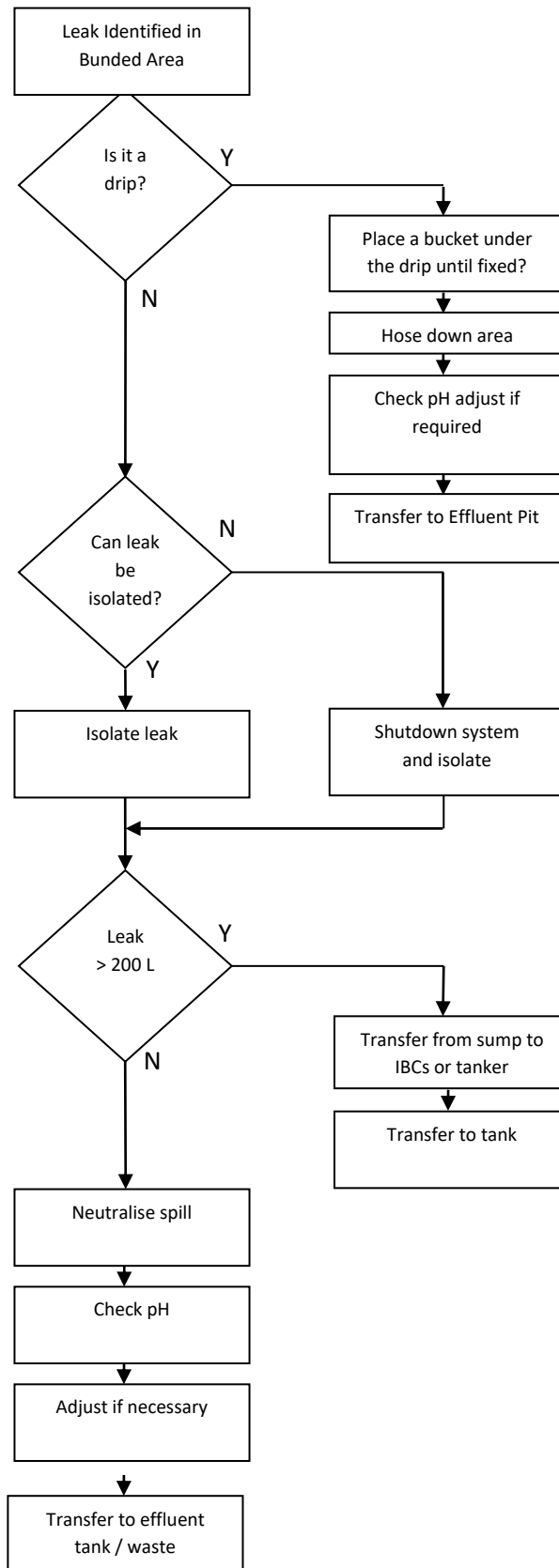


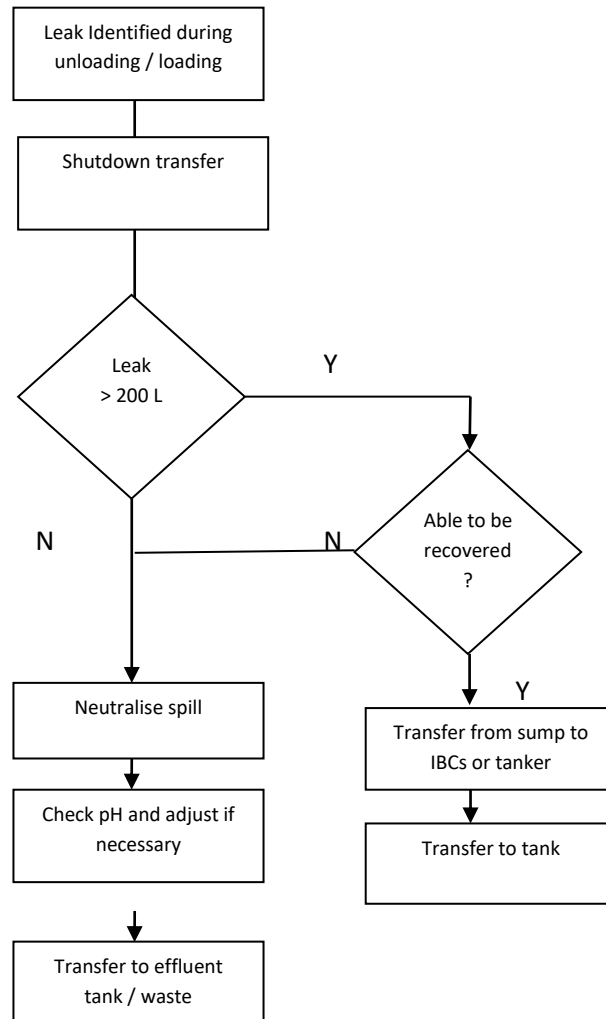
SULPHURIC ACID POLLUTION INCIDENT SCENARIO



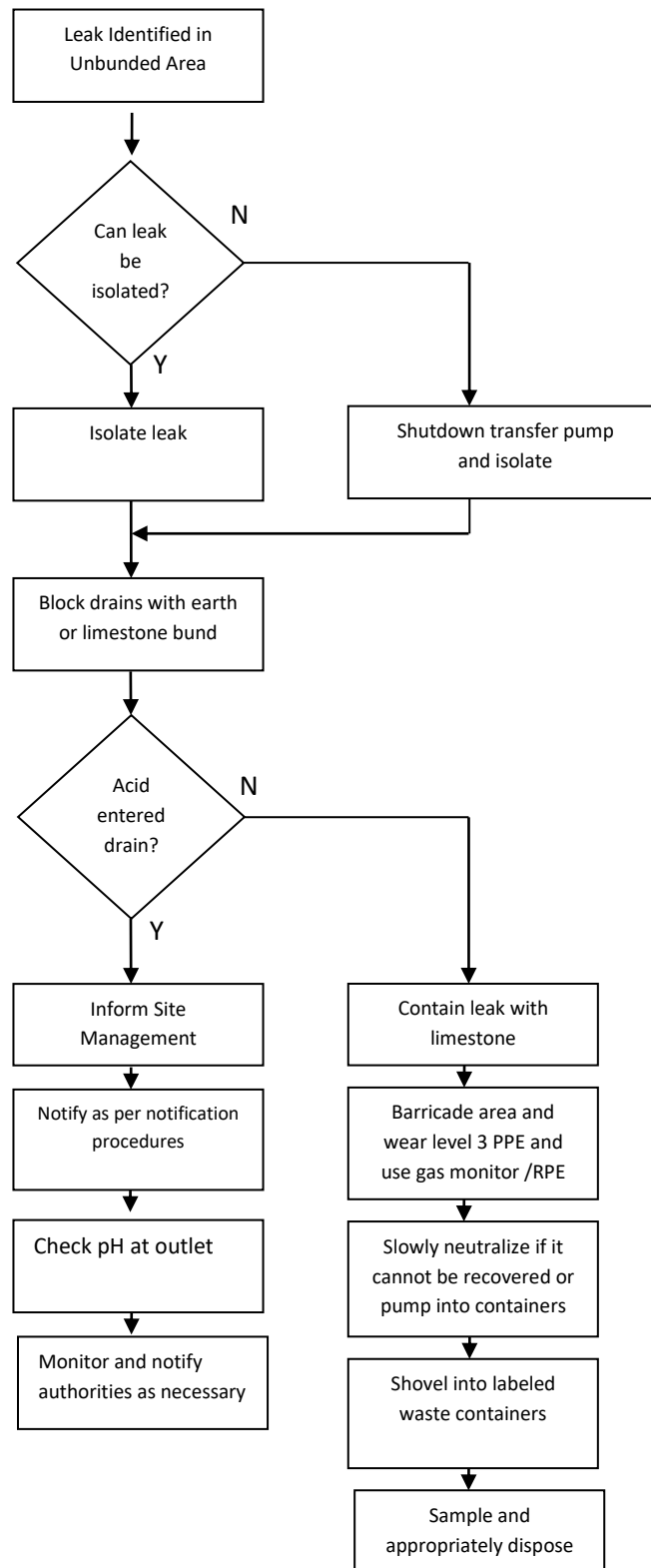
PIRMP Appendix A  
SULPHURIC ACID POLLUTION INCIDENT SCENARIO - Bunded Area Response Plan



SULPHURIC ACID POLLUTION INCIDENT SCENARIO - **Ship to Shore Response Plan**



SULPHURIC ACID POLLUTION INCIDENT SCENARIO - **Unbunded Area Response Plan**



## Sulphuric Acid (more than 51%) Reference SDS 000033972201

Sulphuric acid (H<sub>2</sub>SO<sub>4</sub>) is produced on site for dispatch by tanker, but is also received by ship and pumped to Tank 12. All storage tanks are bunded and any losses will be held in the bund. It is also diluted to specific concentrations in the acid dilution plant.

### Hazards to Human Health

Swallowing can result in nausea, vomiting, diarrhoea, abdominal pain and chemical burns to the gastrointestinal tract. Corrosive to eyes, sulphuric acid may cause corneal burns and contamination of eyes can result in permanent injury. Sulphuric acid is corrosive to skin and may cause skin burns. Breathing in mists or aerosols will produce respiratory irritation. Repeated overexposure may lead to chronic conjunctivitis, lung damage and dental erosion. The International Agency for Research on Cancer (IARC) have concluded that occupational exposure to strong inorganic acid mists containing sulfuric acid is carcinogenic to humans, causing cancer of the larynx and to a lesser extent, the lung. No direct link has been established with sulfuric acid, itself, and cancer in humans. Exposure to any mist or aerosol during the use of this product should be avoided and exposure should not exceed the exposure standard.

Sulphuric acid decomposes on heating emitting oxides of sulfur. It is slippery. Sulfuric acid is corrosive to many metals with the liberation of extremely flammable hydrogen gas. Reacts violently with alkalis.

### Hazards to the Environment

Contamination of waterways is to be avoided. Sulphuric acid will form sodium sulphate in sea water

When spilt into water, sulphuric acid is a strong acid which completely dissolves into sulphate ions and protons, causing the release of a lot of heat. If this mixture occurs on or just below the water surface, the water can be brought to the boil. However, given its high density (d = 1.84), the acid sinks if there is no agitation. Its toxicity depends above all on the acidity of the substance and its effect on the pH: it is noxious for certain aquatic species whose survival requires a pH of at least 5.5. It presents no danger of bioconcentration or bioamplification along the food chain. There is however a danger for the water quality if large quantities infiltrate the ground and/or natural waters.

### Acute ecotoxicity

Crustacean (*Daphnia magna*) EC<sub>50</sub> (24h) = 29 mg/L (fresh water)

Fish (*Brachydanio rerio*) LC<sub>50</sub> (24h) = 82 mg/L (fresh water)

Fish (*Lepomis macrochirus*) LC<sub>50</sub> (48h) = 49 mg/L (fresh water)

Fish (*Pleuronectes platessa*) LC<sub>50</sub> (48h) = 100 to 330 mg/L (seawater)

PNEC (Predicted No-Effect Concentration): no PNEC was able to be calculated as the buffering capacity, the pH and its fluctuation are very specific to the ecosystem in question. To estimate the effect of a sulphuric acid spill, the change in pH of the water must be calculated or measured. Variation by one pH unit could affect flora and fauna. The average pH of water can vary in seawater from 8 to 8.4 (stable pH with high buffering capacity) and in fresh water from 6 to 7.5 [http://www.cedre.fr/en/publication/chemical/sulf\\_gb.pdf](http://www.cedre.fr/en/publication/chemical/sulf_gb.pdf)

*Note : Based on size of outer harbour (130 hectare) and depth near Foreshore Road and Jetty 4 (5 m) [http://www.dpi.nsw.gov.au/data/assets/pdf\\_file/0006/137166/output-41.pdf](http://www.dpi.nsw.gov.au/data/assets/pdf_file/0006/137166/output-41.pdf) a spill of at least 360,000 L would be needed to impact fish. This would be unlikely due to the proximity of the ocean and tidal movements*

PIRMP Appendix A

Environmental Aspects Plant Activities and Sources of Risk	Receptors	Environmental Hazard Potential Pathway and Adverse Impacts	Currently Implemented Risk Control Measures	Conseq Impact	Likelihood Estimate	Risk Level
Item [01]. Overfilling Sulfuric Acid Storage Tanks						
	<b>Nat</b>	Soil – Soil contamination (direct), Groundwater – Groundwater contamination may release heavy metals. Stormwater contamination Adverse impact on a biological component – habitat if more than 300 KL lost to harbour	<input type="checkbox"/> tank high level alarms stop transfer: <input type="checkbox"/> All tanks in bunded areas <input type="checkbox"/> All acid storage areas have concrete surrounds <input type="checkbox"/> Bund sump transfers are controlled release <input type="checkbox"/> Only one licensed liquid discharge point to stormwater <input type="checkbox"/> Site is manned 24 hours <input type="checkbox"/> Response Plan	Category 3.1 Highly Significant Evident Pollution Local Concern	Very Unlikely E Has occurred somewhere (heard of it happening)	Level IV Low
	<b>Hum</b>	People – Acute (immediate) adverse impact on human health due to dermal (skin) contact. Inhalation risk from acid mist and SO2	<input type="checkbox"/> Restricted access to site <input type="checkbox"/> Minimum Level 1 PPE on site <input type="checkbox"/> Safety showers <input type="checkbox"/> Transfers controlled remotely <input type="checkbox"/> Minimum staffing levels	Category 2 Significant	Unlikely D Could occur here at some time but has not happened yet	Level IV Low
Item [02]. Mechanical Failure of Storage Tanks, Bunding, Structures						
	<b>Nat</b>	Soil – Soil contamination (direct), Groundwater – Groundwater contamination, Stormwater contamination Adverse impact on a biological component – habitat if more than 300 KL lost to harbour	<input type="checkbox"/> 10 year internal inspections of tanks and regular checks on external condition <input type="checkbox"/> Correct material and thickness specification <input type="checkbox"/> Tanks and vessels protected by bund walls <input type="checkbox"/> Process tanks & vessels have high level alarms <input type="checkbox"/> Bund capacity is 110% of largest tank or vessel <input type="checkbox"/> Response Plan	Category 3.1 Highly Significant Evident Pollution Local Concern	Very Unlikely E Has occurred somewhere (heard of it happening)	Level IV Low
	<b>Hum</b>	People – Acute (immediate) adverse impact on human health due to dermal (skin) contact	<input type="checkbox"/> Site access restricted <input type="checkbox"/> Contractors inducted and work under permit to work system	Category 3.2 Single lost work day case or multiple medical	Possible (Likely) C Might have occurred at some time but details not known	Level III High

PIRMP Appendix A

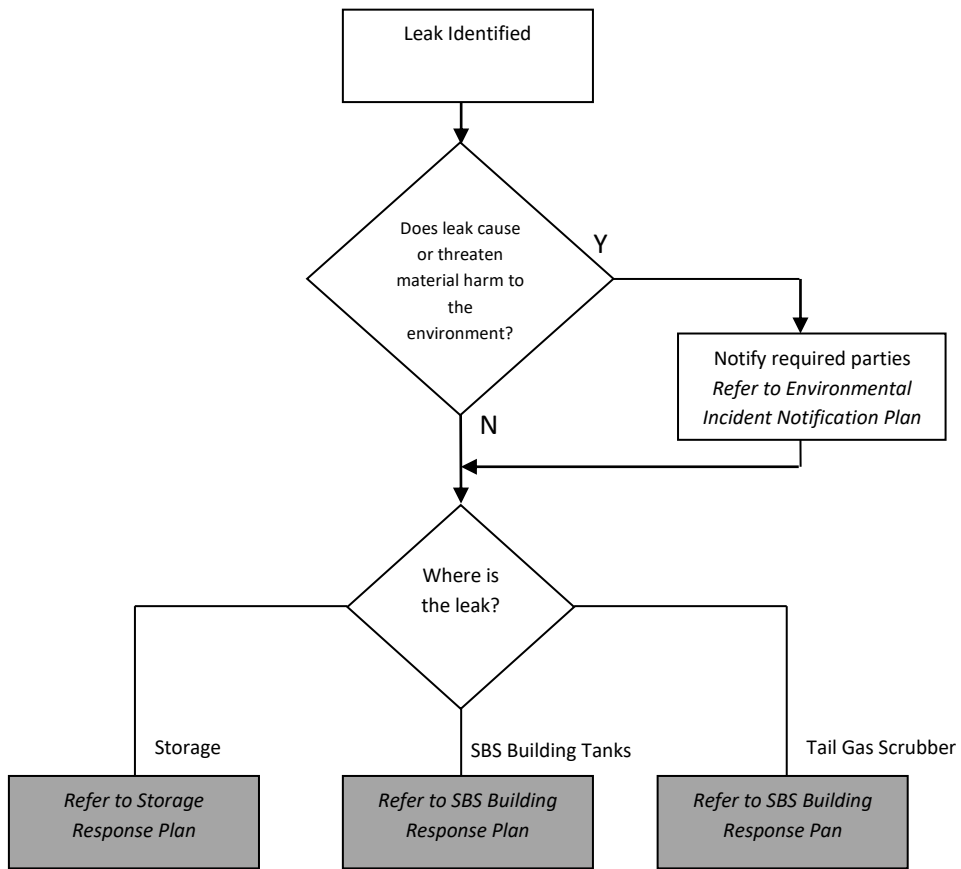
			<input type="checkbox"/> Gantry lowered to reduce risk of splashing onto people and improve inspection access <input type="checkbox"/> Pipework runs without flanged joints where possible <input type="checkbox"/>	treatment injuries		
Item [05]. Loss of containment from piping						
	<b>Nat</b>	Soil – Soil contamination (direct), Groundwater – Groundwater contamination, Stormwater contamination Adverse impact on a biological component – habitat if more than 300 KL lost to harbour treatment system.	<input type="checkbox"/> Correct sulphuric acid piping specification incorporating gasket, flanges, supports etc. <input type="checkbox"/> Double block & bleed isolations <input type="checkbox"/> Selected piping elevated to prevent physical impact damage <input type="checkbox"/> Routine inspection & thickness testing of piping by external contractor (critical piping) <input type="checkbox"/> Amount of flange connections minimised <input type="checkbox"/> Isolation valves <input type="checkbox"/> Visual inspections by operator <input type="checkbox"/> Effluent Pit level alarm <input type="checkbox"/> Site effluent pH control <input type="checkbox"/> Site effluent diversion capabilities <input type="checkbox"/> Control Room Monitoring <input type="checkbox"/> Transfer pump stop by operator <input type="checkbox"/> Response Plan	Category 3.1 Highly Significant Evident Pollution Local Concern	Unlikely D Could occur here at some time but has not happened yet	Level III Medium
	<b>Hum</b>	People – Acute (immediate) adverse impact on human health due to dermal (skin) contact,  Burns from high temperature material under pressure limited to site	<input type="checkbox"/> Site access restricted <input type="checkbox"/> Contractors inducted and work under permit to work system <input type="checkbox"/> Gantry lowered to reduce risk of splashing onto people and improve inspection access <input type="checkbox"/> Pipework runs without flanged joints where possible <input type="checkbox"/> Routine	Category 3.1 Single lost work day case or multiple medical treatment injuries	Very Likely B Very likely to occur at least once during a 10 year period of operation of the facility/business	Level II

PIRMP Appendix A

			<input type="checkbox"/> thickness testing			
--	--	--	--	--	--	--

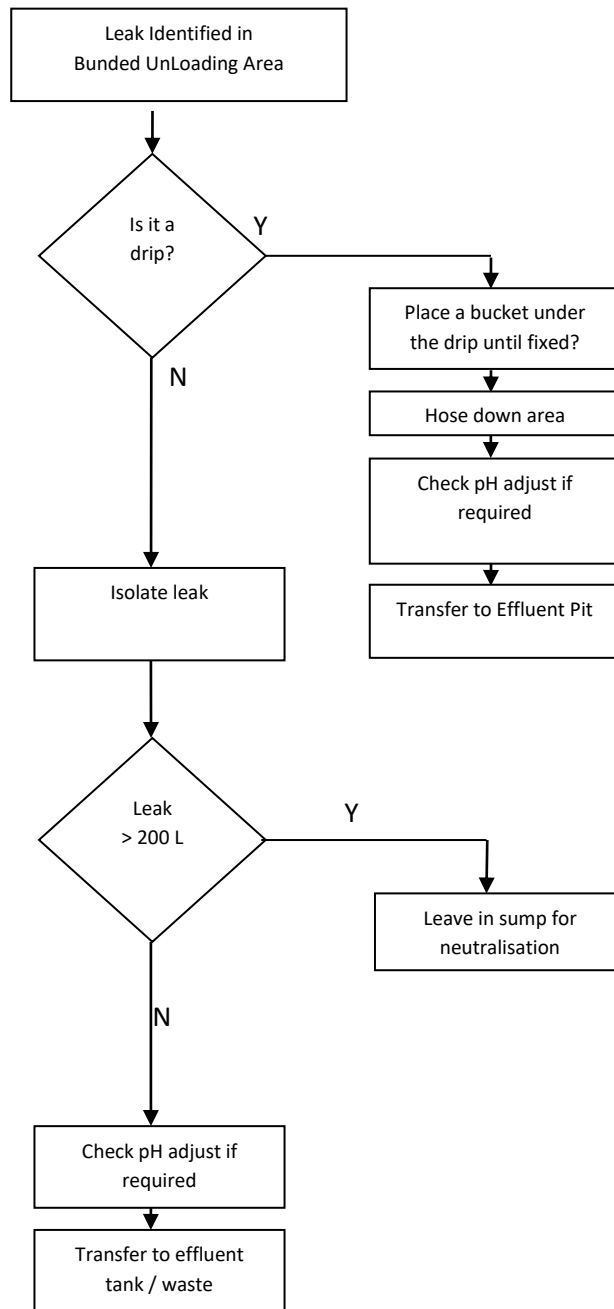


CAUSTIC SODA POLLUTION INCIDENT SCENARIO



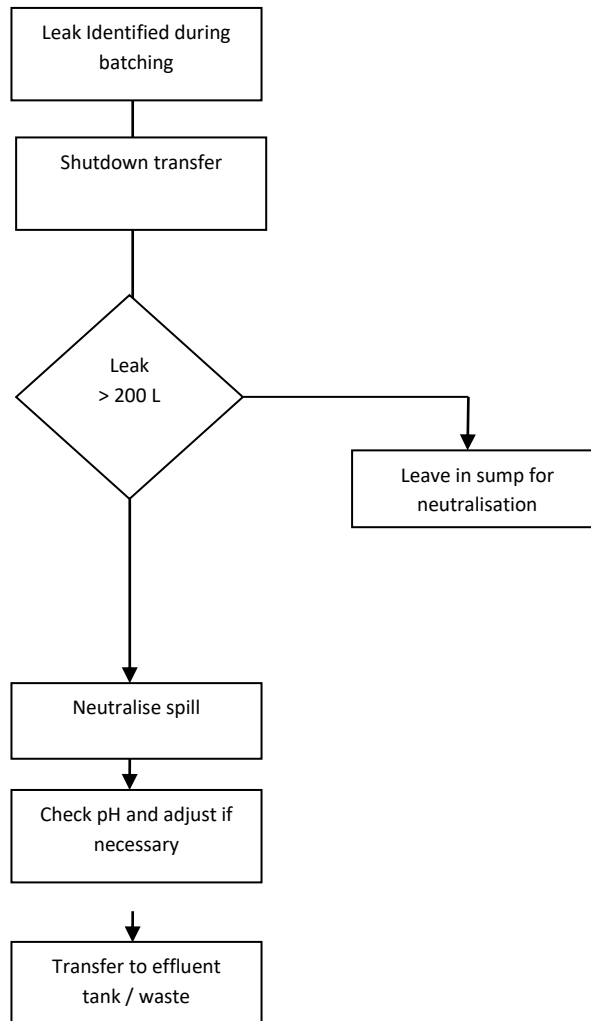
CAUSTIC SODA POLLUTION INCIDENT SCENARIO

Storage



CAUSTIC SODA POLLUTION INCIDENT SCENARIO

**SBS Building**  
(Tail gas scrubber or caustic tanks)



50% Caustic Soda is delivered to the site by road tanker and is stored in bulk in the SARP and diluted on site to 25% and stored in a smaller tank nearby. There are also two 1000 L tanks outside the SBS building for dosing the tail gas scrubber

### **Hazards to Human Health**

Swallowing can result in nausea, vomiting, diarrhoea, abdominal pain, and chemical burns to the gastrointestinal tract. It is corrosive to eyes and can cause corneal burns and permanent damage to the eyes. It is irritant to the skin and can cause skin burns.

### **Hazards to the Environment**

Caustic Soda (sodium hydroxide) will alter the pH of water and is often used to purify waste water. There is unlikely to be any emissions to air from Port Kembla site.

**ACIDIC WATER EPA Maximum Contaminant Level: 6.5 pH Source** - Acidic waters usually attain their acidity from the seepage of acid mine waters, or acidic industrial wastes. Acid mine waters are frequently too low in pH to provide suitable drinking water even after neutralization and treatment.

**Treatment** - Acidic water can be corrected by injecting soda ash or caustic soda (sodium hydroxide) into the water supply to raise the pH. Utilization of these two chemicals slightly increases the alkalinity in direct proportion to the amount used. Acidic water can also be neutralized up to a point by running it through calcite, corosex or a combination of the two. The calcite and the corosex both neutralize by dissolving and they add hardness to the water as the neutralization takes place; therefore, they both need to be replenished on a periodic basis.

<http://dwb.unl.edu/Teacher/NSF/C01/C01Links/www.goodwaterco.com/comprob.htm>

This depends upon nitrate ions in the lake. Contradictory, these ions also are produced by acid rain, contain oxides of nitrogen from combustion sources. These fertilizers do not alter the pH level of the water. Instead, they stimulate the growth of plants. The plants absorb the dissolved nitrates, generating hydroxide ions, which in return neutralize the excess acid.

[http://www.studyworld.com/newsite/reportessay/Science/Earth%5CPhosphates\\_In\\_Water\\_Pollution-361350.htm](http://www.studyworld.com/newsite/reportessay/Science/Earth%5CPhosphates_In_Water_Pollution-361350.htm)

## **ATMOSPHERIC PERSISTENCE**

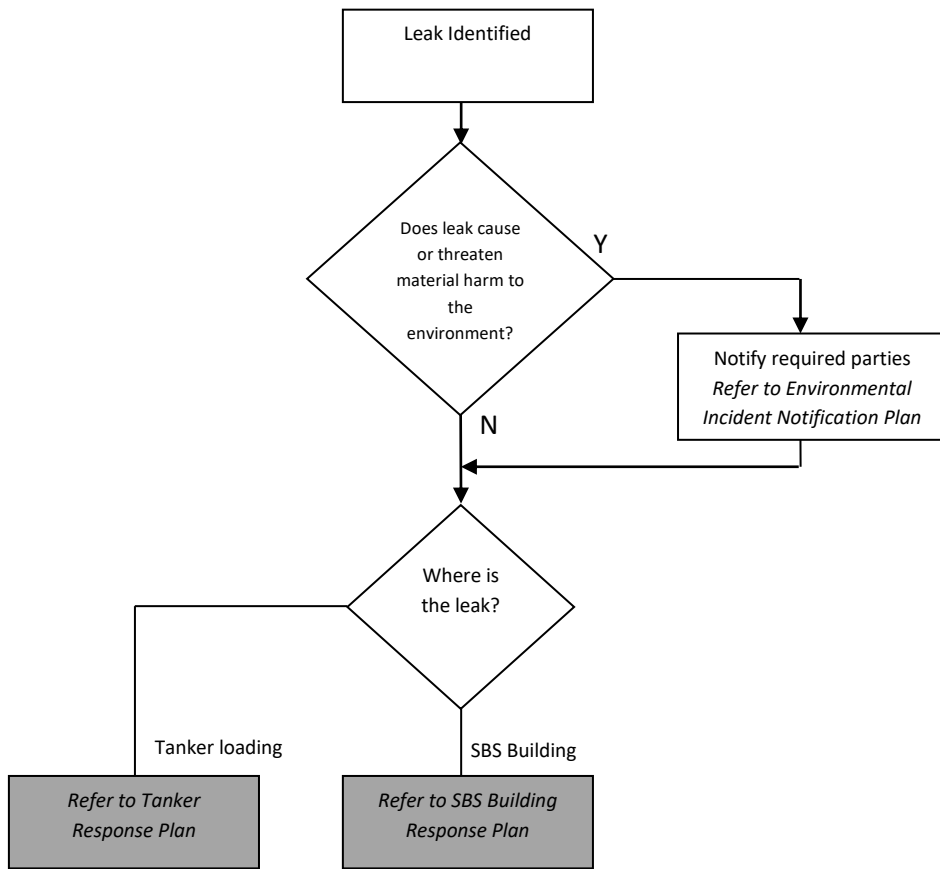
Sodium hydroxide is expected to be particle-associated or in the aerosol form in the atmosphere, and hence subject to wet and dry deposition. The average half-life and lifetime for particles and particle-associated chemicals in the troposphere is estimated to be about 3.5 to 10 days and 5 to 15 days, respectively (Balkanski et al., 1993; Atkinson, 1995).

[http://scorecard.goodguide.com/chemical-profiles/html/sodium\\_hydroxide.html](http://scorecard.goodguide.com/chemical-profiles/html/sodium_hydroxide.html)

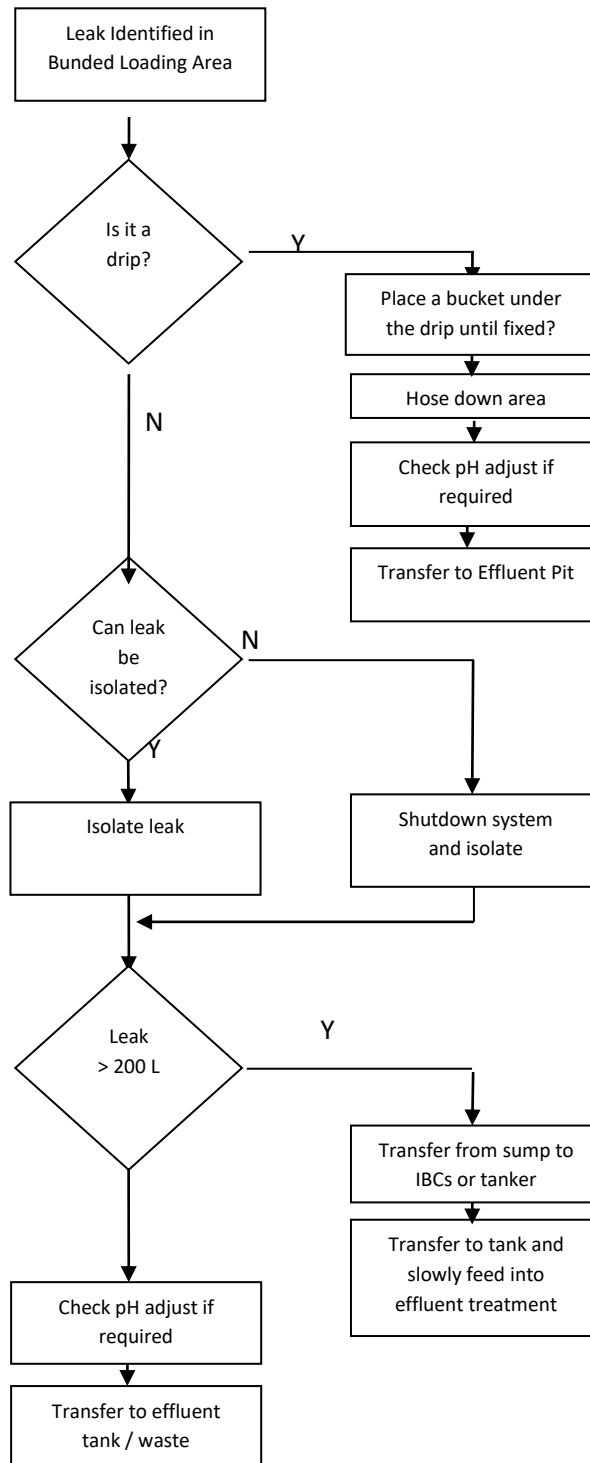
PIRMP Appendix C

Environmental Aspects Plant Activities and Sources of Risk	Receptors	Environmental Hazard Potential Pathway and Adverse Impacts	Currently Implemented Risk Control Measures	Conseq Impact	Likelihood Estimate	Risk Level
Item [01]. Overfilling tanks when unloading road tankers						
	<b>Nat</b>	Soil – Soil contamination (direct), Groundwater – Groundwater contamination and Stormwater contamination unlikely due to bunding	<input type="checkbox"/> tank high level alarms: <input type="checkbox"/> digital gauges at tank <input type="checkbox"/> Authority to discharge procedure <input type="checkbox"/> Storage Tanks bunded <input type="checkbox"/> Plant & storage areas have concrete surrounds <input type="checkbox"/> Site is manned 24 hours <input type="checkbox"/> Response Plan	Category 2 Minor Local Pollution	Very Unlikely E Has occurred somewhere (heard of it happening)	Level IV Low
	<b>Hum</b>	People – Acute (immediate) adverse impact on human health – serious damage to eyes	<input type="checkbox"/> Restricted access to site <input type="checkbox"/> Minimum Level 3 PPE while unloading <input type="checkbox"/> Safety showers <input type="checkbox"/> Minimum staffing levels <input type="checkbox"/> Power supply for pump linked to high level alarm	Category 2 Significant	Unlikely D Could occur here at some time but has not happened yet	Level IV Low
Item [02]. Mechanical Failure of Scrubber, Storage Tanks, Pipework, Bunding, Structures						
	<b>Nat</b>	Soil – Soil contamination (direct), Groundwater – Groundwater contamination and Stormwater contamination unlikely due to low solubility	<input type="checkbox"/> 10 year internal inspections of tanks and regular checks on external condition of pipes and tanks <input type="checkbox"/> Correct material and thickness specification <input type="checkbox"/> Response Plan	Category 2 Minor Local Pollution	Very Unlikely E Has occurred somewhere (heard of it happening)	Level IV Low
	<b>Hum</b>	People – Acute (immediate) adverse impact on human health- serious to eyes damage	<input type="checkbox"/> Site access restricted <input type="checkbox"/> Contractors inducted and work under permit to work system <input type="checkbox"/> Plant controlled remotely except for tanker unloading <input type="checkbox"/> Level 1 PPE	Category .2 Significant	Very likely C Might have occurred at some time but details not known	Level III Medium

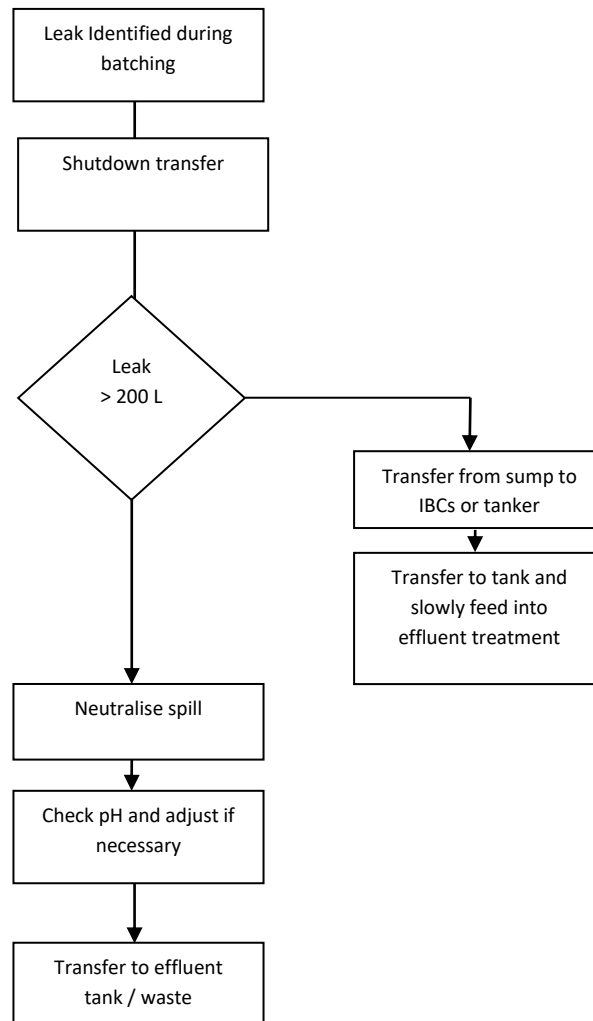
SBS POLLUTION INCIDENT SCENARIO



### TANKER Loading Area



**SBS Building**





## **Sodium Bisulphite Solution Reference SDS 000034437601**

Sodium bisulphite solution (SBS) is manufactured in the SBS plant and delivered to customers by road tanker. The gases from the process are scrubbed in the SMBS scrubber which is kept alkaline by automatic additions of soda ash from the pH monitoring.

### **Hazards to Human Health**

Swallowing can result in nausea, vomiting, diarrhoea, abdominal pain, and gastrointestinal irritation. It is irritant to eyes, skin and mucous membranes if the respiratory tract (airways)

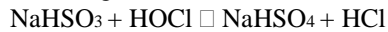
### **Hazards to the Environment**

Sodium bisulphite

Sodium Bisulfite (NaHSO<sub>3</sub>)

Sodium bisulfite is available as a white powder, granule or clear liquid solution. It is highly soluble in water. Currently, many industries and wastewater utilities use sodium bisulfite solution for dechlorination. It undergoes the

following reactions with free chlorine:



Sodium Bisulfite Hypochlorous acid Sodium bisulfate Hydrochloric acid

On a weight-to-weight basis, approximately 1.45 parts of sodium bisulfite are required to dechlorinate 1 part of chlorine. Sodium bisulfite is a good oxygen scavenger. Sodium bisulfite can cause skin, eye and respiratory tract irritation.

It is harmful if swallowed or inhaled. Sodium bisulfite may crystallize at room temperatures. It is highly viscous and

sometimes difficult to handle. Sodium bisulfite is highly corrosive and caution must be exercised in safely handling this

chemical. It has a NFPA rating of 1,0,1.

[http://www.pollardwater.com/pdf/pdf\\_web\\_manuals/AWWARF\\_Dechlor\\_Guides\\_Pollard\\_dmb.pdf](http://www.pollardwater.com/pdf/pdf_web_manuals/AWWARF_Dechlor_Guides_Pollard_dmb.pdf)

PIRMP Appendix F

Environmental Aspects Plant Activities and Sources of Risk	Receptors	Environmental Hazard Potential Pathway and Adverse Impacts	Currently Implemented Risk Control Measures	Conseq Impact	Likelihood Estimate	Risk Level
Item [01]. Overfilling SBS road tanker						
	<b>Nat</b>	Soil – Soil contamination (direct), Groundwater – Groundwater contamination and Stormwater contamination unlikely due to bunding	<input type="checkbox"/> tanker high level probe pump cut out <input type="checkbox"/> Tanker overflows to bunded area <input type="checkbox"/> Plant & storage areas have concrete surrounds <input type="checkbox"/> Site is manned 24 hours <input type="checkbox"/> Response Plan	Category 3.1 Highly Significant Evident Pollution Local Concern	Very Unlikely E Has occurred somewhere (heard of it happening)	Level IV Low
	<b>Hum</b>	People – Acute (immediate) adverse impact on human health – irritation	<input type="checkbox"/> Restricted access to site <input type="checkbox"/> Minimum Level 3 PPE while loading <input type="checkbox"/> Safety showers <input type="checkbox"/> Transfers controlled remotely <input type="checkbox"/> Minimum staffing levels	Category 2 Significant	Unlikely D Could occur here at some time but has not happened yet	Level IV Low
Item [02]. Mechanical Failure of Batching and Storage Tanks, Pipework, Bunding, Structures						
	<b>Nat</b>	Soil – Soil contamination (direct), Groundwater – Groundwater contamination and Stormwater contamination unlikely due to low solubility	<input type="checkbox"/> 10 year internal inspections of tanks and regular checks on external condition <input type="checkbox"/> Correct material and thickness specification <input type="checkbox"/> Whole plant bunded <input type="checkbox"/> Response Plan	Category 3.1 Highly Significant Evident Pollution Local Concern	Very Unlikely E Has occurred somewhere (heard of it happening)	Level IV Low
	<b>Hum</b>	People – Acute (immediate) adverse impact on human health- irritation	<input type="checkbox"/> Site access restricted <input type="checkbox"/> Contractors inducted and work under permit to work system <input type="checkbox"/> Plant controlled remotely <input type="checkbox"/> Level 1 PPE	Category .2 Significant	Unlikely D Could occur here at some time but has not happened yet	Level IV Low