APPENDIX 5

PRELIMINARY RISK ASSESSMENT FOR HAZARDOUS FACILITIES

CONTENTS ..... PAGE

HAZARDOUS FACILITIES SCREENING PROCEDURE

1.0 INTRODUCTION

The Hazardous Facility Screening Procedure (HFSP) has been designed as a screening tool to assist the Council in making decisions on whether a proposed hazardous facility is permitted, or whether it is a controlled or a discretionary activity requiring additional assessment of risks.

The HFSP will be applied to any proposed facility using or storing hazardous substances. Its purpose is to determine whether the facility will be permitted subject to defined minimum performance standards, or will require a land use resource consent.

Hazardous facilities range from home occupations using hazardous or environmentally damaging substances to large chemical factories. Common examples of hazardous substances are acids, solvents, paints, fuels and pesticides. Environmentally damaging substances include seemingly harmless substances such as foodstuffs, which kill aquatic life when released into water ways in large quantities, for example, due to depletion of oxygen.

2.0 OVERVIEW AND TERMINOLOGY

The HFSP is based on the assessment of hazardous substances in terms of three major *Effects Groups*: **fire/ explosion**, **human health**, and the **environment**. Each substance is assigned a *Base Threshold* (B) - expressed as a weight or volume - for each of the three defined *Effect Groups*. The *Base Threshold* is dependent only on the intrinsic hazardous properties of a substance.

Depending on the physical state of the substance(s), the type of storage and activity, site separation distances and the environmental sensitivity of the location, *Adjustment Factors* (F) are applied to the *Base Thresholds*. *Base Thresholds* and *Adjustment Factors* are then multiplied to generate *an Adjusted Threshold* (T) for each of the *Effects Groups*.

The next step is the calculation of the *Effects Ratio* (R), which represents the proposed quantity of a substance (Q) to be used/stored in relation to the *Adjusted Threshold*. The *Effects Ratio* forms the basis to determine the consent status of a particular facility, and to evaluate the cumulative effects presented by multiple substances.

An overview of the HFSP concept is shown in Figure 1.

3.0 EFFECTS GROUPS

The effects of any particular substance can be categorised into three groups:

- **Fire/Explosion effects:**

  This *Effects Group* is concerned with damage to property, the built environment and the safety of people.

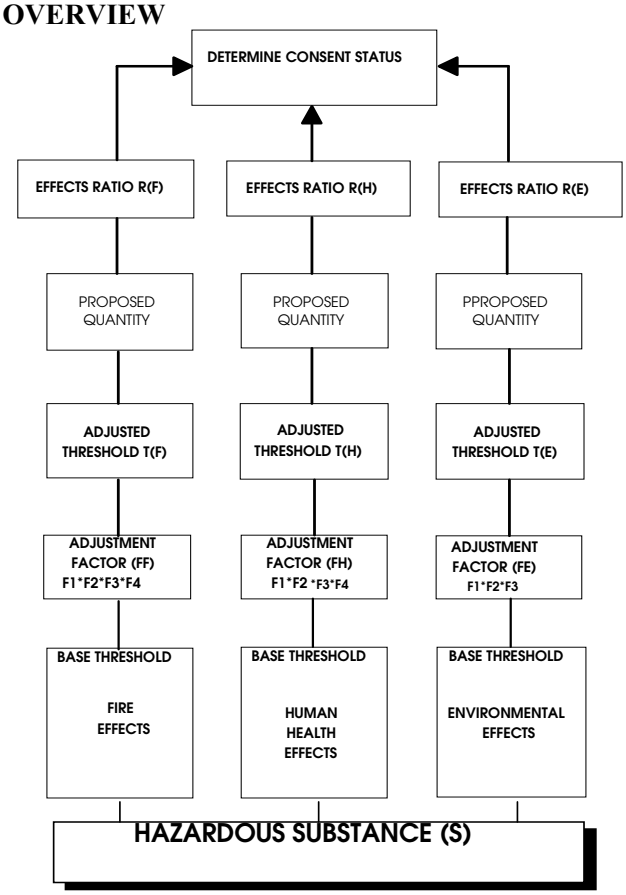
- **Human health effects:**

  This *Effects Group* is concerned with the well-being, health and safety of people.

- **Environmental effects:**

  This *Effects Group* is concerned with damage to ecosystems and natural resources.

FIGURE 1: HFSP CONCEPTUAL OVERVIEW



Each *Effects Group* is divided into four levels: **extreme, high, medium and low**. Mostly, the division into low, medium, and high levels is based on the UN (United Nations) Classification System. However, to enable better scrutiny of extremely hazardous substances, an extreme level was added to each *Effects Groups*. Table 1 shows how the standard UN Classes are used to define the four levels in each of the three *Effect Groups*.

A detailed description of UN Classes and associated Packaging Groups is provided in Attachment A. The reader will need to read in detail through Attachment A, as the standard UN Classification System is insufficient for certain Hazardous Substances Classes (particularly for toxic substances), so that additional definitions have been added.

Hazardous substances lists based on the UN Classification System will often only list the primary hazard of a substance, and sometimes one subsidiary hazard. However, it is of importance to note that a substance may exhibit different levels in each of the *Effects Groups*; for example, a substance may present a medium explosion effect, an extreme human health effect, and a high environmental effect. Hence, it is often possible that a substance will fit into more than one *Effects Group*, based on the definitions provided in Table 1 and Attachment A.

4.0 BASE THRESHOLDS (B)

The *Base Threshold* (B) represents base quantities of a substance for each level in the three *Effects Groups*. These *Base Thresholds*, in combination with relevant *Adjustment Factors* have been assessed to present non-significant off-site environmental effects on a heavy industrial site[1]

The *Base Thresholds* for the individual *Effects Groups* are shown in Table 1.

5.0 ADJUSTMENT FACTORS (FF, FH, FE)

Adjustment Factors (FF, FH and FE) differ for each of the *Effects Groups* to take account of the specific circumstances influencing the severity of the effect. *Adjustment Factors* take into account the following considerations:

- the physical state of the substance;
- the pressure and temperature required for storage and usage;
- the type of storage;
- the type of activity or use;
- separation distances to site boundary; and
- the environmental sensitivity of the site location.

For each *Effects Group*, different types of *Adjustment Factors* are relevant. For example, for the Fire/Explosion *Effects Group*, the temperature is relevant, while for the Human Health *Effects Group*, proximity to a potable water resource is deemed important. In some instances, more than one *Adjustment Factor* will need to be applied. Where this is the case, the *Adjustment Factors* are multiplied to generate one combined Adjustment Factor (FF, FH or FE) for each *Effects Group*. Table 2 presents the *Adjustment Factors* for each *Effects Group*.

6.0 ADJUSTED THRESHOLD (T)

The *Adjusted Threshold* (T) is calculated for each *Effects Group* by multiplying the *Base Threshold* with the relevant *Adjustment Factor*, as follows:

T = B x FF

- provides the *Adjusted Threshold* for a substance in the Fire/Explosion *Effects Group*

T = B x FH

- provides the *Adjusted Threshold* for a substance in the Human Health *Effects Group*

T = B x FE

- provides the *Adjusted Threshold* for a substance in the Environmental *Effects Group*

1. "Base Thresholds" and "Adjustment Factors" were developed based on scientific evidence (risk modelling), professional judgement and experience, and in discussion with both New Zealand and Australian Technical Experts in the field.

Table 1 ASSIGNMENT OF BASE THRESHOLDS FOR HAZARDOUS SUBSTANCES IF UN CLASSIFICATION KNOWN

Note: The other subsidiary effects of the hazardous substance is determined separately from the tables in Attachment A: Classification of hazardous substances. Using Table 1 and Attachment A enables all three Effects Categories for a hazardous substance to be determined, ie fire/explosion effect, human health effect and environmental effect.

Fire and explosion effects group

UN CLASS OR HFSP HAZARD	EFFECT CATEGORY: FIRE			
	Low	Medium	High	Extreme
LPG		LPG		
2			2.1 Exclude LPG	
3C	3C			
3		3PGIII	3PGI-PGII	
4			4.1	4.2-4.3
5			5.1	5.2
B (tonnes)[1]	**100**	**30**	**10**	**1**
B (m^3)[2]			**10,000**	

UN CLASS OR HFSP HAZARD	EFFECT CATEGORY: EXPLOSION			
	Low	Medium	High	Extreme
1		1.3	1.2	1.1
B (tonnes)[1]		3	1	0.1

Human health effects group

UN CLASS OR HFSP HAZARD	EFFECT CATEGORY: HUMAN HEALTH			
	Low	Medium	High	Extreme
2			2.3(b)-(d)	2.3(a)
6	6.1PGIII	6.1PGII	6.1PGI(b)	6.1PGI(a)
8		8 PGI-PGII		
B (tonnes)[1]	**30**	**10**	**1**	**0.1**
B(m^3)[2]			**500**	**50**

Environmental effects group

UN CLASS OR HFSP HAZARD	EFFECT CATEGORY: ENVIRONMENTAL			
	Low	Medium	High	Extreme
3C		3C		
8			8 PGI-PGIII	
Pesticide				Pesticide*
Eco-toxic	Groups 1d & 2d	Groups 1c & 2c	Group 1b	Group 1a
B[1]	**100**	**30**	**3**	**0.3**

Note: [1] B = Base Threshold in tonnes

[2] B = Base Threshold in m^3 for permanent or compressed gases

*For pesticides in which there is available information to demonstrate or substantiate that any uncontrolled releases, accidental or otherwise will not adversely affect the sensitivity of the surrounding environment in which the proposed activity is to be located then a Medium Environmental effects group rating may be used.

7.0 EFFECTS RATIO (R)

The *Effects Ratio* (R) is obtained by dividing the proposed quantity of a substance (Q) or group of substances by the *Adjusted Threshold*. The *Effects Ratio* fulfils two important purposes:

1. It forms the basis to define the trigger levels in the Consent Status Matrix which are used to determine the consent status of a particular facility. The consent status is determined by the highest *Effects Ratio* in any of the three *Effects Groups*.

2. By using a ratio of the proposed quantity of a hazardous substance over the *Adjusted Threshold* instead of *Adjusted Threshold* itself, it is possible to aggregate the effects presented by multiple substances held on the same site. Hence, it becomes possible to assess the cumulative potential effects which may be created by several substances present on the same site, and with similar hazardous properties.

TABLE 2: ADJUSTMENT FACTORS

ADJUSTMENT FACTORS FOR FIRE/EXPLOSION EFFECTS GROUP	ADJUSTMENT FACTORS FOR HUMAN HEALTH EFFECTS GROUP	ADJUSTMENT FACTORS FOR ENVIRONMENTAL EFFECTS GROUP
F1: SUBSTANCE FORM	**F1: SUBSTANCE FORM**	**F1: SUBSTANCE FORM**
Solid = 1 Liquid, Powder = 1 Gas (at 101.3 kPA and 20^{o}C) = 0.1	Solid = 3 Liquid, Powder = 1 Gas (at 101.3 kPA and 20^{o}C) = 0.1	Solid = 3 Liquid, Powder = 1
F2: HANDLING/STORAGE CONDITIONS (Class 3 Flammable liquids only)	**F2: SEPARATION DISTANCE FROM SITE BOUNDARY (For gases only)**	**F2: ENVIRONMENTAL SENSITIVITY**
Temp < flash point = 1 Temp > flash point < boiling point = 0.3 Temp > boiling point = 0.1	< 30 metres = 1 > 30 metres = 3	More than 100m from a waterbody = 1 Adjacent to or within 100m of a waterbody 0.3 Note: Waterbody includes streams, springs, sea, lakes, estuaries, wetlands, etc but excludes aquifers and entry points to stormwater drainage network
F3: SEPARATION DISTANCE FROM SITE BOUNDARY	**F3: PROXIMITY TO POTABLE WATER RESOURCE**	**F3: TYPE OF ACTIVITY**
< 30 metres = 1 >30 metres = 3	Normal = 1 Proximity to potable water resource = 0.3 Note: Potable water resource as defined by the Regional Council	Use = 0.3 Above ground storage = 1 Underground storage = 3 Note: Underground storage only applicable to Class 3 substances
F4: TYPE OF ACTIVITY	**F4: TYPE OF ACTIVITY**	
Use = 0.3 Above ground storage = 1 Underground storage = 10 Note: Underground storage only applicable to Class 3 substances	Use = 0.3 Above ground storage = 1 Underground storage = 10 Note: Underground storage only applicable to Class 3 substances	
F1*F2*F3*F4 = FF	**F1*F2*F3*F4 = FH**	**F1*F2*F3 = FE**

8.0 HFSP STEP-BY-STEP GUIDE

The following provides a step-by-step guide on how to use the HFSP. The sequence of necessary steps is shown in Figure 2. A *Substance Worksheet* form is attached which provides users with an information check list used for the classification of hazardous substances (Attachment B).

8.1 Hazardous Substances Inventory

To use the HFSP, it is necessary to create a full inventory of hazardous substances held on a site. Such an inventory comprises the names, quantities and UN Classifications of hazardous substances.

Standard UN Classifications have been adopted for use in the HFSP procedure (Table 1 and Attachment A).

However, UN classifications are inadequate for toxic gases (Class 2.3) and environmentally toxic/damaging substances. The latter have been incorporated into the Eco-toxic grouping for the purposes of the HFSP. Under this additional classification, foodstuffs such as milk is captured as an "environmentally damaging" substance.

8.2 Select Priority Substances

It is very common that multiple hazardous substances are held on a single site. It is neither practical nor necessary to submit every substance to the HFSP, provided that they do not have "priority status". The following "common sense" guidelines apply for sites where multiple hazardous substances are held:

1) If the number of substances is below ten, the HFSP will be carried out on all substances (unless it is evident that one single substance is likely to exceed the relevant trigger levels in the Consent Status Matrix).

2) If the number of substances is above ten, the HFSP will be carried out on those substances which either have:

   a) a high or extreme effect rating; or

   b) are held in quantities exceeding 10% in quantity of the total hazardous substances inventory.

8.3 Substance Specific Information

It is necessary, as part of the HFSP, to collect substance specific information. The information required is collated on a *Substance Worksheet* (Attachment B). These sheets form the basis to determine the hazard levels within each *Effects Group* for each substance concerned. Sample *Substance Worksheets* and summary information of over 100 commonly used hazardous substances are available on inquiry from the Council.

Additional relevant information for the *Substance Worksheet* can be extracted from Material Safety Data Sheets, national and international data bases, and text/reference books.

8.4 Site Specific Information

In addition to substance specific information, there is a need to assemble site specific information. For this purpose, a *Site Information Form* (Attachment B-2) will be filled in. The information compiled in this form will be used together with the *Substance Worksheets* to carry out the necessary HFSP calculations.

8.5 HFSP Calculations

The HFSP calculations are undertaken using the *HFSP Evaluation Form* (Table 3). The necessary calculations are made to establish the *Adjusted Threshold*s and the *Effects Ratio*s for each substance. This table is available in a computer spreadsheet form.

8.6 Aggregation of Effects Ratios

In the event where multiple hazardous substances are assessed on the same site, it will be necessary to aggregate the *Effects Ratios* by summing them for each *Effects Group*. This can be achieved by either linking spreadsheets, or by manual calculation.

8.7 Determination of Consent Status

The *Effects Ratio* of both individual and multiple substances form the basis to determine the consent status of a particular site. For this purpose, the *Effects Ratio* is compared against the trigger levels in the Consent Status Matrix. Overall, the highest *Effects Ratio* in any of the three *Effects Groups* determines the consent status, and whether an activity is permitted, controlled or discretionary.

Where the ratios indicate that an activity is discretionary, it is possible to review opportunities to reduce cumulative potential effects. This may be achieved by reducing the number and quantity of substances used/stored, or by carrying out the HFSP for individual (sub)facilities on the site, as opposed to the site as a whole. The subdivision of one site into more than one facility may be able to be justified on the basis of separation distances (within the site), and/or the lack of interaction between the individual facilities (for example, between above ground and underground storage tanks). However, the subdivision of a site into separate facilities cannot be done without prior consultation and agreement with council officers.

9.0 ADDITIONAL INFORMATION

9.1 Diluted or Mixed Substances

If a substance is diluted or mixed with other substances, the HFSP is applied to the percentage of the pure substance in the mixture (with the exception where the UN Classification already accounts for mixed/diluted substances). In a case where synergistic (additive) effects result in a mixture which is more hazardous than its components, the mixture may need to be assessed through appropriate testing procedures. In some instances, relevant information on mixtures is readily available (for example, formaldehyde).

9.2 Unavailability of Relevant Information

If the potential effects of a substance are not known, or cannot be readily established with publicly available information, the substance should be rated at least medium for each of the three *Effects Groups*. This mainly applies to the Environmental and Human Health *Effects Group*, and to a lesser degree to the Fire/Explosion *Effects Group*, as information on flammability is generally readily available.

9.3 Temporarily Stored Substances

The temporary storage of hazardous substances should be included in the HFSP.

9.4 Application to Small Package Users

The HFSP is applied to small package users of hazardous substances as if it were a bulk quantity. While small hazardous substances packages reduce the risk of a major spill, they may in the case of fires react like a bulk quantity. Therefore, a conservative approach has been taken. However, users of small hazardous substances packages which are not stored/used in large quantities such as home users, supermarkets, chemist shops and hardware shops are exempt from the procedure.

9.5 Quantity versus Volume Units

As a rule, the HFSP is applied to weights of hazardous substances. However, for permanent and compressed gases, *Base Thresholds* and *Adjusted Thresholds* will be applied as a volume (m^3).

FIGURE 2
HFSP STEP-BY-STEP GUIDE

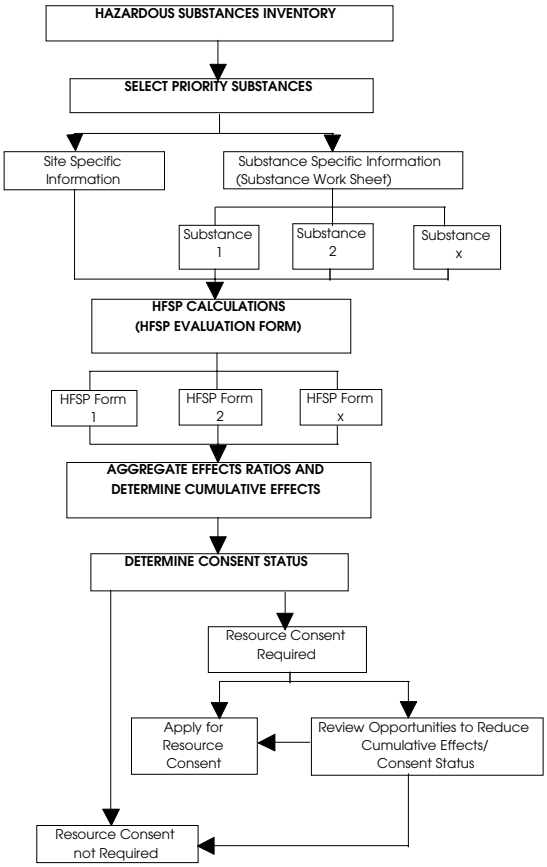


TABLE 3

HFSP EVALUATION FORM

SUBSTANCE:

FIRE/EXPLOSION EFFECTS			HUMAN HEALTH EFFECTS			ENVIRONMENTAL EFFECTS		
BASE THRESHOLD		**B**	**BASE THRESHOLD**		**B**	**BASE THRESHOLD**		**B**
Extreme	0.1/1		Extreme gases	$50m^3$		Extreme	0.3	
			liquids/solids/powders	0.1				
High gases liquids/solids/powders	$10000m^3$ 1/10		High gases liquids/solid/powders	$500m^3$ 1		High	3	
Medium	3/30		Medium	10		Medium	30	
Low	100		Low	30		Low	100	
Base Threshold B	m^3/Tonnes		***Base Threshold B***	m^3/Tonnes		***Base Threshold B***	Tonnes	
ADJUSTMENT FACTORS		**F**	**ADJUSTMENT FACTORS**		**F**	**ADJUSTMENT FACTORS**		**F**
F1	1/ 1/ 0.1		F1	3/1/0.1		F1	3.0/1.0	
F2	1/0.3/0.1		F2	1.0/3.0		F2	1/0.3	
F3	1/3		F3	1/0.3		F3	0.3/1/3	
F4	0.3/1/10		F4	0.3/1/10				
Combined Adjustment Factor FF			***Combined Adjustment Factor FH***			***Combined Adjustment Factor FE***		
Adjusted Threshold T (Fire)= B * FF			***Adjusted Threshold T (Health)= B * FH***			***Adjusted Threshold T (Envir)= B * FE***		
Quantity Held (Q) m^3 Tonnes			**Quantity Held (Q) m^3 Tonnes**			**Quantity Held (Q) m^3 Tonnes**		
EFFECT RATIO R (Fire) Q/T			**EFFECT RATIO R (Health) Q/T**			**EFFECT RATIO R (Env) Q/T**		

ATTACHMENT A: CLASSIFICATION OF HAZARDOUS SUBSTANCES

HFSP hazard	HAZARD	UN Class	DESCRIPTION
	Explosives	1.1	Articles and substances having a mass explosion hazard
		1.2	Articles and substances having a projectile hazard, but not a mass explosion hazard
		1.3	Articles and substances having a fire hazard and either a minor blast hazard or a minor projection hazard or both, but not a mass explosion hazard. This division comprises articles and substances that: • give rise to considerable radiant heat, or • burn one after another, producing minor blast and/or projection effects
		1.4, 1.5, & 1.6	Not applicable
	Flammable gas	2.1	Flammable gas: gases which at 20°C and a standard pressure of 101.3 kPa: • are ignitable when in a mixture of 13% or less by volume with air, or • have a flammable range with air of at least 12% regardless of the lower flammability limit This class includes aerosols containing flammable propellants
	Non-flammable, non toxic gas	2.2	Not applicable
	Toxic gas	2.3	Toxic gas: gases which are known to be toxic or corrosive to humans as to pose a hazard to health. This division is divided into four categories: **a) Extreme:** Inhalation toxicity vapours LC_{50}: < 200 ppm (= ml/m^3) and $V^{(1)} > 10 \times LC_{50}$ (extreme) **b-d) High:** Inhalation toxicity vapours LC_{50}: < 5,000 ppm (= ml/m^3) and $V^{(1)} > LC_{50}$ (1) V = (p/P) x 10^6 ppm or ml/m^3, where P = 760 mm Hg and p = Vapour Pressure (20 ×C)
	Flammable Liquid		Flammable liquids comprising liquids, mixtures of liquids, or liquids containing solids in suspension which give off a flammable vapour at specific temperatures. This class is divided into packaging groups (PG).
		3 PGI	Flash point: < 23°C Initial boiling point: < 35°C
		3 PGII	Flash point: < 23°C Initial boiling point: > 35°C
		3 PGIII	Flash point: > 23°C; < 61°C Initial boiling point: > 35 °C
3C Combustible Liquid			Flash point: > 61°C; ≤ 93°C

ATTACHMENT A: CLASSIFICATION OF HAZARDOUS SUBSTANCES

HFSP hazard	HAZARD	UN Class	DESCRIPTION
	Flammable Solid, Solid Self-Reactive, Solid Desensitised Explosive, Spontaneous Combustible Dangerous When Wet	4.1 PGI-III	• Flammable solids that are readily combustible or may cause fire easily through an ignition source or friction • Self-reacting substances that are thermally unstable and are liable to undergo a strongly exothermic decomposition even without the participation of oxygen • Desensitised explosives are substances which are wetted with water or alcohol or are diluted with other substances to suppress their explosive properties
		4.2 PGI-III	• Pyrophoric substances: liquid or solid substances which, even in small quantities, ignite within 5 minutes of coming in contact with air • Self-heating substances: solid substances which generate heat when in contact with air without additional energy supply
		4.3 PGI-III	• Substances, which in contact with water, become spontaneously flammable, or emit flammable gases
	Oxidising Agent	5.1	Substances which, while in themselves are not necessarily combustible, may, generally by yielding oxygen, cause, or contribute to, the combustion of other material
	Organic Peroxide	5.2	Organic peroxides are liable to exothermic decomposition at normal or elevated temperatures. The decomposition can be initiated by heat, contact with impurities (eg acids, heavy-metal compounds, amines), friction or impact. The rate of decomposition increases with temperature and varies with the organic peroxide formulation. Decomposition may result in the evolution of harmful, or flammable, gases or vapours. In addition they may have one or more of the following properties: • be liable to explosive decomposition • burn rapidly • be sensitive to impact or friction • react dangerously with other substances • cause damage to the eyes

ATTACHMENT A: CLASSIFICATION OF HAZARDOUS SUBSTANCES

HFSP hazard	HAZARD	UN Class	DESCRIPTION
Recognised carcinogen, teratogen or mutagen	Toxic;	6.1	Poisonous substances: Poisonous substances which are liable to cause death or injury or harm to human health if swallowed, inhaled, or contacted by the skin. This division is divided into three packaging categories.
		6.1PGI	**a) Extreme** Oral toxicity LD_{50} (mg/kg): < 1 Dermal toxicity LD_{50} (mg/kg): < 10 Inhalation toxicity dust/mist LC_{50} (mg/l): < 0.5 Inhalation toxicity vapours LC_{50}: < 200 ppm (= ml/m^3) and $V^{(1)}$ > 10 x LC_{50} (extreme) **b) High** Oral toxicity LD_{50} (mg/kg): < 5 Dermal toxicity LD_{50} (mg/kg): < 40 Inhalation toxicity dust/mist LC_{50} (mg/l): < 0.5 Inhalation toxicity vapours LC_{50}: < 1,000 ppm (= ml/^{3}) and $V^{(1)}$ > 10 x LC_{50} (high)
		6.1PGII	**c) Medium** Oral toxicity LD_{50} (mg/kg): < 50 Dermal toxicity LD_{50} (mg/kg): < 200 Inhalation toxicity dust/mist LC_{50} (mg/l): < 2 Inhalation toxicity vapours LC_{50}: < 3,000 ppm (= ml/m^3) and $V^{(1)}$ > LC_{50}
		6.1PGIII	**d) Low** Oral Toxicity LD_{50} (mg/kg): 500 (liquids) or < 200 (solids) Dermal toxicity LD_{50} (mg/kg): < 1,000 Inhalation toxicity dust/mist LC_{50} (mg/l): < 10 Inhalation toxicity vapours LC_{50} < 5,000 ppm (=ml/m^3) and $V^{(1)}$ > LC_{50} $^{(1)}$ V = (p/P) x 10^6 ppm or ml/m^3, where P = 760 mm HG and p = Vapour Pressure (20^{o}C)
	Infectious substance	6.2	Not applicable
Pesticide			Division into specified UN Packaging Groups according to percentage of active substance, (refer to United Nations "Recommendations on the Transport of Dangerous Goods", 8th Edition, 1993).
	Radioactive	7	Not applicable

ATTACHMENT A: CLASSIFICATION OF HAZARDOUS SUBSTANCES

HFSP hazard	HAZARD	UN Class	DESCRIPTION
	Corrosives		Substances which, by chemical action, can cause severe damage when in contact with living tissue, or, in the case of leakage, will materially damage or even destroy other materials. They may also cause other hazards:
		8 PGI	Very dangerous substances and preparations. Substances that cause full thickness destruction of intact skin tissue within an observation period up to 60 minutes starting after the exposure time of three minutes or less.
		8 PGII	Substances and preparations presenting medium damage. Substances that cause full thickness destruction of intact skin tissue within an observation period up to 14 days starting after the exposure time of more than three minutes but not more than 60 minutes.
		8 PGIII	Substances and preparations presenting minor danger. (a) Substances that cause full thickness destruction of intact skin tissue within an observation period up to 14 days starting after the exposure time of more than 60 minutes but not more than 4 hours. (b) Substances which are judged not to cause full thickness destruction of intact skin tissue but which exhibit a corrosion rate on steel or aluminium surfaces exceeding 6.25mm a year at a test temperature of 55^{o}C

ATTACHMENT A: CLASSIFICATION OF HAZARDOUS SUBSTANCES

HFSP hazard	HAZARD	UN Class	DESCRIPTION
	Eco-toxic		**Group 1** Ecotoxic substances: any substance exhibiting a toxic effect on the ecosystem, based on the toxicity to aquatic life. This division is subdivided into four categories: **a) Extreme:** 96 hr LC_{50} salmonoid fish (mg/l): < 0.1 48 hr EC_{50} daphnia (mg/l): < 0.1 72 hr EC_{50} algae (mg/l): < 0.1 Pesticides (unless toxicity data can be demonstrated to show lesser toxicity) **b) High:** 96 hr LC_{50} salmonoid fish (mg/l): < 1.0 48 hr EC_{50} daphnia (mg/l): < 1.0 72 hr EC_{50} algae (mg/l): < 1.0 **c) Medium:** 96 hr LC_{50} salmonoid fish (mg/l): < 10.0 48 hr EC_{50} daphnia (mg/l): < 10.0 72 hr EC_{50} algae (mg/l): < 10.0 **d) Low:** 96 hr LC_{50} salmonoid fish (mg/l): < 100.0 48 hr EC_{50} daphnia (mg/l): < 100.0 72 hr EC_{50} algae (mg/l): < 100.0
			Group 2 Environmentally damaging or persistent substances: any substance exhibiting a damaging (other than toxic) effect on the ecosystem. This division is subdivided into two categories: **c) Medium:** BOD_5 (1) (mg/l) > 10,000 **d) Low:** BOD_5 (mg/l) > 1,000 (1) BOD_5 stands for 5-day biochemical oxygen demand

ATTACHMENT B: SUBSTANCE WORKSHEET

SUBSTANCE NAME **PROPRIETARY NAME** **SUBSTANCE FORM (Solid, Liquid, Gas)**		
PHYSICAL/CHEMICAL CHARACTERISTICS		
UN NUMBER	**UN CLASS** **Subs. Risk** **Pack. Group**	**CAS Number (optional)**
Initial Boiling Point (°C)	**Flash Point (°C)**	**Auto-ignition Temperature (°C)**
Specific Gravity	**Vapour Pressure (mm Hg)**	
HUMAN HEALTH TOXICITY (indicate duration)		
Oral Toxicity LD_{50} (mg/kg)		
Dermal Toxicity LD_{50} (mg/kg)		
Inhalation Toxicity LC_{50} (ppm)		
Confirmed Carcinogen, Mutagen, or Teratogen		
ECOTOXICITY (indicate duration)		
LC_{50} Salmonid Fish (mg/l)		
EC_{50} Daphnia (mg/l)		
EC_{50} Algae (mg/l)		
BOD5 (mg/kg)		
Pesticide (Yes/No)		
EFFECTS RATING		
Explosion/Fire Effect Extreme ☐ High ☐ Medium ☐ Low ☐ NA ☐	**Human Health Effect** Extreme ☐ High ☐ Medium ☐ Low ☐ NA ☐	**Environmental Effect** Extreme ☐ High ☐ Medium ☐ Low ☐ NA ☐

Note: When using LD_{50} or LC_{50} data, the HFSP has been based on using the lowest value irrespective of animal species. This is because many chemicals have had LD_{50} and LC_{50} tests based on different animal species. This approach gives conservative results for the HFSP.

ATTACHMENT B-2: SITE INFORMATION FORM

ITEM	INFORMATION
Company name	
Contact name and phone number	
Address	
Substance name	
Manufacturer or Importer of substance	
Maximum quantity stored (tonnes)/m^3	
Type of facility/container/process	
Number of facilities/containers	
Location on site	
Separation distance from site boundary	
Vicinity of potable water source	
Distance from environmentally sensitive water body