Antarctica New Zealand

Scott Base

SPILL PREVENTION AND RESPONSE PLAN

New Zealand Government

Amendment Record

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Antarctica New Zealand

Fuel And Other Hazardous Substances Spill Prevention And Response Plan

Antarctica New Zealand

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Antarctica New Zealand

Vision

Antarctica and the Southern Ocean: Valued, Protected, Understood.

Purpose

Inspiring people to connect with Antarctica through knowledge and collaboration.

Values

We are a high performing organisation underpinned by a culture of shared beliefs.

To honour our obligation to Antarctica:

- We are passionate about what we do
- We care for each other and the environment
- We work together
- We act with integrity
- We aspire to the highest standards

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Team Process

Define context and purpose
What is the situation and what will we achieve?

↓

Identify critical issues
What could go wrong? Ask "what if…" or "how to…"

↓

Encourage contributions
Get input from team members,
senior staff and specialists

↓

Decide on a plan
Make sure the plan is clear, understood,
approved and addresses the critical issues

↓

Assign tasks
Who, what, where, when, why

↓

Monitor and give feedback
Give and receive timely constructive
feedback to improve our performance

↓

Review
What went well? What didn't go well?
What will we do differently next time?

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Task Assignment

Why	Define context and background for the task
What	What is the purpose or objective?
Where	Set the scene or location
How	What are measures of success or quality required?
Who	What people and resources are available?
When	Set timelines or duration of the task

Antarctica New Zealand

Contents

SECTION 1:

BACKGROUND INFORMATION

1. Introduction

1.1 Context

This plan describes the measures taken by Antarctica New Zealand to prevent and respond to fuel and other hazardous substance spills. The primary focus of this plan is prevention of and response to spills which could result from Antarctica New Zealand's operations at Scott Base. However, small spills occurring in the field are also covered by this plan.

Where spills are considered too large or difficult for field parties to handle, Scott Base will initiate clean up action using either Scott Base or United States Antarctic Programme (USAP) personnel. USAP personnel will respond to any significant spills resulting from New Zealand activities in USAP operational areas, such as McMurdo Station, air fields and associated roads, and fuel facilities.

1.2 Purpose

The purpose of this manual is primarily to:

i. Prevent spills occurring through understanding of storage systems and awareness of proper handling and storage procedures;

ii. Ensure that personnel have the ability to minimise the health, safety and environmental impacts of any spills which do occur through a rapid and effective response;

iii. Raise awareness of the risks of hazardous substances; and

iv. Provide awareness of Antarctica New Zealand's obligation to respond to environmental emergencies under the 'Liability Arising From Environmental Emergencies' (Annex VI) of the Protocol on Environmental Protection to the Antarctic Treaty and the requirements of the Hazardous Substances and New Organisms Act (1996).

1.3 Legal requirements and guidelines for spill contingency planning in Antarctica

The Protocol on Environmental Protection to the Antarctic Treaty contains comprehensive regulations to prevent pollution. In particular, Article 15 of the Protocol and Annex VI of the Protocol requires Parties to provide for prompt and effective response action to environmental emergencies, to establish contingency plans for response to incidents and to establish procedures for immediate notification of, and cooperative response to environmental emergencies.

The Council of Managers of National Antarctic Programmes (COMNAP) has adopted recommended guidelines for spill contingency planning to help national programmes comply with the requirements of the Protocol. These guidelines have been used to develop the Scott Base spill prevention and response plan.

1.4 Related documentation

Relevant documents referring to fuel and hazardous substances storage and handling include:

- Coordinated Incident Management System manual
- Fire Manual
- Scott Base Emergency Response Procedures
- Field/First Aid Manual
- Hazardous substance location plan drawings (location of all hazardous substances storage cabinets, fuel lines and storage tanks at Scott Base)
- Hazardous substance register (register of hazardous substances stored at Scott Base) and associated Safety Data Sheets (SDS)
- Standard Operating Procedures (Fuel Systems and Hazardous Substances)

1.5 How to use this plan

This plan is divided into two main sections, 1) Background Information and 2) Actions and Operations. Section 1 describes the Scott Base facilities and the spill risk environment. Section 2 describes the spill prevention and response equipment available, response techniques and the response structure.

2. Hazardous Substances at Scott Base

2.1 Types of fuel and hazardous substances

Scott Base (Figure 1) consists of 11 connected main buildings. The base accommodates up to 85 people and includes workshops, plant rooms, powerhouses, laboratories, stores and communal living areas.

Figure 1: Scott Base.

There are many hazardous substances stored around the base in hazardous substance cabinets, internal store rooms and external stores. All hazardous substances should always be stored in the designated storage locations.

'The hazardous substances register containers information on all of the hazardous substances at Scott Base, including their quantities and storage locations'

The primary types of fuel stored at Scott Base (Table 1) are:

- AN8 (also know as JP8): used in diesel engines (including the Toyota Light Vehicle fleet and the Hagglunds) and the Scott Base generators and boilers;
- Mogas (cold temperature petrol blend): Used in vehicles and portable plant with spark ignition (petrol) engines (e.g. quad bikes, portable generators, skidoos);
- Liquid Petroleum Gas (LPG): Used for cooking and heating at Scott Base and in the field;
- White spirits: Used for cooking in the field; and
- Methylated Spirits: Used for pre-heating in remote structures.

Table 1: Fuels stored at Scott Base and used in the field

Fuel Type	**Maximum Quantity**	**Storage**
AN8	61,000 litres	2 x double skinned main bulk tanks of 28,000 litre capacity each (Figure 2) 2 x 2,000 litre day tanks (Figures 3a, 3b) 1 x 1,000 day tank (Figure 3c) 1 x 2,000 litre sled mounted tank for field use 209 and 60 litre drums, 20 and 5 litre containers
Mogas	2,000 litres	1 x 2,000 litre trailer mounted tank (Figure 5) 1 x 2,000 litre sled mounted tank – often used for 2 stroke (Figure 4) 209 and 60 litre drums, 20 and 5 litre containers
LPG	5,000 kg	90, 45 and 9 kg cylinders
White Spirits/White Gas	600 litres	209 and 60 litre drums and 1 and 5 litre containers
Methylated Spirits	100 litres	20 and 1 litre containers

2.2 Storage areas

Fuel and hazardous substances are stored outside Scott Base in certified tanks and designated stores, and within Scott Base in store rooms and certified cabinets.

Other than vehicles being refuelled, no ignition sources should be allowed within 2m of any of the fuel storage tanks. This includes electronic equipment which is not rated for use in an explosive atmosphere. There are two intrinsically safe radios at Scott Base which can be used around this area if required. Particular care should be exercised in the pump hutch, on top of the tanks or when refuelling vehicles. Note that anyone climbing on to the bulk tanks must have been trained in the safety procedures for doing so.

2.2.1 Tanks

AN8

Figure 2: AN8 bulk tanks and vehicle bowser.

The AN8/JP8 bulk storage tanks (Figure 2) are a skid-mounted arrangement consisting of two steel 28,000 litre tanks inside an overall secondary containment tank. Built into the North end of the tank arrangement is the pump house containing two Esbray fuel pumps, valves, meters, filters and the inlet connection used for refuelling the tanks. All electrical systems within the Hazardous Area must be either intrinsically safe or explosion proof. The pump room is bunded. The two storage tanks are also fitted with high level alarms and over fill and anti-siphon valves. All AN8 vehicle and drum refuelling is done over a concrete bund next to the bowser.

A vehicle bowser is situated adjacent to the main AN8 storage tanks (Figure 2), with a pump located inside the main storage tank pump room. The fuel dispenser nozzle has auto stop features and the dispensing system operates on a pressure shut off switch but this should never be trusted; closely attend to refuelling operations at all times. Fuel supply to the bowser is isolated by means of a ball valve on the side of the bowser.

In addition to the main bulk storage tanks, Scott Base also has:

- Two 2,000 litre day tanks on raised stands, two and three metres high, used to supply fuel to the main and standby powerhouses (containing generators and boilers) (Figure 3a and b); and
- A 1,000 litre day tank on a stand six metres high supplying fuel to boilers used for heating the HFC (Figure 3c). Note that this tank has a 2,000 litre capacity, but is limited to 1,000 litres due to structural loading constraints.

All three have high and low level alarms, fuel not received alarms and level switches for starting and stopping the fuel transfer operation from the main storage tanks. Meters are situated on all three day tanks measuring fuel received quantities.

All AN8 fuel storage tanks are double skinned and all of the fittings and penetrations are in the top of the tanks. The tanks are fire rated for four hours.
These tanks are filled from the bulk storage tanks via a fuel pipe which initially runs underground (double walled) to the Engineering building, after which it is a single walled pipeline suspended under the buildings. The interstitial space on the tanks and pipelines are checked for evidence of leaks every 6 months.

Figure 3a: 2,000 litre AN8 tank outside main plant room.

Figure 3b: 2,000 litre AN8 tank outside of the standby powerhouse.

Figure 3c: 1,000 litre AN8 tank outside of HFC.

AN8 and two stroke sled mounted storage tanks

Two stroke and AN8 fuel is stored in two aluminium double skin tanks mounted on sleds with a capacity of 2,000 litres (Figure 4). One is used for refuelling skidoos at the Skidoo Park and the other for fuelling mobile generators out in the field. The fuel is dispensed via a hand operated pump. Fuel is isolated when the trailer is not in use by means of two ball valves. All fittings are top mounted. The bowser nozzle is fitted with a cover to capture drips.

Figure 4: Two stroke storage tank.

Mogas trailed mounted storage tank

Mogas is collected in a 2,000 litre trailer mounted tank, which is also used for storage on base. The tank is mounted on a braked trailer (Figure 5). The trailer is used for refuelling vehicles with petrol engines. The fuel is dispensed via a hand operated pump. Fuel is isolated when the trailer is not in use by means of two ball valves. All fittings are top mounted. The tank is situated on a concrete bund and all vehicle refuelling occurs over the bund.

Figure 5: Mogas trailer on concrete bund.

Field fuel storage

When fuel is sent into the field, it is provided in colour coded drums, either in 209 or 60 litres sizes. The coding is as follows:

- AN8 – Black (Figure 6a)
- Mogas – Red (Figure 6b)
- 2 stroke – Red/Green (Figure 6c)

Other fuels are transported and stored in red plastic containers (5, 10 or 20 litres) and labelled appropriately.

*Figure 6a: AN8 /Diesel **BLACK** coloured top with AN8 stencil.*

*Figure 6b: MOGAS/Petrol **RED** coloured top with MOGAS stencil.*

*Figure 6c: 2 STROKE **GREEN and RED** coloured top with PRE-MIX stencil.*

2.2.2 External Stores

There are various external stores located around the immediate surrounds of Scott Base which serve various purposes. For more information, see the Hazardous Substance location plan drawings and register for details where all the stores are located and what is stored in them. The drawings show all the zones around these storage areas. No ignition sources should be present nor taken into any of these zones. This includes any electronic equipment not specifically rated for the zone in which it will be used. The location register also shows the maximum quantities permitted to be stored in each of the stores.

Various fuels and hazardous substances are stored within designated external stores (Figure 7 and 8). All external stores must have secondary containment, such as a modified shipping container incorporating bunding.

Figure 7: External storage containers at Scott Base.

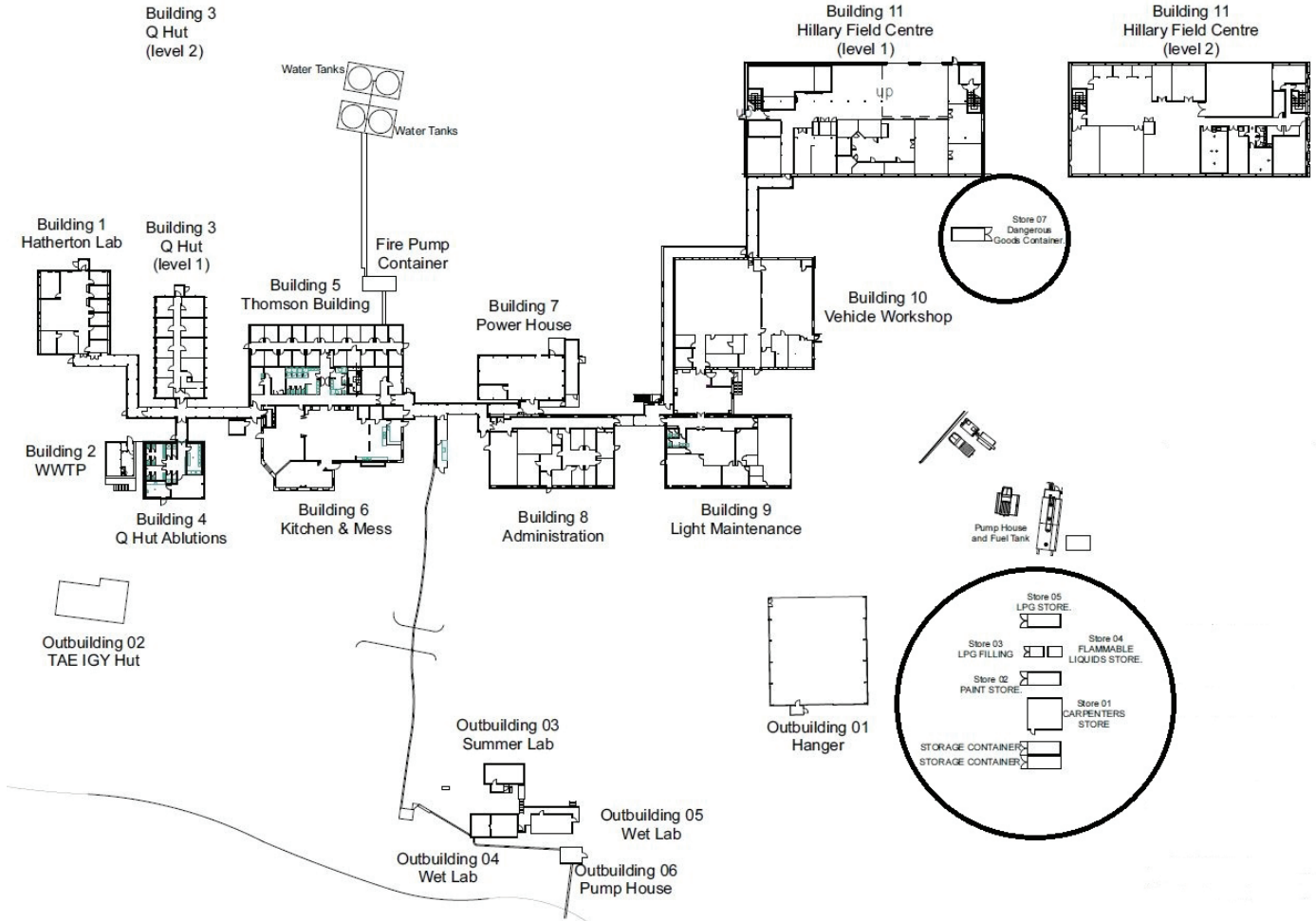


Figure 8: Field stores at Scott Base.

The various stores around Scott Base are:

Paint Store (Store 02)

The paint store contains primarily painting products used at Scott Base (e.g. white gas, fuel lite, linseed oil, turpentine and kerosene).

LPG Filling Store (Store 03)

LPG cylinders are no longer filled at Scott Base so this store now largely houses empty 9kg and 45kg cylinders.

LPG Store (Store 05)

The LPG store contains 18 and 45 kg bottles of gas for heading out to the field.

Flammable Liquids Store (Store 04)

The Flammable liquids store contains a variety of low volume hazardous substances for use by events working at Scott Base. Examples include ethanol, methanol, acetone, turpentine and methylated spirits.

Koru Lounge (Store 06)

The Koru lounge is a store at the helo pads for storage of the survival bags which contain butane canisters and white gas.

Waste Liquids Store (Store 07)

The waste liquids store is located near the mechanics' workshop. All waste liquids (including waste oil, contaminated fuel, contaminated water, glycol and soil) are stored in 209 litre drums inside this purpose modified bunded ISO20 shipping container. The container has built in bunding and is used for shipping the new lubrication oils to Antarctica. All drums in the waste oil container must be clearly labelled indicating their content. Always allow ullage when filling waste liquid drums. Refer to SOP HS 001 for further information.

Event Fuel Store (Store 09)

The event fuel store houses all fuel prepared for science events prior to transport into the field and all unused fuel when the event returns.

Petrol Store (Store 08)

Contains 209 litre drums of pre-mixed two-stroke fuel and empty plastic fuel containers..

2.2.3 Internal Stores and Cabinets

Cold Porch Store (Building 10)

For the storage of flammable and non-flammable gases.

Portable Plant Storeroom (Building 10)

For storing portable field plant such as generators, chainsaws and jiffy drills. The minimum amount of fuel should be kept in these fuel tanks as there must be less than 100 litres total in the room.

Oil Store (Building 10)

This is a day store for lubrication oils, consisting of six 209 litre drums on a raised, bunded stand. Distribution is via pneumatic pumping system.

Hazardous Substance Cabinets

The maximum quantity of hazardous substances stored within each cabinet at any one time is 100 litres or less depending on the size and rating of the cabinet (Table 2). The storage limit for each cabinet is indicated on the door and listed in Table 2.

Note: Antarctica New Zealand has some cabinets that are rated to store more than 100 litres, but to do so would result in the surrounding area being classified as a Hazardous Zone and therefore the cabinets are down-rated.

Table 2: Maximum volume quantities of hazardous substance storage cabinets.
http://chch/docs/sat/Assets/_layouts/15/DocIdRedir.aspx?ID=SATDOC-1942424675-415

Scott Base Building	Location	Maximum Volume (Litres)
Hatherton Lab Building 01	Hatherton Workshop	60
Powerhouse Building 07	Main Powerhouse	100
Administration Building 08	Telecom Room	30
Light Maintenance Building 09	Carpenter Workshop (2x)	100
	Engineers Workshop	100
Vehicle Workshop Building 10	Mechanics Day Store	100
	Oil Store (2x)	100
HFC Building 11	Lab 2	100
	Cargo Bay	2x100, 1x30
	AFT Bay	50
	Kitchen Room	100
Wet Lab Out Building	Wet Lab	30

2.2.4 Remote structures and fuel caches

Fuel is regularly stored at field sites. These include Arrival Heights, Bratina Island Huts, Cape Bird Hut, Cape Evans Hut, Cape Roberts Hut and the Square Frame (Table 3).

Antarctica New Zealand also stores fuel in the field at fuel cache sites to support field operations, including helicopter and fixed wing support. The location of these varies over time and is managed independently of this plan.

Table 3: Current locations and maximum quantity of fuel expected at Antarctica New Zealand remote structures at any one time.

Sites	Maximum No./Weight	Purpose
Arrival Heights	1 x 30 litre storage cabinet	- Safe storage of fuel and hazardous substances - Science experiments
Bratina Island Huts	1 x 60 litre storage cabinet 4 x 209 litre drums of AN8	- Safe storage of fuel and hazardous substances - Helicopter refuelling and field camp support
Cape Bird Field Hut	1 x 60 litre storage cabinet 1 x 100 litre storage cabinet 1 x 600 litre AN8 tank 4 x 45 kg LPG cylinders Up to 4 x 209 litre drums of Mogas and/or AN8	- Safe storage of fuel and hazardous substances - Fuel for heating the hut
Cape Evans Hut	1 x 209 litre drums of Mogas 2 x 209 litre drums of AN8 1 x 9 kg LPG cylinders	- Support of the Antarctic Heritage Trust camp
Cape Roberts Field Hut	1 x 60 litre storage cabinet 5 x 209 litre drums of AN8	-Safe storage of fuel and hazardous substances - Helicopter refuelling and field camp support
Square Frame	1 x 60 litre storage cabinet 1 x 400 litre AN8 tank	-Safe storage of fuel and hazardous substances

* Has not been delivered to the field hut yet.

2.3 Fuel transfer operations

AN8 is transported from McMurdo Station to Scott Base via McMurdo plant and personnel. The Power Engineer is tasked with coordinating the bulk fuel deliveries. It is pumped from the USAP tanker into the bulk fuel tanks, or in some cases directly into vehicles or drums for field use. The 2,000 litre trailer mounted Mogas tank is refilled at McMurdo by the Power Engineer.

For all fuel handling and transfer activities, Standard Operating Procedures (SOPs) have been developed. These include:

SOP FU – 002 Vehicle refuelling

SOP FU – 005 Mogas trailer

SOP FU – 006 Event fuels

SOP FU – 007 Daily fuel pumping and monitoring

SOP FU – 008 Field fuel handling

SOP HS – 001 Waste oil handling procedures

SOP HS – 004 Hazardous substance storage management

SOP FU – 009 Dip Testing the Main Fuel Storage Tanks

If SOPs have not been reviewed in the past year then the Engineering Supervisor should be consulted prior to their use.

3. Spill Risk Assessment

History shows that fuel is the main hazardous substance spilled and that it is the main risk to the environment. Therefore, this section provides information on responding to fuel responses. However, there are also a number of other hazardous substances on site that could be hazardous to humans and the environment if spilled, but as there are many of these, it is best to deal with them on a case by case basis if a spill occurs. Anyone handling hazardous substances must have reviewed the Material Safety Data Sheet (MSDS) to ensure that they are aware of the particular safety concerns and spill response considerations associated with that substance prior to starting work.

3.1 Fuel characteristics

After release into the environment, hydrocarbon contaminants can be dispersed and diluted, volatilised (turned into gas), and may undergo chemical and biologically derived changes depending on the fuel type and receiving environment.

AN8 and Mogas are light fuels. While AN8 has a low volatility, Mogas volatilises rapidly when spilled (meaning it easily becomes a vapour). The remaining liquid moves easily through soil or snow and into cracks in ice. Heavier substances which may be spilled or leaked, such as oils, will not move as far or be reduced as much by volatilisation. During thaw periods, hydrocarbons (either dissolved or attached to soil particles) can be mobilised and spread in melt water (refer to Table 4 for summary of fuel characteristics).

Table 4: Fuel and oil characteristics.

	Mogas	AN8 and Kerosene	Engine and hydraulic oils
Mobility	High	High	Low
Persistence	Low	Medium	High
Toxicity	High	Medium	Medium
Flammability	Very High	High	Low
Solubility	Low	Low	Low

3.2 Spill environments

For all spills the Environment Team will provide advice and response recommendations appropriate for the spill site. In responding to spills, particular care should be taken to avoid damaging the environment further. Be aware of local sensitive locations. For example, at Scott Base, sensitive sites include the near shore marine environment which includes the seal colony, areas of vegetation and the reverse osmosis seawater intake area.

3.2.1 Scott Base

Scott Base is located on high ground at Pram Point and the shoreline is down slope from the bulk fuel storage and vehicle operation areas. Therefore, a large spill could be expected to migrate toward the shoreline. The soil below the bulk fuel storage areas is soft, uneven and

heavily disturbed. Spills are therefore likely to result in pooling when frozen and extensive migration can be expected during thaw periods. Much of this soil is already contaminated, making monitoring and tracking of spills difficult.

3.2.1 Sensitive field environments

Different areas have particular environmental sensitivities (Figure 9) and almost all field sites will be relatively pristine compared to Scott Base. Response actions should be planned to avoid the contamination of sensitive environments with fuels. Possible effects of spills in sensitive locations is summarised in Table 5.

Table 5: Summary of sensitive locations.

Sensitive locations	Potential effects of spills
Antarctic Specially Protected Areas (ASPAs)	Site specific values – consult ASPA management plan
McMurdo Dry Valleys Antarctic Specially Managed Area (ASMA)	Soils, vegetation and fresh water system potentially affected – consult the ASMA management plan
Marine or fresh	Changes to physical, chemical and biological properties, dispersal of contaminants
Soils	Changes to physical, chemical and biological properties
Vegetation	Toxic effects – damage or die off
Wildlife	Toxic effects – illness or mortality

Figure 9: Examples of sensitive locations.

3.3 Common spill types

The most likely type of spill, and the probability with which it may occur during Antarctica New Zealand's operations is outlined in Table 6. This table is based on the recent history of fuel spills at Scott Base.

Table 6: Most likely types of spills and probability of occurrence.

Cause	Location	Type	Litres	Probability
Spill during vehicle refuelling	Scott Base bunded areas	AN8/ Mogas	50	High
Spill during base refuelling	Scott Base bulk storage or day tank	AN8	100	High
Sudden failure of hydraulic hose or fitting on heavy vehicle	Scott Base vehicle operation areas and/or sea ice	Hydraulic fluid	150	High
Drum tipped over or damaged	Field Site	AN8	200	Medium
Tanker crash	Slope below McMurdo	AN8	6,600	Low
Damage to both layers of one of the bulk storage tanks	Scott Base	AN8	27,000	Low

The possible impacts and most appropriate responses for these spill scenarios would be influenced by various factors including the terrain (e.g. soil type, slope), conditions at the time (e.g. snow cover, level of moisture), and the season (e.g. whether the ground is frozen or thawed, whether extreme cold or darkness could hamper response). The probabilities in Table 6 are estimated based on reported spill analysis.

SECTION 2:

ACTIONS AND OPERATIONS

4. Spill and Incident Prevention

A number of procedures are in place to prevent a fuel or hazardous substance incident from occurring.

4.1 Training

Prevention starts with recruitment of seasonal personnel for Scott Base. All Scott Base staff are provided with training in the management and handling of fuel and hazardous substances during:

- Antarctica New Zealand's Awareness Programme;
- Fire and fuel spill training;
- Antarctic field training;
- Additional training is given to those that handle bulk fuel; and
- Regular fire and spill response scenario drills.

Lesson plans for these training sessions are updated annually. Successful completion of these courses is documented through staff Induction Workbooks and EMPEROR training records.

4.2 Secondary containment at storage area

All tanks and storage areas are fitted with secondary containment such as concrete bunding, purpose built containment and drip trays. Fuel taken into the field must be stored with secondary containment where practical.

4.3 Maintenance inspection

- All alarms associated with the fuel systems are inspected annually for correct operation.
- A monthly inspection is made on the above ground fuel reticulation pipework.
- The pump room is inspected daily and the meters are constantly monitored by the Scott Base Building Management System (BMS)
- Fuel bunds are cleared of snow when practical.
- Concrete bunding for refuelling vehicles is routinely cleared of snow.

5. Spill Response

Even with the large focus on spill prevention, spills may happen. At Scott Base a number of different processes, procedures and training have been set up to ensure we are able to respond appropriately to a spill.

The best response for a spill depends on many variables including the type of spill, the location of the spill, the proximity to sensitive environments, weather conditions and the response equipment available.

Spills resulting from New Zealand activities in the United States Antarctic Programme (USAP) operational areas, such as McMurdo Station, air fields, associated roads and fuel facilities are responded to by USAP personnel.

5.1 Relevant documents referring to spill response procedures

The following documents outline the response to a spill and contain the following information:

Coordinated Incident Management System (CIMS) Manual Command Procedures – provides Pre-Plan for a large scale spill response by which the Incident Commander and Communications Operators can refer to when dealing with an event at Scott Base. It includes check sheets, process flow charts and contact numbers as a prompt to the Incident Commander and Communications Operators to help ensure the correct steps are taken when dealing with a large spill and other events.

Fire Manual – although focussed on outlining how to respond to a fire, it also contains information on how spills (especially fuel) should be dealt with. It forms the basis for the training of Scott Base staff in preparation for deployment to Scott Base as a member of the fire crew.

Emergency Response Plan (Scott Base) – outlines the immediate response for all personnel staying at Scott Base. These documents can be found throughout Scott Base and all people at Scott Base are encouraged to become familiar with their contents. They are designed to be used in the event of an emergency allowing the reader a quick reference for how they should respond.

Field/First Aid Manual – more tailored to Event Personnel out in the field. This manual outlines how a small scale spill should be dealt with when support from Antarctica New Zealand is not immediately available.

5.2 Secondary containment and spill response equipment

5.2.1 Scott Base

A range of spill response equipment is available at Scott Base for responding to local spills, deploying to remote spills, and for deploying with field parties and vehicles (Table 7). All spill kits come with instructions (Table 8). Response equipment is also available in field huts and vehicles.

All of the kits for field deployment are kept in the Hangar when not in use. Vehicle kits are always kept in vehicles. There are three large spill kits (yellow wheelie bins) and a fuel recovery pump kept in the Vehicle Workshop (Building 10) plant room and another one which is located in the HFC outside the event cage area.

Safety equipment (overalls, gloves, etc.) and Material Safety Data Sheets for fuels are readily available at Scott Base for use in a spill response. Earthmoving equipment, a pump and storage containers for any spilled substances are also available.

All fuel users are required to carry spill response equipment and smaller 'wipe' kits for catching drips when refuelling.

5.2.2 Field environment

Field parties are required to carry secondary containment and a spill response kit with an absorbency that matches the volume of their largest fuel container.

Fuel in the field needs to be stored in a bund or spill tray in case of a leak or spill. In the event of a spill or leak, the bund or spill tray acts as secondary containment and must therefore be able to hold the quantity of fuel stored within. There are three different types of containment:

- Flat sheet bund: holds up to16x209L drums. Strops are required to hold the bund in place
- Self-supporting bund: holds up to 16x209L drums.
- Spill tray: holds mainly 20L or 10L jerry cans. Generators are also contained in a spill tray

A bund-liner should be placed in the base of the flat sheet or self-supporting bund to prolong its life.

Field spill kits, bunds and fuel are allocated for field use by Field Support and the Engineering staff. Field Support are responsible for checking that the allocated spill kits match the volume of the largest single fuel container allocated and that there is sufficient bunding or secondary containment for the fuel before it goes into the field.

Putty for repairing drums is kept in the Field Support office and is always carried when fuel drums are being handled. This is cold sensitive and should be kept warm. Putty deteriorates over time, so it should be checked prior to being taken in the field to ensure that it has not dried up.

Stocks of replacement sorbent socks and mats are kept on base to replenish kits. Field Support and Engineering staff are responsible, respectively, for checking that the field and base response equipment is in good order and is replenished as needed. If any spill response equipment is used then it should be reported to either Field Support or Engineering so that the kit can be restocked.

Table 7: Summary of spill kits at Scott Base

Field Spill Kits					
Absorbency Capacity	Image	Contents	Storage Location	Quantities Available	Product Code
209 Litres		80 x sorbent pads 8 x 1.2 m sorbent socks 6 x 3 m sorbent socks 8 x sorbent pillows 2 x plug putty Waste bags and ties Instruction cards	Hangar	6 sets	ANT06
81.5 Litres		30 x sorbent pads 3 x 1.2 m sorbent socks 2 x 3 m sorbent socks 4 x sorbent pillows Waste bags and ties Instruction card	Hangar	4	ANT03
20 Litres		14 x sorbent pads 2 x 1.2 m sorbent socks Waste bags and ties Instruction card	Hangar	9	ANZ 01-01 ANZ 01-02
20 Litres		14 x sorbent pads 2 x 1.2 m sorbent socks Waste bags and ties Instruction card	Hangar	7 3 spare sealed kits	N/A

Field Hut Spill Kits					
Absorbency Capacity	**Image**	**Contents**	**Storage Location**	**Quantities Available**	**Product Code**
131 Litres		50 x sorbent pads 4 x 3 m sorbent socks 5 x 1.2 m sorbent socks 4 x sorbent pillows Waste bags and ties Instruction card	Hangar	Bratina Island Huts Cape Bird Hut	ANZ02
17.4 Litres		10 x sorbent pads 2 x 1.2 m sorbent socks Waste bags and ties Instruction card	Hangar	Bratina Island Huts Cape Bird Hut	ANZ01

Vehicle Spill Kits					
Absorbency Capacity	**Image**	**Contents**	**Storage Location**	**Quantities Available**	**Product Code**
0.9 Litres		1 x sorbent pad	Vehicles	0	ANZ 05
9.5 Litres		5 x sorbent pad 1 x sorbent pillow Waste bags and ties	Vehicles	0	ANZ 04
20 Litres (Field Kits)		14 x sorbent pads 2 x 1.2 m sorbent socks Waste bags and ties Instruction card	Hangar	0	ANZ 01-01 ANZ 01-02

Scott Base Spill Kits					
Absorbency Capacity	**Image**	**Contents**	**Storage Location**	**Quantities Available**	**Product Code**
133 Litres Yellow Wheelie Bin		60 x sorbent pads 4 x 3 m sorbent socks 4 x 1.2 m sorbent socks 4 x sorbent pillows Waste bags and ties Instruction card 1 x Putty	Mechanics Locker Room (3) HFC (1)	4	N/A

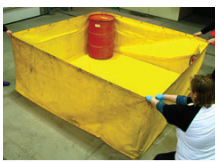
Secondary Containment					
Absorbency Capacity	**Image**	**Contents**	**Storage Location**	**Quantities Available**	**Product Code**
Flat bund		Various sizes to support 4 to 16 drums.	Hangar	~50	N/A
Self-supporting bund		Various sizes, 4 to 16 drums	Hangar	~20	N/A
Bund liner	No image available	Various sizes; use to protect bund from wear and tear.	Hanger	15	N/A
Spill tray		Generator	Mechanics (Generator room)	~20	N/A

Table 8: Spill kit instruction card

IN THE EVENT OF A FUEL SPILL:

ASSESS

- Stop, ensure personal safety and assess the situation
- Do not attempt an external response in Condition 1
- Assess fire/explosion danger and hazards
- Use protective equipment
- If safe and possible to do so, stop and contain the flow
  - Turn off valves or taps
  - Right container and replace lid
  - Plug holes (putty in spill kit) in container or turn container so hole is at top
- Report the time, location, material spilled, volume spilled, likelihood of any further spill, conditions and actions taken so far to Scott Base

CONTAIN

- Consider the impacts of response actions on the environment
- No action is always an option
- Identify any sensitive aspects of the environment which could be at risk (i.e. ice free ground, fresh water, marine environment, vegetation, wildlife)
- Identify an appropriate response strategy to halt or minimise any further spill, contain the existing spill and protect threatened resources
- Use spill kit materials to contain the spill and/or construct bunds (areas of containment), berms (artificial ridges), slots or trenches as needed

RECOVER

- Small spills of highly volatile fuels may be left to evaporate (e.g. mogas)
- Small quantities of liquid can be recovered using sorbent materials
- Pump contained liquids into drums or other emergency containment
- Contaminated snow should be shovelled up (or ice cut out) and melted to separate out the contaminants and water
- Snow makes a good sorbent so check for any pooling under snow cover
- Removal of contaminated soil should be undertaken after consultation
- Use bags from spill kit, place in trays, drums, tarpaulins or other containment to hand
- Ensure all contaminated wastes are clearly labelled

REPORT

- Complete a Health, Safety and Environment Incident Report Form

SPILL RESPONSE EQUIPMENT

SORBENT SOCKS

- Surround the spill or the area you need to protect

SORBENT PILLOWS

- Create a dam (e.g. around drains or catchment basins)
- Place on a spill to soak up material
- Surround area you need to protect

SORBENT PADS

- Place on a spill to soak up material
- Place under leaks and drips
- Use as a wipe

Note that there are three main types of sorbent products so it is best to consider which type is most appropriate for the situation or substance when responding to a spill. The different types are colour coded:

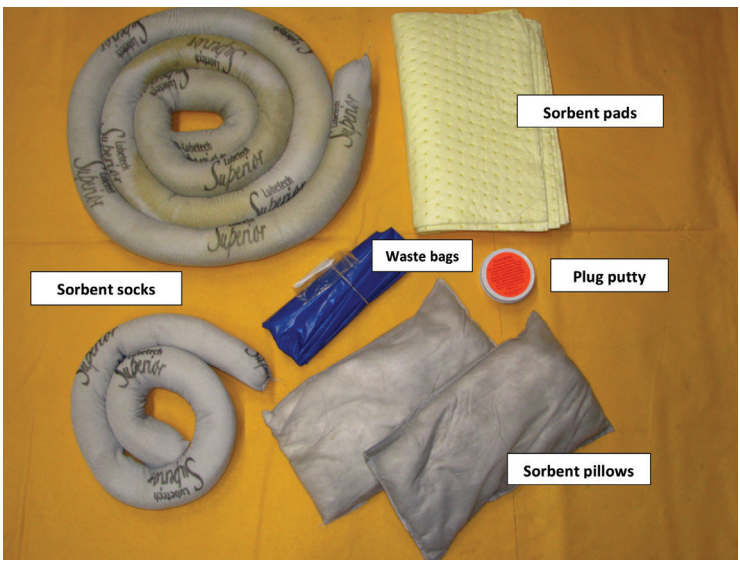
– Grey: Universal, water absorbent products
– White: Oil only absorbent products (these are useful for collecting fuel floating on top of a weir, stream or puddle).
– Yellow: For chemical sorption

PLUG PUTTY

- Use to plug a leaking hole in a fuel drum or container

WASTE BAGS

- Place contaminated material into bag and seal



5.3 Spill response strategy

For all spills, the Environment team in the Christchurch office may be contacted for further advice. The following strategy outlines the likely steps to be taken when dealing with a spill. These steps form the response documented in the Coordinated Incident Management System Manual (Appendix 1), Fire Manual, Emergency Response Plan and the Field/First Aid Manual.

5.3.1 Initial assessment and response priorities

- Stop, ensure personal safety and assess the situation
- Consult the Dangerous Goods Initial Emergency Response Guide or Safety Data Sheets for key safety information prior to responding
- Do not attempt a external response in Condition 1
- Assess fire/explosion danger and hazards
- If safe and possible to do so, stop and contain the flow
- Report the time, location, material spilled, volume spilled, likelihood of any further spill, conditions and actions taken so far to Scott Base (via radio if in the field)
- If the spill has occurred in United States Antarctic Programme areas of operation or the spill is very large or in a very sensitive location, McMurdo should also be notified of the spill and response activities

5.3.2 Response strategies

- Terminate the flow of the material if safe to do so (e.g. turn off tap, roll barrel)
- Talk to the Environment Team and consider the impacts of response actions on the environment (if in the field, seek advice via radio)
- Remember that no action is always an option
- Identify any sensitive aspects of the environment which could be at risk
- Identify an appropriate response strategy to halt or minimise any further spill, contain existing spill and protect threatened resources
- If needed and subject to weather and safety considerations, mobilise response team(s) and appropriate equipment
- Alert medical personnel so that any required preparations can be made

5.3.3 Containment options

- Containment may be undertaken to aid recovery of the material and/or keep the spill out of sensitive environments
- Containment methods need to be matched to the likely spill migration path, the environment the spill has occurred in, and the resources available
- Containment is only effective if deployed soon after the spill
- Small spills can be stopped from spreading using sorbents (particularly socks)
- Larger spills can be contained by constructing berms, dams, trenches or slots (Table 9 - 12). Alternatively these methods can be used to protect vulnerable areas.

Table 9: Containment options in different spill environments.

Environment	Berm	Dam	Trench	Slot
Frozen Ground	✓			
Thawed Ground	✓		✓	
Flowing Water	✓	✓		
Sea ice/Ice	✓		✓	✓
Snow	✓			

Table 10: Method sheet for building a berm to contain a spill.

Berms and Dams	
Suitable for: • Frozen Ground • Land (where the earthworks best protect any special site values) • Running water • Sea ice • Snow	**Uses:** • Contain and stabilise contaminated area • Contain or divert contaminant with potential to migrate • Create cells for recovery • Use natural depressions to act as containment areas for recovery
Strategy: • Identify location and trajectory of spill • Create a configuration that makes best use of the environment and available resources • Construct the containment and check for leaks • Monitor structure regularly • Recover collected contaminants	**Tips:** • Depending on scale of spill and resources available, could be constructed by hand or machine • Snow structures will be absorbent or can be strengthened by applying water • Materials to hand can be used (e.g. bags, pipes, tarpaulins, plastic sheets, plywood, etc.)

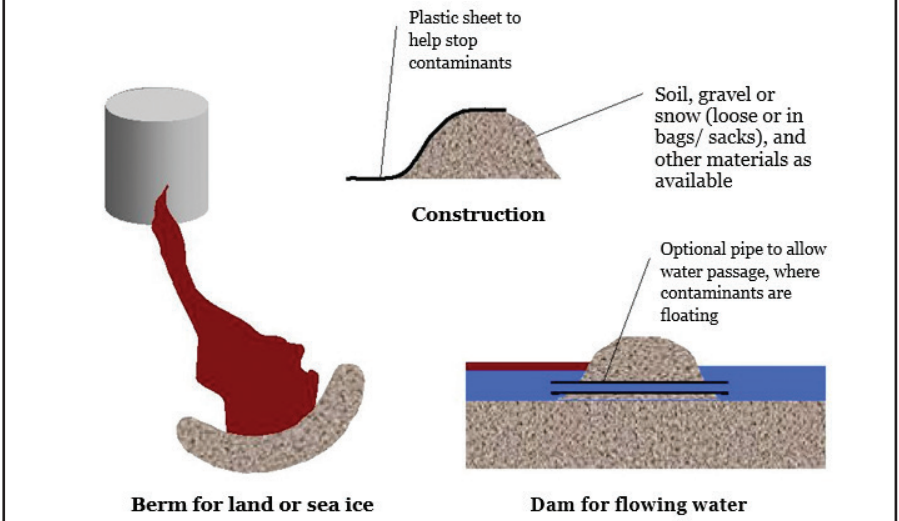


Table 11: Method sheet for building trenches and slots to contain a spill.

Trenches and Slots	
Suitable for: • Land (where the earthworks best protect any special site values) • Sea ice Not suitable for: • Vegetated areas unless surface recovery is impossible	**Uses**: • Collect contaminants for recovery
Strategy: • Identify location and trajectory of spill • Create a configuration that makes best use of the environment and available resources • Construct the trench, pit or slot and line if practical • Monitor structure regularly • Recover collected contaminants	**Tips:** • Place excavated materials on down slope (or current) side of hole • Materials to hand can be used (e.g. bags, pipes, tarpaulins, plastic sheets, plywood, etc.) • A slot can be cut right through sea ice if contaminants are already in the water • Follow normal safety requirements when working on sea ice

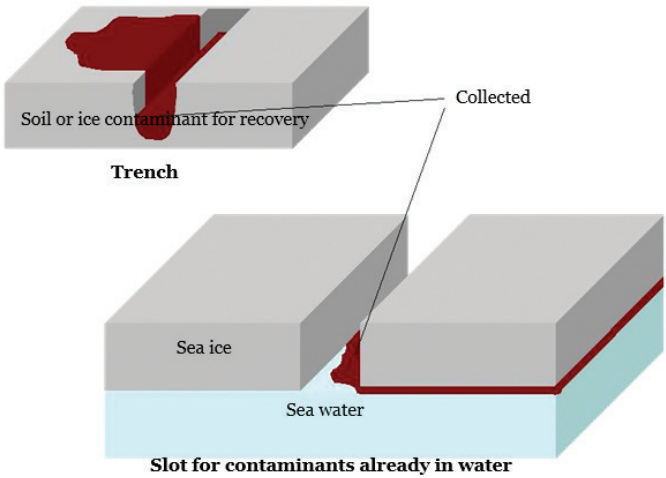


Table 11: Some spill response containment and recovery procedures for typical and worst case scenarios.

Causes	Location	Material	Suggested containment	Suggested recovery	Resources
Spill during vehicle refuelling	Scott Base bunded areas or in the field	50 litres Mogas	• Use sorbent socks to stop migration.	• Mop up with sorbents and allow remainder to evaporate.	• Vehicle and base spill kits
Sudden failure of hydraulic hose or fitting on bulldozer or vehicle	Scott Base vehicle operational areas, sea ice, roadways or ice shelf	150 litres Hydraulic fluid	• Use sorbent socks to stop migration. • Cut trench in sea ice.	• Mop up with sorbents. • Shovel up contaminated snow and surface soil. • Cut out contaminated sea ice.	• Vehicle and base spill kits, shovels, etc.
Drum tipped over or damaged	Field site, Scott Base or established camp	200 litre AN8	• Plug hole or turn to top, and place drum in spill tray, over pack or on tarpaulin. • Consider trench, berm or dam to contain spilled product if sensitive environment at risk from migration.	• Mop up with sorbents. • Reassess situation after initial recovery and consult Environment Team on further action.	• 209L field spill kits • Support and extra containment from Scott Base
Tanker Crash	Slope below McMurdo – Scott Base road	6,600 litres AN8	• Plug or cover compromised sections if possible. • Transfer fuel from tanker to emergency containment. • Use berm (frozen ground) or trench (thawed ground) to collect spilled product down slope.	• Pump collected product into emergency containment. • Reassess situation after initial recovery and consult Environment Team on further action.	• Digging implements • Materials for berm construction • Drums, spare tank, pump • Further containment request from McMurdo
Damage to both layers of the bulk storage tanks	Scott Base	27,000 litres AN8	• Plug or cover compromised sections if possible. • Transfer fuel from leaking tank to emergency containment (eg. second tank). • Use berm (frozen ground) or trench (thawed ground) to collect spilled product down slope.	• Pump collected product into emergency containment. • Reassess situation after initial recovery and consult Environment Team on further action.	• Digging implements • Materials for berm construction • Drums, spare tank, pump • Further containment request from McMurdo

5.3.4 Recovery

- Small spills of highly volatile fuels may be left to evaporate (e.g. Mogas)
- Small quantities of liquid can be recovered using sorbent materials
- Pump contained liquids into drums or other emergency containment
- Contaminated snow should be shovelled up (or ice cut out) and melted to separate out the contaminants and water. When shovelling snow, minimise the amount of clean snow that is recovered and mixed in with the contaminated snow to reduce the total volume of contaminated water waste.
- Snow makes a good sorbent so check for any pooling under snow cover
- Excavation of contaminated soil should only be undertaken after consultation with the Environment Team.
- Use bags from spill kit, place in trays, drums, tarpaulins or other containment to hand
- Ensure all contaminated wastes are clearly labelled

5.3.5 Communication, surveillance and restoration

- Identify a communications officer to maintain contact with people responding to the spill.
- For large spills or spills in sensitive environments, the Senior Leadership Team and the USAP spill team will be kept updated through the Incident Commander or other key contact points.
- Estimate the track of spill and identify threatened resources and/or sensitive environments.
- Check for sub-surface migration if appropriate by digging a pit in snow cover or thawed layer of soil (taking into account impacts on sensitive environments).
- Where patterned ground or previously undisturbed soil layers have been excavated, any uncontaminated soils should be returned to their correct order and position as much as possible.
- Any site restoration will only be done in consultation with the Environment Team.
- Any photos of the spill or the cleanup that were taken can also be uploaded to the report.

5.3.6 Waste and decontamination

- When away from Scott Base, use the bags provided in the spills kits and store waste in spill trays or other additional containment if available. Remember to weigh down any light waste materials to prevent loss, but place any weighting material on top of the bags rather than in them.
- Request containment from Scott Base immediately if resources at hand are sufficient.
- At Scott Base use empty drums for contaminated snow or soil.
- Follow the instructions in the Waste Management Manual.

- All waste contaminated with hazardous substances must be property separated, packaged and labelled for return to New Zealand.
- Any shipment of contaminated soil or water must be notified to the Logistics Manager to allow biosecurity clearance and special disposal to be arranged,
- Provide facilities and materials for staff decontamination.
- Arrange for screening of personnel by facility medical staff.
- Arrange cleaning and maintenance of equipment used.
- Contact the Environment team to order replacement supplies and equipment for future spill response as necessary.

5.3.7 Monitoring

The Environment Team will determine what, if any post spill monitoring is required. Any spill monitoring in the Scott Base area will be recorded. Monitoring may be planned over several years, depending on the nature of the spill. Monitoring could include:

- Hydrocarbon analysis of soil samples;
- More detailed mapping of spills;
- Sending of soil or water samples for analysis and/or other testing in laboratories in New Zealand;
- Studies of vegetation recovery; and
- Photographic monitoring.

5.3.8 Reporting

Spills of any size or substance and all near misses must be reported using the online incident reporting form. In completing the form, be sure to clearly identify:

- The type and volume of material spilled;
- The impact of the spill (e.g. the size and nature of area affected);
- The response actions undertaken;
- An estimate of the volume of material recovered;
- For all spills occurring in the Scott Base area, a map should be appended to the form, showing the exact location of the spill.
- For all spills occurring away from Scott Base, detailed sketch maps with GPS reference points must be provided.
- Any photos of the spill or the cleanup that were taken can also be uploaded to the report

5.3.9 Follow Up

The Environment Team will complete the follow up investigations for fuel spills. They will ensure that international requirements for spill reporting are met. Further information may

need to be requested from those involved in spill response if the incident Report Form does not have sufficient detail.

For spills greater than 200 litres (or other incidents considered significant or of use to other operators), Antarctica New Zealand is required to lodge a COMNAP Oil Spill Report with the COMNAP Secretariat within 30 day of the incident occurring (Appendix 2).

Any further information regarding investigation of the incident and any follow up actions should be lodged with the COMNAP Secretariat within 90 days of the incident occurring. There is no set format for this. Instead copies of appropriate spill investigation reports or other documentation should be provided to the COMNAP Secretariat. This will allow key lessons to be shared with other operators.

In the event of a major spill, a copy of any press release or publically released statement on the incident should be provided to COMNAP members through the COMNAP Secretariat. In addition to reporting of spills, Article 17 of the Protocol on Environmental Protection to the Antarctic Treaty requires annual reporting on contingency manuals. This reporting part of the annual exchange of information which should be lodged with the Antarctic Treaty Secretariat before 1 October each year.

Appendix 1: Spill Response

Declared when Scott Base is notified of:

- Fuel, chemical, hazardous or biological substance spills
- REFER to Scott Base Fuel and Other Substance Spill Prevention and Response Plan
- Gain technical advice and support from the Policy, Environment and Safety team.

IMMEDIATE ACTIONS: Assess & Contain

- Scott Base Comms Operators:
  - > Collect accurate information
  - > Inform Scott Base Duty Supervisor

RESPONSE:

Incident Management Team:

- Liaise with Environmental Advisor (Christchurch) & refer to Spill Response Manual
- Gain information on the spill:
  - > Type of spill [gas, fluid, hazardous material, biological material, UN Number etc]
  - > Area impacted by spill [in m^2]
  - > Volume of spill
  - > Type of terrain/environment the spill has impacted
  - > Has the spill been stopped? Is it actively spilling?
  - > Location: physical description and / or GPS
- Number of people on site?
- Resources required:
  - > Number of people required to mitigate the spill
  - > Type and quantity of resources required to stop the spill
  - > Type of clean-up required – gain advice from the Environmental Advisor before beginning clean up
- Site safety:
  - > Brief all response personnel on known information
  - > Ensure adequate PPE is worn
  - > Assign a team leader to manage the site
- Consider stopping other field movements for a period of time
- Consider requesting mutual aid – Antarctica New Zealand to remain Lead Agency for spill response

RECOVERY:

- Liaise with Environmental Advisor to develop a recovery plan
- Prepare personnel and provide clear briefing on the plan and detail safety precautions
- Prepare Scott Base Engineering department to handle returned material
- Prepare to handle contaminated PPE & clothing
- Prepare to have back up clothing on site if required
- Liaise with Logistics Manager to expedite required resources through the cargo stream
- Christchurch Coordination Centre should manage media enquiries and liaise with MFAT

Appendix 2: COMNAP Spill Report Form

OIL SPILL REPORT

TO: COMNAP Secretariat (for National Operators)

FROM: (Name, address, fax or e-mail of contact person)

OPERATOR: (operator lodging the report)

1. STATION/VESSEL: (General location of spill)
2. TIME AND DATE SPILL OCCURRED:
3. SPILL LOCATION: (Specific location of spill, e.g. name of building and/or area, latitude/longitude of vessel)
4. WEATHER CONDITIONS: (Weather conditions at time of spill and impact of weather conditions on subsequent response action)
5. OPERATION UNDERWAY WHEN SPILL OCCURRED: (Fuelling, defueling, transfer, transport, other)
6. TYPE OF FUEL SPILLED: (Diesel, lubricating oil, hydraulic oil, etc)
7. AMOUNT SPILLED IN LITRES: (Best estimate of spill in litres)
8. AMOUNT RECOVERED: (State in litres the estimated amount recovered and per cent recovered of total litres spilled)
9. SPILL CAUSE: (Describe cause of incident, if known, e.g. structural failure, hose failure or leak, tank rapture, operator error, etc)
10. SLICK DESCRIPTION AND MOVEMENT: (Describe extent of slick if spill occurred or reached open water and the extent of movement)
11. AREAS DAMAGED: (Describe or name areas damaged, e.g. nature and extent of land damage, bodies of water affected, damage to wildlife or other natural resources, any threats still existing)
12. FUEL/WATER SAMPLES WERE/WERE NOT TAKEN: (State number of samples taken, if any, and what is being done with them)
13. CONTAINMENT METHOD USED: (Describe containment action taken, e.g. repaired damaged container, using another container, dyking, damming, diverting, boom deployment, other)
14. SPILL REMOVAL METHOD USED: (Describe clean-up measures taken - i.e. absorbent, skimming, pumping, excavating, type of container used, etc. Also describe: disposal or retrograde plans)
15. PERSONNEL INVOLVED IN SPILL REMOVAL: (Describe typical number of personnel involved at each stage of the response activity)
16. ADDITIONAL COMMENTS: (Use this space to report what measures have been taken to prevent recurrence of a spill, i.e. repairs made, removal of faulty equipment, changes in procedure, etc)

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