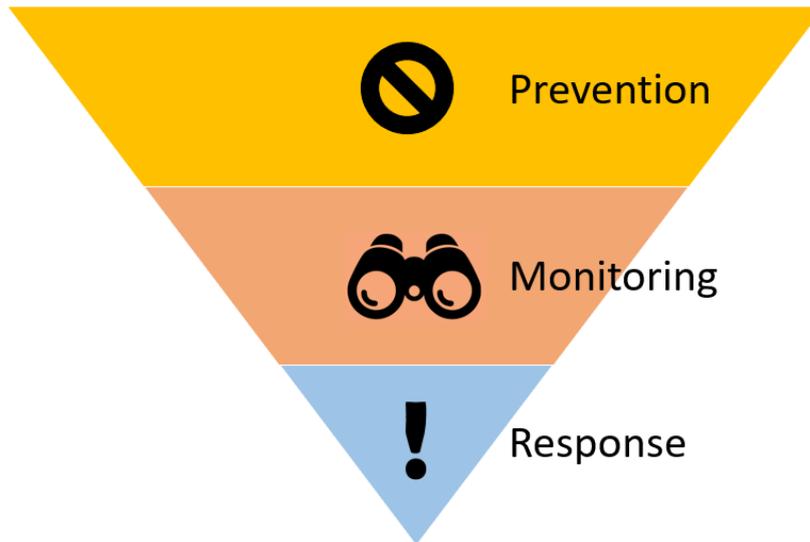


Antarctica New Zealand



Biosecurity System Manual

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1. Purpose

The purpose of this Biosecurity Manual is to provide an overview of Antarctica New Zealand's biosecurity system which aims to prevent the unintended introduction of non-native species and disease to Antarctica or New Zealand through our operational activities.

2. Context

Biological invasions are amongst the most significant threats to biodiversity worldwide. Biological invasions of non-native species threaten native species habitat and survival, and are responsible for major changes to ecosystem structure and functioning. Despite Antarctica's isolation and harsh climatic conditions, invasions are a serious risk to the region.

Rapid climate change occurring in certain regions of Antarctica increases the risk of establishment of non-native species from outside of Antarctica. For example, areas of ice-free ground on the Antarctic Peninsula are increasing due to ice loss, creating new and viable habitats for non-native species to colonise. In addition to the introduction of species from outside Antarctica, cross-contamination between ice-free areas including isolated nunataks, or between different marine areas, also threaten the biological and genetic diversity of the Antarctic Conservation Biogeographic Regions (see appendix 1).

Infectious disease is a major cause of mortality for wild animals worldwide. The introduction of pathogens to Antarctic wildlife may arise from two main sources: a) migratory species that disperse over great distances between the Antarctic and other areas (for example, albatrosses, polar skuas, giant petrels, Arctic terns, elephant seals, Antarctic fur seals); or b) through human activity (scientific and associated logistic activities, construction, tourism, fisheries, etc.). A broad variety of pathogens and infectious diseases have been reported in seabirds in Antarctica and the Sub-Antarctic. Human activities in Antarctica and the Southern Ocean, including science, logistics, construction, tourism, fisheries, and recreational activities are increasing. This increases the risk of unintentional introductions of organisms and disease to Antarctica from areas outside of the region in addition to between distinct biogeographic regions of Antarctica. It is important to note that there are endemic viruses, bacteria, parasites, and fungi in Antarctica that play essential roles in natural ecosystem functioning. Non-native species may compete with, or predate on these endemic pathogens, with climate change making it easier for invasive species to establish.

Antarctic Treaty Parties recognise the importance of reducing the risk of unintentionally introducing non-native species to the region and have stipulated this as a priority issue through Annex II of the 1991 Protocol on Environmental Protection to the Antarctic Treaty (among other key agreements), the Committee for Environmental Protection's (CEP) 5-year work plan and Climate Change Response Work Programme.

New Zealand is an active nation within Antarctic governance fora, and Antarctica New Zealand strives to demonstrate leadership and best practice across all activities. Antarctica New Zealand is firmly committed to the biosecurity of New Zealand, Antarctica, and the Southern Ocean, and aims to manage biosecurity risks to prevent the introduction of non-native species, materials, or diseases to Antarctica, New Zealand, or within regions of Antarctica (see *Environmental Management System (EMS) Design Manual* for Objectives and Targets).

3. Scope

Antarctica New Zealand's organisational *Biosecurity Policy* covers the movement of all personnel and cargo to and from New Zealand and Antarctica and between sites within Antarctica (Figure 1), and states that through our operations we aim to:

- Conserve Antarctic biodiversity and intrinsic values by preventing the unintended introduction of non-native species and diseases to Antarctica

- Avoid the movement of species or diseases within Antarctica, especially from one Antarctic Conservation Biogeographic Region to another
- Protect New Zealand’s unique environment from introduced non-native species and diseases.

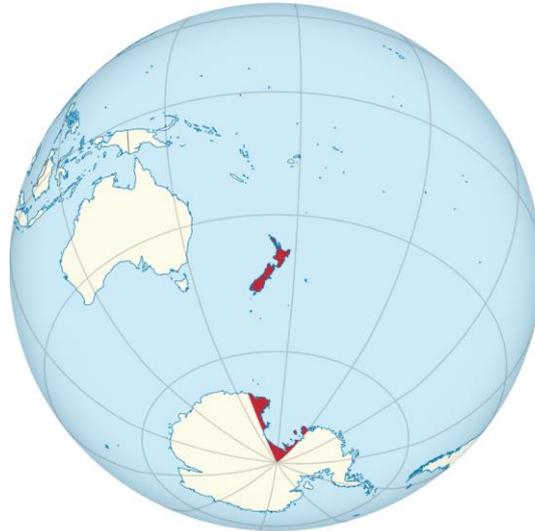


Figure 1. Geographical scope of Antarctica New Zealand's biosecurity system (includes New Zealand, our operational area in the Ross Sea region, as well as the ocean in between).

Our biosecurity system includes several core EMS documents (Figure 2) and many related documents and sources (Table 1).

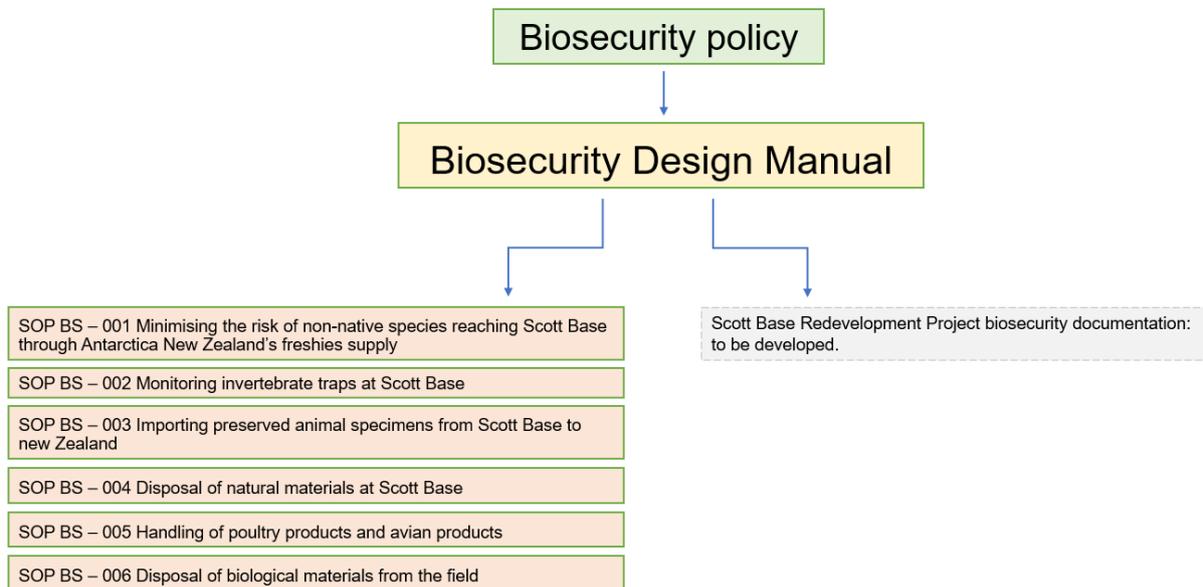


Figure 2. Biosecurity core document map.



Table 1. Antarctica New Zealand's biosecurity (and related) documentation. All references to these documents are italicised throughout the manual.

Section of this manual	Related documents and sources
2. Context	Antarctica New Zealand's Biosecurity Policy Biosecurity 2025 Direction Statement for New Zealand's Biosecurity System
4. Legal requirements and key stakeholders	Protocol on Environmental Protection to the Antarctic Treaty, 1991, Annex II, Conservation of Flora and Fauna Antarctica (Environmental Protection) Act, 1994 Biosecurity Act, 1993 Hazardous Substances and New Organisms Act, 1996 International Code for Ships Operating in Polar Waters (Polar Code), 2017, International Maritime Organisation
5. Roles and Responsibilities	Environmental Management System Design Document
6. Definitions	CEP Non-Native Species Manual (2019) The introduction of non-native species to Antarctica - Antarctic Environments Portal Antarctic Wildlife Diseases - Antarctic Environments Portal Bergstrom (2022). Maintaining Antarctica's isolation from non-native species
7. Biosecurity groups	Internal Antarctica New Zealand Biosecurity Group Terms of Reference External Biosecurity Committee Terms of Reference
9. Risk	Risk Management Reference Guide Organisational Risk Register Risk bowtie for inter-continental transfer of non-native species Risk bowtie for intra-continental transfer of non-native species
9.2 Prevention, monitoring, and response	CEP 5-Year Work Plan COMNAP/SCAR Checklists for supply chain managers of National Antarctic Programmes
9.3 Import permits for biological samples returning to New Zealand	Guidelines for collecting samples in Antarctica and returning them to New Zealand Import Health Standards (MPI website)
9.4 Supplier requirements and sustainable procurement	Sustainable Procurement Policy Environmental Sustainability Checklist for Suppliers Supplier Information Antarctica New Zealand (antarcticanz.govt.nz)
9.3.5 Clothing and personal belongings	Environmental Code of Conduct
9.3.9 Aircraft	Environmental guidelines for helicopter operations in the Ross Sea region
9.3.11 Fresh foods	SOP BS – 001 Minimising the risk of non-native species reaching Scott Base through Antarctica New Zealand's freshies supply
9.3.12 Poultry products	SOP BS – 005 Handling of poultry and avian products
9.3.13 Disposal of biological and natural materials from the field	SOP BS – 004 Disposal of natural materials at Scott Base SOP BS – 006 Disposal of biological materials from the field
9.4.1 Health, safety, and environment (HSE) incident reporting	HSE Incident Reporting Monitoring Data
9.4.2 Scott Base trapping system	SOP BS – 002 Monitoring invertebrate traps at Scott Base 2006 CEP Non-native species workshop report (Christchurch, New Zealand)
9.4.3 Invertebrate identification and long-term data	SOP BS – 003 Importing preserved animal specimens from Scott Base to New Zealand Non-native species monitoring data Newman, J., Poirot, C., Roper-Gee, R., Leihy, R. I., & Chown, S. L. (2018). A decade of invertebrate colonization pressure on Scott Base in the Ross Sea region. <i>Biological Invasions</i>, 20(9), 2623-2633.
9.5.1 Coordinated incident management system (CIMS)	Critical Incident Management System Manual (CIMS)
10. Scott Base Redevelopment	SBR Project Biosecurity Management Procedures Construction environmental management plan (CEMP) Greenstar Submission Guidelines SBR Biosecurity Stakeholder Workshop Report



4. Legal requirements and key stakeholders

Several national and international legal requirements exist in the context of Antarctica New Zealand’s biosecurity system. Compliance with these requirements is achieved in collaboration with key external stakeholders that either have biosecurity expertise, influence our biosecurity system, or have a mandate to enforce biosecurity related legislation (see Table 2).

Table 2. Biosecurity legislation and relevant stakeholders.

Legislation	Related stakeholders
Protocol on Environmental Protection to the Antarctic Treaty, 1991, Annex II, Conservation of Flora and Fauna	<ul style="list-style-type: none"> • Ministry of Foreign Affairs and Trade (MFAT) • Committee for Environmental Protection (CEP) • United States Antarctic Programme (USAP) and other National Antarctic Programmes • Council of Managers of National Antarctic Programmes (COMNAP) • Antarctic research community, including the Scientific Committee on Antarctic Research (SCAR)
Antarctica (Environmental Protection) Act, 1994 – gives effect to the 1991 Protocol on Environmental Protection at the New Zealand domestic level	<ul style="list-style-type: none"> • Ministry of Foreign Affairs and Trade (MFAT) • Department of Conservation (DOC)
Biosecurity Act, 1993	<ul style="list-style-type: none"> • Ministry for Primary Industries (MPI)
Hazardous Substances and New Organisms Act, 1996	<ul style="list-style-type: none"> • Ministry for the Environment (MfE) • Environmental Protection Agency (EPA)
International Code for Ships Operating in Polar Waters (Polar Code), 2017, International Maritime Organisation	<ul style="list-style-type: none"> • New Zealand Defence Force (NZDF) • USAP and other National Antarctic Programmes • COMNAP

5. Roles and responsibilities

Refer to [Environmental Management System Design Manual](#).

6. Definitions

Biosecurity: Controls (prevention, monitoring and response) to prevent or reduce the risk of transferring non-native species and diseases outside natural past or present dispersal ranges through unintentional human activity.

Disease¹: Any harmful deviation from the normal structural or functional state of an organism, including infectious diseases caused in a host by infection from animal parasites, bacteria, fungi, or viruses.

Non-native species that can cause disease include:

- Parasites (internal and external)
- Viruses

¹ Risk related to human disease is dealt with under our Health and Safety system. See Risk 1 “Biological Hazards” in the [organisational risk register](#) and the [Christchurch Infectious Disease Plan](#) for information on issues such as COVID-19 risk management.



- Bacteria
- Fungi

Non-native species: An organism occurring outside its natural past or present range and dispersal potential, and whose presence and dispersal in Antarctica is due to unintentional human actions (*2019 CEP Non-native species manual*).

Non-native species may include:

- Vertebrates (e.g., rats, mice)
- Invertebrates (e.g., spiders, flies, insects)
- Plants
- Fungi (e.g., mould)
- Parasites
- Bacteria
- Viruses
- Archaea
- Protists

Pathway: The geographical movement of vectors e.g., movement between Antarctica and New Zealand, or movement between regions of Antarctica.

Range: The geographical area within which a species can be found.

Vector: The entity that transports non-native species or disease from one location to another e.g., aircraft, ship, fresh food, cargo, scientific equipment, personal clothing, etc (*Bergstrom, 2022*).

7. Biosecurity groups

To effectively deliver on the biosecurity objective and targets (see EMS Design Manual) and reduce our biosecurity risks, Antarctica New Zealand takes a collaborative approach at both the organisational and external stakeholder levels.

Antarctica New Zealand formed an internal Biosecurity Group in 2009 to lead the development and review of standard biosecurity practices and procedures, coordinate information sharing on biosecurity measures across the organisation and identify areas for continual improvement (see Appendix 2 for the Biosecurity Group Terms of Reference).

Antarctica New Zealand also formed a Biosecurity Committee with MPI and DOC in 2006 to discuss, review, and support our biosecurity system (see Biosecurity Committee Terms of Reference). The group aims to meet annually, subject to stakeholder availability and internal needs (e.g., projects like the SBR may require more frequent engagement with stakeholders).

8. Risk

Antarctica New Zealand considers the introduction of non-native species and diseases to Antarctica, and within regions of Antarctica, as critical risks under the Risk Management Framework. Two types of critical biosecurity risk have been identified:

1. **Inter-continental risk pathway** – transferring non-native species and diseases between New Zealand (or elsewhere around the globe) and Antarctica. See Risk 23 on the *Organisational Risk Register and the risk bowtie for inter-continental risk*.
2. **Intra-continental risk pathway** – transferring non-native species and diseases between regions within Antarctica. See Risk 24 on the *Organisational Risk Register and the risk bowtie for intra-continental risk*.



It is important to note that levels of risk are not the same across all regions of Antarctica. The Ross Sea region has experienced very little warming as a result of climate change as compared to other regions. This means that the inter-continental risk profile for non-native species introductions to the Ross Sea region will be different to other, more climatically sensitive regions in Antarctica, such as the Antarctic Peninsula and the sub-Antarctic Islands.

Non-natives species have unique risk profiles. For example, the highest risk organisms for the Ross Sea region are more likely to be microorganisms (including viruses, bacteria etc), lichens, and mosses – especially from high alpine regions in New Zealand, or other Antarctic regions where organisms are cold-weather adapted and thus more able to survive in Antarctic conditions. Some microorganisms can utilise overwintering strategies or remain dormant until more viable temperatures allow for further propagation and establishment. There are also sites in Antarctica that serve to buffer extreme environmental conditions and temperatures, making it easier for introduced species to survive (e.g., beneath the snow, or in ponds and lakes). The introduction of non-native marine species also poses a significant risk to the Antarctic and New Zealand marine environments. For example, Antarctic seaweeds have been shown to survive and grow at temperatures found in the sea around New Zealand.

In 2018, Antarctica New Zealand undertook a pathway analysis for the transfer of non-native species and diseases between New Zealand and Antarctica, and within regions of Antarctica (see Appendix 3). A more comprehensive biosecurity risk assessment will be undertaken during the SBR project.

8.1 Risk vectors

Antarctica New Zealand’s operations have the potential to transfer non-native species and diseases through a variety of activities. Risk vectors include:

- Clothing and personal belongings
- Scientific equipment and samples (e.g., biological samples)
- Cargo (e.g., plant and machinery, pellets, containers)
- Vehicles
- Aircraft
- Shipping
- Fresh foods and poultry products
- Mail

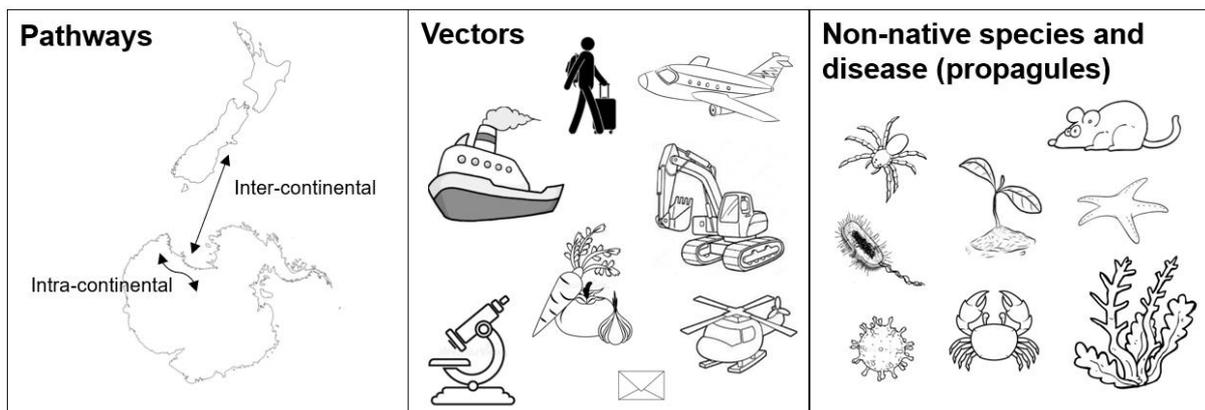


Figure 3. Biosecurity risk pathways, vectors and propagules.

8.2 Risk reduction: Prevention, monitoring, and response

Biosecurity procedures that provide guidance for all National Antarctic Programmes to reduce their biosecurity risks have been developed at the international level. These include:

1. The *2019 CEP Non-native species manual*, which takes a prevention, monitoring, and response approach to the management of non-native species in Antarctica.
2. The *COMNAP/SCAR guide for supply chain managers of National Antarctic Programmes*, which considers biosecurity risks along the supply chain and provides biosecurity checklists for risk reduction.

Antarctica New Zealand's biosecurity system follows these international guidelines by taking a hierarchy approach to biosecurity (Figure 4). This means that our highest priority is to put controls in place to **prevent** the introduction of non-native species and disease. After prevention, comes **monitoring**. Monitoring is important as it gives an indication of how well our prevention controls are working and helps us to understand our environmental impacts. **Response** is the final port of call and is required when our prevention controls have failed, and non-native species or disease have been unintentionally introduced.

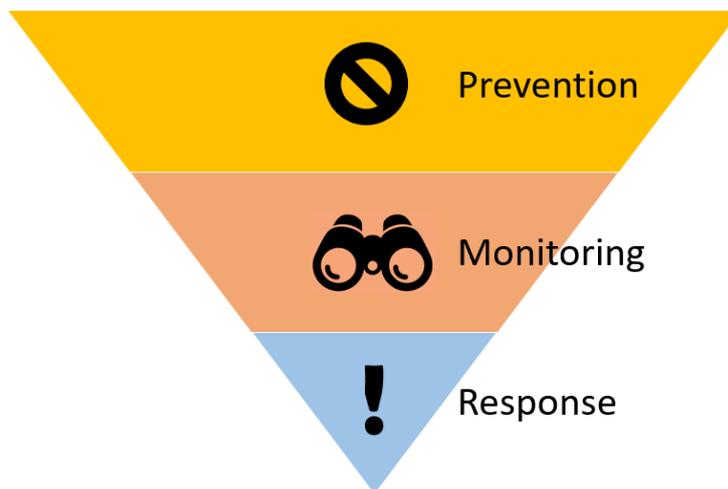


Figure 4. Biosecurity hierarchy

9. Prevention

Prevention controls are the most effective means of minimising the risk of unintentional introduction of non-native species or disease. This section outlines the prevention controls we have in place to reduce our biosecurity risks.

9.1. Education and training

Biosecurity education and training is provided to all staff, visitors, contractors and event personnel who travel to Antarctica through our programme. Training and education programmes include:

- Biosecurity training within ANZAP– for all new staff including Scott Base and Christchurch staff.
- Role specific training – all those who have biosecurity specific roles and responsibilities (see the EMS Design Manual Appendix 1 for full list of roles and responsibilities).
- E-Learning – all event personnel complete an online biosecurity e-learning module prior to deployment.
- Handover and on the job training – on arrival to Scott Base.
- In-brief – all event personnel receive an in-brief, which includes a review of the MFAT Notification Permit outlining all environmental conditions such as biosecurity expectations.

9.2. Event planning and Environmental Impact Assessment (EIA)

Antarctica New Zealand is required to prepare an EIA for its activities in Antarctica and all event personnel are required to prepare their own EIA for the activities that Antarctica New Zealand supports.

An EIA outlines the intended activity, identifies the potential environmental impacts, and describes how those impacts will be avoided or mitigated to the fullest extent possible. This includes impacts related to the unintentional introduction of non-native species and/or disease, and how those biosecurity risks will be mitigated.

Once completed, an EIA is submitted to MFAT for assessment and approval. A notification of approval is issued by the Minister, which may include additional conditions to further regulate the activity. Ministerial conditions include (among others) cleaning all equipment, gear and personal clothing before travelling to Antarctica, and undertaking the same level of cleaning before moving between areas within Antarctica.

9.3. Import permits for biological samples returning to New Zealand

In accordance with the *Biosecurity Act (1993)*, the importation of plants, animals, and/or plant or animal products to New Zealand requires an Import Health Permit. This also applies to materials that could harbour organisms, such as samples of soil or water. The Antarctica New Zealand Christchurch Warehouse is an approved MPI transitional facility.

9.4. Supplier requirements and sustainable procurement

Antarctica New Zealand's *Sustainable Procurement Policy* ensures that the activities, services and products that we procure are assessed against their ability to support our environmental objectives, including our biosecurity objectives. To achieve this, we work with our suppliers to ensure that goods are free from non-native species and disease. Our biosecurity requirements are communicated to suppliers on our website (Figure 5) and in our *Environmental Sustainability Checklist for Suppliers*.

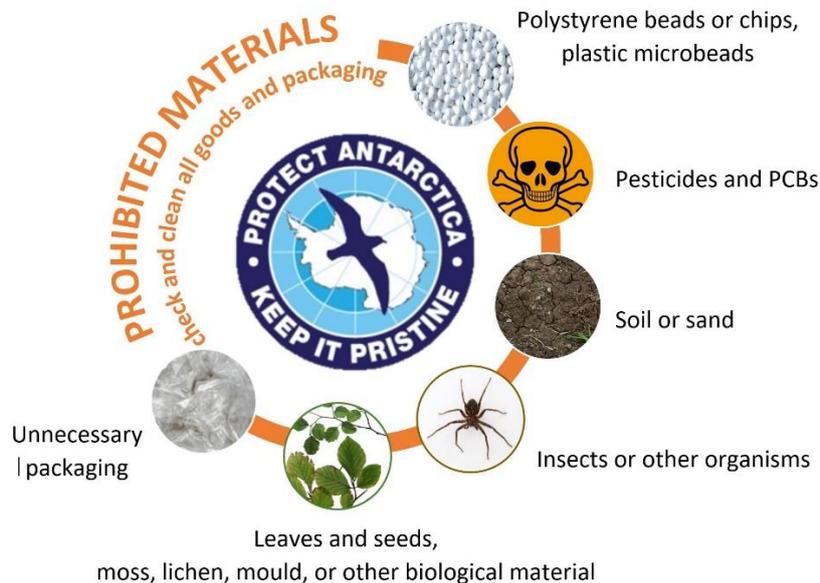


Figure 5. Diagram for suppliers of prohibited materials.

9.5. Clothing and personal belongings

All staff, visitors, contractors and event personnel who travel to Antarctica through our programme are required to self-check and clean all of their clothing and personal belongings pre-deployment and when moving between different Antarctic locations. Self-directed inspections are covered in the biosecurity e-learning module and in



the *Environmental Code of Conduct*. Before event personnel board a helicopter in Antarctica, they must fill out a helicopter boarding pass, which includes a tick box for biosecurity checks.

9.6. Scientific equipment

Researchers must inspect and clean all scientific equipment before it is transported to Antarctica. Researchers and Scott Base staff are also responsible for ensuring that all scientific equipment is clean before it enters the field. If equipment is moving between sites in Antarctica, for example an instrument is used to sample 5 different sites within the McMurdo Dry Valleys, it is expected that the researcher will clean or sterilise the equipment between sites. This will be outlined as a condition in their EIA Notification Permit from MFAT (see Section 9.2).

9.7. Cargo (including vehicles and machinery)

All cargo is inspected for non-native species before being transported to Antarctica. Cargo is stored at the Antarctica New Zealand Christchurch warehouse, which is a transitional facility. The warehouse has several biosecurity controls in place, including:

- Rodent and insect traps
- Hard surfaced areas for staging cargo, which are kept clean and dust free
- Clean area for inspecting freshies
- Biosecurity trained warehouse staff

9.8. Aircraft

Planes

The New Zealand Defence Force provides assets and resources (e.g., military aircraft and personnel) to support Antarctica New Zealand's logistics and operations. New Zealand also participates in a joint logistics pool with the United States and other Ross Sea partners. This means that Antarctica New Zealand has limited capacity to manage the biosecurity practices and procedures of aircraft travelling to and from Antarctica. We rely on these partners to comply with the relevant international biosecurity legislation (see Section 3).

Helicopters

Antarctica New Zealand contracts a New Zealand helicopter operator for helicopter operations in Antarctica. Helicopters often travel to multiple sites in one day. Special attention should be given to the amount of dirt carried on the helicopter skids, and as far as is practicable, dirt should be removed to avoid the transportation of non-native species between sites. At visited sites, there are usually designated helicopter landing areas (see the *Environmental guidelines for helicopter operations in the Ross Sea region*). This helps to contain the overall environmental footprint and impacts of helicopter operations, including reducing the number of sites where potential non-native species invasions could occur.

9.9. Shipping

Antarctica New Zealand does not operate a ship but through the joint logistics pool are able to transport cargo via ship through the United States Antarctic Programme. Antarctica New Zealand relies on the United States to comply with international maritime law, including legislation that is relevant to biosecurity (see Section 3). The NZDF vessel, the HMNZS Aotearoa, ran a successful resupply mission to Scott Base during the 2021-22 season. The HMNZS Aotearoa is likely to play an important role in the resupply of Scott Base and in the Ross Sea region into the future.

9.10. Fresh foods

One of the highest risks of transference of non-native species to Antarctica is through transporting fresh foods (freshies) including fruit and vegetables to Scott Base. Freshies may contain soil, insects, slugs, caterpillars, invertebrate eggs, mould and other microorganisms (e.g., fungi and bacteria). There is a Standard Operating Procedure (*SOP BS- 001 Minimising the risk of non-native species reaching Scott Base through Antarctica New Zealand's freshies supply*) to minimise and continue to reduce the risk of transferring non-native species to



Antarctica through Antarctica New Zealand's freshies process, and to ensure that all of the staff involved understand their roles in minimising such risks.

9.11. Poultry products

Poultry meat has been linked to the transmission of avian diseases, such as Newcastle disease, to other live poultry. There is therefore a risk of transporting avian diseases to the Antarctic if poultry products (e.g., chicken and turkey meat) are not safely managed and disposed of.

Previous reports have shown that Antarctic penguins have been exposed to poultry diseases such as Infectious Bursal Disease Virus (IBDV). This has the potential to result in mass mortality events among Antarctic avian species.

Antarctica New Zealand takes a precautionary approach to the management of poultry in Antarctica. *SOP BS – 005 Handling of poultry and avian products* aims to minimise the risk of transferring diseases via poultry products, and to ensure that all of the staff involved understand their roles in minimising these risks. This includes ensuring our suppliers are aware of our requirements, and not taking poultry products to any field events near to bird colonies.

9.12. Disposal of biological and natural materials from the field

Biological and natural materials that do not naturally occur at Pram Point can be returned to Scott Base both unintentionally (e.g., on the equipment and clothing of field event gear and personnel, or on cargo or personnel arriving at Scott Base from New Zealand), or intentionally (e.g., as scientific samples). This elevates the risk of spreading non-native species and disease between Antarctica and New Zealand, and between regions of Antarctica. There are two SOPs for the correct disposal of both biological (*SOP BS – 006 Disposal of biological materials from the field*) and natural materials at Scott Base (*SOP BS – 004 Disposal of natural materials at Scott Base*).

Biological materials may include:

- Penguin guano
- Seal faeces
- Other biological materials including blood and fur

Natural materials may include:

- Rocks
- Rocks/gravel that contain organic matter (e.g. lichen, algae, soil, etc.)
- Soil/Sand/Scoria (including fuel contaminated soil/sand/scoria)
- Organic matter from within Antarctica (e.g. samples, material found in or on equipment)
- Organic matter from outside Antarctica
- Water



10. Monitoring and surveillance

Antarctica New Zealand implements a biosecurity monitoring and surveillance programme to assess and verify the impact of the New Zealand programme's activities on native flora and fauna. The objectives of the monitoring programme are:

1. To ensure our activities comply with all relevant legislation, as outlined in section 3
2. To ensure the biosecurity policy, objective and practices remain effective, leading to continuous improvement in our biosecurity system
3. To contribute to New Zealand's knowledge base on the state of the Ross Sea region environment, in particular identifying changes to the Antarctic environment caused by the unintentional introduction of non-native species or disease
4. To contribute to the protection of scientific and other essential values of Antarctica.

10.1 Health, safety & environment (HSE) incident reporting

All biosecurity incidents, near misses and hazards are reported using the HSE incident reporting system. The Policy, Environment and Safety (PES) team maintain a spreadsheet of all environmental reports (*HSE Incident Reporting Monitoring Data*), including those related to biosecurity.

10.2 Scott Base trapping system

Antarctica New Zealand implemented a biosecurity surveillance programme at Scott Base in the summer of 2005/06, due to a large incursion of *Drosophilid* flies in beverage packaging. The design of the surveillance programme was informed by the outcomes of a *CEP non-native species workshop* held in Christchurch in 2006. It now follows the guidelines in the *CEP Non-native species manual* and the *COMNAP and SCAR Checklists for supply chain managers developed*. The surveillance programme includes a system of invertebrate traps in high risk areas at Scott Base. There is an SOP that outlines the procedures and responsibilities for maintaining the trapping system (*SOP BS – 002 Monitoring invertebrate traps at Scott Base*).

10.3 Invertebrate identification and long-term data

All non-native invertebrates that are unintentionally introduced to Antarctica are returned to New Zealand for species identification by MPI (unless the insect is damaged, in which case it is disposed of in the biohazardous waste stream). *SOP BS – 003 Importing preserved animal specimens from Scott Base to New Zealand* outlines the process of containing and mailing a non-native invertebrate specimen from Scott Base to New Zealand.

Antarctica New Zealand now have a long-term dataset, beginning in 2006, of all the non-native species introductions that have occurred through Antarctica New Zealand's activities. In 2018, the PES team and colleagues published a journal article, sharing a decade's worth of data on invertebrate introductions to Scott Base: [A decade of invertebrate colonization pressure on Scott Base in the Ross Sea region](#).

10.4 Reporting

All non-native species data is reported to MFAT annually, either in an interim or full environmental performance report. These reports highlight Antarctica New Zealand's performance and compliance against Antarctica New Zealand's Initial Environmental Evaluation (IEE). Non-native species data is also reported internally to the SLT as a part of the HSE Dashboard update.



11. Response

Response becomes necessary when prevention controls have failed, resulting in the unintentional introduction of non-native species or diseases to Antarctica or the Southern Ocean. There are four key steps to consider within biosecurity response:

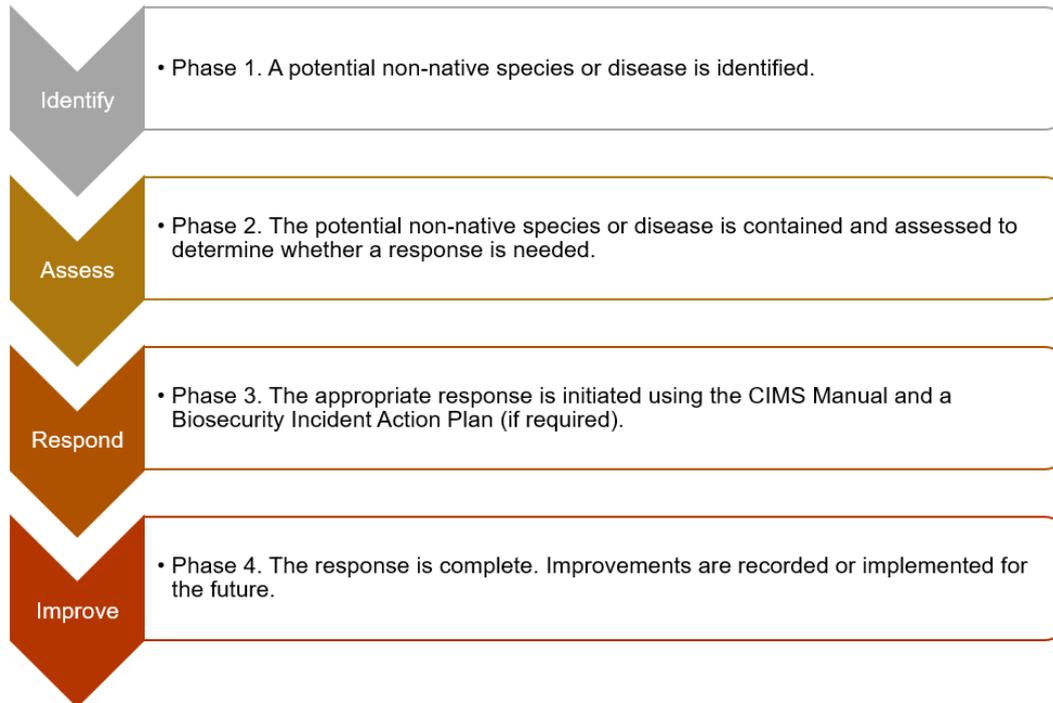


Figure 6. Phases of biosecurity response (for reference see <https://www.mpi.govt.nz/dmsdocument/31917-The-New-Zealand-Government-Biosecurity-Response-Guide>)

11.1 Coordinated Incident Management System (CIMS)

Experience has shown that biosecurity response can be complex, impacting on a range of organisational functions and processes. The Antarctica New Zealand *CIMS Manual* outlines the coordinated response approach to take depending on the significance of the incident (see Appendix 3). CIMS provides a framework for developing a Biosecurity Incident Action Plan, which is developed by the Scott Base Leadership Team in consultation with the PES team.

Response controls are also embedded within the suite of biosecurity SOPs mentioned throughout this document, for example how to respond when non-native species are discovered at Scott Base in the freshies supply.

12. Scott Base Redevelopment (SBR)

The redevelopment of Scott Base offers a unique opportunity to upgrade our biosecurity facilities and practices. Simultaneously, the SBR project will increase our biosecurity risks in the short-term due to a significant increase in materials and people being transported to Scott Base during the construction phase.

12.1 Early works biosecurity procedures

The purpose of the *Biosecurity Management Procedures* document is to minimise the risk of transferring non-native species to Antarctica through Scott Base Redevelopment (SBR) cargo, and to document biosecurity cleaning and checking procedures for contractors and suppliers. The *Biosecurity Management Procedures* document details a procedure for varying cargo types as anticipated through the 2021/22 season. The procedure contains checklists for suppliers and contractors to use for packing, and sending cargo. A biosecurity



risk assessment for the SBR project will be undertaken in consultation with MPI in 2022 and an associated Biosecurity Management Plan developed ahead of the 2022/23 season.

12.2 New Scott Base design

The new Scott Base has been designed to accommodate biosecurity cleaning, checking and containment facilities for inbound and outbound, inter-continental and intra-continental movements. The new Scott Base will include biosecurity facilities in the following locations throughout base:

- Building A for freshies checks.
- Field in/out facilities including stations for final checks and cleaning of equipment ahead of deployment.
- The cargo delivery bay contains a double door containment system to trap any potential incursions. This area contains equipment to check, clean and trap non-native species on cargo arriving at Scott Base, and for cleaning cargo for return to New Zealand.

12.3 Biosecurity workshop (2020)

In 2020, Antarctica New Zealand hosted a workshop with external stakeholders to gain expert advice regarding biosecurity during the SBR and ongoing operations. The outcomes are outlined in the *SBR Biosecurity Stakeholder Report*.

12.4 Construction Environmental Management Plan (CEMP)

The *CEMP* details the environmental objectives and requirements to minimise the environmental impacts as described and assessed in the [Comprehensive Environmental Evaluation](#) (CEE) for the SBR project. Specific plans and standard procedures for activities and their associated environmental impacts will be detailed in a suite of environmental sub-plans including a Biosecurity Management Plan (see 4.1.3. of the *CEMP*).

12.5 Green Star

Green Star is a third-party sustainable design standard being used to guide the design and construction of the new Scott Base. This will enable Antarctica New Zealand to credibly demonstrate the project's sustainability performance against existing, externally verified standards.

The following credits related to biosecurity are required to be given effect through the *CEMP* (detailed in the *Green Star submission guidelines*):

- Credit 7 - Responsible construction practices: To reward responsible construction practices that manage environmental impacts, enhance staff health and wellbeing, and improve sustainability knowledge on site.
- Credit 26 - Construction and demolition waste: To reward projects that reduce construction waste going to landfill by reusing or recycling building materials.
- Credit 27 - Environmental protection: To ensure projects are delivered in accordance with requirements of the Protocol on Environmental Protection to the Antarctic Treaty.
- Credit 28 - Biosecurity: To reward projects that protect the environment through biosecurity measures which address potential risks of construction and building operations.



Appendix 1: Antarctic Conservation Biogeographic Regions

<https://www.scar.org/antarctic-treaty/actm-papers/atcm-xxxv-and-cep-xv-2012/2838-atcm35-wp023/file/>

The Antarctic Conservation Biogeographic Regions (ACBRs) are regions of Antarctica that have been identified as biologically distinct. This means that species in one region may not have come into contact with species in another. The impacts of spreading disease and non-native species between these biologically distinct areas can therefore be highly detrimental to the local environment, as naturally occurring species have not adapted to coexist with novel organisms or disease.

Antarctica New Zealand primarily operates in two ACBRs – South Victoria Land and North Victoria Land, and with less frequent operations in the Transantarctic Mountain region.

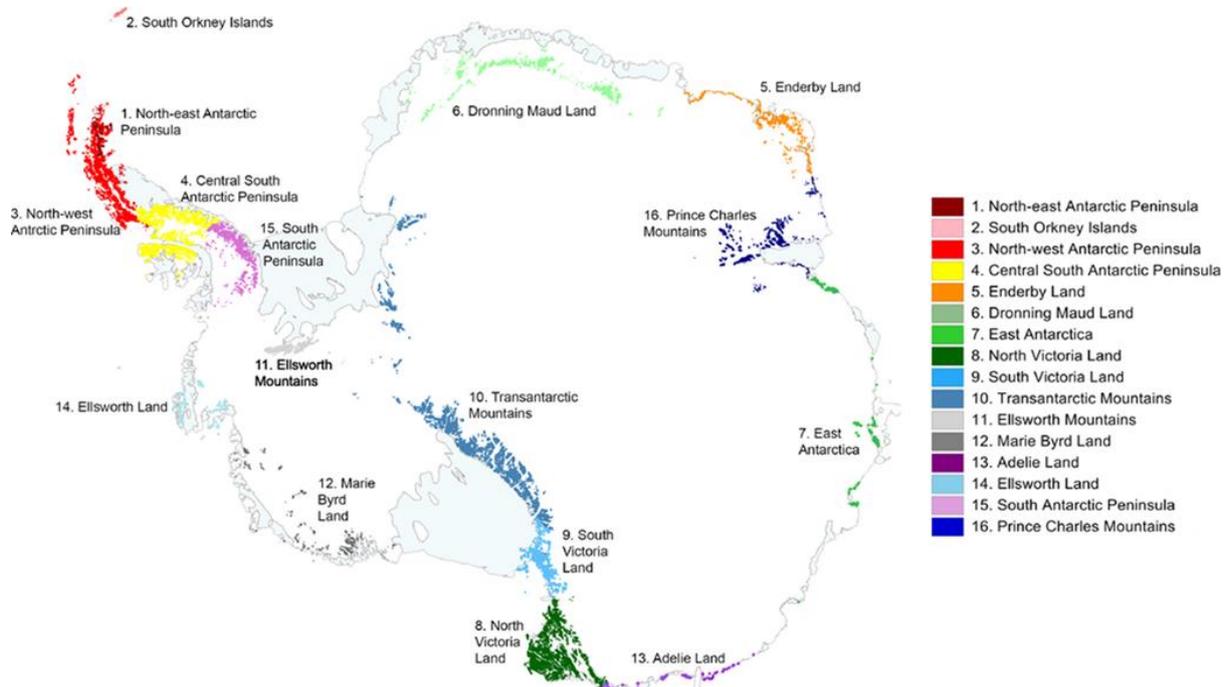


Figure 7. Antarctic Conservation Biogeographic Regions (ACBRs v2) (Terauds et al., 2016)

Antarctic species moved between sites within Antarctica have a high likelihood of survival. Species moved by humans, which establish at new locations, could have a detrimental effect on the local ecosystem and its scientific value. Part of the intention behind the Antarctic Conservation Biogeographic Area analysis shown on the map above is that “biosecurity measures between these ACBRs ...be developed to prevent biotic homogenization” (Terauds et al., 2012).

Research in the McMurdo Dry Valleys has shown great spatial heterogeneity of biota; even within species over small areas there is significant genetic variance (Waterhouse, 2001). Single habitats can have unique features, such as Lake Joyce, the only known Dry Valleys lake with crustaceans. This makes transfer of species very significant but often hard to detect. Based on genetic analysis it appears that transfer of moss between valleys may already have occurred.

Biota is not limited entirely to ice-free areas. Sub glacial lakes which have been isolated for millennia have been found to hold micro-organisms (Christner et al., 2014). Biological contamination when sampling such environments would immediately compromise their scientific value.

Appendix 2: Biosecurity Group Terms of Reference (internal)

Biosecurity Group: Terms of Reference

April 2022

<p>Context</p>	<p>Biological invasions are amongst the most significant threats to biodiversity worldwide. Biological invasions threaten native species habitat and survival, and are responsible for major changes to ecosystem structure and functioning. Despite Antarctica's isolation and harsh climatic conditions, invasions are a serious risk to the region and a Priority 1 issue in the Committee for Environmental Protection's (CEP) five year work plan (atcm42 ww005 e.pdf (ats.aq))</p> <p>With an increasing number of people visiting Antarctica, an increase in the diversity of activities undertaken there, as well as the locations visited; the introduction and establishment of non-native species is almost inevitable, with non-native species introductions within the Treaty area increasing in the past decade (Hughes et al., 2015). Effective management and mitigation of biosecurity risks is therefore fundamental for the protection of Antarctic and New Zealand ecosystems.</p> <p>Antarctica New Zealand's Biosecurity Group was formed in 2009 to develop, implement and manage practices and procedures to reduce the risk of transferring non-native species between New Zealand and Antarctica, Antarctica and New Zealand, and within Antarctica, from all the New Zealand programmes' activities.</p> <p>Antarctica New Zealand also formed a Biosecurity Committee with the Ministry of Primary Industries (MPI) and the Department of Conservation (DOC). MPI work to prevent harmful pests and diseases from entering New Zealand and manage systems to detect and respond to incursions and established pests. As experts in biosecurity, Antarctica New Zealand maintains a close relationship with MPI to minimise the risk of transferring non-native species.</p> <p>In addition, a close relationship is held with Christchurch based MPI who manage the border for goods moving in and out of Christchurch and assist with invertebrate species identification from Scott Base.</p>
<p>Purpose</p>	<p><i>To conserve Antarctic biodiversity and intrinsic values by preventing the unintended introduction to the Antarctic region of species not native to that region, and the movement of species within Antarctica from one biogeographic zone to any other.</i></p> <ul style="list-style-type: none"> * To discuss, review, and support work and improve coordination of operations within Antarctica New Zealand on Antarctic biosecurity issues using the collective experience and skills across the organisation. * To facilitate best practice at Antarctica New Zealand when sending and returning cargo (people, clothing, samples, cargo and waste) from New Zealand to Antarctica and vice versa to reduce the risk of introducing non-native species to either Antarctica or New Zealand. * To develop and maintain a relationship with the Ministry of Primary Industries (MPI) and other key agencies (e.g. Department of Conservation, Southern Lakes Helicopters) in both Christchurch and Wellington.
<p>Quality</p>	<p>The Biosecurity Group (Antarctica New Zealand) will continue to develop, implement and maintain policies and procedures that are practical and reduce the risk of non-native species moving to, from or within Antarctica. These procedures will be reviewed regularly and will be responsive to new information from risk assessments, reporting, technology and science.</p> <p>All group members will champion biosecurity, supporting compliance and proactive behaviour from all programme participants to prevent non-native species introductions and minimise risks.</p> <p>Responsibilities for specific projects are identified within the improvements plan.</p>



	Biosecurity roles and responsibilities of Scott Base staff in particularly the winter chef, cargo handlers, field support staff, and field trainers are outlined in the Environmental Management System Design Manual: Environmental Management System Design Manual.docx
Resources	<p>Internal biosecurity documents held in Sharepoint: Biosecurity - g) By Subactivity</p> <p>Biosecurity SOPs: SOPs Approved - g) By Subactivity</p> <p>Useful resources: CEP Non-native manual: 2019 Non-native Species Manual (ats.aq)</p> <p>Antarctic Environments Portal: www.environments.aq</p> <p>BAS Biosecurity Regulations: BAS-Biosecurity-Regulations.pdf</p> <p>Hughes, K. A., Lee, J. E., Tsujimoto, M., Imura, S., Bergstrom, D. M., Ware, C., ... & Bridge, P. D. (2011). Food for thought: risks of non-native species transfer to the Antarctic region with fresh produce. <i>Biological Conservation</i>, 144(5), 1682-1689.</p> <p>Hughes, K. A., Pertierra, L. R., Molina-Montenegro, M. A., & Convey, P. (2015). Biological invasions in terrestrial Antarctica: what is the current status and can we respond?. <i>Biodiversity and Conservation</i>, 24(5), 1031-1055.</p> <p>Huiskes, A. H., Gremmen, N. J., Bergstrom, D. M., Frenot, Y., Hughes, K. A., Imura, S., ... & Ware, C. (2014). Aliens in Antarctica: assessing transfer of plant propagules by human visitors to reduce invasion risk. <i>Biological Conservation</i>, 171, 278-284.</p> <p>Newman, J., Poirot, C., Roper-Gee, R., Leihy, R. I., & Chown, S. L. (2018). A decade of invertebrate colonization pressure on Scott Base in the Ross Sea region. <i>Biological Invasions</i>, 20(9), 2623-2633.</p> <p>Terauds, A., Chown, S.L., Morgan, F., Peat, H.J., Watts, D.J., Keys, H., Convey, P. & Bergstrom, D.M. (2012) Conservation biogeography of the Antarctic. <i>Diversity and Distributions</i>, 18, 726–741.</p> <p>Terauds, A. and Lee, J. (2016) Antarctic biogeography revisited: updating the Antarctic Conservation Biogeographic Regions. <i>Diversity and Distributions</i>, 22, 836-840.</p>
Time	The Biosecurity Group will meet at least once every six months and more often if required.

Appendix 3: 2018 Risk Assessment

Table 3. Risk summary for transfer of organisms from New Zealand to Antarctica (Source: 2018 biosecurity prevention and response plan - superseded by this manual).

Hazard Group	Likelihood of establishment	Consequences for receiving environment	Risk rating
Organisms in soil or other organic materials – microbes, algae or spores in soil, plant material, guano, human waste	Moderate to high – pathways are proven (soil introductions, sewage treatment failures), establishment is possible but hard to detect	High - Antarctica is a natural reserve with extreme scientific value. Human-induced changes could harm ecosystem function and would impact on science, environmental and intrinsic values.	Moderate to high
Pathogens and other micro-organisms associated with humans - diseases, viruses, bacteria and fungi associated with people and their waste	Moderate to high – pathways are proven e.g. sewage treatment failures, evidence of Antarctic animal exposure to human-associated pathogens		
Marine organisms – all marine organisms except pathogens	Low to moderate – hull and ballast in shipping (not directly controlled by Antarctica New Zealand), diving and sampling equipment. Little information regarding potential for establishment but marine species invasion common through the world		
Cold tolerant terrestrial invertebrates – polar and alpine invertebrates such as springtails, mites and small spiders	Moderate – little is known about the cold tolerance of most invertebrates but given the number of general invertebrate introductions which occur and the likelihood of Antarctic scientists working in other cold climates, entry and establishment is possible.		
Terrestrial macro-organisms – visible terrestrial organisms, mainly invertebrates, excluding cold tolerant species	Moderate to high: Pathways are already proven. Survival at Scott Base has occurred but establishment in the outdoor environment at Ross Island or elsewhere in the region is unlikely based on current information.		
Freshwater organisms – all freshwater organisms, except pathogens	Low – possible pathway is contaminated equipment but this is unlikely with good science practice	High – as above	Moderate
Viable seeds –all seeds that could be propagated	Low - proven pathways, e.g. tomato seeds in waste water treatment by-products, seeds on clothing, but low likelihood of exposure and establishment in the outdoor environment.	Low to moderate – in the unlikely event that plants establish, they would be relatively easily identified and unlikely to displace naturally occurring species.	Low



Table 4. Risk summary for transfer of organisms from Antarctica to New Zealand (Source: 2018 biosecurity prevention and response plan - superseded by this manual).

Type of transfer	Likelihood of establishment	Consequences for receiving environment	Risk rating
Pathogens	Moderate – evidence of diseases from other parts of the world have been found in Antarctic sea birds and mammals, so it is possible they could also transmit from Antarctica to New Zealand species, e.g. through guano or contamination of equipment	High – new diseases transmitted to native birds or marine mammals could have significant impacts on environmental, cultural and social values.	High
Marine organisms	Low to moderate – hull and ballast in shipping (not directly controlled by Antarctica New Zealand), diving and sampling equipment. Little information regarding potential for establishment but marine species invasion is common through the world	High – invasive marine species could have significant impacts on environmental, economic, cultural and social values	High
Terrestrial organisms (excluding pathogens)	Unknown	Low - lack of vascular plants and terrestrial vertebrates in Antarctica means that ‘pest’ species for New Zealand primary industry or native ecosystems are unlikely	Low

Table 5. Risk summary for transfer of organisms within Antarctica (Source: 2018 biosecurity prevention and response plan - superseded by this manual).

Type of transfer	Likelihood of establishment	Consequences for receiving environment	Risk rating
All	High due to pre-adaption to cold environment	All of Antarctica is a natural reserve with extreme scientific value, so that any human-induced changes to ecosystems harms its values.	High

Table 6. Determination of risk (Source: 2018 biosecurity prevention and response plan - superseded by this manual).

Likelihood	Low	Moderate	High
Consequence			
Low	Low	Low	Moderate
Moderate	Low	Moderate	High
High	Moderate	High	High



It is important to note that the above risk assessment and risk matrix are both outdated. See the *Risk Management Reference Guide* for the current risk matrix. As discussed in Section 8, a risk assessment for the SBR project will supersede the above assessment.

Table 7. Significance of potential biosecurity incidents (Source: CIMS manual).

Significance	Examples	Response
High	<ul style="list-style-type: none"> • Multiple observations of a species which could harm people (e.g. whitetail spiders) • Evidence of a non-native species establishing in the outside environment • Discovery of a mass mortality event in birds or mammals (i.e. suspected disease, which could be human introduced) 	Use CIMS
Moderate	<ul style="list-style-type: none"> • Large quantity of risk materials identified after transport to, from or within Antarctica (e.g. equipment or supplies with insects, eggs or larvae, guano, soil, fungi) • Large numbers of one or more insect species inside Scott Base or a field facility 	<p>For Antarctic incidents use CIMS (Scott Base)</p> <p>For Christchurch incidents follow Transitional Facility Operational Manual</p>
Low	<ul style="list-style-type: none"> • Already dead specimens of introduced species • Low numbers of individuals of an introduced species, which do not persist after immediate action • Small quantity of risk materials identified after transport to or within Antarctica (e.g. equipment or supplies with insects, eggs or larvae, guano, soil, fungi) 	Use HSE reporting system (investigation and preventative action planning)