

Management Plan For Antarctic Specially Protected Area No. 154 BOTANY BAY, CAPE GEOLOGY, VICTORIA LAND

Introduction

Botany Bay, Cape Geology is situated in the south western corner of Granite Harbour, southern Victoria Land (77°00'14"S, 162°32'52"E; Map A Inset 1 and 2). The Area is extremely rich botanically for such a high-latitude location and is one of the richest sites in the whole of continental Antarctica. There is a high diversity and abundance of lichens (at least 30 species) and mosses (9 species) with abundant growths of algae (at least 85 taxa). The Area also has a diverse community of invertebrates (collembola, mites, nematodes, rotifers) and a colony (in excess of 40 pairs) of South polar skua (*Catharacta maccormicki*). The Area is the type locality for the collembolan *Gomphiocephalus hodgsoni* Carpenter and the lichen *Caloplaca coeruleofrigida* Sochting and Seppelt.

In addition to the biological values described, the Area contains within it the remains of a rock shelter and associated artefacts of historical importance (from the British Antarctic Expedition 1910-1913), known as Granite House, designated as Historic Site and Monument (HSM) No. 67 in Measure 4 (1995).

Botany Bay, Cape Geology was originally designated in Measure 3 (1997) as Site of Special Scientific Interest (SSSI) No. 37, after a proposal by New Zealand, on the grounds that the Area is an extremely rich botanical refuge for such a high latitude location, with a lichen and moss species diversity and abundance that is unique for southern Victoria Land. The site was re-designated Antarctic Specially Protected Area (ASP) No. 154 in Decision 1 (2002). The Management Plan was revised and adopted in Measure 2 (2003) and Measure 11 (2008).

The primary reason for the designation of Botany Bay, Cape Geology as an Antarctic Specially Protected Area is to protect the Area's unusual ecological features and its exceptional scientific and historic values.

1. Description of values to be protected

In the Ross Sea region, areas of abundant mosses and lichens have been identified at Cape Bird, Ross Island (ASP 116), Beaufort Island (ASP 105), Canada Glacier in the Taylor Valley (ASP 131), Kar Plateau in Granite Harbour, Edmonson Point (ASP 165) and Cape Hallett (ASP 106). While these sites have a high vegetation ground cover and biomass, the diversity of species present is considerably lower than that found at Botany Bay.

Botany Bay is extremely rich botanically and is also one of the richest sites in the whole of continental Antarctica. The terrestrial lichen and moss flora of Botany Bay comprises one liverwort, nine mosses and at least 30 lichens (Annex 1). There are abundant growths of algae (at least 85 taxa), although the algal flora is not considered particularly

unusual for the locality. The Area also has a large population of invertebrates (collembola, mites, nematodes, rotifers) and a colony (in excess of 40 pairs) of South polar skua (*Catharacta maccormicki*). No other birds are known to breed in the Area. The Area is the type locality for the collembolan *Gomphiocephalus hodgsoni* Carpenter and the lichen *Caloplaca coeruleofrigida* Sochting and Seppelt.

The structure and development of the moss and lichen communities at Botany Bay is similar to that found more than 10° of latitude further north. The Area contains by far the most southerly record of the liverwort *Cephaloziella varians*, the lichen *Turgidosculum complicatulum* and the mosses *Bryoerythrophyllum recurvirostrum* and possible *Ceratodon purpureus*. Most are about three degrees of latitude further south than the nearest record to the north in the Terra Nova Bay region.

The boulder beach has rich populations of both epilithic and endolithic lichens. Of great significance is the size (up to 15 cm diameter) of some lichen thalli. At high latitudes, macrolichens are rare and scattered. Botany Bay is exceptional as there is an abundance of several macrolichens including *Umbilicaria aprina*, *Xanthoria elegans*, *Physcia caesia* and several forms of microlichens.

The rich flora is the result of a comparatively warm microclimate produced by the unusual sheltered nature of the Area being protected from the southerly and easterly polar winds but fully open to the brightest sun to the north. Different species assemblages or associations within the Area are determined by nutrient input from the skua colony, the occurrence of the source of water, whether solely from snowmelt from the ice field or snowfall, or from some form of melt stream, and by the regularity and speed of water flow and the type of substrate, especially whether it is loose gravel or solid rock.

Under the influence of a changing climate (both global and local), increases in volume and shifts in location of water flow through or over the vegetation would inevitably lead to change in the vegetation distribution, diversity and abundance. The Area would be ideal for assessing the impacts of climate change on continental Antarctic terrestrial ecosystems dominated by moss and lichen vegetation.

In addition to the biological values described, the Area contains within it the remains of a rock shelter and associated artefacts of historical importance, known as Granite House. The shelter was constructed using a natural hollow in the rocks, with walls built up from granite boulders and a roof of seal skins in 1911 for use as a field kitchen by Griffith Taylor's western geological party during the British Antarctic Expedition of 1910-1913. It was enclosed on three sides with granite boulder walls and used a sledge to support a seal-skin roof. The stone walls of the shelter have since partially collapsed and numerous artefacts have disappeared. In January 2012 parts of the walls remained, but the roof had collapsed and the seal skins had blown some way down the beach. The shelter still contains corroded remnants of tins, a seal skin and some fabrics.

The shelter and associated artefacts are vulnerable to disturbance and therefore access is managed with an Access Zone within the Area, which is subject to access restrictions. A tent site used by the Western Geological Party under Griffith Taylor, is identifiable as a flat gravel area with a number of stones that were used to weigh down the tent valance. This area is outside the Access Zone and is subject to access restrictions.

The primary reason for the designation of Botany Bay, Cape Geology as an Antarctic Specially Protected Area is to protect the limited geographical extent of the ecosystem, the unusual ecological features, and the exceptional scientific and historic values of the Area. The vulnerability of the Area to disturbance through trampling, sampling, pollution or alien introductions, are such that the Area requires long-term special protection.

2. Aims and objectives

Management at Botany Bay aims to:

- avoid degradation of, or substantial risk to, the values of the Area by preventing unnecessary human disturbance to the Area;
- allow scientific research on the ecosystem and elements of the ecosystem in particular on lichen and moss species, algae, invertebrates and skuas while ensuring protection from over-sampling;
- allow other scientific research in the Area provided it is for compelling reasons which cannot be served elsewhere and which will not jeopardize the natural ecological system in the Area;
- preserve a part of the natural ecosystem of the Area as a reference area for future comparative studies;
- prevent or minimise the introduction to the Area of alien plants, animals and microbes;
- allow visits to the historic site Granite House, but under strict control by Permit;
- allow conservation visits to other historic sites, but under strict control by Permit;
- allow visits for management purposes in support of the aims of the Management Plan.

3. Management activities

The following management activities shall be undertaken to protect the values of the Area:

- Information on the location of the Area, stating special restrictions that apply, shall be displayed prominently, and a copy of this Management Plan shall be made available, at National Antarctic Programme stations that operate in the vicinity of the Area.
- Signs illustrating the location and boundaries, with clear statements of entry restrictions, shall be placed at appropriate locations on the boundary of the Area to help avoid inadvertent entry.
- Markers, signs or other structures (e.g. cairns) erected within the Area for scientific or management purposes shall be secured and maintained in good condition and removed when no longer required.

- The Area shall be visited as necessary, and no less than once every five years, to assess whether it continues to serve the purposes for which it was designated and to ensure that management and maintenance activities are adequate.
- National Antarctic Programmes operating in the Area shall consult together with a view to ensuring the above management activities are implemented.

4. Period of designation

Designated for an indefinite period.

5. Maps

Map A - Botany Bay, Antarctic Specially Protected Area No. 154: Topographic map.
Map specifications: Projection - Lambert conformal conic. Standard parallels - 1st 79° 20' 00" S; 2nd 76° 40' 00" S. Central Meridian - 162° 30' 00" E. Latitude of Origin - 78° 01' 16.211" S. Spheroid: WGS84.

Map B - Botany Bay, Antarctic Specially Protected Area No. 154: Access Zone (with Granite House and viewing area).
Map specifications are the same as those in Map A.

Map C - Botany Bay, Antarctic Specially Protected Area No. 154: Vegetation density, showing the distribution density of moss, lichen and algae within ASPA 154.
Map specifications are the same as those in Map A.

6. Description of the Area

6(i) Geographical coordinates, boundary markers and natural features

Cape Geology is situated in the south-western corner of Granite Harbour, southern Victoria Land, at 77°00'14"S, 162°32'52"E approximately 100 km north-west of Ross Island (Map A, Insets). The Area consists of raised boulder beach terraces, weathered rocky steppes and irregular rock platforms around Cape Geology, rising rapidly to the south to include a well-defined elevated cirque containing a small ice field. The ice field provides a regular supply of meltwater over the Area. The Area faces north and is well protected from strong winds. The intensity of the solar radiation is increased by reflection from the sea ice that normally remains in Granite Harbour until the end of January. Consequently, the site has warmer than expected air temperatures sometimes reaching almost 10°C in January. The most extensive vegetation occurs on the sheltered raised beach terrace known as Botany Bay.

The bedrock geology at Cape Geology has been described as a porphyritic grey biotite-granite, with phenocrysts of orthoclase of reddish colour, casting the weathered rock with a reddish tinge.

The boundaries of the Area include the water catchment and encompass the elevated cirque from the small ice field down to the coastline (Map A). The northwest boundary of the Area is marked by a brass plaque in a boulder along the shoreline (M1,

77°00'19"S, 162°31'53"E) 400 m southwest of Cape Geology. The west boundary is defined by a line extending first 260 m south southeast from M1 to a large boulder (marked by a cairn) with terrier bolt (M2, 77°00'27" S 162°33'08" E) at an elevation of 118 m on the ridge above the campsite; thence the boundary extends 250 m up this ridge to a point at 162 m elevation marked by an iron tube with bamboo pole. The west boundary extends a further 300 m up this ridge to a large pointed rock at 255 m elevation (77°00'40"S, 162°31'46"E) near the edge of the permanent ice field. The boundary then extends 150 m south across the ice field to the west edge of a prominent line of exposed rock and moraine in the southwest corner of the Area at 325 m elevation. The south boundary follows this line of rock east until the exposure is buried by the ice-field, thence southeast across the ice field for 500 m to the edge of a second and more prominent exposure at an elevation of just over 400 m (M3, 77°00'59"S, 162°33'22"E). The boundary follows the upper edge of this exposure and then crosses the ice field southeast to an elevation of approximately 325 m where the ice-free eastern boundary ridge and the ice field converge, (77°01'16"S, 162°34'15"E). The east boundary follows the ridge crest for 1,550 m in a northeast direction to a low point on the ridge approximately 392 m (M4, 77°00'13"S, 162°36'10"E) where the east boundary turns to descend due north to the coast at the eastern extremity of the boulder beach of Botany Bay (M5, 77°00'12" S, 162°36'12" E). The mean high water mark of the coastline forms the northern boundary of the Area between M1 and M5.

The Area also supports an Access Zone and Restricted Zone (Map A and B). The Access Zone has been designated to allow access to Granite House while the Restricted Zone has been designated to protect the most extensive area of vegetation in the Area at Botany Bay. The density of moss, lichen and algae is highest in the Restricted Zone of Botany Bay (Map C) and has been protected to preserve part of the Area as a reference site for future comparative studies.

Under the Environmental Domains Analysis (Resolution 3, 2008) the Area is Environment S – McMurdo – South Victoria Land geologic. Environment Domain S includes known areas of abundant mosses and lichens at Cape Bird, Ross Island (ASPA 116), Beaufort Island (ASPA 105) and Canada Glacier in the Taylor Valley (ASPA 131).

6(ii) Access to the Area

Access to the Area is generally via helicopter with a designated helicopter landing site 60 m outside (77° 00' 20.8"S, 162° 31' 47.7"E; Map A-C) of the northwest boundary corner adjacent to the designated camp site. Access to the helicopter landing site should be from the open water/sea ice to the north of the Area (Map A and B). Overflight of the Area lower than 300 m (~1000 ft) above ground level is normally prohibited. When required for essential scientific or management purposes, transient overflight or landing may be allowed by Permit only. Overflight of the Restricted Zone lower than 300 m (~1000 ft) above ground level is prohibited.

Vehicles are prohibited within the Area and access shall be by foot. Access should preferably be from the designated camp site following the preferred corridor of the Access Zone, 10–20 m from the coast, which is relatively devoid of vegetation. Visitors shall not venture south of Granite House to the Restricted Zone, unless specifically authorised by Permit.

6(iii) Location of structures within and adjacent to the Area

The only structures known to exist in the Area are Granite House and the associated artefacts, the boundary survey mark at M1 and other boundary markers (i.e. cairns, iron tube markers). At the designated camp site, there is a large wooden platform with materials stored beneath and an automatic weather station is installed further down the beach.

6(iv) Location of other protected areas in the vicinity

Botany Bay lies within Antarctic Specially Managed Area (ASMA No. 2), McMurdo Dry Valleys. The nearest protected area to Botany Bay is ASPA 123 Barwick and Balham Valleys, 50km away in a southwest direction.

6(ii) Special zones within the Area

Restricted Zone

The most extensive area of vegetation occurs on the sheltered raised beach terrace known as Botany Bay. This embayment and a portion of the Area directly above Botany Bay is designated as a Restricted Zone in order to preserve part of the Area as a reference site for future comparative studies. The remainder of the Area, which is similar in biology, features and character, is more generally available for research programmes and sample collection.

The western boundary of the Restricted Zone is defined by a line from a marker (iron tube in rock, 20 metres from mean high water mark, elevation 8 m) at the west side of Botany Bay (Map A), extending southwest for 170 m up to a second iron tube marker on the crest of the adjacent ridge (87 m). This boundary extends 100 m to a third iron tube and a cairn (98 m), thence 50 m to a large flat rock in the centre of the main flush (marked '1' on Map A). The southern boundary of the Restricted Zone extends from the flat rock in the flush in a straight line 820 m to the first of two prominent boulders closely adjacent to each other, approximately in the middle of the ice-free slopes above Botany Bay (marked '2' on Map A at 165 m). The eastern boundary extends 300 m from there to a large rock at 135 m elevation (marked '3' on Map A), thence northeast down slope to the northeast boundary point (M5, 5 m). The northern boundary of the Restricted Zone is the mean high water mark of Botany Bay and is coincident with the northern boundary of the Area.

Access to the Restricted Zone is allowed only for compelling scientific or management (such as inspection or review) purposes, which cannot be served elsewhere in the Area.

Access Zone

In order to allow access to the rock shelter known as Granite House (HSM No. 67), an Access Zone has been designated to protect historic artefacts and plant communities within the vicinity, while also allowing access to the rock shelter.

The Access Zone is an area of 470 m by 20 m along the coast and by 80 m at the point that surrounds a rock ridge leading from the coast at Cape Geology to the rock shelter. The boundaries are marked on Map B. The shelter was constructed by members of the 1910-1913 British Antarctic Expedition, and used between December 1911 and January 1912 while the party carried out geological and biological exploration in the vicinity.

Access to the Access Zone may be allowed by Permit, subject to the conditions of this Management Plan.

7. Permit conditions

7(i) General permit conditions

Entry into the Area is prohibited except in accordance with a Permit issued by an appropriate national authority. Conditions for issuing a Permit to enter the Area are that:

- outside of the Restricted and Access Zones, access may be permitted only for scientific study of the ecosystem, or for compelling scientific reasons that cannot be served elsewhere, or for conservation at historic sites, or for essential management purposes consistent with plan objectives such as inspection or review;
- access to the Restricted Zone may be permitted only for compelling scientific or management reasons that cannot be served elsewhere in the Area;
- access to the Access Zone may be permitted for scientific, management, historical, educational or recreational purposes;
- the actions permitted will not jeopardise the ecological, scientific or historic values of the Area;
- any management activities are in support of the objectives of the Management Plan;
- the actions permitted are in accordance with the Management Plan;
- the Permit, or an authorized copy, shall be carried within the Area;
- a visit report shall be supplied to the authority named in the Permit;
- permits shall be issued for a stated period.

7(ii) Access to, and movement within or over, the Area

Vehicles are prohibited within the Area and all movement within the Area should be on foot. Helicopters are normally prohibited from landing within the Area. There is a designated helicopter landing site 60 m outside of the Area (77° 00' 20.8"S, 162° 31' 47.7"E Map A-C). Access to the landing site should be from the open water / sea ice to the north of the Area (Map B). Overflight of the Area lower than 300 m (~1000 ft) above ground level is normally prohibited. When required for essential scientific or management purposes, transient overflight or landing may be allowed. Conduct of such anticipated overflights or landings must be specifically authorised by Permit. Use of helicopter smoke grenades within the Area is prohibited unless necessary for safety, and all grenades should be retrieved. All helicopter landing or overflight lower than 300 m (~1000 ft) above ground level is prohibited within the Restricted Zone.

Access into the Area should preferably be from the designated camp site following the preferred corridor of the Access Zone, 10–20 m from the coast, which is relatively devoid of vegetation. Visitors should avoid walking on visible vegetation, or unnecessary disturbance to bird populations. Care should be exercised walking in areas of moist ground, where foot traffic can easily damage sensitive soils, plant and algal communities, and degrade water quality. Visitors should walk around such areas, on ice or rocky ground. Pedestrian traffic should be kept to the minimum necessary consistent with the objectives of any permitted activities and every reasonable effort should be made to minimise effects.

Access to the Access Zone should preferably be from the coast, following the ridge leading up to Granite House (Map B). An alternative route may be used from the designated camp site and helicopter landing site, along a preferred walking route 10-20 m from the coast, if sea-ice travel is unsafe (Map B). Unless specifically authorised by Permit, visitors are prohibited from entering the historic shelter, and are limited to access and viewing from the rock ridge designated for access from the coast in order to prevent damage to the rich vegetation within the Access Zone. Visitors shall not venture south of Granite House, unless specifically authorised by Permit. A maximum of 10 people is permitted to enter the Access Zone at any one time, and a maximum of 5 people is allowed in the viewing area overlooking Granite House at any one time (Map B).

7(iii) Activities which may be conducted within the Area

Activities which may be conducted within the Area include:

- compelling scientific research which cannot be undertaken elsewhere and which will not jeopardise the ecosystem of the Area;
- essential management activities, including monitoring;
- limited visits to the Access Zone for reasons other than science or management subject to the conditions described in this plan;
- activities with the aim of preserving or protecting the historic artefacts within the Area.

7(iv) Installation, modification, or removal of structures

No new structures are to be erected within the Area, or scientific equipment installed, except for compelling scientific or management reasons, and for a pre-established period, as specified in a Permit. All markers, structures or scientific equipment installed in the Area must be clearly identified by country, name of the principal investigator or agency, year of installation and date of expected removal. All such items should be free of organisms, propagules (e.g. seeds, eggs of invertebrates) and non-sterile soil, and be made of materials that can withstand the environmental conditions and pose minimal risk of contamination of the Area. Removal of specific structures or equipment for which the Permit has expired shall be a condition of the Permit.

7(v) Location of field camps

Camping within the Area is prohibited and should be at a site outside of the Area, 100 m from the northwest corner (Map A) and adjacent to the designated helicopter landing site. This camp site has been disturbed by previous activities and visitors should reoccupy these disturbed positions for tents and other facilities.

7(vi) Restrictions on materials and organisms which may be brought into the Area

In addition to the requirements of the Protocol on Environmental Protection to the Antarctic Treaty, restrictions on materials and organisms which may be brought into the Area are:

- No animals, plant material, microorganisms or non-sterile soil shall be deliberately introduced into the Area and precautions shall be taken to prevent against accidental introductions.
- No herbicides or pesticides shall be brought into the Area.
- Any other chemicals, including radio-nuclides or stable isotopes, which may be introduced for scientific or management purposes specified in the Permit, shall

be removed from the Area at or before the conclusion of the activity for which the Permit was granted.

- Fuel is not to be stored in the Area, unless required for essential purposes connected with the activity for which the Permit has been granted.
- All materials introduced into the Area shall be for a stated period only and shall be removed by the end of that stated period, and shall be stored and handled so that risk of their introduction into the environment is minimised.

7(vii) Taking of, or harmful interference, with native flora or fauna

Taking of, or harmful interference with, native flora and fauna is prohibited, except in accordance with a Permit issued in accordance with Annex II of the Protocol on Environmental Protection to the Antarctic Treaty. Where taking or harmful interference with animals is involved this should, as a minimum standard, be in accordance with the SCAR Code of Conduct for the Use of Animals for Scientific Purposes in Antarctica.

7(viii) The collection or removal of materials not brought into the Area by the permit holder

Material may be collected or removed from the Area only in accordance with a Permit and should be limited to the minimum necessary to meet scientific or management needs. Material of human origin likely to compromise the values of the Area, and which was not brought into the Area by the Permit Holder or otherwise authorised, may be removed from the Area unless the environmental impact of the removal is likely to be greater than leaving the material in situ: if this is the case the appropriate authority must be notified and approval obtained.

Unless specifically authorised by Permit, visitors to the Area are prohibited from interfering with or from handling, taking, damaging or attempting restoration of Granite House or any artefacts found within the Access Zone. Evidence of recent changes, damage or new artefacts observed should be notified to the appropriate national authority. Relocation or removal of artefacts for the purposes of preservation, protection or to re-establish historical accuracy is allowable by Permit.

7(ix) Disposal of waste

All wastes, including all human wastes, shall be removed from the Area.

7(x) Measures that may be necessary to continue to meet the aims of the Management Plan

Permits may be granted to enter the Area to:

- carry out monitoring and Area inspection activities, which may involve the collection of small samples or data for analysis or review;
- erect or maintain signposts, structures or scientific equipment;
- carry out management and conservation activities, especially those associated with the Historic Sites.

Any specific sites of long-term monitoring shall be appropriately marked on site and on maps of the Area. A GPS position should be obtained for lodgement with the Antarctic Data Directory System through the appropriate national authority.

To help maintain the ecological and scientific values of the isolation and relatively low level of human impact at the Area visitors shall take special precautions against

introductions. Of particular concern are microbial, animal or vegetation introductions sourced from soils from other Antarctic sites, including stations, or from regions outside Antarctica. To the maximum extent possible, visitors shall ensure that footwear, clothing and any equipment – particularly camping and sampling equipment – is thoroughly clean before entering the Area.

7(xi) Requirements for reports

The principal permit holder for each visit to the Area shall submit a report to the appropriate national authority as soon as practicable, and no later than six months after the visit has been completed.

Such visit reports should include, as applicable, the information identified in the recommended visit report form contained in Appendix 4 of the Guide to the Preparation of Management Plans for Antarctic Specially Protected Areas appended to Resolution 2 (1998).

If appropriate, the national authority should also forward a copy of the visit report to the Party that proposed the Management Plan, to assist in managing the Area and reviewing the Management Plan.

Parties should, wherever possible, deposit originals or copies of such original visit reports in a publicly accessible archive to maintain a record of usage, for the purpose of any review of the Management Plan and in organising the scientific use of the Area.

8. Supporting documentation

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Annex 1: Bryophytes and lichens of the Botany Bay-Cape Geology region, Granite Harbour, Victoria Land, Antarctica (from Seppelt et al., 2010).

HEPATICAЕ (Liverwort)

¹*Cephaloziella varians**

MUSCI (Moss)

*Bryoerythrophyllum recurvirostrum**

²*Bryum argenteum* var. *muticum*

Bryum pseudo triquetrum

*Ceratodon purpureus**

³*Didymodon brachyphyllus*

Grimmia plagiopodia

Hennediella heimii

Schistidium antarctici

⁴*Syntrichia sarconeurum*

LICHEN

Acarospora gwynnii

Amandinea petermannii

Buellia frigida

⁵*Buellia* cf. *papillata*

⁶*Buellia subfrigida*

Caloplaca athallina

Caloplaca citrina

Caloplaca coeruleofrigida

Caloplaca cf. *schofieldii*

Caloplaca saxicola

Candelariella flava

⁷*Carbonea vorticosa*

Lecanora expectans

Lecanora mons-nivis

Lecidea andersonii

Lecidea cancriformis

Lecidella sipleyi

⁸*Leproloma cacuminum*

Physcia caesia

Physcia dubia

Rhizocarpon geminatum

Rhizocarpon geographicum

Rhizoplaca melanophthalma

Rhizoplaca cf. *priestleyi*

Sarcogyne privigna

*Turgidosculum complicatulum**

Umbilicaria aprina

⁹*Xanthomendoza borealis*

Xanthoria elegans

¹ *Cephaloziella varians* has previously been referred to as *C. exiliflora* (Bednarek-Ochyra et al., 2000).

² *Bryum argenteum* var. *muticum* has previously been referred to as *Bryum subrotundifolium* (Ochyra et al., 2008).

³ *Didymodon brachyphyllus* has previously been referred to as *Didymodon gelidus* (Ochyra et al., 2008).

⁴ *Syntrichia sarconeurum* has previously been referred to as *Sarconeurum glaciale* (Ochyra et al., 2008).

⁵ *Buellia* cf. *papillata* has previously been referred to as *Buellia grimmiae*.

⁶ *Buellia subfrigida* has previously been referred to as *Aspicilia glacialis* (Seppelt et al., 1995) and *Hymenelia glacialis* (Ovstedal and Lewis Smith, 2001).

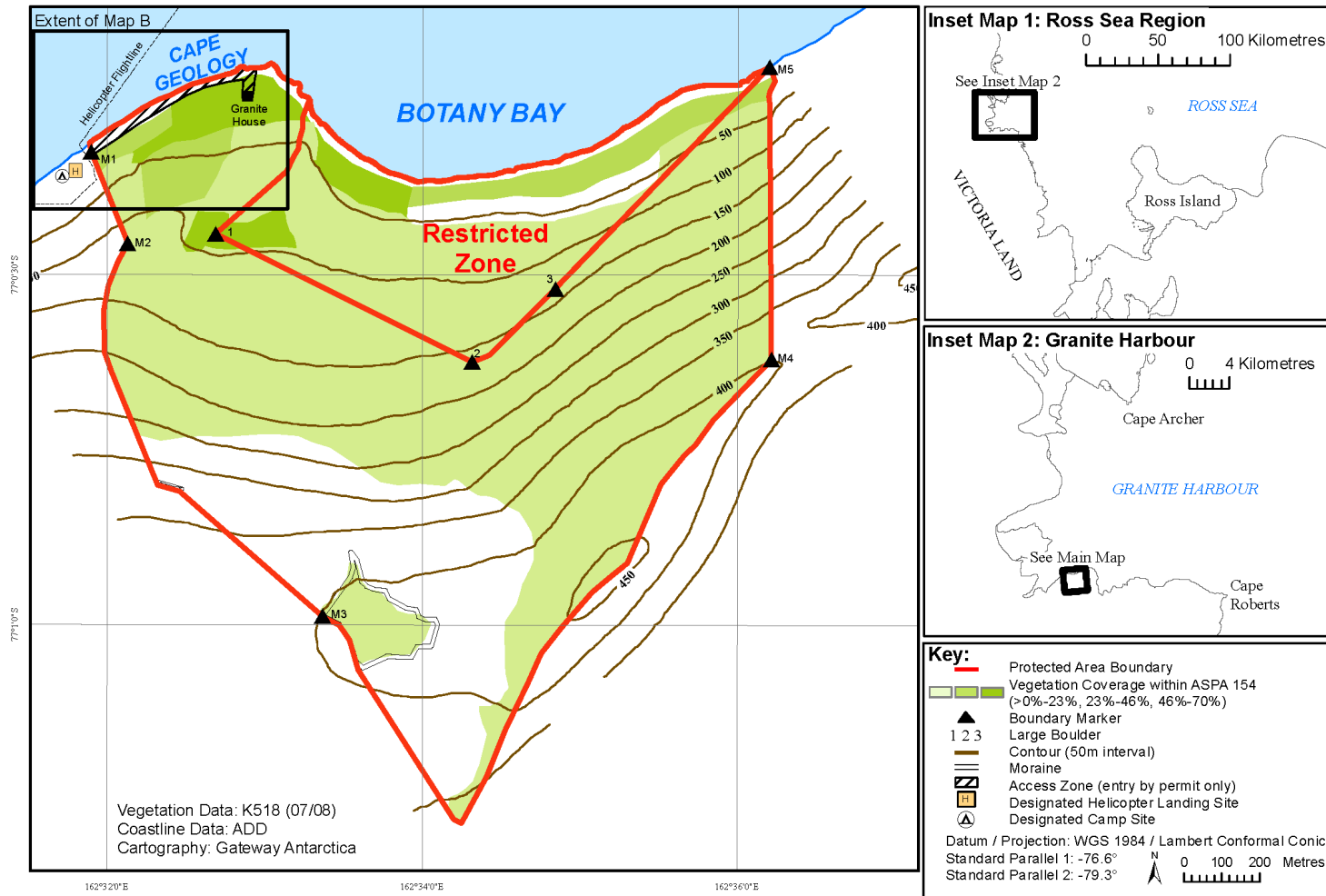
⁷ *Carbonea vorticosa* has previously been referred to as *Lecidea blackburnii* (Seppelt et al., 1995).

⁸ *Leproloma cacuminum* has previously been referred to as *Lepraria* sp.

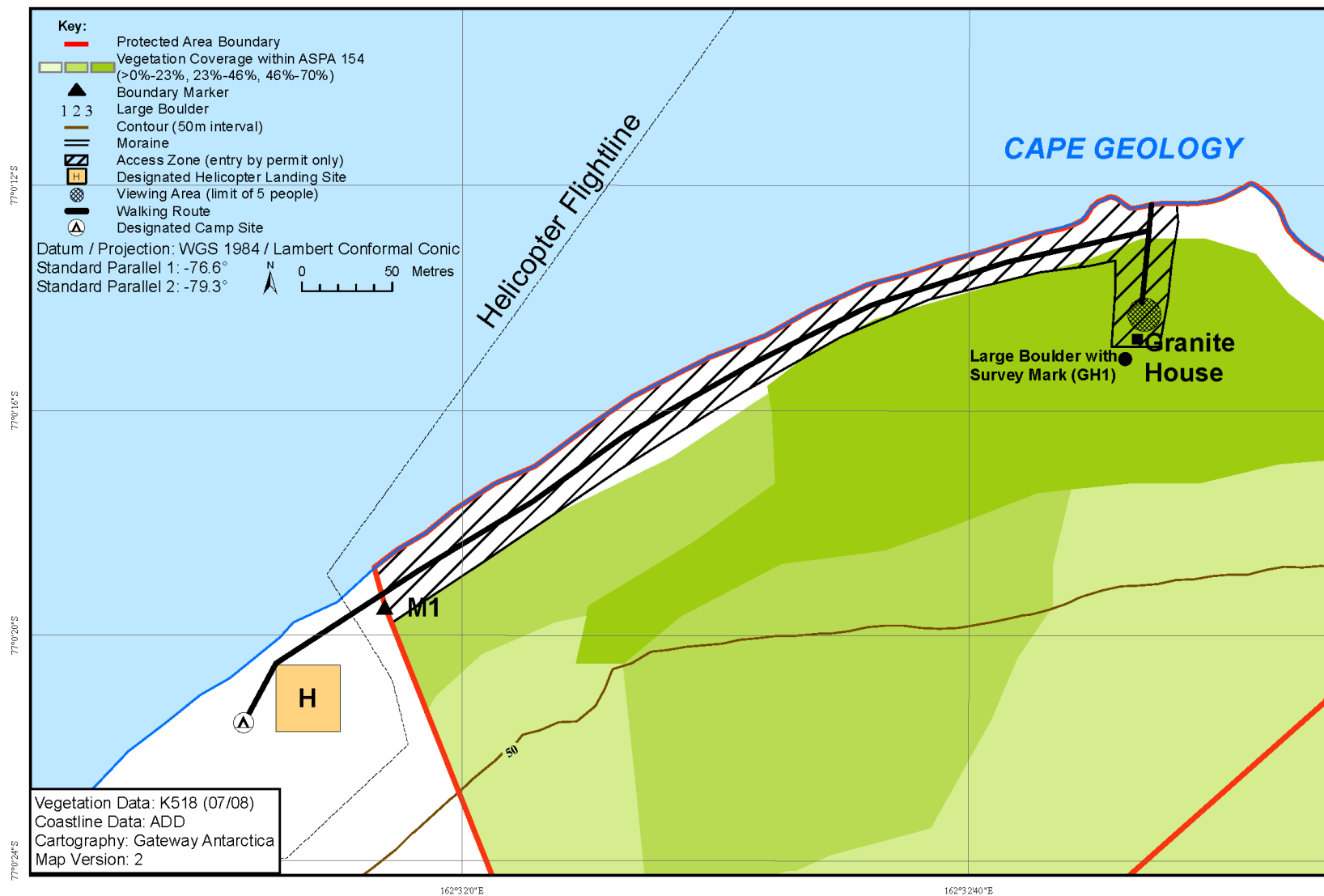
⁹ *Xanthomendoza borealis* has previously been referred to as *Xanthoria mawsonii* (Lindblom and Sochting, 2008).

* The most southerly record of these species.

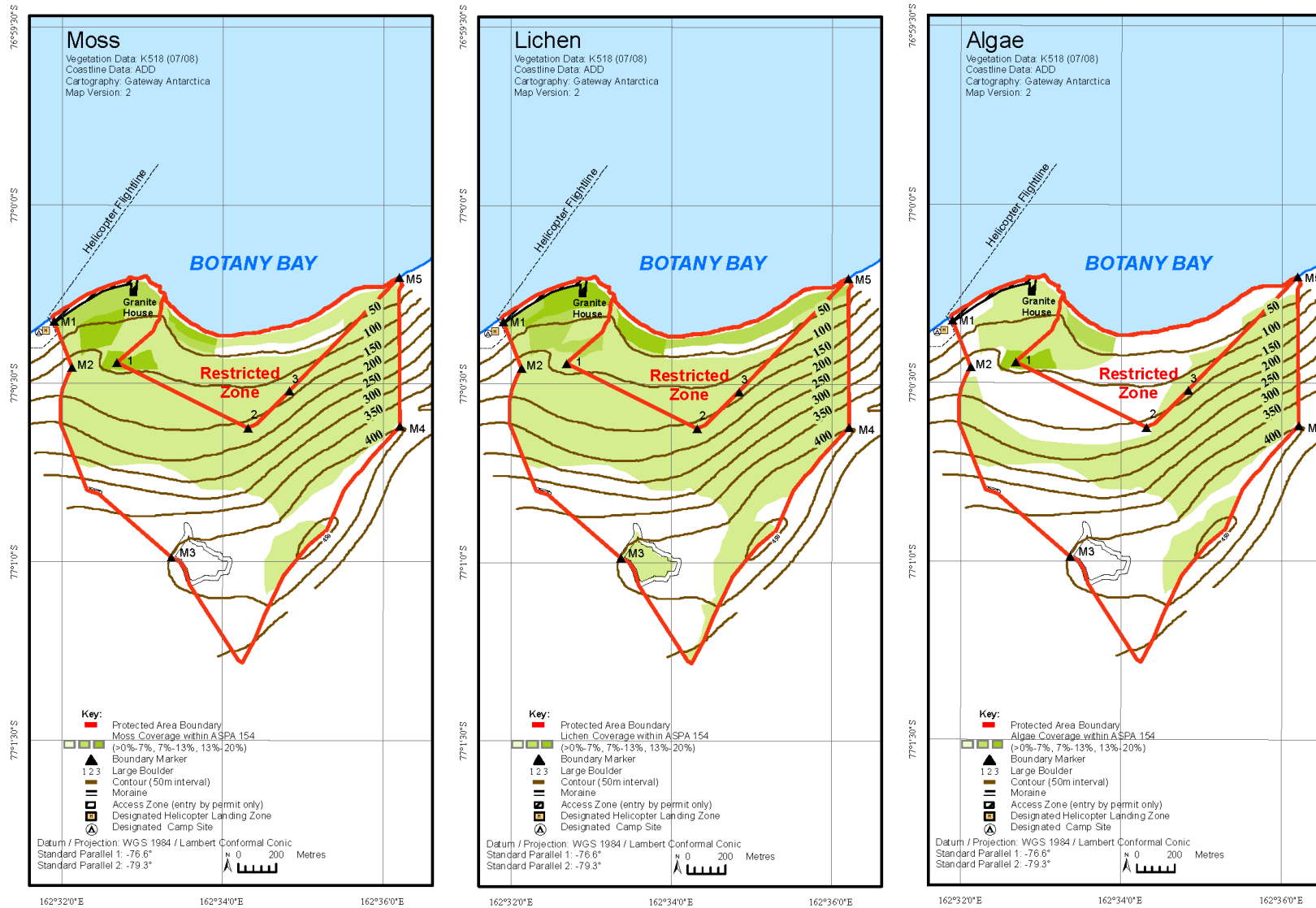
Map A – Botany Bay, Antarctic Specially Protected Area No. 154: Topographic Map



Map B – Botany Bay, Antarctic Specially Protected Area No. 154: Access Zone



Map C – Botany Bay, Antarctic Specially Protected Area No. 154: Vegetation Density



ASPA 154 Botany Bay, Cape Geology, Victoria Land

List of Labels Map A

Map A – Botany Bay, Antarctic Specially Protected Area No. 154: Topographic Map

Extent of Map B

Cape Geology

Helicopter Flightline

Granite House

Botany Bay

Restricted Zone

Vegetation Data: K518 (07/08)

Coastline Data: ADD

Cartography: Gateway Antarctica

Inset Map 1: Ross Sea region

See Inset Map 2

Ross Sea

Victoria Land

Ross Island

Inset Map 2: Granite Harbour

Cape Archer

Granite Harbour

See Main Map

Cape Roberts

Key

Protected Area Boundary

Vegetation Coverage within ASPA 154

Boundary Marker

Large Boulder

Contour (50m intervals)

Moraine

Access Zone (entry by permit only)

Designated Helicopter Landing Site

Designated Camp Site

Datum/Projection: WGS 1984/Lambert Conformal Conic

Standard Parallel 1: -76/6°

Standard Parallel 2:-79.3°

ASPA 154 Botany Bay, Cape Geology, Victoria Land

List of Labels Map B

Map B – Botany Bay, Antarctic Specially Protected Area No. 154: Access Zone

Key

Protected Area Boundary

Vegetation Coverage within ASPA 154

Boundary Marker

Large Boulder

Contour (50m intervals)

Moraine

Access Zone (entry by permit only)

Designated Helicopter Landing Site

Viewing Area (limit of 5 people)

Walking Route

Designated Camp Site

Datum/Projection: WGS 1984/Lambert Conformal Conic

Standard Parallel 1: -76/6°

Standard Parallel 2: -79.3°

Helicopter Flightline

Vegetation Data: K518 (07/08)

Coastline Data: ADD

Cartography: Gateway Antarctica

Map Version: 2

Cape Geology

Granite House

Large Boulder with Survey Mark (GH1)

ASPA 154 Botany Bay, Cape Geology, Victoria Land

List of Labels Map C

Map C – Botany Bay, Antarctic Specially Protected Area No. 154: Vegetation Density

Moss

Vegetation Data: K518 (07/08)

Coastline Data: ADD

Cartography: Gateway Antarctica

Map Version: 2

Helicopter Flightline

Granite House

Botany Bay

Restricted Zone

Key

Protected Area Boundary

Moss Coverage within ASPA 154

Boundary Marker

Large Boulder

Contour (50m intervals)

Moraine

Access Zone (entry by permit only)

Designated Helicopter Landing Site

Designated Camp Site

Datum/Projection: WGS 1984/Lambert Conformal Conic

Standard Parallel 1: -76/6°

Standard Parallel 2: -79.3°

Lichen

Vegetation Data: K518 (07/08)

Coastline Data: ADD

Cartography: Gateway Antarctica

Map Version: 2

Helicopter Flightline

Granite House

Botany Bay

Restricted Zone

Key

Protected Area Boundary

Lichen Coverage within ASPA 154

Boundary Marker

Large Boulder

Contour (50m intervals)

Moraine

Access Zone (entry by permit only)

Designated Helicopter Landing Site

Designated Camp Site

Datum/Projection: WGS 1984/Lambert Conformal Conic

Standard Parallel 1: -76/6°

Standard Parallel 2: -79.3°

Algae

Vegetation Data: K518 (07/08)

Coastline Data: ADD

Cartography: Gateway Antarctica

Map Version: 2

Helicopter Flightline

Granite House

Botany Bay

Restricted Zone

Key

Protected Area Boundary

Algae Coverage within ASPA 154

Boundary Marker

Large Boulder

Contour (50m intervals)

Moraine

Access Zone (entry by permit only)

Designated Helicopter Landing Site

Designated Camp Site

Datum/Projection: WGS 1984/Lambert Conformal Conic

Standard Parallel 1: -76/6°

Standard Parallel 2: -79.3°