ANTARCTIC
DIGITAL DATABASE

User's Guide and Reference Manual

ERRATUM

The coverages

\CARTO\SCALE1\SR43_44\COAST01 and
\CARTO\SCALE1\SR43_44\CONT01

are incorrect. The coverages

\CARTO\SCALE0\SR43_44\COAST00 and
\CARTO\SCALE0\SR43_44\CONT00

should be used in their place.

ANTARCTIC DIGITAL DATABASE (Version 1.0) - Revision card

If you have noticed any errors on the Antarctic Digital Database (ADD) CD-ROM, please help us to maintain the currency of the ADD by completing the form below. Such notes will provide a preliminary record of errors in the database. If necessary, more details will be requested from you when the error is processed. All comments should be substantiated by reference to source maps or publications as these will be cited in version 2.0 of the database.

Location of error:

IMW map sheet number . . . . . .Geographical co-ordinates. . . . . .

Place-name (gazetted names only, please) . . . . . .

Nature of error:

Data layer (cliff, coast, etc.) . . . . . .Dataset (scale0, etc.) . . . . . .

Type of error (e.g. wrong feature code, incorrect position, wrong shape) . . . . . .

. . . . . .

Additional comments:

New information submitted . . . . . .

. . . . . .

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Source of new information. . . . . .

. . . . . .

. . . . . .

Sender's name: . . . . . .

Address . . . . . .

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THANK YOU FOR YOUR HELP

ANTARCTIC DIGITAL DATABASE

USER'S GUIDE AND REFERENCE MANUAL

Version 1.0

Database prepared by:
British Antarctic Survey
Scott Polar Research Institute
World Conservation Monitoring Centre

Manual edited by J.W. Thomson, British Antarctic Survey

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British Antarctic Survey.

Scientific Committee on Antarctic Research
1993

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R.M. Laws, British Antarctic Survey

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Preface

Antarctica - the last great wilderness ...

Antarctica is a remote and inhospitable continent. Although it has no permanent inhabitants, it has provided the focus for international scientific research for many decades and its key role in global processes is now well recognized.

It has been the subject of intense political debate regarding the future of its wildlife and wilderness, its scientific interest and possible mineral wealth. However, the Antarctic is managed under the provisions of the Antarctic Treaty, ratified in 1961, which provides for the protection of specified areas and imposes environmental constraints on human activity. Scientific work on the continent is co-ordinated by the Scientific Committee on Antarctic Research (SCAR).

The remoteness and rugged ice-covered terrain of Antarctica has hindered the collection of topographic data since the early days of exploration. No standard range of paper maps of the continent exists, each nation having published maps at the scale, and with the range of detail, appropriate to their particular area of investigation.

The Antarctic digital topographic database is the product of a truly international collaborative project between 11 nations. It represents a major development in Antarctic mapping, providing access to the first seamless digital map of Antarctica, including the most up-to-date coastline now available. This database, published on one CD-ROM, will form the foundation for future GIS needs in Antarctic research.

Getting started with Antarctica

The Antarctic Digital Database (ADD) is a topographic database that provides the data needed to generate maps of the continent at a variety of scales. It contains cartographic data assembled from a variety of map and satellite image sources and has been designed for scientific GIS applications and educational uses. The Antarctic database is formatted for MS-DOS systems only.

Uses of the database

* To generate simple outline maps for use as insets or location maps.
* Creation of base maps for a variety of applications, including use with raster data.
* As a cartographic base for users' tabular data.
* Generation of digital elevation models and perspective views (when appropriate software is available to the user).

The Antarctic Digital Database package

* Compact disc (CD) that contains the Antarctic Digital Database and four pre-constructed ArcView™ views.
* *Antarctic Digital Database User's Guide and Reference Manual.*
* *Antarctic Digital Database Installation Instructions.*

System configuration requirements

* An IBM compatible PC, with an Intel 80386 (or higher) processor, at least 4 Mbyte RAM. A maths co-processor will significantly improve performance.
* Software suitable for your hardware platform (Table 1).
* CD drive (Isostandard No. 9660).
* Disk space appropriate to the ADD dataset that is to be copied on to your hard drive (Table 2).

Table 1. Software requirements for the Antarctic Digital Database

System	*Software*
MS-DOS	ArcView for Windows or PC ARC/INFO 3.4D or higher or ArcCAD Rev.11 or higher

Table 2. Disk space requirements for the Antarctic Digital Database

Dataset	*Size*
Scale0 (Basic scale data: 1:200,000, 1:250,000, etc.)	153 Mbytes
Scale1 (1:1,000,000)	149 Mbytes
Scale3 (1:3,000,000)	25 Mbytes
Scale10 (1:10,000,000)	11.3 Mbytes
Scale30 (1:30,000,000)	2.2 Mbytes
Conservation sites	96 kbytes
Extras (ancillary datasets)	11.8 Mbytes
Symbols	78 kbytes

Accessing the database

The data can be read directly from the CD-ROM or they can be copied completely or in part to the hard drive. Copying the data on to the hard drive will improve performance significantly but will require extra storage space. Data copying and storage options for particular hardware platforms are discussed in the *Antarctic Digital Database Installation Instructions.*

Using the Antarctic Digital Database with ArcView

Although this manual concentrates on using the database with ArcView, all of the applications discussed are possible using ARC/INFO. Information on how to use ArcView can be found in Chapter 2 of the *ArcView User's Guide.* However, a hands-on tutorial is given in Chapter 2 of this manual, to illustrate the basic techniques for creating displays and querying the data. The preconstructed views of the ADD included on the CD are accessible only through ArcView.

Installation Instructions

Hardware

In order to use the Antarctic Digital Database (ADD) CD-ROM, there must be a correctly installed CD-ROM drive attached to the PC on which it is to be used. This must be set up to read ISO 9660 standard CD-ROMs. Microsoft's MSCDEX software is the usual means of achieving this. The data will then be accessible to other software as if it were installed on a hard disc drive.

ArcView

ArcView software can be used to view the data on the CD. ArcView should be installed according to the instructions provided with the software. Microsoft Windows version 3.0 or higher (version 3.1 is recommended) must also be installed on the PC.

To enable ArcView to be used with the prepared views on the CD-ROM, the following line must be added to the file AUTOEXEC.BAT, which exists in the root directory of the boot drive (usually drive C):

SET ANTHOME=[drive]:

where [drive] is the drive letter on which the CD-ROM drive is installed. For example, if the CD-ROM drive was installed as drive D, then add SET ANTHOME=D to AUTOEXEC.BAT.

Use with other GIS packages

PC ARC/INFO or ArcCad may be used to view or manipulate the data as provided. If it is necessary to transfer the data to another system (e.g. workstation ARC/INFO, or another GIS package), then PC ARC/INFO will be needed to create export files from the PC ARC/INFO coverages on the CD-ROM.

Speeding access to the data

CD-ROM drives are considerably slower than hard disc drives. If faster access is required to all or part of the data, then the DOS command XCOPY should be used to transfer data to a hard disc drive. Approximately 350 Mbytes will be required to copy the whole ADD.

Chapter 1

Introduction to the Antarctic Digital Database

History

The original concept for a topographic database of the Antarctic began in 1984 when the International Geographical Union and the International Cartographic Association considered the development of a *World Digital Database for Environmental Science* (WDDES). Compilation of data for the Antarctic section of WDDES began at the Scott Polar Research Institute in Cambridge, UK, in September 1988. However, the WDDES programme was subsumed by the Digital Chart of the World project, initiated by the US Defense Mapping Agency in 1988, and no further work on Antarctica for WDDES was undertaken in the UK. In August 1989 Petroconsultants (CES) Ltd developed a joint project with the Scott Polar Research Institute to prepare a digital map of Antarctica, based on maps at 1:1,000,000 scale. Petroconsultants funded this project until May 1990 and were responsible for the management, testing of different data capture methods, and initial data structuring of the database.

UK consortium

In May 1990 a new project, the Antarctic Digital Database Project (ADD), was proposed by a Cambridge-based consortium comprising the British Antarctic Survey (BAS), the Scott Polar Research Institute (SPRI) and the World Conservation Monitoring Centre (WCMC) (see Appendix 1). All three organizations agreed to prepare a digital map of the Antarctic from the most appropriate map sources available, within a time-frame of 18 months: such limited time precluded the use of any source data at scales larger than 1:250,000. In the event, the complexity of the task, even using data at medium and small scales, was enough to necessitate an extension of six months to enable completion of the complex editing and merging of the different datasets.

International participation in the project was sought through the Scientific Committee on Antarctic Research (SCAR) and its Working Group on Geodesy and Geographic Information. On behalf of the UK consortium, the UK member of the Working Group tabled the detailed aims of the project at a meeting held at Frankfurt in June 1990. The support and co-operation of SCAR member nations were secured at this meeting and from then on the scope of the project became international. Thereafter substantial amounts of data, both in digital and hard copy format, were provided by various national agencies involved in Antarctic mapping.

Sponsors

Although several nations provided digital data to the project, the bulk of the data capture and data management was undertaken in Cambridge. Such labour-intensive work could not be accommodated within the existing staff resources at any of the three institutes in Cambridge and substantial external funding had to be sought. For work undertaken in the UK the initial six months of the project were sponsored by BAS and the remaining 18-month period by The British Petroleum Company plc (BP).

Other contributing nations sponsored their own data capture through either their national mapping agencies or their Antarctic research organizations.

BP has an active sponsorship programme of science and conservation. As part of its programme BP has collaborated with BAS, SPRI, WCMC and SCAR in developing this topographic database to support conservation management and scientific research in Antarctica.

BP has no commercial interest in the project and the information gained from this database will be in the public domain. BP does not have any exploration activity for oil, gas or minerals in Antarctica and has no short- or long-term plans or ambitions to explore for oil, gas or minerals in Antarctica. BAS, SPRI, WCMC and SCAR, by entering into this project with BP, in no way imply their acceptance or endorsement of any exploration activity for oil, gas or minerals in Antarctica.

Collaborators

In preparing this first seamless digital map of Antarctica it was essential to have the co-operation and collaboration of those nations active in Antarctic mapping programmes. Under the auspices of SCAR and its Working Group on Geodesy and Geographic Information, many nations either contributed digital data to the UK consortium or gave permission for their maps to be digitized for the project.

SCAR, the interdisciplinary Scientific Committee on Antarctic Research, is the committee of the International Council of Scientific Unions (ICSU) charged with the initiation, promotion and co-ordination of scientific activity in the Antarctic. Its members include nations with active and independent research programmes in the Antarctic, and ICSU unions.

Eleven nations participated in the project and many more supported its aims but were unable to contribute data in the time-frame available.

Acknowledgements

Without the generous contributions of data made by several nations, the digital map of Antarctica would never have been completed within the given time-frame. The UK consortium acknowledges with gratitude the following national mapping agencies and Antarctic research organizations that contributed data to the project:

Argentina:	Servicio de Hidrografía Naval, Buenos Aires.
Australia:	Australian Antarctic Division, Hobart, and Australian Surveying and Land Information Group, Canberra.
China:	Wuhan University of Surveying and Technical Mapping.
Germany:	Institut für Angewandte Geodäsie, Frankfurt and Alfred-Wegener-Institut, Bremerhaven.
Japan:	Geographical Survey Institute, Ibaraki-ken.
New Zealand:	Department of Survey and Land Information, Wellington.
Norway:	Norsk Polarinstitutt, Oslo.
Poland:	Polish Academy of Sciences, Warsaw.

Russia: Main Administration of Geodesy and Cartography, Moscow.
USA: US Geological Survey, Reston.

Data from an earlier project, co-ordinated by Petroconsultants SA of Geneva in 1989/90 and derived from small-scale maps (1:1,000,000 and 1:3,000,000 scales), have been incorporated in the topographic database provided on this CD-ROM.

Environmental Systems Research Institute, Inc. (ESRI) of California supported the project by providing facilities in California for Cambridge staff to: complete the design of the database structure and finish generalization procedures for the datasets provided at different scales, prepare the CD-ROM master, and finalize the *Antarctic Digital Database User's Guide and Reference Manual.* The UK consortium acknowledges with gratitude the advice provided by ESRI staff during this final part of the project and the considerable computing facilities made available to UK staff during their stay at ESRI HQ. Furthermore, ESRI have provided a substantial number of complimentary copies of PC ArcView software to the UK consortium, for packaging with the CD-ROM. This will enable users to access, query and manipulate the database without recourse to other GIS packages.

Additional datasets

In addition to the Antarctic topographic database, the CD-ROM has a number of ancillary datasets that will be of interest to users. These are listed below and detailed descriptions are given in Chapter 3 and Appendix 3:

Place-names lists not received in time to be included in the hierarchy (from Argentina, Germany and Poland).
Large-scale maps of Chinese Antarctic stations, contributed by China.
Penguin nesting sites supplied by BAS.
GEOSAT data provided by NASA.
ERS-1 data provided by Mullard Space Science Laboratory, London.

Chapter 2

The ArcView version of Antarctica: a tutorial

A number of preconstructed views of Antarctica have been prepared for the CD-ROM, to introduce users to ArcView and to the Antarctic Digital Database (ADD). These views illustrate some of the ways in which the data at scales of 1:3,000,000 (scale3), 1:10,000,000 (scale10) and 1:30,000,000 (scale30) can be used. Note that these views do not represent the datasets at the basic scale of data capture (scale0) and the generalized dataset at 1:1,000,000 scale (scale1). After following the exercises in this chapter, users will be able to explore the data on their own.

In order to gain the most from these exercises, the user should be familiar with ArcView functions as described in Chapter 2, "A guided tour of ArcView" of the *ArcView User's Guide*. The emphasis of this tutorial is on exploring the ADD and not on how to use the software tools.

Getting started

Before attempting the tutorial, check that ArcView has been installed correctly on your PC, with Microsoft Windows running. The tutorial assumes that the user is familiar with Microsoft Windows version 3.0 or higher.

- If ArcView has to be installed, refer to the ArcView installation instructions.
- Next, load the ADD (see the *Antarctic Digital Database Installation Instructions*). The VIEWS directory includes a number of prepared views as an introduction to the database.

Using prepared views

Starting ArcView

- Double-click on the ArcView icon in the ArcView program group. A welcome message will be displayed; then the ArcView window will open.

Selecting a view

- Click on the **File** box on the menu bar, and then on **Open** in the pull-down menu. A file selection box will open.
- Select the disc corresponding to the CD-ROM (often drive D:).
- Select the directory **AV** and then the directory **VIEWS**. A list of four prepared views will appear in the file selection box (Fig. 2.1).

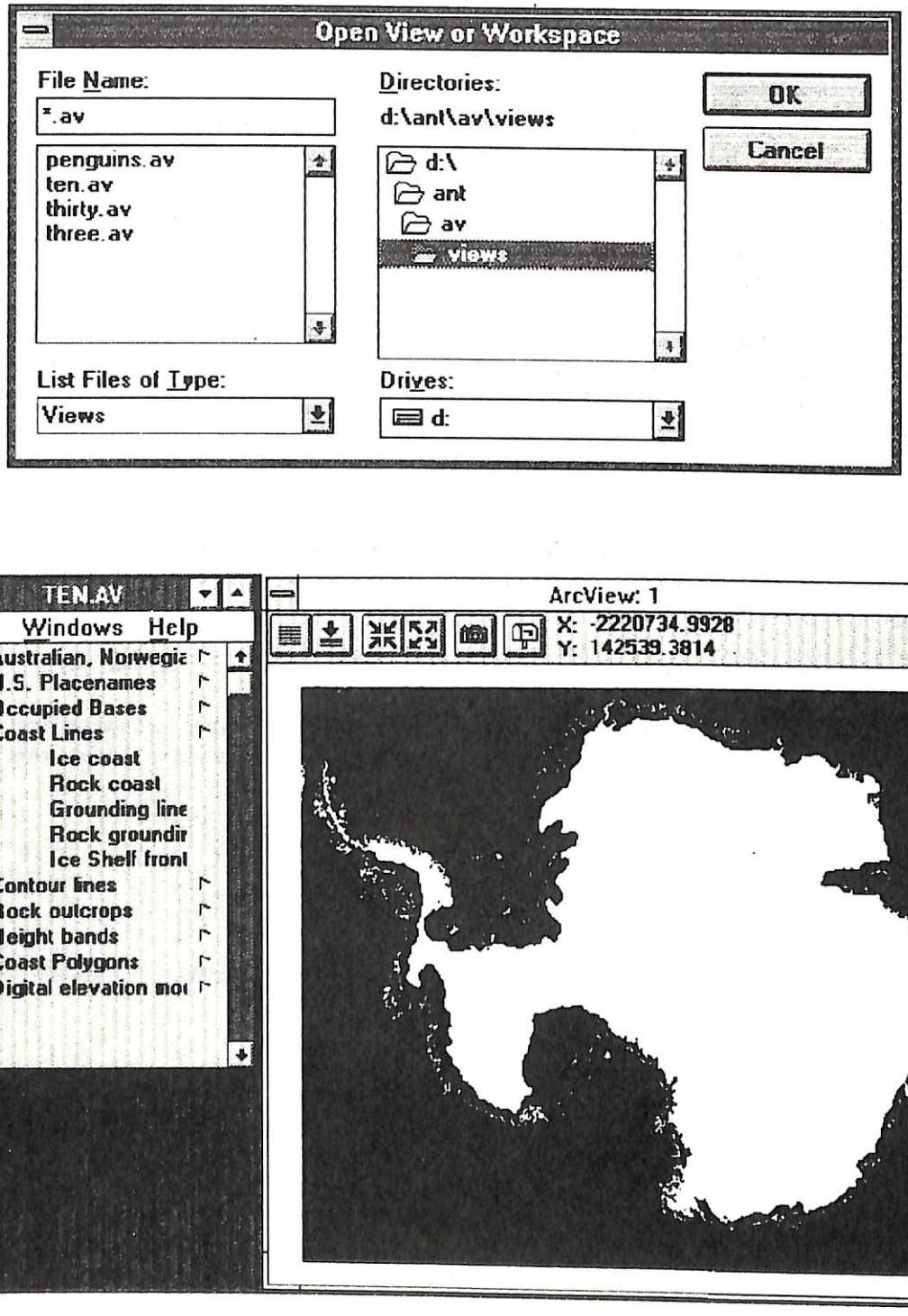


Figure 2.2. Prepared view of Antarctica: DEM with coastline added.

- Double-click on the item **TEN.AV**. A display will appear showing an image of a digital elevation model (DEM) of Antarctica, overlaid by the coastline of Antarctica (Fig. 2.2). The colours used depend on the Windows display driver and the ArcView colour settings.

Selecting themes for display

In the ArcView window, a list of themes will be shown.

- Each theme may be selected or deselected by clicking on the small selection button at the left-hand side of the theme's title. For example, contours can be added to the view already on screen by clicking on the *Contour lines* selection button.

- The opening view can be re-sized by dragging the edges or corners of the window.

Moving around the view

- If the **Tools** window is not visible, click on the **Windows** box on the ArcView menu bar, and then on **Tools**. A window containing a matrix of buttons will appear (Fig. 2.3).

- Click on the button marked with a *dashed box*. A rectangular area can then be marked by moving to one corner, depressing the mouse button and dragging it to the opposite corner. The rectangle being selected is shown while doing this. On releasing the mouse button, the screen will be re-drawn to show the selected area filling the graphic window.

- To move around the image, click on the button marked with a *hand* in the **Tools** window. Place the cursor at the point to become the new centre of the map and press the mouse button.

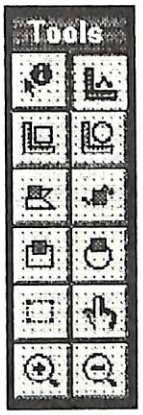


Figure 2.3. The **Tools** window in ArcView.

Modifying the legend

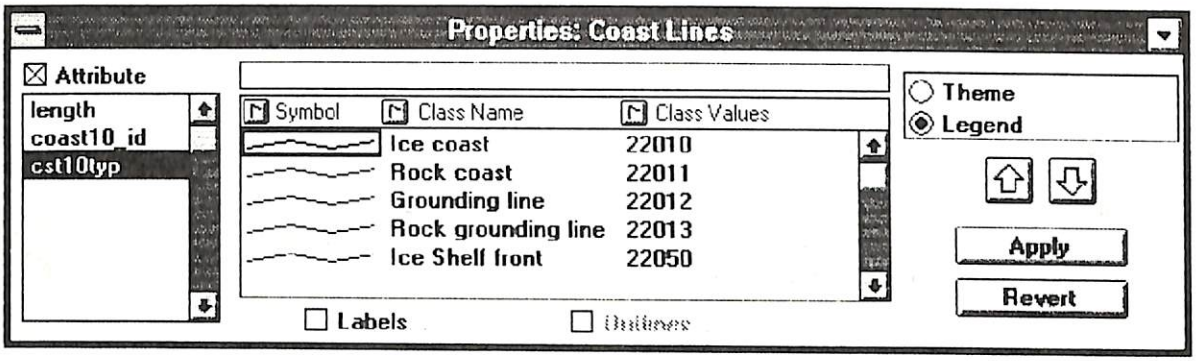
- Click on the small arrow at the right hand side of the list of themes. A menu will be shown with several options.

- Click on Preferences. At the top right hand side of the new window displayed, there are two buttons marked **Theme** and **Legend**.

- Click on **Legend**. The window will alter to show a series of possible ways of changing the legend for the selected theme (Fig. 2.4). For example, to alter the symbolization:

- Click on **Symbols** and select an option from the pull-down menu. You can alter the colour of a particular symbol by double-clicking on the symbol, when a palette of possible colours will be

displayed. Selecting one of these will alter the colour used to display the feature. There are many possible ways of displaying data, and you should consult the ArcView manual for further guidance.



Printing the view

- Click on the button at the top of the graphics window marked with a *camera*. This will enter a utility which allows the page to be laid out, and legends, titles, scale-bars and north arrows to be placed on the map. The latter are of no use for Antarctica, as they are aligned parallel to the projection co-ordinates, not in alignment with the meridian.

For full details, see the supplement to the ArcView manual. You should be aware of the limitations of the printer you are using - the results from monochrome printers can be disappointing if too complex a map is printed.

Creating a customized view

Start ArcView

- Double-click on the ArcView icon in the Arcview program group. A welcome box will be displayed first; then the ArcView window will open.

Create a new view

- Click on the File box on the menu bar, and then on New in the pull-down menu.

Add themes to the view

- Click on the **File** box on the menu bar, and then on **Add** in the pull-down menu. A file selection box will be displayed. For this example, we will create a view of IMW sheet number ST 57-60 (Ross Island), using the basic scale data.
- Select the disc corresponding to the CD-ROM (often drive D:).
- Select the directory **CARTO** and then the directory **SCALE0.** A list of directories containing map coverages will appear in the file selection box (see Fig. 2.1).
- Double-click on the directory name **ST57_60.** All the map coverages within this directory will automatically be opened and displayed in the main ArcView window.
- Click on the **Windows** box on the menu bar, and then on **New Display** in the pull-down menu to open a new graphics window.

Modifying the legend

The view completed in the above step will have random colours assigned to the various lines and polygons in the views, and there is no variation of symbolization with attribute data. Furthermore, several coverages may be regarded either as line or polygon data, as in the COAST00 theme which has been created. Both arc and polygon attributes are available for coast coverages and the automatic process will have created a polygon view.

- To modify the themes, click on the small arrow at the right hand side of the list of themes. A menu will show several options.
- Click on **Preferences.** At the top right hand side of the new window displayed there are two buttons marked **Theme** and **Legend.**
- To alter the nature of a theme, or to impose a selection on the data to be displayed, click on **Theme.** This allows the title of the theme to be changed, selection criteria to be set up, and the nature of the theme to be changed, provided that there are appropriate data in the underlying coverage.
- To alter the way data are displayed, click on **Legend.** The window will alter to show a series of possible ways of changing the legend for the selected theme. For example, to alter the symbolization:
- Click on **Symbols** and select an option from the pull-down menu. You can alter the colour of a particular symbol by double-clicking on the symbol, when a palette of possible colours will be displayed. Selecting one of these will alter the colour used to display the feature. There are many possible ways of displaying data and you should consult the ArcView manual for further guidance. By turning on the COAST00 theme in ST57_60, a view similar to Fig. 2.6 will be produced.

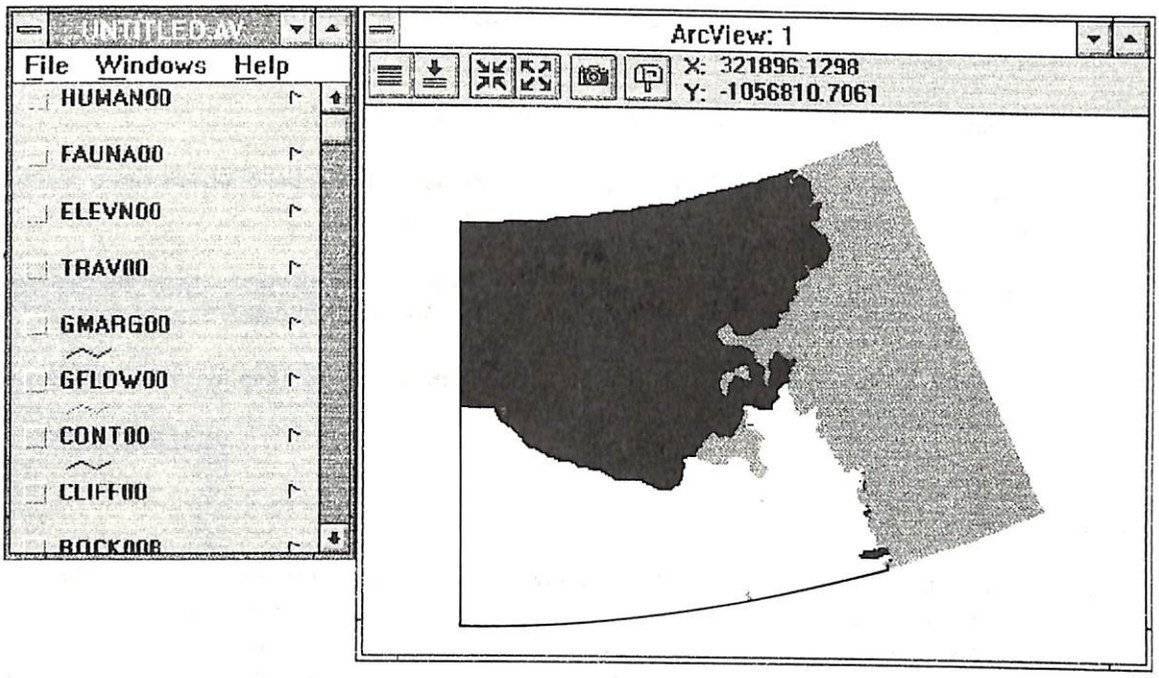


Figure 2.6. A view of sheet ST57_60 with the COAST00 theme turned on.

Prepared Views

Four prepared views are available on the CD-ROM, in the directory \AV\VIEWS. These may be used to look at the generalized data, and as templates for developing further views. Two of the views (1:3,000,000 and 1:10,000,000) include an image which has been created from a digital elevation model (DEM) of Antarctica, at 6 km horizontal resolution. The image is available as a TIFF file in \AV\SCALES\ANT6.TIF. Note that this file is an image created from a DEM, not the DEM itself.

1:3,000,000

The 1:3,000,000 scale view is in the file \AV\VIEWS\THREE.AV. It has themes based on all the coverages in the 1:3,000,000 scale (scale3) generalized data. Some of the coverages are used in several themes, with differing selection or display criteria applied. This view contains a large volume of data, and will be slow to draw on most PCs. The themes available are:

Place-names (USA)	Points
Place-names (Australia, Britain and Norway)	Points
Bases	Points
Height points	Points
Ice thickness points	Points
Coastlines	Arcs
Contour lines	Arcs
Glacier flow lines	Arcs
Lakes	Polygons
Rock outcrop	Polygons
Height bands	Polygons
Coast polygons	Polygons
Digital Elevation Model	Image

1:10,000,000

This view is in the file **\AV\VIEWS\TEN.AV**. It has themes based on all the coverages in the 1:10,000,000 scale (scale10) generalized data. Some of the coverages are used in several themes, with differing selection or display criteria applied. This view is most suitable for topographic overviews of the whole of Antarctica. The themes available are:

US Antarctic place-names	Points
Australian, British and Norwegian Antarctic place-names	Points
Occupied bases	Points
Coastlines	Arcs
Contour lines	Arcs
Rock outcrop	Polygons
Height bands	Polygons
Coast polygons	Polygons
Digital Elevation Model	Image

1:30,000,000

The 1:30,000,000 view is in the file **\AV\VIEWS\THIRTY.AV**. It has themes based on all the coverages in the 1:30,000,000 scale (scale30) generalized data. Some of the coverages are used in several themes, with differing selection or display criteria applied. This view contains an index to the data available in the basic scale (scale0) and 1:1,000,000 scale (scale1) datasets. The themes available are:

US Antarctic place-names	Points
Australian, British and Norwegian Antarctic place-names	Points
Coastlines	Arcs
1 million scale data	Polygons
Basic-scale data	Polygons
Coast polygons	Polygons
IMW sheet boundaries	Polygons

Penguins

This view is in the file \AV\VIEWS\PENGUINS.AV. It has themes based on the coastline from the 1:30,000,000 generalized data, and on the additional coverage containing data on penguin populations in \EXTRAS\BIRDS\PENGUINS. The data displayed are the latest count at each location, shown by a symbol which varies in size according to the population. The themes available are:

Adélie penguins	Points
Chinstrap penguins	Points
Emperor penguins	Points
Gentoo penguins	Points
Macaroni penguins	Points
Coast	Arcs

Chapter 3

Database concepts and organization

Introduction

This chapter describes the design and structure of the Antarctic Digital Database (ADD). The data provided are in the form of ARC/INFO coverages, all of which may be used with PC ArcView and PC ARC/INFO software. Conceptually the data are divided into two distinct sets: the first, which comprises data at the original scale of the source material (scale0) and data generalized to 1:1,000,000 scale (scale1), is designed for use in a detailed cartographic setting. The second includes generalized datasets at scales of 1:3,000,000, 1:10,000,000 and 1:30,000,000 (scale3, scale10 and scale30) which provide small-scale overviews of the whole continent. Preconstructed views of the second set supplied on the CD are accessible only through ArcView.

ADD geocodes are used to indicate the type of feature represented by a particular arc or point; they are the key access code to information in the database. The geocodes are based on the codes devised for the *Standard symbols for use on maps of Antarctica* published by the Scientific Committee on Antarctic Research (SCAR) in 1980. For some coverages (e.g. coast and rock) polygon attributes have been assigned on the basis of these line attributes but the line attribute remains the primary source of information.

Cautions on data usage

The data provided are as complete and accurate as possible, and much effort has been expended to harmonize the data and update them where appropriate. During harmonization features which spanned different map sheets and/or different map series were made consistent in both their geometry (edge-matching) and attributes. However, the original data varied considerably in quality and content, and it was not entirely possible to eliminate variations of mapping style. Therefore, the user is advised to check the data sources before using this database for critical applications. **Note that, in particular, the absence of a feature from this database does NOT mean that no feature exists; it may simply reflect a lack of information on the original maps.**

Map projection used

All data provided in the ADD are projected into the Polar Stereographic projection, with a standard latitude of 71°S, and a central meridian of 0°. The co-ordinates are in metres with the origin at the South Pole. The spheroid used is GRS80. This choice of map projection was made to adhere to the recommendations of SCAR. The orientation of the continental map on the screen is such that the 0° meridian is vertical, with north pointing toward the top of the screen.

The projection chosen is conformal, which means that the shapes of objects are correctly represented; at any point on the map, the scale is the same in all directions. However, it should be noted that the scale of the map varies with latitude: a metre in map co-ordinates is only equal to a metre measured on the ground at 71°S. At other latitudes, the relationship between map units and distances on the ground is as shown in Fig. 3.1.

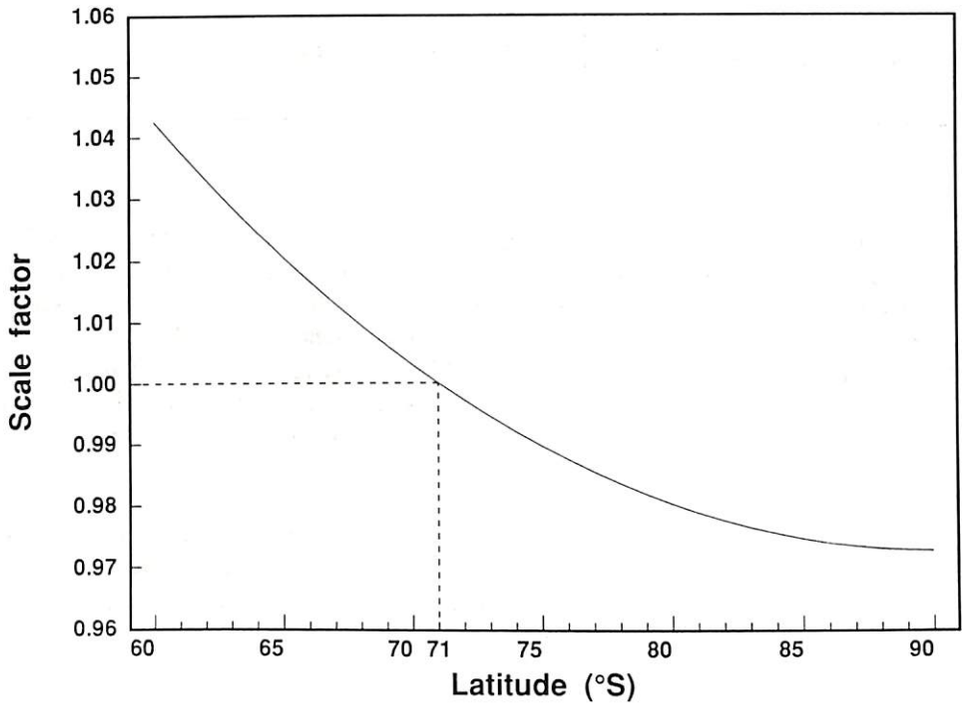


Figure 3.1. Variation in scale factor with latitude. The relationship between map units and distances is given by Snyder (1987) as

$$k = \left(\frac{1+\sin\phi_c}{1+\sin\phi}\right)\sqrt{\left(\frac{1+e\sin\phi}{1+e\sin\phi_c}\right)^{1+e}\left(\frac{1-e\sin\phi}{1-e\sin\phi_c}\right)^{1-e}}$$

where k is the number of metres on the map which represent one metre on the ground, ϕ is the latitude, ϕ_c is the latitude of true scale (71°S) and e is the eccentricity of the ellipsoid (= 0.08181919 for GRS80).

The consequence of this relationship is that areas and lengths measured at different latitudes are *not* directly comparable. If these data are to be used for making area or length-related measurements over a wide range of latitudes, then the map projection should be changed to an equal area projection (e.g. Lambert Azimuthal Equal Area) using the ARC/INFO command PROJECT, or its equivalent in other systems.

Co-ordinate precision refers to the maximum number of digits allocated within a data file for the storage of an x, y, or z co-ordinate value. Single precision maps store up to seven significant digits for each co-ordinate. ADD data are provided in single precision. Thus any x, y co-ordinate in the basic-scale database (scale0) has a worst-case locational resolution of approximately 3 m for features far from the origin.

Organization of the database

The principal content of this database is topographic data digitized from various documentary sources, mostly cartographic. The sources and data acquisition are described in more detail in Chapter 8. The directory structure diagram (Fig. 3.2) and tile scheme information (Fig. 3.3) provide a means by which the user can locate their area of interest.

Directory structure

The directory structure diagram (Fig. 3.2) outlines the distinction between the detailed dataset and the generalized ArcView data. The scale0 data will be of most use for research applications since it contains most known information published on medium-scale and smaller-scale maps of Antarctica. Furthermore, the details have been revised in the light of new knowledge, obtained mostly from satellite images. The generalized datasets provide a general facility for the more casual user.

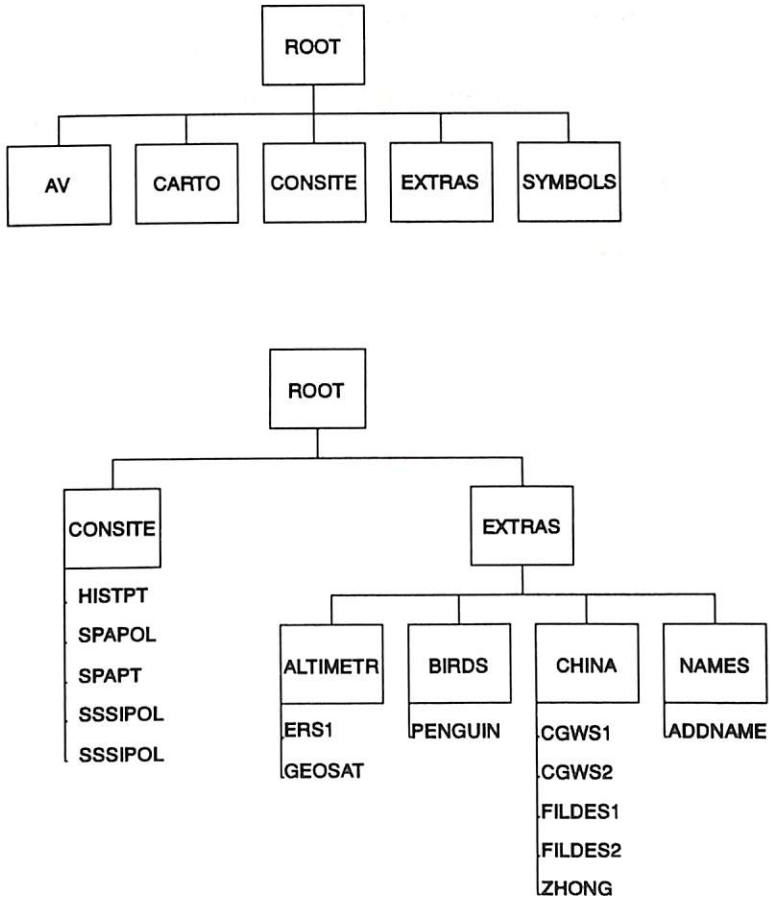


Figure 3.2. Directory structure diagram for the ADD.

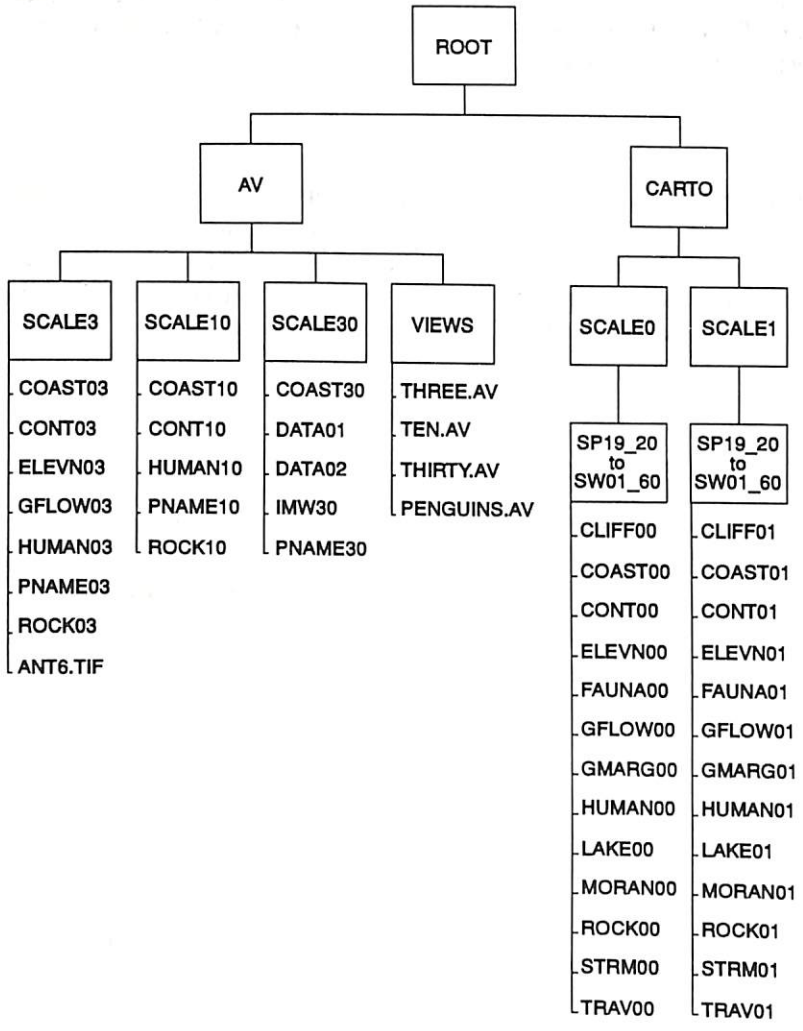


Figure 3.2. Directory structure diagram for the ADD (continued).

The tiling scheme used to divide the basic-scale data (scale0) and the 1:1,000,000 scale dataset (scale1) into areas corresponds to the boundaries of the International Map of the World (IMW) 1:1,000,000 map sheets (Fig. 3.3). An additional sheet, designated SW1_60, is used to cover the region between 88°S and the South Pole. The 1:3,000,000, 1:10,000,000 and 1:30,000,000 datasets are not tiled.

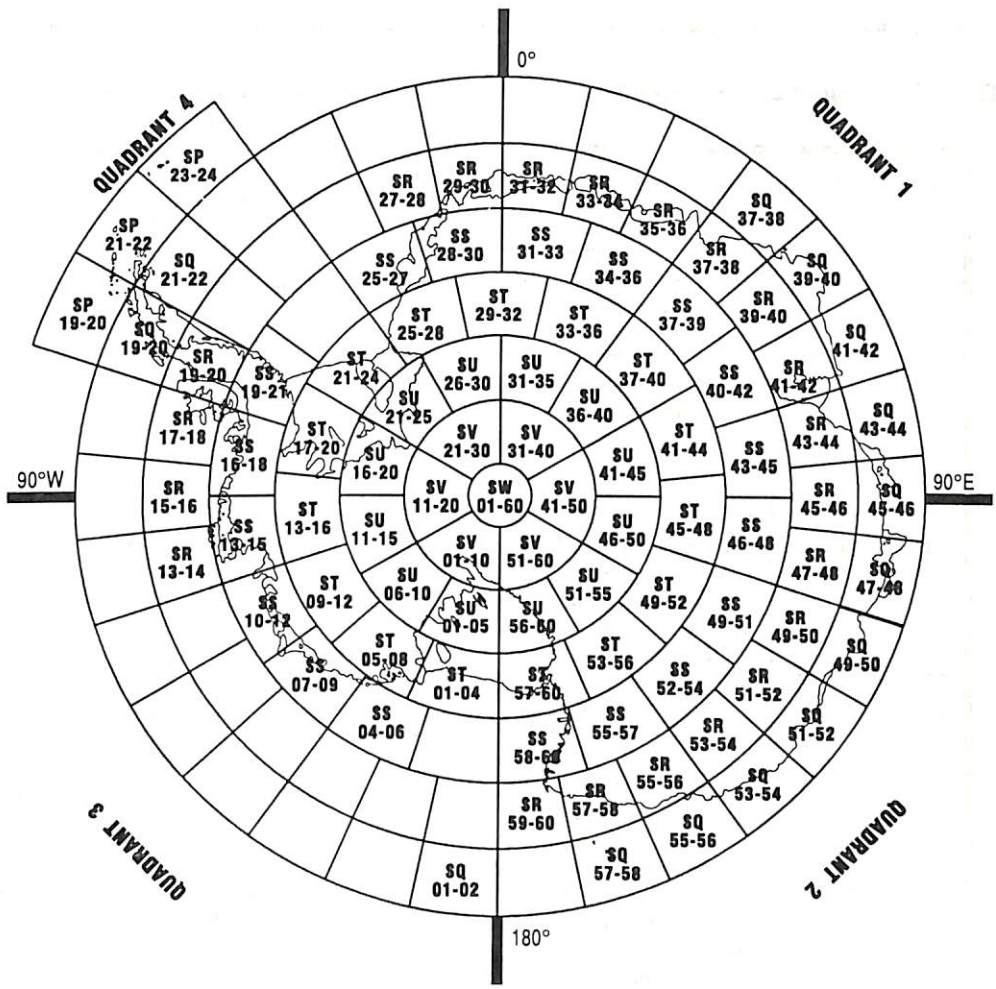


Figure 3.3. IMW 1:1,000,000 scale map sheet boundaries of Antarctica, showing the numbering convention adopted for the ADD scale0 and scale1 tiling scheme. The map is divided into 4° latitudinal bands (from 60°S to 88°S) and the longitudinal divisions are 12° for bands SP, SQ and SR, 18° for band SS, 24° for band ST, 30° for band SU and 60° for SV.

Division of data into layers

The data within each IMW sheet boundary are subdivided into feature layers (Table 3.1), on the basis of the geocode (Table 3.2). Table 3.1 illustrates the feature layers found within each layer of the basic-scale dataset; brief descriptions of features and notes on feature type (whether it is an arc, point or polygon), and their availability in the generalized datasets at 1:1,000,000 (scale1), 1:3,000,000 (scale3), 1:10,000,000 (scale10) and 1:30,000,000 (scale30) are also included. More detailed descriptions of the geocode values and features are given later in this chapter and the layers are described in Chapter 4.

Table 3.1. Summary of database layers for map data at the different scales

Layer name	*Description*	*Type*	*Scales*				
			0	*1*	*3*	*10*	*30*
CLIFF	Steep slope on ice and on ice-free areas; inland ice cliff, rock cliff or escarpment	Arc	*	*	-	-	-
COAST	Ice and rock coastline; includes the grounding line of ice shelves or glacier tongues and the front of ice shelves.	Polygon	*	*	*	*	*
CONTOUR	All contours or formlines on ice and rock including index contours, definite and approximate contours and depression contours.	Arc Polygon	* -	* -	* *	* *	- -
ELEVATION	All points with height information. Distinguishes between trigonometrical, airborne altimetric, photogrammetric, satellite, astronomical, and survey control stations. All measurements are in metres.	Point	*	*	*	-	-
FAUNA	All points giving the location of Adélie and Emperor Penguin rookeries, and petrel and seal colonies as plotted on source maps; Specially Protected Areas (SPAs)	Point	*	*	-	-	-
FLOWLINE	Glacier flowlines	Arc	*	*	*	-	-
GLACIER MARGIN	Glacier margins; shear zones at margins of ice streams	Arc	*	*	-	-	-

Table 3.1. Summary of database layers (continued):

Name	*Description*	*Type*	*Scale*				
			0	*1*	*3*	*10*	*30*
HUMAN	All point data relating to human activity; aerodromes, radio masts, scientific stations, buildings, oil tanks, water tanks, automatic weather stations, Historic Monuments and Sites of Special Scientific Interest	Point	*	*	*	*	-
ICE DOME	Isolated ice hillock or dome	Point	*	-	-	-	-
LAKES	Lakes on ice and rock	Polygon	*	*	*	-	-
MORAINE	Outlines areas of moraine	Polygon	*	*	-	-	-
PLACE-NAMES	Hierarchical place-names from five national Antarctic place-names gazetteers	Point	*	*	*	*	*
ROCK	All areas of rock outcrop including rock coastline, rock against ice shelf	Polygon	*	* -	* -	* -	- -
STREAMS	Meltwater streams	Arc	*	*	-	-	-
TRAVERSE	Tracks of oversnow traverses. TRV00INF contains the name of the traverse and its date	Arc	*	-	-	-	-
HISTORIC	Historic Sites and Monuments	Point	*	-	-	-	-
SPA	Specially Protected Areas	Point and polygon	*	-	-	-	-
SSSI	Sites of Special Scientific Interest	Point and polygon	*	-	-	-	-

Attributes

Data have point and polygon (PAT) and arc (AAT) attribute tables that contain details about the following items: geocode, height, date, text, sheet, editor, source, and revision. However, the attributes are scale-dependent and not all of them are present in every coverage.

Geocode - This numeric attribute is the primary description of a feature in the ADD. The codes are based on those in the *Standard symbols for use on maps of Antarctica* published by SCAR in 1980 but additional codes have been introduced where necessary. Table 3.2 gives a detailed description of the codes used.

Table 3.2. Values of Geocode used in the map data

Description	*SCAR code*	*Geocode*
Coastal features		
Ice coastline (definite)	2.1	22010
Rock coastline (definite)	2.1	22011
Grounding line (definite)	2.1	22012
Rock against ice shelf (definite)	-	22013
Ice wall (approximate)	2.2	22020
Rock coastline (approximate)	2.2	22021
Grounding line (approximate)	2.2	22022
Rock against ice shelf (approximate)	-	22023
Iceberg tongue	2.3	22030
Floating glacier tongue	2.4	22040
Ice shelf and front	2.5	22050
Ice rumples (distinct)	-	22090
Ice rumples (indistinct)	-	22100
Features on ice-covered areas		
Glacier margins (including shear zones at margins of ice streams)	3.1	23010
Plottable features on glacier (flowlines)	3.1	23011
Meltwater stream	3.6	23060
Lake on ice	3.6	23061
Steep slope on snow	3.7	23070
Inland ice cliff or escarpment	3.8	23080
Index contours on ice or snow (definite)	3.9	23090
Contours on ice or snow (definite)	3.9	23091
Index contours on ice or snow (approximate)	3.10	23100
Contours on ice or snow (approximate)	3.10	23101
Depression contour on ice or snow	3.11	23110
Depression area on ice or snow	3.12	23120
Ice hillock, ice dome	3.13	23130
Features on ice-free areas		
Ice-free area (rock outcrop)	3.15	23150
Index contours on ice-free area (definite)	3.16	23160
Contours on ice-free area (definite)	3.16	23161
Index contours on ice-free area (approximate)	3.17	23170
Contours on ice-free area (approximate)	3.17	23171
Depression contour on ice-free area	3.18	23180
Rock cliff or escarpment	3.19	23190
Mountain or hill of exposed rock (uncontoured)	3.20	23200
Moraine field (not linear features)	3.23	23230
Steep slope on ice-free area	-	23260
Lake on rock	3.6	23062

Table 3.2. Values of Geocode (continued):

Description	*SCAR code*	*Geocode*
Features related to survey control		
Elevation on rock (differential levelling or trigonometrical)	4.1	24010
Elevation on ice (differential levelling or trigonometrical)	4.1	24011
Elevation on rock (airborne altimetric, surface barometric)	4.2	24020
Elevation on ice (airborne altimetric, surface barometric)	4.2	24021
Elevation on rock (photogrammetric)	4.3	24030
Elevation on ice (photogrammetric)	4.3	24031
Ice thickness	4.4	24040
Geodetic satellite observation station (precise)	4.5	24050
Geodetic satellite observation station (less precise)	4.5	24051
Astronomical station (monumented)	4.6	24060
Astronomical station (not monumented)	4.6	24061
Survey control station (monumented)	4.7	24070
Survey control station (not monumented)	4.7	24071
Bench mark and elevation	4.8	24080
Oversnow traverse (marked)	4.9	24090
Oversnow traverse (unmarked)	4.10	24100
Features related to human activity		
Aerodrome (with facilities) suitable for wheeled aircraft	4.11	24110
Aerodrome (without facilities) suitable for wheeled aircraft	4.11.1	24111
Aerodrome (with facilities) suitable for ski-equipped aircraft only	4.12	24120
Aerodrome (without facilities) suitable for ski-equipped aircraft only	4.12.1	24121
Helicopter aerodrome (with facilities) unsuitable for fixed wing aircraft	4.13	24130
Helicopter aerodrome (without facilities) unsuitable for fixed wing aircraft	4.13.1	24131
Aircraft wreckage	4.16	24160
Single radio mast	4.18	24180
Multiple radio masts	4.18	24181
Scientific stations	4.19	24190
Occupied building	4.20	24200
Abandoned building	4.20	24201
Refuge	4.21	24210
Oil tanks (in use)	4.24	24240
Oil tanks (disused)	4.24	24241
Water tanks (in use)	4.24	24242
Water tanks (disused)	4.24	24243
Automatic weather station	4.25	24250
Historic Sites and Monuments (sites listed in Antarctic Treaty)	4.26	24260
Sites of Special Scientific Interest (SSSI)	4.27	24270
Features related to animals, birds and vegetation		
Adélie Penguin rookery	5.1	25010
Emperor Penguin rookery	5.2	25020
Seal colony	5.3	25030
Petrel colony	5.4	25040
Specially Protected Area (SPA)	5.5	25060

Height - Contours and heighted positions have their height in metres in this column. Ice thickness in metres are also given here; the geocode may be used to distinguish between surface elevations and ice thickness.

Date - Several features in Antarctica vary with time, especially ice-shelf fronts and glacier or iceberg tongues. Where appropriate, this attribute gives the date of the map or satellite image from which the feature was digitized. This is presented as a character field rather than a date field because many of the dates available are incomplete: for example, 1978 or Dec 1978, rather than 13 Dec 1978.

Text - This is a text field used for any other useful information about the feature.

Sheet - The name or IMW designation of the source map (see Fig. 3.3). This may be used to link the digital data with the detailed list of source data.

Editor - The initials of the member of the project staff who last revised the feature. This is blank if the feature has not been edited. The possible values are shown in Table 3.3.

Table 3.3. Editor codes

Value	*Description*
AJF	Adrian Fox
APRC	Paul Cooper
CWMS	Charles Swithinbank
EMRE	Mary Edwards
JWT	Janet Thomson
SRJ	Sue Jordan

Source - An alphabetical code denoting the source of the data. The possible values are given in Table 3.4.

Table 3.4. Source data codes

Value	*Description*
AUS	Australia
IFAG	Germany
JAP	Japan
NOR	Norway
USGS	United States Geological Survey
USSR	Russia
CWMS	Charles Swithinbank
PROJ	Project staff

Revision - The date of the last revision carried out on the feature. This is blank if no revision has taken place.

Place-names

Place-names from gazetteers provided by four nations have been incorporated into a single point coverage. The names have been related to each other in two ways - as children of parent names, and as equivalents from different sources. The organization of place-names is discussed further in Chapter 5, including the point attribute table of the separate coverages provided for each scale of generalization; point coverages for names selected on the basis of their importance were created for each scale.

The place-names coverage was derived from a database table created and managed using the ORACLE data management software. It incorporates information which allows internal relationships within the database table to be constructed. Thus, there is a 'parent' attribute (PNM00PID) which refers to the accession number (PNAME00_ID) of another name in this table. Furthermore, the relationship can be applied recursively to determine the complete parentage of a given name and it is possible also to find all the children of a particular name. An equivalent field (PNM00EQV) allows similar relationships to be constructed for names referring to the same locality. Thus there are both vertical (parent/child) and horizontal (equivalent) relationships embedded in the attribute table, as shown in Table 3.6. In order to make some of these internal relationships visible to ARC/INFO and ArcView, derived fields (PNM00LVL, PNM00EQN and PNM00EQS) were created from the original ORACLE table.

Table 3.6. The relationship between parent, child and equivalent place-names

Level	*Place-name*	*Place-name_id*	*Parent place-name_id*	*Equivalent place-name_id*
1	The World	0	-	-
2	The Antarctic	4121	0	-
3	Southern Ocean	4754	4121	-
4	Weddell Sea	3494	4754	-
5	Bransfield Strait (UK)	**439**	3494	6568
5	Bransfield Strait (USA)	6568	3494	**439**
6	Gerlache Strait	1391	**439**	
7	Grandidier Channel	1325	1391	

The numbers shown are the unique ID for each place-name in the hierarchy; one number is given in bold type to demonstrate the relationships.

Conservation areas

The co-ordinates for the Sites of Special Scientific Interest (SSSIs) and Specially Protected Areas (SPAs) were generated from the listed descriptions of sites given in Chapter 6. The site name and geocode were then added to the PAT file, and the feature ID updated to correspond with the site number. Using Arcedit, the point data were drawn with a backcoverage from the digitized map; this enabled the selection of appropriate features for the creation of a polygon coverage. The Historic Sites and Monuments (HSM) data were similarly created as a set of generated co-ordinates.

These data are filed in the directory CONSITE as the following coverages:

HISTPT00 - point data of Historic Sites and Monuments
SPAPOL00 - polygon data of Specially Protected Areas
SPAPT00 - point data of Specially Protected Areas
SSSIPOL00 - polygon data of Sites of Special Scientific Interest
SSSIPT00 - point data of Sites of Special Scientific Interest

It is necessary for the polygon data files to be shown in conjunction with the relevant point data files for site identification.

Generalization

The basic data were captured from maps at a wide variety of scales, from 1:200,000 to 1:5,000,000. In most cases, the variation of source scale will have little effect on the use of the data because the source maps were at a scale appropriate to the level of detail in the region. For example, a 1:3,000,000 scalemap was used as the source of most of the contours on the ice sheet, where the surface is smooth and of a very low gradient; a larger-scale source would not have appreciably increased the amount of data to be captured in this part of Antarctica. For the majority of the regions where there is significant topography, data were captured from maps at scales of 1:200,000 (only two map sheets), 1:250,000, 1:500,000 and 1:1,000,000.

In order to allow their use at smaller scales, the data have been generalized to scales of 1:1,000,000, 1:3,000,000, 1:10,000,000 and 1:30,000,000. The map at 1:30,000,000 is mainly intended for use as an index map. No generalization has been carried out for features such as place-names, bases, traverses, survey data, fauna, SSSIs, SPAs and Historic Sites and Monuments. Features included at each level of generalization are shown in Table 3.7 and the methods of generalization, which varied with the scale of generalization and the type of feature, are described below.

Scale1 - The 1:1,000,000 scale generalized data were derived from the basic scale data (scale0) by removing points closer together than 30 m.

Scale3, scale10 and scale30 - Generalization for 1:3,000,000, 1:10,000,000 and 1:30,000,000 data was achieved using two methods.

Coastlines were generalized by first removing small islands and then applying the Douglas-Peucker algorithm with an offset of 1000 m for 1:3,000,000 and 3000 m for 1:10,000,000 scale data.

Rock outcrop, lakes and moraines were generalized as follows:

i. The tiled 1:1,000,000 scale data were combined into single coverages for the whole continent.

ii. Polygon topology was generated for these coverages and construction lines were introduced where necessary to ensure that no polygon was too complex.

iii. The vector polygons were converted to raster with a cell size of 500 m for 1:3,000,000 and 5000 m for 1:10,000,000 scale data. The rasterization was carried out so that all cells which intersected or contained the feature of interest were coded as that feature.

iv. Outlines were re-generated by creating contours from the raster data. For the 1:3,000,000 data, these outlines were smoothed by using the GRID module of ARC/INFO. For the 1:10,000,000 data a three-point smoothing window was used on the output from GRIDPOLY.

v. Polygon topology was recreated from the vector outlines, and the polygon attributes were transferred from the raster data. Construction lines were introduced where necessary to ensure that no polygon was too complex.

vi. Polygons with an area of less than 1,000,000 m^2 were removed from the scale3 data, and those with an area of less than 22,500,000 m^2 from the scale10 data.

vii. Polygon outlines were simplified by removing all points closer together than 50 m.

viii. For moraines and lakes, arc attributes were generated directly from the polygon attributes.

ix. For rock outcrop, the generalized rock coverage was combined with the coast coverage. Polygons where rock lay on sea or ice-shelf were eliminated from the result. Finally, arc attributes for both coast and rock features were generated from the polygon attributes, and the combined coverage split into coast and rock covers.

Contours were generalized by creating triangulation networks from the basic-scale data and removing points closer together than a threshold determined by the required scale of generalization. Contours were then generated from these triangulation networks, and manually edited to remove the effects of flat triangles.

The effects of these methods of generalization are to aggregate clusters of small rock outcrops or islands, to remove isolated small outcrops and islands and to simplify outlines of coasts and rock outcrops. A further benefit of this method is that simplification of the geocodes is also attained. Contours are smoothed and become less complex with increasing generalization. The method has the advantage of not introducing errors in topology, and providing means of validating geocodes.

The provision of a generalized version of a particular set of features does not preclude users from selecting more or less detailed versions of the same data if that is more appropriate for their task.

Table 3.7. Features included at each level of generalization

Scale	*Features included*	*Recommended point data*
1: 1,000,000	Coast, ice front, grounding line, contour, glacier flowlines (filtered), cliff, rock outcrop, moraine, selected lakes and islands, ice rumples	All
1: 3,000,000	Coast, ice front, grounding line, contour, flowline (selected by length to eliminate small glaciers), rock outcrop, large islands and lakes	Traverses and bases
1:10,000,000	Coast, ice front, grounding line, contour, rock outcrop and selected islands	Bases
1:30,000,000	Coast, ice front of major ice shelves, grounding line, islands, IMW sheet boundaries	None

Naming conventions

A systematic method of naming both coverages and attributes has been used in the ADD. Coverage name are in two parts - a three-letter code giving the type of feature in the coverage followed by a two-digit scale indicator. A list of the main coverage names is given in Table 3.8.

Table 3.8. Coverage names for topographic data at different scales

Description	*Basic scale*	*1:1,000,000*	*1:3,000,000*	*1:10,000,000*	*1:30,000,000*
Cliffs	CLIFF00	CLIFF01	-	-	-
Coastline and grounding lines	COAST00	COAST01	COAST03	COAST10	COAST30
Contours	CONT00	CONT01	CONT03	CONT10	-
Elevations	ELEVN00	ELEVN01	ELEVN03	ELEVN10	-
Fauna	FAUNA00	FAUNA01	-	-	-
Glacier flowlines	GFLOW00	GFLOW01	GFLOW03	-	-
Glacier margins	GMARG00	-	-	-	-
Human or cultural features	HUMAN00	HUMAN01	HUMAN03	HUMAN10	-
Ice domes	IDOME00	-	-	-	-
IMW sheets	-	-	-	-	IMW30
Lakes	LAKES00	LAKES01	LAKES03	-	-
Moraine	MORAN00	MORAN01	-	-	-
Place-names	PNAME00	PNAME01	PNAME03	PNAME10	PNAME30
Rock outcrop	ROCK00	ROCK01	ROCK03	ROCK10	-
Streams	STRMS00	-	-	-	-
Overland traverses	TRAV00	-	-	-	-

Attributes were named with a three-letter code indicating the type of features in the coverage, a two-digit scale code, and a three-letter code for the type of information. A sample of the codes used is shown in Table 3.9 and a fuller definition of them is given in Chapter 4, Tables 4.1-4.3.

Table 3.9. Attribute coding conventions used in the ADD

Layers		*Scale*		*Attribute type*	
Description	*Code*	*Description*	*Code*	*Description*	*Code*
Cliff	CLF	1:200,000,	00	Geocode	TYP
Coast	CST	1:250,000, etc.		Height	HGT
Contour	CNT	1:1,000,000	01	Date	DAT
Elevation	ELV	1:3,000,000	03	Text	INF
Fauna	FNA	1:10,000,000	10	Sheet	SHT
Flowline	FLW	1:30,000,000	30	Editor	EDT
Glacier margin	GMG			Source	SRC
Human	HMN			Revision date	REV
Ice dome, etc.	ICD			Surface type	SRF

Ancillary datasets

A number of ancillary datasets are provided on the CD-ROM. These are described below and more details are given in Appendix 3.

Maps of Chinese Antarctic stations - Five files of large-scale maps were received from China. These are: CGWS1000, a 1:1000 scale map of Great Wall of China station, South Shetland Islands; CGWS2000, a 1:2000 map of Great Wall of China station; FILDES1 and FILDES2, two adjacent coverages of the 1:10,000 scale map of Fildes Peninsula, King George Island; and ZHONGSHN, a 1:1000 scale map of Zhongshan station, Larsemann Hills, East Antarctica. These coverages have been reprojected to the Polar Stereographic map projection, but no attempt has been made to integrate them with the main map data. No topology has been created for these coverages. The arc and point attribute tables contain items as shown in Table 3.10.

Table 3.10. Description of attribute table for Chinese data

Name	*Description*
SCODE	A code indicating the type of feature. The values are given in Appendix 3, Table A3.1.
HEIGHT	The height of the feature above sea-level, if appropriate.
TEXT	Any text associated with the feature.

The SCODE values are explained in Appendix 3, Table A3.1, and the type of feature to which they refer is also given. In many cases, a given value of SCODE may refer to both points and lines. This is because the same SCODE may refer to both the feature being mapped and a text item used to identify the feature. Thus, a building (SCODE = 211) will be represented by arcs with SCODE = 211, which give the outline of the building, and possibly by a point with SCODE = 211, whose TEXT attribute can be used to label the feature.

Additional place-names - A single point coverage containing place-names which arrived too late to be included in the hierarchical structure of the main place-names table has been included on the CD-ROM. This coverage contains names received in digital form from Argentina and Germany, and those received in manuscript form from Poland. The point attribute table for this coverage is described in Appendix 3, Table A3.2.

Penguin populations - A single point coverage containing data on penguin populations from Woehler and Poncet (1993); the point attribute table (PAT) is described in Appendix 3, Table A3.3.

Altimetry - Two coverages are provided containing surface elevation data from precise altimeters mounted on satellites. These data are provided as point coverages but it should be noted that the data are on a regular grid, which could easily be converted into a digital elevation model if required. The point attribute table contains a single item (HEIGHT), which gives the height of the surface in metres above the ellipsoid.

These data are not directly comparable with the contour detail given in the main part of the topographic database, for the following reasons:

i. The data are referenced to the ellipsoid, not to the geoid. The geoid deviates from the ellipsoid markedly in the Antarctic, with differences of between +40 and -60 m.

ii. The data contain systematic errors because the altimeter measures the distance to the closest part of the surface within the altimeter footprint, not to the point at the satellite's nadir.

iii. Satellite altimeters cannot track across terrain where the surface slope exceeds approximately 1.5°, and they are unreliable where the slope exceeds 1°. The data given here are only reliable for the inland ice caps, and should not be used in mountainous or coastal regions.

Geosat data are provided on a 20 km grid. Because the satellite orbit did not pass south of 72°S, no information is available south of this latitude. The data were provided by Dr H.J. Zwally, Goddard Space Flight Center; a detailed description of their processing is given by Zwally and others (1988).

ERS-1 data are provided on a 12.5 km grid. This satellite does not pass south of 80°S and no information is available south of 80°S. The data were provided by Dr G. Ridley, Mullard Space Science Laboratory. This dataset was derived from a fast delivery product early in the satellite mission and NO corrections have been made.

Antarctic symbol sets

Specially designed symbol sets have been created to enable the use of internationally accepted symbols in ArcView. These are located in the **SYMBOLS** directory of the CD. To install the symbol sets, follow the instructions given below:

1. Copy the file **fnt025** to the ig163exe directory of ArcView.

2. Change directory to ArcView\symbols directory and change the files named **av.mark, av.shd, av.lin** and **av.txt** to **avold.*****, where *** is one of the previous file extensions.

3. Copy the symbol set files called **symbols.mrk, symbols.shd, symbols.lin** and **symbols.txt** from the CD to this directory, naming them **av.*****, where *** represents the previous file extension.

References

Snyder, J.P. 1987. Map projections - a working manual. *U.S. Geological Survey Professional Paper,* **1395**, 383 pp.

Woehler, E.J. and Poncet, S. 1993. The distribution and abundance of Antarctic and Subantarctic penguins. SCAR Bird Biology Sub-committee, 86 pp.

Zwally, H.J., Major, J.A., Brenner, A.C. and Martin, T.V. 1988. User's guide for Antarctica elevation data from Seasat. *NASA Technical memorandum, satellite radar altimetry over ice*, **4**, 22 pp.

Chapter 4

Layer Descriptions

Introduction

The summary descriptions of the different layers in the Antarctic digital database are arranged alphabetically according to the layer name and in two sections, one for topographic data and the other for conservation areas. Each layer description is organized into three parts:

* The **layer name, coverage file name** (includes number to indicate scale at which these data are available) and **feature class** (point, line or polygon).

* **Items, codes and values** which list the attribute names, geocode, brief definitions of the features in the layer, and the equivalent SCAR code.

* **Feature attribute table** that includes the item names and field definitions, the number of the column in which the fields begin, and the item classification. The latter indicates whether an item contains values which are coded (C), numeric (N), text (T) or date (D). Dates are not held in a date field because they may be incomplete; they may be quoted, for example, as 1980, June 1980 or 5 June 1980 depending on the availability of the information.

An introductory paragraph at the beginning of most layer descriptions summarizes the features briefly and includes comments for special attention. A tabular summary of the database layers provided at different scales is given in Chapter 3, Table 3.1.

Note that some features may be contained in more than one class. For example, in the basic-scale dataset (scale0) contours are included in the CONT00 coverage as lines for the individual segments that cross ice and ice-free areas but in the generalized datasets they occur also as closed contours in the polygon feature class. Furthermore, the zero contour represents the coastline and it is, therefore, in the COAST layer rather than in the CONTOUR layer at scale0 and scale1. However, in the scale3 and scale10 datasets it is included in the CONTOUR layer as a zero contour, to allow polygon topology to be built for all areas above sea level.

All descriptions of ancillary datasets included in the directory EXTRAS are given in Appendix 3.

Naming conventions

Naming conventions have been established to allow the user to identify the layers and their basic contents from the name. Coverage names begin with an abbreviated form of the theme name and end with a numeric code indicating the scale of the data. Some coverages combine both lines and polygons into a coverage type and these are referred to as network coverages; others contain only point data. For example, the ROCK coverage includes individual line segments defining rock areas, the polygon enclosed by the line, and a point that acts as a seed point for the polygon.

The item names within the coverages also carry a naming convention to ensure that they are unique within the database. All item names are preceded by a three-letter theme abbreviation, a two-number code for the scale of the coverage and a three-letter abbreviation for the type of attribute. The naming coventions used in the database are given below in Tables 4.1-4.3.

Table 4.1. Theme abbreviations (layers)

Topographic data			
Code	*Description*	*Code*	*Description*
CLF	Cliff	ICD	Ice dome
CNT	Contour	LAK	Lakes
CST	Coast	MRN	Moraine
ELV	Elevation	PNM	Place-names
FLW	Flowline	RCK	Rock
FNA	Fauna	STR	Streams
GMG	Glacier margin	TRV	Traverse
HMN	Human		

Conservation areas	
Code	*Description*
HST	Historic Sites and Monuments
SPA	Specially Protected Areas
SSI	Sites of Special Scientific Interest

Table 4.2. Numeric codes used to denote the different scales

Code	*Description*
00	Basic scale of data capture (1:200,000, 1:250,000, etc.)
01	1:1,000,000
03	1:3,000,000
10	1:10,000,000
30	1:30,000,000

Table 4.3. Codes denoting attribute type

Code	*Description*	*Code*	*Description*
TYP	Geocode	EDT	Editor
HGT	Height	SRC	Source
DAT	Date	REV	Revision date
INF	Text	SRF	Surface type
SHT	Sheet		

Segmentation

The tiling scheme adopted for the data in the directory CARTO (scale0 and scale1 datasets) corresponds to the boundaries of the International Map of the World 1:1,000,000 scale map sheets. The scale3, scale10 and scale30 datasets in the directory AV are not tiled.

Layers for topographic data

CLIFF layer

Coverage names: CLIFF00, CLIFF01

Feature class: Line

Items, codes and values:

CLF**TYP - This cliff line item contains the geocodes with the following values:

Geocode	Definition	SCAR code
23070	Steep slope on snow	3.7
23080	Inland ice cliff or escarpment	3.8
23190	Rock cliff or escarpment	3.9
23260	Steep slope on ice-free area	-

Feature attribute table

Arc attribute table

Variable	*Defined item name*	*Begin column*	*Item definition*	*Item classification*
Feature ID	CLIFF**_ID	69	11, 11, I	N
Cliff line type	CLF**TYP	80	5, 5, I	C
Date	CLF**DAT	85	10, 10, C	D
Text	CLF**INF	95	50, 50, C	T
Sheet	CLF**SHT	145	10, 10, C	T
Editor	CLF**EDT	155	10, 10, C	C
Source	CLF**SRC	165	50, 50, C	T
Revision	CLF**REV	215	10, 10, C	D

** Replace with relevant scale code.

COAST layer

This layer contains the coastline and the grounding line of ice shelves or glacier tongues; it divides the area into sea, ice shelf or land. Note that a grounding line does **NOT** correspond to the zero contour.

Coverage names: COAST00, COAST01, COAST03, COAST10, COAST30

Feature class: Line and polygon

Items, codes and values:

CST**TYP - This coast line item contains geocodes with the following values:

Geocode	Definition	SCAR code
22010	Ice coastline (definite)	2.1
22011	Rock coastline (definite)	2.1
22012	Grounding line (definite)	2.1
22013	Rock against ice shelf (definite)	-
22020	Ice wall (approximate)	2.2
22021	Rock coastline (approximate)	2.2
22022	Grounding line (approximate)	2.2
22023	Rock against ice shelf (approximate)	-
22030	Iceberg tongue	2.3
22040	Floating glacier tongue	2.4
22050	Ice shelf and front	2.5
22090	Ice rumples (distinct)	-
22100	Ice rumples (indistinct)	-

CST**SRF - This coast surface item contains the following values:

Ocean
Land (= grounded ice or rock)
Ice shelf

Feature attribute tables

Arc attribute table

Variable	*Defined item name*	*Begin*	*Item definition*	*Item classification*
Feature ID	COAST**_ID	69	11, 11, I	N
Coast line type	CST**TYP	80	5, 5, I	C
Date[1]	CST**DAT	85	10, 10, C	D
Text[1]	CST**INF	95	50, 50, C	T
Sheet[1]	CST**SHT	145	10, 10, C	T
Editor[1]	CST**EDT	155	10, 10, C	C
Source[1]	CST**SRC	165	50, 50, C	T
Revision[1]	CST**REV	215	10, 10, C	D

** Replace with relevant scale code.
1 Attribute not used for scale3, scale10 and scale30 data.

Polygon attribute table

Variable	*Defined item name*	*Begin column*	*Item definition*	*Item classification*
Feature ID	COAST**_ID	38	11, 11, I	N
Coast surface type	CST**SRF	49	10, 10, C	C

** Replace with relevant scale code.

CONTOUR layer

The height attribute gives the contour or formline elevation in metres. The division into lines and polygons is dependent on scale; polygons apply to scale3 and scale10 data only.

Coverage name: CONT00, CONT01, CONT03, CONT10

Feature class: Line (scale0 and scale1), line and polygon (scale3 and scale10)

Items, codes and values:

CNT**TYP - This contour line item contains the geocodes with the following values:

Geocode	Definition	SCAR code
23090	Index contours on ice definite	3.9
23091	Contours on ice (definite)	3.9
23100	Index contours on ice (approximate)	3.10
23101	Contours on ice (approximate)	3.10
23110	Depression contour on ice	3.11
23160	Index contour on ice-free area (definite)	3.16
23161	Contours on ice-free area (approximate)	3.16
23170	Index contours on ice-free area (approximate)	3.17
23171	Contours on ice-free area (approximate)	3.17
23180	Depression contour on ice-free area	3.18

CNT**BND - Elevation zone polygon

Code (for scale3 and scale10 datasets where contour interval is 500 m)

0	Sea
1	0-500
2	500-1000
3	1000-1500
4	1500-2000
5	2000-2500
6	2500-3000
7	3000-3500
8	3500-4000
9	4000-4500
10	4500-5000

Feature attribute tables

Arc attribute table for scale0, scale1, scale3 and scale 10

Variable	*Defined item name*	*Begin column*	*Item definition*	*Item classification*
Feature ID	CONT**_ID	69	11, 11, I	N
Contour line type	CNT**TYP	80	5, 5, I	C
Height	CNT**HGT	85	13, 13, F, 6	N
Date[1]	CNT**DAT	98	10, 10, C	D
Text[1]	CNT**INF	108	50, 50, C	T
Sheet[1]	CNT**SHT	158	10, 10, C	T
Editor[1]	CNT**EDT	168	10, 10, C	C
Source[1]	CNT**SRC	178	50, 50, C	T
Revision[1]	CNT**REV	228	10, 10, C	D

** Replace with relevant scale code.
1 Attribute not used for scale3 and scale10 data.

Polygon attribute (Elevation Zone) table for scale3 and scale10

Variable	*Defined item name*	*Begin column*	*Item definition*	*Item classification*
Feature ID	CONT**_ID	38	11, 11, I	N
Height of high side	CNT**HI	49	5, 5, I	N
Height of low side	CNT**LO	54	5, 5, I	N
Elevation band	CNT**BND	59	5, 5, I	C

** Replace with relevant scale code.

ELEVATION layer

This layer contains all points with height information. The height attribute gives the elevation of the point, except for geocode 24040, when the height attribute shows the ice thickness. All measurements are in metres. Lack of height information for a point is indicated by 0.

Coverage name: ELEVN00, ELEVN01, ELEVN03, ELEVN10

Feature class: Point

Items, codes and values:

ELV**TYP - This item contains the geocodes with the following values:

Geocode	Definition	SCAR code
24010	Elevation on rock (differential levelling or trigonometrical)	4.1
24011	Elevation on ice (differential levelling or trigonometrical)	4.1
24020	Elevation on rock (airborne altimetric, surface barometric)	4.2
24021	Elevation on ice (airborne altimetric, surface barometric)	4.2
24030	Elevation on rock (photogrammetric)	4.3
24031	Elevation on ice (photogrammetric)	4.3
24040	Ice thickness	4.4
24050	Geodetic satellite observation station (precise)	4.5
24051	Geodetic satellite observation station (less precise)	4.5
24060	Astronomical station (monumented)	4.6
24061	Astronomical station (not monumented)	4.6
24070	Survey control station (monumented)	4.7
24071	Survey control station (not monumented)	4.7
24080	Bench mark and elevation	4.8

Feature attribute table

Point attribute table

Variable	*Defined name item*	*Begin column*	*Item definition*	*Item classification*
Feature ID	ELV**_ID	38	11, 11, I	N
Elevation point type	ELV**TYP	49	5, 5, I	C
Height	ELV**HGT	54	13, 13, F, 6	N
Date[1]	ELV**DAT	67	10, 10, C	D
Text[1]	ELV**INF	77	50, 50, C	T
Sheet[1]	ELV**SHT	127	10, 10, C	T
Editor[1]	ELV**EDT	137	10, 10, C	C
Source[1]	ELV**SRC	147	50, 50, C	T
Revision[1]	ELV**REV	197	50, 50, C	D

** Replace with relevant scale code.

[1] Attribute not used for scale3 and scale10 data.

FAUNA layer

The point data in this layer, giving the location of bird or seal colonies, represent information derived from published map sources. More detailed information on penguin colonies is given in an ancillary dataset on the CD-ROM (see Appendix 3). A complete list of Specially Protected Areas is included in Chapter 6 and descriptions for the SPA layers are given in the Conservation Areas section of this chapter.

Coverage name: FAUNA00, FAUNA01

Feature class: Point

Items, codes and values:

FNA**TYP - This fauna point item contains the geocodes with the following values:

Geocode	Definition	SCAR code
25010	Adélie Penguin rookery	5.1
25020	Emperor Penguin rookery	5.2
25030	Seal colony	5.3
25040	Petrel colony	5.4
25050	Specially Protected Area (SPA)	5.5

Feature attribute table

Point attribute table

Variable	*Defined item name*	*Begin column*	*Item definition*	*Item classification*
Feature ID	FAUNA**_ID	38	11, 11, I	N
Fauna point type	FNA**TYP	49	5, 5, I	C
Date	FNA**00DAT	54	10, 10, C	D
Text	FNA**INF	64	50, 50, C	T
Sheet	FNA**SHT	114	10, 10, C	T
Editor	FNA**EDT	124	10, 10, C	C
Source	FNA**SRC	134	50, 50, C	T
Revision	FNA**REV	184	10, 10, C	D

** Replace with relevant scale code.

FLOWLINE layer

Contains glacier flowlines. Note that other mappable features on glaciers, such as crevasses and crevasse fields, are not recorded in the database for lack of comprehensive source material over the whole continent.

Coverage name: GFLOW00, GFLOW01, GFLOW03

Feature class: Line

Items, codes and values:

FLW**TYP - This flowline item contains the geocode with the following value:

Geocode	Definition	SCAR code
23011	Plottable feature on glacier	3.1

Feature attribute table

Arc attribute table

Variable	*Defined item name*	*Begin column*	*Item definition*	*Item classification*
Feature ID	GFLOW**_ID	69	11, 11, I	N
Flow line type	FLW**TYP	80	5, 5, I	C
Date	FLW**DAT	85	10, 10, C	D
Text[1]	FLW**NF	95	50, 50, C	T
Sheet[1]	FLW**SHT	145	10, 10, C	T
Editor[1]	FLW**EDT	155	10, 10, C	C
Source[1]	FLW**SRC	165	50, 50, C	T
Revision[1]	FLW**REV	215	10, 10, C	D

** Replace with relevant scale code.

1 Attribute not used for scale3 data.

GLACIER MARGIN layer

Only glacier margins, including shear zones at the margins of ice streams, are present in this layer.

Coverage name: GMARG00

Feature class: Line

Items, codes and values:

GMG00TYP - This glacier margin line item contains the geocode with the following value:

Geocode	Definition	SCAR code
23010	Glacier margin/shear zone at margin of ice stream	3.1

Feature attribute table

Arc attribute table at scale0

Variable	*Defined item name*	*Begin column*	*Item definition*	*Item classification*
Feature ID	GMARG00_ID	69	11, 11, I	N
Glacier margin line type	GMG00TYP	80	5, 5, 1	C
Date	GMG00DAT	85	10, 10, C	D
Text	GMG00INF	95	50, 50, C	T
Sheet	GMG00SHT	145	10, 10, C	T
Editor	GMG00EDT	155	10, 10, C	C
Source	GMG00SRC	165	50, 50, C	T
Revision	GMG00REV	215	10, 10, C	D

HUMAN layer

This layer contains all point data related to human activity.

Coverage name: HUMAN00, HUMAN01, HUMAN03, HUMAN10

Feature class: Point

Items, codes and values:

HMN**TYP - This human point item contains the geocodes with the following values:

Geocode	Definition	SCAR code
24110	Aerodrome (with facilities) suitable for wheeled aircraft	4.11
24111	Aerodrome (without facilities) suitable for wheeled aircraft	4.11.1
24120	Aerodrome (with facilities) suitable for ski-equipped aircraft only	4.12
24121	Aerodrome (without facilities) suitable for ski-equipped aircraft only	4.12.1
24130	Helicopter aerodrome (with facilities) unsuitable for fixed wing aircraft	4.13
24131	Helicopter aerodrome (without facilities) unsuitable for fixed wing aircraft	4.13.1
24160	Aircraft wreckage	4.16
24180	Single radio mast	4.18
24181	Multiple radio masts	4.18
24190	Scientific station	4.19
24200	Occupied building	4.20
24201	Abandoned building	4.20
24210	Refuge	4.21
24240	Oil tanks (in use)	4.24
24241	Oil tanks (disused)	4.24
24242	Water tanks (in use)	4.24
24243	Water tanks (disused)	4.24
24250	Automatic weather station	4.25
24260	Historic Sites and Monuments* (sites listed in Antarctic Treaty)	4.26
24270	Sites of Special Scientific Interest*	4.27

* Note that these items are derived from published map sources. A complete list of such sites is given in Chapter 6 and they are described in the HISTORIC and SSSI layers in the Conservation Areas section of this chapter.

Feature attribute table

Point attribute table

Variable	*Defined item name*	*Begin column*	*Item definition*	*Item classification*
Feature ID	HUMAN**_ID	38	11, 11, I	N
Human point type	HMN**TYP	49	5, 5, I	C
Date[1]	HMN**DAT	54	10, 10, C	D
Text	HMN**INF	64	50, 50, C	T
Sheet[1]	HMN*SHT	114	10, 10, C	T
Editor[1]	HMN**EDT	124	10, 10, C	C
Source	HMN**SRC	134	50, 50, C	T
Revision[1]	HMN**REV	184	10, 10, C	D

** Replace with relevant scale code.
1 Attribute not used for scale3 and scale10 data.

ICE DOME layer

Point data indicating the presence of isolated ice hillocks or domes are included in this layer.

Coverage name: IDOME00

Feature class: Point

Items, codes and values:

ICD00TYP - This ice dome item contains the geocode with the following value:

Geocode	Definition	SCAR code
23130	Ice hillock, ice dome	3.13

Feature attribute table

Point attribute table for scale0

Variable	*Defined item name*	*Begin column*	*Item definition*	*Item classification*
Feature ID	IDOME00_ID	38	11, 11, I	N
Ice-dome point type	ICD00TYP	49	5, 5, I	C
Date	ICD00DAT	54	10, 10, C	D
Text	ICD00INF	64	50, 50, C	T
Sheet	ICD00SHT	114	10, 10, C	T
Editor	ICD00EDT	124	10, 10, C	C
Source	ICD00SRC	134	50, 50, C	T
Revision	ICD00REV	184	10, 10, C	D

LAKES layer

Outlines of lakes and meltpools are present in this layer. Note that ephemeral meltpools on ice shelves are not recorded in the database although they were plotted on some series of Antarctic maps used as source material.

Coverage name: LAKES00, LAKES01, LAKES03

Feature class: Line and polygon

Items, codes and values:

LAK**TYP - This lake line item contains the geocodes with the following values:

Geocode	Definition	SCAR code
23061	Lake or meltpool on ice	3.6
23062	Lake or meltpool on rock	3.6

LAK**SRF - This lake surface item = lake.

Feature attribute tables

Arc attribute table

Variable	*Defined item name*	*Begin column*	*Item definition*	*Item classification*
Feature ID	LAKES**_ID	69	11, 11, N	N
Lake line type	LAK**TYP	80	5, 5, I	C
Date[1]	LAK**DAT	85	10, 10, C	D
Text[1]	LAK**INF	95	50, 50, C	T
Sheet[1]	LAK**SHT	145	10, 10, C	T
Editor[1]	LAK**EDT	155	10, 10, C	C
Source[1]	LAK**SRC	165	50, 50, C	T
Revision[1]	LAK**REV	215	10, 10, C	D

** Replace with relevant scale code.
1 Attribute not used for scale3 and scale10 data.

Polygon attribute table

Variable	*Defined name item*	*Begin column*	*Item definition*	*Item classification*
Feature ID	LAKES**_ID	38	11, 11, I	N
Lake surface type	LAK**SRF	49	10, 10, C	T

** Replace with relevant scale code.

MORAINE layer

Contains the outlines of moraine on ice and on rock.

Coverage name: MORAN00, MORAN01

Feature class: Line and polygon

Items, codes and values:

MRN**TYP - This moraine line item contains the geocode with the following value:

Geocode	Definition	SCAR code
23230	Areas of moraine on ice and on rock	3.23

Feature attribute tables

Arc attribute table

Variable	*Defined item name*	*Begin column*	*Item definition*	*Item classification*
Feature ID	MORAN**_ID	69	11, 11, I	N
Moraine line type	MRN**TYP	80	5, 5, I	C
Date	MRN**DAT	85	10, 10, C	D
Text	MRN**INF	95	50, 50, C	T
Sheet	MRN**SHT	145	10, 10, C	T
Editor	MRN**EDT	155	10, 10, C	C
Source	MRN**SRC	165	50, 50, C	T
Revision	MRN**REV	215	10, 10, C	D

** Replace with relevant scale code.

Polygon attribute table

Variable	*Defined name item*	*Begin column*	*Item definition*	*Item classification*
Feature ID	MORAN**_ID	38	11, 11, I	N
Moraine surface type	MRN**SRF	49	10, 10, C	T (= Moraine)

** Replace with relevant scale code.

PLACE-NAMES layer

Includes names from five national Antarctic place-names gazetteers (Australia, Norway, UK and USA). Other place-name gazetteers not included in the hierarchy created for this layer are available on the CD-ROM as an ancillary dataset (see Appendix 3). More detailed information on place-names is given in Chapter 5.

Coverage name: PNAME00, PNAME01, PNAME03, PNAME10, PNAME30

Feature class: Point

Items, codes and values:

Feature attribute table

Point attribute table

Variable	*Defined name item*	*Begin column*	*Item definition*	*Item classification*
Place-name_ID	PNAME**_ID	38	11, 11, I	N
Name	PNM**NAM	49	45, 45, C	T
Generation	PNM**LVL	94	11, 11, I	C
Latitude	PNM**LAT	105	17, 17, F, 6	N
Longitude	PNM**LON	122	17, 17, F, 6	N
Parent_ID	PNM**PID	139	11, 11, I	N
Parent name	PNM**PNM	150	45, 45, C	T
Source	PNM**SRC	195	4, 4, C	C
Year of publication	PNM**PYR	199	11, 11, I	N
Status	PNM**STA	210	10, 10, C	T
Language_code	PNM**LCD	220	3, 3, C	C
Equivalent_ID	PNM**EQV	223	11, 11, I	N
Equiv_name	PNM**EQN	234	45, 45, C	T
Equiv_source	PNM**EQS	279	4, 4, C	C

** Replace with relevant scale code.

ROCK layer

All lines delimiting exposed rock areas are included in this layer. The polygon_ID is set to 0 for ice-covered areas, and to 1 for ice-free areas. In a few cases in the scale0 and scale1 datasets, rock areas have required splitting further than the basic IMW 1:1,000,000 scale sheet tile, in order that polygon topology can be built. Such coverages are named ROCK00A, ROCK00B, etc.

Coverage name: ROCK00, ROCK01, ROCK03, ROCK10

Feature class: Line, polygon and point

Items, codes and values:

RCK**TYP - This rock line item contains the geocodes with the following values:

Geocode	Definition	SCAR code
22011	Rock coastline (definite)	2.1
22013	Rock against ice shelf (definite)	-
22021	Rock coastline (approximate)	2.2
22023	Rock against ice shelf (approximate)	-
23150	Ice-free area (rock outcrop)	3.15

Feature attribute tables

Arc attribute table

Variable	*Defined item name*	*Begin column*	*Item definition*	*Item classification*
Feature ID	ROCK**_ID	69	11, 11, I	N
Rock line type	RCK**TYP	80	5, 5, I	C
Date[1]	RCK**DAT	85	10, 10, C	D
Text[1]	RCK**INF	95	50, 50, C	T
Sheet[1]	RCK**SHT	145	10, 10, C	T
Editor[1]	RCK**EDT	155	10, 10, C	C
Source[1]	RCK**SRC	165	50, 50, C	T
Revision[1]	RCK**REV	215	10, 10, C	D

Polygon attribute table

Variable	*Defined item name*	*Begin column*	*Item definition*	*Item classification*
Feature ID	ROCKS**_ID	38	11, 11, I	N
Rock surface type	RCK**SRF	49	10, 10, C	T

** Replace with relevant scale code.

[1] Attribute not used for scale3 and scale10 data.

STREAMS layer

Only meltstreams on rock and on continental ice are present in this layer. Meltstreams on ice shelves are not recorded in the database although they have been plotted on some series of Antarctic maps used as source material.

Coverage name: STRMS00

Feature class: Line

Items, codes and values:

STR00TYP - This stream line item contains the geocode with the following value:

Geocode	Definition	SCAR code
23060	Meltwater stream	3.6

Feature attribute table

Arc attribute table for scale0

Variable	*Defined item name*	*Begin column*	*Item definition*	*Item classification*
Feature ID	STRMS00_ID	69	11, 11, I	N
Stream line type	STR00TYP	80	5, 5, I	C
Date	STR00DAT	85	10, 10, C	D
Text	STR00INF	95	50, 50, C	T
Sheet	STR00SHT	145	10, 10, C	T
Editor	STR00EDT	155	10, 10, C	C
Source	STR00SRC	165	50, 50, C	T
Revision	STR00REV	215	10, 10, C	D

TRAVERSE layer

Contains the tracks of overland traverses. The attribute 'text' contains the name of the traverse and its date.

Coverage name: TRAV00

Feature class: Line

Items, codes and values:

TRV00TYP - This traverse line item contains the geocode with the following value:

Geocode	Definition	SCAR code
24090	Oversnow route (marked)	4.9
24100	Oversnow route (unmarked)	4.10

Feature attribute table

Arc attribute table for scale0

Variable	*Defined item name*	*Begin column*	*Item definition*	*Item classification*
Feature ID	TRAV00_ID	69	11, 11, I	N
Traverse line type	TRV00TYP	80	5, 5, I	C
Date	TRV00DAT	85	10, 10, C	D
Text	TRV00INF	95	50, 50, C	T
Sheet	TRV00SHT	145	10, 10, C	T
Editor	TRV00EDT	155	10, 10, C	C
Source	TRV00SRC	165	50, 50, C	T
Revision	TRV00REV	215	10, 10, C	D

Layers for conservation areas

HISTORIC layer

Records all point data for the Historic Sites and Monuments listed in Chapter 6.

Coverage name: HISTPT00

Feature class: Point

Items, codes and values:

HST00TYP - This point item has the following geocode value:

Geocode	Definition	SCAR code
24260	Historic Sites and Monuments	4.26

Feature attribute table

Point attribute table for scale 0

Variable	*Defined item name*	*Begin column*	*Item definition*	*Item classification*
Feature ID[2]	HISTPT00_ID	38	11, 11, I	N
Geocode	HST00TYP	49	5, 5, I	C
Name	HST00NAM	54	100, 100, C	T

[2] Sites are sequentially numbered as HSM No 1, etc.

SPA layers

Contains all records pertaining to Specially Protected Areas (SPAs). Note that for site identification, the polygon data files must be shown in conjunction with the relevant point data files. All SPAs are described in more detail in Chapter 6.

Coverage names: SPAPOL00, SPAPT00

Feature class: Polygon and point

Items, codes and names:

SPA00TYP - This item contains the following code and definition:

Geocode	Definition	SCAR code
25050	Specially Protected Area	5.5

Feature attribute tables

Polygon attribute table for scale0

Variable	*Defined item name*	*Begin column*	*Item definition*	*Item classification*
Feature ID[2]	SPAPOL00_ID	69	11, 11, I	N
Geocode	SPA00TYP	80	5, 5, I	C

[2] Sites are sequentially numbered as SPA No 1, etc.

Point attribute table for scale0

Variable	*Defined item name*	*Begin column*	*Item definition*	*Item classification*
Feature ID[2]	SPAPT00_ID	38	11, 11, I	N
Geocode	SPA00TYP	49	5, 5, I	C
Name	SPA00NAM	54	100, 100, C	T

[2] Sites are sequentially numbered as SPA No 1, etc.

SSSI layers

Lists all records of Sites of Special Scientific Interest (SSSIs). Note that, for site identification, the polygon data files must be shown in conjunction with the relevant point data files. All SSSIs are described in more detail in Chapter 6.

Coverage name: SSSIPOL00, SSSIPT00

Feature class: Polygon and point

Items, codes and names:

SSI00TYP - This item contains the following codes and definitions:

Geocode	Definition	SCAR code
24270	Sites of Special Scientific Interest	4.27

Feature attribute table

Polygon attribute table for scale0

Variable	*Defined item name*	*Begin column*	*Item definition*	*Item classification*
Feature ID[2]	SSSIPOL00_ID	69	11, 11, I	N
Geocode	SSI00TYP	80	5, 5, I	C

Point attribute table for scale0

Variable	Defined item name	Begin column	Item definition	Item classification
Feature ID[2]	SSSIPT00_ID	38	11, 11, I	N
Geocode	SSI00TYP	49	5, 5, I	C
Name	SSI00NAM	54	100, 100, C	T

[2] Sites are sequentially numbered as SSSI No 1, etc.

Ancillary datasets

The ancillary datasets are:

Maps of Chinese Antarctic stations
Additional Antarctic place-names (Argentina, Germany and Poland)
Penguin populations
Altimetry (Geosat and ERS-1)

They represent data that have not been incorporated into the ADD but which are included on the CD-ROM, as stand-alone data, for the user's convenience. Their content is described in Chapter 3 and their attribute tables are given in Appendix 3.

Chapter 5

Place-names

Introduction

Owing to a combination of historical and linguistic factors, there is no single co-ordinating authority for naming features in Antarctica. Names, instead, are controlled by a variety of national place-names committees which have responsibility for their territorial claims or areas of national activity in Antarctica. Some countries, however, have no formal mechanism for establishing Antarctic place-names.

NOTE
Time and resource limitations on the project were such that only those names submitted to the UK in digital form could be made available on the CD-ROM.

Although all territorial claims to the continent have been held in abeyance since the Antarctic Treaty came into force in 1961, Australia, France, New Zealand, Norway and the UK recognize the Antarctic territorial claims of each other and also the English, French and Norwegian names approved by their naming authorities. The UK and USA have an agreement to keep each other informed of their place-name decisions.

Some duplication of names occurs in areas where territorial claims overlap. For example, there are two slightly different sets of Spanish names as well as English names where the Argentine and Chilean territorial claims overlap with the British claim in the Antarctic Peninsula region. Furthermore, Germany and Japan have approved names for features within the Norwegian territorial claim of Dronning Maud Land.

The USA uses only English-language forms of names throughout the continent, having translated most foreign words into English. On Russian maps all generic parts of names are translated into Russian and the specific parts are mostly transliterations into Cyrillic script from other languages. Because of the multiplicity of languages and naming authorities, therefore, there may be a number of synonyms attributed to a given geographical feature in Antarctica instead of a unique place-name.

Each place-names committee publishes the names it approves in the form of a gazetteer; relatively few are available in digital form. The gazetteers are the definitive source of place-names for Antarctica and in them the names are located by a single point, defined either by geographical co-ordinates or by a description in terms of other named features (e.g. coasts). For the CD-ROM approximately 16,000 place-names from five gazetteers have been incorporated into a single point coverage and a hierarchy for the names has been created to enable their selection appropriate to the scale of the map displayed. Cross-links have been established in the database so that equivalent names authorized by the different naming committees could be recorded. Separate coverages for each scale of generalization have been provided, such as PNAME00, PNAME01, etc. The point attribute table (PAT) of these coverages is shown in Table 5.1.

CAUTION

The place-name co-ordinates are as supplied by the datasets derived from gazetteers and they may not match the geographical co-ordinates of the feature as seen on the screen. Errors in co-ordinates (e.g. longitude being East instead of West) have been corrected where noticed but no systematic check on accuracy has been carried out. No names in the ADD have been derived from map sources.

Table 5.1. Attribute table for place-names at the basic scale of data capture

Name	*Description*
PNAME00-ID	Unique accession number for each name. This is used as the point ID in the coverage.
PNM00NAM	The place-name. This may be blank in the case of entries created to maintain the structure of the place-names hierarchy (null level).
PNMOOLUL	The level of the name in the hierarchy. The top of the hierarchy is level 0 ("The World").
PNM00LAT	The latitude of the point defining the name, from the source gazetteer. This is in degrees and decimal degrees, with South latitudes negative.
PNM00LNG	The longitude of the point defining the name, from the source gazetteer. This is in degrees and decimal degrees, with west longitudes negative.
PNM00PID	The accession number of the parent of this name.
PNM00PNM	The place-name corresponding to PNM00PID. This may be blank in the case of entries created to maintain the structure of the place-names hierarchy (null level).
PNM00SRC	An alphabetic code designating the source of the name. Possible values are: **BAT:** British Antarctic Territory **FID:** Falkland Islands Dependencies **USGS:** United States Geological Survey **AAT:** Australian Antarctic Territory **NOR:** Norway **PROJ:** for entries created by project staff.
PNM00PYR	The year of publication of the name in a gazetteer.
PNM00STA	Any comments concerning the status of the name (e.g. NEW if the name was a new name in the year given above).

Table 5.1. Attribute table for place-names at the basic scale of data capture (continued)

Name	*Description*
PNM00LCD	A code indicating the language of the source gazetteer.
PNM00EQV	The accession number of an equivalent name from another source. This may be blank if no equivalent exists.
PNM00EQN	The name corresponding to PNM00EQV
PNM00EQS	A code indicating the source of the equivalent name. The codes are the same as those in PNM00SRC.

In the ADD the seed point for all place-names is the starting point of the text. However, the geographical extent of large features such as lands, mountain ranges, large islands and plateaux cannot be reflected meaningfully in a single co-ordinate, and the entry in the gazetteers for these features, and thus in the database (i.e. the seed point), represents the nominal centre of the feature.

Hierarchy

Place-names can be selected according to the scale of the map displayed by means of a hierarchical tree-structured database. This database was created using the ORACLE relational database management system, each entry being related to a parent place-name. Whereas the common parent of all names is Antarctica, the parent, for example, of several small islands in a group is the name of that island group. The areal extent of parent names may be determined approximately by the co-ordinates of their children.

Levels of hierarchy

Officially named natural features in Antarctica have been assigned to 12 different hierarchical levels. Names relating to human activities (e.g. scientific stations) have not received any special treatment. Work has been carried out at the top levels of the hierarchy but, because of the time-frame of the project, place-names from levels 9-12 have not been attributed to their appropriate level. The names have been ranked according to the size of the feature, such that those representing major geographical regions occupy the upper levels of the hierarchy (Table 5.2) and minor features appear at the lower levels. Classification of individual features according to size has been somewhat subjective, but it will enable the user to select names at a level appropriate to the scale of display.

The following example of names in the South Shetland Islands indicates the general rules that have been developed during the creation of the hierarchy; these have been applied to the whole of Antarctica.

i. Islands in the group have been ranked according to physical size: Livingston Island and King George Island are at a higher level than Deception Island and Low Island.

ii. Bays are related to the island or named coast on which they are situated.

iii. Named points which define bays are placed one level below that of the bay. If the bay is not named, the point is related to the peninsula on which it stands.

iv. Small islands are placed at a level below the surrounding marine area or one level below the nearest point on land. In some cases island names will be related to the island group in which they occur.

v. Straits are on an equivalent level to the two adjacent islands, provided that both islands are at the same level in the hierarchy. If the two islands are at different levels, the strait is placed at the lower level.

vi. The parent of a strait will be the closest significant oceanic feature.

Note that, in general, a distinction has been made in the hierarchy between features on land and oceanic features.

Table 5.2. Levels of the place-names hierarchy

Level	*Features*	*Examples*
1	The Earth	
2	Major region	The Antarctic
3	Continent	Antarctica
4	Major regions and seas	West Antarctica, Weddell Sea
5	Major mountain ranges and plateaux	Transantarctic Mountains
6	Lands, major peninsulas and major ice shelves	Dronning Maud Land, Antarctic Peninsula, Ross Ice Shelf
7	Large ice shelves, major islands and archipelagos, large mountain ranges and plateaux	Larsen Ice Shelf, South Shetland Islands, Ellsworth Mountains
8	Coasts, small mountain ranges, small plateaux, large islands, island groups and straits	Danco Coast, Sentinel Range, Adelaide Island, Biscoe Islands
9-12	All other features from small islands, bays and glaciers to minor peaks, points, rocks and shoals	King George Island, Borge Bay, Kraków Peninsula

Null levels

Because names are distributed unevenly throughout Antarctica and because there was a need to restrict certain names to a particular level, *null levels* (control features) have been introduced. These ensure that a place-name appears at its correct level in the hierarchy even if its parent feature has not been named. For example, control feature 5243, which is of equivalent status to Kraków Peninsula (Fig. 5.1), is a substitute name for the large unnamed peninsula on King George Island; all names at lower levels on that peninsula will be children of control feature 5243, which itself has King George Island as its parent.

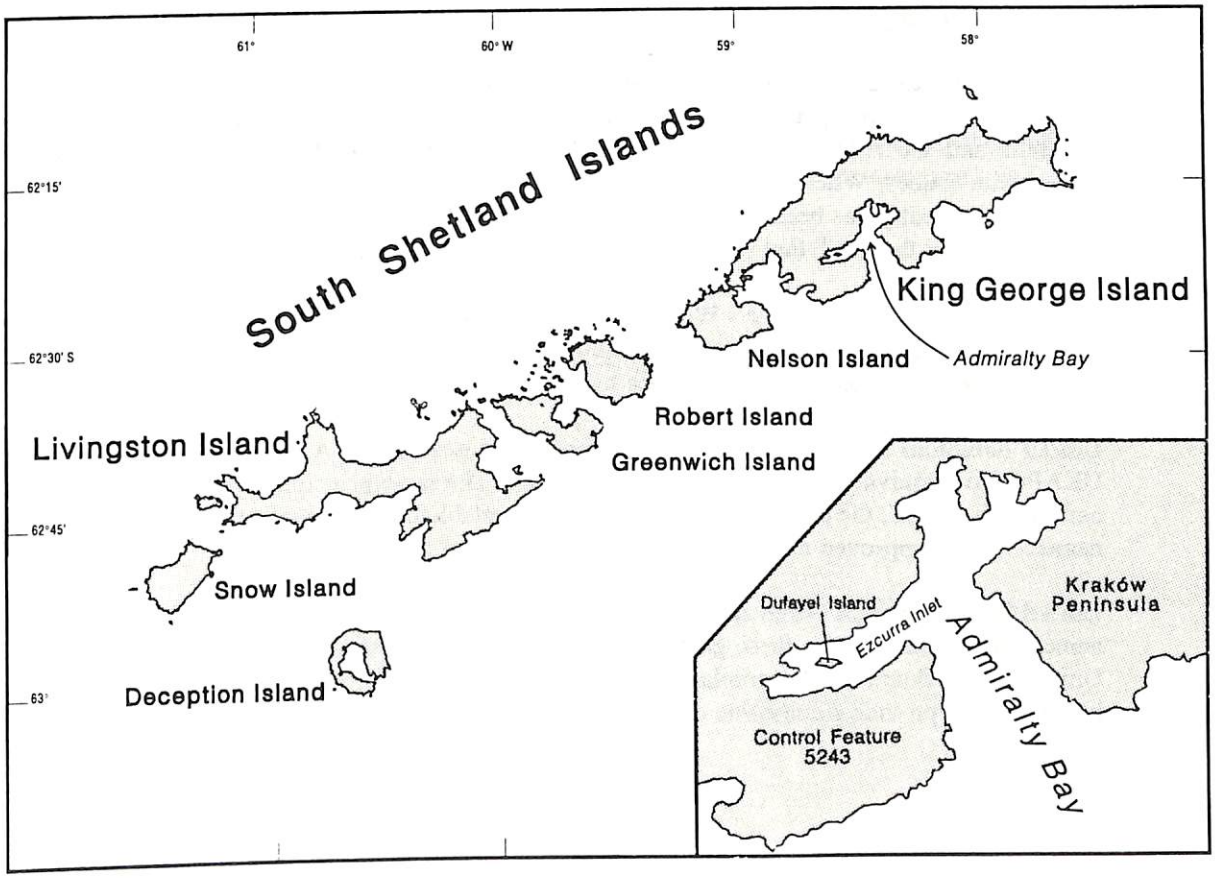


Figure 5.1. Place-names in the South Shetland Islands, Antarctica.

Equivalent names and cross-links

Each place-name from the different gazetteers included in the database has an individual record, identified by a unique accession number. The record contains the attributes shown in Table 5.1, including the accession number of any equivalent name; other equivalent names can be accessed by following the links from record to record. Because ArcView and ARC/INFO do not allow fully relational access to the database, extra fields have been added, so that each record contains both the names and accession numbers of all the parents of the current name. Similarly, the name and accession number of the first equivalent name is also given, where this is relevant. Detailed instructions on the format and use of these data are given in Chapter 3 and the gazetteers incorporated in the hierarchy are described below. These data should be used in conjunction with a database package supporting SQL (Structured Query Language) for maximum advantage.

Australian Antarctic Territory gazetteer - The hierarchy for Australian Antarctic Territory (AAT) has been established using place-names approved by the Antarctic Names and Polar Medal Committee of Australia and the Advisory Committee for Antarctic Names (ACAN) of the United States Board of Geographic Names. Where the co-ordinates and spelling of the names in the two gazetteers are identical, the Australian entry has been used for the hierarchy and the ACAN name retained as an equivalent name. Features within the AAT that have only ACAN-approved names are included in the hierarchy also.

Norsk Polarinstitutt gazetteer - Within Dronning Maud Land, the names used to establish the hierarchy were primarily those approved by the Norsk Polarinstitutt (NPI); ACAN and United Kingdom Antarctic Place-names Committee (UKAPC) names have been provided as equivalent names in some cases.

United Kingdom Antarctic Place-names Committee gazetteer - A number of names approved by the UKAPC have equivalent names approved by ACAN. The same principles were applied as those used for names within AAT, the place-names hierarchy being established by means of the approved UKAPC place-names; ACAN-approved names have been used where no others exist.

United States Board of Geographic Names-Advisory Committee on Antarctic Names - Antarctic place-names not included in the three gazetteers noted above were taken from the gazetteer published by the United States Board of Geographic Names. These ACAN-approved names were used to expand the hierarchy and provide place-name coverage for the whole of Antarctica.

Sources

Names used on the CD-ROM follow the naming authority areas shown in Fig. 5.2. Place-name lists have been received in digital form from the following countries; those marked with an asterisk arrived too late to be incorporated in the hierarchy but they are included on the CD-ROM as a separate dataset (see Appendix 3, Table A3.2):

Argentina* - 2910 place-names for the Argentine Antarctic Territory, as approved by the Servicio de Hidrografía Naval, Armada Argentina (Morandi, 1992)

Australia - 2192 place-names were provided for Australian Antarctic Territory (AAT), as approved by the Antarctic Names and Polar Medal Committee of Australia.

Germany* - 327 official Antarctic place-names were provided by the Institut für Angewandte Geodäsie, Frankfurt.

Norway - 1388 official place-names have been supplied by the Norsk Polarinstitutt, Oslo (Helle, 1992), which is the authority for place-names in Dronning Maud Land, Bouvetøya and Peter I Øy.

Poland* - 265 Antarctic place-names were introduced by Poland between 1978 and 1990. These names were provided by the Commission of Geodesy and Geographic Information, Committee of Polar Research of the Polish Academy of Sciences, Warsaw. Note that it has not been possible to reproduce all of the accented characters used in the Polish language on the CD-ROM.

UK - 4494 official place-names for the British Antarctic Territory were obtained from gazetteers and supplements (Hattersley-Smith, 1977; 1980; 1982; 1986; 1988; 1991) published by the UK Antarctic Place-names Committee, under the auspices of the Foreign and Commonwealth Office, London.

USA - 7809 approved names, authorized by the Advisory Committee on Antarctic Names of the US Board of Geographic Names. This committee has published an Antarctic gazetteer for the whole of the continent (Alberts, 1981; United States, Department of the Interior, 1990); all place-names are in English.

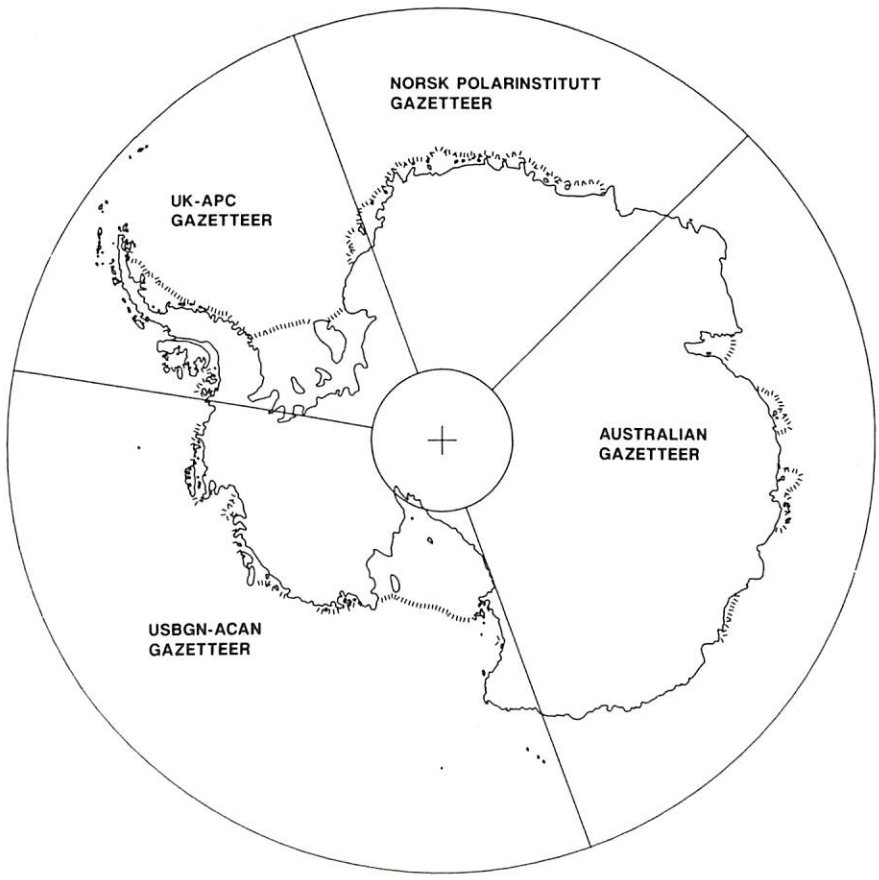


Figure 5.2. Sources of place-names used in the hierarchy.

References

Alberts, G., compiler/editor. 1981. *Geographic names of the Antarctic. Names approved by the United States Board of Geographic Names*. Washington, National Science Foundation, 959 pp.

Hattersley-Smith, G., compiler. 1977. *Gazetteer of the British Antarctic Territory*. London, Her Majesty's Stationery Office, 36 pp. Supplements published as follows: *First*, 6 pp. (1980), *Second*, 4 pp. (1982). *Third*, 3 pp. (1986), *Fourth*, 2 pp. (1988).

Hattersley-Smith, G. 1991. The history of place-names in the British Antarctic Territory. *British Antarctic Survey Scientific Reports*, No. 113, 670 pp.

Helle, G. 1992. *Preliminary lists of Norwegian place-names of Bouvetøya, Dronning Maud Land, Peter I Øy*. Bærum, Norsk Polarinstitutt, 36 pp.

Morandi, M.C., compiler. 1992. *Nomenclador Antártico Argentino*. Buenos Aires, Servicio de Hidrografía Naval, Armada Argentina, 65 pp.

United States, Department of the Interior. 1990. *Gazetteer of the Antarctic. Names approved by the United States Board of Geographic Names*, Washington, National Science Foundation, 145 pp.

Chapter 6

Conservation areas of Antarctica

Introduction

The Antarctic Treaty applies to the area south of latitude 60°S, including all islands and ice shelves. The whole area is subject to Agreed Measures for the Conservation of Antarctic Flora and Fauna. These include prohibitions on the killing, wounding, capturing or molesting of any native mammal or native bird except by permit; and regulations on the importation of non-indigenous species, parasites, and diseases. Permits may be issued only by persons authorized by a participating government.

Conservation areas follow recommendations adopted at Antarctic Treaty Consultative Meetings (ATCM), commonly as a result of recommendations from SCAR. States belonging to the Treaty apply ATCM recommendations in order to control the activities of their own nationals. Each new ATCM recommends additions or alterations to the designation of certain areas. The system aims to evolve in response to changing perceptions and changing needs for conservation.

There are five categories of conservation area: Specially Protected Areas (SPA), Sites of Special Scientific Interest (SSSI), Historic Sites and Monuments (HSM), Specially Reserved Areas (SRA), and Multiple-use Planning Areas (MPA). Some areas designated under one category overlap or include areas in another category. Management plans are required for all areas except HSMs.

The 1991 Antarctic Treaty Consultative Meeting recommended that all SPAs and SSSIs should be redesignated as Antarctic Specially Protected Areas (ASPA) and be renamed and renumbered accordingly. However, the renaming and renumbering has not yet been done. Entry into an ASPA will be prohibited except in accordance with a permit.

A new category of protected areas is to be known as an Antarctic Specially Managed Area (ASMA) to assist in the planning and co-ordination of activities, avoid possible conflicts, improve co-operation between Parties or minimize environmental impacts. Entry into ASMAs will not require a permit.

Six Sealing Zones and three Seal Reserves have been established under the Convention for the Conservation of Antarctic Seals. No areas have yet been set aside under provisions of the Convention on the Conservation of Antarctic Marine Living Resources.

All conservation areas are discussed at length in *Handbook of the Antarctic Treaty System*, Part 3, 7th edition, 1990. Subsequent additions or amendments are discussed in *Antarctic Treaty: final report of the Sixteenth Antarctic Treaty Consultative Meeting, Bonn, 7-18 October 1991.*

The numbering system used for the conservation areas described in this chapter follows the ATCM allocation of numbers for individual sites. These numbers reflect the chronological order of approval of the site and they have no geographical significance. Information on Antarctic conservation areas is

included in the database in five point or polygon coverages (HISTPT, SPAPOL, SPAPT, SSSIPOL and SSSIPT) within the directory CONSITE, and in the thematic layers HISTORIC, SPA and SSSI (see Chapter 4).

Specially Protected Areas

The purpose of SPAs is to preserve both unique and representative examples of the natural ecological systems of areas which are of outstanding scientific interest. Vehicles of any kind are forbidden. Entry to an SPA is prohibited without a permit. The collection of any native plant or animal requires a further and more specific permit. Permits may be issued only for a compelling scientific purpose which cannot be served elsewhere.

1. **Taylor Rookery, Mac. Robertson Land**
   67°27′S 60°52′E. Approximate area 30 ha. The area consists of the whole of the northernmost rock exposure on the eastern side of Taylor Glacier. Designated because Taylor Rookery contains a colony of Emperor Penguins which is one of the few, and probably the largest, of the known colonies of this species breeding wholly on land (see also SPA No 8).

2. **Rookery Islands, Holme Bay**
   Approximate area 65 ha. The area includes all of the approximately 75 small islands within a rectangle extending from 67°33′S to 67°38′S and from 62°33′E to 62°40′E. Designated because of the unusual association of all six bird species resident in the Mawson area. Two of these, the Giant Petrel and the Cape Petrel, occur nowhere else in the region. Field parties travelling from Mawson Station may inadvertently enter the area.

3. **Ardery Island and Odbert Island, Budd Coast**
   Approximate area 220 ha. The islands are at 66°22′S 110°28′E and 66°22′S 110°33′E. The area lies offshore in Vincennes Bay, 13 km south of the former Wilkes Station. Designated on the grounds that it supports several breeding species of petrel and provides an example of their habitat. Two of these species, the Antarctic Petrel and Antarctic Fulmar, are of particular scientific interest.

4. **Sabrina Island, Balleny Islands**
   66°54′S 163°19′E. Approximate area 30 ha. Sabrina Island is 2 km south of Buckle Island. Designated on the grounds that the Balleny Islands, as the most northerly Antarctic land in the Ross Sea region, support fauna and flora which reflect many circumpolar distributions at this latitude; and that Sabrina Island in particular provides a representative sample of such fauna and flora.

5. **Beaufort Island, Ross Sea**
   76°57′S 166°55′E. Approximate area 1865 ha. Beaufort Island lies 37 km north of Ross Island. Designated on the grounds that the island contains substantial and varied avifauna, that it is one of the most important breeding grounds in the region, and that it should be protected to preserve the natural ecological system as a reference area.

   [Cape Crozier redesignated as SSSI No 4]

7. **Cape Hallett, Victoria Land**
72°19′S 170°14′E. Approximate area 15 ha. The area comprises a roughly rectangular block south of the northern coast of Cape Hallett between the road which runs along the eastern side of Willett Cove and the western margin of the permanent ice cap, and to the north of an E-W line from a projection of the line of the road southward to a point 200 m south of 72°18′S to the margin of the permanent ice cap. Designated on the grounds that Cape Hallett includes a small patch of particularly rich and diverse vegetation which supports a variety of terrestrial fauna and that the ecosystem includes a rich avifauna.

8. **Dion Islands, Marguerite Bay, Antarctic Peninsula**
67°52′S 68°42′W. Approximate area 100 ha. A group of small, rocky, low-lying islands in Marguerite Bay, about 13 km south of Adelaide Island. The area comprises all of the Dion Islands archipelago together with the intervening sea. Designated on the grounds that amongst the Dion Islands is found the only colony of Emperor Penguins known to exist on the west side of the Antarctic Peninsula, and that the isolation of this colony from others of the same species makes it of outstanding scientific interest. It is also the most northerly and probably the smallest Emperor Penguin colony, and one of only two in which breeding occurs on land (see also SPA No 1). Adélie Penguins and Blue-eyed Cormorants also breed here.

9. **Green Island, Berthelot Islands, Antarctic Peninsula**
65°19′S 64°09′W. Approximate area 25 ha. A small island situated 150 m north of the largest of the Berthelot Islands. Designated on the grounds that the vegetation on Green Island is exceptionally rich, with well-developed continuous banks of moss turf which overlie peat more than 1 m deep, supporting Antarctic Hair Grass. A large Blue-eyed Cormorant colony, Brown Skuas, South Polar Skuas and hybrids are also found.

[**Byers Peninsula** redesignated as SSSI No 6]

[**Cape Shirreff** redesignated as SSSI No 32]

[**Fildes Peninsula** redesignated as SSSI No 5]

13. **Moe Island, South Orkney Islands**
60°44′S 45°41′W. Approximate area 100 ha. A small island lying about 500 m south-west of Signy Island. The off-lying rocks are not included in the area. Designated on the grounds that Moe Island provides a representative sample of the maritime Antarctic ecosystem, including large areas of peat, Chinstrap Penguins, Cape Petrels, Antarctic Prions, Weddell Seals, Leopard Seals, and Antarctic Fur Seals. Intensive experimental research on the neighbouring Signy Island may alter its ecosystem and Moe Island should be protected as a control area for future comparison.

14. **Lynch Island, South Orkney Islands**
60°39′S 45°36′W. Approximate area 10 ha. A small island in Marshall Bay, off the south coast of Coronation Island. Designated on the grounds that the island supports one of the most extensive and dense stands of Antarctic Hair Grass known in the Treaty area and that it provides an outstanding example of a rare natural ecological system. Several species of moss are unusually fertile, and the soil contains a rich invertebrate fauna. Most species of Antarctic seals are common around the island.

15. **Southern Powell Island and adjacent islands, South Orkney Islands**
60°44′S 45°00′W. Approximate area 600 ha. The area includes all of Powell Island south of the latitude of the southern summit of John Peaks, together with the whole of Fredriksen Island, Michelsen Island, Christoffersen Island, Grey Island and adjacent unnamed islands. Designated on the grounds that southern Powell Island and the adjacent islands support substantial vegetation and a considerable bird and mammal fauna, which is representative of the natural ecology of the South Orkney Islands, and which is rendered more important by the presence of an expanding breeding colony of Antarctic Fur Seals.

16. **Coppermine Peninsula, Robert Island**
62°22′S 59°43′W. Approximate area 65 ha. The area comprises all the land west of a line drawn from north to south across the peninsula 100 m west of the two shelters found on the isthmus. Designated on the grounds that Coppermine Peninsula is a biologically diverse area, supporting rich vegetation, together with a variety of terrestrial fauna, and that the ecosystem includes a rich avifauna. It has one of the largest continuous moss stands in the Antarctic. There are Chinstrap Penguins, Southern Giant Petrels, Wilson's Storm Petrels, Antarctic Terns, Dominican Gulls, Southern Elephant Seals, Weddell Seals and Fur Seals.

17. **Litchfield Island, Arthur Harbour, Palmer Archipelago**
64°46′S 64°06′W. Approximate area 35 ha. A small island designated on the grounds that, together with its littoral, it possesses an unusually rich collection of marine and terrestrial life, is unique amongst the neighbouring islands as a breeding place for six species of native birds and provides an outstanding example of the natural ecological system of the Antarctic Peninsula area.

18. **North Coronation Island, South Orkney Islands**
Between Conception Point, 60°31′S 45°41′W; Wave Peak, 60°37′S 45°36′W; and Foul Point, 60°32′S 45°29′W. Approximate area 5000 ha. The area lies on the central north side of Coronation Island. The entire area between the two points is included. The eastern boundary follows a precipitous ridge 6 km southwards to a position at 750 m altitude immediately to the west of Mt Nivea summit at 60°35′S 45°29′W, thence WSW for 5.5 km to a position at 700 m altitude north-east of Wave Peak summit, then 2 km due west to a point north-west of Wave Peak summit. It continues north-west for 5 km to the summit of an unnamed peak at the north-west end of Brisbane Heights, and from here 6.5 km north to Conception Point. The summits of Mt Nivea and Wave Peak and the col known as High Stile are outside the area. Ommanney Bay and the unnamed bay to the west are included within the area south of the boundary between Conception and Foul points (11.5 km). Designated on the grounds that it embraces areas of coastal ice-free terrain with large seabird colonies and lichen-dominated cliffs, and permanent ice rising to the Brisbane Heights plateau which provides an excellent representative area of a pristine ice environment near the northern limit of the maritime Antarctic, and that the interrelated terrestrial, ice and marine components of the area comprise an integrated example of the coastal, permanent ice, and sublittoral ecosystems typical of the maritime Antarctic environment.

19. **Lagotellerie Island, Marguerite Bay, Antarctic Peninsula**
67°53′S 67°24′W. Approximate area 130 ha. The island lies about 3 km west of the southern part of Horseshoe Island. Designated on the grounds that the island contains a relatively diverse flora and fauna typical of the southern Antarctic Peninsula; that of particular interest is the abundance of the only two Antarctic flowering plants which form stands up to 10 m²; that these are amongst the largest

stands known south of the South Shetland Islands, being only 90 km north of their southern limit; that here both Antarctic Hair Grass and Antarctic Pearlwort flower profusely and the seeds have a greater viability than those in the South Orkney and South Shetland islands; that numerous mosses and lichens also form well-developed communities on the island; that a few of the mosses are fertile, a rare phenomenon in most Antarctic localities; that the invertebrate fauna is rich and that the island is one of the southernmost sites for the Apterous Midge; that the shallow loamy soil developed beneath these swards and its associated invertebrate fauna and microbiota are probably unique at this latitude; that there is a colony of about 1000 Adélie Penguins and one of the southernmost colonies of Blue-eyed Cormorants and that numerous pairs of Brown and South Polar Skuas breed on the island.

20. New College Valley, Caughley Beach, Cape Bird, Ross Island

77°14′S 166°25′E. Approximate area 10 ha. The area consists of the ice-free terrain lying between the cliff top above Caughley Beach and about 100 m east of the Mt Bird ice cap, and between a line south of the main stream bed of Keble Valley and the south ridge of New College Valley. It is surrounded on three sides by SSSI No 10. Designated on the grounds that the area contains some of the most luxuriant stands of vegetation (algae, mosses, and lichens) and associated microflora and microfauna in the Ross Sea sector of Antarctica; that because of the susceptibility of the cryptogamic vegetation to damage from trampling, the designation of the area provides protection for its biota; and that the area should serve as a conservation reserve representative of the adjacent SSSI.

21. Avian Island, Marguerite Bay, Antarctic Peninsula

67°46′S 68°54′W. Approximate area 49 ha. The island lies 0.25 km south of the south-west tip of Adelaide Island. The area consists of the island together with its littoral zone. Designated on the grounds that it is unique in the Antarctic Peninsula region for its abundance and diversity of breeding seabirds, the most important of which are Adélie Penguins, Blue-eyed Cormorants, Southern Giant Petrels, Dominican Gulls, skuas, and Wilson's Storm Petrels. Weddell Seals breed and Antarctic Fur Seals come ashore.

22. Cryptogam Ridge, Mount Melbourne, Victoria Land

74°22′S 164°41′E. Approximate area 60 ha. The area includes most of Cryptogam Ridge on the southern rim of the main summit crater and lies within SSSI No 24. Designated on the grounds that the geothermal ground supports a unique community of bryophytes, algae, and microbiota, including the only known occurrence in the Antarctic of the moss *Campylopus pyriformis* and the very rare continental occurrence of the liverwort *Cephaloziella exiliflora*. The site is comparable with the only other known high-altitude geothermally-influenced ice-free area near the summit of Mount Erebus.

23. Forlidas Pond and Davis Valley ponds, Dufek Massif

82°28′15″S 51°14′W. Approximate area 600 ha. Forlidas Pond is near the east end of Dufek Massif in a small unnamed dry valley about 1 km east of the northern edge of Forlidas Ridge and about 1 km north-west of Davis Valley. The area is in two parts. A: within 500 m of the centre of Forlidas Pond, and B: within 500 m radius of several meltwater ponds at the ice margin along the northern edge of Davis Valley. Designated on the grounds that the area contains some of the most southerly freshwater ponds known in Antarctica that contain plant life which would be threatened by possible contamination by human activity. SPA No 23 lies within SRA No 1.

Table 6.1. List of Specially Protected Areas in Antarctica

1	Taylor Rookery
2	Rookery Islands
3	Ardery Island and Odbert Island
4	Sabrina Island
5	Beaufort Island
	[Cape Crozier redesignated as SSSI No 4]
7	Cape Hallett
8	Dion Islands
9	Green Island
	[Byers Peninsula redesignated as SSSI No 6]
	[Cape Shirreff redesignated as SSSI No 32]
	[Fildes Peninsula redesignated as SSSI No 5]
13	Moe Island
14	Lynch Island
15	Southern Powell Island
16	Coppermine Peninsula
17	Litchfield Island
18	North Coronation Island
19	Lagotellerie Island
20	New College Valley
21	Avian Island
22	Cryptogam Ridge
23	Forlidas Pond

Sites of Special Scientific Interest

The purpose of SSSIs is to protect any kind of scientific investigation or to set aside undisturbed reference areas for the needs of a particular science. SSSIs can only be designated where there is a demonstrable risk of harmful interference. A specific time limit is agreed, but the time limit can be reviewed and, if necessary, extended. Each SSSI should have a management plan that, among other things, identifies other types of research that would not interfere with the purposes for which the SSSI was designated.

1. **Cape Royds, Ross Island**
   77°32′S 166°09′E. Approximate area 230 ha. The area west of a line drawn from the south coast of Cape Royds through Flagstaff Hill to the south-eastern tip of Pony Lake, and the west shoreline of this lake; and south of a line drawn from the western extremity of Pony Lake 280° true to the coast; including the littoral and sublittoral zones from Derrick Point on the east side of Arrival Bay about 4 km northwards to Rocky Point to the north of Horseshoe Bay, extending 500 m offshore from high water mark. Designated on the grounds that the area supports the most southerly Adélie Penguin colony known, the survival of which is marginal. The population declined rapidly from 1956 following interference by visitors until 1963 when US and New Zealand authorities agreed to restrict activities. Expiry of designation 31 December 1995.

2. **Arrival Heights, Hut Peninsula, Ross Island**
   77°31′S 166°43′E. Approximate area 60 ha. The area of Arrival Heights enclosed with a line drawn from the Trig T510 north-west over First Crater to the 500 foot contour, then north along this contour to a point immediately west of Second Crater, then around the lip of this crater and south to Trig T510. The area is a natural and electromagnetically quiet site offering ideal conditions for the installation of sensitive instruments for recording minute signals associated with upper atmosphere programmes. Expiry of designation 31 December 1997.

3. **Barwick Valley, Victoria Land**
   The site is defined by lines joining Skew Peak (77°13′S 160°43′E), Sponsors Peak (77°18′S 161°24′E), a point on the Insel Range (77°24′S 161°26′E), a point in the Apocalypse Peaks (77°24′S 160°46′E), Mount Bastion (77°19′S 160°34′E) and Skew Peak. Approximate area 30,000 ha. Designated on the grounds that Barwick Valley is one of the least disturbed and contaminated of the dry valleys of Victoria Land, which are environmentally unique and possess extreme polar desert ecosystems. Expiry of designation 31 December 1995.

4. **Cape Crozier, Ross Island**
   The site is defined by lines joining 77°28′S 169°20′E; 77°28′S 169°28′E; 77°31′S 169°28′E; 77°31′S 169°20′E; and also includes the land area lying north of a line from 77°28′S 169°20′E to the summit of Post Office Hill and north-east of a line bearing 315° true from the Summit of Post Office Hill to the coast. Approximate area 1900 ha. Designated on the grounds that the Emperor and Adélie penguin colonies are the subject of long-term studies of population dynamics and social behaviour, and are relatively accessible by air from McMurdo Station and Scott Base. Expiry of designation 31 December 2001.

5. **Fildes Peninsula, King George Island, South Shetland Islands**
   There are two sites. A: between 62°10′50″S and 62°11′28″S and between 58°55′27″W and 58°56′38″W; B: between 62°12′30″S and 62°12′59″S and between 58°57′11″W and 58°59′32″W. Approximate area 220 ha. Designation on the grounds that unique fossil ichnites found in these areas

are located close to several permanent scientific stations which are frequently, and increasingly, visited by tourist groups. The areas also contain representative sequences of Tertiary strata. Expiry of designation 31 December 2001.

6. **Byers Peninsula, Livingston Island, South Shetland Islands**
Byers Peninsula is an extensive, largely ice-free area at the western end of Livingston Island and centred on 62°38′S 61°05′W. Approximate area 3000 ha. The site comprises the entire area of Byers Peninsula extending from the ice margin on the west side of Rotch Dome to a point directly north of Stackpole Rocks westwards to the west end of Ray Promontory. The littoral zone of the peninsula is included within the site. Designation on the grounds that the fossils found in this area provide evidence of the former link between Antarctica and the other southern continents. It is important to protect these (Jurassic and Cretaceous) rocks from being used as building materials or as souvenirs. Lakes contain aquatic mosses and serve as breeding sites for the midge *Parochlus steinenii*, the only native winged insect in the Antarctic. The peninsula is of exceptional historical interest, containing the greatest concentration of 19th century archaeological sites in Antarctica. Expiry of designation 31 December 2001.

7. **Haswell Island**
66°35′S 93°01′E. Approximate area 90 ha. The site consists of Haswell Island, the largest of a group of islands lying off Mirny Station, together with its littoral zone and the surrounding fast ice (when present). Designation on the grounds that the site is an exceptionally prolific and representative breeding locality for all the species of birds which occur in this part of the Antarctic: five species of petrel, one species of skua, and one species of penguin. The site provides exceptional opportunities for research and needs protection in view of its close proximity to a large research station. Expiry of designation 31 December 2001.

8. **Western shore of Admiralty Bay, King George Island**
62°12′S 58°28′W. Approximate area 12,000 ha. An area on the western shore of Admiralty Bay, south of Ezcurra Inlet, south of a line connecting Jardine Peak and the shoreline immediately to the north of a prominent group of rocks characterized by a covering of orange lichens bearing approximately 068° from Jardine Peak, and east of a line joining Jardine Peak, The Tower and a point on the shoreline bearing 180° from The Tower. Designation on the grounds that the area supports an exceptional assemblage of Antarctic birds and mammals close to the Polish station Arctowski which is frequently visited by tourist ships. Long-term research programmes could be jeopardized by accidental interference, especially during the breeding season. Expiry of designation 31 December 1995.

9. **Rothera Point, Adelaide Island**
67°34′S 68°07′W. Approximate area 4 ha. Rothera Point is in Ryder Bay at the south-east corner of Square Peninsula. The site is the north-eastern third of the point and is representative of the area as a whole. The British station Rothera and airstrip lie about 350 m west of the western boundary of the site. Designated on the grounds that the site serves to monitor the impact of man on an Antarctic fellfield ecosystem. The vegetation is not rich or well-developed and the soils are shallow and confined to small pockets; there is no significant avifauna. Expiry of designation 31 December 1995.

10. **Caughley Beach, Cape Bird, Ross Island**
77°14′S 166°25′E. Approximate area 25 ha. Caughley Beach and its hinterland lie between the areas known as the Cape Bird Northern and Cape Bird Middle penguin rookeries, about 1 km north of Cape Bird. The site encompasses the area between the top of the coastal cliffs of Caughley Beach and the Mount Bird ice cap, and between a line 200 m south of the New Zealand Antarctic Research Programme's summer station and a line 500 m north of Cape Bird Middle Adélie Penguin rookery. SPA No 20 is within the area of SSSI No 10. Designated on the grounds that the area is the site of the most extensive stands of moss, algae, and lichens in southern Victoria Land. The terrestrial ecosystem within the site is the subject of long-term research. Expiry of designation 31 December 2001.

11. **Tramway Ridge, Mount Erebus, Ross Island**
77°31′S 167°06′E. Approximate area 4 ha. Mount Erebus is one of two active volcanoes on continental Antarctica. Tramway Ridge is situated between 3350 m and 3400 m altitude 1 km north-west of the main crater of Mount Erebus at the lower end of Tramway Ridge. The boundary of the site is a square with sides of 100 m and encompasses the entire warm ground area of lower Tramway Ridge. Designated on the grounds that Mount Erebus provides one of only two known high-altitude areas of fumarolic activity and associated vegetation in the Antarctic (see also SSSI No 24). The warm ground and its vegetation are of interest to botanists, phycologists and microbiologists, and will serve as a reference site. Expiry of designation 31 December 2001.

12. **Canada Glacier, Lake Fryxell, Taylor Valley, Victoria Land**
77°37′S 163°04′E. Approximate area 100 ha. The site is located between the tongue of Canada Glacier and the shoreline of Lake Fryxell. Surface features include old moraine deposits and ancient lake levels. A New Zealand Antarctic Research Programme hut lies within the SSSI. Designation on the grounds that the site contains some of the richest plant growth (algae and mosses) in the southern Victoria Land dry valleys. The concentration of research activity within the area makes it necessary to regulate human impact with respect to trampling, water quality and sampling. Expiry of designation 31 December 2001.

13. **Potter Peninsula, King George Island, South Shetland Islands**
62°15′S 58°39′W. Approximate area 200 ha. The site is on the east side of Maxwell Bay between Mirounga Point and the east side of Stranger Point, and occupies the coastal zone of varying width up to 500 m from the shoreline. The area has a diverse avian and mammal fauna and locally rich vegetation. It is close to the Argentine station Jubany which is frequently visited by tourist cruises. Long-term research programmes could be endangered by accidental interference, especially during breeding periods. Expiry of designation 31 December 1995.

14. **Harmony Point, Nelson Island, South Shetland Islands**
62°18′S 59°14′W. Approximate area 1300 ha. The site is on the western side of the island and includes Harmony Point and The Toe, the adjacent ice-free land and the intertidal zone. Designation on the grounds that it is an area rich in avian species. Vegetation cover is extensive, often dense, and comprises a relatively rich flora including both species of vascular plants. Its rocky coasts are inhabited by large numbers of marine invertebrates. Long-term research programmes could be disrupted by accidental interference, the destruction of the vegetation and substratum, and the perturbation of nesting areas. Expiry of designation 31 December 1995.

15. **Cierva Point and offshore islands, Danco Coast, Antarctic Peninsula**
64°10′S 61°01′W. Approximate area 850 ha. The site comprises the Cierva Point Peninsula with the land west of a line from the south-east of the north side of the point through the summit of Mojon Hill to the south-east of the south side of the point. Also included are Sterneck, Midas, and Moss islands. Primavera Base and all its associated installations and areas of disturbance are excluded. Designation on the grounds that it sustains important avian populations, extensive vegetation and a diverse flora including the two antarctic flowering plants and several liverworts, and an invertebrate fauna. Long-term research programmes could be endangered by accidental interference, destruction of vegetation and soil, pollution of rock pools, and perturbation of breeding birds. Expiry of designation 31 December 1995.

16. **North-east Bailey Peninsula, Budd Coast**
66°17′S 110°32′E. Approximate area 100 ha. Bailey Peninsula is situated between Newcomb and O'Brien bays at the west end of Vincennes Bay. The site consists of an irregular area of rock exposed during summer, surrounding the Casey station transmitter building. Designation on the grounds that it contains contrasting habitats and water bodies, has extremely rich lichen and moss communities and an important stand of liverwort. Proximity to Casey station minimizes logistic problems for field research and, at the same time, maximizes the potential for disturbance of study areas. It is primarily for this latter reason that the site requires protection. Expiry of designation 31 December 1995.

17. **Clark Peninsula, Budd Coast, Wilkes Land**
66°15′S 110°35′E. Approximate area 800 ha. Clark Peninsula is situated on the north side of Newcomb Bay at the western end of Vincennes Bay. The site comprises all land on Clark Peninsula within the southern boundary line connecting the east side of Stevenson Cove with trig station NM/5/6, trig station G3 and a point to the ESE on Løken Moraines. The western boundary is the easternmost limit of Løken Moraines as far north as a point due east of Blakeney Point, and thence to the coast. Designation on the grounds that, within the site, moss and lichen communities are being used as control sites to monitor environmental impact at Casey station. Expiry of designation 31 December 1995.

18. **North-west White Island, McMurdo Sound**
78°07′S 167°06′E. Approximate area 1350 ha. White Island rises out of the Ross Ice Shelf about 30 km SSE of Hut Point, Ross Island. It includes the north-west coastline of White Island from Cape Spencer-Smith in the north to a point protruding into the strait between White and Black islands in the south-west. It extends from high water mark to 5 km offshore across Ross Ice Shelf. Designation on the grounds that the site supports a small population of Weddell Seals which is physically isolated from the rest of mainland Antarctica by an ice shelf. It is one of the very few areas where Weddell Seals feed under an ice shelf. It is also one of the most southerly Weddell Seal populations and has been studied year-round. Expiry of designation 31 December 2001.

19. **Linnaeus Terrace, Asgaard Range, Victoria Land**
77°36′S 161°05′E. Approximate area 300 ha. The site is at the east end of Asgaard Range to the north of Oliver Peak, between Don Juan Pond in South Fork Valley, and Inland Forts, a small mountain range south-east of the Asgaard Range. The site includes the flat terrace north and east of Oliver Peak. Designation on the grounds that Linnaeus Terrace is one of the richest localities for the unique cryptoendolithic communities which colonize the Beacon sandstone. Exposed rock surfaces exhibit a range of biological and physical weathering forms. Expiry of designation 31 December 1995.

20. **Biscoe Point, Anvers Island**
64°48′S 63°46′W. Approximate area 200 ha. Biscoe Point is on the south-east side of Biscoe Bay on the south side of Anvers Island. The site includes the rocky promontory ending in Biscoe Point, the smaller headland immediately to the north and the small islet off the south-west of Biscoe Point. A narrow area of land between the two promontories is included, as is the inshore marine environment. Designation on the grounds that the site contains a large but discontinuous stand of the two native vascular plants, Antarctic Hair Grass and Antarctic Pearlwort. A relatively well-developed loam occurs beneath closed swards of the grass and contains a rich biota. Long-term programmes could be jeopardized by interference from nearby Palmer station and from tourist ships. Expiry of designation 31 December 1995.

21. **Parts of Deception Island, South Shetland Islands**
62°55′S 60°37′W. Approximate area 100 ha. The site includes five areas on the coast of Port Foster. Area A: from the west side of Entrance Point to the west side of Collins Point on the south side of Neptune's Bellows, and extending 500 m inland from the shore. Area B: mid Fumarole Bay, south-west of Wensleydale Point extending for 500 m along the shore, to the line of precipitous lava cliffs about 100 m inland. Area C: the island created during the 1967 eruption in Telefon Bay, and including the low land, containing a lake, which joins the new island to the main island. Area D: a strip 100 m wide extending from the high water mark of the heated shoreline of Pendulum Cove inland to a series of gullies about 750 m inland. The area lies about 300 m south of the former Chilean station Pedro Aguirre Cerda. Area E: Kroner Lake including the land within 50 m of its shore. Designation on the grounds that Deception Island is exceptional because of its volcanic activity, having had major eruptions in 1967, 1969 and 1970. The island offers unique opportunities to study colonization processes in an Antarctic environment. Expiry of designation 31 December 1995.

22. **Yukidori Valley, Langhovde, Lützow-Holm Bay**
69°14′30″S 39°46′00″E. Approximate area 300 ha. Yukidori Valley is situated in the middle part of Langhovde on the east coast of Lützow-Holm Bay. The site encompasses the area between a tongue of the ice cap and sea at the western end of the valley; it extends up to 50 m offshore near the mouth of the stream. Designated on the grounds that it is representative of the typical Antarctic fellfield ecosystem. The area is used for long-term biological research and monitoring. Pedestrian traffic is increasing and it is necessary to reduce human impacts. Expiry of designation 31 December 2003.

23. **Svarthamaren, Mühlig-Hofmannfjella, Dronning Maud Land**
71°53′S 5°10′E. Approximate area 390 ha. Svarthamaren is an ice-free area about 200 km inland. The site consists of the north-east facing cliffs and screes north of the summit of Svarthamaren. Designated on the grounds that the Svarthamaren Antarctic Petrel colony is the largest known seabird colony situated inland on the Antarctic continent, and probably represents a significant proportion of the world population of this species. The site provides for research on the Antarctic Petrel, Snow Petrel and South Polar Skua, and the study of adaptations of seabirds breeding inland. Expiry of designation 31 December 1997.

24. **Summit of Mount Melbourne, Victoria Land**
74°21′S 164°41′E. Approximate area 800 ha. The site comprises all terrain above the 2200 m contour surrounding the main crater. Designation on the grounds that the warmed ground supports a unique cryptogamic flora and microbiota and accumulations of organic matter. Uncontrolled human

activity within this area could cause severe damage by trampling of plants, compacting soil and altering soil temperature gradients, changing rates of steam release and possibly causing the introduction of alien microorganisms and cryptogamic plants. Expiry of designation 31 December 1997.

25. **Marine Plain, Mule Peninsula, Vestfold Hills, Princess Elizabeth Land**
68°03′S 78°08′E. Approximate area 2340 ha. Marine Plain opens into an arm of Crooked Fjord on the southern side of Mule Peninsula. The site extends from 68°36′30″S 78°09′00″E to 68°36′45″S 78°10′30″E to 68°37′30″S 78°10′10″E; then south along 78°12′30″E to its intersection by the low watermark on the northern shore of Crooked Fjord; from here it follows the low water mark of the northern shore of Crooked Fjord to its intersection with 78°03′00″E; thence north along 78°03′00″S to its intersection with 68°37′30″S; thence to 68°37′00″S 78°05′00″E; and finally north-eastwards to the point of commencement. Designated on the grounds of its vertebrate fossil fauna, including a new species, genus, and probably family of fossil dolphin. Burton Lake, within the site, represents a unique stage in the biological and physico-chemical evolution of a terrestrial water body from the marine environment. Expiry of designation 31 December 1997.

26. **Chile Bay (Discovery Bay), Greenwich Island, South Shetland Islands**
Approximate area 75 ha. The site comprises two small areas of benthic habitat. A: between 62°28′54″S and 62°29′18″S, and between 59°41′12″W and 59°41′43″W; B: between 62°28′18″S and 62°28′42″S, and between 59°40′15″W and 59°40′47″W. Designation on the grounds that in Chile Bay there has been continuous benthic research since 1947. Data being accumulated provide a baseline for long-term investigations. The site requires protection from possible harmful interference. Expiry of designation 31 December 1997.

27. **Port Foster, Deception Island, South Shetland Islands**
Approximate area 50 ha. The site comprises two small areas of benthic habitat. A: between 62°55′30″S and 62°56′12″S, and between 60°37′00″W and 60°38′00″W; B: between 62°57′12″S and 62°57′54″S, and between 60°36′20″W and 60°37′20″W. Designation on the grounds of exceptional ecological interest because of its actively volcanic character. The two habitats are subject to long-term research and it is necessary to reduce the risk of accidental interference which could jeopardize these studies. Expiry of designation 31 December 1997.

28. **South Bay, Doumer Island, Palmer Archipelago**
Approximate area 70 ha. The site consists of a small area of coastal and sub-tidal benthos bounded by 64°51′42″S to the north, between 63°34′00″W and 63°35′20″W, and to the south by a diagonal line that starts at a point 100 m north of the Chilean refuge Yelcho on the southern shore of South Bay and extends to 64°51′58″S 63°34′00″W. Designation on the grounds that the site is the subject of a long-term study on marine ecology, and to reduce the risk of accidental interference which might jeopardize these investigations. Expiry of designation 31 December 1997.

29. **Ablation Point-Ganymede Heights, Alexander Island**
Approximate area 16,000 ha. The site extends from 70°45′S to 70°55′S, and from 68°40′W to the George VI Sound coastline. Designation on the grounds that it represents one of the largest ablation areas in West Antarctica. It has a complex lithology and a wide range of geomorphological features including raised beaches, moraine systems, and patterned ground. There are several freshwater lakes and ponds, some ice-covered, supporting a diverse fauna. The terrestrial and freshwater systems are

vulnerable to human impact and therefore merit protection. Expiry of designation 31 December 1999.

[Avian Island redesignated as SPA No 21]

31. **Mount Flora, Hope Bay, Antarctic Peninsula**
63°25′S 57°01′W. Approximate area 65 ha. Mount Flora is situated about 1 km south of Hope Bay and about 1 km south-east of the Argentine station Esperanza. The site comprises the upper slopes of Mount Flora above 250 m altitude where the plant-beds of sandstone and siltstone crop out as a distinct black band between the lower black band of conglomerates and light-coloured volcanic rocks which cap the mountain. Designation on the grounds of its rich fossil flora. It was one of the first fossil floras discovered in Antarctica and has played a significant stratigraphic role in deducing the geological history of the Antarctic Peninsula. Its long history as an easily accessible site has made it vulnerable to souvenir collectors, and for this reason it merits protection. Expiry of designation 31 December 1999.

32. **Cape Shirreff, Livingston Island, South Shetland Islands**
62°28′S 60°48′W. Approximate area 100 ha. The ice-free peninsula lying to the north of the northern margin of the permanent ice cap on Livingston Island, between Barclay Bay and Hero Bay. The site includes most of the Telmo Island group about 2 km west of Cape Shirreff. Designated on the grounds that both Antarctic Fur Seal and penguin breeding colonies, and krill fisheries within the foraging range of these species, make this a critical site for inclusion in the ecosystem monitoring network to help meet the objectives of the Convention for the Conservation of Antarctic Marine Living Resources. Cape Shirreff supports a diversity of plant and animal life, including many invertebrates, and a substantial population of Elephant Seals. Expiry of designation 31 December 1999.

33. **Ardley Island, Maxwell Bay, King George Island**
62°13′S 58°56′W. Approximate area 300 ha. The island is situated 500 m east of the coast of Fildes Peninsula. It is 1 km south-east of the Russian station Bellingshausen and the Chilean station Teniente Marsh, and 500 m east of the Chinese station Great Wall. Designation on the grounds that it has diverse avifauna with 12 breeding species, and is of particular importance for its breeding colonies of Gentoo, Adélie, and Chinstrap Penguins; Southern Giant Petrels, Wilson's Storm Petrels, and Black-bellied Storm Petrels. The island possesses a climax fellfield ecosystem dominated by macrolichens; such vegetation is extremely sensitive to human intervention. A "tourist area" has been designated on the north side of the island within the boundary of the site. Expiry of designation 31 December 2001.

34. **Lions Rump, King George Island, South Shetland Islands**
The area is bounded by 62°07′48″S 58°09′17″W, 62°07′49″S 58°07′14″W, 62°08′19″S 58°07′19″W, and 62°08′16″S 58°09′15″W. Approximate area 100 ha. Designated on the grounds that the area is representative of the terrestrial, limnological and littoral ecosystems of King George Island, possessing diverse biota and rock formations. There is a rich flora, especially of lichens, and two native vascular plants. Twelve species of birds nest within the area, including colonies of Adélie, Chinstrap, and Gentoo Penguins. There are large numbers of Elephant Seals and Antarctic Fur Seals on the beaches. It is a rich part of the coastal ecosystem that has not been disturbed by human activity apart from research personnel. Expiry of designation 31 December 2001.

35. Western Bransfield Strait off Low Island, South Shetland Islands

The area lies off the southern shore of Low Island between 63°20′S and 63°35′S; 61°45′W and 62°30′W. Approximate area 103,000 ha. A small portion of Low Island projects into the area; here the northern limit of the marine SSSI is the associated intertidal zone, extending to depths of about 200 m and then dropping off rapidly near the boundaries of the marine SSSI. Designated on the grounds that the shallow shelf south of Low Island is one of the only two known sites in the western South Shetland Islands to Palmer Archipelago region that are suitable for bottom trawling for fish and other benthic organisms. The shelf appears to be a major spawning ground for several fish species. Expiry of designation 31 December 2001.

36. East Dallman Bay off Brabant Island, Palmer Archipelago

The site lies off the western shore of Brabant Island between 64°00′S and 64°20′S; and from 62°50′W east to the intertidal zone. Approximate area 60,000 ha. Designated on the grounds that the shallow shelf off Brabant Island is one of only two known sites near Palmer Station that are suitable for bottom trawling for fish and other benthic organisms. The benthic community includes numerous fish species, invertebrates, and marine plants. Expiry of designation 31 December 2001.

Table 6.2. List of Sites of Special Scientific Interest in Antarctica

1	Cape Royds
2	Arrival Heights
3	Barwick Valley
4	Cape Crozier
5	Fildes Peninsula
6	Byers Peninsula
7	Haswell Island
8	Western shore of Admiralty Bay
9	Rothera Point
10	Caughley Beach
11	Tramway Ridge
12	Canada Glacier
13	Potter Peninsula
14	Harmony Point
15	Cierva Point
16	North-east Bailey Peninsula
17	Clark Peninsula
18	North-west White Island
19	Linnaeus Terrace
20	Biscoe Point
21	Parts of Deception Island
22	Yukidori Valley
23	Svarthamaren
24	Summit of Mount Melbourne
25	Marine Plain
26	Chile Bay
27	Port Foster
28	South Bay
29	Ablation Point
	[Avian Island redesignated as SPA No 21]
31	Mount Flora
32	Cape Shirreff
33	Ardley Island
34	Lions Rump
35	Western Bransfield Strait
36	East Dallman Bay

Historic Sites and Monuments

The purpose of HSMs is to preserve, and to protect from damage, historic sites and monuments within the Treaty area. Each site should be marked with notices in English, French, Spanish, and Russian indicating that it is scheduled for preservation in accordance with the provisions of the Antarctic Treaty. There are no restrictions on entry.

1. **South Pole**
   Flag mast erected in December 1965 at the South Geographic Pole by the first Argentine Overland Polar Expedition.

2. **Ongul Island, Prins Harald Kyst**
   69°00′S 39°35′E. Rock Cairn and plaques at Syowa Station in memory of Shin Fukushima, a member of the 4th Japanese Antarctic Research Expedition, who died in October 1960.

3. **Proclamation Island, Enderby Land**
   65°51′S 53°41′E. Rock cairn and plaque erected in January 1930 by Sir Douglas Mawson to commemorate landing by a party of the British, Australian and New Zealand Antarctic Research Expedition 1929-31.

4. **Pole of Inaccessibility**
   83°06′S 54°58′E. Station building to which a bust of V I Lenin is fixed, together with a plaque in memory of the conquest of the Pole of Inaccessibility by Soviet Antarctic explorers in 1958.

5. **Cape Bruce, Mac. Robertson Land**
   67°25′S 60°47′E. Rock cairn and plaque erected in February 1931 by Sir Douglas Mawson to commemorate landing by a party of the British, Australian and New Zealand Antarctic Research Expedition 1929-31.

6. **Walkabout Rocks, Vestfold Hills, Princess Elizabeth Land**
   68°22′S 78°33′E. Rock cairn erected in 1939 by Sir Hubert Wilkins. The cairn houses a canister containing a record of his visit.

7. **Mabus Point, Queen Mary Land**
   66°33′S 93°01′E. Stone with plaque erected at Mirny Station in memory of driver-mechanic Ivan Kharma who perished on fast ice in 1956.

8. **Mabus Point, Queen Mary Land**
   66°33′S 93°01′E. Metal monument-sledge with plaque at Mirny Station in memory of driver-mechanic Anatoliy Shcheglov who perished on 3 August 1960.

9. **Buromskiy Island, Queen Mary Land**
   66°32′S 93°01′E. Cemetery in which are buried Soviet, Czechoslovak and German citizens, members of Soviet Antarctic Expeditions, who perished on 3 August 1960.

10. **Bunger Hills, Queen Mary Land**
66°16′S 100°45′E. Magnetic observatory at Dobrowolski Station with plaque in memory of the opening of Oazis Station in 1956.

11. **Vostok Station**
78°28′S 106°48′E. Heavy tractor with plaque in memory of the opening of the station in 1957.

12. **Cape Denison, George V Land**
67°00′S 142°42′E. Cross and plaque erected in 1913 by Sir Douglas Mawson on a hill 300 m west-by-south of the main hut of the Australasian Antarctic Expedition of 1911-14. The cross and plaque commemorate Lieutenant B E S Ninnis and Dr X Mertz, members of the expedition, who died in 1913.

13. **Cape Denison, George V Land**
67°00′S 142°42′E. Hut built in 1912 by Sir Douglas Mawson's Australasian Antarctic Expedition of 1911-14. This was the main base of the expedition.

14. **Inexpressible Island, Terra Nova Bay, Scott Coast**
74°54′S 163°43′E. Remains of rock shelter constructed in March 1912 by Victor Campbell's Northern Party of the British Antarctic Expedition 1910-13. The party spent the winter of 1912 in this shelter and a nearby ice cave.

15. **Cape Royds, Ross Island**
77°38′S 166°07′E. Hut built in February 1908 by the British Antarctic Expedition 1907-09 led by Ernest Shackleton. Restored in 1961 by Antarctic Division of New Zealand Department of Scientific and Industrial Research.

16. **Cape Evans, Ross Island**
77°38′S 166°24′E. Hut built in January 1911 by the British Antarctic Expedition 1910-13 led by Captain R F Scott. Restored in January 1961 by Antarctic Division of New Zealand Department of Scientific and Industrial Research.

17. **Cape Evans, Ross Island**
77°38′S 166°24′E. Cross on Wind Vane Hill erected by the Ross Sea party of the Imperial Trans-Antarctic Expedition 1914-16 led by Ernest Shackleton, in memory of three members of the party who died in the vicinity in 1916.

18. **Hut Point, Ross Island**
77°51′S 166°37′E. Hut built in February 1902 by British Antarctic Expedition 1901-04 led by Captain R F Scott. Partially restored in January 1964 by the New Zealand Antarctic Society with assistance from the US government.

19. **Hut Point, Ross Island**
77°51′S 166°37′E. Cross erected in February 1904 by the British Antarctic Expedition 1901-04 in memory of T Vince, a member of the expedition, who died in the vicinity.

20. **Observation Hill, Ross Island**
77°51′S 166°40′E. Cross erected in January 1913 by the British Antarctic Expedition of 1910-13 in memory of Captain R F Scott's party which perished on the return journey from the South Pole in March 1912.

21. **Cape Crozier, Ross Island**
77°32′S 169°18′E. Remains of stone hut constructed in July 1911 by Edward Wilson's party of the British Antarctic Expedition 1910-13 during the winter journey to collect Emperor Penguin eggs.

22. **Cape Adare, Borchgrevink Coast**
71°17′S 170°15′E. Hut built in February 1899 during the *Southern Cross* Expedition led by C E Borchgrevink. There are three huts. Two date from Borchgrevink's expedition and one from Scott's Northern Party, 1910-11.

23. **Cape Adare, Borchgrevink Coast**
71°17′S 170°15′E. Grave of Norwegian biologist Nicolai Hanson, a member of C E Borchgrevink's *Southern Cross* Expedition 1899-1900. This is the first known grave in the Antarctic.

24. **Mount Betty, Queen Maud Range**
85°11′S 163°45′W. Rock cairn, known as Amundsen's Cairn, on Mount Betty, erected by Roald Amundsen on 6 January 1912 on his way back to Framheim from the South Pole.

25. **Framnesodden, Peter I Øy**
68°47′S 90°42′W. Hut and plaque built by Norwegian Captain Nils Larsen in February 1929. The plaque is inscribed "Norvegiaekspedisjonen 2/2 1929".

26. **Barry Island, Debenham Islands, Marguerite Bay, Antarctic Peninsula**
68°08′S 67°08′W. Abandoned installations of Argentine station General San Martin, with cross, flag mast, and monolith built in 1951.

27. **Megalestris Hill, Petermann Island, Antarctic Peninsula**
65°10′S 64°10′W. Cairn with plaque erected in 1909 by the second French expedition led by J-B Charcot. Restored by British Antarctic Survey in 1958.

28. **Port Charcot, Booth Island, Antarctic Peninsula**
65°03′S 64°01′W. Rock cairn with wooden pillar and plaque inscribed with the names of the first French expedition led by J-B Charcot which wintered here in 1904 aboard *Le Français*.

29. **Lambda Island, Melchior Islands, Antarctic Peninsula**
64°18′S 62°59′W. Lighthouse named Primero de Mayo erected by Argentina in 1942. This was the first Argentine lighthouse in the Antarctic.

30. **Paradise Harbour, Danco Coast, Antarctic Peninsula**
64°49′S 62°51′W. Shelter erected in 1950 near the Chilean base Gabriel Gonzales Videla to honour Gabriel Gonzales Videla, first Head of State to visit the Antarctic.

31. **Whaler's Bay, Deception Island, South Shetland Islands**
62°59'S 60°34'W. Memorial plaque marking the position of a cemetery where some 40 Norwegian whalers were buried in the first half of the 20th century. The cemetery was swept away by a volcanic eruption in February 1969.

32. **Greenwich Island, South Shetland Islands**
62°29'S 59°40'W. Concrete monolith erected in 1947 near Arturo Prat Base. Point of reference for Chilean hydrographic surveys.

33. **Arturo Prat Base, Greenwich Island, South Shetland Islands**
62°29'S 59°41'W. Shelter and cross with plaque near Arturo Prat Base. Named in memory of Lieutenant-Commander Gonzales Pacheco, who died while in charge of the station.

34. **Arturo Prat Base, Greenwich Island, South Shetland Islands**
62°30'S 59°41'W. Bust of the Chilean naval hero Arturo Prat erected in 1947.

35. **Arturo Prat Base, Greenwich Island, South Shetland Islands**
62°30'S 59°41'W. Wooden cross and statue of the Virgin of Carmen erected in 1947 near Arturo Prat Base.

36. **Potter Cove, King George Island, South Shetland Islands**
62°13'S 58°42'W. Metal plaque erected by Eduard Dallmann to commemorate the visit of his German expedition on 1 March 1874.

37. **General Bernardo O'Higgins Base, Trinity Peninsula, Antarctic Peninsula**
63°19'S 57°54'W. Statue of Bernardo O'Higgins, the first ruler of Chile to foresee the importance of Antarctica.

38. **Snow Hill Island, Antarctic Peninsula**
64°24'S 57°00'W. Hut built in February 1902 by the main party of the Swedish South Polar Expedition led by Otto Nordenskjöld.

39. **Hope Bay, Trinity Peninsula, Antarctic Peninsula**
63°24'S 56°59'W. Stone hut built in January 1903 by a party of the Swedish South Polar Expedition.

40. **Hope Bay, Trinity Peninsula, Antarctic Peninsula**
63°24'S 56°59'W. Bust of General San Martin, grotto with a statue of the Virgin of Lujan, and a flag mast at Base Esperanza. Erected by Argentina in 1955; together with a graveyard with stele in memory of members of Argentine expeditions who died in the area.

41. **Paulet Island, Antarctic Peninsula**
63°35'S 55°47'W. Stone hut built in February 1903 by survivors of the wrecked vessel *Antarctic* under Captain C A Larsen, members of the Swedish South Polar Expedition led by Otto Nordenskjöld, together with a grave of a member of the expedition.

42. **Scotia Bay, Laurie Island, South Orkney Islands**
60°46′S 44°40′W. Stone hut built in 1903 by the Scottish Expedition led by W S Bruce; the Argentine meteorological hut and magnetic observatory, built in 1905; and a graveyard with seven graves dating from 1903.

43. **Filchner Ice Front, Weddell Sea**
77°49′S 38°02′W. Cross erected in 1955, 1300 m north-east of the Argentine base General Belgrano.

44. **Nivlisen Ice Front, Princesse Astrid Kyst, Dronning Maud Land**
70°45′S 11°38′E. Plaque erected at the temporary Indian station Dakshin Gangotri listing the names of the members of the First Indian Antarctic Expedition which landed nearby on 9 January 1982.

45. **Metchnikoff Point, Brabant Island, Antarctic Peninsula**
64°02′S 62°34′W. Plaque mounted at a height of 70 m on the crest of the moraine separating Metchnikoff Point from the glacier, erected by members of the Joint Services Expedition 1983-85 to commemorate the first landing on Brabant Island by the Belgian Antarctic Expedition 1897-99 led by Adrien de Gerlache.

46. **Port Martin, Terre Adélie**
66°49′S 141°24′E. All buildings and installations of Port Martin base constructed in 1950 by the 3rd French expedition and partly destroyed by fire during the night of 23-24 January 1952.

47. **Ile des Pétrels, Terre Adélie**
66°40′S 140°01′E. Wooden building Base Marret where seven men under the command of Mario Marret wintered in 1952 following a fire at Port Martin base.

48. **Ile des Pétrels, Terre Adélie**
66°40′S 140°01′E. Cross erected on the north-east headland of the island in memory of André Prudhomme, chief meteorologist of the 3rd French International Geophysical Year expedition, who disappeared during a storm on 7 January 1959.

49. **Bunger Hills, Queen Mary Land**
66°16′18″S 100°45′E. Concrete pillar erected by the First Polish Antarctic Expedition at Dobrowolski station in January 1959 for gravity measurements.

50. **Fildes Peninsula, King George Island, South Shetland Islands**
62°12′S 58°54′W. Plaque mounted on a sea cliff south-west of the Chilean station in memory of Professors Siedlecki and Tazar, members of the first Polish Antarctic maritime research expeditions, who landed here in February 1976.

51. **Admiralty Bay, King George Island, South Shetland Islands**
62°09′S 58°28′W. Grave of Wlodzimierz Puchalski, surmounted by an iron cross, on a hill south of Arctowski station. Puchalski was an artist and producer of documentary nature films who died on 19 January 1979.

52. **Fildes Peninsula, King George Island, South Shetland Islands**
62°13′S 58°58′W. Monolith erected to commemorate the establishment of the Chinese Great Wall Station on 20 February 1985.

53. **Elephant Island, South Shetland Islands**
61°03′S 54°50′W. Monolith and plaque commemorating the rescue of survivors of the British ship *Endurance* by the Chilean navy cutter *Yelcho* on 30 August 1916. Replicas are sited at the Chilean bases Arturo Prat (62°30′S 59°49′W) and Rodolfo Marsh (62°12′S 62°12′W).

54. **McMurdo Station, Ross Island**
77°51′S 166°40′E. Bronze bust on black marble commemorating the polar achievements of R E Byrd, erected in 1965.

55. **Stonington Island, Marguerite Bay, Antarctic Peninsula**
68°11′S 67°00′W. Buildings and artefacts at and near East Base of US Antarctic Service Expedition 1940-41 and Ronne Antarctic Research Expedition 1947-48.

56. **Waterboat Point, Danco Coast, Antarctic Peninsula**
64°49′S 62°52′W. The remains and immediate environs of the Waterboat Point hut, situated close to the unoccupied Chilean station Presidente Gabriel Gonzales Videla. Only the base of the boat, roots of doorposts and an outline of the hut and extension still exist. It was occupied by the UK two-man expedition of Bagshawe and Lester in 1921-22.

57. **Commemorative plaque at Yankee Bay, MacFarlane Strait, Greenwich Island, South Shetland Islands**
Near a Chilean refuge at 62°32′S 59°45′W. Erected to the memory of Captain Robert MacFarlane, who in 1820 explored the Antarctic Peninsula area in the brigantine *Dragon*.

58. **Cairn with memorial plaque at Whaler's Bay, Deception Island, South Shetland Islands**
62°59′S 60°34′W. In the vicinity of the whaler's cemetery (HM No 31). Erected to honour Captain Adolfus Amandus Andresen, Antarctic pioneer, who was first to establish a whaling operation on Deception Island in 1906.

59. **Cairn on Half Moon Beach, Cape Shirreff, Livingston Island, South Shetland Islands**
Commemorating the officers, soldiers and seamen on board *San Telmo* which sank in September 1819; possibly the first people to die in the Antarctic.

Table 6.3. List of Historic Sites and Monuments in Antarctica

1. South Pole
2. Ongul Island, Prins Harald Kyst
3. Proclamation Island, Enderby Land
4. Pole of Inaccessibility
5. Cape Bruce, Mac. Robertson Land
6. Walkabout Rocks, Vestfold Hills, Princess Elizabeth Land
7. Mabus Point, Queen Mary Land
8. Mabus Point, Queen Mary Land
9. Buromskiy Island, Queen Mary Land
10. Bunger Hills, Queen Mary Land
11. Vostok Station
12. Cape Denison, George V Land
13. Cape Denison, George V Land
14. Inexpressible Island, Terra Nova Bay, Scott Coast
15. Cape Royds, Ross Island
16. Cape Evans, Ross Island
17. Cape Evans, Ross Island
18. Hut Point, Ross Island
19. Hut Point, Ross Island
20. Observation Hill, Ross Island
21. Cape Crozier, Ross Island
22. Cape Adare, Borchgrevink Coast
23. Cape Adare, Borchgrevink Coast
24. Mount Betty, Queen Maud Range
25. Framnesodden, Peter I Øy
26. Barry Island, Debenham Islands, Marguerite Bay, Antarctic Peninsula
27. Megalestris Hill, Petermann Island, Antarctic Peninsula
28. Port Charcot, Booth Island, Antarctic Peninsula
29. Lambda Island, Melchior Islands, Antarctic Peninsula
30. Paradise Harbour, Danco Coast, Antarctic Peninsula
31. Whaler's Bay, Deception Island, South Shetland Islands
32. Greenwich Island, South Shetland Islands
33. Arturo Prat Base, Greenwich Island, South Shetland Islands
34. Arturo Prat Base, Greenwich Island, South Shetland Islands
35. Arturo Prat Base, Greenwich Island, South Shetland Islands
36. Potter Cove, King George Island, South Shetland Islands
37. General Bernardo O'Higgins Base, Trinity Peninsula, Antarctic Peninsula

Table 6.3. List of Historic Sites and Monuments (continued):

38. Snow Hill Island, Antarctic Peninsula
39. Hope Bay, Trinity Peninsula, Antarctic Peninsula
40. Hope Bay, Trinity Peninsula, Antarctic Peninsula
41. Paulet Island, Antarctic Peninsula
42. Scotia Bay, Laurie Island, South Orkney Islands
43. Filchner Ice Front, Weddell Sea
44. Nivlisen Ice Front, Princesse Astrid Kyst, Dronning Maud Land
45. Metchnikoff Point, Brabant Island, Antarctic Peninsula
46. Port Martin, Terre Adélie
47. Ile des Pétrels, Terre Adélie
48. Ile des Pétrels, Terre Adélie
49. Bunger Hills, Queen Mary Land
50. Fildes Peninsula, King George Island, South Shetland Islands
51. Admiralty Bay, King George Island, South Shetland Islands
52. Fildes Peninsula, King George Island, South Shetland Islands
53. Elephant Island, South Shetland Islands
54. McMurdo Station, Ross Island
55. Stonington Island, Marguerite Bay, Antarctic Peninsula
56. Waterboat Point, Danco Coast, Antarctic Peninsula
57. Commemorative plaque at Yankee Bay, MacFarlane Strait, Greenwich Island, South Shetland Islands
58. Cairn with memorial plaque at Whaler's Bay, Deception Island, South Shetland Islands
59. Cairn on Half Moon Beach, Cape Shirreff, Livingston Island, South Shetland Islands

Specially Reserved Areas

The purpose of SRAs is to protect representative examples of the major geological, glaciological, and geomorphological features of Antarctica; and representative examples of areas of outstanding aesthetic, scenic, and wilderness value. A management plan for each SRA should distinguish between activities that would jeopardize, and other activities that would not jeopardize, the special values to be protected. Entry to SRAs is prohibited except for purposes identified in the approved management plan or in accordance with a permit. SPA No 23 lies within the area of SRA No 1.

1. **North Dufek Massif, Pensacola Mountains**
   This SRA lies north of the mountain crest from 82°36′S 53°30′W (Brown Nunataks) on the west to 82°26′S 50°36′W (Cox Nunatak) on the east to a line from Cox Nunatak to a point on the snow surface 1 km north of the north edge of Forlidas Ridge to Brown Nunataks. The length is 48 km and the width is about 10 km. Designation on the grounds that the area contains outstanding geological, geomorphological, aesthetic, scenic, and wilderness values. It is presently in a pristine condition and it is important to protect these values while allowing multiple use to permit access to scientists and others.

Multiple-use Planning Areas

The purpose of MPAs is to assist in co-ordinating human activities in areas where such activities pose identified risks of mutual interference or cumulative environmental impacts. Each MPA develops a management plan to identify environmental characteristics threatened by current or planned activities, and agrees specific measures to avoid or minimize harmful and cumulative impacts.

1. **South-west Anvers Island and vicinity**
   This MPA lies between 64°41′30″S and 65°S, and between 63°40′W and 64°35′W, encompassing about 1535 km². Palmer Station is within the MPA, as are many island groups. The area includes SPA No 17 (Litchfield Island) and SSSI No 20 (Biscoe Point). Designation on the grounds that the area, because of its diverse environmental features and scientific history, will become increasingly important for long-term studies of the natural variability in Antarctic ecosystems, the impact of humans on Antarctic communities, and the possible effect of global change on the Antarctic environment and on the physiology and behaviour of its plants and animals.

Sealing Zones

1. **Between 60° and 120° west longitude**
   Sealing is forbidden in this zone between 1 March and 31 August inclusive.

2. **Between 0° and 60° west longitude**
   The zone includes that part of the Weddell Sea lying west of 60°W. Sealing is forbidden in this zone from 1 March to 31 August inclusive.

3. **Between 0° and 70° east longitude**
Sealing is forbidden in this zone from 1 March to 31 August inclusive.

4. **Between 70° and 130° east longitude**
Sealing is forbidden in this zone from 1 March to 31 August inclusive.

5. **Between 130° east longitude and 170° west longitude**
Sealing is forbidden in this zone from 1 March to 31 August inclusive.

6. **Between 120° and 170° west longitude**
Sealing is forbidden in this zone from 1 March to 31 August inclusive.

Seal Reserves

It is forbidden to kill or capture seals in the following reserves, which are seal breeding areas or the site of long-term research.

(a) The area around the South Orkney Islands between 60°20′S and 60°56′S 44°05′W and 46°25′W.

(b) The area of the south-western Ross Sea south of 76°S and west of 170°E.

(c) The area of Edisto Inlet south and west of a line drawn between Cape Hallett (72°19′S 170°18′E) and Helm Point (72°11′S 170°00′E).

Table 6.4. List of species noted in text

Mammals	
Antarctic Fur Seal	*Arctocephalus gazella*
Leopard Seal	*Hydrurga leptonyx*
Southern Elephant Seal	*Mirounga leonina*
Weddell Seal	*Leptonychotes weddellii*
Avifauna	
Adélie Penguin	*Pygoscelis adeliae*
Antarctic Fulmar	*Fulmarus glacialoides*
Antarctic Petrel	*Thalassoica antarctica*
Antarctic Prion	*Pachyptila desolata*
Antarctic Tern	*Sterna vittata*
Black-bellied Storm Petrel	*Fregetta tropica*
Blue-eyed Cormorant	*Phalacrocorax atriceps*
Brown Skua	*Catharacta lonnbergi*
Cape Petrel	*Daption capense*
Chinstrap Penguin	*Pygoscelis antarctica*
Dominican Gull	*Larus dominicanus*
Emperor Penguin	*Aptenodytes forsteri*
Gentoo Penguin	*Pygoscelis papua*
Snow Petrel	*Pagodroma nivea*
South Polar Skua	*Catharacta maccormicki*
Southern Giant Petrel	*Macronectes giganteus*
Wilson's Storm Petrel	*Oceanites oceanicus*
Invertebrates	
Apterous Midge	*Belgica antarctica*
Midge	*Parochlus steinenii*
Flora	
Antarctic Hair Grass	*Deschampsia antarctica*
Antarctic Pearlwort	*Colobanthus quitensis*
Liverwort	*Cephaloziella exiliflora*
Moss	*Campylopus pyriformis*

Chapter 7

Using the database

The factors that influenced the design of the database are described briefly in this chapter and information is given which, it is hoped, will enable the end user to derive the maximum performance from the database.

Database Design

The design of the database was influenced by factors such as: limits on the number of features and the complexity of topology imposed by PC ARC/INFO, the cartographic nature of the data supplied, a requirement to provide simple access to the data, and existing standards for Antarctic mapping applied to the source material.

The principal design features which arose from these requirements were as follows:

i. The basic-scale and 1:1,000,000 data were tiled on the International Map of the World (IMW) 1:1,000,000 scale map sheet boundaries, providing a fixed tiling system which corresponds to the sheet boundaries of many published maps. In all but a few cases, these tiles ensure that the data are not too complex for PC ARC/INFO.

ii. The 1:3,000,000, 1:10,000,000 and 1:30,000,000 scale data have been provided as single coverages (scale3, scale10, scale30) for the whole of Antarctica. Construction lines have been added to those coverages where the topology was too complex for PC ARC/INFO.

iii. The attribute tables are not normalized, in order that ArcView can be used to access the data.

iv. Arc and point features were assigned codes according to the *Standard symbols for use on maps of the Antarctic* (SCAR, 1980).

v. The map projection is Polar Stereographic, with a standard parallel at 71°S. The spheroid used is WGS84. These options correspond to approved SCAR recommendations.

Improving software performance

Generalized datasets

Drawing time can be reduced by using the different generalized datasets as a Browse Map coverage for different layers of information. These are:

1:10,000,000 - Coast, Contour, Human and Rocks layers

1:3,000,000 - As above plus Elevation, Flowline and Lake layers

Reducing the number of features

When using a database as large as the Antarctic Digital Database (ADD), performance will be improved by reducing the amount of data in use as soon as possible. This will improve the time taken for subsequent search operations as well as reducing drawing times.

All of the layers in the most detailed dataset (scale0) and in the 1:1,000,000 scale dataset (scale1) can be accessed through the IMW sheet system. Thus if the IMW sheet number of a given area of interest is known, the layers within that map sheet (tile) can be selected rapidly, without having to call up all of the data in particular layers for the whole of Antarctica.

Reducing the number of attributes

When using ARC/INFO, commands such as DROPITEM or PULLITEM will eliminate unnecessary attributes, thus reducing the number in use. If working with ArcView for Windows, commercially available PC software such as Q+E™, dBASE, or FoxPro™ can be used.

Normalization

ARC/INFO users may want to create a series of smaller, more compact tables for tabular information in order to take advantage of the 'relate' capability in ARC/INFO. The process of creating such related tables is called normalization; explanations can be found in standard database design textbooks. The present design of the ADD allows the ArcView user to access tables that are not normalized.

Working with attributes

Completeness of the attributes

The ADD has been compiled from a variety of map series published by a number of national Antarctic mapping agencies. Whereas most of the map series have conformed to the preferred standardization of cartographic symbols recommended by the Scientific Committee on Antarctic Research (SCAR), published in 1980, not all the maps carry the full range of topographic features. To some extent, the number of features shown on a map is scale dependent. Thus the largest-scale maps carry the greatest range of features.

All features included in scale0 and scale1 of the ADD carry a geocode, date, sheet, editor, source and revision date attribute. The height attribute is only present where needed, that is for elevation points and contour lines. The textual information attribute (text), while always present, is frequently not used; it is used primarily for names of traverses and for comments.

Generation of statistics

The database can be used to generate statistics such as the area of a particular region, or of heights above sea level. For each polygon, the PAT table contains the area of each polygon as an attribute. These can be subjected to statistical analysis using the STATISTICS command of ARC/INFO, or by using an independent database package (e.g. dBASE, FoxPro etc.)

Use of the place-names hierarchy

Place-names may be selected for display according to the level in the place-names hierarchy, and according to the source of the names. For each display scale, a coverage of place-names has been provided, selected from the scale0 data. However, this may provide inappropriate cover of names for particular purposes. In such cases, the user should use the PNAME00 coverage, and apply selection criteria appropriate to the requirements of the task in hand.

Data export

Attribute data from the ADD may be downloaded into other software programmes such as spreadsheets or database management systems, where charts, graphs and other graphic displays can be generated. ArcView users can save a selected tabular dataset to a file by clicking on the "save the table as file" icon at the top of a Theme Table. A dialogue box appears that can be used for navigating to a directory into which the file can be written. By default, ArcView saves a tab-separated ASCII file. This setting can be changed by choosing "Preferences" in the File menu. See Chapter 3 in the *ArcView User's Guide* for more information on saving tabular data.

A list of Windows software which may be used with the ADD appears in Table 7.1. This list of software is included to illustrate the types of packages with which ArcView for Windows can be used. It is not an endorsement of any particular software product, nor is it inclusive; many other products will work as effectively.

Table 7.1. Windows software

Software program	*Functions*
dBASE	Used to manage and manipulate feature attribute and related tables
Excel	Spreadsheet tools for manipulating selected attribute records, business graphics, summaries and other spreadsheet functions
Q + E	Joins dBASE attribute tables
CorelDRAW	Graphics editor for Windows
Paintbrush	Graphics editor for Windows (delivered as part of Windows)
ObjectVision	Used to build front ends to dBASE files
Publisher	A word processing and publishing package that is integrated with Windows

Units of measure

The metric system is used in the ADD for all units of length, elevation and area. Geographical co-ordinates are given as decimal degrees. The ARC/INFO software-generated items AREA and LENGTH are expressed in metres^2 and metres.

Chapter 8

Database production

Production cycle

Data capture

The bulk of the data capture was carried out at WCMC and SPRI using ARC/INFO software; digitizing undertaken at BAS used the HORIZON and LITES2 packages. Film plots were prepared for initial quality assurance checks and minor amendments were made to rectify any errors. Edge-matching and/or incorporation of more up-to-date information then followed and new film plots were created for further quality assurance. Once the primary and secondary data were accepted as correct, the digital files were merged and finally edited to produce a seamless digital map of Antarctica. Using ARC/INFO software, techniques were developed during this last editing and harmonization phase of the seamless map to produce a number of generalized smaller-scale maps.

Generalization

The seamless map, prepared from maps at a variety of scales, has been generalized to enable users to view the data meaningfully at a number of smaller scales: 1:1,000,000, 1:3,000,000 and 1:10,000,000. A 1:30,000,000 scale map can be used as an index to the full dataset. Generalization techniques employed to create these products included selection of certain layers, and simplification, smoothing, aggregation and area conversion. The hierarchical structure created for the place-names allows the user to select names appropriate to the scale of the map displayed. The features included at each level of generalization are shown in Chapter 3, Table 3.6.

Data sources

CAUTION

Information has been obtained from sources believed to be reliable. However, the accuracy of the data and their completeness cannot be guaranteed and the absence of features on a map does not mean that such features do not exist. For example, all crevasses have been omitted because their extent and location are subject to natural change and not all the map series used as source material recorded their existence. While every effort has been made to provide accurate information on the CD-ROM, users should always check against the original data for verification.

The data have been extracted from a variety of sources at different scales. Maps should not be enlarged beyond the scale at which the source data were captured.

International sources

The seamless map of Antarctica incorporates digital data provided by eight nations and also data captured in the UK from sources published by another three nations. The geographical distribution of these different national contributions is shown in Fig. 8.1. The sources used include map data, satellite imagery and place-names gazetteers; Table 8.1 details the types of data provided by each nation. In the UK all the map data and vectorized image-interpretations were digitized by hand.

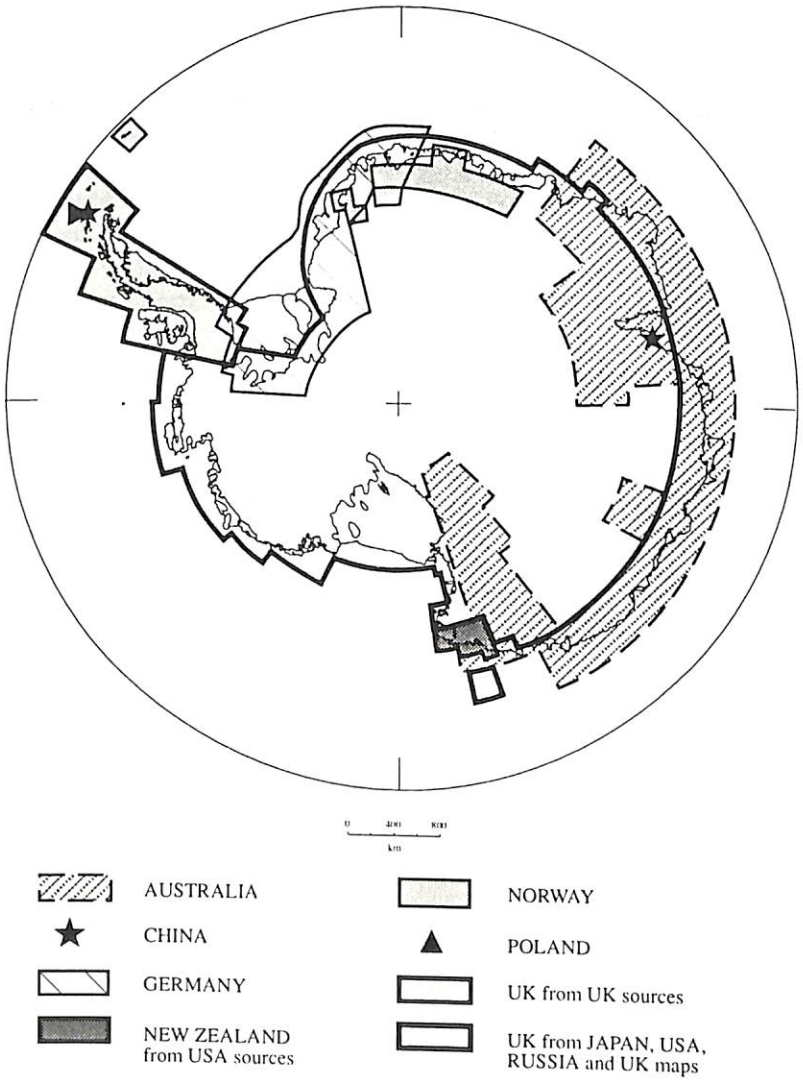


Figure 8.1. Geographical location of data provided by the international participants in the project.

Table 8.1. International collaborators

Country	*Contribution*
Argentina	List of Argentine Antarctic place-names received 12 June 1992; detail for part of Larsen Ice Front digitized in the UK from 1 Hydrographic Chart.
Australia	22 sheets at 1:1,000,000 scale of coastal eastern Antarctica (Enderby Land to Oates Land); 3 sheets covering Victoria Land replaced by data taken from US maps at 1:250,000. Digital data for maps and place-names received 21 October 1991.
China	4 large-scale maps (1:1000, 1:2000 and 1:10,000) of Antarctic station areas, South Shetland Islands and Zhongshan. Digital data received 5 February 1992 and included on CD-ROM as a separate dataset.
Germany	Coastal regions of Filchner-Ronne Ice Shelf, Coats Land and western Neuschwabenland based on 100 geocoded satellite images with topographic interpretation overlays; data captured at 1:400,000 scale. Digital map data received 18 March 1991 and place-names on 30 June 1992.
Japan	3 paper maps (1:250,000 and 1:2,000,000 scale) digitized in the UK.
New Zealand	Digitized 8 US Geological Survey sheets, at 1:250,000 scale, of northern Victoria Land. Digital data received 7 December 1991.
Norway	32 sheets, at 1:250,000 scale of Dronning Maud Land and a list of Norwegian-approved Antarctic place-names in Dronning Maud Land. Digital data received in batches on 12 December 1991, 2 January 1992 and 20 February 1992.
Poland	List of Polish Antarctic place-names received 4 February 1992.
Russia	Permission given for UK to digitize 13 1:1,000,000 scale and 2 1:200,000 scale Antarctic maps for the project.
UK	Digitized the following maps: 2 1:200,000 Russian maps of Marie Byrd Land; 52 BAS 1:250,000 sheets of the Antarctic Peninsula region and parts of Ellsworth Land and Coats Land; 70 US Geological Survey (USGS) sheets at 1:250,000 of Ellsworth Land, Marie Byrd Land and parts of the Transantarctic Mountains; 2 Japanese sheets at 1:250,000 of Dronning Maud Land; 3 USGS sheets at 1:500,000; 13 Russian sheets at 1:1,000,000 of continent and 2 US 1:1,000,000 maps of Ross Ice Shelf; 1 Japanese map at 1:2,000,000 of Dronning Maud Land; large part of interior of continent at 1:3,000,000 scale (SPRI); small part of 1 Argentine Hydrographic Chart; minor parts of 1 US map at 1:5,000,000; list of UK-approved Antarctic place-names. Coastline derived from these maps amended using satellite imagery wherever possible. Main digitizing phase completed by 31 December 1991.
USA	Supplied film positives of 88 USGS 1:250,000 scale sheets of Ellsworth Land, Marie Byrd Land and Transantarctic Mountains, to assist digitization in UK and New Zealand; US-approved place-names on disc. Film positives received March/April 1991; digital place-names on 6 March 1991.

Map scales

The data capture programme was designed for a specific time-frame, using the most appropriate map sources available for different parts of the continent. The larger-scale maps (1:200,000 to 1:250,000) provided detail for coastal regions, areas of high relief and extensive areas of exposed rock (e.g. Antarctic Peninsula, Transantarctic Mountains, parts of Dronning Maud Land and Marie Byrd Land). Data for coastal areas not covered by such maps were taken from 1:500,000, 1:1,000,000 and 1:2,000,000 scale maps, and the contoured elevation data for the continental interior from one 1:3,000,000 scale map. The distribution of the different data sources used during the compilation of the digital map is shown in Fig. 8.2.

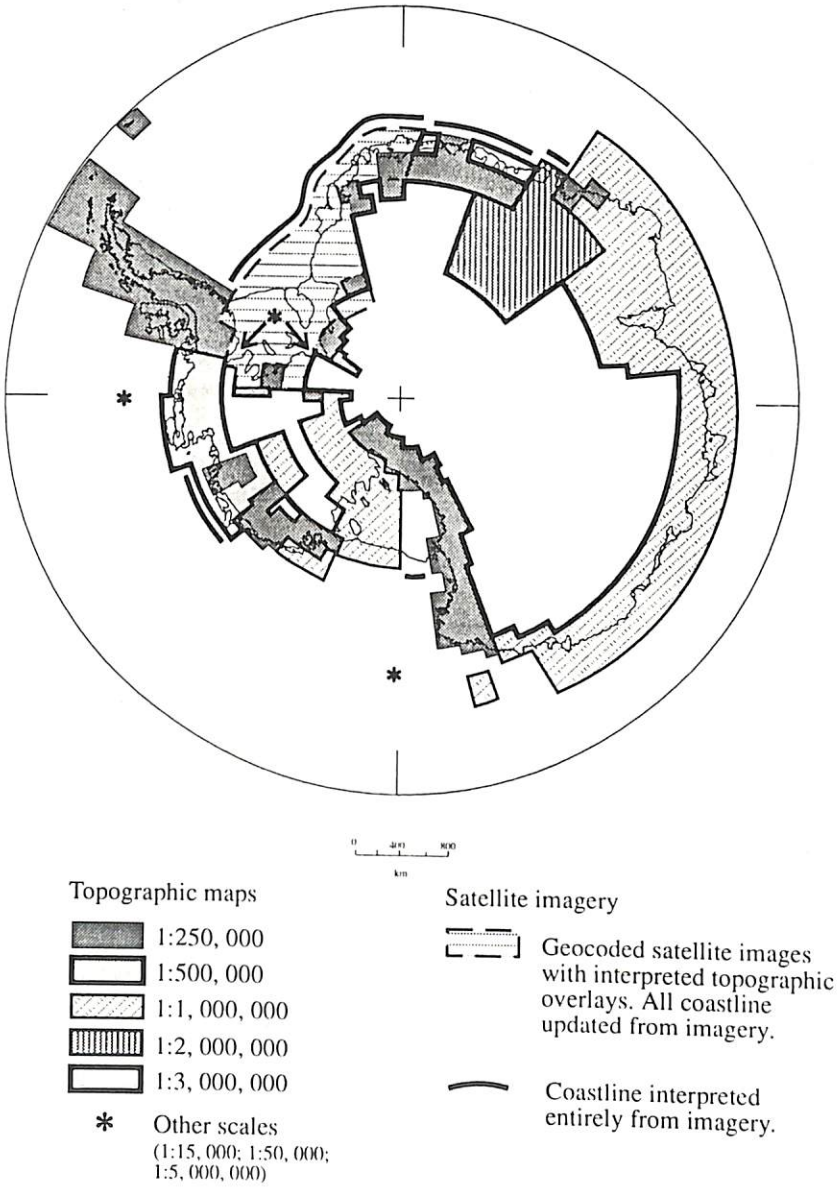


Figure 8.2. Geographical extent of the source material used in the compilation of the ADD.

Table 8.2 indicates the numbers of maps at different scales used by the project, and their country of origin. The total number of maps incorporated in the database, either as a complete map sheet or in part only, is 210.

Table 8.2. Number of map sheets used at the different scales

Scale	*Country of origin*	*No.*	*Total*
1:200,000	Russia	2	2
1:250,000	Japan	2	
	Norway	32	164
	UK	52	
	USA	78	
1:500,000	USA	3	3
1:1,000,000	Australia	22	
	Russia	13	
	USA	2	37
1:2,000,000	Japan	1	1
1:3,000,000	UK	1	1
1:5,000,000	USA	1	1

Maps at scales larger than 1:200,000 to 1:250,000 could not be incorporated in the seamless map within the time-frame available to the project. Nevertheless, a sample of such products (at 1:1000, 1:2000 and 1:10,000) has been made available by China; it can be found as a separate dataset on the CD-ROM.

Imagery

Many of the maps used for the map compilation were published either before satellite imagery became available or at a time when cloud-free imagery of Antarctica had a relatively restricted geographical coverage. Wherever possible, therefore, reference has been made to photographic products of satellite imagery during the editing work in the UK: these were mostly Landsat multi-spectral scanner (MSS) data but also included Landsat Thematic Mapper (TM) and Sojuzkarta. The incorporation of coastline and ice-fronts interpreted from these data sources has enhanced the reliability of the map provided on the CD-ROM.

While reference was made to Landsat 4 and 5 image data for parts of the coastline, only Landsat 1, 2 and 3 images were available for the majority of the coastal areas. A few of the images were digitally enhanced but most of the photographic prints consulted were made from unrectified raw data using band 7 of Landsat MSS (0.8-1.1 μm). Some were of poor quality, with insufficient contrast for reliable interpretation. About 5% of the coastline had no cloud-free cover at all. In cloud-covered areas it was necessary to refer back to small-scale maps, many of which were compiled from sketch maps made without ground control. Where there is control it is confined to rock outcrops. However, in places there were no outcrops within the image area and in these cases it was necessary to mosaic two or more images together by identifying tie points in the overlap areas.

Digital vector data covering the Filchner-Ronne Ice Shelf and parts of Ellsworth Land, Coats Land and western Neuschwabenland, between 5°E and 80°W, were provided by Germany. These vector interpretations of topographic features were derived from a geocoded raster mosaic of 100 Landsat MSS images; the scale of data capture was 1:400,000.

Much of the coastline of Dronning Maud Land between 5°E and 45°E was not covered by conventional, medium-scale linework maps. Therefore the digital map of this sector of Antarctica was prepared by digitizing interpreted vector data direct from photographic products of Landsat MSS scenes, at 1:500,000 scale. Features identified on each scene and on the corresponding published maps of the area (where available) provided control for the photo-mosaic.

Other sources

Reference to other sources has been made where it was considered that more detail would be beneficial to the user. Such data included contour elevation for the Ross Ice Shelf (Shabtaie and Bentley, 1988), recent changes to the ice front of the Ross Ice Shelf (Keys *et al.*, 1990), and interpretation of enhanced images of Antarctica (Swithinbank, 1988).

Bibliography

A full bibliography of the sources used for each International Map of the World (IMW) sheet incorporated in the digital map is given in Chapter 9.

Editing the data

The seamless map

Because of the large size of the digital files acquired in preparing the final map of Antarctica, it was necessary to subdivide the data into geographical blocks. To some extent, these blocks coincided with the geographical limits of national contributions of data. Towards the end of the project, the continent was divided into quadrants, to facilitate the merging of coastal data with the contour data for the interior.

Merging data

Essentially two types of data had to be merged during the preparation of the seamless map: map data at one scale with map data at another scale, and map data with image-derived data. The processes used are described below.

Map data with map data - After careful checking and correcting of all the data digitized from map sources in the UK, individual sheets from the same map series were edge-matched directly on screen; all feature codes were checked and recoded where necessary after edge-matching. Where the data were complex, because of the number of source maps in use at different scales, plots were prepared at a common scale, usually at 1:3,000,000. These showed where there were discrepancies in the position of coastline (grounding line/ice front) and formlines/contours derived from the different map series.

Coastline. When merging the coastline from the different map series, reference was made to photographic products of satellite images since these usually provided a more up-to-date and clearer overview of the shape and position of the coastal features.

Formlines. Point elevation data (from traverses, TWERLE balloon readings and radio-echo sounding) were used for control when repositioning formlines from the different map sources. Preference was given to data taken from either the larger-scale or more up-to-date maps.

Map data with image-derived data - The corrected map sheets were plotted at 1:1,000,000 scale on clear acetate film and overlaid on photographic prints of satellite images; some topographic features were suppressed on the plots (e.g. all but the 200 m contour) to enable detail on the imagery to be seen more easily. Film plots of several map sheets were joined to make mosaics and these were overlaid on the corresponding image mosaics. Linework interpretation of features such as grounding line, glacier margin, glacial flow lines and ice fronts were made directly on to the image scenes and these data were transferred by hand to the film overlays using headlands and rock outcrops for position control. Adjustment to scale was sometimes necessary before the new shape and position of features could be transferred to the acetate films. The revised vector data were then digitized directly from the acetate films.

After digitizing, the new and original map-derived versions were displayed together on screen and edge-matching, repositioning of contours, flow lines etc. were made on screen whenever possible. However, in complicated areas where more detailed maps (1:250,000 scale) were available, the old and new versions were plotted on film at a common scale, and the initial editing was done by conventional pen-and-ink methods. The revised linework was then digitized and merged on screen with the original digital data that did not need to be changed.

The method used to merge image-derived data for parts of the Dronning Maud Land coast that were not covered by conventional maps was similar, with on-screen editing techniques being used once the new data from the images had been digitized.

The final edit

Initial editing tasks concentrated on maps and images of the coastal regions of Antarctica, including those covering the major ice shelves. When compilation for these regions was nearing completion, work began on making these data compatible with the contour data available, at scales of 1:2,000,000 and 1:3,000,000, for the interior of the continent.

All the data currently available for the coastal regions were plotted on film at 1:3,000,000 scale and overlaid by a 1:3,000,000 scale compilation of contoured elevation data for the whole continent (Drewry, 1983, sheet 2). Pen-and-ink editing of the contour information was then carried out to merge the larger-scale data with the small-scale dataset, control being taken from the more up-to-date point data, irrespective of scale. The new linework was digitized and then merged with the original data by on-screen editing. Automatic data checks were carried out subsequently to ensure that all lines of equal elevation were merged correctly.

Attribute codes

Attribute codes (geocode, height, date, text, sheet and source) were assigned to point and arc data when they were captured from the source map (see Chapter 3, Tables 3.2-3.4). Changes made to the data were

automatically coded with attributes that showed the date (revision) and person (editor) making the revisions; if a new source was used to amend the original data, this also was included in the revision attribute code. Full bibliographic details of all map sheets and comments on amendments made to them are given in Chapter 9.

References

Drewry, D.J., *ed.* 1983. *Antarctica: Glaciological and Geophysical Folio*. Cambridge, Scott Polar Research Institute.

Keys, H.J.R., Jacobs, S.S. and Barnett, D. 1990. The calving and drift of iceberg B-9 in the Ross Sea, Antarctica. *Antarctic Science*, **2** (3), 243-257.

Shabtaie, S. and Bentley, C.R. 1988. Ice-thickness map of the West Antarctic ice streams by radar sounding. *Annals of Glaciology*, **11**, 126-136.

Swithinbank, C.W.M. 1988. Satellite image atlas of glaciers of the world: Antarctica. *US Geological Survey Professional Paper*, **1386-B**, 278 pp.

Chapter 9

Bibliography

A full bibliography of the sources used for each International Map of the World (IMW) 1:1,000,000 scale sheet incorporated in the digital map is provided below. Not only does each reference provide the bibliographic details of the original map data but also, where possible, it includes comments on how the original map was compiled and what data have been used in amending the map for this CD-ROM product.

The bibliography is arranged in the alphanumeric order of IMW sheet numbers. The most northerly sheets have numbers beginning with SP and those farther south are arranged in the consequential order SQ to SW. Reference to Fig. 9.1 will help in finding the IMW number for a given geographical area of interest.

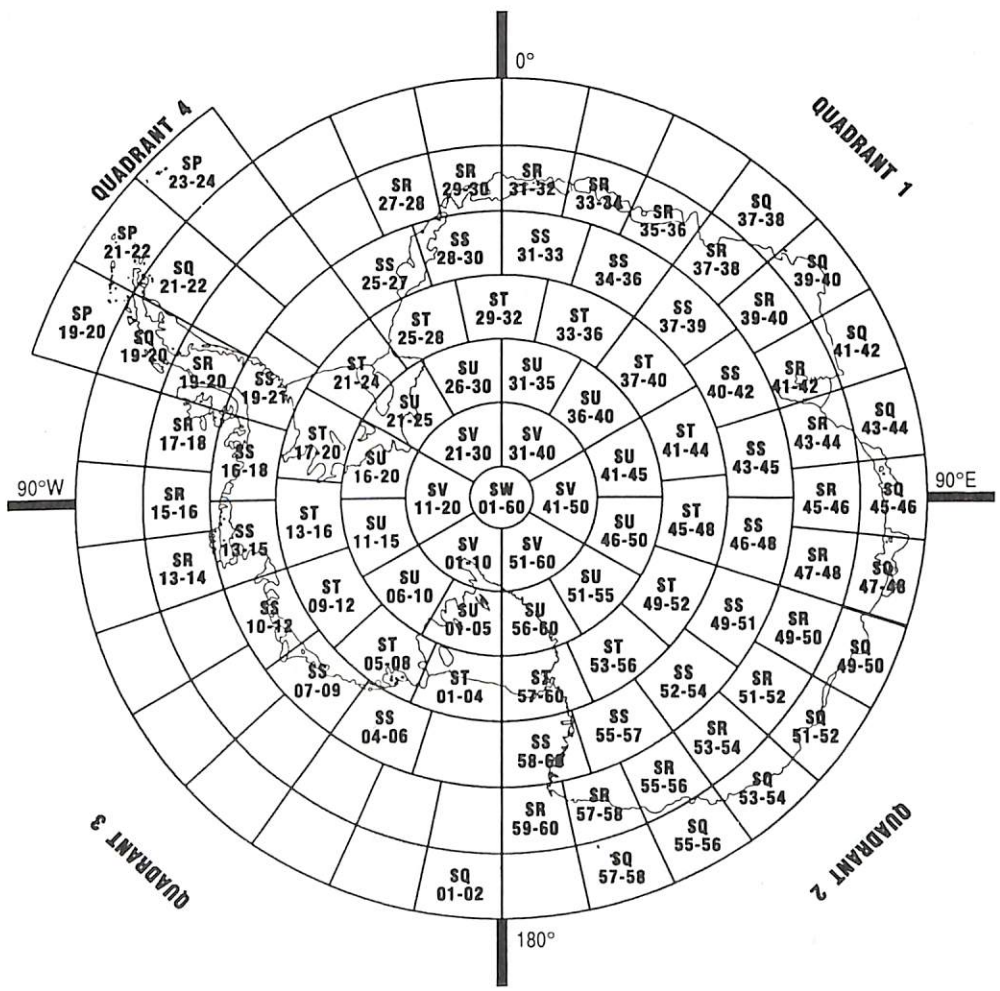


Figure 9.1. Map of Antarctica showing the IMW sheet numbers.

SP 19-20/12* to SP 23-24/1,2

Fleming, E.A. 1977. Sheet 8. Unpublished. B.A.T. 1:250,000, Map **SP 19-20/12***. Scale 1:250,000. (Lambert Conformal Conic, standard parallels 63°20'S, 76°40'S)
[Based on photographically reduced version of 1:200,000 scale map in DOS 610 series, Sheet W62 56.]

Fleming, E.A. and Thomson, J.W. 1978. Sheet 11. Unpublished. B.A.T. 1:250,000, Map **SP 19-20/16**. Scale 1:250,000. (Lambert Conformal Conic, standard parallels 63°20'S, 76°40'S.)
[(1) i. position of Smith Island and Low Island plotted using enlarged Landsat-1 imagery in conjunction with Admiralty Chart (DOS Ref. EW 1000B/E9249/2). Relative position of Hoseason Island, Trinity Island and Intercurrence Island based on DOS unpublished sheet W63 60 and adjusted to position of mainland. Mainland (Trinity Peninsula) and northern tip of Brabant Island extended (by PLDs) from published sheets BAS 250, SQ 19-20/4 and SP 21-22/13. ii. detail sketched from air photography (PLDs). iii. Height sketchlines from PLDs using approximate heights known for peaks on Smith Island and Trinity Island. Deception Island from DOS 610. (2) Trinity, Hoseason, Intercurrence and Liège islands redrafted using Landsat 233/105 (E1532-12311, Jan. 74) and with reference to PLDs 28, 30, 31 by H. Rogers, Jan. 1990 and S.R. Jordan, Nov. 1990). Coastline adjusted by J.W. Thomson from image E30352-12180; formlines correspondingly adjusted by S.R. Jordan, Jan. 1991.]

Fleming, E.A. 1978. Sheet 7. Unpublished. B.A.T. 1:250,000, Map **SP 21-22/6**. Scale 1:250,000. (Lambert Conformal Conic, standard parallels 63°20'S, 76°40'S.)
[Based on photographically reduced version of 1:200,000 scale map in DOS 610 series, Sheet W61 54 (extended).]

Fleming, E.A. 1977. Sheet 9. Unpublished. B.A.T. 1:250,000, Map **SP 21-22/9**. Scale 1:250,000. (Lambert Conformal Conic, standard parallels 63°20'S, 76°40'S)
[Based on photographically reduced version of 1:200,000 scale map in DOS 610 series, Sheet W62 58.]

Fleming, E.A. 1977. Sheet 10. Unpublished. B.A.T. 1:250,000, Map **SP 21-22/10**. Scale 1:250,000. (Lambert Conformal Conic, standard parallels 63°20'S, 76°40'S.)
[Based on photographically reduced version of 1:200,000 scale map in DOS 610 series, Sheet W62 60.]

Fleming, E.A. 1978. Sheet 12. Unpublished. BAT 1:250,000, Map **SP 21-22/13**. Scale 1:250,000. (Lambert Conformal Conic, standard parallels 63°20'S, 76°40'S)
[(1) Based on BAS 250 series, Sheet SP 21-22/13. (2) Coastline in SW of map [Cape Kater to Cape Roquemaurel] adjusted by J.W. Thomson from image E30352-12180, Jan. 1991. Formlines and outcrop positions correspondingly adjusted by S.R. Jordan, Feb. 1991. James Ross Island and Vega Island redrafted using 1:250,000 photo of Kosmos Satellite Image [Kate-200, No. 0596, F200,360 0596 61739378-II] by J.W. Thomson and S.R. Jordan, July 1991.]

Fleming, E.A. 1978. Sheet 13. Unpublished. BAT 1:250,000, Map **SP 21-22/14**. Scale 1:250,000. (Lambert Conformal Conic, standard parallels 63°20'S, 76°40'S)
[Based on BAS 250 series, Sheet SP 21-22/14.]

Harris, J.S. and Thomson, J.W. 1979. Sheet 6. Unpublished. B.A.T. 1:250,000, Map **SP 23-24/1,2.** Scale 1:250,000. (Lambert Conformal Conic, standard parallels 63°20'S, 76°40'S)
[(1) Detail from image E30308-11305 (1979) with 1:100,000 DOS 510 series, South Orkney Islands (West sheet) (1963), and Admiralty Chart 1775 (South Orkney Islands), 1:200,000 (1967). Additional detail for Laurie Island from photographs in: "Voyage of the Scotia" and Marr, Discovery Rep., 10; also from geological map by I.W.D. Dalziel (Lamont-Doherty Geological Observatory, New York). (2) BAS 100 South Orkney Islands, East sheet (provisional) (1988) incorporated by S.R. Jordan, April 1991.]

SQ 1-2 to SQ 57-58

Anon. 1962. Scott Island and approaches. US Navy, Hydrographic Office. Hydrographic Chart, Map H.O. 6668 [**SQ 1-2**]. Scale 1:15,000. (Mercator)
[(1) Only information for Scott Island used in database; original compilation based on British National Antarctic Expedition, 1902-1903, and US Navy surveys in 1960 and 1961.]

Anon. 1991. Península Antártica. Servicio de Hidrografía Naval de la Armada Argentina., Map H-7 [**SQ 19-20 & SQ 21-22, SR 19-20**]. Scale 1:1,500,000. (Mercator)
[(1) Compiled from nautical charts published by Argentina (1990), UK (1987) and USA (1990). Glaciological interpretation of satellite images of the Larsen Ice Shelf area obtained from scientists at the Instituto Antártico Argentino, 1989. (2) Chart used only for front of Larsen Ice Shelf between Cape Sobral and Jason Peninsula. Ice front from Jason Peninsula south to Ewing Island interpreted from NOAA AVHRR image (23 Jan. 90).]

Fleming, E.A. 1978. Sheet 14. Unpublished. BAT 1:250,000, Map **SQ 19-20/3.** Scale 1:250,000. (Lambert Conformal Conic, standard parallels 63°20'S, 76°40'S)
[Position - fitted to control (Louise, Palmer, Conning Island BCN and adjacent BAS 250 series, Sheet SQ 19-20/14). Detail - sketched from air photography and exploratory survey. Height - formlines interpolated from DOS 610 series, Sheet W64 62 (1956).]

Fleming, E.A. 1978. Sheet 15. Unpublished. BAT 1:250,000, Map **SQ 19-20/4.** Scale 1:250,000. (Lambert Conformal Conic, standard parallels 63°20'S, 76°40'S)
[(1) Rock outcrops taken from BAS 250 series, Sheet SQ 19-20/4 with amendments from geologists' maps: M. Fleet, G.J. Hobbs, S.M. West, Alarcón et al., Clarkson et al. - Bransfield landings. (2) Mainland coastline in NE of map adjusted by S.R. Jordan, Nov. 1990 using Landsat 233/105 (E1532-12311, Jan. 74) and 232/105 (E30352-12180) and corresponding adjustments to formlines with reference to FIDASE aerial photography print laydowns 28, 30, 31.]

Fleming, E.A. 1979. Sheet 17. Unpublished. BAT 1:250,000, Map **SQ 19-20/6,7.** Scale 1:250,000. (Lambert Conformal Conic, standard parallels 63°20'S, 76°40'S)
[Plan and detail. DOS 610 series, Sheet W65 64 adjusted to WGS 72 co-ords; area west of 66°W from E1209-12413 and FIDASE Print laydowns. Renaud Island adjusted using image E1209-12413. Height: DOS 610 series, Sheet W65 64, image E1209-12413 (65°55'S 64°07'W).]

Harris, J.S. 1979. Sheet 18. Unpublished. BAT 1:250,000, Map **SQ 19-20/8.** Scale 1:250,000. (Lambert Conformal Conic, standard parallels 63°20'S, 76°40'S)

[(1) Landsat images E30244-12184, E1532-12314, E1173-12403. Eastern coastline from: APC sheet W65 62, RDFO sheet W65 60 and TMA aerial photographs 2158 F33, 2143 F33, 2147 F31 and 2152 (all). Western half: formlines sketched from images; eastern half: formlines from APC and RDFO sheets, adjusted using images. Coastline of Beascochea Bay amended by J.W. Thomson, Feb. 1983, from image E30244-12184. (2) Eastern mainland coast and outcrops adjacent to coast amended by J.W. Thomson and S.R. Jordan from image E50730-1230 (Mar. 86) in October 1991.]

Harris, J.S. 1979. Sheet 19. Unpublished. BAT 1:250,000, Map **SQ 19-20/10.** Scale 1:250,000. (Lambert Conformal Conic, standard parallels 63°20'S, 76°40'S)
[(1) Images E1209-12413, E30283-12360. Weertman Island and adjacent Adelaide Island coast from RDFO sheet W66 66. Positions of some small islets in Crystal Sound from D.C. Goldring (geologist), unpublished map. Formlines based on RDFO sheets W66 66 and W66 68. (2) Southern half revised by A.J. Fox, March 1990: planimetry from enlarged Landsat imagery E1209-12413 (Feb. 73) and E30299-12550 (Dec. 78); detail from aerial photography: FIDASE, 26/FID/62, 63, 66, 67, 69, 70, 71, 86, 87, 88; TMA, 2160, 2161, 2164, 2166; BAS/8/86; RARE, M-5.]

Harris, J.S. 1979. Sheet 20. Unpublished. BAS 1:250,000, Map **SQ 19-20/11.** Scale 1:250,000. (Lambert Conformal Conic, standard parallels 63°20'S, 76°40'S)
[(1) Western half of sheet: coastal and exposure detail from image E1209-12413; formlines based on RDFO W66 64 and DCS 601 adjusted using imagery and TMA photos. Eastern half of sheet: position control from image E1173-12410, coastal and exposure detail from TMA photos. NE corner: formlines based on RDFO sheets W66 62, W66 64 and Fig. 2 in A.F. Marsh, [unpublished] Ph.D. thesis, 1968. SE corner: formlines based on E. Thornton, RDFO W66 64, I. McMorrin, see Fig. 2 in G.M. Stubbs, [unpub.] Ph.D. thesis, 1968. (2) Southern half of map revised by A.J. Fox, March 1990 with further amendments in July 1991: planimetry from enlarged Landsat imagery E1209-12413 (Feb. 73) and E50730-12310 (Mar. 86); detail from aerial photography: FIDASE, 26/FID/71, 83, 84, 86, 87, 88; TMA, 2138, 2139, 2140, 2141, 2142; BAS/5/86; RARE M-4, M-6.]

Harris, J.S. 1979. Sheet 21. Unpublished. BAT 1:250,000, Map **SQ 19-20/12.** Scale 1:250,000. (Lambert Conformal Conic, standard parallels 63°20;S, 76°40'S.)
[(1) NW corner based on RDFO Sheet 66 62 and Fig. 2 in A.F. Marsh, Ph.D. thesis, 1968, adjusted using TMA photography. SW corner from RDFO sheet 66 62 adjusted using TMA photography. Eastern half from RDFO Sheets 65 60 and 66 60, with limited position control from image E30244-12184, adjusted using TMA photography. Additional exposure detail taken from TMA photography. (2) Sheet 21 revised by A.J. Fox, July 1991 using enlarged Landsat imagery E50730-12301 (Mar. 86) and E50730-12304 (Mar. 86), and with reference to TMA photo runs 2187, 2149, 2152, 2159, 2143, 2150.]

Harris, J.S. 1979. Sheet 22. Unpublished. BAT 1:250,000, Map **SQ 19-20/14.** Scale 1:250,000. (Lambert Conformal Conic, standard parallels 63°20'S, 76°40'S)
[(1) From BAS 250P series, Sheet SQ 19-20/14: image E1532-12323, E2405-12375, E1535-12491 and E1209-12413. Control by triangulation and EDM traversing by BAS (1957-75) and geoceiver fixes, 1976. Detail from FIDASE aerial photography. (2) Sheet 22 completely updated by A.J. Fox, April 1990: planimetry from enlarged Landsat imagery E1532-12323 (Jan. 74), E30299-12250 (Dec. 78), E50730-12304 (Mar. 86), E50735-12490 (Mar. 86) and E50735-12493 (Mar. 86); detail from aerial photography: FIDASE, 26/FID/62, 63, 66, 67, 69, 70, 71, 86, 87, 88; IfAG, 02-22, 02-23, 02-24, 02-25, 02-26, 03-31, 03-32, 03-33, 03-34, 03-35, 03-36, 03-37, 04-38, 05-48; TMA, 2160, 2161, 2163, 2164, 2165, 2166; BAS/6/86, BAS/7/86; RARE, M-2, M-5.]

Harris, J.S. 1979. Sheet 23. Unpublished. BAT 1:250,000, Map **SQ 19-20/15**. Scale 1:250,000. (Lambert Conformal Conic, standard parallels 63°20'S, 76°40'S)
[(1) Western half of map from BAS 250P series, Sheet SQ 19-20/14 (Ext) and images E1173-12410, E1532-12323 and E1209-12413, with formlines adjusted from APC W67 66 and unpublished maps by A.K. Hoskins and D.C. Goldring (BAS geologists); outcrop detail from images. Eastern half based on Fig. 2 in G.M. Stubbs [unpub.] Ph.D. thesis, 1968, adjusted using image E1173-12410, RDFO sheet W67 64 and TMA aerial photography; also incorporates unpublished DOS map EW 1000A/84 by R. Barrett. (2) Sheet 23 completely updated by A.J. Fox, April 1990. Planimetry from enlarged Landsat imagery E1209-12413 (Feb. 73), E50735-12493 (Mar. 86), E50730-12310 (Mar. 86), E30299-12250 (Dec. 78); detail from aerial photography: FIDASE, 26/FID/63, 69, 70, 71, 86, 87, 88; IfAG 04-38, 04-39, 05-49; TMA, 1812, 1813, 1822, 1843, 2141, 2142; RARE, M-2, M-6.]

Fleming, E.A. 1978. Sheet 16. Unpublished. BAT 1:250,000, Map **SQ 21-22/1,2**. Scale 1:250,000. (Lambert Conformal Conic, standard parallels 63°20'S, 76°40'S)
[(1) Position: as BAS 250 series, Sheet SQ 21-22/14 (from triangulation and sledge-wheel and compass traverses). Detail: James Ross Island and Snow Hill Island plane-table surveys supplemented by Landsat imagery. Mainland - as BAS 250 sheet (from TMA, FIDASE, AAEE photography). Height: James Ross Island and Snow Hill Island from ground traverses: mainland - photogrammetry. (2) i. Formlines in NW adjusted by S.R. Jordan, Feb. 1991 to correspond with coastline and formline adjustments from satellite imagery on adjacent sheets 11 and 12 using E30352-12180 and E1532-12311. ii. James Ross Island, Snow Hill Island, Prince Gustav Channel and mainland coastline redrafted by J.W. Thomson and S.R. Jordan, July 1991 using 1:250,000 photo of Kosmos Satellite Image [Kate-200, No. 0596, F200,360 0596 61739378-II]. iii. Detailed contouring for Seymour Island, NE Snow Hill Island added by A.P.R. Cooper and E.M.R. Edwards from 'Topographic map of Seymour Island' compiled by Henry H. Brecher and Robert W. Tope, *Geological Society of America, Memoir 169*, 1988, from aerial photographs by BAS 1979.]

Harris, J.S. 1979. Sheet 18a. Unpublished. BAT 1:250,000, Map **SQ 21-22/5**. Scale 1:250,000. (Lambert Conformal Conic, standard parallels 63°20'S, 76°40'S)
[(1) Seal Nunataks - images E30244-12184, E2740-11461, RDFO sheets W65 60, W65 58, formlines from RDFO sheets; Jason Peninsula - coastline and formlines based on RDFO sheet W65 60 and adjusted using TMA photographs. Exposure detail from TMA photographs. (2) Jason Peninsula, Seal Nunataks, Robertson Island and ice front positions adjusted using image E50730-12301 (Mar. 86) by J.W. Thomson and S.R. Jordan, Oct. 1991.]

Anon. 1974. Australian Antarctic Territory. Division of National Mapping. Base compilation series, Map **SQ 37-38**. Scale 1:1,000,000. (Lambert Conformal Conic, standard parallels 64°40'S, 67°20'S)
[(1) Compiled from ANARE photography and ground control 1954-71, US Navy aerial photography 1947 and miscellaneous sources. (2) Part of map replaced by Japanese 1:250,000 scale map of Prince Olav Coast, 1990. (3) Formlines merged with those taken from 1:3 million scale compilation for Sheet 2, Drewry (1983) and 1:2 million scale map of East Queen Maud Land - Enderby Land (1988). Coastline amended by C.W.M. Swithinbank, 1992 using Landsat images E1525-04593 (Dec. 73) and E1490-05055 (Nov. 73).]

Anon. 1990. Prince Olav Coast. Geographical Survey Institute, Japan. 1:250,000 series, Map Parts **SQ 37-38/15** and **SR 37-38/3**. Scale 1:250,000. (Lambert Conformal Conic, standard parallels 68°S, 70°S)

[(1) Prepared by reducing 1:25,000 scale maps compiled from JARE air photography and ground control 1957-62. (2) Formlines merged with those taken from 1:3 million scale compilation for Sheet 2, Drewry (1983) and 1:2 million scale map of East Queen Maud Land - Enderby Land (1988), National Institute of Polar Research, Japan. Coastline amended by C.W.M. Swithinbank, 1992 using Landsat image E1528-05164 (Jan. 74).]

Anon. 1963. Mount Riiser-Larsen, Enderby Land. Division of National Mapping. 1:250,000 series, Map **SQ 38-39/11**. Scale 1:250,000. (Universal Transverse Mercator)
[(1) Compiled from trimetrogon air photography and horizontal control obtained by Australian National Antarctic Research Expeditions 1956-1958, with some additional information from USSR. Hydrographic Chart No. 5594. (2) Map used only for interpretation of formline detail across rock outcrops.]

Anon. 1964. Mount Codrington and Proclamation Island, Enderby Land. Division of National Mapping. 1:250,000 series, Map **SQ 38-39/12** (extended). Scale 1:250,000. (Universal Transverse Mercator)
[(1) Compiled from trimetrogon air photography and horizontal control obtained by Australian National Antarctic Research Expeditions 1956-60, with some additional information from the British, Australian and New Zealand Antarctic Research Expedition 1929-30. (2) Map used only for interpretation of formline detail across rock outcrops.]

Anon. 1964. McLeod Nunataks, Enderby Land. Division of National Mapping. 1:250,000 series, Map **SQ 38-39/16**. Scale 1:250,000. (Universal Transverse Mercator)
[(1) Compiled from trimetrogon air photography, with horizontal and vertical control obtained by Australian National Antarctic Research Expeditions 1956-60. (2) Map used only for interpretation of formline detail across rock outcrops.]

Anon. 1969. Australian Antarctic Territory. Division of National Mapping. Base compilation series, Map **SQ 39-40**. Scale 1:1,000,000. (Lambert Conformal Conic, standard parallels 64°40'S, 67°20'S)
[(1) Compiled from ANARE photography and ground control 1954-69, US Navy aerial photography 1947 and miscellaneous sources. (2) Formlines merged with those taken from 1:3 million scale compilation for Sheet 2, Drewry (1983). Coastline amended by C.W.M. Swithinbank 1992 using Landsat images E1490-05055 (Nov. 73), E1525-04593 (Dec. 73) and E1525-04590 (Dec. 73).]

Anon. 1966. Law Promontory, Kemp Land. Division of National Mapping. 1:250,000 series, Map **SQ 40-41/14**. Scale 1:250,000. (Universal Transverse Mercator)
[(1) Compiled from trimetrogon air photography, horizontal control and other information obtained by Australian National Antarctic Research Expeditions 1954-56-59-60-61-65 and United States trimetrogon air photography 1947. Contours are derived from oblique photo measurements controlled by radar altimeter and surface barometric heights. (2) Map used only for interpretation of formline detail across rock outcrops.]

Anon. 1964. Mawson and Mount Twintop, Mac. Robertson Land. Division of National Mapping. 1:250,000 series, Map **SQ 40-41/15** (extended). Scale 1:250,000. (Universal Transverse Mercator)
[(1) Compiled from trimetrogon air photography and horizontal and vertical control obtained by Australian National Antarctic Research Expeditions 1954-1962, with some additional information from United States trimetrogon air photography 1947. (2) Map used only for interpretation of formline detail across rock outcrops.]

Anon. 1971. Australian Antarctic Territory. Division of National Mapping. Base compilation series, Map **SQ 41-42**. Scale 1:1,000,000. (Lambert Conformal Conic, standard parallels, 64°40'S, 67°20'S)
[(1) Compiled from ANARE photography and ground control 1954-71, US Navy aerial photography 1947 and miscellaneous sources. (2) Formlines merged with those taken from 1:3 million scale compilation for Sheet 2, Drewry (1983). Coastline amended by C.W.M. Swithinbank, 1992 using Landsat images E1137-04053 (Dec. 72), E1137-04051 (Dec. 72) and E1242- 03484 (Mar. 73).]

Anon. 1969. Australian Antarctic Territory. Division of National Mapping. Base compilation series, Map **SQ 43-44**. Scale 1:1,000,000. (Lambert Conformal Conic, standard parallels 64°40'S, 67°20'S)
[(1) Compiled from ANARE photography and ground control 1954-69, US Navy aerial photography 1947 and miscellaneous sources. (2) Formlines merged with those taken from 1:3 million scale compilation for Sheet 2, Drewry (1983). Coastline amended by C.W.M. Swithinbank, 1992 using Landsat images E1142-02510 (Dec. 72), E1176-0239 (Jan. 73) and E30933-02152 (Sept. 80).]

Anon. 1969. Australian Antarctic Territory. Division of National Mapping. Base compilation series, Map **SQ 45-46**. Scale 1:1,000,000. (Lambert Conformal Conic, standard parallels 64°40'S, 67°20'S)
[(1) Compiled from ANARE photography and ground control 1954-69, US Navy aerial photography 1947 and miscellaneous sources. (2) Formlines merged with those taken from 1:3 million scale compilation for Sheet 2, Drewry (1983). Coastline amended by C.W.M. Swithinbank, 1992 using Landsat images E30933-02152 (Sept. 80) bands B,C,D, E1480-02245 (Nov. 73), E1207-02103 (Feb. 73) and E1584-01593 (Feb. 74).]

Anon. 1969. Australian Antarctic Territory. Division of National Mapping. Base compilation series, Map **SQ 47-48**. Scale 1:1,000,000. (Lambert Conformal Conic, standard parallels 64°40'S, 67°20'S)
[(1) Compiled from ANARE photography and ground control 1954-69, US Navy aerial photography 1947 and miscellaneous sources. (2) Formlines merged with those taken from 1:3 million scale compilation for Sheet 2, Drewry (1983). Coastline amended by C.W.M. Swithinbank, 1992 using satellite images E1129-01353 (Nov. 72), E1132-01531 (Dec. 72), E1449-01103 (Oct. 73), E1469-01214 (Nov. 73) and E1580-01364 (Feb. 74).]

Anon. 1971. Australian Antarctic Territory. Division of National Mapping. Base compilation series, Map **SQ 49-50**. Scale 1:1,000,000. (Lambert Conformal Conic, standard parallels 64°40'S, 67°20'S)
[(1) Compiled from ANARE photography and ground control 1954-71, US Navy aerial photography 1947 and miscellaneous sources. (2) Formlines merged with those taken from 1:3 million scale compilation for Sheet 2, Drewry (1983). Coastline amended by C.W.M. Swithinbank, 1992 using satellite images E1178-01064 (Jan. 73), E1192-00441 (Jan. 73), E1460-00300 (Oct. 73), E1482-00530 (Nov. 73), E1209-00384 (Feb. 73) and E2415-23548 (Mar. 76).]

Anon. 1969. Vincennes Bay, Wilkes Land. Division of National Mapping. 1:250,000 series, Map **SQ 49-50/9**. Scale 1:250,000. (Universal Transverse Mercator)
[(1) Vertical and oblique air photography: Australian National Antarctic Research Expeditions 1956, 1962, 1963 and United States Navy 1947. Horizontal and vertical control: ANARE surveys 1956, 1959-60, 1962-65 with additional heights obtained by radar altimeter 1962-63. United States surveys 1948, 1957-58. Selected heights from USSR 1:200,000 series sheets: SQ-49-XIX, XX; SQ-49-XXV, XXVI; SQ-49-XXI, XXII, published 1963. (2) Map used only for interpretation of formline detail across rock outcrops.]

Anon. 1971. Australian Antarctic Territory. Division of National Mapping. Base compilation series, Map **SQ 51-52.** Scale 1:1,000,000. (Lambert Conformal Conic, standard parallels 64°40'S, 67°20'S)
[(1) Compiled from ANARE photography and ground control 1954-71, US Navy aerial photography 1947 and miscellaneous sources. (2) Formlines merged with those taken from 1:3 million scale compilation for Sheet 2, Drewry (1983). Coastline amended by C.W.M. Swithinbank, 1992 using satellite images E1149-00041 (Dec. 72), E1466-23270 (Nov. 73), E1468-23383 (Nov. 73), E1469-23441 (Nov. 73) and E1543-23542 (Jan. 74).]

Anon. 1971. Australian Antarctic Territory. Division of National Mapping. Base compilation series, Map **SQ 53-54.** Scale 1:1,000,000. (Lambert Conformal Conic, standard parallels 64°40'S, 67°20'S)
[(1) Compiled from ANARE photography and ground control 1954-71, US Navy aerial photography 1947 and miscellaneous sources. (2) Formlines merged with those taken from 1:3 million scale compilation for Sheet 2, Drewry (1983). Coastline amended by C.W.M. Swithinbank, 1992 using satellite images E1190-22551 (Jan. 73), E1210-23065 (Feb. 73), E1224-22440 (Mar. 73), E1464-23153 (Oct. 73) and E1466-23270 (Nov. 73).]

Anon. 1971. Australian Antarctic Territory. Division of National Mapping. Base compilation series, Map **SQ 55-56.** Scale 1:1,000,000. (Lambert Conformal Conic, standard parallels 64°40'S, 67°20'S)
[(1) Compiled from ANARE photography and ground control 1954-71, US Navy aerial photography 1947 and miscellaneous sources. (2) Coastline amended by C.W.M. Swithinbank, 1992 using satellite images E1224-22440 (Mar. 73), E1509-22233 (Dec. 73) and E1509-22240 (Dec. 73).]

Bakayev, V.G. (ed.) 1966. Oceanic islands: Map X. Balleny Islands. Main Administration of Geodesy and Cartography, USSR. Atlas Antarctica, I., Map **SQ 57-58.** Scale 1:1,000,000.
[(1) Compiled from US Navy Hydrographic Chart No. 6645, 1:1,500,000 (1961) and USSR Chart No. 5996, 1:2,500,000 (1961).]

SR 13-14 to SR 59-60/13*

Anon. 1968. Antarctica sketch map, Thurston Island-Jones Mountains. US Geological Survey. Antarctica Sketch Map Series, Scale 1:500,000, Map Parts **SR 13-14 & SS 13-15.** (Polar Stereographic, standard parallel 71°S)
[(1) Control by US Geological Survey 1960-1961; compiled in 1967 from US Navy tricamera aerial photography 1966. (2) Formlines taken from 1:3 million scale compilation for Sheet 2, Drewry (1983). Further adjustments to formlines by C.W.M. Swithinbank, 1990, S.R. Jordan and J.W. Thomson, 1991. (3) Coastline adjustments by C.W.M. Swithinbank, 1990 using Landsat satellite images 001/112 (E1191-14264, 30 Jan 73), 249/111 (E1134-14091, 4 Dec 72), 243/112 (E1182-13345, 21 Jan 73), 247/112 (E1168-13574, 7 Jan 73), 002/111 (E1174-14314, 13 Jan 73), 247/111 (E1168-13572, 7 Jan 73), 246/114 (E1185-13530, 24 Jan 73) and 248/114 (E1205-14044, 13 Feb 73). (4) Thurston Island coastline prepared by A.J. Fox in 1990 using satellite images E1174-14314 (13 Jan 73), E1191-14264 (30 Jan 73), E1134-14091 (4 Dec 72) and E1168-13572 (7 Jan 73), as used in the compilation of Thurston Island-Thwaites Glacier area, Antarctica, satellite image map, 1:1,000,000, US Geological Survey 1972-1974; formlines compiled by S.R. Jordan, 1991. (5) Adjustment of formlines in the Jones Mountains area by J.W. Thomson and S.R. Jordan, 1991; amendments to outcrops and formlines by B.C. Storey (BAS), 1992, from local field knowledge.]

Anon. 1988. Peter I Øy. Norsk Polarinstitutt. Topographic map, Map **SR 15-16**. Scale 1:50,000. (Universal Transverse Mercator)
[(1) Photogrammetric compilation from air photographs dated 1987. (2) Simplified version of map at 1:100,000 (LeMasurier and Thomson, 1990, *Antarctic Research Series*, **48**, American Geophysical Union, Fig. F.11.1) used for database.]

Fleming, E.A. 1978. Sheet 27. Unpublished. BAT 1:250,000, Map **SR 17-18/7,8**. Scale 1:250,000. (Lambert Conformal Conic, standard parallels 63°20'S, 76°40'S)
[Outline of Charcot Island from interpretation by R.D. Crabtree (BAS) on 1:500,000 scale print of Landsat image E11211-12541, formlines from APC sheet W69 74.]

Fleming, E.A. 1978. Sheet 32a. Unpublished. BAT 1:250,000, Map **SR 17-18/11,12**. Scale 1:500,000. (Lambert Conformal Conic, standard parallels 63°20'S, 76°40'S)
[Compiled at 1:500,000 from Landsat image E1139-12541]

Fleming, E.A. 1978. Sheet 36. Unpublished. BAT 1:250,000, Map **SR 17-18/15,16**. Scale 1:250,000. (Lambert Conformal Conic, standard parallels 63°20'S, 76°40'S)
[Plan and detail from BAS 250P series, sheet SR 17-18/15,16 (plan as extended from Sheet 37). Height from EW 1000A/204 (BAS Archives map).]

Fleming, E.A. 1978. Sheet 24. Unpublished. BAT 1:250,000, Map **SR 19-20/1**. Scale 1:250,000. (Lambert Conformal Conic, standard parallels 63°20'S, 76°40'S)
[Based on northern part of BAS 250P series, Sheet SR 19-20/5 [Extended].]

Fleming, E.A. 1979. Sheet 25. Unpublished. BAT 1:250,000, Map **SR 19-20/2**. Scale 1:250,000. (Lambert Conformal Conic, standard parallels 63°20'S, 76°40'S)
[(1) Outline and detail from BAS 250P series, Sheet SR 19-20/2. Additional detail from unpublished map by H.M. Fielding (BAS Archives, 1:100,000 map EW 1000A/162). Formlines from Fig. 2, R.B. Wyeth, BAS Bulletin, No. 46 (adjusted). (2) NW edge revised by A.J. Fox, April 1991. Planimetry from enlarged Landsat imagery E50735-12493 (Mar. 86) and E30299-12250 (Dec. 78). Reference to Institut für Angewandte Geodäsie (IfAG) photo runs (Feb. 1989) 04/38, 04/39, 05/49, 05/50 and 05/48.]

Harris, J.S. 1979. Sheet 26. Unpublished. BAT 1:250,000, Map **SR 19-20/3**. Scale 1:250,000. (Lambert Conformal Conic, standard parallels 63°20'S, 76°40'S)
[(1) Coastline and rock outcrop detail from US Geological Survey 1:500,000 sketch map "Northern Palmer Land", adjusted using image E1532-12323. Formlines from Fig. 2, R.B. Wyeth, BAS Bulletin, No. 46 (adjusted), and Fig. 2, A.G. Fraser and P.H. Grimley, BAS Scientific Reports, No. 67. Detail in N from Fig. 2, G.M. Stubbs, Ph.D. thesis. (2) Kenyon Peninsula redrawn by A.J. Fox, April 1991 from enlarged Landsat imagery E50730-12310 (Mar. 86) and with reference to TMA photo runs 1818, 1816, 1825, 1817.]

Fleming, E.A. 1978. Sheet 28. Unpublished. BAT 1:250,000, Map **SR 19-20/5,6**. Scale 1:250,000. (Lambert Conformal Conic, standard parallels 63°20'S, 76°40'S)
[(1) Plan and detail from BAS 250P, Sheet SR 19-20/5; west of 72°30'W from image E1535-12500 and B. Care (geologist) 1:125,000 map, formlines sketched from EW 1000A/205 and RDFO W69 70. Rothschild Island from B. Care's 1:125,000 map. Additional information from E30335-12255.
(2) Adjustments to edge match with changes made to Sheet 32 by A. Perkins (BAS), July 1991.]

Fleming, E.A. 1978. Sheet 29. Unpublished. BAT 1:250,000, Map **SR 19-20/6**. Scale 1:250,000. (Lambert Conformal Conic, standard parallels 63°20'S, 76°40'S)
[(1) Position and detail from BAS 250P, Sheet SR 19-20/6; height (sketchlines): Alexander Island: from DOS 610, 69 70 with 69 68. Palmer Land: (69°-69°50'S, 67°-63°10'W) from R.B. Wyeth, BAS Bulletin, No. 46, rest from EW 1000A/180. (2) Updated from Landsat E30335-12253 and E30335-12255 (Feb. 79) by J.W. Thomson, Sept. 1990.]

Harris, J.S. 1979. Sheet 30. Unpublished. BAT 1:250,000, Map **SR 19-20/7**. Scale 1:250,000. (Lambert Conformal Conic, standard parallels 63°20'S, 76°40'S)
[(1) Coast and exposure details: W of 66°W - BAS 250P series, Sheet SR 19-20/6 and images E1532-12325 and E2291-12054. E of 66°W - US Geological Survey sketch map "Northern Palmer Land" (adjusted) and images as above. (Eternity Range adjusted using geological sources). Formlines: R.B. Wyeth, Fig. 2, BAS Bulletin, No. 46, adjusted.]

Harris, J.S. 1979. Sheet 31. Unpublished. BAT 1:250,000, Map **SR 19-20/8**. Scale 1:250,000. (Lambert Conformal Conic, standard parallels 63°20'S, 76°40'S)
[Positioning from image E2291-12054 and Geoceiver stations. Coastline, ice front and exposure detail from US Geological Survey 1:500,000 scale sketch map "Northern Palmer Land" (adjusted using TMAs). Formlines from APC sheet W69 62 (adjusted using TMAs). Ewing Island positioned from NOAA satellite image of Antarctic Peninsula (1973).]

Fleming, E.A. 1978. Sheet 32. Unpublished. BAT 1:250,000, Map **SR 19-20/9**. Scale 1:250,000. (Lambert Conformal Conic, standard parallels 63°20'S, 76°40'S)
[(1) Plan and detail from BAS 250P, Sheet SR 19-20/9 (edn 1) with additional detail from E30335-12255 (added in 1979). Formlines from 1:200,000 maps and EW 1000A/205 and R. Burns (geologist) field map adjusted to image and BAS 250P. (2) Coastline and outcrop positions corrected by A. Perkins, July 1991 using E30335-12255 (Feb. 79). Corrections in Colbert Mountains using A.J. Fox photography BAS/Misc/91/10 and BAS/Misc/91/11. Also using field knowledge from J. McCarron (BAS geologist).]

Fleming, E.A. 1978. Sheet 33. Unpublished. BAT 1:250,000, Map **SR 19-20/10**. Scale 1:250,000. (Lambert Conformal Conic, standard parallels 63°20'S, 76°40'S)
[(1) Detail and plan from BAS 250P, Sheet SR 19-20/10. Height: Alexander Island - APC W70 68, Palmer Land - EW 1000A/180 with minor additions from APC W70 66. (2) Formlines and outcrops at western boundary adjusted in accordance with repositioning on Sheet 32. Palmer Land outcrops still poorly positioned - awaiting further information (J.W. Thomson, Aug. 1991).]

Harris, J.S. 1979. Sheet 34. Unpublished. BAT 1:250,000, Map **SR 19-20/11**. Scale 1:250,000. (Lambert Conformal Conic, standard parallels 63°20'S, 76°40'S)
[(1) Exposure detail from US Geological Survey 1:500,000 scale sketch map "Northern Palmer Land", adjusted from geological sources, and TMA photographs. Formlines: W. of 64°W based on EW 1000A/180 adjusted using TMAs; E. of 64°W sketched from TMAs with geophysical height data. Also map by J. Yates in J.F. Anckorn, BAS Field Report G4/1973/E (unpublished).]

Harris, J.S. 1979. Sheet 35. Unpublished. BAT 1:250,000, Map **SR 19-20/12**. Scale 1:250,000. (Lambert Conformal Conic, standard parallels 63°20'S, 76°40'S)

[BAS 250 series, sheet SR 19-20/12, some small exposures at western limit of sheet from US Geological Survey 1:500,000 scale sketch map "Northern Palmer Land".]

Fleming, E.A. 1978. Sheet 37. Unpublished. BAT 1:250,000, Map **SR 19-20/13**. Scale 1:250,000. (Lambert Conformal Conic, standard parallels 63°20'S, 76°40'S)
[(1) Plan and detail from BAS 250P, Sheet SR 19-20/13 with Landsat E30299-12261 and E30335-12255. Height from EW 1000A/204. (2) Adjusted by S.R. Jordan, July 1991, at northern limit to correspond with corrections to Sheet 32.]

Fleming, E.A. 1978. Sheet 38. Unpublished. BAT 1:250,000, Map **SR 19-20/14**. Scale 1:250,000. (Lambert Conformal Conic, standard parallels 63°20'S, 76°40'S)
[(1) Planimetry and detail: from BAS 250P, Sheet SR 19-20/14 and Landsat image E30335-12255. Height: Alexander Island - EW 1000A/205 (with additions from DOS 610 Sheet W71 68), Palmer Land - EW 1000A/180 (BAS Archives map). (2) Adjustments made by S.R. Jordan, July 1991, at northern limits to correspond with corrections made to Sheet 32.]

Fleming, E.A. 1978. Sheet 39. Unpublished. BAT 1:250,000, Map **SR 19-20/15**. Scale 1:250,000. (Lambert Conformal Conic, standard parallels 63°20'S, 76°40'S)
[Plan and detail: BAS 250P, Sheet SR 19-20/14 and US Geological Survey 1:500,000 sketch map "Northern Palmer Land". Height: EW 1000A/180 and USGS sketch map with BAS geophysics height data.]

Fleming, E.A. and Harris, J.S. 1979. Sheet 40. Unpublished. BAT 1:250,000, Map **SR 19-20/16**. Scale 1:250,000. (Lambert Conformal Conic, standard parallels 63°20'S, 76°40'S)
[East of 63°W: BAS 250, Sheet SR 19-20/16. West of 63°W: US Geological Survey 1:500,000 scale sketch map "Northern Palmer Land" (enlarged) and fitted to control; additional exposure from geological sources. Formlines sketched from sketch map using BAS geophysics height data for guidance.]

Anon. 1991. Ekströmisen. Institut für Angewandte Geodäsie. Topographic map, preliminary edition digital data, Map **SR 27-28** (on SR 29-30 extended). Scale 1:1,000,000. (Lambert Conformal Conic, standard parallels 76°40'S, 79°20'S)
[(1) Topographic interpretation prepared from geocoded mosaic of Landsat MSS images.]

Drewry, D.J. 1983. Sheet 2. Scott Polar Research Institute. Antarctica: Glaciological and Geophysical Folio, Map **SR 29-30**. Scale 1:6,000,000. (Polar Stereographic)
[(1) Formlines on 1:3 million scale compilation for Sheet 2 used for database and adjusted to new coastline data. Formlines merged where map replaced by Norwegian 1:250,000 scale maps, Sheets F5 and G5. (2) Grounding line, glacier margins and flowlines, and ice shelf features taken from data supplied by Institut für Angewandte Geodäsie (see German topographic map, preliminary edition digital data, Sheet 29-30).]

Anon. 1961. Ahlmannryggen, Maudheimvidda. Norsk Polarinstitutt. Dronning Maud Land 1:250,000, Map G5 [**SR 29-30/16**]. Scale 1:250,000.
[(1) Triangulation and other field work: Norwegian-British-Swedish Antarctic Expedition, 1949-52. Map compilation from oblique aerial photography 1951-52 and 1958-59. (2) Coastline, grounding line, flowlines and glacier margins supplied by Institut für Angewandte Geodäsie.]

Anon. 1962. Giaeverryggen, Maudheimvidda. Norsk Polarinstitutt. Dronning Maud Land 1:250,000, Map F5 [SR 29-30/15]. Scale 1:250,000.
[(1) Triangulation and other field work: Norwegian-British-Swedish Antarctic Expedition, 1949-52. Map compilation from oblique air photography 1951-1952. (2) Formlines merged with those taken from 1:3 million scale compilation for Sheet 2, Drewry (1983). Coastline, grounding line, flowlines and glacier margins supplied by Institut für Angewandte Geodäsie.]

Anon. 1976. Novolazarevskaja. Main Administration of Geodesy and Cartography, Council of Ministers of USSR. 1:1,000,000 Topographic Series, Map SR 31, 32. Scale 1:1,000,000. (Modified Polyconic)
[(1) Elevation details for the northern part of this map sheet are the only data incorporated from this map in the database. (2) New formlines constructed by J.W. Thomson, 1992 to merge with those from adjacent Norwegian 1:250,000 scale maps, Sheets H5, J5, K5 and L4. (3) Coastline, grounding line and flowlines between 0° and 3°30'E supplied by Institut für Angewandte Geodäsie. Coastline, grounding line and flowlines between 3° and 12°E taken from interpretation of Landsat satellite imagery by C.W.M. Swithinbank, 1992 using images E2278-07250 (Oct. 75), E1478-07247 (Nov. 73), E1499-07413 (Dec. 73), E2306-06391 (Nov. 75), E2382-07005 (Feb. 76), E2278-07253 (Oct. 75), E2308-06502 (Nov. 75) and E2279-07311 (Oct. 75).]

Anon. 1973. Schirmacheroasen, Fimbulheimen/Prinsesse Astrid Kyst. Norsk Polarinstitutt. Dronning Maud Land 1:250,000, Map L4 [SR 31-32/12]. Scale 1:250,000.
[(1) Triangulation and other field work: Norwegian Antarctic Expedition 1956-60. Map compilation from oblique aerial photography, 1958-59. (2) Coastline, grounding line and flowlines amended by C.W.M. Swithinbank, 1992 using Landsat images E1478-07242 (Nov. 73), E2306-06391 (Nov. 75), E2382-07005 (Feb. 76) and E2308-06502 (Nov. 75).]

Anon. 1961. Jutulgryta, Fimbulheimen. Norsk Polarinstitutt. Dronning Maud Land 1:250,000, Map H5 [SR 31-32/13]. Scale 1:250,000.
[(1) Triangulation and other field work: Norwegian-British-Swedish Antarctic Expedition 1949-52. Map compilation from oblique aerial photography 1951-52 and 1958-59. (2) Coastline and grounding line supplied by Institut für Angewandte Geodäsie.]

Anon. 1966. Mühlig-Hofmannfjella Nord, Fimbulheimen. Norsk Polarinstitutt. Dronning Maud Land 1:250,000, Map J5 [SR 31-32/14]. Scale 1:250,000.
[(1) Triangulation and other field work: Norwegian Antarctic Expedition 1956-60. Map compilation from oblique aerial photography 1958-59.]

Anon. 1984. Filchnerfjella Nord (Fimbulheimen). Norsk Polarinstitutt. Dronning Maud Land 1:250,000 Landsat Satellite Map, Map K5 [SR 31-32/15]. Scale 1:250,000.
[(1) Test map compiled from: (i) NASA Landsat E1133-0710203 (Dec. 72). (ii) Norsk Polarinstitutt: Dronning Maud Land 1:250,000 K5 Filchnerfjella Nord.]

Anon. 1968. Humboldtfjella. Norsk Polarinstitutt. Dronning Maud Land 1:250,000, Map L5 [SR 31-32/16]. Scale 1:250,000.
[(1) Triangulation and other field work: Norwegian Antarctic Expedition 1956-60. Map compilation from oblique aerial photography 1958-59.]

Drewry, D.J. 1983. Sheet 2. Scott Polar Research Institute. Antarctica: Glaciological and Geophysical Folio, Map **SR 33-34.** Scale 1:6,000,000. (Polar Stereographic)
[(1) 1:3 million scale compilation used for database with amendments to merge formlines with those on Norwegian 1:250,000 scale maps, Sheets M4, N5, P5 and Q5. (2) Coastline, grounding line and flowlines taken from interpretation of Landsat satellite imagery by C.W.M. Swithinbank, 1992 using images E2306-06385 (Nov. 75), E2308-06495 (Nov. 75), E2270-06385 (Oct. 75), E1164-06410 (Jan. 73), E1487-06324 (Nov. 73), E1485-06214 (Nov. 73), E1485-06212 (Nov. 73), E1483-06095 (Nov. 73), E1483-06092 (Nov. 73), E1212-06072 (Feb. 73), E1480-05530 (Nov. 73), E2306-06301 (Nov. 75), E2308-06052 (Nov. 75), E1479-05465 (Nov. 73) and E1480-05524 (Nov. 73). (3) Elevation detail for area to north of Norwegian maps taken from USSR 1:1 million scale map, Sheet SR 33, 34 (1976).]

Anon. 1973. Starheimtind, Fimbulheimen/Prinsesse Astrid Kyst. Norsk Polarinstitutt. Dronning Maud Land 1:250,000, Map M4 [**SR 33-34/9**]. Scale 1:250,000.
[(1) Triangulation and other field work: Norwegian Antarctic Expedition 1956-60. Map compilation and oblique aerial photography 1958-60. (2) Formlines merged with those taken from 1:3 million scale compilation for Sheet 2, Drewry (1983). Coastline, grounding line and flow lines amended by C.W.M. Swithinbank, 1992 using Landsat images E2306-06385 (Nov. 75), E2308-06495 (Nov. 75), E2306-06391 (Nov. 75) and E2308-06502 (Nov. 75).]

Anon. 1968. Wohlthatmassivet, Fimbulheimen. Norsk Polarinstitutt. Dronning Maud Land 1:250,000, Map M5 [**SR 33-34/13**]. Scale 1:250,000.
[(1) Triangulation and other field work: Norwegian Antarctic Expedition 1956-60. Map compilation from oblique aerial photography 1958-60.]

Anon. 1975. Forposten, Fimbulheimen. Norsk Polarinstitutt. Dronning Maud Land 1:250,000, Map N5 [**SR 33-34/14**]. Scale 1:250,000.
[(1) Triangulation and other field work: the Norwegian Antarctic Expedition 1956-60. Map compilation from oblique aerial photography 1958-59. (2) Formlines merged with those taken from 1:3 million scale compilation for Sheet 2, Drewry (1983).]

Anon. 1988. Einsteten, Sør-Rondane. Norsk Polarinstitutt. Dronning Maud Land 1:250,000, Map P5 [**SR 33-34/15**]. Scale 1:250,000.
[(1) Triangulation: Belgian Antarctic Expeditions. (2) Formlines merged with those taken from 1:3 million scale compilation for Sheet 2, Drewry (1983) and from 1:2 million scale East Queen Maud Land - Enderby Land map (1988), National Institute of Polar Research, Japan.]

Anon. 1988. Utsteinflya, Sør-Rondane. Norsk Polarinstitutt. Dronning Maud Land 1:250,000, Map Q5 [**SR 33-34/16**]. Scale 1:250,000.
[(1) Triangulation: Belgian Antarctic Expeditions. (2) Formlines merged with those taken from 1:3 million scale compilation for Sheet 2, Drewry (1983) and from 1:2 million scale East Queen Maud Land - Enderby Land map (1988), National Institute of Polar Research, Japan.]

Drewry, D.J. 1983. Sheet 2. Scott Polar Research Institute. Antarctica: Glaciological and Geophysical Folio, Map **SR 35-36.** Scale 1:6,000,000. (Polar Stereographic)
[(1) 1:3 million scale compilation used for database with amendments to merge formlines with those on adjacent Norwegian 1:250,000 scale maps, Sheets R5 and S5. Amendments made also to incorporate formlines from 1:2 million scale map of East Queen Maud Land - Enderby Land (1988), National Institute

of Polar Research, Japan. (2) Exposed rock in the Yamato Mountains taken from USSR 1:1 million scale map, Sheet SR 35, 36 (1976). (3) Coastline taken from interpretation of Landsat satellite imagery by C.W.M. Swithinbank, 1992 using images E1478-05404 (Nov. 73), E1479-05463 (Nov. 73), E1479-05465 (Nov. 73), E1480-05524 (Nov. 73) and E1490-05055 (Nov. 73).]

Anon. 1988. Byrdbreen, Sør-Rondane. Norsk Polarinstitutt. Dronning Maud Land 1:250,000, Map R5 [**SR 35-36/13**]. Scale 1:250,000.
[(1) Triangulation: Belgian Antarctic Expeditions. (2) Formlines merged with those taken from 1:3 million scale compilation for Sheet 2, Drewry (1983) and from 1:2 million scale East Queen Maud Land - Enderby Land map (1988), National Institute of Polar Research, Japan.]

Anon. 1988. Balchenfjella Nord, Sør-Rondane. Norsk Polarinstitutt. Dronning Maud Land 1:250,000, Map S5 [**SR 35-36/14**]. Scale 1:250,000.
[(1) Triangulation: Belgian Antarctic Expeditions. (2) Formlines merged with those taken from 1:3 million scale compilation for Sheet 2, Drewry (1983) and from 1:2 million scale East Queen Maud Land - Enderby Land map (1988), National Institute of Polar Research, Japan.]

Anon. 1974. Australian Antarctic Territory. Division of National Mapping. Base compilation series, Map **SR 37-38**. Scale 1:1,000,000. (Lambert Conformal Conic, standard parallels 68°40'S, 71°20'S)
[(1) Compiled from ANARE photography and ground control 1954-71, US Navy aerial photography 1947 and miscellaneous sources. (2) Parts of map replaced by Japanese 1:250,000 scale maps of Lützow-Holm Bay (1989) and Prince Olav Coast (1990). Formlines merged with those taken from 1:3 million scale compilation for Sheet 2, Drewry (1983) and 1:2 million scale map of East Queen Maud Land - Enderby Land (1988), Japan. Coastline amended by C.W.M. Swithinbank using Landsat image E1547-05221 (Jan. 74).]

Anon. 1989. Lützow-Holm Bay. Geographical Survey Institute, Japan. 1:250,000 series, Map Parts **SR 37-38/1, 3, 5, 6, 9, 10**. Scale 1:250,000. (Lambert Conformal Conic, standard parallels 68°S, 70°S)
[(1) Prepared by reducing 1:25,000 scale maps compiled from JARE air photography and ground control 1957-62. (2) Formlines merged with those taken from 1:3 million scale compilation for Sheet 2, Drewry (1983) and 1:2 million scale map of East Queen Maud Land - Enderby Land (1988), National Institute of Polar Research, Japan. Coastline amended by C.W.M. Swithinbank, 1992 using Landsat image E1547-05221 (Jan. 74); amendments to glacier tongues using East Queen Maud Land - Enderby Land map (1988).]

Anon. 1969. Australian Antarctic Territory. Division of National Mapping. Base compilation series, Map **SR 39-40**. Scale 1:1,000,000. (Lambert Conformal Conic, standard parallels 68°40'S, 71°20'S)
[(1) Compiled from ANARE photography and ground control 1954-69, US Navy aerial photography 1947 and miscellaneous sources. (2) Formlines merged with those taken from 1:3 million scale compilation for Sheet 2, Drewry (1983) and 1:2 million scale map of East Queen Maud Land - Enderby Land (1988), National Institute of Polar Research, Japan.]

Anon. 1971. Australian Antarctic Territory. Division of National Mapping. Base compilation series, Map **SR 41-42**. Scale 1:1,000,000. (Lambert Conformal Conic, standard parallels 68°40'S, 71°20'S)

[(1) Compiled from ANARE photography and ground control 1954-71, US Navy aerial photography 1947 and miscellaneous sources. (2) Formlines merged with those taken from 1:3 million scale compilation for Sheet 2, Drewry (1983). Coastline amended by C.W.M. Swithinbank, 1992 using Landsat images E1236-03153 (Mar. 73), E1580-03211 (Feb. 74) and E1580-03205 (Feb. 74).]

Anon. 1970. Crohn Massif, Mac. Robertson Land. Division of National Mapping. 1:250,000 series, Map **SR 41-42/10**. Scale 1:250,000. (Universal Transverse Mercator)
[(1) Vertical and oblique air photography: Australian National Antarctic Research Expeditions 1956 and 1965. Terrestrial photography: ANARE surveys 1954-1956-1966. Horizontal and vertical control: ANARE survey 1966. (2) Map used only for interpretation of formline detail across rock outcrops.]

Anon. 1971. Australian Antarctic Territory. Division of National Mapping. Base compilation series, Map **SR 43-44**. Scale 1:1,000,000. (Lambert Conformal Conic, standard parallels 68°40'S, 71°20'S)
[(1) Compiled from ANARE photography and ground control 1954-71, US Navy aerial photography 1947 and miscellaneous sources. (2) Formlines merged with those taken from 1:3 million scale compilation for Sheet 2, Drewry (1983). Coastline amended by C.W.M. Swithinbank, 1992 using Landsat images E1542-03102 (Jan. 74), E1196-02514 (Feb. 73), E1179-02571 (Jan. 73), E31492-02354C (Apr. 82) and E1196-02512 (Feb. 73). (3) Grounding line in the Gillock Island-Reinbolt Hills area taken from provisional data supplied by I. Allison, Australian Antarctic Division, 7 October 1992.]

Drewry, D.J. 1983. Sheet 2. Scott Polar Research Institute. Antarctica: Glaciological and Geophysical Folio, Map **SR 45-46**. Scale 1:6,000,000. (Polar Stereographic)
[(1) 1:3 million scale compilation used for database with minor amendments to merge formlines with those on adjacent Australian maps; map published at 1:6 million.]

Drewry, D.J. 1983. Sheet 2. Scott Polar Research Institute. Antarctica: Glaciological and Geophysical Folio, Map **SR 47-48**. Scale 1:6,000,000. (Polar Stereographic)
[(1) 1:3 million scale compilation used for database with minor amendments to merge formlines with those on adjacent Australian maps; map published at 1:6 million.]

Drewry, D.J. 1983. Sheet 2. Scott Polar Research Institute. Antarctica: Glaciological and Geophysical Folio, Map **SR 49-50**. Scale 1:6,000,000. (Polar Stereographic)
[(1) 1:3 million scale compilation used for database with minor amendments to merge formlines with those on adjacent Australian maps; map published at 1:6 million.]

Drewry, D.J. 1983. Sheet 2. Scott Polar Research Institute. Antarctica: Glaciological and Geophysical Folio, Map **SR 51-52**. Scale 1:6,000,000. (Polar Stereographic)
[(1) 1:3 million scale compilation used for database with minor amendments to merge formlines with those on adjacent Australian maps; map published at 1:6 million.]

Drewry, D.J. 1983. Sheet 2. Scott Polar Research Institute. Antarctica: Glaciological and Geophysical Folio, Map **SR 53-54**. Scale 1:6,000,000. (Polar Stereographic)
[(1) 1:3 million scale compilation used for database with minor amendments to merge formlines with those on adjacent Australian maps; map published at 1:6 million.]

Anon. 1974. Australian Antarctic Territory. Division of National Mapping. Base compilation series, Map **SR 55-56**. Scale 1:1,000,000. (Lambert Conformal Conic, standard parallels 68°40'S, 71°20'S)

[(1) Compiled from ANARE photography and ground control 1954-71, US Navy aerial photography 1947 and miscellaneous sources. (2) Formlines merged with those taken from 1:3 million scale compilation for Sheet 2, Drewry (1983).]

Anon. 1975. Australian Antarctic Territory - Ross Dependency. Division of National Mapping. Base compilation series, Map **SR 57-58**. Scale 1:1,000,000. (Lambert Conformal Conic, standard parallels 68°40'S, 71°20'S)
[(1) Compiled from ANARE photography and ground control 1954-71, US Navy aerial photography 1947 and miscellaneous sources. (2) Parts of map replaced by US Geological Survey, Antarctica 1:250,000 Reconnaissance Series, Sheets SR 57-58/6*, 10 and 14. Formlines merged with those taken from 1:3 million scale compilation for Sheet 2, Drewry 1983.]

Anon. 1970. Suvorov Glacier. US Geological Survey. Antarctica 1:250,000 Reconnaissance Series, Map **SR 57-58/6*** (Extended). Scale 1:250,000. (Lambert Conformal Conic, standard parallels 68°40'S, 71°20'S)
[(1) Control by US Geological Survey; compiled in 1968 from US Navy tricamera aerial photographs taken 1961, 1962 and 1964. (2) Grounding line and coastline interpreted by C.W.M. Swithinbank from Landsat imagery 71/110 (E30928-20440, 18 Sept. 80), 72/110 (E1460-21103, 26 Oct. 73), 76/109 (E1212-21360, 20 Feb. 73). (3) Formlines merged inland with those taken from 1:3 million scale compilation for Sheet 2, Drewry (1983) and with formlines on the Australian 1:1 million scale map sheet SR 57-58.]

Anon. 1970. Pomerantz Tableland. US Geological Survey. Antarctica 1:250,000 Reconnaissance Series, Map **SR 57-58/10**. Scale 1:250,000. (Lambert Conformal Conic, standard parallels 68°40'S, 71°20'S)
[(1) Control by US Geological Survey; compiled in 1968 from US Navy tricamera aerial photographs taken 1961-1962, 1964-1965. (2) Grounding line and coastline interpreted by C.W.M. Swithinbank from Landsat imagery 71/110 (E30928-20440-C, 18 Sept. 80) and 72/110 (E1460-21103, 26 Oct. 73). (3) Formlines merged inland with those taken from 1:3 million scale compilations for Sheet 2, Drewry (1983) and with formlines on the Australian 1:1 million scale map sheet SR 57-58.]

Anon. 1970. Ob' Bay. US Geological Survey. Antarctica 1:250,000 Reconnaissance Series, Map **SR 57-58/11**. Scale 1:250,000. (Lambert Conformal Conic, standard parallels 68°40'S, 71°20'S)
[(1) Control by US Geological Survey; compiled in 1967 from US Navy tricamera aerial photographs taken 1961-1965. (2) Grounding line and coastline interpreted by C.W.M. Swithinbank from Landsat imagery 70/110 (E30927-20382-B, -C, 17 Sept. 80).]

Anon. 1970. Yule Bay. US Geological Survey. Antarctica 1:250,000 Reconnaissance Series, Map **SR 57-58/12**. Scale 1:250,000. (Lambert Conformal Conic, standard parallels 68°40'S, 71°20'S)
[(1) Control by US Geological Survey; compiled in 1968 from US Navy tricamera aerial photographs taken 1961 and 1965. (2) Grounding line and coastline interpreted by C.W.M. Swithinbank from Landsat imagery 68/110 (E1186-20501, 25 Jan. 73) and 70/110 (E30927-20382-D, 17 Sept. 80).]

Anon. 1970. Daniels Range. US Geological Survey. Antarctica 1:250,000 Reconnaissance Series, Map **SR 57-58/14**. Scale 1:250,000. (Lambert Conformal Conic, standard parallels 68°40'S, 71°20'S)
[(1) Control by US Geological Survey; compiled in 1968 from US Navy tricamera aerial photographs taken 1961, 1962, and 1964. (2) Formlines merged inland with those taken from 1:3 million scale compilation for Sheet 2, Drewry (1983).]

Anon. 1989. Mount Soza. US Geological Survey. Antarctica 1:250,000 Reconnaissance Series, Map **SR 57-58/15**. Scale 1:250,000. (Lambert Conformal Conic, standard parallels 68°40'S, 71°20'S)
[(1) Control by US Geological Survey; compiled in 1967 from US Navy tricamera aerial photographs taken 1961-1964, revised 1988.]

Anon. 1969. Ebbe Glacier. US Geological Survey. Antarctica 1:250,000 Reconnaissance Series, Map **SR 57-58/16**. Scale 1:250,000. (Lambert Conformal Conic, standard parallels 68°40'S, 71°20'S)
[(1) Control by US Geological Survey; compiled in 1967 from US Navy tricamera aerial photographs taken 1961-1965.]

Anon. 1970. Cape Adare. US Geological Survey. Antarctica 1:250,000 Reconnaissance Series, Map **SR 59-60/13*** (Extended). Scale 1:250,000. (Lambert Conformal Conic, standard parallels 68°40'S, 71°20'S)
[(1) Control by US Geological Survey; compiled in 1968 from US Navy tricamera aerial photographs taken 1961, 1962 and 1965. (2) Grounding lines and coastline interpreted by C.W.M. Swithinbank from Landsat imagery 64/111 (E1128-20275, 28 Nov. 72).]

SS 7-9/10 to SS 58-60/13

Anon. 1974. Cape Burks. US Geological Survey. Antarctica 1:250,000 Reconnaissance Series, Map **SS 7-9/10**. Scale 1:250,000. (Lambert Conformal Conic, standard parallels 72°40'S, 75°20'S)
[(1) Control by US Geological Survey; compiled in 1969 from US Navy tricamera aerial photographs taken 1964-1965. (2) Amended by C.W.M. Swithinbank and S.R. Jordan, Jan. 1992 using Landsat images E1175-16215 (Jan. 73) and E1175-16213 (Jan. 73). Reference also made to 1:1 million scale Landsat image mosaic held at BAS and to Swithinbank (1988).]

Anon. 1974. Grant island. US Geological Survey. Antarctica 1:250,000 Reconnaissance Series, Map **SS 7-9/11**. Scale 1:250,000. (Lambert Conformal Conic, standard parallels 72°40'S, 75°20'S)
[(1) Control by US Geological Survey; compiled in 1969 from US Navy tricamera aerial photographs taken 1964-1965. (2) Reference made to Landsat satellite imagery E1175-16213 (Jan. 73) and E1172-16042 (Jan. 73) by C.W.M. Swithinbank and S.R. Jordan, Feb. 1992. Ice front updated using images between Grant and Dean islands. Reference also made to 1:1 million scale Landsat image mosaic held at BAS and to Swithinbank (1988).]

Anon. 1976. Dean Island. US Geological Survey. Antarctica 1:250,000 Reconnaissance Series, Map **SS 7-9/12**. Scale 1:250,000. (Lambert Conformal Conic, standard parallels 72°40'S, 75°20'S)
[(1) Control by US Geological Survey; compiled in 1969 from US Navy tricamera aerial photographs taken 1965. Revised from ERTS-I imagery taken 1972-1973 provided by NASA under proposal SR-149. (2) Further reference made to Landsat image E1172-16042 (Jan. 73) by C.W.M. Swithinbank and S.R. Jordan, Jan. 1992 but no changes made to map except to ice front between Grant and Dean islands. Reference made to 1:1 million scale Landsat image mosaic held at BAS and to Swithinbank (1988).]

Anon. 1973. Mount McCoy. US Geological Survey. Antarctica 1:250,000 Reconnaissance Series, Map **SS 7-9/13**. Scale 1:250,000. (Lambert Conformal Conic, standard parallels 72°40'S, 75°20'S)
[(1) Control by US Geological Survey; compiled in 1969 from US Navy tricamera aerial photographs taken 1965. (2) Amendments made using Landsat imagery E1144-16510 (Dec. 72) and E1175-16215 (Jan. 73)

by C.W.M. Swithinbank and S.R. Jordan, Feb. 1992. Reference also made to 1:1 million scale Landsat image mosaic held at BAS and to Swithinbank (1988).]

Anon. 1975. Hull Glacier. US Geological Survey. Antarctica 1:250,000 Reconnaissance Series, Map **SS 7-9/14**. Scale 1:250,000. (Lambert Conformal Conic, standard parallels 72°40'S, 75°20'S)
[(1) Control by US Geological Survey; compiled in 1969 from US Navy tricamera aerial photographs taken 1964-1965. (2) Amendments by C.W.M. Swithinbank and S.R. Jordan, Feb. 1992, using Landsat satellite image E1175-16215 (Jan. 73), and reference to 1:1 million scale Landsat image mosaic held at BAS; also referred to Swithinbank (1988).]

Anon. 1976. Mount Kosciusko. US Geological Survey. Antarctica 1:250,000 Reconnaissance Series, Map **SS 7-9/15**. Scale 1:250,000. (Lambert Conformal Conic, standard parallels 72°40'S, 75°20'S)
[(1) Control by US Geological Survey; compiled in 1969 from US Navy tricamera aerial photographs taken 1964-1965. Revised from Earth Resources Technology Satellite imagery (ERTS-1) taken 1972-1973, provided by NASA under proposal SR-149. Images used: E1172-16044 (Jan. 73), E1172-16042 (Jan. 73) and E1152-15533 (Dec. 72).]

Anon. 1976. McCuddin Hills. US Geological Survey. Antarctica 1:250,000 Reconnaissance Series, Map **SS 7-9/16**. Scale 1:250,000. (Lambert Conformal Conic, standard parallels 72°40'S, 75°20'S)
[(1) Control by US Geological Survey; compiled in 1969 from US Navy tricamera aerial photographs taken 1965-1966. Revised from ERTS-1 imagery taken 1972-1973, provided by NASA under proposal SR-149. Images used: E1172-16042 (Jan. 73), E1172-16044 (Jan. 73), E1152-15531 (Dec. 72), E1152-15533 (Dec. 72), E1146-15191 (Dec. 72), E1200-15194 (Feb. 73) and E1491-15340 (Nov. 73). (2) Formlines tied to fit with those from USSR 1:1 million map (ST 13-16) and to formlines from 1:3 million scale compilation for Sheet 2, Drewry (1983).]

Anon. 1963. Mount Galla. US Geological Survey. Antarctica 1:250,000 Reconnaissance Series, Map **SS 7-9/16 & SS 10-12/13**. Scale 1:250,000. (Lambert Conformal Conic, standard parallels 72°40'S, 75°20'S)
[(1) Control by US Geological Survey; compiled in 1961 from US Navy trimetrogon photography 1960. (2) Incorporated into sheet SS 7-9/16, McCuddin Hills.]

Anon. 1976. Getz Ice Shelf. Main Administration of Geodesy and Cartography, Council of Ministers of USSR. 1:1,000,000 Topographic Series, Map **SS 9,10**. Scale 1:1,000,000. (Modified Polyconic)
[(1) Compiled from: US Geological Survey 1:500,000 Antarctica sketch map "Bakutis Coast-Marie Byrd Land" (1968) and "Hobbs Coast-Marie Byrd Land" (1962). (2) Map considerably amended by S.R. Jordan with C.W.M. Swithinbank and J.W. Thomson, Feb. 1992 using satellite images E1160-14554 (Dec. 72), E1488-15160 (Nov. 73) (including enhanced version), E1172-16035 (Jan. 73) and E42050-16013 (Feb. 88). Reference made also to Swithinbank (1988), 1:1 million scale Landsat image mosaic held at BAS and LeMasurier and Thomson (1990), *Antarctic Research Series*, **48**, American Geophysical Union, Fig. B.5.2. US Geological Survey 1:250,000 Reconnaissance Series maps incorporated; formlines taken from 1:3 million scale compilation for Sheet 2, Drewry (1983).]

Anon. 1968. Antarctica sketch map, Bakutis Coast-Marie Byrd Land. US Geological Survey. Antarctica Sketch Map Series, Scale 1:500,000, Map Parts **SS 10-12 & SS 13-15**. (Polar Stereographic, standard parallel 71°S)

[(1) Control by US Geological Survey 1959-1961; compiled in 1966 from US Navy tricamera aerial photography 1965-1966. (2) Only data between 106°-108°W has been used. Grounding line in this section updated by C.W.M. Swithinbank, 1991 using satellite images E1174-14325 (1973), E1205-14044 (Feb. 73), E1191-14270 (Feb. 73) and E1157-14383 (Dec. 72). Further amendments to ice shelf front and iceberg tongue by J.W. Thomson and S.R. Jordan (1992) with reference to Swithinbank (1988).]

Anon. 1978. Martin Peninsula. US Geological Survey. Antarctica 1:250,000 Reconnaissance Series, Map **SS 10-12/11*** (Extended). Scale 1:250,000. (Lambert Conformal Conic, standard parallels 72°40'S, 75°20'S)
[(1) Control by US Geological Survey; compiled from US Navy tricamera aerial photographs taken 1966-1967. Revised from ERTS-I imagery taken 1972-1973, provided by NASA under proposal SR-149; map edited 1978. Images used are: E1488-15160 (Nov. 73), E1160-14554 (Dec. 72) and E1177-14500 (Jan. 73). (2) Grounding line amended by C.W.M. Swithinbank, 1991 using ERTS-I as above on western half of sheet and also E1488-15160 enhanced image (Nov. 73). Reference made also to 1:1 million scale Landsat image mosaic held at BAS and to Swithinbank (1988).]

Anon. 1978. Bear Peninsula. US Geological Survey. Antarctica 1:250,000 Reconnaissance Series, Map **SS 10-12/12**. Scale 1:250,000. (Lambert Conformal Conic, standard parallels 72°40'S, 75°20'S)
[(1) Control by US Geological Survey; compiled from US Navy tricamera aerial photographs taken 1966. Revised from ERTS-I imagery taken 1972-1973, provided by NASA under proposal SR-149; map edited 1978. Images used: E1160-14554 (Dec. 72), E1174-14325 (Jan. 73) and E1157-14383 (Dec. 72). (2) Amended by C.W.M. Swithinbank and S.R. Jordan in Feb. 1992 using E1157-14383 (Nov. 90), E1174-14325 (Nov. 90) and E1191-14270 (Oct. 90).]

Anon. 1977. Toney Mountain. US Geological Survey. Antarctica 1:250,000 Reconnaissance Series, Map **SS 10-12/15**. Scale 1:250,000. (Lambert Conformal Conic, standard parallels 72°40'S, 75°20'S.)
[(1) Control by US Geological Survey; compiled in 1971 from US Navy tricamera aerial photographs taken 1966-1967. Revised from ERTS-1 imagery taken 1973, provided by NASA under proposal SR-149. Images used: E1177-14500 (Jan. 73), E1177-14503 (Jan. 73) and E1179-15014 (Jan. 73). (2) Formlines from 1:3 million scale compilation for Sheet 2, Drewry (1983); formlines from USSR 1:1 million map (SS 11,12) incorporated at sheet boundary.]

Anon. 1977. Mount Murphy. US Geological Survey. Antarctica 1:250,000 Reconnaissance Series, Map **SS 10-12/16**. Scale 1:250,000. (Lambert Conformal Conic, standard parallels 72°40'S, 75°20'S)
[(1) Control by US Geological Survey; compiled in 1972 from US Navy tricamera aerial photographs taken 1966. Revised from ERTS-1 imagery taken 1973, provided by NASA under proposal SR-149. Images used: E1177-14500 (Jan. 73) and E1174-14325 (Jan. 73). (2) Amendments by C.W.M. Swithinbank and S.R. Jordan (Feb. 1973) using E1174-14325 (Jan. 73) and E1157-14383 (Dec. 72), E1205-14044 (Feb. 73), E1191-14270 (Feb. 73); reference also made to Swithinbank (1988).]

Anon. 1976. Smith Glacier. Main Administration of Geodesy and Cartography, Council of Ministers of USSR. 1:1 million Topographic Series, Map **SS 11,12**. Scale 1:1,000,000. (Modified Polyconic)
[(1) Compiled from US Geological Survey 1:500,000 Antarctica sketch map "Bakutis Coast-Marie Byrd Land" (1968). (2) Major amendments made by S.R. Jordan, Jan. 1992: US Geological Survey 1:250,000 Reconnaissance Series maps have been incorporated; ice fronts, coastlines and grounding lines amended using satellite images E1172-16035 (Jan. 73) and E42050-16013 (Feb. 88) and 1:1 million scale Landsat image mosaic held at BAS. Reference also made to Swithinbank (1988).]

Anon. 1968. Antarctica sketch map, Bryan Coast-Ellsworth Land. US Geological Survey. Antarctica Sketch Map Series, Scale 1:500,000, Map SS 16-18. (Polar Stereographic, standard parallel 71°S)
[(1) Control by US Geological Survey 1961-62; compiled in 1967 from US Navy tricamera aerial photography 1965-1966. (2) Coastline adjustments by S.R. Jordan, 1990 using Landsat satellite imagery: E1190-12380 (Jan. 73), E1182-13345 (Jan. 73), E1173-12433 (Jan. 73), E1176-13004 (Jan. 73), E1537-13022 (Jan. 74), E1139-12550 (Dec. 72), E1536-12570 (Jan. 74), E1190-12374 (Jan. 73), E1170-12262 (Jan. 73) and E1170-12260 (Jan. 73). Formlines taken from 1:3 million scale compilation for Sheet 2, Drewry (1983); further adjustments to formlines by S.R. Jordan and J.W. Thomson, Nov. 1991. (3) B.A.T. 1:250,000 unpublished map series, Sheets 43a, 50, 55, 60 incorporated and edge-matching adjustments made. Reference also made to USGS 1:250,000 Reconnaissance Series, Sky-Hi Nunataks and Lyon Nunataks sheets, and to unpublished coastline compilation by P.D. Marsh, BAS, 1987.]

Fleming, E.A. 1978. Sheet 43a. Unpublished. BAT 1:250,000, Map SS 16-18/3,4. Scale 1:250,000. (Lambert Conformal Conic, standard parallels 63°20'S, 76°40'S)
[(1) Compiled from BAS 250P, Sheet SS 16-18/4. (2) Coastline and ice front amendments by C.W.M. Swithinbank (1991) using E42706-12514 and E42436-12390.]

Fleming, E.A. 1978. Sheet 43. Unpublished. BAT 1:250,000, Map Parts SS 16-18/4 & SS 19-21/1. Scale 1:250,000. (Lambert Conformal Conic, standard parallels 63°20'S, 76°40'S)
[(1) Detail and plan from BAS 250P, Sheets SS 16-18/4 and SS 19-21/1 (amended after A.H.W. Woodruff and image E30299-12261 (Dec. 78). Height from EW 1000A/204 (BAS Archives Map). (2) Spaatz Island coastline adjusted using E42706-12514 (Dec. 89) and ice front adjusted using Landsat E42436-12390 by C.W.M. Swithinbank, June 1991.]

Willan, C.F.H. 1990. Sheet 50. Unpublished. BAS 1:250,000, Map SS 16-18/8. Scale 1:500 000. (Lambert Conformal Conic, standard parallels 63°20'S, 76°40'S)
[(1) Coastline and exposure from images E1170-12260, E1170-12262, E42436-12390 and E42386-12511 supplemented by TMA photos 1733 and by enlargement of data abstracted from US Geological Survey 1:500,000 sketch map "Ellsworth Land - Palmer Land" by J.S. Harris. (2) Some coastline and ice front adjusted by C.W.M. Swithinbank, 1991 with ref to: E1190-12380 (Jan. 73), E1173-12433 (Jan. 73), E1190-12374 (Jan. 73), E1170-12262 (Jan. 73), E1170-12260 (Jan. 73), E1139-12543 (Dec. 72).]

Willan, C.F.H. 1990. Sheet 55. Unpublished. BAT 1:250,000, Map Parts SS 16-18/12 & SS 19-21/9. Scale 1:500,000. (Lambert Conformal Conic, standard parallels 63°20'S, 76°40'S)
[Exposure detail from USGS 1:250,000 Reconnaissance Series, Sheet SS 16-18/12 and BAS 500P, SS 17-20/SE and images E1562-11593, E1563-12045, supplemented by TMA photos 1645 and enlargement of data abstraction from US Geological Survey 1:500,000 sketch map "Ellsworth Land-Palmer Land" by J.S. Harris.]

Fleming, E.A. 1978. Sheet 44. Unpublished. BAT 1:250,000, Map SS 19-21/1,2. Scale 1:250,000. (Lambert Conformal Conic, standard parallels 63°20'S, 76°40'S)
[Alexander Island: plan and detail from BAS 250P, Sheet SS 19-21/1, height from EW 1000A/204 and 1205 610. Palmer Land: detail from US Geological Survey 1:500,000 scale sketch map "Northern Palmer Land" fitted to WGS.72 control. Height from EW 1000A/180 and sketched from USGS sketch map using heights of intersected points.]

Harris, J.S. 1979. Sheet 45 and Sheet 45a. Unpublished. BAT 1:250,000, Map **SS 19-21/2,3.** Scale 1:250,000. (Lambert Conformal Conic, standard parallels 63°20'S, 76°40'S)
[(1) Sheets 45 and 45a considered as 1 sheet. Positioning by geoceiver stations. a) in western half of sheet, image E30288-11233, b) in north-east of sheet image E30291-11401-D (a + b - exposure detail from TMAs), c) in south-east of sheet US Geological Survey sketch map (1966), adjusted using TMAs. Ice front from US Geological Survey 1:500,000 sketch map "Northern Palmer Land", formlines sketched from TMA photographs. (2) Edgematched after adjustments were made to Sheets 45, 45a and 53, S.R. Jordan, April 1991.]

Willan, C.F.H. 1990. Sheet 51. Unpublished. BAT 1:250,000, Map **SS 19-21/5.** Scale 1:500,000. (Lambert Conformal Conic, standard parallels 63°20'S, 76°40'S)
[Coastline and exposure from images E1170-12260, E1525-11541, E1563-12045, E42436-12045, E42390-12263, supplemented by TMA photos 1749, 1731. Incorporates enlargement of data abstracted by J.S. Harris from US Geological Survey 1:500,000 sketch map "Ellsworth Land-Palmer Land" .]

Willan, C.F.H. 1990. Sheet 52. Unpublished. BAT 1:250,000, Map **SS 19-21/6.** Scale 1:500,000. (Lambert Conformal Conic, standard parallels 63°20'S, 76°40'S)
[Exposure detail from image E1181-11461 and enlargement of data abstracted by J.S. Harris from US Geological Survey 1:500,000 sketch map, "Ellsworth Land-Palmer Land" .]

Willan, C.F.H. 1990. Sheet 53. Unpublished. BAT 1:250,000, Map **SS 19-21/7.** Scale 1:500 000. (Lambert Conformal Conic, standard parallels 63°20'S, 76°40'S)
[Coastline and exposure details from images E30288-11233, E2284-11265 and E1538-11253 supplemented by TMA photos 1745, 1746, 1747, 1748 and enlargement of data abstracted by J.S. Harris from US Geological Survey 1:500,000 sketch map "Ellsworth Land-Palmer Land" .]

Willan, C.F.H. 1990. Sheet 56. Unpublished. BAT 1:250,000, Map **SS 19-21/9,10.** Scale 1:500,000. (Lambert Conformal Conic, standard parallels 63°20'S, 76°40'S)
[Exposure detail from BAS 500P, Sheet SS 17-20/SE and image E1563-12045 and enlargement of data abstracted by J.S. Harris from US Geological Survey 1:500,000 sketch map "Ellsworth Land-Palmer Land"; also from US Geological Survey 1:250,000 Reconnaissance series, Sheet SS 19-21/9.]

Willan, C.F.H. 1990. Sheet 57. Unpublished. BAT 1:250,000, Map **SS 19-21/10,11.** Scale 1:500,000. (Lambert Conformal Conic, standard parallels 63°20'S, 76°40'S)
[(1) Coastline and exposure from BAS 500P, Sheet SS 17-20/SE and images E1212-11183, E1538-11260 and TMA photos 1739, 1745, 1746, 1747 and enlargement of data abstracted by J.S. Harris from US Geological Survey 1:500,000 sketch map "Ellsworth Land-Palmer Land". (2) Coastline and grounding line amended using data supplied by Institut für Angewandte Geodäsie.]

Willan, C.F.H. 1990. Sheet 60. Unpublished. BAT 1:250,000, Map **SS 19-21/13,14.** Scale 1:500,000. (Lambert Conformal Conic, standard parallels 63°20'S, 76°40'S)
[Exposures from BAS 500P, Sheet SS 17-20/SE, supplemented by images E1562-11593, E1563-12051, E1505-11440 and E1538-11260. Includes abstraction of data by J.S. Harris from US Geological Survey 1:500,000 sketch map "Ellsworth Land-Palmer Land", supplemented by TMA photos 1737, 1745, 1746.]

Willan, C.F.H. 1991. Sheet 61. Unpublished. BAT 1:250,000, Map **SS 19-21/14, 15.** Scale 1:500,000. (Lambert Conformal Conic, standard parallels 63°20'S, 76°40'S)

[Coastline and exposure details from BAS 500P, Sheet SS 17-20/SE and images E1212-11183, E1212-11185, E1538-11260, TMA photos 1737, 1745, 1746 and enlargement of data abstracted by J.S. Harris from US Geological Survey 1:500,000 sketch map "Ellsworth Land-Palmer Land" .]

Anon. 1990. Brunt Ice Shelf. Institut für Angewandte Geodäsie. Satellite image map, Map **SS 25-27.** Scale 1:1,000,000. (Lambert Conformal Conic, standard parallels 72°40'S, 75°20'S)
[(1) Prepared from eight Landsat MSS images forming part of a large geocoded image mosaic. Interpretation of grounding line and ice shelf features supplied to database by Institut für Angewandte Geodäsie, 1991. (2) Formlines taken from 1:3 million scale compilation for Sheet 2, Drewry (1983), adjusted to new grounding line.]

Anon. 1988. Ritscherhochland. Institut für Angewandte Geodäsie. Satellite image map, Map **SS 28-30.** Scale 1:1,000,000. (Lambert Conformal Conic, standard parallels 72°40'S, 75°20'S)
[(1) Prepared from 15 Landsat MSS images forming part of a large geocoded image mosaic. Interpretation of grounding line and ice shelf features supplied to database by Institut für Angewandte Geodäsie, 1991. (2) Rock outcrop detail and formlines taken from Norwegian 1:250,000 scale maps, Sheets B7, C7, D8, D9, F6, F7, G6 and G7. Formlines for rest of sheet taken from 1:3 million scale compilation for Sheet 2, Drewry (1983), adjusted to new coastline and merged to formlines on Norwegian maps.]

Anon. 1962. Borgmassivet, Maudheimvidda. Norsk Polarinstitutt. Dronning Maud Land 1:250,000, Map F6 [**SS 28-30/3,4**]. Scale 1:250,000.
[(1) Triangulation and other field work: Norwegian-British-Swedish Antarctic Expedition 1949-52. Map compilation from oblique aerial photography 1951-1952. (2) Formlines merged with those taken from 1:3 million scale compilation for Sheet 2, Drewry (1983). Glacier margins and flowlines supplied by Institut für Angewandte Geodäsie.]

Anon. 1961. Jutulstraumen, Maudheimvidda. Norsk Polarinstitutt. Dronning Maud Land 1:250,000, Map G6 [**SS 28-30/4**]. Scale 1:250,000.
[(1) Triangulation and other field work: Norwegian-British-Swedish Antarctic Expedition, 1949-52. Map compilation from oblique aerial photography 1951-52 and 1958-59. (2) Glacier margins and flowlines supplied by Institut für Angewandte Geodäsie.]

Anon. 1972. Vestfjella Vest, Maudheimvidda. Norsk Polarinstitutt. Dronning Maud Land 1:250,000, Map B7 [**SS 28-30/5**]. Scale 1:250,000.
[(1) Triangulation and other field work: Norwegian Antarctic Expedition 1968-69. Map compilation from oblique aerial photography, 1951-52. (2) Formlines merged with those taken from 1:3 million scale compilation for Sheet 2, Drewry (1983). Grounding line, glacier margins and flow lines supplied by Institut für Angewandte Geodäsie.]

Anon. 1972. Vestfjella-Aust, Maudheimvidda. Norsk Polarinstitutt. Dronning Maud Land 1:250,000, Map C7 [**SS 28-30/5,6**]. Scale 1:250,000.
[(1) Triangulation and other field work: Norwegian Antarctic Expedition 1968-69. Map compilation from oblique aerial photography 1950-51 and 1951-52. (2) Formlines merged with those taken from 1:3 million scale compilation for Sheet 2, Drewry (1983). Grounding line, glacier margins and flowlines supplied by Institut für Angewandte Geodäsie.]

Anon. 1961. Kirwanveggen, Maudheimvidda. Norsk Polarinstitutt. Dronning Maud Land 1:250,000, Map F7 [SS 28-30/7,8]. Scale 1:250,000.
[(1) Triangulation and other field work: Norwegian-British-Swedish Antarctic Expedition 1949-52. Map compilation from oblique air photography 1951-52 and 1958-59. (2) Formlines merged with those taken from 1:3 million scale compilation for Sheet 2, Drewry (1983).]

Anon. 1961. Neumayerskarvet, Maudheimvidda. Norsk Polarinstitutt. Dronning Maud Land 1:250,000, Map G7 [SS 28-30/8]. Scale 1:250,000.
[(1) Triangulation and other field work: Norwegian-British-Swedish Antarctic Expedition, 1949-52. Map compilation from oblique aerial photography 1951-52 and 1958-59. (2) Formlines merged with those taken from 1:3 million scale compilation for Sheet 2, Drewry (1983). Glacier margins and flowlines supplied by Institut für Angewandte Geodäsie.]

Anon. 1988. Heimefrontfjella Nord (Maudheimvidda). Norsk Polarinstitutt. Dronning Maud Land 1:250,000, Map D8 [SS 28-30/10]. Scale 1:250,000.
[(1) Triangulation: British Antarctic Expeditions. Map compilation from oblique air photography 1951-52. (2) Formlines merged with those taken from 1:3 million scale compilation for Sheet 2, Drewry (1983). Glacier margins and flowlines supplied by Institut für Angewandte Geodäsie.]

Anon. 1988. Heimefrontfjella Sør (Maudheimvidda). Norsk Polarinstitutt. Dronning Maud Land 1:250,000, Map D9 [SS 28-30/11]. Scale 1:250,000.
[(1) Triangulation: British Antarctic Expeditions. Map compilation from oblique aerial photography 1951-52. (2) Formlines merged with those taken from 1:3 million scale compilation for Sheet 2, Drewry (1983). Glacier margins and flow lines supplied by Institut für Angewandte Geodäsie.]

Anon. 1990. Amelangplatte. Institut für Angewandte Geodäsie. Satellite image map series, Map SS 28-30/11. Scale 1:250,000 (Lambert Conformal Conic, standard parallels 72°40'S, 75°20'S).
[(1) Part of satellite image mosaic prepared from 15 Landsat scenes at 1:1,000,000 scale, transformed geometrically into the map projection. Heights above sea level determined barometrically. This map sheet derived from Landsat MSS images E1227-07342 (Mar. 73), E1227-07345 (Mar. 73), E1230-07514 (Mar. 73) and E1467-08055 (Nov. 73). (2) Rock outcrop detail and formlines north of 74°45'S interpreted by A.J. Fox in October 1992.]

Drewry, D.J. 1983. Sheet 2. Scott Polar Research Institute. Antarctica: Glaciological and Geophysical Folio, Map SS 31-33. Scale 1:6,000,000. (Polar Stereographic)
[(1) 1:3 million scale compilation used for database with amendments to merge formlines with those on adjacent Norwegian 1:250,000 scale maps, Sheets J6, K6, L6, M6 and N6.]

Anon. 1961. H.V. Sverdrupfjella, Fimbulheimen. Norsk Polarinstitutt. Dronning Maud Land 1:250,000, Map H6 [SS 31-33/1]. Scale 1:250,000.
[(1) Triangulation and other field work: Norwegian-British-Swedish Antarctic Expedition 1949-52. Map compilation from oblique aerial photography 1951-52 and 1958-59. (2) Formlines merged with those taken from 1:3 million scale compilation for Sheet 2, Drewry (1983).]

Anon. 1962. Mühlig-Hofmannfjella Sör, Fimbulheimen. Norsk Polarinstitutt. Dronning Maud Land 1:250,000, Map J6 [SS 31-33/1,2]. Scale 1:250,000.

[(1) Triangulation and other field work: the Norwegian Antarctic Expedition 1956-60. Map compilation from oblique aerial photography 1958-59. (2) Formlines merged with those taken from 1:3 million scale compilation for Sheet 2, Drewry (1983).]

Anon. 1962. Filchnerfjella Sör, Fimbulheimen. Norsk Polarinstitutt. Dronning Maud Land 1:250,000, Map K6 [SS 31-33/2]. Scale 1:250,000.
[(1) Triangulation and other field work by the Norwegian Antarctic Expedition 1956-60. Map compilation from oblique aerial photography 1958-59. (2) Formlines merged with those taken from 1:3 million scale compilation for Sheet 2, Drewry (1983).]

Anon. 1964. Glopeflya, Fimbulheimen. Norsk Polarinstitutt. Dronning Maud Land 1:250,000, Map L6 [SS 31-33/3]. Scale 1:250,000.
[(1) Triangulation and other field work: Norwegian Antarctic Expedition 1956-60. Map compilation from oblique aerial photography 1958-59. (2) Formlines merged with those taken from 1:3 million scale compilation for Sheet 2, Drewry (1983).]

Anon. 1964. Hoelfjella Sör, Fimbulheimen. Norsk Polarinstitutt. Dronning Maud Land 1:250,000, Map M6 [SS 31-33/3,4]. Scale 1:250,000.
[(1) Triangulation and other field work: Norwegian Antarctic Expedition 1956-60. Map compilation from oblique aerial photography 1958-59. (2) Formlines merged with those taken from 1:3 million scale compilation for Sheet 2, Drewry (1983).]

Anon. 1975. Sarkofagen, Fimbulheimen. Norsk Polarinstitutt. Dronning Maud Land 1:250,000, Map N6 [SS 31-33/4]. Scale 1:250,000.
[(1) Triangulation and other field work: the Norwegian Antarctic Expedition 1956-60. Map compilation from oblique aerial photography 1958-59. (2) Formlines merged with those taken from 1:3 million scale compilation for Sheet 2, Drewry (1983).]

Drewry, D.J. 1983. Sheet 2. Scott Polar Research Institute. Antarctica: Glaciological and Geophysical Folio, Map SS 34-36. Scale 1:6,000,000. (Polar Stereographic)
[(1) 1:3 million scale compilation used for database with amendments to merge formlines with those on adjacent Norwegian 1:250,000 scale maps, Sheets Q6, R6 and S6. Amendments made also to incorporate formlines from 1:2 million scale map of East Queen Maud Land - Enderby Land (1988), National Institute of Polar Research, Japan.

Anon. 1988. Tussebreen, Sør-Rondane. Norsk Polarinstitutt. Dronning Maud Land 1:250,000, Map P6 [SS 34-36/1]. Scale 1:250,000.
[(1) Triangulation: Belgian Antarctic Expeditions. (2) Formlines merged with those taken from 1:3 million scale compilation for Sheet 2, Drewry (1983).]

Anon. 1988. Widerøefjellet, Sør-Rondane. Norsk Polarinstitutt. Dronning Maud Land 1:250,000, Map Q6 [SS 34-36/1,2]. Scale 1:250,000.
[(1) Triangulation: Belgian Antarctic Expeditions. (2) Formlines merged with those taken from 1:3 million scale compilation for Sheet 2, Drewry (1983) and from 1:2 million scale East Queen Maud Land - Enderby Land map (1988), National Institute of Polar Research, Japan.]

Anon. 1988. Mefjell, Sør-Rondane. Norsk Polarinstitutt. Dronning Maud Land 1:250,000, Map R6 [SS 34-36/2]. Scale 1:250,000.
[(1) Triangulation: Belgian Antarctic Expeditions. (2) Formlines merged with those taken from 1:3 million scale compilation for Sheet 2, Drewry (1983) and from 1:2 million scale East Queen Maud Land - Enderby Land map (1988), National Institute of Polar Research, Japan.]

Anon. 1988. Balchenfjella Sør, Sør-Rondane. Norsk Polarinstitutt. Dronning Maud Land 1:250,000, Map S6 [SS 34-36/3]. Scale 1:250,000.
[(1) Triangulation: Belgian Antarctic Expeditions. (2) Formlines merged with those taken from 1:3 million scale compilation for Sheet 2, Drewry (1983) and from 1:2 million scale East Queen Maud Land - Enderby Land map (1988), National Institute of Polar Research, Japan.]

Drewry, D.J. 1983. Sheet 2. Scott Polar Research Institute. Antarctica: Glaciological and Geophysical Folio, Map SS 37-39. Scale 1:6,000,000. (Polar Stereographic)
[(1) 1:3 million compilation used for database with amendments to merge formlines with those on 1:2 million scale map of East Queen Maud Land - Enderby Land (1988), National Institute of Polar Research, Japan.]

Anon. 1971. Australian Antarctic Territory. Division of National Mapping. Base compilation series, Map SS 40-42. Scale 1:1,000,000. (Lambert Conformal Conic, standard parallels 72°40'S, 75°20'S)
[(1) Compiled from ANARE photography and ground control 1954-71, US Navy aerial photography 1947 and miscellaneous sources. (2) Formlines merged with those taken from 1:3 million scale compilation for Sheet 2, Drewry (1983). Coastline amended by C.W.M. Swithinbank, 1992 using Landsat image E1236-03153 (Mar. 73).]

Anon. 1971. Australian Antarctic Territory. Division of National Mapping. Base compilation series, Map SS 43-45. Scale 1:1,000,000. (Lambert Conformal Conic, standard parallels 72°40'S, 75°20'S)
[(1) Compiled from ANARE photography and ground control 1954-71, US Navy aerial photography 1947 and miscellaneous sources. (2) Most formline data taken from 1:3 million scale compilation for Sheet 2, Drewry (1983).]

Drewry, D.J. 1983. Sheet 2. Scott Polar Research Institute. Antarctica: Glaciological and Geophysical Folio, Map SS 46-48. Scale 1:6,000,000. (Polar Stereographic)
[(1) 1:3 million scale compilation used for database with minor amendments to merge formlines with those on adjacent Australian map; map published at 1:6 million.]

Drewry, D.J. 1983. Sheet 2. Scott Polar Research Institute. Antarctica: Glaciological and Geophysical Folio, Map SS 49-51. Scale 1:6,000,000. (Polar Stereographic)
[(1) 1:3 million scale compilation used for database with minor amendments to merge formlines with those on adjacent Australian map; map published at 1:6 million.]

Drewry, D.J. 1983. Sheet 2. Scott Polar Research Institute. Antarctica: Glaciological and Geophysical Folio, Map SS 52-54. Scale 1:6,000,000. (Polar Stereographic)
[(1) 1:3 million scale compilation used for database with minor amendments to merge formlines with those on adjacent Australian map; map published at 1:6 million.]

Anon. 1989. Australian Antarctic Territory - Ross Dependency. Australian Surveying and Land Information Group. Base compilation series, Map **SS 55-57**. Scale 1:1,000,000. (Lambert Conformal Conic, standard parallels 72°40'S, 75°20'S)
[(1) Compiled from ANARE photography and ground control 1954-71, US Navy aerial photography 1947 and miscellaneous sources. (2) Most of formline data taken from 1:3 million scale compilation for Sheet 2, Drewry (1983).]

Anon. 1970. Welcome Mountain. US Geological Survey. Antarctica 1:250,000 Reconnaissance Series, Map **SS 55-57/4**. Scale 1:250,000. (Lambert Conformal Conic, standard parallels 72°40'S, 75°20'S)
[(1) Control by US Geological Survey; compiled in 1968 from US Navy tricamera aerial photographs taken 1960-1962, and 1964. (2) Formlines merged inland with those taken from 1:3 million scale compilation for Sheet 2, Drewry (1983).]

Anon. 1969. Sequence Hills. US Geological Survey. Antarctica 1:250,000 Reconnaissance Series, Map **SS 55-57/8**. Scale 1:250,000. (Lambert Conformal Conic, standard parallels 72°40'S, 75°20'S)
[(1) Control by US Geological Survey; compiled in 1967 from US Navy tricamera aerial photographs taken 1960-1961, 1964. (2) Formlines merged inland with those taken from 1:3 million scale compilation for Sheet 2, Drewry (1983).]

Anon. 1968. Reeves Névé. US Geological Survey. Antarctica 1:250,000 Reconnaissance Series, Map **SS 55-57/12**. Scale 1:250,000. (Lambert Conformal Conic, standard parallels 72°40'S, 75°20'S)
[(1) Control by US Geological Survey; compiled in 1966 from US Navy tricamera aerial photographs taken 1960-1962. (2) Formlines merged inland with those taken from 1:3 million scale compilation for Sheet 2, Drewry (1983).]

Anon. 1968. Mount Joyce. US Geological Survey. Antarctica 1:250,000 Reconnaissance Series, Map **SS 55-57/16**. Scale 1:250,000. (Lambert Conformal Conic, standard parallels 72°40'S, 75°20'S)
[(1) Control by US Geological Survey; compiled in 1966 from US Navy tricamera aerial photographs taken 1956-1962. (2) Formlines merged inland with those taken from 1:3 million scale compilation for Sheet 2, Drewry (1983).]

Anon. 1989. Freyberg Mountains. US Geological Survey. Antarctica 1:250,000 Reconnaissance Series, Map **SS 58-60/1**. Scale 1:250,000. (Lambert Conformal Conic, standard parallels 72°40'S, 75°20'S)
[(1) Control by US Geological Survey; compiled in 1967 from US Navy tricamera aerial photographs taken 1960-1964, revised 1988.]

Anon. 1989. Cape Hallett. US Geological Survey. Antarctica 1:250,000 Reconnaissance Series, Map **SS 58-60/2**. Scale 1:250,000. (Lambert Conformal Conic, standard parallels 72°40'S, 75°20'S)
[(1) Control by US Geological Survey; compiled in 1968 from US Navy tricamera aerial photographs taken 1961-1964, revised 1988. (2) Grounding line interpreted from map by K.G. Newport in July 1991; ice fronts revised by C.W.M. Swithinbank from Landsat imagery 64/111 (E1128-20275, 28 Nov. 72).]

Anon. 1970. Mount Murchison. US Geological Survey. Antarctica 1:250,000 Reconnaissance Series, Map **SS 58-60/5**. Scale 1:250,000. (Lambert Conformal Conic, standard parallels 72°40'S, 75°20'S)

[(1) Control by US Geological Survey; compiled in 1967 from US Navy tricamera aerial photographs taken 1960-1964. (2) Grounding line interpreted from map by K.G. Newport in July 1991; ice fronts revised by C.W.M. Swithinbank from Landsat imagery 64/113 (E1163-20224, 2 Jan. 73).]

Anon. 1969. Coulman Island. US Geological Survey. Antarctica 1:250,000 Reconnaissance Series, Map **SS 58-60/6**. Scale 1:250,000. (Lambert Conformal Conic, standard parallels 72°40'S, 75°20'S)
[(1) Control by US Geological Survey; compiled in 1967 from US Navy tricamera aerial photographs taken 1962-1964. (2) Grounding line interpreted from map by K.G. Newport in July 1991; ice fronts revised by C.W.M. Swithinbank from Landsat imagery 64/112 (E1128-20281, 28 Nov. 72).]

Anon. 1968. Mount Melbourne. US Geological Survey. Antarctica 1:250,000 Reconnaissance Series, Map **SS 58-60/9**. Scale 1:250,000. (Lambert Conformal Conic, standard parallels 72°40'S, 75°20'S)
[(1) Control by US Geological Survey; compiled in 1967 from US Navy tricamera aerial photographs taken 1955-1957 and 1960-1963. (2) Grounding line interpreted from map by K.G. Newport in July 1991; ice fronts revised and extra flow-lines added by C.W.M. Swithinbank from Landsat imagery 64/03 (E1128-20284, 28 Nov. 72).]

Anon. 1968. Relief Inlet. US Geological Survey. Antarctica 1:250,000 Reconnaissance Series, Map **SS 58-60/13**. Scale 1:250,000. (Lambert Conformal Conic, standard parallels 72°40'S, 75°20'S)
[(1) Control by US Geological Survey; compiled in 1966 from US Navy tricamera aerial photographs taken 1957-1960. (2) Grounding line interpreted from map by K.G. Newport in June 1991; amendments to ice fronts made by C.W.M. Swithinbank from Landsat imagery 64/114 (E1200-20290, 8 Feb. 73), 60/114 (E1214-20062, 22 Feb. 73) and 62/114 (E1540-20134, 14 Jan. 73).]

ST 1-4 to ST 57-60/13*

Drewry, D.J. 1983. Sheet 2. Scott Polar Research Institute. Antarctica: Glaciological and Geophysical Folio, Map **ST 1-4**. Scale 1:6,000,000. (Polar Stereographic)
[(1) Grounding line for mainland and Roosevelt Island, and position of ice front amended after reference to NOAA AVHRR satellite image (28 Oct. 87) in Keys and others (1990). Formlines taken from 1:3 million scale compilation for Sheet 2, amended to merge with US Geological Survey, Antarctica 1:250,000 Reconnaissance Series, Sheet ST 5-8/5.]

Drewry, D.J. 1983. Sheet 2. Scott Polar Research Institute. Antarctica: Glaciological and Geophysical Folio, Map **ST 5-8**. Scale 1:6,000,000. (Polar Stereographic)
[(1) Formlines taken from 1:3 million scale compilation for Sheet 2, with amendments to merge data to formlines on adjacent US Geological Survey, Antarctica 1:250,000 Reconnaissance Series, Sheets ST 5-8/3, 4, 5 and 6.]

Anon. 1990. Vollmer Island. Main Administration of Geodesy and Cartography, Council of Ministers of USSR. Photomap Series, Map **ST 5-8/1**[ST 5-X,XI,XII]. Scale 1:200,000. (Equal-angle cylindrical transverse Gauss projection)
[(1) Planimetric and elevation control developed in 1983 by analytical photo-triangulation method. Map compiled in 1990 using 1984 space images. (2) Incorporated into US Geological Survey 1:250,000 Reconnaissance Series maps [Alexandra Mountains, Boyd Glacier and Guest Peninsula].]

Anon. 1989. Guest Peninsula. US Geological Survey. Antarctica 1:250,000 Reconnaissance Series, Map **ST 5-8/2***(Extended). Scale 1:250,000. (Lambert Conformal Conic, standard parallels 76°40'S, 79°20'S)
[(1) Control by US Geological Survey; compiled in 1969 from US Navy tricamera aerial photographs taken 1964-1965, revised 1988. (2) Amended by C.W.M. Swithinbank and S.R. Jordan, Jan. 1992 using E51015-16513 (Dec. 86), E2391-16304 (Feb. 76) and E2391-16311 (Feb. 76). Between 150°W and 153°W, and 76°40'S and 77°20'S detail taken from USSR 1:200,000 Vollmer Island (ST 5-X,XI,XII), published 1990 using 1984 space images. Amended to fit formlines from 1:3 million scale compilation for Sheet 2, Drewry (1983).]

Anon. 1973. Gutenko Nunataks. US Geological Survey. Antarctica 1:250,000 Reconnaissance Series, Map **ST 5-8/3**. Scale 1:250,000. (Lambert Conformal Conic, standard parallels 76°40'S, 79°20'S)
[(1) Control by US Geological Survey; compiled in 1969 from US Navy tricamera aerial photographs taken 1965. (2) Amendments made at map boundaries to tie with formlines from 1:3 million scale compilation for Sheet 2, Drewry (1983).]

Anon. 1974. Mount Berlin. US Geological Survey. Antarctica 1:250,000 Reconnaissance Series, Map **ST 5-8/4**. Scale 1:250,000. (Lambert Conformal Conic, standard parallels 76°40'S, 79°20'S)
[(1) Control by US Geological Survey; compiled in 1969 from US Navy tricamera aerial photographs taken 1964-1965. (2) Formlines at sheet boundary tied to those taken from USSR 1:1 million map (ST 13-16) and from 1:3 million scale compilation for Sheet 2, Drewry (1983).]

Anon. 1972. Alexandra Mountains. US Geological Survey. Antarctica 1:250,000 Reconnaissance Series, Map **ST 5-8/5**. Scale 1:250,000. (Lambert Conformal Conic, standard parallels 76°40'S and 79°20'S)
[(1) Control by US Geological Survey; compiled in 1969 from US Navy tricamera aerial photographs taken 1964-1966. (2) Amended by C.W.M. Swithinbank and S.R. Jordan, Jan. 1992 using satellite image E2391-16311 (Feb. 76). Between 150°W and 153°W detail taken from USSR 1:200,000 Vollmer Island (ST 5-X,XI,XII) and Howard Heights (ST 5-XVI,XVII,XVIII), published in 1990 using 1984 space images. Amendments to formlines from 1:3 million scale compilation for Sheet 2, Drewry (1983).]

Anon. 1990. Howard Heights. Main Administration of Geodesy and Cartography, Council of Ministers of USSR. Photomap Series, Map **ST 5-8/5**[ST 5-XVI,XVII,XVIII]. Scale 1:200,000. (Equal-angle cyclindrical transverse Gauss projection)
[(1) Planimetric and elevation control developed in 1983 by analytical photo-triangulation method. Map compiled in 1989 using 1984 space images. (2) Incorporated into US Geological Survey 1:250,000 Reconnaissance Series maps [Alexandra Mountains, Boyd Glacier and Guest Peninsula].]

Anon. 1973. Boyd Glacier. US Geological Survey. Antarctica 1:250,000 Reconnaissance Series, Map **ST 5-8/6**. Scale 1:250,000. (Lambert Conformal Conic, standard parallels 76°40'S, 79°20'S)
[(1) Control by US Geological Survey; compiled in 1969 from US Navy tricamera aerial photographs taken 1965. (2) Amended by C.W.M. Swithinbank and S.R. Jordan, Jan. 1992 using E2391-16311 (Feb. 76) and E2391-16304 (Feb. 76). Detail incorporated from USSR 1:200,000 Howard Heights (ST 5-XVI,XVII,XVIII) and Vollmer Island (ST 5-X,XI,XII), published 1990 using 1984 space images, between 150°-153°W and between 74°40' and 76°S. Amendments made to tie with formlines taken from 1:3 million scale compilation for Sheet 2, Drewry (1983).]

Drewry, D.J. 1983. Sheet 2. Scott Polar Research Institute. Antarctica: Glaciological and Geophysical Folio, Map ST 9-12. Scale 1:6,000,000. (Polar Stereographic)
[(1) Formlines taken from 1:3 million scale compilation for Sheet 2, with amendments to merge data to formlines on adjacent US Geological Survey, Antarctica 1:250,000 Reconnaissance Series, Sheets ST 9-12/1, 3, 4 and 5. Some formline data taken also from USSR 1:1,000,000 Topographic Map Series, Sheet ST 9-12 (1972).]

Anon. 1972. Executive Committee Range. Main Administration of Geodesy and Cartography, Council of Ministers of USSR. 1:1 million Topographic Series, Map ST 9-12. Scale 1:1,000,000. (Modified Polyconic)
[(1) Compiled using 1:250,000 US Geological Survey Reconnaissance Series map (1963), 1:500,000 US Geological Survey sketch map series (1968) and 1:3,000,000 USSR Topographic map (1968). (2) US Geological Survey 1:250,000 Reconnaissance Series maps [Crary Mountains, Mount Takahe, Mount Sidley, Mount Hampton] have replaced USSR map (ST 9,10,11,12) where relevant. Formlines taken from 1:3 million scale compilation for Sheet 2, Drewry (1983).]

Anon. 1963. Mount Hampton. US Geological Survey. Antarctica 1:250,000 Reconnaissance Series, Map ST 9-12/1,2. Scale 1:250,000. (Lambert Conformal Conic, standard parallels 76°40'S, 79°20'S)
[(1) Control by US Geological Survey; compiled in 1961 from US Navy trimetrogon photography 1960. (2) Formlines at sheet boundary tied to fit formlines from 1:1 million USSR map (ST 13-16) and from 1:3 million scale compilation for Sheet 2, Drewry (1983).]

Anon. 1976. Crary Mountains. US Geological Survey. Antarctica 1:250,000 Reconnaissance Series, Map ST 9-12/3. Scale 1:250,000. (Lambert Conformal Conic, standard parallels 76°40'S, 79°20'S)
[(1) Control by US Geological Survey; compiled in 1972 from US Navy tricamera aerial photographs taken 1964-1966. Revised from Earth Resources Technology Satellite imagery (ERTS-I) taken 1972-73 and provided by NASA under proposal SR-149. Images used: E1177-14503 (Jan. 73) and E1119-14280 (Nov. 72). (2) Amendments made to tie with formlines from 1:3 million scale compilation for Sheet 2, Drewry (1983).]

Anon. 1989. Mount Takahe. US Geological Survey. Antarctica 1:250,000 Reconnaissance Series, Map ST 9-12/4. Scale 1:250,000. (Lambert Conformal Conic, standard parallels 76°40'S, 79°20'S)
[(1) Control by US Geological Survey; compiled in 1972 from US Navy tricamera aerial photographs taken 1966, revised 1988. Revised from ERTS-I imagery taken 1972, provided by NASA under proposal SR-149. Images used: E1119-14280 (Nov. 72) and E1119-14273 (Nov. 72). (2) Amendments made to formlines to tie with those taken from 1:3 million scale compilation for Sheet 2, Drewry (1983).]

Anon. 1963. Mount Sidley. US Geological Survey. Antarctica 1:250,000 Reconnaissance Series, Map ST 9-12/5,6. Scale 1:250,000. (Lambert Conformal Conic, standard parallels 76°40'S, 79°20'S)
[(1) Control by US Geological Survey; compiled in 1961 from US Navy trimetrogon photograph 1960. (2) Formlines at sheet boundaries tied to those taken from USSR 1:1 million map (ST 13-16) and from 1:3 million scale compilation for Sheet 2, Drewry (1983).]

Anon. 1972. Ellsworth Mountains. Main Administration of Geodesy and Cartography, Council of Ministers of USSR. 1:1,000,000 Topographic Series, Map ST 13-16. Scale 1:1,000,000. (Modified Polyconic)

[(1) Compiled from USSR 1:3 million topographic map (1968) and 1:400,000 map (1966), US Geological Survey 1:250,000 Reconnaissance Series map, "Union Glacier" (1967) and American Geographical Society 1:5,000,000 map of Antarctica (1970). (2) Formlines for Ellsworth Mountains merged with those in adjacent parts of sheet taken from 1:3 million scale compilation for Sheet 2, Drewry (1983). Grounding line and flow lines amended from data supplied by Institut für Angewandte Geodäsie.]

Anon. 1991. Ronne Ice Shelf. Institut für Angewandte Geodäsie. Topographic map, preliminary edition digital data, Map **ST 17-20**. Scale 1:1,000,000. (Lambert Conformal Conic, standard parallels 76°40'S, 79°20'S)
[(1) Topographic interpretation prepared from geocoded mosaic of Landsat MSS images. (2) Rock outcrop detail and formlines for northern part of map taken from unpublished BAT 1:250,000 map, Sheet 63 and for Ellsworth Mountains area from USSR 1:1,000,000 Topographic map, Sheet ST 17-20 (1972) and from US Geological Survey, Antarctica 1:250,000 Reconnaissance Series, Union Glacier (1967). Formlines for remaining part of sheet taken from 1:3 million scale compilation for Sheet 2, Drewry (1983). (3) Additional grounding line detail derived from US Geological Survey 1:5,000,000 Satellite Image Map of Antarctica (1991); rock outcrop at Haag Nunataks taken from 1:3,000,000 British Antarctic Territory map, BAS (Misc) 2 (1981).]

Willan, C.F.H. 1990. Sheet 63. Unpublished. BAT 1:250,000, Map **ST 17-20/3,4**. Scale 1:500,000. (Lambert Conformal Conic, standard parallels 63°20'S, 76°40'S)
[(1) Coastline and exposure detail from 1:250,000 enlargement of BAS 500P, Sheet SS 17-20/SE, image E1212-11185 and enlargement of data abstracted by J.S. Harris from US Geological Survey 1:500,000 sketch map "Ellsworth Land-Palmer Land". (2) Grounding line amended using data supplied by Institut für Angewandte Geodäsie.]

Anon. 1991. Berkner Island. Institut für Angewandte Geodäsie. Topographic map, preliminary edition digital data, Map **ST 21-24**. Scale 1:1,000,000. (Lambert Conformal Conic, standard parallels 76°40'S, 79°20'S)
[(1) Topographic interpretation prepared from geocoded mosaic of Landsat MSS images.]

Anon. 1991. Coats Land. Institut für Angewandte Geodäsie. Topographic map, preliminary edition digital data, Map **ST 25-28**. Scale 1:1,000,000. (Lambert Conformal Conic, standard parallels 76°40'S, 79°20'S)
[(1) Topographic interpretation prepared from geocoded mosaic of Landsat MSS images. (2) Formlines taken from 1:3 million scale compilation for Sheet 2, Drewry (1983), adjusted to new grounding line.]

Drewry, D.J. 1983. Sheet 2. Scott Polar Research Institute. Antarctica: Glaciological and Geophysical Folio, Map **ST 29-32**. Scale 1:6,000,000. (Polar Stereographic)
[(1) 1:3 million scale compilation used for database; map published at 1:6 million.]

Drewry, D.J. 1983. Sheet 2. Scott Polar Research Institute. Antarctica: Glaciological and Geophysical Folio, Map **ST 33-36**. Scale 1:6,000,000. (Polar Stereographic)
[(1) 1:3 million scale compilation used for database with minor amendments to incorporate formlines from 1:2 million scale map of East Queen Maud Land - Enderby Land (1988), National Institute of Polar Research, Japan.]

Drewry, D.J. 1983. Sheet 2. Scott Polar Research Institute. Antarctica: Glaciological and Geophysical Folio, Map **ST 37-40**. Scale 1:6,000,000. (Polar Stereographic)
[(1) 1:3 million scale compilation used for database with minor amendments to incorporate formlines from 1:2 million scale map of East Queen Maud Land - Enderby Land (1988), National Institute of Polar Research, Japan.]

Drewry, D.J. 1983. Sheet 2. Scott Polar Research Institute. Antarctica: Glaciological and Geophysical Folio, Map **ST 41-44**. Scale 1:6,000,000. (Polar Stereographic)
[(1) 1:3 million scale compilation used for database with minor amendments to merge formlines with those on adjacent Australian map; map published at 1:6 million.]

Drewry, D.J. 1983. Sheet 2. Scott Polar Research Institute. Antarctica: Glaciological and Geophysical Folio, Map **ST 45-48**. Scale 1:6,000,000. (Polar Stereographic)
[(1) 1:3 million scale compilation used for database with minor amendments to merge formlines with those on adjacent Australian map; map published at 1:6 million.]

Drewry, D.J. 1983. Sheet 2. Scott Polar Research Institute. Antarctica: Glaciological and Geophysical Folio, Map **ST 49-53**. Scale 1:6,000,000. (Polar Stereographic)
[(1) 1:3 million scale compilation used for database with minor amendments to merge formlines with those on adjacent Australian map; map published at 1:6 million.]

Anon. 1989. Turnstile Ridge. US Geological Survey. Antarctica 1:250,000 Reconnaissance Series, Map **ST 53-56/16**. Scale 1:250,000. (Lambert Conformal Conic, standard parallels 76°40'S, 79°20'S)
[(1) Control by US Geological Survey; compiled in 1963 from US Navy trimetrogon aerial photographs taken 1960-1961, revised 1988. (2) Formlines merged inland with those taken from 1:3 million scale compilation for Sheet 2, Drewry (1983).]

Anon. 1989. Australian Antarctic Territory - Ross Dependency. Australian Surveying and Land Information Group. Base compilation series, Map **ST 54-57**. Scale 1:1,000,000. (Lambert Conformal Conic, standard parallels 76°40'S, 79°20'S)
[(1) Compiled from ANARE photography and ground control 1954-71, US Navy aerial photography 1947 and miscellaneous sources. (2) Part of map replaced by US Geological Survey, Antarctica 1:250,000 Reconnaissance Series, Sheet ST 53-56/16. Most of formline data for entire sheet taken from 1:3 million scale compilation for Sheet 2, Drewry (1983).]

Anon. 1989. Convoy Range. US Geological Survey. Antarctica 1:250,000 Reconnaissance Series, Map **ST 57-60/1**. Scale 1:250,000. (Lambert Conformal Conic, standard parallels 76°40'S, 79°20'S)
[(1) Control by US Geological Survey; compiled in 1962 from US Navy trimetrogon aerial photographs taken 1947-1960, revised 1988. (2) Formlines merged inland with those taken from 1:3 million scale compilation for Sheet 2, Drewry (1983).]

Anon. 1965. Franklin Island. US Geological Survey. Antarctica 1:250,000 Reconnaissance Series, Map **ST 57-60/2*** (Extended). Scale 1:250,000. (Lambert Conformal Conic, standard parallels 76°40'S, 79°20'S)
[(1) Control by US Geological Survey and US Naval Oceanographic Office; compiled in 1962 from US Navy trimetrogon aerial photographs taken 1957-1961. (2) Grounding line interpreted from map by K.G. Newport in June 1991.]

Anon. 1989. Taylor Glacier. US Geological Survey. Antarctica 1:250,000 Reconnaissance Series, Map **ST 57-60/5**. Scale 1:250,000. (Lambert Conformal Conic, standard parallels 76°40'S, 79°20'S)
[(1) Control by US Geological Survey; compiled in 1962 from US Navy trimetrogon aerial photographs taken 1947-1959, revised 1988. (2) Formlines merged inland with those taken from 1:3 million scale compilation for Sheet 2, Drewry (1983).]

Anon. 1972. Ross Island. US Geological Survey. Antarctica 1:250,000 Reconnaissance Series, Map **ST 57-60/6*** (Extended). Scale 1:250,000. (Lambert Conformal Conic, standard parallels 76°40'S, 79°20'S)
[(1) Control by US Geological Survey and US Naval Oceanographic Office; compiled in 1962 from US Navy tricamera aerial photographs taken 1956-1960. Revised from US Navy tricamera photographs taken 1967-1970. (2) Grounding line interpreted from map by K.G. Newport in June 1991.]

Anon. 1989. Mount Harmsworth. US Geological Survey. Antarctica 1:250,000 Reconnaissance Series, Map **ST 57-60/9**. Scale 1:250,000. (Lambert Conformal Conic, standard parallels 76°40'S, 79°20'S)
[(1) Control by the US Geological Survey; compiled in 1963 from US Navy trimetrogon aerial photographs taken 1956-1961, revised 1988. (2) Formlines merged inland with those taken from 1:3 million scale compilation for Sheet 2, Drewry (1983).]

Anon. 1989. Mount Discovery. US Geological Survey. Antarctica 1:250,000 Reconnaissance Series, Map **ST 57-60/10**. Scale 1:250,000. (Lambert Conformal Conic, standard parallels 76°40'S, 79°20'S)
[(1) Control by US Geological Survey; compiled in 1962 from US Navy trimetrogon aerial photographs taken 1956-1959, revised 1988. (2) Grounding line interpreted from map by K.G. Newport in May 1991; revised by C.W.M. Swithinbank from local knowledge.]

Anon. 1966. Carlyon Glacier. US Geological Survey. Antarctica 1:250,000 Reconnaissance Series, Map **ST 57-60/13*** (Extended). Scale 1:250,000. (Lambert Conformal Conic, standard parallels 76°41'S, 79°20'S)
[(1) Control by US Geological Survey; compiled in 1963 from US Navy trimetrogon aerial photographs taken 1959-1963. (2) Grounding line interpreted from map by K.G. Newport in May 1991; revised by C.W.M. Swithinbank from Landsat imagery 46/119 (E1562-18435, 16 Jan. 74).]

SU 1-5 to SU 56-60/16

Shabtaie, S. and Bentley, C.R. 1988. Figs 1 and 3, Annals of Glaciology. International Glaciological Society, Map **SU 1-5**.
[(1) Formlines from compilation at 1:1 million scale amended to incorporate data from 1:3 million scale compilation for Sheet 2, Drewry (1983).]

Drewry, D.J. 1983. Sheet 2. Scott Polar Research Institute. Antarctica: Glaciological and Geophysical Folio, Map **SU 6-10**. Scale 1:6,000,000. (Polar Stereographic)
[(1) Formlines in northern part of sheet taken from 1:3 million scale compilation for Sheet 2, adjusted to merge with formlines in south taken from Shabtaie and Bentley (1988, Figs 1 and 3).]

Drewry, D.J. 1983. Sheet 2. Scott Polar Research Institute. Antarctica: Glaciological and Geophysical Folio, Map **SU 11-15**. Scale 1:6,000,000. (Polar Stereographic)
[(1) Formlines in northern part of sheet taken from 1:3 million scale compilation for Sheet 2, adjusted to merge with formlines in south taken from Shabtaie and Bentley (1988, Figs 1 and 3).]

Drewry, D.J. 1983. Sheet 2. Scott Polar Research Institute. Antarctica: Glaciological and Geophysical Folio, Map **SU 16-20**. Scale 1:6,000,000. (Polar Stereographic)
[(1) Formlines on 1:3 million scale compilation for Sheet 2 used for database and merged to new data where map replaced by US Geological Survey, Antarctica 1:250,000 Reconnaissance Series, Sheets SU 16-20/2*, 13 and 16. (2) Grounding line, flow lines and ice shelf features taken from data supplied by Institut für Angewandte Geodäsie (see German topographic map, preliminary edition digital data, sheet SU 16-20).]

Anon. 1967. Liberty Hills. US Geological Survey. Antarctica 1:250,000 Reconnaissance Series, Map **SU 16-20/2*** (Extended). Scale 1:250,000. (Polar Stereographic, standard parallel 80°14's)
[(1) Control by US Geological Survey; compiled in 1966 from US Navy trimetrogon aerial photographs taken 1961, 1962, and 1964. (2) Formlines merged with those taken from 1:3 million scale compilation for Sheet 2, Drewry (1983) and from USSR 1:1,000,000 scale map, Sheet ST-17, 18, 19, 20. Grounding line and flow lines amended from data supplied by Institut für Angewandte Geodäsie.]

Anon. 1963. Pagano Nunatak. US Geological Survey. Antarctica 1:250,000 Reconnaissance Series, Map **SU 16-20/13**. Scale 1:250,000. (Polar Stereographic, standard parallel 80°14's)
[(1) Control by US Geological Survey; compiled in 1961 from US Navy trimetrogon photography taken in 1959. (2) Formlines merged with those taken from 1:3 million scale compilation for Sheet 2, Drewry (1983).]

Anon. 1968. Blackburn Nunatak. US Geological Survey. Antarctica 1:250,000 Reconnaissance Series, Map **SU 16-20/16**. Scale 1:250,000. (Polar Stereographic, standard parallel 80°14'S)
[(1) Control by US Geological Survey with additional elevation data from Pensacola Mountains Gravimetric Survey; compiled in 1967 from US Navy tricamera aerial photographs taken 1964. (2) Formlines merged inland with those taken from 1:3 million scale compilation for Sheet 2, Drewry (1983). Grounding line and flow lines amended using data supplied by Institut für Angewandte Geodäsie and from US Geological Survey 1:5,000,000 Satellite Image Map of Antarctica (1991).]

Drewry, D.J. 1983. Sheet 2. Scott Polar Research Institute. Antarctica: Glaciological and Geophysical Folio, Map **SU 21-25**. Scale 1:6,000,000. (Polar Stereographic)
[(1) Formlines on 1:3 million scale compilation for Sheet 2 used for database except where map replaced by US Geological Survey, Antarctica 1:250,000 Reconnaissance Series, Sheets SU 21-25/9, 10, 11, 13 and 14. (2) Grounding line, flow lines and ice shelf features taken from data supplied by Institut für Angewandte Geodäsie (see German topographic map, preliminary edition digital data, Sheet SU 21-25). Additional grounding line data taken from US Geological Survey 1:5,000,000 Satellite Image Map of Antarctica (1991).]

Anon. 1969. Cordiner Peaks. US Geological Survey. Antarctica 1:250,000 Reconnaissance Series, Map **SU 21-25/9**. Scale 1:250,000. (Polar Stereographic, standard parallel 80°14'S)
[(1) Control by US Geological Survey with additional elevation data from Pensacola Mountains Gravimetric Survey; compiled in 1968 from US Navy tricamera aerial photographs taken 1964.

(2) Grounding line and flow lines amended using data supplied by Institut für Angewandte Geodäsie and from US Geological Survey 1:5,000,000 Satellite Image Map of Antarctica (1991).]

Anon. 1989. Davis Valley. US Geological Survey. Antarctica 1:250,000 Reconnaissance Series, Map **SU 21-25/10**. Scale 1:250,000. (Polar Stereographic, standard parallel 80°14'S)
[(1) Control by US Geological Survey with additional elevation data from Pensacola Mountains Gravimetric Survey; compiled in 1968 from US Navy tricamera aerial photographs taken 1964, revised 1988. (2) Grounding line amended using data supplied by Institut für Angewandte Geodäsie.]

Anon. 1968. Argentina Range. US Geological Survey. Antarctica 1:250,000 Reconnaissance Series, Map **SU 21-25/11**. Scale 1:250,000. (Polar Stereographic, standard parallel 80°14'S)
[(1) Control by US Geological Survey with additional elevation data from Pensacola Mountains Gravimetric Survey; compiled in 1967 from US Navy tricamera aerial photographs taken 1967. (2) Formlines merged to north and east with those taken from 1:3 million scale compilation for Sheet 2, Drewry (1983) and with USSR 1:1,000,000 scale map, Sheet SU 21-24. Grounding line, glacier margins and flow lines amended using data supplied by the Institut für Angewandte Geodäsie.]

Anon. 1989. Schmidt Hills. US Geological Survey. Antarctica 1:250,000 Reconnaissance Series, Map **SU 21-25/13**. Scale 1:250,000. (Polar Stereographic, standard parallel 80°14'S)
[(1) Control by US Geological Survey with additional elevation data from Pensacola Mountains Gravimetric Survey; compiled in 1967 from US Navy tricamera aerial photographs taken 1964, revised 1988. (2) Grounding line amended using US Geological Survey 1:5,000,000 Satellite Image Map of Antarctica (1991). Formlines and outcrop detail merged southward with USSR 1:1,000,000 scale map, Sheet SV 21-30 and with formlines taken from 1:3 million scale compilation for Sheet 2, Drewry (1983).]

Anon. 1989. Saratoga Table. US Geological Survey. Antarctica 1:250,000 Reconnaissance Series, Map **SU 21-25/14**. Scale 1:250,000. (Polar Stereographic, standard parallel 80°14'S)
[(1) Control by US Geological Survey with additional elevation data from Pensacola Mountains Gravimetric Survey; compiled in 1967 from US Navy tricamera aerial photographs taken 1964, revised 1988. (2) Formlines merged with those taken from 1:3 million scale compilation for Sheet 2, Drewry (1983).]

Anon. 1991. Shackleton Range. Institut für Angewandte Geodäsie. Topographic map, preliminary edition digital data, Map **SU 26-30**. Scale 1:1,000,000. (Polar Stereographic, standard parallel 80°14'S)
[(1) Topographic interpretation prepared from geocoded mosaic of Landsat MSS images. (2) Rock outcrop and formline detail for Shackleton Range taken from British Antarctic Survey BAS GEOMAP Series, Sheet 4 (unpublished). Formlines merged with those taken from 1:3 million scale compilation for Sheet 2, Drewry (1983).]

Fox, A.J. 1991. Shackleton Range. Unpublished. BAS GEOMAP Series, Map Sheet 4 [**SU 26-30/1** (Extended)]. Scale 1:250,000. (Polar Stereographic, standard parallel 80°14'S)
[(1) Planimetry from geocoded Landsat images E50714-07391 (Feb. 86), E50714-07385 (Feb. 86), E41955-06504 (Nov. 87) supplied by Institut für Angewandte Geodäsie (IfAG), Frankfurt. (2) Exposure detail compiled from USGS TMA photography (1967), vertical photography (1986) supplied by IfAG, and from field maps and local knowledge of P.D. Clarkson, BAS. Grounding line and flowlines amended from data supplied by Institut für Angewandte Geodäsie. (3) Formlines compiled from digital data supplied by

USSR and from US Geological Survey, Antarctica 1:250,000 Reconnaissance Series, Sheet SU 26-30/1*. These data merged with formlines taken from 1:3 million scale compilation for Sheet 2, Drewry (1983).]

Drewry, D.J. 1983. Sheet 2. Scott Polar Research Institute. Antarctica: Glaciological and Geophysical Folio, Map **SU 31-35**. Scale 1:6,000,000. (Polar Stereographic)
[(1) 1:3 million scale compilation used for database; map published at 1:6 million.]

Drewry, D.J. 1983. Sheet 2. Scott Polar Research Institute. Antarctica: Glaciological and Geophysical Folio, Map **SU 36-40**. Scale 1:6,000,000. (Polar Stereographic)
[(1) 1:3 million scale compilation used for database; map published at 1:6 million.]

Drewry, D.J. 1983. Sheet 2. Scott Polar Research Institute. Antarctica: Glaciological and Geophysical Folio, Map **SU 41-45**. Scale 1:6,000,000. (Polar Stereographic)
[(1) 1:3 million scale compilation used for database; map published at 1:6 million.]

Drewry, D.J. 1983. Sheet 2. Scott Polar Research Institute. Antarctica: Glaciological and Geophysical Folio, Map **SU 46-50**. Scale 1:6,000,000. (Polar Stereographic)
[(1) 1:3 million scale compilation used for database; map published at 1:6 million.]

Drewry, D.J. 1983. Sheet 2. Scott Polar Research Institute. Antarctica: Glaciological and Geophysical Folio, Maps **SU 51-55 & SU 56-60**. Scale 1:6,000,000. (Polar Stereographic)
[(1) 1:3 million scale compilation used for database with minor amendments to merge formlines with those on Australian map (Sheet SU 53-57) and adjacent US Geological Survey, Antarctica 1:250,000 Reconnaissance Series, Sheets SU 56-60/1, 5, 9 and 14*.]

Anon. 1989. Australian Antarctic Territory - Ross Dependency. Australian Surveying and Land Information Group. Base compilation series, Map **SU 53-57**. Scale 1:1,000,000. (Lambert Conformal Conic, standard parallels 80°40'S, 83°20'S)
[(1) Compiled from ANARE photography and ground control 1954-71, US Navy aerial photography 1947 and miscellaneous sources. (2) Most of formline data taken from 1:3 million scale compilation for Sheet 2, Drewry (1983).]

Anon. 1966. Mount Olympus. US Geological Survey. Antarctica 1:250,000 Reconnaissance Series, Map **SU 56-60/1**. Scale 1:250,000. (Polar Stereographic, standard parallel 80°14'S)
[(1) Control by US Geological Survey; compiled in 1964 from US Navy trimetrogon aerial photographs taken 1960-1962. (2) Formlines merged inland with those taken from 1:3 million scale compilation for Sheet 2, Drewry (1983).]

Anon. 1966. Cape Selborne. US Geological Survey. Antarctica 1:250,000 Reconnaissance Series, Map **SU 56-60/2**. Scale 1:250,000. (Polar Stereographic, standard parallel 80°14'S)
[(1) Control by US Geological Survey; compiled in 1963 from US Navy trimetrogon aerial photographs taken 1960-1961. (2) Grounding line interpreted from map by K.G. Newport in May 1991.]

Anon. 1966. Wilhoite Nunataks. US Geological Survey. Antarctica 1:250,000 Reconnaissance Series, Map **SU 56-60/5**. Scale 1:250,000. (Polar Stereographic, standard parallel 80°14'S)

[(1) Control by US Geological Survey; compiled in 1964 from US Navy trimetrogon aerial photographs taken 1960-1963. (2) Formlines merged inland with those taken from 1:3 million scale compilation for Sheet 2, Drewry (1983).]

Anon. 1966. Mount Nares. US Geological Survey. Antarctica 1:250,000 Reconnaissance Series, Map **SU 56-60/6**. Scale 1:250,000. (Polar Stereographic, standard parallel 80°14'S)
[(1) Control by US Geological Survey; compiled in 1964 from US Navy trimetrogon aerial photographs taken 1960. (2) Grounding line interpreted from map by K.G. Newport in May 1991; partly revised by C.W.M. Swithinbank from Landsat imagery 45/119 (E40495-18544, 23 Nov. 83).]

Anon. 1966. Geologists Range. US Geological Survey. Antarctica 1:250,000 Reconnaissance Series, Map **SU 56-60/9**. Scale 1:250,000. (Polar Stereographic, standard parallel 80°14'S)
[(1) Control by US Geological Survey; compiled in 1964 from US Navy trimetrogon aerial photographs taken 1960-1962. (2) Formlines merged inland with those taken from 1:3 million scale compilation for Sheet 2, Drewry (1983).]

Anon. 1966. Nimrod Glacier. US Geological Survey. Antarctica 1:250,000 Reconnaissance Series, Map **SU 56-60/10**. Scale 1:250,000. (Polar Stereographic, standard parallel 80°14'S)
[(1) Control by US Geological Survey; compiled in 1964 from US Navy trimetrogon aerial photographs taken 1960-1962. (2) Grounding line interpreted from map by E.M.R. Edwards, June 1991; partly revised by C.W.M. Swithinbank Oct. 1991, from local knowledge.]

Anon. 1966. Holland Range. US Geological Survey. Antarctica 1:250,000 Reconnaissance Series, Map **SU 56-60/11**. Scale 1:250,000. (Polar Stereographic, standard parallel 80°14'S)
[(1) Control by US Geological Survey; compiled in 1964 from US Navy trimetrogon aerial photographs taken 1960. (2) Grounding line interpreted from map by E.M.R. Edwards, May 1991.]

Anon. 1989. Mount Rabot. US Geological Survey. Antarctica 1:250,000 Reconnaissance Series, Map **SU 56-60/14*** (Extended). Scale 1:250,000. (Polar Stereographic, standard parallel 80°14'S)
[(1) Control by US Geological Survey and New Zealand Department of Lands and Survey; compiled in 1964 from US Navy trimetrogon aerial photographs taken 1960-1962, revised 1988. (2) Formlines merged inland with those taken from 1:3 million scale compilation for Sheet 2, Drewry (1983).]

Anon. 1989. Mount Elizabeth. US Geological Survey. Antarctica 1:250,000 Reconnaissance Series, Map **SU 56-60/15**. Scale 1:250,000. (Polar Stereographic, standard parallel 80°14'S)
[(1) Control by US Geological Survey; compiled in 1965 from US Navy trimetrogon aerial photographs taken 1958-1962, revised 1988. (2) Grounding line interpreted from map by E.M.R. Edwards in May 1991; partly revised by C.W.M. Swithinbank Oct. 1991, from local knowledge.]

Anon. 1989. Mount Kathleen. US Geological Survey. Antarctica 1:250,000 Reconnaissance Series, Map **SU 56-60/16**. Scale 1:250,000. (Polar Stereographic, standard parallel 80°14'S)
[(1) Control by US Geological Survey; compiled in 1965 from US Navy trimetrogen aerial photographs taken 1958-1963, revised 1988. (2) Grounding line interpreted from map by E.M.R. Edwards, May 1991.]

SV 1-10 to SV 51-60/8*

Anon. 1976. Amundsen Coast. Main Administration of Geodesy and Cartography, Council of Ministers of USSR. 1:1,000,000 Topographic Series, Map **SV 1-10**. Scale 1:1,000,000. (Modified Polyconic)
[(1) Compiled from US Geological Survey, Antarctica 1:250,000 Reconnaissance Series maps (1967 and 1968), American Geographical Society 1:5,000,000 map (1970) and USSR 1:3,000,000 map (1968). (2) Data from eastern part of this map used for database. Detail for western part of sheet taken from US Geological Survey, Antarctica 1:250,00 Reconnaissance Series, Sheets SV 1-10/1, 5, 6, 7, 10, 11 and 15*; formlines merged to those on 1:3 million scale compilation for Sheet 2, Drewry (1983) in south-east and south-west part of sheet. (3) Grounding line and formlines in northern part of sheet taken from Shabtaie and Bentley (1988, Figs 1 and 3), amended to merge with US 1:250,000 maps.]

Anon. 1967. Shackleton Glacier. US Geological Survey. Antarctica 1:250,000 Reconnaissance Series, Map **SV 1-10/1**. Scale 1:250,000. (Polar Stereographic, standard parallel 80°14'S)
[(1) Control by US Geological Survey; compiled in 1965 from US Navy trimetrogon aerial photographs taken 1960-1964. (2) Grounding line interpreted from map by E.M.R. Edwards, December 1991; amended by C.W.M. Swithinbank in 1991, from local knowledge.]

Anon. 1968. Liv Glacier. US Geological Survey. Antarctica 1:250,000 Reconnaissance Series, Map **SV 1-10/5**. Scale 1:250,000. (Polar Stereographic, standard parallel 80°14'S)
[(1) Control by US Geological Survey; compiled in 1965 from US Navy trimetrogon photographs taken 1960-1964.]

Anon. 1989. Mount Goodale. US Geological Survey. Antarctica 1:250,000 Reconnaissance Series, Map **SV 1-10/6**. Scale 1:250,000. (Polar Stereographic, standard parallel 80°14'S)
[(1) Control by US Geological Survey; compiled in 1966 from US Navy trimetrogon aerial photographs taken 1960-1964, revised 1988. (2) Grounding line interpreted from map by E.M.R. Edwards, December 1991; amended by C.W.M. Swithinbank in 1992, from local knowledge.]

Anon. 1968. Leverett Glacier. US Geological Survey. Antarctica 1:250,000 Reconnaissance Series, Map **SV 1-10/7**. Scale 1:250,000. (Polar Stereographic, standard parallel 80°14'S)
[(1) Control by US Geological Survey; compiled in 1966 from US Navy trimetrogon aerial photographs taken 1960-1963. (2) Grounding line interpreted from map by E.M.R. Edwards, December 1991 and amended to merge with that taken from Shabtaie and Bentley (1988). Contours merged with those taken from Shabtaie and Bentley (1988, Figs 1 and 3).]

Anon. 1961. Mount Wisting. US Geological Survey. Antarctica 1:250,000 Reconnaissance Series, Map **SV 1-10/9**. Scale 1:250,000. (Polar Stereographic, standard parallel 80°14'S)
[(1) Control by US Geological Survey; compiled in 1966 from US Navy trimetrogon aerial photographs taken 1960-1963. (2) Formlines merged with those taken from 1:3 million scale compilation for Sheet 2, Drewry (1983).]

Anon. 1967. Nilsen Plateau. US Geological Survey. Antarctica 1:250,000 Reconnaissance Series, Map **SV 1-10/10**. Scale 1:250,000. (Polar Stereographic, standard parallel 80°14'S)
[(1) Control by US Geological Survey; compiled in 1966 from US Navy trimetrogon aerial photographs taken 1960-1964. (2) Formlines merged with those taken from 1:3 million scale compilation for Sheet 2, Drewry (1983).]

Anon. 1989. Mount Blackburn. US Geological Survey. Antarctica 1:250,000 Reconnaissance Series, Map **SV 1-10/11**. Scale 1:250,000. (Polar Stereographic, standard parallel 80°14'S)
[(1) Control by US Geological Survey; compiled in 1966 from US Navy trimetrogon aerial photographs taken 1960-1964, revised 1988. (2) Formlines merged with those taken from 1:3 million scale compilation for Sheet 2, Drewry (1983).]

Anon. 1968. D'Angelo Bluff. US Geological Survey. Antarctica 1:250,000 Reconnaissance Series, Map **SV 1-10/15*** (extended). Scale 1:250,000. (Polar Stereographic, standard parallel 80°14'S)
[(1) Control by US Geological Survey; compiled in 1966 from US Navy trimetrogon aerial photographs taken 1961-1963. (2) Formlines merged with those taken from 1:3 million scale compilation for Sheet 2, Drewry (1983).]

Anon. 1976. Thiel Mountains. Main Administration of Geodesy and Cartography, Council of Ministers of USSR. 1:1,000,000 Topographic Series, Map **SV 11-20**. Scale 1:1,000,000. (Modified Polyconic)
[(1) Compiled from US Geological Survey, Antarctica 1:250,000 Reconnaissance Series maps (1963, 1968) and American Geographical Society 1:5,000,000 map (1970). (2) Detail for small part of sheet taken from US Geological Survey, Antarctica 1:250,000 Reconnaissance Series, Sheet SV 11-20/3. Formlines merged with those taken from 1:3 million scale compilation for Sheet 2, Drewry (1983) away from areas of exposed rock.]

Anon. 1963. Stewart Hills. US Geological Survey. Antarctica 1:250,000 Reconnaissance Series, Map **SV 11-20/3**. Scale 1:250,000. (Polar Stereographic, standard parallel 80°14'S)
[(1) Control by US Geological Survey; compiled in 1961 from US Navy trimetrogen photography taken in 1959. (2) Formlines merged with those taken from 1:3 million scale compilation for Sheet 2, Drewry (1983) and USSR 1:1,000,000 Topographic map, Sheet SV 11-20.]

Anon. 1972. Mount Feldkotter. Main Administration of Geodesy and Cartography, Council of Ministers of USSR. 1:1,000,000 Topographic Series, Map **SV 21-30**. Scale 1:1,000,000. (Modified Polyconic)
[(1) Compiled from US Geological Survey, Antarctica 1:250,000 Reconnaissance Series maps (1968) and American Geographical Society 1:5,000,000 map (1970). (2) Russian data used between 52° and 60°W, 84° and 85°S, and Russian traverse and spot elevation data for entire sheet. Formlines for rest of sheet taken from 1:3 million scale compilation for Sheet 2, Drewry (1983).]

Drewry, D.J. 1983. Sheet 2. Scott Polar Research Institute. Antarctica: Glaciological and Geophysical Folio, Map **SV 31-40**. Scale 1:6,000,000. (Polar Stereographic)
[(1) 1:3 million scale compilation used for database; map published at 1:6 million.]

Drewry, D.J. 1983. Sheet 2. Scott Polar Research Institute. Antarctica: Glaciological and Geophysical Folio, Map **SV 41-50**. Scale 1:6,000,000. (Polar Stereographic)
[(1) 1:3 million scale compilation used for database; map published at 1:6 million.]

Drewry, D.J. 1983. Sheet 2. Scott Polar Research Institute. Antarctica: Glaciological and Geophysical Folio, Map **SV 51-60**. Scale 1:6,000,000. (Polar Stereographic)
[(1) 1:3 million scale compilation used for database with minor amendments to merge formlines with those on adjacent US Geological Survey, Antarctica 1:250,000 Reconnaissance Series, Sheets SV 51-60/3 and 8*, and SV 1-10/9.]

Anon. 1989. Buckley Island. US Geological Survey. Antarctica 1:250,000 Reconnaissance Series, Map **SV 51-60/3**. Scale 1:250,000. (Polar Stereographic, standard parallel 80°14'S)
[(1) Control by US Geological Survey; compiled in 1965 from US Navy trimetrogon aerial photographs taken 1960-1962, revised 1988. (2) Formlines merged inland with those taken from 1:3 million scale compilation for Sheet 2, Drewry (1983).]

Anon. 1989. The Cloudmaker. US Geological Survey. Antarctica 1:250,000 Reconnaissance Series, Map **SV 51-60/4**. Scale 1:250,000. (Polar Stereographic, standard parallel 80°14'S)
[(1) Control by US Geological Survey; compiled in 1965 from US Navy trimetrogon aerial photographs taken 1958-1963, revised 1988. (2) Grounding line interpreted from map by E.M.R. Edwards, May 1991.]

Anon. 1989. Plunket Point. US Geological Survey. Antarctica 1:250,000 Reconnaissance Series, Map **SV 51-60/8*** (Extended). Scale 1:250,000. (Polar Stereographic, standard parallel 80°14'S)
[(1) Control by US Geological Survey; compiled in 1965 from US Navy trimetrogon aerial photographs taken 1959-1963, revised 1988. (2) Formlines merged inland with those taken from 1:3 million scale compilation for Sheet 2, Drewry (1983).]

SW 1-60

Drewry, D.J. 1983. Sheet 2. Scott Polar Research Institute. Antarctica: Glaciological and Geophysical Folio, Map **SW 1-60**. Scale 1:6,000,000. (Polar Stereographic)
[(1) Formlines on 1:3 million scale compilation for Sheet 2 used for database; map published at 1:6 million.]

Appendix 1

UK project participants

UK consortium

Three Cambridge-based institutes, referred to as the UK consortium, collaborated in the preparation of the Antarctic Digital Database.

British Antarctic Survey (BAS) has been responsible for the British Government's scientific research in the Antarctic, South Georgia and the South Sandwich Islands since 1962. The survey originated as a wartime naval operation in 1943 and it transferred to the control of the Colonial Office in 1945, when it was known as the Falkland Islands Dependencies Survey. In 1967 BAS became a component body of the Natural Environment Research Council and, since 1984, it has been the UK Antarctic Mapping Centre.

Scott Polar Research Institute (SPRI) is a department of the University of Cambridge and is involved in research in both the Antarctic and Arctic. SPRI maintains the world's leading polar library and archive. It was founded in 1920 as the national memorial to Captain R.F. Scott.

World Conservation Monitoring Centre (WCMC) is a joint venture between the World Conservation Union (IUCN), United Nations Environment Programme (UNEP) and World Wide Fund for Nature (WWF). Its mission is to support conservation and sustainable development through the provision of information on the world's biological diversity.

The Antarctic Digital Database Project Steering Committee

Table A1.1 lists the members of the Steering Committee during the period 1 June 1990 - 30 September 1992 and shows their respective roles in the project.

Table A1.1. The Antarctic Digital Database Project Steering Committee

Name	*Affiliation*	*Responsibilities*
Dr David Drewry Dr Peter Wadhams Dr Robin Pellew	Director, BAS Director, SPRI Director, WCMC	Policy decisions affecting their respective institutes, public relations, overview and assessment
Dr Ian Borthwick (June 1990-April 1991) Dr William Syratt (May 1991-Sept.1992)	BP BP	Liaison with BP, which provided the main financial support necessary for the project
Dr Mark Collins	WCMC	Financial management of project, including acquisition of equipment, consumables and staff. Liaison and co-ordination with ESRI regarding CD-ROM
Dr Charles Swithinbank	SPRI	Advisor on source material for the database. Acquisition and interpretation of satellite imagery
Janet Thomson	BAS	UK liaison with SCAR and co-ordinator of data acquisition in UK and from SCAR participants
Paul Cooper	BAS	GIS advisor
Grant Heatzig Helen Newport	Petroconsultants Petroconsultants	Advisors on CD-ROM development. Liaison with Petroconsultants and support with product documentation
David Bickmore		Editorial advisor

Special mention - Dr M.R.A. Thomson, BAS, and Dr P.D. Clarkson, SCAR, attended Steering Committee meetings when necessary to advise on international collaboration. Dr J.A. Heap, as the new Director of SPRI, and Dr R.A. Luxmoore, WCMC, joined the Steering Committee in 1993, during the final stages of preparing the product for publication.

UK production team

The consortium of institutes in Cambridge consisted of the British Antarctic Survey (BAS), the Scott Polar Research Institute (SPRI) and the World Conservation Monitoring Centre (WCMC). The different roles that the three institutes played in the project can be ascertained from Tables A1.2-4. In essence, data research, data capture and editing were co-ordinated by BAS and SPRI, whereas the bulk of the digitizing in the UK, the financial management and also general organization of the project were undertaken by WCMC. BAS and WCMC shared the responsibility for management of the digital data and for development of the CD-ROM product.

British Antarctic Survey

BAS was responsible for the scientific aspect of this project. Five staff, all working part-time on the project, were involved in the following activities: co-ordination of data research and data capture in the UK and by the international group of collaborators, quality assurance (QA) of the digitized data and integration of satellite imagery and digital datasets received from overseas. Maps and satellite imagery housed in the UK Antarctic Mapping Centre at BAS provided valuable research material. The final editing of all the datasets was led by staff at BAS, using Laser-Scan HORIZON and LITES2 software packages after conversion on-site from the variety of formats received from overseas. All files were converted into ARC/INFO format for transfer to WCMC. The hierarchical structure for the place-names was developed using the ORACLE relational database package.

Table A1.2. UK production team: British Antarctic Survey

Personnel	*Responsibility*
A.J. Fox (17.2.92-30.6.92)	Digitizer and editor of digital files during final preparation of seamless map.
S.R. Jordan (17.9.90-30.6.92)	Principal editor of digital files; data research and interpretation of satellite imagery; digitizing from source material; quality assurance (QA); contributed to Chapters 8 and 9 of this manual.
A. Roberts (1.3.91-30.4.92)	Research and preparation of hierarchical Antarctic place-names database; wrote Chapter 5 of this manual.
J.W. Thomson (1.6.90-30.6.92*)	Principal editor of source material and co-ordinator of data acquisition in UK and by other SCAR nations; data research and quality assurance; prepared Chapters 1, 4, 7, 8 and 9 and all appendices and was responsible for final editing and preparation of this manual.
A.P.R. Cooper (1.6.90-30.6.92*)	Management of BAS digital files; incorporation of digital data from other nations; R&D of techniques; some digitizing of satellite imagery; development of CD-ROM product and user interface; wrote Chapters 2 and 3 and contributed to Chapters 4, 5 and 7 of this manual.

* Additional time spent between 17 April and 31 July 1993 in preparing the database on CD and finalizing this manual. These tasks were undertaken in consultation with ESRI, partly at ESRI headquarters in Redlands, California.

Scott Polar Research Institute

One staff member (part-time) was located at SPRI using equipment specially purchased for the project, and a project advisor provided expertise in interpreting satellite imagery of Antarctica. Data capture was carried out using ARC/INFO software. Much use was made of the valuable collections of Antarctic maps and satellite imagery housed at SPRI during the research phase of the project, and also later when the final editing of the digital map was in progress.

Table A1.3. UK production team: Scott Polar Research Institute

Personnel	*Responsibility*
K.G. Newport (24.1.91-24.1.92)	Digitizer of source material in UK.
Dr C. Swithinbank (1.6.90-30.6.92)	Principal interpreter of satellite imagery; preparation of linework overlays to images. Prepared Chapter 6 and contributed to Chapter 8 of this manual.

World Conservation Monitoring Centre

Two members of staff, one part-time, undertook the majority of the original digitizing of source maps in the UK and they shared the responsibility with BAS for the final editing of the digital map. The bulk of the film plots produced for QA work at BAS were created at WCMC and also the acetate film plots used to incorporate satellite image data. All generalization of the data to produce smaller-scale subsets of the digital map was undertaken at WCMC using ARC/INFO software, versions 3.3 and 3.4. WCMC was also responsible for supervising the staff member located at SPRI.

Table A1.4. UK production team: World Conservation Monitoring Centre

Personnel	*Responsibility*
E.M.R.Edwards, BAS/WCMC (1.6.90-30.6.92)	Principal digitizer of source material in UK; editor of digital files; contributed to Chapter 3 of this manual.
M. Adam (1.6.90-31.5.92) J. Rhind (1.6.92-30.6.92*)	Management of WCMC digital files; R&D of techniques; development of CD-ROM product and user interface; contributed to Chapters 2 and 3 of this manual.

* Additional time spent between 17 April and 31 July 1993 in preparing the database on CD at ESRI headquarters in Redlands, California, and material for this manual.

Secretarial assistance in the preparation of the CD-ROM documentation was provided by G.M. McDonnell, BAS, B. Brown and V. Greenwood, WCMC.

Appendix 2

Data quality information

Source maps

The reliability of the original maps used for the construction of the database can be assessed by reference to Chapter 9 of this manual. Each source map is listed and the method used to prepare the published maps is described. Any amendments made to the published maps by project staff during the preparation of the database, after reference to other source material (aerial photographs, satellite images, etc), are noted at the end of each source map description.

The project has not given a relative reliability code to the source maps. An alphabetical code in the **source** attribute table indicates either the national map series used or the person providing data to the project.

Feature reliability

Many of the features included in the topographic database of Antarctica have been depicted on published maps in different ways according to the known reliability of their position during the original topographic field survey. Thus features are described as either definite or approximate in the map legends and these variations have been translated into different codes in the **geocode** attribute (see Chapter 3, Table 3.2).

Digitizing standards

Maps were manually digitized in the UK from stable film compilation sheets, film separates of published maps and paper copies of published maps. Hard copy output, on stable film, was then verified through independent quality control inspection. Digitized lines or points that deviated by more than 0.3 mm from the position on the source map were discarded, and amendments made were subjected to a second quality control.

Editing criteria

Data captured from small-scale map sources became redundant during the harmonization process if, for a given area, more detailed information from larger-scale maps was available to the project.

Appendix 3

Tables relating to ancillary datasets

Large-scale maps of Chinese Antarctic stations

Five files containing detailed maps of two Chinese Antarctic stations were supplied to the project by China. Because of their large scale they have not been incorporated in this first version of the main database but they are provided as a separate dataset on the CD-ROM. The items included in the attribute tables for the Chinese data are noted in Chapter 3 (Table 3.10) and the values for the attribute SCODE, a code indicating the type of feature mapped, are explained below in Table A3.1.

Table A3.1. Explanation of values of SCODE

SCODE	*Type of feature*	*Description*
201	Arc & Point	Grid line
202	Arc	Frame line
203	Arc	Road
204	Arc	River
205	Arc & Point	Overhanging rocks
206	Arc	Meteorological observation field boundary
207	Arc	Telephone line
208	Arc	Water supply pipeline
209	Arc	Edge of road (used only in 1:1000 maps)
210	Arc	Undocumented
211	Arc & Point	Edge of building
212	Arc	Edge of airport
213	Arc & Point	Edge of lake
214	Arc	Edge of glacier
215	Arc	Sea shore
221	Arc	Contour
222	Arc	Index contour
223	Arc & Point	Contour
224	Arc	Index contour
231	Arc	Drainage
233	Arc	Undocumented
239	Arc	River or tide line

Table A3.1. Explanation of SCODE values (continued):

SCODE	*Type of feature*	*Description*
240	Arc	Edge of "waste land" (apparently rock outcrop)
241	Arc	Edge of moor
242	Arc	Edge of moss
243	Arc & Point	Antenna
250	Arc & Point	Text style 1
251	Arc & Point	Text style 2
252	Arc	Text style 3
301	Point	Antenna tower
302	Point	Flagpole
303	Point	Meteorological tower
304	Point	Large oil store
305	Point	Small oil store
321	Point	Control point
322	Point	Peak
323	Arc & Point	Height control
324	Point	Geodetic origin
325	Point	Traverse point
525	Arc	Undocumented

Additional place-names

A single point coverage containing place-names which arrived too late to be included in the hierarchical structure of the main place-names table has been provided. This coverage contains names received in digital form from Argentina and Germany, and names received in manuscript form from Poland. Table A3.2 describes the point attribute table for this coverage.

Table A3.2. Description of attribute table for extra place-names

Name	*Description*
SOURCE	An alphabetic code designating the source of the name. Possible values are: **ARG:** Argentina **GER:** Germany **POL:** Poland
NAME	The place-name
LATITUDE	The latitude of the point defining the name, from the source gazetteer. This is in degrees and decimal degrees, with South latitudes negative.
LONGITUDE	The longitude of the point defining the name, from the source gazetteer. This is in degrees and decimal degrees, with West longitudes negative.
EQUIV	An equivalent name in English, from the British gazetteer, provided by Argentina as part of the Argentine dataset.
SID	A numeric code designating the source of the data.

Penguin populations

A single-point coverage is given which contains data on penguin populations from Woehler and Poncet (1993). Table A3.3 describes the point attribute table (PAT).

Table A3.3. Attribute table for penguin data

Name	*Description*
SPECIES	The name of the species counted at this location. Possible values are: EMPEROR, KING, ADELIE, CHINSTRAP, GENTOO and MACARONI. Two other species in Woehler and Poncet (1993) do not nest south of 60°S.
SPECIES_ID	A numeric code denoting the species. 1 = EMPEROR, 2 =KING, 3 = ADELIE, 4 = CHINSTRAP, 5 = GENTOO, and 6 = MACARONI.
ENTRY	The entry number allocated in Woehler and Poncet (1993).
PLACE	The name of the location of the colony. Quotation marks indicate informal names.
LATITUDE	The latitude of the colony, in degrees and decimal degrees, with South latitudes negative.
LONGITUDE	The longitude of the colony, in degrees and decimal degrees, with West longitudes negative.
COLONIES	The number of colonies at this location.
COUNT	The number of pairs of birds at this location.
QUALITY	The quality of the count information, coded as follows: N = Nest count. The most accurate type of count, being a count of breeding pairs made during incubation. C = Chick count. Difficult to interpret because of annual fluctuations in breeding efforts and success. A = Adult count. Less accurate, because the number of adults ashore at a breeding colony varies with the stage of the breeding cycle.

Table A3.3. Attribute table for penguin data (continued)

Name	*Description*
QUALITY (continued)	B = Birds present, but no estimate of numbers. The letter is followed by a number indicating the accuracy of the count, as follows: 1 = Each pair or nest individually counted. Probably accurate to better than ±5%. 2 = Number of pairs in a known area counted individually, and then scaled up by the total area of the colony. Count accuracy ±5% to ±10%. 3 = Accurate estimate: count accuracy probably ±10% to ±15%. 4 = Rough estimate: count accuracy probably ±25% to ±50%. 5 = Guesstimate: only accurate to nearest order of magnitude.
YEAR	The year in which the count was carried out. In the case of several counts being aggregated, the latest year is given.
LATEST	In many instances, several counts have taken place at a given locality. A 'Y' here indicates that this is the latest count.
REFS	Refers to the bibliography in Woehler and Poncet (1993). This bibliography is provided in WordPerfect 5.1 format (\EXTRA\BIRDS\PENGUIN.REF) and in ISO Latin 1 text format (\EXTRA\BIRDS\PENGUIN.ISO) text files on the CD-ROM.
COMMENT	Any comments on the data. In the case of colonies where no numerical size can be given, this item may include an alphabetic code showing the size of the colony, as follows: VS very small 1-99 pairs S small 100-999 pairs M medium 1000-7499 pairs L large 7500-19,999 pairs VL very large 20,000-99,999 pairs EL extra large 100,000 pairs+

References

Woehler, E.J. and Poncet, S. 1993. The distribution and abundance of Antarctic and Subantarctic penguins. SCAR Bird Biology Sub-committee, 86 pp.

Appendix 4

List of acronyms used in the manual

Acronyms have usually been defined after the first reference to them in the text of this manual. However, the glossary provided below collates them all in one place and it also includes a few abbreviations commonly used in the English language. Note that abbreviations and codes devised for the naming conventions adopted in the database (for example CONT00, CNT**TYP, etc.) have not been included in the glossary; these are defined in Chapters 3 and 4.

Glossary

AAEE	Aircraft and Armament Experimental Establishment, UK
AAT	Arc attribute table Australian Antarctic Territory
ACAN	Advisory Committee for Antarctic Names, USA
ADD	Antarctic digital database
ANARE	Australian National Antarctic Research Expedition
APC	Antarctic Place-names Committee, UK
ARC/INFO®	ESRI software package
ASCII	American Standard Code for Information Interchange
ASMA	Antarctic Specially Managed Area
ASPA	Antarctic Specially Protected Area
ATCM	Antarctic Treaty Consultative Meeting
AVHRR	Advanced Very High Resolution Radiometer
BAS	British Antarctic Survey
BP	The British Petroleum Company plc
CAD	Computer Aided Design
CD	Compact Disc
CD-ROM	Compact Disc-Read Only Memory
dBASE™	Borland International (UK) Ltd software package
DEM	Digital elevation model
DOS	Directorate of Overseas Surveys (now Ordnance Survey International)
ERS-1	European Remote Sensing satellite
ERTS-1	Earth Resources Technology Satellite
ESRI	Environmental Systems Research Institute, Inc.

FID	Falkland Islands Dependencies
FIDASE	Falkland Islands and Dependencies Aerial Survey Expedition
FOXPRO™	Microsoft Corporation software package
GEOSAT	US Navy satellite
GIS	Geographic Information System
ha	hectare
HORIZON	Laser-Scan Ltd software package
HQ	Headquarters
HSM	Historic Sites and Monuments
IBM®	International Business Machine, Inc.
ICSU	International Council of Scientific Unions
ID	Identity code
IfAG	Institut für Angewandte Geodäsie
IMW	International Map of the World
IUCN	The World Conservation Union
kbyte	kilobytes
km	kilometre
LITES2	Laser-Scan Ltd software package
m	metre
m^2	square metres
MB/Mbyte	megabyte
MPA	Multiple-use Planning Area
MSCDEX	Microsoft Corporation software package
MS-DOS®	Microsoft Corporation's operating system
MSS	Multi-spectral scanner
NASA	National Aeronautic and Space Administration, USA
NOAA	National Oceanic and Atmospheric Administration, USA
NPI	Norsk Polarinstitutt
ORACLE™	Oracle Corporation UK Ltd relational database management system

PAT	Polygon attribute table
	Point attribute table
PC	Personal computer
PLD	Print laydown (of aerial photography)
QA	Quality assurance
RARE	Ronne Antarctic Research Expedition
R&D	Research and development
RDFO	Research Department, Foreign Office, UK
SCAR	Scientific Committee on Antarctic Research
SPA	Specially Protected Area
SPRI	Scott Polar Research Institute
SQL	Standard Query Language
SRA	Specially Reserved Area
SSSI	Site of Special Scientific Interest
TM	Thematic Mapper
TMA	Trimetrogon aerial photography, US Navy
TWERLE	Tropical Wind Energy Conversion and Reference Level Experiment
UK	United Kingdom
UKAPC	United Kingdom Antarctic Place-names Committee
UNEP	United Nations Environment Programme
US/USA	United States of America
USGS	US Geological Survey
WCMC	World Conservation Monitoring Centre
WDDES	World Digital Database for Environmental Science
WWF	World Wide Fund for Nature

Appendix 5

List of Antarctic scientific stations (winter 1991)

The scientific stations of SCAR nations listed in Table A5.1 are those that operated south of 60°S during the Antarctic winter of 1991. These details, reproduced from *Scar Bulletin,* No 103 (October 1991), indicate the stations included in the HUMAN layer of the ADD CD-ROM. Annotations to Table A5.1 provide additional information to the CD-ROM data, showing those bases that closed in 1992-93 and the new stations that were operating for the first time during the Antarctic winter of 1992.

Table A5.1. Antarctic scientific stations (winter 1991)

Country	*Name of station*	*Co-ordinates*
Argentina	Belgrano II	77°52′S, 34°37′W
	Orcadas	60°44′S, 44°44′W
	Esperanza	63°24′S, 57°00′W
	Marambio	64°14′S, 56°37′W
	San Martin	68°08′S, 67°06′W
	Jubany	62°14′S, 58°40′W
Australia	Mawson	67°36′S, 62°52′E
	Davis	68°36′S, 77°58′E
	Casey	66°18′S, 110°32′E
Brazil	Comandante Ferraz	62°05′S, 58°24′W
Chile	Capitan Arturo Prat	62°30′S, 59°41′W
	General Bernardo O'Higgins	63°19′S, 57°54′W
	Teniente Rodolfo Marsh	62°12′S, 58°55′W
France	Dumont d'Urville	66°40′S, 140°01′E
Germany	Georg von Neumayer	70°37′S, 08°22′W
	Georg Forster[1]	70°47′S, 11°51′E
India	Dakshin Gangotri[1]	70°05′S, 12°00′E
	Maitri[2]	70°46′S, 11°44′E
Japan	Syowa	69°00′S, 39°35′E
	Asuka	71°32′S, 24°08′E
New Zealand	Scott Base	77°51′S, 166°45′E
People's Republic of China	Great Wall	62°13′S, 58°58′W
	Zhongshan	69°22′S, 76°23′E
Poland	Arctowski	62°09′S, 58°28′W
Republic of Korea	King Sejong	62°13°S, 58°47′W
Russia	Mirny	66°33′S, 93°01′E
	Novolazarevskaya	70°46′S, 11°50′E
	Molodezhnaya	67°40′S, 45°51′E
	Vostok	78°28′S, 106°49′E
	Bellingshausen	62°12′S, 58°58′W
	Leningradskaya[1]	69°30′S, 159°24′E
	Progress[1]	69°24′S, 76°24′E
South Africa	SANAE	70°18′S, 02°25′W

[1] Closed in 1992
[2] Opened for the first time in 1992

Table A5.1. Antarctic scientific stations (winter 1991) (continued):

Country	*Name of station*	*Co-ordinates*
United Kingdom	Faraday	65°15′S, 64°16′W
	Halley (IV)[1]	75°36′S, 26°46′W
	Halley (V)[2]	75°35′S, 26°15′W
	Rothera	67°34′S, 68°07′W
	Signy	60°43′S, 45°36′W
United States of America	Amundsen-Scott	90°S
	McMurdo	77°51′S, 166°40′E
	Palmer	64°46′S, 64°03′W
Uruguay	Artigas	62°11′S, 58°51′W

[1] Closed in 1992
[2] Opened for the first time in 1992