This report has been prepared for the benefit of the University Council of Victoria University, the University Research Grants Committee, the Ross Dependency Research Committee and individuals who have assisted the Expedition in the execution of its research programme. It is not intended as a publication and any scientific data contained herein may not be used or referred to in print without the express permission of the expedition leader and project leader concerned.

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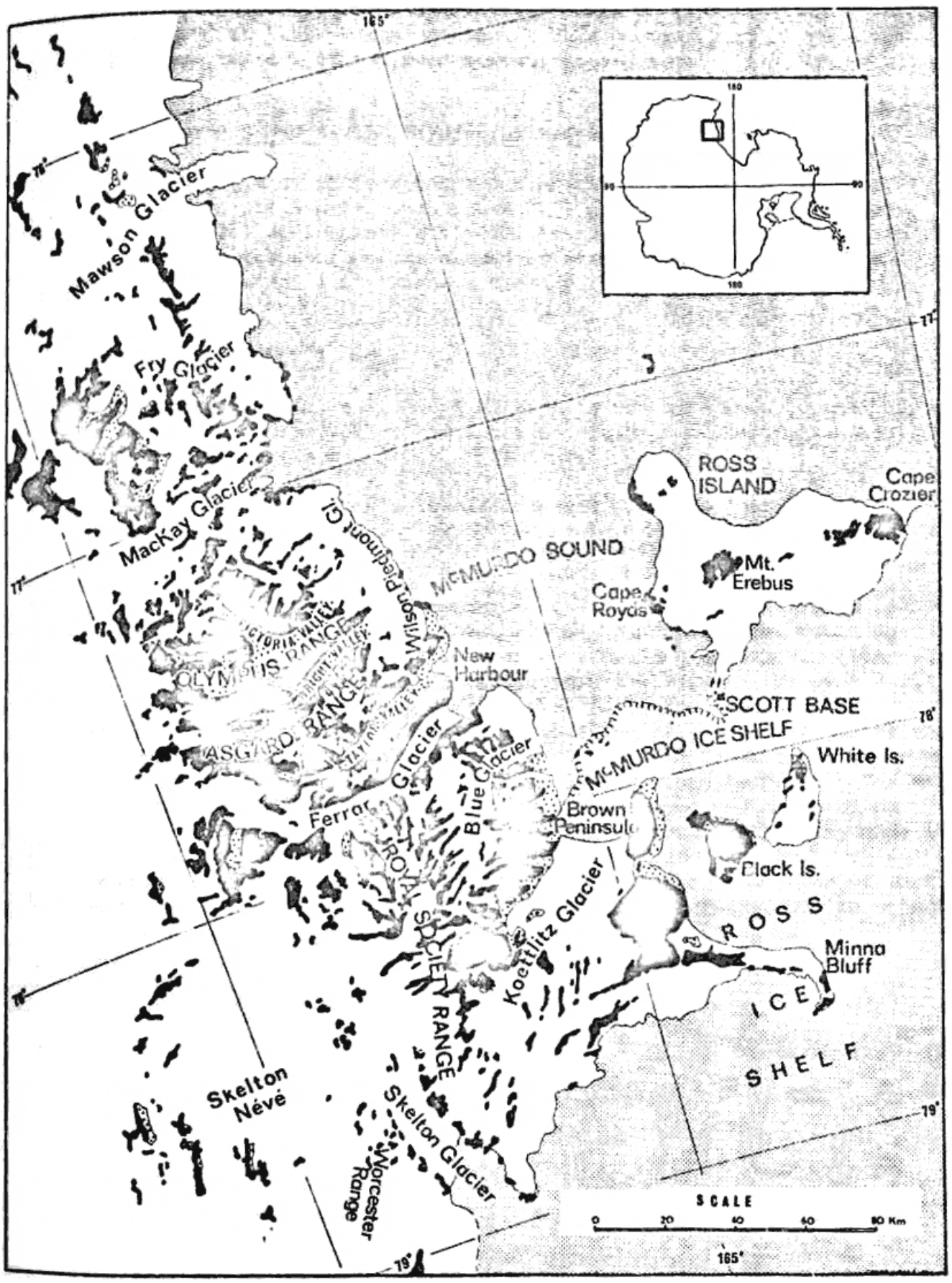

Fig. 1. Map of the McMurdo Sound region.

PREPARATIONS FOR VUWAE 20

A proposed programme outline for VUWAE 20 (1975-76) was submitted to the RDRC at their March meeting. This programme involved seven expedition members in two main scientific projects:

DVDP McMurdo Sound Drillhole/Glacial Sediment Studies

The logging, photographing and on-site sampling of the core according to previously established DVDP procedures. Sampling of recent glacial sedimentary environments to provide baseline data for interpreting the sedimentary sequences cored in McMurdo Sound was proposed to extend last season's field work.

Late Cenozoic Stratigraphy

A continuation of geological mapping of Late Cenozoic till deposits in the Upper Taylor Valley and detailed study of present-day glacial drift deposition from the Taylor Glacier.

Correlation of Cenozoic glaciomarine deposits, moraines and benches of Black Island and Brown Peninsula, McMurdo Sound.

The loss of the third Hercules at Dome Charlie required a review of the programme approved by RDRC because NZARP personnel could no longer plan on returning to New Zealand after mid-December. Alternative arrangements were made for planned geophysical work on the DVDP drill core, and the operator dropped from the programme, reducing the expedition from 7 to 6 persons. At the time of the mishap two of the six were in Antarctica, and were scheduled out in December in any event. A revised programme for the Late Cenozoic stratigraphy project for a field season terminating mid-December was prepared and approved by Antarctic Division. Subsequent changes in aircraft schedules made it possible for three VUWAE personnel to stay on into January. This extended the Late Cenozoic project and allowed the completion of work on the strain net on Taylor Glacier. All changes were made in consultation with the Leader and Deputy-Leader of Scott Base.

EXPEDITION MEMBERS

The main projects of VUWAE 20 were made up as follows:

A. DVDP McMurdo Sound/Glacial Sediment Studies

Geologist	Peter Barrett	M.Sc. (Auck.), Ph.D. (Ohio).
Geologist	Katharine Sillars	B.Sc. (Hons), M.Sc. student, VUW.

B. Late Cenozoic Stratigraphy

Geologist	Paul Robinson	B.Sc. (Hons), Ph.D. student, VUW.
Geologist	Alan Palmer	B.Sc., B.Sc. (Hons) student, VUW.
Geologist	John Collen	B.Sc. (Hons), Ph.D. (VUW).
Geologist	Alan Eggers	B.Sc., B.Sc. (Hons) student, VUW.

C. Cenozoic Glaciomarine Deposits of Black Island and Brown Peninsula

Geologist	John Collen
Geologist	Alan Eggers

D. Taylor Glacier Movement Project

Geologist	Katharine Sillars

FINANCE, EQUIPMENT AND GENERAL PROVISIONS

Finance

A grant from the University Grants Committee was used to pay for food, clothing, camping items, travel, freight, personal insurance and new scientific equipment. The University Council provided financial support for Robinson, Sillars, Eggers and Palmer.

Equipment

Many items were already available in the VUWAE stores both at the University and Scott Base. They included packs, kitbags, ice-axes, sleeping bags, windproof clothing, mukluks and kitchen gear.

Antarctic Division provided polar tents, radio transceivers, rope and first aid kits, and clothed DSIR personnel working with VUWAE. The Geology Department provided miscellaneous scientific equipment supplementing that already owned by VUWAE and VUWAE members. New items of scientific equipment purchased were an instrument for measuring sonic velocity, and two precision surveying altimeters.

Food

As for previous expeditions, VUWAE 20 worked on a man-day basis and were charged a flat rate irrespective of whether in the field or at Scott Base. However, as in the past VUWAE purchased a small amount of food, mainly canned fruit and fresh meat, to supplement the food boxes.

STRUCTURE OF EXPEDITION

The following indicates the field locations, the dates, and the composition of the various fractions of VUWAE 20. A more detailed summary of movements and activities is contained in Appendix II, the expedition itineraries.

A. DVDP McMurdo Sound/Glacial Sediment Studies (Events 3 & 6)

DVDP 15 - McMurdo Sound Oct 13 - Dec 9

Barrett (until Nov 28)
Sillars

Barrett and Sillars as part of DVDP for most of the season, based at McMurdo, worked on the drill core and supported the drill team at the site of DVDP 15. Sillars obtained an extension of time in Antarctica during which the Taylor Glacier Movement project was undertaken.

B. Late Cenozoic Stratigraphy (Event 12)

Part 1. Upper Taylor Valley Nov 19 - Dec 9

Robinson
Collen (until Nov 28)
Palmer
Eggers (until Nov 28)

Also joined by Barrett and Sillars (Nov 26 - 28)

Dry Valleys (Taylor and Wright Valleys and Cape Chocolate)

Dec 12 - Jan 5

Robinson
Palmer

C. Part 2. Black Island and Brown Peninsula (Event 12A)

Nov 28 - Dec 11

Collen
Eggers

D. Taylor Glacier Movement Project

Dec 12 - 31

Sillars
DSIR surveyors and field assistants

SCIENTIFIC RESULTS

A. DVDP McMurdo Sound/Glacial sediment studies

Drilling in the western part of McMurdo Sound (Fig. 1) ended on November 21 after 65 m of penetration, 52 percent of which was recovered as core. The core showed two major units at the site - 13 m of soft muddy sand with scattered pebbles overlying 52+ m of stratified, slightly lithified and better-sorted sand with virtually no pebbles. Post-depositional deformation of the lower unit suggests that it has been disturbed by grounded ice.

Soundings were taken around the drill site, and show it to be on a broad northeast-trending ridge between the submarine extensions of Ferrar and Taylor Valleys. Bottom samples indicate the sea floor is a mantle of muddy sand with occasional pebbles. The flow is covered with a patchy sponge spicule mat and a fauna largely of bryozoans and coelenterates. A report on DVDP 15 will appear in Dry Valley Drilling Project Bulletin No. 7. Work on the bottom samples, and on other samples collected around McMurdo Sound is being continued as an M.Sc. project by K. Sillars.

B. Late Cenozoic Stratigraphy

Part 1

1. Beds of till are ubiquituous throughout the Upper Taylor Valley, although exposure is poor except around the snout of the Taylor Glacier. Here meltwater streams from the Rhone and Calkin Glaciers have cut through till sequences on both sides of the valley. These till outcrops have been described, sampled and measured for pebble fabrics.

Correlation of till deposits throughout the upper valley will be attempted, using grain size analysis, pebble orientation, mineralogy, sedimentary structures etc. From observations of depositional processes occurring around the Taylor Glacier snout at present this correlation could be difficult, for it appears that deposition of till as sheets is quite rare. In fact the glacial drift can change in character from till to mudflow to fluvial sediments over short distances from the ice front, thus limiting the extent of correlation.

The presence of till sheets in parts of the valley contrasts with the recent deposits, suggesting that modes of deposition from Taylor Glacier ice have changed with time. Processes of entrainment, transport and deposition of debris, were analysed in an attempt to set up the Taylor Glacier as a model for glacial drift deposition.

This model was extended to include proglacial, glaciofluvial, glacio-lacustrine and aeolian environments by observation of recent sediment deposition in the Wright Valley and at Cape Chocolate.

2. The Wright Lower Glacier shows signs of active ice ablation from the snout where coarse, angular and moderately sorted ablation till is accumulating. Sand blown by wind on to the glacier is being washed off and concentrated around the snout due to meltwater action.

3. An ice-dammed proglacial lake was probably responsible for the deposition of the stratified fluvial sediments within the terraces at Cape Chocolate, while the surrounding moraines are probably from an enlarged Koettlitz Glacier or Ross Ice Shelf.

C. Part 2

1. Flat coastal areas at the northwestern end of Black Island were found to consist of relatively thin (less than 1 m) moraine overlying solid ice. These apparently have resulted from the grounding and subsequent ablation and melting of part of the Ross Ice Sheet flowing between Black Island and Brown Peninsula. Processes causing changes in the surface morphology with time were studied, and it may be possible to relate these to the formation of the higher level benches on Black Island.

Large numbers of well-preserved marine macrofossils were collected from ice-cored moraine along the west coast of Black Island. This material, which also contains sea-bottom sediment with a rich microfauna, is believed to represent a past bottom fauna living beneath the Ross Ice Shelf. It is probable that the organisms were frozen into the base of the ice, and moved through to the surface as ice ablated from the top.

2. Older fossiliferous deposits of the Scallop Hill Formation were mapped and sampled around the northern end of Brown Peninsula. The type locality of this formation at Scallop Hill was also visited. Analysis of the fossils and sediment will give evidence regarding the conditions of deposition of the formation.

Volcanic agglomerates outcropping extensively around Tuff Bluff and Frame Ridge at the northern end of Brown Peninsula were also mapped and sampled, and a number of distinct units could be distinguished and traced laterally. A change in the composition of the agglomerate with time from dominantly trachytic to dominantly basaltic was noted. The agglomerates may prove to be the source for the sediment of the Scallop Hill Formation.

D. Taylor Glacier Movement Study

Three rows of poles (Fig. 2) were placed on the lower 800 m of the Taylor Glacier. The poles were accurately located by DSIR surveyors using theodolite and tellurometer from three trig stations established on the sides of the valley. The height of each pole above the ice was also measured.

The surveying and height measurements will be repeated during the 1976/77 season to determine the movement and rate of ablation.

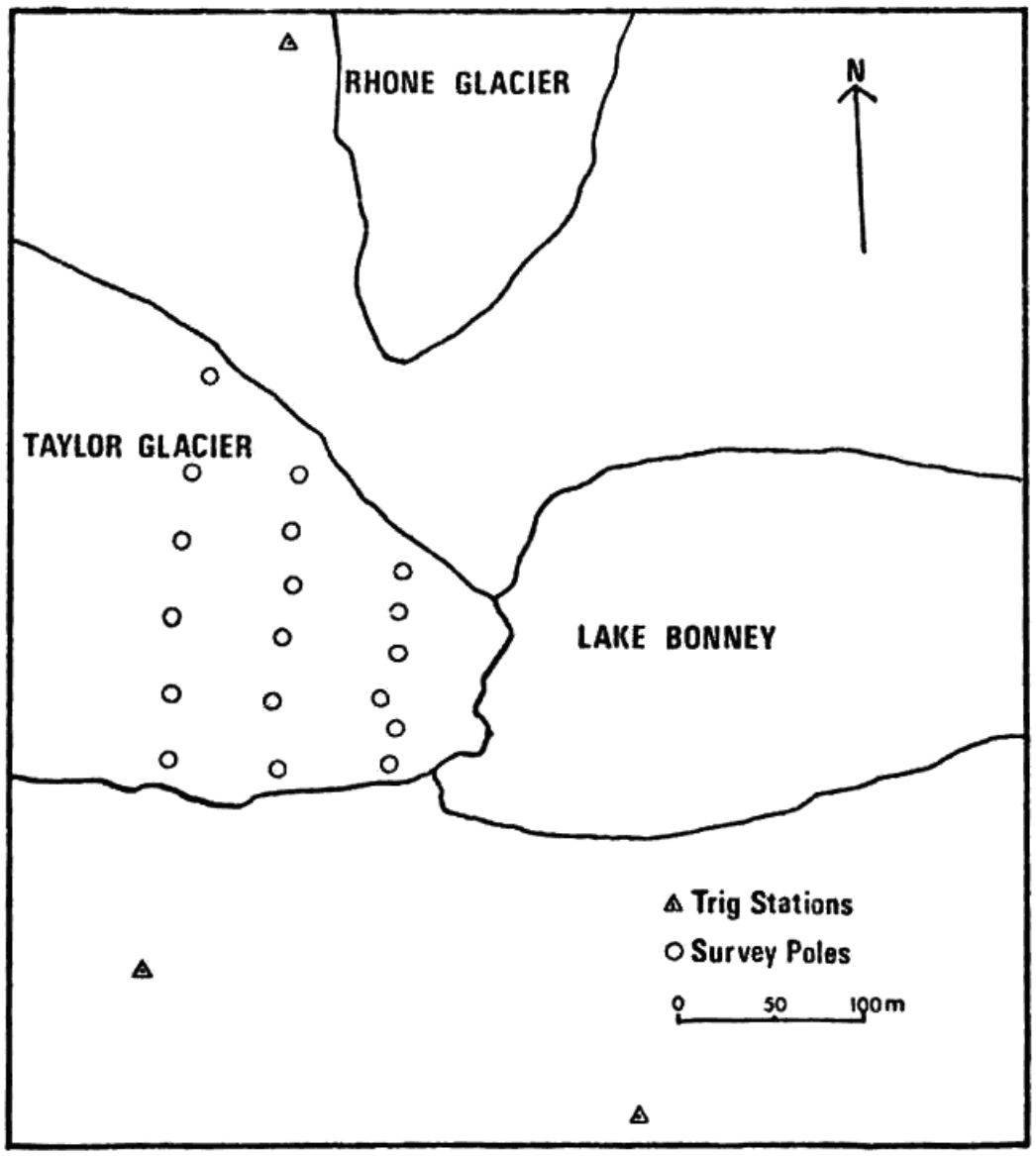

Fig. 2. Map showing the location of poles placed on the lower part of the Taylor Glacier.

ACKNOWLEDGMENTS

The expedition is grateful for the financial assistance provided by the University Grants Committee for equipment and supplies, and by the Council of Victoria University of Wellington for grants to students.

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We thank Hamish Raynham, Wally MacDonald, the Post Office staff, and the rest of the Scott Base staff for their assistance and co-operation throughout the season.

The assistance of Antarctic Division, D.S.I.R., with logistic and clerical matters was much appreciated.

Our thanks also go to Professor Clark, Geology Department, V.U.W., for his interest and support.

APPENDIX I - FLIGHT REQUIREMENTS, VUWAE 20

Date	Project	Purpose	Origin	Destination	Aircraft
Oct 13	A	Transport 1	Christchurch	McMurdo	C141
29	A & D	Transport 1	Christchurch	McMurdo	C141
Before Nov 1	A - D	Air cargo 282 kg	Christchurch	Scott Base	C141
8	A	Transport 1	McMurdo	Christchurch	C141
15	B & C	Transport 4	Christchurch	Scott Base	C141
17	A	Transport 1	Christchurch	McMurdo	C141
18	B	Put in and pick up 4	Scott Base	Cape Barne	Helo
19	B	Put in 4	Scott Base	Lake Bonney	Helo
26	A	Put in 2	McMurdo	Taylor Glacier	Helo
26	B	Transfer 4	Lake Bonney	Taylor Glacier	Helo
28	A	Pick up 2	Taylor Glacier	McMurdo	Helo
28	C	Transfer 2	Taylor Glacier	McMurdo	Helo
28	A	Transport 1	McMurdo	Christchurch	C130
Dec 5	C	Transfer 2	Black Island	Brown Peninsula	Helo
9	B	Pick up 2	Taylor Glacier	Scott Base	Helo
11	C	Pick up 2	Brown Pen.	Scott Base	Helo
12	B	Put in 2	Scott Base	New Harbour	Helo
12	D	Put in 2	Scott Base	Taylor Glacier	Helo
14	B	Transfer 2	New Harbour	Lake Fryxell	Helo
14	D	Pick up 2	Taylor Glacier	Scott Base	Helo
16	C	Transport 2	Scott Base	Christchurch	C130
17	B	Transfer 2	Lake Fryxell	Taylor Glacier	Helo
17	D	Put in 1	Scott Base	Taylor Glacier	Helo
20	B	Transfer 2	Taylor Glacier	Wright Lr. Gl.	Helo
20	D	Put in 1	Scott Base	Taylor Glacier	Helo
27	B	Transfer 2	Wright Glacier	Bull Pass	Helo
27	D	Transfer 1	Vanda Stn.	Taylor Glacier	Helo
31	D	Pick up 3	Taylor Glacier	Scott Base	Helo
Jan 2	A	Put in and pick up 2	McMurdo	Dirty Ice	Helo
2	B	Transfer 2	Bull Pass	Cape Chocolate	Helo
5	B	Pick up 2	C. Chocolate	Scott Base	Helo
8	B & D	Transport 3	Scott Base	Christchurch	C130

APPENDIX II - ITINERARY

DVDP McMURDO SOUND/GLACIAL SEDIMENT STUDIES

Oct 13	Barrett New Zealand to McMurdo.
14-20	Set up laboratory equipment and prepare for traverse to Site 1A.
21-23	Sno-cat traverse with Treves and Wing to Site 1A to cut hole, make current measurements and take bottom samples.
24-29	Processed samples and data from Site 1A.
29	Sillars NZ to McMurdo.
30	Barrett, Sillars and Brady (DVDP paleontologist) to Site 1A.
Oct 31 - Nov 7	Bathymetric and bottom sediment survey of area around drill site. The first core from DVDP 15 was recovered on Nov 7.
Nov 8-17	Barrett returned to NZ for university examinations. Sillars works at McMurdo for DVDP Project Manager supporting the drill team.
18-25	Barrett and Sillars complete essential work on drill core (last core recovered Nov 21).
26-28	Barrett, Sillars to snout of Taylor Glacier to assist Robinson and Palmer (Event 12) with projects.
28	Barrett to NZ.
Nov 29 - Dec 9	Sillars laboratory work for DVDP at McMurdo.

TAYLOR GLACIER STRAIN NET PROJECT

Dec 10	Sillars revises programme to extend to Jan 8, 1976.
11	Field preparations.
12-14	Sillars, Williams (DSIR Surveyor) to Taylor Glacier to start Strain Net project.
15	Sillars packing DVDP cargo.
16	Field preparations.
17-20	Sillars to Taylor Glacier, joining Event 12, work on pebble fabrics.
20	Robinson and Palmer to Wright Lower Glacier. Sillars joined by West (DSIR field assistant).
21	Tent Day.
22-23	Continued placing of strain net.
24	Sillars, West to Vanda.
25	Xmas Day.
26	Remain at Vanda; bad weather prevented return to Taylor Glacier.
27-30	Sillars, West and Wicks (DSIR Surveyor) to Taylor Glacier to survey in strain net.
31	Sillars, West and Wicks to Scott Base, via Strand Moraines for sampling.
Jan 1	New Years Day.
2	Sillars, Eames (NZARP) day trip to Dirty Ice for sampling.
3-7	Cargo packing and stocktaking.
8	Sillars to NZ.

LATE CENOZOIC STRATIGRAPHY

Part 1. Dry Valleys

Nov 15	Robinson, Collen, Palmer and Eggers to Scott Base.
16	Field preparations.
17	" "
18	Event 12 to Cape Barne (return same day).
19	Event 12 to eastern Lake Bonney.
20	Geology reconnaissance to Lacroix Glacier.
21	" measuring sections south side of Lake Bonney.
22	" " " in Matterhorn Stream.
23	" pebble fabrics Lacroix Glacier section.
24	" study benches south side of lake.
25	Tent day.
26	Eastern Lake Bonney to snout of Taylor Glacier join Barrett and Sillars.
27	Geology reconnaissance around glacier.
28	Barrett, Sillars to Scott Base. Collen, Eggers to Black Island.
Nov 28 - Dec 8	Robinson, Palmer. Geology, mapping and description around the snout of the Taylor Glacier.
Dec 9	Robinson and Palmer to Scott Base.
10-11	Revise field programme and field preparations.
12	Robinson, Palmer to New Harbour Stream.
13	Geology, mapping of outcrop in stream.
14	New Harbour to Lake Fryxell.
15-16	Geology of immediate vicinity around Lake Fryxell.
17	Lake Fryxell to Taylor Glacier, joined by Sillars.
18-19	Geology, pebble fabrics, reconnaissance of Rhone and Hughes Glacier.
20	Robinson, Palmer to Wright Lower Glacier.
21	Geology reconnaissance along snout of glacier.
22	" along north side of glacier.
23	" sampling of dirt bands in glacier.
24	" reconnaissance walk to Lake Vanda.
25	Xmas Day.
26	Tent day, bad weather prevented return to camp.
27	Lake Vanda to Bull Pass.
Dec 27 - Jan 2	Geology of Bull Pass pecten deposits, fabric measurements and reconnaissance to Meserve and Bartley Glaciers.
Jan 2	Bull Pass to CapeChocolate.
3-4	Geology of Salmon Valley and Hobbs Glacier.
5	Robinson, Palmer to Scott Base.
6-7	Packing cargo.
8	Robinson, Palmer and Sillars to NZ.

Division of Time:

Work Days	38
Tent Days	2
Travel/awaiting helos	9
Preparation	5
	54

Part 2. Black Island and Brown Peninsula

Nov	28	Collen, Eggers to northern Black Island; reconnaissance of benches and coastal plain.
	29-30	Geology, coastal plain and west coast.
Dec	1	" , coastal plain and dirty ice
	2	" , glaciated valleys at northern end of island.
	3	" , northern part of island and west coast.
	4	" , coastal plain.
	5	Collen, Eggets to northern Brown Peninsula; reconnaissance of Tuff Bluff and Frame Ridge.
	6-7	Geology, mapping and sampling Scallop Hill Formation.
	8	Tent day, packing samples.
	9-10	Geology, mapping and sampling Tuff Bluff agglomerate and Scallop Hill Formation.
	11	Collen, Eggers to Scott Base.
	12	Packing cargo.
	13	Collen, Eggers to Scallop Hill, Black Island (return same day).
	14-15	Packing cargo.
	16	Collen, Eggers to NZ.

Division of Time:

Work Days	11
Tent Days	1
Travel/awaiting helos	4
Preparation	3
	19