

HCA Survey Programme Working Group Letter No. 1/2005

To: Members of the Hydrographic Committee on Antarctica

Subject: **HCA Statement of Survey Requirements and Survey Plan for the International Polar Year (IPY) (2007-08)**

Dear Members,

Reference: Terms of Reference of the HCA Survey Programme Working Group.

1. This circular letter explains the preliminary work conducted by the Working Group, and seeks your input.
2. **Establishment of a prioritised HCA Statement of Survey Requirements.** The stages outlined in the Reference follow the logic-flow of the S-55 questionnaire. The members of the Working Group (WG) have produced and populated this draft document, and I now have pleasure in presenting this draft to you, the HCA members, for the inclusion of your information. Before we can produce an overall prioritised statement of survey requirements, the following information and tools are required:
 - a. Identification of special regional geographical factors. Members are requested to review their areas of operation and report any other factors which should be added to those at the Reference.
 - b. Maritime Shipping Routes (MSR), base/site calls, usage category, and current survey category. The tables at Annex A contain Peninsula and continental data. The Peninsula table has been produced in conjunction with the diagram at Annex D. Members are requested to add proposals to the Tables. Comments on the format and content of the Tables are also welcomed.
 - c. Assessment criteria. Annex B contains a list of Risk Scores which it is proposed should be used to prioritise areas requiring survey. Members are asked to comment on this proposal, offering amendments to the list if they are in favour of its use, or proposing alternative approaches.
 - d. Table of prioritised national rolling survey programmes. Annex C contains tables showing the UK prioritised rolling programme for the area of the Antarctic Peninsula and Australian priorities for their continental responsibility. Members are asked to consider adding their equivalent national data to this format, or providing their own formatted data for consideration by the WG.
3. **HCA Survey Plan for the International Polar Year (IPY) (2007-08).** As a first step, Annex D contains a proposed scheme for a main corridor round the Antarctic Peninsula, together with proposals for some branch routes into major bases/sites. Members are asked to comment and add to this proposal, and to make similar proposals for the Ross Sea area if considered appropriate.
4. To maintain momentum, **responses, by E-mail, are requested by 4th March 2005.** Thank you for your support.



Andy Willett
Chairman IHO HCA Survey Programme WG

Annexes:

- A. Tables of MSRs, base/site calls, usage category, and current survey category.
- B. Risk Scoring Table for assessment of survey priority.
- C. Tables of national prioritised rolling survey programmes.
- D. Proposed Scheme for fully surveyed marine corridors.

Table of MSRs, base/site calls, usage category, and current survey category
PENINSULA

Categories

Category	Usage
A	Frequent
B	Regular
C	Infrequent

Category	Current survey status
A	Adequately surveyed
B	Requires re-survey at larger scale or to S-44 standard
C	Has not been systematically surveyed/Unsurveyed

Main corridors (see Annex D for MSR references)

MSR	Name	Usage category	Survey category	Notes and INT chart coverage. Published and <i>proposed</i> .
1	James Ross Island circular route	B+C	A + C	40% surveyed (Prince Gustav Channel), 60% unsurveyed. In UKHO survey plan. INT 9153
2	Joinville Island circular route	A+B	A + C	45% surveyed (Antarctic Sound), 55% unsurveyed. INT 9154
3	Orleans Strait to Antarctic Sound	B	B + C	INT 9155
4	Gerlache strait	A	A + C	20% surveyed. <i>INT 9156 & 9157</i>
5	Bismarck Strait	A+B	A + B	Approaches to Palmer Station and Port Lockroy. INT 9158
6	Lemaire Channel	A	B	Petermann Is, Pleneau Is, Argentine Is, Yalour Is. INT 9106
7	Grandidier Channel	A+B	B	INT 9158 & <i>9159</i>
8	Cape Garcia to Jagged Island	B	C	<i>INT 9159</i>
9	Crystal Sound	B	B	Numerous reports of uncharted rocks. <i>INT 9160</i>
10	Liard Island to Rothera	C	C	<i>INT 9161, 9108 AND 9163</i>
11	Marguerite Bay	C	B + C	<i>INT 9163 & 9164</i>
12	Woodfield Channel	C	B	<i>INT 9163</i>
13	Woodfield Channel to Matha Strait	C	C	<i>INT 9162 & 9160</i>
14	Matha Strait to Hugo Island	B	C	<i>INT 9160, 9159 & 9158</i>
15	Hugo Island to Low Island	C	B + C	<i>INT 9156, 9157 & 9158</i>
16	Low Island to Antarctic Sound	C	B + C	INT 9154, 9155 & <i>9156</i>
17	South Shetlands MSR	A	C	<i>INT 9151</i>
18	Elephant Island MSR	A+C	C	INT 9150
19	Elephant Island to KGI	A	C	INT 9150, <i>INT 9151</i>
20	Deception Is to Brabant Island	A	C	INT 9120, INT 9155, <i>9156, 9157</i>

Branch corridors and approaches

MSR	Name	Usage category	Survey category	Notes and INT chart coverage. Published and <i>proposed</i>
A	Marambio	B	C	<i>INT 9100</i>
B	Duse Bay and Eagle Island	B	C	Includes Crystal Hill. INT 9154
C	Paulet Island	A	A + C	50% surveyed, remaining area top of UKHO priority. <i>INT 9112</i>
D	Brown Bluff and Fridtjof Sound	A	C	INT 9154
E	Hope Bay	B	B	<i>INT 9101</i>
F	Gourdin Island and Siffrey Point	B	C	INT 9154

Branch corridors and approaches continued

MSR	Name	Usage category	Survey category	Notes and INT chart coverage. Published and <i>proposed</i>
G	Bernado O' Higgins and approaches	C	C	INT 9102
H	Curtiss Bay	C	C	INT 9155 & 9156
I	Hydrurga Rocks	B	C	INT 9156 & 9157
J	Alcock Island	C	C	INT 9156 & 9157
K	Portal Point	C	C	INT 9112
L	Enterprise Island	C	C	INT 9157
M	Melchior Islands and approaches	A+C	C	INT 9157
N	Errera Channel	A	C	Includes Cuverville Is, Danco Is and Ronge Is. INT 9103
O	Andvord Bay	A	C	Includes Neko Harbour. INT 9103
P	Paradise Harbour	A	C	Almirante Station and Waterboat Point. INT 9104
Q	Neumayer Channel and Port Lockroy	A	A + C	70% surveyed, North Neumayer Channel to finish INT 9158 & 9104
R	Arthur harbour	C	C	INT 9105
S	French Passage	B	B	INT 9106
T	Prospect Point	B	C	INT 9107
U	Pendleton Strait	C	B	INT 9159
V	Matha Strait	C	C	INT 9160
W	Detaille Island and approaches	C	C	INT 9161
X	Lallemand Fjord	C	C	INT 9161
Y	Shumskiy Cove	C	C	INT 9108
Z	Rothera	B	A	BAS and RN vessels. INT 9109
Aa	Avian Island	C	B	INT 9110
Ab	Approaches to Millerand Island	C	B	INT 9111
Ac	Deception Island and Port Foster	A	B	Whalers Bay. INT 9120
Ad	South bay and Hannah Point	A	A	INT 9121
Ae	McFarlane Strait	A	A + C	Half Moon Is cat A, Yankee Harbour cat B, rest cat C. INT 9121 & 9112
Af	English Strait	A	B	Aithcho Islands and Discovery Bay. INT 9122 & 9152
Ag	Robert Point	C	C	INT 9151
Ah	Nelson Strait	C	C	INT 9151
Ai	Maxwell Bay and approaches	B	B	Ardley Cove, Marian Cove and Potter Cove. INT 9123
Aj	Admiralty Bay	B	B	Artowski Station, Ferraz Station and Martel Inlet. INT 9125
Ak	Penguin Island and approaches	B	C	Endurance 2005 survey. INT 9151
Al	Cape Lookout	B	C	INT 9112
Am	Point Wild	A	C	INT 9150
An	Cape Valentine	B	C	INT 9150
Ao	Danger Islands	C	C	INT 9154
Ap	Dundee Island	C	C	INT 9154
Aq	Herbert Sound	C	C	INT 9153
Ar	Historic Monument	B	C	INT 9153
As	Freud Passage	B	C	INT 9156 & 9157
At	Booth Is, Port Charcot	B	C	INT 9158
Au	Gunnel Channel	B	C	INT 9108 & 9161
Av	Pourquoi Pas Island	C	C	INT 9163 & 9161

AUSTRALIAN ANTARCTIC DIVISION SUBMISSION

Table of MSRs, base/site calls, usage category, and current survey category**Categories**

Category	Usage
A	Frequent
B	Regular
C	Infrequent

Category	Current survey status
A	Adequately surveyed
B	Requires re-survey at larger scale or to S-44 standard
C	Has not been systematically surveyed/Unsurveyed

Main corridors

MSR	Name	Usage category	Survey category	Notes and INT chart coverage. Published and proposed.
	Hobart to Macquarie Island	C	A + B	Annual re-supply station by Aurora Australis. Tourist vessels and fishing boats Charts - Hobart AUS173 and 174 Macquarie Island – AUS604 Cape Darnley to Tasmania - INT 74 (AUS 4074)
	Hobart to Casey station	C	A + B	Annual re-supply of station by Aurora Australis and other vessel plus occasional tourist vessels. Charts. Hobart AUS173 and 174 Casey - INT9021 (AUS601) Cape Darnley to Tasmania - INT 74 (AUS 4074)
	Hobart to Davis	C	A + B	Annual re-supply of station by Aurora Australis and other vessel plus occasional tourist vessels Charts - Hobart AUS173 and 174 Davis – INT9032(AUS602) Cape Darnley to Tasmania - INT 74 (AUS 4074)
	Hobart to Mawson	C	A+B	Annual re-supply of station by Aurora Australis and other vessel plus occasional tourist vessels Charts Hobart AUS173 and 174 Mawson – AUS600 Cape Darnley to Tasmania - INT 74 (AUS 4074) Magnet bay to Cape Rouse – AUS449
	Hobart to Heard Island	C	A+C	Marine science voyage by Aurora Australis, customs patrol vessels plus occasional tourist and fishing vessels. Charts Hobart AUS173 and 174 Heard Island – AUS605 Cape Darnley to Tasmania - INT 74 (AUS 4074) Magnet bay to Cape Rouse – AUS449
	Fremantle to Heard Island	C	A+C	Marine science voyage by Aurora Australis, customs patrol vessels plus occasional tourist and fishing vessels.
	Hobart to Commonwealth Bay	C	A+C	Occasional visits by Aurora Australis, Astrolabe and occasional tourist vessels Charts - Hobart AUS173 and 174 Commonwealth Bay – AUS603

	Davis to Larsemann Hills	C	A+C	Occasional visits by Aurora Australis, Chinese re-supply vessel Xue Long and Russian re-supply vessels. No charts exist of the approaches to the Larsemann Hills
	Davis to Sansom Island	C	B+C	
	Hobart and Fremantle to Southern Ocean	C	A+C	Marine science voyages

Branch corridors and approaches

MSR	Name	Usage category	Survey category	Notes and INT chart coverage. Published and <i>proposed</i>
	Macquarie Island	C		AUS604
	Casey	C		INT9021 (AUS601)
	Davis	C		INT9032(AUS602)
	Mawson	C		AUS600
	Commonwealth Bay	C		AUS603
	Davis to Larsemann Hills	C		No chart coverage except at small scale. Sandjeford Bay to Cape Rundingen – AUS452 scale 1:500,000
	Davis to Sansom Island	C		No chart coverage except at small scale Sandjeford Bay to Cape Rundingen – AUS452 scale 1:500,000

Risk Scoring Table for assessment of survey priority

SOLAS	5	Significant cruise ship traffic.
Shipping density	2	Major transit area.
	1	Other significant bases/sites and approaches, coastal routes.
Navigational complexity	2	Unsurveyed or poor quality data.
	1	Marginal depths; unstable seabed.
	1	Severe environmental conditions.
Environmental impact	3	Designated sensitive areas.
	1	Other known sensitive areas.

Notes:

Scores are assigned for each MSR or base/site approach, and totals compared to assess comparative priority.

Annex C to HCA Survey Programme WG Letter 1/05

UKHO SURVEY PRIORITIES – 2004

ANTARCTIC PENINSULA AND SOUTH SHETLANDS

CHART BRANCH REQUIREMENTS							GEODETIC & PHOTOGRAMMETRIC REQUIREMENTS			
UKHO Priority	Survey & Requirements	HI	Scale	Estimated Duration	Survey History	Comments	Local Priority	Approximate Location	Geodetic Remarks	Photogrammetric Remarks
1	Dundee Island to Williwaw Rocks Ship, boats, helo	790	1:50,000	c. 187 sqM 24 Days	Not previously surveyed. Adjoins 1994/95 survey of south approaches to Antarctic Sound.	Originally issued as HI 583, and partially completed (HI 538a, b) in 1994 -96. Reissued as HI 790 (Dundee Island to Williwaw Rocks). Paulet Island regularly visited by cruise ships having transited Antarctic Sound 21 visits and 1916 PAX landed in 2002/2003). Outside 200m line by ship, inside by SMB. Survey can be extended south and east if time allows. To be included in INT chart 9154 (BA 225).	1	Paulet Island 63° 35S, 55° 50W BA225	Stations 8301, 8303, 8306, 8307, 8318, 8319, 8322 on ITRF94 datum. From HI790. Underlined on Paulet Island itself. Should be sufficient control for the surveys.	Complete photography
2	Jagged Island to Duchaylard Island Ship, boats, helo	1014	1:50,000		Not previously surveyed. Adjoins 1984 survey of Granddier Channel and 1986 survey of Pendleton Strait.	Previously issued as HI 540. Continuation of the western inshore route. Long standing request from BAS. See also Mutton Point and Prospect Point. For inclusion in INT charts 9107 & 9159 to be produced by UK.	2	65° 59S, 65° 40W to 65° 42S, 65° 05W	Stations 8405, 8406, 8407 on Approx WGS84 datum. Will need re-occupying to obtain accurate coordinates.	Covered by photoplot PG2261 Gap in imagery coverage filled by 2002/03 season by BAS photography? (awaiting delivery from BAS)
3	Point Wild and Cape Valentine Boats and helo	1098	1:25,000	c.10 sqM 10 Days	Not previously surveyed	Increasing cruise visits with particular interest in Point Wild and the association with Shackleton. 20 ship calls with 1992 visitors during the 2002/03 season	3	61°06S, 54°50W & 61°06S, 54°40W	No Stations Establish new stations.	Covered by photography, indexed as 2151/1737 March 2000
4	Penguin Island to Cape Melville Boats and helo	1101	1:25,000	80sqM	Not previously surveyed	Increasing cruise visits with particular interest in Penguin Island. 14 ship calls with 1262 visitors during the 2002/03 season	4	62°07S, 57°57W	No Stations Establish new stations	Covered by photography, indexed as 432/1737 Dec 1956
5	Prospect Point Boats, helo	1015	1:25,000	2.5 sqM 5 days	1957 survey by RRS Shackleton.	BAS requirement for anchorages. Could be undertaken in conjunction with Jagged Rocks to Cape Garcia. See also Mutton Cove. Significant cruise ship activity (5 visits and 377 PAX landed in 2002/2003).	5	66° 05S, 65° 20W BA3573, plan 3213	Stations 8405, 8406, 8407 on Approx WGS84 datum. Will need re-occupying to obtain accurate coordinates.	Complete photography PG2261
6	Southern part of Prince Gustav Channel Ship, boat, helo	980	1:50,000	150 sqM	Not previously surveyed	To provide a corridor through the recently opened channel for inclusion on INT 9153(227). Increased cruise ship activity now that the ice shelf has disappeared.	6	64° 15S, 58° 30W	Stations 8313, 8353 on ITRF94 datum. At extreme ends of channel. Should be sufficient control.	Prince Gustav Ice Shelf & numerous Glaciers around James Ross Is. New runs of photography could be useful in ascertaining current extents. Last photoplot PG2051 (1991)

7	Matha Strait Ship, boats, helo	981	1:50,000	320 sqM 38 days	Unsurveyed by RN. Adjoins 1986 survey of inner route to NE.	Continuation of inner route surveys to provide safe passage into Crystal Sound from open sea. For inclusion on INT chart 9160 to be produced by UK.	7	66° 30S ,67° 40W	Stations 8408, 8409, 8410 on Approx WGS84 datum. Will need re- occupying to obtain accurate coordinates. Additional stations may also be required.	Complete photography Covered by PG2275
8	Ardley Cove Boats and helo	1099	1:15,000	7sqM	No RN survey	Existing coverage sourced from Russian and Uruguayan charts 1976 – 1991. Cove contains Russian, Chinese, Chilean and Uruguayan bases. 563 Cruise visitors during 2002/03 season.	8	62°12S, 58°55W	No Stations Establish new stations	Covered by photography, indexed as 1845/1737 March 1989 and 432/1737 Dec 1956
9	Erebus & Terror Gulf to Admiralty Sound and Snow Hill Island Ship, boats, helo	998	1:50,000	100 sqM 20 days	Not previously surveyed	Issued as HI 998 (60% complete). Continuation of safe navigation corridor around James Ross Island. Includes Cape Gage, which has been visited by cruise vessels. Need to liase with Argentine HO to avoid duplication of work (close to Marambio base). For inclusion on INT chart 9153 (BA 227). Snow Hill Island had 7 cruise ship visits and 516 PAX landed in 2002/2003.	9	Large area round 63° 45S ,56° 45W	Stations 8309, 8311, 8317, 8320, 8354 on ITRF datum. Should be sufficient control from 2001/2 season.	Small gap in photography at head of Coley Glacier (James Ross island) See PG2052. New run of photography to ascertain extent of glacier would be of use.
10	Corridor East of Snow Hill Island Ship, boats, helo	tbi	1:50,000		Not previously surveyed	Mostly deep water to be included on INT 9154(225) and INT 9153(227). To produce an alternative corridor to pass East of Snow Hill Island connecting the southern part of Prince Gustav channel to the northern section of HI998.	10	64° 30S, 57° 0W	Station 8354 ITRF94. Additional stations likely to be required.	Small gap in photography on west coast of Snow Hill Island. New run up west coast could be of use. See PG2051
11	Gerlache Strait Northeastern part. Ship, boat, helo	tbi	1:50,000		Not previously surveyed	To continue the existing corridor (HI984) NE, to extend as far as Orleans Strait. Part of the western inshore route. Regular cruise ship activity on passage to the main tourist sites.	11			
12	Yankee Harbour and approaches Ship, boats and helo	1100	1:10,000 & 1:15,000	2sqM	Surveyed in 1935 with additions from Argentine and Chilean charts of 1953 – 1957	To add safe surveyed bay for tourist vessels. 16 ship calls and 2175 visitors in 2002/03 season	12	62°32S, 59°47W	No Stations Establish new stations	Covered by photography, indexed as 432/1737 Dec 1956
13	Horseshoe Island to Millerand Island Ship, boat, helo	1017	1:50,000	90 sqM	Not previously surveyed	To complete survey area from Rothera to Neny Island and to connect up with 1972 survey north of Millerand Island. Tourist activity. To be included on INT 9163.	13	67° 50S, 67° 10W to 68° 10S ,67° 10W	Stations 8520, 8521, 8522, 8523 on Approx WGS84 datum. Will need re-occupying to obtain accurate coordinates.	Complete coverage. See PG2104, PG2105, PG2165
14	Emperor Island to Faure Island Ship, boat, helo	tbi	1:50,000	300 sqM 35 days	Not previously surveyed. Adjoins 1963 survey to north, 1966 survey to east and 1973/74 survey to south.	To survey shoals and islands. For inclusion on INT chart 9163 to be produced by UK. To be surveyed in 3 blocks, starting with the eastern block.	14	68° 00S, 68° 45W	Stations 8500, 8510 on ITRF94 datum. More stations may be required.	Possible gaps in photography over isolated rocks. Covered by PG2166 Photog: 2108 (Emperor), 2109 & 2074 (Faure).

15	North Neumayer Channel Ship, boats, helo	837	1:75,000	20 sqM	Not previously surveyed	To join up the surveyed areas for INT 9158(446) Issued as HI837. Significant cruise ship activity. One of the routes used to transit Port Lockroy (79 visits and 6928 PAX landed in 2002/2003).	15	64° 45S, 62° 20W BA3570	Station 8329 on ITRF94 datum. More stations may be required.	Complete photography
16	Detaille Island and approaches Ship, boats, helo	tbi	1:10,000 1:50,000	a. 1 sqM 4 days b. 52 sqM 10 days	1956 sketch survey of Detaille Island. Approaches between Matha Strait and the Island are unsurveyed.	BAS requirement for anchorage and safe approach. 7 ship calls and 858 visitors in 2002/03 season.	16	66° 52S, 65° 50W	Stations 8408, 8409, 8410 on Approx WGS84 datum. Will need re-occupying to obtain accurate coordinates.	Complete photography at medium scale (1:20 000). New run down west coast (Wilkinson Glacier & Field Glacier) to ascertain extent of ice coastline.
17	Mutton Cove Boats, helo	tbi	1:10,000	1 sqM 4 days	1936 sketch survey by research yacht.	Large scale chart requirement for anchorages. Could be undertaken in conjunction with Jagged Rocks to Cape Garcia. See also Prospect Point.	17	66° 00S, 65° 40, BA3573 plan 3213	Stations 8405, 8406, 8407 on Approx WGS84 datum. Will need re-occupying to obtain accurate coordinates.	Complete photography PG2261
18	Islands around Penola Strait Ship, boats, helo	tbi	1:50,000	18 sqM 10 days	Partly surveyed in 1958 at 1:50000, with line spacing of 500m.	Petermann, Hovgaard and Pleneau Islands are visited by cruise vessels. For inclusion on UK produced INT chart 9106 (BA 3575). Petermann Island had 66 cruise ship visits and 6311 PAX landed in 2002/2003.	18	65° 15S, 64° 10W BA3575, BA3573 (top)	No stations in the vicinity. Will need to establish all that are necessary.	PG2103 – no indication on plot of photo limits Photography: 836, 1044, 1911, 1912, 1913, 1928 Photography appears complete. Area last plotted using imagery dated 1991.

UKHO SURVEY PRIORITIES – 2004

SOUTH ORKNEY ISLANDS

CHART BRANCH REQUIREMENTS							GEODETIC & PHOTOGRAMMETRIC REQUIREMENTS		
UKHO Priority	Survey & Requirements	HI	Scale	Estimated Duration	Survey History	Comments	Local Priority	Geodetic Remarks	Photogrammetric Remarks
1	Washington Strait Ship, boats, helo	907	1:75,000	16 sqM 7 days	Limited survey 1933	To provide safe routes between Powell and Laurie Islands. To commence from south.	1	No data available. New stations will need to be established.	Complete photography
2	Marshall Bay Boat, helo	979	1:25,000	4.5 sqM	Surveyed in 1964-66	New chart INT 9141(1779) Tourist activity.	2	No data available. New stations will need to be established.	Complete photography
3	Norway Bight Ship, boats, helo	tbi	1:25,000	15 sqM	Not previously surveyed	New chart INT 9141(1779) Tourist activity	3	Station 6771 on WGS84 datum. More stations likely to be required.	Complete photography
4	Western approaches to Coronation Island Ship, boats, helo	tbi	1:75,000	234 sqM 28 days	Limited survey 1933. Adjoins 1965/66 surveys to SE.	Includes several PA and reported depths. Several seasons work commencing in SE.	4	No data available. New stations will need to be established.	No coverage over Inaccessible Is. Also Lay-Brother Rk. And Despair Rks.
5	Signy Island (West coast) Boat, helo	tbi	1:25,000	7.5 sqM	Not previously surveyed	New chart INT 9141(1779). Moe Island is an SPA.	5	No data available. New stations will need to be established.	Complete photography
6									
7									
8									
9									
10									
11									
12									
13									
14									
15									

AUSTRALIAN ANTARCTIC DIVISION SURVEY PRIORITIES – 2004

CHARTING REQUIREMENTS						GEODETIC & PHOTOGRAMMETRIC REQUIREMENTS			
UKHO Priority	Survey & Requirements	Scale	Estimated Duration	Survey History	Comments	Local Priority	Approximate Location	Geodetic Remarks	Photogrammetric Remarks
1	Heard Island	1:50,000		Survey of Atlas Roads Remainder coast unsurveyed.		3	52°45' to 53°30'S 73°00' to 74° 10'E	GPS base station and adequate local control.	Partial photographic and satellite image coverage for eastern side island. Inadequate on west coast.
2	Macquarie Island			Buckles Bay and Hasselborough Bay have been surveyed. Remainder coast inadequately surveyed.	Northern and southern approaches to island are inadequately surveyed.	5	54°15' to 55°0'S 158° 40' to 159°10' E	GPS base station and adequate local control.	Partial photographic and satellite image coverage.
3	Commonwealth Bay	1:25,000		Coast has been mapped from high resolution imagery. Suspect many shoals in anchorage and approaches. Minor survey undertaken in 2000.		6	66° 56' to 67° 01'S 142° 32' to 142°41' E	No survey control	High resolution satellite image coverage
4	Casey	1:25,000		Ship approaches surveyed.		7	110° 05' to 110° 40' S 66° 15' to 66° 27'E	GPS base station and adequate local control.	Complete coverage aerial photography and area mapped at scale 1:25000
5	Davis	1:25,000		Ship approaches surveyed.		5	68°32' to 68° 37' S 77°42' to 78° 01'E	GPS base station and adequate local control.	Complete coverage aerial photography and area mapped at scale 1:25000.
6	Mawson	1:25000		Main ship approach surveyed. Alternative routes required.		2	67° 22' to 67° 38' S 62° 35' to 62° 56' E	GPS base station and adequate local control.	Complete coverage aerial photography and area mapped at scale 1:25000.
7	Larsemann Hills	1:25000		Unsurveyed.		1	69° to 69° 24' S 72° 55' to 76° 40'E	Chinese GPS base station and adequate local control.	Complete coverage aerial photography and area mapped at scale 1:25000.

